



# Implementing DSL Bonding Services Targeted to Small and Medium Size Businesses

## The Market

In today's expanding Internet marketplace, optimizing online presence is crucial for business success. Businesses of all sizes, from multinational corporations to the local corner store, are using the Internet to reach new markets, more efficiently deliver goods and services to customers around the world, and foster better communication with employees, partners, and suppliers. With high-speed DSL Internet access, businesses can affordably achieve these goals and gain the competitive edge.

For businesses looking for an alternative to slow dialup modems or costly conventional leased line connections, high-speed DSL is emerging as the access service of choice. However, the downside to DSL is that bandwidth is limited by the distance from the business location to the nearest central office (CO). The farther away from the CO a business is, the less bandwidth it can receive. In many instances, the bandwidth available to a business may not meet its overall needs. DSL Bonding, pioneered by Netopia, multiplies DSL access speeds to solve the bandwidth/distance problem, enabling businesses to fully utilize the power of the Internet. In addition, DSL Bonding enables new applications that require the highest transfer rates by supporting connection speeds of up to 4.6 Mbps. An example of such an application is the transfer of medical images to a remote specialist.

## DSL Basics

DSL delivers high-speed Internet access to businesses and homes using standard telephone lines that run from a telephone company facility called a central office (CO). What transforms these copper lines into DSL lines are the special DSL equipment installed at the CO and at the customer's location or premises.

Standard telephone switches and telephone lines, while ideal for voice communication, limit the maximum allowable bandwidth for data transmission to 56 Kbps for an analog modem connection or 128 Kbps for ISDN. DSL uses these standard

telephone lines but bypasses the normal telephone switches, thus enabling higher speed data transmission.

DSL works on a telephone line connected between the DSL equipment at the customer's location and a Digital Subscriber Line Access Multiplexer (DSLAM) at the central office. Typically, the DSLAM concentrates multiple lines into an Asynchronous Transfer Mode (ATM) or Frame Relay data network. Internet Service Providers (ISPs) connect to the ATM or Frame Relay cloud to provide their end-customers high-speed connectivity to the Internet.

## DSL Bonding Technology

DSL Bonding is achieved through line aggregation technologies that combine two independent DSL lines into a single logical channel for high-speed transmission. There are currently two techniques for implementing DSL Bonding:

1. DSL Bonding in conjunction with Copper Mountain's CopperEdge DSLAMs with Multilink Frame Relay technology implementation. This type of DSL Bonding is also referred to as DSLAM-based DSL Bonding.
2. DSL Bonding through the industry standard Multilink PPP (MLPPP), which is implemented in the customer's DSL router and the ISP's DSL subscriber management system or router (Redback or Cisco). MLPPP Bonding creates a bonded or aggregated connection consisting of two independent DSL lines. DSL Bonding over MLPPP requires the DSLAM to be configured to support PPP. MLPPP Bonding is supported by a range of DSLAM vendors, including Lucent and Nokia.

Using either of these DSL bonding techniques, two DSL lines can be aggregated to create a single logical data channel that is the sum of the individual lines' bandwidth, minus a small amount used for overhead. In addition to aggregating two DSL lines, both techniques perform automatic balancing of traffic across the links and actively monitor the performance of the bonded connection. Should one of the links fail for any reason, traffic is automatically forwarded to the active link. When the failed link is restored, the bonded connection is also transparently restored. From this perspective, DSL Bonding not only provides increased bandwidth, but it also provides redundancy in the event of line failure.

## Reasons to Offer DSL Bonding

As Internet Service Providers launch DSL to meet the needs of small businesses, DSL Bonding can become an important service offering. With DSL Bonding, Service Providers can create innovative service programs that offer their customers more choice.

DSL Service Providers that offer DSL Bonding services will differentiate themselves from the competition, build stronger, longer-lasting relationships with their business customers, and reduce churn.

### Expand Opportunities, Increase Profits

By offering DSL Bonding to small businesses, Service Providers can greatly expand business opportunities and increase profits.

## Open New Markets

Adding DSL Bonding service enables Service Providers to expand their total available market, reaching businesses that previously could not consider DSL because of bandwidth limitations due to distance. These businesses include larger corporations, branch office situations, and any companies that are considering replacement of existing leased line connections.

## Differentiate DSL Service Offerings

With increasing competition in the DSL space, serious businesses will look for the highest value service offerings that meet their requirements for cost-effective, business-class service. Service Providers that can offer DSL service packages, bundled with value-added business-class services such as DSL Bonding, will have a unique advantage over the competition.

## Support Higher Margins

When bundled with DSL service packages, value-added features, like DSL Bonding, allow Service Providers to increase margins. Businesses will benefit from the value of DSL Bonding, and will be willing to pay a premium for such services.

## Increase Customer Retention

By adding DSL Bonding service, businesses will see their Service Provider as offering 'cutting-edge' solutions. They will be able to count on the fact that their Service Provider understands the needs of small businesses and will continue to offer valuable services. This confidence will increase loyalty and reduce churn.

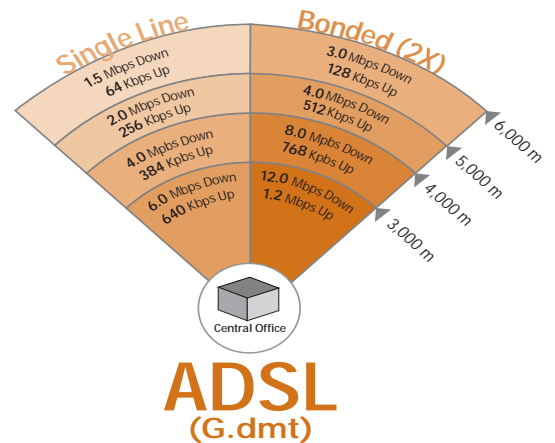
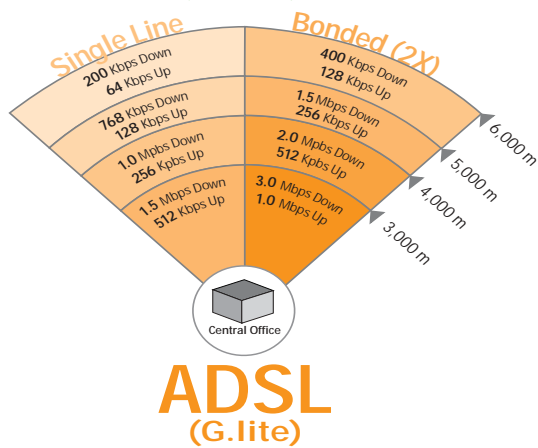
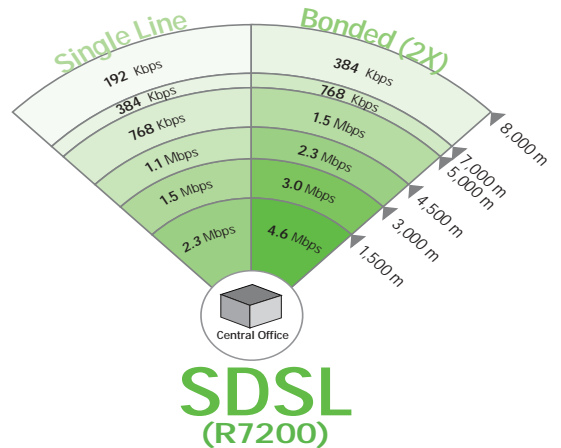
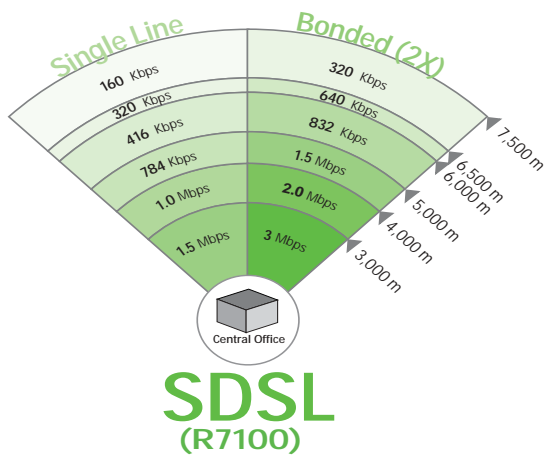
## Netopia Equipment with DSL Bonding

Only Netopia offers DSL Equipment that supports DSL Bonding through both the Copper Mountain DSLAM-based bonding and the industry standard Multilink PPP (MLPPP). For all Netopia DSL equipment with built-in DSL Bonding, there is no software to install and no complicated hardware configuration required at the customer premises. In the Copper Mountain DSLAM-based bonding implementation, the Netopia DSL equipment simply identifies itself to the CopperEdge DSLAM and negotiates with the DSLAM to begin the full bonding operation. The Netopia DSL Bonding over Multilink PPP implementation requires a PPP-enabled DSLAM, and a Multilink PPP-enabled ISP subscriber management system or router (Cisco or Redback) in order to perform the bonding operation.

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## DSL Speed/Distance Diagram

Distance (in metres) from Customer Premise to Central Office. Diagram shows maximum bandwidth available at a given distance. DSL Bonding, enabled by selected Netopia R-Series DSL Routers, utilizes multiple DSL lines to increase available bandwidth at a given distance from the Central Office.



© 2001 Netopia, Inc. All rights reserved. Chosen DSL speeds are used to illustrate bandwidth/speed relationship. Actual available speeds will vary depending on ISP and/or CLEC.

## Netopia Equipment with PPP-Based DSL Bonding

All Netopia R-Series DSL routers can be upgraded to support DSL Bonding over Multilink PPP by adding a second WAN module and enabling the feature with the software key option TER/IMUX. The router should run firmware release 4.8 or higher. A free upgrade of the firmware is available on the Netopia web site. The TER/71 SDSL WAN module adds a second SDSL WAN interface to a Netopia R7100 router connecting to a Copper Mountain CopperEdge DSLAM. The TER/72 SDSL WAN module adds a second SDSL WAN interface to a Netopia R7200 router connecting to any ATM based DSLAM. The TER/61 ADSL WAN module adds a second ADSL WAN interface to a Netopia R6100 ADSL router.

## Netopia Equipment with DSLAM-Based DSL Bonding

DSLAM-Based DSL Bonding is supported in the Netopia R7100 router which is specifically designed to work with the Copper Mountain CopperEdge

DSLAM. The upgrade is done by adding the TER/71 SDSL WAN module for the second interface and by enabling the feature with the software key option TER/IMUX. The router should run firmware release 4.6 or higher.

## How DSL Service providers can Implement DSL Bonding

To implement DSLAM-based DSL Bonding, Copper Mountain's CopperEdge DSLAM must be upgraded to firmware 2.2, and the DSL CPE must be interoperable with the CopperEdge to begin the full bonding operation.

To implement DSL Bonding over Multilink PPP (MLPPP), the following is required:

- The DSLAM must be PPP-enabled
- The DSL CPE must support multiple DSL circuits and the industry standard Multilink PPP (MLPPP)
- The ISP's subscriber management system or router (Redback or Cisco) must terminate the Multilink PPP (MLPPP) connection

By supporting both DSL Bonding techniques, Netopia routers offer ISPs a choice of implementing the DSL Bonding strategy most appropriate for their situation and business model.

## A Complete Solution

Netopia provides small and medium size businesses with complete DSL solutions that include all the features required for business-class connectivity. Powerful features such as Secure VPN with IPSec support, Integrated Dial Backup, and DSL Bonding allow Service Providers to create higher-value, higher-margin service offerings that deliver tangible benefits for businesses that want to leverage the power of the Internet.

Designed specifically to meet the needs of small and medium size businesses, Netopia Internet Equipment elegantly combines business-class features with ease-of-use and a modular architecture:

### Business-Class

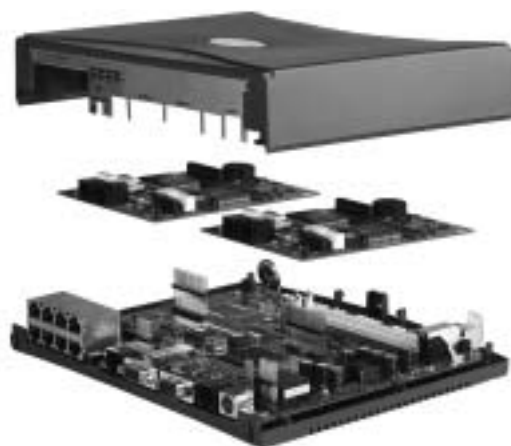
Netopia Equipment comes with all of the business-class features that enable businesses to take advantage of the Internet. Features like Dial Backup, DSL Bonding, Secure VPN with IPSec support, and a host of other business-class capabilities give businesses the flexibility to optimize their Internet connection and provide the performance required for mission-critical business applications.

### Easy-to-Use

Netopia makes configuring and managing a high speed Internet connection simple, allowing a business to focus on financial success, not network troubleshooting. Equipment configuration is a breeze thanks to clear setup instructions, diagrams and intuitive setup programs. These features make it easy for a business to get out of the box and onto the Internet in a matter of minutes. Netopia's friendly and knowledgeable support staff can help with any more difficult problems, should they arise.

## Modular Architecture

For small businesses to keep pace with explosive growth and new Internet connectivity technologies, Netopia is the only equipment in its class with a modular architecture and dual WAN ports. Modularity gives businesses tremendous flexibility by allowing a migration to faster connection technologies as they become available. This preserves the initial hardware investment and simplifies setup by retaining LAN configuration. Dual WAN ports enable advanced features such as Bonding of multiple lines for faster speeds and integrated Dial Backup options.



## Summary

Only Netopia offers easy-to-use, business-class DSL Equipment that integrates DSL bonding. Netopia DSL Equipment comes with unique features that give small businesses the power to take full advantage of the opportunities that the Internet offers.

Netopia's unique features enable Service Providers to open new markets, differentiate their DSL service offerings, support higher margins, and increase customer retention.

**For more Information on Netopia DSL Equipment visit**  
**[www.netopia.com/equipment](http://www.netopia.com/equipment)**

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