
MODULE *SCTP*

LOCAL INSTANCE *Naturals*

LOCAL INSTANCE *Sequences*

LOCAL INSTANCE *FiniteSets*

LOCAL INSTANCE *TLC*

CONSTANT *Nil*

LOCAL $Min(s) \triangleq \text{CHOOSE } x \in s : \forall y \in s : x \geq y$

LOCAL $Max(s) \triangleq \text{CHOOSE } x \in s : \forall y \in s : x \leq y$

VARIABLE *conns*

$vars \triangleq \langle conns \rangle$

MODULE *Client*

CONSTANT *ID*

$Connect(dst) \triangleq$
 $\wedge dst \in \text{DOMAIN } conns$
 $\wedge \text{LET } maxId \triangleq Max(\{conns[dst][i].connId : i \in conns[dst]\})$
 $connId \triangleq Min(\{i \in 1 \dots (maxId + 1) : i \notin \text{DOMAIN } conns[dst]\})$
 $conn \triangleq [id \mapsto connId,$
 $\quad src \mapsto ID,$
 $\quad dst \mapsto dst,$
 $\quad req \mapsto \langle \rangle,$
 $\quad res \mapsto \langle \rangle]$
 $\text{IN } conns' = [conns \text{ EXCEPT } ![dst] = conns[dst] @ @ (connId :> conn)]$

$Disconnect(conn) \triangleq$
 $conns' = [conns \text{ EXCEPT } ![conn.dst] = [x \in \text{DOMAIN } conns[conn.dst] \setminus \{conn.id\} \mapsto conns[conn.dst][x]]]$

$Send(conn, msg) \triangleq$
 $conns' = [conns \text{ EXCEPT } ![conn.dst] = [$
 $\quad conns[conn.dst] \text{ EXCEPT } ![conn.id] = [$
 $\quad \quad conns[conn.dst][conn.id] \text{ EXCEPT } !.req = Append(conns[conn.dst][conn.id].req, msg)]]]$

$Receive(conn) \triangleq$
 $conns' = [conns \text{ EXCEPT } ![conn.dst] = [$
 $\quad conns[conn.dst] \text{ EXCEPT } ![conn.id] = [$
 $\quad \quad conns[conn.dst][conn.id] \text{ EXCEPT } !.res = SubSeq(conns[conn.dst][conn.id].res, 2, Len(conns[conn.dst][conn.id].res))]]]$

$$\begin{aligned}
\text{Reply}(\text{conn}, \text{msg}) &\triangleq \\
&\text{conns}' = [\text{conns}' \text{ EXCEPT } ![\text{conn}.dst] = [\\
&\quad \text{conns}'[\text{conn}.dst] \text{ EXCEPT } ![\text{conn}.id] = [\\
&\quad \quad \text{conns}'[\text{conn}.dst][\text{conn}.id] \text{ EXCEPT } !.\text{req} = \text{Append}(\text{conns}'[\text{conn}.dst][\text{conn}.id].\text{req}, \text{msg})]]]
\end{aligned}$$

$$\text{Connections} \triangleq \{ \text{conn} \in \text{UNION } \{ \{ \text{conns}[s][c] : c \in \text{DOMAIN } s \} : s \in \text{conns} \} : \text{conn}.src = ID \}$$

$$\text{Ready}(\text{conn}) \triangleq \text{Len}(\text{conn}.res) > 0$$

$$\text{Read}(\text{conn}) \triangleq \text{conn}.res[1]$$

$$\text{Client}(ID) \triangleq \text{INSTANCE } \text{Client}$$

MODULE *Server*

CONSTANT *ID*

$$\begin{aligned}
\text{Start} &\triangleq \\
&\wedge ID \notin \text{DOMAIN } \text{conns} \\
&\wedge \text{conns}' = \text{conns} @ @ (ID :> [\text{connId} \in \{ \} \mapsto [\text{connId} \mapsto \text{connId}]])
\end{aligned}$$

$$\begin{aligned}
\text{Stop} &\triangleq \\
&\wedge ID \in \text{DOMAIN } \text{conns} \\
&\wedge \text{conns}' = [c \in \{c \in \text{DOMAIN } \text{conns} : c \neq ID\} \mapsto \text{conns}[c]]
\end{aligned}$$

$$\begin{aligned}
\text{Send}(\text{conn}, \text{msg}) &\triangleq \\
&\wedge \text{Assert}(\text{conn}.dst = ID, \text{"Send on invalid connection"}) \\
&\wedge \text{conns}' = [\text{conns} \text{ EXCEPT } ![\text{conn}.dst] = [\\
&\quad \text{conns}[\text{conn}.dst] \text{ EXCEPT } ![\text{conn}.id] = [\\
&\quad \quad \text{conns}[\text{conn}.dst][\text{conn}.id] \text{ EXCEPT } !.\text{res} = \text{Append}(\text{conns}[\text{conn}.dst][\text{conn}.id].\text{res}, \text{msg})]]]
\end{aligned}$$

$$\begin{aligned}
\text{Receive}(\text{conn}) &\triangleq \\
&\wedge \text{Assert}(\text{conn}.dst = ID, \text{"Receive on invalid connection"}) \\
&\wedge \text{conns}' = [\text{conns} \text{ EXCEPT } ![\text{conn}.dst] = [\\
&\quad \text{conns}[\text{conn}.dst] \text{ EXCEPT } ![\text{conn}.id] = [\\
&\quad \quad \text{conns}[\text{conn}.dst][\text{conn}.id] \text{ EXCEPT } !.\text{res} = \text{SubSeq}(\text{conns}[\text{conn}.dst][\text{conn}.id].\text{req}, 2, \text{Len}
\end{aligned}$$

$$\begin{aligned}
\text{Reply}(\text{conn}, \text{msg}) &\triangleq \\
&\wedge \text{Assert}(\text{conn}.dst = ID, \text{"Reply on invalid connection"}) \\
&\wedge \text{conns}' = [\text{conns}' \text{ EXCEPT } ![\text{conn}.dst] = [\\
&\quad \text{conns}'[\text{conn}.dst] \text{ EXCEPT } ![\text{conn}.id] = [\\
&\quad \quad \text{conns}'[\text{conn}.dst][\text{conn}.id] \text{ EXCEPT } !.\text{req} = \text{Append}(\text{conns}'[\text{conn}.dst][\text{conn}.id].\text{res}, \text{msg})]]]
\end{aligned}$$

$$\text{Connections} \triangleq \{ \text{conn} \in \text{UNION } \{ \{ \text{conns}[s][c] : c \in \text{DOMAIN } s \} : s \in \text{conns} \} : \text{conn}.dst = ID \}$$

$$\text{Ready}(\text{conn}) \triangleq \text{Len}(\text{conn}.req) > 0$$

$$\text{Read}(\text{conn}) \triangleq \text{conn}.req[1]$$

$Server(ID) \triangleq \text{INSTANCE } Server$

$Init \triangleq$
 $\wedge conns = [id \in \{\} \mapsto [$
 $\quad connId \in \{\} \mapsto [connId \mapsto connId,$
 $\quad \quad \quad src \mapsto Nil,$
 $\quad \quad \quad dst \mapsto Nil,$
 $\quad \quad \quad req \mapsto \langle \rangle,$
 $\quad \quad \quad res \mapsto \langle \rangle]]]$

$Next \triangleq$
 $\vee \text{UNCHANGED } \langle conns \rangle$

\ * Modification History
\ * Last modified *Tue Sep 21 09:25:14 PDT 2021* by *jordanhalterman*
\ * Created *Mon Sep 13 12:21:16 PDT 2021* by *jordanhalterman*