1 Deriving the Big Predicate

1.1 User Messages

$Q.P^O.mes(u, H)$
$Q.P^I.mes(u, H)$

P = port associated with channel end $from(H)$.
Q = port associated with channel end $to(H)$.
u = user field transferred in message.
H = data transfer half-channel.

mes output is in the alphabets of port P, the user process, and the message delivery system. *mes* input is in the alphabets of port Q, the user process, and the message delivery system.

1.2 Control Transfer Messages

The *ini* message is sent from a port process to its successor on termination of the former. It carries information needed to initialise the new port.

$P.S^O.ini(E, Q, u, H)$
$P.S^I.ini(E, Q, u, H)$

P = port formerly associated with channel end E.
S = successor port to P.
E = a channel end.
u = user field transferred in message.
H = access transfer half-channel.

ini output is in the alphabets of the user process, port P, and the message delivery system. *ini* input is in the alphabets of the user process, port S, and the message delivery system.

1.3 Port Repointing Messages

These messages are used during transfer of access to a channel end to inform the port associated with the *partner* channel end of the move. *quo* is an acknowledgement of a *chg* message.

$Q.P^O.chg(E,S,H)$
$Q.P^I.chg(E,S,H)$

P = port formerly associated with channel end E.
Q = port associated with partner of E.
S = successor port to P.
E = a channel end.
H = access transfer half-channel.

chg output is in the alphabets of the user process, port P, and the message delivery system. *chg* input is in the alphabets of port Q and the message delivery system.

$P.Q^O.quo(E,H)$
$P.Q^I.quo(E,H)$

P = port formerly associated with channel end E.
Q = port associated with partner of E.
E = a channel end.
H = access transfer half-channel.

quo output is in the alphabets of port Q, and the message delivery system. *quo* input is in the alphabets of port P and the message delivery system.

2 The Port Process

A port process may be "initialised" or "uninitialised". An initialised port is associated from the outset with some channel end $out(C)$ or $in(C)$. It has a partner initialised port, associated with the opposite channel end. An uninitialised port is bound to a channel end when it receives an *ini* message.

The alphabet of a port process P contains

Main control thread events

$$P._^I.ini\ _$$
$$_.P^O.ini\ _$$

Repointing events

$$P._^I.chg\ _$$
$$_.P^O.quo\ _$$
$$_.P^O.chg\ _$$
$$P._^I.quo\ _$$

Communication events

$$_.P^O.mes\ _$$
$$P._^I.mes\ _$$

The traces of P satisfy

1. The trace restricted to *mes*, *chg*, *quo* and *ini* output events, and *ini* inputs, is a prefix of some sequence from

   $$\mathcal{S}(\mathcal{E})$$

   if P is an initialised port, or

   $$\bigcup_E \{\langle P._^I.ini(E, _, _, _)\rangle\}\mathcal{S}(\mathcal{E})$$

   if it is uninitialised. Here

   $$\begin{aligned}\mathcal{S}(\mathcal{E}) \quad = \quad & \{\langle _.P^O.mes(_, from(E))\rangle, \langle _.P^O.quo\ _\rangle\}^N \\ & \{\langle _.P^O.chg(E, _, _),\ _.P^O.ini(E, _, _, _)\rangle\}\end{aligned}$$

2. The trace restricted to repointing events and *ini* output is a prefix of a sequence from

   $$\begin{aligned}&\{\langle P.Q^I.chg(F, _, _),\ Q.P^O.quo(F)\rangle\}^N \\ &\bigcup_{R,H}\{\langle _.P^O.chg(_, R, H)\rangle\}\ \{\langle P._^I.quo\ _\rangle, \langle P._^I.chg\ _\rangle\} \\ &\qquad \{\langle R.P^O.ini(_, _, _, H)\rangle\}\end{aligned}$$

3. In any event from

   $$Q.P^O.mes\ _$$
   $$Q.P^O.chg\ _$$
   $$_.P^O.ini(_, Q, _, _)$$

appearing in a trace, the Q field must have the same value as the Q field in the most recent preceding event of type

$$P._^{I}.chg(_, Q, _)$$

If there is no preceding chg input, the Q field must match either the initial value for the partner port (if P is initialised), or the value in the trace's (compulsory)

$$P._^{I}.ini(_, Q, _, _)$$

event (if it is uninitialised). These constraints impose that communications are always sent to the active partner port.

(These constraints describe a non-terminating process, because they don't restrict occurrences of message input.)