

Ouch...what just bit me?

So you've been bitten by the Internet bug and want to dive into the world wide web by becoming what is called an Internet Service Provider (ISP). The good news is that it is actually very easy.

As an ISP you will offer a service which generally includes some kind of access to the Internet. This can be through dial-up modems, DSL, cable, wireless...you name it! There are two ways of becoming an ISP. One is becoming a Virtual ISP which is reselling another ISP's service under your own name. The other way is becoming a facilities based provider which means you own and operate the physical pieces which make up your network.

By becoming a facilities based provider you'll get some routers and servers, an upstream Internet connection and some phone lines. The number one service a provider offers is dial-up modem access. The center of being an ISP is the Internet and the foremost service is Dial-up modem access, with just a few pieces of equipment you too can build yourself an ISP.

What does it mean to an ISP?

The Internet is nothing more than the world's largest network-of-networks. That's it. The only reason the Internet works is that everyone simply agrees to talk to each other. The language of the Internet is TCP/IP. While there are many other protocols in which networks are connected, if you speak IP, you speak Internet.

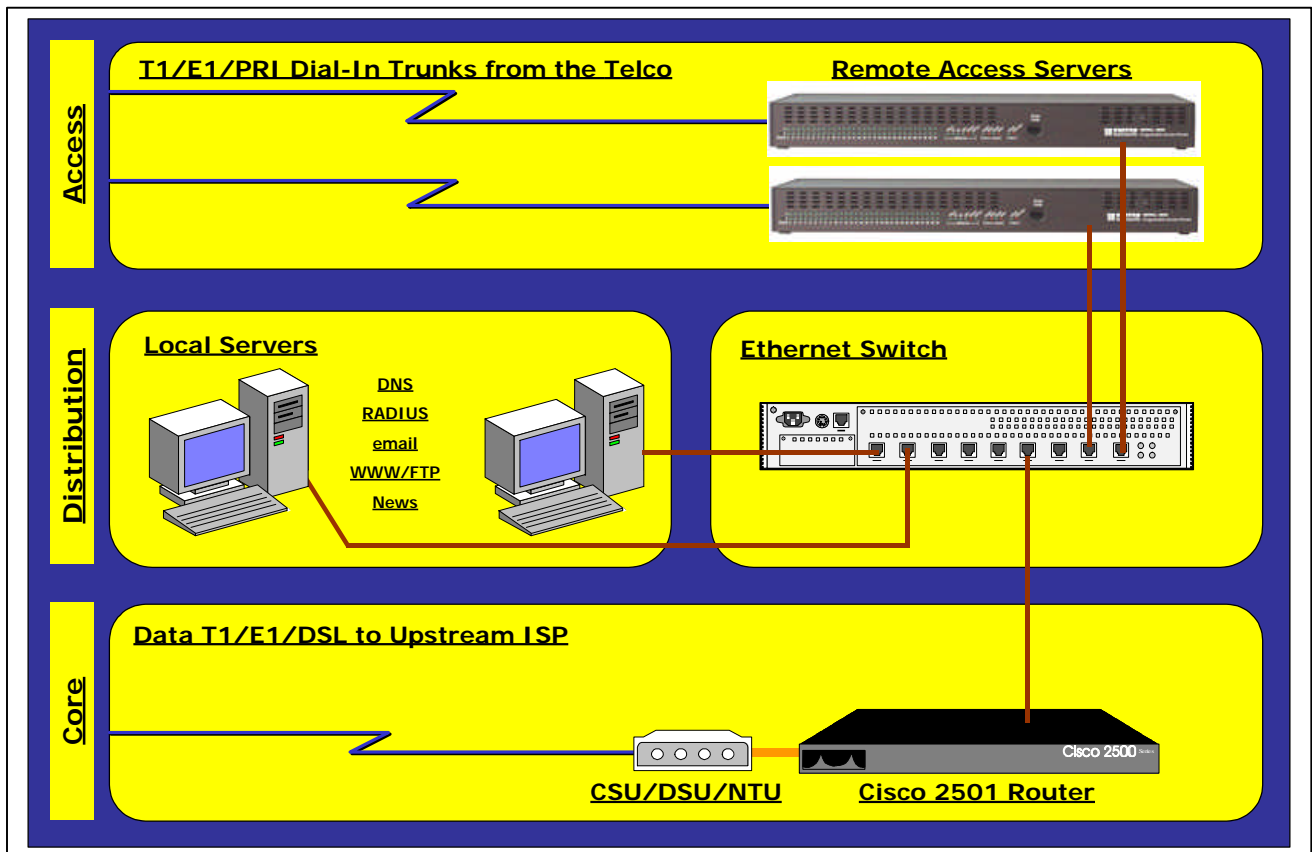
The basic function of an ISP is to connect dial-up callers to the Internet. Typically, customers will call with their modem or TA using Windows 95/98 Dial-Up Networking (DUN), and connect using the Point-to-Point Protocol (PPP). To offer this service means having the capability to answer V.90/K56Flex™ modem and ISDN B-Channel digital calls. Once callers are connected, they will send and receive IP packets to-and-from your network. It is your job to send-and-receive IP packets to-and-from the rest of the world.

There are two distinct sets of Internet users and they fall into the groups of consumer and business. Consumer customers represent the large base of everyday users and are price sensitive. Business customers will require you to provide top-notch service but they will also pay for it. Business customers also may need to connect an office to the Internet, in which case you will route a small piece of the Internet to them called a subnet.

What you need to become a facilities based ISP...the view from 25,000 feet

There are actually very few pieces to the ISP puzzle. By breaking up the ISP's network infrastructure into three distinct areas, we can easily see where each piece fits. The three areas are (see picture below):

- 1) **Access Network** This is where access services are added. For example, these can be remote access servers for terminating dial-up modems or DSL modems for leased-line connections.
- 2) **Distribution Network** This is where your backbone services connect to your access network. Ethernet defines the ISP's "backbone" and glues everything together.
- 3) **Core Network** This part is responsible for the connection to the Wide-Area-Network. In our case it is the Internet. As the Internet is a network-of-networks, this connection is simply to another ISP.



The first piece of equipment to consider is the Ethernet switch. As the backbone of the ISP, Ethernet is the common denominator which permits different vendors' equipment to interconnect. It is through Ethernet that every piece of equipment will be able to communicate with each other. Even in the largest ISPs of the world, Ethernet is the glue which links everything together. From this distribution point, an ISP can add access services as well as additional upstream bandwidth.

The ISP's access network is the point where users connect for service. The most common way is through dial-up modems. In the old days of Bulletin Board's, standalone modems and terminal servers were the standard way of getting on-line. Now, with low cost T1/E1 lines and high-speed V.90 modems, an integrated box provides the best solution. This box is called a Remote Access Server (RAS).

The RAS connects to the local phone company through a T1/E1 or PRI line and to your local Ethernet switch. When users call to get on-line, the RAS is the box that will answer the call with a modem. After a dial-in user connects, the RAS will take IP packets and send them off to the Internet. Here is how a remote access server works:

- 1) A user dials the ISP's access phone number using their Modem/Terminal Adapter and Windows 95/98 DUN. The call is answered by the RAS with a modem.
- 2) Once the modems connect, a PPP session starts between the user and the RAS.
- 3) Through PPP, the RAS obtains the username and password. This is the same username and password that was typed in before dialing the ISP.
- 4) The RAS queries a RADIUS server and asks to authenticate the user.
- 5) Assuming the user is valid, the RAS will automatically issue an IP address to the user and finish setting up the connection. The user is now connected and can surf, email, and so on...

The next piece of equipment is the router. This router will connect your network to your upstream provider. It is through this provider that you will ultimately connect to other networks and hosts...or in other words the Internet. An upstream provider isn't anything special, it is just another ISP selling Internet services to you. As an ISP, if you were to route a subnet to another user or ISP, then you would be that ISP's upstream provider.

What an upstream provider really does is give you a subnet of IP addresses (usually 256) and routes packets to-and-from your upstream router. For most smaller ISPs this router is usually a Cisco 2501 (or equivalent variant). A CSU/DSU or NTU

connects the router to a T1/E1 line or DSL line. The other end of this T1/E1/DSL line terminates at your providers nearest point-of-presence.

Next you will need to add some servers. The basic services which any ISP will need to provide are:

- 1) DNS Primary/Secondary Domain Name Resolution
- 2) RADIUS User Authentication and Accounting
- 3) WWW Basic web server functionality
- 4) EMAIL Providing POP3/IMAP4 and SMTP services

DNS is the method which computers translate names such as www.yahoo.com into an IP address. This is done because all Internet traffic is based on IP addresses, names are only for humans. As an ISP you will need your own local DNS servers for your customers to use.

RADIUS stands for Remote Authentication Dial-In User Service. RADIUS is the authentication protocol in which a client, such as a RAS, will ask a RADIUS server to validate a caller. User names and passwords as well as additional parameters are kept in a centralized database. RADIUS Accounting tracks Authentication and Authorization transactions and captures statistics about each session. There are many *free* RADIUS servers available on the web, and many ISP Billing systems incorporate RADIUS support within their package.

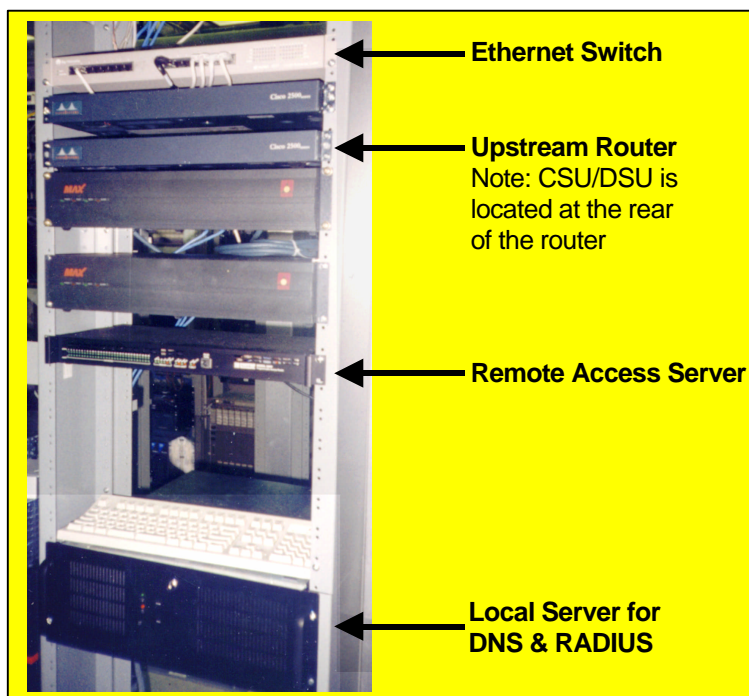
Email and web hosting are the most basic and most important parts of the ISP's service portfolio. These servers will store-and-forward email addressed to your customers. Web hosting is now so common that it is frequently included as part of a basic access package. All of the necessary software is free on the web and often comes pre-installed with your operating system. Alternatively, Email/WWW/FTP services can be done with a special server such as the Cobalt Networks RAQ (<http://www.cobalt.com>). This server takes care of all the configuration and maintenance and has an excellent web interface.

While all four services *can* be done on one server, good network engineering dictates spreading them across two or three servers. This allows backup services on alternate servers. Your customers will expect your service to be available 24 hours a day...without a hitch.

The view from ground zero

Service Providers have been around since the early days of Bulletin Boards. Now, the Internet represents a new communications service market. Mass appeal and low cost have made it easy to become a facilities based provider. With just a few pieces of equipment and some free software, it has never been easier to build yourself an ISP.

A complete ISP Installation



This is a picture of a working ISP which supports about 1,600 subscribers. It is installed in a co-location facility and has a 1.5 mbps connection to its upstream provider.

As this ISP grew it added additional Remote Access Servers as well as an additional router for point-to-point connections.

Additional Resources

Scott Whittle, Patton Electronics scott@patton.com <http://www.patton.com>

<http://www.amazing.com> Maintains a large collection of ISP related materials

<http://www.internet.com> A site focusing on the business aspects of being a service provider

<http://www.isp-lists.com> Maintains ISP related discussion groups

And the link of all links...

<http://www.howtosell.net/html/links.html>