Managing Credentials with **MyProxy**

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http://myproxy.ncsa.uiuc.edu/

What is MyProxy?

- A service for managing X.509 PKI credentials
  - A credential repository and certificate authority
- An Online Credential Repository
  - Issues short-lived X.509 Proxy Certificates
  - Long-lived private keys never leave the server
- An Online Certificate Authority
  - Issues short-lived X.509 End Entity Certificates
- Supporting multiple authentication methods
  - Passphrase, Certificate, PAM, SASL, Kerberos
- Open Source Software
  - Included in Globus Toolkit 4.0 and CoG Kits
  - C, Java, Python, and Perl clients available

MyProxy Logon

- Authenticate to retrieve PKI credentials
    - End Entity or Proxy Certificate
    - Trusted CA Certificates
    - Certificate Revocation Lists (CRLs)
- MyProxy maintains the user’s PKI context
    - Users don’t need to manage long-lived credentials
    - Enables server-side monitoring and policy enforcement (ex. passphrase quality checks)
    - CA certificates & CRLs updated automatically at login

MyProxy Authentication

- Key Passphrase
- X.509 Certificate
  - Used for credential renewal
- Pluggable Authentication Modules (PAM)
  - Kerberos password
  - One Time Password (OTP)
  - Lightweight Directory Access Protocol (LDAP) password
- Simple Authentication and Security Layer (SASL)
  - Kerberos ticket (SASL GSSAPI)

MyProxy Online Credential Repository

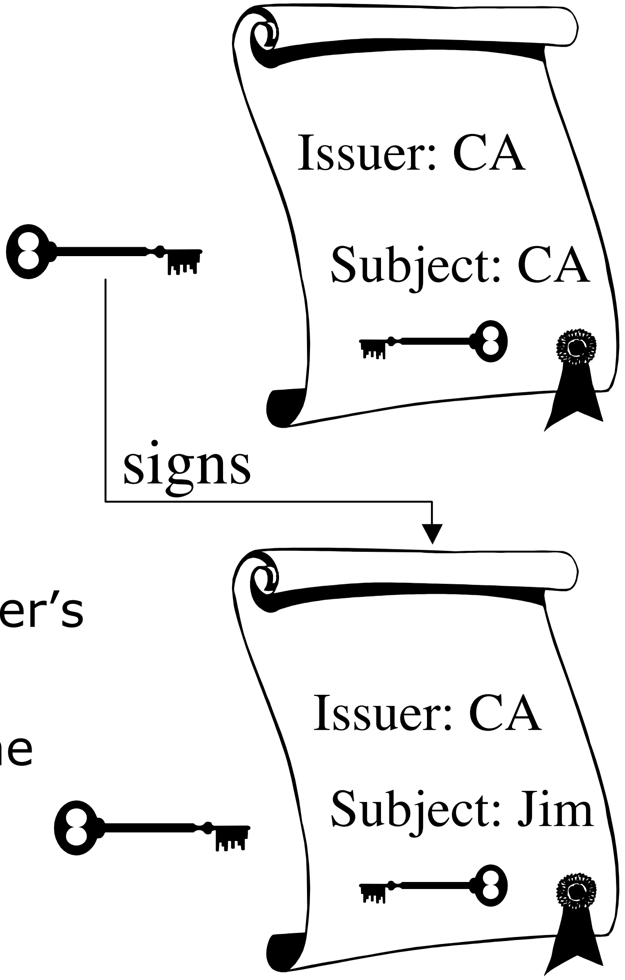
- Stores X.509 End Entity and Proxy credentials
    - Private keys encrypted with user-chosen passphrases
    - Credentials may be stored directly or via proxy delegation
    - Users can store multiple credentials from different CAs
- Access to credentials controlled by user and administrator policies
    - Set authentication requirements
    - Control whether credentials can be retrieved directly or if only proxy delegation is allowed
    - Restrict lifetime of retrieved proxy credentials
- Can be deployed for a single user, a site, a virtual organization, a resource provider, a CA, etc.

MyProxy Online Certificate Authority

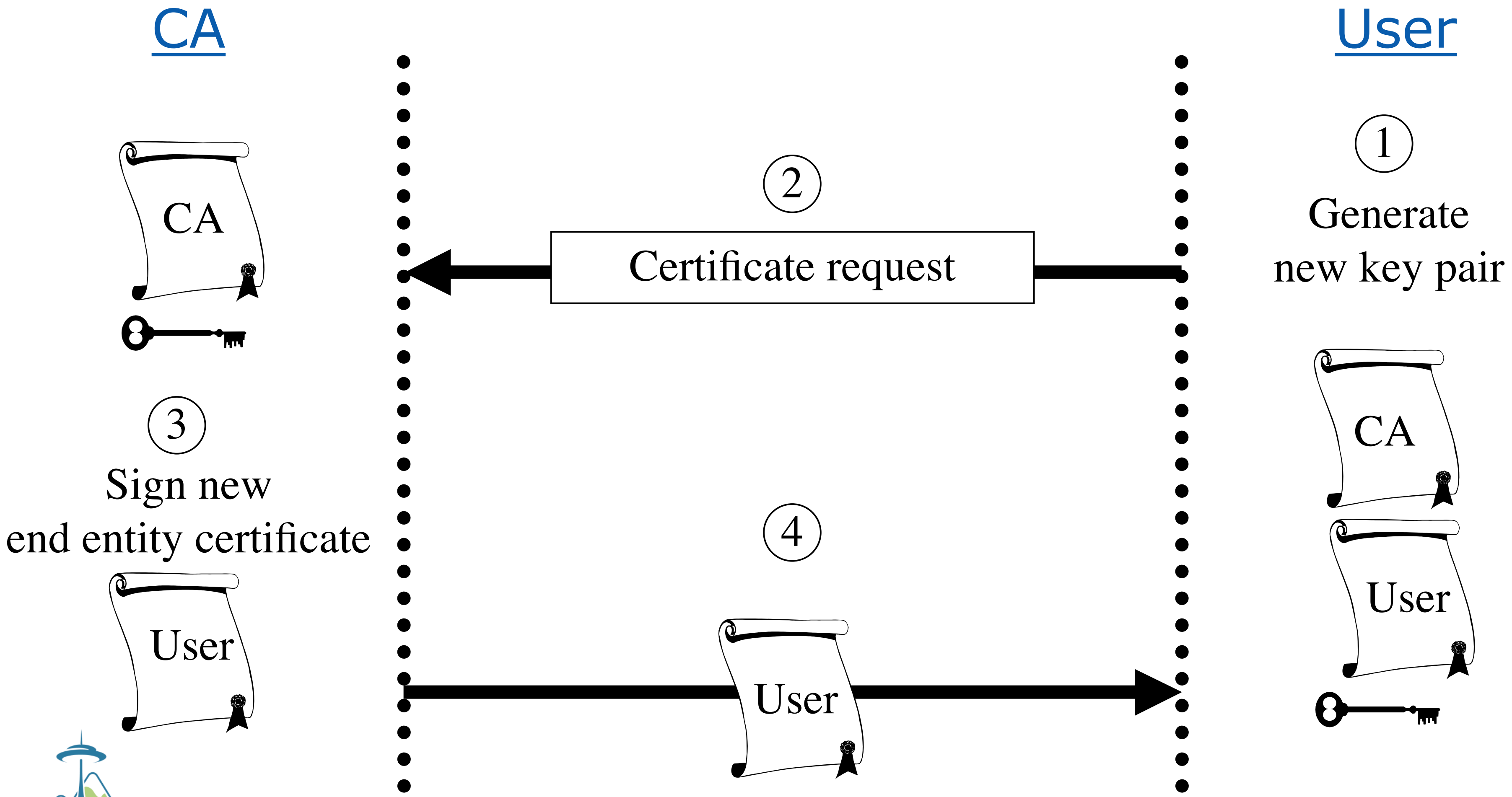
- Issues short-lived X.509 End Entity Certificates
  - Leverages MyProxy authentication mechanisms
  - Compatible with existing MyProxy clients
- Ties in to site authentication and accounting
  - Using PAM and/or Kerberos authentication
  - "Gridmap" file maps username to certificate subject
    - LDAP support under development
- Avoid need for long-lived user keys
- Server can function as both CA and repository
  - Issues certificate if no credentials for user are stored

PKI Overview

- Public Key Cryptography
  - Sign with private key, verify signature with public key
  - Encrypt with public key, decrypt with private key
- Key Distribution
  - Who does a public key belong to?
  - Certification Authority (CA) verifies user's identity and signs certificate
  - Certificate is a document that binds the user's identity to a public key
- Authentication
  - Signature [h (random, …)]

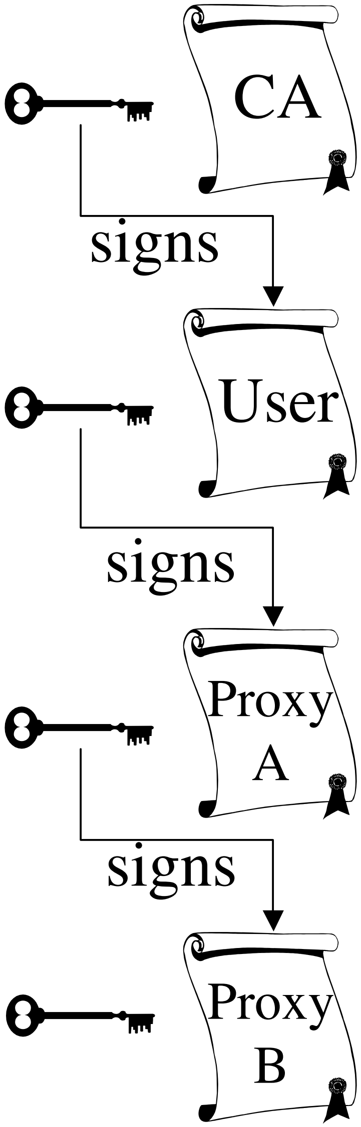


PKI Enrollment



Proxy Credentials

- RFC 3820: Proxy Certificate Profile
- Associate a new private key and certificate with existing credentials
- Short-lived, unencrypted credentials for multiple authentications in a session
  - Restricted lifetime in certificate limits vulnerability of unencrypted key
- Credential delegation (forwarding) without transferring private keys



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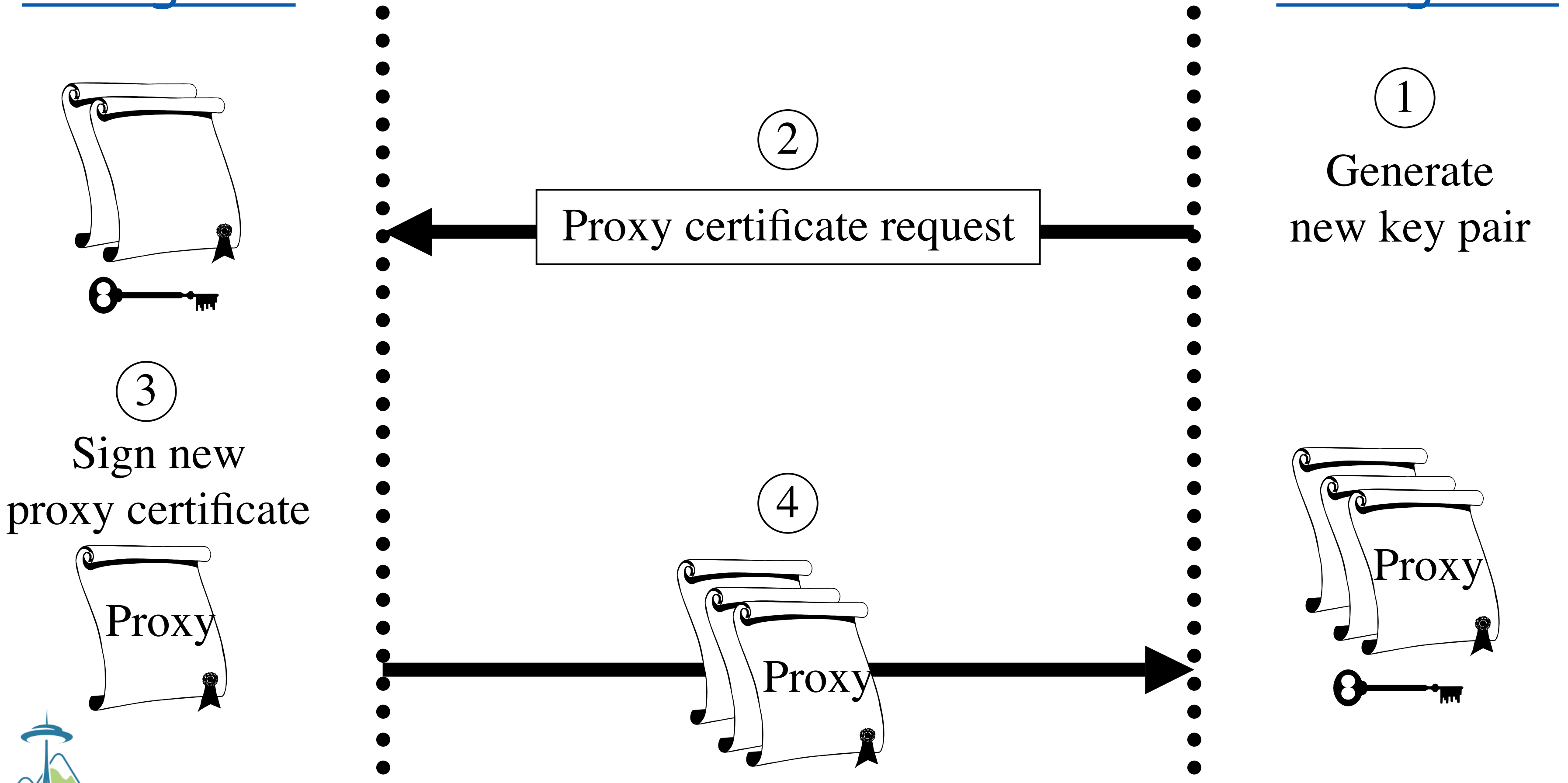
Proxy Delegation



Delegator

Delegatee

1

Generate new key pair

2

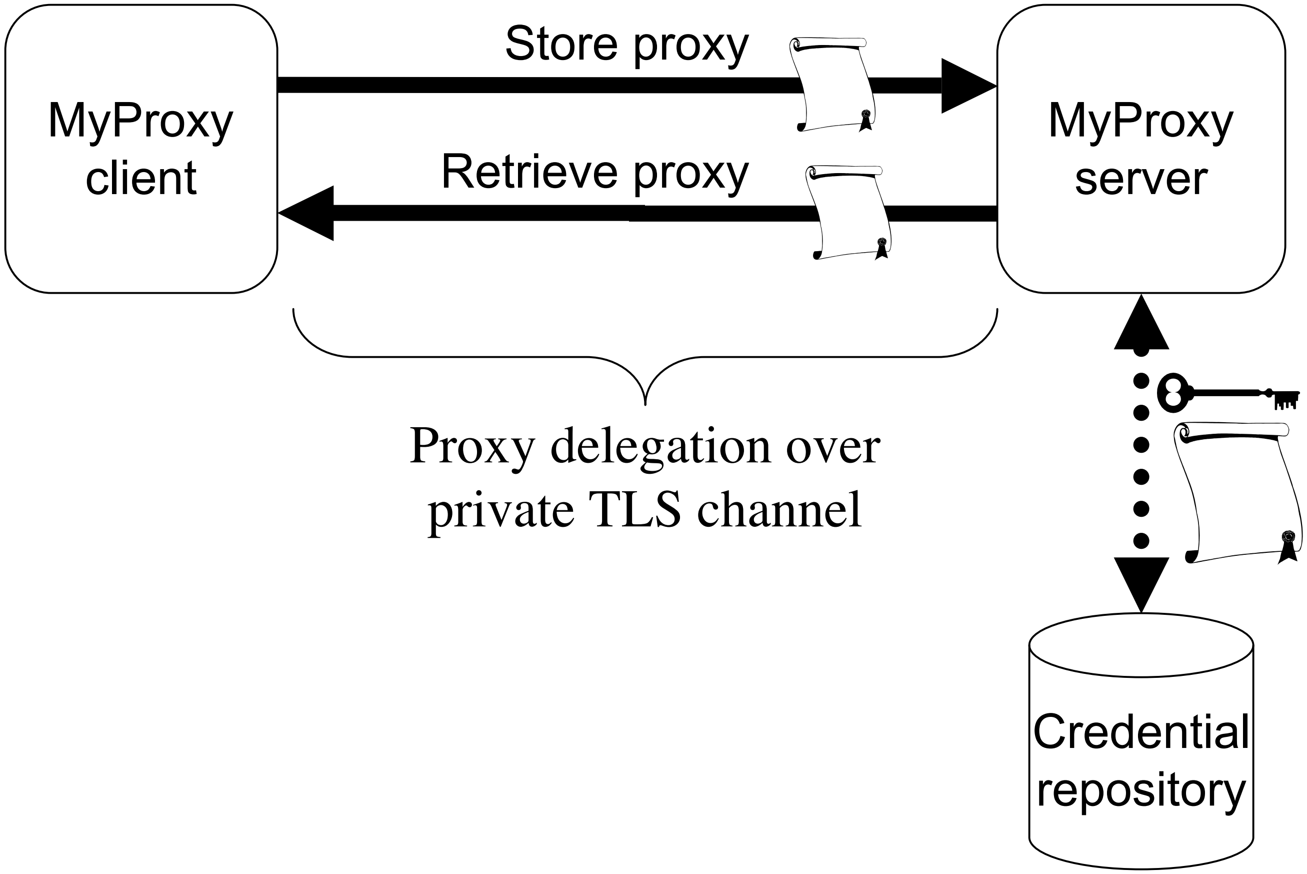
Proxy certificate request

3

Sign new proxy certificate

4

MyProxy Repository



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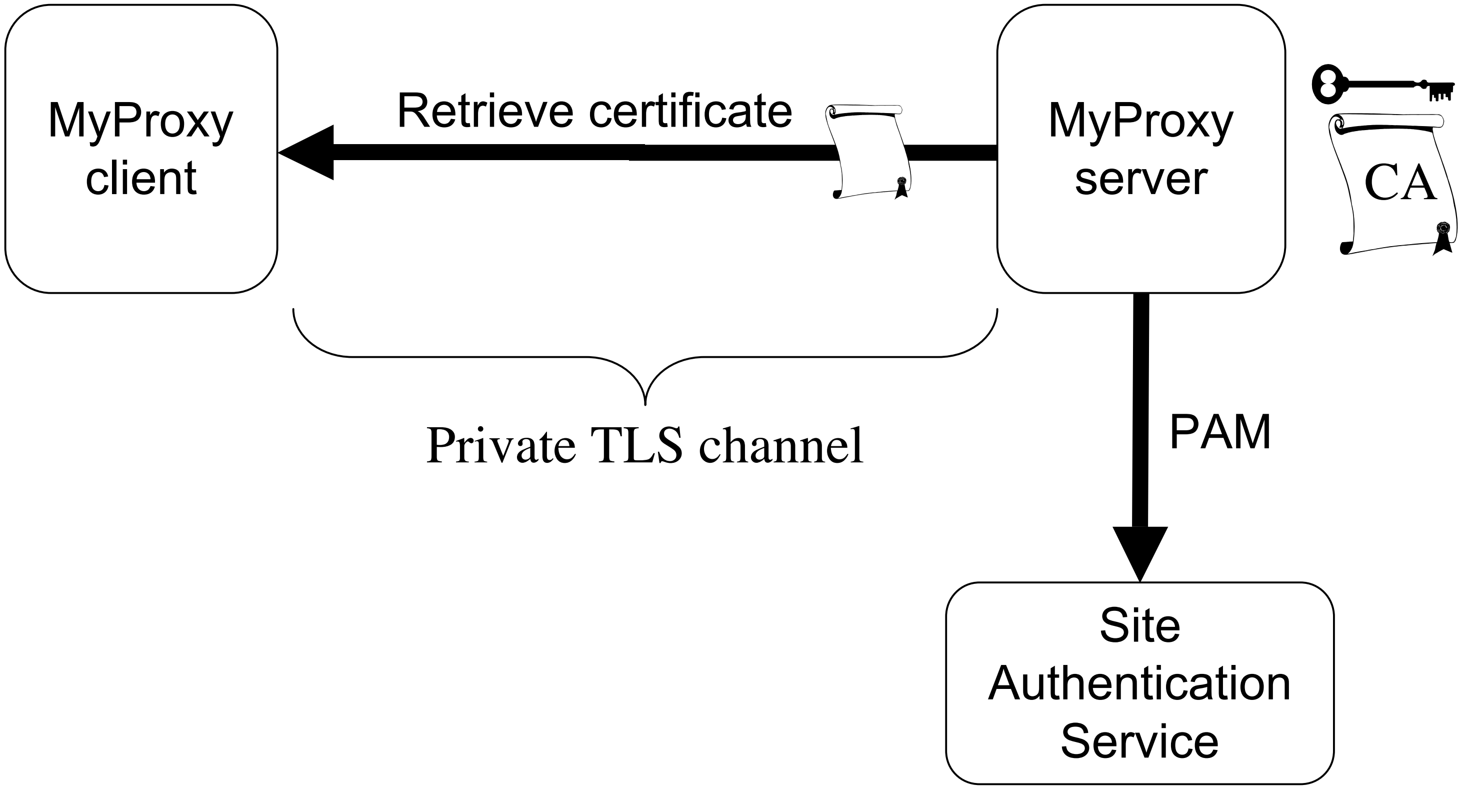
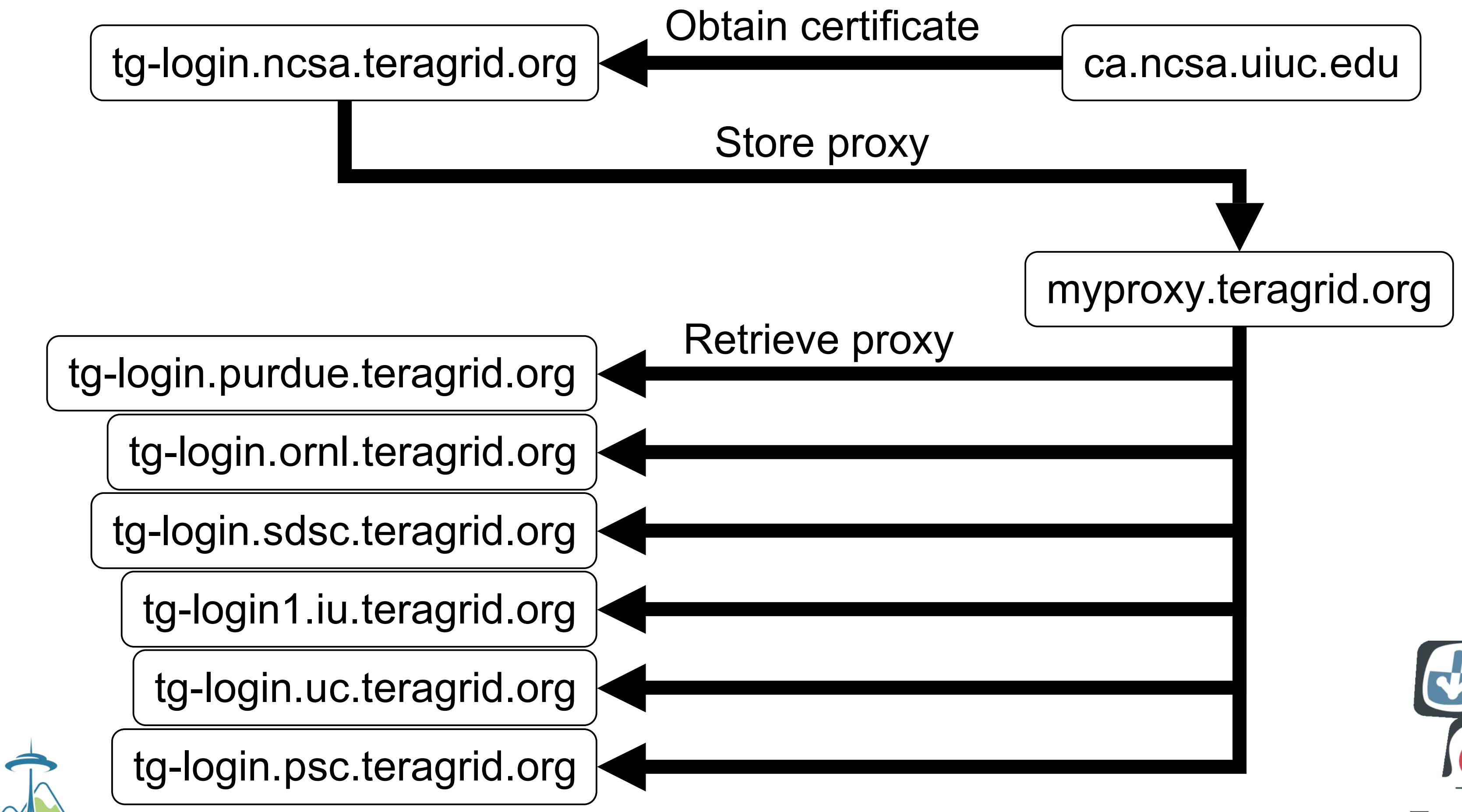
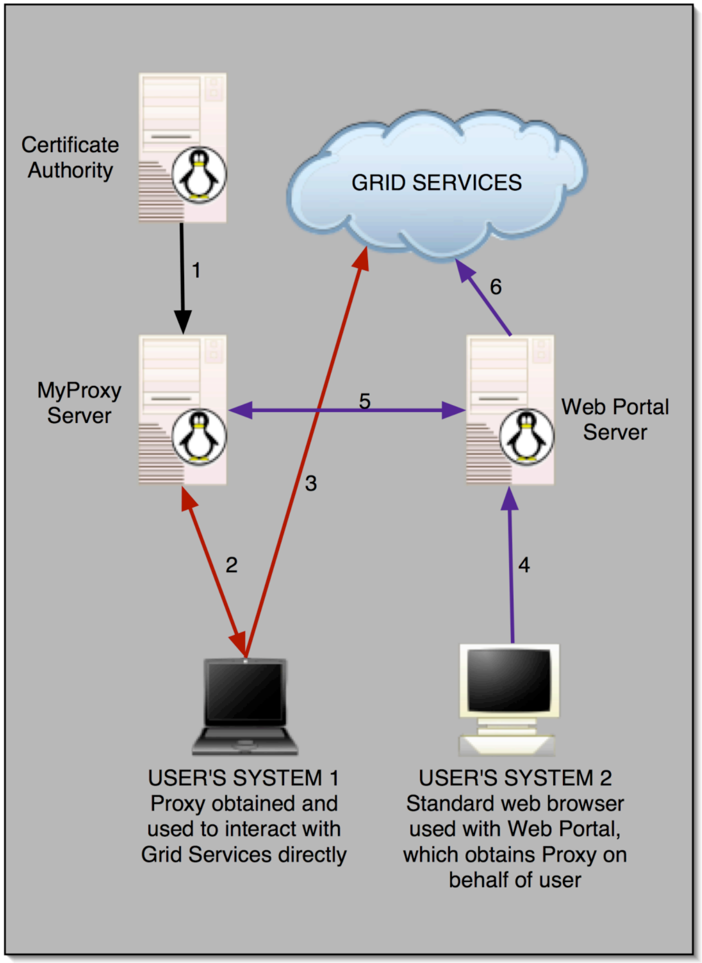
MyProxy Certificate Authority



MyProxy: Credential Mobility


tg-login.ncsa.teragrid.org
Obtain certificate
ca.ncsa.uiuc.edu
Store proxy
myproxy.teragrid.org
Retrieve proxy
tg-login.purdue.teragrid.org
tg-login.ornl.teragrid.org
tg-login.sdsc.teragrid.org
tg-login1.iu.teragrid.org
tg-login.uc.teragrid.org
tg-login.psc.teragrid.org

MyProxy and Grid Portals


Certificate Authority
GRID SERVICES
1
6
MyProxy Server
5
Web Portal Server
3
2
4
USER'S SYSTEM 1
Proxy obtained and used to interact with Grid Services directly
USER'S SYSTEM 2
Standard web browser used with Web Portal, which obtains Proxy on behalf of user

GridPort

OGCE
open grid computing environment

gridsphere portal framework
open-source / portlet jsr168 compliant

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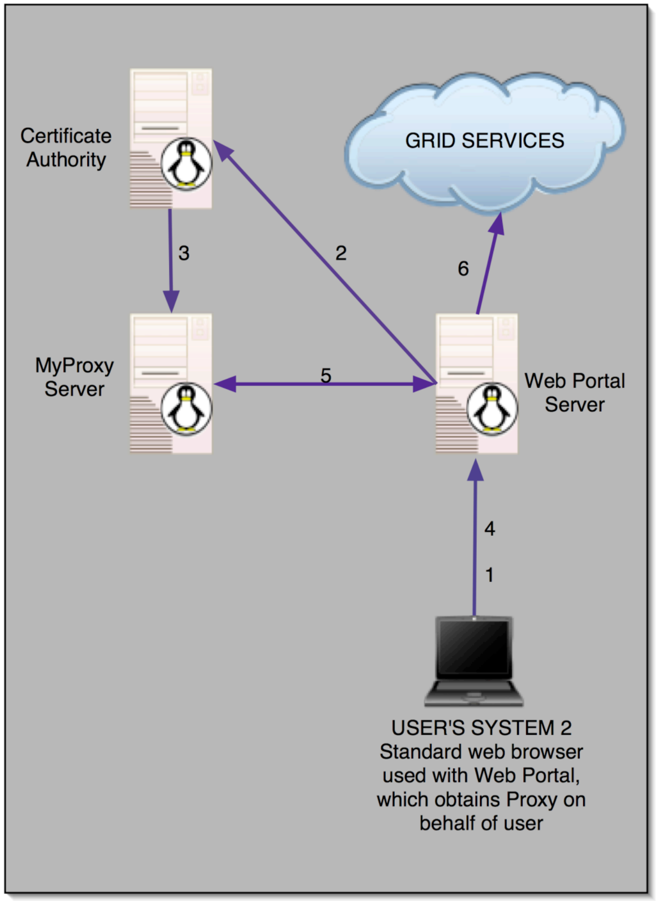
User Registration Portals

PURSE:
Portal-based User Registration Service

GAMA:
Grid Account Management Architecture



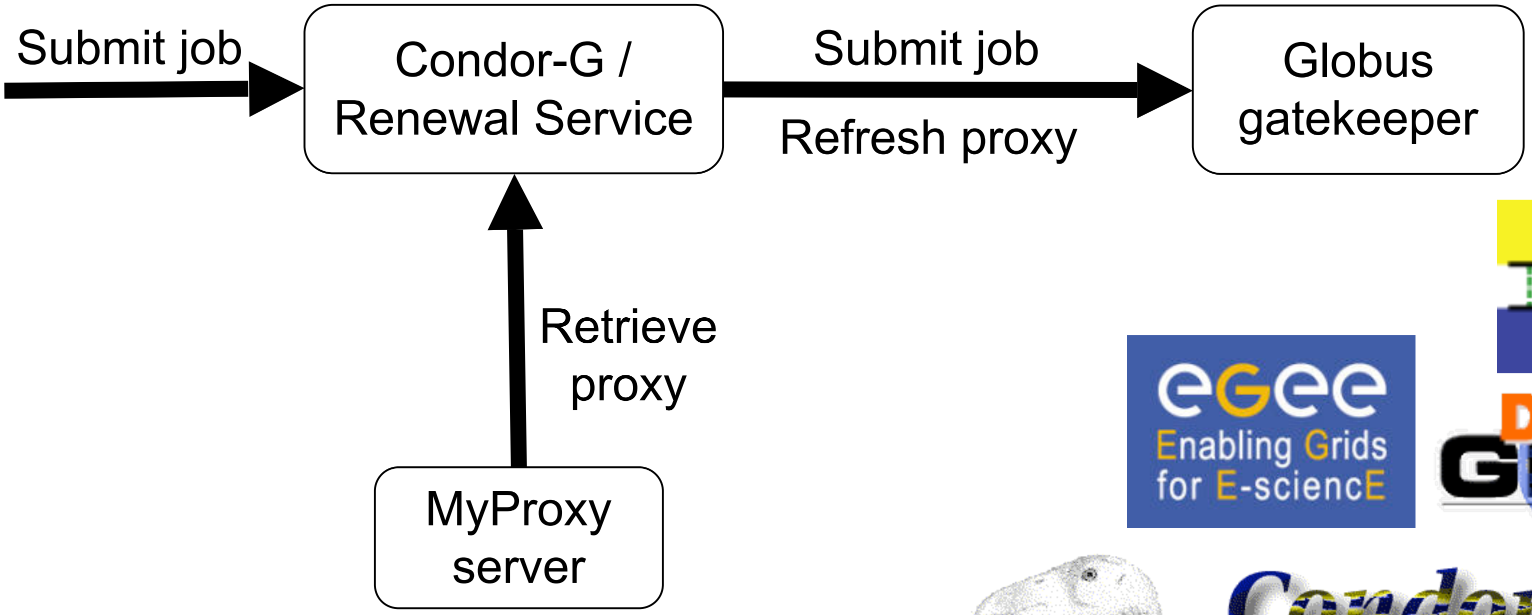
MyProxy: Key Upload/Download

- Store and retrieve keys and certificates directly over the network
  - Encrypted keys transferred over SSL/TLS encrypted channel
  - In contrast to using proxy delegation
- Allows storing end-entity credentials
- Key retrieval must be explicitly enabled by server administrator and key owner

Credential Renewal

- Long-lived jobs or services need credentials
  - Task lifetime is difficult to predict
- Don’t want to delegate long-lived credentials
  - Fear of compromise
- Instead, renew credentials as needed during the job’s lifetime
  - Renewal service provides a single point of monitoring and control
- Renewal policy can be modified at any time
  - Disable renewals if compromise is detected or suspected
  - Disable renewals when jobs complete

MyProxy: Credential Renewal

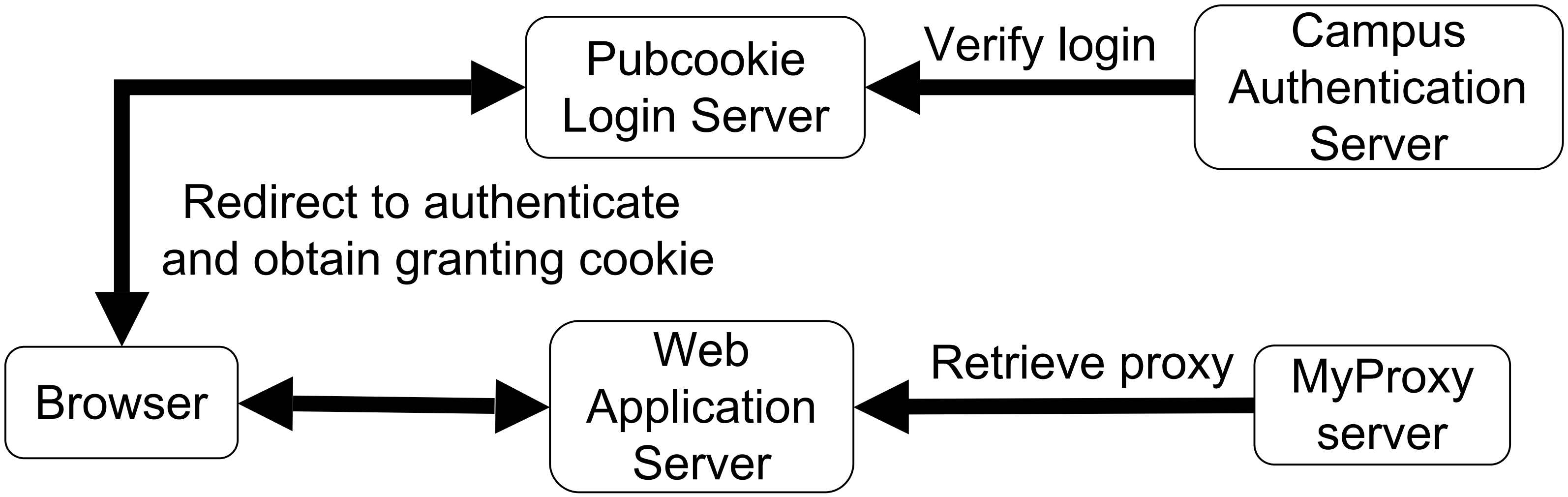


Daniel Kouril and Jim Basney, "A Credential Renewal Service for Long-Running Jobs," 6th IEEE/ACM International Workshop on Grid Computing (Grid 2005), Seattle, WA, November 13-14, 2005.

MyProxy and Pubcookie

Coming soon!

- Combine web and grid single sign-on
  - Authenticate to MyProxy with Pubcookie granting cookie



Jonathan Martin, Jim Basney, and Marty Humphrey, "Extending Existing Campus Trust Relationships to the Grid through the Integration of Pubcookie and MyProxy," 2005 International Conference on Computational Science (ICCS 2005), Emory University, Atlanta, GA, May 22-25, 2005.

Example: TeraGrid User Portal

- Use TeraGrid-wide Kerberos username and password for portal authentication
  - Obtain PKI credentials for resource access across TeraGrid sites via portal & externally
- Plan to use MyProxy CA with Kerberos PAM authentication
  - Leverage existing NCSA Online CA

Example: LTER Grid Pilot Study

- Build a portal for environmental acoustics analysis
- Leverage existing LDAP usernames and passwords for portal authentication
    - Obtain PKI credentials for job submission and data transfer
    - Using MyProxy PAM LDAP authentication

LTER

Long Term Ecological Research
Network Information System

Example: NERSC OTP PKI

- Address usability issues for One Time Passwords
  - Obtain session credentials using OTP authentication
- Prototyping MyProxy CA with PAM Radius authentication
  - ESnet Radius Authentication Fabric federates OTP authentication across sites

NERSC

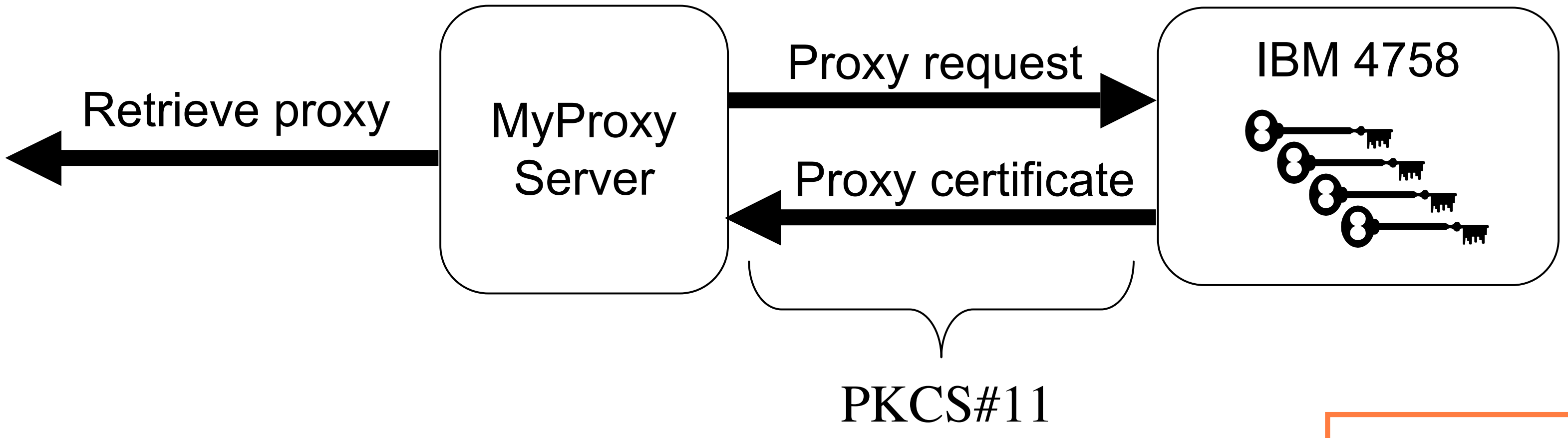
National Energy Research
Scientific Computing Center

MyProxy Security

- Keys encrypted with user-chosen passwords
  - Server enforces password quality
  - Passwords are not stored
- Dedicated server less vulnerable than desktop and general-purpose systems
  - Professionally managed, monitored, locked down
- Users retrieve short-lived credentials
  - Generating new proxy keys for every session
- All server operations logged to syslog
- Caveat: Private key database is an attack target
  - Compare with status quo

Hardware-Secured MyProxy

- Protect keys in tamper-resistant cryptographic hardware



Experimental

M. Lorch, J. Basney, and D. Kafura, "A Hardware-secured Credential Repository for Grid PKIs," 4th IEEE/ACM International Symposium on Cluster Computing and the Grid (CCGrid), April 2004.

MyProxy Server Administration

- Install server certificate and CA certificate(s)
- Configure /etc/myproxy-server.config policy
  - Template provided with examples
- Optionally:
  - Configure password quality enforcement
  - Install cron script to delete expired credentials
- Install boot script and start server
  - Example boot script provided
- Use myproxy-admin commands to manage server
  - Reset passwords, query repository, lock credentials

MyProxy Server Policies

- Who can store credentials?
  - Restrict to specific users or CAs
  - Restrict to administrator only
- Who can retrieve credentials?
  - Allow anyone with correct password
  - Allow only trusted services / portals
- Maximum lifetime of retrieved credentials

server-wide
and
per-credential

MyProxy Server Replication

- Primary/Secondary model (like Kerberos)
  - If primary is down, fail-over to secondary for credential retrieval
  - Store, delete, and change passphrase on primary only
  - Client-side fail-over under development
- Simple configuration
  - Run myproxy-replicate via cron
  - Alternatively, use rsync over ssh

Coming soon!

Related Work

- GT4 Delegation Service
  - Protocol based on WS-Trust and WSRF
- UVA CredEx
  - WS-Trust credential exchange service
- SACRED (RFC 3767) Credential Repository
  - http://sacred.sf.net/
- Kerberized Online CA (KX.509/KCA)
  - Kerberos -> PKI
- Kerberos PKINIT
  - PKI -> Kerberos

MyProxy Community

- MyProxy is an open source, community project
  - Many contributions from outside NCSA
- myproxy-users@ncsa.uiuc.edu mailing list
- Bug tracking: http://bugzilla.ncsa.uiuc.edu/
- Anonymous CVS access

  :pserver:anonymous@cvs.ncsa.uiuc.edu:/CVS/myproxy
- Contributions welcome!
  - Feature requests, bug reports, patches, etc.
  - Please report your experiences

Thank you!

Questions/Comments?

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