

Loughborough University



**Networking in a Large Enterprise**

**Matthew Cook**  
Network & Security Manager  
Loughborough University

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Loughborough University

**A bit about myself...**

- Network & Security Manager at Loughborough University
- Team of ten IT Professionals
- Worked at Loughborough for 9+ years
- JANET(UK) Trainer
- Security Researcher



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Loughborough University

**Super JANET Backbone**



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### Regional Networks



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### The Wider Internet



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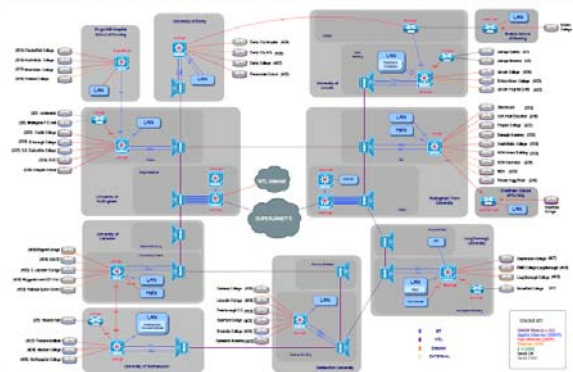
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### EMMAN



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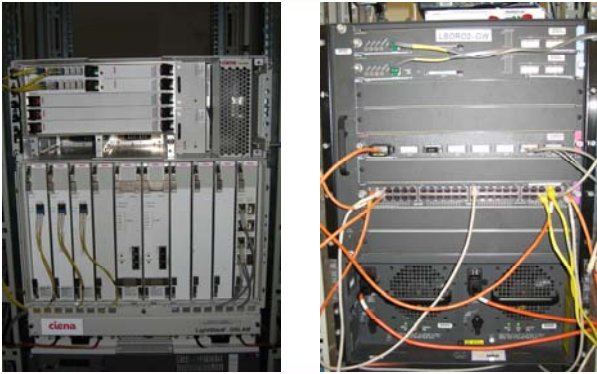
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In real life



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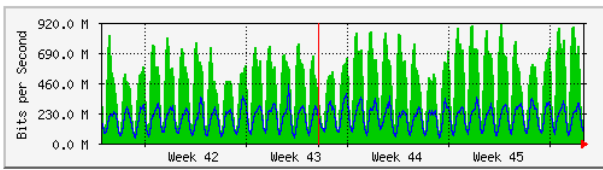
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JANET Traffic

'Monthly' Graph (2 Hour Average)



Max In:916.2 Mb/s (9.2%) Average In:462.7 Mb/s (4.6%) Current In:133.1 Mb/s (1.3%)  
 Max Out:451.7 Mb/s (4.5%) Average Out:196.0 Mb/s (2.0%) Current Out:99.8 Mb/s (1.0%)

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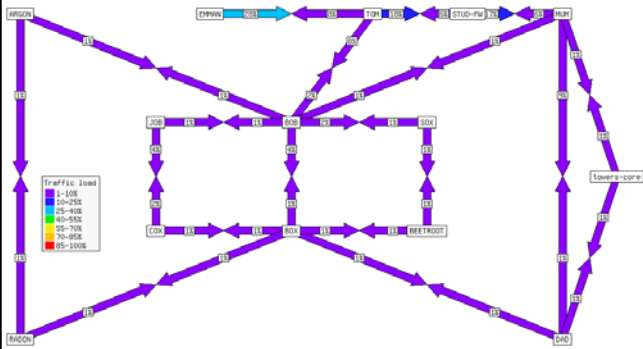
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Lboro Topology



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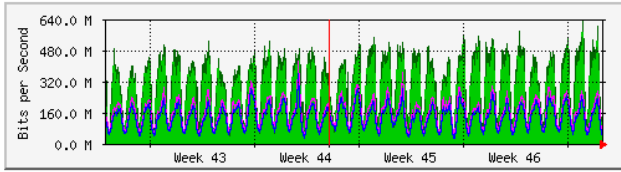
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**Lboro Traffic**

**'Monthly' Graph (2 Hour Average)**



	Max	Average	Current
In	637.0 Mb/s (63.7%)	279.2 Mb/s (27.9%)	73.8 Mb/s (7.4%)
Out	419.0 Mb/s (41.9%)	133.4 Mb/s (13.3%)	50.7 Mb/s (5.1%)

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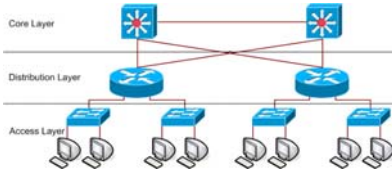
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**Networking Models**

- Most organisations use the three layer hierarchical network model or a model based on a merged core and distribution layer.




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**Access Layer**

- Traffic Sniffing
  - Shared Ethernet
  - Macof
  - Switches turned into hubs
- MAC Address filtering
  - Network Access
  - Prevention of MAC/CAM Table flooding
- DHCP Snooping
  - Rogue DHCP Servers
  - Wireless Base Stations
- Port Shutdown
  - Remote Disconnection
  - Multiple machines and hubs

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Fault Tolerance and Load Balancing

- Network Devices with 24/7 availability
  - Twin power supplies
  - Twin supervisor cards
  - Replaceable chassis components
- Network Level
  - Redundant devices
  - Spanning Tree
  - Hot Standby Routing Protocol
- Load Balancing
  - Less of an issue
  - Session Cookies

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Network Equipment Store

- Warranty
  - Limited Life Time
- Stock
  - One switch to every 40-50 switches
  - Interconnects
  - GBICS
  - Cables
- Wireless/IP over Power




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Network Management




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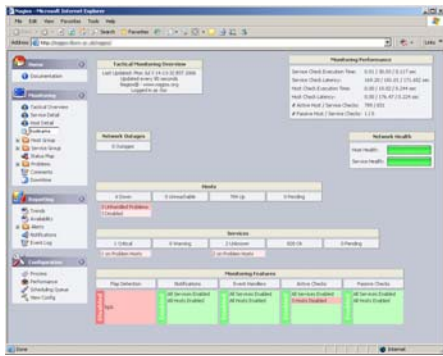
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### Network Management



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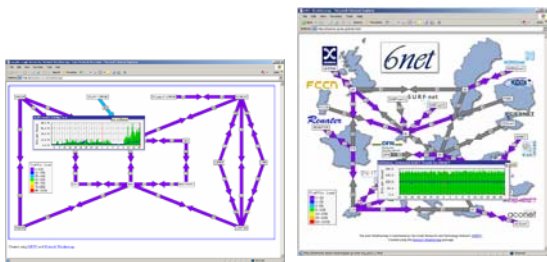
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### Network Management



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### JANET Netsight



Provides an easy-to-understand view of the status and performance of the JANET network

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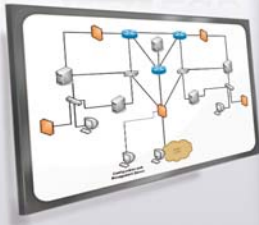
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JANET NetLab



- Core of JANET
- State of the art
- Industry standard
- Course support
- VMware ESX
- VPN connection
- Firewalls
- IPv6
- Multicast

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Network Implications

- Is the virtual network secure?
  - Does your IDS/IPS have visibility of the virtual switch?
  - Network probe guest VM?
  - Increased frequency of SSL based attacks
- Expectation that the network can deliver:
  - Speed requirements, does it make sense to virtualise high bandwidth applications?
  - Same IP Everywhere (VMotion)
  - Automated VLAN changes
  - What is the virtual switch, or router?




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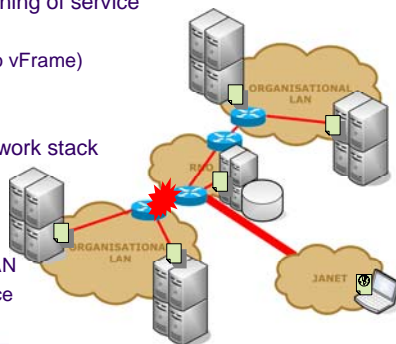
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Futures

- Automated provisioning of service
  - Virtual Machine
  - Networking (Cisco vFrame)
  - Storage
- Complete IPv6 Network stack
- Pervasive Data Centres
  - Organisational SAN
  - Shared VM Service




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**Questions?**  
**Matthew Cook**  
<http://escarpment.net/>

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