VSaaS Model on DRAGON-Lab

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Abstract

Video Surveillance as a Service provides service to users using Cloud technology. The DRAGON-Lab supports an opportunity for researchers to use Cloud technology on an open platform, but the services utilize schemes have not been defined. This paper proposed two VSaaS working models, market model and tender/contract model. A comparision testing are given and proven the proposed models are applicable for the DRAGON-Lab, and the market model evaluated have better performance than the tender/contract model. Both of them are justified as reasonable approaches which fulfiled the lacking of this research field.

Keywords: *VSaaS, cloud, working model, DRAGON-Lab*

1. Introduction

Video Surveillance as a Service (VSaaS) is a solution for Telecos& ISPs, monitoring companies, large integrators, and managed service providers (MSP). It is a centrally hosted video monitoring solution designed for the mass market. The VSaaS platform intelligently stores and manages video content originating from IP and analog cameras, and efficiently delivers this content to multiple user devices, such as web browsers, mobile phones, smart-phones (including Android and iPhone), tablets and media sets, for mass market use. This paper proposed two models for VSaaS working on DRAGON-Lab.

VSaaS is centrally hosted video cluster based on a carrier-grade, Managed Video Surveillance as a Service (MVaaS) standards, supporting innumerable concurrent users in a scalable architecture that grows as the user base increases.

VSaaS provides operators with a complete Managed Video Surveillance as a Service solution via Internet, enabling them to penetrate the visual surveillance markets, and transform existing monitoring services to a managed monthly, commodity-type service. VSaaS virtually eliminates the costs of storing and analyzing video content, while assuring instant ROI (return on investment). It provides managed surveillance service, enabling operators to offer an enterprise solution at commodity pricing to their subscribers, at a fraction of the expense and time typical to mass market.

The DRAGON-Lab, a next generation Internet Cloud experimental platform, has opened its computing resources and network devices to the public. The members of the DRAGON-Lab exchanged their own resources to other members, which has formed a large scale Could resources centre [1]. However, the management of the resource of DRAGON-Lab has become a research issue limited its development. This paper proposed two resource exchange models as approaches.

Based on the current strategy, all members could consume the Cloud resource without any limitations, which has caused to the resource competition between members [2]. Due to the

members belonged to different institutions, all of them are looking after maximum pay back while sharing their own resources. With the increasing membership of DRAGON-Lab, the kind of competition could affect the network performance. While, the current policy can not manage some members who do not have contributions to Could resources but still as consumers [3].

On the other hand, in the aspect of heterogeneous resources, the Could resource of DRAGON-Lab located in different areas in different ways. It not only includes the computing resources, such as CPUs, memories, hard disks, also the human resources, teaching resources and experiment resources [4]. The current first-come-first-served resources reserve strategy could not fulfil the requirements and balance the network performance.

2. Backgrounds

2.1. Brief Introduction of DRAGON-Lab

DRAGON-Lab was finished solely by Network Research Center of Tsinghua University, and gets joint supports of State 863 plan and 973 plan [5]. It is a remote access networks lab that supports various network technique experiments, network products test, application system development and test of engineering plans. The lab can also be used as an online demonstration platform for various network and application products.

The confederation network made up by two kinds of devices, connection device and experiment device. The connection devices include the RG-DLN (DRAGON-Lab Navigation System), RG-DLG (DRAGON-Lab Gateway), RG-NTC1000 (Network Topology Connector) and RG-RCMS (RACK Control and Management Server); the experiment devices are such as switch, router, firewall, wireless access point. Please see figure 1 for the structure of devices in the confederation network.

DRAGON-Lab is a cross-sector, cross-ownership and non-profit strategic Union of technological innovation. It is voluntarily constructed by domestic colleges, and Internet technology institutes and companies in the principle of “voluntariness, equality and cooperation” under the leadership of Ministry of Education, Science and Technology Development Center. The theme of DRAGON-Lab is the research and development, standardization and industrialization of Internet Technology. The platform is based on CERNET and new generation network CNGI-Center2. It can support the double protocol stack of IPV4/IPV6 and remote visualization of experiment network. And it could provide multi-space and multi-time operation modes. Above all, it is a comprehensive experimental Internet technology platform with the combination of virtual and real world. The open interface is used to support upper application platforms. The platform-based service makes the real “cloud” experimental union available.

The platform consists of shared equipments with a large quantity and variety. The first batch reported sharing equipments is in total 6447 sets, including 2652 high-end exchange equipments, 1778 servers, 375 high-end routers, 135 wireless devices, 137 security devices, 108 sets of various application software, 42 sets of storage devices and 21 sets of testers. Abundant experimental and testing environments could be created by purchasing the shared resources on line.

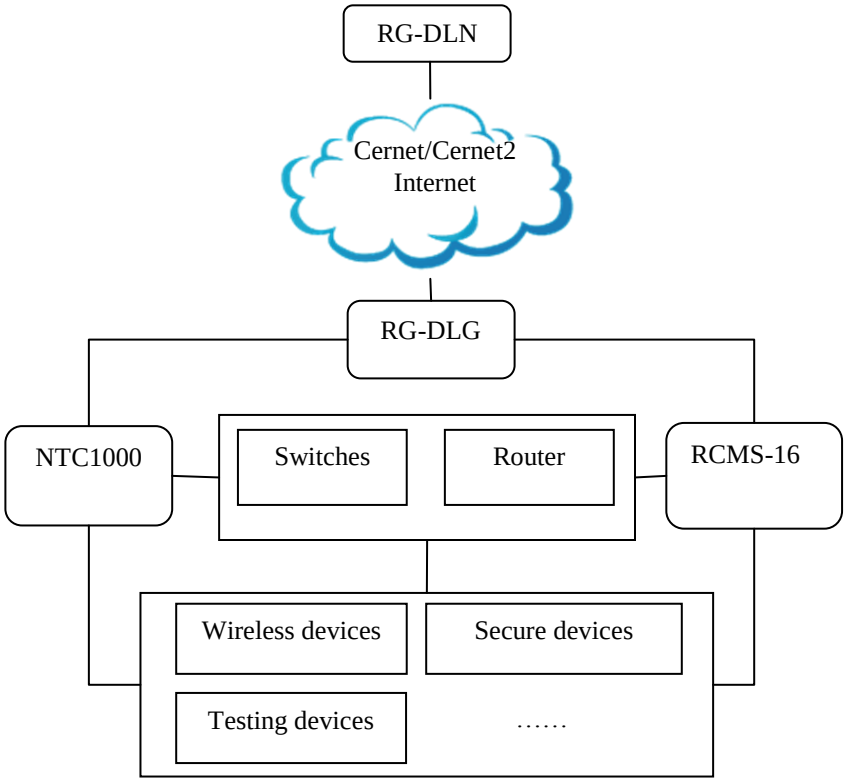

Figure 1. The Structure of Confederation Network

2.2. DRAGON-Lab Cloud Structure

The Cloud computing service of DRAGON-Lab applied the three layer approach, which are IaaS, PaaS and SaaS.See Figure 2 [6].

IaaS is the basic facilitate service providers, which offer network device resources, computing resources and storage resources. Regarding to this research activity, the network resources included the Zigbee devices and WSN devices; the Hadoop Cloud server supply the computing and storage resources.

PaaS is the platform for the confederation network applications. User could develop application module to communicate with the DRAGON-Lab Navigation platform. This research developed an IoT integration module by this approach, which fulfilled the lack in this research field.

SaaS supply software service to users; this research activity using Hadoop Cloud server to support data collection, data storage and data query services for IoT. All of these services are firstly applied to the DRAGON-Lab.

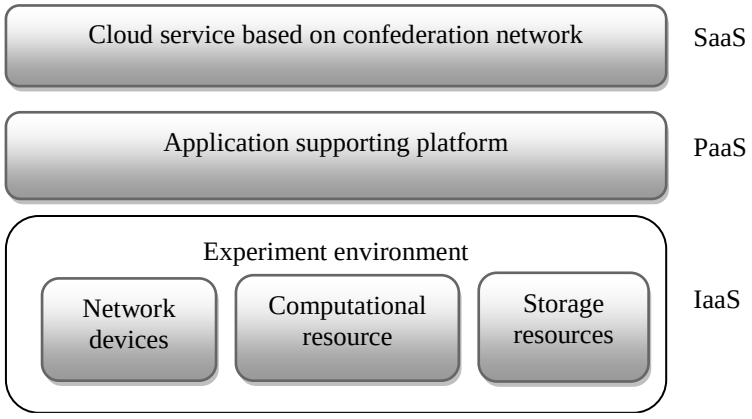

Figure 2. The Three Layers Cloud Structure of Confederation Network

2.3. Brief Introduction of VSaaS

The VSaaS system is a fully manageable, reliable cluster platform with no single points of failure, offered as a VAS product. VSaaS 's VAS architecture platform enables to grow as client base grows (only add servers to the system cluster). VSaaS platform supports compatible plug and play cameras, allowing fast and easy installation even by the most inexperienced users. VSaaS provides zero-configuration process, where cameras become active the moment they are turned-on, never requiring any maintenance on-site. VSaaS platform utilizes two patent-pending key technologies: Distributed media processing core – enables the solution to efficiently distribute the processing tasks over the physical server resources on-demand, in a load-balanced and fault-tolerant fashion. Clustered storage volume –combines the local storage devices of the physical servers into a centrally secured, fault-tolerant storage volume, able to scale on-demand and provide high-speed access to the stored media.

As a pure SaaS solution, there is no need for costly equipment on site. VSaaS platform provides surveillance and monitoring are transformed into on-line ongoing services, affordable for mass-market subscribers. VAS product logic allows for smooth integration with Billing and CRM platforms.

VSaaS video content is located on a secure, scalable and reliable storage cluster platform. This platform stores video content data from unlimited sources, and allows remote access to multiple account profiles, and helps to create a sticky VAS service for operators. VSaaS media processing core efficiently distributes processing tasks over the physical servers in a load-balanced approach. VSaaS is accessible via any Web browser, mobile phone (including Android and iPhone handsets), or tablet PC. It provides real time video motion detection (VMD) and sends alerts via push messages, SMS and email, an added bonus for VAS operators. VSaaS web interface is intuitive and accessible to the users with any level of computer knowledge and experience - from beginning home users to experienced system administrators.

3. VSaaS Model Design

VSaaS as a Service platform, enables seamless and easy to use video security services; On site an Plug & Play (PNP) IP camera with an Internet connection. (No need for server installation or DVR/NVR box on site at the customer's end point) VSaaS Central monitoring information center; Data Center (a server cluster hosted at the service provider or any other secured storage farm). Video is received at the VSaaS data center; analyzed, scanned, recorded, and streamed to viewing interfaces of the system. As a VAS type product the core platform integrates seamlessly with billing and CRM systems as well as with SMSCs and similar platforms. Permitted end-users (using a safe SSL approach - username / password) can approach the VSaaS interface data center from any Web browser (from every occasional computer) or any 3G mobile phone (including Android and iPhone handsets) and view live broadcasting or recorded archived video stored in the system.

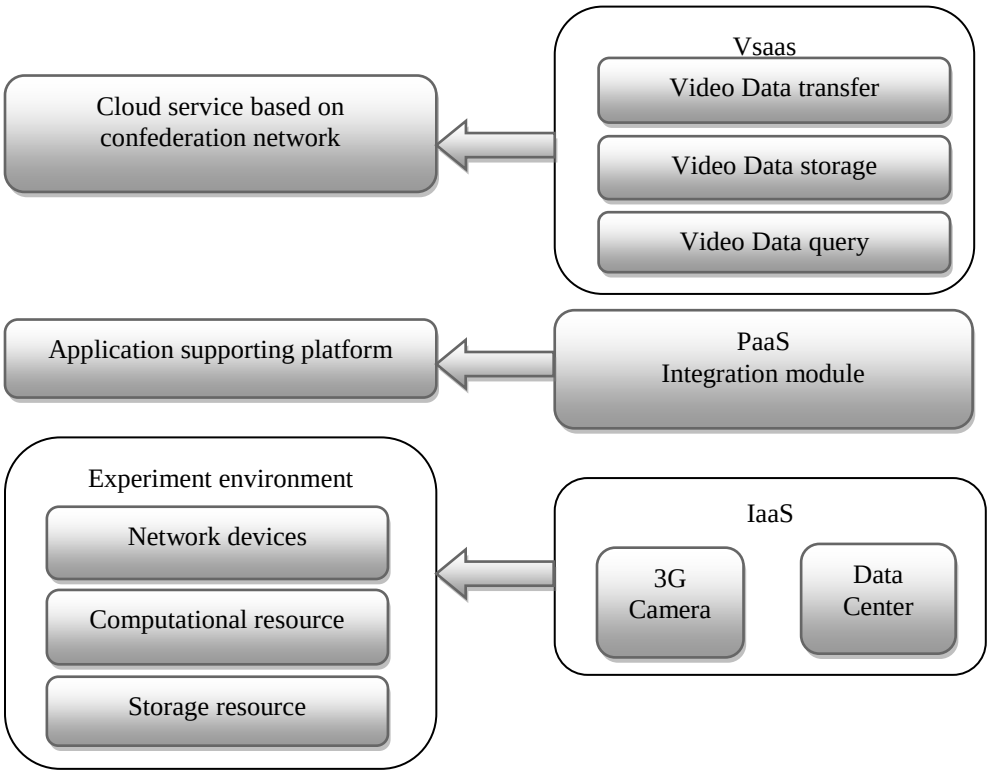

Figure 3. The Integration of VSaaS and Confederation Network

4. VSaaS Model Implementation

4.1.Market Model

For the market model, the resource suppliers charge users depending on the resource services. The supply-demand relationship would play a vital role in the resource pricing

schemes; the price could also balance the supply-demand relationship. The market model for DRAGON-Lab could base on the following factors [5-6]:

Administration fee
Demand and supply relationship
Subscription fee
Resource cost

The resource suppliers publish their prices through the DRAGON-Lab platform. A simple price example may include the following parameters：

supplier_id // this can be same membership ID
peak_time_price // 8am-5pm: office hours on working days
lunch_time_price // (12.30-2pm)
offpeak_time_price // (6pm-9am),
discount_when_lightly_loaded // if load is less than 30% at any time
raise_price_high_demand // % raise price if average load is above 70%
price_holiday_time // during holidays and weekends

Traditionally, computational services are priced based on their production cost and desired profit margin. However, the consumers' perception of value is based on parameters such as supply and demand for resources, priority and service quality requirements. Therefore, the resource value in the DRAGON-Lab needs to be considered in many parameters, such as resource strength, cost of physical resources, service overhead, demand, value perceived by the user preferences. The last three parameters are difficult to determine from user unless they see any benefit in disclosing them and they may vary from time to time, from one application to another [7]. However, there are consumers who prefer regular access to resources during a particular period of the day.

Consumers can be charged for access to various resources including CPU, storage, software and the network. The resource supplier can carry out the following steps for supplying resources:

1. The supplier identifies service consumer;

2. It identifies suitable resources and establishes their prices;

3. It selects resources that meet its utility function and objectives (lower cost and deadline requirements met);

4. It uses DRAGON-Lab navigator to view the job processing;

4.2. Tender/contract Model

Tender/contract model is one of the most widely used models for service negotiation in a distributed problem-solving environment [8]. It is modeled on the contracting mechanism used by businesses to govern the exchange of goods and services. It helps in finding an appropriate service provider to work on a given task [9]. For DRAGON-Lab, it focuses on the interaction between resource supplier and user in their bid to meet their objectives. A user asking for a task to be solved is called the manager and the resource that might be able to solve the task is called the potential contractor. From a manager's perspective, the process is [10]:

1. The user announces its requirements (using a deal template) and invites bids from suppliers;

2. Interested suppliers evaluate the announcement and respond by submitting their bids;

3. The user evaluates and awards the contract to the most appropriate supplier(s);

4. The user and supplier(s) communicate privately and use the resource.

From a supplier perspective, the process is:

1. Receive tender announcements/advertisements;

2. Evaluate the service capability;

3. Respond with a bid;

4. Deliver service if a bid is accepted;

5. Report results and bill the user as per the usage and agreed bid.

The advantage of this model is that if the selected supplier is unable to deliver a satisfactory service, the users can seek the services of other suppliers. This protocol has certain disadvantages. A task might be awarded to a less capable supplier if a more capable supplier is busy at the award time. Another limitation is that the user has no obligation to inform potential supplier that an award has already been made. Sometimes a user may not receive bids for several reasons [11]: (a) all potential supplier s are busy with other tasks; (b) a potential supplier is idle but ranks the proposed tender/task below the other tasks under consideration; (c) no suppliers, even if idle, are capable of offering a service .To handle such cases, a user can request quick response bids to which suppliers respond with messages such as eligible, busy, ineligible or not interested. This helps the user in making changes to its work plan. For example, the user can change the deadline or budget to wait for new suppliers or to attract existing suppliers to submit bids.

The tender model allows directed suppliers to be issued without negotiation. The selected suppliers respond with an acceptance or refusal of an award. This capability can simplify the protocol and improve the efficiency of certain services.

5. Testing and Evaluation

The aim of the research related to enhance the resource exchange of resource supplier and users on the DRAGON-Lab. A comparison test discussed in this section compared the elapsed time on server side between market model and Tender/contract model. Ten testing tasks were designed to test the performance of these two models with different work-load, Task 1 with lightest work-load and Task 7 with the heaviest one. The results of the testing are:

Table 1. Testing Result

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
market model	28.4s	20.2s	25.3s	35.4s	40.9s	59.4s	65.2s
Tender/contract model	19.2s	24.3	29.6s	38.4s	47.2s	60.8	65.8s

The Figure 1 showed the result in a chart, which indicated the trend of the elapsed time.

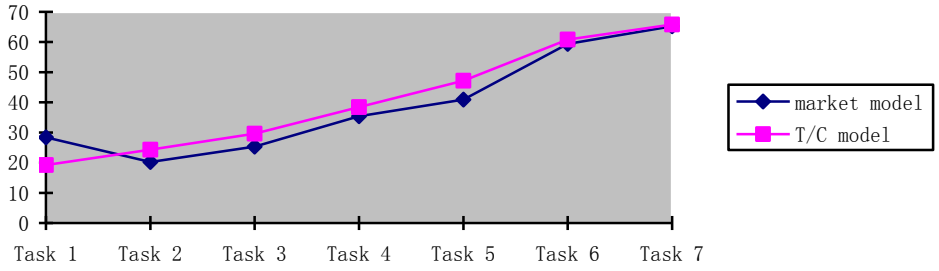

Figure 1. Trend of Testing Result

Based on the result, a short evaluation can be made as follow: (a) For most of the tasks, the market model spend less time then the tender/contract model, expect task 1, which the work-load is very light and the tender/contract model had a better performance. (b) The result has proven that both models are work-load related. The elapsed time of both models increased in a similar trend. (c) The performance differences of two models are reduced with the work-load increase. The results of Task 6 and 7 from both models are much closed.

6. Conclusions

The paper proposed two models, market model and tender/contract model, for the VSaaS working on the DRAGON-Lab. Both of models are proven applicable by testing, and the testing results showed the market model had better performance than the tender/contract model in most of the testing tasks.

These two models gave different approaches for resource supplier and users to finish their demanding. The DRAGON-Lab could implement these models to maintain its daily operation, and support a reasonable resource exchange schemes.

Acknowledgements

This work is funded by “Hebei Yinjin Liuxue Renyuan Zizu Xiangmu ”[2012]349-13. “Research on Integration of VSaaS and Dragon-Lab”.

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