W3C Constraints and Capabilities for Web Services Workshop 13 October 2004

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Sun microsystems
We make the net work.

Key Points

1. Keep it simple, but not simplistic
2. Need a standard language to support intersection of Assertions/Attributes, not just intersection of choices
3. Let WSDL specify mechanisms for binding policies to services

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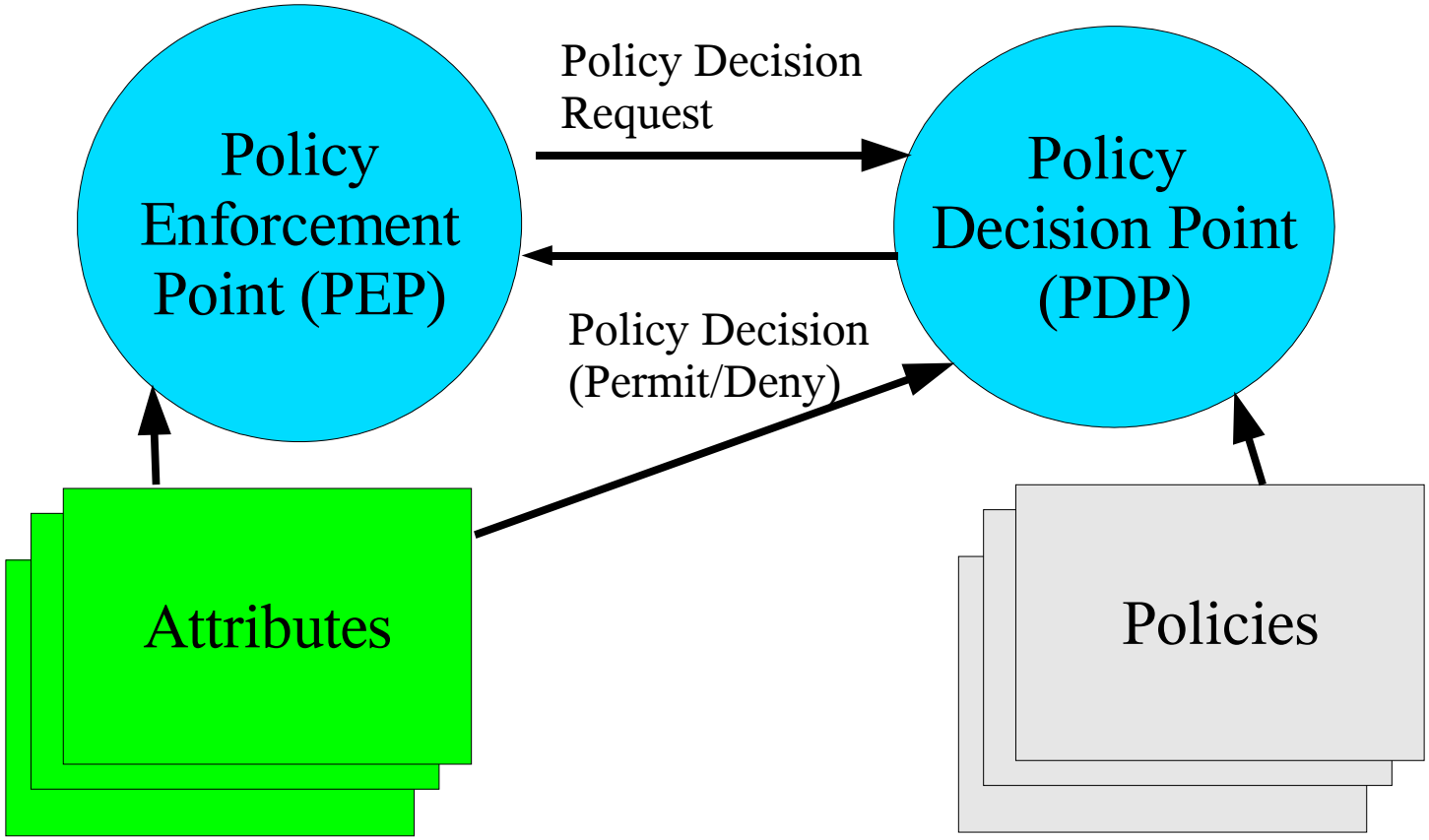
“Web services policy”

- Working Definition:

The requirements and abilities of a web service in its interactions with other web services or consumers.

Endpoints in a web services interaction must agree on one set of parameters from the intersection of their policies in order to interact successfully.

A Standard* Policy Usage Model



*IETF/DMTF

Some aspects of “policy”

- Policy statement
  - Vocabulary elements
  - Vocabulary sets (“domains”)
  - Vocabulary mappings between domains
  - Constraints on vocabulary elements
  - Choices and combinations of constraints (WS-Policy)
- Binding to target (WS-PolicyAttachments); discovery
- Authoring: permission, storage, update, authentication
- Distribution of policies
- Contracts about policies:enforcement, monitor compliance
- Reasoning about policies; policy analysis
- Policy intersection or composition

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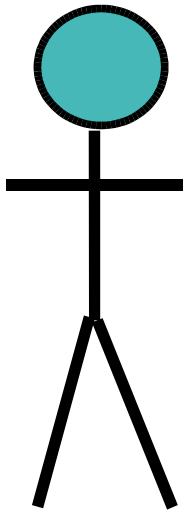
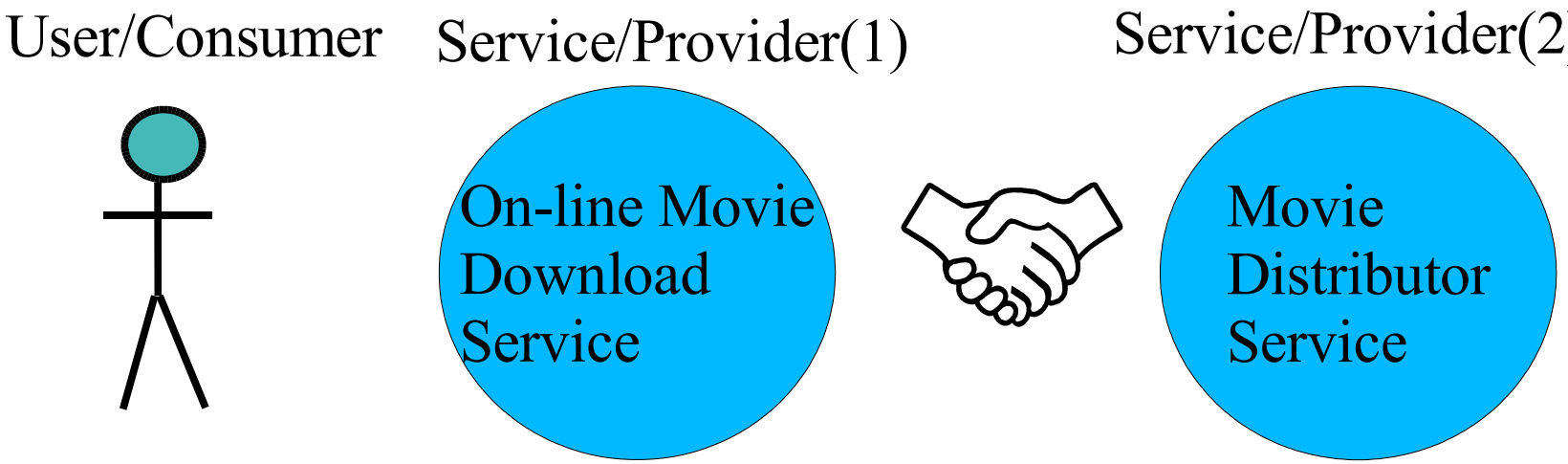
Interaction example

User/Consumer



Service/Provider

Another interaction example

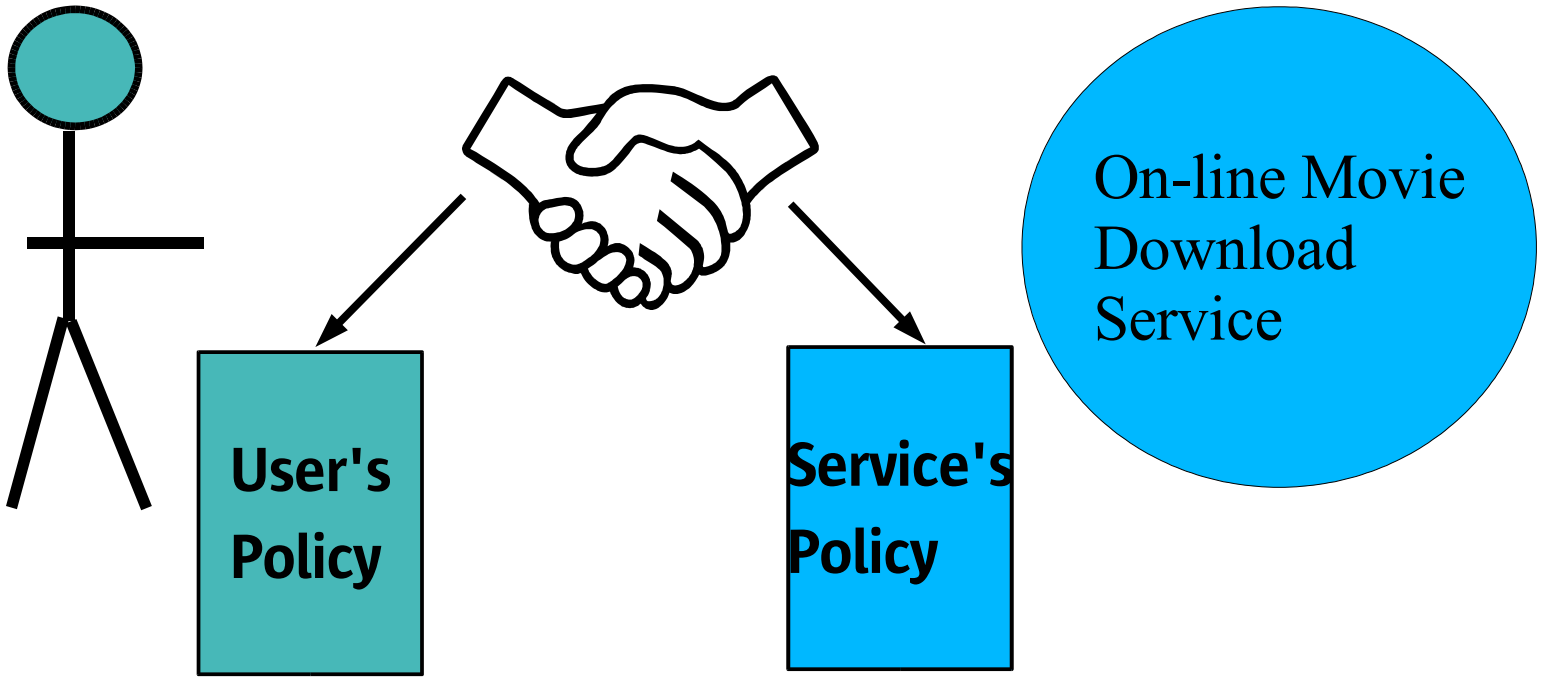


May require Provider 1 to represent User to Provider 2

Policy Intersection

User/Consumer

Service/Provider

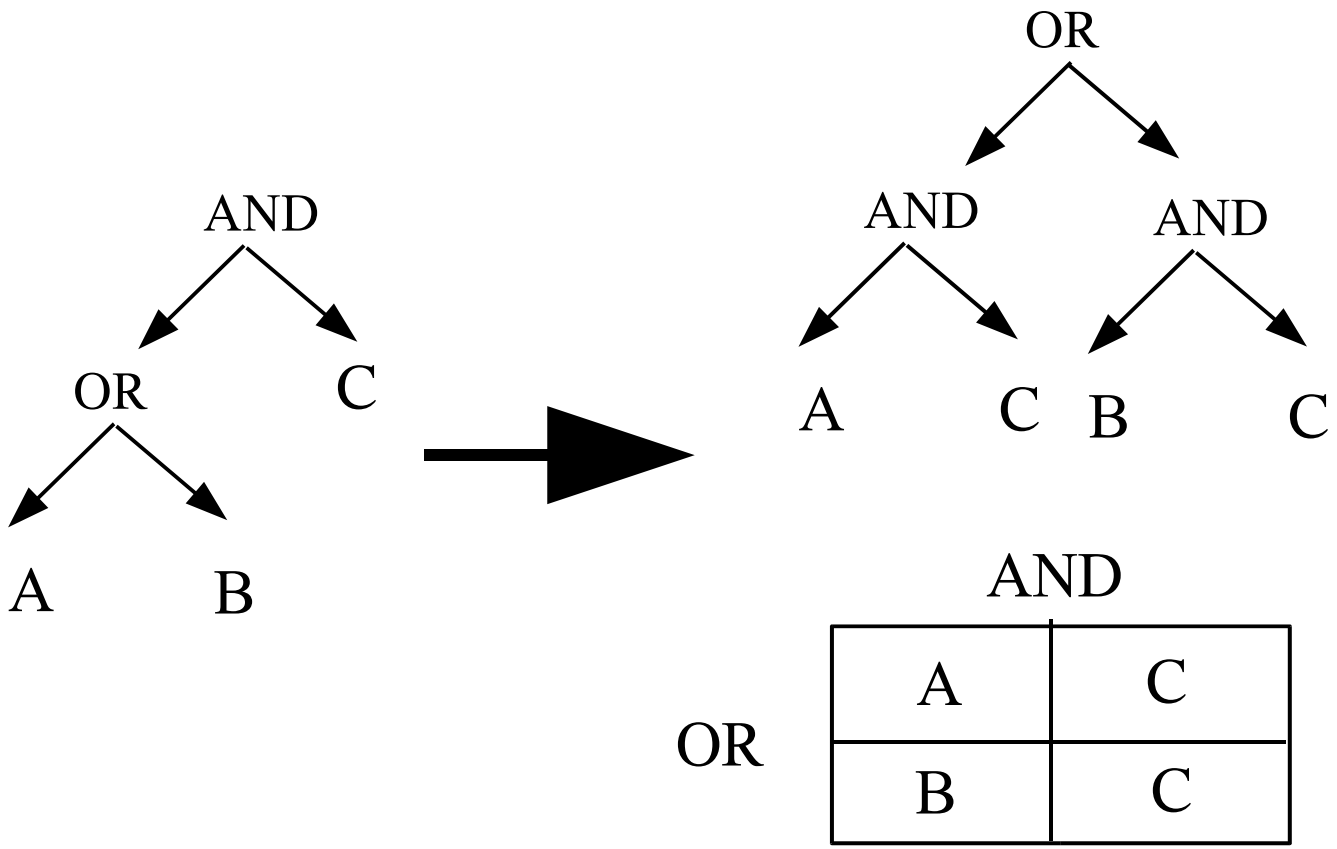


Policy intersection components

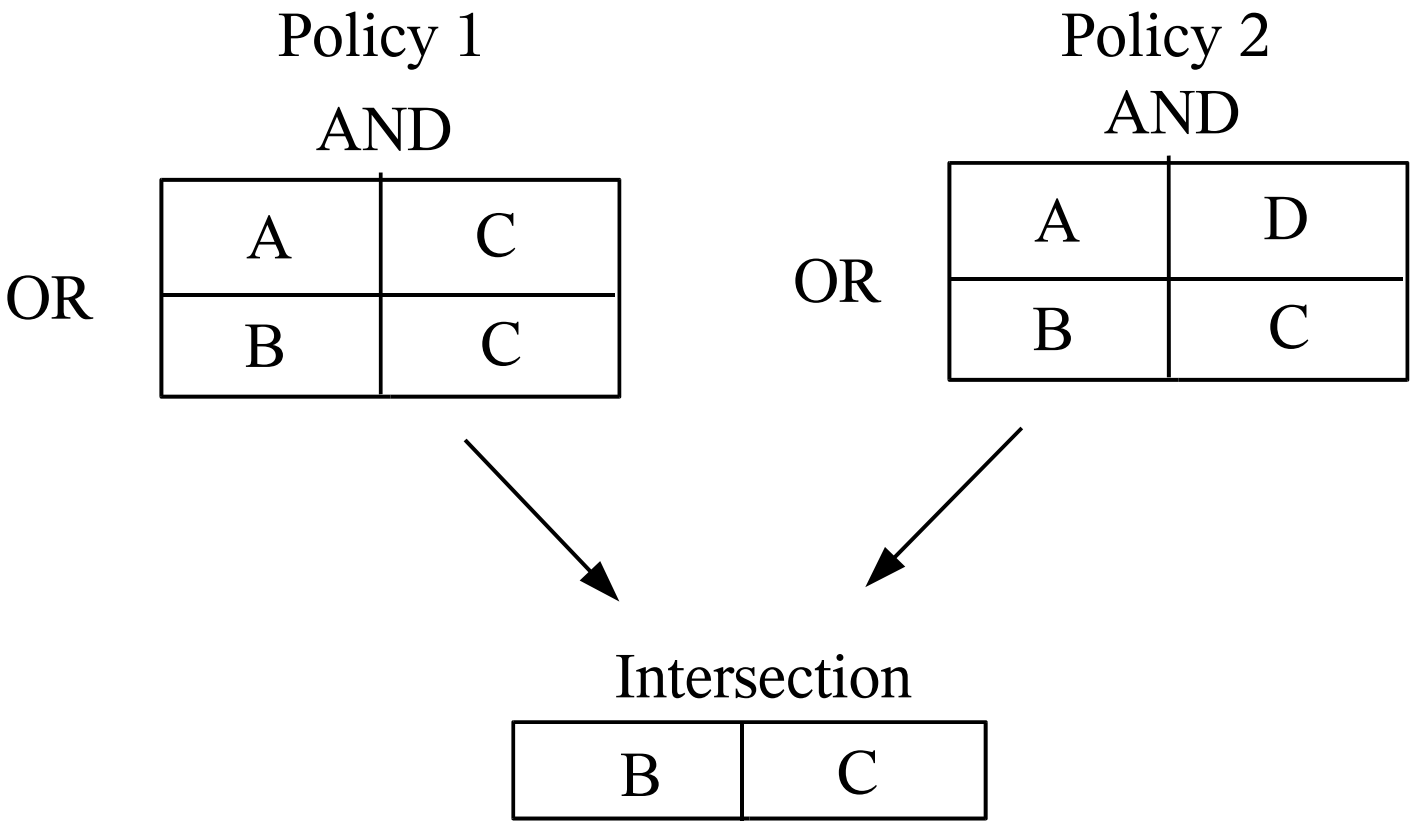
1) Intersection of choices or combinations of constraints (WS-Policy)

2) Intersection of constraints on individual vocabulary elements

Intersection of choices: Convert to DNF (OR of AND's)



Intersection of choices: Select matching rows



Intersection of constraints: WS-Policy style

Client Policy:

<**xx:BuyPrice**>1,000,000</**xx:BuyPrice**>

Service Policy:

<**xx:SellPrice**>999,999</**xx:SellPrice**>

Must understand semantics of `<BuyPrice>` and `<SellPrice>`

Intersection of constraints: alternative

Client Policy:

```
<integer-less-than-or-equal>
  <Attribute Id="yy:Price"/>
  <Value>1,000,000</Value>
</integer-less-than-or-equal>
```

Service Policy:

```
<integer-greater-than-or-equal>
  <Attribute Id="yy:Price"/>
  <Value>999,999</Value>
</integer-greater-than-or-equal>
```

Must understand semantics of integers

Translating schemas:XSLT

<xx:BuyPrice>....</xx:BuyPrice>

```
<integer-less-than-or-equal>
    <Attribute Id="yy:price"/>
    <value>....</value>
</integer-less-than-or-equal>
```

Specifies match-critical semantics of “BuyPrice”

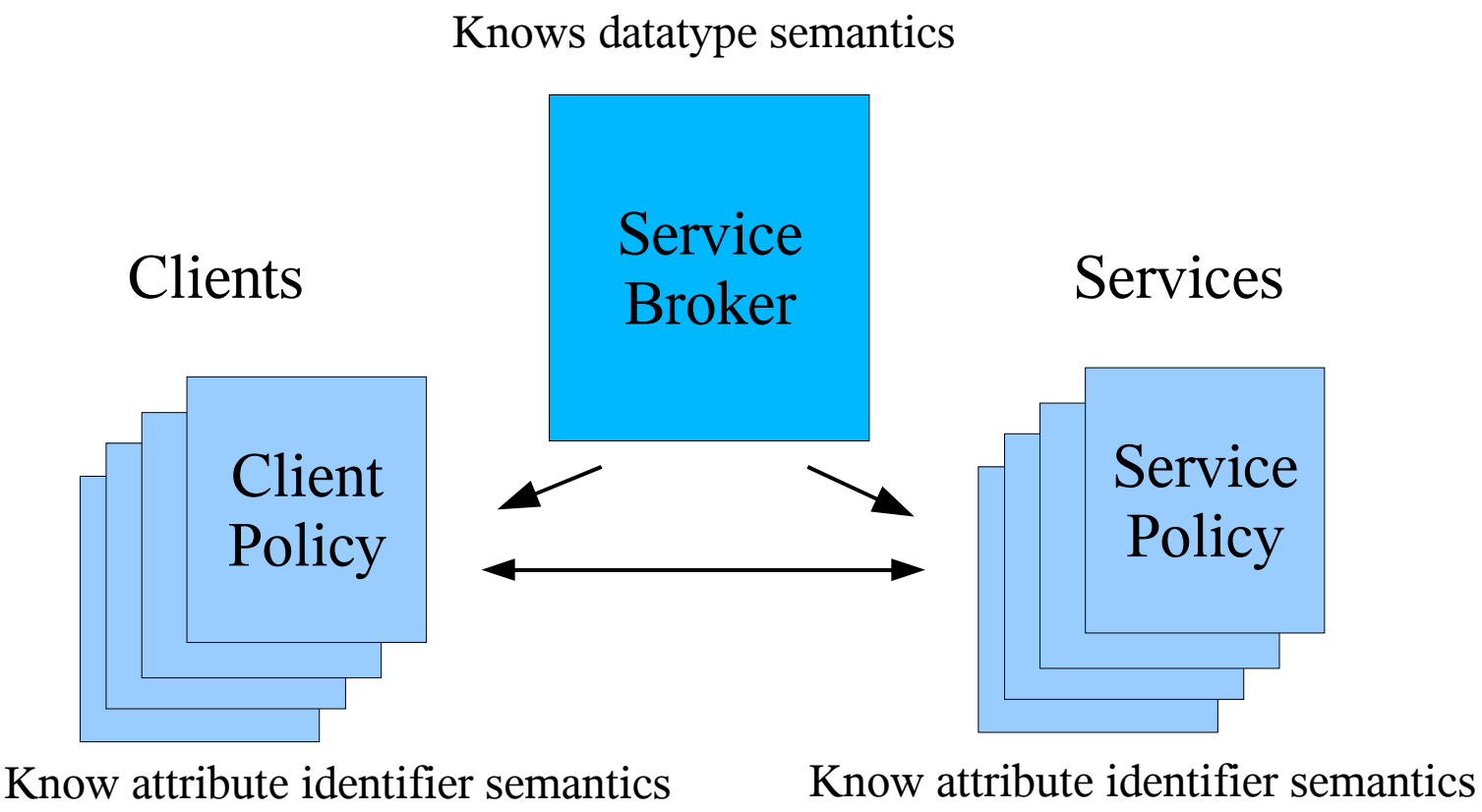
Translating schemas:XPath

<xx:BuyPrice>....</xx:BuyPrice>

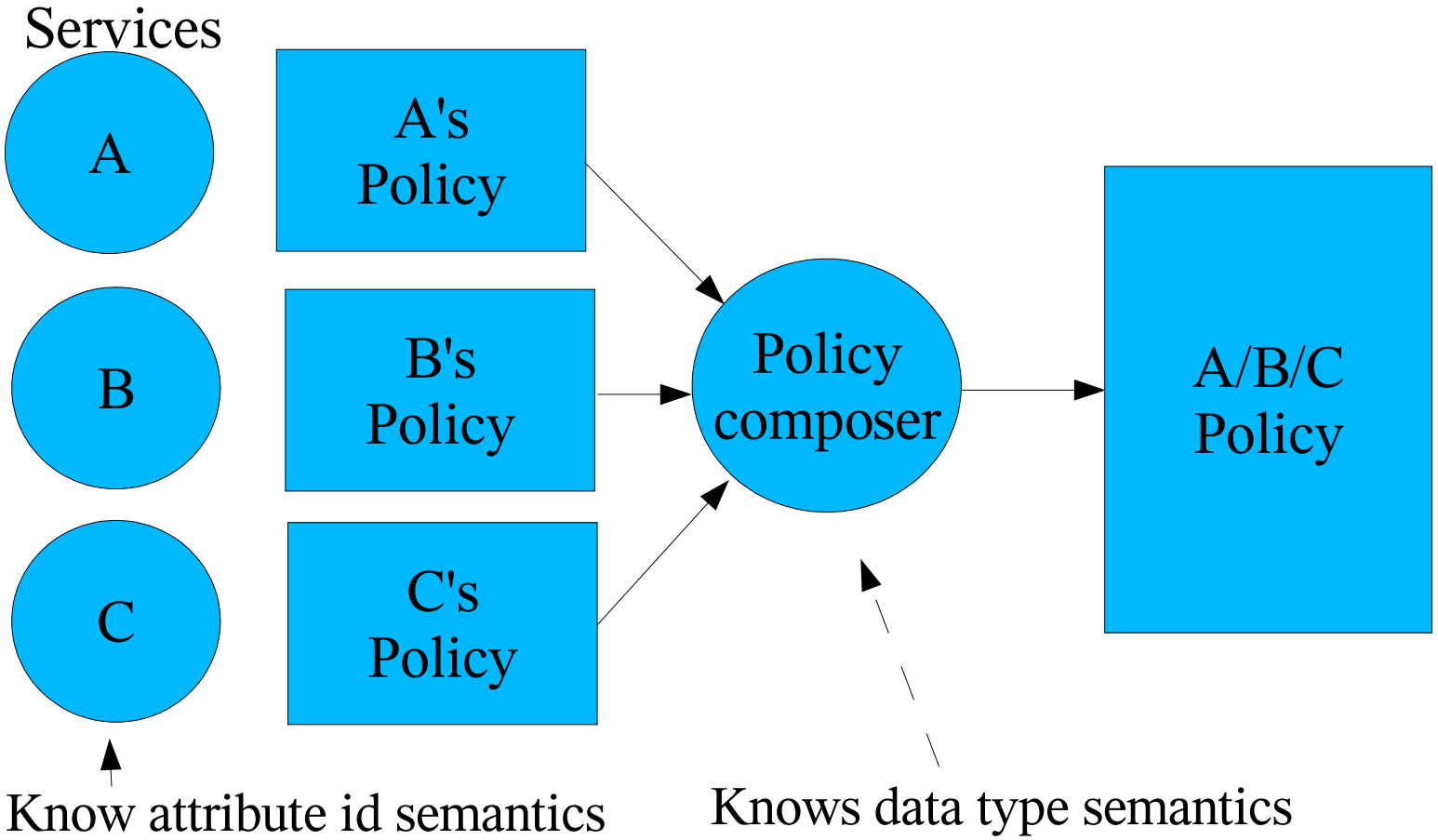
```
<integer-less-than-or-equal>
    <Selector xpath="...xpath to BuyPrice value..."/>
    <value>....</value>
</integer-less-than-or-equal>
```

Specifies match-critical semantics of “BuyPrice”

Policy matching with constraint language



Policy composition with constraint language



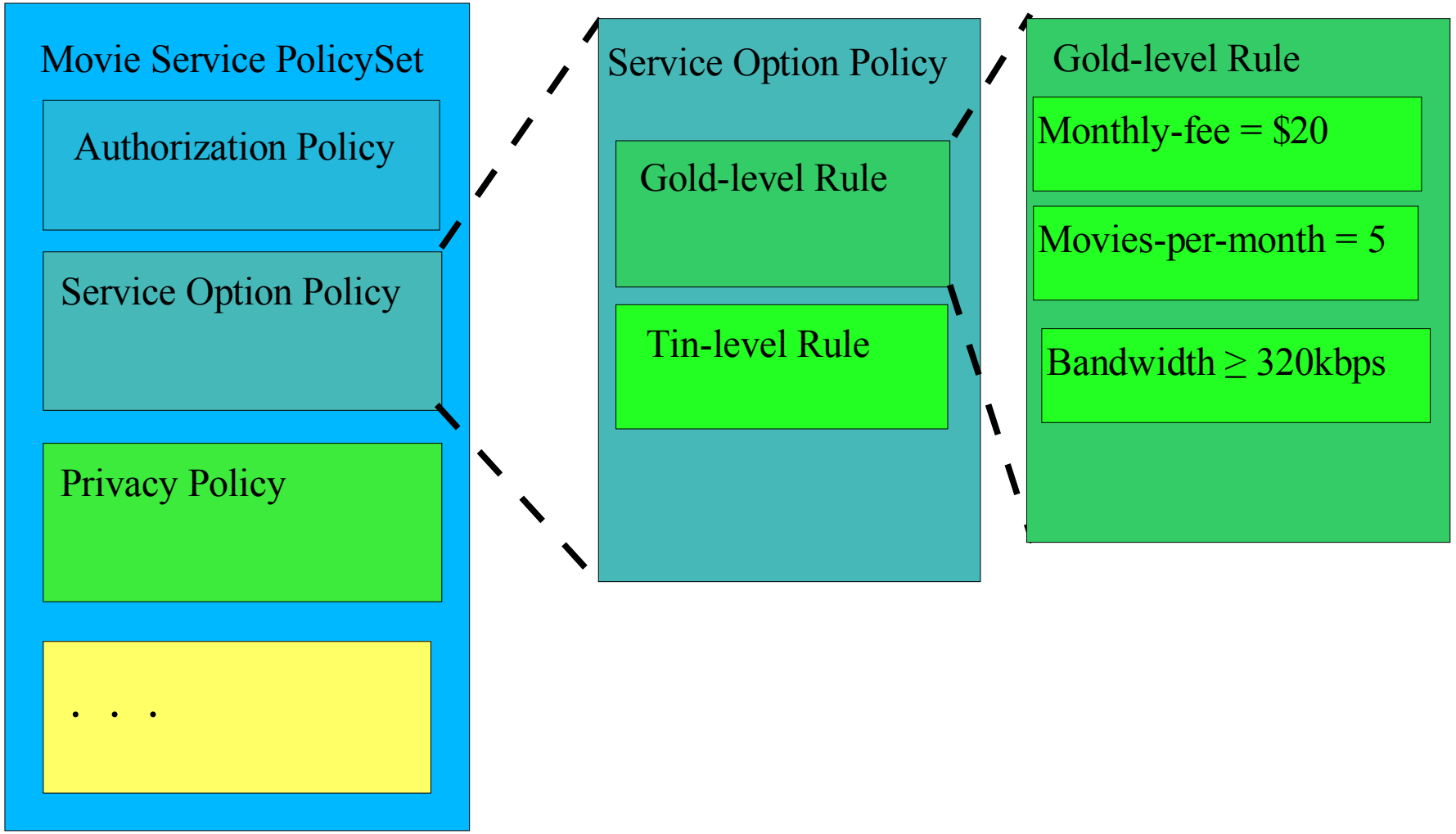
Why does it matter?

- If intersection engine must know semantics of vocabulary elements:
  - Engine must be configured to support each specific element
  - Engine may need new code modules to support specific elements
  - Customers can't define their own policy schemas without doing above
  - Standard engines can't support vocabulary schema updates
  - Standard engines can't support proprietary vocabulary schemas

XACML profile for Web Services

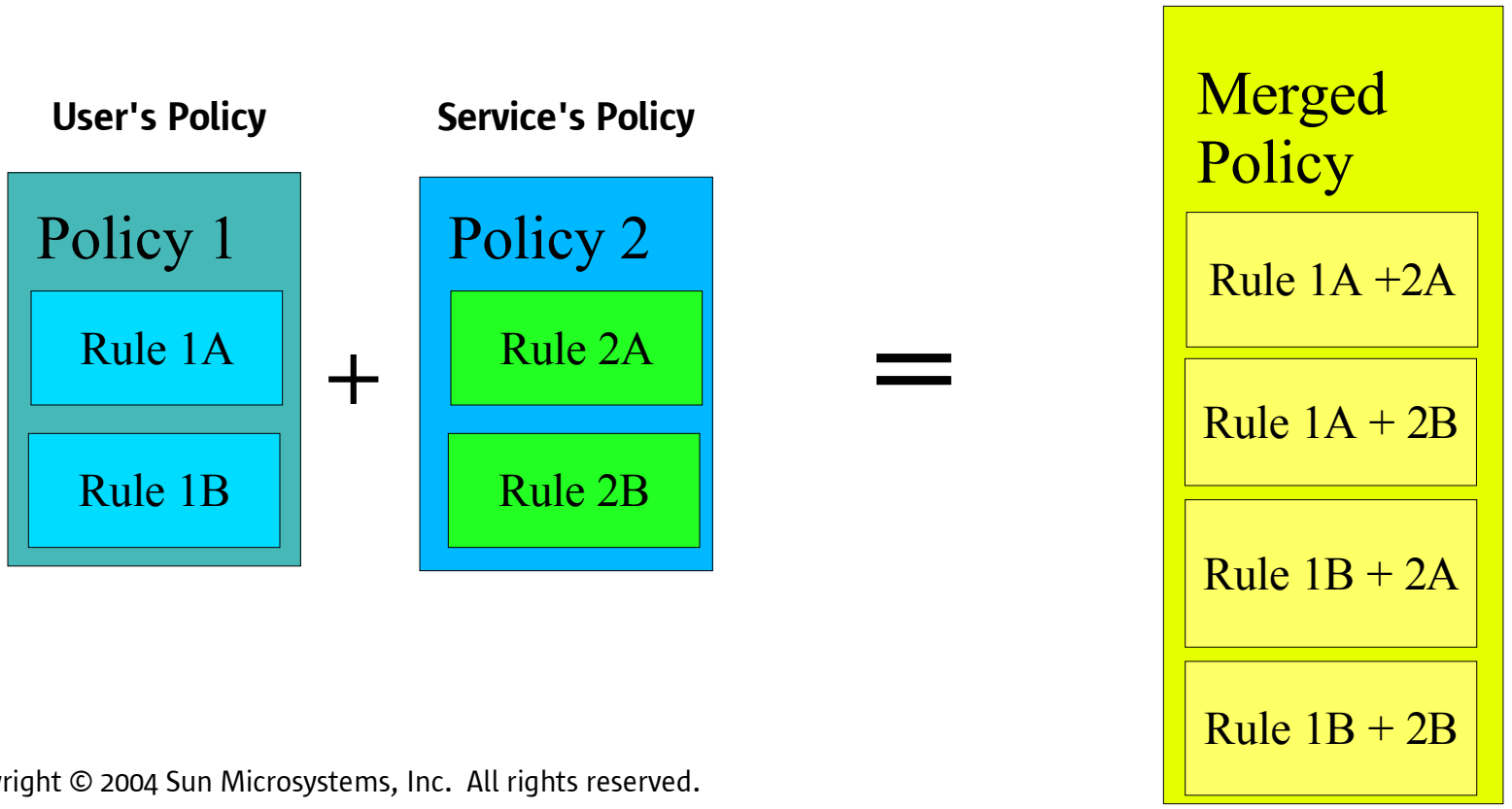
- Example of such a constraint language
- Also known as Web Services Policy Language (WSPL)
- Based on OASIS XACML Standard
- Specifies how to match all constraints
- Rich set of data types
- Rich set of constraint functions

WSPL policy diagram



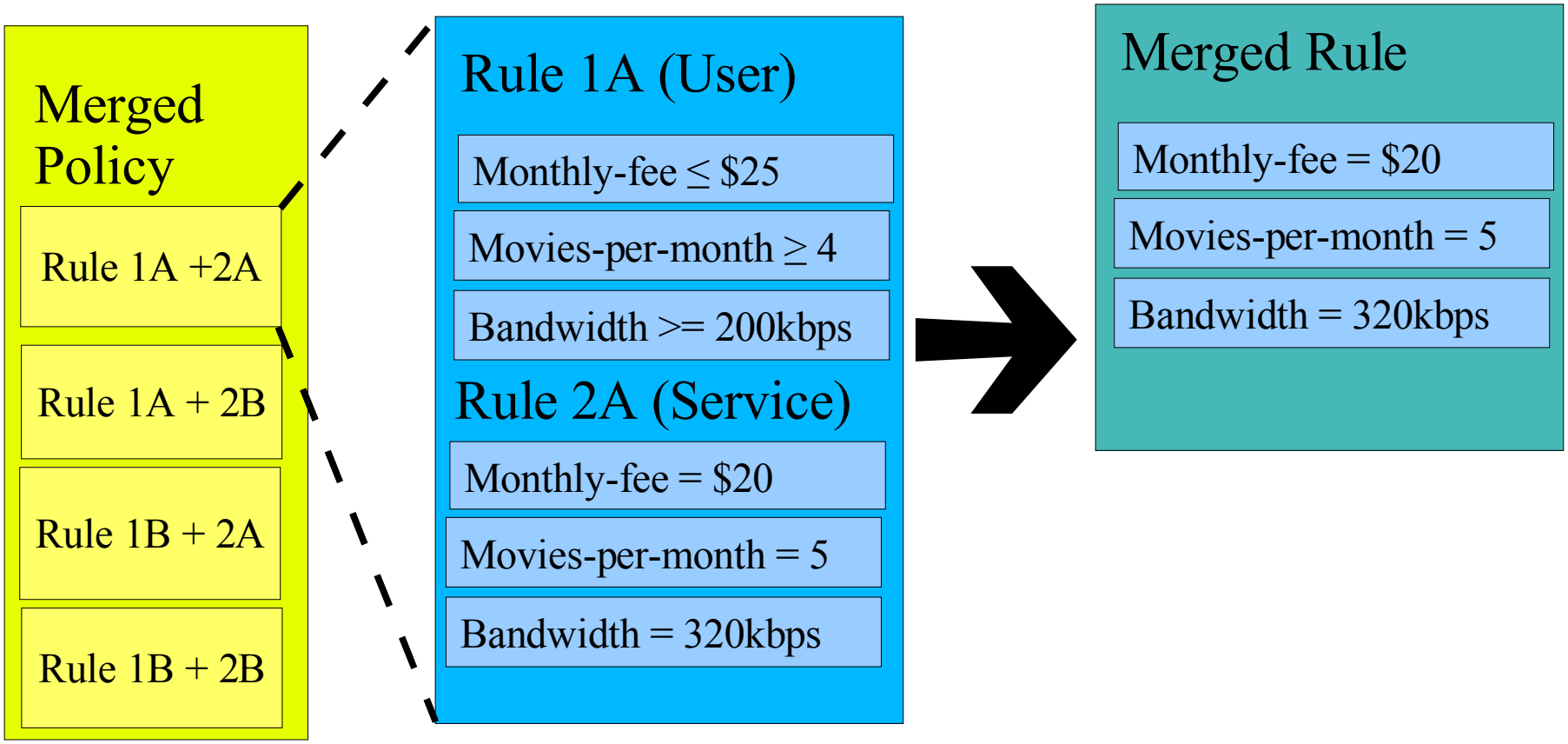
WSPL policy intersection (1)

- Pair rules in all possible combinations



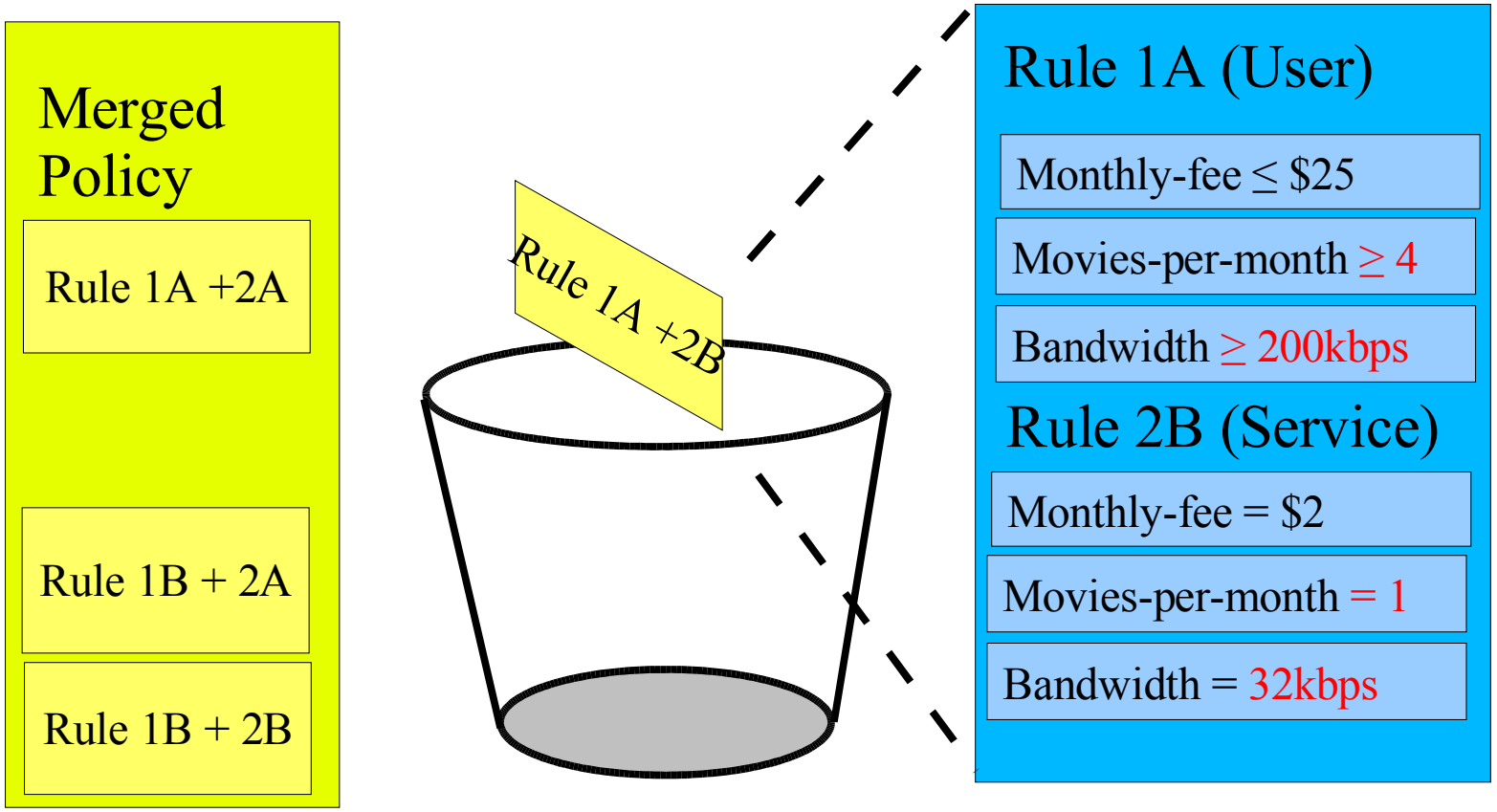
WSPL policy intersection (2)

- Merge rules



WSPL policy intersection (3)

- Eliminate incompatible rules



WSPL policy intersection (4)

- Eliminate unusable rules

Example:

Current time of day:

timeOfDay == 6pm

Rule says:

timeOfDay ≥ 9am

timeOfDay ≤ 5pm

Other potential XACML/WSPL contributions

- Combining algorithms
  - Preferences
- Arithmetic functions
  - E.g. (Birthdate + 21) <= CurrentDate
- Policy and rule “targets”
  - Efficient identification of applicable policies

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➔Let WSDL specify mechanisms for binding policies to services

WSDL: bind policies to services

Using extension elements:

```
<interface name="example4">
  <operation .../>
  <operation .../>
  <xx:[Policy Language] wsdl:required="true">
    ...policy expression...
  </xx:[Policy Language]>
</interface>
```

Using extension attributes:

```
<interface name="example4"
  xx:[Policy Language Reference]="...URL to policy description...">
  <operation .../>
  <operation .../>
</interface>
```

Binding granularity

- Message payload or fraction thereof
  - e.g. XPath to <Password> payload fragment
- Message
- Operation
- PortType / Interface
- Binding
- Port / Endpoint
- Service

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Further Information

- XACML profile for Web Services

  http://www.oasis-open.org/committees/download.php/3661/draft-xacml-wspl-04.pdf

- Web-services policy language use-cases and requirements

  OASIS XACML TC Working Draft 04, 16 April 2003,

  http://www.oasis-open.org/committees/download.php/1608/wd-xacml-wspl-use-cases-04.pdf

- Danfeng Yao's WSPL prototype and demo

  http://www.cs.brown.edu/people/dyao/wspl.html

- Sun's open source XACML implementation

  http://sunxacml.sourceforge.net/

- Comparing WSPL and WS-Policy (IEEE Policy 2004 presentation)

  http://research.sun.com/projects/xacml/WSPL_vs_WS-Policy_v2.pdf

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