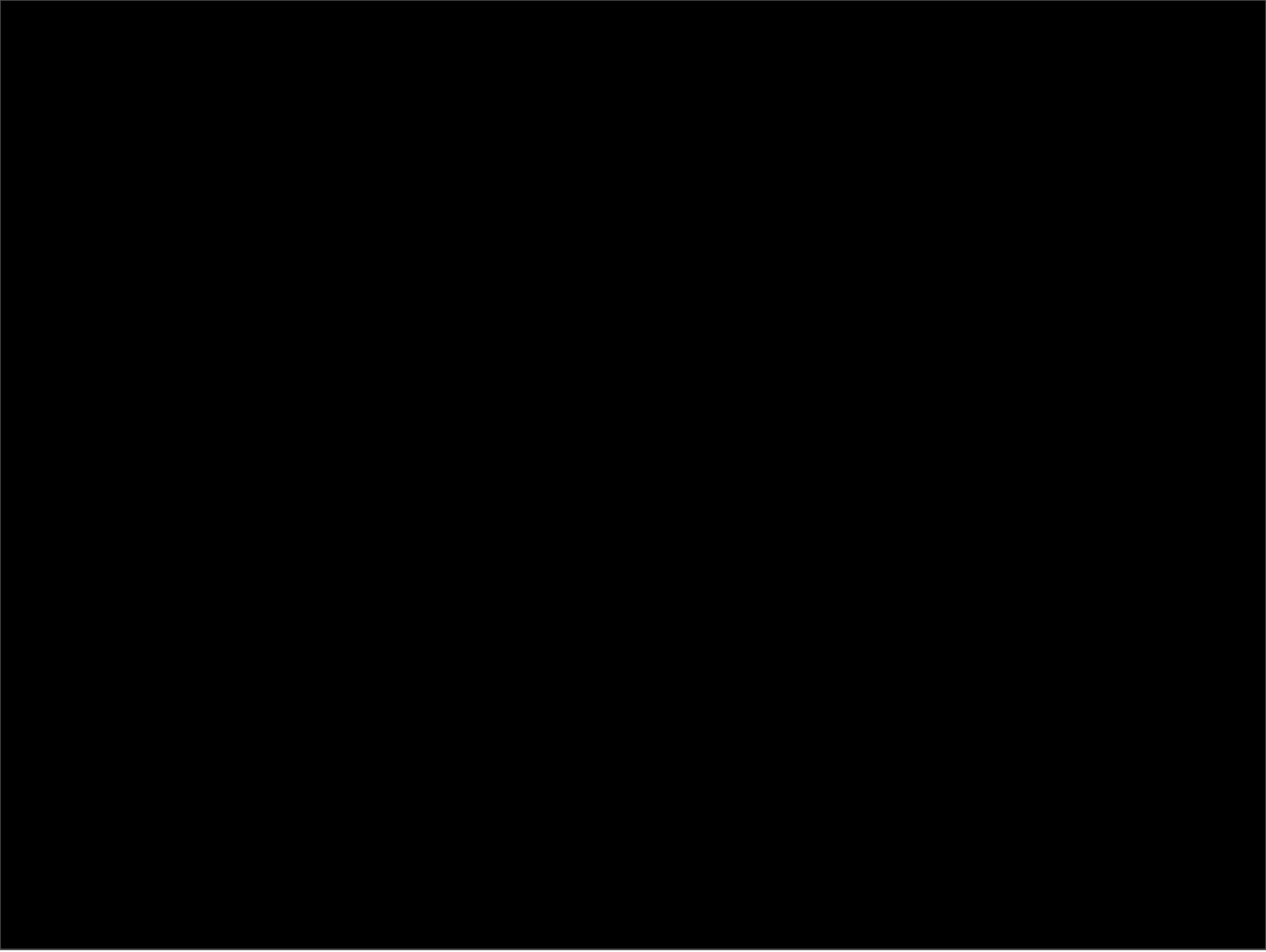

A Case Study:

Victoria University

Traffic Management and Internet Billing

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Agenda

- Where did it all begin?
- The Challenge - Fair and Equitable Internet
- Unexpected Challenges - New Technologies
- Observations
- Building a Solution - Traffic Management
- Building a Solution - Internet Billing
- Achievements and Failures
- Plans for the Future

Where did it all begin?

- Basic Internet Billing was done with in-house tools, using IP addresses.
- The system was fundamentally unfair - the Faculty or Department paying for a computer lab was often not the one whose students were using it.
- The ITS Department and Library incurred huge bills for running Open Access Labs.
- Traffic Shaping was only applied at a very basic level.

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The Challenge - Fair and Equitable Internet

- The need for a **fair** and **equitable** distribution of costs for Internet usage between Faculties.
- The emphasis was on changing the user's behaviour, not restricting their access.
- Greater control was needed over traffic shaping policies, per individual as well as overall.
- Above all, an escape was needed from reliance on IP addresses as the identifier of consumers.

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Unexpected Challenges - New Technologies

- Wireless was slow to catch on at first, then exploded.
- Grants for new computer labs and adoption of Citrix technology led to a dramatic growth in the number of users able to go online at once.
- New internet applications caused incredible changes to internet usage patterns
  - Skype
  - Youtube
  - MySpace

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Observations - Appropriate Use

- Despite an Appropriate Use policy, its estimated that only around 30% of traffic was actually of an Academic or work related nature.
- Flash Memory - students would often bring in 1GB flash memory drives and use them to get large downloads they wanted to take home.
- Laptops became used as a "free for all" - students and even staff seemed to develop a perception that if they were using their personal laptop, then they could use the Internet as they would normally use it at home.

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Observations - Youtube

- The arrival of Youtube coincided with Victoria University finally saturating its Microwave link to AARNet.
- The problem was compounded - when users found the video was slow to load, they would often open ten more tabs in the browser with new videos to load while they waited!!!
- To make matters worse, students would email one another video links, and during lunch periods and other peak times, traffic would spike dramatically, drowning the Internet link with HTTP web browsing requests.

Observations - Traffic Growth

- No matter what traffic policies were applied, Internet usage increase was always at least 20% to 25% per annum.
- In the year of Youtube and Myspace, this growth rose to more than 40% per annum.

Solutions - Traffic Management Stage One - Analysis

- Analyzing traffic uncovered some interesting facts.
  - Typically over 70% of traffic was not of an obviously academic or work-related nature - browsing sports and entertainment sites, movie trailers, games, etc.
  - October was typically 25% greater bandwidth usage than the average in the rest of the year.
  - With Peer 2 Peer applications already blocked, over 75% of traffic was identified as HTTP web browsing.
  - Less than 5% of traffic was SMTP, however there were large spikes in SMTP traffic when large emails arrived.

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Solutions - Traffic Management
Stage Two - Policies

- Initial policies were applied overall, and on a per-workstation basis.
  - 1.5 Mbps maximum per workstation, for HTTP and FTP.
  - No external IRC or Peer 2 Peer applications (firewalled at Layer 7). Blocking IRC reduced virus traffic from bot-nets.
  - Global maximum of 2Mbps for SMTP traffic.
  - Prioritization of latency-sensitive protocols like SIP and videoconferencing.
- Prioritization vs. Shaping - business-critical traffic goes first.

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Solutions - Internet Accounting

- Encouraging Personal Responsibility for Internet usage.
- User Provisioning - Traffic shaping policies for specific users and user groups.
- Integration with the NOS - Novell and Active Directory.
- Student quotas - 80 Mb per month (now 200 Mb).
- Even without charging students, usage patterns began to change.

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Achievements and Failures

- The need to upgrade the Internet link was successfully postponed by over two years through traffic shaping.
- The issue of charging students was and is a highly political topic - the project was forced to leave this "hot potato" alone.
- Collecting user account data from HR and Student Systems proved extremely difficult - it is still an on-going effort to solve some issues in this area (political and technical).

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Achievements and Failures

- Finally, this year executive management is warming to the idea of charging student traffic to their department or faculty.
- Quotas and shaping on volume of usage has encouraged students to be more responsible in their Internet usage.
- "Captive Portal" for Internet access has not been implemented yet, but single-sign-on with Novell Directory Services has been very effective.

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Future Plans

- Start using BGP to track On-Net / Off-Net shaping and accounting.
- Single sign on for Wireless, VPN, Active Directory, etc.
- Show the user their traffic usage User Ranking (eg "You are in the top 2%").
- Captive Portal - disallow all Internet access for users that aren't logged in.

Future Plans

- More reports on usage - top users, "non-user traffic" such as servers, email, etc.
- Delegation of quota control to individual faculties and departments.
- Prepaid charging model.
- Real-time quotas, enforced within seconds.