
MODULE *Configuration*

EXTENDS *Mastership*

INSTANCE *Naturals*

INSTANCE *FiniteSets*

LOCAL INSTANCE *TLC*

Status constants

CONSTANTS

ConfigurationInProgress,
ConfigurationComplete,
ConfigurationFailed

CONSTANT *TraceConfiguration*

A record of per-target configurations

VARIABLE *configuration*

LOCAL *InitState* \triangleq

[*configurations* \mapsto *configuration*,
targets \mapsto *target*,
masterships \mapsto *mastership*,
nodes \mapsto *node*]

LOCAL *NextState* \triangleq

[*configurations* \mapsto *configuration'*,
targets \mapsto *target'*,
masterships \mapsto *mastership'*,
nodes \mapsto *node'*]

LOCAL *Trace* \triangleq INSTANCE *Trace* WITH

Module \leftarrow "Configuration",
InitState \leftarrow *InitState*,
NextState \leftarrow *NextState*,
Enabled \leftarrow *TraceConfiguration*

This section models the *Configuration* reconciler.

ReconcileConfiguration(*n*) \triangleq

\wedge *mastership.master* = *n*
 $\wedge \vee \wedge$ *configuration.state* \neq *ConfigurationInProgress*

$$\begin{aligned}
& \wedge \text{configuration.applied.term} < \text{mastership.term} \\
& \wedge \text{configuration}' = [\text{configuration} \text{ EXCEPT } !.state = \text{ConfigurationInProgress}] \\
& \wedge \text{UNCHANGED } \langle \text{target} \rangle \\
\vee & \wedge \text{configuration.state} = \text{ConfigurationInProgress} \\
& \wedge \text{configuration.applied.term} < \text{mastership.term} \\
& \wedge \text{node}[n].\text{connected} \\
& \wedge \text{target.running} \\
& \wedge \text{target}' = [\text{target} \text{ EXCEPT } !.values = \text{configuration.applied.values}] \\
& \wedge \text{configuration}' = [\text{configuration} \text{ EXCEPT } !.applied.term = \text{mastership.term}, \\
& \hspace{15em} !.state = \text{ConfigurationComplete}] \\
& \wedge \text{UNCHANGED } \langle \text{mastership}, \text{node} \rangle
\end{aligned}$$

Formal specification, constraints, and theorems.

$$\begin{aligned}
\text{InitConfiguration} & \triangleq \\
& \wedge \text{configuration} = [\\
& \quad \text{state} \mapsto \text{ConfigurationInProgress}, \\
& \quad \text{committed} \mapsto [\\
& \quad \quad \text{index} \mapsto 0, \\
& \quad \quad \text{revision} \mapsto 0, \\
& \quad \quad \text{term} \mapsto 0, \\
& \quad \quad \text{values} \mapsto [\\
& \quad \quad \quad \text{path} \in \{\} \mapsto [\\
& \quad \quad \quad \quad \text{index} \mapsto 0, \\
& \quad \quad \quad \quad \text{value} \mapsto \text{Nil}]]], \\
& \quad \text{applied} \mapsto [\\
& \quad \quad \text{index} \mapsto 0, \\
& \quad \quad \text{revision} \mapsto 0, \\
& \quad \quad \text{term} \mapsto 0, \\
& \quad \quad \text{values} \mapsto [\\
& \quad \quad \quad \text{path} \in \{\} \mapsto [\\
& \quad \quad \quad \quad \text{index} \mapsto 0, \\
& \quad \quad \quad \quad \text{value} \mapsto \text{Nil}]]]] \\
& \wedge \text{Trace!Init} \\
\text{NextConfiguration} & \triangleq \\
& \vee \exists n \in \text{Nodes} : \\
& \quad \text{Trace!Step}(\text{ReconcileConfiguration}(n), [\text{node} \mapsto n])
\end{aligned}$$

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