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"The Evolution of C2**"**

Title:
CHESS: Commander HandhEld Support System

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Abstract:

To remain effective, commanders must maintain situational awareness regardless of where they are. In addition, their absence from their main headquarters must not have a negative impact on both the tempo of operations and the timeliness of the planning cycle. Wireless handheld devices could be used to enable the concept of "Commander on the move" by allowing a real-time exchange of information with key DND systems. By supporting situational understanding, decision making, directive dissemination in a designated HQ as well as on the road, they will allow commanders to be virtually present at any required decision points. A prototype called CHESS (Commander HandhEld Support System) has been developed to demonstrate such concept. This paper describes the different functionalities that have been implemented into CHESS.

Section 1: Introduction

One of the most important enablers of effective command and control is the information. It allows commanders to give meaning to and gain understanding of the events and conditions in which they make decisions and conduct operations. Providing access to timely, mission essential information to a commander is then critical to a command and control process. Accordingly, the overarching intent of command support systems should be to place timely mission essential information in the hands of the decision makers throughout the chain of command [DAD 2008].

Regardless of where they are located, it is essential that commanders can continuously have access to information to support the command and control activity under their area of responsibility. Considering this need and the fact that while mobile and separated from a command and control facility, they will face limited connectivity, access to information must be prioritized in order to timely deliver the most important and relevant information. For that reason, the information provided to Commanders should first support the following three important command support functions [DMR 2009b]:

- Maintain Situational Awareness at all times;
- Retain the ability to make decisions and exert command authority and, finally;
- Continue to contribute to headquarters operational planning process.

More routine, yet pertinent, information and data will always be accessible once they reach a command and control node.

Amongst the different existing computer-based systems that can provide support to these three key command support functions, there are:

- CommandView: CommandView is the Canadian Force Joint web-based information portal aimed at providing a single point of access to current information about the status of Canadian military operations. CommandView provides linkages to various Canadian Forces organizations and allows information to be posted and disseminated easily;
- Incident Management System (IMS): IMS is an electronic log and incident management application within CommandView that provides situational awareness in a timely manner to commanders at all levels. It is the tool for the logging of incidents and events electronically and it has a general log for operation/command centers. IMS enables the geographic visualization of incidents and events through CommandView to enhance situational awareness;
- Collaborative Operations Planning System (COPlanS): COPlanS is an integrated flexible suite of planning, decision aid and workflow management tools design to support a distributed team involved in the Military Operations Planning Process (e.g., Canadian Force Operational Planning Process (CFOPP)). COPlanS provides the ability to plan an operation in a net-centric environment with integrated collaborative tools. The system offers functions to design and manage multiple concurrent distributed battle rhythms at different planning levels. It includes a set of tools that are dedicated to support the process as well as the production of the outputs of the different stages of the CFOPP, i.e. the initiation, the orientation, the Courses of Action (COA) development as well as the plan development;
- Execution Management and Plan Adaptation (EMPA): EMPA is a prototype that supports time-sensitive as well as deliberative operations execution through continual monitoring of the situation inputs and execution reports.

All these systems can be accessed through dedicated networks using laptops or desktops. While away from their command posts and/or in transition between locations, it would be more convenient for commanders to use a mobile wireless handheld device. However, in that case, mobile wireless handheld devices should provide the right information, at the right time, in the right form. It means that any decision support system working on mobile wireless handheld technology should have/provide access to the information and functionalities of the systems mentioned previously (Figure 1) or their equivalent.

Depending on their personal preference or based on their location, commanders can decide to delegate or not their authority to an acting commander. In this work, it is assumed that commanders have not delegated that authority and remains fully involved in the decision making process. This paper describes how mobile wireless handheld devices can be used to allow commanders to participate in the planning and the monitoring of operations while being away from their headquarters. Section 2 describes a list of information requirements for commanders away from their command posts. Based on these requirements, mobile wireless handheld device functionalities aiming to support situation understanding as well as operation planning and monitoring are being presented in Section 3. Section 4 describes the approach that has been used to develop the design

of the user's interfaces, Section 5 presents CHESS underlying technology and Section 6 gives an overview of its architecture.

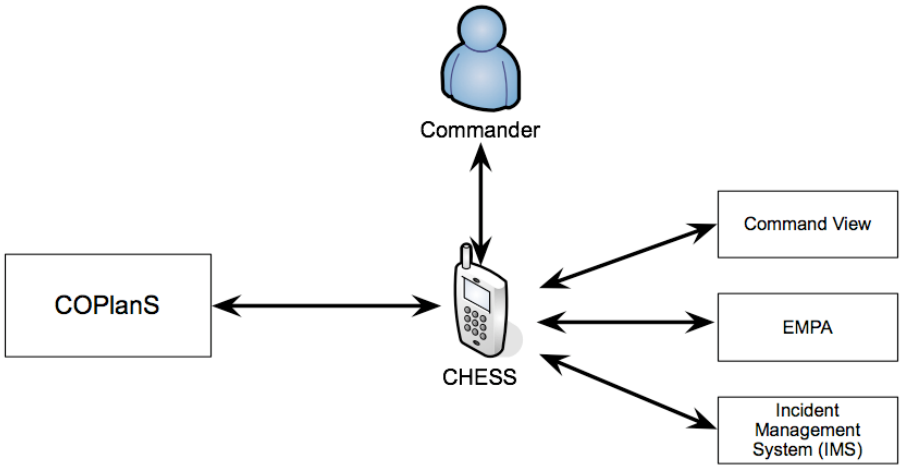

Figure 1 - *CHESS system context*

Section 2: Information Requirements

In all time, commanders need to receive the most up to date information about the evolution of the operations under their areas of responsibility in order to provide directions. They need to continuously remain in touch with their superiors, their staff, subordinate commanders and Other Government Department (OGD) Partners. Commanders must remain an active participant in the decision-making process. They need to know the tempo of their planning staff as well as the evolution of the plans in order to provide guidance as required. Even if, in order to accomplish the different aspects of their work, commanders are often outside of their offices or their command posts, they need to continually have access to information and knowledge related to the current operations and the operations being planned.

Mobile wireless handheld devices can be used by commanders while away from well-established or even mobile semi-permanent headquarters. Those tools can allow commanders to retain access to critical information so they can retain Situational Awareness, remain capable of exerting their authority and be capable of contributing to the planning process of their respective staff. Considering that the bandwidth is limited when commanders are mobile, the idea is not to deliver all the information to the commander at all times, but rather the most relevant information at the right time in order to allow Commanders to make the right decision with a view of delivering the right effect at the right time to generate the desired operational outcome. To do so, it is required to identify what information commanders would require, to understand what and how this information is used for, and determine when it is used for. Then, we have to identify which existing systems can provide it.

Information to maintain baseline situational awareness

Commanders will continuously monitor the status of their area of responsibility as well as the threats and risks. In fact, commanders may require access to most of the operational briefing in their area of operation as well as from the strategic level. Frequency of consultation will highly depends on the level of "urgency" of the situation. Commanders will require ability to interact with Staff to discuss/clarify some aspects of these documents. Less frequently, commanders may want to have access to operation logs.

Commanders must also have the ability to be notified in near real-time about key incidents and events that are emerging or occurring. Then they may want to have access to detailed information about some of them.

To maintain baseline situational awareness, it is expected that the following systems will be used:

- Command View:
    - Access to briefings and documents;
    - Notification scroll bar and alert;
- Operational Log.

Information to retain the ability to make decisions and exert command authority

Commanders must remain capable of monitoring the evolution of the situation, the progress status of key aspects of the plan, and the status of mission-critical assets regardless of where they are located. They will closely look at specific operation or event and will require getting actionable information/intelligence to make timely decisions to maintain mission success and coordinate and synchronize the actions of all players. They will require access to the common operations picture, keystone documents such as plans, rules of engagement (ROE), Strategic Guidance within the context of an on going operation. To be successful, they must remain in contact with their superior commander(s), their subordinate commanders, and the local public partners and allies in order to make the timely decision required to keep a plan on track, including making changes to elements of the plan and rapidly communicating their intent to both their superiors and subordinates.

To retain the ability to make decisions and exert command authority, it is expected that the following systems will be used:

- Command View:
    - Notification scroll bar and alert;
    - Access to briefings and documents;
    - Access to Mission View:
        - Access to plans;
        - Access to reference documents;
- Incident Management System:
    - Notification and access to information about Incidents in specific zones of interest;

    - Geo-referenced information of incidents in specific zone of interest;
    - Access to incidents outside their zone of interest;
- Operational Log;
- EMPA:
    - Monitor the progress of a given operation;
    - Remain involved in the process of amending the plan to achieve mission success;
    - Contribution to hasty planning, cycles, review and approval of fragmentary orders (Frag O) or other instructions.

Information to contribute to headquarters operational planning process

Typically, the operational planning process [SJS 2008] at the Operational Level occurs over longer period of time leading to the production of contingency plans or operational plans. Contrary to the planning and decision making process associated with an incident or on going operation, these activities are not as time sensitive. Commanders would most likely have time to return to their headquarters to be involved in the planning. However, this can change rapidly in the case of a rapidly emerging situation when the timelines to complete a plan can be compressed significantly. Under these circumstances commanders will have to be involved in the process to the full extend possible regardless of where they are located.

In that case, commanders may need to access keystone documents such as existing plans, ROE, Strategic Guidance throughout the planning process. For example, to initiate and orient the planning process, commanders must be able to read and interact with the documents received from higher level of command and had the ability to extract key elements and import them into the Commander's Planning Guidance. They should be able to conduct mission analysis, develop own mission statement, fine tune commander's planning guidance, access and participate in the mission analysis briefing, issue guidance to the staff including concept of operation and develop issue warning orders to subordinate commanders. Commanders must have access to the decision brief produced by the staff and they must have the capability to actively participate in the decision brief to provide guidance to their staff (ex. Commanders must be able to select COA or provide additional guidance and articulate a concept of operations). They may want to consult their superiors or OGD partners to discuss aspects of the plan or seek clarification. Finally, they need to be able to review plans, approve them and authorize their distribution.

To contribute to the headquarters operational planning process, it is expected that the following systems will be used:

- COPlanS:
    - Access to planning process battle rhythm;
    - Provide directive and guidance;
    - Access to information and outputs of the different stages of the CFOPP (initiation, orientation, COA development, plan development);
    - Approve the different outputs (ex. plan);

- Command View:
    - Access to briefings;
- Incident Management System:
    - Notification and access to information about incidents in his zone of interest;
    - Geo-referenced information of incidents in his zone of interest .

Summary of information requirements

To maintain Situational Awareness at all times, retain the ability to make decisions and exert command authority and, finally, contribute to their headquarter operational planning process, commanders need to be able to:

- Have access to information related to the context of an operation as well as to the execution of an operation (for example by having access to some of the information provided through the CommandView portal, EMPA, etc.);
- Have access to information related to the planning of an operation (by having access to Collaborative Planning System (COPlanS) information). This includes information on the battle rhythm of the planning staff as well as intermediate results of the OPP that is being made during the execution of the OPP;
- Provide to their staff commander's intent guidance and/or clarification and/or direction;
- Obtain advice related to the planning of an operation. Such advice could be provided directly by key people of the commander's staff, or produced by available tools in the command post (ex. Decision support functionalities of COPlanS); and,
- Obtain advice related to the execution of an operation. Such advices could be provided directly by key people of his staff, or produced by available tools in the command post (ex. EMPA).

Section 3: System Functional Requirement

Considering the information requirements identified in Section 2, this section identifies the related system functional requirements. Generic system functions that mobile handheld devices should have to support commanders are:

- Provide user identification mechanism to preserve the continuity of the chain of command and maintain its integrity;
- Provide access to different communications mechanisms and networks. This allow commanders to establish and maintain contact between their staff, subordinate commanders and key joint, coalition and public sector partners through different means such as cellular phones, text-based chat with individuals or groups, email, Web;
- Provide commanders with the capability to transmit and receive information in an environment with limited bandwidth and unstable connectivity;

- Provide commanders with a notification, alarm and inter-application through different context adapted mechanism to draw their attention to important or time sensitive information;
- Receive, store, view and send electronic documents;
- Manage personal information including contacts, appointment schedule, calendar, meetings, tasks, emails.

The command support functions that mobile handheld devices should are:

- Support situational awareness : Situation awareness (past, present, and even predicted) will be accessible from heterogeneous data streams (audio, speech, text, video, maps, etc.) through different access means:
    - Access to Command View briefings and other important documents;
    - Access to the incident list and details via IMS;
    - Access to maps with geo-referenced operations or incidents;
    - Ability to monitor plan execution and operations status via EMPA and other legacy C2 applications.
- Participate in the planning process: Access to plans and consultation of planning status can be done via COPlanS to:
    - Monitor progress of planning cycles and associated key deliverables ;
    - Access and control planning battle rhythm;
    - Participate in COA development as required or review the output of the COA Development stage of the OPP;
    - Access and/or add Commander Critical Information Requirements (CCIR);
    - Consult the threats list;
    - View and review the outputs of the planning process;
    - Contribute to the planning process by having the ability to:
        - Complete missions analysis;
        - Draft a proposed mission statement;
        - Prepare and distribute Planning Guidance;
        - Draft a Concept of Operations and its associated Commander's Intent paragraph;
    - Review and approve key documents in particular orders of different formats;
- Receive notifications (via email) related to the status of on-going planning activity, new incidents, mission success criteria, decision points and associated triggers, availability of key planning products;
- Specific text-based chats with other planning personnel, subordinate commanders, current operations staff, superior commanders;
- Conduct audio conversations while viewing briefing documents;
- Receive a full briefing presentation remotely (automatic run of slides remotely controlled by the presenter).

Section 4: Design of User Interface Structure

Designing user interface for mobile handheld devices is a challenging exercise. Effectively, handheld mobile device interfaces have specific constraints related to their screens (their size and their resolution) as well as to the bandwidth limitations. Consequently, it is difficult to display large amounts of text and graphic-based output on such devices [Tarasewich, Gong and Nah 2007]. Adipat and Zhang had identified that mobile users may face problems of 1) information overload – excessive information that causes difficulty of locating the desirable information on small screens, 2) limited memory of mobile devices – placing a burden on users to remember the meanings of commands/icons/labels, 3) navigation loss – confusion about choosing a path to reach a desired page, and 4) cumbersome input methods – small physical/soft keyboards that need high levels of attention and proficiency.

Existing guidelines should be considered when designing interfaces for mobile devices. For example, the guidelines proposed by Gong and Tarasewich [Gong and Tarasewich 2004] are worth to be considered. They include:

- Consistency:
    - The "look and feel" should be the same across multiple platforms and devices;
    - Elements of mobile interfaces such as names, color schemes, and dialog appearances should be the same as their desktop counterpart;
    - Create input/output methodologies that are device independent - avoid using methods specific to mobile platforms where possible;
- Reversal of actions:
    - Mobile applications should rely network connectivity as little as possible;
- Error prevention and simple error handling:
    - Nothing potentially harmful should be triggered by too simple an operation (e.g., power on/off);
- Reduce short-term memory load:
    - Rely on recognition of function choices instead of memorization of commands;
    - Use modalities such as sound to convey information where appropriate
- Design for multiple and dynamic contexts:
    - Allow users to configure output to their needs and preferences (e.g., text size, brightness);
    - Allow for single- or no-handed operation;
    - Have the application adapt itself automatically to the user's current environment;
- Design for small devices:
    - Provide word selection instead of requiring text input;
- Design for limited and split attention:
    - Provide sound and tactile output options;
- Design for speed and recovery:
    - Allow applications to be stopped, started, and resumed with little or no effort;

    - Application should be up and running quickly;
- Design for "top-down" interaction:
    - Present high levels of information and let users decide whether or not to retrieve details;
- Allow for personalization:
    - Provide users the ability to change settings to their needs or liking;
- Design for enjoyment:
    - Applications should be visually pleasing and fun as well as usable.

In a subsequent work, Tarasewich, Gong and Nah [Tarasewich et al. 2007] have modified the guideline "Design for small devices" by "Design for Multi-Modal Interfaces". Such approach wants to leverage on visual, audio and tactile capability that mobile handheld device provide. Recently, in an effort to have consistent user's interfaces amongst different applications developed to support military decision-making, a list of general guidelines has been produced [CAE 2008]. These guidelines included aspects to consider when developing interface for mobile devices. The following aspects have been considered in our work:

- Keep the URLs of site entry points short;
- Provide only minimal navigation at the top of the page;
- Ensure that content appears and behaves properly in landscape mode as well as portrait mode.

As one can expect, it is often difficult to respect all the proposed guidelines. So, while trying to respect these guidelines, it was decided to identify a strategy that would drive the design of the interfaces for CHESS. The strategy developed for this work was:

- Give access primarily to information required by Commanders;
- Minimize the number of clicks to have access to any information;
- Do not present twice the same information, even if it comes from different native applications.

The first item implied that it was not our intent to make all information available on existing systems available on mobile handheld devices. For the second item, the intent was to allow consultation of any piece of relevant information inside 5 clicks. The third item intended to avoid duplication of information. This strategy drove the design of the structure of the screens from a holistic point of view. In fact it invalided the guideline "look and feel" should be the same across multiple platforms and devices". Effectively, in order to avoid duplication of information and reduction of the number of clicks, we decided to create abstract links that allowed going from one piece of information provided by an existing system directly to another piece of information provided by another existing system. So the interfaces were designed without respecting the native interfaces that were provided by the native applications.

Considering that the information identified in the previous section represented what commanders needed to reach/provide, it was required to identify for each one, a unique source, i.e. to identify which one of the existing systems will provide it. During this exercise, we identified point of junctions that would allow linking the different

applications together to reduce the number of steps required to have access to each piece of information. The Table 1 presents the systems that have been identified as a source of information.

Command View	• Provides baseline information at strategic and operational level
IMS (Incident Management System)	• Incidents list • Incidents map • Incidents details
COPlanS	• Campaign list • Campaign plans • Plan • Battle Rhythm • Plan stages information and outputs (Initiation, Orientation, COA Development) • Plan CCIR's • Plan Risks
EMPA	• Global operations information • Plan execution status

Table 1 - ***Information required by systems***

Following these steps, the global design of the screen structure was produced (Figure 9). Upon logging into CHESS, the user (commander) is brought to the main page (Figure 2) comprising three frames: one for Command View, one for IMS and one for COPlanS. From the main page, the user can have access to specific pages designed for each one of these main systems, or go directly to some specific information provided by each of these systems.

For example, on the main page, the user can click "Command View" and be directed on a page were he can have access to baseline level info from strategic or operational level, or list the current operations using different types of filters (by level of command or timeframes) (Figure 3). By selecting Strategic or Operational level baseline information, the user will be brought to a page that presents a list of briefings that can be downloaded and then viewed directly on the mobile device. From the main page, the user also directly clicks on specific operations from a list of current operations. The information is being provided by EMPA which give information about the evolution of the operation.

Figure 2: ***Initial CHESS screen***

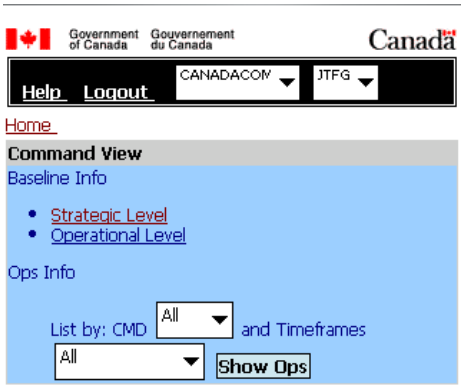

Figure 3: ***Command View page on CHESS***

A similar approach was also used for IMS and COPlanS. The main CHESS page provides a list of incidents (coming from the IMS server) that can be selected to go directly to the page of the selected incident. Clicking the IMS title on the main CHESS page brings the user to the IMS-specific portion of the mobile portal. The main IMS page (Figure 4) presents a list of incidents, relevant to the command and sub-command selected, which can be sorted by name, status or type. A link named "Map" is also available to get a short list of incidents which are also presented on a map (Figure 5). Finally, the user can select an individual incident and get various details for that specific event.

IMS provides notification for new incident. These notifications are being sent using an email to the commander. The email contains the web link leading to the specific incident. Accordingly, the user can click on it to be brought directly to the CHESS web page description of this incident.

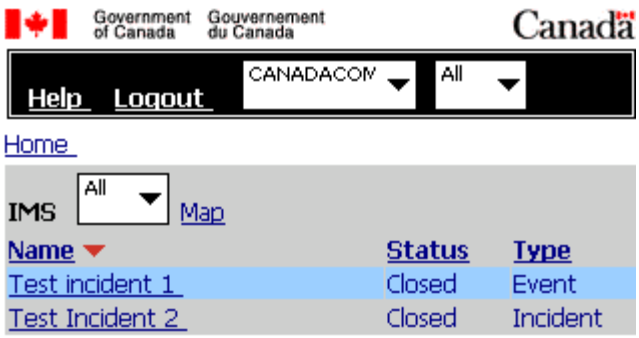

Figure 4: ***IMS main screen on CHESS***

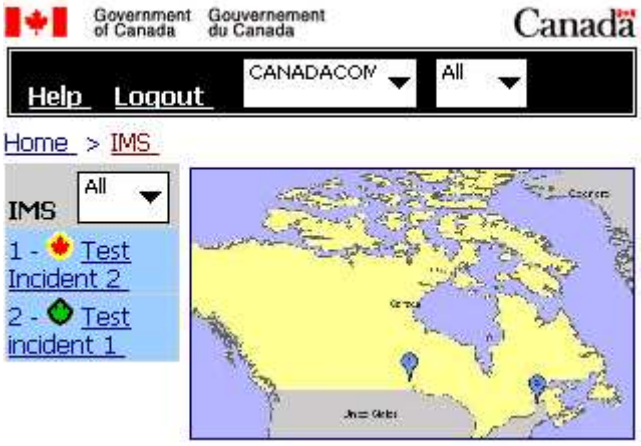

Figure 5: Map

CHESS gets information about all operations that are in the process of being planned through COPlanS. It provides access to the different operational and tactical plans that are associated with a campaign. The main screen for a plan (Figure 6) gives high level information about the plan as well as access to different tools: Commander's Critical Information Requirement (CCIR), Battle Rhythm and Threat and Risk Assessment (TRA). By selecting the battle rhythm, CHESS provides information about the evolution of the planning (Figure 7). From that screen, the user has access to different information and outputs of the initiation, orientation, COA development, plan development. For example, the initiation leads to the screens for the authorized movement, guideline to staff, initial reconnaissance; the orientation leads to the screens for the commander's intent and commander's COA guidance and the COA development leads to the comparison of the different COAs (Figure 8) and allows the commander to select a COA. The screen for the CCIR allows the commander to identify a need of information and display the information obtained. The screen for the treat and risk assessment allows the commander's to consult and accept or reject any elements of risks.

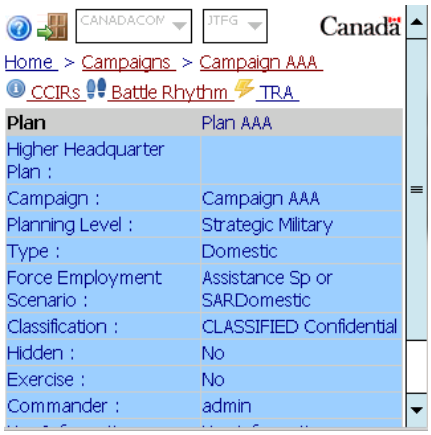

Figure 6: ***Main screen of a plan***

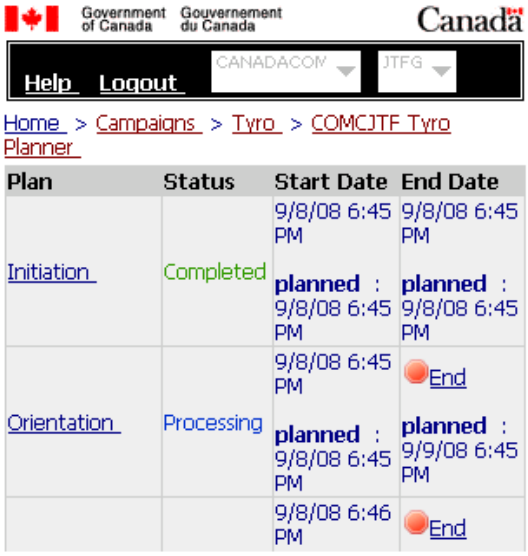

Figure 7: ***Planning battle rhythm***

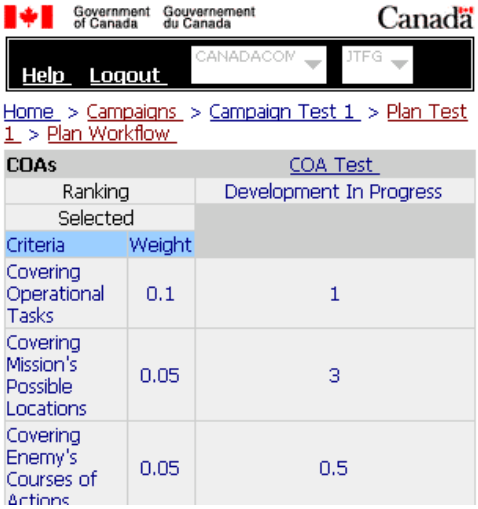

Figure 8: ***COA comparison***

As presented in Figure 9, CHESS gives access to information provided by CommandView (CV), EMPA, IMS and COPlanS. The structure of the screens has been designed so the shortest path reach any information element is always smaller than or equal to 5 clicks. This has been possible by cross-linking the different systems, when appropriate. It has been decided that EMPA would not have its own main page since the information provided by EMPA is very complementary to the information of CommandView.

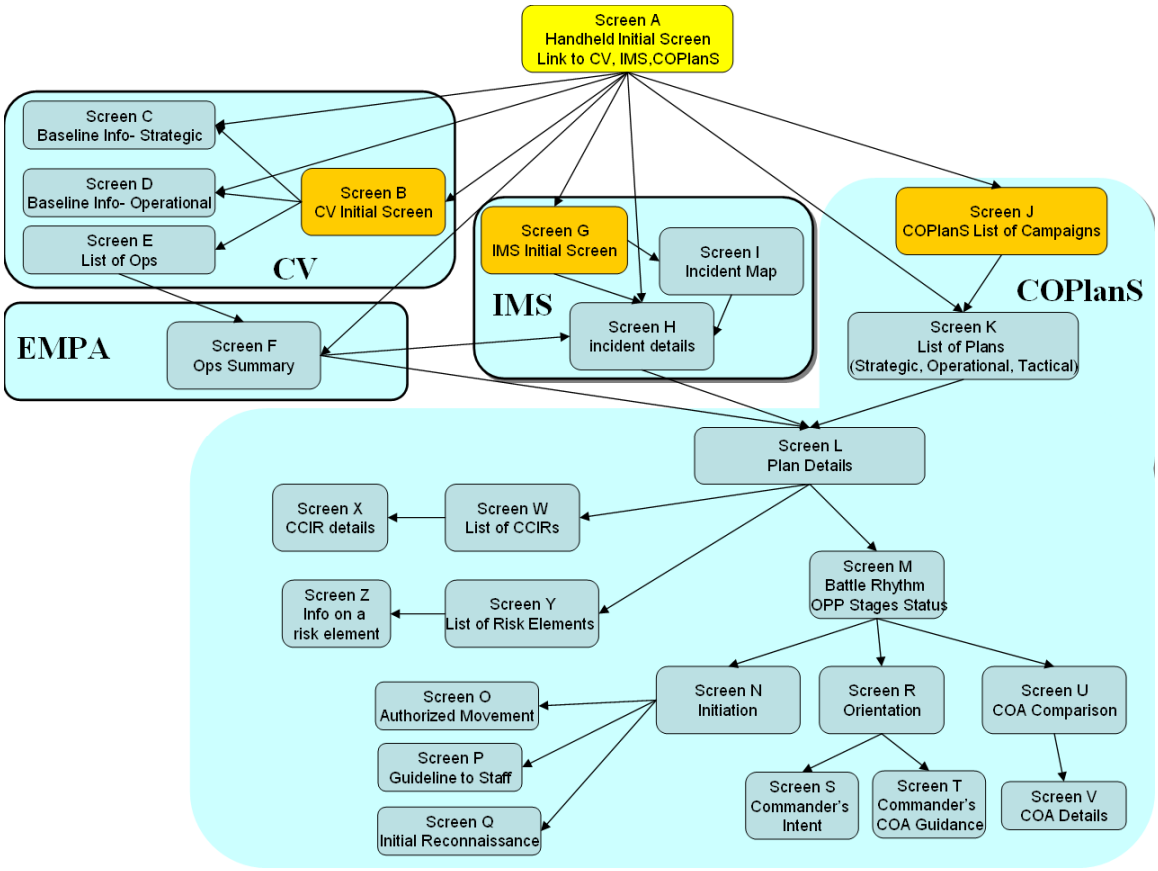

Figure 9: ***Screen structure***

Section 5: CHESS Technology

To be in line with the Canadian Force applications, Microsoft Windows Mobile was a requirement in the selection of a mobile handheld device. Microsoft Windows Mobile provides users with useful business oriented functions and applications by default. They include:

- Personal Information Manager;
- Internet (Browsing, Email, Chat);
- Office Mobile suite.

As an additional application installed on top of the operating system, Resco Explorer is used as the file manager of the device. It includes various options as file encryption, ZIP compression, ZIP/RAR decompression, built-in viewer for files in TXT, BIN or HEX

format, as well as JPEG, GIF, BMP and PNG graphic formats. A Recycle Bin manager allows an "undelete" option, an FTP Explorer, a Registry Editor as well as capability to exchange files via Bluetooth.

The mobile handheld device selected was HTC Mogul (P4000) (Figure 10), which has the following characteristics:

- Touch screen and display size and resolution (320x240 pixels, 65k colours);
- QWERTY slide-in keyboard for easier typing;
- WIFI (802.11 b/g);
- Bluetooth;
- Expandable memory: MicroSD cards;
- Operating System (OS): Windows Mobile 6 (latest available version at that time).

Figure 10: ***HTC Mogul (P4000)***

Section 6: CHESS Architecture Overview

As indicated previously and presented in figure 1, CHESS has access to existing information systems. A system of systems integration approach based on a services oriented architecture has been adopted, which implement an enterprise service bus (ESB). The ESB is being used for information exchange between:

- CHESS and Command View;
- CHESS and IMS;
- CHESS and EMPA.

However, there is a direct link between CHESS and COPlanS.

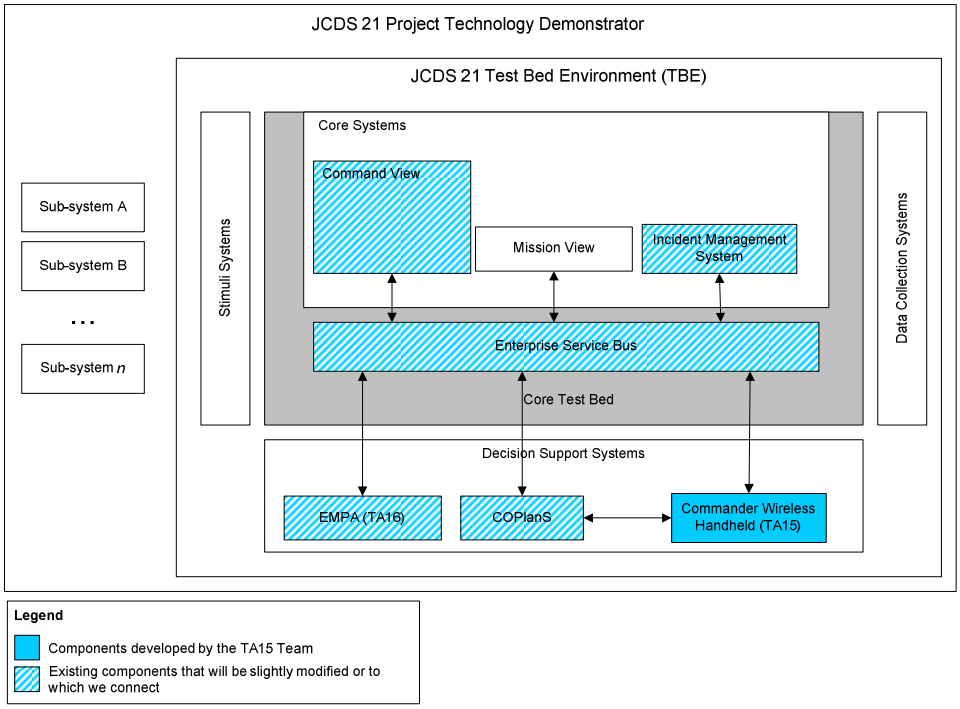

Figure 11: ***CHESS in JCDS 21 Test Bed Environment [DMR 2009b]***

CHESS connects to the network through various means. The wireless handheld device required access to a server in order to call the various systems and/or services it needed. The server can be accessible via a Wi-Fi router for local mobile access or from a PBX providing GSM connectivity could allow the CHESS to access the server via the cellular data network, as pictured in the following diagram.

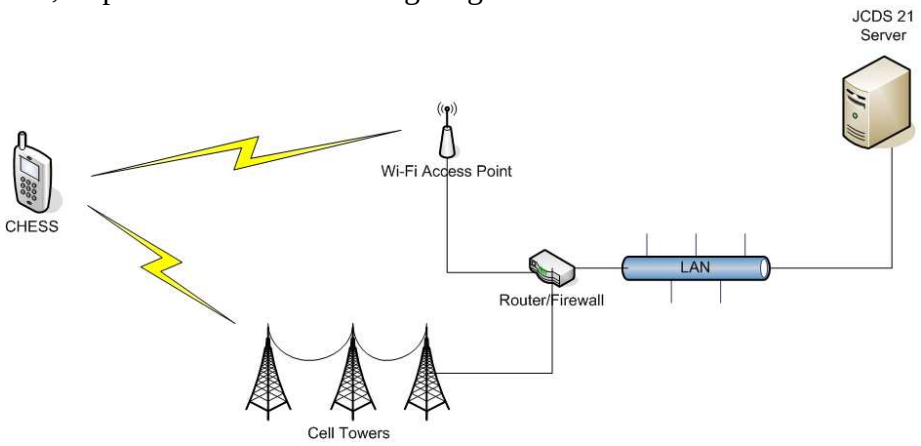

Figure 12: ***CHESS Network Connectivity Overview [DMR 2009a]***

Section 7: Conclusion

Commanders may be called away from their headquarters to liaise with superiors, partners or subordinates. If they decide not to pass the command to a subordinate, they will need to find a way to be continuously aware of the evolution of the operations under their areas of responsibility in order to provide timely directions. This paper describes

how mobile wireless handheld technology can be used to support commanders being away from their headquarters to:

- Maintain situational awareness at all times;
- Retain the ability to make decisions and exert command authority and, finally;
- Continue to contribute to his headquarters operational planning process.

A list of command support key information for commanders being outside of their command post was proposed. This list includes:

- Information related to the context of an operation as well as to the execution of an operation;
- Information related to the planning of an operation (by having access to COPlanS information);
- Commander's intent guidance and/or clarification and/or direction;
- Advice related to the planning of an operation;
- Advice related to the execution of an operation.

This work has demonstrated the following functionalities for a decision support working on a mobile handheld device:

- Access to situational awareness. Awareness of the situation (past, present, and even predicted future) will be accessible from the heterogeneous data streams (audio, speech, text, video, maps, etc.) through different access means supported by the device and provided by JCDS 21 test bed systems, mainly CommandView;
- Reception of notifications events/ alerts through emails or other specialized transmission protocols;
- Access to plans and consult planning status via a web-based interface to COPlanS;
- Collaboration with planning staff to activate planning stages via a web-based interface to COPlanS;
- Contribution to the planning by giving guidance or by inserting information or concerns about strategic aspects (e.g. CCIR, Risk Management, Commander's Guidance);
- Possibility to approve documents;
- Reception of briefings remotely (automatic run of slides on its device screen with audio of the presentation);
- Capacity to store and retrieve e-mail, manage contacts and appointments;
- Text-based online Chat communication over Internet (direct one-on-one or to a group);
- Capacity of audio intervention during a remote briefing

The approach used to design the decision support was composed of 5 steps:

- Identification of the requirements of information that commanders need to receive and send;
- Identification of the existing systems that provide this information;
- Identification of the strategy to be used for the design of the decision support user's interface;

- Elaboration of the structure of the screen that would respect the strategy;
- Implementation of the screens and their underlying functionalities.

The current implementation of CHESS can be used on a secure mobile wireless device. This has a direct impact on the way functionalities have been designed since we had to use an operation system that was accredited and it was not possible to keep anything in memory. However, considering the rapid evolution of mobile wireless handheld technology, it is anticipated that future user's interfaces on such secure devices will be a lot more efficient in term of interaction and visualisation possibilities.

Furthermore, while the strategy used for the design of the user's interface is satisfying for a first effort in this field, more elaborated user interfaces strategies should be further investigated. For example, it would be worthwhile to investigate approaches allowing the automatic adaptation of mobile interfaces to user learned preferences [Smyth et al. 2008]. While these approaches would reduce the number of clicks to reach the information usually consulted, it would also means that the interfaces will not be static and evolve automatically in time considering the habits of specific users. It would be worthwhile to assess the benefit of such approach in a decision support system for a commander.

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