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COMMAND AND CONTROL PORTAL AS A UNIFIED WAY OF COLLABORATION OF DIFFERENT STAFF CELLS IN ARMY HEADQUARTERS ON OPERATIONAL LEVEL AS WELL AS COOPERATION WITH EXTERNAL CIVIL ORGANISATIONS

PORTAL SYSTEMU WSPOMAGANIA DOWODZENIA, JAKO SPOSÓB WSPÓŁPRACY RÓŻNYCH KOMÓREK SZTABU SZCZEBLA OPERACYJNEGO ORAZ KOOPERACJI Z ZEWNĘTRZNYMI ORGANIZACJAMI CYWILNYMI

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Abstract: Civil-Military Co-operation is commander's tool allowing achieving aims of the non-military operations, which are often carried out in parallel with those of warfare, in order to coordinate these two lines of action and to highlight priority for military purposes. Although officers are well trained to perform assigned duties they cannot deal without specially designed tools and modern technology. Instant collection and dissemination of information, efficient collaboration and common situational awareness are factors needed in order to secure effective cooperation with both military and civilian organisations. This can be achieved only by study of NATO doctrines and concepts, such as NNEC and EU NEC. Based on that study, a specially designed web based information system can be introduced that is scalable, flexible, interoperable and extendable. HMS Web Portal - JASMINE is a solution for army requirements which highly increases commander's effectiveness on operational level where cooperation with civilian organisations is essential in time of war and peace.

Keywords: Command, Control, Communication and Information, C3IS, HMS C3IS JASMINE, NNEC, CIMIC, expeditionary operations, Web Portal, Web Services.

Streszczenie: Niezbędnymi elementami w zapewnieniu skutecznej współpracy w ramach sztabu jak i strukturami dowodzenia wojskowymi oraz organizacjami cywilnymi jest pozyskiwanie, gromadzenie, współpraca, współdzielenie informacji i świadomość sytuacyjna. Można to osiągnąć studiując doktryny i koncepcje takie jak NNEC i EU NEC. Wykorzystując tę wiedzę można zaprojektować dedykowany sieciowy (www) system informacyjny który jest elastyczny, skalowalny, interoperacyjny i rozszerzalny. HMS Web Portal - JASMIN, to rozwiązanie spełniające wymogi współczesnego sieciocentrycznego pola walki i znacznie zwiększającego skuteczność dowodzenia na szczeblu operacyjnym, gdzie współpraca z organizacjami cywilnymi jest niezbędna zarówno podczas operacji wojennych, stabilizacyjnych jak i pokojowych.

Słowa kluczowe: dowodzenie, kierowanie, łączność i informacja, C3IS, HMS C3IS JASMIN, NNEC, CIMIC, operacje ekspedycyjne, Web Portal, Web Services.

1. Introduction

Civil-Military Co-operation is commander's tool allowing achieving aims of the non-military operations, which are often carried out in parallel with those of warfare, in order to coordinate these two lines of action and to highlight priority for military purposes.

Nowadays, both military and civil headquarters need modern technology for efficient and effective collaboration of entities and organisations, in order to fulfil required tasks and goals. Moreover, Civil-Military Co-operation [6] is essential for a commander who links army units and civilian agencies active in a theatre of military operations.

For a staff commander, who is responsible for carrying out a military mission consisting of constant adapting to current battlefield requirements, it is very difficult to achieve proper and reliable coordination of subordinate soldiers without a help of specialized tools.

On the operational level of command reliable means of communication can be used to provide wideband digital radio or satellite connections between different command posts on the battlefield. As a result, an amount of data that can be interchanged between high level command posts of cooperating organizations is not an issue. Therefore, with use of properly designed information systems, commanders can focus on their tasks, make faster decisions and increase speed and effectiveness of command.

It is highly demanded that all modern projects are created and modified in accordance with NATO Network Enabled Capability (*NNEC [1][2][3]*) and European Union NEC (EU *NEC [20]*) concept which is about people, processes and technology. It ensures compatibility between various solutions. People need to share information for better situational awareness and faster decision making. That is where a technology becomes very useful for effective data collection, process and dissemination to the right users at the right time.

2. Collaboration of staff cells at operational level in headquarters

HQ (*headquarters*) is usually divided into groups [4] – staff cells having a clearly defined role (*function*), and responsibilities. Their work is coordinated to ensure that the commander is provided with the necessary data to make decisions.

Staff is responsible for ensuring the advice and assistance to the commander and provide support to subordinate commanders. It performs many different tasks that require good organization of work and accomplishment of many goals.

The organizational structure of commands in most of the land armies NATO, which is similar to the ones defined in ATP-Pub 3.2 [5], is presented in Groups shown in this figure have strictly designated areas of responsibility and create leadership structure, while the main group, and a group of specialist liaison officers make up the staff - an essential part of leadership structure.
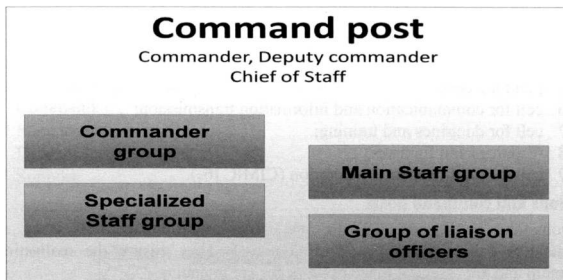
Fig. 1 Headquarters structure (developed based on [4])

Commander group consists of officers and organizational units, which work directly with the commander.

Main group consists of (*depending on the level of command*) branches, departments and sections (*holders*).

Specialty staff group includes organizational units responsible mainly for the use of different types of forces.

Liaison group function is to ensure the efficient exchange of information between the home and cooperating headquarters.
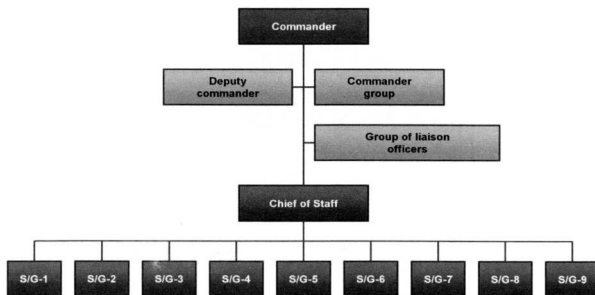
Fig.2 Staff organization (developed based on [4])

The organizational and functional structure is based on the recommendations of the publication of ATP - 3.2. Land Operations. The proposed organization [5] of the main headquarters groups is as follows:

G/S-1 cell of Human Resources and Administration;
G/S-2 cell for reconnaissance and electronic warfare;
G/S-3 cell for operational issues;
G/S-4 cell for logistic support and medical care;
G/S-5 planning cell;
G/S-6 cell for communication and information transmission;
G/S-7 cell for doctrines and training;
G/S-8 resources and finances;
G/S-9 cell for civil-military cooperation (CIMIC [6]).

Positions and command posts

Positions and command posts are managing operations centres. They allow commanders command in any kind of action. They ensure the realisation of leadership and are essential place of work for commanders.

In accordance with accepted principles in the military command posts are organized into three parts [4]:

- operational part (*the body of command post*),
- communications node (te*lecommunications hub, and the centre for battlefield mail*),
- security group.
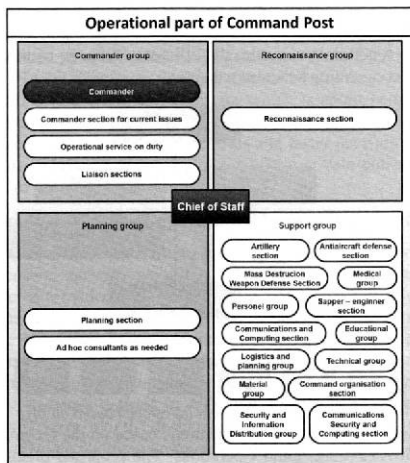
Fig. 3 Operational part of command post (developed based on [4])

Depending on the **level and destination of a command post**, its internal structure is formed from functional components separated from one or more organization cells, combined in the appropriate centres, teams, groups, sections, as essential components of the operational part of command post. There are always parts responsible for the planning and current activities and they include functional cells:

- Command,
- Planning,
- Diagnosis,
- Support.

- ⬇ - Orderly (hierarchical) information links
- ↕ - External – collecting information from the environment and transfer information outside
- ✖ - Internal – the production of information within a command post
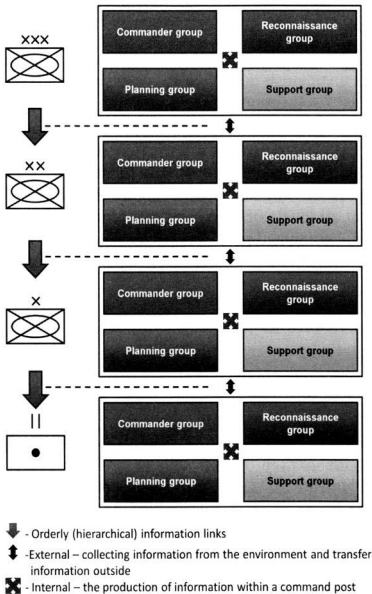
Fig. 4 Types and flow of information (developed based on [4])

Information relations in the command system

Circulation of documents in the command system requires that there exist ways of exchanging information through an organizational structure, level of command and its – Figure 4.

Using the criterion of **organizational structure in information system**, there are two types of informational links [4]:

- orderly (*hierarchical*) - associated with subordination (*sending 'down' orders, sending 'up' reports*),
- cooperation (*functional coordination*) - related to the exchange of information between functional people inside the headquarters or the exchange of information within the specialty at the same level or between different levels without.

Using the criterion of the **direction of the flow of command post** - the environment one can distinguish three types of informational links:

- **inbound external** - collecting information from the environment,
- **internal** - the production of information within a command post,
- **outgoing external** - the transfer of information outside the command post.

Leadership issue from the perspective of the function performed is a cyclical process of collecting, processing and exchanging information. To accomplish these tasks are organized at all levels of command the various centres, teams, groups or sections of a functional command post.

Analysis of this **decision-making cycle** allows separation of phases characterized by different intensity of exchange of information in each group of information links [4]:

- **positioning phase** - the use of inbound external information,
- **planning phase** - the use of internal links,
- **phase of putting tasks** - the use of external information of outgoing external links,
- **control phase** (*targeting troops in the course of action*) - the use of outgoing external links and external information.

3. Concept of realization

Described ways of collaboration of staff cells at operational level in headquarters impose directed implementation of solution. Many people and organisations need to collaborate at the same level and share information with commanders and superior commanders.

The main goal of **HMS JASMINE** system is to improve work of officers within Headquarters Command at the brigade or battalion level of command. It is accomplished by a dedicated web portal existing in a local telecommunication network of a command post.

Command Staff Portal provides functionality dedicated to the different sections and groups. The basis of its activity is a server that allows individual users to have a direct access to shared data and documents generated as files (*reports, plans, orders, notifications, alerts etc*).

Furthermore, it is assumed that already existing and fielded software components of **JASMINE** [7] [8] [9] system will be used, on both the server and individual workstations, to extend capabilities and functionalities of the Web Portal.
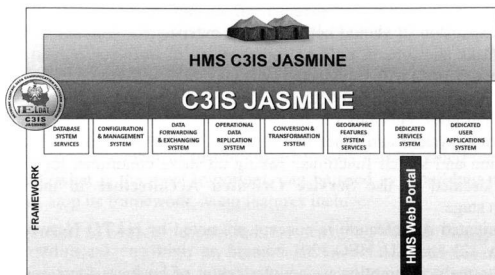
Fig.5 HMS C3IS JASMINE structure (© TELDAT)

Fig. 6 HMS JASMINE - shelter and portable version (© TELDAT)

Local data communications network will be implemented by hardware components of the JASMINE system in shelter or portable version. However, the software supporting the work of Staff will be developed in a dedicated version of the operational level Command Support System - **HMS C3IS JASMINE**.

Implementation should be transparent from business point of view and be flexible to future expansion. It should contain many independent modules responsible for different tasks and jobs in defined communities of interests. Shared information should be exchanged with established and acceptable workflow.

Moreover it should be able to connect to many sources and gain various data from different interfaces. This data should be managed accordingly, with relation to files in operational system and other digital assets. User will also need strong social collaboration and search functions. Taking all these conditions for consideration we have decided to use **Service Oriented Architecture** in the design and production stage.

Service Oriented Architecture is concept promoted by **NATO Network Enabled Capability** [2] and EU NEC [20] pointed as right one for military command systems. Its main assumption is modularization of business functions for greater flexibility and reusability. Software systems are built from components with defined interfaces, which interior is black box. Every component represents service with defined scope of action.

Fig. 7 HMS Web Portal structure (© TELDAT)

The more granular the components (*the more pieces*), the more they can be reused. When functions in a system are made into stand-alone services that can be accessed separately, they are beneficial to several parties. The architecture also provides a way for consumers of services, such as web-based applications, which are the most common and known example of using SOA, to be aware of available SOA-based services. Referring to all mentioned assumptions we have analysed available Web Based solution which can be used as a base for creation our product and we have selected **Microsoft SharePoint in 2010 version** [10].

Microsoft SharePoint is a family of software products developed by Microsoft for collaboration, digital assets sharing and web publishing. It is a Web based server that can be used to build portals and content management sites for collaboration. It is very versatile in a number of features and supports various enterprise and Web scenarios and, what is the most important, can be used as a building platform to build systems atop its framework. Main features include:

- **management of content:** capabilities for managing various files types, audio, video and images, support for terms and keywords, a managed metadata service and tagging features, content organizer, ability to define content types and re-use them across site collections, or even farms,
- **application integration:** possibility to connect SharePoint, business applications and other external data, this includes information that may reside within Web 2.0 services like blogs and wikis, provide read/write capability,
- **social computing:** like blogs and wikis, rich member profiles, tagging and comments, activity feeds, people search, workspaces,
- **business intelligence:** possibility to use scorecards, dashboards and self-service analysis functionality,
- **enterprise search:** including related searches, wild cards, spell check.

Command Staff consists of a group of officers performing a specific task for a commander. From the viewpoint of user Web portal is an element integrating the functions of the whole system in HQ. It is embedded on the Server Box JASMINE server [11] with HMS Web Portal installed.

Users use the workstations that run Web browsers and additional software components that allow them to take advantage of the functionality offered by the JASMINE system.

Officers of specified section log into the system and utilize the specified function modules for which they have permissions. They gain access to their allocated resources and system functionality that allows them to carry out their duties in an efficient way. There is also access to the so-called basic data which is public and requires no logging into the system.

Web Portal consists of different components responsible for data presentation, database storage and services that automate user work as well as other components of the system.
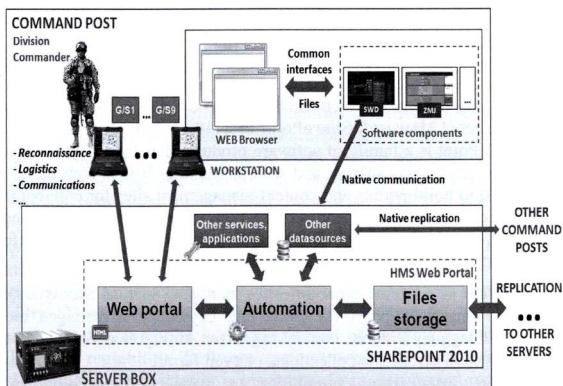
Fig.8 HMS C3IS JASMINE architecture (© TELDAT)

HMS Web Portal is a platform designed for collaboration and files group working which allows concurrently working on documents and their exchange between servers. The system includes a set of services that leverages the power of the engine and integrates them with the JASMINE system. Thus creates a platform on which the command staff can work regardless of number of functional groups it is currently consisting of.

On workstations software components have an ability of connecting directly to system native data sources and provide user with functions capable of data presentation and manipulation. Moreover, in the context of other data sources on the server, native ways of replicating data between other command posts are used. An example would be the transfer of operational data with the BRM (*Battlefield Replication Mechanism*) [12] protocol of C3IS JASMINE system.

In addition, software components, which work directly on files allow users to manipulate them on workstations, while the outcome of their work is stored on the server. Thus, despite the fact that some software components do not have mechanisms for collaboration, it is ensured by HMS Web Portal functionalities.

Other services and applications residing on the server may be used by automating services of HMS Web Portal. An example would be to download topographic backgrounds from Geographic Services servers or provide current status and parameters of individual services of command support system C3IS JASMINE.

The automation services are capable of automatic transfer of data between various data sources. As an example, officers prepare an order, as a Word document, which is submitted to command support system C3IS JASMINE and recreated in MIP JC3IEDM (*Multilateral Interoperability Program - Joint Consultation, Command and Control Information Exchange Data Model [13]*) database model. Another example would be to download information from the JASMINE TBD (*TELDAT Battlefield Directory*) database storing information about human resources and transfer them to C3IS JASMINE system database.

Automation services are also responsible for synchronization of constantly changing data between various data sources. It is assumed that the user will be able to make a decision about automatic data transferring between different sources as well as predefined patterns of behaviour.

The user has capability of searching and creating reports from all available resources (*files and data sources*) to which has permit. Such functionality is implemented by automation service and is associated with the generation of reports from different data sources.

It should be stressed that the security and confidentiality of data exchange in each of command headquarters can be secured by IEG JASMINE that is an implementation of NATO Information Exchange Gateway concept [14]. Flow of information between different security and system domains is controlled in reference to basic services (*ex. electronic mail, instant messaging, web browsing*) and functional protocols (*ex. MIP Data Exchange Mechanism Baseline 3 replication [15], NATO Friendly Force Information [16]*)

4. System functionalities

HMS Web Portal is a portal with many subpages connecting with various services. This is the basement for work of command post and staff users. We can distinguish user modules specialized in user-friendly service of organizational and individual cells - which are part of the functional structure of headquarters.

Specialized modules

System supports headquarters organisational structure recommended by NATO alliance, the ATP-3.2 as a newer form (*G/S1 - G/S9*), which is accepted as binding by most NATO armies:

- **G/S1, a module for human resources**: possibility to edit ORBAT and TASKORG, adding and removing users, military record and army quantity, human resources record (*friendly and enemy - captives*), reports, providing with personal forms,
- **G/S2, a module for reconnaissance and electronic warfare**: support for reconnaissance centres in analysis from many sources and situation monitoring, support for operational reconnaissance section in managing information needs and exchange, reconnaissance planning and putting tasks, gathering information from reconnaissance, summary and reports, support for

developing ways to counteract electronic threats, keeping and managing documents from interrogation of prisoners, direction of the reconnaissance teams, collecting information about their records,

Fig. 9 HMS Web Portal - main page (© TELDAT)

- **G/S3, operational module**: supports the process of coordinating the work of all of the organizational staff, preparation of documents related to the provision of permanent combat readiness, collecting and studying data about the situation and preparation the operational-tactical calculations, development of combat orders and regulations, organizing positions and command posts, the change of operational data - planning, reporting on the current situation, plans of attack and surprising opponents, hydrological and weather data collection and reporting, contamination and infection data collection and reporting, writing verbal orders commander, provision of maps and other topographic documents, the daily combat operations diary, situation map,

- **G/S4, a module for the logistics and medical care**: logistics support (*transportation, supplies, repairs*), medical support, support of the host country - coordination of logistical support by the host country,

- **G/S5, a module for planning**: supports the planning and forecasting campaigns, operations, tactical actions, variant planning, operational analysis,

- **G/S6, a module for communication and information transmission**: management of communications and IT systems, radio frequencies management, cryptography,

- **G/S7, a module for the doctrines and training**: doctrines, exercises and training planning,

- **G/S8, a module for the resources and finances**: supports the activities of the civil secretariat, management of civilian personnel, financial planning and budget, support for organisation and execution of contracts,

- **G/S9, a module for the civil-military cooperation**: data collection and preparation of documents relating to the host country's resources, negotiations on the arrangements and agreements on co-ordination and support, coordination of civil-military cooperation, coordination with other government bodies of the emergency response sections in the event of public emergency.

All modules should allow to work with the formalized documents that are created based on predefined patterns. Each module will have a typical set of the documents templates characteristic for its job. It enables to work through a web browser with the following types of MS Office documents: MS Word, MS Excel, MS PowerPoint.

Information sharing and dissemination

Portal functionality, beyond the storage of files, provides an implementation of the documents relevant access policy, archiving, sharing management information, business processes and publishing content. Web Portal allows to enter the documents in paper form, which, after scanning the user's request may be subject to a process of automatic recognition (*OCR*). The system also allows voice input information. Portal fully integrates with the operating system. Documents can be easily managed from a file manager built into the operating system (*Explorer*). Documents in the portal can also be viewed directly from the operating system.

HMS Web Portal system allows sharing of information between multiple types of databases, files or other formats and connect to various sources of data. The basic sources include: IHS JANE's database (*the database that stores various information regarding geographical situation, the weather, a description of the armoured vehicle in a piecemeal manner [17]*), MAJIIC (*Multisensor Aerospace-ground Joint ISR Interoperability Coalition [18]*), TBD - (*TELDAT Battlefield Directory - provides directory services, a logical and precise way to describe all human resources and hardware*), JC3IEDM and C2IEDM [19] (*older and newer versions of MIP database models*), IMS (*Information Management System* - a database system that stores information about the battlefield), files, photos, voice and video recording.
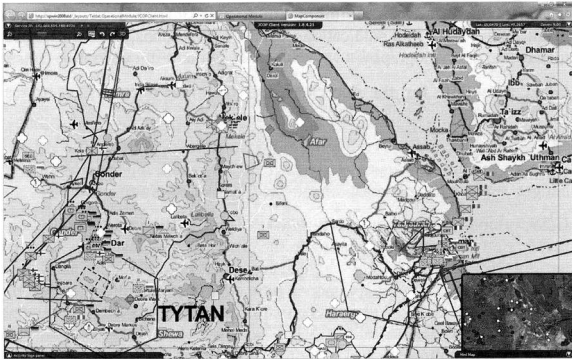
Fig. 10 HMS Web Portal - ORBAT Management page (© TELDAT)

Automation process

Through the process of automation some of the data is imported and delivered automatically through indicated in the previous sections data sources. Some data, however, will require manual entry by the user. Regardless of where and how to enter data, further proceedings against them will be automated according to a defined pattern of information flow.

For the data directly related to SharePoint, the flow of information stored and associated cycles are defined within its native mechanisms. For the remaining elements the definitions of flows is encoded during creation of modules. One of the primary automation process, which can be distinguished, is the process of creating and editing plans and orders. The flow of plans and instructions is strictly defined in the server. Additionally, the system is able to automatically analyze the collected information, and, if necessary, to make the conversion. The operator introduces the plan in the form of a text document (*this may be a Microsoft Word document*), which is then accepted by the immediate supervisor. Such a document goes to the server and according to the flow of documents is further transmitted.

Each server operates independently, but between each of them data is replicated from both the HMS JASMINE system and the data stored and related to SharePoint. However it does not mean, that all servers are obligated to keep all the data. There may be specialized servers that are running a limited number of modules, such as only for the logistics purposes. Everything depends on the software configuration prepared on a particular server and user permissions.

Communication among users

HMS system allows communication between officers working in the staff of command, or the officers in different command levels and specialties. Methods of communication are different for various purposes and depend on demand. They include:

- **Instant text messaging (*JCHAT*)** - communication via text messaging available via the Internet or via a web browser application.
- **E-mail** - communication using e-mail.
- **Voice** - using voice communication between officers in the command staff, functional groups or between the staffs of command.
- **Video** - communication using video image coupled with the transmission of voice (*videoconference*). As for voice chat would be possible with one or more people
- **Forums** - communication using forum / newsgroup.

5. Practical implementation and cooperation with other systems

In current paragraph there will be described imaginary example of HMS Web Portal practical implementation (*see Figure 11*). At first, it has to be assumed that there exist two military units: superior (*SUP*), and subordinate (*SUB*). Each unit has standalone server which are connected with using native replication mechanism. From NATO C3IS SYSTEM unit SUP receives, via one of the standardized protocols, military data regarding some incident in particular area. All data is being presented in JCOP Client application directly from Web Portal, users can see military symbols defining what and when happened. From LOCAL ARMY C3IS SYSTEM, using some other standardized military protocol, unit SUP receives help request from the Red Cross organization regarding mentioned incident. Unit SUP, section G/S9, using module for the civil-military cooperation creates and exchanges mails with the Red Cross organization about possibility of sending military convoy protecting Red Cross volunteers during expedition to incident area. Red Cross organization sends information about people taking part in action with multimedia files which are being saved in HMS Web Portal storage. All data about human resources is being saved in hierarchical manner in section G/S1 with module for human resources. Automatic flow is started which notifies sections G/S5 (*which uses module for planning*), G/S4 (*module for the logistics and medical care*) and GS/3 (*operational module*) about need of creating plan for a mission. Sections cooperate with each other using emails, instant messaging and portal web pages, creating plan as Word document. Plan is replicated, based on automatic workflow, to SUB unit. SUB unit automatically converts plan from Word file to data in system database which is automatically sent and becomes visible to military convoy waiting for orders in vehicles. Convoy with Red Cross volunteers starts a mission going to area of interest. All their moves are

automatically visualised in web browsers. In the meantime Unmanned Reconnaissance Aerial Vehicle gathers audio and video from the planned route and sends to further analysis to G/S2, which uses module for reconnaissance and electronic warfare. Based on received data and additional information from IHS JANE's database, they create reports and sends them back to military convoy and other interested nation which cooperates in mission. Reports are merged with the ones written by section G/S6 with the module for

communication and information transmission.
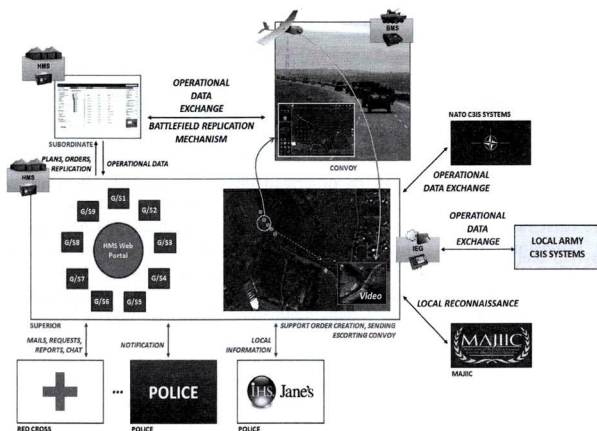
Fig. 11 Example – imaginary situation presenting cooperation of entities with Web Portal (© TELDAT)

6. Summary

During recent years, NATO has developed many doctrines and concepts that describe effective collaboration within military organisations and with the outside world as well. It is essential that all rules are taken into account during planning and execution phase of all tasks resulting from civil-military cooperation.

Considering all aspect presented in the article, a specialized Web portal (***HMS Web Portal***) for commanders who want to improve efficiency, information quality and collaboration is a must. Furthermore, it is manifest that technologies such as

Service Oriented Architecture, Web Services, Web Portals and SharePoint are crucial to ensure system scalability, flexibility, interoperability and future development.

HMS C3IS JASMINE is a web based information system that meets all essential requirements of high level commanders. Furthermore it is a right tool for right people to secure collaboration of unit's sections and groups as well as cooperation with civilian organisations.

Described in the article solution can be used as a support of NATO expeditionary operations or EU Battlegroups, which are mainly involved in civil-military operations such as Crisis Response.

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