



Always On Dynamic ISDN (AO/DI) Enhancements

The Always On Dynamic ISDN (AO/DI) Enhancements update the existing Cisco AO/DI software to allow Layer 2 communications to be reestablished whenever there is X.25 traffic to be transported, even after a central office has brought down Layer 1 and Layer 2 circuits.

History for the Always On Dynamic ISDN (AO/DI) Enhancements Feature

Release	Modification
12.4(4)T	This feature was introduced.

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Contents

- [Prerequisites for Always On Dynamic ISDN \(AO/DI\) Enhancements, page 1](#)
- [Information About Always On Dynamic ISDN \(AO/DI\) Enhancements, page 2](#)
- [Additional References, page 3](#)

Prerequisites for Always On Dynamic ISDN (AO/DI) Enhancements

The Cisco IOS Always On Dynamic (AO/DI) ISDN Enhancements update operation of the Cisco IOS AO/DI software. To use AO/DI, the X.25 encapsulation (per RFC 1356), PPP, Bandwidth Allocation Control Protocol (BACP), and Bandwidth Allocation Protocol (BAP) modules must be present in both the AO/DI client and server.



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AO/DI relies on features from X.25, PPP, and BACP modules and must be configured on both the AO/DI client and server. BAP, if negotiated, is a subset of BACP, which is responsible for bandwidth allocation for the Multilink PPP (MLP) peers. It is recommended you configure MLP with the BAP option due to the differences between the ISDN (E.164) and X.25 (X.121) numbering formats.

Before you can implement AO/DI, you must configure the AO/DI client and server for PPP, incorporating BAP and X.25 module commands. This task involves configuring the BRI or PRI interfaces with the appropriate X.25 commands and the dialer interfaces with the necessary PPP or BAP commands. See the [“Related Documents” section on page 3](#) for pointers to information about configuring AO/DI.

Information About Always On Dynamic ISDN (AO/DI) Enhancements

The enhancements that have been made to AO/DI to allow reestablishment of X.25 Layer 2 connections are described in the following section:

- [SAPI 16 and the Reestablishment of ISDN Layer 2 for Outgoing X.25 Traffic, page 2](#)

SAPI 16 and the Reestablishment of ISDN Layer 2 for Outgoing X.25 Traffic

The Cisco IOS AO/DI software supports PPP encapsulation on switched X.25 virtual circuits (VCs). AO/DI places a call from the subscriber to the packet data service provider using the ISDN D channel to transport X.25 traffic. The link associated with the D-channel X.25 packet connection is used as the primary link to multilink protocols. Because the D channel is an always-available, connectionless, packet-oriented link between Customer Premises Equipment (CPE) and the central office, it is possible to offer an always-available service based on X.25. Further, because the D-channel X.25 packets are handled at the service provider’s central office by an X.25 packet handler, it is possible to route the X.25 packets without first crossing an ISDN switch, which reduces the impact to the telephony network. The multilink and TCP/IP protocols are encapsulated with an X.25 logical circuit carried by the D channel. When a PPP packet is to be transmitted, AO/DI software encapsulates the PPP packet in an X.25 packet.

The implementation of AO/DI before Cisco IOS Release 12.4(4)T allows the encapsulation to proceed *only* when X.25 is in a service-available state. It is fairly common on ISDN switches in Europe for the central office to bring down Layer 1 and Layer 2 circuits, to save power when there is no active call for a period of time. Before Cisco IOS Release 12.4(4)T, AO/DI could not reestablish a Layer 2 circuit after the ISDN switch was brought down, and once down, no more X.25 traffic could be encapsulated and sent over the circuit.



Note

The Layer 2 circuit is governed by Service Access Point Identifier (SAPI) 16. SAPI is Layer 2 information that specifies the Layer 2 data link entity that will process a Layer 2 frame, and the Layer 3 entity that will receive that information. SAPI conforms to definitions contained in Recommendation Q.920 as published by the ITU, and is one part of the Data Link Connection Identifier (DLCI) standard. A SAPI can have as many as 64 service access points assigned, and one such assignment, SAPI 16, specifies packet mode communications using X.25 Layer 3 procedures. When a circuit over a D channel defined by SAPI 16 goes down, a notification is sent to X.25 to change its state, to indicate that the lower layer is not providing service. The X.25 state will *not* change back to the service available state until the circuit is reestablished and an I-frame is received from the ISDN switch.

The Always On Dynamic ISDN (AO/DI) Enhancements allow the gateway to reestablish Layer 2 communications whenever there is X.25 traffic to be transported. To allow AO/DI to reestablish the circuit, a registry function has been implemented that works with X.25 and the Layer 2 circuit procedures to enable service to be reestablished and data encapsulation to proceed normally. Once the link is reestablished, any packets that had already been queued will be sent across the circuit.

Additional References

The following sections provide references related to the Always On Dynamic ISDN (AO/DI) Enhancements.

Related Documents

Related Topic	Document Title
AO/DI configuration	“ Configuring X.25 on ISDN Using AO/DI ” in the ISDN Configuration part of the <i>Cisco IOS Dial Configuration Guide</i>

Standards

Standard	Title
ITU-T Recommendation Q.920	<i>ISDN USER-NETWORK INTERFACE DATA LINK LAYER – GENERAL ASPECTS</i>
ITU-T Recommendation X.25	<i>SERIES X: DATA NETWORKS AND OPEN SYSTEM COMMUNICATION</i> <i>Public data networks – Interfaces</i>

RFCs

RFC	Title
RFC 1356	<i>Multiprotocol Interconnect on X.25 and ISDN in the Packet Mode</i>
RFC 1598	<i>PPP in X.25</i>

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

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