Telecommunication Standardisation Sector
Study Group 15
Experts Group for Video Coding and Systems in
ATM and Other Network Environments

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SOURCE : Stuart Dunstan, Siemens Ltd
TITLE : H.245 B-LCSE modifications and illustrations.
PURPOSE : Proposal

1. Introduction

This document;

- proposes modifications to the bi-directional logical channel signalling entity (B-LCSE) as currently described in H.245 [1]
- provides pictorial representations of Table 34/H.245 and Table 35/H.245
- illustrates B-LCSE use in the form used in Annex II, LBC-95-198 [2]
- illustrates B-LCSE use by showing the exchange of primitives and PDUs with time as the vertical axis.

2. Bi-directional logical channel signalling

Each of the master and slave bi-directional logical channel signalling entities (B-LCSE) use the services of an out-going LCSE and an in-coming LCSE. The B-LCSE simply specifies the order in which two uni-directional logical channels are established and released. This is done by specifying a mapping between B-LCSE primitives, and each of the out-going and in-coming LCSEs.

The specification is done using compound state transition tables, where the compound state is that of the out-going and in-coming LCSEs. The compound state changes as a result of issuing and receiving LCSE primitives.

3. B-LCSE modifications

The modifications to the slave B-LCSE Table 35/H.245 are as follows;

a) addition of O: ESTABLISH.request, in response to the event B-ESTABLISH.response, while in state 1/0. The next state becomes state 1/1. The omission of this transition was clearly an error (as noted by Mike Nilsson August 17 1995).

b) removal of actions in states 1/0, 1/1, 1/3, and 2/2 in response to the event, I: ESTABLISH.indication. Note 7 is also removed. These actions dealt with the occurrence of I: RELEASE.indication followed immediately by I: ESTABLISH.indication. The intermediate state was hidden. This has been changed so that the intermediate state of 0/0 or 0/3 is made explicit. Table 35/H.245 is simplified as a result. This results in no change in logic.

c) addition of state 2/0 to table. This is justified since state 2/0 is indicated as the next state due to the event O: RELEASE.indication in state 2/2. State 2/0 only occurs as the result of an outgoing LCSE protocol error.

d) editorial: addition of ":" to "Next state 1/3" in state 0/3, event I: ESTABLISH.indication.

The modifications to the master B-LCSE Table 34/H.245 are as follows;

a) removal of action in state 2/1 in response to the event, I: ESTABLISH.indication. This is for the same reason as given in b) above for the slave B-LCSE.

b) addition of "I: RELEASE.request Next state: 0/0" to event I: ESTABLISH.indication in state 0/0, since this event is valid for this state. The omission of this transition was an error.

c) insertion of table for state 1/1 into entry for event I: ESTABLISH.indication, state 0/1. Note 8 has been removed accordingly. This is justified since state 1/1 is an interim compound state which exists only between reception of the I: ESTABLISH.indication primitive, and transmission of either the I: ESTABLISH.response or I: RELEASE.request primitives. State 1/1 does not need to be made explicit. There are other interim compound states which are also not stated. (see following re Note 9).

d) editorial: addition of "I: " to "RELEASE.request" in state 0/3, event I: ESTABLISH.indication.

The following applies to both the master B-LCSE and slave B-LCSE tables;

a) a new Note 9 has been added, which states that where there are two LCSE primitives associated with a given event in a given compound state, then an interim compound state may exist. No events are serviced during this interim compound state. A refinement might be to actually state the interim compound state and where it occurs in the notes.

Modified versions of Table 34/H.245 Table 35/H.245 are shown Appendix I. The numbering of the table notes has been modified according to the above changes.

4. B-LCSE compound state diagrams

Compound state diagrams for each of the master and slave B-LCSEs are shown in Figure 1 and Figure 2 respectively, in Appendix II. These diagrams provide a pictorial view of Table 34/H.245 and Table 35/H.245. For each and every entry in Table 34 and Table 35, there is a corresponding line in Figure 1 and 2, respectively. These figures are for explanation only. It should be decided as to whether these figures are appropriate for inclusion in H.245.

5. B-LCSE examples - 1

Examples of B-LCSE use are shown in Appendix III The illustrations in Appendix III take the form of the diagrams used in Annex II, of LBC-95-198. They provide a simple representation of B-LCSE procedures.

6. B-LCSE examples - 2

More elaborate illustrations of examples of B-LCSE use are shown in Appendix IV. The illustrations in Appendix IV show exchanges of B-LCSE primitives, LCSE primitives, and LCSE PDUs, and the B_LCSE compound state.

It is proposed that Appendix IV be included as part of an informative annex in H.245, on H.245 procedures.

References:

[1] Draft Recommendation H.245, "Control protocol for multimedia communication", July 1995.

[2] LBC-95-198, "Explanation of logical channel signalling procedures in the H.310 terminal", 17 June 1995.

Appendix I

TABLE 34/H.245

B-LCSE compound state transition table - master

event	compound state: in-coming LCSE/out-going LCSE		
	0/0	0/1	0/3
B-ESTABLISH.request	O: ESTABLISH.request Next state: 0/1	- Note 1	O: ESTABLISH.request Next state: 0/1
B-RELEASE.request	-	O: RELEASE.request Next state: 0/3	-
I: ESTABLISH.indication Note 2	I: RELEASE.request Note 9 Next state: 0/0	I: ESTABLISH.response Note 9 Next state: 2/1 OR I: RELEASE.request Note 9 Next state: 0/1	I: RELEASE.request Note 9 Next state: 0/3
I: RELEASE.indication	-	-	-
O: ESTABLISH.confirm	-	-	-
O: RELEASE.confirm	-	-	B-RELEASE.confirm Note 5 Next state: 0/0
O: RELEASE.indication	-	B-RELEASE.indication Note 6 Next state: 0/0	-

TABLE 34/H.245

B-LCSE compound state transition table - master (concluded)

event	compound state: in-coming LCSE/out-going LCSE			
	2/0	2/1	2/2	2/3
B-ESTABLISH.request	O: ESTABLISH.request Next state: 2/1	-	-	O: ESTABLISH.request Next state: 2/1
B-RELEASE.request	-	O: RELEASE.request Next state: 2/3	O: RELEASE.request Next state: 2/3	-
I: ESTABLISH.indication	-	-	-	-
I: RELEASE.indication	Next state: 0/0	Next state: 0/1	-	Next state: 0/3
O: ESTABLISH.confirm	-	B-ESTABLISH.confirm Next state: 2/2	-	-
O: RELEASE.confirm	-	-	-	B-RELEASE.confirm Note 5 Next state: 2/0
O: RELEASE.indication	-	B-RELEASE.indication Note 6 Next state: 2/0	B-RELEASE.indication Note 7 Next state: 2/0	-

TABLE 35/H.245

B-LCSE compound state transition table - slave

event	compound state: in-coming LCSE/out-going LCSE		
	0/0	0/3	1/0
B-ESTABLISH.response	-	-	O: ESTABLISH.request Next state: 1/1
B-RELEASE.request	-	-	I: RELEASE.request Next state: 0/0
I: ESTABLISH.indication Note 8	B-ESTABLISH.indication Next state: 1/0	B-ESTABLISH.indication Next state: 1/3	-
I: RELEASE.indication	-	-	B-RELEASE.indication Next state: 0/0
O: ESTABLISH.confirm	-	-	-
O: RELEASE.confirm	-	Note 5. Next state: 0/0	-
O: RELEASE.indication	-	-	-

TABLE 35/H.245

B-LCSE compound state transition table - slave (concluded)

event	compound state: in-coming LCSE/out-going LCSE			
	1/1	1/3	2/0	2/2
B-ESTABLISH.response	-	O: ESTABLISH.request Next state: 1/1	-	-
B-RELEASE.request	-	I: RELEASE.request Next state: 0/3	-	-
I: ESTABLISH.indication Note 8	-	-	-	-
I: RELEASE.indication	O: RELEASE.request B-RELEASE.indication Note 9 Next state: 0/3	B-RELEASE.indication Next state: 0/3	Next state: 0/0	O: RELEASE.request B-RELEASE.indication Note 9 Next state: 0/3
O: ESTABLISH.confirm	I: ESTABLISH.response Note 9 Next state: 2/2	-	-	-
O: RELEASE.confirm	-	Next state: 1/0	-	-
O: RELEASE.indication	I: RELEASE.request B-RELEASE.indication Note 6, 9 Next state: 0/0	-	-	B-RELEASE.indication Note 7 Next state: 2/0

Notes:

1. "-" means that this event in this compound state is illegal.

2. LCSE primitives are qualified with "O:" or "I:" to indicate whether they relate to the in-coming LCSE or the out-going LCSE.

3. Compound states not shown are illegal. Some illegal compound states may however appear as interim compound states (see Note 9).

4. LCSE states:

In-coming:	0	RELEASED	Out-going:	0	RELEASED
	1	AWAITING ESTABLISHMENT		1	AWAITING ESTABLISHMENT
	2	ESTABLISHED		2	ESTABLISHED
				3	AWAITING RELEASE

5. There may be an ERROR.indication(D) primitive associated with the out-going RELEASE.confirm primitive in this state.

6. There may be an ERROR.indication(D) primitive associated with the out-going RELEASE.indication primitive in this state.

7. There is either an ERROR.indication(B) or an ERROR.indication(C) primitive associated with the out-going RELEASE.indication primitive in this state. A management signal should inform the peer B_LCSE that an error has occurred.

8. When an in-coming ESTABLISH.indication primitive is received at the slave B-LCSE, the slave side state variables are set as shown in Table 36.

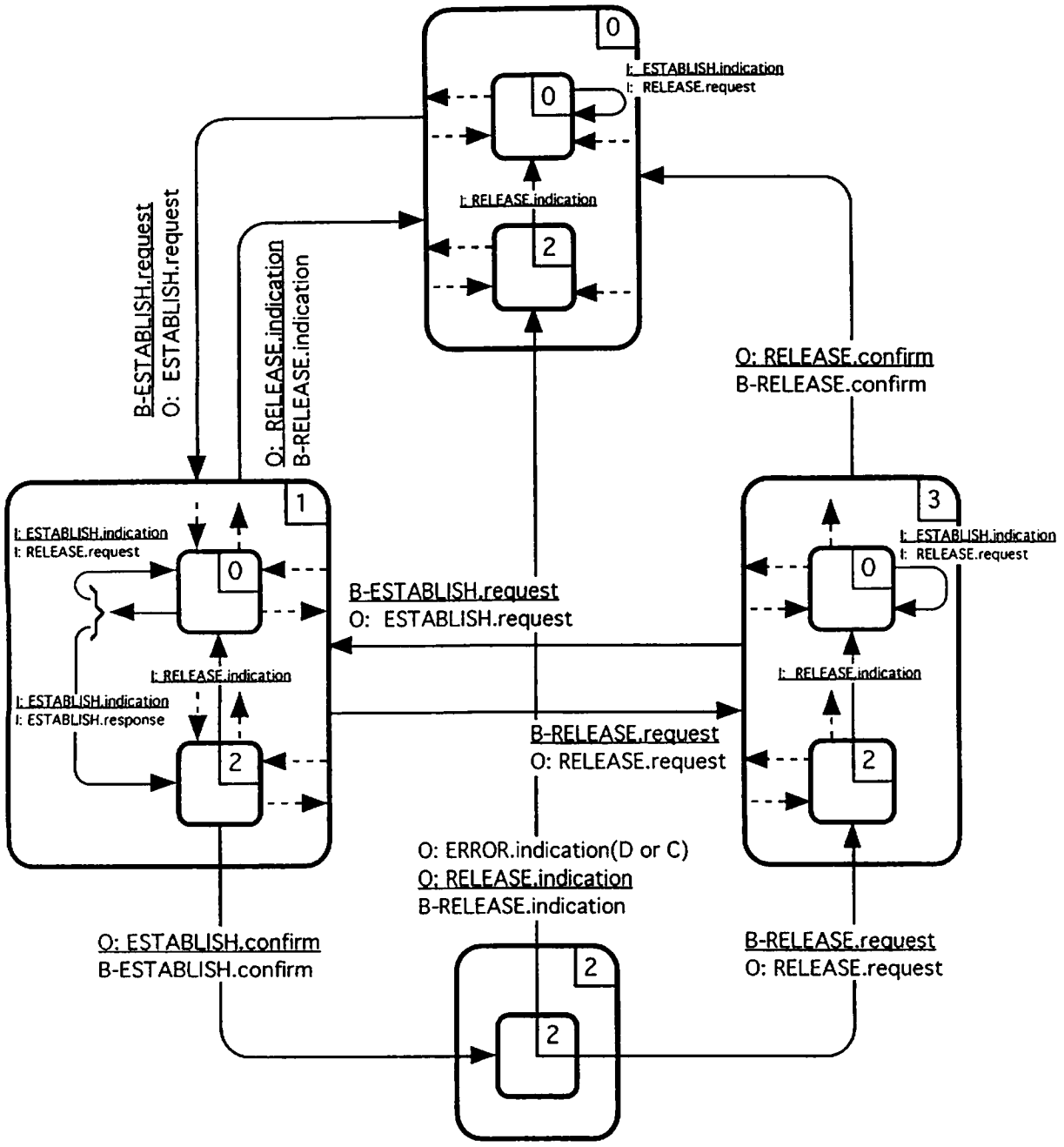
TABLE 36/H.245

Slave B-LCSE state variable values

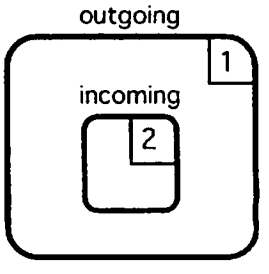
state variable	value
slave_R_PORTNUMBER	I: ESTABLISH.indication(R_PORTNUMBER)
slave_R_DATATYPE	I: ESTABLISH.indication(R_DATATYPE)
slave_R_LC_PARAM	I: ESTABLISH.indication(R_LC_PARAM

9. For this event in this compound state, an interim compound state exists between the time of reception of the LCSE event and the time of transmission of the LCSE response. No events are serviced during this interim state. Such an interim state exists when there are two LCSE primitives associated with one event in a given compound state.

Appendix II - B-LCSE compound state transition diagram



Key:



Notes: 1. For all outgoing state transitions, the incoming state remains unchanged.

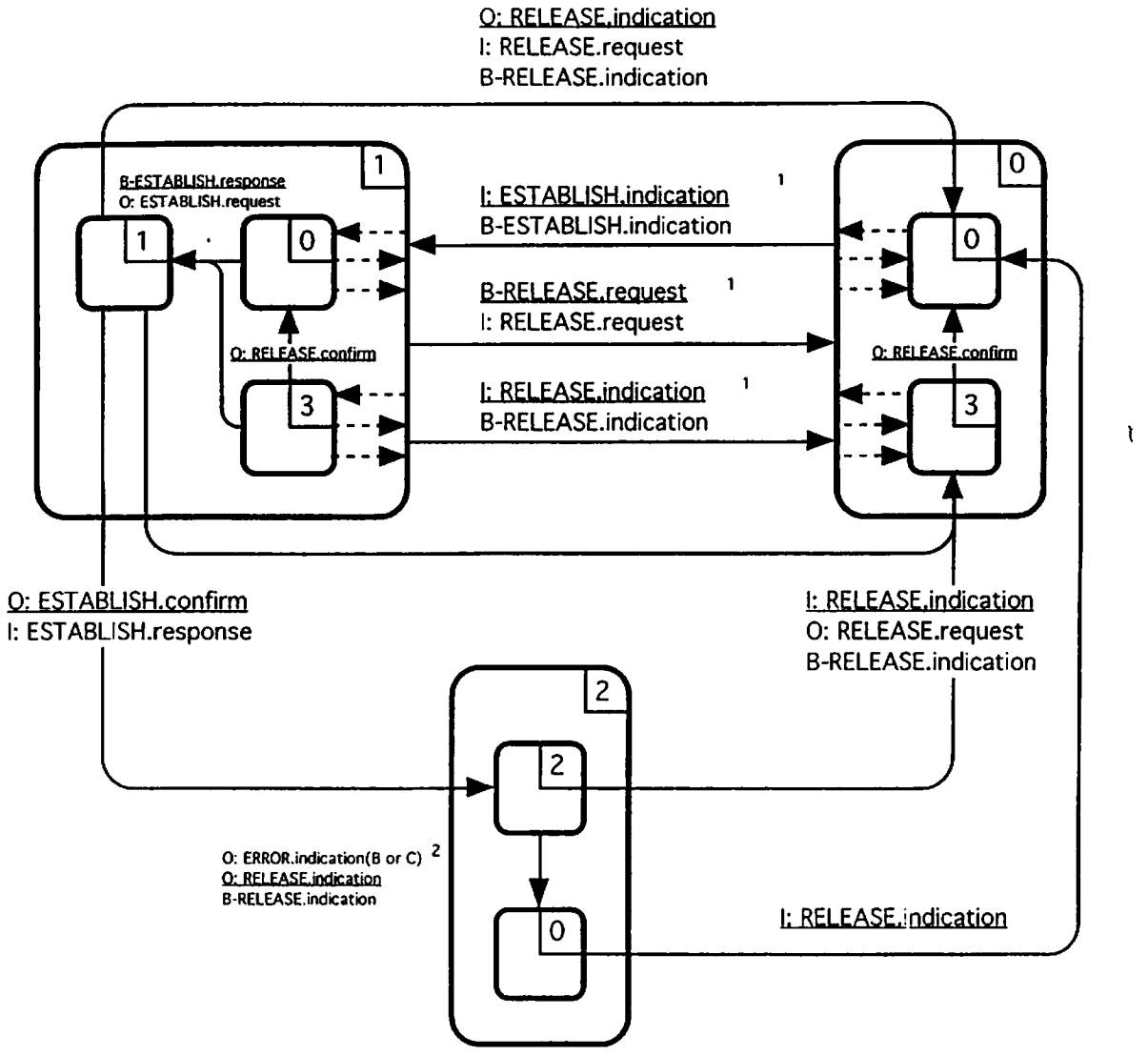
Primitive notation: *stimulus* / *response*

Incoming states:
0: RELEASED
1: AWAITING ESTABLISHMENT
2: ESTABLISHED

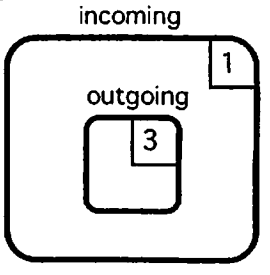
Outgoing states:
0: RELEASED
1: AWAITING ESTABLISHMENT
2: ESTABLISHED
3: AWAITING RELEASE

Figure 1

B-LCSE compound state diagram - master.



Key:



Notes: 1. For these state transitions, only the incoming state changes. The outgoing state remains unchanged.

2. An error in the slave B-LCSE outgoing LCSE was detected. A managment signal is required to inform the master B-LCSE to release the logical channel in the forward direction.

Primitive notation: *stimulus*
response

Incoming states: 0: RELEASED
1: AWAITING ESTABLISHMENT
2: ESTABLISHED

Outgoing states: 0: RELEASED
1: AWAITING ESTABLISHMENT
2: ESTABLISHED
3: AWAITING RELEASE

Figure 2

B-LCSE compound state diagram - slave.

Appendix III

B-LCSE examples - 1

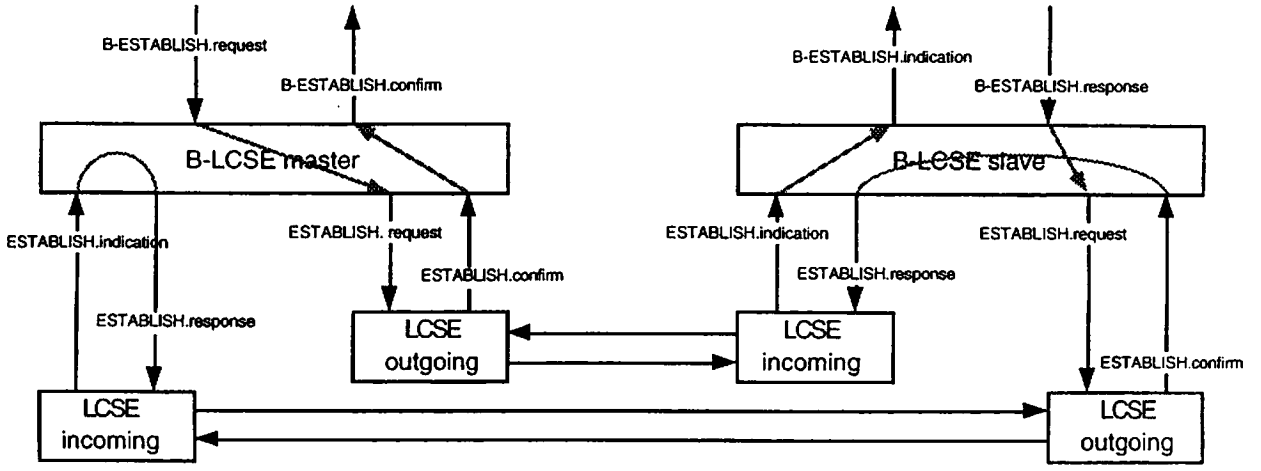


Figure III.1

Bi-directional logical channel establishment

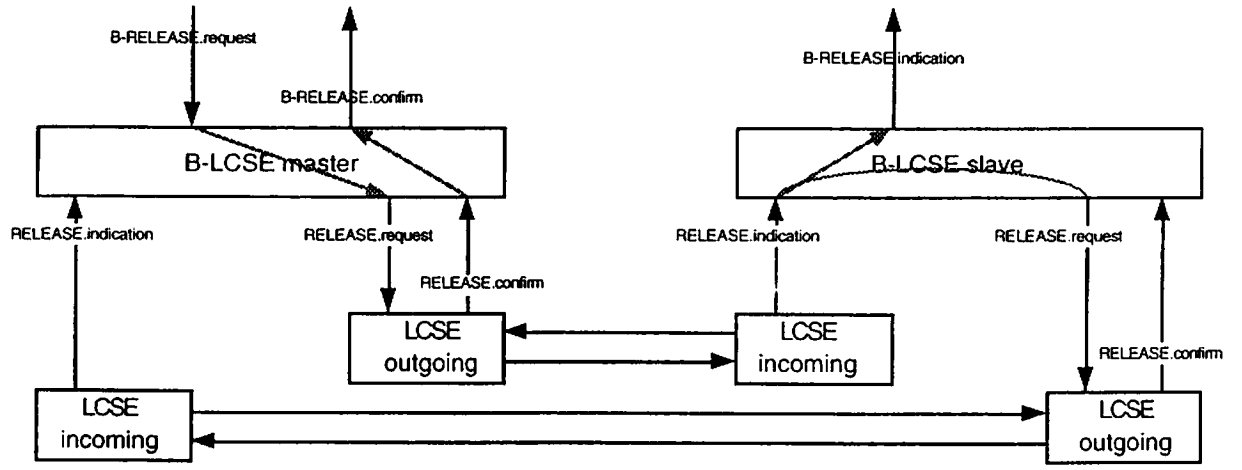


Figure III.2

Bi-directional logical channel release

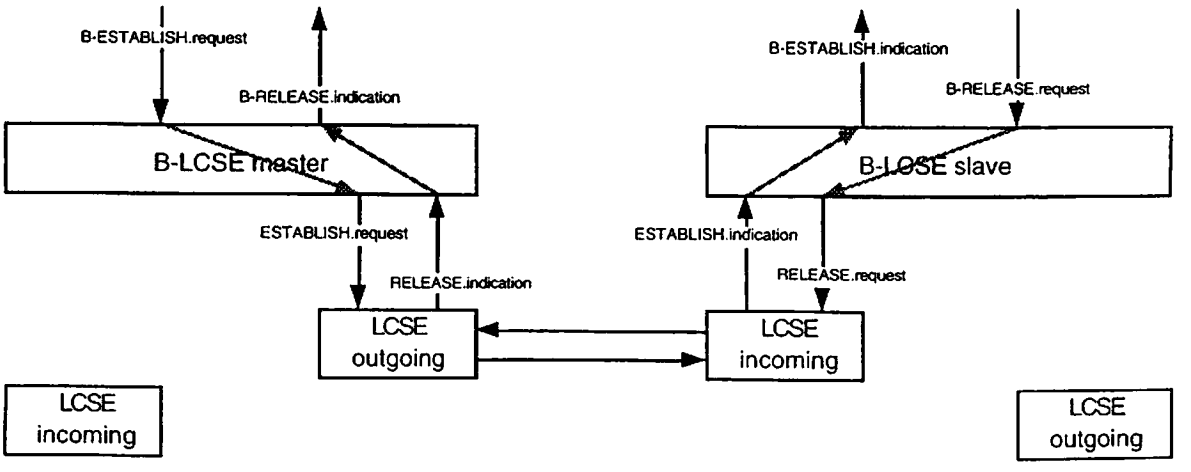


Figure III.3

Rejection by slave B-LCSE user to accept establishment of bi-directional logical channel.

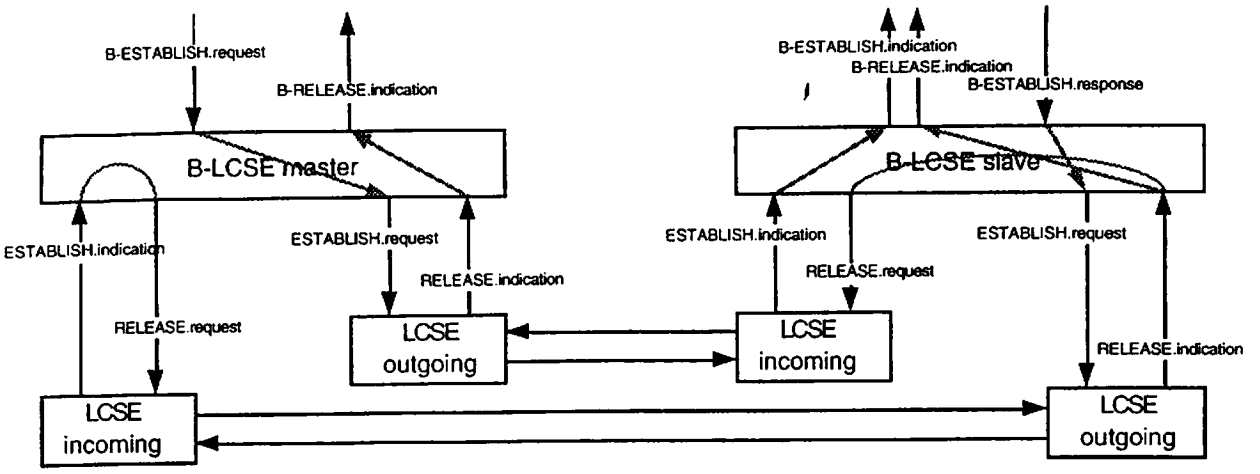


Figure III.4

Rejection at master B-LCSE incoming LCSE of bi-directional logical channel establishment.

Appendix IV

B-LCSE examples - 2

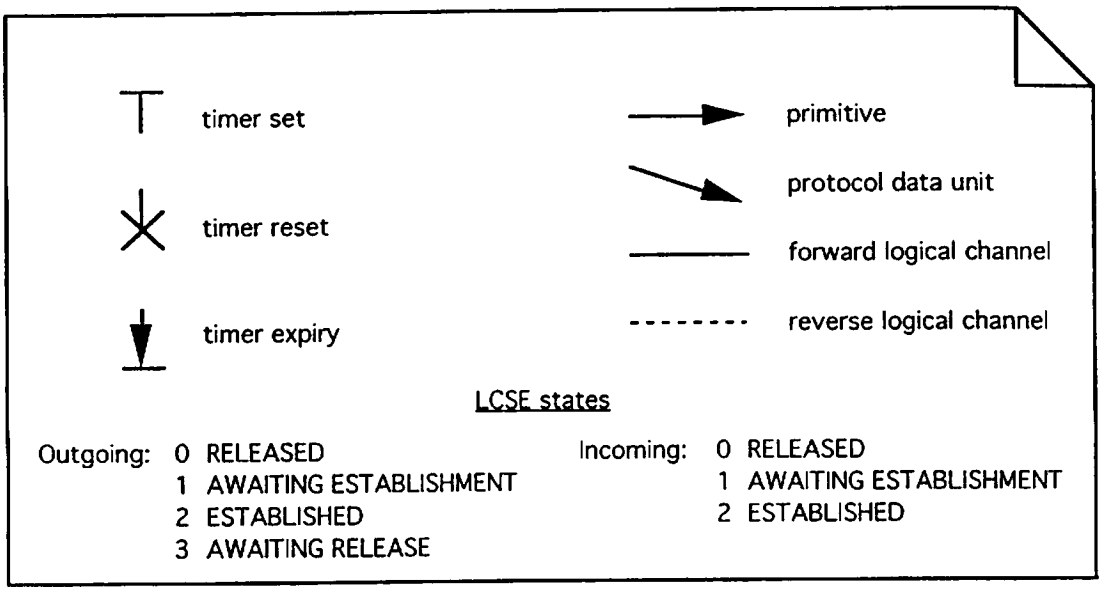


Figure IV.1

Key to B-LCSE examples

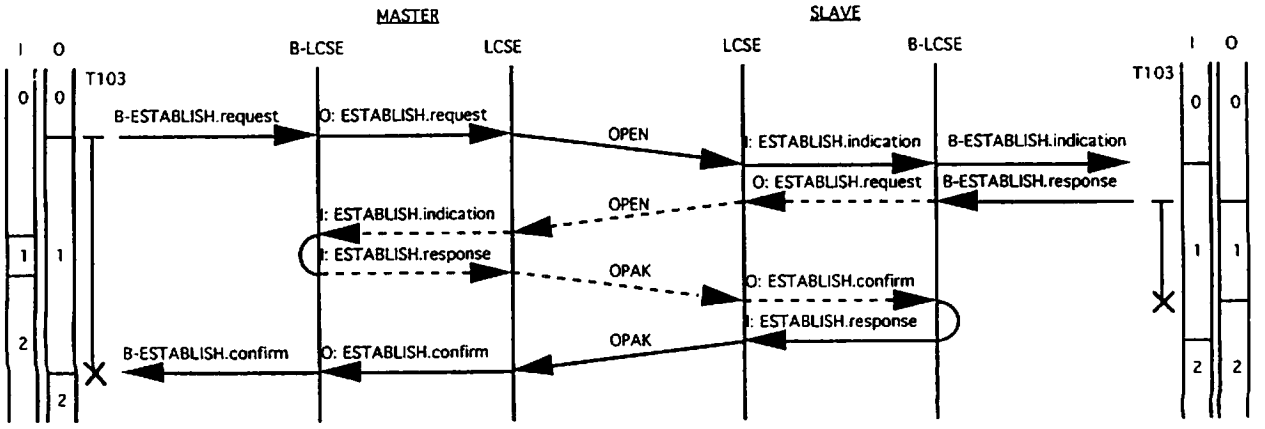


Figure IV.2

Bi-directional logical channel establishment

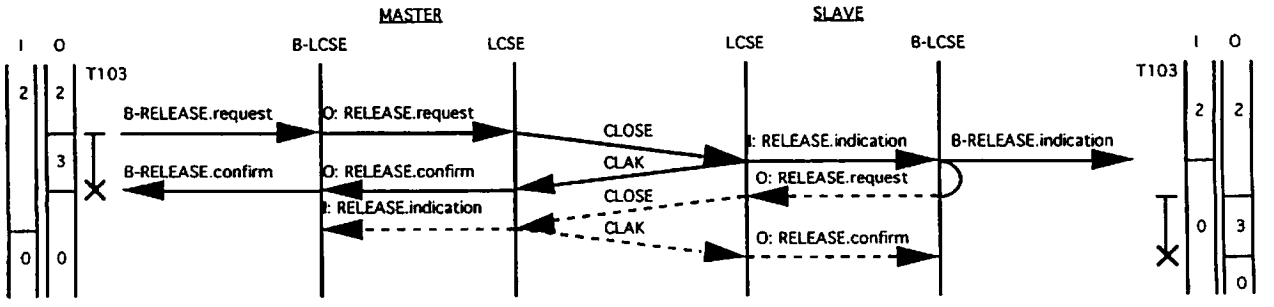


Figure IV.3

Bi-directional logical channel release

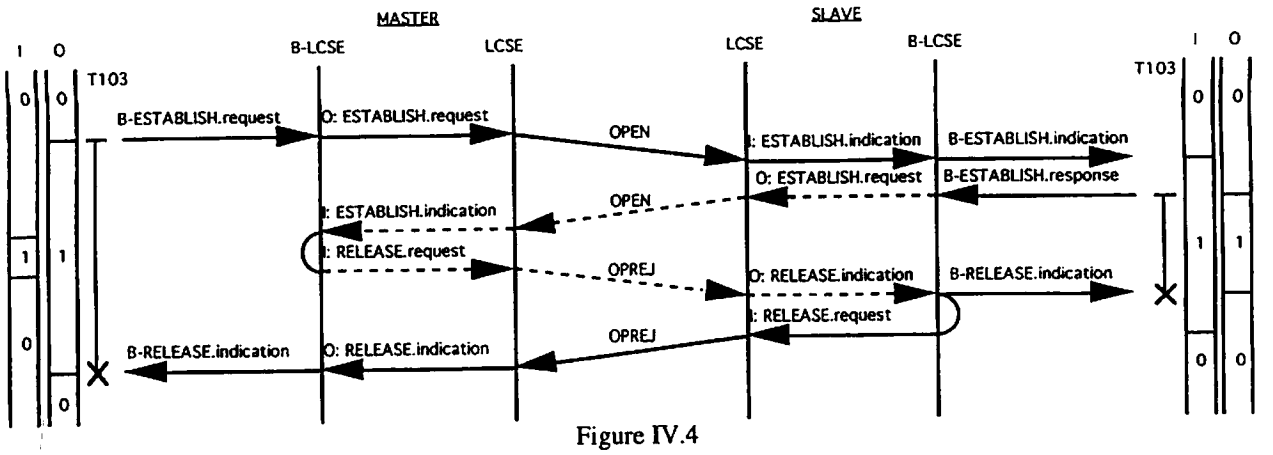


Figure IV.4

Bi-directional logical channel establishment with rejection at master B-LCSE incoming LCSE.

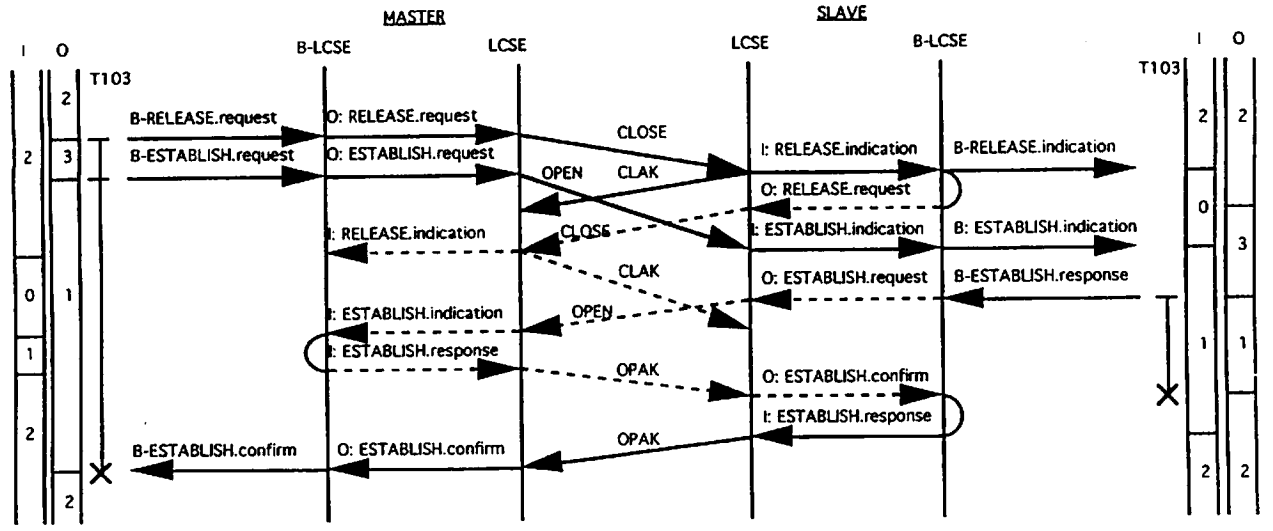


Figure IV.5

Bi-directional logical channel release followed immediatly by re establishment.

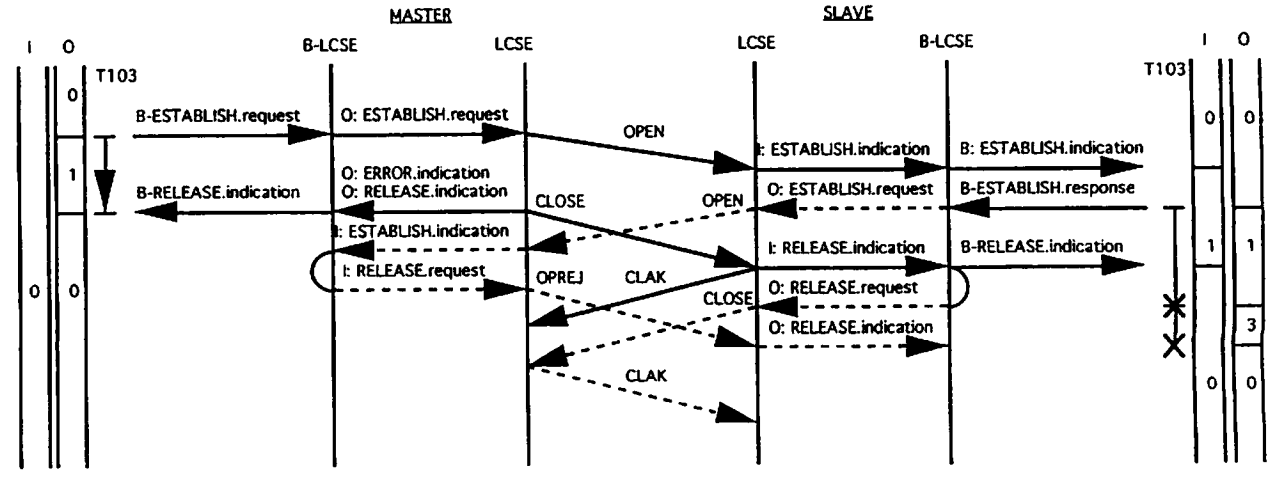


Figure IV.6

Bi-directional logical channel establishment request with timer T103 expiry at master B-LCSE outgoing LCSE, after transmission of slave B-LCSE outgoing OPEN PDU, but before reception of the OPEN PDU at the master B-LCSE incoming LCSE.

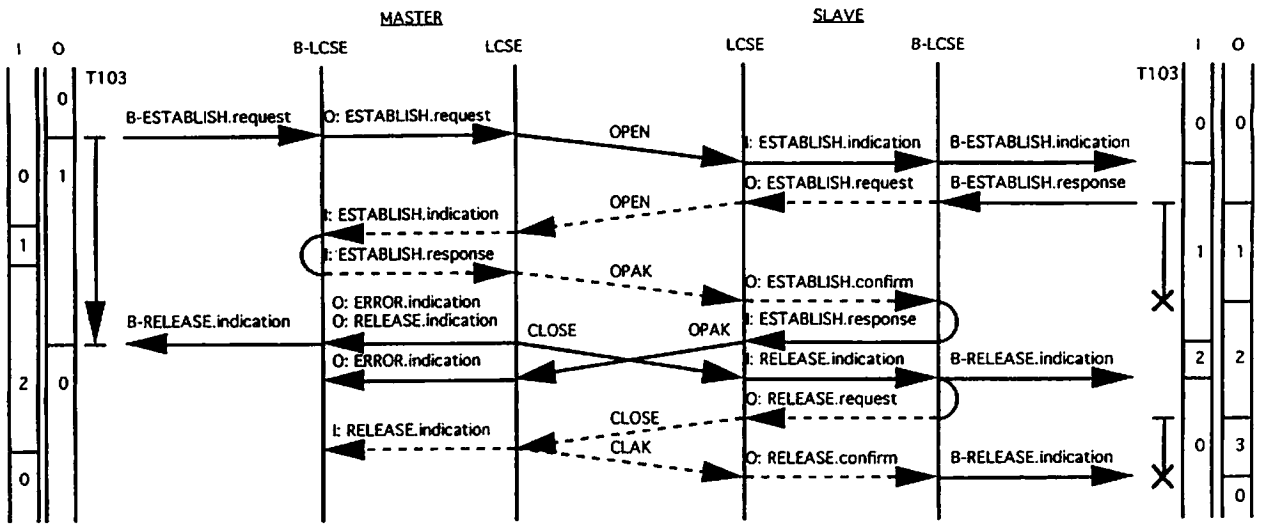


Figure IV.7

Bi-directional logical channel establishment request with timer T103 expiry at master B-LCSE outgoing LCSE, after transmission of slave B-LCSE incoming LCSE OPAK PDU, but before reception of the OPAK PDU at the master B-LCSE outgoing LCSE.

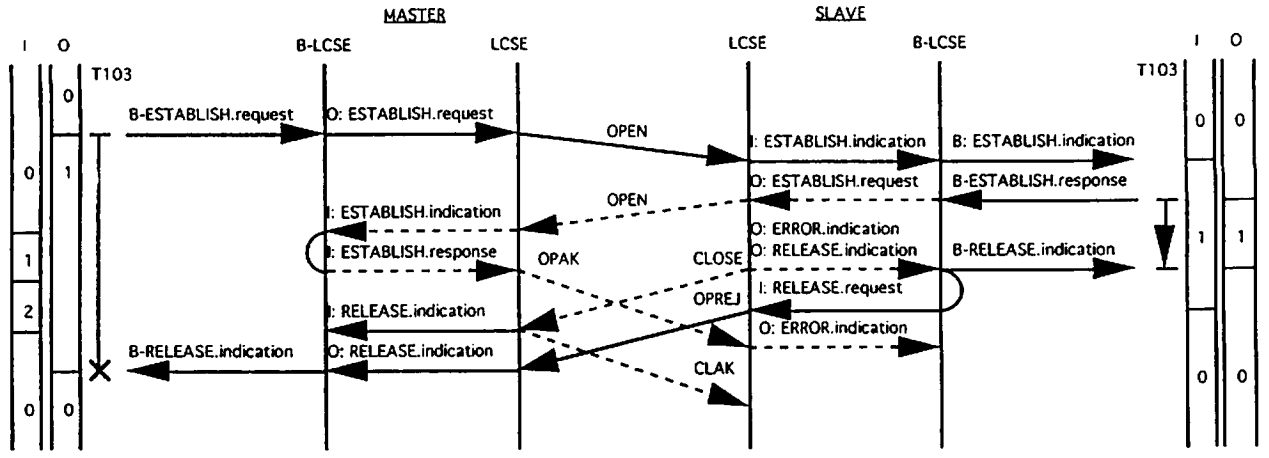


Figure IV.8

Bi-directional logical channel establishment request with timer T103 expiry at slave B-LCSE outgoing LCSE.

- end -