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W. Townsley
A. Valencia
cisco Systems
A. Rubens
Ascend Communications
G. Pall
G. Zorn
Microsoft Corporation
B. Palter
Redback Networks
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Layer Two Tunneling Protocol "L2TP"

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

This document describes the Layer Two Tunneling Protocol (L2TP). STD 51, RFC 1661 specifies multi-protocol access via PPP [RFC1661]. L2TP facilitates the tunneling of PPP packets across an intervening network in a way that is as transparent as possible to both end-users and applications.

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1.0 Introduction

PPP [RFC1661] defines an encapsulation mechanism for transporting multiprotocol packets across layer 2 (L2) point-to-point links. Typically, a user obtains a L2 connection to a Network Access Server (NAS) using one of a number of techniques (e.g., dialup POTS, ISDN, ADSL, etc.) and then runs PPP over that connection. In such a configuration, the L2 termination point and PPP session endpoint reside on the same physical device (i.e., the NAS).

L2TP extends the PPP model by allowing the L2 and PPP endpoints to reside on different devices interconnected by a packet-switched network. With L2TP, a user has an L2 connection to an access concentrator (e.g., modem bank, ADSL DSLAM, etc.), and the concentrator then tunnels individual PPP frames to the NAS. This allows the actual processing of PPP packets to be divorced from the termination of the L2 circuit.

long-distance toll charge), the connection may terminate at a (local) circuit concentrator, which then extends the logical PPP session over

a shared infrastructure such as frame relay circuit or the Internet. From the user's perspective, there is no functional difference between having the L2 circuit terminate in a NAS directly or using L2TP.

L2TP may also solve the multilink hunt-group splitting problem. Multilink PPP [RFC1990] requires that all channels composing a multilink bundle be grouped at a single Network Access Server (NAS). Due to its ability to project a PPP session to a location other than the point at which it was physically received, L2TP can be used to make all channels terminate at a single NAS. This allows multilink operation even when the calls are spread across distinct physical NASs.

This document defines the necessary control protocol for on-demand creation of tunnels between two nodes and the accompanying encapsulation for multiplexing multiple, tunneled PPP sessions.

1.1 Specification of Requirements

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

1.2 Terminology

Analog Channel

A circuit-switched communication path which is intended to carry 3.1 kHz audio in each direction.

Attribute Value Pair (AVP)

The variable length concatenation of a unique Attribute (represented by an integer) and a Value containing the actual value identified by the attribute. Multiple AVPs make up Control Messages which are used in the establishment, maintenance, and teardown of tunnels.

Call

A connection (or attempted connection) between a Remote System and LAC. For example, a telephone call through the PSTN. A Call (Incoming or Outgoing) which is successfully established between a Remote System and LAC results in a corresponding L2TP Session within a previously established Tunnel between the LAC and LNS. (See also: Session, Incoming Call, Outgoing Call).

Called Number

An indication to the receiver of a call as to what telephone number the caller used to reach it.

Calling Number

An indication to the receiver of a call as to the telephone number of the caller.

CHAP

the cleartext password is not passed over the line.

Control Connection

A control connection operates in-band over a tunnel to control the establishment, release, and maintenance of sessions and of the tunnel itself.

Control Messages

Control messages are exchanged between LAC and LNS pairs, operating in-band within the tunnel protocol. Control messages govern aspects of the tunnel and sessions within the tunnel.

Digital Channel

A circuit-switched communication path which is intended to carry digital information in each direction.

DSLAM

Digital Subscriber Line (DSL) Access Module. A network device used in the deployment of DSL service. This is typically a concentrator of individual DSL lines located in a central office (CO) or local exchange.

Incoming Call

A Call received at an LAC to be tunneled to an LNS (see Call, Outgoing Call).

L2TP Access Concentrator (LAC)

A node that acts as one side of an L2TP tunnel endpoint and is a peer to the L2TP Network Server (LNS). The LAC sits between an LNS and a remote system and forwards packets to and from each. Packets sent from the LAC to the LNS requires tunneling with the L2TP protocol as defined in this document. The connection from the LAC to the remote system is either local (see: Client LAC) or a PPP link.

L2TP Network Server (LNS)

A node that acts as one side of an L2TP tunnel endpoint and is a peer to the L2TP Access Concentrator (LAC). The LNS is the logical termination point of a PPP session that is being tunneled from the remote system by the LAC.

Management Domain (MD)

A network or networks under the control of a single administration, policy or system. For example, an LNS's Management Domain might be the corporate network it serves. An LAC's Management Domain might be the Internet Service Provider that owns and manages it.

Network Access Server (NAS)

A device providing local network access to users across a remote access network such as the PSTN. An NAS may also serve as an LAC, LNS or both.

Outgoing Call

A Call placed by an LAC on behalf of an LNS (see Call, Incoming Call).

Peer

LNS. An LAC's Peer is an LNS and vice versa. When used in context with PPP, a peer is either side of the PPP connection.

POTS

Plain Old Telephone Service.

Remote System

An end-system or router attached to a remote access network (i.e. a PSTN), which is either the initiator or recipient of a call. Also referred to as a dial-up or virtual dial-up client.

Session

L2TP is connection-oriented. The LNS and LAC maintain state for each Call that is initiated or answered by an LAC. An L2TP Session is created between the LAC and LNS when an end-to-end PPP connection is established between a Remote System and the LNS. Datagrams related to the PPP connection are sent over the Tunnel between the LAC and LNS. There is a one to one relationship between established L2TP Sessions and their associated Calls. (See also: Call).

Tunnel

A Tunnel exists between a LAC-LNS pair. The Tunnel consists of a Control Connection and zero or more L2TP Sessions. The Tunnel carries encapsulated PPP datagrams and Control Messages between the LAC and the LNS.

Zero-Length Body (ZLB) Message

A control packet with only an L2TP header. ZLB messages are used for explicitly acknowledging packets on the reliable control channel.

2.0 Topology

The following diagram depicts a typical L2TP scenario. The goal is to tunnel PPP frames between the Remote System or LAC Client and an LNS located at a Home LAN.

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