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Network Traffic Control method on Campus Computing Grid

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Abstract: - On monitoring and managing the platform of campus computing grid, having taken great study on great traffic transfers and the monitor of network performance. In order to provide a credible (or reliable) and efficiency communication environment for grid platform, this paper puts forward a mechanism which uses simple network management protocol, port rank and alternant feedback method.

Key-Words: - grid computing; traffic control; SNMP; MIB; alternating feedback

1 Introduction

Nowadays, in the network environment, there are different kinds of users and various appliances that are unstable. Due to the complexity of user groups and variability of business model, the network traffic that demanded by different users at different times will be different, too. If there is not any method to administer and monitor the traffic, the network congestion will occur. The running environment of grid is similar to the running environment of network, in order to ensure the node of grid to obtain abundant bandwidth. The dept. of network need monitor and manage the traffic between the appointed nodes of grid and the topology used by grid, it is important to ensure the stability and reliability of network.

There are many methods to control the network traffic. This paper brings forward a method which uses simple network management protocol, port rank and alternant feedback method. In the platform of network, it allots different rank to the different port in each switch and router according to the different need of user and appliance. It monitors the traffic ever and again during the running of network, that compares to the traffic that calculated by the port rank method of each port in each switch or router. It calculates some port that traffic exceed the top traffic that is calculate by the port rank method and report the ports to manger, the manger can adjust the traffic by the report forms in order to ensure a credibility, efficiency, stability link for the pivotal traffic.

Managing the traffic is importance to the platform of grid. When computing a task in the platform of grid, there are great traffics between the grid ports. In distributed computing environment, the corresponding performance between the computing nodes affects the efficiency of distributed computing, therefore it is necessary to discover the topology used by grid in network topology, and monitor the performance of each equipment used on grid topology, and report the port which uses great traffics. The manager decides some ports to be restricted by the report. It can provide great

credibility, efficiency, stability for the running of the grid task.

2 Systemic Design Ideas

2.1 The frame of grid monitor

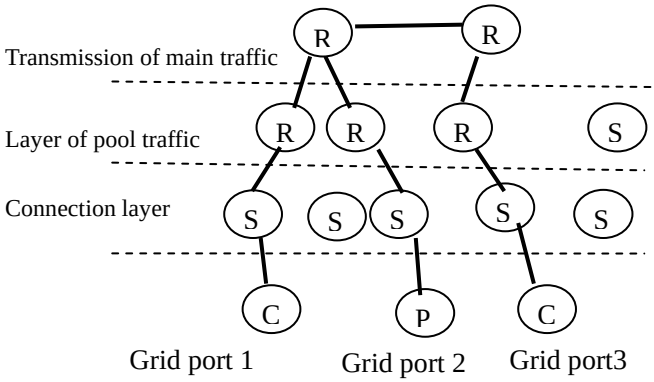
Nowadays, the network is often designed as three-layer frameworks: The connection layer, the layer of pool traffic, the layer of main traffic transmission.

The connection layer mainly transmits the traffic of the link layer. The number and action of users who connect to connection layer can bring great impact on the performance of the switch. The bandwidths of users who connect to switch often use 100M, and meanwhile there are many broadcast packets occur in the link layer. If many users connected to the network, network congestion and the storm of broadcast would occur, which make great impact on the performance of switch; it can make the switch paralysis if the network congestion occurs seriously.

On the layer of pool traffic, it can divides up to the pool of building or backbone by the traffic. Generally, the connection switch uses 1000M bandwidth to connect to the pool layer switch, and the switch in the pool layer can transmit the traffic of the link layer and the network layer. The pool traffic takes great impact on the performance of the pool switch, when a great many traffics occur at the same time. If there is not any good method to monitor and control, the traffic of key appliance will be easily delay, even congestion, and paralysis will occur.

In the layer of transmission of main traffic, the transmission of the third layers traffics are mainly accomplished. It uses 10000M to connect in order to resist congestion. Furthermore, if the traffics have been controlled in the connection layer and the layer of pool traffic, there will not be any congestion. In this layer, almost all the main traffic's problem occurs at the exit. Nevertheless, the traffic's problem in network is mainly concentrate on the connection and pool layers.

The congestion and delay also occur in the connection layer and the layer of pool traffic on the platform of grid. In order to monitor the traffic on the platform of grid, the frame of grid platform can be designed as illustrated:



R：Router；S：Switcher ；

C：Cluster；

P：high computing device。

2.2 The port rank

The traffics in the network is frequent unstable. In order to ensure the grid appliance to use adequate bandwidth, there must be having a strategy to control if a great many traffics occur in the same time. The port rank is a feasible method which allots different level to different port in one switch or different switch, the level can calculate the bandwidth which used by port,

There are many types of users and appliances which need different bandwidth, so they can be allotted to different level, the level can be dynamically allotted according to the user and appliance. it take a important role in deciding the bandwidth of different uses and appliances.

2.3 Alternant feedback method

The method is that when the traffic is small, it does not need feedback and control. If it shows that a switch which traffic is excessive, then it needs to measure the traffic of each port, and find out the port which traffic exceeds. The traffic computed by port rank and reports the detail information of the port, so that the manager can adjust the traffic by the report. This method can ensure the appliance of grid to use adequate and dependable bandwidth.

The flow of the method:

1) Request the traffic of each port in a switch.
2) Calculate the total traffic of a switch to decide whether it needs management or not.
3) If management is necessary, then compare the

traffic at each port to the theoretical traffic computed by port rank at each port.

4) Report the detail information of the port which traffic exceeds the traffic computed by port rank.

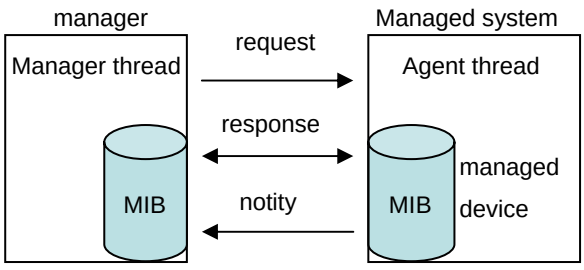
3 The Main technique in Systemic Design

3.1 SNMP: Simple Network Management Protocol

During the development of network technique and the scale of network structure, a key task must be resolved, how to manage the complicated network and improve the management, the rate of utility, security and performance of network. There are many kinds of technology in order to control network, the SNMP is extensively adopted due to its expansibility and simplicity, and it has become the prevalent technique to control the network.

The system of SNMP technology mainly consists of manager, managed system, MIB, SNMP. The managing threads run on the manager, and it provides the interface between the manager and managed system. The managed system consists of service agent thread and managed device. The managed device can be PC, switch, router and so on.MIB is an organic library that consists of some accessible objects which have the Id, description, attribute, accessible type and so on. The agent thread answers for receiving the request package consists of the object which wanted to access from the manager and responded the result to the manager, so it can monitor and manage the devices by accessing the object.

The relationship shows by the grape:



3.2 The method to discover the topology of the grid platform

Many methods can be used to discover the topology; each method has its own technique, feature, merit and complexity of implement. This paper adopts a method which uses SNMP and ICMP. This method discovers the default router by the ICMP protocol that is sends by manager thread used the pocket of discovering the router. When knowing the IP address of default router, the manager thread sends request to the default router by the package of SNMP and accesses the object in MIB, the below object can be used in discovery the topology:

1) ipRouteDest: it points out address of destination network

2) ipRoutemask: it is the net mask of the destination network.

3) ipRouteIfIndex: it is the interface index link to the destination network.

4) ipRouteType: it denotes the type of destination network--direct link or indirect link

5) ipRouteNextHop: it points out the address of next hop to the destination network.

Through those object value and search methods by level, the method can discover the topology.

3.3 Obtain the information of port

The network device can be decided to link layer and route layer device.

3.3.1 The link layer device

Link layer device is used to transmit the traffic of link layer. The traffic consists of actual traffic and broadcast traffic which used in many services. The below objects are used in order to obtain the traffic information of switch and port.

1) ifIndex, ifDescr 2) ifType
3) ifSpeed 4) ifInOctets,ifOutOctets
5) ifInUcastPkts 6) ifInNUcastPkts
7) ifOutUcastPkts 8) ifOutNUcastPkts

The object in the MIB is accessible. And the information can be available by accessing the value of those objects.

3.3.2 The route layer device

The route layer device is used to route between the different network, it transmits the link layer traffic and

the route layer traffic. The below objects are used in order to obtain the traffic information of router and port.

1) ipAdEntAddr 2) ipAdEntNetMask
3) ipInReceive 4) ipForwDatagrams
5) ipOutRequests 6) ipInDiscards

The object in the MIB is accessible. And the information can be available by accessing the value of those objects.

3.4 Calculate bandwidth of each port

There are different connected ports on a switch. Each connected port shares different bandwidth, so all connected ports should be allotted different port ranks. The level can be dynamically allocated according to the need, and it takes a great impact on the bandwidth used by this port.

The switches contain different ports---the connected port and the uplink port.

On the connected switch, the below variable used by this method will be imported.

1) S_UserCount: the number of user on one port.

2) S_PortDegree: the port rank

3) S_Switch: the max traffic transmitted by switch.

4) S_PM: the port on switch can use the max bandwidth.

The bandwidth can be calculated with the formula:

S_PM=S_UserCount*S_PortDegree*(S_Switch/ $\sum S\_UserCount * S\_PortDegree$)

On the pool switch, the calculation of port bandwidth is complicated, it is necessary to gather all the traffic from switch that uplink to it.

On the pool switch, the below variable used by this method will be imported.

1) S_UserCount: the number of user on one port.

2) S_PortDegree: the port rank

3) S_PortUp: the speed of uplink port.

4) S_PM: the port on switch can use the max bandwidth.

5) R_PortDegree: the port rank

5) R_PM: the port on router can used the max bandwidth

The bandwidth can be calculated with the formula:

S_PM=S_UserCount*S_PortDegree*(S_Switch/ $\sum S\_UserCount * S\_PortDegree$)

R_PM=R_PortDegree* $\sum S\_PM$

4 Conclusions

This paper designs a method to monitor and manage the platform of grid by SNMP, and describes the main technology in the system, and also provides a feasible project for the management of platform of grid. However, the access attribute of MIB is fixed; it can not achieve to automatically control traffic of ports. This technology still need deeply continuously research.

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