

MULTICS TECHNICAL BULLETING

MTB-044

DATE: March 1, 1974
TO: Distribution
FROM: M. S. Hodges
SUBJECT: Multics Change Requests

Attached are copies of Multics Change Requests which were approved from February 16 through February 28, 1974.

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MULTICS CHANGE REQUEST		MCR <u>107</u> Page <u>1</u> of <u>1</u> Pages
TITLE: <u>Sort_file enhancements</u>		STATUS
AUTHOR: <u>R. A. Roach</u>		DATE
SOURCE: (if external) e.g., "User", "Marketing"		Written <u>10/12/73</u>
		Approved <u># 2/19/74</u>
		Rejected
		Postponed <u># 10/23/73</u>
		Withdrawn
		Expires <u>8/19/74</u>

CLASSIFICATION	JUSTIFICATION	
	Incompatible Change	Marketing Requirement
		Conformance to Standard
X	Extension	Increased Consistency
	Restriction	Simplification
	Performance Improvement	Generalization
	Reliability Improvement	Bug Fix

Replaced by proposal MCR _____
Implemented in System _____

Objections/Comments:
Needs MTB and design review.

- Rename to be sort seg.
- Dependent on EIS operator installation.

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: Need a more general sort_file to satisfy certain user requirements/desires.

- SUMMARY:
- Add options to allow changing delimiter to allow sorting variable "blocks" (i.e. addresses).
 - Add a "blocking" option to treat a fixed number of lines as one unit.
 - Add ability to sort on "fields" within a line or block.
 - Add ability to sort in decreasing order.
 - Use newer algorithms to increase speed.

IMPLICATIONS: Should be only positive.

MULTICS CHANGE REQUEST		MCR <u>291</u> Page <u>1</u> of <u>1</u> Pages
TITLE: Miscellaneous changes to Answering Service and Process Initialization related to Network		STATUS
		DATE
AUTHOR: <u>D. Wells</u>		Written <u>74.2</u>
		Approved <u># 2/19/74</u>
SOURCE: (if external) e.g., "User", "Marketing"		Rejected
		Postponed <u># 1/22/74</u>
		Withdrawn
		Expires <u>8/19/74</u>

CLASSIFICATION	JUSTIFICATION	
Incompatible Change	Marketing Requirement	Replaced by proposal MCR _____
Extension	Conformance to Standard	Implemented in System _____
Restriction	<input checked="" type="checkbox"/> Increased Consistency	Objections/Comments:
Performance Improvement	Simplification	
<input checked="" type="checkbox"/> Reliability Improvement	Generalization	
	Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS:

Because a new Network Library is being created, it is desired to change the Answering Service to only reference Network-related software through a singly-named dispatch module.

Because a new Network Library is being created, it is desirable to change the FTP process overseer to only use the process overseer in the Network library for security reasons.

Because the defaulting of user process initial IOSIM does not work properly, it is desired to change the AS to properly default it (and to change the initial I/O attachment of a process to respect this default properly.)

SUMMARY

The Network Code in the Answering Service (and the procedures which call them) will be changed to reference the Network Code as "net_as_".

The procedure net_tty_ will be altered to cause it to reference the user process overseer for File Transfer by pathname.

The procedure in the Answering Service which determines the "outer_module" for a user process will be changed to supply the network IOSIM if a user is logged in via a network pseudo-teletypewriter.

The procedure init_admin_util_ will be changed to not look for a device name beginning with "net" (because the AS will already have performed this check).

MULTICS CHANGE REQUEST		MCR 347 Page 1 of 1 Pages	
TITLE: parity fault reporting is incorrect		STATUS	DATE
		Written	2/8/74
AUTHOR: R.B. Snyder		Approved #	2/19/74
		Rejected	
SOURCE: (if external) e.g., "User", "Marketing" local		Postponed	
		Withdrawn	
		Expires	8/19/74

CLASSIFICATION	JUSTIFICATION	
Incompatible Change	Marketing Requirement	Replaced by proposal MCR _____ Implemented in System _____
Extension	Conformance to Standard	Objections/Comments:
Restriction	Increased Consistency	
Performance Improvement	Simplification	
Reliability Improvement	Generalization	
	unreported	
	x Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: There is a bug in the program parity_fault such that when it retries the instruction and data fetches to see if there really is a parity error, it reports the results of these retries incorrectly (if there is an error, it says there isn't one and vice versa).

SUMMARY: The bug will be fixed.

IMPLICATIONS: None

MULTICS CHANGE REQUEST		MCR 348 Page 1 of 1 Pages
TITLE: fix bug in signal_	STATUS	DATE
	Written	2/11/74
AUTHOR: M. Weaver	Approved *	2/19/74
	Rejected	
SOURCE: (if external) e.g., "User", "Marketing"	Postponed	
	Withdrawn	
	Expires	8/19/74

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
Incompatible Change	Marketing Requirement	Implemented in System _____
Extension	Conformance to Standard	Objections/Comments:
Restriction	Increased Consistency	
Performance Improvement	Simplification	
Reliability Improvement	Generalization	
	<input checked="" type="checkbox"/> unreported Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: signal_ currently does not find an explicit on unit for a pll file condition when the condition is signalled with the new pll_signal

SUMMARY: Make one-line fix to use correct pointer.

IMPLICATIONS: New pll signalling cannot be used until this change is installed.

MULTICS CHANGE REQUEST		MCR <u>349</u> Page <u>1</u> of <u>1</u> Pages	
TITLE: <u>fix bug in find_condition_info_</u>		STATUS	DATE
AUTHOR: <u>M. Weaver</u>		Written	<u>2/11/74</u>
SOURCE: (if external) e.g., "User", "Marketing"		Approved <u>H</u>	<u>2/19/74</u>
		Rejected	
		Postponed	
		Withdrawn	
		Expires	<u>8/19/74</u>

CLASSIFICATION	JUSTIFICATION	
Incompatible Change	Marketing Requirement	Replaced by proposal MCR _____
Extension	Conformance to Standard	Implemented in System _____
Restriction	Increased Consistency	Objections/Comments:
Performance Improvement	Simplification	
Reliability Improvement	Generalization	
	unreported	
	X Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: find_condition_info_ does not return information if the signalling procedure (signal_ or its replacement) is not the same as that pointed by the signal_ptr in the stack header.

SUMMARY: Change find_condition_info_ to look at signal flag in stack frame. It was an oversight that this change was not made at the same time as similar changes to other procedures (before their initial installation.)

IMPLICATIONS: This should primarily affect subsystems such as gcos that replace the signal_ptr.

MULTICS CHANGE REQUEST		MCR <u>350</u>
TITLE: Rewrite formline_	STATUS	DATE
AUTHOR: Barry L. Wolman	Written	740212
SOURCE: (if external; e.g., "User", "Marketing") local	Approved #	2/19/74
	Rejected	
	Postponed	
	Withdrawn	
	Expires	8/19/74
CLASSIFICATION	JUSTIFICATION	
<input type="checkbox"/> Incompatible	Marketing	Replaced by proposal MCR
<input type="checkbox"/> Change	Requirement	Implemented in System
<input type="checkbox"/> Extension	Conformance	Objections/Comments:
<input type="checkbox"/> Restriction	to Standard	
<input type="checkbox"/> Performance	Increased	1. Delete item 4.
<input type="checkbox"/> Improvement	Consistency	2. Suggest per-process "installation" first with subset of this MCR referencing ioa as advanced on -line notification.
<input type="checkbox"/> Reliability	Simplification	3. Typically runs 4 times faster than current version.
<input type="checkbox"/> Improvement	Generalization	
	Unreported	
	Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, and optionally DETAILED PROPOSAL

REASONS

The current version of formline_ is slow, uses inaccurate floating point conversion algorithms, contains a number of bugs, and lacks some useful features that have been requested by a large number of people.

PROPOSAL

1. Rewrite formline_ keeping the same interface and calling sequence. Use EIS instructions for string operations.
2. Use the new conversion programs in any_to_any_. The new formline_ would format the decimal values generated by any_to_any_.
3. Correct the following bugs:
 - a. A field of the form ~.0f gives maximum precision after the decimal point instead of no digits after the decimal point.
 - b. The value .0022 printed with the field ~5.2f incorrectly gives the output .01 due to bad rounding.
 - c. The value .123 printed with the field ~f or ~nf gives only a decimal point as output!

4. Change the formline_\$ga entry so that the buffer provided for the expansion must be big enough to hold the output string expressed in 9-bit ASCII. The new formline_\$ge will work in 9-bit ASCII and convert to 6-bit EBCDIC just before it returns. Only one system program currently calls formline_\$ga and the buffer it provides satisfies this restriction.
5. Make the following changes:
 - a. Allow any arithmetic data type, binary or decimal, fixed or float, real or complex, to be printed via the d, e, and f control fields; only the real part of complex values would be printed. any_to_any_ already contains code to convert any arithmetic data type to any other type. This change would not affect users correctly calling the current formline_ (via ioa_ for example) with single precision binary fixed or float values.
 - b. Look at the data type in the descriptor describing a substitutable argument and detect mismatches, e.g. non-arithmetic value used where arithmetic value required. When a mismatch occurs the output field would be set to all "*"s.
 - c. Simplify the ~f and ~gf formats so that no more than P digits are generated where P is the "appropriate" decimal precision corresponding to the input precision according to the rules of PL/I. If more than P digits are required to represent the value being converted, E format would be used. This change would cause some values currently printed in the form .000123456789 to be printed in E format. For the usual case of a float bin(27) values, P is 9 giving the same number of digits as are generated by the current formline_.
 - d. Change the ~pf format so that digits after the decimal point are not dropped. The current formline_ prints the value 1.234 as 1. when the format ~5f is used. If the user wishes to have digits dropped after the decimal point, he can use the ~p.0f format (see point 3a).
 - e. Generate only P digits for the format ~e. For the usual case of a float bin(27) value, 9 digits would be generated instead of the 8 provided by current formline_.
 - g. Change the E format used by formline_ from


```
.ddddddde+dd
```

 to


```
d.dddddde+dd
```


which agrees with the format used by PL/I and FORTRAN. This change might cause problems for any user who depended on current format used by formline_.

- f. Add the format `~i` as another name for the current `~d` format. Remove the description of `~d` from the MPM documentation. The arithmetic conversion codes would be `~i`, `~a`, and `~f` agreeing with FORTRAN.
- h. Add the `b` format to allow processing of bit strings. The legal forms would be

```
~b
~nb
~.gb
~n.gb
```

`g` gives the number of bits to consider at a time when generating output; `g = 1` gives binary, `g = 2` gives quaternary, `g = 3` gives octal, and `g = 4` gives hexadecimal. If `g` is omitted, `g = 1` is assumed. `n` specifies the field width; if `n` is omitted, the field width is the length of the bit string divided by `g`.

- i. Allow repetition of portions of a control string. If a user wants to print varying numbers of arguments in different calls to `ioa_` or a different number of arguments in subsequent instances of the same call, he must use a different control string in each case. The sequence

```
~n( ..... ~)
```

in the control string would cause the portion of the control string between the parentheses to be repeated `n` times or until there were no more substitutable arguments; if `n` is omitted, infinity is assumed. If `n` were 0, the portion of the control string between parentheses would be skipped. Parentheses could be nested to a reasonable depth, 4 for example.

- j. Add the `~s` format to allow substitutable arguments to be skipped. The legal forms would be

```
~s
~ns
```

`n` gives the number of arguments to be skipped; 1 is assumed if `n` is omitted.

- k. Make the `~nw` format observe the specified field width whenever possible. The current formline_ always uses `max(12,n)` where `n` is the specified field width; a value such as 7 always prints as 000000000007. If `n < 12`, the new formline_ would drop t

first 12-p characters provided they were all "0"s; the field would be extended as necessary if the 12-p leading characters are not all "0"s. This change would not affect the cases where the field size was not specified or was greater than 12.

IMPLICATIONS

MPM documentation and info files will have to be updated. Other issues are noted in the body of the proposal.

MULTICS CHANGE REQUEST		MCR 351 Page 1 of 1 Pages	
TITLE: Fix bug in 355 initialization		STATUS	DATE
		Written	2/12/74
AUTHOR: R. B. Snyder		Approved <i>H</i>	2/19/74
		Rejected	
SOURCE: (if external) e.g., "User", "Marketing" local		Postponed	
		Withdrawn	
		Expires	8/19/74

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
<input type="checkbox"/> Incompatible Change	Marketing Requirement	Implemented in System _____
<input type="checkbox"/> Extension	Conformance to Standard	Objections/Comments:
<input type="checkbox"/> Restriction	Increased Consistency	
<input checked="" type="checkbox"/> Performance Improvement	Simplification	
<input type="checkbox"/> Reliability Improvement	Generalization	
<input type="checkbox"/>	<input checked="" type="checkbox"/> Unreported Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: There is a bug in 355 bootload initialization such that an interrupt vector is left zero.

SUMMARY: This bug has been found and will be fixed.

IMPLICATIONS: None.

MULTICS CHANGE REQUEST		MCR <u>352</u> Page <u>1</u> of <u>1</u> Pages	
TITLE: Fix installation_parms access in who command		STATUS	DATE
		Written	2/12/74
		Approved H	2/19/74
		Rejected	
AUTHOR: <u>S. Barr</u>		Postponed	
		Withdrawn	
		Expires	
		8/19/74	
SOURCE: (if external) e.g., "User", "Marketing"		Postponed	
		Withdrawn	
		Expires	
		8/19/74	

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
Incompatible Change	Marketing Requirement	Implemented in System _____
Extension	Conformance to Standard	Objections/Comments:
Restriction	Increased Consistency	
Performance Improvement	Simplification	
Reliability Improvement	Generalization	
	X Bug Fix lib 0008p	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: The first time the "who" command is called it initiates "installation_parms", although that table is not needed for the short form of "who". If the user does not have access to "installation_parms" an incorrect message saying there is no access to "whotab" is printed.

SUMMARY: "who" was changed to initiate "installation_parms" only if the "-long" option was requested. If the user does not have access to "installation_parms" the message "entry not found: insufficient access for -long option".

MULTICS CHANGE REQUEST

MCR 353
Page 1 of 1 Pages

TITLE: Modify IOM Manager for Online T & D Needs

STATUS	DATE
Written	2/13/74
Approved <i>H</i>	2/19/74
Rejected	
Postponed	
Withdrawn	
Expires	8/19/74

AUTHOR: N. I. Morris

SOURCE: (if external) e.g., "User", "Marketing"

CLASSIFICATION	JUSTIFICATION	
	Incompatible Change	Marketing Requirement
X	Extension	Conformance to Standard
	Restriction	Increased Consistency
	Performance Improvement	Simplification
	Reliability Improvement	Generalization
		Bug Fix

Replaced by proposal MCR _____
Implemented in System _____
Objections/Comments:

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: The Phoenix T & D people wish to obtain a copy of the LPW for a channel for consistency checking purposes. The IOM manager must be changed to supply the LPW as an extra argument to the procedure called at interrupt time by the IOM manager.

SUMMARY: The IOM manager will be changed to call interrupt procedures with an additional argument: call int_proc (devx, listx, status, level, lpw)

IMPLICATIONS: Existing interrupt procedures can ignore the additional argument.

MULTICS CHANGE REQUEST		MCR <u>354</u> Page <u>1</u> of <u>1</u> Pages
TITLE: <u>all_rings_util</u> has an unused stacq subroutine		STATUS
AUTHOR: <u>R.B. Snyder</u>		DATE
SOURCE: (if external) e.g., "User", "Marketing"		Written <u>2/8/74</u>
local		Approved <u>H 2/19/74</u>
		Rejected
		Postponed
		Withdrawn
		Expires <u>8/19/74</u>

CLASSIFICATION	JUSTIFICATION	
<input type="checkbox"/> Incompatible Change	<input type="checkbox"/> Marketing Requirement	Replaced by proposal MCR _____
<input type="checkbox"/> Extension	<input type="checkbox"/> Conformance to Standard	Implemented in System _____
<input type="checkbox"/> Restriction	<input type="checkbox"/> Increased Consistency	Objections/Comments:
<input checked="" type="checkbox"/> Performance Improvement	<input checked="" type="checkbox"/> Simplification	
<input type="checkbox"/> Reliability Improvement	<input type="checkbox"/> Generalization	
<input type="checkbox"/>	<input type="checkbox"/> Bug Fix	
<input type="checkbox"/>	<input type="checkbox"/>	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: There is a stacq subroutine in all_rings_util. There is also one in wired_utility. Only the one in wired_utility is used. Therefore, the one in all_rings_util will be removed.

SUMMARY: As above.

IMPLICATIONS: None

MULTICS CHANGE REQUEST		MCR <u>355</u>
TITLE: process metering commands: sample_refs and print_sample_refs		STATUS
AUTHOR: Ross E. Klinger		DATE
SOURCE: (if external; e.g., "User", "Marketing") MIT - PDO		Written <u>02/13/74</u>
		Approved <input checked="" type="checkbox"/> <u>2/19/74</u>
		Rejected
		Postponed
		Withdrawn
		Expires <u>8/19/74</u>
CLASSIFICATION	JUSTIFICATION	
<input type="checkbox"/> Incompatible Change	Marketing Requirement	Replaced by proposal MCR
<input checked="" type="checkbox"/> Extension	Conformance to Standard	Implemented in System
<input type="checkbox"/> Restriction	Increased Consistency	Objections/Comments: Change .psrf to .list
<input type="checkbox"/> Performance Improvement	Simplification	
<input type="checkbox"/> Reliability Improvement	Generalization	
<input type="checkbox"/>	Bug Fix	
<input type="checkbox"/>	<input checked="" type="checkbox"/> Needed Service	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, and optionally DETAILED PROPOSAL

REASON: to provide a process metering facility not implemented by current metering tools.

SUMMARY: see MTB-022, Proposed new commands.

IMPLICATIONS: installation of sample_refs and print_sample_refs in the tools directory.

DETAILED PROPOSAL: changes from MTB-022 specifications:

- 1) the name "snoop" is changed to "sample_refs"
- 2) the name "sn" is changed to "srf"
- 3) the name "print_snoop_data" is changed to "print_sample_refs"
- 4) the name "psd" is changed to "psrf"
- 5) the suffixes ".snoop", ".snoopx", ".snoope", and ".snoopp" are changed to ".srf1", ".srf2", ".srf3", and ".psrf", respectively
- 6) the output segment produced by psrf will be placed in the user's working directory, not in the directory which contains the data segments

MULTICS CHANGE REQUEST		MCR <u>356</u>
TITLE: Improve system administration programs.	STATUS	DATE
AUTHOR: T. H. Van Vleck	Written	02/13/74
SOURCE: (if external; e.g., "User", "Marketing")	Approved	2/19/74
	Rejected	
	Postponed	
	Withdrawn	
	Expires	8/19/74

CLASSIFICATION	JUSTIFICATION	
<input type="checkbox"/> Incompatible	<input type="checkbox"/> Marketing	Replaced by proposal MCR
<input type="checkbox"/> Change	<input type="checkbox"/> Requirement	Implemented in System
<input checked="" type="checkbox"/> Extension	<input type="checkbox"/> Conformance to Standard	Objections/Comments:
<input type="checkbox"/> Restriction	<input type="checkbox"/> Increased Consistency	
<input type="checkbox"/> Performance Improvement	<input type="checkbox"/> Simplification	
<input type="checkbox"/> Reliability Improvement	<input checked="" type="checkbox"/> Generalization	
<input type="checkbox"/>	<input type="checkbox"/> Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, and optionally DETAILED PROPOSAL

REASONS:

Several administrative tools have been written or repaired recently and should be installed.

SUMMARY:

The program "console_report" has been made to work again. It produces list of all users who use a given terminal (by idcode). An optional comment field on the output may be set by the "console_edit" program to give the location of the terminal. This program stopped working when the old-style accounting deck was eliminated.

The program "sys_full_report" has been made to work again. This program produces a histogram of the times that service was denied to users because the system was full.

The program "sweep_disk_" has been converted to the new ACL primitives and made to operate even if the system free area has a capacity of 32K. The source in the libraries for this program does not currently match the object, due to a change made a year ago in connection with 18-0.

Three previously un-installed programs which call sweep_disk_ should be made part of the system: they are "call_finder", which lists all external references to a given segment in object segments in a hierarchy; "hunt"

which lists all segments (or entries) in a hierarchy which match a given star name: and "ckauth", which lists all segments in a hierarchy whose bit count author has a given value.

The program "disk_usage_stat", which also uses sweep_disk_, has had a minor bug fixed which caused a wrong total to be printed.

A new option has been added to "as_who" to allow listing interactive users only.

A new program, "list_delegated_projects", has been written to produce a list of projects which are run by project administrators instead of the system administrator.

A new program, "list_extra_personids", has been written to list those users registered in the PNT who are not registered on any project. These users can be removed from the PNT if the administrator determines that they are not likely to return. (They must stay in the user_registration_file, of course, unless the administrator decides that their names appear on no (important) access control lists.)

A new program, "restore_pdt_access", has been written to re-calculate the ACL's for the system PDT's and the segment >sci>proj_admin_seg and the directory >sci>update. Recent crashes have destroyed large portions of the ACL thread of >sci and >sci>pdt with depressing frequency, and re-generating these ACL's even with a directory compare has been time-consuming.

A new program, "check_dir", has been written to check a directory for all segments whose bit count author is NOT specified in the command line. This provides a tidy exception report useful for checking the system libraries, for example, to find "unusual" segments.

IMPLICATIONS:

Some administrator operations will be facilitated.

MULTICS CHANGE REQUEST		MCR <u>357</u>
TITLE: Make bad clock settings less fatal.	STATUS	DATE
AUTHOR: VanVleck	Written	02/06/74
	Approved <input checked="" type="checkbox"/>	2/19/74
	Rejected	
SOURCE: (If external: e.g., "User", "Marketing")	Postponed	
	Withdrawn	
	Expires	2/19/74

CLASSIFICATION	JUSTIFICATION	
		Replaced by proposal MCR
<input type="checkbox"/> Incompatible	Marketing	
<input type="checkbox"/> Change	Requirement	Implemented in System
<input type="checkbox"/> Extension	Conformance	
<input type="checkbox"/> Restriction	to Standard	Objections/Comments:
<input type="checkbox"/> Performance	Increased	
<input type="checkbox"/> Improvement	Consistency	
<input checked="" type="checkbox"/> Reliability	Simplification	
<input type="checkbox"/> Improvement	Generalization	
	<input checked="" type="checkbox"/> Unreported	
	Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, and optionally DETAILED PROPOSAL

REASONS:

The recent accident which resulted in the system being run for about an hour with the clock set to a date of 01/21/84 showed up several system problems. Additional checking of the clock value should be built into the system, and the accounting programs should not blow up if a date in the future is passed them.

SUMMARY:

1. Add code to system_control_ to check the date modified on answer_table against the clock before starting up. If the date is unreasonable (say, jump of more than a month forward, or any jump backwards), print a warning message and ask the operator if he really wants to start up.
2. Modify several accounting and billing programs to treat a time in the future as the current time. The programs system_total, usage_total, disk_usage_stat, and perhaps several others should have checks added.
3. Add run-time checks in the accounting system so that a jump in the clock will be detected, and an urgent warning printed. (Traffic control already loops if the clock stops or provides a value previous to the last reading.)
4. Add code to clock_init which reads the clocks in all memory controller and checks that they have the same value to within some reasonable

Make bad clock settings less fatal.

02/06/74

tolerance.

IMPLICATIONS:

Hardware, configuration, and operator errors will be detected before they cause trouble. Those that cannot be avoided will cause fewer problems.

MULTICS CHANGE REQUEST		MCR <u>358</u>
TITLE: Improve system administration reports		STATUS DATE
AUTHOR: T. H. Van Vleck		<u>Written</u> <u>02/13/74</u>
SOURCE: (if external; e.g., "User", "Marketing")		<u>Approved #</u> <u>2/19/74</u>
		<u>Rejected</u> _____
		<u>Postponed</u> _____
		<u>Withdrawn</u> _____
		<u>Expires</u> <u>8/19/74</u>

CLASSIFICATION	JUSTIFICATION	
		<u>Replaced by proposal MCR</u>
<input type="checkbox"/> Incompatible	<input type="checkbox"/> Marketing	
<input type="checkbox"/> Change	<input type="checkbox"/> Requirement	<u>Implemented in System</u>
<input checked="" type="checkbox"/> Extension	<input type="checkbox"/> Conformance	
	<input type="checkbox"/> to Standard	Objections/Comments:
	<input type="checkbox"/> Increased	
<input type="checkbox"/> Restriction	<input type="checkbox"/> Consistency	
<input type="checkbox"/> Performance		
<input type="checkbox"/> Improvement	<input type="checkbox"/> Simplification	
<input type="checkbox"/> Reliability	<input checked="" type="checkbox"/>	
<input type="checkbox"/> Improvement	<input type="checkbox"/> Generalization	
	<input type="checkbox"/> Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, and optionally DETAILED PROPOSAL

REASONS:

Several minor improvements to the system administrative reports have been requested. This change collects several new data items and reports them on the daily and monthly reports.

SUMMARY:

The "use_totals" data base has some new items added where padding used to be. A new program, "disk_left", is called to obtain the total physical disk capacity and the number of records left, and store them in the data base. The program "system_total", as well as calling disk_left, also calculates the total zero and multi-programming idle, in addition to the present calculation of total idle. The program "usage_total" now adds up the total charged CPU (virtual cpu), so that the reporting programs can provide a breakdown similar to "total_time_meters" except that segment faults, page faults, and interrupts are reported as "overhead".

System_daily_report is modified to print the total disk capacity and percentage full, and the percentage of overhead. System_monthly_report is modified to print these items too, and in addition to produce a table to compare the current month with the previous month. (This report has been produced manually for several years and published in the IPC Bulletin.)

Reset_usage_totals is modified to reset these new fields and to set installation-specified "flag" field for each summarization category, which will be used to drive the IPC-specific daily and monthly report programs. (The possibility of making these IPC programs table-driven enough to use at other installations and submitting them to the library too is being investigated by Jim Homan.)

The program "b_and_w" is modified to eliminate the peculiar gap now encountered at the end of each month.

IMPLICATIONS:

New items on daily and monthly reports.

MULTICS CHANGE REQUEST		MCR 359 Page 1 of 1 Pages
TITLE: set the max lengths of system initialization segments AUTHOR: E. Stone	STATUS	DATE
	Written	3/15/74
	Approved #	2/26/74
	Rejected	
SOURCE: (if external) e.g., "User", "Marketing"	Postponed	
	Withdrawn	
	Expires	8/26/74

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
<input type="checkbox"/> Incompatible Change	<input type="checkbox"/> Marketing Requirement	<input type="checkbox"/> Implemented in System _____
<input type="checkbox"/> Extension	<input type="checkbox"/> Conformance to Standard	Objections/Comments:
<input type="checkbox"/> Restriction	<input checked="" type="checkbox"/> Increased Consistency	
<input checked="" type="checkbox"/> Performance Improvement	<input type="checkbox"/> Simplification	
<input checked="" type="checkbox"/> Reliability Improvement	<input type="checkbox"/> Generalization	
<input type="checkbox"/>	<input checked="" type="checkbox"/> unreported Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: segments in system_library_1 may utilize page tables larger than necessary, because they are given the default max length of 255k. Users have caused thrashing on the 256k page table pool by reading pages beyond the current length of such segments.

Although this situation may happen for other segments, it is more critical here since these segments generally remain active for long periods.

SUMMARY: Although a more general solution to this problem is desirable, a simple change to init_branches will alleviate a potential performance problem. The change involves setting the max length, taking into account the bit count, current length and max length as specified in the SLT.

MULTICS CHANGE REQUEST		MCR 360 Page 1 of 1 Pages	
TITLE: bound_full_cp_conversion		STATUS	DATE
		Written	2/15/74
AUTHOR: Steve Herbst		Approved <i>H</i>	2/26/74
		Rejected	
SOURCE: (if external) e.g., "User", "Marketing"		Postponed	
		Withdrawn	
		Expires	8/26/74

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
Incompatible Change	Marketing Requirement	Implemented in System _____
Extension	* Conformance to Standard	Objections/Comments:
Restriction	Increased Consistency	
Performance Improvement	Simplification	
Reliability Improvement	Generalization	
	Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: full command loop contains some obsolete code and uses obsolete interfaces.

SUMMARY: Convert all VI p11 to compile in Version II. Standard error codes become fixed bin (35). Any obsolete interfaces are replaced with current ones.

MULTICS CHANGE REQUEST		MCR <u>361</u> Page <u>1</u> of <u>1</u> Pages	
TITLE: Add new T & D program "test_cpu" to Tools AUTHOR: <u>S. Webber</u>		STATUS	DATE
		Written	2/15/74
		Approved <i>H</i>	2/26/74
		Rejected	
SOURCE: (if external) e.g., "User", "Marketing"		Postponed	
		Withdrawn	
		Expires	8/26/74

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
<input type="checkbox"/> Incompatible Change	Marketing Requirement	Implemented in System _____
<input checked="" type="checkbox"/> Extension	Conformance to Standard	Objections/Comments:
<input type="checkbox"/> Restriction	Increased Consistency	
<input type="checkbox"/> Performance Improvement	Simplification	
<input checked="" type="checkbox"/> Reliability Improvement	Generalization	
<input type="checkbox"/>	Bug Fix	
<input type="checkbox"/>	<input checked="" type="checkbox"/> search for hardware bug	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: A program "test_cpu" has been developed which checks (via calls to test cases) all past hardware bugs in the CPU since the mechanism (test_cpu) was started. This program should be run whenever hardware changes are made to verify that all past hardware bugs are still fixed.

SUMMARY: The program "test_cpu" and all its test cases will be installed in tools.

MULTICS CHANGE REQUEST

MCR 362
Page 1 of 1 Pages

TITLE: Add new program set_proc_required to Tools

STATUS	DATE
Written	2/1/74
Approved <i>H</i>	2/26/74
Rejected	

AUTHOR: S. Webber

SOURCE: (if external) e.g., "User", "Marketing"

Postponed	
Withdrawn	
Expires	8/26/74

CLASSIFICATION	JUSTIFICATION	
	Incompatible Change	Marketing Requirement
		Conformance to Standard
<input checked="" type="checkbox"/>	Extension	Increased Consistency
	Restriction	Simplification
	Performance Improvement	Generalization
	Reliability Improvement	
<input checked="" type="checkbox"/>	New Program	Bug Fix

Replaced by proposal MCR _____
Implemented in System _____
Objections/Comments:

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: The set_proc_required program (requiring phcs_access) is used in debugging hardware problems. It allows the user to specify that his process should run on only a specified processor.

SUMMARY: Install the program which has been used privately for several months.

MULTICS CHANGE REQUEST		MCR <u>363</u> Page <u>1</u> of <u>1</u> Pages
TITLE: Add measure of "static" storage use in print linkage_usage.		STATUS
		DATE
AUTHOR: <u>S. Webber</u>		Written <u>2/15/74</u>
		Approved <u>H</u> <u>2/26/74</u>
SOURCE: (if external) e.g., "User", "Marketing"		Rejected
		Postponed
		Withdrawn
		Expires <u>8/26/74</u>
CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
<input type="checkbox"/> Incompatible Change	<input type="checkbox"/> Marketing Requirement	Implemented in System _____
<input checked="" type="checkbox"/> Extension	<input type="checkbox"/> Conformance to Standard	Objections/Comments:
<input type="checkbox"/> Restriction	<input type="checkbox"/> Increased Consistency	
<input type="checkbox"/> Performance Improvement	<input type="checkbox"/> Simplification	
<input type="checkbox"/> Reliability Improvement	<input checked="" type="checkbox"/> Generalization	
<input type="checkbox"/>	<input type="checkbox"/> Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: The print_linkage_usage command reports several useful statistics. The static (internal) storage used by such programs should also be reported.

SUMMARY: Report it.

IMPLICATIONS: Different format for output.

MULTICS CHANGE REQUEST		MCR <u>364</u> Page <u>1</u> of <u>1</u> Pages
TITLE: Fix bugs in et.(eis_tester)	STATUS	DATE
	Written	2/15
AUTHOR: S. Webber	Approved <i>H</i>	2/26/74
	Rejected	
SOURCE: (if external) e.g., "User", "Marketing"	Postponed	
	Withdrawn	
	Expires	8/26/74

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
Incompatible Change	Marketing Requirement	Implemented in System _____
Extension	Conformance to Standard	Objections/Comments:
Restriction	Increased Consistency	
Performance Improvement	Simplification	
Reliability Improvement	Generalization unreported	
	X Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: There are several bugs in et being fixed. These are:
 1. due to a combination of a source code bug and a (since fixed) compiler bug, bit offsets are not being set up correctly.
 2. the condition handlers for expected faults are too global. They need to be set up just before executing the EIS instruction and reverted just after.

SUMMARY: Fix the bugs-(et, et_util).

IMPLICATIONS: None

MULTICS CHANGE REQUEST		MCR 365 Page 1 of 1 Pages
TITLE: Fix duplicated metering bug in total_time_meters		STATUS
		DATE
AUTHOR: S. Webber		Written 2/15/74
		Approved <i>H</i> 2/26/74
SOURCE: (if external) e.g., "User", "Marketing"		Rejected
		Postponed
		Withdrawn
		Expires 8/26/74

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
Incompatible Change	Marketing Requirement	Implemented in System _____
Extension	Conformance to Standard	Objections/Comments:
Restriction	Increased Consistency	
Performance Improvement	Simplification	
Reliability Improvement	Generalization	
	X unreported Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: The metering tool total_time_meters erroneously reports the time spent in seg faults and bound faults.

SUMMARY: Correct the bug.

IMPLICATIONS: None

MULTICS CHANGE REQUEST		MCR <u>366</u> Page <u>1</u> of <u>1</u> Pages
TITLE: Make "component" entry in print_gen_info_ segment in bound_gm_ AUTHOR: <u>S. Webber</u>	STATUS	DATE
	Written	2/15
	Approved <i>H</i>	<i>2/26/74</i>
	Rejected	
SOURCE: (if external) e.g., "User", "Marketing"	Postponed	
	Withdrawn	
	Expires	<i>8/26/74</i>

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
Incompatible Change	Marketing Requirement	Implemented in System _____
Extension	Conformance to Standard	Objections/Comments:
Restriction	<input checked="" type="checkbox"/> Increased Consistency	
Performance Improvement	Simplification	
Reliability Improvement	Generalization	
	<input checked="" type="checkbox"/> unreported Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: The "component" entry of print_gen_info_ should be retained.

The "component" entry of print_gen_info_ should be made available externally by placing the "retain" key word in the bind file for "component".

MULTICS CHANGE REQUEST		MCR <u>367</u>
TITLE: Do more argument checking in substr active function.		STATUS DATE
AUTHOR: Paul A. Green		Written 02/15/74
		Approved 3/26/74
		Rejected
SOURCE: (if external; e.g., "User", "Marketing") local		Postponed
		Withdrawn
		Expires 8/26/74
CLASSIFICATION	JUSTIFICATION	
<input type="checkbox"/> Incompatible	<input type="checkbox"/> Marketing	Replaced by proposal MCR
<input type="checkbox"/> Change	<input type="checkbox"/> Requirement	Implemented in System
<input checked="" type="checkbox"/> Extension	<input type="checkbox"/> Conformance	Objections/Comments:
<input type="checkbox"/> Restriction	<input type="checkbox"/> to Standard	
<input type="checkbox"/> Performance	<input type="checkbox"/> Increased	
<input type="checkbox"/> Improvement	<input type="checkbox"/> Consistency	
<input type="checkbox"/> Reliability	<input type="checkbox"/> Simplification	
<input type="checkbox"/> Improvement	<input type="checkbox"/> Generalization	
<input type="checkbox"/>	<input checked="" type="checkbox"/> unreported	
<input type="checkbox"/>	<input type="checkbox"/> Bug Fix	
<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, and optionally DETAILED PROPOSAL

REASONS:

The substr active function did not check its arguments for consistency. Thus, garbage results were returned when the substring requested was not entirely within the supplied argument.

PROPOSAL:

Given the usage [substr string first length] (where "first" and "length" are integers), return the null string if first > length (string), and return only length (string) - first + 1 characters if (first + length - 1) > length (string).

In other words, if the specified substring is entirely within the argument, return it. If it is partially within the argument, return that part. Otherwise, return the null string.

IMPLICATIONS:

These extensions will not affect any existing use, since they give a well-defined meaning to constructs which are presently totally undefined (and which, in some cases, cause process termination and random faults!). The fact that the extension gives a well-defined meaning to all substring specifications provides the following useful command-language expression:

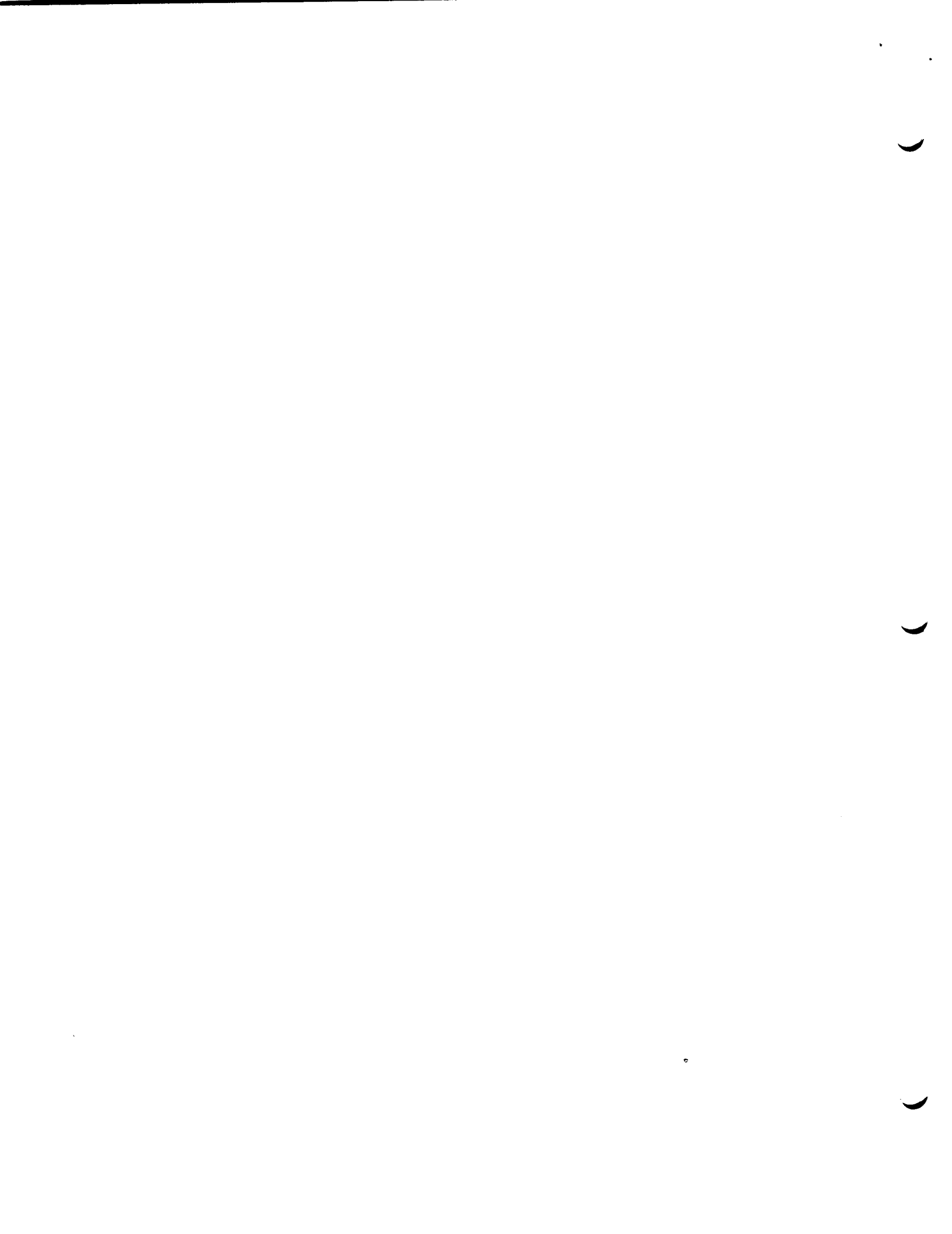
[substr &1 1 27]_list

It returns an entryname which is guaranteed to be less than or equal to 32 characters, ending in "_list".

Do more argument checking in substr active function.

DETAILED PROPOSAL:

Coded, tested, and ready for submission.



MULTICS CHANGE REQUEST		MCR 368 Page 1 of 3 Pages	
TITLE: new Tools command grab_tape_drive		STATUS	DATE
AUTHOR: Susan Barr		Written	2/15/74
		Approved <i>H</i>	2/26/74
		Rejected	
SOURCE: (if external) e.g., "User", "Marketing"		Postponed	
		Withdrawn	
		Expires	8/26/74

CLASSIFICATION	JUSTIFICATION	
<input type="checkbox"/> Incompatible Change	Marketing Requirement	Replaced by proposal MCR _____
<input checked="" type="checkbox"/> Extension	Conformance to Standard	Implemented in System _____
<input type="checkbox"/> Restriction	Increased Consistency	Objections/Comments: This command will never be made available to users; however, its function is required.
<input type="checkbox"/> Performance Improvement	Simplification	
<input type="checkbox"/> Reliability Improvement	Generalization	
<input checked="" type="checkbox"/> new command	Bug Fix	
<input type="checkbox"/>		

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: Extend grab_tape_drive to execute a command line to avoid the problem of grab_tape_drive finding a tape free and then having another process attach the tape before the command is called.

1.

Name grab_tape_drive, gtd

The grab_tape_drive command allows the user to request a number of nine and/or seven track tape drives and enter a command line. It checks the tape drive configuration every 10 seconds and when there are sufficient drives available, the command is executed.

It is possible for a tape drive to be attached by another process in the interval after grab_tape_drive finds the drive free and before the caller's command is executed and attaches the drive. If the command to be executed calls com_err_ with the system code "no device available", grab_tape_drive will continue to check the tape drive configuration and retry the command. The retry will be attempted 10 times.

NOTE

This command requires access to the gate phcs_.

Usage

- `grab_tape_drive` `-control_argument` `command_line`
1. `-control_argument` can be one or more of the following `control_argument` which can appear in any order.
 - `-t9 n` find n free 9 track tape drives before executing the command line. The default if `-t9 n` and `-t7 n` are both omitted is one nine track tape.
 - `-t7 n` find n free 7 track tape drives before executing the command line.
 - `-info` just list the tape drive configuration and return
 - `-in` just list the tape drive configuration and return
 - `-long` list the configuration
 - `-lg` once a minute
 2. `command_line` optional. The command line to be executed when the requested tape drives are free.

MULTICS CHANGE REQUEST		MCR 369 Page 1 of 1 Pages	
TITLE: Improve ioa_		STATUS	DATE
		Written	740219
AUTHOR: Barry L. Wolman		Approved #	2/26/74
		Rejected	
SOURCE: (if external) e.g., "User", "Marketing"		Postponed	
		Withdrawn	
		Expires	8/26/74

CLASSIFICATION	JUSTIFICATION	REPLACED BY PROPOSAL MCR _____
Incompatible Change	Marketing Requirement	Implemented in System _____
* Extension	• Conformance to Standard	Objections/Comments:
Restriction	Increased Consistency	
* Performance Improvement	Simplification	
Reliability Improvement	Generalization	
	(Unreported) Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS:

1. When ioa_ calls formline_ to expand the control string, it requests that the buffer be padded with blanks. This is not necessary since the expanded buffer is passed to iox_. A one character change to the source of ioa_ so that padding is not requested can save as much as 5 milliseconds for each call to ioa_.
2. The ioa_stream entry of ioa_ requires that iox_\$find_iocb be called for each call to ioa_stream.

PROPOSAL:

1. Change ioa_ to eliminate padding of the buffer.
2. Add an entry ioa_switch and an entry ioa_switch_nnl that take pointers to an I/O switch instead of the switch name.

IMPLICATIONS:

These changes are upwards compatible.

MULTICS CHANGE REQUEST		MCR 370 Page 1 of 1 Pages
TITLE: Change quantum time measure from real cpu to virtual cpu.	STATUS	DATE
	Written	2/20 4
AUTHOR: S. Webber	Approved #	2/26/74
	Rejected	
SOURCE: (if external) e.g., "User", "Marketing"	Postponed	
	Withdrawn	
	Expires	8/26/74

CLASSIFICATION	JUSTIFICATION	Replaced by proposal MCR _____
<input type="checkbox"/> Incompatible Change	<input type="checkbox"/> Marketing Requirement	Implemented in System _____
<input type="checkbox"/> Extension	<input type="checkbox"/> Conformance to Standard	Objections/Comments: Installation should require measurement of performance first.
<input type="checkbox"/> Restriction	<input checked="" type="checkbox"/> Increased Consistency	
<input checked="" type="checkbox"/> Performance Improvement	<input type="checkbox"/> Simplification	
<input type="checkbox"/> Reliability Improvement	<input type="checkbox"/> Generalization	
<input type="checkbox"/>	<input type="checkbox"/> unreported	
<input type="checkbox"/>	<input checked="" type="checkbox"/> Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: The eligibility quantum used by the scheduler uses real cpu rather than virtual cpu time. This causes inefficient running of large jobs which spend their entire quantum establishing their working set.

SUMMARY: Change algorithm to use virtual time instead.

MULTICS CHANGE REQUEST

MCR 371
Page 1 of 1 Pages

TITLE: Update metering commands

STATUS	DATE
Written	2/20/74
Approved <i>H</i>	2/26/74
Rejected	
Postponed	
Withdrawn	
Expires	8/26/74

AUTHOR: S. Webber

SOURCE: (if external) e.g., "User", "Marketing"

CLASSIFICATION	JUSTIFICATION	
	Incompatible Change	Marketing Requirement
	Extension	Conformance to Standard
	Restriction	Increased Consistency
<input checked="" type="checkbox"/>	Performance Improvement	Simplification
	Reliability Improvement	Generalization unreported
		<input checked="" type="checkbox"/> Bug Fix

Replaced by proposal MCR _____
Implemented in System _____
Objections/Comments: .

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: The entire set of standard metering commands on Multics have been reprogrammed (in Version II where necessary) to provide greater consistency and to fix all known bugs. The new versions use standard control arguments and the standard utility programs when appropriate.

SUMMARY: The following commands are to be submitted:

tty_lines	meter_signal
traffic_control_queue	meter_gate
traffic_control_meters	link_meters
total_time_meters	file_system_meters
system_performance_graph	disk_queue
system_link_meters	device_meters
set_timax	copy_as_meters
print_tuning_parameters	change_tuning_parameters
print_meters	alarm_clock_meters
print_message_segment_meters	
print_configuration_deck	
page_multilevel_meters	

MULTICS CHANGE REQUEST		MCR 372 Page 1 of 1 Pages	
TITLE: Change BOS not to print on every tape error.		STATUS	DATE
		Written	2/20/74
		Approved <i>H</i>	2/26/74
		Rejected	
AUTHOR: Noel Morris		Postponed	
		Withdrawn	
		Expires	8/26/74
SOURCE: (if external) e.g., "User", "Marketing" M. I. T. Operations			

CLASSIFICATION	JUSTIFICATION	REASON
<input type="checkbox"/> Incompatible Change	<input type="checkbox"/> Marketing Requirement	Replaced by proposal MCR _____
<input type="checkbox"/> Extension	<input type="checkbox"/> Conformance to Standard	Implemented in System _____
<input type="checkbox"/> Restriction	<input type="checkbox"/> Increased Consistency	Objections/Comments:
<input checked="" type="checkbox"/> Performance Improvement	<input checked="" type="checkbox"/> Simplification	
<input type="checkbox"/> Reliability Improvement	<input type="checkbox"/> Generalization	
<input type="checkbox"/>	<input type="checkbox"/> Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, DETAILED PROPOSAL (Optional)

REASONS: The printing of each tape error during a SAVE or RESTOR slows down the system and is unnecessary, especially if the error is recoverable.

SUMMARY: The SAVE and RESTOR commands will print a total count of tape errors for each reel.

IMPLICATIONS: Individual tape errors will no longer be noted. Therefore, bad spots on a tape may go unnoticed. However, the total count should enable an operator to detect a defective handler or tape reel.

MULTICS CHANGE REQUEST		MCR 376
TITLE: Fix send_message to get around compiler bug	STATUS	DATE
AUTHOR: Paul A. Green	Written	02/20/74
SOURCE: (if external; e.g., "User", "Marketing")	Approved	2/26/74
	Rejected	
	Postponed	
	Withdrawn	
	Expires	8/26/74
CLASSIFICATION	JUSTIFICATION	
Incompatible	Marketing	Replaced by proposal MCR
Change	Requirement	Implemented in System
Extension	Conformance	
Restriction	to Standard	Objections/Comments:
Performance	Increased	
Improvement	Consistency	
Reliability	Simplification	
Improvement	Generalization	
	(Bug No. 255)	
	Bug Fix	

Use these headings: REASONS, SUMMARY, IMPLICATIONS, and optionally DETAILED PROPOSAL

REASONS:

The PL/I compiler produces bad code for return statements in begin blocks, which causes a fault if the command "send_message * Project" is given.

SUMMARY:

Insert an end statement to move the return statement out of the begin block.

IMPLICATIONS:

none.

DETAILED PROPOSAL:

Coded, tested, and ready for submission.