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TRUFFLE BBNA Application Note:
Virtual Leased Line (VLL) for Office to Office Communications

Reliable high throughput data connections using low cost and diverse transport technologies.

Executive Summary: The TRUFFLE™ Broadband Bonding Network Appliance (BBNA) enables small businesses or organizations with multiple offices to have reliable high performance data connectivity between their offices by bonding multiple instances of low cost transport technologies such as DSL, which may be from different carriers for increased reliability. Additionally, leveraging the asymmetric DSL connections which provide relatively high downlink rates, each office is provided with very high speed HTTP file downloads. In this brief application note, we explain how the TRUFFLE BBNA can save small and medium sized businesses with two more office facilities on their monthly Internet access cost for each of the office to office links, with a return on investment less than one year.

The Problem: Data connections between offices of a small and medium sized business

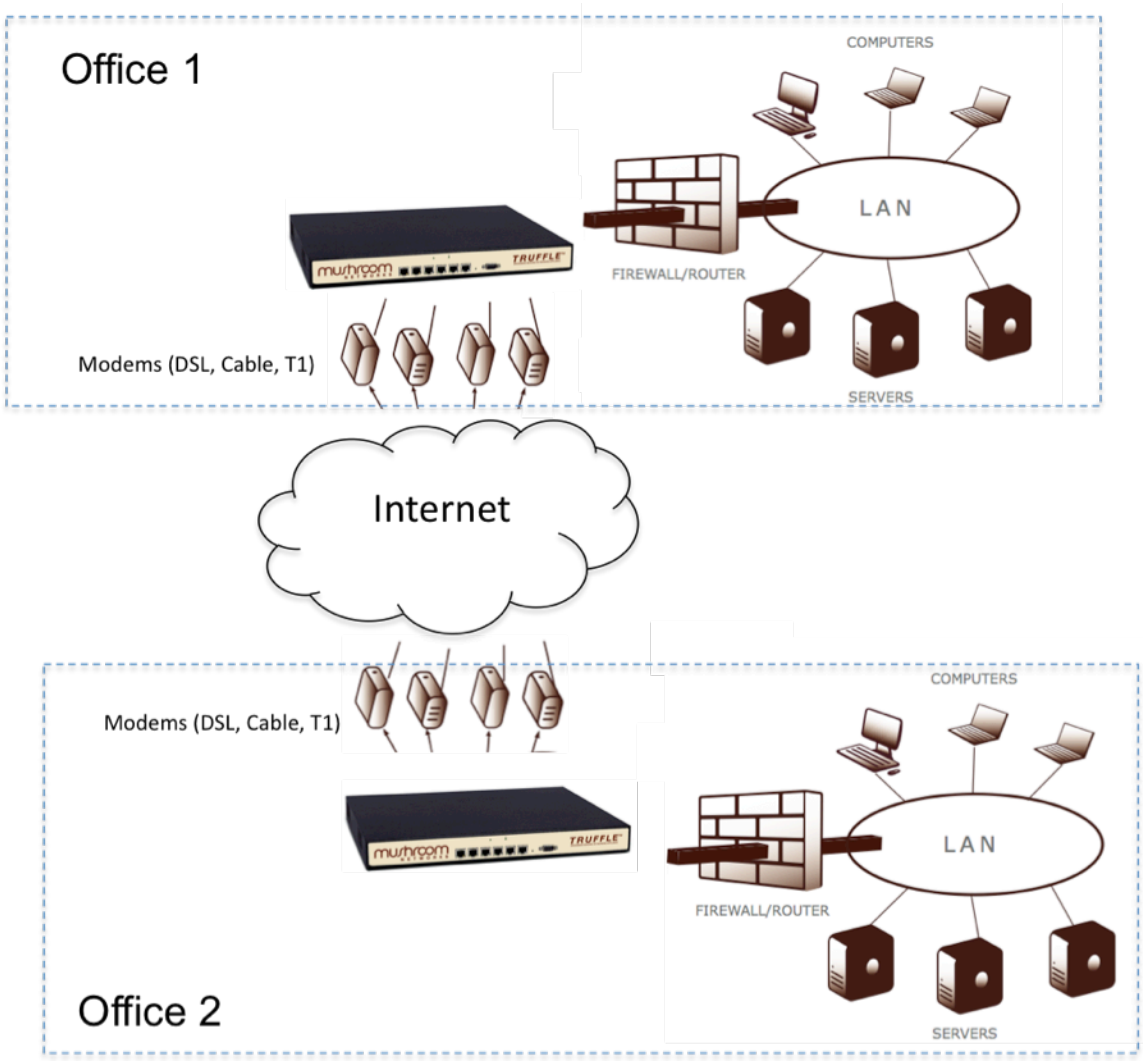
Small and medium sized businesses who have multiple offices often are faced with providing an electronic means of communication between offices, as well as between the offices and the Internet. Often, the size of each office is small enough that paying for a high-speed data connection such as a T1 line, bonded T1 line, or fractional DS3 is prohibitive. On the other hand, it is mission critical to move data between the offices as quickly as possible. Examples include hospitals with multiple branch offices (doctor offices) with data generation devices such as xrays, high resolution ultrasound images, financial institutions with multiple branch offices, government offices, etc.

Legacy solutions for the data connections are expensive

Generally speaking, if each office has only a DSL or cable modem Internet connection, even though that may provide adequate speeds for general Internet access, the upload speeds are usually too low to provide reasonable latencies for data transfers between offices. For this reason, many businesses use a T1 line, which is provisioned from the office to the carrier's Central Office (CO) to provide Internet access. The Internet connection that is provided by the T1 line is then used to access devices and servers in another office. In many cases more data throughput than that is provided by a T1 line is needed. 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 between two offices as illustrated below.



The two BBNA devices form a high-speed data tunnel between them by combining all access resources. For example, suppose each office has four ADSL lines, which 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: 3Mbps/3Mbps between offices

In this example, the four ADSL lines provide an aggregate capacity of 3Mbps (4 x 768Kbps) in the uplink direction out of each office. These lines are in fact aggregated by each BBNA device, and provide a 3Mbps pipe from each office to the other. Even though there is an aggregate capacity of 24Mbps into each office, the uplink out of each office is the bottleneck for connectivity to the other office. In summary, the two BBNA devices create a pipe between the offices, which has a capacity of 3Mbps in each direction.

High Speed file downloads at office is a side benefit: 24Mbps downloads

The BBNA devices can however leverage the 24 Mbps aggregate capacity of the DSL lines for HTTP-based downloads. As an example, even if only a single user requests a file download over HTTP, the BBNA device can use all available access resources simultaneously to download the file.

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 office with the same speed connection 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 downloads at each office that is enabled by Mushroom Network's VLL solution. In the example above, each office can download files over HTTP at 24Mbps. 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

In situations where the an 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.

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 traffic, 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 the offices of a small or medium sized business where the cost of T1 lines, bonded T1 lines, and DS3s are prohibitive. Compared to the alternative of using a T1 line or bonded T1 line, the VLL solution can save the business several hundred dollars per month per office connection. As an added benefit, very high-speed downloads over HTTP are enabled at each office.