Title: Comments on IDRP (CD 10747)

Source: MITRE

We offer the following comments on IDRP:

1. In clause 8.6.3.2 (OPEN-RCVD State), the remote BIS may also send an OPEN PDU with acknowledgement to acknowledge receipt of the local BIS′s OPEN PDU. Therefore, the following changes should be made to clause 8.6.3.2:

> The local BIS state shall wait in OPEN-RCVD state for the remote BIS to send an OPEN PDU, KEEPALIVE or IDRP PDU to acknowledge receipt of the local BIS′s OPEN PDU. Upon receipt of an acknowledgement, the local BIS shall take the following actions:
>
> 1. If the OPEN PDU received from the remote BIS acknowledges the local BIS′s OPEN PDU, then:
>   - If the incoming OPEN PDU successfully passed local error checking, as defined in 8.19.2, the local system shall acknowledge the incoming OPEN PDU by sending a KEEPALIVE PDU. The local BIS shall change its state to ESTABLISHED.
>   - If the incoming OPEN PDU has any of the errors described in 8.19.6, the local system shall send the IDRP ERROR PDU (if required by the local error checking procedure) to acknowledge the receipt of the OPEN PDU. The local BIS shall then change its state to CLOSE-WAIT
> 2. If the OPEN PDU received from the remote BIS does not contain an acknowledgement of the OPEN PDU sent by the local system then:
>   - If the incoming OPEN PDU successfully passed local error checking, then the local BIS shall resend its own OPEN PDU with the same sequence number, but shall also include an acknowledgement of the remote BIS′s OPEN PDU.
>   - If the incoming OPEN PDU fails to pass the local error checking, the local system shall send the IDRP ERROR PDU (if required by the local error checking procedure) to acknowledge the receipt of the OPEN PDU. The IDRP ERROR PDU shall contain the same sequence number used for its previously issued OPEN PDU to that BIS, and shall contain an acknowledgement of the remote BIS′s OPEN PDU. The local BIS shall then change its state to CLOSE-WAIT.″

2. In clause 8.19, there are no error handling procedures given for CEASE, KEEPALIVE and RIB REFRESH PDUs. (Although the procedures are implied for KEEPALIVE and CEASE PDUs in clause 8.19.1) we suggest the following sections be added for clarity:

> 8.19.6 KEEPALIVE PDU Error Handling
>
> The KEEPALIVE PDU consists of only the BISPDU Header. If any of the error conditions provided in clause 8.19.6 are detected, the KEEPALIVE PDU shall be discarded without any further action.

8.19.7 CEASE PDU Error Handling

The CEASE PDU consists of only the BISPDU Header. If any of the error conditions provided in clause 8.19.6 are detected, the CEASE PDU shall be discarded without any further action.

8.19.8 RIB REFRESH PDU Handling

If any of the following error conditions are detected, the BIS shall issue an IDRP ERROR PDU indicating an ″FSM Error″, and shall then close the connection according to 8.6.4:

- Invalid OpCode not in Range 1 to 3
- Receipt of an OpCode 3 (RIB Refresh End) without prior receipt of OpCode 2 (Rib Refresh Start)
- Receipt of an unsupported RIB-Att in the Rib-Atts variable length field in the RIB FRESH PDU for a RIB Refresh Start OpCode

3. Add a new error code to the IDRP ERROR PDU (clause 7.4). Its name is ″FSM_Error″ and its code is 4. Also, add a new 1 octet long error subcode for this error: the first semi-octet should contain the type number of the BISPDU that generated the error condition, and the last semi-octet should contain the number of the state of the local BIS′s FSM when the error was detected (1=CLOSED, 2=OPEN_RCVD, 3=OPEN-SENT, 4=CLOSE-WAIT, and 5=ESTABLISHED). Adjust GDMO as appropriate.

4. In clauses 8.6.3.1, 8.6.3.2, 8.6.3.3, 8.6.3.4 the states (CLOSED, OPEN-SENT, OPEN-RCVD, ESTABLISHED and CLOSE-WAIT) describe the actions for receipt of expected PDU types. There is no description of the actions to be performed for receipt of unexpected BISPDU types for each state (and in which the BISPDU contains no internal errors). It is suggested that the following material should be added to clarify the expected actions:

8.6.2 CLOSED state

The BIS shall remain in the CLOSED state until it receives a Start Event. It shall then send an OPEN PDU to the remote BIS, and shall change its state to OPEN-SENT.

Any OPEN PDUs received while the BIS is in the CLOSED state shall be discarded, and the BIS shall remain in the CLOSED state.

If an IDRP ERROR PDU, UPDATE PDU, KEEPALIVE PDU, CEASE PDU, or RIB REFRESH PDU is received, the local BIS shall send an IDRP ERROR PDU to the remote BIS, indicating ″FSM Error″. The local BIS shall remain in the CLOSED state.

8.6.3.1 OPEN-SENT State

e) If the BIS receives a KEEPALIVE, UPDATE, or RIB REFRESH PDU, the BIS shall issue an IDRP ERROR PDU, indicating ″FSM Error″, and shall then enter the CLOSE-WAIT state.

f) If the BIS receives a CEASE PDU, the BIS shall change its state to CLOSE-WAIT.

g) If the BIS detects any OPEN PDU error conditions (see 8.19.2), it shall send the appropriate IDRP ERROR PDU to the remote BIS, and shall close the connection according to 8.6.4.

h) If the BIS detects any IDRP ERROR PDU error conditions (see 8.19.4), it shall send a CEASE PDU to the remote BIS, and shall then close the connection according to 8.6.4.

8.6.3.2 OPEN-RCVD State

- If the BIS receives an UPDATE or RIB REFRESH PDU, the BIS shall issue an IDRP ERROR PDU, indicating ″FSM Error″, and shall then enter the CLOSE-WAIT state.

-If the BIS receives a CEASE PDU, the BIS shall change its state to CLOSE-WAIT

-If the BIS detects any OPEN PDU error conditions (see 8.19.2), it shall send the appropriate IDRP ERROR PDU to the remote BIS, and shall then enter the CLOSE-WAIT state.

- If the BIS receives an OPEN PDU with correct acknowledgement, the BIS shall change its state to ESTABLISHED and send a KEEPALIVE PDU to the remote BIS.

- If the BIS receives an OPEN PDU with incorrect acknowledgement, the BIS shall resend its OPEN PDU with acknowledgement to the remote BIS.

- If the BIS detects any IDRP ERROR PDU error conditions (see 8.19.4), it shall send a CEASE PDU to the remote BIS, and shall then enter the CLOSE-WAIT state.

- If the BIS detects any KEEPALIVE PDU error conditions (see 8.19.6), it shall send a CEASE PDU to the remote BIS, and shall then enter the CLOSE-WAIT state.

- If the BIS detects any CEASE PDU error conditions (see 8.19.7), it shall send a CEASE PDU to the remote BIS, and shall then enter the CLOSE-WAIT state.

8.6.3.3 ESTABLISHED State

If the BIS receives a KEEPALIVE PDU, the BIS shall restart its Hold Timer as defined in clause 8.19.5.

If the BIS receives an UPDATE PDU, the BIS shall perform the actions provided in clause 8.15 to update the appropriate Adj-RIB-In with the new routing information, and shall restart its Hold Timer.

If the BIS receives a RIB REFRESH PDU, the BIS shall perform the actions provided in clause 8.10.3 to refresh the appropriate Adj-RIB-In for the local or remote BIS, and shall restart its Hold Timer.

-If the BIS detects any OPEN PDU error conditions (see 8.19.2), it shall send the appropriate IDRP ERROR PDU to the remote BIS, and shall then enter the CLOSE-WAIT state.

If the BIS receives an UPDATE PDU with internal errors, the BIS shall send an IDRP ERROR PDU to the remote BIS and shall change its state to CLOSE-WAIT.

- If the BIS detects any IDRP ERROR PDU error conditions (see 8.19.4), it shall send a CEASE PDU to the remote BIS, and shall then close the connection according to 8.6.4.

- If the BIS detects any KEEPALIVE PDU error conditions (see 8.19.6), it shall send a CEASE PDU to the remote BIS, and shall then enter the CLOSE-WAIT state.

- If the BIS detects any CEASE PDU error conditions (see 8.19.7), it shall send a CEASE PDU to the remote BIS, and shall then enter the CLOSE-WAIT state.

- If the BIS detects any RIB REFRESH PDU error conditions (see 8.19.8), it shall send an IDRP Error PDU indicating "FSM Error", and then enter the CLOSE-WAIT state.

8.6.3.4 CLOSE-WAIT State

If the BIS receives a OPEN, UPDATE, KEEPALIVE or RIB REFRESH PDU, the BIS shall ignore them and remain in the CLOSE-WAIT state.

- If the BIS detects any CEASE PDU error conditions (see 8.19.7), it shall send a CEASE PDU to the remote BIS, and shall then enter the CLOSE-WAIT state.

- If the BIS detects any IDRP ERROR PDU error conditions (see 8.19.4), it shall send a CEASE PDU to the remote BIS, and shall then close the connection according to 8.6.4.

5. As an alternative (or a complement) to the text presented in the previous comments, CD 10747 could add a table which succinctly presented the effects that receipt of inbound BISPDUs has on the FSMs. We offer Table 1 on page 6 for consideration.

6. The effects that various events have on the FSMs are described in CD 10747, but these descriptions are scattered throughout the document. Clarity can be improved if there is a single section which collects this information. The following informative text is suggested:

8.6.5 Event Effects on FSM

System generated events and timer expiration events may effect the state of a connection. Upon receipt of the following events, the following actions occur:

a. Start-Event: As defined in clause 8.6.3, upon delivery of a Start-Event, an OPEN PDU is sent to the remote BIS and the state changes to OPEN-SENT.

b. Stop-Event: As defined in clause 8.6.3.1, 8.6.3.2, 8.6.3.3 and 8.6.3.4, upon delivery of a Stop-Event for a BIS-BIS connection, the local BIS sends a CEASE PDU to the remote BIS, and enters the CLOSE-WAIT State.

c. CLOSE-WAIT Timer Expiration Event: An connection remains in the CLOSE-WAIT state for a given amount of time, and then returns to the CLOSED State. When a Close-Wait Timer expires, a Close-Wait Timeout Event occurs, and the connection returns to the CLOSED State.

d. Hold Timer Expiration Event: As defined in clause 8.19.5, if a system does not receive successive KEEPALIVE or UPDATE PDUs within the period specified in the Hold Time field of the OPEN PDU, then an IDRP ERROR PDU with error code Hold_Timer_Expired is sent to the remote BIS.

e. MinRouteSelectionInterval Timer Expiration Event: As defined in clause 8.16.3.1, the architectural constant MinRouteSelectionInterval determines the minimum amount of time that must elapse between advertisements of preferable routes received by a given BIS from systems located in other routing domains. If a BIS has selected new routes based on updates from BISs in adjacent RDs, but have not yet advertised them because this interval has not yet elapsed, the receipt of routes from other BISs in its own RD forces the MinRouteSelectionInterval timer to expire, and triggers a new selection process that will be based on both updates from BISs in the same RD and in adjacent RDs. No state changes occur as a result of this event.

f. MinRDOriginationInterval Timer Expiration Event: As defined in clause 8.16.3.2, the architectural constant MinRDOriginationInterval determines the minimum amount of time that must elapse between successive advertisements of UPDATE PDUs that report changes within the advertising BIS's own routing domain. No state changes occur as a result of this event.

7. In clause 8.12.2, some additional rules can be generated for permissible sets of Distinguishing Attributes for RIB-Atts. Please add the following additional rules:

A permissible set of distinguishing attributes is defined to be a set that can be derived from information that can be validly encoded in the header of an ISO 8473 NPDU, using the mappings described in 9.2. Therefore:

1. A single RIB-Atts may include either the SOURCE SPECIFIC SECURITY attribute or the DESTINATION SPECIFIC SECURITY attribute (but not both).
2. Only one of the following set of distinguishing attributes {Residual Error Probability, Transit Delay, Expense, Capacity, Source Specific QOS, Destination Specific QOS} may be contained in a given RIB-Att.

   Note: The QOS maintenance parameter in the NPDU maps into a single NPDU-Derived Attribute in the set {Transit Delay, Expense, Residual Error, Capacity, Source Specific QOS, Destination Specific QOS}. (See clause 9.4 in CD 10747)
3. A single RIB-Atts may include the Priority Distinguishing Attribute.

   Note: The Priority attribute is mapped from the 8473 priority parameter in the NPDU.
4. A single RIB-Atts may not include any instance of equivalent distinguishing attributes. (Two distinguishing attributes are equivalent if they are both type specific and have the same type or they are both type-value specific and have the same type and same value.)

Table 1. Effect of Received BISPDUs on IDRP FSM

STATE → / **Received BISPDU ↓**	**CLOSED**	**OPEN-RCVD**	**OPEN-SENT**	**CLOSE-WAIT**	**ESTABLISHED**
OPEN	S=CLOSED A=none	If ACK is correct, S=ESTABLISHED A=send KEEPALIVE If ACK is incorrect, S=OPEN-RCVD, A=send OPEN PDU	If ACK is correct, S=ESTABLISHED A=send KEEPALIVE If ACK is incorrect, S=OPEN-RCVD A=send OPEN PDU	S=CLOSE-WAIT A=FSM Error, 8.6.4	S=ESTABLISHED A=none
UPDATE	S=CLOSED A=FSM Error, 8.6.4	S=CLOSE-WAIT A=FSM Error, 8.6.4	S=CLOSE-WAIT A=FSM Error, 8.6.4	S=CLOSE-WAIT A=none	S=ESTABLISHED A=8.15
IDRP ERROR	S=CLOSED A=FSM Error, 8.6.4	S=CLOSE-WAIT A=Send CEASE PDU	S=CLOSE-WAIT A=Send CEASE PDU, 8.6.4	S=CLOSED A=Send CEASE PDU	S=CLOSE-WAIT A=Send CEASE PDU, 8.6.4
KEEPALIVE	S=CLOSED A=FSM Error, 8.6.4	S=ESTABLISHED A=none	S=CLOSE-WAIT A=FSM Error, 8.6.4	S=CLOSE-WAIT A=none	S=ESTABLISHED A=none
RIB REFRESH	S=CLOSED A=FSM Error	S=CLOSE-WAIT A=FSM Error, 8.6.4	S=CLOSE-WAIT A=FSM Error, 8.6.4	S=CLOSE-WAIT A=none	S=ESTABLISHED A=8.10.3
CEASE	S=CLOSED A=FSM Error	S=CLOSE-WAIT A=8.6.4	S=CLOSE-WAIT A=8.6.4	S=CLOSED A=none	S=CLOSE-WAIT A=8.6.4

Notes:

1. This table applies to BISPDUs that are received without any of the errors described in clause 8.19 and its subclauses. Any such errors are handled in accordance with the applicable clause.
2. ″S″ indicates the next state to which the FSM will make a transition.
3. ″A″ indicates the action to be taken.
4. ″X.Y.Z″ is shorthand notation for ″do as specified in clause X.Y.Z″.