

EXTENDS *Proposals*

INSTANCE *Naturals*

INSTANCE *FiniteSets*

INSTANCE *Sequences*

LOCAL INSTANCE *TLC*

This section models configuration changes and rollbacks. Changes are appended to the proposal log and processed asynchronously.

$$\begin{aligned} \text{Value}(s, t, p) &\triangleq \\ &\text{LET } \text{value} \triangleq \text{CHOOSE } v \in s : v.\text{target} = t \wedge v.\text{path} = p \\ &\text{IN} \\ &\quad [\text{value} \mapsto \text{value.value}, \\ &\quad \text{delete} \mapsto \text{value.delete}] \end{aligned}$$

$$\begin{aligned} \text{Paths}(s, t) &\triangleq \\ &[p \in \{v.\text{path} : v \in \{v \in s : v.\text{target} = t\}\} \mapsto \text{Value}(s, t, p)] \end{aligned}$$

$$\begin{aligned} \text{Changes}(s) &\triangleq \\ &[t \in \{v.\text{target} : v \in s\} \mapsto \text{Paths}(s, t)] \end{aligned}$$

$$\begin{aligned} \text{ValidValues}(t, p) &\triangleq \\ &\text{UNION } \{ \{ [\text{value} \mapsto v, \text{delete} \mapsto \text{FALSE}, \text{valid} \mapsto \text{TRUE}] : v \in \text{Target}[t].\text{values}[p] \}, \\ &\quad \{ [\text{value} \mapsto v, \text{delete} \mapsto \text{FALSE}, \text{valid} \mapsto \text{FALSE}] : v \in \text{Target}[t].\text{values}[p] \}, \\ &\quad \{ [\text{value} \mapsto \text{Nil}, \text{delete} \mapsto \text{TRUE}] \} \} \end{aligned}$$

$$\begin{aligned} \text{ValidPaths}(t) &\triangleq \\ &\text{UNION } \{ \{ v @ @ [\text{target} \mapsto t, \text{path} \mapsto p] : v \in \text{ValidValues}(t, p) \} : p \in \text{DOMAIN } \text{Target}[t].\text{values} \} \end{aligned}$$

The set of all valid sets of changes to all targets and their paths.

The set of possible changes is computed from the *Target* model value.

$$\begin{aligned} \text{ValidChanges}(t) &\triangleq \\ &\text{LET } \text{changeSets} \triangleq \{ s \in \text{SUBSET } \text{ValidPaths}(t) : \\ &\quad \wedge \forall p \in \text{DOMAIN } \text{Target}[t].\text{values} : \\ &\quad \wedge \text{Cardinality}(\{ v \in s : v.\text{target} = t \wedge v.\text{path} = p \}) \leq 1 \} \\ &\text{IN} \\ &\quad \{ c \in \{ \text{Changes}(s) : s \in \text{changeSets} \} : \text{DOMAIN } c \neq \{ \} \} \end{aligned}$$

Add change 'c' to the proposal log for target 't'

$$\begin{aligned} \text{RequestChange}(t, c) &\triangleq \\ &\text{LET } \text{index} \triangleq \text{Cardinality}(\text{DOMAIN } \text{proposal}[t]) \\ &\text{IN } \text{proposal}' = [\text{proposal} \text{ EXCEPT } ![t] = \text{proposal}[t] @ @] \end{aligned}$$

$$\begin{aligned}
(index :> [type &\mapsto ProposalChange, \\
&index \mapsto index, \\
&change \mapsto [index \mapsto index, \\
&\quad values \mapsto c], \\
&rollback \mapsto [index \mapsto 0], \\
&phase \mapsto ProposalInitialize, \\
&state \mapsto ProposalInProgress]))
\end{aligned}$$

Add a rollback of proposal 'i' to the proposal log for target 't'

$$\begin{aligned}
RequestRollback(t, i) &\triangleq \\
\text{LET } index &\triangleq Cardinality(\text{DOMAIN } proposal[t]) \\
\text{IN } proposal' &= [proposal \text{ EXCEPT } ![t] = proposal[t] @@ \\
&\quad (index :> [type \mapsto ProposalRollback, \\
&\quad index \mapsto index, \\
&\quad change \mapsto [index \mapsto 0], \\
&\quad rollback \mapsto [index \mapsto i], \\
&\quad phase \mapsto ProposalInitialize, \\
&\quad state \mapsto ProposalInProgress]))
\end{aligned}$$

$$\begin{aligned}
RequestSet &\triangleq \\
&\vee \exists t \in \text{DOMAIN } Target : \\
&\quad \exists c \in ValidChanges(t) : \\
&\quad \quad RequestChange(t, c) \\
&\vee \exists t \in \text{DOMAIN } proposal : \\
&\quad \exists i \in \text{DOMAIN } proposal[t] : \\
&\quad \quad RequestRollback(t, i)
\end{aligned}$$

Formal specification, constraints, and theorems.

$$InitNorthbound \triangleq \text{TRUE}$$

$$\begin{aligned}
NextNorthbound &\triangleq \\
&\vee RequestSet
\end{aligned}$$

\ * Modification History
\ * Last modified *Fri Apr 21 16:42:15 PDT 2023* by *jhalterm*
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