A Tool for Military Officers Enchasing Life Long Learning Applied on the Paradigm of Risk Preparedness and Management

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Abstract: - In this paper model for managing the Job Rotation of personnel attached to specific military units is proposed. This model aims to maintain the level of the overall preparedness of the units against known risks, by maintaining the presence of skilled personnel present in the unit at any time. The model is used for the development of a software tool that manages the systematic training of army officers in risk prevention and crisis management. The aim of this tool is to globally optimize the movements of army officers between units and training centers so that no units are ever left without skilled staff trained for a particular type of contingency. While officers are in training, they prepare for new hazards and prepare emergency plans for dealing with these particular hazards with the support of more experienced trainers or mentors. When this rotation ends, officers return to their units and assume responsibilities in both implementing the plans they have helped create, as well as in disseminating the knowledge and skills they have acquired and training more of the unit's staff in being able to conduct appropriate parts of the newly introduced emergency procedures.

Key-Words: - Risk Preparedness, Job Rotation, Training Sessions, Military Units, Military Applications, Web Services, Grid Architecture.

1 Introduction

No matter how stringent the safety standards are in military units, unforeseen events will occur and military officers must be prepared to deal with their consequences. These unforeseen events, that from now on are going to be referred to by the term "risks", may include both external threats (enemy activities, weapons threats, asymmetrical threats, etc) and possible accidents (hazards arising from personnel activities or unpredictable factors like weather, earthquakes or other natural disasters). Since a large proportion of the military personnel are inexperienced young people like junior commissioned or non-commissioned officers and conscription soldiers, hazards are highly likely to become realized causing dramatic results firstly for the families of the sufferers and most importantly for the moral and credibility of the entire armed forces. Commanding officers are responsible for the safety of their soldiers and are in several cases charged for injuries or deaths occurring to personnel under their commands. As a response to the above situation, military personnel needs to undergo continuous training in order to be prepared to handle new risks while military units are required to be staffed with personnel capable of effectively

responding to all possible risks, as soon as they become apparent.

Accidents due to hazards are not a military only phenomenon. According to the European Agency for Safety and Health at Work (OSHA) every three and a half minutes, somebody in the European Union dies from work-related causes while every year, 142.400 people in the EU die from occupational diseases and 8.900 from work-related accidents.

This work proposes a computer assisted procedure for effective organizing of the continuing training of the military officers in risk preparedness and management in order to be able to predict and efficiently manage such hazards. The model to achieve this, in an extensive network of military units, is a replication and training scheme called Job Rotation that is widely used for the training of employees and their substitution with unemployed in the labor market. Job Rotation in its original approach is a model that enables a limited solution to be found to the big question of the relationship between training and employment. Job rotation is training and education in which the unemployed are educated and trained continuously in order to replace employees in companies, during the time

that they leave their jobs for more education and training [1]. Additionally, it has be proposed in literature that Job Rotation be used for increasing the efficiency and the productivity of the organization, for early discovering and correction of faults in the procedures followed, for on-the-job training and for increasing personnel job satisfaction [2]. While the extent to which civil organizations follow procedures depends on the maturity of the organization and the skills of their managers, the operation of military units is critically based upon following pre-designed procedures and hence Job Rotation is even more important. Finally in the paradigm of the Hellenic Army, upon which this study is based, requires that staff is regularly transferred between units and systematically follows further education courses. Merging this policy with Job Rotation principles can therefore largely increase the overall effectiveness without introducing difficult to accept changes in the overall structure.

In our proposed approach, the Job Rotation, in the field of risk preparedness and management, is an energetic measure for the life long training of the present military officers, under the goal of improvement in hazards prevention and crisis management. The officers trained, will gain the necessary experience and will form a tank of military experts in the field of risk prevention and management tailor made for military units, that will be participating to the implementation of further Job Rotation schemes or can be directly allocated in units seeking for their kind of expertise.

The long term objective of the model is to promote and enhance in the culture of the military officers and army leaders in the necessity of risk preparedness and management and their sense of social responsibility. This is achieved via the support of a distributed software system that assists the effective utilization of the available personnel and the effective management of the army's skills and knowledge resources in the area of risk management.

2 Job Rotation as a labor tool

The Job Rotation model in its labor approach offers opportunities for organizations, as well as for the people searching for a job. The Job Rotation means on the first hand, the refreshment of the present human resource, under the goal of improvement in quality, greater productivity and new forms of management at work, but on the second hand it fulfils the need for the replacement of the staff that left their posts for further training [3], [4], [5].

Job Rotation has been described as a win-win strategy where all concerned derive benefit [6]. The organization's productivity does not suffer from absenteeism among the personnel, its competitive edge is enhanced and recruitment is facilitated. The employees' level of expertise and motivation increase. Inexperienced officers acquire work experience and training and thereby more self-esteem. Job Rotation helps the junior personnel to rapidly acquire experience and hence rapidly be assigned to positions of responsibility for the benefit of both the service and their personal development.

The employment situation in society improves, flexibility on the labor markets is enhanced and the idea of lifelong learning becomes a reality. In order to be successful Job Rotation must be based on extensive and intense co-operation among all concerned. Within the scope of the armed forces, as well as in civil large scale organizations, Job Rotation promotes the process of rapid gathering and dissemination of knowledge and experience between distant staff. A simplified example of conceptual model of the introduction of Job Rotation is given in Figure 1 below.
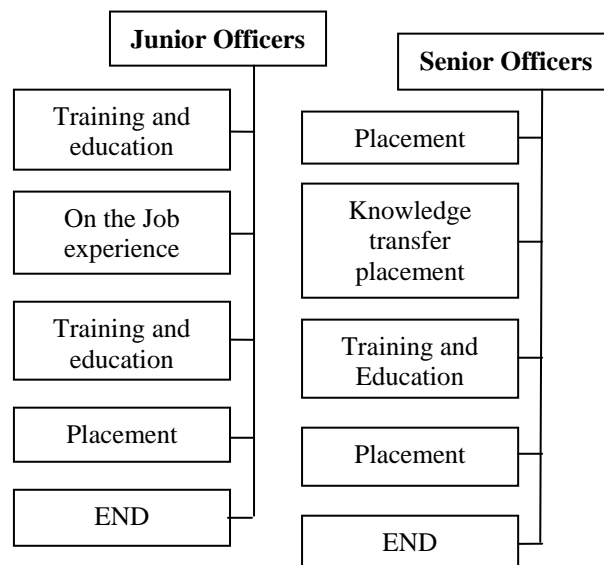

Figure 1: Simple Job Rotation model for army officers

Junior officers receive training and education. Following that they are assigned to units with experience in the required field(s). They then receive further training and education and are placed in units where they apply their specific skills and knowledge.

Senior officers are assumed to be experienced in one or more fields and already placed in units. They are then transferred to units where their particular skill is lacking, where they transfer their knowledge

and train more officers on the job. They go on to receive further training and education. They are hence placed to new units were they apply their newly acquired skills.

3 Risk Management in Military Units

Military units are places that have been created by state authorities as a means of providing responses to unforeseen events, usually external threats but also natural disasters, major accidents (e.g. a plane crash) etc. As all these hazards are dynamic and evolving with time, there is a continuous need for their staff to receive further education in new skills, as required by the evolving risk assessment. A problem that hence arises is that of managing to allow officers to go and attend the required further education courses, without removing from the unit any particular skill without which it cannot function effectively. From a different perspective, the purpose of knowledge dissemination can be served if trained officers are placed in units where their particular skills are required but there exist no trained personnel to provide them. What is therefore required is a means for the army to manage the distribution and movement of existing knowledge and skills in risk management, at the same time as providing to the service both new knowledge and new personnel that is inevitably untrained. The application of the proposed model in risk prevention and management with the participation of military officers will offer a new approach to hazard prevention and provision of security and safety to society as well as a new culture to the military forces about accidents prevention and crisis management.

The main objective of the proposed model is to implement a sustainable Job Rotation scheme in risk management and prevention in the armed forces. The results, apart from mobilizing and sensitizing a great number of military officers, civil staff and soldiers, address the exchange of experience and training in identified hazards between the trained officers. This will be achieved by reporting and analyzing past accidents happened to military units so that lessons to be learnt in order for trained officers to be able to prevent similar accidents from happening in the future in their units.

4 Methodology

In order to implement the proposed model the following tasks need to take place:

1. **Needs analysis:** This task addresses information' gathering and analysis that include base line information on disaster preparedness (i.e. monitoring results, risk assessments/objectives in relation to disaster preparedness, existing work and risk effects, health statistics, etc.). Questionnaires are necessary to survey military units to collect information on disaster preparedness. This includes obtaining data to identify potential impacts (i.e. via specifically-designed questionnaires - quantitative / qualitative methods, consultations, participatory approach) of disasters, containing aspects of socio-economic, cultural and environmental conditions, living conditions, social influences, individual lifestyle factors. Risk assessment work will identify the status quo, and help focus on the recommendations for training in each case.

2. **Identification and customization of the training courses:** This task should be based on previous experience gained from incentives and programs in risk management in all military units. Criteria for the selection of the training courses should be formed and they should confront to the results of the needs analysis.
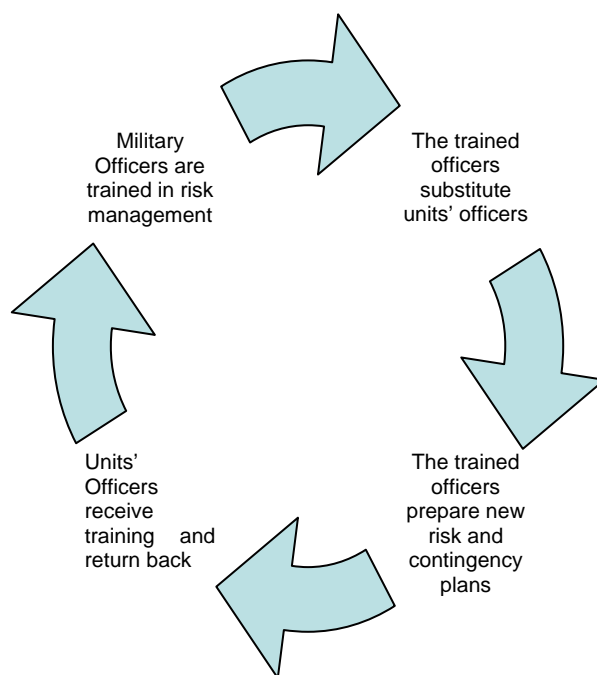

Figure 2: The Job Rotation scheme

3. **Actualization of the Job Rotation scheme:** During this task, the design of the Job Rotation model customized around risk preparedness and management for the military units will be implemented. The Job

Rotation scheme (Figure 2) will address the training of military staff in risk management using the courses selected in task 2. The officers that will be trained will substitute units' officers that will be selected to participate to the same training sessions. The Originally trained officers, while being allocated in the units, during the rotations, will implement an initial risk, and associated contingency plan for each unit. When the rotation will end, the units' officers will return to their position with duty to update disseminate, and realize this plan in case of emergency.

The 9-phase strategy for setting up, manage and implement a Job Rotation schemes in the military force is proposed to be the following:

1. Preparation
2. Application phase
3. Information
4. Detailed planning
5. Officer's Selection phase
6. Carrying out the Job Rotation schemes
7. Implementation of risk identification and contingency plans
8. Evaluation
9. Perspectives for new schemes.

4. **Monitoring and Evaluation:** The overall procedure should be evaluated to obtain measurable results. Questionnaires for the trainers, trainees as well as to the participating officers and Military Units' commanders should be scheduled. The questionnaires should be completed before and after the Job Rotations. The data should be processed and categorized to derive major outcomes. A final report with the current achievements and problems faced will be useful for further implementations.

5. **Networking:** Continues cooperation and networking is recognized as a crucial factor for an effective response to emergencies. The successful implementation of the Job Rotations in risk preparedness and management assumes the life long exchange of best practices and cooperation between the risk management experts and trained officers. Networking can take place through online platforms with forums, blogs, instant messaging tools and other novel WEB 2 technologies.

5 System Functionality

The main barrier to this methodology is the wide distribution of the military units and the large number of officers that will be candidates to take part in the rotation scheme. To manage to coordinate efficiently these rotations and to minimize expenditures the implementation of an on-line management system is more than necessary. The main characteristics of such a service are relativeness and security since it will deal with sensitive military data. A possible solution could be with the use of an integrated Grid/Web Services Job Rotation management tool [7], [8], [9]. The innovation of the system is the implementation of the Job Rotation model and its integration with the Grid and Web Services technologies offering advanced security. The service will deal with the management of the Job Rotation activities. On one hand substitutes Units' Officers with already trained officers centrally selected and on the other hand coordinates monitors and reports on the achieved rotations.

The Grid/Web Services Job Rotation management tool is an integrated Job Rotation on-line platform that coordinates the substitutions (rotation) of Army officers and other staff with trained staff of equivalent skill level in specific aspects. Furthermore, the tool coordinates the attendance of prescribed training courses by all the staff required, so that the global level of readiness for a particular contingency quickly attains the desired level. The system includes an e-learning platform through which distance training is offered, according to the market needs, by training institutions to both the aforementioned target groups. The innovation of the system is the implementation of the Job Rotation model as and e-service.

From a technical perspective, the proposed Job Rotation system is a special management, e-learning, support and matching tool. The service takes into account the focused target of the service, and therefore provides tools and functionality to facilitate work and leverage the use of existing material. The platform does not include unnecessary functionality, without of course sacrificing scalability. The system is consisting of the following parts:

- The Registration system,
- The matching system, and
- The e-learning platform.

5.1 The Registration system

This module's operation concerns the registration of new military units' needs for trained staff and new officers requests to receive new training in prescribed fields, the personalization of the web pages and the creation, update and maintenance of each user's profile. The registration tools for units include the build up, using the offered tools, of on-line multimedia profiles in a "what you see is what you get (WYSIWYG)" environment of their companies that will supplement the Job Rotation offers managed and coordinated with the support of the service. The data exchanged through the system is secured from unauthorized access through authentication passwords for all users and Secure Socket Layers (SSL) protocol under which all the transmitted data is encrypted and protected.

The submission of a new Job Rotation offer includes descriptive metadata, some of which are used from the system in order to propose the best matches between workers and unemployed. Such metadata include:

- Working sector that the position relates,
- Level experience of the unemployed,
- Training required,
- Start and duration of the rotation,
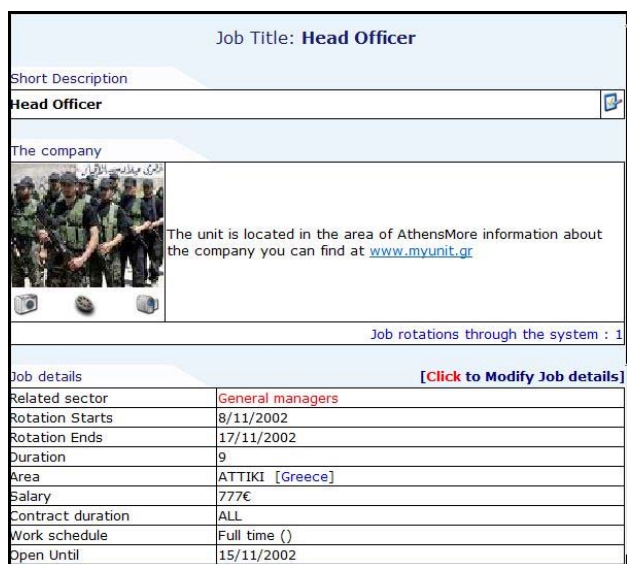- Work schedule, and
- Area that the job is offered.

Figure 3: Example of a Job Rotation offer accompanied by the profile of the company.

These metadata are enriched with further information of the job position such as job description, salary offered, on the job training required, etc. Figure 3 shows an example of a Job

Rotation offer accompanied by the profile of the offering company.

The system offers the units all the functionality required to manage the submitted Job Rotation offers (modify, publish, withdraw, delete, view candidates, etc). Additionally companies can compose an on–line questionnaire for each Job Rotation offer that they submit to the system. The unemployed interesting for the position should fill the questionnaire in order the company to obtain additional information to this recorded from the static forms of the e-service (the content of the questionnaire is subject to the units needs). This questionnaire will be the criteria for selecting among unemployed that will be matched from the system for each specific job offer.

The unemployed interested to subscribe and use the benefits of the Job Rotation e-service have to fill a subscription form. Their data is verified from the system's administrator and the unemployed working profile becomes active. The unemployed feeds the system with personal information and all these required metadata in order the system to make all the appropriate matches (working sectors, work schedule, area interested to work to, etc).

5.2 The matching system

The matching system of the Job Rotation e-service is a tool dedicated to manage and process Job Rotation offers. In that sense, a company that submit job vacancies can then select from a pool of registered unemployed individuals that applied for these offers. Job seekers (unemployed) depending on their working profile will find to their personal pages the job offers that match their qualifications and preferences. These offers for the comfort of the users are categorized by the most recent to older ones. Figure 4 presents an example of a match made from the e-service.
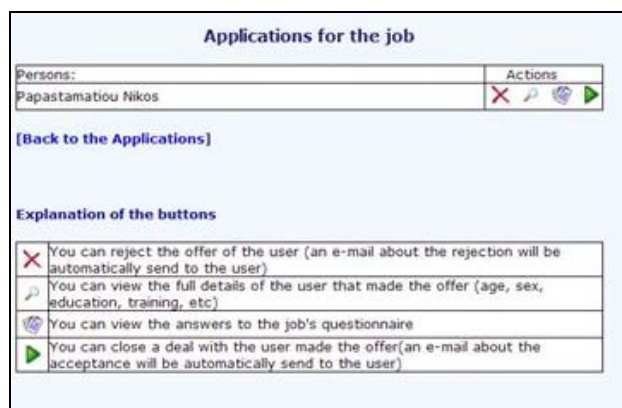

Figure 4: A match made from the e-service.

5.3 The e-learning platform

The e-learning platform [10] is a tool for developing and offering asynchronous and blended learning methods. The internal users of the platform (experts from training institutions) can be easily developed on line courses that will be offered to both unemployed and companies' staff. The e-learning platform, offers the developer of the e-learning course, an authoring tool for creating course content as well as exercises and tests for each course. The tool is user friendly, offers a number of different types of exercises and it is compatible with the IMS Question and Test Interoperability (QTI) standard [11].

This e-service for Military risk management purposes will be setup as a distributed application, whose processing requirements will be satisfied by multiple servers located in the different military units through web services. The integration of these web services to the Job Rotation system will be accomplished through Grid/Web services architecture. The web services, constituting the Grid, will be custom-made for Job Rotation in risk preparedness and management purposes, performing a specific set of operations that will be offering up-to-date information on training sessions and officers willing and capable to participate.

The service is a TCP/IP network engine of Job Rotation and a data storage system. The data storage system deals with issues such as user rights and RDBMS. The web front end has a user friendly GUI that enables users to access information and knowledge and coordinates Job Rotation offers. End users communicate with the system through the HTTP protocol and with SSL sessions when secure connections are required.

5.4. Service Architecture

The proposed Architecture of the system is composed of three equally important modules:

- The user's environment: this module consists of a front-end web interface, through a simple web browser, that takes charge of logged user to the network at any portal. It is comprised of personalisation utilities, query tools, and any other component needed to bring up the service to the end user with a user friendly Graphical User Interface (GUI). This client module can visualise stored data and documents both on a free or restricted way.

- The Job Rotation web server: this module is the core and the backbone of the service. It is a transaction manager that controls traffic, checks user rights, gathers data to the central site, replicates data if needed, etc. Each server will manage the local content of its web portal, maintain the repository index that the client component will access, interoperate with existing databases and establish connection with Relational Database Management System (RDBMS) and document storages.

- The data manager: this module is responsible for the metadata codification and maintenance of the content that is available to the end user. This module categorises data and creates all the workflow necessary to access, publishes or restricts data.

Job Rotation e-service is a Web-fronted network that includes user personalisation, advanced security, workflow management and flexible design capabilities. The service is developed using the Microsoft tools and uses all the capabilities offered by the .NET framework, IIS 4 and SQL server 2000. The front end Microsoft .NET Framework 1.1 offers technologies (ASP.NET, ADO.NET, COM+) that support the successful development of distributed multi–tier applications. These technologies support the implementation of layers in levels distributed in many servers. These levels support User Interface (UI), the implementation of Business Layer (BL), the communication with data base systems (Data Access Layer - DAL) and the communication with other applications that offer services.
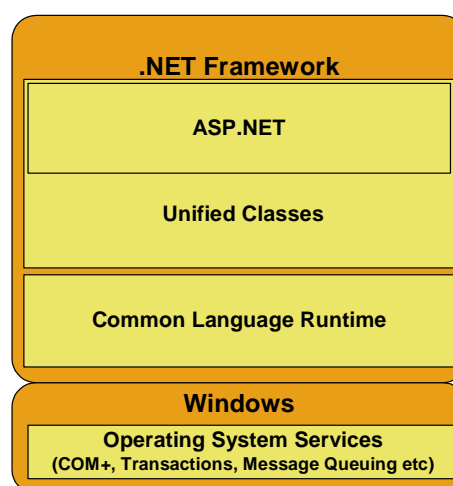

Figure 5: The .Net Framework

The .NET Framework (Figure 5) has been used as a platform for the development of the service. It

is an application model and a number of main technologies for the simplification of the development and the future exploitation of available XML services. The Microsoft .NET Framework offers the necessary infrastructure for the development of XML services that will be visible to the programmers and the external users.

The .NET Framework exploits the best elements of the COM (the Component Object Model of Microsoft) and combines them with the best elements of the Loosely Coupled XML Web Services. The result is a dynamic Web components system that offers scalability, security and reliability.

Objective of the Microsoft .NET Framework is to ease the development of web applications and it is constituted of the following three modules:

- The Common Language Runtime (CLR)
- An hierarchical set of class libraries
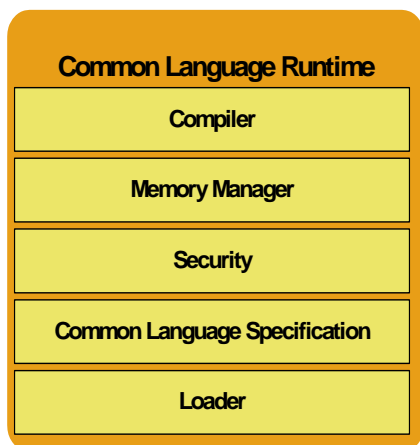- A version with Microsoft Active Server Pages components that is named Microsoft ASP.NET.

Figure 6: The Common Language Runtime

The Common Language Runtime (Figure 6) is created over the services of the operational systems. It is responsible for the execution of the application and ensures all application assemblies, manages the memory, secures the integration of the language, etc. Runtime all those services that help the easier production of code while improves the reliability of the application.

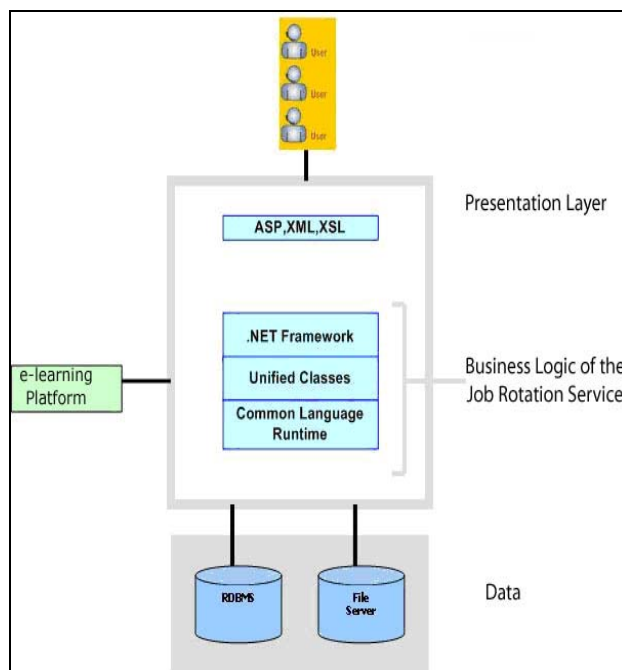The architecture of the e-service is described in the figure 7.

Figure 7: The service's Architecture

5.5 Grid Technologies

Grid technologies support the sharing and coordinated use of diverse resources in dynamic "Virtual Organizations" (VOs) — that is, the creation, from geographically and organizationally distributed components, of virtual computing systems that are sufficiently integrated to deliver desired Quality of Service (QoS) [12].

The Grid idea emerged initially as a model that combines the resources of many separate computers connected to a network (usually the internet) to solve large-scale computation problems.

Web services, as a new, interoperable and effective way to provide functionality over the internet, caused a new center of attention to the Grid technology, to Grids build on web services (GRID\WEB services).

Following this approach a Grid can be defined as a layer of networked services that allow users single sign-on access to a distributed collection of compute, data and application resources [13].

The above lead to the development of The Open Grid Service Architecture [14] that defines standard mechanisms for creating naming, and discovering transient Grid service instances; provides location transparency and multiple protocol bindings for service instances; and supports integration with underlying native platform facilities.

The Open Grid Services Architecture also defines, in terms of Web Services Description Language (WSDL) interfaces and associated

conventions, mechanisms required for creating and composing sophisticated distributed systems, including lifetime management, change management, and notification.

5.6. Web Services

The term Web services describes an important emerging distributed computing paradigm that differs from other approaches such as DCE, CORBA, and Java RMI in its focus on simple, Internet-based standards to address heterogeneous distributed computing. Web services define a technique of describing software components to be accessed, methods for accessing these components, and discovery methods that enable the identification of relevant service providers. Web services are programming language-, programming model-, and system software-neutral [15].
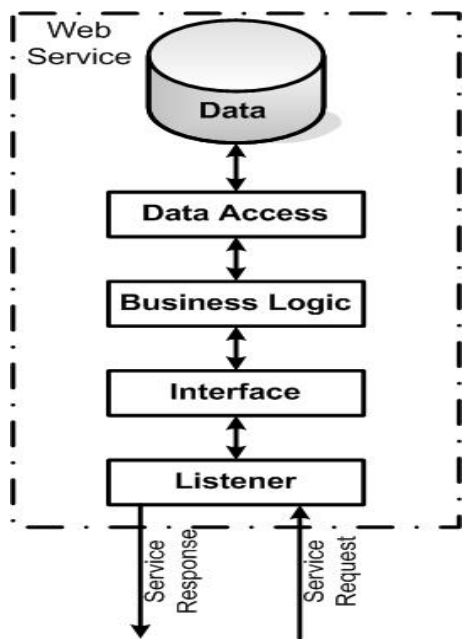

Figure 8: Descritpion of a web service.

Web Services (Figure 8) interact with applications consuming them by exchanging messages in Simple Object Access Protocol (SOAP) format while the contracts for the message exchanges that implement those interactions are described via WSDL interfaces [16].

5.7. Integration

The integration of the job rotation e-service for risk preparedness and management for military units will be accomplished through such Grid/Web services architecture. The web services, constituting the

GRID, will be custom-made for Job Rotation in risk preparedness and management purposes, performing a specific set of operations that will be offering up-to-date information on available Job Rotation places and the relevant training upon requested from the users of the Job Rotation e-service.

In order to setup this architecture a Broker is required (machine that will host the Universal Description, Discovery and Integration (UDDI) directory) where all these web services under the Job Rotation GRID will be registered setting up a Job Rotation private UDDI registry (Figure 9).

A web service must be registered to a UDDI directory in order to be published and reveal its functionality to the world. UDDI is an XML-based standard for describing, publishing, and finding Web services. The UDDI can be hosted to the same server as the Job-rotation e-service or to another server on the web. Service consumers can then interrogate the broker to locate a required web service and use it to implement a business solution. The Job Rotation e-service will act as one of those service consumers and will use all the web services register to the UDDI registry.

Setting up the Grid a Job Rotation specific WSDL (GRID-WSDL) should be developed for each web service to comply to. When each web service will be discovered the GRID-WSDL XML-format protocol will help other systems that need its functionality to understand the way that they can interface it. WSDL describes how to access a web service and not what the web service's business logic is.

To utilize the web services functionality a common language between these web services should be defined. XML/SOAP messages will be used for exchanging information. SOAP is a lightweight protocol intended to exchange structured information in a decentralized, distributed environment [17].

XML is the technology used with SOAP messages that form the requests and responses to a web service. A client invokes a web service by sending an XML/SOAP message, and then waits for a corresponding XML/SOAP response. Because all communication is in XML, web services are not tied to any operating system or programming language.

The content of these messages will comply with the general known standard describing metadata for Learning Objects. Learning Object Metadata (LOM) is a common used standard from the IEEE that can be easily used for communication of information for different learning objects.

Expanding LOM structure and creating Job-Rotation-specific vocabularies will be investigated

to make the identification of the most adequate vocational training courses more effective.
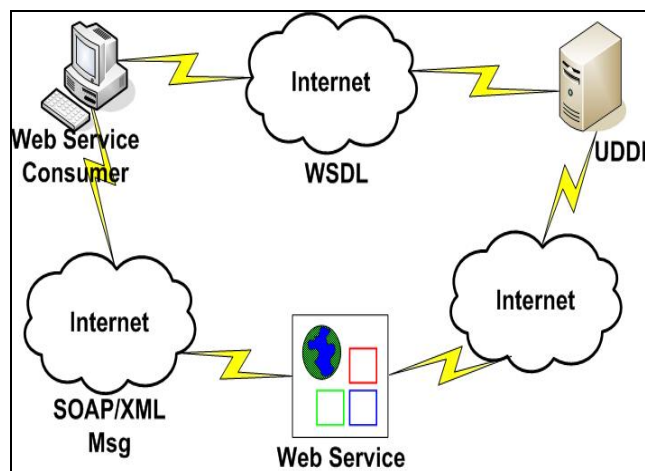

Figure 9: Description of the proposed architecture.

Finally, an application that gives access to all this information, from a single point through the registered web services, will be developed. The application will enclose a smart search engine that will communicate with the web services subscribed to the UDDI registry and request information according to the user's needs. The results will be presented to the user along with more information of the organization offering them. All the nodes described on the next diagram communicate with each other through a Transmission Control Protocol/Internet Protocol (TCP/IP).

The advantage of the described architecture is that the pool of available vocational training courses will grow rapidly as each new organization that desires to join the job-rotation Grid needs to follow some simple steps in order to develop and register its own web service to the GRID's UDDI. Then the web service will offer upon requested information for the organization's courses following the LOM standard.

Administration costs for the Job Rotation e-service are minimized since the administrator needs to do not more than observing the successful integration of the new web service to the Grid.

6 Expected Results

The main objective of this work is to set the foundations to build a continuous and dynamic process of Job Rotation for enhancing risk preparedness in the military, providing to the military officers all the appropriate information and knowledge to protect themselves and Soldiers lives

and the state's property in real and major emergencies.

Further objectives include the prevention of military accidents that can have unwanted effects, and the improvement of the safety conditions and society's confidence. Since it is better to be safe than sorry, the proposed model will prepare the military officers to identify the hazardous operations that take place within the different military units and the possible risks due to natural and technological hazards maintaining a high level of preparedness to respond.

Finally, information technology will facilitate the application of the Job Rotation schemes and will ease access to information on risk prevention and management from the participating officers offering them at the same time the tools to continue exchange ideas and discuss case studies that can be occur and prevented in the different units.

7 Conclusion

The need for a systematic approach to training serving army officers in emergency plans for new risks was pinpointed. This training needs to take place without depriving military units from trained personnel. Units need to be able to request training for their staff and request staff trained in dealing with specific risks. Individual staff members need to be able to apply for the training they need for their own personal development, as well as for the benefit of their unit. Some of the training needs to be conducted on-site. The mode of operation of a coordinated and globally managed scheme concerning all the above needs was presented. The way in which this coordinated effort satisfies the needs of all parties involved was analysed.

Consequently a design of a software tool to manage this whole effort was presented. The tool was based on Grid technologies and innovative web services, while it also included an e-learning subsystem to allow on-site training. The expected impact of the application of the proposed scheme on the overall level of readiness of the armed forces was analysed. It was concluded that this scheme can significantly decrease the average level of risk exposure for military units while at the same time increasing the level of job satisfaction for the officers involved.

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