

Overview of the construction and development of military information infrastructure

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Abstract: In order to improve the construction level of military information infrastructure, this paper discusses the concept and connotation of military information foundation, and introduces the five periods of the development of US military information infrastructure, which are the period of single system construction, the independent development period of each army and arms, and the system integration. Integration period, integration development period, and joint information environment development period. Study the characteristics and functions of each period, learn from and learn from the US military information infrastructure construction and development ideas, and make recommendations in conjunction with our military information infrastructure.

1. Introduction

Information infrastructure is an important support for the military information system, and the construction of the information foundation is related to the overall situation of information construction. The construction of our military's information infrastructure is in its infancy. To build an information-based army, we must solve the problems that arise in the construction with a scientific perspective and methods. Gradually develop the level of informatization to realize the institutionalization of information systems and provide strong support for the construction of military information.

2. Military information infrastructure concept

2.1 Information infrastructure

With the development of informatization, people first use "infrastructure" to describe hardware and software facilities in the field of information technology. Infrastructure is a public infrastructure that guarantees people's lives and provides services to people. Common infrastructure in daily life includes roads, railways, hospitals, schools, and so on. The infrastructure has not been clearly defined so far. The information infrastructure is a type of infrastructure, and the information infrastructure is not specifically defined. After summarizing it has the characteristics of sharing, development, and evolution, the functions are used to support information generation, transmission, and storage.

2.2 Military information infrastructure

In the late 19th century, the United States first proposed the concept of military information infrastructure - "defense information infrastructure (DII)." The defense information infrastructure is the tool for the processing and transmission of the "one-in-one information network" and also meets the needs of the military; the information-integrated network consists of communication networks, computers, software, applications, data, weapon system interfaces, security services and other services [1]. In September 1999, the theory of network-centric warfare, the United States proposed a concept similar to the military information infrastructure - "Global Information Grid" (GIG). The Global Information Grid connects globally dispersed information to collect, process, store, manage, and distribute information based on user needs [2].

In August 2007, the Australian Ministry of Defence proposed that the defense information infrastructure is the technical basis of the defense information environment, in which the defense information environment consists of the defense information domain and the defense information infrastructure. The Defense Information Domain is an information management component that deals with DoD matters, including policies, methods, and procedures, training and structure, and personnel training. The defense information infrastructure consists of seven elements: data, user applications, shared services, user equipment, system hardware, media, and the network.

With the development of military information systems, different countries and different eras have different understandings of military infrastructure. No matter how well understood, military information infrastructure will continue to evolve and improve as technology becomes more developed. There is currently no uniform definition of military information infrastructure in the country. However, there are two points of view. One is that the military information infrastructure is composed of many related communications, computers, and public data. It can collect, process, store, distribute and manage information according to the requirements of combatants [3], and the other is to divide the military information infrastructure from the perspective of application function, which can be divided into information transmission platform, information processing platform and basic information service. The system and the information security system are the general term for all kinds of software and hardware that guarantee the transmission and use of military information; it is a necessary prerequisite for the function of information resources.

Therefore, the military information infrastructure in the information age can be understood as composed of many systems. The system consists of several information infrastructures. The information infrastructure mainly includes communication network facilities, computer storage facilities, information service facilities, security and confidentiality facilities, etc. Facilities are independent, interdependent and complementary.

3. US military information infrastructure development process

The development of US military information infrastructure mainly goes through five periods; one is the stage of single system construction; the other is the stage of independent development of various arms and services; the third is the comprehensive integration stage; the fourth is the stage of integrated development; the fifth is the stage of joint information environment development. The development of each stage is also the product of the new military transformation, in which the development of the joint information environment is the direction of the future development of the US military.

3.1 Single system construction period

In the mid-20th century, the development of the US military information system was in its infancy. This period coincided with the Cold War period. In order to prevent enemy aircraft from attacking, the United States began to build an air defense operational command and control system. At that time, the United States established the world's first command and control system, also known as the Saiqi system (SAGE), the information system of this period. Because the function is single, the main function is command and control, the task is single, the structure is single, and it does not have the ability to cooperate with other systems, so it is called the single system construction stage.

3.2 Period of independent development of various arms and service

In the middle and late 20th century, it was a period of comprehensive escalation of the American Cold War. The situation in this period was dominated by the various arms of the US military. Each of them upgraded their capabilities and established a special information system for each army and service according to the needs of the mission. At that time, the US military established a military command system (WWMCCS), a naval tactical command system (NTCS), and tactics. Air Force Control System (TACS), Tactical-Grade Army Tactical Command System (ATCCS), etc. These systems are all built in the requirements of a certain military service. The information system in this

period has a certain degree in the arms. Collaborative interaction ability, because due to the sequence relationship, through the communication network level cascade, the command is transmitted from the upper layer to the lower layer, the intelligence is reported from the bottom to the upper layer, the overall look is like a one-line, so there is a certain collaborative information sharing Ability. However, the ability to share information across arms is relatively weak. This is also known as the "chimney" system [4].

3.3 System integration period

From the late 1980s to the 1990s. In 1991, the US military exposed the shortcomings of the "chimney" information system independently constructed by the arms of the Gulf War, such as the poor interoperability between systems and the slow transmission of information. Therefore, this system cannot meet the needs of joint operations of multiple arms. In response to the shortcomings of this system, the US Department of Defense proposed the establishment of the Defense Information Infrastructure (DII) in 1993. This system is a system that can satisfy cross-service operations and consists of four layers.

The first level of planning and technical activities mainly refers to important elements of the defense information infrastructure, including DII policies, needs, standards, architecture, software engineering, requirements, modeling and simulation, information assurance and joint spectrum management; And computer infrastructure is the provision of information processing and transmission services to obtain timely and accurate attack and defense and execution information for warfighters; the role of the third layer of public applications is to provide a platform to support all functions and organizations, mainly including defense and civil affairs systems. , e-commerce, information distribution management, public operating environment and shared data environment; the fourth layer of functional applications covering all applications of the Ministry of Defense is to use the common layer to share information, supply services for various functional organizations, including: joint command and control applications, bases Tactical applications, combat support applications and surveillance.

3.4 Integration development period

In the late 1990s, the United States broke out in Bosnia and Herzegovina and the Kosovo War. From the war, the US military realized that the integrated integration system was insufficient and could not meet the needs of joint operations, and it was necessary to further develop the information system interconnection. Integrate the US military command and control system, weapon system and sensor system into one, and improve the command and control ability of the commander [5]. In September 1999, the US Department of Defense first proposed the concept of "global information grid" and divided its architecture. The first layer is the basic layer, including system structure, regulations, policies, governance, signs and engineering. Technology, etc. It defines the global grid through policies and logos, laying the foundation for an interoperable and secure Department of Defense networked organization; the second is the communications layer, which leverages the Department of Defense communications and commercial communications systems to provide universal access to all users of the Department of Defense. Information transmission services, including satellite communications, radio networks, radio frequency communications networks, etc. The third layer is the computing layer, which provides computing power using software hardware devices, including email delivery, Web services, large computing services, and distribution of software from a central repository. The fourth layer is the global application layer. It is a series of application systems used by the joint forces in the global information grid, including global combat support systems, medical systems and logistics support systems. The fifth layer is the operational application layer, including combat personnel, weapons and equipment and network power resources and other operational nodes, to achieve the connection between the combatants and the operational platform through the network, can directly achieve situational awareness and collaboration.

3.5 Joint information environment development period

In January 2013, the United States proposed the "White Paper on Joint Information Environment JIE". JIE proposed to improve the US network efficiency, network performance and network security, and to redesign the US military information infrastructure. The joint information environment consists of multiple networked operations centers and multiple integrated core data centers. Through new technologies such as cloud computing, big data, and mobile communications, large-scale reduction of global data centers and adjustment of network space construction to transformation In the networked service model, the transition from "network center warfare" to "data center warfare" is also provided to provide a joint environment for future cyberspace warfare in the United States [6].

4. Suggestions on the development of our military's information infrastructure

Comprehensive analysis of the development of the US military, combined with our own status quo and information infrastructure hierarchy chart. Taking the development of information technology theory as the traction, developing key information technologies and breaking through the development of key technologies [7], the following four aspects are specifically proposed.

4.1 Strengthen the development of information platform

The information transmission platform is composed of various communication systems. It is transmitted through the public information network, and its basic function is to complete the information transmission between people, between people and equipment, and between equipment and equipment. The development of information transmission platform is to build an integrated public information transmission platform based on grid, which can provide broadband, secure and reliable communication capabilities. The development direction of the information transmission platform is to build an integrated public information transmission platform based on grid that can provide broadband, secure and reliable communication capabilities. Therefore, it is necessary to strengthen the comprehensive integration of the transmission platform, accelerate the development of the satellite transmission platform combining strategy, campaign, tactical communication satellite and constellation system, optimize the layout of the short-wave communication system station, develop the scattering, mobile, air-sea wireless transmission system, and improve the fiber-optic cable. The communication-based cable transmission platform forms a public information transmission platform based on land-based, supplemented by space-based, sea-based and space-based, enabling the troops to achieve efficient connection at any time and anywhere in the operational area. In.

4.2 Strengthen information processing platform

The information processing platform is to comprehensively apply various high-tech information technologies to process and process information. The information processing platform is the "brain" of the information infrastructure. The development direction of the information processing platform is to build a unified platform for the cross-network system of the entire military to realize the symbolization and intelligence of information processing. The focus of the construction is to meet the requirements of intelligent control and decision-making, and to establish high-rate, applicable and information-based operations that can handle different business information processing systems. Further enrich and improve various functional modules commonly used to support application layer, basic service layer, core layer, shared data environment, configuration management tools, related mark specifications and application programming interfaces, and provide security in the system and support for weapon platforms. There are new breakthroughs in other aspects, which fundamentally solve the "plug and play" of various hardware and software in military information systems and the interoperability of various application systems. Based on the premise of compatibility with the national information network, the special interface of the military information network is developed and developed according to the national unified interface mark. The unified military information interface is adopted to ensure the interconnection of the internal information links of the military and

realize the interconnection between the information networks. Actively develop domestic software and hardware, develop large-capacity storage technology and storage environment management technology.

4.3 Strengthen the construction of basic service systems

The basic service system is mainly a system for publishing information, sharing information, and managing information. The grid-based infrastructure service system will provide a network-centric, interoperable information capability that enables commanders and various warfighters to access, process, and manage information at any time, as needed. This new and efficient information distribution method and information environment will ensure that decision makers can accurately access the required information in the shortest time in the future war, gain information decision-making advantages, and effectively command and control the army.

4.4 Strengthening the construction of information security system

The information security system is a secure channel system for storing, processing and transmitting information. In order to prevent various viruses, networks and hackers, it is an important guarantee to win the information war. The development direction of the information security system is to realize distributed, multi-dimensional integration, full-capacity surface protection, and active defense capabilities. The development focus is to strengthen the construction of information security infrastructure, establish security infrastructure such as cryptographic keys, identity authentication, assessment and certification, disaster recovery and backup; break through key technologies, accelerate the development of independent information security technologies, and intensify research and development and mandatory use of independent intellectual property rights. Safety products, establish an access system; carry out the construction of an autonomous information system application environment, build an information system based on domestic hardware, software and security technology; strengthen technical prevention, establish a network space management system and electromagnetic space technology prevention system as soon as possible.

5 Conclusion

The development of US information infrastructure has gone through five periods, from simple to complex systems, from individual arms operations to joint operations. As the information technology becomes more intelligent and diversified with the times, the importance of the information infrastructure we can see depends on the gap between China and the United States. Strengthen the construction of military information infrastructure, continuously learn and innovate information technology, and provide a solid foundation for the military to modernize.

References

- [1] Tong Zhipeng, Liu Xing. The integrated flow of electronic information system-information warfare [M].2. Beijing: National Defense Industry Press, 2008: 104-136.
- [2] Lan Yushi, Ding Feng, Wang Wei. Military Information Infrastructure in the Information Age [M]. 2 Edition. Military Science Press, 2012, 17-42.
- [3] Ji Hongliang, Zhao Nan. On the evolution and advancement of the US military defense information infrastructure [J]. Flying missiles, 2016, 29 (1): 9-14.
- [4] Xu Bin, on behalf of science. Research on the development of US military information infrastructure [J]. Ordnance Automation, 2016, 35 (12).
- [5] Xu Bin, Zhang Wei. Enterprise Service and Application of American Army Network Center[J]. Ordnance Automation, 2013, 32(9): 63-67.

[6] Ji Hongliang, Zhao Nan. Interpretation of US Army Joint Environmental Plan [J]. National Defense Science and Technology, 2015, 36(5): 89-95.

[7] YANG Ping, YAN Shimei, CHENG Shimei, LIU Hu. System Combat Simulation System Based on Information System[J]. Ordnance Automation, 2015.