Status report for NSA 4/1/70

- Multics program
- Computing at M.I.T. in 1970

I. Multics history

Started in 1964 as follow-on to 7094 CTSS
Joint project BTL / GE / M.I.T.
Chose GE 635 hardware to modify (GE agreed to help)
Hardware design complete in 1965 – "645" computer
645 delivered fall 1966
First working segmented environment June 1967
First self-hosted supervisor Dec. 1967
First extended daily operation Sept. 68
24-hour/day operation May 69
Public operation at M.I.T. Oct. 69

II Objectives

Centered around 1. multiple information access
2. controlled sharing of information

Broad goal: computer utility good for a wide range of jobs.

Means: very complex supervisor
sophisticated protection facilities
hierarchical file system.

III Current Status

(check position and derivative)

operational at M.I.T. 1 CPU/256K core service + 1 CPU/128K core development

producing substantial revenue, but not yet fully loaded.

today total of 35 users inc. 12 system programmers

~~and 2 batch streams~~

1 ~~batch stream~~ restricted batch stream

2 informational batch streams.

calibration uncertain: probably ~40.

Operates with 384K core or } (not both - bug in one cpu)
2 CPU's
on Friday's

About 300 registered users outside system prog. staff
and 50 projects

During day 35 users from 12:00 → 4:00 p.m.
evening 20-25 users till 12 p.m.

Pattern of usage similar to early CTSS

(Project TIP, maybe ADMINS)

Uses: 2 or 3 administrative / record keeping systems
Free # student use (limited BASIC system - will have APL ~1 yr.)
Undergraduate Comp Science class 6.231 ~120 students.
Project MAC research (7-8 groups)
BTL misc; GE misc
Many misc. small projects.

Reliability

MTBF slowly climbing; about 7 hrs today.

LTBF ~ 70-80 hrs.

MTB hardware failure ~ 7 hrs.

MTB software failure ~ 60 hrs.

Reasons for hardware trouble

- grounding/noise (most trouble 9-5, M-F)
- barely adequate hardware reliability aids (645 is 20% maintenance aid)
- Shortage of FE's for large, strange configuration.
- FE not familiar with hardware service requirements

Expect to get it under control.

Pattern similar to early CTSS

Software is currently too sensitive to hardware failure. (being fixed)

File storage reliability <u>very</u> high despite MTBF.

backup tapes

salvager

thus: crash causes ~~15~~ 20-30 min. delay, but all storage is intact usually.

Languages

1. PL/I — an advanced compiler - good code, easy to use
   2 sec. + 1000 statements/min. GE provided

2. FORTRAN ~~makes~~ solid, standard

3. BASIC — borrowed, seems to work OK.

4. (Coming) APL — Popular - claimed to be a fast translator/interpreter. GE writing it.

Users are being in others, e.g., BCPL, GASP, AED maybe, may being in SIMSCRIPT.

Future

Planning next hardware now.

- order to be placed ~1 yr delivery ~3 yrs. (IPC)
- based on 655 Technology
- ~~not~~ no major architectural changes
- objective: considerable design in ~~1970~~ 1970 Technology.

Continuing development of systems

performance → ~55 users 1 CPU / 256 K } target
90 " 2 CPU / 384 K }
(no batch) on present hardware

Improvements to come from

1. File system recode recode
2. Program / post program strategy
3. Multilevel file strategy
4. Better typewriter control

to 55 — 5. Reduced size of wired-down supervisor (~ 85K today)

to 90 — 6. Addressing of 2nd CPU + 128K memory

Added visible features

Tie to ARPA net

Graphics (ARDS, Net, PDP-8, etc.)

More console varieties - TN300, M35, etc.

users beginning to develop IPC packages, etc.

Better user control

New assembler

Other changes

simplicity

publishability

erase of word erasure

continuous operation / reconfiguration

cut over to PL/I

Computing at M.I.T.

Machines in use at IPC.

7094 – CTSS – 20 users (phasing down – announced end of 12/70.)

360/65 OS/360 Major batch processing load for M.I.T.
- 2780 + 1130 remote batch
- 360/40 used in ASP (or HASP)

360/67 CP/67 Used primarily ~~to~~ as a virtual machine generator to allow checkout of programs to be declared elsewhere. (All development, no production, since funny financing.)
~16 partitions to software
1 partition runs APC = 5 users
Some run CMS – an early CTSS interface
(two file storage hierarchies)

GE 645 Multics Service Primary time sharing
Multics development ⌐ computer-for-computer work.

Other machines

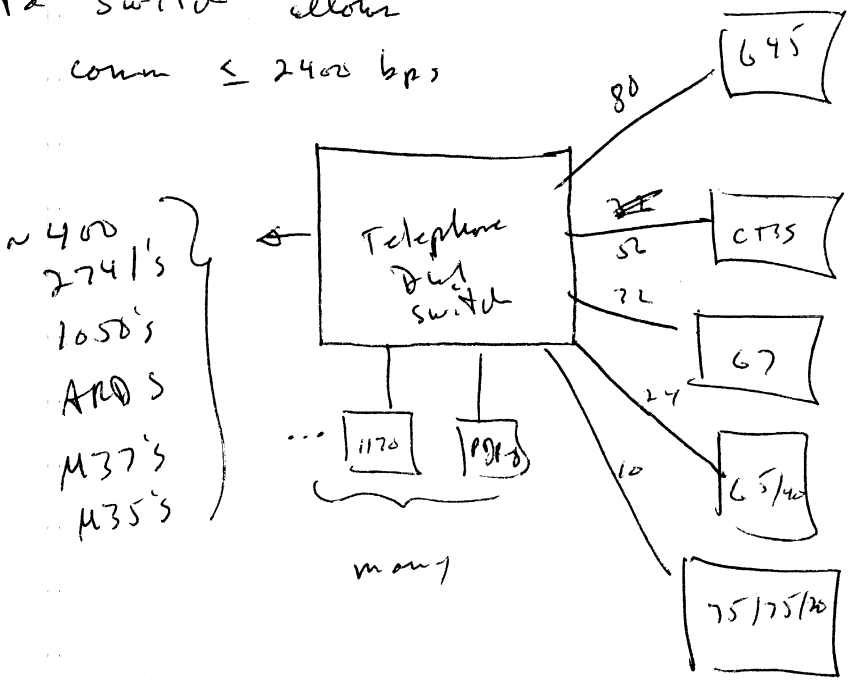
L.L.	360/67	CP/CMS exclusively
I.L.	360/75/75/30	number crunching
L.N.S.	360/65	Undercutilized for batch checkout work
O.I.S.	360/30 (40?)	M.I.T. accounting, etc.

EE Dept PDP-1 Tim showing } experimental
TX 0 + thesis work

MAC PDP 6/10 AI
PDP 6/10 Dynamic modeling / graphics

+ Dozen 1130's
PDP-8's, 9's, 7's } often used as intelligent
misc small computers Terminals for big machines

Data switch allows
comm ≤ 2400 bps



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