

# Improving Network Efficiency for SMB Through Intelligent Load Balancing

## White Paper Series

WP100134

Mike Mo, VP of Engineering

January 2005

---

### Abstract:

As reliable Internet connectivity becomes a daily business "must have" tool, the need for greater bandwidth and reliable access is ever more important to SMB and distributed Enterprise organizations. WAN functions for multi-homing and load balancing allow these needs to be met.

This white paper discusses WAN intelligence, including multi-homing and load balancing, answering these questions, "What are they?", "Why SMB and Enterprise need them?" and "How they work?"

For SMB and distributed Enterprises who desire to achieve a worry free network, integrated WAN intelligence is now available in a single appliance that virtually eliminates down time and improves bandwidth efficiency. The result is an Internet infrastructure investment that quickly pays for itself through improved customer relationships and the allocation of bandwidth to support prioritizing of internal data communications.

## 1.0 What is WAN Intelligence?

Napoleon once remarked that there was no such word as “failure” in his dictionary. As Internet access has become vital for many small and medium size businesses (SMB) as a revenue and productivity tool the need to have uninterrupted access to the Internet, for both their customers and employees, makes “failure” of internet connectivity likewise intolerable by today’s SMB and distributed enterprise operations.

For smaller business organizations simply adding more Internet connections does not answer the need for highly available Internet connectivity without unifying those connections through intelligent functionality. WAN intelligence answers the following three basic needs that identify high availability for Internet access:

- A) Eliminate the single point of failure for Internet connectivity.
- B) Minimize WAN traffic congestion inbound and outbound.
- C) Prioritize bandwidth allocation by Internet application.

SOHware offers a single appliance for the network edge that provides WAN intelligence specifically designed for SMB and distributed enterprise networks to meet these goals. The BroadLink™ family of Multi-homing Load Balancers allows a business to eliminate single point failure, prevent network congestion and provide bandwidth management in a single device, providing excellent ROI by insuring enhanced productivity and WAN connection reliability.

Enterprise networks are familiar with WAN load balancing. Currently, there are two categories of load balancing, WAN Load Balancing and Server Load Balancing as described below:

### 1.0 WAN Load Balancing:

WAN load balancing is focused on WAN fault tolerance. The emphasis is to provide reliable Internet access for employees and inbound access redundancy (Multi-homing) for public customers. The use of multiple WAN links increases aggregated bandwidth to relive traffic congestion in both directions. BroadLink™ is an example of this category.

### 1.1 Server Load Balancing:

Server load balancing involves the control of traffic access demands on servers, often hosted by service providers. Suppose you and ten thousand other Internet browsers all wanted to obtain information from a single site simultaneously (911 for instance). The ISP hosting the Server uses load balancing to manage the public service requests to the destination news

server. The function is to provide fast and reliable HTTP updates for public (HTTP, FTP, etc...) inquiries.

Since the scope of this white paper is limited to WAN Load Balancing we will only address WAN Load Balancing solutions from here on.

## **2.0 Why SMB Needs Load Balancing?**

In order to enhance business productivity and reduce the risk of Internet service disruptions SMB and distributed enterprise are adapting intelligent load balancers to their networks. This innovative WAN solution not only eliminates a single point of failure for Internet service, but also manages congestion encountered during peak demands.

This does not mean the solution for SMB is to throw fatter (and costlier) bandwidth pipes at the problem. For cost sensitive SMB organizations, the real efficiency experienced when implementing intelligent load balancing comes from the ability to combine the right service link mix to meet the demands projected by the business. Rather than adding a second leased line, a business may find their peak demands requiring only the incremental addition of bandwidth offered by DSL. For the SMB, the cost difference between adding a standard T3 and a 1.5Mbps ADSL line can be substantial.

Once the multiple WAN connections are aggregated, the intelligent load balancer can further help the business harvest the benefits of bandwidth management to increase productivity. This is achieved by enabling network administrators to set the priority and amount of bandwidth for different user groups and for specific applications including FTP, Instant Messaging, and http.

For businesses that rely on their web based services as a critical component of their activity, whether for their staff, their customers, or both, the intelligent load balancer needs to be a part of their Internet infrastructure.

## **3.0 How does a Load Balancer work?**

The key components of an effective load balancing solution should include a virus resistant real time O.S. and efficient software modules that react to a failed Internet connection, provide WAN trunking using adaptive load balancing algorithms, and dynamically manage bandwidth tasks.

Once configured, the WAN management activities of the intelligent load balancer should be transparent to the end user's experience, as defined in the following three core functions:

### 3.1 Multi-homing for Inbound Traffic

Multi-homing provides dynamic failover between multiple WAN connections so that, at no time, will access to and from the Internet, be blocked or delayed due to service disruptions by an ISP. By proactively testing each ISP connection, the intelligent Load Balancer can quickly direct incoming traffic to active link connections.

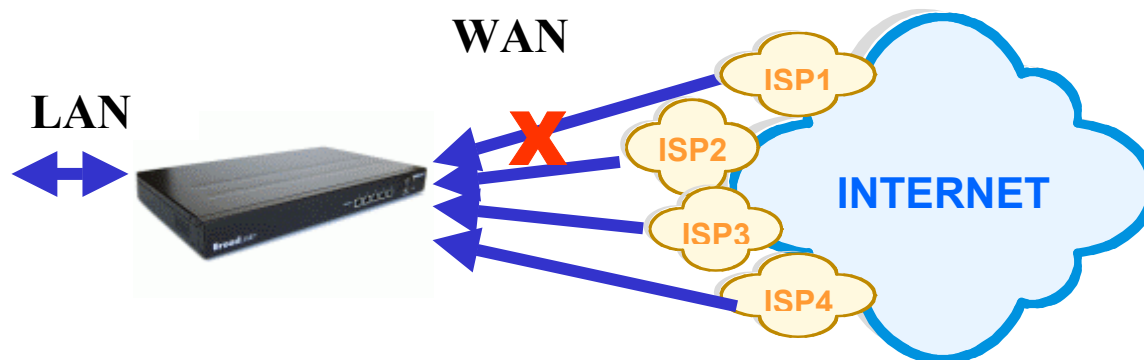


Figure 1: Multi-homing prevents single points of failure. If ISP 1 fails, ISP's 2-4 are still maintaining active Internet connectivity.

#### 3.1.1 What is "Multi-homing"?

The WAN function responsible for inbound traffic load balancing and fault tolerance.

#### 3.1.2 How does Multi-homing accomplish load balancing and fault tolerance for inbound traffic?

By resolving one DNS name to multiple available IP addresses, clients will access the service through different paths by routing. If something is wrong with one WAN link the load balancer will not reply to its client with this IP, thereby controlling access in a fault tolerant manner.

#### 3.1.3 What should an IT administrator do with Multi-homing?

User has to change his registration in NIC (Network Information Center) and replace the old setting with load balancer's interface IP. And then he or she can set up Multi-homing in the load balancer

### 3.2 Auto Routing of Outbound Traffic

Auto Routing on outbound traffic heals congestion problems and service disruptions in the same manner as multi-homing, but for outbound traffic.

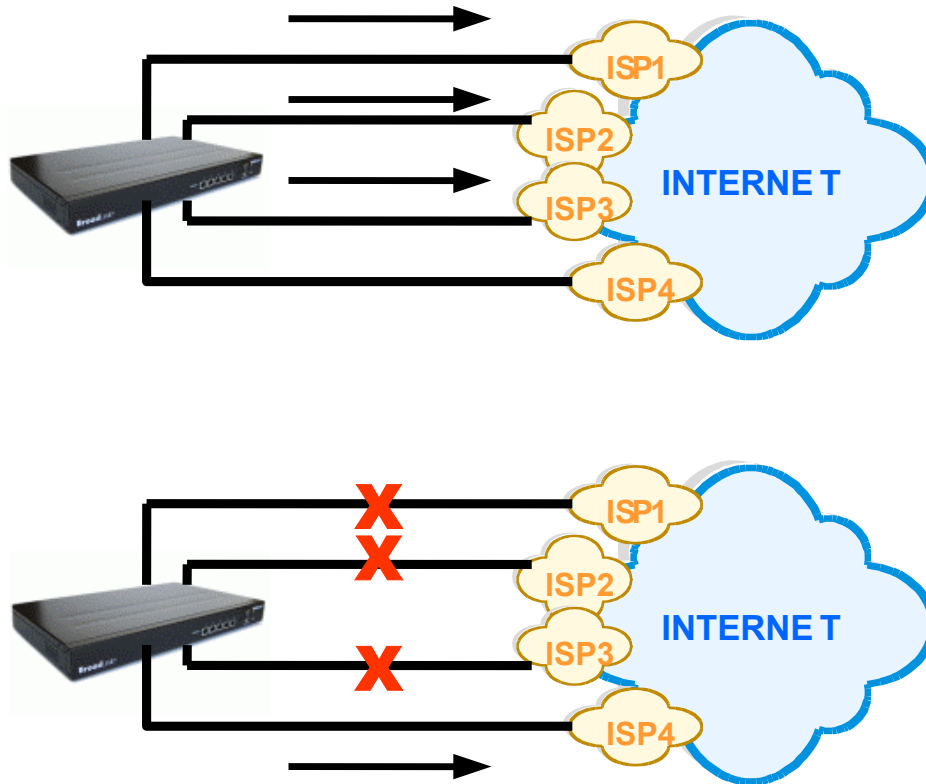


Figure 2: if congestion or failure happens in ISP 1-3, then Auto Routing will allow back up passage via ISP 4.

#### 3.2.1 What is "Auto Routing"?

The WAN function responsible for outbound load balancing and fault tolerance.

#### 3.2.2 What can Auto Routing do?

Auto Routing controls outbound traffic based on L3 and L4 information with load balancing or fault tolerance. This allows, for example, to have specified source IPs prioritized for fault tolerance over backup WAN links.

#### 3.2.3 How many algorithms does an intelligent load balancer typically support?

The minimum types of algorithm necessary for adequate configuration flexibility include: Fixed, Round Robin, Weighted Round Robin, Dynamic by Upstream Traffic,

Dynamic by Downstream, Dynamic by Total Traffic and Dynamic by Connection.

### 3.2.4 How should an IT administrator be able to configure Auto Routing?

Policy and Filter options can control the usage of each WAN link, and apply routing and fail-over policies based on L3 and L4 information.

## 3.3 Bandwidth Management

Bandwidth management tools are normally found on high-end Enterprise server load balancers, yet have important value to be necessary on SMB targeted appliances. Bandwidth allocation applies policy, scheduling and application conditions based on high, normal and low allocation queue levels.

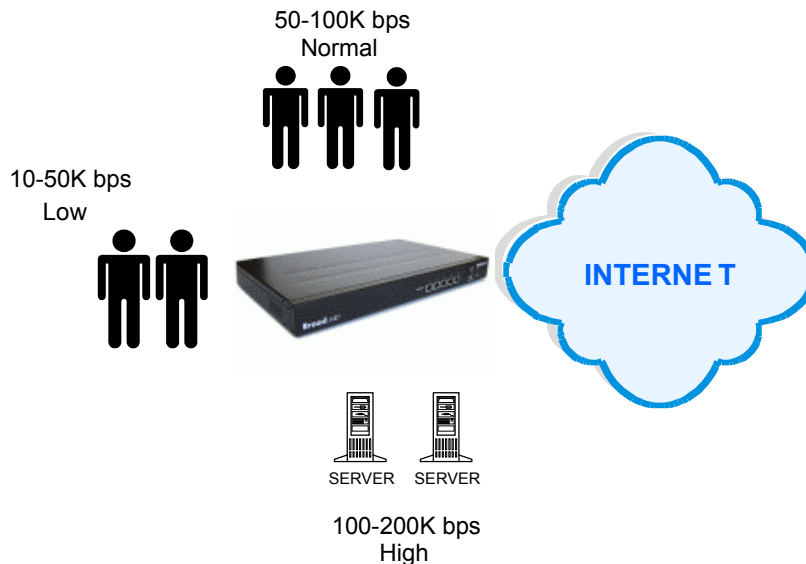


Figure 3: Bandwidth Management, allowing high, normal and low bandwidth to be allocated for different application and groups.

### 3.3.1 What is Bandwidth Management?

Once the business has implemented multiple ISP links, Bandwidth Management can make the usage of the additional bandwidth more efficient and thereby achieve faster ROI.

### 3.3.2 What can the IT administrator do with Bandwidth Management?

Control bandwidth usage based on L3 and L4 information on both inbound and outbound traffic. Typically, a three-tier priority queue of high, normal and low is sufficient to distinguish different types of data flow.

3.3.3 Can Bandwidth Management policies identify scheduling, such as the difference between normal office and after office hours?

Again, an intelligent WAN load balancer must be able to specify busy hours and idle hours to most effectively manage bandwidth prioritization needs for different time periods.

With these main building blocks explained, an intelligent WAN load balancer should operate on an efficient hardware platform using an O.S. that is virus-resistant, such as real time Linux. SOHware’s **BroadLink™** Multi-homing Load Balancer offers these features in an appliance package ideally suited for SMB and distributed Enterprise networks.

#### 4.0 Overview on SOHware’s BroadLink™ Load Balancer

As a state-of-art Load balancer, SOHware BroadLink™ Load Balancer is a productivity-enhancing tool for SMB and Enterprise on mission critical Internet Access. It has the extensive software modules for enterprise-grade appliance as depicted below:

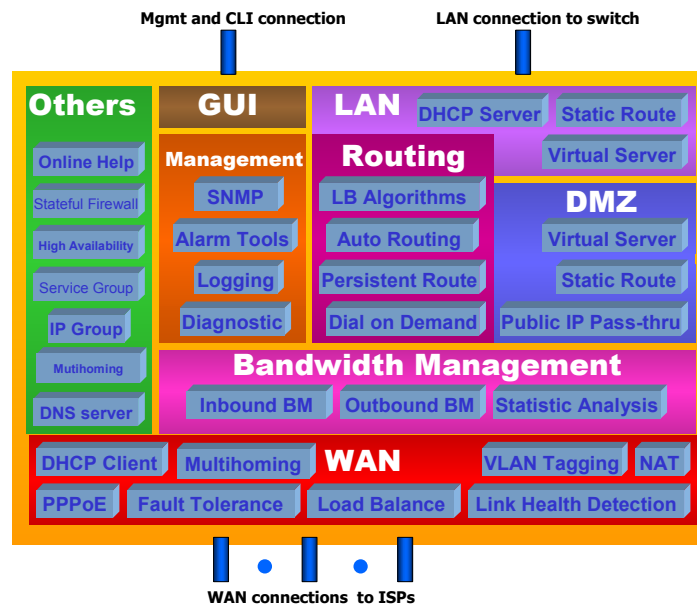


Figure 4: BroadLink™ Software modules and interfaces to WAN/LAN and console

On the WAN module block, BroadLink™ has multiple interfaces to drive Multi-homing for ISP traffic. The Link Health detection sub-module determines when to activate the Load balance and fault tolerance modules. PPPoE supports ADSL connections with dynamic IP address service, a significantly more cost effective solution for small businesses needing incremental bandwidth additions.

BroadLink™, as an edge server, is normally located on the boundary between the intranet (LAN) and the Internet (WAN). The NAT sub-module in BroadLink™ provides the flexibility of setting up NAT rules, and is the basis for the various auto-routing functions between private IP addresses and a given WAN link.

An extension to NAT is the VLAN tagging sub-module that allows mapping WAN, LAN or DMZ links to different VLAN segments of the network.

The Bandwidth-management module block provides analysis of the inbound and outbound traffic with tools to manage bandwidth allocation based on user defined parameters.

The LAN module block has provisions for DHCP and static routing, and supports auto routing to the Internet by deciding which WAN link should be used. This is done by looking up rules in the auto-routing table as defined in the Persistent Routing sub-module.

The Virtual Server sub-module allows an intranet (LAN) server hosted by the business to be made available to the Internet (WAN). Because the private IP address assigned to the server is invisible to the external environment, BroadLink™ redirects external request packets to the corresponding server's location in the LAN or DMZ.

Additional sub-modules support features for online-help, High Availability (HA), Stateful Firewall, IP group, DNS server, service group and Multi-homing. High Availability further enhances redundancy by providing the option to host a backup BroadLink™ appliance that will activate as an automatic failover unit, eliminating the single point of failure potential with a single appliance. Stateful Firewall provides dynamic packet filtering, the most effective means of firewall protection against denial of service attacks.

The IP Group and Service Group sub-modules provide more enhanced administrative organizing functions. IP Group supports the assigning of a name to a group of IP addresses, while Service Group allows the assigning of a name to a group of TCP ports, UDP ports, and/or ICMP. These group




identities simplify communications by automatically identifying members in their respective selection lists.

Dynamic Name Service (DNS) server is embedded within Broadlink™ to support multi-homing fault-tolerance. The DNS server resolves problems with simultaneous use of multiple ISP connections by periodically assigning different IP addresses provided from the multiple ISP connections to inbound requests. As a result, external traffic accesses an internal web server through different IP addresses seamlessly, even if one ISP link were to fail, the goal of Multi-homing.

The GUI module block is for the console management interface including sub-modules such as SNMP, Alarm, Logging and diagnostic tools.

#### 4.1 Comparison between BroadLink™ and other Load Balancers

BroadLink™, as an integrated intelligent WAN appliance, is a more cost effective solution for SMB than Enterprise load balancers. Below is a summary illustrating the comprehensive feature set supporting up to 15 ISP WAN links, targeting the unique needs of small or medium business.

Product Features	BroadLink	Link Controller	Link Proof
Load Balance	Yes	Yes	Yes
Multi-homing	Yes	Yes	Yes
High Availability	Yes	Yes	Yes
QoS	Yes	Yes	No
Firewall	Yes	No	No
DDR	Yes	No	No
Support PPPoE	Yes	No	No

Figure 5: BroadLink™ compared with F5 and Radware load balancers

## 4.2 SOHware's BroadLink™ Multi-homing Load Balancers

BroadLink™ Multi-homing Load Balancers are tailored for SMB and distributed enterprise as intelligent WAN appliances. By combining integrated features, bandwidth control, and ease of use in configuration, BroadLink™ applies to more realistically to the application needs of VAR installers and SMB IT administrators. Highlights of BroadLink™ include:

- **Multi-homing fault tolerance**
- **WAN trunking and load balancing**
- **Time-schedule based bandwidth management**
- **Scalable model options for 3 to 15 WAN links**
- **Ease of management with intuitive GUI**
- **Bandwidth optimizing by application and user**
- **High availability support**
- **Stateful firewall and DoS prevention**
- **VPN pass through management**

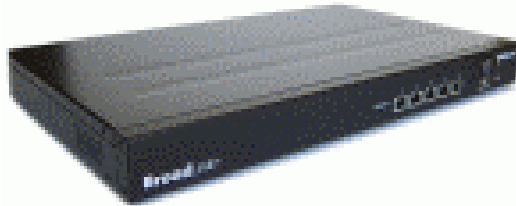


Figure 6: Rack mount BroadLink appliance

## 5.0 Summary

As the demands for Internet presence become increasingly mission critical, even for small businesses, the need for a targeted WAN solution is an ever more essential element for service VARs and their IT customers. BroadLink™ provides important features in a single integrated solution, more than basic load balancing, that ultimately provide return on investment through improved customer satisfaction and Internet usage efficiency.