
MODULE *System*

EXTENDS *Naturals, RealTime*

CONSTANTS *Data, L*
 ASSUME $L \in \text{Nat} \wedge L > 0$

VARIABLES *terminals*

$NoData \triangleq \text{CHOOSE } d : d \notin Data$

$TypeInv \triangleq terminals \in [Nat \rightarrow [status : \{\text{"rdy"}, \text{"transmitting"}, \text{"waiting"}\},$
 $msg : Data \cup \{NoData\}]]$

$Bus \triangleq \text{INSTANCE } BusInterface$
 $Ts \triangleq \text{INSTANCE } Timers$

$Init \triangleq terminals = [Nat \rightarrow [status \rightarrow \text{"ready"}, msg \rightarrow NoData]]$

$Send(i) \triangleq$ $\wedge terminals[i].status = \text{"rdy"}$
 $\wedge \exists d \in data :$
 $\wedge Bus!Free$
 $\wedge Bus!Send(d)$
 $\wedge Ts!Set(i, L)$
 $\wedge Ts!Start(i)$
 $\wedge terminals' = [terminals \text{ EXCEPT } ![i].status = \text{"transmitting"}, ![i].msg = d]$

$NotFree(i) \triangleq$ $\wedge terminals[i].status = \text{"rdy"}$
 $\wedge \exists d \in data :$
 $\wedge \neg Bus!Free$
 $\wedge \text{LET } t = \text{CHOOSE } v : v \in Nat \wedge v > 0$
 IN $\wedge Ts!Set(i, t)$
 $\wedge Ts!Start(i)$
 $\wedge terminals' = [terminals \text{ EXCEPT } ![i].status = \text{"waiting"}, ![i].msg = d]$

$Wait(i) \triangleq$ $\wedge terminals[i].status = \text{"waiting"}$
 $\wedge Ts!Timeout(i)$
 $\wedge terminals' = [terminals \text{ EXCEPT } ![i].status = \text{"rdy"}]$

$Deliver(i) \triangleq$ $\wedge terminals[i].status = \text{"transmitting"}$
 $\wedge Ts!Timeout(i)$
 $\wedge Bus!Deliver$
 $\wedge terminals' = [terminals \text{ EXCEPT } ![i].status = \text{"rdy"}, ![i].msg = NoData]$

$Collision \triangleq$ $\wedge Bus!Collision$
 $\wedge terminals' = [Nat \rightarrow [status \rightarrow \text{"waiting"}, msg \rightarrow NoData]]$
 $\wedge Ts!$
