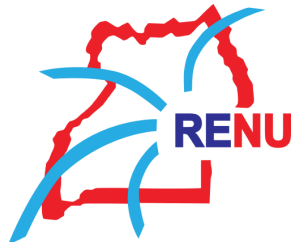


Campus Network Excellence - NOC Webinar 2023

Bandwidth Management

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Bandwidth Management

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Outline

- Definitions
- Why Bandwidth management?
- Bandwidth Requirements calculations
- Network Policy
- Challenges
- AfaaS
- Q & A

Definitions



Network **bandwidth** defines how much data can possibly travel through a communication channel in a period of time.

Network **throughput** refers to how much data successfully travels through a communication channel over a specified period of time.

Latency refers to the time takes for data to travel from source to destination.

Bandwidth Management

Bandwidth management is a generic term that describes the various techniques, technologies, tools and policies employed by an organisation to enable the most efficient use of its bandwidth resources

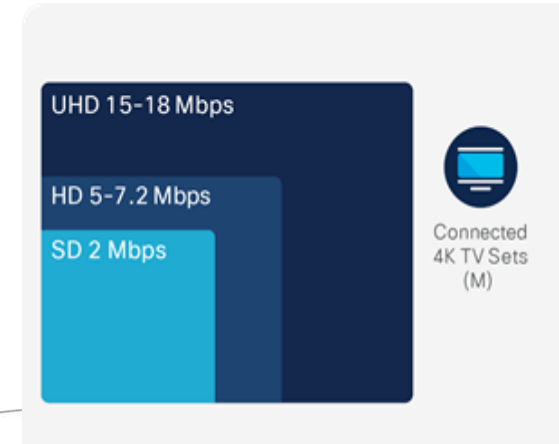
The aim: To improve performance of an Internet connection.

The goal: To have the right amount of bandwidth in the right place at the right time for the right set of users and applications

Why Bandwidth Management



- Market Trends
- Growth in Internet users
- Shifts in mix of devices and connections
- Sensitisation and exposure.
- 240 p, 360p, 480p 720 p 1080 p, 2k , 4K, 8K



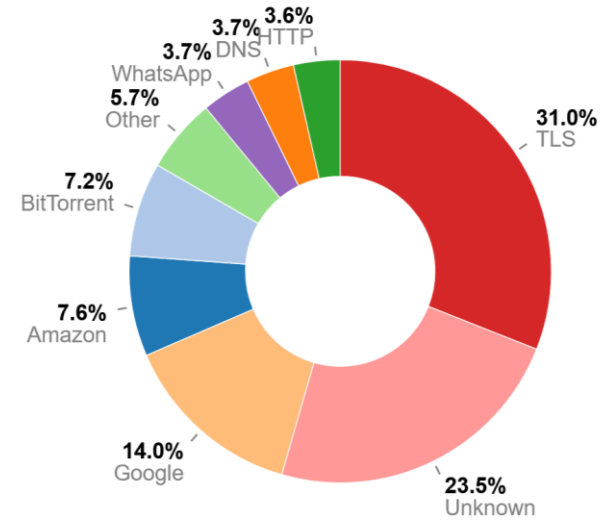
82% of Global Internet Traffic in 2022 Will Come From Video

Proving the popularity of video content, [Cisco reports](#) that 82% of global internet traffic will come from either video streaming or video downloads in 2022.

What consumes my bandwidth?



- Explosive network growth
- Software updates and Server backups
- Video streaming
- Peer-to-Peer (P2P) file sharing applications like BitTorrent
- Background services & updates
- Online gaming
- Large file downloads
- Malware and viruses



Bandwidth Requirements Calculation

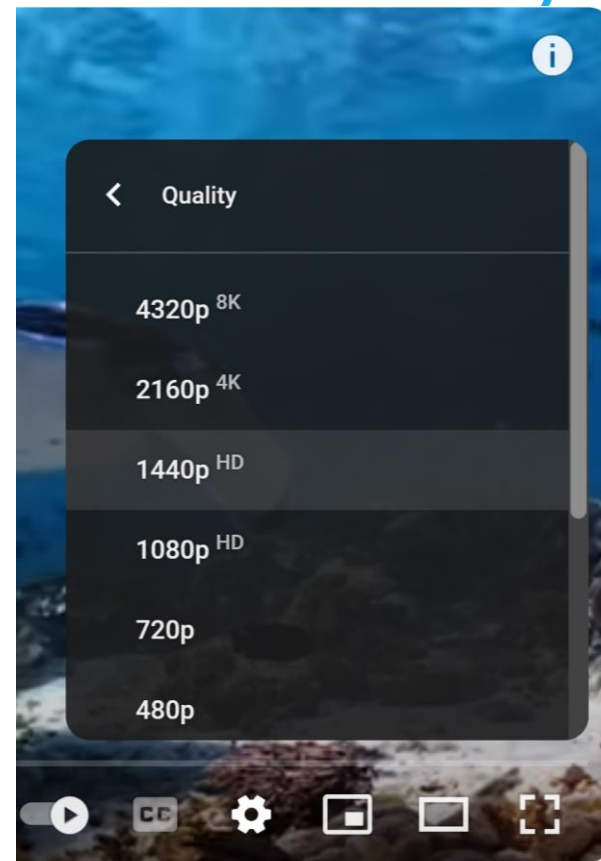
- List Applications and Services
- Determine Bandwidth Requirements per Application
- Estimate Concurrent Users/Devices
- Calculate Application-Specific Bandwidth Requirements
- Sum Up Application Bandwidth Requirements
- Account for Network Overhead
- Plan for Scalability and Growth
- Calculate the Total Network Bandwidth Requirement
- Document and Review

Bandwidth Requirements



Teaching, learning and research needs	Optimal bandwidth per student
Access to Open Educational Resources	1 Mbps
Learning Management System, Moodle, Canvas	1 Mbps
Online Public Access Catalogue, digital library access	500 Kbps
Video streaming	5 Mbps
Remote Instruction	1 Mbps
Video Conferencing	1.5 Mbps
Large files download	100 Mbps
Open science – access to lab and instruments	100 Mbps

Source: Various



Bandwidth Managament Considerations



- Network Design considerations
- Plan to upgrade
- Sensitisations of the Users
- Capacity hungry applications
- Schedule utilisations for upgrades, backups
- VLANs and Capacity allocation
- Equipment considerations
- Know your network, Monitor your network.
- Acceptable use policies (AUP)

Equipment considerations



- Throughput
- Functionality
- Link considerations
- Data sheets

75 Mbps

The Cisco 2900 Series enables deployment in high speed WAN environments with concurrent services enabled **up to 75 Mbps**.



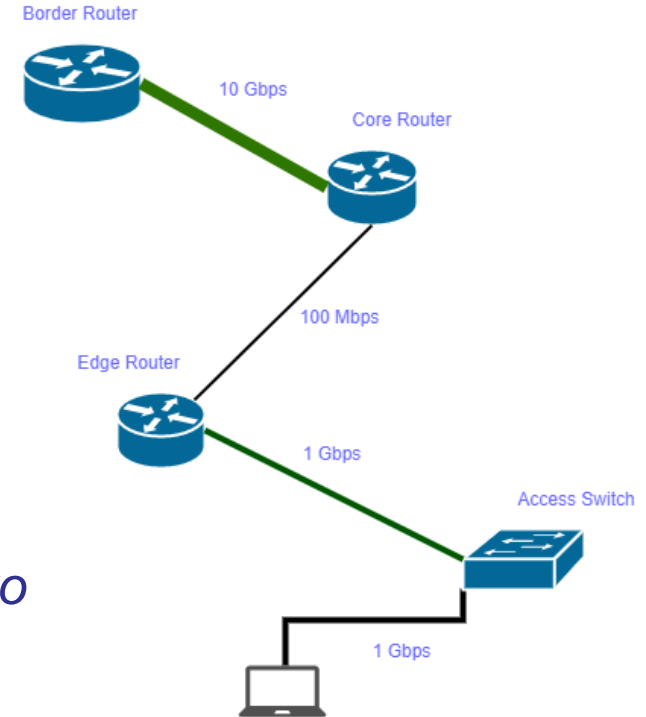
<https://www.router-switch.com> › upload › product-pdf PDF ⋮

[CISCO 2900 SERIES ROUTER DATASHEET](#) ✓

Link Capacity Comparison

- Wireless
- CAT 5E
- CAT 6E
- Optic Fiber

“The maximum throughput between any two nodes on a network is determined by the slowest link between those nodes.”



Network Policy



- Do your users know the network policy?
- Is inappropriate user behaviour (excessive downloads) causing problems on your network?
- Do you need to create a written policy on network usage?
- Do you need to update an existing policy?
- Are your users largely unaware of what the network policy is, and why it is important?

Policy, strategy, rules and regulations



A good policy;

- has an enabling purpose
- is linked to a wider objective
- has clear ownership
- is short and clear
- arises from a valid process
- works within the confines of a given authority
- is enforceable
- is adaptable

Bandwidth Management - General good practices



- User education and sensitisation
- Providing feedback to users about the network load
- Network access authentications
- Optimise your web browser
- Use of collaborative tools
- Control download managers & peer-to-peer clients
- Essential services prioritisation
- Firewall
- Proxies & Web caches
- E-mail management: strategies against spam and viruses.
- Establish you bandwidth requirements

Challenges with Bandwidth Management



- Too many users on the network
- Higher demand compared to available bandwidth
- Different user bandwidth requirements
- Viruses, malware, Ads, spam
- Uncontrolled downloads
- Technical ability of the ICT teams
- Budget limitations
- Little/no monitoring



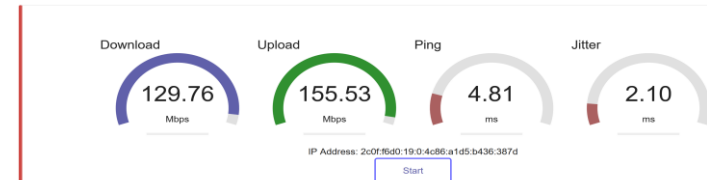
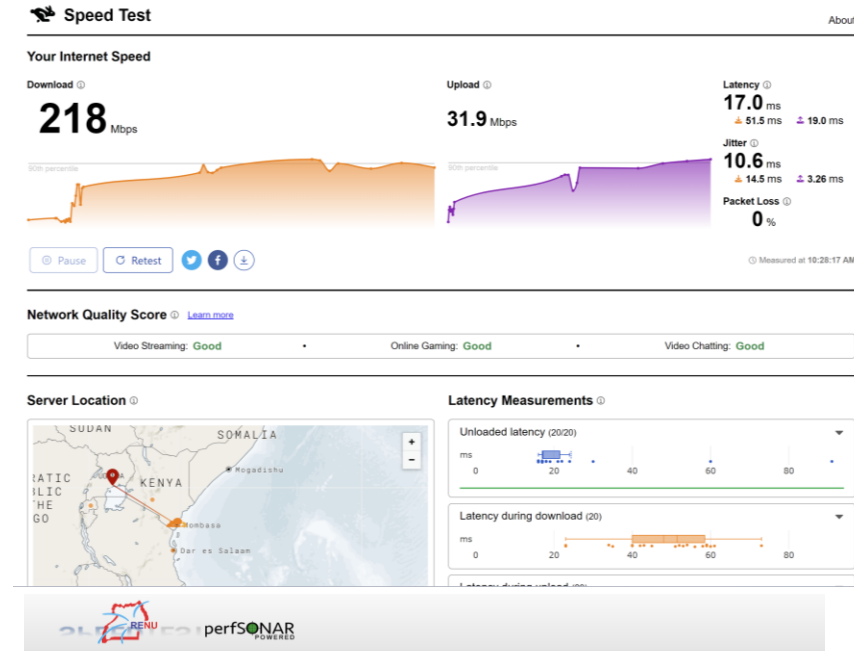
Throughput tests

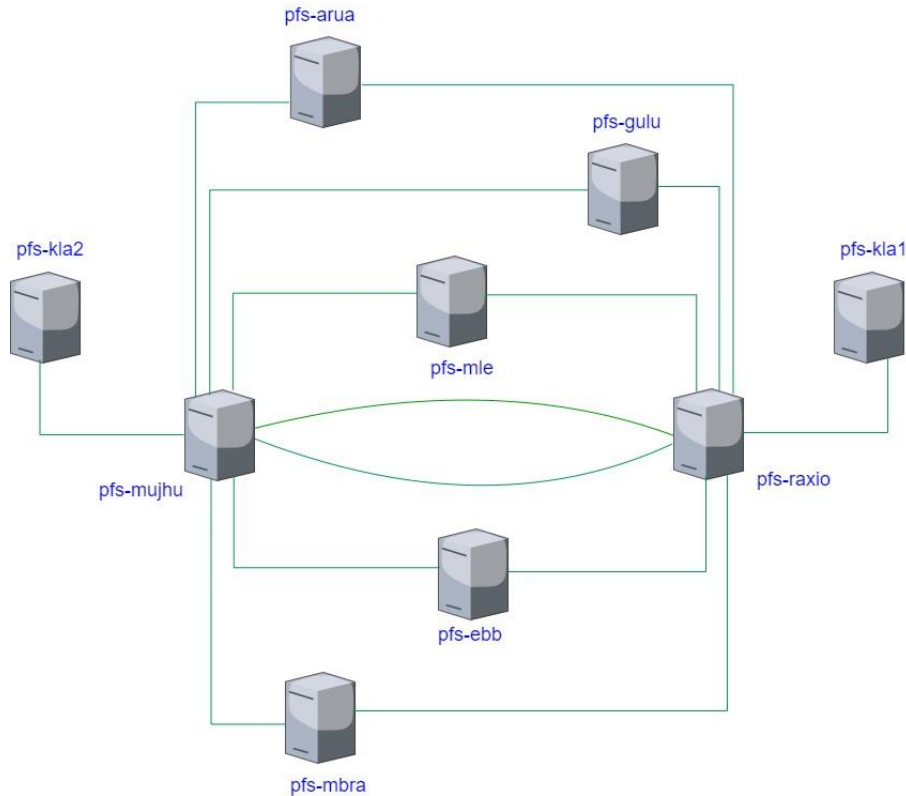


- iperf tests
- Speedtest servers

- <http://speedtest.googlefiber.net/>
- <https://fast.com/>
- <https://www.speedtest.net/>
- <https://speed.measurementlab.net/#/>
- <https://speed.cloudflare.com/>

- perfSONAR tests





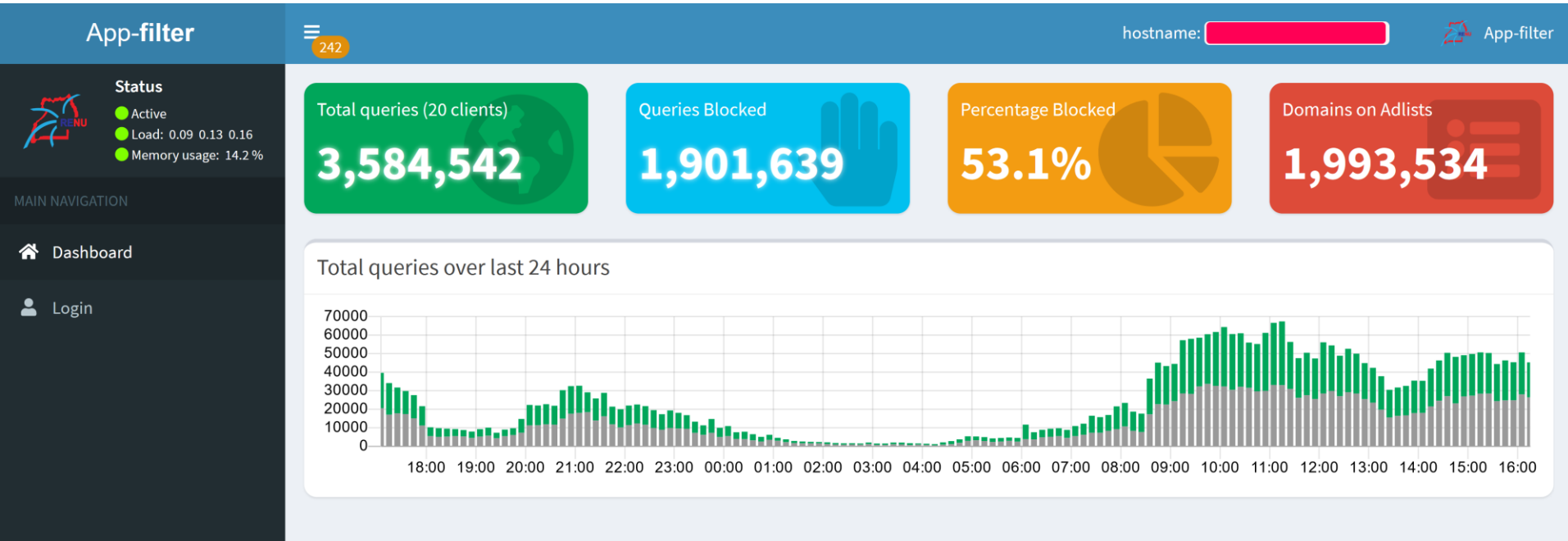
Regional speed test server

- <https://pfs-ebb.renu.ac.ug/speedtest/>
- <https://pfs-mbra.renu.ac.ug/speedtest/>
- <https://pfs-mle.renu.ac.ug/speedtest/>
- <https://pfs-gulu.renu.ac.ug/speedtest/>
- <https://pfs-arua.renu.ac.ug/speedtest/>
- <https://pfs-mujhu.renu.ac.ug/speedtest/>
- <https://pfs-raxio.renu.ac.ug/speedtest/>

Application filtering as a Service



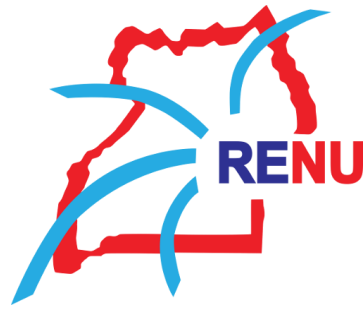
- Based on DNS



References

- [1] “30 Vital Video Marketing Statistics You Need to Know in 2022,” *The Social Shepherd*. <https://thesocialshepherd.com/blog/video-marketing-statistics> (accessed Nov. 16, 2022).
- [2] L. Chitanana, “Bandwidth management in universities in Zimbabwe: Towards a responsible user base through effective policy implementation,” p. 15.
- [3] “Breaking the Final Connectivity Barriers for Higher Education Institutions in Africa,” p. 42.
- [4] “The True Price of Bandwidth Monitoring,” *NetEqualizer News Blog*, Jul. 16, 2009. <https://netequalizernews.com/2009/07/16/the-true-price-of-bandwidth-monitoring/> (accessed Nov. 14, 2022).
- [5] AppNeta, “Rate Limiting Detection: Bandwidth and Latency,” *AppNeta*. <https://www.appneta.com/blog/rate-limiting-bandwidth-latency/> (accessed Nov. 14, 2022).

Q & A



THE END

Thank you