MACHINE m3
REFINES m2
SEES c0
VARIABLES

 wait

 process

 clk

 t1

 t2

 t3

 position

 index

 qsize

 dleave

INVARIANTS

 inv3: $finite(ran(t3))$

 inv1: $\forall p \cdot p \in dom(t1) \Rightarrow p \in dom(index)$

  @inv4 $\forall p \cdot (p \in dom(t1) \wedge p \in dom(t2) \wedge t2(p) \geq t1(p)) \Rightarrow t2(p) - t1(p) \leq index(p) * (ddl2 + ddl4) + ddl4$

 inv5: $dleave \in \mathbb{N}$

 inv6: $ran(position) \subseteq dom(t1)$

 inv7: $process = \varnothing \wedge wait \neq \varnothing \wedge dleave = 0 \Rightarrow clk - t1(position(1)) \leq ddl4$

 inv8: $process = \varnothing \wedge wait \neq \varnothing \wedge dleave \neq 0 \Rightarrow clk - dleave \leq ddl4$

 inv9: $dleave \geq 0 \wedge dleave \leq clk$

 inv10: $\forall p \cdot (p \in wait \wedge p \in dom(t1)) \Rightarrow clk - t1(p) \leq index(p) * (ddl2 + ddl4) + ddl4$

EVENTS
Initialisation ⟨extended⟩

 begin

  act1: $wait := \varnothing$

  act2: $process := \varnothing$

  act3: $clk := 0$

  act4: $t1 := \varnothing$

  act5: $t2 := \varnothing$

  act6: $t3 := \varnothing$

  act7: $position := \varnothing$

  act8: $index := \varnothing$

  act9: $qsize := 0$

  act10: $dleave := 0$

 end

Event wish ⟨ordinary⟩ $\widehat{=}$
extends wish

 any

  pro

 where

  grd1: $pro \in PROCESS \setminus wait$

  grd2: $pro \in PROCESS \setminus process$

 then

  act1: $wait := wait \cup \{pro\}$

  act2: $t1(pro) := clk$

  act4: $index(pro) := qsize$

  act3: $position(qsize + 1) := pro$

  act5: $qsize := qsize + 1$

 end

Event enter ⟨ordinary⟩ $\widehat{=}$
extends enter

 any

pro

where

    grd1: $pro \in wait$

    grd2: $card(process) = 0$

    grd3: $qsize > 0$

    grd4: $pro = position(1)$

then

    act1: $wait := wait \setminus \{pro\}$

    act2: $process := process \cup \{pro\}$

    act3: $t2(pro) := clk$

    act5: $position :\mid position' \in 1..qsize-1 \twoheadrightarrow wait \setminus \{position(1)\} \wedge (\forall i \cdot i \in 1..qsize-1 \Rightarrow position'(i) = position(i+1))$

    act6: $qsize := qsize - 1$

    act7: $dleave := 0$

end

Event leave ⟨ordinary⟩ $\widehat{=}$

extends leave

    any

        pro

    where

        grd1: $pro \in process$

        grd2: $position \neq \varnothing$

    then

        act1: $process := process \setminus \{pro\}$

        act3: $t3(pro) := clk$

        act4: $dleave := clk$

    end

Event leave_idle ⟨ordinary⟩ $\widehat{=}$

refines leave

    any

        pro

    where

        grd1: $pro \in process$

        grd2: $position = \varnothing$

    then

        act1: $process := process \setminus \{pro\}$

        act2: $t3(pro) := clk$

    end

Event tick ⟨ordinary⟩ $\widehat{=}$

refines tick

    when

        grd4: $\forall p \cdot (p \in process \wedge p \in dom(t2)) \Rightarrow clk + 1 - t2(p) \leq ddl2$

        grd5: $process = \varnothing \wedge wait \neq \varnothing \wedge dleave = 0 \Rightarrow clk + 1 - t1(position(1)) \leq ddl4$

        grd7: $process = \varnothing \wedge wait \neq \varnothing \wedge dleave \neq 0 \Rightarrow clk + 1 - dleave \leq ddl4$

    then

        act1: $clk := clk + 1$

    end

END