



Towards Practical Implementation of the New JHA Information Architecture

eu-LISA 11th Industry Roundtable

17 October 2019
Tallinn, Estonia

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REPORT

On 17 October 2019, the European Union Agency for the Operational Management of Large-Scale IT Systems in the Area of Freedom, Security and Justice (eu-LISA) hosted its 11th Industry Roundtable **“Towards Practical Implementation of the New JHA Information Architecture”** in Tallinn, Estonia. The event was dedicated to discussing solutions for the implementation of the new interoperability architecture that are aligned with legal, functional and technical requirements. The running theme of the roundtable, as set by the Executive Director in his introductory speech, was that it is now the right time to move from theoretical discussions and focus on discussing the challenges of the practical implementation of the new information architecture.

The event gathered over 100 participants from 51 different organisations and 19 countries, representing international border management and security industries, EU Member States, the United States of America, EU Institutions and JHA Agencies as well as academia.

The event was opened by Mr Krum Garkov, Executive Director of eu-LISA, and moderated by Ms Ana Maria Ruginis Andrei, the Head of Architecture Sector at eu-LISA.

The agenda as well as the presentations given are available on the roundtable website: eulisaroundtable.eu.

09:30-09:50 Welcome and Setting the Scene
Mr Krum Garkov, Executive Director, eu-LISA

Mr Krum Garkov, Executive Director of eu-LISA, opened the event by emphasising the importance of interoperability and the need to break silos. Interoperability is essential for stronger security of external borders, as well as better border and migration management. eu-LISA is very ambitious with regard to the implementation of interoperability, expecting the interoperability architecture to be in place by 2024.

Interoperability is not a final destination, but only a milestone in the journey towards a seamless functioning of systems in JHA domain, facilitating the work of practitioners on the ground. The Agency counts on a very strong partnership with industry in tackling the challenges that lay ahead.



SESSION 1 NEW INFORMATION ARCHITECTURE FOR JHA DOMAIN: TRENDS AND DEVELOPMENTS

09.50-10.20 Elaboration of a Future Architecture for Interoperable IT Systems
Ms Ana Maria Ruginis Andrei, Head of Architecture Sector, eu-LISA



The presentation focused on the interoperability architecture and its components and their interfaces with existing and new systems. Reaching a highly available interoperability architecture is not possible without a clear understanding of the requirements. It is important to note, however, that interoperability implications are limited for end-users (except for the Multiple-Identity Detector).

The new interoperability architecture includes the following components:

- European Search Portal (ESP) – a one-stop shop carrying out a simultaneous search of multiple EU information systems, in line with users' access rights.
- Shared Biometric Matching Service (sBMS) – a tool to cross-check biometric data (fingerprints and facial images) and detect links between information on the same person in different EU information systems.

- Common Identity Repository (CIR) – a shared container of biometric and biographical information, such as name and date of birth, stored in specific systems about non-EU citizens.
- Multiple Identity Detector (MID) – automatic alert system detecting multiple or fraudulent identities.

The indicative timeline for the migration phase for VIS (Visa Information System), SIS (Schengen Information System), EES (Entry-Exit System) and ECRIS-TCN (European Criminal Records Information System for Third Country Nationals) is mid-2022 and late 2022/early 2023 for Eurodac.

The presentation also included a summary of the study on interoperability architecture¹. The study, amongst others, maps out the existing systems and components, as well as the new systems. The study is a vital contribution to the ongoing work on the evolution of the current systems, the development of new systems and the interoperability components. An impact assessment exercise, including a complete picture of the interfaces between interoperability components and both existing and new systems, as well as an outline for a migration plan towards the new interoperability architecture were included in the study.

The study proposed three interoperability options, including “Continuation”, “Integration” and “Unification”. Analysis of the options revealed that Integration could be the current preferred target architecture eventually leading to Unification. As a conclusion of the analysis, the Service Oriented Architecture with API-led connectivity is recommended as the preferred option.

Although eu-LISA assumes the leading role in this endeavour, interoperability remains a shared responsibility. Hence, the best possible results can only be achieved by the Commission, EU Member States, EU Agencies and other stakeholders working together.

Following the presentation, several questions were received from the audience. One of these focused on the potential for application of new technologies, such as distributed identity management using distributed ledgers. In response to this query, Ms Ruginis Andrei suggested that, although at this point in time the Agency is not considering such technologies, the Agency remains open to new technological developments and therefore does not exclude any technologies from possible application in the future.

10.20-10.45 **The U.S. Experience in Developing New Information Architecture** **Mr James E. McLaughlin IV, Targeting and Analysis Systems Program** **Directorate, US Customs & Border Protection**



The presentation focused on the U.S. experience in developing new information architecture for border management. As with other countries, silos are widespread in the U.S., hence the need to integrate systems and data repositories. In the U.S., integration was done through federating data sources. The U.S. Customs and Border Protection (CBP) agency worked in an agile manner, closely collaborating with the users of the systems and also those involved in the development of systems.

¹ Summary of the study can be found on the eu-LISA website, under [Publications](#).

Cross-functional work was very important in developing the new information architecture, bringing together people from operations and systems development, and getting developers into the field. This new approach facilitated addressing issues in the systems and application much more effectively and much faster. In the U.S., the key focus in developing new systems was on simplifying the processes and workflows for the users, so that they can focus on decision making and not on searching for and retrieving the data necessary for decision-making.

The presentation included an overview of the Traveller Verification System (TVS). In 2016 the U.S. CBP started testing biometric exit, which includes facial recognition using cameras in airports (placing cameras on the jet-way where a passenger needs to present the boarding pass).

A facial recognition system was implemented, allowing airlines to record and do facial recognition at exit (Service-level Agreement - SLA - 2 sec). The system uses templates of facial images that are cryptographically protected and works on a hit/no-hit basis, allowing for faster processing of passengers also at exit, and therefore reducing the overall time of the arrival-exit cycle. Reducing the cycle time allows the introduction of additional flights in the future. The time saved on boarding can also be used by passengers on consuming services provided by the concessionaires in the airport, therefore supporting the business case for the airport authorities to invest in facial recognition technologies.



The new system, based on biometrics works for the following reasons: first, it relies on existing traveller biometrics; second, galleries of facial images are created for each flight, which improves both speed and reliability of facial detection; third, the new system enables token-less processing and integrates into existing airport infrastructure; fourth, the system doesn't require traveller enrolment; last, the system serves as a trusted source for identity verification. So far, the initiative has been successful, attracting 28 committed partners from across the U.S.

The preliminary results of the new system include faster boarding times (e.g. 20 minutes for Airbus A380 - 350 passengers), as well as enhanced customer experiences (+20% increase in customer satisfaction). It is important to note that privacy and security was built into the system by design, and include such measures as, limited retention of facial images and a range of enhanced security measures (e.g. data encryption in transit and at rest; device access restricted to authorised personnel; biometric templates separated from biographic data, associated only with a unique ID).

SESSION 2 INFORMATION FLOWS FOR SEAMLESS STAKEHOLDER COOPERATION

11.30-12.00 Hexagonal Architecture and UMF₃ for Interoperability Mr Amr el Rahwan, ID Solutions Manager at WCC Smart Search & Match

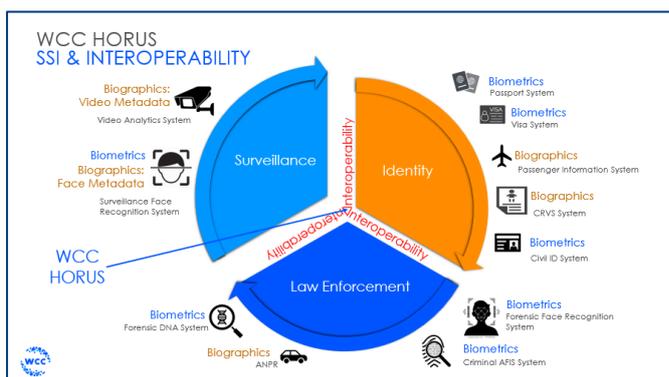
The presentation outlined the landscape in which interoperability needs to be implemented, which includes a number of different types of persons, objects, locations and events that need to be considered. The presentation included a hypothetical scenario, which required the identification of a perpetrator and the victim of a homicide during a football match. A number of challenges, which make search and match difficult, were identified:

- Many systems that need to be queried separately (time);
- Databases process personal and sensitive data, hence access to these is restricted;
- Databases and interfaces developed by different vendors, leading to compatibility issues;
- Different types of data need to be integrated: biometric, biographic, etc.



The presentation continued with an overview of the benefits of the hexagonal architecture proposed by WCC:

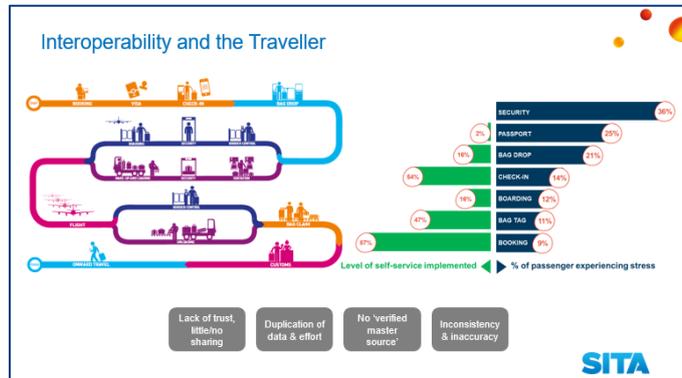
- Separating applications, business domain and infrastructure (e.g. databases);
- Dependencies move from applications and infrastructure to business domain;
- Each of the applications, infrastructure and business domain can be independently modified;
- Architecture is data-agnostic and vendor-agnostic;
- Hexagonal architecture can achieve interoperability and a Single-Search Interface



It was stressed that the implementation of interoperability would require the use of the Universal Message Format (UMF). High-level conceptual diagrams for the hexagonal architecture were presented and explained, including an explanation of how the architecture helps integrate different systems and approaches.

The presentation concluded suggesting that in order for the EU-level architecture implementation to be successful, more effort would be needed at Member State-level to ensure interoperability there.

12.00-12.30 Interoperability Is About More than IT
Mr Andy Smith, Business Development Director Border Management & Government Services, Europe, SITA



The presentation focused on the traveller's perspective. The need for system interoperability was recognised early on in the implementation of ETA (Electronic Travel Authority) in Australia. The two key questions raised in the presentation were: 1) how to get to frictionless travel, making sure that the necessary information is shared and provided and 2) how to combine self-service with the regulatory requirements that carriers need to comply with. What is needed is an interoperable and collaborative approach across the globe to make sure that the traveller can travel efficiently, safely and seamlessly across the globe. However, currently there are only bilateral agreements (e.g. between Canada and Schiphol Airport in the Netherlands). It was also suggested that carriers should not act as intermediaries between the traveller and the relevant authorities. Instead, a direct relationship between the authority and the traveller should be established.

Several points were made in the presentation in regard to the advancement of seamless travel across the globe. First, in order to achieve seamless travel, biometric identification should be enabled across all processes (i.e. from border crossing, to boarding, to exit, to self check-in). Currently, throughout a trip, we are using a number of different identities. In order to support seamless travel, advanced biometric identity with government ID at its core is needed. Secondly, other sources of information should be used to facilitate the travel process (e.g. social media etc.). The latter could help us establish the purpose of travel. Third, whether other means of transportation (e.g. autonomous Uber) should be considered as part of the immigration process. Fourth, whether big data can be used at border crossings.

In conclusion, it was suggested that it is important to focus not only on the EU, as airlines operate in hundreds of different locations with different regulatory requirements. Hence, in order to facilitate the implementation of requirements by carriers, the requirements need to be clear and simple.

12.30-13.00 Discussion

During the **discussion session**, several questions were addressed to and answered by the presenters. **Mr Theofanis Syrigos** (eu-LISA) mentioned that, although the proposed approaches are interesting, eu-LISA needs to operate within the established legal environment. Therefore, eu-LISA expects proposals from industry that are within the lines of the existing regulations, as the solutions for carriers have to go live in 2022.

"Are the service providers ready to provide systems that can be adjusted according to the existing requirements out there?", was one of the questions. **Mr Andy Smith** (SITA) responded that the industry and SITA are ready for this. However, he suggested, engaging directly with the systems providers and not via carriers would perhaps be a better way to proceed.

SESSION 3 FROM OPPORTUNITIES IN INNOVATION TO TECHNICAL IMPLEMENTATION

14.00-14.30 Data Analytics Services and Microservices Architecture Mr Tom Stock, Senior Business Solutions Manager, SAS



The presentation focused on SAS solutions for decision support and intelligent decision making, and in particular, on data management, data quality and machine learning. SAS AI solutions can be integrated on different levels and with different system components, allowing for extensive flexibility. Different machine learning models can be used to target specific problems, also leveraging different types of data through integration, in application to the identified problems. The complexity of the models applied depends on the problem at hand: some problems will require

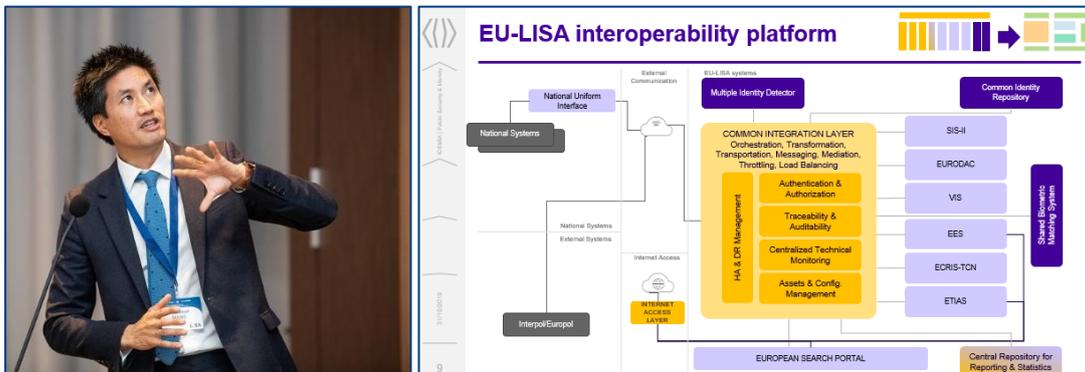
complex neural networks, whereas other problems may require simple decision trees. What is important is that the models are not rigid and can be adjusted with time since criminals will eventually discover how the model works and will develop ways to circumvent it. Therefore, the entities utilising the models should also have the internal capabilities to understand the model and improve it when necessary.



The presentation included a scenario with package tracking technology, used to identify packages with a risk of containing illicit substances. One of the key issues identified was that currently different data, that is necessary to identify potential suspects, is spread around different locations. SAS algorithms, can integrate the scattered information, by automating fuzzy matching, master data management and disambiguation, across languages, thus creating a real picture.

SAS solutions rely on an API-based approach, which allows for more complex calls than a simple JavaScript Object Notation (JSON) object and also permits the creation of more complex responses, integrating contextual information. It is not necessary to be a SAS coder in order to use SAS API since more common programming languages, such as Python or JavaScript, can be used. The presentation also showed that SAS has developed a microservices architecture, which includes 180 microservices. Although the microservices cannot be installed completely independently, they can be used separately, thus allowing for greater efficiency, since only a limited number of services will need to be run on the infrastructure at any point in time depending on requirements.

14.30-15.00 Custom-made Business Services vs. Standard Identity & Biometric Solutions Mr Emmanuel Wang, VP Border Control & Passenger Facilitation, IDEMIA



The presentation focused on the approach to developing a new information architecture, based on standard identity and biometric solutions taken from IDEMIA's experience in developing and providing solutions for border management and biometric identification in Europe and around the world.

Some key trends in border control initiatives were outlined in the presentation:

- Countries have different laws and heterogeneous organisations, but still share common issues and the same ID management needs;
- Biometrics are often an add-on to the legacy systems. Hence, migration and integration are recurrent topics;
- Governments are increasingly turning to biometrics. Hence the need for enrolment terminals and biometric identification;

User experience should be seamless; Due to the complexity of the systems required for border management, there is a growing need for specialist solutions. Therefore, big contracts for system developments are usually addressed by consortia, rather than single companies. At the same time, customers are often not willing to be tied to a single provider and therefore prefer systems based on open standards, in order to avoid monolithic proprietary systems. It was also suggested that new solutions should be highly adaptable, since context and requirements can often change (e.g. changes in laws, as well as new technologies).

The architecture proposed by IDEMIA is based on standard solutions, but covers a mix of generic and custom needs, as it integrates domain-specific products with standard commercial off-the-shelf (COTS) products, which provides flexibility for ad-hoc development and customisation. The presentation included a conceptual overview of the integration of COTS not specific to immigration with custom solutions developed for immigration, outlined the added-value of standard identity services (both ID and biometrics) and stressed the importance of transversal management of coherence between different identities and several biometric features.

The main conclusion of the presentation was that the Common Identity Repository and the Multiple Identity Detector are good candidates to be implemented leveraging business-specific COTS. The use of COTS is a good practice for low variability components; specialised COTS for business-specific matters encapsulate strong business expertise, include the results of long-term research and development, and represent real added-value, being widely field-proven.

14.00-14.30 Closing Remarks

In her **closing remarks**, **Ms Ruginis Andrei** suggested that there is no simple solution to the technical requirements, however the technologies are there and need to be integrated. eu-LISA will continue playing its role in raising awareness about the developments in the domain.

Seamless integration of legislation and technologies will continue to be one of the key objectives for the Agencies, the European Commission, the Member States and industry. The industry roundtable and the conference in this regard served as a venue for valuable discussions for all parties involved.





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