



What Can You Do With All This?

One Use Case

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Virtual Observatory

- ◆ Astronomy has many archives, databases and catalogues, which are:
 - Heterogeneous,
 - Geographically dispersed,
 - Have their own idiosyncratic interfaces.

- ◆ The Virtual Observatory is a way of accessing these archives remotely from a uniform interface.

- ◆ Various projects to implement: NVO, AVO etc.

Virtual Observatory

- ◆ *Computer Networks for the AVO.*
- ◆ Much of the document was influenced by workshop.
- ◆ Measured bandwidth to remote sites,
 - within UK and overseas,
 - using traceroute and pchar.
- ◆ Timed file transfers with FTP, SCP and accelerators.

Recent and Planned Catalogues

<u>Catalogue</u>	<u>Date</u>	<u>Objects</u>
The HST Guide Star Catalog	1990	$\sim 2 \times 10^7$
ROE/NRL Object Catalogue of the Southern Sky	1992	$\sim 5 \times 10^8$
The SuperCOSMOS Southern Sky Survey	2001	$\sim 1 \times 10^9$
WFCAM	2005	$\sim 1 \times 10^{10}$
VISTA	~ 2010	$\sim 1 \times 10^{11}$

Size of Modern Archives

	<u>SuperCOSMOS</u> <u>Sky Survey</u>	<u>WFCAM</u>	<u>VISTA</u>
Object catalogues	~ 1	~10	~ 100
Bulk (or pixel) data	~10	~ 100	~ 1000

All values are in Tbyte.

- ◆ Wide Field Infra-red Camera.
- ◆ Survey instrument in UKIRT in Hawaii.
- ◆ Will survey a significant fraction of the sky.
- ◆ Recently started routine observations.
- ◆ Will continue in operation for some years.

- ◆ Generate about 200 Gbyte/night.

- ◆ These data are:
 - processed in Cambridge,
 - archived in Edinburgh.

- ◆ Transferred:
 - from Hawaii to Cambridge by courier/tape,
 - from Cambridge to Edinburgh across SuperJanet.

◆ Eckhard Sutorius made a series of tweaks to improve transfer rate:

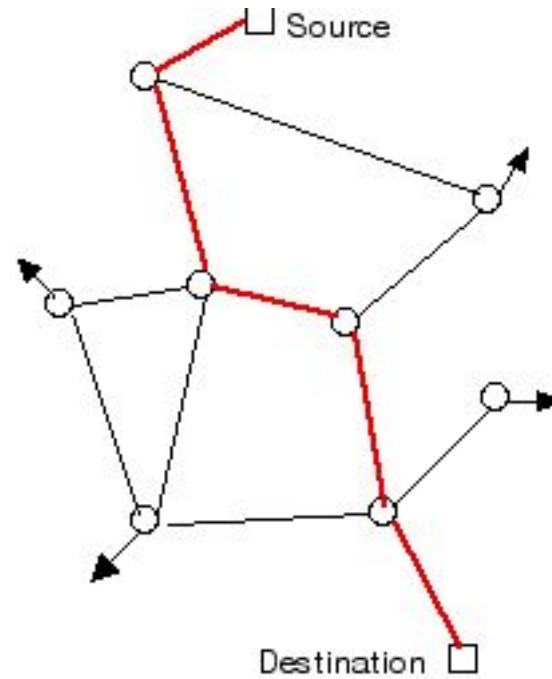
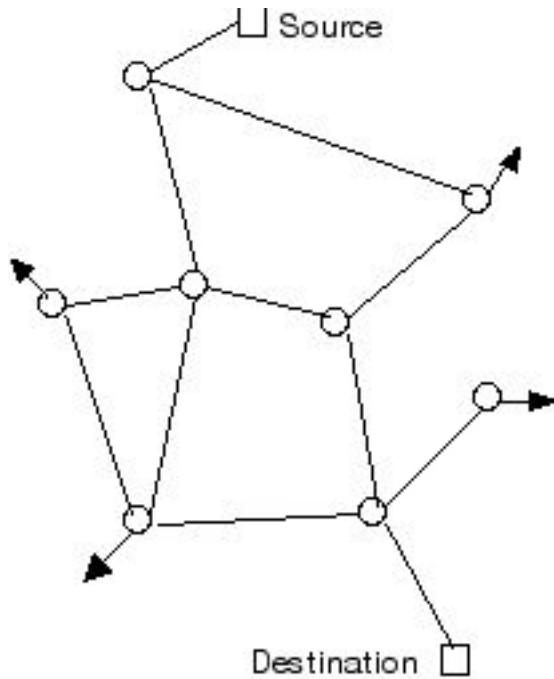
- moved local host to a faster part of the LAN,
- adjusted TCP/IP tuning parameters,
- experimented with FTP, SCP, Axel FTP accelerator and scripts to act as accelerators with SCP,
- got up to a transfer rate of ~12 Mbyte/sec,
- at this rate, can transfer 200 Gbyte in about 5 hours, so can keep up.

- ◆ Optimal configuration for transfer with scp:
 - TCP/IP parameters adjusted,
 - SSH-1,
 - compression level 3,
 - blowfish encryption,
 - an accelerator with 8 threads simulated.

- ◆ But these results are not generally applicable,
 - eg. depend on mix of file sizes.

- ◆ Exploitation of Switched Light-paths for e-Science Applications.
- ◆ Investigate the use of switched-circuit networks and demonstrate that they offer concrete advantages in real applications.
- ◆ Principal Investigator: Prof. Peter Clarke (NeSC).
- ◆ Uses the UKLight network.

Packet-Switched and Circuit-Switched Networks



- ◆ UK contribution to international effort to investigate and develop circuit-switched networks,
- ◆ 10 Gbit/sec connections from hub in London to StarLight and NetherLight,
- ◆ a collection of 1 Gbit/sec links from London to selected points in the UK,
- ◆ Provides dedicated, switched-circuit connections for approved projects,
- ◆ Managed by UKERNA and funded by HEFCE.

◆ Exploitation sub-projects:

- high-energy physics,
- eVLBI,
- RealityGrid,
- E-Health.

◆ Capability development:

- control plane software,
- protocol development

Control Plane Software

- ◆ software to create circuits on demand,
- ◆ not just done in real time,
 - allow reservations in advance,
- ◆ not writing from scratch,
 - modification of the NRS system developed by Saleem Bhatti *et al.* of UCL,
- ◆ largely a programming exercise (in Java),
- ◆ but much of it is informed by the basic networking material in NFNN.

Contact Information



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