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1  |----- MODULE CSComm -----|
   | Specification of communication in a Client-Server system model. |
5  | EXTENDS SequenceUtils |
6  |-----|
7  | CONSTANTS |
8  |   Client, the set of clients |
9  |   Server, the (unique) server |
10 |   Msg the set of messages |
11 |-----|
12 | VARIABLES |
13 |   cincoming, cincoming[c]: incoming channel at client c ∈ Client |
14 |   sincoming incoming channel at the Server |
15 |-----|
16 | TypeOK ≜ |
17 |   ∧ cincoming ∈ [Client → Seq(Msg)] |
18 |   ∧ sincoming ∈ Seq(Msg) |
19 |-----|
20 | Init ≜ |
21 |   ∧ cincoming = [c ∈ Client ↦ ⟨⟩] |
22 |   ∧ sincoming = ⟨⟩ |
23 |-----|
24 | EmptyChannel ≜ Init |
25 |-----|
26 | CSend(msg) ≜ A client sends a message msg to the Server. |
27 |   ∧ sincoming' = Append(sincoming, msg) |
28 |   ∧ UNCHANGED cincoming |
29 |-----|
30 | CRev(c) ≜ Client c receives and consumes a message from the Server. |
31 |   ∧ cincoming[c] ≠ ⟨⟩ |
32 |   ∧ cincoming' = [cincoming EXCEPT ![c] = Tail(@)] |
33 |   ∧ UNCHANGED sincoming |
34 |-----|
   | SRev/SSend below is often used as a subaction. No UNCHANGED in their definitions. |
38 | SRev ≜ The Server receives and consumes a message. |
39 |   ∧ sincoming ≠ ⟨⟩ |
40 |   ∧ sincoming' = Tail(sincoming) |
41 |-----|
42 | SSend(c, cmsg) ≜ The Server sends a message cmsg to each client other than c ∈ Client. |
43 |   ∧ cincoming' = [cl ∈ Client ↦ |
44 |     IF cl = c |
45 |     THEN cincoming[cl] |
46 |     ELSE Append(cincoming[cl], cmsg[cl])] |
47 |-----|
48 | SSendSame(c, msg) ≜ The Server broadcasts the message msg to all clients other than c ∈ Client. |
49 |   ∧ SSend(c, [cl ∈ Client ↦ msg]) |
50 |-----|

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