The Frame Relay Forum
SVC Network-to-Network Interface (NNI) Implementation Agreement

FRF 10.1

Frame Relay Forum Technical Committee

January 21, 2000

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Revision History:

Version	Date	Changes
FRF 10	December, 1995	baseline document
FRF 10.1	January 21, 2000	• Replace section 3.4 *Congestion Control* with reference to FRF.2.1 • Reduce size of section 3.3 *Address Field* with reference to FRF.2.1. • addition of annex to support Generic Application Transport IE • clarification of DLCI IE encoding to eliminate 3 octet address encoding • addition of the following X.76 facilities Transit Network Selection Service Classes and Priorities • update of FRFTC and ITU-T references • replacement of Physical Layer Interface Guidelines with reference to Physical Layer Interface Implementation Agreement • addition of NSAP support for called and calling party numbers and for connected number • addition of RESTART support • informative annex addressing SPVCs. • Reference FRF.4.1 appendix on X.121 and E.164 number encoding in NSAP address format.

1   Introduction

1.1   Purpose

This document is a frame relay switched virtual connection (SVC) network-to-network interface (NNI) implementation agreement. The agreements herein were reached in the Frame Relay Forum, and are based on the relevant frame relay standards referenced in Section 2.0. They address the optional parts of these standards, and document agreements reached among vendors/suppliers of frame relay network products and services regarding the options to be implemented.
Except as noted, these agreements will form the basis of conformance test suites produced by the Frame Relay Forum.
This document may be submitted to different bodies involved in ratification of implementation agreements and conformance testing to facilitate multi-vendor interoperability.

1.2   Definitions

- Network-to-Network Interface (NNI) - the Network-to-Network Interface is concerned with the transfer of C-Plane and U-Plane information between two network nodes belonging to two different frame relay networks.
- Must, Shall, or Mandatory - the item is an absolute requirement of this implementation agreement.
- Should - the item is highly desirable.
- May or Optional - the item is not compulsory, and may be followed or ignored according to the needs of the implementor.
- Not Applicable - the item is outside the scope of this implementation agreement

2   Relevant Standards

The following is a list of standards and implementation agreements on which this frame relay NNI implementation agreement is based:

[1] ITU-T Recommendation I.233.1, ISDN Frame Relay Bearer Services, ITU, Geneva, 1991.

[2] ITU-T Recommendation I.370 - Congestion Management for the ISDN Frame Relaying Bearer Service, ITU, Geneva, 1991.

[3] ITU-T Recommendation I.372 - Frame Relaying Bearer Service Network-to-Network Interface Requirements, ITU, Geneva, 1992.

[4] ITU-T I.555 - Interworking between FMBS and Other Services, ITU, Geneva, 1993.

[5] ITU-T Recommendation Q.931, ISDN User-Network Interface Layer 3 Specification for Basic Call Control, ITU, Geneva, 1993.

[6] ITU-T Recommendation Q.922, ISDN Data Link Layer Specification for Frame Mode Bearer Services, ITU, Geneva, 1992.

[7] ITU-T Recommendation Q.933, DSS1 Signaling Specification for Frame Mode Basic Call Control, ITU, Geneva, 1995.

[8] ITU-T Recommendation E.164 / I.331 The International Public Telecommunications Numbering Plan, ITU, Geneva, 1997

[9] ITU Recommendation X.121 - International Numbering Plan for Public Data Networks, ITU, Geneva,1996.

[10] ITU Recommendation X.76 - Network-to-Network Interface Between Public Data Networking Providing the Frame Relay Data Transmission Service,   ITU, Geneva, 1995.

[11] ITU-T Amendment 1 to ITU-X.76 (SVC Part), ITU, Geneva,   1997.

[12] ITU-T Amendment 2 to ITU-X.76 (SVC Part), ITU, Geneva, September,1998.

[13] Frame Relay Forum FRF 2.1, L. Greenstein (ed.)- Frame Relay Network-to-Network Implementation Agreement, July 10, 1995

[14] Frame Relay Forum FRF.4.1, Sinicrope (ed.) User-to-Network SVC Implementation Agreement, January 20, 2000

[15] FRF.14, K. Rehbehn (ed.), Physical Layer Interface Implementation Agreement, Frame Relay Forum, 1999.

[16] ATM Forum, PNNI Addendum for Generic Application Transport Version 1.0, af-cs-0126.000, July 1999.

3　Implementation Agreement

3.1　Scope of Agreement

This implementation agreement applies to SVCs over Frame Relay NNIs and to SPVCs. It is applicable at NNIs whether both networks are private, both are public or one is private and the other public.
Note: The use of UNI between a private and public network is not excluded.
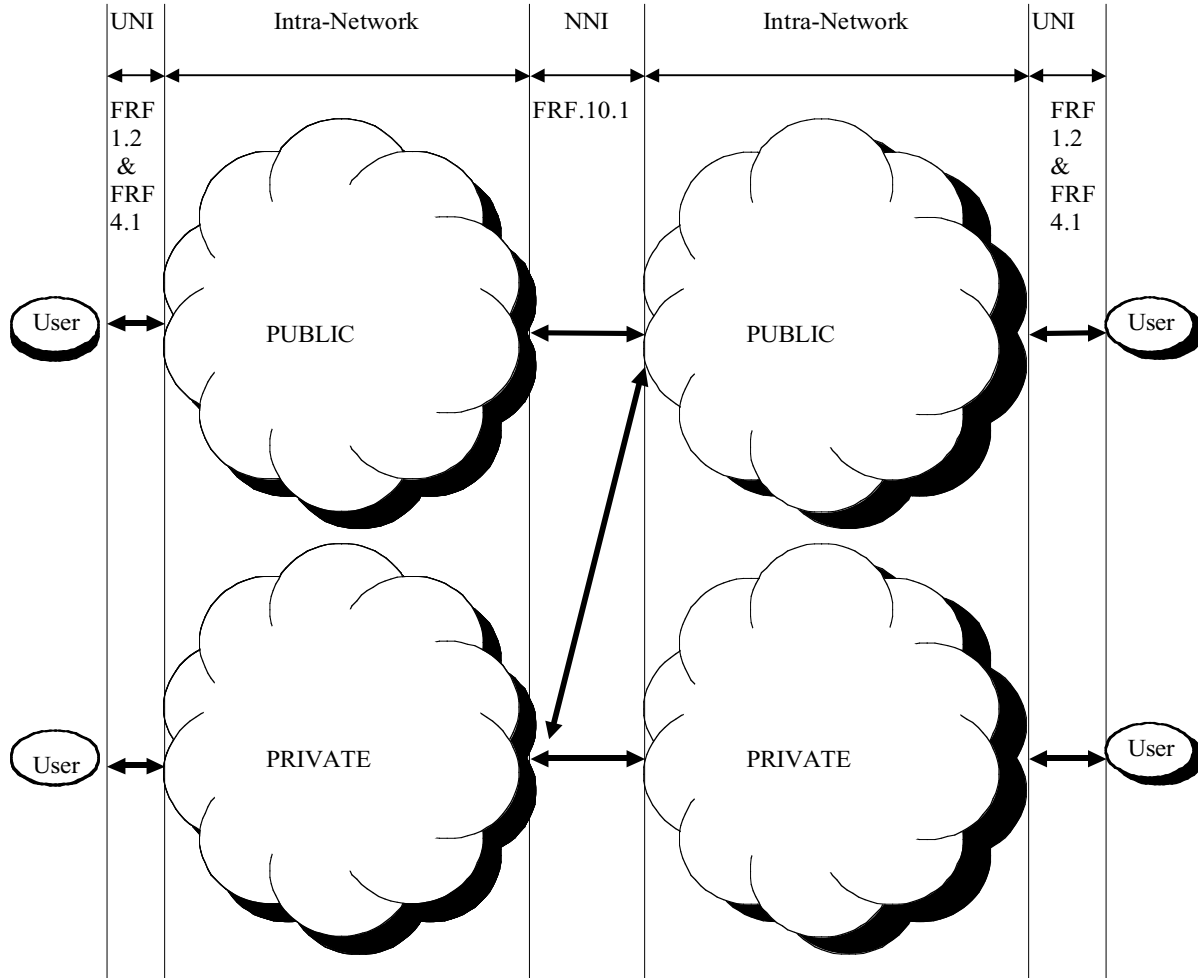
Figure 1 Reference Configuration

3.2 Physical Layer

Refer to [15] for the physical layer interfaces and specifications supported by this implementation agreement.

3.3 Data Transfer

This section is intended to be used for Frame Relay conformance testing. Implementations for the Frame Relay NNI U-plane shall be based on ITU Q.922 Annex A. Implementation agreements on the optional parts of Q.922 Annex A are as described in the following subsections.

3.3.1 Inter-Frame Time Fill

For inter-frame time fill refer to [13] section 3.2.1.

3.3.2 Frame Relay Information Field (Q.922 Annex A Sect. A.2.5)

A maximum frame relay information field size of at least 1600 octets shall be supported by networks. In addition, maximum information field sizes less than, equal to, or greater than 1600 octets may be negotiated during SVC call setup according to ITU Recommendation X.76 section 10.6.2.

3.3.3 Address Field Variables

Note: For the length of the Address field see [13] section 3.2.3. The choice between two or four octets for the length of the address field is determined by bilateral agreement between networks. The default length is two octets. Editor's note: Section 3.2.3 of [13] is being considered for change at the time of this writing. Refer to Annex C for more detail.

3.3.4 Congestion Control

Congestion management and control is as described in [13] section 3.2.4.

3.3.5 Consolidated Link Layer Management (CLLM) Message (Q.922 Annex A Sect. A.7)

Use of the CLLM message is outside the scope of this implementation agreement.

3.4 Permanent Virtual Connection (PVC) Management Procedures

Equipment supporting the NNI shall implement the mandatory bi-directional procedures of ITU Q.933 annex A for managing PVCs on an NNI where switched virtual connections and PVCs coexist. Refer to [13]   for PVC management procedures.

Note: When equipment provides both SVCs and PVCs on an NNI, it simultaneously supports two protocols: SVC procedures according to section 3.5 below, and PVC management procedures. Each protocol determines whether peer-to-peer communication is successful. The equipment should consider the link status of both protocols when reporting the status of the interface (e.g. to the user or network management).

3.5 Switched Virtual Connection (SVC) Signaling Procedures

This section is intended to be used for frame relay conformance testing.

X.76 requires a reliable link layer protocol. The link layer protocol used in this implementation agreement is ITU-T Q.922 as specified in section 10.2 of X.76. All X.76 signaling messages of this implementation agreement shall be sent using DLCI 0. Timer 200 will have a default value of 1 second.

Implementations of the frame relay SVC-NNI signaling procedures for switched virtual connections (SVCs) shall be based on ITU-T X.76 with the exceptions defined herein.

Note: Support of networks implementing Q.933 is outside of the scope of this implementation agreement. Messages and information elements identified in X.76 Ammendment 1 "…used by networks supporting Recommendation Q.933 at the UNI…" are not applicable.

3.5.1 Numbering Plans

Native X.121 addressing and native E.164 addressing are supported. E.164, X.121 and ATM End System Addresses embedded in NSAP format are also applicable.

Note: NSAP encoding is explained in Annex E of [14].

3.5.2 X.76 Section 10.1 - General

The *Frame Relay Priority* and *Service Class* capability as described in Amendment 2 of Recommendation X.76 is fully supported.

The following facility listed in this section is not applicable:
- Reverse charging indication

Note: Transit Network Selection is applicable at the NNI when signaling the selection of an indirectly connected network over which the call should be routed. TNS signaled into the network specifically identified in the TNS Information Element shall be rejected (i.e. call proceeding over an NNI from Network 1 to Network 2 shall not signal a TNS specifying Network 2).

3.5.3   X.76 Section 10.3 - State Definitions

1. Section 10.3.1 - Call delivered (NN4) is not applicable.

2. Section 10.3.1 - Call received (NN7) is not applicable.

3.5.4   X.76 Section 10.4 - Message definitions

1. Section 10.4 - Alerting and Progress are not applicable.

3. Section 10.4.1 - Alerting is not applicable.

4. Section 10.4.3 - Connect.

    After Low Layer Compatibility Information Element remove the reference to Note 1.

    The following information elements are not applicable:
    - Progress indicator
    - End-to-end transit delay
    - Packet layer binary parameters
    - Link layer protocol parameters
    - X.213 priority

5. Section 10.4.4 - Progress is not applicable.

6. Section 10.4.5- Release

    The following information elements are not applicable:
    - Connected number
    - Connected sub-address
    - User-user

7. Section 10.4.6 - Release complete

    The following information elements are not applicable:
    - Connected number
    - Connected sub-address
    - User-user

8. Section 10.4.7 - Restart

    - Table 10-7/X.76:The Restart indicator information element is not applicable.

9. Section 10.4.8 - Restart Acknowledge

    - Table 10-8/X.76:The Restart indicator information element is not applicable.

10. Section 10.4.9 - Setup

The following information elements are not applicable:

- Reverse charging indication
- Progress indicator
- End-to-end transit delay
- Packet layer binary parameters
- Link layer protocol parameters
- X.213 priority
- High Layer Compatibility

Add the following note to the Low Layer Compatibility entry of table 10-9:
"Note 5 This information element may be repeated so that up to three LLC IEs may be present. The information element(s) are to be passed on transparently at the NNI."

3.5.5   X.76 Section 10.5 - General message format and information element coding

1. Section 10.5.3 -Message Type. The following message types will not be supported:

    - ALERTING
    - PROGRESS

2. Section 10.5.6 Call state

    - state NN4 is not applicable.
    - state NN7 is not applicable.

3. Section 10.5.9 Calling party number

    Note: for the encoding of NSAP addresses within this IE refer to [14] Annex E.

    The following code points of the presentation indicator field may be used for interworking with ATM signaling:
    - - 0 1   Presentation restricted
    - - 1 0   Number not available

    The following code points of the screening indicator field may be used for interworking with ATM signaling:
    - - 0 0   User provided, not screened
    - - 1 0   User provided verified and failed

4. Section 10.5.11 Cause

    Octet 3a is not applicable. This implies that only Cause values listed in Q.850 are supported.

5. Section 10.5.12 Clearing network identification

    Note: The encoding of the country identification in octet 3 is different from the carrier identification code/network identification in Transit Network Selection.

6. Section 10.5.14 Connected number

    Note for the encoding of NSAP addresses within this IE refer to [14] Annex E.

    The following code points of the presentation indicator field may be used for interworking with ATM signaling:
    - - 0 1   Presentation restricted

- • - 1 0   Number not available

The following code points of the screening indicator field may be used for interworking with ATM signaling:
- • - 0 0   User provided, not screened
- • - 1 0   User provided verified and failed

7. Section 10.5.16 Data link connection identifier

- • In Figure 10-18/X.76, the first occurrence of octet 3b is not applicable.
- • In Figure 10-18/X.76, Note 3 is not applicable.

8. Section 10.5.21 Low layer compatibility

- • Add the following text to the first paragraph "The low layer compatibility may be repeated in a SETUP message when the calling user offers the called user a choice of possible low layer compatibility IEs for the call."

9. Section 10.5.25 Reverse charging indication

- • This information element is not applicable.

10. Section 10.5.26 Transit network identification

Note: The encoding of the country identification in octet 3 is different from the carrier identification code/network identification in Transit Network Selection.

3.5.6   X.76 Section 10.6 - Procedures

This section is applicable with the following exceptions:

1. Section 10.6.1.3. Alerting and call progressing. This section is not applicable.

2. Section 10.6.2.2 Alerting and call progressing. This section is not applicable.

3. Section 10.6.2.3 Call established

- • paragraph 2 - Remove the current paragraph. The Connected party number is passed transparently at the NNI and there is no need to change the coding at the NNI.

4. Section 10.6.4.1 Sending a RESTART message

- • When the limit is reached the originator of the RESTART shall: record an error, take appropriate actions and consider the interface available for new calls. An example of a set of appropriate actions would be those that cause the release and re-establishment of the data link.

5. Section 10.6.6 Data Link Reset

Whenever a signaling entity is informed of a data link reset, by means of the DL_ESTABLISH indication primitive, The following procedures shall apply:

1) For calls in the clearing phase (states NN11 and NN12), no actions shall be taken.

2) Calls in the establishment phase (states NN1, NN3, NN6 and NN9), and in the active state (NN10) shall be maintained according to the normal or error handling procedures contained in other parts of this document.

6. Section 10.6.8 List of timers at the NNI

- • Timer T301 is not applicable.

7. Section 10.6.9 Frame relay NNI facilities

- Reverse Charging is not applicable

3.6   Switched PVCs

Annex A of X.76, specifies the signaling for switched PVC (SPVC). Annex B of this document provides background information on how NNI resiliency is achieved through the application of SPVCs.

Annex A of X.76 applies with the following two changes:

1. Change A.3.1 item c to read: "the PVC UNI includes the PVC status information element in a full status response or an asynchronous status report with the Active bit asserted."

Annex A   Generic Application Transport (GAT) (Optional)

This annex contains the description and specification for the Generic Application Transport (GAT) feature. Use of this facility is optional.

A.1 General Description

Generic Application Transport (GAT) is an optional facility which allows Frame Relay networks to transport organization-specific information in an interoperable manner. Any node along the path of the call or connection may examine and process the information.

This feature provides a mechanism to support the non-standardized implementation of network-specific or vendor proprietary features.

A.2 ADDITIONS TO FRF.10.1 SIGNALLING MESSAGES

The Generic Application Transport information element may be included in the following messages which have global significance:

- SETUP
- CONNECT
- RELEASE
- RELEASE COMPLETE (first clearing)

The GAT IE entry has to be added to the table associated with each of the above messages in section 3.5.4/FRF.10.1 (X.76 Amendment 1 section 10.4) "Message definitions", as described in the following subsections.

A.2.1 Connect

Table 10-3/X.76 -CONNECT message content is amended to include the following entry:

Information Element	Reference	Type	Length
Generic Application Transport	GAT Addendum 3.1	O (Note 6)	2 - 257

NOTE 6 - This information element may be present up to 10 times.

A.2.2 Release

Table 10-5/X.76- RELEASE message content is amended to include the following entry:

Information Element	Reference	Type	Length
Generic Application Transport	GAT Addendum 3.1	O (Note 6)	2 - 257

NOTE 6 - This information element may be present up to 10 times.

A.2.3 Release Complete

Table 10-6/X.76 - RELEASE COMPLETE message content is amended to include the following entry:

Information Element	Reference	Type	Length
Generic Application Transport	GAT Addendum3.1	O (Note 6)	2 - 257

NOTE 6 - This information element may be present up to 10 times if the RELEASE COMPLETE is sent as the first clearing message.

A.2.4 Setup

Table 10-9/X.76 - SETUP message content is amended to include the following entry:

Information Element	Reference	Type	Length
Generic Application Transport	GAT Addendum3.1	O (Note 5)	2 - 257

NOTE 5 - This information element may be present up to 10 times.

A.3 Information Elements

The following entry is to be added to the list of information elements in section 3.5.5/FRF.10.1 (X.76 Amendment 1 Section 10.5 - General message format and information element coding):

Information element   I.E. identifier coding
Generic Application Transport   01101011

A.3.1 Generic Application Transport

The purpose of the generic application transport information element is to allow the transport of organization-specific information through a Frame Relay network . Any node along the path of the call or connection may examine and process the contents of this information element.

The generic application transport information element is coded as shown in Figure A-1 and Table A-1. The maximum length of this information element is 257 octets. The number of instances of this information element in a message is limited to ten.

Bits								Octets
8	7	6	5	4	3	2	1	
Generic Application Transport information element identifier								1
0	1	1	0	1	0	1	1	
Length of Generic Application Transport contents								2
Start	End	Reserved						3
Application Type								4*
OUI								5 - 7*
Organization-specific information								8 etc.

Figure A-1- FRF.10.1 Generic Application Transport information element

Start (Bit 8 of Octet 3)
This field is used to indicate whether this is the first segment. 1 denotes YES and 0 indicates NO.

End (Bit 7 of Octet 3)
This field is used to indicate whether this is the last segment. 1 denotes YES and 0 indicates NO.

Application Type (Octet 4)

Bits								Meaning
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	1	Organization-specific

All other values are reserved
This field shall only be present if the Start bit is coded as 1.

Organization Unique Identifier (Octets 5 to7)
These octets uniquely identify an organization. The value is assigned by IEEE. The most significant octet of the OUI appears in octet 5 and the least significant octet appears in octet 7. These octets shall only be present if the start bit is coded as 1.

Organization-specific information (octet 8 etc.)
The format of this field is defined by the organization which owns the OUI.

Table A-1 FRF.10.1 Generic Application Transport information element

A.4 SIGNALING PROCEDURES

These procedures are in addition to the normal call/connection procedures defined in 3.5.6/FRF.10.1.

A.4.1 Receiving a Message over the NNI

When the STE receives a message with one or more instances of the GAT information element and the GAT IE is supported, the called STE shall examine and process the contents of the GAT IE instance according to the following procedures (as illustrated by the Flow Chart in Figure A-2):
1)   If the "Start" bit is not coded to 1, the IE shall be discarded.
2)   Otherwise, the "Start" bit is coded to 1, indicating this IE is the start of a new sequence.   The following actions shall then be taken:

A) If the Application Type is not recognized or if the application type is organization-specific but the STE does not recognize the OUI, then the following actions shall be taken:

i)   If the received message is a SETUP, CONNECT or RELEASE message, the IE shall be forwarded unchanged.

ii)   If the received message is a RELEASE COMPLETE (first clearing), then the IE shall be forwarded unchanged in the RELEASE message sent towards the calling user.

iii)   Otherwise, the IE shall be treated according to the procedures defined for "Unexpected recognized information element".

iv)   The remaining instances (if any) are examined and the following actions shall be taken:

    a)   if the "Start" bit is not coded to 1, indicating this IE is part of the current sequence, then the actions to be taken are as described in (A) above.

    b)   If the "Start" bit is coded to 1, then the procedures specified in step (2) above shall be repeated.

B)   If the Application Type is organization-specific and the OUI is recognized, then the STE shall take the following actions:

i)   All previous information accumulated in the intermediate buffer shall be cleared.

ii)   The information in the current IE shall be stored in the intermediate buffer.

iii)   If the "End" bit of the current IE is coded to 1, indicating this is the last segment in the sequence, then the contents of the intermediate buffer shall be assembled and the information processed as defined by the organization identified by the OUI. An implementation may choose to process all or truncate the information if the total length after re-assembly exceeds the maximum allowable length.

iv)   Otherwise, this IE is not the last segment and the following actions shall be taken:

    a)   If there are no more GAT IE instances in the message, then all previous information accumulated in the intermediate buffer shall be discarded.

    b)   Otherwise, the next GAT IE instance in the list is examined and processed. If the Start bit is coded to 1, denoting the start of a new sequence, then all previous information accumulated in the intermediate buffer shall be discarded, since the last segment is missing and the complete sequence cannot be reassembled. The procedures specified in step (2) above shall then be repeated for the current IE with "Start" bit coded to 1.

    Otherwise, the Start bit is not equal to 1, indicating this IE is still part of the current sequence. The organization-specific information, starting at octet 4 etc., shall be appended to the information in the intermediate buffer and the procedures starting at step B(iii) shall be repeated.

The procedures in steps (1) and (2) shall be repeated until all instances of the GAT IE have been processed. After appropriate actions have been taken on all the GAT IE instances, the received message shall be processed according to the normal call/connection procedures.
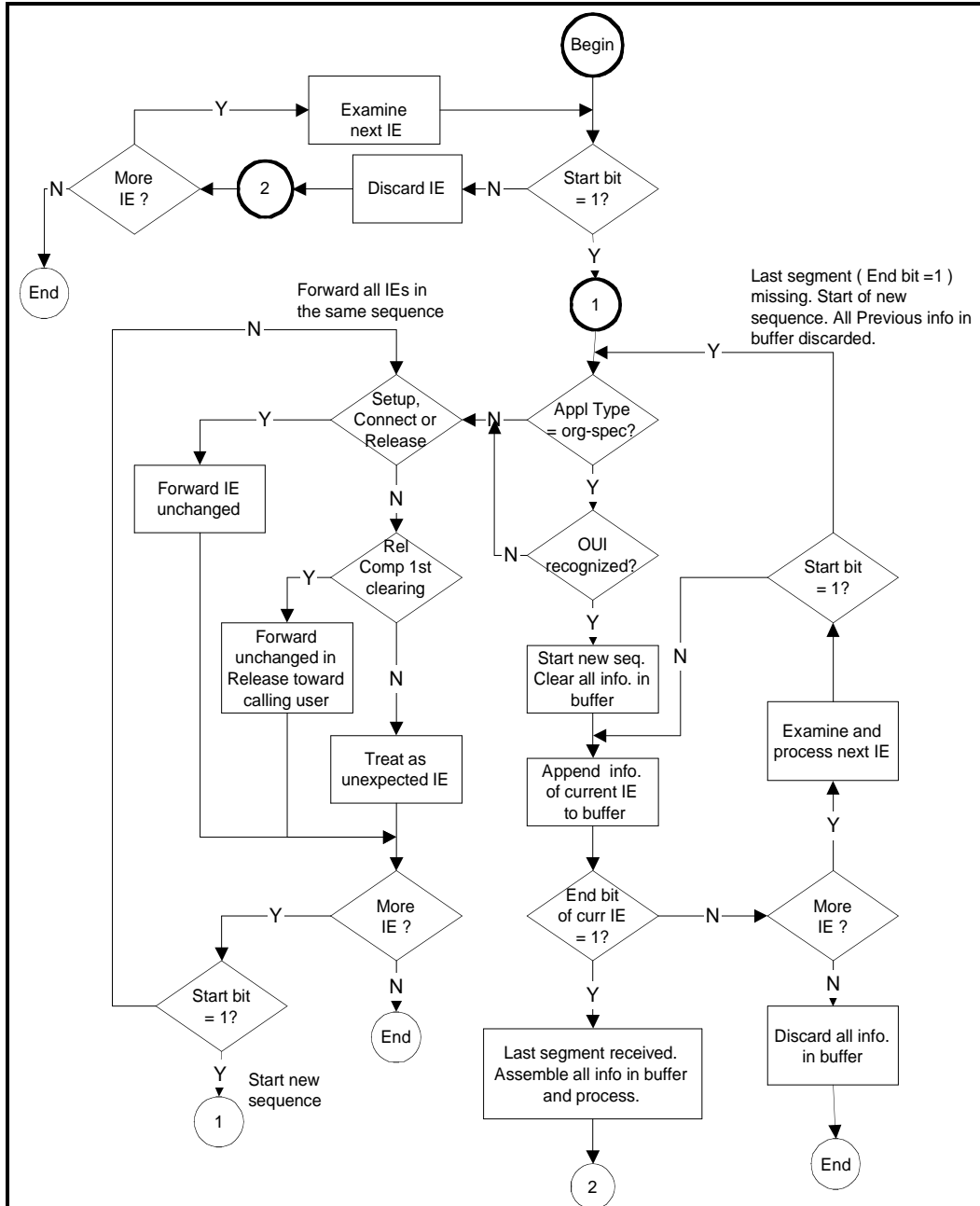
Figure A-2 Processing of Received GAT IE Instances

A.5 Sending a Message over the NNI

When a message is sent from the STE, and the GAT IE is allowed in the message, the STE may insert one or more instances of the GAT IE into the message (up to the maximum number of allowable repetitions). The GAT IE shall be coded as shown in Figure A-1 and Table A-1.

Annex B   Switched PVCs (Informative)

Annex A of X.76, signaling for switched PVC (SPVC), describes procedures which provide a means of establishing a PVC using PVC segments at the UNIs and the SVCs as the NNI. This section describes how NNI resiliency is achieved through the application of SPVCs. Additional informative text is provided to aid in the understanding of SPVCs.

B.1 Aspects of SPVCs

SPVCs appear to the user and network administrator as PVCs, but have the resilience of an SVC and can span multiple networks. As in the case of SVCs, SPVCs require that the call be routed to a called party number in the same way as when a person uses the phone to place a call to another. Unlike SVCs, SPVCs do not require the user to signal the network to indicate the destination and service parameters (e.g., CIR, Bc, and Be). Instead, an agent in the switch or network acts on behalf of the user to signal the call request. The service parameters and destination of the call are configured by the network administrator exactly as they are configured for PVCs, with one difference; the destination is an E.164/X.121 number and that destination may be in another network. This differs from PVCs because PVCs are configured in segments, requiring network administrators to match the DLCI at each PVC-NNI for every PVC. When the call is signaled at the SVC-NNI, these service parameters are signaled to the next network using the X.76 SVC signaling protocol. As in the case of SVCs, SPVCs require the networks to contain routing information for establishing calls to destinations which are on other networks.
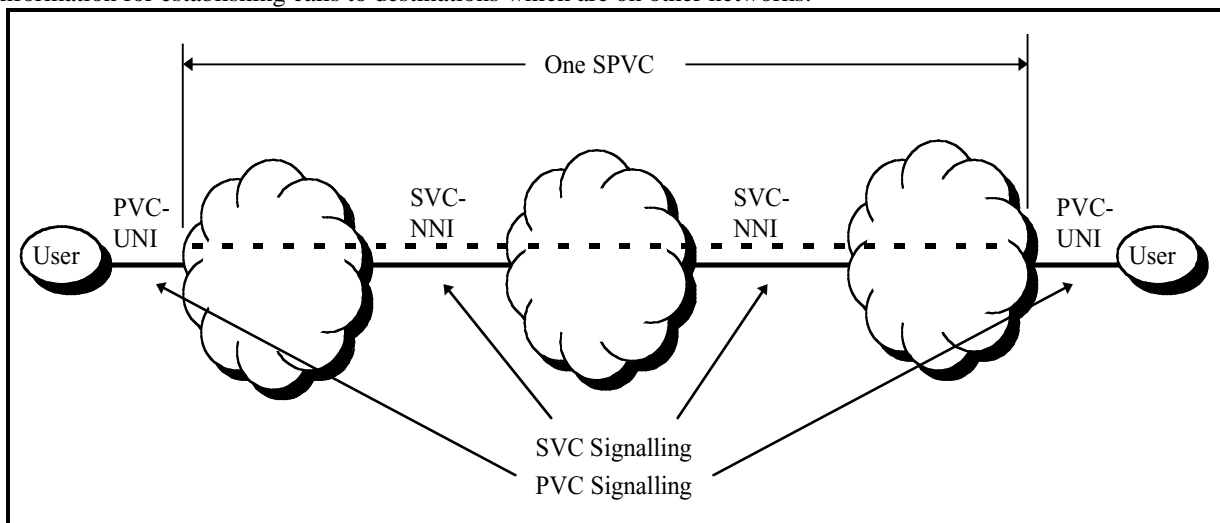

Figure B.1 - Multi-network SPVC

B.2 NNI Resilience Using SPVCs

SPVCs provide built-in automatic NNI resilience using the routing processes and algorithms required for SVC service. This resilience covers restoration from a wide array of failure conditions: site, node, line card, and physical line. Upon the failure of an SVC-NNI or any element in the path of the SPVC, the SPVC is released back to its point of origin (the call request agent). The call request agent then attempts to re-establish the SPVC to the destination. Routing algorithms within the networks know which paths are available for call establishment to the called destination. In the event of an SVC-NNI failure, an alternate SVC-NNI will be used in an attempt to establish the SPVC. The alternate route may include routing to a different card on the same node where the SVC-NNI failed, routing through an SVC-NNI on a different node to the same destination network, or routing through a different transit network to reach the destination. Each SPVC is routed independently and upon an SVC-NNI failure, the released SPVCs may be distributed over a variety of available SVC-NNIs.
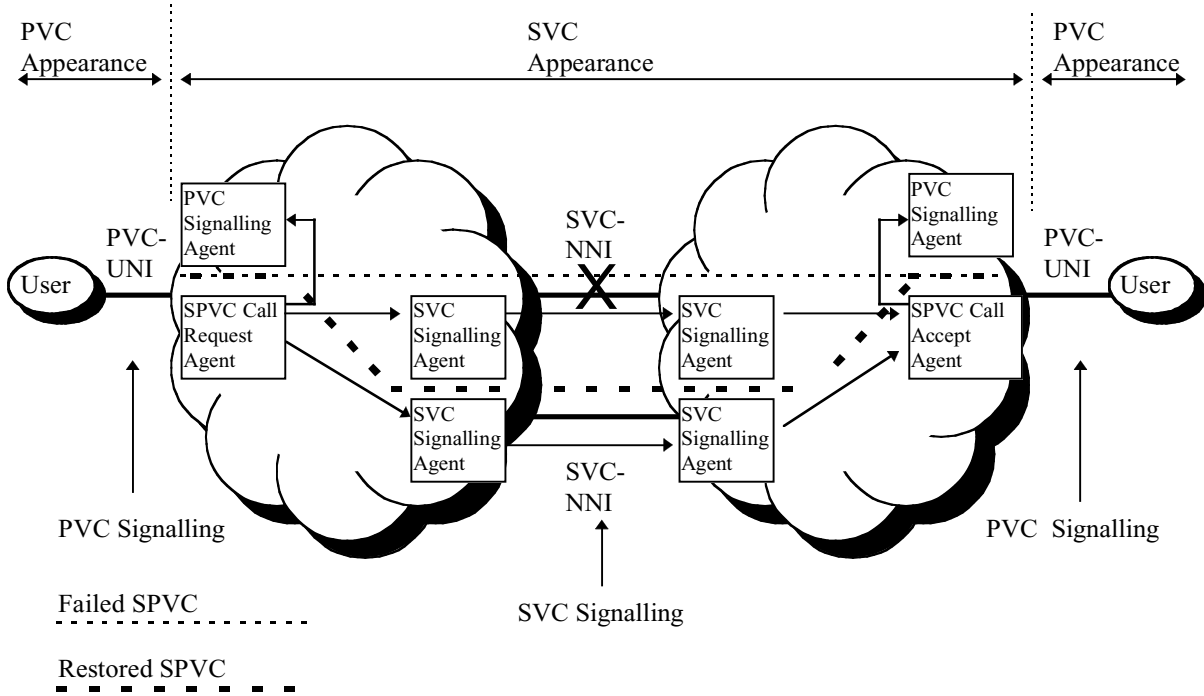
Figure B-2Automatic NNI Resilience Using SPVCs

B.3SPVC Reference Model

The reference model below illustrates the various applications of SPVCs. While the basic functionality of SPVCs does not change with each application, there are issues which are unique to some applications. The basic functionality and application specific functionality are described below. Note that while the reference model illustrates the PVC-UNI as a separate interface from the SVC-UNI, both SVCs and PVCs can be supported simultaneously on a UNI.

The unique SPVC applications are:

1.   SPVC-to-SPVC, UNI-to-UNI (VC_3)
2.   SPVC-to-SPVC, UNI-to-NNI (VC_4)
3.   PVC-to-SPVC, NNI-to-NNI (VC_5)
4.   SPVC-to-SVC, UNI-to-NNI (VC_1)
5.   SPVC-to-SVC, UNI-to-UNI (VC_2)
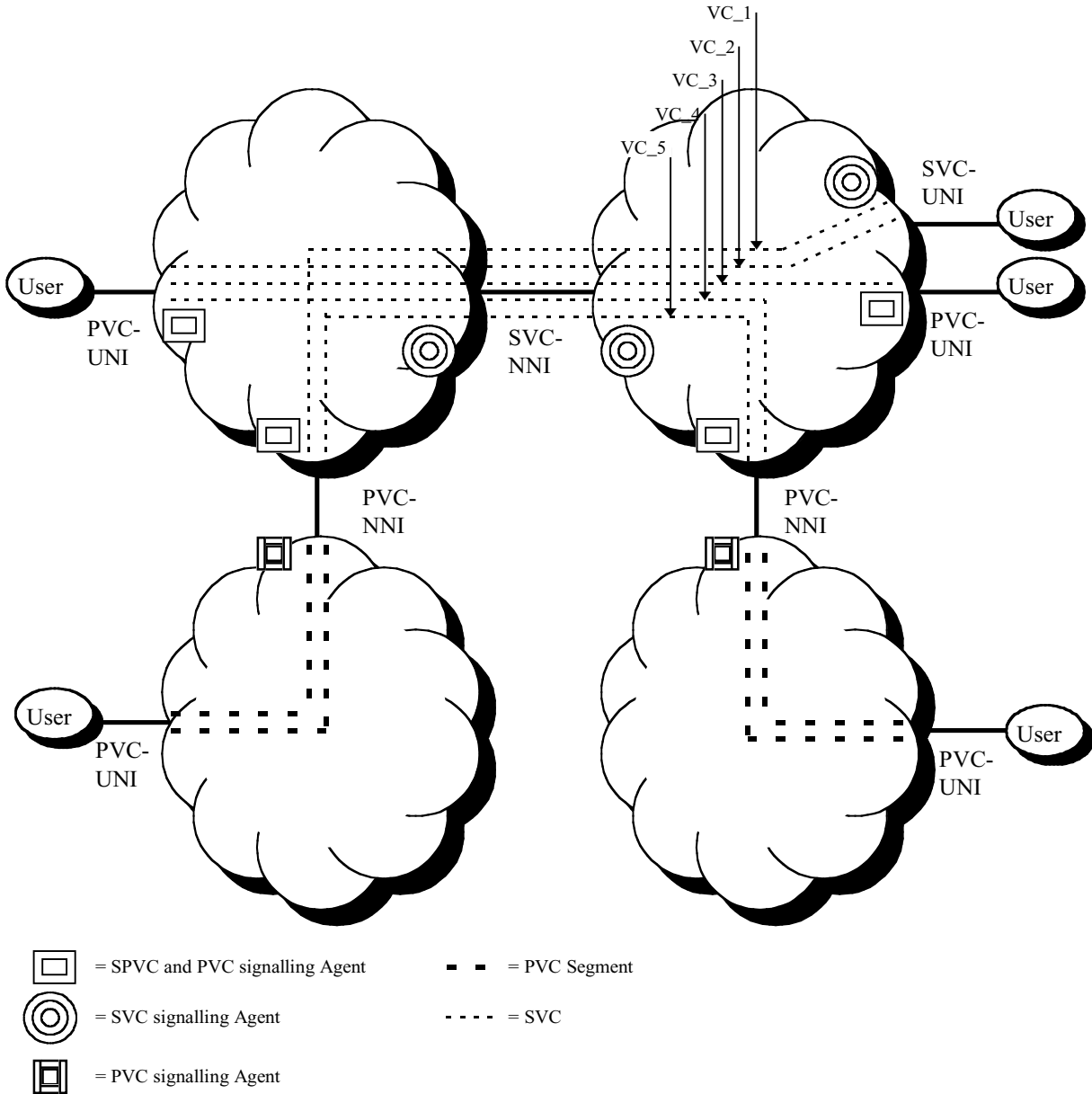
Figure B-3 SPVC Reference Model

Note: Two or more SPVCs cannot be interconnected over a PVC NNI.

B.3.1   SPVC-to-SPVC Interoperability

SPVC-to-SPVC interoperability is illustrated in figure B-3 as VC_3, VC_4, and VC_5. Refer to X.76 Annex A for detailed descriptions of the procedures.

B.3.1.1   Calling End

When an SPVC signaling agent is configured with SPVC parameters, it initiates a call to the destination. This end is referred to as the calling end. It also adds the DLCI associated with the calling end of the SPVC to the PVC signaling full status report and indicates "new.". The active/inactive status associated with this DLCI is inactive whenever the call is not connected and active whenever the call is connected. If the call is unsuccessful or is later

disconnected, a timer is started. Upon expiration of the timer the call is re-tried. The duration of the timer is implementation specific.

Included with the call request is the "specific" DLCI at the destination to which connection is requested. Alternatively, the call request may indicate that "any" available destination DLCI is acceptable.

B.3.1.2 Called End

B.3.1.2.1 Calls to a Specific DLCI

To accept calls to specific DLCIs the called end must be configured per DLCI with information indicating the E.164/X.121 address of the calling party or parties which are permitted to connect to that DLCI. When configured with this information, the called end indicates in the full status report [or an asynchronous status report] that the configured DLCI is "new". When the SPVC is connected, the called end indicates "active", and when the call is released it indicates "inactive".

B.3.1.2.2 Calls to Any DLCI

A call accept agent may be configured with a list of calling E.164/X.121 addresses and only accept calls to "any" DLCI from the address list. Each time the SPVC connects, the "new" status is indicated in the PVC signaling. While the SPVC is connected, the "active" status is indicated.   When the call is released , the PVC signaling indicates the associated DLCI is "deleted" therefore it is not possible to indicate a status of present and inactive at the called end.

B.3.1.2.3 Call Reject Called End

The called end may reject an incoming call for many reasons, some of which are described below:

1.   The "specific" DLCI may be in use. If the call was placed to a specific DLCI, then an alternative DLCI cannot be used and the call must be rejected. If the call was placed to "any" DLCI and none are available, then the call is rejected.

2.   The calling party may not have authority to connect to the called party. Called agents may optionally be configured with a list of calling numbers (E.164 or x.121 numbers) which are permitted to connect to a specific port or a specific DLCI on a port. If the calling number is not on the authorized calling party list or no calling number is present in the call request, the call is rejected.

3.   One of many resources may be exhausted. There may be no more buffers available, or CIR may be exhausted, or any number of other reasons why the call cannot be accepted.

4.   The called interface may be a PVC-NNI which is indicating "inactive" or PVC "deleted" for the status of corresponding PVC segment. The PVC-NNI must indicate the PVC segment is present and "active" in the PVC network before the called agent will accept the call request.
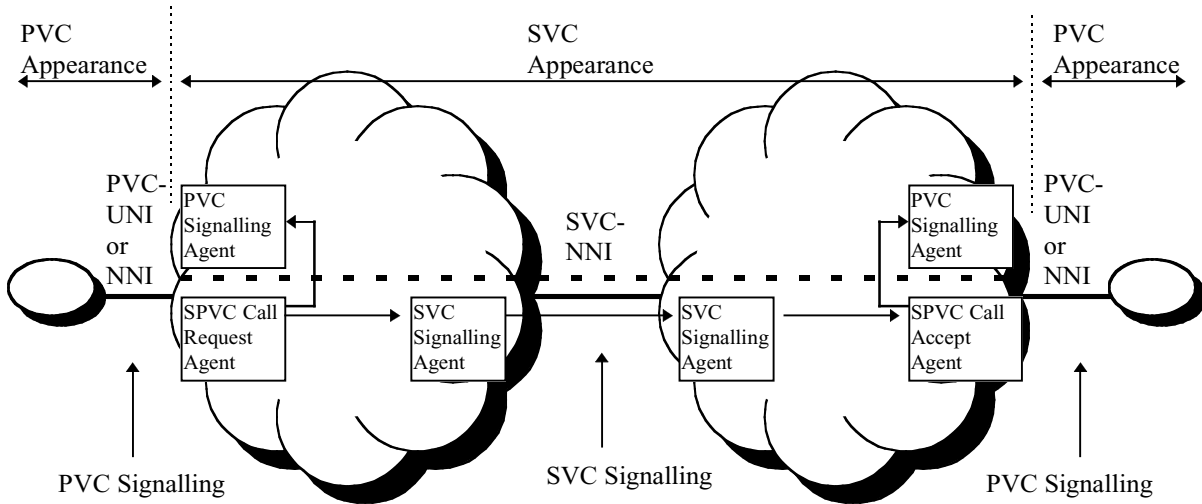
Figure B.4 - SPVC-to-SPVC Call Setup

B.3.2 Disconnect Due To Active Bit Status or Integrity Failure

The Active bit status which is signaled in a full status report at the PVC-NNI indicates the status of a PVC segment. When a transition to inactive status is indicated over the PVC-NNI to either the calling or the called end, an SPVC disconnect is initiated by that end for the SPVC associated with the DLCI which is inactive. If the PVC-NNI interface (or PVC-UNI interface) is declared inoperative, all SPVCs to and from the interface are disconnected. Again, the end that detects the failure initiates the disconnect. Once an SPVC has been disconnected, re-connection is periodically attempted as previously described.

Annex C   Forward Reference FRF.2.2

FRF.2.2 *Network to Network Interface Implementation Agreement* is under development by the Frame Relay Forum Technical Committee at the time of this writing. As soon as a final draft of this document has been ratified, it will become normative to this document. All references to FRF.2.1 [13]will be superseded by references to FRF.2.2.