ASPiS

Architecture for a Shibboleth-Protected iRODS System

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Interoperability of Digital Repositories @
Queen Mary University of London, UK, 2009

Outline

1. Background
    - Access Management
    - Provenance Capture
2. Design
    - Access Management
    - Provenance Capture
3. Implementation
4. Demo

Project Overview

- 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. enhanced access management for iRODS.
  2. enabling provenance capture in iRODS.
  3. engage a broader community with data grids.

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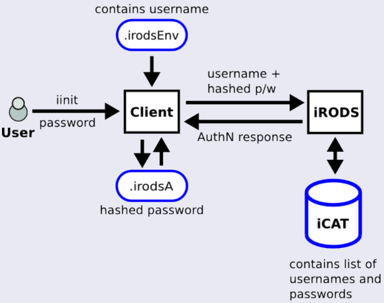
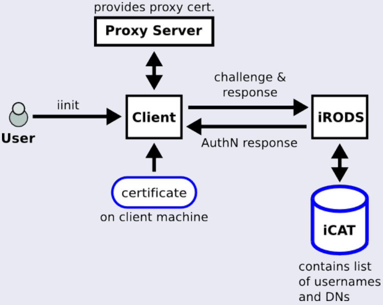
iRODS Authentication

Username + Password



GSI



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
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UK Federation

- **UK Access Management Federation for Education and Research**
  - Based on SAML (**S**ecurity **A**ssertion **M**arkup **L**anguage)
  - 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
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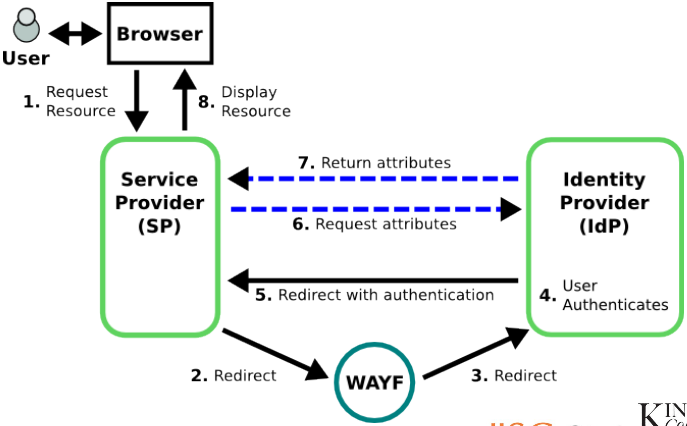
Shibboleth

- SAML software 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

Shibboleth Information Flow



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Overview

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- 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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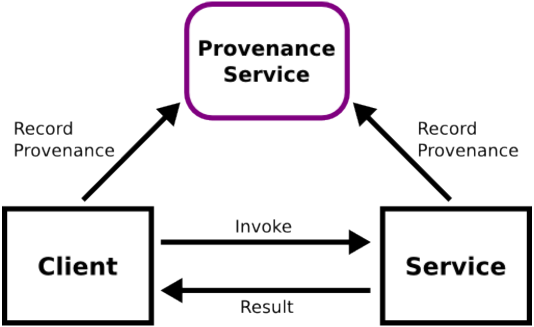
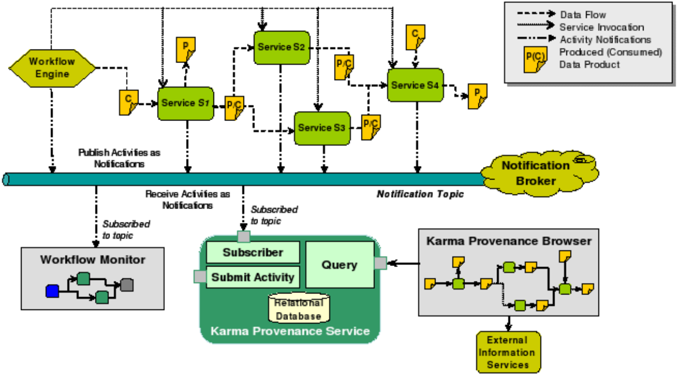
PASOA



- Independent protocols for recording and accessing provenance

Karma



processes

- Publish-subscribe notification protocol

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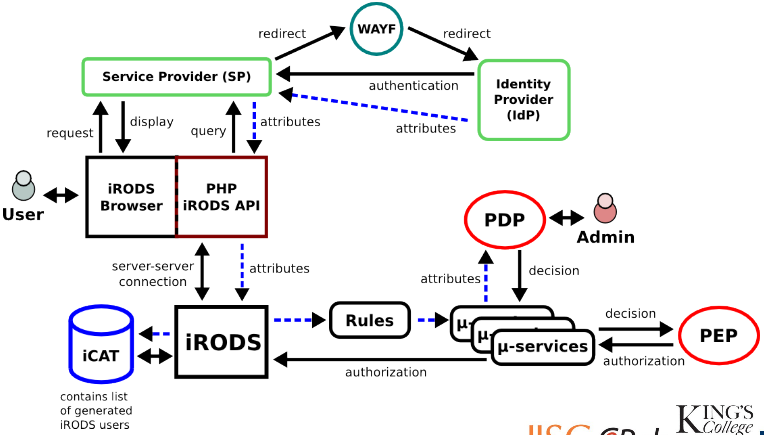
Requirements

- Devolve authentication service to user's home institution
- Common interface layer to decouple authorization services
- Allowing fine-grained access rights to be defined for roles, not just user identities
- No interference to iRODS core system

Architecture



iRODS Rules

<from the iRODS core.irb file>

```
...
acPreprocForDataObjOpen|$objPath1 like
/$rodsZoneProxy/home/$userNameClient/*|msiSortDataObj(random)|nop
acPreprocForDataObjOpen||acGetShibAuthorization(acPreprocForDataObjOpen,
$userNameClient)##msiSortDataObj(random)|nop##nop
...
acGetShibAuthorization(*rule, *user)||acGetAuthorizationInfo(*rule, *user)|nop
acGetAuthorizationInfo(*rule, *user)||msiGetShibAttributes(*user,
*attributes)##msiGetObjectPermissions(*rule, $objPath1, *readPerm, *updatePerm,
*deletePerm)##acCheckPermissions(*rule, *attributes, *readPerm, *updatePerm,
*deletePerm)|nop##nop##nop acCheckPermissions(*rule, *attributes, *readPerm, *updatePerm,
*deletePerm)||msiCheckPermissions(*attributes, *readPerm, *updatePerm, *deletePerm, *rule,
*decision)##msiEnforceAuthorizationDecision($userNameClient, $objPath1, *rule, *decision,
log_file)|nop##nop #acEnforceAuthorizationDecision(*rule,
*decision)||msiEnforceAuthorizationDecision($userNameClient, $objPath1, *rule, *decision,
log_file)|nop
...
```

iRODS Microservices

```
1 acGetShibAuthorization
2  + acGetAuthorizationInfo
3      + msiGetShibAttributes
4      + msiGetObjectPermissions
5      + acCheckPermissions
6          + msiCheckPermissions
7          + msiEnforceAuthorizationDecision
```

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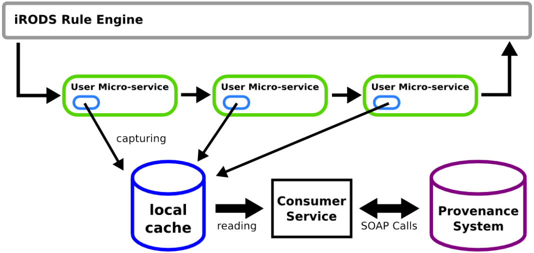
Requirements

- Key points:
    - Manage data throughout its lifecycle
    - Capture and record information about the data analysis
    - Enforce ownership of data thoughout its lifetime
    - Ensure data access is auditable
    - Ensure infrastructure is robust and scalable
- No interference with iRODS core system
- Provenance system should be applicable for any other system
- Easy to use

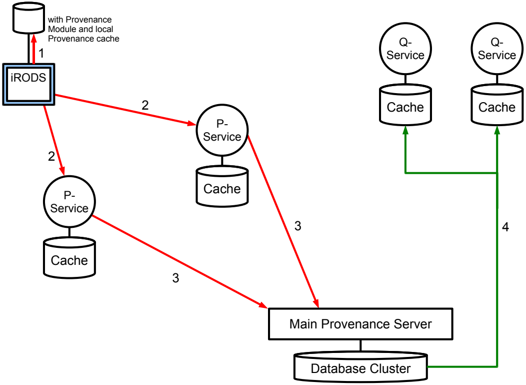
Architecture



Microservice Chain

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

Distributed Framework



Access Management

- **User Interface**
    - Highly modified iRODS Browser supporting Shibboleth
- **Middleware**
    - Extended PHP-iRODS interface
    - PHP authentication module
- **iRODS Integration**
    - Custom rules and microservices

Provenance Capture

- **Provenance Framework**
  - Java interface with distributed framework
- **Middleware**
  - Java interface with local provenance cache
- **iRODS Integration**
  - Custom rules and microservices

Live Demo!

Work so far & Future plans

Completed Work

- Developed prototypes for iRODS-Shibboleth integration
- Developed prototypes for iRODS-Provenance integration

Future Work

- Integration of access control and provenance systems
- Testing with use cases

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Thank you

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