W3C Workshop on

Languages for Privacy Policy Negotiation & Semantics Driven Enforcement

Ispra, 17-18 Oct 2006

Flexible and Usable Policies

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and coordinator of REWERSE WG I2 - Policies

- **REWERSE** is one of the 2 EC FP6 Networks of Excellence devoted to the SW
  - Ranked 6th among 1-1.5K IST proposals in FP6
  - 27 institutions (academy + industry)
  - > 5 million euro
  - focussed on rule-based techniques
  - policies identified as crucial area
  - WG I2 devoted to *policy specification, composition, conformance*
  - using a broad notion of policy – today we focus on privacy

From Access control to Privacy policies

- Same goal
  - Protecting confidentiality
- Local and Remote access control
  - Sticky policies
    - Nonstandard integration & (law) compliance needs
- Under extreme flexibility requirements
  - Interacting with all sorts of services (interoperability)
    - Navigating the Internet, Pervasive computing, ...
  - In extremely dynamic contexts
    - New business models, virtual organizations
    - Fast & easy composition / integration / harmonization
    - Pervasive computing environments – time & location
    - Walking through an airport, sharing info with new friends, using airport services, ...
- New, more expressive languages are needed

Importance of user awareness & control

- Automated information negotiations
  - Essential for usability, but
  - Users may loose control
  - What information is released and when?
  - Explaining policies & negotiations
- No *one size fits all* information release policies
  - In security default policies have already proved their limits
  - Policy personalization should be at everybody's reach
  - User-friendly personalization for untrained users

Mechanisms for Privacy Policies
extend standard mechanisms

- Trust-based disclosure decisions, info negotiation
  - Example: Credential negotiation
  - From need-to-know to need-for-goal (purpose based)
  - Balancing risks and benefits
  - Minimizing the amount and sensitivity of disclosed information
  - New languages before new enforcement mechanisms
- Policy matching and comparison for
  - Disclosure decisions (compliance with privacy requirements)
  - Service selection
- Policy negotiation
  - Conflict resolution
  - Preference handling
  - Incentives to information disclosure
- Explanation facilities & Controlled NL Front ends

Semantic processing
more than interoperability

- Heterogeneous policies
  - Ontologies for interoperability & integration
- One policy, many uses
  - Enforcement, negotiation, comparison, explanation, ...
  - Policies as knowledge bases
    - b.t.w. policies may contain ontologies...
  - Declarative policy languages are needed
    - enhance also user awareness & control...

PROTUNE

REWERSE's Trust Negotiation Framework

Current state & work in progress

To be released by Dec 2006 on sourceforge

- Locally enforced, trust-based privacy policies
- Policy-driven negotiations
- Explanation facility
  - Policies and negotiations

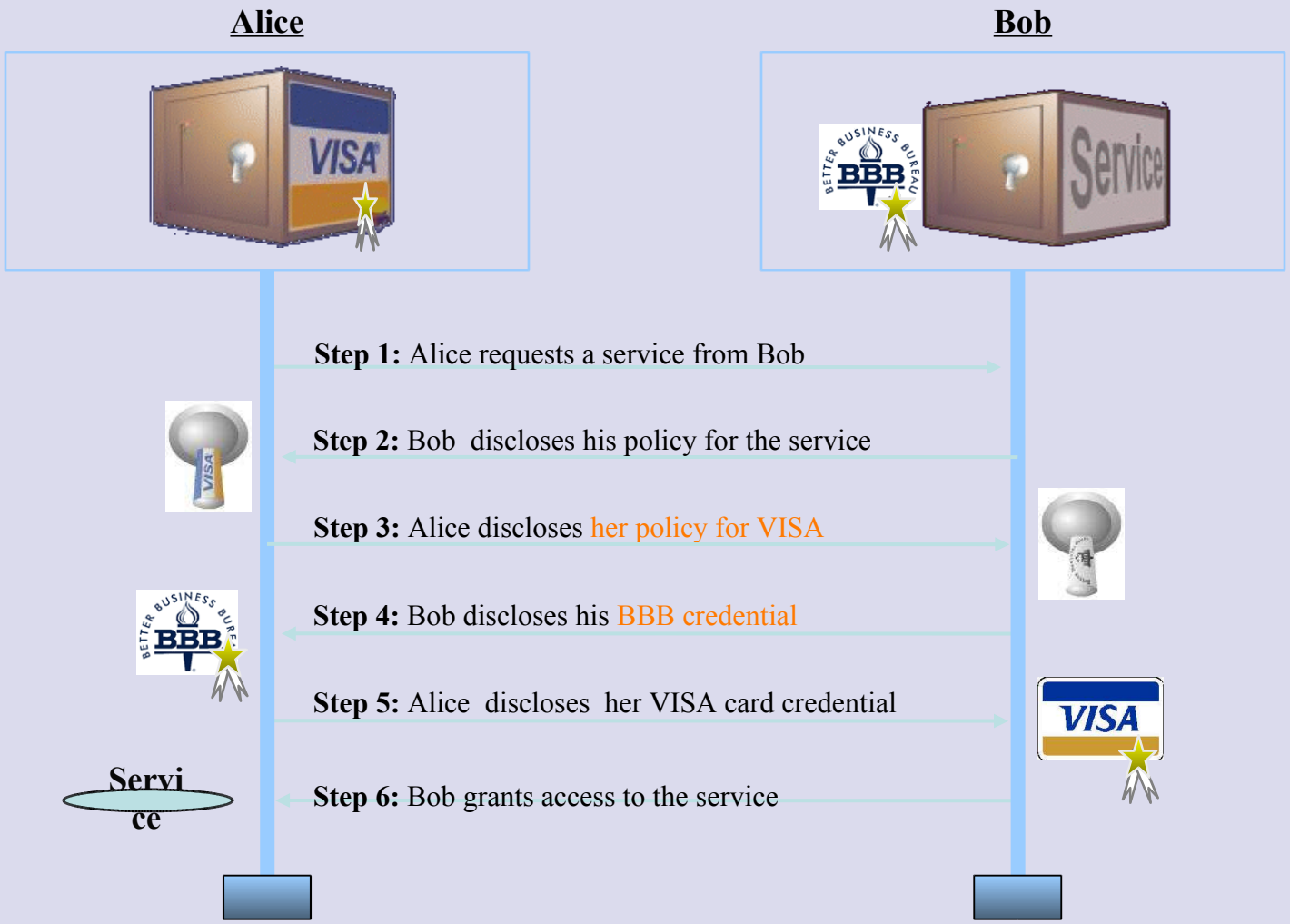
Sticky policies (nonlocal enforcement)

- Joint work with M. Winslett and C. Zhang in CCS 2005

Future work

- More on sticky policies
- Policy comparison & negotiation
- Protune on small mobile appliances

Policy-driven Negotiations
uniform treatment of all policies



[*Bonatti, Samarati.* **A Uniform Framework...** CCS 2000 and J. of Comp. Security 2002]

The policy language
how to represent Bob's policy

- Protune adopts rules (natural!)
- Arbitrary boolean combinations of items
- Restrictions on their attributes
- Possibly recursive conditions
  - Credential chains (~ transitive closure)

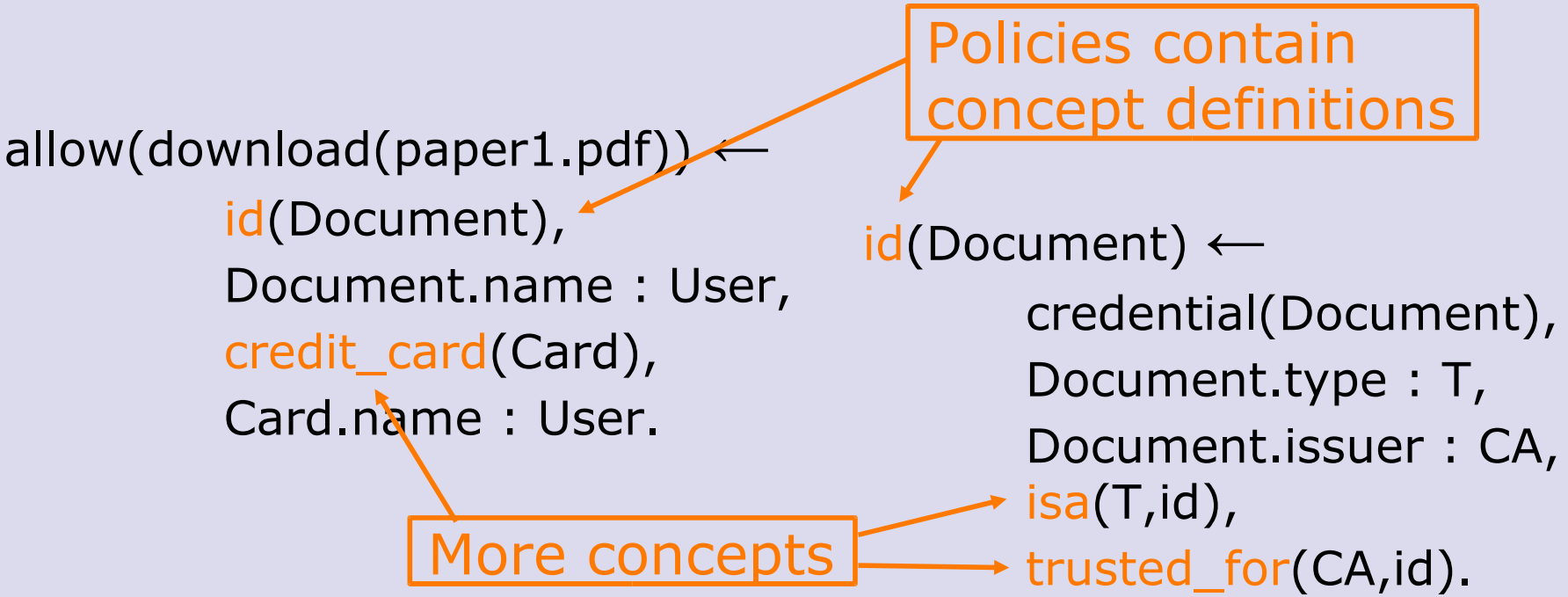
```
allow(download(paper1.pdf)) ←
        id(Document),
        Document.name : User,
        credit_card(Card),
        Card.name : User.
```

Credentials

Restrictions

The policy language
how to represent Bob's policy

- Policies may define **concepts**
  - Policies may include ontologies
  - Released along with requirements to explain them in a machine readable format



The policy language
Alice's privacy policy

- Expressed in a uniform way

```
release(visa_card, Requester) ←
        BBB_member(Requester),
        purpose : purchase(Item),
        Item.cost > 100.

BBB_member(Requester) ←
        credential(C),
        C.issuer : "BBB",
        C.public_key : TheKey
        challenge(Requester,TheKey).
```

Decision based on trust, purpose and risk

Ontology

Minimal shared language

- Defined concepts are eventually grounded on a small number of primitives
  - X.509 credentials
  - declarations (similar to web forms)
  - connect(URI), challenge (actions)
- Based on which a negotiation engine may
  - Submit the required info (if the disclosure policy permits)
  - Execute an action (if the policy permits)
  - Query the user first (if the policy says so)
  - Refuse to comply (the negotiation may fail of proceed differently)

Minimal prerequisites for application

A common understanding of

- Rule semantics
- The shared primitives
  - Credential format (X.509 standard), declaration forms, connect and challenge
- No further semantic infrastructure needed
- Lightweight reasoning (Horn clauses)

Claim

- Technologically feasible
- Even on small mobile appliances

Policies are not (only) passive objects

Policies may specify

- Event logging
- Communications and notifications
  - e.g. query-the-user
- Workflow triggering
  - such as (partly) manual registration procedures

i.e. Policies may specify actions

- To be interleaved with the decision process

Strong, Soft, and Lightweight Evidence

Trust sources

- Strong evidence
  - e.g. **digital credentials** (id, credit cards, subscriptions)
- Soft evidence
  - e.g. **numerical reputation measures**
- Lightweight evidence
  - e.g. **"accept buttons"** (copyright/license agreements)

They can be integrated for balancing:

- trust level
- risk level
- computational costs
- usability (fetching credentials, personal assistants)

Strong, Soft, and Lightweight Evidence

How can individuals *prove* their eligibility?

- Strong evidence
  - e.g. **digital credentials**
- Soft evidence
  - e.g. **numerical reputation measures**
- Lightweight evidence
  - e.g. **"accept buttons"**

They should be integrated for balancing:

- trust level
- risk level
- computational costs
- usability (fetching credentials, personal assistants)

E.g. micropayments vs. buying plane tickets

Exploiting "external" systems

Decisions need data, information, and knowledge

- Each organization has its own
  - Already available through **legacy software and data**
  - A realistic solution *must* interoperate with them
- Third parties
  - Credit card sites for validity checking
  - Credential repositories
- Variety of web resources
- Protune: special syntax for external calls

Explanation mechanism

Main challenge:

- Finding the right tradeoff between
  - Explanation quality (2nd generation explanation facilities)
    - Remove irrelevant information
    - User-friendly denotation of internal objects
    - User-oriented description of reasoning
  - Framework instantiation effort
    - The framework needs to be adapted to each application domain
    - Expensive in 2nd generation EF (ad hoc KB and engine)
    - Reduce the need for specialized staff
  - Computational load

Protune's explanation facility

- Supported queries
  - Why / Why not (for explaining negotiations)
  - How to (for explaining policies)
  - What if (for validating policies)
- Explanations can be built on clients
  - Almost no overhead on servers
  - Scalable approach

Controlled natural language specs

- We are aiming at specifications like

  Credit cards can be released to BBB members if the cost of the purchased item is at least 100 euros

- Based on an evolution of the Attempto system for controlled natural language processing

http :// www.ifi.unizh.ch / attempto /

Protune is evolvable

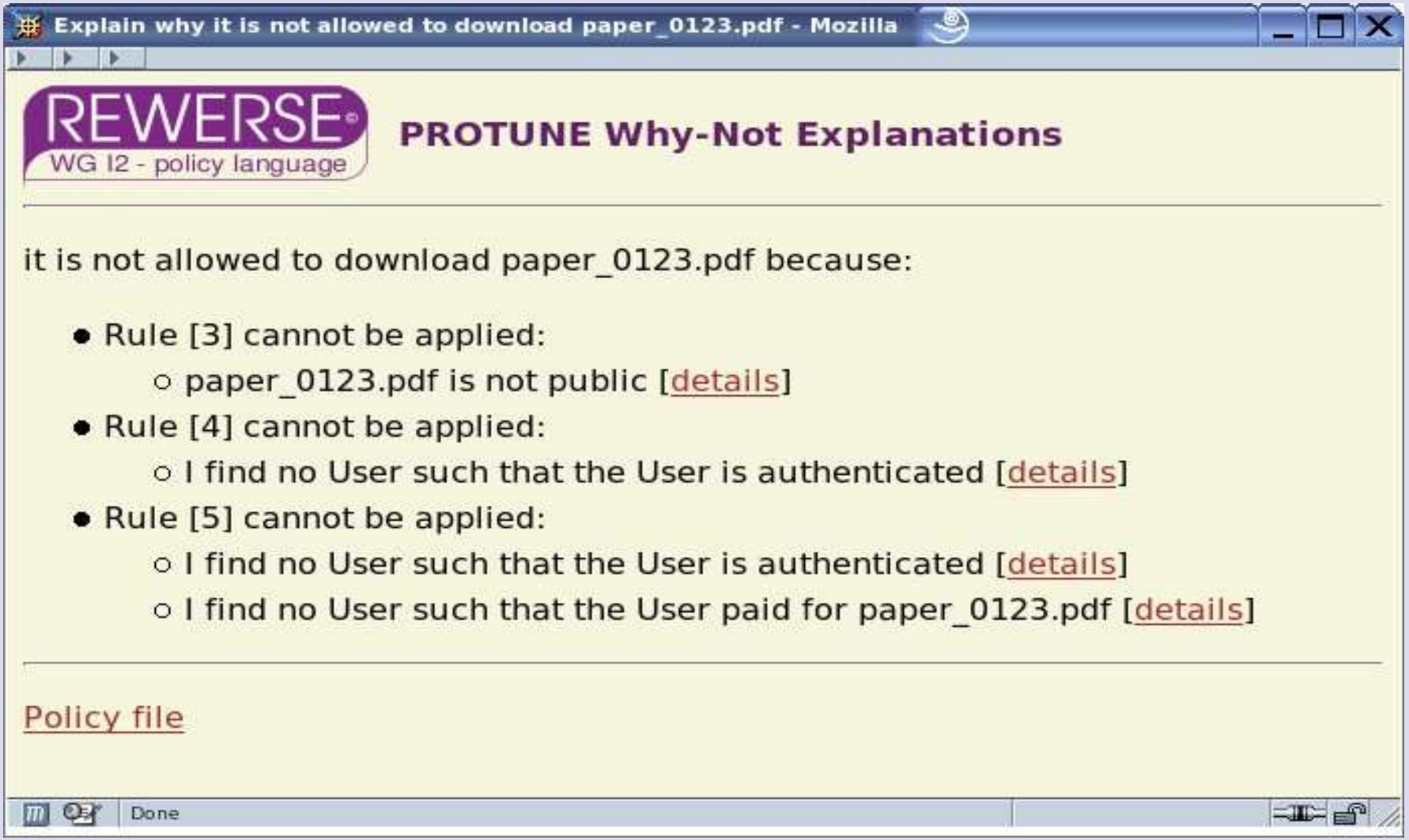
- Two powerful mechanisms
  - Rule libraries
  - Metapolicies
- For language extensions
- For controlling negotiations

REWERSE
WG I2 - Policies

DISCUSSION

[More on **http : //rewerse.net/i2/**]

Why-not demo
sample screenshot



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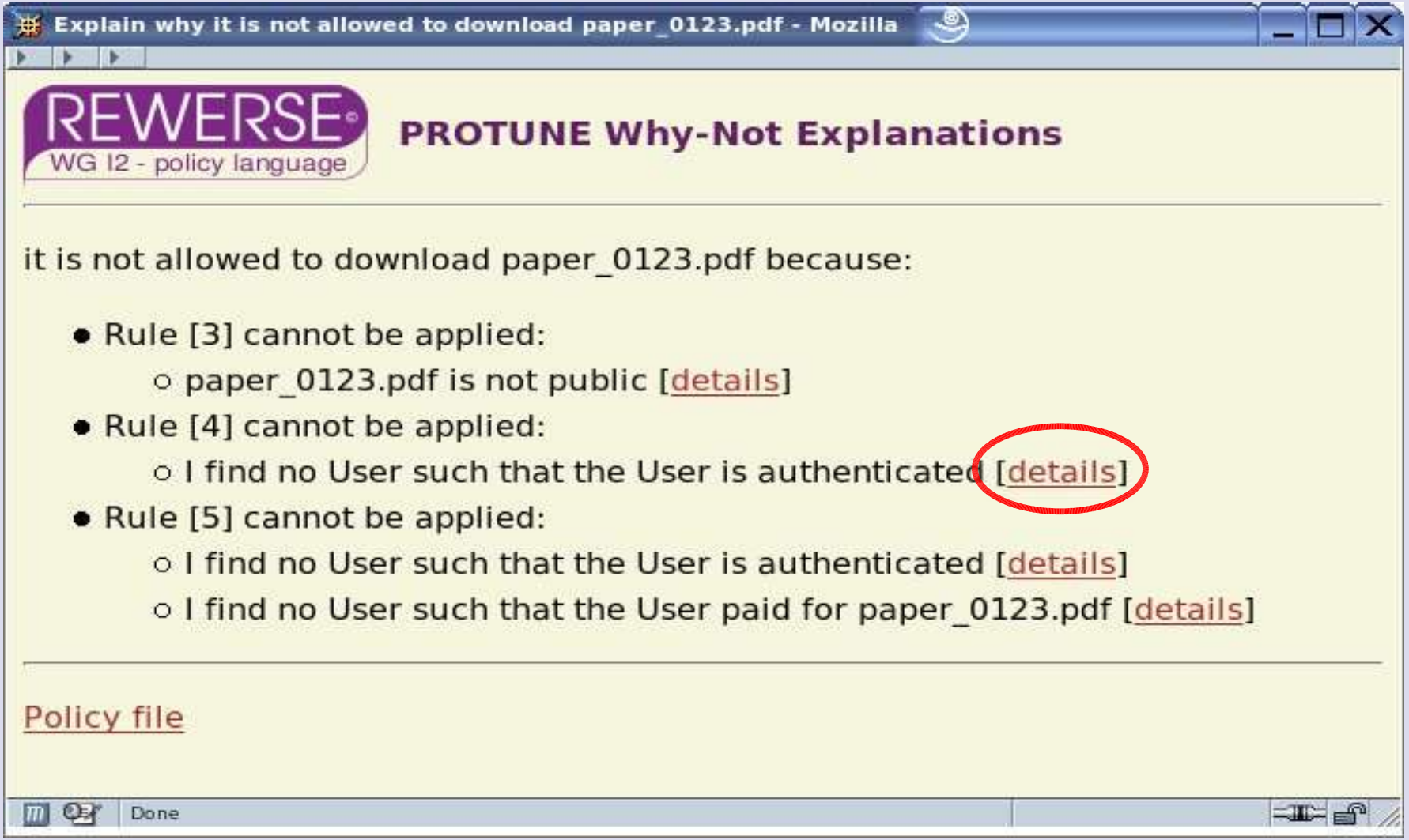

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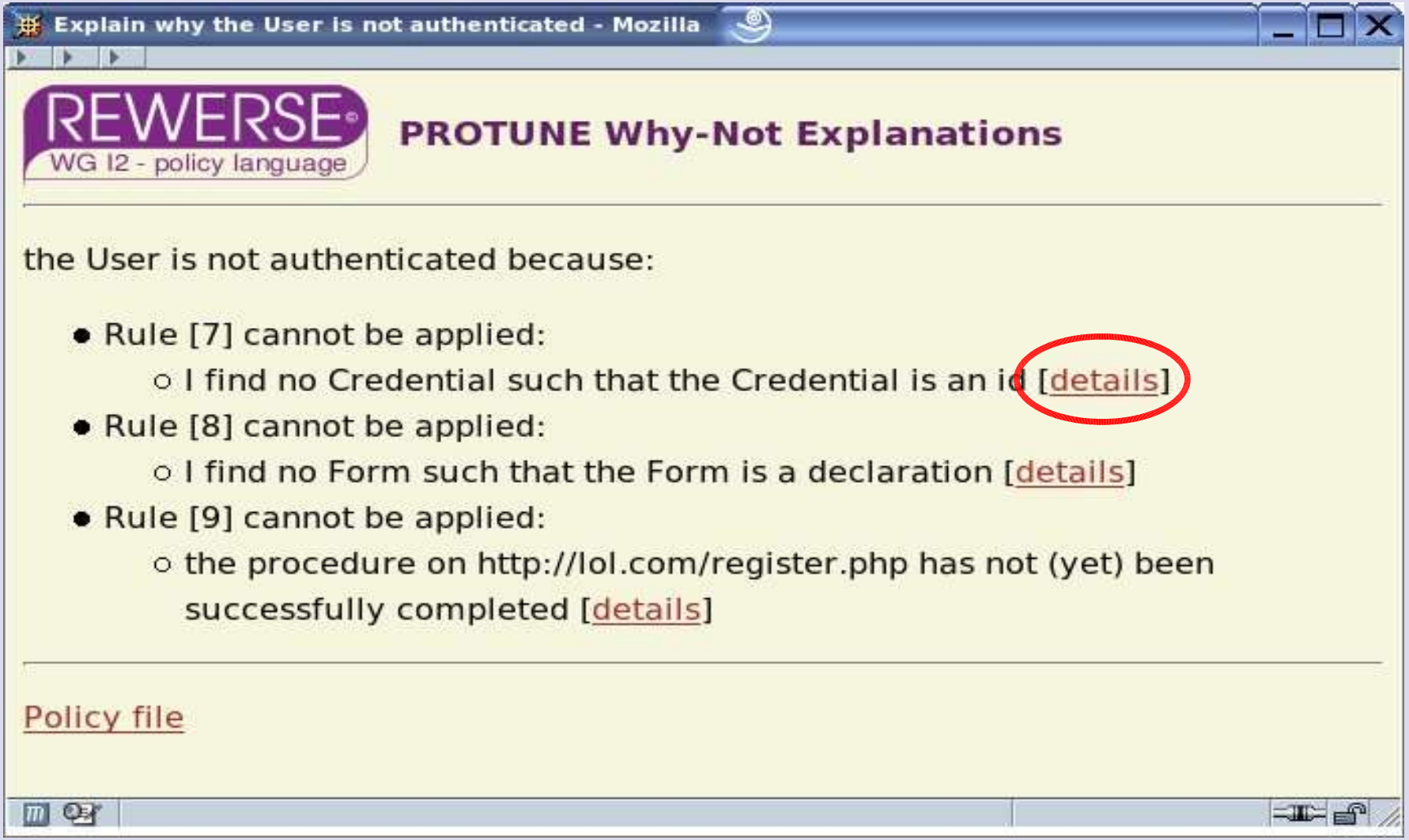
sample screenshot



Why-not demo
after one more step...