# How to divide ~~4000~~ *4612* computers by ~~5~~ staff *4.2* and get a working network


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*Head of networking and systems*

*Brunel University Computing Service*

# The size of the task

*22100*

~~18000~~ registered users

*8100*

~~4200~~ registered machines on network

50+ ‘servers’

*1007GB = 1TB*

~~420~~GB of managed filestore

Four sites

*160000*

~~90000~~ mail messages per week

*1998*

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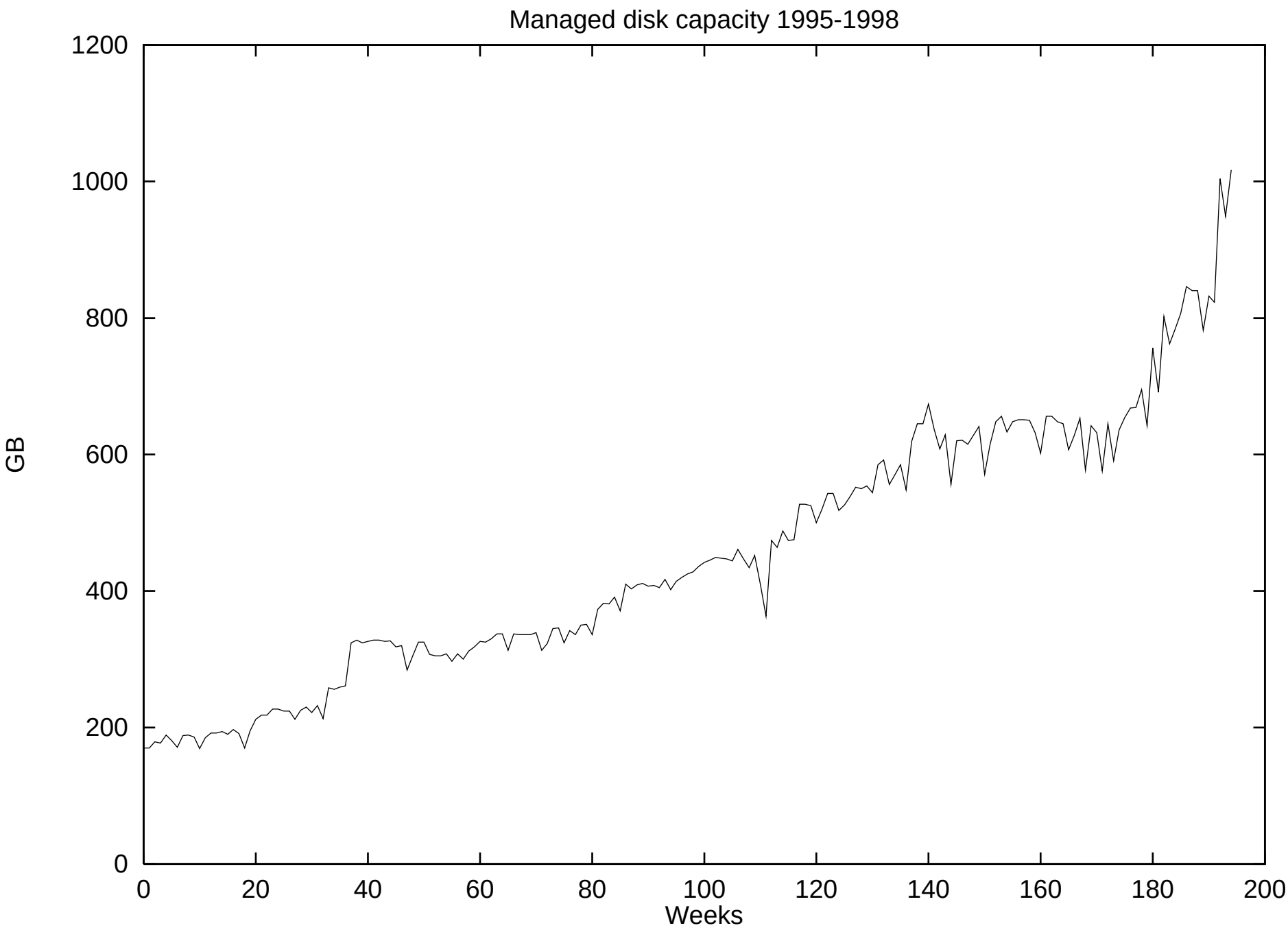
**December ~~1996~~**


Managed disk capacity 1995-1998
GB
Weeks
0
200
400
600
800
1000
1200
0
20
40
60
80
100
120
140
160
180
200

# Staff

16 User Support and Software Support

5 Systems

5 PC Support

3 Network Support

5 Administration

10 Operations and Reception

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# Strategy

Network Everything

Simplify the problem

Design for the large scale

Automate routine tasks

Use remote control - not shoeleather

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# The Network

IP on Ethernet (10M and 100M)

~~60~~ *75*+ Subnets

~~7~~ *6* Routers and many backup paths

Internet via SuperJANET

Manage namespace with DNS

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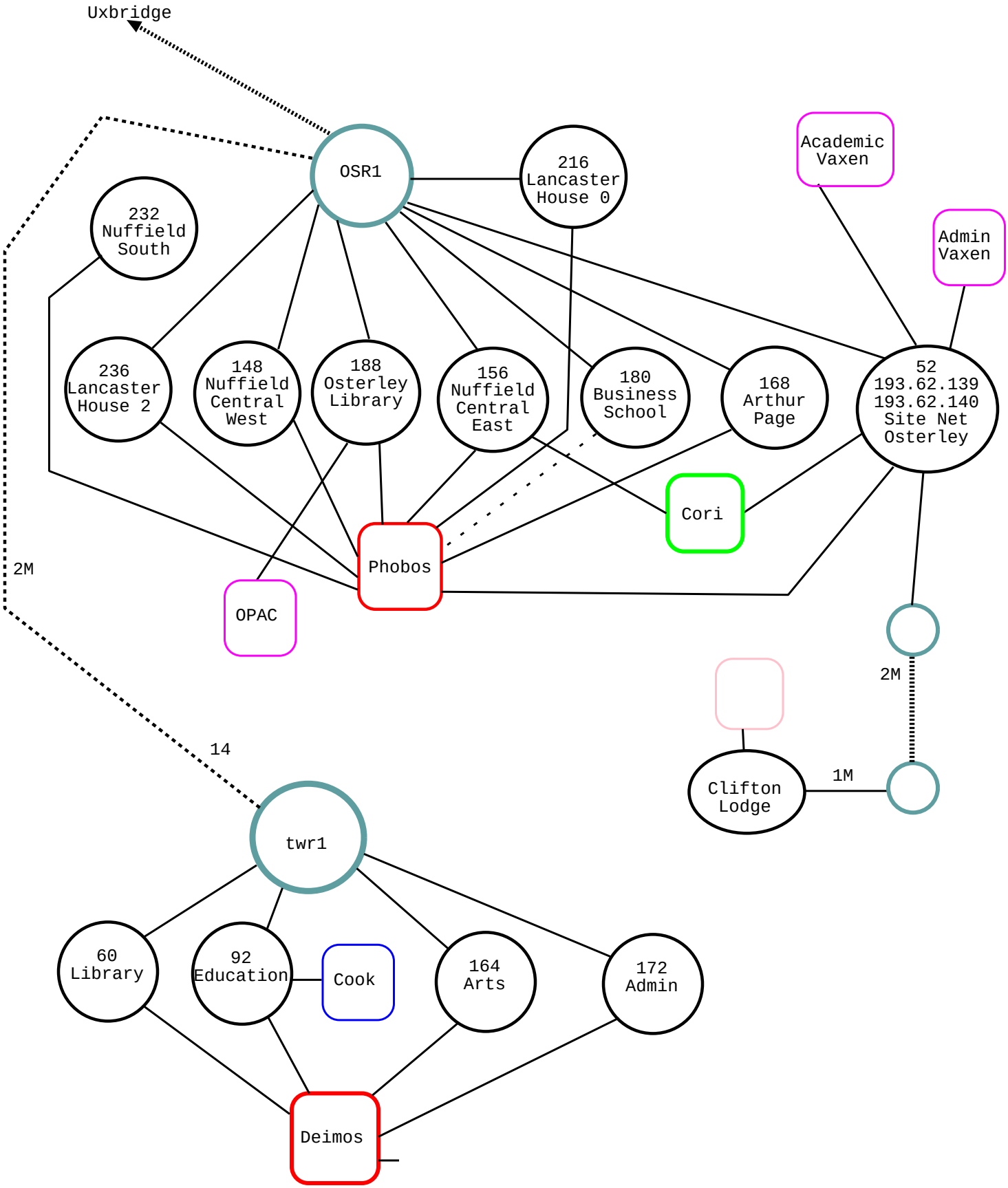
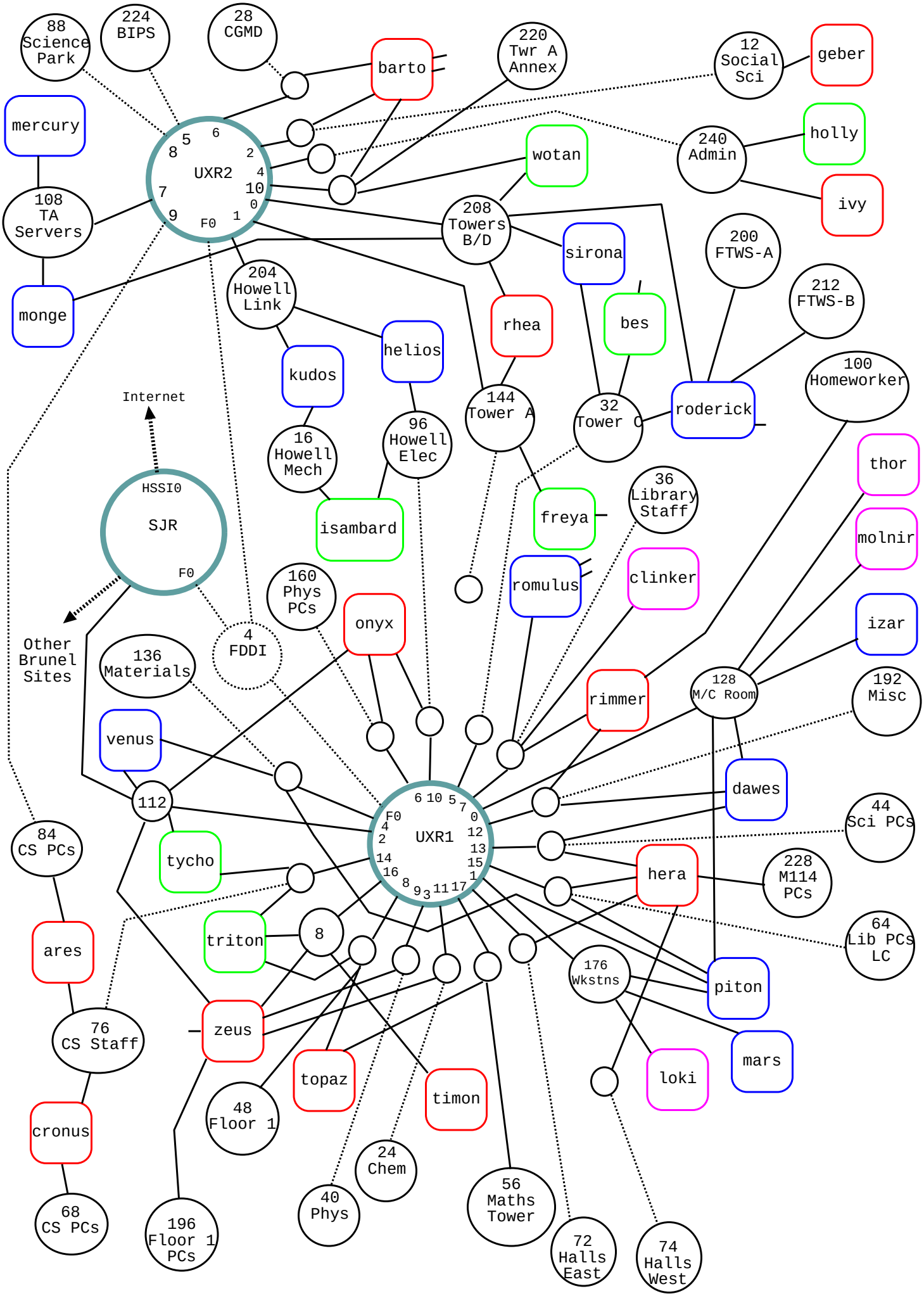


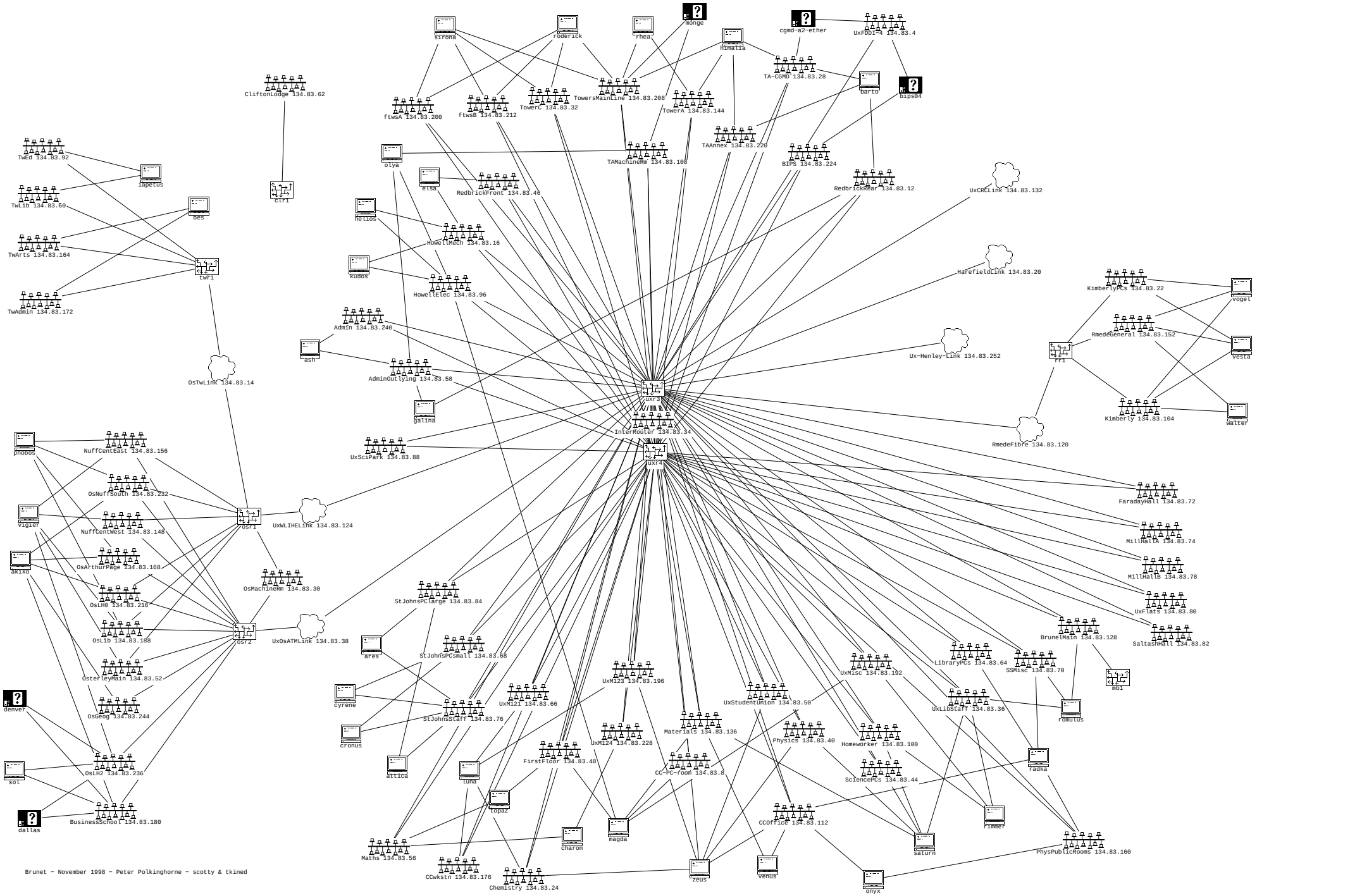

Osterley and Twickenham Sites

October 1996

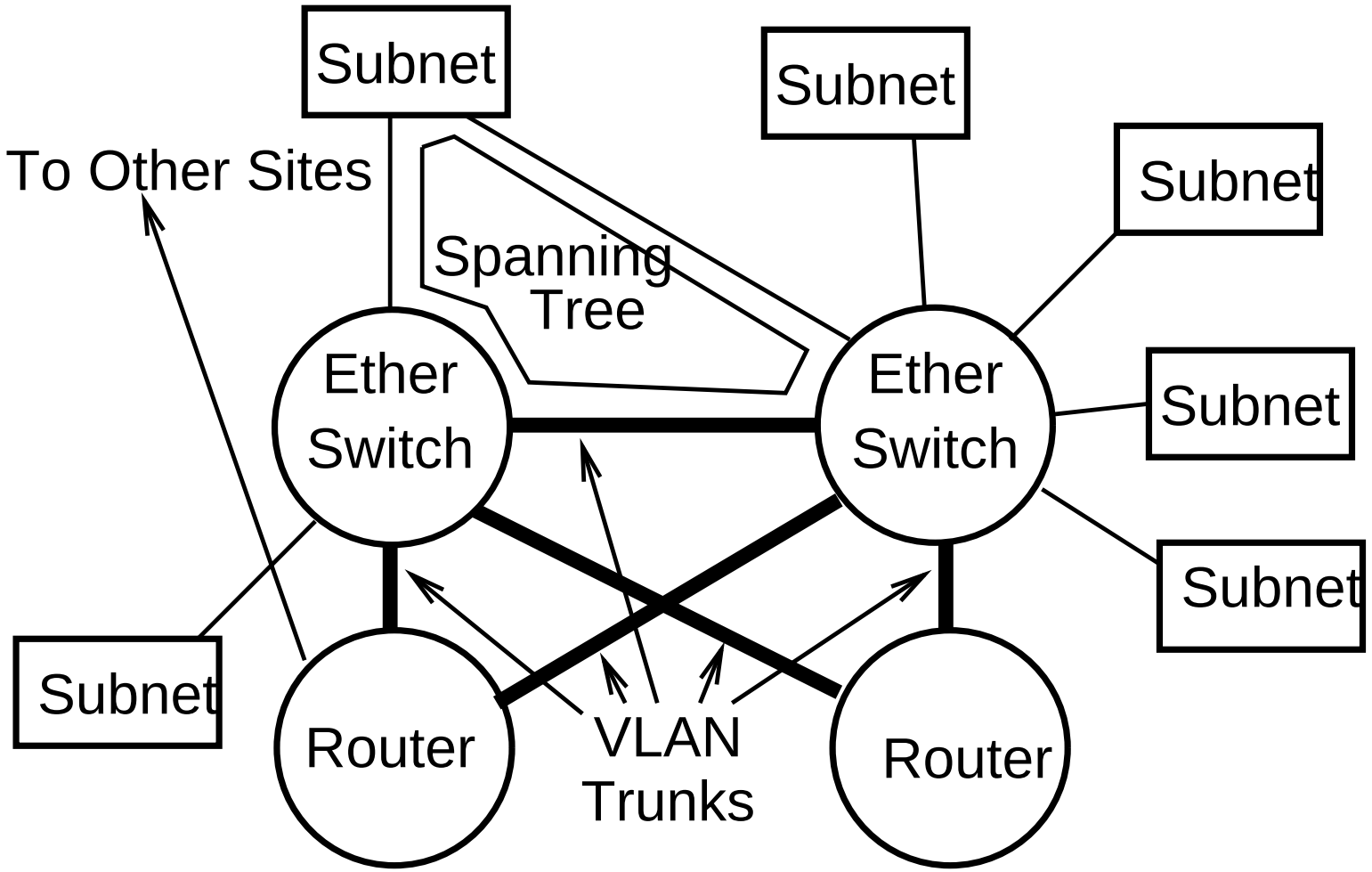



# Uxbridge Site

October 1996


CliftonLodge 134.83.62
ctr1
TwEd 134.83.92
iapetus
TwLib 134.83.60
bes
TwArts 134.83.164
twr1
TwAdmin 134.83.172
OsTwLink 134.83.14
phobos
NuffCentEast 134.83.156
OsNuffSouth 134.83.232
vigie
NuffCentWest 134.83.148
osr1
UxWLIHELink 134.83.124
akiko
OsArthurPage 134.83.168
OsLH0 134.83.216
OsMachineRm 134.83.30
OsLib 134.83.188
osr2
UxOsATMLink 134.83.38
OsterleyMain 134.83.52
denver
OsGeog 134.83.244
OsLH2 134.83.236
sol
dallas
BusinessSchool 134.83.180
Brunet – November 1998 – Peter Polkinghorne – scotty & tkined
sirona
roderick
rhea
monge
cgmd-a2-ether
UxFDD1-4 134.83.4
mimatia
TA-CGMD 134.83.28
barto
bips04
ftwsA 134.83.200
ftwsB 134.83.212
TowerC 134.83.32
TowersMainline 134.83.208
TowerA 134.83.144
TAAnnex 134.83.220
BIPS 134.83.224
olya
TAMachineRm 134.83.108
etsa
RedbrickFront 134.83.46
RedbrickRear 134.83.12
helios
HowellMech 134.83.16
kudos
HowellElec 134.83.96
UxCRCLink 134.83.132
HarefieldLink 134.83.20
Admin 134.83.240
ash
AdminOutlying 134.83.58
galina
Ux-Henley-Link 134.83.252
KimberlyPCs 134.83.22
voget
RmedeGeneral 134.83.152
Vesta
frr1
Kimberly 134.83.104
walter
RmedeFibre 134.83.120
uxr3
InterRouter 134.83.34
uxr4
UxSciPark 134.83.88
FaradayHall 134.83.72
MillHallA 134.83.74
MillHallB 134.83.78
UxFlats 134.83.80
SaltashHall 134.83.82
BrunelMain 134.83.128
mb1
LibraryPCs 134.83.64
SSMisc 134.83.70
romulus
UxMisc 134.83.192
UxLibStaff 134.83.36
radka
UxStudentUnion 134.83.50
HomeWorker 134.83.100
Physics 134.83.40
Materials 134.83.136
SciencePCs 134.83.44
CC-PC-room 134.83.8
CCOffice 134.83.112
saturn
rimmer
PhysPublicRooms 134.83.160
onyx
venus
zeus
UxM123 134.83.196
UxM121 134.83.66
UxM124 134.83.228
FirstFloor 134.83.48
magda
charon
Chemistry 134.83.24
CCwkstn 134.83.176
Maths 134.83.56
topaz
luna
attica
StJohnsPClarge 134.83.84
StJohnsPCsmall 134.83.68
StJohnsStaff 134.83.76
ares
cyrene
cronus

# Site Network Topology: Link Layer

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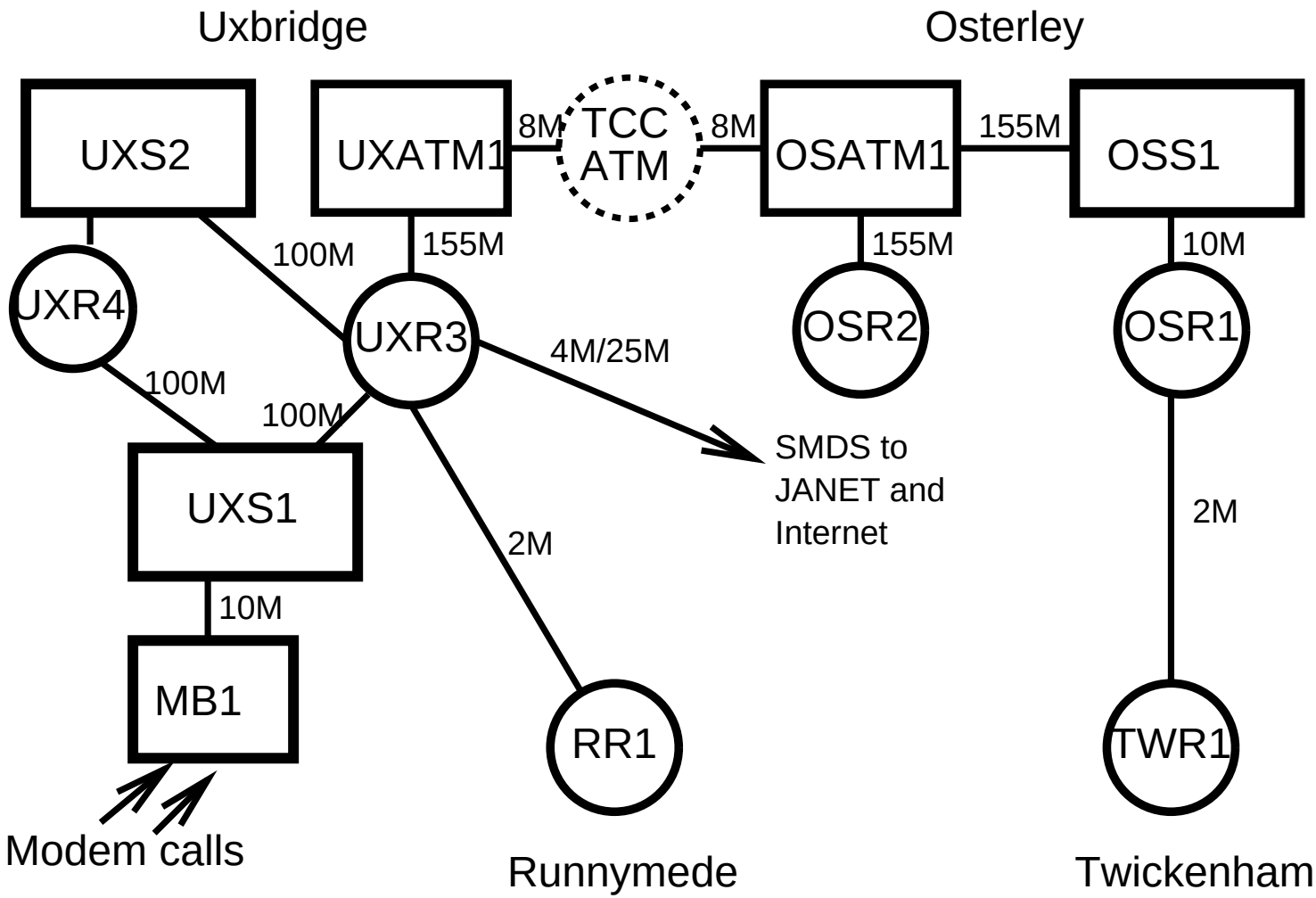
# Inter-site connections

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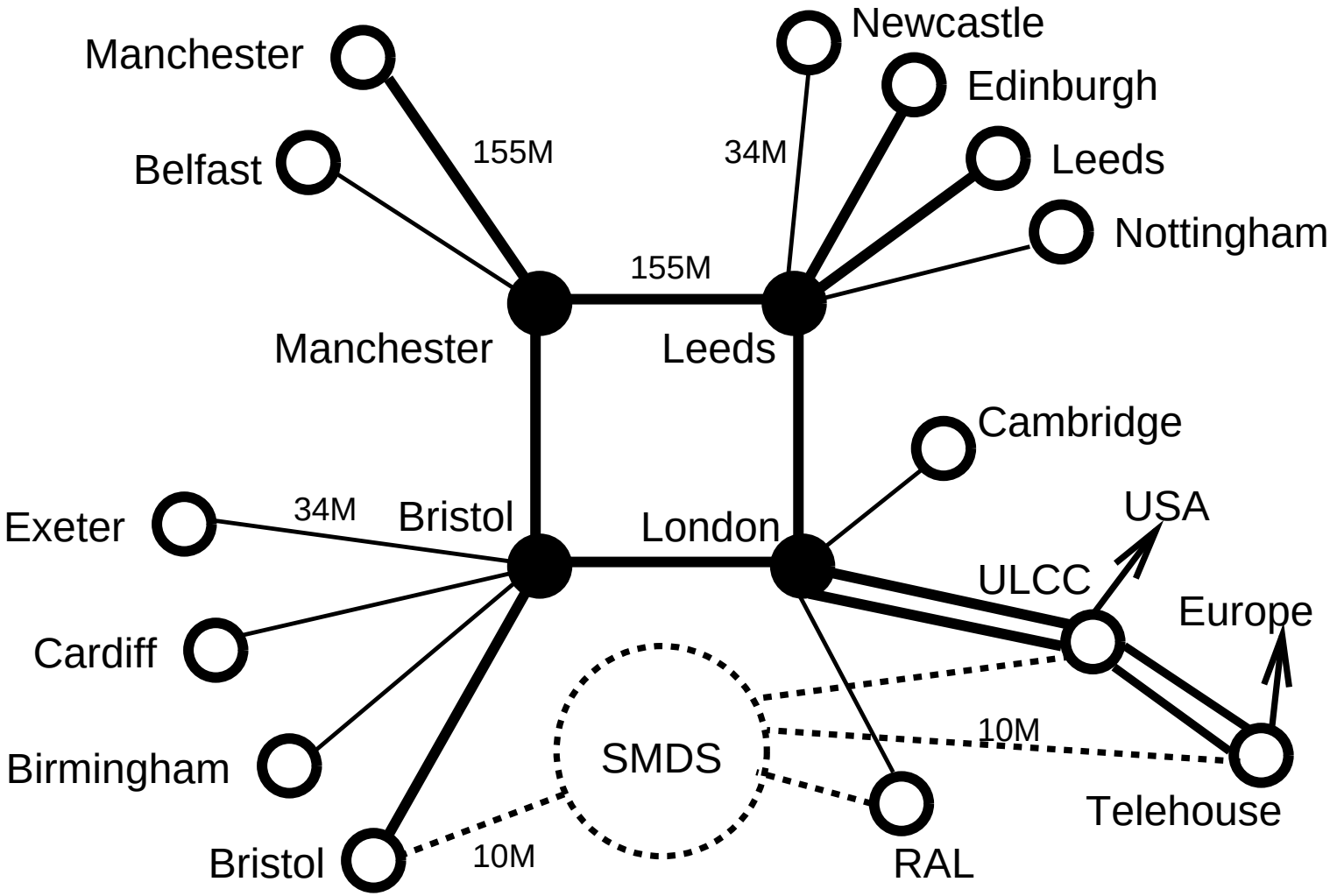
# JANET topology

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# Simplify the problem

Only support Solaris and DOS/Windows

Machine setups identical in each class

One management domain

One network protocol

Every user has a login ID

Classroom machines well protected

# Scaling

Start with a COW

Control the namespace

Unified filestore: NFS, Amd

Replicate popular files: SUP, pc.mount

Plan for continuous growth

# Filestore Naming

User store: /user/groupname/username

Filesystems: /vol/fileservers/srvnam/fsname

Packages: /vol/PACK/packagename_version

Main PC binaries: /vol/pc

PC Packages: /vol/pcpack

Main NT binaries: /vol/nt

Mapping between namespaces by Amd

/vol/network/amd/amd.vol

/vol/network/amd/amd.user

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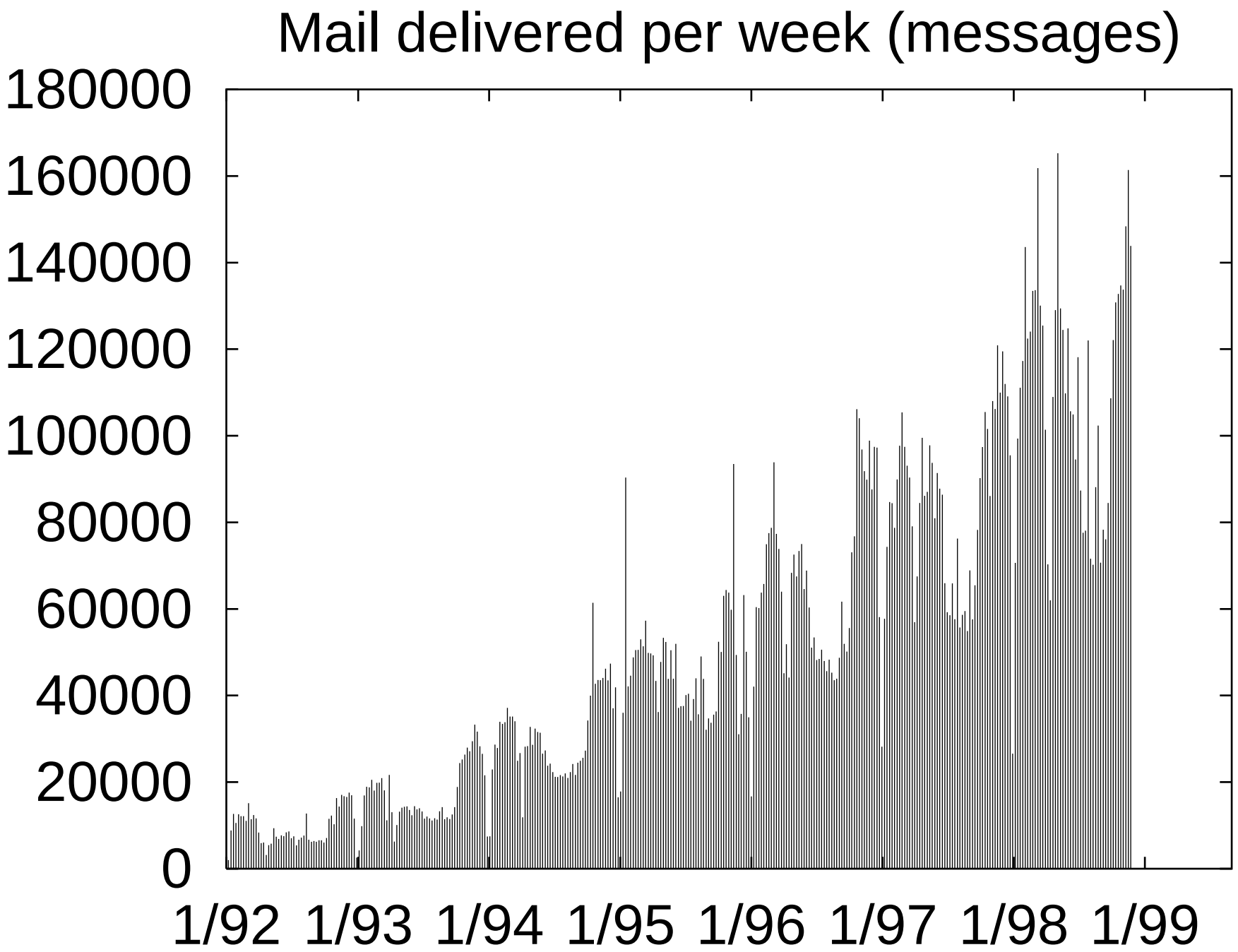
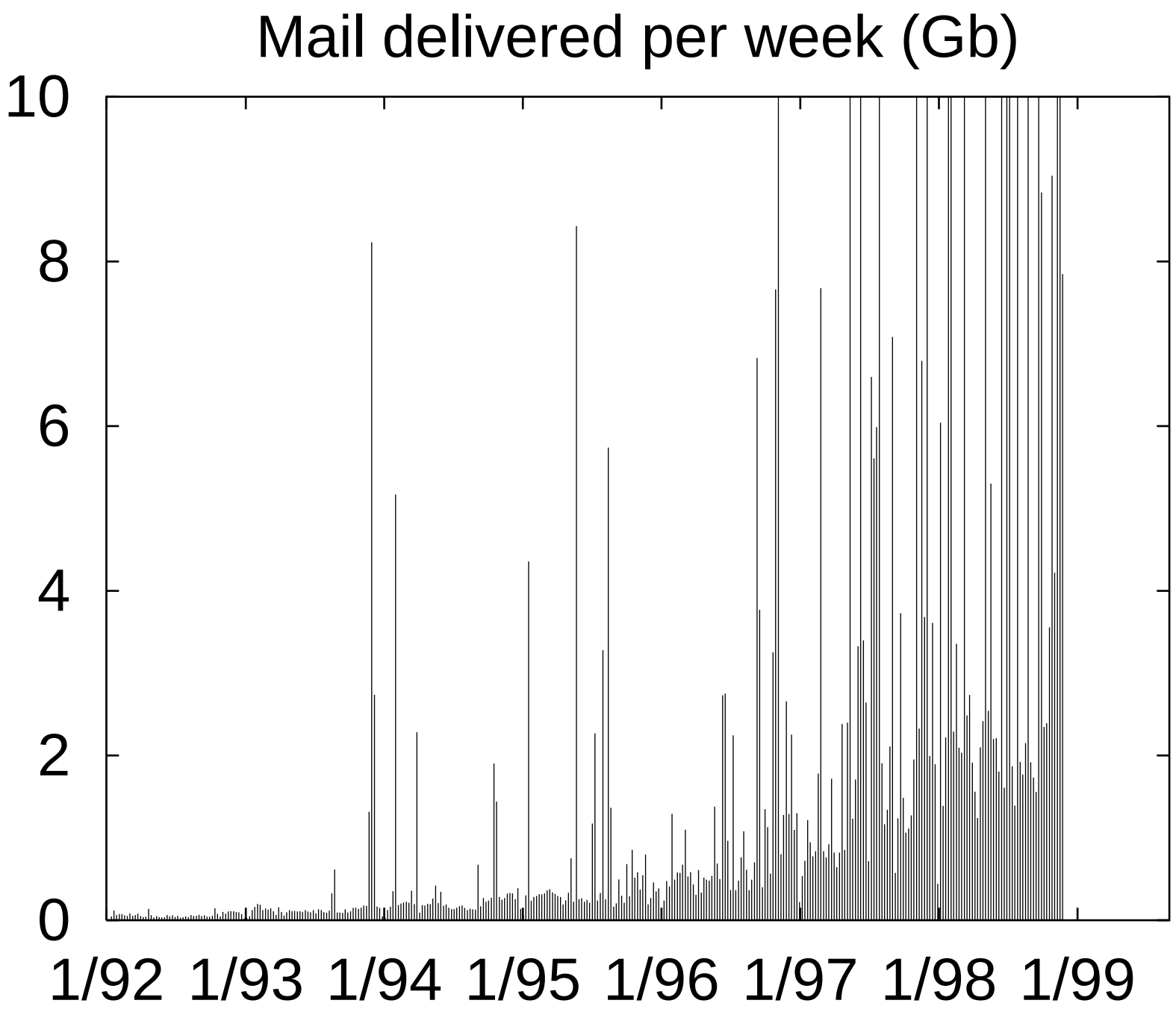

Mail delivered per week (messages)
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
1/92
1/93
1/94
1/95
1/96
1/97
1/98
1/99


Mail delivered per week (Gb)
10
8
6
4
2
0
1/92
1/93
1/94
1/95
1/96
1/97
1/98
1/99

# pc.mount example

EDST.drives  f: /vol/pc/general; j: /vol/pc/nfs_${NV}

EDST.printers lpt3: ps-a4.cho3 /end=xit,fmt=raw

/vol/pc hera-72, hera-74, timon-8, phobos-148

merit.134.83.64.0  134.83.64.0 134.83.192.0

# Automation

Installation and Upgrade

Convert workstation to server

Daily chores

Installation of patches

Backup process

# Remote Control

Unix servers - encrypted remote login

Console servers

Network and dial-in management

SNMP monitoring

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# Summary

Simplify the problem

Design for scale

Control the namespace

Manage change carefully

Think!