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APPN Routing: ISR and HPR

Document ID: 12239

Introduction

This document describes Advanced Peer−to−Peer Networking (APPN) routing. The document covers Intermediate Session Routing (ISR) and High Performance Routing (HPR).

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

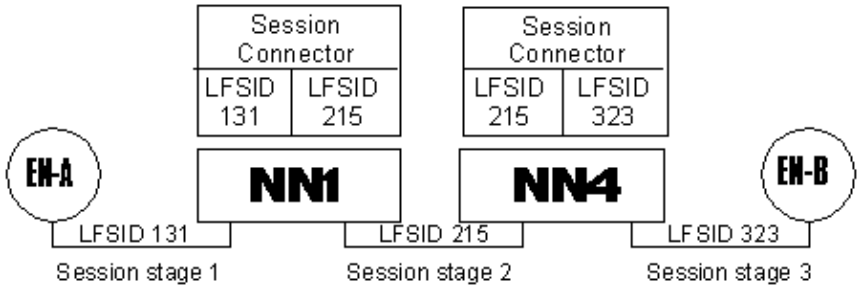
This document is not restricted to specific software and hardware versions.

Conventions

For more information on document conventions, refer to the Cisco Technical Tips Conventions.

Background Information

Figure 1



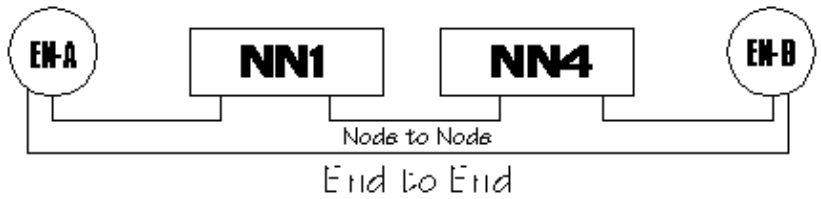
In this network, a single session is divided into stages. There is a stage between every pair of APPN nodes. Each stage has a unique identifier, the **Local−Form Session Identifier** (LFSID). Each stage can have unique segmenting and pacing requirements. Therefore, at each intermediate node, the entire message must be buffered. These processes occur:

- Error detection
- Error correction
- Flow control
- Resegmentation

The message header does not carry network addresses or names. Instead, the nodes use the unique 17−bit session identifier. Each node has a session connector that swaps the incoming unique label for the outgoing unique label. So only the label and port in both directions must be remembered.

Issues with ISR

Figure 2



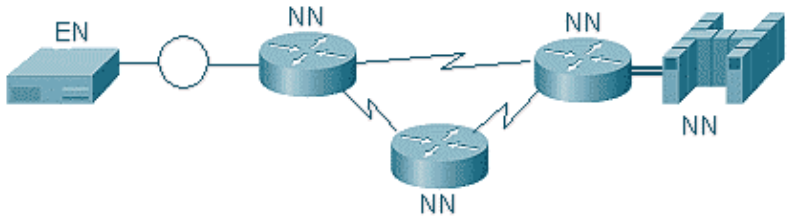
While ISR does improve some capabilities over legacy Systems Network Architecture (SNA), there remain issues with ISR. These issues reduce the effectiveness of ISR in a high−speed LAN interconnected environment.

ISR requires *significant processing* for error control, flow control, and segmentation at each intermediate node. The significant processing causes *significant latency* in each node. This latency defeats the value that you gain when you build a high−speed network. End−to−end processing is preferred over node−to−node processing as a way to provide error control and flow control.

With other, newer protocols, you can switch connections without disruption. But ISR requires you to tear down and restart sessions when a line outage occurs.

Use of HPR

Figure 3

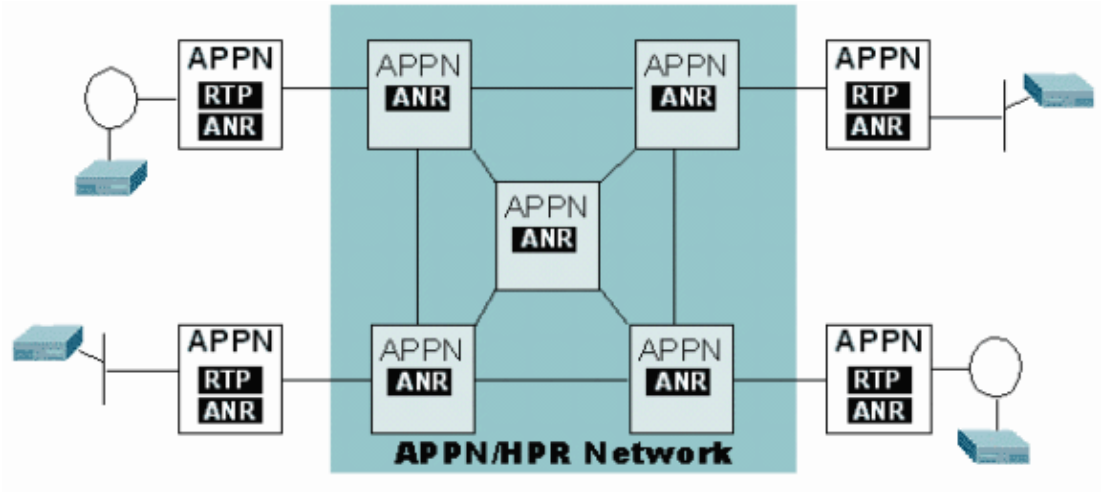


HPR is the second generation of APPN routing. HPR overcomes the shortcomings of ISR because HPR is able to:

- Reduce the amount of processing in *intermediate nodes*. HPR moves these processes to nodes at the "edge" of the network only:
    - ♦ Error processing
    - ♦ Flow control
    - ♦ Segmentation
- Route around failures in session paths **without disrupting sessions**.
- Implement Adaptive Rate−Based (ARB) flow control, a more optimal method of flow control in high−bandwidth environments.

HPR Layers

Figure 4



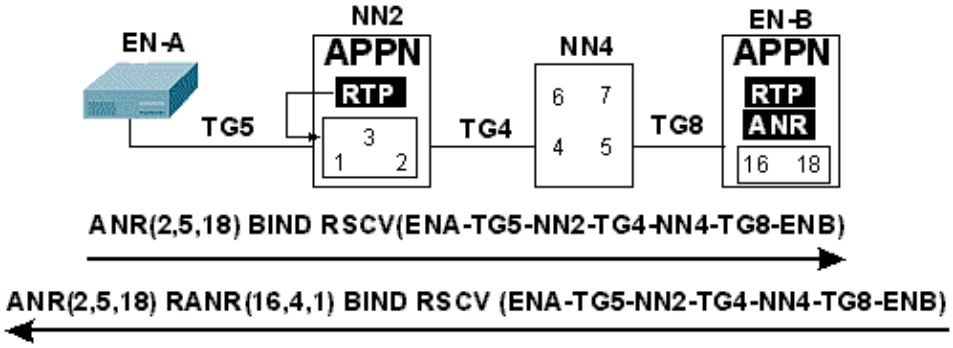
HPR consists of these layers:

- **Automatic Network Routing** (ANR) A connectionless layer that enables rerouting around failures.
- **Rapid Transport Protocol** (RTP) A reliable connection−oriented layer that provides the end−to−end functionality.

In intermediate nodes, processing occurs at the ANR level, which significantly reduces latency. This latency reduction is important in high−speed networking.

HPR Route Setup

Figure 5



HPR does not rely on routing tables on each router. Instead, HPR uses **source routing**, in which the header of each message carries the path. This routing field is actually the set of labels that represent the ports that each node uses. As a message goes out of the port, the label is deleted from the path.

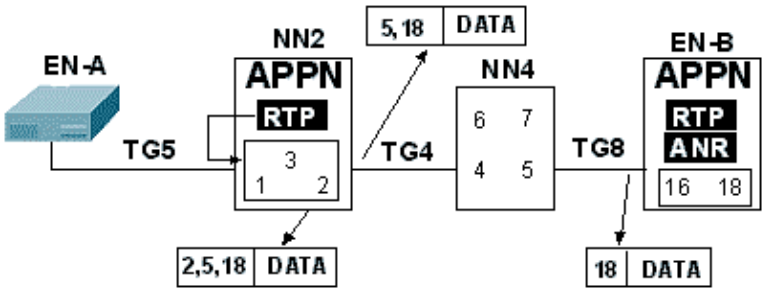
While the routing algorithms have changed, the session setup is the same as the ISR setup, up to the point at which the *BIND* is built. The BIND build involves:

- Location of the resources
- Selection of the route, with class of service (CoS) as a basis
- Inclusion of the path in the Route Selection Control Vector (RSCV)

RTP connections are established between the **edge** nodes. If a connection does not exist between the appropriate two RTPs for a particular CoS, the send of the **Route Setup Request** establishes a connection. The Route Setup Reply provides the ANR and Reverse ANR (RANR) paths. The BIND can be appended to the Route Setup Request or can be sent separately. After determination of the ANR and RANR, the headers of all subsequent messages carry these paths.

ANR Processing

Figure 6



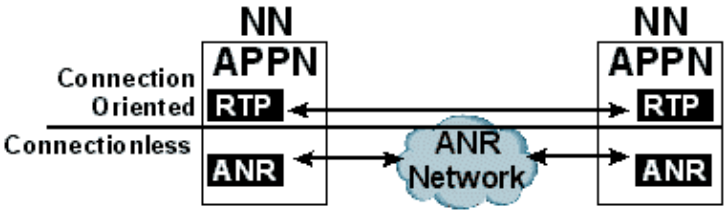
Since ANR is a **connectionless protocol**, ANR discards packets under congested conditions. The responsibility of RTP is to detect this discard and request a retransmission.

Figure 6 depicts the use of the routing field in order to find the next port. The last port number, 18, represents the "port" inside the final node where the message is sent. This can be an application on the control point to process control messages or pass messages to an ISR node.

In Figure 6, the reverse path (RANR) is (16, 4, 1).

RTP Processing

Figure 7



The RTP−RTP connections carry session data. The RTP layer provides reliable delivery of HPR, much like the TCP layer does in TCP/IP.

The RTP layer is also responsible for the selection of a new path if an outage occurs in the network.

When an outage occurs, the packet is routed back to the end RTP node. Then, the determination of a new route occurs. The Route Setup Request flows in order to determine the ANR and RANR fields. Then, the message begins to flow on the new path, without the need for the end user to restart the session.

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