

Cbc  
2.7.5

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## Contents

<b>1</b>	<b>Class Index</b>	<b>1</b>
1.1	Class Hierarchy . . . . .	1
<b>2</b>	<b>Class Index</b>	<b>6</b>
2.1	Class List . . . . .	6
<b>3</b>	<b>File Index</b>	<b>12</b>
3.1	File List . . . . .	12
<b>4</b>	<b>Class Documentation</b>	<b>16</b>
4.1	ampl_info Struct Reference . . . . .	16
4.1.1	Detailed Description . . . . .	16
4.2	CbcGenCtlBlk::babState_struct Struct Reference . . . . .	16
4.2.1	Detailed Description . . . . .	16
4.3	CbcBaseModel Class Reference . . . . .	17
4.3.1	Detailed Description . . . . .	17
4.4	CbcBranchAllDifferent Class Reference . . . . .	17
4.4.1	Detailed Description . . . . .	19
4.4.2	Member Data Documentation . . . . .	19
4.5	CbcBranchCut Class Reference . . . . .	19
4.5.1	Detailed Description . . . . .	21
4.5.2	Member Function Documentation . . . . .	21
4.6	CbcBranchDecision Class Reference . . . . .	22
4.6.1	Detailed Description . . . . .	24
4.6.2	Member Function Documentation . . . . .	24
4.7	CbcBranchDefaultDecision Class Reference . . . . .	25
4.7.1	Detailed Description . . . . .	26
4.7.2	Member Function Documentation . . . . .	26
4.8	CbcBranchDynamicDecision Class Reference . . . . .	27
4.8.1	Detailed Description . . . . .	28
4.8.2	Member Function Documentation . . . . .	28
4.9	CbcBranchingObject Class Reference . . . . .	29
4.9.1	Detailed Description . . . . .	32

---

4.9.2	Member Function Documentation	32
4.9.3	Member Data Documentation	35
4.10	CbcBranchToFixLots Class Reference	35
4.10.1	Detailed Description	37
4.10.2	Constructor & Destructor Documentation	38
4.10.3	Member Data Documentation	38
4.11	CbcBranchUserDecision Class Reference	38
4.11.1	Detailed Description	39
4.11.2	Member Function Documentation	39
4.12	CbcCbcParam Class Reference	40
4.12.1	Detailed Description	41
4.12.2	Member Enumeration Documentation	42
4.12.3	Constructor & Destructor Documentation	42
4.13	CbcClique Class Reference	43
4.13.1	Detailed Description	45
4.13.2	Constructor & Destructor Documentation	45
4.13.3	Member Function Documentation	45
4.13.4	Member Data Documentation	46
4.14	CbcCliqueBranchingObject Class Reference	47
4.14.1	Detailed Description	48
4.14.2	Member Function Documentation	48
4.15	CbcCompare Class Reference	49
4.15.1	Detailed Description	49
4.16	CbcCompareBase Class Reference	50
4.16.1	Detailed Description	51
4.16.2	Member Function Documentation	51
4.17	CbcCompareDefault Class Reference	52
4.17.1	Detailed Description	54
4.18	CbcCompareDepth Class Reference	54
4.18.1	Detailed Description	55
4.19	CbcCompareEstimate Class Reference	55
4.19.1	Detailed Description	56
4.20	CbcCompareObjective Class Reference	57
4.20.1	Detailed Description	58

4.21 CbcCompareUser Class Reference . . . . .	58
4.21.1 Detailed Description . . . . .	59
4.21.2 Member Function Documentation . . . . .	59
4.22 CbcConsequence Class Reference . . . . .	59
4.22.1 Detailed Description . . . . .	60
4.22.2 Member Function Documentation . . . . .	60
4.23 CbcCountRowCut Class Reference . . . . .	61
4.23.1 Detailed Description . . . . .	62
4.23.2 Constructor & Destructor Documentation . . . . .	62
4.23.3 Member Function Documentation . . . . .	62
4.24 CbcCutBranchingObject Class Reference . . . . .	63
4.24.1 Detailed Description . . . . .	64
4.24.2 Constructor & Destructor Documentation . . . . .	65
4.24.3 Member Function Documentation . . . . .	65
4.25 CbcCutGenerator Class Reference . . . . .	65
4.25.1 Detailed Description . . . . .	69
4.25.2 Member Function Documentation . . . . .	69
4.26 CbcCutModifier Class Reference . . . . .	70
4.26.1 Detailed Description . . . . .	71
4.27 CbcCutSubsetModifier Class Reference . . . . .	71
4.27.1 Detailed Description . . . . .	73
4.28 CbcDummyBranchingObject Class Reference . . . . .	73
4.28.1 Detailed Description . . . . .	75
4.28.2 Member Function Documentation . . . . .	75
4.29 CbcDynamicPseudoCostBranchingObject Class Reference . . . . .	75
4.29.1 Detailed Description . . . . .	77
4.29.2 Constructor & Destructor Documentation . . . . .	78
4.29.3 Member Function Documentation . . . . .	78
4.30 CbcEventHandler Class Reference . . . . .	78
4.30.1 Detailed Description . . . . .	80
4.30.2 Member Enumeration Documentation . . . . .	81
4.30.3 Constructor & Destructor Documentation . . . . .	81
4.30.4 Member Function Documentation . . . . .	82
4.31 CbcFathom Class Reference . . . . .	82

---

4.31.1	Detailed Description	84
4.31.2	Member Function Documentation	84
4.32	CbcFathomDynamicProgramming Class Reference	84
4.32.1	Detailed Description	87
4.32.2	Member Function Documentation	87
4.33	CbcFeasibilityBase Class Reference	87
4.33.1	Detailed Description	88
4.33.2	Member Function Documentation	88
4.34	CbcFixingBranchingObject Class Reference	88
4.34.1	Detailed Description	89
4.34.2	Member Function Documentation	89
4.35	CbcFixVariable Class Reference	90
4.35.1	Detailed Description	92
4.35.2	Member Function Documentation	92
4.36	CbcFollowOn Class Reference	92
4.36.1	Detailed Description	94
4.37	CbcFollowOn2 Class Reference	94
4.37.1	Detailed Description	96
4.37.2	Member Function Documentation	96
4.38	CbcFullNodeInfo Class Reference	96
4.38.1	Detailed Description	98
4.38.2	Member Function Documentation	99
4.38.3	Member Data Documentation	99
4.39	CbcGenCtlBlk Class Reference	100
4.39.1	Detailed Description	106
4.39.2	Member Enumeration Documentation	106
4.39.3	Member Function Documentation	108
4.39.4	Member Data Documentation	112
4.40	CbcGeneral Class Reference	114
4.40.1	Detailed Description	116
4.41	CbcGenParam Class Reference	116
4.41.1	Detailed Description	118
4.41.2	Member Enumeration Documentation	118
4.41.3	Constructor & Destructor Documentation	119

---

4.42 CbcHeuristic Class Reference . . . . .	119
4.42.1 Detailed Description . . . . .	124
4.42.2 Member Function Documentation . . . . .	124
4.42.3 Member Data Documentation . . . . .	125
4.43 CbcHeuristicCrossover Class Reference . . . . .	126
4.43.1 Detailed Description . . . . .	128
4.43.2 Member Function Documentation . . . . .	128
4.44 CbcHeuristicDINS Class Reference . . . . .	128
4.44.1 Detailed Description . . . . .	130
4.44.2 Member Function Documentation . . . . .	130
4.45 CbcHeuristicDive Class Reference . . . . .	130
4.45.1 Detailed Description . . . . .	133
4.45.2 Member Function Documentation . . . . .	133
4.46 CbcHeuristicDiveCoefficient Class Reference . . . . .	133
4.46.1 Detailed Description . . . . .	135
4.46.2 Member Function Documentation . . . . .	135
4.47 CbcHeuristicDiveFractional Class Reference . . . . .	135
4.47.1 Detailed Description . . . . .	137
4.47.2 Member Function Documentation . . . . .	137
4.48 CbcHeuristicDiveGuided Class Reference . . . . .	137
4.48.1 Detailed Description . . . . .	139
4.48.2 Member Function Documentation . . . . .	139
4.49 CbcHeuristicDiveLineSearch Class Reference . . . . .	139
4.49.1 Detailed Description . . . . .	141
4.49.2 Member Function Documentation . . . . .	141
4.50 CbcHeuristicDivePseudoCost Class Reference . . . . .	141
4.50.1 Detailed Description . . . . .	143
4.50.2 Member Function Documentation . . . . .	143
4.51 CbcHeuristicDiveVectorLength Class Reference . . . . .	143
4.51.1 Detailed Description . . . . .	145
4.51.2 Member Function Documentation . . . . .	145
4.52 CbcHeuristicDynamic3 Class Reference . . . . .	145
4.52.1 Detailed Description . . . . .	147
4.52.2 Member Function Documentation . . . . .	147

---

4.53 CbcHeuristicFPump Class Reference . . . . .	147
4.53.1 Detailed Description . . . . .	151
4.53.2 Member Function Documentation . . . . .	151
4.53.3 Member Data Documentation . . . . .	152
4.54 CbcHeuristicGreedyCover Class Reference . . . . .	152
4.54.1 Detailed Description . . . . .	154
4.54.2 Member Function Documentation . . . . .	154
4.55 CbcHeuristicGreedyEquality Class Reference . . . . .	154
4.55.1 Detailed Description . . . . .	156
4.55.2 Member Function Documentation . . . . .	156
4.56 CbcHeuristicGreedySOS Class Reference . . . . .	156
4.56.1 Detailed Description . . . . .	158
4.56.2 Member Function Documentation . . . . .	158
4.57 CbcHeuristicJustOne Class Reference . . . . .	158
4.57.1 Detailed Description . . . . .	159
4.57.2 Member Function Documentation . . . . .	160
4.58 CbcHeuristicLocal Class Reference . . . . .	160
4.58.1 Detailed Description . . . . .	162
4.58.2 Member Function Documentation . . . . .	162
4.59 CbcHeuristicNaive Class Reference . . . . .	162
4.59.1 Detailed Description . . . . .	163
4.59.2 Member Function Documentation . . . . .	164
4.60 CbcHeuristicNode Class Reference . . . . .	164
4.60.1 Detailed Description . . . . .	164
4.61 CbcHeuristicNodeList Class Reference . . . . .	165
4.61.1 Detailed Description . . . . .	165
4.62 CbcHeuristicPartial Class Reference . . . . .	165
4.62.1 Detailed Description . . . . .	167
4.63 CbcHeuristicPivotAndFix Class Reference . . . . .	167
4.63.1 Detailed Description . . . . .	168
4.63.2 Member Function Documentation . . . . .	168
4.64 CbcHeuristicRandRound Class Reference . . . . .	169
4.64.1 Detailed Description . . . . .	170
4.64.2 Member Function Documentation . . . . .	170

4.65 CbcHeuristicRENS Class Reference . . . . .	170
4.65.1 Detailed Description . . . . .	172
4.65.2 Member Function Documentation . . . . .	172
4.66 CbcHeuristicRINS Class Reference . . . . .	172
4.66.1 Detailed Description . . . . .	174
4.66.2 Member Function Documentation . . . . .	174
4.66.3 Member Data Documentation . . . . .	175
4.67 CbcHeuristicVND Class Reference . . . . .	175
4.67.1 Detailed Description . . . . .	177
4.67.2 Member Function Documentation . . . . .	177
4.68 CbcIntegerBranchingObject Class Reference . . . . .	177
4.68.1 Detailed Description . . . . .	180
4.68.2 Constructor & Destructor Documentation . . . . .	180
4.68.3 Member Function Documentation . . . . .	180
4.69 CbcIntegerPseudoCostBranchingObject Class Reference . . . . .	181
4.69.1 Detailed Description . . . . .	183
4.69.2 Constructor & Destructor Documentation . . . . .	184
4.69.3 Member Function Documentation . . . . .	184
4.70 CbcLink Class Reference . . . . .	184
4.70.1 Detailed Description . . . . .	186
4.70.2 Constructor & Destructor Documentation . . . . .	186
4.71 CbcLinkBranchingObject Class Reference . . . . .	187
4.71.1 Detailed Description . . . . .	188
4.71.2 Member Function Documentation . . . . .	188
4.72 CbcLongCliqueBranchingObject Class Reference . . . . .	188
4.72.1 Detailed Description . . . . .	190
4.72.2 Member Function Documentation . . . . .	190
4.73 CbcLotsize Class Reference . . . . .	190
4.73.1 Detailed Description . . . . .	192
4.73.2 Member Function Documentation . . . . .	193
4.74 CbcLotsizeBranchingObject Class Reference . . . . .	194
4.74.1 Detailed Description . . . . .	195
4.74.2 Constructor & Destructor Documentation . . . . .	196
4.74.3 Member Function Documentation . . . . .	196

4.75 CbcMessage Class Reference . . . . .	196
4.75.1 Detailed Description . . . . .	196
4.76 CbcModel Class Reference . . . . .	197
4.76.1 Detailed Description . . . . .	214
4.76.2 Member Enumeration Documentation . . . . .	215
4.76.3 Constructor & Destructor Documentation . . . . .	217
4.76.4 Member Function Documentation . . . . .	217
4.77 CbcNode Class Reference . . . . .	228
4.77.1 Detailed Description . . . . .	231
4.77.2 Member Function Documentation . . . . .	231
4.78 CbcNodeInfo Class Reference . . . . .	234
4.78.1 Detailed Description . . . . .	237
4.78.2 Constructor & Destructor Documentation . . . . .	238
4.78.3 Member Function Documentation . . . . .	238
4.78.4 Member Data Documentation . . . . .	239
4.79 CbcNWay Class Reference . . . . .	239
4.79.1 Detailed Description . . . . .	241
4.80 CbcNWayBranchingObject Class Reference . . . . .	242
4.80.1 Detailed Description . . . . .	243
4.80.2 Constructor & Destructor Documentation . . . . .	243
4.80.3 Member Function Documentation . . . . .	243
4.81 CbcObject Class Reference . . . . .	245
4.81.1 Detailed Description . . . . .	248
4.81.2 Member Function Documentation . . . . .	248
4.81.3 Member Data Documentation . . . . .	250
4.82 CbcObjectUpdateData Class Reference . . . . .	251
4.82.1 Detailed Description . . . . .	252
4.82.2 Member Data Documentation . . . . .	252
4.83 CbcOsiParam Class Reference . . . . .	252
4.83.1 Detailed Description . . . . .	253
4.83.2 Member Enumeration Documentation . . . . .	253
4.83.3 Constructor & Destructor Documentation . . . . .	254
4.84 CbcParam Class Reference . . . . .	254
4.84.1 Detailed Description . . . . .	257

---

4.85	CbcGenCtlBlk::cbcParamsInfo_struct Struct Reference	258
4.85.1	Detailed Description	258
4.86	CbcPartialNodeInfo Class Reference	258
4.86.1	Detailed Description	260
4.86.2	Member Function Documentation	260
4.87	CbcRounding Class Reference	260
4.87.1	Detailed Description	262
4.88	CbcSerendipity Class Reference	262
4.88.1	Detailed Description	263
4.88.2	Member Function Documentation	263
4.89	CbcSimpleInteger Class Reference	264
4.89.1	Detailed Description	266
4.89.2	Member Function Documentation	266
4.89.3	Member Data Documentation	267
4.90	CbcSimpleIntegerDynamicPseudoCost Class Reference	267
4.90.1	Detailed Description	273
4.90.2	Member Function Documentation	273
4.90.3	Member Data Documentation	274
4.91	CbcSimpleIntegerFixed Class Reference	274
4.91.1	Detailed Description	275
4.91.2	Member Function Documentation	275
4.92	CbcSimpleIntegerPseudoCost Class Reference	276
4.92.1	Detailed Description	278
4.92.2	Member Data Documentation	278
4.93	CbcSolver Class Reference	278
4.93.1	Detailed Description	281
4.93.2	Member Function Documentation	281
4.94	CbcSolver2 Class Reference	282
4.94.1	Detailed Description	283
4.95	CbcSolver3 Class Reference	283
4.95.1	Detailed Description	284
4.96	CbcSolverLongThin Class Reference	285
4.96.1	Detailed Description	286
4.97	CbcSolverUsefulData Struct Reference	286

---

4.97.1 Detailed Description . . . . .	286
4.98 CbcSOS Class Reference . . . . .	286
4.98.1 Detailed Description . . . . .	289
4.98.2 Constructor & Destructor Documentation . . . . .	289
4.98.3 Member Function Documentation . . . . .	289
4.99 CbcSOSBranchingObject Class Reference . . . . .	290
4.99.1 Detailed Description . . . . .	291
4.99.2 Member Function Documentation . . . . .	291
4.100CbcStatistics Class Reference . . . . .	292
4.100.1 Detailed Description . . . . .	293
4.101CbcStopNow Class Reference . . . . .	293
4.101.1 Detailed Description . . . . .	294
4.101.2 Member Function Documentation . . . . .	294
4.102CbcStrategy Class Reference . . . . .	294
4.102.1 Detailed Description . . . . .	296
4.102.2 Member Function Documentation . . . . .	296
4.102.3 Member Data Documentation . . . . .	296
4.103CbcStrategyDefault Class Reference . . . . .	297
4.103.1 Detailed Description . . . . .	298
4.104CbcStrategyDefaultSubTree Class Reference . . . . .	298
4.104.1 Detailed Description . . . . .	300
4.105CbcStrategyNull Class Reference . . . . .	300
4.105.1 Detailed Description . . . . .	301
4.106CbcStrongInfo Struct Reference . . . . .	301
4.106.1 Detailed Description . . . . .	302
4.107CbcThread Class Reference . . . . .	302
4.107.1 Detailed Description . . . . .	302
4.108CbcTree Class Reference . . . . .	302
4.108.1 Detailed Description . . . . .	306
4.108.2 Member Function Documentation . . . . .	306
4.109CbcTreeLocal Class Reference . . . . .	307
4.109.1 Detailed Description . . . . .	308
4.110CbcTreeVariable Class Reference . . . . .	309
4.110.1 Detailed Description . . . . .	310

4.111 CbcUser Class Reference . . . . .	310
4.111.1 Detailed Description . . . . .	312
4.111.2 Member Function Documentation . . . . .	312
4.112 CglTemporary Class Reference . . . . .	313
4.112.1 Detailed Description . . . . .	313
4.112.2 Member Function Documentation . . . . .	314
4.113 CbcGenCtlBlk::chooseStrongCtl_struct Struct Reference . . . . .	314
4.113.1 Detailed Description . . . . .	314
4.114 ClpAmplObjective Class Reference . . . . .	314
4.114.1 Detailed Description . . . . .	315
4.114.2 Member Function Documentation . . . . .	316
4.115 ClpConstraintAmpl Class Reference . . . . .	316
4.115.1 Detailed Description . . . . .	317
4.115.2 Member Function Documentation . . . . .	317
4.116 ClpQuadInterface Class Reference . . . . .	318
4.116.1 Detailed Description . . . . .	319
4.116.2 Member Function Documentation . . . . .	319
4.117 CbcGenCtlBlk::debugSollInfo_struct Struct Reference . . . . .	319
4.117.1 Detailed Description . . . . .	319
4.118 CbcGenCtlBlk::djFixCtl_struct Struct Reference . . . . .	319
4.118.1 Detailed Description . . . . .	319
4.119 CbcGenCtlBlk::genParamsInfo_struct Struct Reference . . . . .	320
4.119.1 Detailed Description . . . . .	320
4.120 OsiBiLinear Class Reference . . . . .	320
4.120.1 Detailed Description . . . . .	324
4.120.2 Member Function Documentation . . . . .	324
4.120.3 Member Data Documentation . . . . .	324
4.121 OsiBiLinearBranchingObject Class Reference . . . . .	325
4.121.1 Detailed Description . . . . .	325
4.122 OsiBiLinearEquality Class Reference . . . . .	325
4.122.1 Detailed Description . . . . .	327
4.123 OsiCbcSolverInterface Class Reference . . . . .	327
4.123.1 Detailed Description . . . . .	335
4.123.2 Member Function Documentation . . . . .	335

---

4.123.3 Friends And Related Function Documentation . . . . .	341
4.124OsiChooseStrongSubset Class Reference . . . . .	342
4.124.1 Detailed Description . . . . .	342
4.124.2 Member Function Documentation . . . . .	343
4.125OsiLink Class Reference . . . . .	343
4.125.1 Detailed Description . . . . .	345
4.125.2 Constructor & Destructor Documentation . . . . .	345
4.125.3 Member Function Documentation . . . . .	345
4.126OsiLinkBranchingObject Class Reference . . . . .	346
4.126.1 Detailed Description . . . . .	346
4.127OsiLinkedBound Class Reference . . . . .	346
4.127.1 Detailed Description . . . . .	347
4.128OsiOldLink Class Reference . . . . .	347
4.128.1 Detailed Description . . . . .	348
4.128.2 Constructor & Destructor Documentation . . . . .	348
4.128.3 Member Function Documentation . . . . .	349
4.129OsiOldLinkBranchingObject Class Reference . . . . .	349
4.129.1 Detailed Description . . . . .	349
4.130OsiOneLink Class Reference . . . . .	350
4.130.1 Detailed Description . . . . .	351
4.130.2 Constructor & Destructor Documentation . . . . .	351
4.130.3 Member Data Documentation . . . . .	351
4.131CbcGenCtlBlk::osiParamsInfo_struct Struct Reference . . . . .	351
4.131.1 Detailed Description . . . . .	351
4.132OsiSimpleFixedInteger Class Reference . . . . .	351
4.132.1 Detailed Description . . . . .	352
4.132.2 Member Function Documentation . . . . .	352
4.133OsiSolverLinearizedQuadratic Class Reference . . . . .	353
4.133.1 Detailed Description . . . . .	354
4.134OsiSolverLink Class Reference . . . . .	354
4.134.1 Detailed Description . . . . .	358
4.134.2 Constructor & Destructor Documentation . . . . .	358
4.134.3 Member Function Documentation . . . . .	358
4.134.4 Member Data Documentation . . . . .	359

4.135OsiUsesBiLinear Class Reference . . . . .	359
4.135.1 Detailed Description . . . . .	360
4.135.2 Member Function Documentation . . . . .	360
4.136PseudoReducedCost Struct Reference . . . . .	361
4.136.1 Detailed Description . . . . .	361
<b>5 File Documentation</b>	<b>361</b>
5.1 CbcEventHandler.hpp File Reference . . . . .	361
5.1.1 Detailed Description . . . . .	362
5.2 CbcGenMessages.hpp File Reference . . . . .	363
5.2.1 Detailed Description . . . . .	363
5.2.2 Enumeration Type Documentation . . . . .	363
5.3 CbcSolver.hpp File Reference . . . . .	363
5.3.1 Detailed Description . . . . .	364
5.4 CbcSolverAnalyze.hpp File Reference . . . . .	365
5.4.1 Detailed Description . . . . .	365
5.5 CbcSolverExpandKnapsack.hpp File Reference . . . . .	365
5.5.1 Detailed Description . . . . .	365
5.6 CbcSolverHeuristics.hpp File Reference . . . . .	365
5.6.1 Detailed Description . . . . .	365

## 1 Class Index

### 1.1 Class Hierarchy

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

<b>ampl_info</b>	<b>16</b>
<b>CbcGenCtIBlk::babState_struct</b>	<b>16</b>
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_istream< char >	
std::basic_istream< 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 >	
<b>CbcBaseModel</b>	<b>17</b>
<b>CbcBranchDecision</b>	<b>22</b>
<b>CbcBranchDefaultDecision</b>	<b>25</b>
<b>CbcBranchDynamicDecision</b>	<b>27</b>
<b>CbcBranchUserDecision</b>	<b>38</b>
<b>CbcBranchingObject</b>	<b>29</b>
<b>CbcCliqueBranchingObject</b>	<b>47</b>
<b>CbcCutBranchingObject</b>	<b>63</b>
<b>CbcDummyBranchingObject</b>	<b>73</b>
<b>CbcFixingBranchingObject</b>	<b>88</b>
<b>CbcIntegerBranchingObject</b>	<b>177</b>
<b>CbcDynamicPseudoCostBranchingObject</b>	<b>75</b>
<b>CbcIntegerPseudoCostBranchingObject</b>	<b>181</b>
<b>CbcLinkBranchingObject</b>	<b>187</b>
<b>CbcLongCliqueBranchingObject</b>	<b>188</b>
<b>CbcLotsizeBranchingObject</b>	<b>194</b>
<b>CbcNWayBranchingObject</b>	<b>242</b>
<b>CbcSOSBranchingObject</b>	<b>290</b>
<b>CbcCbcParam</b>	<b>40</b>
<b>CbcCompare</b>	<b>49</b>

---

<b>CbcCompareBase</b>	<b>50</b>
<b>CbcCompareDefault</b>	<b>52</b>
<b>CbcCompareDepth</b>	<b>54</b>
<b>CbcCompareEstimate</b>	<b>55</b>
<b>CbcCompareObjective</b>	<b>57</b>
<b>CbcCompareUser</b>	<b>58</b>
<b>CbcConsequence</b>	<b>59</b>
<b>CbcFixVariable</b>	<b>90</b>
<b>CbcCountRowCut</b>	<b>61</b>
<b>CbcCutGenerator</b>	<b>65</b>
<b>CbcCutModifier</b>	<b>70</b>
<b>CbcCutSubsetModifier</b>	<b>71</b>
<b>CbcEventHandler</b>	<b>78</b>
<b>CbcFathom</b>	<b>82</b>
<b>CbcFathomDynamicProgramming</b>	<b>84</b>
<b>CbcFeasibilityBase</b>	<b>87</b>
<b>CbcGenCtlBlk</b>	<b>100</b>
<b>CbcGenParam</b>	<b>116</b>
<b>CbcHeuristic</b>	<b>119</b>
<b>CbcHeuristicCrossover</b>	<b>126</b>
<b>CbcHeuristicDINS</b>	<b>128</b>
<b>CbcHeuristicDive</b>	<b>130</b>
<b>CbcHeuristicDiveCoefficient</b>	<b>133</b>
<b>CbcHeuristicDiveFractional</b>	<b>135</b>
<b>CbcHeuristicDiveGuided</b>	<b>137</b>
<b>CbcHeuristicDiveLineSearch</b>	<b>139</b>
<b>CbcHeuristicDivePseudoCost</b>	<b>141</b>

---

<b>CbcHeuristicDiveVectorLength</b>	<b>143</b>
<b>CbcHeuristicDynamic3</b>	<b>145</b>
<b>CbcHeuristicFPump</b>	<b>147</b>
<b>CbcHeuristicGreedyCover</b>	<b>152</b>
<b>CbcHeuristicGreedyEquality</b>	<b>154</b>
<b>CbcHeuristicGreedySOS</b>	<b>156</b>
<b>CbcHeuristicJustOne</b>	<b>158</b>
<b>CbcHeuristicLocal</b>	<b>160</b>
<b>CbcHeuristicNaive</b>	<b>162</b>
<b>CbcHeuristicPartial</b>	<b>165</b>
<b>CbcHeuristicPivotAndFix</b>	<b>167</b>
<b>CbcHeuristicRandRound</b>	<b>169</b>
<b>CbcHeuristicRENS</b>	<b>170</b>
<b>CbcHeuristicRINS</b>	<b>172</b>
<b>CbcHeuristicVND</b>	<b>175</b>
<b>CbcRounding</b>	<b>260</b>
<b>CbcSerendipity</b>	<b>262</b>
<b>CbcHeuristicNode</b>	<b>164</b>
<b>CbcHeuristicNodeList</b>	<b>165</b>
<b>CbcMessage</b>	<b>196</b>
<b>CbcModel</b>	<b>197</b>
<b>CbcNode</b>	<b>228</b>
<b>CbcNodeInfo</b>	<b>234</b>
<b>CbcFullNodeInfo</b>	<b>96</b>
<b>CbcPartialNodeInfo</b>	<b>258</b>
<b>CbcObject</b>	<b>245</b>
<b>CbcBranchCut</b>	<b>19</b>

---

<b>CbcBranchAllDifferent</b>	<b>17</b>
<b>CbcBranchToFixLots</b>	<b>35</b>
<b>CbcClique</b>	<b>43</b>
<b>CbcFollowOn</b>	<b>92</b>
<b>CbcFollowOn2</b>	<b>94</b>
<b>CbcGeneral</b>	<b>114</b>
<b>CbcLink</b>	<b>184</b>
<b>CbcLotsize</b>	<b>190</b>
<b>CbcNWay</b>	<b>239</b>
<b>CbcSimpleInteger</b>	<b>264</b>
<b>CbcSimpleIntegerDynamicPseudoCost</b>	<b>267</b>
<b>CbcSimpleIntegerFixed</b>	<b>274</b>
<b>CbcSimpleIntegerPseudoCost</b>	<b>276</b>
<b>CbcSOS</b>	<b>286</b>
<b>CbcObjectUpdateData</b>	<b>251</b>
<b>CbcOsiParam</b>	<b>252</b>
<b>CbcParam</b>	<b>254</b>
<b>CbcGenCtIBlk::cbcParamsInfo_struct</b>	<b>258</b>
<b>CbcSolver</b>	<b>278</b>
<b>CbcSolver2</b>	<b>282</b>
<b>CbcSolver3</b>	<b>283</b>
<b>CbcSolverLongThin</b>	<b>285</b>
<b>CbcSolverUsefulData</b>	<b>286</b>
<b>CbcStatistics</b>	<b>292</b>
<b>CbcStopNow</b>	<b>293</b>
<b>CbcStrategy</b>	<b>294</b>
<b>CbcStrategyDefault</b>	<b>297</b>

---

<b>CbcStrategyDefaultSubTree</b>	<b>298</b>
<b>CbcStrategyNull</b>	<b>300</b>
<b>CbcStrongInfo</b>	<b>301</b>
<b>CbcThread</b>	<b>302</b>
<b>CbcTree</b>	<b>302</b>
<b>CbcTreeLocal</b>	<b>307</b>
<b>CbcTreeVariable</b>	<b>309</b>
<b>CbcUser</b>	<b>310</b>
<b>CglTemporary</b>	<b>313</b>
<b>CbcGenCtlBlk::chooseStrongCtl_struct</b>	<b>314</b>
<b>ClpAmplObjective</b>	<b>314</b>
<b>ClpConstraintAmpl</b>	<b>316</b>
<b>ClpQuadInterface</b>	<b>318</b>
<b>CbcGenCtlBlk::debugSollInfo_struct</b>	<b>319</b>
<b>CbcGenCtlBlk::djFixCtl_struct</b>	<b>319</b>
<b>CbcGenCtlBlk::genParamsInfo_struct</b>	<b>320</b>
<b>OsiBiLinear</b>	<b>320</b>
<b>OsiBiLinearEquality</b>	<b>325</b>
<b>OsiBiLinearBranchingObject</b>	<b>325</b>
<b>OsiCbcSolverInterface</b>	<b>327</b>
<b>OsiChooseStrongSubset</b>	<b>342</b>
<b>OsiLink</b>	<b>343</b>
<b>OsiLinkBranchingObject</b>	<b>346</b>
<b>OsiLinkedBound</b>	<b>346</b>
<b>OsiOldLink</b>	<b>347</b>
<b>OsiOldLinkBranchingObject</b>	<b>349</b>
<b>OsiOneLink</b>	<b>350</b>

<b>CbcGenCtIBlk::osiParamsInfo_struct</b>	<b>351</b>
<b>OsiSimpleFixedInteger</b>	<b>351</b>
<b>OsiSolverLinearizedQuadratic</b>	<b>353</b>
<b>OsiSolverLink</b>	<b>354</b>
<b>OsiUsesBiLinear</b>	<b>359</b>
<b>PseudoReducedCost</b>	<b>361</b>

## 2 Class Index

### 2.1 Class List

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

<b><a href="#">ampl_info</a></b>	<b>16</b>
<b><a href="#">CbcGenCtIBlk::babState_struct</a></b> (State of branch-and-cut )	<b>16</b>
<b><a href="#">CbcBaseModel</a></b> (Base model )	<b>17</b>
<b><a href="#">CbcBranchAllDifferent</a></b> (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 $x \geq y+1$ )	<b>17</b>
<b><a href="#">CbcBranchCut</a></b> (Define a cut branching class )	<b>19</b>
<b><a href="#">CbcBranchDecision</a></b>	<b>22</b>
<b><a href="#">CbcBranchDefaultDecision</a></b> (Branching decision default class )	<b>25</b>
<b><a href="#">CbcBranchDynamicDecision</a></b> (Branching decision dynamic class )	<b>27</b>
<b><a href="#">CbcBranchingObject</a></b> (Abstract branching object base class Now just difference with <a href="#">OsiBranchingObject</a> )	<b>29</b>
<b><a href="#">CbcBranchToFixLots</a></b> (Define a branch class that branches so that one way variables are fixed while the other way cuts off that solution )	<b>35</b>
<b><a href="#">CbcBranchUserDecision</a></b> (Branching decision user class )	<b>38</b>
<b><a href="#">CbcCbcParam</a></b> (Class for control parameters that act on a <a href="#">CbcModel</a> object )	<b>40</b>
<b><a href="#">CbcClique</a></b> (Branching object for cliques )	<b>43</b>
<b><a href="#">CbcCliqueBranchingObject</a></b> (Branching object for unordered cliques )	<b>47</b>

---

<a href="#">CbcCompare</a>	49
<a href="#">CbcCompareBase</a>	50
<a href="#">CbcCompareDefault</a>	52
<a href="#">CbcCompareDepth</a>	54
<a href="#">CbcCompareEstimate</a>	55
<a href="#">CbcCompareObjective</a>	57
<a href="#">CbcCompareUser</a>	58
<a href="#">CbcConsequence</a> (Abstract base class for consequent bounds )	59
<a href="#">CbcCountRowCut</a> (OsiRowCut augmented with bookkeeping )	61
<a href="#">CbcCutBranchingObject</a> (Cut branching object )	63
<a href="#">CbcCutGenerator</a> (Interface between Cbc and Cut Generation Library )	65
<a href="#">CbcCutModifier</a> (Abstract cut modifier base class )	70
<a href="#">CbcCutSubsetModifier</a> (Simple cut modifier base class )	71
<a href="#">CbcDummyBranchingObject</a> (Dummy branching object )	73
<a href="#">CbcDynamicPseudoCostBranchingObject</a> (Simple branching object for an integer variable with pseudo costs )	75
<a href="#">CbcEventHandler</a> (Base class for Cbc event handling )	78
<a href="#">CbcFathom</a> (Fathom base class )	82
<a href="#">CbcFathomDynamicProgramming</a> (FathomDynamicProgramming class )	84
<a href="#">CbcFeasibilityBase</a>	87
<a href="#">CbcFixingBranchingObject</a> (General Branching Object class )	88
<a href="#">CbcFixVariable</a> (Class for consequent bounds )	90
<a href="#">CbcFollowOn</a> (Define a follow on class )	92
<a href="#">CbcFollowOn2</a> (Define a follow on class )	94
<a href="#">CbcFullNodeInfo</a> (Information required to recreate the subproblem at this node )	96
<a href="#">CbcGenCtBlk</a>	100
<a href="#">CbcGeneral</a> (Define a catch all class )	114

---

<a href="#">CbcGenParam</a> (Class for cbc-generic control parameters )	116
<a href="#">CbcHeuristic</a> (Heuristic base class )	119
<a href="#">CbcHeuristicCrossover</a> (Crossover Search class )	126
<a href="#">CbcHeuristicDINS</a>	128
<a href="#">CbcHeuristicDive</a> (Dive class )	130
<a href="#">CbcHeuristicDiveCoefficient</a> (DiveCoefficient class )	133
<a href="#">CbcHeuristicDiveFractional</a> (DiveFractional class )	135
<a href="#">CbcHeuristicDiveGuided</a> (DiveGuided class )	137
<a href="#">CbcHeuristicDiveLineSearch</a> (DiveLineSearch class )	139
<a href="#">CbcHeuristicDivePseudoCost</a> (DivePseudoCost class )	141
<a href="#">CbcHeuristicDiveVectorLength</a> (DiveVectorLength class )	143
<a href="#">CbcHeuristicDynamic3</a> (Heuristic - just picks up any good solution )	145
<a href="#">CbcHeuristicFPump</a> (Feasibility Pump class )	147
<a href="#">CbcHeuristicGreedyCover</a> (Greedy heuristic classes )	152
<a href="#">CbcHeuristicGreedyEquality</a>	154
<a href="#">CbcHeuristicGreedySOS</a> (Greedy heuristic for SOS and L rows (and positive elements) )	156
<a href="#">CbcHeuristicJustOne</a> (Just One class - this chooses one at random )	158
<a href="#">CbcHeuristicLocal</a> (LocalSearch class )	160
<a href="#">CbcHeuristicNaive</a> (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 )	162
<a href="#">CbcHeuristicNode</a> (A class describing the branching decisions that were made to get to the node where a heuristic was invoked from )	164
<a href="#">CbcHeuristicNodeList</a>	165
<a href="#">CbcHeuristicPartial</a> (Partial solution class If user knows a partial solution this tries to get an integer solution it uses hotstart information )	165
<a href="#">CbcHeuristicPivotAndFix</a> (LocalSearch class )	167
<a href="#">CbcHeuristicRandRound</a> (LocalSearch class )	169

---

<a href="#">CbcHeuristicRENS</a> (LocalSearch class )	170
<a href="#">CbcHeuristicRINS</a> (LocalSearch class )	172
<a href="#">CbcHeuristicVND</a> (LocalSearch class )	175
<a href="#">CbcIntegerBranchingObject</a> (Simple branching object for an integer variable )	177
<a href="#">CbcIntegerPseudoCostBranchingObject</a> (Simple branching object for an integer variable with pseudo costs )	181
<a href="#">CbcLink</a> (Define Special Linked Ordered Sets )	184
<a href="#">CbcLinkBranchingObject</a> (Branching object for Special ordered sets )	187
<a href="#">CbcLongCliqueBranchingObject</a> (Unordered Clique Branching Object class )	188
<a href="#">CbcLotsize</a> (Lotsize class )	190
<a href="#">CbcLotsizeBranchingObject</a> (Lotsize branching object )	194
<a href="#">CbcMessage</a>	196
<a href="#">CbcModel</a> (Simple Branch and bound class )	197
<a href="#">CbcNode</a> (Information required while the node is live )	228
<a href="#">CbcNodeInfo</a> (Information required to recreate the subproblem at this node )	234
<a href="#">CbcNWay</a> (Define an n-way class for variables )	239
<a href="#">CbcNWayBranchingObject</a> (N way branching Object class )	242
<a href="#">CbcObject</a>	245
<a href="#">CbcObjectUpdateData</a>	251
<a href="#">CbcOsiParam</a> (Class for control parameters that act on a OsiSolverInterface object )	252
<a href="#">CbcParam</a> (Very simple class for setting parameters )	254
<a href="#">CbcGenCtlBlk::cbcParamsInfo_struct</a> (Start and end of <a href="#">CbcModel</a> parameters in parameter vector )	258
<a href="#">CbcPartialNodeInfo</a> (Holds information for recreating a subproblem by incremental change from the parent )	258
<a href="#">CbcRounding</a> (Rounding class )	260

---

<a href="#">CbcSerendipity</a> (Heuristic - just picks up any good solution found by solver - see <a href="#">OsiBabSolver</a> )	262
<a href="#">CbcSimpleInteger</a> (Define a single integer class )	264
<a href="#">CbcSimpleIntegerDynamicPseudoCost</a> (Define a single integer class but with dynamic pseudo costs )	267
<a href="#">CbcSimpleIntegerFixed</a> (Define a single integer class where branching is forced until fixed )	274
<a href="#">CbcSimpleIntegerPseudoCost</a> (Define a single integer class but with pseudo costs )	276
<a href="#">CbcSolver</a> (This allows the use of the standalone solver in a flexible manner )	278
<a href="#">CbcSolver2</a> (This is to allow the user to replace initialSolve and resolve )	282
<a href="#">CbcSolver3</a> (This is to allow the user to replace initialSolve and resolve )	283
<a href="#">CbcSolverLongThin</a> (This is to allow the user to replace initialSolve and resolve )	285
<a href="#">CbcSolverUsefulData</a> (Structure to hold useful arrays )	286
<a href="#">CbcSOS</a> (Branching object for Special Ordered Sets of type 1 and 2 )	286
<a href="#">CbcSOSBranchingObject</a> (Branching object for Special ordered sets )	290
<a href="#">CbcStatistics</a> (For gathering statistics )	292
<a href="#">CbcStopNow</a> (Support the use of a call back class to decide whether to stop )	293
<a href="#">CbcStrategy</a> (Strategy base class )	294
<a href="#">CbcStrategyDefault</a> (Default class )	297
<a href="#">CbcStrategyDefaultSubTree</a> (Default class for sub trees )	298
<a href="#">CbcStrategyNull</a> (Null class )	300
<a href="#">CbcStrongInfo</a> (Abstract base class for 'objects' )	301
<a href="#">CbcThread</a> (A class to encapsulate thread stuff )	302
<a href="#">CbcTree</a> (Using MS heap implementation )	302
<a href="#">CbcTreeLocal</a>	307
<a href="#">CbcTreeVariable</a>	309

---

<a href="#">CbcUser</a> (A class to allow the use of unknown user functionality )	310
<a href="#">CglTemporary</a> (Stored Temporary Cut Generator Class - destroyed after first use )	313
<a href="#">CbcGenCtlBlk::chooseStrongCtl_struct</a> (Control variables for a strong branching method )	314
<a href="#">ClpAmplObjective</a> (Ampl Objective Class )	314
<a href="#">ClpConstraintAmpl</a> (Ampl Constraint Class )	316
<a href="#">ClpQuadInterface</a> (This is to allow the user to replace initialSolve and resolve )	318
<a href="#">CbcGenCtlBlk::debugSolInfo_struct</a> (Array of primal variable values for debugging )	319
<a href="#">CbcGenCtlBlk::djFixCtl_struct</a> (Control use of reduced cost fixing prior to B&C )	319
<a href="#">CbcGenCtlBlk::genParamsInfo_struct</a> (Start and end of cbc-generic parameters in parameter vector )	320
<a href="#">OsiBiLinear</a> (Define BiLinear objects )	320
<a href="#">OsiBiLinearBranchingObject</a> (Branching object for BiLinear objects )	325
<a href="#">OsiBiLinearEquality</a> (Define Continuous BiLinear objects for an == bound )	325
<a href="#">OsiCbcSolverInterface</a> (Cbc Solver Interface )	327
<a href="#">OsiChooseStrongSubset</a> (This class chooses a variable to branch on )	342
<a href="#">OsiLink</a> (Define Special Linked Ordered Sets )	343
<a href="#">OsiLinkBranchingObject</a> (Branching object for Linked ordered sets )	346
<a href="#">OsiLinkedBound</a> (List of bounds which depend on other bounds )	346
<a href="#">OsiOldLink</a>	347
<a href="#">OsiOldLinkBranchingObject</a> (Branching object for Linked ordered sets )	349
<a href="#">OsiOneLink</a> (Define data for one link )	350
<a href="#">CbcGenCtlBlk::osiParamsInfo_struct</a> (Start and end of OsiSolverInterface parameters in parameter vector )	351
<a href="#">OsiSimpleFixedInteger</a> (Define a single integer class - but one where you keep branching until fixed even if satisfied )	351

---

<a href="#">OsiSolverLinearizedQuadratic</a> (This is to allow the user to replace initialSolve and resolve )	353
<a href="#">OsiSolverLink</a> (This is to allow the user to replace initialSolve and resolve This version changes coefficients )	354
<a href="#">OsiUsesBiLinear</a> (Define a single variable class which is involved with <a href="#">OsiBiLinear</a> objects )	359
<a href="#">PseudoReducedCost</a>	361

## 3 File Index

### 3.1 File List

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

<a href="#">Cbc_ampl.h</a>	??
<a href="#">Cbc_C_Interface.h</a>	??
<a href="#">CbcBranchActual.hpp</a>	??
<a href="#">CbcBranchAllDifferent.hpp</a>	??
<a href="#">CbcBranchBase.hpp</a>	??
<a href="#">CbcBranchCut.hpp</a>	??
<a href="#">CbcBranchDecision.hpp</a>	??
<a href="#">CbcBranchDefaultDecision.hpp</a>	??
<a href="#">CbcBranchDynamic.hpp</a>	??
<a href="#">CbcBranchFollow2.hpp</a>	??
<a href="#">CbcBranchingObject.hpp</a>	??
<a href="#">CbcBranchLink.hpp</a>	??
<a href="#">CbcBranchLotsize.hpp</a>	??
<a href="#">CbcBranchToFixLots.hpp</a>	??
<a href="#">CbcBranchUser.hpp</a>	??
<a href="#">CbcClique.hpp</a>	??
<a href="#">CbcCompare.hpp</a>	??

---

<b>CbcCompareActual.hpp</b>	??
<b>CbcCompareBase.hpp</b>	??
<b>CbcCompareDefault.hpp</b>	??
<b>CbcCompareDepth.hpp</b>	??
<b>CbcCompareEstimate.hpp</b>	??
<b>CbcCompareObjective.hpp</b>	??
<b>CbcCompareUser.hpp</b>	??
<b>CbcConfig.h</b>	??
<b>CbcConsequence.hpp</b>	??
<b>CbcCountRowCut.hpp</b>	??
<b>CbcCutGenerator.hpp</b>	??
<b>CbcCutModifier.hpp</b>	??
<b>CbcCutSubsetModifier.hpp</b>	??
<b>CbcDummyBranchingObject.hpp</b>	??
<b>CbcEventHandler.hpp</b> (Event handling for cbc )	<b>361</b>
<b>CbcFathom.hpp</b>	??
<b>CbcFathomDynamicProgramming.hpp</b>	??
<b>CbcFeasibilityBase.hpp</b>	??
<b>CbcFixVariable.hpp</b>	??
<b>CbcFollowOn.hpp</b>	??
<b>CbcFullNodeInfo.hpp</b>	??
<b>CbcGenCbcParam.hpp</b>	??
<b>CbcGenCtlBlk.hpp</b>	??
<b>CbcGeneral.hpp</b>	??
<b>CbcGeneralDepth.hpp</b>	??
<b>CbcGenMessages.hpp</b> (This file contains the enum that defines symbolic names for for cbc-generic messages )	<b>363</b>
<b>CbcGenOsiParam.hpp</b>	??

---

<b>CbcGenParam.hpp</b>	??
<b>CbcHeuristic.hpp</b>	??
<b>CbcHeuristicDINS.hpp</b>	??
<b>CbcHeuristicDive.hpp</b>	??
<b>CbcHeuristicDiveCoefficient.hpp</b>	??
<b>CbcHeuristicDiveFractional.hpp</b>	??
<b>CbcHeuristicDiveGuided.hpp</b>	??
<b>CbcHeuristicDiveLineSearch.hpp</b>	??
<b>CbcHeuristicDivePseudoCost.hpp</b>	??
<b>CbcHeuristicDiveVectorLength.hpp</b>	??
<b>CbcHeuristicFPump.hpp</b>	??
<b>CbcHeuristicGreedy.hpp</b>	??
<b>CbcHeuristicLocal.hpp</b>	??
<b>CbcHeuristicPivotAndFix.hpp</b>	??
<b>CbcHeuristicRandRound.hpp</b>	??
<b>CbcHeuristicRENS.hpp</b>	??
<b>CbcHeuristicRINS.hpp</b>	??
<b>CbcHeuristicVND.hpp</b>	??
<b>CbcLinked.hpp</b>	??
<b>CbcMessage.hpp</b>	??
<b>CbcModel.hpp</b>	??
<b>CbcNode.hpp</b>	??
<b>CbcNodeInfo.hpp</b>	??
<b>CbcNWay.hpp</b>	??
<b>CbcObject.hpp</b>	??
<b>CbcObjectUpdateData.hpp</b>	??
<b>CbcParam.hpp</b>	??

---

<b>CbcPartialNodeInfo.hpp</b>	??
<b>CbcSimpleInteger.hpp</b>	??
<b>CbcSimpleIntegerDynamicPseudoCost.hpp</b>	??
<b>CbcSimpleIntegerPseudoCost.hpp</b>	??
<b>CbcSolver.hpp</b> (Defines <b>CbcSolver</b> , the proposed top-level class for the new-style cbc solver )	<b>363</b>
<b>CbcSolver2.hpp</b>	??
<b>CbcSolver3.hpp</b>	??
<b>CbcSolverAnalyze.hpp</b> (Look to see if a constraint is all-integer (variables & coeffs), or could be all integer )	<b>365</b>
<b>CbcSolverExpandKnapsack.hpp</b> (Expanding possibilities of $x*y$ , where $x*y$ are both integers, constructing a knapsack constraint )	<b>365</b>
<b>CbcSolverHeuristics.hpp</b> (Routines for doing heuristics )	<b>365</b>
<b>CbcSolverLongThin.hpp</b>	??
<b>CbcSOS.hpp</b>	??
<b>CbcStatistics.hpp</b>	??
<b>CbcStrategy.hpp</b>	??
<b>CbcSubProblem.hpp</b>	??
<b>CbcThread.hpp</b>	??
<b>CbcTree.hpp</b>	??
<b>CbcTreeLocal.hpp</b>	??
<b>ClpAmplObjective.hpp</b>	??
<b>ClpConstraintAmpl.hpp</b>	??
<b>ClpQuadInterface.hpp</b>	??
<b>Cbc/src/config.h</b>	??
<b>ThirdParty/Glpk/config.h</b>	??
<b>config_cbc.h</b>	??
<b>config_cbc_default.h</b>	??

<b>config_default.h</b>	??
<b>configall_system.h</b>	??
<b>configall_system_msc.h</b>	??
<b>OsiCbcSolverInterface.hpp</b>	??

## 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:

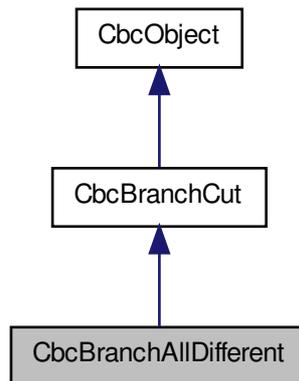
- CbcThread.hpp

#### 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:





#### 4.4.2 Member Data Documentation

##### 4.4.2.1 int CbcBranchAllDifferent::numberInSet\_ [protected]

data

Number of entries

Definition at line 57 of file CbcBranchAllDifferent.hpp.

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

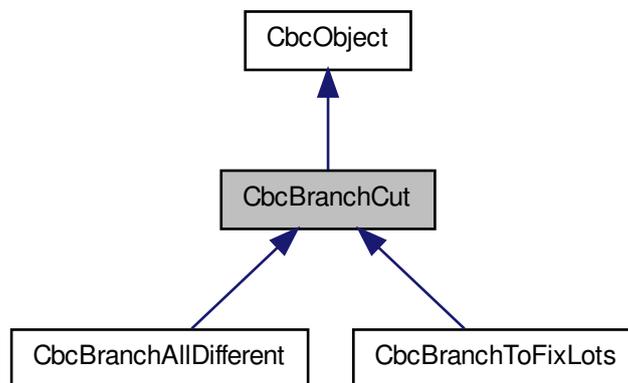
- CbcBranchAllDifferent.hpp

#### 4.5 CbcBranchCut Class Reference

Define a cut branching class.

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

Inheritance diagram for CbcBranchCut:





#### 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.



- 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 `numberOfInfeasibilitiesUp`, double `changeDown`, int `numberOfInfeasibilitiesDown`)=0  
*Compare two branching objects.*
- virtual int `bestBranch` (`CbcBranchingObject **objects`, int `numberOfObjects`, int `numberOfUnsatisfied`, double `*changeUp`, int `*numberOfInfeasibilitiesUp`, double `*changeDown`, int `*numberOfInfeasibilitiesDown`, 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 `numberOfInfeasibilitiesUp`, double `changeDown`, int `numberOfInfeasibilitiesDown` ) [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 [CbcBranchUserDecision](#), [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 [CbcBranchUserDecision](#), and [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:

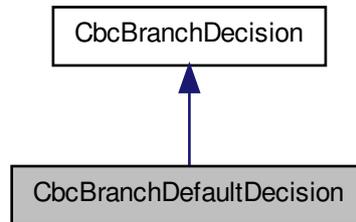
- `CbcBranchDecision.hpp`

## 4.7 CbcBranchDefaultDecision Class Reference

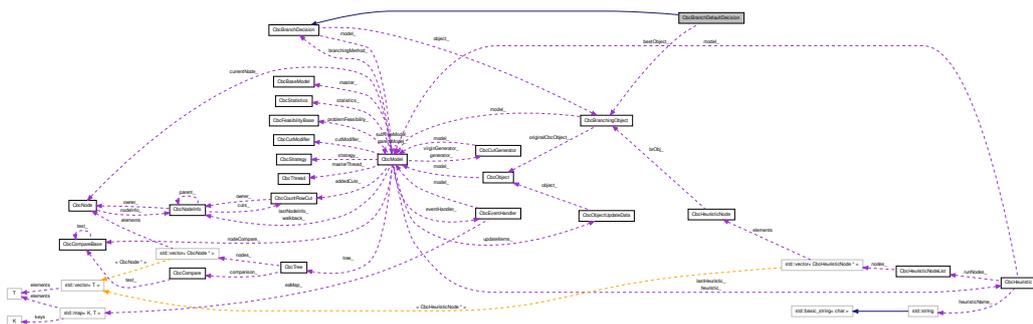
Branching decision default class.

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

Inheritance diagram for CbcBranchDefaultDecision:



Collaboration diagram for CbcBranchDefaultDecision:



### Public Member Functions

- virtual `CbcBranchDecision * clone () const`  
*Clone.*
- virtual void `initialize (CbcModel *model)`  
*Initialize, e.g. before the start of branch selection at a node.*
- virtual int `betterBranch (CbcBranchingObject *thisOne, CbcBranchingObject *bestSoFar, double changeUp, int numInfUp, double changeDn, int numInfDn)`  
*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`



*Sets or gets best criterion so far.*

- virtual int [whichMethod](#) ()

*Says whether this method can handle both methods - 1 better, 2 best, 3 both.*

- virtual void [saveBranchingObject](#) (OsiBranchingObject \*object)

*Saves a clone of current branching object.*

- virtual void [updateInformation](#) (OsiSolverInterface \*solver, const [CbcNode](#) \*node)

*Pass in information on branch just done.*

#### 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:

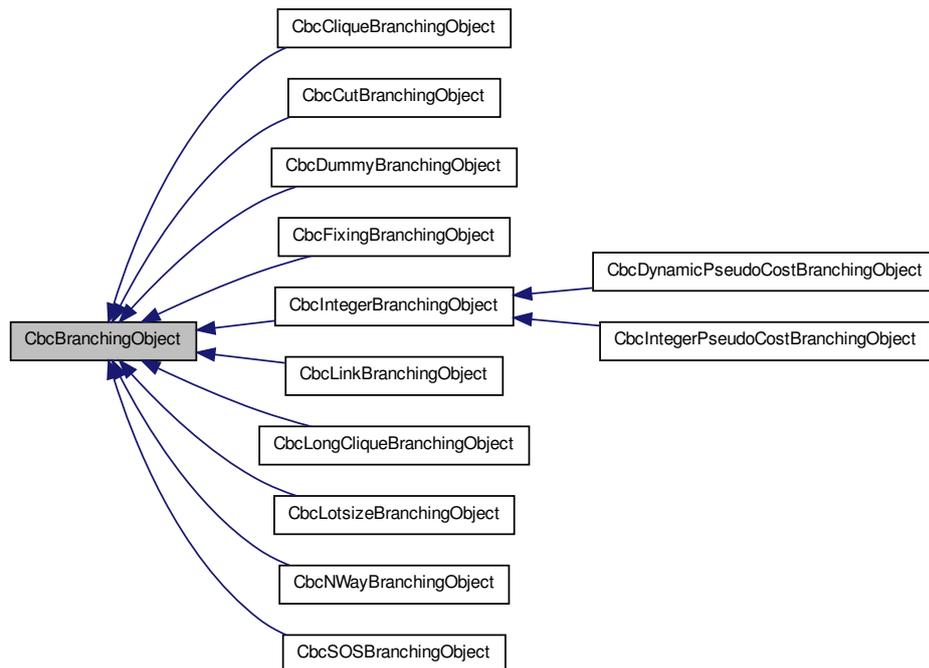
- CbcBranchDynamic.hpp

## 4.9 CbcBranchingObject Class Reference

Abstract branching object base class Now just difference with OsiBranchingObject.

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

Inheritance diagram for CbcBranchingObject:





- 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 [CbcLinkBranchingObject](#), [CbcCutBranchingObject](#), [CbcDynamicPseudoCostBranchingObject](#), [CbcLotsizeBranchingObject](#), [CbcCliqueBranchingObject](#), [CbcLongCliqueBranchingObject](#), [CbcDummyBranchingObject](#), [CbcFixingBranchingObject](#), [CbcNWayBranchingObject](#), [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 [CbcLinkBranchingObject](#), [CbcCutBranchingObject](#), [CbcDynamicPseudoCostBranchingObject](#), [CbcLotsizeBranchingObject](#), [CbcCliqueBranchingObject](#), [CbcLongCliqueBranchingObject](#), [CbcDummyBranchingObject](#), [CbcFixingBranchingObject](#), [CbcNWayBranchingObject](#), [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 [CbcLinkBranchingObject](#), [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:

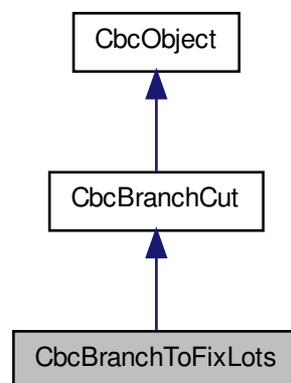
- CbcBranchingObject.hpp

## 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:





## 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 &amp; 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:

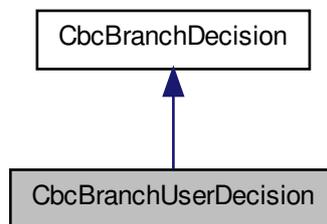
- CbcBranchToFixLots.hpp

## 4.11 CbcBranchUserDecision Class Reference

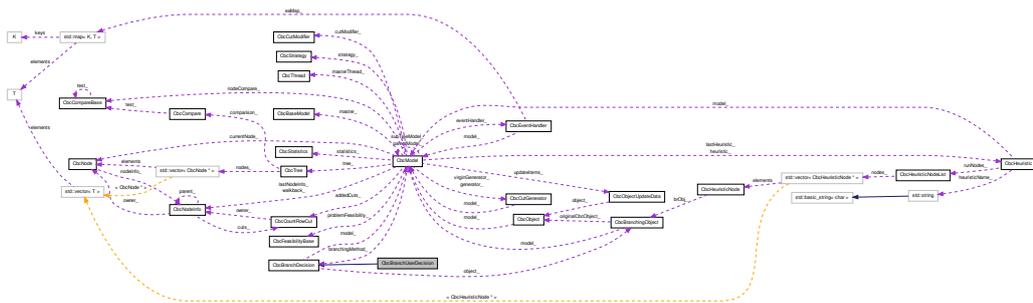
Branching decision user class.

```
#include <CbcBranchUser.hpp>
```

Inheritance diagram for CbcBranchUserDecision:



Collaboration diagram for CbcBranchUserDecision:



### Public Member Functions

- virtual [CbcBranchDecision](#) \* [clone](#) () const  
*Clone.*
- virtual void [initialize](#) ([CbcModel](#) \*model)  
*Initialize i.e. before start of choosing at a node.*

- virtual int [betterBranch](#) ([CbcBranchingObject](#) \*thisOne, [CbcBranchingObject](#) \*bestSoFar, double changeUp, int numberInfeasibilitiesUp, double changeDown, int numberInfeasibilitiesDown)  
*Returns nonzero if branching on first object is "better" than on second (if second NULL first wins).*
- virtual int [bestBranch](#) ([CbcBranchingObject](#) \*\*objects, int numberObjects, int numberUnsatisfied, double \*changeUp, int \*numberInfeasibilitiesUp, double \*changeDown, int \*numberInfeasibilitiesDown, double objectiveValue)  
*Compare N branching objects.*

#### 4.11.1 Detailed Description

Branching decision user class.

Definition at line 14 of file CbcBranchUser.hpp.

#### 4.11.2 Member Function Documentation

- 4.11.2.1 virtual int CbcBranchUserDecision::betterBranch ( [CbcBranchingObject](#) \* thisOne, [CbcBranchingObject](#) \* bestSoFar, double changeUp, int numberInfeasibilitiesUp, double changeDown, int numberInfeasibilitiesDown ) [virtual]

Returns nonzero if branching on first object is "better" than on second (if second NULL first wins).

This is only used after strong branching. The initial selection is done by infeasibility() for each [CbcObject](#) return code +1 for up branch preferred, -1 for down

Implements [CbcBranchDecision](#).

- 4.11.2.2 virtual int CbcBranchUserDecision::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. This is recommended version as it can be more sophisticated

Reimplemented from [CbcBranchDecision](#).

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

- CbcBranchUser.hpp

## 4.12 CbcCbcParam Class Reference

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



- 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.*

#### 4.12.1 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`.

#### 4.12.2 Member Enumeration Documentation

##### 4.12.2.1 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`.

#### 4.12.3 Constructor & Destructor Documentation

- 4.12.3.1 `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.

4.12.3.2 `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.

4.12.3.3 `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.

4.12.3.4 `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:

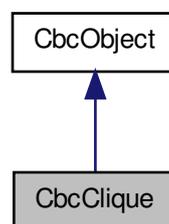
- `CbcGenCbcParam.hpp`

## 4.13 CbcClique Class Reference

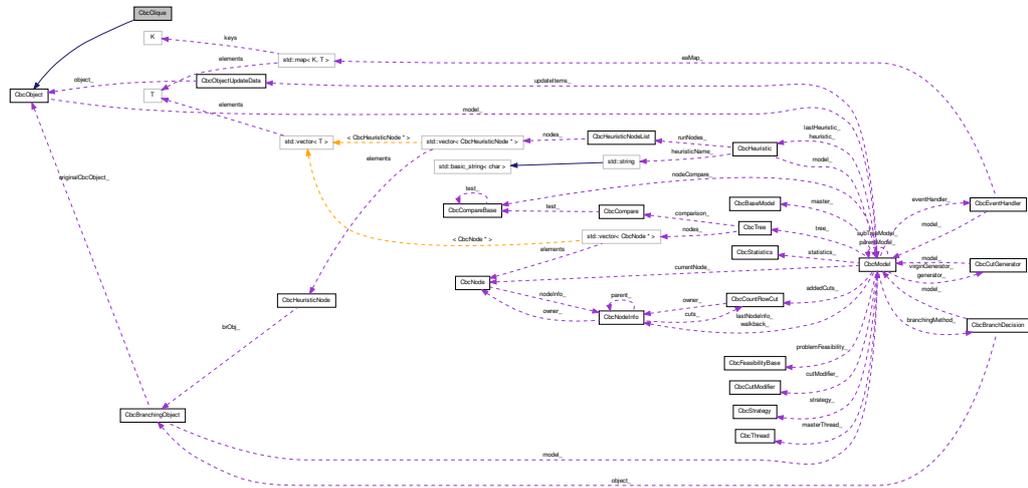
Branching object for cliques.

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

Inheritance diagram for `CbcClique`:



Collaboration diagram for CbcClique:



Public Member Functions

- **CbcClique** ()  
*Default Constructor.*
- **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.*
- **CbcClique** (const **CbcClique** &)  
*Copy constructor.*
- virtual **CbcObject** \* **clone** () const  
*Clone.*
- **CbcClique** & **operator=** (const **CbcClique** &rhs)  
*Assignment operator.*
- virtual ~**CbcClique** ()  
*Destructor.*
- 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.*
- 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.*

#### 4.13.1 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-numberNonSOSMembers_`.

Definition at line 41 of file CbcClique.hpp.

#### 4.13.2 Constructor & Destructor Documentation

**4.13.2.1** `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

#### 4.13.3 Member Function Documentation

**4.13.3.1** `int CbcClique::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 CbcClique.hpp.

**4.13.3.2** `char CbcClique::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 CbcClique.hpp.

#### 4.13.4 Member Data Documentation

**4.13.4.1** `char* CbcClique::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 CbcClique.hpp.

#### 4.13.4.2 int CbcClique::cliqueType\_ [protected]

Clique type.

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

Definition at line 143 of file CbcClique.hpp.

#### 4.13.4.3 int CbcClique::slack\_ [protected]

Slack variable for the clique.

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

Definition at line 151 of file CbcClique.hpp.

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

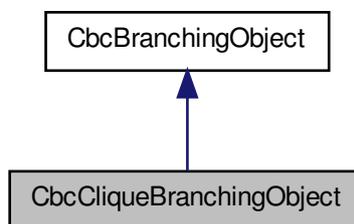
- CbcClique.hpp

## 4.14 CbcCliqueBranchingObject Class Reference

Branching object for unordered cliques.

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

Inheritance diagram for CbcCliqueBranchingObject:





## 4.14.2 Member Function Documentation

4.14.2.1 `virtual int CbcCliqueBranchingObject::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](#).

4.14.2.2 `virtual CbcRangeCompare CbcCliqueBranchingObject::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.

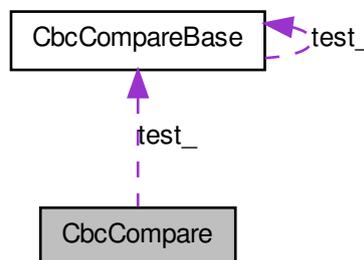
Implements [CbcBranchingObject](#).

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

- `CbcClique.hpp`

## 4.15 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*

#### 4.15.1 Detailed Description

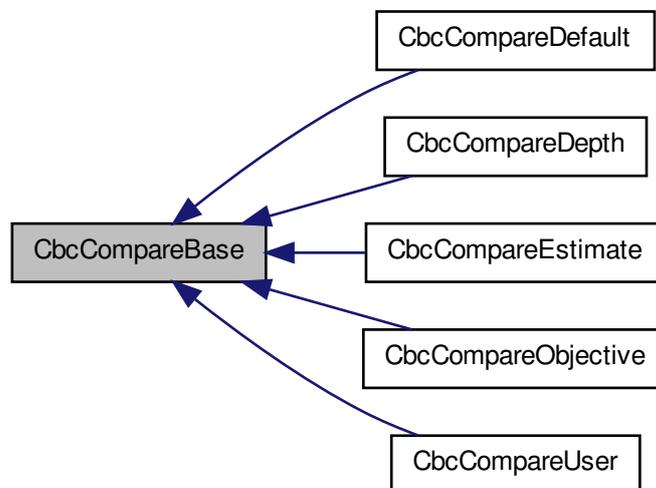
Definition at line 11 of file `CbcCompare.hpp`.

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

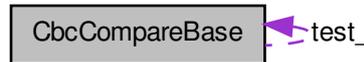
- `CbcCompare.hpp`

## 4.16 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.*

#### 4.16.1 Detailed Description

Definition at line 27 of file CbcCompareBase.hpp.

#### 4.16.2 Member Function Documentation

**4.16.2.1** 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.

```
4.16.2.2 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 [CbcCompareUser](#), and [CbcCompareDefault](#).

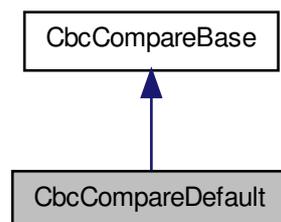
Definition at line 57 of file CbcCompareBase.hpp.

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

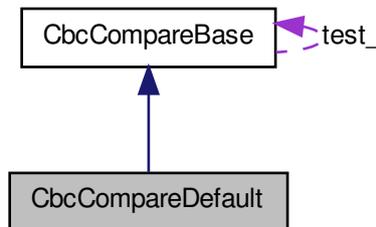
- CbcCompareBase.hpp

## 4.17 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.*

#### 4.17.1 Detailed Description

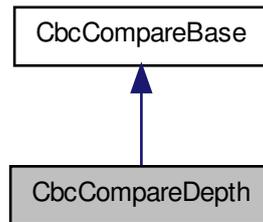
Definition at line 31 of file CbcCompareDefault.hpp.

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

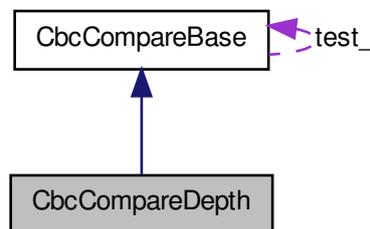
- CbcCompareDefault.hpp

## 4.18 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.*

## 4.18.1 Detailed Description

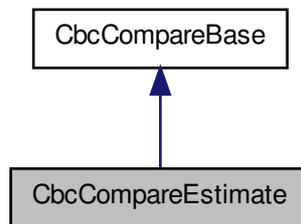
Definition at line 25 of file CbcCompareDepth.hpp.

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

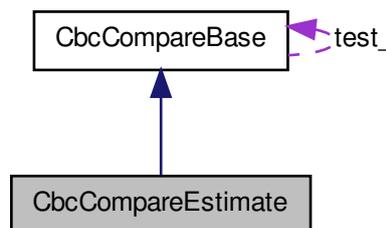
- CbcCompareDepth.hpp

## 4.19 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.*

#### 4.19.1 Detailed Description

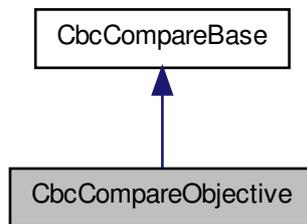
Definition at line 27 of file CbcCompareEstimate.hpp.

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

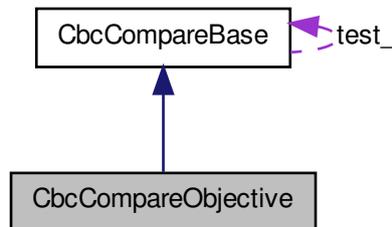
- CbcCompareEstimate.hpp

## 4.20 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.*

#### 4.20.1 Detailed Description

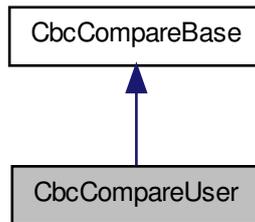
Definition at line 26 of file CbcCompareObjective.hpp.

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

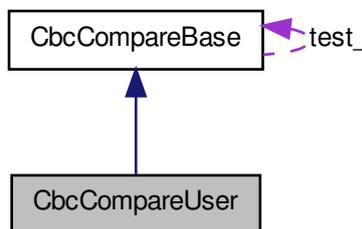
- CbcCompareObjective.hpp

## 4.21 CbcCompareUser Class Reference

Inheritance diagram for CbcCompareUser:



Collaboration diagram for CbcCompareUser:



#### Public Member Functions

- virtual [CbcCompareBase](#) \* [clone](#) () const  
*Clone.*
- virtual bool [test](#) ([CbcNode](#) \*x, [CbcNode](#) \*y)  
*This is test function.*
- virtual bool [alternateTest](#) ([CbcNode](#) \*x, [CbcNode](#) \*y)  
*This is alternate test function.*
- virtual bool [newSolution](#) ([CbcModel](#) \*model, double objectiveAtContinuous, int numberInfeasibilitiesAtContinuous)

*Reconsider behaviour after discovering a new solution.*

- virtual bool `fullScan` () const

*Returns true if wants code to do scan with alternate criterion.*

#### 4.21.1 Detailed Description

Definition at line 17 of file `CbcCompareUser.hpp`.

#### 4.21.2 Member Function Documentation

4.21.2.1 virtual bool `CbcCompareUser::newSolution` ( `CbcModel *`, `double`, `int` )  
[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 from [CbcCompareBase](#).

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

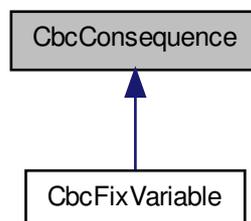
- `CbcCompareUser.hpp`

## 4.22 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.*

#### 4.22.1 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.

#### 4.22.2 Member Function Documentation

4.22.2.1 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:

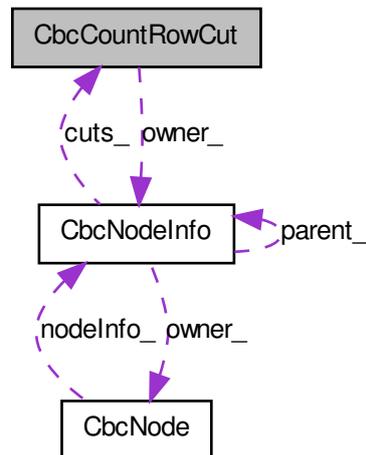
- CbcConsequence.hpp

### 4.23 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.*

#### 4.23.1 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](#).

#### 4.23.2 Constructor & Destructor Documentation

##### 4.23.2.1 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.

#### 4.23.3 Member Function Documentation

##### 4.23.3.1 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:



*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 replaceOverlap=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.*

#### 4.24.1 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.

## 4.24.2 Constructor &amp; Destructor Documentation

## 4.24.2.1 CbcCutBranchingObject::CbcCutBranchingObject ( CbcModel \* model, OsiRowCut &amp; down, OsiRowCut &amp; 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

## 4.24.3 Member Function Documentation

## 4.24.3.1 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](#).

## 4.24.3.2 virtual int CbcCutBranchingObject::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](#).

## 4.24.3.3 virtual CbcRangeCompare CbcCutBranchingObject::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:

- `CbcBranchCut.hpp`

## 4.25 CbcCutGenerator Class Reference

Interface between Cbc and Cut Generation Library.



- 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.*
- 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 **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.*

#### 4.25.1 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`.

#### 4.25.2 Member Function Documentation

##### 4.25.2.1 `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

##### 4.25.2.2 `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.

#### 4.25.2.3 `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.

#### 4.25.2.4 `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:

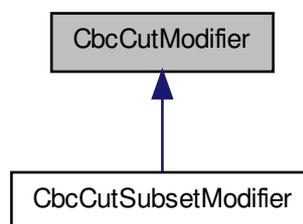
- `CbcCutGenerator.hpp`

## 4.26 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.*

#### 4.26.1 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:

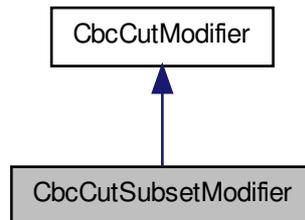
- [CbcCutModifier.hpp](#)

## 4.27 CbcCutSubsetModifier Class Reference

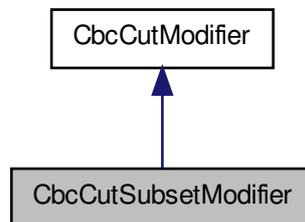
Simple cut modifier base class.

```
#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*

#### 4.27.1 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:

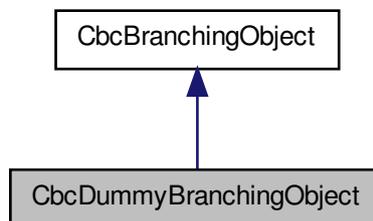
- CbcCutSubsetModifier.hpp

## 4.28 CbcDummyBranchingObject Class Reference

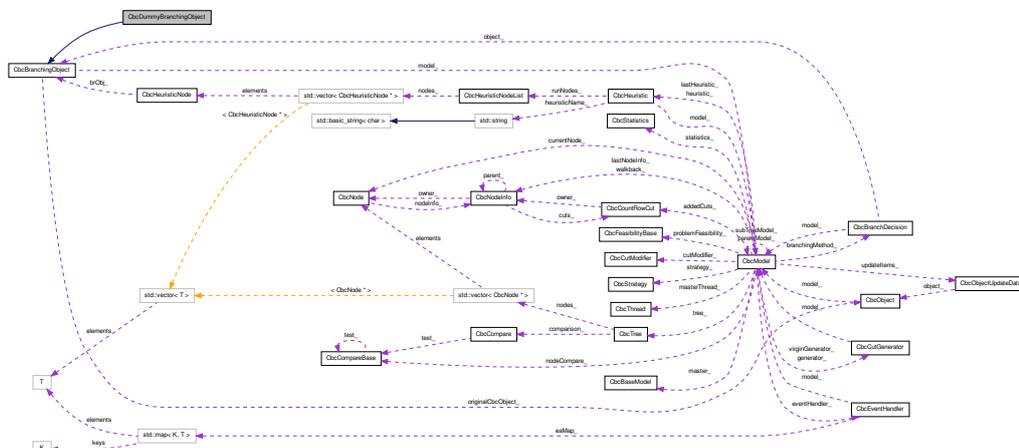
Dummy branching object.

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

Inheritance diagram for CbcDummyBranchingObject:



Collaboration diagram for CbcDummyBranchingObject:



## Public Member Functions

- **CbcDummyBranchingObject** (**CbcModel** \*model=NULL)  
*Default constructor.*
- **CbcDummyBranchingObject** (const **CbcDummyBranchingObject** &)  
*Copy constructor.*
- **CbcDummyBranchingObject** & operator= (const **CbcDummyBranchingObject** &rhs)  
*Assignment operator.*
- virtual **CbcBranchingObject** \* clone () const  
*Clone.*
- virtual ~**CbcDummyBranchingObject** ()  
*Destructor.*
- virtual double **branch** ()  
*Dummy branch.*
- 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 **replacelfOverlap**=false)  
*Compare the this with brObj.*

#### 4.28.1 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.

#### 4.28.2 Member Function Documentation

**4.28.2.1** `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](#).

**4.28.2.2** `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

## 4.29 CbcDynamicPseudoCostBranchingObject Class Reference

Simple branching object for an integer variable with pseudo costs.

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



- Create a degenerate branch object.*

  - [CbcDynamicPseudoCostBranchingObject](#) (const [CbcDynamicPseudoCostBranchingObject](#) &)

*Copy constructor.*

  - [CbcDynamicPseudoCostBranchingObject](#) & `operator=` (const [CbcDynamicPseudoCostBranchingObject](#) &rhs)

*Assignment operator.*

  - virtual [CbcBranchingObject](#) \* `clone` () const

*Clone.*

  - virtual `~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.*

#### 4.29.1 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`.

## 4.29.2 Constructor &amp; Destructor Documentation

## 4.29.2.1 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  $lb \leq x \leq floor(x^*)$ , the other  $ceil(x^*) \leq x \leq ub$ . Specify  $way = -1$  to set the object state to perform the down arm first,  $way = 1$  for the up arm.

## 4.29.2.2 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  $lowerValue = upperValue$ .

## 4.29.3 Member Function Documentation

## 4.29.3.1 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](#).

## 4.29.3.2 virtual int CbcDynamicPseudoCostBranchingObject::fillStrongInfo ( CbcStrongInfo &amp; 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

## 4.30 CbcEventHandler Class Reference

Base class for Cbc event handling.

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



#### Set/Get methods

- void [setModel](#) ([CbcModel](#) \*model)  
*Set model.*
- const [CbcModel](#) \* [getModel](#) () const  
*Get model.*
- void [setDfltAction](#) ([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](#) [dfltAction\\_](#)  
*Default action.*
- [eaMapPair](#) \* [eaMap\\_](#)  
*Pointer to a map that holds non-default event/action pairs.*

#### 4.30.1 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](#).

#### 4.30.2 Member Enumeration Documentation

##### 4.30.2.1 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.

##### 4.30.2.2 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.

#### 4.30.3 Constructor & Destructor Documentation

##### 4.30.3.1 CbcEventHandler::CbcEventHandler ( CbcModel \* model = 0 )

Default constructor.

##### 4.30.3.2 CbcEventHandler::CbcEventHandler ( const CbcEventHandler & orig )

Copy constructor.

4.30.3.3 `virtual CbcEventHandler::~~CbcEventHandler ( ) [virtual]`

Destructor.

#### 4.30.4 Member Function Documentation

4.30.4.1 `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.

4.30.4.2 `CbcEventHandler& CbcEventHandler::operator= ( const CbcEventHandler & rhs )`

Assignment.

4.30.4.3 `virtual CbcEventHandler* CbcEventHandler::clone ( ) const [virtual]`

Clone (virtual) constructor.

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

Set model.

Definition at line 176 of file CbcEventHandler.hpp.

4.30.4.5 `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:

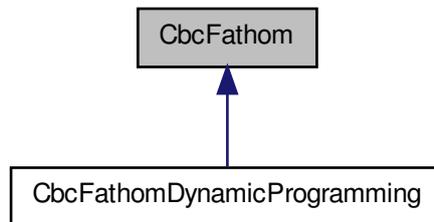
- [CbcEventHandler.hpp](#)

## 4.31 CbcFathom Class Reference

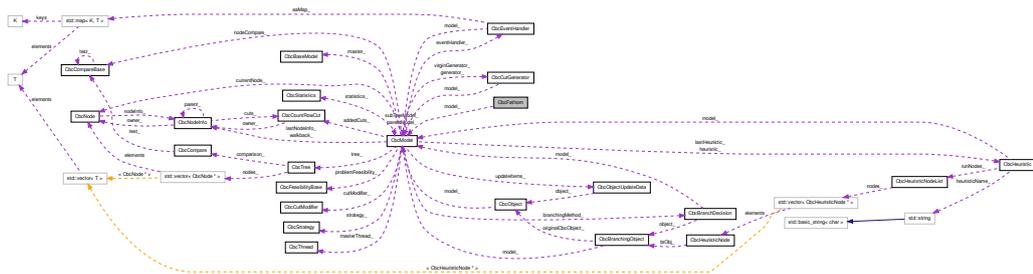
Fathom base class.

```
#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.*

#### 4.31.1 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.

#### 4.31.2 Member Function Documentation

##### 4.31.2.1 `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.

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

Implemented in [CbcFathomDynamicProgramming](#).

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

- CbcFathom.hpp

## 4.32 CbcFathomDynamicProgramming Class Reference

FathomDynamicProgramming class.

```
#include <CbcFathomDynamicProgramming.hpp>
```



- 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.*

#### 4.32.1 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.

#### 4.32.2 Member Function Documentation

4.32.2.1 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

### 4.33 CbcFeasibilityBase Class Reference

#### Public Member Functions

- virtual int [feasible](#) ([CbcModel](#) \*, int)  
*On input mode: 0 - called after a solve but before any cuts.*
- virtual [CbcFeasibilityBase](#) \* [clone](#) () const  
*Clone.*

## 4.33.1 Detailed Description

Definition at line 22 of file CbcFeasibilityBase.hpp.

## 4.33.2 Member Function Documentation

4.33.2.1 `virtual int CbcFeasibilityBase::feasible ( CbcModel *, int ) [inline, virtual]`

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

Definition at line 36 of file CbcFeasibilityBase.hpp.

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

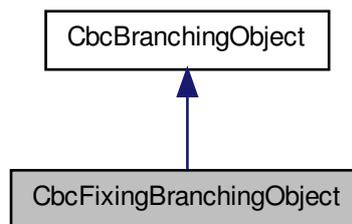
- CbcFeasibilityBase.hpp

## 4.34 CbcFixingBranchingObject Class Reference

General Branching Object class.

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

Inheritance diagram for CbcFixingBranchingObject:





4.34.2.1 `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](#).

4.34.2.2 `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:

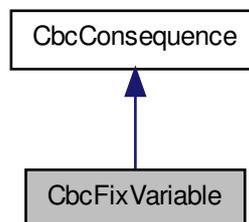
- `CbcFollowOn.hpp`

## 4.35 CbcFixVariable Class Reference

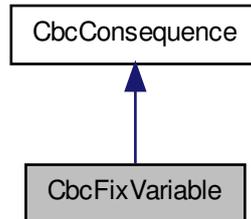
Class for consequent bounds.

```
#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.*

#### 4.35.1 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.

#### 4.35.2 Member Function Documentation

4.35.2.1 `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:

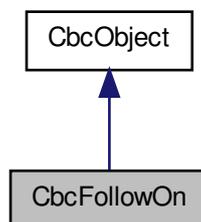
- CbcFixVariable.hpp

## 4.36 CbcFollowOn Class Reference

Define a follow on class.

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

Inheritance diagram for CbcFollowOn:





#### 4.36.1 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 23 of file CbcFollowOn.hpp.

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

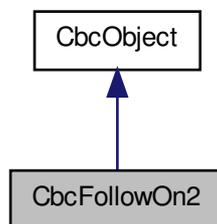
- CbcFollowOn.hpp

### 4.37 CbcFollowOn2 Class Reference

Define a follow on class.

```
#include <CbcBranchFollow2.hpp>
```

Inheritance diagram for CbcFollowOn2:





*Possible rhs (if 0 then not possible)*

- int `maximumRhs_`

*If > 1 then allow cuts if effective rhs <= this.*

#### 4.37.1 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 tries to generalize so that cuts are produced with  $\sum a_{ij} x_j \leq b_i$  on each side. It should be intelligent enough to fix if things can be fixed. We also need to make sure branch cuts work properly (i.e. persistence).

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

Definition at line 26 of file `CbcBranchFollow2.hpp`.

#### 4.37.2 Member Function Documentation

4.37.2.1 `virtual int CbcFollowOn2::gutsOfFollowOn2 ( int & otherRow, int & preferredWay, int & effectiveRhs ) const` `[virtual]`

As some computation is needed in more than one place - returns row.

Also returns other row and effective rhs (so we can know if cut)

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

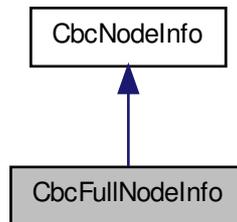
- `CbcBranchFollow2.hpp`

## 4.38 CbcFullNodeInfo Class Reference

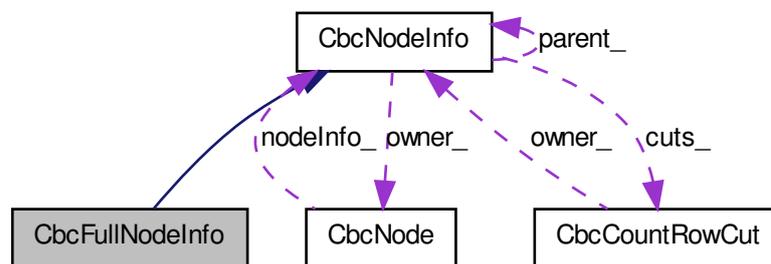
Information required to recreate the subproblem at this node.

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

Inheritance diagram for CbcFullNodeInfo:



Collaboration diagram for CbcFullNodeInfo:



#### Public Member Functions

- virtual void [applyToModel](#) ([CbcModel](#) \*model, [CoinWarmStartBasis](#) \*&basis, [CbcCountRowCut](#) \*\*addCuts, int &currentNumberCuts) 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).*
- [CbcFullNodeInfo](#) ([CbcModel](#) \*model, int numberRowsAtContinuous)  
*Constructor from continuous or satisfied.*

- virtual [CbcNodeInfo](#) \* [clone](#) () const  
*Clone.*
- const double \* [lower](#) () const  
*Lower bounds.*
- const double \* [upper](#) () const  
*Upper bounds.*

#### Protected Attributes

- CoinWarmStartBasis \* [basis\\_](#)  
*Full basis.*

#### 4.38.1 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](#).

#### 4.38.2 Member Function Documentation

4.38.2.1 `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](#).

4.38.2.2 `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](#).

#### 4.38.3 Member Data Documentation

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

Full basis.

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

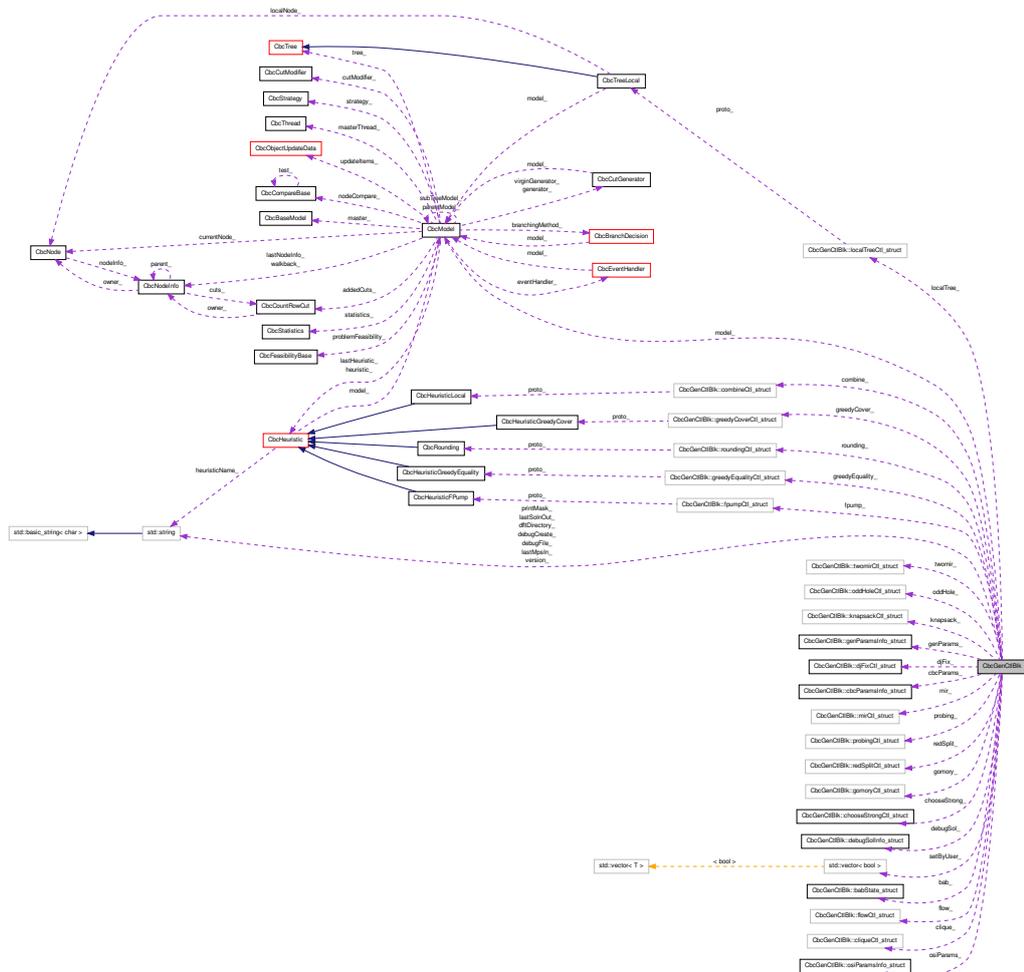
Definition at line 137 of file CbcFullNodeInfo.hpp.

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

- CbcFullNodeInfo.hpp

## 4.39 CbcGenCtlBlk Class Reference

Collaboration diagram for CbcGenCtlBlk:



## Classes

- struct [babState\\_struct](#)  
*State of branch-and-cut.*
- struct [cbcParamsInfo\\_struct](#)  
*Start and end of `CbcModel` parameters in parameter vector.*
- struct [chooseStrongCtl\\_struct](#)  
*Control variables for a strong branching method.*
- struct [cliqueCtl\\_struct](#)  
*Control variable and prototype for clique cut generator.*

- struct **combineCtl\_struct**  
*Control variable and prototype for combine heuristic.*
- 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 [BPCControl](#)
- *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](#) [getIPPAAction](#) ()
- void [setIPPAAction](#) ([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_`
- struct `CbcGenCtlBlk::cbcParamsInfo_struct` `cbcParams_`
- struct `CbcGenCtlBlk::osiParamsInfo_struct` `osiParams_`
- 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_`

- `double totalTime_`  
*Total elapsed time for this run.*

#### Models of various flavours

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

#### Various algorithm control variables and settings

- `struct CbcGenCtlBlk::djFixCtl_struct djFix_`
- `BPControl 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_`

#### 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.*

#### 4.39.1 Detailed Description

Definition at line 67 of file CbcGenCtlBlk.hpp.

#### 4.39.2 Member Enumeration Documentation

##### 4.39.2.1 enum CbcGenCtlBlk::IPPControl

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 ' $\leq$ ' 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.

##### 4.39.2.2 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.

#### 4.39.2.3 enum CbcGenCtlBlk::BPControl

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.

#### 4.39.2.4 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.

#### 4.39.2.5 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.

#### 4.39.2.6 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.

### 4.39.3 Member Function Documentation

#### 4.39.3.1 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.

4.39.3.2 `void CbcGenCtlBlk::setCutDepth ( int cutDepth ) [inline]`

Set cut depth setting.

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

Definition at line 245 of file CbcGenCtlBlk.hpp.

4.39.3.3 `CGControl CbcGenCtlBlk::getProbing ( CglCutGenerator *& gen )`

Obtain a prototype for a probing cut generator.

4.39.3.4 `void CbcGenCtlBlk::setProbingAction ( CGControl action ) [inline]`

Set action state for use of probing cut generator.

Definition at line 267 of file CbcGenCtlBlk.hpp.

4.39.3.5 `CGControl CbcGenCtlBlk::getClique ( CglCutGenerator *& gen )`

Obtain a prototype for a clique cut generator.

4.39.3.6 `void CbcGenCtlBlk::setCliqueAction ( CGControl action ) [inline]`

Set action state for use of clique cut generator.

Definition at line 277 of file CbcGenCtlBlk.hpp.

4.39.3.7 `CGControl CbcGenCtlBlk::getFlow ( CglCutGenerator *& gen )`

Obtain a prototype for a flow cover cut generator.

4.39.3.8 `void CbcGenCtlBlk::setFlowAction ( CGControl action ) [inline]`

Set action state for use of flow cover cut generator.

Definition at line 287 of file CbcGenCtlBlk.hpp.

4.39.3.9 `CGControl CbcGenCtlBlk::getGomory ( CglCutGenerator *& gen )`

Obtain a prototype for a Gomory cut generator.

4.39.3.10 `void CbcGenCtlBlk::setGomoryAction ( CGControl action ) [inline]`

Set action state for use of Gomory cut generator.

Definition at line 297 of file CbcGenCtlBlk.hpp.

4.39.3.11 `CGControl CbcGenCtlBlk::getKnapsack ( CglCutGenerator *& gen )`

Obtain a prototype for a knapsack cover cut generator.

4.39.3.12 `void CbcGenCtlBlk::setKnapsackAction ( CGControl action ) [inline]`

Set action state for use of knapsack cut generator.

Definition at line 307 of file CbcGenCtlBlk.hpp.

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

Set action state for use of MIR cut generator.

Definition at line 329 of file CbcGenCtlBlk.hpp.

**4.39.3.14** CGControl CbcGenCtlBlk::getRedSplit ( CglCutGenerator \*& *gen* )

Obtain a prototype for a reduce and split cut generator.

**4.39.3.15** 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.

**4.39.3.16** CGControl CbcGenCtlBlk::getTwomir ( CglCutGenerator \*& *gen* )

Obtain a prototype for a 2-MIR cut generator.

**4.39.3.17** void CbcGenCtlBlk::setTwomirAction ( CGControl *action* ) [inline]

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

Definition at line 349 of file CbcGenCtlBlk.hpp.

**4.39.3.18** 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.

**4.39.3.19** void CbcGenCtlBlk::setFPumpAction ( CGControl *action* ) [inline]

Set action state for use of feasibility pump heuristic.

Definition at line 366 of file CbcGenCtlBlk.hpp.

**4.39.3.20** 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.

**4.39.3.21** void CbcGenCtlBlk::setCombineAction ( CGControl *action* ) [inline]

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

Definition at line 382 of file CbcGenCtlBlk.hpp.

**4.39.3.22** `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.

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

Set action state for use of greedy cover heuristic.

Definition at line 398 of file `CbcGenCtlBlk.hpp`.

**4.39.3.24** `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.

**4.39.3.25** `void CbcGenCtlBlk::setGreedyEqualityAction ( CGControl action ) [inline]`

Set action state for use of greedy equality heuristic.

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

**4.39.3.26** `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.

**4.39.3.27** `void CbcGenCtlBlk::setRoundingAction ( CGControl action ) [inline]`

Set action state for use of simple rounding heuristic.

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

**4.39.3.28** `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.

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

Set action state for use of local tree.

Definition at line 446 of file `CbcGenCtlBlk.hpp`.

4.39.3.30 `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.

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

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

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

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

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

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

4.39.3.33 `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](#).

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

Print a message.

Uses the current message handler and messages.

4.39.3.35 `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`.

4.39.3.36 `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 `setLanguage` 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.

#### 4.39.4 Member Data Documentation

#### 4.39.4.1 int CbcGenCtIBlk::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 CbcGenCtIBlk.hpp.

#### 4.39.4.2 std::string CbcGenCtIBlk::printMask\_

Print mask.

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

Definition at line 590 of file CbcGenCtIBlk.hpp.

#### 4.39.4.3 int CbcGenCtIBlk::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 CbcGenCtIBlk.hpp.

#### 4.39.4.4 bool CbcGenCtIBlk::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 CbcGenCtIBlk.hpp.

#### 4.39.4.5 std::string CbcGenCtIBlk::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 CbcGenCtIBlk.hpp.

#### 4.39.4.6 std::string CbcGenCtIBlk::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.

#### 4.39.4.7 double CbcGenCtlBlk::totalTime\_

Total elapsed time for this run.

Definition at line 680 of file CbcGenCtlBlk.hpp.

#### 4.39.4.8 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.

#### 4.39.4.9 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.

#### 4.39.4.10 bool CbcGenCtlBlk::goodModel\_

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

Definition at line 709 of file CbcGenCtlBlk.hpp.

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

- CbcGenCtlBlk.hpp

## 4.40 CbcGeneral Class Reference

Define a catch all class.

```
#include <CbcGeneral.hpp>
```



- 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.*

#### 4.40.1 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:

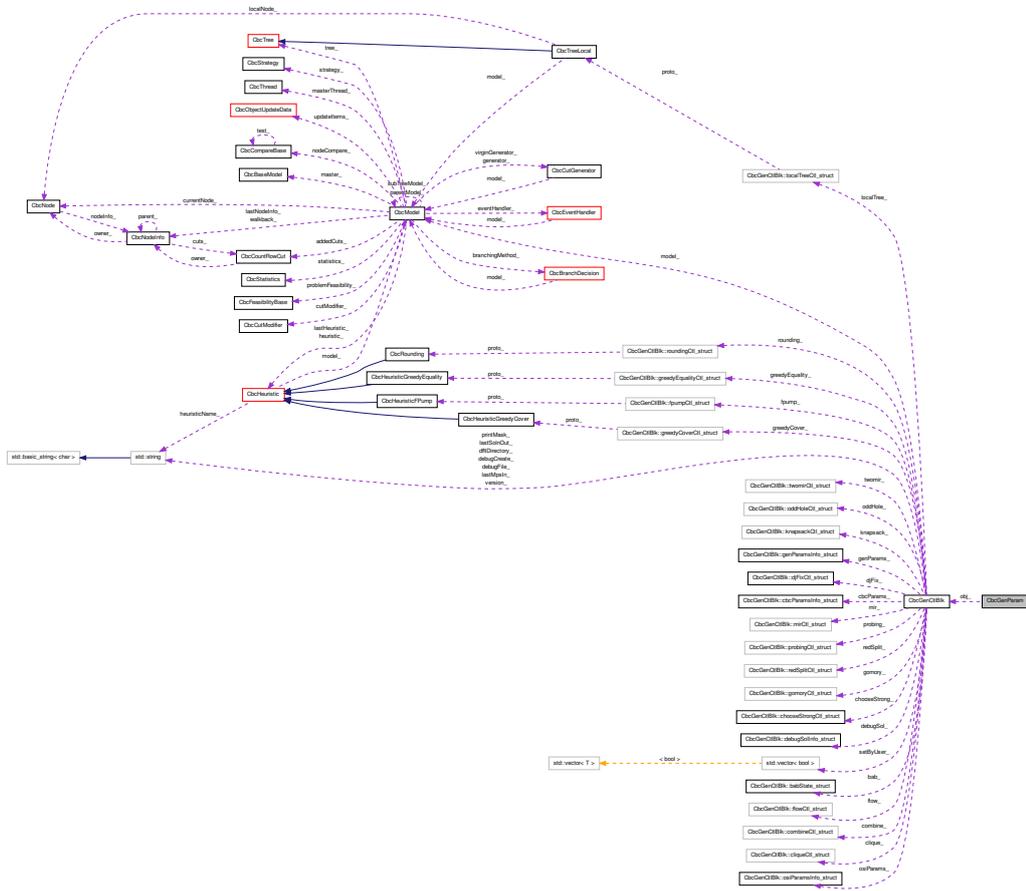
- CbcGeneral.hpp

#### 4.41 CbcGenParam Class Reference

Class for cbc-generic control parameters.

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

Collaboration diagram for CbcGenParam:



Public Types

Subtypes

- enum [CbcGenParamCode](#)  
Enumeration for cbc-generic parameters.

Public Member Functions

Constructors and Destructors

*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.*

#### 4.41.1 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.

#### 4.41.2 Member Enumeration Documentation

##### 4.41.2.1 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.

#### 4.41.3 Constructor & Destructor Documentation

4.41.3.1 `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.

4.41.3.2 `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.

4.41.3.3 `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.

4.41.3.4 `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:

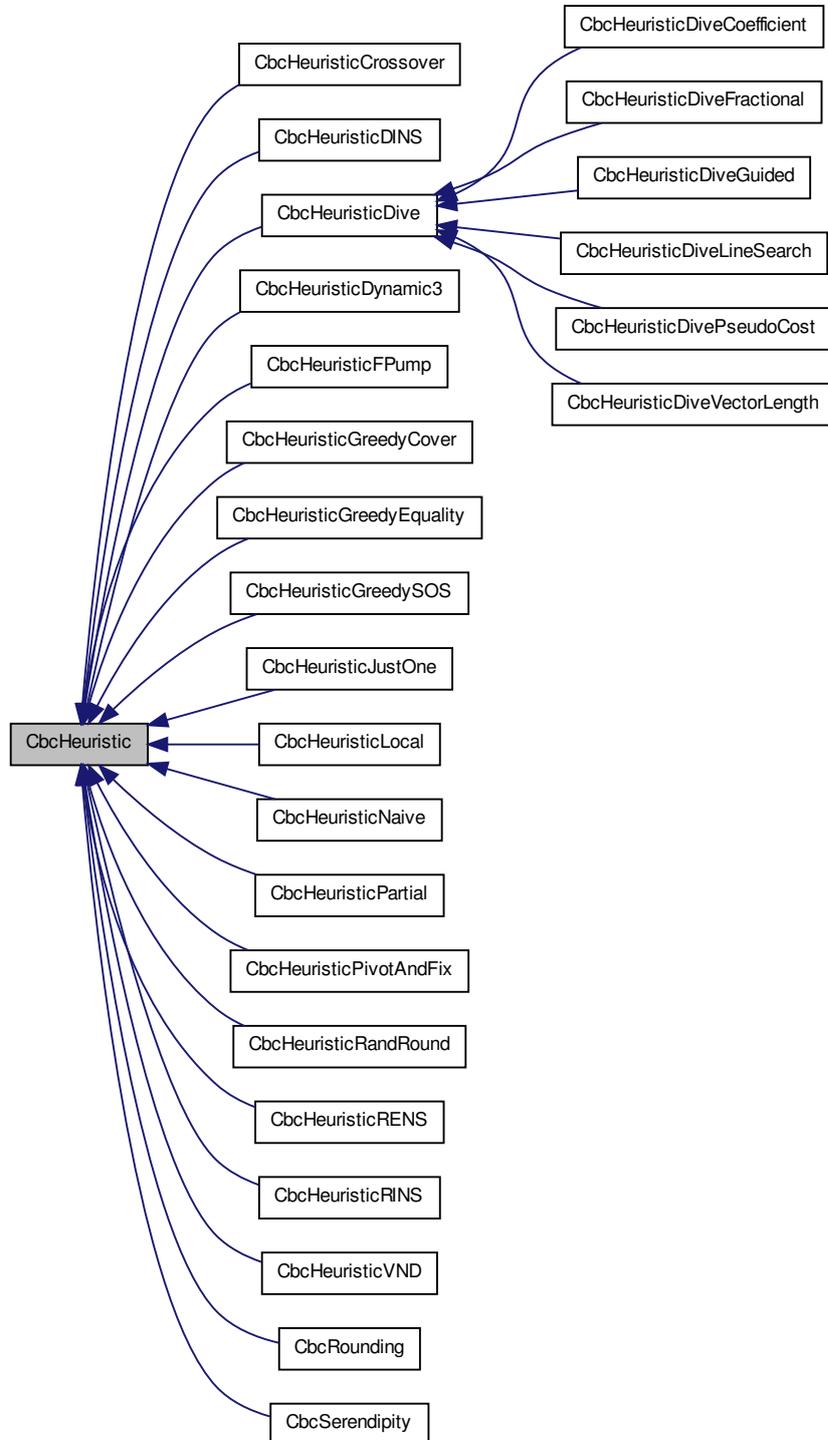
- CbcGenParam.hpp

## 4.42 CbcHeuristic Class Reference

Heuristic base class.

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

Inheritance diagram for CbcHeuristic:





*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 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 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)*
- 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.*

- 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 doHeuristics) 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)*
- 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 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.*

#### 4.42.1 Detailed Description

Heuristic base class.

Definition at line 77 of file CbcHeuristic.hpp.

#### 4.42.2 Member Function Documentation

##### 4.42.2.1 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.

4.42.2.2 `int CbcHeuristic::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

4.42.2.3 `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 heur should run at all.

Definition at line 263 of file CbcHeuristic.hpp.

4.42.2.4 `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 273 of file CbcHeuristic.hpp.

4.42.2.5 `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).

#### 4.42.3 Member Data Documentation

4.42.3.1 `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 heur should run at all.

Definition at line 354 of file CbcHeuristic.hpp.

#### 4.42.3.2 int CbcHeuristic::numInvocationsInShallow\_ [protected]

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

Definition at line 359 of file CbcHeuristic.hpp.

#### 4.42.3.3 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 362 of file CbcHeuristic.hpp.

#### 4.42.3.4 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 370 of file CbcHeuristic.hpp.

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

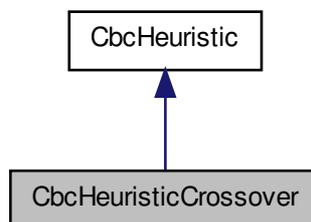
- CbcHeuristic.hpp

## 4.43 CbcHeuristicCrossover Class Reference

Crossover Search class.

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

Inheritance diagram for CbcHeuristicCrossover:





#### 4.43.1 Detailed Description

Crossover Search class.

Definition at line 151 of file CbcHeuristicLocal.hpp.

#### 4.43.2 Member Function Documentation

4.43.2.1 `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

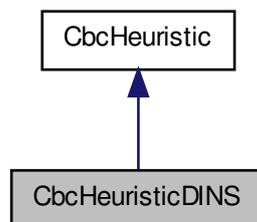
Implements [CbcHeuristic](#).

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

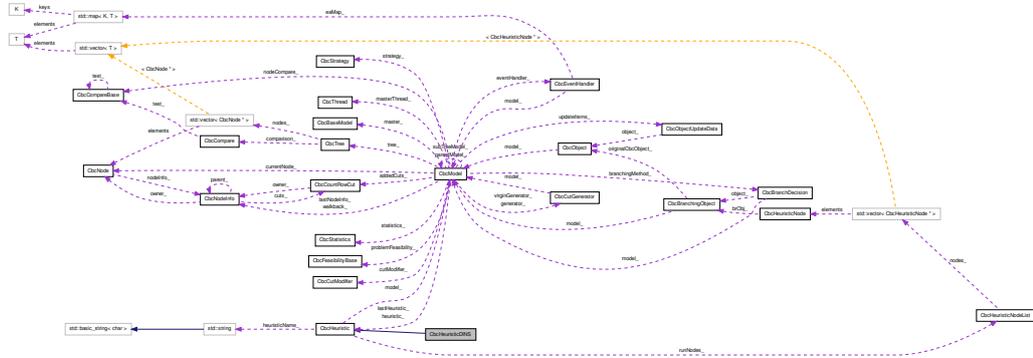
- CbcHeuristicLocal.hpp

## 4.44 CbcHeuristicDINS Class Reference

Inheritance diagram for CbcHeuristicDINS:



Collaboration diagram for CbcHeuristicDINS:



### Public Member Functions

- virtual [CbcHeuristic](#) \* [clone](#) () const  
*Clone.*
- [CbcHeuristicDINS](#) & [operator=](#) (const [CbcHeuristicDINS](#) &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.*
- 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.*

#### 4.44.1 Detailed Description

Definition at line 14 of file CbcHeuristicDINS.hpp.

#### 4.44.2 Member Function Documentation

4.44.2.1 `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

## 4.45 CbcHeuristicDive Class Reference

Dive class.

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



- 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*
- 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.*
- 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)*

#### 4.45.1 Detailed Description

Dive class.

Definition at line 19 of file CbcHeuristicDive.hpp.

#### 4.45.2 Member Function Documentation

4.45.2.1 `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

## 4.46 CbcHeuristicDiveCoefficient Class Reference

DiveCoefficient class.

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



*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

DiveCoefficient class.

Definition at line 14 of file CbcHeuristicDiveCoefficient.hpp.

#### 4.46.2 Member Function Documentation

**4.46.2.1** 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

## 4.47 CbcHeuristicDiveFractional Class Reference

DiveFractional class.

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



*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.*

#### 4.47.1 Detailed Description

DiveFractional class.

Definition at line 14 of file CbcHeuristicDiveFractional.hpp.

#### 4.47.2 Member Function Documentation

4.47.2.1 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

## 4.48 CbcHeuristicDiveGuided Class Reference

DiveGuided class.

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



- 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.*

#### 4.48.1 Detailed Description

DiveGuided class.

Definition at line 14 of file CbcHeuristicDiveGuided.hpp.

#### 4.48.2 Member Function Documentation

**4.48.2.1** 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

## 4.49 CbcHeuristicDiveLineSearch Class Reference

DiveLineSearch class.

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



*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.*

#### 4.49.1 Detailed Description

DiveLineSearch class.

Definition at line 14 of file CbcHeuristicDiveLineSearch.hpp.

#### 4.49.2 Member Function Documentation

- 4.49.2.1 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

## 4.50 CbcHeuristicDivePseudoCost Class Reference

DivePseudoCost class.

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



*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.*

#### 4.50.1 Detailed Description

DivePseudoCost class.

Definition at line 14 of file CbcHeuristicDivePseudoCost.hpp.

#### 4.50.2 Member Function Documentation

**4.50.2.1** 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

## 4.51 CbcHeuristicDiveVectorLength Class Reference

DiveVectorLength class.

```
#include <CbcHeuristicDiveVectorLength.hpp>
```



*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.*

#### 4.51.1 Detailed Description

DiveVectorLength class.

Definition at line 14 of file CbcHeuristicDiveVectorLength.hpp.

#### 4.51.2 Member Function Documentation

- 4.51.2.1 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

## 4.52 CbcHeuristicDynamic3 Class Reference

heuristic - just picks up any good solution

```
#include <CbcLinked.hpp>
```



#### 4.52.1 Detailed Description

heuristic - just picks up any good solution

Definition at line 379 of file CbcLinked.hpp.

#### 4.52.2 Member Function Documentation

4.52.2.1 `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:

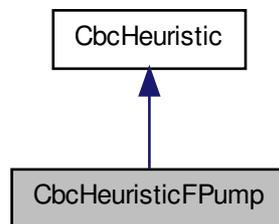
- CbcLinked.hpp

### 4.53 CbcHeuristicFPump Class Reference

Feasibility Pump class.

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

Inheritance diagram for CbcHeuristicFPump:





- 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.

#### 4.53.1 Detailed Description

Feasibility Pump class.

Definition at line 15 of file CbcHeuristicFPump.hpp.

#### 4.53.2 Member Function Documentation

4.53.2.1 `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](#).

4.53.2.2 `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.

#### 4.53.3 Member Data Documentation

##### 4.53.3.1 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.

##### 4.53.3.2 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:

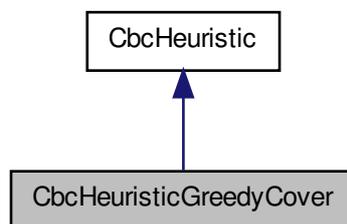
- CbcHeuristicFPump.hpp

#### 4.54 CbcHeuristicGreedyCover Class Reference

Greedy heuristic classes.

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

Inheritance diagram for CbcHeuristicGreedyCover:





#### 4.54.1 Detailed Description

Greedy heuristic classes.

Definition at line 13 of file CbcHeuristicGreedy.hpp.

#### 4.54.2 Member Function Documentation

**4.54.2.1** `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.

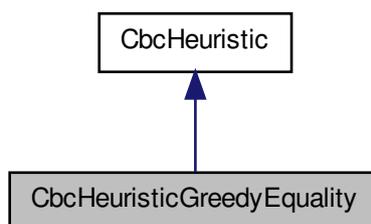
Implements [CbcHeuristic](#).

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

- CbcHeuristicGreedy.hpp

## 4.55 CbcHeuristicGreedyEquality Class Reference

Inheritance diagram for CbcHeuristicGreedyEquality:





#### 4.55.1 Detailed Description

Definition at line 98 of file CbcHeuristicGreedy.hpp.

#### 4.55.2 Member Function Documentation

4.55.2.1 `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:

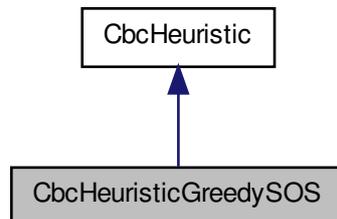
- CbcHeuristicGreedy.hpp

## 4.56 CbcHeuristicGreedySOS Class Reference

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

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

Inheritance diagram for CbcHeuristicGreedySOS:





#### 4.56.1 Detailed Description

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

Definition at line 193 of file CbcHeuristicGreedy.hpp.

#### 4.56.2 Member Function Documentation

**4.56.2.1** `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:

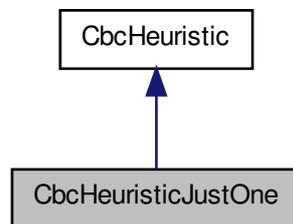
- CbcHeuristicGreedy.hpp

## 4.57 CbcHeuristicJustOne Class Reference

Just One class - this chooses one at random.

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

Inheritance diagram for CbcHeuristicJustOne:





#### 4.57.2 Member Function Documentation

4.57.2.1 `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 633 of file CbcHeuristic.hpp.

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

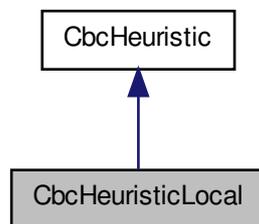
- CbcHeuristic.hpp

#### 4.58 CbcHeuristicLocal Class Reference

LocalSearch class.

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

Inheritance diagram for CbcHeuristicLocal:





#### 4.58.1 Detailed Description

LocalSearch class.

Definition at line 13 of file CbcHeuristicLocal.hpp.

#### 4.58.2 Member Function Documentation

**4.58.2.1** `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:

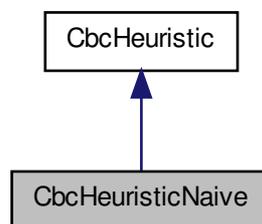
- CbcHeuristicLocal.hpp

## 4.59 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>
```

Inheritance diagram for CbcHeuristicNaive:











*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.*

#### 4.62.1 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 477 of file CbcHeuristic.hpp.

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

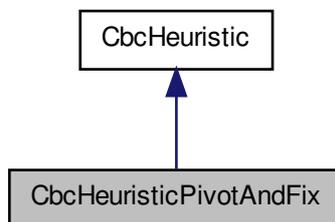
- CbcHeuristic.hpp

## 4.63 CbcHeuristicPivotAndFix Class Reference

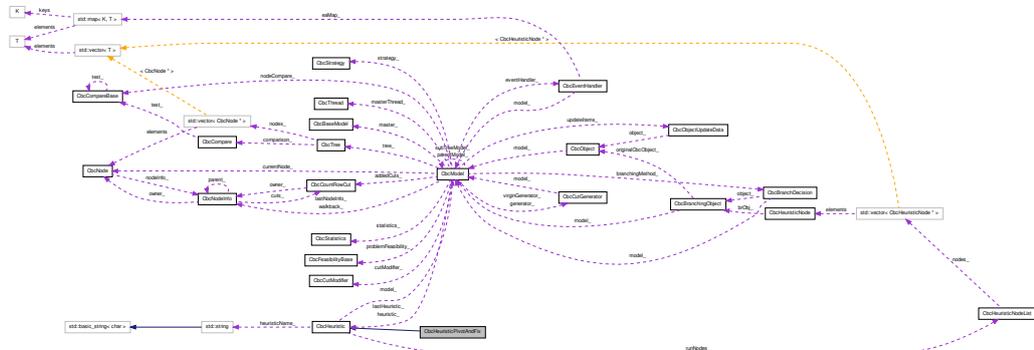
LocalSearch class.

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

Inheritance diagram for CbcHeuristicPivotAndFix:



Collaboration diagram for CbcHeuristicPivotAndFix:



### Public Member Functions

- virtual [CbcHeuristic](#) \* [clone](#) () const  
*Clone.*
- [CbcHeuristicPivotAndFix](#) & [operator=](#) (const [CbcHeuristicPivotAndFix](#) &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.*

#### 4.63.1 Detailed Description

LocalSearch class.

Definition at line 13 of file CbcHeuristicPivotAndFix.hpp.

#### 4.63.2 Member Function Documentation

4.63.2.1 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](#).



- [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.*

#### 4.64.1 Detailed Description

LocalSearch class.

Definition at line 13 of file CbcHeuristicRandRound.hpp.

#### 4.64.2 Member Function Documentation

**4.64.2.1** 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

## 4.65 CbcHeuristicRENS Class Reference

LocalSearch class.

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



### 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.*

### 4.65.1 Detailed Description

LocalSearch class.

Definition at line 16 of file CbcHeuristicRENS.hpp.

### 4.65.2 Member Function Documentation

4.65.2.1 `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

## 4.66 CbcHeuristicRINS Class Reference

LocalSearch class.

```
#include <CbcHeuristicRINS.hpp>
```



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.*
- int [lastNode\\_](#)  
*Node when last done.*
- char \* [used\\_](#)  
*Whether a variable has been in a solution.*

#### 4.66.1 Detailed Description

LocalSearch class.

Definition at line 17 of file CbcHeuristicRINS.hpp.

#### 4.66.2 Member Function Documentation

4.66.2.1 `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](#).

### 4.66.3 Member Data Documentation

#### 4.66.3.1 int CbcHeuristicRINS::stateOfFixing\_ [protected]

State of fixing continuous variables - 0 - not tried +n - this divisor makes small enough.

-n - this divisor still not small enough

Definition at line 91 of file CbcHeuristicRINS.hpp.

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

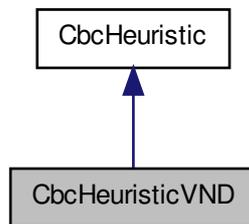
- CbcHeuristicRINS.hpp

## 4.67 CbcHeuristicVND Class Reference

LocalSearch class.

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

Inheritance diagram for CbcHeuristicVND:





- *Number of successes.*  
int [numberTries\\_](#)
- *Number of tries.*  
int [lastNode\\_](#)
- *Node when last done.*  
int [stepSize\\_](#)
- *Step size for decomposition.*  
double \* [baseSolution\\_](#)
- *Base solution.*

#### 4.67.1 Detailed Description

LocalSearch class.

Definition at line 17 of file CbcHeuristicVND.hpp.

#### 4.67.2 Member Function Documentation

4.67.2.1 `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

## 4.68 CbcIntegerBranchingObject Class Reference

Simple branching object for an integer variable.

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



Create a degenerate branch object.

- [CbcIntegerBranchingObject](#) (const [CbcIntegerBranchingObject](#) &)

Copy constructor.

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

Assignment operator.

- virtual [CbcBranchingObject](#) \* clone () const

Clone.

- 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 branch-State) 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)

#### 4.68.1 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 21 of file CbcSimpleInteger.hpp.

#### 4.68.2 Constructor & Destructor Documentation

##### 4.68.2.1 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.

##### 4.68.2.2 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`.

#### 4.68.3 Member Function Documentation

##### 4.68.3.1 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 [CbcIntegerPseudoCostBranchingObject](#).

##### 4.68.3.2 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](#).

4.68.3.3 `virtual bool CbcIntegerBranchingObject::tighten ( OsiSolverInterface * )`  
[virtual]

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

Return true if now fixed

Reimplemented from [CbcBranchingObject](#).

4.68.3.4 `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`

## 4.69 CbcIntegerPseudoCostBranchingObject Class Reference

Simple branching object for an integer variable with pseudo costs.

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



Create a standard floor/ceiling branch object.

- [CbcIntegerPseudoCostBranchingObject](#) ([CbcModel](#) \*model, int variable, int way, double lowerValue, double upperValue)

Create a degenerate branch object.

- [CbcIntegerPseudoCostBranchingObject](#) (const [CbcIntegerPseudoCostBranchingObject](#) &)

Copy constructor.

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

Assignment operator.

- virtual [CbcBranchingObject](#) \* clone () const

Clone.

- 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 [replacelfOverlap](#)=false)

Compare the *this* with *brObj*.

#### Protected Attributes

- double [changeInGuessed\\_](#)

Change in guessed objective value for next branch.

#### 4.69.1 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](#).

## 4.69.2 Constructor &amp; Destructor Documentation

## 4.69.2.1 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  $lb \leq x \leq floor(x^*)$ , the other  $ceil(x^*) \leq x \leq ub$ . Specify  $way = -1$  to set the object state to perform the down arm first,  $way = 1$  for the up arm.

## 4.69.2.2 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  $lowerValue \leq x \leq upperValue$ . Used to fix a variable when  $lowerValue = upperValue$ .

## 4.69.3 Member Function Documentation

## 4.69.3.1 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](#).

## 4.69.3.2 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`

## 4.70 CbcLink Class Reference

Define Special Linked Ordered Sets.

```
#include <CbcBranchLink.hpp>
```



- virtual `CbcObject * clone ()` const  
*Clone.*
- virtual double `infeasibility (int &preferredWay)` const  
*Infeasibility - large is 0.5.*
- virtual void `feasibleRegion ()`  
*This looks at solution and sets bounds to contain solution.*
- virtual `CbcBranchingObject * createBranch (int way)`  
*Creates a branching object.*
- int `numberMembers ()` const  
*Number of members.*
- int `numberLinks ()` const  
*Number of links for each member.*
- const int \* `which ()` const  
*Which variables.*
- const double \* `weights ()` const  
*Array of weights.*

#### 4.70.1 Detailed Description

Define Special Linked Ordered Sets.

Definition at line 16 of file CbcBranchLink.hpp.

#### 4.70.2 Constructor & Destructor Documentation

##### 4.70.2.1 `CbcLink::CbcLink ( CbcModel * model, 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  $\text{numberInSet}$ . For this constructor the variables in matrix are the  $\text{numberInSet} \cdot \text{numberLink}$  starting at first. If weights null then 0,1,2..

##### 4.70.2.2 `CbcLink::CbcLink ( CbcModel * model, 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  $\text{numberInSet} - 1$ .

The length of weights array is  $\text{numberInSet}$ . For this constructor the variables are given by list - grouped. If weights null then 0,1,2..

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

- CbcBranchLink.hpp



- 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 [replacelfOverlap](#)=false)  
*Compare the this with brObj.*

#### 4.71.1 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 98 of file CbcBranchLink.hpp.

#### 4.71.2 Member Function Documentation

4.71.2.1 virtual CbcRangeCompare CbcLinkBranchingObject::compareBranchingObject ( const [CbcBranchingObject](#) \* brObj, const bool [replacelfOverlap](#) = 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 `replacelfOverlap` 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:

- CbcBranchLink.hpp

## 4.72 CbcLongCliqueBranchingObject Class Reference

Unordered Clique Branching Object class.

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



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`.

#### 4.72.1 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.

#### 4.72.2 Member Function Documentation

4.72.2.1 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](#).

4.72.2.2 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

#### 4.73 CbcLotsize Class Reference

Lotsize class.

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



- 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.), return a branching object which would give a new feasible point in the good direction.*
- virtual [CbcBranchingObject](#) \* [notPreferredNewFeasible](#) () const
  - Given a valid solution (with reduced costs, etc.), return a branching object which would give a new feasible point in a bad direction.*
- 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.*

#### 4.73.1 Detailed Description

Lotsize class.

Definition at line 13 of file CbcBranchLotsize.hpp.

## 4.73.2 Member Function Documentation

## 4.73.2.1 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](#).

## 4.73.2.2 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](#).

## 4.73.2.3 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](#).

## 4.73.2.4 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](#).

## 4.73.2.5 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:

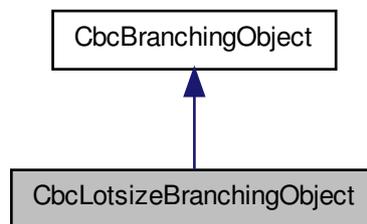
- CbcBranchLotsize.hpp

#### 4.74 CbcLotsizeBranchingObject Class Reference

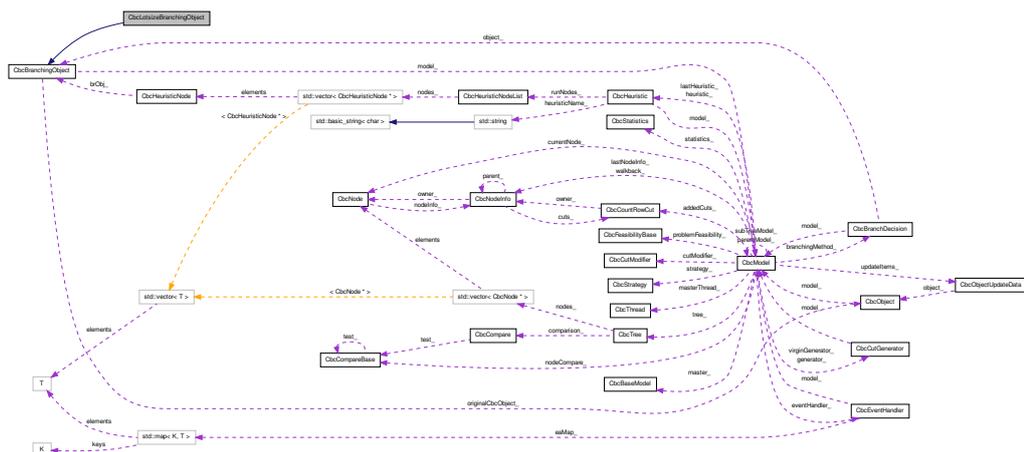
Lotsize branching object.

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

Inheritance diagram for CbcLotsizeBranchingObject:



Collaboration diagram for CbcLotsizeBranchingObject:



## Public Member Functions

- [CbcLotsizeBranchingObject](#) ()  
*Default constructor.*
- [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 [replacelfOverlap](#)=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)*

## 4.74.1 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](#).

## 4.74.2 Constructor &amp; Destructor Documentation

## 4.74.2.1 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.

## 4.74.2.2 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

## 4.74.3 Member Function Documentation

4.74.3.1 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`

## 4.75 CbcMessage Class Reference

## Public Member Functions

## Constructors etc

- [CbcMessage](#) (Language language=us\_en)  
*Constructor.*

## 4.75.1 Detailed Description

Definition at line 80 of file `CbcMessage.hpp`.



*Do integer presolve, creating a new (presolved) model.*

- 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.*

#### 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 [addObjects](#) (int numberObjects, OsiObject \*\*objects)  
*Add in object information.*
- void [addObjects](#) (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.
  - 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.*
- 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.*
- 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)  
*Set original columns as created by preprocessing.*
- 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.*
- 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 `numberOfRowsAtContinuous` () 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 `numberOfIntegers` () 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.*
- 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 &numberObjectInfeasibilities) 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.*
- 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.*

#### 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 [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.*
- [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.*

## 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.*
- int [specialOptions](#) () const  
*Get special options.*
- 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.*

- int [moreSpecialOptions](#) () const  
*Get more special options.*
- void [setUseElapsedTime](#) (bool yesNo)  
*Set time method.*
- bool [useElapsedTime](#) () const  
*Get time method.*
- bool [ownObjects](#) () const  
*Go to dantzig pivot selection if easy problem (clp only)*
- 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 .*
- [CbcModel](#) & [operator=](#) (const [CbcModel](#) &rhs)  
*Assignment operator.*
- [~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 subproblem.*
- 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()`*
- `OsiCuts` \* `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)*
- 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 [usefullInformation](#) () 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 numberRows, 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.*

## 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.*
- 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.*
- void [moveToModel](#) ([CbcModel](#) \*baseModel, int mode)  
*Move/copy information from one model to another.*
- 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.*

## 4.76.1 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 99 of file [CbcModel.hpp](#).

#### 4.76.2 Member Enumeration Documentation

##### 4.76.2.1 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 103 of file CbcModel.hpp.

#### 4.76.2.2 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 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.

**CbcLastDbIParam** Just a marker, so that a static sized array can store parameters.

Definition at line 129 of file CbcModel.hpp.

#### 4.76.3 Constructor & Destructor Documentation

##### 4.76.3.1 CbcModel::CbcModel ( const CbcModel & rhs, bool cloneHandler = false )

Copy constructor .

If cloneHandler is true then message handler is cloned

#### 4.76.4 Member Function Documentation

##### 4.76.4.1 void CbcModel::initialSolve ( )

Solve the initial LP relaxation.

Invoke the solver's initialSolve() method.

##### 4.76.4.2 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

##### 4.76.4.3 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

**4.76.4.4** `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 `#numberObjects_` 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.

**4.76.4.5** `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

**4.76.4.6** `bool CbcModel::integerPresolveThisModel ( OsiSolverInterface * originalSolver, bool weak = false )`

Do integer presolve, modifying the current model.

Returns true if the model remains feasible after presolve.

**4.76.4.7** `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.

**4.76.4.8** `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.

**4.76.4.9** void CbcModel::addObjects ( int *numberObjects*, OsiObject \*\* *objects* )

Add in object information.

Objects are cloned; the owner can delete the originals.

**4.76.4.10** void CbcModel::addObjects ( int *numberObjects*, CbcObject \*\* *objects* )

Add in object information.

Objects are cloned; the owner can delete the originals.

**4.76.4.11** 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

**4.76.4.12** 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.

**4.76.4.13** 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

**4.76.4.14** int CbcModel::getCurrentPassNumber ( ) const [inline]

Get current cut pass number in this round of cuts.

(1 is first pass)

Definition at line 744 of file CbcModel.hpp.

**4.76.4.15** void CbcModel::setNumberStrong ( int *number* )

Set the maximum number of candidates to be evaluated for strong branching.

A value of 0 disables strong branching.

**4.76.4.16** void CbcModel::setPreferredWay ( int *value* ) [inline]

Set global preferred way to branch.

-1 down, +1 up, 0 no preference

Definition at line 762 of file CbcModel.hpp.

**4.76.4.17** 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.

**4.76.4.18** int CbcModel::numberBeforeTrust ( ) const [inline]

get the number of branches before pseudo costs believed in dynamic strong branching.  
Definition at line 792 of file CbcModel.hpp.

**4.76.4.19** 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.

**4.76.4.20** int CbcModel::numberPenalties ( ) const [inline]

get the number of variables for which to compute penalties in dynamic strong branching.  
Definition at line 803 of file CbcModel.hpp.

**4.76.4.21** double CbcModel::penaltyScaleFactor ( ) const [inline]

Get scale factor to make penalties match strong.  
Should/will be computed  
Definition at line 815 of file CbcModel.hpp.

**4.76.4.22** void CbcModel::setPenaltyScaleFactor ( double *value* )

Set scale factor to make penalties match strong.  
Should/will be computed

**4.76.4.23** 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 828 of file CbcModel.hpp.

**4.76.4.24** 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 859 of file CbcModel.hpp.

**4.76.4.25** `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 916 of file CbcModel.hpp.

**4.76.4.26** `int CbcModel::secondaryStatus ( ) const [inline]`

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

Definition at line 933 of file CbcModel.hpp.

**4.76.4.27** `const char* CbcModel::getRowSense ( ) const [inline]`

Get pointer to array[getNumRows()] of row constraint senses.

- 'L': <= constraint
- 'E': = constraint
- 'G': >= constraint
- 'R': ranged constraint
- 'N': free constraint

Definition at line 1021 of file CbcModel.hpp.

**4.76.4.28** `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 1033 of file CbcModel.hpp.

**4.76.4.29** `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 1045 of file `CbcModel.hpp`.

**4.76.4.30** `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 1084 of file `CbcModel.hpp`.

**4.76.4.31** `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 1157 of file `CbcModel.hpp`.

**4.76.4.32** `double CbcModel::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.

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)

**4.76.4.33** `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`).

**4.76.4.34** `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 1195 of file `CbcModel.hpp`.

**4.76.4.35** `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.

**4.76.4.36** `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 1273 of file CbcModel.hpp.

**4.76.4.37** `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

**4.76.4.38** `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 1315 of file CbcModel.hpp.

**4.76.4.39** `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 1358 of file CbcModel.hpp.

**4.76.4.40** `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

**4.76.4.41** `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

4.76.4.42 `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 1439 of file CbcModel.hpp.

4.76.4.43 `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 1467 of file CbcModel.hpp.

4.76.4.44 `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.

4.76.4.45 `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).

4.76.4.46 `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.

4.76.4.47 `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

**4.76.4.48** void CbcModel::passInEventHandler ( const CbcEventHandler \* *eventHandler* )

Set an event handler.

A clone of the handler passed as a parameter is stored in [CbcModel](#).

**4.76.4.49** 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.

**4.76.4.50** 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

**4.76.4.51** 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 1694 of file CbcModel.hpp.

**4.76.4.52** bool CbcModel::ownObjects ( ) const [inline]

Go to dantzig pivot selection if easy problem (clp only)

Now we may not own objects - just point to solver's objects

Definition at line 1781 of file CbcModel.hpp.

**4.76.4.53** 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.

4.76.4.54 `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 1818 of file `CbcModel.hpp`.

4.76.4.55 `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 1827 of file `CbcModel.hpp`.

4.76.4.56 `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

4.76.4.57 `int CbcModel::parallelMode ( ) const [inline]`

Return.

-2 if deterministic threaded and main thread -1 if deterministic threaded and serial thread  
0 if serial 1 if opportunistic threaded

Definition at line 1944 of file `CbcModel.hpp`.

4.76.4.58 `void CbcModel::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

4.76.4.59 `void CbcModel::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)

4.76.4.60 `int CbcModel::reducedCostFix ( )`

Perform reduced cost fixing.

Fixes integer variables at their current value based on reduced cost penalties. Returns number fixed

4.76.4.61 `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

4.76.4.62 `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.

4.76.4.63 `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

4.76.4.64 `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 book-keeping (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

4.76.4.65 `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

4.76.4.66 `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)

4.76.4.67 `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

4.76.4.68 `void CbcModel::convertToDynamic ( )`

If numberBeforeTrust >0 then we are going to use CbcBranchDynamic.

Scan and convert [CbcSimpleInteger](#) objects

4.76.4.69 `void CbcModel::doHeuristicsAtRoot ( int deleteHeuristicsAfterwards = 0 )`

Do heuristics at root.

0 - don't delete 1 - delete 2 - just delete - don't even use

4.76.4.70 `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 2249 of file CbcModel.hpp.

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

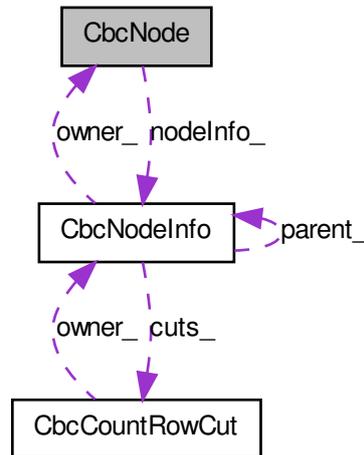
- CbcModel.hpp

## 4.77 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 [checksCutoff](#) (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.*

#### 4.77.1 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`.

#### 4.77.2 Member Function Documentation

**4.77.2.1** 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.)

**4.77.2.2** `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

**4.77.2.3** `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)

**4.77.2.4** `int CbcNode::chooseOsiBranch ( CbcModel * model, CbcNode * lastNode, OsiBranchingInformation * usefullInfo, 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

#### 4.77.2.5 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

#### 4.77.2.6 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:

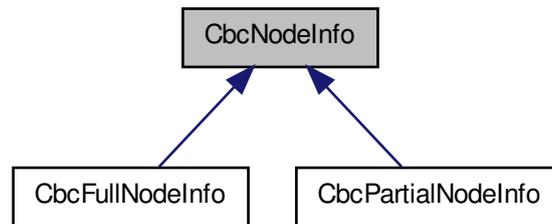
- CbcNode.hpp

## 4.78 CbcNodeInfo Class Reference

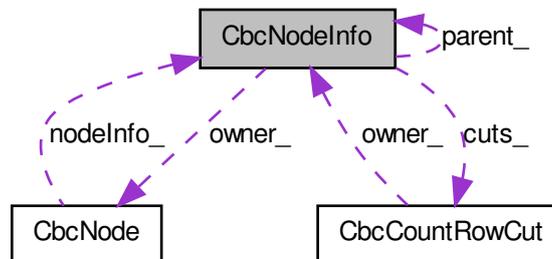
Information required to recreate the subproblem at this node.

```
#include <CbcNodeInfo.hpp>
```

Inheritance diagram for CbcNodeInfo:



Collaboration diagram for CbcNodeInfo:



## Public Member Functions

- virtual void [applyToModel](#) (CbcModel \*model, CoinWarmStartBasis \*&basis, CbcCountRowCut \*\*addCuts, int &currentNumberCuts) 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 (1=>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.*

#### 4.78.1 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`.

## 4.78.2 Constructor &amp; Destructor Documentation

## 4.78.2.1 CbcNodeInfo::CbcNodeInfo ( )

Default Constructor.

Creates an empty NodeInfo object.

## 4.78.2.2 CbcNodeInfo::CbcNodeInfo ( CbcNodeInfo \* parent, CbcNode \* owner )

Construct with parent and owner.

As for 'construct with parent', and attached to `owner`.

## 4.78.2.3 virtual CbcNodeInfo::~CbcNodeInfo ( ) [virtual]

Destructor.

Note that the destructor will recursively delete the parent if this nodeInfo is the last child.

## 4.78.3 Member Function Documentation

## 4.78.3.1 virtual void CbcNodeInfo::applyToModel ( CbcModel \* model, CoinWarmStartBasis \*&amp; basis, CbcCountRowCut \*\* addCuts, int &amp; 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](#).

## 4.78.3.2 virtual CbcNodeInfo\* CbcNodeInfo::buildRowBasis ( CoinWarmStartBasis &amp; 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](#).

## 4.78.3.3 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.

## 4.78.3.4 void CbcNodeInfo::deactivate ( int mode = 3 )

Deactivate node information.

1 - bounds 2 - cuts 4 - basis!

#### 4.78.4 Member Data Documentation

##### 4.78.4.1 `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`.

##### 4.78.4.2 `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`.

##### 4.78.4.3 `int CbcNodeInfo::numberBranchesLeft_` [protected]

Number of branch arms left to explore at this node.

Definition at line 323 of file `CbcNodeInfo.hpp`.

##### 4.78.4.4 `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`

## 4.79 CbcNWay Class Reference

Define an n-way class for variables.

```
#include <CbcNWay.hpp>
```



*Destructor.*

- void [setConsequence](#) (int iColumn, const [CbcConsequence](#) &consequence)  
*Set up a consequence for a single member.*
- void [applyConsequence](#) (int iSequence, int state) const  
*Applies a consequence for a single member.*
- virtual double [infeasibility](#) (const [OsiBranchingInformation](#) \*info, int &preferred-Way) const  
*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)*

#### 4.79.1 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



*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.*

#### 4.80.1 Detailed Description

N way branching Object class.

Variable is number of set.

Definition at line 81 of file CbcNWay.hpp.

#### 4.80.2 Constructor & Destructor Documentation

##### 4.80.2.1 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

#### 4.80.3 Member Function Documentation

##### 4.80.3.1 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](#).

```
4.80.3.2 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.

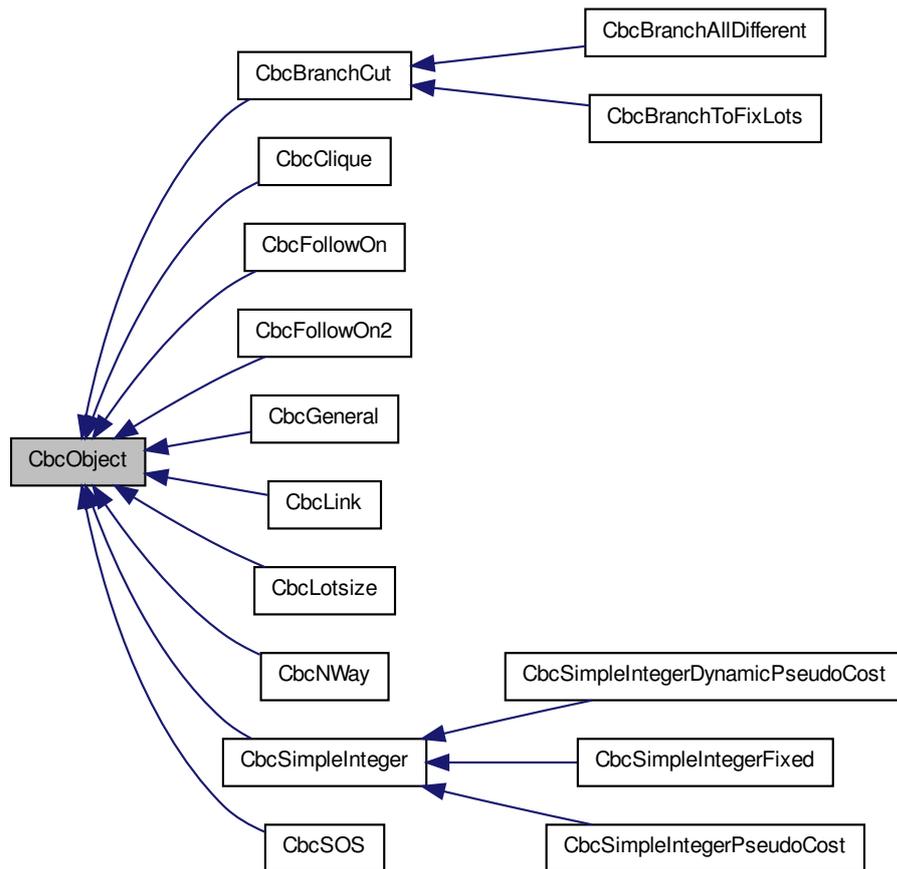
Implements [CbcBranchingObject](#).

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

- `CbcNWay.hpp`

## 4.81 CbcObject Class Reference

Inheritance diagram for CbcObject:





- Given a valid solution (with reduced costs, etc.), return a branching object which would give a new feasible point in a good direction.*
- virtual [CbcBranchingObject](#) \* [notPreferredNewFeasible](#) () const  
*Given a valid solution (with reduced costs, etc.), return a branching object which would give a new feasible point in a bad direction.*
  - 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.*

#### 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.*

#### 4.81.1 Detailed Description

Definition at line 67 of file CbcObject.hpp.

#### 4.81.2 Member Function Documentation

**4.81.2.1** `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](#), [CbcGeneral](#), [CbcNWay](#), [CbcSimpleInteger](#), [CbcSimpleIntegerDynamicPseudoCost](#), [CbcSimpleIntegerPseudoCost](#), and [CbcSOS](#).

Definition at line 107 of file CbcObject.hpp.

**4.81.2.2** `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

**4.81.2.3** `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](#), [CbcGeneral](#), [CbcNWay](#), [CbcSimpleInteger](#), [CbcSimpleIntegerDynamicPseudoCost](#), [CbcSimpleIntegerPseudoCost](#), and [CbcSOS](#).

Definition at line 137 of file CbcObject.hpp.

4.81.2.4 `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.)

4.81.2.5 `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](#).

4.81.2.6 `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.

4.81.2.7 `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.

4.81.2.8 `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.

4.81.2.9 `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](#).

```
4.81.2.10 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](#).

```
4.81.2.11 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](#).

```
4.81.2.12 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](#).

### 4.81.3 Member Data Documentation

```
4.81.3.1 CbcModel* CbcObject::model_ [protected]
```

data

Model

Definition at line 259 of file [CbcObject.hpp](#).

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

- [CbcObject.hpp](#)



- double [branchingValue\\_](#)  
*Branching value.*
- double [originalObjective\\_](#)  
*Objective value before branching.*
- double [cutoff\\_](#)  
*Current cutoff.*

#### 4.82.1 Detailed Description

Definition at line 14 of file CbcObjectUpdateData.hpp.

#### 4.82.2 Member Data Documentation

##### 4.82.2.1 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

## 4.83 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.*

#### 4.83.1 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](#).

#### 4.83.2 Member Enumeration Documentation

##### 4.83.2.1 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.

#### 4.83.3 Constructor & Destructor Documentation

4.83.3.1 `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.

4.83.3.2 `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.

4.83.3.3 `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.

4.83.3.4 `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:

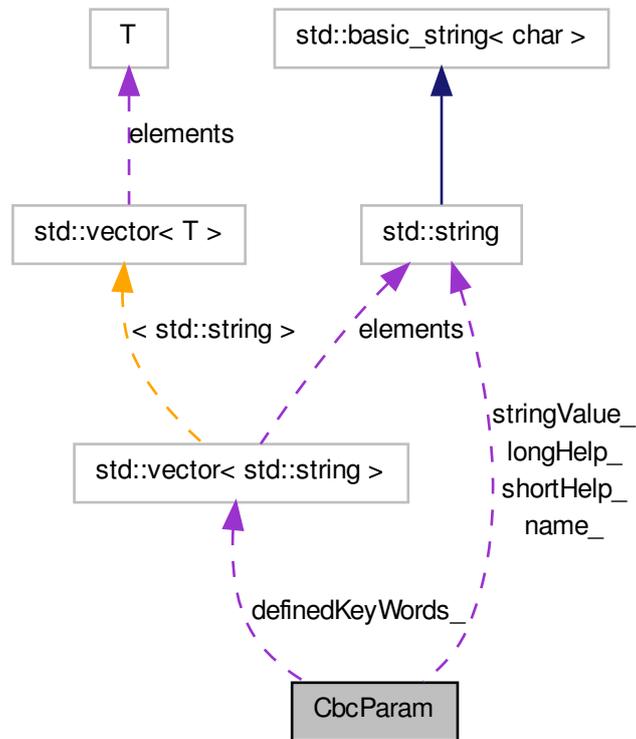
- CbcGenOsiParam.hpp

## 4.84 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*

#### 4.84.1 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

#### 4.85 CbcGenCtlBlk::cbcParamsInfo\_struct Struct Reference

Start and end of [CbcModel](#) parameters in parameter vector.

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

##### 4.85.1 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:

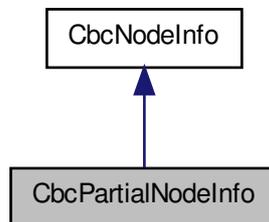
- CbcGenCtlBlk.hpp

#### 4.86 CbcPartialNodeInfo Class Reference

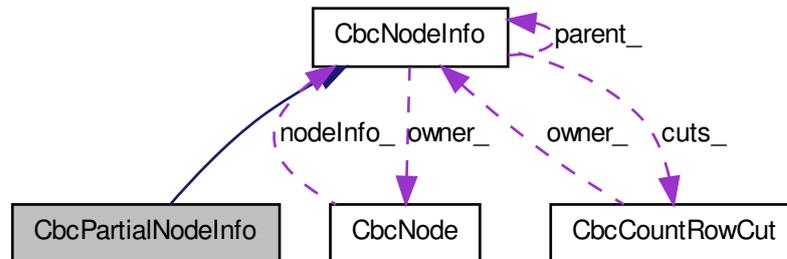
Holds information for recreating a subproblem by incremental change from the parent.

```
#include <CbcPartialNodeInfo.hpp>
```

Inheritance diagram for CbcPartialNodeInfo:



Collaboration diagram for CbcPartialNodeInfo:



#### Public Member Functions

- virtual void [applyToModel](#) (CbcModel \*model, CoinWarmStartBasis \*&basis, CbcCountRowCut \*\*addCuts, int &currentNumberCuts) 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.*

#### 4.86.1 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`.

#### 4.86.2 Member Function Documentation

**4.86.2.1** `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](#).

**4.86.2.2** `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`

## 4.87 CbcRounding Class Reference

Rounding class.

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



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.

#### 4.87.1 Detailed Description

Rounding class.

Definition at line 395 of file CbcHeuristic.hpp.

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

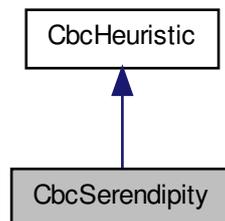
- CbcHeuristic.hpp

## 4.88 CbcSerendipity Class Reference

heuristic - just picks up any good solution found by solver - see OsiBabSolver

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

Inheritance diagram for CbcSerendipity:





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:

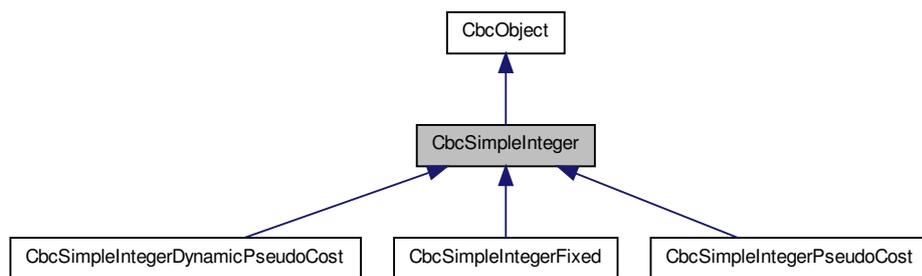
- CbcHeuristic.hpp

## 4.89 CbcSimpleInteger Class Reference

Define a single integer class.

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

Inheritance diagram for CbcSimpleInteger:





- 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 ->  $\geq 0.7$  go up first.*
- void [setBreakEven](#) (double value)  
*Set breakeven e.g 0.7 ->  $\geq 0.7$  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.*

#### 4.89.1 Detailed Description

Define a single integer class.

Definition at line 165 of file CbcSimpleInteger.hpp.

#### 4.89.2 Member Function Documentation

- 4.89.2.1 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](#).

```
4.89.2.2 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](#).

```
4.89.2.3 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

```
4.89.2.4 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](#).

```
4.89.2.5 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](#).

### 4.89.3 Member Data Documentation

```
4.89.3.1 double CbcSimpleInteger::originalLower_ [protected]
```

data

Original lower bound

Definition at line 273 of file [CbcSimpleInteger.hpp](#).

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

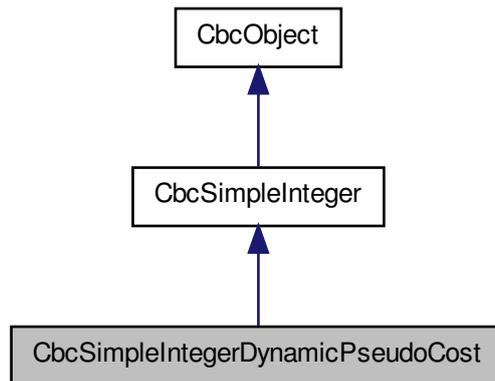
- [CbcSimpleInteger.hpp](#)

## 4.90 **CbcSimpleIntegerDynamicPseudoCost Class Reference**

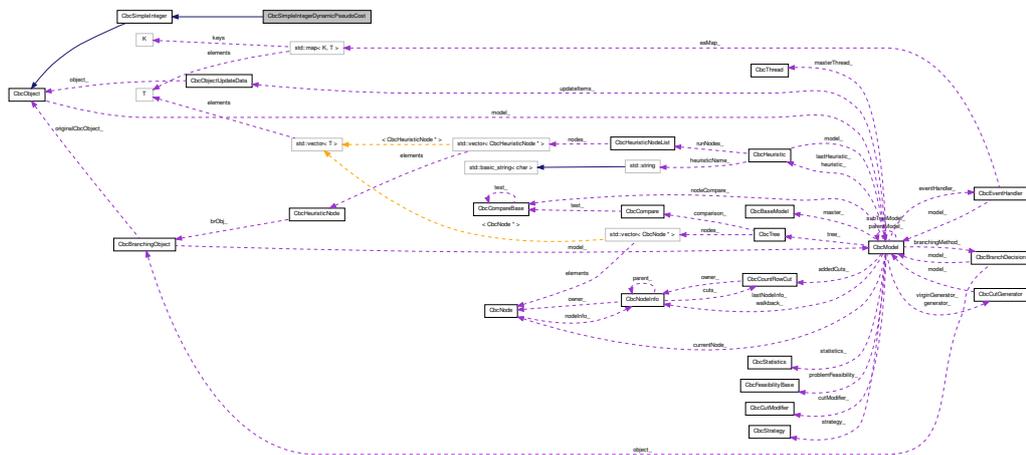
Define a single integer class but with dynamic pseudo costs.

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

Inheritance diagram for CbcSimpleIntegerDynamicPseudoCost:



Collaboration diagram for CbcSimpleIntegerDynamicPseudoCost:



### Public Member Functions

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

- virtual double [infeasibility](#) (const OsiBranchingInformation \*info, int &preferred-Way) const  
*Infeasibility - large is 0.5.*
- virtual [CbcBranchingObject](#) \* [createCbcBranch](#) (OsiSolverInterface \*solver, const OsiBranchingInformation \*info, int way)  
*Creates a branching object.*
- void [fillCreateBranch](#) ([CbcIntegerBranchingObject](#) \*branching, const OsiBranchingInformation \*info, int way)  
*Fills in a created 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](#).*
- 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.*

#### 4.90.1 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.

#### 4.90.2 Member Function Documentation

4.90.2.1 `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](#).

4.90.2.2 `virtual OsiSolverBranch* CbcSimpleIntegerDynamicPseudoCost::solverBranch ( ) const [virtual]`

Create an OsiSolverBranch object.

This returns NULL if branch not represented by bound changes

Reimplemented from [CbcObject](#).

## 4.90.3 Member Data Documentation

4.90.3.1 double CbcSimpleIntegerDynamicPseudoCost::downDynamicPseudoCost\_  
[protected]

data

Down pseudo cost

Definition at line 320 of file CbcSimpleIntegerDynamicPseudoCost.hpp.

## 4.90.3.2 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:

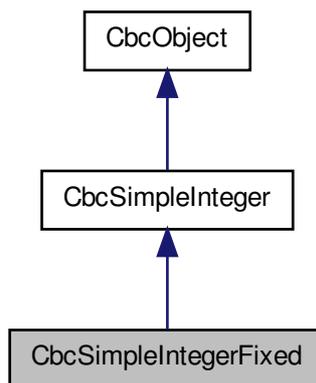
- CbcSimpleIntegerDynamicPseudoCost.hpp

## 4.91 CbcSimpleIntegerFixed Class Reference

Define a single integer class where branching is forced until fixed.

```
#include <CbcBranchUser.hpp>
```

Inheritance diagram for CbcSimpleIntegerFixed:





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

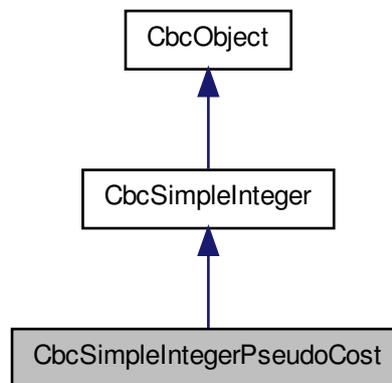
- CbcBranchUser.hpp

#### 4.92 CbcSimpleIntegerPseudoCost Class Reference

Define a single integer class but with pseudo costs.

```
#include <CbcSimpleIntegerPseudoCost.hpp>
```

Inheritance diagram for CbcSimpleIntegerPseudoCost:





- 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) >= 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)*

#### 4.92.1 Detailed Description

Define a single integer class but with pseudo costs.

Definition at line 14 of file CbcSimpleIntegerPseudoCost.hpp.

#### 4.92.2 Member Data Documentation

##### 4.92.2.1 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

## 4.93 CbcSolver Class Reference

This allows the use of the standalone solver in a flexible manner.

```
#include <CbcSolver.hpp>
```



- 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 &numberChanged, 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.*

### 4.93.1 Detailed Description

This allows the use of the standalone solver in a flexible manner.

It has an original OsiClpSolverInterface and [CbcModel](#) which it can use repeatedly, e.g., to get a heuristic solution and then start again.

So I [jif] 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.

### 4.93.2 Member Function Documentation

#### 4.93.2.1 `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)

#### 4.93.2.2 `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)

#### 4.93.2.3 `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\_.

#### 4.93.2.4 `void CbcSolver::updateModel ( ClpSimplex * model2, int returnMode )`

1 - add heuristics to model 2 - do heuristics (and set cutoff and best solution) 3 - for mip lib 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:



- get which ones have been used*
- int [getMemory](#) () const  
*Get memory (i.e. how recent use should be)*
- int [getCount](#) () const  
*Get current count.*
- void [setMemory](#) (int value)  
*Set memory (i.e. how recent use should be)*
- void [setAlgorithm](#) (int value)  
*Say whether to just count usage.*
- int [getAlgorithm](#) () const  
*Say whether to just count usage.*
- void [setStrategy](#) (int value)  
*Strategy.*
- int [getStrategy](#) () const  
*Strategy.*

#### 4.94.1 Detailed Description

This is to allow the user to replace initialSolve and resolve.

This version is to try and speed up long thin problems.

This particular version assumes unit elements and rhs Can be E or G rhs

Definition at line 22 of file CbcSolver2.hpp.

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

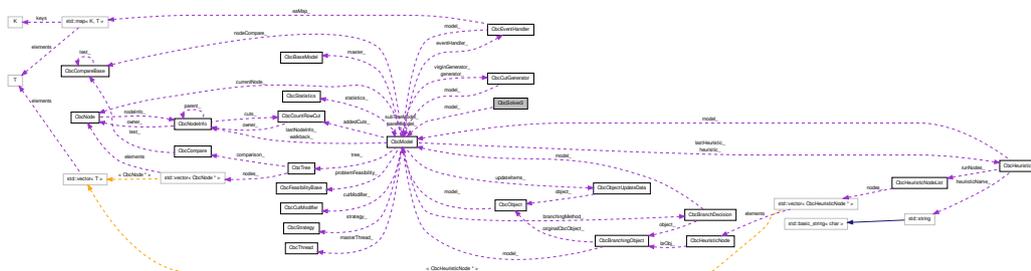
- CbcSolver2.hpp

## 4.95 CbcSolver3 Class Reference

This is to allow the user to replace initialSolve and resolve.

```
#include <CbcSolver3.hpp>
```

Collaboration diagram for CbcSolver3:



## Public Member Functions

## Solve methods

- virtual void [initialSolve](#) ()  
*Solve initial LP relaxation.*
- virtual void [resolve](#) ()  
*Resolve an LP relaxation after problem modification.*

## Constructors and destructors

- [CbcSolver3](#) ()  
*Default Constructor.*
- virtual [OsiSolverInterface](#) \* [clone](#) (bool CopyData=true) const  
*Clone.*
- [CbcSolver3](#) (const [CbcSolver3](#) &)  
*Copy constructor.*
- [CbcSolver3](#) & [operator=](#) (const [CbcSolver3](#) &rhs)  
*Assignment operator.*
- virtual [~CbcSolver3](#) ()  
*Destructor.*

## Sets and Getss

- void [initialize](#) ([CbcModel](#) \*model, const char \*keep)  
*Setup arrays - ones in keep will always be in.*
- const int \* [when](#) () const  
*get which ones have been used*
- int [getMemory](#) () const  
*Get memory (i.e. how recent use should be)*
- int [getCount](#) () const  
*Get current count.*
- void [setMemory](#) (int value)  
*Set memory (i.e. how recent use should be)*
- void [setBelieveInfeasible](#) (bool yesNo)  
*Say whether to believe infeasible.*
- void [setAlgorithm](#) (int value)  
*Say whether to just count usage.*
- void [setNested](#) (double value)  
*Do nested search if this fraction fixed.*
- int [getAlgorithm](#) () const  
*Say whether to just count usage.*
- double [getNested](#) () const  
*Do nested search if this fraction fixed.*

## 4.95.1 Detailed Description

This is to allow the user to replace initialSolve and resolve.

Definition at line 19 of file CbcSolver3.hpp.

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

- CbcSolver3.hpp



- int [getCount](#) () const  
*Get current count.*
- void [setMemory](#) (int value)  
*Set memory (i.e. how recent use should be)*
- void [setBelieveInfeasible](#) (bool yesNo)  
*Say whether to believe infeasible.*
- void [setAlgorithm](#) (int value)  
*Say whether to just count usage.*
- void [setNested](#) (double value)  
*Do nested search if this fraction fixed.*
- int [getAlgorithm](#) () const  
*Say whether to just count usage.*
- double [getNested](#) () const  
*Do nested search if this fraction fixed.*

#### 4.96.1 Detailed Description

This is to allow the user to replace initialSolve and resolve.

Definition at line 19 of file CbcSolverLongThin.hpp.

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

- [CbcSolverLongThin.hpp](#)

## 4.97 CbcSolverUsefulData Struct Reference

Structure to hold useful arrays.

```
#include <CbcSolver.hpp>
```

#### 4.97.1 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](#)

## 4.98 CbcSOS Class Reference

Branching object for Special Ordered Sets of type 1 and 2.

```
#include <CbcSOS.hpp>
```



- 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.*

### 4.98.1 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.

### 4.98.2 Constructor & Destructor Documentation

**4.98.2.1** `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.

### 4.98.3 Member Function Documentation

**4.98.3.1** `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](#).

**4.98.3.2** `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:



- 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 replaceOverlap=false)  
*Compare the this with brObj.*
- void [computeNonzeroRange](#) ()  
*Fill out the firstNonzero\_ and lastNonzero\_ data members.*

#### 4.99.1 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.

#### 4.99.2 Member Function Documentation

**4.99.2.1** 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](#).

**4.99.2.2** 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.

4.99.2.3 `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](#).

4.99.2.4 `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`

## 4.100 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*

#### 4.100.1 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

## 4.101 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.*

#### 4.101.1 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.

#### 4.101.2 Member Function Documentation

4.101.2.1 `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:

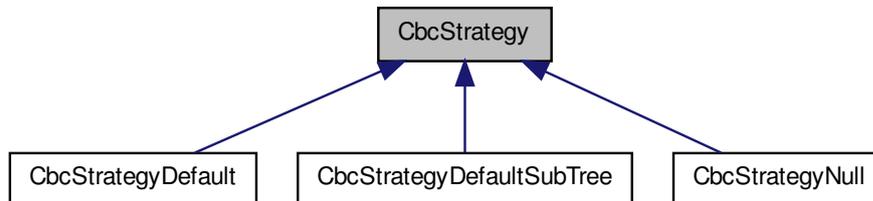
- [CbcSolver.hpp](#)

## 4.102 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.*

#### Protected Attributes

- int [depth\\_](#)  
*Model depth.*
- int [preProcessState\\_](#)  
*PreProcessing state -.*
- [CglPreProcess](#) \* [process\\_](#)  
*If preprocessing then this is object.*

#### 4.102.1 Detailed Description

Strategy base class.

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

#### 4.102.2 Member Function Documentation

4.102.2.1 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

#### 4.102.3 Member Data Documentation

4.102.3.1 int [CbcStrategy::preProcessState\\_](#) [protected]

PreProcessing state -.

-1 infeasible 0 off 1 was done (so need post-processing)

Definition at line 87 of file [CbcStrategy.hpp](#).

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

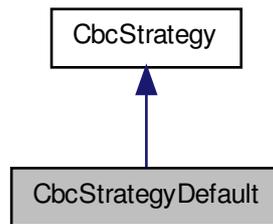
- [CbcStrategy.hpp](#)

### 4.103 CbcStrategyDefault Class Reference

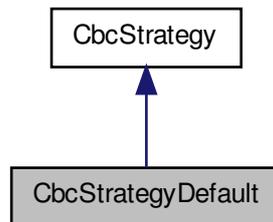
Default class.

```
#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.*

#### 4.103.1 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

#### 4.104 CbcStrategyDefaultSubTree Class Reference

Default class for sub trees.

```
#include <CbcStrategy.hpp>
```



## 4.104.1 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:

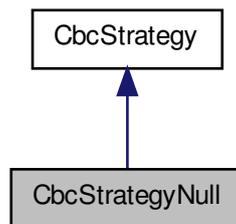
- CbcStrategy.hpp

## 4.105 CbcStrategyNull Class Reference

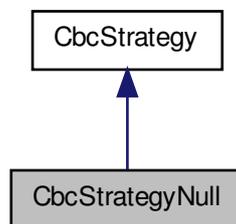
Null class.

```
#include <CbcStrategy.hpp>
```

Inheritance diagram for CbcStrategyNull:



Collaboration diagram for CbcStrategyNull:





#### 4.106.1 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

## 4.107 CbcThread Class Reference

A class to encapsulate thread stuff.

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

#### 4.107.1 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:

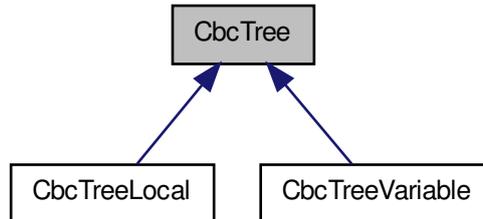
- CbcThread.hpp

## 4.108 CbcTree Class Reference

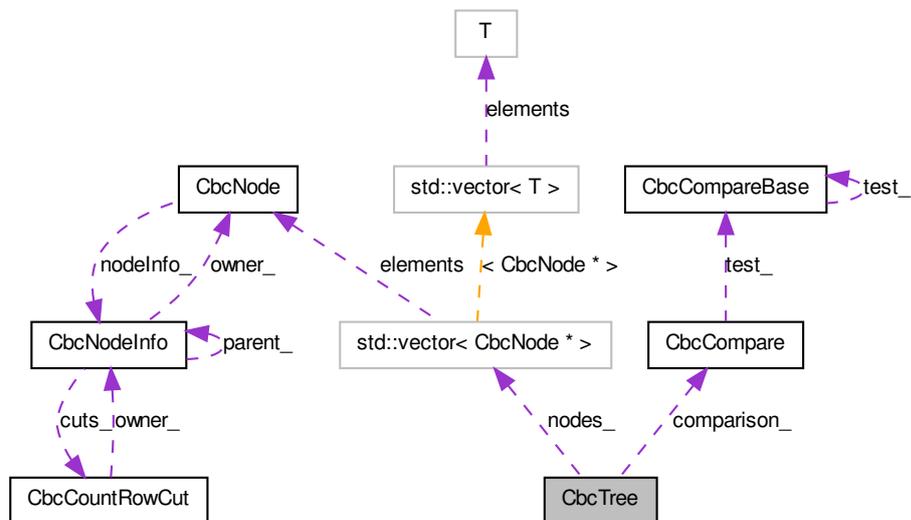
Using MS heap implementation.

```
#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.*

#### 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.*

#### 4.108.1 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`.

#### 4.108.2 Member Function Documentation

**4.108.2.1** `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.

**4.108.2.2** `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`



## 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)

## 4.109.1 Detailed Description

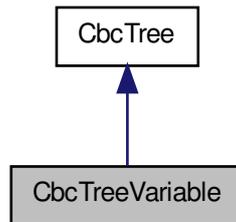
Definition at line 40 of file CbcTreeLocal.hpp.

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

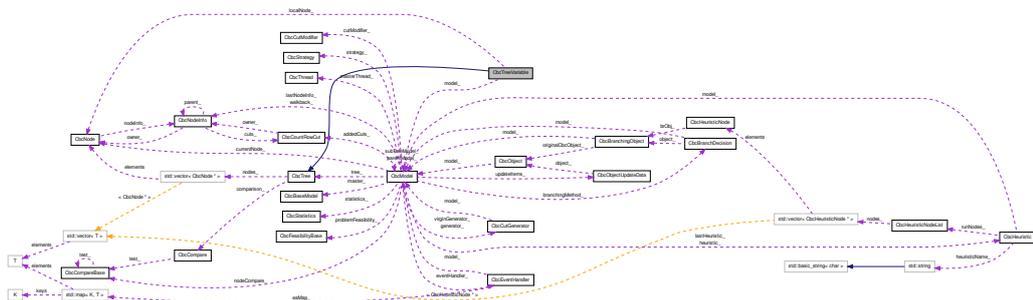
- CbcTreeLocal.hpp

## 4.110 CbcTreeVariable Class Reference

Inheritance diagram for CbcTreeVariable:



Collaboration diagram for CbcTreeVariable:



## 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)

## 4.110.1 Detailed Description

Definition at line 206 of file CbcTreeLocal.hpp.

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

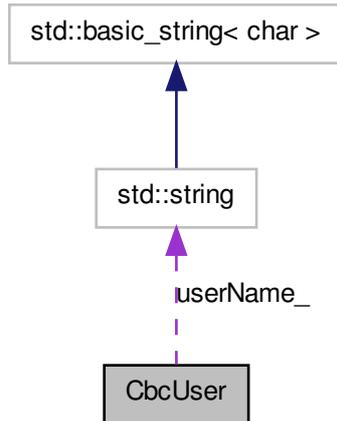
- CbcTreeLocal.hpp

## 4.111 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.*

#### 4.111.1 Detailed Description

A class to allow the use of unknown user functionality.

For example, access to a modelling language ([CbcAmp](#)).

Definition at line 260 of file [CbcSolver.hpp](#).

#### 4.111.2 Member Function Documentation

4.111.2.1 `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](#).

4.111.2.2 `virtual void CbcUser::exportSolution ( CbcSolver *, int , const char * =NULL )`  
`[inline, virtual]`

Export.

Values for mode:

- 1 OsiCipSolver
- 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](#)

## 4.112 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()) const  
*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.*

### 4.112.1 Detailed Description

Stored Temporary Cut Generator Class - destroyed after first use.

Definition at line 1266 of file CbcLinked.hpp.

#### 4.112.2 Member Function Documentation

4.112.2.1 `virtual void CglTemporary::generateCuts ( const OsiSolverInterface & si, OsiCuts & cs, const CglTreeInfo info = CglTreeInfo() ) const` [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

### 4.113 CbcGenCtlBlk::chooseStrongCtl\_struct Struct Reference

Control variables for a strong branching method.

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

#### 4.113.1 Detailed Description

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](#).

Definition at line 765 of file CbcGenCtlBlk.hpp.

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

- CbcGenCtlBlk.hpp

### 4.114 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 &currentObj, 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.*

#### 4.114.1 Detailed Description

Ampl Objective Class.

Definition at line 18 of file ClpAmplObjective.hpp.

## 4.114.2 Member Function Documentation

4.114.2.1 `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

4.114.2.2 `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).

4.114.2.3 `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

4.114.2.4 `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

## 4.115 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.*

#### 4.115.1 Detailed Description

Ampl Constraint Class.

Definition at line 17 of file ClpConstraintAmpl.hpp.

#### 4.115.2 Member Function Documentation

- 4.115.2.1 `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

4.115.2.2 `virtual int ClpConstraintAmpl::markNonlinear ( char * which ) const` [virtual]

Given a zeroed array sets nonampl columns to 1.

Returns number of nonampl columns

4.115.2.3 `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

## 4.116 ClpQuadInterface Class Reference

This is to allow the user to replace initialSolve and resolve.

```
#include <ClpQuadInterface.hpp>
```

### Public Member Functions

#### Solve methods

- virtual void [initialSolve](#) ()  
*Solve initial LP relaxation.*
- virtual void [resolve](#) ()  
*Resolve an LP relaxation after problem modification.*

#### Constructors and destructors

- [ClpQuadInterface](#) ()  
*Default Constructor.*
- virtual `OsiSolverInterface * clone (bool CopyData=true) const`  
*Clone.*
- [ClpQuadInterface](#) (const [ClpQuadInterface](#) &)  
*Copy constructor.*
- [ClpQuadInterface](#) & operator= (const [ClpQuadInterface](#) &rhs)  
*Assignment operator.*
- virtual `~ClpQuadInterface` ()  
*Destructor.*

#### Sets and Getss

- void [initialize](#) ()  
*Setup fake objective.*
- virtual double [getObjValue](#) () const  
*Get objective function value (can't use default)*

**4.116.1 Detailed Description**

This is to allow the user to replace initialSolve and resolve.

Definition at line 18 of file ClpQuadInterface.hpp.

**4.116.2 Member Function Documentation****4.116.2.1 void ClpQuadInterface::initialize ( )**

Setup fake objective.

It could also read an ampl .nl file or somehow get nonlinear info

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

- ClpQuadInterface.hpp

**4.117 CbcGenCtlBlk::debugSollInfo\_struct Struct Reference**

Array of primal variable values for debugging.

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

**4.117.1 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

**4.118 CbcGenCtlBlk::djFixCtl\_struct Struct Reference**

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

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

**4.118.1 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

#### 4.119 CbcGenCtlBlk::genParamsInfo\_struct Struct Reference

Start and end of cbc-generic parameters in parameter vector.

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

##### 4.119.1 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:

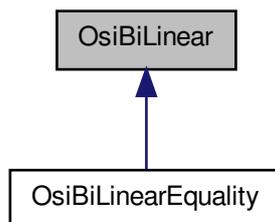
- CbcGenCtlBlk.hpp

#### 4.120 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.*

#### 4.120.1 Detailed Description

Define BiLinear objects.

This models  $x*y$  where one or both are integer

Definition at line 720 of file CbcLinked.hpp.

#### 4.120.2 Member Function Documentation

**4.120.2.1** `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.

**4.120.2.2** `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.

**4.120.2.3** `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.

#### 4.120.3 Member Data Documentation

**4.120.3.1** `double OsiBiLinear::coefficient_` `[protected]`

data

Coefficient

Definition at line 929 of file CbcLinked.hpp.

#### 4.120.3.2 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

### 4.121 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.*

#### 4.121.1 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:

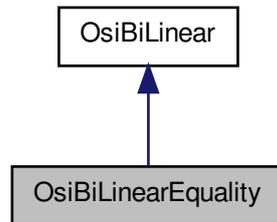
- CbcLinked.hpp

### 4.122 OsiBiLinearEquality Class Reference

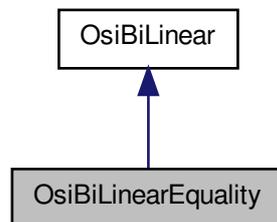
Define Continuous BiLinear objects for an == bound.

```
#include <CbcLinked.hpp>
```

Inheritance diagram for OsiBiLinearEquality:



Collaboration diagram for OsiBiLinearEquality:



### Public Member Functions

- [OsiBiLinearEquality](#) (OsiSolverInterface \*solver, int xColumn, int yColumn, int xy-Row, 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*



*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). <br>**

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 fullRay=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.<br>

*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.*

#### 4.123.1 Detailed Description

Cbc Solver Interface.

Instantiation of [OsiCbcSolverInterface](#) for the Model Algorithm.

Definition at line 30 of file [OsiCbcSolverInterface.hpp](#).

#### 4.123.2 Member Function Documentation

4.123.2.1 `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.

4.123.2.2 `virtual bool OsiCbcSolverInterface::setWarmStart ( const CoinWarmStart * warmstart )`  
[virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

#### 4.123.2.3 `virtual const char* OsiCbcSolverInterface::getRowSense ( ) const [virtual]`

Get pointer to array[[getNumRows\(\)](#)] of row constraint senses.

- 'L' <= constraint
- 'E' = constraint
- 'G' >= constraint
- 'R' ranged constraint
- 'N' free constraint

#### 4.123.2.4 `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`

#### 4.123.2.5 `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

#### 4.123.2.6 `virtual int OsiCbcSolverInterface::getIterationCount ( ) const [virtual]`

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver).

#### 4.123.2.7 `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[]`.

4.123.2.8 `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[]`.

4.123.2.9 `virtual std::string OsiCbcSolverInterface::getRowName ( int rowIndex, unsigned maxLen = std::string::npos ) const` [virtual]

Return the name of the row.

4.123.2.10 `virtual void OsiCbcSolverInterface::setColLower ( int elementIndex, double elementValue )` [virtual]

Set a single column lower bound

Use `-DBL_MAX` for -infinity.

4.123.2.11 `virtual void OsiCbcSolverInterface::setColUpper ( int elementIndex, double elementValue )` [virtual]

Set a single column upper bound

Use `DBL_MAX` for infinity.

4.123.2.12 `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**

<i>index-</i>	pointers to the beginning and after the end of the array of the indices of the
<i>First, indexLas</i>	variables whose <i>either</i> bound changes
<i>boundList</i>	the new lower/upper bound pairs for the variables

4.123.2.13 `virtual void OsiCbcSolverInterface::setRowLower ( int elementIndex, double elementValue ) [virtual]`

Set a single row lower bound

Use -DBL\_MAX for -infinity.

4.123.2.14 `virtual void OsiCbcSolverInterface::setRowUpper ( int elementIndex, double elementValue ) [virtual]`

Set a single row upper bound

Use DBL\_MAX for infinity.

4.123.2.15 `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

<i>index-</i>	pointers to the beginning and after the end of the array of the indices of the
<i>First, indexLas</i>	constraints whose <i>either</i> bound changes
<i>boundList</i>	the new lower/upper bound pairs for the constraints

4.123.2.16 `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

<i>index-</i>	pointers to the beginning and after the end of the array of the indices of the
<i>First, indexLas</i>	constraints whose <i>any</i> characteristics changes
<i>senseList</i>	the new senses
<i>rhsList</i>	the new right hand sides
<i>rangeList</i>	the new ranges

4.123.2.17 `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.

4.123.2.18 `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.

4.123.2.19 `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.

4.123.2.20 `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.

4.123.2.21 `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

4.123.2.22 `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

4.123.2.23 `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.

4.123.2.24 `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

4.123.2.25 `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.

4.123.2.26 `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).

4.123.2.27 `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).

4.123.2.28 `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

4.123.2.29 `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

4.123.2.30 `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.

4.123.2.31 `virtual void OsiCbcSolverInterface::applyRowCut ( const OsiRowCut & rc )`  
[protected, virtual]

Apply a row cut (append to constraint matrix).

4.123.2.32 `virtual void OsiCbcSolverInterface::applyColCut ( const OsiColCut & cc )`  
[protected, virtual]

Apply a column cut (adjust one or more bounds).

### 4.123.3 Friends And Related Function Documentation

4.123.3.1 `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

## 4.124 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 -.*
- 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)*

#### 4.124.1 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.

#### 4.124.2 Member Function Documentation

4.124.2.1 `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!

4.124.2.2 `virtual int OsiChooseStrongSubset::chooseVariable ( OsiSolverInterface * solver, OsiBranchingInformation * info, bool fixVariables ) [virtual]`

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

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

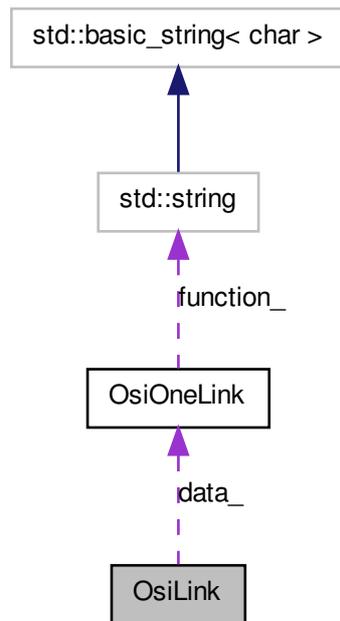
- CbcLinked.hpp

#### 4.125 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 &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.*

#### 4.125.1 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.

#### 4.125.2 Constructor & Destructor Documentation

##### 4.125.2.1 `OsiLink::OsiLink ( const OsiSolverInterface * solver, int yRow, int yColumn, double meshSize )`

Useful constructor -.

#### 4.125.3 Member Function Documentation

##### 4.125.3.1 `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.

##### 4.125.3.2 `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

## 4.126 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.*

### 4.126.1 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:

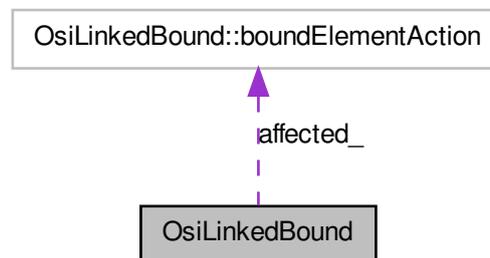
- Cbclinked.hpp

## 4.127 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.*

### 4.127.1 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

## 4.128 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.*

#### 4.128.1 Detailed Description

Definition at line 434 of file CbcLinked.hpp.

#### 4.128.2 Constructor & Destructor Documentation

##### 4.128.2.1 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  $\text{numberInSet}$ . For this constructor the variables in matrix are the  $\text{numberInSet} \cdot \text{numberLink}$  starting at first. If weights null then 0,1,2..

##### 4.128.2.2 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  $k \cdot \text{numberLink}$  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 are given by list - grouped. If weights null then 0,1,2..

#### 4.128.3 Member Function Documentation

4.128.3.1 `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.

4.128.3.2 `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

## 4.129 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.*

#### 4.129.1 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:

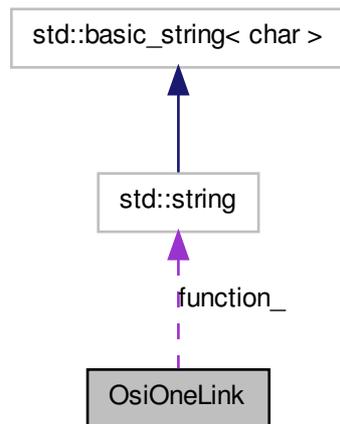
- CbcLinked.hpp

### 4.130 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 xyRow, const char \*functionString)  
*Useful constructor -.*

#### Public Attributes

- int `xRow_`  
*data*
- int `xColumn_`  
*Column which defines x.*
- int `xyRow`  
*Output row.*
- `std::string` `function_`  
*Function.*

#### 4.130.1 Detailed Description

Define data for one link.

Definition at line 558 of file CbcLinked.hpp.

#### 4.130.2 Constructor & Destructor Documentation

4.130.2.1 OsiOneLink::OsiOneLink ( const OsiSolverInterface \* *solver*, int *xRow*, int *xColumn*, int *xyRow*, const char \* *functionString* )

Useful constructor -.

#### 4.130.3 Member Data Documentation

##### 4.130.3.1 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

### 4.131 CbcGenCtlBlk::osiParamsInfo\_struct Struct Reference

Start and end of OsiSolverInterface parameters in parameter vector.

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

#### 4.131.1 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

### 4.132 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 &whichWay) const  
*Infeasibility - large is 0.5.*
- virtual OsiBranchingObject \* [createBranch](#) (OsiSolverInterface \*solver, const OsiBranchingInformation \*info, int way) const  
*Creates a branching object.*

## 4.132.1 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.

## 4.132.2 Member Function Documentation

4.132.2.1 `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

### 4.133 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*

#### 4.133.1 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:

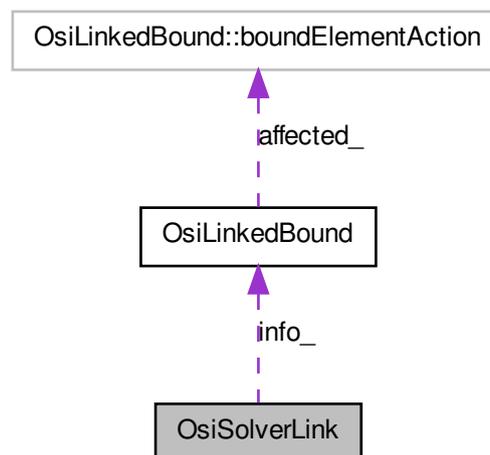
- CbcLinked.hpp

#### 4.134 OsiSolverLink Class Reference

This is to allow the user to replace initialSolve and resolve This version changes coefficients.

```
#include <CbcLinked.hpp>
```

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](#) (CglSimplex \*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.*
- 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*

#### 4.134.1 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.

#### 4.134.2 Constructor & Destructor Documentation

##### 4.134.2.1 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.

#### 4.134.3 Member Function Documentation

##### 4.134.3.1 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

##### 4.134.3.2 double OsiSolverLink::linearizedBAB ( CglStored \* *cut* )

Solve linearized quadratic objective branch and bound.

Return cutoff and OA cut

4.134.3.3 `void OsiSolverLink::setBranchingStrategyOnVariables ( int strategyValue, int priorityValue = -1, int mode = 7 )`

Set options and priority on all or some biLinear variables 1 - on l-l 2 - on l-x 4 - on x-x or combinations.

-1 means leave (for priority value and strategy value)

4.134.3.4 `void OsiSolverLink::gutsOfDestructor ( bool justNullify = false )`  
`[protected]`

Do real work of initialize.

Do real work of delete

#### 4.134.4 Member Data Documentation

4.134.4.1 `int* OsiSolverLink::convex_` `[protected]`

Indicator whether is convex, concave or neither.

-1 concave, 0 neither, +1 convex

Definition at line 257 of file CbcLinked.hpp.

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

- CbcLinked.hpp

## 4.135 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 &whichWay) 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.*

#### 4.135.1 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](#).

#### 4.135.2 Member Function Documentation

- 4.135.2.1 `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.

4.135.2.2 `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

## 4.136 PseudoReducedCost Struct Reference

### 4.136.1 Detailed Description

Definition at line 10 of file CbcHeuristicDive.hpp.

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

- CbcHeuristicDive.hpp

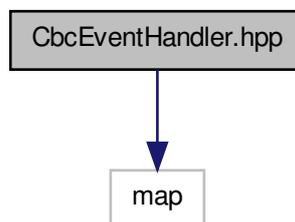
## 5 File Documentation

### 5.1 CbcEventHandler.hpp File Reference

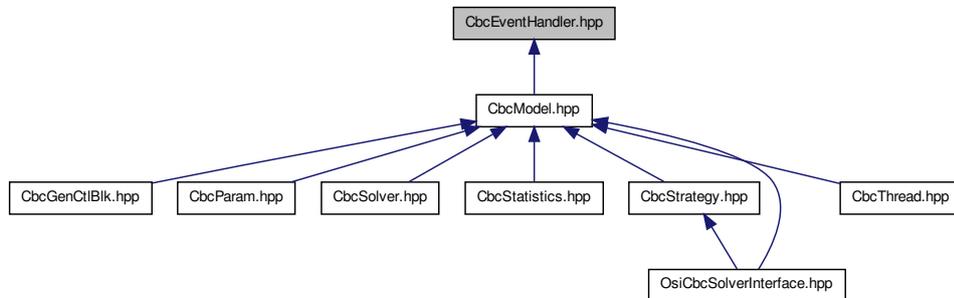
Event handling for cbc.

```
#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 response 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 `dfmtAction_` 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.

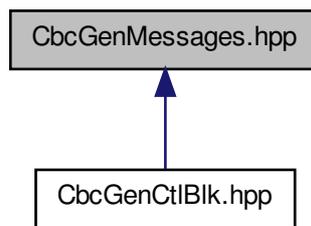
The design of the class deliberately matches `ClpEventHandler`, so that other solvers can participate in cbc without breaking the patterns set by clp-specific code.

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](#).

#### 5.2.2 Enumeration Type Documentation

##### 5.2.2.1 enum CbcGenMsgCode

Symbolic names for cbc-generic messages.

These are the 'internal IDs' for cbc-generic messages.

Definition at line 36 of file CbcGenMessages.hpp.

## 5.3 CbcSolver.hpp File Reference

Defines [CbcSolver](#), the proposed top-level class for the new-style cbc solver.

```
#include <string>
```

```
#include <vector>
```



## 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](#).