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**An Event-B Specification of Main @ Date: 16 May 2008 @ Time: 04:43:26 PM**  
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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* :  $last\_op \in OP\_TYPE$

**EVENTS**

**INITIALISATION**

**BEGIN**

*act1* :  $buffer : \in 0 \dots Buffer\_size - 1 \rightarrow TC\_DATA$   
*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* :  $new\_tc \in TC\_DATA$   
*grd2* :  $(read\_pointer \neq write\_pointer) \vee (last\_op = READ)$

**THEN**

*act1* :  $buffer(write\_pointer) := new\_tc$   
*act2* :  $write\_pointer := (write\_pointer + 1) \bmod Buffer\_size$   
*act3* :  $last\_op := WRITE$

**END**

**EVENT Read\_TC\_success**

**WHEN**

*grd1* :  $(read\_pointer \neq write\_pointer) \vee (last\_op = WRITE)$   
*grd2* :  $Valid(buffer(read\_pointer)) = TRUE$

**THEN**

*act1* :  $tc\_pool := tc\_pool \cup \{buffer(read\_pointer)\}$   
*act3* :  $tm\_pool := tm\_pool \cup \{New\_TM(1 \mapsto 1 \mapsto buffer(read\_pointer))\}$   
*act2* :  $read\_pointer := (read\_pointer + 1) \bmod Buffer\_size$   
*act4* :  $last\_op := READ$

**END**

**EVENT Read\_TC\_failure**

**WHEN**

*grd1* :  $(read\_pointer \neq write\_pointer) \vee (last\_op = WRITE)$   
*grd2* :  $Valid(buffer(read\_pointer)) = FALSE$

**THEN**

*act2* :  $tm\_pool := tm\_pool \cup \{New\_TM(1 \mapsto 2 \mapsto buffer(read\_pointer))\}$   
*act1* :  $read\_pointer := (read\_pointer + 1) \bmod Buffer\_size$   
*act3* :  $last\_op := READ$

**END**

**EVENT Execute\_TC\_success**

**ANY**

*tc*

**WHERE**

*grd1* :  $tc \in tc\_pool$   
*grd2* :  $\neg(tc \in executed)$

**THEN**

*act1* :  $tm\_pool := tm\_pool \cup \{New\_TM(1 \mapsto 7 \mapsto tc)\}$   
*act2* :  $executed := executed \cup \{tc\}$

**END**

**EVENT Execute\_TC\_failure**

**ANY**

*tc*

**WHERE**

*grd1* :  $tc \in tc\_pool$   
*grd2* :  $\neg(tc \in executed)$

**THEN**

*act1* :  $tm\_pool := tm\_pool \cup \{New\_TM(1 \mapsto 8 \mapsto tc)\}$   
*act2* :  $executed := executed \cup \{tc\}$

**END**

**EVENT Write\_TM\_register**

**ANY**

*tm*

**WHERE**

*grd1* :  $tm \in tm\_pool$   
*grd2* :  $\neg(tm \in sent)$   
*grd3* :  $register\_status = 0$

**THEN**

```
    act1 : register_data := tm  
    act2 : register_status := 1  
    act3 : sent := sent  $\cup$  {tm}  
END
```

**EVENT** Read\_TM\_register

```
  WHEN  
    grd1 : register_status = 1  
  THEN  
    act1 : register_status := 0  
  END
```

**END**