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Increase in Quality of Service by Implementing Hybrid Technique for Communication among the Nodes

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ABSTRACT

Present research paper is focusing on performance evaluation of computer networks through Network scalability using Network simulator over Simulation environment. The performance of the Network is evaluated on the basis of Throughput.[6] To investigate the issue we have use NS2 network simulation framework and Nclient application module from hybrid framework. Present research paper studies the network scalability effects. Network performance has been the subject of much research over the past decades. However, the impact of performance on a network's users is much less understood from a scientific standpoint. This gap in our knowledge is particularly stark since the primary role of real-world network performance is to increase user satisfaction, and encourage user behaviors that lead to greater monetization. As an example, consider the video delivery ecosystem consisting of content delivery networks (CDNs), video content providers, and their users. Content providers use CDNs to deliver videos to their users with higher performance. In turn, content providers expect the higher quality stream delivery to translate into lesser viewer abandonment, greater viewer engagement, and more repeat viewers, all of which lead to greater profits. Thus, whether and to what extent video performance causally impacts viewer behavior is at the core of the online video ecosystem.

Keywords : Content Delivery Networks, Nclient Application Module, VPN, ISP

I. INTRODUCTION

VARIOUS WAYS IDENTIFIED TO INCREASE THE PERFORMANCE OF COMMUNICATION WITHIN THE NETWORK

FOLLOWING ARE THE WAYS:
UNDERSTAND YOUR NETWORK

Without having an understanding of what's actually happening on your network, you are likely to fail at any attempt to address performance issues. Peter Prichard, marketing director Asia-Pacific at Compuware, says people tend to blame the network for poor performance, but the PCs and servers can also be the cause.[1].

"The first thing to do is make sure the network really is the problem," Prichard says. "Even if it's not the network, IT spends a lot of time proving it's not." Tools such as Compuware's Vantage suite can isolate problems such as a slow client, excessive latency on a WAN link, [2] or poorly written SQL on a back end

server. An application might be developed on a LAN and then deployed over a WAN with disappointing results due to an excessive number of database calls. This sort of analysis may reveal things you didn't know about your network, such as a 1.5Mbps WAN link when you're paying for 2Mbps, says Peter Owen, territory manager at Packeteer. [5]
Collecting the right information also lets you take an active stance, identifying and dealing with problems before they impact on users.

Many people will blindly add bandwidth in an attempt to solve a perceived problem -- this tends to be one of the biggest mistakes people make, Prichard says. "You've got to have facts -- application-based facts," he says.

David Gibb, technical consultant with Vanco Australasia agrees. He says that what may dramatically improve performance in one environment could hinder performance in another.

Scott Atkinson, managed LAN services practice leader at Netforce, points out, there are a variety of free, cheap, and expensive tools that singly or in combination can show what's happening and why. MRTG (Multi Router Traffic Grapher), a free utility from http://people.ee.ethz.ch/~oetiker/webtools/mrtg/, is one that can help you gain an understanding of your network.

A network analyser itself will only show the aggregate traffic, and won't deliver the information you need. Prichard says to "start with the premise that the application is king", rather than checking individual aspects of the infrastructure.

Lorenzo Modesto, general manager at Bulletproof Networks, says this monitoring should be accompanied by alerting. Once the monitor is tuned to avoid false positives, an appropriate person should be automatically alerted when an unusual event occurs. "SMS is absolutely perfect for that," he says.

When it comes to things such as radio frequency, monitoring is important for good wireless LAN performance, says Mark Hayes, manager of consulting and solutions at CSC. "The RF environment is not static," he says. According to Hayes, a WLAN coming online on a close neighbour's premises can affect the performance of your network. [6]

QUALITY OF SERVICE AND PACKET SHAPING

One way of improving perceived performance is to ensure that the most important applications get priority. Typically, applications are allocated to classes of service (typically platinum, gold, silver, and bronze), and then policies are set for each class. For example, platinum traffic might be guaranteed at least 50 percent of the available bandwidth.

Three or four categories are typical, says Danny Price, solutions manager at Vanco Australasia, but some organisations use as many as six. A larger number is too hard to manage, he says.

Some category decisions are easy, such as blocking or severely limiting peer-to-peer file sharing, says Owen. Packeteer's software supports auto-discovery and auto-configuration, after which priorities can be fine-tuned to suit the needs of the organisation. [3]

The traffic shaping capabilities of routers are "generally all that you need to get you started," says Atkinson. "A lot of places don't take the basic steps." If further improvements are needed, the Packeteer Packet Shaper is a good product, he says.

Hayes warns that people don't always understand the impact of packet shaping, which can be negative if not done correctly. "We understand the applications and how to configure the [Packeteer] devices to provide the appropriate performance for the applications [along with detailed reports that the network administrator needs]," Hayes says.[2]

Path optimization can be used in conjunction with service classes, says Steve Wastie, director of strategic alliances at Peribit. For example, two sites might be connected by frame relay plus a higher bandwidth VPN link via an ISP. ERP traffic might always be sent by frame relay, while internal e-mail goes across the VPN as long as the latency does not exceed 200ms. This makes good use of the infrastructure, and "is a critical enabler for us", Wastie says.

Modesto points out that you may need to shop around among providers (or get an expert to point you in the right direction) to get a WAN link with the characteristics needed for your application to work at peak performance. Price says that where multiple carriers are involved (say one in Australia, another handling international traffic and the third within the US or Europe) it's important to ensure that the different classes of service are correctly aligned for optimum performance. In particular, real-time traffic must be kept in the top class all the way through the infrastructure.

COMPRESSION

"You're always going to have a bandwidth limitation," says Wastie. Changes such as the perceived need for disaster recovery, ever-growing PowerPoint decks and the tension between increasingly distributed staff and increasingly centralized infrastructure soak up previously spare bandwidth, while locations in rural areas and hard-to-service facilities such as oil rigs will always have limited bandwidth.

Where this is the problem, compression could be the answer. Modern compression algorithms, including those used by Peribit and Packeteer, are able to recognize patterns in very large data streams perhaps weeks apart. This gives better results than traditional algorithms that use a limited window, perhaps as small as 1Mbit of data.

Compression is actually a combination of compression and caching, says Owen. He says Packeteer uses four different algorithms to suit the requirements of different applications. For example, file transfers can benefit from relatively slow but thorough compression, while packets for a transactional application should be handled as fast as possible.

"Having TCP rate control and the level of compression [handled by one appliance] by far provides the best value in terms of optimizing the network," says Owen. The functions can work against each other if they are separated, and the most aggressive application will still win. Correctly implemented, compression can increase the throughput as much as fourfold, he says.

PROTOCOL ACCELERATION

Satellite links involve an additional round-trip latency of approximately one second, and this limits the speed of TCP/IP communication. Wastie cites a real-life example of a 1Mbit/sec line with a latency of 1.1 seconds that achieves a maximum throughput of 100Kbit/sec. TCP acceleration removes that bottleneck and allows the line to run at its nominal speed.

Adjusting packet sizes can also help, says Gibb. As mentioned above, large file transfer packets can block small packets from interactive applications. The problem is that even if the small packets are prioritised, they may be delayed for the time it takes to send a large packet. The answer is to split the large packet into smaller pieces. This can be achieved by configuring the client, server or router.

Increasing the window size so the sender doesn't wait for an acknowledgement of one packet before sending the next can reduce the effects of high latency, and incorporating error-correction information can reduce or eliminate the need for retransmission when an error does occur, explains Gibb.

USER INVOLVEMENT AND EDUCATION

Poor performance can occur as a result of bad user behavior, but it may be more effective to get your colleagues onside through participation and education rather than imposing harsh standards and technical lockdowns. Prichard relates a situation where a mining company in WA experienced network slowdowns at lunchtime. The cause was traced to Doom sessions between staff at the minehead and down the shaft. Once the problem was explained, play ceased. "It's education, not Big Brother. People don't understand [the effect they can have on the network]," he says.

Similarly, encouraging people to save PowerPoint files on a shared drive instead of e-mailing copies to everyone concerned can help. Hayes notes that user education may be required to discourage people from doing things like unnecessarily replicating e-mail databases from a server to their PCs.

Modesto says malware often gets inside the firewall on notebook computers, so their security is a priority and user education about safe practices is an important element of avoiding problems, in addition to locking down configurations as far as possible without excessively impinging on user activities.

HR issues can affect performance in other ways: if incentive payments to IT staff are based on technical criteria such as the uptime of WAN links, they may concentrate on these rather than business outcomes, suggests Prichard.

OUT OF BAND MANAGEMNET

How often does cycling the power fix a transient problem with a server or other device? If you don't trust branch office staff with the key to the broom cupboard -- sorry, the server room -- for fear they will flip the wrong switch it can take hours to get a technician on site. Another problem is that if a device becomes misconfigured and drops off the network, you can't use the normal remote management facilities to reconfigure it.

Out of band management using products such as those from Cyclades can overcome both types of issue, and is becoming increasingly important with the trend to geographically separate data centres and systems administration staff (which may or may not include the outsourcing of administration). Charlie Waters, senior vice president for global marketing at Cyclades, says that reducing the mean time to repair a fault increases overall productivity, as well as that of the staff involved in fixing it. If a customer has 3000 servers, of which six are usually down at any one time, it is important to get failed servers back online quickly for performance reasons, even if service availability is 100 percent due to redundancy.

Out-of-band management uses separate, secure communications paths into the production infrastructure to minimise downtime. Devices such as console servers and power managers are co-located with the servers and other devices and connected to them using serial, KVM, or Ethernet links. The important points are that the connections between the administration point and these devices are completely separate from the production channels, and a single management console can support all the infrastructure components.

According to Waters, a European telco reduced overtime costs by 88 percent, the average fault fix time by 97 percent, and the total fault hours by 88 percent as a result of using this technology -- and the cost was recovered in around a year.

"There is tremendous pressure on IT managers to improve service levels and efficiency," Waters says. He says the separation of the control network from the data network is an architecture proven by the high service levels delivered by the phone system.

KEEP JUNK TRAFFIC OFF THE NETWORK

Antivirus software, spam filters and firewalls all help prevent the generation of junk traffic within your network, so make sure they are enabled and kept up-to-date. Modesto says it is worth considering outsourced antispam and antivirus services, as they typically use multiple products to provide ongoing protection on the occasions when a vendor takes an extra day to provide an update for the latest virus or worm.

Atkinson also suggests blocking e-mail attachments to the extent that is feasible, and configuring software so that large attachments are held on the server as long as possible. Just because 10 people are sent copies of a multi-megabyte PowerPoint deck, that doesn't mean they are all going to open it. User education comes into this too, as it would probably have been better to store the file in a shared folder, and send a link to those 10 people. Atkinson also recommends disabling the "All" group in e-mail -- it typically comes at the top of the list, so users will accidentally select it from time to time. It's also a sitting target for mail viruses and worms.

"Make patch management... and laptop security a priority," advises Modesto, though updates should be performed at night or staggered throughout the day to avoid congestion. He also warns that some popular printers run cut-down versions of old operating systems and can be affected by worms. Monitoring tools such as MRTG can reveal unexpected traffic: "a little bit of graphing goes a long way."

Users may want to install legitimate but unapproved software that adds to the load, such as utilities that load fresh wallpaper every day. A noticeable spike can occur if enough people follow suit. Or the program might hog RAM or another resource, causing poor overall performance. "It's really about knowing what's running, who's running it, and what they're doing," said Prichard.

Broadcast traffic that's not relevant to all users can also be regarded as junk. Jae-Won Lee, product marketing manager for data networking solutions at Nortel Asia Pacific, says this can be reduced by dividing the network into multiple virtual LANs (VLANs). Segregating a 100 user LAN into five VLANs will hide around 80 percent of broadcast traffic.

"For example, if an organisation has multimedia, CAD/CAM design or on-line collaboration tools that use multi-cast protocols which inherently produce a lot of broadcast traffic then these functional groups can be separated from the rest of the organisation as not to impact other traffic on the network," he says.

Although it's important to monitor the network, Atkinson warns that it is possible to overdo things by sending too many pings and test frames. Some of his customers were losing one third of their bandwidth to multiple and inappropriately configured network management tools until he set them straight.

II. RELATED WORK

Research Paper entitled On-Chip Networks from a Networking Perspective: Congestion and Scalability in Many-Core Interconnects focuses on congestion control in on-chip bufferless networks and has shown such congestion to be fundamentally different from that of other networks, for several reasons. Research examined both network performance in moderately-sized networks and scalability in very large networks, and they find congestion to be a fundamental bottleneck. Researchers develop an application-aware congestion control algorithm and show significant improvement in application-level system throughput on a wide variety of real workloads for NoCs.

III. RESEARCH METHODOLOGY

To investigate Performance evaluation of Computer Networks through Network Scalability we use

Simulation environment with hybrid framework. We have used Nclient application form simulation environment to simulate our research. There are three basic setup provided under Nclients in simulation environment are TelenetApp, File transfer and basicHTTP module. Out of these we choose basicHTTP module with TCPBasicCliApp and TCPGenericSrvApp modules. TelenetApp generates very low traffic. Initially we setup network configuration with a server and variable number of clients from 10 number of clients to 150 Number of clients with the interval of 10 number of clients on a server and collect the throughput also we measure the throughput by changing datarate from 10Mbps to 100Mbps with the interval of 10Mbps. In the next phase we change network configuration from a single server to two servers by keeping remaining configuration like initial setup; with this setup we have shared the Network load of single server with two servers. Throughput readings Collected from single server setup and two server setup are compared to investigate the performance of the networks. We have kept data packet size constant i.e. 256bytes for both the configurations.

FIG1: Nclients.Ned: Network Configuration setup with single server

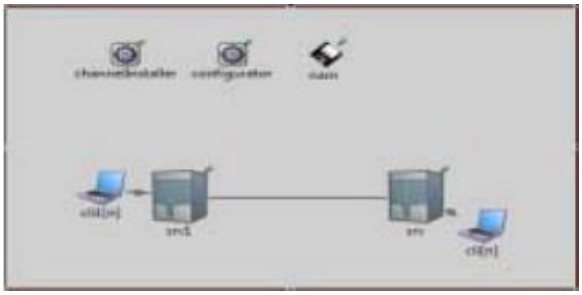

FIG2: Nclients.Ned: Network Configuration setup with two servers.

We collect the reading of the simulation experiment for both the setups i.e. with single server and with two servers by changing datarate of the network setup and by increasing the network load with number of servers. 1. We Kept datarate constant and changed the number of clients on the server and average throughput scalar values are collected for respective experiments. 2. For specific client setup on a server we change the datarate and collect the scalar average throughput in excel files. We collected the throughput results by running the simulation experiment with single server 10 (datarate variance from 10Mbps to 100Mbps with the interval of 10Mbps) ×15 (no of client variance from 10 clients to 150 clients with the interval of 10) =150 times, and same is repeated for two server setup too i.e. 10 × 15 =150 times.

IV. RESULT ANALYSIS

Throughput values of the simulation experiment is collected in excel file. We have collected results at 10, 20, 30, 40, 50, 60, 70, 80, 90, 100Mbps datarate with 10, 20, 30,…….130, 140, 150 clients per server with single server and same setup is also used with two servers to evaluate the performance of the Computer Network by keeping all other parameters same for both the setups. In the Network configuration with two servers we have divided the load of single server on to two servers equally. These results are collected by keeping packet size constant i.e. 256Mbps. At specific datarate we took reading of throughput from the server and throughput to the server by changing number of clients from 10 numbers to 150 numbers of clients with the interval of 10 clients per server. We took these readings at different datarates ranging from 10Mbps to 100Mbps with the interval of 10Mbps. After collection of the readings we took average of all the throughput from the server and throughput to the server readings. The same procedure is followed for the Network configuration with two servers too.

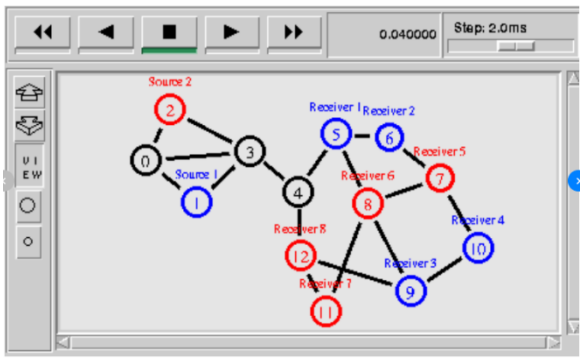

FIG 3. Environment set up with NClient architecture.

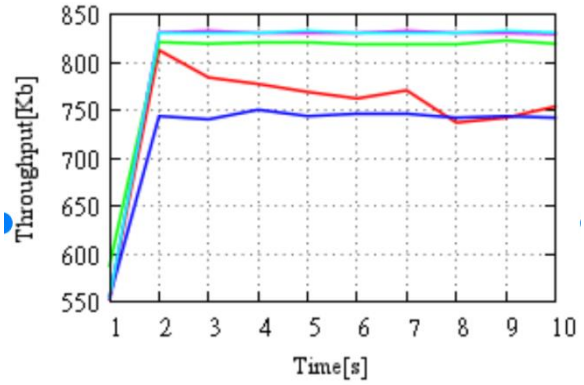

FIG 43. Throughput to single server & two server comparison with client variance.

Analysis shows that average throughput from the server and average throughput to the server with single server are higher than the average throughput from and to the server with two servers. Graph1 & Graph2 shows average throughput from and to the server comparison between single server and two servers at variable datarates ranging from 10Mbps to 100Mbps with the interval of 10Mbps. It shows that average throughput form and to the server with single server is higher than the average throughput from and to the server with two servers. It also shows that average throughput from the single server and to the single server are giving steady performance with increase in the datarates from 10Mbps to 100Mbps while average throughput from the server and to the server with two server setup are giving maximum value at 10Mbps datarate and minimum value at 60Mbps. Graph3 & Graph4 shows average throughput from and to the server comparison between single server and two servers with variable number of clients from 10 to 150 clients with the interval of 10 numbers of clients on server. It shows that average throughput from the single server is higher than the average throughput from the two servers with the number of clients on the servers except readings with 40 & 60 number of clients on the servers. While average throughput to the server readings shows that similar type of average throughput with both the setups except readings with number of clients 70, 110 & 130 on server, where it shows remarkable difference between the readings i.e. lower throughput to the server with two servers.

II. CONCLUSION

Finally we say that when we divide the network load of single server on to the two servers we found subsequent decrease in the average throughput from & average throughput to the server. We got maximum average throughput from and to the server with single server.

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