



# Research on China Academic Library & Information System

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## Abstract

China Academic Library & Information System (CALIS) is the world's largest university library consortium, which is responsible for resource coordination and joint construction, document information sharing services, etc. It uses cloud computing technology to build a platform for resource sharing, which is a model for the development of China's university library alliances (CULAS) in the past 30 years. CALIS has played an important role in promoting the CULAS development, which has independently designed and developed an online cooperative cataloging system and an online public retrieval (OPAC) system. This article mainly adopts the method of case analysis to study the development process, organizational structure, operation mode, and development trend of CALIS, to reveal the general laws of CULAS construction.

## Subject Areas

Library, CALIS, ULAS

## Keywords

CALIS, ULAS, Cloud Service, AI

## 1. Introduction

The widespread application of emerging information technology is the first factor in promoting the development of university library alliances. To take advantage of the new technology, CULAS had to turn their organizations upside down with new architecture and processes. CALIS is a public service infrastructure for academic libraries. [1] By 2012, the Chinese government has invested a total of 352 million yuan to build CALIS. This cost is still the highest record of the Chinese government's investment in the construction of the CULAS. The reason

why the Chinese government has invested so much money to build CALIS is to break down barriers and achieve document resource sharing among university libraries. At present, CALIS has more than 1800 member libraries [2], which is the largest university library alliance in China. In this regard, it can be said that the Chinese government has achieved its initial goal—establishing a document resource—sharing system that can serve university libraries nationwide. CALIS represents the highest level of development of CULAS and plays an important role in promoting the construction of CULAS. In China, many regional alliances of university libraries are established based on CALIS. CALIS will build a new generation of library service platform soon, which will be more intelligent and able to provide cloud services. Using cloud technology, CALIS will truly realize the sharing of literature resources among Chinese university libraries. The development direction of CALIS represents the development direction of CULAS.

## 2. The Development Path

The construction of CALIS is mainly divided into four phases (Figure 1). “Phase I” (1998-2001) mainly includes four aspects: Firstly, CALIS has established a joint catalog retrieval system. [3] Through this system, the readers can retrieve the collections of all the member libraries. Like CALIS, the other CULAS generally build their joint catalog retrieval system. With the joint catalog retrieval system, the readers can know which member libraries have the literature resources they need. Secondly, it created a digital resource group procurement model. The Group procurement can reduce the procurement cost of literature resources for member libraries, which is an important work of the CULAS. Database providers generally determine preferential prices based on the number of CALIS member libraries participating in group procurement. The more CALIS member libraries that participate in the group’s procurement, the more favorable the prices tend to be. At the same time, CALIS also has a close cooperative relationship with the Digital Resource Acquisition Alliance of Chinese Academic Libraries (DRAA). Thirdly, CALIS has established a three-level document guarantee system. [3] Through this system, CALIS has built a unified national management



Figure 1. The development process of CALIS. (The Information is from <http://www.calis.edu.cn>)

and service platform. Fourth, CALIS has established a document delivery system. Through this system, readers of CALIS member libraries can quickly obtain the documents they need.

“Phase II” (2004-2006) includes three major aspects: First, Establishing a digital library standard system. CALIS has established unified technical standards for its member libraries. [3] Within an organization, if there are no common technical standards, there will be confusion in the development and application of technology, and the organization’s goals will not be achieved through technical means. Secondly, CALIS has established a distributed document delivery system, through which, readers can obtain documents more conveniently. [4] Within a university library alliance, if there is no document delivery network, the sharing of document resources in the digital era will become empty talk. Thirdly, CALIS had established 15 provincial centers. [5] The establishment of the 15 provincial centers marked a more complete service system for CALIS.

“Phase III” (2010-2012) includes four aspects: Firstly, CALIS has established a Unified Authentication System. [6] With this system, it is easier for readers to register. Secondly, CALIS has carried out cross-system document delivery cooperation. For instance, CALIS and Shanghai Library formally launched the inter-library loan service in 2011. Thirdly, CALIS has promoted the personalized and diversified development of university library alliances. In addition to continuing to strengthen the construction of provincial centers, CALIS has also supported the construction of multiple distinctive sharing and collaboration alliances, such as the Dalian Urban Regional Alliance and the Fuzhou University City Regional Alliance. [7] Fourth, CALIS has established a three-level unified certification system for national colleges and universities.

“Phase IV” (2013-now) (**Figure 2**): The goal of CALIS is going to promote the overall development of university libraries and improve the service system.

### 3. The Management Mechanism and the Service System

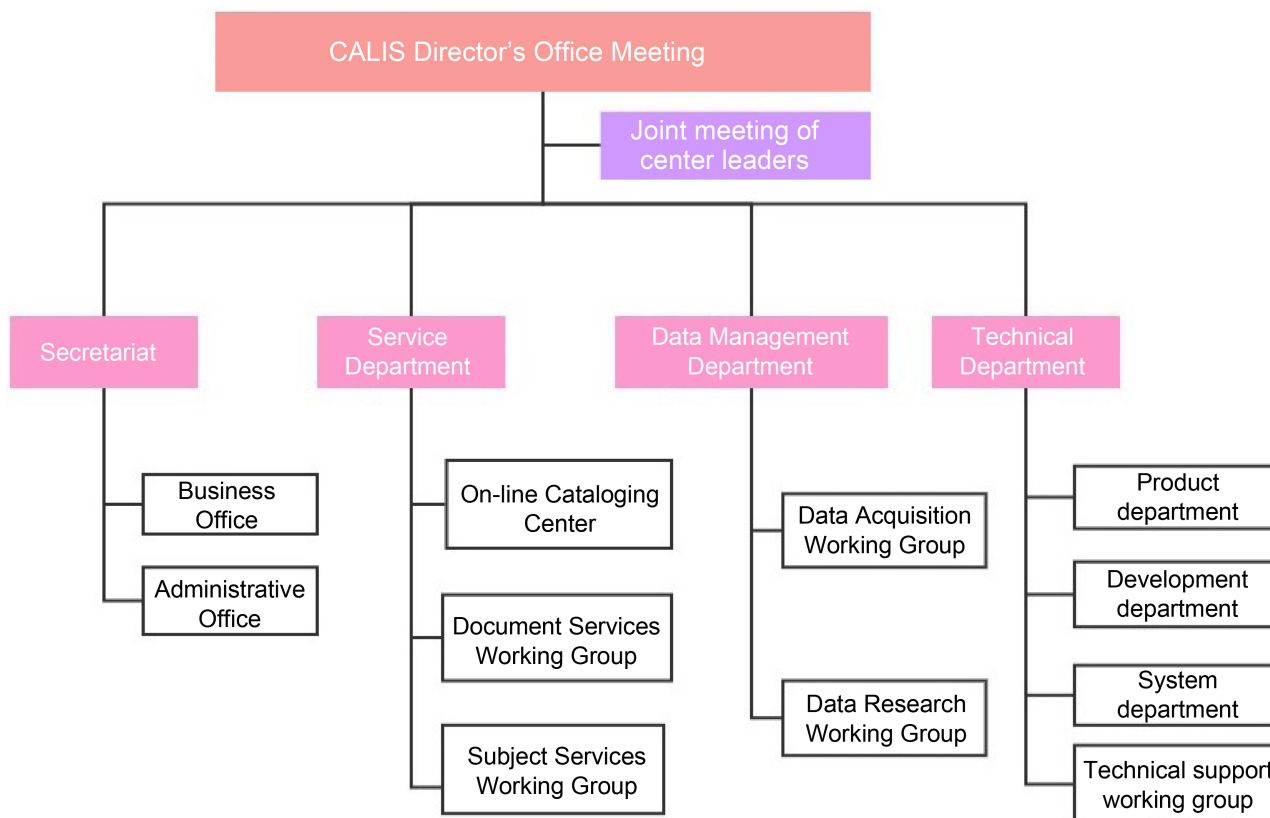
#### 3.1. The CALIS Management Center

CALIS is operated by the CALIS Management Center (MCC) at Peking University, which is the brain of CALIS. The MCC consists of four departments (**Figure 3**)—the Secretariat, the Service Department, the Data Management Department (DMD), and the Technology Department (TD).

The Secretariat is mainly responsible for the overall planning and daily administrative management of CALIS business. The Service Department is primarily responsible for online cataloging, document services, and subject services. [8] The DMD is mainly responsible for data collection and data research.



**Figure 2.** CALIS's vision and objectives. (The information is from <http://www.calis.edu.cn>)

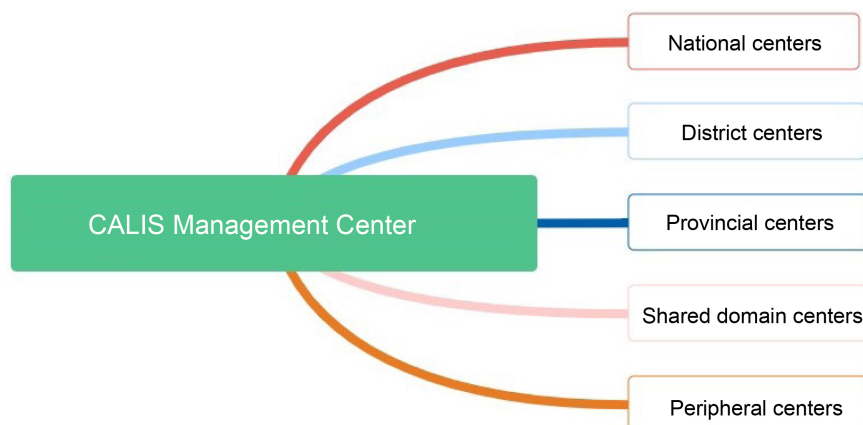


**Figure 3.** The organizational structure of CALIS management center. [8]

Data have become the most valuable resource in the world. AI depends on data. The University Library Alliances in every province are counting on AI to drive growth over the next several years in China. The Technology Department is responsible for technical services, whose main business is to formulate the CALIS technology development plan and design the overall framework, etc. [8] The TD also designs the technical route of CALIS and evaluates the actual results achieved of technical applications. All technical issues encountered by CALIS are resolved by TD. The engineers of CALIS can solve most problems alone or after conferring with colleagues.

### 3.2. The Backbone Service System

The backbone service system of CALIS consists of four national centers, seven regional centers, and thirty-one provincial centers (Figure 4). [9] CALIS' organizational structure facilitates its goal achievement. These service centers constitute the vast service system of CALIS, allowing readers to freely access the required literature resources. CALIS successfully organized the member libraries into self-managed groups, each devoted to a group of similar readers. The various literature resources of these backbone libraries are integrated to support shared services for all colleges and universities across the country. [10] The network of CALIS serving national university libraries has been established, which provides great convenience for resource sharing among university libraries in China.



**Figure 4.** CALIS service framework. [11]

### 3.2.1. The Four National Centers

CALIS has established four national literature information centers in Beijing, which are like the limbs of CALIS. Among them, the two National Centers (NCS) for liberal arts and engineering are located at Peking University and Tsinghua University [12], which are the best universities in China. The other two NCS of agronomy and medicine are located at China Agricultural University (as CALIS National Agricultural Literature Information Center, CNALIC), and the Medical Department of Peking University (as CALIS National Information Center in Medicine, CNICIM). [12] The main task of CNICIM is to build a joint literature resources guarantee system. [13] The CNICIM has introduced a batch of high-quality biomedical databases and provides Document Delivery and Interlibrary Loan services for universities across the country. [14] The CNALIC has also introduced a batch of agricultural, forestry, and water-related literature databases to provide services to all alliance users. [15]

### 3.2.2. The District Center and the Provincial Center

CALIS has established a three-level document information guarantee system—“The National Centers—The District Centers—The Provincial Centers”. [16] The regional and provincial centers are like CALIS’s hands and feet. The information in the forms (Table 1 and Table 2) is from <http://www.calis.edu.cn>.

The District Centers are responsible for the construction of university library alliances in the region, which are important pillars supporting the entire service system of CALIS. The regional centers selected by CALIS are all very famous university libraries in the region.

The establishment of Provincial Centers is very important for improving the service network of CALIS. With these provincial centers, CALIS can extend its services to various universities across the country. At the same time, the establishment of these provincial centers has played a very important role in promoting the construction of university library alliances in the province, as these provincial centers are often the organizers and supporters of the construction of university library alliances in the province.

**Table 1.** CALIS district centers [17].

CALIS Regional Center	Center's Institution
Northeast Regional Center	Jilin University Library
East China Regional Center	Nanjing University Library
Southeast China Regional Center	Shanghai Jiao Tong University Library
South China Regional Center	Sun Yat-sen University Library
Central China Regional Center	Wuhan University Library
Northwest Regional Center	Xi'an Jiaotong University Library
Southwest Regional Center	Sichuan University Library

**Table 2.** Some provincial centers of CALIS [18].

Some CALIS Provincial Centers	Center's Institution
Beijing	Library of Renmin University of China
Chongqing	Chongqing University Library
Shandong Province	Shandong University Library
Tianjin	Tianjin Polytechnic University Library
Zhejiang Province	Zhejiang University Library

#### 4. The Development Trend

With the continuous enrichment of library collection resources and the continuous expansion of service content, the traditional integrated management system designed with paper resource management as the core can no longer meet the needs of the continuous development of libraries, and developing a library platform facing the future is inevitable. In this situation, CALIS will launch a new generation LSP based on FOLIO microservice architecture. The LSP adopts the FOLIO microservice architecture and is in line with the international FOLIO platform, which can make full use of the latest research and development results of the FOLIO community. [19] CALIS will deepen the connotation and expand the boundaries based on the established higher education document guarantee system, and build it into a national-level, guaranteed public infrastructure. CALIS will also mine big data, looking for ways to benefit from this technology. An explosion of new technology will reshape CALIS. Artificial intelligence (AI) technology will be the main technology leading the construction of CULAS in the future. CALIS has responded to the trend, which is accompanied by a profound change in emerging information technology. The ChatGPT has dominated tech headlines in recent months. Shortly, AI will help CALIS achieve greater development.

#### 5. Conclusion

CALIS is the largest university library alliance in China, which represents the development level of CULAS. By studying CALIS, we can see the organization,

operation mechanism, service characteristics and development trend of the CULAS. CALIS will build a cloud platform in the future to provide readers with cloud services (CS), which is also the development direction of the CULAS. CALIS plays a role as a benchmark and an example in the application of emerging information technology in China's academic libraries, whose development direction often indicates the mainstream direction of the development of the CULAS. The development of CS and AI is undoubtedly the general direction of the future development of the ULAS. CALIS needs to continue to strengthen the interaction with readers to meet readers' literature needs more quickly and efficiently. At the same time, strengthening the construction of its resources and continuously launching distinctive services are also issues that CALIS should consider. Therefore, CALIS should change its development thought. The long-term solution is to shift from focusing on network construction to focusing on readers and resources.

### Acknowledgements

This brief introductory text about CALIS for international students of Beijing University of Chemical Technology, whose information mainly comes from the CALIS official website (COW), here I would like to thank my CALIS colleagues, for their strong support that I can complete the various publicity and promotion work of CALIS every year. If readers want to know more about CALIS, they can log on to the COW for in-depth reading.

### Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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