Pushing the Limits

ADSM Symposium
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Overview

- History of ADSM services at Oxford
  - October 1995 - started : single ADSM server
  - January 1999 - split into two ADSM servers
  - July 1999 - major enhancements to Backup server
- Future service development questions
  - How do we best take the services forward?
  - How do we best exploit ADSM *(or the forthcoming TSM)* and SAN technology?

Key
Cycle Track
Cycle Route
Informal Route/Canal Towpath
Recommended Route
Cycle Lane
Bus Lane
Cycling only permitted 6pm-8am Mon-Sat and all day Sunday
Subway or Cycle Underpass
Pelican Crossing
Zebra Crossing
Bridge
Cycle only access
Cycle Park
One-way street
University Parks
Radcliffe Infirmary
Somerville College
Keble College
University Museum
University Science Area
Linacre College
Mansfield College
Wadham College
Ruskin College
St. Cross College
Ashmolean Museum
St. John's College
Trinity College
Balliol College
Worcester College
BEAUMONT STREET
Gloucester Green Bus Station
Oxford Station
PARK END STREET
Nuffield College
Manchester College
Hertford College
Sheldonian Theatre
New College
Jesus College
Exeter College
Bodleian Library
The Queen's College
Lincoln College
All Souls College
St. Edmund Hall
St Peter's College
Oxford Castle
County Hall
HIGH STREET
Town Hall
Museum
Oriel College
University College
Magdalen College
Merton College
Westgate Shopping Centre
Pembroke College
Corpus Christi College
Christ Church
Cathedral
Botanic Garden
Magdalen Bridge
College of Further Education
Ice Rink
SPEEDWELL ST.
Folly Bridge
Music Meadow
St. Catherine's College
MANOR ROAD
ST. GILES
BANBURY ROAD
WOODSTOCK ROAD
ST. BERNARDS ROAD
WALTON STREET
NELSON STREET
RICHMOND ROAD
WALTON CRESCENT
OXPENS ROAD
ABINGDON ROAD
ALDATES
THAMES STREET
WESTERN RD.
PARKS ROAD
SOUTH PARKS ROAD
ST. CROSS ROAD
HOLYWELL STREET
LONGWALL STREET
HOLLYBUSH ROW
ST. THOMAS STREET
ROSE PLACE
MERTON STREET
QUEEN ST.
¼ Mile
½ Kilometre

Network Infrastructure

- FDDI Campus backbone since 1993
  - Largest private network in UK/ Europe
  - Delivered to every College and Department
  - Extends over several square miles
  - 26,000+ registered hosts in DNS
- ***October 1999***
  - ***begin move to Gigabit Ethernet for Campus backbone***
  - ***ADSM services can upgrade to Gigabit Ethernet***

ADSM BACKUP Services at Oxford today

- 150+ departmental servers backed up
- 2,000+ desktop systems backed up
- 8.5TB+ data held in ADSM server
- 95,000,000+ files held in ADSM server
  - ***600,000+ added daily***
  - ***70-110GB+ added daily***
- Expire 2-3 million files each week
- Major focus is ***small files : average 100kb***

ADSM Backup Service Set-up

- ADSM Server : RS6000/H70 (*July 1999)*
  - 4 CPUs, 2048MB memory; Fast Ethernet
  - 450GB Enhanced SSA RAID disk
- 3494 Automated Tape Library
  - Capacity 2000 3590E tapes; 10 3590E tape drives
- ADSM Server 3.1.2.40; AIX 4.3.2
- ADSM clients
  - W95, NT, NetWare, Win32, Mac, OS/2
  - Solaris, SunOS, Linux, Digital, AIX, IRIX, HP-UX

ADSM Asset Repository Services at Oxford today

- ***HSM : 3.5TB data***
  - **460,000 files**
  - ***On average, 1,000 files added daily***
  - ***On average, 10GB data added daily***
  - ***recall 1-2GB daily***
- ***Archive :***
  - ***500,000 files***
  - ***200GB data***
- Major focus is on ***very long term storage***

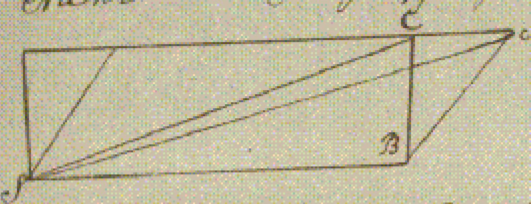
ADSM Asset Repository Set-up

- ADSM Server - HSM Client: RS6000/R40
  - 4 CPUs, 1024MB memory; FDDI
  - 50GB 7137-SCSI RAID disk
  - 150GB Enhanced SSA RAID disk
- Shares … 3494 Automated Tape Library and 3590E drives
- ADSM Client 3.1.0.6 ; AIX 4.2.1
- Services : FTP, HSM, WWW

Ad dñm cum tribularer.
Leuaui. Letatus. añ.
Aue maria. cap. Egredie
tur uirga. V. Diffusa est.
Propterea bened. Kyrieleyson
Xpeleyson, Kyriel. orō:
Deus qui de beate. añ.
Ecce dñs ueniet. V. Ecce appar:
Et cum eo. orō. Consci
entias nostras. Ad sextam:
Deus in adiutorium.
Domine ad adiuuandum.
Gloria. Memento. Gloria tibi




ert. Triang: SBC, ob parallelas SB. Cc. = Δ° SBc.)
37. Compleantur utraq ΔΔ in □^{a}, Basis SB est utriq communis, & altitudo æqualis, ergo hæc dua triangula, cum sint suorum parallel. dimidia erunt inter se quoq æqualia. vid: de hac prop Whistonum p:22 Lemm: 15.



n. L.14 erit ex conicis PvG. Qvq :: PCq. CDq) in Ellipsi □^{ta} semiordinatarum sunt ut □^{la} sub segmentis lateris transversi. Qv est semiord.^{ta} lineæ PG. et DC potest sumi pro semiord.^{ta} aliâ ejusdem lineæ. cujus dimidia PC & CG (hic PCq) faciunt □^{lu} sub segm: & DCq est □^{m} semiord.^{te} ergo ut PvG □^{m} sub segm: ad Qvq □^{m} semiord.^{ta} sive PCG, vel PCq □^{m} sub segm: ad DCq □^{m} semiord.^{te}

Lin:17. ob similia ΔΔ Qvt. PCF.) Anguli ad F et t sunt recti ob PF. Qt. perpendic:. Ang: ad C C^{v} =^{es} quia sunt alterni inter duas = las Qv CF semiord.^{tas} ejusdẽ axis. &c.

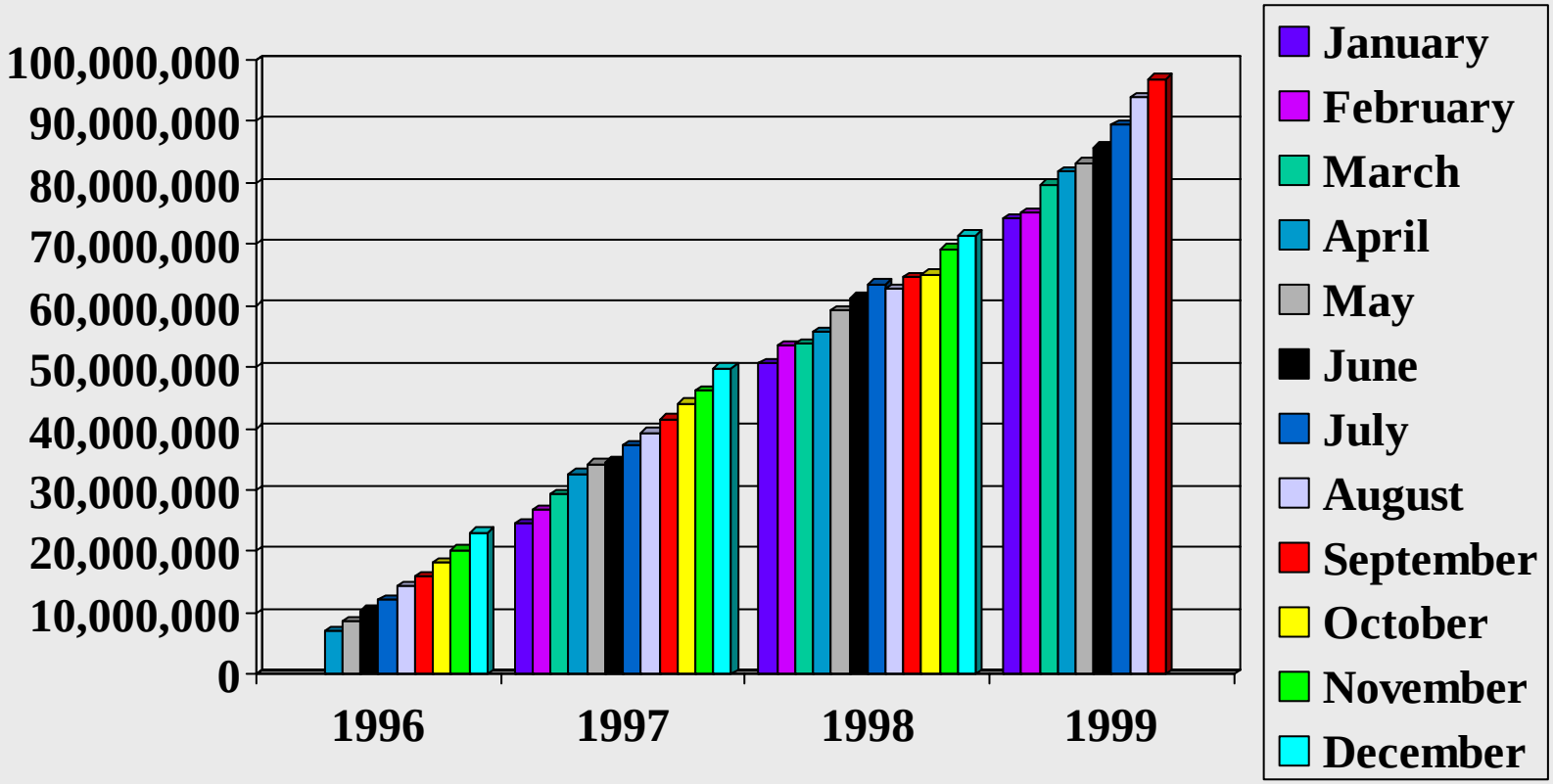
L.22. CD x PF) Ducetur PF in CD quia PF erit latus perpendiculare parallelogrammi circa Ellipsim describendi.

o L.13. ob æquales CS, CH æquantur ES, EQ.) Δ^{li} SHI latera SH. SI, dividuntur in segmenta proportionalia per lineam EC basi HI parallelam. ergo SC. SE :: CH. EI. et ob æqualitatem Antecedentium SC & CH æquantur consequentia SE, EI.

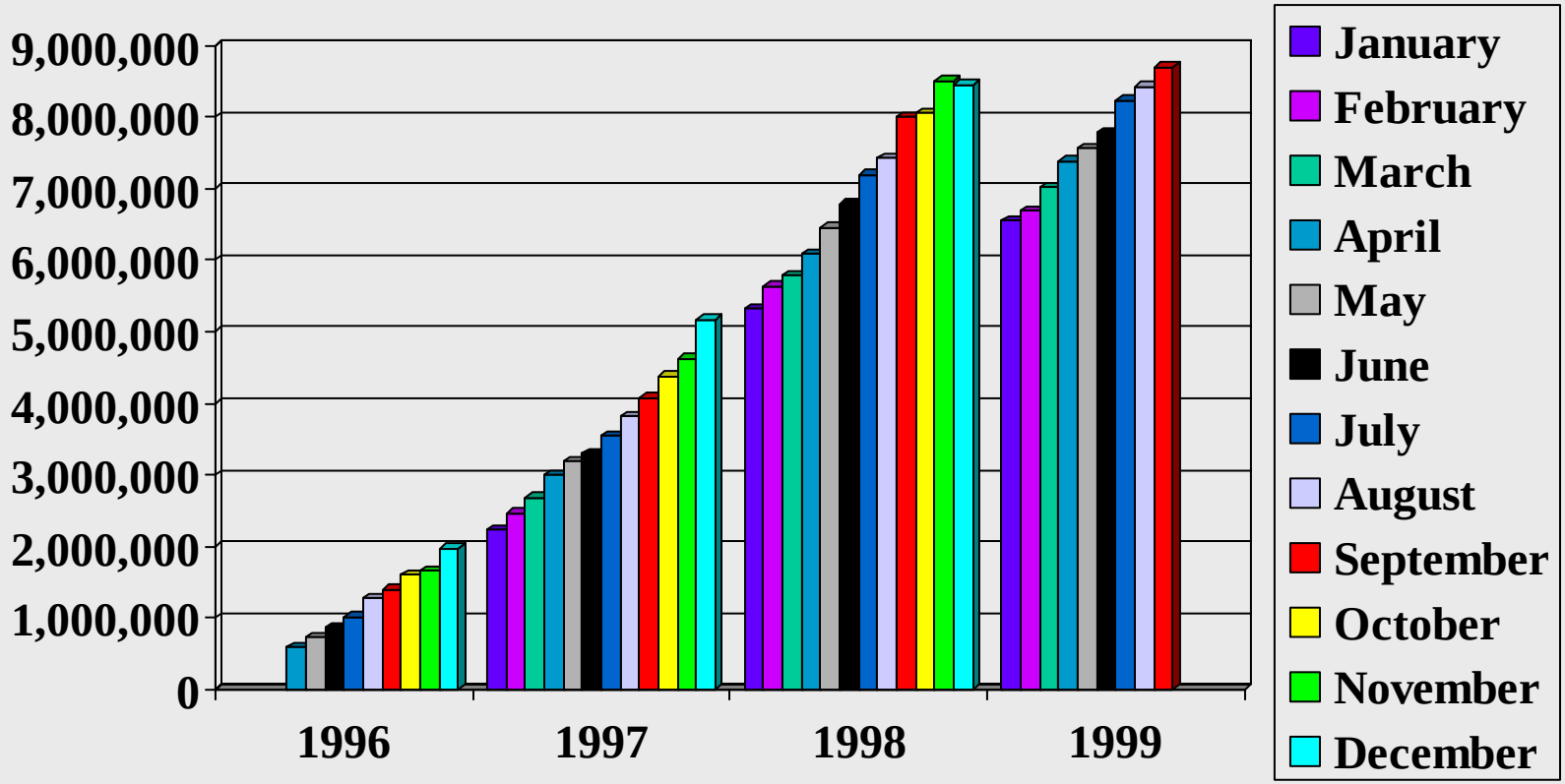
Scaling up the site-wide Backup Service

- 1995-1999
  - From nothing to over ***2,000+ desktop clients***
  - Average Desktop storage up from ***400MB to 4GB***
  - From nothing ***to 150+ departmental servers***
  - Average Departmental server storage up from ***2GB to 20GB-100GB***
- 2000… the next 5 years
  - Growth in client base … ***potential for 30,000 clients***
  - Growth in client size …***disks getting bigger***
  - Devolve management … ***has to be an aim***

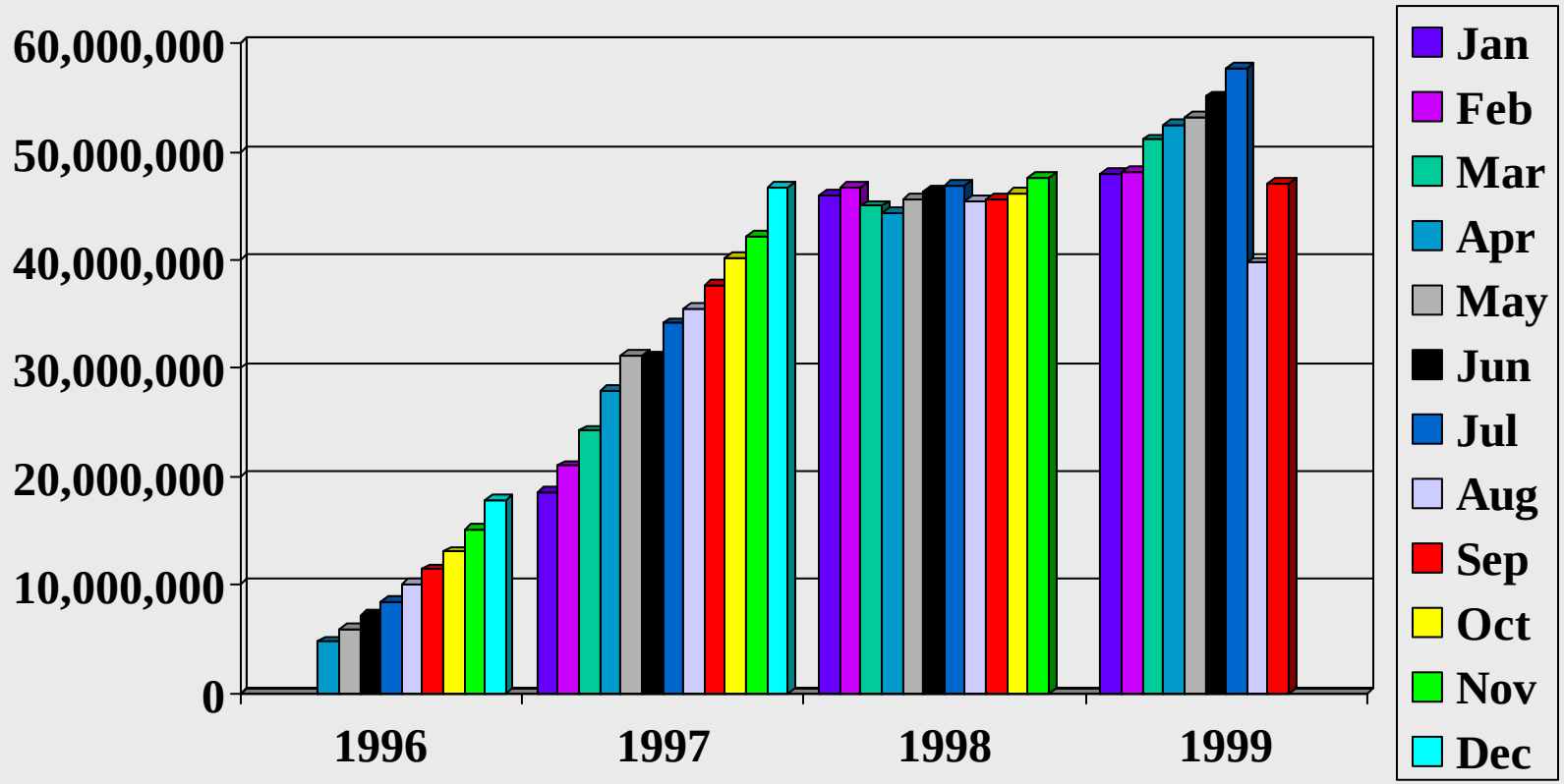
Growth … all backup data (*files)*



Growth … all backup data (*MB*)



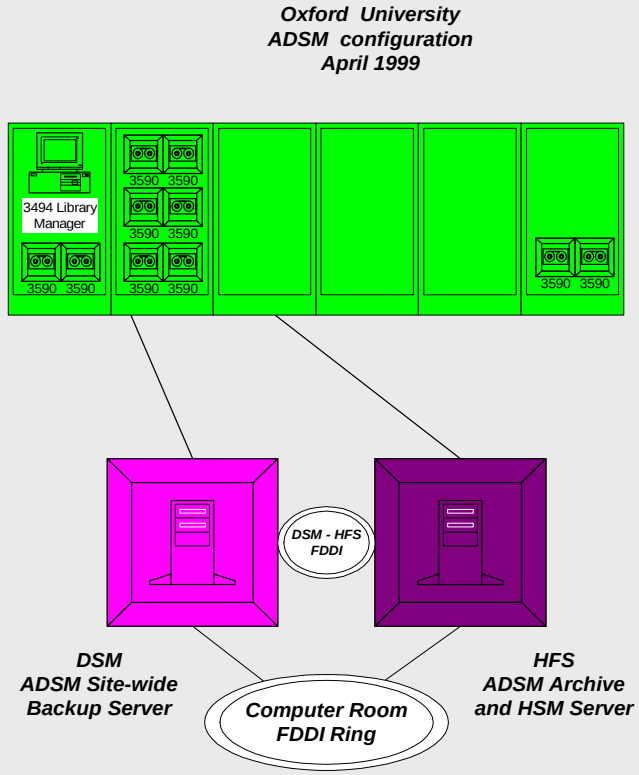
Growth … ADSM Database (*KB*)



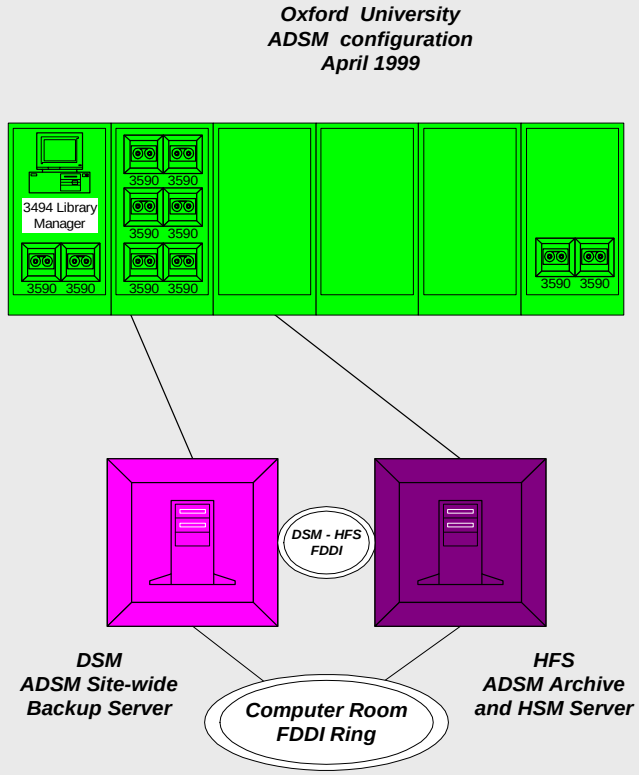
Possibly the way ahead …

- Single ADSM server may not scale well …
  - ***Have already split a single ADSM server into two to improve performance with HSM/Archive***
  - ***ADSM database bottlenecks -***
    - ***Client lookups and updates; Inventory Expiration***
  - ***ADSM server housekeeping - multiple processes***
  - ***Client operations and housekeeping fighting?***
  - ***Completing backups in time-window available***
  - ***70% current backup load is departmental servers***
  - ***Desktop clients want daytime facilities***

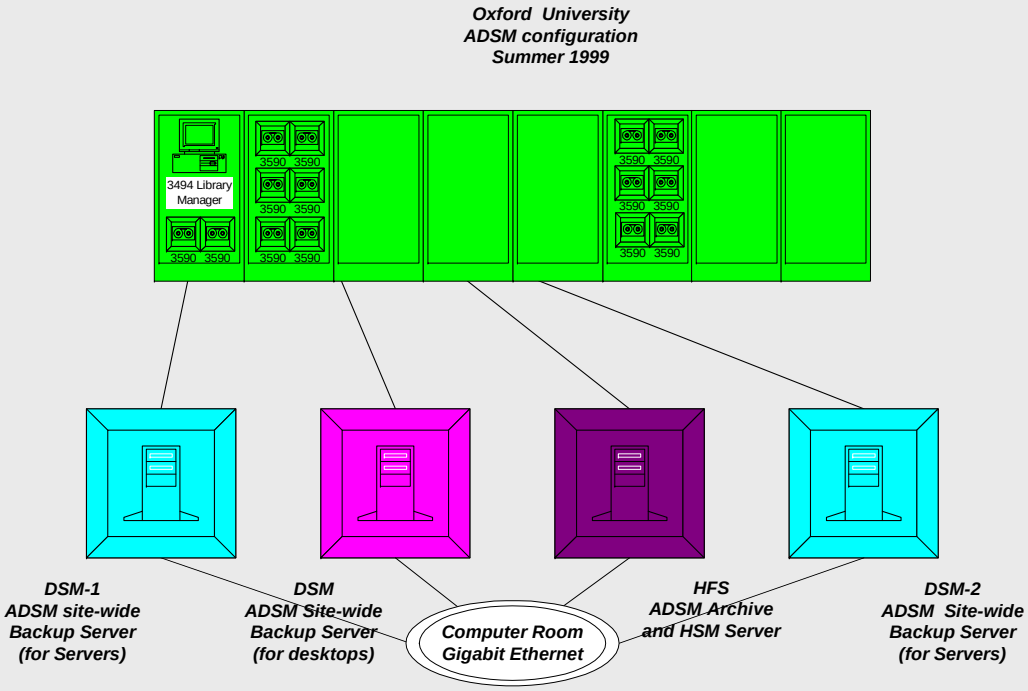
ADSM configuration *April 1999*



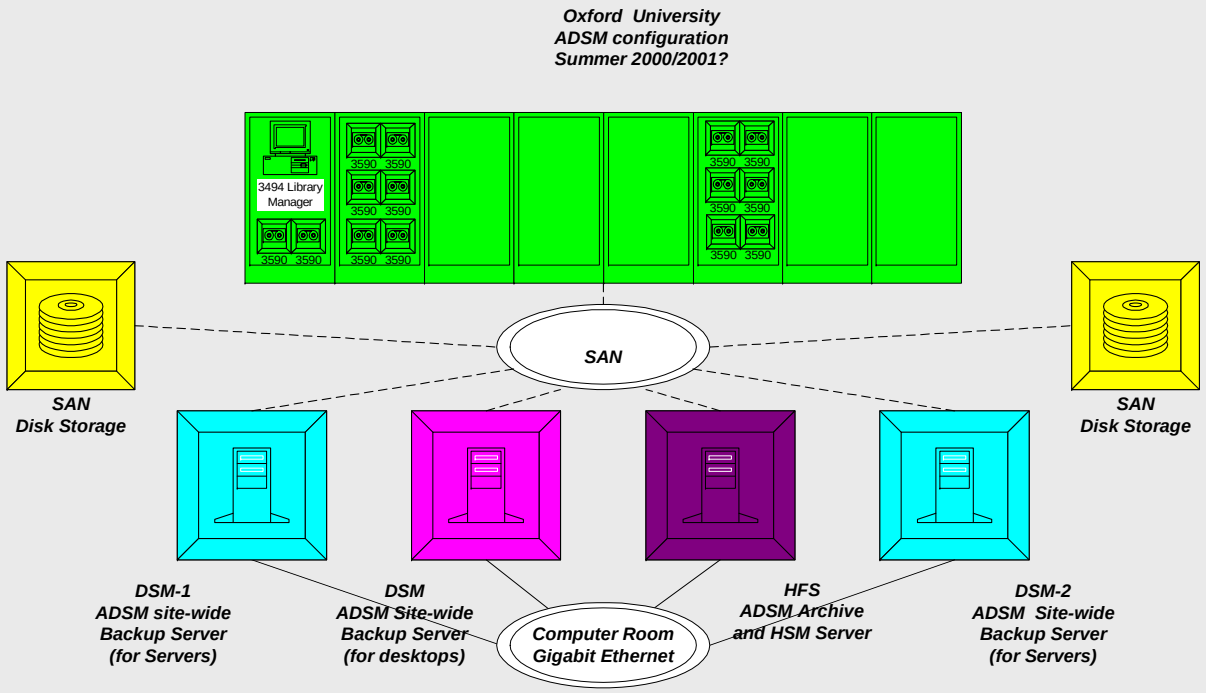
ADSM configuration *July 1999 … installed H70 and 3590Es*



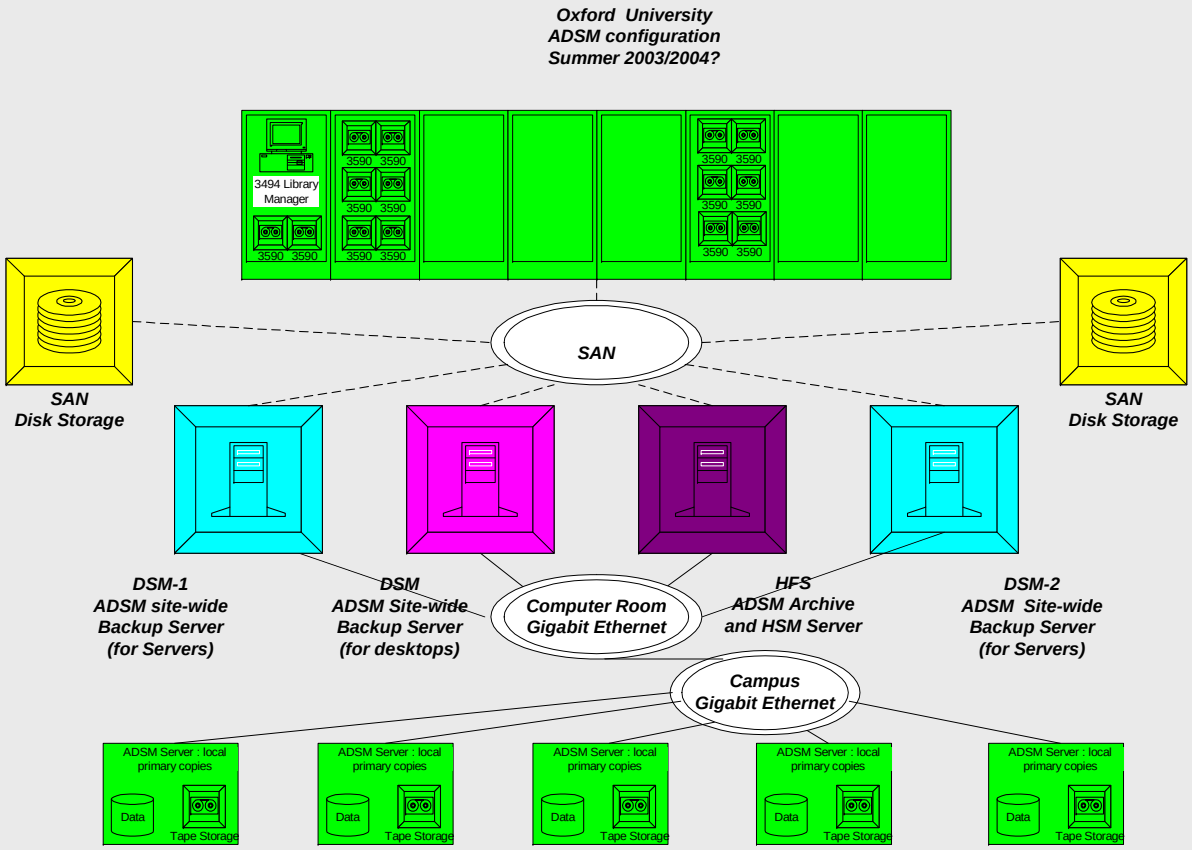
Summer 2000?
add 2 servers and split backup?



Later … 2001/2002? Introduce SAN technology?



Even later ... 2003/2004? Exploit SAN and ADSM?



Scaling up … exploiting the tape and robot technology we have

- 3494/3590E issues ...
  - Dynamic sharing of 3590Es across RS6000s : ***requires microcode with autoshare : Q3 1999?***
  - 3494: LAN connected *(currently tty connected)* ***needed to support 4 servers and 14 drives***
  - Fibre Channel-SCSI switch(es) for 3590Es ?
- Maximise 3590E speed and capacity ...
  - ***We get 15MB/sec on single process; but 4 concurrent ones aggregate to around 30 MB/sec***

Scaling up … exploiting SAN?

- Some questions to be addressed?
  - **Is the ADSM database a real bottleneck?**
  - **Will ADSM DB scale up to keep pace with SAN?**
  - **Expire Inventory: scanning 8,000,000 files takes 15 hours today on H70 - *what more can be done?***
  - **Offsite Reclamation is very slow - *can it improve?***
  - **Client operations slower than expectations ...**
- What other issues are there?

  … ***answers are in the ADSM Symposium?***