Any Transport over MPLS on

Cisco 7200, 7400, and 7500

Series Routers

Introduction

Many service providers currently offer Layer 2 transport services to their customers over a circuit-based infrastructure to build Layer 2 virtual private networks (VPNs). These services are created using point-to-point data link layer connectivity, on ATM or Frame Relay virtual circuits. Customers of these service providers build their own Layer 3-based networks to accommodate IP traffic. This practice results in two separate networks for Layer 2 and Layer 3 traffic with high maintenance costs and administrative challenges.

Any Transport over MPLS (AToM) is the Cisco solution for transporting Layer 2 traffic over an IP or Multiprotocol Label Switching (MPLS) backbone. AToM extends the usability of the IP/MPLS backbone by enabling it to offer both Layer 2 and Layer 3 services. The AToM product set accommodates many types of Layer 2 frames, including Ethernet, Frame Relay, ATM, Point-to-Point Protocol (PPP), and High-Level Data Link Control (HDLC) across Cisco 7200, 7400, and 7500 Series routers to meet varying customer requirements for performance, features, and bandwidth.

Benefits of AToM

The AToM solution for the Cisco 7200, 7400, and 7500 series offers a variety of benefits to customers:

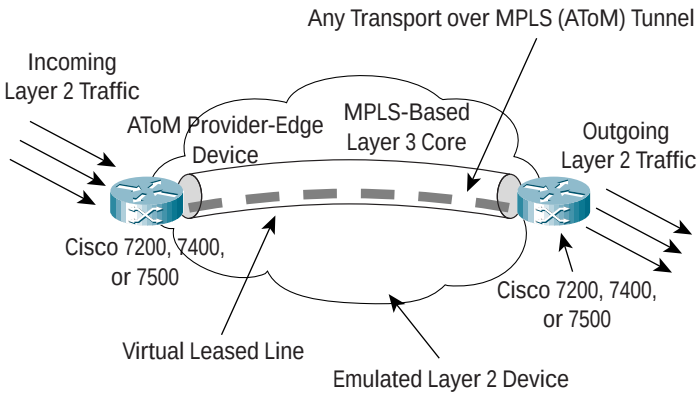
- *Extends* existing/newly deployed MPLS networks by reusing the MPLS network infrastructure built using Cisco 7200, 7400, and 7500 routers as MPLS provider-edge devices to offer new Layer 2 VPN services.
- *Improves scalability* for ATM-based core networks. MPLS AToM links any pair of provider-edge routers with a single label switched path (LSP) instead of a multitude of virtual circuits. That single LSP then serves as a carrier of many emulated virtual circuits by means of label stacking, resulting in better scalability.
- *Enables migration* from traditional Layer 2 VPNs to new MPLS-based Layer 2/3 VPN networks using Cisco 7200, 7400, and 7500 routers at the edge of the network.
- It offers *lower infrastructure and maintenance costs* for service providers by building a unified network for Layer 2 and Layer 3 VPNs using the same set of Cisco 7200, 7400, and 7500 routers.
- Can be combined with quality of service (QoS) and traffic engineering to build *new revenue-generating services* such as

virtual leased lines that mimic existing Layer 2 services (ATM, Frame Relay) without compromising the scalability and flexibility of the MPLS networks on which they run.

How AToM works on the Cisco 7200, 7400, and 7500

Cisco 7200, 7400, and 7500 AToM works in a similar way across platforms (Figure 1). The incoming Layer 2 packet is encapsulated in an MPLS frame, and is transported across the MPLS cloud via a Layer 2 virtual circuit signaled using a Label Distribution Protocol (LDP)-based signaling mechanism. The Layer 2 virtual circuit uses an existing MPLS LSP to tunnel the incoming Layer 2 traffic across an MPLS core. Described in more general terms, the MPLS core acts as a Layer 2 device, such as an Ethernet switch or Frame Relay switch, and so on.

Figure 1
How AToM Works on Cisco 7200-/7400-/7500-Based MPLS Core



Cisco AToM is implemented based on Internet standards for transport of Layer 2 traffic in a point-to-point (Phase 1—available now) and multipoint (Phase 2—future release) fashion between the two provider-edge devices, typically a Cisco 7200, 7500, or 7400 Series Router.

In supporting the incoming Layer 2 frames to be transported across an MPLS cloud, Cisco 7200, 7400, and 7500 Series routers apply various rules that enable the customer's Layer 2 frames to be transported as if the MPLS cloud were simply a Layer 2 device. This requires transfer of some control information from incoming Layer 2 traffic (at ingress provider edge) to outgoing Layer 2 traffic (at egress provider edge). This exchange of information takes place using the rules defined in the various Internet drafts, as mentioned later in the section "Standards Compliance for AToM on the Cisco 7200, 7400, and 7500 Series."

The MPLS cloud, therefore, acts as an emulated Layer 2 device (Figure 1). The AToM service based on the Cisco 7200, 7400, and 7500 looks like a virtual leased line, with which customers are very familiar.

Supported Transport Types

AToM for the Cisco 7200, 7400, and 7500 enables the following types of Layer 2 frames and cells to be directed across an MPLS backbone:

- Ethernet VLAN
- Frame Relay
- ATM adaptation layer 5 (AAL5)
- ATM cell relay (single cell)
- PPP
- HDLC

The first phase of AToM development on the Cisco 7200, 7400, and 7500 series supports like-to-like connectivity. This requires that the same transport type be at each end of the network. In the future, AToM will be enhanced to provide interworking functions that can connect disparate transport types at each end, such as Frame Relay at one end connecting to an Ethernet virtual LAN (VLAN) at the other.

Details on supported port adapters for this service on the Cisco 7200, 7400, and 7500 are available at www.cisco.com.

Standards Compliance for AToM on the Cisco 7200, 7400, and 7500 Series

AToM technology is based on the following Internet Engineering Task Force (IETF) draft documents:

Transport of Layer 2 Frames over MPLS:

http://search.ietf.org/internet-drafts/draft-martini-l2circuit-trans-mpls-xx.txt

Encapsulation Methods for Transport of Layer 2 Frames over MPLS:

http://search.ietf.org/internet-drafts/draft-martini-l2circuit-encap-mpls-xx.txt

Architecture for Layer 2 VPNs:

http://search.ietf.org/internet-drafts/draft-ietf-ppvpn-l2vpn-xx.txt

The following terms are common to AToM technology on the Cisco 7200, 7400, and 7500 series.

Any Transport over MPLS (AToM)—The name of the Cisco product set that transports many types of frames and cells over an MPLS backbone.

Label switched path (LSP)—A path from one MPLS router to another. Packets travel between MPLS routers through LSPs. LSPs go in only one direction. To provide two-way traffic, configure LSPs in each direction. An LSP can be established dynamically, based on normal routing mechanisms, or through configuration.

Label imposition—The act of putting label(s) onto a packet. The provider-edge router does label imposition. In the case of Layer 2 transport over MPLS, this is the router that receives a packet and encapsulates it with MPLS encapsulation.

Label disposition—The act of removing label(s) from a packet. The provider-edge router does this. In the case of Layer 2 transport over MPLS, this is the router that receives an MPLS encapsulated packet, removes the last label, and transmits the Layer 2 protocol data unit (PDU) out the appropriate interface.

Label Distribution Protocol (LDP)—A standard protocol between MPLS-enabled routers to negotiate the labels (addresses) used to forward packets.

Virtual circuit—A logical connection created to ensure reliable communication between two network devices. A virtual circuit denotes the existence of a logical, bidirectional path from one device to another across a network.

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