

Technology,  
Networks,  
and

# THE LIBRARY OF THE FUTURE

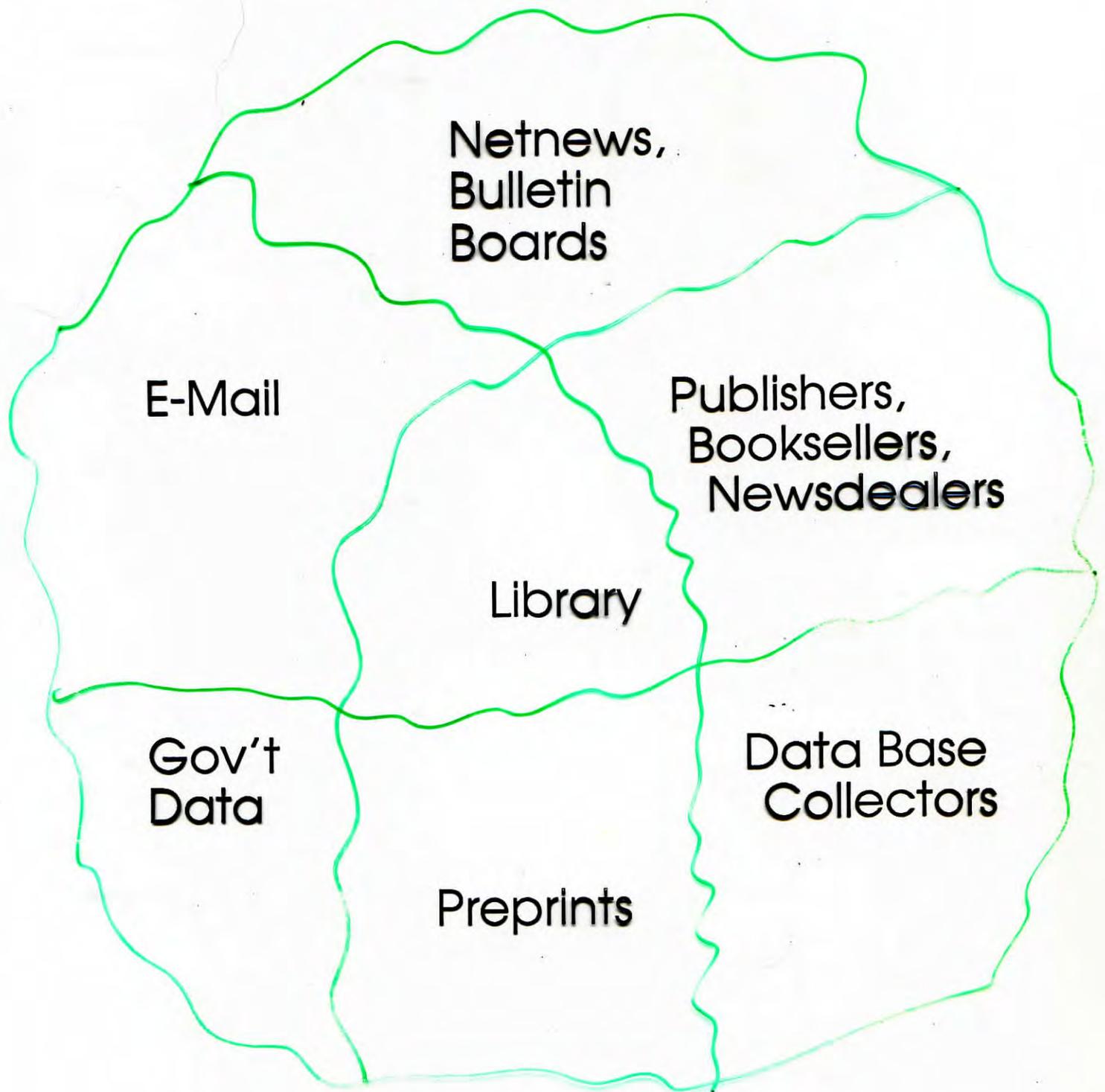
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# Overview

1. The vision
2. The driving technology
3. The system engineering challenges

# Find the Boundaries



## Library:

- Selective
- Archival
- Shared

# How Computers Might Help

(CS View): Discovery/  
Relevance

(Librarian's  
View): Back Office  
Automation

# How Computers Might Help

(CS View): Discovery/  
Relevance

(Librarian's  
View): Back Office  
Automation

(My View): Storage,  
Browsing,  
Navigation

Identification

Discovery



Show me  
*Met. Zeitschrift*  
Vol. i, p. 161.

Find all the  
papers that  
discuss arms  
control from  
the point of  
view of a  
greengrocer

## The Enabling Technologies:

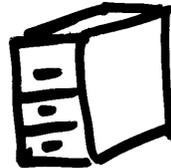
- High-res desktop display



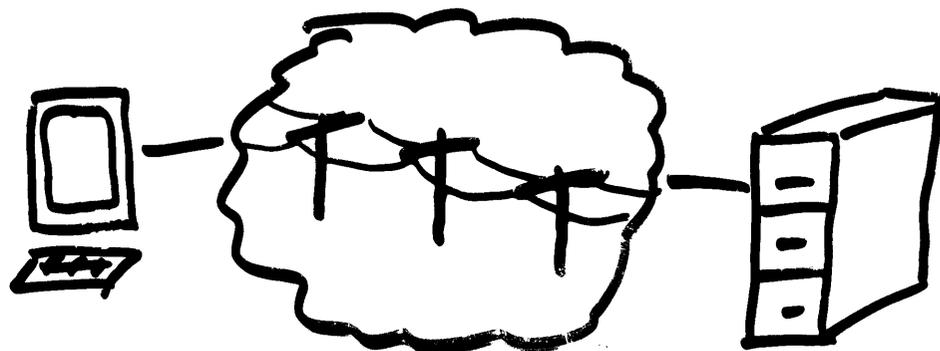
- MB/Sec data communications



- VERY big disks



- Client/server architecture



“The appearance presented by our evening skies for some weeks past has been the subject of general remark.

“Last evening, November 14, the sky was almost cloudless after sunset, and the usual brick-red light again made its appearance along the west-south-west horizon. It was reflected apparently from an almost invisible and gauze-like cloud in the higher regions of the atmosphere. About 7 o'clock the red glow was at its maximum, when a solitary cloud, whose apparent surface did not exceed ten square degrees, presented itself above it at an altitude of 25°. This cloud, which was at first white, quickly changed to a beautiful green, its borders being of a deeper tint. Of all the cloud phenomena that I have witnessed, it was one of the most remarkable. It retained its green colour for the space of about 10 minutes, being all the time subject to much internal commotion. It soon afterwards resolved itself into several cloudlets and finally disappeared. Two or three other small clouds were visible at the same time, and about the same altitude above the northern horizon; but these were of a grey colour throughout. The eastern sky about the moon was of that deep blue which is frequently observed to surround her when rising during the winter oppositions. Shortly after the dispersion of the green cloud the ruddy glow gave place to the ordinary pale gray of the twilight, but by half-past seven o'clock the western sky became diffused with red, but this time of a clearer and more aurora-like tint. It did not appear, as in the former case, to be reflected from hazy cloud, and it extended much higher in the sky. This repetition of the ruddy glow on the same evening is a phenomenon which I had witnessed on several occasions during the present month. I remember that many years ago (probably twenty-five) a somewhat similar patch of red light used to make its appearance regularly after sunset in the west-north-west. This phenomenon occurred previously to the commencement of my regular meteorological observations in 1863, and was, I think, contemporaneous with a very dry winter.

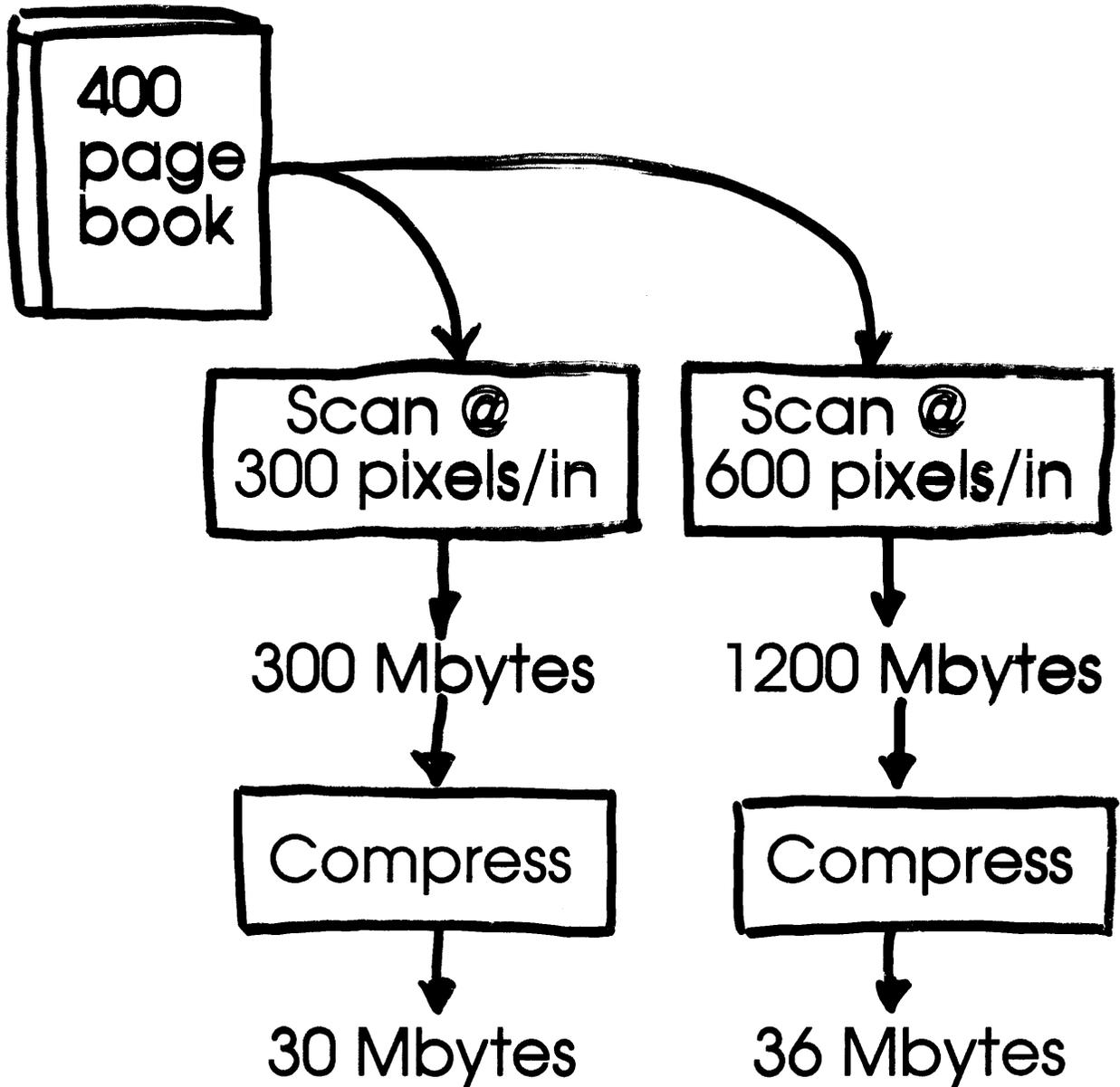
“That the present ruddy skies are not merely a local phenomenon is obvious from the fact that during the past three months they have been regularly observed over a considerable portion of the Indian Ocean.”

Herr G. MEYER wrote,\* at the end of December, as follows:—

“The twilight phenomena occurred here from the 26th of November, and lasted till 5.45 p.m. On the last days of November their course was such that at first a strong evening redness developed itself, which lasted till 4.30 (and similarly a morning redness). At this time the whole sky shone with a yellowish colour, and from 4.45 a purplish glow developed itself, which attained its maximum at 5, and sank down to the horizon till 5.30. On other days these periods were not so sharply distinguishable. On December 19 the phenomenon was absent. On December 5 the moon had a large circular corona. The sky is, in a striking degree, never pure, even with a

\* ‘Met. Zeitschrift,’ vol. i., p. 161.

# Image scanning



## Space Needed:

(300 pixels/inch, compressed)

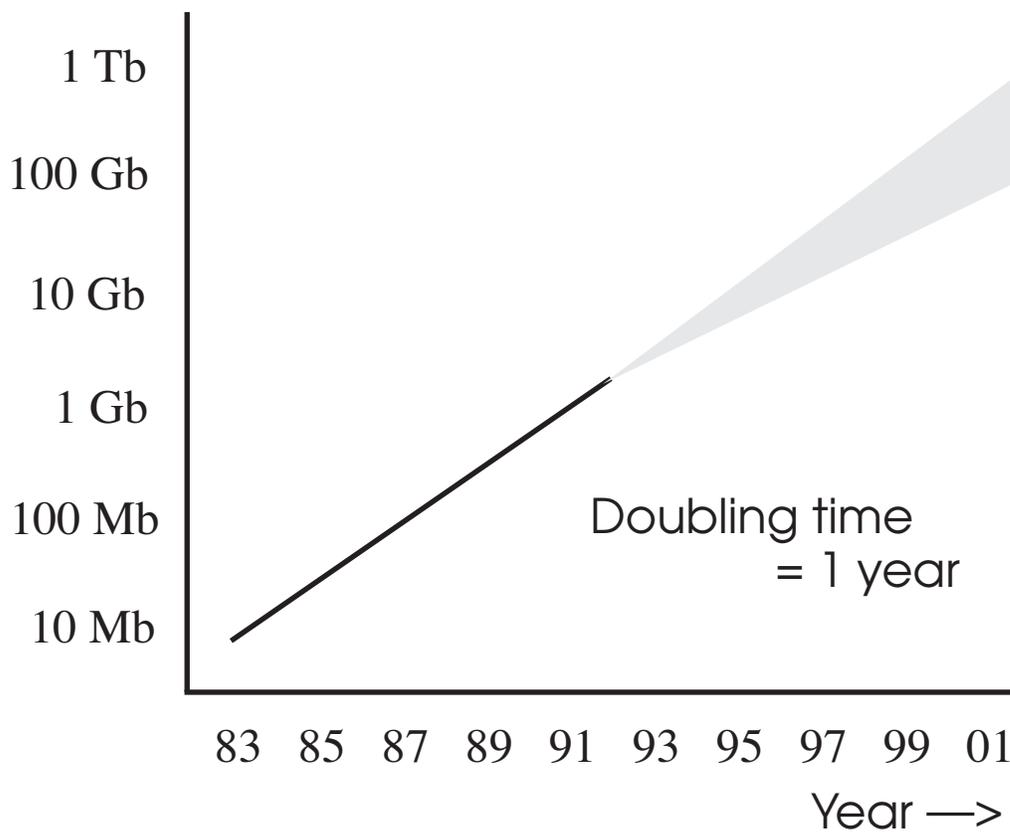
1 400-page book	30 Megabytes
2 M books (M.I.T.)	60 Terabytes
60 M books (L/C)	1.8 Petabytes

Tera =  $10^{12}$

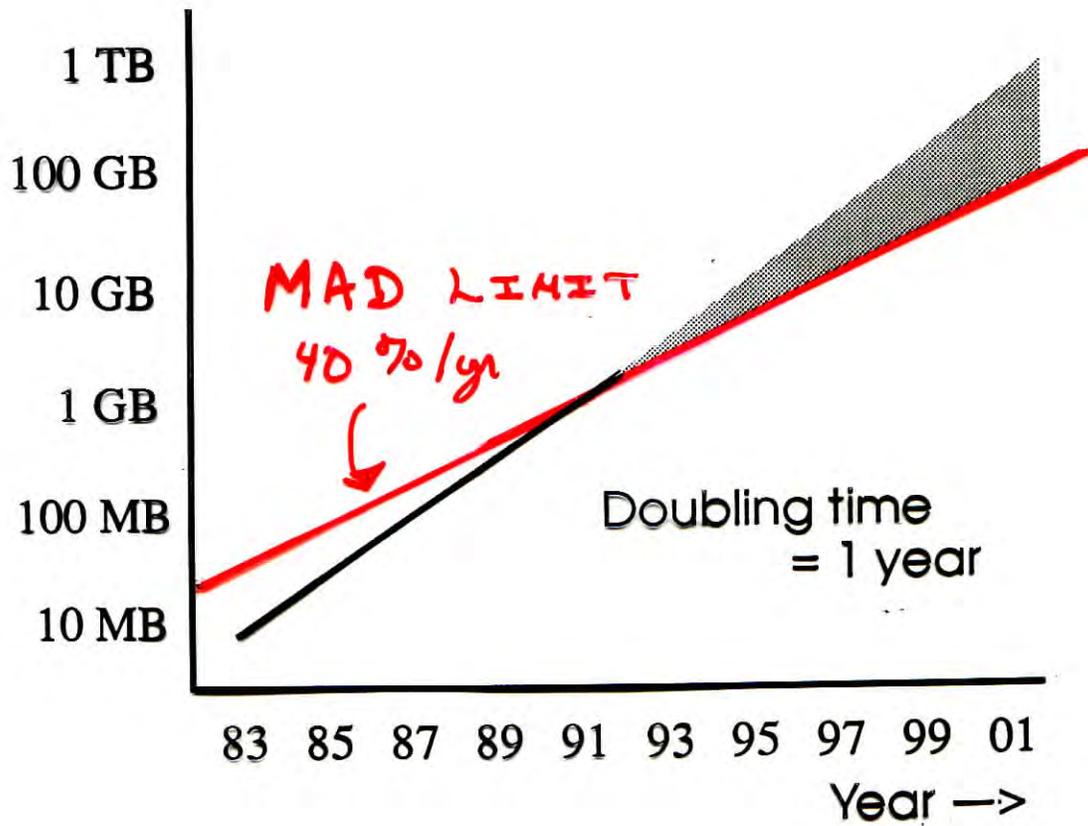
Peta =  $10^{15}$

Exa =  $10^{18}$

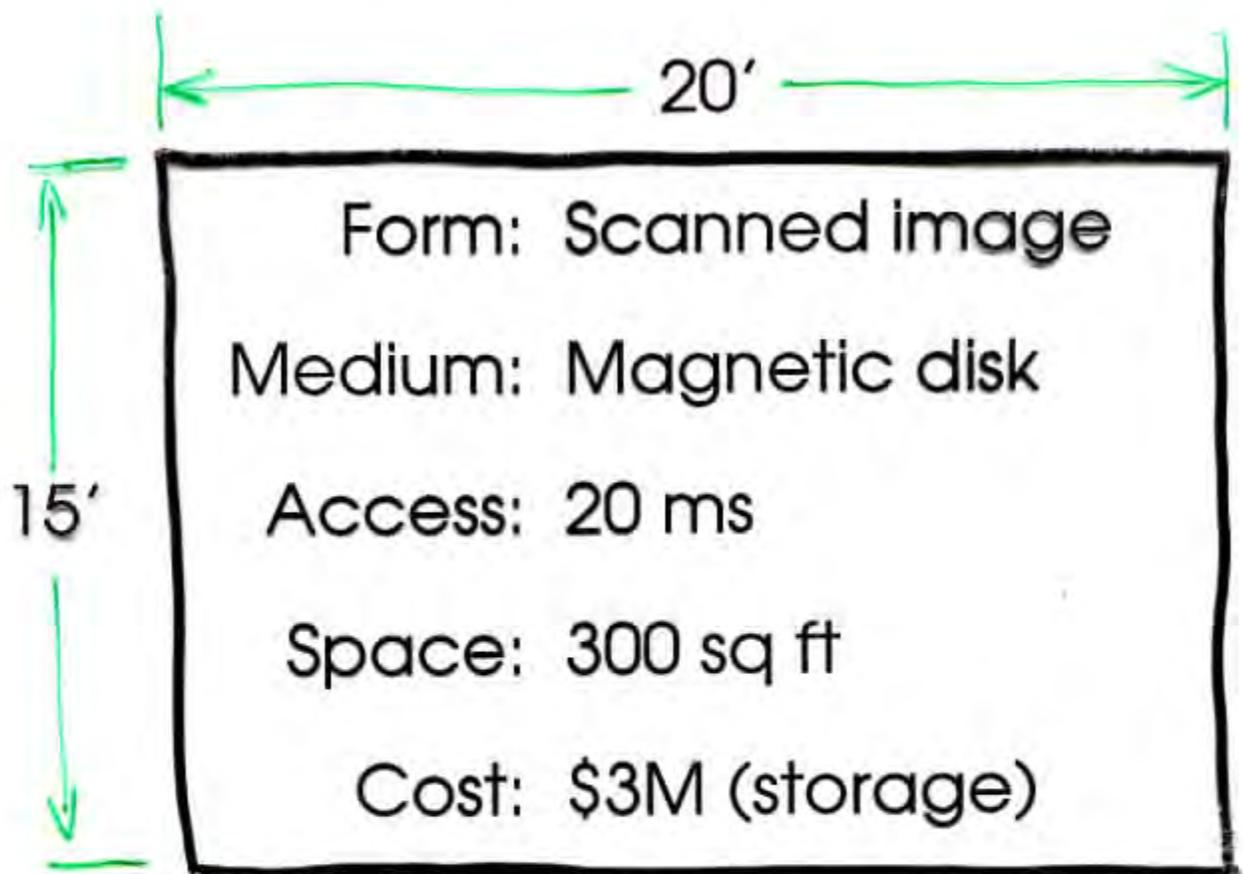
# Disk Storage Capacity for \$2500.



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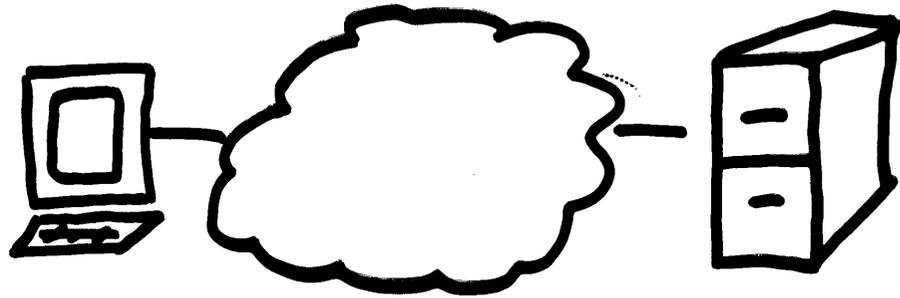


## M.I.T. Library Circa 1999

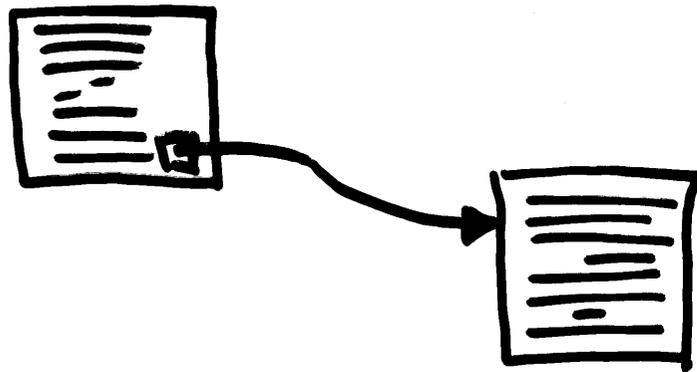


# Challenges

- Applying Client/Server Design



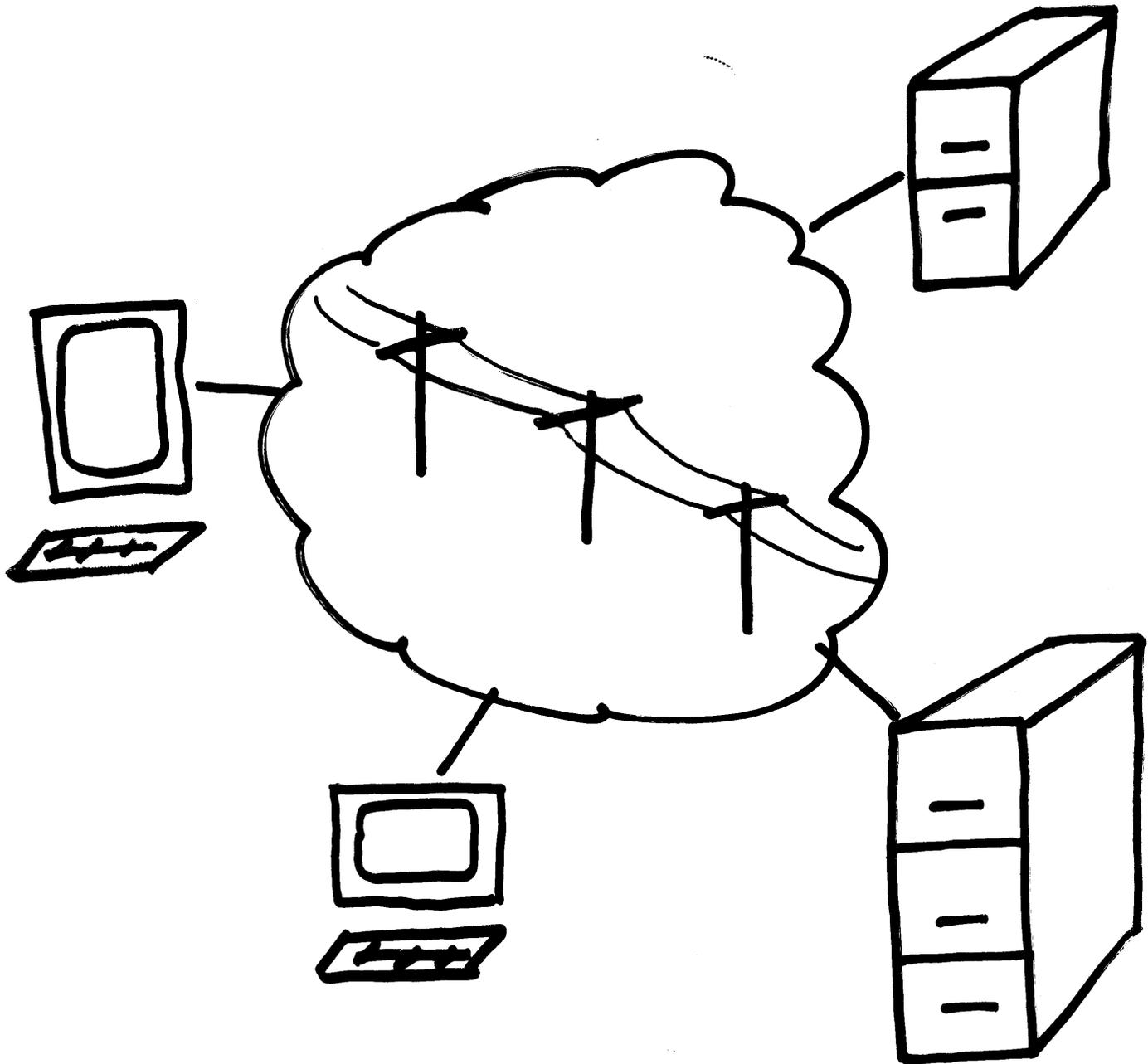
- Links



- Persistence



# Client/Server Architecture



## LINKS

Intellectually generated



Scholarly paper with citations

Survey paper with lots of citations

Bibliographical book

End of year journal index

Library card catalog

List of an author's works

New York Times list of name appearances

Reader's Guide, SCI, SSCI, RILA,

— publication boundary —

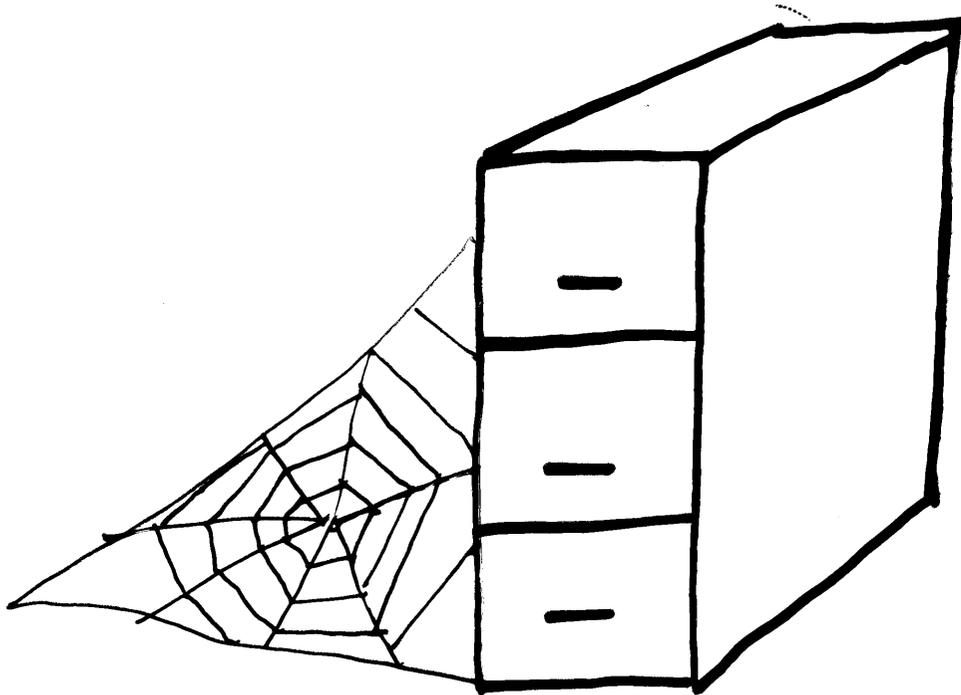
File containing the result of a search request

List of papers consulted by Einstein



Mechanically generated

# Persistence



## Other challenges

- Where to place extra copies
- Connecting words with images of those words
- Reliability of storage
- Startup (production continuity, revenue/copyright)
- Variant copies

# Conclusions

1. A revolution is available for the asking.
2. The engineering is a fascinating challenge.