

TAS³ Architecture and Project

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Trusted Architecture for Securely Shareable Services Outline

1. Business Case
2. Architecture at Glance
3. Context and Prior Art
4. Novelty of the Architecture
5. Wire interoperability, many software implementations possible
6. Trustworthy and Secure
7. Technology Demo
8. TAS³ and Kantara

Trusted Architecture for Securely Shareable Services

Who are we?

- EU FP7 financed research program
 - 2 plus years into the project, ending end of 2011
- KU Leuven / Bart Preneel, Brendan Van Alsenoy
- SAP Sophia Antipolis (coordination)
- Oracle / Joseph Alhadeff (legal)
- Synergetics / Luk Vervenne (Commercial)
- Symlabs / Sampo Kellomäki (Architecture)
- Kent / David Chadwick (Authorization)
- CNR Pisa / Antonietta Bertolini (Online Compliance Testing)
- TU Eindhoven / Jerry Den Hartog (Trust scoring, feedback)
- Karlsruhe / Jutta Mülle (Business Processes)
- Koblenz (Dashboard, data layer)

- VUB (Ontologies)
- Nottingham (Employability pilot)
- Custodix (Healthcare pilot, Commercial)
- Risaris (Pilot, Commercial)
- Zaragoza (Usability, Preception)

<http://www.tas3.eu/>

<http://zxid.org/tas3/>

Goal

- General architecture with prospect of becoming endorsed and adopted in Europe
- Model for setting up trust networks
- Security layer for building sector specific applications ecosystems
- Grow from sector specific to multipurpose Trust Networks
- Initial aim at employability and health care
- First commercial PoC: Province of Limburg (Maastricht)

Privacy Protection

1. Awareness

- Self audit (dashboard)
- Identity mirrors

2. Confidentiality

- Consent to release
- Reputation and trust based screening
- Trust and Privacy Negotiation

3. Control

- Intended purpose
- Sticky policies

4. Practise

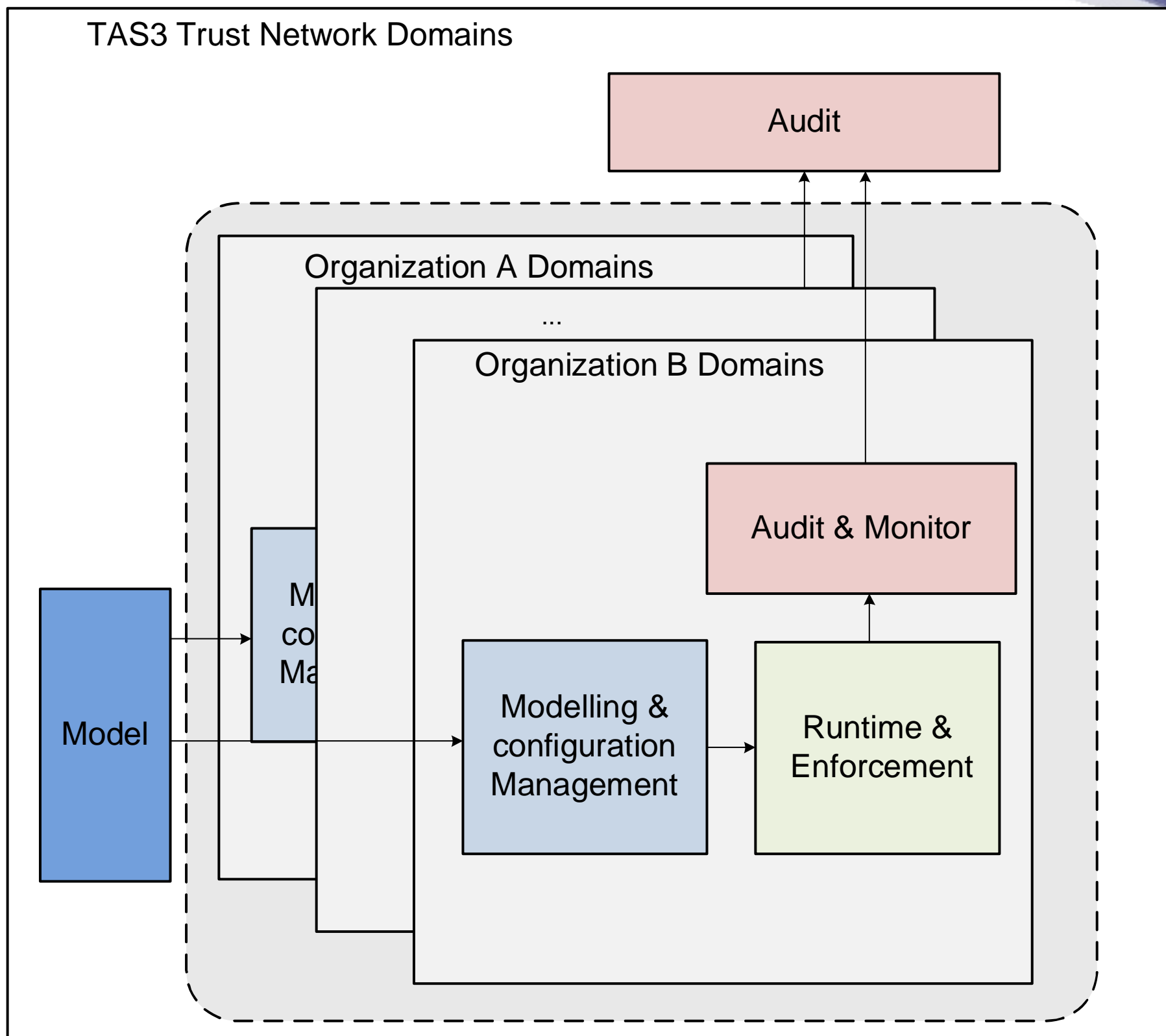
- Right to correct or delete, Right to response
- Trust feedback

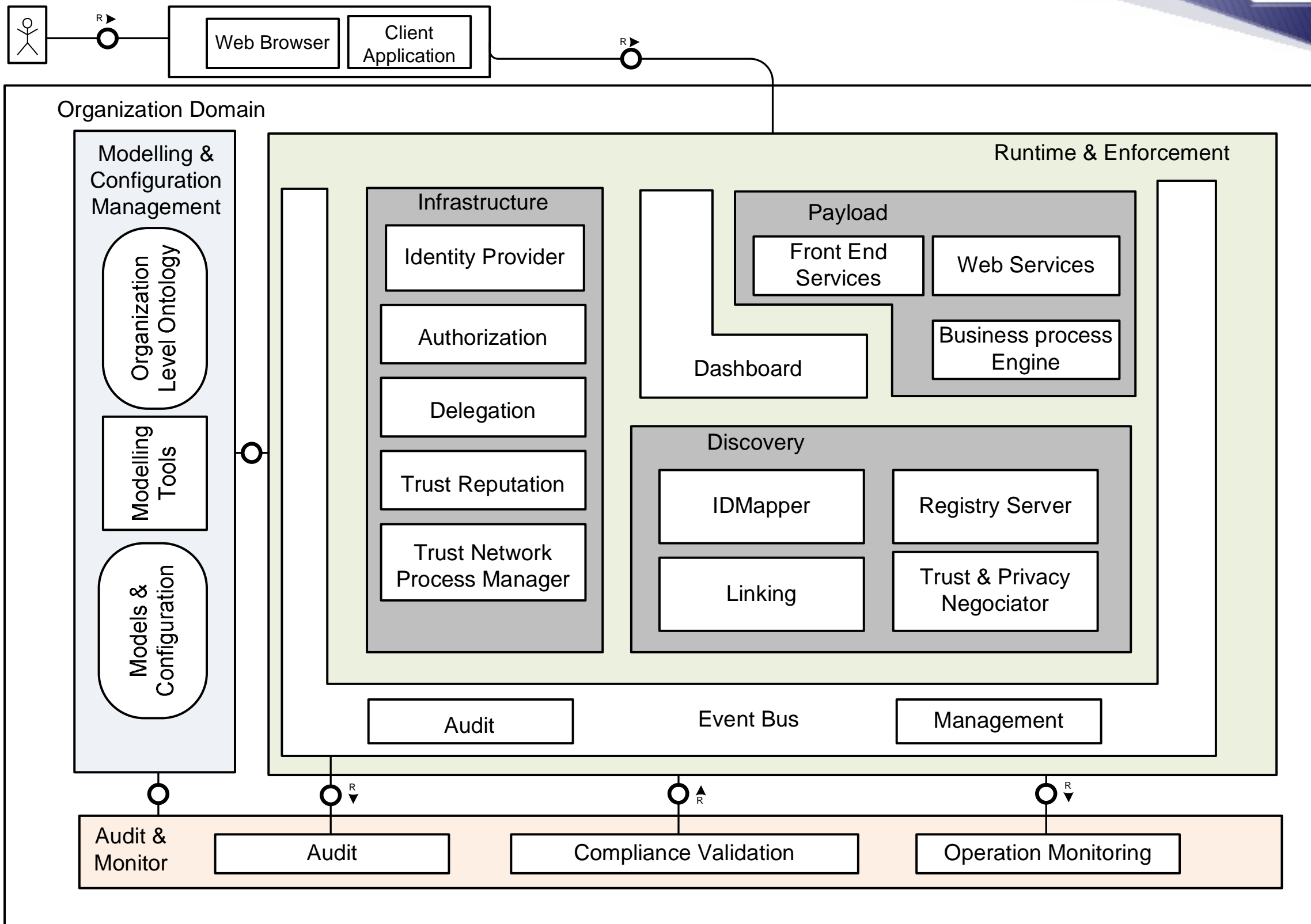
Combined approach is needed!

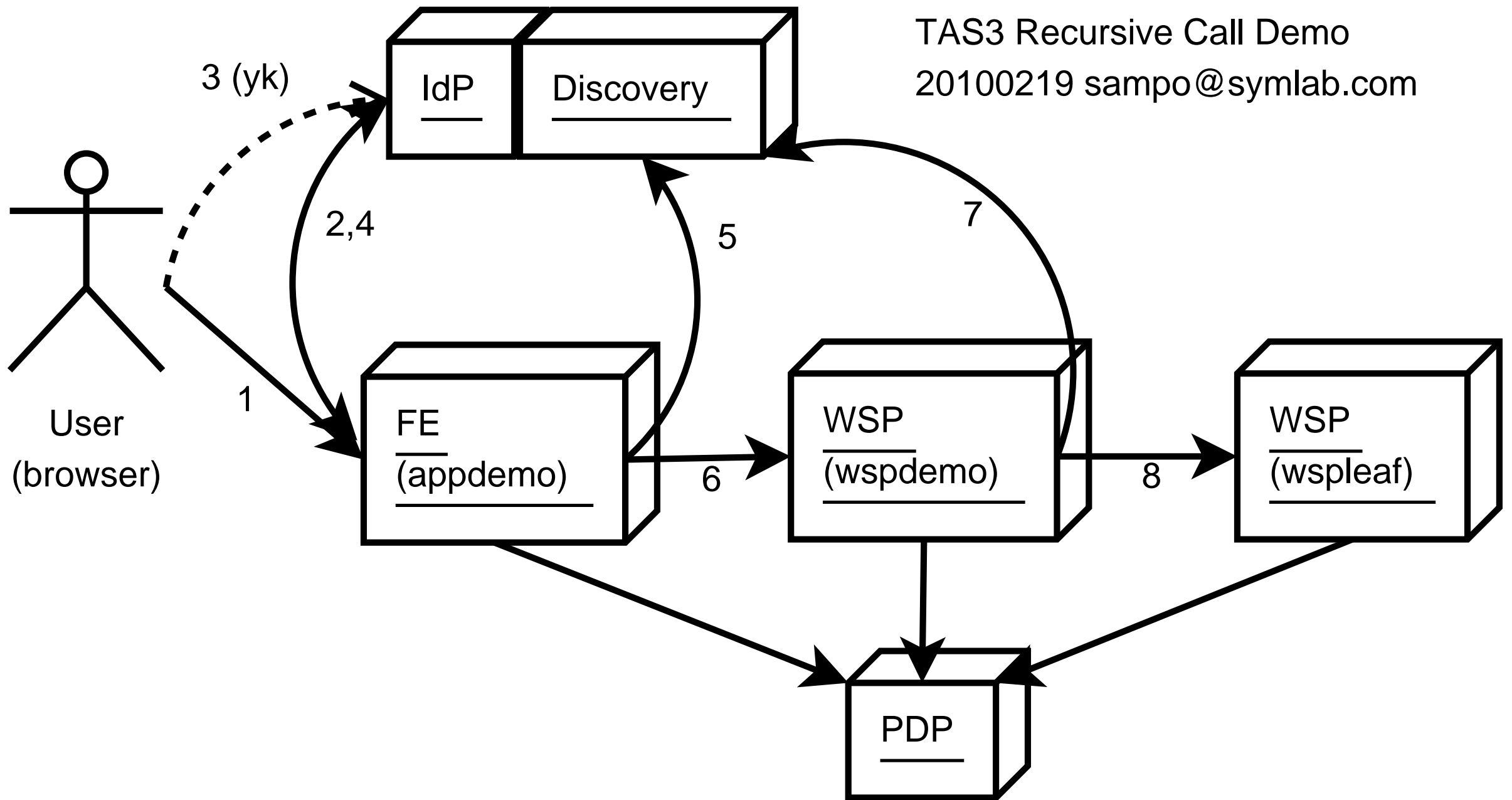
- SSO and Web Services identity plumbing
- Authorization
- Audit
- Credentials issuance, management, and validation
- Trust establishment
- Governance

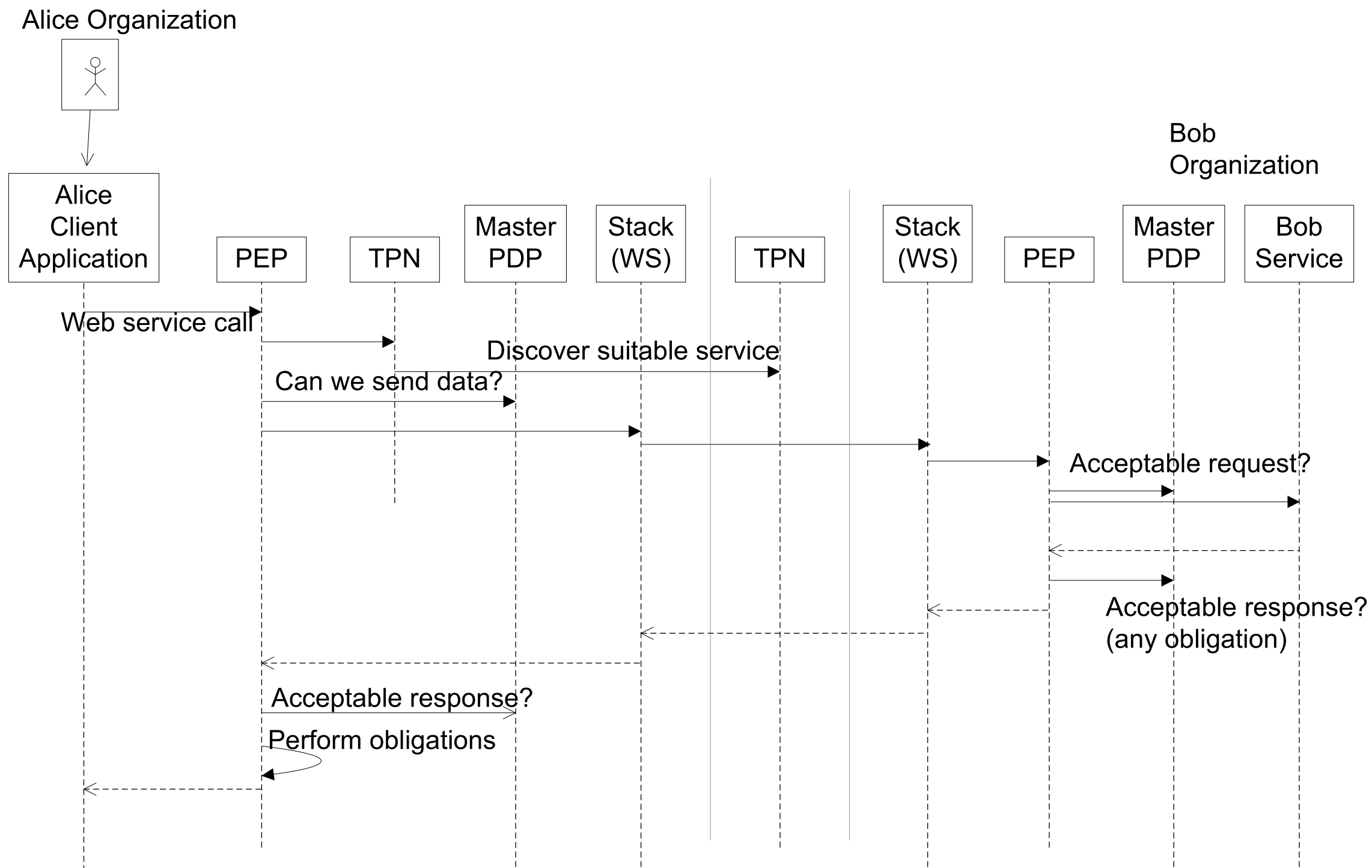
Trust, Security, Privacy

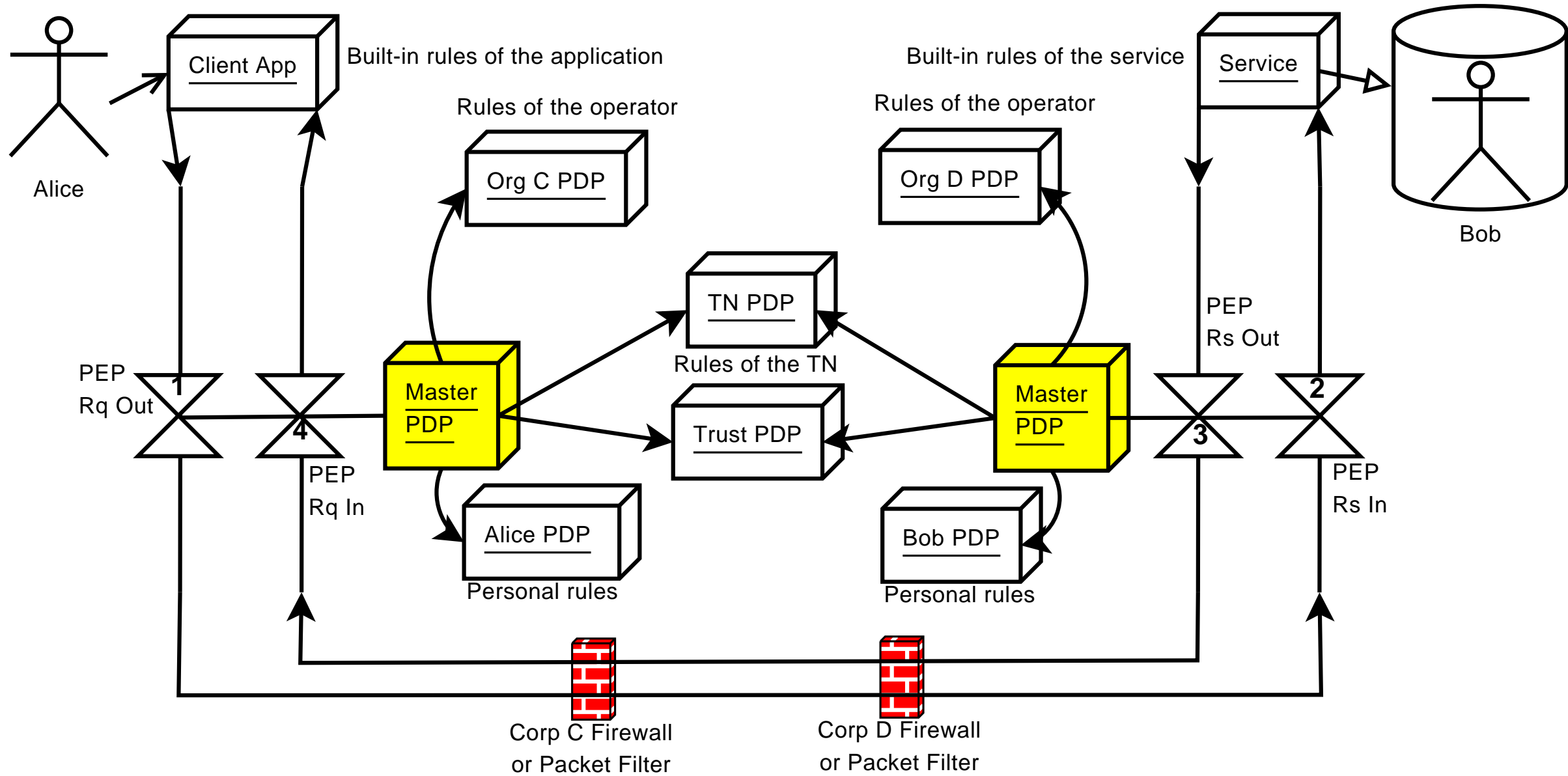
- Single Sign-On and Identity Web Services
- Enable loosely coupled collaboration
- Ecosystem of providers
- Federation
- Separation of data from applications
 - Controlled reuse of data
- Earn user's trust, gain adoption
- User centricity
- Privacy protection
- Comply with legal requirements
- User management by home organization
- Convenience

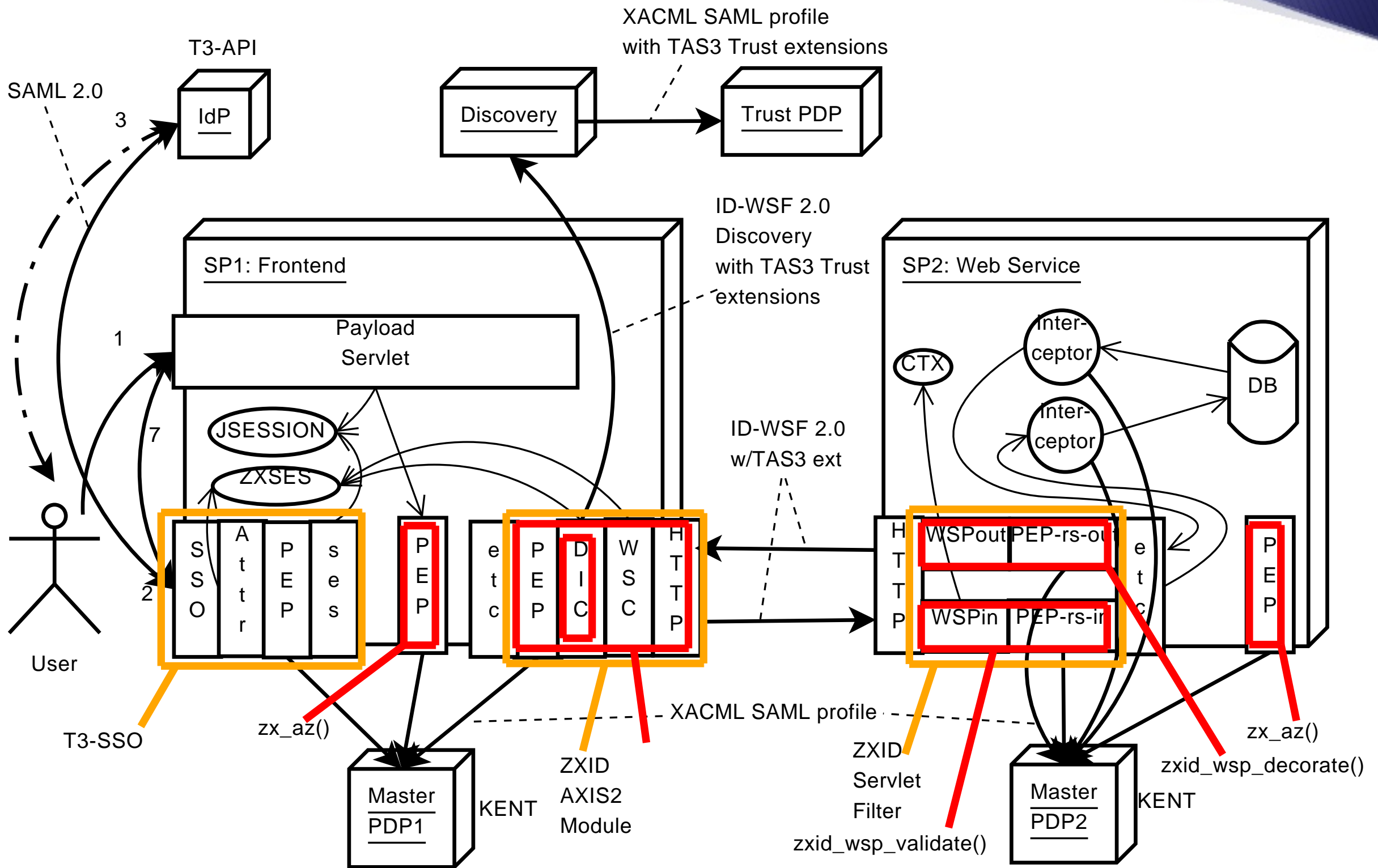












Prior Art and Reference Architectures

- Standards compliant
- Leverage existing art where available, adapt it for our novelty
- TAS³ Architecture draws from and is compatible with
 - OASIS SAML 2.0
 - Nessi's NexofRA
 - Access-eGov Platform Architecture
 - Liberty Alliance's ID Web Services Framework (ID-WSF 2.0)
 - OASIS XACML 2.0
- TAS³ Architecture is not as abstract as a reference architecture
 - Goal is to drive real, wire interoperable, implementations

Novelty of the Architecture (1/2)

- TAS³ Architecture is novel as a blueprint that brings together
 - Identity Management (IdM)
 - Attribute based access control
 - Business process modelling
 - Ontology
 - Dynamic trust
 - Distributed auditing
 - Legal & Policy
 - Support for multiple policies in different languages
- User transparency features
 - Dashboard
 - User accessible audit trail
 - Automated compliance validation
 - Consent and control of policies

Novelty of the Architecture (2/2)

- Separation of data and processing
- Privacy protection using sticky policies
- Marriage of Trust and Privacy Negotiation with discovery and trust scoring
- Secure dynamic business processes
- Built-in first class support for delegation
- Architecture needs to be instantiated in context of a *business model* and legal / contractual framework
 - Leave many decisions to be decided in that context
 - Many business models are possible

Trustworthy and Secure (1/2)

- Operational, legal, and business model to ensure trustworthiness
 - Responsible entity, Trust Guarantor, ensures "buck stops here"
 - Legal framework developed hand-in-hand with architecture
 - Certification of software and deployments
 - Automated Compliance Validation keeps SPs in line
 - Manual audits complement automated approaches
 - Modeling network and its members provide consistent security configuration
- Legal concerns are built-in from the ground up
- Threat analysis to understand what we are defending against

Trustworthy and Secure (2/2)

- Technical

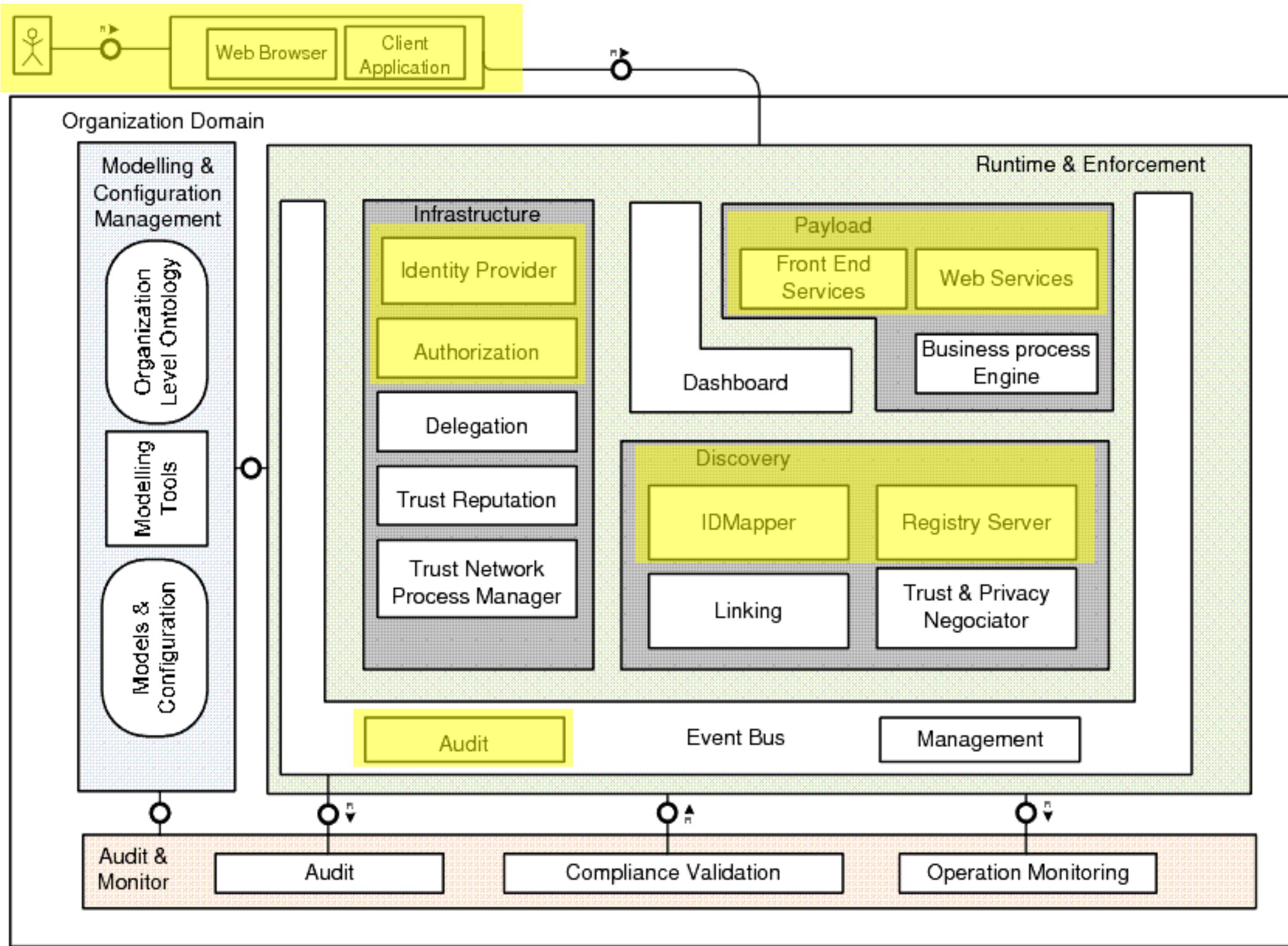
- Fully encrypted, fully digitally signed
- Fully pseudonymous design ensures maximum privacy
- Fully cross organizational federation model
- Explicit tokens based audit trail at all layers
- Explicit authorization at all layers
- Advanced trust and reputation management
- Model and ontology driven to ensure accurate implementation

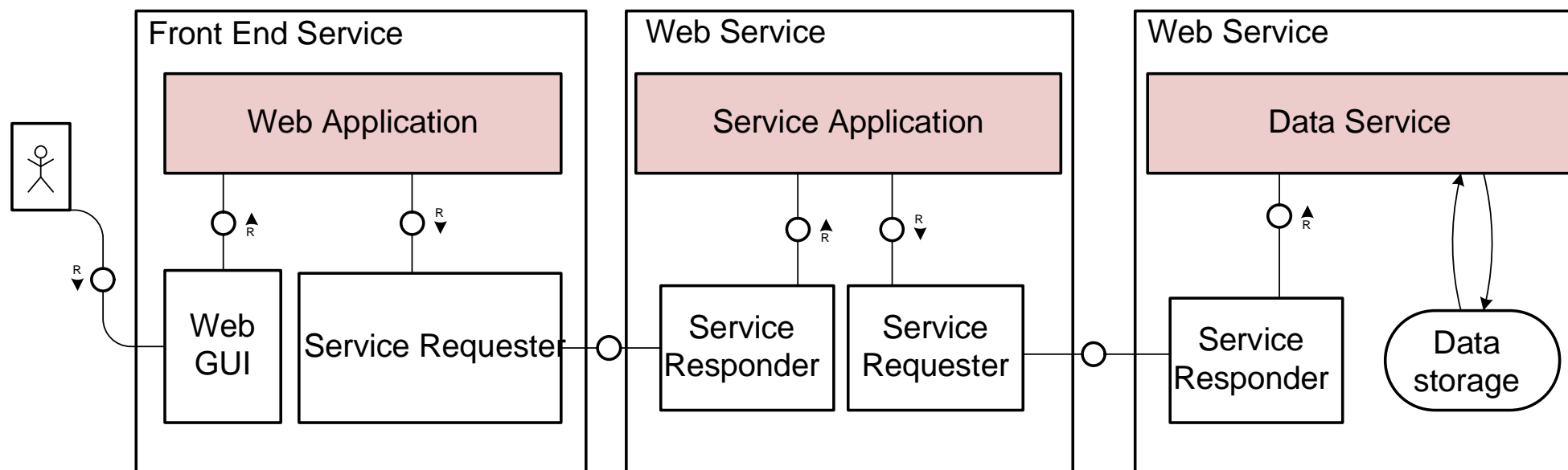
- End-to-End

- Policies carried along the data
- Comprehensive solution with all aspects addressed: no gaps

TAS³ Technology Demo

- Multi-tier, recursive / deep, call capability
- Fully dynamic using discovery
- Fully pseudonymous at all layers: no privacy compromise



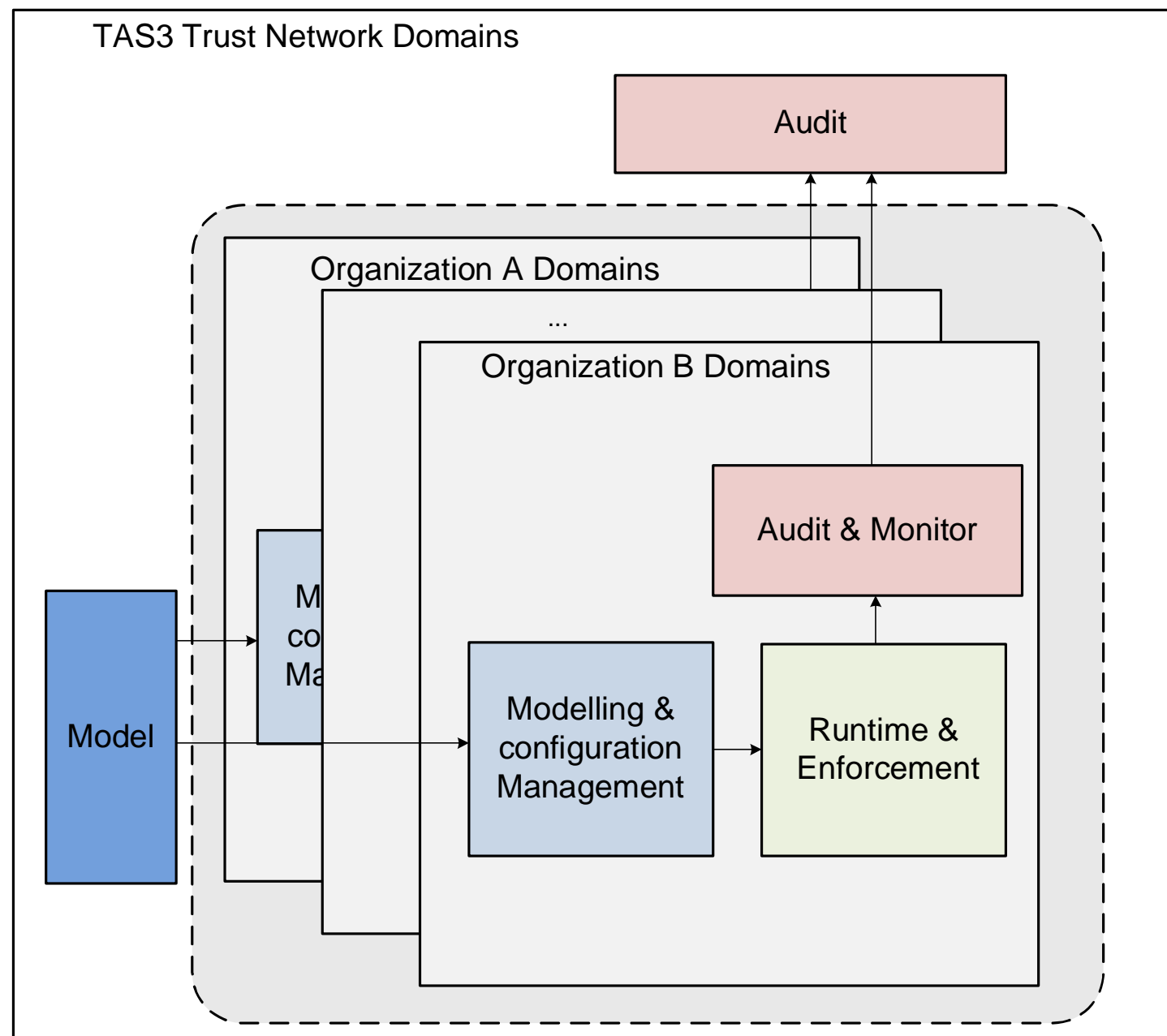


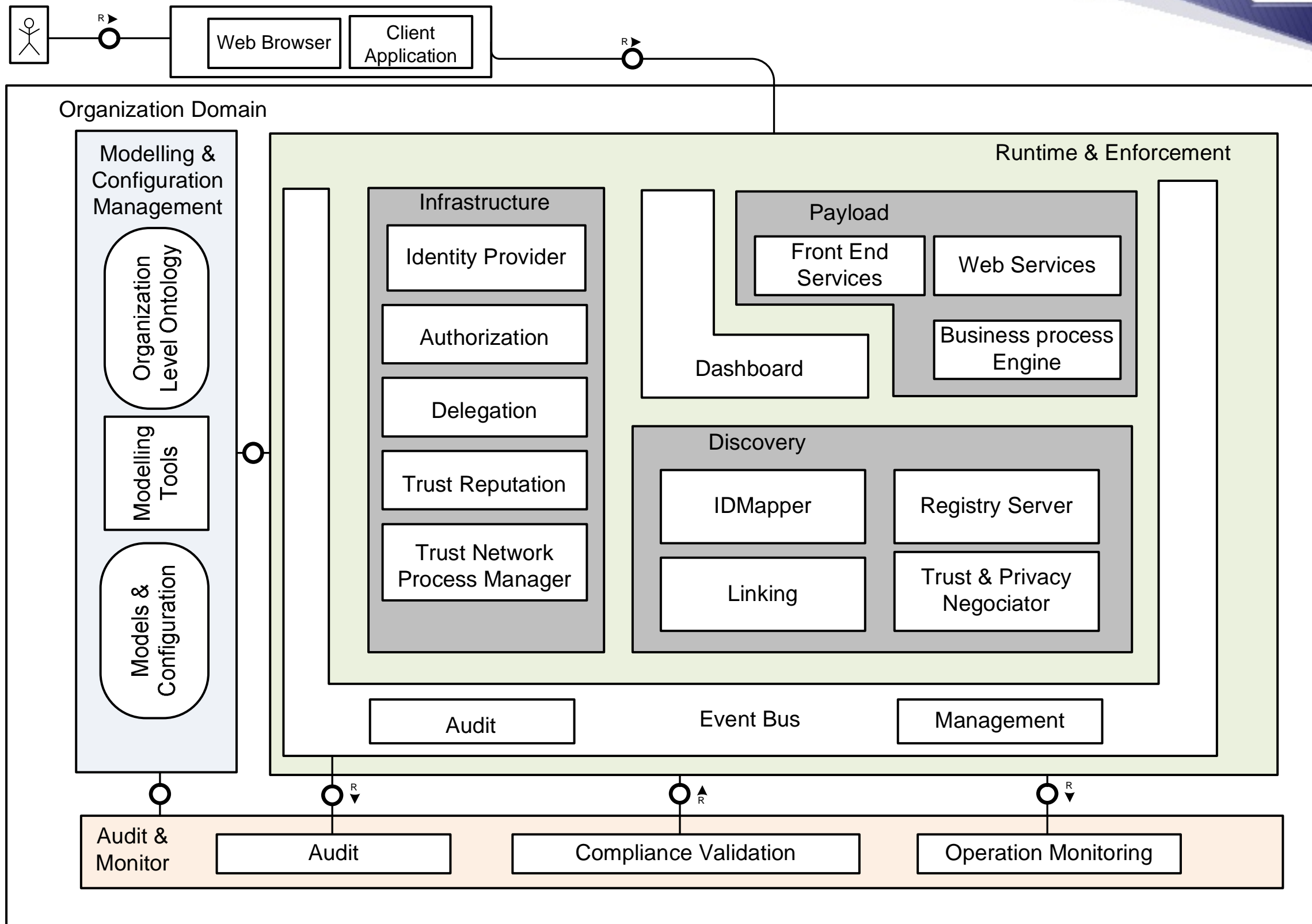
Implementing TAS³

- Set up legal and governance framework
 - Public Private Partnership
- Standalone server products - or SaaS
 - Identity Provider (IdP), Trusted Third Party (TTP)
 - Discovery Server
 - Delegation Server
 - Policy Decision Point (PDP)
 - Dashboard
 - Online Compliance Testing
- Integration tools for enabling applications
 - Apache integration
 - Java Servlet integration
 - SDKs for various languages
 - Integrated to SOA Gateway and Capitain Casa

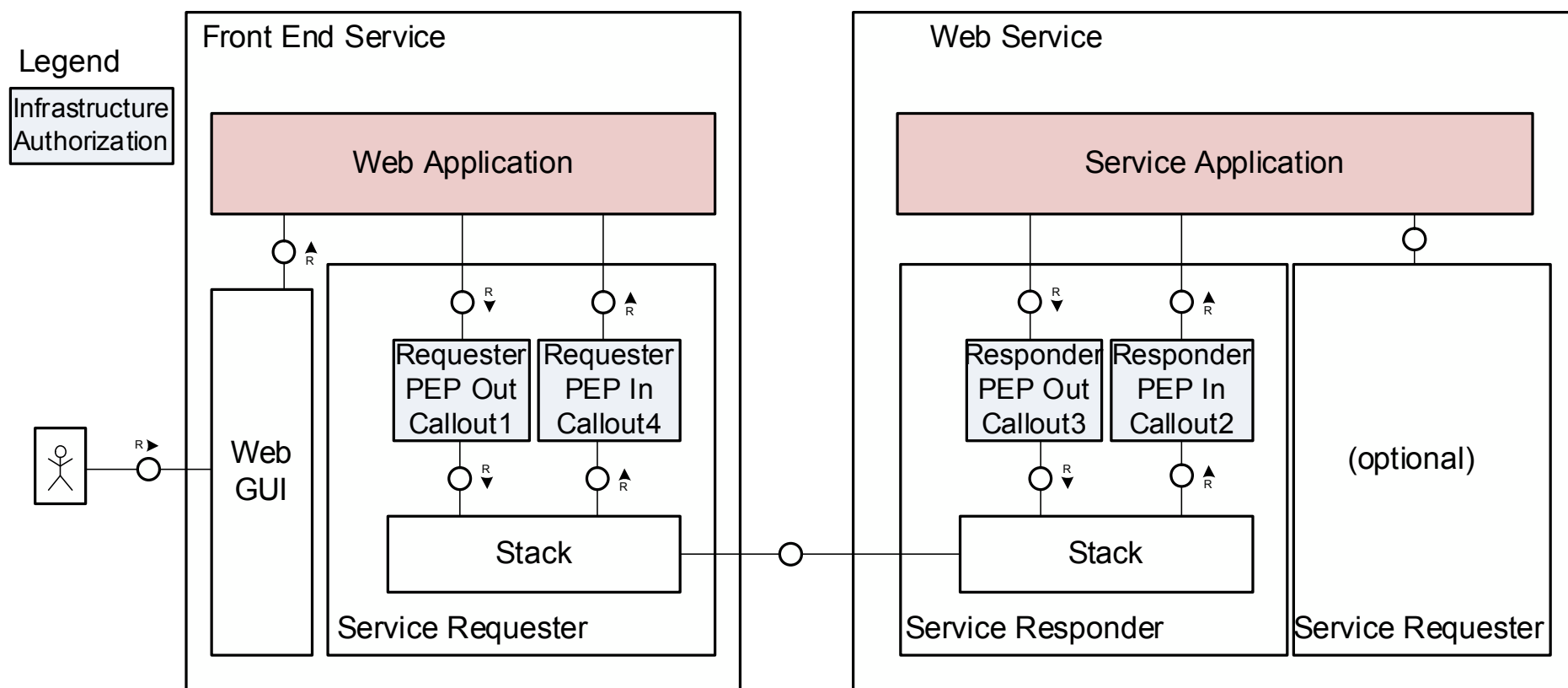
- Services
 - Trust Network Management
 - Installation and configuration help
 - Audit services
 - SaaS: IdP, TTP, Discovery, ...

Architecture Drilldown

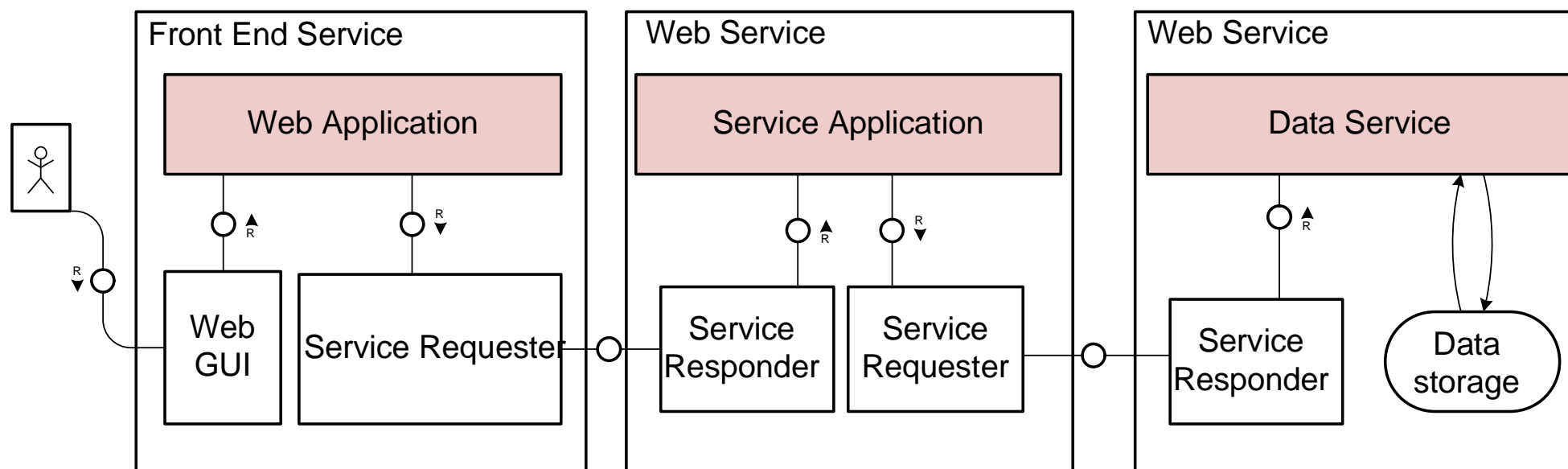




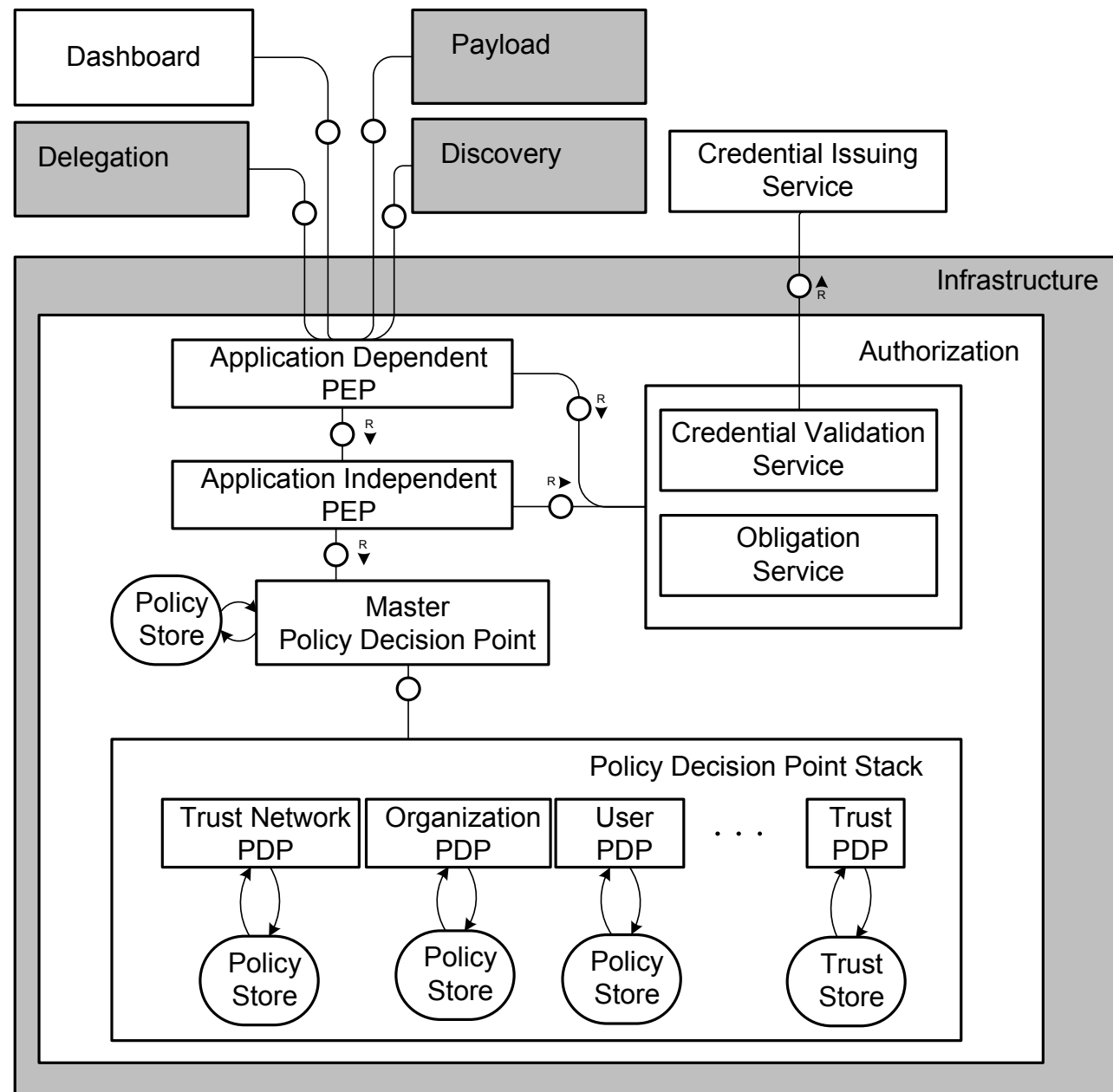
Web Service Authorization



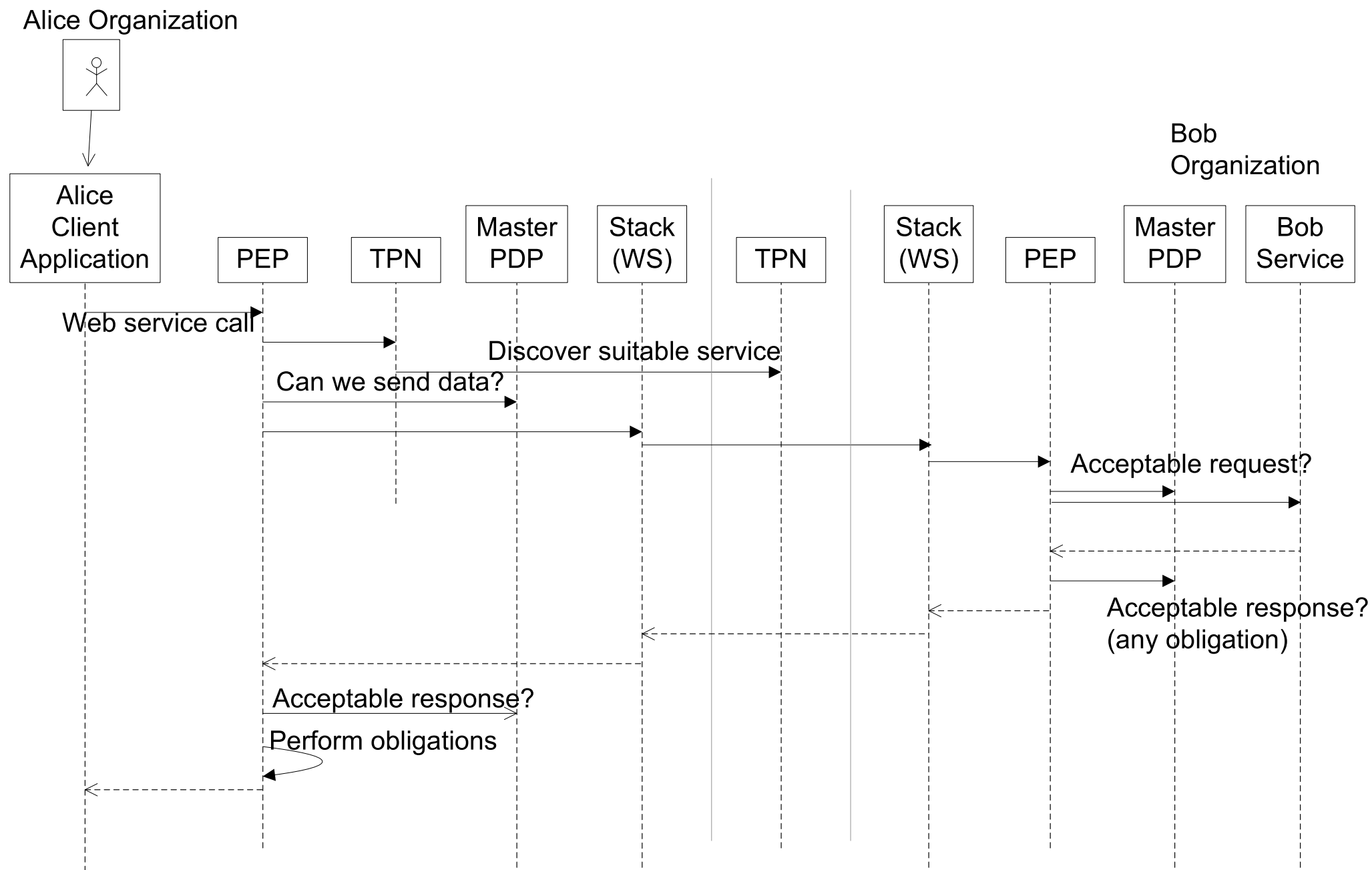
Multi-tier Web Service Call



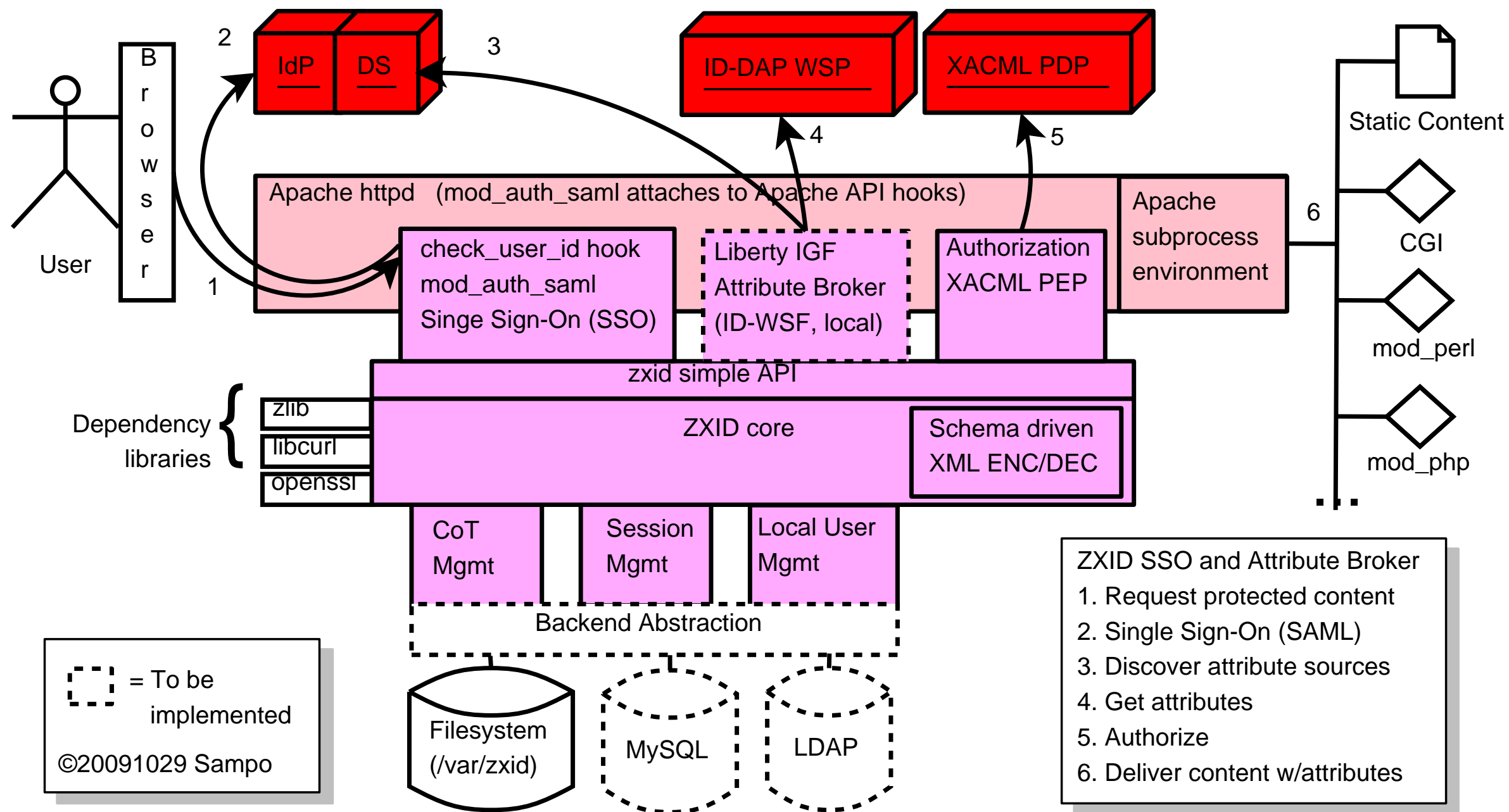
Details of Authorization

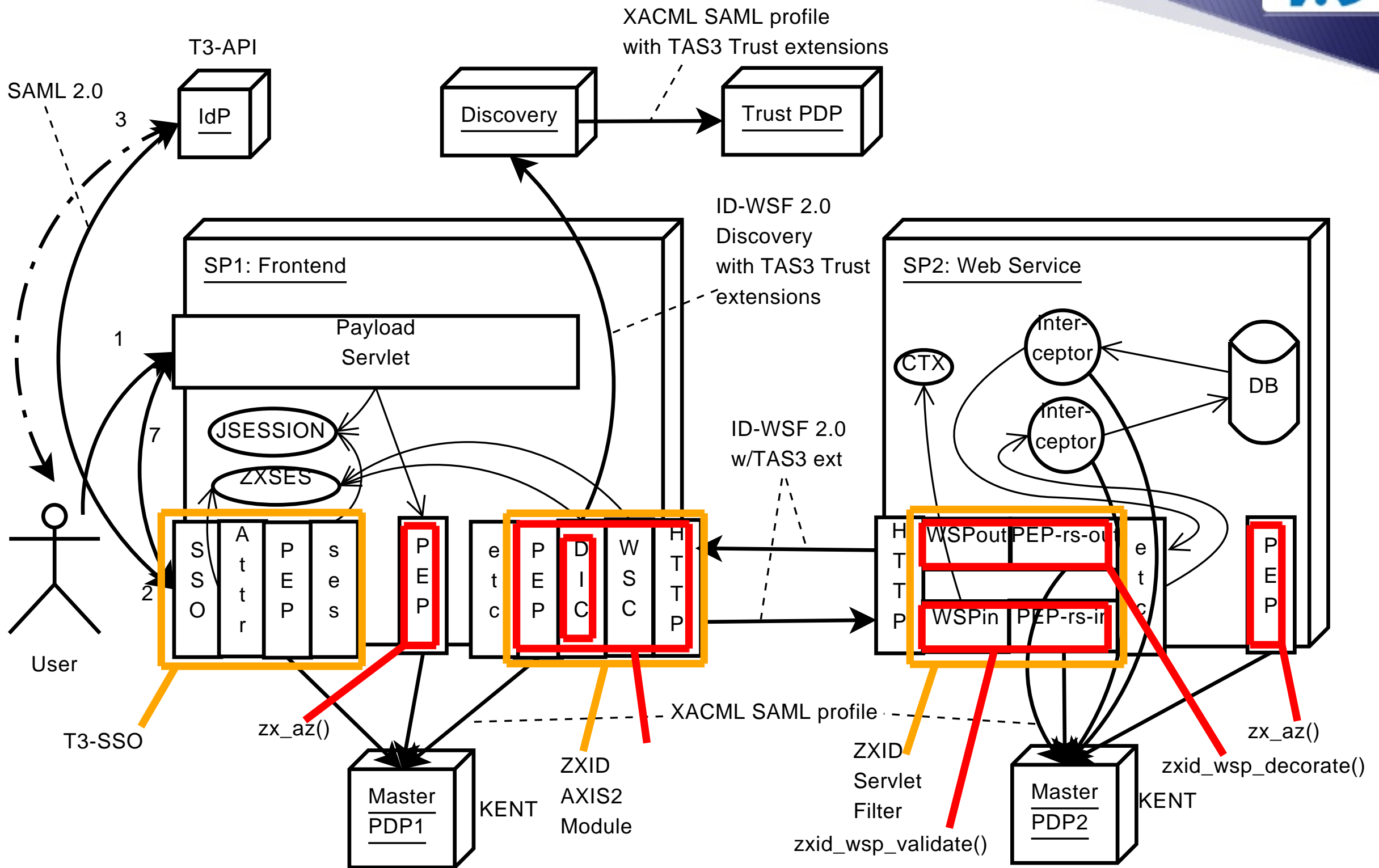


Steps of a Web Service Call



Integration





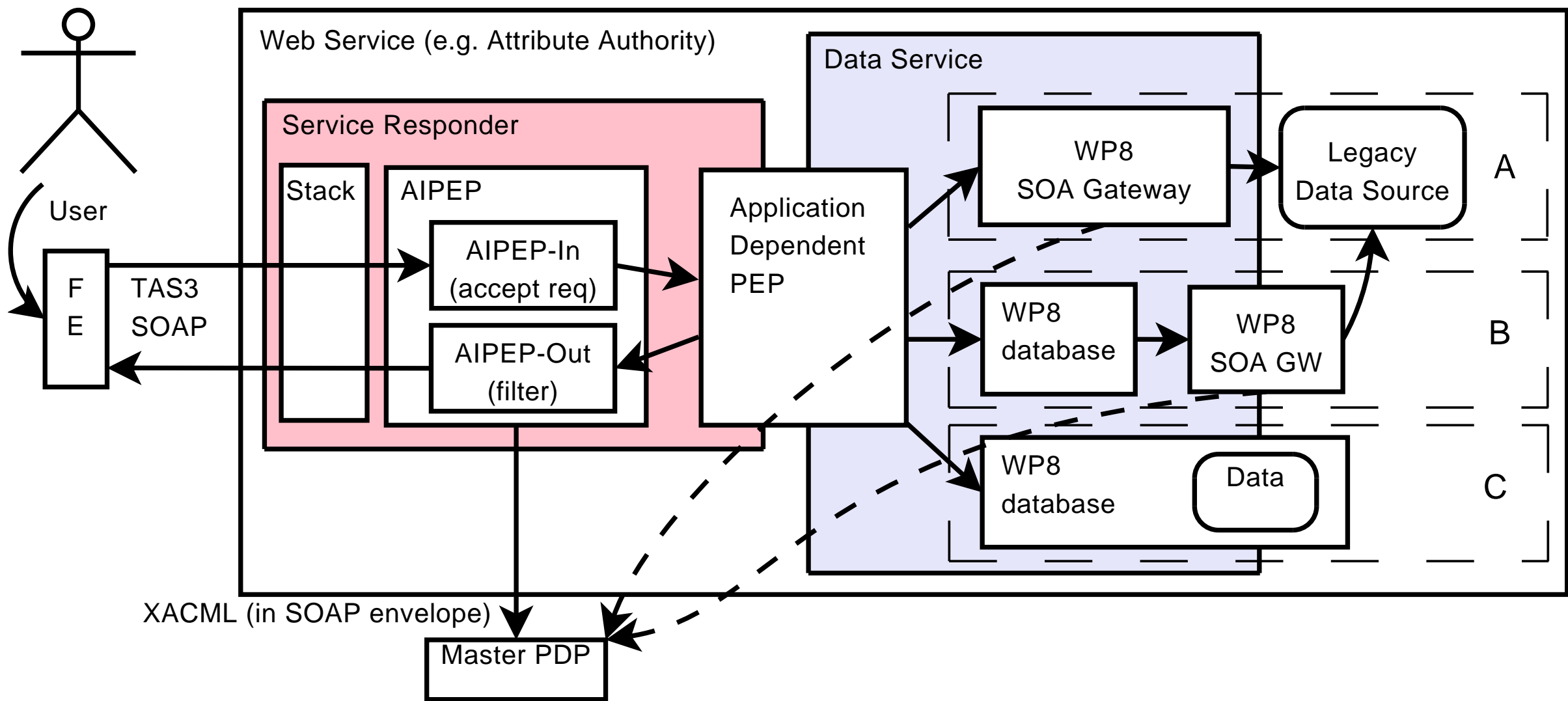


Figure 1: Application Integration using ADPEP and (A) WP8 SOA Gateway, (B) WP8 as frontend to WP8 SOA GW, (C) WP8 database.

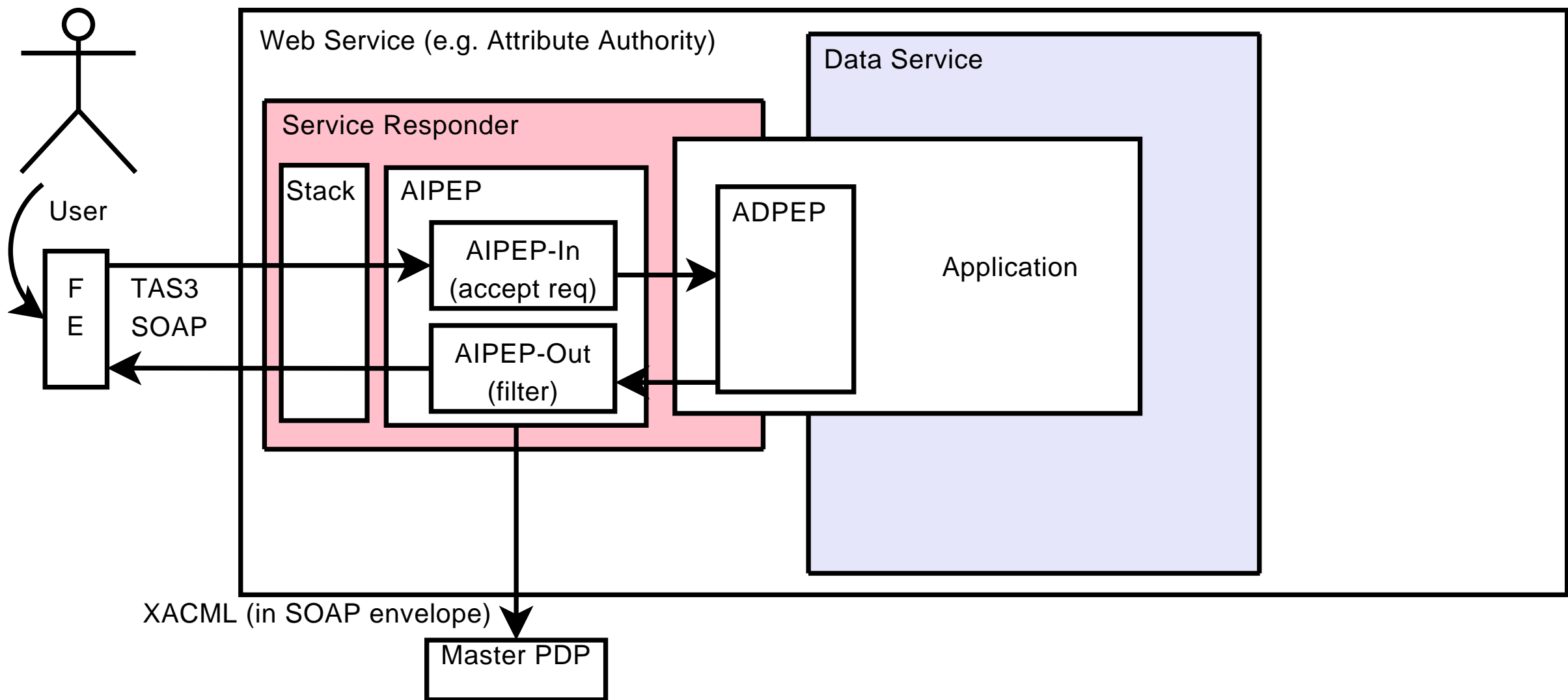


Figure 2: Application Integration: ADPEP implemented in application itself.

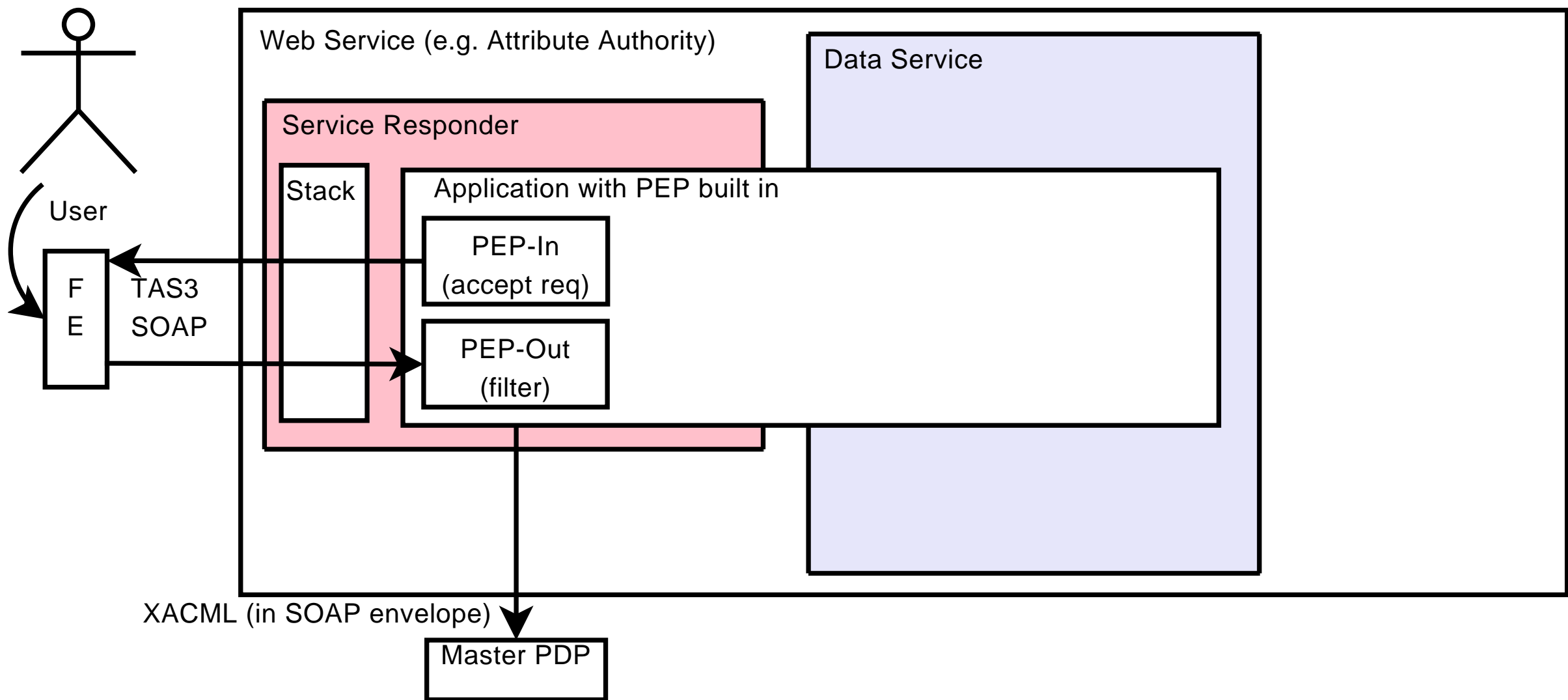
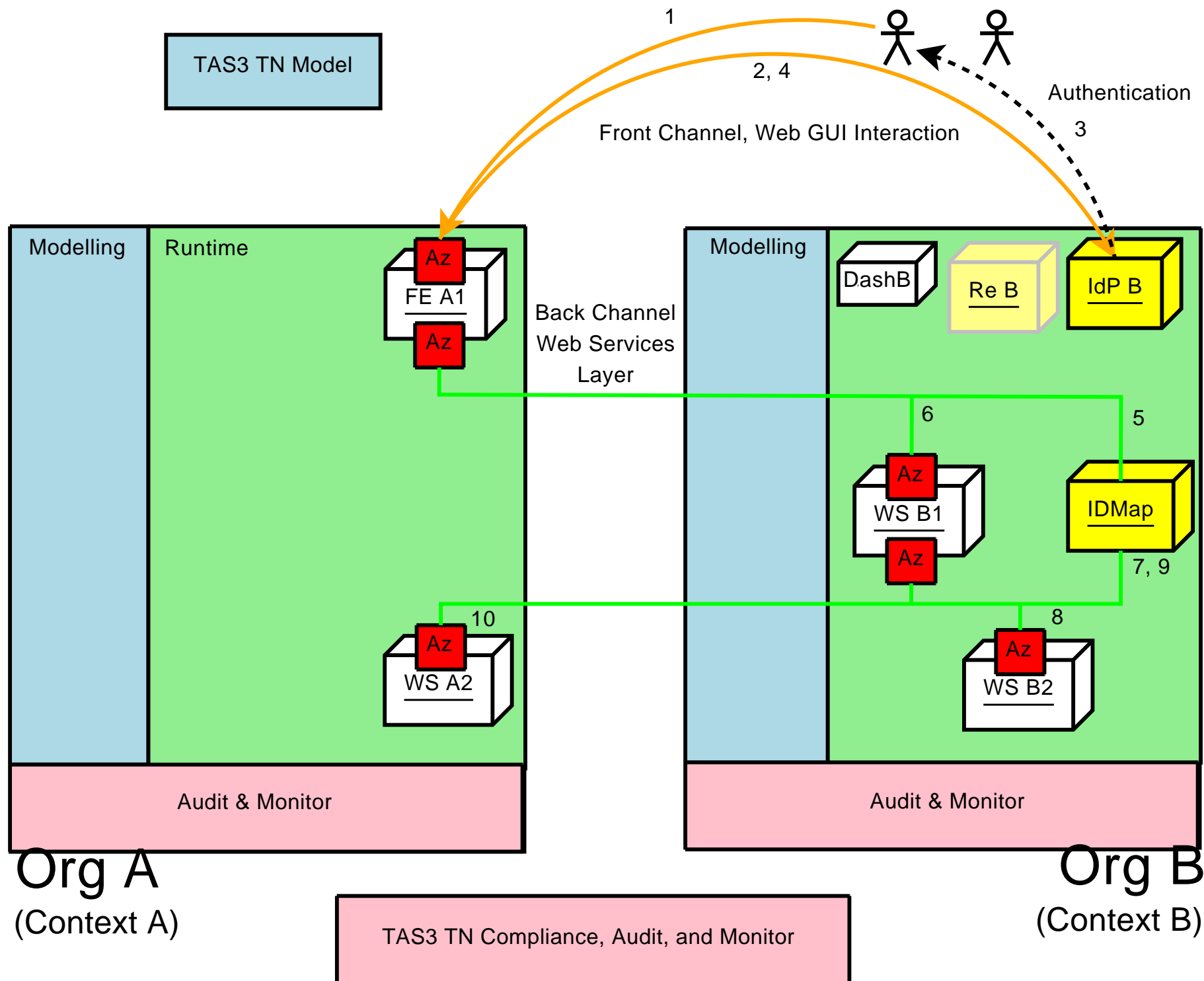
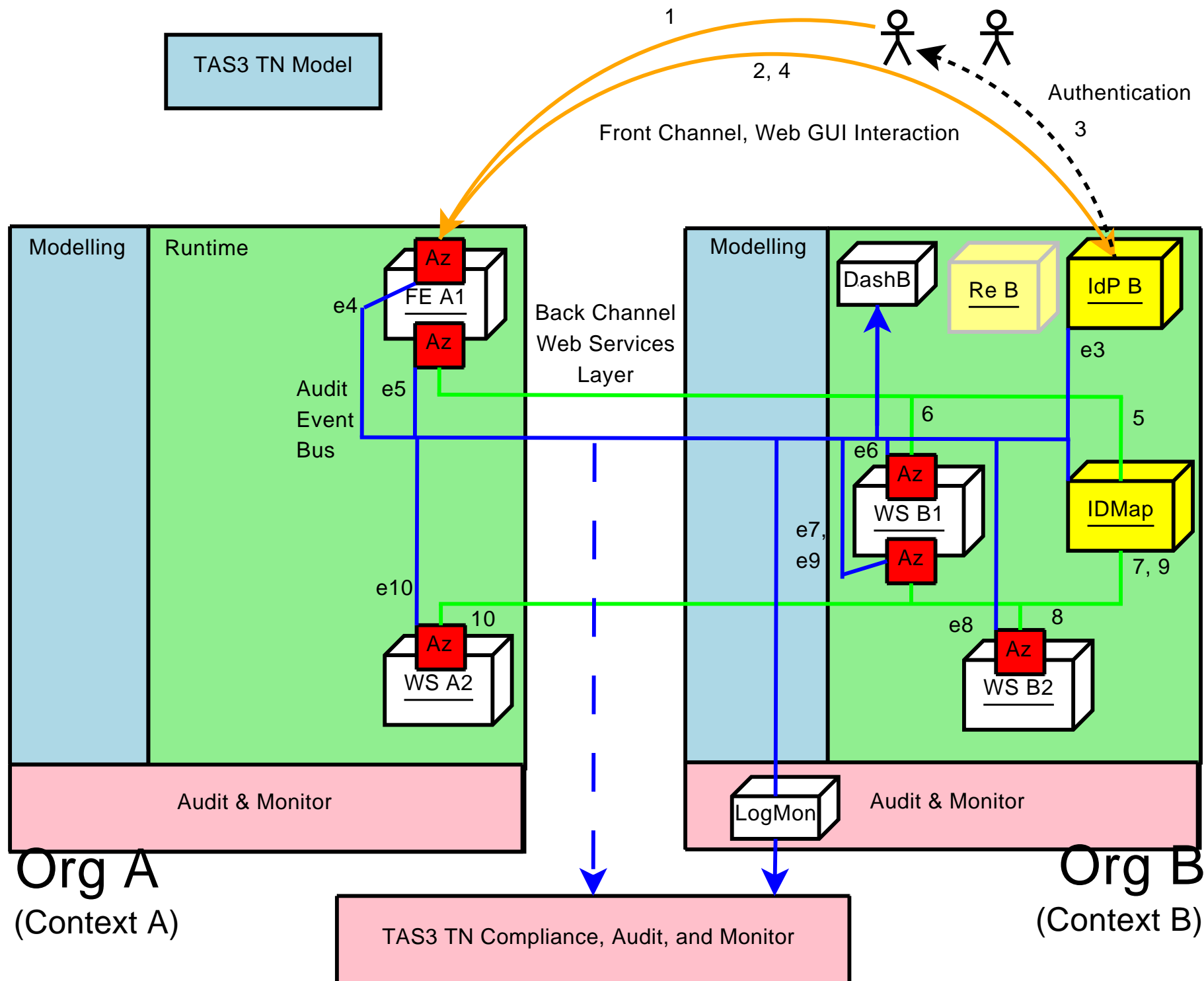


Figure 3: Application Integration: PEP implemented directly in application.

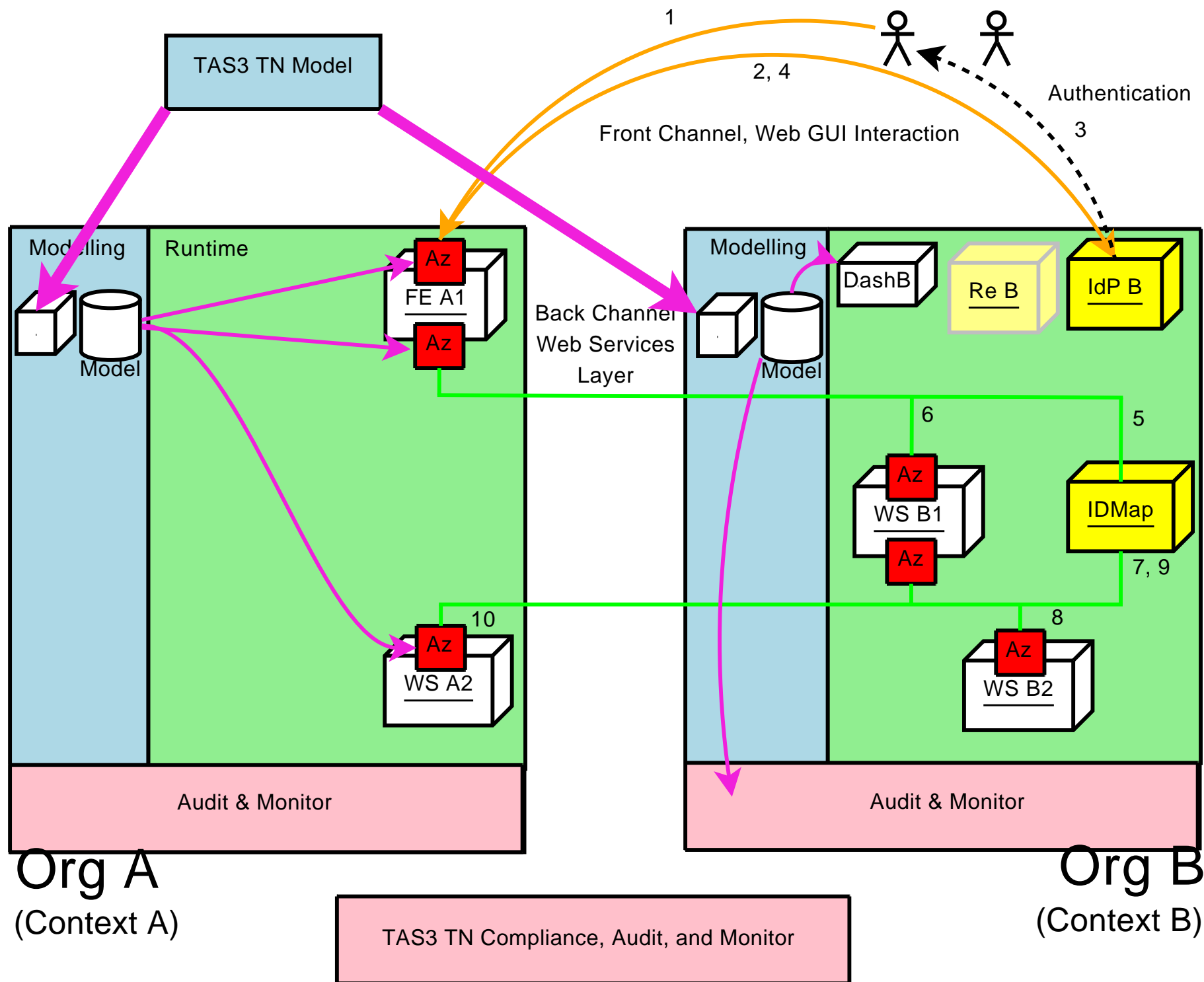
Front channel and back channel interaction



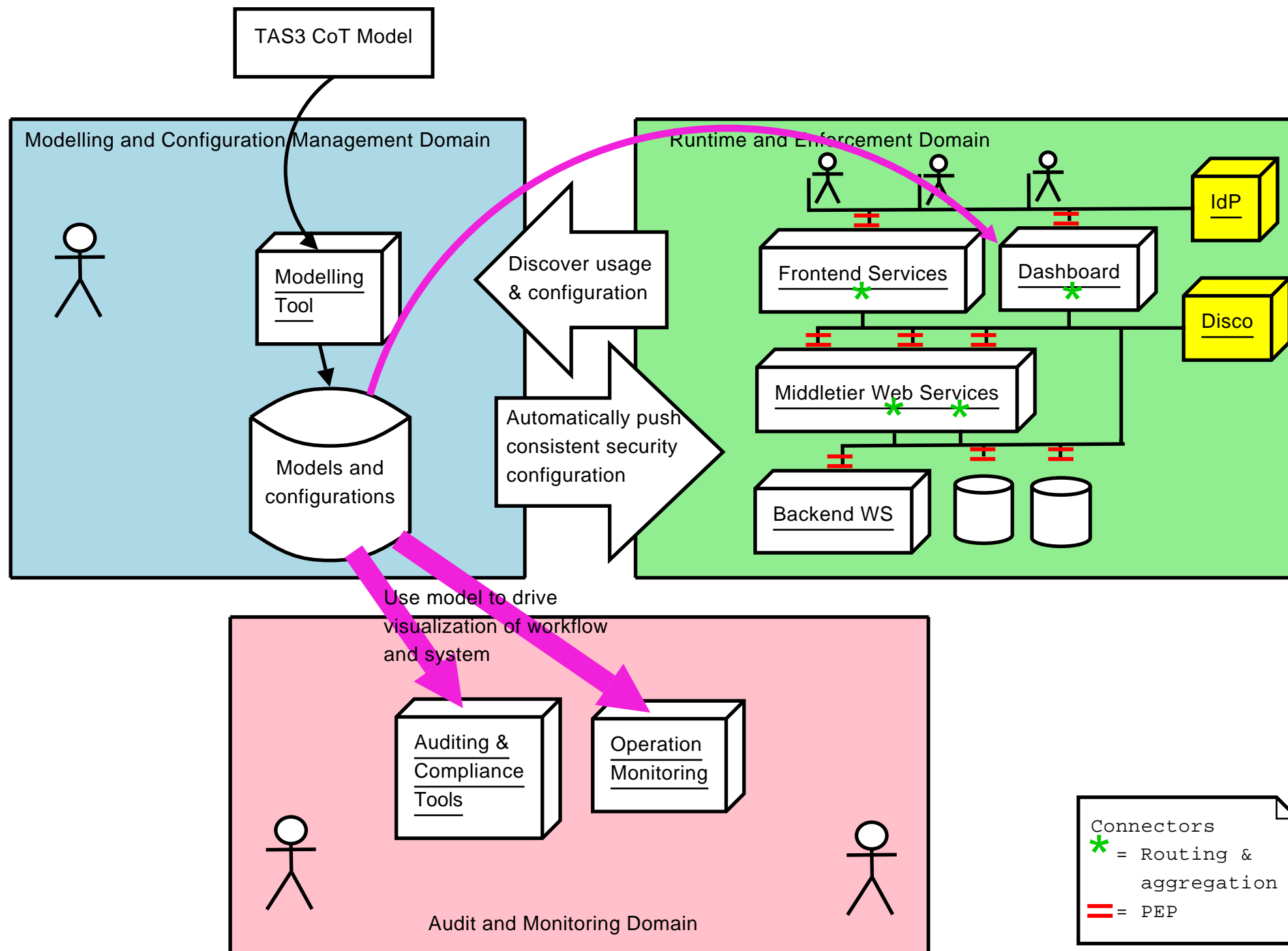
Audit Channel



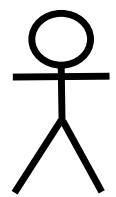
Model driven configuration



Model driven audit



Summit



TAS3 CoT Model

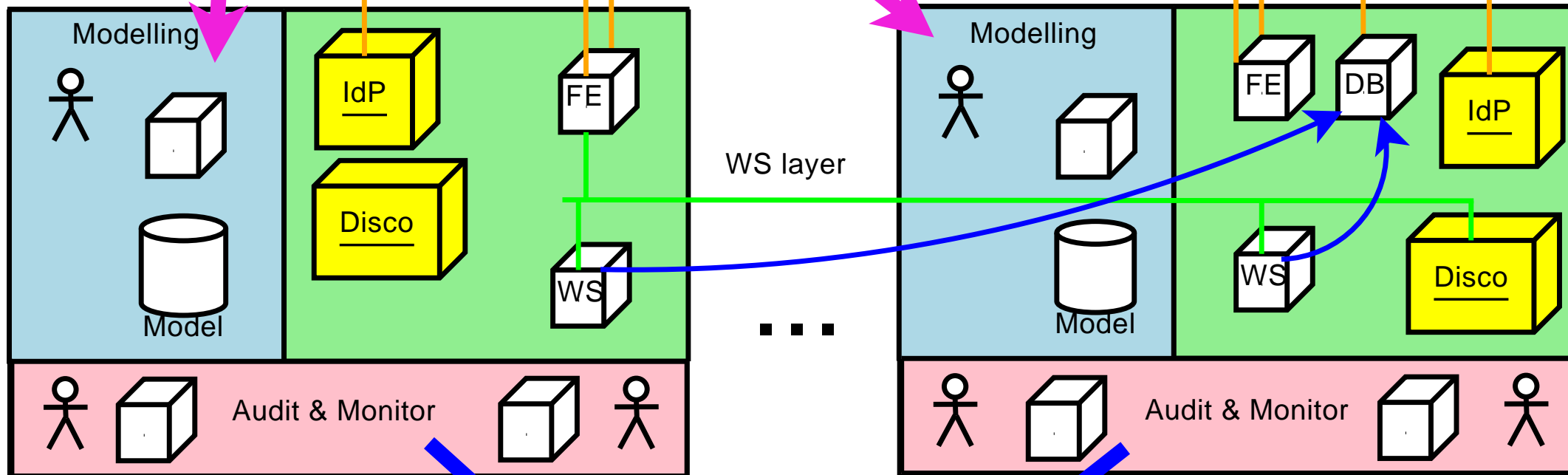
SSO sub CoT B



SSO sub CoT A

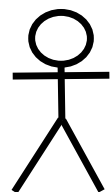


Core

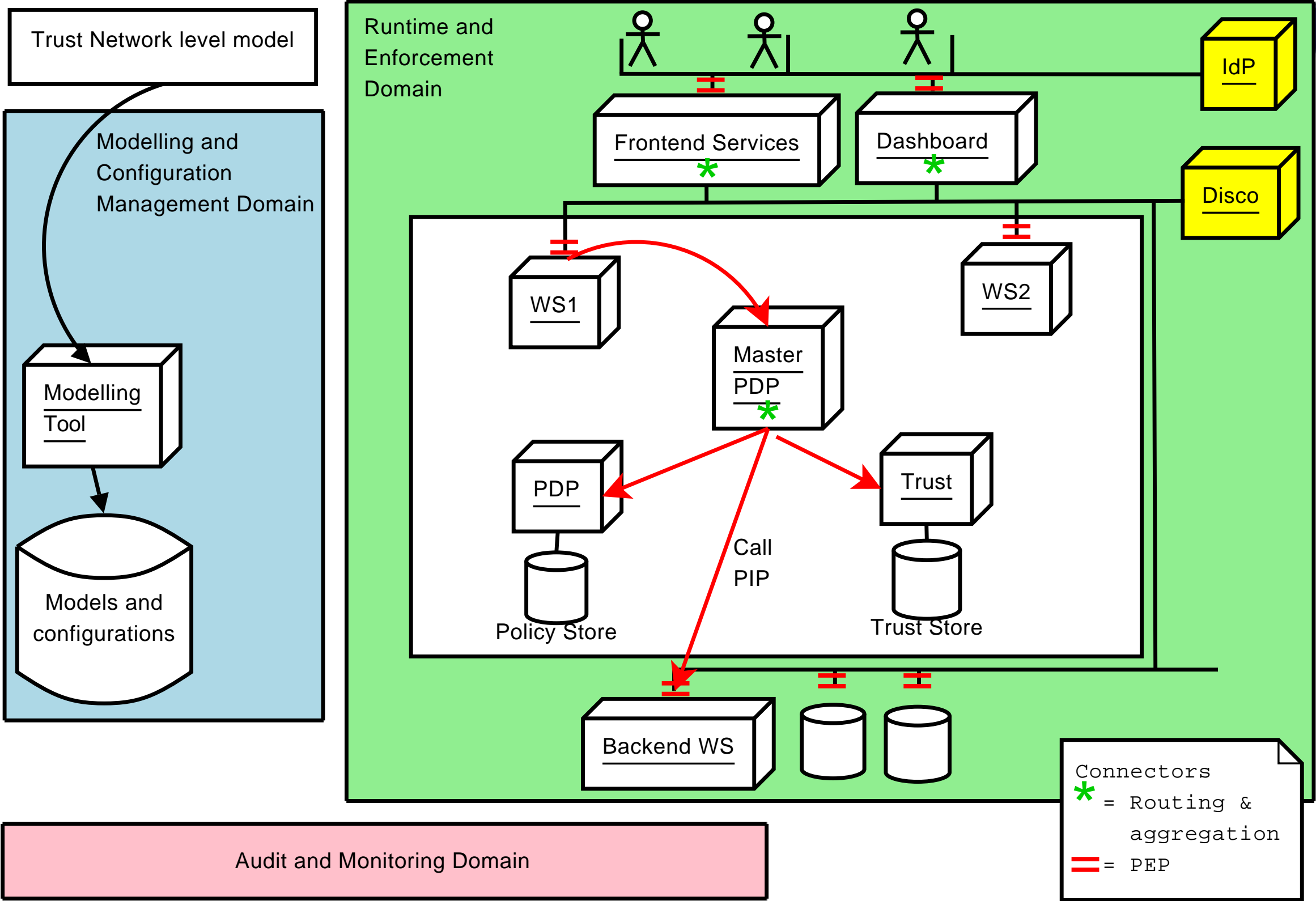


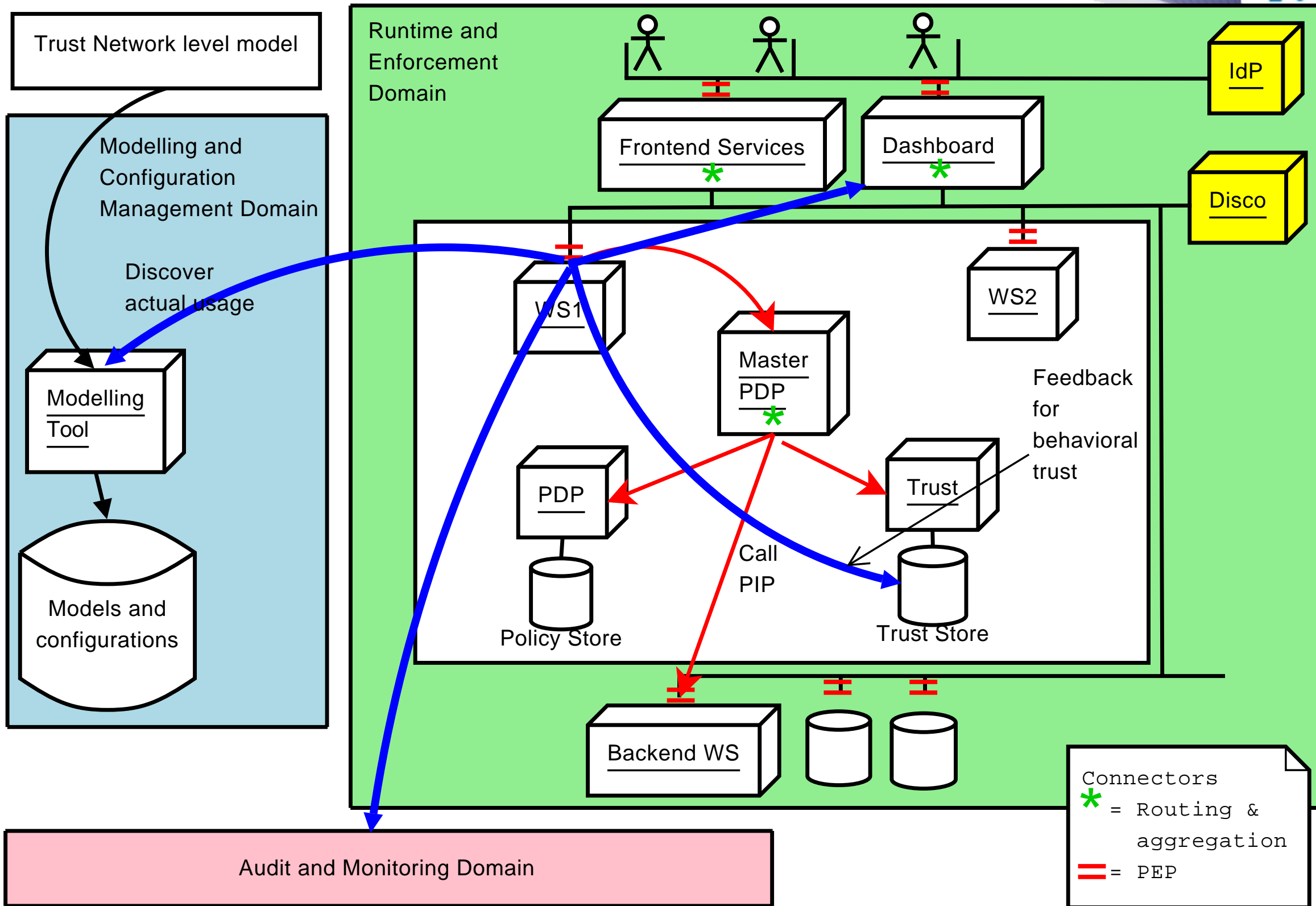
Org A
(Context A)

Org B
(Context B)

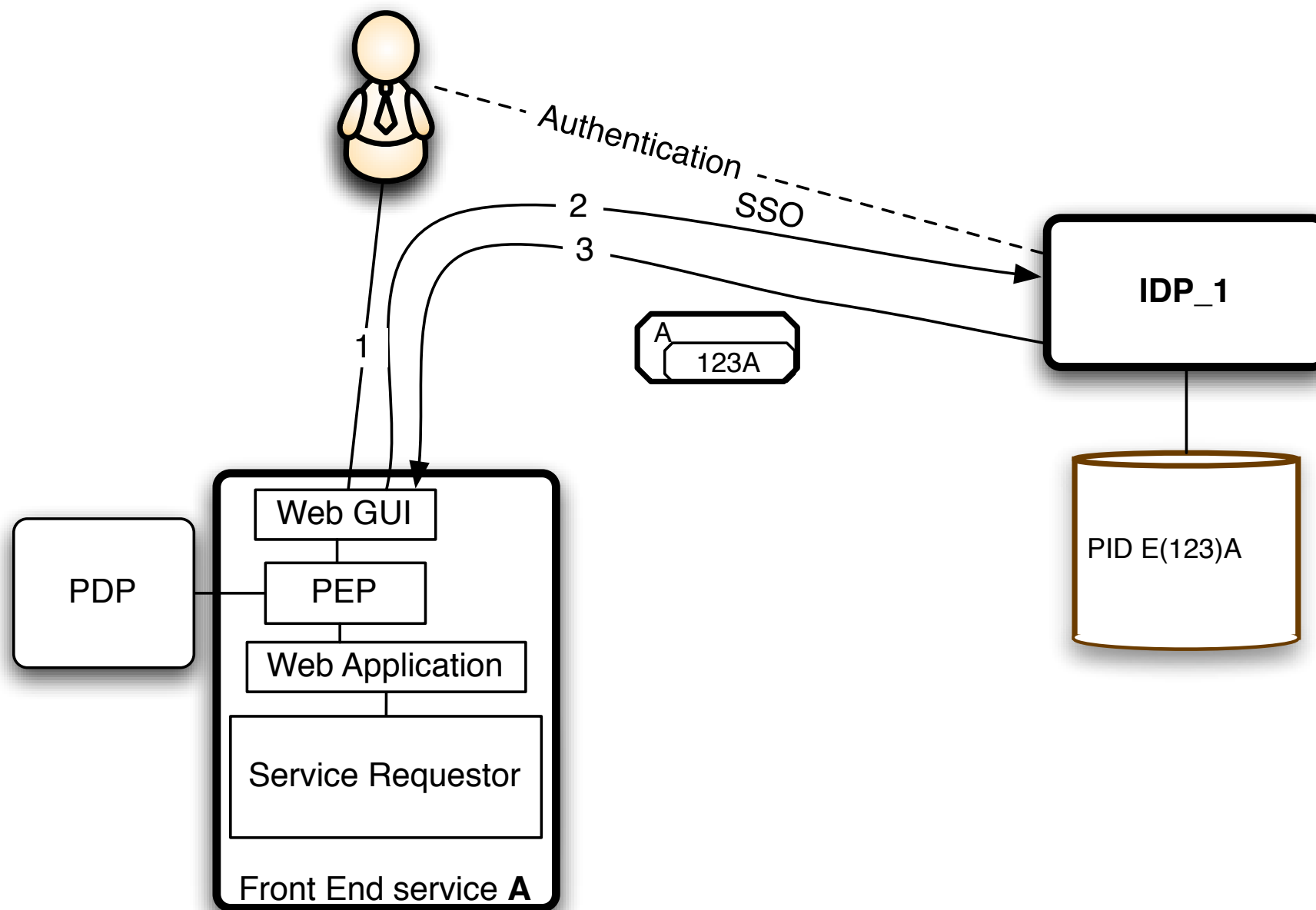


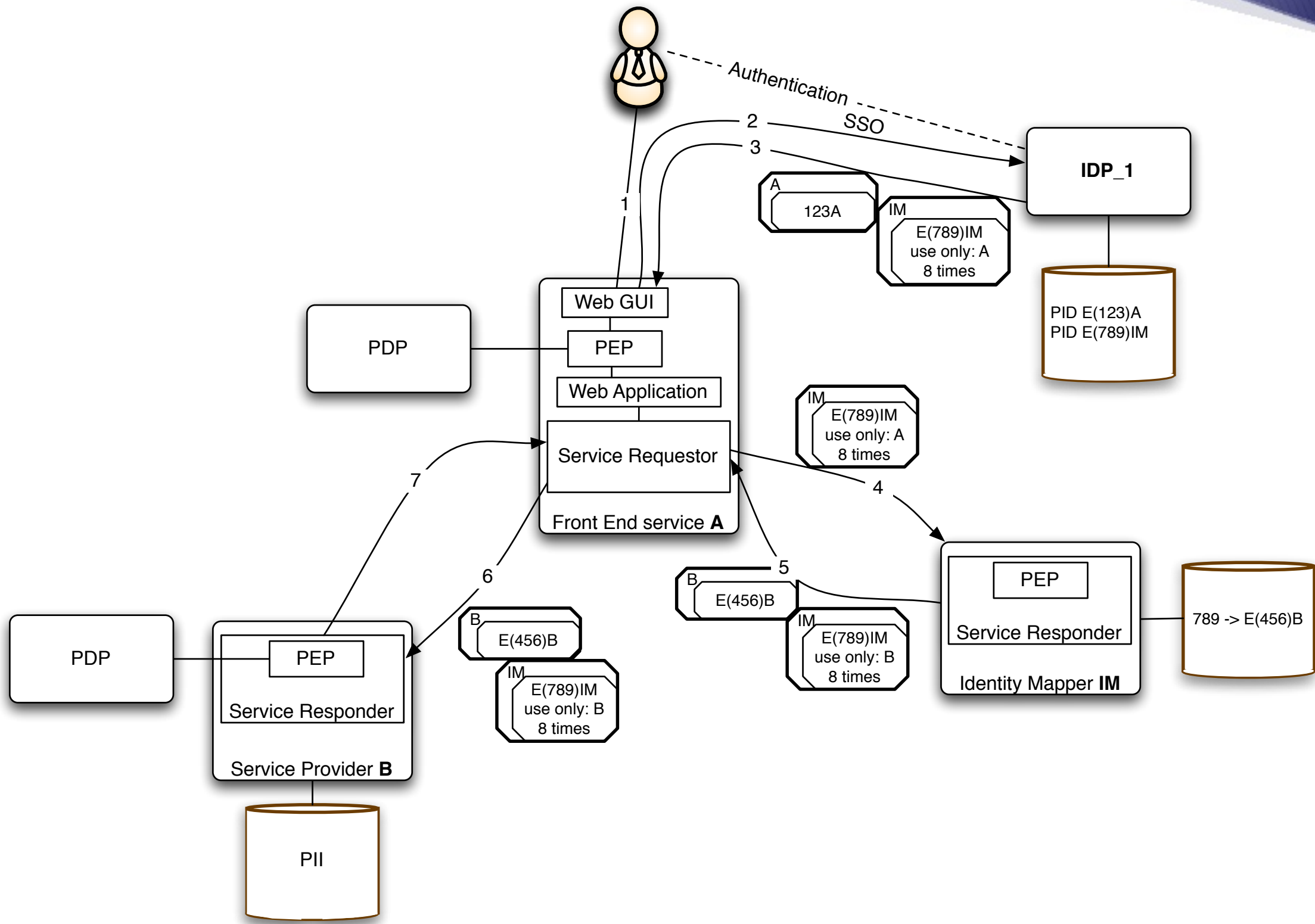
TAS3 CoT Audit

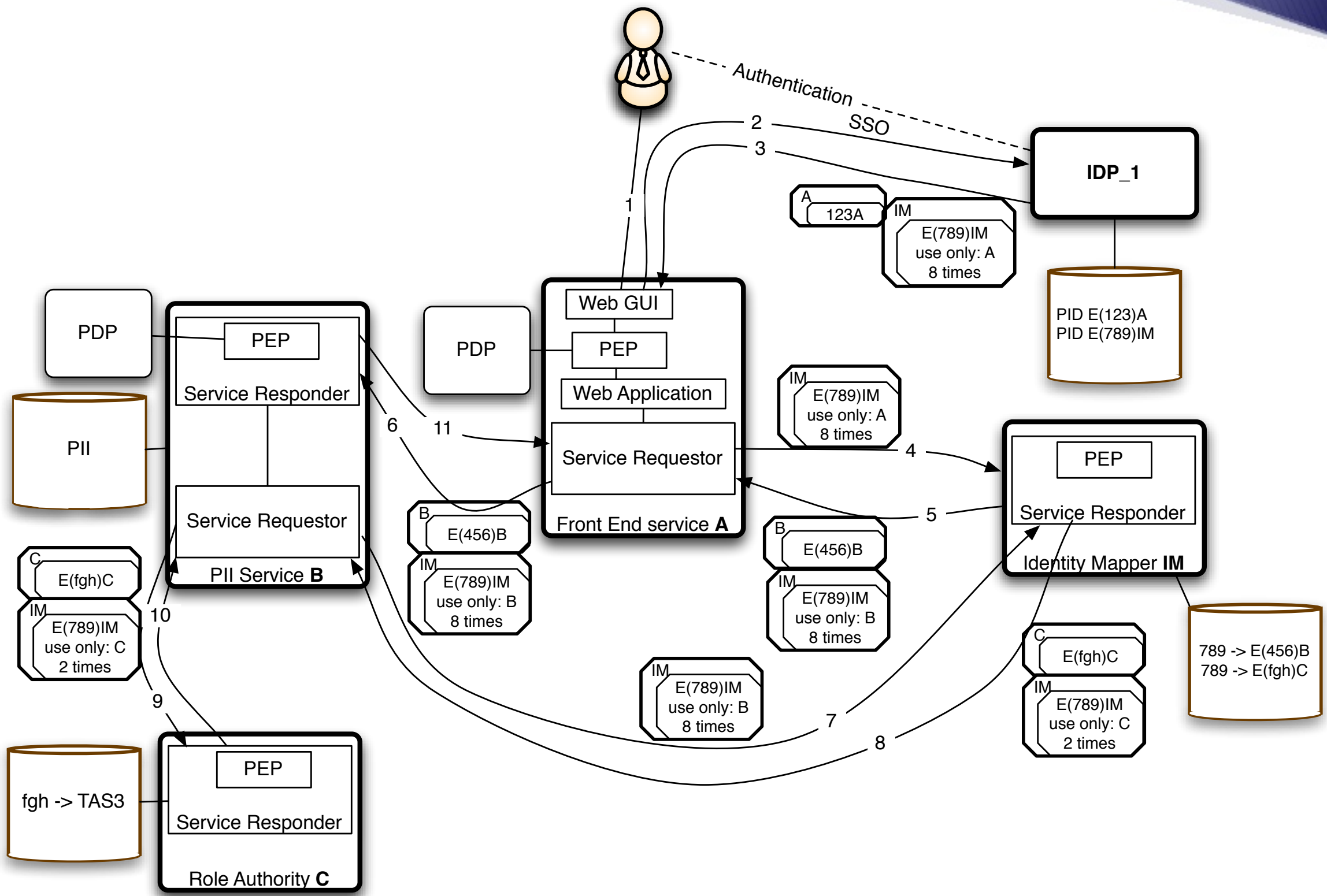




Core Security Architecture Flows







Acronym Expansion

TG Trust Guarantor, the organization that operates TN ("Summit")

TN Trust Network

IdP Identity Provider (SAML role, aka authentication authority)

SP Service Provider: a member organization of TN that operates Frontend and/or Web Services

Disco Service discovery, sometimes specifically identity enabled service discovery such as Liberty ID-WSF Discovery Service.

DB Dashboard, a web GUI for viewing audit records, work flow status, and/or viewing and editing privacy settings and permissions.

FE Frontend, here means web site, i.e. SP

WS Web Service, SOAP based machine to machine communication. Sometimes specifically Identity enabled web service, e.g. Liberty ID-WSF based WS.

WSC Web Service Client, aka Service Requester

WSP Web Services Provider, Service Responder

PEP Policy Enforcement Point

PDP Policy Decision Point

TAS³ and Kantara Initiative (Discussion)

eGovt Potential framework and profile for Governments to Adopt

UMA Sticky Policies, user centricity, RESTful bindings

ULX Usability is important for trust preception

IdP Selection As TAS³ foresees multiple IdPs, this needs to be solved.

ID-WSF Evolution TAS³ is really a profile of ID-WSF plus some extensions. Push these for standardization.

- Usage Directive elaboration
- Pushing more complex credentials than just a token
- Credentials of the WSC / Requesting Party
- Trust and Privacy Negotiation

ID-WSF RESTful RESTful is in TAS³ v2 scope

- SAML-OAuth hybrid

- UMA

IAF WG Trust Network governance leverages IAF work

IOP and Certification TAS³ Trust Network intake, Online Compliance Testing

API standardisation Any interest? Reference implementation?

ID-HR-XML We are using this

TAS³ and Other Standards

- OASIS
 - SSTC: SAML AuthnReq Query extension
 - SSTC: SAML support for XACML
 - Access Control (XACML): Obligations support
- ISO
 - Brendan

Apache Integration using mod_auth_saml

- No programming. Just add to your Apache configuration:

```
LoadModule auth_saml_module modules/mod_auth_saml.s

<Location /protected>
  Require valid-user
  AuthType "saml"
  ZXIDConf "URL=https://sp.demo.org:8443/protected/"
  ZXIDConf "REDIR_TO_CONTENT=1"
</Location>
```

- All applications that support HTTP Basic Authentication will "just work" due to emulation of REMOTE_USER header.

SSO Servlet Approach for Tomcat

```
01 import tas3.*;    // Pull in the tas3.az() API
02 public class appdemo extends HttpServlet {
03     public void doGet(HttpServletRequest req, HttpServletResponse
04         throws ServletException, IOException
05
06         String fullURL = req.getRequestURI();
07         if (req.getQueryString() != null)
08             fullURL += "?" + req.getQueryString();
09         HttpSession ses = req.getSession(false);
10         if (ses == null) {
11             res.sendRedirect("sso?o=E&fr=" + fullURL);
12             return;
13         }
14
```

```
15 res.setContentType("text/html");
16 res.getOutputStream().print("<title>Demo App Prote
17
18 String[] val_names = ses.getValueNames();
19 for (int i = 0; i < val_names.length; ++i) {
20     res.getOutputStream().print(val_names[i]
21         + ": " + ses.getValue(val_names[i]) + "\n");
21 }
22
23 // Render logout buttons (optional)
24
25 res.getOutputStream().print("[<a href=\"sso?gl=1&s
```

SAML Hello World in PHP, the *tas3_sso()* approach

- 38 lines of PHP code of which only 22 do something (rest are comments or HTML)
- Complete
 - All profiles are handled
 - Single Logout handled
 - Well Known Location (WKL) metadata exchange handled
- Hides SAML protocol details
- This Hello World can be cut-and-pasted into any PHP application

Initialization once

```
01 <?
02 dl("php_zxid.so"); # Pull in module (.so file)
03 # CONFIG: You must have created /var/zxid directory
04 # CONFIG: You must edit the URL to match your domain
05 $conf = "PATH=/var/zxid/
           &URL=https://sp1.demo.org:8443/hlo.php";
06 $cf = tas3_new_conf_to_cf($conf);
07 ?>
```

- PATH configuration means multiple instances of ZXID can coexist (e.g. virtual hosting of web sites)
- URL configuration determines provider ID, can also be configured via `/var/zxid/zxid.conf`

Per protected page or until session is bootstrapped

```
08 <?
09 $qs = $_SERVER['REQUEST_METHOD'] == 'GET'
10     ? $_SERVER['QUERY_STRING']
11     : file_get_contents('php://input');
12 $res = tas3_sso_cf($cf, -1, $qs, &ses, 0x1814);
13
14 switch (substr($res, 0, 1)) {
15 case 'L': header($res); exit;
16 case '<': header('Content-type: text/xml'); echo $re
```

- Read input and call *tas3_sso()* to handle SAML protocol details
- Act on outcome of *tas3_sso()* as indicated by the first letter
 - L: protocol requires redirect, perform it
 - <: Send out XML data (such as Metadata or SOAP response)

The IdP Selection Page

```
17 case 'n': exit;    # Already handled, do nothing furt
18 case 'e':
19 ?>
20 <title>Please Login Using IdP</title>
21 <h1>Please Login Using IdP</h1>
22 <?=tas3_idp_select_cf($cf, null, 0x1800)?>
23 <?
24 exit;
```

- **e**: indicates that IdP Selection page needs to be rendered
- *tas3_idp_select()* generates the ZXID standard form
- Alternatively you could supply your own HTML for the form as long as you respect the form field naming convention

Login Successful Case

```
25 case 'd': break; # Logged in case -- continue after
26 default: die("Unknown tas3_sso() res($res)");
27 }
28
29 # Parse the LDIF in $res into a hash of attributes $
30
31 foreach (split("\n", $res) as $line) {
32     $a = split(":", $line);
33     $attr[$a[0]] = $a[1];
34 }
35 ?>
```

- d: login successful, return data is LDIF entry with attributes of SSO

Protected Content with Single Logout and Defederate Buttons

```
36 <title>Protected content, logged in</title>
37 <h1>Protected content, logged in as <?=$attr['cn']?>
38 <?=tas3_fed_mgmt_cf($cf, null, -1, $attr['sesid'], 0
```

- *tas3_fed_mgmt()* generates the Single Log-Out buttons
- This is the place to bootstrap your application's own session

Login Successful: Returned LDIF

```
dn: idpnid=Pa45XAs2332SDS2asFs,affid=https://idp.dem
objectclass: zxidsession
affid: https://idp.demo.com/idp.xml
idpnid: Pa45XAs2332SDS2asFs
authnctxlevel: password
sesid: S12aF3Xi4A
cn: Joe Doe
```

- The LDIF entry is used as convenient format for passing attribute-value pairs from *tas3_sso()* to application
- Some "attributes" are synthesized, others come actually from assertion

IdP Selection

ZXID SP Federated SSO (user NOT logged in, no session)

Login Using New IdP

A new IdP is one whose metadata we do not have yet. We need to know the IdP URL (aka Entity ID) in order to fetch the metadata using the well known location method. You will need to ask the administrator of the IdP to tell you what the EntityID is.

IdP URL

Entity ID of this SP (click on the link to fetch the SP metadata): <https://sp1.zxidsp.org:8443/zxidhlo?o=B>

Login Using Known IdP

Technical options

Create federation, NID Format:

zxid.org, 0.18 1178728139 libzxid (zxid.org)

Login at IdP

symLABS

e-nabling your business

Symlabs Federated Identity Access Manager

DirectoryScript

Welcome to Id Provider "IdP3 A" Home Login

You may login using various methods (pick your poison)

(be sure browser accepts cookies from the same domain)

1. Cookie login

Username: sue

Password: ****

If any web site (SP) asks...

The *IdP URL* (Provider ID/Entity ID) of this IdP is <https://a-idp.liberty-iop.org:8881/idp.xml>

You can cut and paste the above URL to any web site that allows Single Sign-On using *IdP URL* or "Any IdP" or "Other IdP". This mechanism allows the web site (SP) to dynamically join the Circle of Trust of this IdP. This is called *Auto-CoT*.

SSO Successful: Protected Page

ZXID HELLO SP Management (user logged in, session active)

Local Logout

Single Logout (Redir)

Single Logout (SOAP)

Defederate (Redir)

Defederate (SOAP)

sid(Snlg5j2nB) nid(Ple9OQMhOpLCkz72rTbJv) [Reload](#)

[zxid.org](#), 0.18 1178728139 libzxid (zxid.org)

TAS³ API (Java, PHP, Perl, C / C++)

tas3_sso() SSO (with optional application independent authorization)

tas3_az() Application Dependent Authorization

tas3_call() Web Services Client: call a web service and validate response

tas3_wsp_validate() Validate that web service request can be processed

tas3_wsp_decorate() Create a web service response

TAS³ Using Java SDK: Authorization

```
30     if (tas3.az("PATH=/var/zxid/", "Action=Show",
31               ses.getValue("sesid").toString()) == n
31         res.getOutputStream().print("<p><b>Denied.</b>")
32         res.setStatus(302, "Denied");
33     } else {
34         res.getOutputStream().print("<p>Authorized.\n")
35     }
36
```

Making web service call

```
45     ret = tas3.call(cf, tas3.fetch_ses(cf, sid),
46         "urn:hrxml:service", null, null, null,
47         "<idhrxml:Query>"
48         + "<idhrxml:QueryItem>"
49         + "<idhrxml:Select></idhrxml:Select>"
50         + "</idhrxml:QueryItem>" +
51         "</idhrxml:Query>");
```

Responding to a web service call

```
01 public void doPost (HttpServletRequest req, HttpServlet
02     throws ServletException, IOException
03 {
04     tas3.tas3_ses ses = tas3.alloc_ses (cf);
05
06     String buf;
07     int len = req.getContentLength ();
08     byte[] b = new byte[len];
09     int here, got;
10     for (here = 0; here < len; here += got)
11         got = req.getInputStream().read(b, here, len -
12     buf = new String(b, 0, len);
```

```
15 String nid = tas3.wsp_validate(cf, ses, null, buf)
16 if (nid == null) {
17     System.err.print("Validate fail buf("+buf+")\n")
18     return;
19 }
20 String ldif = tas3.ses_to_ldif(cf, ses);
21
22 String ret;
23 ret = tas3.wsp_decorate(cf, ses, null,
24     "<recursed>"
25     + "<lu:Status code=\"OK\"></lu:Status>"
26     + "<data>nid="+nid+"\n"+ldif+"\n</data>" +
27     "</recursed>");
29 res.getOutputStream().print(ret);
30 }
```

Thank You

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