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Activity Framework of the Command Information System Based on Big Data Analysis

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***Abstract*—With the improvement of Internet and data innovation, enormous information investigation brings new open doors for all businesses and fields on the planet. This paper clarifies the essential idea of enormous information and information investigation, fabricates a structure of the order data framework in light of large information examination, invests the arrangement of genuine effort information investigation and information conveyance for the order data framework, gives hypothetical establishment to our military order data framework in time of huge information.**
Keywords-big data; big data analysis; real-time distributionof big data; command information system

I. INTRODUCTION

With the continuous advancement and development ofnew military reform, the combat mode is transforming om pla form centric warfare to network centric warfare. As the key link and core of the whole weapon system, command information system is the soul of the whole system. The core function of the command information system is make quick and accurate decisions, and how to quickly d valuable intelligence information from massive and mplex "big data", so as to support the key to winning the battle when making combat command decisions [1]. Only relying on large data processing technology, extract valuable information from huge amounts of data, so as to master the enemy's strategic attempt to accurately and timely, operational rules and skirmishes, objective forecasting operational idea and behavior characteristics of rivals, accurately grasp analysis against power relations and the development and change of the battlefield, to realize real-time awareness and commander synchronous cognition, can convert the battlefield "data advantage" to "decision advantage", to operate fighting purposes.

II. BIG DATA AND BIG DATA ANALYSIS

A. Large Data

International data center (IDC), is the birth anddevelopment of big data research pioneer. The 2011 report defines the attributes of big data: "big data technology describes a new era of technologies and systems designed to extract the value of data from large and diverse data sets through high-speed capture, discovery and analysis techniques." In this definition, four "V's" can be used to summarize the attributes of big data [2].

- Volume: large data Volume, which is measured by PB, EB and ZB.
- Variety: a Variety of data types, including structureddata, semi-structured data and unstructured data.
- Value: the Value density of data is low, so it isnecessary to extract valuable data from massive data.
- Velocity: the generation and processing of data isfast and time-efficient.

B. Big Data Analysis

Big Data Analytics (BDA) is the automatic andtelligent search for patterns, rules and char cteristics in Big Data sets. Therefore, BDA mainly focuses on two aspects:first, big data and analysis technology; The second is how tocombine the two organically to extract valuable knowledge
from big data and use it to support decision making.
The analysis techniques available for BDA includedictive analysis, data mining, statistical analysis, omplex structured query language, etc., as well as data visualization, artificial intelligence, fact clustering, text analysis, natural language processing, database and other related technologies
that support big data analysis [3].

III. CHALLENGES OF DATA ANALYSIS IN COMMANDINFORMATION SYSTEM

A. Isomeric Type and Incompleteness

In the command information system, there are various pes of intelligence data obtained by various reconnaissance sensors and electronic countermeasures equipment, including structured intelligence data, semi-structured and unstructureddata such as battlefield situation image, video intelligence,geographic and terrain information [4]. Such complex data types are difficult to analyze with traditional, fixed-format database tools. In addition, most of the intelligence data obtained are missing and wrong, which must be processed during data analysis.

B. Large Data Scale

In the course of combat, various reconnaissance and surveillance satellites, manned and unmanned reconnaissance aircraft, battlefield reconnaissance radar and other battlefield sensors will collect a large amount of data, voice and image information every day. With the realization of full spectrum sensing, the data obtained by signal intelligence and reconnaissance are multiplied, which constitute massive signal intelligence data [5]. However, in the mass data collected, including a large number of noise or interference, as well as a variety of signals from their ownside and friends, to extract valuable intelligence information from the mass data, increasing the difficulty of data analysis.

C. Timeliness

In the information battlefield, a variety of reconnaissance sensors will continuously and in real time to transmit a variety of intelligence data, aircraft fleeting, put forward a higher demand for intelligence data analysis speed. Only the rapid and

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accurate analysis of massive intelligence data can provide real-time and accurate command decision-making basis for commanders.

IV. APPLICATION OF BIG DATA ANALYSIS IN COMMAND INFORMATION SYSTEM

In the future information battlefield, "enemy first cognition" is one of the core requirements for the decision-making ability of command information system. Therefore, it is necessary to transform all kinds of intelligence "data" into "knowledge" through big data analysis and eventually rise to the "cognition" of commanders [6].

The operational architecture of big data analysis in the command information system is shown in figure 1. From the perspective of architecture, in order to realize the smooth transition from hierarchical command to flat command, a centralized and distributed strategy is adopted. From the perspective of analysis strategy, in order to meet the requirements of intelligent, real-time and precise command decision-making, off-line analysis and real-time online analysis are adopted. Among them, offline analysis is concentrated in the intelligence center, while real-time online analysis is respectively conducted in each intelligence station and intelligence center.

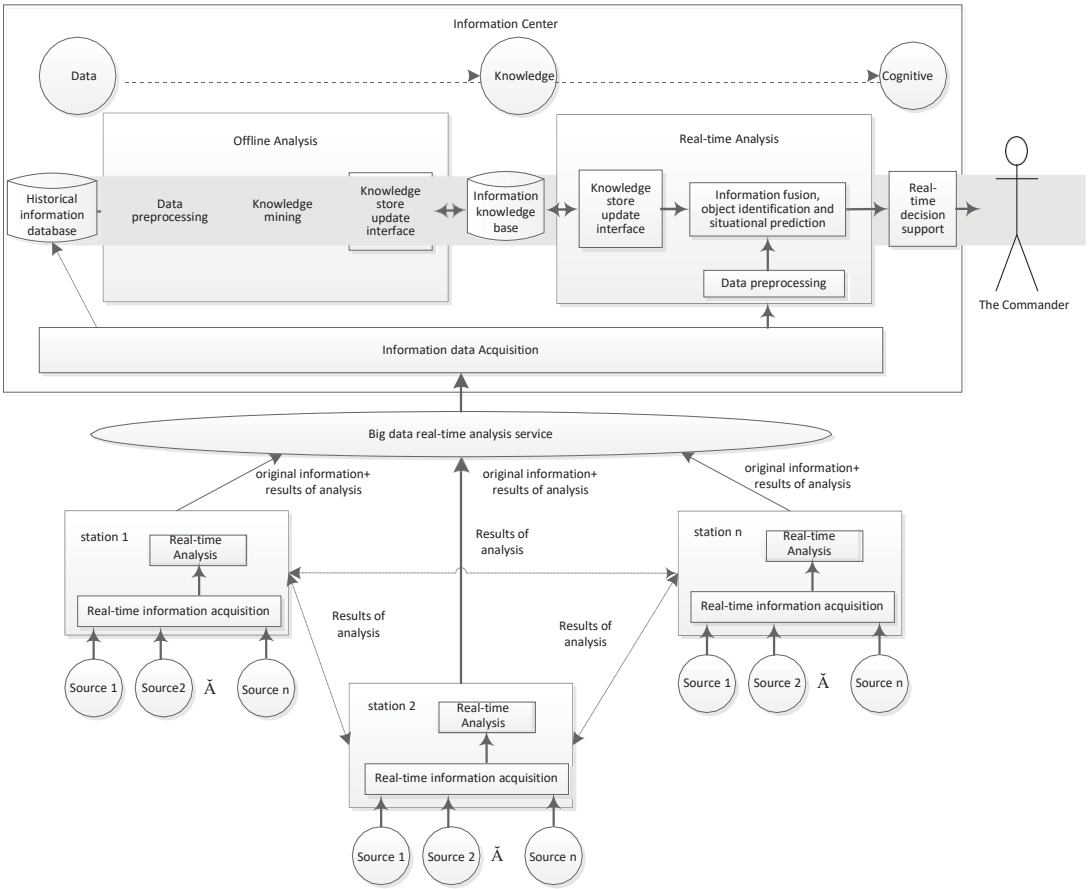

Figure 1. Operation Architecture of Command Information System based on Big data Analysis

The basic working principle is as follows:

First of all, each information station obtains all kinds of real-time intelligence data from various information sources (such as reconnaissance sensors, electronic countermeasures equipment, etc.). Combining with the analysis results of other intelligence stations, the station conducts a preliminary analysis of real-time information, and reports the analysis results to the information center [7]. At the same time, the analysis results of this station will be distributed to other information stations to assist other information stations in real-time analysis.

Secondly, in the information center, information data are obtained from each intelligence station through the information data acquisition module and stored in the historical intelligence database. On the one hand, based on the massive historical information data accumulated in the historical information database, various information knowledge is accumulated through offline analysis; On the other hand, the obtained information data and analysis result data, combined with the information knowledge in the knowledge base, carry out information data fusion, target comprehensive identification, situation assessment and situation prediction through real-time online analysis, and finally provide real-time decision support for commanders.

In addition, the information exchange among information stations and between information stations and information centers is completed through real-time big data distribution service to ensure the effectiveness of information

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information transmission.

The following will learn from the existing commercial technology, respectively for the big data analysis and real-time distribution of big data solution ideas are discussed.

A. Big Data Analysis in Command Information System

Big data analysis in command information system includes offline analysis and online analysis. Among them, offline analysis requires timely and accurate processing of massive historical information data and acquisition of potential and valuable information knowledge through correlation analysis, clustering, classification and other data mining means. Cloud computing integrates grid computing, distributed computing, parallel computing, utility computing, network storage, load balancing and other technologies into one, with massive storage capacity and flexible computing capacity. Since Google came up with GAE (Google App Engine), various cloud computing products have emerged. Among them, Hadoop, as the standard in the field of big data, has many advantages such as high throughput, high availability, universality, etc. In addition to its open source characteristics, it has been widely applied. Hadoop technology and platform enable big data analysts to analyze raw data and obtain the intelligence knowledge needed to support decision making [8].

However, in the command information system, a large number of constantly updated information data streams are transmitted from various reconnaissance sensors in real time, and the battlefield situation is constantly changing. Only through real-time analysis of these information data can real-time battlefield situation be obtained, thus ensuring the effectiveness and accuracy of command decisions. Although Hadoop cloud computing platform has many advantages, it has problems such as large delay and large scheduling cost, which cannot meet the real-time requirements of battle command. At present, there are also some computingplatforms suitable for real-time data analysis, such as Twitter Storm, Cloudera Impala, Hstreaming and so on [9]. Among them, Storm is an open source distributed real-time streaming computing framework, which supports full memory computing, and has the advantages of high fault tolerance, simple deployment, etc., which can make up forthe defects of batch processing that cannot meet the real-time requirements.

Based on the above analysis, a parallel data analysis architecture suitable for command information system big data analysis can be built based on Hadoop distributed cloud storage technology, combined with Map Reduce parallel computing framework and Storm flow computing framework, as shown in Figure 2.

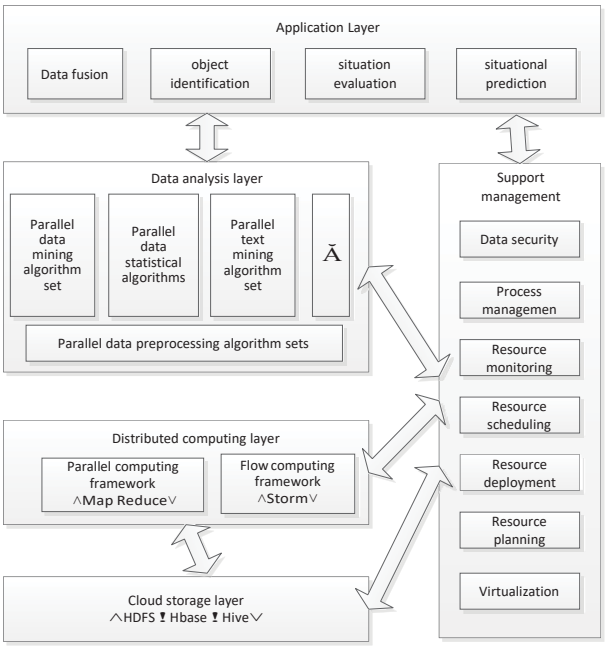

Figure 2. Big Data Analysis Architecture in Command Information System

The whole architecture includes cloud storage layer, distributed computing layer, data analysis layer and application layer. The support management module provides corresponding service support for each layer, including data security, process management, resource monitoring, resource scheduling, resource deployment, resource planning and virtualization functions, ensuring high reliability for each layer. Specific functions of each level are as follows:

- The cloud storage layer is composed of the Distributed File System, the Distributed Database and the Distributed data warehouse tool Hive to realize the Distributed access of data.
- The distributed computing layer consists of parallel computing framework and flow computing framework. Map Reduce provides non-real-time parallel computing power and Storm provides real-time stream computing power.

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- The data analysis layer contains a set of parallel data preprocessing algorithms and a variety of parallelanalysis algorithms, such as parallel data mining algorithms, parallel data statistics algorithms, parallel text mining algorithms, etc., which can efficiently and accurately process various structured, semi-structured and unstructured data.
- The application layer provides data fusion, target identification, situation assessment, situation prediction and other specific operational applications for the business users of command and information system.

B. Real-time Big Data Distribution Service in CommandInformation System

In the command information system, big data analysis, especially the real-time analysis in the information center, needs to obtain the latest information data in real time from each information station, which requires that the information data of each information station can be distributed in real time.

There are already some open source real-time data delivery systems in the industry, such as Facebook Scribe, Cloudera Flume, Apache Chukwa, etc. Although each system has its own advantages in design architecture, load balancing, scalability and fault tolerance, it has three basic components, namely agent, collector and store. Among them, agent is used to encapsulate data source and send data in data source to collector. Collector is responsible for receiving the data of multiple agents, collecting them and importing them into the store. Store is a central storage system that supports distributed data storage. The real-time big data distribution service in the command information system built is shown in Figure 3.

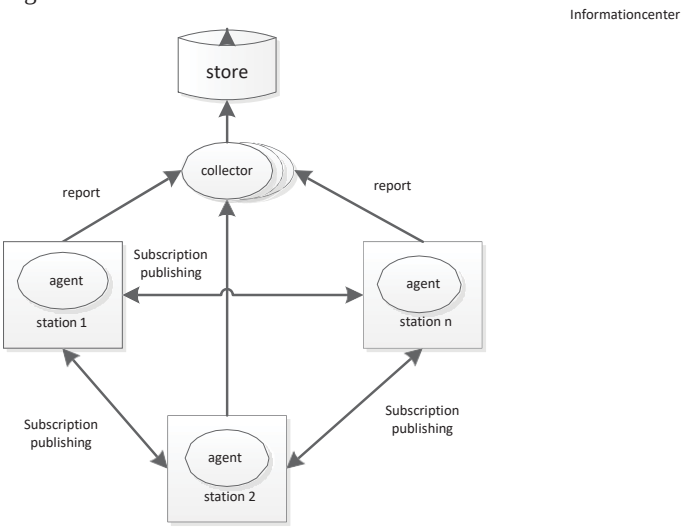

Figure 3. Real-time Big Data Distribution Service in CommandInformation System

Agents are located at information stations, and report the information of the station to the information center in real time, and send the analysis results to other information stations based on the subscription and distribution mechanism [10]. Used for distributed storage of massive information data. Collectors can have multiple to provideload balancing and fault tolerance.

V. CONCLUSION

This paper discusses the application of big data analysisin command information system. To successfully apply big data analysis to command information system, there are a lot of further research issues, such as: how to battlefield unstructured data such as image, video information effectively extract and fast retrieval, how to manage the comprehensive analysis of a variety of heterogeneous information data in order to get more valuable information knowledge, etc.

The world's military powers have been attaching importance to data for a long time, but they have traditionally positioned its function as "decision support", while the big data strategy sublimates its function as "decision support", which indicates that military data has changed from the auxiliary position to the dominant position. The application of big data analysis technology in command information system can greatly improve the intelligentprocessing ability of all kinds of battlefield intelligence data and effectively enhance the decision-making support ability of command information system..

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