24/7 NETWORKS

POWERING YOU

Broadband Bonding Network Appliance

Reliable High Throughput Data Connections With
Low-Cost & Diverse Transport Technologies

PART I - SUMMARY

BROADBAND BONDING NETWORK APPLIANCE-BBNA

We describe how our SD Network powered Bonded Internet can provide an SMB (Small and Medium Sized Business) or a enterprise branch-office with faster and more reliable Internet access at an affordable cost. The return on investment, compared to alternative service offerings when available, is often only a few months.

Problem

Lack of Internet Access Solutions That are Fast, Reliable and Cost Effective for Small and Medium Sized Businesses and Enterprise Branch Offices.

Bonded Internet is the only one-sided broadband bonding network appliance that enables SMBs and enterprise branch offices to broadband bond™ multiple Internet access lines together without any ISP coordination. Companies looking for cost effective ways to bring a more reliable and faster Internet WAN pipe, can do so with our SD WAN powered Internet without requiring any provisioning or coordination from their service providers. providers. Most SMBs currently rely on DSL or Dedicated/Leased circuits for providing Internet access to the company premises. Ironically, many employees may experience slower Internet access at work than their broadband connections at home. The speed of Internet access for the SMB may be insufficient for a number of reasons. For example, the speed of a DSL line may be too slow, due to the long distance from the company premises to the Central Office. As another example, the data traffic over a T1 line may be shared with reserved channels for voice over a PBX system, and hence less bandwidth is available for data. Increasingly, due to the large volume of spam e-mails, the capacity for carrying useful Internet communications is greatly diminished. In parallel, the Internet performance requirements of the cloud services that businesses are using have been steadily increasing. As private and public cloud services become essential for businesses of all sizes, so does the Internet services that connect the business to those services in the cloud.Faster Internet access for the SMB may either be unavailable, or too expensive to justify the recurring expense. A single Dedicated/Leased circuit line may already be too expensive, and Bonded-T1 service is even more expensive. DS3s or partial DS3s, when available, can have prohibitive costs.

Often, a business already has an investment in computer networking infrastructure, and desires evolutionary, incremental growth with maximum utilization of existing resources, in order to reduce operating costs. This creates the need for these businesses, or the solution providers that serve them, to find innovative ways to address these problems.

Solution

Broadband Bonding With Our SD Network Powered Internet for Fast, Reliable and Cost Effective Internet.

Fast · Reliable · Multiple Internet Access Resources · Cost Effective
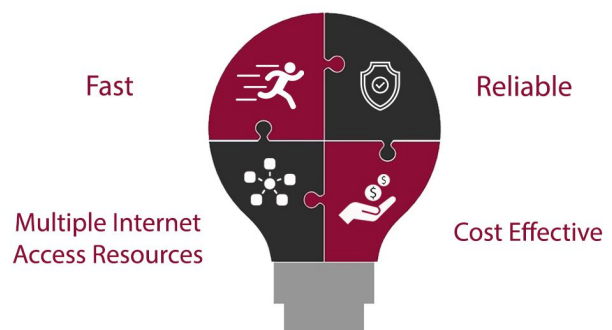
We have developed the Broadband Bonding Network Appliance. which provides intelligent aggregation of multiple Internet access resources, such as DSL lines, T1 lines, cable modem, satellite, Dedicated/Leased circuits etc. This enables file download speeds that reflect of the total bandwidth of all Internet access lines available. The graphic is an actual representation of how fast 1 Gbps is ?

The Bonded Internet platform is capable of providing download speeds in excess of 1 Gbps, depending on the total speed available from all of the available Internet access lines.
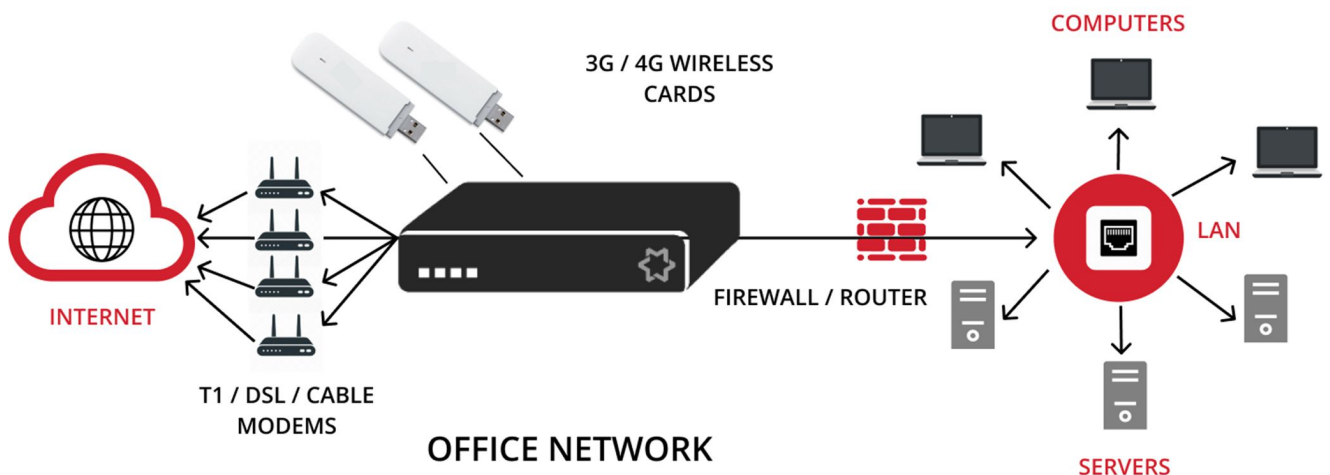
How fast *is* **1 Gbps?**

25 songs = 1 sec. 1 TV show = 5 sec.

1 HD Movie = 25 sec. Stream Anything = 0 Buffering

Functionality

Our Bonder is a unique stand-alone device, with multiple Ethernet ports. It can operate without any coordination with an ISP, and does not require any new software or reconfiguration on the clientdevices. Up to 30 of the Ethernet ports on the Bonder device are Wide Area Network (WAN) ports, and plug into DSL modems, cable modems, T1 modems, fiber lines, 3G/4G/LTE modems etc, which provide internet access. The remaining 2 Ethernet ports of the Bonder are Local Area Network (LAN) ports. The active WAN ports are intelligently aggregated in order to provide high performance Internet access to any device connected to a LAN port of the Bonder.

COMPUTERS

3G / 4G WIRELESS CARDS

INTERNET

FIREWALL / ROUTER

LAN

T1 / DSL / CABLE MODEMS

SERVERS

OFFICE NETWORK

The Bonder provides an unmatched level of intelligent aggregation. The Bonder will bond all types of traffic in uplink and downlink directions. In failover operation, i.e. when not using all circuits, all traffic will be intelligently load-balanced.The Bonder has optional router and firewall functionalities built in. A cellular data card module is also available to add one or two more WAN option for Bonder to provide an unmatched reliability of the various wired connections and the cellular data cards. Configuration of the Bonder can be accomplished through a web based management interface. Router and firewall functionalities include support for port forwarding, DMZ, blocking of outbound traffic per destination port and/or per source IP address, allowance of inbound traffic per destination IP address or port, a DHCP server, sophisticated QoS functions, traffic monitoring and filtering and visualization of network utilization and traffic graphically. Often, however, an SMB may have existing networking infrastructure it wants to use, including routers, firewalls, switches, etc. In an installation mode for the Bonder called "Pass Through", **Bonder can be installed without any modification or reconfiguration of the existing networking hardware and software.** This enables Bonder to be installed easily and quickly, with minimal disruption to an already operational network.

Example Scenario : **Speeding Up Slow T1 Access**

OFFICE NETWORK
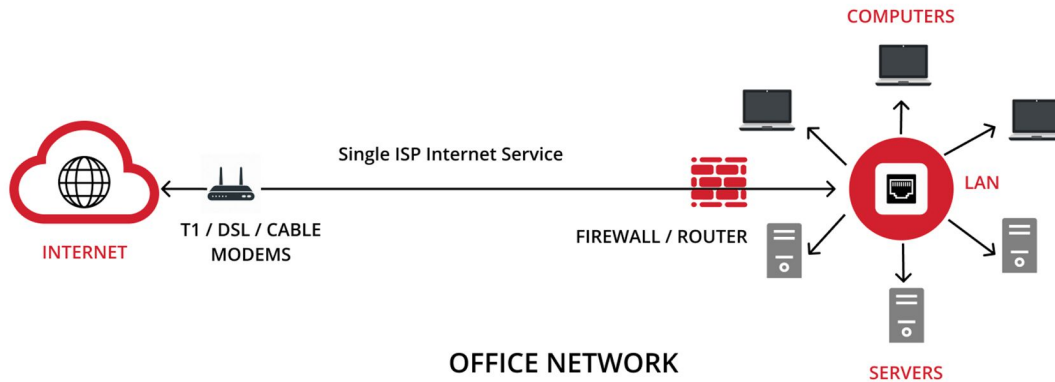
In this scenario, an SMB uses a 20 mbps Fibre access line for Internet access. The Fibre line may be used for both data access as well as for providing voice communications through a Private Branch Exchange (PBX) system. Because of this, a fraction of the bandwidth available from the Fibre line may be available for Internet traffic. Considering in addition the volume of traffic that may be consumed by incoming spam e-mail, this often leaves little capacity available for useful Internet communications. Bonder can be installed in-line between the existing Fibre modem and the firewall/router, withoutany reconfiguration of hardware or software in the existing network. It is necessary to configure the Bonder through the management interface, to specify the IP addresses of the Fibre modem and the firewall/router.

OFFICE NETWORK
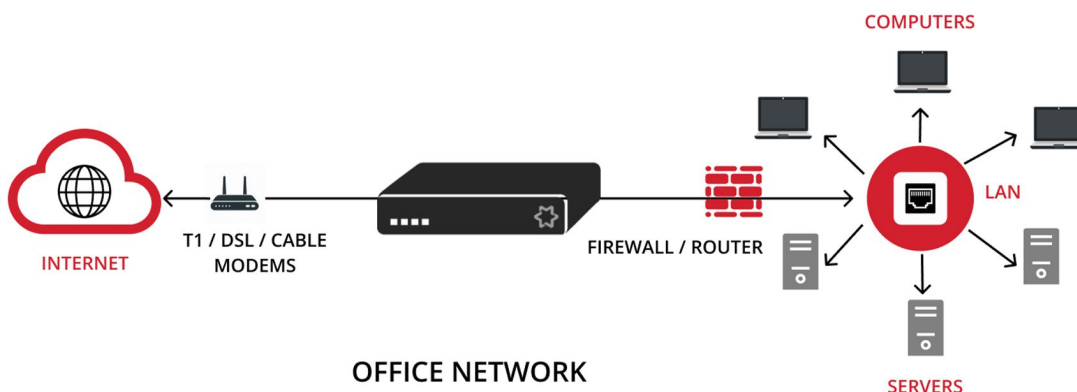
After installation of the Bonder, additional Internet access resources can easily be added as bandwidth requirements dictate. In the illustration below, 3 more DSL lines and 2 more wireless WAN links are added to the network.

OFFICE NETWORK
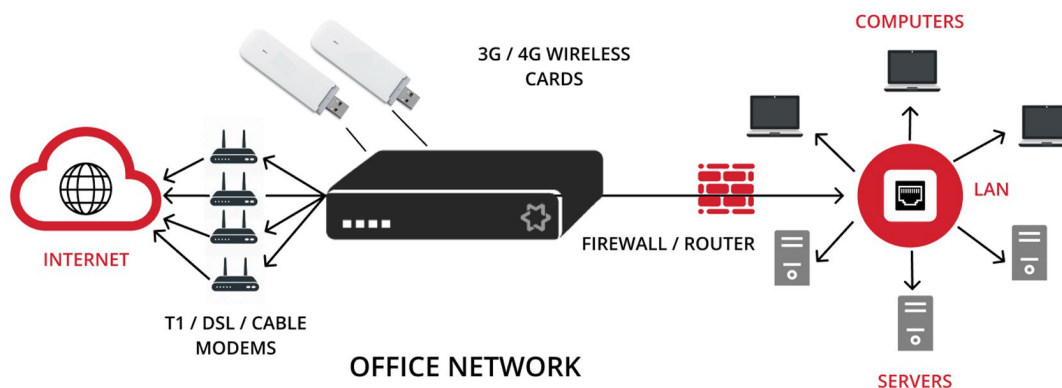
As a result of the Bonder and the additional DSL lines, Internet access for users within the LAN is greatly accelerated. File downloads are usually http-based, and these receive the benefit of all available Internet access resources, simultaneously. Other traffic is distributed over the Internet access resources at the packet level, so that efficient utilization of all resources is achieved when there are a large number of concurrent traffic sessions.A notable feature of the Bonder is that it allows graceful growth. Up to a total of 32 Internet access lines can be aggregated, and these resources can be added as needed as bandwidth requirements increase. The Internet access lines do not need to be of the same type or even from the same ISP, and indeed no coordination with the ISP is necessary. It may be desirable to use Internet access lines from different carriers, in order to increase overall system reliability.

ROI (Return On Investment) Analysis

The Bonder Pays of Itself Within a 2 to 4 Months.

We will compare two scenarios for a small/medium company that has a Fibre line (20Mbps)and they would like to increase their office connectivity speeds equivalent to a normal residential broadband Internet access (50Mbps or faster).
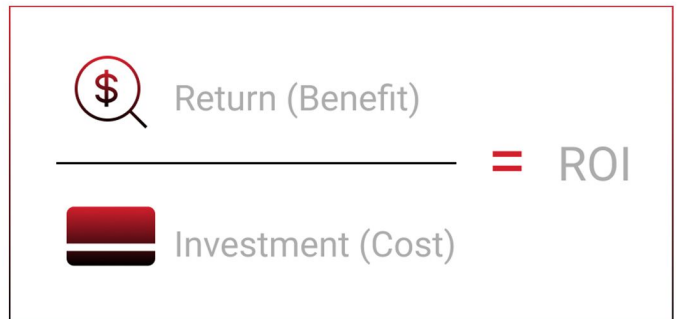
SCENARIO A

The IT person considers upgrading to a fractional DS3 or bonded T1 (with multiple T1 lines).
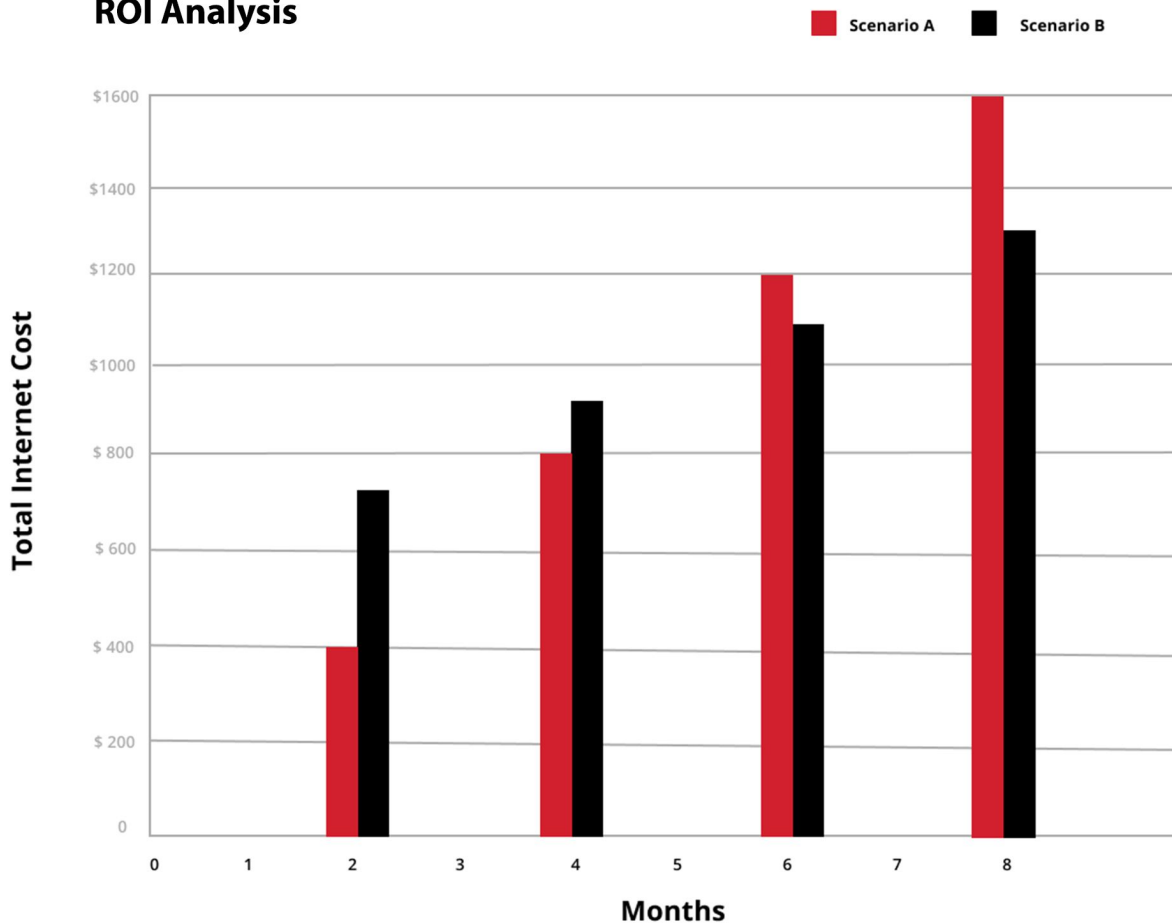
The per month subscription for these type of services are anywhere from $400 to $4,000 per month (we will assume $400 per month). These services sometimes have setup fees (assumed to be zero for this analysis) and/or require long-term commitments. The setup times may also vary from several weeks to months, if the service is available.

SCENARIO B

The IT person considers bringing in one or four business class DSL lines and Bond those four lines with his T1 line via our Bonder. His monthly total subscription fee is $200 (for 4 DSL lines). His one-time investment in the Bonder unit is around $500.

$$\frac{\text{Return (Benefit)}}{\text{Investment (Cost)}} = \text{ROI}$$

ROI Analysis

Legend: ■ Scenario A ■ Scenario B

Months	Scenario A	Scenario B
2	$400	$720
4	$800	$920
6	$1200	$1090
8	$1600	$1300

Y-axis: Total Internet Cost ($0, $200, $400, $600, $800, $1000, $1200, $1400, $1600)
X-axis: Months (0–8)

PART II - SUMMARY

CLOUD LEASED LINE (CLL) FOR BRANCH OFFICE COMMUNICATIONS

The Bonded Internet Network Appliance enables enterprises with branch offices to have reliable high-performance data connectivity between their main headquarter office datacenters and branch offices. Each branch office is enabled with this fast Internet pipe by bonding multiple instances of cost-effective transport technologies such as DSL via Bonder. The Internet lines to be bonded may be from different-carriers for ISP diversity to increase reliability. Additionally, leveraging the high bandwidth connectivity present at the main office of the enterprise, Bonder provides the branch office facility with reliable, high performance Internet access at a fraction of the cost of single provider solutions. In this brief application note, we explain how Bonder can save enterprises with branch offices on their monthly Internet access cost, with a return on investment measured in a few months.

Problem

Data Connections Between an Enterprise Head-Quarters Facility and Branch Offices are Unreliable Not Fast Enough and Expensive.

Enterprises that have a main headquarters facility such as a main office or data-center andbranch offices need to electronically commucate with each other as well as with devices and servers on the public Internet. With the proliferationof cloud services based on private and public clouds, as well as services that are heavily dependent on reliableand high-performance applications have saturated the limits of available WAN (Wide Area Network) services. Although it may be economically feasible to provide high bandwidth Internet connectivity to the main office, providing the same speed connections to each branch office can become prohibitively expensive since there may be many branch offices and the available Internet services might be limited or costly. Due to security considerations, typically all data communications at a branch office, including Internet access, is funeled through the main office facility. Thus, for the data connection between the main office data-centers or public data-centers and the branch office, it is desired to have as high throughput as possible with high reliability that also supports session continuity of applications even during some ISP failures.Generally speaking, if the branch office uses the Internet to communicate with the main office, and has only a single DSL or cable modem connection this will provide insufficient data throughput, particularly for uploading data from the branch office to the main office.

For this reason, many businesses use a Leased line to provide Internet access. The Internet connection that is provided by the Leased line is then used to access devices and servers in the main office. In many cases more data throughput than that is provided by a Leased line is needed between the main office and the branch office.onded Leased lines are often used in such cases, which may double the throughput, with a commensurate increase in cost.

Data Connection Between Head Quarters and Branch Office

Unreliable + Slow + Expensive
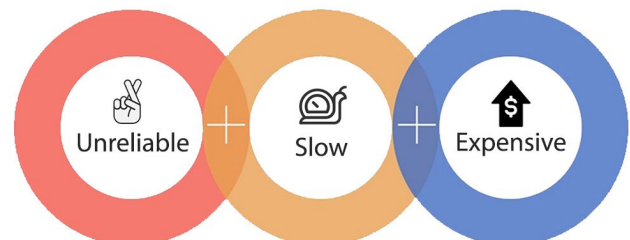
Solution

Leveraging Low Cost Transport Technologies and Carrier Diversity for Fast and Reliable Connectivity Between Branch Offices and Datacenter.

We have developed a Cloud Leased Line (CLL) solution, which enables bonding of multiple Internet access resources such as DSL or Cable to provide reliable high throughput data channels with 99% uptime. The bonder will leverage the unlimited availability of throughput and speed of the data center and reliability of a lease/dedicated circuit.The two Bonder devices form a transparent high-speed data tunnel between them by combining all access resources. To illustrate, suppose the enterprise data-center has a DS3 (or fibre)connection that provides the data-center with a symmetric 100Mbps pipe to the Internet.

This 100Mbps pipe is in the form of an Ethernet connection that is plugged into a WAN port of a Bonder device. At the branch office, suppose four ADSL lines are plugged into the WAN ports of the Bonder device installed there. Suppose each of the ADSL lines provides a 8Mbps pipe in the downlink direction and a 1mbps pipe in the uplink direction.

Branch Office
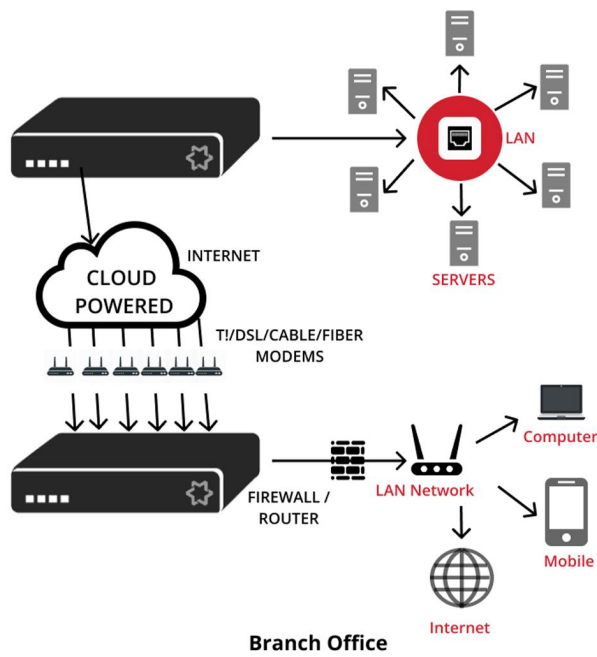
Benefits

● **High Speed Connectivity From Branches to the Headquarters/Datacenter.**

In this example, the four ADSL lines provide an aggregate capacity of 4Mbps (4 x 1mbps) in the uplink direction. These lines are in fact aggregated by the Bonder device, and provide a 4Mbps pipefrom the branch office to the cloud. From the cloud to the Internet there is 100Mbps connection, and from the Internet to the branch office there is an aggregate capacity of 32Mbps. Insummary, the Bonder devices create an IP pipe between the cloud and the branch office, which has a capacity of 32Mbps from the cloud to the branch office, and a capacity of 4Mbps from the branch office to the cloud.

● **High Speed General Internet Access at the Branch Office.**

If desired, the branch office can use the 32Mbps/4Mbps pipe that connects it to the main office for general Internet access. On the other hand, the bonder device at the office can leverage the 32Mbps aggregate download capacity for HTTP downloads directly. Thus, the users at the branch office facility can enjoy an Internet access with downloads up to 32Mbps and upload speeds of up to 4Mbps.

● **High 9's Reliable WAN Connectivity for All Branch Offices.**

The overlay bonding tunnel CLL is similar conceptually to a VPN tunnel in the sense that there is a logical connectivity path between the two Bonder points. This provides the ability of the CLL tunnel to shield any ISP outages from the applications that are utilizing the SD WAN powered CLL tunnel. For the branch office to loose their application session, all of the ISPs that are bonded require to have disconnect event at the same time, which is a very low probability event compared to a single Internet connection. CLL can bond various types of Internet connections from any service provider including Fibre, DSL, Cable, MPLS, T1, E1 or any other IP based Internet connectivity.

● **50% Cost Reduction on Monthly Internet Access Fees & Quick ROI (Return On Investment).**

Compared to using a Leased line or a bonded Leased line, our CLL solution provided by Bonder units can save a business 50% per month. For example, a typical price for bonded Leased service is $800 per month. Rather than using bonded Leased circuit, which has a throughput of 100Mbps in each direction, the business can use two Bonder units and four 40Mbps/10mbps DSL lines. This provides the branch office with a faster 160Mbps/40Mbps data connection to the main office at a fraction of the cost.

A typical price for business DSL is $100 per month, so the cost of four DSL lines is approximately $400 per month. This results in a savings of $400 per-month, a 50% savings on monthly fees and there-fore paying for the Bonder equipment in less than a few months. Similarly, consider the case where a Fibre leased line is used, which typically costs around $400 per month. Instead, this could be re-placed by 4 DSL lines resulting in a savings of approximately $200 per month.

These calculations do not factor in the added value of high speed general Internet access at the branch office that is enabled by the SD WAN powered CLL solution. In the example above, a 32Mbps down / 4 Mbps up Internet access service is provided at a cost of $200 per month.Nor do these calculations take into account that the CLL solution can provide highly reliable service than otherwise possible, by combining different types of services from different carriers and providing session continuity for appli-cations even during ISP failures.

Features

Plug and Play Transparent Installation & Advanced Router and QoS Feautres.

In situations where the branch office has an exist-ing local network with a single WAN connection, Bonder can be installed without any modification to the existing network, including assignment of IP addresses and the existing firewall configura-tion. This makes the installation of the CLL solu-tion very fast, with minimal down time of an op-erational network during the installation process.
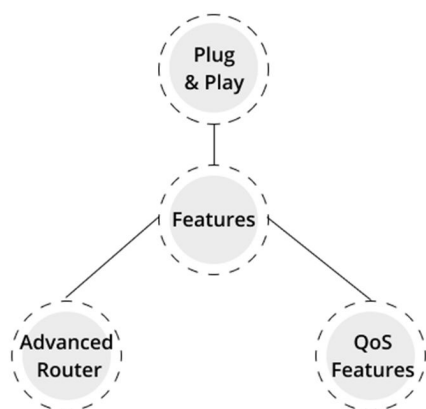
The Bonder has advanced router features, which can be optionally enabled at no additionalcost. A notable feature is the VOIP module, to control congestion from inbound traffic to control QoS for real-time applications. Many company net-work administrators currently provision dedicat-ed access lines that only carry VoIP traffic, to pre-vent QoS degradation. The VOIP module present

on the Bonder enables user defined rate limiting of non-real-time traffic so that real-time traffic, such as VOIP traffic, does not suffer unacceptable QoS degradation due to non-real-time traffic, for example video downloads.

The Bonder includes a full function stateful firewall, which can optionally be enabled. Flows canbe de-fined by source IP address, destination IP address, source port, and destination port, and protocol number, and each such flow can be selec-tively blocked (outgoing) or selectively un-blocked (incoming).

Protocol number, and each such flow can be selec-tively blocked (outgoing) or selectively unblocked (incoming). Bonder can be easily configured so that traffic to certain external public IP addresses and ports numbers can be forwarded to local servers and hosts with internal private IP addresses and ports, a feature called port forwarding.

A DMZ feature is included so that all incoming traffic not matching certain criteria are sent to a "DMZ" server, to facilitate advanced security.Bonder also supports a feature called tunnel bypass, which allows an operator control to pin down certain types of traffic to a particular interface during normal conditions.

Bonder can be configured to automatically send out email alarm messages after critical events.

Bonder is easily managed through an easy to use web-based graphical user interface, which can be accessed remotely, via a password. SNMP support is included (MIB 2, read-only).

Traffic Monitoring module provides applications identifiers of traffic provides pin-point control of your traffic within the network. A graph based traffic monitoring is also available with histograms over minutes, hours, days, months and years.

Conclusion

Bonder provides a unique fast, reliable and inex-pensive data connectivity between the main-of-fice / data-center of an enterprise with its branch offices, by bonding low cost transport technolo-gies, such as DSL, cable or any other IP based In-ternet connection.

Compared to the alternative of using a single and expensive Internet line, CLL solution reduces WAN expenses for an enterprise around 50% per month per branch office. As an added benefit, re-liable general Internet access can be provided for the branch office through the Internet connec-tion at the main office.