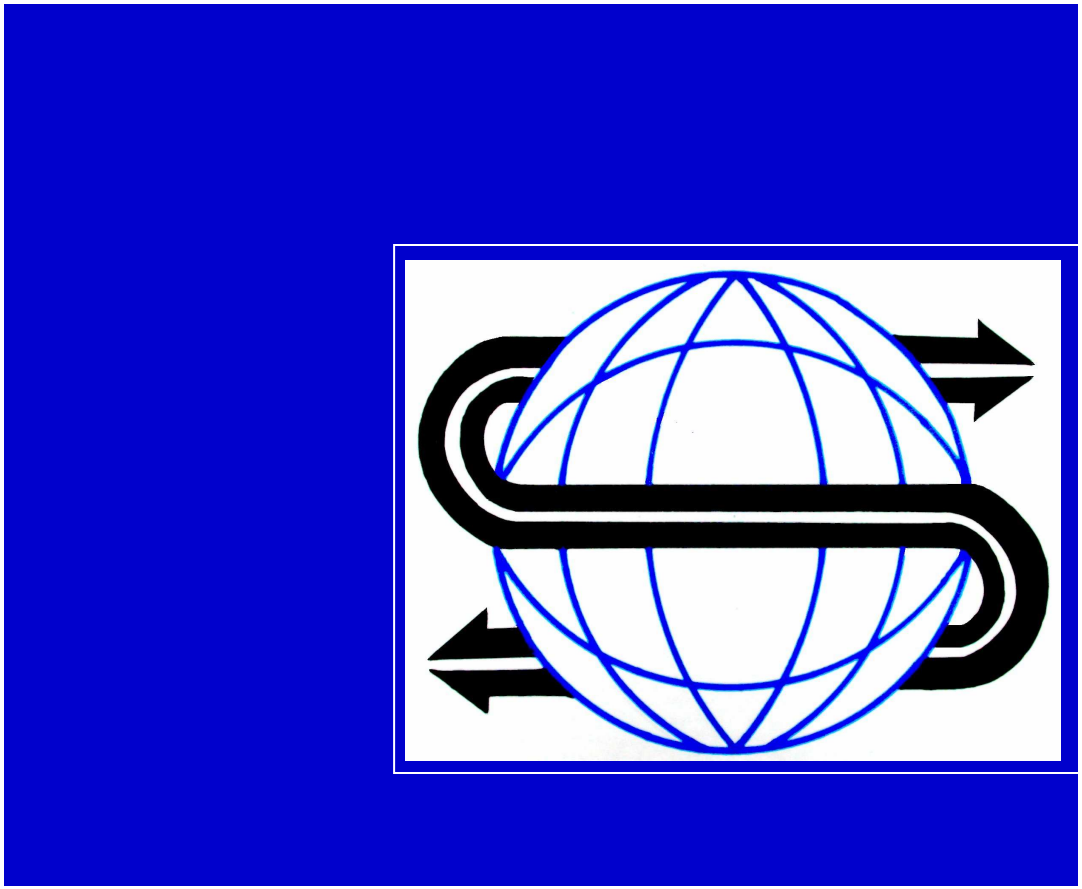

Optimization Services
OS Server
and
OS Libraries

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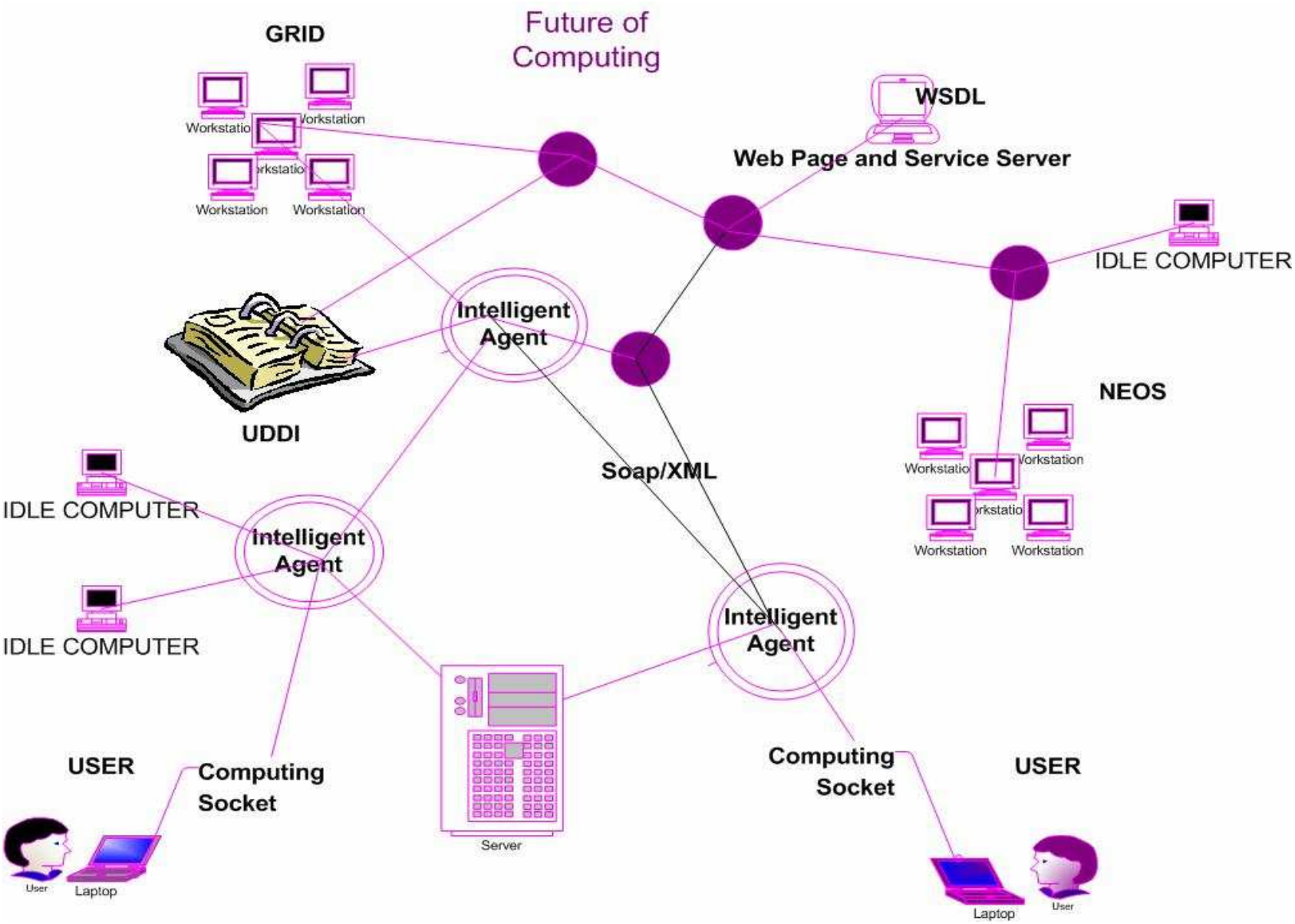
Outline

- Motivation
- OS Framework
- OS Library
- OS Server
- Conclusion/User Experience

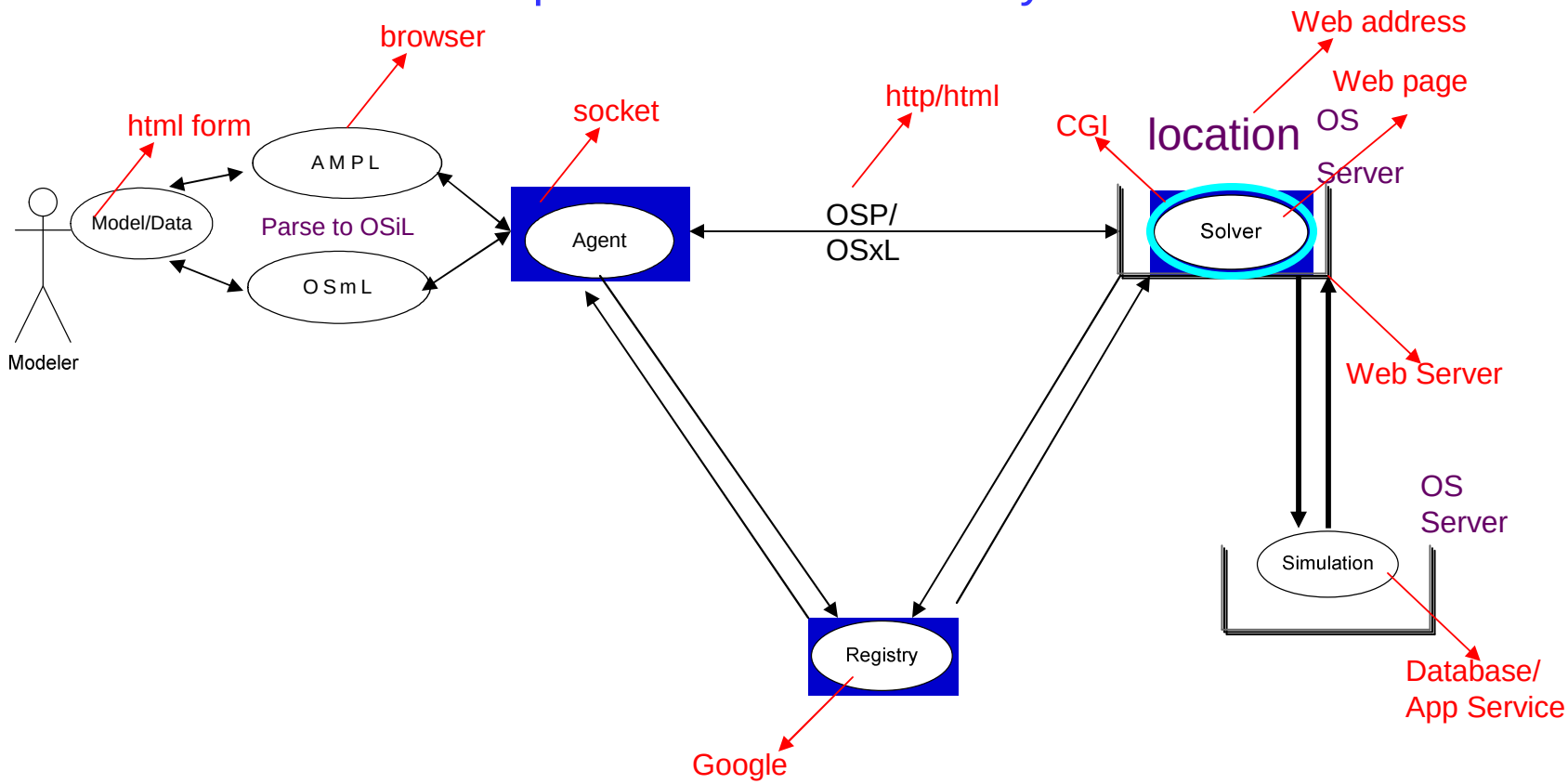
Motivation

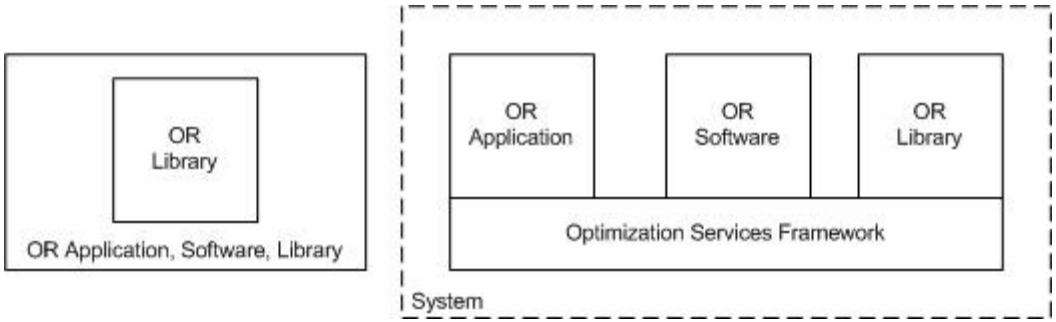
Future of Computing



OS Framework

Optimization Services System





OS Library

- OSCommon
  - representationParser
    - OSiL Reader/Writer
    - OSrL result
    - OSoL option
    - Etc.
  - util
    - data structure
    - io
    - xml
    - etc
  - communicationInterface
    - OShL (hook up to solvers/analyzers: solve, send, retrieve)
    - OScL (call to simulations)
    - OSdL (discover in registries)
  - localInterface
    - OSInstance
    - etc.
  - nonlinear: defines all the nonlinear operator/operands/functions

```
OSiLReader reader = new OSiLReader();
reader.read(example.osil);
reader.getLinearConstraintCoefficients();
reader.calculateNonlinearFunction(5, x); //x is double[]
```

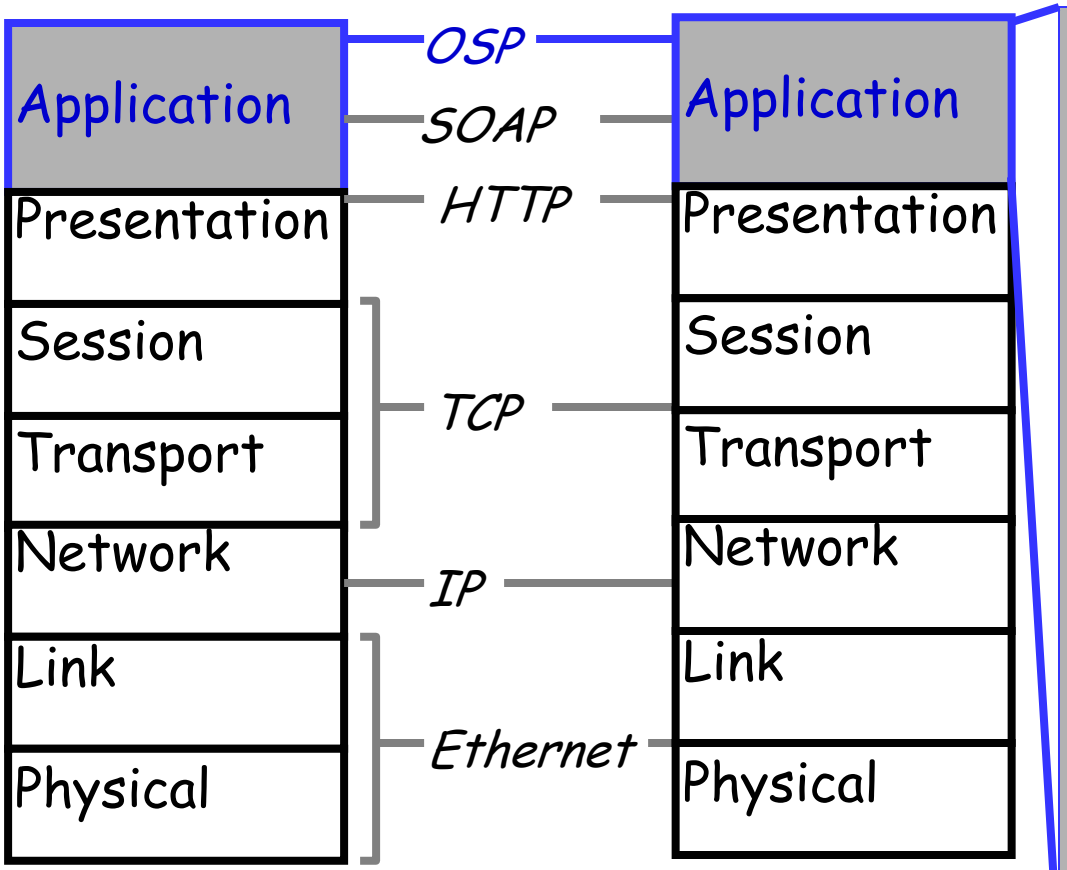

OS Library

- OSAgent
  - Solver agent
  - Simulation agent
  - Solver agent
- OSSolver
  - Utility and implementation of os-compatible solvers
- OSSimulation
  - Utility and implementation of os-compatible simulation.
- OSRegistry
  - Allows os developers to register their services
  - Lets os users discover os services
  - Let os users/developers validate instances
- OSAnalyzer
  - Utility and implementation of os-compatible analyzers.
- OSScheduler
  - Schedules optimization jobs over the distributed system
  - Takes care of all the non-optimization related chores.

```
OSSolverAgent agent = new OSSolverAgent();
agent.solverAddress = “http://1.2.3.6/impactSolverService”;
String osrlResult = agent.solve(osilInstance, osolOption);
```


OS Framework

Optimization Services Protocol (OSP)



The 7-layer OSI Model **The 4-layer Internet model**

```
GET /xt/services/ColorRequest HTTP/1.0
Content Length: 442
Host: localhost
Content-type: text/xml; charset=utf-8
SOAPAction: "/getColor"
```

```
<soap:Envelope>
  <soap:Body>
```

OSP – specifies soap content

Communication Interface Representation

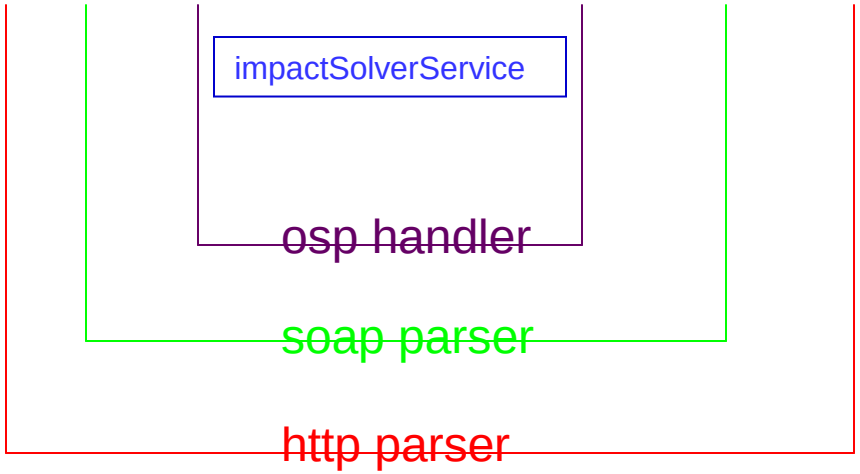
e.g. hook (“<OSiL> … </OSiL>”)

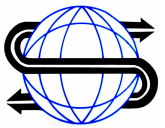
```
  <soap:Body>
</soap:Envelope>
```


OS Server

- **Networking Protocols: HTTP, SOAP, OSP**
  (OS server: Tomcat, Axis, OS library)

OSServer =





Conclusion/User Experience

- Open Environment
- Convenience just like Using Utility Services
- No High Computing Power Needed
- No Knowledge in Optimization Algorithms and Software (solvers, options, etc.)
- Better and More Choices of Modeling Languages
- More Solver Choices
- Solve More Types of Problems
- Automatic Optimization Services Discovery
- Decentralized Optimization Services Development and Registration
- More Types of Optimization Services Components Integrated (Analyzers/Preprocessors, Problem Providers, Bench Markers)
- Smooth Flow and Coordination of Various Optimization Services Components.
- A Universal, Scalable and Standard Infrastructure that promotes Collaboration and Other Related Researches
- Concentration on Good Modeling

Interested?

- MC43 – Standards for Optimization Problem Representation
  - OSiL (Fourer, Ma, Martin)
  - OSiL stochastic extension (Gassmann, Fourer, Ma, Martin)
  - Panel on standards
  - etc
- TC44 – Optimization Tools and Modeling Languages
  - OSmL (Ma, Martin)
  - Impact Solver Services (Huanyuan Sheng, Ma, Mehrotra)
  - etc.
- TD43 – Distributed Optimization Systems
  - Optimization Services Framework (Fourer, Ma, Martin)
  - etc.