TRUFFLE BBNA Application Note:
Virtual Leased Line (VLL) for Office to Internet Data Center(IDC) Communications
Reliable high throughput data connections using low cost and diverse transport technologies.

Executive Summary: The TRUFFLE™ Broadband Bonding Network Appliance (BBNA) enables businesses who use a co-location service at a multi-tenant Internet Data Center (IDC) to have reliable high performance data connectivity from their main office facilities to the IDC by bonding multiple instances of low cost transport technologies such as DSL, which may be from different carriers for increased reliability. Additionally, leveraging the high bandwidth connectivity present at an IDC, the TRUFFLE BBNA provides the main office facility of a business with reliable, high performance Internet access at a fraction of the cost of single provider solutions. In this brief application note, we explain how the TRUFFLE BBNA can save businesses on their monthly Internet access cost, with a return on investment less than one year.

The Problem: Data connections between a business and its servers at an IDC

Businesses who host web and Internet servers are increasingly using co-location services at multi-tenant Internet Data Centers (IDCs) to house their server equipment, since the IDCs provide very reliable high bandwidth connections to the Internet to reach their customers. The IDCs also provide reliable power sources and on-site personnel for urgent physical maintenance of server equipment. In order to access the servers at the IDC from the office, a reliable and high throughput data connection between the main office of the business and the IDC is required.
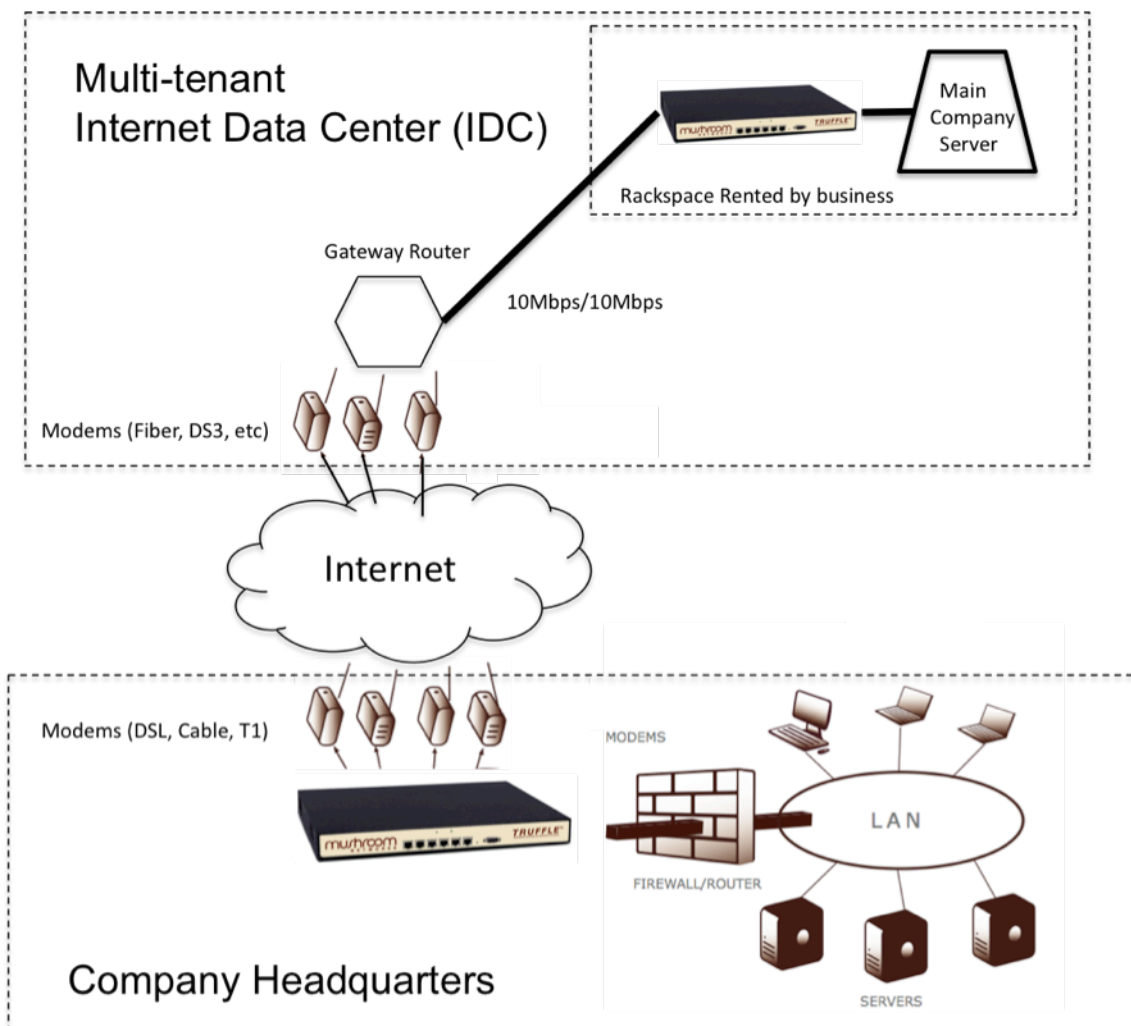
Legacy solutions for the data connections are expensive

Generally speaking, if the business has only a single DSL or cable modem connection, this will provide insufficient data throughput to communicate with the servers in the IDC, particularly for uploading from the main office to the IDC. For this reason, many businesses use a T1 line, which is provisioned from the business to the carrier's Central Office (CO) of the local telephone company to provide Internet access. The Internet connection that is provided by the T1 line is then used to access the server in the IDC. In many cases more data throughput than that is provided by a T1 line is needed between the main office and the IDC. Bonded T1 lines are often used in such cases, which may double, triple, or quadruple the throughput, with a commensurate increase in cost.

Exploiting low cost asynchronous transport technologies and carrier diversity

Mushroom Networks has developed a Virtual Leased Line (VLL) solution, which enables bonding of multiple Internet access resources such as DSL, Cable to provide reliable high

throughput data channels. A TRUFFLE™ Broadband Bonding Network Appliance (BBNA) can be installed at the IDC and at the business as illustrated below.

The two BBNA devices form a high-speed data tunnel between them by combining all access resources. To illustrate, suppose the IDC provides the business with a symmetric 10Mbps (burstable to 100Mbps) pipe to the Internet at the IDC. This up to 100Mbps pipe is in the form of an Ethernet connection that is plugged into a WAN port of a BBNA device. At the company headquarters, or main office, suppose four ADSL lines are plugged into the WAN ports of the BBNA device installed there. Suppose each of the ADSL lines provides a 6Mbps pipe in the downlink direction and a 768kbps pipe in the uplink direction.

Example: 24Mbps/3Mbps between IDC and Office

In this example, the four ADSL lines provide an aggregate capacity of 3Mbps (4 x 768Kbps) in the uplink direction. These lines are in fact aggregated by the BBNA device, and provide a 3Mbps pipe from the business to the IDC. From the IDC to the Internet there is 100Mbps connection, and from the Internet to the business there is an aggregate capacity of 24Mbps. In summary, the two BBNA devices create an asymmetric pipe between the IDC and the business, which has a capacity of 24Mbps from the IDC to the business, and a capacity of 3Mbps from the business to the IDC.

High Speed general Internet access at the company is a side benefit: 24Mbps / 3Mbps

If desired, the business can use the 24Mbps/3Mbps pipe that connects it to the IDC for general Internet access. On the other hand, the BBNA device at the office can leverage the 24Mbps aggregate download capacity for HTTP downloads directly, rather than being routed through the IDC. Thus, the users at the company facility enjoy an Internet access with downloads up to 24Mbps and upload speeds of up to 3Mbps.

Quick Return on Investment

Compared to the approach of using a T1 line or a bonded T1 line, Mushroom Network's VLL solution provided by the TRUFFLE BBNA can save a business several hundred dollars per month. For example, a typical price for bonded T1 service is $800 per month. Rather than using bonded T1, which has a throughput of 3Mbps in each direction, the business can use two TRUFFLE BBNAs and four 6Mbps/768kbps DSL lines. This provides the business with a faster 24Mbps/3Mbps data connection to the IDC at a fraction of the cost. A typical price for business DSL is $50 per month, so the cost of four DSL lines is approximately $200 per month. This results in a savings of $600 per month, a 75% savings on monthly fees.

Similarly, consider the case where a T1 line is used, which typically costs around $400 per month. Instead, this could be replaced by 2 DSL lines resulting in a savings of approximately $300 per month.

These calculations do not factor in the added value of high speed general Internet access at the main office that is enabled by Mushroom Network's VLL solution. In the example above, a 24Mbps down / 3 Mbps up Internet access service is provided at a cost of $200 per month. Nor do these calculations take into account that the VLL solution can provide more reliable service than otherwise possible, by combining different types of services from different carriers.

Plug and play installation at main office

In situations where the main office has an existing local network with a single WAN connection, the BBNA can be installed without any modification to the existing network, including assignment of IP addresses and firewall configuration. This makes the installation of the VLL solution very fast, with minimal down time of an operational network during the installation process.

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Advanced Router Features

The TRUFFLE BBNA has advanced features, which can be optionally enabled at no additional cost. A notable feature is the *VOIP quality module*, to control congestion from inbound traffic to control QoS for real-time applications. Many company network administrators currently provision dedicated access lines that only carry VoIP traffic, to prevent QoS degradation. The VOIP module present on the TRUFFLE enables user defined rate limiting of non-real-time traffic so that real-time traffic, such as VOIP, does not suffer unacceptable QoS degradation due to non-real-time traffic, for example video downloads.

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

The BBNA 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.

The TRUFFLE also supports a feature called *Interface binding*, which allows an operator control to pin down certain types of traffic to a particular interface during normal conditions. This allows the operator maximum flexibility for configuring the BBNA for operation in many application environments.

The TRUFFLE BBNA can be configured to automatically send out *email alarm messages* after critical events. The BBNA is easily managed through an easy to use web-based graphical user interface, which can either be accessed locally, or remotely, via a password. SNMP support is included (MIB 2, read-only).

Conclusion

The TRUFFLE BBNA provides a unique fast, reliable and inexpensive data connectivity between a multi-tenant Internet Data Center and the office facilities of a business, by bonding low cost asynchronous transport technologies, such as DSL or cable. Compared to the alternative of using a T1 line or bonded T1 line, the VLL solution can save a business several hundred dollars per month. As an added benefit, reliable general Internet access can be provided for the business through the Internet connection at an IDC.