



EWP anatomy an in-depth look at its architecture

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erasmuswithoutpaper.eu



Agenda

- What is the EWP Network?
- How to build the EWP node to get connected?
- How to get help on a technical level?
- What are the plans for 2019?
- What are the plans beyond 2019?
- What are your tasks as EWP ambassador?

What is the EWP Network?

Design

- Network architecture, protocols, services etc. fully described in **GitHub** which is **publicly** available repository of source code:
 - **ReadMe** part – high level description in „common” language.
 - **Flowcharts** explaining the mobility process – for „business” oriented people.
 - **XML, XSD files** – for technical staff.
- Available at: <https://github.com/erasmus-without-paper/>



Erasmus Without Paper

A common space for all EWP-related Git projects.

<http://developers.erasmuswithoutpaper.eu/> [✉ usos@usos.edu.pl](mailto:usos@usos.edu.pl)

[ewp-specs-mobility-flowcharts](#)

"EWP Mobility Process Explained" document.

Updated on 25 Jan

[ewp-specs-api-discovery](#)

Specifications of EWP's Discovery API.

🔗 2 1 issue needs help Updated on 25 Jan

[ewp-specs-architecture](#)

Description of EWP's Architecture and Security.

Updated on 24 Jan

What is the EWP Network?

Registry

- Address book which gathers in one place information about:
 - **who** – is connected,
 - **where** – how to find him,
 - **what** – services are offered.
- Registry is updated automatically.
- Available at:
 - PROD: <https://registry.erasmuswithoutpaper.eu/>
 - DEV: <https://dev-registry.erasmuswithoutpaper.eu/>
- Eventually PROD registry will have a couple of instances synchronized in real time (SLA, HA).

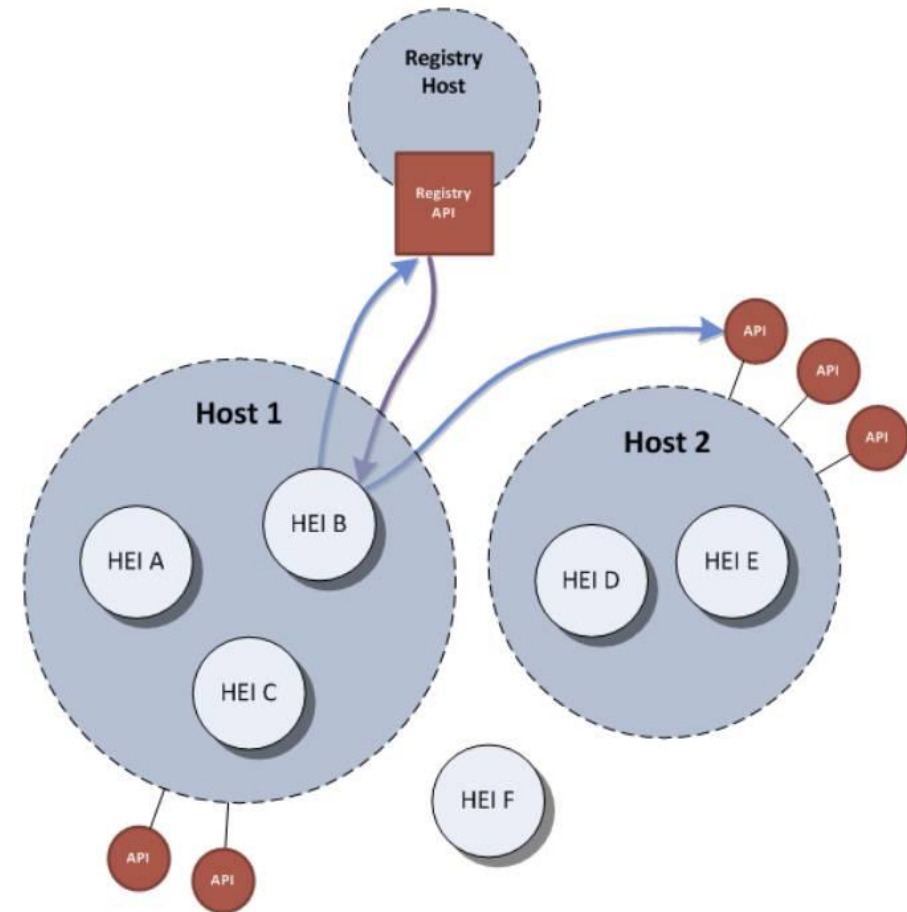


The screenshot shows the 'EWP Registry Service' page. It features the Erasmus Without Paper logo and the title 'EWP Registry Service'. Below the title, it states 'Automated discovery service of APIs related to Higher Education in Europe' and 'Provided and supported by Erasmus Without Paper project'. The main content area includes a URL: <https://registry.erasmuswithoutpaper.eu/catalogue-v1.xml>. It also mentions that the catalogue is continuously refreshed and provides links to 'Manifest Importer Status', 'HEI/API Coverage Matrix', and 'EWP Developers Hub'. On the right side, there is a box titled 'Uptime ratios' showing 100.00% for 24 hours, 7 days, 30 days, and 365 days. At the bottom right, it says 'v1.6.2-SNAPSHOT' and 'Contact: usos@usos.edu.pl'.

What is the EWP Network?

Connector (EWP server)

- Piece of software which is a SIS's **agent** in the EWP Network.
- Has to implement:
 - Security transport protocols (**ECHO**).
 - **Discovery** service (**Manifest** file).
- May implement some **business oriented** APIs.
- Exposed to the public by **URL** available in the Registry.
- One **EWP node** can host more than one HEI (recognized by domain names=SCHAC codes).



Discovery API (Manifest file)



DEV Registry Service

Manifest Importer Status

Currently defined manifest sources and their statuses:

https://dev-registry.erasmuswithoutpaper.eu/manifest.xml	OK	details
https://ewp.demo.usos.edu.pl/ewp/manifest	OK	details
https://ewp-hei.demo.usos.edu.pl/ewp/manifest	OK	details

```
-<ns41:manifest>
  -<ns41:host>
    <admin-email>hostmaster@usos.edu.pl</admin-email>
  -<ns40:apis-implemented>
    -<ns15:discovery version="5.0.0">
      <ns15:url>https://ewp.demo.usos.edu.pl/ewp/manifest</ns15:url>
    </ns15:discovery>
    +<ns3:echo version="2.0.0"></ns3:echo>
    +<ns12:imobilities version="0.3.0"></ns12:imobilities>
    +<ns11:imobility-cnr version="0.1.1"></ns11:imobility-cnr>
    +<ns8:institutions version="2.1.0"></ns8:institutions>
    +<ns4:organizational-units version="2.1.0"></ns4:organizational-units>
    +<ns13:iias version="2.1.0"></ns13:iias>
    +<ns14:iaa-cnr version="2.0.2"></ns14:iaa-cnr>
    +<ns5:omobilities version="0.15.0"></ns5:omobilities>
    +<ns7:omobility-cnr version="0.4.1"></ns7:omobility-cnr>
    +<ns16:courses version="0.7.1"></ns16:courses>
    +<ns9:imobility-tors version="0.7.0"></ns9:imobility-tors>
    +<ns10:imobility-tor-cnr version="0.1.1"></ns10:imobility-tor-cnr>
  </ns40:apis-implemented>
  -<ns41:institutions-covered>
    -<ns40:hei id="demo.usos.edu.pl">
      <ns40:other-id type="erasmus">PL WARSZAW01</ns40:other-id>
      <ns40:other-id type="pic">999572294</ns40:other-id>
      <ns40:name xml:lang="pl">Uniwersytet Warszawski</ns40:name>
      <ns40:name xml:lang="en">University of Warsaw</ns40:name>
    </ns40:hei>
  </ns41:institutions-covered>
  +<ns41:client-credentials-in-use></ns41:client-credentials-in-use>
  +<ns41:server-credentials-in-use></ns41:server-credentials-in-use>
</ns41:host>
</ns41:manifest>
```


Other APIs (offered services)



DEV Registry Service

```

<ns41:manifest>
- <ns41:host>
  <admin-email>hostmaster@usos.edu.pl</admin-email>
- <ns40:apis-implemented>
  + <ns15:discovery version="5.0.0"></ns15:discovery>
  + <ns3:echo version="2.0.0"></ns3:echo>
  + <ns12:imobilities version="0.3.0"></ns12:imobilities>
  + <ns11:imobility-cnr version="0.1.1"></ns11:imobility-cnr>
  + <ns8:institutions version="2.1.0"></ns8:institutions>
  + <ns4:organizational-units version="2.1.0"></ns4:organizational-units>
  + <ns13:iias version="2.1.0"></ns13:iias>
  + <ns14:iia-cnr version="2.0.2"></ns14:iia-cnr>
  + <ns5:omobilities version="0.15.0"></ns5:omobilities>
  + <ns7:omobility-cnr version="0.4.1"></ns7:omobility-cnr>
  + <ns16:courses version="0.7.1"></ns16:courses>
  + <ns9:imobility-tors version="0.7.0"></ns9:imobility-tors>
  + <ns10:imobility-tor-cnr version="0.1.1"></ns10:imobility-tor-cnr>
</ns40:apis-implemented>
- <ns41:institutions-covered>
  - <ns40:hei id="demo.usos.edu.pl">
    <ns40:other-id type="erasmus">PL WARSZAW01</ns40:other-id>
    <ns40:other-id type="pic">999572294</ns40:other-id>
    <ns40:name xml:lang="pl">Uniwersytet Warszawski</ns40:name>
    <ns40:name xml:lang="en">University of Warsaw</ns40:name>
  </ns40:hei>
</ns41:institutions-covered>
  
```

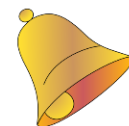
HEI/API Coverage Matrix

Institution	General Purpose APIs				IIAs			OMobilities				IMobilities			IMobility ToRs		
	inst.	ounits	courses	course replic.	ver.	CNR		ver.	update types	CNR		ver.	CNR		ver.	CNR	
						sends	recv.			sends	recv.		sends	recv.		sends	recv.
demo.usos.edu.pl	2.1.0	2.1.0	0.7.1		2.1.0	yes	2.0.2	0.15.0	NN	yes	0.4.1	0.3.0	yes	0.1.1	0.7.0	yes	0.1.1
hei.demo.usos.edu.pl	2.1.0	2.1.0	0.7.1		2.1.0	yes	2.0.2	0.15.0	NN	yes	0.4.1	0.3.0	yes	0.1.1	0.7.0	yes	0.1.1
uw.edu.pl	2.0.0	2.0.0	0.7.0		2.0.0	yes	2.0.1	0.15.0	NN	yes	0.4.0	0.3.0	yes	0.1.0	0.7.0	yes	0.1.0
up.pt	2.1.0	2.1.0			2.1.0	no	2.0.2	0.15.0	NN	yes	0.4.1	0.2.0	no	0.1.1	0.7.0	no	0.1.1

credentials-in-use>
credentials-in-use>

What is the EWP Network?

- **APIs (Application Programming Interfaces)** — a set of clearly defined methods of communication between various software components used to build applications.
- There are many APIs supporting the **EWP business model**:
 - **Primary Network** APIs (Discovery Manifest, Echo, Registry).
 - **General Purpose** APIs (Institutions, Organizational Units, Courses).
 - **Erasmus Mobility** APIs (Interinstitutional Agreements, Outgoing Mobilities, Incoming Mobilities, Nominations Approval, Mobility Arrival and Departure, Transcripts of Records, CNRs).
 - **MT+** APIs (Institutions, Projects, Dictionaries).
- Each API is relatively simple and can be implemented separately from the others.
- APIs may be implemented one by one, gradually building support for the whole process.
- There are APIs for **sending** (pushing) data and for **requesting** (pulling) data in response to **change notifications** (CNR). It is possible to handle EWP data exchange **automatically** by subscribing to notifications and firing triggers when they come.



What is the EWP Network?

EWP Client

- EWP functionalities spread over the **User Interface** of the Mobility module used by IRO.
- The most **business oriented** part of the project.
- Should be designed with close contact with the **business owner** (mostly IRO staff).
- May (will) change in time from less to more automated.

International cooperation > Arrival Nominations

New EWP notifications [Download](#) Pending nominations [Show](#) [Get data from EWP](#)

[+ Add](#) [Enter nominating entity's data](#) [Notify the partner](#) [Send a message](#) [Accept](#) [Reject](#)

<input type="checkbox"/>	No	D	Family name	Given names	Country	Higher Education Instituti
<input type="checkbox"/>	1	2018	Cassio	Aguinaldo	Portugalia	Universidade do Porto
<input type="checkbox"/>	2	2018	Diogo	Diego	Portugalia	Universidade do Porto
<input type="checkbox"/>	3	2018	Fernando	Barnabe	Portugalia	Universidade do Porto

Details Address Telephones External units External persons Logo Factsheet Mobility Tool

[+ Add](#) [Get data from EWP](#)

No	Name in national language	Name in English	WWW
1	Katedra Białorusistyki	Department of Belarusian Studies	http://www.kfb.uw.edu.pl
2	Katedra Ukrainistyki	Department of Ukrainian Studies	http://www.ukraina.uw.edu.pl
3	Wydział Zarządzania	Faculty of Management	http://www.wz.uw.edu.pl

How to build EWP node to get connected?

- Implement the **EWP connector** with ECHO and Discovery (or take it from OSUA).
- Send URL to the Registry administrator (usos@usos.edu.pl).
- Start testing.
- Implement other APIs as agreed with local users.
- Update your manifest file as new APIs become available.
- Test, test, test (using automated tests, reference connector, demo installations of the partners, or you own).

How to build EWP node to get connected?

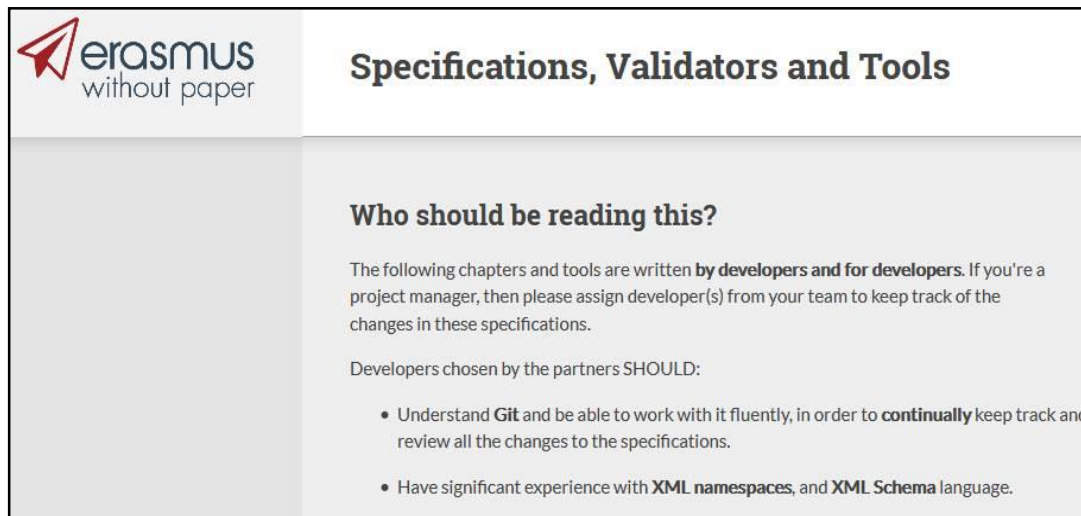
In the meantime:


- Design the **EWP client** with your business clients.
- Search for inspiration looking at installations of the partners.
- Integrate EWP services into your local processes.
- Test, test, test in DEMO EWP Network.
- Go to production.

The image displays several screenshots from the MoveOn EWP system interface. The top right screenshot shows a table for 'New EWP Notifications' with columns for 'No', 'Date', 'Faculty name', 'Gender', 'Organization', 'Verified', and 'Status'. The middle right screenshot shows the 'EWP Organizational Units' page for 'External institution: Universität Bremen', listing various departments like EM-LogDynamics, EMBC - Marine Biologie, and FB01 Physics. The bottom left screenshot shows a 'Connect' sidebar with a list of institutions including ARISTOTELEIO PANEPISTIMIO THESSALONIKIS, Ozyegin University, and UNIVERSITÄT BREMEN. The bottom center screenshot shows a detailed form for 'WARSAW1' with fields for Code, Name, Address, and Contact information.

How to get help on a technical level?

- Developers Guide: <https://developers.erasmuswithoutpaper.eu/>
- Self testing: ECHO, XML Validator.
- Much more to come.



 **Specifications, Validators and Tools**

Who should be reading this?

The following chapters and tools are written **by developers and for developers**. If you're a project manager, then please assign developer(s) from your team to keep track of the changes in these specifications.

Developers chosen by the partners SHOULD:

- Understand **Git** and be able to work with it fluently, in order to **continually** keep track and review all the changes to the specifications.
- Have significant experience with **XML namespaces**, and **XML Schema** language.

- ⊕ Chapter 1. Working with EWP Technical Documentation **v1.2.0**
- ⊖ Chapter 2. Introduction to EWP Network
 - ⊕ Chapter 2.1. Architecture and Common Datatypes **v1.10.0**
 - ⊕ Chapter 2.2. Authentication and Security **v2.0.2**
 - ⊖ Chapter 2.3. Client Authentication Methods
 - ⊕ Chapter 2.3.1. Handling Anonymous Clients **v1.1.0**
 - ⊕ Chapter 2.3.2. Authenticating Clients with TLS Certificate **v1.1.0**
 - ⊕ Chapter 2.3.3. Authenticating Clients with HTTP Signature **v1.0.1**
 - ⊖ Chapter 2.4. Server Authentication Methods
 - ⊕ Chapter 2.4.1. Authenticating Servers with TLS Certificate **v1.1.0**
 - ⊕ Chapter 2.4.2. Authenticating Servers with HTTP Signature **v1.0.1**

Validation result: **NOTICE**

Basic information

- URL of the Echo API being tested: `https://ewp.demo.usos.edu.pl/ewp/echo`
- Datetime validation started: `2018-06-03T11:56:57.751Z`
- Datetime client keys regenerated: `2018-05-09T06:30:52.232Z` (2179565 seconds before validation)

Tests performed

1. Check if our client credentials have been served long enough.

SUCCESS

2. Verifying the format of the URL. Expecting a valid HTTPS-scheme URL.

SUCCESS

3. Verifying if the URL is properly registered.

4. Querying for supported security methods. Validating http-security int

16. Trying Combination[GSTTT] GET request with a list of echo values [a, b, a].
Expecting to receive a valid HTTP 200 Echo API response, with proper hei-id and matching echo values.

FAILURE

HTTP 200 expected, but HTTP 401 received.

112. Trying Combination[PHHTT] with additional "gzip" added in Accept-Encoding.
Expecting the same response, but preferably gzipped.

NOTICE

The client explicitly accepted gzip, but the server didn't compress its response. That's not an error, but it might be useful to support gzip encoding to save bandwidth.

Security
ECHO API Validator
(performs thousands of tests)

Schema Validator

</> XML Schema Validator

This tool will help you with writing EWP XML documents. For example, you can paste the contents of your [Manifest file](#) here before you upload it onto your production site. You should be able to validate any XML document described in all **RELEASED**, **DEPRECATED** and **OBSOLETE** specifications above (plus, perhaps, some of the **DRAFT** ones).

Note, that this tool will validate **against the schema only!** Even if such validation succeeds, your file **may still be invalid** (if, for example, you didn't adhere to the guidelines described in `<xs:documentation>` elements included in the XSD files).

Paste your XML document below and press

```
<courses-response
  xmlns="https://github.com/erasmus-without-paper/ewp-specs-api-courses/tree/stable-v1"
  xmlns:trm="https://github.com/erasmus-without-paper/ewp-specs-types-academic-term/tree/stable-v1"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    https://github.com/erasmus-without-paper/ewp-specs-api-courses
    https://raw.githubusercontent.com/erasmus-without-paper/ewp-sp
"
>
<!--
IMPORTANT: Please see the response.xsd file for detailed requirements
descriptions of all the elements. You MUST NOT base your implementation
solely on the example file.
```

Validation result: **PASSED**

Recognized element

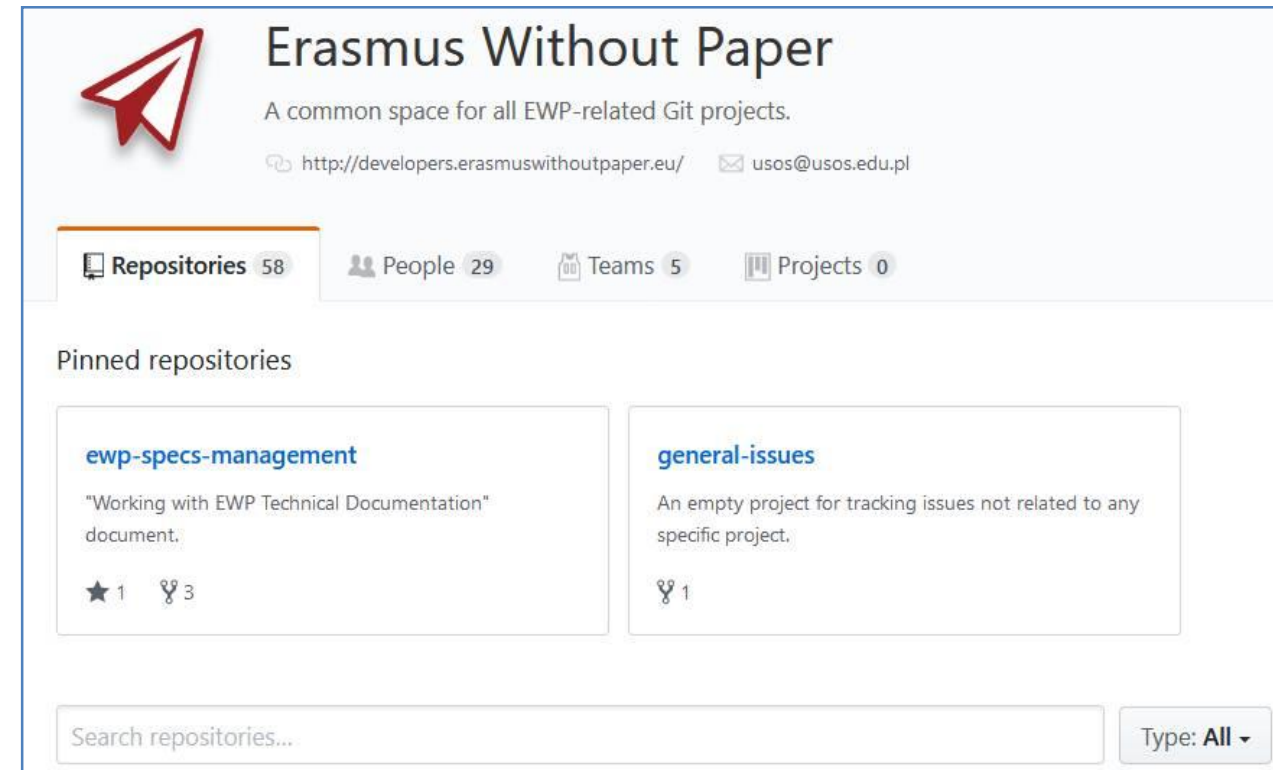
This seems to be a valid `courses-response` element (from `https://github.com/erasmus-without-paper/ewp-specs-api-courses/tree/stable-v1` namespace).

[Try again](#)

Where to find technical stuff?

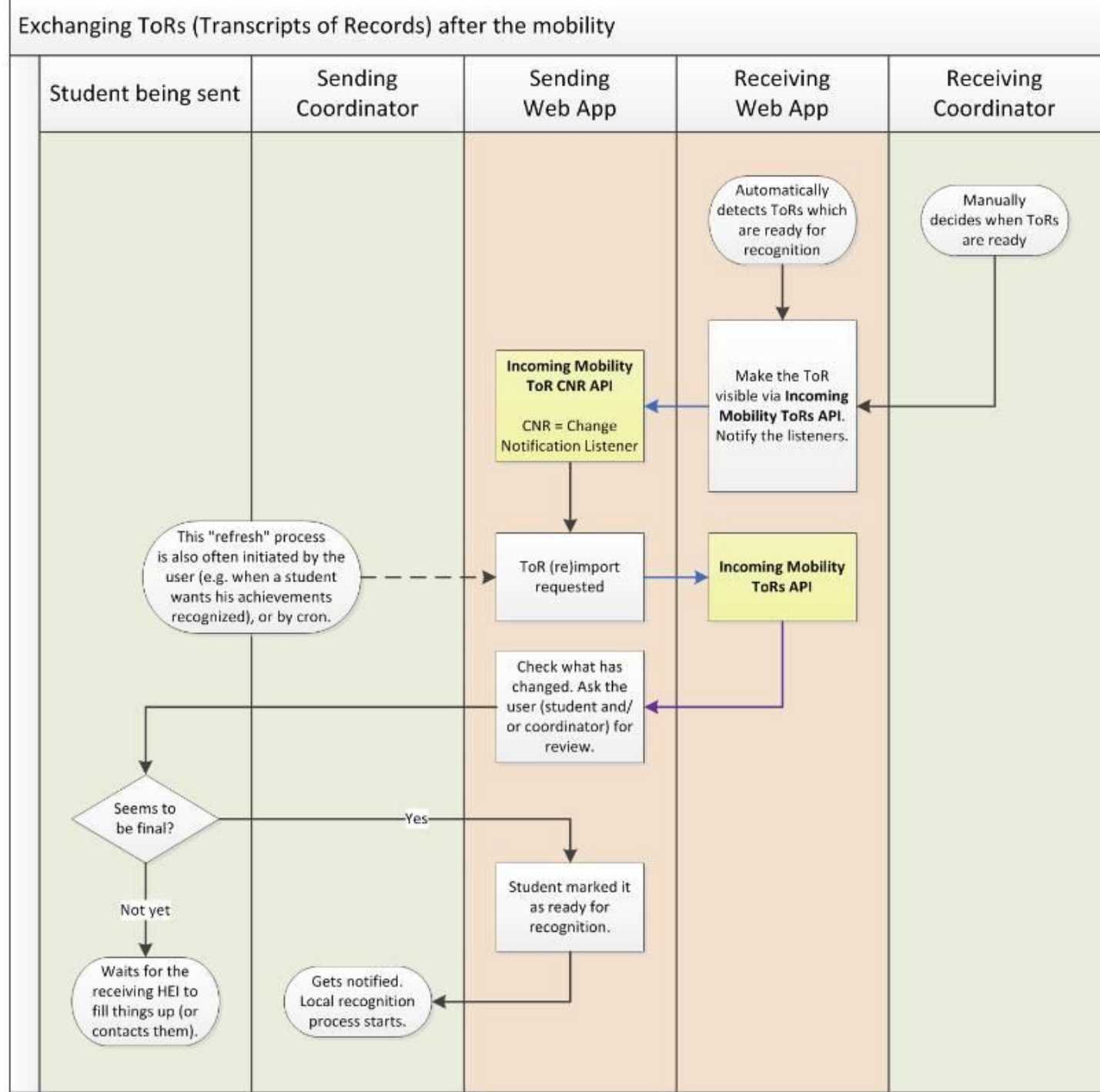
GitHub: <https://github.com/erasmus-without-paper>

- Specifications.
- Common data types.
- XSD Schemas.
- Examples of requests and responses in XML.
- Issue tracker.
- Libraries of code.



The screenshot shows the GitHub profile page for 'Erasmus Without Paper'. At the top left is a red paper airplane icon. To its right, the name 'Erasmus Without Paper' is displayed, followed by the tagline 'A common space for all EWP-related Git projects.' Below this, there are links for the website 'http://developers.erasmuswithoutpaper.eu/' and an email address 'usos@usos.edu.pl'. A navigation bar shows 'Repositories 58', 'People 29', 'Teams 5', and 'Projects 0'. Underneath, the 'Pinned repositories' section features two cards: 'ewp-specs-management' with a description 'Working with EWP Technical Documentation' document, 1 star, and 3 forks; and 'general-issues' with a description 'An empty project for tracking issues not related to any specific project.' and 1 fork. At the bottom, there is a search bar for repositories and a filter dropdown set to 'Type: All'.

GitHub Mobility process explained on flowcharts



Mobility Tool+ Institutions API

- [What is the status of this document?](#)
- [See the index of all other EWP Specifications](#)

Summary

This document describes the **Mobility Tool+ Institutions API**. It is assumed that this API is implemented by only one host managed by the Directorate-General Education and Culture Unit (DG EAC) of the European Commission. However, the specification itself does not limit the number of hosts.

Once implemented by the host, it allows external clients to retrieve general information on institutions known by this host.

Request method

- Requests MUST be made with either HTTP GET or HTTP POST method. Servers MUST support both these methods. Servers SHOULD reject all other request methods.
- Clients are advised to use POST when passing large number of parameters (servers MAY set a limit on the string length).

Request parameters

Parameters MUST be provided in the regular `application/x-www-form-urlencoded` format.

pic (repeatable, required)

A list of institution PICs the client wants to retrieve information on (no more than `<max-ids>` items).

This parameter is *repeatable*, so the request MAY contain multiple occurrences of it. The server is REQUIRED to parse them.

Server implementers provide their own chosen value of `<max-ids>` via their manifest entry (see [manifest-entry](#)). Servers SHOULD parse this value (or assume it is equal to `1`).

Clients may retrieve proper PICs from other EWP APIs (most often, the [Registry Service](#)).

eche_at_date (required)

A date in the `YYYY-MM-DD` format. The Erasmus Charter for Higher Education (ECHE) accreditation included in the response should be the one valid at this date.

GitHub
Specification of the API
request parameters
Response example

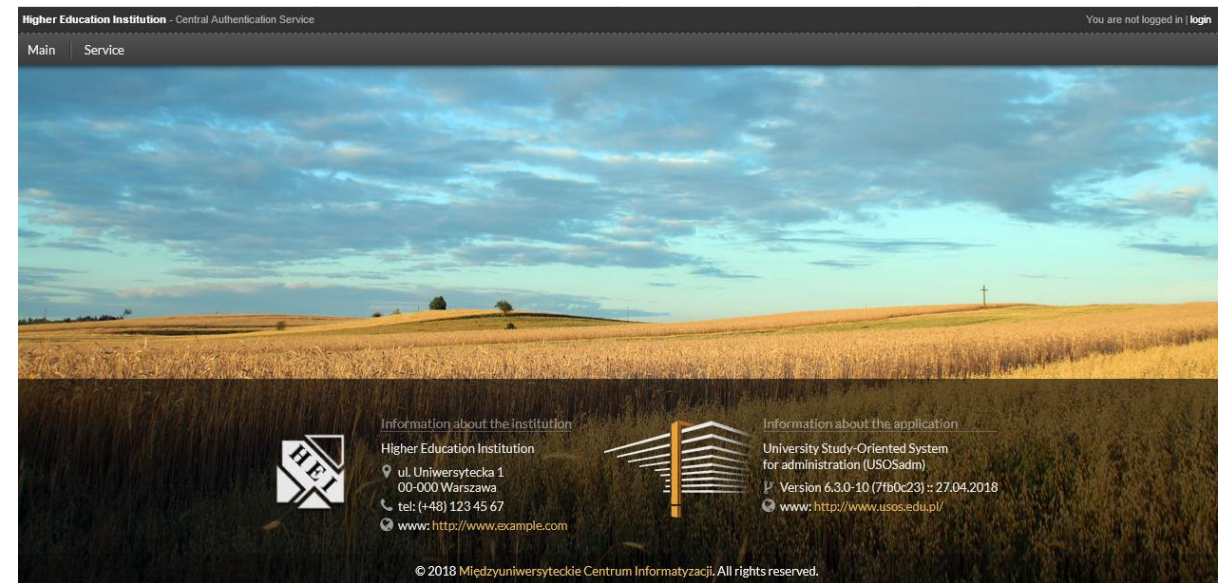
```
<mt-institutions-response>
  <hei>
    <pic>999975814</pic>
    <erasmus>N OSL001</erasmus>
    <erasmus-charter startDate="2014-01-01" endDate="2020-12-31">29714-EPP-1-2014-1-NO-EPPKA3-ECHE
    </erasmus-charter>

    <name xml:lang="en">University of Oslo</name>
    <name xml:lang="no">Universitetet i Oslo</name>

    <a:mailing-address>
      <a:addressLine>University of Oslo</a:addressLine>
      <a:addressLine>PROBLEMVEIEN 5-7 1073</a:addressLine>
      <a:postalCode>03313</a:postalCode>
      <a:locality>Oslo</a:locality>
      <a:country>NO</a:country>
    </a:mailing-address>
  </hei>
</mt-institutions-response>
```


How to test?

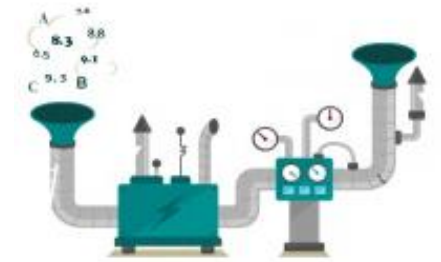
- Use your own demo installation
- ... or the EWP partners', e.g.
 - University of Warsaw DEMO at <https://usosadm.demo.usos.edu.pl/usosadm/>
 - Univeristy of Warsaw HEI-DEMO at <https://usosadm-hei.demo.usos.edu.pl/usosadm/>



What are the plans for 2019?

- Designing new MT+ API.
- Grade conversion using **Egracons algorithm**.
- Sending transcripts of records without the mobility context.
- Sending learning agreements without the mobility context.
- Sending learning agreements with embedded PDF.
- Getting prefiltered set of courses.
- Implementing automatic tests.

**Use GitHub to tell us about your favorite scenarios
– are any APIs or data missing?**



What are the plans beyond 2019?

- Exchange of **diploma supplements** – ELMO 1.4 (?)
- HEIs, like MT+, might offer **open services** with public data, like global statistics for ranking providers or some global dictionaries (list of higher education institutions, postal codes etc.).
- **Registry** may be used to offer digital services of other EU projects:
 - **ESMO** – integrating education sector *Service Providers* to the *eIDAS* network, giving access to *Education Domain Specific Attributes*.
 - **EMREX** – giving students access to their academic achievements.
 - **European Student Card** – checking student status at home university.
- Integrating **digital services** for the **academic community** into **one network**.

What are your tasks as EWP ambassador?

- If you are a **lucky user** of one of the demonstrated softwares:
 - Gradually incorporate EWP services to your daily routines, some of them need small time investment while quickly paying back.
 - Share your experience.
 - Tell developers about your needs and priorities:
 - What scenarios are missing?
 - What other data to exchange?
- Encourage your partners in mobility to join the EWP Network.
- Get ready for new Erasmus+ in 2021-2027.

GOAL: interconnecting all ECHE holders



helping universities succeed



UNISOLUTION



UNIVERSIDAD DE MÁLAGA



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- EWP project is co-funded by the Erasmus+ Programme of the European Union.
- In Poland it is also co-financed by the Polish Ministry of Science and Higher Education from the funds allocated in the years 2018-2019 for science,

<http://erasmuswithoutpaper.eu>

<http://developers.erasmuswithoutpaper.eu>

<http://github.com/erasmus-without-paper>

<https://www.linkedin.com/groups/13590744>

<https://twitter.com/hashtag/ErasmusWithoutPaper>

