

Cbc
2.8

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Contents

1	Class Index	1
1.1	Class Hierarchy	1
2	Class Index	7
2.1	Class List	7
3	File Index	14
3.1	File List	14
4	Class Documentation	17
4.1	ampl_info Struct Reference	17
4.1.1	Detailed Description	17
4.2	CbcGenCtlBlk::babState_struct Struct Reference	18
4.2.1	Detailed Description	18
4.3	CbcBaseModel Class Reference	18
4.3.1	Detailed Description	18
4.4	CbcBranchAllDifferent Class Reference	18
4.4.1	Detailed Description	20
4.4.2	Member Data Documentation	20
4.5	CbcBranchCut Class Reference	21
4.5.1	Detailed Description	23
4.5.2	Member Function Documentation	23
4.6	CbcBranchDecision Class Reference	25
4.6.1	Detailed Description	27
4.6.2	Member Function Documentation	27
4.7	CbcBranchDefaultDecision Class Reference	28
4.7.1	Detailed Description	29
4.7.2	Member Function Documentation	30
4.8	CbcBranchDynamicDecision Class Reference	31
4.8.1	Detailed Description	32
4.8.2	Member Function Documentation	32

4.9	CbcBranchingObject Class Reference	33
4.9.1	Detailed Description	37
4.9.2	Member Function Documentation	38
4.9.3	Member Data Documentation	41
4.10	CbcBranchToFixLots Class Reference	42
4.10.1	Detailed Description	44
4.10.2	Constructor & Destructor Documentation	45
4.10.3	Member Data Documentation	45
4.11	CbcCbcParam Class Reference	45
4.11.1	Detailed Description	47
4.11.2	Member Enumeration Documentation	47
4.11.3	Constructor & Destructor Documentation	48
4.12	CbcClique Class Reference	49
4.12.1	Detailed Description	52
4.12.2	Constructor & Destructor Documentation	52
4.12.3	Member Function Documentation	53
4.12.4	Member Data Documentation	53
4.13	CbcCliqueBranchingObject Class Reference	54
4.13.1	Detailed Description	56
4.13.2	Member Function Documentation	56
4.14	CbcCompare Class Reference	57
4.14.1	Detailed Description	57
4.15	CbcCompareBase Class Reference	58
4.15.1	Detailed Description	59
4.15.2	Member Function Documentation	59
4.16	CbcCompareDefault Class Reference	60
4.16.1	Detailed Description	63
4.17	CbcCompareDepth Class Reference	63
4.17.1	Detailed Description	64
4.18	CbcCompareEstimate Class Reference	65
4.18.1	Detailed Description	66

4.19 CbcCompareObjective Class Reference	66
4.19.1 Detailed Description	67
4.20 CbcConsequence Class Reference	67
4.20.1 Detailed Description	68
4.20.2 Member Function Documentation	69
4.21 CbcCountRowCut Class Reference	69
4.21.1 Detailed Description	70
4.21.2 Constructor & Destructor Documentation	71
4.21.3 Member Function Documentation	71
4.22 CbcCutBranchingObject Class Reference	71
4.22.1 Detailed Description	74
4.22.2 Constructor & Destructor Documentation	74
4.22.3 Member Function Documentation	74
4.23 CbcCutGenerator Class Reference	75
4.23.1 Detailed Description	80
4.23.2 Member Function Documentation	81
4.24 CbcCutModifier Class Reference	82
4.24.1 Detailed Description	83
4.25 CbcCutSubsetModifier Class Reference	83
4.25.1 Detailed Description	85
4.26 CbcDummyBranchingObject Class Reference	85
4.26.1 Detailed Description	87
4.26.2 Member Function Documentation	87
4.27 CbcDynamicPseudoCostBranchingObject Class Reference	88
4.27.1 Detailed Description	90
4.27.2 Constructor & Destructor Documentation	91
4.27.3 Member Function Documentation	91
4.28 CbcEventHandler Class Reference	92
4.28.1 Detailed Description	94
4.28.2 Member Enumeration Documentation	94
4.28.3 Constructor & Destructor Documentation	95

4.28.4	Member Function Documentation	96
4.29	CbcFathom Class Reference	97
4.29.1	Detailed Description	98
4.29.2	Member Function Documentation	98
4.30	CbcFathomDynamicProgramming Class Reference	99
4.30.1	Detailed Description	102
4.30.2	Member Function Documentation	102
4.31	CbcFeasibilityBase Class Reference	102
4.31.1	Detailed Description	103
4.32	CbcFixingBranchingObject Class Reference	103
4.32.1	Detailed Description	105
4.32.2	Member Function Documentation	105
4.33	CbcFixVariable Class Reference	105
4.33.1	Detailed Description	107
4.33.2	Member Function Documentation	107
4.34	CbcFollowOn Class Reference	108
4.34.1	Detailed Description	110
4.35	CbcFullNodeInfo Class Reference	110
4.35.1	Detailed Description	112
4.35.2	Member Function Documentation	113
4.35.3	Member Data Documentation	114
4.36	CbcGenCtlBlk Class Reference	115
4.36.1	Detailed Description	123
4.36.2	Member Enumeration Documentation	123
4.36.3	Member Function Documentation	126
4.36.4	Member Data Documentation	133
4.37	CbcGeneral Class Reference	137
4.37.1	Detailed Description	138
4.38	CbcGenParam Class Reference	138
4.38.1	Detailed Description	141
4.38.2	Member Enumeration Documentation	141

4.38.3	Constructor & Destructor Documentation	141
4.39	CbcHeuristic Class Reference	142
4.39.1	Detailed Description	149
4.39.2	Member Function Documentation	149
4.39.3	Member Data Documentation	150
4.40	CbcHeuristicCrossover Class Reference	151
4.40.1	Detailed Description	153
4.40.2	Member Function Documentation	153
4.41	CbcHeuristicDINS Class Reference	154
4.41.1	Detailed Description	156
4.41.2	Member Function Documentation	156
4.42	CbcHeuristicDive Class Reference	156
4.42.1	Detailed Description	160
4.42.2	Member Function Documentation	160
4.43	CbcHeuristicDiveCoefficient Class Reference	160
4.43.1	Detailed Description	162
4.43.2	Member Function Documentation	162
4.44	CbcHeuristicDiveFractional Class Reference	162
4.44.1	Detailed Description	164
4.44.2	Member Function Documentation	164
4.45	CbcHeuristicDiveGuided Class Reference	164
4.45.1	Detailed Description	166
4.45.2	Member Function Documentation	166
4.46	CbcHeuristicDiveLineSearch Class Reference	166
4.46.1	Detailed Description	168
4.46.2	Member Function Documentation	168
4.47	CbcHeuristicDivePseudoCost Class Reference	168
4.47.1	Detailed Description	170
4.47.2	Member Function Documentation	170
4.48	CbcHeuristicDiveVectorLength Class Reference	171
4.48.1	Detailed Description	172

4.48.2	Member Function Documentation	172
4.49	CbcHeuristicDynamic3 Class Reference	172
4.49.1	Detailed Description	174
4.49.2	Member Function Documentation	174
4.50	CbcHeuristicFPump Class Reference	174
4.50.1	Detailed Description	179
4.50.2	Member Function Documentation	180
4.50.3	Member Data Documentation	181
4.51	CbcHeuristicGreedyCover Class Reference	181
4.51.1	Detailed Description	183
4.51.2	Member Function Documentation	183
4.52	CbcHeuristicGreedyEquality Class Reference	184
4.52.1	Detailed Description	185
4.52.2	Member Function Documentation	185
4.53	CbcHeuristicGreedySOS Class Reference	186
4.53.1	Detailed Description	188
4.53.2	Member Function Documentation	188
4.54	CbcHeuristicJustOne Class Reference	188
4.54.1	Detailed Description	190
4.54.2	Member Function Documentation	190
4.55	CbcHeuristicLocal Class Reference	191
4.55.1	Detailed Description	193
4.55.2	Member Function Documentation	193
4.56	CbcHeuristicNaive Class Reference	193
4.56.1	Detailed Description	195
4.56.2	Member Function Documentation	195
4.57	CbcHeuristicNode Class Reference	196
4.57.1	Detailed Description	196
4.58	CbcHeuristicNodeList Class Reference	197
4.58.1	Detailed Description	197
4.59	CbcHeuristicPartial Class Reference	197

4.59.1 Detailed Description	199
4.60 CbcHeuristicPivotAndFix Class Reference	199
4.60.1 Detailed Description	201
4.60.2 Member Function Documentation	201
4.61 CbcHeuristicProximity Class Reference	202
4.61.1 Detailed Description	203
4.61.2 Member Function Documentation	203
4.62 CbcHeuristicRandRound Class Reference	204
4.62.1 Detailed Description	205
4.62.2 Member Function Documentation	205
4.63 CbcHeuristicRENS Class Reference	205
4.63.1 Detailed Description	207
4.63.2 Member Function Documentation	207
4.64 CbcHeuristicRINS Class Reference	208
4.64.1 Detailed Description	210
4.64.2 Member Function Documentation	210
4.65 CbcHeuristicVND Class Reference	210
4.65.1 Detailed Description	213
4.65.2 Member Function Documentation	213
4.66 CbcIdiotBranch Class Reference	213
4.66.1 Detailed Description	215
4.67 CbcIntegerBranchingObject Class Reference	216
4.67.1 Detailed Description	219
4.67.2 Constructor & Destructor Documentation	219
4.67.3 Member Function Documentation	220
4.68 CbcIntegerPseudoCostBranchingObject Class Reference	221
4.68.1 Detailed Description	223
4.68.2 Constructor & Destructor Documentation	224
4.68.3 Member Function Documentation	224
4.69 CbcLongCliqueBranchingObject Class Reference	225
4.69.1 Detailed Description	227

4.69.2	Member Function Documentation	227
4.70	CbcLotsize Class Reference	227
4.70.1	Detailed Description	230
4.70.2	Member Function Documentation	230
4.71	CbcLotsizeBranchingObject Class Reference	231
4.71.1	Detailed Description	234
4.71.2	Constructor & Destructor Documentation	234
4.71.3	Member Function Documentation	234
4.72	CbcMessage Class Reference	235
4.72.1	Detailed Description	235
4.73	CbcModel Class Reference	235
4.73.1	Detailed Description	264
4.73.2	Member Enumeration Documentation	265
4.73.3	Constructor & Destructor Documentation	267
4.73.4	Member Function Documentation	267
4.74	CbcNode Class Reference	282
4.74.1	Detailed Description	286
4.74.2	Member Function Documentation	286
4.75	CbcNodeInfo Class Reference	289
4.75.1	Detailed Description	294
4.75.2	Constructor & Destructor Documentation	294
4.75.3	Member Function Documentation	295
4.75.4	Member Data Documentation	296
4.76	CbcNWay Class Reference	297
4.76.1	Detailed Description	299
4.77	CbcNWayBranchingObject Class Reference	300
4.77.1	Detailed Description	301
4.77.2	Constructor & Destructor Documentation	302
4.77.3	Member Function Documentation	302
4.78	CbcObject Class Reference	303
4.78.1	Detailed Description	306

4.78.2	Member Function Documentation	307
4.78.3	Member Data Documentation	310
4.79	CbcObjectUpdateData Class Reference	310
4.79.1	Detailed Description	312
4.79.2	Member Data Documentation	312
4.80	CbcOsiParam Class Reference	312
4.80.1	Detailed Description	314
4.80.2	Member Enumeration Documentation	314
4.80.3	Constructor & Destructor Documentation	314
4.81	CbcOsiSolver Class Reference	315
4.81.1	Detailed Description	317
4.82	CbcParam Class Reference	317
4.82.1	Detailed Description	321
4.83	CbcGenCtlBlk::cbcParamsInfo_struct Struct Reference	322
4.83.1	Detailed Description	322
4.84	CbcPartialNodeInfo Class Reference	322
4.84.1	Detailed Description	324
4.84.2	Member Function Documentation	324
4.85	CbcRounding Class Reference	325
4.85.1	Detailed Description	326
4.86	CbcRowCuts Class Reference	327
4.86.1	Detailed Description	327
4.87	CbcSerendipity Class Reference	327
4.87.1	Detailed Description	329
4.87.2	Member Function Documentation	329
4.88	CbcSimpleInteger Class Reference	329
4.88.1	Detailed Description	332
4.88.2	Member Function Documentation	332
4.88.3	Member Data Documentation	334
4.89	CbcSimpleIntegerDynamicPseudoCost Class Reference	334
4.89.1	Detailed Description	342

4.89.2	Member Function Documentation	342
4.89.3	Member Data Documentation	343
4.90	CbcSimpleIntegerPseudoCost Class Reference	343
4.90.1	Detailed Description	346
4.90.2	Member Data Documentation	346
4.91	CbcSolver Class Reference	346
4.91.1	Detailed Description	350
4.91.2	Member Function Documentation	350
4.92	CbcSolverUsefulData Struct Reference	351
4.92.1	Detailed Description	351
4.93	CbcSOS Class Reference	351
4.93.1	Detailed Description	354
4.93.2	Constructor & Destructor Documentation	355
4.93.3	Member Function Documentation	355
4.94	CbcSOSBranchingObject Class Reference	355
4.94.1	Detailed Description	357
4.94.2	Member Function Documentation	357
4.95	CbcStatistics Class Reference	359
4.95.1	Detailed Description	360
4.96	CbcStopNow Class Reference	360
4.96.1	Detailed Description	360
4.96.2	Member Function Documentation	361
4.97	CbcStrategy Class Reference	361
4.97.1	Detailed Description	363
4.97.2	Member Function Documentation	364
4.98	CbcStrategyDefault Class Reference	364
4.98.1	Detailed Description	366
4.99	CbcStrategyDefaultSubTree Class Reference	366
4.99.1	Detailed Description	368
4.100	CbcStrategyNull Class Reference	368
4.100.1	Detailed Description	369

4.101CbcStrongInfo Struct Reference	370
4.101.1 Detailed Description	370
4.102CbcThread Class Reference	371
4.102.1 Detailed Description	371
4.103CbcTree Class Reference	371
4.103.1 Detailed Description	375
4.103.2 Member Function Documentation	376
4.104CbcTreeLocal Class Reference	377
4.104.1 Detailed Description	379
4.105CbcTreeVariable Class Reference	379
4.105.1 Detailed Description	381
4.106CbcUser Class Reference	381
4.106.1 Detailed Description	383
4.106.2 Member Function Documentation	383
4.107CglTemporary Class Reference	384
4.107.1 Detailed Description	385
4.107.2 Member Function Documentation	385
4.108CbcGenCtlBlk::chooseStrongCtl_struct Struct Reference	385
4.108.1 Detailed Description	385
4.109ClpAmplObjective Class Reference	386
4.109.1 Detailed Description	387
4.109.2 Member Function Documentation	387
4.110ClpConstraintAmpl Class Reference	388
4.110.1 Detailed Description	390
4.110.2 Member Function Documentation	390
4.111CoinHashLink Struct Reference	391
4.111.1 Detailed Description	391
4.112CbcGenCtlBlk::debugSolInfo_struct Struct Reference	391
4.112.1 Detailed Description	391
4.113CbcGenCtlBlk::djFixCtl_struct Struct Reference	391
4.113.1 Detailed Description	392

4.114CbcGenCtlBlk::genParamsInfo_struct Struct Reference	392
4.114.1 Detailed Description	392
4.115OsiBiLinear Class Reference	392
4.115.1 Detailed Description	398
4.115.2 Member Function Documentation	398
4.115.3 Member Data Documentation	399
4.116OsiBiLinearBranchingObject Class Reference	399
4.116.1 Detailed Description	400
4.117OsiBiLinearEquality Class Reference	400
4.117.1 Detailed Description	401
4.118OsiCbcSolverInterface Class Reference	402
4.118.1 Detailed Description	413
4.118.2 Member Function Documentation	413
4.118.3 Friends And Related Function Documentation	422
4.119OsiChooseStrongSubset Class Reference	422
4.119.1 Detailed Description	423
4.119.2 Member Function Documentation	424
4.120OsiLink Class Reference	424
4.120.1 Detailed Description	426
4.120.2 Constructor & Destructor Documentation	426
4.120.3 Member Function Documentation	426
4.121OsiLinkBranchingObject Class Reference	427
4.121.1 Detailed Description	427
4.122OsiLinkedBound Class Reference	428
4.122.1 Detailed Description	429
4.123OsiOldLink Class Reference	429
4.123.1 Detailed Description	430
4.123.2 Constructor & Destructor Documentation	430
4.123.3 Member Function Documentation	431
4.124OsiOldLinkBranchingObject Class Reference	431
4.124.1 Detailed Description	432

4.125	OsiOneLink Class Reference	432
4.125.1	Detailed Description	434
4.125.2	Constructor & Destructor Documentation	434
4.125.3	Member Data Documentation	434
4.126	CbcGenCtBlk::osiParamsInfo_struct Struct Reference	434
4.126.1	Detailed Description	434
4.127	OsiSimpleFixedInteger Class Reference	435
4.127.1	Detailed Description	436
4.127.2	Member Function Documentation	436
4.128	OsiSolverLinearizedQuadratic Class Reference	436
4.128.1	Detailed Description	438
4.129	OsiSolverLink Class Reference	438
4.129.1	Detailed Description	444
4.129.2	Constructor & Destructor Documentation	444
4.129.3	Member Function Documentation	444
4.130	OsiUsesBiLinear Class Reference	445
4.130.1	Detailed Description	447
4.130.2	Member Function Documentation	447
4.131	PseudoReducedCost Struct Reference	448
4.131.1	Detailed Description	448
5	File Documentation	448
5.1	CbcEventHandler.hpp File Reference	448
5.1.1	Detailed Description	449
5.2	CbcGenMessages.hpp File Reference	450
5.2.1	Detailed Description	450
5.2.2	Enumeration Type Documentation	451
5.3	CbcSolver.hpp File Reference	451
5.3.1	Detailed Description	452
5.4	CbcSolverAnalyze.hpp File Reference	452
5.4.1	Detailed Description	452

5.5	CbcSolverExpandKnapsack.hpp File Reference	452
5.5.1	Detailed Description	452
5.6	CbcSolverHeuristics.hpp File Reference	453
5.6.1	Detailed Description	453

1 Class Index

1.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

ampl_info	17
CbcGenCtIBlk::babState_struct	18
std::basic_fstream< char >	
std::basic_fstream< wchar_t >	
std::basic_ifstream< char >	
std::basic_ifstream< wchar_t >	
std::basic_ios< char >	
std::basic_ios< wchar_t >	
std::basic_iostream< char >	
std::basic_iostream< wchar_t >	
std::basic_istream< char >	
std::basic_istream< wchar_t >	
std::basic_istreamstream< char >	
std::basic_istreamstream< wchar_t >	
std::basic_ofstream< char >	
std::basic_ofstream< wchar_t >	
std::basic_ostream< char >	
std::basic_ostream< wchar_t >	
std::basic_ostringstream< char >	
std::basic_ostringstream< wchar_t >	
std::basic_string< char >	
std::basic_string< wchar_t >	
std::basic_stringstream< char >	
std::basic_stringstream< wchar_t >	
CbcBaseModel	18
CbcBranchDecision	25
CbcBranchDefaultDecision	28

CbcBranchDynamicDecision	31
CbcBranchingObject	33
CbcCliqueBranchingObject	54
CbcCutBranchingObject	71
CbcDummyBranchingObject	85
CbcFixingBranchingObject	103
CbcIntegerBranchingObject	216
CbcDynamicPseudoCostBranchingObject	88
CbcIntegerPseudoCostBranchingObject	221
CbcLongCliqueBranchingObject	225
CbcLotsizeBranchingObject	231
CbcNWayBranchingObject	300
CbcSOSBranchingObject	355
CbcCbcParam	45
CbcCompare	57
CbcCompareBase	58
CbcCompareDefault	60
CbcCompareDepth	63
CbcCompareEstimate	65
CbcCompareObjective	66
CbcConsequence	67
CbcFixVariable	105
CbcCountRowCut	69
CbcCutGenerator	75
CbcCutModifier	82

CbcCutSubsetModifier	83
CbcEventHandler	92
CbcFathom	97
CbcFathomDynamicProgramming	99
CbcFeasibilityBase	102
CbcGenCtlBlk	115
CbcGenParam	138
CbcHeuristic	142
CbcHeuristicCrossover	151
CbcHeuristicDINS	154
CbcHeuristicDive	156
CbcHeuristicDiveCoefficient	160
CbcHeuristicDiveFractional	162
CbcHeuristicDiveGuided	164
CbcHeuristicDiveLineSearch	166
CbcHeuristicDivePseudoCost	168
CbcHeuristicDiveVectorLength	171
CbcHeuristicDynamic3	172
CbcHeuristicFPump	174
CbcHeuristicGreedyCover	181
CbcHeuristicGreedyEquality	184
CbcHeuristicGreedySOS	186
CbcHeuristicJustOne	188
CbcHeuristicLocal	191
CbcHeuristicNaive	193

CbcHeuristicPartial	197
CbcHeuristicPivotAndFix	199
CbcHeuristicProximity	202
CbcHeuristicRandRound	204
CbcHeuristicRENS	205
CbcHeuristicRINS	208
CbcHeuristicVND	210
CbcRounding	325
CbcSerendipity	327
CbcHeuristicNode	196
CbcHeuristicNodeList	197
CbcMessage	235
CbcModel	235
CbcNode	282
CbcNodeInfo	289
CbcFullNodeInfo	110
CbcPartialNodeInfo	322
CbcObject	303
CbcBranchCut	21
CbcBranchAllDifferent	18
CbcBranchToFixLots	42
CbcClique	49
CbcFollowOn	108
CbcGeneral	137
CbcIdiotBranch	213

CbcLotsize	227
CbcNWay	297
CbcSimpleInteger	329
CbcSimpleIntegerDynamicPseudoCost	334
CbcSimpleIntegerPseudoCost	343
CbcSOS	351
CbcObjectUpdateData	310
CbcOsiParam	312
CbcOsiSolver	315
OsiSolverLink	438
CbcParam	317
CbcGenCtIBlk::cbcParamsInfo_struct	322
CbcRowCuts	327
CbcSolver	346
CbcSolverUsefulData	351
CbcStatistics	359
CbcStopNow	360
CbcStrategy	361
CbcStrategyDefault	364
CbcStrategyDefaultSubTree	366
CbcStrategyNull	368
CbcStrongInfo	370
CbcThread	371
CbcTree	371
CbcTreeLocal	377

CbcTreeVariable	379
CbcUser	381
CglTemporary	384
CbcGenCtIBlk::chooseStrongCtl_struct	385
ClpAmplObjective	386
ClpConstraintAmpl	388
CoinHashLink	391
CbcGenCtIBlk::debugSolInfo_struct	391
CbcGenCtIBlk::djFixCtl_struct	391
CbcGenCtIBlk::genParamsInfo_struct	392
OsiBiLinear	392
OsiBiLinearEquality	400
OsiBiLinearBranchingObject	399
OsiCbcSolverInterface	402
OsiChooseStrongSubset	422
OsiLink	424
OsiLinkBranchingObject	427
OsiLinkedBound	428
OsiOldLink	429
OsiOldLinkBranchingObject	431
OsiOneLink	432
CbcGenCtIBlk::osiParamsInfo_struct	434
OsiSimpleFixedInteger	435
OsiSolverLinearizedQuadratic	436
OsiUsesBiLinear	445

PseudoReducedCost [448](#)

2 Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

ampl_info	17
CbcGenCtIBlk::babState_struct (State of branch-and-cut)	18
CbcBaseModel (Base model)	18
CbcBranchAllDifferent (Define a branch class that branches so that it is only satisfied if all members have different values So cut is $x \leq y-1$ or $x \geq y+1$)	18
CbcBranchCut (Define a cut branching class)	21
CbcBranchDecision	25
CbcBranchDefaultDecision (Branching decision default class)	28
CbcBranchDynamicDecision (Branching decision dynamic class)	31
CbcBranchingObject (Abstract branching object base class Now just difference with OsiBranchingObject)	33
CbcBranchToFixLots (Define a branch class that branches so that one way variables are fixed while the other way cuts off that solution)	42
CbcCbcParam (Class for control parameters that act on a CbcModel object)	45
CbcClique (Branching object for cliques)	49
CbcCliqueBranchingObject (Branching object for unordered cliques)	54
CbcCompare	57
CbcCompareBase	58
CbcCompareDefault	60
CbcCompareDepth	63

CbcCompareEstimate	65
CbcCompareObjective	66
CbcConsequence (Abstract base class for consequent bounds)	67
CbcCountRowCut (OsiRowCut augmented with bookkeeping)	69
CbcCutBranchingObject (Cut branching object)	71
CbcCutGenerator (Interface between Cbc and Cut Generation Library)	75
CbcCutModifier (Abstract cut modifier base class)	82
CbcCutSubsetModifier (Simple cut modifier base class)	83
CbcDummyBranchingObject (Dummy branching object)	85
CbcDynamicPseudoCostBranchingObject (Simple branching object for an integer variable with pseudo costs)	88
CbcEventHandler (Base class for Cbc event handling)	92
CbcFathom (Fathom base class)	97
CbcFathomDynamicProgramming (FathomDynamicProgramming class)	99
CbcFeasibilityBase	102
CbcFixingBranchingObject (General Branching Object class)	103
CbcFixVariable (Class for consequent bounds)	105
CbcFollowOn (Define a follow on class)	108
CbcFullNodeInfo (Information required to recreate the subproblem at this node)	110
CbcGenCtIBlk	115
CbcGeneral (Define a catch all class)	137
CbcGenParam (Class for cbc-generic control parameters)	138
CbcHeuristic (Heuristic base class)	142
CbcHeuristicCrossover (Crossover Search class)	151
CbcHeuristicDINS	154

CbcHeuristicDive (Dive class)	156
CbcHeuristicDiveCoefficient (DiveCoefficient class)	160
CbcHeuristicDiveFractional (DiveFractional class)	162
CbcHeuristicDiveGuided (DiveGuided class)	164
CbcHeuristicDiveLineSearch (DiveLineSearch class)	166
CbcHeuristicDivePseudoCost (DivePseudoCost class)	168
CbcHeuristicDiveVectorLength (DiveVectorLength class)	171
CbcHeuristicDynamic3 (Heuristic - just picks up any good solution)	172
CbcHeuristicFPump (Feasibility Pump class)	174
CbcHeuristicGreedyCover (Greedy heuristic classes)	181
CbcHeuristicGreedyEquality	184
CbcHeuristicGreedySOS (Greedy heuristic for SOS and L rows (and positive elements))	186
CbcHeuristicJustOne (Just One class - this chooses one at random)	188
CbcHeuristicLocal (LocalSearch class)	191
CbcHeuristicNaive (Naive class a) Fix all ints as close to zero as possible b) Fix all ints with nonzero costs and < large to zero c) Put bounds round continuous and UIs and maximize)	193
CbcHeuristicNode (A class describing the branching decisions that were made to get to the node where a heuristic was invoked from)	196
CbcHeuristicNodeList	197
CbcHeuristicPartial (Partial solution class If user knows a partial solution this tries to get an integer solution it uses hotstart information)	197
CbcHeuristicPivotAndFix (LocalSearch class)	199
CbcHeuristicProximity	202
CbcHeuristicRandRound (LocalSearch class)	204
CbcHeuristicRENS (LocalSearch class)	205

CbcHeuristicRINS (LocalSearch class)	208
CbcHeuristicVND (LocalSearch class)	210
CbcIdiotBranch (Define an idiotic idea class)	213
CbcIntegerBranchingObject (Simple branching object for an integer variable)	216
CbcIntegerPseudoCostBranchingObject (Simple branching object for an integer variable with pseudo costs)	221
CbcLongCliqueBranchingObject (Unordered Clique Branching Object class)	225
CbcLotsize (Lotsize class)	227
CbcLotsizeBranchingObject (Lotsize branching object)	231
CbcMessage	235
CbcModel (Simple Branch and bound class)	235
CbcNode (Information required while the node is live)	282
CbcNodeInfo (Information required to recreate the subproblem at this node)	289
CbcNWay (Define an n-way class for variables)	297
CbcNWayBranchingObject (N way branching Object class)	300
CbcObject	303
CbcObjectUpdateData	310
CbcOsiParam (Class for control parameters that act on a OsiSolverInterface object)	312
CbcOsiSolver (This is for codes where solver needs to know about CbcModel Seems to provide only one value-added feature, a CbcModel object)	315
CbcParam (Very simple class for setting parameters)	317
CbcGenCtIBlk::cbcParamsInfo_struct (Start and end of CbcModel parameters in parameter vector)	322

CbcPartialNodeInfo (Holds information for recreating a subproblem by incremental change from the parent)	322
CbcRounding (Rounding class)	325
CbcRowCuts	327
CbcSerendipity (Heuristic - just picks up any good solution found by solver - see OsiBabSolver)	327
CbcSimpleInteger (Define a single integer class)	329
CbcSimpleIntegerDynamicPseudoCost (Define a single integer class but with dynamic pseudo costs)	334
CbcSimpleIntegerPseudoCost (Define a single integer class but with pseudo costs)	343
CbcSolver (This allows the use of the standalone solver in a flexible manner)	346
CbcSolverUsefulData (Structure to hold useful arrays)	351
CbcSOS (Branching object for Special Ordered Sets of type 1 and 2)	351
CbcSOSBranchingObject (Branching object for Special ordered sets)	355
CbcStatistics (For gathering statistics)	359
CbcStopNow (Support the use of a call back class to decide whether to stop)	360
CbcStrategy (Strategy base class)	361
CbcStrategyDefault (Default class)	364
CbcStrategyDefaultSubTree (Default class for sub trees)	366
CbcStrategyNull (Null class)	368
CbcStrongInfo (Abstract base class for ‘objects’)	370
CbcThread (A class to encapsulate thread stuff)	371
CbcTree (Using MS heap implementation)	371
CbcTreeLocal	377
CbcTreeVariable	379

CbcUser (A class to allow the use of unknown user functionality)	381
CglTemporary (Stored Temporary Cut Generator Class - destroyed after first use)	384
CbcGenCtIBlk::chooseStrongCtl_struct (Control variables for a strong branching method)	385
ClpAmplObjective (Ampl Objective Class)	386
ClpConstraintAmpl (Ampl Constraint Class)	388
CoinHashLink (Really for Conflict cuts to - a) stop duplicates b) allow half baked cuts The whichRow_ field in OsiRowCut2 is used for a type 0 - normal 1 - processed cut 2 - unprocessed cut i.e)	391
CbcGenCtIBlk::debugSolInfo_struct (Array of primal variable values for debugging)	391
CbcGenCtIBlk::djFixCtl_struct (Control use of reduced cost fixing prior to B&C)	391
CbcGenCtIBlk::genParamsInfo_struct (Start and end of cbc-generic parameters in parameter vector)	392
OsiBiLinear (Define BiLinear objects)	392
OsiBiLinearBranchingObject (Branching object for BiLinear objects)	399
OsiBiLinearEquality (Define Continuous BiLinear objects for an == bound)	400
OsiCbcSolverInterface (Cbc Solver Interface)	402
OsiChooseStrongSubset (This class chooses a variable to branch on)	422
OsiLink (Define Special Linked Ordered Sets)	424
OsiLinkBranchingObject (Branching object for Linked ordered sets)	427
OsiLinkedBound (List of bounds which depend on other bounds)	428
OsiOldLink	429
OsiOldLinkBranchingObject (Branching object for Linked ordered sets)	431
OsiOneLink (Define data for one link)	432

CbcGenCtIBlk::osiParamsInfo_struct (Start and end of OsiSolverInterface parameters in parameter vector)	434
OsiSimpleFixedInteger (Define a single integer class - but one where you keep branching until fixed even if satisfied)	435
OsiSolverLinearizedQuadratic (This is to allow the user to replace initialSolve and resolve)	436
OsiSolverLink (This is to allow the user to replace initialSolve and resolve This version changes coefficients)	438
OsiUsesBiLinear (Define a single variable class which is involved with OsiBiLinear objects)	445
PseudoReducedCost	448

3 File Index

3.1 File List

Here is a list of all documented files with brief descriptions:

Cbc_ampl.h	??
Cbc_C_Interface.h	??
CbcBranchActual.hpp	??
CbcBranchAllDifferent.hpp	??
CbcBranchBase.hpp	??
CbcBranchCut.hpp	??
CbcBranchDecision.hpp	??
CbcBranchDefaultDecision.hpp	??
CbcBranchDynamic.hpp	??
CbcBranchingObject.hpp	??
CbcBranchLotsize.hpp	??
CbcBranchToFixLots.hpp	??

CbcClique.hpp	??
CbcCompare.hpp	??
CbcCompareActual.hpp	??
CbcCompareBase.hpp	??
CbcCompareDefault.hpp	??
CbcCompareDepth.hpp	??
CbcCompareEstimate.hpp	??
CbcCompareObjective.hpp	??
CbcConfig.h	??
CbcConsequence.hpp	??
CbcCountRowCut.hpp	??
CbcCutGenerator.hpp	??
CbcCutModifier.hpp	??
CbcCutSubsetModifier.hpp	??
CbcDummyBranchingObject.hpp	??
CbcEventHandler.hpp (Event handling for cbc)	448
CbcFathom.hpp	??
CbcFathomDynamicProgramming.hpp	??
CbcFeasibilityBase.hpp	??
CbcFixVariable.hpp	??
CbcFollowOn.hpp	??
CbcFullNodeInfo.hpp	??
CbcGenCbcParam.hpp	??
CbcGenCtlBlk.hpp	??
CbcGeneral.hpp	??

CbcGeneralDepth.hpp	??
CbcGenMessages.hpp (This file contains the enum that defines symbolic names for for cbc-generic messages)	450
CbcGenOsiParam.hpp	??
CbcGenParam.hpp	??
CbcHeuristic.hpp	??
CbcHeuristicDINS.hpp	??
CbcHeuristicDive.hpp	??
CbcHeuristicDiveCoefficient.hpp	??
CbcHeuristicDiveFractional.hpp	??
CbcHeuristicDiveGuided.hpp	??
CbcHeuristicDiveLineSearch.hpp	??
CbcHeuristicDivePseudoCost.hpp	??
CbcHeuristicDiveVectorLength.hpp	??
CbcHeuristicFPump.hpp	??
CbcHeuristicGreedy.hpp	??
CbcHeuristicLocal.hpp	??
CbcHeuristicPivotAndFix.hpp	??
CbcHeuristicRandRound.hpp	??
CbcHeuristicRENS.hpp	??
CbcHeuristicRINS.hpp	??
CbcHeuristicVND.hpp	??
CbcLinked.hpp	??
CbcMessage.hpp	??
CbcMipStartIO.hpp	??

CbcModel.hpp	??
CbcNode.hpp	??
CbcNodeInfo.hpp	??
CbcNWay.hpp	??
CbcObject.hpp	??
CbcObjectUpdateData.hpp	??
CbcParam.hpp	??
CbcPartialNodeInfo.hpp	??
CbcSimpleInteger.hpp	??
CbcSimpleIntegerDynamicPseudoCost.hpp	??
CbcSimpleIntegerPseudoCost.hpp	??
CbcSolver.hpp (Defines CbcSolver , the proposed top-level class for the new-style cbc solver)	451
CbcSolverAnalyze.hpp (Look to see if a constraint is all-integer (variables & coeffs), or could be all integer)	452
CbcSolverExpandKnapsack.hpp (Expanding possibilities of $x*y$, where $x*y$ are both integers, constructing a knapsack constraint)	452
CbcSolverHeuristics.hpp (Routines for doing heuristics)	453
CbcSOS.hpp	??
CbcStatistics.hpp	??
CbcStrategy.hpp	??
CbcSubProblem.hpp	??
CbcThread.hpp	??
CbcTree.hpp	??
CbcTreeLocal.hpp	??
ClpAmplObjective.hpp	??

ClpConstraintAmpl.hpp	??
config_cbc_default.h	??
config_default.h	??
OsiCbcSolverInterface.hpp	??

4 Class Documentation

4.1 ampl_info Struct Reference

4.1.1 Detailed Description

Definition at line 11 of file Cbc_ampl.h.

The documentation for this struct was generated from the following file:

- Cbc_ampl.h

4.2 CbcGenCtlBlk::babState_struct Struct Reference

State of branch-and-cut.

```
#include <CbcGenCtlBlk.hpp>
```

4.2.1 Detailed Description

State of branch-and-cut. Major and minor status codes, and a solver holding the answer, assuming we have a valid answer. See the documentation with the BACMajor, BACMinor, and BACWhere enums for the meaning of the codes.

Definition at line 718 of file CbcGenCtlBlk.hpp.

The documentation for this struct was generated from the following file:

- CbcGenCtlBlk.hpp

4.3 CbcBaseModel Class Reference

Base model.

```
#include <CbcThread.hpp>
```

4.3.1 Detailed Description

Base model.

Definition at line 429 of file CbcThread.hpp.

The documentation for this class was generated from the following file:

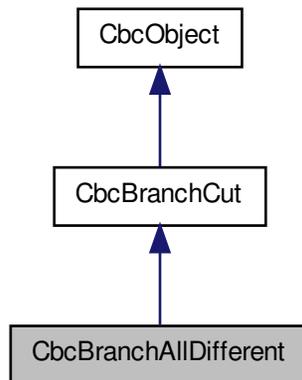
- CbcThread.hpp

4.4 CbcBranchAllDifferent Class Reference

Define a branch class that branches so that it is only satisfied if all members have different values So cut is $x \leq y-1$ or $x \geq y+1$.

```
#include <CbcBranchAllDifferent.hpp>
```

Inheritance diagram for CbcBranchAllDifferent:



Which variables.

4.4.1 Detailed Description

Define a branch class that branches so that it is only satisfied if all members have different values So cut is $x \leq y-1$ or $x \geq y+1$.

Definition at line 22 of file CbcBranchAllDifferent.hpp.

4.4.2 Member Data Documentation

4.4.2.1 `int CbcBranchAllDifferent::numberInSet_` [protected]

data

Number of entries

Definition at line 50 of file CbcBranchAllDifferent.hpp.

The documentation for this class was generated from the following file:

- CbcBranchAllDifferent.hpp

4.5 CbcBranchCut Class Reference

Define a cut branching class.

```
#include <CbcBranchCut.hpp>
```


Public Member Functions

- `CbcBranchCut (CbcModel *model)`
In to maintain normal methods.
- `virtual CbcObject * clone () const`
Clone.
- `virtual double infeasibility (const OsiBranchingInformation *info, int &preferredWay) const`
Infeasibility.
- `virtual void feasibleRegion ()`
Set bounds to contain the current solution.
- `virtual bool boundBranch () const`
Return true if branch created by object should fix variables.
- `virtual CbcBranchingObject * createCbcBranch (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way)`
Creates a branching object.
- `virtual CbcBranchingObject * preferredNewFeasible () const`
Given a valid solution (with reduced costs, etc.
- `virtual CbcBranchingObject * notPreferredNewFeasible () const`
Given a valid solution (with reduced costs, etc.
- `virtual void resetBounds ()`
Reset original upper and lower bound values from the solver.

4.5.1 Detailed Description

Define a cut branching class. At present empty - all stuff in descendants

Definition at line 17 of file CbcBranchCut.hpp.

4.5.2 Member Function Documentation

4.5.2.1 `virtual void CbcBranchCut::feasibleRegion () [virtual]`

Set bounds to contain the current solution.

More precisely, for the variable associated with this object, take the value given in the current solution, force it within the current bounds if required, then set the bounds to fix the variable at the integer nearest the solution value.

At present this will do nothing

Implements [CbcObject](#).

4.5.2.2 **virtual CbcBranchingObject* CbcBranchCut::preferredNewFeasible () const [virtual]**

Given a valid solution (with reduced costs, etc.

), return a branching object which would give a new feasible point in the good direction.

The preferred branching object will force the variable to be +/-1 from its current value, depending on the reduced cost and objective sense. If movement in the direction which improves the objective is impossible due to bounds on the variable, the branching object will move in the other direction. If no movement is possible, the method returns NULL.

Only the bounds on this variable are considered when determining if the new point is feasible.

At present this does nothing

Reimplemented from [CbcObject](#).

4.5.2.3 **virtual CbcBranchingObject* CbcBranchCut::notPreferredNewFeasible () const [virtual]**

Given a valid solution (with reduced costs, etc.

), return a branching object which would give a new feasible point in a bad direction.

As for [preferredNewFeasible\(\)](#), but the preferred branching object will force movement in a direction that degrades the objective.

At present this does nothing

Reimplemented from [CbcObject](#).

4.5.2.4 **virtual void CbcBranchCut::resetBounds () [virtual]**

Reset original upper and lower bound values from the solver.

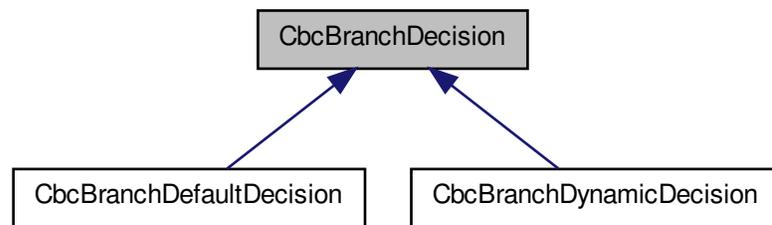
Handy for updating bounds held in this object after bounds held in the solver have been tightened.

The documentation for this class was generated from the following file:

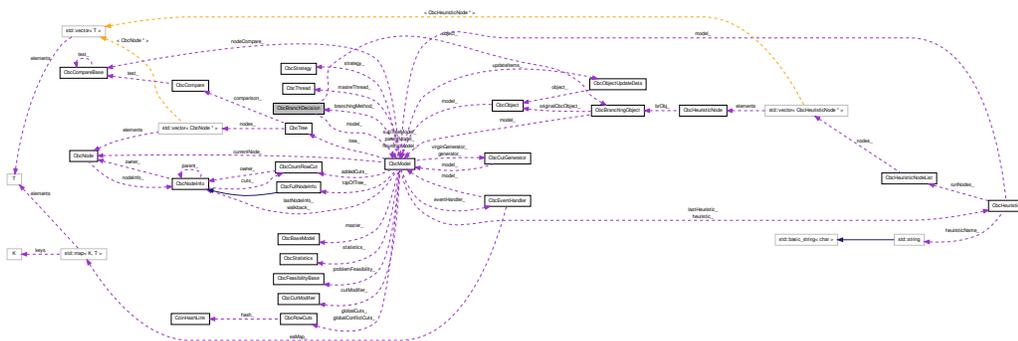
- CbcBranchCut.hpp

4.6 CbcBranchDecision Class Reference

Inheritance diagram for CbcBranchDecision:



Collaboration diagram for CbcBranchDecision:



Public Member Functions

- [CbcBranchDecision](#) ()
Default Constructor.
- virtual [~CbcBranchDecision](#) ()
Destructor.
- virtual [CbcBranchDecision](#) * [clone](#) () const =0
Clone.
- virtual void [initialize](#) ([CbcModel](#) *model)=0
Initialize e.g. before starting to choose a branch at a node.
- virtual int [betterBranch](#) ([CbcBranchingObject](#) *thisOne, [CbcBranchingObject](#) *bestSoFar, double changeUp, int numberInfeasibilitiesUp, double changeDown, int numberInfeasibilitiesDown)=0
Compare two branching objects.
- virtual int [bestBranch](#) ([CbcBranchingObject](#) **objects, int numberObjects, int numberUnsatisfied, double *changeUp, int *numberInfeasibilitiesUp, double *changeDown, int *numberInfeasibilitiesDown, double objectiveValue)
Compare N branching objects.
- virtual int [whichMethod](#) ()
Says whether this method can handle both methods - 1 better, 2 best, 3 both.
- virtual void [saveBranchingObject](#) ([OsiBranchingObject](#) *)
Saves a clone of current branching object.
- virtual void [updateInformation](#) ([OsiSolverInterface](#) *, const [CbcNode](#) *)
Pass in information on branch just done.
- virtual void [setBestCriterion](#) (double)
Sets or gets best criterion so far.
- virtual void [generateCpp](#) (FILE *)
Create C++ lines to get to current state.
- [CbcModel](#) * [cbcModel](#) () const
Model.
- void [setChooseMethod](#) (const [OsiChooseVariable](#) &method)
Set (clone) chooseMethod.

Protected Attributes

- [CbcModel](#) * `model_`
Pointer to model.

4.6.1 Detailed Description

Definition at line 28 of file CbcBranchDecision.hpp.

4.6.2 Member Function Documentation

4.6.2.1 `virtual int CbcBranchDecision::betterBranch (CbcBranchingObject * thisOne, CbcBranchingObject * bestSoFar, double changeUp, int numberInfeasibilitiesUp, double changeDown, int numberInfeasibilitiesDown) [pure virtual]`

Compare two branching objects.

Return nonzero if branching using `thisOne` is better than branching using `bestSoFar`.

If `bestSoFar` is NULL, the routine should return a nonzero value. This routine is used only after strong branching. Either this or `bestBranch` is used depending which user wants.

Implemented in [CbcBranchDefaultDecision](#), and [CbcBranchDynamicDecision](#).

4.6.2.2 `virtual int CbcBranchDecision::bestBranch (CbcBranchingObject ** objects, int numberObjects, int numberUnsatisfied, double * changeUp, int * numberInfeasibilitiesUp, double * changeDown, int * numberInfeasibilitiesDown, double objectiveValue) [virtual]`

Compare N branching objects.

Return index of best and sets way of branching in chosen object.

Either this or `betterBranch` is used depending which user wants.

Reimplemented in [CbcBranchDefaultDecision](#).

4.6.2.3 virtual void CbcBranchDecision::saveBranchingObject (OsiBranchingObject *) [inline, virtual]

Saves a clone of current branching object.

Can be used to update information on object causing branch - after branch

Reimplemented in [CbcBranchDynamicDecision](#).

Definition at line 80 of file CbcBranchDecision.hpp.

4.6.2.4 virtual void CbcBranchDecision::updateInformation (OsiSolverInterface *, const CbcNode *) [inline, virtual]

Pass in information on branch just done.

assumes object can get information from solver

Reimplemented in [CbcBranchDynamicDecision](#).

Definition at line 83 of file CbcBranchDecision.hpp.

The documentation for this class was generated from the following file:

- CbcBranchDecision.hpp

4.7 CbcBranchDefaultDecision Class Reference

Branching decision default class.

```
#include <CbcBranchDefaultDecision.hpp>
```


Compare two branching objects.

- virtual void [setBestCriterion](#) (double value)
Sets or gets best criterion so far.
- virtual int [bestBranch](#) ([CbcBranchingObject](#) **objects, int numberObjects, int numberUnsatisfied, double *changeUp, int *numberInfeasibilitiesUp, double *changeDown, int *numberInfeasibilitiesDown, double objectiveValue)
Compare N branching objects.

4.7.1 Detailed Description

Branching decision default class. This class implements a simple default algorithm ([betterBranch\(\)](#)) for choosing a branching variable.

Definition at line 18 of file [CbcBranchDefaultDecision.hpp](#).

4.7.2 Member Function Documentation

4.7.2.1 virtual int [CbcBranchDefaultDecision::betterBranch](#) (
[CbcBranchingObject](#) * *thisOne*, [CbcBranchingObject](#) * *bestSoFar*,
double *changeUp*, int *numInfUp*, double *changeDn*, int *numInfDn*)
[virtual]

Compare two branching objects.

Return nonzero if *thisOne* is better than *bestSoFar*.

The routine compares branches using the values supplied in *numInfUp* and *numInfDn* until a solution is found by search, after which it uses the values supplied in *changeUp* and *changeDn*. The best branching object seen so far and the associated parameter values are remembered in the [CbcBranchDefaultDecision](#) object. The nonzero return value is +1 if the up branch is preferred, -1 if the down branch is preferred.

As the names imply, the assumption is that the values supplied for *numInfUp* and *numInfDn* will be the number of infeasibilities reported by the branching object, and *changeUp* and *changeDn* will be the estimated change in objective. Other measures can be used if desired.

Because an [CbcBranchDefaultDecision](#) object remembers the current best branching candidate (*bestObject_*) as well as the values used in the comparison, the parameter *bestSoFar* is redundant, hence unused.

Implements [CbcBranchDecision](#).

4.7.2.2 `virtual int CbcBranchDefaultDecision::bestBranch (CbcBranchingObject ** objects, int numberObjects, int numberUnsatisfied, double * changeUp, int * numberInfeasibilitiesUp, double * changeDown, int * numberInfeasibilitiesDown, double objectiveValue) [virtual]`

Compare N branching objects.

Return index of best and sets way of branching in chosen object.

This routine is used only after strong branching.

Reimplemented from [CbcBranchDecision](#).

The documentation for this class was generated from the following file:

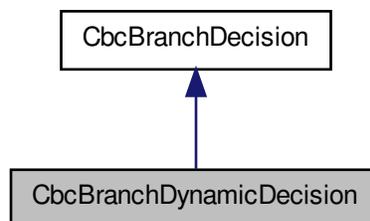
- CbcBranchDefaultDecision.hpp

4.8 CbcBranchDynamicDecision Class Reference

Branching decision dynamic class.

```
#include <CbcBranchDynamic.hpp>
```

Inheritance diagram for CbcBranchDynamicDecision:



4.8.1 Detailed Description

Branching decision dynamic class. This class implements a simple algorithm ([betterBranch\(\)](#)) for choosing a branching variable when dynamic pseudo costs.

Definition at line 19 of file CbcBranchDynamic.hpp.

4.8.2 Member Function Documentation

4.8.2.1 `virtual int CbcBranchDynamicDecision::betterBranch (CbcBranchingObject * thisOne, CbcBranchingObject * bestSoFar, double changeUp, int numInfUp, double changeDn, int numInfDn) [virtual]`

Compare two branching objects.

Return nonzero if `thisOne` is better than `bestSoFar`.

The routine compares branches using the values supplied in `numInfUp` and `numInfDn` until a solution is found by search, after which it uses the values supplied in `changeUp` and `changeDn`. The best branching object seen so far and the associated parameter values are remembered in the [CbcBranchDynamicDecision](#) object. The nonzero return value is +1 if the up branch is preferred, -1 if the down branch is preferred.

As the names imply, the assumption is that the values supplied for `numInfUp` and `numInfDn` will be the number of infeasibilities reported by the branching object, and `changeUp` and `changeDn` will be the estimated change in objective. Other measures can be used if desired.

Because an [CbcBranchDynamicDecision](#) object remembers the current best branching candidate (`bestObject_`) as well as the values used in the comparison, the parameter `bestSoFar` is redundant, hence unused.

Implements [CbcBranchDecision](#).

4.8.2.2 `virtual void CbcBranchDynamicDecision::saveBranchingObject (OsiBranchingObject * object) [virtual]`

Saves a clone of current branching object.

Can be used to update information on object causing branch - after branch

Reimplemented from [CbcBranchDecision](#).

4.8.2.3 virtual void CbcBranchDynamicDecision::updateInformation (OsiSolverInterface * solver, const CbcNode * node) [virtual]

Pass in information on branch just done.

assumes object can get information from solver

Reimplemented from [CbcBranchDecision](#).

The documentation for this class was generated from the following file:

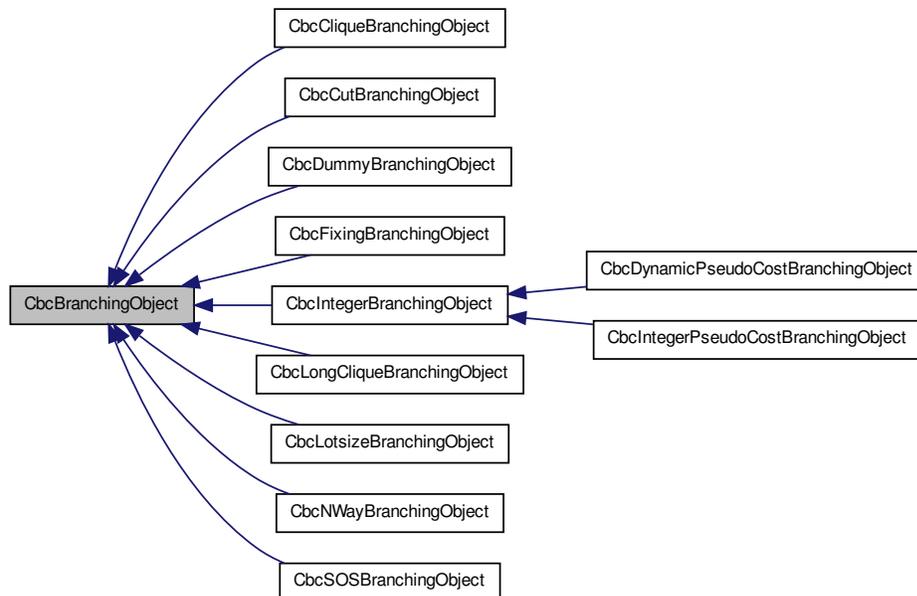
- CbcBranchDynamic.hpp

4.9 CbcBranchingObject Class Reference

Abstract branching object base class Now just difference with OsiBranchingObject.

```
#include <CbcBranchingObject.hpp>
```

Inheritance diagram for CbcBranchingObject:



- void `resetNumberBranchesLeft ()`
Reset number of branches left to original.
- void `setNumberBranches (int value)`
Set number of branches to do.
- virtual double `branch ()=0`
Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.
- virtual double `branch (OsiSolverInterface *)`
Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.
- virtual void `fix (OsiSolverInterface *, double *, double *, int) const`
Update bounds in solver as in 'branch' and update given bounds.
- virtual bool `tighten (OsiSolverInterface *)`
Change (tighten) bounds in object to reflect bounds in solver.
- virtual void `previousBranch ()`
Reset every information so that the branching object appears to point to the previous child.
- virtual void `print () const`
Print something about branch - only if log level high.
- int `variable () const`
Index identifying the associated CbcObject within its class.
- int `way () const`
Get the state of the branching object.
- void `way (int way)`
Set the state of the branching object.
- void `setModel (CbcModel *model)`
update model
- `CbcModel * model () const`
Return model.
- `CbcObject * object () const`

Return pointer back to object which created.

- void [setOriginalObject](#) (CbcObject *object)
Set pointer back to object which created.
- virtual CbcBranchObjType [type](#) () const =0
Return the type (an integer identifier) of this.
- virtual int [compareOriginalObject](#) (const CbcBranchingObject *brObj) const
Compare the original object of this with the original object of brObj.
- virtual CbcRangeCompare [compareBranchingObject](#) (const CbcBranchingObject *brObj, const bool replaceIfOverlap=false)=0
Compare the this with brObj.

Protected Attributes

- CbcModel * [model_](#)
The model that owns this branching object.
- CbcObject * [originalCbcObject_](#)
Pointer back to object which created.
- int [variable_](#)
Branching variable (0 is first integer).
- int [way_](#)
The state of the branching object.

4.9.1 Detailed Description

Abstract branching object base class Now just difference with OsiBranchingObject. In the abstract, an [CbcBranchingObject](#) contains instructions for how to branch. We want an abstract class so that we can describe how to branch on simple objects (*e.g.*, integers) and more exotic objects (*e.g.*, cliques or hyperplanes).

The [branch\(\)](#) method is the crucial routine: it is expected to be able to step through a set of branch arms, executing the actions required to create each subproblem in turn. The base class is primarily virtual to allow for a wide range of problem modifications.

See [CbcObject](#) for an overview of the three classes ([CbcObject](#), [CbcBranchingObject](#), and [CbcBranchDecision](#)) which make up cbc's branching model.

Definition at line 53 of file CbcBranchingObject.hpp.

4.9.2 Member Function Documentation

4.9.2.1 `virtual int CbcBranchingObject::fillStrongInfo (CbcStrongInfo &)` `[inline, virtual]`

Some branchingObjects may claim to be able to skip strong branching.

If so they have to fill in [CbcStrongInfo](#). The object mention in incoming [CbcStrongInfo](#) must match. Returns nonzero if skip is wanted

Reimplemented in [CbcDynamicPseudoCostBranchingObject](#).

Definition at line 79 of file CbcBranchingObject.hpp.

4.9.2.2 `virtual double CbcBranchingObject::branch ()` `[pure virtual]`

Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Mainly for diagnostics, whether it is true branch or strong branching is also passed. Returns change in guessed objective on next branch

Implemented in [CbcCutBranchingObject](#), [CbcDynamicPseudoCostBranchingObject](#), [CbcLotsizeBranchingObject](#), [CbcCliqueBranchingObject](#), [CbcLongCliqueBranchingObject](#), [CbcDummyBranchingObject](#), [CbcFixingBranchingObject](#), [CbcN-WayBranchingObject](#), [CbcIntegerBranchingObject](#), [CbcIntegerPseudoCostBranchingObject](#), and [CbcSOSBranchingObject](#).

4.9.2.3 `virtual double CbcBranchingObject::branch (OsiSolverInterface *)` `[inline, virtual]`

Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Mainly for diagnostics, whether it is true branch or strong branching is also passed. Returns change in guessed objective on next branch

Definition at line 105 of file CbcBranchingObject.hpp.

4.9.2.4 `virtual void CbcBranchingObject::fix (OsiSolverInterface *, double * , double *, int) const [inline, virtual]`

Update bounds in solver as in 'branch' and update given bounds.

branchState is -1 for 'down' +1 for 'up'

Reimplemented in [CbcIntegerBranchingObject](#), and [CbcSOSBranchingObject](#).

Definition at line 110 of file CbcBranchingObject.hpp.

4.9.2.5 `virtual bool CbcBranchingObject::tighten (OsiSolverInterface *) [inline, virtual]`

Change (tighten) bounds in object to reflect bounds in solver.

Return true if now fixed

Reimplemented in [CbcIntegerBranchingObject](#).

Definition at line 116 of file CbcBranchingObject.hpp.

4.9.2.6 `virtual void CbcBranchingObject::previousBranch () [inline, virtual]`

Reset every information so that the branching object appears to point to the previous child.

This method does not need to modify anything in any solver.

Reimplemented in [CbcSOSBranchingObject](#).

Definition at line 121 of file CbcBranchingObject.hpp.

4.9.2.7 `int CbcBranchingObject::variable () const [inline]`

Index identifying the associated [CbcObject](#) within its class.

The name is misleading, and typically the index will *not* refer directly to a variable. Rather, it identifies an [CbcObject](#) within the class of similar CbcObjects

E.g., for an [CbcSimpleInteger](#), `variable()` is the index of the integer variable in the set of integer variables (*not* the index of the variable in the set of all variables).

Definition at line 143 of file CbcBranchingObject.hpp.

4.9.2.8 int CbcBranchingObject::way () const [inline]

Get the state of the branching object.

Returns a code indicating the active arm of the branching object. The precise meaning is defined in the derived class.

See also

[way_](#)

Definition at line 154 of file CbcBranchingObject.hpp.

4.9.2.9 void CbcBranchingObject::way (int way) [inline]

Set the state of the branching object.

See [way\(\)](#)

Definition at line 162 of file CbcBranchingObject.hpp.

4.9.2.10 virtual CbcBranchObjType CbcBranchingObject::type () const [pure virtual]

Return the type (an integer identifier) of `this`.

See definition of CbcBranchObjType above for possibilities

Implemented in [CbcCutBranchingObject](#), [CbcDynamicPseudoCostBranchingObject](#), [CbcLotsizeBranchingObject](#), [CbcCliqueBranchingObject](#), [CbcLongCliqueBranchingObject](#), [CbcDummyBranchingObject](#), [CbcFixingBranchingObject](#), [CbcN-WayBranchingObject](#), [CbcIntegerBranchingObject](#), [CbcIntegerPseudoCostBranchingObject](#), and [CbcSOSBranchingObject](#).

4.9.2.11 virtual int CbcBranchingObject::compareOriginalObject (const CbcBranchingObject * brObj) const [inline, virtual]

Compare the original object of `this` with the original object of `brObj`.

Assumes that there is an ordering of the original objects. This method should be invoked only if `this` and `brObj` are of the same type. Return negative/0/positive depending on whether `this` is smaller/same/larger than the argument.

Reimplemented in [CbcCutBranchingObject](#), [CbcCliqueBranchingObject](#), [CbcLongCliqueBranchingObject](#), [CbcDummyBranchingObject](#), [CbcFixingBranchingObject](#), [CbcNWayBranchingObject](#), and [CbcSOSBranchingObject](#).

Definition at line 199 of file `CbcBranchingObject.hpp`.

4.9.2.12 virtual CbcRangeCompare CbcBranchingObject::compareBranchingObject (const CbcBranchingObject * brObj, const bool replaceIfOverlap = false) [pure virtual]

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate `CbcRangeCompare` value (first argument being the sub/superset if that's the case). In case of overlap (and if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

Implemented in [CbcCutBranchingObject](#), [CbcLotsizeBranchingObject](#), [CbcCliqueBranchingObject](#), [CbcLongCliqueBranchingObject](#), [CbcDummyBranchingObject](#), [CbcFixingBranchingObject](#), [CbcNWayBranchingObject](#), [CbcIntegerBranchingObject](#), [CbcIntegerPseudoCostBranchingObject](#), and [CbcSOSBranchingObject](#).

4.9.3 Member Data Documentation

4.9.3.1 int CbcBranchingObject::way_ [protected]

The state of the branching object.

Specifies the active arm of the branching object. Coded as -1 to take the 'down' arm, +1 for the 'up' arm. 'Down' and 'up' are defined based on the natural meaning (floor and ceiling, respectively) for a simple integer. The precise meaning is defined in the derived class.

Definition at line 232 of file `CbcBranchingObject.hpp`.

The documentation for this class was generated from the following file:

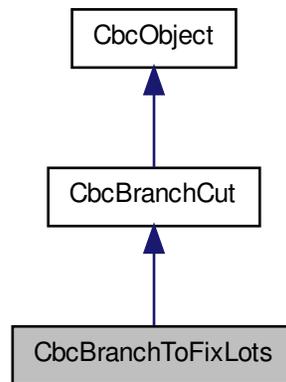
- `CbcBranchingObject.hpp`

4.10 CbcBranchToFixLots Class Reference

Define a branch class that branches so that one way variables are fixed while the other way cuts off that solution.

```
#include <CbcBranchToFixLots.hpp>
```

Inheritance diagram for CbcBranchToFixLots:



Creates a branching object.

- virtual void [redoSequenceEtc](#) (CbcModel *model, int numberColumns, const int *originalColumns)

Redoes data when sequence numbers change.

Protected Attributes

- double [djTolerance_](#)
data
- double [fractionFixed_](#)
We only need to make sure this fraction fixed.
- char * [mark_](#)
Never fix ones marked here.
- CoinPackedMatrix [matrixByRow_](#)
Matrix by row.
- int [depth_](#)
Do if depth multiple of this.
- int [numberClean_](#)
number of ==1 rows which need to be clean
- bool [alwaysCreate_](#)
If true then always create branch.

4.10.1 Detailed Description

Define a branch class that branches so that one way variables are fixed while the other way cuts off that solution. a) On reduced cost b) When enough ==1 or <=1 rows have been satisfied (not fixed - satisfied)

Definition at line 23 of file CbcBranchToFixLots.hpp.

4.10.2 Constructor & Destructor Documentation

4.10.2.1 CbcBranchToFixLots::CbcBranchToFixLots (CbcModel * *model*, double *djTolerance*, double *fractionFixed*, int *depth*, int *numberClean* = 0, const char * *mark* = *NULL*, bool *alwaysCreate* = *false*)

Useful constructor - passed reduced cost tolerance and fraction we would like fixed.

Also depth level to do at. Also passed number of 1 rows which when clean triggers fix Always does if all 1 rows cleaned up and number>0 or if fraction columns reached Also whether to create branch if can't reach fraction.

4.10.3 Member Data Documentation

4.10.3.1 double CbcBranchToFixLots::djTolerance_ [protected]

data

Reduced cost tolerance i.e. dj has to be >= this before fixed

Definition at line 79 of file CbcBranchToFixLots.hpp.

The documentation for this class was generated from the following file:

- CbcBranchToFixLots.hpp

4.11 CbcCbcParam Class Reference

Class for control parameters that act on a [CbcModel](#) object.

```
#include <CbcGenCbcParam.hpp>
```


Constructor for a string parameter.

- [CbcCbcParam](#) ([CbcCbcParamCode](#) code, std::string name, std::string help, bool display=true)

Constructor for an action parameter.

- [CbcCbcParam](#) (const [CbcCbcParam](#) &orig)

Copy constructor.

- [CbcCbcParam](#) * clone ()

Clone.

- [CbcCbcParam](#) & operator= (const [CbcCbcParam](#) &rhs)

Assignment.

- [~CbcCbcParam](#) ()

Destructor.

Methods to query and manipulate a parameter object

- [CbcCbcParamCode](#) paramCode () const

Get the parameter code.

- void setParamCode ([CbcCbcParamCode](#) code)

Set the parameter code.

- [CbcModel](#) * obj () const

Get the underlying [CbcModel](#) object.

- void setObj ([CbcModel](#) *obj)

Set the underlying [CbcModel](#) object.

4.11.1 Detailed Description

Class for control parameters that act on a [CbcModel](#) object. Adds parameter type codes and push/pull functions to the generic parameter object.

Definition at line 31 of file [CbcGenCbcParam.hpp](#).

4.11.2 Member Enumeration Documentation

4.11.2.1 enum [CbcCbcParam::CbcCbcParamCode](#)

Enumeration for parameters that control a [CbcModel](#) object.

These are parameters that control the operation of a [CbcModel](#) object. `CBCCBC_FIRSTPARAM` and `CBCCBC_LASTPARAM` are markers to allow convenient separation of parameter groups.

Definition at line 45 of file `CbcGenCbcParam.hpp`.

4.11.3 Constructor & Destructor Documentation

4.11.3.1 `CbcCbcParam::CbcCbcParam (CbcCbcParamCode code, std::string name, std::string help, double lower, double upper, double dflt = 0.0, bool display = true)`

Constructor for a parameter with a double value.

The default value is 0.0. Be careful to clearly indicate that `lower` and `upper` are real (double) values to distinguish this constructor from the constructor for an integer parameter.

4.11.3.2 `CbcCbcParam::CbcCbcParam (CbcCbcParamCode code, std::string name, std::string help, int lower, int upper, int dflt = 0, bool display = true)`

Constructor for a parameter with an integer value.

The default value is 0.

4.11.3.3 `CbcCbcParam::CbcCbcParam (CbcCbcParamCode code, std::string name, std::string help, std::string firstValue, int dflt, bool display = true)`

Constructor for a parameter with keyword values.

The string supplied as `firstValue` becomes the first keyword. Additional keywords can be added using `appendKwd()`. Keywords are numbered from zero. It's necessary to specify both the first keyword (`firstValue`) and the default keyword index (`dflt`) in order to distinguish this constructor from the string and action parameter constructors.

4.11.3.4 CbcCbcParam::CbcCbcParam (CbcCbcParamCode *code*, std::string *name*, std::string *help*, std::string *dflt*, bool *display* = *true*)

Constructor for a string parameter.

The default string value must be specified explicitly to distinguish a string constructor from an action parameter constructor.

The documentation for this class was generated from the following file:

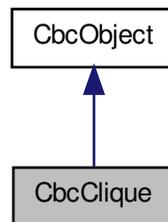
- CbcGenCbcParam.hpp

4.12 CbcCliques Class Reference

Branching object for cliques.

```
#include <CbcCliques.hpp>
```

Inheritance diagram for CbcCliques:



Infeasibility - large is 0.5.

- virtual void `feasibleRegion ()`
This looks at solution and sets bounds to contain solution.
- virtual `CbcBranchingObject * createCbcBranch (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way)`
Creates a branching object.
- int `numberMembers () const`
Number of members.
- int `numberNonSOSMembers () const`
Number of variables with -1 coefficient.
- const int * `members () const`
Members (indices in range 0 ... numberIntegers_-1).
- char `type (int index) const`
Type of each member, i.e., which way is strong.
- int `cliqueType () const`
Clique type: 0 is <=, 1 is ==.
- virtual void `redoSequenceEtc (CbcModel *model, int numberColumns, const int *originalColumns)`
Redoes data when sequence numbers change.

Protected Attributes

- int `numberMembers_`
data Number of members
- int `numberNonSOSMembers_`
Number of Non SOS members i.e. fixing to zero is strong.
- int * `members_`
Members (indices in range 0 ... numberIntegers_-1).
- char * `type_`
Strong value for each member.

- int `cliqueType_`
Clique type.
- int `slack_`
Slack variable for the clique.

4.12.1 Detailed Description

Branching object for cliques. A clique is defined to be a set of binary variables where fixing any one variable to its ‘strong’ value fixes all other variables. An example is the most common SOS1 construction: a set of binary variables x_j s.t. $\sum\{j\} x_j = 1$. Setting any one variable to 1 forces all other variables to 0. (See comments for [CbcSOS](#) below.)

Other configurations are possible, however: Consider $x_1 - x_2 + x_3 \leq 0$. Setting x_1 (x_3) to 1 forces x_2 to 1 and x_3 (x_1) to 0. Setting x_2 to 0 forces x_1 and x_3 to 0.

The proper point of view to take when interpreting [CbcClique](#) is ‘generalisation of SOS1 on binary variables.’ To get into the proper frame of mind, here’s an example.

Consider the following sequence, where $x_j = (1 - y_j)$:

```
x1 + x2 + x3 <= 1 all strong at 1
x1 - y2 + x3 <= 0 y2 strong at 0; x1, x3 strong at 1
-y1 - y2 + x3 <= -1 y1, y2 strong at 0, x3 strong at 1
-y1 - y2 - y3 <= -2 all strong at 0
```

The first line is a standard SOS1 on binary variables.

Variables with +1 coefficients are ‘SOS-style’ and variables with -1 coefficients are ‘non-SOS-style’. So `numberNonSOSMembers_` simply tells you how many variables have -1 coefficients. The implicit rhs for a clique is $1 - \text{numberNonSOSMembers}_$.

Definition at line 41 of file `CbcClique.hpp`.

4.12.2 Constructor & Destructor Documentation

4.12.2.1 CbcClique::CbcClique (CbcModel * *model*, int *cliqueType*, int *numberMembers*, const int * *which*, const char * *type*, int *identifier*, int *slack* = -1)

Useful constructor (which are integer indices) `slack` can denote a slack in set.

If `type == NULL` then as if 1

4.12.3 Member Function Documentation

4.12.3.1 `int CbcCliques::numberNonSOSMembers () const [inline]`

Number of variables with -1 coefficient.

Number of non-SOS members, i.e., fixing to zero is strong. See comments at head of class, and comments for [type_](#).

Definition at line 86 of file CbcCliques.hpp.

4.12.3.2 `char CbcCliques::type (int index) const [inline]`

Type of each member, i.e., which way is strong.

This also specifies whether a variable has a +1 or -1 coefficient.

- 0 => -1 coefficient, 0 is strong value
- 1 => +1 coefficient, 1 is strong value If unspecified, all coefficients are assumed to be positive.

Indexed as 0 .. numberMembers_-1

Definition at line 104 of file CbcCliques.hpp.

4.12.4 Member Data Documentation

4.12.4.1 `char* CbcCliques::type_ [protected]`

Strong value for each member.

This also specifies whether a variable has a +1 or -1 coefficient.

- 0 => -1 coefficient, 0 is strong value
- 1 => +1 coefficient, 1 is strong value If unspecified, all coefficients are assumed to be positive.

Indexed as 0 .. numberMembers_-1

Definition at line 136 of file CbcCliques.hpp.

4.12.4.2 int CbcCliques::cliqueType_ [protected]

Clique type.

0 defines a \leq relation, 1 an equality. The assumed value of the rhs is numberNonSOSMembers_+1. (See comments for the class.)

Definition at line 143 of file CbcCliques.hpp.

4.12.4.3 int CbcCliques::slack_ [protected]

Slack variable for the clique.

Identifies the slack variable for the clique (typically added to convert a \leq relation to an equality). Value is sequence number within clique members.

Definition at line 151 of file CbcCliques.hpp.

The documentation for this class was generated from the following file:

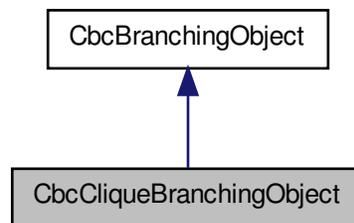
- CbcCliques.hpp

4.13 CbcCliquesBranchingObject Class Reference

Branching object for unordered cliques.

```
#include <CbcCliques.hpp>
```

Inheritance diagram for CbcCliquesBranchingObject:



4.13.1 Detailed Description

Branching object for unordered cliques. Intended for cliques which are long enough to make it worthwhile but ≤ 64 members. There will also be ones for long cliques.

Variable_ is the clique id number (redundant, as the object also holds a pointer to the clique).

Definition at line 162 of file CbcCliques.hpp.

4.13.2 Member Function Documentation

4.13.2.1 `virtual int CbcCliquesBranchingObject::compareOriginalObject (const CbcBranchingObject * brObj) const [virtual]`

Compare the original object of `this` with the original object of `brObj`.

Assumes that there is an ordering of the original objects. This method should be invoked only if `this` and `brObj` are of the same type. Return negative/0/positive depending on whether `this` is smaller/same/larger than the argument.

Reimplemented from [CbcBranchingObject](#).

4.13.2.2 `virtual CbcRangeCompare CbcCliquesBranchingObject::compareBranchingObject (const CbcBranchingObject * brObj, const bool replaceIfOverlap = false) [virtual]`

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate `CbcRangeCompare` value (first argument being the sub/superset if that's the case). In case of overlap (and if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

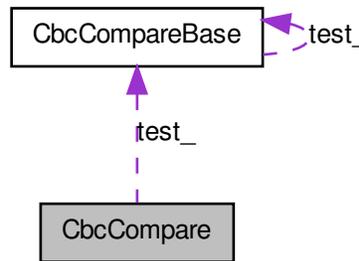
Implements [CbcBranchingObject](#).

The documentation for this class was generated from the following file:

- CbcCliques.hpp

4.14 CbcCompare Class Reference

Collaboration diagram for CbcCompare:



Public Member Functions

- bool [alternateTest](#) (CbcNode *x, CbcNode *y)
This is alternate test function.
- [CbcCompareBase * comparisonObject](#) () const
return comparison object

4.14.1 Detailed Description

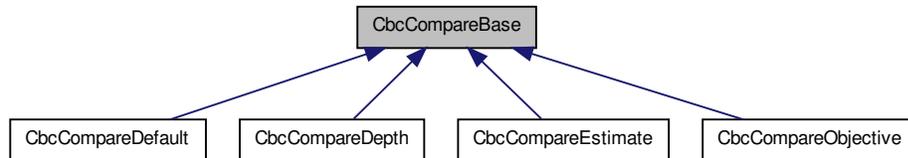
Definition at line 11 of file CbcCompare.hpp.

The documentation for this class was generated from the following file:

- CbcCompare.hpp

4.15 CbcCompareBase Class Reference

Inheritance diagram for CbcCompareBase:



Collaboration diagram for CbcCompareBase:



Public Member Functions

- virtual bool `newSolution` (`CbcModel *`)
Reconsider behaviour after discovering a new solution.
- virtual bool `newSolution` (`CbcModel *`, double, int)
Reconsider behaviour after discovering a new solution.
- virtual bool `fullScan` () const
Returns true if wants code to do scan with alternate criterion NOTE - this is temporarily disabled.
- virtual void `generateCpp` (FILE *)
Create C++ lines to get to current state.

- virtual `CbcCompareBase * clone () const`
Clone.
- virtual `bool test (CbcNode *, CbcNode *)`
This is test function.
- virtual `bool alternateTest (CbcNode *x, CbcNode *y)`
This is alternate test function.
- `bool equalityTest (CbcNode *x, CbcNode *y) const`
Further test if everything else equal.
- `void sayThreaded ()`
Say threaded.

4.15.1 Detailed Description

Definition at line 27 of file CbcCompareBase.hpp.

4.15.2 Member Function Documentation

4.15.2.1 `virtual bool CbcCompareBase::newSolution (CbcModel *)` `[inline, virtual]`

Reconsider behaviour after discovering a new solution.

This allows any method to change its behaviour. It is called after each solution.

The method should return true if changes are made which will alter the evaluation criteria applied to a node. (So that in cases where the search tree is sorted, it can be properly rebuilt.)

Definition at line 45 of file CbcCompareBase.hpp.

4.15.2.2 `virtual bool CbcCompareBase::newSolution (CbcModel *, double , int)` `[inline, virtual]`

Reconsider behaviour after discovering a new solution.

This allows any method to change its behaviour. It is called after each solution.

The method should return true if changes are made which will alter the evaluation criteria applied to a node. (So that in cases where the search tree is sorted, it can be properly rebuilt.)

Reimplemented in [CbcCompareDefault](#).

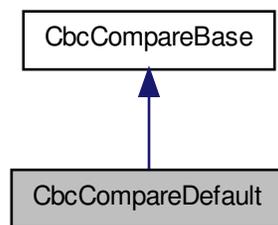
Definition at line 57 of file CbcCompareBase.hpp.

The documentation for this class was generated from the following file:

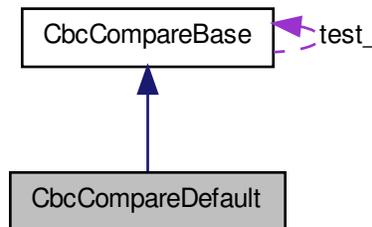
- CbcCompareBase.hpp

4.16 CbcCompareDefault Class Reference

Inheritance diagram for CbcCompareDefault:



Collaboration diagram for CbcCompareDefault:



Public Member Functions

- [CbcCompareDefault](#) ()
Default Constructor.
- [CbcCompareDefault](#) (double weight)
Constructor with weight.
- [CbcCompareDefault](#) (const [CbcCompareDefault](#) &rhs)
Copy constructor.
- [CbcCompareDefault](#) & [operator=](#) (const [CbcCompareDefault](#) &rhs)
Assignment operator.
- virtual [CbcCompareBase](#) * [clone](#) () const
Clone.
- virtual void [generateCpp](#) (FILE *fp)
Create C++ lines to get to current state.
- virtual bool [test](#) ([CbcNode](#) *x, [CbcNode](#) *y)
This is test function.
- virtual bool [newSolution](#) ([CbcModel](#) *model, double objectiveAtContinuous, int numberInfeasibilitiesAtContinuous)

This allows method to change behavior as it is called after each solution.

- virtual bool `every1000Nodes` (CbcModel *model, int numberNodes)
This allows method to change behavior Return true if want tree re-sorted.
- double `getCutoff` () const
Cutoff.
- double `getBestPossible` () const
Best possible solution.
- void `setBreadthDepth` (int value)
Depth above which want to explore first.
- void `startDive` (CbcModel *model)
Start dive.
- void `cleanDive` ()
Clean up diving (i.e. switch off or prepare).

Protected Attributes

- double `weight_`
Weight for each infeasibility.
- double `saveWeight_`
Weight for each infeasibility - computed from solution.
- double `cutoff_`
Cutoff.
- double `bestPossible_`
Best possible solution.
- int `numberSolutions_`
Number of solutions.
- int `treeSize_`
Tree size (at last check).
- int `breadthDepth_`

Depth above which want to explore first.

- int [startNodeNumber_](#)
Chosen node from estimated (-1 is off).
- int [afterNodeNumber_](#)
Node number when dive started.
- bool [setupForDiving_](#)
Indicates doing setup for diving.

4.16.1 Detailed Description

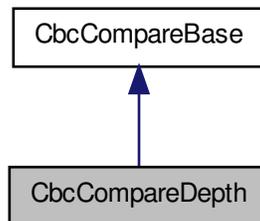
Definition at line 31 of file CbcCompareDefault.hpp.

The documentation for this class was generated from the following file:

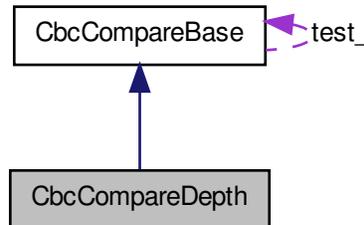
- CbcCompareDefault.hpp

4.17 CbcCompareDepth Class Reference

Inheritance diagram for CbcCompareDepth:



Collaboration diagram for CbcCompareDepth:



Public Member Functions

- virtual [CbcCompareBase](#) * [clone](#) () const
Clone.
- virtual void [generateCpp](#) (FILE *fp)
Create C++ lines to get to current state.
- virtual bool [test](#) ([CbcNode](#) *x, [CbcNode](#) *y)
This is test function.

4.17.1 Detailed Description

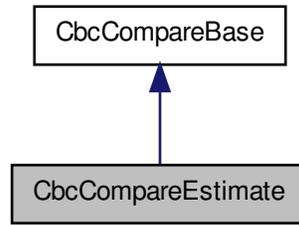
Definition at line 25 of file CbcCompareDepth.hpp.

The documentation for this class was generated from the following file:

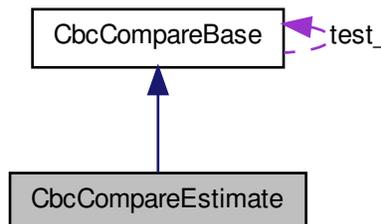
- CbcCompareDepth.hpp

4.18 CbcCompareEstimate Class Reference

Inheritance diagram for CbcCompareEstimate:



Collaboration diagram for CbcCompareEstimate:



Public Member Functions

- virtual [CbcCompareBase](#) * [clone](#) () const
Clone.
- virtual void [generateCpp](#) (FILE *fp)
Create C++ lines to get to current state.

- virtual bool `test (CbcNode *x, CbcNode *y)`

This is test function.

4.18.1 Detailed Description

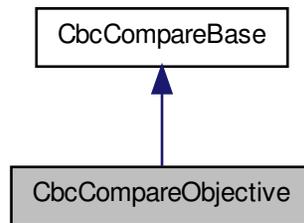
Definition at line 27 of file CbcCompareEstimate.hpp.

The documentation for this class was generated from the following file:

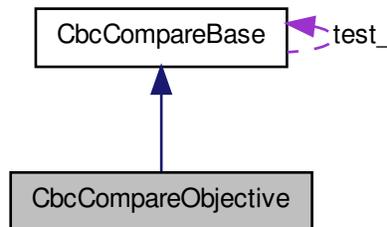
- CbcCompareEstimate.hpp

4.19 CbcCompareObjective Class Reference

Inheritance diagram for CbcCompareObjective:



Collaboration diagram for CbcCompareObjective:



Public Member Functions

- virtual `CbcCompareBase * clone () const`
Clone.
- virtual void `generateCpp (FILE *fp)`
Create C++ lines to get to current state.
- virtual bool `test (CbcNode *x, CbcNode *y)`
This is test function.

4.19.1 Detailed Description

Definition at line 26 of file CbcCompareObjective.hpp.

The documentation for this class was generated from the following file:

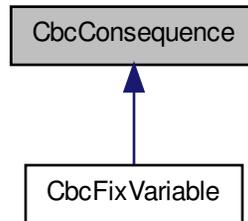
- CbcCompareObjective.hpp

4.20 CbcConsequence Class Reference

Abstract base class for consequent bounds.

```
#include <CbcConsequence.hpp>
```

Inheritance diagram for CbcConsequence:



Public Member Functions

- virtual [CbcConsequence](#) * [clone](#) () const =0
Clone.
- virtual [~CbcConsequence](#) ()
Destructor.
- virtual void [applyToSolver](#) (OsiSolverInterface *solver, int state) const =0
Apply to an LP solver.

4.20.1 Detailed Description

Abstract base class for consequent bounds. When a variable is branched on it normally interacts with other variables by means of equations. There are cases where we want to step outside LP and do something more directly e.g. fix bounds. This class is for that.

At present it need not be virtual as only instance is [CbcFixVariable](#), but ...

Definition at line 22 of file CbcConsequence.hpp.

4.20.2 Member Function Documentation

4.20.2.1 `virtual void CbcConsequence::applyToSolver (OsiSolverInterface * solver, int state) const [pure virtual]`

Apply to an LP solver.

Action depends on state

Implemented in [CbcFixVariable](#).

The documentation for this class was generated from the following file:

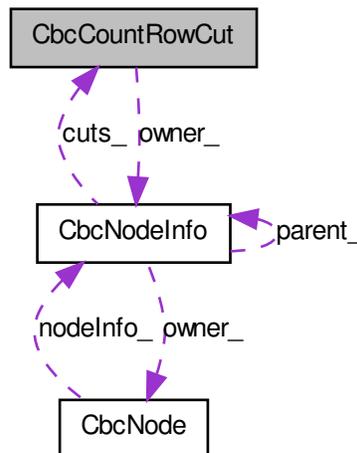
- CbcConsequence.hpp

4.21 CbcCountRowCut Class Reference

OsiRowCut augmented with bookkeeping.

```
#include <CbcCountRowCut.hpp>
```

Collaboration diagram for CbcCountRowCut:



Public Member Functions

- void [increment](#) (int change=1)
Increment the number of references.
- int [decrement](#) (int change=1)
Decrement the number of references and return the number left.
- void [setInfo](#) ([CbcNodeInfo](#) *, int whichOne)
Set the information associating this cut with a node.
- int [numberPointingToThis](#) ()
Number of other [CbcNodeInfo](#) objects pointing to this row cut.
- int [whichCutGenerator](#) () const
Which generator for cuts - as user order.
- bool [canDropCut](#) (const [OsiSolverInterface](#) *solver, int row) const
Returns true if can drop cut if slack basic.

Constructors & destructors

- [CbcCountRowCut](#) ()
Default Constructor.
- [CbcCountRowCut](#) (const [OsiRowCut](#) &)
'Copy' constructor using an [OsiRowCut](#)
- [CbcCountRowCut](#) (const [OsiRowCut](#) &, [CbcNodeInfo](#) *, int whichOne, int whichGenerator=-1, int numberPointingToThis=0)
'Copy' constructor using an [OsiRowCut](#) and an [CbcNodeInfo](#)
- virtual [~CbcCountRowCut](#) ()
Destructor.

4.21.1 Detailed Description

[OsiRowCut](#) augmented with bookkeeping. [CbcCountRowCut](#) is an [OsiRowCut](#) object augmented with bookkeeping information: a reference count and information that specifies the the generator that created the cut and the node to which it's associated.

The general principles for handling the reference count are as follows:

- Once it's determined how the node will branch, increment the reference count under the assumption that all children will use all cuts currently tight at the node and will survive to be placed in the search tree.
- As this assumption is proven incorrect (a cut becomes loose, or a child is fathomed), decrement the reference count accordingly.

When all possible uses of a cut have been demonstrated to be unnecessary, the reference count (`numberPointingToThis_`) will fall to zero. The `CbcCountRowCut` object (and its included `OsiRowCut` object) are then deleted.

Definition at line 35 of file `CbcCountRowCut.hpp`.

4.21.2 Constructor & Destructor Documentation

4.21.2.1 virtual `CbcCountRowCut::~CbcCountRowCut ()` [virtual]

Destructor.

Note

The destructor will reach out (via `owner_`) and NULL the reference to the cut in the owner's `cuts_` list.

4.21.3 Member Function Documentation

4.21.3.1 void `CbcCountRowCut::setInfo (CbcNodeInfo *, int whichOne)`

Set the information associating this cut with a node.

An `CbcNodeInfo` object and an index in the cut set of the node. For locally valid cuts, the node will be the search tree node where the cut was generated. For globally valid cuts, it's the node where the cut was activated.

The documentation for this class was generated from the following file:

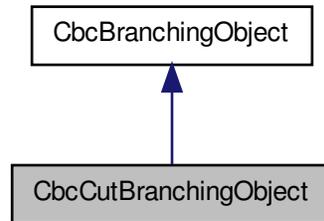
- `CbcCountRowCut.hpp`

4.22 CbcCutBranchingObject Class Reference

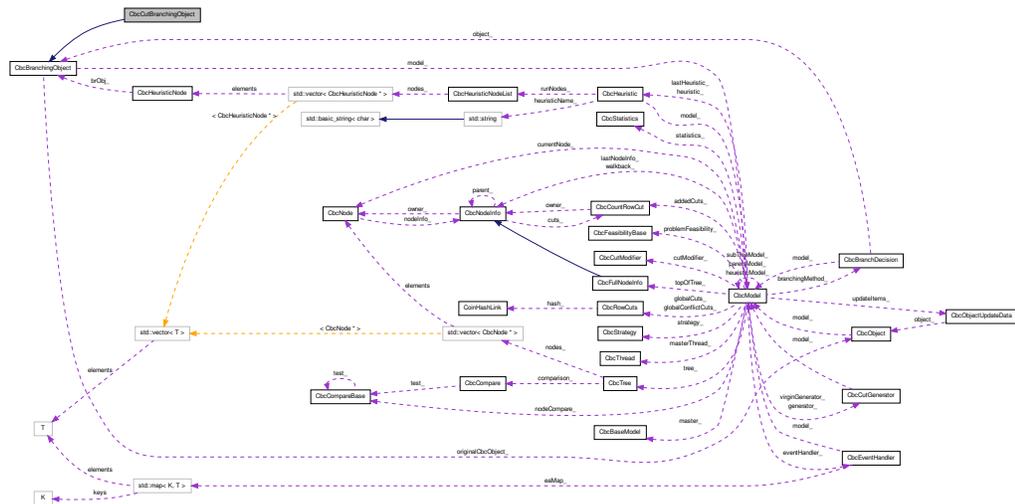
Cut branching object.

```
#include <CbcBranchCut.hpp>
```

Inheritance diagram for CbcCutBranchingObject:



Collaboration diagram for CbcCutBranchingObject:



Public Member Functions

- [CbcCutBranchingObject \(\)](#)

Default constructor.

- [CbcCutBranchingObject](#) ([CbcModel](#) *model, [OsiRowCut](#) &down, [OsiRowCut](#) &up, bool canFix)
Create a cut branching object.
- [CbcCutBranchingObject](#) (const [CbcCutBranchingObject](#) &)
Copy constructor.
- [CbcCutBranchingObject](#) & operator= (const [CbcCutBranchingObject](#) &rhs)
Assignment operator.
- virtual [CbcBranchingObject](#) * clone () const
Clone.
- virtual ~[CbcCutBranchingObject](#) ()
Destructor.
- virtual double [branch](#) ()
Sets the bounds for variables or adds a cut depending on the current arm of the branch and advances the object state to the next arm.
- virtual void [print](#) ()
Print something about branch - only if log level high.
- virtual bool [boundBranch](#) () const
Return true if branch should fix variables.
- virtual [CbcBranchObjType](#) [type](#) () const
Return the type (an integer identifier) of this.
- virtual int [compareOriginalObject](#) (const [CbcBranchingObject](#) *brObj) const
Compare the original object of this with the original object of brObj.
- virtual [CbcRangeCompare](#) [compareBranchingObject](#) (const [CbcBranchingObject](#) *brObj, const bool replaceIfOverlap=false)
Compare the this with brObj.

Protected Attributes

- [OsiRowCut](#) [down_](#)
Cut for the down arm (way_ = -1).

- OsiRowCut [up_](#)
Cut for the up arm ($way_ = 1$).
- bool [canFix_](#)
True if one way can fix variables.

4.22.1 Detailed Description

Cut branching object. This object can specify a two-way branch in terms of two cuts
Definition at line 108 of file CbcBranchCut.hpp.

4.22.2 Constructor & Destructor Documentation

4.22.2.1 CbcCutBranchingObject::CbcCutBranchingObject (CbcModel * *model*, OsiRowCut & *down*, OsiRowCut & *up*, bool *canFix*)

Create a cut branching object.

Cut down will applied on $way=-1$, up on $way==1$ Assumed down will be first so $way_$ set to -1

4.22.3 Member Function Documentation

4.22.3.1 virtual double CbcCutBranchingObject::branch () [virtual]

Sets the bounds for variables or adds a cut depending on the current arm of the branch and advances the object state to the next arm.

Returns change in guessed objective on next branch

Implements [CbcBranchingObject](#).

4.22.3.2 virtual int CbcCutBranchingObject::compareOriginalObject (const CbcBranchingObject * *brObj*) const [virtual]

Compare the original object of `this` with the original object of `brObj`.

Public Member Functions

Generate Cuts

- bool [generateCuts](#) (OsiCuts &cs, int fullScan, OsiSolverInterface *solver, CbcNode *node)

Generate cuts for the client model.

Constructors and destructors

- [CbcCutGenerator](#) ()
Default constructor.
- [CbcCutGenerator](#) (CbcModel *model, CglCutGenerator *generator, int howOften=1, const char *name=NULL, bool normal=true, bool atSolution=false, bool infeasible=false, int howOftenInsub=-100, int whatDepth=-1, int whatDepthInSub=-1, int switchOffIfLessThan=0)

Normal constructor.

- [CbcCutGenerator](#) (const [CbcCutGenerator](#) &)
- Copy constructor.*
- [CbcCutGenerator](#) & operator= (const [CbcCutGenerator](#) &rhs)
- Assignment operator.*
- [~CbcCutGenerator](#) ()

Destructor.

Gets and sets

- void [refreshModel](#) (CbcModel *model)
Set the client model.
- const char * [cutGeneratorName](#) () const
return name of generator
- void [generateTuning](#) (FILE *fp)
Create C++ lines to show how to tune.
- void [setHowOften](#) (int value)
Set the cut generation interval.
- int [howOften](#) () const
Get the cut generation interval.

- int `howOftenInSub` () const
Get the cut generation interval.in sub tree.
- int `inaccuracy` () const
Get level of cut inaccuracy (0 means exact e.g. cliques).
- void `setInaccuracy` (int level)
Set level of cut inaccuracy (0 means exact e.g. cliques).
- void `setWhatDepth` (int value)
Set the cut generation depth.
- void `setWhatDepthInSub` (int value)
Set the cut generation depth in sub tree.
- int `whatDepth` () const
Get the cut generation depth criterion.
- int `whatDepthInSub` () const
Get the cut generation depth criterion.in sub tree.
- void `setMaximumTries` (int value)
Set maximum number of times to enter.
- int `maximumTries` () const
Get maximum number of times to enter.
- int `switches` () const
Get switches (for debug).
- bool `normal` () const
Get whether the cut generator should be called in the normal place.
- void `setNormal` (bool value)
Set whether the cut generator should be called in the normal place.
- bool `atSolution` () const
Get whether the cut generator should be called when a solution is found.
- void `setAtSolution` (bool value)
Set whether the cut generator should be called when a solution is found.
- bool `whenInfeasible` () const
Get whether the cut generator should be called when the subproblem is found to be infeasible.

- void **setWhenInfeasible** (bool value)
Set whether the cut generator should be called when the subproblem is found to be infeasible.
- bool **timing** () const
Get whether the cut generator is being timed.
- void **setTiming** (bool value)
Set whether the cut generator is being timed.
- double **timeInCutGenerator** () const
Return time taken in cut generator.
- void **incrementTimeInCutGenerator** (double value)
- CglCutGenerator * **generator** () const
Get the CglCutGenerator corresponding to this CbcCutGenerator.
- int **numberTimesEntered** () const
Number times cut generator entered.
- void **setNumberTimesEntered** (int value)
- void **incrementNumberTimesEntered** (int value=1)
- int **numberCutsInTotal** () const
Total number of cuts added.
- void **setNumberCutsInTotal** (int value)
- void **incrementNumberCutsInTotal** (int value=1)
- int **numberElementsInTotal** () const
Total number of elements added.
- void **setNumberElementsInTotal** (int value)
- void **incrementNumberElementsInTotal** (int value=1)
- int **numberColumnCuts** () const
Total number of column cuts.
- void **setNumberColumnCuts** (int value)
- void **incrementNumberColumnCuts** (int value=1)
- int **numberCutsActive** () const
Total number of cuts active after (at end of n cut passes at each node).
- void **setNumberCutsActive** (int value)
- void **incrementNumberCutsActive** (int value=1)
- void **setSwitchOffIfLessThan** (int value)
- int **switchOffIfLessThan** () const
- bool **needsOptimalBasis** () const

Say if optimal basis needed.

- void **setNeedsOptimalBasis** (bool yesNo)
Set if optimal basis needed.
- bool **mustCallAgain** () const
*Whether generator **MUST** be called again if any cuts (i.e. ignore break from loop).*
- void **setMustCallAgain** (bool yesNo)
*Set whether generator **MUST** be called again if any cuts (i.e. ignore break from loop).*
- bool **switchedOff** () const
Whether generator switched off for moment.
- void **setSwitchedOff** (bool yesNo)
Set whether generator switched off for moment.
- bool **ineffectualCuts** () const
Whether last round of cuts did little.
- void **setIneffectualCuts** (bool yesNo)
Set whether last round of cuts did little.
- bool **whetherToUse** () const
Whether to use if any cuts generated.
- void **setWhetherToUse** (bool yesNo)
Set whether to use if any cuts generated.
- bool **whetherInMustCallAgainMode** () const
Whether in must call again mode (or after others).
- void **setWhetherInMustCallAgainMode** (bool yesNo)
Set whether in must call again mode (or after others).
- bool **whetherCallAtEnd** () const
Whether to call at end.
- void **setWhetherCallAtEnd** (bool yesNo)
Set whether to call at end.
- int **numberCutsAtRoot** () const
Number of cuts generated at root.

- void **setNumberCutsAtRoot** (int value)
- int **numberActiveCutsAtRoot** () const
Number of cuts active at root.
- void **setNumberActiveCutsAtRoot** (int value)
- int **numberShortCutsAtRoot** () const
Number of short cuts at root.
- void **setNumberShortCutsAtRoot** (int value)
- void **setModel** (CbcModel *model)
Set model.
- bool **globalCutsAtRoot** () const
Whether global cuts at root.
- void **setGlobalCutsAtRoot** (bool yesNo)
Set whether global cuts at root.
- bool **globalCuts** () const
Whether global cuts.
- void **setGlobalCuts** (bool yesNo)
Set whether global cuts.
- void **addStatistics** (const CbcCutGenerator *other)
Add in statistics from other.
- void **scaleBackStatistics** (int factor)
Scale back statistics by factor.

4.23.1 Detailed Description

Interface between Cbc and Cut Generation Library. `CbcCutGenerator` is intended to provide an intelligent interface between Cbc and the cutting plane algorithms in the CGL. A `CbcCutGenerator` is bound to a `CglCutGenerator` and to an `CbcModel`. It contains parameters which control when and how the `generateCuts` method of the `CglCutGenerator` will be called.

The builtin decision criteria available to use when deciding whether to generate cuts are limited: every X nodes, when a solution is found, and when a subproblem is found to be infeasible. The idea is that the class will grow more intelligent with time.

Definition at line 49 of file `CbcCutGenerator.hpp`.

4.23.2 Member Function Documentation

4.23.2.1 `bool CbcCutGenerator::generateCuts (OsiCuts & cs, int fullScan, OsiSolverInterface * solver, CbcNode * node)`

Generate cuts for the client model.

Evaluate the state of the client model and decide whether to generate cuts. The generated cuts are inserted into and returned in the collection of cuts *cs*.

If *fullScan* is !=0, the generator is obliged to call the CGL `generateCuts` routine. Otherwise, it is free to make a local decision. Negative *fullScan* says things like at integer solution The current implementation uses `whenCutGenerator_` to decide.

The routine returns true if reoptimisation is needed (because the state of the solver interface has been modified).

If *node* then can find out depth

4.23.2.2 `void CbcCutGenerator::refreshModel (CbcModel * model)`

Set the client model.

In addition to setting the client model, `refreshModel` also calls the `refreshSolver` method of the `CglCutGenerator` object.

4.23.2.3 `void CbcCutGenerator::setHowOften (int value)`

Set the cut generation interval.

Set the number of nodes evaluated between calls to the Cgl object's `generateCuts` routine.

If *value* is positive, cuts will always be generated at the specified interval. If *value* is negative, cuts will initially be generated at the specified interval, but Cbc may adjust the value depending on the success of cuts produced by this generator.

A value of -100 disables the generator, while a value of -99 means just at root.

4.23.2.4 `void CbcCutGenerator::setWhatDepth (int value)`

Set the cut generation depth.

Set the depth criterion for calls to the Cgl object's `generateCuts` routine. Only active if > 0 .

If `whenCutGenerator` is positive and this is positive then this overrides. If `whenCutGenerator` is -1 then this is used as criterion if any cuts were generated at root node. If `whenCutGenerator` is anything else this is ignored.

The documentation for this class was generated from the following file:

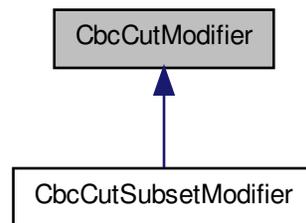
- CbcCutGenerator.hpp

4.24 CbcCutModifier Class Reference

Abstract cut modifier base class.

```
#include <CbcCutModifier.hpp>
```

Inheritance diagram for CbcCutModifier:



Public Member Functions

- [CbcCutModifier \(\)](#)
Default Constructor.
- [virtual ~CbcCutModifier \(\)](#)
Destructor.
- [CbcCutModifier & operator= \(const CbcCutModifier &rhs\)](#)
Assignment.

- virtual `CbcCutModifier * clone () const =0`
Clone.
- virtual `int modify (const OsiSolverInterface *solver, OsiRowCut &cut)=0`
Returns 0 unchanged 1 strengthened 2 weakened 3 deleted.
- virtual `void generateCpp (FILE *)`
Create C++ lines to get to current state.

4.24.1 Detailed Description

Abstract cut modifier base class. In exotic circumstances - cuts may need to be modified a) strengthened - changed b) weakened - changed c) deleted - set to NULL d) unchanged

Definition at line 27 of file CbcCutModifier.hpp.

The documentation for this class was generated from the following file:

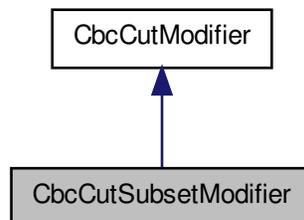
- CbcCutModifier.hpp

4.25 CbcCutSubsetModifier Class Reference

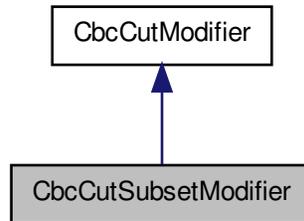
Simple cut modifier base class.

```
#include <CbcCutSubsetModifier.hpp>
```

Inheritance diagram for CbcCutSubsetModifier:



Collaboration diagram for CbcCutSubsetModifier:



Public Member Functions

- [CbcCutSubsetModifier](#) ()
Default Constructor.
- [CbcCutSubsetModifier](#) (int firstOdd)
Useful Constructor.
- virtual [~CbcCutSubsetModifier](#) ()
Destructor.
- [CbcCutSubsetModifier](#) & [operator=](#) (const [CbcCutSubsetModifier](#) &rhs)
Assignment.
- virtual [CbcCutModifier](#) * [clone](#) () const
Clone.
- virtual int [modify](#) (const [OsiSolverInterface](#) *solver, [OsiRowCut](#) &cut)
Returns 0 unchanged 1 strengthened 2 weakened 3 deleted.
- virtual void [generateCpp](#) (FILE *)
Create C++ lines to get to current state.

Protected Attributes

- int `firstOdd_`
data First odd variable

4.25.1 Detailed Description

Simple cut modifier base class. In exotic circumstances - cuts may need to be modified a) strengthened - changed b) weakened - changed c) deleted - set to NULL d) unchanged

initially get rid of cuts with variables $\geq k$ could weaken

Definition at line 31 of file CbcCutSubsetModifier.hpp.

The documentation for this class was generated from the following file:

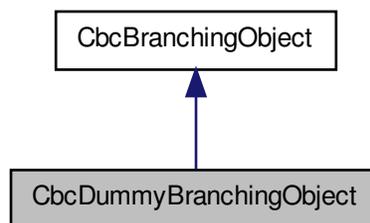
- CbcCutSubsetModifier.hpp

4.26 CbcDummyBranchingObject Class Reference

Dummy branching object.

```
#include <CbcDummyBranchingObject.hpp>
```

Inheritance diagram for CbcDummyBranchingObject:



Print something about branch - only if log level high.

- virtual CbcBranchObjType `type () const`
Return the type (an integer identifier) of this.
- virtual int `compareOriginalObject (const CbcBranchingObject *brObj) const`
Compare the original object of this with the original object of brObj.
- virtual CbcRangeCompare `compareBranchingObject (const CbcBranchingObject *brObj, const bool replaceIfOverlap=false)`
Compare the this with brObj.

4.26.1 Detailed Description

Dummy branching object. This object specifies a one-way dummy branch. This is so one can carry on branching even when it looks feasible

Definition at line 18 of file CbcDummyBranchingObject.hpp.

4.26.2 Member Function Documentation

4.26.2.1 virtual int CbcDummyBranchingObject::compareOriginalObject (const CbcBranchingObject * brObj) const [virtual]

Compare the original object of `this` with the original object of `brObj`.

Assumes that there is an ordering of the original objects. This method should be invoked only if `this` and `brObj` are of the same type. Return negative/0/positive depending on whether `this` is smaller/same/larger than the argument.

Reimplemented from [CbcBranchingObject](#).

4.26.2.2 virtual CbcRangeCompare CbcDummyBranchingObject::compareBranchingObject (const CbcBranchingObject * brObj, const bool replaceIfOverlap = false) [virtual]

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate CbcRangeCompare value (first argument being the sub/superset if that's the case). In case of overlap (and

if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

Implements [CbcBranchingObject](#).

The documentation for this class was generated from the following file:

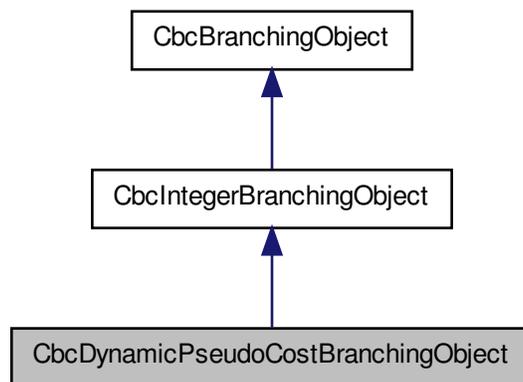
- `CbcDummyBranchingObject.hpp`

4.27 CbcDynamicPseudoCostBranchingObject Class Reference

Simple branching object for an integer variable with pseudo costs.

```
#include <CbcBranchDynamic.hpp>
```

Inheritance diagram for `CbcDynamicPseudoCostBranchingObject`:



Destructor.

- void `fillPart` (int variable, int way, double value, `CbcSimpleIntegerDynamicPseudoCost *object`)
Does part of constructor.
- virtual double `branch` ()
Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.
- virtual int `fillStrongInfo` (`CbcStrongInfo &info`)
Some branchingObjects may claim to be able to skip strong branching.
- double `changeInGuessed` () const
Change in guessed.
- void `setChangeInGuessed` (double value)
Set change in guessed.
- `CbcSimpleIntegerDynamicPseudoCost * object` () const
Return object.
- void `setObject` (`CbcSimpleIntegerDynamicPseudoCost *object`)
Set object.
- virtual `CbcBranchObjType type` () const
Return the type (an integer identifier) of `this`.

Protected Attributes

- double `changeInGuessed_`
Change in guessed objective value for next branch.
- `CbcSimpleIntegerDynamicPseudoCost * object_`
Pointer back to object.

4.27.1 Detailed Description

Simple branching object for an integer variable with pseudo costs. This object can specify a two-way branch on an integer variable. For each arm of the branch, the upper and lower bounds on the variable can be independently specified.

Variable_ holds the index of the integer variable in the integerVariable_ array of the model.

Definition at line 111 of file CbcBranchDynamic.hpp.

4.27.2 Constructor & Destructor Documentation

4.27.2.1 CbcDynamicPseudoCostBranchingObject::CbcDynamicPseudoCostBranchingObject (CbcModel * *model*, int *variable*, int *way*, double *value*, CbcSimpleIntegerDynamicPseudoCost * *object*)

Create a standard floor/ceiling branch object.

Specifies a simple two-way branch. Let `value = x*`. One arm of the branch will be $lb \leq x \leq \text{floor}(x^*)$, the other $\text{ceil}(x^*) \leq x \leq ub$. Specify `way = -1` to set the object state to perform the down arm first, `way = 1` for the up arm.

4.27.2.2 CbcDynamicPseudoCostBranchingObject::CbcDynamicPseudoCostBranchingObject (CbcModel * *model*, int *variable*, int *way*, double *lowerValue*, double *upperValue*)

Create a degenerate branch object.

Specifies a 'one-way branch'. Calling `branch()` for this object will always result in $lowerValue \leq x \leq upperValue$. Used to fix a variable when `lowerValue = upperValue`.

4.27.3 Member Function Documentation

4.27.3.1 virtual double CbcDynamicPseudoCostBranchingObject::branch () [virtual]

Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.

This version also changes guessed objective value

Reimplemented from [CbcIntegerBranchingObject](#).

4.27.3.2 virtual int CbcDynamicPseudoCostBranchingObject::fillStrongInfo (CbcStrongInfo & info) [virtual]

Some branchingObjects may claim to be able to skip strong branching.

If so they have to fill in [CbcStrongInfo](#). The object mention in incoming [CbcStrongInfo](#) must match. Returns nonzero if skip is wanted

Reimplemented from [CbcBranchingObject](#).

The documentation for this class was generated from the following file:

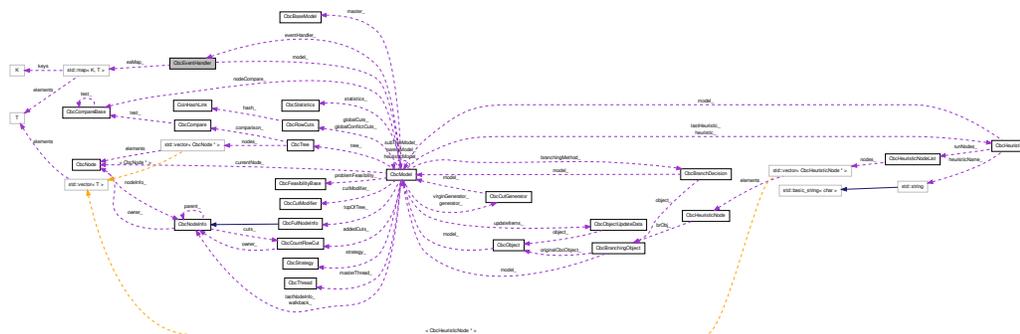
- CbcBranchDynamic.hpp

4.28 CbcEventHandler Class Reference

Base class for Cbc event handling.

```
#include <CbcEventHandler.hpp>
```

Collaboration diagram for CbcEventHandler:



Public Types

- enum [CbcEvent](#) {
[node](#) = 200, [treeStatus](#), [solution](#), [heuristicSolution](#),
[beforeSolution1](#), [beforeSolution2](#), [afterHeuristic](#), [endSearch](#) }
Events known to cbc.
- enum [CbcAction](#) {
[noAction](#) = -1, [stop](#) = 0, [restart](#), [restartRoot](#),

`addCuts, killSolution }`

Action codes returned by the event handler.

- `typedef std::map< CbcEvent, CbcAction > eaMapPair`

Data type for event/action pairs.

Public Member Functions

Event Processing

- virtual `CbcAction event (CbcEvent whichEvent)`

Return the action to be taken for an event.

Constructors and destructors

- `CbcEventHandler (CbcModel *model=0)`
Default constructor.
- `CbcEventHandler (const CbcEventHandler &orig)`
Copy constructor.
- `CbcEventHandler & operator= (const CbcEventHandler &rhs)`
Assignment.
- virtual `CbcEventHandler * clone () const`
Clone (virtual) constructor.
- virtual `~CbcEventHandler ()`
Destructor.

Set/Get methods

- void `setModel (CbcModel *model)`
Set model.
- const `CbcModel * getModel () const`
Get model.
- void `setDefaultAction (CbcAction action)`
Set the default action.
- void `setAction (CbcEvent event, CbcAction action)`
Set the action code associated with an event.

Protected Attributes

Data members

Protected (as opposed to private) to allow access by derived classes.

- [CbcModel](#) * `model_`
Pointer to associated [CbcModel](#).
- [CbcAction](#) `dftAction_`
Default action.
- [eaMapPair](#) * `eaMap_`
Pointer to a map that holds non-default event/action pairs.

4.28.1 Detailed Description

Base class for Cbc event handling. Up front: We're not talking about unanticipated events here. We're talking about anticipated events, in the sense that the code is going to make a call to [event\(\)](#) and is prepared to obey the return value that it receives.

The general pattern for usage is as follows:

1. Create a [CbcEventHandler](#) object. This will be initialised with a set of default actions for every recognised event.
2. Attach the event handler to the [CbcModel](#) object.
3. When execution reaches the point where an event occurs, call the event handler as `CbcEventHandler::event(the event)`. The return value will specify what the code should do in response to the event.

The return value associated with an event can be changed at any time.

Definition at line 81 of file `CbcEventHandler.hpp`.

4.28.2 Member Enumeration Documentation

4.28.2.1 `enum CbcEventHandler::CbcEvent`

Events known to cbc.

Enumerator:

node Processing of the current node is complete.

treeStatus A tree status interval has arrived.

solution A solution has been found.

heuristicSolution A heuristic solution has been found.

beforeSolution1 A solution will be found unless user takes action (first check).

beforeSolution2 A solution will be found unless user takes action (thorough check).

afterHeuristic After failed heuristic.

endSearch End of search.

Definition at line 87 of file CbcEventHandler.hpp.

4.28.2.2 enum CbcEventHandler::CbcAction

Action codes returned by the event handler.

Specific values are chosen to match ClpEventHandler return codes.

Enumerator:

noAction Continue --- no action required.

stop Stop --- abort the current run at the next opportunity.

restart Restart --- restart branch-and-cut search; do not undo root node processing.

restartRoot RestartRoot --- undo root node and start branch-and-cut afresh.

addCuts Add special cuts.

killSolution Pretend solution never happened.

Definition at line 110 of file CbcEventHandler.hpp.

4.28.3 Constructor & Destructor Documentation

4.28.3.1 CbcEventHandler::CbcEventHandler (CbcModel * model = 0)

Default constructor.

4.28.3.2 CbcEventHandler::CbcEventHandler (const CbcEventHandler & orig)

Copy constructor.

4.28.3.3 virtual CbcEventHandler::~~CbcEventHandler () [virtual]

Destructor.

4.28.4 Member Function Documentation

4.28.4.1 virtual CbcAction CbcEventHandler::event (CbcEvent *whichEvent*) [virtual]

Return the action to be taken for an event.

Return the action that should be taken in response to the event passed as the parameter. The default implementation simply reads a return code from a map.

4.28.4.2 CbcEventHandler& CbcEventHandler::operator= (const CbcEventHandler & *rhs*)

Assignment.

4.28.4.3 virtual CbcEventHandler* CbcEventHandler::clone () const [virtual]

Clone (virtual) constructor.

4.28.4.4 void CbcEventHandler::setModel (CbcModel * *model*) [inline]

Set model.

Definition at line 176 of file CbcEventHandler.hpp.

4.28.4.5 const CbcModel* CbcEventHandler::getModel () const [inline]

Get model.

Definition at line 182 of file CbcEventHandler.hpp.

The documentation for this class was generated from the following file:

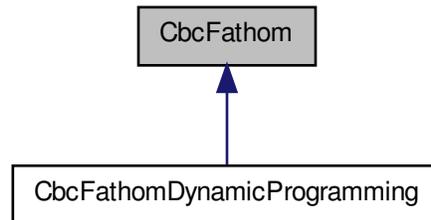
- [CbcEventHandler.hpp](#)

4.29 CbcFathom Class Reference

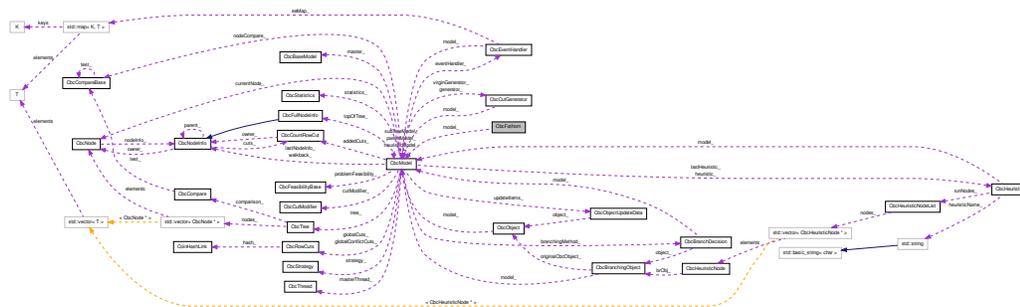
Fathom base class.

```
#include <CbcFathom.hpp>
```

Inheritance diagram for CbcFathom:



Collaboration diagram for CbcFathom:



Public Member Functions

- virtual void [setModel](#) (CbcModel *model)

update model (This is needed if cliques update matrix etc)

- virtual `CbcFathom * clone () const =0`
Clone.
- virtual void `resetModel (CbcModel *model)=0`
Resets stuff if model changes.
- virtual int `fathom (double *&newSolution)=0`
returns 0 if no fathoming attempted, 1 fully fathomed, 2 incomplete search, 3 incomplete search but treat as complete.

Protected Attributes

- `CbcModel * model_`
Model.
- bool `possible_`
Possible - if this method of fathoming can be used.

4.29.1 Detailed Description

Fathom base class. The idea is that after some branching the problem will be effectively smaller than the original problem and maybe there will be a more specialized technique which can completely fathom this branch quickly.

One method is to presolve the problem to give a much smaller new problem and then do branch and cut on that. Another might be dynamic programming.

Definition at line 32 of file CbcFathom.hpp.

4.29.2 Member Function Documentation

4.29.2.1 `virtual int CbcFathom::fathom (double *& newSolution) [pure virtual]`

returns 0 if no fathoming attempted, 1 fully fathomed, 2 incomplete search, 3 incomplete search but treat as complete.

If solution then newSolution will not be NULL and will be freed by `CbcModel`. It is expected that the solution is better than best so far but `CbcModel` will double check.

Public Member Functions

- virtual void `setModel` (`CbcModel *model`)
update model (This is needed if cliques update matrix etc)
- virtual `CbcFathom * clone` () const
Clone.
- virtual void `resetModel` (`CbcModel *model`)
Resets stuff if model changes.
- virtual int `fathom` (`double *&newSolution`)
returns 0 if no fathoming attempted, 1 fully fathomed, 2 incomplete search, 3 incomplete search but treat as complete.
- int `maximumSize` () const
Maximum size allowed.
- int `checkPossible` (`int allowableSize=0`)
Returns type of algorithm and sets up arrays.
- bool `tryColumn` (`int numberElements, const int *rows, const double *coefficients, double cost, int upper=COIN_INT_MAX`)
Tries a column returns true if was used in making any changes.
- const double * `cost` () const
Returns cost array.
- const int * `back` () const
Returns back array.
- int `target` () const
Gets bit pattern for target result.
- void `setTarget` (`int value`)
Sets bit pattern for target result.

Protected Attributes

- int `size_`
Size of states (power of 2 unless just one constraint).

- int `type_`
Type - 0 coefficients and rhs all 1, 1 - coefficients > 1 or rhs > 1.
- double * `cost_`
Space for states.
- int * `back_`
Which state produced this cheapest one.
- int * `lookup_`
Some rows may be satisfied so we need a lookup.
- int * `indices_`
Space for sorted indices.
- int `numberActive_`
Number of active rows.
- int `maximumSizeAllowed_`
Maximum size allowed.
- int * `startBit_`
Start bit for each active row.
- int * `numberBits_`
Number bits for each active row.
- int * `rhs_`
Effective rhs.
- int * `coefficients_`
Space for sorted coefficients.
- int `target_`
Target pattern.
- int `numberNonOne_`
Number of Non 1 rhs.
- int `bitPattern_`
Current bit pattern.

- int [algorithm_](#)
Current algorithm.

4.30.1 Detailed Description

FathomDynamicProgramming class. The idea is that after some branching the problem will be effectively smaller than the original problem and maybe there will be a more specialized technique which can completely fathom this branch quickly.

This is a dynamic programming implementation which is very fast for some specialized problems. It expects small integral rhs, an all integer problem and positive integral coefficients. At present it can not do general set covering problems just set partitioning. It can find multiple optima for various rhs combinations.

The main limiting factor is size of state space. Each 1 rhs doubles the size of the problem. 2 or 3 rhs quadruples, 4,5,6,7 by 8 etc.

Definition at line 28 of file CbcFathomDynamicProgramming.hpp.

4.30.2 Member Function Documentation

4.30.2.1 virtual int CbcFathomDynamicProgramming::fathom (double *& newSolution) [virtual]

returns 0 if no fathoming attempted, 1 fully fathomed , 2 incomplete search, 3 incomplete search but treat as complete.

If solution then newSolution will not be NULL and will be freed by [CbcModel](#). It is expected that the solution is better than best so far but [CbcModel](#) will double check.

If returns 3 then of course there is no guarantee of global optimum

Implements [CbcFathom](#).

The documentation for this class was generated from the following file:

- CbcFathomDynamicProgramming.hpp

4.31 CbcFeasibilityBase Class Reference

Public Member Functions

- virtual int [feasible](#) ([CbcModel](#) *, int)
On input mode: 0 - called after a solve but before any cuts -1 - called after strong branching Returns : 0 - no opinion -1 pretend infeasible 1 pretend integer solution.

- virtual `CbcFeasibilityBase * clone () const`
Clone.

4.31.1 Detailed Description

Definition at line 22 of file CbcFeasibilityBase.hpp.

The documentation for this class was generated from the following file:

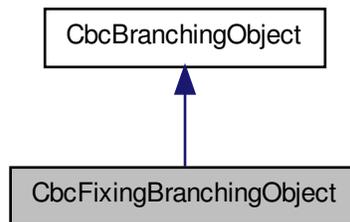
- CbcFeasibilityBase.hpp

4.32 CbcFixingBranchingObject Class Reference

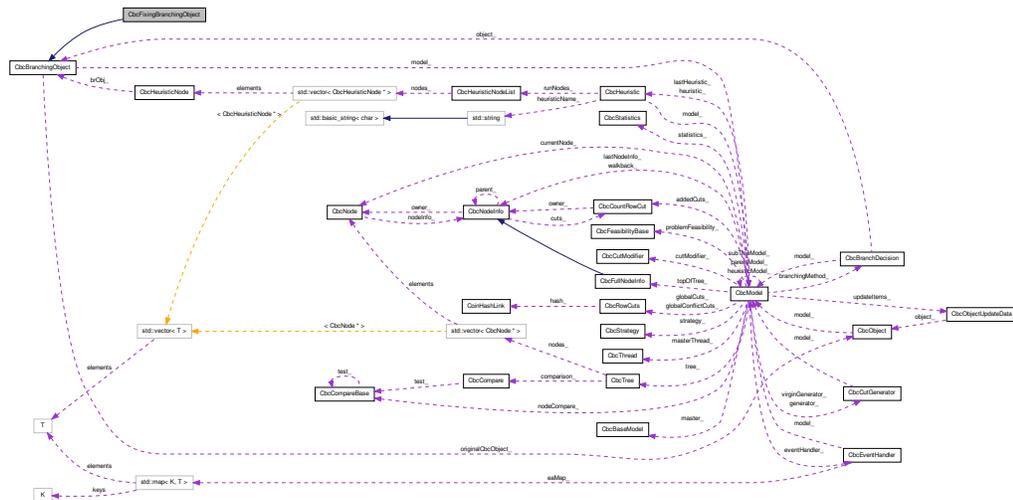
General Branching Object class.

```
#include <CbcFollowOn.hpp>
```

Inheritance diagram for CbcFixingBranchingObject:



Collaboration diagram for CbcFixingBranchingObject:



Public Member Functions

- virtual `CbcBranchingObject * clone ()` const
Clone.
- virtual double `branch ()`
Does next branch and updates state.
- virtual void `print ()`
Print something about branch - only if log level high.
- virtual `CbcBranchObjType type ()` const
Return the type (an integer identifier) of this.
- virtual `int compareOriginalObject (const CbcBranchingObject *brObj)` const
Compare the original object of this with the original object of brObj.
- virtual `CbcRangeCompare compareBranchingObject (const CbcBranchingObject *brObj, const bool replaceIfOverlap=false)`
Compare the this with brObj.

4.32.1 Detailed Description

General Branching Object class. Each way fixes some variables to lower bound
Definition at line 74 of file CbcFollowOn.hpp.

4.32.2 Member Function Documentation

4.32.2.1 `virtual int CbcFixingBranchingObject::compareOriginalObject (const CbcBranchingObject * brObj) const [virtual]`

Compare the original object of `this` with the original object of `brObj`.

Assumes that there is an ordering of the original objects. This method should be invoked only if `this` and `brObj` are of the same type. Return negative/0/positive depending on whether `this` is smaller/same/larger than the argument.

Reimplemented from [CbcBranchingObject](#).

4.32.2.2 `virtual CbcRangeCompare CbcFixingBranchingObject::compareBranchingObject (const CbcBranchingObject * brObj, const bool replaceIfOverlap = false) [virtual]`

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate `CbcRangeCompare` value (first argument being the sub/superset if that's the case). In case of overlap (and if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

Implements [CbcBranchingObject](#).

The documentation for this class was generated from the following file:

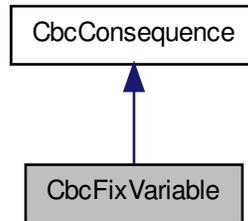
- CbcFollowOn.hpp

4.33 CbcFixVariable Class Reference

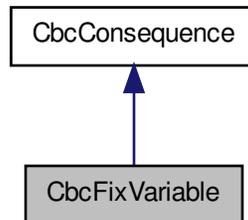
Class for consequent bounds.

```
#include <CbcFixVariable.hpp>
```

Inheritance diagram for CbcFixVariable:



Collaboration diagram for CbcFixVariable:



Public Member Functions

- virtual [CbcConsequence](#) * [clone](#) () const
Clone.
- virtual [~CbcFixVariable](#) ()
Destructor.
- virtual void [applyToSolver](#) (OsiSolverInterface *solver, int state) const

Apply to an LP solver.

Protected Attributes

- int `numberStates_`
Number of states.
- int * `states_`
Values of integers for various states.
- int * `startLower_`
Start of information for each state (setting new lower).
- int * `startUpper_`
Start of information for each state (setting new upper).
- double * `newBound_`
For each variable new bounds.
- int * `variable_`
Variable.

4.33.1 Detailed Description

Class for consequent bounds. When a variable is branched on it normally interacts with other variables by means of equations. There are cases where we want to step outside LP and do something more directly e.g. fix bounds. This class is for that.

A state of -9999 means at LB, +9999 means at UB, others mean if fixed to that value.

Definition at line 22 of file CbcFixVariable.hpp.

4.33.2 Member Function Documentation

4.33.2.1 `virtual void CbcFixVariable::applyToSolver (OsiSolverInterface * solver, int state) const [virtual]`

Apply to an LP solver.

Action depends on state

Implements [CbcConsequence](#).

The documentation for this class was generated from the following file:

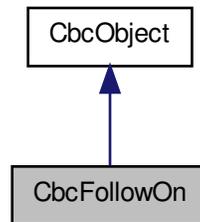
- CbcFixVariable.hpp

4.34 CbcFollowOn Class Reference

Define a follow on class.

```
#include <CbcFollowOn.hpp>
```

Inheritance diagram for CbcFollowOn:



Protected Attributes

- CoinPackedMatrix `matrix_`
data Matrix
- CoinPackedMatrix `matrixByRow_`
Matrix by row.
- int * `rhs_`
Possible rhs (if 0 then not possible).

4.34.1 Detailed Description

Define a follow on class. The idea of this is that in air-crew scheduling problems crew may fly in on flight A and out on flight B or on some other flight. A useful branch is one which on one side fixes all which go out on flight B to 0, while the other branch fixes all those that do NOT go out on flight B to 0.

This branching rule should be in addition to normal rules and have a high priority.

Definition at line 25 of file CbcFollowOn.hpp.

The documentation for this class was generated from the following file:

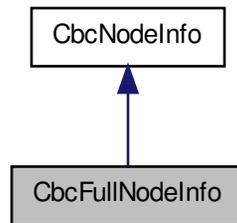
- CbcFollowOn.hpp

4.35 CbcFullNodeInfo Class Reference

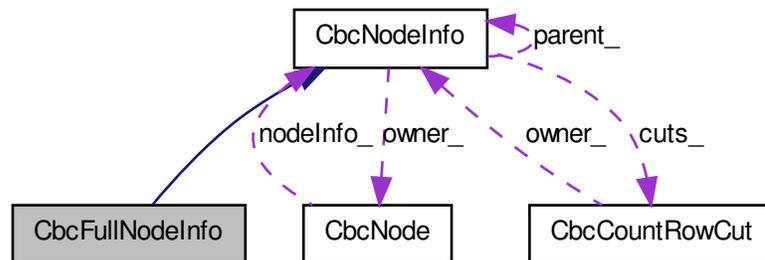
Information required to recreate the subproblem at this node.

```
#include <CbcFullNodeInfo.hpp>
```

Inheritance diagram for CbcFullNodeInfo:



Collaboration diagram for CbcFullNodeInfo:



Public Member Functions

- virtual void [applyToModel](#) (CbcModel *model, CoinWarmStartBasis *&basis, CbcCountRowCut **addCuts, int ¤tNumberCuts) const
Modify model according to information at node.
- virtual int [applyBounds](#) (int iColumn, double &lower, double &upper, int force)

Just apply bounds to one variable - force means overwrite by lower,upper (I=>infeasible).

- virtual `CbcNodeInfo * buildRowBasis` (`CoinWarmStartBasis &basis`) const
Builds up row basis backwards (until original model).
- `CbcFullNodeInfo` (`CbcModel *model`, int `numberOfRowsAtContinuous`)
Constructor from continuous or satisfied.
- virtual `CbcNodeInfo * clone` () const
Clone.
- const double * `lower` () const
Lower bounds.
- void `setColLower` (int `sequence`, double `value`)
Set a bound.
- double * `mutableLower` () const
Mutable lower bounds.
- const double * `upper` () const
Upper bounds.
- void `setColUpper` (int `sequence`, double `value`)
Set a bound.
- double * `mutableUpper` () const
Mutable upper bounds.

Protected Attributes

- `CoinWarmStartBasis * basis_`
Full basis.

4.35.1 Detailed Description

Information required to recreate the subproblem at this node. When a subproblem is initially created, it is represented by a `CbcNode` object and an attached `CbcNodeInfo` object.

The [CbcNode](#) contains information needed while the subproblem remains live. The [CbcNode](#) is deleted when the last branch arm has been evaluated.

The [CbcNodeInfo](#) contains information required to maintain the branch-and-cut search tree structure (links and reference counts) and to recreate the subproblem for this node (basis, variable bounds, cutting planes). A [CbcNodeInfo](#) object remains in existence until all nodes have been pruned from the subtree rooted at this node.

The principle used to maintain the reference count is that the reference count is always the sum of all potential and actual children of the node. Specifically,

- Once it's determined how the node will branch, the reference count is set to the number of potential children (*i.e.*, the number of arms of the branch).
- As each child is created by [CbcNode::branch\(\)](#) (converting a potential child to the active subproblem), the reference count is decremented.
- If the child survives and will become a node in the search tree (converting the active subproblem into an actual child), increment the reference count.

Notice that the active subproblem lives in a sort of limbo, neither a potential or an actual node in the branch-and-cut tree.

[CbcNodeInfo](#) objects come in two flavours. A [CbcFullNodeInfo](#) object contains a full record of the information required to recreate a subproblem. A [CbcPartialNodeInfo](#) object expresses this information in terms of differences from the parent. Holds complete information for recreating a subproblem.

A [CbcFullNodeInfo](#) object contains all necessary information (bounds, basis, and cuts) required to recreate a subproblem.

Definition at line 81 of file [CbcFullNodeInfo.hpp](#).

4.35.2 Member Function Documentation

4.35.2.1 `virtual void CbcFullNodeInfo::applyToModel (CbcModel * model, CoinWarmStartBasis *& basis, CbcCountRowCut ** addCuts, int & currentNumberCuts) const [virtual]`

Modify model according to information at node.

The routine modifies the model according to bound information at node, creates a new basis according to information at node, but with the size passed in through basis, and adds any cuts to the addCuts array.

Note

The basis passed in via basis is solely a vehicle for passing in the desired basis size. It will be deleted and a new basis returned.

Implements [CbcNodeInfo](#).

4.35.2.2 `virtual CbcNodeInfo* CbcFullNodeInfo::buildRowBasis (CoinWarmStartBasis & basis) const [virtual]`

Builds up row basis backwards (until original model).

Returns NULL or previous one to apply . Depends on Free being 0 and impossible for cuts

Implements [CbcNodeInfo](#).

4.35.3 Member Data Documentation

4.35.3.1 `CoinWarmStartBasis* CbcFullNodeInfo::basis_ [protected]`

Full basis.

This MUST BE A POINTER to avoid cutting extra information in derived warm start classes.

Definition at line 151 of file CbcFullNodeInfo.hpp.

The documentation for this class was generated from the following file:

- CbcFullNodeInfo.hpp

- struct [debugSolInfo_struct](#)
Array of primal variable values for debugging.
- struct [djFixCtl_struct](#)
Control use of reduced cost fixing prior to B&C.
- struct **flowCtl_struct**
Control variable and prototype for flow cover cut generator.
- struct **fpumpCtl_struct**
Control variable and prototype for feasibility pump heuristic.
- struct [genParamsInfo_struct](#)
Start and end of cbc-generic parameters in parameter vector.
- struct **gomoryCtl_struct**
Control variable and prototype for Gomory cut generator.
- struct **greedyCoverCtl_struct**
Control variable and prototype for greedy cover heuristic.
- struct **greedyEqualityCtl_struct**
Control variable and prototype for greedy equality heuristic.
- struct **knapsackCtl_struct**
Control variable and prototype for knapsack cover cut generator.
- struct **localTreeCtl_struct**
Control variables for local tree.
- struct **mirCtl_struct**
Control variable and prototype for MIR cut generator.
- struct **oddHoleCtl_struct**
Control variable and prototype for odd hole cut generator.
- struct [osiParamsInfo_struct](#)
Start and end of OsiSolverInterface parameters in parameter vector.
- struct **probingCtl_struct**
Control variable and prototype for probing cut generator.

- struct **redSplitCtl_struct**
Control variable and prototype for reduce-and-split cut generator.
- struct **roundingCtl_struct**
Control variable and prototype for simple rounding heuristic.
- struct **twomirCtl_struct**
Control variable and prototype for Two-MIR cut generator.

Public Types

Enumeration types used for cbc-generic control variables

- enum [IPPControl](#)
Codes to control integer preprocessing.
- enum [CGControl](#)
Codes to control the use of cut generators and heuristics.
- enum [BPControl](#)
Codes to specify the assignment of branching priorities.
- enum [BACMajor](#)
Major status codes for branch-and-cut.
- enum [BACMinor](#)
Minor status codes.
- enum [BACWhere](#)
Codes to specify where branch-and-cut stopped.

Public Member Functions

Constructors and destructors

- [CbcGenCtlBlk](#) ()
Default constructor.
- [~CbcGenCtlBlk](#) ()
Destructor.

Access and Control Functions for Cut Generators and Heuristics

Control functions, plus lazy creation functions for cut generators and heuristics

cbc-generic avoids creating objects for cut generators and heuristics unless they're actually used. For cut generators, a prototype is created and reused. For heuristics, the default is to create a new object with each call, because the model may have changed. The object is returned through the reference parameter. The return value of the function is the current action state.

Cut generator and heuristic objects created by these calls will be deleted with the destruction of the [CbcGenCtlBlk](#) object.

- `int getCutDepth ()`
Get cut depth setting.
- `void setCutDepth (int cutDepth)`
Set cut depth setting.
- `IPPCControl getIPPAction ()`
- `void setIPPAction (IPPCControl action)`
Set action state for use of integer preprocessing.
- `CGControl getProbing (CglCutGenerator *&gen)`
Obtain a prototype for a probing cut generator.
- `void setProbingAction (CGControl action)`
Set action state for use of probing cut generator.
- `CGControl getClique (CglCutGenerator *&gen)`
Obtain a prototype for a clique cut generator.
- `void setCliqueAction (CGControl action)`
Set action state for use of clique cut generator.
- `CGControl getFlow (CglCutGenerator *&gen)`
Obtain a prototype for a flow cover cut generator.
- `void setFlowAction (CGControl action)`
Set action state for use of flow cover cut generator.
- `CGControl getGomory (CglCutGenerator *&gen)`
Obtain a prototype for a Gomory cut generator.
- `void setGomoryAction (CGControl action)`
Set action state for use of Gomory cut generator.
- `CGControl getKnapsack (CglCutGenerator *&gen)`
Obtain a prototype for a knapsack cover cut generator.

- void **setKnapsackAction** (CGControl action)
Set action state for use of knapsack cut generator.
- CGControl **getMir** (CglCutGenerator *&gen)
Obtain a prototype for a mixed integer rounding (MIR) cut generator.
- void **setMirAction** (CGControl action)
Set action state for use of MIR cut generator.
- CGControl **getRedSplit** (CglCutGenerator *&gen)
Obtain a prototype for a reduce and split cut generator.
- void **setRedSplitAction** (CGControl action)
Set action state for use of reduce and split cut generator.
- CGControl **getTwomir** (CglCutGenerator *&gen)
Obtain a prototype for a 2-MIR cut generator.
- void **setTwomirAction** (CGControl action)
Set action state for use of 2-MIR cut generator.
- CGControl **getFPump** (CbcHeuristic *&gen, CbcModel *model, bool alwaysCreate=true)
Obtain a feasibility pump heuristic.
- void **setFPumpAction** (CGControl action)
Set action state for use of feasibility pump heuristic.
- CGControl **getCombine** (CbcHeuristic *&gen, CbcModel *model, bool alwaysCreate=true)
Obtain a local search/combine heuristic.
- void **setCombineAction** (CGControl action)
Set action state for use of local search/combine heuristic.
- CGControl **getGreedyCover** (CbcHeuristic *&gen, CbcModel *model, bool alwaysCreate=true)
Obtain a greedy cover heuristic.
- void **setGreedyCoverAction** (CGControl action)
Set action state for use of greedy cover heuristic.
- CGControl **getGreedyEquality** (CbcHeuristic *&gen, CbcModel *model, bool alwaysCreate=true)
Obtain a greedy equality heuristic.

- void `setGreedyEqualityAction` (`CGControl` action)
Set action state for use of greedy equality heuristic.
- `CGControl` `getRounding` (`CbcHeuristic` *&gen, `CbcModel` *model, bool alwaysCreate=true)
Obtain a simple rounding heuristic.
- void `setRoundingAction` (`CGControl` action)
Set action state for use of simple rounding heuristic.
- `CGControl` `getTreeLocal` (`CbcTreeLocal` *&localTree, `CbcModel` *model, bool alwaysCreate=true)
Obtain a local search tree object.
- void `setTreeLocalAction` (`CGControl` action)
Set action state for use of local tree.

Status Functions

Convenience routines for status codes.

- void `setBaBStatus` (`BACMajor` majorStatus, `BACMinor` minorStatus, `BACWhere` where, bool haveAnswer, `OsiSolverInterface` *answerSolver)
Set the result of branch-and-cut search.
- void `setBaBStatus` (const `CbcModel` *model, `BACWhere` where, bool haveAnswer=false, `OsiSolverInterface` *answerSolver=0)
Set the result of branch-and-cut search.
- `BACMajor` `translateMajor` (int status)
Translate `CbcModel` major status to `BACMajor`.
- `BACMinor` `translateMinor` (int status)
Translate `CbcModel` minor status to `BACMinor`.
- `BACMinor` `translateMinor` (const `OsiSolverInterface` *osi)
Translate `OsiSolverInterface` status to `BACMinor`.
- void `printBaBStatus` ()
Print the status block.

Public Attributes

Parameter parsing and input/output.

- `std::string version_`
cbc-generic version
- `std::string dfltDirectory_`
Default directory prefix.
- `std::string lastMpsIn_`
Last MPS input file.
- `bool allowImportErrors_`
Allow/disallow errors when importing a model.
- `std::string lastSolnOut_`
Last solution output file.
- `int printMode_`
Solution printing mode.
- `std::string printMask_`
Print mask.
- `CoinParamVec * paramVec_`
The parameter vector.
- `struct CbcGenCtlBlk::genParamsInfo_struct genParams_`
Start and end of cbc-generic parameters in parameter vector.
- `struct CbcGenCtlBlk::cbcParamsInfo_struct cbcParams_`
Start and end of CbcModel parameters in parameter vector.
- `struct CbcGenCtlBlk::osiParamsInfo_struct osiParams_`
Start and end of OsiSolverInterface parameters in parameter vector.
- `int verbose_`
Verbosity level for help messages.
- `int paramsProcessed_`
Number of parameters processed.
- `std::vector< bool > setByUser_`
Record of parameters changed by user command.
- `bool defaultSettings_`
False if the user has made nontrivial modifications to the default control settings.
- `std::string debugCreate_`

Control debug file creation.

- `std::string debugFile_`
Last debug input file.
- `struct CbcGenCtlBlk::debugSolInfo_struct debugSol_`
Array of primal variable values for debugging.
- `double totalTime_`
Total elapsed time for this run.

Models of various flavours

- `CbcModel * model_`
The reference `CbcModel` object.
- `OsiSolverInterface * dftSolver_`
The current default LP solver.
- `bool goodModel_`
True if we have a valid model loaded, false otherwise.
- `struct CbcGenCtlBlk::babState_struct bab_`
State of branch-and-cut.

Various algorithm control variables and settings

- `struct CbcGenCtlBlk::djFixCtl_struct djFix_`
Control use of reduced cost fixing prior to B&C.
- `BPCControl priorityAction_`
Control the assignment of branching priorities to integer variables.

Branching Method Control

Usage control and prototypes for branching methods.

Looking to the future, this covers only `OsiChoose` methods.

- `struct CbcGenCtlBlk::chooseStrongCtl_struct chooseStrong_`
Control variables for a strong branching method.

Messages and statistics

- int [printOpt_](#)
When greater than 0, integer presolve gives more information and branch-and-cut provides statistics.
- CoinMessageHandler & [message](#) (CbcGenMsgCode inID)
Print a message.
- void [passInMessageHandler](#) (CoinMessageHandler *handler)
Supply a new message handler.
- CoinMessageHandler * [messageHandler](#) () const
Return a pointer to the message handler.
- void [setMessages](#) (CoinMessages::Language lang=CoinMessages::us_en)
Set up messages in the specified language.
- void [setLogLevel](#) (int lvl)
Set log level.
- int [logLevel](#) () const
Get log level.

4.36.1 Detailed Description

Definition at line 67 of file CbcGenCtlBlk.hpp.

4.36.2 Member Enumeration Documentation

4.36.2.1 enum CbcGenCtlBlk::IPPCControl

Codes to control integer preprocessing.

- IPPOff: Integer preprocessing is off.
- IPPOn: Integer preprocessing is on.
- IPPSave: IPPOn, plus preprocessed system will be saved to presolved.mps.
- IPPEqual: IPPOn, plus '<=' cliques are converted to '=' cliques.

- IPPSOS: IPPOn, plus will create SOS sets (see below).
- IPPTrySOS: IPPOn, plus will create SOS sets (see below).
- IPPEqualAll: IPPOn, plus turns all valid inequalities into equalities with integer slacks.
- IPPStrategy: look to [CbcStrategy](#) object for instructions.

IPPSOS will create SOS sets if all binary variables (except perhaps one) can be covered by SOS sets with no overlap between sets. IPPTrySOS will allow any number of binary variables to be uncovered.

Definition at line 99 of file CbcGenCtlBlk.hpp.

4.36.2.2 enum CbcGenCtlBlk::CGControl

Codes to control the use of cut generators and heuristics.

- CGOff: the cut generator will not be installed
- CGOn: the cut generator will be installed; exactly how often it's activated depends on the settings at installation
- CGRoot: the cut generator will be installed with settings that restrict it to activation at the root node only.
- CGIfMove: the cut generator will be installed with settings that allow it to remain active only so long as it's generating cuts that tighten the relaxation.
- CGForceOn: the cut generator will be installed with settings that force it to be called at every node
- CGForceBut: the cut generator will be installed with settings that force it to be called at every node, but more active at root (probing only)
- CGMarker: a convenience to mark the end of the codes.

The same codes are used for heuristics.

Definition at line 129 of file CbcGenCtlBlk.hpp.

4.36.2.3 enum CbcGenCtlBlk::BPCControl

Codes to specify the assignment of branching priorities.

- BPOff: no priorities are passed to cbc
- BPCost: a priority vector is constructed based on objective coefficients
- BPOrder: a priority vector is constructed based on column order
- BPExt: the user has provided a priority vector

Definition at line 141 of file CbcGenCtlBlk.hpp.

4.36.2.4 enum CbcGenCtlBlk::BACMajor

Major status codes for branch-and-cut.

- BACInvalid: status not yet set
- BACNotRun: branch-and-cut has not yet run for the current problem
- BACFinish: branch-and-cut has finished normally
- BACStop: branch-and-cut has stopped on a limit
- BACAbandon: branch-and-cut abandoned the problem
- BACUser: branch-and-cut stopped on user signal

Consult `minorStatus_` for details.

These codes are (mostly) set to match the codes used by [CbcModel](#). Additions to [CbcModel](#) codes should be reflected here and in `translateMajor`.

Definition at line 158 of file CbcGenCtlBlk.hpp.

4.36.2.5 enum CbcGenCtlBlk::BACMinor

Minor status codes.

- BACmInvalid status not yet set
- BACmFinish search exhausted the tree; optimal solution found
- BACmInfeas problem is infeasible
- BACmUbnd problem is unbounded
- BACmGap stopped on integrality gap

- BACmNodeLimit stopped on node limit
- BACmTimeLimit stopped on time limit
- BACmSolnLimit stopped on number of solutions limit
- BACmUser stopped due to user event
- BACmOther nothing else is appropriate

It's not possible to make these codes agree with [CbcModel](#). The meaning varies according to context: if the BACWhere code specifies a relaxation, then the minor status reflects the underlying OSI solver. Otherwise, it reflects the integer problem.

Definition at line 181 of file CbcGenCtlBlk.hpp.

4.36.2.6 enum CbcGenCtlBlk::BACWhere

Codes to specify where branch-and-cut stopped.

- BACwNotStarted stopped before we ever got going
- BACwBareRoot stopped after initial solve of root relaxation
- BACwIPP stopped after integer preprocessing
- BACwIPPRelax stopped after initial solve of preprocessed problem
- BACwBAC stopped at some point in branch-and-cut

Definition at line 195 of file CbcGenCtlBlk.hpp.

4.36.3 Member Function Documentation

4.36.3.1 int CbcGenCtlBlk::getCutDepth () [inline]

Get cut depth setting.

The name is a bit of a misnomer. Essentially, this overrides the 'every so many nodes' control with 'execute when (depth in tree) mod (cut depth) == 0'.

Definition at line 236 of file CbcGenCtlBlk.hpp.

4.36.3.2 void CbcGenCtlBlk::setCutDepth (int *cutDepth*) [inline]

Set cut depth setting.

See comments for [getCutDepth\(\)](#).

Definition at line 245 of file CbcGenCtlBlk.hpp.

4.36.3.3 CGControl CbcGenCtlBlk::getProbing (CglCutGenerator *& *gen*)

Obtain a prototype for a probing cut generator.

**4.36.3.4 void CbcGenCtlBlk::setProbingAction (CGControl *action*)
[inline]**

Set action state for use of probing cut generator.

Definition at line 267 of file CbcGenCtlBlk.hpp.

4.36.3.5 CGControl CbcGenCtlBlk::getClique (CglCutGenerator *& *gen*)

Obtain a prototype for a clique cut generator.

**4.36.3.6 void CbcGenCtlBlk::setCliqueAction (CGControl *action*)
[inline]**

Set action state for use of clique cut generator.

Definition at line 277 of file CbcGenCtlBlk.hpp.

4.36.3.7 CGControl CbcGenCtlBlk::getFlow (CglCutGenerator *& *gen*)

Obtain a prototype for a flow cover cut generator.

**4.36.3.8 void CbcGenCtlBlk::setFlowAction (CGControl *action*)
[inline]**

Set action state for use of flow cover cut generator.

Definition at line 287 of file CbcGenCtlBlk.hpp.

4.36.3.9 CGControl CbcGenCtlBlk::getGomory (CglCutGenerator *& *gen*)

Obtain a prototype for a Gomory cut generator.

**4.36.3.10 void CbcGenCtlBlk::setGomoryAction (CGControl *action*)
[inline]**

Set action state for use of Gomory cut generator.

Definition at line 297 of file CbcGenCtlBlk.hpp.

4.36.3.11 CGControl CbcGenCtlBlk::getKnapsack (CglCutGenerator *& *gen*)

Obtain a prototype for a knapsack cover cut generator.

**4.36.3.12 void CbcGenCtlBlk::setKnapsackAction (CGControl *action*)
[inline]**

Set action state for use of knapsack cut generator.

Definition at line 307 of file CbcGenCtlBlk.hpp.

**4.36.3.13 void CbcGenCtlBlk::setMirAction (CGControl *action*)
[inline]**

Set action state for use of MIR cut generator.

Definition at line 329 of file CbcGenCtlBlk.hpp.

4.36.3.14 `CGControl CbcGenCtlBlk::getRedSplit (CglCutGenerator *& gen)`

Obtain a prototype for a reduce and split cut generator.

4.36.3.15 `void CbcGenCtlBlk::setRedSplitAction (CGControl action)`
`[inline]`

Set action state for use of reduce and split cut generator.

Definition at line 339 of file CbcGenCtlBlk.hpp.

4.36.3.16 `CGControl CbcGenCtlBlk::getTwomir (CglCutGenerator *& gen)`

Obtain a prototype for a 2-MIR cut generator.

4.36.3.17 `void CbcGenCtlBlk::setTwomirAction (CGControl action)`
`[inline]`

Set action state for use of 2-MIR cut generator.

Definition at line 349 of file CbcGenCtlBlk.hpp.

4.36.3.18 `CGControl CbcGenCtlBlk::getFPump (CbcHeuristic *& gen,`
`CbcModel * model, bool alwaysCreate = true)`

Obtain a feasibility pump heuristic.

By default, any existing object is deleted and a new object is created and loaded with `model`. Set `alwaysCreate = false` to return an existing object if one exists.

4.36.3.19 `void CbcGenCtlBlk::setFPumpAction (CGControl action)`
`[inline]`

Set action state for use of feasibility pump heuristic.

Definition at line 366 of file CbcGenCtlBlk.hpp.

4.36.3.20 `CGControl CbcGenCtlBlk::getCombine (CbcHeuristic *& gen,
CbcModel * model, bool alwaysCreate = true)`

Obtain a local search/combine heuristic.

By default, any existing object is deleted and a new object is created and loaded with `model`. Set `alwaysCreate = false` to return an existing object if one exists.

4.36.3.21 `void CbcGenCtlBlk::setCombineAction (CGControl action)`
`[inline]`

Set action state for use of local search/combine heuristic.

Definition at line 382 of file CbcGenCtlBlk.hpp.

4.36.3.22 `CGControl CbcGenCtlBlk::getGreedyCover (CbcHeuristic *& gen,
CbcModel * model, bool alwaysCreate = true)`

Obtain a greedy cover heuristic.

By default, any existing object is deleted and a new object is created and loaded with `model`. Set `alwaysCreate = false` to return an existing object if one exists.

4.36.3.23 `void CbcGenCtlBlk::setGreedyCoverAction (CGControl action)`
`[inline]`

Set action state for use of greedy cover heuristic.

Definition at line 398 of file CbcGenCtlBlk.hpp.

4.36.3.24 CGControl CbcGenCtlBlk::getGreedyEquality (CbcHeuristic *&gen, CbcModel * model, bool alwaysCreate = true)

Obtain a greedy equality heuristic.

By default, any existing object is deleted and a new object is created and loaded with `model`. Set `alwaysCreate = false` to return an existing object if one exists.

4.36.3.25 void CbcGenCtlBlk::setGreedyEqualityAction (CGControl action) [inline]

Set action state for use of greedy equality heuristic.

Definition at line 414 of file `CbcGenCtlBlk.hpp`.

4.36.3.26 CGControl CbcGenCtlBlk::getRounding (CbcHeuristic *&gen, CbcModel * model, bool alwaysCreate = true)

Obtain a simple rounding heuristic.

By default, any existing object is deleted and a new object is created and loaded with `model`. Set `alwaysCreate = false` to return an existing object if one exists.

4.36.3.27 void CbcGenCtlBlk::setRoundingAction (CGControl action) [inline]

Set action state for use of simple rounding heuristic.

Definition at line 430 of file `CbcGenCtlBlk.hpp`.

4.36.3.28 CGControl CbcGenCtlBlk::getTreeLocal (CbcTreeLocal *&localTree, CbcModel * model, bool alwaysCreate = true)

Obtain a local search tree object.

By default, any existing object is deleted and a new object is created and loaded with `model`. Set `alwaysCreate = false` to return an existing object if one exists.

4.36.3.29 `void CbcGenCtlBlk::setTreeLocalAction (CGControl action)`
`[inline]`

Set action state for use of local tree.

Definition at line 446 of file CbcGenCtlBlk.hpp.

4.36.3.30 `void CbcGenCtlBlk::setBaBStatus (const CbcModel * model,
BACWhere where, bool haveAnswer = false, OsiSolverInterface *
answerSolver = 0)`

Set the result of branch-and-cut search.

This version will extract the necessary information from the [CbcModel](#) object and set appropriate status based on the value passed for where.

4.36.3.31 `BACMajor CbcGenCtlBlk::translateMajor (int status)`

Translate [CbcModel](#) major status to [BACMajor](#).

See the [BACMajor](#) enum for details.

4.36.3.32 `BACMinor CbcGenCtlBlk::translateMinor (int status)`

Translate [CbcModel](#) minor status to [BACMinor](#).

See the [BACMinor](#) enum for details.

4.36.3.33 `BACMinor CbcGenCtlBlk::translateMinor (const
OsiSolverInterface * osi)`

Translate OsiSolverInterface status to [BACMinor](#).

See the [BACMinor](#) enum for details. Optimal, infeasible, and unbounded get their own codes; everything else maps to BACmOther.

4.36.3.34 `CoinMessageHandler& CbcGenCtlBlk::message (CbcGenMsgCode inID)`

Print a message.

Uses the current message handler and messages.

4.36.3.35 `void CbcGenCtlBlk::passInMessageHandler (CoinMessageHandler * handler)`

Supply a new message handler.

Replaces the current message handler. The current handler is destroyed if `ourMsgHandler_` is true, and the call will set `ourMsgHandler_ = true`.

4.36.3.36 `void CbcGenCtlBlk::setMessages (CoinMessages::Language lang = CoinMessages::us_en)`

Set up messages in the specified language.

Building a set of messages in a given language implies rebuilding the whole set of messages, for reasons explained in the body of the code. Hence there's no separate set-Language routine. Use this routine for the initial setup of messages and any subsequent change in language. Note that the constructor gives you a message handler by default, but *not* messages. You need to call `setMessages` explicitly.

The default value specified here for `lang` effectively sets the default language.

4.36.4 Member Data Documentation

4.36.4.1 `int CbcGenCtlBlk::printMode_`

Solution printing mode.

Controls the amount of information printed when printing a solution. Coding is set by the keyword declarations for the `printingOptions` command.

Definition at line 583 of file `CbcGenCtlBlk.hpp`.

4.36.4.2 `std::string CbcGenCtlBlk::printMask_`

Print mask.

Used to specify row/column names to be printed. Not implemented as of 060920.

Definition at line 590 of file CbcGenCtlBlk.hpp.

4.36.4.3 `int CbcGenCtlBlk::verbose_`

Verbosity level for help messages.

Interpretation is bitwise:

- (0): short help
- (1): long help
- (2): unused (for compatibility with cbc; indicates AMPL)
- (3): show parameters with `display = false`.

Definition at line 628 of file CbcGenCtlBlk.hpp.

4.36.4.4 `bool CbcGenCtlBlk::defaultSettings_`

False if the user has made nontrivial modifications to the default control settings.

Initially true. Specifying DJFIX, TIGHTENFACTOR, or any cut or heuristic parameter will set this to false.

Definition at line 644 of file CbcGenCtlBlk.hpp.

4.36.4.5 `std::string CbcGenCtlBlk::debugCreate_`

Control debug file creation.

At the conclusion of branch-and-cut, dump the full solution in a binary format to `debug.file` in the current directory. When set to "createAfterPre", the solution is dumped before integer presolve transforms are removed. When set to "create", the solution is dumped after integer presolve transforms are backed out.

Definition at line 654 of file CbcGenCtlBlk.hpp.

4.36.4.6 `std::string CbcGenCtlBlk::debugFile_`

Last debug input file.

The file is expected to be in a binary format understood by `activateRowCutDebugger`.

Definition at line 662 of file `CbcGenCtlBlk.hpp`.

4.36.4.7 `struct CbcGenCtlBlk::debugSolInfo_struct CbcGenCtlBlk::debugSol_`

Array of primal variable values for debugging.

Used to provide a known optimal solution to `activateRowCutDebugger()`.

4.36.4.8 `double CbcGenCtlBlk::totalTime_`

Total elapsed time for this run.

Definition at line 680 of file `CbcGenCtlBlk.hpp`.

4.36.4.9 `CbcModel* CbcGenCtlBlk::model_`

The reference [CbcModel](#) object.

This is the [CbcModel](#) created when `cbc-generic` boots up. It holds the default solver with the current constraint system. [CbcCbcParam](#) parameters are applied here, and [CbcOsiParam](#) parameters are applied to the solver. Major modifications for branch-and-cut (integer preprocessing, installation of heuristics and cut generators) are performed on a clone. The solution is transferred back into this object.

Definition at line 697 of file `CbcGenCtlBlk.hpp`.

4.36.4.10 `OsiSolverInterface* CbcGenCtlBlk::dfltSolver_`

The current default LP solver.

This is a pointer to a reference copy. If you want the solver associated with [model_](#), ask for it directly.

Definition at line 705 of file CbcGenCtlBlk.hpp.

4.36.4.11 bool CbcGenCtlBlk::goodModel_

True if we have a valid model loaded, false otherwise.

Definition at line 709 of file CbcGenCtlBlk.hpp.

4.36.4.12 struct CbcGenCtlBlk::babState_struct CbcGenCtlBlk::bab_

State of branch-and-cut.

Major and minor status codes, and a solver holding the answer, assuming we have a valid answer. See the documentation with the BACMajor, BACMinor, and BACWhere enums for the meaning of the codes.

4.36.4.13 struct CbcGenCtlBlk::djFixCtl_struct CbcGenCtlBlk::djFix_

Control use of reduced cost fixing prior to B&C.

This heuristic fixes variables whose reduced cost for the root relaxation exceeds the specified threshold. This is purely a heuristic, performed before there's any incumbent solution. It may well fix variables at the wrong bound!

4.36.4.14 struct CbcGenCtlBlk::chooseStrongCtl_struct CbcGenCtlBlk::chooseStrong_

Control variables for a strong branching method.

Consult [OsiChooseVariable](#) and [CbcModel](#) for details. An artifact of the changeover from [CbcObjects](#) to [OsiObjects](#) is that the number of uses before pseudo costs are trusted ([numBeforeTrust_](#)) and the number of variables evaluated with strong branching ([numStrong_](#)) are parameters of [CbcModel](#).

The documentation for this class was generated from the following file:

- CbcGenCtlBlk.hpp

Public Member Functions

- [CbcGeneral](#) ([CbcModel](#) *model)
Useful constructor Just needs to point to model.
- virtual [CbcObject](#) * [clone](#) () const =0
Clone.
- virtual double [infeasibility](#) (const [OsiBranchingInformation](#) *info, int &preferredWay) const
Infeasibility - large is 0.5.
- virtual void [feasibleRegion](#) ()=0
This looks at solution and sets bounds to contain solution.
- virtual [CbcBranchingObject](#) * [createCbcBranch](#) ([OsiSolverInterface](#) *solver, const [OsiBranchingInformation](#) *info, int way)
Creates a branching object.
- virtual void [redoSequenceEtc](#) ([CbcModel](#) *model, int numberColumns, const int *originalColumns)=0
Redoes data when sequence numbers change.

4.37.1 Detailed Description

Define a catch all class. This will create a list of subproblems

Definition at line 17 of file CbcGeneral.hpp.

The documentation for this class was generated from the following file:

- CbcGeneral.hpp

4.38 CbcGenParam Class Reference

Class for cbc-generic control parameters.

```
#include <CbcGenParam.hpp>
```


Be careful how you specify parameters for the constructors! There's great potential for confusion.

- [CbcGenParam](#) ()
Default constructor.
- [CbcGenParam](#) ([CbcGenParamCode](#) code, std::string name, std::string help, double lower, double upper, double dflt=0.0, bool display=true)
Constructor for a parameter with a double value.
- [CbcGenParam](#) ([CbcGenParamCode](#) code, std::string name, std::string help, int lower, int upper, int dflt=0, bool display=true)
Constructor for a parameter with an integer value.
- [CbcGenParam](#) ([CbcGenParamCode](#) code, std::string name, std::string help, std::string firstValue, int dflt, bool display=true)
Constructor for a parameter with keyword values.
- [CbcGenParam](#) ([CbcGenParamCode](#) code, std::string name, std::string help, std::string dflt, bool display=true)
Constructor for a string parameter.
- [CbcGenParam](#) ([CbcGenParamCode](#) code, std::string name, std::string help, bool display=true)
Constructor for an action parameter.
- [CbcGenParam](#) (const [CbcGenParam](#) &orig)
Copy constructor.
- [CbcGenParam](#) * clone ()
Clone.
- [CbcGenParam](#) & operator= (const [CbcGenParam](#) &rhs)
Assignment.
- [~CbcGenParam](#) ()
Destructor.

Methods to query and manipulate a parameter object

- [CbcGenParamCode](#) paramCode () const
Get the parameter code.
- void setParamCode ([CbcGenParamCode](#) code)
Set the parameter code.

- `CbcGenCtlBlk * obj () const`
Get the underlying cbc-generic control object.
- `void setObj (CbcGenCtlBlk *obj)`
Set the underlying cbc-generic control object.

4.38.1 Detailed Description

Class for cbc-generic control parameters. Adds parameter type codes and push/pull functions to the generic parameter object.

Definition at line 34 of file CbcGenParam.hpp.

4.38.2 Member Enumeration Documentation

4.38.2.1 `enum CbcGenParam::CbcGenParamCode`

Enumeration for cbc-generic parameters.

These are parameters that control the operation of the cbc-generic main program by operating on a `CbcGenCtlBlk` object. `CBCGEN_FIRSTPARAM` and `CBCGEN_LASTPARAM` are markers to allow convenient separation of parameter groups.

Definition at line 49 of file CbcGenParam.hpp.

4.38.3 Constructor & Destructor Documentation

4.38.3.1 `CbcGenParam::CbcGenParam (CbcGenParamCode code, std::string name, std::string help, double lower, double upper, double dflt = 0.0, bool display = true)`

Constructor for a parameter with a double value.

The default value is 0.0. Be careful to clearly indicate that `lower` and `upper` are real (double) values to distinguish this constructor from the constructor for an integer parameter.

**4.38.3.2 CbcGenParam::CbcGenParam (CbcGenParamCode *code*,
std::string *name*, std::string *help*, int *lower*, int *upper*, int *dflt* = 0,
bool *display* = *true*)**

Constructor for a parameter with an integer value.

The default value is 0.

**4.38.3.3 CbcGenParam::CbcGenParam (CbcGenParamCode *code*,
std::string *name*, std::string *help*, std::string *firstValue*, int *dflt*,
bool *display* = *true*)**

Constructor for a parameter with keyword values.

The string supplied as *firstValue* becomes the first keyword. Additional keywords can be added using `appendKwd()`. Keywords are numbered from zero. It's necessary to specify both the first keyword (*firstValue*) and the default keyword index (*dflt*) in order to distinguish this constructor from the string and action parameter constructors.

**4.38.3.4 CbcGenParam::CbcGenParam (CbcGenParamCode *code*,
std::string *name*, std::string *help*, std::string *dflt*, bool *display* =
true)**

Constructor for a string parameter.

The default string value must be specified explicitly to distinguish a string constructor from an action parameter constructor.

The documentation for this class was generated from the following file:

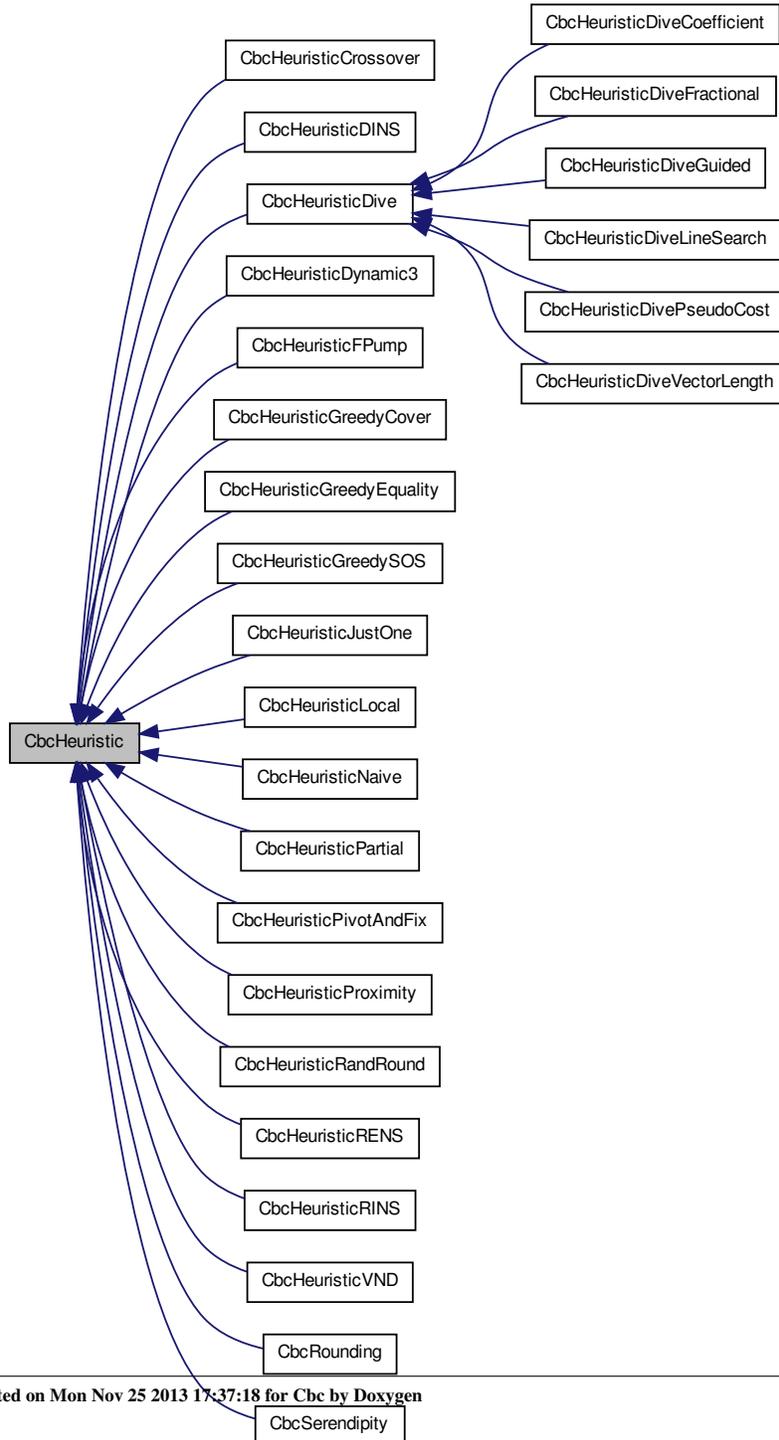
- CbcGenParam.hpp

4.39 CbcHeuristic Class Reference

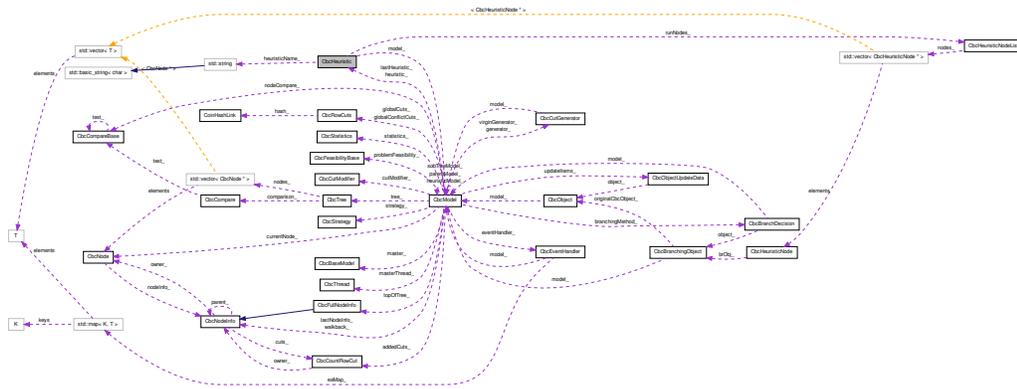
Heuristic base class.

```
#include <CbcHeuristic.hpp>
```

Inheritance diagram for CbcHeuristic:



Collaboration diagram for CbcHeuristic:



Public Member Functions

- virtual `CbcHeuristic * clone () const =0`
Clone.
- `CbcHeuristic & operator= (const CbcHeuristic &rhs)`
Assignment operator.
- virtual void `setModel (CbcModel *model)`
update model (This is needed if cliques update matrix etc)
- virtual void `resetModel (CbcModel *model)=0`
Resets stuff if model changes.
- virtual int `solution (double &objectiveValue, double *newSolution)=0`
returns 0 if no solution, 1 if valid solution with better objective value than one passed in Sets solution values if good, sets objective value This is called after cuts have been added - so can not add cuts
- virtual int `solution2 (double &, double *, OsiCuts &)`
returns 0 if no solution, 1 if valid solution, -1 if just returning an estimate of best possible solution with better objective value than one passed in Sets solution values if good, sets objective value (only if nonzero code) This is called at same time as cut generators - so can add cuts Default is do nothing
- virtual void `validate ()`
Validate model i.e. sets when_ to 0 if necessary (may be NULL).

- void `setWhen` (int value)
Sets "when" flag - 0 off, 1 at root, 2 other than root, 3 always.
- int `when` () const
Gets "when" flag - 0 off, 1 at root, 2 other than root, 3 always.
- void `setNumberNodes` (int value)
Sets number of nodes in subtree (default 200).
- int `numberNodes` () const
Gets number of nodes in a subtree (default 200).
- void `setSwitches` (int value)
Switches (does not apply equally to all heuristics) 1 bit - stop once allowable gap on objective reached 2 bit - always do given number of passes 4 bit - weaken cutoff by 5% every 50 passes? 8 bit - if has cutoff and suminf bobbling for 20 passes then first try halving distance to best possible then try keep halving distance to known cutoff 16 bit - needs new solution to run 1024 bit - stop all heuristics on max time.
- int `switches` () const
Switches (does not apply equally to all heuristics) 1 bit - stop once allowable gap on objective reached 2 bit - always do given number of passes 4 bit - weaken cutoff by 5% every 50 passes? 8 bit - if has cutoff and suminf bobbling for 20 passes then first try halving distance to best possible then try keep halving distance to known cutoff 16 bit - needs new solution to run 1024 bit - stop all heuristics on max time.
- bool `exitNow` (double bestObjective) const
Whether to exit at once on gap.
- void `setFeasibilityPumpOptions` (int value)
Sets feasibility pump options (-1 is off).
- int `feasibilityPumpOptions` () const
Gets feasibility pump options (-1 is off).
- void `setModelOnly` (CbcModel *model)
Just set model - do not do anything else.
- void `setFractionSmall` (double value)
Sets fraction of new(rows+columns)/old(rows+columns) before doing small branch and bound (default 1.0).
- double `fractionSmall` () const

Gets fraction of new(rows+columns)/old(rows+columns) before doing small branch and bound (default 1.0).

- int [numberSolutionsFound](#) () const
Get how many solutions the heuristic thought it got.
- void [incrementNumberSolutionsFound](#) ()
Increment how many solutions the heuristic thought it got.
- int [smallBranchAndBound](#) (OsiSolverInterface *solver, int numberNodes, double *newSolution, double &newSolutionValue, double cutoff, std::string name) const
Do mini branch and bound - return 0 not finished - no solution 1 not finished - solution 2 finished - no solution 3 finished - solution (could add global cut if finished) -1 returned on size -2 time or user event.
- virtual void [generateCpp](#) (FILE *)
Create C++ lines to get to current state.
- void [generateCpp](#) (FILE *fp, const char *heuristic)
Create C++ lines to get to current state - does work for base class.
- virtual bool [canDealWithOdd](#) () const
Returns true if can deal with "odd" problems e.g. sos type 2.
- const char * [heuristicName](#) () const
return name of heuristic
- void [setHeuristicName](#) (const char *name)
set name of heuristic
- void [setSeed](#) (int value)
Set random number generator seed.
- int [getSeed](#) () const
Get random number generator seed.
- void [setDecayFactor](#) (double value)
Sets decay factor (for howOften) on failure.
- void [setInputSolution](#) (const double *solution, double objValue)
Set input solution.

- void [setShallowDepth](#) (int value)
Upto this depth we call the tree shallow and the heuristic can be called multiple times.
- void [setHowOftenShallow](#) (int value)
How often to invoke the heuristics in the shallow part of the tree.
- void [setMinDistanceToRun](#) (int value)
How "far" should this node be from every other where the heuristic was run in order to allow the heuristic to run in this node, too.
- virtual bool [shouldHeurRun](#) (int whereFrom)
Check whether the heuristic should run at all 0 - before cuts at root node (or from do-Heuristics) 1 - during cuts at root 2 - after root node cuts 3 - after cuts at other nodes 4 - during cuts at other nodes 8 added if previous heuristic in loop found solution.
- bool [shouldHeurRun_randomChoice](#) ()
Check whether the heuristic should run this time.
- int [numRuns](#) () const
how many times the heuristic has actually run
- int [numCouldRun](#) () const
How many times the heuristic could run.
- OsiSolverInterface * [cloneBut](#) (int type)
Clone, but ...

Protected Attributes

- [CbcModel](#) * [model_](#)
Model.
- int [when_](#)
When flag - 0 off, 1 at root, 2 other than root, 3 always.
- int [numberNodes_](#)
Number of nodes in any sub tree.
- int [feasibilityPumpOptions_](#)
Feasibility pump options , -1 is off >=0 for feasibility pump itself -2 quick proximity search -3 longer proximity search.

- double `fractionSmall_`
Fraction of new(rows+columns)/old(rows+columns) before doing small branch and bound.
- CoinThreadRandom `randomNumberGenerator_`
Thread specific random number generator.
- std::string `heuristicName_`
Name for printing.
- int `howOften_`
How often to do (code can change).
- double `decayFactor_`
How much to increase how often.
- int `switches_`
Switches (does not apply equally to all heuristics) 1 bit - stop once allowable gap on objective reached 2 bit - always do given number of passes 4 bit - weaken cutoff by 5% every 50 passes? 8 bit - if has cutoff and suminf bobbling for 20 passes then first try halving distance to best possible then try keep halving distance to known cutoff 16 bit - needs new solution to run 1024 bit - stop all heuristics on max time.
- int `shallowDepth_`
Upto this depth we call the tree shallow and the heuristic can be called multiple times.
- int `howOftenShallow_`
How often to invoke the heuristics in the shallow part of the tree.
- int `numInvocationsInShallow_`
How many invocations happened within the same node when in a shallow part of the tree.
- int `numInvocationsInDeep_`
How many invocations happened when in the deep part of the tree.
- int `lastRunDeep_`
After how many deep invocations was the heuristic run last time.
- int `numRuns_`
how many times the heuristic has actually run
- int `minDistanceToRun_`

How "far" should this node be from every other where the heuristic was run in order to allow the heuristic to run in this node, too.

- [CbcHeuristicNodeList runNodes_](#)
The description of the nodes where this heuristic has been applied.
- `int numCouldRun_`
How many times the heuristic could run.
- `int numberSolutionsFound_`
How many solutions the heuristic thought it got.
- `int numberNodesDone_`
How many nodes the heuristic did this go.

4.39.1 Detailed Description

Heuristic base class.

Definition at line 77 of file CbcHeuristic.hpp.

4.39.2 Member Function Documentation

4.39.2.1 `void CbcHeuristic::setWhen (int value) [inline]`

Sets "when" flag - 0 off, 1 at root, 2 other than root, 3 always.

If 10 added then don't worry if validate says there are funny objects as user knows it will be fine

Definition at line 134 of file CbcHeuristic.hpp.

4.39.2.2 `void CbcHeuristic::setShallowDepth (int value) [inline]`

Upto this depth we call the tree shallow and the heuristic can be called multiple times.

That is, the test whether the current node is far from the others where the heuristic was invoked will not be done, only the frequency will be tested. After that depth the heuristic will can be invoked only once per node, right before branching. That's when it'll be tested whether the heuristic should run at all.

Definition at line 267 of file CbcHeuristic.hpp.

4.39.2.3 void CbcHeuristic::setMinDistanceToRun (int *value*) [inline]

How "far" should this node be from every other where the heuristic was run in order to allow the heuristic to run in this node, too.

Currently this is tested, but we may switch to avgDistanceToRun_ in the future.

Definition at line 277 of file CbcHeuristic.hpp.

4.39.2.4 OsiSolverInterface* CbcHeuristic::cloneBut (int *type*)

Clone, but ...

If type is

- 0 clone the solver for the model,
- 1 clone the continuous solver for the model
- Add 2 to say without integer variables which are at low priority
- Add 4 to say quite likely infeasible so give up easily (clp only).

4.39.3 Member Data Documentation

4.39.3.1 int CbcHeuristic::shallowDepth_ [protected]

Upto this depth we call the tree shallow and the heuristic can be called multiple times.

That is, the test whether the current node is far from the others where the heuristic was invoked will not be done, only the frequency will be tested. After that depth the heuristic will can be invoked only once per node, right before branching. That's when it'll be tested whether the heuristic should run at all.

Definition at line 363 of file CbcHeuristic.hpp.

4.39.3.2 int CbcHeuristic::numInvocationsInShallow_ [protected]

How many invocations happened within the same node when in a shallow part of the tree.

Definition at line 368 of file CbcHeuristic.hpp.

4.39.3.3 int CbcHeuristic::numInvocationsInDeep_ [protected]

How many invocations happened when in the deep part of the tree.

For every node we count only one invocation.

Definition at line 371 of file CbcHeuristic.hpp.

4.39.3.4 int CbcHeuristic::minDistanceToRun_ [protected]

How "far" should this node be from every other where the heuristic was run in order to allow the heuristic to run in this node, too.

Currently this is tested, but we may switch to avgDistanceToRun_ in the future.

Definition at line 379 of file CbcHeuristic.hpp.

The documentation for this class was generated from the following file:

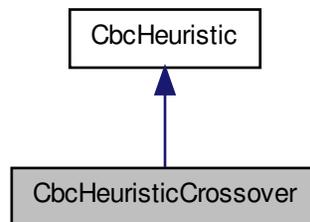
- CbcHeuristic.hpp

4.40 CbcHeuristicCrossover Class Reference

Crossover Search class.

```
#include <CbcHeuristicLocal.hpp>
```

Inheritance diagram for CbcHeuristicCrossover:



Protected Attributes

- `std::vector< double > attempts_`
Attempts.
- `double random_ [10]`
Random numbers to stop same search happening.
- `int numberSolutions_`
Number of solutions so we only do after new solution.
- `int useNumber_`
Number of solutions to use.

4.40.1 Detailed Description

Crossover Search class.

Definition at line 207 of file CbcHeuristicLocal.hpp.

4.40.2 Member Function Documentation

4.40.2.1 `virtual int CbcHeuristicCrossover::solution (double & objectiveValue, double * newSolution) [virtual]`

returns 0 if no solution, 1 if valid solution.

Fix variables if agree in useNumber_ solutions when_ 0 off, 1 only at new solutions, 2 also every now and then add 10 to make only if agree at lower bound

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicLocal.hpp

- virtual void `generateCpp` (FILE *fp)
Create C++ lines to get to current state.
- virtual void `resetModel` (CbcModel *model)
Resets stuff if model changes.
- virtual void `setModel` (CbcModel *model)
update model (This is needed if cliques update matrix etc)
- virtual int `solution` (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.
- int `solutionFix` (double &objectiveValue, double *newSolution, const int *keep)

This version fixes stuff and does IP.
- void `setHowOften` (int value)
Sets how often to do it.
- void `setMaximumKeep` (int value)
Sets maximum number of solutions kept.
- void `setConstraint` (int value)
Sets tightness of extra constraint.

Protected Attributes

- int `numberSolutions_`
Number of solutions so we can do something at solution.
- int `howOften_`
How often to do (code can change).
- int `numberSuccesses_`
Number of successes.
- int `numberTries_`
Number of tries.
- int `maximumKeepSolutions_`

Maximum number of solutions to keep.

- int [numberKeptSolutions_](#)
Number of solutions kept.
- int [numberIntegers_](#)
Number of integer variables.
- int [localSpace_](#)
Local parameter.
- int ** [values_](#)
Values of integer variables.

4.41.1 Detailed Description

Definition at line 14 of file CbcHeuristicDINS.hpp.

4.41.2 Member Function Documentation

4.41.2.1 `virtual int CbcHeuristicDINS::solution (double & objectiveValue, double * newSolution) [virtual]`

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) This does Relaxation Induced Neighborhood Search

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicDINS.hpp

4.42 CbcHeuristicDive Class Reference

Dive class.

```
#include <CbcHeuristicDive.hpp>
```


Public Member Functions

- virtual `CbcHeuristicDive * clone () const =0`
Clone.
- `CbcHeuristicDive & operator= (const CbcHeuristicDive &rhs)`
Assignment operator.
- virtual void `generateCpp (FILE *)`
Create C++ lines to get to current state.
- void `generateCpp (FILE *fp, const char *heuristic)`
Create C++ lines to get to current state - does work for base class.
- virtual void `resetModel (CbcModel *model)`
Resets stuff if model changes.
- virtual void `setModel (CbcModel *model)`
update model (This is needed if cliques update matrix etc)
- virtual int `solution (double &objectiveValue, double *newSolution)`
returns 0 if no solution, 1 if valid solution with better objective value than one passed in Sets solution values if good, sets objective value (only if good) This is called after cuts have been added - so can not add cuts This does Fractional Diving
- int `solution (double &objectiveValue, int &numberNodes, int &numberCuts, OsiRowCut **cuts, CbcSubProblem **&nodes, double *newSolution)`
inner part of dive
- int `fathom (CbcModel *model, int &numberNodes, CbcSubProblem **&nodes)`

returns 0 if no solution, 1 if valid solution with better objective value than one passed in also returns list of nodes This does Fractional Diving
- virtual void `validate ()`
Validate model i.e. sets when_ to 0 if necessary (may be NULL).
- void `selectBinaryVariables ()`
Select candidate binary variables for fixing.
- void `setPercentageToFix (double value)`
Set percentage of integer variables to fix at bounds.

- void [setMaxIterations](#) (int value)
Set maximum number of iterations.
- void [setMaxSimplexIterations](#) (int value)
Set maximum number of simplex iterations.
- int [maxSimplexIterations](#) () const
Get maximum number of simplex iterations.
- void [setMaxSimplexIterationsAtRoot](#) (int value)
Set maximum number of simplex iterations at root node.
- void [setMaxTime](#) (double value)
Set maximum time allowed.
- virtual bool [canHeuristicRun](#) ()
Tests if the heuristic can run.
- virtual bool [selectVariableToBranch](#) (OsiSolverInterface *solver, const double *newSolution, int &bestColumn, int &bestRound)=0
Selects the next variable to branch on Returns true if all the fractional variables can be trivially rounded.
- virtual void [initializeData](#) ()
Initializes any data which is going to be used repeatedly in selectVariableToBranch.
- int [reducedCostFix](#) (OsiSolverInterface *solver)
Perform reduced cost fixing on integer variables.
- virtual int [fixOtherVariables](#) (OsiSolverInterface *solver, const double *solution, [PseudoReducedCost](#) *candidate, const double *random)
Fix other variables at bounds.

Protected Attributes

- double * [downArray_](#)
Extra down array (number Integers long).
- double * [upArray_](#)
Extra up array (number Integers long).

4.42.1 Detailed Description

Dive class.

Definition at line 21 of file CbcHeuristicDive.hpp.

4.42.2 Member Function Documentation

4.42.2.1 `virtual bool CbcHeuristicDive::selectVariableToBranch (OsiSolverInterface * solver, const double * newSolution, int & bestColumn, int & bestRound) [pure virtual]`

Selects the next variable to branch on Returns true if all the fractional variables can be trivially rounded.

Returns false, if there is at least one fractional variable that is not trivially roundable. In this case, the bestColumn returned will not be trivially roundable.

Implemented in [CbcHeuristicDiveCoefficient](#), [CbcHeuristicDiveFractional](#), [CbcHeuristicDiveGuided](#), [CbcHeuristicDiveLineSearch](#), [CbcHeuristicDivePseudoCost](#), and [CbcHeuristicDiveVectorLength](#).

The documentation for this class was generated from the following file:

- CbcHeuristicDive.hpp

4.43 CbcHeuristicDiveCoefficient Class Reference

DiveCoefficient class.

```
#include <CbcHeuristicDiveCoefficient.hpp>
```


- [CbcHeuristicDiveCoefficient](#) & `operator=` (const [CbcHeuristicDiveCoefficient](#) &rhs)
Assignment operator.
- virtual void `generateCpp` (FILE *fp)
Create C++ lines to get to current state.
- virtual bool `selectVariableToBranch` (OsiSolverInterface *solver, const double *newSolution, int &bestColumn, int &bestRound)
Selects the next variable to branch on.

4.43.1 Detailed Description

DiveCoefficient class.

Definition at line 14 of file CbcHeuristicDiveCoefficient.hpp.

4.43.2 Member Function Documentation

4.43.2.1 virtual bool `CbcHeuristicDiveCoefficient::selectVariableToBranch`
(`OsiSolverInterface * solver`, `const double * newSolution`, `int & bestColumn`, `int & bestRound`) [`virtual`]

Selects the next variable to branch on.

Returns true if all the fractional variables can be trivially rounded. Returns false, if there is at least one fractional variable that is not trivially roundable. In this case, the bestColumn returned will not be trivially roundable.

Implements [CbcHeuristicDive](#).

The documentation for this class was generated from the following file:

- CbcHeuristicDiveCoefficient.hpp

4.44 CbcHeuristicDiveFractional Class Reference

DiveFractional class.

```
#include <CbcHeuristicDiveFractional.hpp>
```


- [CbcHeuristicDiveFractional](#) & `operator=` (const [CbcHeuristicDiveFractional](#) &rhs)
Assignment operator.
- virtual void `generateCpp` (FILE *fp)
Create C++ lines to get to current state.
- virtual bool `selectVariableToBranch` (OsiSolverInterface *solver, const double *newSolution, int &bestColumn, int &bestRound)
Selects the next variable to branch on.

4.44.1 Detailed Description

DiveFractional class.

Definition at line 14 of file CbcHeuristicDiveFractional.hpp.

4.44.2 Member Function Documentation

4.44.2.1 virtual bool CbcHeuristicDiveFractional::selectVariableToBranch (OsiSolverInterface * solver, const double * newSolution, int & bestColumn, int & bestRound) [virtual]

Selects the next variable to branch on.

Returns true if all the fractional variables can be trivially rounded. Returns false, if there is at least one fractional variable that is not trivially roundable. In this case, the bestColumn returned will not be trivially roundable.

Implements [CbcHeuristicDive](#).

The documentation for this class was generated from the following file:

- CbcHeuristicDiveFractional.hpp

4.45 CbcHeuristicDiveGuided Class Reference

DiveGuided class.

```
#include <CbcHeuristicDiveGuided.hpp>
```


- [CbcHeuristicDiveGuided](#) & `operator=` (const [CbcHeuristicDiveGuided](#) &rhs)
Assignment operator.
- virtual void `generateCpp` (FILE *fp)
Create C++ lines to get to current state.
- virtual bool `canHeuristicRun` ()
Tests if the heuristic can run.
- virtual bool `selectVariableToBranch` (OsiSolverInterface *solver, const double *newSolution, int &bestColumn, int &bestRound)
Selects the next variable to branch on.

4.45.1 Detailed Description

DiveGuided class.

Definition at line 14 of file CbcHeuristicDiveGuided.hpp.

4.45.2 Member Function Documentation

4.45.2.1 virtual bool CbcHeuristicDiveGuided::selectVariableToBranch (OsiSolverInterface * solver, const double * newSolution, int & bestColumn, int & bestRound) [virtual]

Selects the next variable to branch on.

Returns true if all the fractional variables can be trivially rounded. Returns false, if there is at least one fractional variable that is not trivially roundable. In this case, the bestColumn returned will not be trivially roundable.

Implements [CbcHeuristicDive](#).

The documentation for this class was generated from the following file:

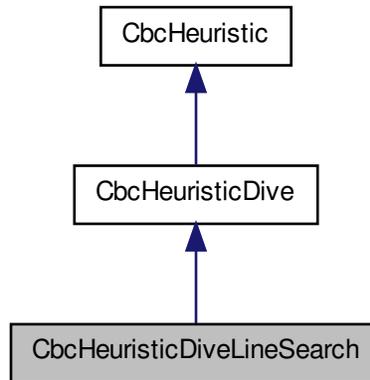
- CbcHeuristicDiveGuided.hpp

4.46 CbcHeuristicDiveLineSearch Class Reference

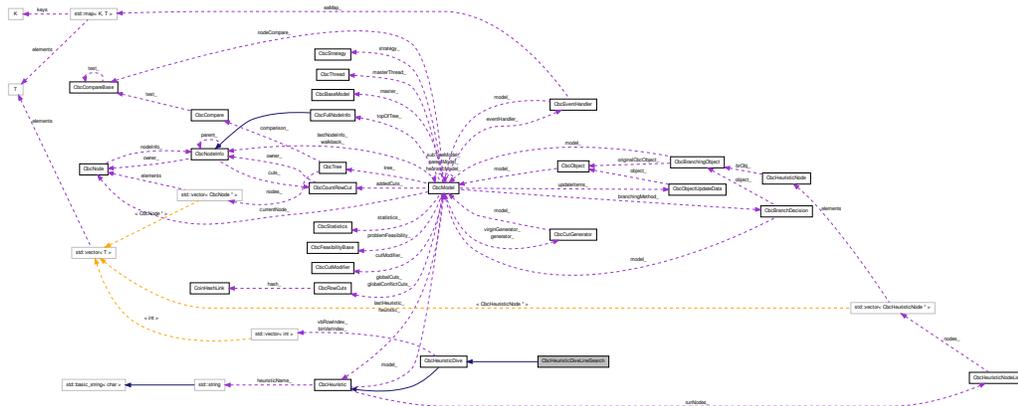
DiveLineSearch class.

```
#include <CbcHeuristicDiveLineSearch.hpp>
```

Inheritance diagram for CbcHeuristicDiveLineSearch:



Collaboration diagram for CbcHeuristicDiveLineSearch:



Public Member Functions

- virtual `CbcHeuristicDiveLineSearch * clone () const`
Clone.

- [CbcHeuristicDiveLineSearch](#) & `operator=` (const [CbcHeuristicDiveLineSearch](#) &rhs)
Assignment operator.
- virtual void `generateCpp` (FILE *fp)
Create C++ lines to get to current state.
- virtual bool `selectVariableToBranch` (OsiSolverInterface *solver, const double *newSolution, int &bestColumn, int &bestRound)
Selects the next variable to branch on.

4.46.1 Detailed Description

DiveLineSearch class.

Definition at line 14 of file CbcHeuristicDiveLineSearch.hpp.

4.46.2 Member Function Documentation

4.46.2.1 virtual bool CbcHeuristicDiveLineSearch::selectVariableToBranch (OsiSolverInterface * solver, const double * newSolution, int & bestColumn, int & bestRound) [virtual]

Selects the next variable to branch on.

Returns true if all the fractional variables can be trivially rounded. Returns false, if there is at least one fractional variable that is not trivially roundable. In this case, the bestColumn returned will not be trivially roundable.

Implements [CbcHeuristicDive](#).

The documentation for this class was generated from the following file:

- CbcHeuristicDiveLineSearch.hpp

4.47 CbcHeuristicDivePseudoCost Class Reference

DivePseudoCost class.

```
#include <CbcHeuristicDivePseudoCost.hpp>
```


- [CbcHeuristicDivePseudoCost](#) & `operator=` (const [CbcHeuristicDivePseudoCost](#) &rhs)
Assignment operator.
- virtual void [generateCpp](#) (FILE *fp)
Create C++ lines to get to current state.
- virtual bool [selectVariableToBranch](#) (OsiSolverInterface *solver, const double *newSolution, int &bestColumn, int &bestRound)
Selects the next variable to branch on.
- virtual void [initializeData](#) ()
Initializes any data which is going to be used repeatedly in [selectVariableToBranch](#).
- virtual int [fixOtherVariables](#) (OsiSolverInterface *solver, const double *solution, [PseudoReducedCost](#) *candidate, const double *random)
Fix other variables at bounds.

4.47.1 Detailed Description

DivePseudoCost class.

Definition at line 14 of file [CbcHeuristicDivePseudoCost.hpp](#).

4.47.2 Member Function Documentation

4.47.2.1 virtual bool [CbcHeuristicDivePseudoCost::selectVariableToBranch](#) (OsiSolverInterface * solver, const double * newSolution, int & bestColumn, int & bestRound) [virtual]

Selects the next variable to branch on.

Returns true if all the fractional variables can be trivially rounded. Returns false, if there is at least one fractional variable that is not trivially roundable. In this case, the `bestColumn` returned will not be trivially roundable.

Implements [CbcHeuristicDive](#).

The documentation for this class was generated from the following file:

- [CbcHeuristicDivePseudoCost.hpp](#)

Public Member Functions

- virtual [CbcHeuristicDiveVectorLength](#) * [clone](#) () const
Clone.
- [CbcHeuristicDiveVectorLength](#) & [operator=](#) (const [CbcHeuristicDiveVectorLength](#) &rhs)
Assignment operator.
- virtual void [generateCpp](#) (FILE *fp)
Create C++ lines to get to current state.
- virtual bool [selectVariableToBranch](#) (OsiSolverInterface *solver, const double *newSolution, int &bestColumn, int &bestRound)
Selects the next variable to branch on.

4.48.1 Detailed Description

DiveVectorLength class.

Definition at line 14 of file CbcHeuristicDiveVectorLength.hpp.

4.48.2 Member Function Documentation
4.48.2.1 virtual bool CbcHeuristicDiveVectorLength::selectVariableToBranch (OsiSolverInterface * solver, const double * newSolution, int & bestColumn, int & bestRound) [virtual]

Selects the next variable to branch on.

Returns true if all the fractional variables can be trivially rounded. Returns false, if there is at least one fractional variable that is not trivially roundable. In this case, the bestColumn returned will not be trivially roundable.

Implements [CbcHeuristicDive](#).

The documentation for this class was generated from the following file:

- CbcHeuristicDiveVectorLength.hpp

4.49 CbcHeuristicDynamic3 Class Reference

heuristic - just picks up any good solution

- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.
- virtual void [resetModel](#) (CbcModel *model)
Resets stuff if model changes.
- virtual bool [canDealWithOdd](#) () const
Returns true if can deal with "odd" problems e.g. sos type 2.

4.49.1 Detailed Description

heuristic - just picks up any good solution

Definition at line 379 of file CbcLinked.hpp.

4.49.2 Member Function Documentation

4.49.2.1 virtual int CbcHeuristicDynamic3::solution (double & *objectiveValue*, double * *newSolution*) [virtual]

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) We leave all variables which are at one at this node of the tree to that value and will initially set all others to zero. We then sort all variables in order of their cost divided by the number of entries in rows which are not yet covered. We randomize that value a bit so that ties will be broken in different ways on different runs of the heuristic. We then choose the best one and set it to one and repeat the exercise.

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.50 CbcHeuristicFPump Class Reference

Feasibility Pump class.

```
#include <CbcHeuristicFPump.hpp>
```


Create C++ lines to get to current state.

- virtual void [resetModel](#) (CbcModel *model)
Resets stuff if model changes.
- virtual void [setModel](#) (CbcModel *model)
update model (This is needed if cliques update matrix etc)
- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution with better objective value than one passed in Sets solution values if good, sets objective value (only if good) This is called after cuts have been added - so can not add cuts.
- void [setMaximumTime](#) (double value)
Set maximum Time (default off) - also sets starttime to current.
- double [maximumTime](#) () const
Get maximum Time (default 0.0 == time limit off).
- void [setFakeCutoff](#) (double value)
Set fake cutoff (default COIN_DBL_MAX == off).
- double [fakeCutoff](#) () const
Get fake cutoff (default 0.0 == off).
- void [setAbsoluteIncrement](#) (double value)
Set absolute increment (default 0.0 == off).
- double [absoluteIncrement](#) () const
Get absolute increment (default 0.0 == off).
- void [setRelativeIncrement](#) (double value)
Set relative increment (default 0.0 == off).
- double [relativeIncrement](#) () const
Get relative increment (default 0.0 == off).
- void [setDefaultRounding](#) (double value)
Set default rounding (default 0.5).
- double [defaultRounding](#) () const
Get default rounding (default 0.5).

- void [setInitialWeight](#) (double value)
Set initial weight (default 0.0 == off).
- double [initialWeight](#) () const
Get initial weight (default 0.0 == off).
- void [setWeightFactor](#) (double value)
Set weight factor (default 0.1).
- double [weightFactor](#) () const
Get weight factor (default 0.1).
- void [setArtificialCost](#) (double value)
Set threshold cost for using original cost - even on continuous (default infinity).
- double [artificialCost](#) () const
Get threshold cost for using original cost - even on continuous (default infinity).
- double [iterationRatio](#) () const
Get iteration to size ratio.
- void [setIterationRatio](#) (double value)
Set iteration to size ratio.
- void [setMaximumPasses](#) (int value)
Set maximum passes (default 100).
- int [maximumPasses](#) () const
Get maximum passes (default 100).
- void [setMaximumRetries](#) (int value)
Set maximum retries (default 1).
- int [maximumRetries](#) () const
Get maximum retries (default 1).
- void [setAccumulate](#) (int value)
Set use of multiple solutions and solves 0 - do not reuse solves, do not accumulate integer solutions for local search 1 - do not reuse solves, accumulate integer solutions for local search 2 - reuse solves, do not accumulate integer solutions for local search 3 - reuse solves, accumulate integer solutions for local search If we add 4 then use second form of problem (with extra rows and variables for general integers) At some point (date?), I added.

- int `accumulate` () const
Get accumulation option.
- void `setFixOnReducedCosts` (int value)
Set whether to fix variables on known solution 0 - do not fix 1 - fix integers on reduced costs 2 - fix integers on reduced costs but only on entry.
- int `fixOnReducedCosts` () const
Get reduced cost option.
- void `setReducedCostMultiplier` (double value)
Set reduced cost multiplier 1.0 as normal <1.0 (x) - pretend gap is x actual gap - just for fixing.*
- double `reducedCostMultiplier` () const
Get reduced cost multiplier.

Protected Attributes

- double `startTime_`
Start time.
- double `maximumTime_`
Maximum Cpu seconds.
- double `fakeCutoff_`
Fake cutoff value.
- double `absoluteIncrement_`
If positive carry on after solution expecting gain of at least this.
- double `relativeIncrement_`
If positive carry on after solution expecting gain of at least this times objective.
- double `defaultRounding_`
Default is round up if > this.
- double `initialWeight_`
Initial weight for true objective.

- double `weightFactor_`
Factor for decreasing weight.
- double `artificialCost_`
Threshold cost for using original cost - even on continuous.
- double `iterationRatio_`
If iterationRatio >0 use instead of maximumPasses_ test is iterations > ratio(2*nrow+ncol).*
- double `reducedCostMultiplier_`
Reduced cost multiplier 1.0 as normal <1.0 (x) - pretend gap is x actual gap - just for fixing.*
- int `maximumPasses_`
Maximum number of passes.
- int `maximumRetries_`
Maximum number of retries if we find a solution.
- int `accumulate_`
Set use of multiple solutions and solves 0 - do not reuse solves, do not accumulate integer solutions for local search 1 - do not reuse solves, accumulate integer solutions for local search 2 - reuse solves, do not accumulate integer solutions for local search 3 - reuse solves, accumulate integer solutions for local search If we add 4 then use second form of problem (with extra rows and variables for general integers) If we do not accumulate solutions then no mini branch and bounds will be done reuse - refers to initial solve after adding in new "cut" If we add 8 then can run after initial cuts (if no solution).
- int `fixOnReducedCosts_`
Set whether to fix variables on known solution 0 - do not fix 1 - fix integers on reduced costs 2 - fix integers on reduced costs but only on entry.
- bool `roundExpensive_`
If true round to expensive.

4.50.1 Detailed Description

Feasibility Pump class.

Definition at line 15 of file CbcHeuristicFPump.hpp.

4.50.2 Member Function Documentation

4.50.2.1 virtual int CbcHeuristicFPump::solution (double & *objectiveValue*, double * *newSolution*) [virtual]

returns 0 if no solution, 1 if valid solution with better objective value than one passed in Sets solution values if good, sets objective value (only if good) This is called after cuts have been added - so can not add cuts.

It may make sense for user to call this outside Branch and Cut to get solution. Or normally is just at root node.

new meanings for when_ - on first try then set back to 1 11 - at end fix all integers at same bound throughout 12 - also fix all integers staying at same internal integral value throughout 13 - also fix all continuous variables staying at same bound throughout 14 - also fix all continuous variables staying at same internal value throughout 15 - as 13 but no internal integers And beyond that, it's apparently possible for the range to be between 21 and 25, in which case it's reduced on entry to [solution\(\)](#) to be between 11 and 15 and allSlack is set to true. Then, if we're not processing general integers, we'll use an all-slack basis to solve ... what? Don't see that yet.

Implements [CbcHeuristic](#).

4.50.2.2 void CbcHeuristicFPump::setAccumulate (int *value*) [inline]

Set use of multiple solutions and solves 0 - do not reuse solves, do not accumulate integer solutions for local search 1 - do not reuse solves, accumulate integer solutions for local search 2 - reuse solves, do not accumulate integer solutions for local search 3 - reuse solves, accumulate integer solutions for local search If we add 4 then use second form of problem (with extra rows and variables for general integers) At some point (date?), I added.

And then there are a few bit fields: 4 - something about general integers So my (lh) guess for 4 was at least in the ballpark, but I'll have to rethink 8 entirely (and it may well not mean the same thing as it did when I added that comment. 8 - determines whether we process general integers

And on 090831, John added

If we add 4 then use second form of problem (with extra rows and variables for general integers) If we add 8 then can run after initial cuts (if no solution)

Definition at line 175 of file CbcHeuristicFPump.hpp.

4.50.3 Member Data Documentation

4.50.3.1 double CbcHeuristicFPump::fakeCutoff_ [protected]

Fake cutoff value.

If set then better of real cutoff and this used to add a constraint

Definition at line 215 of file CbcHeuristicFPump.hpp.

4.50.3.2 int CbcHeuristicFPump::maximumRetries_ [protected]

Maximum number of retries if we find a solution.

If negative we clean out used array

Definition at line 241 of file CbcHeuristicFPump.hpp.

The documentation for this class was generated from the following file:

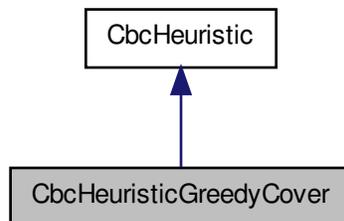
- CbcHeuristicFPump.hpp

4.51 CbcHeuristicGreedyCover Class Reference

Greedy heuristic classes.

```
#include <CbcHeuristicGreedy.hpp>
```

Inheritance diagram for CbcHeuristicGreedyCover:



Protected Member Functions

- void [gutsOfConstructor](#) (CbcModel *model)
Guts of constructor from a CbcModel.

Protected Attributes

- int [numberTimes_](#)
Do this many times.

4.51.1 Detailed Description

Greedy heuristic classes.

Definition at line 13 of file CbcHeuristicGreedy.hpp.

4.51.2 Member Function Documentation

4.51.2.1 `virtual int CbcHeuristicGreedyCover::solution (double & objectiveValue, double * newSolution) [virtual]`

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) We leave all variables which are at one at this node of the tree to that value and will initially set all others to zero. We then sort all variables in order of their cost divided by the number of entries in rows which are not yet covered. We randomize that value a bit so that ties will be broken in different ways on different runs of the heuristic. We then choose the best one and set it to one and repeat the exercise.

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicGreedy.hpp

Assignment operator.

- virtual void `generateCpp` (FILE *fp)
Create C++ lines to get to current state.
- virtual void `setModel` (CbcModel *model)
update model (This is needed if cliques update matrix etc)
- virtual int `solution` (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.
- virtual void `validate` ()
Validate model i.e. sets when_ to 0 if necessary (may be NULL).
- virtual void `resetModel` (CbcModel *model)
Resets stuff if model changes.

Protected Member Functions

- void `gutsOfConstructor` (CbcModel *model)
Guts of constructor from a CbcModel.

Protected Attributes

- int `numberTimes_`
Do this many times.

4.52.1 Detailed Description

Definition at line 98 of file CbcHeuristicGreedy.hpp.

4.52.2 Member Function Documentation

4.52.2.1 virtual int CbcHeuristicGreedyEquality::solution (double & objectiveValue, double * newSolution) [virtual]

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) We leave all variables which are at one at this node of the tree to that value and will initially set all others to zero. We then sort all variables in order of their cost divided by the number of entries in rows which are not yet covered. We randomize that value a bit so that ties will be broken in different ways on different runs of the heuristic. We then choose the best one and set it to one and repeat the exercise.

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

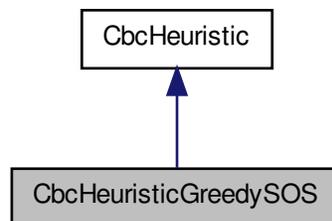
- CbcHeuristicGreedy.hpp

4.53 CbcHeuristicGreedySOS Class Reference

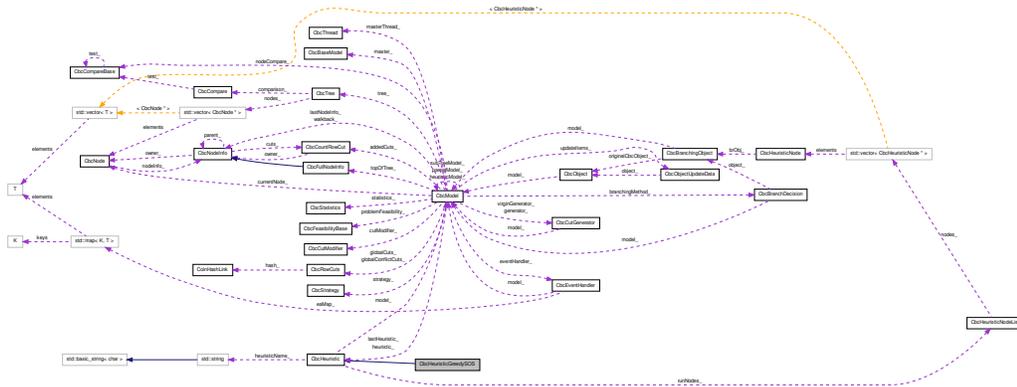
Greedy heuristic for SOS and L rows (and positive elements).

```
#include <CbcHeuristicGreedy.hpp>
```

Inheritance diagram for CbcHeuristicGreedySOS:



Collaboration diagram for CbcHeuristicGreedySOS:



Public Member Functions

- virtual [CbcHeuristic](#) * [clone](#) () const
Clone.
- [CbcHeuristicGreedySOS](#) & [operator=](#) (const [CbcHeuristicGreedySOS](#) &rhs)
Assignment operator.
- virtual void [generateCpp](#) (FILE *fp)
Create C++ lines to get to current state.
- virtual void [setModel](#) ([CbcModel](#) *model)
update model (This is needed if cliques update matrix etc)
- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.
- virtual void [validate](#) ()
Validate model i.e. sets when_ to 0 if necessary (may be NULL).
- virtual void [resetModel](#) ([CbcModel](#) *model)
Resets stuff if model changes.

Protected Member Functions

- void `gutsOfConstructor` (`CbcModel *model`)
Guts of constructor from a `CbcModel`.

Protected Attributes

- int `numberTimes_`
Do this many times.

4.53.1 Detailed Description

Greedy heuristic for SOS and L rows (and positive elements).

Definition at line 193 of file `CbcHeuristicGreedy.hpp`.

4.53.2 Member Function Documentation

4.53.2.1 `virtual int CbcHeuristicGreedySOS::solution (double & objectiveValue, double * newSolution) [virtual]`

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) We leave all variables which are at one at this node of the tree to that value and will initially set all others to zero. We then sort all variables in order of their cost divided by the number of entries in rows which are not yet covered. We randomize that value a bit so that ties will be broken in different ways on different runs of the heuristic. We then choose the best one and set it to one and repeat the exercise.

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- `CbcHeuristicGreedy.hpp`

4.54 CbcHeuristicJustOne Class Reference

Just One class - this chooses one at random.

```
#include <CbcHeuristic.hpp>
```


Create C++ lines to get to current state.

- virtual int `solution` (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution with better objective value than one passed in Sets solution values if good, sets objective value (only if good) This is called after cuts have been added - so can not add cuts This does Fractional Diving
- virtual void `resetModel` (CbcModel *model)
Resets stuff if model changes.
- virtual void `setModel` (CbcModel *model)
update model (This is needed if cliques update matrix etc)
- virtual bool `selectVariableToBranch` (OsiSolverInterface *, const double *, int &, int &)
Selects the next variable to branch on.
- virtual void `validate` ()
Validate model i.e. sets when_ to 0 if necessary (may be NULL).
- void `addHeuristic` (const CbcHeuristic *heuristic, double probability)
Adds an heuristic with probability.
- void `normalizeProbabilities` ()
Normalize probabilities.

4.54.1 Detailed Description

Just One class - this chooses one at random.

Definition at line 601 of file CbcHeuristic.hpp.

4.54.2 Member Function Documentation

4.54.2.1 virtual bool CbcHeuristicJustOne::selectVariableToBranch (OsiSolverInterface *, const double *, int &, int &) [`inline`, `virtual`]

Selects the next variable to branch on.

Returns true if all the fractional variables can be trivially rounded. Returns false, if there is at least one fractional variable that is not trivially roundable. In this case, the bestColumn returned will not be trivially roundable. This is dummy as never called

Definition at line 645 of file CbcHeuristic.hpp.

The documentation for this class was generated from the following file:

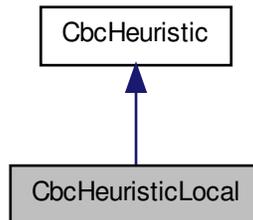
- CbcHeuristic.hpp

4.55 CbcHeuristicLocal Class Reference

LocalSearch class.

```
#include <CbcHeuristicLocal.hpp>
```

Inheritance diagram for CbcHeuristicLocal:



- `int * used () const`

Used array so we can set.

Protected Attributes

- `int * used_`

Whether a variable has been in a solution (also when).

4.55.1 Detailed Description

LocalSearch class.

Definition at line 13 of file CbcHeuristicLocal.hpp.

4.55.2 Member Function Documentation

4.55.2.1 `virtual int CbcHeuristicLocal::solution (double & objectiveValue, double * newSolution) [virtual]`

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) This is called after cuts have been added - so can not add cuts First tries setting a variable to better value. If feasible then tries setting others. If not feasible then tries swaps

This first version does not do LP's and does swaps of two integer variables. Later versions could do Lps.

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicLocal.hpp

4.56 CbcHeuristicNaive Class Reference

Naive class a) Fix all ints as close to zero as possible b) Fix all ints with nonzero costs and < large to zero c) Put bounds round continuous and UIs and maximize.

```
#include <CbcHeuristicLocal.hpp>
```


Create C++ lines to get to current state.

- virtual void [resetModel](#) (CbcModel *model)
Resets stuff if model changes.
- virtual void [setModel](#) (CbcModel *model)
update model (This is needed if cliques update matrix etc)
- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.
- void [setLargeValue](#) (double value)
Sets large cost value.
- double [largeValue](#) () const
Gets large cost value.

Protected Attributes

- double [large_](#)
Data Large value.

4.56.1 Detailed Description

Naive class a) Fix all ints as close to zero as possible b) Fix all ints with nonzero costs and < large to zero c) Put bounds round continuous and UIs and maximize.

Definition at line 150 of file CbcHeuristicLocal.hpp.

4.56.2 Member Function Documentation

4.56.2.1 virtual int CbcHeuristicNaive::solution (double & *objectiveValue*, double * *newSolution*) [virtual]

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good)

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- virtual `CbcHeuristic * clone () const`
Clone.
- virtual void `generateCpp (FILE *fp)`
Create C++ lines to get to current state.
- virtual void `resetModel (CbcModel *model)`
Resets stuff if model changes.
- virtual void `setModel (CbcModel *model)`
update model (This is needed if cliques update matrix etc)
- virtual int `solution (double &objectiveValue, double *newSolution)`
returns 0 if no solution, 1 if valid solution with better objective value than one passed in Sets solution values if good, sets objective value (only if good) This is called after cuts have been added - so can not add cuts
- virtual void `validate ()`
Validate model i.e. sets when_ to 0 if necessary (may be NULL).
- void `setFixPriority (int value)`
Set priority level.
- virtual bool `shouldHeurRun (int whereFrom)`
Check whether the heuristic should run at all.

4.59.1 Detailed Description

Partial solution class If user knows a partial solution this tries to get an integer solution it uses hotstart information.

Definition at line 489 of file CbcHeuristic.hpp.

The documentation for this class was generated from the following file:

- CbcHeuristic.hpp

4.60 CbcHeuristicPivotAndFix Class Reference

LocalSearch class.

```
#include <CbcHeuristicPivotAndFix.hpp>
```


Create C++ lines to get to current state.

- virtual void [resetModel](#) ([CbcModel](#) *model)
Resets stuff if model changes.
- virtual void [setModel](#) ([CbcModel](#) *model)
update model (This is needed if cliques update matrix etc)
- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.

4.60.1 Detailed Description

LocalSearch class.

Definition at line 13 of file CbcHeuristicPivotAndFix.hpp.

4.60.2 Member Function Documentation

4.60.2.1 virtual int CbcHeuristicPivotAndFix::solution (double & objectiveValue, double * newSolution) [virtual]

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) needs comments

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicPivotAndFix.hpp

Assignment operator.

- virtual void [generateCpp](#) (FILE *fp)
Create C++ lines to get to current state.
- virtual void [resetModel](#) (CbcModel *model)
Resets stuff if model changes.
- virtual void [setModel](#) (CbcModel *model)
update model (This is needed if cliques update matrix etc)
- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.
- int * [used](#) () const
Used array so we can set.

Protected Attributes

- int * [used_](#)
Whether a variable has been in a solution (also when).

4.61.1 Detailed Description

Definition at line 90 of file CbcHeuristicLocal.hpp.

4.61.2 Member Function Documentation

4.61.2.1 virtual int CbcHeuristicProximity::solution (double & objectiveValue, double * newSolution) [virtual]

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good)

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicLocal.hpp

- [CbcHeuristicRandRound](#) & `operator=` (const [CbcHeuristicRandRound](#) &rhs)
Assignment operator.
- virtual void `generateCpp` (FILE *fp)
Create C++ lines to get to current state.
- virtual void `resetModel` ([CbcModel](#) *model)
Resets stuff if model changes.
- virtual void `setModel` ([CbcModel](#) *model)
update model (This is needed if cliques update matrix etc)
- virtual int `solution` (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.

4.62.1 Detailed Description

LocalSearch class.

Definition at line 13 of file CbcHeuristicRandRound.hpp.

4.62.2 Member Function Documentation

4.62.2.1 virtual int CbcHeuristicRandRound::solution (double & objectiveValue, double * newSolution) [virtual]

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) needs comments

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicRandRound.hpp

4.63 CbcHeuristicRENS Class Reference

LocalSearch class.

```
#include <CbcHeuristicRENS.hpp>
```


Resets stuff if model changes.

- virtual void [setModel](#) (CbcModel *model)
update model (This is needed if cliques update matrix etc)
- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.
- void [setRensType](#) (int value)
Set type.

Protected Attributes

- int [numberTries_](#)
Number of tries.
- int [rensType_](#)
*Type 0 - fix at LB 1 - fix on dj 2 - fix at UB as well 3 - fix on 0.01*average dj add 16 to allow two tries.*

4.63.1 Detailed Description

LocalSearch class.

Definition at line 16 of file CbcHeuristicRENS.hpp.

4.63.2 Member Function Documentation

4.63.2.1 virtual int CbcHeuristicRENS::solution (double & objectiveValue, double * newSolution) [virtual]

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) This does Relaxation Extension Neighborhood Search Does not run if when_<2 and a solution exists

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicRENS.hpp

- `CbcHeuristicRINS & operator= (const CbcHeuristicRINS &rhs)`
Assignment operator.
- virtual void `generateCpp (FILE *fp)`
Create C++ lines to get to current state.
- virtual void `resetModel (CbcModel *model)`
Resets stuff if model changes.
- virtual void `setModel (CbcModel *model)`
update model (This is needed if cliques update matrix etc)
- virtual int `solution (double &objectiveValue, double *newSolution)`
returns 0 if no solution, 1 if valid solution.
- int `solutionFix (double &objectiveValue, double *newSolution, const int *keep)`

This version fixes stuff and does IP.
- void `setHowOften (int value)`
Sets how often to do it.
- char * `used () const`
Used array so we can set.
- void `setLastNode (int value)`
Resets lastNode.

Protected Attributes

- int `numberSolutions_`
Number of solutions so we can do something at solution.
- int `howOften_`
How often to do (code can change).
- int `numberSuccesses_`
Number of successes.
- int `numberTries_`

Number of tries.

- int `stateOfFixing_`
State of fixing continuous variables - 0 - not tried +n - this divisor makes small enough -n - this divisor still not small enough.
- int `lastNode_`
Node when last done.
- char * `used_`
Whether a variable has been in a solution.

4.64.1 Detailed Description

LocalSearch class.

Definition at line 17 of file CbcHeuristicRINS.hpp.

4.64.2 Member Function Documentation

4.64.2.1 `virtual int CbcHeuristicRINS::solution (double & objectiveValue, double * newSolution) [virtual]`

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) This does Relaxation Induced Neighborhood Search

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicRINS.hpp

4.65 CbcHeuristicVND Class Reference

LocalSearch class.

```
#include <CbcHeuristicVND.hpp>
```


Create C++ lines to get to current state.

- virtual void [resetModel](#) (CbcModel *model)
Resets stuff if model changes.
- virtual void [setModel](#) (CbcModel *model)
update model (This is needed if cliques update matrix etc)
- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.
- int [solutionFix](#) (double &objectiveValue, double *newSolution, const int *keep)

This version fixes stuff and does IP.

- void [setHowOften](#) (int value)
Sets how often to do it.
- double * [baseSolution](#) () const
base solution array so we can set

Protected Attributes

- int [numberSolutions_](#)
Number of solutions so we can do something at solution.
- int [howOften_](#)
How often to do (code can change).
- int [numberSuccesses_](#)
Number of successes.
- int [numberTries_](#)
Number of tries.
- int [lastNode_](#)
Node when last done.
- int [stepSize_](#)
Step size for decomposition.

- double * [baseSolution_](#)
Base solution.

4.65.1 Detailed Description

LocalSearch class.

Definition at line 17 of file CbcHeuristicVND.hpp.

4.65.2 Member Function Documentation

4.65.2.1 `virtual int CbcHeuristicVND::solution (double & objectiveValue, double * newSolution) [virtual]`

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) This does Relaxation Induced Neighborhood Search

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristicVND.hpp

4.66 CbcIdiotBranch Class Reference

Define an idiotic idea class.

```
#include <CbcFollowOn.hpp>
```


Clone.

- virtual double [infeasibility](#) (const OsiBranchingInformation *info, int &preferredWay) const

Infeasibility - large is 0.5.

- virtual void [feasibleRegion](#) ()

This looks at solution and sets bounds to contain solution.

- virtual [CbcBranchingObject](#) * [createCbcBranch](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way)

Creates a branching object.

- virtual void [initializeForBranching](#) (CbcModel *)

Initialize for branching.

Protected Member Functions

- OsiRowCut [buildCut](#) (const OsiBranchingInformation *info, int type, int &preferredWay) const

Build "cut".

Protected Attributes

- CoinThreadRandom [randomNumberGenerator_](#)

data Thread specific random number generator

- CoinThreadRandom [savedRandomNumberGenerator_](#)

Saved version of thread specific random number generator.

4.66.1 Detailed Description

Define an idiotic idea class. The idea of this is that we take some integer variables away from integer and sum them with some randomness to get signed sum close to 0.5. We then can branch to exclude that gap.

This branching rule should be in addition to normal rules and have a high priority.

Definition at line 161 of file CbcFollowOn.hpp.

The documentation for this class was generated from the following file:

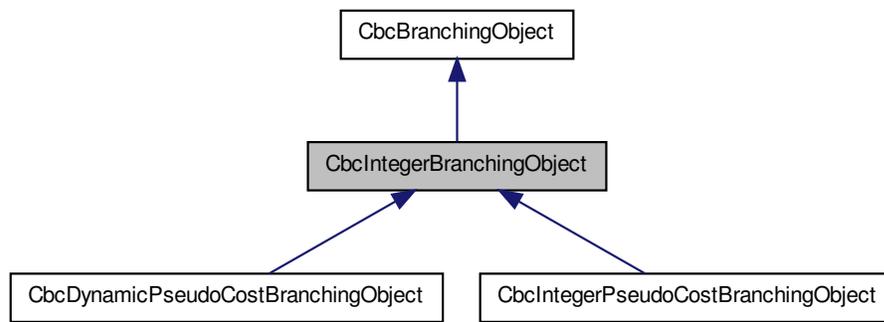
- CbcFollowOn.hpp

4.67 CbcIntegerBranchingObject Class Reference

Simple branching object for an integer variable.

```
#include <CbcSimpleInteger.hpp>
```

Inheritance diagram for CbcIntegerBranchingObject:



- virtual `~CbcIntegerBranchingObject ()`
Destructor.
- void `fillPart (int variable, int way, double value)`
Does part of constructor.
- virtual double `branch ()`
Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.
- virtual void `fix (OsiSolverInterface *solver, double *lower, double *upper, int branchState) const`
Update bounds in solver as in 'branch' and update given bounds.
- virtual bool `tighten (OsiSolverInterface *)`
Change (tighten) bounds in object to reflect bounds in solver.
- virtual void `print ()`
Print something about branch - only if log level high.
- const double * `downBounds () const`
Lower and upper bounds for down branch.
- const double * `upBounds () const`
Lower and upper bounds for up branch.
- void `setDownBounds (const double bounds[2])`
Set lower and upper bounds for down branch.
- void `setUpBounds (const double bounds[2])`
Set lower and upper bounds for up branch.
- virtual CbcBranchObjType `type () const`
Return the type (an integer identifier) of this.
- virtual CbcRangeCompare `compareBranchingObject (const CbcBranchingObject *brObj, const bool replaceIfOverlap=false)`
Compare the this with brObj.

Protected Attributes

- double `down_ [2]`
Lower [0] and upper [1] bounds for the down arm ($way_ = -1$).
- double `up_ [2]`
Lower [0] and upper [1] bounds for the up arm ($way_ = 1$).

4.67.1 Detailed Description

Simple branching object for an integer variable. This object can specify a two-way branch on an integer variable. For each arm of the branch, the upper and lower bounds on the variable can be independently specified.

`Variable_` holds the index of the integer variable in the `integerVariable_` array of the model.

Definition at line 23 of file `CbcSimpleInteger.hpp`.

4.67.2 Constructor & Destructor Documentation**4.67.2.1 CbcIntegerBranchingObject::CbcIntegerBranchingObject (CbcModel * *model*, int *variable*, int *way*, double *value*)**

Create a standard floor/ceiling branch object.

Specifies a simple two-way branch. Let `value = x*`. One arm of the branch will be $lb \leq x \leq \text{floor}(x^*)$, the other $\text{ceil}(x^*) \leq x \leq ub$. Specify `way = -1` to set the object state to perform the down arm first, `way = 1` for the up arm.

4.67.2.2 CbcIntegerBranchingObject::CbcIntegerBranchingObject (CbcModel * *model*, int *variable*, int *way*, double *lowerValue*, double *upperValue*)

Create a degenerate branch object.

Specifies a 'one-way branch'. Calling `branch()` for this object will always result in $\text{lowerValue} \leq x \leq \text{upperValue}$. Used to fix a variable when `lowerValue = upperValue`.

4.67.3 Member Function Documentation

4.67.3.1 virtual double CbcIntegerBranchingObject::branch () [virtual]

Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.

Returns change in guessed objective on next branch

Implements [CbcBranchingObject](#).

Reimplemented in [CbcDynamicPseudoCostBranchingObject](#), and [CbcIntegerPseudo-CostBranchingObject](#).

4.67.3.2 virtual void CbcIntegerBranchingObject::fix (OsiSolverInterface * solver, double * lower, double * upper, int branchState) const [virtual]

Update bounds in solver as in 'branch' and update given bounds.

branchState is -1 for 'down' +1 for 'up'

Reimplemented from [CbcBranchingObject](#).

4.67.3.3 virtual bool CbcIntegerBranchingObject::tighten (OsiSolverInterface *) [virtual]

Change (tighten) bounds in object to reflect bounds in solver.

Return true if now fixed

Reimplemented from [CbcBranchingObject](#).

4.67.3.4 virtual CbcRangeCompare CbcIntegerBranchingObject::compareBranchingObject (const CbcBranchingObject * brObj, const bool replaceIfOverlap = false) [virtual]

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate `CbcRangeCompare` value (first argument being the sub/superset if that's the case). In case of overlap (and

if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

Implements [CbcBranchingObject](#).

Reimplemented in [CbcIntegerPseudoCostBranchingObject](#).

The documentation for this class was generated from the following file:

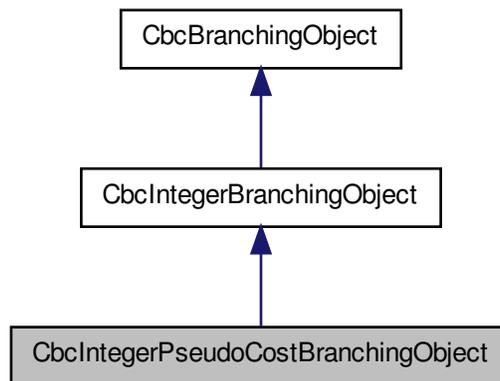
- `CbcSimpleInteger.hpp`

4.68 CbcIntegerPseudoCostBranchingObject Class Reference

Simple branching object for an integer variable with pseudo costs.

```
#include <CbcSimpleIntegerDynamicPseudoCost.hpp>
```

Inheritance diagram for `CbcIntegerPseudoCostBranchingObject`:



- virtual `~CbcIntegerPseudoCostBranchingObject ()`
Destructor.
- virtual double `branch ()`
Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.
- double `changeInGuessed () const`
Change in guessed.
- void `setChangeInGuessed (double value)`
Set change in guessed.
- virtual CbcBranchObjType `type () const`
Return the type (an integer identifier) of this.
- virtual CbcRangeCompare `compareBranchingObject (const CbcBranchingObject *brObj, const bool replaceIfOverlap=false)`
Compare the this with brObj.

Protected Attributes

- double `changeInGuessed_`
Change in guessed objective value for next branch.

4.68.1 Detailed Description

Simple branching object for an integer variable with pseudo costs. This object can specify a two-way branch on an integer variable. For each arm of the branch, the upper and lower bounds on the variable can be independently specified.

`Variable_` holds the index of the integer variable in the `integerVariable_` array of the model.

Definition at line 389 of file `CbcSimpleIntegerDynamicPseudoCost.hpp`.

4.68.2 Constructor & Destructor Documentation

4.68.2.1 CbcIntegerPseudoCostBranchingObject::CbcIntegerPseudoCostBranchingObject (CbcModel * *model*, int *variable*, int *way*, double *value*)

Create a standard floor/ceiling branch object.

Specifies a simple two-way branch. Let `value = x*`. One arm of the branch will be `lb <= x <= floor(x*)`, the other `ceil(x*) <= x <= ub`. Specify `way = -1` to set the object state to perform the down arm first, `way = 1` for the up arm.

4.68.2.2 CbcIntegerPseudoCostBranchingObject::CbcIntegerPseudoCostBranchingObject (CbcModel * *model*, int *variable*, int *way*, double *lowerValue*, double *upperValue*)

Create a degenerate branch object.

Specifies a ‘one-way branch’. Calling `branch()` for this object will always result in `lowerValue <= x <= upperValue`. Used to fix a variable when `lowerValue = upperValue`.

4.68.3 Member Function Documentation

4.68.3.1 virtual double CbcIntegerPseudoCostBranchingObject::branch () [virtual]

Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.

This version also changes guessed objective value

Reimplemented from [CbcIntegerBranchingObject](#).

4.68.3.2 virtual CbcRangeCompare CbcIntegerPseudoCostBranchingObject::compareBranchingObject (const CbcBranchingObject * *brObj*, const bool *replaceIfOverlap = false*) [virtual]

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate `CbcRangeCompare`

value (first argument being the sub/superset if that's the case). In case of overlap (and if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

Reimplemented from [CbcIntegerBranchingObject](#).

The documentation for this class was generated from the following file:

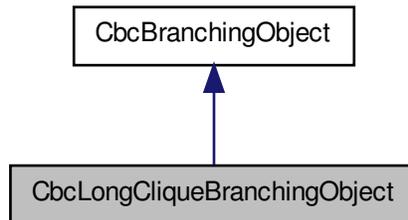
- `CbcSimpleIntegerDynamicPseudoCost.hpp`

4.69 CbcLongCliqueBranchingObject Class Reference

Unordered Clique Branching Object class.

```
#include <CbcClique.hpp>
```

Inheritance diagram for `CbcLongCliqueBranchingObject`:



4.69.1 Detailed Description

Unordered Clique Branching Object class. These are for cliques which are > 64 members Variable is number of clique.

Definition at line 234 of file CbcClique.hpp.

4.69.2 Member Function Documentation

4.69.2.1 `virtual int CbcLongCliqueBranchingObject::compareOriginalObject (const CbcBranchingObject * brObj) const [virtual]`

Compare the original object of `this` with the original object of `brObj`.

Assumes that there is an ordering of the original objects. This method should be invoked only if `this` and `brObj` are of the same type. Return negative/0/positive depending on whether `this` is smaller/same/larger than the argument.

Reimplemented from [CbcBranchingObject](#).

4.69.2.2 `virtual CbcRangeCompare CbcLongCliqueBranchingObject::compareBranchingObject (const CbcBranchingObject * brObj, const bool replaceIfOverlap = false) [virtual]`

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate `CbcRangeCompare` value (first argument being the sub/superset if that's the case). In case of overlap (and if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

Implements [CbcBranchingObject](#).

The documentation for this class was generated from the following file:

- CbcClique.hpp

4.70 CbcLotsize Class Reference

Lotsize class.

```
#include <CbcBranchLotsize.hpp>
```


Infeasibility - large is 0.5.

- virtual void `feasibleRegion ()`
Set bounds to contain the current solution.
- virtual `CbcBranchingObject * createCbcBranch (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way)`
Creates a branching object.
- virtual `CbcBranchingObject * preferredNewFeasible () const`
Given a valid solution (with reduced costs, etc.
- virtual `CbcBranchingObject * notPreferredNewFeasible () const`
Given a valid solution (with reduced costs, etc.
- virtual void `resetBounds (const OsiSolverInterface *solver)`
Reset original upper and lower bound values from the solver.
- bool `findRange (double value) const`
Finds range of interest so value is feasible in range range_ or infeasible between hi[range_] and lo[range_+1].
- virtual void `floorCeiling (double &floorLotsize, double &ceilingLotsize, double value, double tolerance) const`
Returns floor and ceiling.
- int `modelSequence () const`
Model column number.
- void `setModelSequence (int value)`
Set model column number.
- virtual int `columnNumber () const`
Column number if single column object -1 otherwise, so returns ≥ 0 Used by heuristics.
- double `originalLowerBound () const`
Original variable bounds.
- int `rangeType () const`
Type - 1 points, 2 ranges.
- int `numberRanges () const`

Number of points.

- double * [bound](#) () const
Ranges.
- virtual bool [canDoHeuristics](#) () const
Return true if object can take part in normal heuristics.

4.70.1 Detailed Description

Lotsize class.

Definition at line 13 of file CbcBranchLotsize.hpp.

4.70.2 Member Function Documentation

4.70.2.1 virtual void CbcLotsize::feasibleRegion () [virtual]

Set bounds to contain the current solution.

More precisely, for the variable associated with this object, take the value given in the current solution, force it within the current bounds if required, then set the bounds to fix the variable at the integer nearest the solution value.

Implements [CbcObject](#).

4.70.2.2 virtual CbcBranchingObject* CbcLotsize::preferredNewFeasible () const [virtual]

Given a valid solution (with reduced costs, etc.

), return a branching object which would give a new feasible point in the good direction.

The preferred branching object will force the variable to be +/- 1 from its current value, depending on the reduced cost and objective sense. If movement in the direction which improves the objective is impossible due to bounds on the variable, the branching object will move in the other direction. If no movement is possible, the method returns NULL.

Only the bounds on this variable are considered when determining if the new point is feasible.

Reimplemented from [CbcObject](#).

4.70.2.3 `virtual CbcBranchingObject* CbcLotsize::notPreferredNewFeasible () const [virtual]`

Given a valid solution (with reduced costs, etc.

), return a branching object which would give a new feasible point in a bad direction.

As for [preferredNewFeasible\(\)](#), but the preferred branching object will force movement in a direction that degrades the objective.

Reimplemented from [CbcObject](#).

4.70.2.4 `virtual void CbcLotsize::resetBounds (const OsiSolverInterface * solver) [virtual]`

Reset original upper and lower bound values from the solver.

Handy for updating bounds held in this object after bounds held in the solver have been tightened.

Reimplemented from [CbcObject](#).

4.70.2.5 `bool CbcLotsize::findRange (double value) const`

Finds range of interest so value is feasible in range range_ or infeasible between hi[range_] and lo[range_+1].

Returns true if feasible.

The documentation for this class was generated from the following file:

- CbcBranchLotsize.hpp

4.71 CbcLotsizeBranchingObject Class Reference

Lotsize branching object.

```
#include <CbcBranchLotsize.hpp>
```


- [CbcLotsizeBranchingObject](#) ([CbcModel](#) *model, int variable, int way, double value, const [CbcLotsize](#) *lotsize)
Create a lotsize floor/ceiling branch object.
- [CbcLotsizeBranchingObject](#) ([CbcModel](#) *model, int variable, int way, double lowerValue, double upperValue)
Create a degenerate branch object.
- [CbcLotsizeBranchingObject](#) (const [CbcLotsizeBranchingObject](#) &)
Copy constructor.
- [CbcLotsizeBranchingObject](#) & operator= (const [CbcLotsizeBranchingObject](#) &rhs)
Assignment operator.
- virtual [CbcBranchingObject](#) * clone () const
Clone.
- virtual ~[CbcLotsizeBranchingObject](#) ()
Destructor.
- virtual double [branch](#) ()
Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.
- virtual void [print](#) ()
Print something about branch - only if log level high.
- virtual [CbcBranchObjType](#) [type](#) () const
Return the type (an integer identifier) of this.
- virtual [CbcRangeCompare](#) [compareBranchingObject](#) (const [CbcBranchingObject](#) *brObj, const bool replaceIfOverlap=false)
Compare the this with brObj.

Protected Attributes

- double [down_](#) [2]
Lower [0] and upper [1] bounds for the down arm (way_ = -1).
- double [up_](#) [2]
Lower [0] and upper [1] bounds for the up arm (way_ = 1).

4.71.1 Detailed Description

Lotsize branching object. This object can specify a two-way branch on an integer variable. For each arm of the branch, the upper and lower bounds on the variable can be independently specified.

`Variable_` holds the index of the integer variable in the `integerVariable_` array of the model.

Definition at line 166 of file `CbcBranchLotsize.hpp`.

4.71.2 Constructor & Destructor Documentation

4.71.2.1 `CbcLotsizeBranchingObject::CbcLotsizeBranchingObject (CbcModel * model, int variable, int way, double value, const CbcLotsize * lotsize)`

Create a lotsize floor/ceiling branch object.

Specifies a simple two-way branch. Let `value = x*`. One arm of the branch will be `lb <= x <= valid range below(x*)`, the other valid range `above(x*) <= x <= ub`. Specify `way = -1` to set the object state to perform the down arm first, `way = 1` for the up arm.

4.71.2.2 `CbcLotsizeBranchingObject::CbcLotsizeBranchingObject (CbcModel * model, int variable, int way, double lowerValue, double upperValue)`

Create a degenerate branch object.

Specifies a 'one-way branch'. Calling `branch()` for this object will always result in `lowerValue <= x <= upperValue`. Used to fix in valid range

4.71.3 Member Function Documentation

4.71.3.1 `virtual CbcRangeCompare CbcLotsizeBranchingObject::compareBranchingObject (const CbcBranchingObject * brObj, const bool replaceIfOverlap = false) [virtual]`

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate `CbcRangeCompare` value (first argument being the sub/superset if that's the case). In case of overlap (and if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

Implements [CbcBranchingObject](#).

The documentation for this class was generated from the following file:

- `CbcBranchLotsize.hpp`

4.72 CbcMessage Class Reference

Public Member Functions

Constructors etc

- [CbcMessage](#) (Language language=us_en)

Constructor.

4.72.1 Detailed Description

Definition at line 81 of file `CbcMessage.hpp`.

The documentation for this class was generated from the following file:

- `CbcMessage.hpp`

4.73 CbcModel Class Reference

Simple Branch and bound class.

```
#include <CbcModel.hpp>
```


- bool [integerPresolveThisModel](#) (OsiSolverInterface *originalSolver, bool weak=false)
Do integer presolve, modifying the current model.
- void [originalModel](#) (CbcModel *presolvedModel, bool weak)
Put back information into the original model after integer presolve.
- bool [tightenVubs](#) (int type, bool allowMultipleBinary=false, double useCutoff=1.0e50)
For variables involved in VUB constraints, see if we can tighten bounds by solving lp's.
- bool [tightenVubs](#) (int numberVubs, const int *which, double useCutoff=1.0e50)
For variables involved in VUB constraints, see if we can tighten bounds by solving lp's.
- void [analyzeObjective](#) ()
Analyze problem to find a minimum change in the objective function.
- void [AddIntegers](#) ()
Add additional integers.
- void [saveModel](#) (OsiSolverInterface *saveSolver, double *checkCutoffForRestart, bool *feasible)
Save copy of the model.
- void [flipModel](#) ()
Flip direction of optimization on all models.

Object manipulation routines

See *OsiObject* for an explanation of 'object' in the context of *CbcModel*.

- int [numberObjects](#) () const
Get the number of objects.
- void [setNumberObjects](#) (int number)
Set the number of objects.
- OsiObject ** [objects](#) () const
Get the array of objects.
- const OsiObject * [object](#) (int which) const
Get the specified object.

- `OsiObject * modifiableObject (int which) const`
Get the specified object.
- `void setOptionalInteger (int index)`
- `void deleteObjects (bool findIntegers=true)`
Delete all object information (and just back to integers if true).
- `void addObject (int numberObjects, OsiObject **objects)`
Add in object information.
- `void addObject (int numberObjects, CbcObject **objects)`
Add in object information.
- `void synchronizeModel ()`
Ensure attached objects point to this model.
- `void findIntegers (bool startAgain, int type=0)`
Identify integer variables and create corresponding objects.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false if the value of the parameter is out of range.

The get methods return the value of the parameter.

- `bool setIntParam (CbcIntParam key, int value)`
Set an integer parameter.
- `bool setDbiParam (CbcDbiParam key, double value)`
Set a double parameter.
- `int getIntParam (CbcIntParam key) const`
Get an integer parameter.
- `double getDbiParam (CbcDbiParam key) const`
Get a double parameter.
- `void setCutoff (double value)`
Set cutoff bound on the objective function.
- `double getCutoff () const`
Get the cutoff bound on the objective function - always as minimize.
- `bool setMaximumNodes (int value)`
Set the maximum node limit .

- int `getMaximumNodes` () const
Get the maximum node limit .
- bool `setMaximumSolutions` (int value)
Set the maximum number of solutions desired.
- int `getMaximumSolutions` () const
Get the maximum number of solutions desired.
- bool `setPrintingMode` (int value)
Set the printing mode.
- int `getPrintingMode` () const
Get the printing mode.
- bool `setMaximumSeconds` (double value)
Set the maximum number of seconds desired.
- double `getMaximumSeconds` () const
Get the maximum number of seconds desired.
- double `getCurrentSeconds` () const
Current time since start of branchAndbound.
- bool `maximumSecondsReached` () const
Return true if maximum time reached.
- bool `setIntegerTolerance` (double value)
Set the integrality tolerance .
- double `getIntegerTolerance` () const
Get the integrality tolerance .
- bool `setInfeasibilityWeight` (double value)
Set the weight per integer infeasibility .
- double `getInfeasibilityWeight` () const
Get the weight per integer infeasibility .
- bool `setAllowableGap` (double value)
Set the allowable gap between the best known solution and the best possible solution.
- double `getAllowableGap` () const

Get the *allowable gap* between the best known solution and the best possible solution.

- bool **setAllowableFractionGap** (double value)
Set the *fraction allowable gap* between the best known solution and the best possible solution.
- double **getAllowableFractionGap** () const
Get the *fraction allowable gap* between the best known solution and the best possible solution.
- bool **setAllowablePercentageGap** (double value)
Set the *percentage allowable gap* between the best known solution and the best possible solution.
- double **getAllowablePercentageGap** () const
Get the *percentage allowable gap* between the best known solution and the best possible solution.
- bool **setHeuristicGap** (double value)
Set the *heuristic gap* between the best known solution and the best possible solution.
- double **getHeuristicGap** () const
Get the *heuristic gap* between the best known solution and the best possible solution.
- bool **setHeuristicFractionGap** (double value)
Set the *fraction heuristic gap* between the best known solution and the best possible solution.
- double **getHeuristicFractionGap** () const
Get the *fraction heuristic gap* between the best known solution and the best possible solution.
- bool **setCutoffIncrement** (double value)
Set the *CbcModel::CbcCutoffIncrement* desired.
- double **getCutoffIncrement** () const
Get the *CbcModel::CbcCutoffIncrement* desired.
- bool **canStopOnGap** () const
See if can stop on gap.
- void **setHotstartSolution** (const double *solution, const int *priorities=NULL)

Pass in target solution and optional priorities.

- void **setMinimumDrop** (double value)
Set the minimum drop to continue cuts.
- double **getMinimumDrop** () const
Get the minimum drop to continue cuts.
- void **setMaximumCutPassesAtRoot** (int value)
Set the maximum number of cut passes at root node (default 20) Minimum drop can also be used for fine tuning.
- int **getMaximumCutPassesAtRoot** () const
Get the maximum number of cut passes at root node.
- void **setMaximumCutPasses** (int value)
Set the maximum number of cut passes at other nodes (default 10) Minimum drop can also be used for fine tuning.
- int **getMaximumCutPasses** () const
Get the maximum number of cut passes at other nodes (default 10).
- int **getCurrentPassNumber** () const
Get current cut pass number in this round of cuts.
- void **setNumberStrong** (int number)
Set the maximum number of candidates to be evaluated for strong branching.
- int **numberStrong** () const
Get the maximum number of candidates to be evaluated for strong branching.
- void **setPreferredWay** (int value)
Set global preferred way to branch -1 down, +1 up, 0 no preference.
- int **getPreferredWay** () const
Get the preferred way to branch (default 0).
- int **whenCuts** () const
Get at which depths to do cuts.
- void **setWhenCuts** (int value)
Set at which depths to do cuts.
- bool **doCutsNow** (int allowForTopOfTree) const
Return true if we want to do cuts If allowForTopOfTree zero then just does on multiples of depth if 1 then allows for doing at top of tree if 2 then says if cuts allowed anywhere apart from root.

- void `setNumberBeforeTrust` (int number)
Set the number of branches before pseudo costs believed in dynamic strong branching.
- int `numberBeforeTrust` () const
get the number of branches before pseudo costs believed in dynamic strong branching.
- void `setNumberPenalties` (int number)
Set the number of variables for which to compute penalties in dynamic strong branching.
- int `numberPenalties` () const
get the number of variables for which to compute penalties in dynamic strong branching.
- const `CbcFullNodeInfo * topOfTree` () const
Pointer to top of tree.
- void `setNumberAnalyzeIterations` (int number)
Number of analyze iterations to do.
- int `numberAnalyzeIterations` () const
- double `penaltyScaleFactor` () const
Get scale factor to make penalties match strong.
- void `setPenaltyScaleFactor` (double value)
Set scale factor to make penalties match strong.
- void `setProblemType` (int number)
Problem type as set by user or found by analysis.
- int `problemType` () const
- int `currentDepth` () const
Current depth.
- void `setHowOftenGlobalScan` (int number)
Set how often to scan global cuts.
- int `howOftenGlobalScan` () const
Get how often to scan global cuts.
- int * `originalColumns` () const
Original columns as created by integerPresolve or preprocessing.

- void `setOriginalColumns` (const int *originalColumns, int numberGood=COIN_INT_MAX)
Set original columns as created by preprocessing.
- OsiRowCut * `conflictCut` (const OsiSolverInterface *solver, bool &localCuts)
Create conflict cut (well - most of).
- void `setPrintFrequency` (int number)
Set the print frequency.
- int `printFrequency` () const
Get the print frequency.

Methods returning info on how the solution process terminated

- bool `isAbandoned` () const
Are there a numerical difficulties?
- bool `isProvenOptimal` () const
Is optimality proven?
- bool `isProvenInfeasible` () const
Is infeasibility proven (or none better than cutoff)?
- bool `isContinuousUnbounded` () const
Was continuous solution unbounded.
- bool `isProvenDualInfeasible` () const
Was continuous solution unbounded.
- bool `isNodeLimitReached` () const
Node limit reached?
- bool `isSecondsLimitReached` () const
Time limit reached?
- bool `isSolutionLimitReached` () const
Solution limit reached?
- int `getIterationCount` () const
Get how many iterations it took to solve the problem.
- void `incrementIterationCount` (int value)

Increment how many iterations it took to solve the problem.

- int `getNodeCount` () const
Get how many Nodes it took to solve the problem (including those in complete fathoming B&B inside CLP).
- void `incrementNodeCount` (int value)
Increment how many nodes it took to solve the problem.
- int `getExtraNodeCount` () const
Get how many Nodes were enumerated in complete fathoming B&B inside CLP.
- int `status` () const
Final status of problem Some of these can be found out by is.....
- void `setProblemStatus` (int value)
- int `secondaryStatus` () const
Secondary status of problem -1 unset (status_ will also be -1) 0 search completed with solution 1 linear relaxation not feasible (or worse than cutoff) 2 stopped on gap 3 stopped on nodes 4 stopped on time 5 stopped on user event 6 stopped on solutions 7 linear relaxation unbounded 8 stopped on iteration limit.
- void `setSecondaryStatus` (int value)
- bool `isInitialSolveAbandoned` () const
Are there numerical difficulties (for initialSolve) ?
- bool `isInitialSolveProvenOptimal` () const
Is optimality proven (for initialSolve) ?
- bool `isInitialSolveProvenPrimalInfeasible` () const
Is primal infeasibility proven (for initialSolve) ?
- bool `isInitialSolveProvenDualInfeasible` () const
Is dual infeasibility proven (for initialSolve) ?

Problem information methods

These methods call the solver's query routines to return information about the problem referred to by the current object.

Querying a problem that has no data associated with it result in zeros for the number of rows and columns, and NULL pointers from the methods that return vectors.

Const pointers returned from any data-query method are valid as long as the data is unchanged and the solver is not called.

- int `numberRowsAtContinuous` () const

Number of rows in continuous (root) problem.

- int `getNumCols` () const
Get number of columns.
- int `getNumRows` () const
Get number of rows.
- CoinBigIndex `getNumElements` () const
Get number of nonzero elements.
- int `numberIntegers` () const
Number of integers in problem.
- const int * `integerVariable` () const
- char `integerType` (int i) const
Whether or not integer.
- const char * `integerType` () const
Whether or not integer.
- const double * `getColLower` () const
Get pointer to array[getNumCols()] of column lower bounds.
- const double * `getColUpper` () const
Get pointer to array[getNumCols()] of column upper bounds.
- const char * `getRowSense` () const
Get pointer to array[getNumRows()] of row constraint senses.
- const double * `getRightHandSide` () const
Get pointer to array[getNumRows()] of rows right-hand sides.
- const double * `getRowRange` () const
Get pointer to array[getNumRows()] of row ranges.
- const double * `getRowLower` () const
Get pointer to array[getNumRows()] of row lower bounds.
- const double * `getRowUpper` () const
Get pointer to array[getNumRows()] of row upper bounds.
- const double * `getObjCoefficients` () const
Get pointer to array[getNumCols()] of objective function coefficients.
- double `getObjSense` () const

Get objective function sense (1 for min (default), -1 for max).

- `bool isContinuous (int colIndex) const`
Return true if variable is continuous.
- `bool isBinary (int colIndex) const`
Return true if variable is binary.
- `bool isInteger (int colIndex) const`
Return true if column is integer.
- `bool isIntegerNonBinary (int colIndex) const`
Return true if variable is general integer.
- `bool isFreeBinary (int colIndex) const`
Return true if variable is binary and not fixed at either bound.
- `const CoinPackedMatrix * getMatrixByRow () const`
Get pointer to row-wise copy of matrix.
- `const CoinPackedMatrix * getMatrixByCol () const`
Get pointer to column-wise copy of matrix.
- `double getInfinity () const`
Get solver's value for infinity.
- `const double * getCbcColLower () const`
Get pointer to array[getNumCols()] (for speed) of column lower bounds.
- `const double * getCbcColUpper () const`
Get pointer to array[getNumCols()] (for speed) of column upper bounds.
- `const double * getCbcRowLower () const`
Get pointer to array[getNumRows()] (for speed) of row lower bounds.
- `const double * getCbcRowUpper () const`
Get pointer to array[getNumRows()] (for speed) of row upper bounds.
- `const double * getCbcColSolution () const`
Get pointer to array[getNumCols()] (for speed) of primal solution vector.
- `const double * getCbcRowPrice () const`
Get pointer to array[getNumRows()] (for speed) of dual prices.
- `const double * getCbcReducedCost () const`

Get a pointer to array[[getNumCols\(\)](#)] (for speed) of reduced costs.

- const double * [getCbcRowActivity](#) () const
Get pointer to array[[getNumRows\(\)](#)] (for speed) of row activity levels.

Methods related to querying the solution

- double * [continuousSolution](#) () const
Holds solution at continuous (after cuts if [branchAndBound](#) called).
- int * [usedInSolution](#) () const
Array marked whenever a solution is found if non-zero.
- void [incrementUsed](#) (const double *solution)
Increases [usedInSolution](#) for nonzeros.
- void [setBestSolution](#) (CBC_Message how, double &objectiveValue, const double *solution, int fixVariables=0)
Record a new incumbent solution and update [objectiveValue](#).
- void [setBestObjectiveValue](#) (double objectiveValue)
Just update [objectiveValue](#).
- [CbcEventHandler::CbcAction](#) [dealWithEventHandler](#) ([CbcEventHandler::CbcEvent](#) event, double objValue, const double *solution)

Deals with event handler and solution.
- virtual double [checkSolution](#) (double cutoff, double *solution, int fixVariables, double originalObjValue)
Call this to really test if a valid solution can be feasible Solution is number columns in size.
- bool [feasibleSolution](#) (int &numberIntegerInfeasibilities, int &numberObjectiveInfeasibilities) const
Test the current solution for feasibility.
- double * [currentSolution](#) () const
Solution to the most recent lp relaxation.
- const double * [testSolution](#) () const
For testing infeasibilities - will point to [currentSolution_](#) or [solver->getColSolution\(\)](#).
- void [setTestSolution](#) (const double *solution)

- void `reserveCurrentSolution` (const double *solution=NULL)
Make sure region there and optionally copy solution.
- const double * `getColSolution` () const
Get pointer to array[getNumCols()] of primal solution vector.
- const double * `getRowPrice` () const
Get pointer to array[getNumRows()] of dual prices.
- const double * `getReducedCost` () const
Get a pointer to array[getNumCols()] of reduced costs.
- const double * `getRowActivity` () const
Get pointer to array[getNumRows()] of row activity levels.
- double `getCurrentObjValue` () const
Get current objective function value.
- double `getCurrentMinimizationObjValue` () const
Get current minimization objective function value.
- double `getMinimizationObjValue` () const
Get best objective function value as minimization.
- void `setMinimizationObjValue` (double value)
Set best objective function value as minimization.
- double `getObjValue` () const
Get best objective function value.
- double `getBestPossibleObjValue` () const
Get best possible objective function value.
- void `setObjValue` (double value)
Set best objective function value.
- double `getSolverObjValue` () const
Get solver objective function value (as minimization).
- double * `bestSolution` () const
The best solution to the integer programming problem.
- void `setBestSolution` (const double *solution, int numberColumns, double objectiveValue, bool check=false)
User callable setBestSolution.

- int `getSolutionCount` () const
Get number of solutions.
- void `setSolutionCount` (int value)
Set number of solutions (so heuristics will be different).
- int `numberSavedSolutions` () const
Number of saved solutions (including best).
- int `maximumSavedSolutions` () const
Maximum number of extra saved solutions.
- void `setMaximumSavedSolutions` (int value)
Set maximum number of extra saved solutions.
- const double * `savedSolution` (int which) const
Return a saved solution (0==best) - NULL if off end.
- double `savedSolutionObjective` (int which) const
Return a saved solution objective (0==best) - COIN_DBL_MAX if off end.
- void `deleteSavedSolution` (int which)
Delete a saved solution and move others up.
- int `phase` () const
Current phase (so heuristics etc etc can find out).
- int `getNumberHeuristicSolutions` () const
Get number of heuristic solutions.
- void `setNumberHeuristicSolutions` (int value)
Set number of heuristic solutions.
- void `setObjSense` (double s)
Set objective function sense (1 for min (default), -1 for max,).
- double `getContinuousObjective` () const
Value of objective at continuous.
- void `setContinuousObjective` (double value)
- int `getContinuousInfeasibilities` () const
Number of infeasibilities at continuous.
- void `setContinuousInfeasibilities` (int value)
- double `rootObjectiveAfterCuts` () const

Value of objective after root node cuts added.

- double `sumChangeObjective ()` const
Sum of Changes to objective by first solve.
- int `numberGlobalViolations ()` const
Number of times global cuts violated.
- void `clearNumberGlobalViolations ()`
- bool `resolveAfterTakeOffCuts ()` const
Whether to force a resolve after takeOffCuts.
- void `setResolveAfterTakeOffCuts (bool yesNo)`
- int `maximumRows ()` const
Maximum number of rows.
- CoinWarmStartBasis & `workingBasis ()`
Work basis for temporary use.
- int `getStopNumberIterations ()` const
Get number of "iterations" to stop after.
- void `setStopNumberIterations (int value)`
Set number of "iterations" to stop after.
- `CbcModel * heuristicModel ()` const
A pointer to model from CbcHeuristic.
- void `setHeuristicModel (CbcModel *model)`
Set a pointer to model from CbcHeuristic.

Node selection

- `CbcCompareBase * nodeComparison ()` const
- void `setNodeComparison (CbcCompareBase *compare)`
- void `setNodeComparison (CbcCompareBase &compare)`

Problem feasibility checking

- `CbcFeasibilityBase * problemFeasibility ()` const
- void `setProblemFeasibility (CbcFeasibilityBase *feasibility)`
- void `setProblemFeasibility (CbcFeasibilityBase &feasibility)`

Tree methods and subtree methods

- `CbcTree * tree () const`
Tree method e.g. heap (which may be overridden by inheritance).
- `void passInTreeHandler (CbcTree &tree)`
For modifying tree handling (original is cloned).
- `void passInSubTreeModel (CbcModel &model)`
For passing in an CbcModel to do a sub Tree (with derived tree handlers).
- `CbcModel * subTreeModel (OsiSolverInterface *solver=NULL) const`
For retrieving a copy of subtree model with given OsiSolver.
- `int numberStoppedSubTrees () const`
Returns number of times any subtree stopped on nodes, time etc.
- `void incrementSubTreeStopped ()`
Says a sub tree was stopped.
- `int typePresolve () const`
Whether to automatically do presolve before branch and bound (subTrees).
- `void setTypePresolve (int value)`

Branching Decisions

See the *CbcBranchDecision* class for additional information.

- `CbcBranchDecision * branchingMethod () const`
Get the current branching decision method.
- `void setBranchingMethod (CbcBranchDecision *method)`
Set the branching decision method.
- `void setBranchingMethod (CbcBranchDecision &method)`
Set the branching method.
- `CbcCutModifier * cutModifier () const`
Get the current cut modifier method.
- `void setCutModifier (CbcCutModifier *modifier)`
Set the cut modifier method.
- `void setCutModifier (CbcCutModifier &modifier)`
Set the cut modifier method.

Row (constraint) and Column (variable) cut generation

- int [stateOfSearch](#) () const
State of search 0 - no solution 1 - only heuristic solutions 2 - branched to a solution 3 - no solution but many nodes.
- void [setStateOfSearch](#) (int state)
- int [searchStrategy](#) () const
Strategy worked out - mainly at root node for use by [CbcNode](#).
- void [setSearchStrategy](#) (int value)
Set strategy worked out - mainly at root node for use by [CbcNode](#).
- int [strongStrategy](#) () const
Stong branching strategy.
- void [setStrongStrategy](#) (int value)
Set strong branching strategy.
- int [numberCutGenerators](#) () const
Get the number of cut generators.
- [CbcCutGenerator](#) ** [cutGenerators](#) () const
Get the list of cut generators.
- [CbcCutGenerator](#) * [cutGenerator](#) (int i) const
Get the specified cut generator.
- [CbcCutGenerator](#) * [virginCutGenerator](#) (int i) const
Get the specified cut generator before any changes.
- void [addCutGenerator](#) (CglCutGenerator *generator, int howOften=1, const char *name=NULL, bool normal=true, bool atSolution=false, bool infeasible=false, int howOftenInSub=-100, int whatDepth=-1, int whatDepthInSub=-1)
Add one generator - up to user to delete generators.

Strategy and sub models

See the [CbcStrategy](#) class for additional information.

- [CbcStrategy](#) * [strategy](#) () const
Get the current strategy.
- void [setStrategy](#) ([CbcStrategy](#) &strategy)
Set the strategy. Clones.

- void `setStrategy` (`CbcStrategy` *strategy)
Set the strategy. assigns.
- `CbcModel` * `parentModel` () const
Get the current parent model.
- void `setParentModel` (`CbcModel` &parentModel)
Set the parent model.

Heuristics and priorities

- void `addHeuristic` (`CbcHeuristic` *generator, const char *name=NULL, int before=-1)
Add one heuristic - up to user to delete.
- `CbcHeuristic` * `heuristic` (int i) const
Get the specified heuristic.
- int `numberHeuristics` () const
Get the number of heuristics.
- void `setNumberHeuristics` (int value)
Set the number of heuristics.
- `CbcHeuristic` * `lastHeuristic` () const
Pointer to heuristic solver which found last solution (or NULL).
- void `setLastHeuristic` (`CbcHeuristic` *last)
set last heuristic which found a solution
- void `passInPriorities` (const int *priorities, bool ifNotSimpleIntegers)
Pass in branching priorities.
- int `priority` (int sequence) const
Returns priority level for an object (or 1000 if no priorities exist).
- void `passInEventHandler` (const `CbcEventHandler` *eventHandler)
Set an event handler.
- `CbcEventHandler` * `getEventHandler` () const
Retrieve a pointer to the event handler.

Setting/Accessing application data

- void [setApplicationData](#) (void *appData)
Set application data.
- void * [getApplicationData](#) () const
Get application data.
- void [passInSolverCharacteristics](#) (OsiBabSolver *solverCharacteristics)
For advanced applications you may wish to modify the behavior of Cbc e.g.
- const OsiBabSolver * [solverCharacteristics](#) () const
Get solver characteristics.

Message handling etc

- void [passInMessageHandler](#) (CoinMessageHandler *handler)
Pass in Message handler (not deleted at end).
- void [newLanguage](#) (CoinMessages::Language language)
Set language.
- void [setLanguage](#) (CoinMessages::Language language)
- CoinMessageHandler * [messageHandler](#) () const
Return handler.
- CoinMessages & [messages](#) ()
Return messages.
- CoinMessages * [messagesPointer](#) ()
Return pointer to messages.
- void [setLogLevel](#) (int value)
Set log level.
- int [logLevel](#) () const
Get log level.
- void [setDefaultHandler](#) (bool yesNo)
Set flag to say if handler_ is the default handler.
- bool [defaultHandler](#) () const
Check default handler.

Specialized

- void [setSpecialOptions](#) (int value)
Set special options 0 bit (1) - check if cuts valid (if on debugger list) 1 bit (2) - use current basis to check integer solution (rather than all slack) 2 bit (4) - don't check integer solution (by solving LP) 3 bit (8) - fast analyze 4 bit (16) - non-linear model - so no well defined CoinPackedMatrix 5 bit (32) - keep names 6 bit (64) - try for dominated columns 7 bit (128) - SOS type 1 but all declared integer 8 bit (256) - Set to say solution just found, unset by doing cuts 9 bit (512) - Try reduced model after 100 nodes 10 bit (1024) - Switch on some heuristics even if seems unlikely 11 bit (2048) - Mark as in small branch and bound 12 bit (4096) - Funny cuts so do slow way (in some places) 13 bit (8192) - Funny cuts so do slow way (in other places) 14 bit (16384) - Use Cplex! for fathoming 15 bit (32768) - Try reduced model after 0 nodes 16 bit (65536) - Original model had integer bounds 17 bit (131072) - Perturbation switched off 18 bit (262144) - donor CbcModel 19 bit (524288) - recipient CbcModel 20 bit (1048576) - waiting for sub model to return 22 bit (4194304) - do not initialize random seed in solver (user has) 23 bit (8388608) - leave solver_ with cuts.
- int [specialOptions](#) () const
Get special options.
- void [setRandomSeed](#) (int value)
Set random seed.
- int [getRandomSeed](#) () const
Get random seed.
- void [setMultipleRootTries](#) (int value)
Set multiple root tries.
- int [getMultipleRootTries](#) () const
Get multiple root tries.
- void [sayEventHappened](#) ()
Tell model to stop on event.
- bool [normalSolver](#) () const
Says if normal solver i.e. has well defined CoinPackedMatrix.
- bool [waitingForMiniBranchAndBound](#) () const
Says if model is sitting there waiting for mini branch and bound to finish This is because an event handler may only have access to parent model in mini branch and bound.
- void [setMoreSpecialOptions](#) (int value)
Set more special options at present bottom 6 bits used for shadow price mode 1024 for experimental hotstart 2048,4096 breaking out of cuts 8192 slowly increase minimum drop 16384 gomory 32768 more heuristics in sub trees 65536 no cuts in

preprocessing 131072 Time limits elapsed 18 bit (262144) - Perturb fathom nodes 19 bit (524288) - No limit on fathom nodes 20 bit (1048576) - Reduce sum of infeasibilities before cuts 21 bit (2097152) - Reduce sum of infeasibilities after cuts 22 bit (4194304) - Conflict analysis 23 bit (8388608) - Conflict analysis - temporary 24 bit (16777216) - Add cutoff as LP constraint (out) 25 bit (33554432) - diving/reordering 26 bit (67108864) - load global cuts from file 27 bit (134217728) - append binding global cuts to file 28 bit (268435456) - idiot branching 29 bit (536870912) - don't make fake objective.

- int [moreSpecialOptions](#) () const
Get more special options.
- void [setCutoffAsConstraint](#) (bool yesNo)
Set cutoff as constraint.
- void [setUseElapsedTime](#) (bool yesNo)
Set time method.
- bool [useElapsedTime](#) () const
Get time method.
- void * [temporaryPointer](#) () const
Get useful temporary pointer.
- void [setTemporaryPointer](#) (void *pointer)
Set useful temporary pointer.
- void [goToDantzig](#) (int numberNodes, ClpDualRowPivot *&savePivotMethod)
Go to dantzig pivot selection if easy problem (clp only).
- bool [ownObjects](#) () const
Now we may not own objects - just point to solver's objects.
- void [checkModel](#) ()
Check original model before it gets messed up.

Constructors and destructors etc

- [CbcModel](#) ()
Default Constructor.
- [CbcModel](#) (const OsiSolverInterface &)
Constructor from solver.

- void [assignSolver](#) (OsiSolverInterface *&solver, bool deleteSolver=true)
Assign a solver to the model (model assumes ownership).
- void [setModelOwnsSolver](#) (bool ourSolver)
Set ownership of solver.
- bool [modelOwnsSolver](#) ()
Get ownership of solver.
- [CbcModel](#) (const [CbcModel](#) &rhs, bool cloneHandler=false)
Copy constructor .
- virtual [CbcModel](#) * [clone](#) (bool cloneHandler)
Clone.
- [CbcModel](#) & [operator=](#) (const [CbcModel](#) &rhs)
Assignment operator.
- virtual [~CbcModel](#) ()
Destructor.
- OsiSolverInterface * [solver](#) () const
Returns solver - has current state.
- OsiSolverInterface * [swapSolver](#) (OsiSolverInterface *solver)
Returns current solver - sets new one.
- OsiSolverInterface * [continuousSolver](#) () const
Returns solver with continuous state.
- void [createContinuousSolver](#) ()
Create solver with continuous state.
- void [clearContinuousSolver](#) ()
Clear solver with continuous state.
- OsiSolverInterface * [referenceSolver](#) () const
A copy of the solver, taken at constructor or by saveReferenceSolver.
- void [saveReferenceSolver](#) ()
Save a copy of the current solver so can be reset to.
- void [resetToReferenceSolver](#) ()
Uses a copy of reference solver to be current solver.
- void [gutsOfDestructor](#) ()

Clears out as much as possible (except solver).

- void `gutsOfDestructor2 ()`
Clears out enough to reset `CbcModel` as if no branch and bound done.
- void `resetModel ()`
Clears out enough to reset `CbcModel` cutoff etc.
- void `gutsOfCopy (const CbcModel &rhs, int mode=0)`
Most of copy constructor mode - 0 copy but don't delete before 1 copy and delete before 2 copy and delete before (but use virgin generators).
- void `moveInfo (const CbcModel &rhs)`
Move status, nodes etc etc across.

semi-private i.e. users should not use

- int `getNodeCount2 () const`
Get how many Nodes it took to solve the problem.
- void `setPointers (const OsiSolverInterface *solver)`
Set pointers for speed.
- int `reducedCostFix ()`
Perform reduced cost fixing.
- void `synchronizeHandlers (int makeDefault)`
Makes all handlers same.
- void `saveExtraSolution (const double *solution, double objectiveValue)`
Save a solution to saved list.
- void `saveBestSolution (const double *solution, double objectiveValue)`
Save a solution to best and move current to saved.
- void `deleteSolutions ()`
Delete best and saved solutions.
- int `resolve (OsiSolverInterface *solver)`
Encapsulates solver resolve.
- int `chooseBranch (CbcNode *&newNode, int numberPassesLeft, CbcNode *oldNode, OsiCuts &cuts, bool &resolved, CoinWarmStartBasis *lastws, const double *lowerBefore, const double *upperBefore, OsiSolverBranch *&branches)`

Encapsulates choosing a variable - anyAction -2, infeasible (-1 round again), 0 done.

- int **chooseBranch** (CbcNode *newNode, int numberPassesLeft, bool &resolved)
- CoinWarmStartBasis * **getEmptyBasis** (int ns=0, int na=0) const
Return an empty basis object of the specified size.
- int **takeOffCuts** (OsiCuts &cuts, bool allowResolve, OsiCuts *saveCuts, int numberNewCuts=0, const OsiRowCut **newCuts=NULL)
Remove inactive cuts from the model.
- int **addCuts** (CbcNode *node, CoinWarmStartBasis *&lastws, bool canFix)
Determine and install the active cuts that need to be added for the current sub-problem.
- bool **addCuts1** (CbcNode *node, CoinWarmStartBasis *&lastws)
Traverse the tree from node to root and prep the model.
- void **previousBounds** (CbcNode *node, CbcNodeInfo *where, int iColumn, double &lower, double &upper, int force)
Returns bounds just before where - initially original bounds.
- void **setObjectiveValue** (CbcNode *thisNode, const CbcNode *parentNode) const
Set objective value in a node.
- void **convertToDynamic** ()
If numberBeforeTrust >0 then we are going to use CbcBranchDynamic.
- void **synchronizeNumberBeforeTrust** (int type=0)
Set numberBeforeTrust in all objects.
- void **zapIntegerInformation** (bool leaveObjects=true)
Zap integer information in problem (may leave object info).
- int **cliquePseudoCosts** (int doStatistics)
Use cliques for pseudocost information - return nonzero if infeasible.
- void **pseudoShadow** (int type)
Fill in useful estimates.
- void **fillPseudoCosts** (double *downCosts, double *upCosts, int *priority=NULL, int *numberDown=NULL, int *numberUp=NULL, int *numberDownInfeasible=NULL, int *numberUpInfeasible=NULL) const

Return pseudo costs If not all integers or not pseudo costs - returns all zero Length of arrays are [numberIntegers\(\)](#) and entries correspond to [integerVariable\(\)\[i\]](#) User must allocate arrays before call.

- void [doHeuristicsAtRoot](#) (int deleteHeuristicsAfterwards=0)
Do heuristics at root.
- void [adjustHeuristics](#) ()
Adjust heuristics based on model.
- const double * [hotstartSolution](#) () const
Get the hotstart solution.
- const int * [hotstartPriorities](#) () const
Get the hotstart priorities.
- [CbcCountRowCut](#) ** [addedCuts](#) () const
Return the list of cuts initially collected for this subproblem.
- int [currentNumberCuts](#) () const
Number of entries in the list returned by [addedCuts\(\)](#).
- [CbcRowCuts](#) * [globalCuts](#) ()
Global cuts.
- void [setNextRowCut](#) (const [OsiRowCut](#) &cut)
Copy and set a pointer to a row cut which will be added instead of normal branching.
- [CbcNode](#) * [currentNode](#) () const
Get a pointer to current node (be careful).
- [CglTreeProbingInfo](#) * [probingInfo](#) () const
Get a pointer to probing info.
- [CoinThreadRandom](#) * [randomNumberGenerator](#) ()
Thread specific random number generator.
- void [setNumberStrongIterations](#) (int number)
Set the number of iterations done in strong branching.
- int [numberStrongIterations](#) () const
Get the number of iterations done in strong branching.
- int [maximumNumberIterations](#) () const
Get maximum number of iterations (designed to be used in heuristics).

- void [setMaximumNumberIterations](#) (int value)
Set maximum number of iterations (designed to be used in heuristics).
- void [setFastNodeDepth](#) (int value)
Set depth for fast nodes.
- int [fastNodeDepth](#) () const
Get depth for fast nodes.
- int [continuousPriority](#) () const
Get anything with priority \geq this can be treated as continuous.
- void [setContinuousPriority](#) (int value)
Set anything with priority \geq this can be treated as continuous.
- void [incrementExtra](#) (int nodes, int iterations)
- int [numberExtraIterations](#) () const
Number of extra iterations.
- void [incrementStrongInfo](#) (int numberTimes, int numberIterations, int numberFixed, bool ifInfeasible)
Increment strong info.
- const int * [strongInfo](#) () const
Return strong info.
- int * [mutableStrongInfo](#) ()
Return mutable strong info.
- CglStored * [storedRowCuts](#) () const
Get stored row cuts for donor/recipient [CbcModel](#).
- void [setStoredRowCuts](#) (CglStored *cuts)
Set stored row cuts for donor/recipient [CbcModel](#).
- bool [allDynamic](#) () const
Says whether all dynamic integers.
- void [generateCpp](#) (FILE *fp, int options)
Create C++ lines to get to current state.
- OsiBranchingInformation [usefulInformation](#) () const
Generate an OsiBranchingInformation object.

- void `setBestSolutionBasis` (const CoinWarmStartBasis &bestSolutionBasis)
Warm start object produced by heuristic or strong branching.
- void `redoWalkBack` ()
Redo walkback arrays.

Solve methods

- void `initialSolve` ()
Solve the initial LP relaxation.
- void `branchAndBound` (int doStatistics=0)
Invoke the branch & cut algorithm.
- void `addUpdateInformation` (const CbcObjectUpdateData &data)
Adds an update information object.
- int `doOneNode` (CbcModel *baseModel, CbcNode *&node, CbcNode *&newNode)
*Do one node - broken out for clarity? also for parallel (when baseModel!=this)
Returns 1 if solution found node NULL on return if no branches left newNode NULL
if no new node created.*
- int `resolve` (CbcNodeInfo *parent, int whereFrom, double *saveSolution=NULL, double *saveLower=NULL, double *saveUpper=NULL)
Reoptimise an LP relaxation.
- void `makeGlobalCuts` (int numberOfRows, const int *which)
Make given rows (L or G) into global cuts and remove from lp.
- void `makeGlobalCut` (const OsiRowCut *cut)
Make given cut into a global cut.
- void `makeGlobalCut` (const OsiRowCut &cut)
Make given cut into a global cut.
- void `makeGlobalCut` (const OsiColCut *cut)
Make given column cut into a global cut.
- void `makeGlobalCut` (const OsiColCut &cut)
Make given column cut into a global cut.

- void `makePartialCut` (const OsiRowCut *cut, const OsiSolverInterface *solver=NULL)
Make partial cut into a global cut and save.
- void `makeGlobalCuts` ()
Make partial cuts into global cuts.
- const int * `whichGenerator` () const
Which cut generator generated this cut.

Multithreading

- `CbcThread * masterThread` () const
Get pointer to masterthread.
- `CbcNodeInfo ** walkback` () const
Get pointer to walkback.
- int `getNumberThreads` () const
Get number of threads.
- void `setNumberThreads` (int value)
Set number of threads.
- int `getThreadMode` () const
Get thread mode.
- void `setThreadMode` (int value)
Set thread mode always use numberThreads for branching 1 set then deterministic 2 set then use numberThreads for root cuts 4 set then use numberThreads in root mini branch and bound 8 set and numberThreads - do heuristics numberThreads at a time 8 set and numberThreads==0 do all heuristics at once default is 0.
- int `parallelMode` () const
Return -2 if deterministic threaded and main thread -1 if deterministic threaded and serial thread 0 if serial 1 if opportunistic threaded.
- bool `isLocked` () const
From here to end of section - code in CbcThread.cpp until class changed Returns true if locked.

- void **lockThread** ()
- void **unlockThread** ()
- void **setInfoInChild** (int type, [CbcThread](#) *info)

Set information in a child -3 pass pointer to child thread info -2 just stop -1 delete simple child stuff 0 delete opportunistic child stuff 1 delete deterministic child stuff.
- void **moveToModel** ([CbcModel](#) *baseModel, int mode)

Move/copy information from one model to another -1 - initialization 0 - from base model 1 - to base model (and reset) 2 - add in final statistics etc (and reset so can do clean destruction).
- int **splitModel** (int numberModels, [CbcModel](#) **model, int numberNodes)

Split up nodes.
- void **startSplitModel** (int numberIterations)

Start threads.
- void **mergeModels** (int numberModel, [CbcModel](#) **model, int numberNodes)

Merge models.
- static bool **haveMultiThreadSupport** ()

Indicates whether Cbc library has been compiled with multithreading support.

4.73.1 Detailed Description

Simple Branch and bound class. The [initialSolve\(\)](#) method solves the initial LP relaxation of the MIP problem. The [branchAndBound\(\)](#) method can then be called to finish using a branch and cut algorithm.

Search Tree Traversal Subproblems (aka nodes) requiring additional evaluation are stored using the [CbcNode](#) and [CbcNodeInfo](#) objects. Ancestry linkage is maintained in the [CbcNodeInfo](#) object. Evaluation of a subproblem within [branchAndBound\(\)](#) proceeds as follows:

- The node representing the most promising parent subproblem is popped from the heap which holds the set of subproblems requiring further evaluation.
- Using branching instructions stored in the node, and information in its ancestors, the model and solver are adjusted to create the active subproblem.
- If the parent subproblem will require further evaluation (*i.e.*, there are branches remaining) its node is pushed back on the heap. Otherwise, the node is deleted. This may trigger recursive deletion of ancestors.

- The newly created subproblem is evaluated.
- If the subproblem requires further evaluation, a node is created. All information needed to recreate the subproblem (branching information, row and column cuts) is placed in the node and the node is added to the set of subproblems awaiting further evaluation.

Note that there is never a node representing the active subproblem; the model and solver represent the active subproblem.

Row (Constraint) Cut Handling For a typical subproblem, the sequence of events is as follows:

- The subproblem is rebuilt for further evaluation: One result of a call to [addCuts\(\)](#) is a traversal of ancestors, leaving a list of all cuts used in the ancestors in `addedCuts_`. This list is then scanned to construct a basis that includes only tight cuts. Entries for loose cuts are set to NULL.
- The subproblem is evaluated: One result of a call to `solveWithCuts()` is the return of a set of newly generated cuts for the subproblem. `addedCuts_` is also kept up-to-date as old cuts become loose.
- The subproblem is stored for further processing: A call to `CbcNodeInfo::addCuts()` adds the newly generated cuts to the [CbcNodeInfo](#) object associated with this node.

See [CbcCountRowCut](#) for details of the bookkeeping associated with cut management. Definition at line 100 of file `CbcModel.hpp`.

4.73.2 Member Enumeration Documentation

4.73.2.1 enum `CbcModel::CbcIntParam`

Enumerator:

CbcMaxNumNode The maximum number of nodes before terminating.

CbcMaxNumSol The maximum number of solutions before terminating.

CbcFathomDiscipline Fathoming discipline. Controls objective function comparisons for purposes of fathoming by bound or determining monotonic variables.

If 1, action is taken only when the current objective is strictly worse than the target. Implementation is handled by adding a small tolerance to the target.

CbcPrinting Adjusts printout 1 does different node message with number unsatisfied on last branch.

CbcNumberBranches Number of branches (may be more than number of nodes as may include strong branching).

CbcLastIntParam Just a marker, so that a static sized array can store parameters.

Definition at line 104 of file CbcModel.hpp.

4.73.2.2 enum CbcModel::CbcDbiParam

Enumerator:

CbcIntegerTolerance The maximum amount the value of an integer variable can vary from integer and still be considered feasible.

CbcInfeasibilityWeight The objective is assumed to worsen by this amount for each integer infeasibility.

CbcCutoffIncrement The amount by which to tighten the objective function cutoff when a new solution is discovered.

CbcAllowableGap Stop when the gap between the objective value of the best known solution and the best bound on the objective of any solution is less than this. This is an absolute value. Conversion from a percentage is left to the client.

CbcAllowableFractionGap Stop when the gap between the objective value of the best known solution and the best bound on the objective of any solution is less than this fraction of of the absolute value of best known solution. Code stops if either this test or CbcAllowableGap test succeeds

CbcMaximumSeconds The maximum number of seconds before terminating. A double should be adequate!

CbcCurrentCutoff Cutoff - stored for speed.

CbcOptimizationDirection Optimization direction - stored for speed.

CbcCurrentObjectiveValue Current objective value.

CbcCurrentMinimizationObjectiveValue Current minimization objective value.

CbcStartSeconds The time at start of model. So that other pieces of code can access

CbcHeuristicGap Stop doing heuristics when the gap between the objective value of the best known solution and the best bound on the objective of any solution is less than this. This is an absolute value. Conversion from a percentage is left to the client.

CbcHeuristicFractionGap Stop doing heuristics when the gap between the objective value of the best known solution and the best bound on the objective of any solution is less than this fraction of of the absolute value of best known solution. Code stops if either this test or CbcAllowableGap test succeeds

CbcSmallestChange Smallest non-zero change on a branch.

CbcSumChange Sum of non-zero changes on a branch.

CbcLargestChange Largest non-zero change on a branch.

CbcSmallChange Small non-zero change on a branch to be used as guess.

CbcLastDblParam Just a marker, so that a static sized array can store parameters.

Definition at line 130 of file CbcModel.hpp.

4.73.3 Constructor & Destructor Documentation

4.73.3.1 `CbcModel::CbcModel (const CbcModel & rhs, bool cloneHandler = false)`

Copy constructor .

If cloneHandler is true then message handler is cloned

4.73.4 Member Function Documentation

4.73.4.1 `void CbcModel::initialSolve ()`

Solve the initial LP relaxation.

Invoke the solver's initialSolve() method.

4.73.4.2 `void CbcModel::branchAndBound (int doStatistics = 0)`

Invoke the branch & cut algorithm.

The method assumes that [initialSolve\(\)](#) has been called to solve the LP relaxation. It processes the root node, then proceeds to explore the branch & cut search tree. The search ends when the tree is exhausted or one of several execution limits is reached. If doStatistics is 1 summary statistics are printed if 2 then also the path to best solution (if found by branching) if 3 then also one line per node

4.73.4.3 `int CbcModel::resolve (CbcNodeInfo * parent, int whereFrom, double * saveSolution = NULL, double * saveLower = NULL, double * saveUpper = NULL)`

Reoptimise an LP relaxation.

Invoke the solver's `resolve()` method. `whereFrom` - 0 - initial continuous 1 - resolve on branch (before new cuts) 2 - after new cuts 3 - obsolete code or something modified problem in unexpected way 10 - after strong branching has fixed variables at root 11 - after strong branching has fixed variables in tree

returns 1 feasible, 0 infeasible, -1 feasible but skip cuts

4.73.4.4 `CbcModel* CbcModel::findCliques (bool makeEquality, int atLeastThisMany, int lessThanThis, int defaultValue = 1000)`

Identify cliques and construct corresponding objects.

Find cliques with size in the range [`atLeastThisMany`, `lessThanThis`] and construct corresponding `CbcClique` objects. If `makeEquality` is true then a new model may be returned if modifications had to be made, otherwise `this` is returned. If the problem is infeasible `numberOfObjects_` is set to -1. A client must use `deleteObjects()` before a second call to `findCliques()`. If priorities exist, clique priority is set to the default.

4.73.4.5 `CbcModel* CbcModel::integerPresolve (bool weak = false)`

Do integer presolve, creating a new (presolved) model.

Returns the new model, or NULL if feasibility is lost. If `weak` is true then just does a normal presolve

4.73.4.6 `bool CbcModel::integerPresolveThisModel (OsiSolverInterface * originalSolver, bool weak = false)`

Do integer presolve, modifying the current model.

Returns true if the model remains feasible after presolve.

4.73.4.7 `bool CbcModel::tightenVubs (int type, bool allowMultipleBinary = false, double useCutoff = 1.0e50)`

For variables involved in VUB constraints, see if we can tighten bounds by solving lp's.

Returns false if feasibility is lost. If CglProbing is available, it will be tried as well to see if it can tighten bounds. This routine is just a front end for [tightenVubs\(int,const int*,double\)](#).

If `type = -1` all variables are processed (could be very slow). If `type = 0` only variables involved in VUBs are processed. If `type = n > 0`, only the `n` most expensive VUB variables are processed, where it is assumed that `x` is at its maximum so `delta` would have to go to 1 (if `x` not at bound).

If `allowMultipleBinary` is true, then a VUB constraint is a row with one continuous variable and any number of binary variables.

If `useCutoff < 1.0e30`, the original objective is installed as a constraint with `useCutoff` as a bound.

4.73.4.8 `bool CbcModel::tightenVubs (int numberVubs, const int * which, double useCutoff = 1.0e50)`

For variables involved in VUB constraints, see if we can tighten bounds by solving lp's.

This version is just handed a list of variables to be processed.

4.73.4.9 `void CbcModel::addObjects (int numberObjects, OsiObject ** objects)`

Add in object information.

Objects are cloned; the owner can delete the originals.

4.73.4.10 `void CbcModel::addObjects (int numberObjects, CbcObject ** objects)`

Add in object information.

Objects are cloned; the owner can delete the originals.

4.73.4.11 void CbcModel::findIntegers (bool *startAgain*, int *type* = 0)

Identify integer variables and create corresponding objects.

Record integer variables and create an [CbcSimpleInteger](#) object for each one. If *startAgain* is true, a new scan is forced, overwriting any existing integer variable information. If *type* > 0 then 1==PseudoCost, 2 new ones low priority

4.73.4.12 void CbcModel::setCutoff (double *value*)

Set cutoff bound on the objective function.

When using strict comparison, the bound is adjusted by a tolerance to avoid accidentally cutting off the optimal solution.

4.73.4.13 void CbcModel::setHotstartSolution (const double * *solution*, const int * *priorities* = NULL)

Pass in target solution and optional priorities.

If *priorities* then >0 means only branch if incorrect while <0 means branch even if correct. +1 or -1 are highest priority

4.73.4.14 int CbcModel::getCurrentPassNumber () const [inline]

Get current cut pass number in this round of cuts.

(1 is first pass)

Definition at line 757 of file CbcModel.hpp.

4.73.4.15 void CbcModel::setNumberStrong (int *number*)

Set the maximum number of candidates to be evaluated for strong branching.

A value of 0 disables strong branching.

4.73.4.16 void CbcModel::setNumberBeforeTrust (int *number*)

Set the number of branches before pseudo costs believed in dynamic strong branching.
A value of 0 disables dynamic strong branching.

4.73.4.17 int CbcModel::numberBeforeTrust () const [inline]

get the number of branches before pseudo costs believed in dynamic strong branching.
Definition at line 805 of file CbcModel.hpp.

4.73.4.18 void CbcModel::setNumberPenalties (int *number*)

Set the number of variables for which to compute penalties in dynamic strong branching.
A value of 0 disables penalties.

4.73.4.19 int CbcModel::numberPenalties () const [inline]

get the number of variables for which to compute penalties in dynamic strong branching.
Definition at line 816 of file CbcModel.hpp.

4.73.4.20 double CbcModel::penaltyScaleFactor () const [inline]

Get scale factor to make penalties match strong.
Should/will be computed
Definition at line 831 of file CbcModel.hpp.

4.73.4.21 void CbcModel::setPenaltyScaleFactor (double *value*)

Set scale factor to make penalties match strong.

Should/will be computed

4.73.4.22 void CbcModel::setProblemType (int *number*) [inline]

Problem type as set by user or found by analysis.

This will be extended 0 - not known 1 - Set partitioning <= 2 - Set partitioning == 3 - Set covering 4 - all +- 1 or all +1 and odd

Definition at line 844 of file CbcModel.hpp.

4.73.4.23 void CbcModel::setPrintFrequency (int *number*) [inline]

Set the print frequency.

Controls the number of nodes evaluated between status prints. If *number* <=0 the print frequency is set to 100 nodes for large problems, 1000 for small problems. Print frequency has very slight overhead if small.

Definition at line 878 of file CbcModel.hpp.

4.73.4.24 int CbcModel::status () const [inline]

Final status of problem Some of these can be found out by is.....

functions -1 before branchAndBound 0 finished - check isProvenOptimal or isProvenInfeasible to see if solution found (or check value of best solution) 1 stopped - on maxnodes, maxsols, maxtime 2 difficulties so run was abandoned (5 event user programmed event occurred)

Definition at line 935 of file CbcModel.hpp.

4.73.4.25 const char* CbcModel::getRowSense () const [inline]

Get pointer to array[[getNumRows\(\)](#)] of row constraint senses.

- 'L': <= constraint
- 'E': = constraint

- 'G': \geq constraint
- 'R': ranged constraint
- 'N': free constraint

Definition at line 1041 of file CbcModel.hpp.

4.73.4.26 `const double* CbcModel::getRightHandSide () const [inline]`

Get pointer to array[[getNumRows\(\)](#)] of rows right-hand sides.

- if `rowsense()[i] == 'L'` then `rhs()[i] == rowupper()[i]`
- if `rowsense()[i] == 'G'` then `rhs()[i] == rowlower()[i]`
- if `rowsense()[i] == 'R'` then `rhs()[i] == rowupper()[i]`
- if `rowsense()[i] == 'N'` then `rhs()[i] == 0.0`

Definition at line 1053 of file CbcModel.hpp.

4.73.4.27 `const double* CbcModel::getRowRange () const [inline]`

Get pointer to array[[getNumRows\(\)](#)] of row ranges.

- if `rowsense()[i] == 'R'` then `rowrange()[i] == rowupper()[i] - rowlower()[i]`
- if `rowsense()[i] != 'R'` then `rowrange()[i]` is 0.0

Definition at line 1065 of file CbcModel.hpp.

4.73.4.28 `bool CbcModel::isInteger (int colIndex) const [inline]`

Return true if column is integer.

Note: This function returns true if the the column is binary or a general integer.

Definition at line 1104 of file CbcModel.hpp.

4.73.4.29 int* CbcModel::usedInSolution () const [inline]

Array marked whenever a solution is found if non-zero.

Code marks if heuristic returns better so heuristic need only mark if it wants to on solutions which are worse than current

Definition at line 1177 of file CbcModel.hpp.

4.73.4.30 virtual double CbcModel::checkSolution (double *cutoff*, double * *solution*, int *fixVariables*, double *originalObjValue*) [virtual]

Call this to really test if a valid solution can be feasible Solution is number columns in size.

If *fixVariables* true then bounds of continuous solver updated. Returns objective value (worse than *cutoff* if not feasible) Previously computed objective value is now passed in (in case user does not do solve) virtual so user can override

4.73.4.31 bool CbcModel::feasibleSolution (int & *numberIntegerInfeasibilities*, int & *numberObjectInfeasibilities*) const

Test the current solution for feasibility.

Scan all objects for indications of infeasibility. This is broken down into simple integer infeasibility (*numberIntegerInfeasibilities*) and all other reports of infeasibility (*numberObjectInfeasibilities*).

4.73.4.32 double* CbcModel::currentSolution () const [inline]

Solution to the most recent lp relaxation.

The solver's solution to the most recent lp relaxation.

Definition at line 1216 of file CbcModel.hpp.

4.73.4.33 double CbcModel::getBestPossibleObjValue () const

Get best possible objective function value.

This is better of best possible left on tree and best solution found. If called from within branch and cut may be optimistic.

4.73.4.34 `double* CbcModel::bestSolution () const [inline]`

The best solution to the integer programming problem.

The best solution to the integer programming problem found during the search. If no solution is found, the method returns null.

Definition at line 1294 of file CbcModel.hpp.

4.73.4.35 `void CbcModel::setBestSolution (const double * solution, int numberColumns, double objectiveValue, bool check = false)`

User callable setBestSolution.

If check false does not check valid If true then sees if feasible and warns if objective value worse than given (so just set to COIN_DBL_MAX if you don't care). If check true then does not save solution if not feasible

4.73.4.36 `int CbcModel::phase () const [inline]`

Current phase (so heuristics etc etc can find out).

0 - initial solve 1 - solve with cuts at root 2 - solve with cuts 3 - other e.g. strong branching 4 - trying to validate a solution 5 - at end of search

Definition at line 1338 of file CbcModel.hpp.

4.73.4.37 `int CbcModel::numberGlobalViolations () const [inline]`

Number of times global cuts violated.

When global cut pool then this should be kept for each cut and type of cut

Definition at line 1381 of file CbcModel.hpp.

4.73.4.38 void CbcModel::passInSubTreeModel (CbcModel & *model*)

For passing in an [CbcModel](#) to do a sub Tree (with derived tree handlers).

Passed in model must exist for duration of branch and bound

4.73.4.39 CbcModel* CbcModel::subTreeModel (OsiSolverInterface * *solver* = *NULL*) const

For retrieving a copy of subtree model with given OsiSolver.

If no subtree model will use self (up to user to reset cutoff etc). If solver NULL uses current

4.73.4.40 int CbcModel::typePresolve () const [inline]

Whether to automatically do presolve before branch and bound (subTrees).

0 - no 1 - ordinary presolve 2 - integer presolve (dodgy)

Definition at line 1468 of file CbcModel.hpp.

4.73.4.41 void CbcModel::setBranchingMethod (CbcBranchDecision & *method*) [inline]

Set the branching method.

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Definition at line 1496 of file CbcModel.hpp.

4.73.4.42 void CbcModel::setCutModifier (CbcCutModifier & *modifier*)

Set the cut modifier method.

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

4.73.4.43 `void CbcModel::addCutGenerator (CglCutGenerator * generator, int howOften = 1, const char * name = NULL, bool normal = true, bool atSolution = false, bool infeasible = false, int howOftenInSub = -100, int whatDepth = -1, int whatDepthInSub = -1)`

Add one generator - up to user to delete generators.

howoften affects how generator is used. 0 or 1 means always, >1 means every that number of nodes. Negative values have same meaning as positive but they may be switched off (-> -100) by code if not many cuts generated at continuous. -99 is just done at root. Name is just for printout. If depth >0 overrides how often generator is called (if howOften==1 or >0).

4.73.4.44 `void CbcModel::addHeuristic (CbcHeuristic * generator, const char * name = NULL, int before = -1)`

Add one heuristic - up to user to delete.

The name is just used for print messages.

4.73.4.45 `void CbcModel::passInPriorities (const int * priorities, bool ifNotSimpleIntegers)`

Pass in branching priorities.

If ifClique then priorities are on cliques otherwise priorities are on integer variables. Other type (if exists set to default) 1 is highest priority. (well actually -INT_MAX is but that's ugly) If hotstart > 0 then branches are created to force the variable to the value given by best solution. This enables a sort of hot start. The node choice should be greatest depth and hotstart should normally be switched off after a solution.

If ifNotSimpleIntegers true then appended to normal integers

This is now deprecated except for simple usage. If user creates Cbcobjects then set priority in them

4.73.4.46 `void CbcModel::passInEventHandler (const CbcEventHandler * eventHandler)`

Set an event handler.

A clone of the handler passed as a parameter is stored in [CbcModel](#).

4.73.4.47 void CbcModel::setApplicationData (void * *appData*)

Set application data.

This is a pointer that the application can store into and retrieve from the solver interface. This field is available for the application to optionally define and use.

4.73.4.48 void CbcModel::passInSolverCharacteristics (OsiBabSolver * *solverCharacteristics*)

For advanced applications you may wish to modify the behavior of Cbc e.g.

if the solver is a NLP solver then you may not have an exact optimum solution at each step. Information could be built into OsiSolverInterface but this is an alternative so that that interface does not have to be changed. If something similar is useful to enough solvers then it could be migrated You can also pass in by using solver->setAuxiliaryInfo. You should do that if solver is odd - if solver is normal simplex then use this. NOTE - characteristics are not cloned

4.73.4.49 void CbcModel::setDefaultHandler (bool *yesNo*) [inline]

Set flag to say if handler_ is the default handler.

The default handler is deleted when the model is deleted. Other handlers (supplied by the client) will not be deleted.

Definition at line 1735 of file CbcModel.hpp.

4.73.4.50 void CbcModel::assignSolver (OsiSolverInterface *& *solver*, bool *deleteSolver = true*)

Assign a solver to the model (model assumes ownership).

On return, *solver* will be NULL. If *deleteSolver* then current solver deleted (if model owned)

Note

Parameter settings in the outgoing solver are not inherited by the incoming solver.

**4.73.4.51 void CbcModel::setModelOwnsSolver (bool *ourSolver*)
[inline]**

Set ownership of solver.

A parameter of false tells [CbcModel](#) it does not own the solver and should not delete it. Once you claim ownership of the solver, you're responsible for eventually deleting it. Note that [CbcModel](#) clones solvers with abandon. Unless you have a deep understanding of the workings of [CbcModel](#), the only time you want to claim ownership is when you're about to delete the [CbcModel](#) object but want the solver to continue to exist (as, for example, when `branchAndBound` has finished and you want to hang on to the answer).

Definition at line 1900 of file `CbcModel.hpp`.

4.73.4.52 bool CbcModel::modelOwnsSolver () [inline]

Get ownership of solver.

A return value of true means that [CbcModel](#) owns the solver and will take responsibility for deleting it when that becomes necessary.

Definition at line 1909 of file `CbcModel.hpp`.

4.73.4.53 void CbcModel::resetToReferenceSolver ()

Uses a copy of reference solver to be current solver.

Because of possible mismatches all exotic integer information is lost (apart from normal information in `OsiSolverInterface`) so SOS etc and priorities will have to be redone

4.73.4.54 int CbcModel::reducedCostFix ()

Perform reduced cost fixing.

Fixes integer variables at their current value based on reduced cost penalties. Returns number fixed

4.73.4.55 void CbcModel::synchronizeHandlers (int *makeDefault*)

Makes all handlers same.

If *makeDefault* 1 then makes top level default and rest point to that. If 2 then each is copy

4.73.4.56 CoinWarmStartBasis* CbcModel::getEmptyBasis (int *ns* = 0, int *na* = 0) const

Return an empty basis object of the specified size.

A useful utility when constructing a basis for a subproblem from scratch. The object returned will be of the requested capacity and appropriate for the solver attached to the model.

4.73.4.57 int CbcModel::takeOffCuts (OsiCuts & *cuts*, bool *allowResolve*, OsiCuts * *saveCuts*, int *numberNewCuts* = 0, const OsiRowCut ** *newCuts* = NULL)

Remove inactive cuts from the model.

An OsiSolverInterface is expected to maintain a valid basis, but not a valid solution, when loose cuts are deleted. Restoring a valid solution requires calling the solver to reoptimise. If it's certain the solution will not be required, set *allowResolve* to false to suppress reoptimisation. If *saveCuts* then slack cuts will be saved On input current cuts are *cuts* and *newCuts* on exit current cuts will be correct. Returns number dropped

4.73.4.58 int CbcModel::addCuts (CbcNode * *node*, CoinWarmStartBasis *& *lastws*, bool *canFix*)

Determine and install the active cuts that need to be added for the current subproblem.

The whole truth is a bit more complicated. The first action is a call to [addCuts1\(\)](#). [addCuts\(\)](#) then sorts through the list, installs the tight cuts in the model, and does

bookkeeping (adjusts reference counts). The basis returned from [addCuts1\(\)](#) is adjusted accordingly.

If it turns out that the node should really be fathomed by bound, [addCuts\(\)](#) simply treats all the cuts as loose as it does the bookkeeping.

canFix true if extra information being passed

4.73.4.59 `bool CbcModel::addCuts1 (CbcNode * node, CoinWarmStartBasis *& lastws)`

Traverse the tree from node to root and prep the model.

[addCuts1\(\)](#) begins the job of prepping the model to match the current subproblem. The model is stripped of all cuts, and the search tree is traversed from node to root to determine the changes required. Appropriate bounds changes are installed, a list of cuts is collected but not installed, and an appropriate basis (minus the cuts, but big enough to accommodate them) is constructed.

Returns true if new problem similar to old

4.73.4.60 `void CbcModel::previousBounds (CbcNode * node, CbcNodeInfo * where, int iColumn, double & lower, double & upper, int force)`

Returns bounds just before where - initially original bounds.

Also sets downstream nodes (lower if force 1, upper if 2)

4.73.4.61 `void CbcModel::setObjectiveValue (CbcNode * thisNode, const CbcNode * parentNode) const`

Set objective value in a node.

This is separated out so that odd solvers can use. It may look at extra information in `solverCharacteriscs_` and will also use bound from parent node

4.73.4.62 `void CbcModel::convertToDynamic ()`

If `numberBeforeTrust > 0` then we are going to use `CbcBranchDynamic`.

Scan and convert [CbcSimpleInteger](#) objects

4.73.4.63 `void CbcModel::doHeuristicsAtRoot (int deleteHeuristicsAfterwards = 0)`

Do heuristics at root.

0 - don't delete 1 - delete 2 - just delete - don't even use

4.73.4.64 `void CbcModel::setBestSolutionBasis (const CoinWarmStartBasis & bestSolutionBasis) [inline]`

Warm start object produced by heuristic or strong branching.

If get a valid integer solution outside branch and bound then it can take a reasonable time to solve LP which produces clean solution. If this object has any size then it will be used in solve.

Definition at line 2332 of file CbcModel.hpp.

The documentation for this class was generated from the following file:

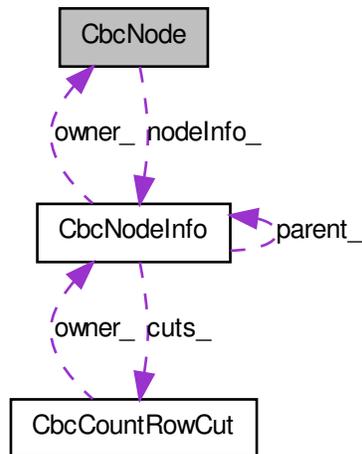
- CbcModel.hpp

4.74 CbcNode Class Reference

Information required while the node is live.

```
#include <CbcNode.hpp>
```

Collaboration diagram for CbcNode:



Public Member Functions

- [CbcNode](#) ()
Default Constructor.
- [CbcNode](#) ([CbcModel](#) *model, [CbcNode](#) *lastNode)
Construct and increment parent reference count.
- [CbcNode](#) (const [CbcNode](#) &)
Copy constructor.
- [CbcNode](#) & [operator=](#) (const [CbcNode](#) &rhs)
Assignment operator.
- [~CbcNode](#) ()
Destructor.
- void [createInfo](#) ([CbcModel](#) *model, [CbcNode](#) *lastNode, const [CoinWarmStartBasis](#) *lastws, const double *lastLower, const double *lastUpper, int numberOldActiveCuts, int numberNewCuts)

Create a description of the subproblem at this node.

- int `chooseBranch` (CbcModel *model, CbcNode *lastNode, int numberPassesLeft)
Create a branching object for the node.
- int `chooseDynamicBranch` (CbcModel *model, CbcNode *lastNode, OsiSolverBranch *&branches, int numberPassesLeft)
Create a branching object for the node - when dynamic pseudo costs.
- int `chooseOsiBranch` (CbcModel *model, CbcNode *lastNode, OsiBranchingInformation *usefulInfo, int branchState)
Create a branching object for the node.
- int `chooseClpBranch` (CbcModel *model, CbcNode *lastNode)
Create a branching object for the node.
- void `decrementCuts` (int change=1)
Decrement active cut counts.
- void `decrementParentCuts` (CbcModel *model, int change=1)
Decrement all active cut counts in chain starting at parent.
- void `nullNodeInfo` ()
Nulls out node info.
- void `initializeInfo` ()
Initialize reference counts in attached CbcNodeInfo.
- int `branch` (OsiSolverInterface *solver)
Does next branch and updates state.
- double `checkIsCutoff` (double cutoff)
Double checks in case node can change its mind! Returns objective value Can change objective etc.
- int `numberBranches` () const
Number of arms defined for the attached OsiBranchingObject.
- int `depth` () const
Depth in branch-and-cut search tree.
- void `setDepth` (int value)

Set depth in branch-and-cut search tree.

- int `numberUnsatisfied` () const
Get the number of objects unsatisfied at this node.
- void `setNumberUnsatisfied` (int value)
Set the number of objects unsatisfied at this node.
- double `sumInfeasibilities` () const
Get sum of "infeasibilities" reported by each object.
- void `setSumInfeasibilities` (double value)
Set sum of "infeasibilities" reported by each object.
- const `OsiBranchingObject * branchingObject` () const
Branching object for this node.
- `OsiBranchingObject * modifiableBranchingObject` () const
Modifiable branching object for this node.
- void `setBranchingObject` (`OsiBranchingObject *branchingObject`)
Set branching object for this node (takes ownership).
- int `nodeNumber` () const
The node number.
- bool `onTree` () const
Returns true if on tree.
- void `setOnTree` (bool yesNo)
Sets true if on tree.
- bool `active` () const
Returns true if active.
- void `setActive` (bool yesNo)
Sets true if active.
- void `print` () const
Print.
- void `checkInfo` () const
Debug.

4.74.1 Detailed Description

Information required while the node is live. When a subproblem is initially created, it is represented by an `CbcNode` object and an attached `CbcNodeInfo` object.

The `CbcNode` contains information (depth, branching instructions), that's needed while the subproblem remains 'live', *i.e.*, while the subproblem is not fathomed and there are branch arms still to be evaluated. The `CbcNode` is deleted when the last branch arm has been evaluated.

The `CbcNodeInfo` object contains the information needed to maintain the search tree and recreate the subproblem for the node. It remains in existence until there are no nodes remaining in the subtree rooted at this node.

Definition at line 49 of file `CbcNode.hpp`.

4.74.2 Member Function Documentation

4.74.2.1 `void CbcNode::createInfo (CbcModel * model, CbcNode * lastNode, const CoinWarmStartBasis * lastws, const double * lastLower, const double * lastUpper, int numberOldActiveCuts, int numberNewCuts)`

Create a description of the subproblem at this node.

The `CbcNodeInfo` structure holds the information (basis & variable bounds) required to recreate the subproblem for this node. It also links the node to its parent (via the parent's `CbcNodeInfo` object).

If `lastNode == NULL`, a `CbcFullNodeInfo` object will be created. All parameters except `model` are unused.

If `lastNode != NULL`, a `CbcPartialNodeInfo` object will be created. Basis and bounds information will be stored in the form of differences between the parent subproblem and this subproblem. (More precisely, `lastws`, `lastUpper`, `lastLower`, `numberOldActiveCuts`, and `numberNewCuts` are used.)

4.74.2.2 `int CbcNode::chooseBranch (CbcModel * model, CbcNode * lastNode, int numberPassesLeft)`

Create a branching object for the node.

The routine scans the object list of the model and selects a set of unsatisfied objects as candidates for branching. The candidates are evaluated, and an appropriate branch object is installed.

The numberPassesLeft is decremented to stop fixing one variable each time and going on and on (e.g. for stock cutting, air crew scheduling)

If evaluation determines that an object is monotone or infeasible, the routine returns immediately. In the case of a monotone object, the branch object has already been called to modify the model.

Return value:

- 0: A branching object has been installed
- -1: A monotone object was discovered
- -2: An infeasible object was discovered

4.74.2.3 `int CbcNode::chooseDynamicBranch (CbcModel * model, CbcNode * lastNode, OsiSolverBranch *& branches, int numberPassesLeft)`

Create a branching object for the node - when dynamic pseudo costs.

The routine scans the object list of the model and selects a set of unsatisfied objects as candidates for branching. The candidates are evaluated, and an appropriate branch object is installed. This version gives preference in evaluation to variables which have not been evaluated many times. It also uses numberStrong to say give up if last few tries have not changed incumbent. See Achterberg, Koch and Martin.

The numberPassesLeft is decremented to stop fixing one variable each time and going on and on (e.g. for stock cutting, air crew scheduling)

If evaluation determines that an object is monotone or infeasible, the routine returns immediately. In the case of a monotone object, the branch object has already been called to modify the model.

Return value:

- 0: A branching object has been installed
- -1: A monotone object was discovered
- -2: An infeasible object was discovered
- >0: Number of quick branching objects (and branches will be non NULL)

4.74.2.4 `int CbcNode::chooseOsiBranch (CbcModel * model, CbcNode * lastNode, OsiBranchingInformation * usefulInfo, int branchState)`

Create a branching object for the node.

The routine scans the object list of the model and selects a set of unsatisfied objects as candidates for branching. The candidates are evaluated, and an appropriate branch object is installed.

The numberPassesLeft is decremented to stop fixing one variable each time and going on and on (e.g. for stock cutting, air crew scheduling)

If evaluation determines that an object is monotone or infeasible, the routine returns immediately. In the case of a monotone object, the branch object has already been called to modify the model.

Return value:

- 0: A branching object has been installed
- -1: A monotone object was discovered
- -2: An infeasible object was discovered

Branch state:

- -1: start
- -1: A monotone object was discovered
- -2: An infeasible object was discovered

4.74.2.5 `int CbcNode::chooseClpBranch (CbcModel * model, CbcNode * lastNode)`

Create a branching object for the node.

The routine scans the object list of the model and selects a set of unsatisfied objects as candidates for branching. It then solves a series of problems and a [CbcGeneral](#) branch object is installed.

If evaluation determines that an object is infeasible, the routine returns immediately.

Return value:

- 0: A branching object has been installed
- -2: An infeasible object was discovered

4.74.2.6 void CbcNode::initializeInfo ()

Initialize reference counts in attached [CbcNodeInfo](#).

This is a convenience routine, which will initialize the reference counts in the attached [CbcNodeInfo](#) object based on the attached [OsiBranchingObject](#).

See also

[CbcNodeInfo::initializeInfo\(int\)](#).

The documentation for this class was generated from the following file:

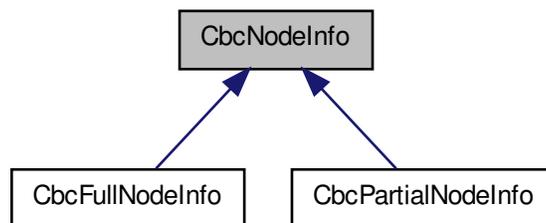
- CbcNode.hpp

4.75 CbcNodeInfo Class Reference

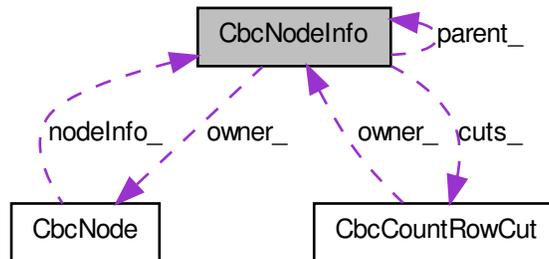
Information required to recreate the subproblem at this node.

```
#include <CbcNodeInfo.hpp>
```

Inheritance diagram for CbcNodeInfo:



Collaboration diagram for CbcNodeInfo:



Public Member Functions

- virtual void [applyToModel](#) ([CbcModel](#) *model, [CoinWarmStartBasis](#) *&basis, [CbcCountRowCut](#) **addCuts, int ¤tNumberCuts) const =0
Modify model according to information at node.
- virtual int [applyBounds](#) (int iColumn, double &lower, double &upper, int force)=0
Just apply bounds to one variable - force means overwrite by lower,upper (I=>infeasible).
- virtual [CbcNodeInfo](#) * [buildRowBasis](#) ([CoinWarmStartBasis](#) &basis) const =0
Builds up row basis backwards (until original model).
- virtual [CbcNodeInfo](#) * [clone](#) () const =0
Clone.
- virtual void [allBranchesGone](#) ()
Called when number branches left down to zero.
- void [increment](#) (int amount=1)
Increment number of references.
- int [decrement](#) (int amount=1)
Decrement number of references and return number left.

- void [initializeInfo](#) (int number)
Initialize reference counts.
- int [numberBranchesLeft](#) () const
Return number of branches left in object.
- void [setNumberBranchesLeft](#) (int value)
Set number of branches left in object.
- int [numberPointingToThis](#) () const
Return number of objects pointing to this.
- void [setNumberPointingToThis](#) (int number)
Set number of objects pointing to this.
- void [incrementNumberPointingToThis](#) ()
Increment number of objects pointing to this.
- int [branchedOn](#) ()
Say one branch taken.
- void [throwAway](#) ()
Say thrown away.
- [CbcNodeInfo](#) * [parent](#) () const
Parent of this.
- void [nullParent](#) ()
Set parent null.
- void [deleteCuts](#) (int numberToDelete, [CbcCountRowCut](#) **cuts)
Delete cuts (decrements counts) Slow unless cuts in same order as saved.
- void [deleteCut](#) (int whichOne)
Really delete a cut.
- void [decrementCuts](#) (int change=1)
Decrement active cut counts.
- void [incrementCuts](#) (int change=1)
Increment active cut counts.

- void `decrementParentCuts` (`CbcModel *model`, `int change=1`)
Decrement all active cut counts in chain starting at parent.
- void `incrementParentCuts` (`CbcModel *model`, `int change=1`)
Increment all active cut counts in parent chain.
- `CbcCountRowCut ** cuts` () const
Array of pointers to cuts.
- int `numberCuts` () const
Number of row cuts (this node).
- void `nullOwner` ()
Set owner null.
- int `nodeNumber` () const
The node number.
- void `deactivate` (`int mode=3`)
Deactivate node information.
- bool `allActivated` () const
Say if normal.
- bool `marked` () const
Say if marked.
- void `mark` ()
Mark.
- void `unmark` ()
Unmark.
- const `OsiBranchingObject * parentBranch` () const
Branching object for the parent.
- void `unsetParentBasedData` ()
If we need to take off parent based data.

Constructors & destructors

- [CbcNodeInfo \(\)](#)
Default Constructor.
- [CbcNodeInfo \(const CbcNodeInfo &\)](#)
Copy constructor.
- [CbcNodeInfo \(CbcNodeInfo *parent, CbcNode *owner\)](#)
Construct with parent and owner.
- [virtual ~CbcNodeInfo \(\)](#)
Destructor.

Protected Attributes

- [int numberPointingToThis_](#)
Number of other nodes pointing to this node.
- [CbcNodeInfo * parent_](#)
parent
- [OsiBranchingObject * parentBranch_](#)
Copy of the branching object of the parent when the node is created.
- [CbcNode * owner_](#)
Owner.
- [int numberCuts_](#)
Number of row cuts (this node).
- [int nodeNumber_](#)
The node number.
- [CbcCountRowCut ** cuts_](#)
Array of pointers to cuts.
- [int numberRows_](#)
Number of rows in problem (before these cuts).
- [int numberBranchesLeft_](#)
Number of branch arms left to explore at this node.
- [int active_](#)
Active node information.

4.75.1 Detailed Description

Information required to recreate the subproblem at this node. When a subproblem is initially created, it is represented by a [CbcNode](#) object and an attached [CbcNodeInfo](#) object.

The [CbcNode](#) contains information needed while the subproblem remains live. The [CbcNode](#) is deleted when the last branch arm has been evaluated.

The [CbcNodeInfo](#) contains information required to maintain the branch-and-cut search tree structure (links and reference counts) and to recreate the subproblem for this node (basis, variable bounds, cutting planes). A [CbcNodeInfo](#) object remains in existence until all nodes have been pruned from the subtree rooted at this node.

The principle used to maintain the reference count is that the reference count is always the sum of all potential and actual children of the node. Specifically,

- Once it's determined how the node will branch, the reference count is set to the number of potential children (*i.e.*, the number of arms of the branch).
- As each child is created by [CbcNode::branch\(\)](#) (converting a potential child to the active subproblem), the reference count is decremented.
- If the child survives and will become a node in the search tree (converting the active subproblem into an actual child), increment the reference count.

Notice that the active subproblem lives in a sort of limbo, neither a potential or an actual node in the branch-and-cut tree.

[CbcNodeInfo](#) objects come in two flavours. A [CbcFullNodeInfo](#) object contains a full record of the information required to recreate a subproblem. A [CbcPartialNodeInfo](#) object expresses this information in terms of differences from the parent.

Definition at line 68 of file [CbcNodeInfo.hpp](#).

4.75.2 Constructor & Destructor Documentation

4.75.2.1 CbcNodeInfo::CbcNodeInfo ()

Default Constructor.

Creates an empty NodeInfo object.

4.75.2.2 CbcNodeInfo::CbcNodeInfo (CbcNodeInfo * *parent*, CbcNode * *owner*)

Construct with parent and owner.

As for 'construct with parent', and attached to `owner`.

4.75.2.3 virtual CbcNodeInfo::~CbcNodeInfo () [virtual]

Destructor.

Note that the destructor will recursively delete the parent if this nodeInfo is the last child.

4.75.3 Member Function Documentation

4.75.3.1 virtual void CbcNodeInfo::applyToModel (CbcModel * *model*, CoinWarmStartBasis *& *basis*, CbcCountRowCut ** *addCuts*, int & *currentNumberCuts*) const [pure virtual]

Modify model according to information at node.

The routine modifies the model according to bound and basis information at node and adds any cuts to the `addCuts` array.

Implemented in [CbcFullNodeInfo](#), and [CbcPartialNodeInfo](#).

4.75.3.2 virtual CbcNodeInfo* CbcNodeInfo::buildRowBasis (CoinWarmStartBasis & *basis*) const [pure virtual]

Builds up row basis backwards (until original model).

Returns NULL or previous one to apply . Depends on `Free` being 0 and impossible for cuts

Implemented in [CbcFullNodeInfo](#), and [CbcPartialNodeInfo](#).

4.75.3.3 void CbcNodeInfo::initializeInfo (int *number*) [inline]

Initialize reference counts.

Initialize the reference counts used for tree maintenance.

Definition at line 149 of file `CbcNodeInfo.hpp`.

4.75.3.4 void CbcNodeInfo::deactivate (int *mode* = 3)

Deactivate node information.

1 - bounds 2 - cuts 4 - basis!

4.75.4 Member Data Documentation

4.75.4.1 int CbcNodeInfo::numberPointingToThis_ [protected]

Number of other nodes pointing to this node.

Number of existing and potential search tree nodes pointing to this node. 'Existing' means referenced by [parent_](#) of some other [CbcNodeInfo](#). 'Potential' means children still to be created ([numberBranchesLeft_](#) of this [CbcNodeInfo](#)).

Definition at line 293 of file CbcNodeInfo.hpp.

4.75.4.2 int CbcNodeInfo::numberRows_ [protected]

Number of rows in problem (before these cuts).

This means that for top of chain it must be rows at continuous

Definition at line 315 of file CbcNodeInfo.hpp.

4.75.4.3 int CbcNodeInfo::numberBranchesLeft_ [protected]

Number of branch arms left to explore at this node.

Definition at line 323 of file CbcNodeInfo.hpp.

4.75.4.4 int CbcNodeInfo::active_ [protected]

Active node information.

1 - bounds 2 - cuts 4 - basis!

Definition at line 329 of file CbcNodeInfo.hpp.

The documentation for this class was generated from the following file:

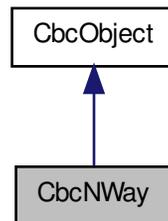
- CbcNodeInfo.hpp

4.76 CbcNWay Class Reference

Define an n-way class for variables.

```
#include <CbcNWay.hpp>
```

Inheritance diagram for CbcNWay:



Infeasibility - large is 0.5 (and 0.5 will give this).

- virtual void `feasibleRegion ()`
This looks at solution and sets bounds to contain solution.
- virtual `CbcBranchingObject * createCbcBranch (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way)`
Creates a branching object.
- int `numberMembers () const`
Number of members.
- const int * `members () const`
Members (indices in range 0 ... numberColumns-1).
- virtual void `redoSequenceEtc (CbcModel *model, int numberColumns, const int *originalColumns)`
Redoes data when sequence numbers change.

Protected Attributes

- int `numberMembers_`
data Number of members
- int * `members_`
Members (indices in range 0 ... numberColumns-1).
- `CbcConsequence ** consequence_`
Consequences (normally NULL).

4.76.1 Detailed Description

Define an n-way class for variables. Only valid value is one at UB others at LB Normally 0-1

Definition at line 15 of file CbcNWay.hpp.

The documentation for this class was generated from the following file:

- CbcNWay.hpp

Public Member Functions

- `CbcNWayBranchingObject` (`CbcModel *model`, `const CbcNWay *nway`, `int numberBranches`, `const int *order`)
Useful constructor - order had matrix indices way_ -1 corresponds to setting first, +1 to second, +3 etc.
- virtual `CbcBranchingObject * clone () const`
Clone.
- virtual `double branch ()`
Does next branch and updates state.
- virtual `void print ()`
Print something about branch - only if log level high.
- virtual `int numberBranches () const`
The number of branch arms created for this branching object.
- virtual `bool twoWay () const`
Is this a two way object (-1 down, +1 up).
- virtual `CbcBranchObjType type () const`
Return the type (an integer identifier) of this.
- virtual `int compareOriginalObject (const CbcBranchingObject *brObj) const`
Compare the original object of this with the original object of brObj.
- virtual `CbcRangeCompare compareBranchingObject (const CbcBranchingObject *brObj, const bool replaceIfOverlap=false)`
Compare the this with brObj.

4.77.1 Detailed Description

N way branching Object class. Variable is number of set.

Definition at line 81 of file CbcNWay.hpp.

4.77.2 Constructor & Destructor Documentation

4.77.2.1 CbcNWayBranchingObject::CbcNWayBranchingObject (CbcModel * model, const CbcNWay * nway, int numberBranches, const int * order)

Useful constructor - order had matrix indices way_ -1 corresponds to setting first, +1 to second, +3 etc.

this is so -1 and +1 have similarity to normal

4.77.3 Member Function Documentation

4.77.3.1 virtual int CbcNWayBranchingObject::compareOriginalObject (const CbcBranchingObject * brObj) const [virtual]

Compare the original object of `this` with the original object of `brObj`.

Assumes that there is an ordering of the original objects. This method should be invoked only if `this` and `brObj` are of the same type. Return negative/0/positive depending on whether `this` is smaller/same/larger than the argument.

Reimplemented from [CbcBranchingObject](#).

4.77.3.2 virtual CbcRangeCompare CbcNWayBranchingObject::compareBranchingObject (const CbcBranchingObject * brObj, const bool replaceIfOverlap = false) [virtual]

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate `CbcRangeCompare` value (first argument being the sub/superset if that's the case). In case of overlap (and if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

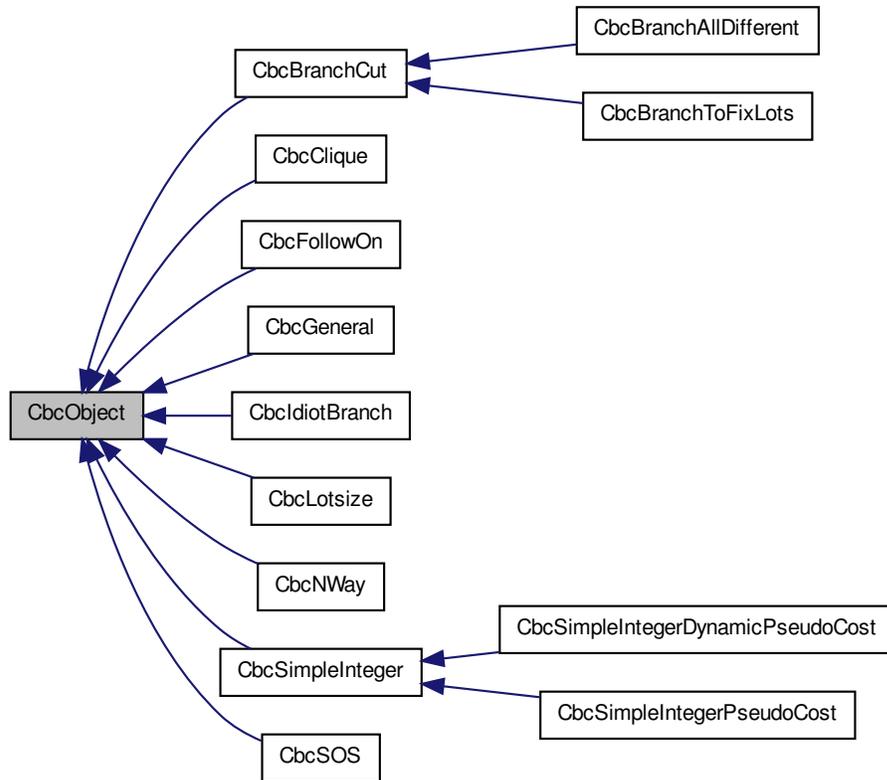
Implements [CbcBranchingObject](#).

The documentation for this class was generated from the following file:

- CbcNWay.hpp

4.78 CbcObject Class Reference

Inheritance diagram for CbcObject:



- virtual `CbcBranchingObject * createCbcBranch` (`OsiSolverInterface *`, `const OsiBranchingInformation *`, `int`)
Create a branching object and indicate which way to branch first.
- virtual `OsiBranchingObject * createOsiBranch` (`OsiSolverInterface *solver`, `const OsiBranchingInformation *info`, `int way`) `const`
Create an Osibranching object and indicate which way to branch first.
- virtual `OsiSolverBranch * solverBranch` () `const`
Create an OsiSolverBranch object.
- virtual `CbcBranchingObject * preferredNewFeasible` () `const`
Given a valid solution (with reduced costs, etc.
- virtual `CbcBranchingObject * notPreferredNewFeasible` () `const`
Given a valid solution (with reduced costs, etc.
- virtual `void resetBounds` (`const OsiSolverInterface *`)
Reset variable bounds to their original values.
- virtual `void floorCeiling` (`double &floorValue`, `double &ceilingValue`, `double value`, `double tolerance`) `const`
Returns floor and ceiling i.e.
- virtual `CbcObjectUpdateData createUpdateInformation` (`const OsiSolverInterface *solver`, `const CbcNode *node`, `const CbcBranchingObject *branchingObject`)
Pass in information on branch just done and create CbcObjectUpdateData instance.
- virtual `void updateInformation` (`const CbcObjectUpdateData &`)
Update object by CbcObjectUpdateData.
- `int id` () `const`
Identifier (normally column number in matrix).
- `void setId` (`int value`)
Set identifier (normally column number in matrix) but 1000000000 to 1100000000 means optional branching object i.e.
- `bool optionalObject` () `const`
Return true if optional branching object i.e.
- `int position` () `const`

Get position in object_list.

- void [setPosition](#) (int position)
Set position in object_list.
- void [setModel](#) (CbcModel *model)
update model
- [CbcModel * model](#) () const
Return model.
- int [preferredWay](#) () const
If -1 down always chosen first, +1 up always, 0 normal.
- void [setPreferredWay](#) (int value)
Set -1 down always chosen first, +1 up always, 0 normal.
- virtual void [redoSequenceEtc](#) (CbcModel *, int, const int *)
Redoes data when sequence numbers change.
- virtual void [initializeForBranching](#) (CbcModel *)
Initialize for branching.

Protected Attributes

- [CbcModel * model_](#)
data
- int [id_](#)
Identifier (normally column number in matrix).
- int [position_](#)
Position in object list.
- int [preferredWay_](#)
If -1 down always chosen first, +1 up always, 0 normal.

4.78.1 Detailed Description

Definition at line 67 of file CbcObject.hpp.

4.78.2 Member Function Documentation

4.78.2.1 `virtual double CbcObject::infeasibility (const
OsiBranchingInformation *, int & preferredWay) const [inline,
virtual]`

Infeasibility of the object.

This is some measure of the infeasibility of the object. It should be scaled to be in the range [0.0, 0.5], with 0.0 indicating the object is satisfied.

The preferred branching direction is returned in preferredWay,

This is used to prepare for strong branching but should also think of case when no strong branching

The object may also compute an estimate of cost of going "up" or "down". This will probably be based on pseudo-cost ideas

Reimplemented in [CbcBranchAllDifferent](#), [CbcBranchCut](#), [CbcLotsize](#), [CbcBranchToFixLots](#), [CbcClique](#), [CbcFollowOn](#), [CbcIdiotBranch](#), [CbcGeneral](#), [CbcNWay](#), [CbcSimpleInteger](#), [CbcSimpleIntegerDynamicPseudoCost](#), [CbcSimpleIntegerPseudoCost](#), and [CbcSOS](#).

Definition at line 107 of file CbcObject.hpp.

4.78.2.2 `virtual double CbcObject::feasibleRegion (OsiSolverInterface *
solver) const [virtual]`

For the variable(s) referenced by the object, look at the current solution and set bounds to match the solution.

Returns measure of how much it had to move solution to make feasible

4.78.2.3 `virtual CbcBranchingObject* CbcObject::createCbcBranch (OsiSolverInterface * , const OsiBranchingInformation * , int)
[inline, virtual]`

Create a branching object and indicate which way to branch first.

The branching object has to know how to create branches (fix variables, etc.)

Reimplemented in [CbcBranchAllDifferent](#), [CbcBranchCut](#), [CbcLotsize](#), [CbcBranchToFixLots](#), [CbcClique](#), [CbcFollowOn](#), [CbcIdiotBranch](#), [CbcGeneral](#),

[CbcNWay](#), [CbcSimpleInteger](#), [CbcSimpleIntegerDynamicPseudoCost](#), [CbcSimpleIntegerPseudoCost](#), and [CbcSOS](#).

Definition at line 137 of file CbcObject.hpp.

4.78.2.4 `virtual OsiBranchingObject* CbcObject::createOsiBranch (OsiSolverInterface * solver, const OsiBranchingInformation * info, int way) const [virtual]`

Create an OsiBranching object and indicate which way to branch first.

The branching object has to know how to create branches (fix variables, etc.)

4.78.2.5 `virtual OsiSolverBranch* CbcObject::solverBranch () const [virtual]`

Create an OsiSolverBranch object.

This returns NULL if branch not represented by bound changes

Reimplemented in [CbcSimpleIntegerDynamicPseudoCost](#), and [CbcSOS](#).

4.78.2.6 `virtual CbcBranchingObject* CbcObject::preferredNewFeasible () const [inline, virtual]`

Given a valid solution (with reduced costs, etc.

), return a branching object which would give a new feasible point in a good direction.

If the method cannot generate a feasible point (because there aren't any, or because it isn't bright enough to find one), it should return null.

Reimplemented in [CbcBranchCut](#), and [CbcLotsize](#).

Definition at line 169 of file CbcObject.hpp.

4.78.2.7 `virtual CbcBranchingObject* CbcObject::notPreferredNewFeasible () const [inline, virtual]`

Given a valid solution (with reduced costs, etc.

), return a branching object which would give a new feasible point in a bad direction.

If the method cannot generate a feasible point (because there aren't any, or because it isn't bright enough to find one), it should return null.

Reimplemented in [CbcBranchCut](#), and [CbcLotsize](#).

Definition at line 181 of file [CbcObject.hpp](#).

4.78.2.8 `virtual void CbcObject::resetBounds (const OsiSolverInterface *)
[inline, virtual]`

Reset variable bounds to their original values.

Bounds may be tightened, so it may be good to be able to set this info in object.

Reimplemented in [CbcLotsize](#), and [CbcSimpleInteger](#).

Definition at line 189 of file [CbcObject.hpp](#).

4.78.2.9 `virtual void CbcObject::floorCeiling (double & floorValue, double &
ceilingValue, double value, double tolerance) const [virtual]`

Returns floor and ceiling i.e.

closest valid points

Reimplemented in [CbcLotsize](#).

4.78.2.10 `virtual CbcObjectUpdateData CbcObject::createUpdateInformation
(const OsiSolverInterface * solver, const CbcNode * node, const
CbcBranchingObject * branchingObject) [virtual]`

Pass in information on branch just done and create [CbcObjectUpdateData](#) instance.

If object does not need data then backward pointer will be NULL. Assumes can get information from solver

Reimplemented in [CbcSimpleIntegerDynamicPseudoCost](#), and [CbcSOS](#).

4.78.2.11 `void CbcObject::setId (int value) [inline]`

Set identifier (normally column number in matrix) but 1000000000 to 1100000000 means optional branching object i.e.

code would work without it

Definition at line 214 of file CbcObject.hpp.

4.78.2.12 bool CbcObject::optionalObject () const [inline]

Return true if optional branching object i.e.

code would work without it

Definition at line 220 of file CbcObject.hpp.

4.78.3 Member Data Documentation

4.78.3.1 CbcModel* CbcObject::model_ [protected]

data

Model

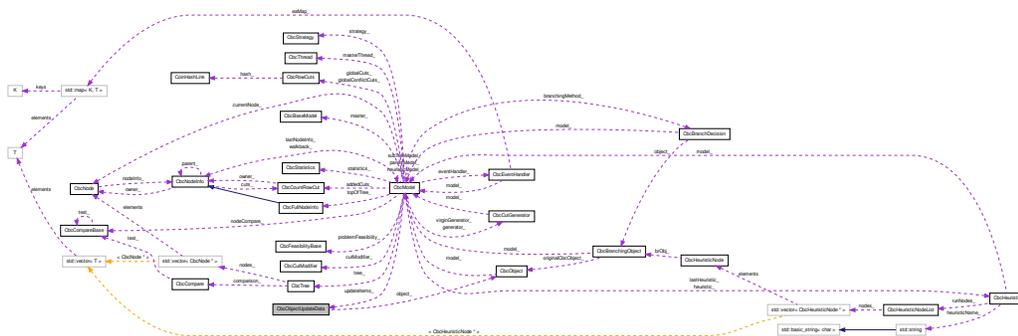
Definition at line 261 of file CbcObject.hpp.

The documentation for this class was generated from the following file:

- CbcObject.hpp

4.79 CbcObjectUpdateData Class Reference

Collaboration diagram for CbcObjectUpdateData:



Public Member Functions

- [CbcObjectUpdateData \(\)](#)
Default Constructor.
- [CbcObjectUpdateData \(CbcObject *object, int way, double change, int status, int intDecrease_, double branchingValue\)](#)
Useful constructor.
- [CbcObjectUpdateData \(const CbcObjectUpdateData &\)](#)
Copy constructor.
- [CbcObjectUpdateData & operator= \(const CbcObjectUpdateData &rhs\)](#)
Assignment operator.
- virtual [~CbcObjectUpdateData \(\)](#)
Destructor.

Public Attributes

- [CbcObject * object_](#)
data
- [int way_](#)
Branch as defined by instance of CbcObject.
- [int objectNumber_](#)
Object number.
- [double change_](#)
Change in objective.
- [int status_](#)
Status 0 Optimal, 1 infeasible, 2 unknown.
- [int intDecrease_](#)
Decrease in number unsatisfied.
- [double branchingValue_](#)
Branching value.

- double [originalObjective_](#)
Objective value before branching.
- double [cutoff_](#)
Current cutoff.

4.79.1 Detailed Description

Definition at line 14 of file CbcObjectUpdateData.hpp.

4.79.2 Member Data Documentation

4.79.2.1 CbcObject* CbcObjectUpdateData::object_

data

Object

Definition at line 43 of file CbcObjectUpdateData.hpp.

The documentation for this class was generated from the following file:

- CbcObjectUpdateData.hpp

4.80 CbcOsiParam Class Reference

Class for control parameters that act on a OsiSolverInterface object.

```
#include <CbcGenOsiParam.hpp>
```

Public Types

Subtypes

- enum [CbcOsiParamCode](#)
Enumeration for parameters that control an OsiSolverInterface object.

Public Member Functions

Constructors and Destructors

Be careful how you specify parameters for the constructors! There's great potential for confusion.

- [CbcOsiParam \(\)](#)
Default constructor.
- [CbcOsiParam \(CbcOsiParamCode code, std::string name, std::string help, double lower, double upper, double dflt=0.0, bool display=true\)](#)
Constructor for a parameter with a double value.
- [CbcOsiParam \(CbcOsiParamCode code, std::string name, std::string help, int lower, int upper, int dflt=0, bool display=true\)](#)
Constructor for a parameter with an integer value.
- [CbcOsiParam \(CbcOsiParamCode code, std::string name, std::string help, std::string firstValue, int dflt, bool display=true\)](#)
Constructor for a parameter with keyword values.
- [CbcOsiParam \(CbcOsiParamCode code, std::string name, std::string help, std::string dflt, bool display=true\)](#)
Constructor for a string parameter.
- [CbcOsiParam \(CbcOsiParamCode code, std::string name, std::string help, bool display=true\)](#)
Constructor for an action parameter.
- [CbcOsiParam \(const CbcOsiParam &orig\)](#)
Copy constructor.
- [CbcOsiParam * clone \(\)](#)
Clone.
- [CbcOsiParam & operator= \(const CbcOsiParam &rhs\)](#)
Assignment.
- [~CbcOsiParam \(\)](#)
Destructor.

Methods to query and manipulate a parameter object

- [CbcOsiParamCode paramCode \(\) const](#)
Get the parameter code.
- [void setParamCode \(CbcOsiParamCode code\)](#)
Set the parameter code.

- OsiSolverInterface * `obj` () const
Get the underlying OsiSolverInterface object.
- void `setObj` (OsiSolverInterface *obj)
Set the underlying OsiSolverInterace object.

4.80.1 Detailed Description

Class for control parameters that act on a OsiSolverInterface object. Adds parameter type codes and push/pull functions to the generic parameter object.

Definition at line 31 of file CbcGenOsiParam.hpp.

4.80.2 Member Enumeration Documentation

4.80.2.1 enum CbcOsiParam::CbcOsiParamCode

Enumeration for parameters that control an OsiSolverInterface object.

These are parameters that control the operation of an OsiSolverInterface object. CBCOSI_FIRSTPARAM and CBCOSI_LASTPARAM are markers to allow convenient separation of parameter groups.

Definition at line 46 of file CbcGenOsiParam.hpp.

4.80.3 Constructor & Destructor Documentation

4.80.3.1 CbcOsiParam::CbcOsiParam (CbcOsiParamCode *code*, std::string *name*, std::string *help*, double *lower*, double *upper*, double *dflt* = 0.0, bool *display* = true)

Constructor for a parameter with a double value.

The default value is 0.0. Be careful to clearly indicate that `lower` and `upper` are real (double) values to distinguish this constructor from the constructor for an integer parameter.

4.80.3.2 CbcOsiParam::CbcOsiParam (CbcOsiParamCode *code*, std::string *name*, std::string *help*, int *lower*, int *upper*, int *dflt* = 0, bool *display* = *true*)

Constructor for a parameter with an integer value.

The default value is 0.

4.80.3.3 CbcOsiParam::CbcOsiParam (CbcOsiParamCode *code*, std::string *name*, std::string *help*, std::string *firstValue*, int *dflt*, bool *display* = *true*)

Constructor for a parameter with keyword values.

The string supplied as *firstValue* becomes the first keyword. Additional keywords can be added using `appendKwd()`. Keywords are numbered from zero. It's necessary to specify both the first keyword (*firstValue*) and the default keyword index (*dflt*) in order to distinguish this constructor from the string and action parameter constructors.

4.80.3.4 CbcOsiParam::CbcOsiParam (CbcOsiParamCode *code*, std::string *name*, std::string *help*, std::string *dflt*, bool *display* = *true*)

Constructor for a string parameter.

The default string value must be specified explicitly to distinguish a string constructor from an action parameter constructor.

The documentation for this class was generated from the following file:

- CbcGenOsiParam.hpp

4.81 CbcOsiSolver Class Reference

This is for codes where solver needs to know about [CbcModel](#) Seems to provide only one value-added feature, a [CbcModel](#) object.

```
#include <CbcFathom.hpp>
```


- [CbcOsiSolver](#) & `operator=` (const [CbcOsiSolver](#) &rhs)
Assignment operator.
- virtual `~CbcOsiSolver` ()
Destructor.

Sets and Gets

- void `setCbcModel` ([CbcModel](#) *model)
Set Cbc Model.
- [CbcModel](#) * `cbcModel` () const
Return Cbc Model.

Protected Attributes

Private member data

- [CbcModel](#) * `cbcModel_`
Pointer back to CbcModel.

4.81.1 Detailed Description

This is for codes where solver needs to know about [CbcModel](#) Seems to provide only one value-added feature, a [CbcModel](#) object.

Definition at line 90 of file CbcFathom.hpp.

The documentation for this class was generated from the following file:

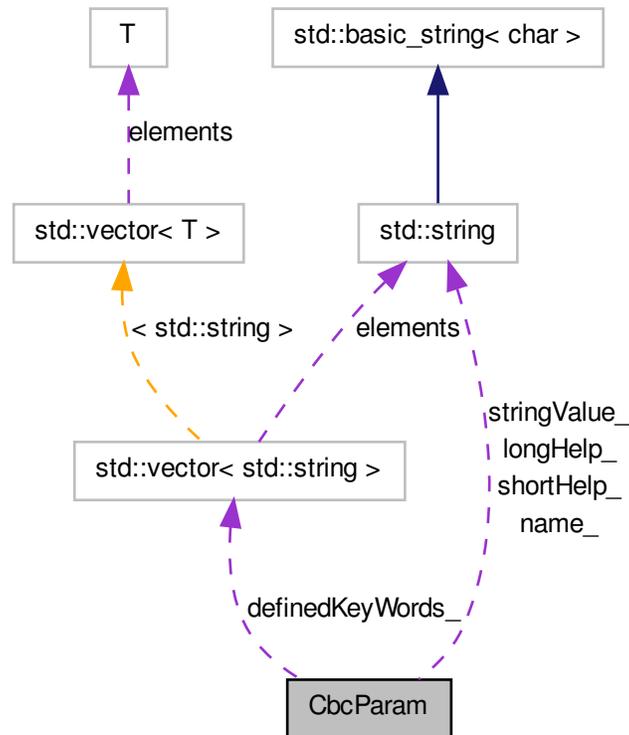
- CbcFathom.hpp

4.82 CbcParam Class Reference

Very simple class for setting parameters.

```
#include <CbcParam.hpp>
```

Collaboration diagram for CbcParam:



Public Member Functions

Constructor and destructor

- [CbcParam \(\)](#)
Constructors.
- **CbcParam** (std::string name, std::string help, double lower, double upper, CbcParameterType type, bool display=true)
- **CbcParam** (std::string name, std::string help, int lower, int upper, CbcParameterType type, bool display=true)

- **CbcParam** (std::string name, std::string help, std::string firstValue, CbcParameterType type, int defaultIndex=0, bool display=true)
- **CbcParam** (std::string name, std::string help, CbcParameterType type, int indexNumber=-1, bool display=true)
- **CbcParam** (const **CbcParam** &)
Copy constructor.
- **CbcParam** & **operator=** (const **CbcParam** &rhs)
Assignment operator. This copies the data.
- **~CbcParam** ()
Destructor.

stuff

- void **append** (std::string keyWord)
Insert string (only valid for keywords).
- void **addHelp** (std::string keyWord)
Adds one help line.
- std::string **name** () const
Returns name.
- std::string **shortHelp** () const
Returns short help.
- int **setDoubleParameter** (**CbcModel** &model, double value) const
Sets a double parameter (nonzero code if error).
- double **doubleParameter** (**CbcModel** &model) const
Gets a double parameter.
- int **setIntParameter** (**CbcModel** &model, int value) const
Sets a int parameter (nonzero code if error).
- int **intParameter** (**CbcModel** &model) const
Gets a int parameter.
- int **setDoubleParameter** (ClpSimplex *model, double value) const
Sets a double parameter (nonzero code if error).

- double [doubleParameter](#) (ClpSimplex *model) const
Gets a double parameter.
- int [setIntParameter](#) (ClpSimplex *model, int value) const
Sets a int parameter (nonzero code if error).
- int [intParameter](#) (ClpSimplex *model) const
Gets a int parameter.
- int [setDoubleParameter](#) (OsiSolverInterface *model, double value) const
Sets a double parameter (nonzero code if error).
- double [doubleParameter](#) (OsiSolverInterface *model) const
Gets a double parameter.
- int [setIntParameter](#) (OsiSolverInterface *model, int value) const
Sets a int parameter (nonzero code if error).
- int [intParameter](#) (OsiSolverInterface *model) const
Gets a int parameter.
- int [checkDoubleParameter](#) (double value) const
Checks a double parameter (nonzero code if error).
- std::string [matchName](#) () const
Returns name which could match.
- int [parameterOption](#) (std::string check) const
Returns parameter option which matches (-1 if none).
- void [printOptions](#) () const
Prints parameter options.
- std::string [currentOption](#) () const
Returns current parameter option.
- void [setCurrentOption](#) (int value)
Sets current parameter option.
- void [setIntValue](#) (int value)
Sets int value.

- int **intValue** () const
- void **setDoubleValue** (double value)
Sets double value.
- double **doubleValue** () const
- void **setStringValue** (std::string value)
Sets string value.
- std::string **stringValue** () const
- int **matches** (std::string input) const
Returns 1 if matches minimum, 2 if matches less, 0 if not matched.
- CbcParameterType **type** () const
type
- bool **displayThis** () const
whether to display
- void **setLonghelp** (const std::string help)
Set Long help.
- void **printLongHelp** () const
Print Long help.
- void **printString** () const
Print action and string.
- int **indexNumber** () const
type for classification

4.82.1 Detailed Description

Very simple class for setting parameters.

Definition at line 153 of file CbcParam.hpp.

The documentation for this class was generated from the following file:

- CbcParam.hpp

4.83 CbcGenCtlBlk::cbcParamsInfo_struct Struct Reference

Start and end of [CbcModel](#) parameters in parameter vector.

```
#include <CbcGenCtlBlk.hpp>
```

4.83.1 Detailed Description

Start and end of [CbcModel](#) parameters in parameter vector.

Definition at line 605 of file CbcGenCtlBlk.hpp.

The documentation for this struct was generated from the following file:

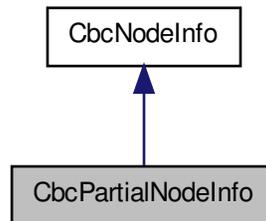
- CbcGenCtlBlk.hpp

4.84 CbcPartialNodeInfo Class Reference

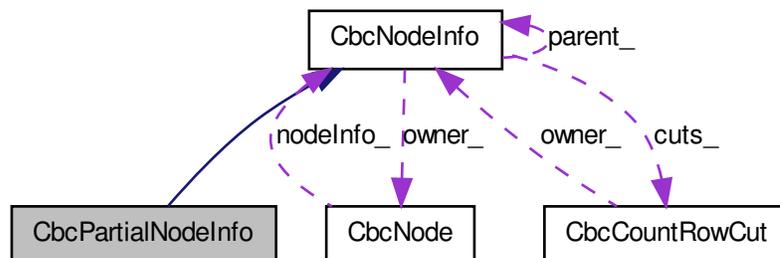
Holds information for recreating a subproblem by incremental change from the parent.

```
#include <CbcPartialNodeInfo.hpp>
```

Inheritance diagram for CbcPartialNodeInfo:



Collaboration diagram for CbcPartialNodeInfo:



Public Member Functions

- virtual void [applyToModel](#) (CbcModel *model, CoinWarmStartBasis *&basis, CbcCountRowCut **addCuts, int ¤tNumberCuts) const
Modify model according to information at node.
- virtual int [applyBounds](#) (int iColumn, double &lower, double &upper, int force)
Just apply bounds to one variable - force means overwrite by lower,upper (1=>infeasible).
- virtual CbcNodeInfo * [buildRowBasis](#) (CoinWarmStartBasis &basis) const
Builds up row basis backwards (until original model).
- virtual CbcNodeInfo * [clone](#) () const
Clone.
- const CoinWarmStartDiff * [basisDiff](#) () const
Basis diff information.
- const int * [variables](#) () const
Which variable (top bit if upper bound changing).
- int [numberChangedBounds](#) () const
Number of bound changes.

Protected Attributes

- CoinWarmStartDiff * [basisDiff_](#)
Basis diff information.
- int * [variables_](#)
Which variable (top bit if upper bound changing).
- int [numberChangedBounds_](#)
Number of bound changes.

4.84.1 Detailed Description

Holds information for recreating a subproblem by incremental change from the parent. A [CbcPartialNodeInfo](#) object contains changes to the bounds and basis, and additional cuts, required to recreate a subproblem by modifying and augmenting the parent subproblem.

Definition at line 39 of file CbcPartialNodeInfo.hpp.

4.84.2 Member Function Documentation

4.84.2.1 `virtual void CbcPartialNodeInfo::applyToModel (CbcModel * model, CoinWarmStartBasis *& basis, CbcCountRowCut ** addCuts, int & currentNumberCuts) const` [[virtual](#)]

Modify model according to information at node.

The routine modifies the model according to bound and basis change information at node and adds any cuts to the addCuts array.

Implements [CbcNodeInfo](#).

4.84.2.2 `virtual CbcNodeInfo* CbcPartialNodeInfo::buildRowBasis (CoinWarmStartBasis & basis) const` [[virtual](#)]

Builds up row basis backwards (until original model).

Returns NULL or previous one to apply . Depends on Free being 0 and impossible for cuts

Implements [CbcNodeInfo](#).

The documentation for this class was generated from the following file:

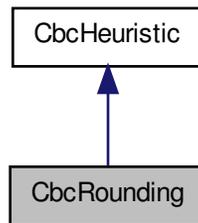
- CbcPartialNodeInfo.hpp

4.85 CbcRounding Class Reference

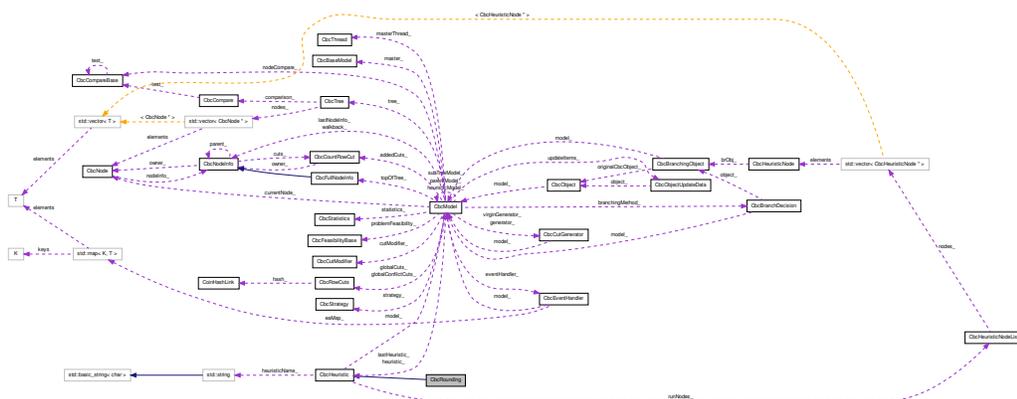
Rounding class.

```
#include <CbcHeuristic.hpp>
```

Inheritance diagram for CbcRounding:



Collaboration diagram for CbcRounding:



Public Member Functions

- [CbcRounding](#) & [operator=](#) (const [CbcRounding](#) &rhs)
Assignment operator.
- virtual [CbcHeuristic](#) * [clone](#) () const
Clone.
- virtual void [generateCpp](#) (FILE *fp)
Create C++ lines to get to current state.
- virtual void [resetModel](#) ([CbcModel](#) *model)
Resets stuff if model changes.
- virtual void [setModel](#) ([CbcModel](#) *model)
update model (This is needed if cliques update matrix etc)
- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution with better objective value than one passed in Sets solution values if good, sets objective value (only if good) This is called after cuts have been added - so can not add cuts
- virtual int [solution](#) (double &objectiveValue, double *newSolution, double solutionValue)
returns 0 if no solution, 1 if valid solution with better objective value than one passed in Sets solution values if good, sets objective value (only if good) This is called after cuts have been added - so can not add cuts Use solutionValue rather than solvers one
- virtual void [validate](#) ()
Validate model i.e. sets when_ to 0 if necessary (may be NULL).
- void [setSeed](#) (int value)
Set seed.

4.85.1 Detailed Description

Rounding class.

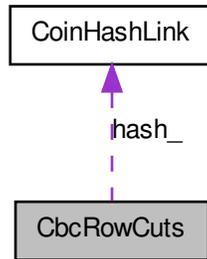
Definition at line 407 of file [CbcHeuristic.hpp](#).

The documentation for this class was generated from the following file:

- [CbcHeuristic.hpp](#)

4.86 CbcRowCuts Class Reference

Collaboration diagram for CbcRowCuts:



4.86.1 Detailed Description

Definition at line 134 of file `CbcCountRowCut.hpp`.

The documentation for this class was generated from the following file:

- `CbcCountRowCut.hpp`

4.87 CbcSerendipity Class Reference

heuristic - just picks up any good solution found by solver - see `OsiBabSolver`

```
#include <CbcHeuristic.hpp>
```


Create C++ lines to get to current state.

- virtual void [setModel](#) ([CbcModel](#) *model)
update model
- virtual int [solution](#) (double &objectiveValue, double *newSolution)
returns 0 if no solution, 1 if valid solution.
- virtual void [resetModel](#) ([CbcModel](#) *model)
Resets stuff if model changes.

4.87.1 Detailed Description

heuristic - just picks up any good solution found by solver - see OsiBabSolver

Definition at line 552 of file CbcHeuristic.hpp.

4.87.2 Member Function Documentation

4.87.2.1 virtual int CbcSerendipity::solution (double & objectiveValue, double * newSolution) [virtual]

returns 0 if no solution, 1 if valid solution.

Sets solution values if good, sets objective value (only if good) We leave all variables which are at one at this node of the tree to that value and will initially set all others to zero. We then sort all variables in order of their cost divided by the number of entries in rows which are not yet covered. We randomize that value a bit so that ties will be broken in different ways on different runs of the heuristic. We then choose the best one and set it to one and repeat the exercise.

Implements [CbcHeuristic](#).

The documentation for this class was generated from the following file:

- CbcHeuristic.hpp

4.88 CbcSimpleInteger Class Reference

Define a single integer class.

```
#include <CbcSimpleInteger.hpp>
```


Clone.

- OsiSimpleInteger * [osiObject](#) () const
Construct an OsiSimpleInteger object.
- virtual double [infeasibility](#) (const OsiBranchingInformation *info, int &preferredWay) const
Infeasibility - large is 0.5.
- virtual double [feasibleRegion](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info) const
Set bounds to fix the variable at the current (integer) value.
- virtual [CbcBranchingObject](#) * [createCbcBranch](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way)
Create a branching object and indicate which way to branch first.
- void [fillCreateBranch](#) ([CbcIntegerBranchingObject](#) *branching, const OsiBranchingInformation *info, int way)
Fills in a created branching object.
- virtual OsiSolverBranch * [solverBranch](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info) const
Create an OsiSolverBranch object.
- virtual void [feasibleRegion](#) ()
Set bounds to fix the variable at the current (integer) value.
- virtual int [columnNumber](#) () const
Column number if single column object -1 otherwise, so returns ≥ 0 Used by heuristics.
- void [setColumnNumber](#) (int value)
Set column number.
- virtual void [resetBounds](#) (const OsiSolverInterface *solver)
Reset variable bounds to their original values.
- virtual void [resetSequenceEtc](#) (int numberColumns, const int *originalColumns)
Change column numbers after preprocessing.
- double [originalLowerBound](#) () const

Original bounds.

- double `breakEven ()` const
Breakeven e.g 0.7 -> ≥ 0.7 go up first.
- void `setBreakEven (double value)`
Set breakeven e.g 0.7 -> ≥ 0.7 go up first.

Protected Attributes

- double `originalLower_`
data
- double `originalUpper_`
Original upper bound.
- double `breakEven_`
Breakeven i.e. \geq this preferred is up.
- int `columnNumber_`
Column number in model.
- int `preferredWay_`
If -1 down always chosen first, +1 up always, 0 normal.

4.88.1 Detailed Description

Define a single integer class.

Definition at line 167 of file CbcSimpleInteger.hpp.

4.88.2 Member Function Documentation

4.88.2.1 `virtual double CbcSimpleInteger::feasibleRegion (OsiSolverInterface * solver, const OsiBranchingInformation * info) const [virtual]`

Set bounds to fix the variable at the current (integer) value.

Given an integer value, set the lower and upper bounds to fix the variable. Returns amount it had to move variable.

Reimplemented from [CbcObject](#).

4.88.2.2 `virtual CbcBranchingObject* CbcSimpleInteger::createCbcBranch (OsiSolverInterface * solver, const OsiBranchingInformation * info, int way) [virtual]`

Create a branching object and indicate which way to branch first.

The branching object has to know how to create branches (fix variables, etc.)

Reimplemented from [CbcObject](#).

Reimplemented in [CbcSimpleIntegerDynamicPseudoCost](#), and [CbcSimpleIntegerPseudoCost](#).

4.88.2.3 `virtual OsiSolverBranch* CbcSimpleInteger::solverBranch (OsiSolverInterface * solver, const OsiBranchingInformation * info) const [virtual]`

Create an OsiSolverBranch object.

This returns NULL if branch not represented by bound changes

4.88.2.4 `virtual void CbcSimpleInteger::feasibleRegion () [virtual]`

Set bounds to fix the variable at the current (integer) value.

Given an integer value, set the lower and upper bounds to fix the variable. The algorithm takes a bit of care in order to compensate for minor numerical inaccuracy.

Implements [CbcObject](#).

4.88.2.5 `virtual void CbcSimpleInteger::resetBounds (const OsiSolverInterface * solver) [virtual]`

Reset variable bounds to their original values.

Bounds may be tightened, so it may be good to be able to set this info in object.

Reimplemented from [CbcObject](#).

4.88.3 Member Data Documentation

4.88.3.1 double CbcSimpleInteger::originalLower_ [protected]

data

Original lower bound

Definition at line 275 of file CbcSimpleInteger.hpp.

The documentation for this class was generated from the following file:

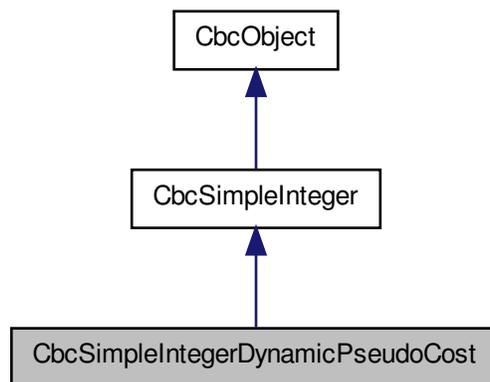
- CbcSimpleInteger.hpp

4.89 CbcSimpleIntegerDynamicPseudoCost Class Reference

Define a single integer class but with dynamic pseudo costs.

```
#include <CbcSimpleIntegerDynamicPseudoCost.hpp>
```

Inheritance diagram for CbcSimpleIntegerDynamicPseudoCost:



- void [copySome](#) (const [CbcSimpleIntegerDynamicPseudoCost](#) *otherObject)
Copy some information i.e. just variable stuff.
- virtual void [updateBefore](#) (const [OsiObject](#) *rhs)
Updates stuff like pseudocosts before threads.
- virtual void [updateAfter](#) (const [OsiObject](#) *rhs, const [OsiObject](#) *baseObject)
Updates stuff like pseudocosts after threads finished.
- void [updateAfterMini](#) (int numberDown, int numberDownInfeasible, double sumDown, int numberUp, int numberUpInfeasible, double sumUp)
Updates stuff like pseudocosts after mini branch and bound.
- virtual [OsiSolverBranch](#) * [solverBranch](#) () const
Create an [OsiSolverBranch](#) object.
- double [downDynamicPseudoCost](#) () const
Down pseudo cost.
- void [setDownDynamicPseudoCost](#) (double value)
Set down pseudo cost.
- void [updateDownDynamicPseudoCost](#) (double value)
Modify down pseudo cost in a slightly different way.
- double [upDynamicPseudoCost](#) () const
Up pseudo cost.
- void [setUpDynamicPseudoCost](#) (double value)
Set up pseudo cost.
- void [updateUpDynamicPseudoCost](#) (double value)
Modify up pseudo cost in a slightly different way.
- double [downShadowPrice](#) () const
Down pseudo shadow price cost.
- void [setDownShadowPrice](#) (double value)
Set down pseudo shadow price cost.
- double [upShadowPrice](#) () const

Up pseudo shadow price cost.

- void [setUpShadowPrice](#) (double value)
Set up pseudo shadow price cost.
- double [upDownSeparator](#) () const
Up down separator.
- void [setUpDownSeparator](#) (double value)
Set up down separator.
- double [sumDownCost](#) () const
Down sum cost.
- void [setSumDownCost](#) (double value)
Set down sum cost.
- void [addToSumDownCost](#) (double value)
Add to down sum cost and set last and square.
- double [sumUpCost](#) () const
Up sum cost.
- void [setSumUpCost](#) (double value)
Set up sum cost.
- void [addToSumUpCost](#) (double value)
Add to up sum cost and set last and square.
- double [sumDownChange](#) () const
Down sum change.
- void [setSumDownChange](#) (double value)
Set down sum change.
- void [addToSumDownChange](#) (double value)
Add to down sum change.
- double [sumUpChange](#) () const
Up sum change.
- void [setSumUpChange](#) (double value)

Set up sum change.

- void [addToSumUpChange](#) (double value)
Add to up sum change and set last and square.
- double [sumDownDecrease](#) () const
Sum down decrease number infeasibilities from strong or actual.
- void [setSumDownDecrease](#) (double value)
Set sum down decrease number infeasibilities from strong or actual.
- void [addToSumDownDecrease](#) (double value)
Add to sum down decrease number infeasibilities from strong or actual.
- double [sumUpDecrease](#) () const
Sum up decrease number infeasibilities from strong or actual.
- void [setSumUpDecrease](#) (double value)
Set sum up decrease number infeasibilities from strong or actual.
- void [addToSumUpDecrease](#) (double value)
Add to sum up decrease number infeasibilities from strong or actual.
- int [numberTimesDown](#) () const
Down number times.
- void [setNumberTimesDown](#) (int value)
Set down number times.
- void [incrementNumberTimesDown](#) ()
Increment down number times.
- int [numberTimesUp](#) () const
Up number times.
- void [setNumberTimesUp](#) (int value)
Set up number times.
- void [incrementNumberTimesUp](#) ()
Increment up number times.
- int [numberTimesDownInfeasible](#) () const

Down number times infeasible.

- void `setNumberTimesDownInfeasible` (int value)
Set down number times infeasible.
- void `incrementNumberTimesDownInfeasible` ()
Increment down number times infeasible.
- int `numberTimesUpInfeasible` () const
Up number times infeasible.
- void `setNumberTimesUpInfeasible` (int value)
Set up number times infeasible.
- void `incrementNumberTimesUpInfeasible` ()
Increment up number times infeasible.
- int `numberBeforeTrust` () const
Number of times before trusted.
- void `setNumberBeforeTrust` (int value)
Set number of times before trusted.
- void `incrementNumberBeforeTrust` ()
Increment number of times before trusted.
- virtual double `upEstimate` () const
Return "up" estimate.
- virtual double `downEstimate` () const
Return "down" estimate (default 1.0e-5).
- int `method` () const
method - see below for details
- void `setMethod` (int value)
Set method.
- void `setDownInformation` (double changeObjectiveDown, int changeInfeasibilityDown)
Pass in information on a down branch.
- void `setUpInformation` (double changeObjectiveUp, int changeInfeasibilityUp)

Pass in information on a up branch.

- void [setProbingInformation](#) (int fixedDown, int fixedUp)
Pass in probing information.
- void [print](#) (int type=0, double value=0.0) const
Print - 0 -summary, 1 just before strong.
- bool [same](#) (const [CbcSimpleIntegerDynamicPseudoCost](#) *obj) const
Same - returns true if contents match(ish).

Protected Attributes

- double [downDynamicPseudoCost_](#)
data
- double [upDynamicPseudoCost_](#)
Up pseudo cost.
- double [upDownSeparator_](#)
Up/down separator If >0.0 then do first branch up if value-floor(value) >= this value.
- double [sumDownCost_](#)
Sum down cost from strong or actual.
- double [sumUpCost_](#)
Sum up cost from strong or actual.
- double [sumDownChange_](#)
Sum of all changes to x when going down.
- double [sumUpChange_](#)
Sum of all changes to x when going up.
- double [downShadowPrice_](#)
Current pseudo-shadow price estimate down.
- double [upShadowPrice_](#)
Current pseudo-shadow price estimate up.
- double [sumDownDecrease_](#)

Sum down decrease number infeasibilities from strong or actual.

- double [sumUpDecrease_](#)
Sum up decrease number infeasibilities from strong or actual.
- double [lastDownCost_](#)
Last down cost from strong (i.e. as computed by last strong).
- double [lastUpCost_](#)
Last up cost from strong (i.e. as computed by last strong).
- int [lastDownDecrease_](#)
Last down decrease number infeasibilities from strong (i.e. as computed by last strong).
- int [lastUpDecrease_](#)
Last up decrease number infeasibilities from strong (i.e. as computed by last strong).
- int [numberTimesDown_](#)
Number of times we have gone down.
- int [numberTimesUp_](#)
Number of times we have gone up.
- int [numberTimesDownInfeasible_](#)
Number of times we have been infeasible going down.
- int [numberTimesUpInfeasible_](#)
Number of times we have been infeasible going up.
- int [numberBeforeTrust_](#)
Number of branches before we trust.
- int [numberTimesDownLocalFixed_](#)
Number of local probing fixings going down.
- int [numberTimesUpLocalFixed_](#)
Number of local probing fixings going up.
- double [numberTimesDownTotalFixed_](#)
Number of total probing fixings going down.
- double [numberTimesUpTotalFixed_](#)

Number of total probing fixings going up.

- int `numberTimesProbingTotal_`
Number of times probing done.
- int `method_`
Number of times infeasible when tested.

4.89.1 Detailed Description

Define a single integer class but with dynamic pseudo costs. Based on work by Achterberg, Koch and Martin.

It is wild overkill but to keep design all twiddly things are in each. This could be used for fine tuning.

Definition at line 35 of file CbcSimpleIntegerDynamicPseudoCost.hpp.

4.89.2 Member Function Documentation

4.89.2.1 `virtual CbcObjectUpdateData CbcSimpleIntegerDynamicPseudoCost::createUpdateInformation (const OsiSolverInterface * solver, const CbcNode * node, const CbcBranchingObject * branchingObject) [virtual]`

Pass in information on branch just done and create [CbcObjectUpdateData](#) instance.

If object does not need data then backward pointer will be NULL. Assumes can get information from solver

Reimplemented from [CbcObject](#).

4.89.2.2 `virtual OsiSolverBranch* CbcSimpleIntegerDynamicPseudoCost::solverBranch () const [virtual]`

Create an OsiSolverBranch object.

This returns NULL if branch not represented by bound changes

Reimplemented from [CbcObject](#).

4.89.3 Member Data Documentation

4.89.3.1 double

CbcSimpleIntegerDynamicPseudoCost::downDynamicPseudoCost_
[protected]

data

Down pseudo cost

Definition at line 320 of file CbcSimpleIntegerDynamicPseudoCost.hpp.

4.89.3.2 int CbcSimpleIntegerDynamicPseudoCost::method_ [protected]

Number of times infeasible when tested.

Method - 0 - pseudo costs 1 - probing

Definition at line 377 of file CbcSimpleIntegerDynamicPseudoCost.hpp.

The documentation for this class was generated from the following file:

- CbcSimpleIntegerDynamicPseudoCost.hpp

4.90 CbcSimpleIntegerPseudoCost Class Reference

Define a single integer class but with pseudo costs.

```
#include <CbcSimpleIntegerPseudoCost.hpp>
```


Public Member Functions

- virtual [CbcObject](#) * [clone](#) () const
Clone.
- virtual double [infeasibility](#) (const [OsiBranchingInformation](#) *info, int &preferredWay) const
Infeasibility - large is 0.5.
- virtual [CbcBranchingObject](#) * [createCbcBranch](#) ([OsiSolverInterface](#) *solver, const [OsiBranchingInformation](#) *info, int way)
Creates a branching object.
- double [downPseudoCost](#) () const
Down pseudo cost.
- void [setDownPseudoCost](#) (double value)
Set down pseudo cost.
- double [upPseudoCost](#) () const
Up pseudo cost.
- void [setUpPseudoCost](#) (double value)
Set up pseudo cost.
- double [upDownSeparator](#) () const
Up down separator.
- void [setUpDownSeparator](#) (double value)
Set up down separator.
- virtual double [upEstimate](#) () const
Return "up" estimate.
- virtual double [downEstimate](#) () const
Return "down" estimate (default 1.0e-5).
- int [method](#) () const
method - see below for details
- void [setMethod](#) (int value)
Set method.

Protected Attributes

- double `downPseudoCost_`
data
- double `upPseudoCost_`
Up pseudo cost.
- double `upDownSeparator_`
Up/down separator If >0.0 then do first branch up if $value - floor(value) \geq$ this value.
- int `method_`
Method - 0 - normal - return min (up,down) 1 - if before any solution return CoinMax(up,down) 2 - if before branched solution return CoinMax(up,down) 3 - always return CoinMax(up,down).

4.90.1 Detailed Description

Define a single integer class but with pseudo costs.

Definition at line 14 of file CbcSimpleIntegerPseudoCost.hpp.

4.90.2 Member Data Documentation**4.90.2.1 double CbcSimpleIntegerPseudoCost::downPseudoCost_ [protected]**

data

Down pseudo cost

Definition at line 95 of file CbcSimpleIntegerPseudoCost.hpp.

The documentation for this class was generated from the following file:

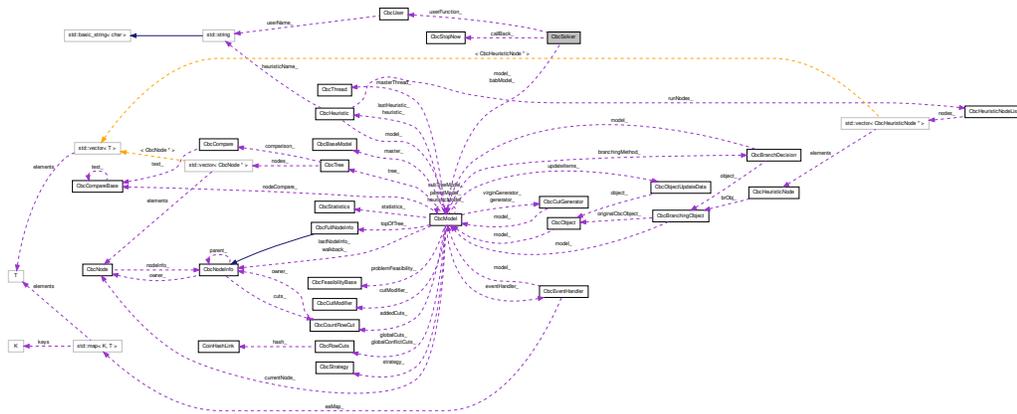
- CbcSimpleIntegerPseudoCost.hpp

4.91 CbcSolver Class Reference

This allows the use of the standalone solver in a flexible manner.

```
#include <CbcSolver.hpp>
```

Collaboration diagram for CbcSolver:



Public Member Functions

Solve method

- `int solve (int argc, const char *argv[], int returnMode)`
This takes a list of commands, does "stuff" and returns returnMode - 0 model and solver untouched - babModel updated 1 model updated - just with solution basis etc 2 model updated i.e.
- `int solve (const char *input, int returnMode)`
This takes a list of commands, does "stuff" and returns returnMode - 0 model and solver untouched - babModel updated 1 model updated - just with solution basis etc 2 model updated i.e.

Constructors and destructors etc

- `CbcSolver ()`
Default Constructor.
- `CbcSolver (const OsiClpSolverInterface &)`
Constructor from solver.
- `CbcSolver (const CbcModel &)`
Constructor from model.
- `CbcSolver (const CbcSolver &rhs)`

Copy constructor .

- [CbcSolver](#) & [operator=](#) (const [CbcSolver](#) &rhs)
Assignment operator.
- [~CbcSolver](#) ()
Destructor.
- void [fillParameters](#) ()
Fill with standard parameters.
- void [fillValuesInSolver](#) ()
Set default values in solvers from parameters.
- void [addUserFunction](#) ([CbcUser](#) *function)
Add user function.
- void [setUserCallBack](#) ([CbcStopNow](#) *function)
Set user call back.
- void [addCutGenerator](#) ([CglCutGenerator](#) *generator)
Add cut generator.

miscellaneous methods to line up with old

- int * [analyze](#) ([OsiClpSolverInterface](#) *solverMod, int &number-Changed, double &increment, bool changeInt, [CoinMessageHandler](#) *generalMessageHandler)
- void [updateModel](#) ([ClpSimplex](#) *model2, int returnMode)
1 - add heuristics to model 2 - do heuristics (and set cutoff and best solution) 3 - for miplib test so skip some (out model later)

useful stuff

- int [intValue](#) ([CbcOrClpParameterType](#) type) const
Get int value.
- void [setIntValue](#) ([CbcOrClpParameterType](#) type, int value)
Set int value.
- double [doubleValue](#) ([CbcOrClpParameterType](#) type) const
Get double value.
- void [setDoubleValue](#) ([CbcOrClpParameterType](#) type, double value)

Set double value.

- `CbcUser * userFunction (const char *name) const`
User function (NULL if no match).
- `CbcModel * model ()`
Return original Cbc model.
- `CbcModel * babModel ()`
Return updated Cbc model.
- `int numberUserFunctions () const`
Number of userFunctions.
- `CbcUser ** userFunctionArray () const`
User function array.
- `OsiClpSolverInterface * originalSolver () const`
Copy of model on initial load (will contain output solutions).
- `CoinModel * originalCoinModel () const`
Copy of model on initial load.
- `void setOriginalSolver (OsiClpSolverInterface *originalSolver)`
Copy of model on initial load (will contain output solutions).
- `void setOriginalCoinModel (CoinModel *originalCoinModel)`
Copy of model on initial load.
- `int numberCutGenerators () const`
Number of cutgenerators.
- `CglCutGenerator ** cutGeneratorArray () const`
Cut generator array.
- `double startTime () const`
Start time.
- `void setPrinting (bool onOff)`
Whether to print to std::cout.
- `void setReadMode (int value)`
Where to start reading commands.

4.91.1 Detailed Description

This allows the use of the standalone solver in a flexible manner. It has an original `OsIcIpSolverInterface` and `CbcModel` which it can use repeatedly, e.g., to get a heuristic solution and then start again.

So I [jjf] will need a primitive scripting language which can then call solve and manipulate solution value and solution arrays.

Also provides for user callback functions. Currently two ideas in gestation, `CbcUser` and `CbcStopNow`. The latter seems limited to deciding whether or not to stop. The former seems completely general, with a notion of importing and exporting, and a 'solve', which should be interpreted as 'do whatever this user function does'.

Parameter initialisation is at last centralised in `fillParameters()`.

Definition at line 56 of file `CbcSolver.hpp`.

4.91.2 Member Function Documentation

4.91.2.1 `int CbcSolver::solve (int argc, const char * argv[], int returnMode)`

This takes a list of commands, does "stuff" and returns returnMode - 0 model and solver untouched - babModel updated 1 model updated - just with solution basis etc 2 model updated i.e.

as babModel (babModel NULL) (only use without preprocessing)

4.91.2.2 `int CbcSolver::solve (const char * input, int returnMode)`

This takes a list of commands, does "stuff" and returns returnMode - 0 model and solver untouched - babModel updated 1 model updated - just with solution basis etc 2 model updated i.e.

as babModel (babModel NULL) (only use without preprocessing)

4.91.2.3 `void CbcSolver::fillValuesInSolver ()`

Set default values in solvers from parameters.

Misleading. The current code actually reads default values from the underlying solvers and installs them as default values for a subset of parameters in `parameters_`.

4.91.2.4 void CbcSolver::updateModel (ClpSimplex * *model2*, int *returnMode*)

1 - add heuristics to model 2 - do heuristics (and set cutoff and best solution) 3 - for miplib test so skip some (out model later)

Updates *model_* from *babModel_* according to *returnMode* *returnMode* - 0 model and solver untouched - *babModel* updated 1 model updated - just with solution basis etc 2 model updated i.e. as *babModel* (*babModel* NULL) (only use without preprocessing)

The documentation for this class was generated from the following file:

- [CbcSolver.hpp](#)

4.92 CbcSolverUsefulData Struct Reference

Structure to hold useful arrays.

```
#include <CbcSolver.hpp>
```

4.92.1 Detailed Description

Structure to hold useful arrays.

Definition at line 240 of file `CbcSolver.hpp`.

The documentation for this struct was generated from the following file:

- [CbcSolver.hpp](#)

4.93 CbcSOS Class Reference

Branching object for Special Ordered Sets of type 1 and 2.

```
#include <CbcSOS.hpp>
```


Clone.

- virtual double [infeasibility](#) (const OsiBranchingInformation *info, int &preferredWay) const
Infeasibility - large is 0.5.
- virtual void [feasibleRegion](#) ()
This looks at solution and sets bounds to contain solution.
- virtual [CbcBranchingObject](#) * [createCbcBranch](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way)
Creates a branching object.
- virtual [CbcObjectUpdateData](#) [createUpdateInformation](#) (const OsiSolverInterface *solver, const [CbcNode](#) *node, const [CbcBranchingObject](#) *branchingObject)
Pass in information on branch just done and create [CbcObjectUpdateData](#) instance.
- virtual void [updateInformation](#) (const [CbcObjectUpdateData](#) &data)
Update object by [CbcObjectUpdateData](#).
- virtual OsiSolverBranch * [solverBranch](#) () const
Create an OsiSolverBranch object.
- virtual void [redoSequenceEtc](#) ([CbcModel](#) *model, int numberColumns, const int *originalColumns)
Redoes data when sequence numbers change.
- OsiSOS * [osiObject](#) (const OsiSolverInterface *solver) const
Construct an OsiSOS object.
- int [numberMembers](#) () const
Number of members.
- const int * [members](#) () const
Members (indices in range 0 ... numberColumns-1).
- int [sosType](#) () const
SOS type.
- int [numberTimesDown](#) () const
Down number times.

- int `numberTimesUp` () const
Up number times.
- const double * `weights` () const
Array of weights.
- void `setNumberMembers` (int n)
Set number of members.
- int * `mutableMembers` () const
Members (indices in range 0 ... numberColumns-1).
- double * `mutableWeights` () const
Array of weights.
- virtual bool `canDoHeuristics` () const
Return true if object can take part in normal heuristics.
- void `setIntegerValued` (bool yesNo)
Set whether set is integer valued or not.

4.93.1 Detailed Description

Branching object for Special Ordered Sets of type 1 and 2. SOS1 are an ordered set of variables where at most one variable can be non-zero. SOS1 are commonly defined with binary variables (interpreted as selection between alternatives) but this is not necessary. An SOS1 with all binary variables is a special case of a clique (setting any one variable to 1 forces all others to 0).

In theory, the implementation makes no assumptions about integrality in Type 1 sets. In practice, there are places where the code seems to have been written with a binary SOS mindset. Current development of SOS branching objects is proceeding in OsiSOS.

SOS2 are an ordered set of variables in which at most two consecutive variables can be non-zero and must sum to 1 (interpreted as interpolation between two discrete values). By definition the variables are non-integer.

Definition at line 29 of file CbcSOS.hpp.

4.93.2 Constructor & Destructor Documentation

4.93.2.1 CbcSOS::CbcSOS (CbcModel * *model*, int *numberMembers*, const int * *which*, const double * *weights*, int *identifier*, int *type* = 1)

Constructor with SOS type and member information.

Type specifies SOS 1 or 2. Identifier is an arbitrary value.

Which should be an array of variable indices with numberMembers entries. Weights can be used to assign arbitrary weights to variables, in the order they are specified in which. If no weights are provided, a default array of 0, 1, 2, ... is generated.

4.93.3 Member Function Documentation

4.93.3.1 virtual CbcObjectUpdateData CbcSOS::createUpdateInformation (const OsiSolverInterface * *solver*, const CbcNode * *node*, const CbcBranchingObject * *branchingObject*) [virtual]

Pass in information on branch just done and create [CbcObjectUpdateData](#) instance.

If object does not need data then backward pointer will be NULL. Assumes can get information from solver

Reimplemented from [CbcObject](#).

4.93.3.2 virtual OsiSolverBranch* CbcSOS::solverBranch () const [virtual]

Create an OsiSolverBranch object.

This returns NULL if branch not represented by bound changes

Reimplemented from [CbcObject](#).

The documentation for this class was generated from the following file:

- CbcSOS.hpp

4.94 CbcSOSBranchingObject Class Reference

Branching object for Special ordered sets.

- virtual double [branch](#) ()
Does next branch and updates state.
- virtual void [fix](#) (OsiSolverInterface *solver, double *lower, double *upper, int branchState) const
Update bounds in solver as in 'branch' and update given bounds.
- virtual void [previousBranch](#) ()
Reset every information so that the branching object appears to point to the previous child.
- virtual void [print](#) ()
Print something about branch - only if log level high.
- virtual CbcBranchObjType [type](#) () const
Return the type (an integer identifier) of this.
- virtual int [compareOriginalObject](#) (const CbcBranchingObject *brObj) const
Compare the original object of this with the original object of brObj.
- virtual CbcRangeCompare [compareBranchingObject](#) (const CbcBranchingObject *brObj, const bool replaceIfOverlap=false)
Compare the this with brObj.
- void [computeNonzeroRange](#) ()
Fill out the firstNonzero_ and lastNonzero_ data members.

4.94.1 Detailed Description

Branching object for Special ordered sets. Variable_ is the set id number (redundant, as the object also holds a pointer to the set).

Definition at line 189 of file CbcSOS.hpp.

4.94.2 Member Function Documentation

- 4.94.2.1** `virtual void CbcSOSBranchingObject::fix (OsiSolverInterface * solver, double * lower, double * upper, int branchState) const [virtual]`

Update bounds in solver as in 'branch' and update given bounds.

branchState is -1 for 'down' +1 for 'up'

Reimplemented from [CbcBranchingObject](#).

4.94.2.2 virtual void CbcSOSBranchingObject::previousBranch ()
[inline, virtual]

Reset every information so that the branching object appears to point to the previous child.

This method does not need to modify anything in any solver.

Reimplemented from [CbcBranchingObject](#).

Definition at line 225 of file CbcSOS.hpp.

4.94.2.3 virtual int CbcSOSBranchingObject::compareOriginalObject (const CbcBranchingObject * brObj) const [virtual]

Compare the original object of `this` with the original object of `brObj`.

Assumes that there is an ordering of the original objects. This method should be invoked only if `this` and `brObj` are of the same type. Return negative/0/positive depending on whether `this` is smaller/same/larger than the argument.

Reimplemented from [CbcBranchingObject](#).

4.94.2.4 virtual CbcRangeCompare CbcSOSBranchingObject::compareBranchingObject (const CbcBranchingObject * brObj, const bool replaceIfOverlap = false) [virtual]

Compare the `this` with `brObj`.

`this` and `brObj` must be of the same type and must have the same original object, but they may have different feasible regions. Return the appropriate `CbcRangeCompare` value (first argument being the sub/superset if that's the case). In case of overlap (and if `replaceIfOverlap` is true) replace the current branching object with one whose feasible region is the overlap.

Implements [CbcBranchingObject](#).

The documentation for this class was generated from the following file:

- CbcSOS.hpp

4.95 CbcStatistics Class Reference

For gathering statistics.

```
#include <CbcStatistics.hpp>
```

Protected Attributes

- double `value_`
Value.
- double `startingObjective_`
Starting objective.
- double `endingObjective_`
Ending objective.
- int `id_`
id
- int `parentId_`
parent id
- int `way_`
way -1 or +1 is first branch -10 or +10 is second branch
- int `sequence_`
sequence number branched on
- int `depth_`
depth
- int `startingInfeasibility_`
starting number of integer infeasibilities
- int `endingInfeasibility_`
ending number of integer infeasibilities
- int `numberIterations_`
number of iterations

4.95.1 Detailed Description

For gathering statistics.

Definition at line 13 of file CbcStatistics.hpp.

The documentation for this class was generated from the following file:

- CbcStatistics.hpp

4.96 CbcStopNow Class Reference

Support the use of a call back class to decide whether to stop.

```
#include <CbcSolver.hpp>
```

Public Member Functions

Decision methods

- virtual int [callBack](#) ([CbcModel](#) *, int)
Import.

Constructors and destructors etc

- [CbcStopNow](#) ()
Default Constructor.
- [CbcStopNow](#) (const [CbcStopNow](#) &rhs)
Copy constructor .
- [CbcStopNow](#) & [operator=](#) (const [CbcStopNow](#) &rhs)
Assignment operator.
- virtual [CbcStopNow](#) * [clone](#) () const
Clone.
- virtual [~CbcStopNow](#) ()
Destructor.

4.96.1 Detailed Description

Support the use of a call back class to decide whether to stop. Definitely under construction.

Definition at line 351 of file CbcSolver.hpp.

4.96.2 Member Function Documentation

4.96.2.1 `virtual int CbcStopNow::callBack (CbcModel *, int) [inline, virtual]`

Import.

Values for whereFrom:

- 1 after initial solve by dualsimplex etc
- 2 after preprocessing
- 3 just before branchAndBound (so user can override)
- 4 just after branchAndBound (before postprocessing)
- 5 after postprocessing
- 6 after a user called heuristic phase

Returns

0 if good nonzero return code to stop

Definition at line 369 of file CbcSolver.hpp.

The documentation for this class was generated from the following file:

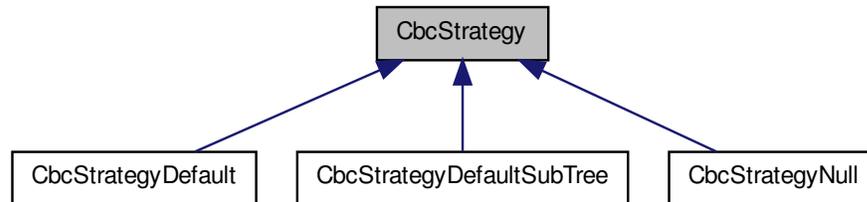
- [CbcSolver.hpp](#)

4.97 CbcStrategy Class Reference

Strategy base class.

```
#include <CbcStrategy.hpp>
```

Inheritance diagram for CbcStrategy:



Public Member Functions

- virtual `CbcStrategy * clone () const =0`
Clone.
- virtual void `setupCutGenerators (CbcModel &model)=0`
Setup cut generators.
- virtual void `setupHeuristics (CbcModel &model)=0`
Setup heuristics.
- virtual void `setupPrinting (CbcModel &model, int modelLogLevel)=0`
Do printing stuff.
- virtual void `setupOther (CbcModel &model)=0`
Other stuff e.g. strong branching and preprocessing.
- void `setNested (int depth)`
Set model depth (i.e. how nested).
- int `getNested () const`
Get model depth (i.e. how nested).
- void `setPreProcessState (int state)`
Say preProcessing done.
- int `preProcessState () const`

See what sort of preprocessing was done.

- CglPreProcess * [process](#) () const
Pre-processing object.
- void [deletePreProcess](#) ()
Delete pre-processing object to save memory.
- virtual [CbcNodeInfo](#) * [fullNodeInfo](#) ([CbcModel](#) *model, int numberOfRowsAtContinuous) const
Return a new Full node information pointer (descendant of [CbcFullNodeInfo](#)).
- virtual [CbcNodeInfo](#) * [partialNodeInfo](#) ([CbcModel](#) *model, [CbcNodeInfo](#) *parent, [CbcNode](#) *owner, int numberChangedBounds, const int *variables, const double *boundChanges, const CoinWarmStartDiff *basisDiff) const
Return a new Partial node information pointer (descendant of [CbcPartialNodeInfo](#)).
- virtual void [generateCpp](#) (FILE *)
Create C++ lines to get to current state.
- virtual int [status](#) ([CbcModel](#) *model, [CbcNodeInfo](#) *parent, int whereFrom)
After a [CbcModel::resolve](#) this can return a status -1 no effect 0 treat as optimal 1 as 0 but do not do any more resolves (i.e.

Protected Attributes

- int [depth_](#)
Model depth.
- int [preProcessState_](#)
PreProcessing state - -1 infeasible 0 off 1 was done (so need post-processing).
- CglPreProcess * [process_](#)
If preprocessing then this is object.

4.97.1 Detailed Description

Strategy base class.

Definition at line 18 of file CbcStrategy.hpp.

4.97.2 Member Function Documentation

4.97.2.1 `virtual int CbcStrategy::status (CbcModel * model, CbcNodeInfo * parent, int whereFrom) [virtual]`

After a `CbcModel::resolve` this can return a status -1 no effect 0 treat as optimal 1 as 0 but do not do any more resolves (i.e.

no more cuts) 2 treat as infeasible

The documentation for this class was generated from the following file:

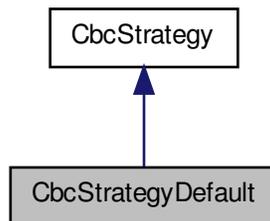
- CbcStrategy.hpp

4.98 CbcStrategyDefault Class Reference

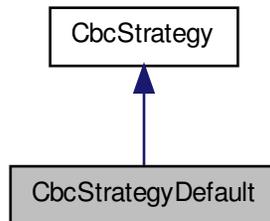
Default class.

```
#include <CbcStrategy.hpp>
```

Inheritance diagram for CbcStrategyDefault:



Collaboration diagram for CbcStrategyDefault:



Public Member Functions

- virtual [CbcStrategy](#) * [clone](#) () const
Clone.
- virtual void [setupCutGenerators](#) ([CbcModel](#) &model)
Setup cut generators.
- virtual void [setupHeuristics](#) ([CbcModel](#) &model)
Setup heuristics.
- virtual void [setupPrinting](#) ([CbcModel](#) &model, int modelLogLevel)
Do printing stuff.
- virtual void [setupOther](#) ([CbcModel](#) &model)
Other stuff e.g. strong branching.
- void [setupPreProcessing](#) (int desired=1, int passes=10)
Set up preProcessing - see below.
- int [desiredPreProcess](#) () const
See what sort of preprocessing wanted.
- int [preProcessPasses](#) () const
See how many passes wanted.

- virtual void [generateCpp](#) (FILE *fp)
Create C++ lines to get to current state.

Protected Attributes

- int [desiredPreProcess_](#)
Desired pre-processing 0 - none 1 - ordinary 2 - find sos 3 - find cliques 4 - more aggressive sos 5 - add integer slacks.
- int [preProcessPasses_](#)
Number of pre-processing passes.

4.98.1 Detailed Description

Default class.

Definition at line 131 of file CbcStrategy.hpp.

The documentation for this class was generated from the following file:

- CbcStrategy.hpp

4.99 CbcStrategyDefaultSubTree Class Reference

Default class for sub trees.

```
#include <CbcStrategy.hpp>
```


- virtual void [setupPrinting](#) (CbcModel &model, int modelLogLevel)
Do printing stuff.
- virtual void [setupOther](#) (CbcModel &model)
Other stuff e.g. strong branching.

4.99.1 Detailed Description

Default class for sub trees.

Definition at line 209 of file CbcStrategy.hpp.

The documentation for this class was generated from the following file:

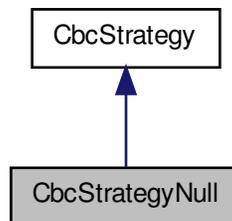
- CbcStrategy.hpp

4.100 CbcStrategyNull Class Reference

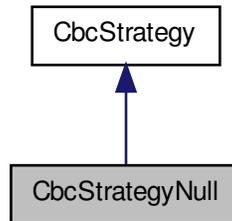
Null class.

```
#include <CbcStrategy.hpp>
```

Inheritance diagram for CbcStrategyNull:



Collaboration diagram for CbcStrategyNull:



Public Member Functions

- virtual [CbcStrategy](#) * [clone](#) () const
Clone.
- virtual void [setupCutGenerators](#) ([CbcModel](#) &)
Setup cut generators.
- virtual void [setupHeuristics](#) ([CbcModel](#) &)
Setup heuristics.
- virtual void [setupPrinting](#) ([CbcModel](#) &, int)
Do printing stuff.
- virtual void [setupOther](#) ([CbcModel](#) &)
Other stuff e.g. strong branching.

4.100.1 Detailed Description

Null class.

Definition at line 95 of file CbcStrategy.hpp.

The documentation for this class was generated from the following file:

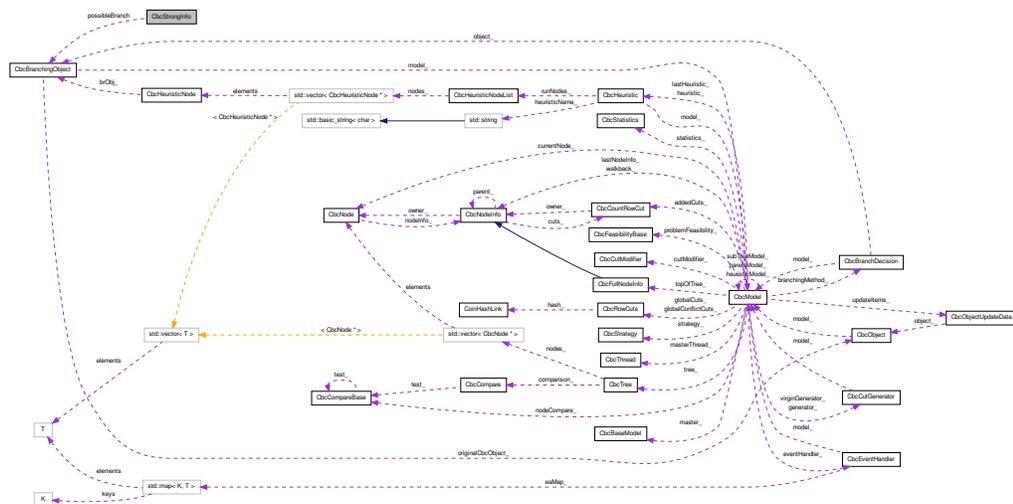
- CbcStrategy.hpp

4.101 CbcStrongInfo Struct Reference

Abstract base class for ‘objects’.

```
#include <CbcObject.hpp>
```

Collaboration diagram for CbcStrongInfo:



4.101.1 Detailed Description

Abstract base class for ‘objects’. It now just has stuff that `OsiObject` does not have

The branching model used in Cbc is based on the idea of an *object*. In the abstract, an object is something that has a feasible region, can be evaluated for infeasibility, can be branched on (*i.e.*, there’s some constructive action to be taken to move toward feasibility), and allows comparison of the effect of branching.

This class ([CbcObject](#)) is the base class for an object. To round out the branching model, the class [CbcBranchingObject](#) describes how to perform a branch, and the class [CbcBranchDecision](#) describes how to compare two `CbcBranchingObjects`.

To create a new type of object you need to provide three methods: `infeasibility()`, `feasibleRegion()`, and `createCbcBranch()`, described below.

This base class is primarily virtual to allow for any form of structure. Any form of discontinuity is allowed.

Definition at line 51 of file `CbcObject.hpp`.

The documentation for this struct was generated from the following file:

- CbcObject.hpp

4.102 CbcThread Class Reference

A class to encapsulate thread stuff.

```
#include <CbcThread.hpp>
```

4.102.1 Detailed Description

A class to encapsulate thread stuff.

Definition at line 418 of file CbcThread.hpp.

The documentation for this class was generated from the following file:

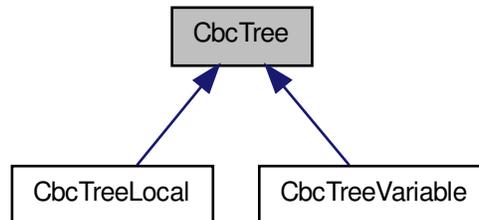
- CbcThread.hpp

4.103 CbcTree Class Reference

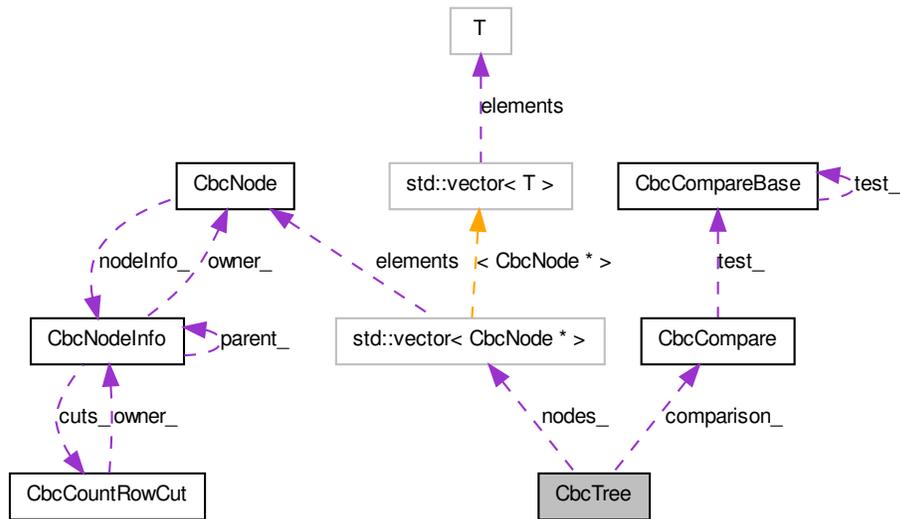
Using MS heap implementation.

```
#include <CbcTree.hpp>
```

Inheritance diagram for CbcTree:



Collaboration diagram for CbcTree:



Public Member Functions

Constructors and related

- [CbcTree](#) ()
Default Constructor.
- [CbcTree](#) (const [CbcTree](#) &rhs)
Copy constructor.
- [CbcTree](#) & [operator=](#) (const [CbcTree](#) &rhs)
= operator
- virtual [~CbcTree](#) ()
Destructor.
- virtual [CbcTree](#) * [clone](#) () const
Clone.

- virtual void `generateCpp` (FILE *)
Create C++ lines to get to current state.

Heap access and maintenance methods

- void `setComparison` (CbcCompareBase &compare)
Set comparison function and resort heap.
- virtual CbcNode * `top` () const
Return the top node of the heap.
- virtual void `push` (CbcNode *x)
Add a node to the heap.
- virtual void `pop` ()
Remove the top node from the heap.
- virtual CbcNode * `bestNode` (double cutoff)
Gets best node and takes off heap.
- virtual void `rebuild` ()
Rebuild the heap.

Direct node access methods

- virtual bool `empty` ()
Test for an empty tree.
- virtual int `size` () const
Return size.
- CbcNode * `operator[]` (int i) const
Return a node pointer.
- CbcNode * `nodePointer` (int i) const
Return a node pointer.
- void `realpop` ()
- void `fixTop` ()
After changing data in the top node, fix the heap.
- void `realpush` (CbcNode *node)

Search tree maintenance

- virtual void `cleanTree` (`CbcModel *model`, double cutoff, double &bestPossibleObjective)
Prune the tree using an objective function cutoff.
- `CbcNode * bestAlternate` ()
Get best on list using alternate method.
- virtual void `endSearch` ()
We may have got an intelligent tree so give it one more chance.
- virtual double `getBestPossibleObjective` ()
Get best possible objective function in the tree.
- void `resetNodeNumbers` ()
Reset maximum node number.
- int `maximumNodeNumber` () const
Get maximum node number.
- void `setNumberBranching` (int value)
Set number of branches.
- int `getNumberBranching` () const
Get number of branches.
- void `setMaximumBranching` (int value)
Set maximum branches.
- int `getMaximumBranching` () const
Get maximum branches.
- unsigned int * `branched` () const
Get branched variables.
- int * `newBounds` () const
Get bounds.
- void `addBranchingInformation` (const `CbcModel *model`, const `CbcNodeInfo *nodeInfo`, const double *currentLower, const double *currentUpper)
Adds branching information to complete state.
- void `increaseSpace` ()
Increase space for data.

Protected Attributes

- `std::vector< CbcNode * > nodes_`
Storage vector for the heap.
- `CbcCompare comparison_`
Sort predicate for heap ordering.
- `int maximumNodeNumber_`
Maximum "node" number so far to split ties.
- `int numberBranching_`
Size of variable list.
- `int maximumBranching_`
Maximum size of variable list.
- `unsigned int * branched_`
Integer variables branched or bounded top bit set if new upper bound next bit set if a branch.
- `int * newBound_`
New bound.

4.103.1 Detailed Description

Using MS heap implementation. It's unclear if this is needed any longer, or even if it should be allowed. Cbc occasionally tries to do things to the tree (typically tweaking the comparison predicate) that can cause a violation of the heap property (parent better than either child). In a debug build, Microsoft's heap implementation does checks that detect this and fail. This symbol switched to an alternate implementation of `CbcTree`, and there are clearly differences, but no explanation as to why or what for.

As of 100921, the code is cleaned up to make it through 'cbc -unitTest' without triggering 'Invalid heap' in an MSVS debug build. The method `validateHeap()` can be used for debugging if this turns up again.

Controls search tree debugging In order to have `validateHeap()` available, set `CBC_DEBUG_HEAP` to 1 or higher.

- 1 calls `validateHeap()` after each change to the heap
- 2 will print a line for major operations (clean, set comparison, etc.)

- 3 will print information about each push and pop

define CBC_DEBUG_HEAP 1

Implementation of the live set as a heap.

This class is used to hold the set of live nodes in the search tree.

Definition at line 53 of file CbcTree.hpp.

4.103.2 Member Function Documentation

4.103.2.1 virtual CbcNode* CbcTree::bestNode (double *cutoff*) [virtual]

Gets best node and takes off heap.

Before returning the node from the top of the heap, the node is offered an opportunity to reevaluate itself. Callers should be prepared to check that the node returned is suitable for use.

4.103.2.2 virtual void CbcTree::cleanTree (CbcModel * *model*, double *cutoff*, double & *bestPossibleObjective*) [virtual]

Prune the tree using an objective function cutoff.

This routine removes all nodes with objective worse than the specified cutoff value. It also sets bestPossibleObjective to the best objective over remaining nodes.

The documentation for this class was generated from the following file:

- CbcTree.hpp

Heap access and maintenance methods

- virtual `CbcNode * top () const`
Return the top node of the heap.
- virtual void `push (CbcNode *x)`
Add a node to the heap.
- virtual void `pop ()`
Remove the top node from the heap.

Other stuff

- int `createCut (const double *solution, OsiRowCut &cut)`
Create cut - return -1 if bad, 0 if okay and 1 if cut is everything.
- virtual bool `empty ()`
*Test if empty *** note may be overridden.*
- virtual void `endSearch ()`
We may have got an intelligent tree so give it one more chance.
- void `reverseCut (int state, double bias=0.0)`
Other side of last cut branch (if bias==rhs_ will be weakest possible).
- void `deleteCut (OsiRowCut &cut)`
Delete last cut branch.
- void `passInSolution (const double *solution, double solutionValue)`
Pass in solution (so can be used after heuristic).
- int `range () const`
- void `setRange (int value)`
- int `typeCuts () const`
- void `setTypeCuts (int value)`
- int `maxDiversification () const`
- void `setMaxDiversification (int value)`
- int `timeLimit () const`
- void `setTimeLimit (int value)`
- int `nodeLimit () const`
- void `setNodeLimit (int value)`
- bool `refine () const`
- void `setRefine (bool yesNo)`

Public Member Functions

- virtual `CbcTree * clone ()` const
Clone.
- virtual void `generateCpp (FILE *fp)`
Create C++ lines to get to current state.

Heap access and maintenance methods

- virtual `CbcNode * top ()` const
Return the top node of the heap.
- virtual void `push (CbcNode *x)`
Add a node to the heap.
- virtual void `pop ()`
Remove the top node from the heap.

Other stuff

- int `createCut (const double *solution, OsiRowCut &cut)`
Create cut - return -1 if bad, 0 if okay and 1 if cut is everything.
- virtual bool `empty ()`
*Test if empty *** note may be overridden.*
- virtual void `endSearch ()`
We may have got an intelligent tree so give it one more chance.
- void `reverseCut (int state, double bias=0.0)`
Other side of last cut branch (if bias==rhs_ will be weakest possible).
- void `deleteCut (OsiRowCut &cut)`
Delete last cut branch.
- void `passInSolution (const double *solution, double solutionValue)`
Pass in solution (so can be used after heuristic).
- int `range ()` const
- void `setRange (int value)`
- int `typeCuts ()` const
- void `setTypeCuts (int value)`

- int **maxDiversification** () const
- void **setMaxDiversification** (int value)
- int **timeLimit** () const
- void **setTimeLimit** (int value)
- int **nodeLimit** () const
- void **setNodeLimit** (int value)
- bool **refine** () const
- void **setRefine** (bool yesNo)

4.105.1 Detailed Description

Definition at line 206 of file CbcTreeLocal.hpp.

The documentation for this class was generated from the following file:

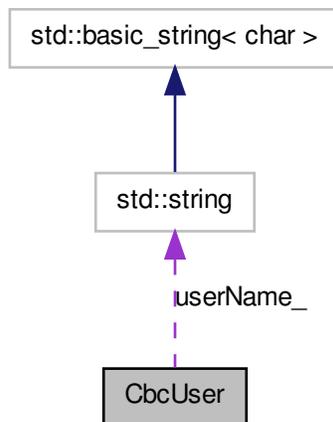
- CbcTreeLocal.hpp

4.106 CbcUser Class Reference

A class to allow the use of unknown user functionality.

```
#include <CbcSolver.hpp>
```

Collaboration diagram for CbcUser:



Public Member Functions

import/export methods

- virtual int `importData` (`CbcSolver *`, int &, char **) *Import - gets full command arguments.*
- virtual void `exportSolution` (`CbcSolver *`, int, const char *=`NULL`) *Export.*
- virtual void `exportData` (`CbcSolver *`) *Export Data (i.e. at very end).*
- virtual void `fillInformation` (`CbcSolver *`, `CbcSolverUsefulData` &) *Get useful stuff.*

usage methods

- `CoinModel *` `coinModel` () const *CoinModel if valid.*
- virtual void * `stuff` () *Other info - needs expanding.*
- std::string `name` () const *Name.*
- virtual void `solve` (`CbcSolver *`model, const char *options)=0 *Solve (whatever that means).*
- virtual bool `canDo` (const char *options)=0 *Returns true if function knows about option.*

Constructors and destructors etc

- `CbcUser` () *Default Constructor.*
- `CbcUser` (const `CbcUser` &rhs) *Copy constructor.*
- `CbcUser` & `operator=` (const `CbcUser` &rhs) *Assignment operator.*

- virtual `CbcUser * clone () const =0`
Clone.
- virtual `~CbcUser ()`
Destructor.

Protected Attributes

Private member data

- `CoinModel * coinModel_`
CoinModel.
- `std::string userName_`
Name of user function.

4.106.1 Detailed Description

A class to allow the use of unknown user functionality. For example, access to a modelling language (CbcAmpl).

Definition at line 260 of file CbcSolver.hpp.

4.106.2 Member Function Documentation

4.106.2.1 `virtual int CbcUser::importData (CbcSolver *, int &, char **)` `[inline, virtual]`

Import - gets full command arguments.

Returns

- -1 - no action
- 0 - data read in without error
- 1 - errors

Definition at line 272 of file CbcSolver.hpp.

4.106.2.2 `virtual void CbcUser::exportSolution (CbcSolver *, int, const char * = NULL) [inline, virtual]`

Export.

Values for mode:

- 1 OsiClpSolver
- 2 [CbcModel](#)
- add 10 if infeasible from odd situation

Definition at line 283 of file CbcSolver.hpp.

The documentation for this class was generated from the following file:

- [CbcSolver.hpp](#)

4.107 CglTemporary Class Reference

Stored Temporary Cut Generator Class - destroyed after first use.

```
#include <CbcLinked.hpp>
```

Public Member Functions

Generate Cuts

- virtual void [generateCuts](#) (const OsiSolverInterface &si, OsiCuts &cs, const CglTreeInfo info=CglTreeInfo())
Generate Mixed Integer Stored cuts for the model of the solver interface, si.

Constructors and destructors

- [CglTemporary](#) ()
Default constructor.
- [CglTemporary](#) (const [CglTemporary](#) &rhs)
Copy constructor.
- virtual CglCutGenerator * [clone](#) () const
Clone.

- [CglTemporary](#) & operator= (const [CglTemporary](#) &rhs)
Assignment operator.
- virtual [~CglTemporary](#) ()
Destructor.

4.107.1 Detailed Description

Stored Temporary Cut Generator Class - destroyed after first use.

Definition at line 1266 of file CbcLinked.hpp.

4.107.2 Member Function Documentation

4.107.2.1 virtual void CglTemporary::generateCuts (const OsiSolverInterface & si, OsiCuts & cs, const CglTreeInfo info = CglTreeInfo ()) [virtual]

Generate Mixed Integer Stored cuts for the model of the solver interface, si.

Insert the generated cuts into OsiCut, cs.

This generator just looks at previously stored cuts and inserts any that are violated by enough

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.108 CbcGenCtlBlk::chooseStrongCtl_struct Struct Reference

Control variables for a strong branching method.

```
#include <CbcGenCtlBlk.hpp>
```

4.108.1 Detailed Description

Control variables for a strong branching method. Consult OsiChooseVariable and [Cbc-Model](#) for details. An artifact of the changeover from CbcObjects to OsiObjects is that the number of uses before pseudo costs are trusted (numBeforeTrust_) and the number of variables evaluated with strong branching (numStrong_) are parameters of [CbcModel](#).

Definition at line 765 of file CbcGenCtlBlk.hpp.

The documentation for this struct was generated from the following file:

- CbcGenCtlBlk.hpp

4.109 ClpAmplObjective Class Reference

Ampl Objective Class.

```
#include <ClpAmplObjective.hpp>
```

Public Member Functions

Stuff

- virtual double * [gradient](#) (const ClpSimplex *model, const double *solution, double &offset, bool refresh, int includeLinear=2)
Returns gradient.
- virtual double [reducedGradient](#) (ClpSimplex *model, double *region, bool useFeasibleCosts)
Resize objective.
- virtual double [stepLength](#) (ClpSimplex *model, const double *solution, const double *change, double maximumTheta, double ¤tObj, double &predictedObj, double &thetaObj)
*Returns step length which gives minimum of objective for solution + theta * change vector up to maximum theta.*
- virtual double [objectiveValue](#) (const ClpSimplex *model, const double *solution) const
Return objective value (without any ClpModel offset) (model may be NULL).
- virtual void [resize](#) (int newNumberColumns)
- virtual void [deleteSome](#) (int numberToDelete, const int *which)
Delete columns in objective.
- virtual void [reallyScale](#) (const double *columnScale)
Scale objective.
- virtual int [markNonlinear](#) (char *which)
Given a zeroed array sets nonlinear columns to 1.
- virtual void [newXValues](#) ()
Say we have new primal solution - so may need to recompute.

Constructors and destructors

- [ClpAmplObjective](#) ()
Default Constructor.
- [ClpAmplObjective](#) (void *amplInfo)
Constructor from ampl info.
- [ClpAmplObjective](#) (const [ClpAmplObjective](#) &rhs)
Copy constructor .
- [ClpAmplObjective](#) & operator= (const [ClpAmplObjective](#) &rhs)
Assignment operator.
- virtual ~[ClpAmplObjective](#) ()
Destructor.
- virtual [ClpObjective](#) * [clone](#) () const
Clone.

Gets and sets

- double * [linearObjective](#) () const
Linear objective.

4.109.1 Detailed Description

Ampl Objective Class.

Definition at line 18 of file ClpAmplObjective.hpp.

4.109.2 Member Function Documentation
**4.109.2.1 virtual double* ClpAmplObjective::gradient (const ClpSimplex *
model, const double * *solution*, double & *offset*, bool *refresh*, int
includeLinear = 2) [virtual]**

Returns gradient.

If Ampl then solution may be NULL, also returns an offset (to be added to current one)
 If refresh is false then uses last solution Uses model for scaling includeLinear 0 - no, 1
 as is, 2 as feasible

4.109.2.2 `virtual double ClpAmplObjective::reducedGradient (ClpSimplex *
model, double * region, bool useFeasibleCosts) [virtual]`

Resize objective.

Returns reduced gradient>Returns an offset (to be added to current one).

4.109.2.3 `virtual double ClpAmplObjective::stepLength (ClpSimplex *
model, const double * solution, const double * change, double
maximumTheta, double & currentObj, double & predictedObj,
double & thetaObj) [virtual]`

Returns step length which gives minimum of objective for solution + theta * change vector up to maximum theta.

arrays are numberColumns+numberRows Also sets current objective, predicted and at maximumTheta

4.109.2.4 `virtual int ClpAmplObjective::markNonlinear (char * which)
[virtual]`

Given a zeroed array sets nonlinear columns to 1.

Returns number of nonlinear columns

The documentation for this class was generated from the following file:

- ClpAmplObjective.hpp

4.110 ClpConstraintAmpl Class Reference

Ampl Constraint Class.

```
#include <ClpConstraintAmpl.hpp>
```

Public Member Functions

Stuff

- virtual int [gradient](#) (const ClpSimplex *model, const double *solution, double *gradient, double &functionValue, double &offset, bool useScaling=false, bool refresh=true) const

Fills gradient.

- virtual void [resize](#) (int newNumberColumns)
Resize constraint.
- virtual void [deleteSome](#) (int numberToDelete, const int *which)
Delete columns in constraint.
- virtual void [reallyScale](#) (const double *columnScale)
Scale constraint.
- virtual int [markNonlinear](#) (char *which) const
Given a zeroed array sets nonampl columns to 1.
- virtual int [markNonzero](#) (char *which) const
Given a zeroed array sets possible nonzero coefficients to 1.
- virtual void [newXValues](#) ()
Say we have new primal solution - so may need to recompute.

Constructors and destructors

- [ClpConstraintAmpl](#) ()
Default Constructor.
- [ClpConstraintAmpl](#) (int row, void *amplInfo)
Constructor from ampl.
- [ClpConstraintAmpl](#) (const [ClpConstraintAmpl](#) &rhs)
Copy constructor .
- [ClpConstraintAmpl](#) & [operator=](#) (const [ClpConstraintAmpl](#) &rhs)
Assignment operator.
- virtual [~ClpConstraintAmpl](#) ()
Destructor.
- virtual [ClpConstraint](#) * [clone](#) () const
Clone.

Gets and sets

- virtual int [numberCoefficients](#) () const
Number of coefficients.

- const int * `column` () const
Columns.
- const double * `coefficient` () const
Coefficients.

4.110.1 Detailed Description

Ampl Constraint Class.

Definition at line 17 of file ClpConstraintAmpl.hpp.

4.110.2 Member Function Documentation

4.110.2.1 `virtual int ClpConstraintAmpl::gradient (const ClpSimplex * model, const double * solution, double * gradient, double & functionValue, double & offset, bool useScaling = false, bool refresh = true) const [virtual]`

Fills gradient.

If Ampl then solution may be NULL, also returns true value of function and offset so we can use x not deltaX in constraint If refresh is false then uses last solution Uses model for scaling Returns non-zero if gradient undefined at current solution

4.110.2.2 `virtual int ClpConstraintAmpl::markNonlinear (char * which) const [virtual]`

Given a zeroed array sets nonampl columns to 1.

Returns number of nonampl columns

4.110.2.3 `virtual int ClpConstraintAmpl::markNonzero (char * which) const [virtual]`

Given a zeroed array sets possible nonzero coefficients to 1.

Returns number of nonzeros

The documentation for this class was generated from the following file:

- ClpConstraintAmpl.hpp

4.111 CoinHashLink Struct Reference

Really for Conflict cuts to - a) stop duplicates b) allow half baked cuts The whichRow_ field in OsiRowCut2 is used for a type 0 - normal 1 - processed cut 2 - unprocessed cut i.e.

```
#include <CbCCountRowCut.hpp>
```

4.111.1 Detailed Description

Really for Conflict cuts to - a) stop duplicates b) allow half baked cuts The whichRow_ field in OsiRowCut2 is used for a type 0 - normal 1 - processed cut 2 - unprocessed cut i.e. dual ray computation

Definition at line 131 of file CbcCountRowCut.hpp.

The documentation for this struct was generated from the following file:

- CbcCountRowCut.hpp

4.112 CbcGenCtlBlk::debugSolInfo_struct Struct Reference

Array of primal variable values for debugging.

```
#include <CbcGenCtlBlk.hpp>
```

4.112.1 Detailed Description

Array of primal variable values for debugging. Used to provide a known optimal solution to activateRowCutDebugger().

Definition at line 669 of file CbcGenCtlBlk.hpp.

The documentation for this struct was generated from the following file:

- CbcGenCtlBlk.hpp

4.113 CbcGenCtlBlk::djFixCtl_struct Struct Reference

Control use of reduced cost fixing prior to B&C.

```
#include <CbcGenCtlBlk.hpp>
```

4.113.1 Detailed Description

Control use of reduced cost fixing prior to B&C. This heuristic fixes variables whose reduced cost for the root relaxation exceeds the specified threshold. This is purely a heuristic, performed before there's any incumbent solution. It may well fix variables at the wrong bound!

Definition at line 739 of file CbcGenCtlBlk.hpp.

The documentation for this struct was generated from the following file:

- CbcGenCtlBlk.hpp

4.114 CbcGenCtlBlk::genParamsInfo_struct Struct Reference

Start and end of cbc-generic parameters in parameter vector.

```
#include <CbcGenCtlBlk.hpp>
```

4.114.1 Detailed Description

Start and end of cbc-generic parameters in parameter vector.

Definition at line 598 of file CbcGenCtlBlk.hpp.

The documentation for this struct was generated from the following file:

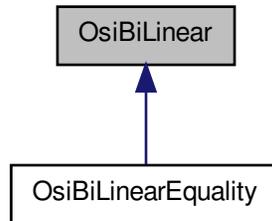
- CbcGenCtlBlk.hpp

4.115 OsiBiLinear Class Reference

Define BiLinear objects.

```
#include <CbcLinked.hpp>
```

Inheritance diagram for OsiBiLinear:



Public Member Functions

- [OsiBiLinear](#) (OsiSolverInterface *solver, int xColumn, int yColumn, int xyRow, double coefficient, double xMesh, double yMesh, int numberExistingObjects=0, const OsiObject **objects=NULL)

Useful constructor - This Adds in rows and variables to construct valid Linked Ordered Set Adds extra constraints to match other x/y So note not const solver.

- [OsiBiLinear](#) (CoinModel *coinModel, int xColumn, int yColumn, int xyRow, double coefficient, double xMesh, double yMesh, int numberExistingObjects=0, const OsiObject **objects=NULL)

Useful constructor - This Adds in rows and variables to construct valid Linked Ordered Set Adds extra constraints to match other x/y So note not const model.

- virtual OsiObject * [clone](#) () const
Clone.
- virtual double [infeasibility](#) (const OsiBranchingInformation *info, int &whichWay) const
Infeasibility - large is 0.5.
- virtual double [feasibleRegion](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info) const
Set bounds to fix the variable at the current (integer) value.
- virtual OsiBranchingObject * [createBranch](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way) const

Creates a branching object.

- virtual void [resetSequenceEtc](#) (int numberColumns, const int *originalColumns)

Redoes data when sequence numbers change.

- virtual bool [canDoHeuristics](#) () const
Return true if object can take part in normal heuristics.
- virtual bool [boundBranch](#) () const
Return true if branch should only bound variables.
- int [xColumn](#) () const
X column.
- int [yColumn](#) () const
Y column.
- int [xRow](#) () const
X row.
- int [yRow](#) () const
Y row.
- int [xyRow](#) () const
XY row.
- double [coefficient](#) () const
Coefficient.
- void [setCoefficient](#) (double value)
Set coefficient.
- int [firstLambda](#) () const
First lambda (of 4).
- double [xSatisfied](#) () const
X satisfied if less than this away from mesh.
- double [ySatisfied](#) () const
Y satisfied if less than this away from mesh.
- double [xOtherSatisfied](#) () const

X other satisfied if less than this away from mesh.

- double `yOtherSatisfied ()` const
Y other satisfied if less than this away from mesh.
- double `xMeshSize ()` const
X meshSize.
- double `yMeshSize ()` const
Y meshSize.
- double `xySatisfied ()` const
XY satisfied if two version differ by less than this.
- void `setMeshSizes (const OsiSolverInterface *solver, double x, double y)`
Set sizes and other stuff.
- int `branchingStrategy ()` const
branching strategy etc bottom 2 bits 0 branch on either, 1 branch on x, 2 branch on y next bit 4 set to say don't update coefficients next bit 8 set to say don't use in feasible region next bit 16 set to say - Always satisfied !!
- int `boundType ()` const
Simple quadratic bound marker.
- void `newBounds (OsiSolverInterface *solver, int way, short xOrY, double separator)` const
Does work of branching.
- int `updateCoefficients (const double *lower, const double *upper, double *objective, CoinPackedMatrix *matrix, CoinWarmStartBasis *basis)` const
Updates coefficients - returns number updated.
- double `xyCoefficient (const double *solution)` const
Returns true value of single xyRow coefficient.
- void `getCoefficients (const OsiSolverInterface *solver, double xB[2], double yB[2], double xybar[4])` const
Get LU coefficients from matrix.
- double `computeLambdas (const double xB[3], const double yB[3], const double xybar[4], double lambda[4])` const
Compute lambdas (third entry in each .B is current value) (nonzero if bad).

- void [addExtraRow](#) (int row, double multiplier)
Adds in data for extra row with variable coefficients.
- void [getPseudoShadow](#) (const OsiBranchingInformation *info)
Sets infeasibility and other when pseudo shadow prices.
- double [getMovement](#) (const OsiBranchingInformation *info)
Gets sum of movements to correct value.

Protected Member Functions

- void [computeLambdas](#) (const OsiSolverInterface *solver, double lambda[4])
const
Compute lambdas if coefficients not changing.

Protected Attributes

- double [coefficient_](#)
data
- double [xMeshSize_](#)
x mesh
- double [yMeshSize_](#)
y mesh
- double [xSatisfied_](#)
x satisfied if less than this away from mesh
- double [ySatisfied_](#)
y satisfied if less than this away from mesh
- double [xOtherSatisfied_](#)
X other satisfied if less than this away from mesh.
- double [yOtherSatisfied_](#)
Y other satisfied if less than this away from mesh.
- double [xySatisfied_](#)

xy satisfied if less than this away from true

- double [xyBranchValue_](#)
value of x or y to branch about
- int [xColumn_](#)
x column
- int [yColumn_](#)
y column
- int [firstLambda_](#)
First lambda (of 4).
- int [branchingStrategy_](#)
branching strategy etc bottom 2 bits 0 branch on either, 1 branch on x, 2 branch on y next bit 4 set to say don't update coefficients next bit 8 set to say don't use in feasible region next bit 16 set to say - Always satisfied !!
- int [boundType_](#)
Simple quadratic bound marker.
- int [xRow_](#)
x row
- int [yRow_](#)
*y row (-1 if x*x)*
- int [xyRow_](#)
Output row.
- int [convexity_](#)
Convexity row.
- int [numberExtraRows_](#)
Number of extra rows (coefficients to be modified).
- double * [multiplier_](#)
Multiplier for coefficient on row.
- int * [extraRow_](#)
Row number.

- short `chosen_`

Which chosen -1 none, 0 x, 1 y.

4.115.1 Detailed Description

Define BiLinear objects. This models $x*y$ where one or both are integer

Definition at line 720 of file CbcLinked.hpp.

4.115.2 Member Function Documentation

4.115.2.1 `virtual double OsiBiLinear::feasibleRegion (OsiSolverInterface * solver, const OsiBranchingInformation * info) const [virtual]`

Set bounds to fix the variable at the current (integer) value.

Given an integer value, set the lower and upper bounds to fix the variable. Returns amount it had to move variable.

4.115.2.2 `virtual OsiBranchingObject* OsiBiLinear::createBranch (OsiSolverInterface * solver, const OsiBranchingInformation * info, int way) const [virtual]`

Creates a branching object.

The preferred direction is set by `way`, 0 for down, 1 for up.

4.115.2.3 `int OsiBiLinear::boundType () const [inline]`

Simple quadratic bound marker.

0 no 1 L if coefficient pos, G if negative i.e. value is ub on xy^2 G if coefficient pos, L if negative i.e. value is lb on xy^3 E If bound then real coefficient is 1.0 and `coefficient_` is bound

Definition at line 899 of file CbcLinked.hpp.

4.115.3 Member Data Documentation

4.115.3.1 double OsiBiLinear::coefficient_ [protected]

data

Coefficient

Definition at line 929 of file CbcLinked.hpp.

4.115.3.2 int OsiBiLinear::boundType_ [protected]

Simple quadratic bound marker.

0 no 1 L if coefficient pos, G if negative i.e. value is ub on xy 2 G if coefficient pos, L if negative i.e. value is lb on xy 3 E If bound then real coefficient is 1.0 and coefficient_ is bound

Definition at line 970 of file CbcLinked.hpp.

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.116 OsiBiLinearBranchingObject Class Reference

Branching object for BiLinear objects.

```
#include <CbcLinked.hpp>
```

Public Member Functions

- virtual OsiBranchingObject * [clone](#) () const
Clone.
- virtual double [branch](#) (OsiSolverInterface *solver)
Does next branch and updates state.
- virtual void [print](#) (const OsiSolverInterface *solver=NULL)
Print something about branch - only if log level high.
- virtual bool [boundBranch](#) () const
Return true if branch should only bound variables.

4.116.1 Detailed Description

Branching object for BiLinear objects.

Definition at line 991 of file CbcLinked.hpp.

The documentation for this class was generated from the following file:

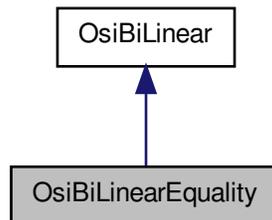
- CbcLinked.hpp

4.117 OsiBiLinearEquality Class Reference

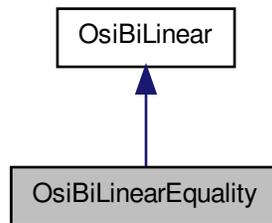
Define Continuous BiLinear objects for an == bound.

```
#include <CbcLinked.hpp>
```

Inheritance diagram for OsiBiLinearEquality:



Collaboration diagram for OsiBiLinearEquality:



Public Member Functions

- [OsiBiLinearEquality](#) (OsiSolverInterface *solver, int xColumn, int yColumn, int xyRow, double rhs, double xMesh)
*Useful constructor - This Adds in rows and variables to construct Ordered Set for $x*y = b$ So note not const solver.*
- virtual OsiObject * [clone](#) () const
Clone.
- virtual double [improvement](#) (const OsiSolverInterface *solver) const
Possible improvement.
- double [newGrid](#) (OsiSolverInterface *solver, int type) const
change grid if type 0 then use solution and make finer if 1 then back to original returns mesh size
- int [numberPoints](#) () const
Number of points.

4.117.1 Detailed Description

Define Continuous BiLinear objects for an == bound. This models $x*y = b$ where both are continuous

Definition at line 1038 of file CbcLinked.hpp.

The documentation for this class was generated from the following file:

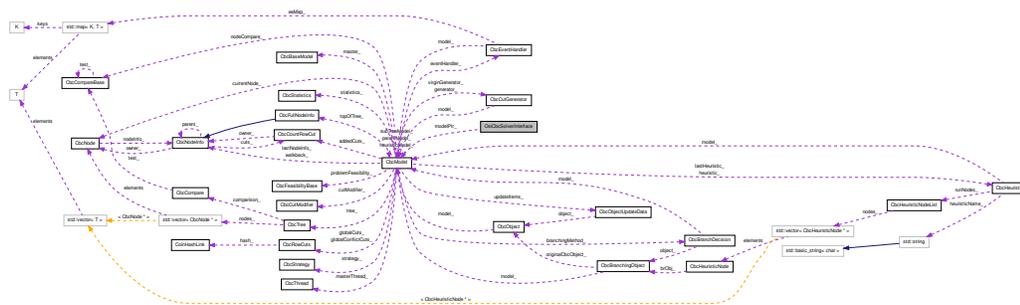
- CbcLinked.hpp

4.118 OsiCbcSolverInterface Class Reference

Cbc Solver Interface.

```
#include <OsiCbcSolverInterface.hpp>
```

Collaboration diagram for OsiCbcSolverInterface:



Public Member Functions

- virtual void [setObjSense](#) (double s)
Set objective function sense (1 for min (default), -1 for max.).
- virtual void [setColSolution](#) (const double *colsol)
Set the primal solution column values.
- virtual void [setRowPrice](#) (const double *rowprice)
Set dual solution vector.

Solve methods

- virtual void [initialSolve](#) ()
Solve initial LP relaxation.
- virtual void [resolve](#) ()

Resolve an LP relaxation after problem modification.

- virtual void [branchAndBound](#) ()

Invoke solver's built-in enumeration algorithm.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the cbc algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

- bool **setIntParam** (OsiIntParam key, int value)
- bool **setDbiParam** (OsiDbiParam key, double value)
- bool **setStrParam** (OsiStrParam key, const std::string &value)
- bool **getIntParam** (OsiIntParam key, int &value) const
- bool **getDbiParam** (OsiDbiParam key, double &value) const
- bool **getStrParam** (OsiStrParam key, std::string &value) const
- virtual bool **setHintParam** (OsiHintParam key, bool yesNo=true, OsiHintStrength strength=OsiHintTry, void *otherInformation=NULL)
- virtual bool [getHintParam](#) (OsiHintParam key, bool &yesNo, OsiHintStrength &strength, void *&otherInformation) const

Get a hint parameter.

- virtual bool [getHintParam](#) (OsiHintParam key, bool &yesNo, OsiHintStrength &strength) const

Get a hint parameter.

Methods returning info on how the solution process terminated

- virtual bool [isAbandoned](#) () const
Are there a numerical difficulties?
- virtual bool [isProvenOptimal](#) () const
Is optimality proven?
- virtual bool [isProvenPrimalInfeasible](#) () const
Is primal infeasibility proven?

- virtual bool [isProvenDualInfeasible](#) () const
Is dual infeasibility proven?
- virtual bool [isPrimalObjectiveLimitReached](#) () const
Is the given primal objective limit reached?
- virtual bool [isDualObjectiveLimitReached](#) () const
Is the given dual objective limit reached?
- virtual bool [isIterationLimitReached](#) () const
Iteration limit reached?

WarmStart related methods

- virtual CoinWarmStart * [getEmptyWarmStart](#) () const
Get an empty warm start object.
- virtual CoinWarmStart * [getWarmStart](#) () const
Get warmstarting information.
- virtual bool [setWarmStart](#) (const CoinWarmStart *warmstart)
Set warmstarting information.

Hotstart related methods (primarily used in strong branching).

The user can create a hotstart (a snapshot) of the optimization process then reoptimize over and over again always starting from there.

NOTE: *between hotstarted optimizations only bound changes are allowed.*

- virtual void [markHotStart](#) ()
Create a hotstart point of the optimization process.
- virtual void [solveFromHotStart](#) ()
Optimize starting from the hotstart.
- virtual void [unmarkHotStart](#) ()
Delete the snapshot.

Methods related to querying the input data

- virtual int [getNumCols](#) () const
Get number of columns.

- virtual int `getNumRows ()` const
Get number of rows.
- virtual int `getNumElements ()` const
Get number of nonzero elements.
- virtual const double * `getColLower ()` const
Get pointer to array[getNumCols()] of column lower bounds.
- virtual const double * `getColUpper ()` const
Get pointer to array[getNumCols()] of column upper bounds.
- virtual const char * `getRowSense ()` const
Get pointer to array[getNumRows()] of row constraint senses.
- virtual const double * `getRightHandSide ()` const
Get pointer to array[getNumRows()] of rows right-hand sides.
- virtual const double * `getRowRange ()` const
Get pointer to array[getNumRows()] of row ranges.
- virtual const double * `getRowLower ()` const
Get pointer to array[getNumRows()] of row lower bounds.
- virtual const double * `getRowUpper ()` const
Get pointer to array[getNumRows()] of row upper bounds.
- virtual const double * `getObjCoefficients ()` const
Get pointer to array[getNumCols()] of objective function coefficients.
- virtual double `getObjSense ()` const
Get objective function sense (1 for min (default), -1 for max).
- virtual bool `isContinuous (int colNumber)` const
Return true if column is continuous.
- virtual const CoinPackedMatrix * `getMatrixByRow ()` const
Get pointer to row-wise copy of matrix.
- virtual const CoinPackedMatrix * `getMatrixByCol ()` const
Get pointer to column-wise copy of matrix.
- virtual double `getInfinity ()` const
Get solver's value for infinity.

Methods related to querying the solution

- virtual const double * [getColSolution](#) () const
Get pointer to array[getNumCols()] of primal solution vector.
- virtual const double * [getRowPrice](#) () const
Get pointer to array[getNumRows()] of dual prices.
- virtual const double * [getReducedCost](#) () const
Get a pointer to array[getNumCols()] of reduced costs.
- virtual const double * [getRowActivity](#) () const
Get pointer to array[getNumRows()] of row activity levels (constraint matrix times the solution vector).
- virtual double [getObjValue](#) () const
Get objective function value.
- virtual int [getIterationCount](#) () const
Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver).
- virtual std::vector< double * > [getDualRays](#) (int maxNumRays, bool full-Ray=false) const
Get as many dual rays as the solver can provide.
- virtual std::vector< double * > [getPrimalRays](#) (int maxNumRays) const
Get as many primal rays as the solver can provide.

Methods for row and column names.

Because OsiCbc is a pass-through class, it's necessary to override any virtual method in order to be sure we catch an override by the underlying solver.

See the OsiSolverInterface class documentation for detailed descriptions.

- virtual std::string [dfltRowColName](#) (char rc, int ndx, unsigned digits=7) const
Generate a standard name of the form Rnnnnnnn or Cnnnnnnn.
- virtual std::string [getObjName](#) (unsigned maxLen=std::string::npos) const
Return the name of the objective function.
- virtual void [setObjName](#) (std::string name)
Set the name of the objective function.

- virtual std::string [getRowName](#) (int rowIndex, unsigned maxLen=std::string::npos) const
Return the name of the row.
- virtual const OsiNameVec & [getRowNames](#) ()
Return a pointer to a vector of row names.
- virtual void [setRowName](#) (int ndx, std::string name)
Set a row name.
- virtual void [setRowNames](#) (OsiNameVec &srcNames, int srcStart, int len, int tgtStart)
Set multiple row names.
- virtual void [deleteRowNames](#) (int tgtStart, int len)
Delete len row names starting at index tgtStart.
- virtual std::string [getColName](#) (int colIndex, unsigned maxLen=std::string::npos) const
Return the name of the column.
- virtual const OsiNameVec & [getColNames](#) ()
Return a pointer to a vector of column names.
- virtual void [setColName](#) (int ndx, std::string name)
Set a column name.
- virtual void [setColNames](#) (OsiNameVec &srcNames, int srcStart, int len, int tgtStart)
Set multiple column names.
- virtual void [deleteColNames](#) (int tgtStart, int len)
Delete len column names starting at index tgtStart.

Changing bounds on variables and constraints

- virtual void [setObjCoeff](#) (int elementIndex, double elementValue)
Set an objective function coefficient.
- virtual void [setColLower](#) (int elementIndex, double elementValue)
*Set a single column lower bound
Use -DBL_MAX for -infinity.*
- virtual void [setColUpper](#) (int elementIndex, double elementValue)

Set a single column upper bound

Use DBL_MAX for infinity.

- virtual void [setColBounds](#) (int elementIndex, double lower, double upper)
Set a single column lower and upper bound.
- virtual void [setColSetBounds](#) (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of columns simultaneously
The default implementation just invokes [setColLower\(\)](#) and [setColUpper\(\)](#) over and over again.
- virtual void [setRowLower](#) (int elementIndex, double elementValue)
Set a single row lower bound
Use -DBL_MAX for -infinity.
- virtual void [setRowUpper](#) (int elementIndex, double elementValue)
Set a single row upper bound
Use DBL_MAX for infinity.
- virtual void [setRowBounds](#) (int elementIndex, double lower, double upper)
Set a single row lower and upper bound.
- virtual void [setRowType](#) (int index, char sense, double rightHandSide, double range)
Set the type of a single row
- virtual void [setRowSetBounds](#) (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of rows simultaneously
The default implementation just invokes [setRowLower\(\)](#) and [setRowUpper\(\)](#) over and over again.
- virtual void [setRowSetTypes](#) (const int *indexFirst, const int *indexLast, const char *senseList, const double *rhsList, const double *rangeList)
Set the type of a number of rows simultaneously
The default implementation just invokes [setRowType\(\)](#) over and over again.

Integrality related changing methods

- virtual void [setContinuous](#) (int index)
Set the index-th variable to be a continuous variable.
- virtual void [setInteger](#) (int index)
Set the index-th variable to be an integer variable.

- virtual void [setContinuous](#) (const int *indices, int len)
Set the variables listed in indices (which is of length len) to be continuous variables.
- virtual void [setInteger](#) (const int *indices, int len)
Set the variables listed in indices (which is of length len) to be integer variables.

Methods to expand a problem.

Note that if a column is added then by default it will correspond to a continuous variable.

- virtual void **addCol** (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)
- virtual void [addCol](#) (int numberElements, const int *rows, const double *elements, const double collb, const double colub, const double obj)
Add a column (primal variable) to the problem.
- virtual void **addCols** (const int numcols, const CoinPackedVectorBase *const *cols, const double *collb, const double *colub, const double *obj)
- virtual void **deleteCols** (const int num, const int *colIndices)
- virtual void **addRow** (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)
- virtual void **addRow** (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)
- virtual void **addRows** (const int numRows, const CoinPackedVectorBase *const *rows, const double *rowlb, const double *rowub)
- virtual void **addRows** (const int numRows, const CoinPackedVectorBase *const *rows, const char *rowsen, const double *rowrhs, const double *rowrng)
- virtual void **deleteRows** (const int num, const int *rowIndices)
- virtual void [applyRowCuts](#) (int numberCuts, const OsiRowCut *cuts)
Apply a collection of row cuts which are all effective.
- virtual void [applyRowCuts](#) (int numberCuts, const OsiRowCut **cuts)
Apply a collection of row cuts which are all effective.

Methods to input a problem

- virtual void [loadProblem](#) (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)
Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

- virtual void [assignProblem](#) (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, double *&rowlb, double *&rowub)
Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void [loadProblem](#) (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const char *rowSen, const double *rowRhs, const double *rowRng)
Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void [assignProblem](#) (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, char *&rowSen, double *&rowRhs, double *&rowRng)
Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void [loadProblem](#) (const int numcols, const int numRows, const CoinBigIndex *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)
Just like the other [loadProblem\(\)](#) methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual void [loadProblem](#) (const int numcols, const int numRows, const CoinBigIndex *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const char *rowSen, const double *rowRhs, const double *rowRng)
Just like the other [loadProblem\(\)](#) methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual int [readMps](#) (const char *filename, const char *extension="mps")
Read an mps file from the given filename (defaults to Osi reader) - returns number of errors (see OsiMpsReader class).
- virtual void [writeMps](#) (const char *filename, const char *extension="mps", double objSense=0.0) const
Write the problem into an mps file of the given filename.
- virtual int [writeMpsNative](#) (const char *filename, const char **rowNames, const char **columnNames, int formatType=0, int numberAcross=2, double objSense=0.0) const
Write the problem into an mps file of the given filename, names may be null.

Message handling (extra for Cbc messages).

Normally I presume you would want the same language.

If not then you could use underlying model pointer

- void `newLanguage` (CoinMessages::Language language)
Set language.
- void `setLanguage` (CoinMessages::Language language)

Cbc specific public interfaces

- `CbcModel * getModelPtr` () const
Get pointer to Cbc model.
- `OsiSolverInterface * getRealSolverPtr` () const
Get pointer to underlying solver.
- void `setCutoff` (double value)
Set cutoff bound on the objective function.
- double `getCutoff` () const
Get the cutoff bound on the objective function - always as minimize.
- void `setMaximumNodes` (int value)
Set the `CbcModel::CbcMaxNumNode` maximum node limit.
- int `getMaximumNodes` () const
Get the `CbcModel::CbcMaxNumNode` maximum node limit.
- void `setMaximumSolutions` (int value)
Set the `CbcModel::CbcMaxNumSol` maximum number of solutions.
- int `getMaximumSolutions` () const
Get the `CbcModel::CbcMaxNumSol` maximum number of solutions.
- void `setMaximumSeconds` (double value)
Set the `CbcModel::CbcMaximumSeconds` maximum number of seconds.
- double `getMaximumSeconds` () const
Get the `CbcModel::CbcMaximumSeconds` maximum number of seconds.
- bool `isNodeLimitReached` () const
Node limit reached?
- bool `isSolutionLimitReached` () const
Solution limit reached?

- int [getNodeCount](#) () const
Get how many Nodes it took to solve the problem.
- int [status](#) () const
Final status of problem - 0 finished, 1 stopped, 2 difficulties.
- virtual void [passInMessageHandler](#) (CoinMessageHandler *handler)
Pass in a message handler.

Constructors and destructors

- [OsiCbcSolverInterface](#) (OsiSolverInterface *solver=NULL, [CbcStrategy](#) *strategy=NULL)
Default Constructor.
- virtual OsiSolverInterface * [clone](#) (bool copyData=true) const
Clone.
- [OsiCbcSolverInterface](#) (const [OsiCbcSolverInterface](#) &)
Copy constructor.
- [OsiCbcSolverInterface](#) & [operator=](#) (const [OsiCbcSolverInterface](#) &rhs)
Assignment operator.
- virtual [~OsiCbcSolverInterface](#) ()
Destructor.

Protected Member Functions

Protected methods

- virtual void [applyRowCut](#) (const OsiRowCut &rc)
Apply a row cut (append to constraint matrix).
- virtual void [applyColCut](#) (const OsiColCut &cc)
Apply a column cut (adjust one or more bounds).

Protected Attributes

Protected member data

- [CbcModel](#) * [modelPtr_](#)
Cbc model represented by this class instance.

Friends

- void [OsiCbcSolverInterfaceUnitTest](#) (const std::string &mpsDir, const std::string &netlibDir)

A function that tests the methods in the [OsiCbcSolverInterface](#) class.

4.118.1 Detailed Description

Cbc Solver Interface. Instantiation of [OsiCbcSolverInterface](#) for the Model Algorithm. Definition at line 30 of file [OsiCbcSolverInterface.hpp](#).

4.118.2 Member Function Documentation

4.118.2.1 virtual CoinWarmStart* OsiCbcSolverInterface::getEmptyWarmStart () const [virtual]

Get an empty warm start object.

This routine returns an empty CoinWarmStartBasis object. Its purpose is to provide a way to give a client a warm start basis object of the appropriate type, which can be resized and modified as desired.

4.118.2.2 virtual bool OsiCbcSolverInterface::setWarmStart (const CoinWarmStart * warmstart) [virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

4.118.2.3 virtual const char* OsiCbcSolverInterface::getRowSense () const [virtual]

Get pointer to array[[getNumRows\(\)](#)] of row constraint senses.

- 'L' <= constraint
- 'E' = constraint

- 'G' \geq constraint
- 'R' ranged constraint
- 'N' free constraint

4.118.2.4 `virtual const double* OsiCbcSolverInterface::getRightHandSide () const [virtual]`

Get pointer to array[[getNumRows\(\)](#)] of rows right-hand sides.

- if `rowsense()[i] == 'L'` then `rhs()[i] == rowupper()[i]`
- if `rowsense()[i] == 'G'` then `rhs()[i] == rowlower()[i]`
- if `rowsense()[i] == 'R'` then `rhs()[i] == rowupper()[i]`
- if `rowsense()[i] == 'N'` then `rhs()[i] == 0.0`

4.118.2.5 `virtual const double* OsiCbcSolverInterface::getRowRange () const [virtual]`

Get pointer to array[[getNumRows\(\)](#)] of row ranges.

- if `rowsense()[i] == 'R'` then `rowrange()[i] == rowupper()[i] - rowlower()[i]`
- if `rowsense()[i] != 'R'` then `rowrange()[i]` is undefined

4.118.2.6 `virtual int OsiCbcSolverInterface::getIterationCount () const [virtual]`

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver).

4.118.2.7 `virtual std::vector<double*> OsiCbcSolverInterface::getDualRays (int maxNumRays, bool fullRay = false) const [virtual]`

Get as many dual rays as the solver can provide.

(In case of proven primal infeasibility there should be at least one.)

The first `getNumRows()` ray components will always be associated with the row duals (as returned by `getRowPrice()`). If `fullRay` is true, the final `getNumCols()` entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length `getNumRows()` and they should be allocated via `new[]`.

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using `delete[]`.

4.118.2.8 `virtual std::vector<double*> OsiCbcSolverInterface::getPrimalRays (int maxNumRays) const [virtual]`

Get as many primal rays as the solver can provide.

(In case of proven dual infeasibility there should be at least one.)

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length `getNumCols()` and they should be allocated via `new[]`.

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using `delete[]`.

4.118.2.9 `virtual std::string OsiCbcSolverInterface::getRowName (int rowIndex, unsigned maxLen = std::string::npos) const [virtual]`

Return the name of the row.

4.118.2.10 `virtual void OsiCbcSolverInterface::setColLower (int elementIndex, double elementValue) [virtual]`

Set a single column lower bound

Use -DBL_MAX for -infinity.

4.118.2.11 `virtual void OsiCbcSolverInterface::setColUpper (int elementIndex, double elementValue) [virtual]`

Set a single column upper bound

Use DBL_MAX for infinity.

4.118.2.12 `virtual void OsiCbcSolverInterface::setColSetBounds (const int * indexFirst, const int * indexLast, const double * boundList) [virtual]`

Set the bounds on a number of columns simultaneously

The default implementation just invokes `setColLower()` and `setColUpper()` over and over again.

Parameters

indexFirst, indexLast pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes

boundList the new lower/upper bound pairs for the variables

4.118.2.13 `virtual void OsiCbcSolverInterface::setRowLower (int elementIndex, double elementValue) [virtual]`

Set a single row lower bound

Use -DBL_MAX for -infinity.

4.118.2.14 `virtual void OsiCbcSolverInterface::setRowUpper (int
elementIndex, double elementValue) [virtual]`

Set a single row upper bound

Use DBL_MAX for infinity.

4.118.2.15 `virtual void OsiCbcSolverInterface::setRowSetBounds (const int
* indexFirst, const int * indexLast, const double * boundList)
[virtual]`

Set the bounds on a number of rows simultaneously

The default implementation just invokes `setRowLower()` and `setRowUpper()` over and over again.

Parameters

indexFirst, indexLast pointers to the beginning and after the end of the array of the indices of the constraints whose *either* bound changes

boundList the new lower/upper bound pairs for the constraints

4.118.2.16 `virtual void OsiCbcSolverInterface::setRowSetTypes (const int *
indexFirst, const int * indexLast, const char * senseList, const
double * rhsList, const double * rangeList) [virtual]`

Set the type of a number of rows simultaneously

The default implementation just invokes `setRowType()` over and over again.

Parameters

indexFirst, indexLast pointers to the beginning and after the end of the array of the indices of the constraints whose *any* characteristics changes

senseList the new senses

rhsList the new right hand sides

rangeList the new ranges

4.118.2.17 `virtual void OsiCbcSolverInterface::setColSolution (const double * colsol) [virtual]`

Set the primal solution column values.

colsol[numcols()] is an array of values of the problem column variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of colsol() until changed by another call to setColsol() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

4.118.2.18 `virtual void OsiCbcSolverInterface::setRowPrice (const double * rowprice) [virtual]`

Set dual solution vector.

rowprice[numrows()] is an array of values of the problem row dual variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of rowprice() until changed by another call to setRowprice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

4.118.2.19 `virtual void OsiCbcSolverInterface::addCol (int numberElements, const int * rows, const double * elements, const double collb, const double colub, const double obj) [virtual]`

Add a column (primal variable) to the problem.

4.118.2.20 `virtual void OsiCbcSolverInterface::applyRowCuts (int numberCuts, const OsiRowCut * cuts) [virtual]`

Apply a collection of row cuts which are all effective.

applyCuts seems to do one at a time which seems inefficient.

4.118.2.21 `virtual void OsiCbcSolverInterface::applyRowCuts (int numberCuts, const OsiRowCut ** cuts) [virtual]`

Apply a collection of row cuts which are all effective.

applyCuts seems to do one at a time which seems inefficient. This uses array of pointers

4.118.2.22 `virtual void OsiCbcSolverInterface::loadProblem (const CoinPackedMatrix & matrix, const double * collb, const double * colub, const double * obj, const double * rowlb, const double * rowub) [virtual]`

Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

4.118.2.23 `virtual void OsiCbcSolverInterface::assignProblem (CoinPackedMatrix *& matrix, double *& collb, double *& colub, double *& obj, double *& rowlb, double *& rowub) [virtual]`

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

4.118.2.24 `virtual void OsiCbcSolverInterface::loadProblem (const CoinPackedMatrix & matrix, const double * collb, const double * colub, const double * obj, const char * rowsen, const double * rowrhs, const double * rowrng) [virtual]`

Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are \geq
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

4.118.2.25 `virtual void OsiCbcSolverInterface::assignProblem (CoinPackedMatrix *& matrix, double *& collb, double *& colub, double *& obj, char *& rowsen, double *& rowrhs, double *& rowrng) [virtual]`

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

4.118.2.26 `virtual void OsiCbcSolverInterface::loadProblem (const int numcols, const int numRows, const CoinBigIndex * start, const int * index, const double * value, const double * collb, const double * colub, const double * obj, const double * rowlb, const double * rowub) [virtual]`

Just like the other `loadProblem()` methods except that the matrix is given in a standard column major ordered format (without gaps).

4.118.2.27 `virtual void OsiCbcSolverInterface::loadProblem (const int numcols, const int numRows, const CoinBigIndex * start, const int * index, const double * value, const double * collb, const double * colub, const double * obj, const char * rowsen, const double * rowrhs, const double * rowrng) [virtual]`

Just like the other `loadProblem()` methods except that the matrix is given in a standard column major ordered format (without gaps).

4.118.2.28 `virtual void OsiCbcSolverInterface::writeMps (const char * filename, const char * extension = "mps", double objSense = 0.0) const [virtual]`

Write the problem into an mps file of the given filename.

If `objSense` is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants

4.118.2.29 `virtual int OsiCbcSolverInterface::writeMpsNative (const char * filename, const char ** rowNames, const char ** columnNames, int formatType = 0, int numberAcross = 2, double objSense = 0.0) const [virtual]`

Write the problem into an mps file of the given filename, names may be null.

`formatType` is 0 - normal 1 - extra accuracy 2 - IEEE hex (later)

Returns non-zero on I/O error

4.118.2.30 `virtual void OsiCbcSolverInterface::passInMessageHandler (CoinMessageHandler * handler) [virtual]`

Pass in a message handler.

It is the client's responsibility to destroy a message handler installed by this routine; it will not be destroyed when the solver interface is destroyed.

4.118.2.31 `virtual void OsiCbcSolverInterface::applyRowCut (const OsiRowCut & rc) [protected, virtual]`

Apply a row cut (append to constraint matrix).

4.118.2.32 `virtual void OsiCbcSolverInterface::applyColCut (const OsiColCut & cc) [protected, virtual]`

Apply a column cut (adjust one or more bounds).

4.118.3 Friends And Related Function Documentation

4.118.3.1 `void OsiCbcSolverInterfaceUnitTest (const std::string & mpsDir, const std::string & netlibDir) [friend]`

A function that tests the methods in the [OsiCbcSolverInterface](#) class.

The documentation for this class was generated from the following file:

- [OsiCbcSolverInterface.hpp](#)

4.119 OsiChooseStrongSubset Class Reference

This class chooses a variable to branch on.

```
#include <CbcLinked.hpp>
```

Public Member Functions

- [OsiChooseStrongSubset](#) ()
Default Constructor.
- [OsiChooseStrongSubset](#) (const [OsiSolverInterface](#) *solver)
Constructor from solver (so we can set up arrays etc).
- [OsiChooseStrongSubset](#) (const [OsiChooseStrongSubset](#) &)
Copy constructor.
- [OsiChooseStrongSubset](#) & operator= (const [OsiChooseStrongSubset](#) &rhs)

Assignment operator.

- virtual OsiChooseVariable * [clone](#) () const
Clone.
- virtual [~OsiChooseStrongSubset](#) ()
Destructor.
- virtual int [setupList](#) (OsiBranchingInformation *info, bool initialize)
Sets up strong list and clears all if initialize is true.
- virtual int [chooseVariable](#) (OsiSolverInterface *solver, OsiBranchingInformation *info, bool fixVariables)
Choose a variable Returns - -1 Node is infeasible 0 Normal termination - we have a candidate 1 All looks satisfied - no candidate 2 We can change the bound on a variable - but we also have a strong branching candidate 3 We can change the bound on a variable - but we have a non-strong branching candidate 4 We can change the bound on a variable - no other candidates We can pick up branch from bestObjectIndex() and bestWhichWay() We can pick up a forced branch (can change bound) from firstForcedObjectIndex() and firstForcedWhichWay() If we have a solution then we can pick up from goodObjectiveValue() and goodSolution() If fixVariables is true then 2,3,4 are all really same as problem changed.
- int [numberObjectsToUse](#) () const
Number of objects to use.
- void [setNumberObjectsToUse](#) (int value)
Set number of objects to use.

Protected Attributes

- int [numberObjectsToUse_](#)
Number of objects to be used (and set in solver).

4.119.1 Detailed Description

This class chooses a variable to branch on. This is just as OsiChooseStrong but it fakes it so only first so many are looked at in this phase

Definition at line 1203 of file CbcLinked.hpp.

4.119.2 Member Function Documentation

4.119.2.1 `virtual int OsiChooseStrongSubset::setupList (OsiBranchingInformation * info, bool initialize) [virtual]`

Sets up strong list and clears all if initialize is true.

Returns number of infeasibilities. If returns -1 then has worked out node is infeasible!

The documentation for this class was generated from the following file:

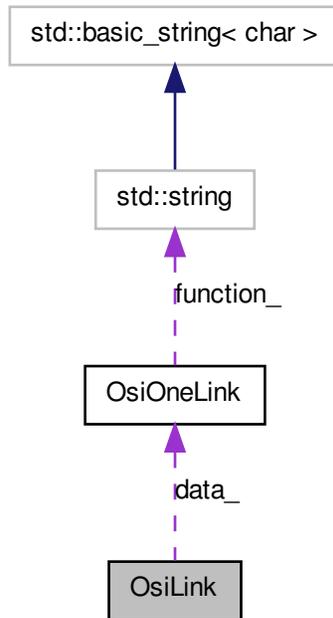
- CbcLinked.hpp

4.120 OsiLink Class Reference

Define Special Linked Ordered Sets.

```
#include <CbcLinked.hpp>
```

Collaboration diagram for OsiLink:



Public Member Functions

- `OsiLink` (const OsiSolverInterface *solver, int yRow, int yColumn, double mesh-Size)
Useful constructor -.
- virtual OsiObject * `clone` () const
Clone.
- virtual double `infeasibility` (const OsiBranchingInformation *info, int &which-Way) const
Infeasibility - large is 0.5.
- virtual double `feasibleRegion` (OsiSolverInterface *solver, const OsiBranching-Information *info) const

Set bounds to fix the variable at the current (integer) value.

- virtual OsiBranchingObject * [createBranch](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way) const

Creates a branching object.

- virtual void [resetSequenceEtc](#) (int numberColumns, const int *originalColumns)

Redoes data when sequence numbers change.

- int [numberLinks](#) () const

Number of links for each member.

- virtual bool [canDoHeuristics](#) () const

Return true if object can take part in normal heuristics.

- virtual bool [boundBranch](#) () const

Return true if branch should only bound variables.

4.120.1 Detailed Description

Define Special Linked Ordered Sets. New style members and weights may be stored in SOS object
This is for y and $x*f(y)$ and $z*g(y)$ etc
Definition at line 600 of file CbcLinked.hpp.

4.120.2 Constructor & Destructor Documentation

4.120.2.1 OsiLink::OsiLink (const OsiSolverInterface * solver, int yRow, int yColumn, double meshSize)

Useful constructor -.

4.120.3 Member Function Documentation

4.120.3.1 virtual double OsiLink::feasibleRegion (OsiSolverInterface * solver, const OsiBranchingInformation * info) const [virtual]

Set bounds to fix the variable at the current (integer) value.

Given an integer value, set the lower and upper bounds to fix the variable. Returns amount it had to move variable.

4.120.3.2 virtual OsiBranchingObject* OsiLink::createBranch (OsiSolverInterface * solver, const OsiBranchingInformation * info, int way) const [virtual]

Creates a branching object.

The preferred direction is set by way, 0 for down, 1 for up.

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.121 OsiLinkBranchingObject Class Reference

Branching object for Linked ordered sets.

```
#include <CbcLinked.hpp>
```

Public Member Functions

- virtual OsiBranchingObject * [clone](#) () const
Clone.
- virtual double [branch](#) (OsiSolverInterface *solver)
Does next branch and updates state.
- virtual void [print](#) (const OsiSolverInterface *solver=NULL)
Print something about branch - only if log level high.

4.121.1 Detailed Description

Branching object for Linked ordered sets.

Definition at line 678 of file CbcLinked.hpp.

The documentation for this class was generated from the following file:

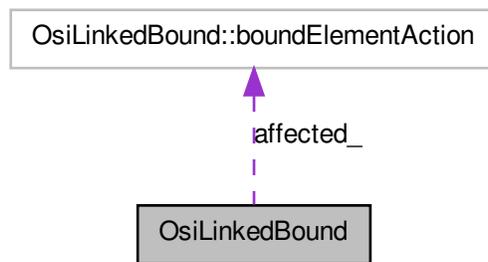
- CbcLinked.hpp

4.122 OsiLinkedBound Class Reference

List of bounds which depend on other bounds.

```
#include <Cbclinked.hpp>
```

Collaboration diagram for OsiLinkedBound:



Classes

- struct **boundElementAction**

Public Member Functions

Action methods

- void **updateBounds** (ClpSimplex *solver)
Update other bounds.

Constructors and destructors

- **OsiLinkedBound** ()
Default Constructor.
- **OsiLinkedBound** (OsiSolverInterface *model, int variable, int numberAffected, const int *positionL, const int *positionU, const double *multiplier)
Useful Constructor.

- [OsiLinkedBound](#) (const [OsiLinkedBound](#) &)
Copy constructor.
- [OsiLinkedBound](#) & [operator=](#) (const [OsiLinkedBound](#) &rhs)
Assignment operator.
- [~OsiLinkedBound](#) ()
Destructor.

Sets and Gets

- int [variable](#) () const
Get variable.
- void [addBoundModifier](#) (bool upperBoundAffected, bool useUpperBound, int whichVariable, double multiplier=1.0)
Add a bound modifier.

4.122.1 Detailed Description

List of bounds which depend on other bounds.

Definition at line 300 of file CbcLinked.hpp.

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.123 OsiOldLink Class Reference

Public Member Functions

- [OsiOldLink](#) (const [OsiSolverInterface](#) *solver, int numberMembers, int numberLinks, int first, const double *weights, int setNumber)
Useful constructor - A valid solution is if all variables are zero apart from $k \cdot \text{numberLink}$ to $(k+1) \cdot \text{numberLink} - 1$ where k is 0 through $\text{numberInSet} - 1$.
- [OsiOldLink](#) (const [OsiSolverInterface](#) *solver, int numberMembers, int numberLinks, int typeSOS, const int *which, const double *weights, int setNumber)
Useful constructor - A valid solution is if all variables are zero apart from $k \cdot \text{numberLink}$ to $(k+1) \cdot \text{numberLink} - 1$ where k is 0 through $\text{numberInSet} - 1$.

- virtual OsiObject * [clone](#) () const
Clone.
- virtual double [infeasibility](#) (const OsiBranchingInformation *info, int &whichWay) const
Infeasibility - large is 0.5.
- virtual double [feasibleRegion](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info) const
Set bounds to fix the variable at the current (integer) value.
- virtual OsiBranchingObject * [createBranch](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way) const
Creates a branching object.
- virtual void [resetSequenceEtc](#) (int numberColumns, const int *originalColumns)

Redoes data when sequence numbers change.
- int [numberLinks](#) () const
Number of links for each member.
- virtual bool [canDoHeuristics](#) () const
Return true if object can take part in normal heuristics.
- virtual bool [boundBranch](#) () const
Return true if branch should only bound variables.

4.123.1 Detailed Description

Definition at line 434 of file CbcLinked.hpp.

4.123.2 Constructor & Destructor Documentation

4.123.2.1 OsiOldLink::OsiOldLink (const OsiSolverInterface * solver, int numberMembers, int numberLinks, int first, const double * weights, int setNumber)

Useful constructor - A valid solution is if all variables are zero apart from $k \cdot \text{numberLink}$ to $(k+1) \cdot \text{numberLink} - 1$ where k is 0 through $\text{numberInSet} - 1$.

The length of weights array is numberInSet. For this constructor the variables in matrix are the numberInSet*numberLink starting at first. If weights null then 0,1,2..

4.123.2.2 OsiOldLink::OsiOldLink (const OsiSolverInterface * solver, int numberMembers, int numberLinks, int typeSOS, const int * which, const double * weights, int setNumber)

Useful constructor - A valid solution is if all variables are zero apart from k*numberLink to (k+1)*numberLink-1 where k is 0 through numberInSet-1.

The length of weights array is numberInSet. For this constructor the variables are given by list - grouped. If weights null then 0,1,2..

4.123.3 Member Function Documentation

4.123.3.1 virtual double OsiOldLink::feasibleRegion (OsiSolverInterface * solver, const OsiBranchingInformation * info) const [virtual]

Set bounds to fix the variable at the current (integer) value.

Given an integer value, set the lower and upper bounds to fix the variable. Returns amount it had to move variable.

4.123.3.2 virtual OsiBranchingObject* OsiOldLink::createBranch (OsiSolverInterface * solver, const OsiBranchingInformation * info, int way) const [virtual]

Creates a branching object.

The preferred direction is set by way, 0 for down, 1 for up.

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.124 OsiOldLinkBranchingObject Class Reference

Branching object for Linked ordered sets.

```
#include <CbcLinked.hpp>
```

Public Member Functions

- virtual OsiBranchingObject * `clone` () const
Clone.
- virtual double `branch` (OsiSolverInterface *solver)
Does next branch and updates state.
- virtual void `print` (const OsiSolverInterface *solver=NULL)
Print something about branch - only if log level high.

4.124.1 Detailed Description

Branching object for Linked ordered sets.

Definition at line 518 of file CbcLinked.hpp.

The documentation for this class was generated from the following file:

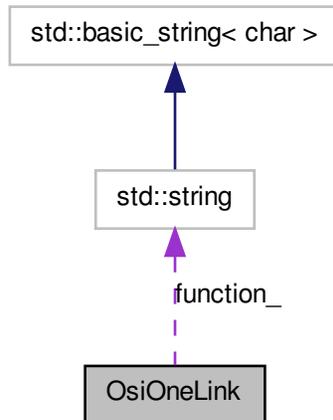
- CbcLinked.hpp

4.125 OsiOneLink Class Reference

Define data for one link.

```
#include <CbcLinked.hpp>
```

Collaboration diagram for OsiOneLink:



Public Member Functions

- `OsiOneLink` (const OsiSolverInterface *solver, int xRow, int xColumn, int xy-Row, const char *functionString)

Useful constructor -.

Public Attributes

- int `xRow_`
data
- int `xColumn_`
Column which defines x.
- int `xyRow`
Output row.
- `std::string` `function_`

Function.

4.125.1 Detailed Description

Define data for one link.

Definition at line 558 of file CbcLinked.hpp.

4.125.2 Constructor & Destructor Documentation

4.125.2.1 OsiOneLink::OsiOneLink (const OsiSolverInterface * *solver*, int *xRow*, int *xColumn*, int *xyRow*, const char * *functionString*)

Useful constructor -.

4.125.3 Member Data Documentation

4.125.3.1 int OsiOneLink::xRow_

data

Row which defines x (if -1 then no x)

Definition at line 583 of file CbcLinked.hpp.

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.126 CbcGenCtlBlk::osiParamsInfo_struct Struct Reference

Start and end of OsiSolverInterface parameters in parameter vector.

```
#include <CbcGenCtlBlk.hpp>
```

4.126.1 Detailed Description

Start and end of OsiSolverInterface parameters in parameter vector.

Definition at line 614 of file CbcGenCtlBlk.hpp.

The documentation for this struct was generated from the following file:

- CbcGenCtlBlk.hpp

4.127 OsiSimpleFixedInteger Class Reference

Define a single integer class - but one where you keep branching until fixed even if satisfied.

```
#include <CbcLinked.hpp>
```

Public Member Functions

- [OsiSimpleFixedInteger](#) ()
Default Constructor.
- [OsiSimpleFixedInteger](#) (const OsiSolverInterface *solver, int iColumn)
Useful constructor - passed solver index.
- [OsiSimpleFixedInteger](#) (int iColumn, double lower, double upper)
Useful constructor - passed solver index and original bounds.
- [OsiSimpleFixedInteger](#) (const OsiSimpleInteger &)
Useful constructor - passed simple integer.
- [OsiSimpleFixedInteger](#) (const [OsiSimpleFixedInteger](#) &)
Copy constructor.
- virtual OsiObject * [clone](#) () const
Clone.
- [OsiSimpleFixedInteger](#) & [operator=](#) (const [OsiSimpleFixedInteger](#) &rhs)
Assignment operator.
- virtual [~OsiSimpleFixedInteger](#) ()
Destructor.
- virtual double [infeasibility](#) (const OsiBranchingInformation *info, int &which-Way) const
Infeasibility - large is 0.5.
- virtual OsiBranchingObject * [createBranch](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way) const
Creates a branching object.

4.127.1 Detailed Description

Define a single integer class - but one where you keep branching until fixed even if satisfied.

Definition at line 1089 of file CbcLinked.hpp.

4.127.2 Member Function Documentation

4.127.2.1 virtual OsiBranchingObject* OsiSimpleFixedInteger::createBranch (OsiSolverInterface * solver, const OsiBranchingInformation * info, int way) const [virtual]

Creates a branching object.

The preferred direction is set by `way`, 0 for down, 1 for up.

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.128 OsiSolverLinearizedQuadratic Class Reference

This is to allow the user to replace `initialSolve` and `resolve`.

```
#include <CbcLinked.hpp>
```

Public Member Functions

Solve methods

- virtual void [initialSolve](#) ()
Solve initial LP relaxation.

Constructors and destructors

- [OsiSolverLinearizedQuadratic](#) ()
Default Constructor.
- [OsiSolverLinearizedQuadratic](#) (ClpSimplex *quadraticModel)
Useful constructor (solution should be good).
- virtual OsiSolverInterface * [clone](#) (bool copyData=true) const

Clone.

- `OsiSolverLinearizedQuadratic` (const `OsiSolverLinearizedQuadratic` &)
Copy constructor.
- `OsiSolverLinearizedQuadratic` & `operator=` (const `OsiSolverLinearizedQuadratic` &rhs)
Assignment operator.
- virtual `~OsiSolverLinearizedQuadratic` ()
Destructor.

Sets and Gets

- double `bestObjectiveValue` () const
Objective value of best solution found internally.
- const double * `bestSolution` () const
Best solution found internally.
- void `setSpecialOptions3` (int value)
Set special options.
- int `specialOptions3` () const
Get special options.
- `ClpSimplex` * `quadraticModel` () const
Copy of quadratic model if one.

Protected Attributes

Private member data

- double `bestObjectiveValue_`
Objective value of best solution found internally.
- `ClpSimplex` * `quadraticModel_`
Copy of quadratic model if one.
- double * `bestSolution_`
Best solution found internally.
- int `specialOptions3_`
0 bit (1) - don't do mini B&B 1 bit (2) - quadratic only in objective

4.128.1 Detailed Description

This is to allow the user to replace initialSolve and resolve.

Definition at line 1318 of file CbcLinked.hpp.

The documentation for this class was generated from the following file:

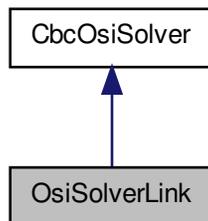
- CbcLinked.hpp

4.129 OsiSolverLink Class Reference

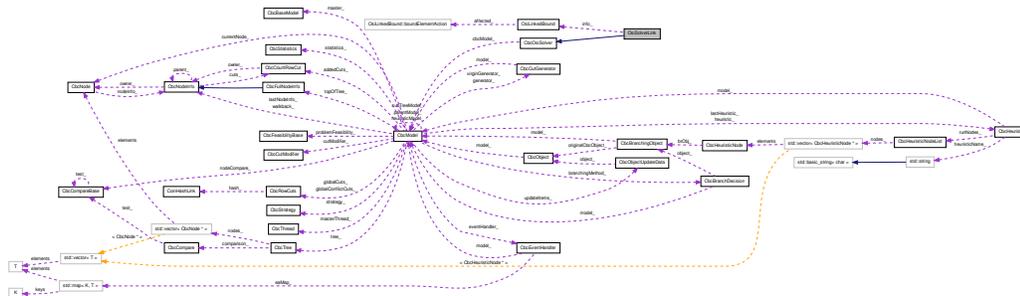
This is to allow the user to replace initialSolve and resolve This version changes coefficients.

```
#include <CbcLinked.hpp>
```

Inheritance diagram for OsiSolverLink:



Collaboration diagram for OsiSolverLink:



Public Member Functions

Solve methods

- virtual void [initialSolve](#) ()
Solve initial LP relaxation.
- virtual void [resolve](#) ()
Resolve an LP relaxation after problem modification.
- virtual int [fathom](#) (bool allFixed)
Problem specific Returns -1 if node fathomed and no solution 0 if did nothing 1 if node fathomed and solution allFixed is true if all LinkedBound variables are fixed.
- double * [nonlinearSLP](#) (int numberPasses, double deltaTolerance)
Solves nonlinear problem from CoinModel using SLP - may be used as crash for other algorithms when number of iterations small.
- double [linearizedBAB](#) (CglStored *cut)
Solve linearized quadratic objective branch and bound.
- double * [heuristicSolution](#) (int numberPasses, double deltaTolerance, int mode)
Solves nonlinear problem from CoinModel using SLP - and then tries to get heuristic solution Returns solution array mode - 0 just get continuous 1 round and try normal bab 2 use defaultBound_ to bound integer variables near current solution.
- int [doAOCuts](#) (CglTemporary *cutGen, const double *solution, const double *solution2)
Do OA cuts.

Constructors and destructors

- [OsiSolverLink](#) ()
Default Constructor.
- [OsiSolverLink](#) (CoinModel &modelObject)
This creates from a coinModel object.
- void **load** (CoinModel &modelObject, bool tightenBounds=false, int logLevel=1)
- virtual OsiSolverInterface * **clone** (bool copyData=true) const
Clone.
- [OsiSolverLink](#) (const [OsiSolverLink](#) &)
Copy constructor.
- [OsiSolverLink](#) & **operator=** (const [OsiSolverLink](#) &rhs)
Assignment operator.
- virtual **~OsiSolverLink** ()
Destructor.

Sets and Gets

- void **addBoundModifier** (bool upperBoundAffected, bool useUpperBound, int whichVariable, int whichVariableAffected, double multiplier=1.0)
Add a bound modifier.
- int **updateCoefficients** (ClpSimplex *solver, CoinPackedMatrix *matrix)
Update coefficients - returns number updated if in updating mode.
- void **analyzeObjects** ()
Analyze constraints to see which are convex (quadratic).
- void **addTighterConstraints** ()
Add reformulated bilinear constraints.
- double **bestObjectiveValue** () const
Objective value of best solution found internally.
- void **setBestObjectiveValue** (double value)
Set objective value of best solution found internally.
- const double * **bestSolution** () const
Best solution found internally.

- void [setBestSolution](#) (const double *solution, int numberColumns)
Set best solution found internally.
- void [setSpecialOptions2](#) (int value)
Set special options.
- void [sayConvex](#) (bool convex)
Say convex (should work it out) - if convex false then strictly concave.
- int [specialOptions2](#) () const
Get special options.
- CoinPackedMatrix * [cleanMatrix](#) () const
Clean copy of matrix So we can add rows.
- CoinPackedMatrix * [originalRowCopy](#) () const
Row copy of matrix Just genuine columns and rows Linear part.
- ClpSimplex * [quadraticModel](#) () const
Copy of quadratic model if one.
- CoinPackedMatrix * [quadraticRow](#) (int rowNumber, double *linear) const
Gets correct form for a quadratic row - user to delete.
- double [defaultMeshSize](#) () const
Default meshSize.
- void [setDefaultMeshSize](#) (double value)
- double [defaultBound](#) () const
Default maximumbound.
- void [setDefaultBound](#) (double value)
- void [setIntegerPriority](#) (int value)
Set integer priority.
- int [integerPriority](#) () const
Get integer priority.
- int [objectiveVariable](#) () const
Objective transfer variable if one.
- void [setBiLinearPriority](#) (int value)
Set biLinear priority.

- int [biLinearPriority](#) () const
Get biLinear priority.
- const CoinModel * [coinModel](#) () const
Return CoinModel.
- void [setBiLinearPriorities](#) (int value, double meshSize=1.0)
Set all biLinear priorities on x-x variables.
- void [setBranchingStrategyOnVariables](#) (int strategyValue, int priorityValue=-1, int mode=7)
Set options and priority on all or some biLinear variables 1 - on I-I 2 - on I-x 4 - on x-x or combinations.
- void [setMeshSizes](#) (double value)
Set all mesh sizes on x-x variables.
- void [setFixedPriority](#) (int priorityValue)
Two tier integer problem where when set of variables with priority less than this are fixed the problem becomes an easier integer problem.

Protected Member Functions

functions

- void [gutsOfDestructor](#) (bool justNullify=false)
Do real work of initialize.
- void [gutsOfCopy](#) (const OsiSolverLink &rhs)
Do real work of copy.

Protected Attributes

Private member data

- CoinPackedMatrix * [matrix_](#)
Clean copy of matrix Marked coefficients will be multiplied by L or U.
- CoinPackedMatrix * [originalRowCopy_](#)
Row copy of matrix Just genuine columns and rows.
- ClpSimplex * [quadraticModel_](#)
Copy of quadratic model if one.

- int [numberNonLinearRows_](#)
Number of rows with nonLinearities.
- int * [startNonLinear_](#)
Starts of lists.
- int * [rowNonLinear_](#)
Row number for a list.
- int * [convex_](#)
Indicator whether is convex, concave or neither -1 concave, 0 neither, +1 convex.
- int * [whichNonLinear_](#)
Indices in a list/row.
- CoinModel [coinModel_](#)
Model in CoinModel format.
- int [numberVariables_](#)
Number of variables in tightening phase.
- [OsiLinkedBound](#) * [info_](#)
Information.
- int [specialOptions2_](#)
0 bit (1) - call fathom (may do mini B&B) 1 bit (2) - quadratic only in objective (add OA cuts) 2 bit (4) - convex 3 bit (8) - try adding OA cuts 4 bit (16) - add linearized constraints
- int [objectiveRow_](#)
Objective transfer row if one.
- int [objectiveVariable_](#)
Objective transfer variable if one.
- double [bestObjectiveValue_](#)
Objective value of best solution found internally.
- double [defaultMeshSize_](#)
Default mesh.
- double [defaultBound_](#)
Default maximum bound.

- double * [bestSolution_](#)
Best solution found internally.
- int [integerPriority_](#)
Priority for integers.
- int [biLinearPriority_](#)
Priority for bilinear.
- int [numberFix_](#)
Number of variables which when fixed help.
- int * [fixVariables_](#)
list of fixed variables

4.129.1 Detailed Description

This is to allow the user to replace initialSolve and resolve This version changes coefficients.

Definition at line 29 of file CbcLinked.hpp.

4.129.2 Constructor & Destructor Documentation

4.129.2.1 OsiSolverLink::OsiSolverLink (CoinModel & *modelObject*)

This creates from a coinModel object.

if errors.then number of sets is -1

This creates linked ordered sets information. It assumes -

for product terms syntax is yy*f(zz) also just f(zz) is allowed and even a constant modelObject not const as may be changed as part of process.

4.129.3 Member Function Documentation

4.129.3.1 double* OsiSolverLink::nonlinearSLP (int *numberPasses*, double *deltaTolerance*)

Solves nonlinear problem from CoinModel using SLP - may be used as crash for other algorithms when number of iterations small.

Also exits if all problematical variables are changing less than deltaTolerance Returns solution array

4.129.3.2 `double OsiSolverLink::linearizedBAB (CglStored * cut)`

Solve linearized quadratic objective branch and bound.

Return cutoff and OA cut

4.129.3.3 `void OsiSolverLink::setBranchingStrategyOnVariables (int strategyValue, int priorityValue = -1, int mode = 7)`

Set options and priority on all or some biLinear variables 1 - on I-I 2 - on I-x 4 - on x-x or combinations.

-1 means leave (for priority value and strategy value)

4.129.3.4 `void OsiSolverLink::gutsOfDestructor (bool justNullify = false)` [protected]

Do real work of initialize.

Do real work of delete

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.130 OsiUsesBiLinear Class Reference

Define a single variable class which is involved with [OsiBiLinear](#) objects.

```
#include <CbcLinked.hpp>
```

Public Member Functions

- [OsiUsesBiLinear](#) ()
Default Constructor.
- [OsiUsesBiLinear](#) (const OsiSolverInterface *solver, int iColumn, int type)

Useful constructor - passed solver index.

- [OsiUsesBiLinear](#) (int iColumn, double lower, double upper, int type)
Useful constructor - passed solver index and original bounds.
- [OsiUsesBiLinear](#) (const OsiSimpleInteger &rhs, int type)
Useful constructor - passed simple integer.
- [OsiUsesBiLinear](#) (const [OsiUsesBiLinear](#) &rhs)
Copy constructor.
- virtual OsiObject * [clone](#) () const
Clone.
- [OsiUsesBiLinear](#) & [operator=](#) (const [OsiUsesBiLinear](#) &rhs)
Assignment operator.
- virtual [~OsiUsesBiLinear](#) ()
Destructor.
- virtual double [infeasibility](#) (const OsiBranchingInformation *info, int &which-Way) const
Infeasibility - large is 0.5.
- virtual OsiBranchingObject * [createBranch](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info, int way) const
Creates a branching object.
- virtual double [feasibleRegion](#) (OsiSolverInterface *solver, const OsiBranchingInformation *info) const
Set bounds to fix the variable at the current value.
- void [addBiLinearObjects](#) ([OsiSolverLink](#) *solver)
Add all bi-linear objects.

Protected Attributes

- int [numberBiLinear_](#)
data Number of bilinear objects (maybe could be more general)
- int [type_](#)
Type of variable - 0 continuous, 1 integer.

- OsiObject ** [objects_](#)
Objects.

4.130.1 Detailed Description

Define a single variable class which is involved with [OsiBiLinear](#) objects. This is used so can make better decision on where to branch as it can look at all objects.

This version sees if it can re-use code from OsiSimpleInteger even if not an integer variable. If not then need to duplicate code.

Definition at line 1139 of file CbcLinked.hpp.

4.130.2 Member Function Documentation

4.130.2.1 `virtual OsiBranchingObject* OsiUsesBiLinear::createBranch (OsiSolverInterface * solver, const OsiBranchingInformation * info, int way) const [virtual]`

Creates a branching object.

The preferred direction is set by `way`, 0 for down, 1 for up.

4.130.2.2 `virtual double OsiUsesBiLinear::feasibleRegion (OsiSolverInterface * solver, const OsiBranchingInformation * info) const [virtual]`

Set bounds to fix the variable at the current value.

Given an current value, set the lower and upper bounds to fix the variable. Returns amount it had to move variable.

The documentation for this class was generated from the following file:

- CbcLinked.hpp

4.131 PseudoReducedCost Struct Reference

4.131.1 Detailed Description

Definition at line 12 of file CbcHeuristicDive.hpp.

The documentation for this struct was generated from the following file:

- CbcHeuristicDive.hpp

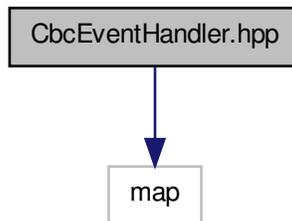
5 File Documentation

5.1 CbcEventHandler.hpp File Reference

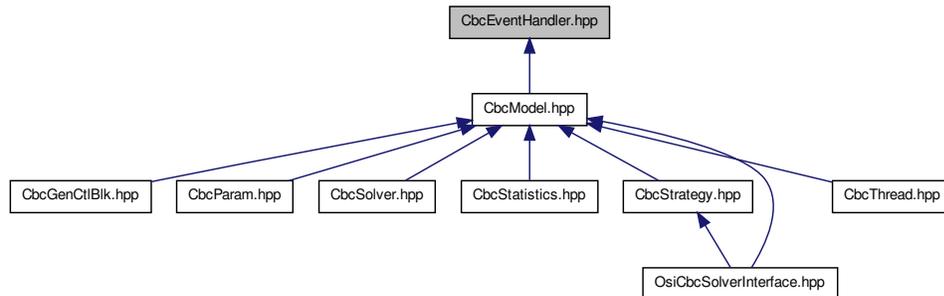
Event handling for cbc.

```
#include <map>
```

Include dependency graph for CbcEventHandler.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class [CbcEventHandler](#)
Base class for Cbc event handling.

5.1.1 Detailed Description

Event handling for cbc. This file contains the declaration of [CbcEventHandler](#), used for event handling in cbc.

The central method is [CbcEventHandler::event\(\)](#). The default semantics of this call are ‘ask for the action to take in reponse to this event’. The call is made at the point in the code where the event occurs (*e.g.*, when a solution is found, or when a node is added to or removed from the search tree). The return value specifies the action to perform in response to the event (*e.g.*, continue, or stop).

This is a lazy class. Initially, it knows nothing about specific events, and returns `defaultAction_` for any event. This makes for a trivial constructor and fast startup. The only place where the list of known events or actions is hardwired is in the enum definitions for [CbcEvent](#) and [CbcAction](#), respectively.

At the first call to `setAction`, a map is created to hold (Event,Action) pairs, and this map will be consulted ever after. Events not in the map will still return the default value.

For serious extensions, derive a subclass and replace `event()` with a function that suits you better. The function has access to the [CbcModel](#) via a pointer held in the [CbcEventHandler](#) object, and can do as much thinking as it likes before returning an answer. You

can also print as much information as you want. The model is held as a const, however, so you can't alter reality.

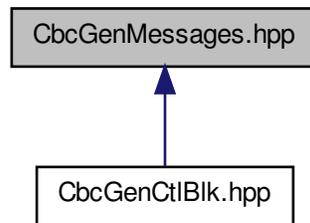
The design of the class deliberately matches ClpEventHandler, so that other solvers can participate in cbc without breaking the patterns set by clp-specific code.

Definition in file [CbcEventHandler.hpp](#).

5.2 CbcGenMessages.hpp File Reference

This file contains the enum that defines symbolic names for for cbc-generic messages.

This graph shows which files directly or indirectly include this file:



Enumerations

- enum [CbcGenMsgCode](#)
Symbolic names for cbc-generic messages.

5.2.1 Detailed Description

This file contains the enum that defines symbolic names for for cbc-generic messages.

Definition in file [CbcGenMessages.hpp](#).

This allows the use of the standalone solver in a flexible manner.

- struct [CbcSolverUsefulData](#)
Structure to hold useful arrays.
- class [CbcUser](#)
A class to allow the use of unknown user functionality.
- class [CbcStopNow](#)
Support the use of a call back class to decide whether to stop.

5.3.1 Detailed Description

Defines [CbcSolver](#), the proposed top-level class for the new-style cbc solver. This class is currently an orphan. With the removal of all code flagged with the NEWS_STYLE_SOLVER, this class is never instantiated (and cannot be instantiated). It is available to be coopted as a top-level object wrapping the current CbcMain0 and CbcMain1, should that appear to be a desirable path forward. -- lh, 091211 --

Definition in file [CbcSolver.hpp](#).

5.4 CbcSolverAnalyze.hpp File Reference

Look to see if a constraint is all-integer (variables & coeffs), or could be all integer.

5.4.1 Detailed Description

Look to see if a constraint is all-integer (variables & coeffs), or could be all integer.

Definition in file [CbcSolverAnalyze.hpp](#).

5.5 CbcSolverExpandKnapsack.hpp File Reference

Expanding possibilities of $x*y$, where $x*y$ are both integers, constructing a knapsack constraint.

5.5.1 Detailed Description

Expanding possibilities of $x*y$, where $x*y$ are both integers, constructing a knapsack constraint. Results in a tighter model.

Definition in file [CbcSolverExpandKnapsack.hpp](#).

5.6 CbcSolverHeuristics.hpp File Reference

Routines for doing heuristics.

Functions

- int `doHeuristics` (`CbcModel` *model, int type, `CbcOrClpParam` *parameters_, int numberParameters_, int noPrinting_, int initialPumpTune)
1 - add heuristics to model 2 - do heuristics (and set cutoff and best solution) 3 - for miplib test so skip some (out model later)

5.6.1 Detailed Description

Routines for doing heuristics.

Definition in file [CbcSolverHeuristics.hpp](#).

Index

- ~CbcCountRowCut
 - CbcCountRowCut, 71
- ~CbcEventHandler
 - CbcEventHandler, 95
- ~CbcNodeInfo
 - CbcNodeInfo, 295
- active_
 - CbcNodeInfo, 296
- addCol
 - OsiCbcSolverInterface, 418
- addCutGenerator
 - CbcModel, 276
- addCuts
 - CbcEventHandler, 95
 - CbcModel, 280
- addCuts1
 - CbcModel, 281
- addHeuristic
 - CbcModel, 277
- addObjects
 - CbcModel, 269
- afterHeuristic
 - CbcEventHandler, 95
- ampl_info, 17
- applyColCut
 - OsiCbcSolverInterface, 422
- applyRowCut
 - OsiCbcSolverInterface, 421
- applyRowCuts
 - OsiCbcSolverInterface, 418
- applyToModel
 - CbcFullNodeInfo, 113
 - CbcNodeInfo, 295
 - CbcPartialNodeInfo, 324
- applyToSolver
 - CbcConsequence, 69
 - CbcFix Variable, 107
- assignProblem
 - OsiCbcSolverInterface, 419, 420
- assignSolver
 - CbcModel, 278
- bab_
 - CbcGenCtlBlk, 136
- BACMajor
 - CbcGenCtlBlk, 125
- BACMinor
 - CbcGenCtlBlk, 125
- BACWhere
 - CbcGenCtlBlk, 126
- basis_
 - CbcFullNodeInfo, 114
- beforeSolution1
 - CbcEventHandler, 95
- beforeSolution2
 - CbcEventHandler, 95
- bestBranch
 - CbcBranchDecision, 27
 - CbcBranchDefaultDecision, 30
- bestNode
 - CbcTree, 376
- bestSolution
 - CbcModel, 275
- betterBranch
 - CbcBranchDecision, 27
 - CbcBranchDefaultDecision, 30
 - CbcBranchDynamicDecision, 32
- boundType
 - OsiBiLinear, 398
- boundType_
 - OsiBiLinear, 399
- BPControl
 - CbcGenCtlBlk, 124
- branch
 - CbcBranchingObject, 38
 - CbcCutBranchingObject, 74
 - CbcDynamicPseudoCostBranchingObject, 91
 - CbcIntegerBranchingObject, 220
 - CbcIntegerPseudoCostBranchingObject, 224
- branchAndBound
 - CbcModel, 267
- buildRowBasis

- CbcFullNodeInfo, 114
- CbcNodeInfo, 295
- CbcPartialNodeInfo, 324
- callBack
 - CbcStopNow, 361
- CbcAction
 - CbcEventHandler, 95
- CbcAllowableFractionGap
 - CbcModel, 266
- CbcAllowableGap
 - CbcModel, 266
- CbcBaseModel, 18
- CbcBranchAllDifferent, 18
 - numberInSet_, 20
- CbcBranchCut, 21
 - feasibleRegion, 23
 - notPreferredNewFeasible, 24
 - preferredNewFeasible, 23
 - resetBounds, 24
- CbcBranchDecision, 25
 - bestBranch, 27
 - betterBranch, 27
 - saveBranchingObject, 27
 - updateInformation, 28
- CbcBranchDefaultDecision, 28
 - bestBranch, 30
 - betterBranch, 30
- CbcBranchDynamicDecision, 31
 - betterBranch, 32
 - saveBranchingObject, 33
 - updateInformation, 33
- CbcBranchingObject, 33
 - branch, 38
 - compareBranchingObject, 41
 - compareOriginalObject, 40
 - fillStrongInfo, 38
 - fix, 38
 - previousBranch, 39
 - tighten, 39
 - type, 40
 - variable, 39
 - way, 40
 - way_, 41
- CbcBranchToFixLots, 42
 - CbcBranchToFixLots, 45
 - djTolerance_, 45
- CbcCbcParam, 45
 - CbcCbcParam, 48
 - CbcCbcParamCode, 47
- CbcCbcParamCode
 - CbcCbcParam, 47
- CbcClique, 49
 - CbcClique, 52
 - cliqueType_, 53
 - numberNonSOSMembers, 53
 - slack_, 54
 - type, 53
 - type_, 53
- CbcCliqueBranchingObject, 54
 - compareBranchingObject, 56
 - compareOriginalObject, 56
- CbcCompare, 57
- CbcCompareBase, 58
 - newSolution, 59
- CbcCompareDefault, 60
- CbcCompareDepth, 63
- CbcCompareEstimate, 65
- CbcCompareObjective, 66
- CbcConsequence, 67
 - applyToSolver, 69
- CbcCountRowCut, 69
 - ~CbcCountRowCut, 71
 - setInfo, 71
- CbcCurrentCutoff
 - CbcModel, 266
- CbcCurrentMinimizationObjectiveValue
 - CbcModel, 266
- CbcCurrentObjectiveValue
 - CbcModel, 266
- CbcCutBranchingObject, 71
 - branch, 74
 - CbcCutBranchingObject, 74
 - compareBranchingObject, 75
 - compareOriginalObject, 74
- CbcCutGenerator, 75
 - generateCuts, 81
 - refreshModel, 81
 - setHowOften, 81
 - setWhatDepth, 81
- CbcCutModifier, 82
- CbcCutoffIncrement

- CbcModel, 266
- CbcCutSubsetModifier, 83
- CbcDbiParam
 - CbcModel, 266
- CbcDummyBranchingObject, 85
 - compareBranchingObject, 87
 - compareOriginalObject, 87
- CbcDynamicPseudoCostBranchingObject, 88
 - branch, 91
 - CbcDynamicPseudoCostBranchingObject, 91
 - fillStrongInfo, 91
- CbcEvent
 - CbcEventHandler, 94
- CbcEventHandler, 92
 - ~CbcEventHandler, 95
 - addCuts, 95
 - afterHeuristic, 95
 - beforeSolution1, 95
 - beforeSolution2, 95
 - CbcAction, 95
 - CbcEvent, 94
 - CbcEventHandler, 95
 - clone, 96
 - endSearch, 95
 - event, 96
 - getModel, 96
 - heuristicSolution, 95
 - killSolution, 95
 - noAction, 95
 - node, 94
 - operator=, 96
 - restart, 95
 - restartRoot, 95
 - setModel, 96
 - solution, 95
 - stop, 95
 - treeStatus, 94
- CbcEventHandler.hpp, 448
- CbcFathom, 97
 - fathom, 98
- CbcFathomDiscipline
 - CbcModel, 265
- CbcFathomDynamicProgramming, 99
 - fathom, 102
- CbcFeasibilityBase, 102
- CbcFixingBranchingObject, 103
 - compareBranchingObject, 105
 - compareOriginalObject, 105
- CbcFix Variable, 105
 - applyToSolver, 107
- CbcFollowOn, 108
- CbcFullNodeInfo, 110
 - applyToModel, 113
 - basis_, 114
 - buildRowBasis, 114
- CbcGenCtlBlk, 115
 - bab_, 136
 - BACMajor, 125
 - BACMinor, 125
 - BACWhere, 126
 - BPCControl, 124
 - CGControl, 124
 - chooseStrong_, 136
 - debugCreate_, 134
 - debugFile_, 134
 - debugSol_, 135
 - defaultSettings_, 134
 - dfltSolver_, 135
 - djFix_, 136
 - getClique, 127
 - getCombine, 130
 - getCutDepth, 126
 - getFlow, 127
 - getFPump, 129
 - getGomory, 128
 - getGreedyCover, 130
 - getGreedyEquality, 130
 - getKnapsack, 128
 - getProbing, 127
 - getRedSplit, 129
 - getRounding, 131
 - getTreeLocal, 131
 - getTwomir, 129
 - goodModel_, 136
 - IPPCControl, 123
 - message, 132
 - model_, 135
 - passInMessageHandler, 133
 - printMask_, 133
 - printMode_, 133

- setBaBStatus, 132
- setCliqueAction, 127
- setCombineAction, 130
- setCutDepth, 126
- setFlowAction, 127
- setFPumpAction, 129
- setGomoryAction, 128
- setGreedyCoverAction, 130
- setGreedyEqualityAction, 131
- setKnapsackAction, 128
- setMessages, 133
- setMirAction, 128
- setProbingAction, 127
- setRedSplitAction, 129
- setRoundingAction, 131
- setTreeLocalAction, 131
- setTwomirAction, 129
- totalTime_, 135
- translateMajor, 132
- translateMinor, 132
- verbose_, 134
- CbcGenCtlBlk::babState_struct, 18
- CbcGenCtlBlk::cbcParamsInfo_struct, 322
- CbcGenCtlBlk::chooseStrongCtl_struct, 385
- CbcGenCtlBlk::debugSolInfo_struct, 391
- CbcGenCtlBlk::djFixCtl_struct, 391
- CbcGenCtlBlk::genParamsInfo_struct, 392
- CbcGenCtlBlk::osiParamsInfo_struct, 434
- CbcGeneral, 137
- CbcGenMessages.hpp, 450
 - CbcGenMsgCode, 451
- CbcGenMsgCode
 - CbcGenMessages.hpp, 451
- CbcGenParam, 138
 - CbcGenParam, 141, 142
 - CbcGenParamCode, 141
- CbcGenParamCode
 - CbcGenParam, 141
- CbcHeuristic, 142
 - cloneBut, 150
 - minDistanceToRun_, 151
 - numInvocationsInDeep_, 150
 - numInvocationsInShallow_, 150
 - setMinDistanceToRun, 149
 - setShallowDepth, 149
 - setWhen, 149
 - shallowDepth_, 150
- CbcHeuristicCrossover, 151
 - solution, 153
- CbcHeuristicDINS, 154
 - solution, 156
- CbcHeuristicDive, 156
 - selectVariableToBranch, 160
- CbcHeuristicDiveCoefficient, 160
 - selectVariableToBranch, 162
- CbcHeuristicDiveFractional, 162
 - selectVariableToBranch, 164
- CbcHeuristicDiveGuided, 164
 - selectVariableToBranch, 166
- CbcHeuristicDiveLineSearch, 166
 - selectVariableToBranch, 168
- CbcHeuristicDivePseudoCost, 168
 - selectVariableToBranch, 170
- CbcHeuristicDiveVectorLength, 171
 - selectVariableToBranch, 172
- CbcHeuristicDynamic3, 172
 - solution, 174
- CbcHeuristicFPump, 174
 - fakeCutoff_, 181
 - maximumRetries_, 181
 - setAccumulate, 180
 - solution, 180
- CbcHeuristicFractionGap
 - CbcModel, 266
- CbcHeuristicGap
 - CbcModel, 266
- CbcHeuristicGreedyCover, 181
 - solution, 183
- CbcHeuristicGreedyEquality, 184
 - solution, 185
- CbcHeuristicGreedySOS, 186
 - solution, 188
- CbcHeuristicJustOne, 188
 - selectVariableToBranch, 190
- CbcHeuristicLocal, 191
 - solution, 193
- CbcHeuristicNaive, 193
 - solution, 195

- CbcHeuristicNode, 196
- CbcHeuristicNodeList, 197
- CbcHeuristicPartial, 197
- CbcHeuristicPivotAndFix, 199
 - solution, 201
- CbcHeuristicProximity, 202
 - solution, 203
- CbcHeuristicRandRound, 204
 - solution, 205
- CbcHeuristicRENS, 205
 - solution, 207
- CbcHeuristicRINS, 208
 - solution, 210
- CbcHeuristicVND, 210
 - solution, 213
- CbcIdiotBranch, 213
- CbcInfeasibilityWeight
 - CbcModel, 266
- CbcIntegerBranchingObject, 216
 - branch, 220
 - CbcIntegerBranchingObject, 219
 - compareBranchingObject, 220
 - fix, 220
 - tighten, 220
- CbcIntegerPseudoCostBranchingObject, 221
 - branch, 224
 - CbcIntegerPseudoCostBranchingObject, 224
 - compareBranchingObject, 224
- CbcIntegerTolerance
 - CbcModel, 266
- CbcIntParam
 - CbcModel, 265
- CbcLargestChange
 - CbcModel, 267
- CbcLastDbIParam
 - CbcModel, 267
- CbcLastIntParam
 - CbcModel, 266
- CbcLongCliqueBranchingObject, 225
 - compareBranchingObject, 227
 - compareOriginalObject, 227
- CbcLotsize, 227
 - feasibleRegion, 230
 - findRange, 231
 - notPreferredNewFeasible, 230
 - preferredNewFeasible, 230
 - resetBounds, 231
- CbcLotsizeBranchingObject, 231
 - CbcLotsizeBranchingObject, 234
 - compareBranchingObject, 234
- CbcMaximumSeconds
 - CbcModel, 266
- CbcMaxNumNode
 - CbcModel, 265
- CbcMaxNumSol
 - CbcModel, 265
- CbcMessage, 235
- CbcModel, 235
 - addCutGenerator, 276
 - addCuts, 280
 - addCuts1, 281
 - addHeuristic, 277
 - addObjects, 269
 - assignSolver, 278
 - bestSolution, 275
 - branchAndBound, 267
 - CbcAllowableFractionGap, 266
 - CbcAllowableGap, 266
 - CbcCurrentCutoff, 266
 - CbcCurrentMinimizationObjectiveValue, 266
 - CbcCurrentObjectiveValue, 266
 - CbcCutoffIncrement, 266
 - CbcDbIParam, 266
 - CbcFathomDiscipline, 265
 - CbcHeuristicFractionGap, 266
 - CbcHeuristicGap, 266
 - CbcInfeasibilityWeight, 266
 - CbcIntegerTolerance, 266
 - CbcIntParam, 265
 - CbcLargestChange, 267
 - CbcLastDbIParam, 267
 - CbcLastIntParam, 266
 - CbcMaximumSeconds, 266
 - CbcMaxNumNode, 265
 - CbcMaxNumSol, 265
 - CbcModel, 267
 - CbcNumberBranches, 266
 - CbcOptimizationDirection, 266
 - CbcPrinting, 265

- CbcSmallChange, 267
 - CbcSmallestChange, 267
 - CbcStartSeconds, 266
 - CbcSumChange, 267
 - checkSolution, 274
 - convertToDynamic, 281
 - currentSolution, 274
 - doHeuristicsAtRoot, 281
 - feasibleSolution, 274
 - findCliques, 268
 - findIntegers, 270
 - getBestPossibleObjValue, 274
 - getCurrentPassNumber, 270
 - getEmptyBasis, 280
 - getRightHandSide, 273
 - getRowRange, 273
 - getRowSense, 272
 - initialSolve, 267
 - integerPresolve, 268
 - integerPresolveThisModel, 268
 - isInteger, 273
 - modelOwnsSolver, 279
 - numberBeforeTrust, 271
 - numberGlobalViolations, 275
 - numberPenalties, 271
 - passInEventHandler, 277
 - passInPriorities, 277
 - passInSolverCharacteristics, 278
 - passInSubTreeModel, 275
 - penaltyScaleFactor, 271
 - phase, 275
 - previousBounds, 281
 - reducedCostFix, 279
 - resetToReferenceSolver, 279
 - resolve, 267
 - setApplicationData, 278
 - setBestSolution, 275
 - setBestSolutionBasis, 282
 - setBranchingMethod, 276
 - setCutModifier, 276
 - setCutoff, 270
 - setDefaultHandler, 278
 - setHotstartSolution, 270
 - setModelOwnsSolver, 279
 - setNumberBeforeTrust, 270
 - setNumberPenalties, 271
 - setNumberStrong, 270
 - setObjectiveValue, 281
 - setPenaltyScaleFactor, 271
 - setPrintFrequency, 272
 - setProblemType, 272
 - status, 272
 - subTreeModel, 276
 - synchronizeHandlers, 280
 - takeOffCuts, 280
 - tightenVubs, 268, 269
 - typePresolve, 276
 - usedInSolution, 273
- CbcNode, 282
- chooseBranch, 286
 - chooseClpBranch, 288
 - chooseDynamicBranch, 287
 - chooseOsiBranch, 287
 - createInfo, 286
 - initializeInfo, 288
- CbcNodeInfo, 289
- ~CbcNodeInfo, 295
 - active_, 296
 - applyToModel, 295
 - buildRowBasis, 295
 - CbcNodeInfo, 294
 - deactivate, 295
 - initializeInfo, 295
 - numberBranchesLeft_, 296
 - numberPointingToThis_, 296
 - numberRows_, 296
- CbcNumberBranches
- CbcModel, 266
- CbcNWay, 297
- CbcNWayBranchingObject, 300
- CbcNWayBranchingObject, 302
 - compareBranchingObject, 302
 - compareOriginalObject, 302
- CbcObject, 303
- createCbcBranch, 307
 - createOsiBranch, 308
 - createUpdateInformation, 309
 - feasibleRegion, 307
 - floorCeiling, 309
 - infeasibility, 307
 - model_, 310
 - notPreferredNewFeasible, 308

- optionalObject, 310
- preferredNewFeasible, 308
- resetBounds, 309
- setId, 309
- solverBranch, 308
- CbcObjectUpdateData, 310
 - object_, 312
- CbcOptimizationDirection
 - CbcModel, 266
- CbcOsiParam, 312
 - CbcOsiParam, 314, 315
 - CbcOsiParamCode, 314
- CbcOsiParamCode
 - CbcOsiParam, 314
- CbcOsiSolver, 315
- CbcParam, 317
- CbcPartialNodeInfo, 322
 - applyToModel, 324
 - buildRowBasis, 324
- CbcPrinting
 - CbcModel, 265
- CbcRounding, 325
- CbcRowCuts, 327
- CbcSerendipity, 327
 - solution, 329
- CbcSimpleInteger, 329
 - createCbcBranch, 333
 - feasibleRegion, 332, 333
 - originalLower_, 334
 - resetBounds, 333
 - solverBranch, 333
- CbcSimpleIntegerDynamicPseudoCost, 334
 - createUpdateInformation, 342
 - downDynamicPseudoCost_, 343
 - method_, 343
 - solverBranch, 342
- CbcSimpleIntegerPseudoCost, 343
 - downPseudoCost_, 346
- CbcSmallChange
 - CbcModel, 267
- CbcSmallestChange
 - CbcModel, 267
- CbcSolver, 346
 - fillValuesInSolver, 350
 - solve, 350
 - updateModel, 350
- CbcSolver.hpp, 451
- CbcSolverAnalyze.hpp, 452
- CbcSolverExpandKnapsack.hpp, 452
- CbcSolverHeuristics.hpp, 453
- CbcSolverUsefulData, 351
- CbcSOS, 351
 - CbcSOS, 355
 - createUpdateInformation, 355
 - solverBranch, 355
- CbcSOSBranchingObject, 355
 - compareBranchingObject, 358
 - compareOriginalObject, 358
 - fix, 357
 - previousBranch, 358
- CbcStartSeconds
 - CbcModel, 266
- CbcStatistics, 359
- CbcStopNow, 360
 - callBack, 361
- CbcStrategy, 361
 - status, 364
- CbcStrategyDefault, 364
- CbcStrategyDefaultSubTree, 366
- CbcStrategyNull, 368
- CbcStrongInfo, 370
- CbcSumChange
 - CbcModel, 267
- CbcThread, 371
- CbcTree, 371
 - bestNode, 376
 - cleanTree, 376
- CbcTreeLocal, 377
- CbcTreeVariable, 379
- CbcUser, 381
 - exportSolution, 383
 - importData, 383
- CGControl
 - CbcGenCtlBlk, 124
- CglTemporary, 384
 - generateCuts, 385
- checkSolution
 - CbcModel, 274
- chooseBranch
 - CbcNode, 286
- chooseClpBranch

- CbcNode, 288
- chooseDynamicBranch
 - CbcNode, 287
- chooseOsiBranch
 - CbcNode, 287
- chooseStrong_
 - CbcGenCtlBlk, 136
- cleanTree
 - CbcTree, 376
- cliqueType_
 - CbcClique, 53
- clone
 - CbcEventHandler, 96
- cloneBut
 - CbcHeuristic, 150
- ClpAmplObjective, 386
 - gradient, 387
 - markNonlinear, 388
 - reducedGradient, 387
 - stepLength, 388
- ClpConstraintAmpl, 388
 - gradient, 390
 - markNonlinear, 390
 - markNonzero, 390
- coefficient_
 - OsiBiLinear, 399
- CoinHashLink, 391
- compareBranchingObject
 - CbcBranchingObject, 41
 - CbcCliqueBranchingObject, 56
 - CbcCutBranchingObject, 75
 - CbcDummyBranchingObject, 87
 - CbcFixingBranchingObject, 105
 - CbcIntegerBranchingObject, 220
 - CbcIntegerPseudoCostBranchingObject, 224
 - CbcLongCliqueBranchingObject, 227
 - CbcLotsizeBranchingObject, 234
 - CbcNWayBranchingObject, 302
 - CbcSOSBranchingObject, 358
- compareOriginalObject
 - CbcBranchingObject, 40
 - CbcCliqueBranchingObject, 56
 - CbcCutBranchingObject, 74
 - CbcDummyBranchingObject, 87
 - CbcFixingBranchingObject, 105
 - CbcLongCliqueBranchingObject, 227
 - CbcNWayBranchingObject, 302
 - CbcSOSBranchingObject, 358
- convertToDynamic
 - CbcModel, 281
- createBranch
 - OsiBiLinear, 398
 - OsiLink, 427
 - OsiOldLink, 431
 - OsiSimpleFixedInteger, 436
 - OsiUsesBiLinear, 447
- createCbcBranch
 - CbcObject, 307
 - CbcSimpleInteger, 333
- createInfo
 - CbcNode, 286
- createOsiBranch
 - CbcObject, 308
- createUpdateInformation
 - CbcObject, 309
 - CbcSimpleIntegerDynamicPseudoCost, 342
 - CbcSOS, 355
- currentSolution
 - CbcModel, 274
- deactivate
 - CbcNodeInfo, 295
- debugCreate_
 - CbcGenCtlBlk, 134
- debugFile_
 - CbcGenCtlBlk, 134
- debugSol_
 - CbcGenCtlBlk, 135
- defaultSettings_
 - CbcGenCtlBlk, 134
- dfltSolver_
 - CbcGenCtlBlk, 135
- djFix_
 - CbcGenCtlBlk, 136
- djTolerance_
 - CbcBranchToFixLots, 45
- doHeuristicsAtRoot
 - CbcModel, 281

- downDynamicPseudoCost_
 - CbcSimpleIntegerDynamicPseudoCost, 343
- downPseudoCost_
 - CbcSimpleIntegerPseudoCost, 346
- endSearch
 - CbcEventHandler, 95
- event
 - CbcEventHandler, 96
- exportSolution
 - CbcUser, 383
- fakeCutoff_
 - CbcHeuristicFPump, 181
- fathom
 - CbcFathom, 98
 - CbcFathomDynamicProgramming, 102
- feasibleRegion
 - CbcBranchCut, 23
 - CbcLotsize, 230
 - CbcObject, 307
 - CbcSimpleInteger, 332, 333
 - OsiBiLinear, 398
 - OsiLink, 426
 - OsiOldLink, 431
 - OsiUsesBiLinear, 447
- feasibleSolution
 - CbcModel, 274
- fillStrongInfo
 - CbcBranchingObject, 38
 - CbcDynamicPseudoCostBranchingObject, 91
- fillValuesInSolver
 - CbcSolver, 350
- findCliques
 - CbcModel, 268
- findIntegers
 - CbcModel, 270
- findRange
 - CbcLotsize, 231
- fix
 - CbcBranchingObject, 38
 - CbcIntegerBranchingObject, 220
 - CbcSOSBranchingObject, 357
- floorCeiling
 - CbcObject, 309
- generateCuts
 - CbcCutGenerator, 81
 - CglTemporary, 385
- getBestPossibleObjValue
 - CbcModel, 274
- getClique
 - CbcGenCtlBlk, 127
- getCombine
 - CbcGenCtlBlk, 130
- getCurrentPassNumber
 - CbcModel, 270
- getCutDepth
 - CbcGenCtlBlk, 126
- getDualRays
 - OsiCbcSolverInterface, 414
- getEmptyBasis
 - CbcModel, 280
- getEmptyWarmStart
 - OsiCbcSolverInterface, 413
- getFlow
 - CbcGenCtlBlk, 127
- getFPump
 - CbcGenCtlBlk, 129
- getGomory
 - CbcGenCtlBlk, 128
- getGreedyCover
 - CbcGenCtlBlk, 130
- getGreedyEquality
 - CbcGenCtlBlk, 130
- getIterationCount
 - OsiCbcSolverInterface, 414
- getKnapsack
 - CbcGenCtlBlk, 128
- getModel
 - CbcEventHandler, 96
- getPrimalRays
 - OsiCbcSolverInterface, 415
- getProbing
 - CbcGenCtlBlk, 127
- getRedSplit
 - CbcGenCtlBlk, 129
- getRightHandSide
 - CbcModel, 273

- OsiCbcSolverInterface, 414
- getRounding
 - CbcGenCtlBlk, 131
- getRowName
 - OsiCbcSolverInterface, 415
- getRowRange
 - CbcModel, 273
 - OsiCbcSolverInterface, 414
- getRowSense
 - CbcModel, 272
 - OsiCbcSolverInterface, 413
- getTreeLocal
 - CbcGenCtlBlk, 131
- getTwomir
 - CbcGenCtlBlk, 129
- goodModel_
 - CbcGenCtlBlk, 136
- gradient
 - ClpAmplObjective, 387
 - ClpConstraintAmpl, 390
- gutsOfDestructor
 - OsiSolverLink, 445
- heuristicSolution
 - CbcEventHandler, 95
- importData
 - CbcUser, 383
- infeasibility
 - CbcObject, 307
- initializeInfo
 - CbcNode, 288
 - CbcNodeInfo, 295
- initialSolve
 - CbcModel, 267
- integerPresolve
 - CbcModel, 268
- integerPresolveThisModel
 - CbcModel, 268
- IPPControl
 - CbcGenCtlBlk, 123
- isInteger
 - CbcModel, 273
- killSolution
 - CbcEventHandler, 95
- linearizedBAB
 - OsiSolverLink, 445
- loadProblem
 - OsiCbcSolverInterface, 419, 420
- markNonlinear
 - ClpAmplObjective, 388
 - ClpConstraintAmpl, 390
- markNonzero
 - ClpConstraintAmpl, 390
- maximumRetries_
 - CbcHeuristicFPump, 181
- message
 - CbcGenCtlBlk, 132
- method_
 - CbcSimpleIntegerDynamicPseudo-Cost, 343
- minDistanceToRun_
 - CbcHeuristic, 151
- model_
 - CbcGenCtlBlk, 135
 - CbcObject, 310
- modelOwnsSolver
 - CbcModel, 279
- newSolution
 - CbcCompareBase, 59
- noAction
 - CbcEventHandler, 95
- node
 - CbcEventHandler, 94
- nonlinearSLP
 - OsiSolverLink, 444
- notPreferredNewFeasible
 - CbcBranchCut, 24
 - CbcLotsize, 230
 - CbcObject, 308
- numberBeforeTrust
 - CbcModel, 271
- numberBranchesLeft_
 - CbcNodeInfo, 296
- numberGlobalViolations
 - CbcModel, 275
- numberInSet_
 - CbcBranchAllDifferent, 20
- numberNonSOSMembers

- CbcClique, 53
- numberPenalties
 - CbcModel, 271
- numberPointingToThis_
 - CbcNodeInfo, 296
- numberRows_
 - CbcNodeInfo, 296
- numInvocationsInDeep_
 - CbcHeuristic, 150
- numInvocationsInShallow_
 - CbcHeuristic, 150
- object_
 - CbcObjectUpdateData, 312
- operator=
 - CbcEventHandler, 96
- optionalObject
 - CbcObject, 310
- originalLower_
 - CbcSimpleInteger, 334
- OsiBiLinear, 392
 - boundType, 398
 - boundType_, 399
 - coefficient_, 399
 - createBranch, 398
 - feasibleRegion, 398
- OsiBiLinearBranchingObject, 399
- OsiBiLinearEquality, 400
- OsiCbcSolverInterface, 402
 - addCol, 418
 - applyColCut, 422
 - applyRowCut, 421
 - applyRowCuts, 418
 - assignProblem, 419, 420
 - getDualRays, 414
 - getEmptyWarmStart, 413
 - getIterationCount, 414
 - getPrimalRays, 415
 - getRightHandSide, 414
 - getRowName, 415
 - getRowRange, 414
 - getRowSense, 413
 - loadProblem, 419, 420
 - OsiCbcSolverInterfaceUnitTest, 422
 - passInMessageHandler, 421
 - setColLower, 415
 - setColSetBounds, 416
 - setColSolution, 417
 - setColUpper, 416
 - setRowLower, 416
 - setRowPrice, 418
 - setRowSetBounds, 417
 - setRowSetTypes, 417
 - setRowUpper, 416
 - setWarmStart, 413
 - writeMps, 421
 - writeMpsNative, 421
- OsiCbcSolverInterfaceUnitTest
 - OsiCbcSolverInterface, 422
- OsiChooseStrongSubset, 422
 - setupList, 424
- OsiLink, 424
 - createBranch, 427
 - feasibleRegion, 426
 - OsiLink, 426
- OsiLinkBranchingObject, 427
- OsiLinkedBound, 428
- OsiOldLink, 429
 - createBranch, 431
 - feasibleRegion, 431
 - OsiOldLink, 430, 431
- OsiOldLinkBranchingObject, 431
- OsiOneLink, 432
 - OsiOneLink, 434
 - xRow_, 434
- OsiSimpleFixedInteger, 435
 - createBranch, 436
- OsiSolverLinearizedQuadratic, 436
- OsiSolverLink, 438
 - gutsOfDestructor, 445
 - linearizedBAB, 445
 - nonlinearSLP, 444
 - OsiSolverLink, 444
 - setBranchingStrategyOnVariables, 445
- OsiUsesBiLinear, 445
 - createBranch, 447
 - feasibleRegion, 447
- passInEventHandler
 - CbcModel, 277
- passInMessageHandler

- CbcGenCtlBlk, 133
- OsiCbcSolverInterface, 421
- passInPriorities
 - CbcModel, 277
- passInSolverCharacteristics
 - CbcModel, 278
- passInSubTreeModel
 - CbcModel, 275
- penaltyScaleFactor
 - CbcModel, 271
- phase
 - CbcModel, 275
- preferredNewFeasible
 - CbcBranchCut, 23
 - CbcLotsize, 230
 - CbcObject, 308
- previousBounds
 - CbcModel, 281
- previousBranch
 - CbcBranchingObject, 39
 - CbcSOSBranchingObject, 358
- printMask_
 - CbcGenCtlBlk, 133
- printMode_
 - CbcGenCtlBlk, 133
- PseudoReducedCost, 448
- reducedCostFix
 - CbcModel, 279
- reducedGradient
 - ClpAmplObjective, 387
- refreshModel
 - CbcCutGenerator, 81
- resetBounds
 - CbcBranchCut, 24
 - CbcLotsize, 231
 - CbcObject, 309
 - CbcSimpleInteger, 333
- resetToReferenceSolver
 - CbcModel, 279
- resolve
 - CbcModel, 267
- restart
 - CbcEventHandler, 95
- restartRoot
 - CbcEventHandler, 95
- saveBranchingObject
 - CbcBranchDecision, 27
 - CbcBranchDynamicDecision, 33
- selectVariableToBranch
 - CbcHeuristicDive, 160
 - CbcHeuristicDiveCoefficient, 162
 - CbcHeuristicDiveFractional, 164
 - CbcHeuristicDiveGuided, 166
 - CbcHeuristicDiveLineSearch, 168
 - CbcHeuristicDivePseudoCost, 170
 - CbcHeuristicDiveVectorLength, 172
 - CbcHeuristicJustOne, 190
- setAccumulate
 - CbcHeuristicFPump, 180
- setApplicationData
 - CbcModel, 278
- setBaBStatus
 - CbcGenCtlBlk, 132
- setBestSolution
 - CbcModel, 275
- setBestSolutionBasis
 - CbcModel, 282
- setBranchingMethod
 - CbcModel, 276
- setBranchingStrategyOnVariables
 - OsiSolverLink, 445
- setCliqueAction
 - CbcGenCtlBlk, 127
- setColLower
 - OsiCbcSolverInterface, 415
- setColSetBounds
 - OsiCbcSolverInterface, 416
- setColSolution
 - OsiCbcSolverInterface, 417
- setColUpper
 - OsiCbcSolverInterface, 416
- setCombineAction
 - CbcGenCtlBlk, 130
- setCutDepth
 - CbcGenCtlBlk, 126
- setCutModifier
 - CbcModel, 276
- setCutoff
 - CbcModel, 270
- setDefaultHandler
 - CbcModel, 278

- setFlowAction
 - CbcGenCtlBlk, 127
- setFPumpAction
 - CbcGenCtlBlk, 129
- setGomoryAction
 - CbcGenCtlBlk, 128
- setGreedyCoverAction
 - CbcGenCtlBlk, 130
- setGreedyEqualityAction
 - CbcGenCtlBlk, 131
- setHotstartSolution
 - CbcModel, 270
- setHowOften
 - CbcCutGenerator, 81
- setId
 - CbcObject, 309
- setInfo
 - CbcCountRowCut, 71
- setKnapsackAction
 - CbcGenCtlBlk, 128
- setMessages
 - CbcGenCtlBlk, 133
- setMinDistanceToRun
 - CbcHeuristic, 149
- setMirAction
 - CbcGenCtlBlk, 128
- setModel
 - CbcEventHandler, 96
- setModelOwnsSolver
 - CbcModel, 279
- setNumberBeforeTrust
 - CbcModel, 270
- setNumberPenalties
 - CbcModel, 271
- setNumberStrong
 - CbcModel, 270
- setObjectiveValue
 - CbcModel, 281
- setPenaltyScaleFactor
 - CbcModel, 271
- setPrintFrequency
 - CbcModel, 272
- setProbingAction
 - CbcGenCtlBlk, 127
- setProblemType
 - CbcModel, 272
- setRedSplitAction
 - CbcGenCtlBlk, 129
- setRoundingAction
 - CbcGenCtlBlk, 131
- setRowLower
 - OsiCbcSolverInterface, 416
- setRowPrice
 - OsiCbcSolverInterface, 418
- setRowSetBounds
 - OsiCbcSolverInterface, 417
- setRowSetTypes
 - OsiCbcSolverInterface, 417
- setRowUpper
 - OsiCbcSolverInterface, 416
- setShallowDepth
 - CbcHeuristic, 149
- setTreeLocalAction
 - CbcGenCtlBlk, 131
- setTwomirAction
 - CbcGenCtlBlk, 129
- setupList
 - OsiChooseStrongSubset, 424
- setWarmStart
 - OsiCbcSolverInterface, 413
- setWhatDepth
 - CbcCutGenerator, 81
- setWhen
 - CbcHeuristic, 149
- shallowDepth_
 - CbcHeuristic, 150
- slack_
 - CbcClique, 54
- solution
 - CbcEventHandler, 95
 - CbcHeuristicCrossover, 153
 - CbcHeuristicDINS, 156
 - CbcHeuristicDynamic3, 174
 - CbcHeuristicFPump, 180
 - CbcHeuristicGreedyCover, 183
 - CbcHeuristicGreedyEquality, 185
 - CbcHeuristicGreedySOS, 188
 - CbcHeuristicLocal, 193
 - CbcHeuristicNaive, 195
 - CbcHeuristicPivotAndFix, 201
 - CbcHeuristicProximity, 203
 - CbcHeuristicRandRound, 205

- CbcHeuristicRENS, 207
- CbcHeuristicRINS, 210
- CbcHeuristicVND, 213
- CbcSerendipity, 329
- solve
 - CbcSolver, 350
- solverBranch
 - CbcObject, 308
 - CbcSimpleInteger, 333
 - CbcSimpleIntegerDynamicPseudo-Cost, 342
 - CbcSOS, 355
- status
 - CbcModel, 272
 - CbcStrategy, 364
- stepLength
 - ClpAmplObjective, 388
- stop
 - CbcEventHandler, 95
- subTreeModel
 - CbcModel, 276
- synchronizeHandlers
 - CbcModel, 280
- takeOffCuts
 - CbcModel, 280
- tighten
 - CbcBranchingObject, 39
 - CbcIntegerBranchingObject, 220
- tightenVubs
 - CbcModel, 268, 269
- totalTime_
 - CbcGenCtlBlk, 135
- translateMajor
 - CbcGenCtlBlk, 132
- translateMinor
 - CbcGenCtlBlk, 132
- treeStatus
 - CbcEventHandler, 94
- type
 - CbcBranchingObject, 40
 - CbcClique, 53
- type_
 - CbcClique, 53
- typePresolve
 - CbcModel, 276
- updateInformation
 - CbcBranchDecision, 28
 - CbcBranchDynamicDecision, 33
- updateModel
 - CbcSolver, 350
- usedInSolution
 - CbcModel, 273
- variable
 - CbcBranchingObject, 39
- verbose_
 - CbcGenCtlBlk, 134
- way
 - CbcBranchingObject, 40
- way_
 - CbcBranchingObject, 41
- writeMps
 - OsiCbcSolverInterface, 421
- writeMpsNative
 - OsiCbcSolverInterface, 421
- xRow_
 - OsiOneLink, 434