Research on the Construction of Army Command System Based on "Cloud Top"

Jian Wang¹*, Wei Wei²

¹ Command Department, Army Command College, Nan Jing, Jiang Su, 210000, China
² Command Department, Army Command College, Nan Jing, Jiang Su, 210000, China
Corresponding author’s e-mail: 2415022661@qq.com

Abstract. With the development of information technology, combat modes tend to be intelligent. As the most complex and pluralistic military force, the Army has higher requirements for its command system which must have the characteristics of parallel, efficient and real-time. The traditional command system can no longer meet the requirements of future operational command. This paper through researches Construction of Operational Command Architecture Based on "Cloud Top" and Technical System of Army Command System to provide some reference for the Army to gain command superiority.

1. Introduction
With the rapid development of artificial intelligence technology, intelligent warfare is emerging, unmanned equipment is more and more widely used in warfare, combat units are becoming more and more complex and diverse, and the operational organization structure is in urgent need of remodeling. The traditional command system and organizational structure are no longer suitable for future operational requirements. Based on this consideration, this paper preliminarily studies the command organization structure of future army forces, builds a command system based on "cloud top" architecture, and studies its architecture and key technologies supporting "cloud top" architecture.

2. Construction of Operational Command Architecture Based on "Cloud Top"
The command system is the relatively stable organizational basis for the army to perform its command functions, and is the carrier for launching and implementing all command activities. The preparation and implementation of any military operation depends on the establishment of the command system and the achievement of military objectives under the unified command of commanders. Therefore, the command system is not only an important part of the military operation system, but also the most important and active factor in the military command. It plays a very important role in the smooth command activities and the success of military operations. Under the condition of informationization, the characteristics of system operations need to rely more on the command system to promote the integration of military operations. Therefore, it is of great significance to establish and improve a scientific, rigorous and systematic command system for the unification of military operations, the improvement of command quality and the ultimate achievement of military objectives. The military command system refers to the organic whole established by all levels and all kinds of command organs according to the command relations, and it is a relatively stable organizational form for the army to perform its command functions.[1]

The concept of cloud computing originated in 1961. Professor John McCarthy proposed that future
computing power and specific applications might be sold in a business model with the advent of computer time-sharing technology. In 2006, Eric Schmidt, the president of Google, formally presented the concept of cloud computing at a search engine conference. Cloud computing is widely recognized by academia as a new computing model.\[2\] This new technology has great construction significance for changing the future combat mode. The cloud computing architecture of the army can be designed as shown in Figure 1.

![Cloud Computing Architecture Of The Army](image.png)

Figure 1  The Cloud Computing Architecture Of The Army
Cloud computing is a large-scale distributed computing model and a management method of shared infrastructure. The complex implementation details of underlying systems will be shielded.

Large-scale infrastructure, data and applications can be dynamically extended to shared resource pools by means of network in different geographical locations. Personalized customization services can be achieved at a small cost. This method is extremely suitable for military applications, and has highly similar characteristics with OODA command and control loop. \[3\] As shown in figure 2
In order to build an army command system based on cloud, several concepts need to be clarified first.

The purpose of cloud command is to achieve certain operational purposes, virtualize and service the operational resources and capabilities contained in military members on the network, and centralize and unified management and control by means of intellectualization, so that this special organizational command activities can be intellectualized, modularized and efficiently shared, and command through the network as a whole. Process provides a new command mode for services that can be accessed at any time and used precisely on demand.

Cloud service is supported by cloud warfare theory and technology such as Internet of Things, Cloud Computing, Information Technology, Cloud Attack, Cloud Fusion. It can virtualize and encapsulate combat capability and combat resources, intelligently connect with cloud service platform, and the details of technology implementation within combat resources will be shielded, so that it can be used to realize the virtual processing and encapsulation of combat capability and combat resources. Virtualized combat capability and combat resources rely on network to provide services for command of the whole military command system. The ability and resources that can be virtualized and encapsulated are cloud services.

Based on the above considerations, combined with the Army's own characteristics, the Army Command System based on “cloud top”can be constructed as follows in figure 3.

The command organization based on cloud can be divided into three layers: Cloud Service Source, Cloud Service Platform and Cloud Service Requester.

Army cloud service source mainly includes Armored Vehicles, Artillery, Anti-tank Missiles, Anti-aircraft Missiles, Anti-aircraft Artillery, Helicopter Reconnaissance Equipment, Communication Equipment, Command and Control Equipment, Logistics Resources, Combatants, and Other Resources. This level cloud related operational resources, and publish entities and capabilities into the form of services to the cloud.
Cloud service platform takes classified and encapsulated cloud service resource pool as its core, which can differentiate cloud services according to the functions of operational entities. Situation Awareness Cloud Services, Command and Control Cloud Services, Strike Cloud Services (force, firepower, electronics, etc.), Combat Effectiveness Evaluation Cloud Services, Logistics and Equipment Support Cloud Services, and Other Cloud Services, etc.

The cloud service requester is a request for cloud service from all levels, all kinds of command agencies and independent combat units according to mission requirements. (Strategic Command Agencies, Campaign Command Agencies, Tactical Command Agencies, Task Units and Other Task Teams, Operational Platforms, Other Operational Command Entities)

3. **Technical System of Army Command System Based on "Cloud Top"

The Army Command System Based on “Cloud Top” is a complex giant system, which can be divided into three categories: cloud command system theory support technology, cloud command system architecture, norms and standards, and core technology of system operation. As follow Figure 4.
3.1 Supporting technology of cloud command theory

(1) Cloud Computing Technology. Cloud computing is a network-based, centralized integration of computing and storage resources, sharing information processing resources. This coincides with the recognition of future Army operational command, such as "command organization combination, situation awareness automation, information processing efficiency, real-time information sharing, and integration of command and control". The key to win the decision-making advantage of future ground warfare lies in whether the appropriate command information can be provided to the corresponding combatants quickly and accurately. Cloud computing is equipped with the ability to quickly transform command information.

(2) Super-dimensional Internet of Things technology. Future combat platforms will develop towards informationization and intellectualization. These platforms will have dual carrier functions, that is, combat carrier and information carrier. It can be understood that future weapon platforms themselves are also information platforms that can accomplish specific tasks independently. From the point of view of the Internet of Things, as long as authorized users of the Internet of Things, whether army, navy, air force, rocket army, celestial army, etc., are integrated into the Internet of Things, they can identify, monitor, track, locate and access online. This kind of super-dimension material association is the bright mark and technical starting point of the future weapon platform. It can truly realize the integration of land, sea, air, sky, electricity and network.

(3) Cloud Convergence. Super-dimensional Material Federation technology can put the whole command system in the networked world, and with the support of information system, the whole system can be formed into a "cloud". The purpose of cloud fusion is to improve the effectiveness of multi-source information fusion, so situational awareness can be more comprehensive, real-time and accurate. On the one hand, the operational platform transmits the detected enemy information to the reconnaissance intelligence system network in the first time, and after fusion with multi-party information, it can provide support for command and decision-making; on the other hand, it can obtain the required information in the system network and improve its operational efficiency in an all-round way.

(4) Cloud Attack. On the basis of cloud fusion, warfighters can operate all kinds of weapon systems on-line through hyper-dimension material federation, breaking the traditional mode that combat platforms only play their effectiveness within the scope of their own weapon technology performance, and realizing systematic combat of weapon systems.
3.2 Cloud Command System Architecture, Norms and Standards

This kind of technology is standing in the perspective of system structure, analyzing and researching the cloud command system architecture, operation mode, etc., and launching research on the norms and standards supporting the construction of cloud command system. Through discussing, analyzing and discussing the cloud command system architecture, this paper explores the mode of operational capability and resource sharing and interoperability under the army command system based on cloud, and standardizes the principles and protocols of cloud command system. Through the system-level specification, it ensures that cloud command system is forward-looking and innovative, aiming at the future. Quasi-elimination of the lag of the command system.

3.3 Key Technologies of Operational Command System Operation Based on "Cloud End"

Efficient operation of cloud command system involves a large number of technologies. By analyzing the army's three-tier operational command system based on cloud, three key technologies supporting the interaction of the three tiers are analyzed. Operational resource cloud service technology that encapsulates resources and capabilities, clustering and reorganization technology that classifies and reorganizes cloud services, and according to requests. The end can provide a reasonable cloud service composition optimization technology.

1) Cloud Service of Army Operational Resources

The cloud service of army combat resources is a process of realizing virtual and encapsulating physical domain to information domain for army combat members, that is, the process of physical resource-cloud service, establishing cloud service template, which covers the use attributes, deployment configurations, static attributes and dynamic attributes of combat resources in physical domain. The components of virtual encapsulation of operational resources are established, and the operational resources in physical domain are virtually encapsulated into situational awareness cloud services, command and control cloud services, attack cloud services (forces, firepower, electronics, etc.), operational effectiveness evaluation cloud services, logistics and equipment support cloud services, and other cloud services. Complex implementation process is "black box" and ultimately provides commanders and command organs with various services in the form of standard access interface for command decision-making.

2) Clustering and Reorganization of Cloud Services

Clustering and reorganization of cloud services is based on certain rules and standards, which merges services with similar status, same type, providing the same operational resources or performing the same tasks. Through clustering and aggregation, cloud services can be more clearly and openly provided to army commanders for organizational command and use.

3) Cloud Service Portfolio Optimization

The optimization of cloud service composition is to analyze the military task requirement of requester, decompose it into several sub-tasks, search and match the candidate cloud services matching the sub-task requirement from the cloud service resource pool, select the best combination to complete the task service.

4. Conclusion

Cloud command system, as a new way of operational command, belongs to a new generation of command system with service as the core. Starting from the concept of modern organization, it studies the organization, leadership and interaction among members of the army command. This architecture can not only solve the problem of integrating distributed heterogeneous combat resources, but also realize the transformation from physical domain to information domain through virtual encapsulation of combat resources. At the same time, the target of command will be extended to the service level. Compared with improving the command and control ability of a single member or optimizing a determined plan, this innovation will have a far-reaching impact on the operational mode, and will have a subversive impact on the change of command mode.

In future land operations, the combat members will be more pluralistic, and some people will fight
side by side with unmanned equipment. The traditional command system has been difficult to adapt to the characteristics of future land operations. How to effectively implement command, how to deal with the command problem between human and unmanned platforms, how to improve the efficiency of command decision-making to adapt to the ultra-fast pace of war? The construction of cloud command system can provide better ideas and ways to solve the timeliness, accuracy and interaction of command. It will have the following characteristics: Service-oriented command, Multi-user command, Knowledge-based command, Uncertain command.

References

[1] Xia, W.J. (2012) Military Command Curse. Military Science Publishing, The Beijing.
[2] Wang, X.F. (2012) Current Situation of Cloud Computing in China and Its Military Application Prospect. Value Engineering, 6: 164–165.
[3] Zhang, Y.Z., Zhang, A., Xia, Q.J. (2010) Research on modeling and simulation of an adaptive combat agent infrastructure for network centric warfare. Lecture Notes in Computer Science, 6328(1): 205-212.