INASP: Effective Network Management Workshops

Unit 5: The Bandwidth Challenge

About these workshops

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Date: 2013-04-29

Objectives

On completion of this session, we hope you will know about:

- Importance of Internet in network management
- Why is Internet bandwidth particularly scarce?
- Why is that a problem?
- How does it relate to IT/network management?
- How can we fix it? What can we change?

Why do we care about Internet access?

What is your Internet connection used for?
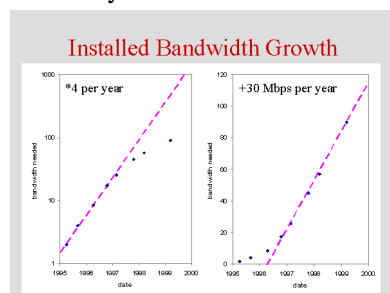
Why else do you have a campus network? What if you didn't have one?

What is it used for? Do you know? (Monitoring can tell you)

How much do you spend on your campus network? On your Internet connection?

Please share your views with the group about whether having an Internet connection is important to your university.

JANET is the UK NREN (National Research and Education Network), providing Internet and inter-university connectivity, support and services. (Basically the equivalent of your University internet/NREN connection).

163 UK universities are connected, at an average cost of £32,000 (USD 50,000) per year. < https://community.ja.net/sites/default/files/network-charges-calculation-12-13-issue-1.xls > Their total budget is £6.4 million (USD 10 million).

JANET installed bandwidth grew approximately 400% per year between 1995 and 2000 (old figures, I know):

About 60% of JANET's traffic came from outside JANET (i.e. the Internet).

Why is it so expensive?

African universities pay 50x more for the same bandwidth as Europeans:

> "While a university in Germany might pay about US $4000 per month for 1 gigabit per second of bandwidth, a school in Kenya can expect to pay $200 000 for the same service." IEEE Spectrum, Feb 2013.

The Association of African Universities (AAU) conducted a connectivity survey during 2008 from universities in West and Central Africa. The study identified a bandwidth deficit for universities in the region and that… these universities would fall further and further behind their own estimated bandwidth requirements and the level of bandwidth which is *required for performance-leading work and teaching conditions.*
The Socio-Economic Impact of Broadband in sub-Saharan Africa: The Satellite Advantage

How did this happen?

• Lack of infrastructure, especially copper and fibre networks
• Lack of competitive service providers
• High costs of installing infrastructure
• Long delay in investment and deregulation

Key findings from ATICS survey 2006

• African university = European home
• Pays 50x more than European home
• Limited bandwidth per computer
• Always congested (over 60% of the time)
• 59% of institutions do not monitor or manage bandwidth
Note: this survey was in 2006, the results may be outdated.

Demand for bandwidth is increasing everywhere

Used International Bandwidth, 2002-2020
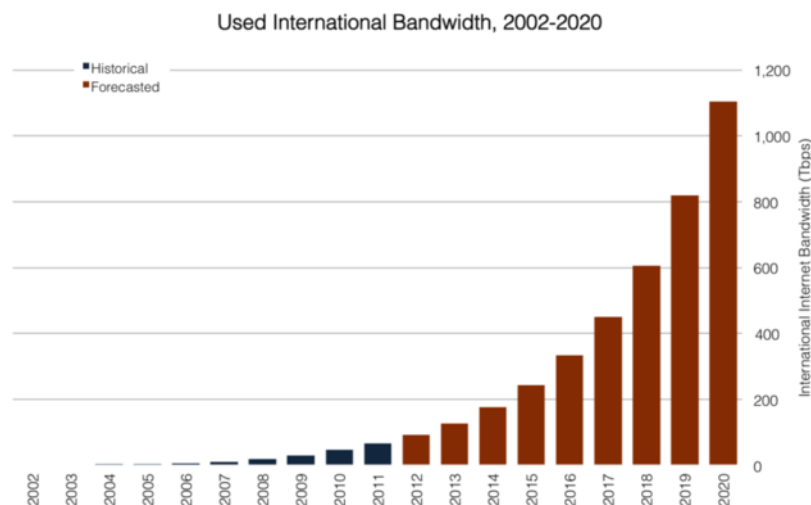
Effects of higher demand than supply
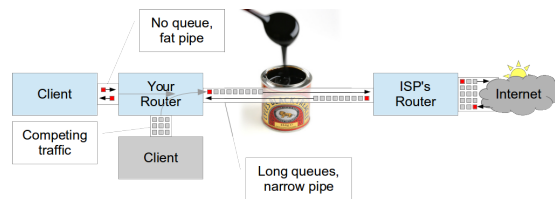
Abuse of shared resource hurts others

In economics, the tragedy of the commons is:

- the depletion of a shared resource by individuals,
- acting independently and rationally according to each one's self-interest,
- despite their understanding that depleting the common resource is contrary to the group's long-term best interests.

How does this relate to computer networks?

On a shared and very limited connection, users can harm each other when:

- there is no incentive for users to limit their use of bandwidth

    - for example, financial cost, punishment, self-harm
- users are allowed to use bandwidth to the point that it affects others
- network or bandwidth management is not used (the default)

Shared resources always need management. More users -> more management. This is not unique to African universities!

Effects of bandwidth challenges

- What Internet resources are hard to use?
- How much money and time is wasted?
- What effect does this have on the university?

Difficulties in using Internet based information resources and communication tools:

- Digital library resources are under utilised
- Resource license costs can be less effective
- Free or low cost resources are difficult to take advantage of
- The digital library revolution is difficult to participate in
- Continued digital divide

Under utilisation of ICT capacities and investments:

- Bandwidth charges of $5,000 per month that result in an unusable link – is that money well spent?

• Infrastructure costs e.g. PC computer labs that users spend most of their time sitting around waiting for pages to display – is that money well spent?

Impacts on a university's core activities, especially those that require up to date and a wide range of information resources e.g. teaching and research.

Possible solutions?

　　　• Find out if this is affecting you!
　　　• Collect the data to back you up (Units 6 and 7).
　　　• Negotiate more bandwidth and/or a change of policy (Units 9 and 10).

Note: bandwidth management and capacity increase are subject to diminishing returns! Increasing both gives more benefit than either alone.

ATICS said:

> "Improving bandwidth management is probably the easiest way for universities to improve the quantity and quality of their bandwidth for educational purposes."

Group Discussion

What challenges does your institution face with network management?

What impact are they having on:

　　　• User satisfaction?
　　　• User perception of IT staff performance?
　　　• How the outside world sees your institution?

How are these issues being addressed within your institution?

　　　• Technically?
　　　• With policies?
　　　• With both?
　　　• If not, why not?

You may want to nominate a group representative to capture the key points of the discussion on a flipchart sheet.

Plenary Discussion

Please present the results of your group discussions.

　　　• One representative, 5 minutes per group.
　　　• Please focus on your top three-five challenges/solutions.

During the discussion of other groups' results, please consider:

　　　• Are there similarities with your institution?
　　　• Are there differences?
　　　• Are there lessons that you can learn?

Can you help?

　　　• What problems are you experiencing?
　　　• Have you found a good tool or skills?
　　　• Give us the benefit of your experience: especially with a successful problem resolution!
　　　• Share your knowledge with others, don't hide or sell it.
　　　• Build a community in your country, or online.