Unlock the Power of Ethernet

Delivering 100 Mbps and PoE over CAT3 and Legacy Copper with ADTRAN ActivReach

Executive Summary

For the last three decades, Ethernet has grown well beyond being simply a Local Area Networking technology to become the infrastrucure backbone for applications such as 802.11 wireless networking, Voice over IP (VoIP), Unified Communications (UC), IP surveillance, IP Television, and many more.

In spite of this evolution, delivery of these new and exciting applications is contrained by the limitations imposed by traditional copper-based Ethernet networks:

- Voice-grade cabling must be upgraded to CAT5 or higher to support Ethernet
- Ethernet is limited to 100 meters (328 feet)
- Approaches to delivering Ethernet over CAT3 are limited to 10 Mbps

In this solution brief, we will outline the ADTRAN® innovative ActivReach™ technology, which provides a fresh approach, and removes these troublesome constraints. Complementing the gigabit capabilities on ADTRAN's new NetVanta® 1535P Ethernet switch, ActivReach unlocks the power of Ethernet. Now businesses around the world can utilize their existing voice-grade cabling to deploy cutting edge business applications, and access data at speeds of 100 Mbps, while transitioning towards a gigabit future.

Barriers of Traditional LAN Ethernet Infrastructure

Since its inception in the 1980s, Ethernet quickly grew to become the dominant technology for Local Area Network (LAN) infrastructure across a number of industries. Today, the use of the IEEE 802.3 standard for Ethernet networks has grown far beyond computer networking facilitating as the backbone infrastructure for applications such as VoIP and UC, 802.11a/b/g/n wireless networking, IP surveillance and security, IP Television service, and many others. Certainly, the power of Ethernet is universally recognized within the telecommunications industry.

Despite the capabilities of this astounding technology, significant obstacles must often be overcome to ensure the delivery of these new and exciting applications. In general, these obstacles are related to the limitations imposed by traditional copper-based Ethernet networks:

- All cabling must be four-pair CAT5 quality or higher; legacy voice-grade copper is unsuitable for Ethernet networking.
- Distance runs of Ethernet for data and Power over Ethernet (PoE) applications are limited at only 100 m (328 ft). In order to span longer distances, the use of fiber, repeaters, and/or additional switches must be employed.
- It is possible to configure Ethernet circuits across CAT3 copper wiring. However, speeds are limited to only 10 Mbps which is unusable for many applications.

For years, those in the networking industry have had to live with these severe limitations when designing customer networks and layering technologies and services on top of them. Indeed, many of these obstacles were never even perceived as limitations since there was no other solution on the market. In general, customers had to either dig deep into their pocket-books to overcome these challenges or delay the installation of these technologies until a sizeable budget became available.

The Solution

ADTRAN, the leading global provider of networking and communications equipment, now introduces and innovative technology that breaks down these barriers and unlocks the true power of Ethernet. ADTRAN's ActivReach Technology, currently available on the new NetVanta 1535P Gigabit Ethernet switch, allows for ultimate flexibility for designing networks across a variety of cable-plant infrastructures and long distances. The flexibility of ActivReach allows customers to immediately take advantage of next-generation Ethernet-based technologies without incurring significant cost to build-out their network infrastructure.

- **Supports all grades of cabling:** With ActivReach, networks achieving speeds of 100 Mbps can be designed utilizing four-pair, two-pair, or even a single twisted-pair of CAT5, CAT3, or legacy voice-grade copper.
- **Triples Ethernet reach:** Using ActivReach, copper Ethernet circuits can span distances up to 365 meters (1200 feet) from the switch without the use of fiber, repeaters, or multiple switches.
- **Delivers high-speed data over existing wiring:** With the ability to deliver PoE and 10/100 Mbps data to a variety of IP devices, ActivReach allows converged voice, data and PoE service delivery, utilizing the existing wiring.

This Solution Brief examines the flexibility of ActivReach technology across a myriad of real-world applications.

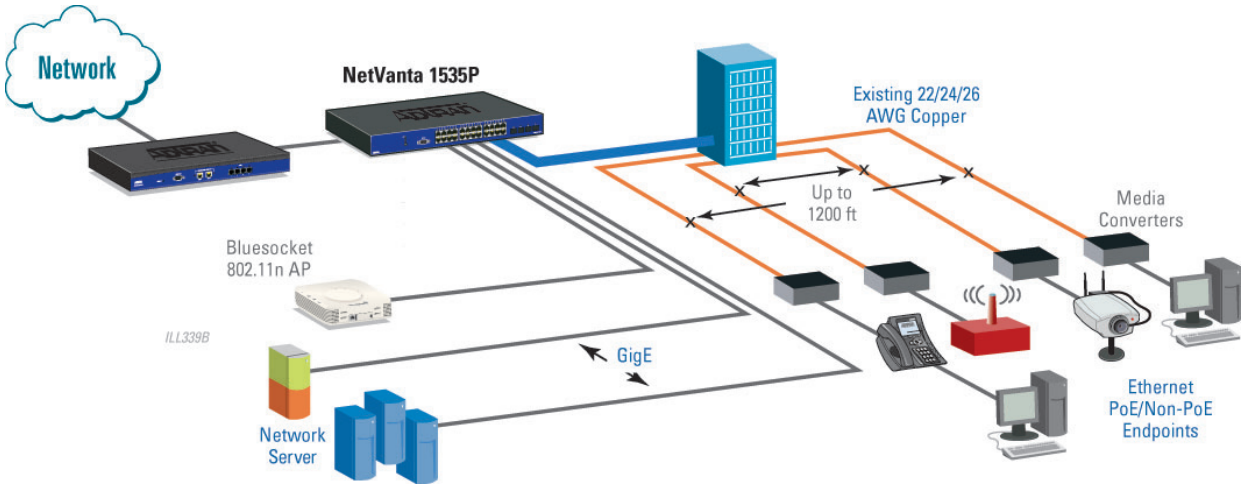
Parallel Voice and Data Networks

When businesses decide to upgrade their voice infrastructure from analog or digital hand-sets to VoIP, key decisions must be made. In many cases, CAT5 cabling may already exist connecting workers' desktop or laptop machines to the rest of the network. In such a scenario, a decision must be made whether or not to layer VoIP on top of existing data network, resulting in more questions such as:

- What types of traffic are currently running on my data network?
- Based on that traffic, is bandwidth sufficient to handle existing and future data applications along with voice traffic?
- What impact will voice Quality of Service (QoS) configurations have on data requirements?

For many businesses, the risk of layering voice over the data network is simply too great and IT managers are forced to run new cable to make their dreams of VoIP and cutting-edge UC a reality. This can result in an extremely high premium to deploy IP phones and UC services. In addition, the existing voice-grade cabling within the business is left unused.

ActivReach solves this problem by allowing parallel voice and data networks without the need for additional cabling. With the ability to supply 10/100 Mbps Ethernet and PoE at distances up to 365 meters (1200 ft), ActivReach takes full advantage of the existing cable plant infrastructure (whether that's CAT3 or legacy copper) to deliver flawless voice quality over extremely long distances without any impact to the existing data network.



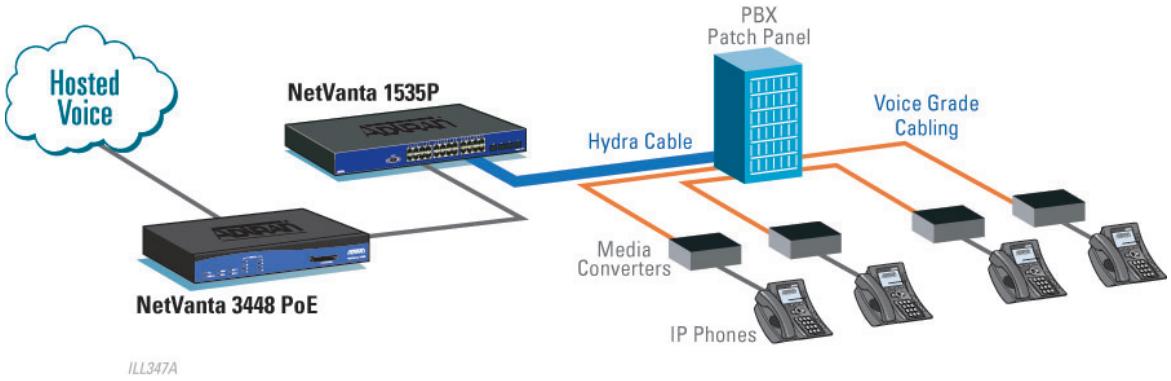
Connectivity for Hosted Services

In older office buildings, retail stores, hotels, hospitals, and distribution facilities, the only cable plant infrastructure that hosted-service providers have to work with is voice-grade wiring, primarily used for legacy phone systems.

The cost of upgrading to a full-scale data network can be extremely high. Network drops of CAT5 cabling can cost anywhere from $150 to $500 each, so all possible solutions must be considered. Wireless is an option. However, for the highest amount of flexibility, control, and security, wired data networks are still the way to go. In general, if costs associated with installing new cabling are too high, the alternatives become limited.

Jeff Hayes, VP of sales at Acuative highlights this difficulty, "Following a site survey, if the customer's infrastructure is deemed unsuitable for service, an equipment and cable-plant infrastructure remediation plan is drawn-up and submitted to the customer. This can be an expensive and time-consuming process for the service-provider. Unfortunately, often times, the customer walks away from the opportunity due to the significant cost hurdles that must be overcome to put the service in place."

The NetVanta 1535P with ActivReach now provides another option at an extremely low price-point. With bi-directional networking speeds up to 100 Mbps, ActivReach is the only technology that can provide data networking speeds over existing voice-grade wiring. In addition, with the ability to power IP phones, apply QoS policies to properly prioritize voice traffic, and separate voice and data traffic across multiple VLANs, the NetVanta 1535P provides the ability to deploy a complete voice and data hosted-services solution.

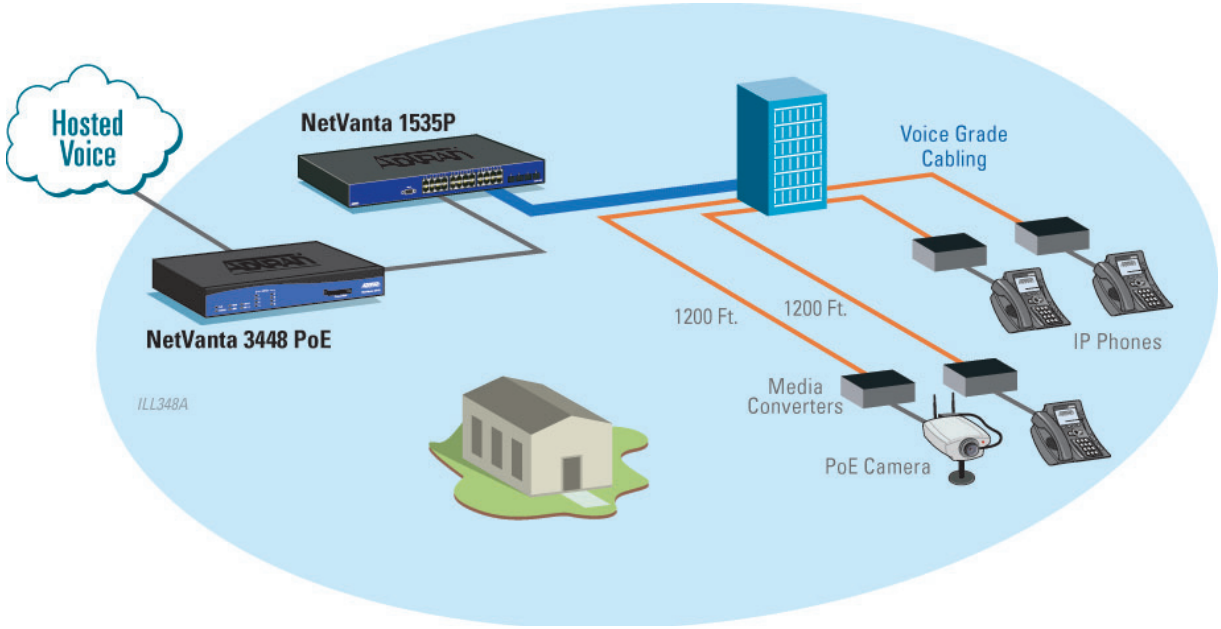


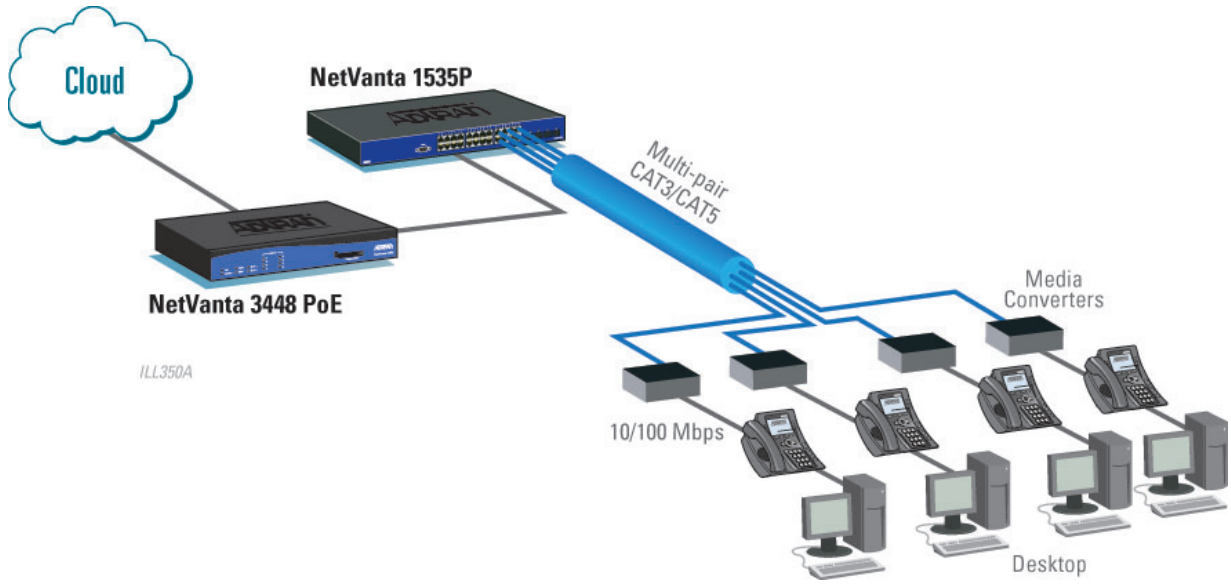
A True Switch with support for Long-distance Endpoints

When rolling-out a new network or performing a network upgrade, it is not uncommon to come across situations that require cabling longer than the 100 meters (328 feet) supported by standard IEEE Ethernet today. Many times, it's only a handful of these types of endpoints which hardly justifies the cost of an additional business-class switch and supporting network infrastructure.

The beauty of the NetVanta 1535P lies in the fact that it is a true 24-port Gigabit Ethernet switch with the option of ActivReach technology for 10/100 Mbps connectivity up to a distance of 365 meters (1200 ft). Since ActivReach can be enabled or disabled per port, it is possible to deliver gigabit connectivity speeds to end-points within 100 meters of the switch and enable ActivReach for the long-distance end-points that also need network connectivity.

This can come with an enormous cost savings over the purchase of multiple switches to provide connectivity to all end-points and some type of networking infrastructure to connect them all together (usually fiber).





One Cable, Many Ports

Since ActivReach can be used to provide both PoE and data connectivity using a single twisted pair of cabling, it is possible to leverage existing cable plant to increase the number of end-point connections without running new cable.

For example, consider a cable run that was done many years ago to provide PoE to an IP phone, and the need arises to extend that single IP phone to multiple phones in the same location. In addition, workstations must be installed behind the phones to provide users with a 100 Mbps connection to the network. Today, based on these requirements, an IT professional would have two options:

- Run new Ethernet cabling from the PoE switch to the end-points. This could be very costly!
- Drop-in a hub or switch with PoE injectors for the phones. This could also be very costly and limits the workstations to only a 100 Mbps network uplink shared between four machines.

With ActivReach, another possibility becomes a reality. Over certain distances, it is possible to split the individual pairs within a CAT3 or CAT5 cable to run PoE and data over each individual pair. Thus, a single 100 Mbps uplink with PoE can become four 100 Mbps uplinks with PoE. In this scenario, cost is minimized considerably since no new cabling has to be put in place.

Real Future-Proof Upgrade Path to Gigabit

Not only does the NetVanta 1535P provide the ability to deploy a converged voice and data network over existing CAT3 cabling, the switch also provides an easy upgrade path to gigabit networking speeds without the need to change the switch. Since each port can be configured for ActivReach speeds of 10/100 Mbps or standard 10/100/1000Base-T Ethernet, infrastructure upgrades can be performed incrementally and the same switch port can be configured to provide Gigabit speeds once new cabling is put in place.

This level of flexibility allows IT managers to easily maximize the total cost of ownership (TCO) of a NetVanta 1535P networking solution well into the future.

Learn more at *www.adtran.com/activreach*

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