



Business Paper

Rolling out ML-IP powered broadband services

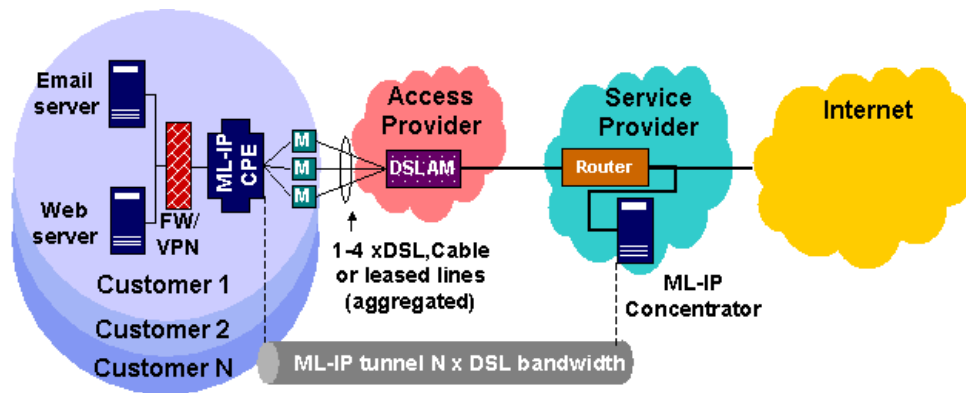
Background

This white paper considers the key issues involved in creating unique Multilink-IP (ML-IP) powered broadband services that deliver performance spanning T-1/E-1, T-2/E-2 and fractional T-3/E-3 dedicated access speeds with minimal investment. With ML-IP, even service providers without direct DSL coverage can service a wider range of subscribers with enhanced broadband solutions. Wholesale DSL access purchased from carriers or other access providers can be also enhanced with ML-IP to create differentiated services. These ML-IP enhanced services will increase your broadband revenue opportunities because ML-IP extends the bandwidth, application and reliability of any DSL service.

Create a larger portfolio of broadband products

By installing ML-IP you can offer a range of multi-megabit solutions up to 20Mbps without having to purchase DSLAMs, switches or edge aggregation routers. ML-IP enhanced broadband services do not require special support within the DSL infrastructure. Therefore providers that have their own DSL infrastructure as well as those that don't have direct DSL coverage can offer broadband services enhanced by ML-IP.

In order to increase the speed and reliability of broadband connections, ML-IP combines the bandwidth of multiple DSL links between the subscriber and you, creating a wider pipe into your network at the IP layer. These new multi-megabit services can be further differentiated by speed, range, application and subscriber contention ratios to create a larger portfolio of products. Using this technology, the optimum service can be made available to every subscriber from small and medium sized businesses, to large enterprises and government. To cater for changing subscriber needs, your ML-IP powered service supports incremental speed upgrades.



Implementing ML-IP inside your network

Implementing ML-IP inside your network is simple and doesn't require a large investment in infrastructure, as it is independent of the access type – a single ML-IP Concentrator can service a large number of subscribers, each with multiple links. The CPE devices have a small footprint and interoperate with common CPE DSL modems and routers, operating at full or fractional DSL speeds as dictated by the various carrier DSL speed packages and copper line quality. A number of custom-branded ML-IP powered broadband services can be rolled out to subscribers over splitter-less ADSL (G.Lite), symmetric DSL (e.g. G.SHDSL) and full rate ADSL (G.DMT). Following is an example of some of the ML-IP enhanced DSL service offerings that are attractive to a broad range of subscribers and markets, which can be provided using ML-IP capable products from ePipe.

T-1 to T-3 performance over Ubiquitous ADSL circuits

Universal ADSL (G.Lite) availability and performance

Universal ADSL (G.Lite) is the most widely available xDSL service currently on the market. Subscribers whose phone lines are less than 3 miles from the exchange can typically have a connection from 384 Kbps to 1.5 Mbps downstream and 128Kbps to 384K Kbps upstream, using the G.Lite standard.

The performance of ADSL has suffered through numerous teething problems over the past few years. However it has weathered these and will most likely remain the dominant broadband data connection medium. ML-IP can further improve performance and reliability and availability of ADSL G.Lite by utilising multiple concurrent connections.

Target Markets and Applications

Certain businesses are particularly data hungry, yet cannot purchase the bandwidth they need at a reasonable cost. The printing industry has emerged as a leading consumer of bandwidth. The convenience of transferring large files across the Internet has meant that printing companies often have all of their bandwidth consumed for hours. ADSL does certainly provide these people with the ability to receive large files (although even more downstream bandwidth would often be useful). The problem lies in a printing company's inability to transfer large files quickly, due to the asymmetric nature of ADSL. There are many more industries that could benefit from more, cost effective bandwidth. Any who routinely transfer large files certainly fit the bill, such as:

- Medical (X-Ray clinics particularly)
- Advertising agencies
- Architects
- Graphic designers

The rise in 'thin client' architectures including Citrix and Microsoft Terminal Services has seen the way many companies conduct business change. National retail chains are now using thin clients to connect their POS terminals to a server at head office, via the Internet, using VPNs. Remote offices, tele-workers and travelling executives also use thin clients to access files stored at a central locations. Increasingly, companies are looking at hosting their web and mail servers internally as their environment becomes more e-commerce orientated. The upstream bandwidth of ADSL severely limits the ability of companies to effectively host these services, with only 64K to 384K (upstream) at their disposal.

G.Lite service with full rate ADSL performance – powered by ML-IP

For many users of ADSL, the upstream bandwidth maximum of 384K Kbps is extremely limiting. Increasingly, businesses are relying on the Internet for day-to-day operations, whether it is transferring files between physically separate sites or companies hosting their own servers for web sites or thin client applications.

Multilink-IP can easily boost your customers' performance by allowing them to use three or four simultaneous connections to your network giving them a pipe that achieves up to 5 Mbps/1Mbps at any location that has access to G.Lite. These customers can achieve superior speed for their web server and remote access and site-to-site VPNs, which would have previously been impractically slow with the limited upstream bandwidth afforded by G.Lite.

The customer only needs to add additional ADSL modems or routers and an ML-IP CPE device and their performance and reliability has doubled, trebled, quadrupled when connected through your network to the Internet. This solution is more cost effective and more flexible than dedicated T-1/E-1 (1.554 Mbps/2.048Mbps) and T-2/E-2 (6.3 Mbps/8 Mbps) or NxT-1 connections.

Revenue Opportunity and ROI for G.Lite ADSL based services accelerated by ML-IP

The opportunity provided by ML-IP is two-fold:

Firstly, multiple connections may be sold to a customer who previously could only utilise a single connection. The recurring revenue for providing a bonded solution can provide a ROI in as little as two months on the provider infrastructure requirements. The subscriber equipment can then either be charged as a part of the contract, or the ISP can sell the equipment outright to the customer.

Secondly, ISPs can sell solutions based on G.Lite ADSL into bandwidth hungry markets which required more bandwidth than ADSL was capable of providing. This is particularly true of upstream bandwidth, which could increase from 384 Kbps up to 1 Mbps. Upstream bandwidth has always been the "*Achilles' Heel*" of ADSL. With ML-IP, upstream bandwidth can be accelerated to T-1 performance, while downstream bandwidth rivals T-2. If the customer is using a Frame Relay or ISDN solution, the ROI for the customer will be extremely short, with the added upside of up to 5 Mbps downstream speeds.

An ML-IP accelerated G.Lite ADSL service provides a strong return because of G.Lite's large installed base and wide geographic coverage. It is a good method of retaining the customer after buying their initial DSL line as they can easily upgrade to 2, 3 or 4 times the performance through your ML-IP service. Other xDSL services such as symmetric DSL and full rate G.DMT ADSL are only available in selected areas. Therefore an ML-IP accelerated G.Lite ADSL service is very strong solution.

Fractional T-3 Performance Over Symmetric DSL Circuits

Symmetric DSL Availability and Performance

Symmetric broadband services are now being delivered over G.SHDSL 2.3 Mbps services using a single copper pair. Although touted as the killer of the T-1/E-1 leased line, G.SHDSL provides little more bandwidth than the traditional leased line. It is far more useful to larger businesses, because of its symmetric nature, than G.Lite ADSL is. However the bandwidth requirement for larger businesses continues to grow as they often have branch offices and more mobile employees. Subscribers whose phone lines are less than 2.5 miles from the exchange typically can have a connection of up to 2.3 Mbps both downstream and upstream, although it can be rate limited to deliver exactly T-1 or E-1 speeds or fractions of these.

Target Markets and Applications

Any market where symmetrical bandwidth is important and broadband is not being used solely for web surfing is prime for ML-IP accelerated broadband services. Video and voice across data networks are becoming increasingly common. For most companies, a single DSL connection simply doesn't have enough bandwidth to allow for normal data transmissions, as well as video and voice across the same connection. Fractional fibre or other high bandwidth solutions were the only option for businesses wishing to utilise these advanced technologies between offices before ML-IP. Multiple SDSL connections can now be bonded together with ML-IP to give fractional fibre speeds at a fraction of the price. Other areas in which multiple SDSL connections may be used include:

- Heavy Duty Website
- Heavy Duty e-Commerce
- Many branch offices connecting to a single site

G.SHDSL Service with Fractional T-3 Performance – Powered by ML-IP

For bandwidth hungry users and large corporate companies, a symmetric connection from 384 Kbps up to 2.3 Mbps sometimes just isn't enough – particularly when VoIP or other bandwidth hungry, real time applications are being used. Increasingly, businesses are relying on the Internet more and more for day-to-day operations, whether it is transferring files between physically separate sites, companies hosting their own servers for web sites, or thin client applications.

Multilink-IP enables ISPs to create services with the performance of NxT-1 and fractional T-3 connections (3, 6 ... 22 Mbps) utilising their current G.SHDSL offerings. This allows an ISP to offer a product with up to 6 to 8 Mbps both downstream and upstream using standard 2.3 Mbps G.SHDSL. This figure doubles when using dual pair (4 wire) G.SHDSL circuits (4.6 Mbps each) at the customer site delivering 12 to 16 Mbps symmetric solutions. The customer only needs to add additional SDSL modems or routers and an ML-IP CPE device and their performance and reliability has doubled, trebled, quadrupled when connected through your network to the Internet. The solution is cost-effective, reliable, scalable and easily deployable compared with NxT-1 or fractional T-3.

Revenue Opportunity and ROI for G.SHDSL based services accelerated by ML-IP

The opportunity provided by ML-IP is two-fold:

Firstly, multiple connections may be sold to a customer who previously could only utilise a single connection. The recurring revenue and the cost for providing a bonded solution can provide a ROI in as little as two months on the provider infrastructure requirements. The subscriber equipment can then either be charged as a part of the contract, or the ISP can sell the equipment outright to the customer.

Secondly, ISPs can sell SDSL solutions into bandwidth hungry markets that require fractional T-3 speeds. Fibre based solutions are expensive and not as freely available as SDSL driven solutions. The difference in cost between a fractional T-3 solution and an ML-IP powered SDSL solution will provide an extremely short ROI for the customer.

Other solutions such as NxT-1, where a number of parallel T-1 lines are used, have very small coverage. It requires dedicated equipment at the access provider in each region. The CPE equipment is often expensive and complex. It does not leverage the benefit of being able to use lower-cost DSL circuits, which can be accelerated by ML-IP without infrastructure upgrades at the access provider or carrier. Unlike G.Lite ADSL, G.SHDSL services are usually more profitable because of the market they serve and the higher level of performance and reliability. This profitability can be further enhanced as ML-IP allows you sell more lines to the same customer and have a range of solutions that fill symmetric bandwidth gaps across T-1, T-2 and fractional T-3.

The "above 2 Mbps" symmetric broadband service sector is an emerging market. It is potentially a good way of differentiating your broadband offering early on by being able to deliver a premium service using multiple combined G.SHDSL circuits.

VDSL-speed broadband services for multi-tenant, campus and Internet café installations

VDSL Availability and Performance

The VDSL standard is still in the definition phase so many specifications are still in flux. Generally it proposes 6.5M to 52M downstream and 1.8M to 6.4M upstream for the asymmetric service. However all proposals for this service impose an extremely short proximity requirement between a subscriber and an access point for any VDSL speed increase, above a full rate ADSL service. In addition VDSL is also sensitive to external interference. Both of these issues are slowing its real world adoption and deployment. However with ML-IP a number of standard full-rate ADSL connections can be combined to create VDSL speed solutions without these limitations.

ML-IP an alternative way of delivering VDSL speed services

A number of selected broadband providers can deliver full rate G.DMT ADSL (6Mbps/640Kbps) services to certain areas. Although this bandwidth seems almost limitless, when you share it in a multi-tenant or campus environment, even 6 Mbps can easily be consumed. In addition the upstream bandwidth is still below one megabit and not that attractive in site-to-site or upload situations.

The "above 10Mbps" broadband service sector is an emerging market. It is potentially a good way of differentiating your broadband offering by being able to deliver a premium VDSL-like service using multiple combined full rate ADSL circuits. In certain circumstances just the ability to raise the upstream bandwidth to over 2 Mbps with ML-IP makes full rate ADSL look more attractive, notwithstanding it's ability to deliver over 20 Mbps downstream.

Provider Infrastructure Requirements for all ML-IP services

Provider Infrastructure Requirements for ML-IP are minimal. As ML-IP operates at layer 3, it requires only one ML-IP Concentrator (which can serve many users, all using multiple connections) to be installed within the provider's network, rather than deploying extra equipment to exchanges or POPs. The Concentrator can be placed anywhere within the IP network for simple installation and management.

The recommended minimum hardware specifications for the ePipe ML-IP Concentrator are:

- Pentium 4, 2GHz (brand name)
- 256MB RAM and two 10/100 Ethernet ports
- Red Hat Linux (7.2 or later)
- 20 MB of free disk space on the Linux file system
- Linux IP Networking installed and operational

The ML-IP Concentrator can be configured to manage up to:

- 100 ML-IP subscribers using 3 to 4 G.Lite ADSL services at their premises
- 50 ML-IP subscribers using 3 to 4 G.SHDSL SHDSL at their premises
- 20 ML-IP subscribers using 3 to 4 Full Rate G.DMT ADSL at their premises

It will be up to each provider to decide on the most appropriate subscriber contention ratio that delivers the specified level of service for each target market.

Subscriber Equipment

To enable bonding of G.Lite ADSL, G.SHDSL and other SDSL services up to 2.3 Mbps per link, subscribers will require an ePipe 2344 appliance at their premises. Each device can bond 3 broadband links back to the ML-IP Concentrator. There is also provision for fail over to one or more dial back-up PSTN or ISDN connections.

Most customers currently only have a single DSL connection at best. With ML-IP, it may be necessary to adjust the network configuration of certain desktop PCs in order to ensure that they are tuned for maximum speed TCP transfers across the higher bandwidth ML-IP connection.

The ePipe 2344 can be configured to allow the device to be remotely managed by the ISP if required.



<http://www.ml-ip.com/html/products/2344-overview.html>

Due to the high processing power required to bond multiple connections higher than 2.3 Mbps and to bond more than 3 links, an ML-IP Concentrator device must be used in place of an ePipe 2344. This will be ML-IP Concentrator software, either running on a (typically small footprint) PC or running on an appliance-style PC with the appropriate number of network interfaces. The concentrator software supports up to 4 broadband links. An application note detailing this solution is available at the link below.

<http://www.ml-ip.com/html/support/appnotes/index.html#rollyourown>

This describes how you can create your own set-top box to handle higher throughput requirements.

Test Drive ML-IP

So you're interested in putting ML-IP's claims to the test. ePipe welcomes you to try before you buy. Just click on this link below and you can create ML-IP connections between two locations for a limited time period.

<http://www.ml-ip.com/html/solutions/mlip-evaluate.html>

ePipe is currently looking to implement ML-IP services with a limited number of ISPs in each region. If the free trial of ML-IP interests you, or for more information, please contact us via email or phone or sign up on the web.

<http://www.ml-ip.com/html/infocenter/partners.html>

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