─────────────── MODULE *Southbound* ───────────────

INSTANCE *Naturals*

INSTANCE *FiniteSets*

LOCAL INSTANCE *TLC*

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An empty constant
CONSTANT *Nil*

The set of all nodes
CONSTANT *Node*

Target is the set of all targets and their possible paths and values.

Example:
  $Target \triangleq$
    $[target1 \mapsto$
      $[persistent \mapsto$ FALSE, $values \mapsto$ [
        $path1 \mapsto \{$"$value1$", "$value2$"$\}$,
        $path2 \mapsto \{$"$value2$", "$value3$"$\}]]$,
     $target2 \mapsto$
      $[persistent \mapsto$ TRUE, $values \mapsto$ [
        $path2 \mapsto \{$"$value3$", "$value4$"$\}$,
        $path3 \mapsto \{$"$value4$", "$value5$"$\}]]]$

CONSTANT *Target*

A record of target states
VARIABLE *target*

A record of target *masterships*
VARIABLE *mastership*

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This section models *mastership* for the configuration service.

Mastership is used primarily to track the lifecycle of individual configuration targets and react to state changes on the southbound. Each target is assigned a master from the *Node* set, and masters can be unset when the target disconnects.

Set node n as the master for target t
$SetMaster(n, t) \triangleq$
    $\land\ mastership[t].master \neq n$
    $\land\ mastership' = [mastership$ EXCEPT $![t].term\ \ \ = mastership[t].term + 1,$
                                  $![t].master = n]$
    $\land$ UNCHANGED $\langle target \rangle$

$UnsetMaster(t) \triangleq$

$\land mastership[t].master \neq Nil$
$\land mastership' = [mastership \text{ EXCEPT } ![t].master = Nil]$
$\land \text{UNCHANGED } \langle target \rangle$

Formal specification, constraints, and theorems.

$Init \triangleq$
$\quad \land target = [t \in \text{DOMAIN } Target \mapsto$
$\qquad\qquad [path \in \{\} \mapsto$
$\qquad\qquad\quad [value \mapsto Nil]]]$
$\quad \land mastership = [t \in \text{DOMAIN } Target \mapsto [master \mapsto Nil, term \mapsto 0]]$

$Next \triangleq$
$\quad \lor \exists n \in Node :$
$\qquad \exists t \in \text{DOMAIN } Target :$
$\qquad\quad SetMaster(n, t)$
$\quad \lor \exists t \in \text{DOMAIN } Target :$
$\qquad UnsetMaster(t)$

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