Lessons From Project Athena

Jerome H. Saltzer,
Technical Director

Topics

- The Project
- The System
- The Lessons

DIFFERENCE:

GOAL IS

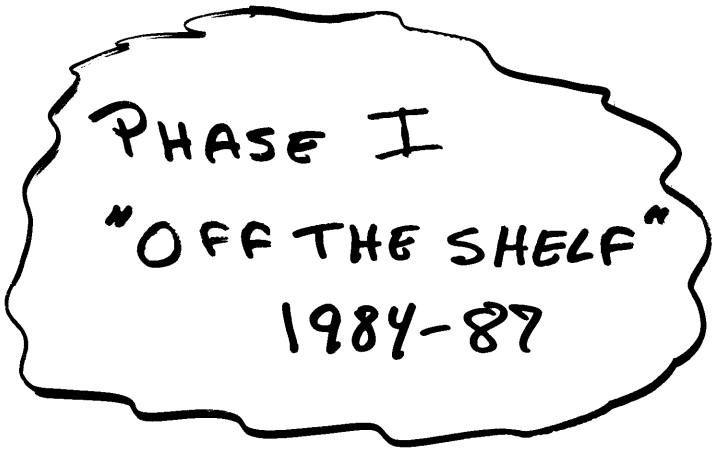
EDUCATION IMPACT

NOT

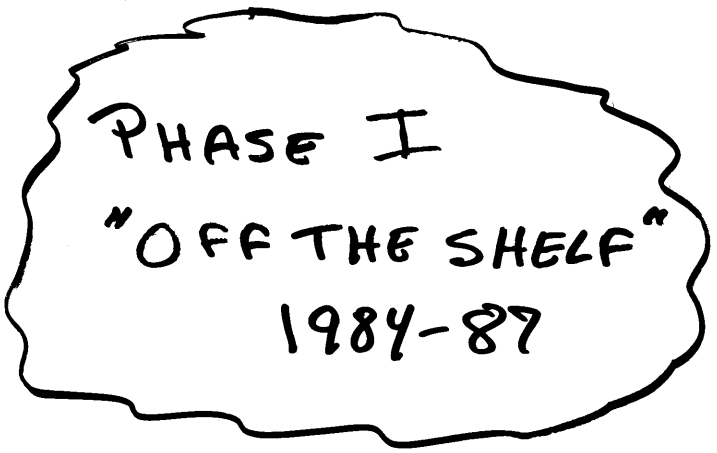
COMPUTER SYSTEM

ADVANCES

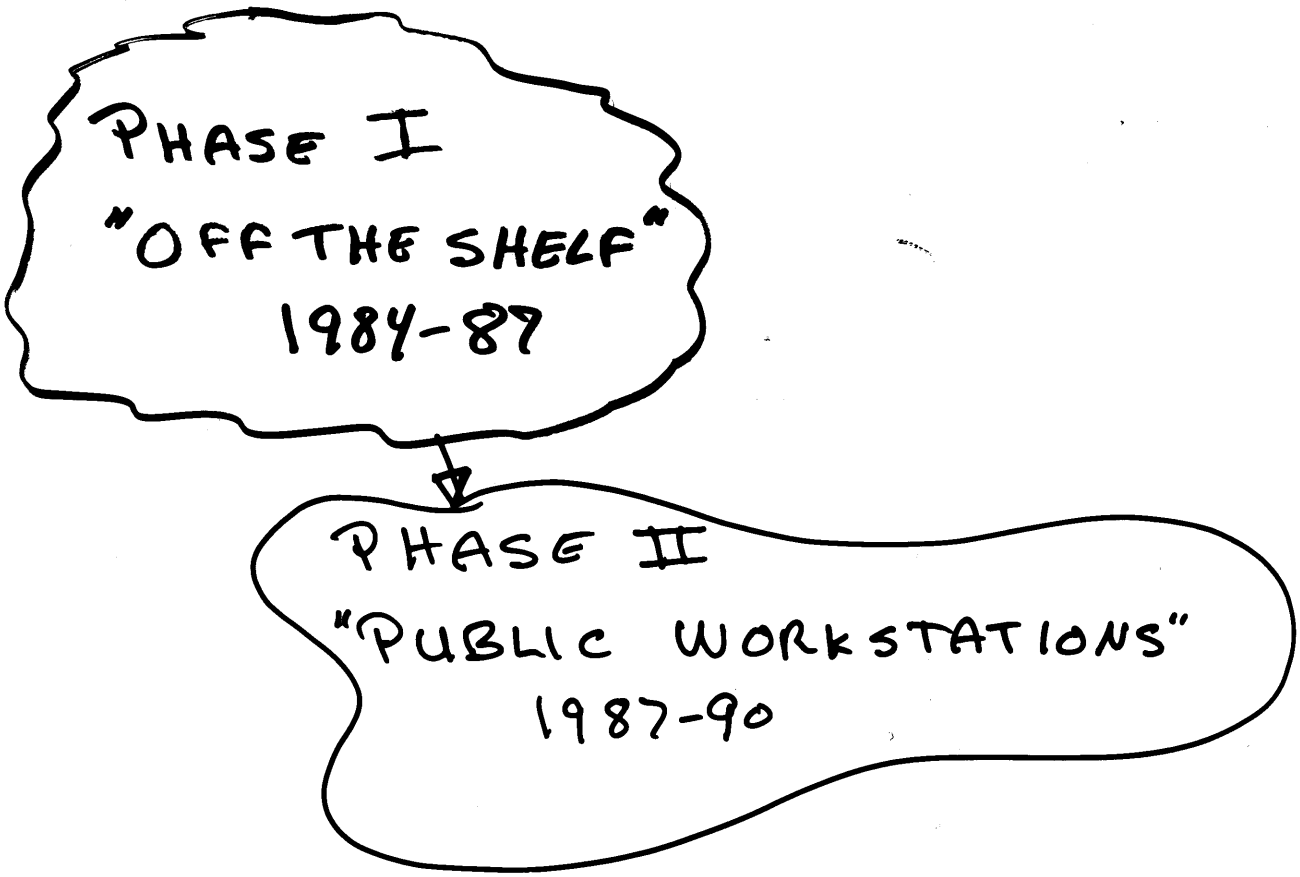
ATHENA EVOLUTION



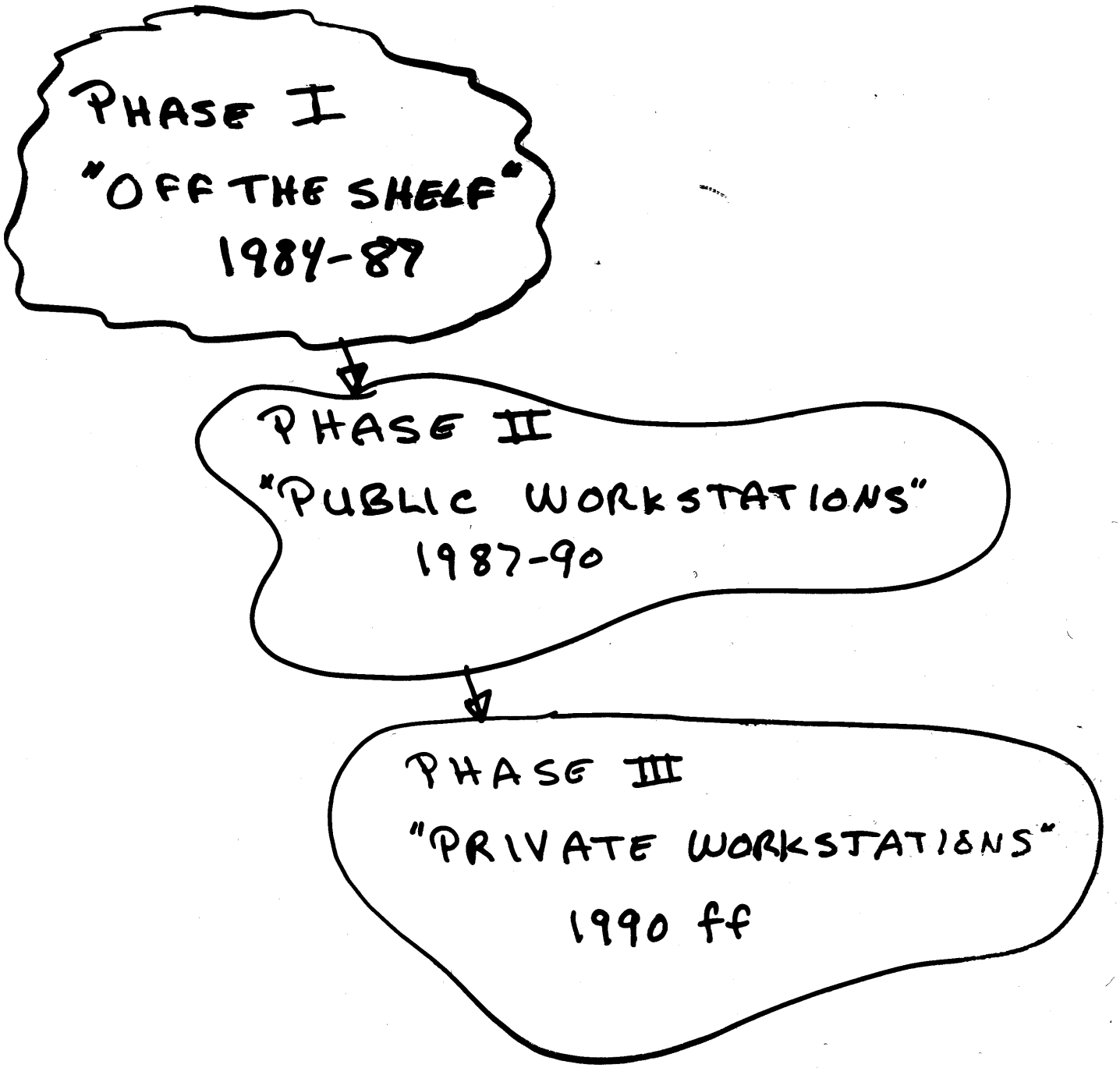
ATHENA EVOLUTION



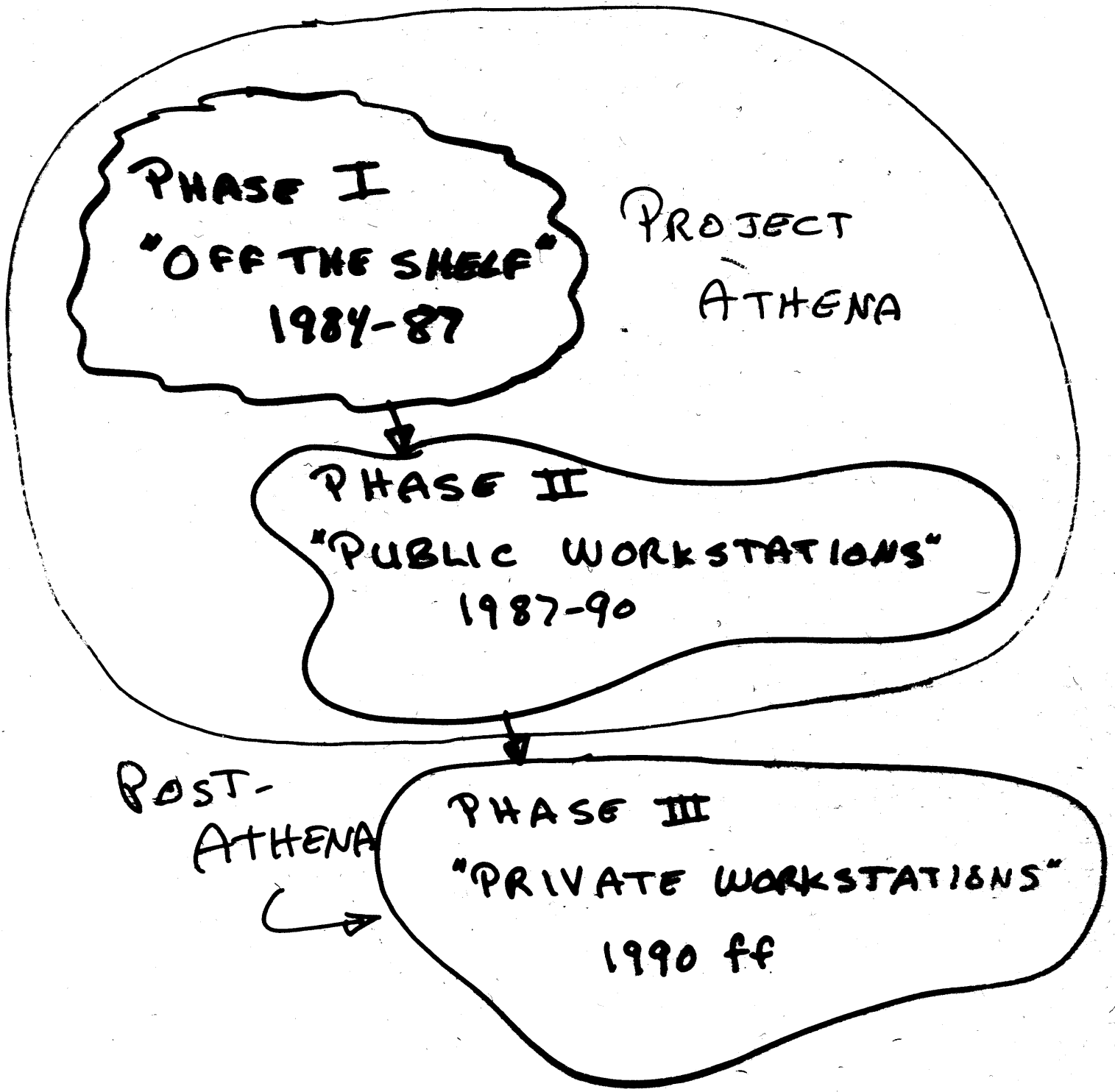
ATHENA EVOLUTION



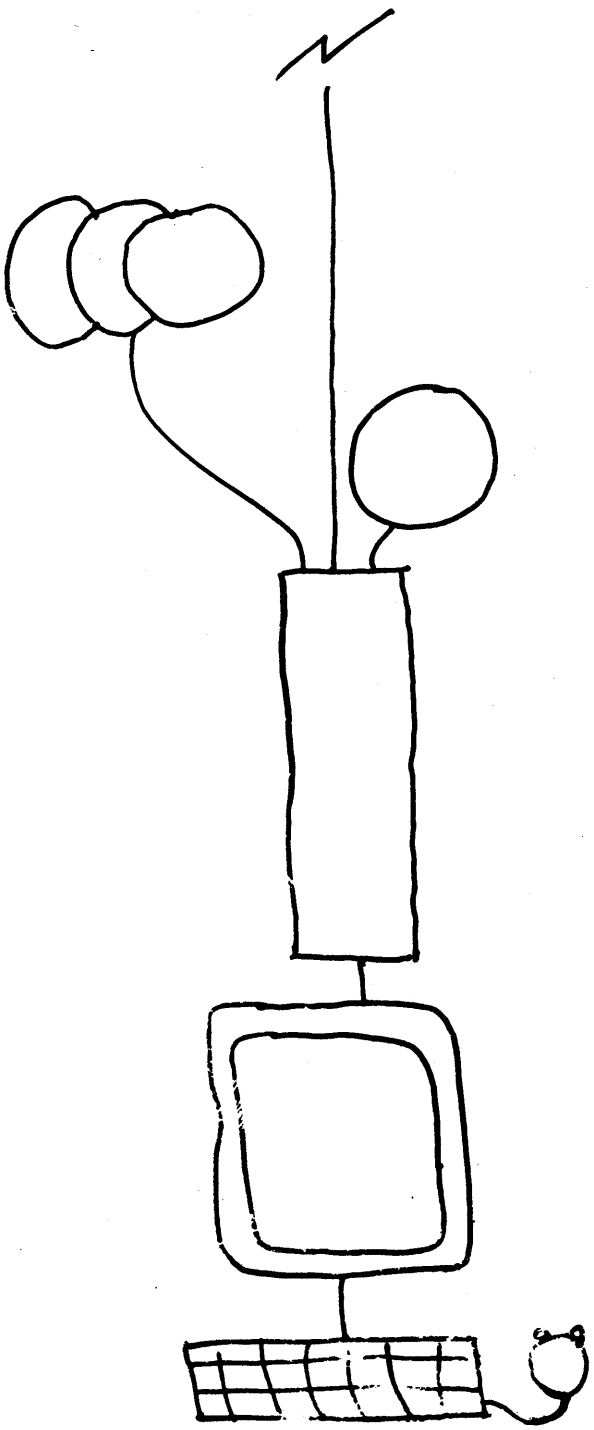
ATHENA EVOLUTION



ATHENA EVOLUTION



THE ATHENA WORKSTATION



NETWORK CONNECTION
1 MB+/SEC

REMOVABLE DISK OR TAPE

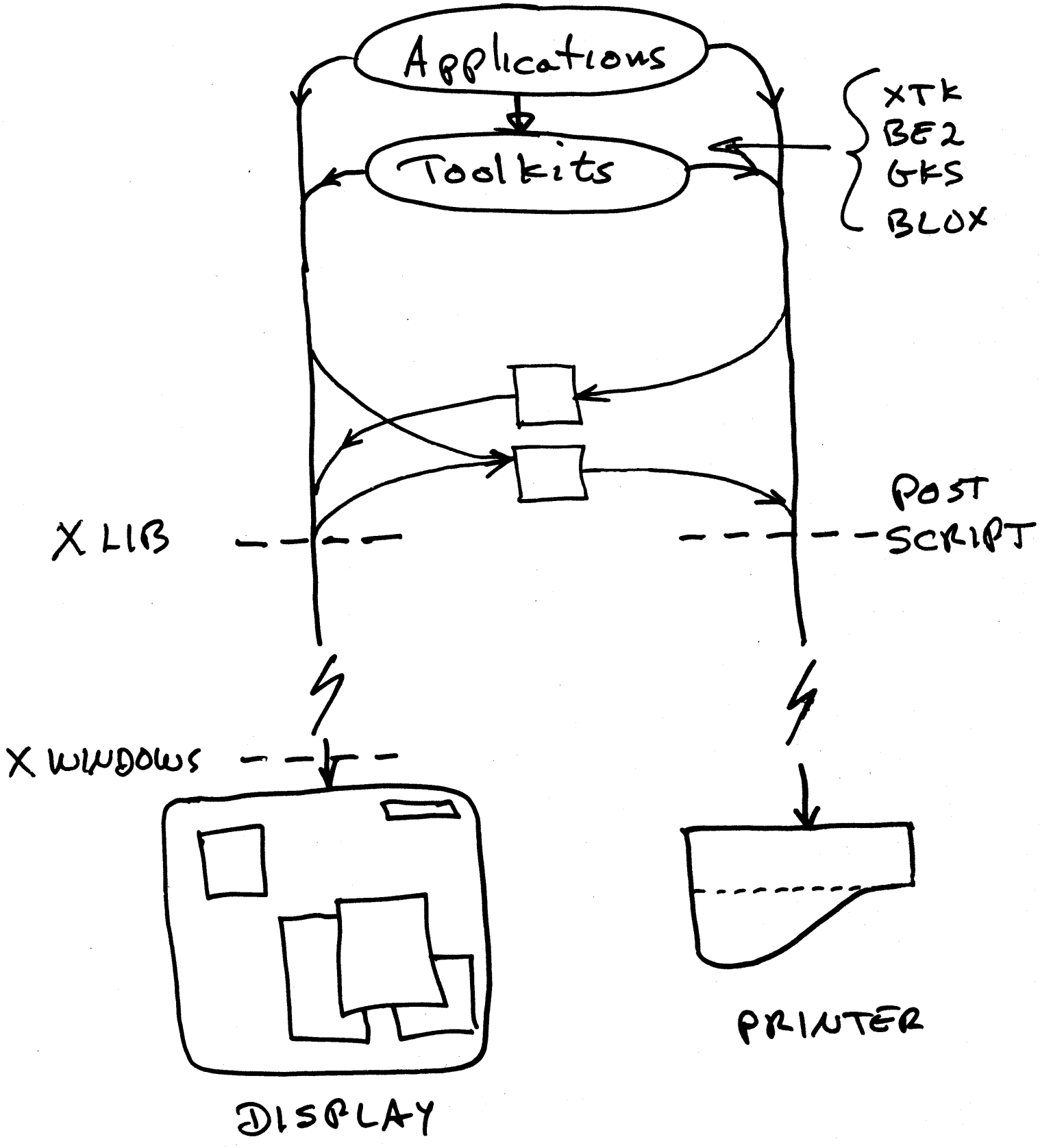
FIXED DISK
30-60 MBYTES

PROCESSOR
1 MIPS, 32-BIT
2-4 MBYTES

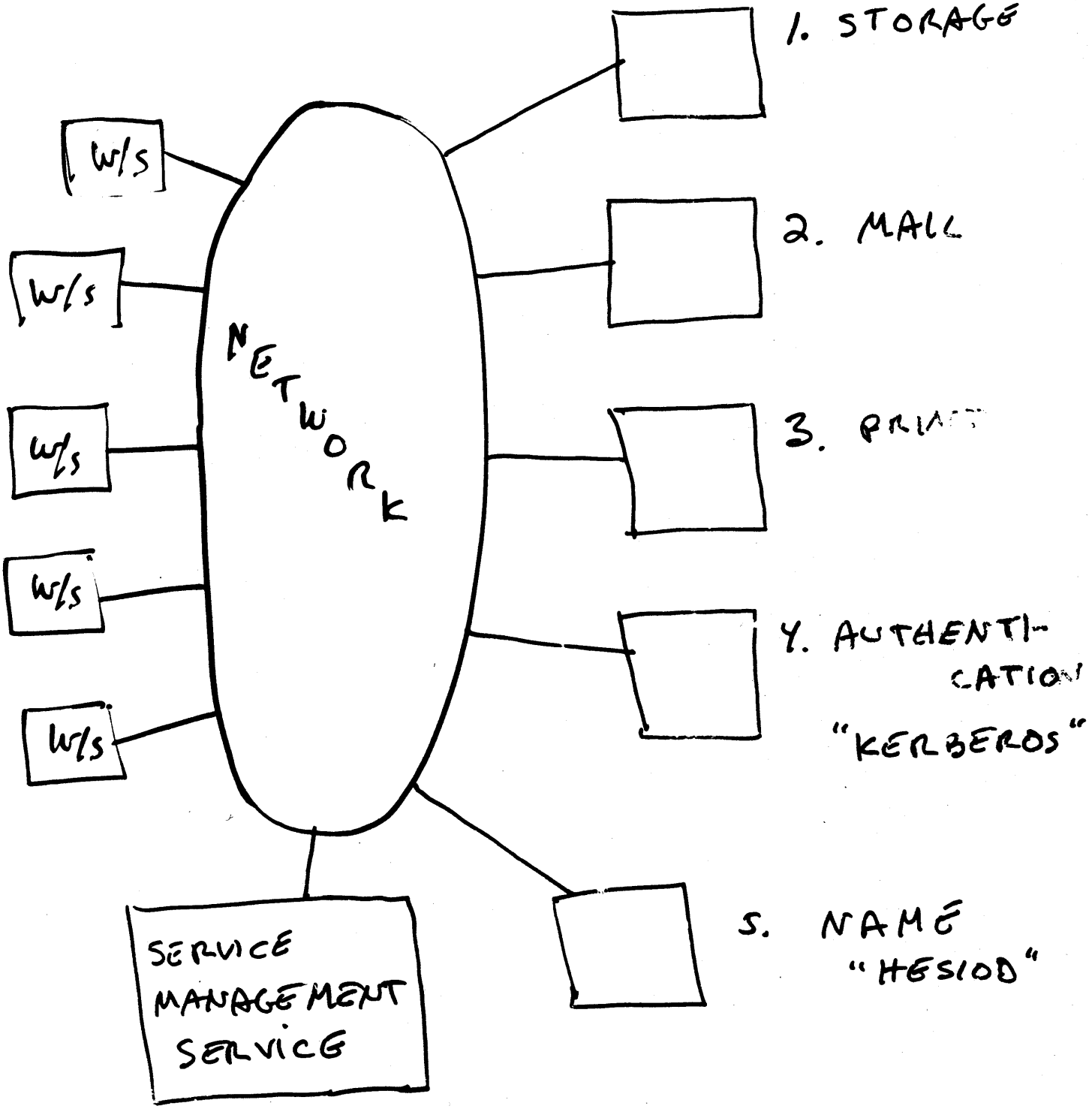
DISPLAY
1000 x 1000
GRAPHICS

KEYBOARD + MOUSE

INFORMATION DISPLAY

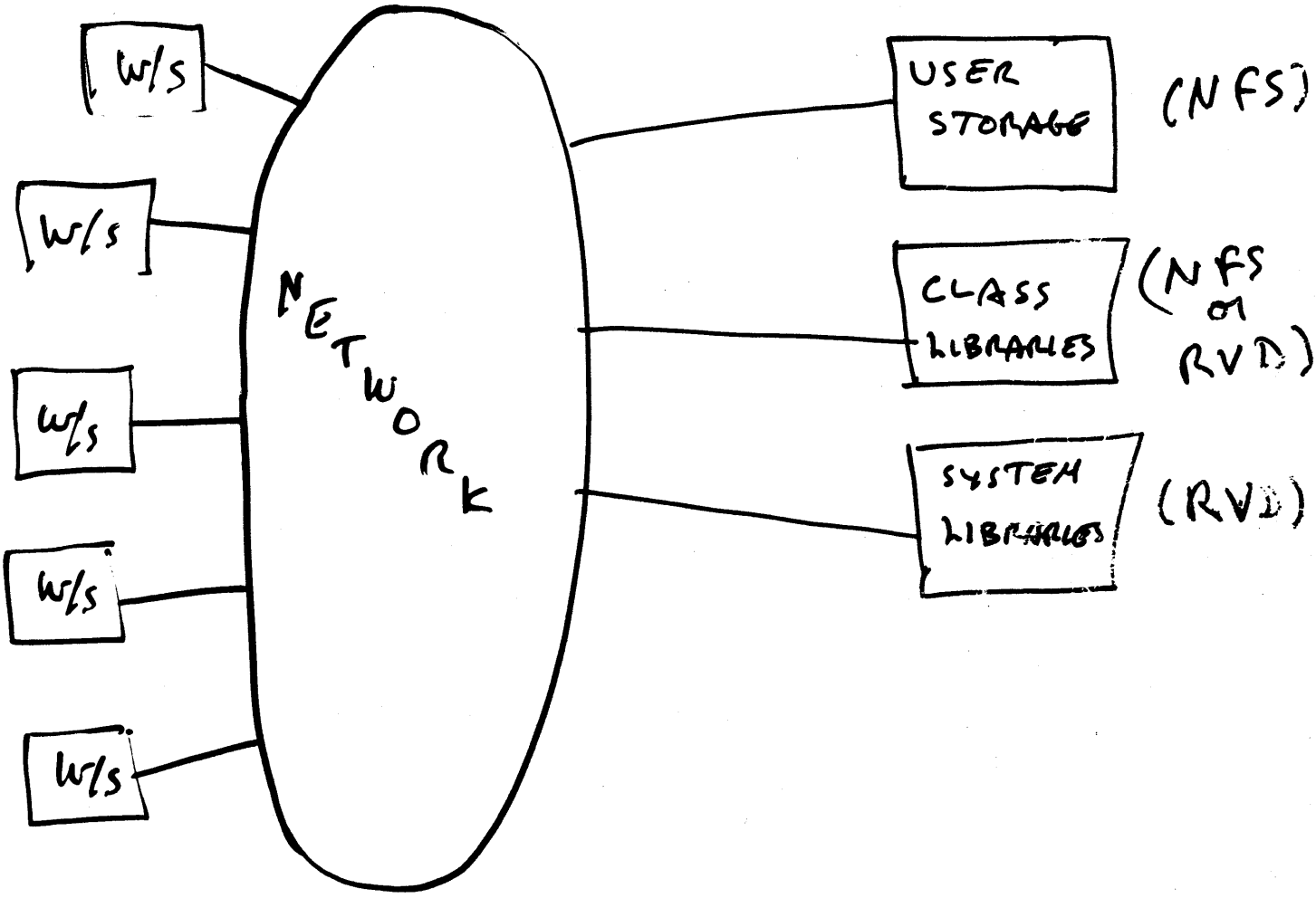


THE MAJOR SERVICES

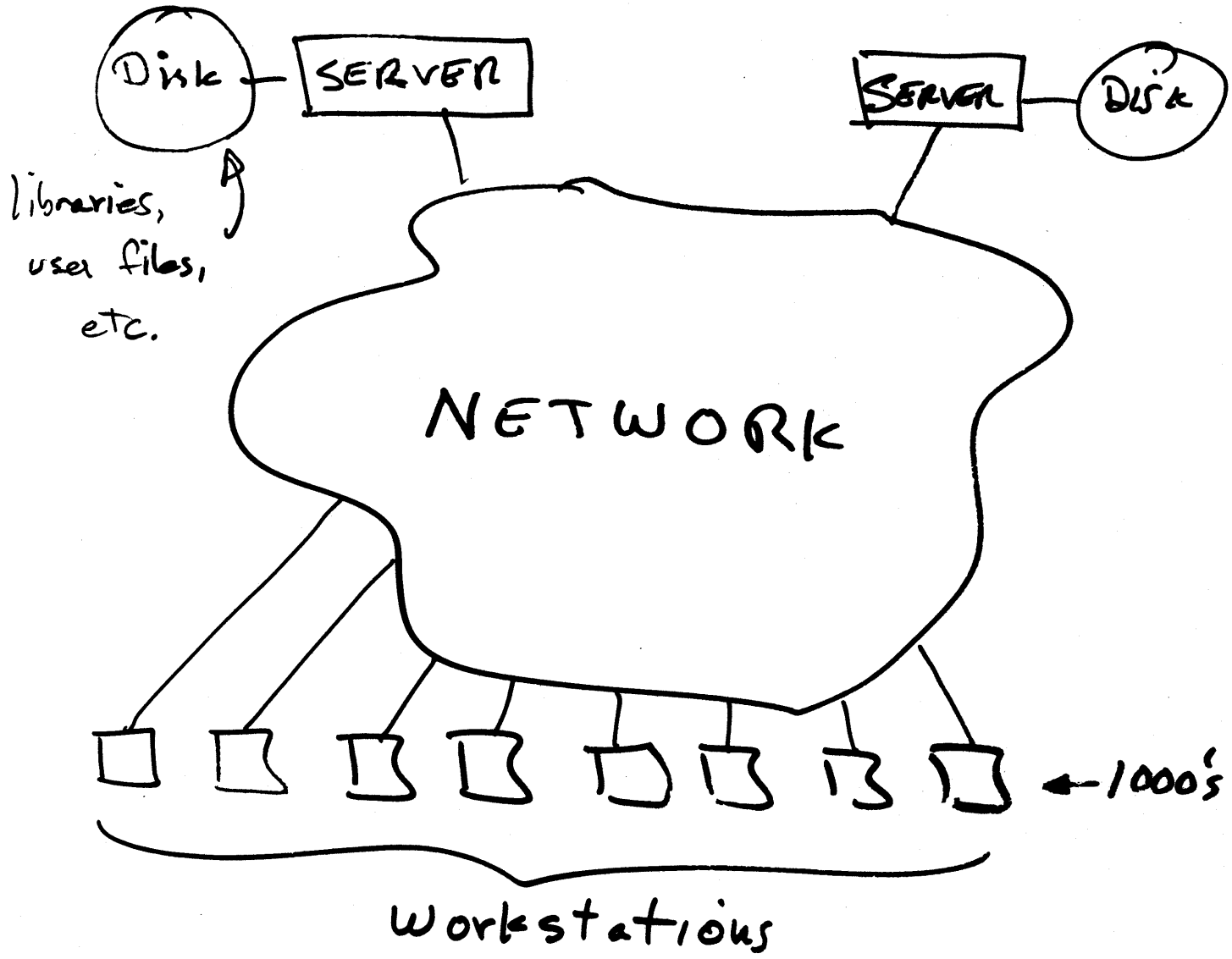


THE MAJOR SERVICES

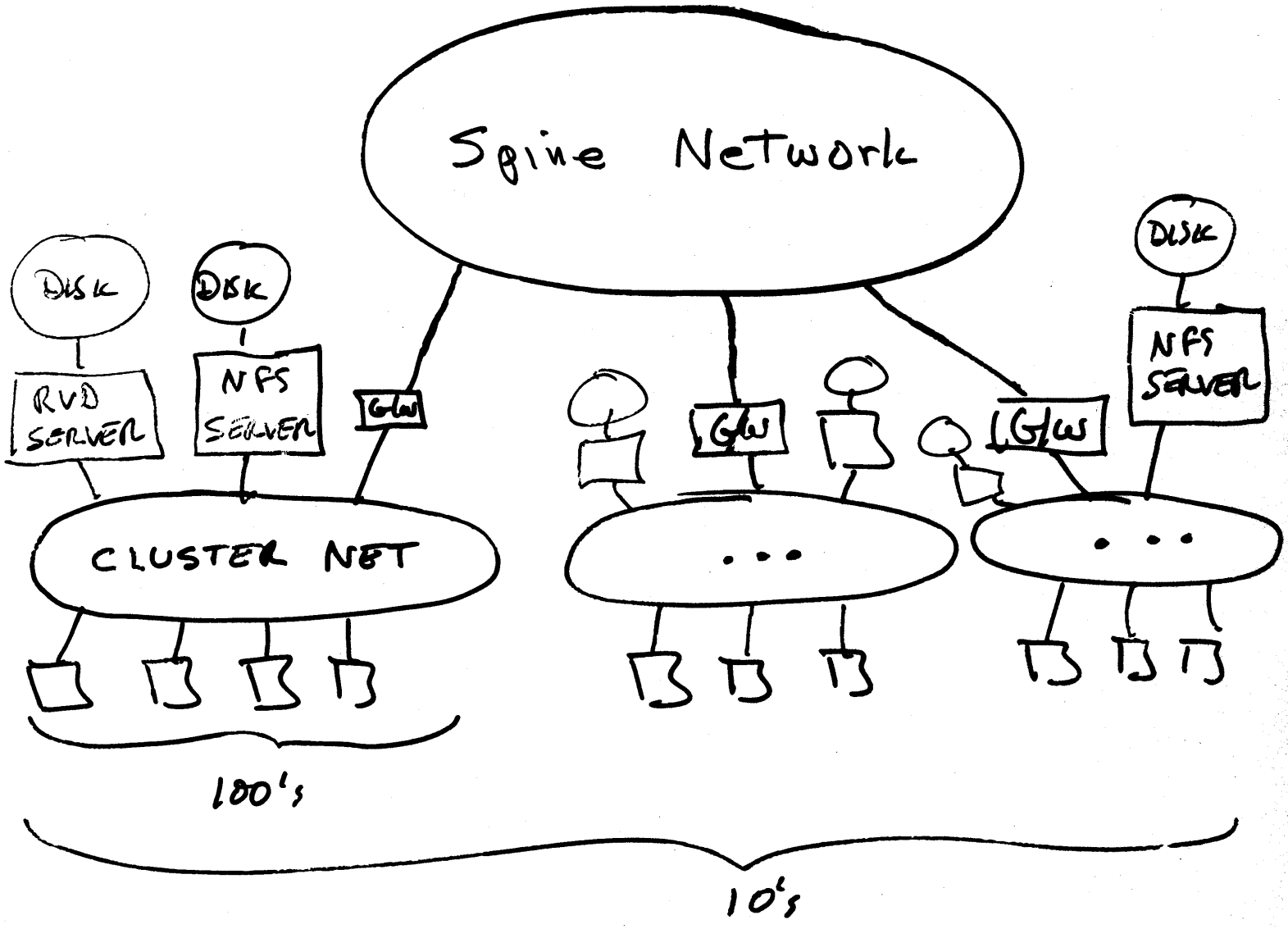
1. STORAGE SERVICES



STORAGE MODEL (CONCEPT)



STORAGE MODEL (REAL)



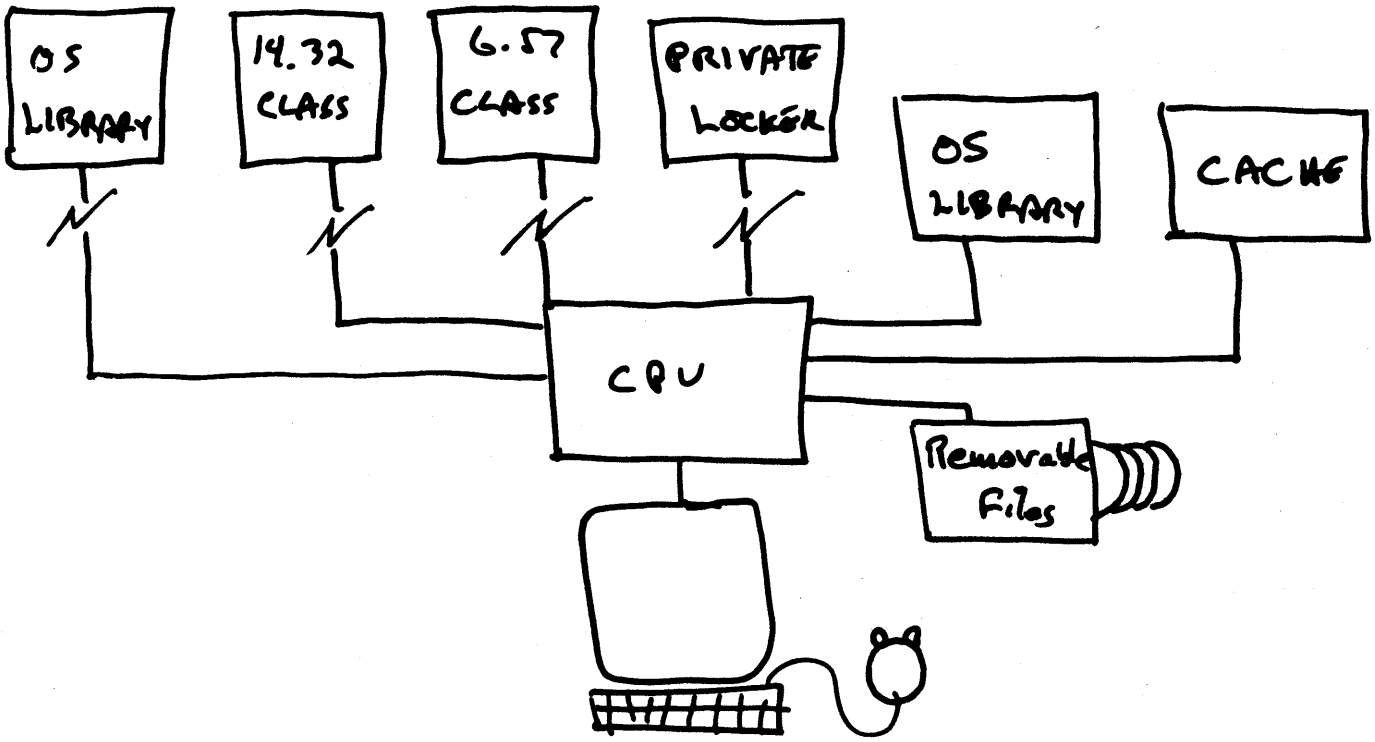
Duplicated Libraries (RVD) - Always use cluster

Personal Files (NFS) - Usually cross spine

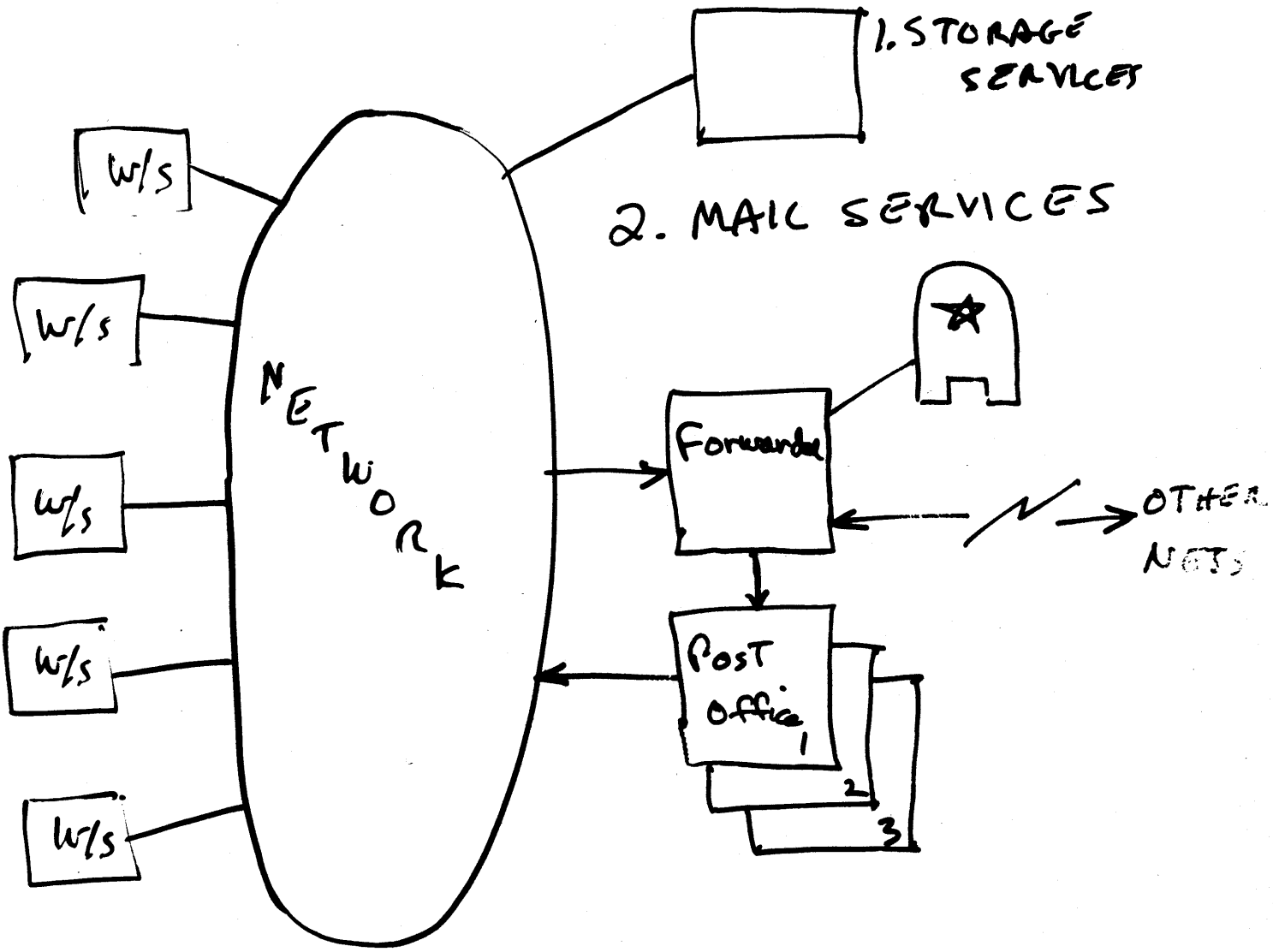
Swap area - local to workstation
(Not diskless!)

USER VIEW: ONE UNIX FILE HIERARCHY

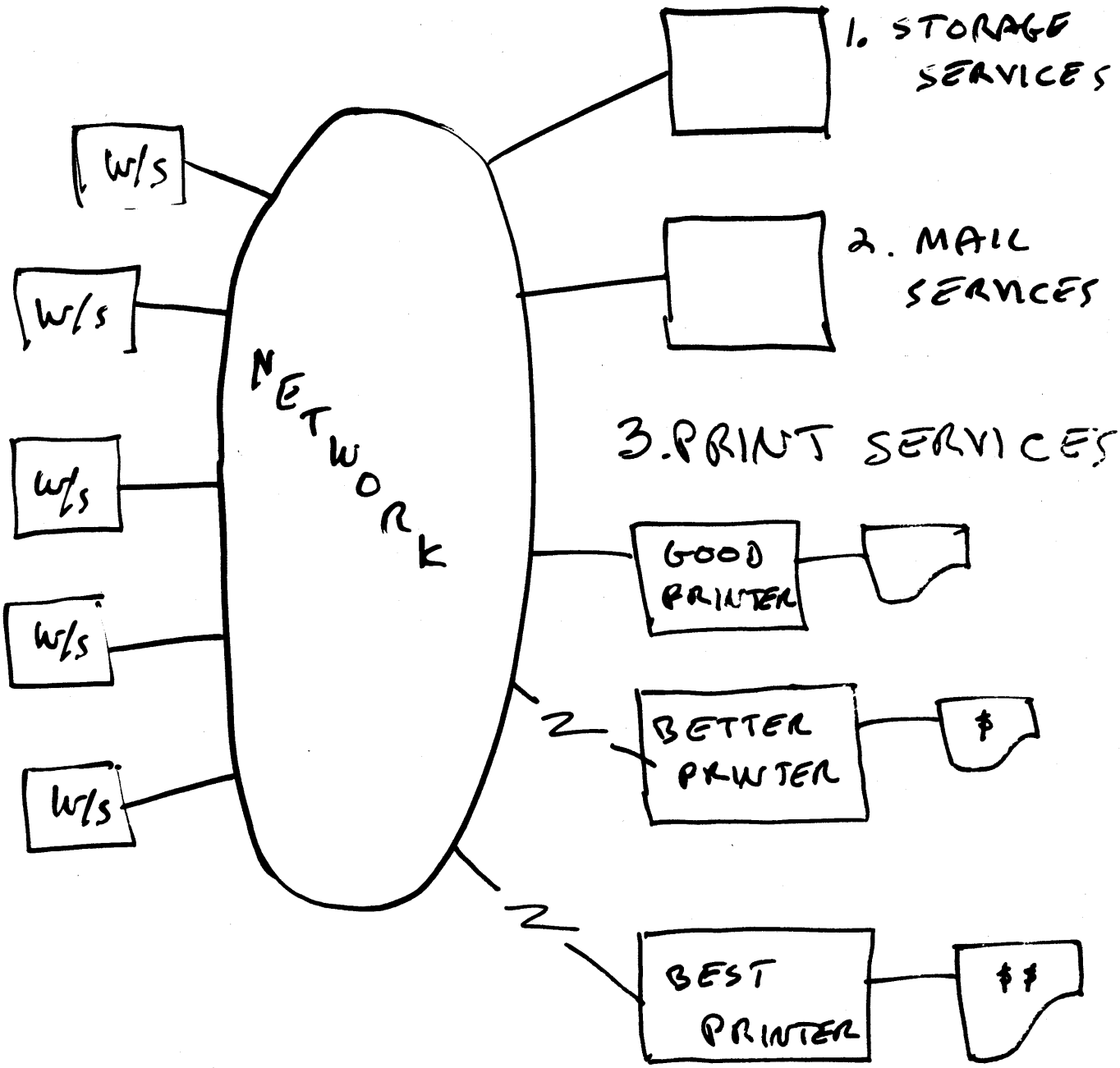
ON MULTIPLE PHYSICAL OR VIRTUAL DISKS



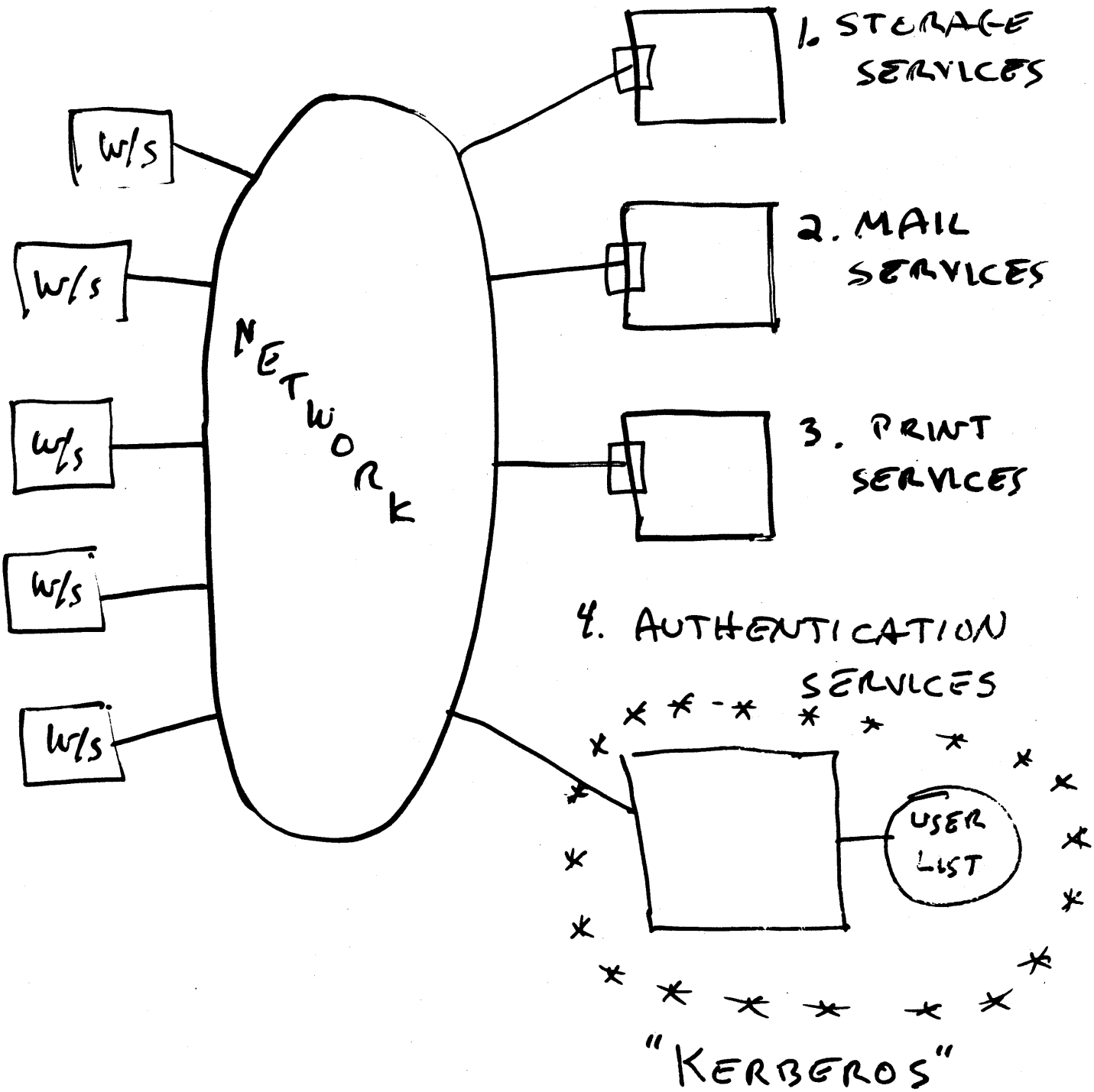
THE MAJOR SERVICES



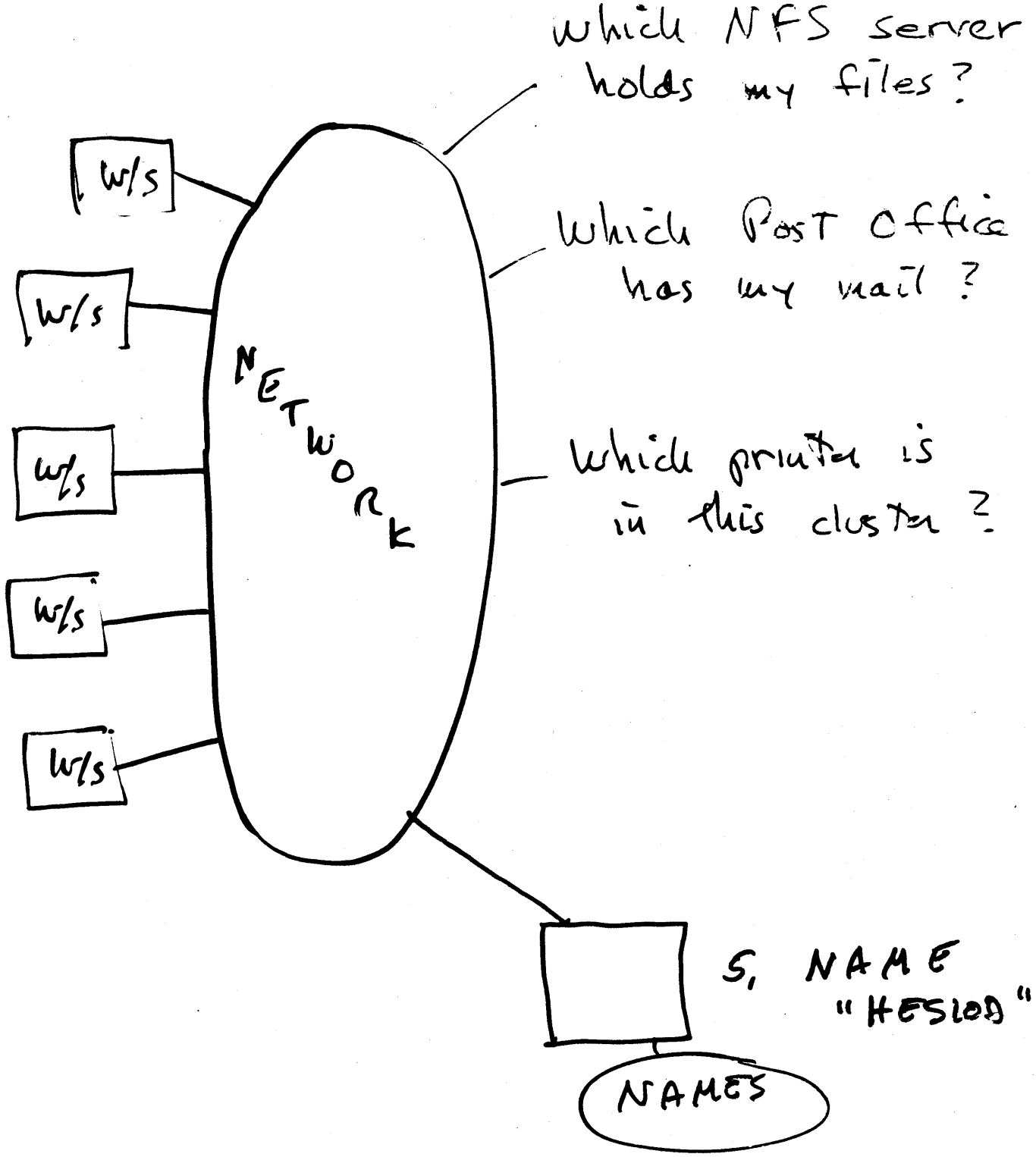
THE MAJOR SERVICES



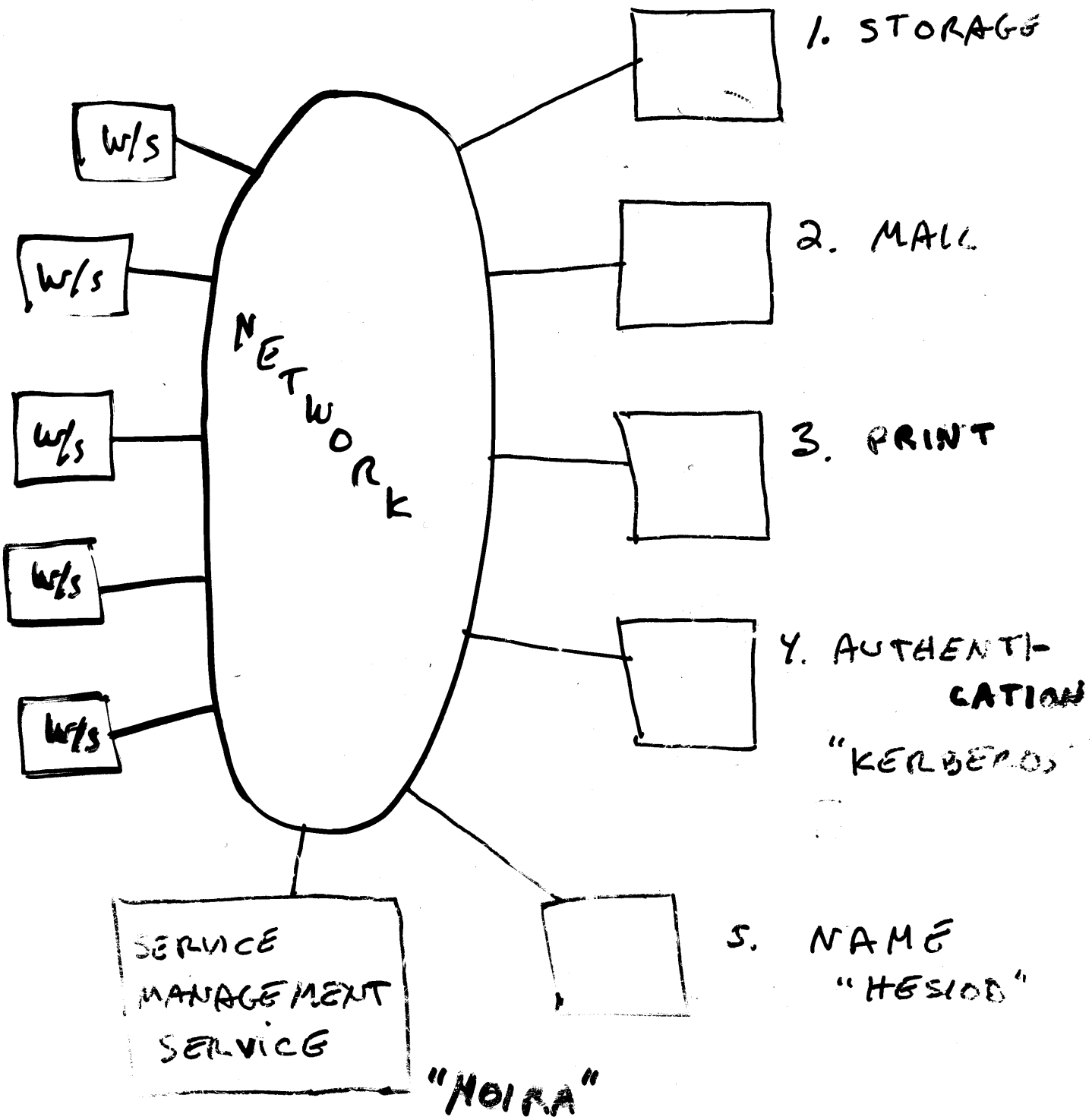
THE MAJOR SERVICES



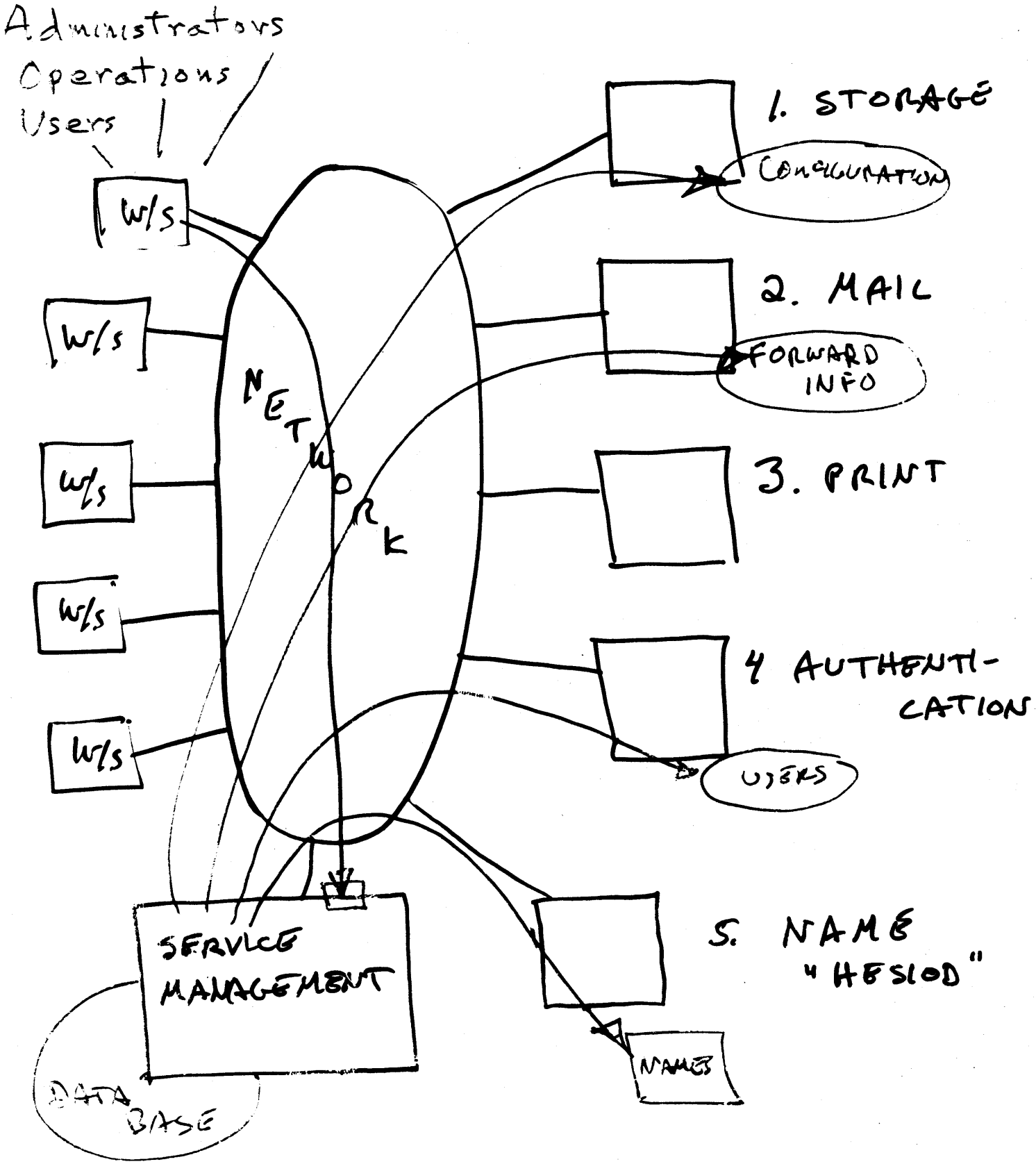
THE MAJOR SERVICES



THE MAJOR SERVICES



THE MAJOR SERVICES

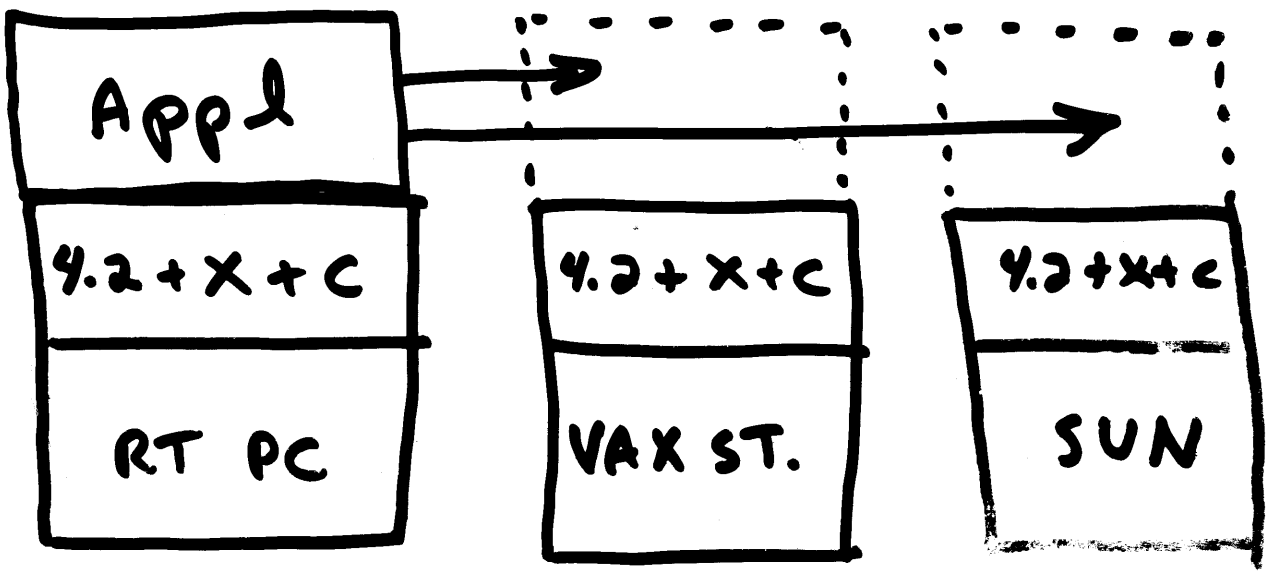


Topics

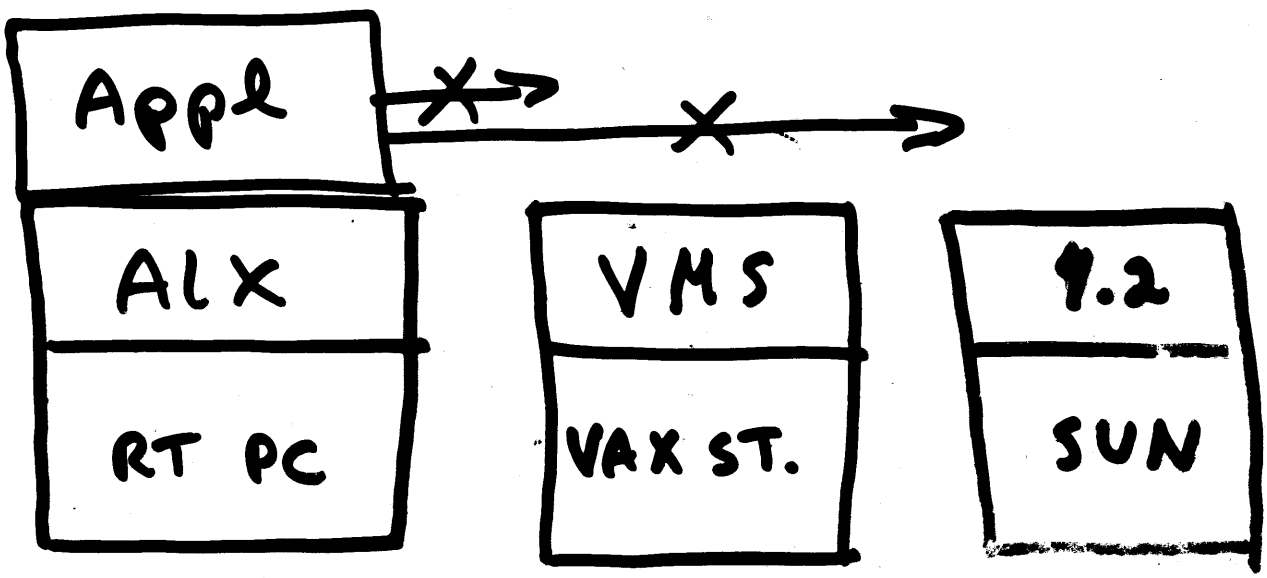
- The Project
- The System
- The Lessons


RT PC
VAX ST.
SUN

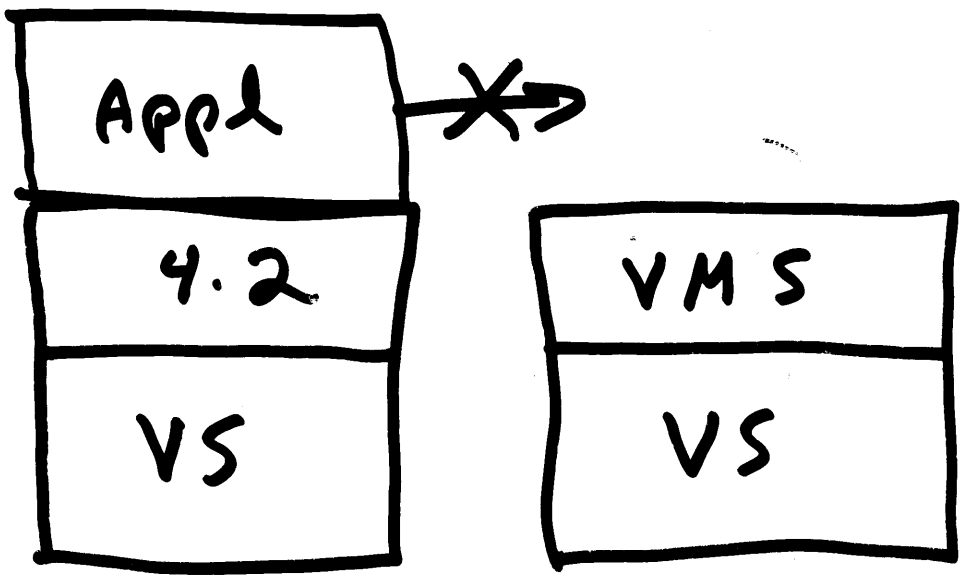
EASY



HARD



HARD



Also: RT + AIX + C → RT + 4.2 + C

68000 + MAC → 68000 + 4.2 (SUN)

THE HARD PARTS

- Scale up by 10
- Unprepared Institution
- Unprepared Industry
- Unprepared Technology
- Networking

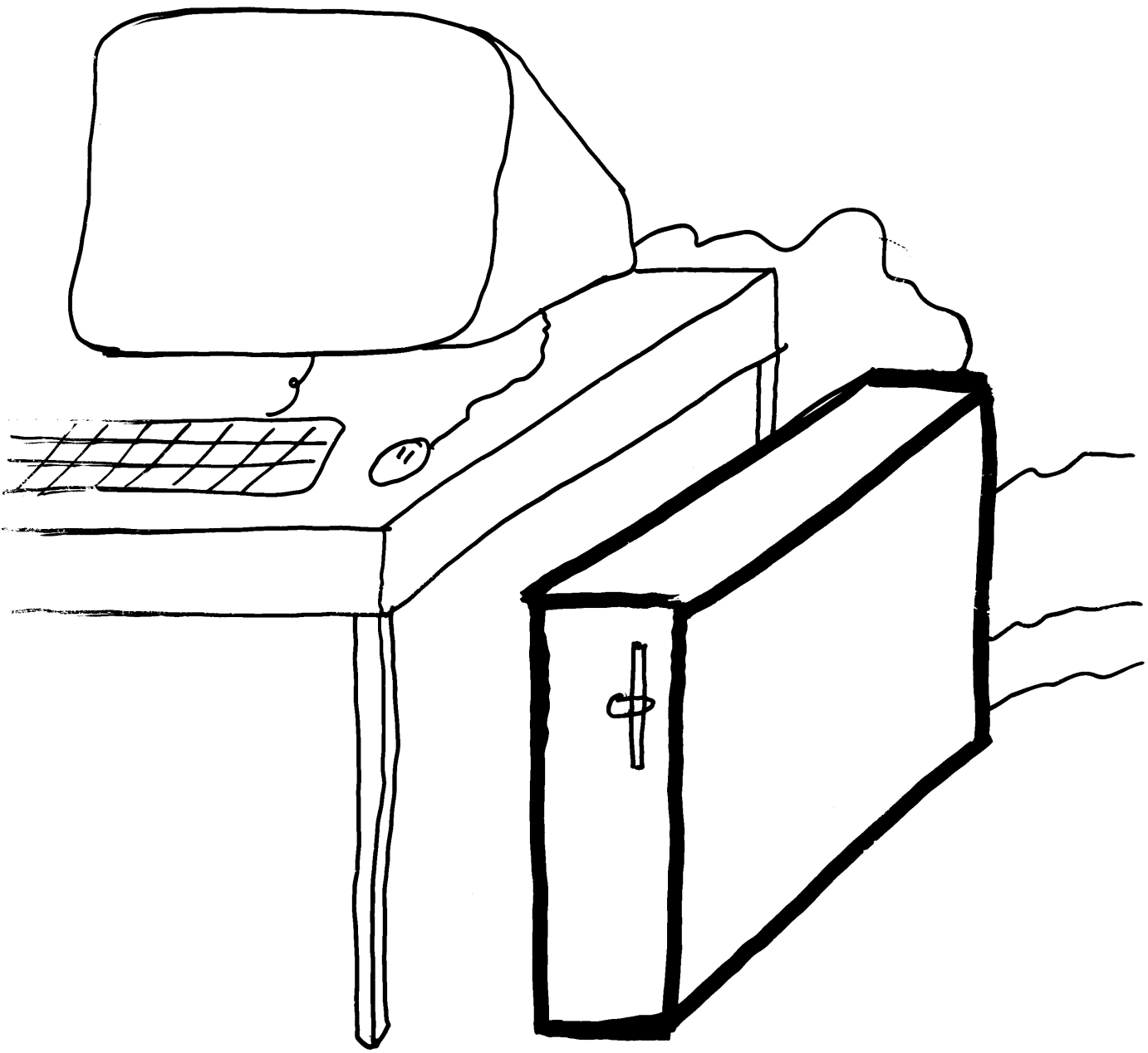
Except for that, no problem. . .

SCALE

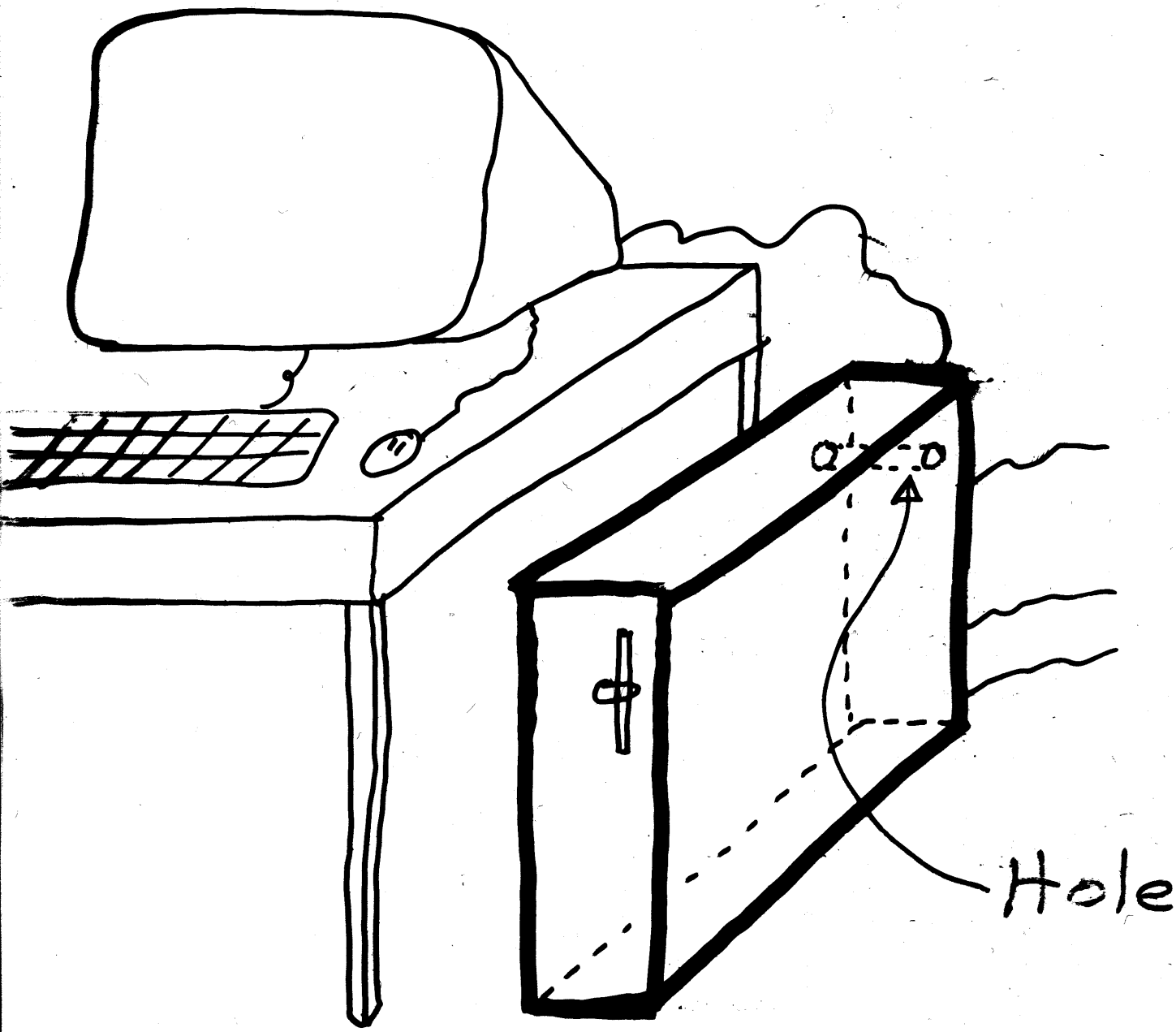
6 -> 60 -> 600 Workstations

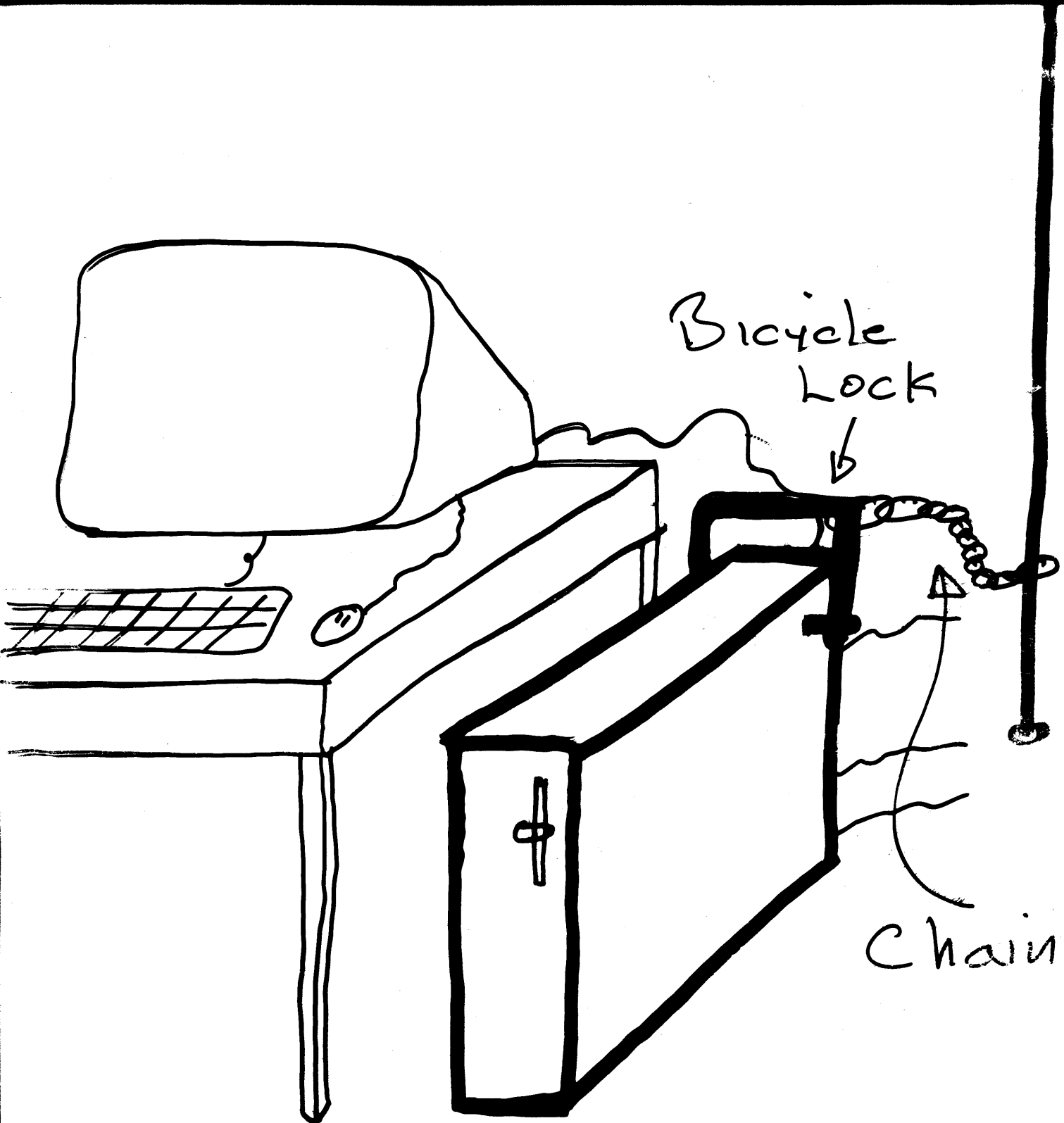
UNPREPARED INSTITUTION

UNPREPARED INDUSTRY



MISSING FEATURE



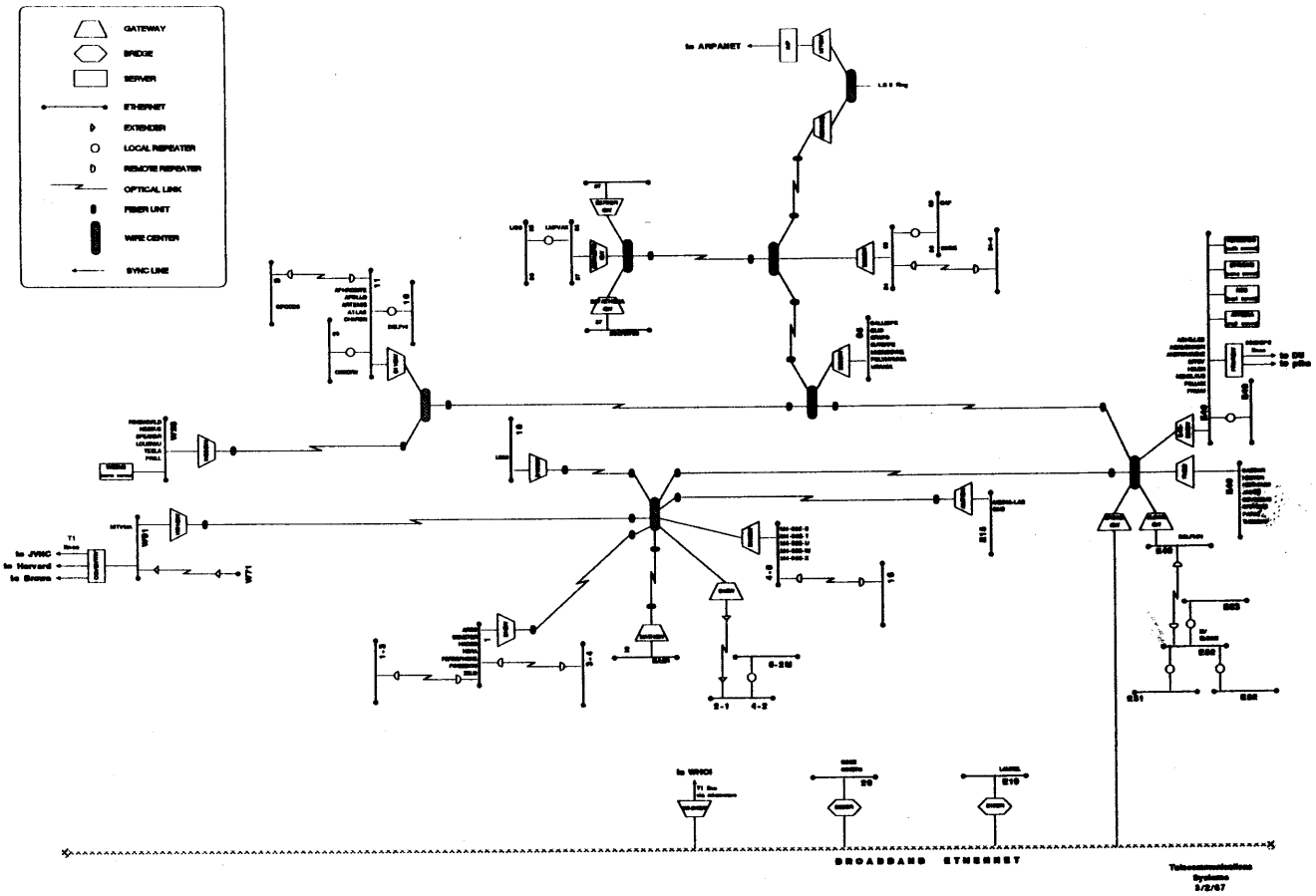

Bicycle
Lock
Chain

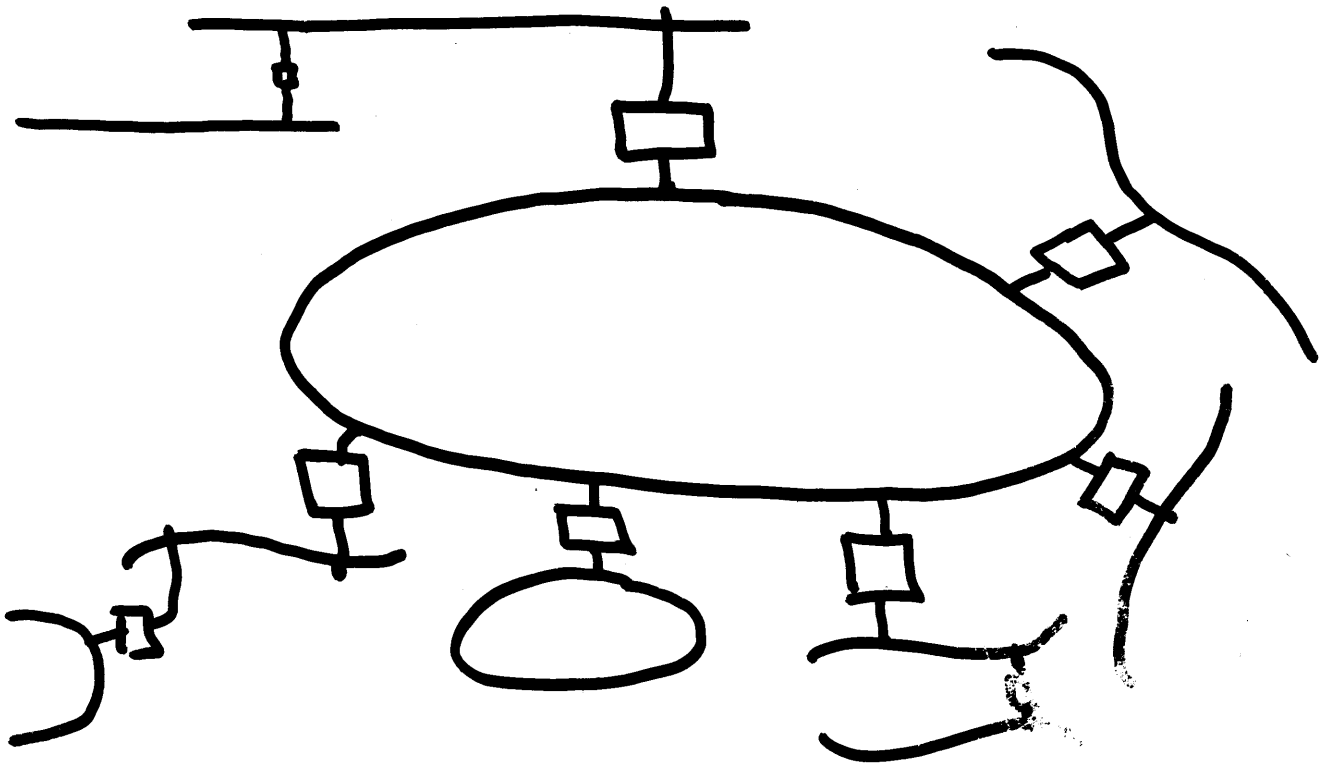
UNPREPARED TECHNOLOGY

System architecture is a
do-it-yourself project

NETWORKING IS HARD!

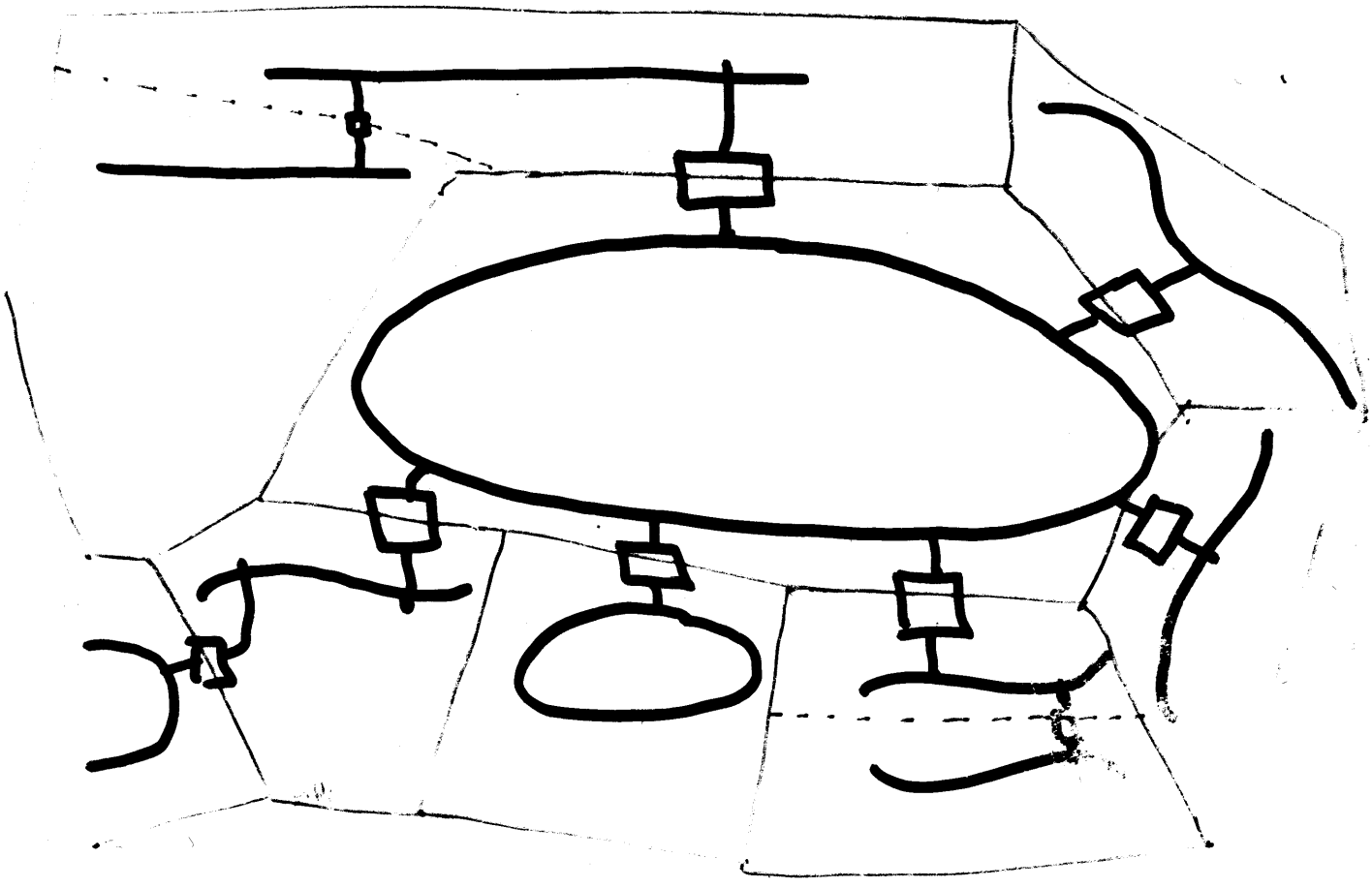
M.I.T. Campus Network





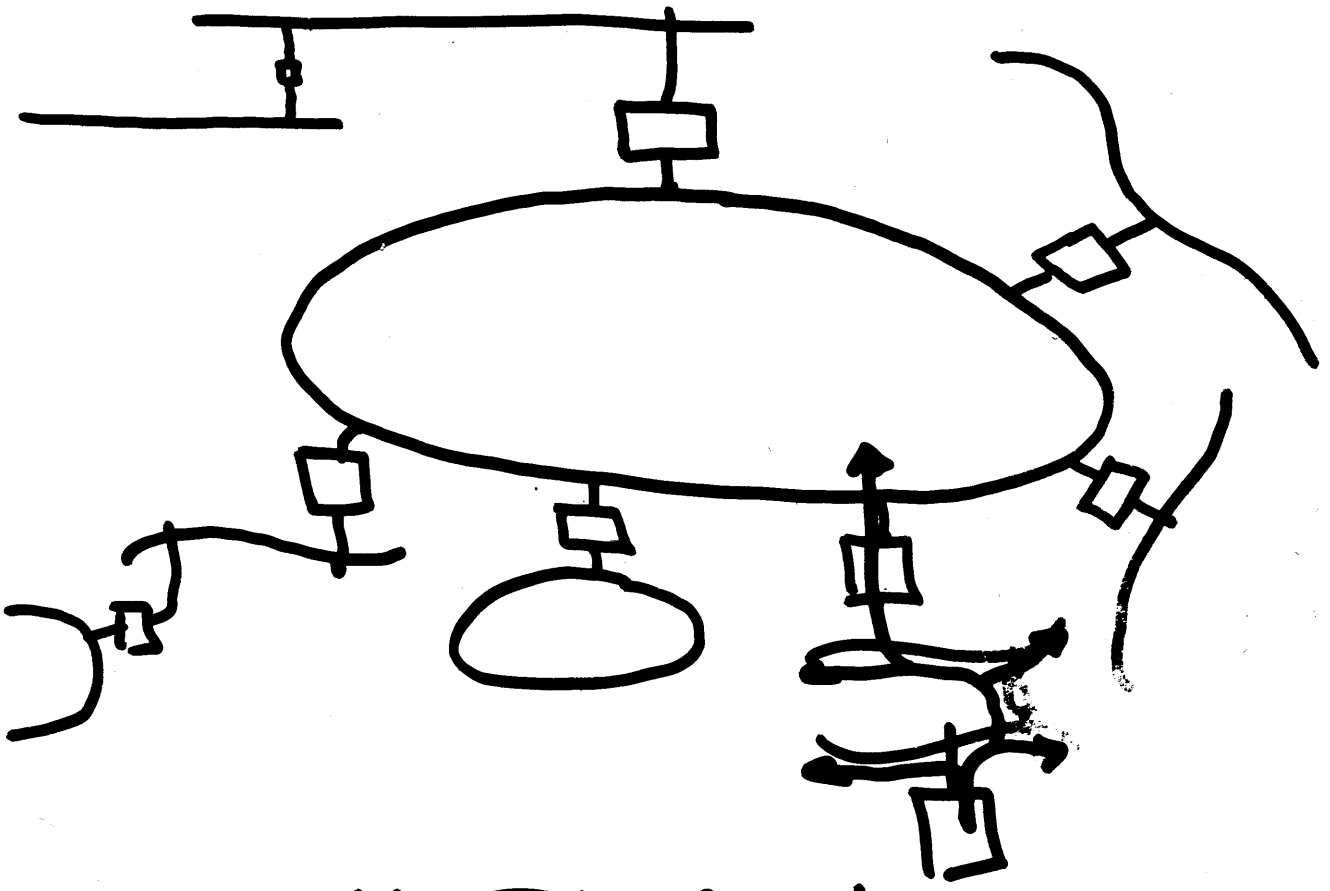
NETWORK

FIREWALLS: GOOD



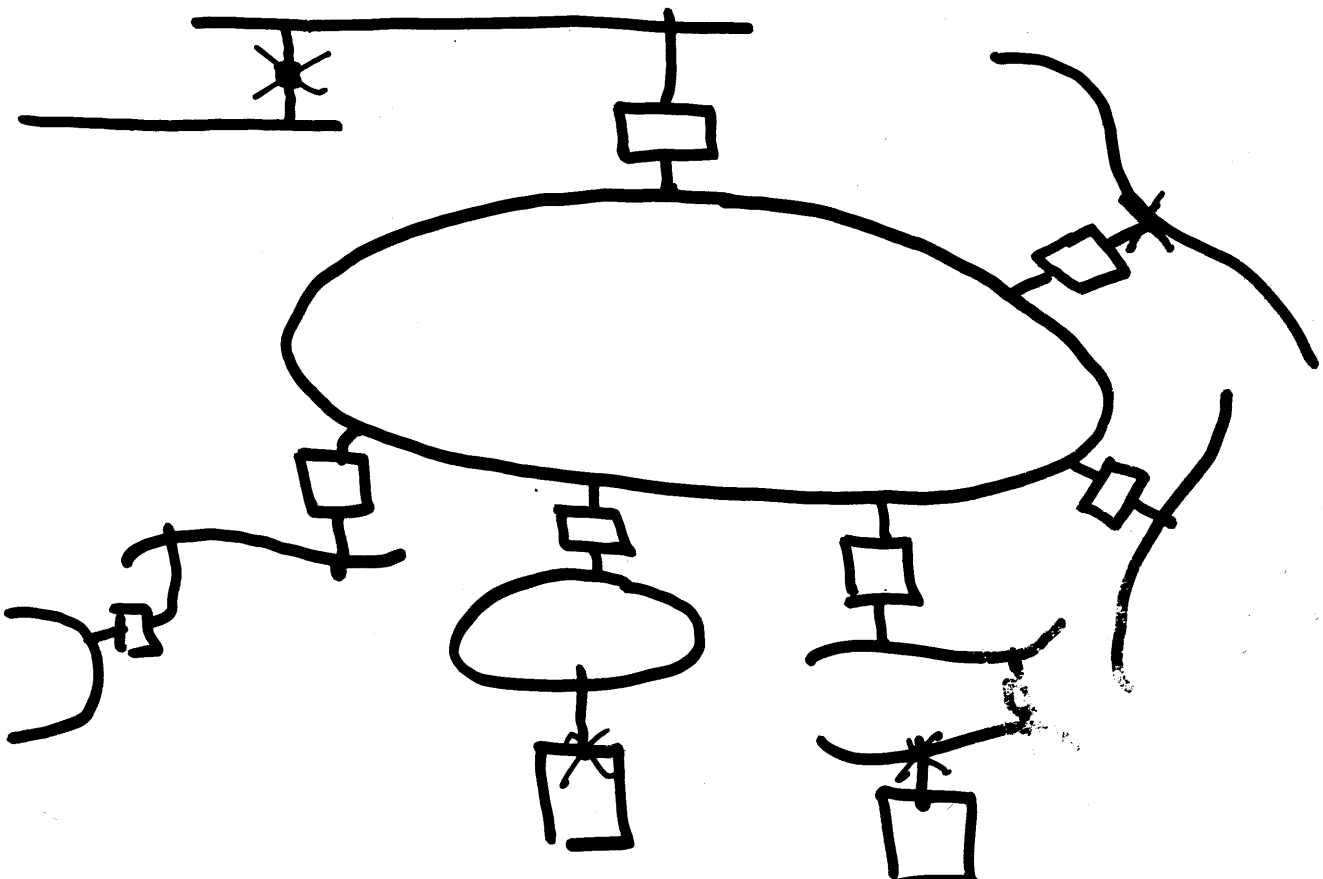
NETWORK

BROADCAST: BAD



NETWORK

QUALITY : AWFUL



UNSOLVED PROBLEMS

- Cost vs Function
- Integration w/ low-end world
- Ease of use
- Cost/Durability of laser printer
- Terrorism in shared info
- Display programming is hard

STATUS (Jan., 1988)

5000 users

600 workstations

70 servers

25 gateways

X11

Storage model

Kerberos

Hesiod

Service Mgt

Post Office

Network

} In production