

# FIRST STAGE REPORT

## Study of the Cloud Platform Ecosystem in China

# Table of Contents

<b>Description Of The Study</b>	<b>3</b>
General overview	3
<b>Cloud Service Providers</b>	<b>3</b>
Chinese Providers	3
Western Providers	3
Provided Services	4
<b>Technical Requirements</b>	<b>8</b>
General Requirements	8
Software Mirrors and Package Repositories	8
<b>Legal Requirements</b>	<b>8</b>
Internet Content Provider License (备案)	8
Cyber Security Law of the People's Republic of China (中华人民共和国网络安全法)	9
Telecom Regulation of the People's Republic of China (中华人民共和国电信条例)	10
<b>Cloud Services</b>	<b>10</b>
HTTP Traffic Load Balancing	10
Web Application Firewall	10
CDN (Distributed Content Delivery Network)	11
Provisioning of Virtual Machines Using APIs	11
Centralized Logging Options	11
Centralized Metric Tools	11
Geographically Distributed and Replicated Database Options	11

**FIRST STAGE REPORT**

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## 1. Description Of The Study

### 1.1. General overview

This first stage of the study consisted of researching and documenting the different options available for cloud infrastructure and service providers in Mainland China as well as their special requirements and differences from the perspective of European industries. In order to confirm the technical requirements, some of the services and tools provided by the local cloud service providers were tested on small scale by setting up test accounts with different providers and researching virtual server provisioning APIs.

The main focus of the study is to research the use of cloud platforms from the perspective of the European industries working in China. This stage of the study has been implemented remotely from Finland.

## 2. Cloud Service Providers

### 2.1. Chinese Providers

This study focuses on the 14 Chinese cloud service providers with the most visibility online, and ones that provided most of the services listed in the study requirements. These services researched for this study were: Alibaba Cloud (阿里云), Baidu Cloud (百度云), Baidu SU (百度云加速), Meituan Open Services (美团云), Tencent Cloud (腾讯云), UCloud (与云), QingCloud (青云), Huawei Enterprise Cloud (华为企业云), NetEase Cloud (网易蜂巢), Western Digital (西部数码), Elephant Cloud (象云), E Cloud (天翼云), Grand Cloud (盛大云), KS Cloud (金山云).

### 2.2. Western Providers

From the Western Providers, 2 of the only cloud service providers that provide services listen in the study requirements were: Azure (operated by 21Vianet) and Amazon (operated by NWCD and Sinnet).

Due to China's legal and regulatory requirements, foreign-owned companies have either licensed their technologies or formed different kinds of collaborations with Chinese companies in order to be able to provide services in China. <sup>1 2 3</sup>

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<sup>1</sup> Stanford Management Science and Engineering. (2018) Why China is taking over the cloud computing market

<https://mse238blog.stanford.edu/2018/07/sebgomez/why-china-is-taking-over-the-cloud-computing-market/>

<sup>2</sup> AWS. (2018) 在中国简介

[https://www.amazonaws.cn/about-aws/china/?nc1=h\\_ls](https://www.amazonaws.cn/about-aws/china/?nc1=h_ls)

**FIRST STAGE REPORT****Aarila Dots Oy**

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According to the People's Republic of China Telecom Regulation (中华人民共和国电信条例), cloud service providers must have telecommunication permits in order to provide cloud services in China. According to Article 10 of the regulation only, local companies with less than 50 percent foreign investment qualify for said permits. <sup>4</sup>

Western providers are a relatively recent addition to the list of service providers in China. <sup>5 6</sup> While these providers might be the largest providers outside China, their number of services, tools, scale, and server locations are still not at the same level as local providers. <sup>7 8</sup>

These restrictions have given an edge for the local providers, giving them more time to build their cloud platforms locally.

For the purpose of European industries, using these providers may speed up the development time when using the same tools and services as they may already use outside China. There are however major obstacles and the services may be completely different to how they work outside of China, even if they share the same name. <sup>9</sup>

Customer support, server access, and other key parts may be operated by the local Chinese partner company. And some of the key features, like server root access, AWS KMS, AWS Route53 and others may not work at all. <sup>10</sup>

### 2.3. Provided Services

List of providers and the availability of services researched in this study can be found below. More details about the providers, website links and the documentation languages are listed in attachment 1 of this study.

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<sup>3</sup> Azure China Documentation. (2018) Azure operations in China vs. Global Azure  
<https://docs.microsoft.com/en-us/azure/china/china-overview-operations>

<sup>4</sup> 中华人民共和国工业和信息化部. (2016) 中华人民共和国电信条例  
<http://www.miit.gov.cn/n1146295/n1146557/n1146619/c4860613/content.html>

<sup>5</sup> AWS News Blog. (2017) Now Open – AWS China (Ningxia) Region  
<https://aws.amazon.com/blogs/aws/now-open-aws-china-ningxia-region/>

<sup>6</sup> Microsoft Azure. (2018) Welcome to Azure China 21Vianet  
<https://docs.microsoft.com/en-us/azure/china/china-welcome>

<sup>7</sup> 微软云技术. (2018) 智能安全可信混合全球的 Azure 平台  
<https://www.microsoft.com/china/azure/>

<sup>8</sup> Bloomberg. (2018) Google Is In China Cloud Talks With Tencent, Others  
<https://www.bloomberg.com/news/articles/2018-08-03/google-is-said-to-be-in-china-cloud-talks-with-tencent-others>

<sup>9</sup> AWS Documentation. (2018) Documentation by Service  
[https://docs.amazonaws.cn/en\\_us/aws/latest/userguide/services.html](https://docs.amazonaws.cn/en_us/aws/latest/userguide/services.html)

<sup>10</sup> The Register. (2018) No root for you, or how to stop worrying and love AWS China  
[https://www.theregister.co.uk/2018/05/18/china\\_cloud\\_setup/](https://www.theregister.co.uk/2018/05/18/china_cloud_setup/)

Company name		List of services required in the study	
English	Chinese	Provided	Missing
Alibaba Cloud	阿里云	Machine Learning Platform For AI Web Application Firewall Cloud CDN Elastic Computing - Scalable Virtual Servers - Auto Scaling - Server Load Balancer - Various Security and Monitoring Resources Log Service CloudMonitor Database Services - ApsaraDB	
Baidu Cloud	百度云	AI development platform Infinite Baidu machine learning BML Load balancing BLB Application firewall WAF Content Distribution Network CDN Cloud server BCC Document database MongoDB	Centralized logging service Metrics and performance tools
Baidu SU	百度云加速	Application firewall WAF Content Distribution Network CDN	
Meituan Open Services	美团云	Load balancing Web application firewall WAF Content Distribution Network CDN Cloud host MongoDB	Artificial Intelligence Platform Centralized logging service Metrics and performance tools
Tencent Cloud	腾讯云	Cloud Load Balancer Web Application Firewall (WAF) Content Delivery Network Cloud Virtual Machine - Auto Scaling Cloud Log Service (CLS) Cloud Monitoring and Warning Cloud MongoDB Service	Artificial Intelligence Platform

## Aarila Dots Oy

28.12.2018

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UCloud	与云	AI online service UAI-Inference AI training service UAI-Train Load balancing ULB Web application firewall UWAF Cloud distribution UCDN Cloud host UHost Cloud monitoring UMon Cloud database MongoDB UDB	Centralized logging service
QingCloud	青云	Deep learning platform Load balancing Web application firewall CDN service Virtual host - Automatic expansion Operation and maintenance and monitoring MongoDB	Centralized logging service
Huawei Enterprise Cloud	华为企业云	Machine Learning Service Deep Learning Service Elastic Load Balance Web Application Firewall Content Delivery Network Elastic Cloud Server - Auto Scaling Log Tank Service Open platform for real-time resource monitoring, alarming, and notification Document Database Service (DDS) is a MongoDB-compatible database	
NetEase Cloud	网易蜂巢	Load balancing Web application firewall Content Delivery Network (CDN) Cloud Server Log service Application monitoring Alarm management MongoDB	Artificial Intelligence Platform
Western Digital	西部数码	Web Application Firewall (WAF) Cloud Server	
Elephant Cloud	象云	Load balancing CDN acceleration Public cloud Real-time monitoring and alarm services	Artificial Intelligence Platform Web Application Firewall Centralized logging service

		Cloud database service (MySQL)	
E Cloud	天翼云	Elastic load balancing Web application firewall CDN content distribution Elastic cloud host Log audit Cloud audit Cloud monitoring service Document database service (MongoDB protocol)	Artificial Intelligence Platform
Grand Cloud	盛大云	Load balancing Cloud host Cloud monitoring Database MySQL	Artificial Intelligence Platform Web Application Firewall Distributed Content Delivery Network Centralized logging service
KS Cloud	金山云	Deep Learning Platform (KDL) Machine Learning Platform (KML) Load balancing (SLB) Web Application Firewall (WAF) Content Distribution Network (CDN) Cloud Server (KEC) Cloud Monitoring Cloud database (MongoDB)	Centralized logging service
Azure	.	Cognitive Services Load Balancer Application Gateway Content Delivery Network (CDN) Virtual Machines Azure Monitor Azure Cosmos DB (MongoDB 3.2 compatible)	Centralized logging service
Amazon	-	AWS Deep Learning AMIs Elastic Load Balancing Amazon CloudFront (CDN) Amazon EC2 Amazon Elasticsearch Service Amazon CloudWatch Amazon Relational Database Service (RDS) Amazon DynamoDB	Web Application Firewall

## 3. Technical Requirements

### 3.1. General Requirements

From a technical perspective, the Chinese cloud services researched in this study operate in a very similar way to western service providers.

There are however some requirements that are either mandatory or at least make the process of using the services easier. Many of the services use WeChat or Baidu accounts for authentication, need a Chinese phone number for verification or two-factor authentication tokens or need an address in China. And some provide only Chinese payment methods or restrictions in place for international payment cards.

There is also a requirement to provide proof of ownership to the Ministry of Industry and Information Technology when linking a domain name, using a domain ownership certificate (域名证书). Most domain registrars do not provide a valid certificate and companies may have to transfer their domains to local companies or alternatively register new domain names for these purposes. Some TLDs are not available for use in China at all.

### 3.2. Software Mirrors and Package Repositories

There are restrictions when installing software packages to servers inside Mainland China. Most of the Western software mirror servers are not accessible or don't always perform as expected.

One of the de-facto standard mirrors is from Taobao.<sup>11 12</sup>

It provides mostly Node.js packages (NPM) but also mirrors for things like Node.js, io.js, Python, PhantomJS, electron, atom-shell, git-for-windows, atom, yarn, etc.

Other popular mirror for RubyGems is hosted by Ruby China and sponsored by UpYun.<sup>13</sup>

## 4. Legal Requirements

### 4.1. Internet Content Provider License (备案)

The Internet Content Provider License, commonly known as the ICP license is a permit issued by the Ministry of Industry and Information Technology of the People's Republic of China (中华人民共和国工业和信息化部) for companies publishing online content that is

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<sup>11</sup> TaoNPM. (2018) 淘宝 NPM 镜像

<https://npm.taobao.org/>

<sup>12</sup> StackOverflow. (2014) `npm install` goes [tø] dead in China

<https://stackoverflow.com/questions/22764407/npm-install-goes-to-dead-in-china>

<sup>13</sup> Ruby China. (2018) RubyGems 镜像

<https://gems.ruby-china.com/>



**FIRST STAGE REPORT****Aarila Dots Oy**

Study of the Cloud Platform Ecosystem in China

28.12.2018

available in China. Including operating a domain name or having a publicly accessible IP address.<sup>14</sup> The regulation states that the license is required when publishing content available online. These licenses are issued at the provincial level and in addition to statewide rules, provincial requirements may also apply. Depending on the situation, foreign companies may want to choose their jurisdiction based on the local requirements. There is also a grace period for companies when they can operate without a valid license while the registration process is in progress. In practice, however, it was found during the research for this study, that the license is required immediately when a company registers as a client for any of the cloud service providers researched in this study. In order to use a domain name with the cloud services, a valid domain ownership certificate is also required.

Most of the cloud service companies provide tools and services to help with the whole ICP registration process.

There are two types of ICP licenses granted by the ministry:

**4.1.1. ICP license**

For commercial websites directly selling goods or services online. Represented in the ICP number with the characters “ICP证”.

**4.1.2. ICP filing**

For non-commercial websites which are purely informational and do not directly sell goods or services online. Represented with the characters “ICP备”.

**4.2. Cyber Security Law of the People’s Republic of China (中华人民共和国网络安全法)**

The Cyber Security Law was enacted to *“increase cybersecurity and national security, safeguard cyberspace sovereignty and public interest, protect the legitimate rights and interests of citizens, legal persons and other organizations and promote healthy economic and social development.”*<sup>15</sup>

It requires network operators, service providers, content providers, and many other companies to store select data within China and allows Chinese authorities to conduct spot-checks on a company’s network operations.<sup>16</sup>

The law includes, but is not limited to internet security, but also communication security, computer security, information security, and may in some cases even include industrial automation and control system security. Significantly, the companies affected are not limited to content providers or network operators. It may, however, be difficult for

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<sup>14</sup> 江苏省通信管理局. (2016) 中华人民共和国电信条例

[http://www.jsca.gov.cn/xxgk/zcfq/xzfq/201611/t20161114\\_45619.html](http://www.jsca.gov.cn/xxgk/zcfq/xzfq/201611/t20161114_45619.html)

<sup>15</sup> 中国人大网. (2015) 中华人民共和国网络安全法

[http://www.npc.gov.cn/npc/xinwen/lfgz/flca/2015-07/06/content\\_1940614.htm](http://www.npc.gov.cn/npc/xinwen/lfgz/flca/2015-07/06/content_1940614.htm)

<sup>16</sup> The Diplomat. (2017) China’s Cybersecurity Law: What You Need to Know

<https://thediplomat.com/2017/06/chinas-cybersecurity-law-what-you-need-to-know/>

companies to identify and verify their category and what obligations and responsibilities they have.

Many of the cloud service providers of this study do provide services to help with the implementation of this law and automation tools for their servers and services, as well as consultation for foreign and domestic companies.

#### **4.3. Telecom Regulation of the People's Republic of China (中华人民共和国电信条例)**

The telecom regulation is a permit issued by the Ministry of Industry and Information Technology of the People's Republic of China and Information Technology to companies providing telecom services.

The telecom requirement mostly applies to companies providing telecommunication services, hosting services etc. In some cases, if the provided service is a service classified in Chapter 2 of the regulation, providing platform as a service (PaaS) or even software as a service (SaaS) may fall under the regulation.<sup>17</sup>

According to Article 10 of the regulation, only local companies with less than 50 percent foreign investment qualify for said permits.

## **5. Cloud Services**

### **5.1. HTTP Traffic Load Balancing**

All of the researched cloud service providers provide HTTP traffic load balancing that is integrated into their systems, similarly to the tools and services of Western service providers.

Cloudflare provides their services through Baidu with their service: SU (百度云加速). This service includes load balancing, WAF etc., that can be used in conjunction with other cloud service providers in a way that is similar to how Cloudflare services are used internationally.

### **5.2. Web Application Firewall**

With the exception of Elephant Cloud, E Cloud, and Amazon, all of the researched cloud service providers provide an integrated Web Application Firewall as a service.

When distributing infrastructure between multiple providers, a load balancer providing WAF, like Baidu SU can be used even with those service providers that are not providing this service.

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<sup>17</sup> 中华人民共和国工业和信息化部. (2016) 中华人民共和国电信条例  
<http://www.miit.gov.cn/n1146295/n1146557/n1146619/c4860613/content.html>

### 5.3. **CDN (Distributed Content Delivery Network)**

With the exception of Grand Cloud, all of the researched cloud service providers provide a CDN service that can be used to distribute content from various geographical locations.

The functionality of CDNs is critically dependant on the geographical location of the edge servers. The server location availability of the service providers is a key part and should be taken into account when selecting a provider.

The two Western service providers researched in this study both had only two data centers in China.

### 5.4. **Provisioning of Virtual Machines Using APIs**

All of the researched cloud service providers have APIs for provisioning and deploying virtual machines and some have the functionality to automatically scale servers based on usage.

### 5.5. **Centralized Logging Options**

Most of the researched cloud service providers do not have their own centralized logging services. However, the largest service providers have logging options available where the data can be fed into from all the other providers.

### 5.6. **Centralized Metric Tools**

While most of the researched cloud service providers do have their own metrics and performance tools, some also provide options for aggregating data from multiple providers into one, making the use of a distributed infrastructure possible, where the services are distributed between different service providers.

### 5.7. **Geographically Distributed and Replicated Database Options**

Most of the researched cloud service providers have distributed and replicated database options that have their own proprietary modifications to the database software.

The provided database options are compatible with the common protocols, like MongoDB, MySQL, PostgreSQL etc., and work as drop-in replacements using existing drivers and libraries. Depending on the use case, there might still be additional requirements in case of importing data into these databases. There may also be differences in the replication and geographical distribution options between the providers.

In addition to the technical differences, services related to the legal requirements, like the Cyber Security Law may not be available or may differ between providers.

These differences should be taken into account when selecting the database service provider.