# Security and Strategies in Air Logistics Based on Cloud Computing

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*Abstract*—In this paper, firstly, we analyze and design an air logistics system based on Cloud Computing platform. As Cloud Computing referred to both the applications delivered as services over the Internet and the infrastructures that provide those services, secondly, we present the security and privacy issues in terms of the air logistics system. Moreover, more concerns on security issues, such as availability, confidentiality, data integrity control and so on, are discussed. Finally, according to the layers of Cloud Logistics, we suggest a few strategies in terms of the five aspects.

Keywords-air logistics; cloud computing; Cloud Logistics; security; privacy

## I. INTRODUCTION

Cloud Computing is a new business model based on the Internet. The computation task is distributed in resource pool composed of a large number of computers, so every application system can request computing power, storage space and a variety of software services on-demand. Cloud Computing is a development product of the parallel computing, distributed computing and grid computing, or a commercial implementation of these concepts in computer science. In Cloud Computing systems, the most important technologies include data processing model (MapReduce), data management (Hadoop Distributed File System) and virtualization technology.

Cloud Logistics based on Cloud Computing platform, has information characteristics of Cloud Computing and also extends Cloud Computing technology model to the operation processes of the logistics industry. According to the demands on time and space from production to consumer and depending on a large scale processing power of cloud computing, Cloud Logistics can process a variety of information from the manufacturing, transport, handling, packing, storage, processing and produce distribution, which can meet the information demand of logistics enterprise and consumer in modern logistics supply chain.

However, security and privacy issues present a strong barrier for users to adapt into Cloud Computing systems. Security is the top one concern, say users of Cloud Computing worry about their businesses' information and critical IT resources in the Cloud Computing system which are vulnerable to be attacked. Nevertheless, concerns on Jing WU

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performance and availability are below the security. Furthermore, Forrester [1] also said data protection, operational integrity vulnerability management, business continuity (BC), disaster recovery (DR), and identity management (IAM) are the top concerns of security issues for Cloud Computing and privacy is another key concern.

In this paper, firstly, we analyze and design an air logistics system based on Cloud Computing platform, more details in our paper [2]. As Cloud Computing referred to both the applications delivered as services over the Internet and the infrastructures that provide those services, secondly, we present the security and privacy issues in terms of the air logistics system. Moreover, more concerns on security issues, such as availability, confidentiality, data integrity control and so on, are discussed. Finally, we present a few strategies in terms of the five aspects.

## II. AIR LOGISTICS SYSTEM BASED ON CLOUD COMPUTING

Traditional development procedure of the new business system must consider the full deployment from hardware resources to application software and management software in the upper layer, which leads to lower utilization of local resources and long deployment time. However, with the continual growth of new business, it has been unable to meet market demand.

## A. Air Logistics

Traditional air cargo is the centralized shipping by the air cargo agent. The airlines provide air transportation services for goods by aircraft. The advantages of air transportation are speed and high safety factor, but the disadvantages are expensive and restrictions for many cargos in the transport.

Compared with traditional air cargo, air logistics is not only to complete the air transport of the goods, but also to participate in the whole process of gathering, import, export, storage, and distribution of goods, as well as to design and manage the entire logistics operation process for reducing the cost of customer. Therefore, air logistics emphasizes much on integration of logistics capabilities and cooperation to form a "customer focus" service chain.

## B. Service Chain of Air Logistics

One entire logistics business process is the whole process of cargo flow, information flow as well as controlling and management in the goods transport. Air logistics partners involve air cargo agent, ground transportation companies, airport cargo terminal, airline and customer. Through this service chain, the partners implement information exchange of cargo transport, warehousing and cargo information.

Firstly, owners send out goods.

Express delivery companies receive air goods from owners which are transported to airport operating centre by ground transportation companies.

Secondly, The goods received by air cargo agent.

Owners commission air cargo agent. The agent reviews documents, receives goods, and books flight according to customer requirements. It's necessary that agent declares to customs if the cargo is import or export.

Thirdly, goods are sorted by airport cargo service terminals.

At the airport operating centre, the service terminal determines the corresponding airport, total shipments, package information of goods, etc.

Fourthly, airlines arrange flight and class.

According to the actual situation, the airline reserves flight and class. After booking successfully, the airline issues a letter of confirmation and a receiving credential.

Finally, the goods arrives the airport and are distributed.

Air cargo agent pass on the information of goods to the express delivery companies, who will take goods in 2-3 hours after the plane landing and the goods are sorted and distributed.

There is no doubt that one air cargo transport involves multiple collaboration partners. It's the key to ensure the accuracy of cargo transport that cooperating and information sharing with the parties. On the basis of standards for consistency and coordination of services, the enterprises must integrate all related resources to make sure of the close links and the coordination of the air logistics services chains.

#### C. Architecture of Cloud logistics

Based on layers, each layer of cloud computing model provides one specific function. According to the layers named IaaS, PaaS and SaaS, the architecture of cooperation system based on cloud computing is also divided into three layers. The structure of air logistics cooperation system is as shown in Figure 1.

#### D. Function of Each Layer in Cloud Logistics

Corresponds to each layer of the cloud computing model, the definitions of air logistics service system are:

(1) Layer of data and resources, based on the IaaS layer in cloud model.

It's responsible for the centralized and virtualized IT infrastructure, and integrated management, scheduling, and maintenance of air logistics service chain collaborating partners on IT resources, which make full use of existing equipments and reduce duplication of inputs. Meanwhile, according to the agreement between the cooperation enterprises, users can establish special interface to access shared resources.

The cooperation business of air logistics service chian



Figure 1. the structure of air logistics service chain cooperation system

(2)Layer of service, based on the PaaS layer of in cloud model.

In this layer, the differences of various business system are shielded. Many new business are implemented based on middleware technologies, which are encapsulated and abstracted in different levels, and provided interface if the service is accessed.

(3)Layer of application, based on the SaaS layer in cloud model.

With the help of IaaS and PaaS, users can develop and deploy the applications which integrate client management, information query, personalized service and market analysis to provide decision support for managers.

Above architecture is characterized centralized management of the different business systems by exchange and sharing of the underlying public resource. The elastic scalability of IaaS makes the cooperative system easy to extend business capabilities. Users only need to focus on logic business, rather than brought pressure to cooperative enterprises in the air logistic service chain on capital investment.

#### III. SECURITY AND STRATEGIES OF CLOUD COMPUTING

Cloud Computing platform is the infrastructure of Cloud Logistics. Security and privacy of Cloud Computing system become a key factor for users to adapt into these applications based on it. Traditionally, it contains 5 aspects, such as availability, confidentiality, data integrity, control and audit. Nevertheless, few Cloud computing systems can achieve the five goals together nowadays.

#### A. Availability

The goal of availability for Cloud computing systems is to ensure its users can use them at anytime and anywhere [3].

Depending on the Internet, Cloud Computing system enables its user to access the system from anywhere. To be accessed at any time, the Cloud Computing system should be serviced all the time for all the users. Many Cloud Computing system vendors provide Cloud infrastructures and platforms based on virtual machines, such as Amazon, Skytap, and so on.

On one hand, virtual machines have the capability in providing on demand services in terms of users' individual resource requirement for a large amount of users. On the other hand, Cloud Computing system vendors depend on the virtual machine to tie commodity personal computers or servers together and to provide a scalable, robust system.

That's to say, Cloud Computing systems can provide available services through virtual machines, and virtual machines present the hardening and redundancy strategies.

## B. Confidentiality

Confidentiality means keeping users' data secret in the Cloud Computing systems [3].

Compares with the applications or systems hosted in the private data centers, Cloud Computing systems are exposed to more attacks. Traditionally, there are two basic approaches which are physical isolation and cryptography to achieve confidentiality.

In fact, because Cloud Computing system offerings are transmitted through public network, so physical isolation could not be achieved. But Virtual Local Area Network, and network middleware should be deployed to achieve the virtual physical isolation [4].

Encrypting data before placing it in a Cloud may be even more secure than unencrypted data in a local data center. So encrypted storage is another effective way to enhance the confidentiality.

### C. Data Integrity

Data integrity in the Cloud Computing system means to preserve the integrity of information which is not lost or modified by unauthorized [3].

In layer of Data as a Services, Software as a Service and Platform as a Services, Keeping data integrity is a basic content.

The typical techniques applied to achieve data integrity include RAID-6, HDFS, digital signature and so on.

#### D. Control

Control in the Cloud Computing system means to regulate the use of the system, including the applications, its infrastructure and the data [3].

The MapReduce framework, which uses Hadoop instead in implementation, can provide rigorous privacy and security control in the computation for the individual data. By providing several trusted initial mappers and trusted reducers, the MapReduce framework is able to carry out privacypreserving computations.

## E. Audit

Audit in the Cloud Computing system means to watch what happened in the system. Auditability could be added as an additional layer above the virtualized application environment hosted on the virtual machine to provide facilities watching what happened in the system [3].

Three main attributes should be audited: Events, Logs and Monitoring.

More security strategies should be deployed in the Cloud Computing environment to achieve the five goals, especially according to different application problem.

# IV. SECURITY AND STRATEGIES OF CLOUD LOGISTICS

It's important to note that all Cloud Models are not the same. As such, it is critical that organizations don't apply a broad brush one-size fits all approach to security across all models. According to the layers of Cloud Logistics, we suggest a few strategies in terms of the five aspects being mentioned.

#### A. Security of SaaS

This particular model is focused on managing access to applications. The security officer needs to focus on establishing controls regarding users' access to applications.

It is necessary to ensure the security of the core information of logistics enterprises, but also the information sharing within the enterprise, and between the enterprises interactive cooperation. Cloud computing platforms can effectively promote data sharing between the terminals of the same service. However, in the data exchange between different services or different cloud platform, especially selective partial data sharing, there is a lack of uniform standards and interfaces.

## B. Security of PaaS

The primacy focus of this model is on protecting data. This is especially important in the case of storage as a service. The security operation needs to consider providing for the ability to load balance across providers to ensure fail over of services in the event of an outage.

For logistics companies, including two aspects: one is to guarantee data available, that is not lost, the other is to ensure complete controlling of data, that is not revealed. The controlling of data integrity in Cloud computing is entirely responsible to the cloud operator, in this case, there is more complicated than traditional enterprise independent controlling, and more prone to problems. Such as access control, data storage technology and internal management of the cloud operator also can cause data loss and leakage, then resulting in a disruption of normal business and logistics enterprise core leaks of confidential.

## C. Security of IaaS

Within this model, the focus is on managing virtual machines. The Chief Security Officers (CSOs) priority is to overlay a governance framework to enable the organization to put controls in place regarding how virtual machine are treated and spun down thus avoiding uncontrolled access and potential costly wastage.

# V. CONCLUSION

As with any new technology, it creates new risks and new opportunities. In some cases, the Cloud provides an opportunity to re-architect older applications and infrastructure to meet or exceed modern security requirements. Based on the applications of air logistics system, we observe the security concerns of every layer, such as SaaS, PaaS, IaaS. Nevertheless, those concerns are not adequate. More security strategies should be deployed in the Cloud Computing environment to achieve the five goals. We will study further in the future work.

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