Theme 1: The start of on-line data

- March 1966: Drum storage
- 2 units, each holding 3 Mbyte
  - Transfer speed of 1.5 Mbyte/s per unit
  - Read entire contents in 2 seconds
  - (c.f. half a day to read the entire contents of a modern disc)
- First on-line storage for CSIRO – concept of a Document
- Used primarily for systems and libraries, small amount for users.

Theme 1: The start of on-line data

- DAD March 1967:
  - saving for extended periods
  - Signalled discarding
  - Charging: set in advance: $108 per hour of compute, $7.50/Mbyte/day

- October 1967:
  - disc added: 75 Mbyte

- Managing on-line storage for users
- Drum and disc were unreliable – crashes and preventative maintenance
- Multiple tiers already
- Flushing a necessity!

- *Still issues today with shared storage!!!!!*

Theme 1: The start of on-line data

- March 1968:
  - documents able to be retained on-line
  - removed each weekend
- August 1968:
  - documents saved to tape across weekend – sorted by access time
  - oldest discarded!
- Feb 1969:
  - more flushing, not just over weekends
- July 1969
  - Flushing – possible down to 15 minutes old – by access time!
- Dealing with filling filesystems
  - Dynamic flushing: depends on activity – right solution, rather fixed age currently still practised.

Theme 1: The start of on-line data

- Feb 1970:
  - Charging: for inactive files only
  - 'touch' disabled!
- Sep 1970:
  - Flushing again: max: two months: min two days
  - Suggestion to still make card decks!
  - Later – two days grace period – allowing for delayed airline flights
- March 1971
  - Saving flushed files to tape, allowing restoration within 8 weeks: HSM!

Most files are small!
Most data is in large files
Still true!!
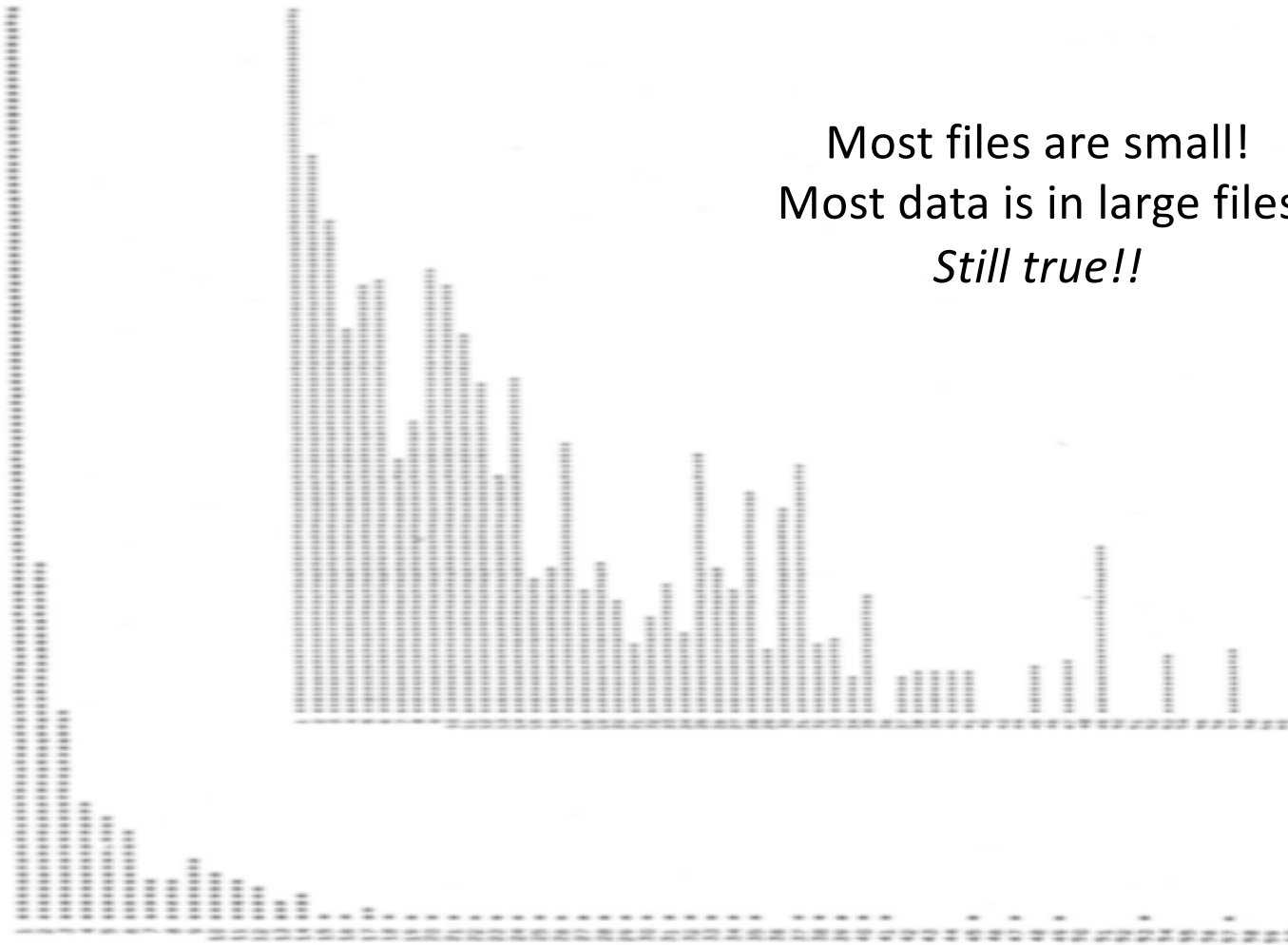
Theme 1: The start of on-line data

- May 1971
  - 8 weeks retention for flushed documents
  - control statements provide info. on off-line copy
  - Three levels of persistent storage: drum, disc, tape
  - Commands to audit files and to move/copy files between levels

- Feb 1972
  - Unified Document Storage
  - "automatic archival and retrieval of documents to magnetic tape will be implemented"

CSIRO

Theme 1: The start of on-line data
Feb 1972: virtualisation
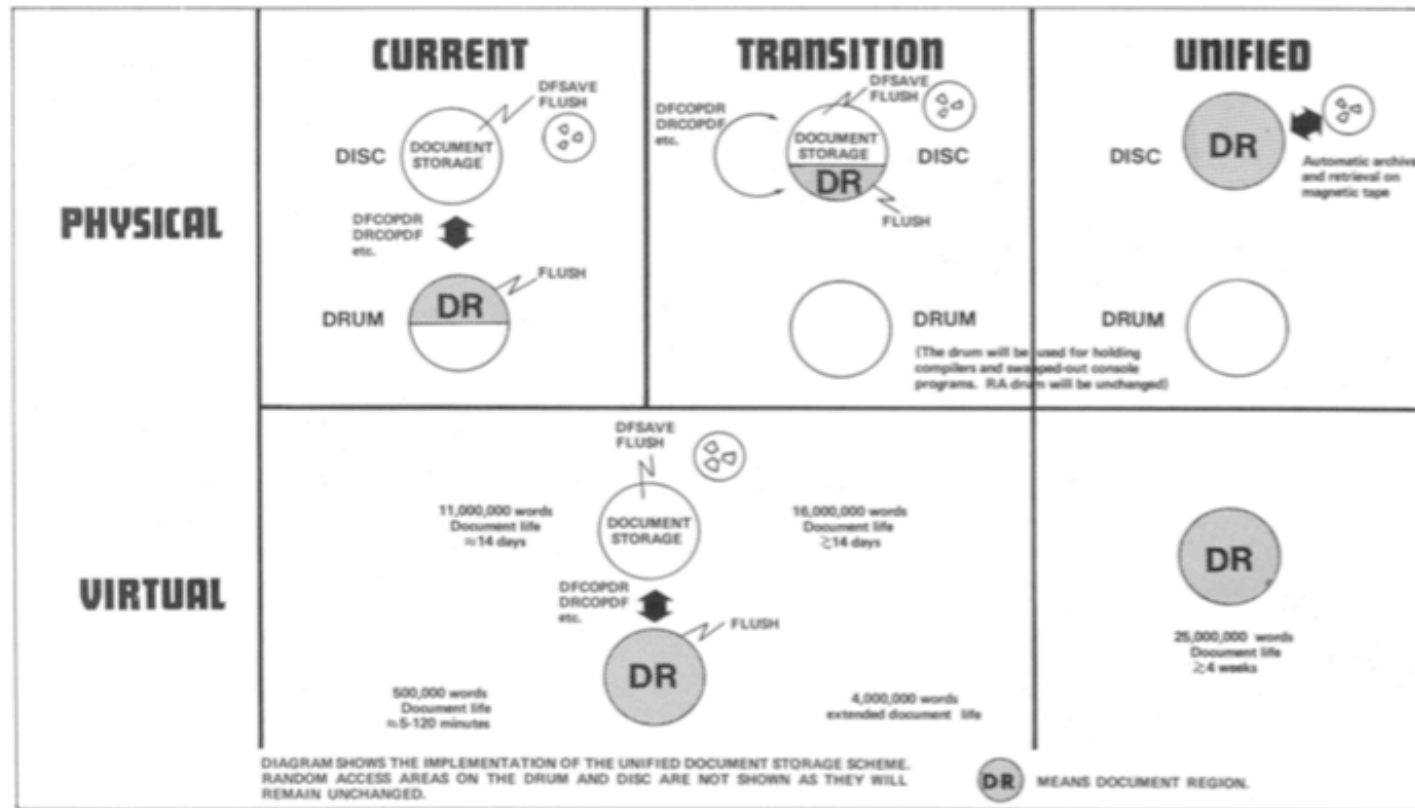
Theme 1: The start of on-line data

- Apr 1972
  - Unified Document System in production
  - Further developments/refinements
- May 1973
  - Retention period up to 99 days
  - Charging for storage: up-front!
    - Brilliant control
    - Charge up-front by size and user-specified retention period!
    - (Terrible for users? But they could specify a short retention period, and extend when needed.)

May 1973: real HSM – up to 2 copies; automatic retrieval, with job scheduling integration (stall while waiting for recalls)

- Automatic Archive
  - done weekly, with two copies if the retention period was long enough
  - Maximum of 99 days retention
- Automatic Retrieval
  - Pre-scan of job, and job-start deferred while retrieving specified documents
  - Retrieval requests "batched at hourly intervals so as to improve the efficiency of retrievals from a number of requests to the same archive tape. The user's job is run after his document has been retrieved."
  - Not extended to interactive access
- User Retrieval
  - Access to the archive directory containing all attributes of the document and the tape name and serial number.
  - RETRIEVE statement to restore document to the document region
- Operator-mounted tapes – HSM without tape automation

CSIRO

Jul 1973 on

- July 1973
  - Cyber 76 installed, taking over main compute role from 3600
- Oct 1973
  - Command to suppress automatic retrieval
- June 1974
  - High priority execution queue for retrievals
- Nov 1975
  - Phase out of 3600 and DR starts
  - Utility to copy files to Cyber 76
- Jul 1976
  - DR charges increase by 80%
- Dec 1976
  - 3600 phase-out begins
- May 1977
  - 3600 service ceased, and document region/HSM died

Theme 1: The start of on-line data: automated but archive storage in the 1980s

- Dec 1977
  - *"Perhaps the only answer to the problem of providing a file service lies in an automated archive system. The Division is currently investigating the utility of such devices."*
- Aug 1979
  - First mention of Calcomp Automated Tape library installation
- Aug 1980
  - Article on Braegen ATL (first in Australia), and pictures
  - Facom M190 host, XYTEX software to intercept operator mount requests
  - STK round tape drives, robotic tape library
  - NSC Hyperchannel network
- Early 1980s on Csironet: Robotic 'Archive' storage, without HSM

- Conclusion: CSIRO staff provided innovative storage solutions to meet the needs of users

CSIRO