

A NOVEL SERVICE ORIENTED ARCHITECTURE (SOA) TO SECURE SERVICES IN E-CITY

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ABSTRACT

Many cities in the world have moved toward being e-city using IT and there are some who have implemented it and or seeking out to make it operational. However, experience shows that implementation of e-city faces Challenges which the effectiveness of e-city, improvement of provided services and security are the most important part of these challenges. Today, for realization of a perfect e-city, to overcome faced challenges Such as security issues is an urgent need. Considering that e-city consists of multiple information systems, it's the most important challenge to create integration between these systems and provide its security which service oriented architecture as a computational model and an approach for data integration could largely overcome these problems. In this paper through studying challenges of information systems in e-city layers and with concentrating on advantages of service oriented architecture, a new architecture to improve the security of e-city's systems and their provided services and also overcoming the challenges of information systems has been proposed.

KEYWORDS

E-city, service-oriented architecture, information systems, integration, security as a service, Participation strategies

1. INTRODUCTION

In today's world, the rapid growth of cities and it's outpacing from managerial abilities and sources have hugely challenged them in providing adequate city services. According to the development of information and communication technology (ICT), governments are obliged to use of these technologies properly to remain in global competitiveness board and reduce costs and unemployment in their communities [1, 2].

There is no comprehensive and complete definition for e-city. Dr. Jalali One of the renowned experts in the field of IT. His definition of an e-city: "a city which can provide different city services, including government services, municipality services and the private sector in the areas of economic, social and cultural in 24 hours of a day and 7 days a week with appropriate quality by using information and communication technology"[1]. In other words, e-city is a project that focuses on improvement and updating of the engineering networks to create an information public space at a particular area [2, 3, and 4]. For maximum use and development of e-city, offer a

framework for the architecture of e-city is one of the most fundamental and most basic tasks [3] and includes of important sectors such as transforming from present state to an appropriate state that are general polices and lines of e-city development [5].

The most important stages in e-city development are safety and integration that makes the setting up effective communication with users to respond to questions and their needs possible. Different methods have been suggested to integrate of information systems in e-city [2, 3]. SOA is the most important approach used in this field and is a standard framework which in it, the services are creation, development and managed. Also, service-oriented architecture aim is the create an integrated and safety interface for city users and increase of agility of IT in order to rapid reaction to business changes [2, 6, 7]. Using this architecture, we can reduce the development costs of new elements and expansion of existing components. So, will increase speed, security and reliability of services and will recover integrated management of city network [4].

Continue on with this paper studying information systems, e-city architecture and challenges of information systems in e-city layers and with focuses on the benefits of SOA, a new architecture for improvement the security of e-city's systems, their provided services and increase the participation and also overcoming the challenges related to information systems has been proposed.

2. INFORMATION SYSTEMS

The IT architecture is an integrated framework for the pro-motion or maintenance of existing technology and acquiring new information technology to achieve the organization's strategic goals and management of its resources [2, 8]. The IT architecture which is also known as enterprise architecture is looking to provide an organizational framework for the coordination and alignment of all activities and elements of information technology within an organization. NIST Institute for IT architecture has introduced a 5-layer model which includes: Business architecture layer, information architecture layer, application or information systems architecture layer, data architecture layer and Technology architectures layer [2, 9]

- **Business architecture layer:** The order of this layer in an organization is missions, goals, perspective and its long-term strategies which in fact express existential cause of organization and the way that achieves its goals.
- **Information architecture layer:** Organization needs information and information functions to achieve their goals. In this layer, elements and information resources of an organization is being discussed. In other words, in this layer map of organization's proper information flow, is determined to achieve goals and strategies formulated in the previous layer.
- **Application or information systems architecture layer:** This layer will determine the number and types of proper applications which makes possible producing and accessing to information, to achieve the previous layer's information architecture.
- **Data architecture layer:** In this layer content and form of organization database, patterns of storage and their ex-change will be discussed.
- **Technology architectures layer:** In lowest layer necessary hardware, software and communication environment for the information systems implementation and information flow will be determined. Elements of this layer are exposed to the most rapid changes and transformation.

According to the model proposed by NIST, information systems fit in application architecture layer [2]. These systems are responsible for tasks such as information gathering, pro-cessing,

storage, analysis and distribution of information. Such systems make the effective use of IT in an organization possible [10, 11].

2.1 Benefits of information systems

TABLE1. BENEFITS OF INFORMATION SYSTEMS [2, 10, 11]:

❖ Greater participation in decision-making
❖ Increase the speed and quality of decision-making
❖ Increasing speed in identifying issues
❖ Establishing effective communication between the organization units as well as other organizations
❖ Increasing the speed, accuracy and functionality
❖ Improving the effectiveness and efficiency
❖ Get used for various applications in the enterprise
❖ Storage capability, recovery, analysis and information re-sources share

3. E-CITY

Electronics City (e-city) is a definition for expressing kind of services that can be offered to citizens of a community with modern e-services [1]. E-city is known as a structure for the provision of e-services to citizens. Which are consists of layers; Stakeholders, service providing channels, e-services and technology platforms [12]. The highest layer consists of industries, citizens and even governmental institutions. The next layer that acts as a channel of communication can also include a variety of browsers and types of telecom equipment. The electronic services layer consists of set of e-services such as electronic learning, electronic shop, electronic banking, electronic insurance. Platforms which provider e-services are located in last layer. These platforms are distributed in different organizations and locations, and each one is designed with specific technology on the other hand they are capable of interaction and incorporation with other platforms [2, 3, 12].

Another of major issue in implementing e-city is type of services. Type of service must be appropriate to the circumstances of a city, because each city has different characteristics. Its need to establish basic policies on the basis of policies conducted by other organs, to avoid wasting resources and systems should be implemented with high integrity [13]. This issue causes that government to develop their services with detailed plan and according to actual needs of cities. The introduced service will be integrated and the lifetime of the projects will be increased [2, 3].

3.1 Reasons of E-city implementation

The main reason for the investment and use of various technologies in the delivery of services to citizens is believe that city and managerial problems have inverse relation with citizens' awareness increase [1]. In Table 2 we can point to E-city achievements based on this important topic [1].

TABLE2. REASONS OF E-CITY IMPLEMENTATION

❖ Improve in management sight
❖ Integrated information system
❖ Optimizing information flow
❖ Suppliers' support and relations
❖ Change in organizational culture
❖ Decrease of fuel consumption
❖ Flexibility of organizational processes
❖ Increasing customers bargaining power
❖ Correct perception about customer's demand
❖ Decrease of necessary traffic, number of car accidents and their casualties

E-city is comprised of multiple information systems and one of the main challenges is the providing architecture for the interaction between information systems, increase security and integration of these systems to provide appropriate quality services to the users [2]. Therefore, according to service-oriented architecture capabilities as a computational model and an approach for integrating information systems and the interaction between them continue on with overview of service-oriented architecture, we propose a new service-oriented architecture to overcome the challenges of the security of information systems.

4. SERVICE ORIENTED ARCHITECTURE

SOA is lightness of design, which focuses on all aspects of implementation and using business services during their life cycle. It also is a way to prepare the required infrastructure for the exchange of information among different applications on any OS and programming language they've been created [2, 14]. SOA is a standard framework and its goal is increase of IT agility to rapidly respond to business changes and create an integrated interface for city users [6, 7]. Using this architecture can decrease the cost of developing new elements as well as the existing elements development and also speed, reliability and security will be increased and will improve the integrated management of city network [4].

The main goal of the provide a SOA is to cope with challenges such as the lack of integration and interaction of information systems in organizations and lack of the IT's ability to adapt the business's changes speed according to the organizations constant need to changing of processes and services, difference among experts of IT and experts of business in views [2, 3].

TABLE3: THE MOST IMPORTANT GOALS OF OFFERING A SOA [2, 3, 15]

❖ Upgrade IT coordinated with business
❖ Improvement of the interaction between organizations
❖ Flexibility of IT to respond to on-going changes in business
❖ Standardization and integration of platforms and IT substructures
❖ Flexibility of software components and improvement of the level of reuse

5. THE PROPOSED ARCHITECTURE

As we noticed, service oriented architecture is a good approach to create interaction and integration in e-city. But some challenges are hindering the implementation of e-city that the most important was stated security issues. Now we will propose an architecture which through implementation of e-city with it, large extent of security issues and challenges associated with it can be solved and with the notion fairly comfortable benefit from the services offered by e-city.

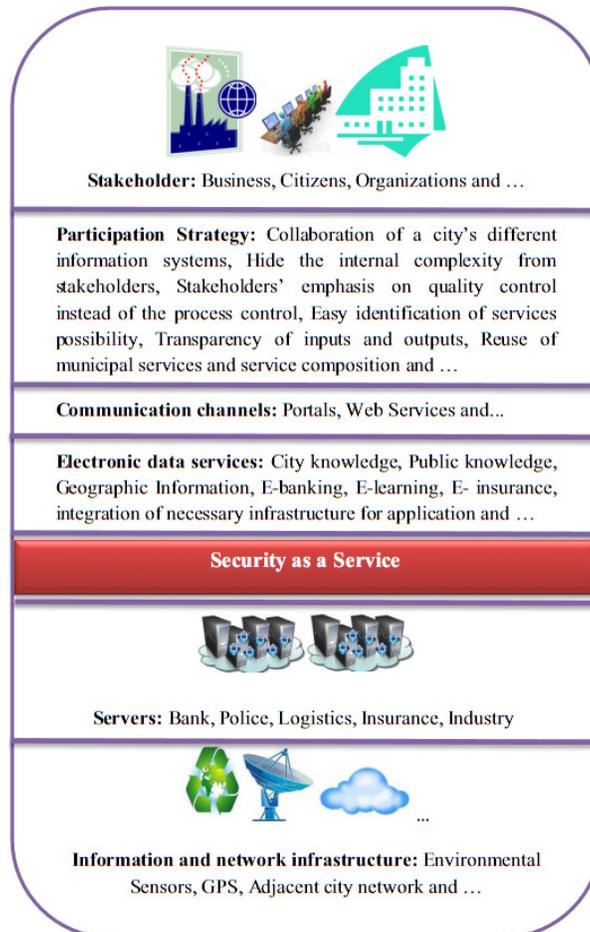


FIGURE 1. THE PROPOSED ARCHITECTURE TO SECURE SERVICES IN E-CITY

According to the architecture needs, each of the layers is responsible to the following tasks:

- 1) **Stakeholder layer:** provides APP services for users, organizations, citizens, etc.
- 2) **Participation strategies Layer:** This layer has been placed for strategies to get maximum attraction of citizens and explaining policies to participate in E-city.
- 3) **Communication channels layer:** this layer is placed to create a connecting bridge for accessing provided services by e-city, that can includes variety browsers and or telecommunication equipment connectable to the internet.

- 4) **Electronic data services layer:** this layer provides a broad collection of e-services such as e-banking, e-learning, e-insurance, integration of necessary infrastructure for application and data transfer to ultimate goal in network.
- 5) **Security as a Service layer:** this layer is to establish a secure and provide secure and reliable services to the users, in fact security as a service means that service applicant depending on the type of service and Concurrent with the re-requested service will request required Level security as a separate service. In simple words, based on real-world systems where necessary security is provided in accordance with the individual or organization position, here also depending on how important the requested service is, naturally it will need higher security to protect data. For example, a service requested by the user for banking needs stronger security compared to a service requested to perform simple administrative matters.
- 6) **Systems and Servers layer:** this layer is used to organize and process information, management of information flow and Services of data systems, City data and allocate them to knowledge base.
- 7) **Information and network infrastructure layer:** this layer is used to provide information and city systems. In fact, raw data will be given to upper layer by this layer to process and allocate them to knowledge base

6. CONCLUSIONS

Most of the activities are conducted over the Internet and electronic systems in e-cities and its purpose is citizens' access to all required information in entire week and at all hours and in a stable, reliable and confidential manner. The main challenge in architecture presentation for e-cities is to create interaction between information systems and create a trusted and secure environment. On this basis, and to overcome outlined challenges, we presented a 7 layered architecture, including stakeholders layer, participation strategies layer, channels of communication layer, electronic data services layer, security as a service layer, systems and servers layer and information and network infrastructure layer. The proposed architecture can partially overcome the problems mentioned and provides a secure and interoperable environment for e-city information systems. Also, the success of any system depends the number of users and the efficiency of the system. To increase participation in a system, elements of satisfying of users should be provided. Therefore, in the architecture that we proposed in a discrete layer we put elements such as the independency of the services during calls by various stakeholders, reuse of municipal services and service composition, transparency of inputs and outputs, easy identification of services possibility, stakeholders' emphasis on quality control instead of the process control, hide the internal complexity from stakeholders, collaboration of a city's different information systems to increase the participation and satisfaction of users of the system.

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