

```

|----- MODULE gRPC -----|

LOCAL INSTANCE Naturals

LOCAL INSTANCE Sequences

LOCAL INSTANCE FiniteSets

LOCAL INSTANCE TLC

|-----|

CONSTANT Nil

|-----|

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

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

VARIABLE servers

VARIABLE conns

vars  $\triangleq$   $\langle servers, conns \rangle$ 

|----- MODULE Client -----|

Connect(c, s)  $\triangleq$ 
  LET  $maxId \triangleq Max(DOMAIN\ conns)$ 
     $connId \triangleq Min(\{i \in 1..(maxId + 1) : i \notin DOMAIN\ conns\})$ 
  IN  $conns' = conns\ @\@ (connId :> [id \mapsto connId, src \mapsto c, dst \mapsto s, req \mapsto \langle \rangle, res \mapsto \langle \rangle])$ 

Disconnect(c)  $\triangleq$ 
   $conns' = [x \in DOMAIN\ conns \setminus \{c.id\} \mapsto conns[x]]$ 

Send(c, m)  $\triangleq$ 
   $conns' = [conns\ EXCEPT\ ![c.id] = [conns[c.id]\ EXCEPT\ !.req = Append(conns[c.id].req, m)]$ 

Receive(c)  $\triangleq$ 
   $conns' = [conns\ EXCEPT\ ![c.id] = [conns[c.id]\ EXCEPT\ !.res = SubSeq(conns[c.id].res, 2, Len(conns[c.id].res))]$ 

Reply(c, m)  $\triangleq$ 
   $conns' = [conns'\ EXCEPT\ ![c.id] = [conns'[c.id]\ EXCEPT\ !.req = Append(conns'[c.id].req, m)]$ 

Handle(c, f(-, -))  $\triangleq Len(c.res) > 0 \wedge f(c, c.res[1])$ 

|-----|

Client  $\triangleq$  INSTANCE Client

Connections  $\triangleq \{conns[c] : c \in DOMAIN\ conns\}$ 

```

```

┌────────────────────────────────── MODULE Server ───────────────────────────────────┐
Start(s)  $\triangleq$ 
   $\wedge$  servers' = servers  $\cup$  {s}
   $\wedge$  UNCHANGED  $\langle$ conns $\rangle$ 

Stop(s)  $\triangleq$ 
   $\wedge$  servers' = servers  $\setminus$  {s}
   $\wedge$  conns' = [c  $\in$  DOMAIN conns  $\setminus$  {c  $\in$  conns : conns[c].dst  $\neq$  s}  $\mapsto$  conns[c]]

Send(c, m)  $\triangleq$ 
  conns' = [conns EXCEPT ![c.id] = [conns[c.id] EXCEPT !.res = Append(conns[c.id].res, m)]]

Receive(c)  $\triangleq$ 
  conns' = [conns EXCEPT ![c.id] = [conns[c.id] EXCEPT !.req = SubSeq(conns[c.id].req, 2, Len(conns[c.id].req)))]

Reply(c, m)  $\triangleq$ 
  conns' = [conns' EXCEPT ![c.id] = [conns'[c.id] EXCEPT !.res = Append(conns'[c.id].res, m)]]

Handle(c, f(-, -))  $\triangleq$  Len(c.req) > 0  $\wedge$  f(c, c.req[1])

┌────────────────────────────────────────────────────────────────────────────────────────┐
Servers  $\triangleq$  servers

Server  $\triangleq$  INSTANCE Server

Init  $\triangleq$ 
   $\wedge$  servers = {}
   $\wedge$  conns = [c  $\in$  {}]  $\mapsto$  [e2n  $\mapsto$  Nil, e2t  $\mapsto$  Nil, req  $\mapsto$   $\langle \rangle$ , res  $\mapsto$   $\langle \rangle$ ]

Next  $\triangleq$ 
   $\vee$   $\wedge$  FALSE
   $\wedge$  UNCHANGED  $\langle$ servers, conns $\rangle$ 

┌────────────────────────────────────────────────────────────────────────────────────────┐
\ * Modification History
\ * Last modified Mon Sep 13 12:24:10 PDT 2021 by jordanhalterman
\ * Created Mon Sep 13 12:23:50 PDT 2021 by jordanhalterman

```