



Application Note

SmartDNS™

FatPipe Networks is well known for its patented and patent pending technology that provides redundancy, high reliability, and aggregate speed of WAN connections. Its core innovation for intelligent inbound load balancing and line failover is called SmartDNS. SmartDNS balances incoming IP traffic load and provides redundancy by allowing the host on the LAN to be accessible through multiple connections. Therefore, WARP supports the hosting of internal servers including web, e-mail, firewall and load balancing servers.

Basic Functionality of FatPipe's SmartDNS

- **Load Balancing:** SmartDNS balances load by allowing the host on the network to be accessible through multiple connections. The host appears to be a different IP address at different times, thus using all available lines. The IP addresses are resolved based on the selected load-balancing algorithm.
- **Speed:** Through load balancing, Fatpipe SmartDNS speeds up the delivery of inbound traffic.
- **Failover:** FatPipe's SmartDNS will intelligently sense when a failure occurs and will make adjustments to the DNS replies so it will not resolve host names to the IP addresses that are associated with the connection that is down or unavailable.

FatPipe's SmartDNS allows hosts on a network to have multiple IP addresses associated with them from different providers, and will hand out the IP addresses for these hosts using the load balancing algorithm selected by administrators. There are three load balancing algorithms: Round Robin, Response Time and On Failure.

SmartDNS Basic Setup Steps

1. **New Domain:** Register domain with a registrar.
2. **Existing Domain:** Get all current domain information from current DNS provider (the people managing your DNS, typically it's one of your ISPs).
3. **Register new name server domain names** with registrar using your domain name (e.g. ns0.yourdomain.com and ns1.yourdomain.com)
4. **Setup DNS Zone** (domain information) on FatPipe WARP (See below).

5. **Initiate a transfer of your domain name** with registrar and point it to your newly registered name server domain names (e.g. ns0.yourdomain.com and ns1.yourdomain.com)

Registering a New Domain

You must contact a domain registrar to register a domain name. You can get a full list of ICANN-accredited registrars from InterNIC.com. Directnic.com and Networksolutions.com are two of the competing ICANN-accredited registrars you can use. In the course of registering the new domain, you may be required to provide two name servers that will handle your domain name. If the registrar provides default name servers, you can use them, otherwise just specify any existing domain name servers (perhaps just put in ns.yahoo.com and ns1.yahoo.com and their corresponding IP addresses). It really doesn't matter at the point of registration. You will transfer these domains to your domain name server names in a future step anyhow.

Registering Name Servers

Contact your registrar to initiate the creation of your new name servers using your domain name (e.g. ns0.yourdomain.com and ns1.yourdomain.com). Each name server domain name will map to its own WAN port IP address on the FatPipe unit. So as far as the registrar knows, your domain name is handled on multiple physical name servers, but in reality you're simply mapping a different name server domain name to each of the WAN port IP addresses.

Setting Up DNS Zone (Domain Information) on FatPipe

To achieve inbound redundancy, each domain name record (e.g. www) will have multiple IP addresses assigned to it -- one from each WAN IP block. SmartDNS will hand out these IP addresses based on the type of load balancing you have set the FatPipe unit to use. If you choose Round Robin, the IP addresses are handed out in a round-robin fashion. If you choose Response Time, packets will be handed out based on the response time of each WAN line. If you use On Failure, only IP addresses from the designated primary WAN lines are handed out. If you specify two primary WAN lines, then the two IP addresses associated with those lines are handed out in a round-robin fashion.

A Basic Example

1st WAN IP Block	11.11.11.0 – 11.11.11.255
2nd WAN IP Block	12.12.12.0 – 12.12.12.255
3rd WAN IP Block	13.13.13.0 – 13.13.13.255

IP Addresses on FatPipe WAN Ports

Port 2 (WAN)	11.11.11.2
Port 3 (WAN)	12.12.12.2
Port 4 (WAN)	13.13.13.2

SmartDNS Name Server Entries

ns0.yourdomain.com	11.11.11.2
ns1.yourdomain.com	12.12.12.2
ns2.yourdomain.com	13.13.13.2

SmartDNS Host Name Entries

www	11.11.11.5
	12.12.12.9
	13.13.13.44
ftp	11.11.11.7
	12.12.12.35
	13.13.13.19

Transferring the Domain to Your New Name Servers

Contact your existing registrar to initiate the transfer to your new name server domain names. This is usually done online by logging into your account at the registrar's website and filling out the proper request for transfer.

A Quick Note About Time to Live (TTL)

SmartDNS uses a short TTL to ensure the information about the IP addresses for the hosts it serves are accurate and up-to-date. This means that the machines on the Internet will always connect to the host using a route that is open instead of trying to access the host using an IP address that is not accessible due to a line failure.

The TTL value informs all DNS servers on the Internet how long they should store information about your domain. For example, a name server caches your domain information following a request for a website that uses your domain. Until the TTL value is exceeded, that name server will continue using the information supplied by the first request each time your domain is requested. When your domain is requested after the TTL period, the name server will conduct a new query for updated information about your domain. The TTL value is measured in seconds.

WARP uses a short TTL to ensure that DNS information is up-to-date. Administrators can change the TTL to their own preferences, along with Refresh, Expire and Retry settings.

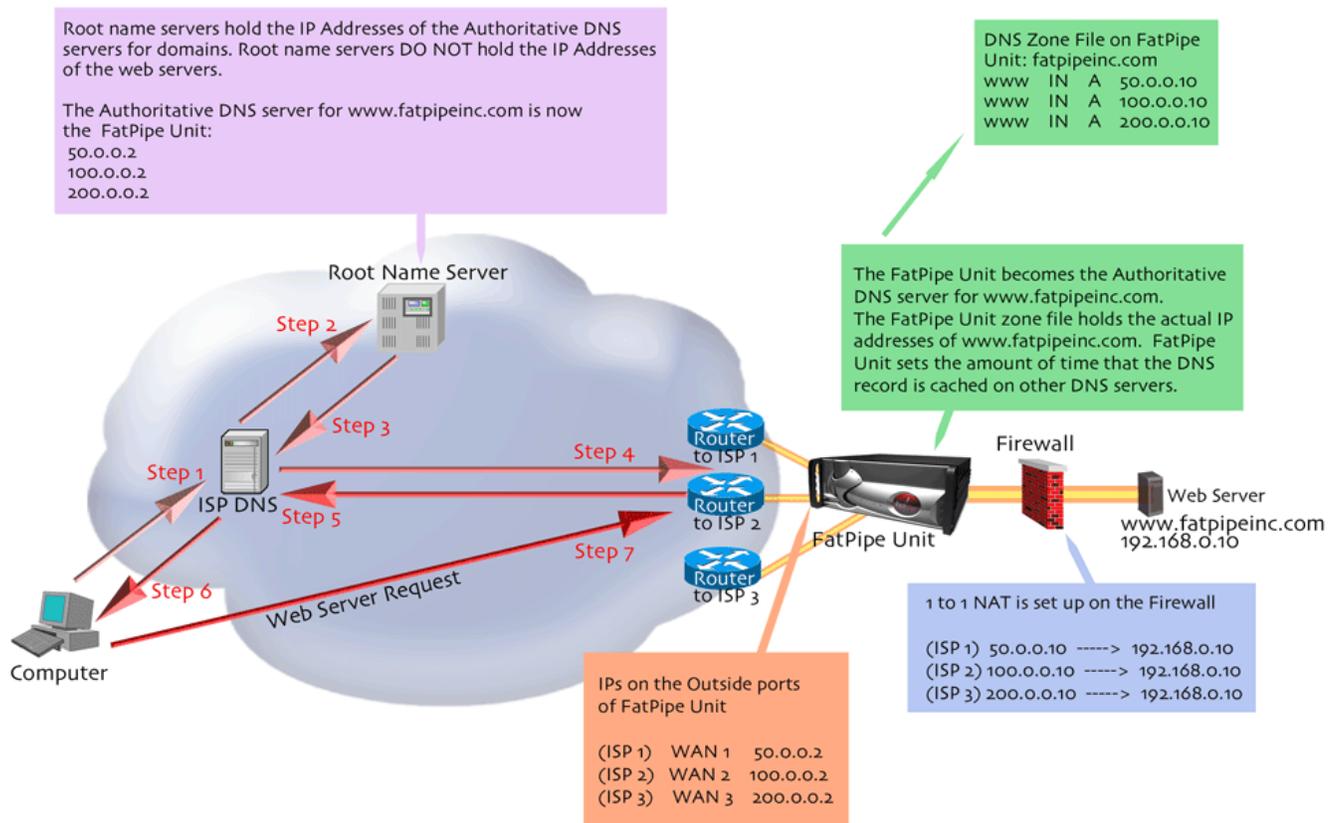


Figure 1

Example

Figure 1 clearly explains the route of a DNS query while using FatPipe's SmartDNS. FatPipe WARP features SmartDNS as part of its functionality, as does FatPipe MPVPN and MPFR. Please read below for a step-by-step explanation of the DNS process while using SmartDNS.

Step 1 Personal Computer queries the DNS at the ISP asking what is the IP address for www.fatpipeinc.com

Step 2 The DNS at the ISP has never looked up www.fatpipeinc.com before, so there is no cached record for www.fatpipeinc.com. The DNS server at the ISP queries the Root name server asking what are the IP addresses of the Authoritative DNS servers for www.fatpipeinc.com

Step 3 The Root name server returns the IP addresses of the outside interfaces of the WARP (50.0.0.2,100.0.0.2, 200.0.0.2) The WARP acts as the Authoritative DNS for www.fatpipeinc.com

Step 4 The DNS at the ISP then queries the WARP and asks for the IP address of www.fatpipeinc.com

Step 5 The WARP is constantly checking the health of its connections to the Internet and returns one of the IP address for www.fatpipeinc.com to the ISP DNS that WARP knows is working. That DNS record for www.fatpipeinc.com is then cached at the ISP DNS for 3 to 6 seconds. The amount of time a DNS record is cached on a DNS server is controlled by the Authoritative DNS (WARP). This is called a TTL or time to live. Every time someone tries to get to www.fatpipeinc.com the WARP unit will be queried because the TTL is so short. The WARP will only dish out the IP addresses for www.fatpipeinc.com that it knows are up. If a line goes down then WARP will no longer dish out the IP address associated with that line.

Step 6 The ISP DNS returns the IP address of www.fatpipeinc.com to the Personal Computer.

Step 7 The Personal Computer then connects to www.fatpipeinc.com using the newly acquired IP.

Conclusion

SmartDNS provides intelligent load balancing capabilities, redundancy and speed for IP traffic effectively without the need for BGP programming or any specialized knowledge of routing protocol or languages. SmartDNS does all the work for you, so you can get back to your other duties, and still be confident that your WAN will stay up and running despite intermittent failures in your network. For more information about FatPipe technology, products and services, please visit our website at www.fatpipeinc.com.