A Snapshot of the Computing Facilities November 1994.

Computing Service

University of Newcastle upon Tyne

Introduction.

A few years ago the service changed from being based on a mainframe computer to a distributed system. It was a radical change from the previous two decades of evolutionary progression. We now have left the mainframe era, taken distributed computing as the way forward, and taking the next evolutionary step forward in this new era. X25 protocols are being phased out. Various services have outgrown their platforms and moving to new technology hardware. Quick, take a look before it goes, and is lost.

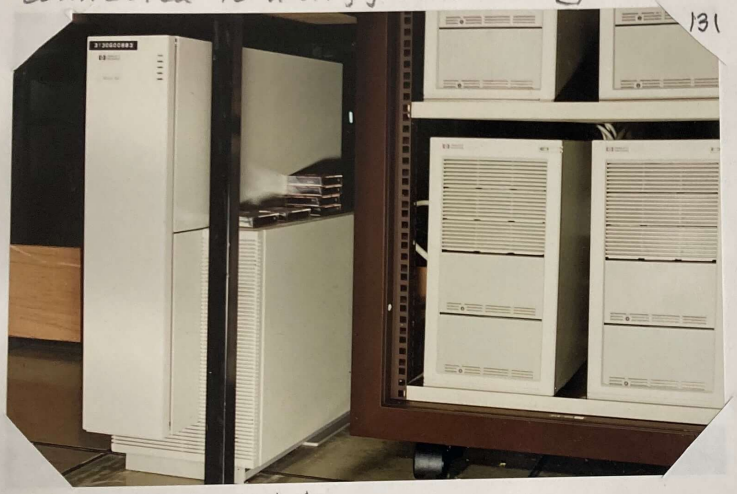
This is a snapshot of how it is now, in November 1994. For posterity. For us to stop and think. Where have we been?. where are we going?.

The photographs are of machines. Not the machines the users sit at to use the service, but the machines behind the scenes. There are no people, just machines. People do not change. Machines do change. This is to record the state of the machinary just now. Do not forget the people. No people - No machines.

133

A gaggle of applications servers. Although physically together each is connected to a different building network.

131



lake
Unix applications server for cluster of workstations in Bedson Building.

105

cragsted
Unix applications server for cluster of workstations in old Library

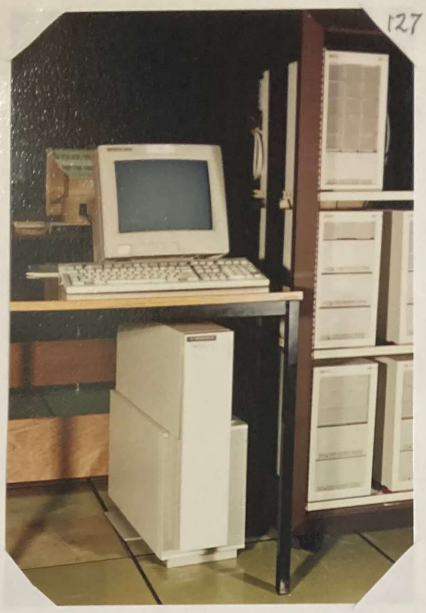
Applications Servers

Each workstation requires 3 types of data to function. The basic unix operating system resides on each workstation. This allows it to be powered on, boot the system and function as a computer.

The basic system does not included application software e.g. compilers, statistical packages, graphics, etc. Each cluster of workstations share an applications server. When a user at workstation invokes an applications package it is loaded across the network from the server.

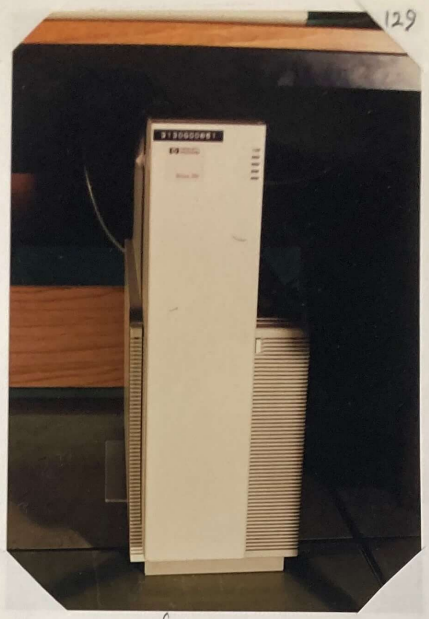
In this way applications software can be upgraded more easily (fewer copies to upgrade), and each workstation only needs disk space for the basic unix operating system.

The third type of data required by each workstation is their own data. See File Servers elsewhere.



burn

Daysh Building
NTP time server alias ntp2



foss
Unix application server for cluster in Stephenson Building

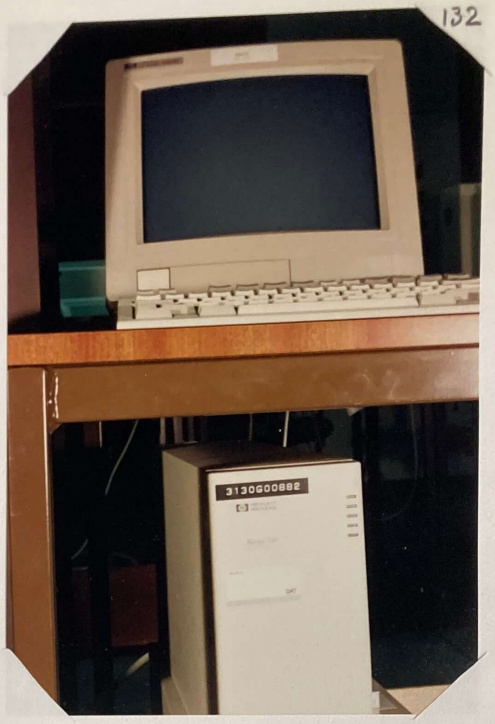
pike

Old Library
Secondary DNS server
alias ntp1 - NTP time server

dene
Unix applications

Cookson Building

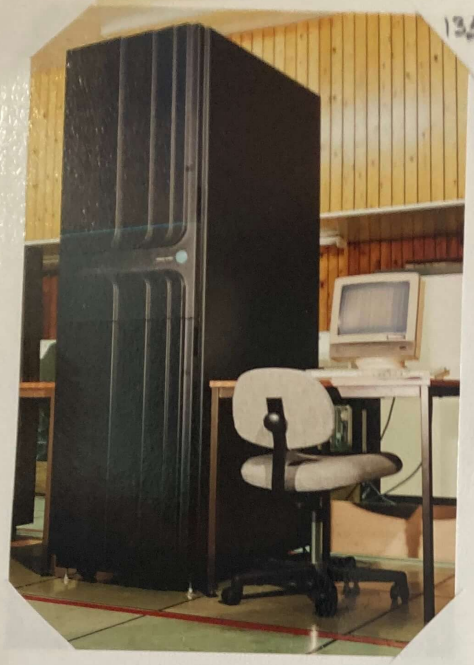
glen
Unix applications server for
workstation cluster in Herschel Building



mere
Unix applications server for
cluster in Merz Court

pass

scar



135

File servers

Users files are stored on computers whose sole function is to respond to read and write requests to users files. The file systems are exported to all service computers which means a user can 'see' his/her files at any service computer.

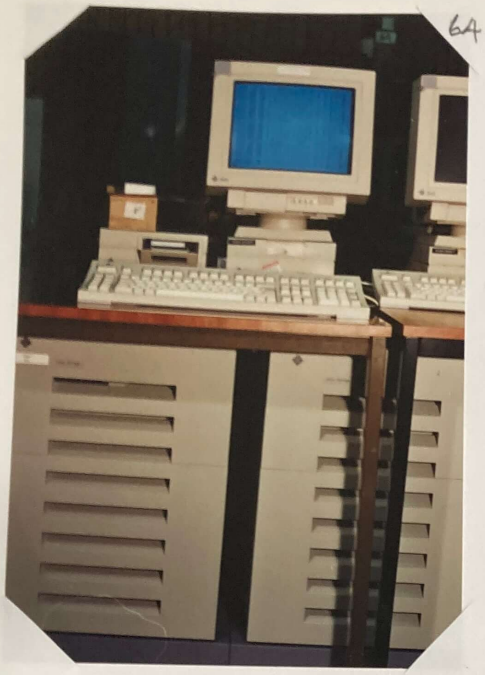
This is townend a purpose built file server, having four network ports, dualed power supplies, etc.

40

ucsarc1

An archive server. Users who have files that they do not need to access in the near future can archive them using this service. A restore request can be expected to complete by next day.

64



ucsfs1
'eata directories'
1125 users
14 G bytes

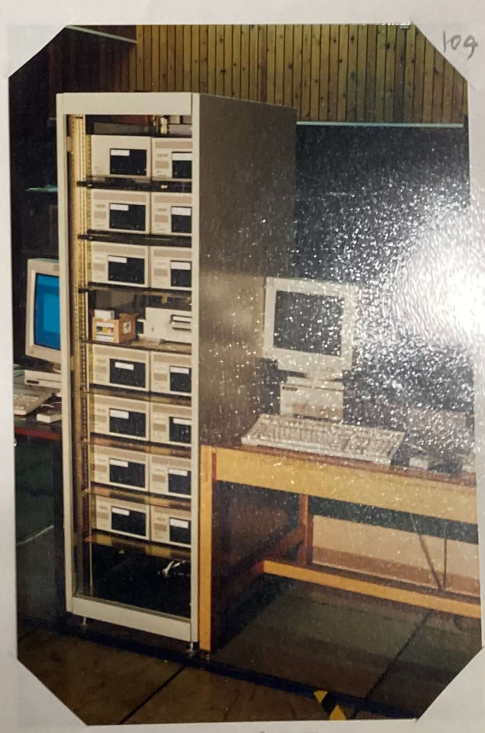
136

townend
6273 home directories
326 bytes

115

ucsfs2
'tuda directories'

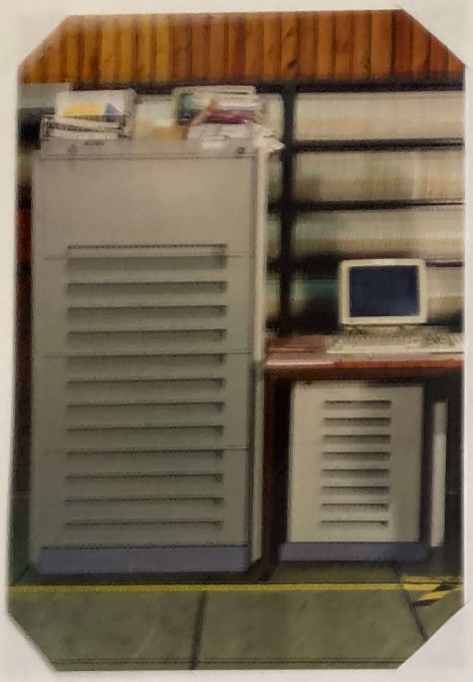
109



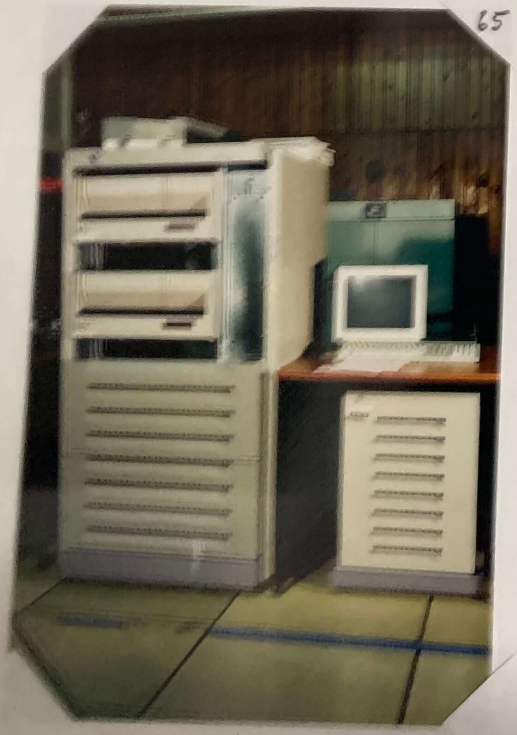
ucsfs3
'cragsted directories'
240 users

Time sharing unix machines

Users may login from machines in their office or home (via dialup, see elsewhere.) To support their requirements there are three general purpose time sharing computers.



aidan

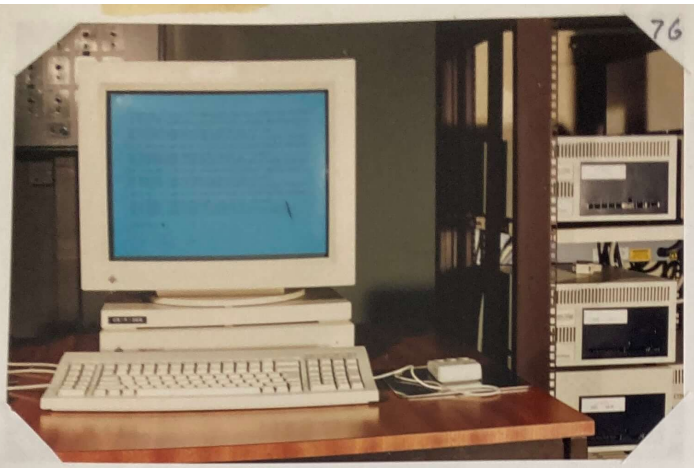


65

gaba

106

tuda

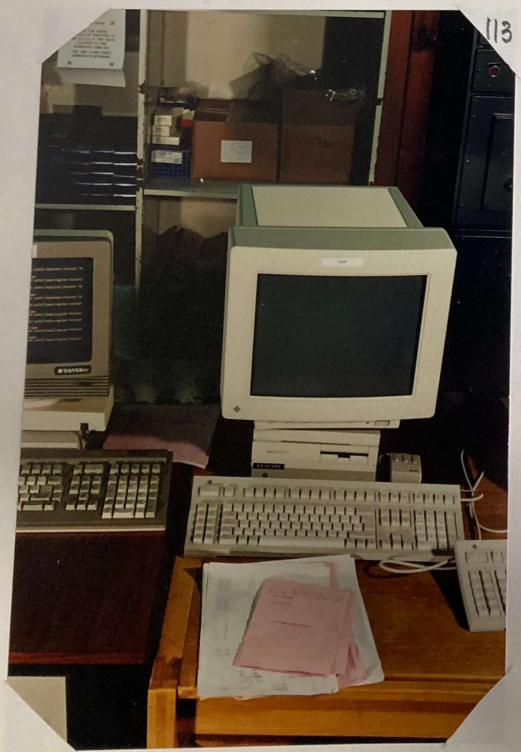


cragdb

Every user of the service has to have an entry in a central data base called DUND. This ensures uniqueness of identification. That data base is on cragdb.

scawdell

Print server. All jobs for printing are sent to scawdell that queues them for one of nineteen printers or plotters scattered around the campus.



dns0.ncl.ac.uk

People like to use names, computers like to use numbers. So if a user wishes to access a computer called doc.ic.ac.uk this name has to be mapped to the address 155.198.1.40 This lookup is done by the DNS (Domain Name Service.) dns0.ncl.ac.uk is the source for DNS lookups for the ncl.ac.uk domain from anywhere in the World.

110

smithy

A backup server. This and its companions cycle round 30 odd machines taking backup copies of all 'changed' files every night. In the event of a disk problem users files can be restored to what they were the day before.

109

goat

A backup server
On the right of it are two Exabyte cartridge drives. (8mm tape.)
Underneath the screen is the processor box.

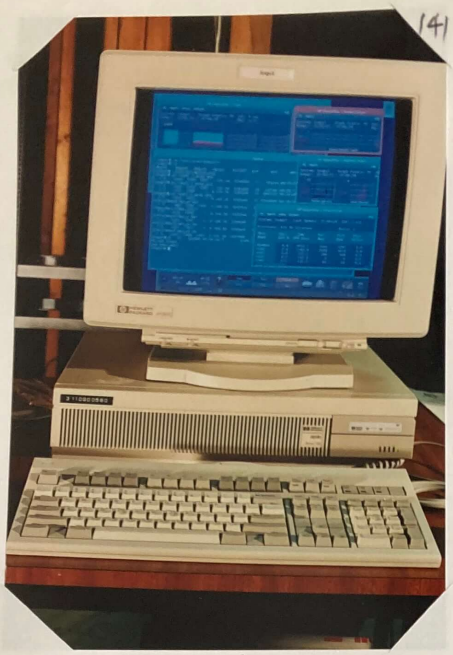
111

burnmoor

A mail server. Users may elect to have their 'mail box' on this machine when they can read their mail on any unix service computer.

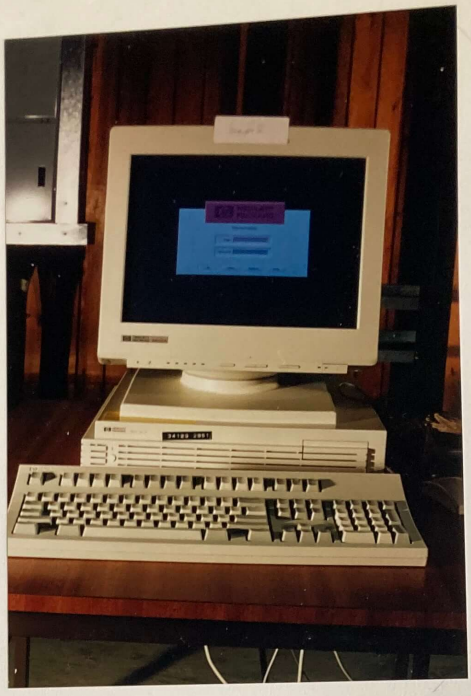
The little table top box on the right stores 1000,000,000 characters (1 Gb). Modern boxes of this size store 10 Gb.

141



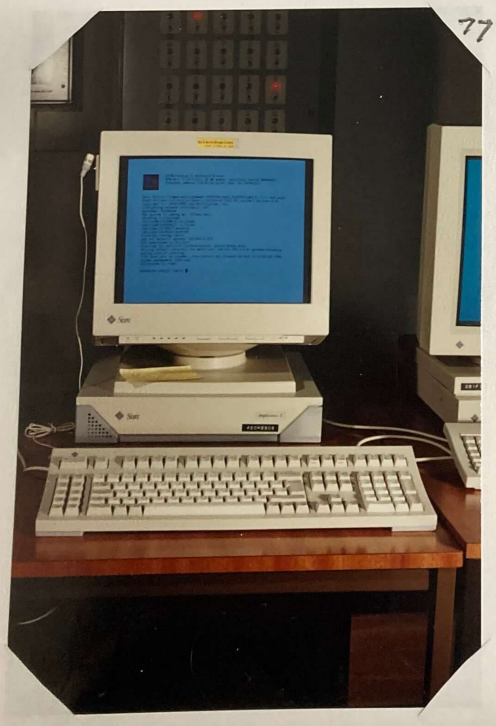
leaps 1
batch job servers. Uses the dngs (Distributed network queing system).

142



leaps 2
Another batch job server.
(Why are they called batch jobs?)

77



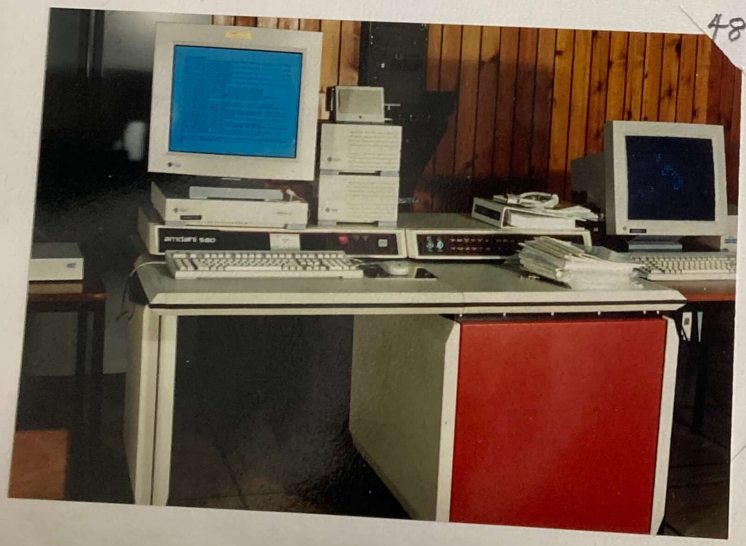
blenheim
Mail server to take over from burnmoor.

wath
Developement print server.

cheviot
The email 'sorting office'.
Directs incoming mail to a user's mailbox. Resigns outgoing mail with the user's mailname.
TELEX/fax gateway.
(TELEX box on top of fax box on top of chest of drawers)
10000+ messages/day.

107

nisp
Alias – mailbase.ac.uk
UK mailbase service.
People of like interest can join a list and exchange information as a group by electronic mail. Opposite is the old machine now replaced by:



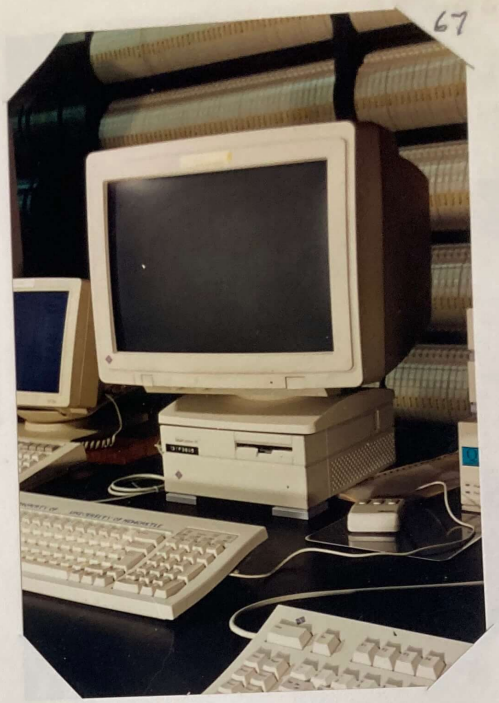
48

norn
The new mailbase machine.
770 lists
70000 subscribtions
133000 mail messages/day.
45000 users

68

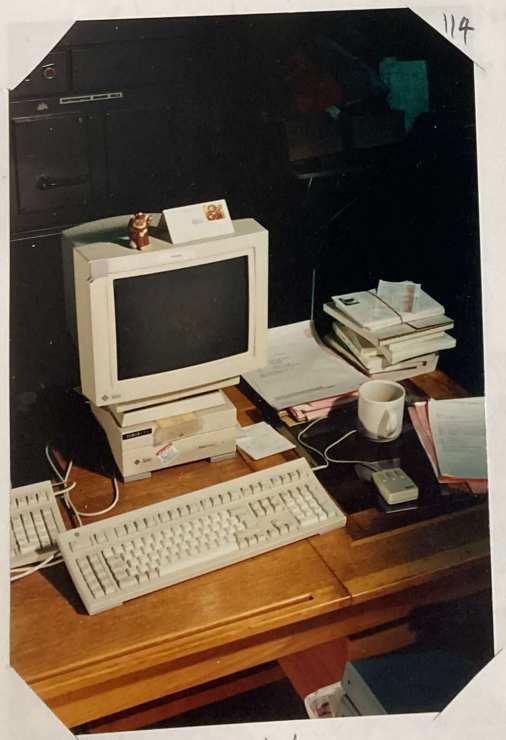
whitbeck
News server

67



ipgate
A gateway between the X25 Pink Book protocol and the IP world.

114

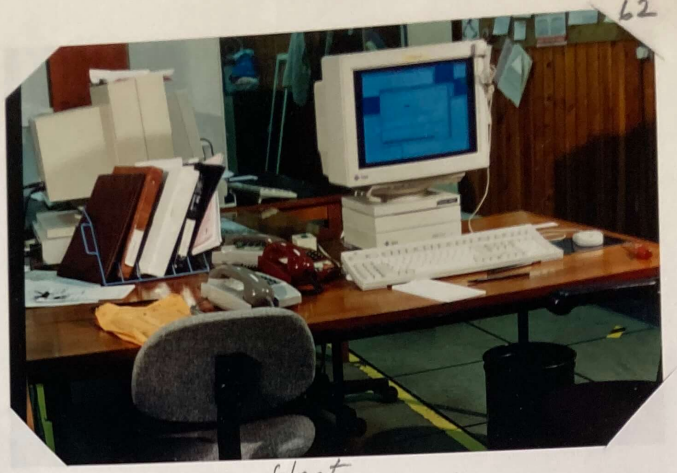


crinkle
A licence server.

112

whin
CWIS/gopher, World Wide Web server.

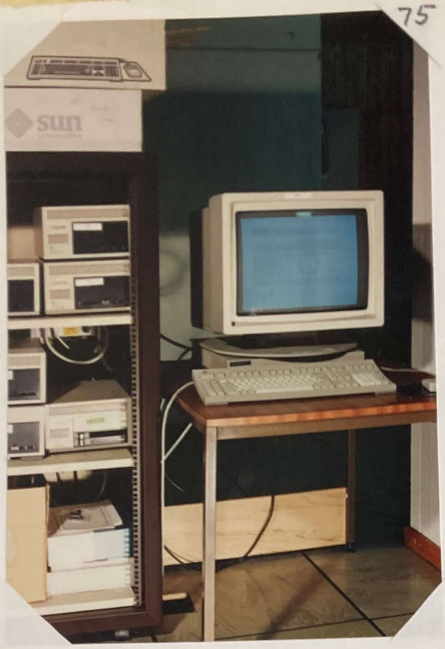
62



fleet

Computer operators workstation.

75



hilldb

Data base server.

100

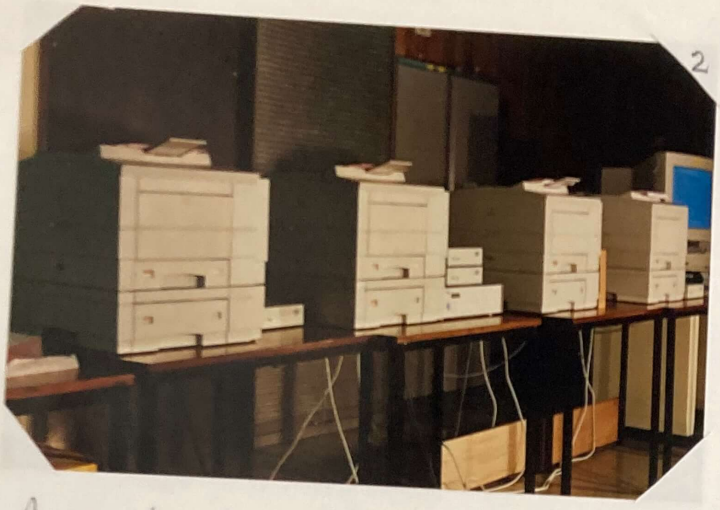
step

A name server for t
NRS (Name Regist
Scheme) which is p
of the X25 protocol
suite.

50

Network monitoring machine
under evaluation.

2

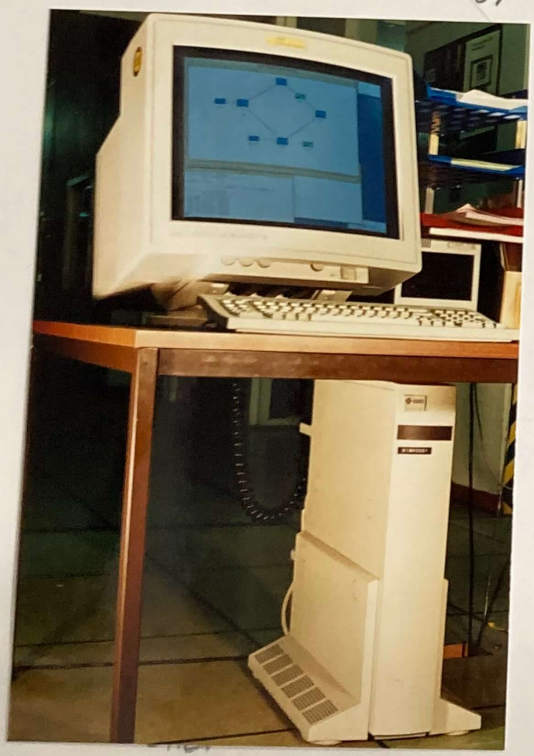


A gaggle of black & white laser printers.

34

High speed line printer for draft quality prints

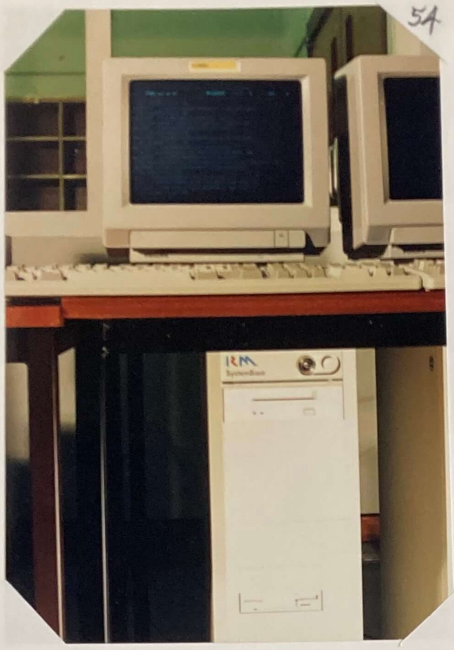
37



Network monitoring machine. Unfortunately the users telephone the computer operators

Colour printer / plotter capable of doing A3 size prints. (This page size.)

54



town 1

File server

55

town 2

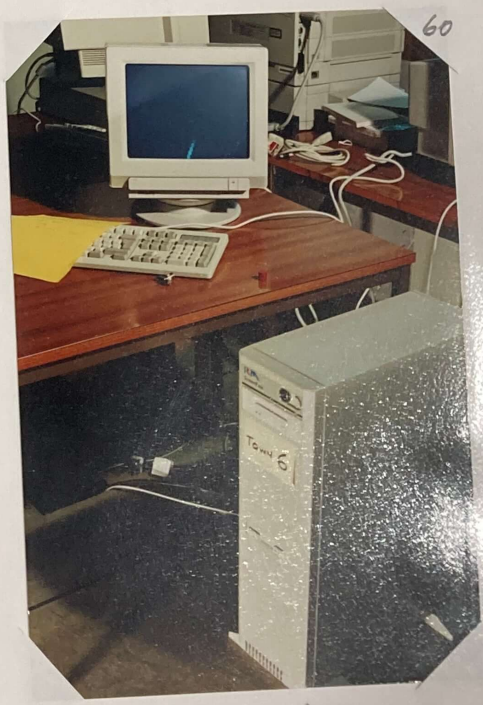
file server

56

town 3

file server

60



town 6

file server

town4

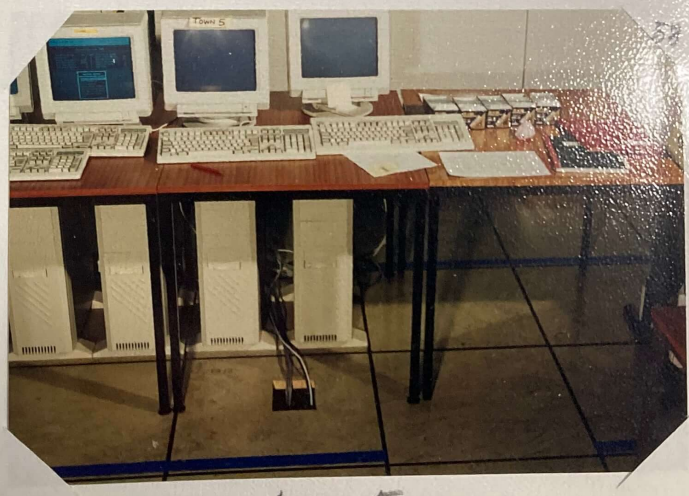
file server

peak

Novell server server

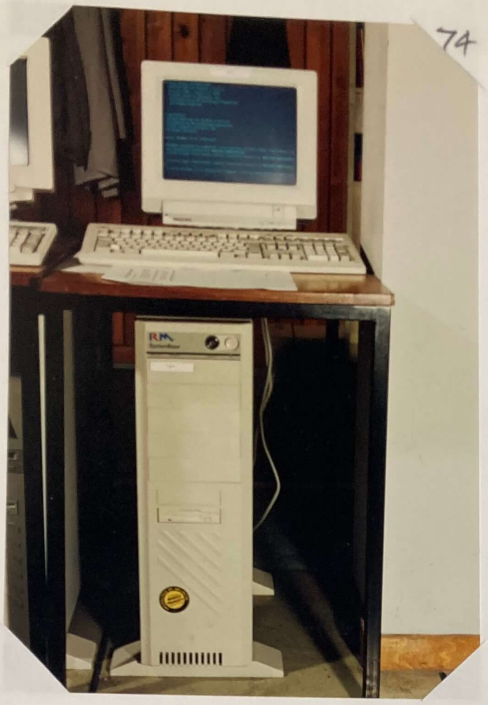
fangrain

A hybrid server, both file and application to Computing Service staff machines.



town5

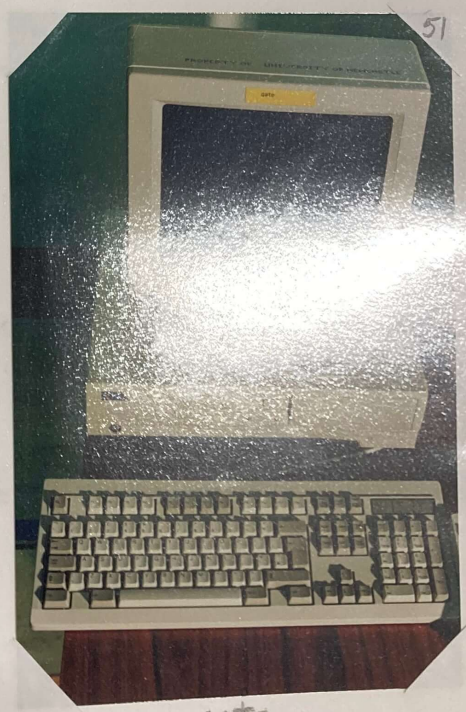
file server



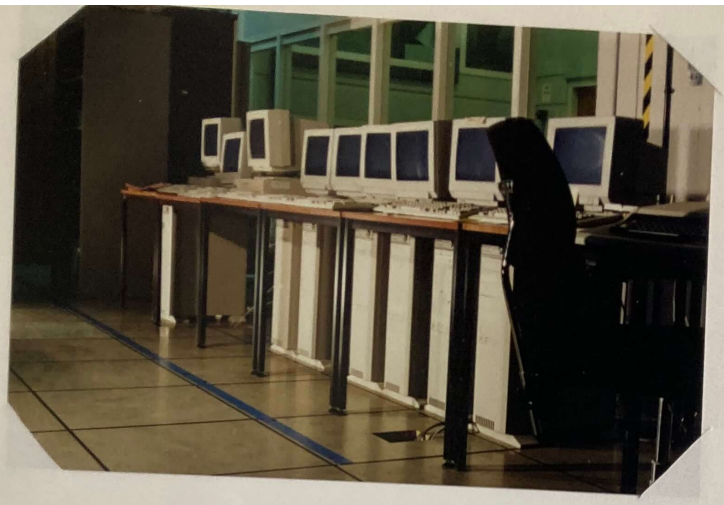
tarn
Application server for
Old Library cluster

tree
Application server for

pool
Application server for



gate
Gateway to unix
archive server



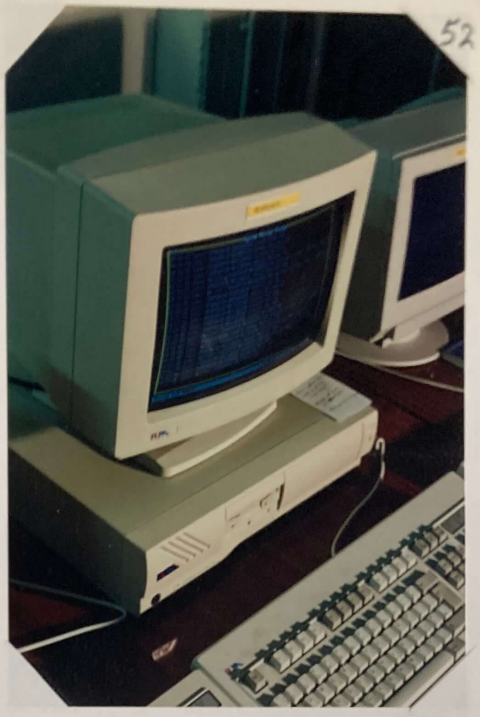
The Federation

A concentration of PC servers

There are over 11,000 registered users of "The Federation"

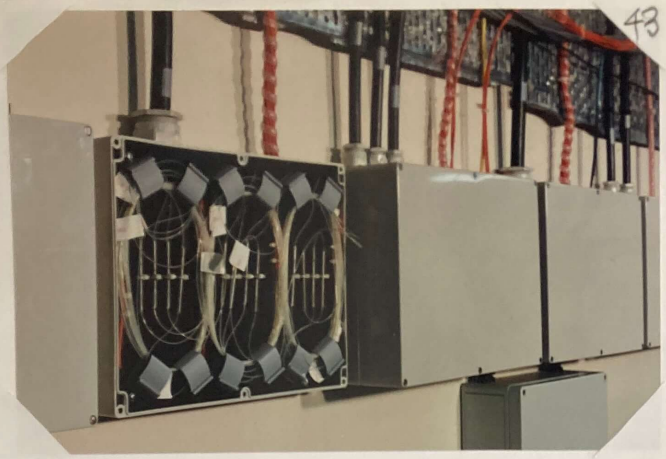
Over the last few years the number of PCs has dramatically increased so that there are about 3700 now. The provision of support for these machines by Computing Service is impossible with the staff available. The Computing Service provides PC facilities via "The Federation". In the Federation, PCs are connected via Novell Netware software to application and user file servers. Federation PCs only have the Microsoft operating system and Novell software installed. Users can log on to any Federation PC and access their own files and a consistent set of application packages where ever they are. There are nine service Federation clusters of PCs plus four belonging to other departments, providing 260 PC seats.

bowscale
Charon mail gateway

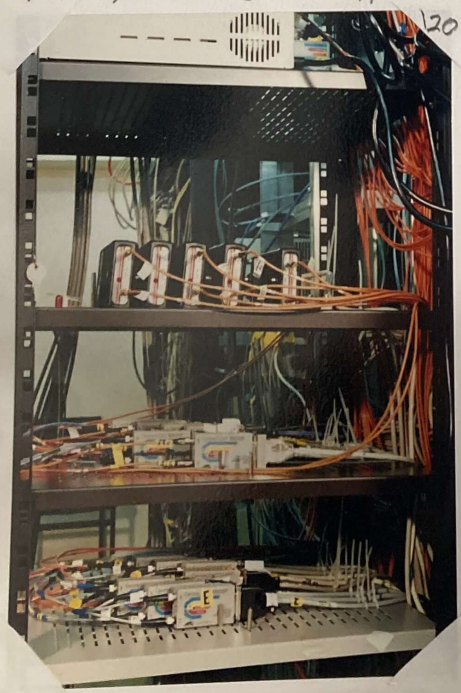


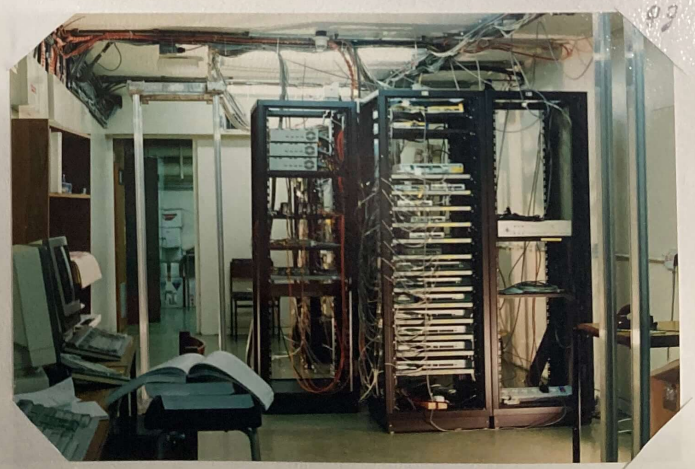
seascale
Charon mail gateway

scales
Charon mail gateway

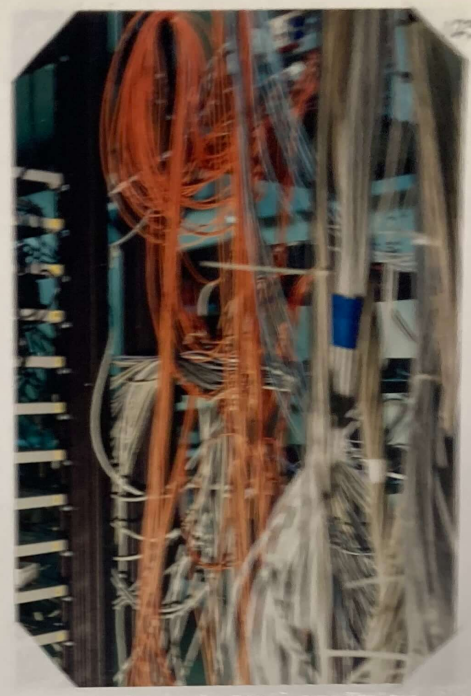


LAN (Local Area Network)
Buildings on the campus are connected by fibre optic cable to the campus 'hub'. (Thick black cables above) These fibres are spliced to more flexible cables (red thinner cables). The splice involves joining two fibres of hair dimensions such that the laser light passes undiminished. The fibres then go across the ceiling (below right) to a rack of FoTs, Fibre Optic Transceivers (below left) where the data is converted to electrical signals transmitted by copper. The data then goes to 'routers', if need be via a TP (Twisted Pair) hub if an application server needs connecting to the remote building subnet. From the FoTs or the hubs cables go to the routers. The routers are central to the LAN.





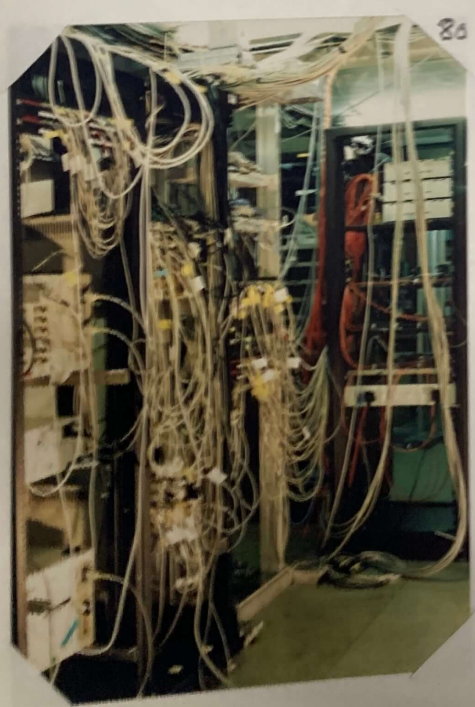
The data goes via a tangle of cables to the routers. The routers are 'fast' boxes. The routers 'look' inside every packet to see its destination subnet. All the routers know which subnet connects to which router. The routers are 'hot'. They use ECL (Emmitter Coupled Logic) technology to achieve the speed required. You can put your hand in the air exhaust from them and feel the heat.

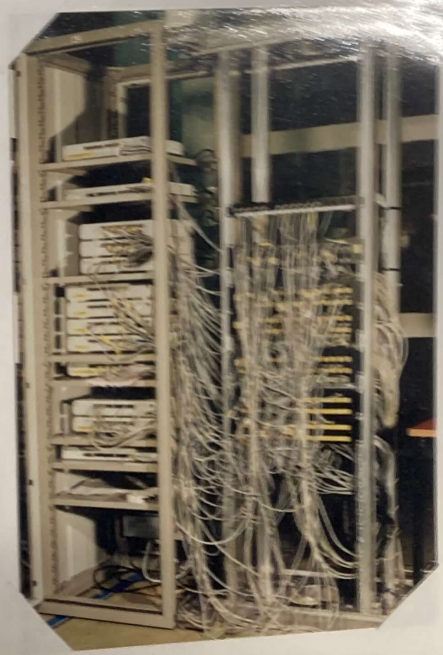


Tidying up these cables would mean closing down the network.

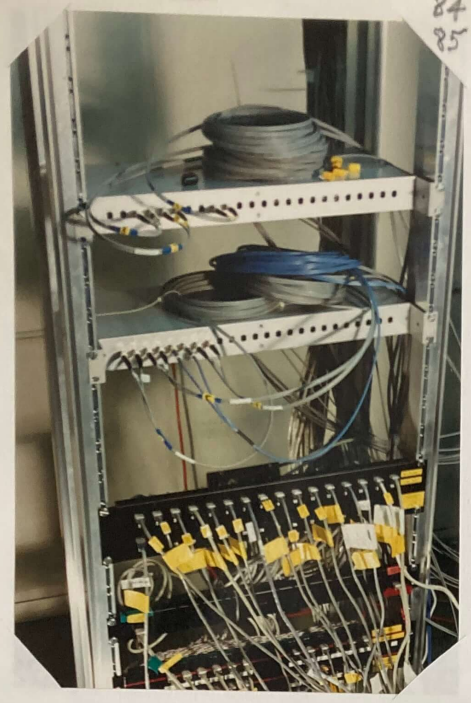
Machine room [illegible] and FDDI HUBS

General view of FOTS, routers and FDDI hub

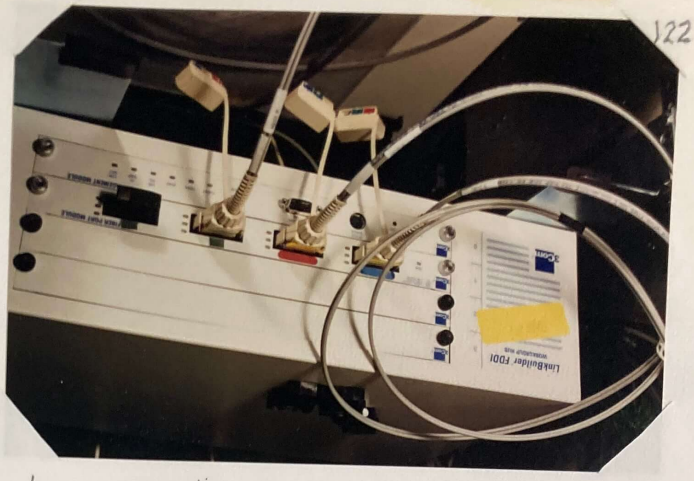




84
85

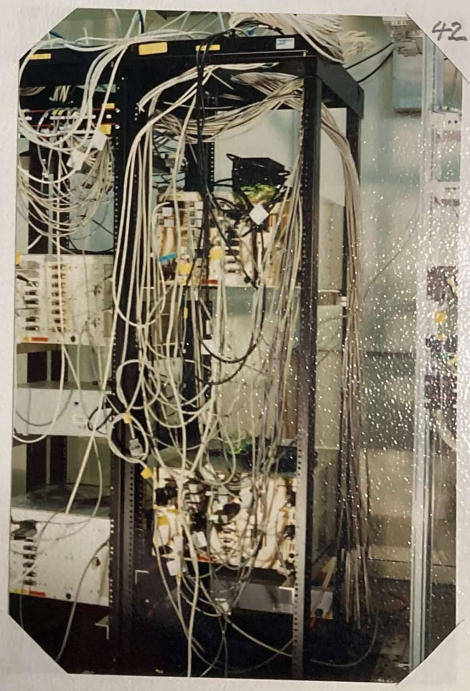


122



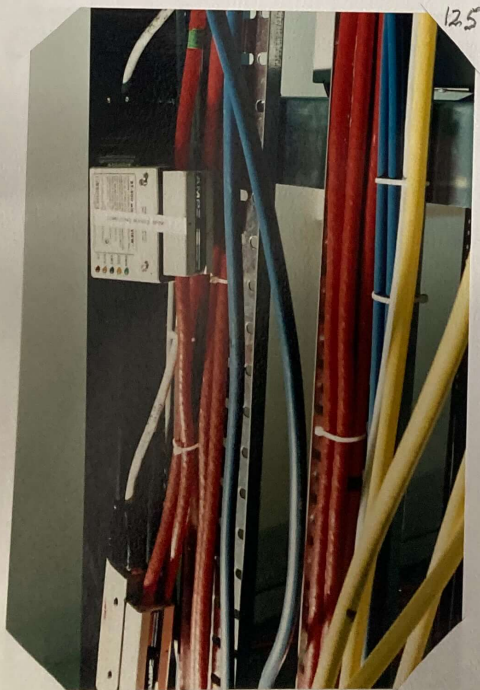
The FDDI (Fibre Distributed Data Interface) is the heart of the LAN. Everywhere else operates at 10M b.t.s/sec. The FDDI operates at 100M b.t.s/sec.

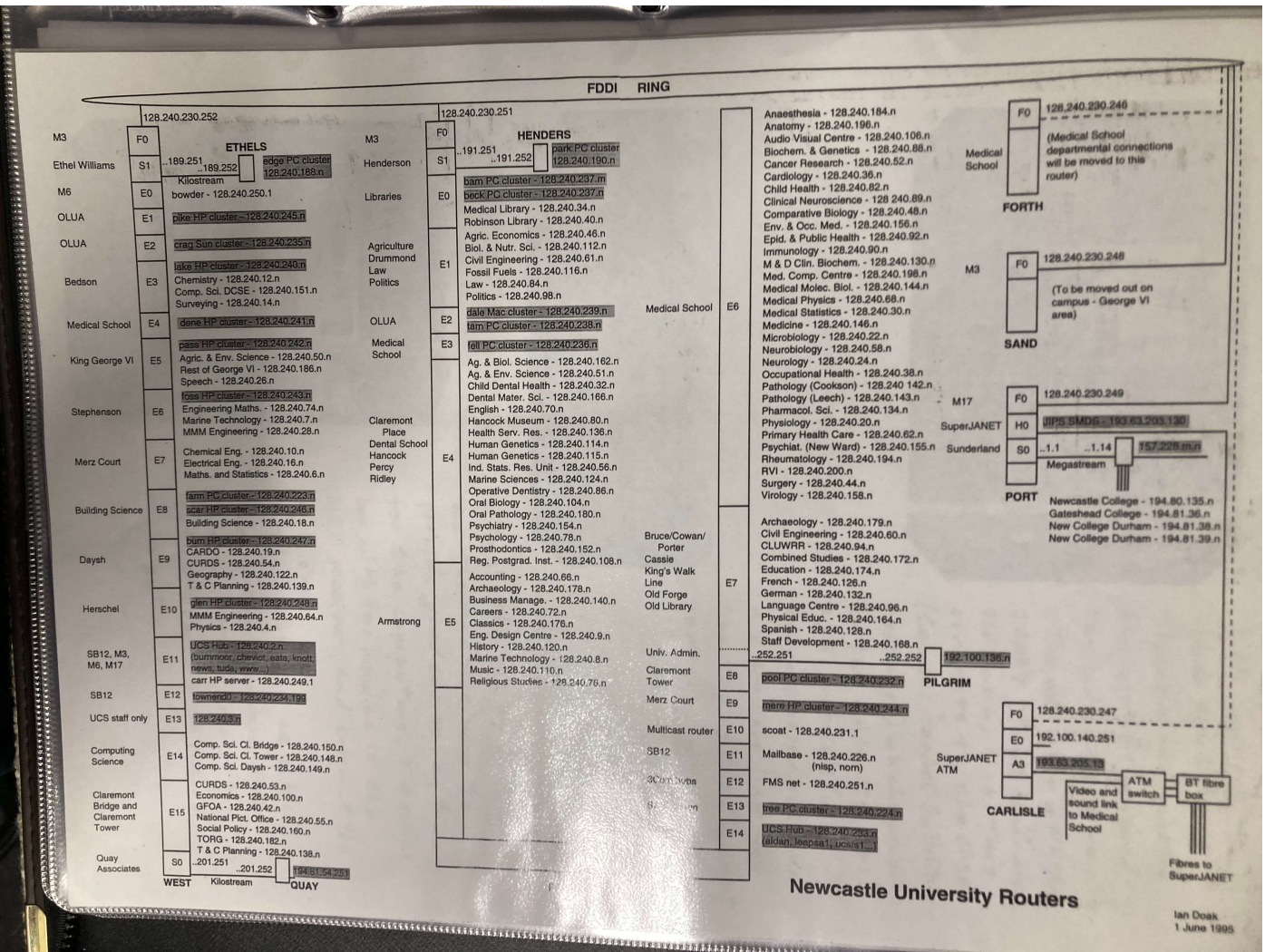
42



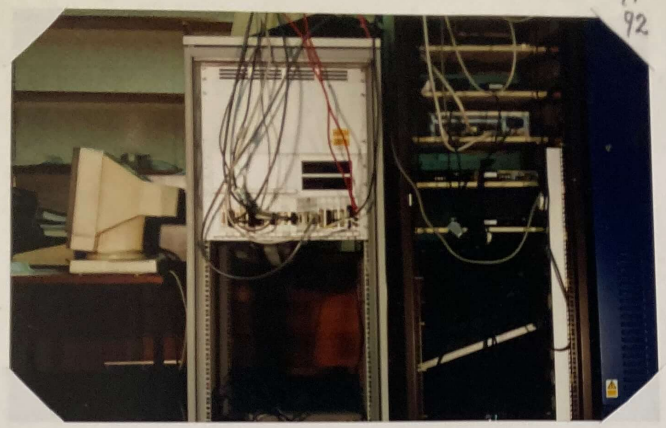
Four routers

125




FDDI RING
128.240.230.252
ETHELS
M3
F0
Ethel Williams
S1
..189.251
..189.252
Kilostream
edge PC cluster
128.240.188.n
M6
E0
bowder - 128.240.250.1
OLUA
E1
pike HP cluster - 128.240.245.n
OLUA
E2
crag Sun cluster - 128.240.235.n
Bedson
E3
lake HP cluster - 128.240.240.n
Chemistry - 128.240.12.n
Comp. Sci. DCSE - 128.240.151.n
Surveying - 128.240.14.n
Medical School
E4
dene HP cluster - 128.240.241.n
King George VI
E5
pass HP cluster - 128.240.242.n
Agric. & Env. Science - 128.240.50.n
Rest of George VI - 128.240.186.n
Speech - 128.240.26.n
Stephenson
E6
foss HP cluster - 128.240.243.n
Engineering Maths. - 128.240.74.n
Marine Technology - 128.240.7.n
MMM Engineering - 128.240.28.n
Merz Court
E7
Chemical Eng. - 128.240.10.n
Electrical Eng. - 128.240.16.n
Maths. and Statistics - 128.240.6.n
Building Science
E8
farm PC cluster - 128.240.223.n
scar HP cluster - 128.240.246.n
Building Science - 128.240.18.n
Daysh
E9
burn HP cluster - 128.240.247.n
CARDO - 128.240.19.n
CURDS - 128.240.54.n
Geography - 128.240.122.n
T & C Planning - 128.240.139.n
Herschel
E10
glen HP cluster - 128.240.248.n
MMM Engineering - 128.240.64.n
Physics - 128.240.4.n
SB12, M3, M6, M17
E11
UCS Hub - 128.240.2.n
(bummoor, cheviot, eata, knott, news, tuda, www...)
carr HP server - 128.240.249.1
SB12
E12
townend - 128.240.224.199
UCS staff only
E13
128.240.3.n
Computing Science
E14
Comp. Sci. Cl. Bridge - 128.240.150.n
Comp. Sci. Cl. Tower - 128.240.148.n
Comp. Sci. Daysh - 128.240.149.n
Claremont Bridge and Claremont Tower
E15
CURDS - 128.240.53.n
Economics - 128.240.100.n
GFOA - 128.240.42.n
National Pict. Office - 128.240.55.n
Social Policy - 128.240.160.n
TORG - 128.240.182.n
T & C Planning - 128.240.138.n
Quay Associates
S0
..201.251
..201.252
194.81.54.251
WEST
Kilostream
QUAY
128.240.230.251
HENDERS
M3
F0
Henderson
S1
..191.251
..191.252
park PC cluster
128.240.190.n
Libraries
E0
bam PC cluster - 128.240.237.m
beck PC cluster - 128.240.237.n
Medical Library - 128.240.34.n
Robinson Library - 128.240.40.n
Agriculture
Drummond
Law
Politics
E1
Agric. Economics - 128.240.46.n
Biol. & Nutr. Sci. - 128.240.112.n
Civil Engineering - 128.240.61.n
Fossil Fuels - 128.240.116.n
Law - 128.240.84.n
Politics - 128.240.98.n
OLUA
E2
dale Mac cluster - 128.240.239.n
tarn PC cluster - 128.240.238.n
Medical School
E3
fell PC cluster - 128.240.236.n
Claremont
Place
Dental School
Hancock
Percy
Ridley
E4
Ag. & Biol. Science - 128.240.162.n
Ag. & Env. Science - 128.240.51.n
Child Dental Health - 128.240.32.n
Dental Mater. Sci. - 128.240.166.n
English - 128.240.70.n
Hancock Museum - 128.240.80.n
Health Serv. Res. - 128.240.136.n
Human Genetics - 128.240.114.n
Human Genetics - 128.240.115.n
Ind. Stats. Res. Unit - 128.240.56.n
Marine Sciences - 128.240.124.n
Operative Dentistry - 128.240.86.n
Oral Biology - 128.240.104.n
Oral Pathology - 128.240.180.n
Psychiatry - 128.240.154.n
Psychology - 128.240.78.n
Prosthodontics - 128.240.152.n
Reg. Postgrad. Inst. - 128.240.108.n
Armstrong
E5
Accounting - 128.240.66.n
Archaeology - 128.240.178.n
Business Manage. - 128.240.140.n
Careers - 128.240.72.n
Classics - 128.240.176.n
Eng. Design Centre - 128.240.9.n
History - 128.240.120.n
Marine Technology - 128.240.8.n
Music - 128.240.110.n
Religious Studies - 128.240.76.n
Medical School
E6
Anaesthesia - 128.240.184.n
Anatomy - 128.240.196.n
Audio Visual Centre - 128.240.106.n
Biochem. & Genetics - 128.240.88.n
Cancer Research - 128.240.52.n
Cardiology - 128.240.36.n
Child Health - 128.240.82.n
Clinical Neuroscience - 128 240.89.n
Comparative Biology - 128.240.48.n
Env. & Occ. Med. - 128.240.156.n
Epid. & Public Health - 128.240.92.n
Immunology - 128.240.90.n
M & D Clin. Biochem. - 128.240.130.n
Med. Comp. Centre - 128.240.198.n
Medical Molec. Biol. - 128.240.144.n
Medical Physics - 128.240.68.n
Medical Statistics - 128.240.30.n
Medicine - 128.240.146.n
Microbiology - 128.240.22.n
Neurobiology - 128.240.58.n
Neurology - 128.240.24.n
Occupational Health - 128.240.38.n
Pathology (Cookson) - 128.240 142.n
Pathology (Leech) - 128.240.143.n
Pharmacol. Sci. - 128.240.134.n
Physiology - 128.240.20.n
Primary Health Care - 128.240.62.n
Psychiat. (New Ward) - 128.240.155.n
Rheumatology - 128.240.194.n
RVI - 128.240.200.n
Surgery - 128.240.44.n
Virology - 128.240.158.n
Bruce/Cowan/
Porter
Cassie
King's Walk
Line
Old Forge
Old Library
E7
Archaeology - 128.240.179.n
Civil Engineering - 128.240.60.n
CLUWRR - 128.240.94.n
Combined Studies - 128.240.172.n
Education - 128.240.174.n
French - 128.240.126.n
German - 128.240.132.n
Language Centre - 128.240.96.n
Physical Educ. - 128.240.164.n
Spanish - 128.240.128.n
Staff Development - 128.240.168.n
Univ. Admin.
..252.251
..252.252
192.100.136.n
PILGRIM
Claremont
Tower
E8
pool PC cluster - 128.240.232.n
Merz Court
E9
mere HP cluster - 128.240.244.n
Multicast router
E10
scoat - 128.240.231.1
SB12
E11
Mailbase - 128.240.226.n
(nisp, norn)
3Com boba
E12
FMS net - 128.240.251.n
E13
tree PC cluster - 128.240.224.n
E14
UCS Hub - 128.240.233.n
(aldan, leapsa1, ucsr1...)
Medical School
F0
128.240.230.246
(Medical School departmental connections will be moved to this router)
FORTH
M3
F0
128.240.230.248
(To be moved out on campus - George VI area)
SAND
M17
F0
128.240.230.249
SuperJANET
H0
JIPS SMDS - 193.63.203.130
Sunderland
S0
..1.1
..1.14
157.228.m.n
Megastream
PORT
Newcastle College - 194.80.135.n
Gateshead College - 194.81.36.n
New College Durham - 194.81.38.n
New College Durham - 194.81.39.n
SuperJANET
ATM
F0
128.240.230.247
E0
192.100.140.251
A3
193.63.205.13
CARLISLE
ATM switch
BT fibre box
Video and sound link to Medical School
Fibres to SuperJANET
Newcastle University Routers
Ian Doak
1 June 1995

91
92



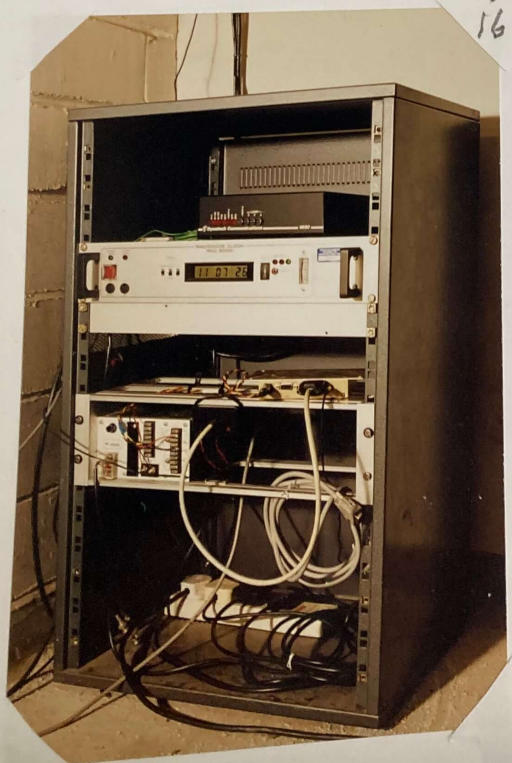
WAN Connections
(Wide Area Network)

There are two links to the rest of the World, the old and the new.

The old is the 2Mbit/sec JANET (Joint Academic NETwork) link. This connects to the CPSE (Campus Packet Switching Exchange) which connects to the LAN. It uses X25 protocols (now being phased out) and a microwave link from the top of the Claremont Tower.

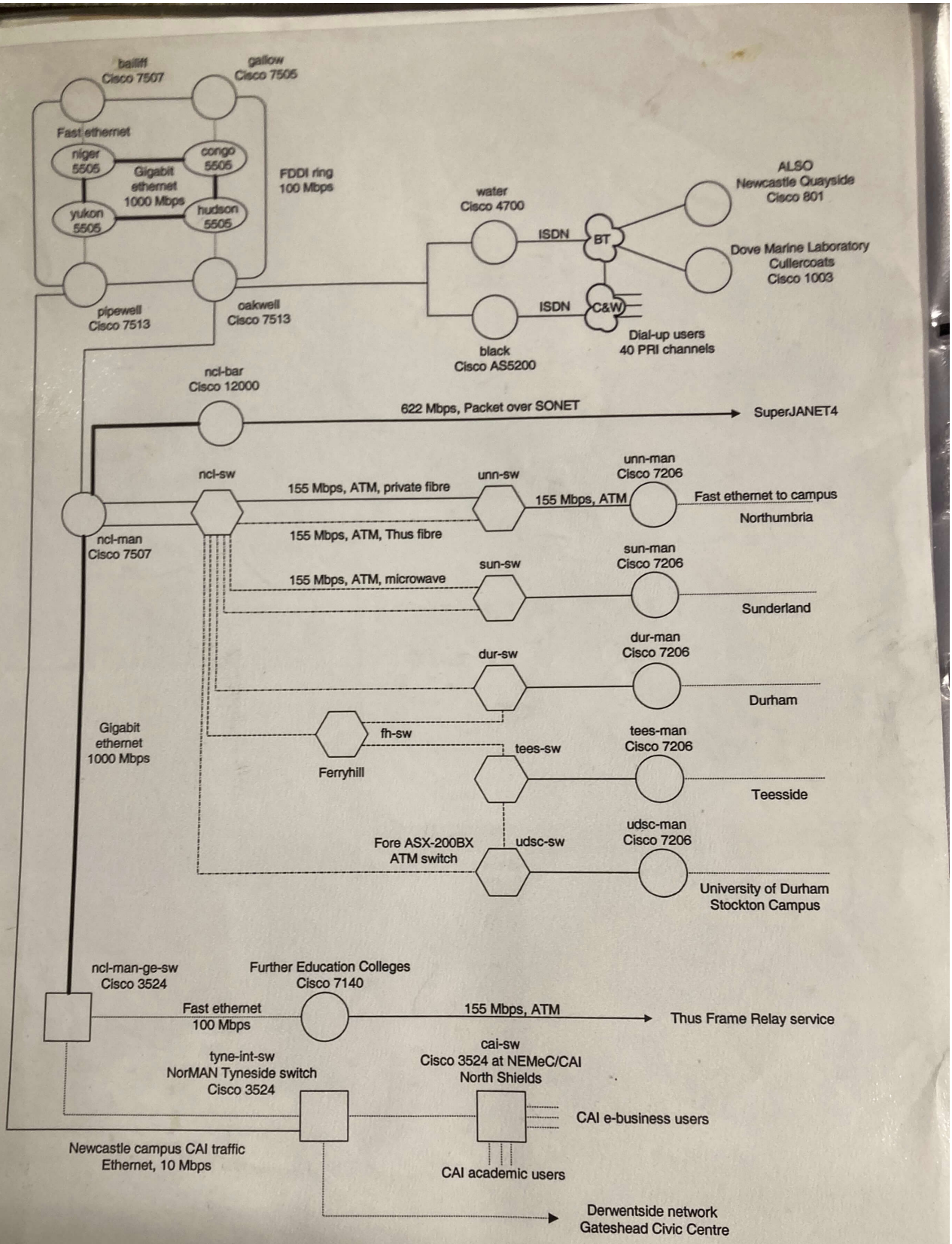
20

15
16



Also at the top of the tower are the two receivers to provide good sources of time for the computer [illegible] box with two hands: MSF receiver, and the GPS one.

Their antenna are either side of the microwave dish (above), little GPS one to the left, T shaped MSF one on the right.



Newcastle University Operated Network

Ian Doak
February 2001

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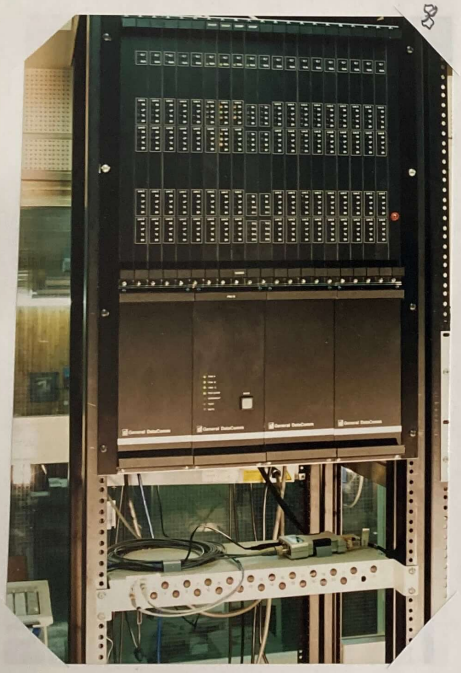
The new WAN connection is SuperJANET or JIPS (Janet IP Service). A general view of it is to the left. At the rear is the BT NTU (Network Termination Unit). This provides SMDS (Switched Mode Data Service) in multiples of 34 M bits/sec. That is connected to a router (the white box half way up a rack) which is connected by FDDI to the rest of the routers.



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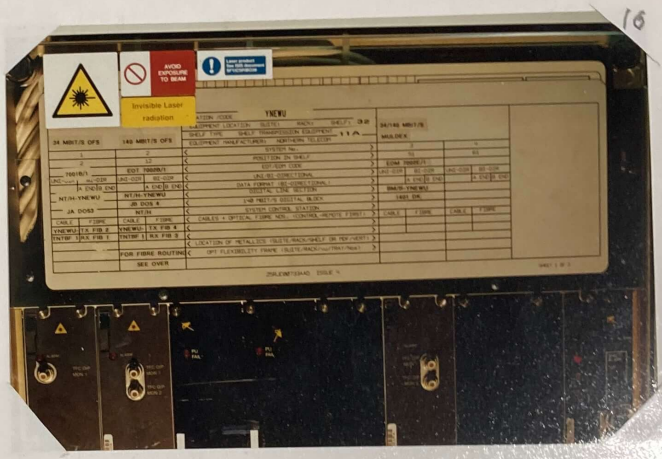

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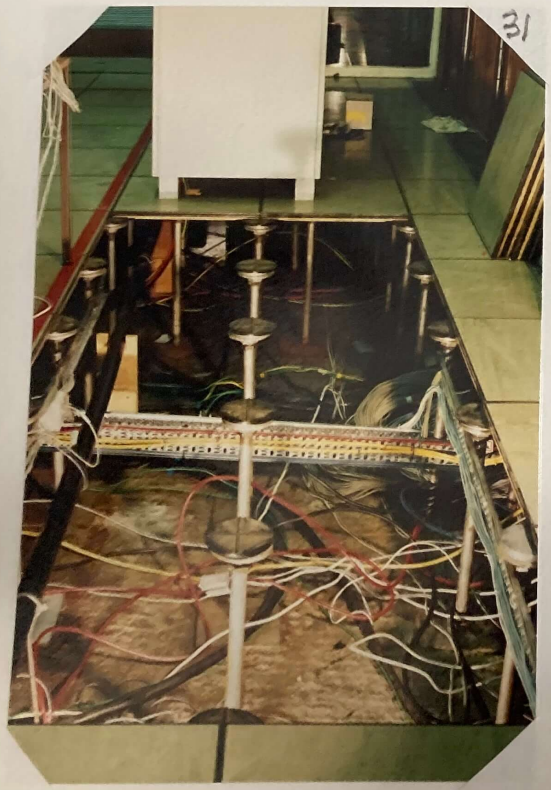
Above is a close up of the BT [illegible]. To the left is an ATM (Asynchronous Transfer Mode) switch. This is thought to be the network technology of the future. All information transmitted will be split into small fixed size packets. Because they are fixed size the ATM switches can switch them very quickly. ATM is a multimedia carrier e.g. computer data, video, telephone, whatever. All very fast.

23
24

Good quality electricity is vital for computer reliability and so data integrity! The mains supply to the machine room (top left) goes via a UPS, above. (Uninterruptible Power Supply.) The 240volt, three phase, 50cps alternating supply is fed via panel (with red cables inside) to the UPS. Here it is rectified to DC (Direct Current) which float chages batteries. This DC electricity is then converted back to 240volt alternating electricity. That 'conditioned' supply then goes via the distribution panel (above right) under the false floor (left) to the computers.

The batteries isolate the computers from any fluctuations in the mains supply.



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