

Atherton: Web Services Research at IST / PSU



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IST / Penn State
@ eBRC Advisory Board Meeting



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SOA: Service-Oriented Architecture



- Services? “A procedure, method, or object with a stable, published interface that can be invoked by clients”
- Popular means to establish services is [Web Services](#)

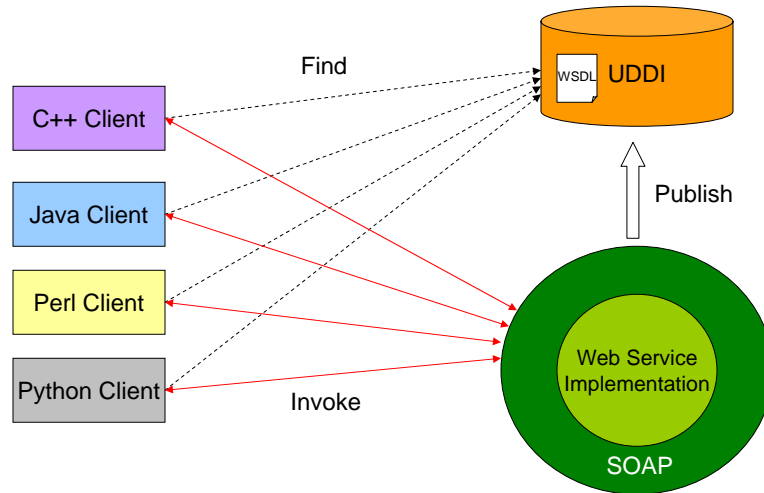
Web Services

- *“**Web Services** are a new breed of Web application. They are self-contained, self-describing, modular applications that can be **published, located, and invoked** across the Web. Web services perform functions, which can be anything from simple requests to complicated business processes... Once a Web service is deployed, other applications (and other Web services) can discover and invoke the deployed service...” [IBM]*

Web Services

- XML-based framework for machine interoperability
 - API: **WSDL**
 - Communication: **SOAP**
 - Yellow Page: **UDDI**
- Disguised RPC or CORBA in XML
- Let S/W agents communicate each other w/o human intervention (in theory)

Big Picture



Web Services

- Web services market will be **\$21 billion** by 2007 and will peak at \$27 billion in 2010 [IDC, 2003]
- **80%** of US enterprises will have some type of Web services project under way by 2008 [IDC, 2003]
- **41%** percent of enterprise software purchased in 2007 will be Web-services-enabled [Gartner, 2004]
- Tools for Web Services are needed to:
 - Discover
 - Compose
 - Analyze
 - Optimize
 - ...

Web Services Research @ IST/Penn State



- **Atherton** project is to develop tools/methodology for Web Services
 - <http://nike.psu.edu/atherton/>
- Sub-projects
 - Analysis & Optimization: **MISQ** [BSN 05]
 - Generation : **Pollock** [ACM SAC 05, ECDL 04, IBM Eclipse Grant 04]
 - Discovery and Composition: **BF*** [IEEE EEE 05, Microsoft SciData Grant 05]
 - ...

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1. MISQ : Motivation

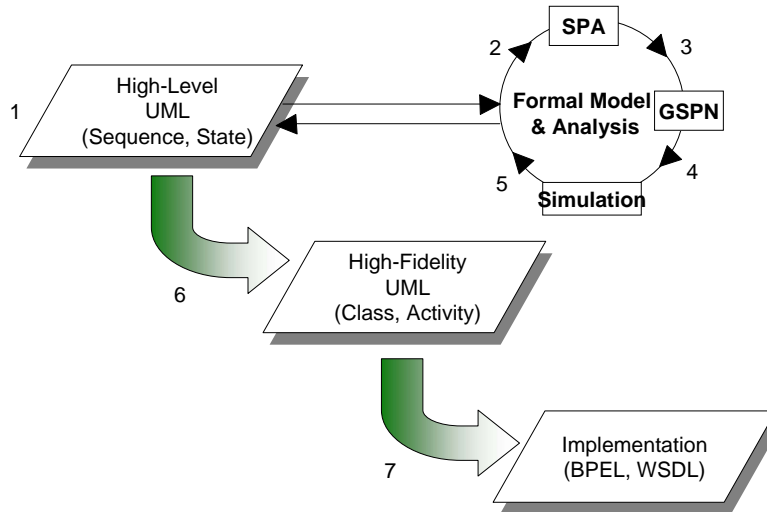


- Composing various services in various ways can yield value-added services in BSN
- Finding an optimal configuration in general settings is *NP-complete* (proof via a reduction to SAT problem)
- Nevertheless, optimization is still feasible for a small-size setting => How?
 - People start from graphical model: UML, ER, ...
 - Other mathematical models are good for analysis: Petri Net, Automata, ...

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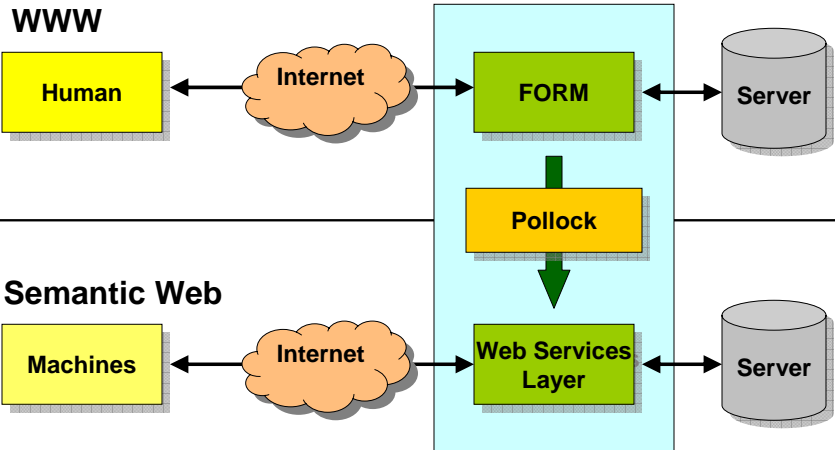
1. MISQ: Optimize UML



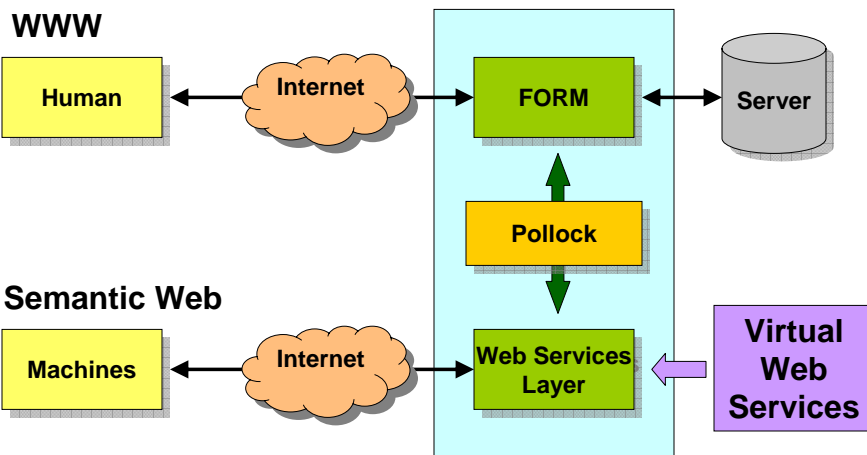
2. Pollock: Data in "Hidden" Web

Title	Prep. Time	Total Time	Rating	Votes
French Onion Soup with Port and Burgundy			★★★★★	5
French Onion Soup	:15	:30	★★★★★	3
French Strawberry Pie			★★★★★	1
French Cherry Pie			★★★★★	1
French Onion Soup	:15 to :20	:45 to 1:00	★★★★★	1
French Cherry Pie	:30	to 1 day	★★★★	1
French Apple Pie			★★★★	1
Baker's Square French Silk Pie			★★★★	1
French Pistachio Butter Creams	:30		★★★★	1
French Silk Chocolate Pie	:25		★★★★	1
French Silk Pie	:20		★★★★	1
French Caramels			★★★	1
Diabetic French Fudge	:15 to :20		★★★	1
French Cheesecake			★★★	1

2. Pollock: WS Generator



2. Pollock: WS Generator



3. BF*: WS Composition

- What to do when single WS cannot satisfy given task? => Combine multiple WS
- Can be cast to classical Graph Planning/Search problem
 - Partial Order Planning
 - Integer Programming
- We attack “Large-Scale” WS composition problem – 10,000 WS
 - Heuristic greedy algorithm (eg, A*, Tabu)
 - Novel index structure – Bloom Filter

Conclusion

- Exciting research going on @ IST
- Current major focus is on Computational aspect, but like to expand to ...
- Detailed information are available at:
 - Project Homepage: <http://nike.psu.edu/atherton>
 - Prototype: <http://nike.psu.edu/atherton/bfstar/>
 - Demo: <http://opendbip.psu.edu/bfstar/>
- Thanks !!