MODULE *AdaptiveBFT_Types*

EXTENDS *Naturals*, *Integers*, *Sequences*, *FiniteSets*

$$
\begin{aligned}
&\mathit{MsgType} \triangleq \{ \\
&\quad \text{“Minor”}, \text{“Full”}, \text{“TeProposal”}, \text{“ReProposal”}, \text{“VProposal”}, \\
&\quad \text{“NPMessage”}, \text{“SynMessage”}, \text{“Vote”} \\
&\}
\end{aligned}
$$

$$
\begin{aligned}
&\mathit{ConsensusPhase} \triangleq \{ \\
&\quad \text{“CollectMinor”}, \text{“Prepare”}, \text{“PreCommit”}, \text{“Commit”}, \text{“ViewChange”} \\
&\}
\end{aligned}
$$

$$\mathit{SchedulerStateType} \triangleq \{\text{“Monitor”}, \text{“Sample”}, \text{“Estimate”}, \text{“Explore”}, \text{“Deploy”}\}$$

$$\mathit{NetworkConditionType} \triangleq \{\text{“Stable”}, \text{“Unstable”}\}$$

$$\mathit{PriorityLevelType} \triangleq \{\text{“High”}, \text{“Mid”}, \text{“Low”}\}$$

$$\mathit{NilQC} \triangleq [\mathit{view} \mapsto -1]$$

$$\mathit{QC}(\mathit{view}) \triangleq [\mathit{view} \mapsto \mathit{view}]$$

$$\mathit{MinorMessage}(\mathit{view}, \mathit{abstract}, \mathit{qc}, \mathit{from}) \triangleq [\mathit{type} \mapsto \text{“Minor”}, \mathit{view} \mapsto \mathit{view}, \mathit{abstract} \mapsto \mathit{abstract}, \mathit{qc} \mapsto \mathit{qc}, \mathit{from} \mapsto \mathit{from}]$$

$$\mathit{FullMessage}(\mathit{view}, \mathit{txs}, \mathit{qc}, \mathit{parentView}, \mathit{from}) \triangleq [\mathit{type} \mapsto \text{“Full”}, \mathit{view} \mapsto \mathit{view}, \mathit{txs} \mapsto \mathit{txs}, \mathit{qc} \mapsto \mathit{qc}, \mathit{parentView} \mapsto \mathit{parentView}, \mathit{from} \mapsto \mathit{from}]$$

$$\mathit{TeProposal}(\mathit{view}, \mathit{alist}, \mathit{qc}, \mathit{parentView}, \mathit{from}) \triangleq [\mathit{type} \mapsto \text{“TeProposal”}, \mathit{view} \mapsto \mathit{view}, \mathit{alist} \mapsto \mathit{alist}, \mathit{qc} \mapsto \mathit{qc}, \mathit{parentView} \mapsto \mathit{parentView}, \mathit{from} \mapsto \mathit{from}]$$

$$\mathit{ReProposal}(\mathit{view}, \mathit{txs}, \mathit{qc}, \mathit{parentView}, \mathit{from}) \triangleq [\mathit{type} \mapsto \text{“ReProposal”}, \mathit{view} \mapsto \mathit{view}, \mathit{txs} \mapsto \mathit{txs}, \mathit{qc} \mapsto \mathit{qc}, \mathit{parentView} \mapsto \mathit{parentView}, \mathit{from} \mapsto \mathit{from}]$$

$$\mathit{VProposal}(\mathit{view}, \mathit{rv}, \mathit{qc}, \mathit{parentView}, \mathit{from}) \triangleq [\mathit{type} \mapsto \text{“VProposal”}, \mathit{view} \mapsto \mathit{view}, \mathit{rv} \mapsto \mathit{rv}, \mathit{qc} \mapsto \mathit{qc}, \mathit{parentView} \mapsto \mathit{parentView}, \mathit{from} \mapsto \mathit{from}]$$

$$
\begin{aligned}
&\mathit{NPMessage}(\mathit{view}, \mathit{leader}, \mathit{ticket}, \mathit{strikes}, \mathit{proof}, \mathit{qc}, \mathit{from}) \triangleq \\
&\quad [\\
&\qquad \mathit{type} \mapsto \text{“NPMessage”}, \\
&\qquad \mathit{view} \mapsto \mathit{view}, \\
&\qquad \mathit{leader} \mapsto \mathit{leader}, \\
&\qquad \mathit{ticket} \mapsto \mathit{ticket}, \\
&\qquad \mathit{strikes} \mapsto \mathit{strikes}, \\
&\qquad \mathit{proof} \mapsto \mathit{proof}, \\
&\qquad \mathit{qc} \mapsto \mathit{qc}, \\
&\qquad \mathit{from} \mapsto \mathit{from} \\
&\quad]
\end{aligned}
$$

$SynMessage(view,\ leader,\ rv,\ qc,\ from) \triangleq$
$[type \mapsto$ "SynMessage", $view \mapsto view,\ leader \mapsto leader,\ rv \mapsto rv,\ qc \mapsto qc,\ from \mapsto from]$

$VoteMessage(view,\ phase,\ voter) \triangleq$
$[type \mapsto$ "Vote", $view \mapsto view,\ phase \mapsto phase,\ voter \mapsto voter]$

$Block(view,\ txs,\ parentView,\ proposer) \triangleq$
$[view \mapsto view,\ txs \mapsto txs,\ parentView \mapsto parentView,\ proposer \mapsto proposer]$

$MinNat(a,\ b) \triangleq \text{IF } a \leq b \text{ THEN } a \text{ ELSE } b$

$SamePrefix(s1,\ s2) \triangleq$
LET $m \triangleq MinNat(Len(s1),\ Len(s2))$
IN $\forall\, i \in 1\,..\,m : s1[i] = s2[i]$