

## Introduction to Dynamic Service Selection (DSS)

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**Making Broadband Manageable: Be Empowered.**

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## INTRODUCTION

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Dynamic Service Selection (DSS) is an advanced feature under development as part of the IETF PPPoE working group. DSS is designed to use the PPPoE framework to its greatest advantage. Service Providers (such as ISPs and LECs) often back-end advanced technology (e.g., MPLS, DiffServ, so on) on their expensive network devices. They do this in order to provide additional services to their users and increase their revenue. The goal of this paper is to present an overview of DSS and to introduce a few a representative samples of applications that make use of DSS for ISPs.

## WHY PPPoE AND DSS

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PPPoE has brought residential users and small Service Providers into the broadband world, which has created a huge business market for LECs or ISPs. Since PPPoE can be used to create multi-PPP-sessions over a single broadband connection link, e.g., ADSL, end-users, like residential users and the smaller service providers, can take the advantage of PPPoE to build their own networks with low cost. PPPoE gives the end-users bandwidth access service, it is also designed to improve the utilization of the equipment already in the LECs and ISPs. PPPoE also aids in the ability to provide additional services to end users, e.g., video stream, telephony and VPN – all with the use of the PPPoE Dynamic Service Selection (DSS) feature.

## HOW PPPoE WORKS

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PPP, which was designed for serial communications, has now been adapted to Ethernet, and is appropriately called PPP over Ethernet (PPPoE). Since PPP was designed to do things that were either impossible or unnecessary with Ethernet, users are often confused as to why one would want to use PPP over Ethernet at all. Let's think of a TCP/IP network and its traffic to a network of city streets and vehicle traffic. Streets can serve many access points. It is easy to get on to and off of the street. Additional access points can be added with little disruption. But it is hard to tell how many cars are actually using each street. PPP, on the other hand, would be comparable to an overhead monorail. Travel is generally between two well-defined points. You can't get on and off just anywhere, it's relatively easy to count and monitor passengers. And with the monorail you need a ticket to board.

In short PPPoE is not unlike running an elevated railway over a street system (or freeway). The train offers speedy access between two well-defined points - allows you to count passengers and you need a ticket to get on

PPPoE protocol uses "information handshakes" to create individual sessions over a single broadband link; a link is able to maintain multiple PPP-sessions at the same time. PPPoE is a client/server type protocol, the client starts to request for the connection and the server responds.

PPPoE has two distinct stages, Discovery stage and PPP Session stage. When a Host wishes to initiate a PPPoE session, it must first perform a Discovery to identify the Ethernet MAC address of the peer and establish a PPPoE SESSION-ID. This SESSION\_ID is used to identify a PPP connection. In the Discovery process, a Host discovers an Access Concentrator. The Host could discover more than one Access Concentrators, and select one. When Discovery completes successfully, both the Host and the selected Access Concentrator have the information they will use to build their PPP connection.

Discovery Stage Procedures:

### *PPPoE Active Discovery Initiation (PADI)*

The Host sends a PADI packet to all reachable Access Concentrators, the PADI packet contains exactly one Type Service Name (tag), which specifies the service that the Host is requesting.

### *PPPoE Active Discovery Offer (PADO)*

When the Access Concentrator receives a PADI packet from a Host, it will respond to the Host with a PADO packet if the Access Concentrator supports the requested service in the received PADI. The responded PADO contains all services the Access Concentrator supports as well as its Mac Address. It is possible for a Host to get responds from more than one Access Concentrator.

### *PPPoE Active Discovery Request (PADR)*

When the Host receives the PADOs it selects one and sends PADR back to the selected Access Concentrator. The choice is based on the Services offered by the Access Concentrator. The PADR contains exactly one Type Service Name (tag), indicating the service being request. Note that the service name in PADR is the same as the one in PADI, by default, only when DSS is disabled.

### *PPPoE Active Discovery Session-Confirmation (PADS)*

When the selected Access Concentrator receives the PADR from the Host, it begins a PPP session by generating a unique SESSION\_ID. Finally, the Access Concentrator confirms the

Host Service request by sending a PADS packet to the Host. The PADS contains the SESSION-ID and Service Name requested by the Host. Once the Host receives the PADS, it establishes a PPP connection with SESSION-ID in PADS.

*PPPoE Active Discovery Terminate (PADT)*

Both the Host and the Access Concentrator can send a PADT packet to terminate a PPP connection specified by SESSION-ID, the termination does not affect other PPP connections in the same broadband link. PPP itself can terminate an active session without PPPoE sending the PADT packet.

After discovery stages complete the PPPoE is switched to “session stage”, in which all communications between the Host and the Access Concentrator are PPP session specified by the SESSION\_ID from the Discovery Stage. As you have seen, PPPoE, by default, is only used to provide a Broadband Access service to the Internet. Because of this it cannot differentiate the ISPs and LECs from others to improve their revenue. This is where (and why) PPPoE Dynamic Service Selection comes to play. The DSS feature is the technology under the PPPoE framework that allows ISPs and LECs to bring their diverse services to the end-users. Services such as VPN, VoIP, QoS, Billing and Bandwidth on Demand, have the potential increase their revenue dynamically. In other words, DSS makes LECs and ISPs more competitive in the telecom market place.

## HOW DSS WORKS

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Dynamic Service Selection is not an extension of PPPoE, which is still under the PPPoE framework. As we have described, the Discovery Stage handshake can be completed between the Host and the Access Concentrators without any interruption. There is, however, a limitation for the uninterrupted handshake procedure. The end-users have no choice in the selection of services contained in PADO (except the default service specified in PADI). In order to interrupt the handshakes - to give the end-users the chance to select whatever the service they want - the Discovery Stage handshake should be enhanced with DSS support.

Discovery Stage procedures with DSS support:

### *PPPoE Active Discovery Initiation (PADI)*

Same as before, but the Host sets the length field of the Type Service Name to 0 in order to make the service name a wild card service in the PADI packet. All reachable Access Concentrators will respond to the Host sending the PADI with the wild card service name.

### *PPPoE Active Discovery Offer (PADO)*

Same as before.

### *PPPoE Active Discovery Request (PADR)*

When the Host receives the PADO packets from Access Concentrator, the Host goes through each PADO packet, retrieves its corresponding Access Concentrator information and its supported services, then displays them to the end-users. Once the end-users select the Access Concentrators and one of the Access Concentrators' supported services, the Host will construct a PADR packet with the selected service name and sent it to the selected Concentrators. With this feature, ISPs & LECs can provide their unique services to their end-users, which can differentiate themselves from others in the market and maximize their revenue.

The remaining procedures are exactly same.

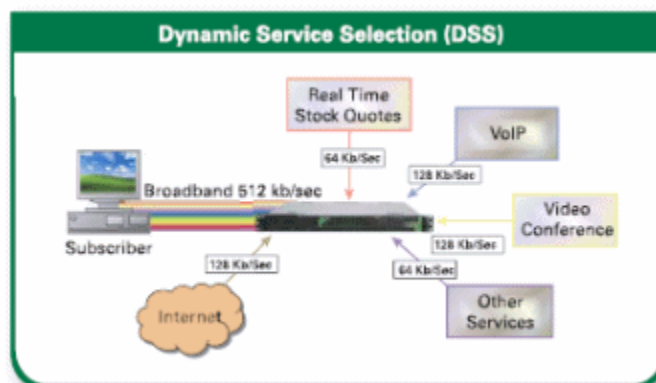
## HOW IMPLEMENT DSS IN ISP/LEC WITH VALUE ADDED SERVICES

We have explained how PPPoE and DSS work theoretically. In this section, we will illustrate how they can work in the network infrastructure of ISPs and LECs. Fine Point Technologies is the leader in providing PPPoE /DSS products in the telecom market. WinPoET/MacPoET is the FinePoint PPPoE/DSS client implementation in Windows and Macintosh respectively, which hides all complexity of PPPoE/DSS protocol and shows the end-users with a GUI for the broadband connection. The end-users will have a familiar dialup-like experience for the broadband connection with WinPoET and MacPoET. The ServPoET is the Fine Point Technologies Inc. PPPoE/DSS server implementation, which functions as the Access Concentrator.

Figure 1 shows a basic network infrastructure and how WinPoET and ServPoET work together to provide the broadband access.

All the ISP and LEC Access Concentrators are configured with services that they support; B-RAS ISP equipment can provide many ISP specific applications, e.g., VPN, VoIP and so on. The Access Concentrators function to record what services the ISP devices can provide.

WinPoET starts PPPoE Active Discovery by sending the PADI with wild card service name tag to all Access Concentrators, they respond to the PADI packet with all available services. Once the Host and one Access Concentrator establish a connection, the selected Access Concentrator is responsible to “route” to the ISP devices that provide the selected service, for example, a MPLS tunnel in a gateway router for VoIP.



## **REGIONAL LOCATIONS WORLDWIDE**

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