Research on Test and Control Method for Network Performance Based on NQA

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Abstract*:* By using eNSP network simulation technology and Virtual BOX virtual machine technology, it can design network topology according to the actual need of performance test of network in engineering network, combined with NTP network time protocol and Huawei NQA technology, as well as the fiducially time of all devices in synchronous virtual network, adding different types of network traffic, simulating the real operation of network, so as to construct a virtual network performance test environment. Moreover, it can stimulate network congestion by means of limiting network traffic, which also can realize the detection and control over the network performance through the deployment of QoS strategy. The experimental result can verify that the method is correct and feasible, which can effectively solve the technical training of network performance test in practical network engineering as well as network engineering experiment and teaching..

Keywords NQA; eNSP; Network performance; QoS; NTP

INTRODUCTION

Network performance test is not only a core content in network management and maintenance, but also is one of the teaching contents of college network design. It can not only improve the scientific nature of network design, but also is the key to ensure the normal service of the network technology. There two methods that are most commonly used for network performance testing, namely, active test and passive test [1]. However, in the face of the actual operation of the network, it is not easy to carry out the network performance test and technical training. The first problem is that the actual network of operation can not carry on the test of QoS capability[2]. Because the artificial loading network traffic will affect the operation of the running network when it is tested; the second problem is that the designed QoS control strategy of network is difficult to deploy and test in the running network, so as to verify the correctness of the configuration and the effectiveness of operation; the third problem is that the advanced QoS theory and complex QoS configuration command[3], which can make it difficult for the network management staff to have quick grasp. For the network teaching in colleges and universities, the above two methods are lack of ease of use due to environmental constraints. Therefore, it is necessary to study a kind of network performance test method, which should be simple, economical, flexible and easy to use.

Based on eNSP network simulator[4], VirtualBOX virtual machine[5] and the integrated application research of Huawei Company's NQA technology, it puts forward a kind of network performance test method based on virtual network environment, the main contents can be including four aspects, one is to build a virtual network topology based on the need of actual test, the second is the reference time of synchronization network equipment, and the third is configuration NQA specific test types, test group parameters, pour different types of data to the network under test, the performance parameters of the normal operation of the network test, according to the network QoS control need to configure the deployment of QoS control strategy and retest network performance, so as to make a comparative analysis. The advantage of this method is that it can not be restricted by the actual network environment and equipment, which is not only convenient, economical, flexible, easy to use, but also can be tried and trained again and again.

THE CONSTRUCTION OF VIRTUAL NETWORK TESTING ENVIRONMENT

Figure1 is the constructed virtual that is tested, one part is the virtual network topology that is similar to the actual network topology, which consists of three sets of routers, public cloud, namely, cloud1, a server and two customer machines, three routers can simulate the accessed routers of headquarter in the real network respectively, including (AR3260, one set) the intranet router of headquarter (AR2220, one set) and branch router of the enterprise (AR2220, one set); virtual server can adopt the embedded virtual server of eNSP simulator server, besides the basic networking functions, it can provide web service, Ftp service and DNS service, which can simulate the response function of the network service. Another part is the physical network that is used for QoS test

and verification (such as campus network),moreover, it can use PC-CLIENT4 to simulate the real networking host computer , then the real host computer can have access to Cloud by ICS sharing network, which can realize the connection between eNSP virtual network and real physical network. In

this way, the two parts can achieve two-way communication and interconnection, so as to form a basic test environment for learning, training, verification based on the method of network performance test with NQA technology.
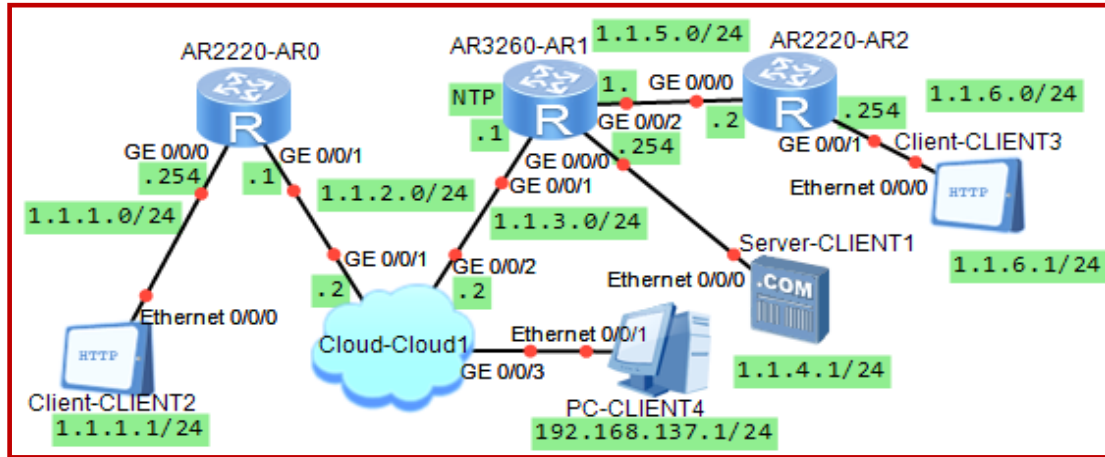

Fig.1 The Basic Environment for Network Performance Test

NTP PROTOCOL AND SETTING

NTP (Network Time Protocol) is time synchronization protocol defined by RFC 1305, which is used to synchronize the real-time network for all devices[6]. It can adopt C/S mode, the device that provides reference time is called NTP time server, while the device that provides synchronization time is called NTP time client terminal. In order to provide convenience and varying degrees of precision of time synchronization, NTP can define time from 0 to 15, totally 16 levels, which can offer different levels of coding, the lower the level of the code is, the more accurate the time is. The allocation of time can be arranged from the lowest level to the highest level sequentially, therefore, the first zero level is the source of reference time for the synchronization network of the device, after that devices of different levels may play different roles in the course of time synchronization, for example, the device of the second level is the client computer for the device of the first level, however, it is the server for the device of the third level. The NTP server of different levels can provide time source with different degrees of accurateness, it can correct the real-time clock calibration through network synchronization for NTP client computer. In order to prevent the vandalism for NTP client computer, NTP can adopt authentication mechanism so as to identify and check whether the information is true from the claimed server as well as the return route of the testing data, which can provide the security for network time alignment. In this study, choosing routerAR1 as NTP Server form Fig.1, setting system time and time zone in the system view, then configuring the IP address of NTP Server. To provide the safety of time alignment, it also needs to

set and start NTP authentication mechanism at the terminal of NTP Server. NTP Client can only need to specify NTP Server chosen by the time alignment as well as NTP authentication information.

NQA TEST MECHANISM AND SETTING OF TEST TYPE

NQA Test Mechanism

NQA（Network Quality Analyzer) is a real-time network performance measurement and statistical technique provided by Huawei, which adopts client / server mode, the devices initiated request for testing can act as client terminal of NQA-agent, while the tested opposite end device can be called as the server of NQA-Server, NQA-agent and NQA-Server can send different types of test messages, use different testing and processing mechanism, so as to test different network performance and quality as well as service parameters correspondingly, such as response time, jitter, packet loss rate and so on[7]. At present, NQA can support ICMP-echo, HTTP, UDP-jitter and so on totally eleven kinds of test types. Taking UDP-jitter test as an example, first of all, NQA server has configured UDP monitor function, which is in the state of monitoring; NQA agent can send UDP-jitter message to NQA server at a certain time interval, after NQA server received message it gave a response, which also can carry about received time and departure time in the message, after NQA agent received the data sent by NQA server, it can calculate out delay jitter through calculating the difference between the received data pack time interval of the target terminal and the data sent time interval of the source terminal. Through statistical analysis, it can calculate out the minimum and maximum average

jitter parameters respectively, therefore, it can clearly reflect the condition of network delay jitter. On the other hand, during the process of the communication between NQA agent and NQA serve, it can get its transmit number and receive number, as well as the

Based on Fig.1 network topology, it mainly configures the following test type including ICMP-echo、DNS、FTP、HTTP、UDP-jitter、Voice、UDP-echo and so on, so that it can add different types of network traffic to the tested network and detect different performance parameters. Taking the test type of UDP-jitter as an example, router AR0 and

maximum message ID and message number received by NQA server. In this way, it can calculate out the number of bidirectional packet loss.

Setting of NQA Testing Type

AR2 can be acted as NQA agent and NQA server respectively, first of all, it should configure AR2, which should be acted as IP address and UDP port number of NQA server, then it can configure AR0, which can be acted as the other test parameters of NQA agent. The specific configurations are as follows:

```
[AR2] nqa-server udpecho 1.1.5.2 9000          // Setting IP and UDP port number of NQA server
[AR0]nqa test-instance zqu user1               // Setting the manager and users of the practical testing cases
[AR0-nqa-zqu-user1]test-type jitter            // Setting the testing type
[AR0-nqa-zqu-user1]destination-address ipv4 1.1.5.2    // Address of target
[AR0-nqa-zqu-user1]destionation-port 9000      // Port number of target
[AR0-nqa-zqu-user1]start now                   // Starting test
```

Testing result of NQA and history information of test stored in the testing group, which can be seen through the command line.

TRAFFIC SIMULATION AND CONFIGURATION OF QOS STRATEGY

Method of Traffic Simulation

In order to test the network performance parameters of the network under different load conditions, it is necessary to simulate the change of traffic load in the network. This study should be conducted in the virtual network environment of Huawei eNSP, it can configure different testing types of NQA through router AR0, so as to add different protocol traffic with different frequency and different size data report forms; on the client terminal, it can artificially have access to the server, so as to generate generated another part of network traffic randomly. On such basis, it can adopt CAR speed limit method based on Huawei equipment [8], it can simulate and construct the phenomenon of heavy load operation of network through the limited traffic of the trunk link.

Configuration of QoS Strategy

Controllable network performance can be achieved

under the control of the corresponding QoS strategy[9]. Therefore, in order to meet the requirement of the network performance, first of all, it must develop and deploy suitable QoS control strategy according to the requirement of running the network. In this paper, it studied and simulated the strategy of using PQ queue to ensure the important business Http, besides, it can configure and operate under the simulated network environment, so as to verify the effectiveness of establishing QoS strategy, as well as the correctness of configuration operation. Specific approach is to put the traffic of Http on the PQ's "top" priority queue, put the traffic of ftp on the PQ's "middle" priority queue, put the traffic of dns on the PQ's "normal" priority queue, put the other traffic on the PQ's "bottom" priority queue. Then it can configure the same strategy on router AR0 and route AR1 respectively, which also can be applied to the exit direction of the link between the two routers.

Under the circumstance of configuring PQ queue, combined with the simulation of the network traffic load changes, collecting network performance parameter of Http service (see Table 1), the result shows that, PQ queue can play a role of having priority to ensure Http service, its performance can not be greatly affected by the increase of network load.

Table 1 The Comparison of parameter Http Performance after Configuring QoS Strategy at Different Time of Network Load

Testing parameter	Time of having light load (MS) (sum/min/max)	Time of having heavy load (MS) (sum/min/max)
Sendprobe	3	3
DNS RTT	0/0/0	0/0/0
TCP Connecte RTT	50/20/30	80/20/30
Transaction RTT	190/90/100	220/20/110
RTT	240/110/130	300/40/140

CONCLUSION

In this paper, it proposed a detecting method under the virtual network environment based on network

performance of NQA, through Huawei eNSP network simulator to build, which can satisfy the realistic network engineering of measured network topology and configure QoS strategy as well as the testing type of network performance, it also can train the QoS

configuration and performance testing technology based on Huawei network technology and equipment in the real network, which can greatly reduce the cost of network management and network of professional talent cultivation, so as to provide training at anytime and anywhere. What needs to be explained is that the network performance testing result based on NQA in the virtual network environment will be different according to the performance of host computer, but the method and the conclusion should be consistent.

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