Architectures for the Development of the National Interoperability Framework in Romania

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The authors of Digital Agenda consider that Europe do not take fully advantage of interoperability. They believe that we need effective interoperability between IT products and services to build a truly Digital Society. The Digital Agenda can only be effective if all the elements and applications are interoperable and based on open standards and platforms. In this context, I propose in this article a specific architecture for developing Romanian National Interoperability framework.
Keywords: *interoperability, collaborative working environment, cloud computing*

1 The Interoperability dimensions from the European Interoperability Framework.

Political context. The political support for achieving interoperability is an absolute necessity. For action cooperation to be effective in the achievement of the common objectives, it is necessary that partners share common visions, focus their efforts and resources in the same directions, use the same timeframe and synchronize their changes determined by mutual agreement.

In the European context, the political support for the achievement of interoperability can be reflected by the specific political instruments, such as the European Directives, ministerial statements and multiannual programs. These instruments express the vision and the priorities of the European policy makers, in whole or in part. The level of funding, the budgetary issues, the measures and deadlines imposed can offer additional details about the political priorities and the understanding of the political context.

An important challenge in the context of political changes in the European Union is the management of the cross-border services development in order to ensure their continuous development and support. Namely, the challenges are:

avoidance and/or prevention of divergences in the vision of interoperability and the insufficient support in the member states. The best way to ensure a continuous support is through the ongoing activities of the various bodies of coordination and consultation, especially any permanent structures dealing specifically with the interoperability problems.

Legislative aspects. The interoperability requires proper timing of the legislation in the Member States which are cooperating so that the electronic data from any of the Member States can be in accordance with the law and recognized wherever it is necessary to be used in any other Member State.

Speaking of the legislative aspects of the interoperability, these are necessary for a variety of reasons, especially for: mutual recognition of electronic data from other Member States of the Union, mutual assistance for process integration and cross-border processes through competent institutions of the Member States. A solution for the legislative problems which are related to the lack of legislative clarity of electronic data protection is the implementation of some pilot systems for several Member States. Afterwards, their example may be followed by other countries. Thru these pilot systems the market entry barriers are reduced, eliminating the need to solve conflicts and other problems that may result from the compliance ([9,10]) of the 27 sets of constraints.
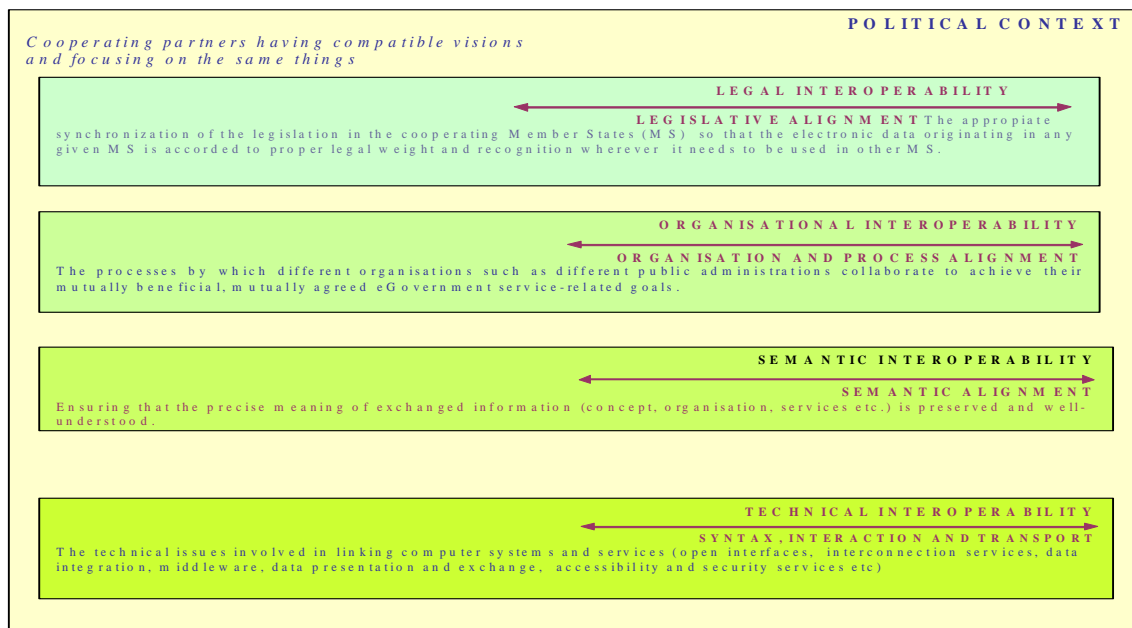
Fig. 1. The interoperability dimentions from the European Framework of Interoperability, version 2.0.

The data protection in the cross-border context is one of the key legal issues. The question that arises here is whether there is enough legal and operational support to cover the entities and the mechanisms which are responsible for ensuring data protection. The answer to this question may be provided by a data protection strategy, which should include elements such as the designation of one or more data protection authorities and a planning for the establishment of some collaborative structures and of the associated mechanisms. The Commission and the Member States should assess the impact of the legislative proposals on the ICT and the interoperability should be included as a standard criterion in the public procurement process being preferred the choice of some open standards and specifications.

Organizational Interoperability - The organizational interoperability allows the definition of the business objectives, the business process modeling and the collaboration of the administrations which want to exchange information and have internal structures and different business processes. The organizational interoperability addresses to the users requirements through the implementation of the basic electronic services, making them easily identifiable and user-centered. For a better approach between public administration and citizens or companies, the Member States use the important events in the lives of citizens (birth, marriage, death, etc.) and the business stages for the companies (the setting up of a business, the liquidation, etc.) by providing them under the form of basic services by electronic means. In this way citizens and companies remain focused on their needs and do not have to focus their efforts on the understanding of the functional organization specific to the public sector. The provision of the services is transparent and customer oriented.

Each of the life time events and of the stages of business is associated with the relevant actions and with interactions with and among public institutions. Electronic services may involve one or more business processes to be performed in a given sequence between different administrations.

The cross-border services should be determined jointly by the participating administrations through a demand-driven approach, but the responsibility should be decentralized.Decentralized responsibility involves the ability of each partner to organize its business processes in a manner best suited to its national practices. It is

unrealistic to believe that the administrations of different Member States will be able to harmonize business processes due to the cross-border requirements. The stages and the internal processes of a Member State may remain unchanged only if the "points of entry" and "exit" to these processes are made transparent and interoperable to other Member States which are involved.

The public institutions that are providing cross-border electronic services should analyze the business processes involved and to agree on interoperable interfaces Business (IIB) and on their specific standards (Fig. 2.).
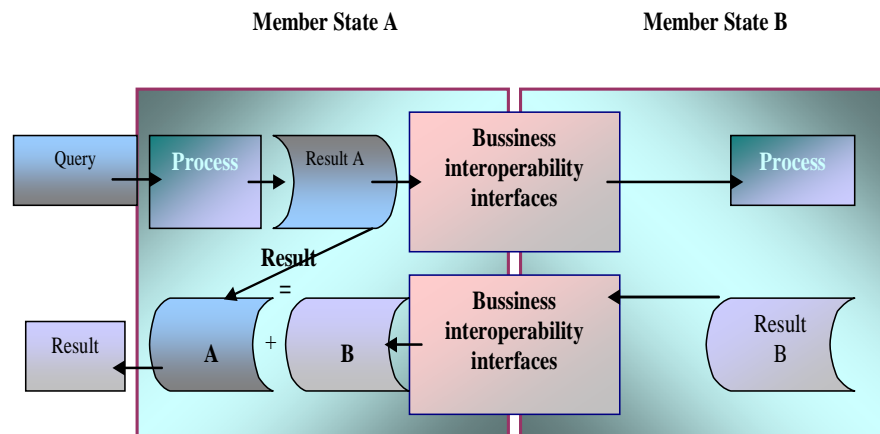

Fig. 2. Interoperable interfaces of business

IIB application is permitted if the administrations concerned have agreed in advance which are the cross-border services that are interested in, which business processes are involved in this, which administration provides the necessary functionalities for the interconnection between administrations through IBB of the national business processes (which may be completely different at the organizational, semantic and technical level).

To operationalize the cross-border processes there are necessary the following steps: the alignment of the business processes, the business process reengineering, the establishment of the service level agreements, the assessment and the dealing of the gaps, the change management, the enhanced collaboration. The entities (Member States, administrations) involved in the alignment of the business processes must align their used standards for describing business processes. A collection of business processes and the best practices in the Member States concerned is absolutely necessary because it allows the reuse of the best practices between Member States.

The business process reengineering is an interim solution to achieve organizational interoperability necessary to provide cross-border services. To achieve this it is necessary a cross-border effort to analyze the used business process, aimed at a common understanding of the business processes, identifying common elements and the decomposition of the process in the processes components in a way to allow the cross-border interconnection.

The establishments of agreements at service level allow formalizing specific aspects of the mutual assistance, joint activities, business processes "coupled" in order to provide cross-border services. One of the means is the memoranda of understanding between governments, detailing bilateral agreements on joint actions and cooperation. We consider the establishment of service level agreements as a standardizing cross-border activity, where the standards which have to be defined and implemented are exactly these instruments.

The assessments of the common assessment framework should be carried out at the sectorial level, in order to identify the real deficiencies of the business processes. The identification of the deficiencies allows the improving and the alignment of the business processes.

In order to set up the change management, the Member States must establish a change management strategy at national level and to integrate it in the action plans for achieving cross-border services.

The strengthening cooperation of the Member States is provided through:
- ✓ the cross-border exchange of information on business processes;
- ✓ the cross-border consultations about the taxonomy of business processes and its components;
- ✓ the cross-border coordination of the change management activities;
- ✓ the cross-border functional and sectorial coordination;
- ✓ the cross-border assessment of the sectorial deficiencies that affect specific activities electronic services;
- ✓ The cross-border consultation on the mechanisms and the orchestration architecture for the cross-border business process.

Semantic interoperability - Semantic interoperability allows to all application to understand the exchanged data and allows also to the systems to combine information and the resources in order to process them in a meaningful manner. In practice, this will involve the establishment of common sets of data structures, data and protocols. The data which is to be exchanged may become interoperable if the responsible administrations:
- ✓ publish the information on the data involved at national level;
- ✓ agree on data and data dictionaries needed across borders;
- ✓ agree on multilateral mailing lists

between different national and cross-border data.

The essential requirement for information exchange is the existence of a single language that allows the description of the meaning and the basic structure of data involved. The development of a common XML semantics must be done in a coordinated manner and it should be considered in cooperation with existing standardization bodies. The definitions and the European schemes should be made available to interested parties (stakeholders) through a common infrastructure. The Semic.eu portal aims to lay the foundations of semantic interoperability necessary for cross-border services in all the activity sectors and at all levels both conceptual as well as implementation.

The European Commission and the Member States should identify and support the development of the sectorial communities whose role is to enable semantic interoperability. The sectorial communities are the entities that have the best knowledge about the reference models, the services they use or offer and also the problems they are facing. The knowledge and the expertise of the sectorial communities' members should be focused on standardization efforts.

The national interoperability frameworks should take into account the transboundary nature of the semantic interoperability when the data dictionaries are developed.

Technical interoperability - Technical interoperability includes the key issues for connecting the systems and the services through open interfaces, through the interconnectivity of the services, through the interconnectivity of the data, through the exchange and the presentation of data, through the accessibility and secure services. Technical interoperability should be applied both at the front-office level (Fig. 3.) and at the back office level of the system (Fig. 4.).
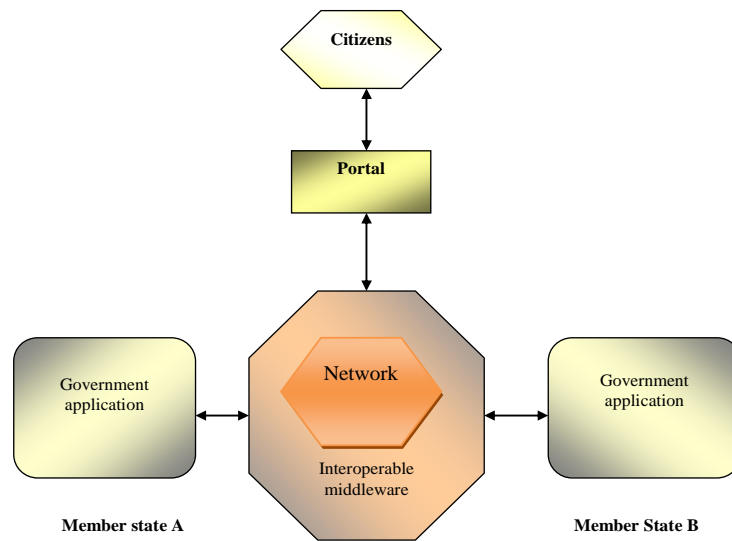
Fig. 3. The complex interactions through a portal

The aspects that have to be considered at front office in order to achieve the technical interoperability are:
- ✓ the exchange and the presentation of data;
- ✓ the availability – the design principles of interfaces;
- ✓ the multichannel access;
- ✓ the character sets;
- ✓ the file types and the documents format;
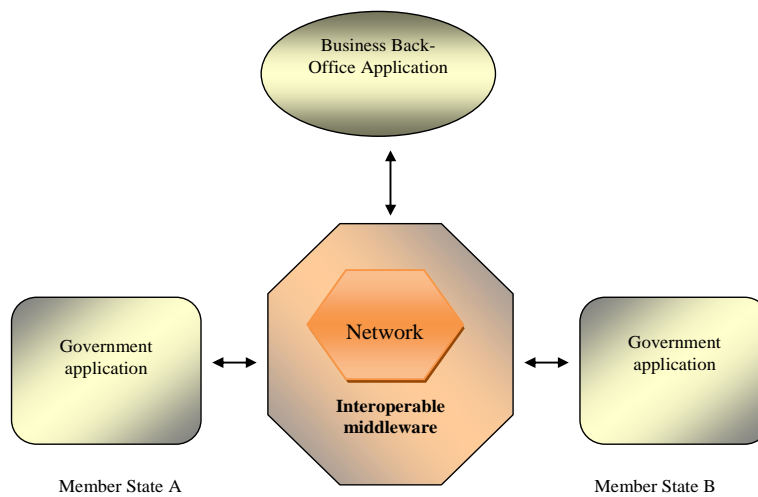- ✓ the file compression.

Fig. 4. Interactions in the middleware

The aspects that have to be considered at back-office in order to achieve the technical interoperability with the business applications from the back-office are:
- ✓ the integration of data;
- ✓ the XML-based standards;
- ✓ the EDI-based standards;
- ✓ the web services;
- ✓ the architecture of distributed applications;
- ✓ the interconnection of services;
- ✓ the transfer protocols of the messages and of the files;
- ✓ the security and the transport of messages;

✓ the messages storage services;
✓ the access to email;
✓ the services directory and type name;
✓ network services.

The European Union and the Member States administrations must have a clear and a precise image on the used technologies, on the technical expertise and the capacity of their staff and on the documentation of business processes. The administrations must also engage themselves in auditing, compliance and benchmarking to identify closed systems and other barriers in order to obtain technical interoperability.

Analyzing the information provided by the National Interoperability Frameworks observer (NIFO) [11], there is a list of the mature interoperability frameworks comprising the following countries: Bulgaria, Denmark, Estonia, Germany, Greece, Hungary, Italy, Poland, UK and Switzerland. Following a web analysis, there were eliminated from that list the frameworks that do not support an international language (English, French) and are not at least the second version. The new list includes Bulgaria, Estonia, Germany and the UK.

The specific frameworks from Bulgaria and Estonia provides general directions of their development and implementation without a detailed presentation, while Germany and the UK provides a detailed overview of the general directions of development and implementation, proposing solutions that can be integrated in other national interoperability frameworks.

Following these examples, the recommendation for the creation of the National Interoperability Framework in Romania is that this should be made in collaboration with Germany and UK which would increase its development through the transfer of know-how, best practice examples that can be provided by these countries.

2. National Interoperability Framework in Romania

A possible architecture for a collaborative solution [4,5,6] in order to develop, update and maintain the national interoperability framework in Romania is shown in Fig. 5.
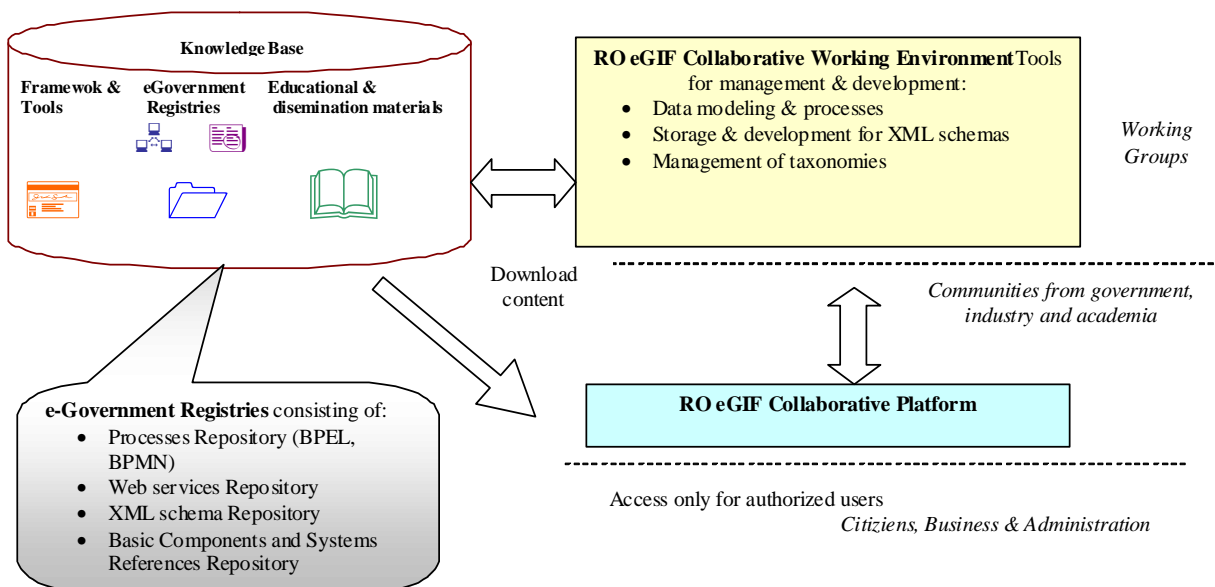

Fig. 5. The collaborative solution architecture for developing, updating and maintaining the National Interoperability Framework of Romania (ROeGIF)

The collaborative platform should contain at least 4 components: a content management system made by the working groups with the purpose to disseminate research conducted by multichannel means, a system of training management related to the specific e-skills, an open social platform and a multilingual library of case studies in the field of e-Government, with the purpose to assess e-competences acquired through them.

The components of the collaborative platform must be interconnected.

To implement the proposed collaborative architecture it is necessary to use as many solutions (open source) and open standards as possible. They allow a better channeling towards the development of the required e-government components, the reuse and the improvement of the existing ones and, not least, the existence of a community of developers that can allow the further development of the prototypes proposed in our architecture. It should be also implemented a collaborative working environment using a private cloud architecture.

3. Collaborative working environment in the cloud

The architecture will be analyzed from two perspectives: one is for the cloud functional services and the other is for the systems involved in the cloud.

From the perspective of the functional services, the services and functionalities offered by cloud respond to the user's need which initiates a request for services or other resources through the self-service portal. The cloud applications are seeking for resources that meet the requirements using the cloud services portfolio. The access to resources and services is provided on through the portal too. The services are provided to the user by the administrator (cloud service provider). The administrator uses the management portal in order to make public the services that are offered through the cloud and to prepare resources to be used in the cloud. The portal represents an interface to a range of tools and reports, as it can be seen in Fig. 6.

The cloud services provided are: the services for business processes and information, services for software platforms and infrastructure services.

The services for business processes focus on providing existing business processes through cloud community. If the steps of an existing process are known, this can be provided as a service via the service catalog. This allows to the cloud services provider to automate any stage of the process while leaving the changes transparent to the client. Information can be provided as a service, thus enabling the organization to improve the relevance and to streamline costs for information. Information becomes available to the people, to the processes and to the applications, thereby improving operational impact.

The services for the software platforms allow the user to select an instance of particular software that is intended to be created without the need to know where and how it will be hosted. Such type of services includes workflows that enable the design, the development, the implementation and the hosting, and also the collaboration, the integration, the database integration, the security, the scalability, the storage, the persistence, the state management, the versioning applications, the orchestration and the possibility of developing a community of developers. These services are provided in the form of integrated web solutions. The key components of the services for software platforms include tools and services for developers, for using the software in a dynamic manner, for reporting and for optimized middleware - application servers, database servers and portal servers.

The infrastructure services enable the provision of standardized computing resources. They allow the user to request and receive the instance of a computer system without the need to focus on IT issues such as the placement in the network and hardware availability.

The Cloud Management Platform includes: business support systems, service delivery platforms, tools for

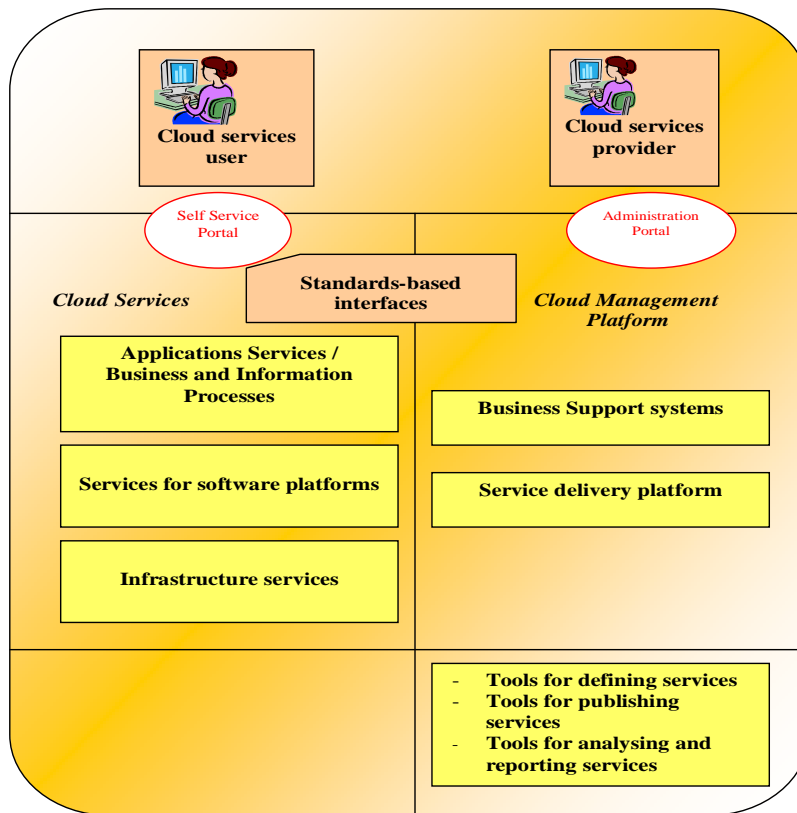defining, publishing, analyzing and reporting services.

Fig. 6. The proposed private cloud architecture - the perspective of functional services

The business support systems are designed to support the cloud services provider in taking orders, processing invoices and collecting payments. The services delivery platform enables rapid development and the implementation of services.

The tools for defining services allow the administrator to create and to modify the services offer that will be made available to the user, to define what information is needed in order to meet the user's demand, what are the necessary automated activities and manuals to meet this demand and what resources from the datacenter will be used. In addition, the administrator can establish the services level agreements and the costs associated with the entire request.

The tools for publishing the services allow the administrator to publish and to eliminate the types of requests from the

services catalog. The administrator can determine who can access the service and who may require a service. The tools for analyzing and reporting the services provide performance reporting to the owners of services and to their applicants.

A private cloud is composed of management environments and managed environments, as can be seen in Fig. 7.

The environment for the management of cloud services supports services throughout their life cycle. This layer acts as the control center that effectively manages the entire cloud environment. The combination between the environment for the services management and managed environment by cloud ensures that resources are efficiently managed from the data center and can be predicted, provided and configured quickly. The products and the services that perform automated management help in defining and managing the supply of services associated

with hardware resources throughout the life cycle of the service. Automated management of services usually includes: the catalog of services, the management of services requests, service definition, image management, booking, instantiation of services, services discovery, monitoring, managing licenses and instance management.

The management of change and the management of configuration stores the information needed to support service management automation. This typically includes the following elements: service templates, topologies, management plans, booking and configurations.
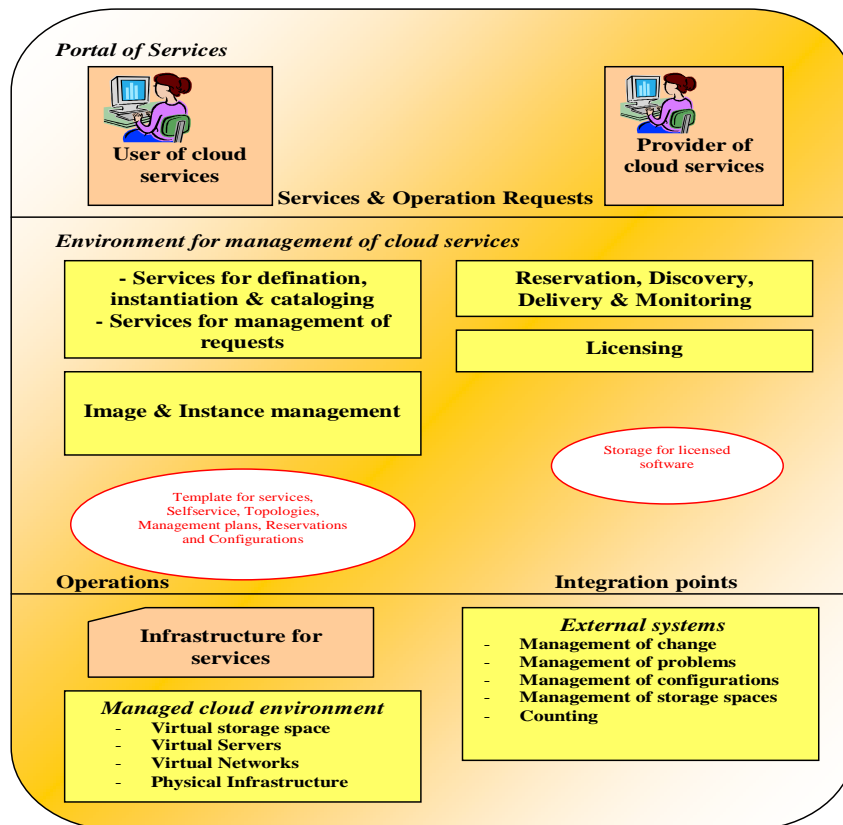

Fig. 7. The proposed private cloud architecture – the perspective of the systems involved in cloud

Managed cloud environment includes the physical and virtual hardware layer. They provide a flexible platform adapted to improve the resources utilization. In a virtualized environment, computing environments can be dynamically created, expanded, reduced, or removed depending on changes in demand. Virtualization is required for a dynamic cloud infrastructure because it provides important advantages of pooling, management and isolation of resources (multiple users and applications can share physical resources without affecting each other). Virtualization allows a set of underutilized physical servers to be consolidated into a smaller number of physical servers fully used, thereby contributing to significant cost savings. There are many forms of virtualization commonly used in today's IT infrastructures.

A common interpretation of server virtualization is the mapping of natural resources more logical representations or more partitions. The logical partitions (LPARs) and virtual machines (VM) are examples of this.

The layer of external systems represents integration points between the private cloud and the existing customer environments. Some examples of such integration points are: change management, problem

management, configuration management, storage management and metering areas.

Actions regarding the use of interoperability, open specifications and innovative e-Government were taken into account in developing the proposed architectures. Implementing collaborative solution for developing, updating and maintaining the Romanian National Interoperability Framework (RO eGIF) allows the integration of European expertise and reuse of interoperable electronic service solutions. The development of the collaborative platform and repositories involved in the development of the National Interoperability Framework was taken into account in the collaborative production of electronic services and reuse of public sector information. The open social platform contained in the proposed collaborative platform can the support action to facilitate the exchange of knowledge and experience for producing collaborative e-services and conducting activities for public sector information reuse. The private cloud architecture proposed for implementing the collaborative working environment supports the innovative e-Government action, by applying emerging technologies and paradigms.

4. Conclusions

I believe that the collaborative approach architectures proposed in this article are the best solution for Romania and for the implementation of the e-Government 2011-2015 Action Plan regarding production of the e-services by working with stakeholders and all interested parties. Proof of concept of proposed architectures may be a good starting point for the study which must be conducted in Romania according to the action plan.

Acknowledgment

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