

# Cross-border e-learning and academic services based on eIDs: case of Slovenia

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**Abstract:** Lack of a pan-European technical infrastructure that would enable EU citizens to easily use foreign services with their national electronic identities is one of the main obstacles of wider use of secure cross-border electronic transactions in EU. A promising approach in creating such an infrastructure is being provided by the EU STORK 2.0 project that brings together EU identity and service providers, as well as proven sources of business attributes, e.g. academic qualifications and mandates. In this paper we describe the STORK 2.0 infrastructure and three cross-border academic e-services that have been recently established in Slovenia and make use of electronic identities and sources of academic information: virtual learning environment, anonymous e-surveys, and job selection services. The services promise to be beneficial both for students and higher educational institutions, as well as for companies that make decisions on the basis of proven academic information, for example when validating job applicant's qualifications in an electronic way.

## 1. Introduction

The European Commission has recently proposed new rules to enable cross-border and secure electronic transactions in Europe. The proposed regulation [1] aims at ensuring that people and businesses can use their own national electronic identification schemes (eIDs) to access public services in other EU countries. While a large number of eIDs and national eID-based electronic services already exist in the EU countries [2], there is still lack of a pan-European technical infrastructure that would enable EU citizens to easily use foreign services with their national eIDs.

One of the most promising frameworks and infrastructures for cross-border electronic identification and authentication in the EU is being provided by the STORK 2.0 (Secure idenTity acrOss boRders linKed 2.0) project. STORK 2.0 is a 3-year EU co-funded project under the ICT Policy Support Programme (ICT PSP) of the Competitiveness and Innovation Framework Programme (CIP). It involves directly 58 institutions from 19 countries (Austria, Belgium, Czech Republic, Estonia, France, Greece, Iceland, Italy, Lithuania, Luxembourg, Netherlands, Portugal, Slovenia, Slovakia, Spain, Sweden, Switzerland, Turkey and the United Kingdom) [3]. The project will end in March 2015.

The project builds on the STORK infrastructure [4, 5, 6] and extends the use of eIDs for the authentication and digital signature of natural persons as established by STORK, with the same functionalities for legal persons. Apart from the basic identity attributes, such as name, surname, date of birth or gender, the project also makes use of business attributes, for example mandates and academic qualifications. The cross-border services that are piloted in STORK 2.0 belong to the eAcademia, eBanking, eHealth and public services for business domains [3].

## 2. Objectives

The main goal of this paper is to present three new eID-based cross-border academic and e-learning services that have been recently set up in Slovenia within the STORK 2.0 project and can be used by anyone from the STORK 2.0 participating countries. The developed services are: virtual learning environment service, anonymous e-survey service, and job selection service. The paper also briefly describes the STORK 2.0 infrastructure and provides experience with integration of a national evidence student system eVŠ into the infrastructure. The system eVŠ serves as an initial trusted source of academic information about current students and former graduates of all higher educational institutions in Slovenia. At the end of the paper future plans regarding integration of new service and attribute providers into the infrastructure are given.

## 3. Infrastructure

The STORK 2.0 infrastructure brings together EU identity, attribute and service providers, as well as STORK 2.0 national centralised nodes or gateways called Pan European Proxy Services (PEPS). The main objectives of the gateways are to hide national issues from the other EU member states, to be an anchor of trust, and to guarantee scalability, as changes in member states only affect their gateways [7]. The nodes connect national infrastructure to foreign service providers, as well as national service and attribute providers to foreign infrastructures. As the PEPSs form a STORK 2.0 circle of trust, the service and attribute providers in a country need to establish trust only with their national STORK 2.0 gateway.

Figure 1 illustrates an example of a STORK 2.0 infrastructure with centralised nodes. In the picture a user from Slovenia, who studied in the past at Slovenian and Spanish universities, wants to access a job portal in Belgium using her Slovenian credentials. The use of a service is subject to verified identity and proven academic qualifications.

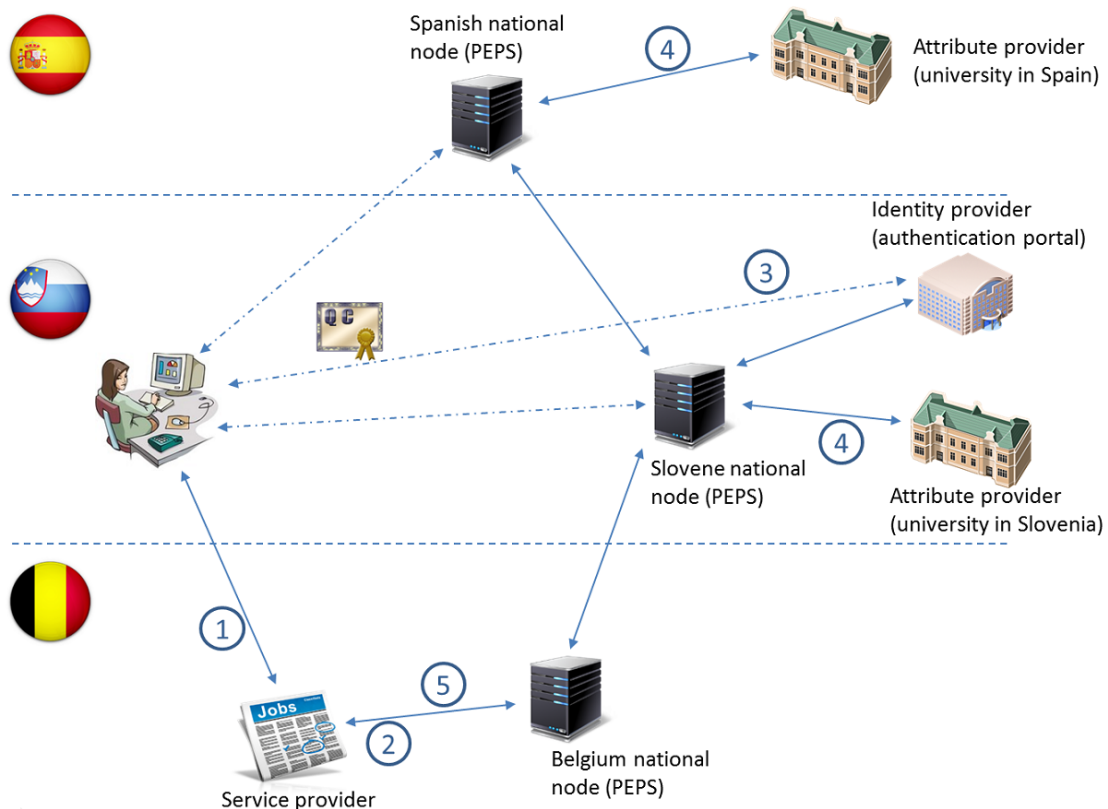


Figure 1: Example of a STORK 2.0 infrastructure architecture

The user selects at the Belgium service provider the country she is coming from (1), and after being redirected by the Belgium PEPS to the Slovenian one (2) she is authenticated by means of a qualified certificate at a national identity provider (authentication portal) in Slovenia (3). Her academic qualifications are then collected with user consent both from national (Slovenia) and foreign (Spain) higher educational institutions (attribute providers) (4). The collected qualifications (attributes) she is willing to disclose to the service provider are then sent by Slovenian STORK node via Belgium STORK node to the service provider (5).

Universities are only one example of STORK 2.0 attribute providers. Different business-attribute providers from academia, public administration and health domains are being integrated into the STORK 2.0 infrastructure. Higher educational institutions serve as academic attribute providers, public registries play the role of mandate attribute providers, and hospitals and medical registries are proven sources of health-related information. Simple and complex academic attributes include diploma supplement attributes for the graduates (e.g. title, qualification, study programme information, duration of the study), attributes about current studies (e.g. average grade, enrolled courses), attributes indicating roles (e.g. student, professor, course administrator), and other academic attributes (e.g. university degree and title). The list of academic attributes has been prepared on the basis of envisaged use cases and attributes availability at the higher educational institutions participating in the project. The mandate attribute identifies the representative and the represented entities, the authorizations granted by the represented entity to the representative, and restrictions to the authorizations granted [8].

Apart from the business attribute provision new functionalities added to the basic STORK 2.0 infrastructure include authentication on behalf of (a user authenticates as a representative of a company and not as a citizen) and powers (mandates) validation.

It should be noted that another architectural model of the core STORK 2.0 infrastructure exists: distributed with Virtual Identity Providers (VIDP) instead of centralized PEPSs. All functionalities of the STORK 2.0 infrastructure have been developed in such a way that the two models can be combined, i.e. the users from a country with one architectural model can also use the services in the countries with different model. From the STORK 2.0 participating countries currently only Austria is not using a national gateway. In the distributed model a user is directly authenticated at the service provider.

### *National infrastructure*

In Slovenia, Ministry of the Interior operates the national gateway (PEPS). The Ministry also validates national qualified certificates and operates Central population register that serves as a trusted source of basic identity information, such as name, surname, gender, date of birth, etc. There are four certification service providers that currently issue qualified certificates in Slovenia: SIGEN-CA, NLB, Post of Slovenia, and Halcom. Most of the certificates meet STORK quality of authentication assurance (QAA) level 3 (software-based qualified certificates); only a small amount of the qualified certificates are issued on smart cards and thus meet the highest QAA level 4. QAA level 3 is sufficient for all cross-border academic e-services that are envisaged by the STORK 2.0 consortium partners.

With regard to the academic attribute providers a Slovenian national system eVŠ has been initially connected to the national STORK node for the purpose of academic and e-learning services. The system eVŠ is a national evidence system set up by Ministry of Education that collects information about study programmes and students from all higher educational institutions in Slovenia. The student information collected includes, for

example, year of study, field of study, name of the institution, status of the institution, study programme, length of the programme, mode of study, programme requirements, and date of first enrolment in higher educational programmes in Slovenia.

#### *STORK 2.0 implementation availability*

The STORK 2.0 implementation is currently available only to the project partners. STORK software was published as open source code under European Public License v1.1 on the European Commission's platform Joinup and EC's Directorate-General for Informatics (DIGIT) maintains it within the STORK sustainability action of the ISA (Interoperability Solutions for European Public Administration) work programme. It is expected that the DIGIT code will converge with the STORK 2.0 code and be again available as open source in 2015.

Many countries participating in the STORK project have released demo service provider (SP) packages tailored to their country specific infrastructure. It is anticipated that STORK 2.0 project will provide similar country specific demonstration packages for service and attribute providers (AP).

## **4. Developed Cross-border Services**

In Slovenia, Jožef Stefan Institute has set up three of the five envisaged cross-border e-services within the STORK 2.0 project: virtual learning environment, anonymous e-survey service, and job selection service. Jožef Stefan Institute is the biggest research institute in Slovenia for pure and applied research in the natural sciences and technology. At present the Institute, totalling about 1000, has a research staff of about 700. Many foreign researchers and students are performing their research at the Institute while being on short-term internships and Erasmus exchanges, being involved in a national programme for young researchers, or studying at Jožef Stefan International Postgraduate School. As such, the institute has found interest in enabling foreign students in using e-services with their national credentials, as well as making use of the STORK 2.0 infrastructure in easier validation of student qualifications.

All services are accessible with qualified certificates issued by EU certification service providers, and take into account users' proven academic attributes. The other two academic services offered by other STORK 2.0 partners include TADS (Trusted attribute display service) and Job qualification service [9]. A cross-border academic service for student mobility, in particular Erasmus exchanges, was already piloted by the STORK project that successfully finished its work in 2011, however only with basic identity attributes [6].

#### *Virtual learning environment*

A shared virtual learning environment is based on the open source Moodle learning management system. The system supports different learning and administration services, such as student administration, virtual learning rooms (courses) or learning content creation and administration, and different actors. An authentication plugin has been integrated in Moodle that supports log in with STORK 2.0 credentials. On the basis of their national eID credentials and proven academic attributes (e.g. student status, study year, average grade, academic degree, teacher role) the users are being denied or granted access to specific e-learning courses, and their roles (e.g. teacher, administrator, or learner) in the system assigned.

In 2014, eight EU universities will carry out a joint course on information security and identity management, and distribute the course content (modules) between their STORK-enabled e-learning systems. The course consists of seven modules and covers topics such as

information security concepts and definitions, digital identity, electronic signatures and public key infrastructure, access control and authorisation, SAML, identity federation, and STORK 2.0 security mechanisms. The pilot service is available at <http://learn.e5.ijs.si/security/>.



Figure 2. STORK 2.0 enabled virtual learning environment

### *Anonymous e-survey service*

The e-survey service allows designing and carrying on-line surveys in an authenticated and authorized, but anonymous, way. The service is based on open source software LimeSurvey and integrated in the STORK 2.0 infrastructure.

The service enables researchers and professors to design surveys for particular target groups. Figure 3 shows a form where they can specify the required characteristics of the targeted users. For example, a questionnaire can be created where only female students of computer science are allowed to answer the survey. Participation in such survey is thus subject to the provision of electronic proofs of gender and current studies, issued by national identity provider (gender) and higher educational institutions (studies). Each user can fill the survey only once. The service can also be used by higher educational institutions to obtain anonymous feedback on particular course at the end of a school year. While the service is piloted in the academic domain, there is nothing domain specific in it. It can be used in other domains provided that trusted attribute providers exist. For example, in the eHealth domain one could create a survey where only registered doctors were allowed to provide their answers to the survey questionnaires.

For anonymity provision the service makes use of the STORK 2.0 anonymity layer. The anonymity layer uses ciphered delivery with a random controlled latency over different random paths approach [6] to ensure that no one can associate survey answers with the survey participants. The layer uses PEPSs/V-IDPs as authoritative anonymity nodes that are used for mixing and relaying encrypted messages. Other, non-authoritative nodes, e.g. higher educational institutions, can also be added after approval by member states to increase the number of anonymity nodes and anonymity degree. The pilot service is available at <http://esurvey.e5.ijs.si/>.

Choose which STORK attributes and their values must be used to restrict participation on this survey. A citizen will only be able to participate if all selected attributes are provided and their values match the restrictions. With complex attributes, it is not mandatory to fill all the fields.

eIdentifier:  One alternative option per line

Country code of birth:  One alternative option per line

Gender:  Select multiple alternative options

Age: between  and

Is age over:

Nationality code:  One alternative option per line

e-mail:  One alternative option per line

Marital status:  Select multiple alternative options

Is student:

Institution:  One alternative option per line

Programme of study:

Figure 3: eSurvey form for target group definition

### Job selection service

The third service brings together academic institutions and companies, and aims at reducing the paper work in validation of the academic qualification when evaluating job seeker applications. This service provides an operational platform for the selection of personnel to companies/universities hiring foreign citizens or offering internships to foreign students with verified specific academic qualifications. The companies can specify in their job or internship position descriptions which proofs of qualifications need to be submitted in an electronic way when applying for the position, e.g. only students on information and communication technologies who already have a bachelor degree in that field are eligible for student internship. Figure 4 shows such job description with specification of expected attributes needed to apply for the position. Applicants can use their national eID credentials to authenticate to the service through European ID login on the bottom of the page, and thus to the company offering the job or internship, and automatically collect proofs of qualifications from their higher educational institutions or attribute providers such as eVŠ. Only applicants that provide valid required academic information can apply for the position.

## Student internship - Internship

Jožef Stefan Institute – Ljubljana, Ljubljana, Slovenia

13 Jun

2014

### Job Description

Laboratory of Open Systems and Networks at Jožef Stefan Institute is offering 1-month student internship during the 2014 autumn period. You should be a student on information and communication technologies who already has a degree in this field equivalent to 1st Bologna level (3 years of studies).

You are eligible for this position if your credentials fulfil the requirements displayed below. Select your country and click on the "European ID Login" button below in order to apply for the position and start the authentication and requirements validation process.

Is Student: Y

Name of study institution: Any

Study programme: 061

Study course: Any

Has Degree: Y

Degree level: S (Bachelor's Degree)

Name of institution issuing the degree: Any

Degree obtained on or after: Any


Degree study programme: 061

Job Categories: Science, Technology. Job Types: Internship. Job expires in 20 days.

25 total views, 1 today

Please click the button below to log in with your EID

Select your country:

 Slovenia - Slovenija

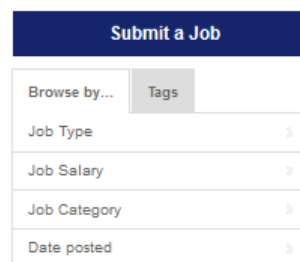


Figure 4: Job selection service

The pilot service is based on Wordpress and Jobroller Wordpress theme, and available at <http://jobselection.e5.ijs.si/>. At the moment the service does not support yet authentication on behalf of where company representatives who submit job positions need to prove by public business registers that they are authorized to do that on behalf of the company.

## 5. First Experience

Described services have been developed in the first half of 2014 and are still in the piloting phase that runs in the final year of the project, i.e. until the end of March 2015. The main barrier for wider use of the academic STORK 2.0 services at the moment is the low number of attribute providers that are connected to the infrastructure. Comparing to the number of national identity providers, e.g. four certification service providers that issue qualified certificates in Slovenia and are recognized by the infrastructure cover the whole Slovenian population, many more academic attribute providers are expected to be needed for full operation of all services.

It might happen that every higher educational institution would need to be a separate attribute provider. The main reasons for this are the amount of student information that is being collected on the national level and isolation of higher educational information systems. As the national evidence centre eVŠ collects only a subset of required student information from higher educational institutions in Slovenia, the institutions themselves

need to provide the missing attributes, such as a list of courses the student is enrolled in, current average grade, or roles of the users.

At the time of writing, the national evidence system also does not include information about the graduates who finished their studies more than five years ago as the database is still being populated. This means that only students and graduates from the institutions that are connected to the STORK 2.0 infrastructure can use all available services, i.e. the services that require other student information than the basic identity attributes, student status, year of study, field of study, and the name of the institution.

It is expected that other higher educational institutions, e.g. members of the largest Slovenian university (University of Ljubljana) and private higher educational institutions, will join the infrastructure in 2014. As the software for a demo attribute provider (Demo AP) is available from the project, the main required effort for joining the infrastructure is syntactic and semantic mapping of the attributes from their internal information systems and databases into the schema used by STORK 2.0. Jožef Stefan Institute will also help Slovenian institutions by making available the Demo AP and Demo SP (Demo service provider) packages in various programming languages that are adapted to the Slovenian national infrastructure.

Implementation wise the integration between the STORK 2.0 infrastructure, libraries and external platforms (Moodle, LimeSurvey and Jobroller/WordPress) was straightforward. Few reasons can be identified for smooth integration. First is the maturity of the SAML framework [10], on which the STORK 2.0 implementation is based. Second, the STORK 2.0 infrastructure, implementation, service provider libraries and integration packages (Moodle, LimeSurvey) proved to be already at high technology readiness level. And third, the use cases presented have used quite simple combinations of attributes. For this reason the access control decision implementations were simple as well.

## **6. Business Benefits**

Different actors, for example e-learning service providers, higher education institutions, companies, and students, can benefit from the developed e-identity-based cross-border services and established STORK 2.0 infrastructure. The institutions that are providing e-learning services can increase security level of their services and enlarge service user groups by the users from other countries. Secure authentication of the users is transparent to the service providers as trusted national identity providers perform it. New infrastructure also enables existing service providers to introduce new services that are based on user identities and proven academic qualifications.

Higher educational institutions serving solely as sources of information about students and graduates will enable additional learning opportunities for their students. Automatic academic attribute provision and verification will also reduce the burden of administrative tasks derived from the mobility of students from different countries. On the other hand, compatibility with other higher educational institutions' learning systems and electronic data formats, for example electronic version of a diploma supplement, will contribute to the creation of the European Higher Education Area (EHEA).

The companies will also reduce administrative burdens when verifying student and job seekers' qualifications, as proofs of required qualifications will be available online. Last but not least, students can access the services from anywhere and at any time using only one national credential. They also have the possibility of directly accessing their records in foreign higher educational institutions where they followed some courses or obtained degree. The infrastructure ensures that their rights are safeguarded, as personal data is protected and disclosed to particular service providers only with student's consent.



## 7. Conclusions

In the paper we presented three pilot cross-border academic e-services that are based on eIDs and have been recently established in Slovenia: virtual learning environment service, anonymous e-survey service, and job selection service. The services make use of the STORK 2.0 infrastructure, and identity and academic attribute providers. Other cross-border services are also being developed in Slovenia in other domains: eBanking and public services for business. The next steps include large-scale pilots of the developed services with real users and integration of additional academic attribute providers. It is also envisaged that further cross-border academic services are developed or the existing ones deployed in different settings. One candidate is Public Employment Services (PES) institutions within the FP7 EmployID integrated project. The main goal of the EmployID (Scalable cost-effective facilitation of professional identity transformation in public employment services) project is to support and facilitate the learning process of the PES practitioners in their professional identity development by the efficient use of technologies to provide advanced coaching, reflection, networking and learning support services [11]. As learning and training environments of the PES institutions in EU are mostly closed, efficient authentication and authorization mechanisms are required for cross-border training activities among different PES institutions. Further work is also needed on unsolved governance problems, for example definition of a pricing model for the infrastructure [12].

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