



UNIFY YOUR NETWORK FOR A MOBILE ENTERPRISE

APPLICATION NOTE



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INTRODUCTION

Enterprise networks face challenges today that were almost unimaginable even a few short years ago. Corporations are issuing their workers with an ever-increasing array of wireless devices to perform their jobs more easily and efficiently, and at the same time employees, partners and guests are bringing personal smartphones, tablets and laptops into the workplace and expect to be able to connect them to the network seamlessly. What's more, many of the applications being run on these devices rely on video or real-time connectivity to be used productively, which is putting strain on networks not designed for that type of functionality or bandwidth requirements.

Enabling mobility within enterprise networks has become a top priority to improve productivity, increase employee satisfaction and drive greater profitability. This application note will discuss what it means to be a mobile enterprise and will analyze the typical infrastructure issues facing information technology (IT) organizations. It will explain how the Alcatel-Lucent application fluent network is the best approach to address the challenges and discuss the steps enterprise can take to become a mobile enterprise.

THE MOBILE ENTERPRISE

A decade ago, mobility for enterprise networks was viewed as a convenience, a way to provide those employees fortunate enough to have laptops with some ability to move about their workplace while remaining connected to the network. Today, however, wireless local-area networks (WLANs) have become mission-critical and enabling mobility has become vital to the enterprise.

And with good reason: studies have shown that mobility-enabled workers contribute up to 240 more hours of work per year ([source](#)), and are more productive, help to increase profits and are happier employees. ([source](#)) What's more, the definition of what constitutes a workplace has undergone a shift in recent years, as working from home becomes more common to both give employees more flexibility and to reduce corporate space requirements and their associated expense.

The definition of enterprise mobility has also grown to reflect its importance. Beyond creating campus-wide Wi-Fi® access, enabling a mobile enterprise means providing ubiquitous connectivity and simple access: employees – or any user in the network – are provided with quality access to whatever applications they need, anywhere, anytime, on any device.

THE MOBILE ENTERPRISE IS HERE TODAY

The benefits of advanced, real-time, video-enabled applications have the power to change how enterprises communicate and collaborate, internally and with customers and partners. But they are also changing the demands on enterprise networks. Real-time applications such as voice over IP (VoIP), video, customer service, and virtual desktop collaboration suites require levels of throughput and latency far beyond the needs of traditional enterprise applications.

And this traffic is rapidly consuming available bandwidth: multimedia content is expected to comprise 83 percent of traffic by the end of 2013, according to Gartner, as videoconferencing, video collateral and the use of multimedia for enterprise applications grows in popularity.

The rapid adoption of mobile devices is also adding to stress on the network. Pyramid predicts there will be 1 billion smartphones by 2015, and tablet devices such as the Apple iPad® are quickly becoming the device of choice for many business users. These rich-media devices, combined with employees connecting from almost anywhere, both consume network resources and make it increasingly difficult for network managers to predict bandwidth consumption.

The challenge of BYOD

The bring your own device (BYOD) phenomenon is growing within enterprise networks. Worldwide, the percentage of employees who own their smartphones has grown to 46 percent, while the number of workers with company issued smartphones has dropped to 33 percent. Tablet use has also skyrocketed, with 59 percent of mobile workers using or planning to use tablets in 2013. ([source](#))

The challenge with BYOD for enterprise IT departments lies in how to allow employees to use their own device or provide guests with access while maintaining network security. Non-corporate issued devices are outside of enterprise IT control and could be vectors for viruses and malware that could infect the entire network.

Today, when BYOD and guest access is allowed, the process is often complicated and bureaucratic, requiring considerable manual intervention from IT.

Today's networks aren't ready

The networks that were designed and built a few years ago are not prepared to support the requirements of today's technology and applications. They were created to handle predictable, static traffic flows that originated mostly from wired devices and which had much lower bandwidth requirements. As portions of the network are modified to meet the needs of specific applications, it adds to the complexity, making them more difficult to manage and increasing operating costs.

In concrete terms, the inability of the network to meet the requirements of today's applications results in impairments such as increased jitter which can decrease the quality of experience (QoE) for real-time application such as voice and video.

What's more, users' experience is inconsistent as they move around the enterprise, particularly from a wired to a wireless network. Applications available with a wired connection may not be available on wireless due to different policies being in place. Each network may also have a different login process, making the transition between them cumbersome. The quality of the connection is frequently different between wired and wireless networks, and campuses may have locations with poor or non-existent coverage.

A COLLABORATIVE MOBILE ENTERPRISE EXAMPLE - ALCATEL-LUCENT OPENTOUCH™

A number of applications, devices and use cases have risen to prominence in recent years that take full advantage of the new capabilities of enterprise networks.

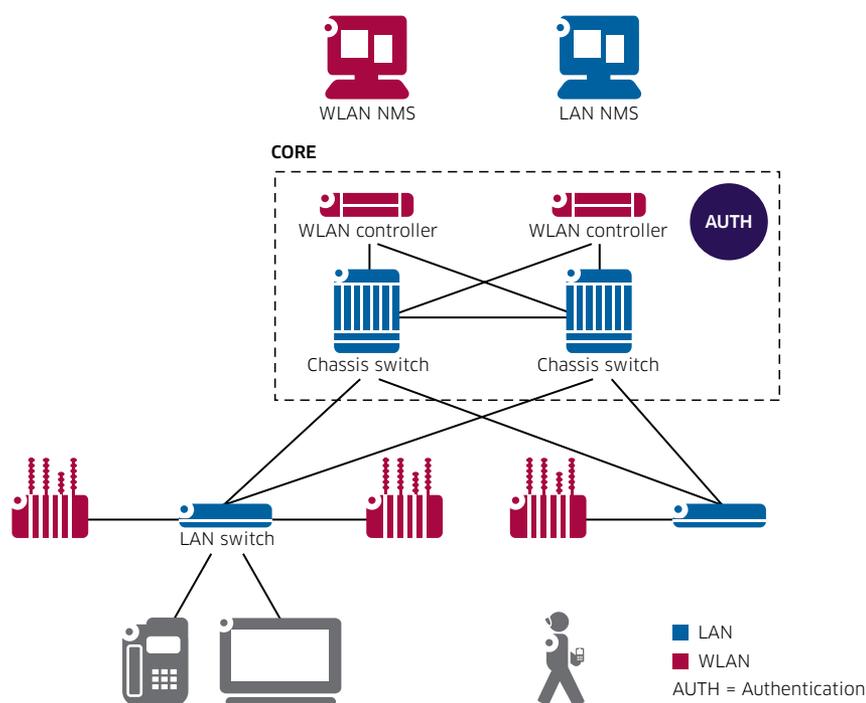
One example of a next-generation application that helps to illustrate the benefits of a mobile enterprise is OpenTouch, the Alcatel-Lucent unified communication and collaboration solution which improves productivity by enabling employees, partners and customers more easily communicate and collaborate.

OpenTouch combines instant messaging, voice and video multi-party conferencing and the ability to share applications from anywhere, using a variety of devices, wired or wireless, providing a consistent user interface. Furthermore, shifting a conversation session from one device to another is simple to do.

The network operation is also becoming more complex. The mix of corporate-issued and BYOD devices come with a multitude of operating systems that need to be accommodated. Most organizations have separate management systems for their wired and wireless networks as well as other complementary solutions, which increase the effort required to configure and maintain the solutions and make them increasingly difficult to troubleshoot. Ultimately, today's piecemeal approach is adding more and more work for IT departments that are already overloaded and operating under restricted budgets.

Figure 1 shows a typical enterprise network infrastructure today. The LAN network is represented in blue and wireless is represented in red as an overlay to the LAN network. Each network has a separate authentication mechanism (in many cases the LAN is an open network that doesn't require any authentication), different QoE (different policies, QoS and limited wireless coverage) and its own network management system, increasing the workload for IT managers.

Figure 1. Today's typical enterprise network architecture



A recent study from Gartner shows the problems associated with today's networks will continue unless more action is taken to get to the heart of the problem. Their data shows 80 percent of the WLAN installations being undertaken in 2013 are at risk of not being able to handle the traffic loads by 2015.

While the benefits available through advanced enterprise mobility solutions are considerable, they are very reliant on the QoE the user receives. If using an application is more cumbersome than previous tools, or if a solution makes communication and collaboration more difficult due to poor audio or video quality, or dropped connections, for example, it will frustrate users and they will stop using it – eliminating any potential productivity gains.

It is essential the network infrastructure delivers sufficient QoE for enterprise applications, with enough bandwidth, low latency, intelligent prioritization and appropriate wireless coverage to increase productivity and maximize return on investment.

Conditions required to create a mobile enterprise

Enterprise networks need to go through a substantial transformation to meet both today's and tomorrow's challenges, which can essentially be broken down into three main objectives.

First, the network must be able to support a wide variety of devices, with both wired and wireless connections. There are now desktop computers, laptops, printers, fax machines, desktop phones, smartphones, tablets, surveillance cameras and more, but given how quickly some of the newer devices have exploded in popularity, the network must be ready to handle new devices that may still be on the drawing board.

Second, the network must make it easy to adopt the large number of new VoIP, video, virtual desktop, customer service and collaboration applications that are becoming essential tools for corporations to compete effectively and stay engaged with customers, employees, partners, and vendors. Network planners must also keep in mind many of these make heavy use of multimedia, especially video.

Third, the network must support all these devices and applications in a very mobile environment. Employees no longer sit in one fixed location all day long, they frequently move about the campus and need to have good connectivity and identical quality of experience wherever they are. Traffic patterns are no longer predictable and the network must adjust constantly.

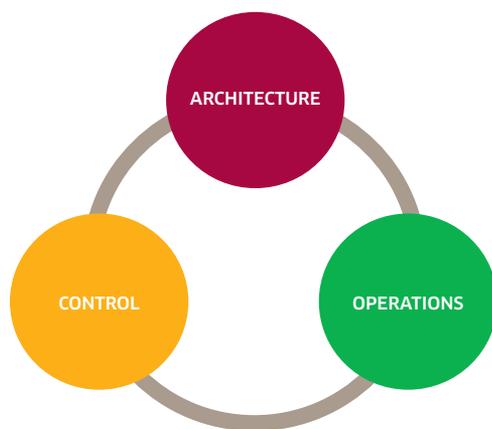
If properly designed and executed, the mobile enterprise network will usher in a new era of corporate connectivity that will extend clear benefits to employees, customers and to the business. How this transformation will affect campus network infrastructure will be the focus of the remainder of the paper.

THE NETWORK IS KEY

The Alcatel-Lucent network solution is based on our Application Fluent Network (AFN) vision, which contains all the functionality required to enable an organization to truly become a mobile enterprise.

The AFN concept – first introduced three years ago – is based upon a resilient architecture with streamlined operations and automatic control as shown in Figure 2.

Figure 2. Alcatel-Lucent application fluent network



An AFN possesses broad knowledge of the users, the network devices they utilize and the applications they are connecting to. Most importantly, the application fluent network understands the context of the conversation — the device, user, location and application—and makes decisions based on that understanding.

AFN brings significant benefits to the enterprise including a high-quality user experience, lower network administration costs, and a better return on investment.

Architecture: The AFN architecture is the foundation for cost-effective real time application delivery, such as video on an all-IP network. It includes a resilient, secure, simplified network topology with unified access and a high performance and right-sized core.

Control: An AFN possesses broad knowledge of who the user is and what device is being used, and then provides control of real-time application delivery with a unique ability to dynamically tune network performance based upon the user, the application, the device and location to facilitate the best possible user experience.

Operations: Streamlined operations means that the burden on the IT team is significantly reduced through automation, consistency of features, and unified management.

FROM VISION TO REALITY – A PHASED APPROACH

Next let's examine how Alcatel-Lucent can help enterprises with this transition process. As discussed, companies need to be prepared to support more users, devices, multimedia and mobility. This requires a considerable increase in capability, so this paper outlines gradual improvements Alcatel-Lucent believes are fundamental to enable the network to handle its increased role and responsibilities.

There are two major steps or phases in the evolutionary approach, each with specific solution improvements which can be done all at the same time or gradually added in the order that best suits the needs of the enterprise.

The first phase is what Alcatel Lucent terms **Enablement**. During this phase, the foundation is put in place for the network to provide more bandwidth and better performance to support the increased traffic generated by the new applications. In addition, policies to control the quality of service (QoS) and network security are introduced. This is complemented by the deployment of BYOD services.

The second phase is termed **Unification**, which helps simplify the overall network and its policies and access processes to provide a seamless experience regardless of access media utilized by the device. The overall network operation is simplified in this phase.

Enablement

Pervasive WLAN

If starting from a typical network as described above in Figure 1, the first step in the Enablement phase is to increase the coverage of the WLAN to encompass the entire campus, while at the same time increasing bandwidth to create a pervasive WLAN. Today, that increased wireless bandwidth can be provided with 802.11n, which is the standard interface on PCs, tablets, smartphones and other networked devices. The sheer number of Wi-Fi devices already accessing corporate networks for data-intensive applications such as HD video, however, means the capacity and data rates enabled by 802.11n may soon not be enough to support demand, as discussed earlier in the paper.

Fortunately, the successor to 802.11n, 802.11ac, provides greater reliability, higher throughput and increased capacity.

Alcatel Lucent offers one of the best mobile application experiences over the fastest and most reliable scalable Wi-Fi infrastructure. The Alcatel Lucent 802.11ac and 802.11n Wi-Fi solution can be deployed simply and flexibly. Unlike one-size-fits-all WLANs, Alcatel Lucent offers network control that can be distributed across a group of intelligent, fault-tolerant access points or centralized in a mobility controller or switch.

To accommodate new wireless infrastructures, Alcatel-Lucent recommends undertaking a wired network audit. While typical first-generation 802.11ac deployments (three stream, 80-MHz. channels) are not expected to exceed the capacity of ports on gigabit-Ethernet switches, future switch deployments should include at least ten-gigabit uplinks to avoid bottlenecks as the switch moves traffic to the core.

Right-sizing and virtualizing the core

The next step is to upgrade the LAN to a wire-rate 10 GigE core to improve performance and at the same time right-size and virtualize the hardware. Large racks of hardware are no longer required; next-generation standalone switches combined with network virtualization techniques will provide both the performance and resilience required.

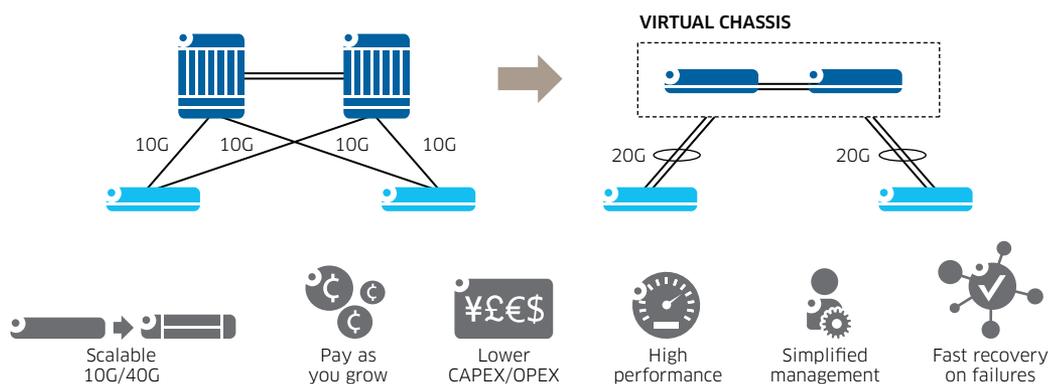
Figure 3 illustrates the concept of right-sizing and virtualizing. A current typical enterprise network core is shown on the left: one or two chassis with high power consumption, low performance and bottlenecks in the backplane. The access (or distribution layer) connects to the core using spanning tree, which is inefficient since it keeps half of the links disabled. In addition, spanning tree resiliency is not adapted to modern, real-time applications.

The right side of the figure shows Alcatel-Lucent’s proposed simplification of the core, using new generation switches with non-blocking and high performance capabilities. Network virtualization techniques make a pair of switches behave like a single unit, providing the necessary redundancy, fast recovery on link or switch failure and full utilization of all links to the access layer. As these core switches behave as a single unit, they are simpler to manage. This design uses less space, consumes less energy and the switches have expansion slots that allow the core to scale and add higher speeds, such as a 40 GigE interface.

CHALLENGES OF INCREASED WIRELESS CAPACITY

“This speed will challenge current architectures in much the same way that the migration from 10 or 100 Mbps to 1 Gbps wired networks did. Pushing the limits of performance at the network edge creates the possibility of bottlenecks as dozens of devices run at hundreds of megabits per second at each access point and also roam between access points. While current 802.11n solutions work great in a 1 Gbps wired environment, 802.11ac will demand a 10 Gbps–or higher–switched backbone. And it won’t stop there. Some vendors have already announced products to boost maximum data rates as high as 5-7 Gbps for 802.11ac; these will likely appear by late 2014 or early 2015.” [\(source\)](#)

Figure 3. Right-sized, virtualized network core



This next-generation core — using Alcatel-Lucent virtual chassis technology — offers scalability, high performance, fast recovery from failures (without affecting real-time applications), simplified management, reduced capital and operating expenses, and enable a pay-as-you-grow approach while protecting IT investments.

Automation

The final step in the Enablement phase is to introduce network automation, so the network knows how to adapt as users move around the corporation. To do so, it is necessary to add authentication to the LAN network and policy enforcement to both LAN and WLAN networks to increase security and manage the QoS delivered to each user according to organizational priorities. This can be achieved with user and device profiling, which is the ability to identify who the user is and associate network behaviors specific to that user.

Profiling the users

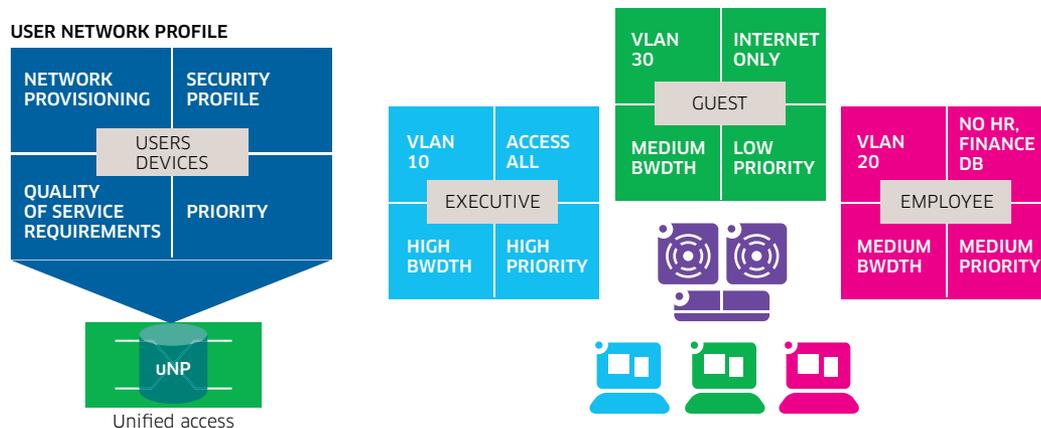
Users are identified in the Alcatel-Lucent mobile enterprise approach using a variety of methods available. Then the User Network Profile (uNP) binds access rights and service levels to specific users and devices on the network. By recognizing device and user, uNP can assign service provisioning requirements, security profiles, expected QoS levels, and the priority of the conversation for the organization.

Figure 4 provides an example of how uNP works in practice. There are three different profiles and each is assigned to a different virtual LAN (VLAN) so their traffic does not mix:

- Executives are guaranteed high bandwidth, the highest priority for their application traffic, and access to all the servers in the network.
- Employees may have access to most of the network but not to some, such as human resources or finance data servers. They are granted medium bandwidth and assigned medium priority for their application traffic.
- Guests are isolated in a separate VLAN which may have Internet access only, medium or best-effort bandwidth and the lowest priority for their application traffic.

With this mechanism, the users are free to move around the network. As soon as they connect, the network identifies who they are and automatically adjusts based on these predefined profiles.

Figure 4. Profiling the user: policy enforcement on wired and wireless



Profiling the device

One of the goals of a mobile enterprise is to be able to handle the multitude of BYOD and guest devices. The Alcatel-Lucent converged campus solution has a number of services that facilitate the adoption of BYOD for both wired and wireless users. It also enables the network to become more aware of what devices are being used.

The guest access service allows both sponsored and unsponsored users to register on the network. Guests can self-register and obtain their login credentials via SMS or e-mail, or a sponsor from within the enterprise can approve access and determine the length of time the guest will be granted network connectivity. Access can be revoked manually or automatically.

The device on-boarding service enables any employee to easily connect their own device to the network. During the registration process, the network automatically sets up the device to obtain the access rights allowed by corporate IT policy, which could be the same access provided to corporate devices or a more restrictive approach. This is all accomplished without requiring any IT intervention or manual device configuration.

The solution can also profile devices without an agent. It is able to recognize device type, make, model, and operating system, and use that information to decide what access rights and bandwidth should be granted.

If an organization wants to place tighter controls over devices and applications, then the network can also perform posture checking using an agent installed in the device, either permanently or temporarily as a dissolvable agent. This agent keeps tabs on what kind of applications the user is running, makes sure that the device has the latest operating system and the anti-virus software is active.

Finally, the BYOD network services provide visibility and reporting. IT gains visibility into what devices are connected and by whom, and provide reports that help make decisions about future network planning.

One of the main benefits of adding the BYOD network services is the enablement of a more powerful policy engine. It combines information about the user, device, situation (such as time, location, posture) and application to decide what profile should be enforced. The profile, as illustrated above in Figure 4, determines factors such as the access rights users receive and the quality assurance offered – in other words the experience the user will have on the network.

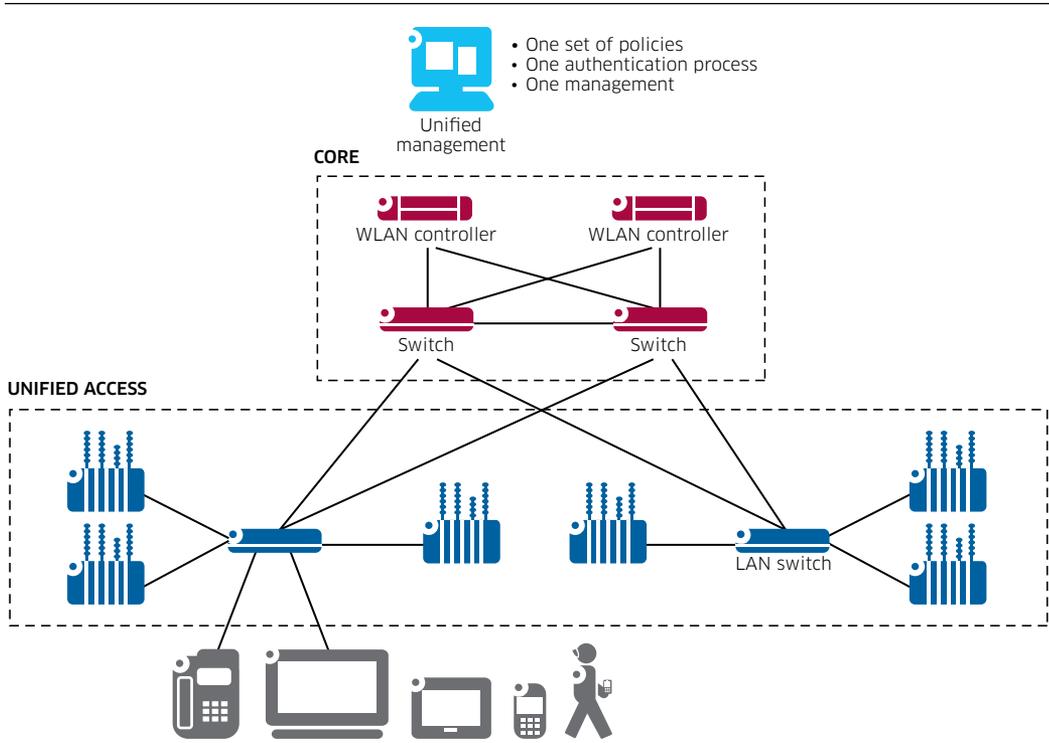
UNIFICATION

The Unification step simplifies network management and provides a consistent experience across the entire network. In previous sections, we demonstrated how to improve security and user experience by adding authentication and policy enforcement on both the LAN and the WLAN. However, the wired and wireless networks still behave as separate environments, each with its own authentication process and unique set of policies. This means users may still have different experiences when they are using a wired or a wireless device. It is also complicated for enterprise IT departments: there are two separate management systems, two set of policies and two authentication processes, making maintenance and troubleshooting more difficult.

Improving the overall experience requires network architecture to be simplified with a common authentication process and a set of security and QoS policies that apply to both wired and wireless networks. These changes create what Alcatel-Lucent calls **unified access**.

Another fundamental step is a **unified management**. A single network management system (NMS) with a single pane of glass to configure, monitor and troubleshoot the unified access network.

Figure 5. Unified access architecture



For the users, unified access means having a consistent authentication process, the same applications available on both wired and wireless connections, similar security rules and QoS. What's more, once 802.11ac is introduced, even the performance will be comparable on wired and wireless networks.

For the administrators, unification means having the same level of security over the wired and wireless access. In addition, overall network operation is simplified because there is now a single place to configure the policies, unified access procedures and a unified NMS with a single pane of glass. It is simpler to analyze and troubleshoot the network and tasks are performed once instead of twice.

Unification also means coordinating and optimizing operations between the wired and wireless networking elements. A software defined network (SDN) architecture and standards such as OpenFlow make it possible to identify bandwidth-intensive and delay-sensitive traffic and redirect it to the most optimized path. This approach improves the traditional approach of sending all wireless traffic back to the WLAN controller and therefore improves latency, performance, and enables better scalability without requiring additional hardware.

BECOMING A MOBILE ENTERPRISE WITH ALCATEL-LUCENT

Alcatel-Lucent offers a complete suite of services, partnering with and supporting business partners during the entire solution lifecycle.

During the advisory stage at the beginning of the process, Alcatel-Lucent consults with enterprises and helps them to choose the solution best suited for their business and environment. Alcatel-Lucent Professional Services consultants accompany our partners and gain a complete picture of an enterprise's current situation and what they want to accomplish, including:

- Performing a needs assessment
- Observing business processes
- Undertaking a complete health check of the physical and networking environment to validate partner designs and make recommendations based on integration best-practices.

During integration, enterprises want to minimize risks and control costs. Alcatel-Lucent integration experts can work hand-in-hand with integration partners to mentor them and ensure new solutions are integrated smoothly and securely, without affecting business and operational continuity. The Alcatel-Lucent integration team possesses in-depth solution knowledge, has performed thousands of deployments and can help control integration risks and costs based on field-proven deployment processes and best practices.

Once solutions have been integrated, enterprises need to ensure their employees are able to take full advantage of the new capabilities and IT staff is fully able to administer the solution. Alcatel-Lucent Education Services is a global organization dedicated to fulfilling the training needs of partners and customers, including:

- More than 120 Alcatel-Lucent Certified System Instructors who can deliver training in more than 15 languages around the globe
- Training available in more than 50 classrooms, all fully equipped with up-to-date training materials
- 240 mobile learning platforms that allow enterprises to be trained on their own premises

Finally, once the new solution is fully integrated into an enterprise business environment, Alcatel-Lucent can help to protect it with a full palette of support options to ensure the solutions are always running at peak efficiency and capacity. Technical assistance and application upgrades keep networks running to the highest standards and with optimal efficiency, giving enterprises the advantages of consistent and reliable performance.

CONCLUSION

Mobility in today's enterprise networks entails more than just enabling campus-wide Wi-Fi access. Real mobility delivers high-performance applications anywhere, on any device and over any access media.

Achieving a true mobile enterprise requires a complete network transformation. This can be done gradually in steps: right-sizing the core while improving performance; building a pervasive WLAN; adding functionality to enable BYOD adoption; enabling the network to profile users and devices and provide different levels of service based on those profiles; unifying access so users have the same experience no matter where they access the network and on what device; and unifying management functions to reduce complexity for IT.

Enterprises need a strong partner to help them through this transformation. Alcatel-Lucent and its business partners have the expertise to analyze an enterprise's specific needs, help to ensure the solution architecture achieves those goals and work side-by-side with its partners to integrate the new solutions.