
Larging it for the GRID

Big Networking for Big Science

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on behalf of the MB-NG project
<http://www.mb-ng.net/>

Let's go Large

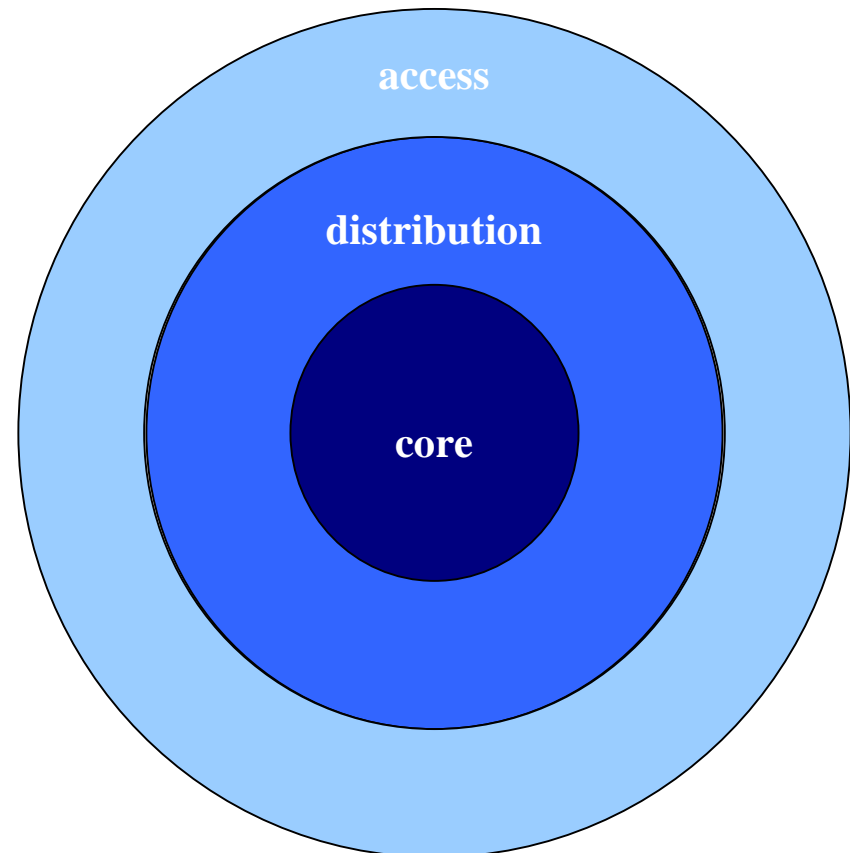
- User in Glasgow wants to access the HGP data
- HGP database:
 - 0.25PB (growing at ~1TB/week)
- SuperJANET4 (SJ4):
 - 10Gb/s backbone (still <2.5Gb/s access in places)
- Extreme case – transfer all of the HGP data
- So, **iff** user gets **all** the SJ4 backbone capacity:
 - transfer of HGP data still takes ~55½ hours!
 - no one else can use the network at all during this time
- **Can't do it!** ☹

So what can we do about it?

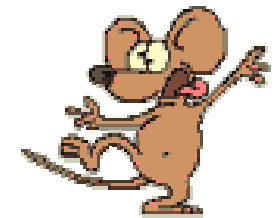
- **Build a new and better network (of course)!**
 - very high capacity (Gb/s \rightarrow Tb/s \rightarrow Pb/s)
 - users can have access from their desktop
 - provide (QoS-)controlled access
- Two broad problems to consider:
 - **control**: *how do we mix different types of traffic and still control the traffic flows in the network sensibly?*
 - **capacity**: *what happens when you run a very high capacity network with very high capacity access links?*
- This talk highlights the **Research** issues:
 - there are also **Operational** issues! (but that's SEP ☺)

Problem: network hierarchy

- Access network:
 - low multiplexing
 - low volume of traffic
- Distribution network:
 - interconnectivity at local level
 - low multiplexing
 - medium volume of traffic
- Core network – backbone:
 - high volume of traffic
 - high multiplexing
- **Different administrative domains**

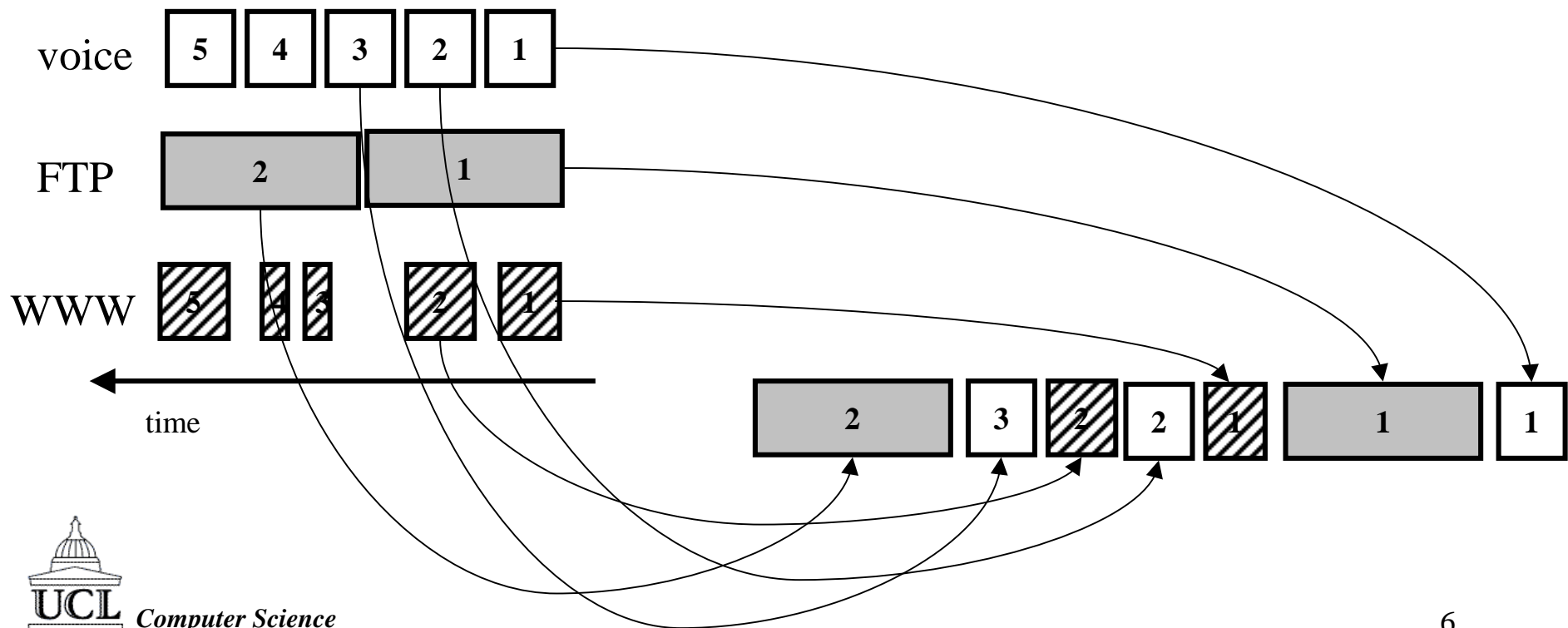


Problem: network traffic profiles



Problem: mixing traffic

- Example – voice, FTP and WWW traffic through a router:
 - 3 input lines: serviced FCFS at a router
 - 1 output line (1 output buffer)



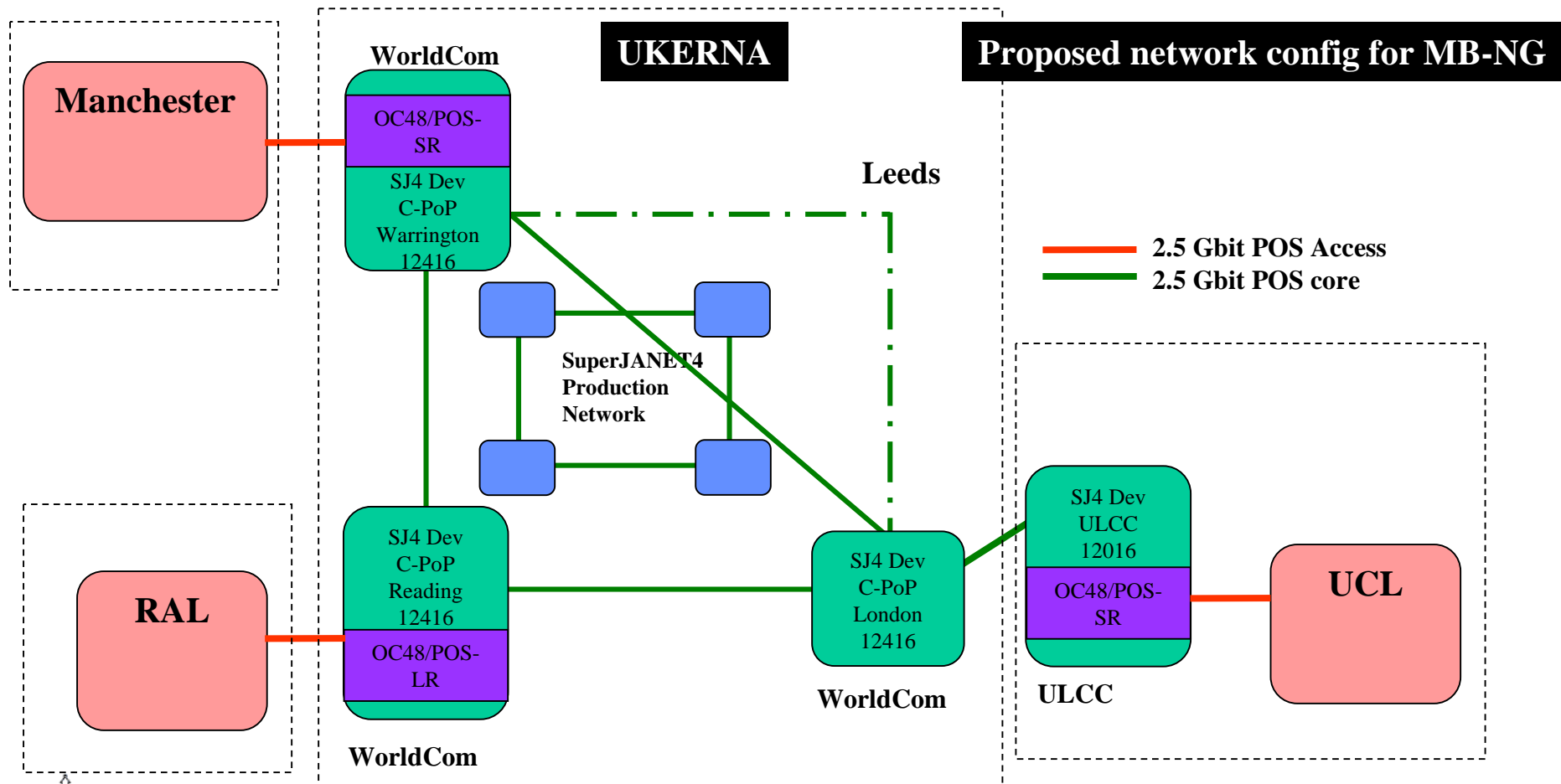
General problems

- Changing research usage:
 - “big science” GRID users: HEP, bio-informatics, etc.
- Changing and (mostly) unpredictable traffic patterns (access and core)
- Changing networking landscape:
 - access speeds vs. core speeds
 - over-provisioning may not cut it in the future
- **Complex system behaviour:**
 - learning curve – technical and operational
 - next generation HE networks (SJ5, SJ6 ...)

Control and capacity: core network

- **MB-NG project (May2002 – Apr2004)**
- <http://www.mb-ng.net/>
- Looking at high-speed QoS provisioning using:
 - DIFFSERV – a class-based QoS system
 - MPLS – traffic engineering
- UKERNA and Cisco are project partners
- Managed bandwidth service for UK academia:
 - site-to-site (possibly end-to-end)
 - **multi-domain**
- **Current state: deploying network components**

MB-NG network



With thanks to R. Hughes-Jones, Manchester HEP

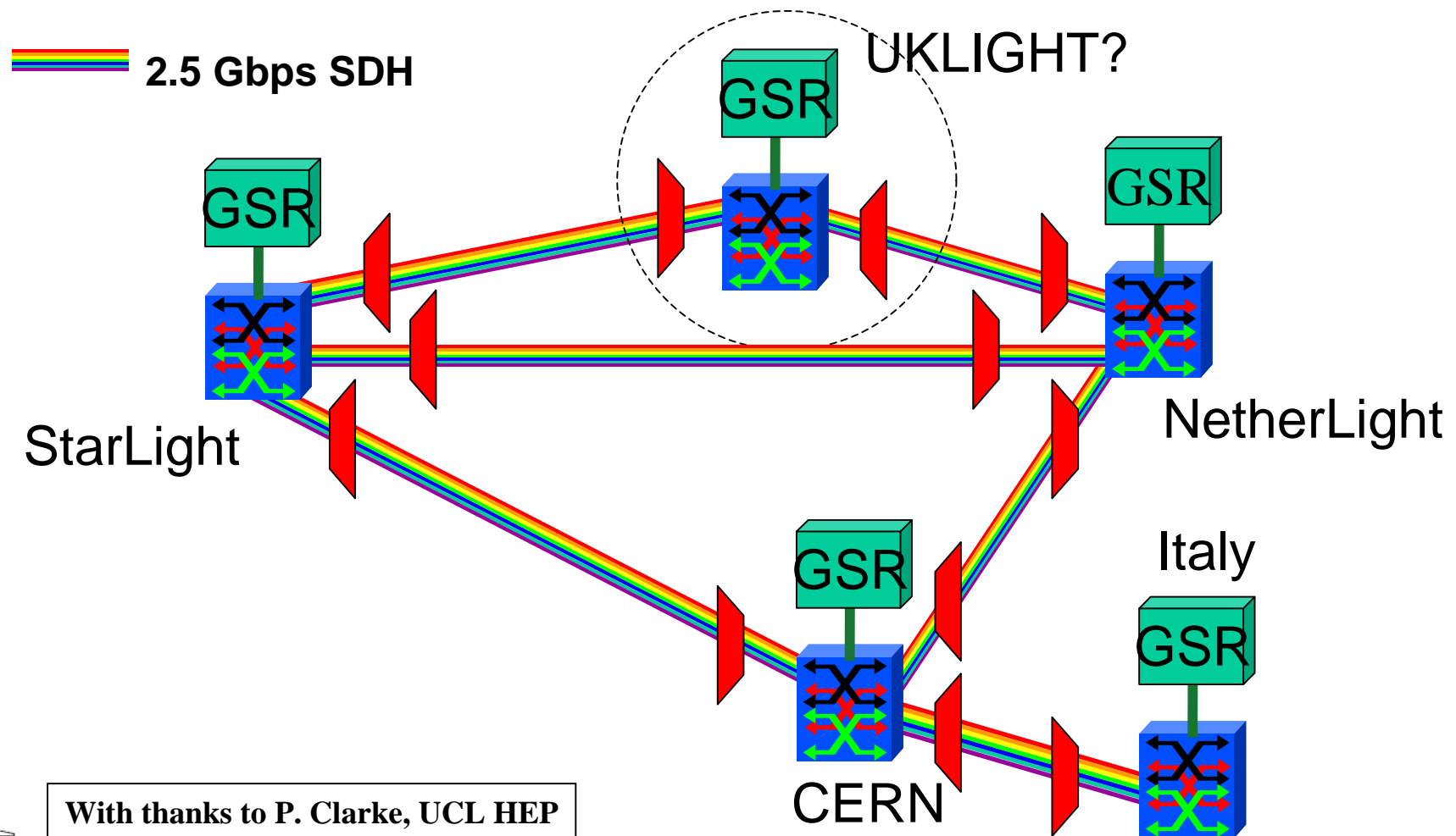
Research issues to be investigated

- Control:
 - demarcation points – administrative domains
 - (signalling protocols)
- Packet handling:
 - classification
 - admission control
 - policing
 - (general problem: increased per-packet processing)
- Measurement and performance analysis:
 - at 1Gb/s, a 40byte TCP ACK is transmitted in $\sim 0.3\mu\text{s}$
 - how do we measure performance and test the network?

International capacity

- **UKLIGHT**
- <http://www.cs.ucl.ac.uk/research/uklight/>
- **Provide an optical networking infrastructure for network systems research in the UK**
- Very-high speed (multi-gigabits ++)
- International connectivity
- Current gang includes:
 - UKERNA, UCL, Cambridge, Aston, Brighton, CLRC, Manchester, Southampton, Lancaster
- **Needs funding ☺**

UKLIGHT: international links



With thanks to P. Clarke, UCL HEP



Acknowledgements

- Many people involved with MB-NG:
 - <http://www.mb-ng.net/>
- UKLIGHT:
 - <http://www.cs.ucl.ac.uk/research/uklight/>
- Promoting the case for **large GRID** networking activity:
 - computer science, electronic engineering, photonics, high-energy physics, network services

Questions?