

SWITCHaai Introduction Course



SWITCH

SWITCHaai Team
aai@switch.ch

Bern, 1. March 2013

Overview

- Federated Identity Management
- Introduction to Shibboleth
 - AAI Login Demo
- *Coffee Break*
- The SWITCHaai Federation
- AAI Attributes
- Resource Registry

Federated Identity Management



SWITCH

Thomas Lenggenhager
aai@switch.ch

SWITCHaai Introduction Course
Bern, 1. March 2013

Overview

- What is Federated Identity Management?
- What is a Federation?
- The SWITCHaai Federation
- Interfederation
- Conclusions

Federated Identity

- Older mechanisms assume applications are within the same administrative domain
 - Adding a user from outside means creating an account within your IdM system. This could result in the new user having access to more than just the intended application.
 - *Simple technical solutions based on domain cookies*
- Federated Identity Management (FIM) securely shares information managed at a users home organization with remote services.
 - Within FIM systems it doesn't matter if the service is in your administrative domain or another. It's all handled the same.
 - *More advanced technical solutions required!* → SAML2

SAML = Security Assertion Markup Language

Federated Identity (2)

- In Federated Identity Management:



Identity Providers (IdP) asserts authentication and identity information about users



Service Providers (SP) check and consume this information for authorization and makes it available to an application

- An IdP or SP is generically known as an **entity**
- The first principle within federated identity management is the active protection of user information
 - Protect the user's credentials
 - only the IdP ever handles the credential
 - Protect the user's identity information, including identifier
 - customized set of information released to each SP

What does FIM do for me?

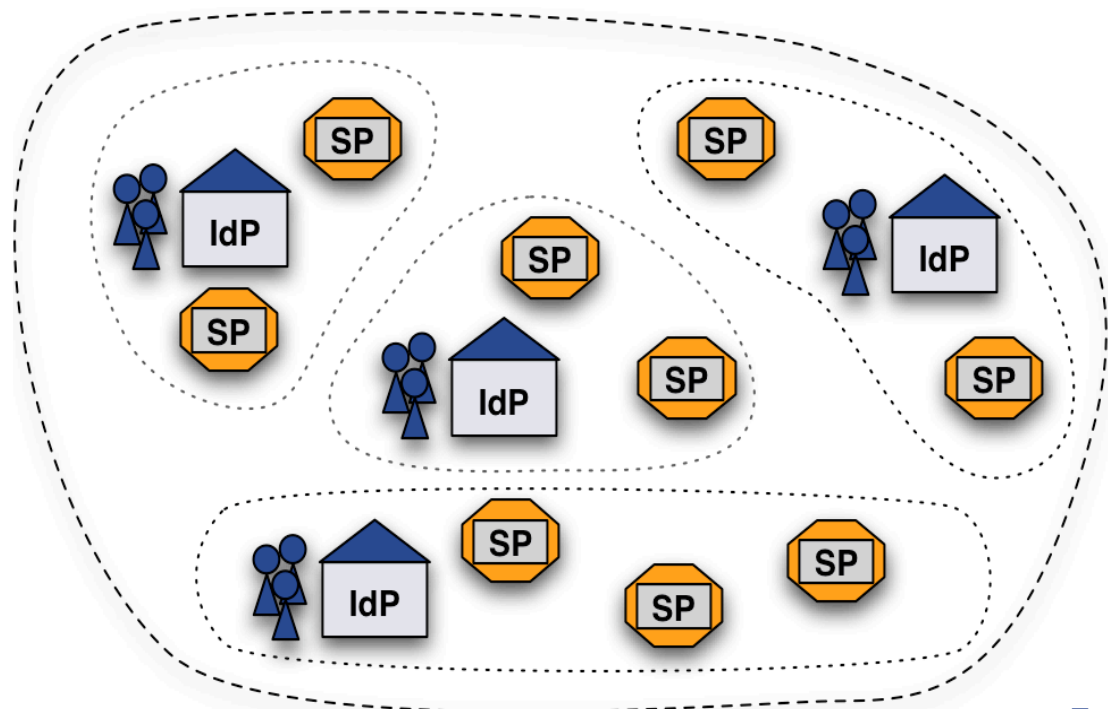
- Reduces work
 - Authentication-related calls to Penn State University's helpdesk dropped by 85% after they installed Shibboleth
- Provides current data
 - Studies of applications that maintain user data show that the majority of data is out of date. Are you “protecting” your app with stale data?
- Insulation from service compromises
 - In FIM data is pushed to services as needed. If those services are compromised the attacker can't get everyone's data.
- Minimize attack surface area
 - Only the IdP needs to be able to contact user data stores. All effort can be focused on securing this one connection instead of one or more connections per service.

Some other gains

- Users generally find the resulting single sign-on experience to be nicer than logging in numerous times.
- Consistent authentication process regardless of the service accessed. Usability-focused individuals like that .
- A properly maintained federation drastically simplifies the process of integrating new services.

What is a Federation?

- A group of organizations running IdPs and SPs that agree on a common set of rules and standards
 - An organization may belong to more than one federation at a time
- The grouping can be on a regional level (e.g. SWITCHaai) or on a smaller scale (e.g. large campus)
- IdPs and SPs "know" nothing about federations
They read metadata!



What are these rules of which you speak?

- Technical Interoperability
 - Supported protocols
 - User authentication mechanisms
 - User attribute specifications
 - Accepted X.509 server certificates
- Legal Interoperability
 - Membership agreement or contract
 - Federation operation policies
 - Requirements on identity management practices
- Others
 - Common/best operational practices <http://switch.ch/aai/bcp>

What does a Federation do?

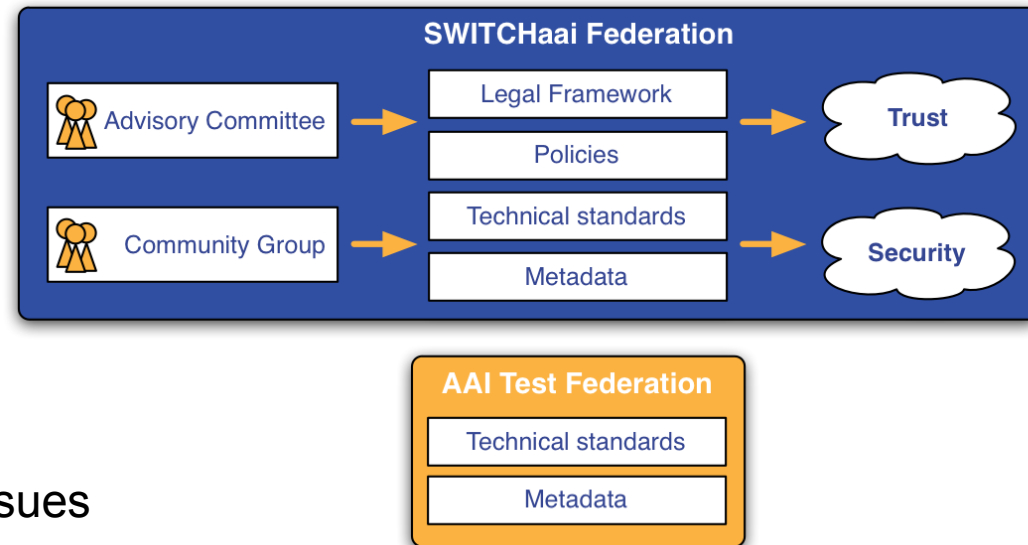
- At a minimum a federation maintains the list of which IdPs and SPs are in the federation
- Most federations also
 - define agreements, rules, and policies
 - provide some user support (documentation, email list, etc.)
 - operate a central discovery service and test infrastructure
- Some federations
 - provide self-service tools for managing IdP and SP data
 - provide application integration support
 - host or help with outsourced IdPs <http://switch.ch/aai/idp-hosting>
 - provide tools for managing "guest" users <http://switch.ch/aai/vho>
 - develop custom tools for the community

Federation Metadata

- An XML document that describes every federation entity
- Contains
 - Unique identifier for each entity known as the entityID
 - Endpoints where each entity can be contacted
 - Certificates used for signing and encrypting data
- May contain
 - Organization and person contact information
 - Information about which attributes an SP wants/needs
- Metadata is usually distributed by a public HTTP URL
 - The metadata should be digitally signed
 - Bilateral metadata exchange scales very badly
- Metadata **must** be kept up to date so that
 - New entities can work with existing ones
 - Old, or revoked, entities are blocked

SWITCHaai Federation (1)

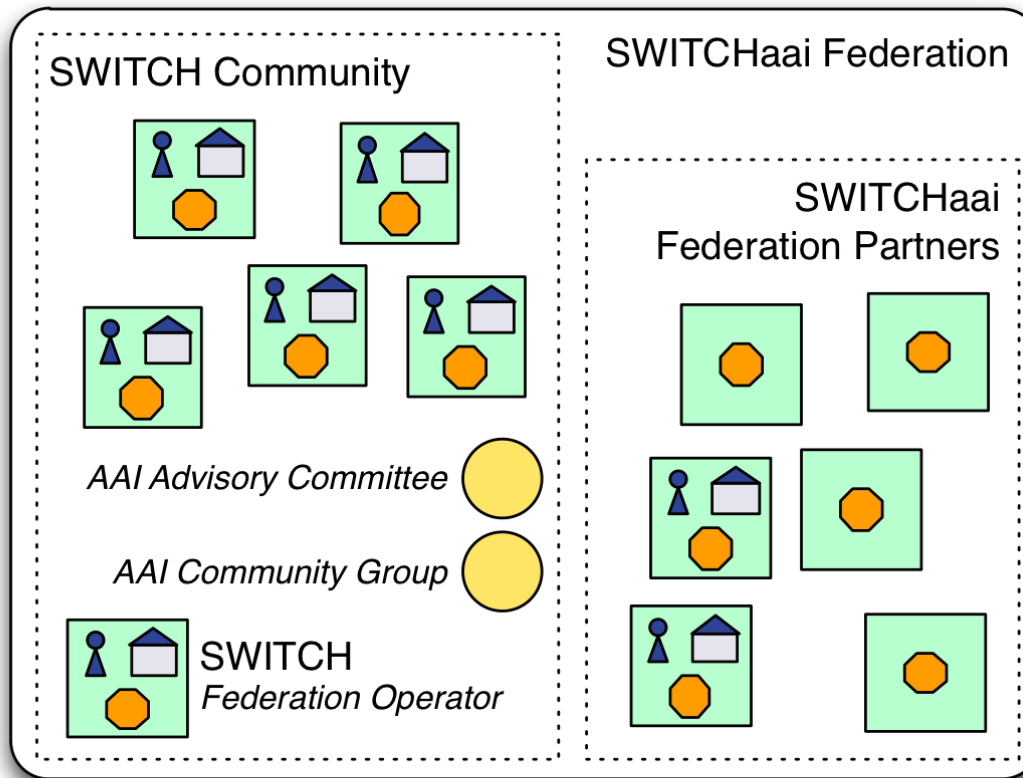
- SWITCH consults with two bodies
 - Advisory Committee deals with policies and legal framework
 - Community Group deals with technical/operational issues



- Two classes of SWITCHaai Participants
 - SWITCH Community
 - Organization fits the definition from the SWITCH Service Regulations
 - Federation Partner
 - Organization sponsored by a SWITCHaai Participant from the SWITCH Community

<http://switch.ch/aai/about/federation/>

SWITCHaai Federation (2)



- SWITCH operates the SWITCHaai Federation
- AAI is a Basic Service for the SWITCH Community

SWITCHaai: Rules, Policies, & Agreements

- SWITCHaai Service Description (includes the Policy) concepts and rules for all entities in the federation

http://switch.ch/aai/docs/SWITCHaai_Service_Description.pdf

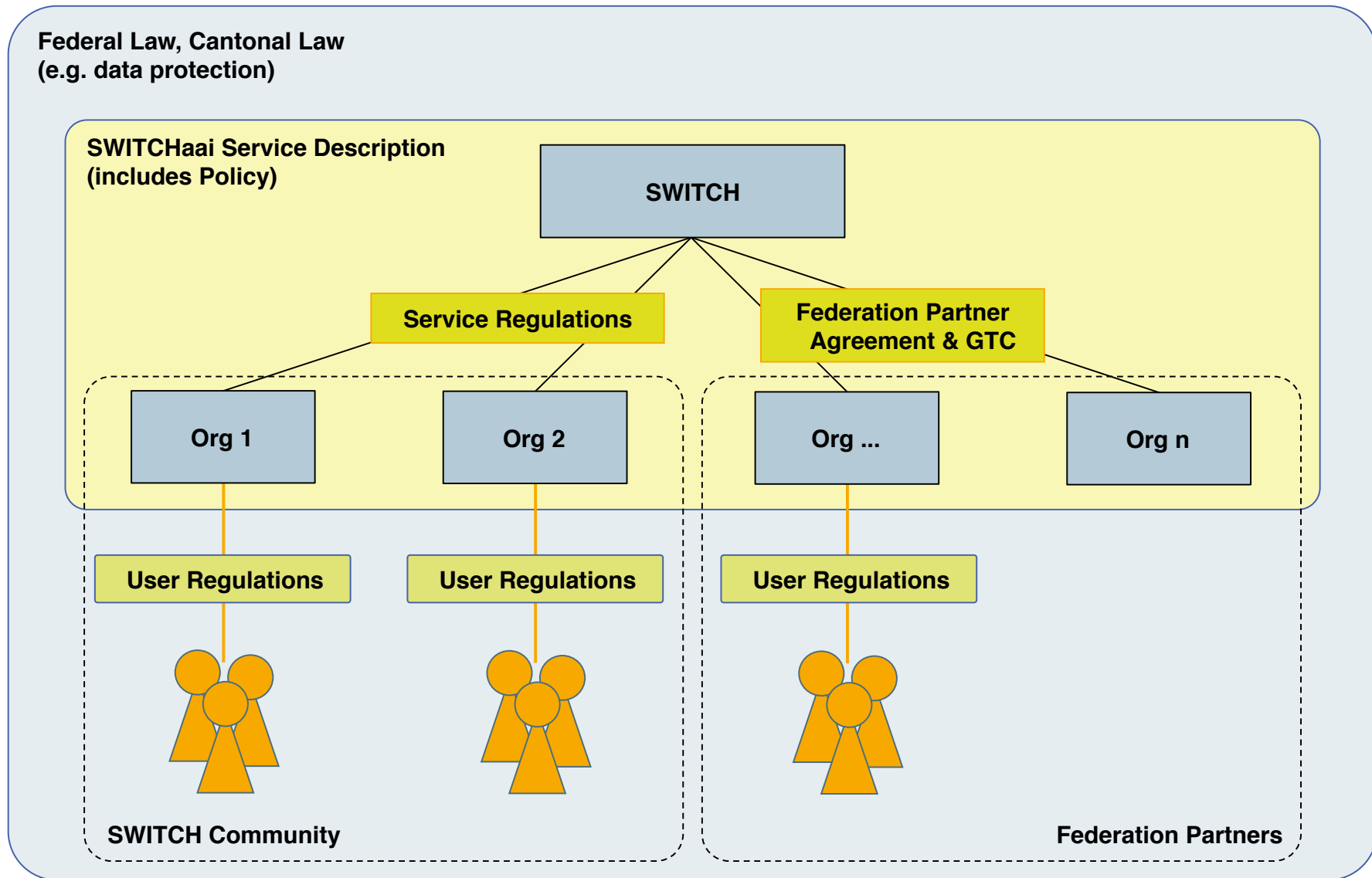
- Federation Partner Agreement
legal contract between SWITCH and federation partner

- Certificate Acceptance Policy
policy certificates accepted by the federation

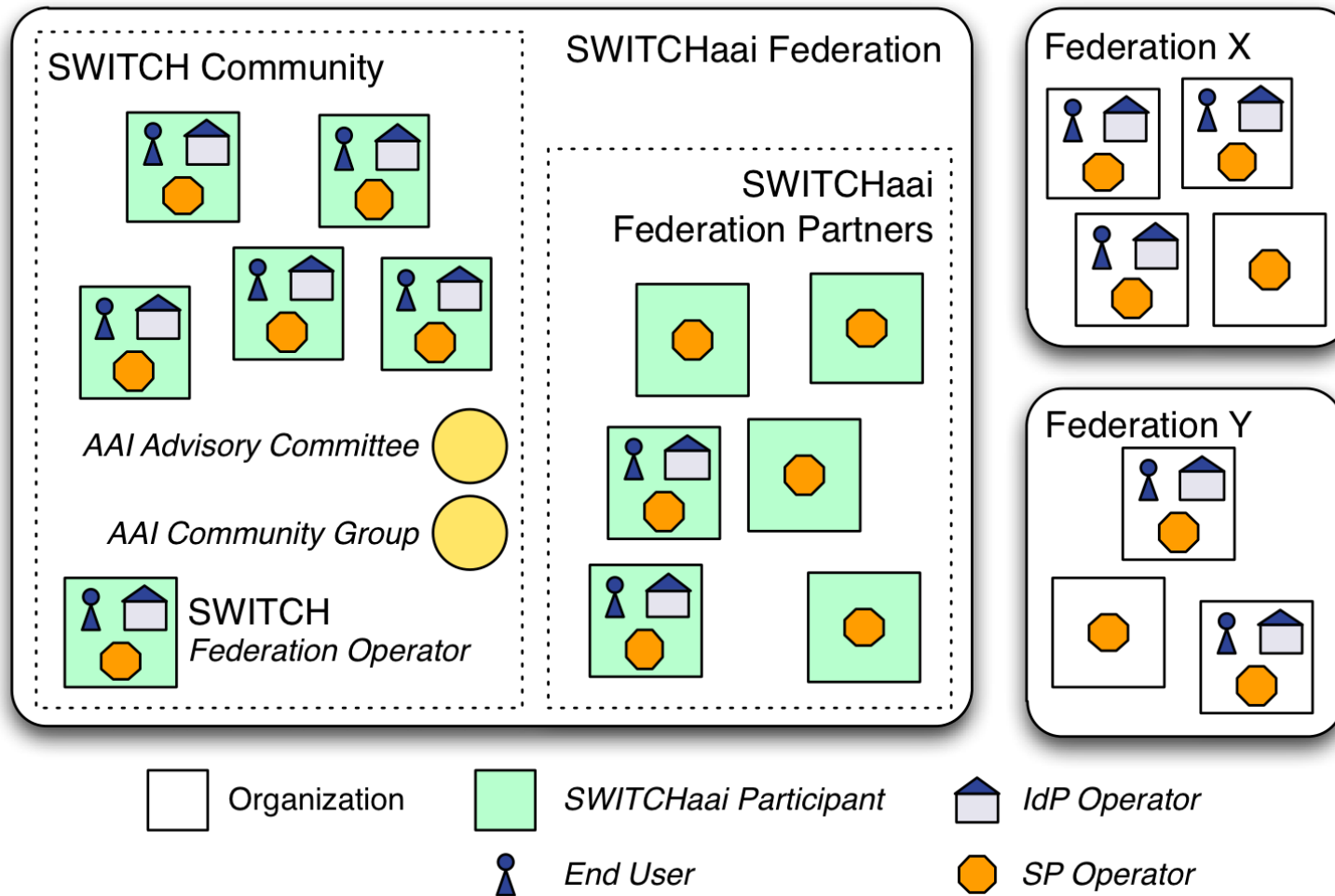
- AAI Attribute Specification
minimum set of core and optional attributes supported by federation entities

http://switch.ch/aai/docs/AAI_Attr_Specs.pdf

SWITCHhai: The Legal Framework



SWITCHHaaI & Interfederation



<http://switch.ch/aai/interfederation>

Conclusions

- Federated Identity Management
 - provides scalable, protected access to services also in other administrative domains
 - supports data protection by releasing only personal data as required by the SP
 - separates responsibilities for authentication and authorization
 - is based on a set of rules and guidelines to support trust

Introduction to Shibboleth



SWITCH

Daniel Lutz
aai@switch.ch

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Agenda

- What is Shibboleth?
- IdP/SP Communication
- Shibboleth
- Support Resources

Shibboleth – Origin and Consortium

- The Origin
 - Internet2 in the US launched the open source project
- The name
 - Word **Shibboleth** was used to identify members of a group
- The standard
 - Based on Security Assertion Markup Language (SAML)
- The Consortium
 - The new home for Shibboleth development
 - collect financial contributions from deployers worldwide



<http://shibboleth.net>

What is Shibboleth? (1)

- Technically it's a project group, like Apache or Eclipse, whose core team maintains a set of software components
- Most people think of it as the set of software components
 - OpenSAML C++ and Java libraries
 - Shibboleth Identity Provider (IdP)
 - Shibboleth Service Provider (SP)
 - Shibboleth Discovery Service (DS)
 - Shibboleth Metadata Aggregator (MA)
- Taken together these components make up a federated identity management (FIM) platform.
- You might also think of Shibboleth as a multi-protocol platform that enforces a consistent set of policies.

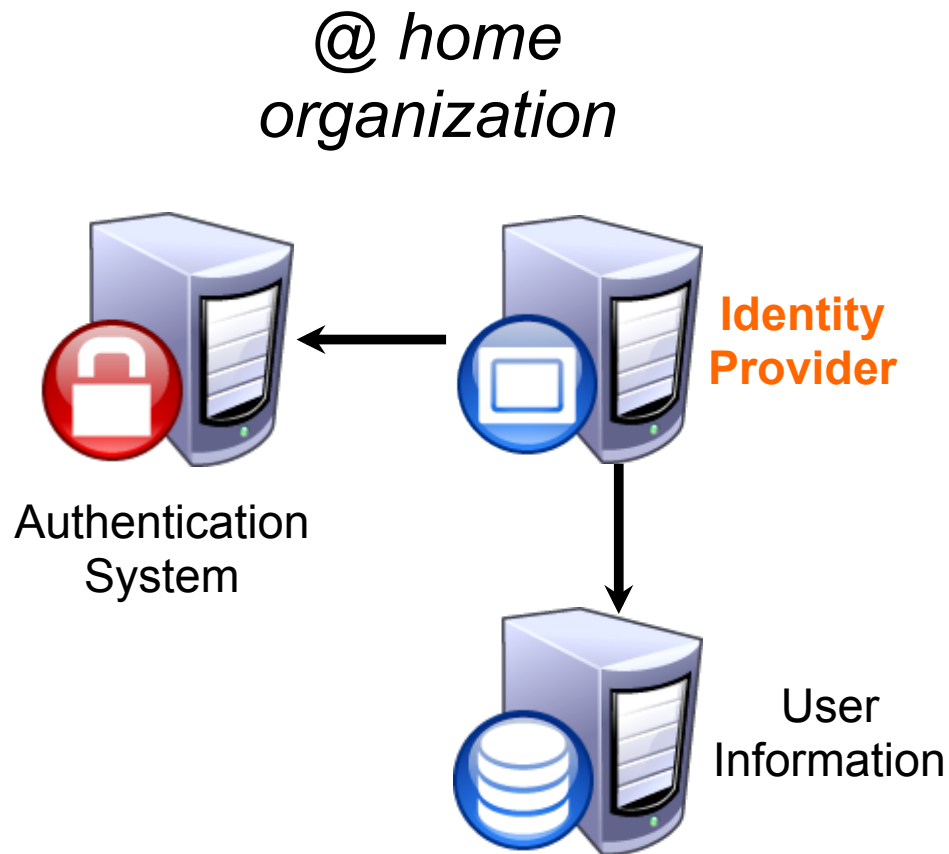


Shibboleth®

What is Shibboleth? (2)

- The Shibboleth software components are an implementation of the SAML protocols and bindings. There are other products, too (like e.g. SimpleSAMLphp).
- The Shibboleth software is widely used in the research and education environment

The Components

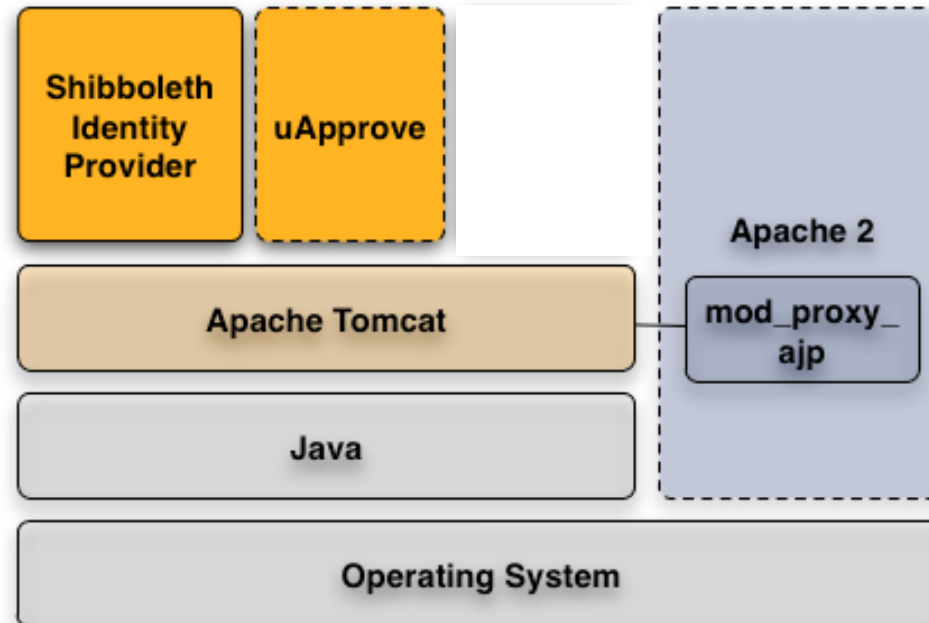


@service organization



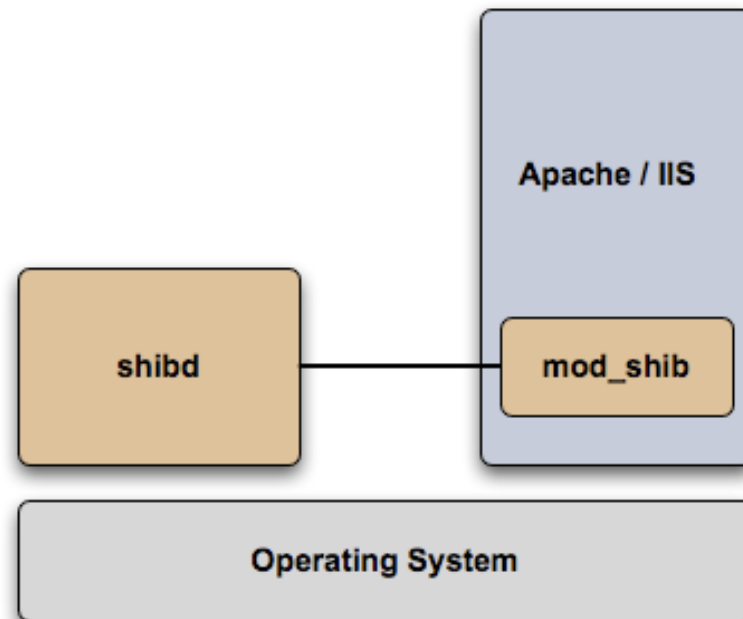
Shibboleth Components: Identity Provider

- What is it?
 - A Java Servlet (2.4) web application
- What does it do?
 - Connects to **existing** authentication and user data systems
 - Provides information about how a user has been authenticated
 - Provides user identity information from the data source



Shibboleth Components: Service Provider

- What is it?
 - mod_shib: A C++ web server (Apache/IIS) module
 - shibd: A C++ daemon - keeps state when web server processes die
- What does it do?
 - Optionally initiates the request for authentication and attributes
 - Processes incoming authentication and attribute information
 - Optionally evaluates content access control rules



Terminology (1)

- SAML - Security Assertion Markup Language
The standard describing the XML messages sent back and forth by the Shibboleth components (two versions: 1.1, 2.0)
- Profile - Standard describing how to use SAML to accomplish a specific task (e.g. SSO, attribute query)
- Binding - Standard that describes how to take a profile message and send it over a specific transport (e.g. HTTP)

Terminology (2)

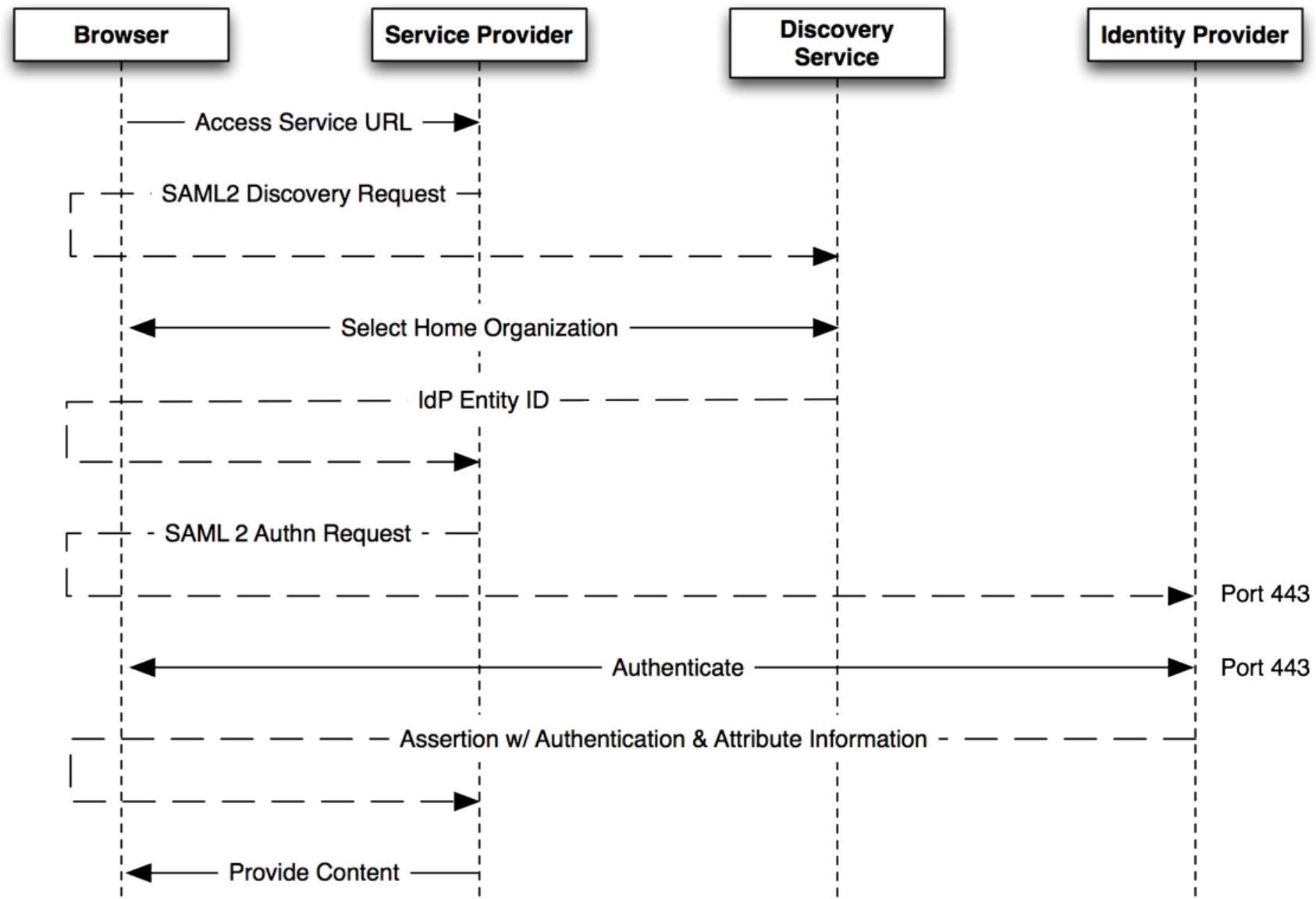
- entityID - Unique identifier for an IdP or SP
- NameID - An identifier by which an IdP knows a user
- Attribute - A named piece of information about a user
- Assertion - The unit of information in SAML

Shibboleth Supported Profiles

- SAML 2
 - SSO
 - Attribute Query
 - Artifact Resolution
 - Enhanced Client
 - Single Logout (SP-only)
- SAML 1 (deprecated)
 - Shibboleth SSO
 - Attribute Query
 - Artifact Resolution
- Discovery
 - SAML 2 Discovery Service
(not used in SWITCHaai)
 - Shibboleth 1 Discovery (WAYF)
(deprecated; not used in SWITCHaai)

<https://wiki.shibboleth.net/confluence/display/DEV/Supported+Protocols>

Shibboleth Communication Flow: Shibboleth 2 SSO



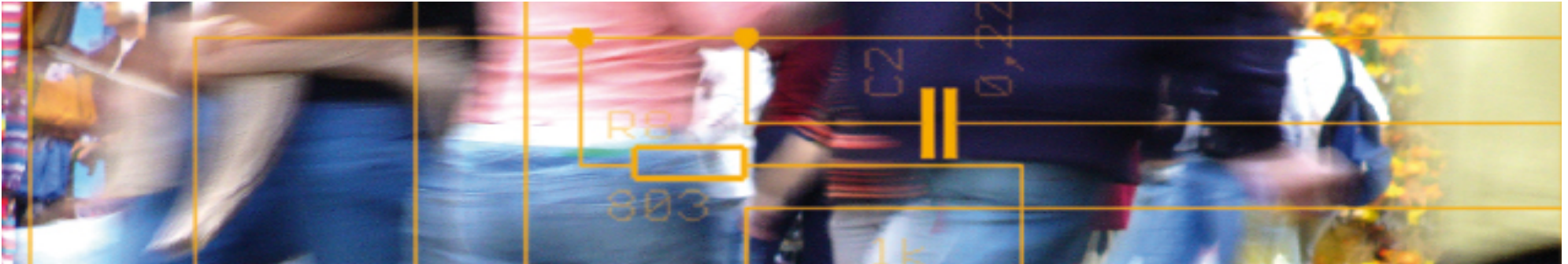
Odds and Ends

- Shibboleth knows nothing about federations, it just consumes metadata in order to:
 - locate the entity to which messages are sent
 - determine what protocols the entity supports
 - determine what signing/encryption keys to use
- The IdP is CPU bound, unlike most web apps
 - No support for crypto-acceleration currently
 - Limited support for clustering though

Support Resources

- First, check with your Federation
 - <http://switch.ch/aai/support/documents>
 - <http://switch.ch/aai/support/help>
- Shibboleth Wiki
 - <https://wiki.shibboleth.net/confluence/display/SHIB2>
- Shibboleth Mailing Lists
 - Available lists: <http://shibboleth.net/community/lists.html>
 - Users
 - Announcements
 - Development
 - User's list archive: <http://marc.info/?l=shibboleth-users>

AAI Login Demo



SWITCH

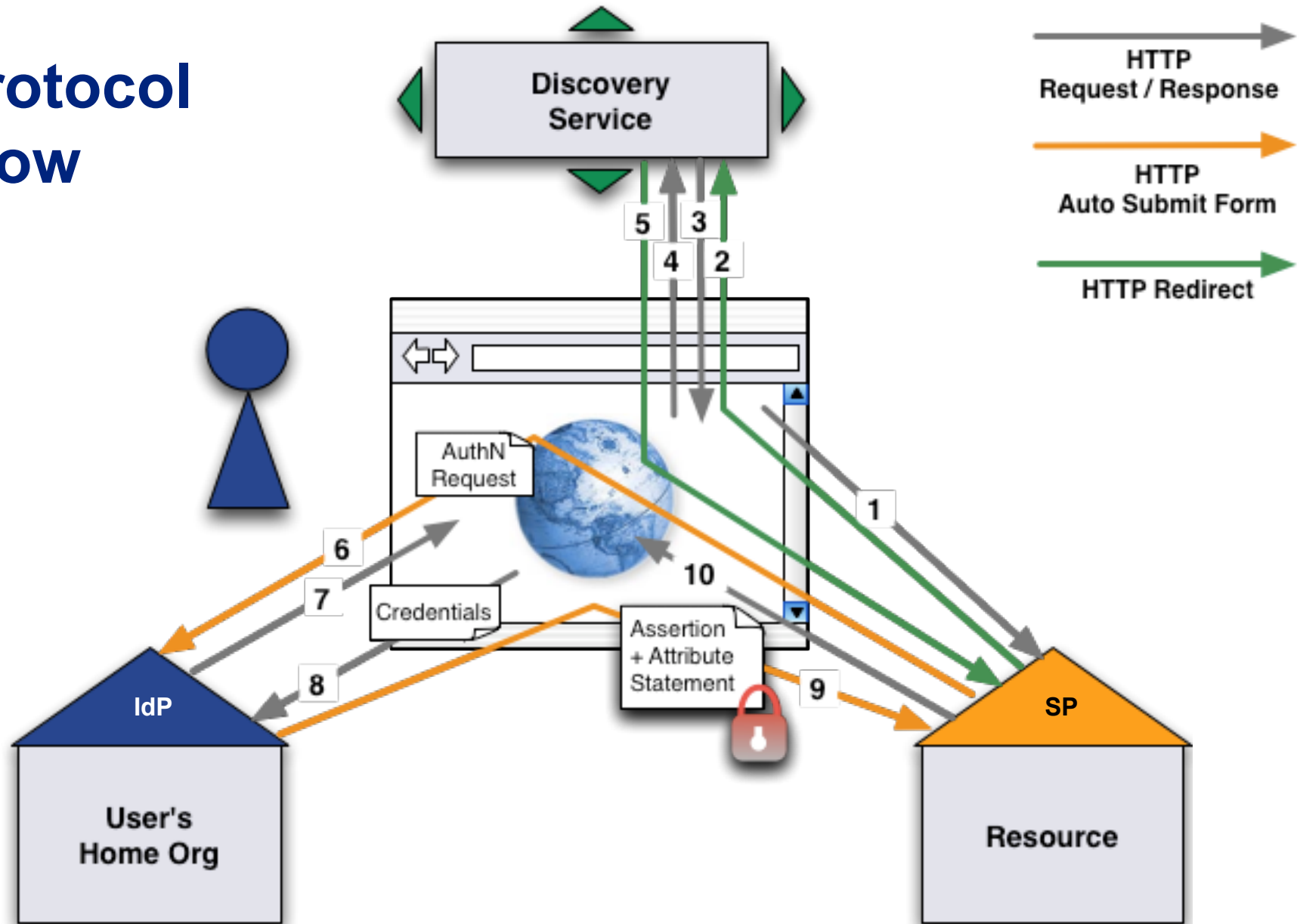
Daniel Lutz
aai@switch.ch

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Agenda

- Illustration of protocol flow
SAML2, Web Browser SSO
- Live demonstration

Protocol Flow

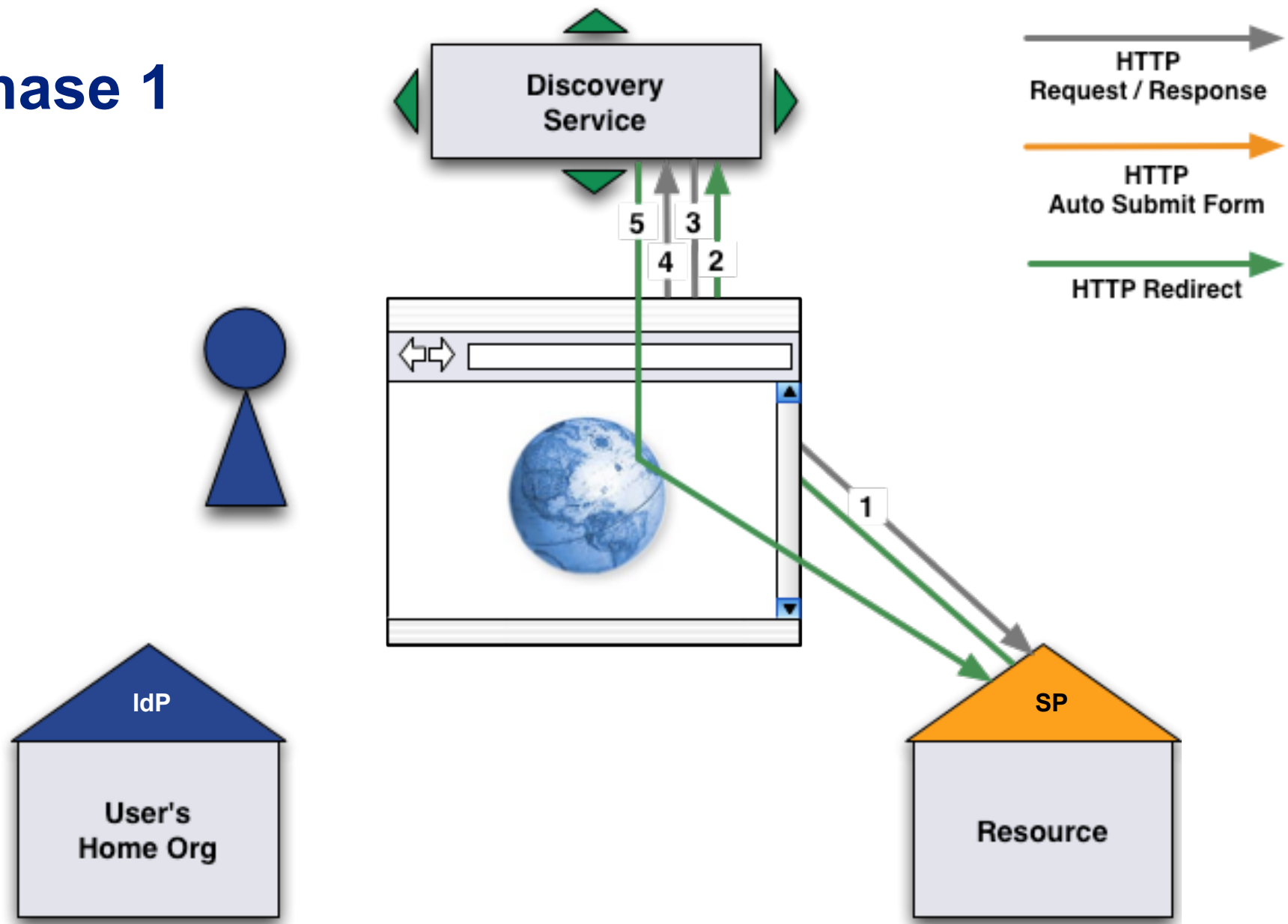


<http://www.switch.ch/aai/demo/>

Phase 1

**First access to the Service Provider and Identity
Provider discovery**

Phase 1



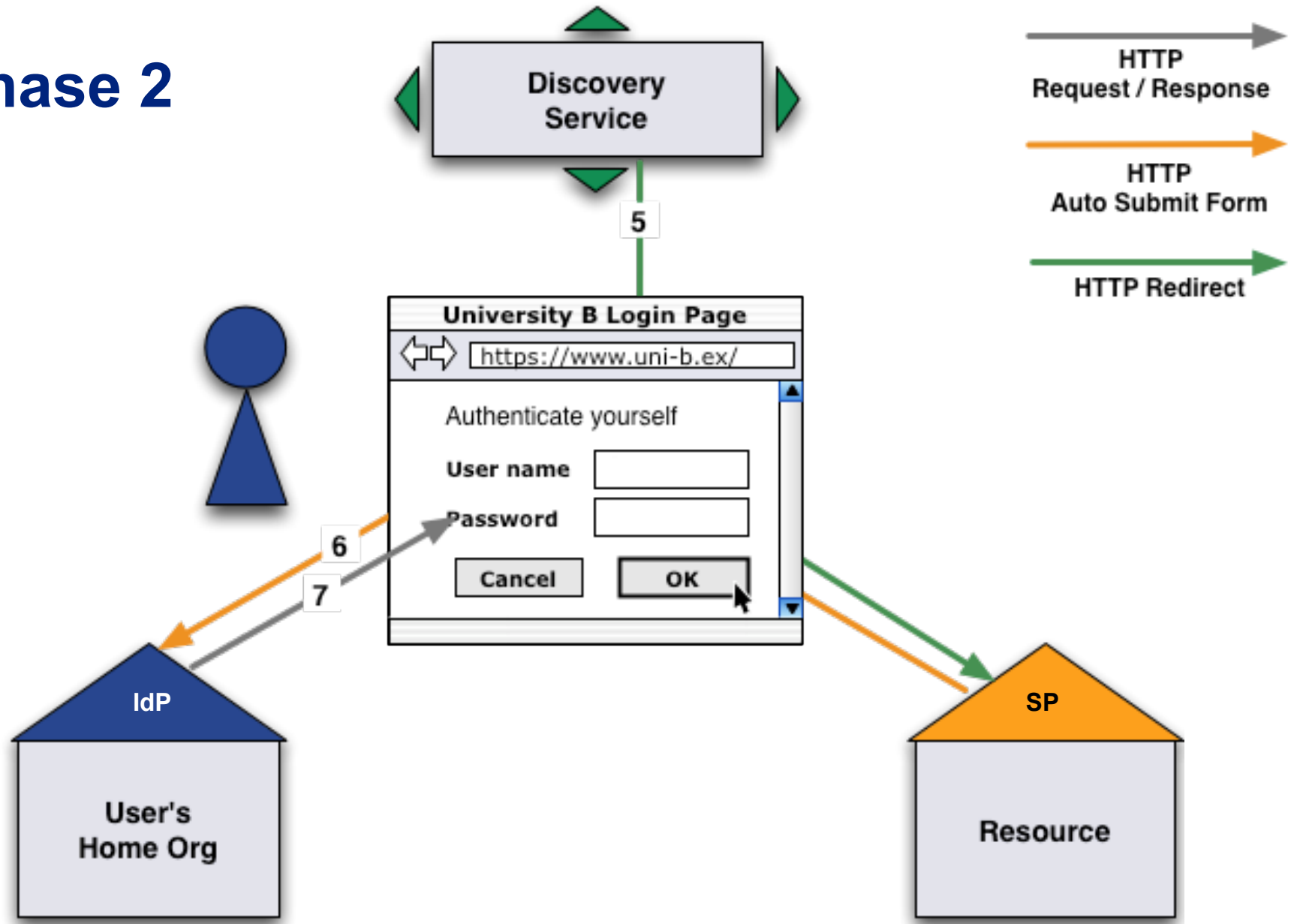
First access to the Service Provider and Identity Provider discovery

- ① The user opens a web browser and accesses the Service Provider.
- ② The user is redirected to the Discovery Service by the Service Provider. Consequently, the web browser sends a new request to the Discovery Service.
- ③ The Discovery Service answers with the web page that allows the user to select an Identity Provider.
- ④ On the Discovery Service page, the user submits the Identity Provider selection.
- ⑤ The Discovery Service sends a redirect to the SP return destination, including the IdP selection.

Phase 2

Session initiation and authentication request

Phase 2



SAML AuthN Request

Plain HTML:

```
<html>
  <body onload="document.forms[0].submit()">
    <form method="POST" action="https://aai-demo-idp.switch.ch/idp/profile/SAML2/POST/SSO">
      <input type="hidden" name="RelayState" value="ss:mem:23e3a3b1268acd89dc226bb1ce0d0c6ba7ecf773"/>
      <input type="hidden" name="SAMLRequest"
        value="PHNhbWxwOkF1dGhuUmVxdWVzdCB4bWxuczpzYW1scD0idXJuOm9hc2lzOm5h...
        ...YXR1PSIxIi8+PC9zYW1scDpBdXR0b1JlcXVlc3Q+"/>
    </form>
  </body>
</html>
```

SAML AuthN Request (Base64 decoded)

```
<samlp:AuthnRequest xmlns:samlp="urn:oasis:names:tc:SAML:2.0:protocol"
  AssertionConsumerServiceIndex="1"
  Destination="https://aai-demo-idp.switch.ch/idp/profile/SAML2/POST/SSO"
  ID="_f2f27516ec08af29501c749629b119d3"
  IssueInstant="2008-02-27T12:17:40Z"
  Version="2.0">
  <saml:Issuer xmlns:saml="urn:oasis:names:tc:SAML:2.0:assertion">
    https://aai-demo.switch.ch/shibboleth
  </saml:Issuer>
  <samlp:NameIDPolicy xmlns:samlp="urn:oasis:names:tc:SAML:2.0:protocol"
    AllowCreate="1"/>
</samlp:AuthnRequest>
```

Session initiation and authentication request

- ⑤ The browser is redirected to the Service Provider by the Discovery Service.
- ⑥ The session initiator of the Service Provider creates an authentication request and returns it within an auto-submit-post-form to the browser.

The browser posts the SAML AuthN Request automatically to the Identity Provider using JavaScript.

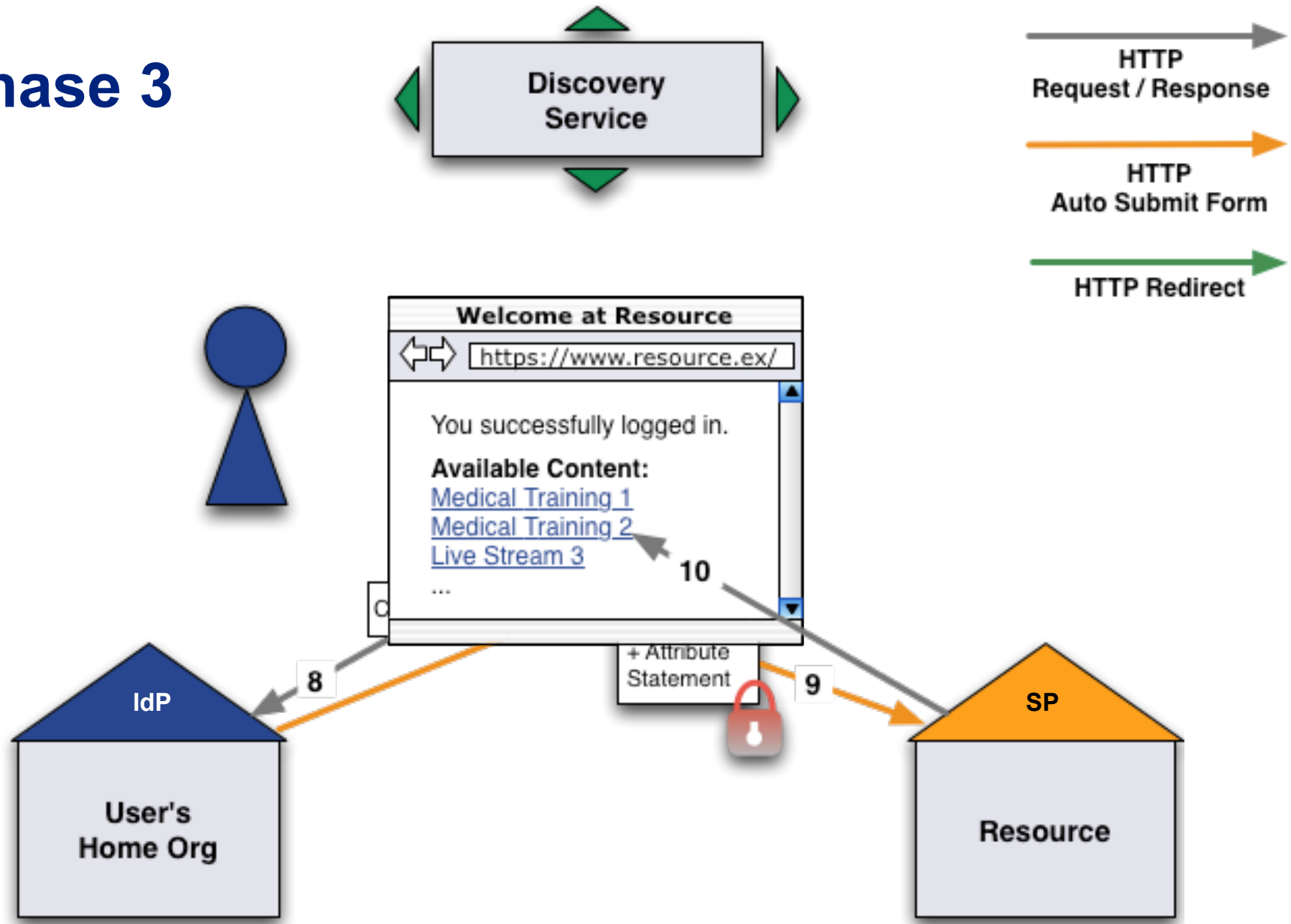
Session initiation and authentication request

- ⑦ The Identity Provider checks the authentication request. Because the user hasn't yet been authenticated, the Identity Provider sends a redirect to the appropriate login page (usually: Username/Password).

Phase 3

Authentication, attribute statement and access

Phase 3



SAML Assertion + Attribute Statement

Plain HTML

```
<html xml:lang="en">
  <body onload="document.forms[0].submit()">
    <form action="https://aai-demo.switch.ch/Shibboleth.sso/SAML2/POST" method="post">
      <div>
        <input type="hidden" name="RelayState" value="ss:mem:23e3a3b1268acd89dc226bb1ce0d0c6ba7ecf773"/>
        <input type="hidden" name="SAMLResponse"
          value="PD94bWwgdmVyc2lvbj0iMS4wIiBlbmNvZGluz0iVVRGLTgiPz4KPHNhbw08...
          ...vbj0iW1scDVlc+PC9zYW1scRGLsTgiPz4KPlc3U+"/>
      </div>
    </form>
  </body>
</html>
```

SAML Assertion + Attribute Statement

SAML Assertion + Attribute Statement, decrypted (Base64 decoded)

```
<saml:Assertion ...>
  <saml:Issuer ...>
    https://aai-demo-idp.switch.ch/idp/shibboleth
  </saml:Issuer>
  <saml:Subject ...>
    <saml:NameID ...>
      _e7b68a04488f715cda642fbdd90099f5
    </saml:NameID>
    [...]
  </saml:Subject>
  [...]
  <saml:AuthnStatement ...
    AuthnInstant="2008-02-27T12:20:06.991Z"
    SessionIndex="4m2ETlKYtvbNEmBzVNo3UHLuKSdo3HqTUqAmeZiar94="
    SessionNotOnOrAfter="2008-02-27T12:50:06.991Z">
    [...]
  </saml:AuthnStatement>
  <saml:AttributeStatement ...>
    [...] (Attributes)
  </saml:AttributeStatement>
</saml:Assertion>
```

Authentication, attribute statement and access

- ⑧ The user types his username and password credentials and submits them to the Identity Provider.
- ⑨ The Identity Provider verifies the credentials. If authentication succeeds, the IdP issues an assertion for the SP and returns it within an auto-submit-post-form to the browser.

The web browser immediately posts the SAML Assertion to the Service Provider with use of Javascript automatically.

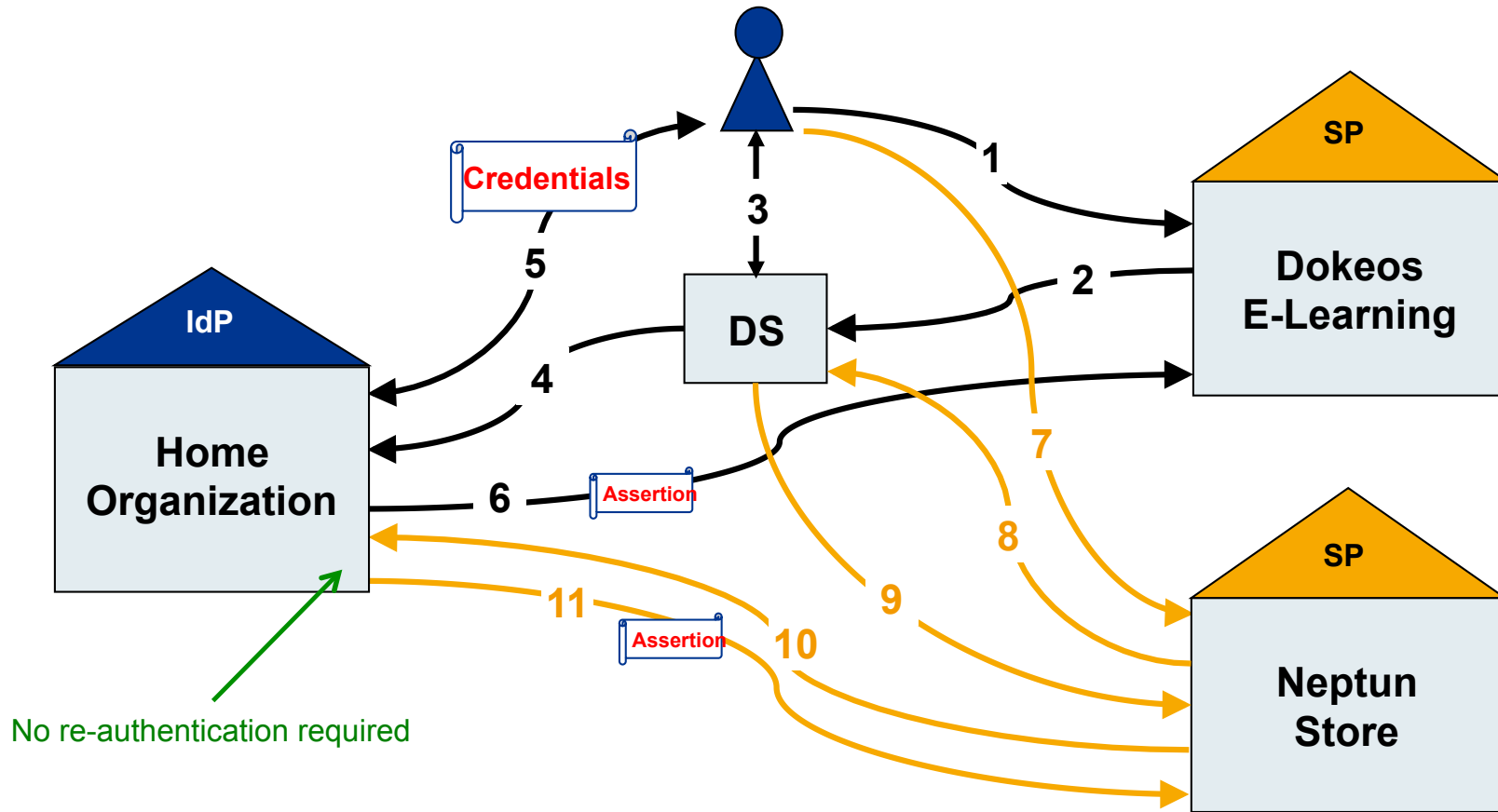
The Service Provider processes the SAML assertion including the authentication and attribute statements.

Authentication, attribute statement and access

- ⑩ Finally, the Service Provider starts a new session for the user and redirects the user to the previously requested resource.

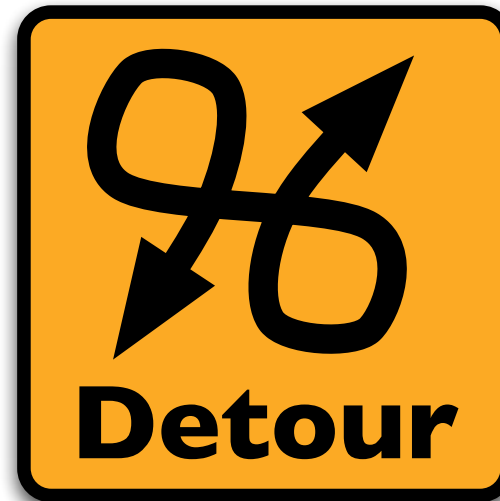
Now, the user is authenticated and gets access to the resource depending on the access rules configured for the resource.

Accessing multiple SPs



IdP: Identity Provider
 SP: Service Provider
 DS: Discovery Service

Live Demo



<https://www.switch.ch/aai/demo/>

Links

The AAI Demo shows how AAI works.

<https://www.switch.ch/aai/demo/>

The AAI Attribute Viewer shows which attributes are released by an Identity Provider.

<https://av.aai.switch.ch/>

The SWITCHaai Federation

A success story by the community, made in Switzerland



SWITCH

Kaspar Brand
aai@switch.ch

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From the federation's early roots...

e-Academia / AAI Concept

SWITCH

The Swiss Education & Research Network

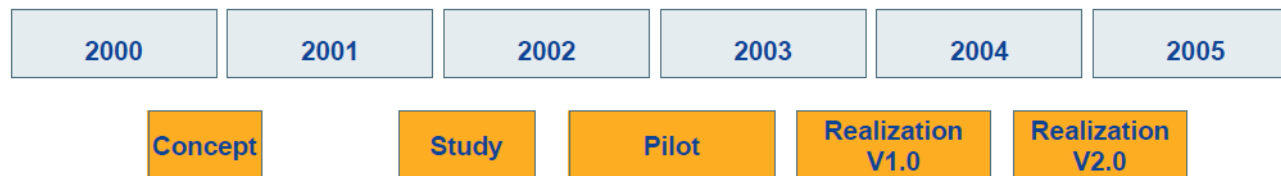
Vision of e-Academia

“We want a virtual community across our institutions in which all persons associated with the Swiss Higher Education System are able to gain access to its electronic resources, independent of the accrediting organization and independent of the place where they happen to be working.”

AAI as the foundation of e-Academia

“... let's develop e-Academia, let us build the foundations in the form of a uniform authentication and authorization infrastructure (AAI) for the higher education system in Switzerland...”

Roadmap

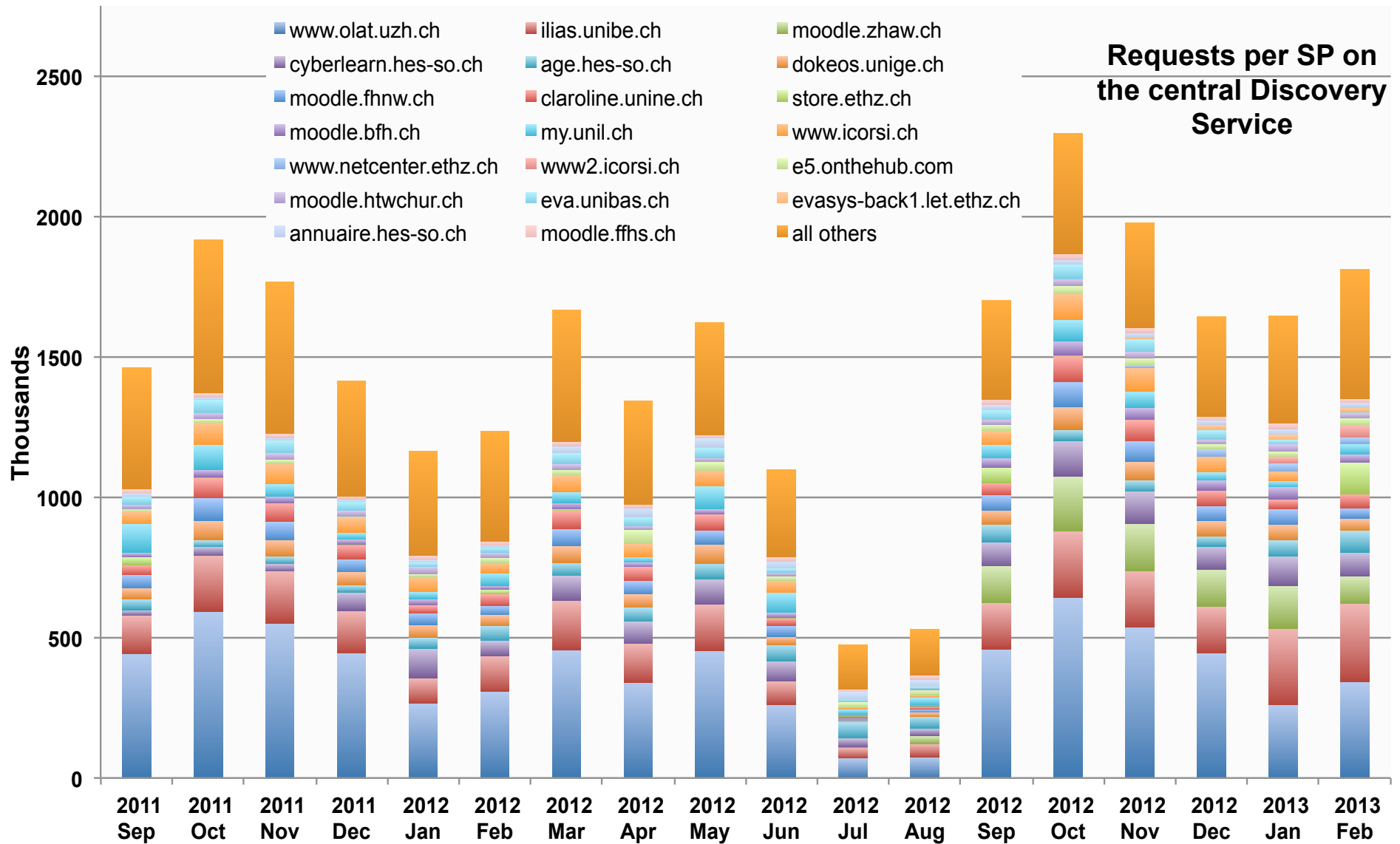


SWITCHaai Federation Quick Facts

- as of 2013: about 50 participating home organizations with approx. 350'000 users
- coverage in the SWITCH community (higher education) is close to 100%:
 - all cantonal universities
 - all federal institutes/facilities of the “ETH-Bereich”: ETHZ, EPFL, PSI, WSL, Empa, Eawag
 - most universities of applied sciences (“FH”/“HES”)
 - most teacher training colleges (“PH”/“HEP”)
- about 600 resources (“service providers”) currently registered in the federation
 - e-learning systems still the most popular application
 - number of federation partners steadily increasing (digital content providers as well as online shops, alumni organizations etc.)

AAI User Authentication Requests

Sept 11 – Feb 13



Federation Infrastructure operated by SWITCH

- AAI Resource Registry
rr.aai.switch.ch
- Metadata distribution
metadata.aai.switch.ch
- Discovery Service / “Where Are You From”
wayf.switch.ch
- Virtual Home Organization / VHO
aai-logon.vho-switchaai.ch
- AAI Test Federation
- AAI Demo Site
<https://www.switch.ch/aai/demo/>
- AAI Attribute Viewer
<https://attribute-viewer.aai.switch.ch>

Conclusion

- the success of the SWITCHaai federation is based on the cooperation of all participating members:
 - SWITCH is coordinating the federation and its infrastructure, but credits are due to the participating organizations, in the first place
 - identity management stays at the place where it belongs – i.e., the user’s home organization –, with mutual acceptance of authentication
 - ensuring and maintaining high-quality user data at the identity provider is essential for the federation’s continued success
- the outreach of the SWITCHaai federation is likely to grow in the future, e.g.:
 - home organizations from the “Extended SWITCH Community”
 - interfederation-enabled resources in other countries

AAI Attributes



SWITCH

Bea Huber
aai@switch.ch

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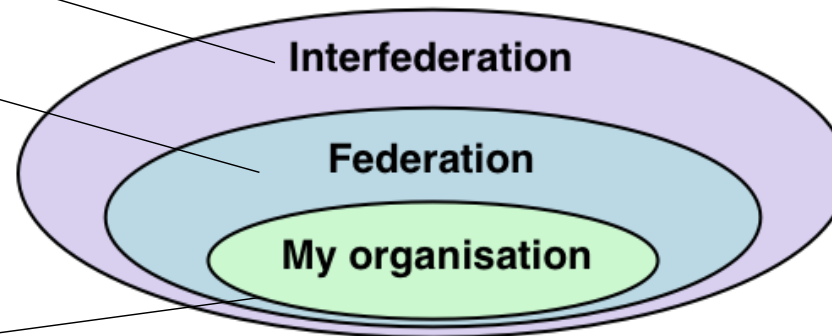
- attribute usage
- attribute scope
- user identifier attributes

Attribute usage

- identification
- authorisation
 - Access decision based on attribute values
 - individual or role based access control
- additional user information
 - Portal personalization e.g. preferred language
- accounting

Attribute scopes

- Standardized
- SWITCHaai
- Core
- Other
- Local



Attribute examples

Local scope:

Group membership at the Uni Lausanne

SAML1 Name:

urn:mace:switch.ch:SWITCHaai:unil.ch:unilMemberOf

SAML2 Name:

urn:oid:2.16.756.1.2.5.1.1.1003

Attribute examples

SWITCHaai scope:

Study branch 1 (swissEduPersonStudyBranch1)
Study branch of a student, first level of classification

SAML1 Name:

urn:mace:switch.ch:attribute-def:swissEduPersonStudyBranch1

SAML2 Name:

urn:oid:2.16.756.1.2.5.1.1.6

SWITCHaai Attributes

Federation

Personal

Unique Identifier

Surname

Given name

E-mail

Persistent ID

User ID

Matriculation number

Employee number

Address(es)

Phone number(s)

Preferred language

Date of birth

Card UID

Group Membership

Home Organization Name

Home Organization Type

Affiliation

Study branch

Study level

Staff category

Group membership

Organization Path

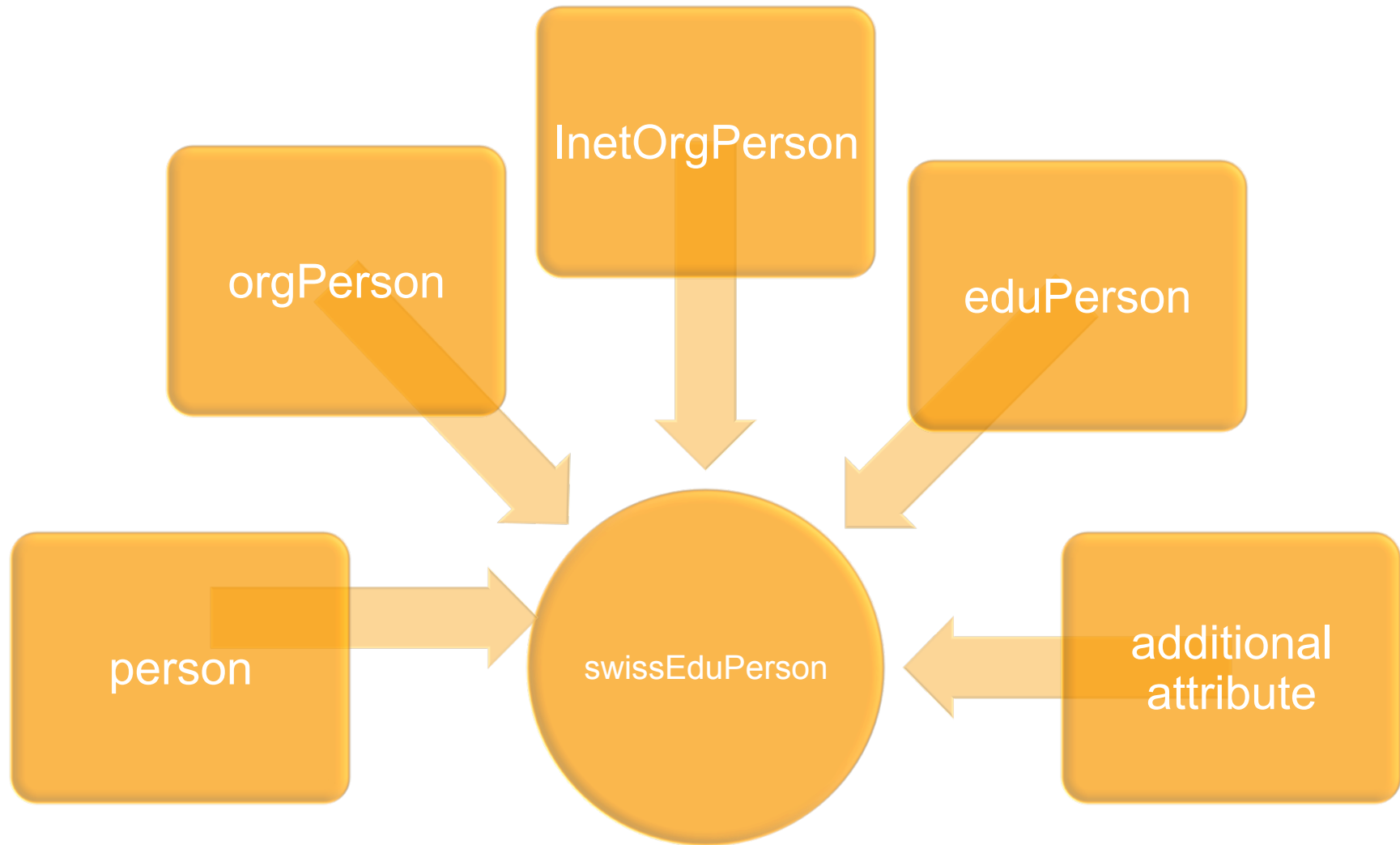
Organizational Unit Path

Implementation of Attributes

- Core Attributes
- Other Attributes

AAI Attribute Specification: <http://switch.ch/aai/attributes>

swissEduPerson definition





Attribute examples

SWITCHaai scope:

Affiliation (eduPersonAffiliation)

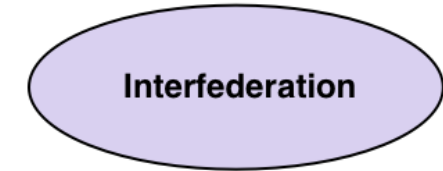
SAML2 Name:

urn:oid:1.3.6.1.4.1.5923.1.1.1.1

Since 2012:

The member affiliation **MUST** be asserted for people carrying one or more of the following affiliations: faculty or staff or student.

Standardized Attributes

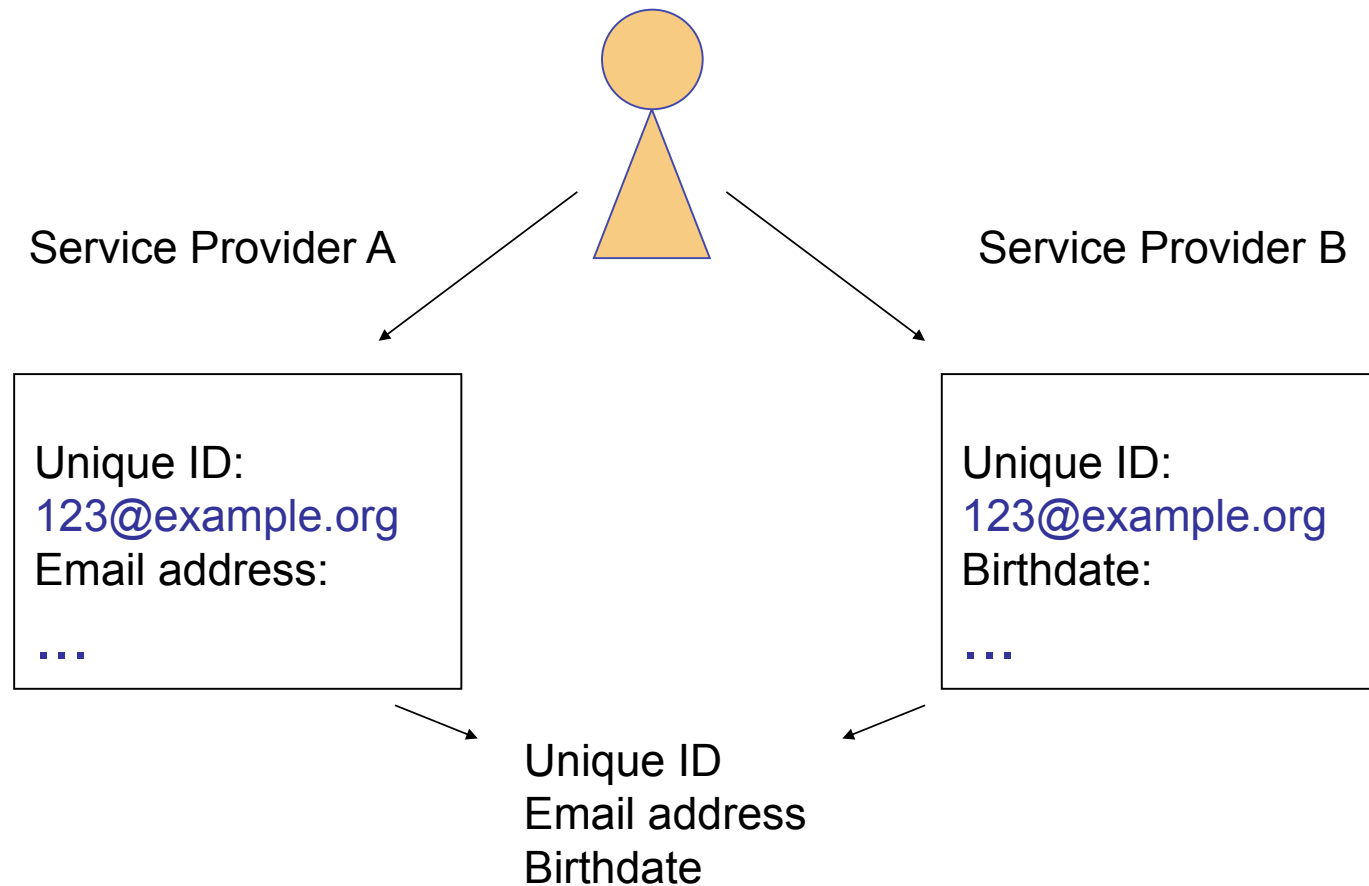


- Relevant for communication with entities from other federation via eduGAIN (or on bilateral basis)

Friendly name	Defined in	Example
displayName	eduPerson	Beatrice Huber
common name (cn)	eduPerson	Beatrice Huber
mail	eduPerson	bea.huber@switch.ch
eduPersonAffiliation eduPersonScopedAffiliation	eduPerson	staff staff@switch.ch
eduPersonPrincipalName	eduPerson	234cd8z239@switch.ch
schacHomeOrganization	SCHAC	switch.ch
schacHomeOrganizationType	SCHAC	urn:mace:terena.org:schac:home OrganizationType:int:NREN

User identifier attributes

- Using account linking, the data is worth even more.



persistent ID (eduPersonTargetedID)

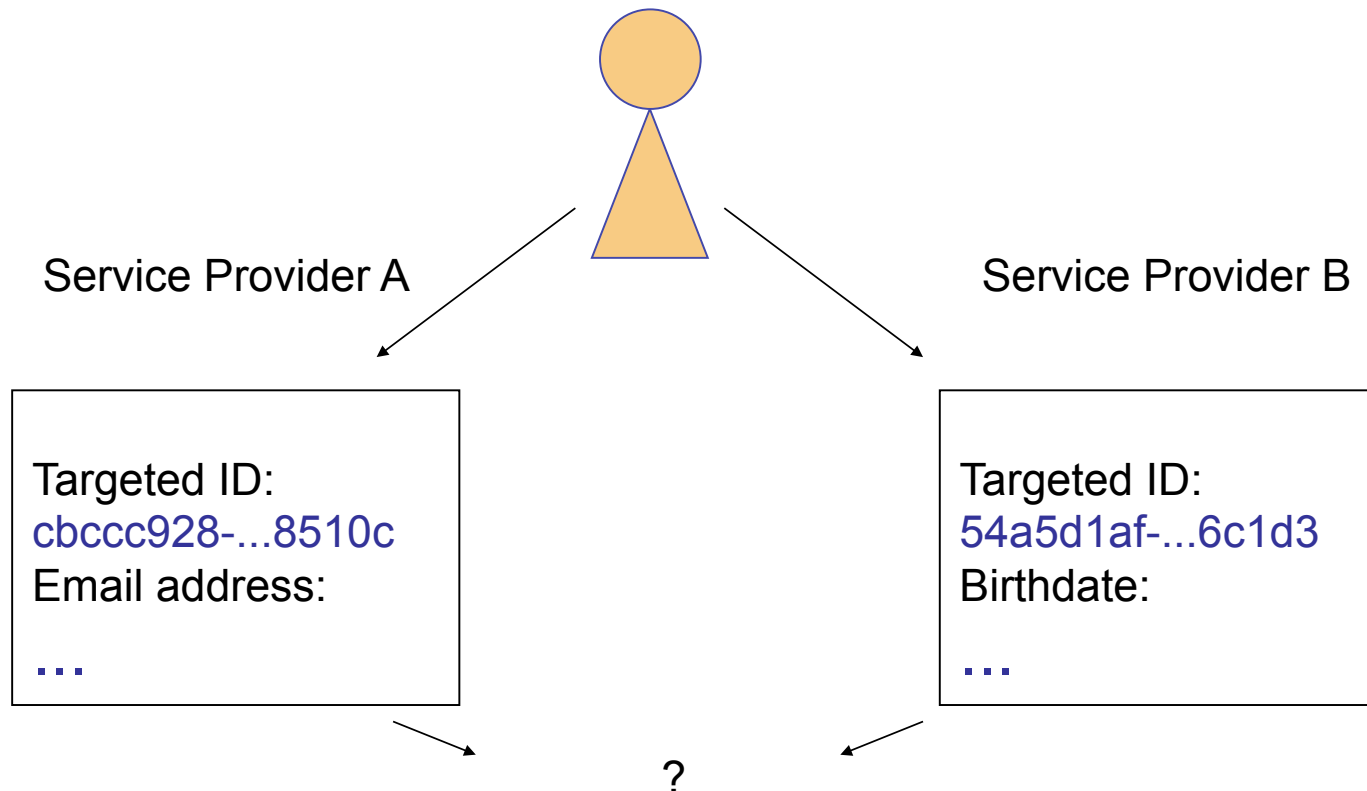


Example persistent ID

`https://idp.example.org/idp/shibboleth!`

`https://sp.example.org/shibboleth!`

`f74698d6-854c-480c-b566-702006318cc3c`



Email vs persistent ID vs Unique ID



Properties	Email	Unique ID	★ persistent ID ★
scoped	✓	✓	✓
persistent	✓	✓	✓
opaque	x	✓	✓
non-reusable	x	✓	✓
targeted	x	x	✓
revocable	x	x	✓

Resource Registry

How to manage Federation metadata and other descriptions



SWITCH

Thomas Bärecke
aai@switch.ch

SWITCHaai Introduction Course
Bern, 1. March 2013

Difficulties and Goals

- Editing XML files by hand is error-prone and clumsy
- Managing the federation metadata by hand is cumbersome
- Legal processes should be technically supported
- Multiple federations must be managed

A web-based tool to solve these problems!

Goals for such a Tool:

- Scalable metadata management
- Support administrative processes
- Provide auxiliary functions to support federation
- As little overhead as possible

The AAI Resource Registry

AAI Resource Registry

SWITCH

[Home](#) | [Resources](#) | [Registration Requests](#) | [Home Organizations](#) | [Registry Administration](#) | [Thomas Baerecke \(switch.ch\)](#) | [Logout](#) | [Help](#)

[↑ About AAI](#)
[Home](#)

Home and General Information

This page provides usage instructions and general information about the federations managed by the Resource Registry.

Resource Registry Usage Instructions

- [Resource Registry Guide](#) explaining the basic principles and mechanisms of the Resource Registry
- [Resource Registry Screencast](#) for first time users on how to register a resource

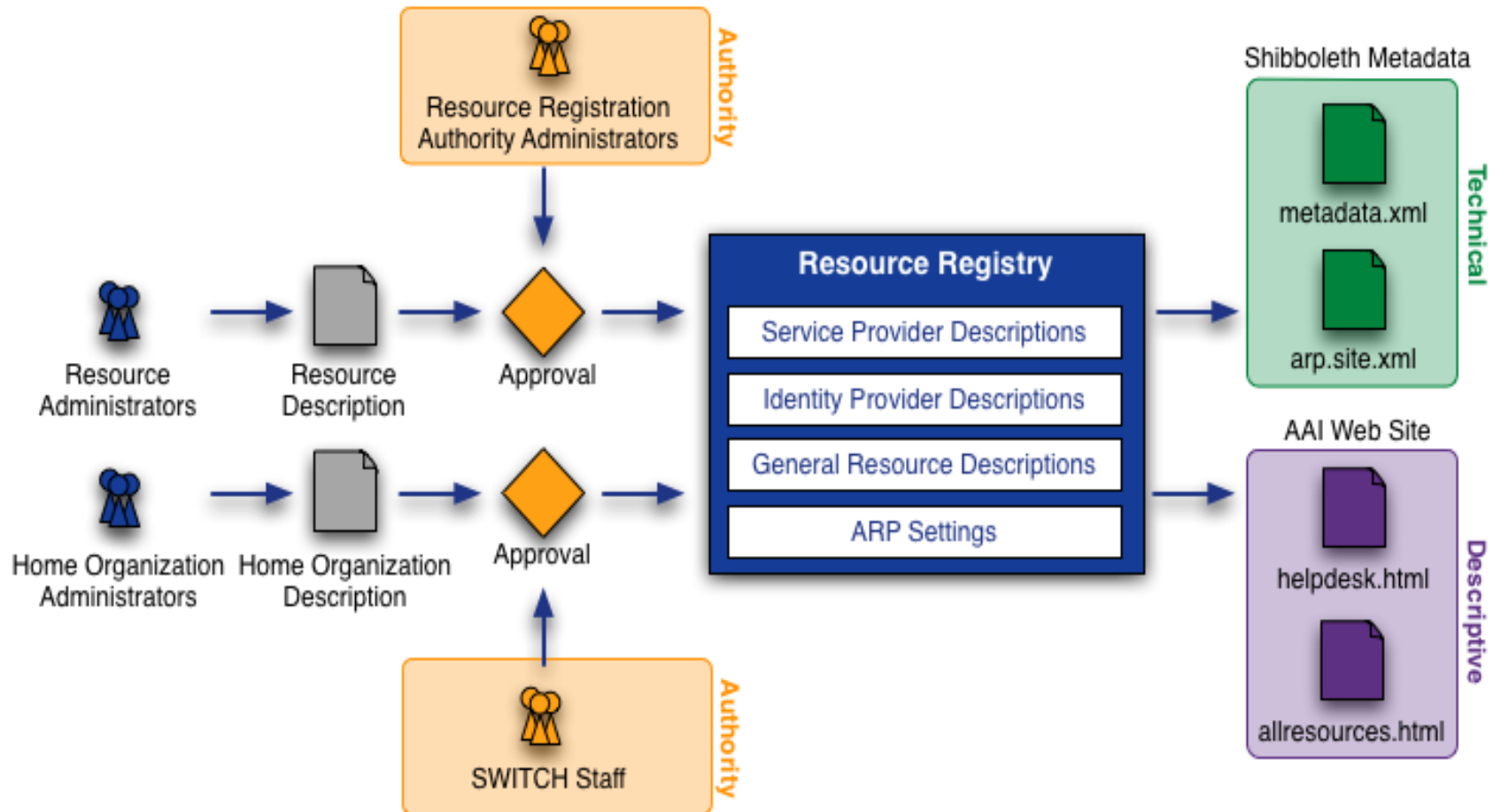
Federation Information

- [Federations](#): List of federations operated by the Resource Registry
- [All Home Organizations](#): List of approved Home Organizations
- [Federation Partners](#): List of accepted Federation Partners for SWITCHaai
- [All available Resources](#): List of approved active and inactive Resource Descriptions
- [Search for resources](#): Search according to name, entityID, Home Organization etc.
- [Users from domain switch.ch](#): Users from your organisation that have used the Resource Registry
- [Attribute definitions](#): List of available attribute names and descriptions
- [Attribute release matrix](#): Which attributes can be released by which Home Organization?
- [Resource attribute requirement matrix](#): Which attributes are requested by which resources?

SWITCHaai Migration statistics



Resource Registry Processes



Before an SP/IdP description becomes part of federation metadata, it must be approved by an authority first

Roles in the Resource Registry

- **Resource Registry Administrator**
SWITCH staff members. Can edit/delete everything
- **Home Organisation Administrator**
User that can manages the description/metadata of an organisation
 - **Attribute Administrator**
Subset of privileges of Home Organisation administrator
User that can change the attribute release policy of an organisation
- **Resource Administrator**
Creates and manages descriptions of AAI services/Service Providers
- **Resource Registration Authority Administrator**
Approves descriptions of AAI services/Service Providers

Output of Resource Registry

- **Metadata**, see <http://www.switch.ch/aai/metadata/>
- **Configuration files** for IdPs and SPs (shibboleth2.xml, ...)
- **Helpdesk webpage** shows contact persons/helpdesk for your SP

Your most recently used Resource's helpdesk

Contact the helpdesk of the Resource you wanted to connect to, if you experience **problems after successful login**.

Forge: Project Hosting Platform

Support Contact: [SWITCHaai Team](#), +41 44 268 15 05

Find the Resource in the [list of Resources grouped by Home Organization](#) or in the [long list of all public Resources](#).

- **Public Resource list**, see <http://www.switch.ch/aai/participants/>

AAI Wiki - Waaikiki

No Helpdesk web page specified

[Show contact persons](#)

[Show requested attributes](#)

[Show intended audience](#)

[en] AAI Wiki - Waaikiki

Live Demonstration

AAI Resource Registry

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[Home](#) | [Resources](#) | [Registration Requests](#) | [Home Organizations](#) | [Registry Administration](#) | [Thomas Baerecke \(switch.ch\)](#) | [Logout](#) | [Help](#)

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