How to Exploit Ontologies in Trust Negotiation

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Traditional Access Control for Decentralized Systems

Assumption: I already know you---you have a local account!

Not a member?
Trust Negotiation

- Trust is based on parties’ properties
- Every party can define access control policies to control outsiders’ access to their sensitive resources
- Establish trust iteratively and bilaterally by the disclosure of certificates and by requests for certificates
Step 1: Alice requests a service from Bob

Step 2: Bob discloses his policy for the service

Step 3: Alice discloses her policy for VISA

Step 4: Bob discloses his BBB credential

Step 5: Alice discloses her VISA card credential

Step 6: Bob grants access to the service
Problems & Questions

■ Correctness of our policies
  ▪ Real-world policies are complex
  ▪ Errors might provide inappropriate access

■ How to avoid information leakage?
  ▪ E.g. authorized entities may try to get access not relevant to the current negotiation
Sharing Policies for Common Attributes

- Id
- Name
- String

Enterprise_Issued_Id
- Rank
- String

Government_Issued_Id
- Age
- Integer

IBM_Employee_Id
- Name
- String
- Rank
- String

Cisco_Employee_Id
- Department
- String
- Name
- String
- Rank
- String

State_Id
- Age
- Integer
- Name
- String

DL
- Age
- Integer
- Name
- String
Composing and Overriding Policies

Mandatory
- P1 = {Signed by authorized authority}

Default
- P2 = {Non-commercial}
- P3 = {Category not F}
- P4 = {4 years experience}
- P5 = {3 years experience}

Illinois driver = {P1, P2, P3, P4, P5}

Texas driver = {P1, P2, P4}
Avoiding Information Leaking Requests
Avoiding Answering Unnecessary Requests

Financial_Transaction
- Id: Integer
- Name: String

Investment
- Custodial_Account: Float

Loan
- Credit_Rating: Float
- Employment_History: String*

Credit
- Credit_Card_#: Integer
- Expiration_Date: String

Small_Business
- Business_License: String

Home
- Utilities_Payment_History: String

Need-to-know Disclosure

Request
Conclusions

Ontologies can be used to

- Make easy management of policies
  - Composition and overriding of policies
    - Mandatory and default policies

- Avoid information leakage
  - Need-to-know disclosure
  - Predisposed negotiation
Questions?