Secure Information Sharing within a Collaborative Environment

DoE ECPI Project

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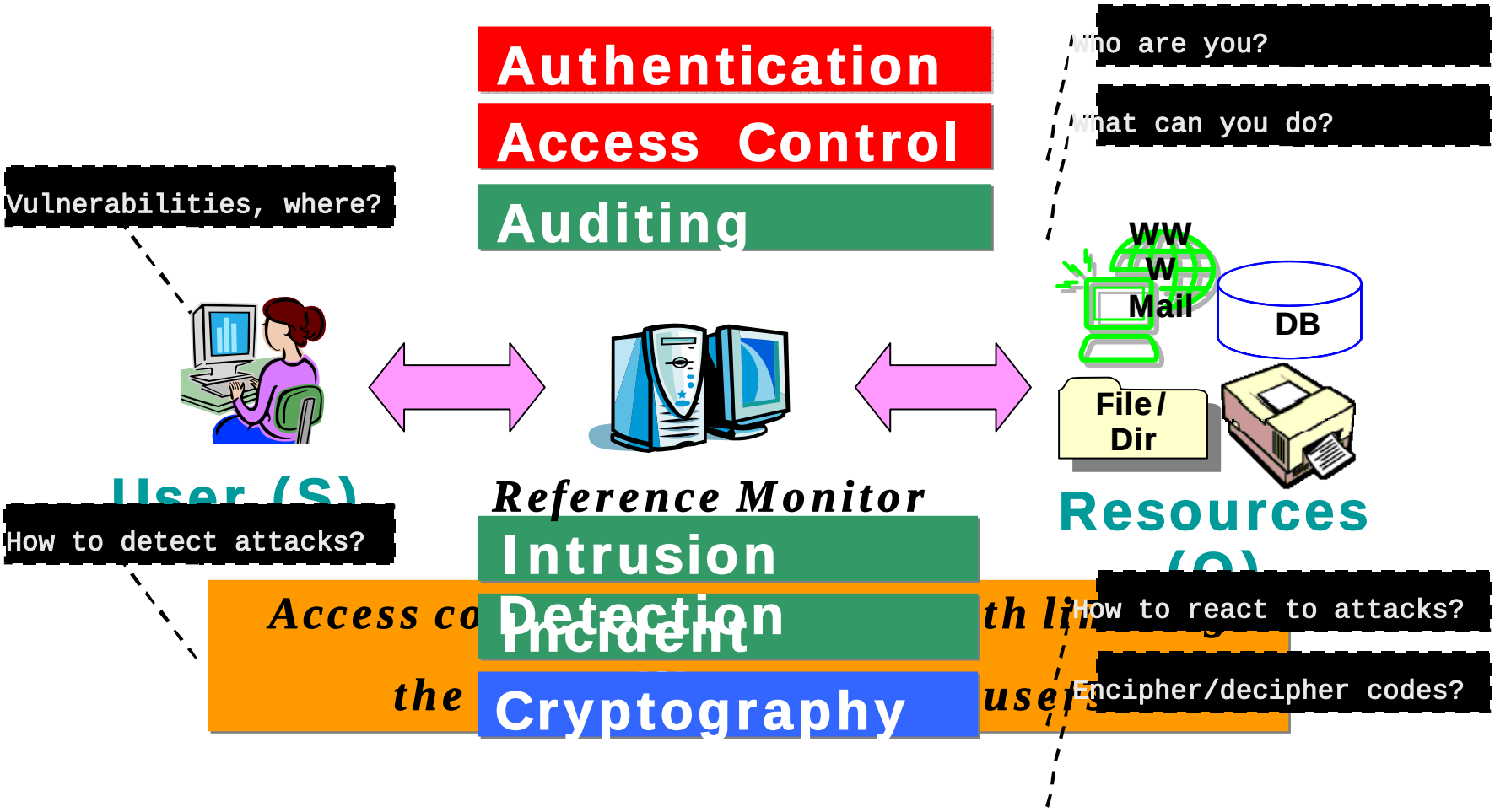
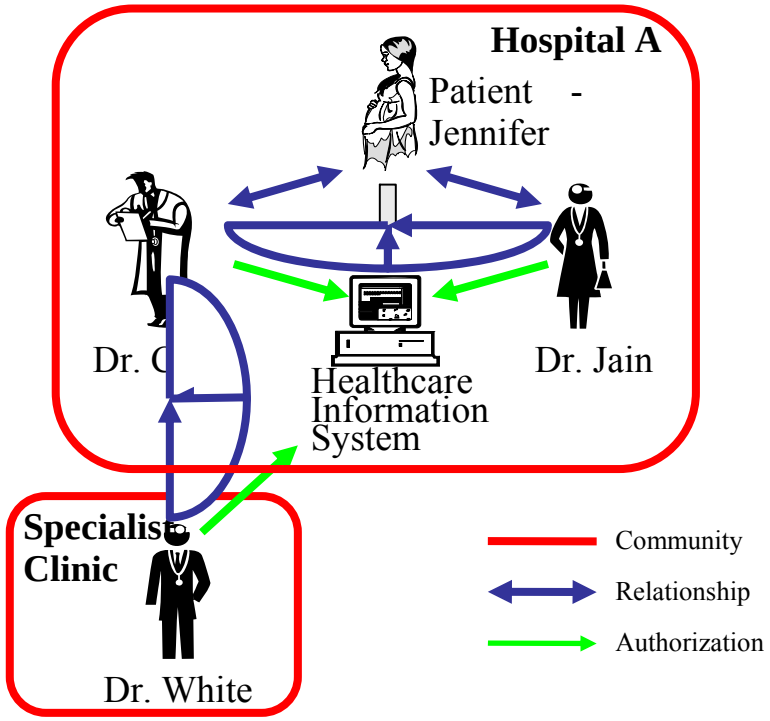
Security techniques



Collaborative Environment



How can we share critical information in a secure manner ?

- Selective information sharing is necessary
- Information may be shared across organizational boundaries
- It is impossible to fully predict what data should be shared, when and to whom

- **Authentication**
  - Scalable authentication
  - Token-based
- **Access Control**
  - Role-based delegation
  - Interoperable access management
- **Identity Management**
  - Privacy Attribute Mgmt
  - Identity Federation

- A mechanism must be provided for revoking the sharing when it is no longer needed

Research Issues

- Can we share information in a secure manner?
- Do we need new security models for this environment?
- What kind of security requirements/constraints/policies should be identified?
- How can we specify them?
- How can we enforce security policies over distributed domains?
- What security architectures are needed?

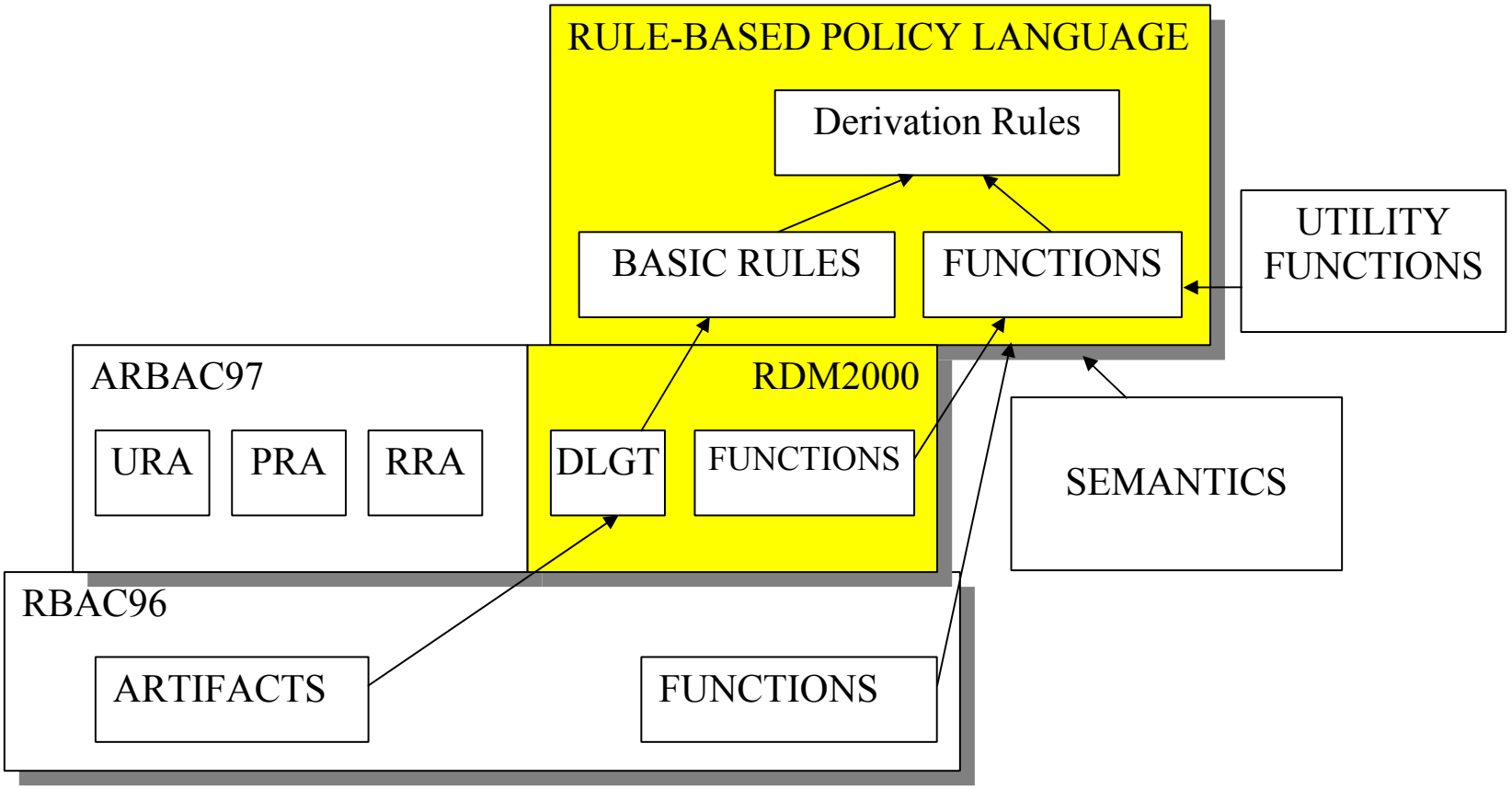
Our Approaches

- Propose security model to address human-to-human delegation and revocation
- Use authorization language to express and enforce delegation and revocation policies in this model
- Identify security architectures and supporting components
- Evaluate the feasibility and applicability of our approach

Delegation Issues

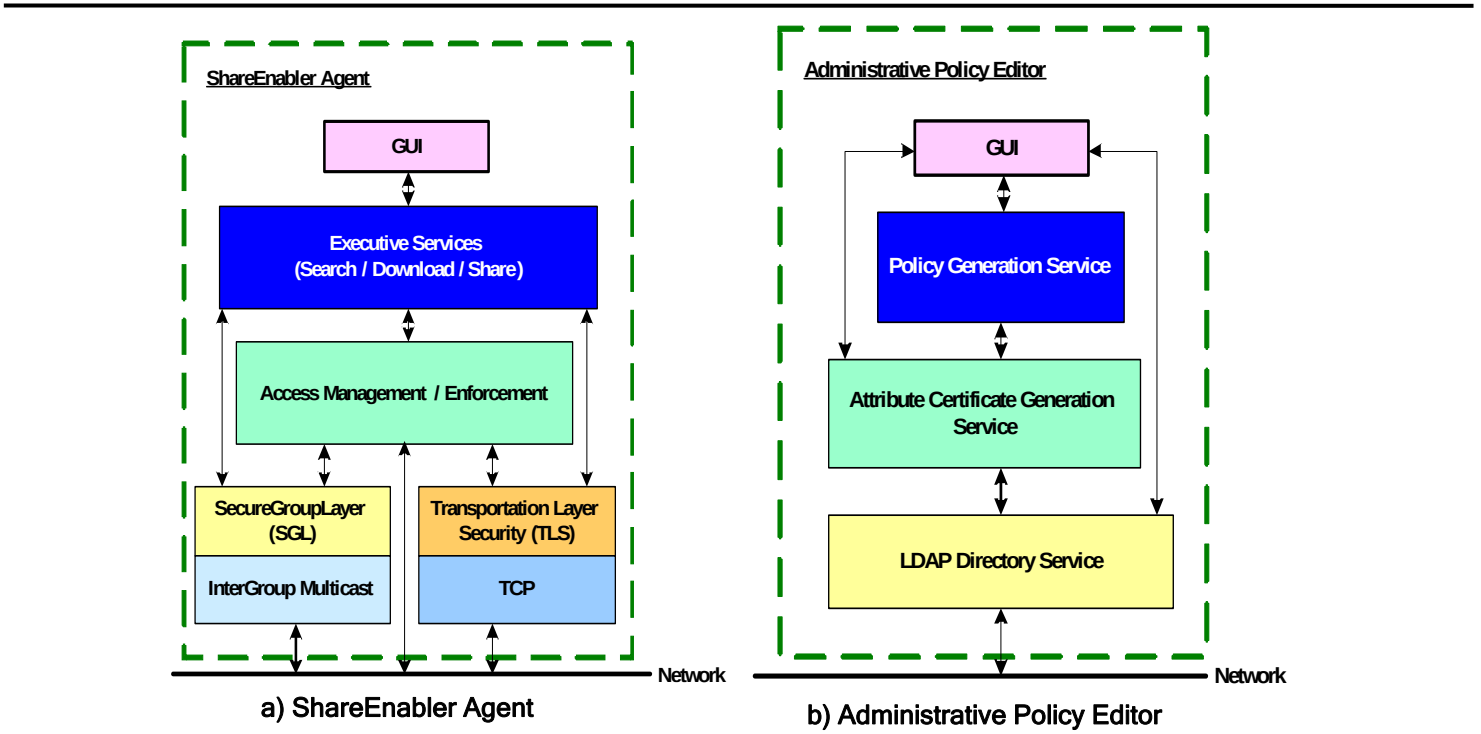
- Permanence
  - Type of delegation in terms of their time duration
- Monotonicity
  - The state of the power that the delegating role member possesses after he or she delegates the role
  - Monotonic and non-monotonic
- Totality
  - How completely the permissions assigned to a role are delegated
- Administration
  - Who will be the actual administrator of the delegation?
- Levels of delegation
  - Defines whether or not each delegation can be further delegated and for how many times
- Multiple delegation
  - The number of users to whom a delegating role member can delegate at any given time
  - More effective if the delegation is temporary
- Delegation Forms
  - Human-to-Human
    - A user delegates his/her privileges to anther users
  - Human-to-Machine
    - A user delegates his/her privileges to a system so that the system can access the resources on behalf of the user
  - Machine-to-Machine

Role-based Delegation



Available in **ACM Transactions on Information and System Security, Vol.6, No.3**

ShareEnabler



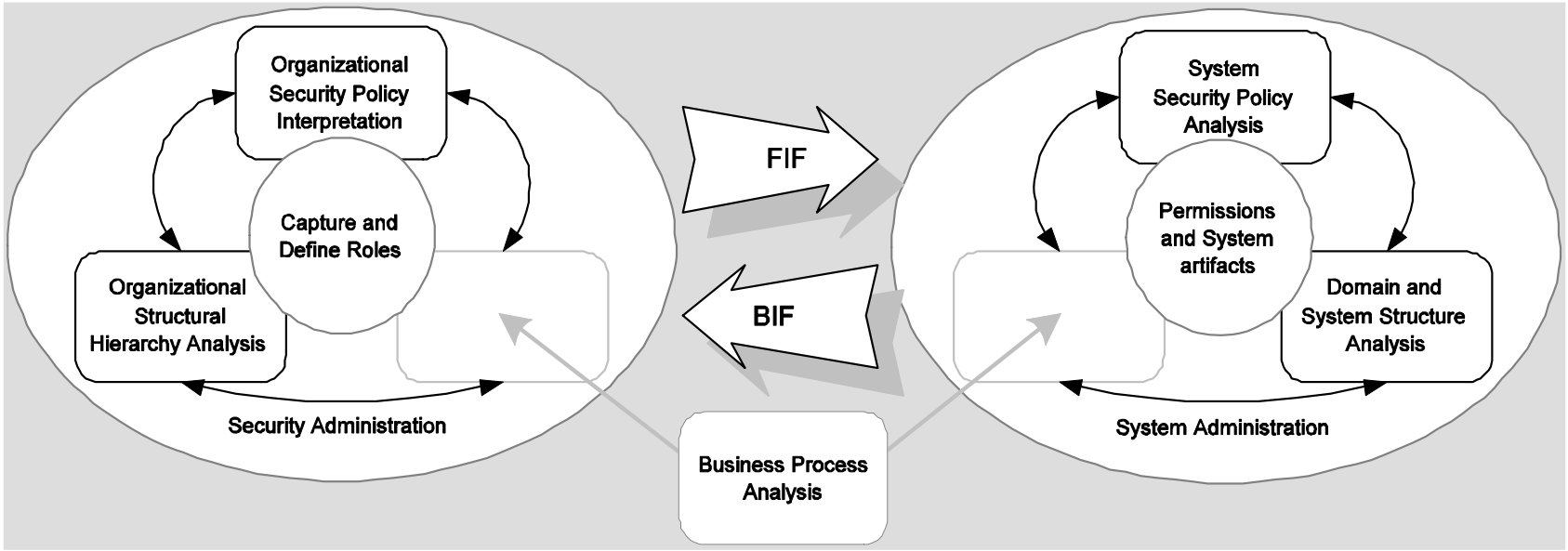
- Currently testing it on Grid and Scishare (P2P)

Other Supporting Components

- Role Engineering
  - Role identification
  - Meta-modeling
    - System, permission, and domain
- Role Administration
  - Structural analysis
  - Behavioral analysis

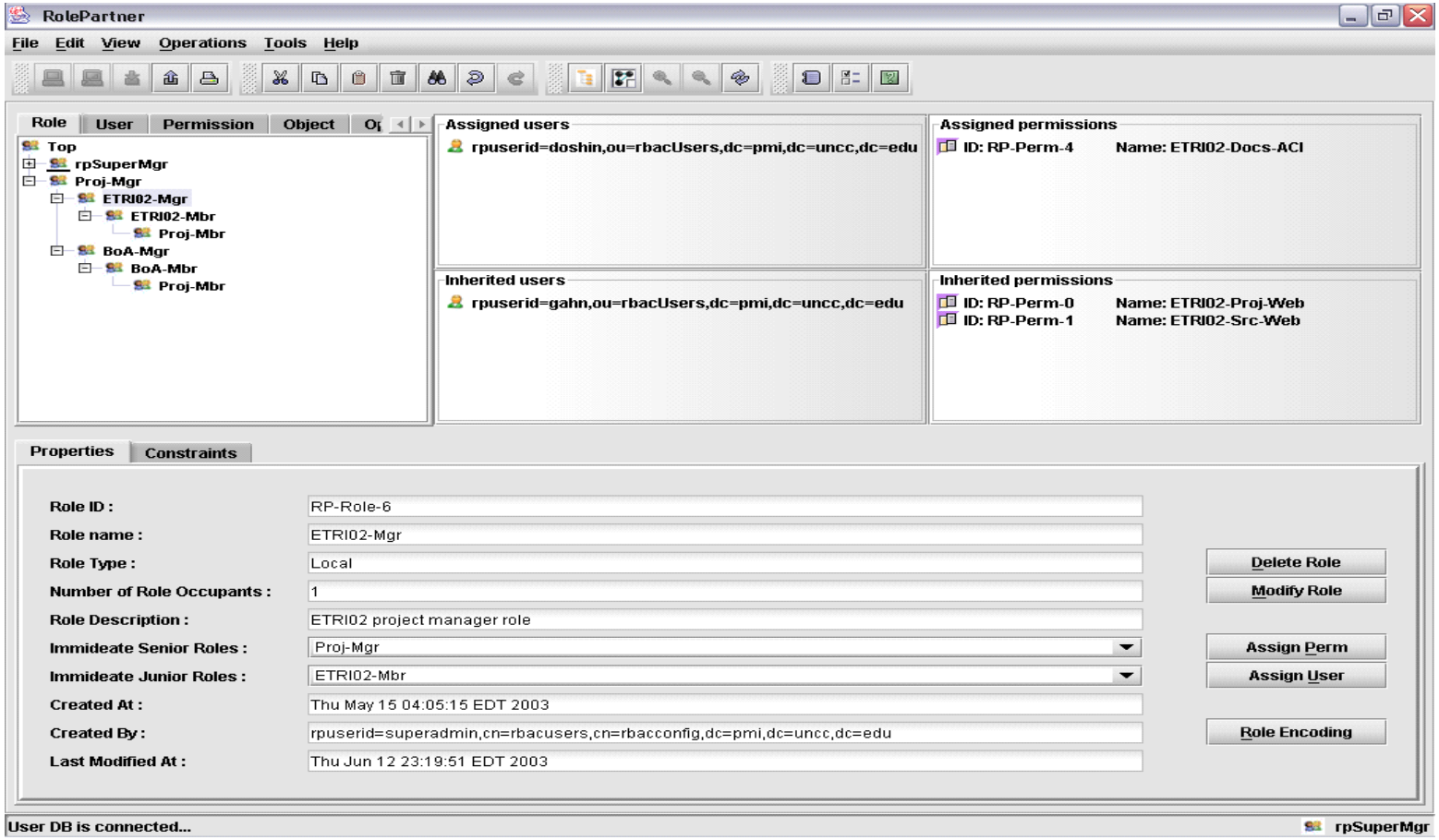
Information flow types in RE

- Forward Information Flow (FIF)
- Backward Information Flow (BIF)



"On Modeling System.centric Information for Role Engineer-ing," Proc. of 8th ACM Symposium on Access Control Model and Technology, June 2-3, 2003, Como, Italy.

RolePartner



Ongoing and Future Works

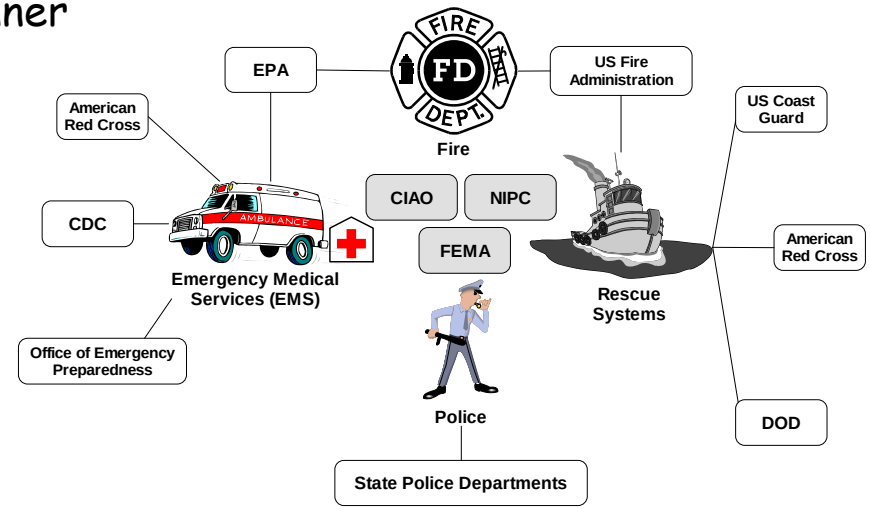
- **Ongoing related projects are**
  - Marriage with Wireless Communication and Collaborative Delegation
    - Supported by **NSF & DoE CAREER Award**
    - ACM TISSEC Vol.6 /No.3 2003, IEEE ITCC 2004
  - Private Attribute Management
    - Supported by **Bank of America**
    - IEEE IPCCC and DEXA 2004
  - Role Engineering Methodology
    - Collaboration with **NIST**
    - ACM SACMAT 2003, ACM SAC 2003
  - Vulnerabilities in Collaborative Systems
    - Supported by **SPAWAR**
- **Our future research includes**
  - Another type of delegation
    - Permission-centric delegation
    - Role-role delegation
  - Specification of constraints related to delegation
  - Correctness and convergence of rule derivations
  - Distribute and manage rules across organizational boundaries

Other Applicable Domains

Information sharing in Military domain ⇒

- Robotic warfare may be a reality by the year 2025.
- Battlefield robots need to communicate each other for their mission. They should be able to share information in a secure manner

Official DOD Photo



⇑ Proactive protection for Critical Infrastructures

- Critical infrastructures need to share information each other because one incidents in a critical infrastructure may cause severe damages to other infrastructures due to interdependencies between critical infrastructures

Summary

- First attempt to propose a systematic role-based delegation model
- We have
  - articulated issues in delegation
  - specified this model with rule-based language
  - implemented a role-based delegation framework to manage information sharing in the healthcare information system
    - System components, System architecture, System implementation
    - Highlighted features: rule management and context constraints
- Acknowledgement
  - Supported by **Department of Energy CAREER award** (DE-FG02-03ER25565) and **National Science Foundation** (IIS-0242393)