



Honeywell

Handwritten notes:
H. S. Saltzer
for your info
JH

To: List of Attendees

cc: RC Daley
RM Gross
ED Kleinow
SH Webber

Subject: FORUM Minutes for March 13, 1973

Attendees: WJ Burner RE Hoffman LJ Ryan
CT Clingen RA Roach JR Steinberg
JW Gintell DR Vinograd

A. H6180 Hardware Status

--Riley Doberstein should be arriving today to begin EIS updates (to be incorporated during swing-shifts).
--we "lost" a stack of Bulk Store last week; this is the first stack failure since the recent swapout of CSM's.
--in SCU-C, we found some imperfect solder joints which may have been the cause of previous problems on this unit.
--SCU-A is experiencing power-downs; margins have been re-adjusted.
--high ambient temperatures are suspected as a cause of some of our unexplained failures; five thermometers have been posted for measuring; Ryan reported that a 10-inch flexible duct will be installed (near the 355) by the end of April.
--Ohlin reported that the third floor of B39 seems to be 3-4 times as dirty as the ninth floor of 545TS, as indicated by dirt accumulation in the air filters. Burner stressed the need to get this situation corrected via Phil Doan.

B. H6180 Software Status

--FASTDUMP is installed, should become completely operational (including on-line dump) this week.
--RUNOFF was installed last week.
--355/HSLA software remains to be converted.
--still working on checkout of two-processor software, may not make too much progress during next two weeks because of EIS updating.

C. Communications, Consoles, Terminals

--LSLA subchannels on 355-B were checked-out; one problem was found and fixed.
--Ryan expects to have another 28 lines and another Tuck Cabinet installed and operational in 355-A by April 9th.
--Roach reported that an FE left a jumper cable installed in LSLA #11 after he finished working on it; Ohlin to bring this "no-no" to the attention of the FE's.

FORUM - 3/13/74

D. Progress on Service

--for the past few days, we've had a large number of crashes caused by both hardware and software; some files have been lost and never recovered; software changes are not being pre-tested on Development System under current procedures.

--yesterday, we had 22 users on system and the response was poor; possible reasons include: only 750-K words of Bulk Store and two dumpers going at the time.

--expect hardware changes to settle down in about two weeks.

--began using all four DSU190 drives on Service late last week.

E. Tech Square

--the update of Bulk Store/Serial #02 was accomplished.

--minor problem with belt-slip on DSU270.

--the op-not-complete problem on CPU-A still exists; Ohlin reports that the FE's are not working on this problem because of low manpower; Roach to investigate and assess impact on users.

--Steinberg agreed to make arrangements to have Bulk Store moved from B39 to 545TS at same time as PRT300.

F. Miscellaneous

--the relocation of the DSS181 subsystem will be deferred until shortly before the scheduled arrival of the MTS500.

--Ryan/Ohlin/Kleinow/Hoffman to meet at 1300 on Wednesday to discuss site layout (placement of Board Tester, etc.)

--meeting adjourned after brief review of Master Plan activities which have target dates coming due within next week.



R.E. Hoffman, Account Manager, MIT

REH/s

A combination of hardware, software, communications capabilities, and supervisory techniques intended as a true computer utility will be produced at the Phoenix, Ariz plant of Honeywell Information Systems, Inc for initial delivery in the first quarter of 1974. The system, known as Multics (multiplexed information and computing service), evolved through a joint 7-year development effort with Project MAC at the Massachusetts Institute of Technology. It is designed to oper-

COMPUTER DESIGN/MARCH 1973

ate as a general-purpose system serving the diverse needs of a large user community on a time-sharing basis.

Although its hardware is based on the company's 6000 series computers, Multics is not intended as a replacement for that line, but rather as a complement to it for the sophisticated, large-scale data processing user who requires data security, shared programming, and a centralized data base. Specifically, the processor, designated the 6180, is a standard 6080 to which provision for segment referencing, protection rings, and paging has been added.

The original design goals, claimed to have been attained without significant compromise and believed to set the system apart from earlier time-sharing systems, include (1) convenient remote terminal access as the normal mode of system usage; (2) a view of continuous operation analogous to that of the electric power and telephone companies; (3) a wide range of capacity to allow growth or contraction without either system or

user reorganization; (4) an internal file system so reliable that users can entrust their only copy of programs and data to be stored on the system; (5) sufficient control of access to allow selective sharing of information (the method and conditions of access are beyond the control of a "guest" accessing the file); (6) the ability to structure hierarchically the logical storage of information as well as administration of the system; (7) the capability of serving both large and small users without inefficiency to either; (8) the ability to support various programming environments and human interfaces within a single system, and (9) the flexibility and generality of system organization required for evolution through successive waves of technological improvements and the inevitable growth of user expectations.

Sharing of information between users while maintaining adequate data security is probably the most significant requirement of a computer utility. Multics features segmentation and protection rings, which permit controlled sharing of information in memory with no loss of performance.

A segment may be either a subprogram or an array of data. In typical

third-generation computers, programs are prepared by merging subprograms and data arrays into a monolithic whole prior to machine execution. The addressee portion of the subprogram must be modified to fit the user's program. Because of this modification, called linking, and further modification during execution, frequently used programs, subprograms, and data cannot be shared between users without multiple copies being held in memory at the same time. This wastes space and may cause confusion as to which is the authentic copy. In Multics, linking is accomplished by the hardware rather than by altering addresses, allowing the individual segments to be executed in their original separate form. Thus if a user's program accesses a segment, a copy need be made only if that segment is in current use in another program. An added attraction of the hardware implementation is that it allows dynamic linking to a segment, the need for which becomes known only after execution has begun. This feature is very valuable, for example, in interactive design programs using CRT terminals.

To prevent unauthorized reference to a segment, whether accidental or malicious, an access permission list is held on the disc file with the segment. This list denotes which users or classes of users are authorized to access or alter the segment. In addition to the access control list a protection ring level is set for each segment and an access ring level is derived for each user. During program execution the hardware constantly compares the user level with the segment access level to make certain the user is authorized to access that segment. Unauthorized referencing of a segment automatically suspends program execution. A user can allow others access to his files, but the method and conditions of access are completely dictated by the owner and beyond the reach of anyone else.

Use of a virtual memory system claimed to be the most powerful yet available results in the operating system supervisor, user programs, and data files being free of core memory restraints. For increased efficiency, each of the previously discussed segments is broken up into standardized pages which may be individually stored wherever there is space in the disc file.

Although only now being announced commercially, the system has seen service in four prototype installations, including one at MIT which has been operational for three years and now services about 50 terminals.