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IT STRATEGY

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1. HOW THE IT STRATEGY IS REALISED

In this chapter, the main principles of the IT Strategy will be demonstrated on how they are realised and on their value for all stakeholders.

1.1. THE SERVICE-ORIENTED ARCHITECTURE

The introduction of the service-oriented approach in the design of the new IT systems for customs will result in flexible and modular applications that can adapt easier to the changes and can benefit from the reuse of existing functionality.

The Service-Oriented Architecture (SOA) is mainly a way of thinking and designing that aims to align the business world (organisation, processes, workflows, rules, etc.) with the world of computing - creating software systems to meet business needs - so that both become more efficient. The SOA aims at modelling business services related directly with business operations (business tasks), and implementing them through software services as it is explained in "SOA Overview and Guide to SOA Research" conducted by Gartner in 2011.

This approach is in line with the European Interoperability Framework (EIF) that recommends the development of a component-based service model allowing the establishment of European public services by reusing, as much as possible, existing service components.

In order to model this real world operation and to design IT systems that implement these business services, SOA focuses on the analysis of the business processes as to identify the services that are needed to perform this operation and the orchestration of these services in order to produce the desired results. For example, following the analysis of Import, Export and Transit procedures, all of them require an IT application to perform risk analysis; therefore, the most efficient solution would be a unique application that offers risk analysis services to all of these procedures adapted to each particular process and not three risk-related IT systems as one for each workflow.

By implementing SOA, the aim is to use a common design pattern associated with proven technologies. There are many examples of successfully implemented SOA systems ranging from IT systems of international companies on the private sector. As examples: IT systems for airline companies - Lufthansa, United airlines and Delta airlines (for reservations, inventory and passenger check-in); IT systems in the area of logistics, Con-Way, the logistics and trucking company and IT systems in the area of communications Motorola and T-mobile¹; e-government IT systems offering one-stop shop services, such as Denmark's Customs IT system and Greece's Customs IT system. Finally, even the famous CERN (European Organisation for Nuclear Research) is employing SOA-based software to monitor and manage potential emergencies.

Applying the SOA approach will result in:

¹ Ten examples of SOA at work, Joe McKendric, Dec 2006 and Jan 2008 studies.

- Increased flexibility and reusability and reduced cost: The adaptation of the IT systems to new functionality is easier, faster and at a lower cost, since changes have a limited impact on specific services. Also with SOA, early prototypes can easily be built to avoid erroneous implementations and maintenance cost at a later stage;
- Improved business agility and alignment of business and IT systems: SOA is a natural complement to the BPM policy, as the implementation of business processes can be translated in a workflow of software services. SOA is for IT the natural equivalent of what Business Process Models are for Business. Furthermore, SOA does not imply the rebuild of the existing systems similarly for the same reason that BPM does not implicitly change the processes themselves; it only gives an opportunity to manage them in a more efficient manner. In addition, the design on the basis of a set of services allows functionalities to be specified in an unambiguous way;
- Increased consolidation and increased revenue: There are many opportunities that could be enabled by the SOA. SOA using Cloud technology could mean that these services can then be hosted by a MS, common cloud infrastructure from the Commission or hosted by a reliable service Supplier. Furthermore, the COTS – implemented IT solutions from the market - are proposed as alternative solutions in order to deliver the services in a more efficient and effective way. Once the services could be defined with structured SOA governance by means of a common Reference Architecture, there is possibility to have them:
 - Centrally implemented by DG TAXUD;
 - Shared by any MS from the existing national services;
 - Collectively developed by some collaborating MS;
 - Provided by a service provider from the market.

The main assumptions for the SOA implementation in customs are:

1. Not mandatory for MS to adopt nationally: It is not the purpose to impose SOA technologies for the systems, MS may implement the defined services the way as it is decided at national level;
2. Common language and standard in the EU. The objective of the Reference Architecture is to define a mandatory framework allowing to address unambiguously IT-related matters in Customs in the EU from the service, process and data perspectives;
3. Gradual approach: SOA does not have to be applied everywhere simultaneously, it will be applied gradually, where substantial changes or new IT systems are required to be implemented;
4. Started with central services: DG TAXUD will itself apply SOA for the central development, in order to make services available to be consumed by MS;
5. Does not impact the legacy systems: There will be no impact on the existing systems and in addition, stability of existing interfaces shall be assured. Therefore, when a MS decides to use the central services, minimal integration

effort needs to be foreseen to allow full compatibility regardless the MS is SOA-compliant or not;

6. Tested by the architecture group: The service paradigm has been tested by the architecture group. The Reference Architecture is based on the Service-Oriented approach and for the IT projects of the MASP, an analysis of the services needed to be implemented in order to offer the required functionality has been in progress, in compliance with the Business Process Modelling, as it is explained in the corresponding chapter of the Reference Architecture;
7. Creating the conditions for market standardisation. When the Reference Architecture will be sufficiently developed, it shall be used as a guideline to COTS suppliers so as to produce compliant products and services.

The first projects that were designed and implemented using the SOA approach are the UCC Registered Exporter System (REX) and UCC Customs Decisions (the SOA pilot project). Projects addressed in collaboration shall also be using SOA-based design. The adoption of the SOA will not alter the existing message exchange patterns and will have no impact on the existing common systems which will continue to operate on the basis of existing IT architecture.

1.2. IS CENTRALISATION OF PARTS OF CUSTOMS IT FEASIBLE AND USEFUL?

The aim of centralisation is to address the IT solutions optimally without altering the responsibilities of the National Customs authorities and the Commission. In addition, central implementation and/or operation of IT systems can only take place if it can be justified by a positive business case.

The possible centralisation of the EU Customs systems needs to be considered from the following perspectives/possibilities:

1. Central development and operation of systems:

In this case agreed IT systems for Customs could be developed and operated centrally so that MS could use the functionality that is provided by a common system. Such an approach could be based on the EOS experience, extended by the capabilities provided by SOA.

2. Central development with national business expert involvement:

In this case, IT System/Services of the national domain could be developed centrally, supported by customs business and IT experts from MS on the condition that this is justified by a business case. In such project, national workflows in Customs Decisions domain could be implemented centrally. For centrally implemented systems where interaction with trader is necessary, direct access for traders to central capabilities is through the Uniform User Management and Digital Signatures (UUM&DS) system. This work requires active participation of MS experts in the project to ensure that national requirements are met effectively.

3. Shared service components developed by collaborating MS:

Instead of having each Member State design and develop on their own similar functionalities, MS could work in a collaborative mode in particular areas to design and develop common services. The Reference Architecture can be used to facilitate this shift towards a new generation of IT systems for Customs

built on the principles of harmonisation, convergence and modularity by providing a common view on the IT system design in various levels of detail. These services could be deployed centrally or deployed by one MS and shared by many or customised and deployed by each MS.

Based on this work the market can offer solutions that meet effectively the requirements and the high quality standards that have been defined beforehand. This aspect is also closely linked to the collaboration work. All these types of solutions can run effectively in a cloud environment meaning that they can be hosted by some MS, the Commission or a Service Provider.

4. Central data repository:

In this case the creation of a central repository is used in an IT system implementation so as to reduce the number of interacting parties from $n*(n-1)$ to $(n+1)$, where n is the number of MS. This approach is meant to increase the agility of the IT systems deployed in the Customs Union, but it needs to be understood and agreed in the case of specific systems. This option will be subject to feasibility studies and business case analysis and will require high level discussions and agreement prior to move to the implementation phase.

In any case, MS will always have the choice to use the central services or to develop national ones.

- For the national domain, MS may exercise their responsibility the way they consider it to be more efficient;
- For the common domain, when exchanges between MS are involved, systems will continue to be based on the same or analogous design patterns as in the past. The evolution will be the exposure of web services rather than CSI queues for new systems;
- For IT systems developed by the Commission, systems shall expose services, accessible through web services and will replicate final data to all MS for use in their administration.

In conclusion, centralisation aims at the rationalisation of the total cost of ownership of customs IT systems and by no means at the alteration of the way national responsibilities are exercised. By having IT systems implemented with more central effort, it will avoid having 28 times implementation of similar or nearly identical functionalities, and solve the issue of absence of business case justification in certain countries. The high cost, complexity, lengthy implementation time associated to such repetition of implementation and the multiplied costs of maintenance can be reduced significantly.

1.3. COLLABORATION WORK/SHARING IN PROJECT SPECIFICATIONS AND IMPLEMENTATIONS

Some MS expressed the need to address some future challenges together. MS could collaborate, on a voluntary basis, in tackling their responsibilities areas, depending on their own constraints and priorities. Several domains are open candidates for collaborative work.

The Reference Architecture work has demonstrated that collaboration between the Member States to build something in common is possible.

The collaboration activity may take several forms such as:

- Refining and completing the Reference Architecture horizontally with the services, data and interfaces for all the complete range of Customs systems;
- Concrete collaboration projects with specific value for a group of MS and potential value to all MS (e.g. the Pilot Project for Customs Warehousing or the Pilot Phase for UCC Special Procedures).

The above is the way that opens towards a new generation of Customs systems where each service provided in the community could be referenced in within a common framework resulting from collaboration work and at the same time leading to further opportunities of collaboration and sharing.

All collaboration activities are following the principles below:

- Volunteer basis

It is not mandatory for any MS to join the collaboration activity or to use the product developed by the collaborating MS.

- Collaboration outcome would be available for all

The final product from the collaboration activity would belong to the entire European Union and would be offered to any MS willing to use it. This collaboration work would either produce common specifications, complete applications or parts of application (web services). It is expected that this type of centrally-funded efforts would create a library of knowledge (e.g. design and specifications) or even software components that could be used by willing MS.

- Towards Customs IT Cloud or Customs App Store?

For the services produced in a collaborative manner, new technologies such as the open source software (OSS), which is a model promoted as an enabler of the European Interoperability Framework, or “cloud” type delivery could be considered for the delivery of the services. This set of services may constitute the “cloud” of customs services that through their use by other MS will reduce the overall cost.

In the context of IT Collaboration, it is also worth mentioning that the Expert Team on new approaches on Collaboration (ETC IT) to develop and operate customs IT systems was launched in 2018 as an initiative by Estonia and 12 other Member States, supported by the Commission through the Customs 2020 programme. The goal of the ETC IT is to explore how customs IT systems could be developed and operated in the future via studying new approaches, analysing relevant legal and governance frameworks, providing possible options for launching pilot project(s) and exploring new or alternative possibilities for financing the future development and operation of these systems. Working under the supervision of the Commission, the ETC IT will provide expertise and recommendations on how to develop, fund, maintain and operate customs IT systems through further expanding cooperation between EU customs administrations. The ETC IT activity began in October 2018 and is expected to finish in September 2019. The new ETC IT2 team will continue its activities for another two years.

1.4. REFERENCE ARCHITECTURE

The European Interoperability Framework introduces a conceptual model for developing European public services. It presents a building block approach to construct them allowing service components to be interconnected and promoting the reuse of information, concepts, patterns, solutions and specifications in Member States and at European level. In the same line, the IT Strategy is targeting a new generation of customs systems architected by building blocks of logical services.

The IT Strategy is based on the assumption that centralisation is not feasible in the coming 10 years or more, except for specific projects or components. If MASP systems are to be based on their majority on distributed architectures, it is essential to invest in the convergence of these systems as being the building blocks supporting customs public services.

The Reference Architecture itself is not a standalone project; however, it is the key instrument to allow the realisation of the IT Strategy by breaking the monolithic nature of the systems into a set of logical services or building blocks that can be associated to customs functions supported across the customs processes and so clearly and universally defined and understood.

The Reference Architecture is tightly related to collaboration activities aiming at facilitating cooperation, exchange of information and at achieving a common understanding of IT systems and services, their business value and purpose, and their evolution over time.

The Reference Architecture is not only about services, it is also about data and about IT components and how these relate to and implement the business tasks and processes leading to the fulfilment of the business goals themselves.

The Reference Architecture would become an indispensable instrument for any future collaborative development as it provides the following benefits:

- Enable collaboration amongst the MS by providing:
 - A common reference of services;
 - A common language for discussions and decisions;
 - A customs functional landscape to identify services candidates for sharing and reusing.
- Fix unambiguously the scope of each project in terms of services to be implemented:
 - Associate unambiguously the services with the BPMs functions and requirements (Functional Specifications).
- Ensure alignment with the business architecture and BPMs:
 - Closely relate to the BPM and build a clear relation between business and IT allowing the management of business changes with an immediate view of their IT impact and the other way around.
- Defines common service and data models which will enable:
 - The emergence of shared National Systems using shared components;
 - Normalisation of the market and allow the possibility to have COTS services;

- Creating services that could be provided throughout a 'cloud' in a flexible manner. The services in the “cloud” can be the result of specific services offered centrally by the Commission or by a MS, or from collaboration projects resulting on shared services, or solutions offered by the market.
- Maintain systems in a flexible way identifying the impact of changes and being able to modulate the scope of those changes.

Therefore, the Reference Architecture is essential in terms of driving towards the convergence; by describing in a common place the acknowledged components and services of EU Custom's systems and enabling the harmonisation, reusability, collaboration and cost reduction.

In this regard, it should also be highlighted that the European Commission supports the development of high-performing, sustainable and interconnected trans-European networks in the area of digital infrastructure through the Connecting Europe Facility (CEF) programme. This facility was set up as a dedicated financing instrument to channel EU funding into the development of infrastructure networks. CEF is funding a set of generic and reusable Digital Service Infrastructures (DSI), also known as building blocks (e.g. eDelivery, eID and eInvoicing) to interconnect complex digital services and IT systems across the EU. The basis for the CEF building blocks are interoperability agreements between the Member States. The blocks represent basic capabilities that can be reused in any project, where appropriate, to facilitate the delivery of digital public services across borders and sectors. Recently, the Commission introduced three new building blocks (Big Data Test Infrastructure, Context Broker and eArchiving) to provide reliable services across different domains and bring added-value to the areas of data infrastructures, digital archiving and real-time data in line with the vision laid out in the Tallinn Declaration.

Whatever the way these services are deployed or built, it can only be possible if a common view is built on the structure and characteristics of these services and the Reference Architecture is the necessary instrument to achieve this.

1.5. HARMONISATION OF INTERFACES TOWARDS TRADE – COMMON SPECIFICATIONS FOR INTERFACES

In “The future business architecture for the Customs Union” study conducted for DG TAXUD, “lack of harmonised interface towards Trade” is repeatedly listed as a major limitation of the EU customs systems. The UCC also establishes the intention to offer an EU harmonised trader interface designed by the Commission and the Member States in agreement with each other, wherever possible. The implementation of different external interfaces for the same Customs process throughout the EU has made a significant negative impact on trade. Moreover, the capacity of change of the current systems is challenged and more flexibility is required for future systems. Therefore, it is necessary to agree and implement common message specification and also to provide common access interface for trade.

To address this issue, the IT Strategy aims to harmonise the external domain for new systems (common specifications/collaborative implementations for the external domain) and/or to offer a single access points for trade, so as to reduce the number of connections to the customs union for trade.

There are two possible types of harmonisation of external interfaces:

1. Harmonisation of national interfaces, on the basis of mandatory common specifications for the external domain.

DG TAXUD is investigating the possibility to test the external domain interfaces during the Conformance Testing. This would allow the harmonisation of external interfaces where common specifications for the external domain have been provided.

2. External Trader Access for Central Applications.

In the context of the Customs Decisions IT project, a Trader Portal was developed. However, since the requirements were specific for Customs Decisions, this Trader Portal is not generic enough to be used as an external access by the EU traders who need access to several business specific customs domains such as UCC INF, UCC AEO, UCC BTI, ICS2 STI and REX. Therefore, in order to have one single point of access for traders, the Generic Trader Portal was developed which can be connected to these Specific Trader Portal modules (one per the above-mentioned domain). Each Specific Trader Portal module (STP module) implements a respective Customs Application trader access and will adhere to the GTP design aspects in a seamless, uniform and easily maintainable way. The project that will use the GTP will have its own set of screens and communication services that are specific to the project due to the business requirements. The UCC INF SP pilot project has already connected to its specific module using this Generic Trader Portal. Uniform access is provided to the economic operators by offering a single user interface centrally. This access is taking advantage of the UCC UUM&DS as it is allowing the traders to access the central applications with their national credentials.

1.6. GRADUAL IMPLEMENTATION

The UCC proposal defines an operational deadline for all the requirements to be realised in the IT systems. It is foreseen to have a gradual approach for the implementation. This gradual implementation practically means:

- Progressive realisation rather than big-bang: It is planned to have the IT systems go-live one after the other to avoid having all the systems ready in operation in close period. The sequence of the project initiation has been defined carefully taking into account of the following criteria:
 - Business case justification for IT implementation;
 - Feasibility and complexity;
 - Business solution clarity;
 - Dependencies with other projects;
 - Infrastructure requirement and readiness.
- Phased approach for system implementation: For the implementation of some systems, a phased approach will be undertaken similar to the past NCTS project.
- Incremental adaptation of the new approach: The harmonisation of the interfaces the SOA approach and the new way of working shall not be planned to be fully implemented or adopted at once. They are mainly planned to be implemented starting with new systems. Adopting such an incremental

approach allows minimising costs and risks and justifies investments on a project-by-project basis.

One of the essential instruments supporting the EU Customs Union in its efforts to modernise IT systems is the Business Process Modelling (BPM) methodology. The enhancement of the BPM policy remains an important objective for the e-Customs architecture. Given the complex business environment of EU customs, DG TAXUD is considering ways of improving its delivery model to streamline the preparation and implementation of the functional and technical specifications. This would entail the introduction of agile practices to enhance the end-to-end view of the various project artefacts as well as the cross-systems alignments and to create a more efficient environment for requirements' analysis. Careful consideration will be given to the impact that these changes may have on the different stakeholders, in particular the Member States and Trade. DG TAXUD intends to hold consultations and organize workshops in due time to present and discuss the integration of these agile solutions into the current modelling discipline. This streamlining exercise will aim at facilitating a smooth transition from the business analysis and business modelling phase to the elaboration phase along with the project initiation phase, while supporting the timely deployment of customs IT systems.

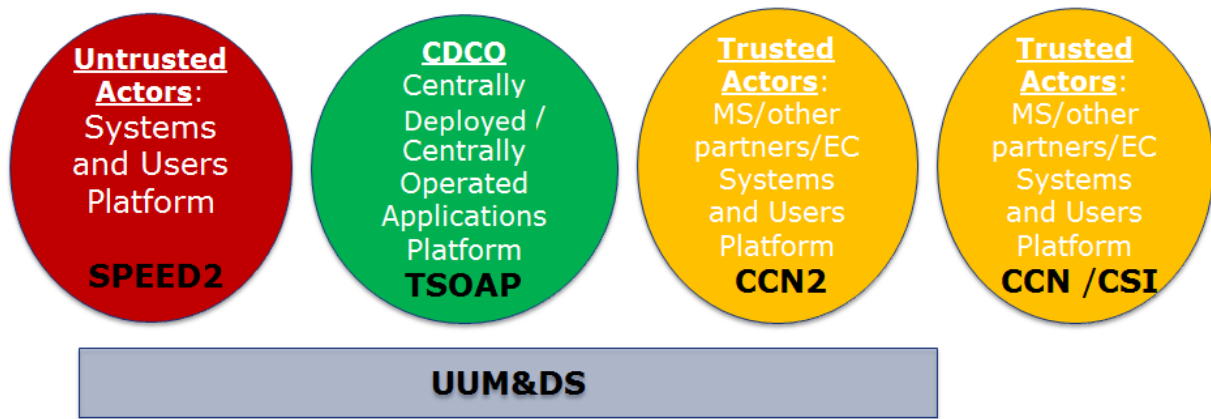
1.7. IT BUSINESS CONTINUITY MANAGEMENT SYSTEM (IT BCMS)

In 2018, DG TAXUD's Directorate B launched the IT Business Continuity Management System (IT BCMS) revamping project. Its objective is to ensure that DG TAXUD's investments in preparedness of prior years will be effectively translated into recoverability when required, in line with its business priorities and requirements. The IT BCMS will be aligned with all other levels of business continuity management arrangements already in place, taking into account inter-dependencies within DG TAXUD's complex ecosystem to effectively meet the IT service continuity needs of its stakeholders. A set of deliverables has been already revised and will be further elaborated, validated and adopted, including IT BCMS requirements, policy, business impact analysis (BIA), risk analysis/assessment, strategy, IT business continuity plan (IT BCP), processes and relevant guidance. The project is also aligned with the continuity plan of the trans-European systems and the TEMPO methodology framework.

2. DG TAXUD SOA ARCHITECTURE OVERVIEW

The future SOA architecture is built according to the circles of trust principles, stating that only specific classes of actors will be authorised to access the different platforms and focusing the platforms on their core functionalities.

- Untrusted actors such as Traders or 3rd countries will only access SPEED2(ng);
- Trusted actors such as Member States, EC users and systems access CCN2(ng) and CCN/CSI;
- The CDCO/TSOAP applications are not directly accessed by external entities (except EC entities) but are accessed through the other platforms;
- The UUM&DS platform can be accessed by all entities.



A summary of the usage of the platforms:

- CDCO/TSOAP will host the centrally deployed and centrally operated SOA-Enabled applications;
- SPEED2(ng) will become the Single Entry Point for all Traders (untrusted actors) interactions next to the existing messaging flows with Third and Partner Countries;
- CCN2(ng) is the platform supporting Member States interactions for all new applications using the SOA Paradigm;
- CCN/CSI currently remains the platform supporting Member States interactions for legacy applications using the CSI Paradigm.

The guiding principles are to standardize, simplify, and improve reliability, availability and performance by:

- Aligning all platforms in terms of system design by using common standards (e.g. hardware, operating system, security mechanisms);
- Standardisation and simplification will help to gradually reach the MASP Gold service (99.8% availability);
- Deliver performance required by new Customs applications (e.g. ICS2).

TAXUD platforms such as CCN2, SPEED2 & Application Platforms are conceived to support public services in line with the European Interoperability Framework Conceptual Model.²

2.1. CCN2(ng)

CCN2(ng), which is a specific project in the MASP, is the evolution of the current CCN architecture and services. The CCN/CSI operational infrastructure consists of a closed,

²Annex 2 to the Commission communication on interoperability "Towards interoperability for European public services", Dec 2010 COM (2010)744.

secured network infrastructure that is provided by the European Commission to facilitate the exchange of information between the National Administrations (NAs) of the Customs and Taxation areas.

CCN2(ng) applies a SOA architecture and provides a set of value-added services to support the evolution of new application development and deployment paradigms. Applications to be developed will use this new CCN2 infrastructure.

CCN2 evolution is in line with the global TAXUD architecture consolidation, encompassing the notions of the circles of trust and integrating with the shared services capabilities.

2.2. SPEED2(ng)

SPEED2(ng) is an evolution of the existing SPEED2 platform. SPEED2 is currently used for different Business Flows between Third and Partner countries, Member States and partner DGs. For example Mutual Recognition Agreements, Customs Single Window and OECD Common Transmission System. The evolution will provide a set of new capabilities and the scope will be extended to accommodate for other actors.

The architecture is based on the SOA paradigm, allowing heterogeneous systems and platforms to communicate with SPEED2(ng) while maintaining their own architecture. Additionally, SPEED2(ng) will have the capability to host applications that require user interface. In other words, on top of the system-to-system existing interactions, a user-to-system capability will be added.

SPEED2(ng) evolution is in line with the global TAXUD architecture consolidation, encompassing the notions of the circles of trust and integrating with the shared services capabilities.

2.3. Centrally Deployed Centrally Operated (CDCO)

CDCO is an evolution of the existing TSOAP platform. The evolution is comprised of moving several capabilities to the SPEED2(ng) platform and the scope will be extended in order to accommodate the basic principles of the circles of trust.

The architecture of the CDCO platform keeps the same approach as its predecessor since it is based on the SOA paradigm, allowing heterogeneous systems to communicate with CDCO while maintaining their own architecture. CDCO will keep hosting applications for system-to-system interactions, as well as holding user interfaces for internal and trusted users. Other user-to-system capabilities, i.e. those used by external parties, will be moved to SPEED2(ng) or CCN2(ng).

CDCO will host application components in a flexible and modular way, adapting easier to business changes and benefiting from the reuse of existing functionalities. This approach is in line with the European Interoperability Framework that recommends reusing, as much as possible, existing service components.

2.4. Shared Services (SSV)

Shared Services (SSV) are an evolution and consolidation of capabilities, which are common across all DG TAXUD platforms. Shared Services accommodate the basic principles of the Circles of Trust.

In the initial phase, Shared Services will provide Monitoring, Logging, Auditing, and Archiving capabilities. Gradually these will be expanded with additional capabilities such as Security, Backup and Restore, and Governance.

The architecture keeps the same approach as it is based on the SOA paradigm, allowing heterogeneous systems and platforms to communicate with Shared Services while maintaining their own architecture.