FAT Pipe

WARP

WHITE PAPERS

FatPipe WARP™ Reliability, Redundancy and Speed of Bi-directional IP Traffic

The implementation of mission critical applications run over wide area networks as a basic communication tool is now commonplace among small and large businesses alike. According to Frost & Sullivan, the U.S. revenue forecast for IP enabled virtual private networks has increased two-fold between 1998 and 2000 from a market of $3.54 billion in 1998, and is expected to double again by 2002, reaching $18.77 billion in 2004. Dataquest, a division of Gartner Group, states that the U.S. hosting market alone will grow from $2.8 billion in 2000 to over $9.3 billion by 2004. And eMarketer states that by 2003, the broadband market for business will grow to 11.30 million subscribers from the 3.51 million subscribers at the end of 1999.

There is no doubt that WAN infrastructures play an important role in how we do day-to-day business. The deployment of Virtual Private Networks, ASPs, and Thin Client technologies are good examples of relatively new business models that companies employ to enhance productivity levels and provide better service to customers. Mission critical business applications using WAN technologies must be robust and stable enough to transmit data accurately, timely and securely.

To ensure connectivity for these WAN infrastructures stay to fast, up and running, FatPipe Networks developed a new router clustering device called WARP. WARP is the next generation of high-speed router clustering devices from FatPipe Networks. It is the ultimate solution for companies that want the highest level of WAN redundancy, reliability and speed for hosting servers internally, as well as outbound redundancy and aggregate speed of connections.

FatPipe WARP is a patented product that aggregates multiple routers over multiple ISPs and backbones for highly reliable and redundant Internet/WAN access for inbound and outbound IP traffic. FatPipe WARP is an essential part of WAN infrastructures that require large bandwidth and high speeds. WARP works with all existing hardware and applications and no BGP programming is required.

The need for redundancy and speed of bi-directional IP traffic will briefly be reviewed in the next section. The remainder of the White Paper will review WARP's main features, benefits, and its application for business.

The Need for Secure, Redundant and Fast WANs
As data communications models evolve using WAN technology, redundancy of WAN infrastructures at the client end becomes an essential issue. It's simple: when the connection to the Internet is down, offices cannot communicate and customers and remote users cannot access Intranets, e-mail, database, or other internal servers. In other words, productivity is lost.

FatPipe Networks designed WARP to address the fundamental shift in business where critical data is stored in remote locations. WARP is a router-clustering device that provides high redundancy, reliability and speed for the deployment of IP data transmission over the Internet or any other wide area network. By transmitting data over two or three lines together, WARP provides increased speed, reliability and redundancy for bi-directional data transfer.

Challenges Associated with WAN Computing
FatPipe understands the advantages of using WAN technology for business, but also the risks associated with WAN technology. When WANs fail due to router, line, ISP or backbone failure, productivity and communication comes to a halt. Information access is lost and customers and remote users cannot access internal LAN servers.

Single Points of Failure
ASPs, Thin Client, VPNs, and other web-based applications have single points of failure along the route of data transmission. It is not uncommon for failures to occur within wide area networks, as the statistics below suggest:

- One in four companies have experienced a network disaster with a medium length of disaster time of 8 hours. Twenty four percent had outage times over 24 hours. **
- WANs fail or degrade on an average of 7.1 hours per month, the cost of which could add up significantly for any company. *
- Sixty-four percent of companies do not have sufficient disaster recovery plans for their WANs. **

The Cost of Downtime
When router, CSU/DSU, last mile connection, and ISP or backbone failure occur, business is disrupted and can be very costly. The cost of downtime can be astronomical, even detrimental for companies who use their WAN infrastructure for critical interaction with customers, colleagues, and other business transactions such as time sensitive financial, medical or legal transactions. The following statistics illustrate the cost of network failures:

- The average corporation has the potential to lose an average of $7.8 million per year in WAN downtime alone. ***
- Network downtimes (LAN/WAN) among large companies cost an average of $32.5 million in lost productivity and revenue. *

SOURCE OF STUDY: Infonetics Research*
Comdisco/BellSouth/Oracle Vulnerability **
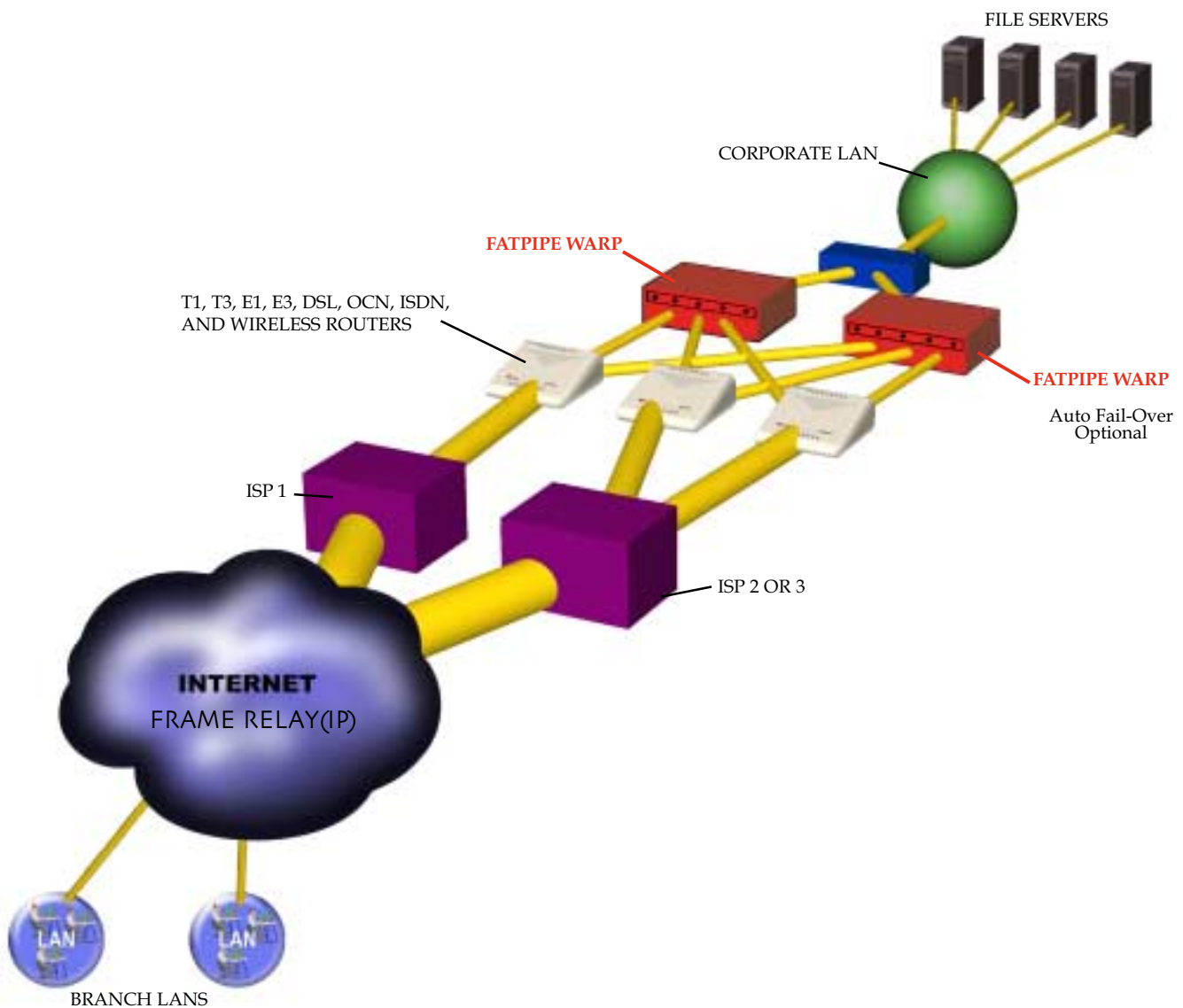Contingency Planning Research**

In summary, companies who use their WAN infrastructures for mission critical information access are vulnerable to catastrophic failure if they do not consider the serious risks associated with WAN technology, unless they implement a solution that provides redundancy and reliability. FatPipe has developed an easy to implement solution for companies who need redundancy, reliability and speed for their inbound and outbound IP traffic to resolve these common problems. The solution is FatPipe WARP.

FatPipe WARP: Bi-directional Load Balancing, Redundancy, and Speed

FatPipe Networks set out to eliminate single points of failure for companies implementing wide area networks. WARP combines multiple WAN connections of any kind over multiple backbones and ISPs, or the same ISP with different POPs, for up to 135 Mbps, and the highest level of reliability and redundancy for inbound and outbound IP traffic. No BGP programming or ISP cooperation is required.

FatPipe WARP gives customers control over their WAN networks and keeps them up and running despite line failures. WARP load balances and bonds incoming and outgoing WAN traffic, providing the highest level of speed, reliability and redundancy for WANs. WARP accommodates the hosting of large sets of internal servers including load balancing servers, e-mail, web and firewall servers.

FILE SERVERS

CORPORATE LAN

FATPIPE WARP

T1, T3, E1, E3, DSL, OCN, ISDN, AND WIRELESS ROUTERS

FATPIPE WARP

Auto Fail-Over Optional

ISP 1

ISP 2 OR 3

INTERNET
FRAME RELAY(IP)

LAN LAN

BRANCH LANS

Redundancy and Reliability

WARP gives customers the ability to transmit data over multiple lines, bypassing failures along its route when necessary, including router, ISP, line or backbone failures. Users enjoy faster speeds when all lines are available and can rest assure that their connection to the outside world will be up 24 hours a day, 365 days a year.

Integrating WARP as part of a WAN infrastructure significantly enhances system reliability. The figure below shows the potential cost associated with VPN models that do not have the advantage of WARP as part of their WAN network. Money, time and productivity is lost even when every single point of failure is 99 percent reliable. However, system reliability is increased when WARP is used to support the WAN infrastructre.

Availability of Systems without WARP

OFFICE A

ROUTER		CSU/DSU		LAST MILE		ISP		BACKBONE

0.99   X   0.99   X   0.99   X   0.99   X   0.99

OFFICE B

ROUTER		CSU/DSU		LAST MILE		ISP		BACKBONE

0.99   X   0.99   X   0.99   X   0.99   X   0.99

INTERNET

System reliability = 0.99^{10} = 90.43%   i.e. the system will be down 9.56% of the time, or 168 hours in an 8am - 5pm period (220 days/yr). At $10,000/hr, the cost to the company = 168 x $10,000 = $1,680,000/year for a two office connection

Availability of Systems with WARP

OFFICE A

ROUTER	CSU/DSU	LAST MILE	ISP	BACKBONE
ROUTER	CSU/DSU	LAST MILE	ISP	BACKBONE
ROUTER	CSU/DSU	LAST MILE	ISP	BACKBONE

OFFICE B

ROUTER	CSU/DSU	LAST MILE	ISP	BACKBONE
ROUTER	CSU/DSU	LAST MILE	ISP	BACKBONE
ROUTER	CSU/DSU	LAST MILE	ISP	BACKBONE

INTERNET

For multiple (3) parallel systems as shown above, the system reliability is 0.999995 x 0.999995 = 99.999% I.e. system will fail only 0.001% or 0.0176 hours in a year (8 hour day, 220 days/yr.). Potential loss averted = $1,680,000 - $176 = $1,679,824

Outbound Redundancy

FatPipe's patented technology called Redundant Array of Independent Lines bonds any combination of multiple T3, E3, T1, E1, DSL, ISDN, and Wireless connections for increased speed and redundancy. Should any of the services fail along the route of transmission, IP packets are automatically rerouted, circumventing points of failure to keep WAN infrastructures intact and functional while the failure is active.

Inbound Redundancy

FatPipe's patent-pending SmartDNS™ provides redundancy for incoming traffic by allowing the host on the network to be accessible through multiple connections. SmartDNS makes adjustments to the DNS records when connections fail, and will not resolve host names to IP addresses that are associated with the failed connection. WARP uses a short Time to Live (TTL) to ensure that information about the IP addresses for the host that it serves is accurate. When a line goes down, SmartDNS will not broadcast the IP address that is associated with the failed line. Instead, it guides queries to available lines, thus providing redundancy for inbound traffic. Administrators can change the TTL according to their preference.

Load Balancing and Speed

FatPipe's RAIL and SmartDNS technologies not only provide redundancy, they also balance load over available lines and add speed to the delivery of bi-directional data transactions through load balancing.

WARP dynamically load balances inbound and outbound traffic using all available lines. There is no need to setup router tables or use the more traditional BGP programming. WARP also speeds up the delivery of information over wide area networks. Regardless of size, WARP can provide speed, reliability, and security for WANs at a minimal cost and effort.

FatPipe RAIL™

For outbound IP traffic, WARP automatically senses load on each line and dynamically balances load according to line availability using FatPipe's patented RAIL technology. There are no compli-

cated router tables to configure; BGP programming is not required. RAIL enables WARP to balance the load of data transmission over WAN connections of similar or dissimilar speeds.

WARP also aggregates multiple connections forming a single, virtual fatpipe for combined speed. It bonds any combination of lines, including T3, E3, T1, E1, DSL, Wireless, ISDN, 56K for outbound IP transmissions. The result is cost savings for companies, replacing expensive backup lines such as T3 and T1s lines with cheaper alternatives such as DSL or Wireless.

FatPipe SmartDNS™

Inbound IP traffic is balanced by FatPipe's SmartDNS™ technology. SmartDNS balances load by allowing the host on the network to be accessible through multiple connections. The host appears to be at different IP addresses at different times, thus using all available lines to transmit data. FatPipe's SmartDNS also speeds up the delivery of inbound traffic by intelligently choosing the fastest connection of available lines.

Easy Management

FatPipe WARP offers a secure networking environment that lends flexibility and control to help Administrators accomplish their tasks. WARP's web-based management tools allow Administrators to access the network, view routers, the speed meter and the speed chart, and the status of connections from any location worldwide. WARP comes with paging and e-mail alert software that can be installed on any computer on the LAN to notify Administrators of ISP, router, line, or backbone failures. WARP even offers the ability to send SNMP traps to select SNMP manager stations.

Reverse Port Mapping for Efficient Delivery of Inbound IP Traffic

Reverse Port Mapping is an efficient way to deliver IP packets and requests from the outside world into a LAN. Reverse Port Mapping allows specifically assigned servers on a LAN to be accessible to machines on the Internet by assigning multiple private IP address to a public IP address. Reverse Port Mapping conserves public IP addresses. A single public IP address can be mapped based on port number to multiple internal servers.
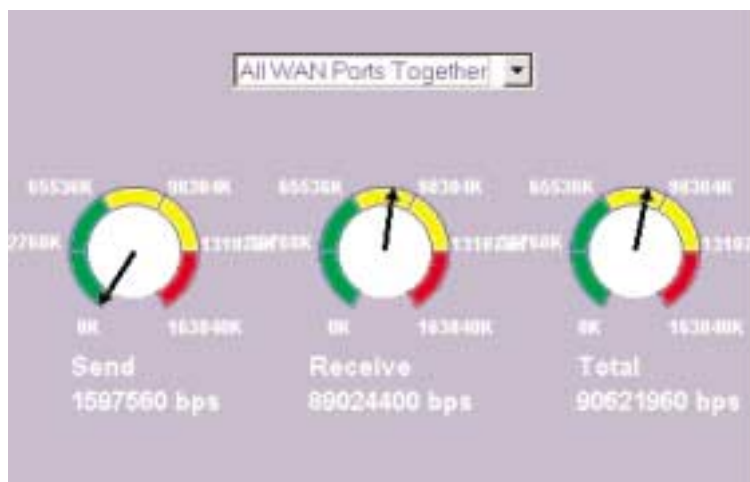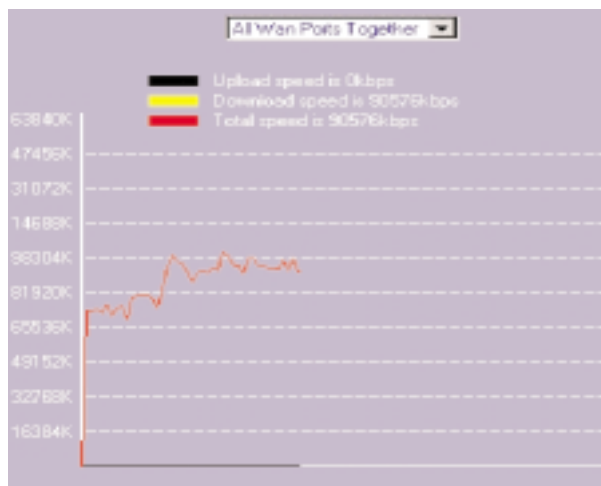
Proxy ARP

WARP uses Proxy ARP to help the Administrator integrate WARP into their network with very little change to the existing LAN/WAN IP configuration. It is designed to minimize changes to the network. By subnetting the existing IP range into a smaller network, Proxy ARP "fakes out" the WARP unit into thinking all of its interfaces (WAN and LAN) are on different networks (Subnets). WARP will take the traffic intended for the router's IP address.

Auto Failover

In addition to automatically rerouting information when lines fail, WARP also has other redundancy features such as hot-swappable power supplies and a Dual WARP setup option. The Dual WARP setup is comprised of two units installed at one site. A master - slave configuration allows each unit to talk to the other and check availability on a consistent basis. If the master unit fails, the slave unit will takeover until the Administrator can pinpoint the master unit's cause of failure. (If the master unit needs rebooting, the Administrator can reboot from a remote location). In failover mode, the maximum possible system redundancy is achieved, resulting in maximum uptime for the WAN system.

FatPipe WARP in auto fail-over mode

FatPipe WARP combines multiple routers into a single, high-speed Internet connection. In this diagram, two WARP units are used (called Dual WARP) for ultimate reliability.

Seamless and Transparent

WARP is technology and application independent and does not require proprietary components. Therefore, it does not matter what type of hardware or software technology is used in the LAN. WARP is router hardware independent and works seamlessly with any type of firewall, caching and server load balancing devices. It works with any WAN technology that uses IPsec protocol and over operating systems and platforms.

Scalable and Flexible

FatPipe makes it easy for companies to get the support they need for their WAN infrastructures. It comes in two versions, 135Mbps and 50Mbps throughput, making reliability, redundancy and speed available to companies according to their individual needs.

WARP provides a solution for companies who have branch offices in remote areas where high bandwidth is not readily available. Bonding lower speed lines adds up to a fast connection for these offices and provides the redundancy they need. A bank, for example, can use the 135Mbps version at its head office while its branch offices in the US and abroad utilize the 50Mbps version, where broadband is either too expensive, unavailable, or not needed. WARP is scalable and can grow as the company grows.

Easy Setup

FatPipe WARP is easy to install using its Graphical User Interface. Unlike BGP programming, there's no need to contact the ISP or for the ISP to have proprietary hardware or software at their site.

FatPipe WARP in a Corporate Environment
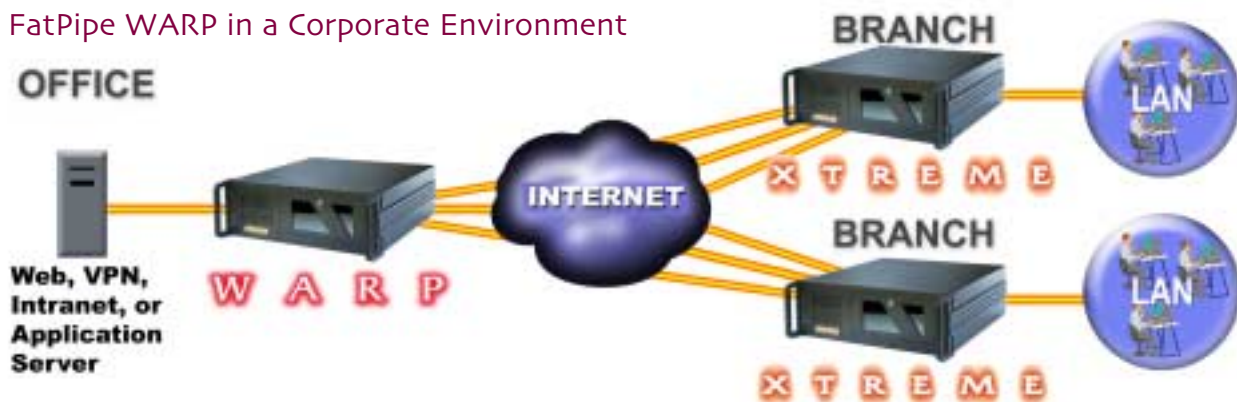
FatPipe WARP provides high redundancy for server availability on the WAN, while Xtreme provides branch reliability access to servers.

Review of WARP's Benefits and Features
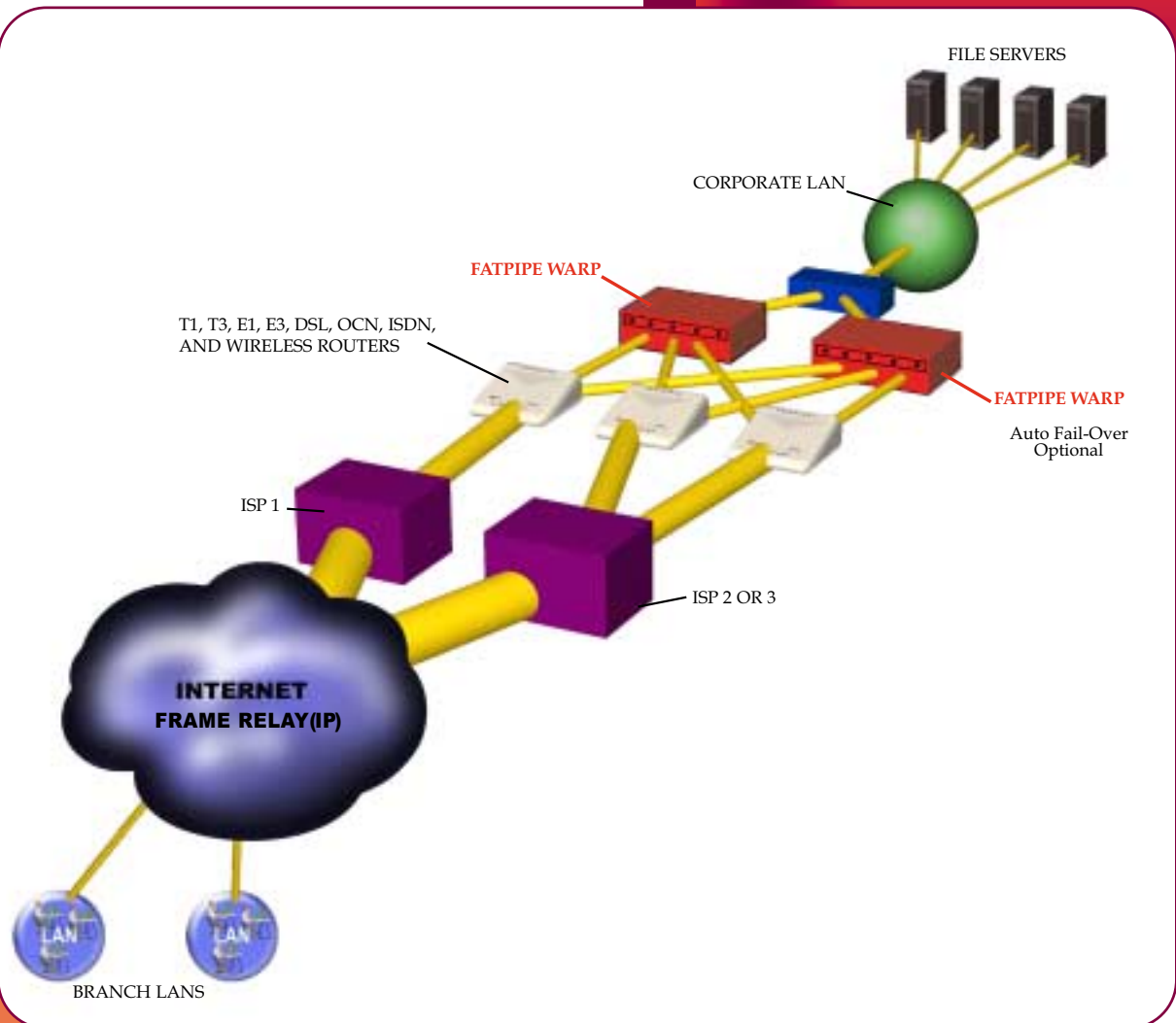
Features
- Combines multiple T3, T1, DSL, Wireless, ISDN connections for aggregate speed
- Works over multiple ISPs and backbones for reliability
- Auto load balancing and auto failover for inbound and outbound IP traffic
- SmartDNS™ provides redundancy and dynamically balances incoming traffic load
- RAIL™ technology for redundancy and load balancing of outgoing IP traffic
- Reverse Port Mapping to conserve IP addresses
- Proxy ARP designed to minimize changes to the network
- No BGP programming or additional router programming or hardware needed
- Web-based management tools for remote monitoring and paging and e-mail emergency notification
- No new or specialized hardware or software at the ISP site
- Remote reboot
- Easy Install

Benefits
- Provides the highest level of redundancy and reliability for inbound and outbound IP traffic.
- Aggregates any combination of T3, E3, T1, E1, DSL, ISDN and/or Wireless connections, with speeds up to 135 Mbps
- Seamless technology that is application and technology independent

Conclusion

FatPipe Networks' WARP provides the highest level of redundancy, reliability, and speed for bi-directional IP traffic over a WAN infrastructure. Whether you have offices all over the country or all over the globe, FatPipe's WARP will keep your WAN infrastructure up and running despite intermittent ISP, router, line, or backbone failures.

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