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# Optimal management and use of critical resources in campus networks: bandwidth management and optimisation

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# Background and context

- International Network for the Availability of Scientific Publications
  - UK based charity working to support access to, use and production of scientific information to support research and education
  - Interest in bandwidth due to central role of bandwidth in the information environment
- Organised and supported research and best practice in bandwidth management in African (+other) university and research sectors
- Organised and enabled capacity development and training activities in these areas since 2003
  - 35 workshops, 600+ trainees, 17 countries
  - Technical training, policy development, strategic management
  - Advocacy and lobbying

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# Bandwidth management and optimisation (BMO)

- Bandwidth is a resource that is...
  - Limited, in high demand, expensive, of high value
  - RENs will change this but not in the short term
- Existing bandwidth is often not managed [effectively]
  - 59% of institutions do not monitor or manage bandwidth at all
    - » African Tertiary Institutions Connectivity Survey 2006
- Technical management requires skills, knowledge, and resources
- Needs to be supported at a strategic management and policy level
- Technically BMO is straight forward in many respects
  - Big impacts on network usage and efficiency are possible with well established approaches
  - Totally original approaches are rarely required

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# Examples of BMO

- Good security and effective anti-virus practices
  - Configure the network to avoid open relay hosts and open proxies
- Use the network to locally manage upgrades and updates
- Extensive network traffic monitoring and analysis
  - Track and report on all relevant aspects of the network, bandwidth and Internet usage
  - Make sure all user activities can (if necessary) be traced
- Proxy servers and local caching DNS servers
- Consider implementing a bandwidth manager product: bandwidth priority to certain protocols or network segments, and to throttle others

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# Examples continued

- Discourage and control certain types of ‘peer to peer’ networking
- Implement content filtering to block undesirable web content
- Provide locally based email services and control Web based international mail services
- Consider outsourcing and mirroring options
- Train all users to use the Internet safely and efficiently
- Quotas or charging for bandwidth may help encourage users to use bandwidth sparingly
- User authentication

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# Strategic decisions for bandwidth management

- Required to maximise the impact of technical approaches (which are not sufficient alone)
- Strategic management = an approach that connects the management of the bandwidth as tightly as possible to institutional objectives, and is willing to sacrifice the lesser good for the greater
- Developing a framework in which qualitative AND quantitative traffic management approaches can be used
- Move from defensive to strategic bandwidth management

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# What is the [improved] network for?

- Why are we concerned with bandwidth/network access?
- Why does my organisation need Internet connectivity?
- Why bother setting up a REN?
- What will the REN's services and improved network connectivity be used for?
- What are the answers to these questions and how high are they as priorities?

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# Roles for RENs in BMO?

- Network monitoring and analysis
  - Supporting member organisations on set up and analyse
- Network services
  - Centralised caching
  - Email services
  - Hosting and negotiations
- Bandwidth management advisory services
  - Advisory and technical services to members
  - Identifying and sharing best practice
  - Providing technical support, training and solutions
  - Role for UK type Bandwidth Management Advisory Service (BMAS)?
    - <http://www.ja.net/services/advisory/janet-bandwidth-management-advisory-service.html>
- Support for policy development and strategic management
- Enforcement (?) of best practice or minimum standards

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# NREN strategic bandwidth planning meeting

- Discussion and planning with selected participants; 6 NRENs, UbuntuNet Alliance, AfNOG, others...
- Mapping what needs doing now in terms of BMO and in particular the role of NRENs
  - Strengthened policy and management environments at institutional and national levels
  - Technical skills capacity building at all levels
    - *Technical competencies mapped and updated*
  - Improved ICT Leadership at institutional level
  - Strengthened RENs and their services
- Technical training capacity not as high a priority as policy and management development

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# KENET example

- Provision of network access via KENET
- Complaints of poor service/connectivity
- Assistance with setting up powerful campus wide caching solution
  - Very positive effect in terms of optimisation [40-73% hit ratios]
- “Good” connectivity still not having an effect at the end user level [2.3Mb/960Kbps = 5kbps per networked computer]
- Institution unable to solve the problem
- KENET analysis and monitoring
- Problem identified as single user (sys-admin) bypassing the cache resulting in usable bandwidth of 1.2kbps per computer
- Approx \$4,000 worth of bandwidth wasted/lost before this was stopped
- The capacity of KENET stopped this – what would the impact on the REN be without that capacity? What would the impact on the institution be without that capacity?

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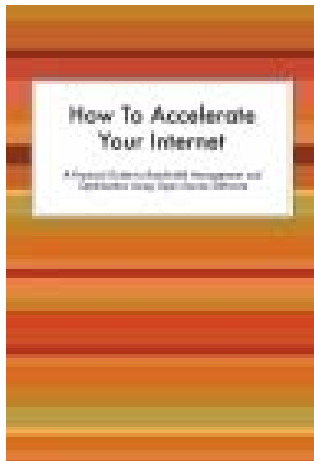
# Possible future developments

- Core capacity requirements to ensure QoS at the REN level
  - Technical, administrative and policy staffing capacities
- What more can the REN offer to strengthen its members (and itself)?
  - Shared technical resources (staff and equipment), provision of services, delivery of training and staff development
- Collaboration between RENs on these issues
- Regional bandwidth advisory service
  - JANET Bandwidth Management Advisory Service
- Bandwidth and network management will always be required regardless of available bandwidth
  - What is needed now and what is likely in the future?

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# Thank you

Further information on bandwidth management and optimisation:



<http://www.inasp.info/training/bandwidth/>  
See also: <http://bwmo.net/>