

WAN Application Acceleration for LAN-like Performance



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Introduction

Today's Wide Area Networks (WANs) provide much more than just a framework for information transport. The recent consolidation trend of servers, storage and applications relies more heavily on the WAN to provide an intelligent path for connecting users in remote offices to the core and data center. Our dependency on applications is only increasing — improved response times for remotely accessed applications is becoming more crucial for the enterprise. The primary challenges facing WAN optimization devices are ensuring fast application-response time, dealing with latency and maintaining complete transparency.

Expand Networks' Accelerator is the only WAN optimization device that provides patented caching and compression techniques while tackling all three of these challenges — simultaneously maintaining packet integrity, eliminating performance pains, and improving network-response times. Expand's patented Router Transparency Mode enables complete network transparency, guaranteeing seamless integration with other WAN services. At the same time, Expand employs a standards-based TCP Acceleration algorithm to compensate for TCP inefficiencies. Expand's unique approach to accelerating webified applications targets DNS queries as well as dynamic and static content. Combined, Expand's powerful compression and caching solution offers a complete and unique approach to WAN optimization.

1. Complete Transparency

Deploying WAN-optimization devices in a modern-enterprise WAN can present integration challenges, especially when advanced services are already deployed, such as:

- Traffic prioritization and shaping (QoS/Traffic Engineering)
- Monitoring traffic, applications, sessions and users on the network
- Protecting the network (Access lists, Firewall/IDS)

Most integration challenges stem from loss of information, or lack of transparency, in WAN-optimization solutions. A viable WAN-optimization device in a modern network must provide complete application and network transparency:

- **Application transparency:** preservation of all clients and servers on the network.
- **Network transparency:** preservation of information required by the WAN/WAN equipment.

Virtually all modern WAN optimization solutions offer application transparency. However, most WAN optimization devices tunnel compressed traffic between appliances, changing the original packet header and payload. Original IP source and destination addresses, for example, are replaced by the IP addresses of the WAN optimization devices.

As such, any WAN service or device that relies on the original packet header information will not function properly once the header and payload have been hidden inside the tunnel. Router-based QoS, for example, will no longer be able to allocate bandwidth based on destination IP address.

Only Expand Networks offers a completely transparent implementation.

Expand's Router Transparency Mode

In order to provide full transparency for compressed traffic, Expand Networks offers a unique tunnel encapsulation mode, Router Transparency Mode (RTM). RTM is the only solution on the market which delivers 100% WAN transparency.

RTM preserves the full IP header and the TCP and UDP headers, giving full IP-flow visibility across the network. RTM protects all current and future services deployed by the

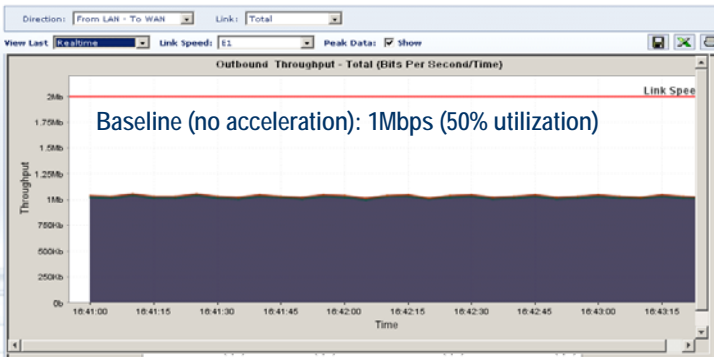
Enterprise, guaranteeing proper functioning for WAN services including:

- Customer Edge routers can classify, shape and mark traffic and IP flows
- WAN probes can report data on the actual IP flows to and from original source/destination IP addresses
- IP based Access Lists (ACL) continue to work
- Per-session-services on the network (e.g. session-based load balancing and QoS schemes)

2. Latency – The (Silent) Response-Time Killer

Latency is unavoidable in WANs. Transmission and equipment delays create latencies that typically begin at 50 milliseconds for US domestic links, 200+ milliseconds for international links, and as high as 2000 milliseconds over multi-hop satellite links.

TCP uses several mechanisms to ensure reliable connections between sender and receiver. These mechanisms — including acknowledge packets, packet retransmission, transmission windows, the slow-start mechanism congestion avoidance mechanisms — control transmission speed and ensure that TCP works extremely well on Local Area Networks (LAN). These TCP mechanisms were not designed for the high latency and high-packet loss found on many WANs, resulting in slow file-transfer rates, degraded web performance and unresponsive applications. Across long-distance WAN links, what appears to be slow-network operation may actually be an application hampered by TCP inefficiencies. Transferring a file over an uncongested 2 Mbps long-haul link may achieve slow transfer rates as a result of TCP limitations:



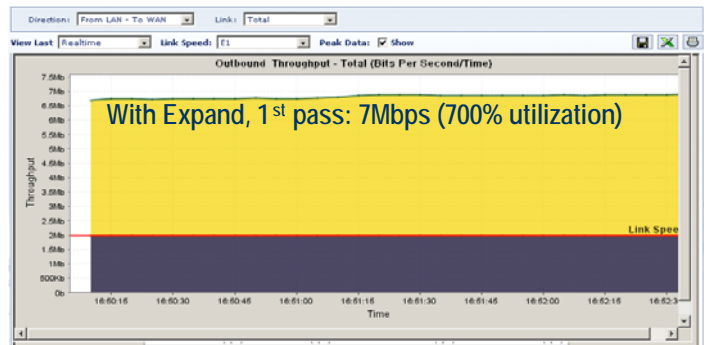
[Orange represents end-user throughput; blue represents traffic on the WAN]

Expand's Standards-Based Approach

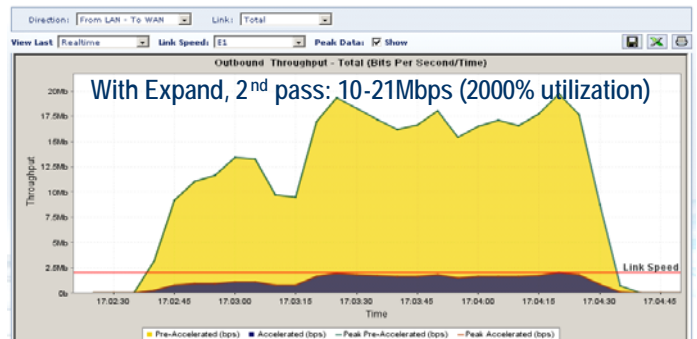
Expand's TCP Acceleration solution is based on the Space Communications Protocol Standards (SCPS), developed by NASA and the US Air Force (www.scps.org). SCPS is a transparent, highly reliable algorithm that is interoperable with all other devices working with the SCPS protocol.

The TCP Acceleration solution optimizes and better utilizes WANs that suffer from distance-induced TCP limitations by enlarging transmission windows for much higher throughput over high-latency links; optimizing retransmissions, avoiding slow-start and congestion-avoidance; anticipating potential link outages; and resuming file transfers after communication is reestablished.

TCP acceleration transfers the file 14 times faster, filling the 2 Mbps WAN pipe with compressed data:



Repeat transfers result in incredible performance gains — the file is cached and Expand's compression ratio improves even further:



3. Accelerated Webified Applications

End-users are becoming more and more dependant on webified applications. Improving response times for remote-

ly accessed applications is becoming more crucial for the enterprise. As more applications migrate to web-enabled versions and HTTP traffic is multiplying, applications perform poorly at WAN sites. Users complain of slow response times and the inability of the application to perform reliably with a required number of concurrent users per site. Moreover, organizations are planning to provision new webified applications in the future. This trend means that WAN optimization solutions have to take acceleration of Webified applications seriously, and Expand Networks has done just that with its 3-tiered approach to complete web acceleration.

Complete Web Acceleration

Expand's unique approach to handling webified content focuses on the entire web-application experience. Webified applications seem slow and heavy due to: multiple round-trips, slow loading static content, and non-cacheable dynamic content. Expand's approach targets all three aspects of webified applications to improve end-user experience and application performance:

- **DNS Caching:** multiple round trips to the Domain Name Server (DNS) delays page loading. Each time a web page is accessed, its URL must be translated to an IP address by the Domain Name Server before the page can load. Expand resolves these queries at the remote branch by caching the DNS entries on the Accelerator. This cuts the amount of time spent on DNS queries down to a few milliseconds, significantly improving response times for webified applications.
- **HTTP Acceleration:** webified applications contain many small objects (graphics, logos, etc.) that download slowly because they require multiple roundtrips over the WAN. Expand's local-content-delivery mechanism handles this type of traffic by serving the objects locally from the Accelerator cache at LAN speeds, eliminating repetitive content transfers over the WAN. Accelerator cached content speeds up delivery times upwards of 1000%.
- **Dynamic Content:** all webified pages include content marked as non-cacheable. While this content isn't cacheable on the HTTP level, it is still accelerated by

Expand's byte-level caching and compression. Expand's powerful caching and compression algorithms work in coordination with Expand's Layer-7 QoS which ensures enhanced response times for critical webified applications.

This three-tiered model targets the complete webified application — speeding up content delivery by shortening DNS resolution times, caching repetitive static content and compressing and prioritizing your most important content. Less repeat traffic on the WAN cleans up your bandwidth for other traffic, while the result is better application performance and improved end-user experience.

Conclusion

Expand Networks offers several unique features and functions which make its Accelerator an easy-to-deploy, high-performance, future-proof solution.

In a modern WAN, full WAN transparency is essential for successful integration of different network services that rely on header data. Expand is the only vendor to offer a fully transparent implementation, based on its patented Router Transparency Mode. In addition, Expand's SCPS-based TCP Acceleration enables a transparent, interoperable solution which mends WANs that suffer from distance-induced TCP limitations. Combined with Expand's unique approach to total-content-acceleration for webified applications including DNS caching, HTTP caching and Dynamic content caching, coupled with the Accelerators caching and compression benefits to be the all-around best performing WAN optimization device.

These combined features allow enterprises to benefit from Expand Networks' outstanding compression and acceleration algorithms while guaranteeing compatibility with all current and future advanced WAN technologies.

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