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**An Event-B Specification of Main @ Date: 15 May 2008 @ Time: 06:30:18 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*

**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* :  $sent \in \mathbb{P}(TM\_DATA)$

**EVENTS**

**INITIALISATION**

**BEGIN**

*act1* :  $buffer := 0 \dots Buffer\_size - 1 \times \{NIL\}$   
*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* :  $sent := \emptyset$

**END**

**EVENT** Write\_TC

**ANY**

*new\_tc*

**WHERE**

*grd1* :  $new\_tc \in TC\_DATA$   
*grd2* :  $buffer(write\_pointer) = NIL$   
*grd3* :  $\neg(new\_tc = NIL)$

**THEN**

*act1* :  $buffer(write\_pointer) := new\_tc$

*act2* : *write\_pointer* := (*write\_pointer* + 1) mod *Buffer\_size*  
**END**

**EVENT Read\_TC\_success**

**WHEN**

*grd1* :  $\neg(\text{read\_pointer} = \text{write\_pointer})$   
*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)*)}  
*act4* : *buffer(read\_pointer)* := *NIL*  
*act2* : *read\_pointer* := (*read\_pointer* + 1) mod *Buffer\_size*

**END**

**EVENT Read\_TC\_failure**

**WHEN**

*grd1* :  $\neg(\text{read\_pointer} = \text{write\_pointer})$   
*grd2* : *Valid(buffer(read\_pointer))* = *FALSE*

**THEN**

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

**END**

**EVENT Execute\_TC\_success**

**ANY**

*tc*

**WHERE**

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

**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* :  $\neg(\text{tc} \in \text{executed})$

**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* :  $\neg(\text{tm} \in \text{sent})$   
*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**