CICS Performance Basics

Dan Zachary

CICS Level 2 Support

WebSphere® Support Technical Exchange

ON DEMAND BUSINESS™

Agenda

- The meanings of the key Performance Class Monitoring fields
- How to get these fields out of a dump

What is Performance Class Monitoring data?

- Information about what a task did.
- Collected by CICS if activated by MN=YES and MNPER=YES SIT parameters or corresponding SPI command.
- Written out by CICS in SMF110 record.

What information is collected?

- Lots and lots of information organized in groups.
- Go to CICS Performance Guide section 3.8 'Performance Class Data: listing of data fields' or search in Information Center on 'listing of data fields'
- The DFHTASK and DFHCICS groups contain some basic and essential fields.

USRDISPT – DFHTASK 007

- Dispatch Time
- The total elapsed time a task was in control of, or "running on" , a CICS Dispatcher-managed TCB.
- Includes everything, for example:

  ▸ Application code

  ▸ CICS code servicing EXEC CICS calls

  ▸ Time in DB2 setting up a thread and servicing SQL calls

USRDISPT – DFHTASK 007

- During dispatch time, the TCB the task is in control of could be waiting on something.

  ▸ On I/O during program load. Happens on RO.

  ▸ On an IRLM lock while DB2 is servicing an SQL call. Happens on an L8.

  ▸ On I/O to a VSAM file if request is from a threadsafe program running on an open TCB at CICS/TS 3.2.

USRDISPT – DFHTASK 007

- QRDISPT is a key subset. It is that part of USRDISPT that happens on the QR TCB. Typically, a task's QRDISPT time is time spent executing instructions.
- KY8DISPT is that part of USRDISPT that occurs on one of the open TCBs (L8, S8, J8, X8)

SUSPTIME – DFHTASK 014

- Suspend Time
- All of the time during the task life when the task is not dispatched.
- A task is always either suspended (accruing SUSPTIME) or dispatched (accruing USRDISPT time.)

DISPWTT – DFHTASK 102

- Wait For Re-dispatch
- An important subset of SUSPTIME
- A part of each suspend is the part where the reason for the suspend is over, but the task has not yet been chosen for re-dispatch by the CICS dispatcher.
- On single-TCB modes (like QR and RO and CO) other tasks might be dispatched (running) on the TCB.   Only one task runs at a time.
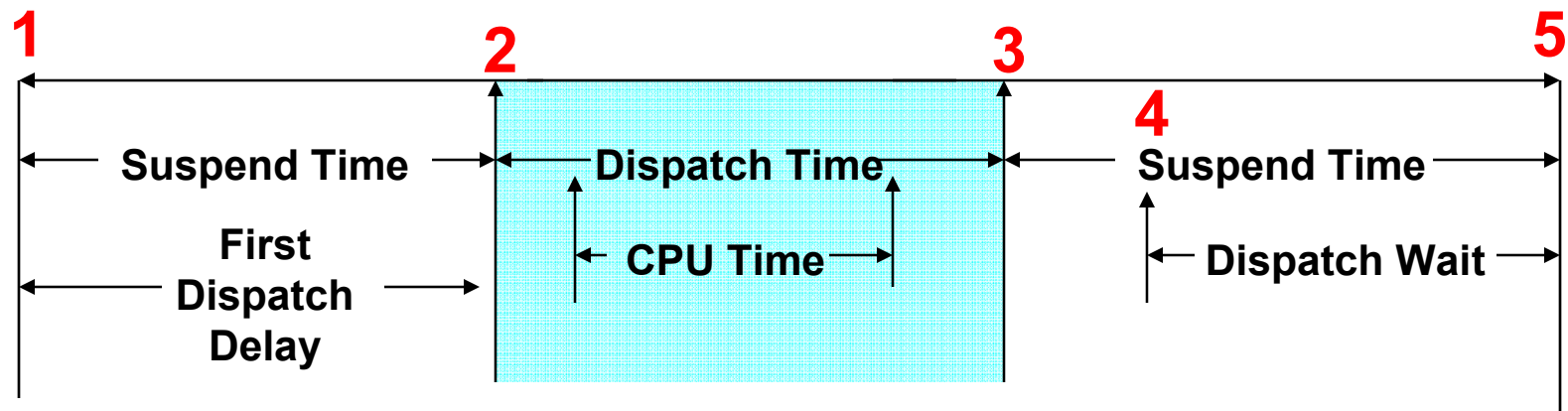
DISPWTT – DFHTASK 102

- QRMODDLY is a key subset.
  - ▶ Time spent waiting for re-dispatch on the QR.
- DSCHMDLY is a subset.
 - ▶ Time spent waiting for re-dispatch following a TCB switch.
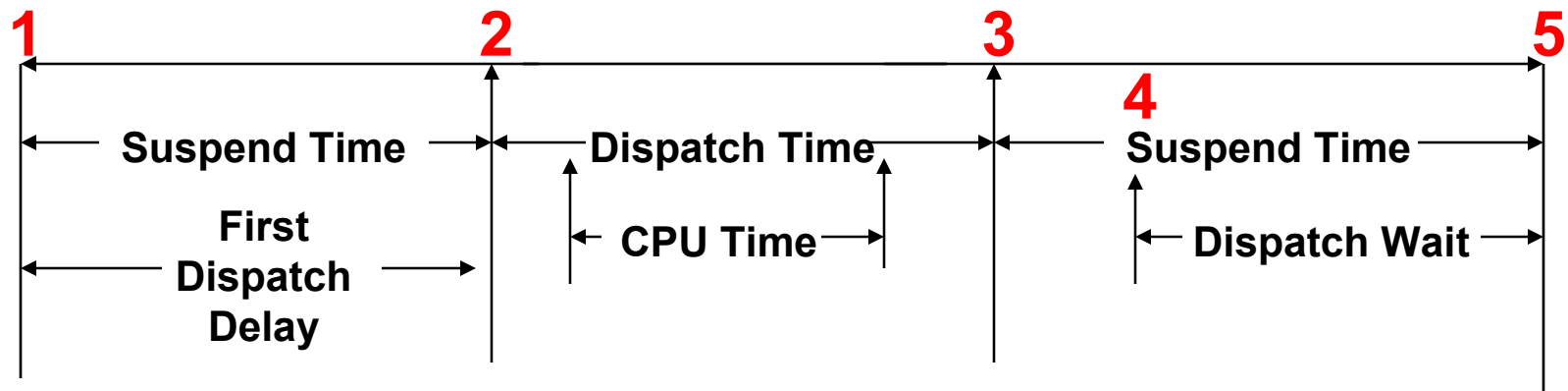
1. Attach of task

2. Task starts running. It is dispatched.

3. Task suspends

4. Task is made dispatchable

5. Go back to 2. Task starts running again. It is re-dispatched.

1 2 3 5 4

Suspend Time

First Dispatch Delay

Dispatch Time

CPU Time

Suspend Time
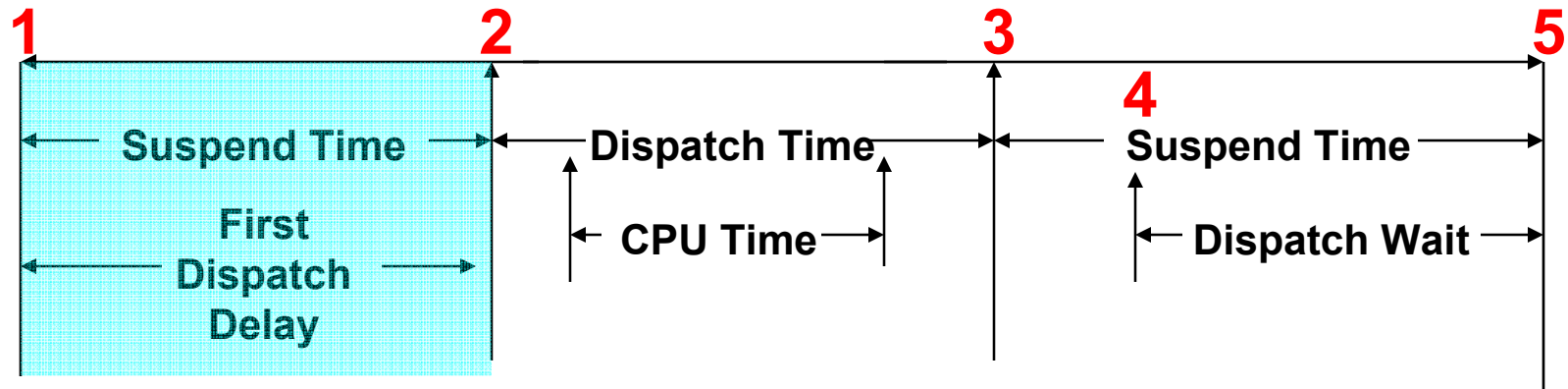
Dispatch Wait

1. **DSPDELAY - Wait for 1st Dispatch**

2. **Included in SUSPTIME**

3. **TCLDELAY and MXTDELAY are subsets**

1   **2**   **3**   **5**

4

Suspend Time   Dispatch Time   Suspend Time

First Dispatch Delay   CPU Time   Dispatch Wait

- **At point 2, the CICS dispatcher notes what time it is and notes how much CPU the TCB has used up to this point, and gives control to the task.**

- **At point 3, when the task suspends giving control back to the CICS dispatcher, those same times are noted so the delta can be calculated.**
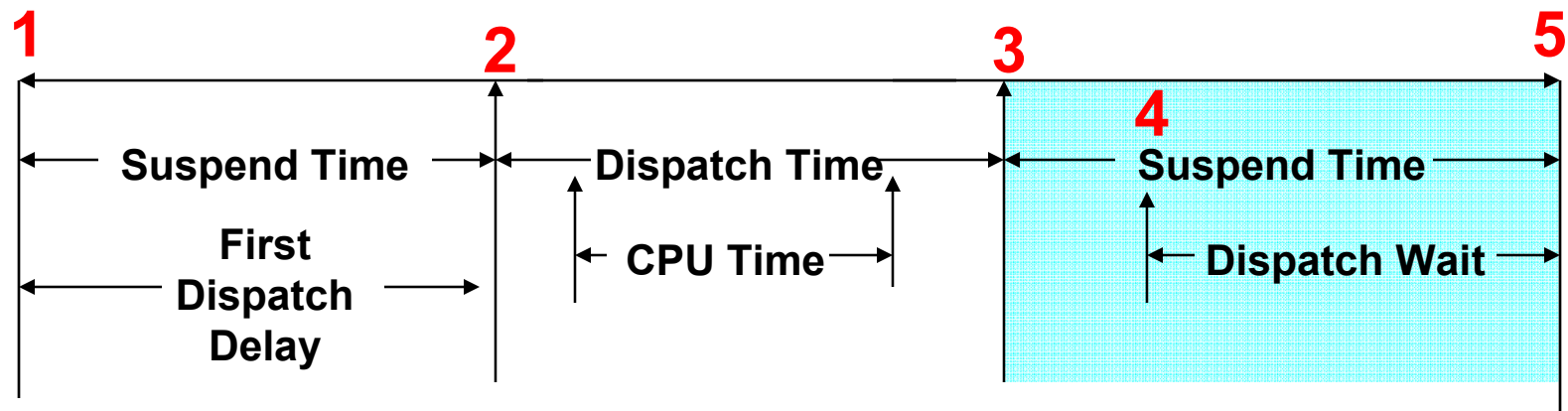
- **At point 3, the task begins waiting.**

- **At point 4, the wait is satisfied and the task becomes dispatchable.**

- **At point 5, the CICS dispatcher re-dispatches the task and control goes back to point 2.**
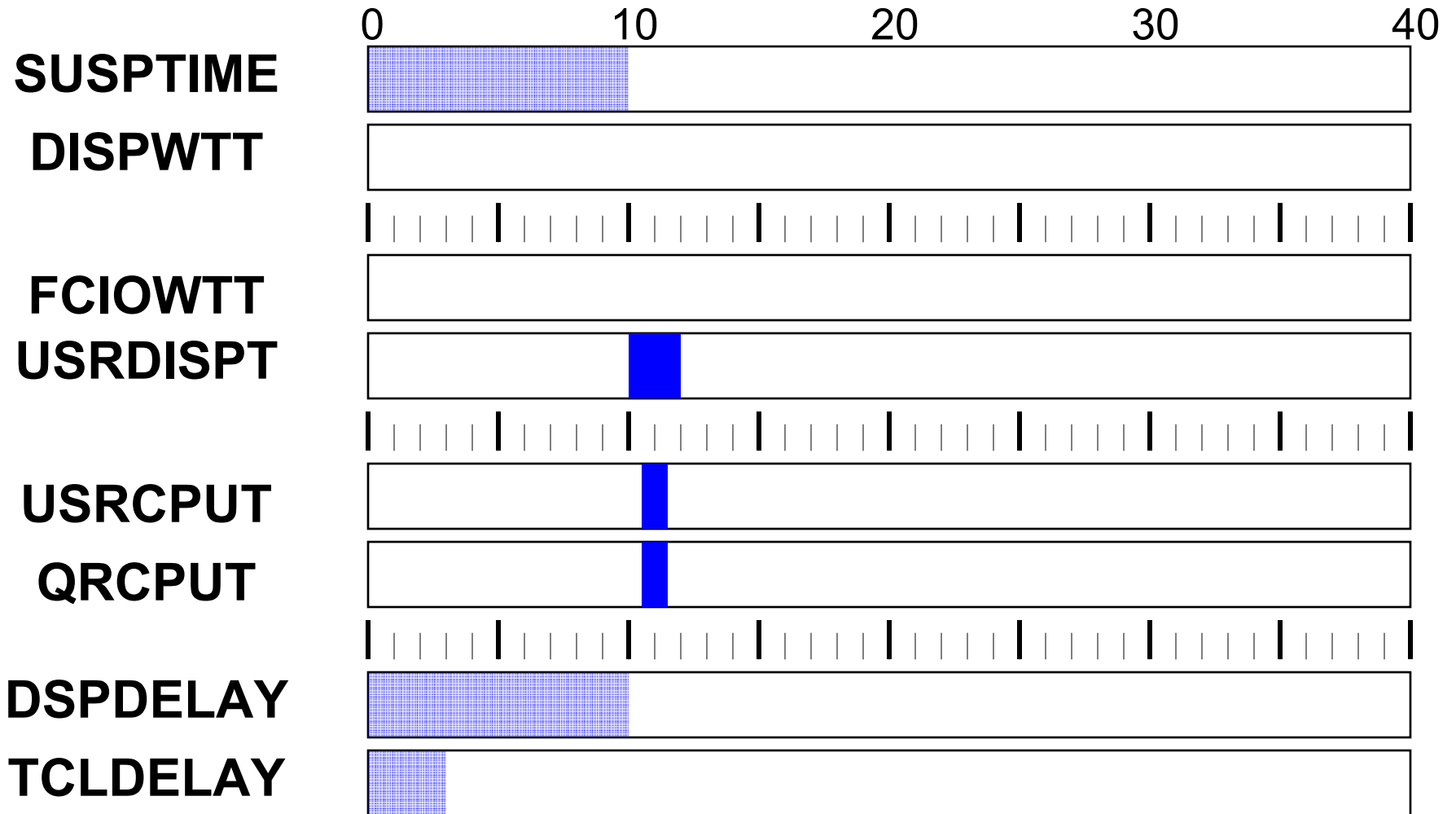
Example 1 – CICSAPI program suspending for File I/O

- Notice most of FCIOWTT is DISPWTT.

Task waits for 1ˢᵗ dispatch.

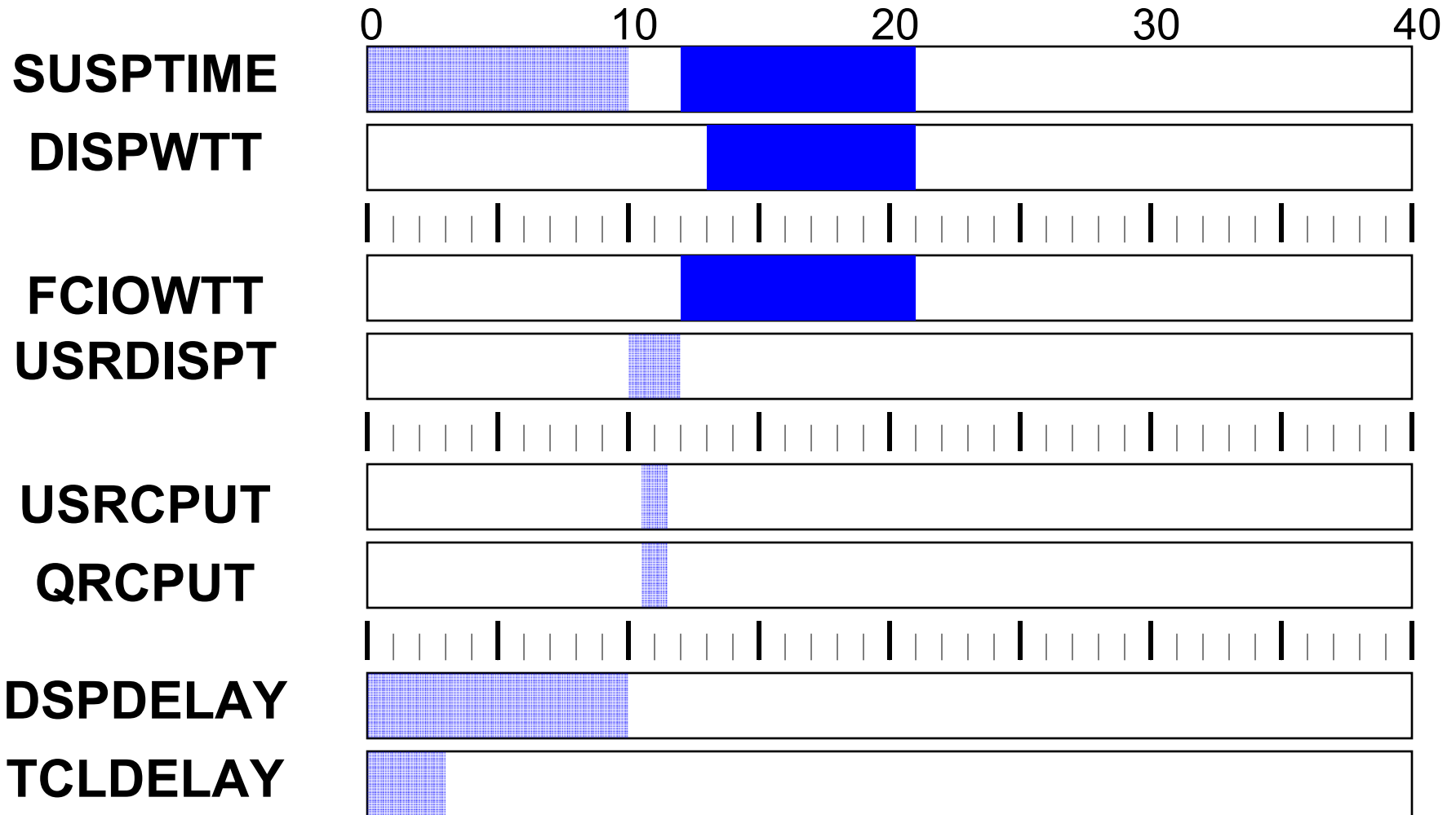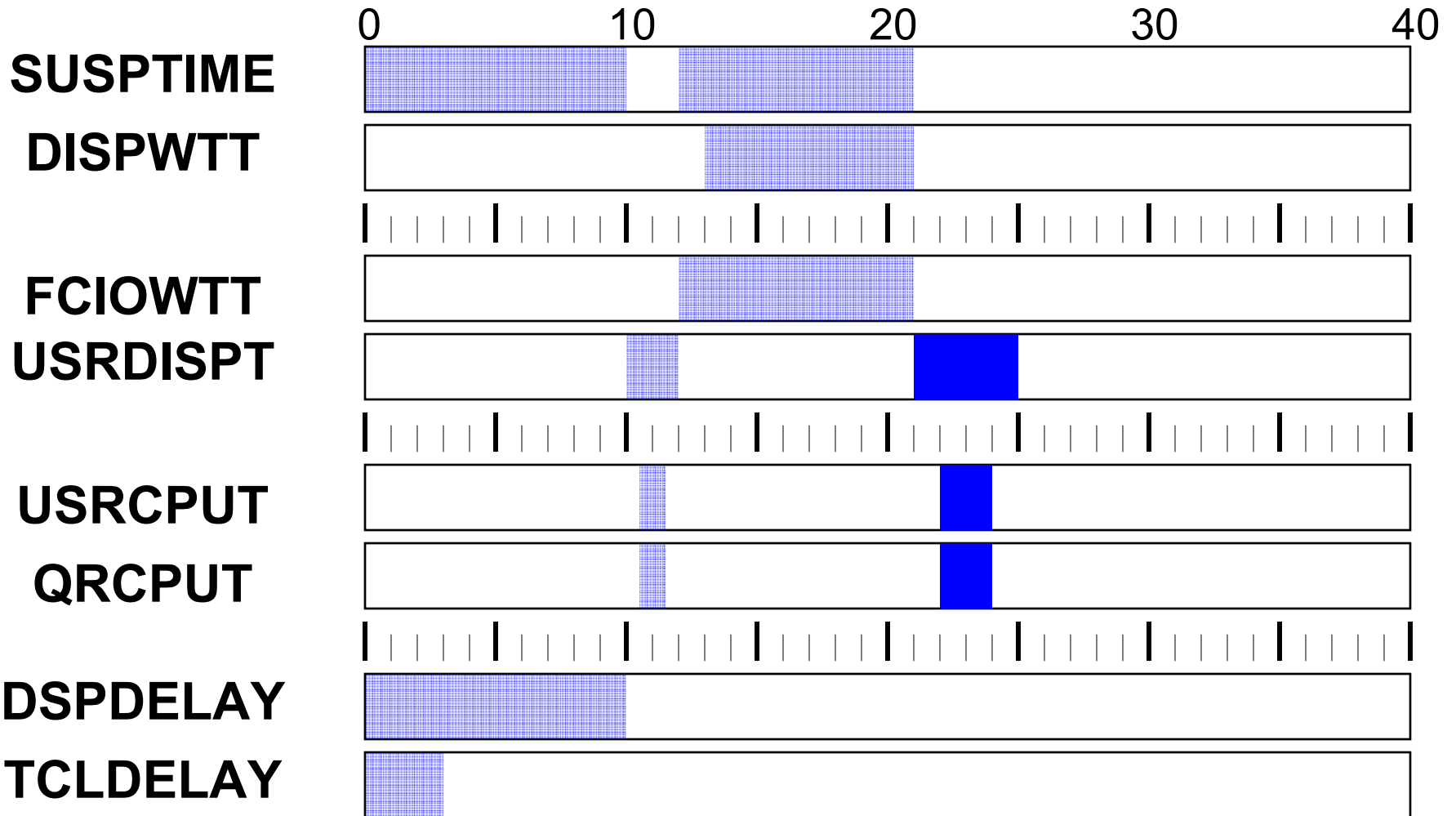SUSPTIME
DISPWTT
FCIOWTT
USRDISPT
USRCPUT
QRCPUT
DSPDELAY
TCLDELAY

0   10   20   30   40
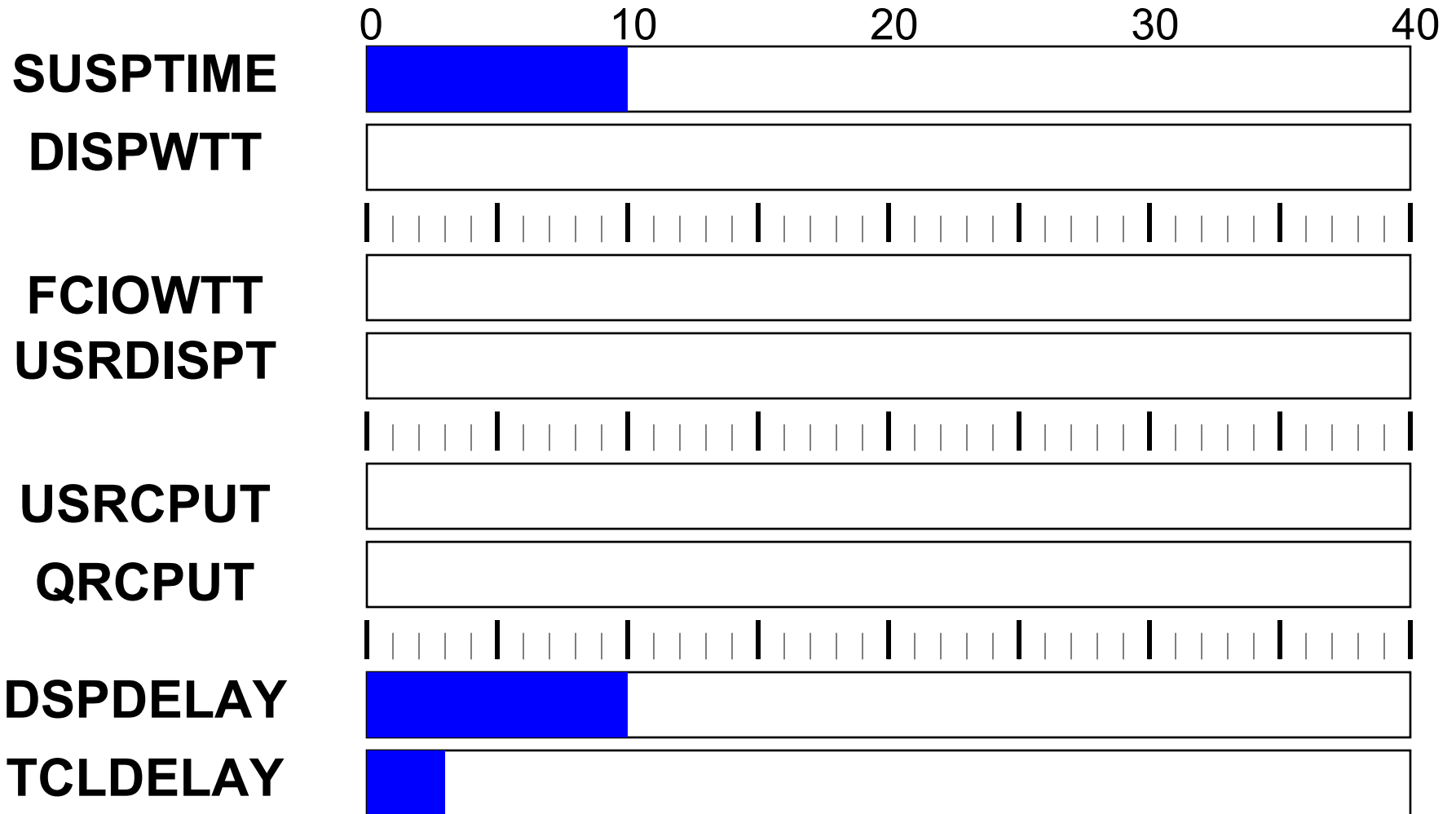
Task runs for 1st time. Always on the QR.

SUSPTIME

DISPWTT

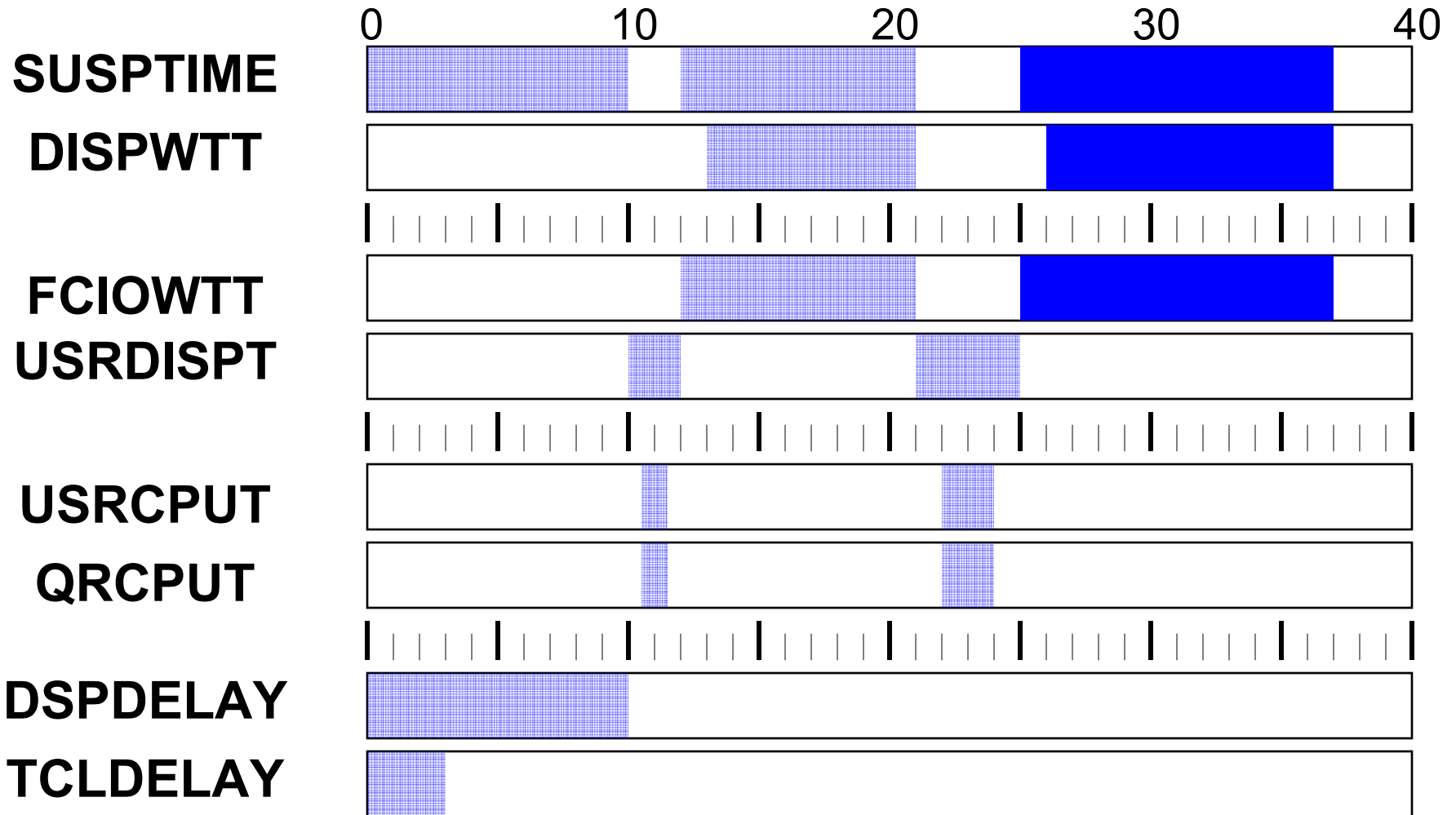**FCIOWTT**

USRDISPT

USRCPUT

QRCPUT

DSPDELAY

TCLDELAY

Task suspends for file I/O. The amount of time waiting for VSAM to finish is short.

SUSPTIME

DISPWTT
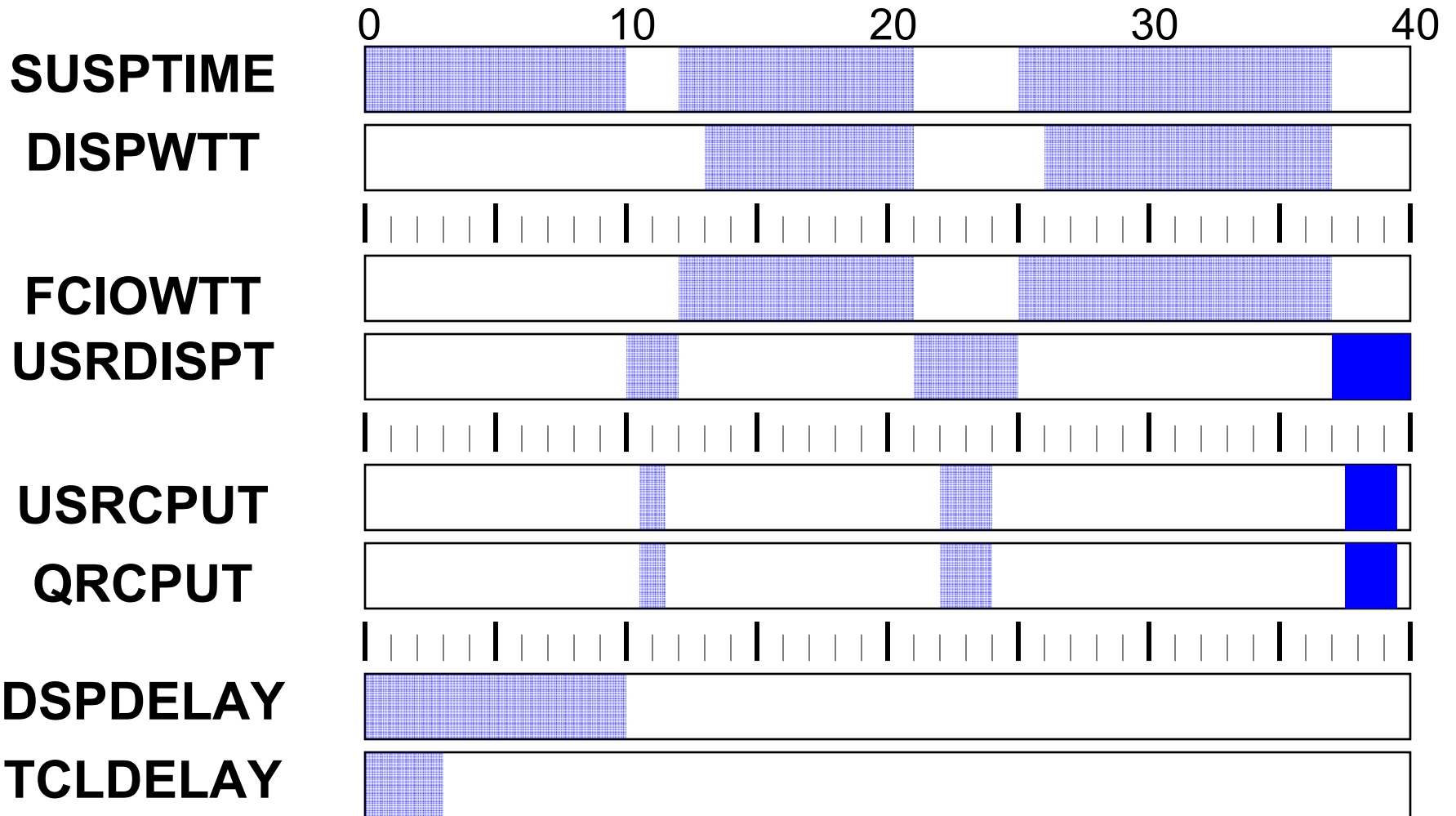
FCIOWTT

USRDISPT

USRCPUT

QRCPUT

DSPDELAY

TCLDELAY

Task runs some more on QR.

Task suspends for file I/O. Most of that time is DISPWTT.

Task finishes up on QR.

	0	10	20	30	40

SUSPTIME — Time: 31 mils   Count: 3

DISPWTT — Time: 19 mils   Count: 2

FCIOWTT — Time: 21 mils   Count: 2

USRDISPT — Time: 9 mils   Count: 3

USRCPUT — Time: 5 mils   Count: 3

QRCPUT — Time: 5 mils   Count: 3

DSPDELAY — Time: 10 mils   Count: 1

TCLDELAY — Time: 3 mils   Count: 1
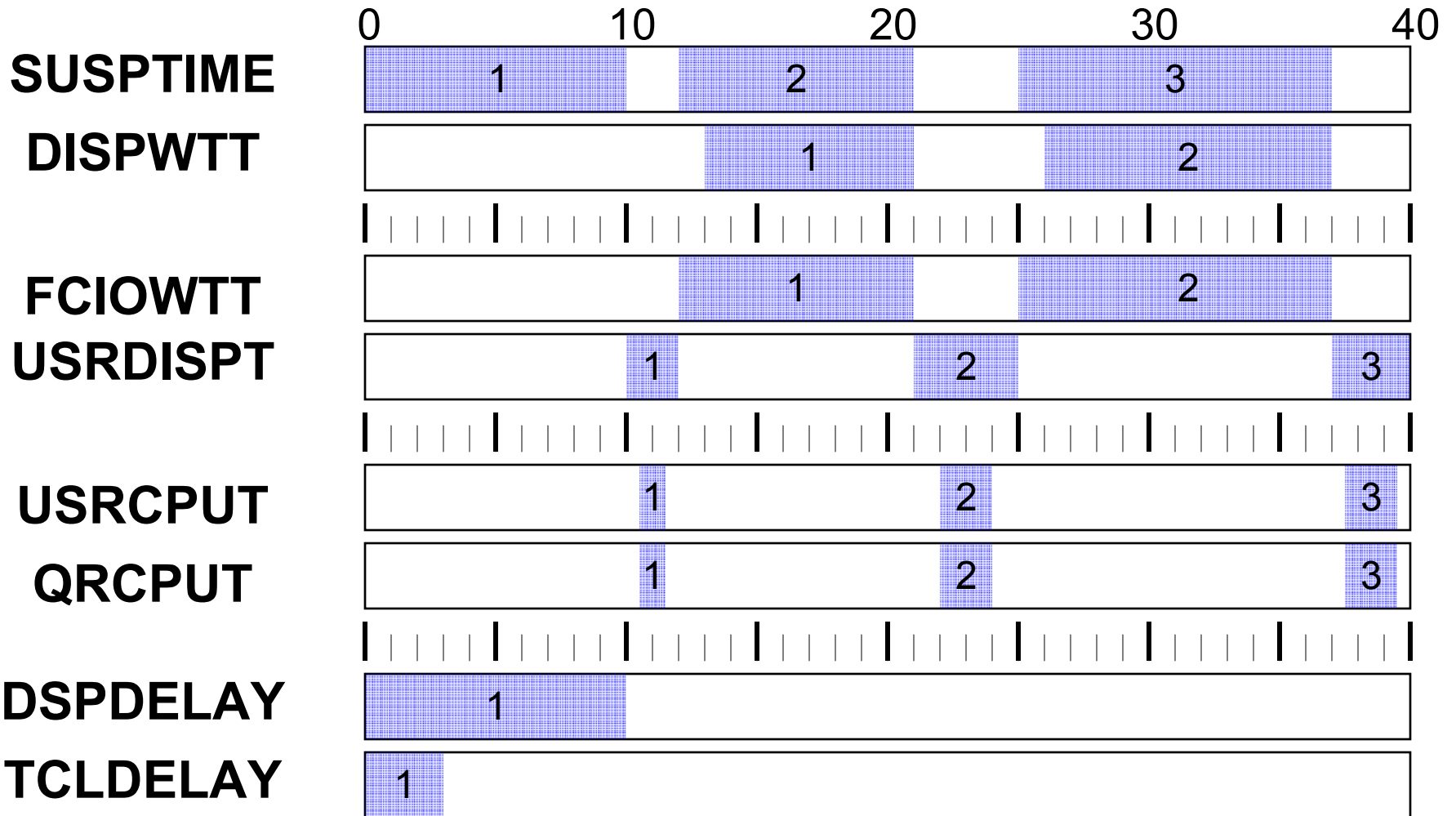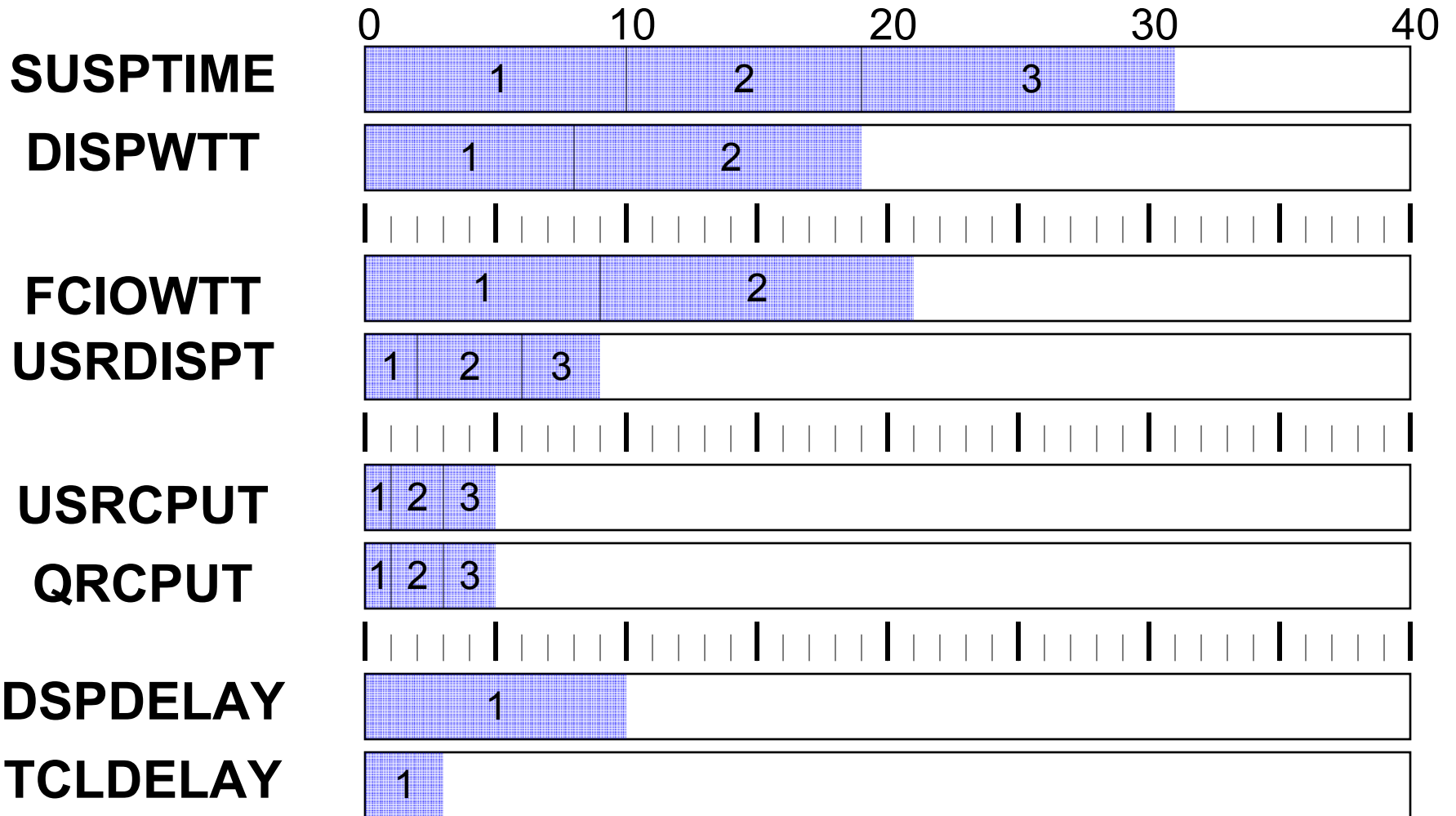
Example 2 – Threadsafe CICSAPI program doing SQL calls.

- Notice that when a task does a TCB switch, it gives up control to the CICS dispatcher and has to wait for re-dispatch on the new TCB.
- QRMODDLY is the time waiting for re-dispatch on the QR TCB.

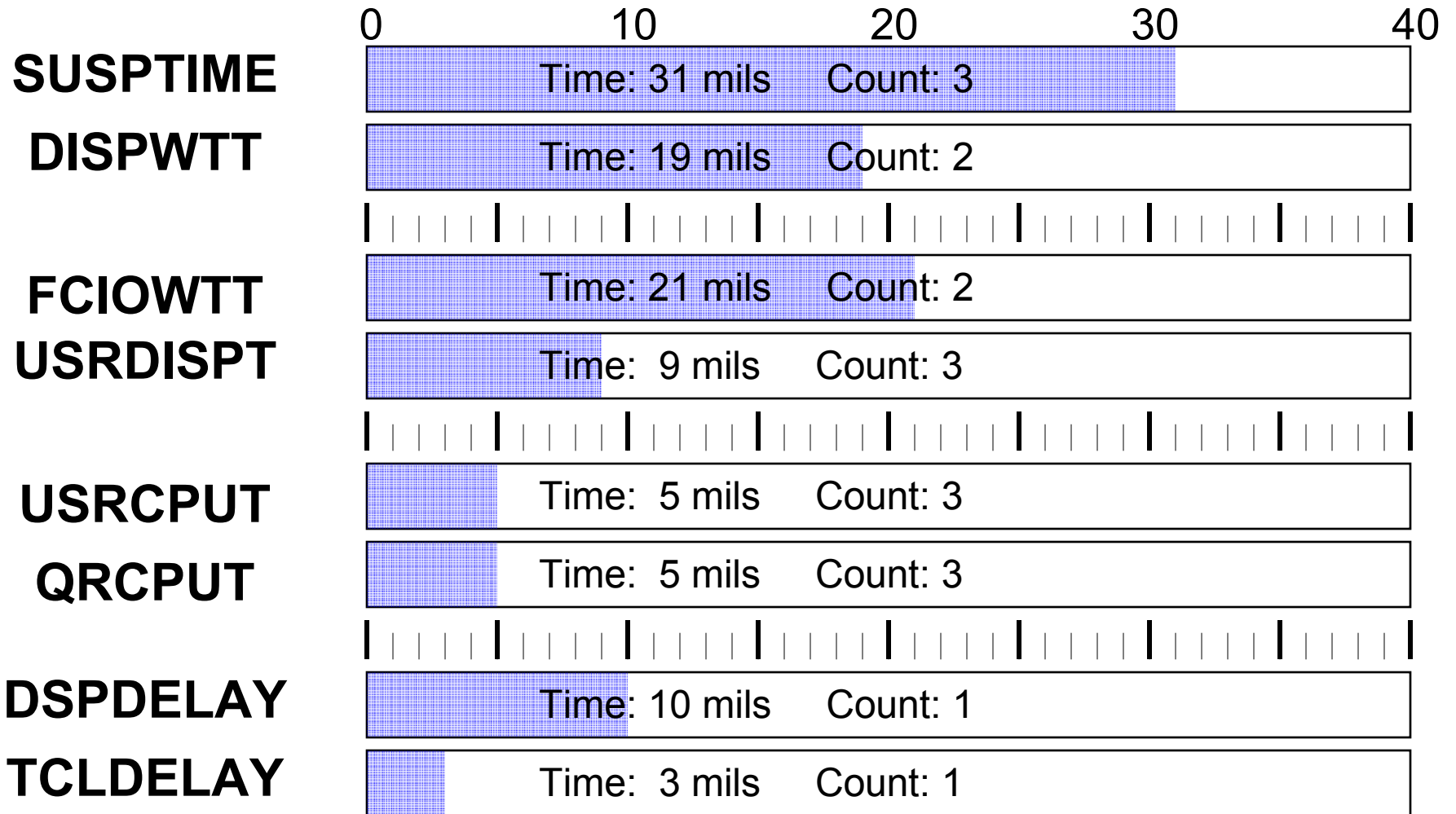# Task waits for 1st dispatch.

SUSPTIME

USRDISPT

DISPWTT

QRMODDLY

KY8DISPT

KY8CPUT

QRDISPT

DSCHMDLY
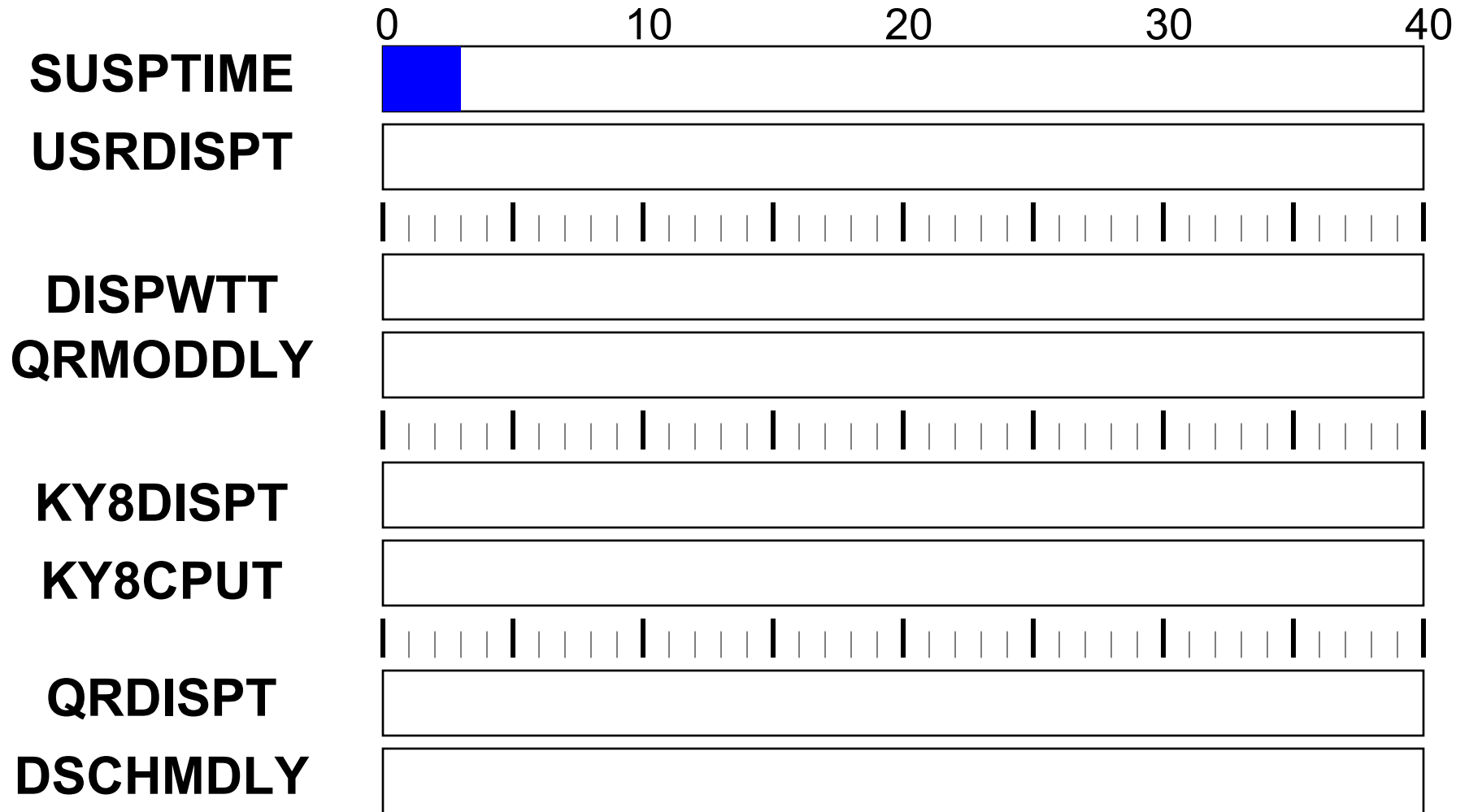
Task gets started. Always on QR.
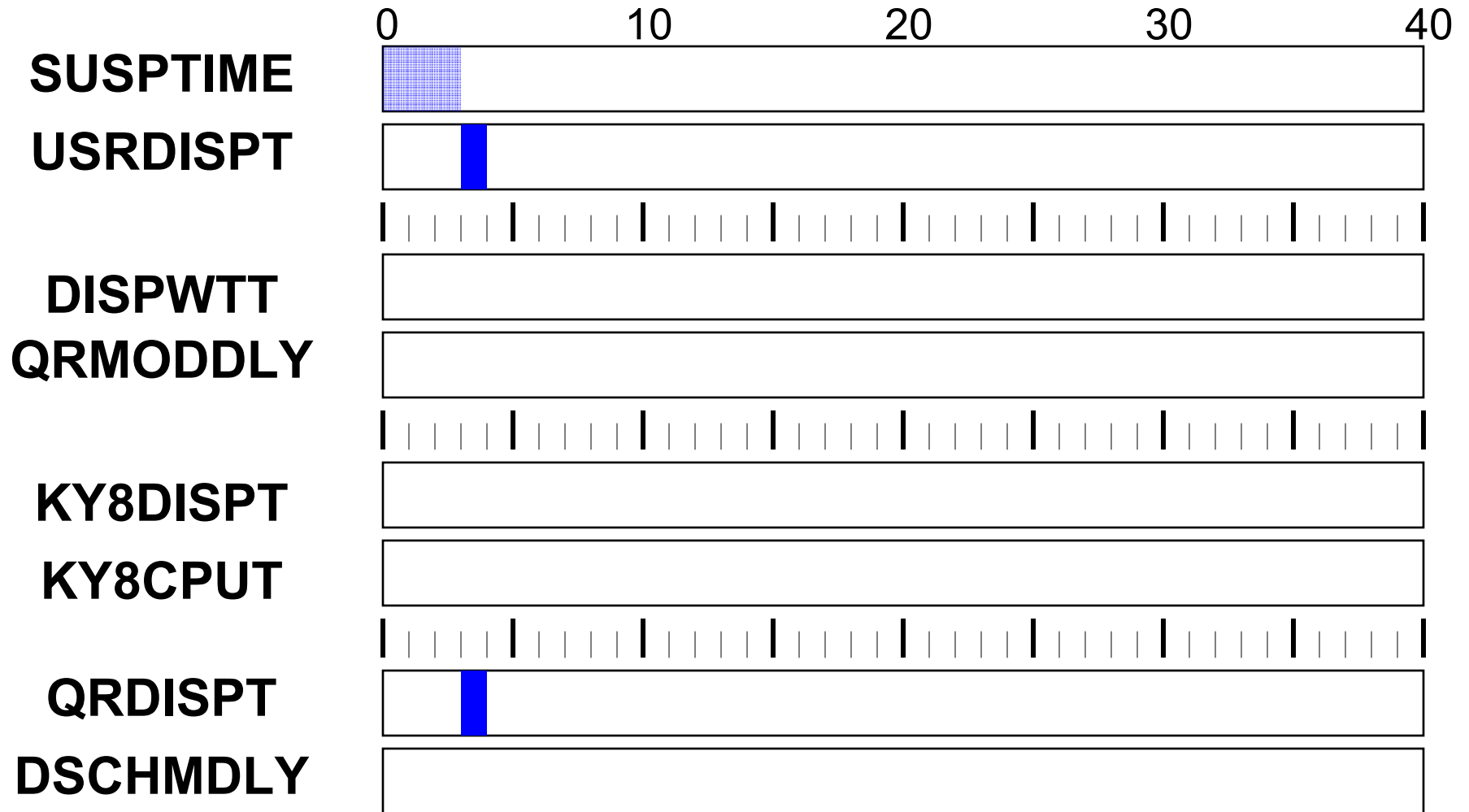
Task does a SQL call. Must switch to L8.

SUSPTIME

USRDISPT

DISPWTT

QRMODDLY

KY8DISPT

KY8CPUT

QRDISPT

DSCHMDLY

0 10 20 30 40
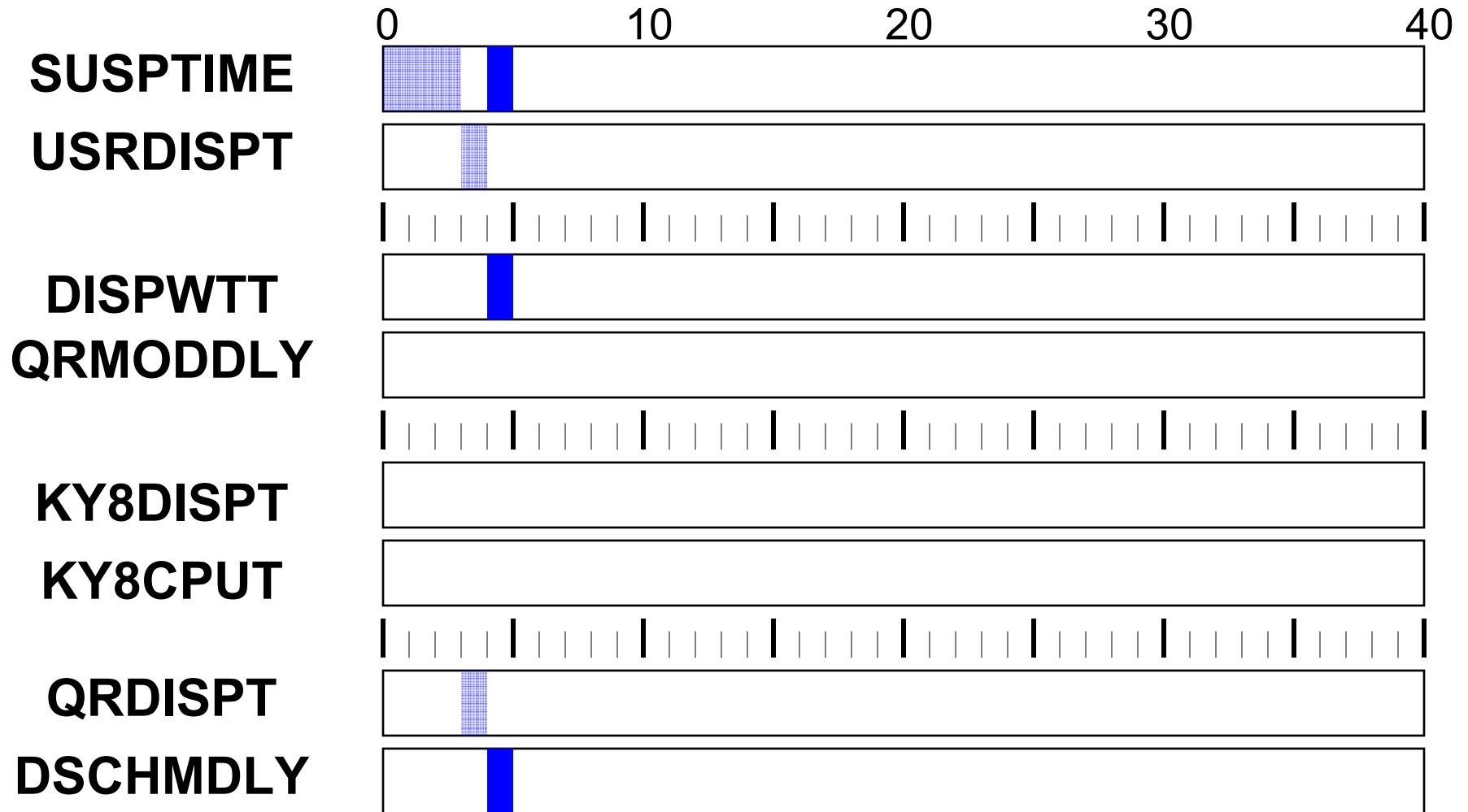
Task does SQL calls, application code and threadsafe CICS commands.
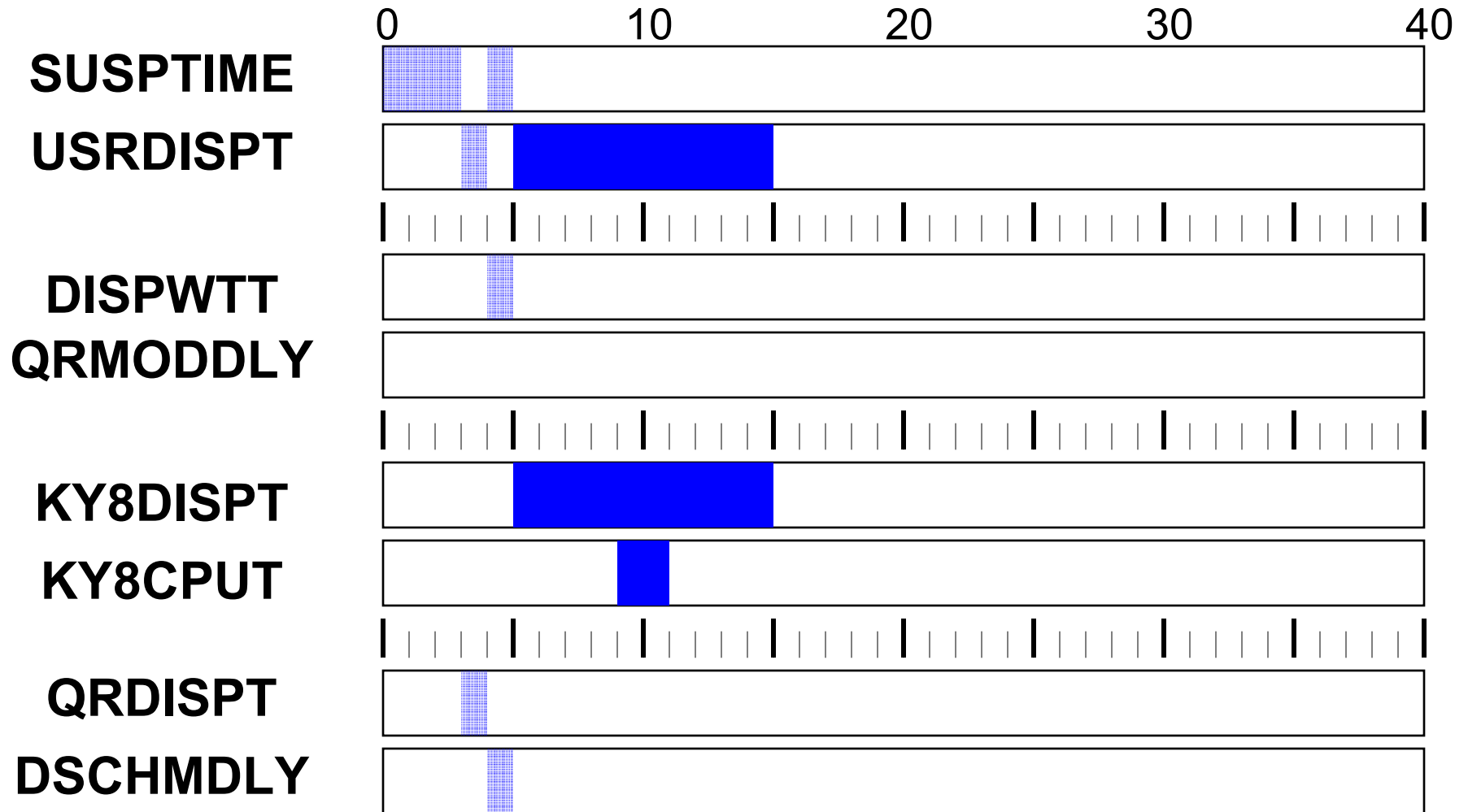
Task does non-threadsafe command. Must switch to QR.
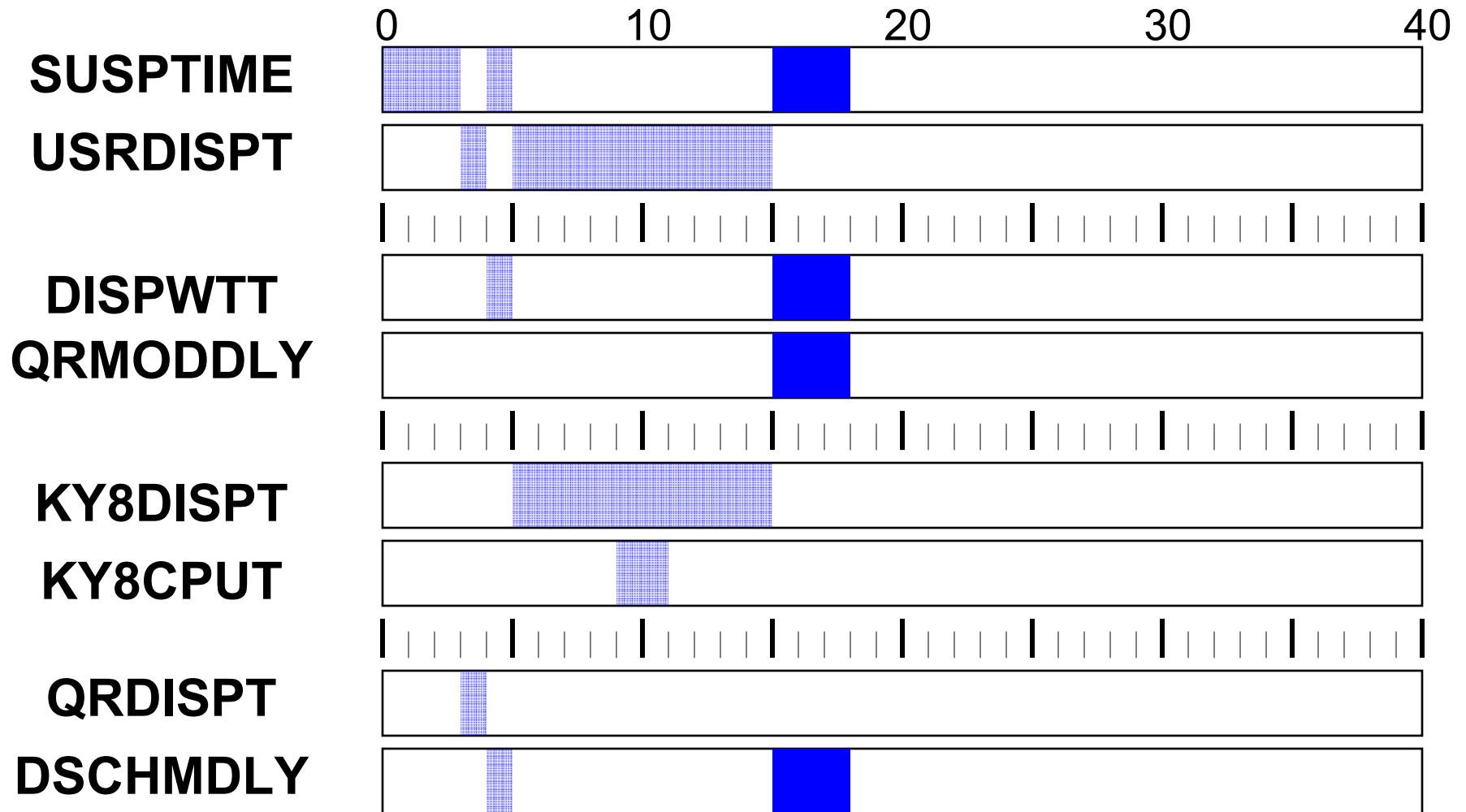
Task does something on QR.
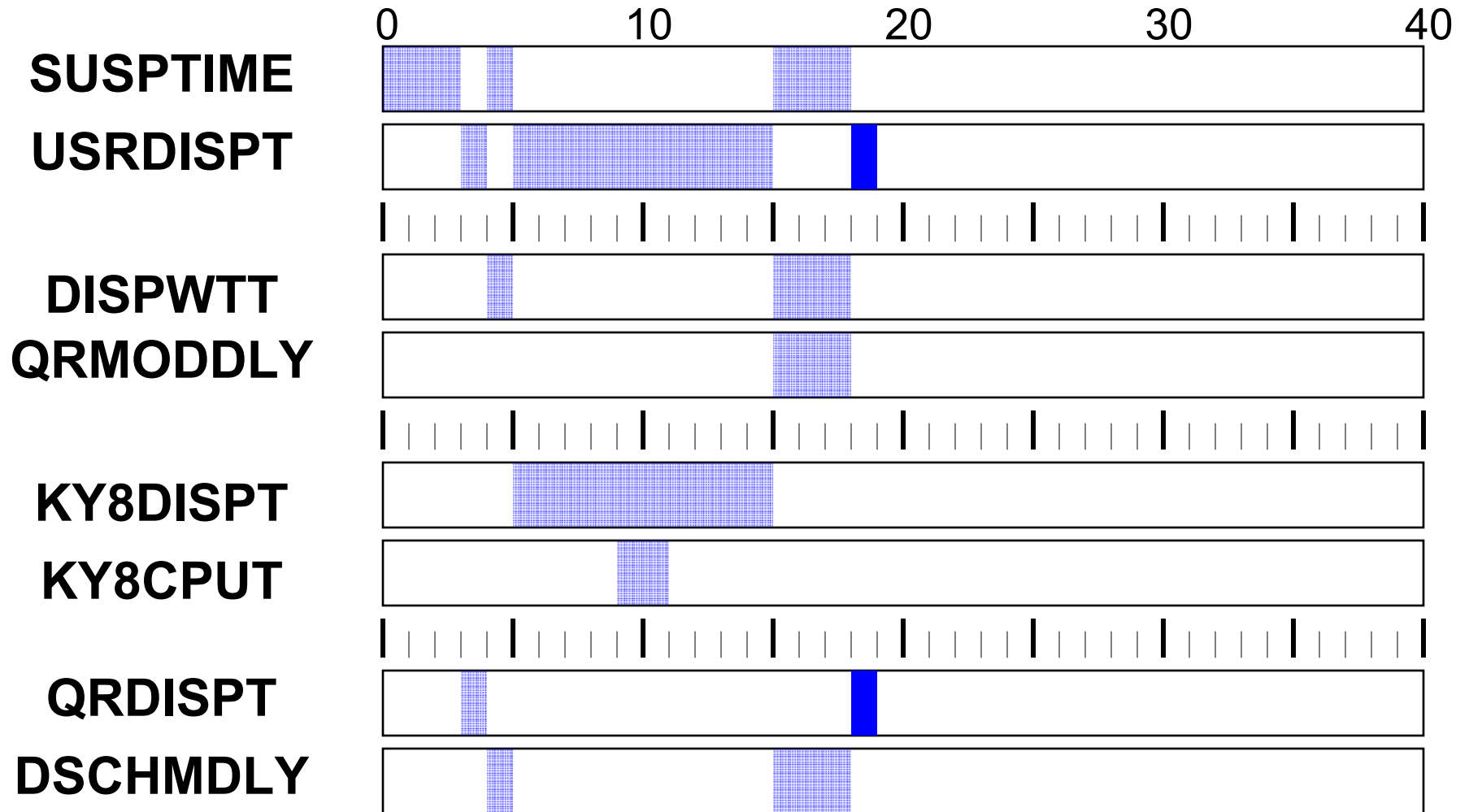
Task does another SQL call. Must switch to L8.

SUSPTIME

USRDISPT

DISPWTT

QRMODDLY

KY8DISPT

KY8CPUT

QRDISPT

DSCHMDLY
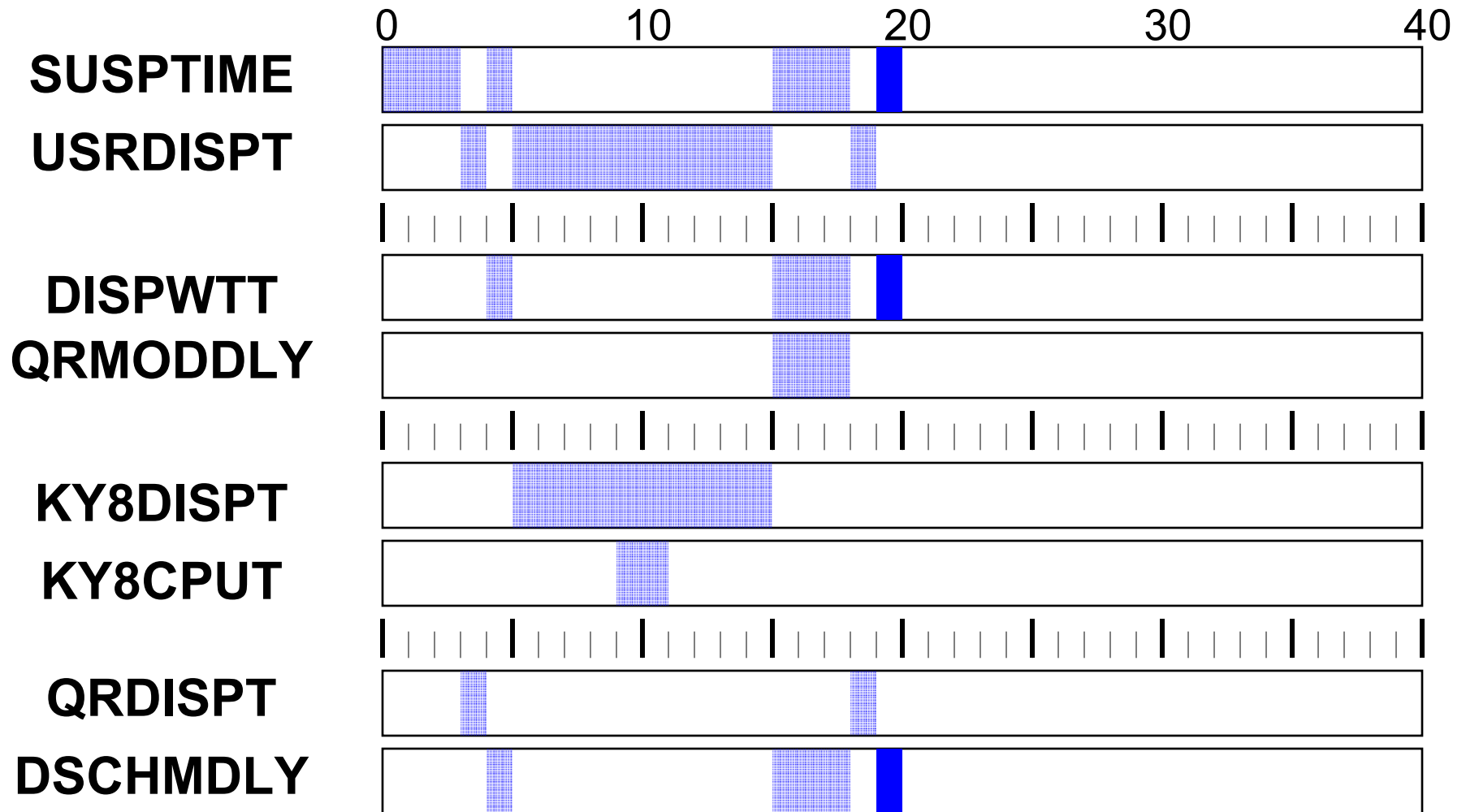
Task runs on L8.
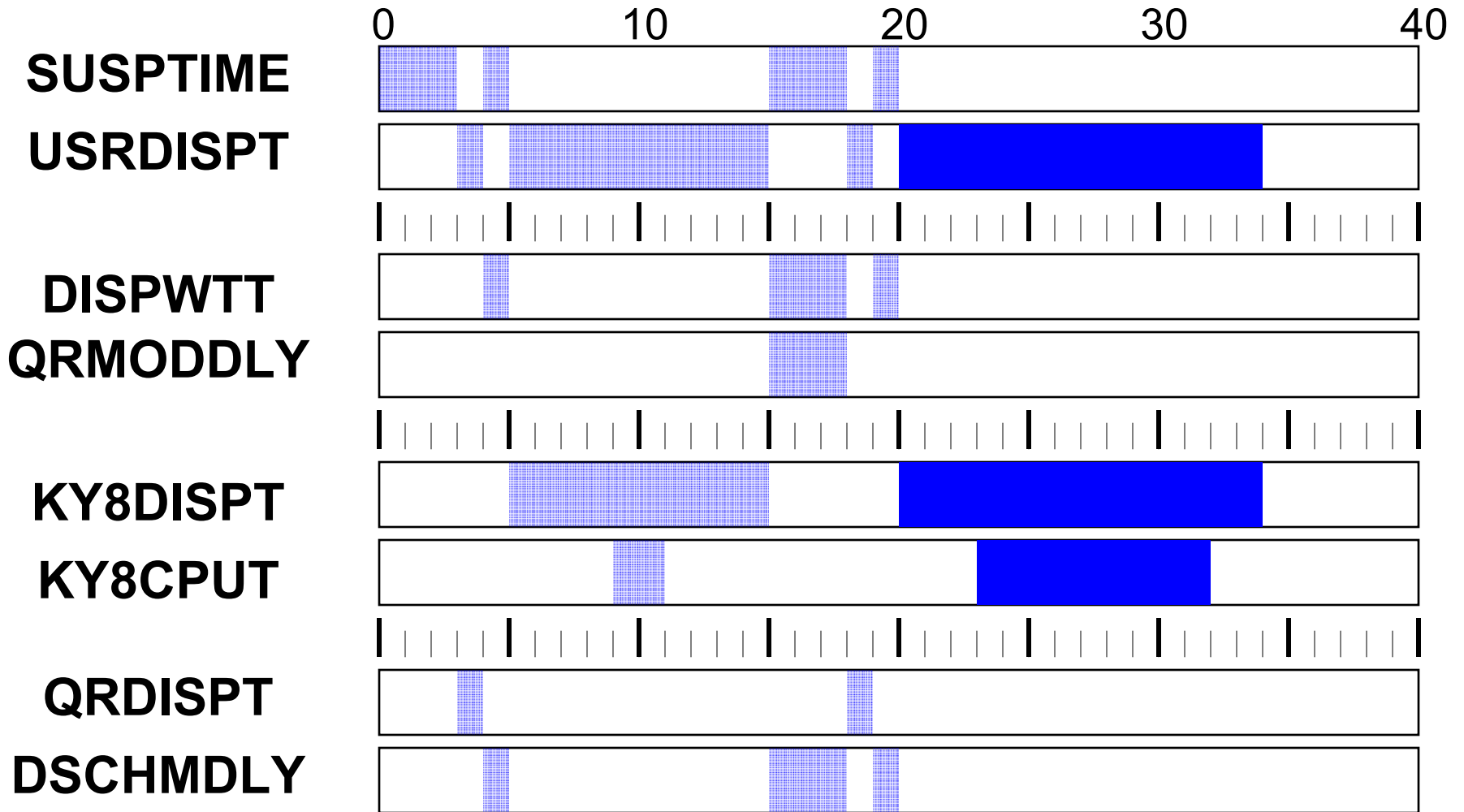
Task needs to switch to QR to finish up.

Task ends on QR.

0   10   20   30   40

SUSPTIME Time: 13 mils   Count: 5

USRDISPT Time: 27 mils   Count: 5

DISPWTT Time:10 mils   Count: 4

QRMODDLY Time: 8 mils   Count: 2

KY8DISPT Time: 24 mils   Count: 2

KY8CPUT Time: 16 mils   Count: 2

QRDISPT Time: 3 mils   Count: 3

DSCHMDLY Time: 10 mils   Count: 4
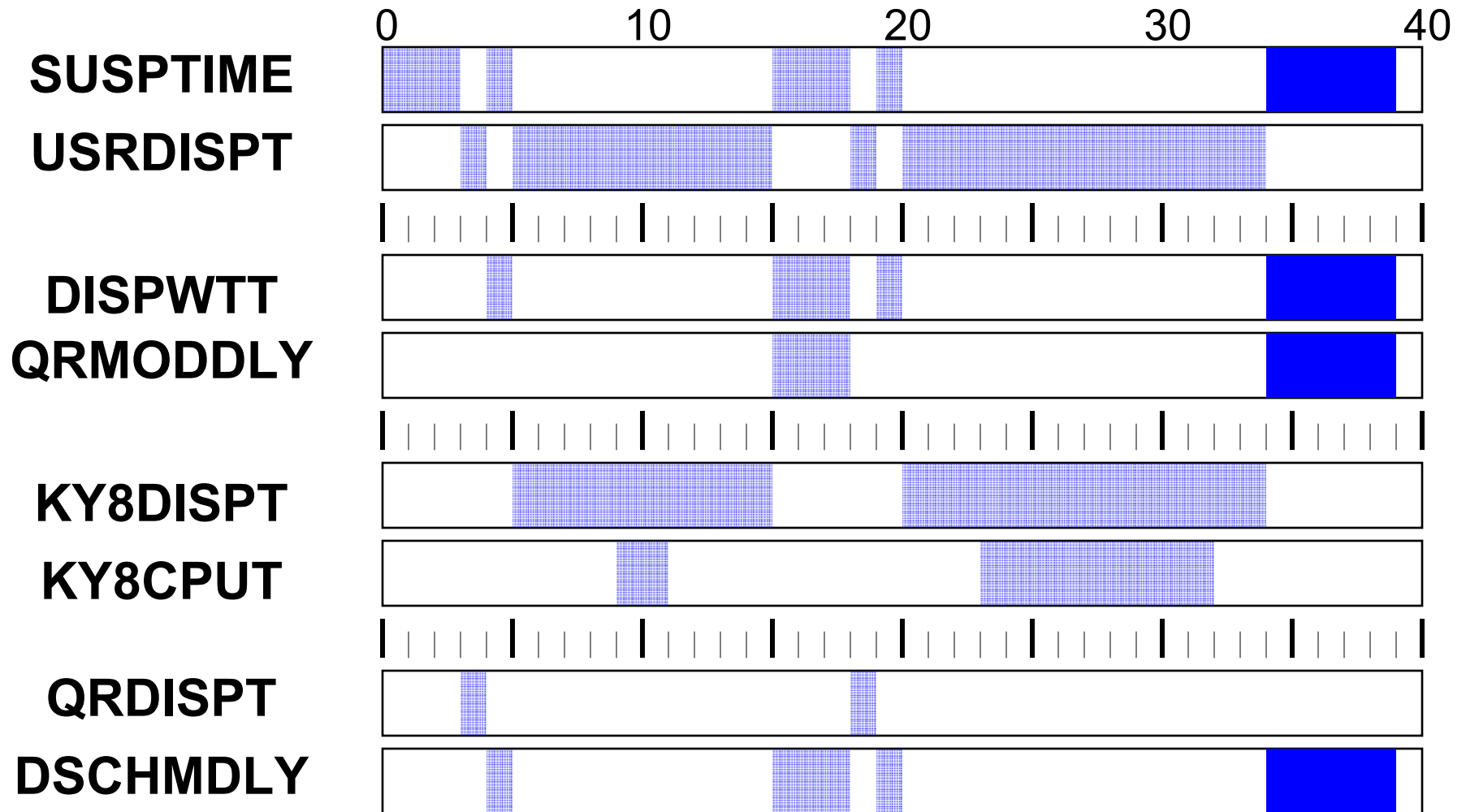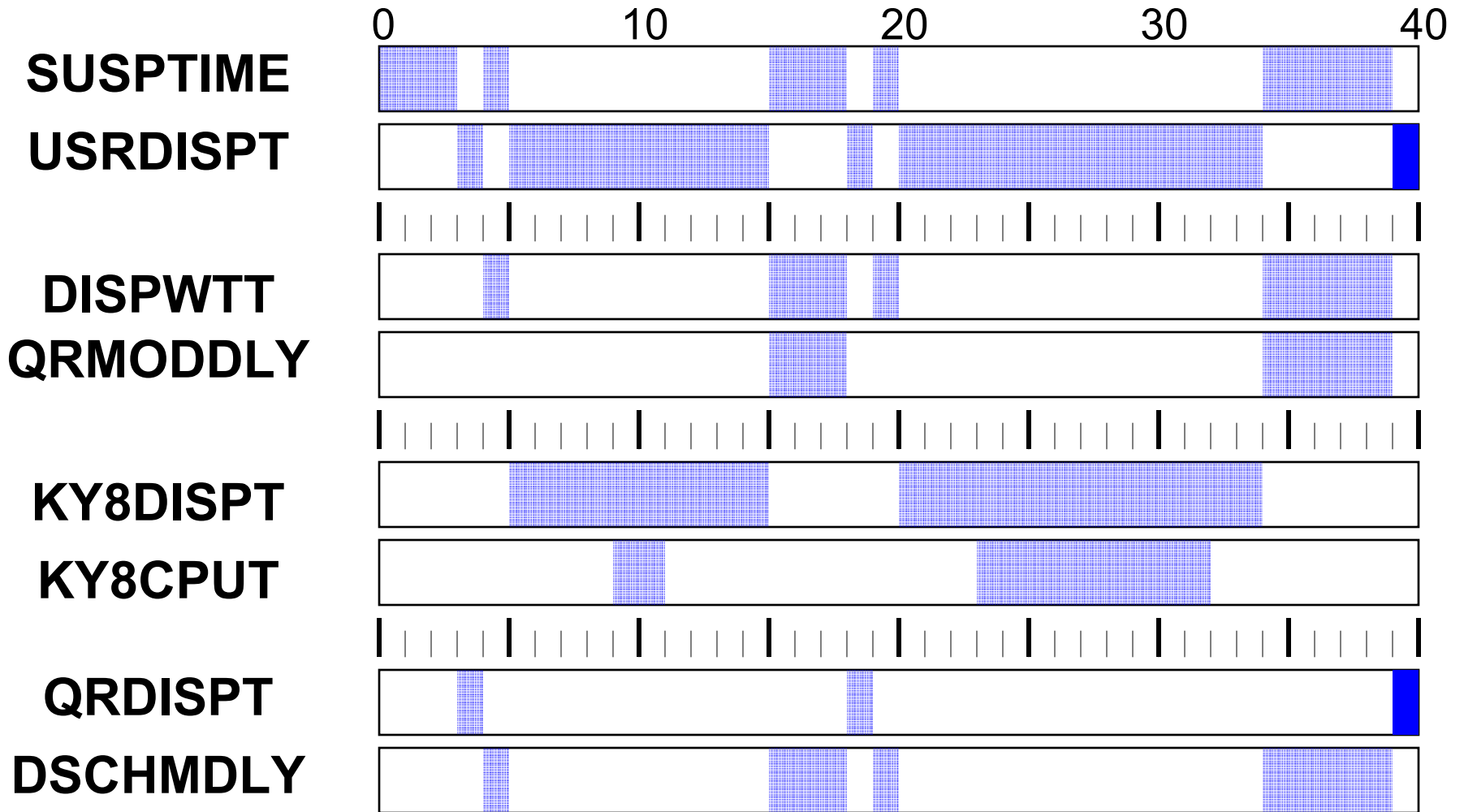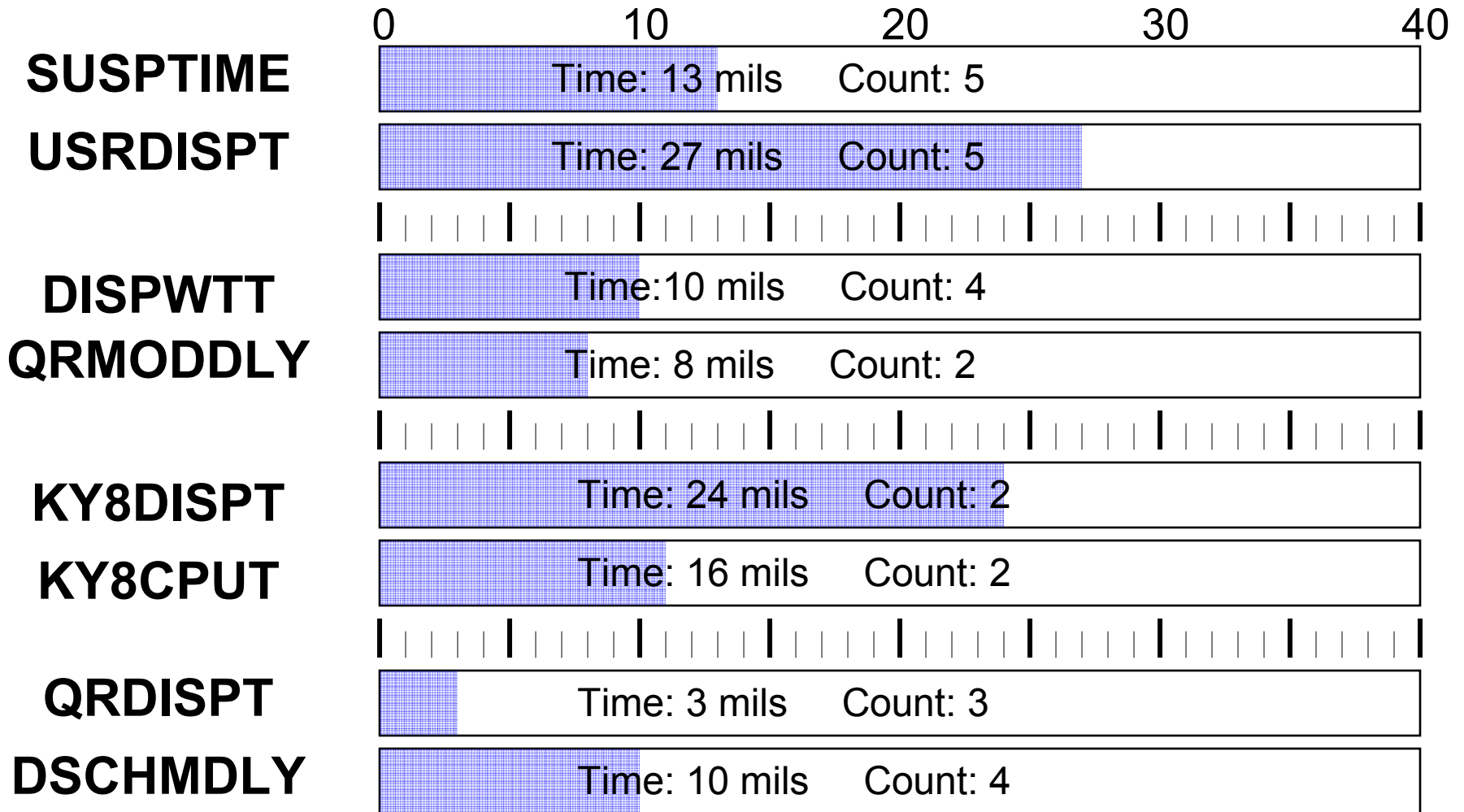
How do you get this information from a dump?

- Tasks were backing up. You took a dump before cancelling.
- Tasks, including perhaps a problem task, haven't ended and so haven't dumped SMF110 data yet.
- Console dump is much better than CEMT P SNAP

  ▶ You catch the CICS region by surprise.

  ▶ Tasks are doing what they normally do.

  ▶ In a CEMT P SNAP dump, the task running on the QR is taking the dump.

Verbx dfhpd650 'ds=1'

- This is what the Dispatcher Summary looks like when the QR TCB is a bottleneck.

S	F	P	TT	RESOURCE TYPE	RESOURCE_NAME	TIME OF SUSPEND	TIMEOUT DUE	DTA (DSTSK)	AD	ATTACHER TOKEN	M
D								3EB44E00	XM	239EA100	QR
D								3EB8C080	XM	2393D500	QR
D								3EB8C200	XM	24CA9D00	QR
D								3EB8C380	XM	239EAD00	QR
D								3EB8C500	XM	24C6E300	QR

Verbx dfhpd650 'mn=3'

- If you are running with Monitoring and Performance Class Monitoring on, you will see this:

CICS   **Monitoring is ACTIVE**

Exception   **Monitoring is NOT ACTIVE**

Performance Monitoring is ACTIVE

Resource   **Monitoring is NOT ACTIVE**

- SIT parms are MN=ON and MNPER=ON

Verbx dfhpd650 'mn=3'

- Find on the word TMA

Tran id	Tran num	DS token	TMA token	PB token
CSSY	00005	010A0003	1D907000	FF4F9400
CSSY	00006	01900003	1D907BA8	FF4F9800
CSTP	00008	008E0003	1D928000	FF4FA000

Verbx dfhpd650 'mn=3'

- Scroll down to the application transactions.

```
Tran   Tran   DS        TMA        PB

id     num    token     token      token

……

CD11   00096  0A120003  1D8AB000   FF4E7800

EF23   41284  069243AF  1F063000   FF515C00

HI02   32062  06903057  1F0F6000   FE412800
```

- Note TMA token.

Verbx dfhpd650 'mn=3'

- Find on the TMA token

```
MNTMA  1F063000  Transaction Monitoring Area


   0000   0BA86EC4 C6C8D4D5 E3D4C140 40404040   C2E02C66 412C892B 00000000 00000000   *.y>DFHMNTMA

   0020   00000000 00000000 00000001 00000000   00000000 1F063A28 069243AF 0A958000   *............

   0040   00000000 00000000 1C5B2000 40000000   00000000 00000000 C2EDF9AF 7B1E12AE   *.........$..

   0060   00001656 85AA90A0 C2EDF9AF 7B1C71EE   00000000 00000000 C2EDF9AF 7B1E12AE   *....e...B.9.

   0080   00000000 00000000 00000000 000DB61F   40EDD673 02F6B216 00000000 00000000   *............

   . . . . . . . . . . . .

   . . . . . . . . . . . .
```

The TMA

- 1 for each in-flight task
- Contains all of the Performance Class monitoring data that CICS has been collecting during the life of the task
- To find where in the TMA the information is, you need to know for each field the Group name and the ID number., and you need a Supplementary Data Areas or, for CICS/TS 3.2, the Information Center.

Verbx dfhpd650 'mn=3'

- From the top, find on   Dictionary   and repeat find.

```
==MN: MONITORING DICTIONARY

ENTRYNAME    TYPE       ID      LENGTH    CONNECTOR    OFFSET    HEADING

DFHTASK       C        001      0004        0001       0000      TRAN

   . . .

DFHCICS       T        005      0008        0005       0014      START

DFHCICS       T        006      0008        0006       001C      STOP

DFHTASK       P        031      0004        0007       0024      TRANNUM
```

- For START time, DFHCICS is the group and 005 is the ID number.

Verbx dfhpd650 'mn=3'

- Scroll down or find on fields you want.

DFHTASK	S	007	000C	00E7	0594	USRDISPT
DFHTASK	S	008	000C	00E8	05A0	USRCPUT
DFHTASK	S	014	000C	00E9	05AC	SUSPTIME
DFHTASK	S	102	000C	00EA	05B8	DISPWTT
DFHTASK	S	255	000C	00EB	05C4	QRDISPT
DFHTASK	S	256	000C	00EC	05D0	QRCPUT

…..

| DFHTASK | S | 249 | 000C | 00FC | 0690 | QRMODDLY |

Find offset in TMA for information you want

- Go to Information Center or Supplementary Data Areas
- Search on   TMA_groupname_id#
  - For example for DFHTASK 007 USRDISPT, search on TMA_DFHTASK_007

(68C)	CHARACTER	12	TMA_DFHTASK_007
(68C)	CHARACTER	8	TMA_DFHTASK_ 007_TIME
(694)	BIT(8)	1	TMA_DFHTASK_ 007_FLAG
(695)	UNSIGNED	3	TMA_DFHTASK_ 007_COUNT

How much USRDISPT time?

```
0680   00000000 00000000 00000000 00001729   F7F0A628 00F6B217 00001656 85AB8660

06A0   00F6B217 C2E04390 39F48070 80F6B218   00000C5A DED569D8 00F6B216 00001729

06C0   B4E183C9 00F6909F 00001656 49A0C720   00F6909F 00000000 4408D83A 00002178

06E0   00000000 3C0ABF40 00002178 00000000   00000000 00000000 00000000 00000000

0700   00000000 00000000 00000000 00000000   00000000 00000000 00000000 00000000
```

- Time component is 00001729 F7F0A628
- To convert that to seconds:

  ▸ Lop off the bottom 2 bytes: 00001729F7F0

  ▸ Convert to decimal: 388626416

  ▸ Multiply by .000016:   6218.022656

- Task has accrued 6,218 seconds of dispatch time so far.

How many dispatches?

```
0680    00000000 00000000 00000000 00001729    F7F0A628 00F6B217 00001656 85AB8660

06A0    00F6B217 C2E04390 39F48070 80F6B218    00000C5A DED569D8 00F6B216 00001729

06C0    B4E183C9 00F6909F 00001656 49A0C720    00F6909F 00000000 4408D83A 00002178

06E0    00000000 3C0ABF40 00002178 00000000    00000000 00000000 00000000 00000000

0700    00000000 00000000 00000000 00000000    00000000 00000000 00000000 00000000
```

- Count component is F6B217: decimal 16167447
- This task has had 16,167,447 separate dispatches, and counting!
- This field is 3-bytes long. It is possible to wrap.

Back in the TMA

```
0680    00000000 00000000 00000000 00001729    F7F0A628 00F6B217 00001656 85AB8660

06A0    00F6B217 C2E04390 39F48070 80F6B218    00000C5A DED569D8 00F6B216 00001729

06C0    B4E183C9 00F6909F 00001656 49A0C720    00F6909F 00000000 4408D83A 00002178

06E0    00000000 3C0ABF40 00002178 00000000    00000000 00000000 00000000 00000000

0700    00000000 00000000 00000000 00000000    00000000 00000000 00000000 00000000
```

- QRDISPT is TMA_DFHTASK_255 at offset 6BC.
- 00001729 B4E183C9 00F6909F
- A quick way to convert to seconds is to just use the 1st word of the time component.
- This task has accrued about X'1729' seconds or dispatch time on the QR TCB.

Back in the TMA

```
0680   00000000 00000000 00000000 00001729   F7F0A628 00F6B217 00001656 85AB8660

06A0   00F6B217 C2E04390 39F48070 80F6B218   00000C5A DED569D8 00F6B216 00001729

06C0   B4E183C9 00F6909F 00001656 49A0C720   00F6909F 00000000 4408D83A 00002178

06E0   00000000 3C0ABF40 00002178 00000000   00000000 00000000 00000000 00000000

0700   00000000 00000000 00000000 00000000   00000000 00000000 00000000 00000000
```

- SUSPTIME is TMA_DFHTASK_014 at offset 6A4.
- This task is currently suspended so the Suspend Clock is active.
- That is what the 80 means
- Can't convert to seconds as easily.
- Task Start time plus Dispatch Time plus Suspend Time equals Dump time. So you can figure out Suspend time another way.

Back in the TMA

```
06C0   B4E183C9 00F6909F 00001656 49A0C720   00F6909F 00000000 4408D83A 00002178

06E0   00000000 3C0ABF40 00002178 00000000   00000000 00000000 00000000 00000000

0700   00000000 00000000 00000000 00000000   00000000 00000000 00000000 00000000

0720 -    077F LINES SAME AS ABOVE

0780   00000000 00000000 00000C5A AFCDBFA6   00F6909E 00000000 00000000 00000000
```

- You can go backwards too. Notice the field at offset X'788'. It has about X'C5A' seconds of time.
- Go to Supplemental Data Areas or Information Center and see what field in the TMA is at that offset.

  (788)   CHARACTER   12   TMA_DFHTASK_249

Search on DFHTASK

- Choose the hit on 'Performance Data in DFHTASK'
- Scroll down to ID number 249
- 249 (TYPE-S, 'QRMODDLY'
  - ▶ The elapsed time for which the user task waited for re-dispatch on the CICS QR TCB.
- So this task spent about X'C5A' seconds waiting its turn to run on the QR TCB.

Pre-CICS/TS 3.2 time fields

```
05C0   00000000 00000000 00000000 00049B26   00000069 00004168 00000069 47280287

05E0   8000006A 000F1822 00000068 000000BA   00000026 000000A8 00000026 00000000

0600   00000000 00000000 00000000 00000000   00000000 00000000 00000000 00049A6C

0620   00000043 000040C0 00000043 00000000   00000000 00000000 00000000 000040C0
```

- 8 bytes instead of 12 bytes.
- Time part is 4 bytes.
- To convert to seconds, take the entire 1st word and convert to decimal then multiply by .000016
- For a quick conversion, just use the top 2 bytes of the 1st word. That is roughly the number of seconds.

So what did we talk about?

- We clarified the meanings of some of the Performance Class monitoring fields.
- We discussed how to get that information out of a dump.

Additional WebSphere Product Resources

- Discover the latest trends in WebSphere Technology and implementation, participate in technically-focused briefings, webcasts and podcasts at:
  http://www.ibm.com/developerworks/websphere/community/

- Learn about other upcoming webcasts, conferences and events:
  http://www.ibm.com/software/websphere/events_1.html

- Join the Global WebSphere User Group Community: http://www.websphere.org

- Access key product show-me demos and tutorials by visiting IBM Education Assistant:
  http://www.ibm.com/software/info/education/assistant

- View a Flash replay with step-by-step instructions for using the Electronic Service Request (ESR) tool for submitting problems electronically:
  http://www.ibm.com/software/websphere/support/d2w.html

- Sign up to receive weekly technical My Notifications emails:
  http://www.ibm.com/software/support/einfo.html

Questions and Answers