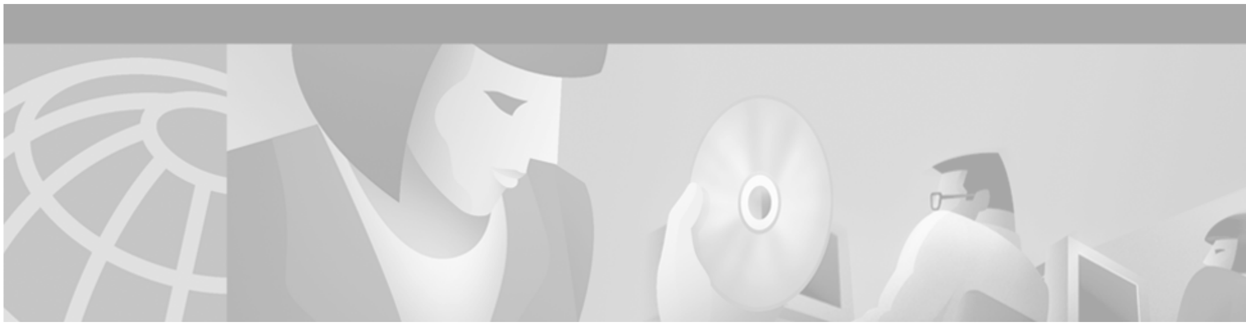

AppleTalk and Novell IPX Overview

The Cisco IOS software supports a variety of routing protocols. The *Cisco IOS AppleTalk and Novell IPX Configuration Guide* discusses AppleTalk and Novell IPX network protocols; it contains these sections:

- AppleTalk Overview
- Novell IPX Overview

The *Cisco IOS IP Configuration Guide* discusses the following network protocols:

- IP
- IP Routing

The *Cisco IOS Apollo Domain, Banyan VINES, DECnet, ISO CLNS, and XNS Configuration Guide* discusses the following network protocols:

- Apollo Domain
- Banyan VINES
- DECnet
- ISO CLNS
- XNS

This overview chapter provides a high-level description of AppleTalk and Novell IPX. For configuration information, see the appropriate chapter in this publication.

To identify the hardware platform or software image information associated with a feature, use the Feature Navigator on Cisco.com to search for information about the feature or refer to the software release notes for a specific release. For more information, see the section "Identifying Supported Platforms" in the "Using Cisco IOS Software" chapter.

AppleTalk Overview

This section provides background on AppleTalk and briefly describes the Cisco implementation of AppleTalk.

Background on AppleTalk

AppleTalk is a LAN system designed and developed by Apple Computer, Inc. It can run over Ethernet, Token Ring, and FDDI networks, and over the Apple proprietary twisted-pair media access system (LocalTalk). AppleTalk specifies a protocol stack comprising several protocols that direct the flow of traffic over the network.

Apple Computer uses the name *AppleTalk* to refer to the Apple network protocol architecture. Apple Computer refers to the actual transmission media used in an AppleTalk network as LocalTalk, TokenTalk (AppleTalk over Token Ring), EtherTalk (AppleTalk over Ethernet), and FDDITalk (AppleTalk over FDDI).

The Cisco Implementation of AppleTalk

Cisco IOS software supports AppleTalk Phase 1 and AppleTalk Phase 2. For AppleTalk Phase 2, Cisco devices support both *extended* and *nonextended* networks.

A Cisco router or access server may receive equivalent routes advertised by neighboring routers with one router giving an AppleTalk Phase 1 form of the route (for example, 101), and another giving an AppleTalk Phase 2 form of the route (for example, 101-101). When neighboring routers advertise equivalent overlapping routes to a router, the router always uses the AppleTalk Phase 2 form of the route and discards the AppleTalk Phase 1 route.

Media Support

The Cisco implementation of AppleTalk routes packets over Ethernet, Token Ring, and FDDI LANs, and over X.25, High-Level Data Link Control (HDLC), Frame Relay, and Switched Multimegabit Data Service (SMDS) WANs.

Standard AppleTalk Services

The Cisco implementation of AppleTalk supports the following standard AppleTalk protocols:

- AppleTalk Address Resolution Protocol (AARP)
- AppleTalk Port Group
- Datagram Delivery Protocol (DDP)
- Routing Table Maintenance Protocol (RTMP)
- Name Binding Protocol (NBP)
- Zone Information Protocol (ZIP)
- AppleTalk Echo Protocol (AEP)
- AppleTalk Transaction Protocol (ATP)

AARP, DDP, and RTMP provide end-to-end connectivity between internetworked nodes. AARP maps AppleTalk node addresses to the addresses of the underlying data link, thus making it possible for AppleTalk to run on several data links. DDP provides socket-to-socket delivery of packets. RTMP establishes and maintains routing tables.

NBP and ZIP maintain node name and zone information. NBP maps network names to AppleTalk addresses. ZIP tracks which networks are in which zones.

AEP is an echo (or ping-type) protocol. It generates packets that test the reachability of network nodes.

ATP is a reliable transport protocol that provides data acknowledgment and retransmission for transaction-based applications, such as file services provided by the AppleTalk Filing Protocol (AFP) and print services provided by the Printer Access Protocol (PAP).

Our software provides support for the AppleTalk MIB variables as described in RFC 1243.

Enhancements to Standard AppleTalk Services

The Cisco AppleTalk implementation includes the following enhancements to standard AppleTalk support:

- Support for AppleTalk Enhanced Interior Gateway Routing Protocol (Enhanced IGRP). AppleTalk Enhanced IGRP provides the following features:
  - Automatic redistribution. By default, AppleTalk RTMP routes are automatically redistributed into Enhanced IGRP, and AppleTalk Enhanced IGRP routes are automatically redistributed into RTMP. If desired, you can turn off redistribution. You can also completely turn off AppleTalk Enhanced IGRP and AppleTalk RTMP on the device or on individual interfaces.
  - Configuration of routing protocols on individual interfaces. You can configure interfaces that are configured for AppleTalk to use either RTMP, Enhanced IGRP, or both routing protocols. If two neighboring routers are configured to use both RTMP and Enhanced IGRP, the Enhanced IGRP routing information supersedes the RTMP information. However, both routers continue to send RTMP routing updates. This feature allows you to control the excessive bandwidth usage of RTMP on WAN links. Because a WAN link is a point-to-point link (that is, there are no other devices on the link), there is no need to run RTMP to perform end-node router discovery. Using Enhanced IGRP on WAN links allows you to save bandwidth and, in the case of packet-switched data networks (PSDNs), traffic charges.
- Support for EtherTalk 1.2 and EtherTalk 2.0 without the need for translation or transition routers.
- Support for Ethernet-emulated LANs. For more information on emulated LANs (ELANs) and routing AppleTalk between them, refer to the “Configuring LAN Emulation” chapter of the *Cisco IOS Switching Services Configuration Guide*.
- Support for VLANs. For more information on VLANs and routing AppleTalk between them over Inter-Switch Link (ISL) or IEEE 802.10, refer to the “Configuring Routing Between VLANs with ISL Encapsulation” and “Configuring Routing Between VLANs with IEEE 802.10 Encapsulation” chapters of the *Cisco IOS Switching Services Configuration Guide*.
- Support for WAN protocols, including SMDS, Frame Relay, X.25, and HDLC.
- Configurable protocol constants (including the control of the aging of entries in the routing table and control of the AARP interval and number of retransmissions).
- No software limits on the number of zones or routes. However, per AppleTalk specification you can only have a maximum of 255 zones per segment.
- MacTCP support via a MacIP server.
- Support of IPTalk, which provides IP encapsulation of AppleTalk, IPTalk, and the Columbia AppleTalk Package (CAP).
- Access control for filtering network traffic by network number, ZIP filtering, by NBP entity names, filtering routing table updates, and filtering GetZoneList (GZL) responses.
- Integrated node name support to simplify AppleTalk network management.

- Interactive access to AEP and NBP provided by the **test appletalk** command.
- Configured (seed) and discovered interface configuration.
- Support for the AppleTalk Responder, which is used by network monitoring packages such as *Inter•Poll*.
- Simple Network Management Protocol (SNMP) over AppleTalk.
- Encapsulation (tunneling) of AppleTalk RTMP packets over an IP backbone.
- Support for AppleTalk static routes.
- Simple Multicast Routing Protocol (SMRP) over AppleTalk.

Security

AppleTalk, like many network protocols, makes no provisions for network security. The design of the AppleTalk protocol architecture requires that security measures be implemented at higher application levels. Cisco supports AppleTalk distribution lists, allowing control of routing updates on a per-interface basis. This security feature is similar to those that Cisco provides for other protocols.

Note that the Cisco implementation of AppleTalk does not forward packets with local source and destination network addresses. This behavior does not conform with the definition of AppleTalk in the Apple Computer *Inside AppleTalk* publication. However, this behavior is designed to prevent any possible corruption of the AARP table in any AppleTalk node that is performing address gleaning through MAC.

Novell IPX Overview

This section offers background information and briefly describes the Cisco implementation of Novell IPX.

Background on Novell IPX

Novell Internetwork Packet Exchange (IPX) is derived from the Xerox Network Systems (XNS) Internet Datagram Protocol (IDP). IPX and XNS have the following differences:

- IPX and XNS do not always use the same Ethernet encapsulation format.
- IPX uses the Novell proprietary Service Advertising Protocol (SAP) to advertise special network services. File servers and print servers are examples of services that typically are advertised.
- IPX uses delay (measured in ticks) while XNS uses hop count as the primary metric in determining the best path to a destination.

The Cisco Implementation of Novell IPX

The Cisco implementation of the Novell IPX protocol is certified to provide full IPX routing functionality.

IPX MIB Support

Cisco supports the IPX MIB (currently, read-only access is supported). The IPX Accounting group represents one of the local Cisco-specific IPX variables we support. This group provides access to the active database that is created and maintained if IPX accounting is enabled on a router or access server.

IPX Enhanced IGRP Support

Cisco IOS software supports IPX Enhanced IGRP, which provides the following features:

- Automatic redistribution—IPX Routing Information Protocol (RIP) routes are automatically redistributed into Enhanced IGRP, and Enhanced IGRP routes are automatically redistributed into RIP. If desired, you can turn off redistribution. You also can completely turn off Enhanced IGRP and IPX RIP on the device or on individual interfaces.
- Increased network width—With IPX RIP, the largest possible width of your network is 15 hops. When Enhanced IGRP is enabled, the largest possible width is 224 hops. Because the Enhanced IGRP metric is large enough to support thousands of hops, the only barrier to expanding the network is the transport layer hop counter. Cisco works around this problem by incrementing the transport control field only when an IPX packet has traversed 15 routers, and the next hop to the destination was learned via Enhanced IGRP. When a RIP route is being used as the next hop to the destination, the transport control field is incremented as usual.
- Incremental SAP updates—Complete SAP updates are sent periodically on each interface until an Enhanced IGRP neighbor is found, and thereafter only when changes are made to the SAP table. This procedure works by taking advantage of the Enhanced IGRP reliable transport mechanism, which means that an Enhanced IGRP peer must be present for incremental SAPs to be sent. If no peer exists on a particular interface, periodic SAPs will be sent on that interface until a peer is found. This functionality is automatic on serial interfaces and can be configured on LAN media.

LANE Support

Cisco IOS software supports routing IPX between Ethernet-emulated LANs and Token Ring-emulated LANs. For more information on emulated LANs and routing IPX between them, refer to the “Configuring LAN Emulation” chapter of the *Cisco IOS Switching Services Configuration Guide*.

VLAN Support

Cisco IOS software supports routing IPX between VLANs. Users with Novell NetWare environments can configure any one of the four IPX Ethernet encapsulations to be routed using ISL encapsulation across VLAN boundaries. For more information on VLANs and routing IPX between them over ISL, refer to the “Configuring Routing Between VLANs with ISL Encapsulation” chapter of the *Cisco IOS Switching Services Configuration Guide*.

Multilayer Switching Support

Cisco IOS software supports IPX Multilayer Switching (MLS). For more information on IPX MLS, refer to the “Multilayer Switching” chapter of the *Cisco IOS Switching Services Configuration Guide*.