# Chapter 8. LU-LU Session Routing

SSCP services (or Session Services) will be provided to the dependent SLUs by the DLUS node, but session routing will be directly between the PLU and SLU nodes. The DLUS node is the owner of the dependent SLUs. As such, it is the CP responsible for responding to searches for the SLUs it serves. In this sense, it acts as the CP(SLU). Since the SLU is actually located on or directly attached to the DLUR node, the DLUS will appear in the associated resource hierarchy of Locate Find and Locate Found flows as if it were the NNS(SLU) and the DLUR node as the CP(SLU). In this way, other nodes will cache the DLUS node as the NNS of the SLU and will, therefore, send any ensuing session initiation requests to the DLUR node via the DLUS node. In order to get session routing directly between the PLU and SLU nodes, the associated resource hierarchy will also carry the tail vectors (TGVs) associated with the DLUR node. In the case where the DLUR is a T2.1 EN, these tail vectors are the real DLUR node TGVs. In the case where the DLUR node is a T2.1 NN, the Cdinit does not carry any tail vectors. [1]

In the first case (when the DLUR node is an EN), Topology and Routing Services (TRS) at the NNS(PLU) will compute a route from the origin node to one of the partner NNs specified in the DLUR TGVs. The final hop is constructed using the TG number specified in the associated TGV and the CP name of the DLUR node.

In the second case (when the DLUR node is an NN), SS at the NNS(PLU) should pass a REQUEST_ROUTE message to TRS indicating the DLUR (NN) as the target node with no TGVs. Since the DLUR is actually a NN (and therefore part of the topology database), TRS should respond with the appropriate route.

## 8.1 BIND Routing

The DLUR must examine RUs on the SSCP-PU and SSCP-LU sessions and save information from these RUs for BIND processing.

### 8.1.1 ACTLU

Since the RSCV for incoming BINDs will terminate at the DLUR node, the DLUR node must maintain a knowledge of dependent LU locations. This is so that the DLUR node can route incoming BIND messages by SLU name to the dependent SLU. In order to do this, DLUR nodes will maintain a relationship between dependent LU names, their supporting PU, and the physical connectivity to the PU. This is done by examining the ACTLU commands as they are received at the DLUR node (as mentioned in 6.3, “SSCP-LU Session Activation” on page 6-24).

Part of the information maintained by the DLUR will be a session count field, initialized to 0. When the DLUR receives a PLU-initiated BIND, it does not know whether the DLUS has been involved in the LU-LU session activation process or rather that the RU is a surprise BIND. To keep from passing a BIND to an LU already in an LU-LU session, the DLUR will manage the session count field and only pass a

[1] This assumes that the NNS of APPN PLU nodes will support receipt of a Locate_Found indicating an NNCP, ENCP hierarchy with a Cdinit that contains no TGVs. Product polls to date indicate this is not a problem. See A.1, “LU-LU Session Route Calculation” on page A-1 for a description of an alternate approach to provide direct routing between the CP(PLU) and DLUR node, if TGVs are required.

BIND to an LU whose current session count is zero (maximum session count value for a dependent LU is one).

The DLUR will zero out all indicators (ACTLU RU byte 1) except the type activation requested field (bits 6-7). Other indicators have been defined (and appear in the licensed formats) for use by the NCP BF and are not recognized by the LU; the NCP BF zeroes out these indicators and so will the DLUR.

The DLUR will remember the function management (FM) and transmission services (TS) profiles (which together make up ACTLU RU byte 2). This information will be used when converting a 2 byte RSP(ACTLU) into a 3 byte RSP(ACTLU).

The DLUR will remember two fields from the Assign LU Characteristics (X′30′) control vector included in the GDS variable encapsulating the ACTLU. The following fields will be used in processing a BIND for adaptive session pacing and for window size setting:

- Route extension (REX) stage pacing parameter (byte 4, bit 0)
- REX stage pacing window size (byte 4, bits 2-7)

### 8.1.2 +RSP(ACTLU)

The DLUR must also examine the +RSP(ACTLU), since it carries the X′0C′ (LU-LU Session Services Capabilities) control vector.

- If the RSP(ACTLU) does not have a CV X′0C′, the DLUR will build one:
  - if the RSP(ACTLU) includes a CV X′0C′, continue processing
  - if the RSP(ACTLU) only includes a CV X′00′, build a CV X′0C′ and add it to the RU
  - if the RSP(ACTLU) has no CVs, build a CV X′00′ and a CV X′0C′ and add them to the RU
    - — if the RSP(ACTLU) RU is 2 bytes long, add a third byte before adding the CVs; the contents of the added byte will be the remembered ACTLU RU byte 2
  - when building a CV X′00′, set maximum RU size to 256 bytes and all other fields to 0
  - when building a CV X′0C′, set secondary LU capability to enabled, LU-LU session limit to 1, SESSST support to 1 (part of new DLUR support described below), and all other fields to 0
- In the CV X′0C′ is an indicator as to whether or not the dependent LU supports SESSSTs (byte 7, bit 2). The DLUR will set this indicator on, regardless of the value set by the dependent LU for this indicator. This support includes all aspects of session awareness, i.e., SESSEND and CV X′2A′ as well as SESSST (see 10.1.2, “DLUR/S Dependent LU Session Awareness” on page 10-2 for more information on session awareness).
- In the CV X′0C′ are two indicators as to whether or not the dependent/subarea LU supports extended BINDs (byte 7, bits 4 and 6). The DLUR will remember these indicators′ settings with its other information about the dependent LU. Both bits off will indicate that the LU does not support extended BINDs, while either bit on will indicate the LU does support extended BINDs.
- In the CV X′0C′ is an indicator as to whether or not the dependent LU supports network-qualified names (byte 7, bit 5). The DLUR will remember this indicator′s setting with its other information about the dependent LU.

If there already is an active LU-LU session when the +RSP(ACTLU) is received, the active LU-LU session awareness information will be sent to the SSCP in the DLUS by way of the CV X′2A′ added to the

+RSP(ACTLU) by the DLUR (see 10.1.2, “DLUR/S Dependent LU Session Awareness” on page 10-2 for more information on session awareness).

### 8.1.3 INIT-SELF

When the DLUR node receives an INIT-SELF from a DLUR-attached dependent LU, it will save the PLU name and the User Request Correlation (URC) field from the RU and associate this information with the LU.

### 8.1.4 BIND

When the DLUR node receives a BIND whose RSCV terminates at the DLUR, the DLUR must check its LU table to determine the location of the SLU name specified in the RU. Once located,

- ***SLU session count processing -*** the LU′s session count will be checked:
  - if the count is zero, it will be incremented to one, and processing will continue;
  - if the count is already one, the BIND will be rejected with sense data X′0805 000A′;
- ***extended BIND processing -*** the BIND will be unextended if necessary, based on the extended BIND support indicators in the CV X′0C′ in the +RSP(ACTLU) - this involves removing all keyed control vectors and turning off the CVs included indicator;
- ***network-qualified name processing -*** the NETIDs (if any) will be stripped from the LU names in the BIND if necessary, based on the network-qualified names support indicator in the CV X′0C′ in the +RSP(ACTLU);
- ***name substitution processing -*** the PLU name will be replaced if necessary, based on whether or not the saved and BIND′s URCs match:
  - if the URCs do not match, BIND processing will continue;
  - if the URCs match, the BIND PLU name will be replaced with the saved PLU name, and the DLUR will discard the saved URC and the saved PLU name;
- ***adaptive session pacing processing -*** the Adaptive Session-Level Pacing support indicator (byte 9, bit 0 in the BIND) value for the APPN stage (from the DLUR into the APPN network) will be remembered by the DLUR, which will then set the indicator for the REX stage (from the DLUR to the downstream PU) as follows - note that this processing is performed on non-negotiable BINDs as well as negotiable BINDs:
  - set the ASP indicator to the same value as the REX stage pacing parameter (byte 4, bit 0) in the Assign LU Characteristics (X′30′) control vector included in the GDS variable encapsulating the ACTLU (note that the supported/not supported settings are defined opposite to each other in the BIND and in the CV X′30′);
- ***pacing window size processing -*** the DLUR will put the REX stage pacing window size into the BIND only if the following three conditions are all true:
  1. the DLUR changed the BIND′s ASP indicator from 1 (adaptive) to 0 (fixed), and
  2. the BIND is negotiable, and
  3. the BIND pacing window size is zero;

and the BIND (if not rejected) will be forwarded to the appropriate internal or external component.

When a DLUR receives a BIND for a dependent LU and there is no active CP-SVR pipe servicing that dependent LU, the DLUR as a product option can forward the BIND to the LU.

### 8.1.5 +RSP(BIND)

When the DLUR node receives a +RSP(BIND),

& • ***short RSP(BIND) processing -*** the short +RSP(BIND) is converted into an extended short form & RSP(BIND) by:

& – zeroing 31 (X′1F′) bytes for the extended short form RSP(BIND)

& – setting the RU code to BIND (X′31′)

& – setting the BIND type to nonnegotiable

& – including the SLU max send size and the PLU max send size from the BIND request

% – setting the pacing fields in the RSP(BIND) for the REX stage to the BIND request values

& – setting the limited resource bit if the link station is a limited resource link (LU 6.2 RSP(BIND)s & only)

& and the pacing values for the SLU stage are saved so that fixed session pacing will be used with the & window sizes specified in the BIND request;

• ***extended BIND processing -*** the +RSP(BIND) will be reextended if necessary, based on the extended BIND support indicators in the CV X′0C′ in the +RSP(ACTLU) - this involves reinserting the FQPCID control vector and turning on the CVs included indicator;

% • ***WBRI processing -*** a DLUR can, as an implementation option, support segment reassembly at its BF; % whether or not a DLUR provides this support is reflected in how it sets the Whole BIUs Required Indi- % cator (WBRI) - WBRI=0 means sending node supports receipt of segments on this session while % WBRI=1 means sending node does not support receipt of segments (this processing could apply to % RSP(BIND)s built as well as received by the DLUR):

% – if WBRI is valid (not a reserved field), use the received value

% – if WBRI is reserved, act as if DLUR received WBRI=1

% – if WBRI=1 and DLUR BF can support segment reassembly, set WBRI to 0

% – if WBRI=1 and DLUR BF can′t support segment reassembly, set WBRI to 1;

• ***adaptive session pacing processing -*** the Adaptive Session-Level Pacing support indicator value will be restored to its remembered value, unless the SLU is locally attached and the negotiable or non-negotiable RSP(BIND) does not indicate adaptive session pacing support (ASP indicator set to 0), in which case the DLUR can leave the ASP indicator at 0 regardless of the remembered value;

• ***session awareness processing -*** SESSST will be built and sent to the SSCP on the CP-SVR pipe

– When a DLUR receives a +RSP(BIND) for a dependent LU and there is no active CP-SVR pipe servicing that dependent LU, the DLUR should try to activate a CP-SVR pipe. When the CP-SVR pipe is activated, the SESSST should not be sent on the new CP-SVR pipe. The active LU-LU session awareness information will be sent to the SSCP in the DLUS by way of the CV X′2A′ added to the +RSP(ACTLU) by the DLUR (see 10.1.2, “DLUR/S Dependent LU Session Awareness” on page 10-2 for more information on session awareness).

and the +RSP(BIND) will be forwarded to the appropriate internal or external component.

### 8.1.6 LU-LU Session Deactivation

When the DLUR node receives a -RSP(INIT-SELF) or detects a link failure affecting an LU-LU session, it will discard the saved URC and the saved PLU name associated with the dependent LU.

When the DLUR node receives a -RSP(BIND), UNBIND, or detects a link failure affecting an LU-LU session, it will reset the session count for the associated dependent LU to zero.

% The UNBIND will be unextended if necessary, based on the extended BIND support indicators in the CV
% X'0C' in the +RSP(ACTLU) - this involves:

% • ***all UNBIND types except X'FE'*** **-** truncating the UNBIND RU to only the request code plus the
% UNBIND type;

% • ***UNBIND type X'FE'*** **-** truncating the UNBIND RU to only the request code, the UNBIND type, and
% the sense data.

% No reextending of the RSP(UNBIND) is required.

## 8.2 DLUR EN Tail Vector Registration

In order for the DLUS node to send Locate Find/Found flows with the appropriate associated resource hierarchy as described above, it will have to know the DLUR tail vectors. In the case where the DLUR node is a NN this will not be necessary. The EN DLUR node will be required to register its tail vectors with the DLUS node; this registration will be done only when the DLUS and DLUR are in the same subnet.

DLUR tail vector registration will involve sending TOPOLOGY_DATABASE_UPDATEs (TDUs) to the DLUS node:

- if the DLUR and the DLUS are adjacent, and if the DLUS supports receipt of TDUs (indicated in the CP Capabilities (X'12C1') GDS variable, then the TDUs will be sent over the CP-CP session between the two nodes;
- otherwise the TDUs will be sent over the CP-SVR pipe to the DLUS node.

The DLUS node will receive, but not propagate, these TDUs.

This will require the DLUR and DLUS CPs to be modified such that the TDU send and receive TPs can also run over the CP-SVR pipe using the CPSVRMGR mode. No special CP-SVR pipe should be brought up for this purpose. The existing CP-SVR pipe should be used. Since a DLUR may have CP-SVR pipes with multiple DLUS nodes, these TDUs must be sent over each CP-SVR pipe to each partner DLUS node.

### 8.2.1 DLUR/S Capabilities Exchange

TDUs can be sent on the pipe any time after CP-SVR pipe activation completes. Activation includes the exchange of DLUR/S Capabilities control vectors, so TDUs can be sent by the DLUR after:

- DLUR-initiated pipe activation: receipt of +RSP(REQACTPU) from DLUS
- DLUS-initiated pipe activation: transmission of +RSP(ACTPU) to DLUS

Included within the DLUR/S Capabilities control vector are fields relevant to EN tail vector registration:

- a Flow Reduction Sequence Number (FRSN) -

  - the DLUR will always set this field to zero in the DLUR/S Capabilities control vector; this will tell the DLUS to throw away any tail vectors previously registered by this DLUR;
  - the DLUS will set this field to the last FRSN value received from the DLUR;
- an indicator for support of the RECEIVE_TDU_TP (X′22F0F0F4′) service transaction program - when set, the sending node supports receipt of TDUs on this session
  - the DLUS should set this indicator on;
  - the DLUR should set this indicator off.

### 8.2.2 Initial EN Tail Vector Registration

After CP-SVR pipe activation, the DLUR will send all of its tail vectors to the DLUS (for more information, see “Processing CP_STATUS Signals” in the *SNA APPN Architecture Reference*).

The DLUS will process the received TDUs as described in “TDU Processing” in the *SNA APPN Architecture Reference*, with one exception: these TDUs should not be propagated to other NNs.

### 8.2.3 EN Tail Vector Registration Updates

When there is a change to a previously registered tail vector, the DLUR will send an update TDU to the DLUS (for more information, see “Processing Resource Updates” in the *SNA APPN Architecture Reference*).

The DLUS will process the received TDUs as described in “TDU Processing” in the *SNA APPN Architecture Reference*, with one exception: these TDUs should not be propagated to other NNs.

# Chapter 12. DLUR Option Set Content

## 12.1 DLUR Tower Requirements

Any product that implements the DLUR tower must implement the following functions as described in this document:

### 12.1.1 CP-SVR Pipe

The DLUR node will have to be able to establish the CP-SVR pipes in conjunction with the activation or reactivation of a given SSCP-PU session as described in Chapter 5, "CP-SVR Pipe" on page 5-1. This will specifically include the ability to:

1. Support the new CPSVRMGR mode and COS.
2. Know the DLUS node to be contacted when a PU requires ACTPU.
3. De-activate CP-SVR pipes when idle.
4. Bring down a conwinner session when the conloser fails.

### 12.1.2 SSCP-PU & SSCP-LU Session Activation/Encapsulation

The DLUR node will also be required to activate SSCP-PU and SSCP-LU sessions over the CP-SVR pipes. This will include both logic to establish the sessions as well as logic to encapsulate and de-encapsulate the associated flows. Specific requirements include the ability to:

1. Generate an FQPCID for a PU requiring activation.
2. Correlate SSCP-PU and SSCP-LU sessions to PU images on the basis of the FQPCID.
3. Generate the REQACTPU RU and understand related responses and sense codes.
4. Interrogate ACTLU commands to build a table that relates SLU names to the PU image that supports them.
5. Maintain an active session count for each dependent LU.
6. Examine +RSP(ACTLU) for extended BIND and network-qualified name support information.
7. Examine INIT-SELF to acquire PLU name and URC information.
8. Optionally provide SDDLU NMVT support to allow for dynamic dependent LU definition in the DLUS (required only if dynamic definition is supported).
9. Detect ACTPU race conditions and resolve them appropriately.
10. Generate the REQDACTPU RU and understand related responses and sense codes.
11. Encapsulate and de-encapsulate SSCP-PU and SSCP-LU FID2 PIUs.

### 12.1.3 EN TGV Reporting

DLUR ENs will be required to report their TGVs up to the DLUS node only if the DLUR and the DLUS are in the same subnet. These TDUs will be sent as events that effect them occur. In the case where the DLUR and the DLUS are non-adjacent (or no CPSVCMG session exists between them), these TDUs will flow over the CP-SVR pipe. In the case where the DLUR and DLUS are also connected via a CPSVCMG session, these TDUs will flow over that pipe.

### % 12.1.4 LU-LU BIND/UNBIND Processing

% 1. Provide reformating services:

% • Unextend extended BINDs destined for nodes that do not support receipt of such BINDs.

& • Reextend unextended +RSP(BIND)s when the corresponding BIND request was unextended.

& • Convert short +RSP(BIND)s into extended short form +RSP(BIND)s.

% • Unextend extended UNBINDs destined for nodes that do not support receipt of extended BINDs -
% no reextending of the +RSP(UNBIND) is required.

2. Remove NETIDs from LU names in BINDs destined for nodes that do not support network-qualified names.

3. Replace PLU names in BINDs destined for nodes which specified a PLU name in the INIT-SELF different from the PLU name received in the BIND.

4. Reject BINDs received for already active dependent LUs.

% 5. Properly set the Whole BIUs Required Indicator (WBRI) in the RSP(BIND) dependent on the segment
% reassembly capabilities of the DLUR BF.

6. Properly set the adaptive session pacing indicator in the BIND and +RSP(BIND) for the REX and
& APPN stages and set the REX stage pacing window size in the BIND when required.

7. Route BINDs to the destination PU/LU based upon the SLU name specified in the NS field of the BIND and information maintained in the SLU name table.

8. Perform intermediate routing functions when the LU is located on a downstream PU. This includes:

   • Intermediate routing function

   • Session outage notification

   • Maintaining pacing counts/indicators in both directions

### 12.1.5 Session Awareness Reporting

In order to assist the DLUS node in providing session limit management, the DLUR node must provide the DLUS node with session awareness data. The DLUR node will be required to:

1. Upon receipt of a positive RSP(ACTLU) from the attached dependent LU, if the dependent LU has an active LU-LU session, the DLUR must build a Session Information (X′2A′) control vector, append it to the RSP(ACTLU), and send the RU to the SSCP by encapsulating the RU and sending it on the CP-SVR pipe to the DLUS.

2. Upon receipt of a positive RSP(BIND) from the attached dependent LU, the DLUR must build a SESSST RU and send it to the SSCP by encapsulating the RU and sending it on the CP-SVR pipe to the DLUS.

3. Upon receipt of a RSP(UNBIND) from the attached dependent LU, the DLUR must build a SESSEND RU and send it to the SSCP by encapsulating the RU and sending it on the CP-SVR pipe to the DLUS.

### 12.1.6 Multi-Subnet Support

1. The DLUR returns not found for Locates for its DLUS-served resources unless the OCR bit is set and the DLUR supports full multi-subnet function.
2. The DLUR returns Found (with the DSL bit set) if the OCR bit is set in the Find and the DLUR owns the resource (identifies the SLU as served by a DLUS) and the DLUR supports full multi-subnet function.
3. The DLUR returns Found with CV X′40′ indicating the DLUS name for use by management services.
4. The DLUR sets the PSP bit when initiating a Locate for the DLUS for the purpose of setting up the CP-SVR pipe. This prevents setting up a pipe across a subarea.
5. Wildcards do not apply to DLUS-served LUs. All DLUS-served LUs must be explicitly defined on the DLUR and on the DLUS. No wildcard responses are made with the DSL bit set.
6. A DLUR-capable EN must set the Search Status indicator in the ENCP Search Control CV (X′33′) during the CP Capabilities exchange with its network node server when the EN has full multi-subnet support but its NNS does not support DLUS-served LU registration. When an EN DLUR has full multi-subnet support and its NNS supports DLUS-served LU registration, the Search Status Indicator
& can be reset and the DLUS-served LUs can be registered with the NNS (with the Central Resource
& Registration Request Indicator reset). When an EN DLUR has limited multi-subnet support, the Search Status Indicator can be reset and the DLUS-served LUs need not be registered with the NNS.