



Key Differences Between XACML and EPAL

New Challenges for Access Control 2005

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Outline

- Overview
 - XACML
 - EPAL
- Choice of rules to evaluate
- Policy vocabulary
- Hierarchical Request objects
 - XML document resources
- Subjects
- Conclusion

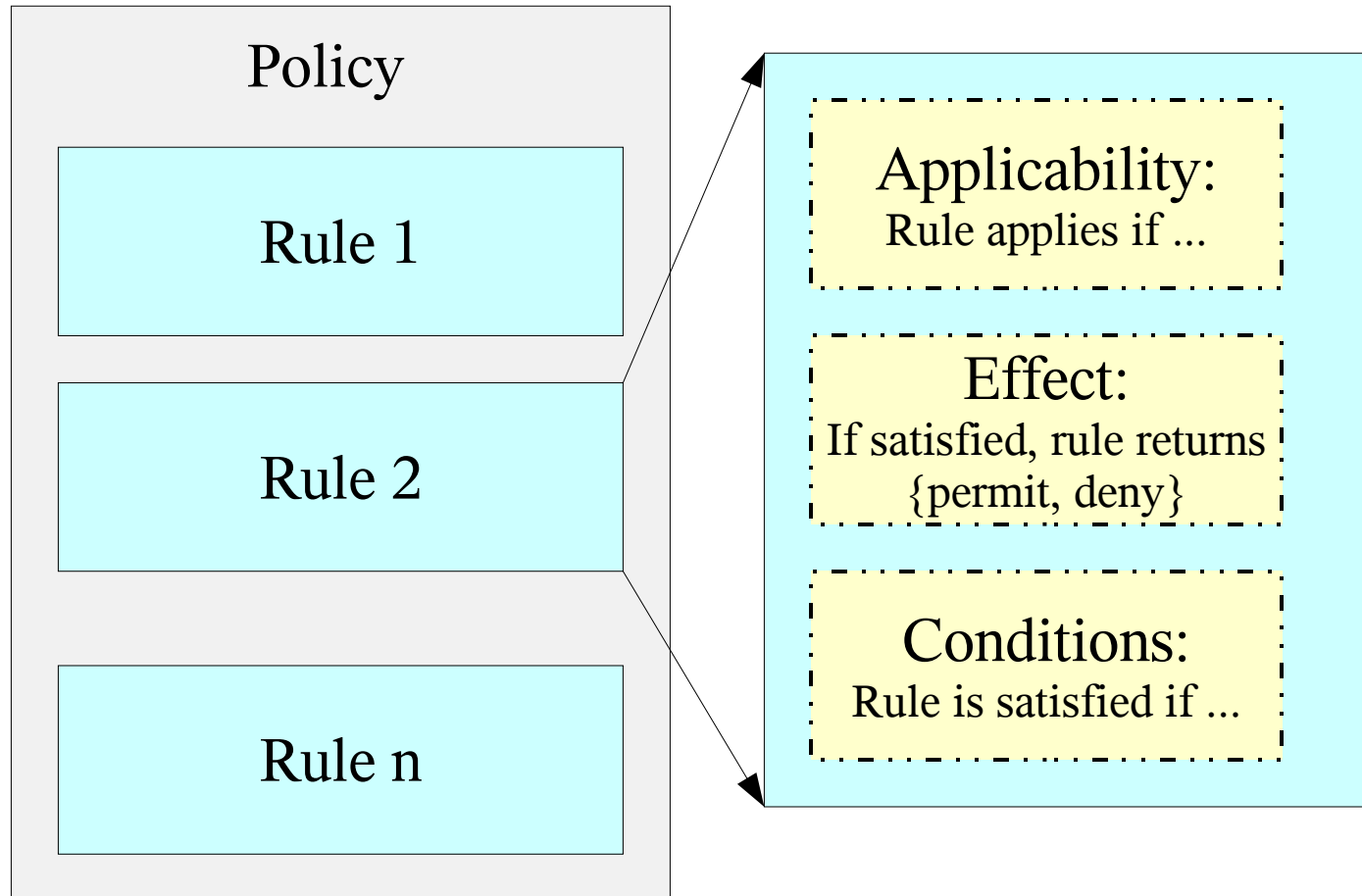
XACML Overview

- “eXtensible Access Control Markup Language”
- Version 1.0 OASIS Standard, February 2003
- Version 2.0 OASIS Standard, February 2005
 - Includes “Privacy profile of XACML”
- Publicly available (C++, C#) and open source (Java) implementations

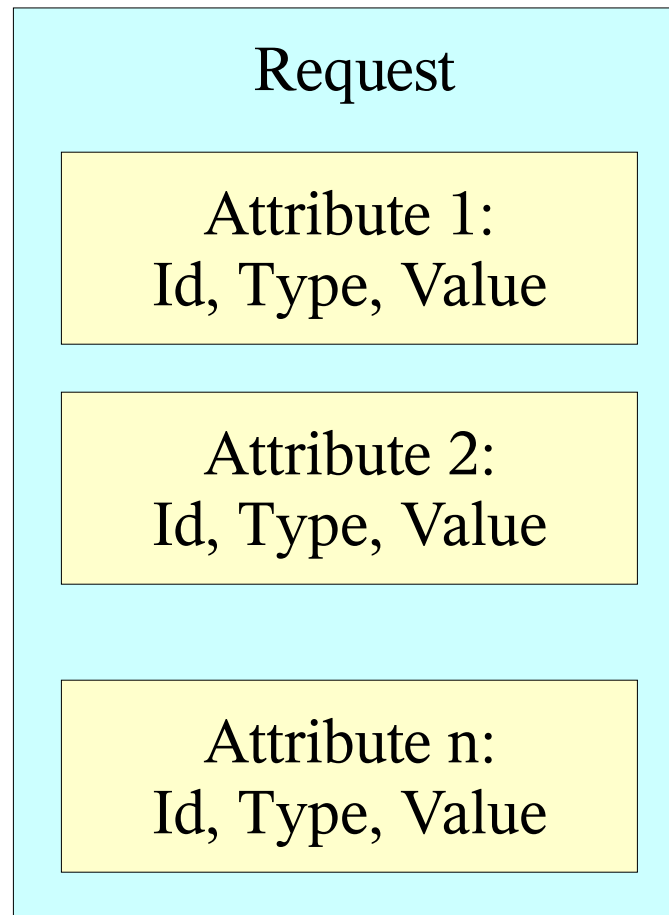
EPAL Overview

- “Enterprise Privacy Authorization Language”
- IBM proprietary specification
- Submitted to W3C 10 November 2003; no action
- EPAL 1.1 used XACML explicitly
- EPAL 1.2 uses a lot of XACML (attribute and target concepts, rules, conditions, functions, datatypes, obligations)

Common Framework: Policy



Common Framework:Request



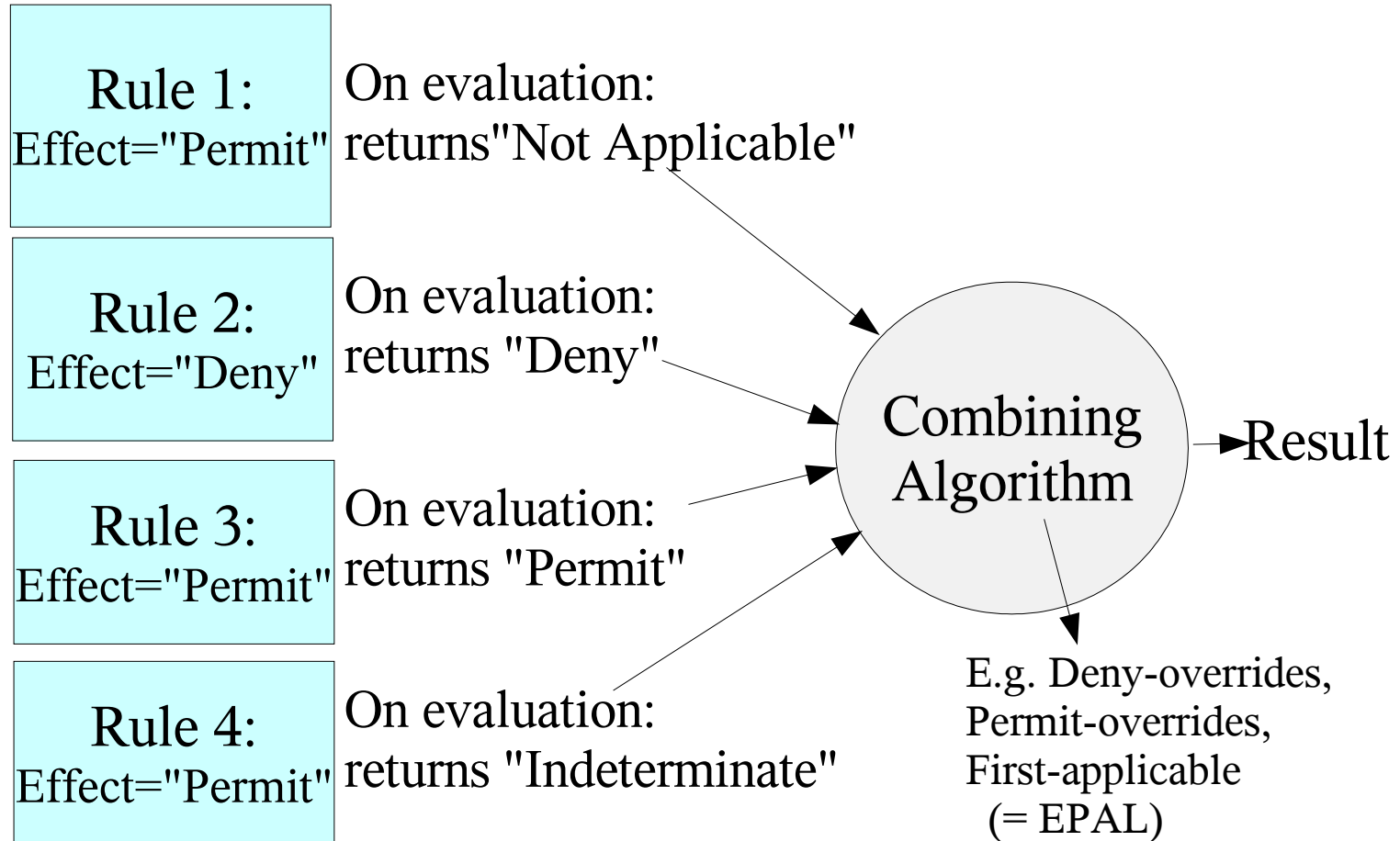
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Rules to evaluate:EPAL

- Fixed algorithm:
 - Process rules in document order
 - Return result from first applicable rule whose conditions are satisfied

Rules to evaluate: XACML



Rule choice impact

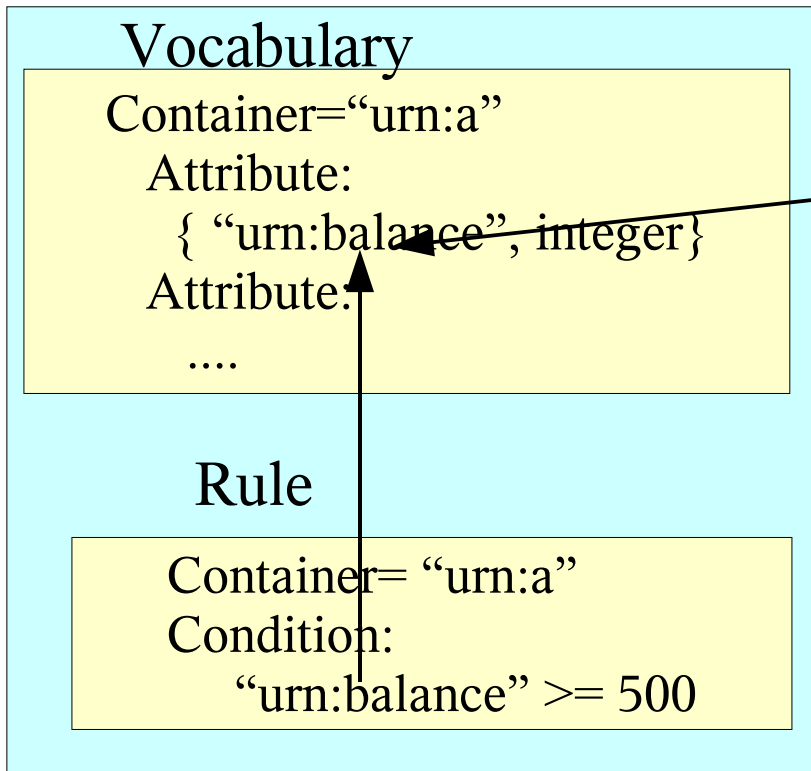
- First applicable rule
 - Not scalable – requires global rule preference agreement
 - Sacrifices closure under combination [Barth]
- Deny unless all applicable rules permit
 - Forces evaluation of all rules unless “deny” returned earlier: inefficient if “deny” is rare
 - “Deny” rules insecure in open environments
- Permit if at least one rule permits
 - Incompatible with “deny” rules
 - Forces evaluation of all rules unless “permit” returned earlier
 - Not scalable – coordination required to ensure deny
- XACML gives choice; EPAL does not

Outline

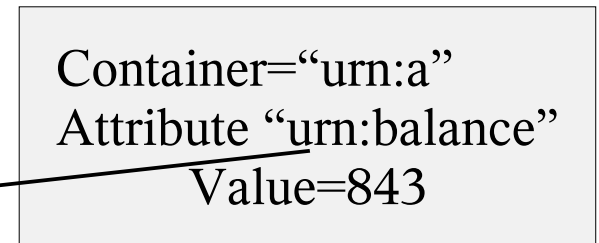
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EPAL Policy Vocabulary

Policy

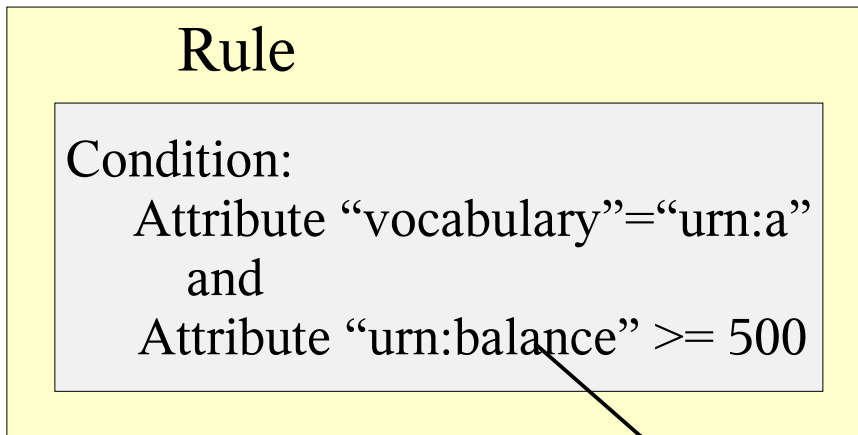


Request Context

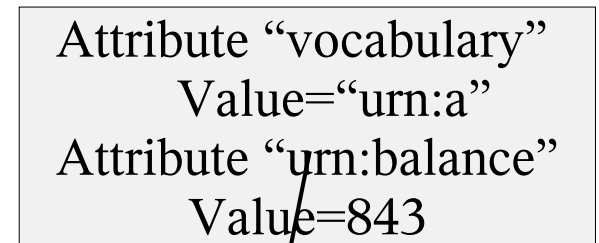


XACML Policy Vocabulary

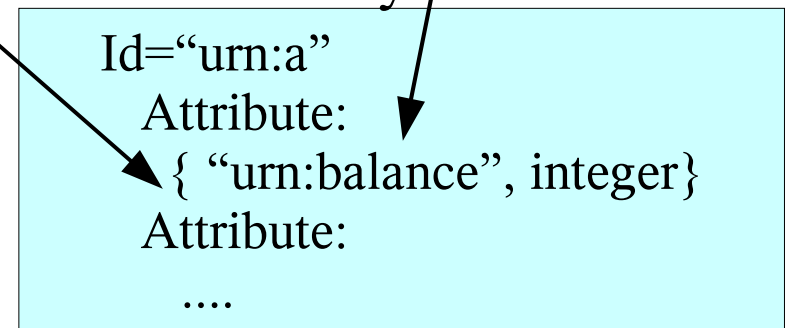
Policy



Request Context



Vocabulary



Vocabulary impact

- **EPAL: Specified in policy**
 - Policy evaluation can enforce agreement
 - Attribute references in Conditions do not need to include DataType, so policies shorter
 - Containers require Requester to know Containers needed for applicable Rules
- **XACML: Specified externally**
 - Vocabulary specifiers are not usually the ones who write policies, so more flexible
 - Request may supply only a subset of Attributes; whether sufficient determined during evaluation
 - XACML references can save re-specifying Attribute details

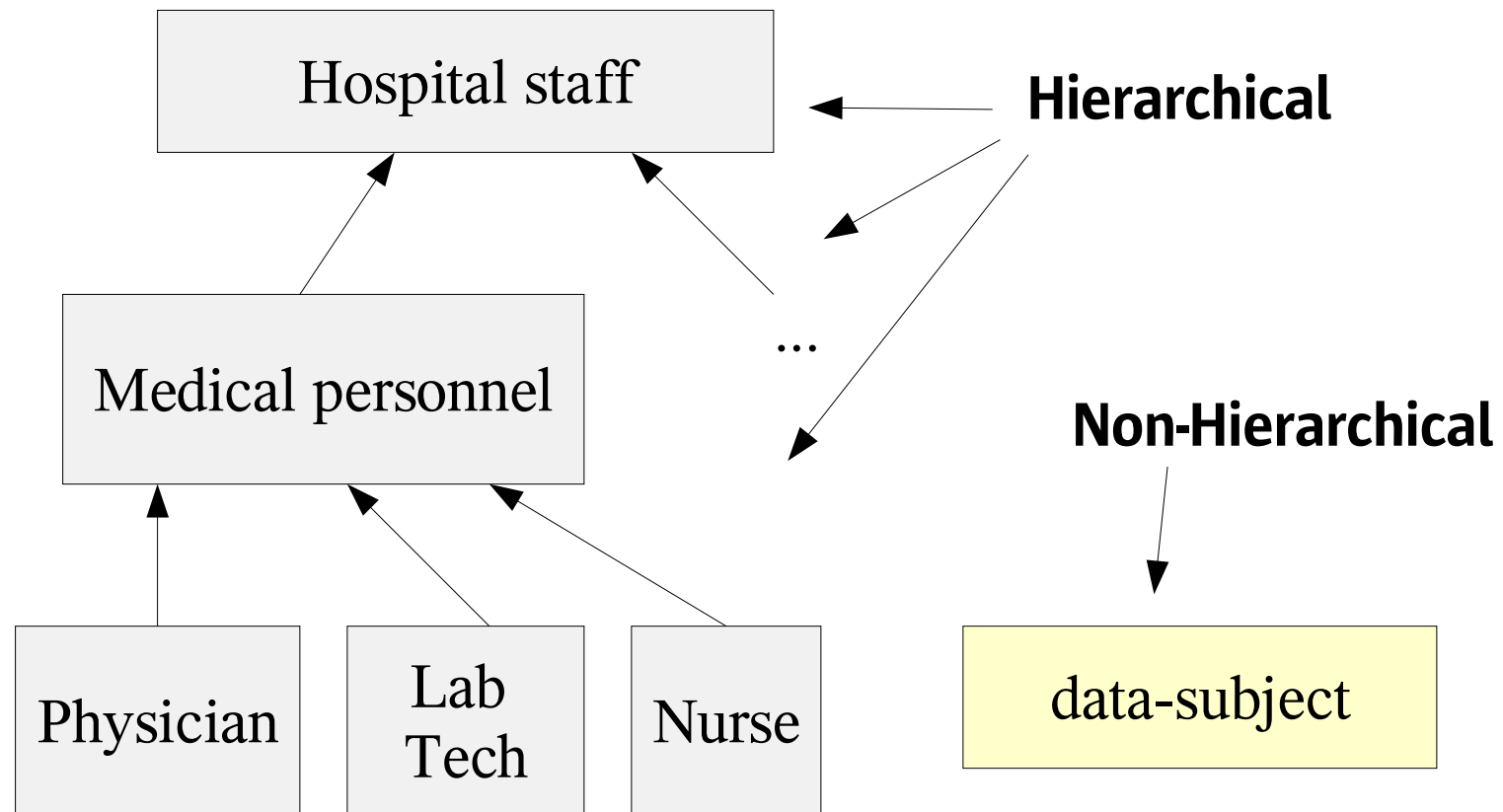
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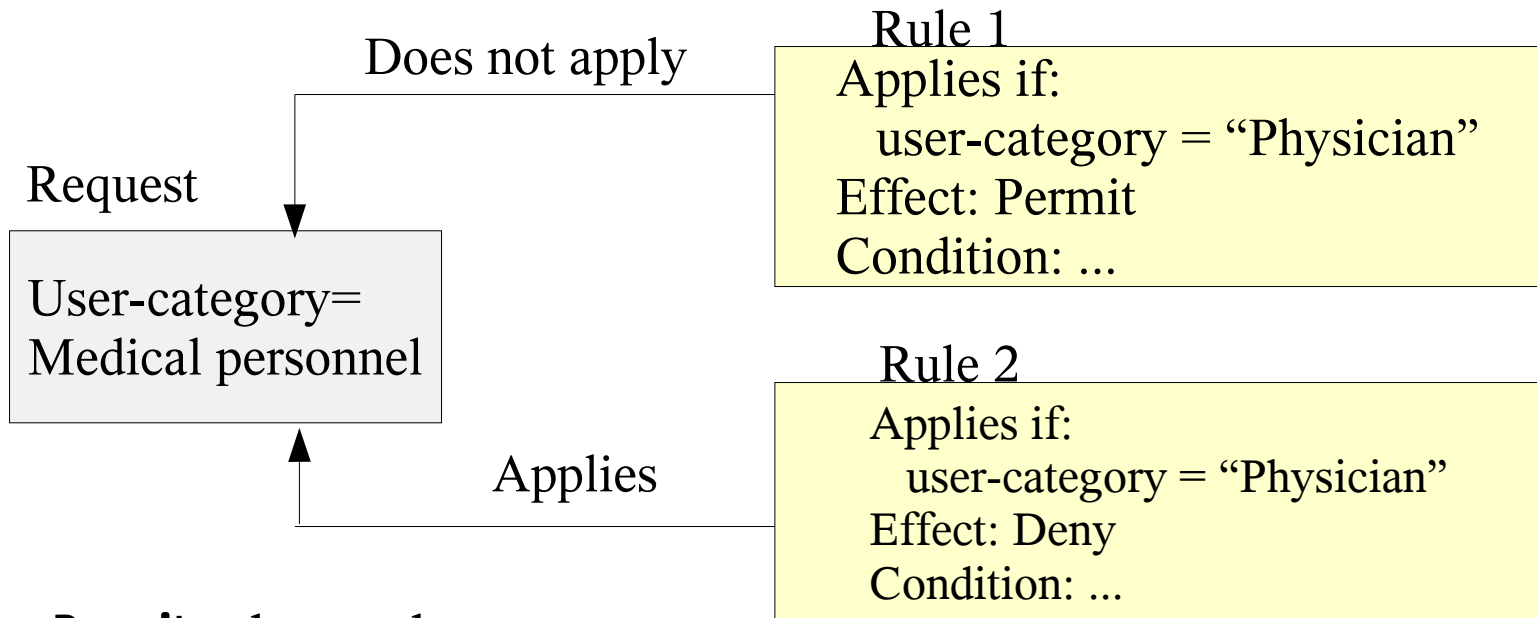
EPAL “categories”

- Two types of Attributes
 - 1) User-category, data-category, purpose-category
 - 2) Container attributes
- Categories
 - Used only for applicability of a Rule
 - At least one Attribute from each category type must be supplied in each Request
- Category Attributes may be hierarchical
- Semantic hierarchies, not physical

EPAL hierarchical vocabulary example: user-categories



EPAL rules and hierarchies



Permit rules apply to:

specified category and its descendants

Deny rules apply to:

specified category, its descendants, and its ancestors

XACML hierarchies

- Hierarchical “roles” (profiled for Subjects)
 - Inherit up: more senior/parent roles are more powerful
 - Senior roles also inherit “deny” permissions of juniors
 - Most senior role must be included in Request
- Hierarchical resources (profiled for Resources)
 - “resource-ancestor” or “scope”=“EntireHierarchy”, “Children”...
 - Constraints can be applied to those Attributes
- Semantic hierarchy possibilities
 - “Category” Attributes: “user-category”, “resource-category”, ... + “...-category-ancestor”, “...-category-descendant”
 - XML categories: XPath expressions to select ancestors or descendants, “xpath-node-match” operator (exists)

XACML: XML doc example

Resource

```
<MedicalRecord>  
  <PatientName>...  
  <PrimaryPhysician>...  
  <History>...  
  <Diagnosis>...  
  <AccountStatus>...  
</MedicalRecord>
```

Policy

Permit access if:

```
  Subject-id=  
/MedicalRecord/PatientName/text()  
  OR  
  { Subject-id=  
/MedicalRecord/PrimaryPhysician/text()  
  AND  
  Resource-id≠  
/MedicalRecord/AccountStatus/* }
```

Hierarchy impact: EPAL

•EPAL

- Models typical privacy policy abstraction levels well
- Hierarchies defined in policy itself
 - But policy writer often not hierarchy definer/owner
- Only user-category, data-category, purpose-category can be hierarchical
- Hierarchies used only for applicability of rules
- Semantic hierarchies, not physical hierarchies
 - Does not handle hierarchical documents (e.g. XML docs)
- Does not handle hierarchical roles (where parents inherit privileges of children)
- Each combination of categories processed separately
 - Combinatorial explosion

Hierarchy impact: XACML

•XACML

- Does not handle semantic hierarchies (where children inherit semantics and privileges of parents)
- Open question: can “category” Attributes and XACML Context Handler handle semantic hierarchies?
- Handles access to subtrees of hierarchical documents
 - One response for entire subtree (if ALL permit), OR
 - Response per node in subtree
- All role, other attributes evaluated in a single pass
- Each node in hierarchical resource document evaluated separately

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Subjects: EPAL

- One subject entity per access Request
- Entity may belong to multiple user-categories
- Each user-category evaluated as if submitted separately
 - Can't say “must be in Category A and Category B”
 - If any user-category gets “permit”, return “permit”
 - Secondly, if any user-category gets “deny”, return “deny”

Subjects: XACML

- One or more entities per Request
 - Id of user identified with session
 - Id of application initiating actual Request
 - Id of platform on which application is executing
 - Id of intended receiver of information
 -
- Any subject may have multiple roles
- All entities, roles evaluated at once

Subject handling: impact

•EPAL

- Only one subject entity per Request
- Only “permit-overrides” semantics supported:
 - E.g. Must be in Category A OR in Category B
- Separate evaluation pass for each category

•XACML

- Multiple subject entities all involved with the Request
- Flexible semantics supported:
 - E.g. Must be in Role A AND/OR Role B
- One evaluation pass for all entities, all roles

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Conclusion

- XACML is an OASIS Standard
 - EPAL is IBM proprietary specification
- XACML more flexible
 - EPAL is a subset of XACML functionality
 - XACML superset is important for privacy policies, scalability
- Exception: Semantic hierarchies
 - XACML does not support semantic hierarchies; EPAL does
 - Useful in connecting abstract to concrete policies
 - Is policy itself appropriate place to specify semantic hierarchies?
 - Open question: can XACML Context Handler fill the gap?

References

- A. Anderson, *A Comparison of EPAL and XACML*, <http://research.sun.com/projects/xacml/CompareEPALandXACML.html>
- T. Moses, ed., *eXtensible Access Control Markup Language (XACML) v2.0*, OASIS Standard, February 2005, <http://www.oasis-open.org/committees/xacml>
- T. Moses, ed., *Privacy profile of XACML v2.0*, OASIS Standard, February 2005, <http://www.oasis-open.org/committees/xacml>
- C. Powers, et al., eds., *Enterprise Privacy Authorization Language (EPAL 1.2)*, 10 November 2003, <http://www.w3.org/Submission/2003/SUBM-EPAL-20031110/>
- [Barth], A. Barth, J. C. Mitchell, J. Rosenstein, *Conflict and combination in privacy policy languages*, ACM Workshop on Privacy in the Electronic Society, 17 June 2004.



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