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Cloud-computing Framework for Network Monitoring

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ABSTRACT

Cloud computing is the recent realm of today's networking. In today's world highly skilled network admin is essential to monitor the organizations network throughout the clock. The organization spread across geological areas lack in unified view of monitoring approach. The versatility of the network system, needs compulsory changes in network monitoring. The Cloud Computing Framework which solves the problems of combined view of Network Management Servers executes the task constantly and gives consistent summary of results. And also, it enables remote monitoring which need not want the network admin to be near the system always. The focus was to design a model framework of cloud computing and implement two of the cloud-ware. The 'Cloud Cop' cloud computing framework provides Software as a Service (SaaS) and Platform as a Service (PaaS). A desktop application to monitor the shared network in the back-end is developed. The User Interface is designed using Java Applet.

Key words: Agent based services, service oriented computing, enterprise web agent

INTRODUCTION

Network management is a challenging area where many research works are done to meet the challenges in monitoring the network from the time of its setting up back in 1980s. Ahuja *et al.* (2011) cloud computing originates from parallel computing, distributed computing and utility computing. Cloud computing has lot of excellent feature such as scalability, reliability and autonomy. Google's cloud includes even millions of low cost computers. Zhou *et al.* (2011) proposed unstructured P2P paradigm for service discovery in cloud. QoS parameters were not considered. The ease of colossal task of maintaining heterogeneous large network in distributed environment is made possible in new era of 'cloud computing' (Xu and Xiao, 2007). Gao and Kang (2012) proposed cloud simulation scheduling algorithm based on quality of service in multi dimension. Analytical hierarchy process was introduced into resource scheduling algorithm to compute every dimensional parameters weight and then the tasks were allocated to the appropriate resource according to customer satisfaction. Allocating customer request to appropriate resource and continuous monitoring of the service in cloud is an important issue to be handled. Network monitoring through cloud computing, used to bring unified view of network servers in terms of consistent task execution and intelligent remote monitoring. Monitoring the network is to obtain status throughout the clock. The network parameters to be monitored include congestion, band width, packet loss, failure, service level verification, quality guarantees and soon. Dingguo *et al.* (2011) provided the design for cloud trust assessment and management model and the policy to compute trust information and supplied trust decision. At present with the rapid development of internet information age,

variety factors make SaaS application model be superior to traditional software customization model. Multi-tenant application in SaaS architecture is a core issue (Zhang *et al.*, 2011).

The Simple Network Management Protocol (SNMP) consists of central management and an agent executing on each network nodes. A central node polls to all the nodes in the network and takes care of network administration. The agent node receives command from central node (Poller node) to collect the status details of the nodes in the network. Management Information Base is the warehouse of network information. It contains information about the protocol, the status of software running in the node, information about incoming and outgoing packets, discarded packets and so on used by SNMP (Zapf *et al.*, 1999). When the network becomes large, complex and scalable. Therefore, the scalable monitoring system is of much interest to system admin. Pervasive monitoring of the network has become more essential and imperative, enabling the admin to monitor routing on move without physical presence in a particular location. When the organization is spread geographically, there is in need of more network servers to maintain each network (Nair *et al.*, 2009a).

CLOUD COMPUTING FRAME WORK AND ARCHITECTURE

Mainly, there are three types of services. Information as a service, Platform as a service, Software as a service that client can receive from service providers (Nair *et al.*, 2010). Customers can use the services based on their need.

- **Infrastructure as a service(IaaS):** The cost of the servers, network equipment and storage backup are beard by the service providers. The client has to pay for the usage
- **Platform as a service(PaaS):** The client can develop any application on the platform provided by the service providers. The client need not invest in hardware and software
- **Software as a service(SaaS):** The client need not purchase the software, the service provider will provide the software. Pay for usage of software

The key attributes of SaaS architectures are namely, configurability, multi-tenant efficiency and scalability (Nair *et al.*, 2009b). The cloud computing stack is shown in Fig. 1.

CHALLENGES IN CLOUD COMPUTING

Though the operations of cloud computing is cost-effective. It is used to compensate the varying need of the client without further huge investment for timely demand. The major issues are

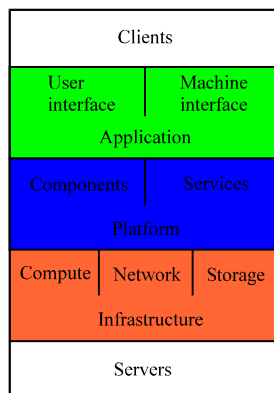


Fig. 1: Cloud computing stack

security and privacy. As it is the emerging technology it has got the scope of becoming a matured reliable and cost effective computing system. The idea behind cloud computing is outsourcing. The essential data resides in third party system. This issue is still not convinced by many business owners. More sensitive information like banking and government data has been a great asset to the society where the leakage of data is not compromised. Strict rules and regulations are to be enforced so that the client (business) will feel secured to use cloud computing.

In spite of some serious confidentiality allied drawbacks, cloud computing is a profitable alternative to progress productivity in any business environment, where IT is in high need. To increase the protection and confidentiality issues of cloud service providers, there must be more co-ordination amid world governments so that we can incorporate universal rules and guidance for running a safe cloud computing service.

IMPLEMENTATION RESULTS

The objective is to constantly monitor the multiple clients, accepting and acknowledging the information, data from the multiple clients and updating the existing database with those data at a considerable rate with a specified time stamp. The client side administrator shown in Fig. 2 gets connected to the service provider using the IP address. The Server detects the list of clients connected to it and retrieves its IP address. Then, it retrieves information from the client using PaaS and SaaS as shown in Fig. 3. The Automated Server monitors the resources utilized by the client using Software as a Service and stores the usage of resource from server with timestamp in database. The Network Administrator can see the database log (Fig. 4) to find the usage of resource by the client and then takes necessary steps if any of the client undergone illegal activities.



Fig. 2: Client side administrator

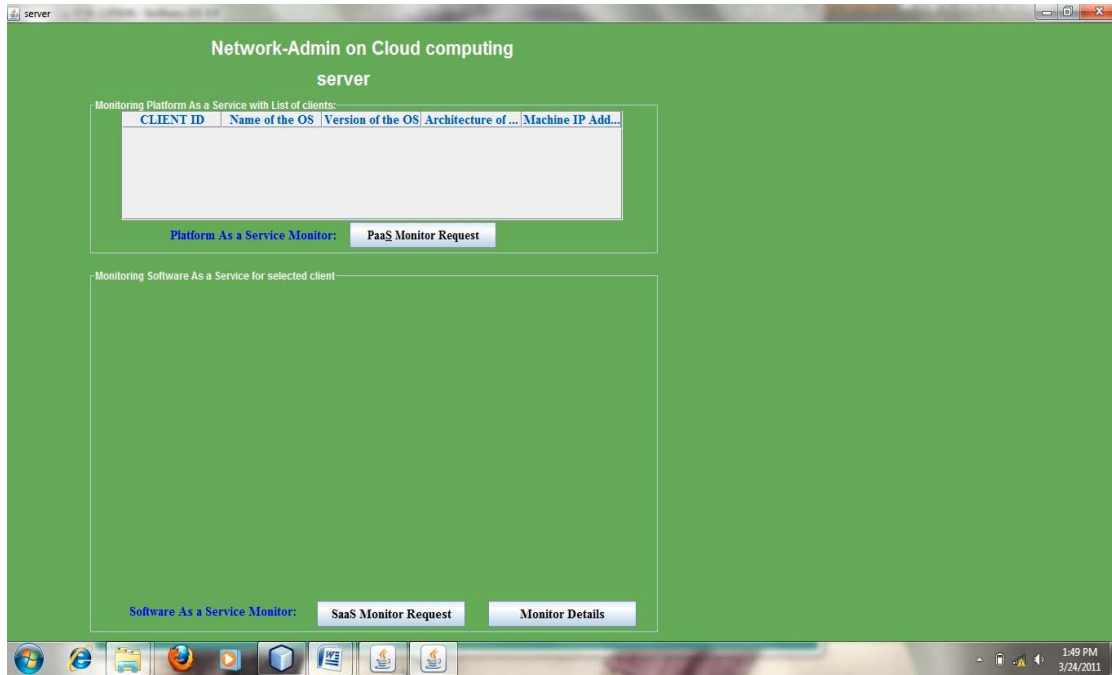


Fig. 3: Network admin on cloud computing

Web service: In Cloud Computing structure, the Service Oriented Enterprise is implemented on open realm. This instill ‘SaaS’ mainly with three Services the first is Registration and Licensing Web Service the second is Task Scheduling Web Service and the third is Reporting the result Web Service. The Agent interlinks the network management Application along with the Service oriented enterprise services. It is placed in network monitoring application on the manager node of the network.

Network monitoring: To perform Network monitoring in Cloud Computing there are important aspects, namely “Software as a Service (SaaS)” and “Platform as a Service (PaaS)” in the field of Network Monitoring and management. In SaaS, software is deployed behind the firewall over internet on a local area network. The Network management and monitoring tool is deployed on a central node to manage the large network.

Mobile agents: The Network management and Monitoring System and SNMP agents are deployed on the nodes in the network. The network monitoring and management system commands the SNMP agents to receive network information.

Centralized network monitoring servers: Multiple NM servers are needed to manage a group of devices in a LAN. Cloud computing often provides web accessed general online business applications services, while the data and application software are stored on the servers. “Infrastructure as a Service (IaaS)” provides the network infrastructure as a service. In case of timely demand the purchase of hardware and other investment on IT infrastructure is avoided and completely outsourced. Customers can now pay for those outsourced resources. The application

Machine IP Address	Name of the OS	Version of the OS	Monitored Task	DateTime
192.168.209.191	Windows 7	6.1	null	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	conhost.exe 554...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	tasklist.exe 764...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	SearchFilterHost.exe ...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	WmiPrvSE.exe 5...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	conhost.exe 972...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	java.exe 4052...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	SearchProtocolHost.exe ...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	audodg.exe 316...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	conhost.exe 384...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	java.exe 2640...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	svchost.exe 274...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	httpd.exe 6080...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	mysqld.exe 664...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	httpd.exe 3692...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	wampmanager.exe ...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	netbeans.exe 330...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	wmpnetwk.exe 5...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	svchost.exe 538...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	UNS.exe 5308...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	sprtsvc.exe 5232...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	svchost.exe 520...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	WENWORD.EXE ...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	SearchIndexer.exe 1...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	IEMonitor.exe 40...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	CCC.exe 390...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	BTStackServer.exe ...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	SynIPHelper.exe 3...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	BTTray.exe 354...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	IDMan.exe 350...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	jusched.exe 348...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	argnt.exe 3436...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	MOM.exe 34...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	WebcamDell2.exe ...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	GrooveMonitor.exe ...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	wwwb32.exe 334...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	WmiPrvSE.exe 3...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	FF Protection.exe 3...	24-3-2011 1:51:49 PM
192.168.209.191	Windows 7	6.1	WLTRAY.FXF ...	24-3-2011 1:51:49 PM

Fig. 4: Monitoring log

needed by the client is hosted on the service provider’s web server. The client can also download the application to their own device. The client can use the application on pay for service mode. The User Interface is designed using Java Applet. To get the input and to display the output front end will be required. In this module Java.awt is used. Swing package will be used to create the front end.

The client is connected to the server to access the resource available on the server using its IP Address. With the help of IP Address the server perform on PaaS and SaaS on the client to monitor the resource accessed by the client. Thus, the monitoring function updates the data to the database from which the Network Administrator gathers the Information about the client.

MySQL is used for establishing database connectivity. Database Connections are being created as and when required, instead they are retrieved from it. This way the data transfer is faster in execution.

Software Interface Using Java Applet is used to create front end design that is linked to web server and Application server. Communications Interface is Wireless Local Area Network (WLAN).

CONCLUSION AND FUTURE WORK

The objective of this study is to deploy a model framework of cloud-computing to monitor multiple clients. Accepting and acknowledging the information, data from the multiple clients and updating the existing database with those data at a considerable rate with a specified time stamp. In our cloud-computing structure, the service provided are “Software as a Service (SaaS)” and “Platform as a Service (PaaS)”. In this study implementation of network functions are able to do reporting to the Network Administrator. In future, the centralized NM Server can be used to control the services for client based on the report from database through which there is no need of human resource to monitor the cloud environment. By this idea, the Network Monitoring becomes the automated one without human resource.

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