

MACHINE m3

REFINES m2

SEES c0

VARIABLES

wait
process
clk
t1
t2
t3
position
index
dleave

INVARIANTS

inv3: $finite(ran(t3))$
inv1: $\forall p. p \in dom(t1) \Rightarrow p \in dom(index)$
inv4: $\forall p. (p \in dom(t1) \wedge p \in dom(t2) \wedge t2(p) \geq t1(p)) \Rightarrow t2(p) - t1(p) \leq index(p) * (ddl2 + ddl4) + ddl4$
inv5: $dleave \in PROCESS \rightarrow \mathbb{N}$
inv6: $wait \neq \emptyset \Rightarrow position \neq \emptyset$
inv7: $position \neq \emptyset \Rightarrow min(ran(position)) = 0$
inv8: $dom(position) \subseteq dom(t1)$
inv9: $process = \emptyset \wedge wait \neq \emptyset \wedge dleave = \emptyset \Rightarrow clk - t1(position^{-1}(0)) \leq ddl4$
inv10: $\forall p. (p \in dom(t1) \wedge p \in dom(t2) \wedge t2(p) \geq t1(p) \wedge dleave = \emptyset) \Rightarrow t2(p) - t1(p) \leq ddl4$

EVENTS

Initialisation $\langle extended \rangle$

begin

act1: $wait := \emptyset$
act2: $process := \emptyset$
act3: $clk := 0$
act4: $t1 := \emptyset$
act5: $t2 := \emptyset$
act6: $t3 := \emptyset$
act7: $position := \emptyset$
act8: $index := \emptyset$
act9: $dleave := \emptyset$

end

Event wish $\langle ordinary \rangle \hat{=}$

extends wish

any

pro
pos

where

grd1: $pro \in PROCESS \setminus wait$
grd2: $pro \in PROCESS \setminus process$
grd3: $pos \in POSITION$
grd4: $pos \notin ran(position)$
grd7: $finite(ran(position))$
grd6: $position \neq \emptyset \Rightarrow pos = max(ran(position)) + 1$
grd8: $position = \emptyset \Rightarrow pos = 0$

then

act1: $wait := wait \cup \{pro\}$
act2: $t1(pro) := clk$
act4: $index(pro) := pos$
act3: $position(pro) := pos$

end

Event enter $\langle \text{ordinary} \rangle \hat{=}$

extends enter

any

pro

where

grd1: $pro \in wait$

grd2: $card(process) = 0$

grd3: $pro \in dom(position)$

grd4: $position(pro) = min(ran(position))$

then

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

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

act3: $t2(pro) := clk$

act5: $position := \lambda p. p \in wait \setminus \{pro\} \mid position(p) - 1$

act6: $dleave := \{pro\} \triangleleft dleave$

end

Event leave $\langle \text{ordinary} \rangle \hat{=}$

extends leave

any

pro

where

grd1: $pro \in process$

grd2: $position \neq \emptyset$

then

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

act3: $t3(pro) := clk$

act4: $dleave(position^{-1}(0)) := clk$

end

Event leave_idle $\langle \text{ordinary} \rangle \hat{=}$

refines leave

any

pro

where

grd1: $pro \in process$

grd2: $position = \emptyset$

then

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

act2: $t3(pro) := clk$

end

Event tick $\langle \text{ordinary} \rangle \hat{=}$

refines tick

when

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

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

grd7: $process = \emptyset \wedge wait \neq \emptyset \wedge dleave \neq \emptyset \Rightarrow clk + 1 - dleave(position^{-1}(0)) \leq ddl4$

then

act1: $clk := clk + 1$

end

END