Intelligence Information System (IIS) with SOA-based Information Systems

Jugoslav Achkoski [1], Vladimir Trajkovik [2]
[1] Military Academy „General Mihailo Apostolski",
Str. Vasko Karangelevski bb, 1000 Skopje, Macedonia
[2] Faculty of Electrical Engineering and Information Technologies,
Str. Rugjer Boshkovik bb, PO Box 574 1000 Skopje, Macedonia
jugoslav_ackoski@yahoo.com , trvlado@feit.ukim.edu.mk

Abstract: *Intelligence Information System (IIS) is created in order to satisfy unique intelligence functions. Users of the system are part of a certain department, section, service or agency with the various specific features of the work, for the purpose of satisfying the processes of intelligence cycle.*

The information exchange or its use and availability to different participants depending on the information system security polices to a great extent helps authorities in the decision making process. It also helps them in the planning future steps. To achieve the above, a model of information systems integration that can be used with different technologies and different integration platforms has to be developed.

This paper presents the features of information systems required for integration with IIS, then it gives an overview of models for application integration and finally it presents a suitable solution model for the integration of different institutional information systems with IIS.

Keywords: Information systems, system integration, web service, legacy system, models of integration

1. Introduction

Integration of Information Systems is very important for the ongoing processes in intelligence, but also it is important for other spheres of society as well.

In [1] for defining future architectures is presented that authorities responsible for creating defense systems recognize need of creating general or full service oriented platform which will be used for operational military application and services. As an example of previous mentioned are the concepts for Network Core Services (Department of Defense (DoD)) and Network enabled core services (NATO). In the same framework, Australian Department of Defence suggested similar architecture (Single Information Environment Architectural Intent 2010). Implementing service platform is enabled with usage of COTS technology. Triton is integrated set of COTS software products, best practice and it comprises pattern which provides elements required to implement and integrate SOA in organization infrastructure, without financial implication for coding and modifying.

System Triton Core comprises Enterprise Service Bus (ESB) and core for services which connects other services, application and resource in order to establish "Net-Centric" solution. Created System Triton Core is solution which contributes to decrease costs of Australian Defense Department and Australian defense industry generally, and this solution raises approach efficiency toward Single Information Environment architecture.

In [2] information systems for command and control which are exploited in headquarters in a operational level use service oriented architecture in order to increase capability in exchanging information in military environment. SOA approach allows flexibility in increasing capability through integration and systems interoperability based on using commercial-off-the shelf (COTS) technology and standards. In the paper is presented solution which based on SOA made by Thales (UK). As a summary it concludes that SOA solution can be used in increasing capability in military environment. Also, as a further work from Thales is developing SOA solution in all areas of information systems like this in military environment. In addition solution is planned to be used for integration and interoperability with

other information systems in military environment.

The existing integration models have limitations related to systems security, systems stability and real time communication. Web services are a possible solution to integration problems [3]. Information systems can be integrated, depending on the aim and function, with different web services they create. Web services are presented with WSDL that firmly define communication interface [4].

Usage of web services in service oriented architecture (SOA) is the solution we propose to be used for information systems integration [5]. When using this approach, engineers do not need knowledge about every information system which will be integrated in details. The most important issue is understanding communication interface for every web services. Web services are anticipated to be used in information systems integration on the method of *peer-to-peer* connecting.

Within the e-Gov project [6] of the Republic of Macedonia, which has started in 2004 and is to be implemented by 2011, different information systems solutions have been developed in order to increase efficiency and transparency in public sectors, manage business in a safe manner, etc. All of them are developed following new trends in the Information systems Design.

The e-Gov project consists of applications that establish interactions between government institutions and the business community (G2B), the public administration and the citizens (G2C) and interaction between government institutions (G2G) [7].

The information systems within the e-Gov project that relate to Intelligence are Information System Documentum, Information System eParliament, Information System IBMS and Interoperability System.

These Information Systems are based on service oriented architecture, for that reason information integration between IIS and selected Information Systems is simplified [8], [9].

Information System Documentum [6] goal is to manage and store documents with different functions in a proper and convenient way, and it will present a communication platform with other institutional Information Systems and applications in the Republic of Macedonia.

**Information System eParliament** [6] solution refers to the interior judicial processes, preparing and holding sessions, providing high level of effectiveness, decreasing costs, mobility, transparency and responsibility in the processes of preparation, implementation and daily coordination in making decisions which are derived from the judicial processes in Parliament.

The **Integrated Border Management System – IBMS** [6] will provide a platform for exchanging Information, controlling and monitoring border. IBMS will use a database to manage the border, which will provide coordinated approach to the information between state authorities that are responsible for the border management

The data exchange between state institutions will be faster and more efficient with system integration in the **Interoperability System** [6], which helps to avoid duplicating data and causing errors and institutions will be more effective and efficient. Furthermore, this system should establish interconnections in registers and databases between the state bodies and institutions, as an advance phase of the project e-government.

The enterprise application integration usually means the sum of technologies that support the interoperability of separate information systems. The principal use of this concept is based on the integration of different enterprise applications and process automation. Because of that, the service oriented architecture represents the main platform for the existing application integration solutions [10]. Application integration means building a system which consists of different software components which communicate among each other via standardized messages. Certain components of that system are called adapters and use the external components, which need to be integrated in the system.

Adapters provide complete isolation to the external from the need to understand the internal logics of the business processes in which the integrated business systems take part, which on the other hand provides high integration flexibility. The messages are exchanged according to the publish-and-subscribe model via a central component called broker (**Figure 1**) and it has the task to receive and distribute messages in a system. Adapters and other components in the system can be subscribed on a certain category of messages, however; the broker component after receiving each message sends that message to all subscribed receivers.
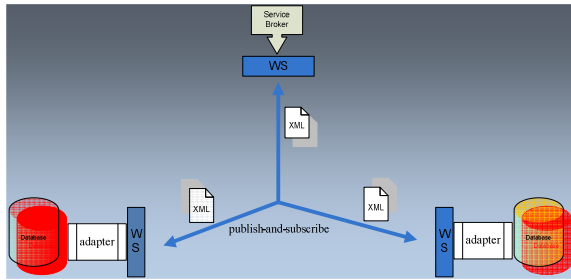
Figure 1: Adapter according to the hub-and-spoke model integration [11]

In the same manner a simpler architecture is possible, where the recipient and the sender directly communicate via messages, however; the publish-and-subscribe model gives bigger flexibility and system openness.

The architecture where the recipient and the sender communicate via messages is possible with a messaging backbone (bus). Applications publish their messages via messaging backbone (bus) and they use adapters to fulfill that task. The subscribed applications have adapters which recognize the messages from the bus which will transform the messages into a format that is recognizable for the applications themselves. The key difference between the broker architecture, which uses hub-and -spoke topology, and the bus topology is that the integration component, which performs the message transformation and their delivery, is distributed into the application adapters; also the bus architecture requires the application adapters to use the same platform as the original applications [12].
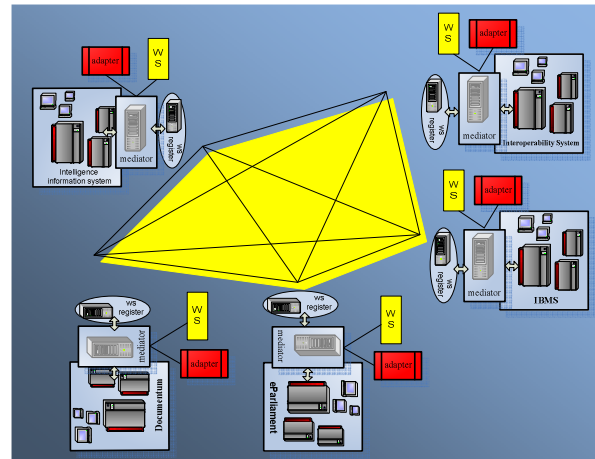
2. IIS Integration model

Intelligence, as a service has a great significance for the country. An information system for support of intelligence activities is very often in everyday use and from that use comes great influence in the decision making process. Usage of the modern information technology in big way contributes for improvement of the process (activities) which are supporting intelligence cycles (planning, collecting, analyzing and dissemination) [13].

Implementation of Service Oriented Architecture – SOA, i.e. the usage of SOA, is providing possibilities for making new opportunities in the form of expanded solutions for designing intelligence information systems, regarding the more efficient management of information, as well as their use by the end users for whom hum they are intended. In order to

keep up with the pace with modern development, short, medium and long term planning is needed for development of information systems for supporting intelligence, in relation to the IT development [14].

The figure (**Figure 2.**) bellow shows one possible solution for Information Systems integration with the Intelligence Information System (IIS) [15].

Figure 2: Information systems integration according to the peer-to-peer model

Users of IIS and their functionalities can be treated from different aspects according to users' types of division. This section will give explanation about definitions of users' functionalities in IIS. There are four types of users in IIS. They are:

- Service requester
- Service provider
- Companies
- Intelligence (IMINT, SIGINT, OSINT, MASINT)

Analyzing processes which are part of institution included in IIS presents that end users can use the same meta users' scenario, which means that they can follow same general procedure (process). This process consists three different phases (sub processes). These phases are:

- Recording
- Verification
- Notification

These phases are in each process which is related in IIS, although they are not subject for supporting IIS. Occasionally those phases are supported by internal information systems on institutions included in processes of IIS. That is additional reason related to need of integrating

system to support workflow on mediation level in all institution integrated in process of intelligence.

Service for controlling and data usage is presented with graphical pattern (**Figure 3.**). That pattern also presents modules which exchange data between them and they are following modules: client application which is integrated into process of intelligence, IIS mediation module, system registry service and IIS center.

It is important to stress that symbols and pattern is same for service request and service providing. In a both cases client application should receive notification through provided interface. Diagram allows concluding by following:

- Records about each service request;
- Records about usage of service;
- Service is executed if local and global policies allow that;
- Users information are exchanged on mediation level, which are integrated polices, transactions and reformate;
- If some service does not exists, but also is taken affirmative format request, that means that request will be recorded and if service provider exists about that service, then their

mediation system should provide service as a obligation from his service provider. In that process new service is recorded in register of services.

General user iteration can be reflected in more specific user functionality of all four types of end users. It will be presented with global users functionalities for all four types of users.

User type called Service provider executes following phases:

Phase of service definition takes:

- Defining workflow for requested service with usage of graphical editor, so that it defines participant in the process, their responsibilities and privileges;
- Defining data format (e.g. SOAP in case of web services) and principle of data exchanging through accurate specification (e.g. WSDL in a case of web services)
- Defining level of service access (whether it provides service access through internet, intranet or other separate network);
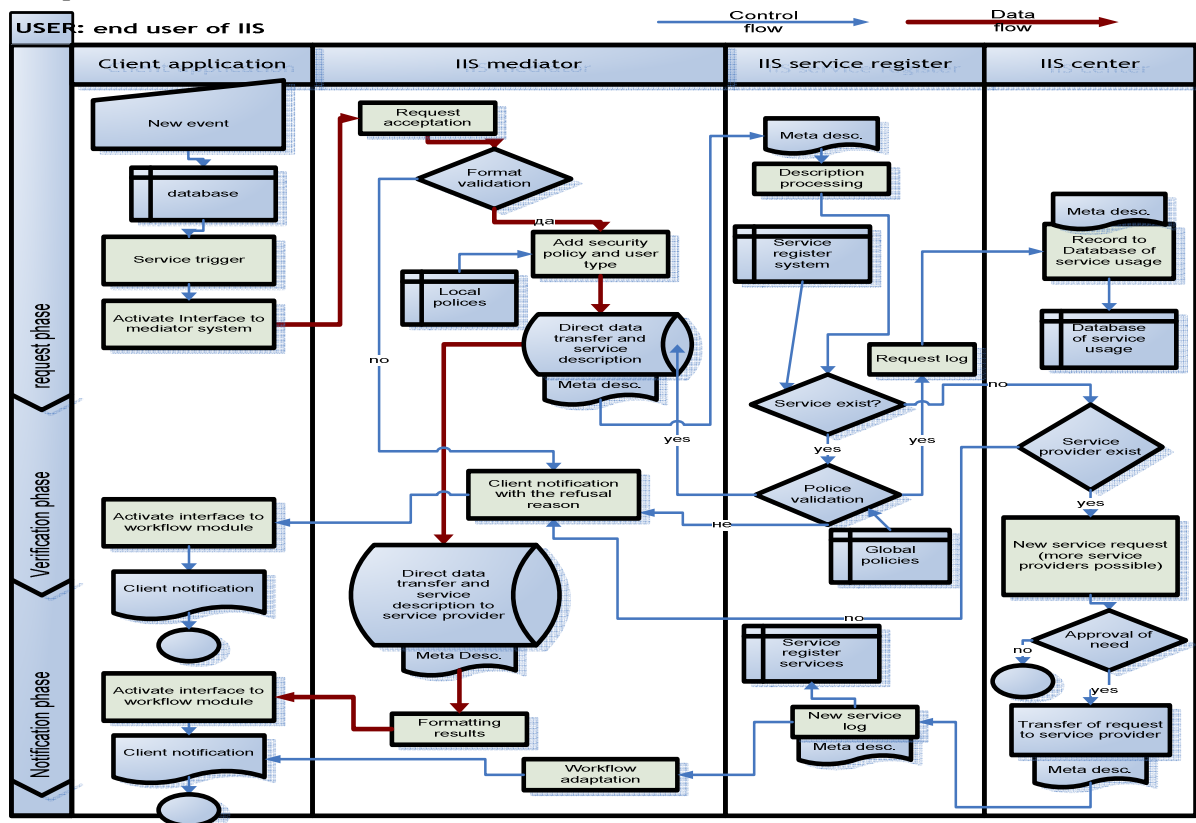- Publishing services in accurate public, private or other service register (UDDI in a case of web service).

Figure 3: General user iteration to end user of IIS

Phase of periodical service validation takes:

- Checking policy of service access when administration changes internal rules and legal framework. In a case of need it can stop service access (this phase makes automated notification of the users);
- Updating policy for service usage (process level), not on data format level. In a case of need to changing data format, it stops service (creating automated notification to their users) and after that it defines new service;
- Introducing additional process for filtering information content if it is needed.

Phase of service activating takes:

- Publishing services in accurate public, private or other service register (UDDI in a case of web service).

User type called Service requester executes following phase:

Phase of service request takes:

- Searching available services through service registers (depends of defined access level, requestor can search through internet, intranet and separate service registers);
- If service is not allowed to the users, it sends service request to IIS center with specification about data format (e.g. SOAP in a case of web services).

Phase of service validation takes:

- IIS center decides about information designation and it sends request to the service provider and on that way service provider activated own user scenario.

Phase of service usage takes:

- Active service usage, which is recorded in the system;
- Receiving information for ending or changing access level to the information related to the;
- Receiving periodical statements and reports according request of service usage for the needs of internal control systems;
- Possibility of giving opinion (evaluation) about service quality to the service provider.

User type called Intelligence executes following phase:

Phase of identification and verification takes:

- Person identification, depends of necessitate (e.g. monitoring of person);
- Identification and verification of combat assets and weapons according to digital document or official document with possibility of automated detection;
- Identification of goods and their verification.

Phase comprises controlling of:

- Comparisons between verified information from previous phase from different sources (internal and external) which can be changeable upon a time, in order to detect suspicious event or offense;

Phase comprises following orders:

- Automatic record of events which can be approved from set of active and automatic and Manuel polices so that they can provide sources of information to the institutions which are actively participated in the process.

User type called Companies executes following phases:

Phase compromises identification and verification:

- Filling of electronic forms.

Phase comprises controlling of:

- Information checking according request and/or request approval.

Phase of checking status takes:

- Giving information about status request.

As it previously mentioned, phase of general process of functionalities on IIS appear to all end users, so that separation between end users is made according to usage of security polices and subject of functionalities separation from the phase (whether they are subject of IIS or they are subject to other Information System which has to be wrap in certain information systems to different institutions included in the process of intelligence).

Following users scenario are given as a example of specific functionalities which IIS can provide to the end users.

It is chosen specific scenario which consist specific cases that need to face IIS. Those scenarios are mentioned by following:

- Providing information from one institution, but from more sources of data. Scenarios which are called other scenarios or they are called themselves or they are called in iteration;
- Scenarios which request coordination of employment on more than one institutions;
- Scenarios which provide support to specific request on certain institution.

3. CONCLUSION

The level of technological development in certain societies has pushed the use of certain benefits which have emerged from the degree of development [16]. Thus, according to the issues discussed in this paper, it can be said that the number of information systems and data which are used increase, at the same time as the integration information problem and uses of data are push. In order to optimally exploit the selected systems, explained in the paper, and for the needs of the intelligence, they need to be integrated. The integration of the information systems should be based on the assumption that any system can work individually and with its own data, but by sharing information a higher level of synergy between the information systems is achieved.

For these reasons, the elaborated issue of integration of the selected information systems, for which various models of integration have been developed, the most appropriate method is chosen i.e. architecture where the recipient and sender directly communicate through messages and they are connected in a peer-to-peer integration model of information systems.

This model is appropriate, because it can exchange all types of data and provides an opportunity for easy upgrades to new systems following the world standards.

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