Delivering workplace bandwidth

Wave 2 bandwidth on standard twisted pair wiring with HP Smart Rate
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Executive summary

Many enterprises are experiencing extraordinary demands on their Wireless Local Area Networks (WLANs). The combination of the increased number of wireless devices and high-bandwidth multimedia and collaboration workloads cause performance bottlenecks and contention that can reduce staff productivity.

The immediate step enterprises can expect to take to boost WLAN capacity is to replace existing access points (APs) with 802.11ac Wave 2 devices. Wave 2 ac products deliver faster data rates via tightly packed transmissions, cleaner 5 GHz channels and wider channels. This combination supports very high throughput applications such as HD video.

Most businesses use installed twisted-pair copper cabling to power and connect the wireless access points to the access layer switches, with typical speeds of 1 gigabit Ethernet. Because the new Wave 2 APs operate at higher speeds, new high speed PoE+ Ethernet connectivity is needed.

HP Smart Rate multi-gigabit technology allows customers to expand their total system capacity using their existing cable plant. Using Smart Rate ports between the access point and the switches expands the bandwidth capacity of the wired network resolving the “crimped pipe” issue of the AP and switch ports operating at 1G before.

This approach minimizes the need to upgrade the wired network in lockstep with the rollout of 802.11ac access points, providing investment protection for the next generation of higher speed APs. HP Smart Rate ports auto-negotiate to obtain the highest transfer rate (1, 2.5, 5, or 10 Gbps) based on cable run length and wiring category type.

In addition to HP Smart Rate, selected HP switches will incorporate a new purpose-built 6th generation HP Networking ASIC. This enhancement accelerates switching and routing functions by implementing them in silicon. These capabilities combine to give higher levels of performance, flexibility, and value.

HP’s portfolio also includes industry leading, fully flexible OpenFlow and hardware performance to support complementary SDN applications.

Demands reshaping the wireless network

The forecast of exponential growth in wireless devices and the ensuing high-bandwidth requirements for applications are driving network transformation. Many enterprises will need to upgrade their WLAN infrastructure to support increased traffic demands and performance requirements. BYOD (Bring Your Own Device) adoption, the impending rollout of Internet of Things solutions, and the adoption of cloud storage and backup solutions will push incumbent WLAN infrastructure to the limit. This is reflected in the emergence—and rapid traction—of 802.11ac Wave 2. There are several important aspects to the transition to the ac standard.

• Rapid Mobile Traffic Growth: Ongoing BYOD and unified communications (UC) adoption will continue to increase WLAN bandwidth demands, forcing 802.11ac upgrades.

• Edge Performance: Over time, newer 802.11ac—Wave 2 capable devices significantly increase edge performance demands on supporting cabling to nearly 7 Gbps. Wave 2 also can offer faster performance for older devices.

• Pervasive Adoption: Enterprise 802.11ac AP adoption is projected to grow faster than 802.11n did. Within 5 years 95% of shipping 802.11 devices will support 802.11ac. The increase in 802.11ac devices will drive MU-MIMO\(^1\) adoption, which puts additional bandwidth stress on the WLAN.

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\(^1\) MIMO—Multiple Input/Multiple Output—is a technology for multiplexing multiple data streams over a single radio channel. MU-MIMO—Multiple User-MIMO—is an enhanced form of the MIMO technology that enables multiple independent radio terminals to access a system. These technologies encourage even greater usage of high bandwidth applications.
For these reasons, when enterprises replace older 802.11a/g or 802.11n APs with Wi-Fi-certified ac Wave 2 APs, the organizations will see an immediate increase in WLAN capacity, especially when the WLAN is used by Wave 2-compliant smartphones, tablets and notebooks. Legacy clients will see improvement in speed as well, enabling administrators to increase the total number of devices each WLAN can support.

However, one bottleneck remains that could prevent many businesses from capitalizing on these advancements: the existing access cabling infrastructure and speed of the switch port to which the AP is connected. Most of the Ethernet cabling deployed worldwide today is limited to 1 Gbps at 100 meters. Therefore, the ever-increasing traffic volumes generated by users on the Wi-Fi networks are constrained by the existing access infrastructure. Until now, adding bandwidth has meant major new cabling investments.

**Improving Wired Campus Network Bandwidth**

WLANs were originally used to support occasional access, guest access and simple client/server apps like email from laptops. Now WLANs are used more widely than wired LANs— with laptops plus smartphones and tablets. And they are used for more and more applications like file sharing, UC, etc. So the WLAN needs to provide consistent coverage, bandwidth, security (authentication, authorization and accounting controls) and QoS throughout the extended enterprise.

**How can we solve the cabling infrastructure bottleneck?**

In the simplest case, simply adding a second Cat5e cable or replacing the Cat5e cable with Cat6a cable can add additional bandwidth to the switch. However, cabling infrastructure conversion to 10GBASE-T can be a complex, expensive, and a risky disruption of the site, and possibly to the business.

**HP Smart Rate**

HP Smart Rate is a new type of multi-gigabit (1, 2.5, 5, 10 Gbps) twisted-pair network interface. It will allow the majority of existing cable installations found in campus LAN environments to provide higher bandwidth connectivity, improve power to connected devices, and secure the wired-link for next-generation 802.11ac applications.

<table>
<thead>
<tr>
<th>Link speed</th>
<th>Power</th>
<th>Security</th>
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</thead>
<tbody>
<tr>
<td>1Gbps</td>
<td></td>
<td></td>
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<tr>
<td>2.5Gbps</td>
<td>PoE+</td>
<td>MACsec</td>
</tr>
<tr>
<td>5Gbps</td>
<td>At any speed</td>
<td>Planned</td>
</tr>
<tr>
<td>10Gbps</td>
<td>Over twisted pair on a single port. Auto-negotiated</td>
<td></td>
</tr>
</tbody>
</table>
Multi-gigabit 1 Gbps, 2.5 Gbps, 5 Gbps and 10 Gbps with auto negotiation on a single port is supported for operation over twisted-pair cabling. Customers can deliver the additional bandwidth required to support expanding campus WLAN traffic demands now and in the future.

### Mode | Cable type | Cable length
--- | --- | ---
1 Gbps (1000BASE-T) | Category 5e, 6, 6A | At least 100 meters of CAT5e or better cabling
2.5 Gbps | Category 5e, 6, 6A | At least 100 meters of CAT5e or better cabling
5 Gbps | Category 5e | Up to 100 meters of CAT5e or better cabling
   Available when link partner is HP Smart Rate or compatible vendor
10 Gbps (10GBASE-T) | Category 6 | Up to 55 meters of CAT6 cabling
   Category 6A | Up to 100 meters of CAT6A cabling

### Auto-negotiation
This maximizes bandwidth and eases management and deployment complexity. For example, AP uplink speeds can be up to 5Gbe over twisted pair for Cat 5e. HP Smart Rate enables users to extract 2.5-5x more bandwidth from their existing cable infrastructure. The table shown above summarizes the performance capabilities.

### Security
MACsec enables industry standard 802.1AE MAC layer encryption to ensure data confidentiality and integrity.

### Investment protection
The 1 Gbps and 10 Gbps HP Smart Rate modes interoperate with existing 1 Gbps and 10 Gbps ports. Customers get investment protection in existing switch-to-switch infrastructure along with providing the flexibility to move to 2.5 Gbps or 5 Gbps when needed. This includes an uplink speed of 5 GB on Cat 5E for at least 100 meters.

### Power management
Power over Ethernet up to 30W at 1, 2.5, 5 or 10G link speeds. Customers can to continue to power existing and future access points and accessories regardless of bandwidth and link speed requirements.

### SDN and OpenFlow Support
HP Smart Rate ports will complement support OpenFlow 1.3 products.
HP campus networking solutions

As the trends described in the previous section play out, a new reality emerges: traditional network solutions are insufficient for the complexity of today and tomorrow’s campus networks. Those networks must support the New Style of IT demands for data, security, and mobility. Network administrators recognize that network demands will grow and change in unexpected ways. That calls for new levels of flexibility AND efficiency. A new approach is needed. In response, HP offers a New Style of IT—driven converged campus network solution as a forward-thinking approach to providing the network administrator with advanced technology and management solutions to address these changing requirements.

The HP campus networking portfolio addresses New Style of IT requirements by enabling more agile, flexible, and easily manageable networks. Specifically, HP offers a tightly integrated family of high-speed wired and wireless access solutions, coupled with unified management and security. The solution delivers consistent user experiences across devices, like smartphones, tablets, PCs, and wired and wireless networks.

Support for Multi-Gigabit Switching Standards
HP consistently delivers standards-compliant, rather than proprietary, solutions to the marketplace. In many cases, HP innovations establish the foundation for emerging standards. HP will be a driving force behind the new IEEE 802.3 standards effort around 2.5G/5G.

Product Support and Migration Services
Many network administrators are already preparing for the access spending cycle that will accompany Wave 2 rollouts. Some enterprises will choose to future proof with 10GbE and Cat6A cable while others will want to retain their older cables and are ready to prepare their networks for the ongoing shift to Wi-Fi and the performance demands of 802.11ac Wave 2.

In many cases, HP is seeing organizations with 802.11n deployments struggling to deliver sufficient bandwidth and performance for today’s applications. Most legacy 802.11n networks will run out of capacity in a few years and will need to be upgraded, ahead of a typical refresh budget schedule.

HP can help customers create a clear transition plan to migrate their networks to newer standards and architectures, including wired and wireless network integration. First, the same install, startup and support services (i.e., Foundation Care, Proactive Care, and Proactive Care Advanced) will be available for 802.11ac that are available for the rest of the HP Network portfolio.

Second, HP Technical Services can help businesses integrate new and existing product and technologies. HP Wireless Services provides access to HP Networking technology expertise to help expedite WLAN assessment, design, and integration. Service feature highlights include pre-deployment service planning; WLAN site survey and assessment; WLAN design; and WLAN integration, advanced deployment and optimization.
Advantages of the HP campus networking solutions

With the introduction of Smart Rate, HP enhances the ability of the HP Campus Network to support Wave 2 access points. The complete campus solution addresses the network administrator’s needs for network services that support wired and wireless clients.

The HP campus network portfolio with HP Smart Rate now provides:

**Process Automation and Optimization**

- **Policy enforcement** that provides access to applications, credentials, location and device profiling. This is particularly useful in securing BYOD scenarios.

- **Integrated network management** that spans wired components and WLAN-vendor-independent products for configuration and provisioning.

- **Onboarding services**, including device authentication and user authorization services for BYOD applications and operational systems.

- **Network Analytics applications** at the network layer, and to address end-user data access issues.

- **Network forensics tools** to characterize the entire access layer, including security.

**Network and Operations Optimization**

- **Support for voice and video applications** by adding features such as reduced jitter, awareness and monitoring of voice and video quality, and fixed mobile convergence capabilities.

- **Location-based services**, context-oriented services and asset management.

- **Managed services** to augment or repurpose IT resources.

With limited growth in IT resources, administrator efficiency calls for unifying network management, access security, guest access application and policy enforcement. The solution must offer the flexibility to be deployed in a public cloud, private cloud or on-premises. HP Intelligent Management Center (IMC) addresses these requirements and provides a unified way to administer access policies across devices and networks, eliminating manually-intensive error-prone configuration processes.

The HP solution delivers fully integrated management coupled with innovative approaches that supports high-bandwidth workloads from the edge to the data center core as well as cloud services.
Conclusion

HP expects Wave 2 to see a strong uptake in the enterprise WLAN market. In 2014, 802.11ac accounted for 35% of all enterprise AP spending. Dell’Oro forecasts this percentage will rise to 56% in 2015 as 802.11ac revenue exceeds 802.11n revenue.

The HP campus network solution provides you with a single, optimized, and scalable network for secure and consistent access to business critical applications. HP Smart Rate provides an innovative approach to optimizing WLAN traffic and preserving existing cabling investments. The combined solution helps organizations meet emerging trends such as:

• Pervasive UC adoption
• The Internet of Things
• Cloud computing and storage
• IEEE 802.11ac Wave 2 WLAN

HP offers a comprehensive portfolio of campus access technologies, allowing businesses to deliver high-performance, reliable network services to the ever-growing number of mobile users, devices, and applications—and meet users’ expectations for wireless connectivity, BYOD, unified communications, and security.

HP is your trusted partner to help you transform your network to meet New Style of IT requirements and deliver the future today.

Additional links

To learn more about HP Smart Rate and the HP Networking portfolio visit:

hp.com/go/convergedcampus

hp.com/go/networks

hp.com/services/mobility

hp.com/go/tsconnect

Learn more at
hp.com/networking