
MODULE *Configurations*

EXTENDS *Southbound*

INSTANCE *Naturals*

INSTANCE *FiniteSets*

LOCAL INSTANCE *TLC*

Status constants

CONSTANTS

ConfigurationInProgress,
ConfigurationComplete,
ConfigurationFailed

A record of per-target configurations

VARIABLE *configuration*

LOCAL *InitState* \triangleq

$[configuration \mapsto configuration,$
 $targets \mapsto target,$
 $masterships \mapsto mastership]$

LOCAL *NextState* \triangleq

$[configuration \mapsto configuration',$
 $targets \mapsto target',$
 $masterships \mapsto mastership']$

LOCAL *Trace* \triangleq INSTANCE *Trace* WITH

Module \leftarrow "Configurations",
InitState \leftarrow *InitState*,
NextState \leftarrow *NextState*

This section models the *Configuration* reconciler.

ReconcileConfiguration(*n*, *t*) \triangleq

$\wedge \vee \wedge Target[t].persistent$
 $\wedge configuration[t].state \neq ConfigurationComplete$
 $\wedge configuration' = [configuration \text{ EXCEPT } ![t].state = ConfigurationComplete]$
 $\wedge \text{UNCHANGED } \langle target \rangle$
 $\vee \wedge \neg Target[t].persistent$
 $\wedge \vee mastership[t].term > configuration[t].config.term$
 $\vee \wedge mastership[t].term = configuration[t].config.term$

$$\begin{aligned}
& \wedge \text{mastership}[t].\text{master} = \text{Nil} \\
& \wedge \text{configuration}' = [\text{configuration} \text{ EXCEPT } ![t].\text{config.term} = \text{mastership}[t].\text{term}, \\
& \hspace{15em} ![t].\text{state} = \text{ConfigurationInProgress}] \\
& \wedge \text{UNCHANGED } \langle \text{target} \rangle \\
& \vee \wedge \text{configuration}[t].\text{state} = \text{ConfigurationInProgress} \\
& \wedge \text{mastership}[t].\text{term} = \text{configuration}[t].\text{config.term} \\
& \wedge \text{mastership}[t].\text{master} = n \\
& \wedge \text{target}' = [\text{target} \text{ EXCEPT } ![t] = \text{configuration}[t].\text{target.values}] \\
& \wedge \text{configuration}' = [\text{configuration} \text{ EXCEPT } ![t].\text{target.term} = \text{mastership}[t].\text{term}, \\
& \hspace{15em} ![t].\text{state} = \text{ConfigurationComplete}] \\
& \wedge \text{UNCHANGED } \langle \text{mastership} \rangle
\end{aligned}$$

Formal specification, constraints, and theorems.

$$\begin{aligned}
& \text{InitConfiguration} \triangleq \\
& \wedge \text{configuration} = [t \in \text{DOMAIN } \text{Target} \mapsto \\
& \quad [\text{state} \mapsto \text{ConfigurationInProgress}, \\
& \quad \text{config} \mapsto \\
& \quad \quad [\text{index} \mapsto 0, \\
& \quad \quad \text{term} \mapsto 0, \\
& \quad \quad \text{values} \mapsto \\
& \quad \quad \quad [\text{path} \in \{\} \mapsto \\
& \quad \quad \quad \quad [\text{path} \mapsto \text{path}, \\
& \quad \quad \quad \quad \text{value} \mapsto \text{Nil}, \\
& \quad \quad \quad \quad \text{index} \mapsto 0, \\
& \quad \quad \quad \quad \text{deleted} \mapsto \text{FALSE}]]], \\
& \quad \text{proposal} \mapsto [\text{index} \mapsto 0], \\
& \quad \text{commit} \mapsto [\text{index} \mapsto 0], \\
& \quad \text{target} \mapsto \\
& \quad \quad [\text{index} \mapsto 0, \\
& \quad \quad \text{term} \mapsto 0, \\
& \quad \quad \text{values} \mapsto \\
& \quad \quad \quad [\text{path} \in \{\} \mapsto \\
& \quad \quad \quad \quad [\text{path} \mapsto \text{path}, \\
& \quad \quad \quad \quad \text{value} \mapsto \text{Nil}, \\
& \quad \quad \quad \quad \text{index} \mapsto 0, \\
& \quad \quad \quad \quad \text{deleted} \mapsto \text{FALSE}]]]]] \\
& \wedge \text{Trace!Init} \\
& \text{NextConfiguration} \triangleq \\
& \vee \exists n \in \text{Node} : \\
& \quad \exists t \in \text{DOMAIN } \text{configuration} : \\
& \quad \quad \text{Trace!Step}(\text{"Reconcile"}, \text{ReconcileConfiguration}(n, t), [\text{node} \mapsto n, \text{target} \mapsto t])
\end{aligned}$$

* Modification History
* Last modified Sun *Feb* 20 10:07:49 *PST* 2022 by *jordanhalterman*
* Created Sun *Feb* 20 10:06:55 *PST* 2022 by *jordanhalterman*