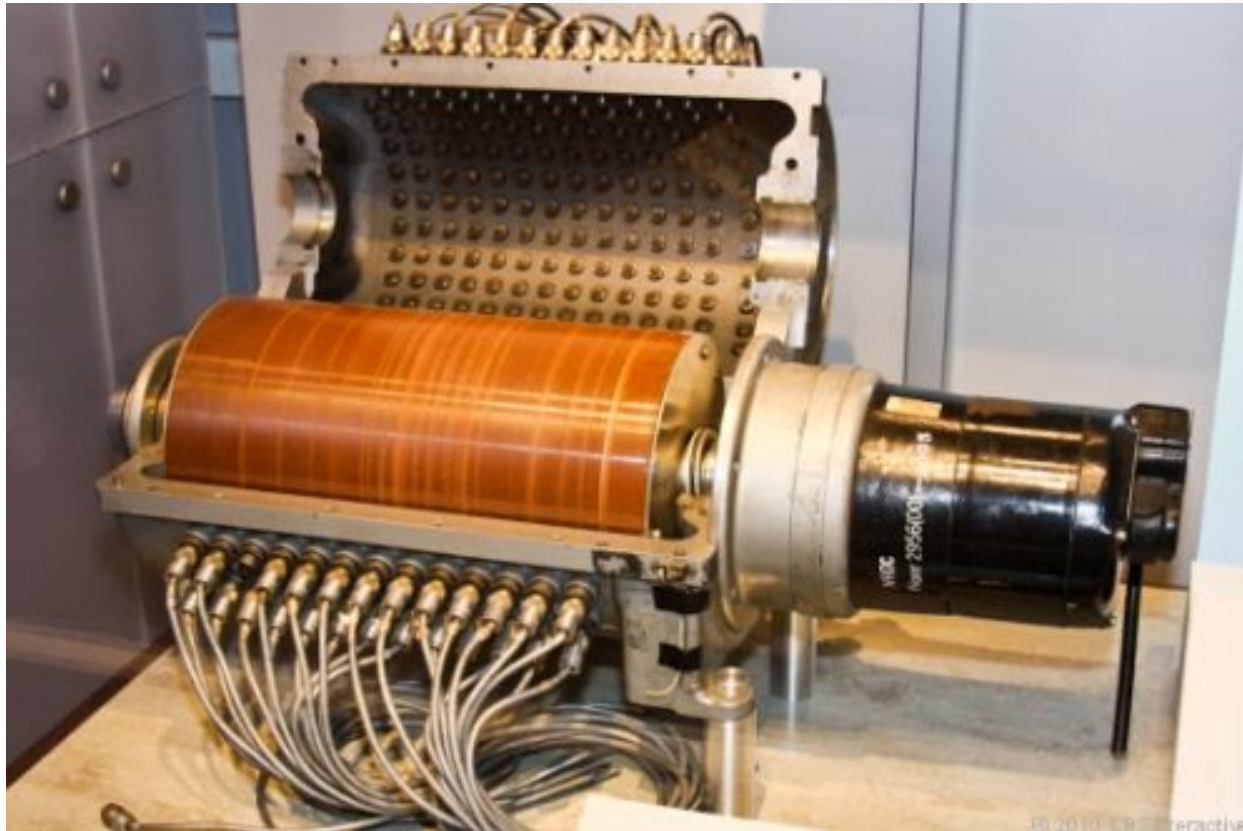


History: CSIRO's Computing Services

- Critical issues – systems did one task at a time
 - For example: no overlap of card reading with computation, nor printing with computation
 - Only magnetic tape for working storage – compilers were on tape, wrote binary code to tape, then loaders had to read tapes to load programs
- 1966: DAD Operating system – Drums And Display
 - Written by CSIRO and CDA staff
 - Overlapping operations
 - Document Region
 - On-line system – interactive document management, editing, INTERP, visualisation.

Example Magnetic Drum

<http://forpresentation12.blogspot.com/2015/01/magnetic-drum.html>



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 or 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!!!!*

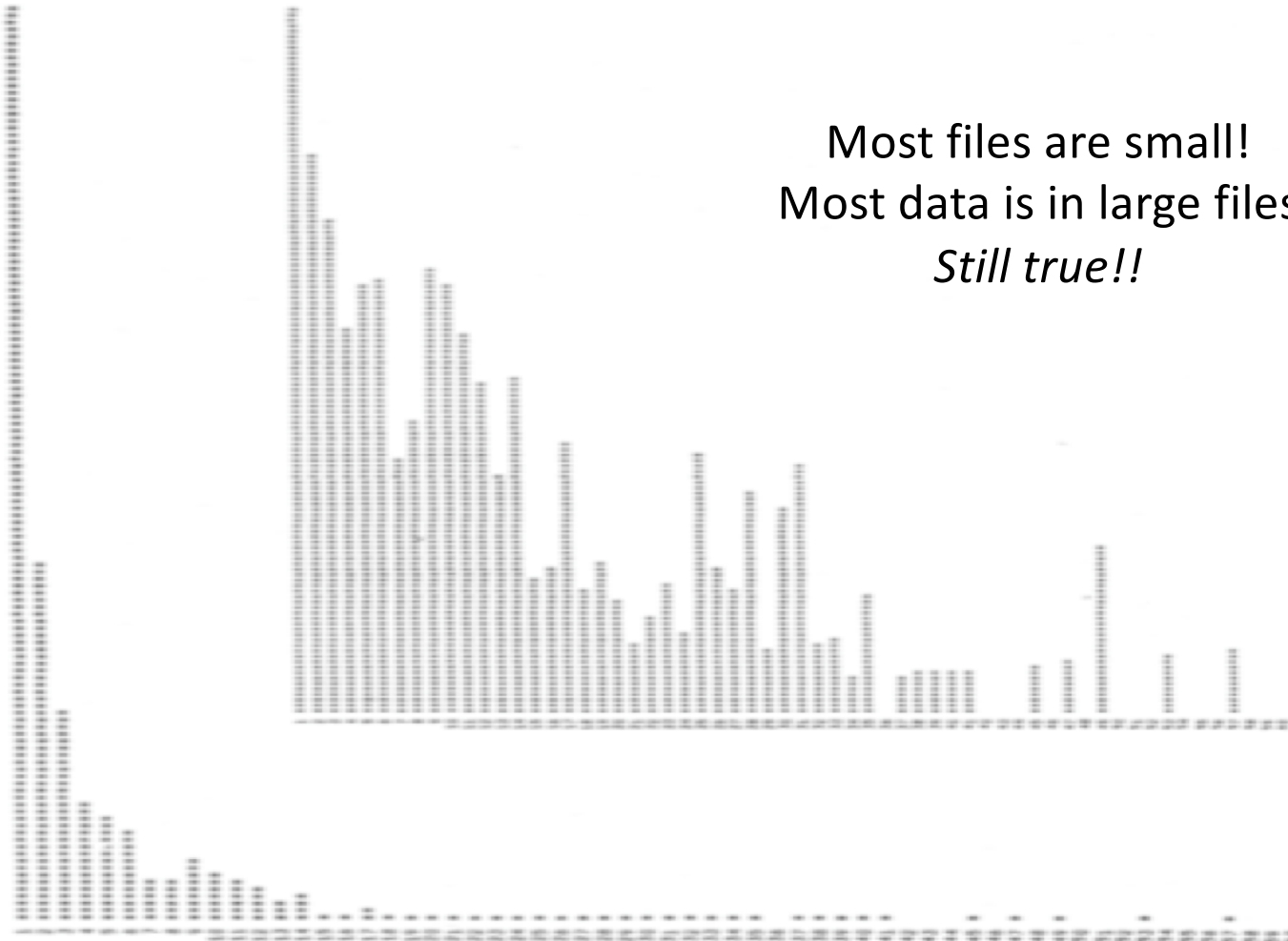
Theme 1: The start of on-line data

- 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!!

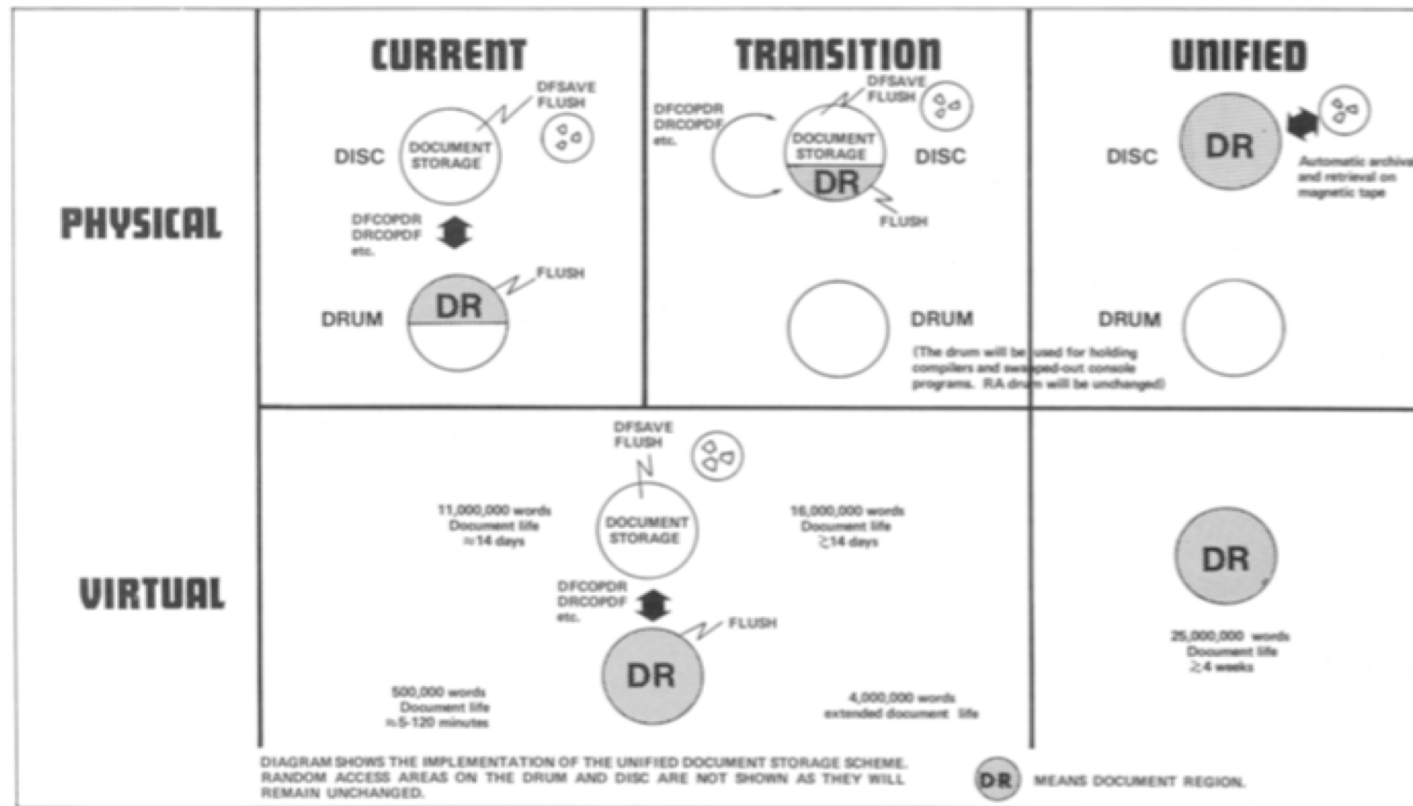


Theme 1: The start of on-line data

- 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"

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

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