Lessons From Project Athena

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Topics

- The Project
- The System
- The Lessons
DIFFERENCE:

GOAL IS EDUCATION IMPACT

NOT COMPUTER SYSTEM ADVANCES
ATHENA EVOLUTION

PHASE I
"OFF THE SHELF"
1984-87
ATHENA EVOLUTION

PHASE I
"OFF THE SHELF"
1984-87
ATHENA EVOLUTION

PHASE I
"OFF THE SHELF"
1984-87

PHASE II
"PUBLIC WORKSTATIONS"
1987-90
ATHENA EVOLUTION

PHASE I
"OFF THE SHELF"
1984-87

PHASE II
"PUBLIC WORKSTATIONS"
1987-90

PHASE III
"PRIVATE WORKSTATIONS"
1990 ff
ATHENA EVOLUTION

**PHASE I**
"OFF THE SHELF"
1984-87

**PHASE II**
"PUBLIC WORKSTATIONS"
1987-90

**PHASE III**
"PRIVATE WORKSTATIONS"
1990 ff

PROJECT
ATHENA

POST-ATHENA
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
1800 X 1800
GRAPHICS

KEYBOARD + MOUSE
THE MAJOR SERVICES

1. STORAGE
2. MAIL
3. PRINT
4. AUTHENTICATION "KERBEROS"
5. NAME "HESi0D"

SERVICE MANAGEMENT SERVICES
THE MAJOR SERVICES

1. STORAGE SERVICES

NETWORK

W/S

W/S

W/S

W/S

W/S

USER STORAGE (NFS)

CLASS LIBRARIES (NFS or RVD)

SYSTEM LIBRARIES (RVD)
Storage Model (Concept)

Disk

Server

Server

Disk

Network

Libraries, user files, etc.

Workstations

-1000's
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

1. STORAGE SERVICES

2. MAIL SERVICES

NETWORK

Post Office

Forwarder

OTHER NETS
THE MAJOR SERVICES

1. STORAGE SERVICES

2. MAIL SERVICES

3. PRINT SERVICES

- GOOD PRINTER

- BETTER PRINTER

- BEST PRINTER
THE MAJOR SERVICES

1. STORAGE SERVICES

2. MAIL SERVICES

3. PRINT SERVICES

4. AUTHENTICATION SERVICES

"KERBEROS"
THE MAJOR SERVICES

Which NFS server holds my files?

Which Post Office has my mail?

Which printer is in this cluster?

S, NAME "HEISLER"

NAMES
THE MAJOR SERVICES

1. STORAGE
2. MAIL
3. PRINT
4. AUTHENTICATION
   "KERBEROS"
5. NAME
   "HERSIOB"

NETWORK

W/S
W/S
W/S
W/S
THE MAJOR SERVICES

Administrators
Operations
Users

1. STORAGE
   Consolidation

2. MAIL
   Forward Info

3. PRINT

4. AUTHENTICATION
   Users

5. NAME "HESIOD"

SERVICE MANAGEMENT

DATABASE
Topics
- The Project
- The System
- The Lessons
RT PC

VAX ST.

SUN
EASY

Diagram:
- Box labeled "App1" connected to "4.2 + X + C".
- "RT PC" below "4.2 + X + C".
- Arrows pointing right to "4.2 + X + C" labeled "VAX ST."
- "SUN" on the right side.
HARD

- Apple
- ALX
- RT PC

- VMS
- VAX ST.

- 9.2
- SUN
HARD

Also: \[ \text{RT} + \text{AIX} + c \rightarrow \text{RT} + 4.2 + c \]
\[ 68000 + \text{MAC} \rightarrow 68000 + 4.2 \ (\text{Sun}) \]
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

Hole
UNPREPARED TECHNOLOGY

System architecture is a do-it-yourself project
NETWORKING IS HARD!

M.I.T. Campus Network
FIREWALLS: GOOD

NETWORK
BROADCAST: BAD

NETWORK
QUALITY: AWFUL

NETWORK
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