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;THIS SUB-PROGRAM ASSEMBLED WITH SYSTEM PARAMETER FILE - S,MAC(V414)
XLIST
LIST
;THIS SUB-PROGRAM ASSEMBLED WITH CONFIGURATION DEPENDENT FEATURE SWITCHES - FT40N,MAC(V
003)
XLIST
LIST
TITLE CLKCSS - SCHEDULING ALGORITHM FOR NON-SWAPPING SYSTEMS
SUBTTL T. HASTINGS/TH TS3.17 6 SEP 67 V001
XP VCLKCS,001*
;PUT VERSION NUMMR IN GLOB LISTING AND LOADER STORAGE MAP

;SCHEDULING ALGORITHM IS:
;CALLED EVERY 60TH OF A SECOND WHEN CURRENT JOB IS USER MODE
;CALLED WHEN CURRENT JOB IS IN EXEC MODE AND:
; 1, JUST STARTED TO WAIT FOR IO
; 2, JUST STARTED TO WAIT FOR A BUSY SHARABLE DEVICE
; 3, RETURNING TO USER MODE AFTER TYPING CONTROL C
; 4, RETURNING TO USER MODE AFTER CLOCK TRIED TO INTERRUPT
; CURRENT JOB WHILE IT WAS IN EXEC MODE
; 5, AN ERROR OCCURRED IN CURRENT JOB

;CALL: SETOM TIMEF ;IF CLOCK HAS GONE OFF SINCE LAST CALL
; PUSHJ POP,NXTJOB
; RETURN WITH NEXT JOB TO RUN IN AC ITEM

;INITIALIZE SCHEDULER(CALLED FROM IOINI1 BEFORE ALL OTHER
; DEVICES ARE INITIALIZED)

INTERNAL NXTINI
NXTINI: MOVSI TAC,-NQUEUE ;NO. OF QUEUES
SETZM AVALTB(TAC) ;CLEAR SHARABLE DEVICE AVAILABLE FLAGS
SETOM REQTAB(TAC) ;SET SHARABLE DEVICE REQUEST COUNT TO -1
AOBJN TAC,-2 ;IE NO JOB WAITING OR USING DEVICE
POPJ POP, ;OTHER DEVICE INITIALIZATION
;MAY CHOOSE TO SET REQUEST TO MORE
;NEG. VALUE IF MORE THAN ON JOB CAN
;USE DEVICE AT ONCE

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43          INTERNAL NXTJOB
44          INTERNAL FTIRPSET,FTDISK
45          EXTERNAL JOB,TIMEF,JRTSTS,JORMAX,JOBN,PJBSTS,CPOPJ,CHKSHF
46          ENTRY XCKCSS
47
48          000001 T=TAC          ;TEMPORARY
49          000002 Q=TAC1        ;QUEUE NO.
50          000006 Q1=DEVDAT     ;QUEUE NO, SHIFTED TO MATCHING POS. OF JRTSTS WORD
51          000005 C=DAT         ;COUNT OF JOB LEFT TO SCAN
52
53          000005          XCKCSS:
54          000005 260140 000000 NXTJOB: PUSHJ PDP,CHKSHF          ;SHUFFLE CORE IF NEEDED
55          000006 402000 000001 SETEM T
56          000007 336200 000000 SKIPN ITEM,JOB          ;CURRENT JOB NO., IS IT NULL JOB?
57          000010 254000 000017' JRST NXT0          ;YES, DO NOT DECREMENT QUANTUM RUN TIME
58          000011 332000 000000 SKIPE TIMEF          ;NO, IS THIS A CLOCK INTERRUPT CALL?
59          000012 374044 000000 SOSA T,JRTSTS(ITEM)          ;YES, DECREMENT QUANTUM RUN TIME
60
61          000013 334044 000012' SKIPA T,JRTSTS(ITEM)          ;NO, JUST PICKUP STATUS WORD
62          000014 602040 777777 TRNE T,-1          ;REDUCED TIME TO ZERO YET?
63          000015 254000 000020' JRST NXT1          ;NO
64          000016 540040 000113' HRR T,RNQUNT          ;YES, RESET FOR RUN QUEUE QUANTUM
65          000017 476000 000066' NXT0: SETOM RNAVAL          ;FLAG TO SCAN RUN QUEUE FOR DIFFERENT JOB
66          000020 542044 000013' NXT1: HRRM T,JRTSTS(ITEM)          ;STORE MODIFIED QUANTUM RUN TIME
67          000021 201100 000026' MOVEI Q,MAXQ          ;HIGHEST PRIORITY QUEUE SCANNED FIRST
68          000022 336002 000066' NXT2: SKIPN AVALTB(Q)          ;SHOULD THIS QUEUE BE SCANNED FOR A RUNABLE JOB?
69          000023 365100 000022' NXT3: SOJGE Q,NXT2          ;NO, LOOK AT NEXT LOWEST PRIORITY QUEUE
70          000024 321120 000042' JUMPL Q,NXT7          ;YES, LOOKED AT QUEUES NQUEUE-1...0?
71          000025 200300 000022' MOVE Q1,Q          ;MOVE QUEUE INDEX TO PROPER POS.
72          000026 241300 000023' ROT Q1,+D17-JWPOS          ;TO MATCH JOB STATUS WORD
73          000027 201240 000000' MOVEI C,JORMAX          ;NO, SCAN ALL JOBS(EXCEPT NULL JOB)
74          000030 354202 000075' AOSA ITEM,JOBP(Q)          ;SCAN ALL OTHER JOBS IN THIS QUEUE FIRST
75
76          000031 476000 000066' NXT4: SETOM RNAVAL          ;FLAG RUN QUEUE BEING SCANNED
77
78          000032 301200 000020' NXT5: CAIL ITEM,JOBN          ;GREATER THAN HIGHEST JOB NO.?
79          000033 201200 000001' MOVEI ITEM,1          ;YES, RESET TO 1(SKIP NULL JOB)
80          000034 554044 000020' HLRE T,JRTSTS(ITEM)          ;IS JOB RUNABLE?
81          000035 620040 311424' TRZ T,RUNMSK+C*WBR          ;MASK OUT JOB STATUS BITS WHICH DO NOT MATTER
82          000036 306046 440000' CAIN T,RUNABLE(Q1)          ;ADD IN QUEUE NO. IN PROPER POSITION
83          000037 254000 000050' JRST NXT8          ;YES, IT IS RUNABLE AND IS IN THIS QUEUE
84          000040 363240 000023' NXT6: SOJLE C,NXT3          ;NO IT IS NOT, SCANNED ALL JOBS YET?
85          000041 344200 000032' AOJA ITEM,NXT5          ;NO, LOOK AT NEXT JOB
    
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106                                     ;HERE IF NO JOBS FOUND TO RUN(Q=-1)
107
108 000042 201240 000032' NXT7:  MOVEI C,JORN          ;SCAN ALL JOBS INCLUDING POSSIBLY NULL JOB
109 000043 200200 000077'        MOVE ITEM,JOB      ;STARTING WITH LAST JOB TO RUN
110 000044 336300 000066'        SKIPN Q1,RNAVAL     ;HAS RUN QUEUE(Q,Q1=?) BEEN SCANNED?
111 000045 344100 000031'        AOJA Q,NXT4         ;NO, FLAG THAT IS HAS AND SCAN RUN QUEUE(Q,Q1=2)
112 000046 403200 000066'        SETZR ITEM,RNAVAL    ;YES, CLEAR FLAG, SET NULL JOB TO RUN
113 000047 263140 000000'        POPJ PDP,          ;RETURN
114
115 000050                                     NXT8:
116                                     IFN FITRPSET,<
117                                     EXTERNAL STOPTS
118 000050 200040 000000'        MOVE T,STOPTS        ;HAS A TRPSET UO0 BEEN DONE FOR JOB1
119                                     ;WITH NON ZERO AC?
120 000051 302200 000021'        CAIE ITEM,1          ;IS THIS JOB 1?
121 000052 326040 000040'        JUMPN T,NXT6         ;KEEP LOOKING IF NOT JOB1 AND
122                                     ;STOPTS FLAG SET
123
124
125 000053 302100 000022'        CAIE Q,TSQ          ;IS THIS TTY WAIT SATISFIED Q?
126 000054 306100 000001'        MAIN Q,WSQ          ;IS THIS IO WAIT SATISFIED QUEUE?
127 000055 375022 000066'        SOSGE AVALTB(Q)      ;YES, DECREMENT COUNT OF JOBS WITH SATISFIED IO
128 000056 402002 000066'        SETZM AVALTB(Q)     ;NO, CLEAR AVAILABLE FLAG FOR THIS QUEUE
129 000057 202202 000075'        MOVEM ITEM,JOBP(Q)   ;SAVE JOB NUMBER FOR THIS QUEUE FOR NEXT TIME
130 000060 322100 000020'        JUMPE Q,CPOPJ        ;IS THIS RUN QUEUE?
131 000061 201040 000020'        MOVEI T,RNO         ;NO, SET STATE CODE TO RUN
132 000062 137040 000020'        JPR T,PJRSTS        ;CLEAR WAIT CODE(SO HE WILL BE IN RUN QUEUE)
133 000063 200042 000113'        MOVE T,QUANTS(Q)    ;SET QUANTUM RUNNING TIME FOR QUEUE
134 000064 542244 000234'        WRRM T,JRTSTS(ITEM)  ;WHICH JOB HAS JUST LEFT
135 000065 263140 000000'        POPJ PDP,          ;RETURN
136

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117 INTERNAL FTCHECK,FTMONP
118
119 IFN FTCHECK+FTMONP,<
120 EXTERNAL JOBP,AVALTB,REQTAR,QUANTS
121
122 DEFINE X(A,B)
123 < EXTERNAL A'AVAIL,A'REQ,A'QUNT
124 INTERNAL A'Q
125 A'Q=ZZ
126 ZZ=ZZ+1
127 >
128 ZZ=0
129 QUEUES
130 LOC=ZZ
131
132 >
133 IFE FTCHECK+FTMONP,<
134 ;APPROPRIATE ENTRY IS NON-ZERO WHEN SCHEDULER SHOULD LOOK
135 ;AT THAT QUEUE TO FIND A JOB TO RUN
136 ;HSAVAL CONTAINS THE NO. OF JOBS WITH IO WAIT SATISFIED(0=NONE)
137 ;SIMILARLY FOR TSAVAL
138
139
140 DEFINE X(A,B)
141 < INTERNAL A'AVAIL,A'Q
142 A'Q=-AVALTB
143 A'AVAIL: 0
144 >
145
146 INTERNAL AVALTB
147
148 000066 000000 000000 AVALTB: QUEUES * X RN,7 * INTERNAL RNAVAL,RNQ
149 000066 000000 000000 RNAVAL: 0
150 000067 000000 000000 WSAVAL: 0
151 000070 000000 000000 TSAVAL: 0
152 000071 000000 000000 STAVAL: 0
153 000072 000000 000000 DTAVAL: 0
154 000073 000000 000000 DCAVAL: 0
155 000074 000000 000000 MTAVAL: 0
156 000007 LOC=-AVALTB
157 >
158
159 000007 NQUEUE=LOC ;NO. OF QUEUES COUNTING RUN QUEUE
160 XP MAXQ,NQUEUE-1 ;MAX STATE CODE WHICH HAS A QUEUE
161
162 ;DEFINE STATE CODES WHICH DO NOT HAVE QUEUES ASSOCIATED WITH THEM
163
164
165 DEFINE X(A)
166 < INTERNAL A'Q
167 A'Q=LOC
168 LOC=LOC+1
169 >

```

CLKCSS - SCHEDULING ALGORITHM FOR NON-SWAPPING SYSTEMS MACRO, V36 19:01 4-JUN-69 PAGE 16-1
T. HASTINGS/TH TS3.17 6 SEP 67 V201

170
171
172

CODES* .X IOW,* INTERNAL IOWO

```
173             IFE FTCHECK+FTMONP,<  
174             ;LAST JOB SCHEDULED FOR EACH QUEUE  
175 000075      JORP: REPEAT NQUEUE,< EXP 1>  
176 000075 000000 000001      EXP 1  
177 000076 000000 000001      EXP 1  
178 000077 000000 000001      EXP 1  
179 000100 000000 000001      EXP 1  
180 000101 000000 000001      EXP 1  
181 000102 000000 000001      EXP 1  
182 000103 000000 000001      EXP 1
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!SHARABLE DEVICE REQUEST TABLE (GENERALIZED FOR OTHER QUEUES TOO)
 !CONTAINS THE NUMBER OF JOBS WAITING TO USE SHARABLE DEVICE
 !WSREQ AND RNREQ ARE UNUSED

```
DEFINE X(A,B)
<   A'REQ: ?
INTERNAL A'REQ
>
```

INTERNAL RECTAB

```
195 000104 000000 000000 RECTAB: QUEUES + Y RN,7 + RNREQ: ?
196 000105 000000 000000 X WS,6 + WSREQ: ?
197 000106 000000 000000 X TS,6 + TSREQ: ?
198 000107 000000 000000 X ST,6 + STREQ: ?
199 000110 000000 000000 X DT,4 + DTREQ: ?
200 000111 000000 000000 X DC,4 + DCREQ: ?
201 000112 000000 000000 X MT,4 + MTREQ: ?
```

272

```
                ;QUANTUM RUNNING TIME FOR EACH QUEUE IN JIFFIES(CLOCK TICKS)
273
274             DEFINE X(A,B)
275             <           A'QUNT: EXP B
276                   INTERNAL A'QUNT
277             >
278
279 000113 000000 000007 QUANTS: QUEUES +           X RN,7 +           RNQUNT: EXP 7
280 000114 000000 000006           X WS,6 +           WSQUNT: EXP 6
281 000115 000000 000006           X TS,6 +           TSQUNT: EXP 6
282 000116 000000 000006           X ST,6 +           STQUNT: EXP 6
283 000117 000000 000004           X DT,4 +           DTQUNT: EXP 4
284 000120 000000 000004           X DC,4 +           DCQUNT: EXP 4
285 000121 000000 000004           X MT,4 +           MTQUNT: EXP 4
286
287             >
288             END,
```

NO ERRORS DETECTED

PROGRAM BREAK IS 000122

CLKCSS - SCHEDULING ALGORITHM FOR NON-SWAPPING SYSTEMS MACRO,V36 19:01 4-JUN-69 PAGE 20
 SYMBOL TABLE

AVALTB	000066'	INT	C	000005		CHKSHF	000005'	FXT
CMWB	200000	INT	CPOPJ	000060'	EXT	DAT	000005	INT
DCAVAL	000073'	INT	DCQ	000005	INT	DCOUNT	000120'	INT
DCREQ	000111'	INT	DEVDAT	000006	INT	DTAVAL	000072'	INT
DTQ	000004	INT	DTQUNT	000117'	INT	DTREQ	000110'	INT
FTCCL	000000		FTCHEC	000000	INT	FTDISK	000000	INT
FTLOGI	000000		FTMONP	000000	INT	FTRC10	000000	
FTSWAP	000000		FTRPS	777777	INT	IOWQ	000007	INT
ITEM	000004	INT	JBTSTS	000064'	EXT	JOB	000043'	EXT
JOBMAX	000027'	EXT	JORN	000042'	EXT	JOBP	000075'	
JWPOS	000016	INT	LOC	000014		MAXQ	000006	INT
MTAVAL	000074'	INT	MTQ	000006	INT	MTQUNT	000121'	INT
MTREQ	000112'	INT	NQUEUE	000007		NULQ	000012	INT
NXT0	000017'		NXT1	000020'		NXT2	000022'	
NXT3	000023'		NXT4	000031'		NXT5	000032'	
NXT6	000040'		NXT7	000042'		NXT8	000050'	
NXTINI	000000'	INT	NXTJOB	000005'	INT	PDP	000003	INT
PJBSTS	000062'	EXT	Q	000002		Q1	000006	
QUANTS	000113'		REQTAB	000104'	INT	RNAVAL	000066'	INT
RNQ	000000	INT	RNQUNT	000113'	INT	RNREQ	000104'	INT
RUNABL	440000	INT	RUNMSK	111404	INT	SLPQ	000011	INT
STAVAL	000071'	INT	STOPO	000013	INT	STOPTS	000050'	FXT
STQ	000003	INT	STQUNT	000116'	INT	STREQ	000107'	INT
T	000001		TAC	000001	INT	TAC1	000002	INT
TIMEF	000011'	EXT	TIOWQ	000010	INT	TAVAL	000070'	INT
TSQ	000002	INT	TSQUNT	000115'	INT	TSREQ	000106'	INT
VCLKCS	000001	INT	WSAVAL	000067'	INT	WSQ	000001	INT
WSQUNT	000114'	INT	WSREQ	000105'	INT	XCKCSS	000005'	INT

DLK	6#	6			
DMT	6#	6			
DNAERR	6#	6			
DOU	6#	6			
DR	6#	6			
DRL	6#	6			
DRN	6#	6			
DSEB	6#	6			
DSI	6#	6			
DSKRLB	6#	6			
DSD	6#	6			
DTAVAL	153	153#			
DTG	153	153#			
DTQUNT	213#	214			
DTREQ	199#	200			
DVAVAL	6#	6			
DVCDR	6#	6			
DVDIR	6#	6			
DVDIRI	6#	6			
DVDIS	6#	6			
DVDSK	6#	6			
DVDTA	6#	6			
DVIN	6#	6			
DVLNG	6#	6			
DVLPT	6#	6			
DVMTA	6#	6			
DVOUT	6#	6			
DVPTP	6#	6			
DVPTR	6#	6			
DVTTY	6#	6			
ENTRR	6#	6			
FBMERR	6#	6			
FNFERR	6#	6			
FRGSEG	6#	6			
FT3REL	6#	6			
FTATTA	6#				
FTCCL	10#				
FTCHEC	6#	117	119	133	172#
FTDISK	10#	44	153	199	213
FTEXAM	6#				
FTFINI	6#				
FTGETT	6#				
FTHALT	6#				
FTKCT	6#				
FTLOGI	10#				
FTMONP	6#	117	119	133	172
FTPRV	6#				
FTRA10	6#				
FTRC10	10#				
FTRCHK	6#				
FTREAS	6#				
FTSLEE	6#				
FTSWAP	10#				

WSQNT	210#	211
WSREQ	196#	197
WTMASK	6#	6
XCKCSS	46	53#

