Interoperable Authentication for the Virtual Observatory: an Update

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Reminder: What we'd like to see from interoperable security

- Trustworthy access to restricted resources
  - Remote storage: VOStore
  - Proprietary data: new data from observatory archives
  - CPU cycles: services that require significant computing power

  Resource providers need full control of access rights and auditing
- Single sign-on
  - User enters a username/password once per session
  - Can access many restricted resources in an operation from different providers
    - User can use the NOAO portal to access proprietary Hubble data in MAST
  - Interoperates with public (non-restricted) data and services seamlessly
  - Interoperability with Grid security
- A framework that can be leveraged by observatories
  - A common way to get at proprietary data
  - A common way to support security in portals
    - Simple toolkit for portal developers

Portal-Managed Certificates

Portal

Local Registration Service

NVO Registration Service

CA (Purse)

VO Project

UAS e.g., NVO

Certificate Repository (MyProxy)

Login Service

Archive #1

e.g. NOAO Science Archive

Restricted Service

Restricted Service

Restricted Service

Archive #2

e.g. MAST

A short-lived *proxy* certificate is returned to the portal.

Portal-Managed Certificates

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e.g. NOAO Science Archive

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Archive #2
e.g. MAST

The proxy certificate is used to access restricted services—e.g., to retrieve proprietary data.

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Restricted Service

Archive #2

e.g. MAST

During the same session, the portal can even retrieve proprietary data from other VO-compatible archives

Framework Principles

- X.509 Certificates for authenticating to restricted services
  - Globus convention for certificate chaining, proxies
- Weak and strong certificates
  - Weak allows immediate access to some services
  - Strong certificates are backed by identity verification
- Emphasis on portal-managed certificates
  - Users experience similar to current portals
  - Users unaware of use of certificates
  - Power users still have access to certs for use with specialized clients.
  - Implemented with PURSE, MyProxy, pubcookie
- Identity Verification Services
  - Leverage community structures to verify user's identity
- Authorization is mainly a local issue
  - Service providers know who is allowed to do what
  - Access rights are *not* centrally managed for community
  - VO projects can assist with attribute management

Framework Design

- Each major regional VO project runs a User Authentication Server (UAS)
  - User registers with UAS's CA to create a VO identity
  - Each regional UAS may specialize the user registration process to their needs
  - Each may employ their own user identity verification mechanisms
  - Total number of UASs worldwide should be $\lesssim 5$
    - Hold down the number of CAs that services need to support
- Portals use UAS standard interfaces to register, login users

  e.g. observatory archive portals, service portals, etc.
  - Users talk directly with UAS; portals never see passwords
  - UAS returns a short-lived certificate to portal.
  - Authorization is handled by the portal provider
    - May be based on user attributes contained in certificate
  - Users generally must register with portal on first visit
    - Allows portal to track and manage own user information

Demo

http://sky1.ncsa.uiuc.edu/nsahome/nsahome.html

Framework Implementation

Components

- User Authentication Server
  - Globus PURSE
    - Support portal-managed credentials
    - Contains user database
  - Pubcookie
    - Provides login service
    - Enables cross-portal single sign-on
  - MyProxy
    - For retrieval of credentials
    - Added support for Pubcookie authentication
      - Cookie provided by login service to user's browser contains secure authenticating token
      - Browser delivers cookie to portal
      - Portal passes pubcookie token to MyProxy in lieu of password
- Portal Server
  - Apache modules: mod_pubcookie, mod_myproxy
    - Helps Portal manage pubcookie and myproxy interactions transparently

Framework Implementation

- Two phase implementation
  - Phase 1: based on current PURSE implementation
    - PURSE includes a CA
    - Long-term cert stored in MyProxy repository
    - MyProxy delivers proxy credentials
  - Phase 2: move CA to MyProxy
    - PURSE manages user data
    - MyProxy produces short-lived certificate based on latest user data

Pubcookie-based authentication

Portal

Archive #1

e.g. NOAO Science Archive

Portal

Archive #2

e.g. NRAO

VO Project

UAS e.g., NVO

CA (Purse)

Login Service (pubcookie)

Certificate Repository (MyProxy)

When astronomer visits portal, she is directed to the UAS Login Service to log in.

Pubcookie-based authentication

Portal

username/password

Archive #1

2 secure cookies, redirect to portal

e.g. NOAO Science Archive

Portal

Archive #2

e.g. NRAO

VO Project

UAS e.g., NVO

CA (Purse)

Login Service (pubcookie)

Certificate Repository (MyProxy)

The astronomer provides the Login Service with a username and password; if valid, the Login Service sets 2 secure tokens validating the user.

Pubcookie-based authentication

cookies

Portal

username/
Pubcookie token

Archive #1

e.g. NOAO Science Archive

VO Project

UAS e.g., NVO

CA
(Purse)

Login
Service
(pubcookie)

Certificate
Repository
(MyProxy)

credentials

Portal

Archive #2

e.g. NRAO

The portal retrieves the cookies from the browser, extracting and validating the secure token. The token is passed to MyProxy In lieu of password to Retrieve credentials.

Pubcookie-based authentication

Portal

Archive #1

e.g. NOAO Science Archive

Portal

Archive #2

e.g. NRAO

VO Project

UAS e.g., NVO

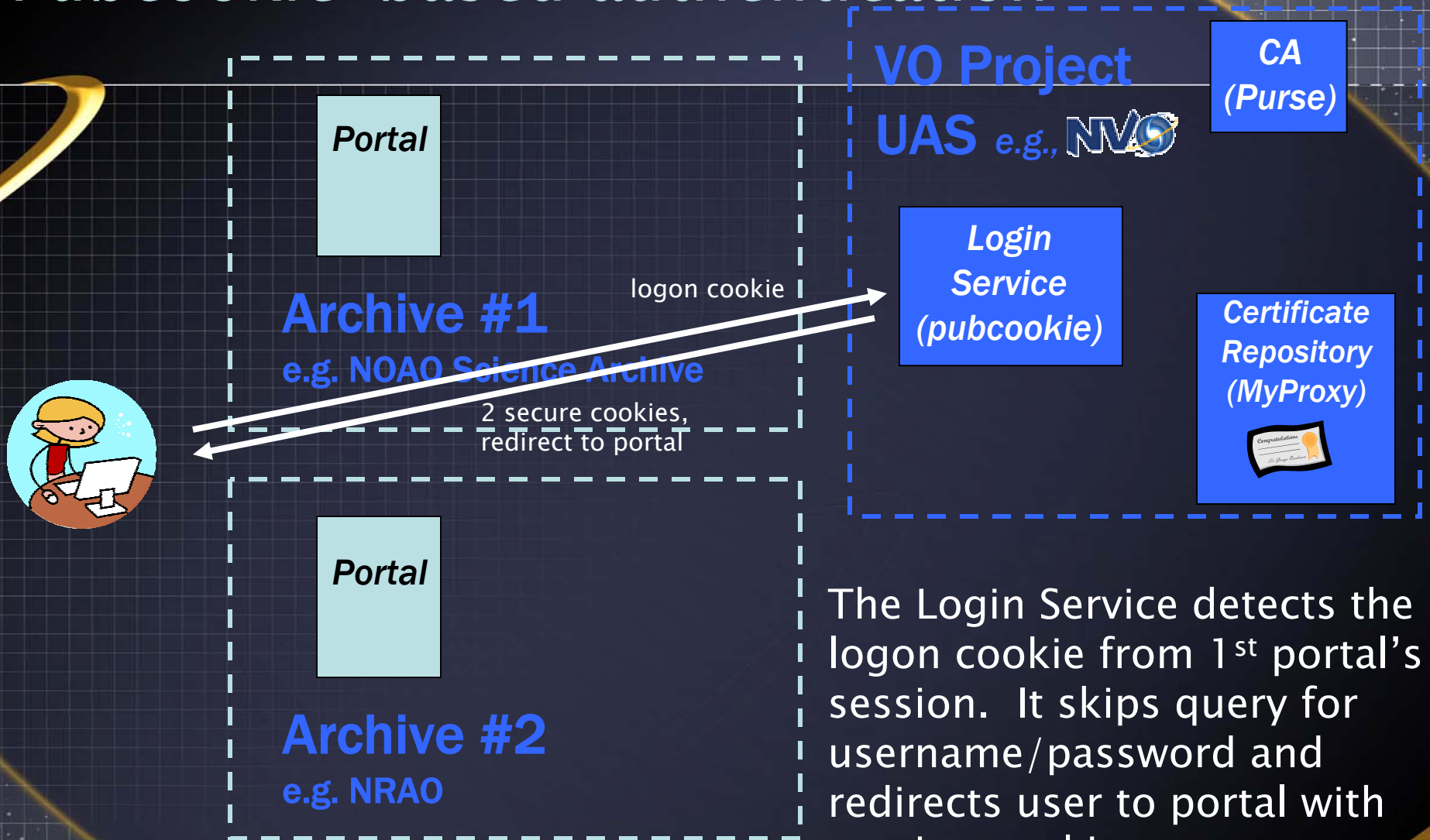
CA (Purse)

Login Service (pubcookie)

Certificate Repository (MyProxy)

When astronomer visits 2nd portal, she is directed to the login service.

Pubcookie-based authentication



The Login Service detects the logon cookie from 1st portal's session. It skips query for username/password and redirects user to portal with session cookies.

Pubcookie-based authentication

cookies

Portal

Archive #1

e.g. NOAO Science Archive

username/
Pubcookie token

Portal

Archive #2

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credentials

2nd portal transparently retrieves credentials.

Becoming a compliant portal

- Obtain portal support kit
- Register with UAS
  - Obtain a server certificate to allow portal to connect to myproxy service
  - Obtain a symmetric key for pubcookie decryption

Supporting user-managed certs in client apps

- Power users enable direct download of credentials in user profile
  - To discourage phishing on naïve users
- Use standard myproxy tools/libraries to retrieve creds

Identity Verification

- Weak Identities
  - Confirm only that registrants email is correct
  - Many services don't need strong identity assurance
    - won't need to know that users are who they say they are
    - Just need to know that an identity is the same user across sessions
  - Provides immediate access to some restricted resources
- Strong Identity Verification
  - Engage asynchronously one or more Identity Verification Services (IVS)
    - Example IVS hosts: observatories, home academic depts.
    - UAS sends registration info, IVS confirms information
  - UAS records IVS confirmations into user DB as they come in
  - When certificate is issued, identifiers for confirming IVSs are encoded into certificate
  - Services decides which IVSs it trusts/requires to allow access
    - Service would apply local authorization tests on top

Identity Verification Policies

- What a "yes" response means depends on IVS policy
  - Home department:
    - The named person is a member of the dept. with the given email address
    - The named person has confirmed having registered with the NVO with the given login name
  - Observatory:
    - The named person with the supplied email address has been award time on our telescope
  - NVO would verify persons via traditional means to help get network of trusted identities going.
- Each registered IVS publishes policy with VO project
  - Project would provide toolkit/assistance to local authority for installing IVS.
- Mechanics and Proceedures still under development
  - Globus project is developing tool support for encoding IVS IDs into certificates
  - What is a trustworthy but workable system from community's perspective?
    - Engage existing trust proceedures

Authorization

- VO Project UAS may manage regionally related user attributes
  - Ex: UK astronomer, EU astronomer
  - Attributes encoded in certificates
    - As SAML embedded assertions
  - Leverage Shibboleth infrastructure
    - GridShib
  - Setting of attributes may be incorporated into IVS mechanism
- Services would use attributes to manage authorization policies

Conclusions

- We've built a working prototype
  - Built on existing grid tools
  - Through close collaboration between the NVO and grid specialists
  - Ready to begin working with portal developers
- Based on a user-friendly but scalable model
  - Single-Sign On that operates across administrative domains
    - Regional CAs
    - Pubcookie: interoperability across portals in a secure way
  - Focus on portal-managed certificates
    - But also allow access to services via specialized clients
  - Weak & Strong certificates
    - Weak lowers the users entry barrier
    - Strong engages framework for verifying identities
  - Locally-managed authorization policies aided by regionally-managed attributes