The Concept of Network-Centric Control - A Revolutionary Step in the Theory and Technique of Information Systems

Anatoliy Zubkov, Andriy Shcherba

Abstract - **the basic directions of development of information systems of future in the concept of network-centric control as to improve the ideology of hierarchical control, are considered on example of command and control organization.**

Keywords - **information system, hierarchical control, network-centric control, reconnaissance fire system.**

I. INTRODUCTION

Synthesis and analysis of information systems is based on general principles of complex systems theory [1]. However, information systems play a crucial role control issues. The developing process of information systems theory and techniques is in a great deal determined by information systems improvement for military use, and, in particular, combat technique and troops control systems [2]. The prevailing idea of such system creating in the 80s of last century were the creation of reconnaissance-strike and reconnaissance-fire complexes (RSK and RFC) of the "JYSK", "Assault Breaker", PLSS (USA), "Ravenstvo", "Rovestnik" (USSR). The ideological basis of these systems is the concept of "platform-centric war", which was based on the principles of hierarchical control. The main disadvantages of the RSK and RFC were:

- the impossibility of processing and lading information to user in real time;
- low level of operational flexibility of use;
- a small battle stability;
- significant expenditure of forces and facilities for the task.

II.MAIN PART

The main reasons for collapse of ideology of RSK and RFC are:

- lack of a unified information concept of construction, as a level of radio-electronic and information technology at that time did not allow her to formulate it in complete form;
- orientation of construct ideology on the concrete control level (tactical, operational, strategic);
- connection of prospects development with improvement of technical facilities of reconnaissance and weapons.

The rapid development of military technology led to appearance of the concept of network-centric control, the authors of which is accepted to consider Vice-Admiral U.S. Navy Arthur Sebrovski and Professor John Garstka. The basic idea of network-centric control is conception of all forces and facilities in single information space, that allows to multiply the effectiveness of application due to synergetic effect.

The introduction of networking technologies in the military sphere became a revolutionary step, aimed at improving the weapons capabilities, but not so much by increasing the performance characteristics, and, above all, by reducing the cycle of combat control [3,4]. The concept of information and network technologies created pre-conditions for transition to the next stage in the evolution of warfare - "network-centric warfare", the main idea of which is to achieve information superiority above the enemy through the introduction of high-tech systems for collecting, processing, simulating, data visualization and decision support in real-time.

In the conceptual-theoretical level network-centric control logic model can be represented as a system that consists of four overlapping sub-systems (grids) of information, sensory (reconnaissance), the control and combat (Fig. 1)

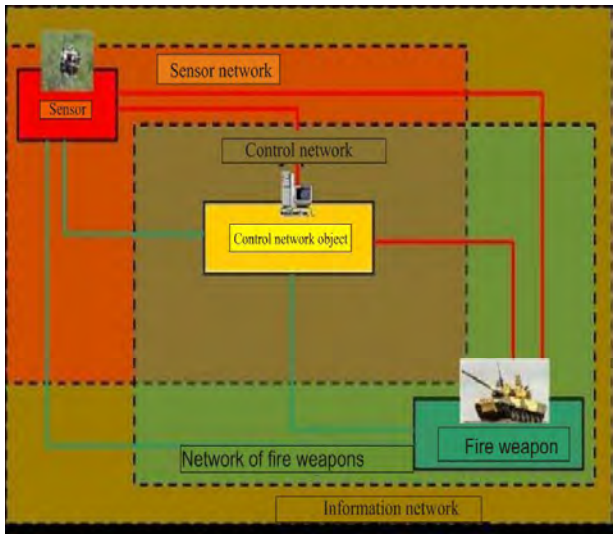

Fig. 1 A logical model of the network-centric control

The nodes of a comprehensive information grid is unified telecommunications facilities, performing tasks of reception, transmission (retransmission) by means of radio, processing and converting information to ensure antijammingness and crypt firmness. Sensory nodes of the lattice are the facilities of instrumental reconnaissance.

Decomposition of information systems efficiency increasing task based on network-centric control is shown in Fig. 2.

Anatoliy Zubkov, Andriy Shcherba - Petro Sahaydachnyi Army Academy, Gwardiyska Str., 32, Lviv, 79012, UKRAINE, E-mail:shch_ay@mail.ru

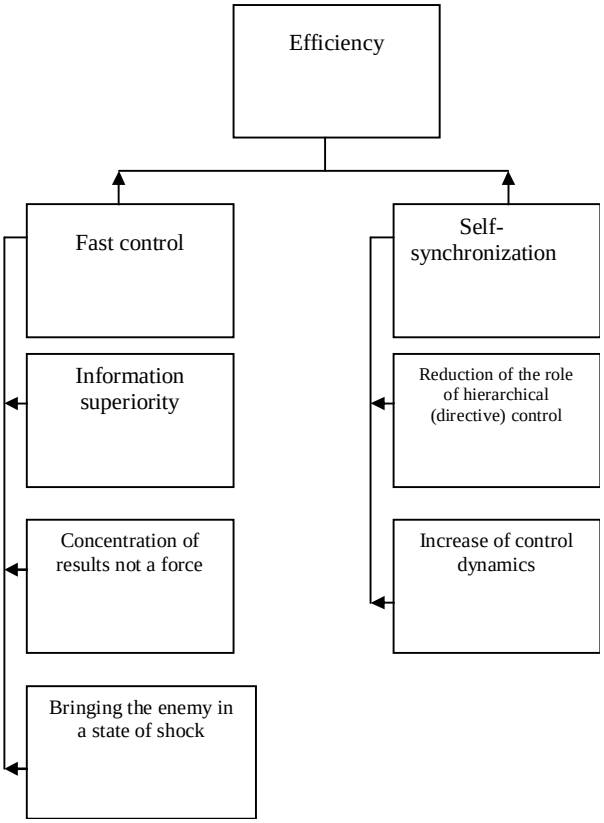

Fig. 2 Decomposition information systems effectiveness increasing task

The basic idea of the new approach is a fundamental principle of self-synchronization, which is held by American experts from the complex systems theory. According to this principle the difficult phenomena and structure in the best possible extent organized on principle "bottom - up". In other words, a self-locking means the ability to self-organize the structure of the information below, and do not vary according to the directions above. It follows from this fundamental conclusion - the organizational structure of military equipment in combat units and how to perform their combat missions based on modern electronic and information technology hardware and software should be modified at the discretion of the commander on battlefield, but in accordance with the requirements of the higher command. The last circumstance does not eliminate the hierarchical control, but requires the solution of theoretical problems of structure optimization and characteristics of algorithms of the centralized and network control.

From a technical point of view, implementing a new management concept requires the following tasks:

- introduction of modern unified communications tools, which are the nodes of the lattice;
- equipment of all means of information, control and combat grids by adapters of general use information channels for the interface with unified telecommunication facilities.

III.CONCLUSIONS

Network-centric approach allows us to achieve more effective military systems, not by improving the characteristics of weapons and military equipment, but by optimizing the information structure. This leads to a significant reduction in financial costs, which is especially important for Ukraine.

REFERENCES

1. Бусленко Н.П., Калашников В.В., Коваленко И.Н. Лекции по теории сложных систем. М.: Сов. радио. – 1973. – 440 с.

2. Масной В., Судаков Ю. Автоматизированные системы управления Сухопутных войск США // Зарубежное военное обозрение. – 2002. – № 2. – С. 39–41.

3. Азов В. О реализации в США концепции военных действий в едином информационном пространстве // Зарубежное военное обозрение. – 2004. – № 6. – С. 10–17.

4. Горбачев Ю.Е. Сетецентрическая война: миф или реальность? // Военная мысль. – 2005. – № 1. – С. 66–67.