eIDAS REGULATION: eID – OPPORTUNITIES AND RISKS

Jens Bender

Abstract

This paper states the current (as of January 2015) state of play relating to the eID chapter of the EU eIDAS Regulation. The exposition of the current state is combined with hints at and discussions of changes necessary for the German eID market resulting from the regulation. A section on implementing the interoperability framework in Germany and on integrating the German eID scheme in other Member States gives a first outlook on the necessary work for the next years.

1 The eIDAS Regulation

In June 2012, the EU Commission proposed a new regulation covering »electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC«, the well-known signature Directive.

After long deliberations in the European Parliament and the European Council, comprising the representatives of the Member States, the regulation was adopted in July 2014. The publication in the Official Journal on 28.08.2014 as regulation [EU 910/2014] concluded the legislative process.

The 52 articles of the new regulation cover different aspects of electronic transactions:

- electronic identification
- trust services, comprising
  - electronic signatures, seals and time stamps
  - electronic registered delivery services
  - certificates for website authentication
- electronic documents.

This paper focuses on the chapter on electronic identification. The effects on trust services will be covered by a contribution of A. Fiedler [Fied15].

2 Principles

Since many Member States have already deployed electronic identification schemes (based on quite different technologies, i.e. ranging from passwords to smart cards), the regulation does not opt for harmonization of the electronic identification means itself, but for interoperability of the national schemes. This principle aims at protecting existing investments, but is also of importance for those Member States where the identification is based on official (electronic) documents (like the German Personalausweis), for which the EU does not have a regulatory competence.

The eID chapter of the regulation is based on *Notification* of national eID schemes. Member States can notify their schemes to the Commission. The conditions on notification are detailed in the next section of this paper. The counterpart to the notification is the *mutual recognition* of notified eID schemes. While the notification is voluntary, the recognition of notified schemes is mandatory, c.f. Article 6 (1) of the regulation:

> When an electronic identification using an electronic identification means and authentication is required under national law or by administrative practice to access a service provided by a public sector body online in one Member State, the electronic identification means issued in another Member State shall be recognised in the first Member State for the purposes of cross-border authentication for that service online, provided that the following conditions are met:
> (a) the electronic identification means is [notified];
> (b) the assurance level of the electronic identification means corresponds to an assurance level equal to or higher than the assurance level required by the relevant public sector body to access that service online in the first Member State, provided that the assurance level of that electronic identification means corresponds to the assurance level substantial or high;
> (c) the relevant public sector body uses the assurance level substantial or high in relation to accessing that service online.

While this approach of interoperability and mutual recognition protects existing infrastructures, it bears also considerable risks:

- Besides the legal recognition, technical interoperability on a high level of security (and privacy) must be achieved.
- It must be ensured that relying parties know the level of security of the recognized eID schemes, to be able to base their risk management on this information. They must also be able to exclude eID schemes which are too weak for the offered service.

These two points are the major points which are currently being further developped via Implementing Acts (see below).

While the first Commission's draft of the Regulation was tailored for centralized eID infrastructures, the outcome of the legislative process is more open on the internal structure of the national eID schemes, which on the other hand, means that the interoperability framework must be more flexible. Depending on the outcome of the further refinements, the German Personalausweis seems to fit »as is« into the regulatory framework of the eIDAS regulation.

3 Implementing Acts

The regulation itself is – as a typical European compromise – quite sparse in details which would be important for technicians, e.g. concrete requirements for security and interoperability. From our view, the regulation is more concerned with legal details, although lawyers claim that the regulation is too sparse on important legal aspects.

The regulation contains numerous hooks for the Commission to refine the requirements of the regulation via *Implementing Acts*. The legal instrument of an Implementing Act is laid down in the Treaty of Lisbon, and subsequently detailed in Regulation [EU 182/2011]. In a nutshell, Implementing Acts allow the Commission to detail the requirements from the regulation to ensure harmonized implementation of the regulation across all Member States. They cannot be used to define new or additional requirements on Member States or market participants beyond what is already required by the regulation.

The Implementing Acts are drafted by the Commission. As part of the adoption of an Act, a committee of the Member States (*Comitology*) gives an opinion on the draft, and may block an Act by giving a negative opinion.

Outside of the formal legislative procedure, the Commission has established an *informal Expert Group*, comprising delegates from the Member States, which is tasked to support the Commission with drafting the Implementing Acts. The Expert Group was established in May 2014, and meets once a month since then.

The deadlines for adopting the Implementing Acts for the chapter on electronic identification are based on the entry into force of the regulation on 17.09.2014. One year after this (i.e. 18.09.2015), the mutual recognition of eID schemes can be started on a voluntary basis, after three years (i.e. 18.09.2018) the mutual recognition is mandatory.

Since voluntary mutual recognition starts in September 2015, the Commission aims to adopt the Implementing Acts for the eID part of the regulation before that date. Taking into account the necessary time for the legislative procedure and the translations, this implies that the text of the Implementing Acts have to be finalized by the first or, at the latest, the second quarter of 2015.

3.1 Level of Assurance

The regulation mandates to establish three *Levels of Assurance*, which categorize the notified eID schemes according to their security, covering the complete lifecycle of the credentials, including enrolment, issuance of the credentials, usage and finally revocation. The three level *low*, *substantial* and *high* roughly correspond to the levels 2, 3 and 4 of [ISO 29115] or of [STORK QAA].

There was no agreement to use ISO 29115 or STORK QAA directly, but it was decided to draft a new document based on these standards. It needs to be avoided to have »too concrete« requirements, and thereby stopping or hindering technological advance, and on the other hand to have »too open« requirements, which gets so flexible that a reasonable security level cannot be assured.

The Expert Group decided to go with an »outcome based approach«, i.e. not requiring concrete technology to fulfil security goals, but stating the fulfilment of a security goal itself as the requirement. While this approach is in general advantageous for Germany – the German Personalausweis certainly follows some unusual routes, and therefore would be difficult to fit into a too normative Level of Assurance scheme – it could certainly be stronger in the requirements in some places. As an example, the current draft does not require tamper resistant hardware (smart cards) to store cryptographic keys, but only that cryptographic keys must be protected against tampering on a high level of assurance. This approach has obviously some attached risks, but at the same time opens up opportunities for new ideas and technologies.

The Level of Assurance-definitions contained in an Implementing Act will be accompanied by a Guidance-document, which hopefully can close some of the gaps between stated security goals and good/best practices to fulfil these goals, thereby reducing the risk of having »weak« eID schemes notified on a high Level of Assurance.

3.2 Interoperability Framework

The technical interoperability between the different eID schemes will be based on an *Interoperability Framework*, based on the work done in the EU-cofunded STORK project (see https://www.eid-stork.eu).

The security goals which must be fulfilled by the framework are based on the requirements and expectations of the stakeholder into this framework:

- the service provider requires authenticity/integrity of the received person identification data, and, in order to fulfil his data protection obligations, requires also confidentiality of the received personal identification data;
- the citizen expects confidentiality of his personal identification data and also expects that the operators of the framework itself respects his privacy.

To fulfil these requirements, and to provide the accountability/liability mandated by the regulation, a chain of responsibility/trust is needed throughout the complete authentication process.

Therefore the framework for cross-border interoperability must provide
- confidentiality of personal identification data;
- authenticity/integrity of personal identification data;
- secure identification of communication end-points.

The framework must not put requirements on the eID scheme or the systems of the Member State where the service provider is established. It is assumed that the respective national systems provide adequate measures to provide confidentiality, authenticity/integrity and communication end-point identification for their schemes.

To discuss the framework, a *Technical Subgroup* of the Expert Group was set up.

Minimum Data Set

The regulation is concerned with *identification* of *natural persons*, *legal persons*, and *natural persons representing legal persons*. Here identification is defined (contrary to the definition in [ISO 24760-1]) as the unique identification of a person. Therefore an interoperable Minimum Data Set, ensuring unique identification, must be defined.

The Minimum Data Set for natural persons consists of
- The current family name, the current first name and the date of birth; if these data do not uniquely identify a person, one or several of the following attributes are added: Name and family name at birth/Place of birth/Gender/Current address. The choice of additional data is up to the notifying Member State.
- A »uniqueness identifier«, which corresponds to the »Pseudonym« of the German system, i.e. an identifier, which is different for different persons, but might change over time for the same person.

The Minimum Data Set for legal persons is not yet finally discussed. The Data Set for natural persons representing legal persons will basically be the union of one instance of the Data Set for natural persons and one for legal persons.

It was resolved that the framework should also support transmission of additional identity attributes, but it cannot be expected that they are available from all eID schemes.

Interoperability

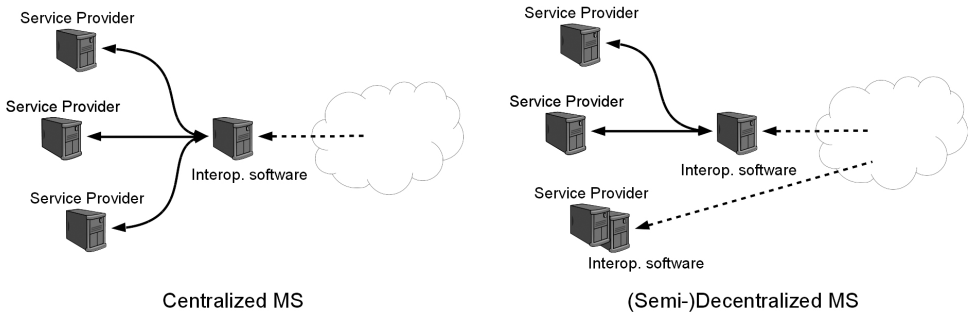
Notifying Member State can choose between two integration scenarios for their eID scheme.
1. *Proxy*-based: The notifying Member State operates a *Proxy* (called *C-PEPS* in the STORK project), relaying authentication information between a receiving Member State and the eID scheme of the notifying Member State.
2. *Middleware*-based: In this scenario the notifying Member State does not operate a Proxy for the purpose of authentication of citizens to service providers of other Member States. Instead, the notifying Member State provides a *Middleware* (called *V-IdP* in the STORK project) to the other Member States, which is operated by the receiving Member States.

Similarly, receiving Member States can choose between two models:
1. *Centralized*: The receiving Member State operates one central instance (called S-PEPS in the STORK project) of the interoperability software, which receives identity information from other eID schemes and forwards the information to the service providers established in that Member State.

2. *Decentralized*: The interoperability software is directly instantiated at the service provider (or an outsourcing partner). This model corresponds to the German deployment model using eID-Servers (or eID-Services).

The architecture leads to a simple process flow:

1. The process is started by the service provider, which sends an authentication request to the responsible interoperability instance. This instance can be directly attached to the service provider (decentralized) or operated by a separate entity (centralized). The instance requests the eID scheme to be used for the authentication from the user.
2. If the chosen eID scheme is a Proxy-based scheme, a SAML-Request is send to the Proxy, the Proxy performs the authentication of the citizen according to the national eID scheme (or delegates this to an Identity Provider), and returns a SAML-Assertion. If the chosen eID scheme is a middleware based scheme, a SAML-Request is send to the middleware instance operated by the interoperability instance, the middleware performs the authentication of the citizen and returns a SAML-Assertion.
3. The interoperability instance sends the received authenticated personal identification data to the requesting service provider.



Centralized MS

(Semi-)Decentralized MS

To provide an uninterrupted chain-of-trust for authentications, as well as an uninterrupted chain of responsibility for integrity/authenticity and confidentiality for personal identification data, all entities participating in the process must be securely identified before transmitting data to them/accepting data from them. To enable this, Member States will need to exchange information, e.g. public keys, in a trustworthy manner. While some of this can be done manually, at least for decentralized deployments this seems not to be feasible, therefore an automated mechanism needs to be defined.

Each of those variants – both on the notifying as well as on the receiving side – comes with its on set of risks:

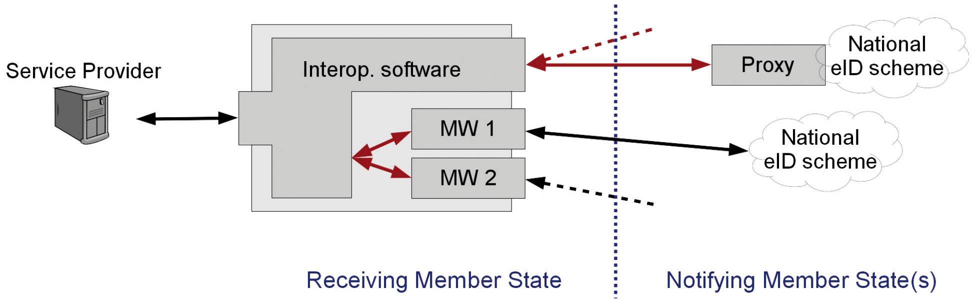
- Centralized vs. decentralized deployment on the receiving side: In general, a centralized deployment always carries greater risks in terms of IT-security and privacy. In terms of security, a central instance is a high value target for both internal and external attackers, while a fully decentralized deployment does not create a new concentration of personal identification data compared to the concentration already present at the service provider anyway.

On the other hand, a central entity can be easier in terms of interoperability, since fewer entities need to be interoperable. This is the reason most Member States opt for a centralized deployment.

- Proxy- vs. middleware-based notification: Similarly, the Proxy deployment requires a central instance, this time on the side of the notifying Member State. Since this enables the tracking of all outgoing authentications of all citizens, this is even more troublesome from a privacy perspective than a centralized deployment on the receiving side.

The proxy-based notification is mainly useful for those Member States, where the eID scheme is based on a (central) Identity Provider, while the middleware-based notification is sensible if no central instance exists in the scheme (or only exists in a form not capable of transmitting identification data directly to the receiving entity, like attribute provider-based schemes).

It should be noted, that a central capability for tracking is not seen negatively by all Member States, since this capability also offers the (positive) possibility to monitor for suspicious behaviour, in order to identify compromised credentials (analogously to the monitoring customary in the financial sector, e.g. for credit cards).



Only the decentralized deployment in combination with the middleware model allows end-to-end-encryption of the personal identification data, and is therefore preferable in light of the principle of »privacy-by-design« mandated by the regulation. This combination also provides the end-to-end chain of trust (see above) for free.

The perspective of the user, i.e. the citizen, should also be taken into account. Besides the already discussed aspect of privacy, the aspect of usability is important. While in general all combinations of models »work«, the whole authentication process gets slower the more entities are involved (the communication is based on SAML, i.e. the entities do not communicate directly with each other, but via the browser). Additionally, in case of problems, it gets more complicated to identify the responsible entity.

Not yet finally discussed is the liability in case of a middleware-based eID scheme for the middleware part, which is on the one hand part of the national eID scheme of the notifying Member State, but is on the other hand operated by the receiving Member State. While it seems straightforward to consider the middleware as a »product«, and hence the notifying Member State takes liability for the correctness of the software, while the receiving State for the operational environment, this opinion is not (yet) shared by all Member States.

Operational Security Standards

Additionally to the specifications necessary for interoperability, the Implementing Act contains operational security requirements aimed at the operators of the interoperability components. The current state of discussions is to require operators to have an Information Security Management System according to [ISO 27001] (or equivalent national standards).

3.3 Cooperation Network

The regulation establishes a *Cooperation Network* of the Member States, i.e. a group where Member States can exchange information about their eID schemes. The main task of this Network will be to perform the peer reviews as part of the (pre-)notification process, and to form an opinion on the schemes (see below).

The details of the functioning of the Cooperation Network are laid down in an Implementing Act, which was already voted upon in the Comitology in January 2015.

3.4 Notification

Notification of an eID scheme comprises several steps.

1. Pre-notification: A Member State intending to notify an eID scheme submits the material necessary for notification to the Cooperation Network:
   - a description of the eID scheme and how the scheme fits into the interoperability framework;
   - documents providing information and evidence that the eID scheme complies to a chosen Level of Assurance;
   - information on responsible bodies for supervision of the scheme, as well as enrolment and issuance.

   Pre-notification must be started six month before notification.

2. Peer Review: Based on the material submitted, the other Member State may initiate a peer review of the to-be-notified eID scheme. As part of the peer review, the reviewing states may ask for additional information from the notifying Member State. The peer review is concluded with a formal opinion on the scheme by the Cooperation Network.

3. Notification: Finally, the scheme is notified. The Commission publishes the notified scheme, which triggers the mandatory recognition of that scheme after twelve months. The Commission does not have the right to reject a notification, and must not judge the correctness of the notification. Only obviously wrong or incomplete notifications can be rejected.

This procedure is the result of long discussions during deliberation of the regulation, as well as in the Expert Group. The main point of contention was the question who is responsible for evaluating the to-be-notified schemes: the notifying Member State, the receiving Member States, or the Commission. Each variant comes with its own (obvious) risks. The situation is further complicated by the quite different situations in the Member States, ranging from eID schemes completely operated by the private sector on one end of the spectrum, to schemes based on governmental identity documents on the other end of the spectrum. The latter documents are comparable to passports, which are issued under sole authority of the Member State, but fully recognized by all (Schengen) Member States.

Weighing the risks and the needs of Member States to keep control of their national eID schemes, it was finally decided that the schemes are evaluated by the notifying Member State. The peer review was introduced to take care of the receiving Member States desire to get some insight in (and assurance on) the notified scheme. While the results of the peer review are not binding (formally, the notifying Member State is free to ignore the result), the political pressure of a negative or critical outcome of the review should hopefully suffice to stop notifying Member States from notifying a »broken« or »too weak« scheme.

4 Implementation and Deployment

The Commission (more precisely, DG DIGIT) will provide an open source implementation of the interoperability software financed by the CEF program (Connect Europe Facility). This software is based on the implementation of the STORK project, essentially integrating the roles C-PEPS, S-PEPS and V-IdP into a single component.

At first, the Commission (and most Member States) aimed at using this implementation as a reference implementation, i.e. all other implementations must behave exactly the same as this reference implementation to achieve interoperability. Some Member States even went so far to propose that the reference implementation is the only implementation which must be used by all notifying Member States and relying parties.

While a reference implementation might be helpful to achieve interoperability in the short term, it hinders progress in the mid to long term. Every change to the reference implementation must be implemented at the same time by all other implementations. It is not distinguishable for outside implementations which changes affect interoperability and which do not. This effectively freezes the interoperability framework. Furthermore, under this scheme it is not the Member States setting the standards for interoperability, but the implementer of the reference implementation unilaterally sets the standards.

After many months of discussion, it was agreed that transparent specifications for the interoperability software are necessary. This opens the door for alternative implementations of the interoperability software, either derived from the open source implementation of DIGIT or implemented from scratch.

4.1 Deployment in DE

Combining the possibility to have a decentralized deployment of the interoperability software with the freedom of implementation given by having an interoperability specification, a straightforward deployment model for the German landscape is to integrate the necessary interoperability components into the role eID-Server of the German system.

The alternative deployment model, a centralized deployment, creates a privacy and IT security hot spot, which was carefully avoided while designing the German eID system. Additionally, the effort for the service providers/eID-Services to integrate the interface to a central component would be on a similar scale as integrating the EU interoperability component directly.

In the decentralized deployment, it is also possible to integrate the interoperability software directly into the service. The German system then can be integrated via a separate eID-Server, or via the German middleware as part of the interoperability software.

Each service provider and software vendor will need to find the right solution for their deployment. This will certainly evolve the market for eID-Servers – and especially eID-Services – in Germany, combined with the usual opportunities and risks of a changing market.

Independently of the chosen deployment model, service providers will have to integrate the additional eID schemes into their process flows. The exact efforts cannot be estimated »from the outside«. In the best case, if the service needs exactly the data provided from the Minimum Data Set (or a subset thereof), and can already handle the data formats provided by the interoperability framework, no changes are necessary. For other services it might be necessary to handle the case where not all required data are available through the Minimum Data Set, to distinguish process flows depending on the nationality of the eID holder, or other adaptions.

Obviously, these adaptions, with the legal deadline of the 18.09.2018, are the biggest risks on the way of adopting (the eID chapter of) the eIDAS Regulation. At the same time, the stated goal of opening up eGovernment processes for all EU citizens is a big opportunity to move eGovernment forward.

4.2 Deployment outside DE

The mirror situation to the deployment for German service providers is the integration of the German Personalausweis into the services of the other Member States, via the middleware integration model. While this model avoids the necessity to set up a central component in Germany, it will be necessary for all other Member States to integrate a German middleware into their interoperability software instances.

The straightforward way is to integrate a (reduced) eID-Server as the German middleware component. Since the interoperability software provided by DIGIT is open source (EUPL), it will most probably be required that also the national middleware will be open source. To avoid interference with the existing eID-Server market, this middleware should not contain the functionalities present in the commercial eID-Servers, but not necessary in the EU interoperability setting.

An open question, and the biggest risk for this model, is the necessary service and support for the middleware. While it is self evident that the notifying Member State is responsible for bug fixes and updates, provisioning of operational support for the other Member States is under discussion.

Alternatively, receiving Member States could opt to out-source their middleware to an eID-Service (most probably located in Germany). While this would solve the problem of operational support, this model requires a contract between the receiving Member State and the eID-Service, to fulfil the requirements of the data protection legislation (controller/processor-relationship, in German law »Auftragsdatenverarbeiter«). The contract would need to stipulate that the receiving Member State is responsible for the operation of the eID-Service (processor). It seems improbable that this would be acceptable for other Member States. It should be noted that even in this model for technical reasons a (small) part of the middleware needs to be operated directly be the receiving Member State.

5 The future?

The regulation correctly separates the notions of »identification« and »signature«. The former represents the identification of an acting natural or legal person (usually at the beginning of an electronic transaction), while the latter concludes a transaction via signing a document, equivalent to a handwritten signature. At the same time, the regulation opens up possibilities to have synergies between both chapters, the most obvious *being remote or server-based signatures*, which are discussed in [Kügl15] in this proceedings. This will certainly both affect the market for electronic identification and the market for electronic signatures.

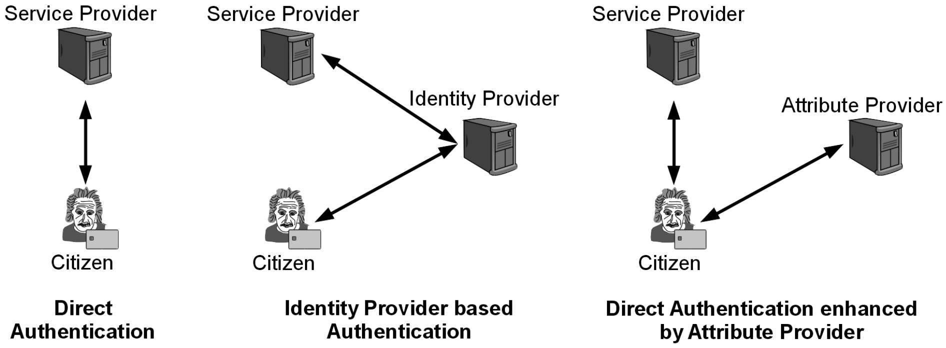
As hinted at several places in this paper, there are different ideas from the Member States about the »right« security level for the different components for interoperable electronic identification. While a first compromise seems to be found, a challenge for the future will be to sustain a balance between security and usability. It is to be seen if the drafted Level of Assurance are sufficient to provide adequate assurance for the different security levels, or if more demanding requirements will be necessary.

In the section on the interoperability framework it was discussed that the middleware model has clear advantages in terms of security and privacy. The main disadvantage is the need for a middleware for each technological different eID scheme, which is notified as a middleware based scheme. This disadvantage is mitigated if different schemes share the same technology, i.e. can use the same middleware instance.

5.1 eIDAS-Token

An important example for a suitable technology is the *eIDAS-Token* specified in [TR-03110]. This specification is an (of course backwards compatible) evolution of the specification for the German Personalausweis, integrating new cryptographic protocols (like *Pseudonymous Signatures*) and the concept of an *Attribute Provider*.

The technology of the Personalausweis is based on a Direct Authentication between the citizen (represented by his eID card) and the service provider. There is no third part »in between«. The identity attributes are stored on the card itself, and also the genuineness of the data is guaranteed by the card (and the cryptographic protocols). This has obvious advantages in terms of security and privacy compared to the more traditional three party model, where a (central) Identity Provider between citizen and service provider authenticates the citizen, and subsequently sends the identity data to the service provider. Note that an »eID-Service« in the German deployment model is not an Identity Provider, since legally an eID-Service is a processor on behalf of the service provider, while an Identity Provider is a data controller in its own right.



The direct authentication model and the Identity Provider based model map directly to the middleware-based resp. the proxy-based interoperability models discussed above. The main advantage of an Identity Provider is the extensibility of the system. The set of attributes needs not to be fixed at issuance of the credential, but the Identity Provider can introduce new attributes at any time after issuance, or can keep attributes up to date without necessary actions by the citizen. The concept of an Attribute Provider takes this extensibility to a direct authentication based scheme. The citizen still authenticates directly to the service provider using his token, but may request additional attributes for his credential from an Attribute Provider, as part of the authentication procedure or as a stand-alone process. This can be done in a way that the Attribute Provider does not learn to which service provider the citizen authenticates, providing better privacy than an Identity Provider based system.

The specification is a common endeavour of the BSI and the French counterpart ANSSI, supported by the respective smart card industry. Since many European smart card manufacturers participated in this project, there are good chances that this could be a future basis for many eID card projects, which will be directly interoperable without the needs for translation Proxies, and which can be integrated into the European interoperability framework via a single eIDAS-Token middleware, for both eID schemes constructed around attributes stored on a smart card as well as eID schemes utilizing one or several Attribute Providers. The cryptographic protocols can, besides smart cards, also be build around SIM cards, secure mobile phones or other technologies, extending further the deployment possibilities.

An interesting and important feature of the eIDAS-Token (and the Personalausweis) is the mutual authentication, i.e. the secure identification of the recipient of identification data via card verifiable certificates. This provides the »chain of trust« required by the interoperability framework as an integral component of the eID scheme, removing the need to provide this functionality from the interoperability framework itself, simplifying the latter.

5.2 Standardization

Currently, the role of standardization in the context of the eID chapter of the regulation is quite restricted. Most of the necessary specifications are directly contained in the Implementing Acts, and not referenced from standards.

Of course, this can change in the future, if suitable European or international standards get available. It would be quite advantageous, if the many different eID schemes could converge to a (finite) set of different schemes, in order to reduce complexity, and to enable business opportunities for vendors. This is the classical task of industry standardization. A first step in the form of the standardization of the eIDAS-Token as a common smart card specification is already under way.

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