The Bandwidth Challenge

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Understanding bandwidth

- Refers to the data rate supported by a network connection or interface.
- Bandwidth represents the capacity of the connection. The greater the capacity, the more likely that greater performance will follow, though overall performance also depends on other factors, such as latency.
- The term *latency* refers to any of several kinds of delays typically incurred in processing of network data. A so-called *low latency* network connection is one

Understanding Bandwidth

- Bandwidth is typically measured in bits per second (bps). Commonly used larger units are kilobits per second (Kbps), megabits per second (Mbps) and gigabits per second (Gbps).
- speed and bandwidth are two very different things
- Speed is measured in latency/response time. Bits per second is the size of the pipe, or how much data can move at one time.
- Definition of Throughput is

Bandwidth Measurements

- Several sites on the internet offer **speed tests** or **bandwidth tests e.g.**
  - **http://www.speedtest.net/**
  - **https://monitor.kenet.or.ke/speedtest**
  - http://measurementlab.net/
- Other Tools
  - Cacti
  - MRTG
  - Wireshark

Bandwidth measurement

- **Measuring network throughput**
  - A typical method of performing a measurement is to transfer a 'large' file from one system to another system and measure the time required to complete the transfer or copy of the file. The throughput is then calculated by dividing the file size by the time to get the throughput in megabits, kilobits, or bits per second.(Not Accurate)
- use dedicated software such as iperf
- Lets try these tools now!

Iperf explained

- Install iperf
  - sudo apt-get install iperf
- Now start one of them in server mode
  - iperf –s
- And on the client site enter this command
  - iperf -c x.y.z.w Where x.y.z.w is the ip of server
- In windows use jperf

The bandwidth challenge

- Available bandwidth is limited and insufficient to meet demand
- Existing capacity is usually running at maximum capacity
- As a result it is often unusable Universal flat lining during working hours
- The cost of bandwidth is high
- Expanding bandwidth capacity is limited due to finances, supply, technology .
- The network is often extremely slow and frustrating to use

The Bandwidth Challenge

- Bandwidth is a resource that is… Limited, in high demand, expensive, of high value
- Existing bandwidth is often not managed

Bandwidth demands in Universities

- Audio Bandwidth
- Video Bandwidth
- eLearning
- Social Media
- Research
- Communication – IP telephony, Skype, instant messaging
- And many more

The bandwidth Challenge

- Possible solutions?
  - Do nothing ! often the reality but not the answer
  - Better management of the existing resource Improved access, no additional bandwidth costs

Improving bandwidth

- management is probably the easiest way for universities to improve the quantity and quality of their bandwidth for educational purposes.
- Purchasing more may not be an option!

Strategies

- Bandwidth management Monitoring and management of available resource
- Optimisation of the resource to ensure value for money and fitness of purpose

Bandwidth Management

- To ensure network performance, the network engineer must have full visibility into all activity occurring on the network – especially with user/application interaction – and how it is impacting bandwidth and availability.
- With this insight, network professionals can analyze utilization, maintain control, and meet the expected service level quality.
- Identification of these sorts of activities is the first and most important step to

Addressing common issues that consume bandwidth

- Several common causes negatively impact bandwidth in the enterprise environment by "hogging" that bandwidth.
- A comprehensive, robust network analyzer can identify many of them, including:
  - Peer-to-peer (P2P) applications
  - Incorrectly configured connections between servers and clients
  - Skype or personal instant messaging (IM) software

Utilize best practices for a well-managed network

- The first step in managing network bandwidth is developing policies that define access parameters and discourage activities such as streaming video.
- Employees may not even know how their activities are impacting others on the network;
- Building awareness of common issues and guidelines can take the organization one step closer to a better managed network.

Best Practice

- The next step is implementing the three best practices as described below:
  - Monitor - Discover what is happening on the network in real-time
  - Baseline - Document and report usage; define the current state of the network
  - Manage - Improve performance based on the documentation and monitor progress

Prevent unwanted network traffic

- Unwanted network traffic comes from several sources and often contributes to unnecessary processing by devices throughout the network. For example:
  - P2P applications can rob WAN bandwidth from mission critical applications
  - Unwanted protocols may indicate a legacy application or other incorrect device configuration
  - Factory-default switch port settings may cause considerable amounts of unnecessary traffic and contribute to intermittent network sluggishness

Planning for bandwidth

- Know the demand for your bandwidth
  - Determine the number of users – include students & staff
  - Determine services that require the Internet e.g. Where is the eLearning, email , the website etc. hosted
  - What are the trends – Check the KENET graphs especially when allowed to burst.
- KENET Recommends 100 students per MB

Remember

- Keep local traffic local
  - Advisable to install local DNS, DHCP, Email, ERP and other servers running critical services.
- Use a Cache like a proxy server
- Hierarchical design of the campus network with a fiber backbone
  - Core
  - Distribution
  - Access layers
- Define & implement a policy that explains what is allowed and disallowed within the campus network eg you can