

eGovernment interoperability in the context of European Interoperability Framework (EIF)

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Abstract: European Commission recognized interoperability as a key factor in development of national eGovernment in the member states of European Union (EU) and as the unique eGovernment at the level of EU. The European Interoperability Strategy (EIS) and the European Interoperability Framework (EIF) which are used for European public services represent two key elements in the Digital Agenda for Europe promoting together interoperability among public administrations.

Since National Interoperability Framework (NIF) of the Republic of Serbia was adopted on January, 10th 2014, until then the development of eGovernment in the Republic of Serbia had been in accordance with EIF where EIF had been the only document and guideline relating to eGovernment interoperability in the Republic of Serbia. This study shows eGovernment interoperability in the context of EIF and the proposed solution of connecting portal of eGovernment and Ministry of Interior Affairs (MOI) Republic of Serbia through Enterprise services bus (ESB).

Keywords: eGovernment interoperability, European Interoperability Framework (EIF), National Interoperability Frameworks (NIF), SOA, web services, GSB, ESB

I. INTRODUCTION

eGovernment is based on digital interactions between a government and citizens (G2C), government and businesses/Commerce (G2B), government and employees (G2E), and it is also based on government and governments/agencies (G2G). The European Commission made a definition by which eGovernment means the usage of the combination of information technology, organisational changes and new skills in public administration, so that public services could be improved and strengthen democratic processes could support public policies [1].

According to the European Commission „if eGovernment services want to support the single market and its allies in fight for freedom, not only interoperability both within and across organisational and administrative boundaries is needed, but also across national boundaries with public administrations in other Member States. This will result in evolving interoperability with the enterprise sector—[1].

Interoperability has a specific importance if eGovernment tends to achieve its full potential. The importance of interoperability is most clearly seen in the

situation where it does not exist and its deficiency results in an inability to exchange documents and to make connections and in lost of valued time and possibilities [2]. Interoperability enables the seamless eGovernment in EU.

According to European Commission „the interoperability of ICT systems, share and re-usage of information and join up of administrative processes first in public sector organisations within themselves then between themselves is crucial for the provision of high quality, innovative, seamless and customer-centric eGovernment services—[2].

EIF is defined by sets of legal acts, standards and recommendations which describe the way in which member states in European public services agreed on or the way in which they should agree in order to establish cooperation. The European Interoperability Framework [3] has the following purpose:

- a promotion/popularization and support to the delivery of European Public Services by fostering cross-border and cross-sectoral interoperability;
- a guidance in public administrations' efforts in order to provide European public services to businesses and citizens;
- to make compatible and bind together the various National Interoperability Frameworks (NIF) in a European dimension.

A set of recommendations and guidelines for eGovernment services is defined by European Interoperability Framework, so that public administrations, enterprises and citizens could interact across borders in a pan-European context.

EIF comprises the following interoperability layers:

- Political,
- Legal,
- Organisational,
- Semantic and
- Technical.

Three basic interaction scenarios are represented in EIF which show interaction ways in European Public Services between member states.

EIF promotes public sector conceptual model which consists of three layers: basic public functions, secure data exchange and aggregate public services, detailed in the following sections.

The premise that each Member State has, or is in the process of developing its national Government Interoperability Framework (GIF) is the base of the EIF. As a result, the EIF concentrates more on supplement than

replacement, and on National Interoperability Frameworks which gives a pan-European dimension [3].

EIF had a special importance for the development of eGovernment in Serbia because NIF had not been adopted in the Republic of Serbia for a long time (January, 10th 2014). The development of eGovernment in the Republic of Serbia was based on Strategy and action plan for the development of eGovernment until 2013 while EIF was the only one document relating to eGovernment interoperability.

According to these two documents, the concept of eGovernment in the Republic of Serbia started realizing where the access point for citizens and business users is eGovernment portal. Business processes which support eGovernment services are performed at eGovernment portal and exchange necessary data and information with other public authorities directly through web services.

Since a significant degree of interoperability in the development of eGovernment of the Republic of Serbia has not been achieved until now, the exchange of data and information directly through web services satisfied the needs. In order to provide a simple and safer but more complex data exchange between eGovernment portal of the Republic of Serbia and other public authorities, the implementation of Government Services Bus (GSB) is necessary.

The information system of the MOI of the Republic of Serbia IS is based on Services Oriented Architecture (SOA) which is based on web services. Enterprise Services Bus (ESB) is implemented in SOA architecture as an independent component which enables web services to communicate between themselves.

In this study, the solution of connecting the portals of eGovernment and MOI through ESB, that is connecting of GSB of the Republic of Serbia and MOI of the Republic of Serbia is proposed and described.

II. EGOVERNMENT INTEROPERABILITY

The European Commission made a definition by which eGovernment means the usage of the combination of information technology, organisational changes and new skills in public administration, so that public services could be improved and strengthen democratic processes could support public policies [1]. The improvement of the quality of public services, encouragement of the democratic processes and support of community objectives are the goal.

Defined by Commission's initiative, eGovernment is:

- an open and transparent: public administration is able to comprehend expectations of the citizens, is responsible and open to democratic participation,
- excludes none: user-centred public administration must reach everyone with personalized services,
- effective public administration: operates efficiently saving time and cost in order to collect money from taxpayers.

There are a various number of definitions for interoperability. We quote four definitions given by the IEEE [4] [5]:

1. –The ability of two or more systems or elements to exchange information and to use the information that has been exchanged”;
2. –The capability for units of equipment to work efficiently together to provide useful functions”;
3. –The capability—promoted but not guaranteed—achieved through joint conformance with a given set of standards, that enables heterogeneous equipments, generally built by various vendors, to work together in a network environment”;
4. –The ability of two or more systems or components to exchange and use the exchanged information in a heterogeneous network”.

According to the „European Interoperability Framework for pan-European eGovernment services— report, „Interoperability means the ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable sharing of information and knowledge.—[6]

The eGovernment Working Group of the European Public Administration Network (EPAN) report proposes „ Interoperability is the ability of a system or process to use information and/or functionality of another system process by adhering to common standards—

„The Role of eGovernment for Europe’s Future—report suggests that interoperability is —. the means by which this inter-linking of systems, informations and ways of working will occur: within or between administrations, nationality or across Europe, or with the entrprise sector— [7].

e-Government interoperability, in its broad sense, is the ability of government constituencies to work together. At a technical level, it is the ability of two or more diverse government information and communications technology (ICT) systems or components to meaningfully and seamlessly exchange information and use the information that has been exchanged [8].

eGovernment interoperability is very important for enhancement of governments and effectiveness for the delivery of basic public services to all citizens and business users. eGovernment interoperability provides better decisions and better governance within public sectors. This kind of governance enables citizens and business users an easier and faster access to government information and services.

Most governments of EU accepted the design of national eGovernment strategies and are implementing priority programs.

eGovernment interoperability is important for both governments of member states of European Union and states which are to become part of European Union.

eGovernment interoperability is realized by adoption of standards and architecture. Standards are provided by Government Interoperability Framework (GIF) which represents a set of standards and policies that a government uses to specify the way in which public sectors, citizens, and partners interact with each other.

The GIF includes the technical specifications that all public sectors involved in eGovernment implementation should adopt. These standards relate to:

- Business process or organisational interoperability;

- Information or semantic interoperability; and
- Technical interoperability.

eGovernment interoperability architectures are provided by Enterprise Architecture (EA) and SOA. IEEE defines architecture as “the fundamental organisation of a system, embodied by its components and their relationships to each other and to the environment and by the principles guiding its design and activity.” [9].

An Enterprise Architecture (EA) is a strategic planning framework that relates and aligns ICT with the governmental functions that it supports [9]. The Danish government has defined EA as a “common framework that ensures general coherence between public sector IT systems at the same time as the systems are optimized in terms of local needs.” [11].

A SOA is an “enterprise-wide IT architecture that promotes loose coupling, reuse, and interoperability between systems” [12]. A service orientation defines the needs and outcomes of eGovernment in terms of services, independent from the technology (the hardware platform, operating system, and programming language) that implements them.

What distinguishes SOA is its implementation of “a service platform consisting of many services that signify elements of business processes that can be combined and recombined into different solutions and scenarios, as determined by the business needs” [12]. This capability to integrate and recombine services is what gives a service oriented enterprise the agility needed to respond quickly and effectively to new situations and requirements.

III. EUROPEAN INTEROPERABILITY FRAMEWORK (EIF)

European interoperability framework is defined as , “an interoperability framework is an agreed approach to interoperability for organisations that wish to work together towards the joint delivery of public services. Within its scope of applicability, it specifies a set of common elements: vocabulary, concepts, principles, policies, guidelines, recommendations, and practices”[3].

The European Union's interoperability strategy which has for its goal to provide guidelines and give priority to activities necessary for improvement of interaction, exchange and cooperation between European public services, across the borders and between sectors in order to provide public services in Europe is based on European Interoperability Framework responsible for provision of user-centred eGovernment services and facilitating a pan-European level of interoperability of services and systems between public administrations, as well as between administrations and the public (citizens, businesses). The common, uniform approach to interoperability with agreed vision that until 2015 interoperability enables a high degree of adoption of public services provision in Europe by:

- Adequate organisations and processes of government in accordance with policies and goals of European Union;
- A safe exchange of information enabled through common adopted, cohesive and coordinated initiatives for interoperability when creating of legal environment, creating of interoperability framework and agreements on standards and rules of interoperability.

In strategy is emphasized that activities should be coordinated at the level of European Union and member states and interoperability governance should be established at the level of European Union. Interoperability is considered to be a key segment for efficient and effective provision of public services in Europe in all frameworks of policy of European Union.

EIF is based on a premise that each member state of European Union has or is in a procedure of creating a national framework of government interoperability. Having that in mind, EIF is more focused on the adding on process than on the process of replacement of national frameworks of interoperability giving them pan-European dimension.

EIF mostly deals with pan-European dimension of interoperability, besides this, it has significance at the national level.

The figure 1 represents European interoperability framework.

Interoperability is both a prerequisite for and a facilitator of the efficient delivery of European Public Services. Interoperability relates to:

- cooperation between public administrations aiming at the establishment of public services;
- exchanging information between public administrations to fulfil legal requirements or political commitments;
- sharing and reusing information among public administrations to increase administrative efficiency and reduce administrative burden on citizens and businesses; leading to:
- improving public service delivery to citizens and business by facilitating the one-stop shop delivery of public services;
- reducing costs for public administrations, businesses and citizens through efficient and effective delivery of public services. [3]

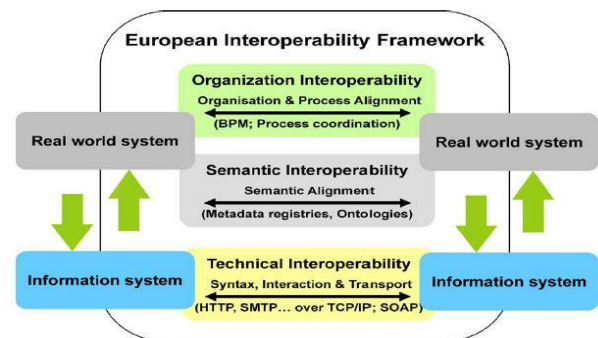


Figure 1. European interoperability framework [10]

EIF defines a conceptual model which describes an organising principle underlying the construction and operation of European Public Services and emphasizes a building-block approach to the construction of European Public Services, allowing for the interconnection and reusability of components when building new services.

The EIF represents 12 important principles:

- The first principle sets the frame for community action in the area of European Public Services (1. subsidiarity and proportionality);

- The second principle sets generic user needs and expectations (2. User Centricity, 3. Inclusion and Accessibility, 4. Security and Privacy, 5. Multilingualism, 6. Administrative Simplification, 7. Transparency and 8. Preservation of Information);
- The third principle sets a foundation for collaboration between public administrations (9. Openness, 10. Reusability, 11. Technological Neutrality and Adaptability and 12. Effectiveness and Efficiency).

IV. CONCEPTUAL MODEL

EIF v2.0 promotes a conceptual model as a model which provides the reuse of information, concepts, patterns, solutions, and standards in Member States and at European level for European Public Services.

European public services are based on data and information in different locations and administration levels in different member states. Beside this, they combine basic services constructed independently by public administrations in different member states.

The conceptual model starts from the fact that it is necessary to provide modularity, loosely coupled service components which are interconnected through the necessary infrastructure, and all of them work together, so they could provide the delivery of European public services.

According to the conceptual model, service orientation to system conception and services development is in the first plan. Service orientation is a specific style of creating and using business processes. Business process is realized as a set of services. The figure 2 represents the conceptual model of European interoperability framework.

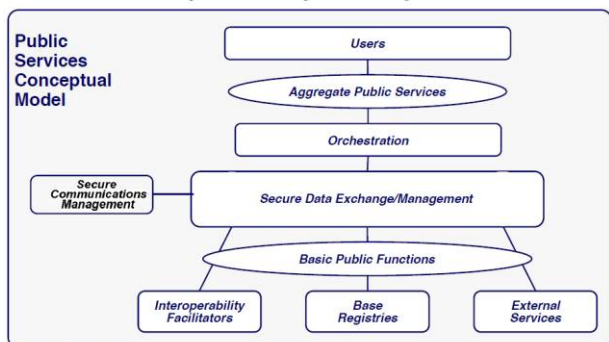


Figure 2. Conceptual model

The special recommendations relating to conceptual model are recommendations number 8 and number 9:

- „ Public administrations should develop a component based service model, allowing the establishment of European Public Services by reusing, as much as possible, existing service components.—
- Public administrations should agree on a common scheme to interconnect loosely-coupled components and put in place the necessary infrastructure when establishing European Public Services.—[3]

V. INTEROPERABILITY LEVELS

The EIF considers few interoperability levels:

- Political interoperability;

- Legal interoperability;
- Organisational interoperability;
- Semantic interoperability;
- Technical interoperability;

Political interoperability

Political interoperability relates to cooperating partners with compatible visions, aligned priorities, and focused objectives.

Recommendation 13: Public administrations should obtain political support for their interoperability efforts required for the establishment of European Public Services [3].

Legal interoperability

Legal interoperability relates to aligned legislation so that exchanged data are accorded to proper legal weight.

Recommendation 14: Public administrations should carefully consider all relevant legislation linked to the information exchange, including data protection legislation, when envisaging the establishment of a European public service [3].

Organisational interoperability

Organisational interoperability relates to coordinated processes in which different organisations achieve a previously agreed and mutually beneficial goal.

Organisational interoperability defines business goals, aligns and coordinates business processes and brings collaboration capabilities to organisations that want to exchange information and may have different internal structures and processes. The aim of organisational interoperability is to satisfy the requirements of the citizens and business users by making services available, easily identifiable, accessible and user centric. It is the ability of organisations to provide services to each other as well as to users or customers or to the wider public in the case of administrative organisations.

Common organisational problems to be solved in enterprise networking at an organisational level include, but are not limited to: different human and organisational behaviors, different organisational structures, different business process organisations and management approaches, different senses of value creation networks, different business goals, different legal bases, legislations, cultures or methods of work and different decision-making approaches [10].

In order to achieve an organisational interoperability, it is needed to coordinate business processes of cooperating administrative entities, define synchronization steps and messages and define coordination and collaboration mechanisms for inter-organisational processes.

Business Process Management (BPM) is realized by Business Process Management (BPM) tools and methods required for the modeling and control of these business processes, workflow engines for the coordination of the execution of the process steps defined as business services, collaborative tools and enterprise portals to provide user-friendly access to business services and information pages made available to end-users.

A standard language for modeling and analyzing business processes at the business level is BPMN (Business Process Modeling and Notation) version 2.0.

Semantic interoperability

Semantic interoperability relates to precise meaning of exchanged information which is preserved and understood by all parties.

Semantic interoperability is defined as the ability to share, aggregate or synchronize data and information across heterogeneous information systems. Semantic interoperability deals with data and information integration and consistency issues to support cooperation and collaboration, and especially share of knowledge and information. It is necessary to provide that two systems which collaborate safely interpret common or shared data and information in a consistent way.

Semantic barriers and problems which are necessary to be solved are: syntactic and semantic heterogeneity of information, semantic gap, database schema integration with naming problems (E.g. homonyms and synonyms), structural logical inconsistencies, etc.

It is necessary to provide systems which interpret the meaning of data, information and knowledge. The simplest solution is to build shared metadata repositories. Metadata repositories describe the contents and intent of data stored in the various information systems used in the enterprise or by other administrative entities. For example, LDAP for users, IT resources metadata, and UDDI repositories for Web service registries and thesauri [10].

Ontological models are expressed by RDF (Resource Description Format) and OWL-S (Web Ontology Language) according to W3C recommendations. "The ontology is used as a pivotal language to map concepts used in one system with concepts of another system and to resolve the semantic impedance mismatch." [10]

Recommendation 18: Public administrations should support the establishment of both sector-specific and cross-sectoral communities aimed at facilitating semantic interoperability and should encourage the sharing of results produced by such communities through national and European platforms [3].

Technical interoperability

Technical interoperability relates to planning of technical issues involved in linking computer systems and services.

The technical interoperability (syntactical interoperability) provides the technical foundations. The goal is facilitating communication and interchange in terms of communication protocols, data exchange and message passing among application systems. This aspect of interoperability is developed very fast thanks to the development of ICT.

In order to provide the building of loosely coupled systems in which applications support administration business processes made of web services, exchange messages (in synchronous or asynchronous modes) using neutral formats (XML or XML-based) and simple transfer

protocols (E.g. HTTP/HTTPS, SMTP, MIME, JMS or SOAP over TCP/IP) [10].

"State of the art" techniques for building integrated or interoperable enterprise systems are SOA based on web services. SOA provides the using of the existing systems as services where those services are wrapped legacy systems and expose functions. On the other hand, SOA provides building of new systems as a composition of web services executed on different servers, remotely located and communicate over internet.

SOA has provided that long term used solutions: Object Request Broker (ORB) and Enterprise Application Integration (EAI) are replaced with new Enterprise Service Bus solution. Due to ESB the usage of new technologies based on new languages and standards, namely HTTP, SMTP or JMS (Java Messaging System) over TCP/IP at the data transport level, SOAP (Simple Object Access Protocol) or RosettaNet at the messaging level, WSDL (Web Service Description Language) at the service description level, UDDI (Universal Description, Discovery and Integration) repositories at the service publication and discovery level and BPEL (Business Process Execution Language) at the service composition level is enabled [13].

Recommendation 19: Public administrations should agree on the standards and specifications to be used to ensure technical interoperability when establishing European Public Services [3].

VI. REALIZATION OF INTEROPERABILITY BY GSB IN EGOVERNMENT OF THE REPUBLIC OF SERBIA

The development strategy of eGovernment for the period from 2009 until 2013 and the action plan which follows this strategy is based on the possibility of applying ICT in the public sector of the Republic of Serbia. In accordance with this strategy, the development of eGovernment in the Republic of Serbia is considered as prevailing decentralized model of eGovernment with a single access point to eGovernment services. eGovernment portal represents the point where citizens and business entities access to eGovernment services in order to do business with the country, whereas each public authority of the Republic of Serbia is in charge of a provided service and keeps the overall responsibility for the quality of services and data it is in charge of.

Most of public authorities in the Republic of Serbia have their own information system (IS). Some of IS are within the network of public authorities (NPA) whereas others are not. IS which are not within NPA and have their own network must be connected to NPA in order to support eGovernment business processes at government portal. For example, IS of MOI is not within NPA and in order to connect with NPA and eGovernment portal, EXTRANET of MOI Republic of Serbia was developed [14] [15].

In order to provide a higher level of interoperability and safer data exchange, information and knowledge, it is necessary to implement Government services bus (GSB) in eGovernment of the Republic of Serbia.

ESB in EXTRANET zone has already been implemented in information system MOI in order to

provide simpler and safer connection with other public authorities.

Figure 3 represents a proposal of implementation of interoperability in the government of the Republic of Serbia. The connection between eGovernment portal and information system of MOI through ESB (GSB and ESB) is presented. Besides this, the examples of connection of eGovernment service at eGovernment portal with services and records stored in MOI are given.

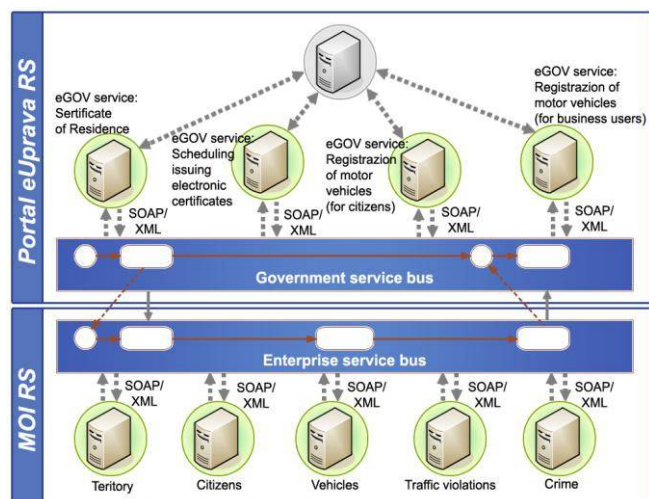


Figure 3. Interoperability GSB - ESB

The realization of GSB would provide:

- a platform for a high level of interoperability of information systems of public authorities of the Republic of Serbia;
- a platform for a standardized integration of public authorities of the Republic of Serbia;
- a safe data exchange between public authorities of the Republic of Serbia;
- a simple registration of the services at eGovernment portal;
- a tight coupling with a module for generating of electronic services at eGovernment portal;

CONCLUSION

European interoperability framework supports the strategy of European Union in sense of provision of electronic government services which is adapted to users enabled at pan-European level, in sense of provision of interoperability services and systems between public sector as well as between public sector and public (citizens and business entities).

EIF represents a conceptual model as a model which provides a reuse of information, concepts, patterns, solutions, and standards in Member States and at European level for European Public Services and considers few levels of interoperability: political interoperability, legal interoperability, organisational interoperability, semantic interoperability, and technical interoperability. Besides this, EIF promotes few interaction scenarios.

e-Government interoperability, as the ability of government constituencies to work together, is very important for enhancement of governments and

effectiveness for the delivery of basic public services to all citizens and business users.

Service oriented architectures based on web services provide architectures for eGovernment interoperability in accordance with EIF.

GSB provides secure, aligned and controlled exchange of data and use of electronic services.

The connection of IS MOI Republic of Serbia and eGovernment portal of the Republic of Serbia through ESB would provide the solution which would support a simple, safer and faster development of eGovernment of the Republic of Serbia.

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