ASPiS
integrating iRODS with Shibboleth and provenance engines

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Outline

1. iRODS and Shibboleth
   - Access Control in iRODS
   - Shibboleth
   - ASPiS Access Control System

2. iRODS and Provenance
   - Provenance in iRODS
   - Provenance Systems
   - ASPiS Provenance System
Funded by JISC e-Infrastructure programme.

Partners:
- Centre for e-Research, King’s College London
- University of Liverpool
- Science and Technology Facilities Council
- (University of Reading - very helpful PhD student)

Project Goals:
1. access management in iRODS - integration with Shibboleth (and authorisation systems such as PERMIS).
2. integration of iRODS with provenance capture systems.
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# iRODS Authentication

## Username + Password

- **User**
  - iiinit
  - password

- **Client**
  - .irodsEnv
  - .irodsA
  - hashed password

- **iRODS**
  - username + hashed p/w
  - AuthN response

- **.irodsA**
  - contains list of usernames and passwords

- **iCAT**
  - contains list of usernames and passwords

## GSI

- **User**
  - iiinit

- **Client**
  - certificate on client machine

- **Proxy Server**
  - provides proxy cert.

- **iRODS**
  - challenge & response
  - AuthN response

- **iCAT**
  - contains list of usernames and DNs

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iRODS Authorization

- iCAT stores information on:
  - Users
  - Domains
  - Groups
  - Access Control Lists (ACLs)

- Access managed according to:
  - Mode of access (read / write / delete / annotate)
  - By user, domain, group

- Information held centrally
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Information held centrally
Observed Issues

- Centralised management of user identities and access rights
- Doesn’t scale well
- Different organisations cannot maintain their own lists of users in data grid - duplication, lists can get out of sync
- Inflexible authorisation system - no locally managed admin of access rights
- Certificates a barrier to uptake of grids in some communities
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Shibboleth Overview

- Architecture for federated access to web based resources
- Based on circle of trust among organisations
- User identities managed locally to their institution
- Access to resources managed locally to the owning institution
- Adopted by JISC as a solution for managing access to distributed web resources
UK Access Management Federation for Education and Research

- Based on SAML (Security Assertion Markup Language)
- Provides a single access solution to online resources/services
- Metadata based on the Internet2 eduPerson LDAP schema

Core Federation eduPerson attributes

- ScopedAffiliation → staff@kcl.ac.uk, visitor@stfc.ac.uk
- TargetedId → idp.kcl.ac.uk!sp.stfc.uk!<opaque string>
- PrincipalName → eric.liao@kcl.ac.uk
- Entitlement → urn:mace:ac.uk:irods.stfc.ac.uk:visitor
UK Federation

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Access Control Requirements

- Devolve authentication service to user’s home institution
- Common interface layer to decouple authorization services
- Access control allowing fine-grained access rights to be defined for roles, not just user identities
- No interference to iRODS core system
Access Control Architecture
Access Control Rules

iRODS Rule Engine

- Retrieve Attributes
- Check Attributes
- Enforce Decision
- User Action

Shibboleth Authorization

PIP

PDP

PEP

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Overview

- Provenance → history of operation applied to a digital object

Provenance is an important issue

- Gives history of events
- Allows to verify the authenticity of data
- Determines quality of data
- Supports researchers in many ways (e.g. re-executing experiments)

Provenance in iRODS

- iRODS does not capture changes made to data
- iRODS’s metadata is not sufficient to capture workflows
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Key Requirements

- Manage data throughout its lifecycle
- Capture and record information about the data analysis
- Enforce ownership of data throughout its lifetime
- Ensure data access is auditable
- Ensure infrastructure is robust and scalable
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- Independent protocols for recording and accessing provenance
Karma

- Publish-subscribe notification protocol
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Provenance System Requirements

- Meet provenance requirements
- No interference with iRODS core system
- Provenance system should be applicable for any other system
- Easy to use
- Eliminate single point of failure within PASOA and Karma
Provenance System Design Ideas

Microservice Wrapper

- Embed user microservice in provenance microservice
- Capturing all information
- User microservice has to be modified

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Provenance System Design Ideas

**Microservice Chain**
- Embed provenance microservice in user microservice
- User deals with capturing specific data
- Decouples capturing and reading

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A Provenance Framework

- Recording service (P-Service) + Querying service (Q-Service)
- Balanced distributed web service lookup system
Work so far & Future plans

Completed Work
- Liased with potential users and determined initial use cases
- Developed prototypes for iRODS-Shibboleth integration
- Developed prototypes for iRODS-Provenance integration

Future Work
- Refine prototypes of access control and provenance systems
- Integration of access control and provenance systems
- Testing with use cases
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