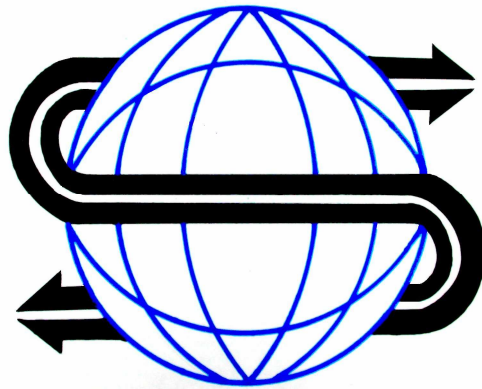




Impact

On Implementing a Parallel Integer Solver Using Optimization Services



Jun Ma
Huanyuan (Wayne) Sheng

Joint work with
Sanjay Mehrotra

Outline

- Brief Introduction
 - Impact Generalized MIP Solver
 - Optimization Services (OS)
- Distributed Parallel For Integer Programming Using OS
- Conclusion



Introduction

Impact GMIP Solver

- IMPACT -- **I**ntegrated **M**athematical **P**rogramming **A**dvanced **C**omputational **T**ools
- Features
 - Generalized Mixed Integer Nonlinear Solver (GMIP).
 - Generalized Hyperplanes based Branch and Bound.
 - Standalone Solver and Remote Solver Service.
 - Unified NATIVE Interface with Optimization Services.



Impact GMIP Solver Features

Algorithms

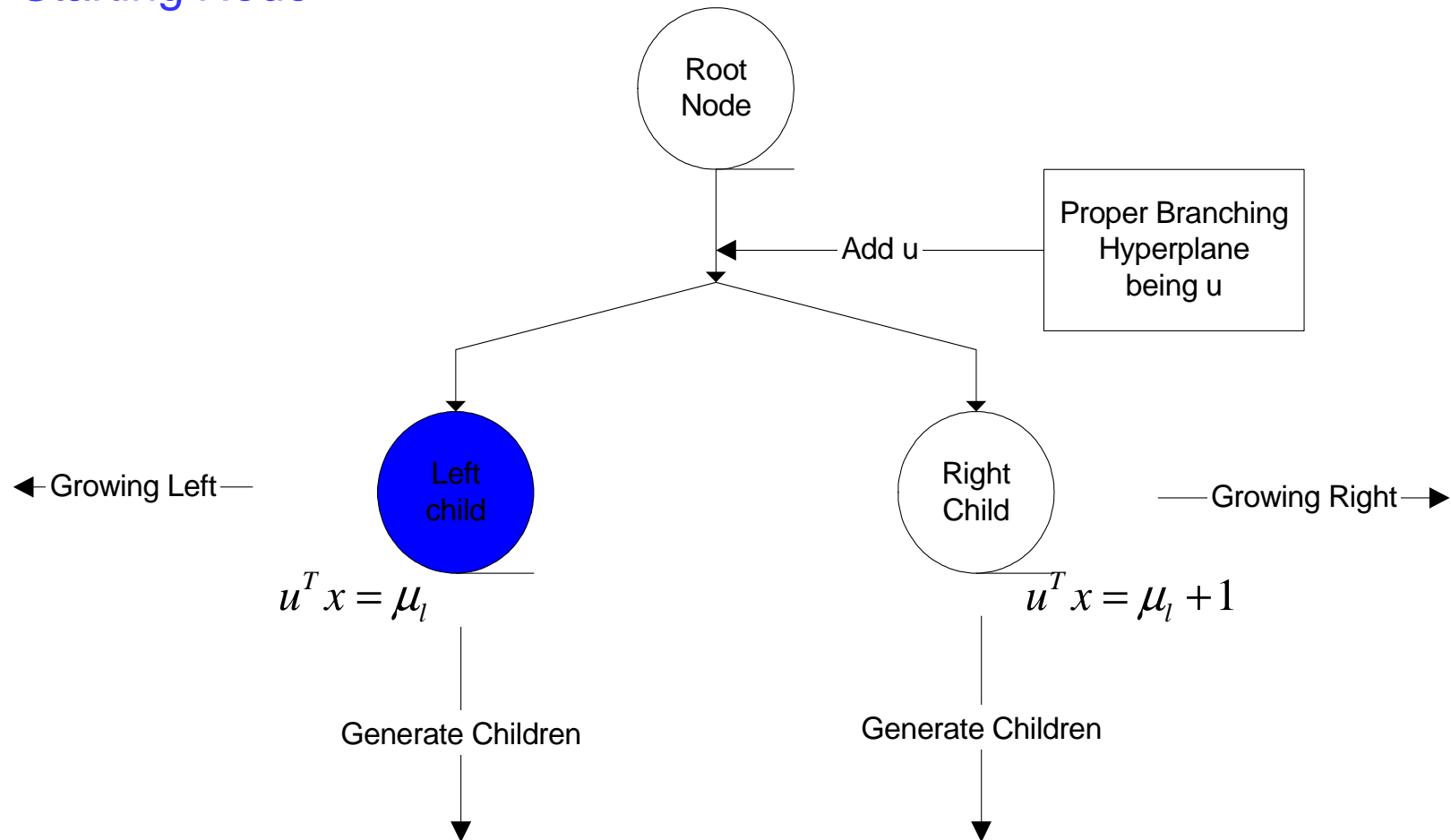
- Research Focus
 - Mixed Integer Nonlinear Programming
 - Parallel computing for MINLP
- Algorithm Studies
 - Heuristics for generalized branch and bound methods
 - Optimization Services based distributed parallel, e.g. communications, load balance handling.



Impact GMIP Solver Features

Algorithms

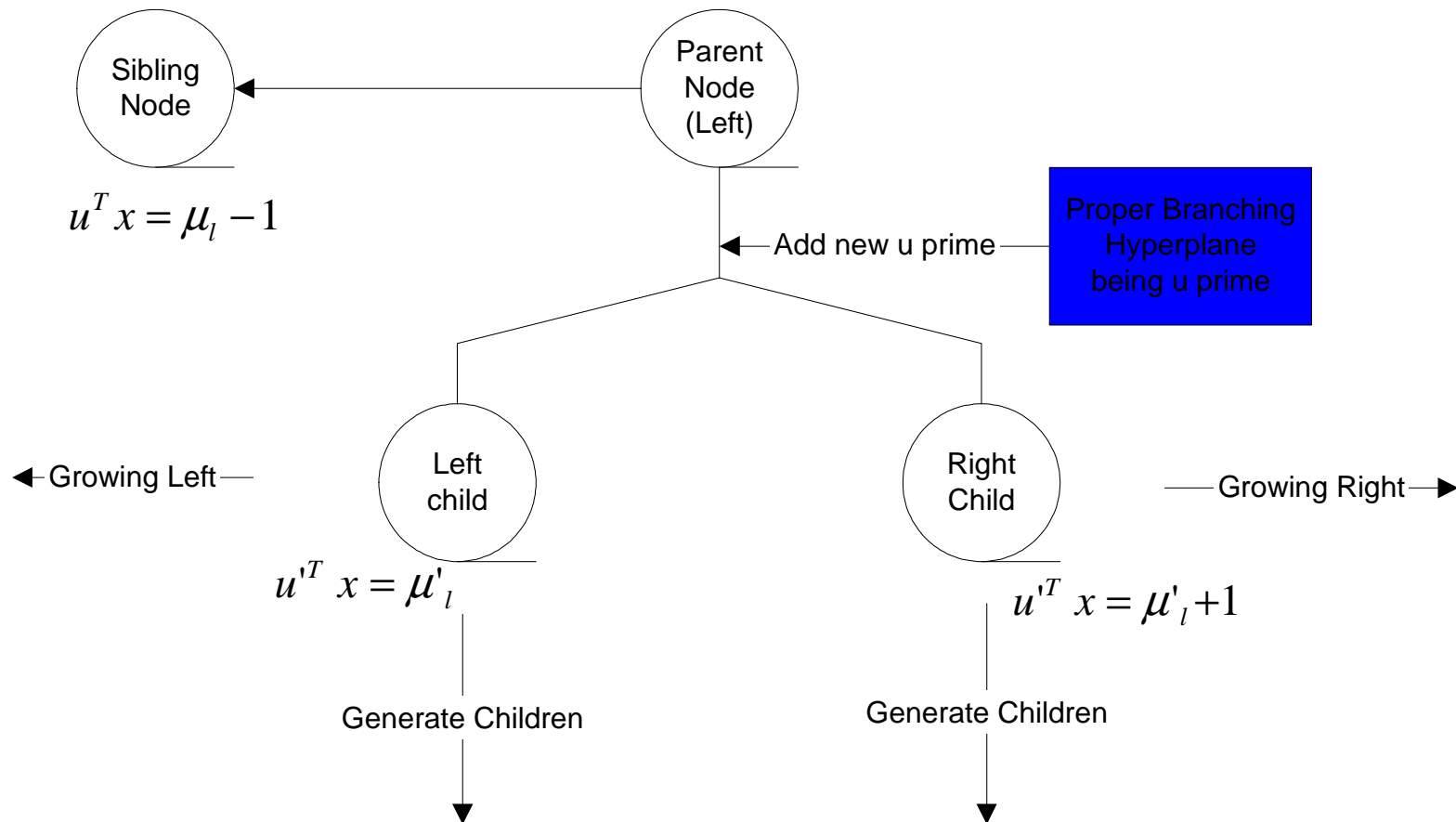
- Starting Node



Impact GMIP Solver Features

Algorithms

- Subsequent Node

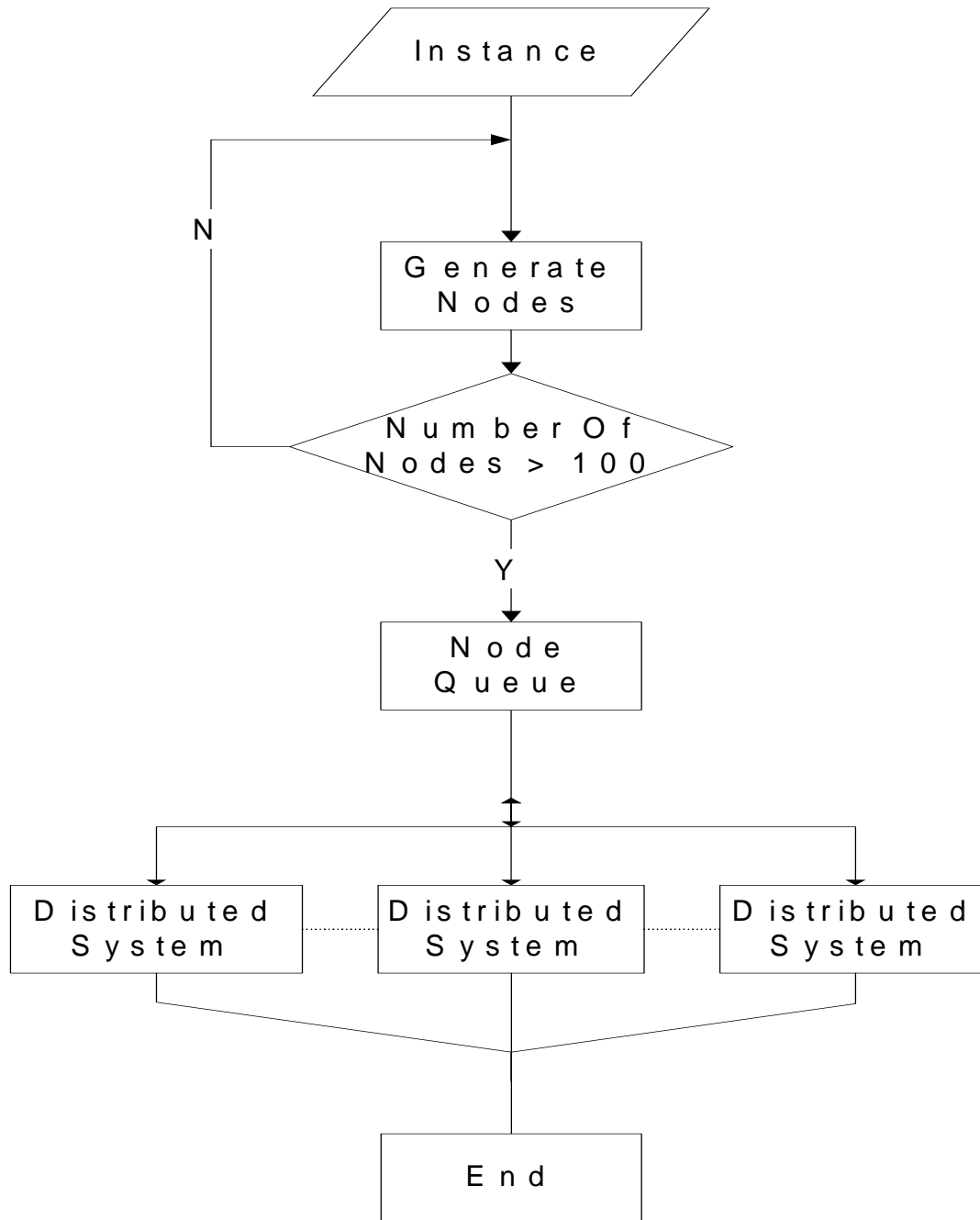


Impact GMIP Solver Features

Algorithms

- Generate Proper Branching Hyperplanes
 - Basis Reduction Based (Mehrotra and Li)
 - LLL
 - GBR (Generalized Basis Reduction)
 - Heuristics (ongoing)

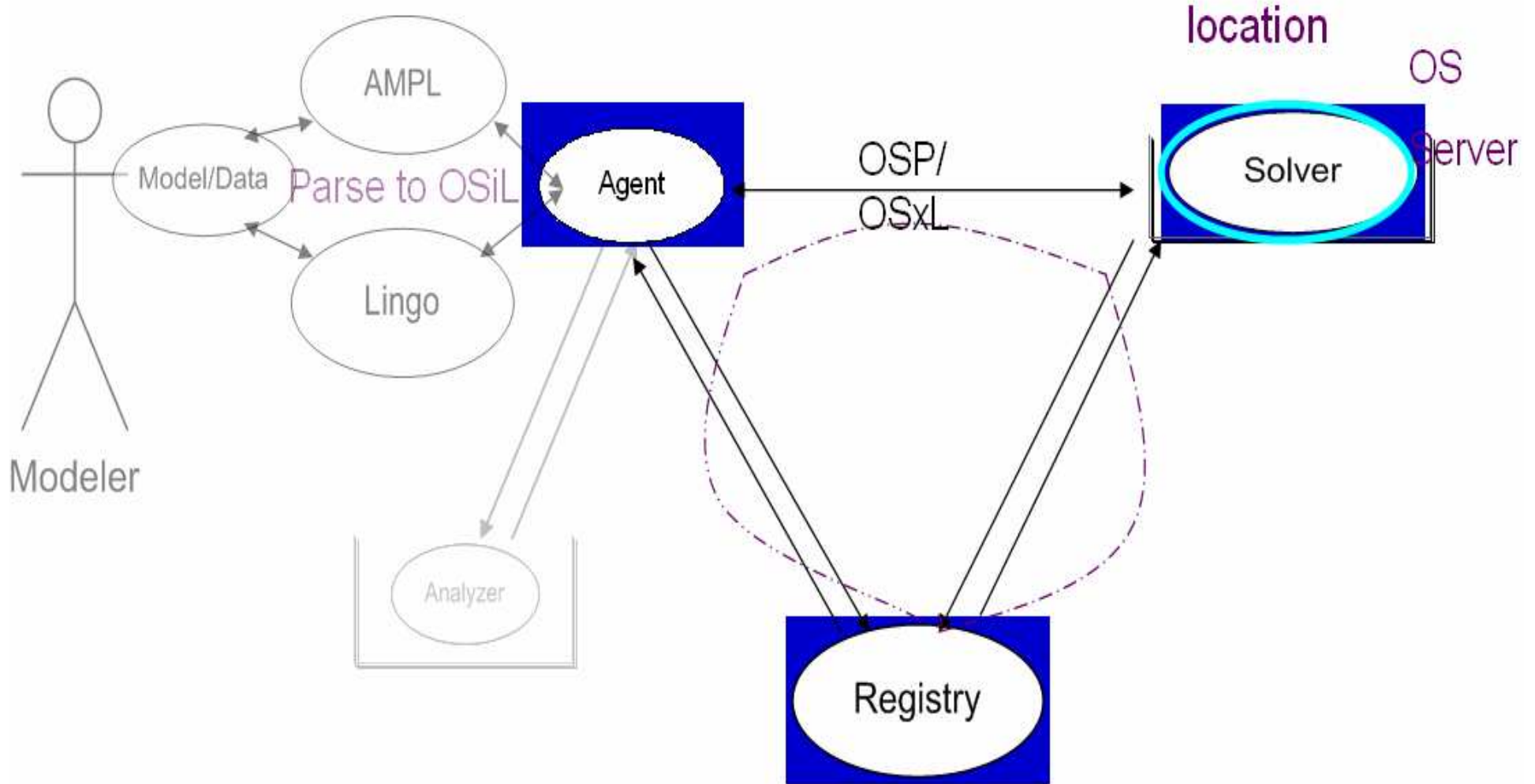




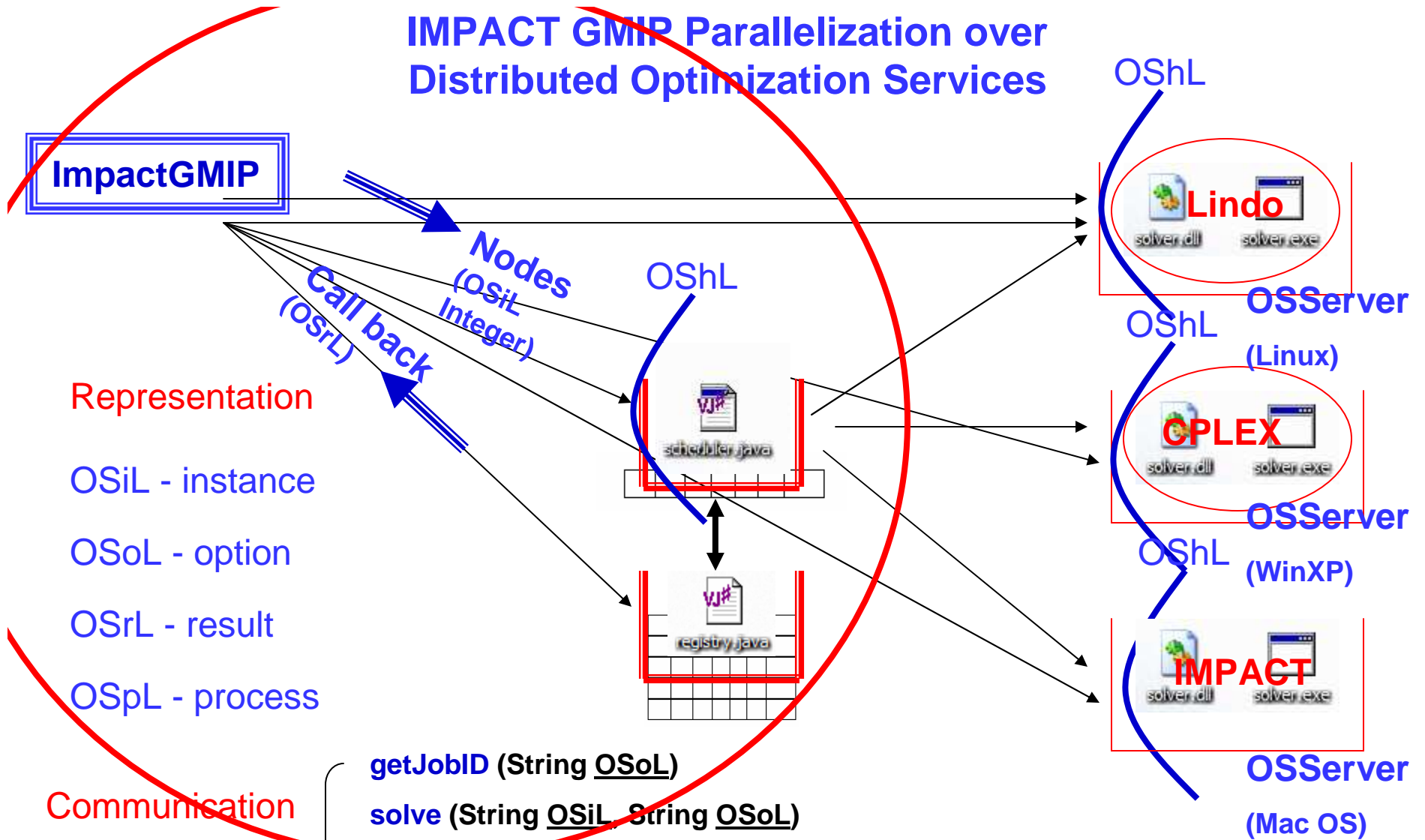
XML-based standard

Optimization Services (OS)

THE Optimization Internet



IMPACT GMP Parallelization over Distributed Optimization Services



Representation

OSiL - instance

OSoL - option

OSrL - result

OSpL - process

Communication

OShL - hookup

- getJobID (String OSoL)**
- solve (String OSiL, String OSoL)**
- send (String OSiL, String OSoL)**
- retrieve (String OSoL)**
- kill (String OSoL)**
- knock (String OSpL, String OSoL)**



Conclusion

- Introduced the Generalized MIP and showed it is friendliness for Parallelization
- Showed Optimization Services has a general and high extendable design fit for many derived researches





Jun Ma, Sanjay Mehrotra and Huanyuan Sheng
Impact Solver for Optimization Services, November 8, 2006