



# Trust & Identity Incubator Status Notifications activity

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Final Demo, 2021-02-09

Public

[www.geant.org](http://www.geant.org)

The screenshot shows the 'eduGAIN Reporting' dashboard. At the top, there are logos for 'eduGAIN Reporting', 'GÉANT', and 'TRUST & IDENTITY INCUBATOR'. The main heading is 'eduGAIN Overview'. Below this, there are four report categories, each with an icon and a brief description:

- Statistics**: Show eduGAIN in numbers, tools, CoCo and SIRTPI. Icon: A clipboard with a pie chart, line graph, and bar chart.
- Overview**: View your entire federation, it's score and trends. Icon: A blue grid with yellow squares.
- Details**: Discover entity errors, warnings and improvements. Icon: A yellow checklist with green checkmarks.
- Checks**: Perform automated technical and security audits. Icon: A magnifying glass over a bug icon and a bar chart.

At the bottom of the dashboard, there is a blue banner with the text: 'Get Your Own Reports - Try the eduGAIN Reporting Pilot'.



## Overview

- Several tools reporting the status of the eduGAIN metadata:
  - Quality of the metadata (contacts, urls, etc)
  - Connection status of SPs and IdPs
  - Entity attributes
  - Attribute checks (live interaction)
- Current tools (mostly relying on the eduGAIN metadata itself)
  - CoCo monitor
  - ECCS (eduGAIN Connectivity Check Service)
- Status intake is considered lackluster:
  - Data is not always readily available
  - Somewhat tedious to “sift” through the data
- No automated notifications / No historical data
- **Proposal: make a nice presentation / notifications / historic data available**

# Feature design

# Feature design principles

- **Nudging:**
  - convenient presentation, appeal to competitive spirit/OCD
- Data source
  - Primary: eduGAIN Technical Database
  - Secondary: inference (software guess by binding)
  - **No active checks at this point**
- Scoring - letter-based
- Issue Weights
- Daily cycles

A++	A+	A	B	C	D	E	F
>70	70-61	60-51	50-41	40-31	30-21	20-11	<11

Score	Calculation	Visibility
Entity	Requirements measurement	EntityOp only their own score FedOp all Federation members eduGAIN Op all
Federation	$\sum$ Entity Score / number of entities	EntityOp/FedOp only their own score eduGAIN Op all

Issue type	Requirement	Points
Major	Missing signing or encryption certificate	-10
Minor	Registration attributes missing or wrong	-5
	CoCo declared but attributes are missing	
	SIRTFI declared but attributes are missing	
Improvement	Missing display or organisational data	-1
	No English language support	
	Wrongly configured server or certificates	
Bonus	Claiming of CoCo	+50
	Claiming of SIRTFI	
	Claiming of R&S	



## A collaborative effort

- Stakeholder Interviews
  - Lukas, Thomas, Tomasz, Davide, Nicole, etc.
  - Well over a dozen interviews
  - Input collected:
    - Various requests for visualizations / metrics
    - Involve federation operators
    - Stick with the “official” data (eduGAIN db)
    - Separation of monitoring (including notification) and visualization
- Standing on the shoulders of / collaboration with eduGAIN Ops
- Collaboration with Product Marketing & Management (Karl/Andrea)

# Feature tour

# Feature Tour / eduGAIN highlights

## eduGAIN Overview

### CoCo v1

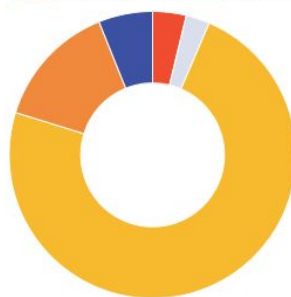
■ CoCo present with errors
 ■ CoCo status unknown
 ■ No CoCo



Check	Count
CoCo present with errors <sup>?</sup>	34
CoCo status unknown <sup>?</sup>	3181
No CoCo <sup>?</sup>	4212

### Platform

■ Microsoft ADFS
 ■ openAthens
 ■ Shibboleth
 ■ SimpleSAMLphp
 ■ unknown



Check	Count
Microsoft ADFS <sup>?</sup>	272
openAthens <sup>?</sup>	193
Shibboleth <sup>?</sup>	5271
SimpleSAMLphp <sup>?</sup>	1016
unknown <sup>?</sup>	438

### ECCS

■ ECCS Errors
 ■ ECCS OK
 ■ ECCS status unknown
 ■ ECCS Warnings
 ■ No ECCS



Check	Count
ECCS Errors <sup>?</sup>	272
ECCS OK <sup>?</sup>	2709
ECCS status unknown <sup>?</sup>	3587
ECCS Warnings <sup>?</sup>	732
No ECCS <sup>?</sup>	5

# Feature Tour / eduGAIN metadata issue summary

## Metadata Validation Issues

RegistrationPolicy



1443 <sup>?</sup>

no mdui Logo



1163 <sup>?</sup>

DisplayName



1085 <sup>?</sup>

UIInfo



344 <sup>?</sup>

Email Address



8 <sup>?</sup>



# Feature Tour / eduGAIN entity attribute aggregates

## Entity Attributes

Show/Hide list

R&S (support), <a href="http://macedir.org/entity-category-support">http://macedir.org/entity-category-support</a>	<a href="http://refeds.org/category/research-and-scholarship">http://refeds.org/category/research-and-scholarship</a>	1051	<div style="width: 100%;"></div>	(History)
R&S, <a href="http://macedir.org/entity-category">http://macedir.org/entity-category</a>	<a href="http://refeds.org/category/research-and-scholarship">http://refeds.org/category/research-and-scholarship</a>	264	<div style="width: 25%;"></div>	(History)
HfD, <a href="http://macedir.org/entity-category">http://macedir.org/entity-category</a>	<a href="http://refeds.org/category/hide-from-discovery">http://refeds.org/category/hide-from-discovery</a>	163	<div style="width: 12.5%;"></div>	(History)
CoC (support), <a href="http://macedir.org/entity-category-support">http://macedir.org/entity-category-support</a>	<a href="http://www.geant.net/uri/dataprotection-code-of-conduct/v1">http://www.geant.net/uri/dataprotection-code-of-conduct/v1</a>	486	<div style="width: 38.5%;"></div>	(History)
CoC, <a href="http://macedir.org/entity-category">http://macedir.org/entity-category</a>	<a href="http://www.geant.net/uri/dataprotection-code-of-conduct/v1">http://www.geant.net/uri/dataprotection-code-of-conduct/v1</a>	194	<div style="width: 15.5%;"></div>	(History)
assurance-certification	<a href="https://refeds.org/sirtfi">https://refeds.org/sirtfi</a>	0	<div style="width: 0%;"></div>	(History)
<a href="http://aai.dfn.de/loa/degree-of-reliance">http://aai.dfn.de/loa/degree-of-reliance</a>	advanced	219	<div style="width: 17.5%;"></div>	(History)
<a href="http://aai.dfn.de/loa/degree-of-reliance">http://aai.dfn.de/loa/degree-of-reliance</a>	basic	29	<div style="width: 2.3%;"></div>	(History)
<a href="http://aai.dfn.de/require-loa/degree-of-reliance">http://aai.dfn.de/require-loa/degree-of-reliance</a>	advanced	33	<div style="width: 2.6%;"></div>	(History)
<a href="http://aai.dfn.de/require-loa/degree-of-reliance">http://aai.dfn.de/require-loa/degree-of-reliance</a>	basic	108	<div style="width: 8.6%;"></div>	(History)

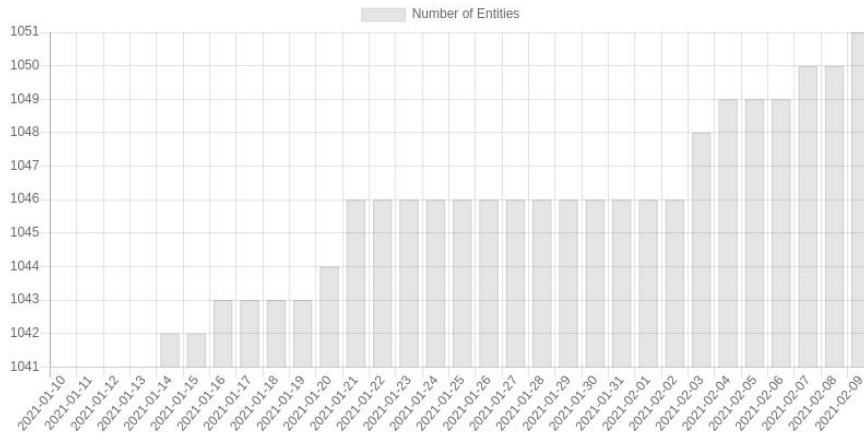
# Feature Tour - Entity Attribute historic trends

## Entity Attribute History

**R&S (support)**

[http://macedir.org/entity-category-support:](http://macedir.org/entity-category-support)

<http://refeds.org/category/research-and-scholarship>



# Feature Tour - Issues grouped by federation

## Offending Entities

Federation	Entity	Measured value	Last Check
AAF	<b>[IdP] Murdoch University</b> <a href="https://idp.murdoch.edu.au/idp/shibboleth">https://idp.murdoch.edu.au/idp/shibboleth</a> (show entity statistics)	ECCS Warnings 🟡	2021-02-09 04:00:08
AAIEDUMK	<b>[IdP] Ministry for education and science in Macedonia</b> <a href="https://idp.schools.mk/idp/shibboleth">https://idp.schools.mk/idp/shibboleth</a> (show entity statistics)	ECCS Warnings 🟡	2021-02-09 04:00:10
ACONET	<b>[Unknown] Bundesministerium für Bildung, Wissenschaft, Forschung</b> <a href="http://adfs.noc-science.at/adfs/services/trust">http://adfs.noc-science.at/adfs/services/trust</a> (show entity statistics)	ECCS Warnings 🟡	2021-02-09 04:00:11
ACONET	<b>[IdP] Naturhistorisches Museum Wien (NHM)</b> <a href="https://nhm-eduid.nhm-wien.ac.at/idp/shibboleth">https://nhm-eduid.nhm-wien.ac.at/idp/shibboleth</a> (show entity statistics)	ECCS Errors 🔴	2021-02-09 04:00:11
ARNAAI	<b>[IdP] DZ e-Science GRID IDP</b> <a href="https://idp.grid.arn.dz/idp/shibboleth">https://idp.grid.arn.dz/idp/shibboleth</a> (show entity statistics)	ECCS Errors 🔴	2021-02-09 04:00:12
ARNAAI	<b>[IdP] DZ e-Science MEDECINE IDP</b> <a href="https://med-idp.arn.dz/idp/shibboleth">https://med-idp.arn.dz/idp/shibboleth</a> (show entity statistics)	ECCS Errors 🔴	2021-02-09 04:00:12
BELNET	<b>[IdP] CRA-W</b> <a href="http://adfsvalid.bgda.cra.wallonie.be/adfs/services/trust">http://adfsvalid.bgda.cra.wallonie.be/adfs/services/trust</a> (show entity statistics)	ECCS Errors 🔴	2021-02-09 04:00:15
BELNET	<b>[IdP] Hogeschool West-Vlaanderen</b> <a href="https://idp.howest.be/idp/shibboleth">https://idp.howest.be/idp/shibboleth</a> (show entity statistics)	ECCS Warnings 🟡	2021-02-09 04:00:16
BELNET	<b>[IdP] Liege University - (ULiege / ULg)</b> <a href="https://idp-fed.uliege.be/simplesaml/saml2/idp/metadata.php">https://idp-fed.uliege.be/simplesaml/saml2/idp/metadata.php</a> (show entity statistics)	ECCS Warnings 🟡	2021-02-09 04:00:15
BELNET	<b>[Unknown] Universite de Mons (UMONS)</b> <a href="https://adfs.umons.ac.be/adfs/services/trust">https://adfs.umons.ac.be/adfs/services/trust</a> (show entity statistics)	ECCS Warnings 🟡	2021-02-09 04:00:15
BELNET	<b>[IdP] VIB</b> <a href="http://sts1.vib.be/adfs/services/trust">http://sts1.vib.be/adfs/services/trust</a> (show entity statistics)	ECCS Warnings 🟡	2021-02-09 04:00:15

# Feature Tour - federations grouped by issue

## eduGAIN Issues Overview

### Federation

md:EmailAddress in md:ContactPerson element should start with mailto: prefix ?

FEIDE (no)  
Federation Overview

3



CAFE (br)  
Federation Overview

1

EDUID-CZ (cz)  
Federation Overview

1

MINGA (ec)  
Federation Overview

1

PIONIER-ID (pl)  
Federation Overview

1

RUNNET-AAI (ru)  
Federation Overview

1

# Feature Tour / Federation Overview

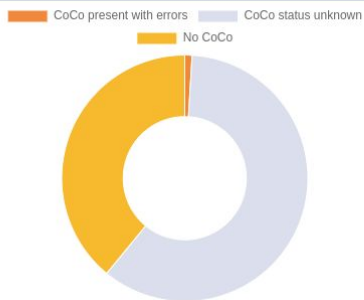
## Federation

You can see the stats of your federation here, in comparison with eduGAIN as a whole.

**A** **51.1333**

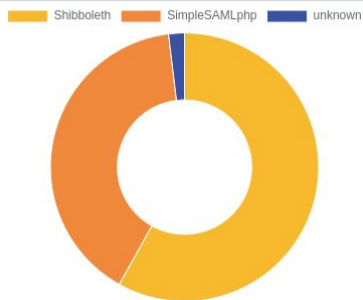
### Statistics for EDUID-HU federation

#### CoCo v1



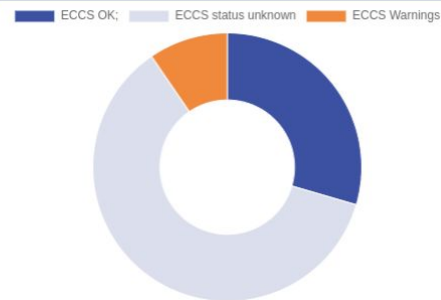
Check	Count
CoCo present with errors	1
CoCo status unknown	63
No CoCo	41

#### Platform



Check	Count
Shibboleth	61
SimpleSAMLphp	42
unknown	2

#### ECCS



Check	Count
ECCS OK	31
ECCS status unknown	64
ECCS Warnings	10

# Feature Tour / Federation comparison

mdui:UllInfo found but no mdui:Logo element The Lower The Better

CoCo status unknown The Lower The Better

No CoCo The Lower The Better

CoCo present with errors The Lower The Better

SIRTFI present The Higher The Better

This federation: 49.52%(eduGAIN avg: 16%)



This federation: 60.00%(eduGAIN avg: 43%)



This federation: 39.05%(eduGAIN avg: 57%)



This federation: 0.95%(eduGAIN avg: 0%)



This federation: 21.90%(eduGAIN avg: 14%)





# Feature Tour / Federation comparison

mdui:UllInfo found but no mdui:Logo element The Lower The Better

CoCo status unknown The Lower The Better

No CoCo The Lower The Better

CoCo present with errors The Lower The Better

SIRTFI present The Higher The Better

This federation: 49.52%(eduGAIN avg: 16%)



This federation: 60.00%(eduGAIN avg: 43%)



This federation: 39.05%(eduGAIN avg: 57%)



This federation: 0.95%(eduGAIN avg: 0%)



This federation: 21.90%(eduGAIN avg: 14%)



# Feature Tour / Entity Change visualization

[IdP] Coleg Ceredigion

<https://idp.ceredigion.ac.uk/shibboleth> (show entity statistics)

[IdP] University of Chester

<https://idp.chester.ac.uk/shibboleth> (show entity statistics)

2021-02-09  
04:03:24

A (A) 55 (55)



2021-02-09  
04:03:24

B (B) 42 (50)








# Feature Tour / Entity Score

## Entity

### Statistics for <https://idp.chester.ac.uk/shibboleth>

Here is the score and current status of this entity.

**B** **42**

Check	Measured value	Last Check
 Validation issue	mdrpi:RegistrationPolicy not found (show measurement history)	
 CoCo v1	No CoCo (show measurement history)	
 SIRTFI	SIRTFI status unknown (show measurement history)	
 ECCS	ECCS Errors (show measurement history)	
 Platform	Shibboleth (show measurement history)	

# Feature Tour / Entity Measurement history

History of ECCS check for  
<https://idp.chester.ac.uk/shibboleth>

## February 2021

22 --	23 --	24 --	25 --	26 --	27 --	28 --
15 --	16 --	17 --	18 --	19 --	20 --	21 --
8 ECCS OK;	9 ECCS Errors	10 --	11 --	12 --	13 --	14 --
1 ECCS OK;	2 ECCS OK;	3 ECCS OK;	4 ECCS OK;	5 ECCS OK;	6 ECCS OK;	7 ECCS OK;

## January 2021

25 ECCS OK;	26 ECCS OK;	27 ECCS Errors	28 ECCS Errors	29 ECCS OK;	30 ECCS Errors	31 ECCS OK;
18 ECCS OK;	19 ECCS OK;	20 ECCS OK;	21 ECCS OK;	22 ECCS OK;	23 ECCS OK;	24 ECCS OK;
11 ECCS Errors	12 ECCS OK;	13 ECCS OK;	14 ECCS Errors	15 ECCS OK;	16 ECCS OK;	17 ECCS OK;
4 ECCS Errors	5 ECCS Errors	6 ECCS Errors	7 ECCS Errors	8 ECCS OK;	9 ECCS OK;	10 ECCS OK;
\	\	\	\	1 ECCS Errors	2 ECCS OK;	3 ECCS Errors

## December 2020

28 ECCS Errors	29 ECCS OK;	30 ECCS Errors	31 ECCS OK;	\	\	\
21 ECCS Errors	22 ECCS OK;	23 ECCS Errors	24 ECCS OK;	25 ECCS OK;	26 ECCS OK;	27 ECCS OK;
14 ECCS Errors	15 ECCS Errors	16 ECCS OK;	17 ECCS OK;	18 ECCS OK;	19 ECCS OK;	20 ECCS Errors
7	8	9	10	11	12	13

# Feature Tour / User profile

First Name	Mihály	user_input	2020-11-05 15:09:37	Edit Attribute
Last Name	Héder	user_input	2020-11-05 15:09:37	Edit Attribute
Federation Ownership	EDUID-HU INCOMMON SWAMID CAF IDEM PIONIER-ID SWITCHAAI UK-FEDERATION	admin admin admin email_token email_token email_token email_token	2020-11-17 18:20:40 2020-11-17 18:20:40 2020-11-17 18:20:40 2020-12-02 15:50:26 2020-12-02 15:50:26 2020-12-02 15:50:26 2020-12-02 15:50:26	(Read-only attribute)
Email notifications	daily	user_input	2021-01-21 14:22:32	Edit Attribute

# Feature Tour / Profile

First Name	Mihály	user_input	2020-11-05 15:09:37	Edit Attribute
Last Name	Héder	user_input	2020-11-05 15:09:37	Edit Attribute
Federation Ownership	EDUID-HU INCOMMON SWAMID CAF IDEM PIONIER-ID SWITCHAAI UK-FEDERATION	admin admin admin email_token email_token email_token email_token	2020-11-17 18:20:40 2020-11-17 18:20:40 2020-11-17 18:20:40 2020-12-02 15:50:26 2020-12-02 15:50:26 2020-12-02 15:50:26 2020-12-02 15:50:26 2020-12-02 15:50:26 2020-12-02 15:50:26	(Read-only attribute)
Email notifications	daily	user_input	2021-01-21 14:22:32	Edit Attribute

# Feature Tour / Subscription

**Claim Access to Federation DFN-AAI. This will send an email to [edugain@dfn.de](mailto:edugain@dfn.de) with an activation link.**

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Send token to fedop email: [edugain@dfn.de](mailto:edugain@dfn.de)

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## ABOUT GÉANT

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[geant.org](http://geant.org)  
[cookies and policies](#)  
[disclaimer](#)  
[anti-slavery policy](#)

## SITEMAP

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[eduGAIN Overview](#)  
[Issue Overview](#)  
[Warnings and Errors](#)  
[Federations](#)



# Feature Tour / Notificaiton granularity setting

## Email notifications

- No email notifications
- Daily email notifications
- Daily (ECCS does not trigger)

Save these values

---

# Feature Tour / Notification emails

	Last Measurement	Current Measurement
<a href="https://idp.cardiff.ac.uk/shibboleth">https://idp.cardiff.ac.uk/shibboleth</a>	Old Score: <b>60</b>	New Score: <b>52</b>
ECCS	ECCS OK;	ECCS Warnings
<a href="https://idp.chester.ac.uk/shibboleth">https://idp.chester.ac.uk/shibboleth</a>	Old Score: <b>50</b>	New Score: <b>42</b>
ECCS	ECCS OK;	ECCS Errors
<a href="https://idp.southport-college.ac.uk/shibboleth">https://idp.southport-college.ac.uk/shibboleth</a>	Old Score: <b>55</b>	New Score: <b>47</b>
ECCS	ECCS OK;	ECCS Warnings
<a href="https://login.library.dmu.ac.uk/oala/metadata">https://login.library.dmu.ac.uk/oala/metadata</a>	Old Score: <b>55</b>	New Score: <b>54</b>
Validation issue	(No measurement)	mdui:UllInfo found but no mdui:Logo element
<a href="https://oala.aaschool.ac.uk/oala/metadata">https://oala.aaschool.ac.uk/oala/metadata</a>	Old Score: <b>55</b>	New Score: <b>47</b>
ECCS	ECCS OK;	ECCS Errors
<a href="https://rcis.regents.ac.uk/openathens">https://rcis.regents.ac.uk/openathens</a>	Old Score: <b>(No score)</b>	New Score: <b>48</b>
CoCo v1	(No measurement)	No CoCo
ECCS	(No measurement)	ECCS status unknown
SIRTFI	(No measurement)	SIRTFI status unknown
Validation issue	(No measurement)	mdui:UllInfo found but no mdui:Logo element

# Feature screencast!

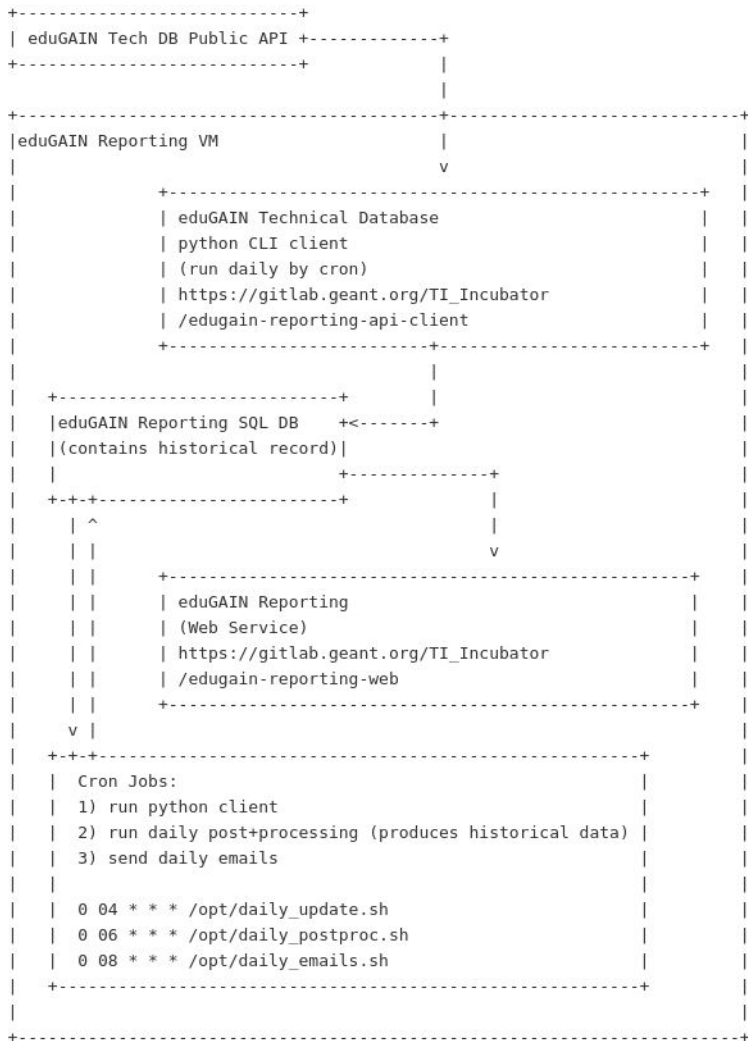
<https://edugain-reporting-beta.incubator.geant.org/>



# Technical design

# Technical design principles

- Goal: Long-term maintainability
  - Simple, lightweight design
  - Low entry for new developers
  - **Means:** low-dependency LAMP app + python Tech DB client
- Goal: simple testing
  - **Means:** tidy html code with IDs
- Goal: long-term host of accounts
  - **Means:** data design supports account linking
- Goal: easy pdf export
  - **Means:** all web pages can be generated without header/footer/menu + wkhtml2pdf (or any renderer engine)
- Goal: easy translations
  - **Means:** fully featured translation engine



# Architecture

## Testing with Selenium / html tidy + ids pay off

- Server side: xdebug code evaluation tracker
- Client side: selenium test going through all screens

# Test suite screencast!

# Testing with Selenium / html tidy + ids pay off

```
self.driver.set_window_size(1920, 1044)
self.driver.find_element(By.ID, "go_to_edugain_overview").click()
self.driver.find_element(By.ID, "expand_collapse_button").click()
self.driver.find_element(By.ID, "link_to_ea_stat_76").click()
self.driver.find_element(By.ID, "link_to_edugain_overview.php").click()
self.driver.find_element(By.ID, "expand_collapse_button").click()
self.driver.find_element(By.ID, "link_to_ea_stat_87").click()
self.driver.find_element(By.ID, "link_to_issues.php").click()
self.driver.find_element(By.ID,
"link_list_entity_issues_mdrpi%3ARegistrationPolicy+not+found").click()
self.driver.find_element(By.ID, "link_to_issues.php").click()
self.driver.find_element(By.ID, "link_to_entity_issue_list.php").click()
self.driver.find_element(By.ID, "link_to_issue_desc_ECCS+Warnings").click()
self.driver.find_element(By.ID, "link_to_federation_list.php").click()
self.driver.find_element(By.ID, "link_to_federation_details_EDUID-HU").click
()
self.driver.find_element(By.ID, "link_to_entity_https%3A%2F%2Faai.nytud.
hu%2Fsimplesaml%2Fsaml2%2Fidp%2Fmetadata.php").click()
self.driver.find_element(By.ID,
"link_to_entity_stat_history_https%3A%2F%2Faai.nytud.
hu%2Fsimplesaml%2Fsaml2%2Fidp%2Fmetadata.php_ct5").click()
self.driver.find_element(By.CSS_SELECTOR, "#link_to_profile_page > .divimg")
.click()
self.driver.find_element(By.ID, "link_edit_attribute_first_name").click()
self.driver.find_element(By.ID, "content").click()
self.driver.find_element(By.ID, "submitbutton").send_keys("Aladár")
```

# Testing with Selenium / html tidy + ids pay off

```
## /var/www/html/edugain_overview.php
array (
  23 => 1,
  25 => 1,
  27 => 1,
)
#R: 3, 100.00%
#N: 0, 0.00%
```

- 1612655540.3609\_index-php.txt
- 1612655542.264\_edugain-overview-php.txt
- 1612655544.5151\_ea-stat-php-ea-id-76.txt
- 1612655545.9489\_edugain-overview-php.txt
- 1612655547.9835\_ea-stat-php-ea-id-87.txt
- 1612655549.3191\_issues-php.txt
- 1612655551.091\_entity-issue-list-php-s-value-mdrpi-3aregistrationpolicy-not-found.txt
- 1612655555.9961\_issues-php.txt
- 1612655558.1156\_entity-issue-list-php.txt
- 1612655562.3378\_issue-desc-php-s-value-eccs-warnings.txt
- 1612655563.7573\_federation-list-php.txt
- 1612655565.1349\_federation-php-id-eduid-hu.txt
- 1612655567.1721\_entity-php-id-https-aai-nytud-hu-simplesaml-saml2-idp-metadata-php.txt
- 1612655568.3535\_history-php-id-https-aai-nytud-hu-simplesaml-saml2-idp-metadata-php-ct-id-5.txt
- 1612655569.7468\_aai-profile-php.txt
- 1612655570.7036\_aai-attr-edit-php-attrname-first-name.txt
- 1612655572.3763\_aai-profile-php.txt
- 1612655573.3879\_aai-attr-edit-php-attrname-first-name.txt
- 1612655575.0689\_aai-profile-php.txt
- 1612655576.2268\_aai-attr-edit-php-attrname-email-setting.txt
- 1612655578.9298\_aai-profile-php.txt
- 1612655580.1028\_aai-attr-edit-php-attrname-email-setting.txt
- 1612655581.9218\_aai-profile-php.txt

```
1 <?php
2
3 #####
4 #
5 # Copyright [2020] [Mihály Héder]
6 #
7 # Licensed under the Apache License, Ve
8 # you may not use this file except in c
9 # You may obtain a copy of the License
10 #
11 # http://www.apache.org/licenses/LIC
12 #
13 # Unless required by applicable law or
14 # distributed under the License is dist
15 # WITHOUT WARRANTIES OR CONDITIONS OF A
16 # See the License for the specific lang
17 # limitations under the License.
18 #
19 #####
20
21 include "init.php";
22
23 make_header();
24
25 make_stats();
26
27 make_footer();
28
```

## Testing with Selenium / html tidy + ids pay off

- Selenium selectors 90%+ ID-based, or “semantic” meaning that future changes should not bother it much
- php code coverage 90%+
- bonus: execution timing!





## Next steps (not for the incubator)

- **Handover** to eduTEAMS Ops
  - VM procurement (done)
  - Ansible deployment (in progress)
- User **engagement**
- Long-term ideas
  - TLS quality check
  - More evident visualizations in lists
  - Even more charts
  - enable regular pdf reports
  - db optimizations
  - more educational content

# Thank you

Any questions?

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