

Bandwidth Management

Getting the most from your Internet Connection

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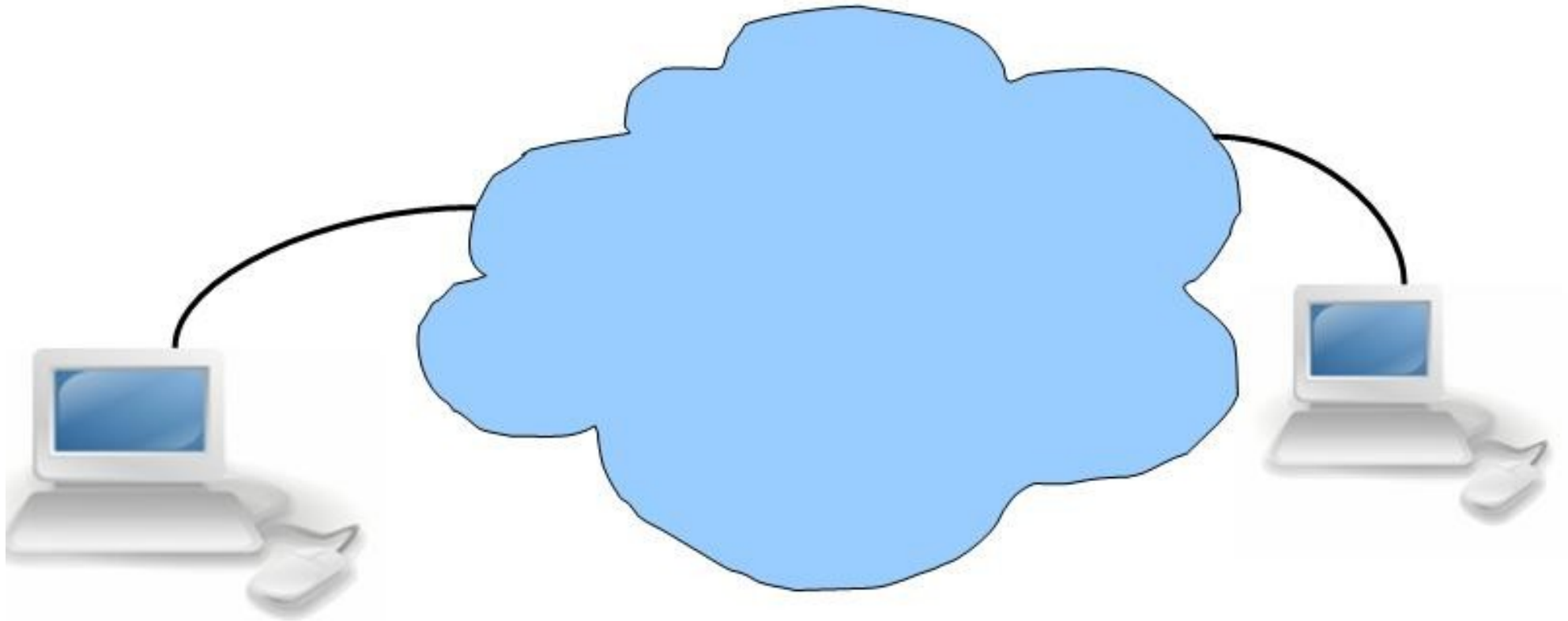
Outline

- Introduction
- Objectives and Format of the Workshop
- What is bandwidth?
- Bandwidth Management and Optimisation
- Monitoring and Technical Implementation
- Policy and Management
- Advocacy
- Useful Initiatives and Organisations

Timetable

- Start: 8.30 am
 - Introduction and objectives
 - How to look at bandwidth
- Morning break: 9.45 am – 10.00 am
 - Bandwidth management and optimisation; what approaches can be used?
 - Monitoring and Technical Implementation
- Lunch: 11.30 am - 1pm
 - Policy
 - Acceptable Use Policy
 - User Education
- Afternoon break: 3.00 pm – 3.15 pm
 - Bandwidth Management Advocacy
 - Further Resources
 - Any other questions
- Finish: 4.30 pm

The Internet



The Network

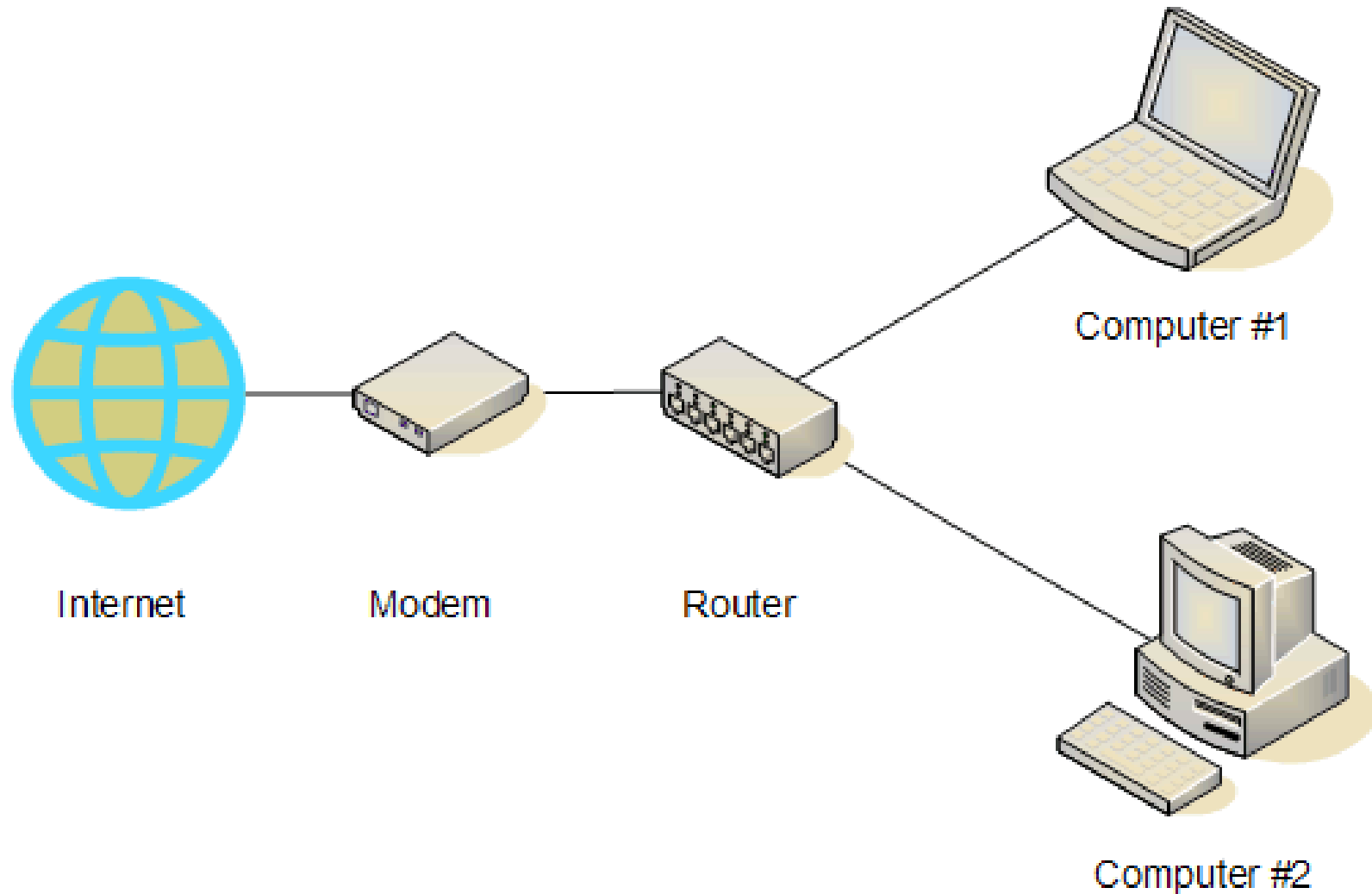
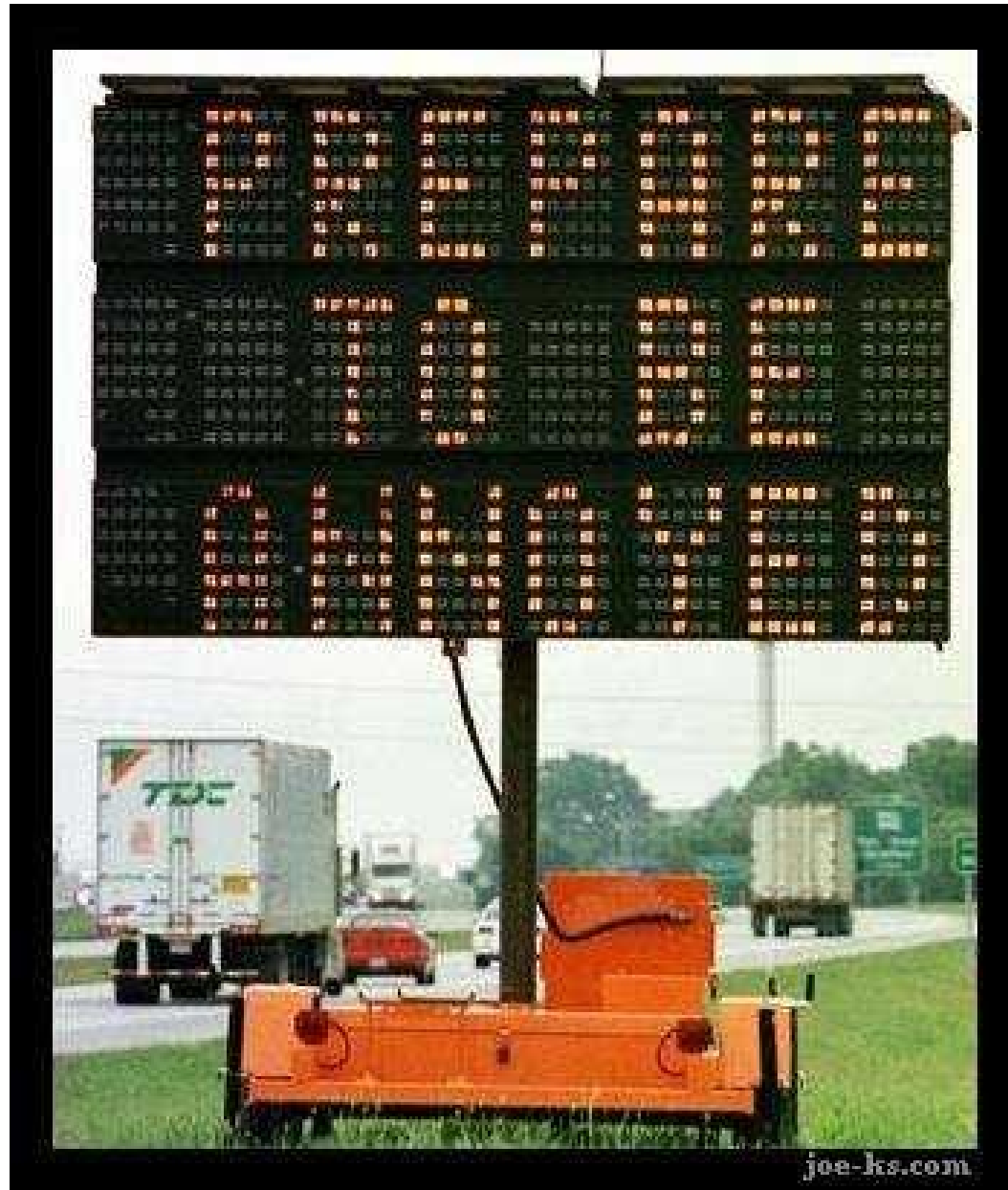


Diagram from Microsoft

What is bandwidth?







joe-ks.com

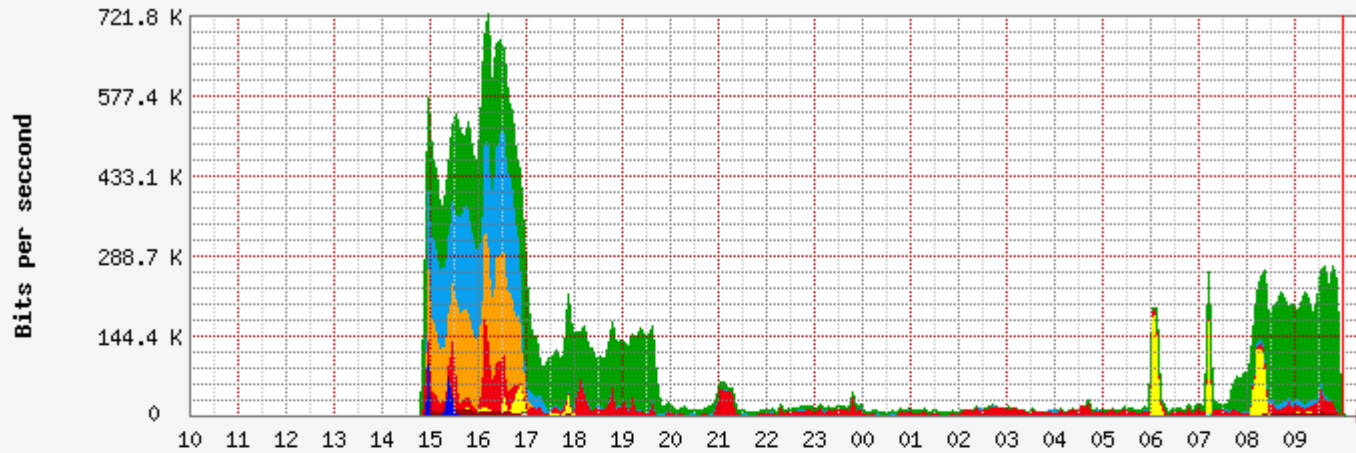
Bandwidth Measurement

- Data measured in bits (b) or bytes (B)
- 8 bits = 1 byte
- e.g. 1MB = 1,000,000 bytes or 8,000,000 bits
- Rate can be measured by data flow per second, e.g. 256Kbps (256,000 bits per second)
- Internet connection has an **upload speed** and a **download speed**. When one speed is quoted, it refers to the download speed.

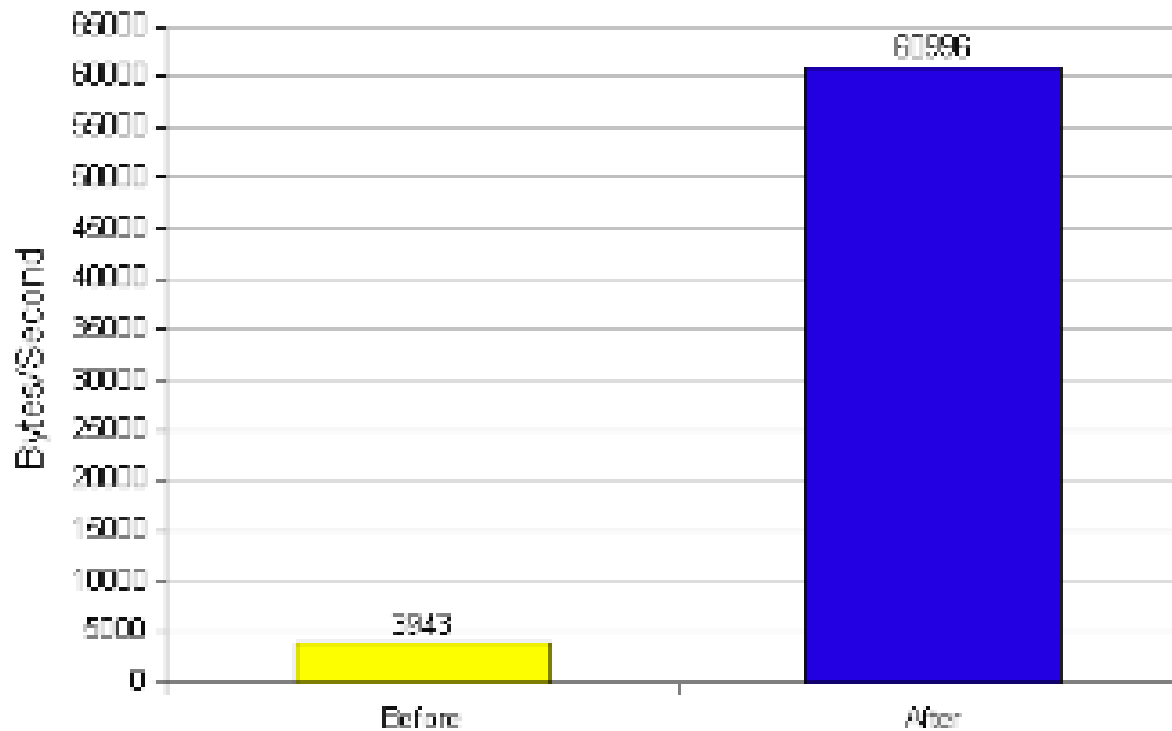
Uploading and Downloading

- Downloading is receiving information
- Uploading is sending information
- When mainly web browsing, you are downloading.

Protocol counter JKUAT



	average	peak	transferred	Last update: 23 November 09:53
http	51.8K	244.4K	546Mb	
udp_other	19.7K	218.7K	207.7Mb	
Sasser	15.1K	191.6K	159Mb	
mail	14.2K	161.7K	149.4Mb	
tcp_other	5.7K	218.9K	59.7Mb	
dns	1.5K	9.9K	15.4Mb	
ssh	1.1K	117K	11.6Mb	
icmp	208.9	1.8K	2.2Mb	
ftp	45.8	4.4K	483.5Kb	
rtsp	31.2	7K	329.5Kb	
edonkey	14	212.4	148.1Kb	
galileo	12.5	204.3	131.4Kb	
blaster	11.9	123.1	125Kb	
iMesh	8.9	166.2	93.6Kb	
wms-messenger	6.2	87.4	65.7Kb	
ultima	3.8	59.8	39.6Kb	
Kazaa	3	112.1	31.7Kb	
bittorrent	0	6.4	448.8b	
real	0	0	0b	
ipsec	0	0	0b	
telnet	0	0	0b	
bo2k	0	0	0b	
other	0	0	0b	
tunnels	0	0	0b	
MSN	0	0	0b	
nntp	0	0	0b	
IRC	0	0	0b	
Napster	0	0	0b	
Gnutella	0	0	0b	
aim	0	0	0b	
irc	0	0	0b	

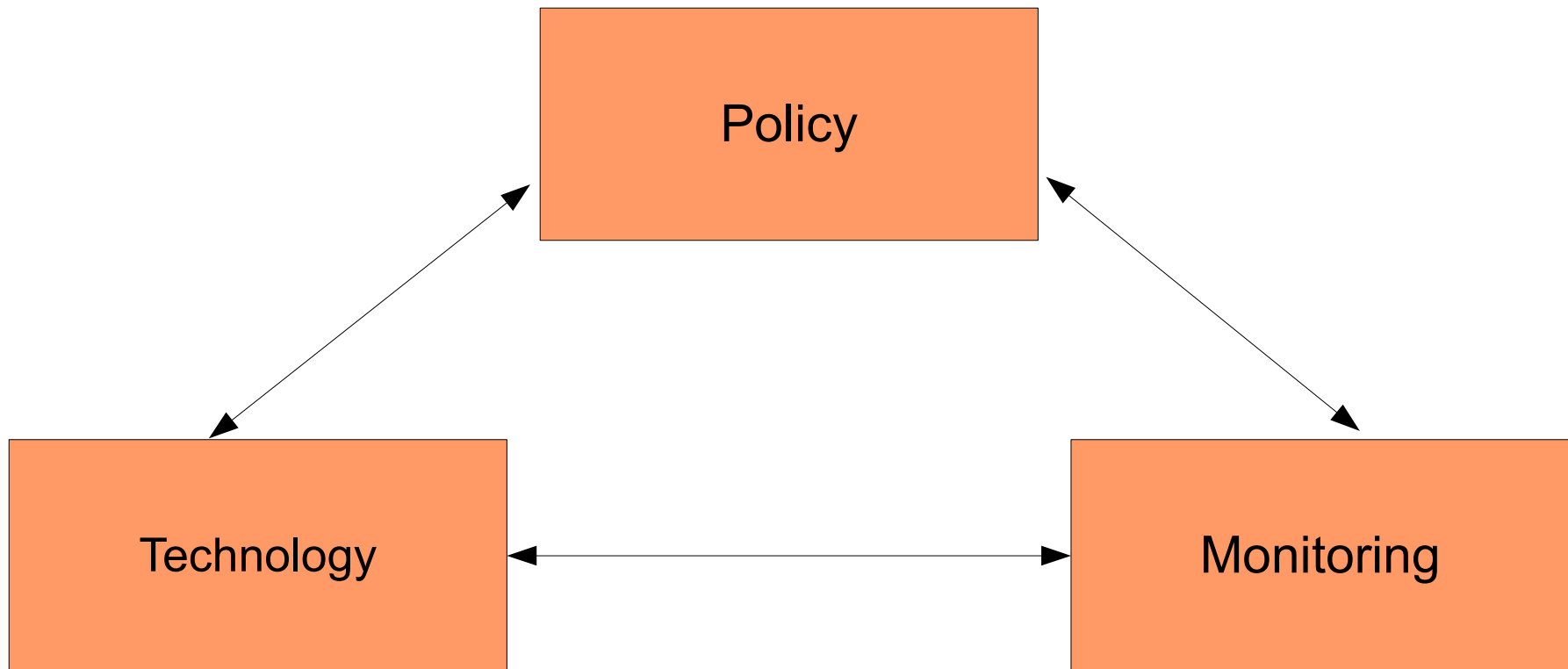


Before: Viruses, worms, peer-to-peer

After: 15 fold increase in capacity for useful traffic

If they were paying \$1000 a month for their connection, about \$935 was being spent on bad traffic before bandwidth management.

How do we manage bandwidth?



Monitoring

- Informs policy, and then allows the institution to see if the policy is adhered to.
- Looks at total volumes of traffic, usage patterns.
- Examines types of traffic on the network.
- Identifies what users are using a lot of bandwidth, or acting unacceptably.
- Diagnoses viruses, worms and security problems.

Technical Management

Technical strategies to implement policy, informed by monitoring.

- Network filtering
- Caching
- Virus protection
- Traffic prioritisation
- User prioritisation

Before

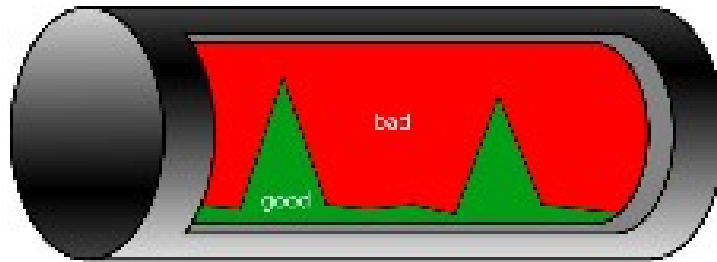


Figure 1 - Bad traffic dominates bandwidth

After

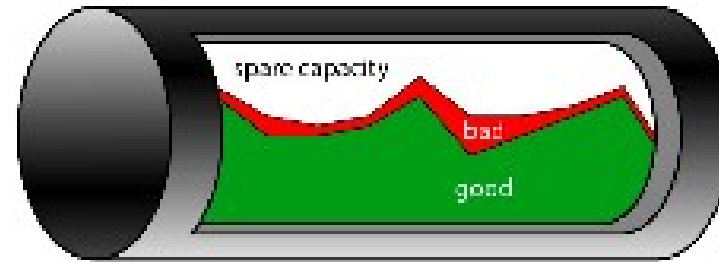


Figure 2 - Bad traffic is reduced, freeing capacity for good traffic

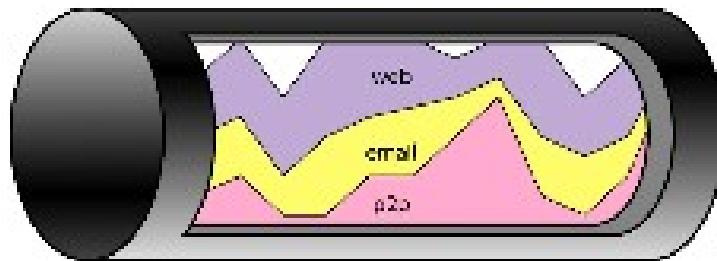


Figure 3 - Unshaped traffic allows peer-to-peer traffic to impede on other legitimate uses

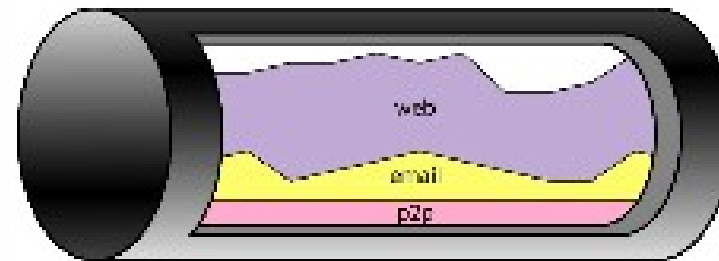


Figure 4 - Shaped traffic limits peer-to-peer to a minimum acceptable level

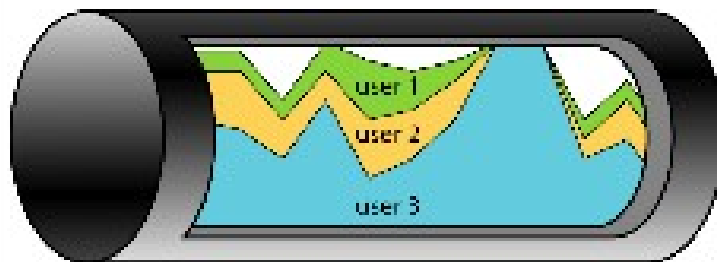


Figure 5 - Unshared traffic means some users can block others' access



Figure 6 - Shared traffic ensures each user receives a fair share of the available bandwidth

Common Problems in Technical Implementation

- Network administration staff are not given a mandate for their work, ie, there is no AUP
- Shortage of trained staff
- Network administration not on Computer science curricula
- Trained staff frequently leave for commercial employment
- Management does not appreciate needs of technical staff

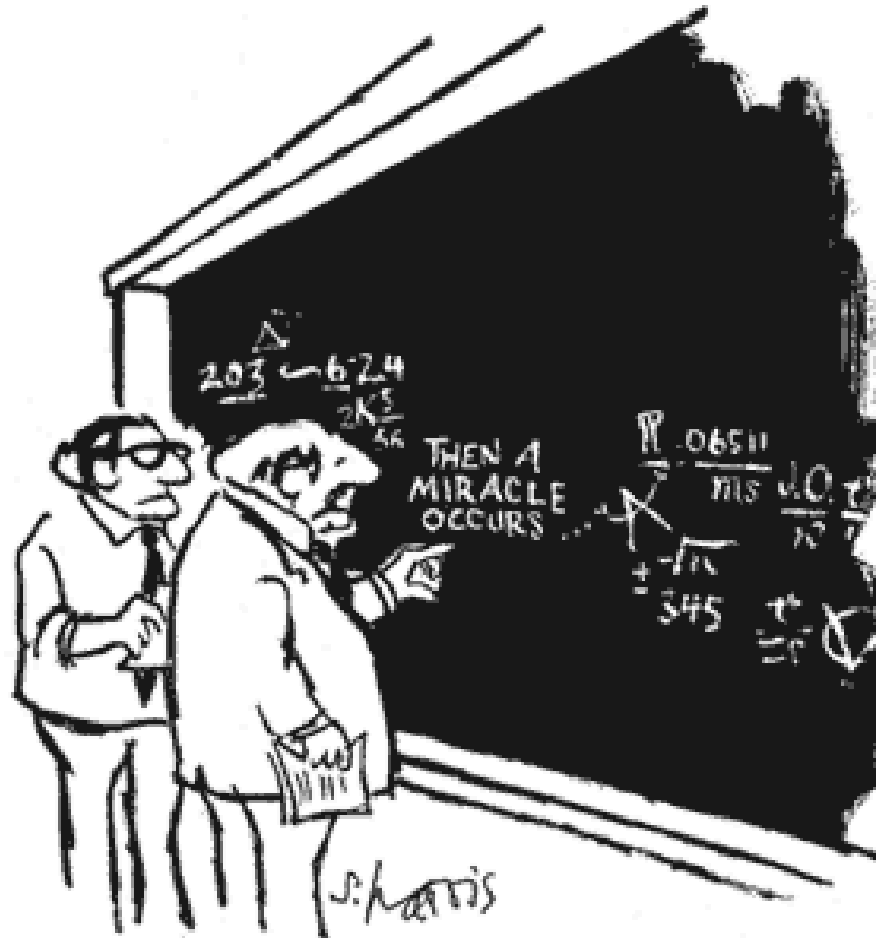
Policy Elements

- Determine and actively **prioritise key traffic** (online resources, journals, institutional email)
- **Limit 'bad' or non-key traffic** (webmail, peer-to-peer)
- **Ensure virus protection**
- **Acceptable Use Policy (AUP)**
- **Educate users** so they know the effects of their online behaviour.

Acceptable Use Policy

- **Defensive approach:** block 'bad' traffic, the rest is essentially treated as neutral
- **Pro-active approach:** block 'bad' traffic, but actively promote core 'good' traffic and limit 'neutral' traffic

User education



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Advocacy

- Costs / Benefits
- Return on investment
- Educational and research mandate
- BMO can give legitimacy to demands for higher bandwidth capacity
- Library is a key stakeholder

Low Bandwidth Web Design

- Websites should be designed so that they work over low bandwidth connections
- Over the last 5 years the average website has become **3 times larger**.
- You can measure the size of web pages with online tools.
- Libraries can tell the publishers that their websites are too big!