The Synergic Integrated Concepts of C2S

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Abstract

One of the features determining the strength of troops is command and control. The quality of command and control is determined by the quality of the command and control systems (C2S). To improve a C2S, it is necessary to define its basic concept – a synergic integrated concept of C2S. The synergic integrated concept (SIC) of C2S defines its basic idea, rules and principles. By its employment we considerably improve C2S functionality. The synergic integrated concept is defined for a certain part or layer of C2S. To apply this SIC we improve the functions and order of this part, we improve its systemisation level. The C2 information support is improved as well. The basic synergic integrated concepts of C2S are battlefield digitalization and Network Centric Warfare.

1   Introduction

One of the features determining the strength of troops is command and control. The quality of command and control is determined by the quality of the command and control systems (C2S). According to the Czech Army field manual the C2S's consist of the command and control processes, commanders and staff, command posts, command equipment. The main representatives of the command equipment are computer networks.

Using computer networks brings many advantages that are based on ICT potential utilization. Information digitalization allows its better creation, processing, distribution. Once created, information can be processed, used by all users who need this information. The computer networks are very open systems that provide a broad functionality spectrum. The military units are being equipped with C2S not at once but step-by-step. However, different computer operation systems, platforms, databases, communication protocols are used here. We have C2S that must be joint. The integration must be, beside of system and technical levels, on the operation level too. To solve this problem we need a good concept. This concept describes the solution of C2S problem area. For a good solution the problem consists of the basic idea of C2S, basic function areas, command and control processes, meeting information needs. To improve a C2S, it is necessary to define its basic concept – a synergic integrated concept of C2S. The synergic integrated concept (SIC) of C2S defines its basic idea, rules and principles. By its employment we considerably improve C2S functionality. The synergic integrated concept is defined for a certain part or layer of C2S. To apply this SIC we improve the order of this part, we improve its systemisation level. The C2 information support is improved as well. Battle information is then more complete, easy to receive and understand, updated etc. The basic synergic integrated

concepts of C2S are battlefield digitalization and network centric warfare. They use an information and communications technology (ICT) potential for command and control enhancement.

2   ICT potential for C2 enhancement

What is the ICT potential residing in, as far as command and control concerned? Information is compared to glue that bonds organization into one unit stuck together to accomplish the object function. ***For C2 the potential of ICT rests mainly on the ability of creating and reproducing the picture of military important reality. The picture is exploitable for the purposes of command and control, decision-making support, planning, project control, or in favour of troops education and training.*** Particularly information disseminating and sharing allows the organization to adopt uniform processes, synchronized actions, and teamwork in the processes. It enables information sharing in combat action based on common database, uniform view of the battle space. All of the involved commanders and staff members can see the situation in unified manner, usually in a reality-close condition, and can synchronise their actions according to the plan to accomplish their mission. Thus, informatics considerably limits the "fog-of-war" effect, i.e. uncertainty in knowledge of friendly and/or enemy forces conditions. Information sharing on database principle (updated data image of reality) is to be done by means of situation visualization. The information image in computer environment uses presentation in the form of impressions (electronic overlays). Their perception is easy to understand, as it is based on parallel imaging of all objects of the visualised information. It may highlight positions of military key information (target detection, threshold limit exceeding).

ICT can make a substantial contribution with system knowledge support of the defence department personnel, readiness to accomplish tasks as assigned, building of "knowledge armed forces". It is utilisation of ICT capability for formation, capture and distribution of knowledge to all defence department personnel. The technology enables knowledge sharing, fitting each personnel with necessary know-how of more qualified decision-making and more precise operation exercise while the following methods of knowledge storage, reporting a making are used:

- Data analysis of the concerned area ("history analysis") and acquisition of new derived knowledge, identification of enemy's new tactical courses of action, new ways of fire distribution and share this new knowledge with the whole users domain,
- Generation of knowledge systems that clarify the system function principle, concerned area principle, applicable to fast problem orientation, acquisition of knowledge and mind,
- E-learning for distance education,
- Computer aided simulations for acquisition of military important knowledge and experience of battle actions and crisis management, battle employment training, etc.

New applications that enable new forms of communication, information processing and control actions support arise in these days, particularly in the sphere of commercial technologies. The problems related to the applications are from the field of concept definition and detailed project

for a commercially successful (user-wished, useful and friendly) application rather than development of the application. ICT promises a huge potential for command and control measures, however facing a problematic lack of creative invention in its implementation, of developing successful applications, of interconnection of individual technologies into a useful unit.

3 Synergic integrated concept of C2S

The concept represents the basic manner, main intention or construction principle. The synergic integrated concept of the command and control system represents a definition and sorting (order) of specific ICT part. It is defined what part of the command and control process is to be improved. If the ICT potential should be used for C2 enhancement then effort should direct towards some part of its abilities. This part of ICT abilities should be orchestrated and systemized for the requested aim. The synergic result is done by integration of the defined function.

C2S synergic integrated concept consists of:

- basic idea,
- improvement result,
- ICT integration,
- systemization rules (concept pattern).

Basic idea

The basic idea defines how C2 improvement is done and what a part of ICT is used for C2 improvement and what benefit is created with this potential. Orchestrated, systematic grouping of the ICT functions provides synergic effect. Synergic effect is done by integration of ICT abilities. Digital information form enables the information to be stored. The information correctness is achieved by conversion process accuracy. Digital information can be shared, copied and quickly presented. The battlefield digitalization is a concept that takes advantage of digital information for C2 improvement.

Improvement result

An improved part of the C2 process is specified. This improvement is based on concept implementation. New features of C2S are specified, as well as new quality of C2. The synergic benefit specifies the concept effect attained by its implementation. It is a description of aim, benefit and profit received. By battlefield digitalization concept implementation, new qualities can be achieved, such as:

- common sharing of situation information trough all the command levels (platform centric warfare),
- perpetual precise observation of enemy and own troops positions,
- reliable and quick information distribution,
- quick response of command and control,
- graphic presentation of information.

ICT integration

The concept is based on use and orchestration of a specific part of ICT in C2S. There is a specification of the new ICT or function integrated to get a new C2 quality or an improvement.

Systemisation rules

There are same patterns of ITC structure. It is possible to create different ICT patterns to get the best C2S solution. Defined rules orchestrate IC technology order.

The concept is directed into certain layer (area) of C2S. It is based on the abstraction of defined function area. Stress is put on the basic idea of what ICT are integrated and what is the synergic result or benefit.

4   SIC examples

The modern militaries have defined and developed synergic integrated concepts for the command and control systems to improve their logic, integration, systematisation. The examples of such concepts comprise Network Centric Warfare, battlefield digitisation and more. The synergic integrated concept defines policy, objective, basic principles, course of action, systematisation rules, benefit etc. It is a summary of systemic, logic and technologic principles and analyses. The concept result is application of new sensor types, new approaches to information distribution (information distribution models), CIS services systematisation, information visualisation, data fusion etc. The concept purpose is synergic effect resulting from arrangement of the command and control system; staff practices defined in the operation procedures; accelerated, more effective and easier process of command and control. The synergic integrated concept of battlefield digitisation focuses primarily on how to create the command and control technical assets, especially sensors. The synergic integrated concept of Network Centric Warfare concentrates on integration of separated C2 systems into a single unit that would provide Common Operation Picture. Promising, however still undefined, will be the concept focused on the warfare knowledge support of command and control. Figure 1 depicts the SIC positions in C2S.

4.1   Battlefield digitalization

Battlefield digitalization is the synergic integrated concept, which is directed into an area of digital information used according to real commander's information needs. It is mainly defined for C2S of a unit (for example a division, platform centric warfare) by Force type (land, air..). This concept defines the rules for sensor types selection, information collection, processing, distribution and presentation. The effective deployment, control, and exploitation of these capabilities will require the ability to form real-time situation awareness for each warfighter using all information available. This will require cooperative distributed fusion of information generated by every node. Each participant has one or more sensors. So that every element of this force operates effectively, that element must be aware of situation awareness. This situation
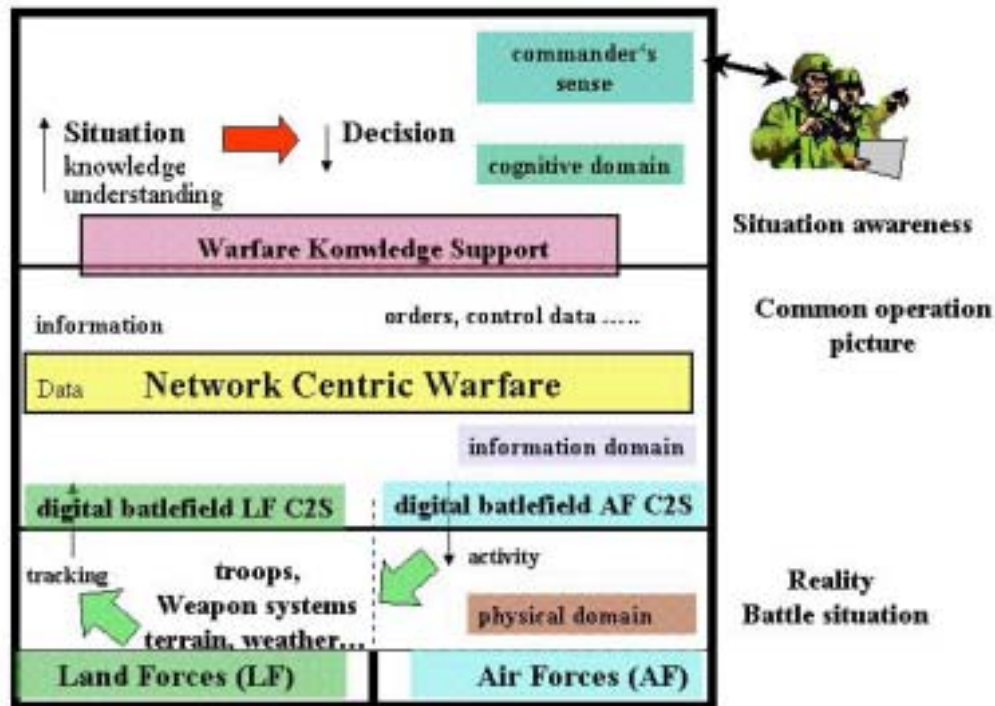
Fig. 1 SIC positions in C2S

awareness must be shared among all participants of the unit, a concept commonly referred to as the Common Tactical Picture.

Main features:

- systematic coverage of the battle area for information acquisition by broad spectrum of sensors,
- digital information form potential exploitation for command and control,
- platform centric data fusion, quick data distribution, common tactical picture.

4.2 Network Centric Warfare

The network centric warfare (NCW) is a more common concept. It is one layer above the battlefield digitalization. Its main aim is integration of C2S's. To apply this concept separate C2S's of different units are integrated into one logical system, into one common C2S. Thus it is possible to create the common operation picture for all units of the task force.

NCW focuses on the combat power that can be generated from the effective linking or networking of warfighting military troops. It is characterized by the ability of the geographically dispersed forces to create a high level of shared battle space awareness that can be exploited via self-synchronization and other network centric operations to achieve commander's intent.

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NCW concerns about networking rather than networks. It concerns increased combat power that can be generated by a network centric force. The power of NCW is derived from the effective linking or networking of knowledgeable entities that are geographically or hierarchically dispersed. NCW recognizes the centrality of information and is potentially a source of power. The networking of entities enables them to share information and collaborate to develop shared awareness, and also to collaborate with one another to achieve a degree of self-synchronization. The net result is increased combat power.

NCW provides opportunities to improve both C2 and execution at each echelon. NCW offers the opportunity to not only be able to develop and execute highly synchronized operations, but also to explore C2 approaches based upon horizontal coordination or self-synchronization battle entities.

Main features:

- digital C2S integration across all task force,
- complete data fusion from all sensors,
- Common Operation Picture that supports Joint Situation Awareness,
- global information base for command and control support.

In NCW, the emphasis is on ability to create one logical system and to use its potential for command and control process.

4.3   Warfare Knowledge Support

The next synergic integrated concept of C2S can be expected to direct another important layer. We foresee its key role in improvement of commanders' knowledge areas, knowledge storage and sharing. It will result in quick knowledge offer for problem solving and thus the concept will improve commanders' ability to see opportunities to accomplish their tasks.

Main features:

- commanders knowledge support in time of mission preparation,
- new knowledge acquisition by data-mining from historical data (for example new tactical manner of enemy),
- quick distribution of new tactical knowledge,
- quick full knowledge offer for problem solution (knowledge that has relation to problem solving),
- situation understanding support.

5   Conclusion

The paper discusses the new trends in the area of command and control. These significant trends comprise specifications of synergic integrated concepts for the command and control systems, particularly battlefield digitalisation and Network Centric Warfare. The next synergic integrated

concept of C2S can be expected to direct another important layer. We foresee its key role in improvement of commanders' knowledge areas, knowledge storage and sharing. This article is of theoretical nature indicating a way for the future development of the command and control systems and their concepts.

6   References

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