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An Event-B Specification of Main @ Date: 6 Jun 2008 @ Time: 11:05:37 AM
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MACHINE Main

SEES Data

VARIABLES

buffer
read_pointer
write_pointer
tc_pool
tm_pool
executed
register_status
register_data
sent
last_op

INVARIANTS

inv1 : $buffer \in 0 \dots Buffer_size - 1 \rightarrow TC_DATA$
inv2 : $read_pointer \in 0 \dots Buffer_size - 1$
inv3 : $write_pointer \in 0 \dots Buffer_size - 1$
inv5 : $tc_pool \in \mathbb{P}(TC_DATA)$
inv6 : $tm_pool \in \mathbb{P}(TM_DATA)$
inv4 : $executed \in \mathbb{P}(TC_DATA)$
inv7 : $register_status \in 0 \dots 1$
inv8 : $register_data \in TM_DATA$
inv9 : $sent \in \mathbb{P}(TM_DATA)$
inv10 : $last_op \in OP_TYPE$

THEOREMS

thm1 : $\forall x. x \in \mathbb{N} \Rightarrow x \bmod Buffer_size \in 0 \dots Buffer_size - 1$

EVENTS

INITIALISATION

BEGIN

act1 : $buffer := 0 \dots Buffer_size - 1 \rightarrow TC_DATA$
act2 : $read_pointer := 0$
act3 : $write_pointer := 0$
act5 : $tc_pool := \emptyset$
act6 : $tm_pool := \emptyset$
act4 : $executed := \emptyset$
act7 : $register_status := 0$
act8 : $register_data \in TM_DATA$
act9 : $sent := \emptyset$
act10 : $last_op := READ$

END

EVENT Write_TC

ANY

```

    new_tc
WHERE
    grd1 : new_tc ∈ TC_DATA
    grd2 : (read_pointer ≠ write_pointer) ∨ (last_op = READ)
THEN
    act1 : buffer(write_pointer) := new_tc
    act2 : write_pointer := (write_pointer + 1) mod Buffer_size
    act3 : last_op := WRITE
END

```

EVENT Read_TC_success

```

WHEN
    grd1 : (read_pointer ≠ write_pointer) ∨ (last_op = WRITE)
    grd2 : Valid(buffer(read_pointer)) = TRUE
THEN
    act1 : tc_pool := tc_pool ∪ {buffer(read_pointer)}
    act3 : tm_pool := tm_pool ∪ {New_TM(1 ↦ 1 ↦ buffer(read_pointer))}
    act2 : read_pointer := (read_pointer + 1) mod Buffer_size
    act4 : last_op := READ
END

```

EVENT Read_TC_failure

```

WHEN
    grd1 : (read_pointer ≠ write_pointer) ∨ (last_op = WRITE)
    grd2 : Valid(buffer(read_pointer)) = FALSE
THEN
    act2 : tm_pool := tm_pool ∪ {New_TM(1 ↦ 2 ↦ buffer(read_pointer))}
    act1 : read_pointer := (read_pointer + 1) mod Buffer_size
    act3 : last_op := READ
END

```

EVENT Execute_TC_success

```

ANY
    tc
WHERE
    grd1 : tc ∈ tc_pool
    grd2 : ¬(tc ∈ executed)
THEN
    act1 : tm_pool := tm_pool ∪ {New_TM(1 ↦ 7 ↦ tc)}
    act2 : executed := executed ∪ {tc}
END

```

EVENT Execute_TC_failure

```

ANY
    tc
WHERE
    grd1 : tc ∈ tc_pool
    grd2 : ¬(tc ∈ executed)
THEN
    act1 : tm_pool := tm_pool ∪ {New_TM(1 ↦ 8 ↦ tc)}
    act2 : executed := executed ∪ {tc}
END

```

EVENT Write_TM_register

```

ANY
    tm
WHERE

```

```
    grd1 : tm ∈ tm_pool
    grd2 : ¬(tm ∈ sent)
    grd3 : register_status = 0
  THEN
    act1 : register_data := tm
    act2 : register_status := 1
    act3 : sent := sent ∪ {tm}
  END

EVENT Read_TM_register
  WHEN
    grd1 : register_status = 1
  THEN
    act1 : register_status := 0
  END

END
```