Smart traffic management for massive bandwidth demand

Layer Exempt Aggregation Device (LEAD)

White Paper

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Executive Summary

New problems, old solutions

The demand for bandwidth has grown exponentially in recent years, and the trend shows no sign of slowing. ISPs are responding with better, faster infrastructure. Hardware vendors are designing faster servers, processors, and mobile devices.

What is traffic management doing to keep up? Traditional traffic management methods don't scale and they can't support the current growing demand for bandwidth. These traditional methods include:

- **Static Port Limits** (or Rate Limits) enforces a usage cap on a single IP address. For example, assume a network has 250 users sharing a 100Mbps circuit, with port limits set at 5Mbps per user. Based on current Internet traffic statistics, during peak utilization, 125 users will attempt to stream video through a service like Netflix. These services require 5Mbps to stream in HD. To avoid gridlock, the network would need more than 625Mbps to service these users plus the 125 other users. Also, users will never experience speeds over 5Mbps.
- **Traffic Shaping** (or Packet Shaping) enforces traffic policies based on the content of IP packets. For example, an admin might specify VoIP traffic should be given priority over streaming video traffic. But many applications encrypt their data, thus making traffic shaping ineffective.
- **Caching** is effective, but costly. Caching stores commonly used data caching servers so future requests for that data can be served more efficiently from the caching server rather than the Internet. Caching is best suited for enterprise networks and large data centers, and is considered a high-end, big-ticket solution.
- **Buying more bandwidth** is only feasible on a small scale, and wastes money because you pay for more bandwidth than your users will ever see.

New Solution

Admins need a new traffic management solution, one that's innovative, affordable, and simple. Introducing the **Layer Exempt Aggregation Device (LEAD)** by Vicidiem.

- The **LEAD** borrows and shares all available bandwidth between active and inactive users.
- If two users are on a 100Mbps circuit, they each get 50Mbps. If two more users connect, everybody gets 25Mbps. If all but one disconnect, the lone user gets 100Mbps.
- Network-transparent.
- Manages Ethernet bandwidth within Layer 2.
- Operates under the IEEE 802.1Q standard.
- Integrates with Layer 2+ managed switches, enterprise routers, and network equipment.
- A complex algorithm incorporates aspects of CBQ, heuristics, and active port limiting protocols.

Vicidiem's LEAD Technology

Whether it's in a multi-tenant environment or a sophisticated network, Vicidiem's Layer Exempt Aggregation Device ("LEAD") is the solution. Once the LEAD is installed on a primary trunk line, it implements a lending/borrowing structure to manage bandwidth allocation to end users. This lending/borrowing structure is the key to bridging the gap between the two traditional management models. A complex algorithm incorporates aspects of the CBQ, heuristics, and active port limiting protocols to ensure the maximum bandwidth is allocated fairly to each user. It also ensures maximum utilization of the circuit. The LEAD borrows and shares all available bandwidth between active and inactive users, which significantly increases in bandwidth speed to active users.

The LEAD can also operate as a "Router-on-a-Stick" and act as the core router in the network stack. It was originally designed for a scenario where the device would terminate hundreds of VLANs for metro-Ethernet delivery to end users in a hotel or apartment complex. In these environments, the LEAD delivers all the expected functionality for routing, NATing, firewalling, BGP/OSPF, etc.

In addition, the LEAD can operate as a transparent aggregation device within the network. This is perfect for well-established or complex networks, where the prospect of replacing core routing equipment is not feasible. In these scenarios, the LEAD can act entirely in Layers 1 and 2 making it transparent to the rest of the network. Any administrator can access the device via line command prompts.

The LEAD eliminates the need for static port limits; it overcomes the uncertainty of packet shaping; removes the need for caching; and significantly diminishes the bandwidth needed. The LEAD is a network-transparent hardware platform built specifically to manage Ethernet bandwidth within Layer 2. The LEAD operates under the IEEE 802.1Q standard, and integrates with layer 2+ managed switches, enterprise routers, and network equipment. The LEAD does not classify network traffic in the highly subjective or complex layer 3+ criteria such as packet content, port, IP, or MAC address. This methodology also contains each user in their own broadcast domain within the network that isolates the user from other users on the circuit.

Layer Exempt Aggregation Technology at work

Hilton Grand Vacations, Las Vegas, NV
Timeshare/Hotel
400 units

Previous Speed: 256k (50 Mbps circuit via Cat3 cabling)
Speed after implementation: 9/9 Mbps (same 50Mbps circuit, Cat3 cabling)

Vicidiem installed its device, and removed the port limits, that were causing nearly 70% of the circuit to be unused. Once the network was delivering usable speeds, network utilization jumped to over 80%.

Optima Sonoran Village, Scottsdale, AZ
Luxury Apartment
600 units

Current Internet Speed: 200/200 Mbps
Vicidiem engineered the entire network infrastructure and the low voltage scope of work for Optima Sonoran Village. This includes a dedicated Fiber Optic Ethernet connection of 500/500Mbps allowing for each resident to enjoy 200/200Mbps to each unit.

Ventana Apartments Orem, UT
Student Housing
430 Units

Previous Speed: 2/2 Mbps (200 Mbps circuit)
Speed after implementation: 90/90 Mbps (same 200Mbps circuit)
Ventana Apartments is an off campus student housing project in Orem, UT. Despite having an over engineered network infrastructure, local ISP's and Managed Service Providers could not deliver over 2 Mbps to each unit. After 10 years and four service providers, management was told that nothing more could be done to increase the Internet speeds. Vicidiem deployed our LEAD technology and increased the speed to each unit from 2Mbps to 90-100Mbps still utilizing the existing Internet connection available at the property. Tenants enjoy over 60Mbps during peak utilization.

Mercer and Eastside Apartments Salt Lake City, UT
Class A Residential
300 Units

Previous Speed: 4/4 Mbps (300Mbps circuit)
Speed after LEAD implementation: 95/95 (same 300 Mbps circuit)
Mercer's and Eastside's management team was referred to Vicidiem because of daily complaints regarding Internet speeds at their properties, which shared a 300Mbps circuit. Upon running a diagnostic test, tenants were receiving 4Mbps. After implementing our LEAD technology the residents are now enjoying 95Mbps.

Conclusion

The astounding innovation that has come from the first twenty-five years of the Internet begs the question of where the next twenty-five years will take us. Regardless of where we are headed, it is safe to say the demand for better, faster, and more reliable bandwidth will only increase. Having a solution that allows networks to intelligently manage and deliver bandwidth to meet that demand is vital. Vicidiem's LEAD technology is that solution.