# Implementing CAS

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2. Problems CAS solves
3. CAS protocol
4. Building from sources
5. Customizing the presentation
6. Authentication handlers
7. CAS-enabling uPortal
8. CAS-enabling Tomcat

# Introduction

Who are we?

What is CAS?

Brief history of CAS

# Adam’s Involvement with CAS

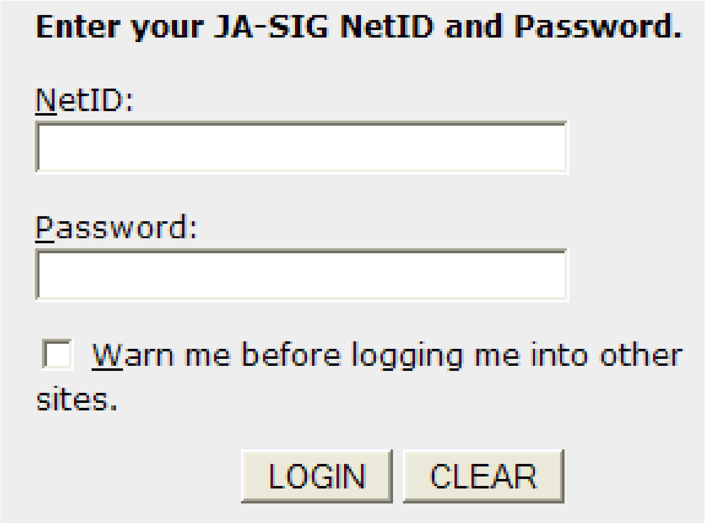
- Got interested.
- Worked with several clients helping them to CASify their applications.
- Asked many questions of the CAS mail list
- Wrote a CAS self-study guide for Unicon developers. (https://confluence.unicon.net/confluence/x/XgZi) (authentication required)
- Answered some questions on the CAS list.
- Currently working with Unicon clients on CAS server implementations and CAS-enabling their Web applications.

# Introductions

- Who are you?
  - Name
  - Institution
  - Role
  - Why interested in CAS?

# What is CAS?

- CAS is enterprise single-sign-on for the Web.
  - Free
  - Open source
  - Server implemented in Java
  - Clients implemented in a plethora of languages



**Enter your JA-SIG NetID and Password.**

□ Warn me before logging me into other sites.

# Some of the people involved as the project has evolved

- Scott Battaglia
- Shawn Bayern
- Susan Bramhall
- Marc-Antoine Garrigue
- Howard Gilbert
- Dmitriy Kopylenko
- Arnaud Lesueur
- Drew Mazurek
- Benn Oshrin
- Jan Van der Velpen (Velpi)

# Many CAS deployers

- Appian Corporation
- Athabasca University
- Azusa Pacific University
- BCcampus
- California Polytechnic Institute
- California State University, Chico
- Campus Crusade for Christ
- Case Western Reserve University
- Columbia
- Employers Direct
- GET-INT
- Hong Kong University of Science and Technology
- Indiana
- Karlstad University, Sweden
- La Voz de Galicia, Spain
- Memorial University of Newfoundland
- Nagoya University
- NHMCCD
- Northern Arizona University
- Plymouth State University (used with SunGardHE Luminis)
- Roskilde University
- Rutgers, The State University of New Jersey
- SunGard HE Luminis
- Simon Fraser University (Vancouver, B.C.)
- Suffield Academy
- Tollpost Globe AS

# … and more

- Universita degli Studi di Parma
- Universite de Bourgogne - France
- Universite de La Rochelle, France
- Universite de Pau et des Pays de l'Adour, France
- University of Nancy 1, France
- Universite Nancy 2, France
- Universite Pantheon Sorbonne
- Universiteit van Amsterdam
- University of Bristol, England
- University of California Merced
- University of California, Riverside
- University of Crete, Greece
- University of Delaware
- University of Geneva
- University of Hawaii
- University of New Mexico
- University of Rennes1
- University of Technology, Sydney
- Uppsala University
- Valtech
- Virginia Tech
- Yale University

- And likely more not well-enumerated…

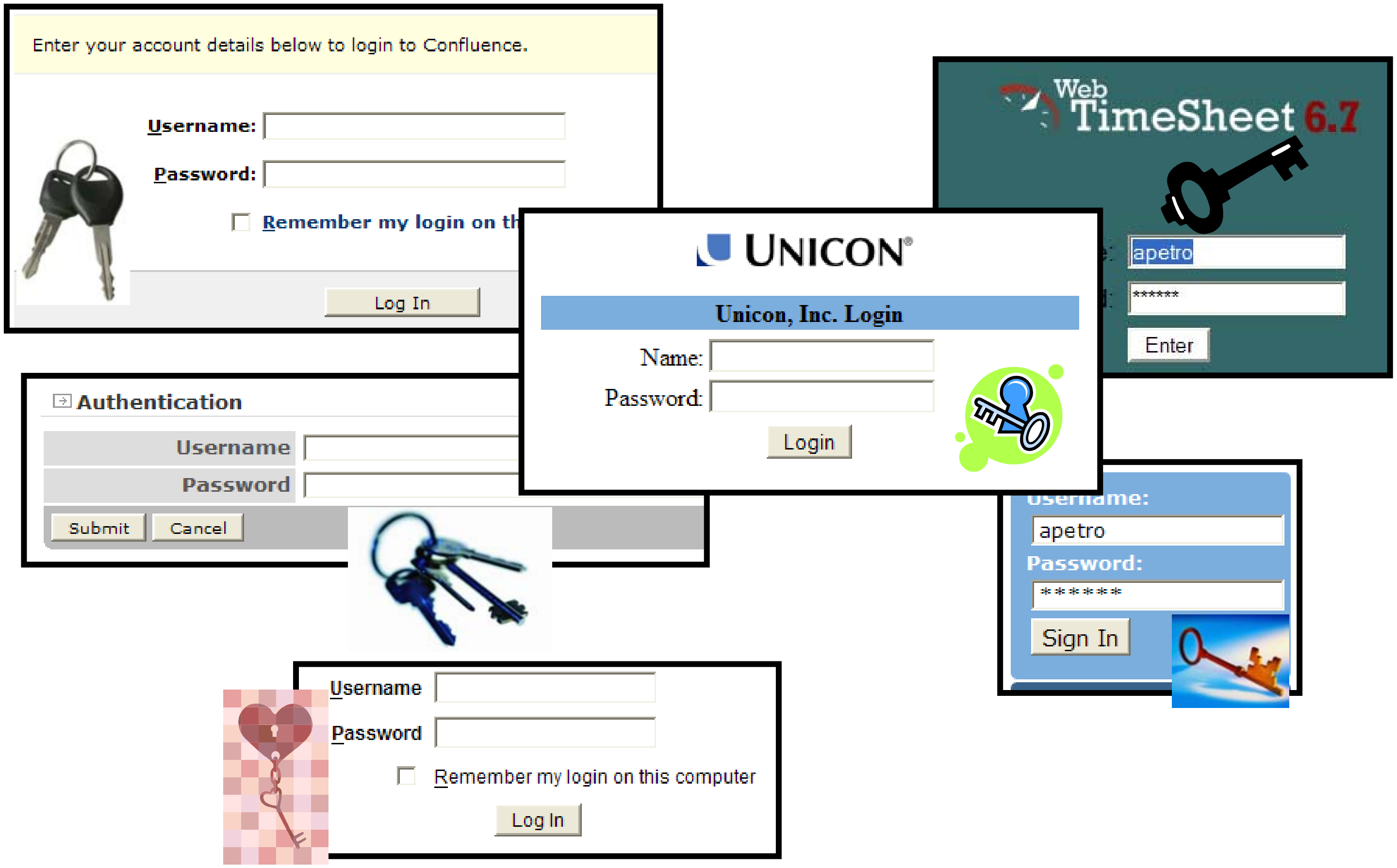
# Problems CAS solves

Disparate credentials and name spaces

Too many Web applications dealing with credentials

CAS creates new challenges, too

# Multi-sign-on for the Web



Enter your account details below to login to Confluence.

Username:

Password:

□ Remember my login on th

Log In

Authentication

Username

Password

Submit Cancel

Web TimeSheet 6.7

apetro

******

Enter

UNICON®

Unicon, Inc. Login

Name:

Password:

Login

Username:

apetro

Password:

******

Sign In

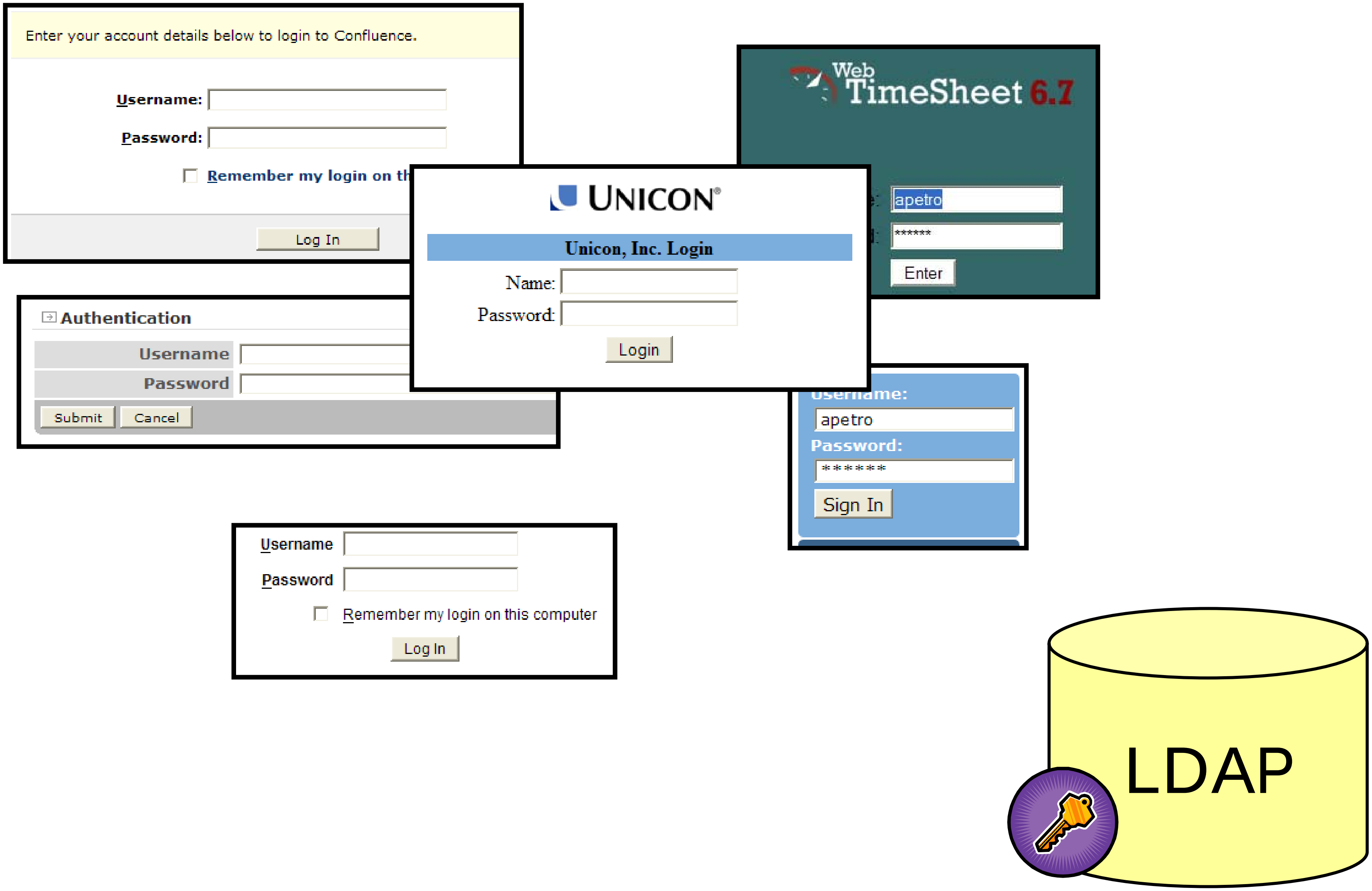
Username

Password

□ Remember my login on this computer

Log In

# At least with one username/password?



Enter your account details below to login to Confluence.

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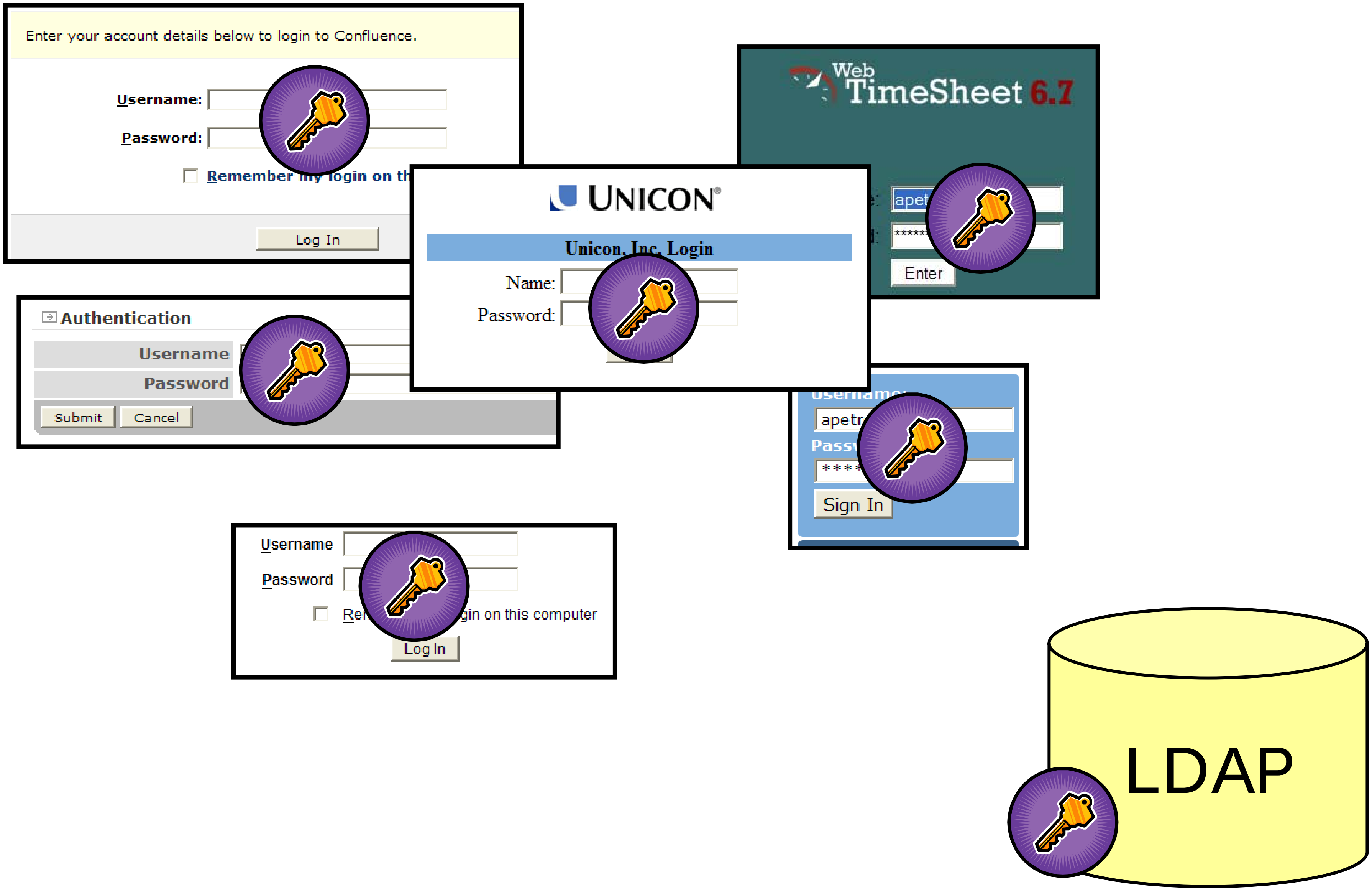
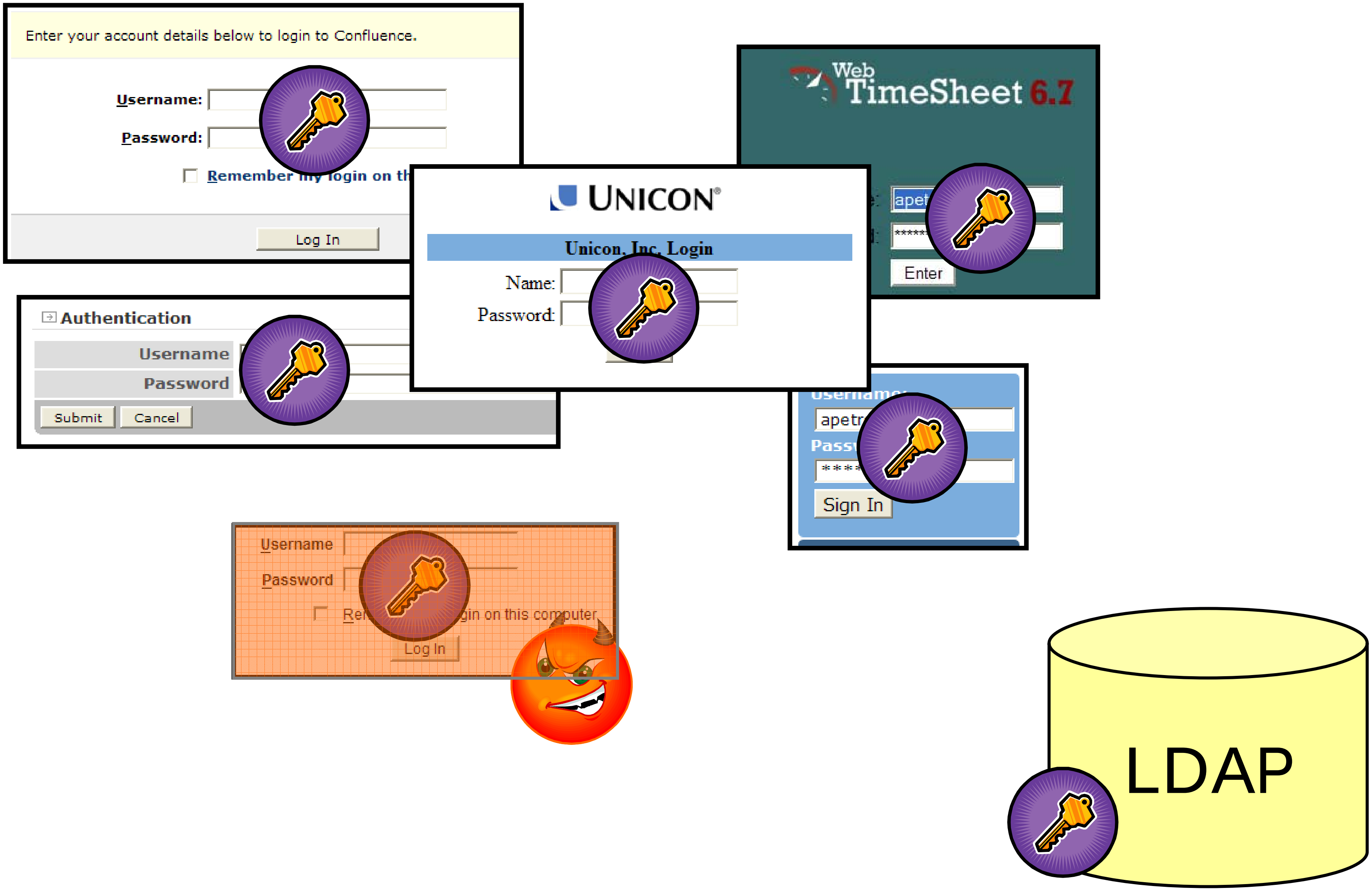
# All applications touch passwords

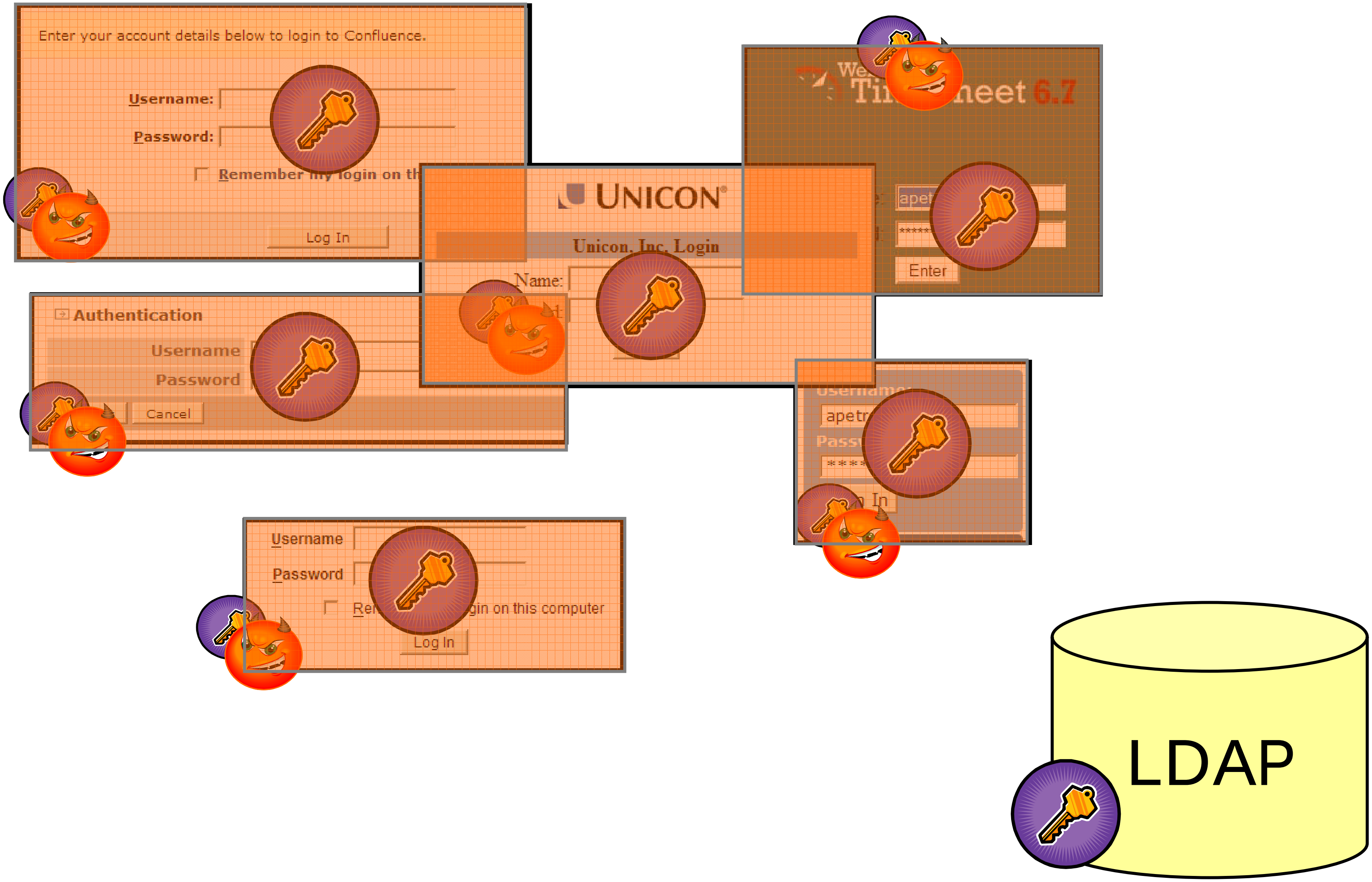


Enter your account details below to login to Confluence.

# Any compromise leaks primary credentials



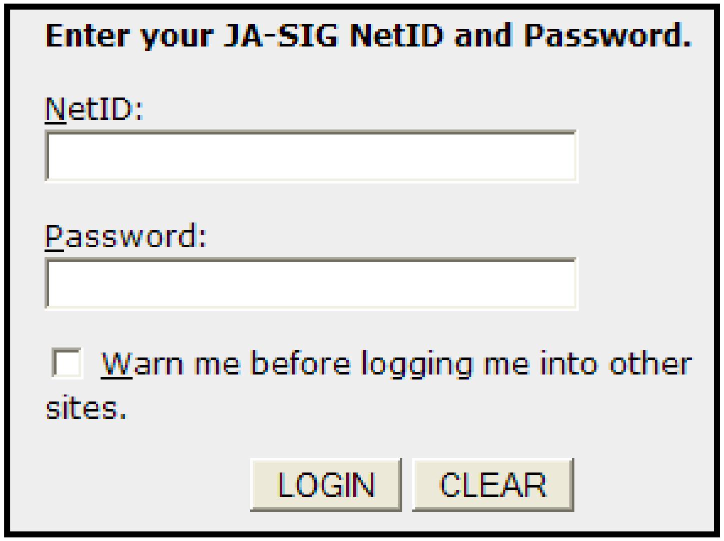
# Adversary then can run wild



Enter your account details below to login to Confluence.

# What to do about this?

- What if there were only one login form, only one application trusted to touch primary credentials?



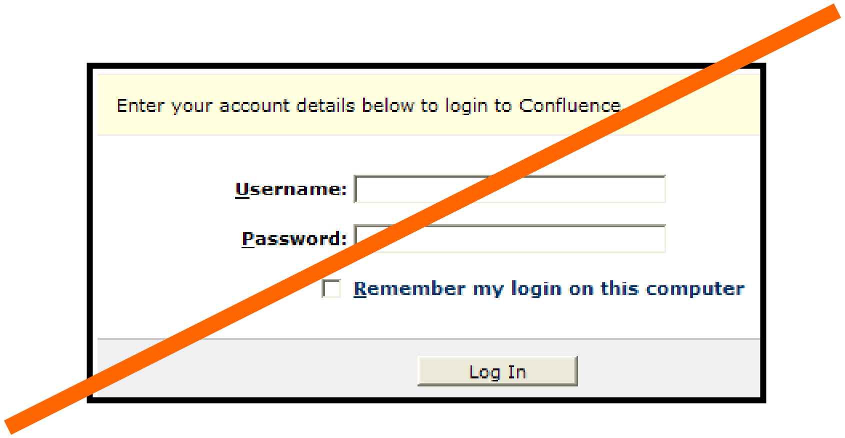
**Enter your JA-SIG NetID and Password.**

NetID:

Password:

□ Warn me before logging me into other sites.

# Delete your login forms.



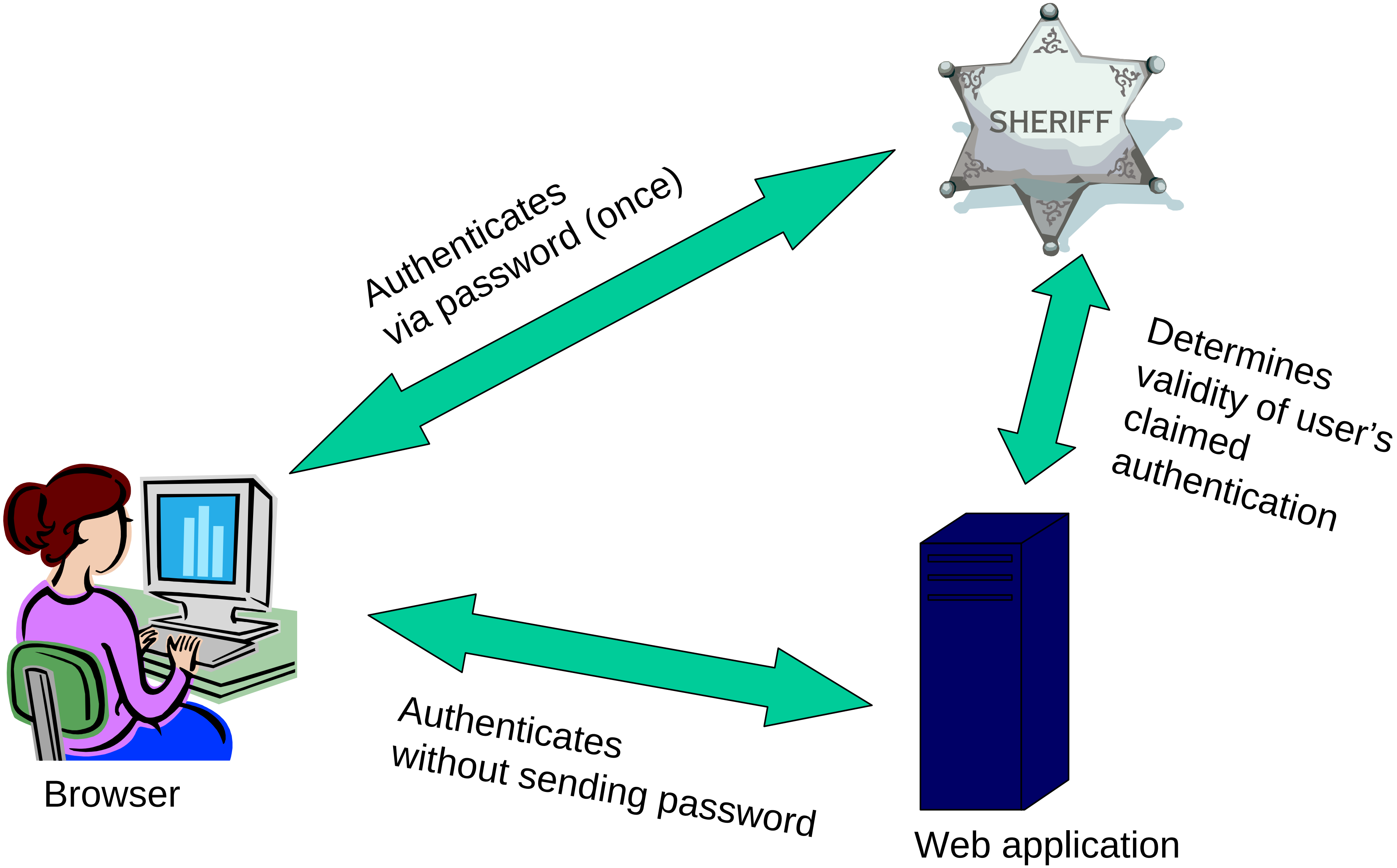
Enter your account details below to login to Confluence

Username:

Password:

□ Remember my login on this computer

# CAS in a nutshell



Authenticates
via password (once)

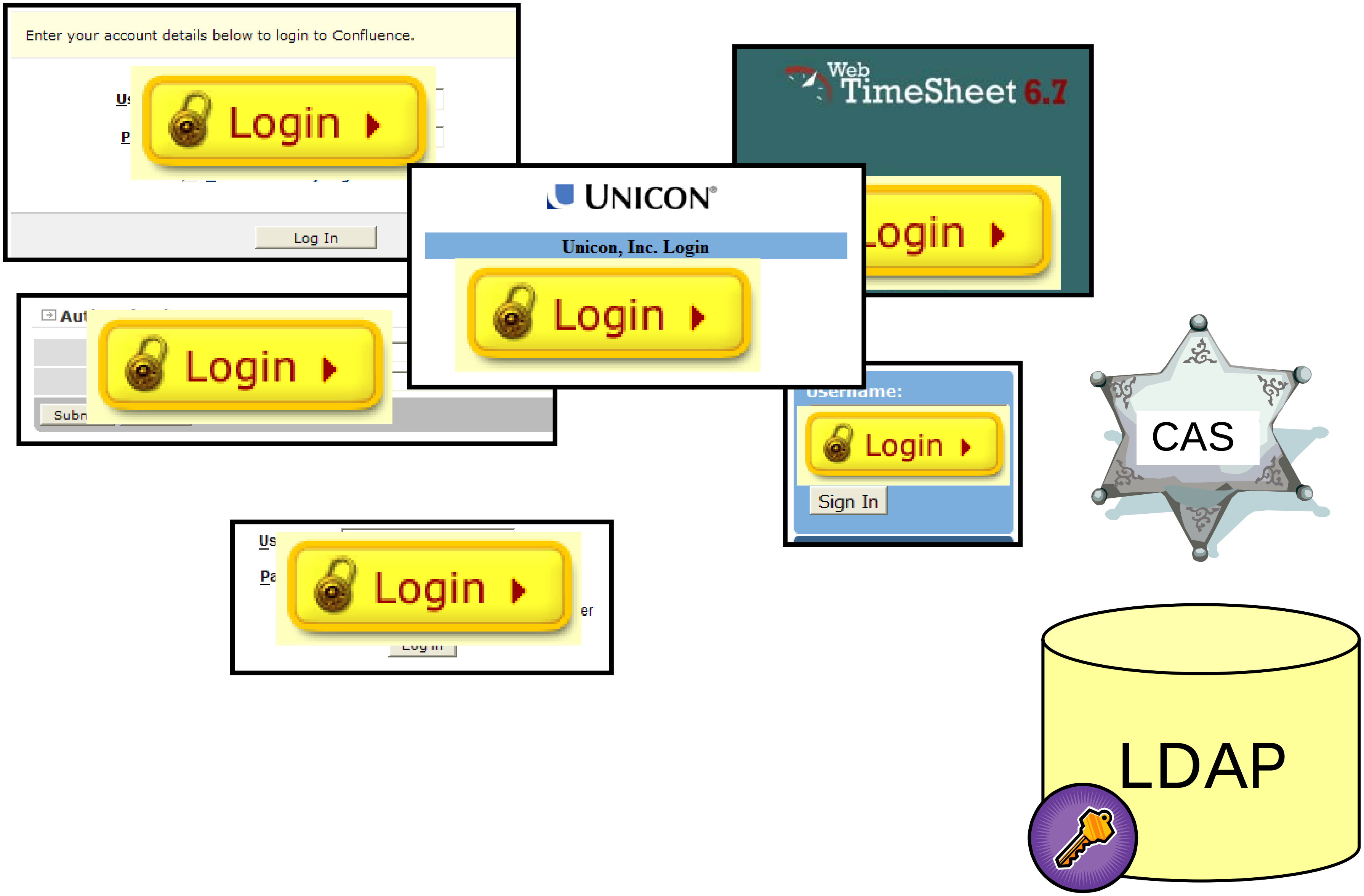
Determines
validity of user's
claimed
authentication

Browser

Authenticates
without sending password

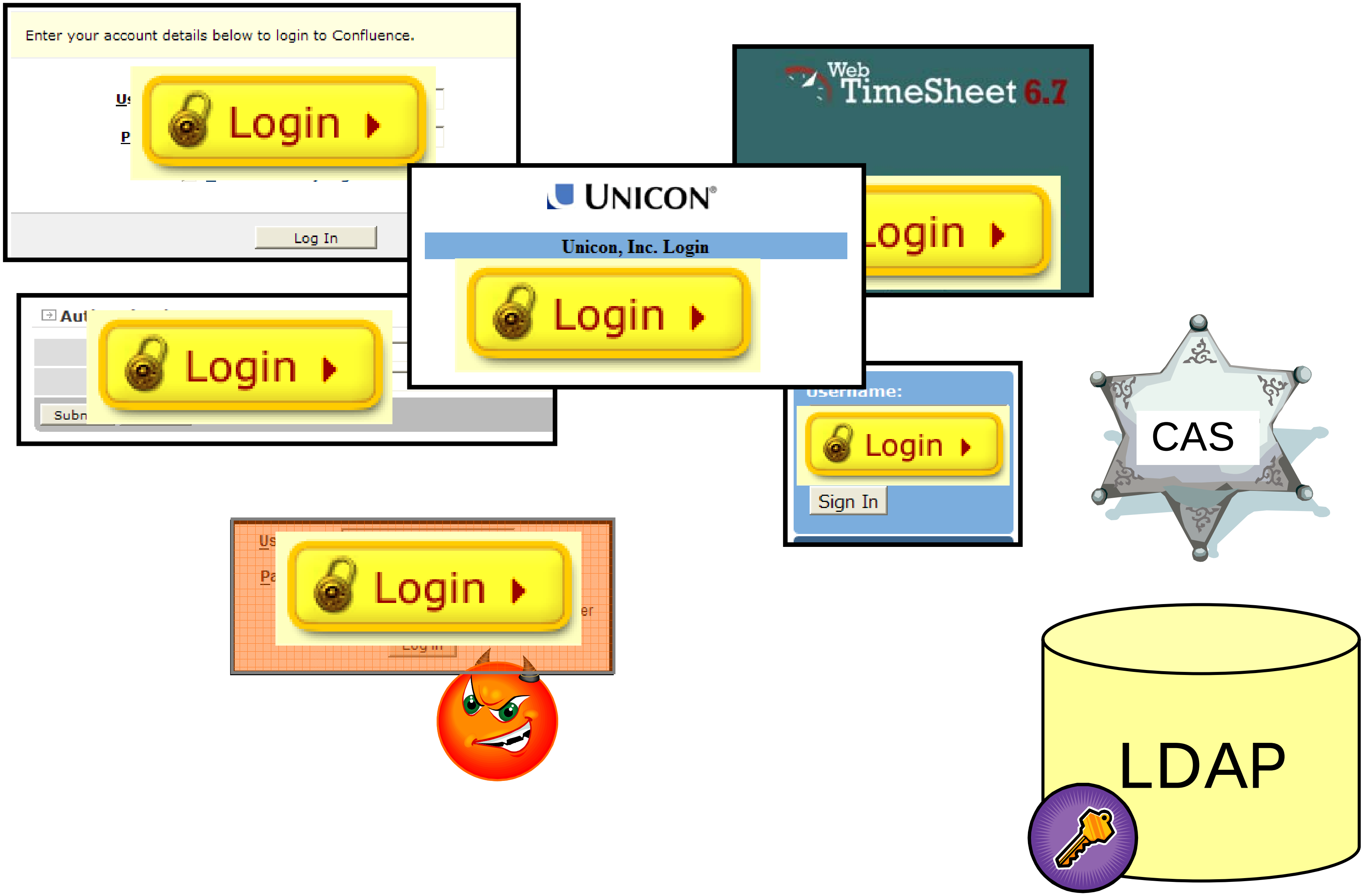
Web application

# Webapps no longer touch passwords



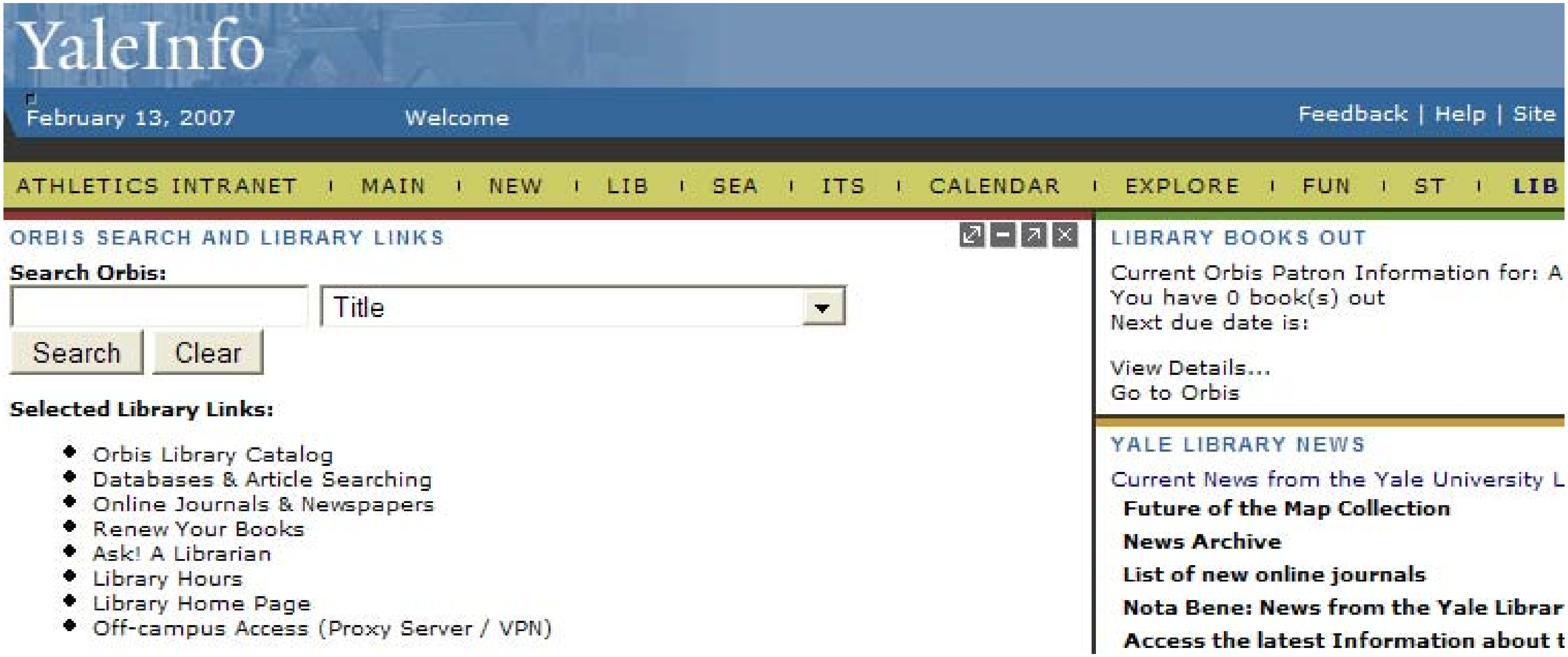
Enter your account details below to login to Confluence.

# Adversary compromises only single apps



Enter your account details below to login to Confluence.

# What about portals?



YaleInfo
February 13, 2007
Welcome
Feedback | Help | Site
ATHLETICS INTRANET | MAIN | NEW | LIB | SEA | ITS | CALENDAR | EXPLORE | FUN | ST | LIB

ORBIS SEARCH AND LIBRARY LINKS

**Search Orbis:**

Title

Search Clear

**Selected Library Links:**

- Orbis Library Catalog
- Databases & Article Searching
- Online Journals & Newspapers
- Renew Your Books
- Ask! A Librarian
- Library Hours
- Library Home Page
- Off-campus Access (Proxy Server / VPN)

LIBRARY BOOKS OUT

Current Orbis Patron Information for: A
You have 0 book(s) out
Next due date is:

View Details...
Go to Orbis

YALE LIBRARY NEWS

Current News from the Yale University L

**Future of the Map Collection**

**News Archive**

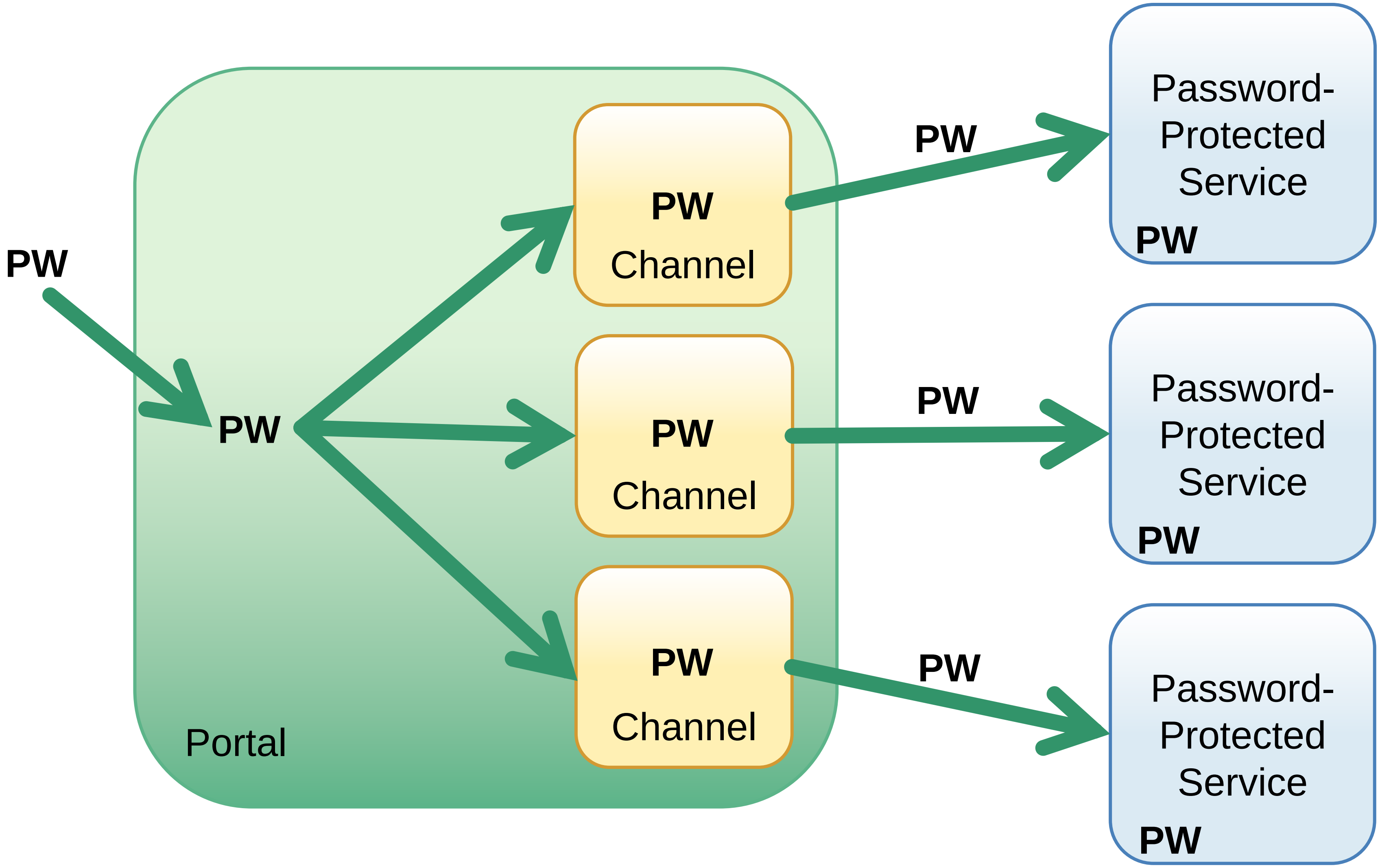
**List of new online journals**

**Nota Bene: News from the Yale Librar**

**Access the latest Information about t**

Need to go get interesting content from different systems.

# Password Replay


PW
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Portal
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Channel
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Password-Protected Service
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Password-Protected Service
PW
Password-Protected Service
PW

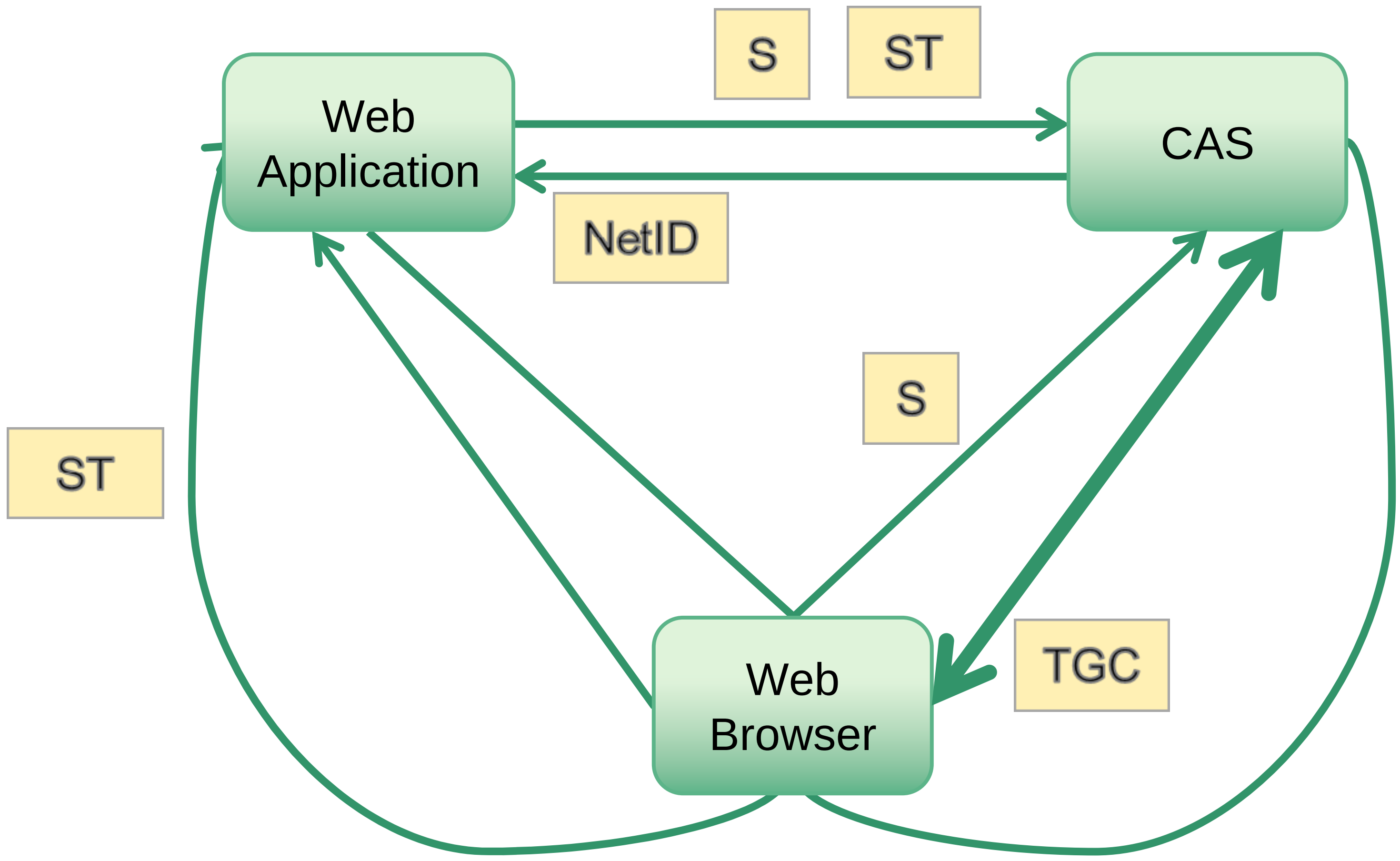
# CAS Protocol

Tickets and services

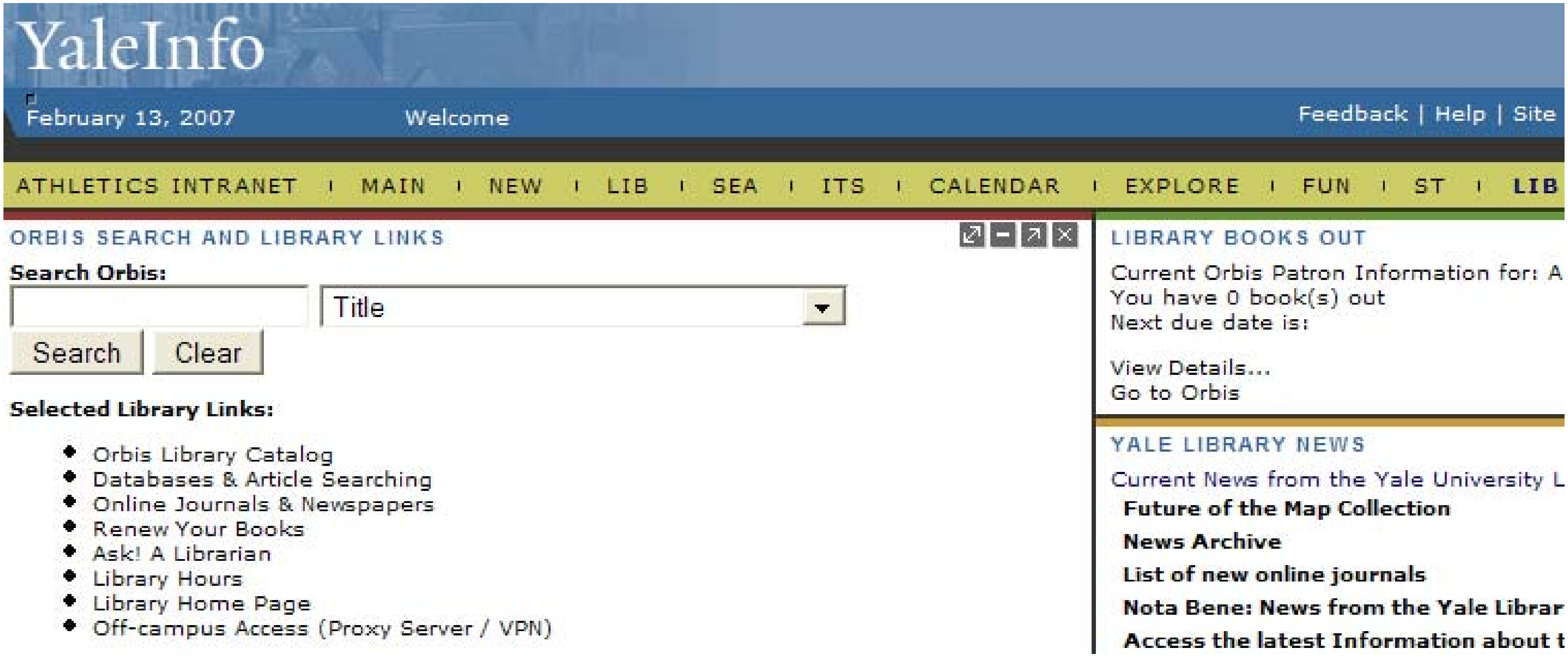
Ticket validation

Proxy authentication

# How CAS Works



# What about portals?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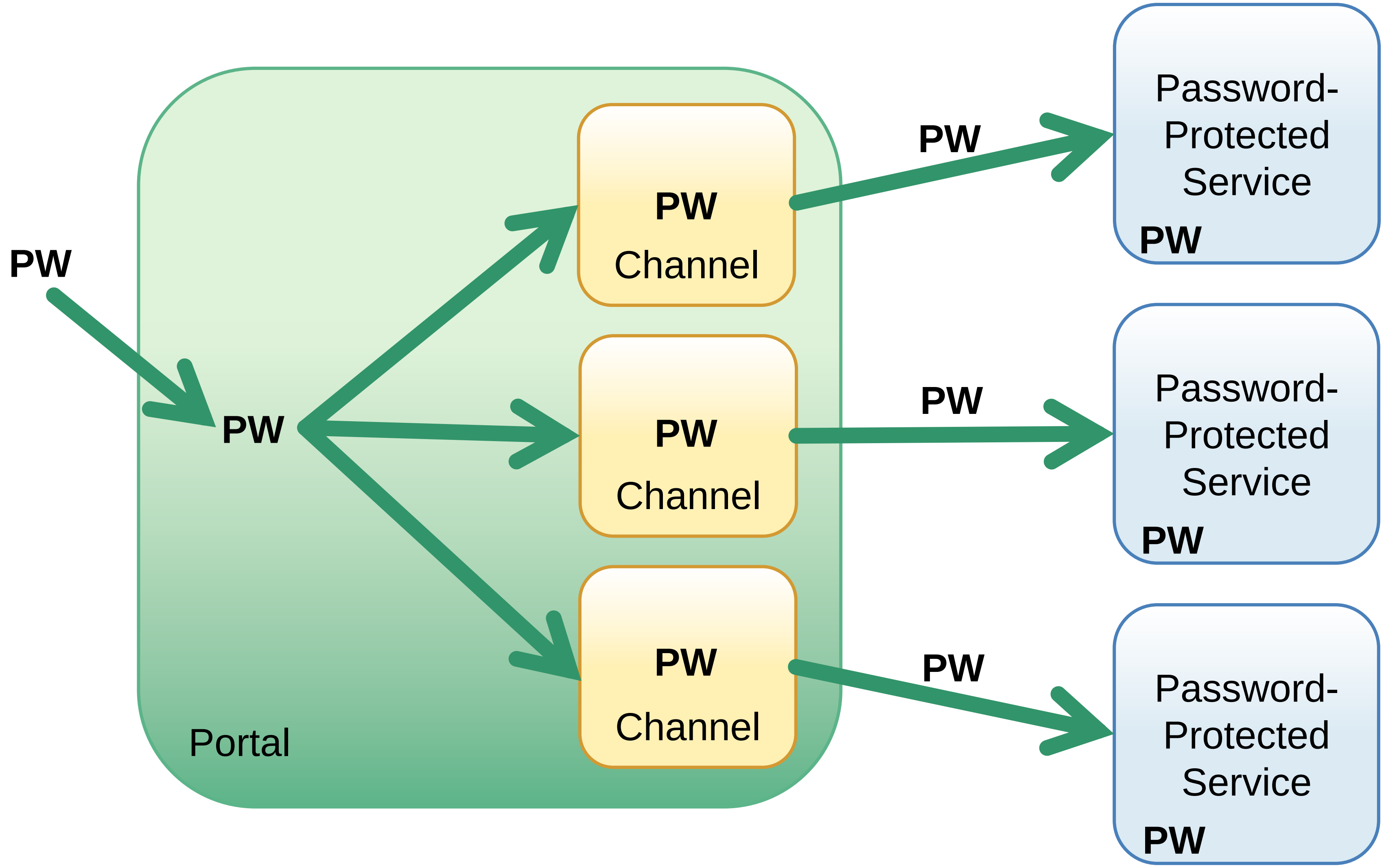
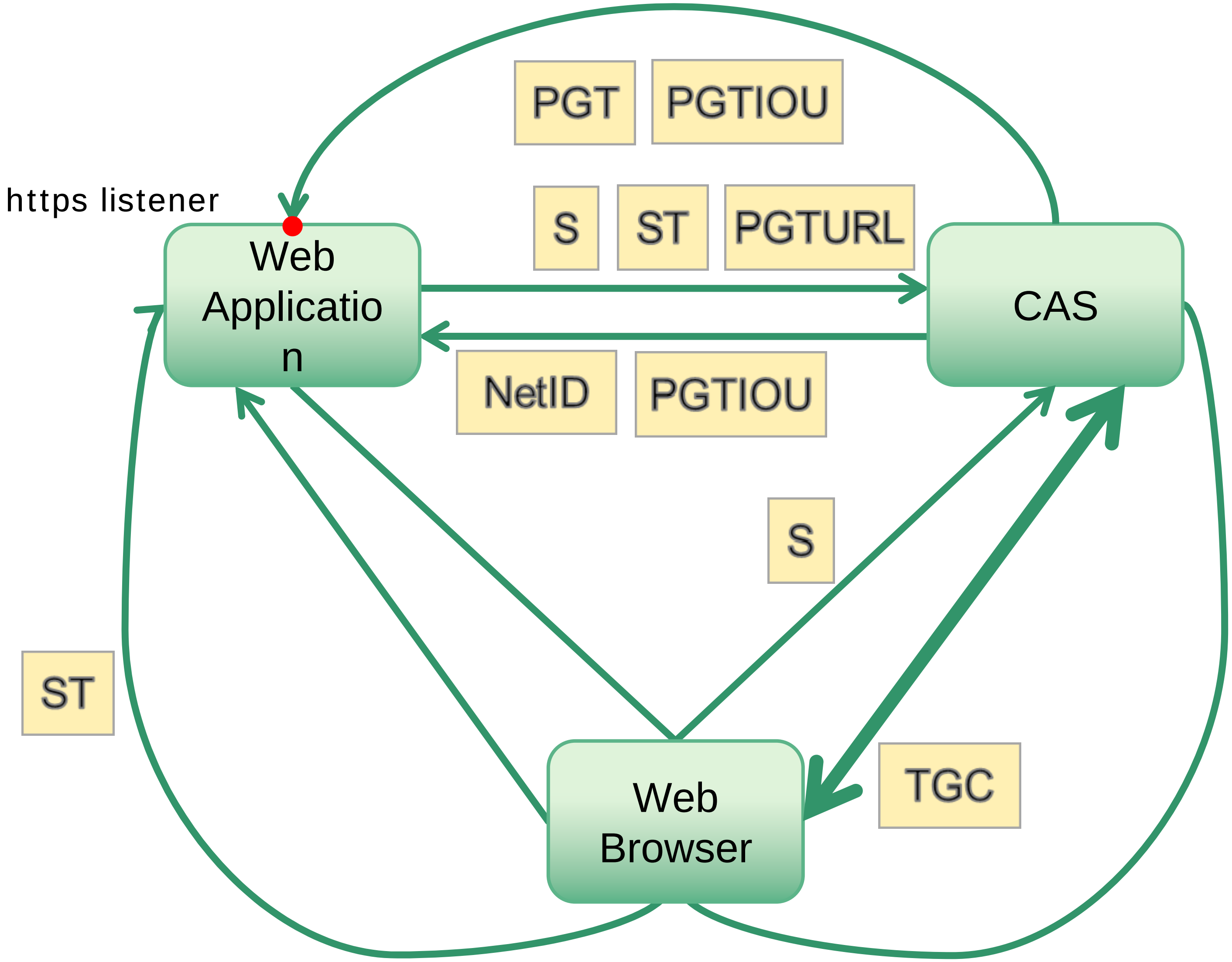
# Password Replay


PW
PW
PW
Channel
PW
Channel
PW
Channel
Portal
PW
PW
PW
Password-Protected Service
PW
Password-Protected Service
PW
Password-Protected Service
PW

# Look ma, no password!

- Without a password to replay, how am I going to authenticate my portal to other applications?

# Proxy CAS


PGT
PGTIOU
https listener
S
ST
PGTURL
Web Applicatio n
CAS
NetID
PGTIOU
S
ST
TGC
Web Browser

# Proxy CAS

- Feature unique to CAS among most of SSO systems
- Allows some Web applications to act as proxies on behalf of the users
- Proxied Web applications may act as N-th level proxies

http://www.jasig.org/cas/protocol

# Provided Authentication Handlers

- LDAP
  - Fast bind
  - Search and bind
- Active Directory
  - LDAP
  - Kerberos (JAAS)
- JAAS
- JDBC
- RADIUS
- SPNEGO
- Trusted
- X.509 certificates
- Writing a custom authentication handler is easy

# CAS – More than Authentication

- Return attributes of logged on users
- Adding support for standards
  - OpenID
  - SAML
- Single Sign-Out
- RESTful API
- Support for clustering
  - Implements distributed ticket registry
  - Requires session replication
  - Must guarantee cross-server ticket uniqueness
- Services management (white listing)
- Remember me (long-term SSO)

# Short Term Goals

- Service Registry Enhancements:
  - Self Registration Page
  - Service Priority
  - LDAP implementation of Service Registry
- InfoCard Support
- Auditing, Logging etc.
- More Internationalization

# Long Term Goals

- Re-architecture to support emerging use cases
  - Account Management integration
  - Password Expiration Policies/Password Change Integration
  - SAML, OAuth, OpenID2, etc.
  - Levels of assurance / multifactor authentication / second-level
- Better online / realtime administration
  - Installer / configurer
  - Information about CAS server (open SSO sessions, etc.)
- Hardening / anti-phishing

http://www.ja-sig.org/wiki/display/CASST/CAS+4+Roadmap

# Building from sources

Obtaining the distribution

Requirements and tools

File structure and dependencies

# Obtaining the distribution

- http://www.jasig.org/cas/
- SVN at developer.ja-sig.org

```
svn checkout https://www.ja-
  sig.org/svn/cas3/tags/cas-3-3-1-final/
  cas-server
```

- Import and maintain in your source control's vendor branch

# Requirements to build CAS

- Required
  - Java Development Kit 5 or 6
  - Maven 2
- Optional
  - SVN
  - Eclipse (with SVN and Maven plugins)
  - EasyEclipse Server (plus Maven plugin)
  - Tomcat (gotta test it somewhere!)

# File structure and dependencies

- Top-level Project Object Model (POM or pom.xml) used for all builds and to build dependent sub-projects.
- The top-level POM builds all the sub-projects, but by default they are NOT included in the resulting war file.
- To add dependent sub-projects or additional external libraries to the war file, you need to add dependencies to pom.xml in cas-server-webapp.

# Adding a dependency to pom.xml

```xml
<!-- ... -->
<dependency>
  <groupId>ognl</groupId>
  <artifactId>ognl</artifactId>
  <version>2.6.9</version>
  <scope>runtime</scope>
</dependency>

<dependency>
  <groupId>${project.groupId}</groupId>
  <artifactId>cas-server-support-ldap</artifactId>
  <version>${project.version}</version>
</dependency>

<dependency>
  <groupId>log4j</groupId>
  <artifactId>log4j</artifactId>
  <version>1.2.14</version>
  <type>jar</type>
  <scope>runtime</scope>
</dependency>
<!-- ... -->
```

# Building using Maven overlay method

Requirements

Project Structure

Dependencies

# Requirements to build CAS

- Required
  - Java Development Kit 5 or 6
  - Maven 2
- Optional
  - SVN
  - Eclipse (with SVN and Maven plugins)
  - EasyEclipse Server (plus Maven plugin)
  - Tomcat (gotta test it somewhere!)

# File structure and dependencies

- Start with just Project Object Model (pom.xml) in an empty project directory.
- Add files, as needed, to “overlay” those in the standard WAR file.
    - Your own deployerConfigContext.xml would be the first such file.
    - May want to add institutional images and CSS modifications.
- Add dependencies, as needed, to additional CAS modules.

# Configuring CAS

deployerConfigContext.xml

web.xml

log4j.properties

# deployerConfigContext.xml

- Located in cas-server-webapp/src/main/webapp/WEB-INF
- Deployer-specific configuration file
- This is the first and possibly the only file you have to modify
- Replace the default authentication handler with the one your deployment needs
- Add configuration options that your authentication handler requires

# deployerConfigContext.xml example

```
<bean id="authenticationManager" class="org.jasig.cas.authentication.AuthenticationManagerImpl">
 <!-- ... -->
   <property name="authenticationHandlers">
     <list>
       <!--
         | This is the authentication handler that authenticates services by means of callback via SSL, thereby validating
         | a server side SSL certificate.
         +-->
       <bean class="org.jasig.cas.authentication.handler.support.HttpBasedServiceCredentialsAuthenticationHandler" />

       <bean class="org.jasig.cas.adaptors.ldap.BindLdapAuthenticationHandler">
         <property name="filter" value="uid=%u" />
         <property name="searchBase" value="ou=People,dc=training" />
         <property name="contextSource" ref="contextSource" />
       </bean>
     </list>
   </property>
 </bean>

 <bean id="contextSource" class="org.jasig.cas.adaptors.ldap.util.AuthenticatedLdapContextSource">
   <property name="anonymousReadOnly" value="true" />
   <property name="password" value="{password_goes_here}" />
   <property name="pooled" value="true" />
   <property name="urls">
     <list>
        <value>ldap://localhost/</value>
     </list>
   </property>
   <property name="userName" value="{username_goes_here}" />
   <property name="baseEnvironmentProperties">
     <map>
       <entry>
         <key><value>java.naming.security.authentication</value></key>
         <value>simple</value>
       </entry>
     </map>
   </property>
 </bean>
```

# web.xml

- Located in cas-server-webapp/src/main/webapp/WEB-INF
- Standard JEE deployment descriptor
- All endpoints defined as mapped to one servlet
- Uses Spring WebMVC
- This is the “root” of the CAS Web application configuration
- Re-enable the user-friendly error reporting
- Lists all the Spring context configuration files
- My need to add auditTrailContext.xml

# log4j.properties

- Located in cas-server-webapp/src/main/webapp/WEB-INF/classes
- Log4j periodically re-reads this file (no Tomcat restart needed after editing)
- Add fully-qualified path to “cas.log”
- May want to increase the log level for troubleshooting
- Warning: setting the log level to DEBUG or higher will log users’ passwords

# Additional Features

Service registry

Single sign-out

OpenID

# Service registry

- Allows to maintain a list of services authorized to authenticate to CAS
- Off by default
- When turned on, only registered services will be allowed to authenticate to CAS
- Implementing service registry introduces a database requirement to CAS (using Hibernate)
- Service registry’s management interface requires authentication (CAS, of course)
- Must add the service registry URL as the first service to avoid locking out access to the service registry management interface

# Enabling service registry

Find a section of deployerConfigContext.xml that looks like this:

```
<bean id="userDetailsService" class="org.acegisecurity.userdetails.memory.InMemoryDaoImpl">
  <property name="userMap">
    <value>

    </value>
  </property>
</bean>
```

and make it look like this:

```
<bean id="userDetailsService" class="org.acegisecurity.userdetails.memory.InMemoryDaoImpl">
  <property name="userMap">
    <value>
      adam=notused,ROLE_ADMIN
    </value>
  </property>
</bean>
```

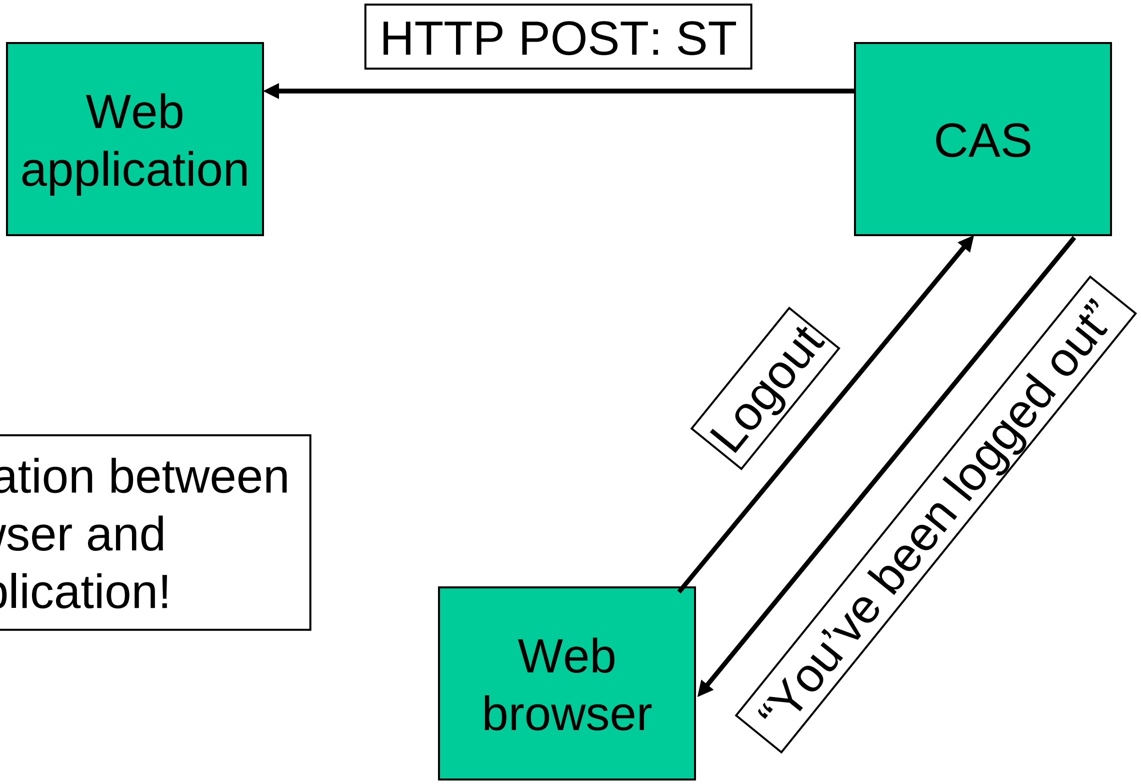
Now user “adam” is authorized to manage services.

Need to enable the database persistence, too.

# Single sign-out

- Allows CAS to post a “user signed out” message to all services that have previously authenticated to CAS
- On by default
- Services receive the SSOut message as an HTTP POST to the same endpoint identified during authentication
- Service Ticket identifies the SSO session that was terminated

# Single sign-out



HTTP POST: ST

Web application

CAS

Logout

"You've been logged out"

Web browser

No communication between the browser and Web application!

# OpenID (http://openid.net/)

- Allows to use a single digital identity across the Internet
- Web applications delegate authentication to an OpenID provider
- CAS can be configured to be an OpenID provider
- Useful if you have Web applications that support OpenID authentication and not CAS

# CAS-enabling (or CASifying) Web applications

uPortal

Tomcat Manager

????

# uPortal

- Edit `properties/security.properties`
- Edit `webpages/WEB-INF/web.xml`
- Edit (uPortal 2.x only) `webpages/stylesheets/org/jasig/portal/channels/CLogin/html.xsl`
- Deploy the changes
- Restart uPortal

# Tomcat Manager

- Tomcat Manager relies on container authentication
- This example illustrates how CAS authentication can replace Tomcat’s BASIC Authentication without having to write or modify any code
- Locate the Manager applications deployment descriptor (web.xml)
- Replace its original authentication section with CAS filter-based authentication
- Add simple authorization
- http://www.ja-sig.org/wiki/x/5yM

# Questions?

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