MACHINE M_PartProc_With_Events
REFINES M_PartProc_Trans
SEES C_Part_Proc_With_Events
VARIABLES

partition_mode
processes
processes_of_partition
process_state
processes_of_cores
finished_core
location_of_service
create_process_parm
periodtype_of_process

INVARIANTS

inv_periodtype_of_proc: $periodtype\_of\_process \in processes \pfun PROC\_PERIOD\_TYPE$

EVENTS

Initialisation ⟨extended⟩

begin

act001: $partition\_mode := PARTITIONS \times \{PM\_COLD\_START\}$
act101: $processes := \varnothing$
act102: $processes\_of\_partition := \varnothing$
act103: $process\_state := \varnothing$
act104: $processes\_of\_cores := \varnothing$
act105: $finished\_core := CORES \times \{TRUE\}$
act106: $location\_of\_service := \varnothing$
act201: $periodtype\_of\_process := \varnothing$

end

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

any

part

where

grd001: $part \in PARTITIONS$
grd002: $partition\_mode(part) = PM\_NORMAL \lor partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START$

then

skip

end

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

any

part
proc
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(process\_state) \cap dom(processes\_of\_cores) \cap dom(processes\_of\_partition)$
grd003: $core \in CORES$
grd004: $processes\_of\_partition(proc) = part$
grd005: $core \in Cores\_of\_Partition(part)$
grd006: $processes\_of\_cores(proc) = core$
grd007: $partition\_mode(part) = PM\_NORMAL$
grd008: $process\_state(proc) = PS\_Ready \lor process\_state(proc) = PS\_Running$

then

skip

end

Event create_process_init ⟨ordinary⟩ $\widehat{=}$
extends create_process_init
any
$part$
$proc$
$core$
$service$
ptype
where
grd001: $part \in PARTITIONS$
grd002: $proc \in (PROCESSES \setminus processes)$
grd003: $core \in CORES$
grd004: $service \in Services$
grd005: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START$
grd006: $finished\_core(core) = TRUE$
grd007: $service = Create\_Process$
grd101: $ptype \in PROC\_PERIOD\_TYPE$
then
act001: $location\_of\_service(core) := service \mapsto loc\_i$
act002: $finished\_core(core) := FALSE$
act003: $processes := processes \cup \{proc\}$
act004: $processes\_of\_partition(proc) := part$
act005: $create\_process\_parm(core) := proc$
act101: $periodtype\_of\_process(proc) := ptype$
end
Event create_process_dormant ⟨ordinary⟩ $\widehat{=}$
extends create_process_dormant
any
$part$
$proc$
$core$
where
grd001: $part \in PARTITIONS$
grd002: $proc \in processes$
grd003: $core \in CORES \cap dom(location\_of\_service)$
grd004: $location\_of\_service(core) = Create\_Process \mapsto loc\_i$
grd005: $finished\_core(core) = FALSE$
grd007: $proc = create\_process\_parm(core)$
grd008: $processes\_of\_partition(proc) = part$
grd009: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START$
then
act001: $location\_of\_service(core) := Create\_Process \mapsto loc\_1$
act002: $process\_state(proc) := PS\_Dormant$
end
Event create_process_core ⟨ordinary⟩ $\widehat{=}$
extends create_process_core
any
$part$
$proc$
$core$
where
grd001: $part \in PARTITIONS$
grd002: $proc \in processes$
grd003: $core \in CORES \cap dom(location\_of\_service)$
grd004: $location\_of\_service(core) = Create\_Process \mapsto loc\_1$
grd005: $finished\_core(core) = FALSE$
grd007: $processes\_of\_partition(proc) = part$

grd008: $process\_state(proc) = PS\_Dormant$
grd009: $create\_process\_parm(core) = proc$
grd010: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START$

then
act001: $location\_of\_service(core) := Create\_Process \mapsto loc\_2$
act002: $processes\_of\_cores(proc) := core$
end

Event create_process_return ⟨ordinary⟩ $\widehat{=}$
extends create_process_return
any
$part$
$proc$
$core$
where
grd001: $part \in PARTITIONS$
grd002: $proc \in processes$
grd003: $core \in CORES \cap dom(location\_of\_service)$
grd004: $location\_of\_service(core) = Create\_Process \mapsto loc\_2$
grd005: $finished\_core(core) = FALSE$
grd007: $processes\_of\_partition(proc) = part$
grd008: $process\_state(proc) = PS\_Dormant$
grd009: $create\_process\_parm(core) = proc$
grd010: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START$

then
act001: $location\_of\_service(core) := Create\_Process \mapsto loc\_r$
act002: $finished\_core(core) := TRUE$
act003: $create\_process\_parm := \{core\} \lhd create\_process\_parm$
end

Event set_partition_mode_to_idle ⟨ordinary⟩ $\widehat{=}$
extends partition_modetransition_to_idle
any
$part$
$newm$
$procs$
$cores$
where
grd001: $part \in PARTITIONS$
grd002: $newm \in PARTITION\_MODES$
grd101: $procs = processes\_of\_partition^{-1}[\{part\}]$
grd102: $cores \in \mathbb{P}_1(CORES)$
grd103: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \lor partition\_mode(part) = PM\_NORMAL$
grd104: $newm = PM\_IDLE$
grd105: $cores = Cores\_of\_Partition(part)$
grd106: $\forall core \cdot (core \in (Cores\_of\_Partition(part) \cap dom(finished\_core)) \Rightarrow finished\_core(core) = TRUE)$
then
act001: $partition\_mode(part) := newm$
act101: $processes := processes \setminus procs$
act102: $process\_state := procs \lhd process\_state$
act103: $processes\_of\_partition := procs \lhd processes\_of\_partition$
act104: $processes\_of\_cores := procs \lhd processes\_of\_cores$
act201: $periodtype\_of\_process := procs \lhd periodtype\_of\_process$
end

Event set_partition_mode_to_normal_init ⟨ordinary⟩ $\widehat{=}$
extends partition_modetransition_to_normal_init

any
part
core
service
where
grd001: $part \in PARTITIONS$
grd002: $core \in CORES$
grd003: $service \in Services$
grd004: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START$

grd005: $finished\_core(core) = TRUE$
grd006: $service = Set\_Normal$
then
act001: $location\_of\_service(core) := service \mapsto loc\_i$
act002: $finished\_core(core) := FALSE$
end

Event set_partition_mode_to_normal_mode ⟨ordinary⟩ $\widehat{=}$
extends partition_modetransition_to_normal_mode
any
part
newm
core
where
grd001: $part \in PARTITIONS$
grd002: $newm \in PARTITION\_MODES$
grd101: $core \in CORES \cap dom(location\_of\_service)$
grd102: $newm = PM\_NORMAL$
grd103: $finite(processes\_of\_partition^{-1}[\{part\}]) \land card(processes\_of\_partition^{-1}[\{part\}]) > 0$
grd104: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START$

grd105: $location\_of\_service(core) = Set\_Normal \mapsto loc\_i$
grd106: $finished\_core(core) = FALSE$
then
act001: $location\_of\_service(core) := Set\_Normal \mapsto loc\_1$
act002: $partition\_mode(part) := newm$
end

Event set_partition_mode_to_normal_ready ⟨ordinary⟩ $\widehat{=}$
extends partition_modetransition_to_normal_ready
any
part
procs
procs2
procsstate
core
where
grd001: $part \in PARTITIONS$
grd002: $partition\_mode(part) = PM\_NORMAL$
grd003: $procs = processes\_of\_partition^{-1}[\{part\}] \cap process\_state^{-1}[\{PS\_Waiting\}]$
grd004: $procs2 = processes\_of\_partition^{-1}[\{part\}] \cap process\_state^{-1}[\{PS\_WaitandSuspend\}]$
grd005: $procsstate \in procs \to \{PS\_Waiting, PS\_Ready\}$
grd006: $core \in CORES \cap dom(location\_of\_service)$
grd007: $location\_of\_service(core) = Set\_Normal \mapsto loc\_1$
grd008: $finished\_core(core) = FALSE$
then
act001: $location\_of\_service(core) := Set\_Normal \mapsto loc\_2$
act002: $process\_state := (process\_state \lhd\!\!\!- procsstate) \lhd\!\!\!- (procs2 \times \{PS\_Suspend\})$
end

Event set_partition_mode_to_normal_return ⟨ordinary⟩ $\widehat{=}$
extends partition_modetransition_to_normal_return

any
part
core
where
grd001: $part \in PARTITIONS$
grd002: $partition\_mode(part) = PM\_NORMAL$
grd003: $core \in CORES \cap dom(location\_of\_service)$
grd004: $location\_of\_service(core) = Set\_Normal \mapsto loc\_2$
grd005: $finished\_core(core) = FALSE$
then
act001: $location\_of\_service(core) := Set\_Normal \mapsto loc\_r$
act002: $finished\_core(core) := TRUE$
end

Event set_partition_mode_to_coldstart ⟨ordinary⟩ $\widehat{=}$
extends partition_modetransition_to_coldstart
any
part
newm
procs
cores
where
grd001: $part \in PARTITIONS$
grd002: $newm \in PARTITION\_MODES$
grd101: $cores \in \mathbb{P}_1(CORES)$
grd102: $newm = PM\_COLD\_START$
grd103: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \lor partition\_mode(part) = PM\_NORMAL$
grd107: $part \in ran(processes\_of\_partition)$
grd104: $procs = processes\_of\_partition^{-1}[\{part\}]$
grd105: $cores = Cores\_of\_Partition(part)$
grd106: $\forall core \cdot (core \in (Cores\_of\_Partition(part) \cap dom(finished\_core)) \Rightarrow finished\_core(core) = TRUE)$
then
act001: $partition\_mode(part) := newm$
act101: $processes := processes \setminus procs$
act102: $process\_state := procs \lhd process\_state$
act103: $processes\_of\_partition := procs \lhd processes\_of\_partition$
act104: $processes\_of\_cores := procs \lhd processes\_of\_cores$
act201: $periodtype\_of\_process := procs \lhd periodtype\_of\_process$
end

Event set_partition_mode_to_warmstart ⟨ordinary⟩ $\widehat{=}$
extends partition_modetransition_to_warmstart
any
part
newm
procs
cores
where
grd001: $part \in PARTITIONS$
grd002: $newm \in PARTITION\_MODES$
grd101: $cores \in \mathbb{P}_1(CORES)$
grd102: $newm = PM\_WARM\_START$
grd103: $partition\_mode(part) = PM\_WARM\_START \lor partition\_mode(part) = PM\_NORMAL$
grd104: $procs = processes\_of\_partition^{-1}[\{part\}]$
grd105: $cores = Cores\_of\_Partition(part)$
grd106: $\forall core \cdot (core \in (Cores\_of\_Partition(part) \cap dom(finished\_core)) \Rightarrow finished\_core(core) = TRUE)$
then
act001: $partition\_mode(part) := newm$

act101: $processes := processes \setminus procs$
act102: $process\_state := procs \lhd process\_state$
act103: $processes\_of\_partition := procs \lhd processes\_of\_partition$
act104: $processes\_of\_cores := procs \lhd processes\_of\_cores$
act201: $periodtype\_of\_process := procs \lhd periodtype\_of\_process$

end

Event warmstart_partition_from_idle ⟨ordinary⟩ $\widehat{=}$
extends partition_modetransition_idle_to_warmstart

any
$part$
$newm$
$cores$

where
grd001: $part \in PARTITIONS$
grd002: $newm \in PARTITION\_MODES$
grd101: $cores \in \mathbb{P}_1(CORES)$
grd102: $newm = PM\_WARM\_START$
grd103: $partition\_mode(part) = PM\_IDLE$
grd104: $cores = Cores\_of\_Partition(part)$
grd105: $\forall core \cdot (core \in (Cores\_of\_Partition(part) \cap dom(finished\_core)) \Rightarrow finished\_core(core) = TRUE)$

then
act001: $partition\_mode(part) := newm$

end

Event coldstart_partition_from_idle ⟨ordinary⟩ $\widehat{=}$
extends partition_modetransition_idle_to_coldstart

any
$part$
$newm$
$cores$

where
grd001: $part \in PARTITIONS$
grd002: $newm \in PARTITION\_MODES$
grd101: $cores \in \mathbb{P}_1(CORES)$
grd102: $newm = PM\_COLD\_START$
grd103: $partition\_mode(part) = PM\_IDLE$
grd104: $cores = Cores\_of\_Partition(part)$
grd105: $\forall core \cdot (core \in (Cores\_of\_Partition(part) \cap dom(finished\_core)) \Rightarrow finished\_core(core) = TRUE)$

then
act001: $partition\_mode(part) := newm$

end

Event suspend_self ⟨ordinary⟩ $\widehat{=}$
refines process_state_transition

any
part
proc
newstate
core

where
grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state) \cap dom(periodtype\_of\_process)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd101: $partition\_mode(part) = PM\_NORMAL$
grd102: $process\_state(proc) = PS\_Running$

grd103: $newstate = PS\_Suspend$
grd104: $periodtype\_of\_process(proc) = APERIOD\_PROC$

then

act001: $process\_state(proc) := newstate$

end

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

refines process_state_transition

any

part
proc
newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state) \cap dom(periodtype\_of\_process)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd006: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \lor partition\_mode(part) = PM\_NORMAL$
grd101: $partition\_mode(part) = PM\_NORMAL \Rightarrow (process\_state(proc) = PS\_Ready \land newstate = PS\_Suspend) \lor (process\_state(proc) = PS\_Waiting \land newstate = PS\_WaitandSuspend)$
grd102: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \Rightarrow (process\_state(proc) = PS\_Waiting \land newstate = PS\_WaitandSuspend)$
grd103: $periodtype\_of\_process(proc) = APERIOD\_PROC$

then

act001: $process\_state(proc) := newstate$

end

Event resume ⟨ordinary⟩ $\widehat{=}$

refines process_state_transition

any

part
proc
newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state) \cap dom(periodtype\_of\_process)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd006: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \lor partition\_mode(part) = PM\_NORMAL$
grd101: $partition\_mode(part) = PM\_NORMAL \Rightarrow (process\_state(proc) = PS\_Suspend \land newstate = PS\_Ready) \lor (process\_state(proc) = PS\_WaitandSuspend \land newstate = PS\_Waiting)$
grd102: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \Rightarrow (process\_state(proc) = PS\_WaitandSuspend \land newstate = PS\_Waiting)$
grd103: $periodtype\_of\_process(proc) = APERIOD\_PROC$

then

act001: $process\_state(proc) := newstate$

end

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

refines process_state_transition

any

part
proc

newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd101: $partition\_mode(part) = PM\_NORMAL$
grd102: $process\_state(proc) = PS\_Running \land newstate = PS\_Dormant$

then

act001: $process\_state(proc) := newstate$

end

Event stop ⟨ordinary⟩ $\widehat{=}$

refines process_state_transition

any

part
proc
newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd006: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \lor partition\_mode(part) = PM\_NORMAL$
grd101: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \Rightarrow ((process\_state(proc) = PS\_Waiting \lor process\_state(proc) = PS\_WaitandSuspend) \land newstate = PS\_Dormant)$
grd102: $partition\_mode(part) = PM\_NORMAL \Rightarrow ((process\_state(proc) = PS\_Ready \lor process\_state(proc) = PS\_Waiting \lor process\_state(proc) = PS\_WaitandSuspend \lor process\_state(proc) = PS\_Suspend \lor process\_state(proc) = PS\_Faulted) \land newstate = PS\_Dormant)$

then

act001: $process\_state(proc) := newstate$

end

Event start ⟨ordinary⟩ $\widehat{=}$

refines process_state_transition

any

part
proc
newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state) \cap dom(periodtype\_of\_process)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd006: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \lor partition\_mode(part) = PM\_NORMAL$
grd101: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \Rightarrow (process\_state(proc) = PS\_Dormant \land newstate = PS\_Waiting)$
grd102: $partition\_mode(part) = PM\_NORMAL \Rightarrow (process\_state(proc) = PS\_Dormant \land ((periodtype\_of\_process(p$
$APERIOD\_PROC \Rightarrow newstate = PS\_Ready) \land (periodtype\_of\_process(proc) = PERIOD\_PROC \Rightarrow newstate = PS\_Waiting)))$

then

act001: $process\_state(proc) := newstate$

end

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

refines process_state_transition

any

part
proc
newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd006: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \lor partition\_mode(part) = PM\_NORMAL$
grd101: $partition\_mode(part) = PM\_COLD\_START \lor partition\_mode(part) = PM\_WARM\_START \Rightarrow (process\_state(proc) = PS\_Dormant \land newstate = PS\_Waiting)$
grd102: $partition\_mode(part) = PM\_NORMAL \Rightarrow (process\_state(proc) = PS\_Dormant \land newstate = PS\_Waiting)$

then

act001: $process\_state(proc) := newstate$

end

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

new!! running –> faulted

refines process_state_transition

any

part
proc
newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd101: $partition\_mode(part) = PM\_NORMAL$
grd102: $process\_state(proc) = PS\_Running \land newstate = PS\_Faulted$

then

act001: $process\_state(proc) := newstate$

end

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

refines process_state_transition

any

part
proc
newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd101: $partition\_mode(part) = PM\_NORMAL$
grd102: $process\_state(proc) = PS\_Running \land (newstate = PS\_Ready \lor newstate = PS\_Waiting)$

then

act001: $process\_state(proc) := newstate$

end

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

refines process_state_transition

any

part

proc

newstate

core

where

grd001: $part \in PARTITIONS$

grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$

grd003: $newstate \in PROCESS\_STATES$

grd004: $core \in CORES$

grd005: $processes\_of\_partition(proc) = part$

grd101: $partition\_mode(part) = PM\_NORMAL$

grd102: $process\_state(proc) = PS\_Running \wedge newstate = PS\_Waiting$

then

act001: $process\_state(proc) := newstate$

end

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

refines process_state_transition

any

part

proc

newstate

core

where

grd001: $part \in PARTITIONS$

grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$

grd003: $newstate \in PROCESS\_STATES$

grd004: $core \in CORES$

grd005: $processes\_of\_partition(proc) = part$

grd101: $partition\_mode(part) = PM\_NORMAL$

grd102: $process\_state(proc) = PS\_Running \wedge (newstate = PS\_Waiting \vee newstate = PS\_Dormant)$

then

act001: $process\_state(proc) := newstate$

end

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

refines process_state_transition

any

part

proc

newstate

core

where

grd001: $part \in PARTITIONS$

grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$

grd003: $newstate \in PROCESS\_STATES$

grd004: $core \in CORES$

grd005: $processes\_of\_partition(proc) = part$

grd101: $partition\_mode(part) = PM\_NORMAL$

grd102: $process\_state(proc) = PS\_Waiting \vee process\_state(proc) = PS\_Suspend \vee process\_state(proc) = PS\_WaitandSuspend$

grd103: $process\_state(proc) = PS\_Waiting \vee process\_state(proc) = PS\_Suspend \Rightarrow newstate = PS\_Ready$

grd104: $process\_state(proc) = PS\_WaitandSuspend \Rightarrow newstate = PS\_Suspend$

then

act001: $process\_state(proc) := newstate$

end

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

refines process_state_transition

any

part
proc
newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd101: $partition\_mode(part) = PM\_NORMAL$
grd102: $process\_state(proc) = PS\_Running$
grd103: $newstate = PS\_Waiting$

then

act001: $process\_state(proc) := newstate$

end

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

refines process_state_transition

any

part
proc
newstate
core

where

grd001: $part \in PARTITIONS$
grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state)$
grd003: $newstate \in PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $processes\_of\_partition(proc) = part$
grd101: $partition\_mode(part) = PM\_NORMAL$
grd102: $process\_state(proc) = PS\_Waiting \lor process\_state(proc) = PS\_WaitandSuspend$
grd103: $process\_state(proc) = PS\_Waiting \Rightarrow newstate = PS\_Ready$
grd104: $process\_state(proc) = PS\_WaitandSuspend \Rightarrow newstate = PS\_Suspend$

then

act001: $process\_state(proc) := newstate$

end

Event resource_become_available2 ⟨ordinary⟩ $\widehat{=}$

refines process_state_transition2

any

part
procs
newstates
core

where

grd001: $part \in PARTITIONS$
grd002: $procs \subseteq processes \cap dom(process\_state)$
grd003: $newstates \in procs \rightarrow PROCESS\_STATES$
grd004: $core \in CORES$
grd005: $procs \subseteq processes\_of\_partition^{-1}[\{part\}]$
grd101: $partition\_mode(part) = PM\_NORMAL$
grd102: $\forall proc \cdot (proc \in procs \Rightarrow process\_state(proc) = PS\_Waiting \lor process\_state(proc) = PS\_WaitandSuspend)$

grd103: $\forall proc \cdot (proc \in procs \wedge process\_state(proc) = PS\_Waiting \Rightarrow newstates(proc) = PS\_Ready)$

grd104: $\forall proc \cdot (proc \in procs \wedge process\_state(proc) = PS\_WaitandSuspend \Rightarrow newstates(proc) = PS\_Suspend)$

then

act001: $process\_state := process\_state \lhd\!\!+ newstates$

end

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

refines process_state_transition

any

part

proc

newstate

core

where

grd001: $part \in PARTITIONS$

grd002: $proc \in processes \cap dom(processes\_of\_partition) \cap dom(process\_state) \cap dom(periodtype\_of\_process)$

grd003: $newstate \in PROCESS\_STATES$

grd004: $core \in CORES$

grd005: $processes\_of\_partition(proc) = part$

grd101: $partition\_mode(part) = PM\_NORMAL$

grd102: $periodtype\_of\_process(proc) = PERIOD\_PROC$

grd103: $process\_state(proc) = PS\_Waiting$

grd104: $newstate = PS\_Ready$

then

act001: $process\_state(proc) := newstate$

end

END