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LEPS – Leveraging eID in the Private Sector

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Although the government issued electronic identities (eID) in Europe appeared more than 20 years ago, their adoption so far has been very low. This is even more the case in cross-border settings, where private service providers (SP) from one EU Member State needs trusted eID services from identity provider located in another state. LEPS project aims to validate and facilitate the connectivity options to recently established eIDAS ecosystem, which provides this trusted environment with legal, organisational and technical guarantees already in place. Strategies have been devised to reduce SP implementation costs for this connectivity to eIDAS technical infrastructure. Based on the strategy, architectural options and implementation details have been worked out. Finally, actual integration and validation have been done in two countries: Spain and Greece. In parallel, market analysis and further options are considered both for LEPS project results and for e-IDAS compliant eID services.

15.1 Introduction

With the eIDAS regulation [1], the EU has put in place a legal and technical framework that obliges EU Member States to mutually recognize each other's notified eID schemes for cross-border access to online public-sector services, creating at the same time unprecedented opportunities for the private online service providers. The concept of notified eID limits the scope of electronic identity to the electronic identification means issued under the electronic identification scheme operated by one of the EU Member State (MS), under a mandate from the MS; or, in some cases, independently of the MS, but recognised and notified by that MS. To ensure this mutual recognition of notified e-ID, so called eIDAS infrastructure or eIDAS network has been established with an eIDAS node in each MS that serves as a connectivity proxy towards notified identity schemes. For a service provider that wants to connect to eIDAS network and to use cross-border eID services through it, this resolves only a part of the overall connectivity challenges. The connection from a service provider to its own MS eIDAS node, still has to be implemented by themselves and costs could be a considerable barrier.

This is where LEPS (Leveraging eID in the Private Sector) projects comes into picture. It is a European project financed by the EU through the Connecting Europe Facility (CEF) Digital programme [2], with a duration of 15 months, under grant agreement No. INEA/CEF/ICT/A2016/1271348. The CEF programme, with Digital Service Infrastructure (DSI) building blocks such as eID [3], aims at boosting the growth of the EU Digital Single Market (DSM). While public service providers are already under obligation to recognize notified eID services from another MS, private sector online service providers are especially targeted in CEF projects, and in LEPS in particular, in order to connect them to eIDAS network and offer eIDAS compliant eID services to the European citizens.

The LEPS consortium is formed by 8 partners from Spain and Greece. The project is coordinated by Atos Spain, that also performs the integration with the Spanish eIDAS node and supporting the Spanish partners. The University of Aegean in Greece performing the integration with the Greek eIDAS node and is supporting the Greek partners.

Three end-users participate in the projects in order to validate the use of the pan-European eIDAS infrastructure:

- Two postal services companies in Spain and Greece (Sociedad Estatal de Correos y Telégrafos and Hellenic Post respectively) integrating existing online services

- A digital financial services provider from Greece, Athens Exchange Group (ATHEX), aiming to offer remote electronic signature services to EU customers, compliant with eIDAS regulation.

Other partners include the Universidad de Murcia that creates the mobile application for using NFC eID cards, the Hellenic Ministry of Administrative Reconstruction in charge of the eIDAS node, and the National Technical University of Athens supporting the Greek partners.

Challenges in LEPS project cannot be understood outside of context of market adoption of "eIDAS eID services". However, set of challenges related to service provider (SP) connectivity to eIDAS is the main scope of the project. The focus is on the SP side of the eID market, more specifically sub-group of private sector online service providers. The approach taken in LEPS is to explore different options related to integration through so called eIDAS adapters in order to reduce burden for service providers and to reduce overall costs. eIDAS adapters is a sort of generic name given to reusable components, such as supporting tools, libraries or application programming interfaces.

The second group of challenges is around end user adoption, which indirectly affects service providers as well. Many service providers wait for the moment when citizens will activate and start to use massively their eID. This is also explored in LEPS project through design and development of mobile interface for the use of Spanish eID supporting NFC (known as DNI 3.0). The uptake of mobile ID solutions in many countries, notably in Austria, Belgium and Estonia, is growing faster than expected, so the introduction of LEPS mobile ID solution for Spanish DNI 3.0 can be considered as "right on time" action.

To summarise, challenges LEPS project faces are both related to the adoption of eIDAS eID services in general, as well as specific and related to the SP-to-eIDAS connectivity.

Finally, we can say that LEPS is fully aligned with the overall aim of CEF programme [4] to bring down the barriers that are holding back the growth of the EU Digital Single Market the development of which could contribute additional EUR 415 billion per year to EU economy.

15.2 Solution Design

The eIDAS network has been built by the European Commission (EC) and EU Member States based on previous development made in European projects such as STORK 1.0 [5] and STORK 2.0 [6]. The work developed by the eSENS project [7], and the collaboration with Connecting
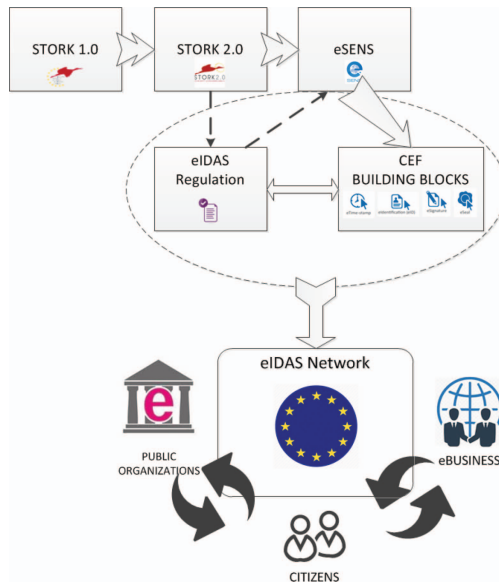
Figure 15.1 eIDAS network and CEF building blocks background [9].

Europe Facility (CEF) Digital [8] led to the generation of so called DSI building blocks "providing a European digital ecosystem for cross-border interoperability and interconnection of citizens and services between European countries" [9]. Figure 15.1 shows eIDAS network and CEF building blocks evolution.

While many public service providers, especially at the central government level, have already been connected to eIDAS network, although mainly in pilot projects and pre-production environments, the interest of private service providers to connect to eIDAS network and use eID services has been so far very limited. One of the main challenges, it has been mentioned, is related to the uncertainty about architectural options, costs and overall stability and security of the service provision.

With the aim to integrate the selected private SP services with the eIDAS network, two different approaches, one for Spain and one for Greece, were designed and implemented.

For the **Spanish services** scenario, the **eIDAS Adapter** [9] is the API implemented by ATOS which allows Correos Services (through MyIdentity service) to communicate with the Spanish eIDAS node. The eIDAS Adapter is based on a Java integration package provided by the Spanish Ministry for integrating e-services from the private sector with the Spanish eIDAS node.

This integration package, in its turn, uses the integration package delivered by the EC [10]. The Spanish eIDAS adapter provides a SP interface to the Correos' services, and an eIDAS interface for connecting to the eIDAS infrastructure, through Spanish eIDAS node, as depicted in Figure 15.2.

The eIDAS adapter is able to integrate Correos services with the eIDAS network, allowing a Greek citizen accessing to Correos e-services using a Greek eID, as is explained in Validation section.

For the **Greek services** scenario, the University of the Aegean has proposed a similar approach, as can be seen in Figure 15.3.

The integration of Greek services with the eIDAs network is made through the called LEPS eIDAS API Connector [11]. This API Connector re-uses the basic functionalities of eIDAS Demo SP package provided by CEF [10], and is provided in three different flavours, which can be used in different scenarios.

1. **eIDAS SP SAML Tools Library**. Used in the case of Java-based SP (developed from scratch) in which there's no need for one certificate for many services within SP and in which there is no need for pre-built UIs. This was used to avoid extra development time for creating and processing SAML messages.
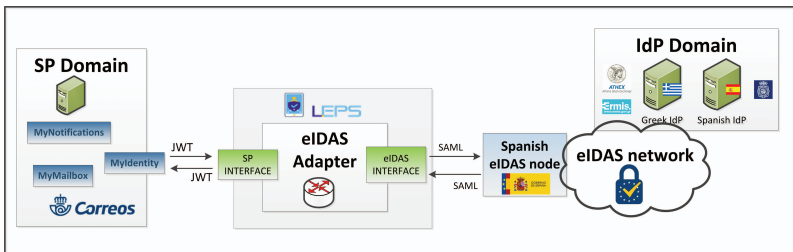

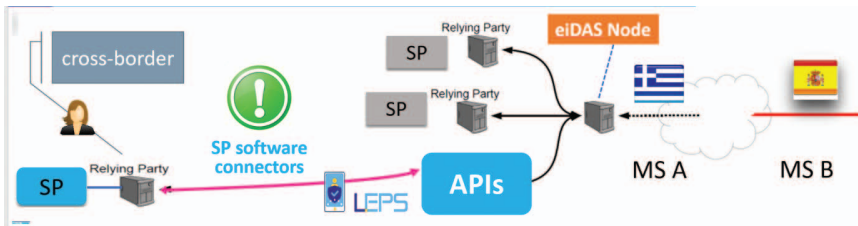**Figure 15.2**   eIDAS adapter architecture general overview [9].

Figure 15.3   SP integration with eIDAS node using greek connector(s) [11].

2. **eIDAS WebApp 2.0**. This solution is for Java or non-Java-based SP scenarios, in which there is no need for one certificate for many services within SP but with need for built-in UIs. This allows to avoid development time for processing SAML messages, completely handles an eIDAS-based authentication flow (including UIs). Is SP infrastructure independent and operates over a simple REST API. This solution increases the security (JWT based security) (Figure 15.4).

3. **eIDAS ISS 2.0**. This solution is for Java or non-Java-based SP (developed from scratch) in which it is used one certificate for many services within SP and comes with or without SP e-Forms/thin WebApp. It is used to avoid development time for processing SAML messages, supports the interconnection of many SP services in the same domain (each service is managed via a thin WebApp). It sends SAML 2.0 request to eIDAS Node, translates response from SAML 2.0 to JSON and other common enterprise standards (and forward it to the relevant SP service). It's for multiple services with the same SPs sharing one certificate (Figure 15.5).
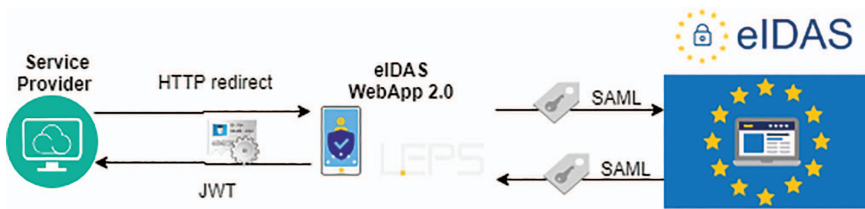

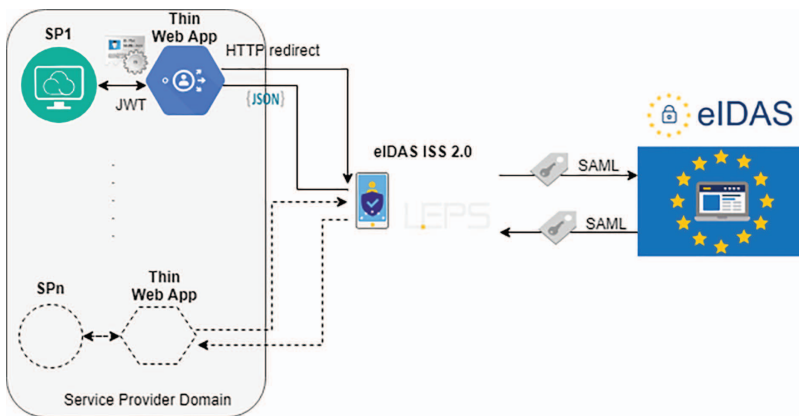**Figure 15.4** eIDAS WebApp 2.0 [12].

Figure 15.5 eIDAS ISS 2.0 (plus this WebApp) [12].

These connectors provided APIs facilitates the integration of ATHEX and Hellenic Post (ELTA) services with the eIDAS network, allowing a Spanish citizen accessing to Greek e-services using the Spanish eID, as indicated in Validation section.

15.2.1 LEPS Mobile App

The use of smartphones and tablets for interacting with public administrations and private companies has currently become an increasing common practice, therefore it is necessary to offer mobile solutions that integrate mobile eIDAS authentication in the SP service ecosystem.

An efficient solution for **mobile devices** with a successful integration of mobile eIDAS authentication is offered. Concretely, mobile app provides mobile support for Greek services (ATHEX and ELTA) to enable authentication of Spanish citizens, through eIDAS infrastructure using the Spanish DNIe 3.0 (electronic Spanish Identity National Document), which supporting NFC technology [13].

The mobile application developed by Universidad de Murcia can work with any SP offering eIDAS authentication for Spanish users [14]. Additionally, the implementation can be easily extended to other EU Member States by adding other authentication methods beyond the Spanish DNIe. Also, the requirements for SPs to integrate the mobile application are practically minimal and limited to the global requirements of operating in a mobile environment, i.e. providing responsive interfaces and use standard components such as HTML and JavaScript 7.

15.3 Implementation

Aiming to cover all the functionalities and requirements needed by the SPs and the eIDAS network, the developed **Spanish eIDAS adapter** comprises the following modules depicted in Figure 15.6:

- **SP interface**: Establishes interaction with the integrated services. Contains a single endpoint which receives the authentication request from the SP;
- **eIDAS interface**: Connects to the country eIDAS node, Comprises two endpoints:
  - Metadata endpoint: Provides SP metadata;
  - ReturnPage endpoint: Receives the SAML response from the country eIDAS node.
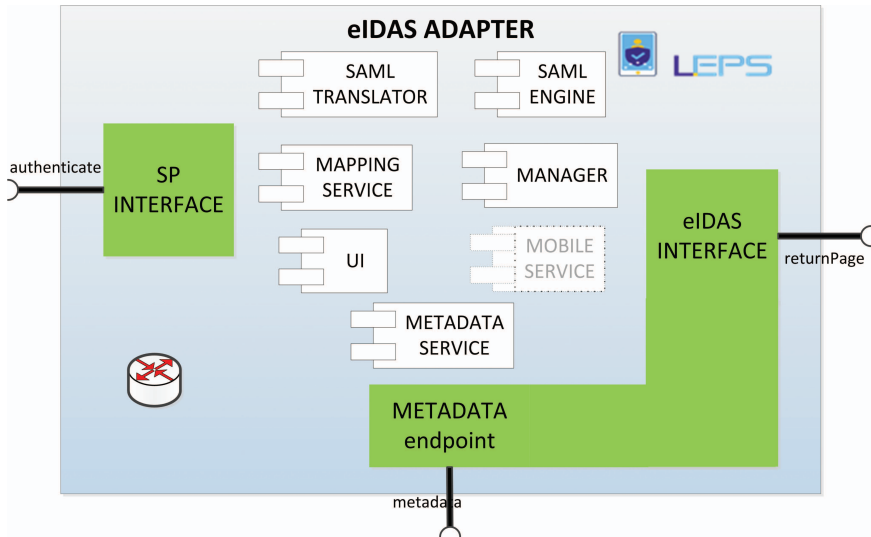
Figure 15.6 Spanish eIDAS adapter modules [10].

- **UI module**: Interacts with the end user;
- **Manager service**: Orchestrate the authentication process inside the eIDAS Adapter;
- **Translator service**: Translates in both ways from the SP to eIDAS node:
  - ○ The authentication request (JWT) from the SP to a SAML request;
  - ○ The SAML response from eIDAS node to an authentication response (JWT) to SP;
- **Mapping service**: Maps the SP attribute names to SAML eIDAS attribute names, doing the semantic translation;
- **SAML Engine**: Manages the SAML request and response, encrypting/decrypting and signing;
- **Metadata service**: Creates SP metadata;
- **Mobile service:** Optional component able to detect the device where the authentication process is performed.

The most relevant technologies, standards and protocols used during the implementation include among others: Java 8.0 as implementing language, JWT (industry standard RFC 751) to transmit the user data between the SP and the adapter in a secure way, SAML 2.0 for transmitting user authentication between the eIDAS infrastructure and the adapter. For the deployment process Apache Tomcat as web application server was used and deployed as a Docker container.

During the implementation, deployment and test of the Spanish eIDAS adapter some challenges arose. The actions performed for overtaking these challenges could help MS for taking decisions when facing the implementation of new adapters for integrating private online services to eIDAS infrastructure.

The plan for designing and implementing this adapter was reuse the integration package the Spanish Ministry provided for the private SP integration. This approach would help to reduce the use of resources guarantying the connection to eIDAS node. Thus, only some minor effort for integrating SP service would be needed. Despite this advantage the use of legacy code and the used technologies could restrict the use of cutting-edge or more familiar. In the particular case of the Spanish eIDAS adapter implementation, mixing technologies such as Struts 2 and Spring took more time than expected. It was necessary to carry out some changes and the developer team had to acquire some knowledge on Struts 2 framework. The use of generic eIDAS libraries beside well know technologies by the development team, is recommended. Apart from this, the relevant integration information and the technical support the organization in charge of the country eIDAS node can provide, is very useful.

As a summary the main features of the Spanish eIDAS adapter [10] are:

- Modular design;
- Reusable;
- JWT based security for transmitting user information;
- Able to create SAML Requests and process SAML Reponses;
- Translate SAML 2.0 to JSON and vice versa;
- SP client programming language independent;
- Docker based deployment.
- SP infrastructure independent (can be deployed on SP infrastructure or on a third party);
- Able to connect with different SP services in the same or from different domains.

Regarding the **Greek API connectors** [11]:

The **eIDAS SP SAML Tools library** can be used to simplify SP-eIDAS node communication development, on the SP side. It is offered in the form of a Java library, which can be easily integrated into the development of any Java-based SP. The library itself is based on the CEF provided SP implementation (demo SP). This library provides methods that a Java-based SP implementation can call to create SAML Requests (format, encode,

encrypt), parse SAML Responses (decrypt, decode, parse) and create the SP metadata xml, as required by the eIDAS specifications [11].

The **eIDAS WebApp 2.0** uses the previous eIDAS SP SAML Tools library, providing a UI, a simple REST API and the business logic for handling the eIDAS authentication flow. The WebApp is offered as a Docker image for deployment purposes and need to be deployed on the same domain than the SP [11].

The **eIDAS ISS 2.0** simplifies the connection of any further SP enabling SPs to connect to the eIDAS node without using SAML 2.0 protocol. Allowing that one ISS 2.0 installation can support multiple services within the same SPs. Provides communication endpoint based on JSON. The ISS 2.0 app is provided as a war artefact to be deployed on Apache Tomcat 7+ [11].

15.4 Validation

With the aim to demonstrate and validate the SP integration with the eIDAS infrastructure through the country eIDAS nodes, the following selected services have been customized in order to proceed with the integration.

The selected services customized on the Spanish side were provided by Correos [15]:

- "My Identity" provides secured digital identities to citizens, businesses and governments;
- "My Mailbox" is a digital mailbox and storage that enables you to create a nexus of secure document-based communication;
- "My Notifications" provides a digital service that aims to centralize and manage governmental notifications.

The services provided on the Greek side were provided by ATHEX and ELTA [16]:

- "Athex Identity service" provides an eIDAS compliant identity provider service;
- "Athex Sign" is a service that provides a secure way to sign on the go. Anytime and anywhere;
- "Athex AXIAWeb" allows any European Union citizen-investor to register and login via eIDAS.
- "ELTA e-shop" offers functionalities such as letter mail services or prepaid envelopes;

- "ELTA eDelivery Hybrid Service" provides document management functionalities through the use of digital signatures, standardization flow and other tools;
- "Parcel Delivery Voucher" allows customers print online the accompanying vouchers for parcels send to their customers.
- "Online Zip Codes" allows corporate customers to obtain the current version of Zip codes of Greece.

After the customization and integration, the IT infrastructure of these services were connected to the appropriate country eIDAS node, allowing the services to use the eIDAS network for user authentication with eID issued by EU Member States. Additionally, is demonstrated the usability of eIDAS specifications and the Spanish and Greek eIDAS nodes in the private sector.

For testing the integrated services during the project, the following steps have been performed [17]:

1. Preparation of the pre-production tests necessary for the SP services integration verification in pre-production environment;
2. Execution of the pre-production automated tests against the Spanish (for Correos) and Greek (for ATHEX and ELTA) eIDAS node using test credentials on a pre-production environment. Finally, feedback of this step is generated for the next steps for the production testing;
3. Preparation of the production tests considering the feedback from previous steps;
4. Execution of the production manual tests against the Spanish eIDAS node in pre-production environment (for pre-production Correos services) due to Spanish Ministry restrictions, and against (for production ATHEX and ELTA services) production eIDAS Node. In both cases real credentials were used.

The automated testing on pre-production environment where performed using an automated testing tool eCATS (eIDAS Connectivity Automated Testing Suite) based on Selenium Selenium portable software-testing framework for web applications. eCATS tool has been customized for each integrated service as depicted in Figure 15.7.

Apart from the connectivity tested between the Spanish and the Greek eIDAS nodes, additional interoperability tests have been performed from the Spanish eIDAS node to Iceland, The Netherlands and Italy, and between Greece and the Czech Republic. For this purpose, test credentials provided by different public organizations in change of the eIDAS node management in their countries were used.
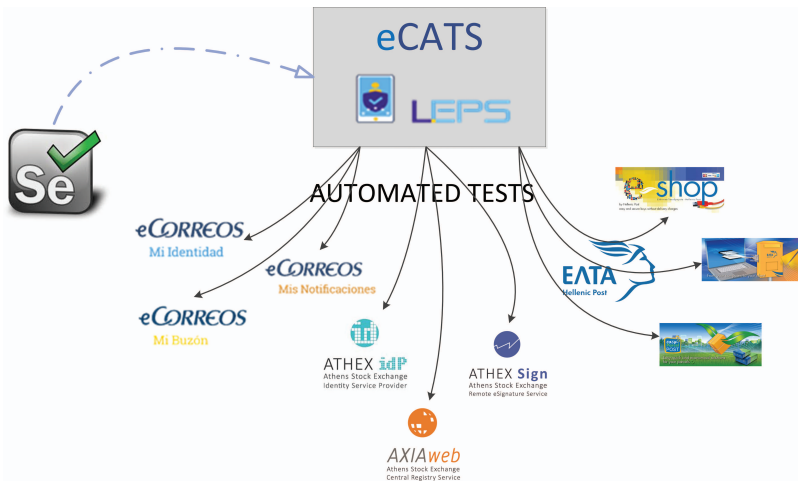
Figure 15.7 LEPS services and automated eCATS tool [13].

15.5 Related Work

LEPS project is linked to a set of projects where the LEPS partners participated with the aim to increase the use of the eID between the EU citizens for accessing online services across EU and reinforce the Digital Single Market in Europe. Among these is worth to mention the following projects:

- **STORK** [5] (CIP program, 2008–2011), providing the first European eID Interoperability Platform allowing citizens to access digital services across borders, using their national eID;
- **STORK 2.0** [6] (CIP program, 2012–2015), as continuation of STORK was intended to boost the acceptance of eID in EU for electronic authentication for both physical and legal person, and place the basis for the creation of an interoperable and stable cross-border infrastructure (eIDAS network) for public and private online services and attribute providers;
- **FutureID** [18] (FP7-ICT program, 2012–2015), "created a comprehensive, flexible, privacy-aware and ubiquitously usable identity management infrastructure for Europe, integrating existing eID technology and trust infrastructures, emerging federated identity management services and modern credential technologies to provide a user-centric system for the trustworthy and accountable management of identity claims" [18];

- **FIDES** [19] (EIT, 2015–2016), built a secure federated and interoperable identity management platform (mobile/desktop). An identity broker was implemented, where STORK infrastructure was provided;
- **STRATEGIC** [20] (CIP program, 2014–2017), provided more effective public cloud services, where STORK network was integrated;

Additionally, there are projects related to eID management in different sectors, such as the academic domain, or the public sector, where the LEPS partners are also participating, and are currently under development.

- **ESMO** project aims to integrate education sector Service Providers to the eIDAS network, contributing to increase eIDAS eID uptake and use in the European Higher Education Area (EHEA) [21]. Outcomes from LEPS will be used;
- **TOOP** [22] project main objective is "to explore and demonstrate the once-only principle across borders, focusing on data from businesses". TOOP demo architecture implementation incorporates LEPS APIs (WebApp 2.0). Task: Identify users accessing the services of a TOOP Data Consumer via eID_EU.
- **FIWARE** project (FP7-ICT) [23]. Since Atos is co-founder of FIWARE Foundation it is supporting publication of connectivity to CEF eID building block as generic enabler. LEPS adaptor for Spanish DNIe will be part of know-how exchange with Polytechnic University of Madrid, partner responsible for generic enabler.

Finally, LEPS project stablished links with other eID projects under the umbrella of the LEPS Industry Monitoring Group (IMG), such as "Opening a bank account with an EU digital identity" CEF Telecom eID project [24] and "The eIDAS 2018 Municipalities Project CEF Telecom eID project" [25]. Contacts have also been done with other eID initiatives such as Future Trust, ARIES and Credential projects, as well as industrial initiatives EEMA, ECSO, TDL, OIX, Kantara and OASIS.

Besides direct integration of external eID services through the identity provider available APIs, e-service providers have also an option to use broker or aggregator of different identity providers that might offer additional eID services or functionalities. In this category we can mentioned related work on so-called Identity clouds or CIAM (customer identity and access management) solutions. In Germany SkIDentity Service [26] is a kind of broker for service providers that can use popular social logins such as LinkedIn and Facebook Login, as well as eIDAS eID services from a number of countries. In Netherlands, similar broker role to municipal e-services is

provided by Connectis with support from CEF project. In Spain Safelayer has offering named TrustedX eIDAS Platform that is "orchestrating" digital identities for authentication, electronic signature, single sign-on (SSO) and Two-factor Authentication (2FA) for Web environments.

15.6 Market Analysis

LEPS Market analysis had to take into account specific pre-existing context of provide e-service provider, such as:

1. Organisations that need or want to make migration from the existing identity and access management (IAM) solution. This could apply to organisations that have scaled out their internal or tailor made IAM solutions, or organisations that already use partially external or third-party e-identification or authentication services, but are looking for the services with a higher level of assurance (LoA)
2. Organisations that use low assurance third party eID services, such as social login, and want to elevate overall level of security and decrease identity theft and fraud by integration of eIDAS eID services, either to replace or to enhance exiting external eID services
3. Organisations that are already acting or could be acting as eID brokers
4. Organisations that want to open new service delivery channels through mobile phone and are interested in mobile ID solutions that work across borders

The first group is composed of organisations that made important investments in their internally operated IAM solutions. These solutions, however, are originally not meant to handle the requirements for large scale cross-border e-service use cases, although the functional building blocks and protocols might be the same. They usually have internal know-how and capacity to implement eIDAS connectivity and the main driver for adoption of eIDAS eID services could be regulatory compliance, such as "know your customer" (KYC) requirement in anti-money laundry (AML) directive.

In addition, given that the main value proposition of LEPS approach, right from the start, was based on cost effectiveness and, in a lesser amount, also on cost efficiency, one of the main adoption targets are small and medium enterprises (SME) operating in cross-border context, planning migration or extension of their current third-party eID services. Unlike the first group of LEPS adopters, these organisations are unlikely to have know-how, resources and capacity to implement eIDAS connectivity. The main proposition from LEPS

in this regard is saving cost and time for e-service provider organisations in regard to activities such as familiarization with SAML communication (protocol understanding and implementation), implementation of the required web interface (UI) for user interaction with the eIDAS-enabled services, formulation and proper preparation of an eIDAS SAML Authentication Request, processing of an eIDAS Node SAML Authentication Response and provision of the appropriate authentication process end events for success or failure.

The fact that many organisations do not have resources for eID service implementation and operation internally was already exploited by social networks and other online eID service providers that offer their "identity APIs". This is an easy way to integrate highly scalable, yet low assurance, eID services. In some SP segments, such as e-commerce, there is a huge dominance of Facebook and Google eID services (with 70% and 15% market share respectively), while in the other segments, so called customer IAM (or CIAM) appeared as an emerging alternative to integrate API gateways to different online eID service providers.

This new generation of CIAM solutions, complemented by a variety of eID broker solutions, is the third potential target for LEPS adoption. Integrating external identities can be linked to onboarding, such as in the case of Correos Myidentity service, or can help in trust elevation and/or migration from social e-IDs with low LoA to eIDAS eID with high LoA. With scalability, there are other requirements that might depend on a specific e-service provider, such as for example integration with customer relationship management or handling a single customer with many identities.

From all trends that have been analysed in market analysis, the one that is most promising to impact LEPS results uptake is mobile identification and authentication, which targets user experience and usability. Given that the subset of LEPS results also contains interface for mobile eID (although only Spanish DNI 3.0), the organisation that have this specific need, targeting Spanish citizens that use mobile e-service from other members state SP, are considered as the fourth group of adopters.

For all of these users, LEPS brings benefits of cost saving, while eIDAS eID services represent well known benefits:

- Improved quality of the service offered to the customer;
- The introduction of a process of identity check and recognition through eID reduces frauds;
- Reduction in operational, legal and reputational risk as trusted identities and authentication is provided by national public MS infrastructures;

- Time savings, reduction in terms of administrative overhead and costs;
- Increasing potential customer base.

These theoretical assumptions have been partially validated in the case of LEPS service providers. In ELTA case, for example, possible users are Greek nationals living abroad and using some eID different than Greek. According to the General Secretariat for Greeks Abroad more than 5M citizens of Greek nationality live outside the Greek border, scattered in 140 countries of the world. The greater concentration has been noted in the US (3M), Europe (1M), Australia (0, 7M), Canada (0, 35 M), Asia – Africa (0, 1M) and Central and South America (0, 06M). In this view as regards cross-European e-delivery, the primary target for this service has customer base of 1M with initial penetration rate set to 1% (10.000 users). ELTA focus on existing and new customers was distinguished with 2 supplementary strategies: Revenue Growth (existing) and Market Share (new) Strategies.

As we can see from Table 15.1 (with data collected from the actual pilots), the cost of implementation of eIDAS connectivity depends of a selected architectural and software options. Reuse of LEPS results significantly reduces this cost, both for fixed one-time expenditures and for operational costs.

Two strategies envisaged by ELTA aimed at benefit of 100.000 within 2 years. With the figures from Table 15.1 it is clear that this breakeven point can be reached only with the reuse of LEPS components (with the accumulated cost of 87.624 euros for 24 months), while building eIDAS connectivity from the scratch would reach this point only in the year 3 (the accumulated cost at the end of 24-months period would be 111.235 euros for this option).

Table 15.1   Cost of three eIDAS connectivity options

Integration Scenario	Fixed Cost (in EUR)	Operational Cost (in EUR per year)
Build from scratch (Scenario 1)	41,739.36	34,748.44
Build by using CEF Demo SP (Scenario 2)	33,792.96	32,627.80
LEPS eIDAS API Connectors (Scenario 3)	25,734.46	30,945.28

15.7 Conclusion

The challenge of adoption of eIDAS eID services can be divided into challenges related to service provider connectivity with eIDAS network and challenges related to citizen/business use of notified eID means, including NFC enabled eID cards in case of Spanish citizens. LEPS projects tried to reduce gaps for both types of challenges. The solution for service provider connectivity to eIDAS nodes can be considered as easily replicable across EU. It is focused on service provider cost saving, when it comes to investments in eIDAS connectivity. The other LEPS solution, focused on the Spanish eID card use through mobile phone interface is targeting usability as the main value proposition.

The analysis of architectural option provided by LEPS project demonstrated that there are different approaches to integrate online services with the eIDAS infrastructure through the connection with the country eIDAS node. Implementation of API's in two countries and pilot trials with real services and users, resulted not only in technical verification of selected approaches, but also in validation from cost-benefit and usability perspectives.

The final outcomes generate benefits mainly to the SPs such as reduction of time and effort for integrating their online services with the pan-European eIDAS network. In its turn, the use of eIDAS eID services facilitates the cross-border provision of e-services and elevates level of trust by end users. In addition, LEPS interface for mobile access to Spanish DNI3.0 eID card services improves the user experience. Finally, the results of the project will benefit larger community of eIDAS developers and other stakeholders since results and guidelines generated during the project will help in taking decisions on how to approach and manage the challenges related to service provider connectivity to the country eIDAS node.

Acknowledgements

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