

MODULE <i>P2PBroadcastSpec</i>	
Spec for a reliable <i>p2p</i> broadcast.	
EXTENDS <i>Naturals</i> , <i>Sequences</i> , <i>FiniteSets</i>	
CONSTANT	
<i>Proc</i> ,	Set of processes
<i>Data</i>	
VARIABLES	
<i>sent</i> ,	All messages sent by all processors
<i>received_by</i>	All messages received. Function from message to receiving processors
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<i>vars</i> $\triangleq$ $\langle sent, received\_by \rangle$	
Message is a record including the sending proc and a data	
<i>Message</i> $\triangleq$ $[from : Proc, data : Data]$	
<i>Init</i> $\triangleq$ $\wedge sent = \{\}$ $\wedge received\_by = [m \in Message \mapsto \{\}]$	
<i>TypeOK</i> $\triangleq$ $\wedge sent \in \text{SUBSET } Message$ $\wedge received\_by \in [Message \rightarrow \text{SUBSET } Proc]$	
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Send message <i>m</i>	
<i>Send</i> ( <i>m</i> ) $\triangleq$ $\wedge m \notin sent$ Message is sent only once by the original sender $\wedge sent' = sent \cup \{m\}$ $\wedge \text{UNCHANGED } \langle received\_by \rangle$	
Receive a message <i>m</i> at proc <i>p</i>	
<i>Recv</i> ( <i>m</i> , <i>p</i> ) $\triangleq$ $\wedge m \in sent$ receive only if <i>m</i> was sent first $\wedge p \notin received\_by[m]$ receive only once $\wedge received\_by' = [received\_by \text{ EXCEPT } ![m] = @ \cup \{p\}]$ $\wedge \text{UNCHANGED } \langle sent \rangle$	
<i>Next</i> $\triangleq \exists m \in Message, p \in Proc : Send(m) \vee Recv(m, p)$	
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<i>Spec</i> $\triangleq Init \wedge \Box [Next]_{vars}$	
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<i>FairSpec</i> is <i>Spec</i> with the addition requirement that it keeps taking steps.	
<i>FairSpec</i> $\triangleq Spec \wedge WF_{vars}(Next)$	
Liveness is a temporal property that captures the property that if a message is sent, it is eventually received.	
The <i>WF Conjunction</i> rule is used here ref: Specifying Systems <i>p</i> 105	

$Liveness \triangleq \exists m \in Message, p \in Proc : WF_{vars}(Send(m) \vee Recv(m, p))$

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\\* Modification History

\\* Last modified Sat Apr 08 21:02:35 CEST 2023 by kulpreet

\\* Created Wed Apr 05 09:47:12 CEST 2023 by kulpreet