



ALCATEL-LUCENT ENTERPRISE CONVERGED CAMPUS NETWORK SOLUTION

Deliver a consistent, high-quality user experience,
streamline operations, and reduce costs

Alcatel·Lucent 
Enterprise

CHALLENGES TO BECOMING A NEXT-GENERATION ORGANIZATION

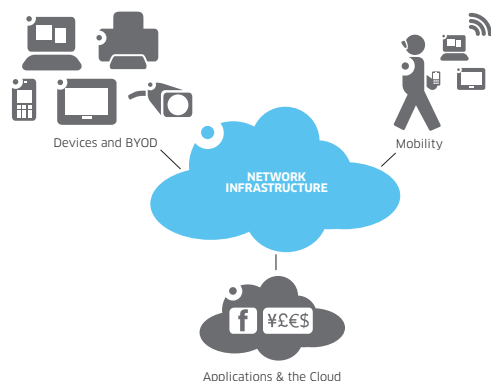
Technology is essential for enterprises to be efficient and to differentiate in a dynamic and demanding market. Network infrastructure is the backbone that, if done correctly, enables the successful adoption of this technology. Corporations are adopting major trends, such as support for next-generation devices, mobility, the bring-your-own-device (BYOD) phenomena, and the movement to the cloud. These trends are driving new demands on the network and creating increased complexity to existing network infrastructures.

The rapid growth of real-time applications such as Voice over Internet Protocol (VoIP), video and collaboration suites, and their importance to organizations, push legacy networks to their limit with increasing demands for bandwidth and enhanced quality of service (QoS). Furthermore, a large number of new applications, both business and personal, are competing for available bandwidth. It is important to have visibility into the applications traversing the network and to provide mechanisms to prioritize business-critical applications.

Many new devices, such as smartphones, IP cameras, smart boards and feature-rich next-generation IP phones demand additional bandwidth that are above the limits of today's networks. Many employees insist on using their own devices, such as smartphones and tablets, and need to connect them to corporate networks. This new use of personal devices, combined with the need to support mobility, not only creates an unpredictable bandwidth use but also increases security risks. This renders the standard practice of statically provisioning bandwidth priority ineffective. Since IT can no longer control all users' devices, any tuning to improve application delivery must now be done in the network – preferably automatically.

Virtualization today is no longer confined to the data center, but extends throughout the network, all the way down to the desktop. Virtualized desktops conduct computing in the data center rather than at the desktop, making a traffic stream for display information more sensitive to delays and network interruptions.

Figure 1: Major trends are challenging the network infrastructure



It is imperative to have a converged network architected from the ground up to effectively meet the demands of new applications, devices, mobility and virtualization. Now is the time for enterprises to rethink their strategy of supporting increased bandwidth, higher wireless local area network (WLAN) utilization, and better network performance overall. They must adopt a network infrastructure with a simplified architecture that optimizes resource utilization, provides a consistent quality of experience (QoE) for wired and wireless users and simplifies overall management.

THE ALCATEL-LUCENT ENTERPRISE APPLICATION FLUENT CONVERGED CAMPUS NETWORK

INTRODUCTION

The Alcatel-Lucent Enterprise Application Fluent Network strategy answers the requirements of modern enterprises. The Converged Campus Solution is based on this strategy.

The Application Fluent Network strategy is based on a resilient architecture with automatic controls capable of dynamically tuning the network performance, and streamlined operations that reduce network complexity. This Application Fluent Network is user, device and application aware. It uses this information to make automatic adjustments and consequently enhance the user experience.

The Alcatel-Lucent Enterprise Application Fluent Converged Campus Network solution is built on a comprehensive set of state-of-the-art network equipment and software. The network equipment includes access switches, core switches, wide area network (WAN) routers and management servers. Following our strategy to address the needs of modern enterprise, three key technologies have been introduced to build the industry's best solution:

- Unified Access
- Intelligent Fabric (iFab)
- Network Analytics

All three key technologies and their advantages are elaborated in the following sections.

KEY TECHNOLOGIES

UNIFIED ACCESS: SEAMLESS EXPERIENCE ON WIRED OR WIRELESS ACCESS

It is imperative in today's competitive environment for employees to share knowledge and remain connected with peers and customers at any time or location.

Deploying an Alcatel-Lucent Enterprise Converged Campus Network Solution with Unified Access ensures employees can fully exploit the benefits of mobility. Users experience the same level of high-quality application delivery, the same policies, and the same network services, whether they are using a wired or wireless connection. Access points with the latest IEEE 802.11ac technology make the performance of wireless networks almost on par with wired and enable the speeds needed for real-time applications.

A Unified Access approach also simplifies the tasks for the IT team. They can offer common policies on both wired and wireless access, with the same level of security. Furthermore, a single management infrastructure provides better end-to-end visibility and troubleshooting tools.

In order to offer a high-quality user experience on wired as well as wireless and to streamline the IT operations, the Unified Access includes a set of capabilities that are listed below.

THE ALCATEL-LUCENT ENTERPRISE USER NETWORK PROFILE

Embedded in the access layer switches and access points (APs) is a feature unique to Alcatel-Lucent Enterprise solutions: the ability to manage conversations contextually, using the Alcatel-Lucent Enterprise User Network Profile (uNP). Figure 3 shows the uNP, where the users are surrounded by the information required to support them.

The uNP enables the network to follow the user and automatically adjust network configuration depending on where the user is connected, instead of the traditional approach of static configurations based on switch port, access point (AP) or service set identifier (SSID).

Figure 2: The Application Fluent Network (AFN) and the three main technologies

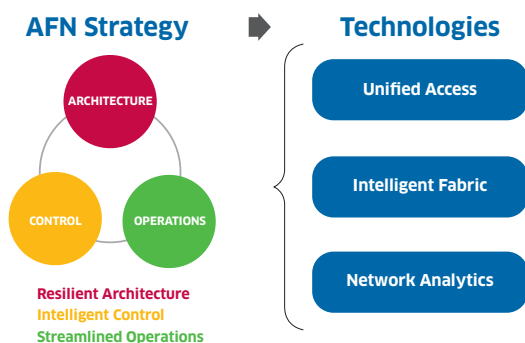
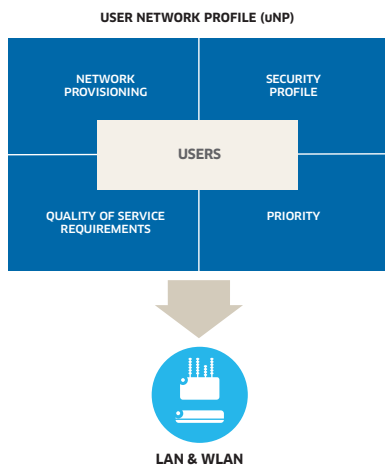


Figure 3: User Network Profile



The benefits of uNP are the following:

- Minimizes IT effort by eliminating the need to manually adjust the network
- Improves mobile application delivery performance by dynamically fine-tuning the network wherever the users are connected, offering the same experience everywhere
- Provides consistent security throughout the network

HIGH-QUALITY MULTIMEDIA DELIVERY

To better support the increased use of multimedia applications, Alcatel-Lucent Enterprise solutions have introduced a unique multimedia fluency technology. It allows the Unified Access layer

to detect the initiation of session initiated protocol (SIP) based conversations on the network, assign a specific QoS and monitor the actual QoS received and provide IT administrators with a dashboard for visibility into the conversation quality within the network. For example, it is possible for specific users to receive QoS for their voice and video sessions that are differentiated from any other application they are using. Users could even have different QoS on individual voice and video sessions, based on their specific needs.

ENABLING CONSUMER DEVICES ON A CORPORATE NETWORK

Consumer devices such as Apple TV® or Digital Living Network Alliance (DLNA) compatible TVs, projectors and printers use a special protocol – such as Apple® Bonjour® or universal plug-n-play (uPnP) – which allows these devices to be easily discovered on a network. The problem with these protocols is that they were designed to work on residential networks with a single virtual LAN (VLAN). When these same devices are connected to a corporate network the protocol doesn't work.

AirGroup™ network service enables wired or wireless devices to be accessible in corporate environments. Additionally, users can restrict who can access their devices. IT departments don't need to create special network configurations (such as VLANs or SSID) and users can self-register their device without IT intervention.

Figure 4: Multimedia Fluency

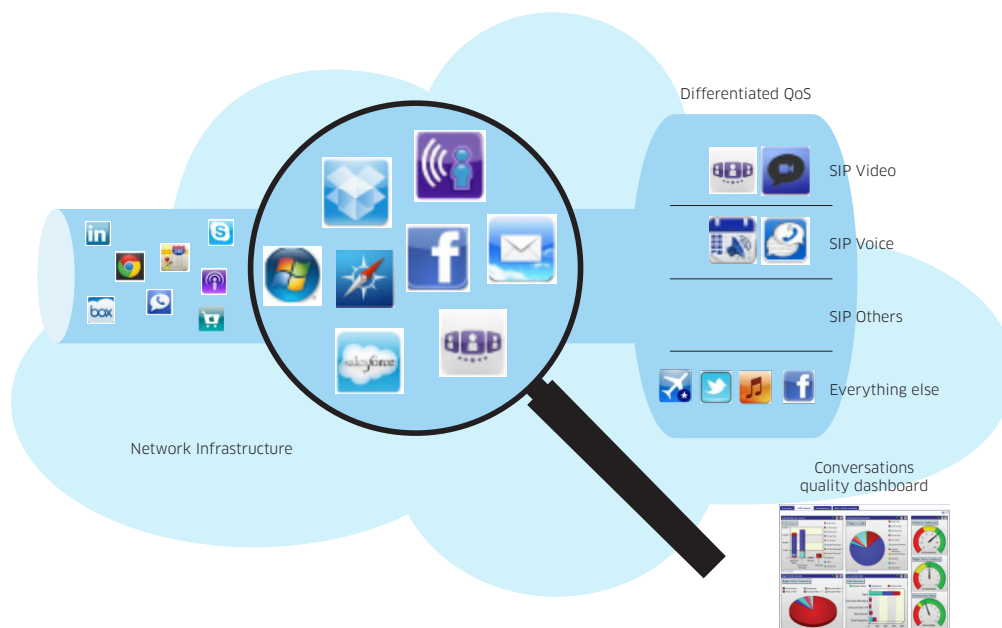
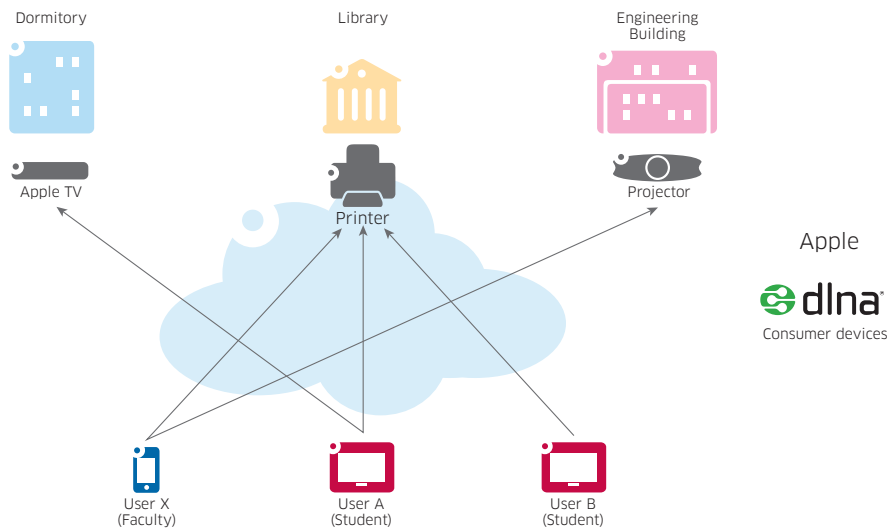


Figure 5: AirGroup network service for Apple and DLNA compatible devices



BYOD SERVICES

There can be multiple levels of BYOD adoption. Basic BYOD services, such as simple guest management and user- or device-based network access are built into Alcatel-Lucent LAN switches and WLAN APs. Premium BYOD and guest services can be added using the Aruba® ClearPass platform. It offers multiple services that are activated by individual software licenses, providing flexible deployment options.

These services include:

- Device fingerprinting: discovery of devices, including type and brand, connected to the network
- Device onboarding: automated device configuration for secure access to the network without IT intervention
- Device Health Check: device compliance check using active agents installed in the devices
- Guest management: sponsored or self-registration of guests with advertising capabilities

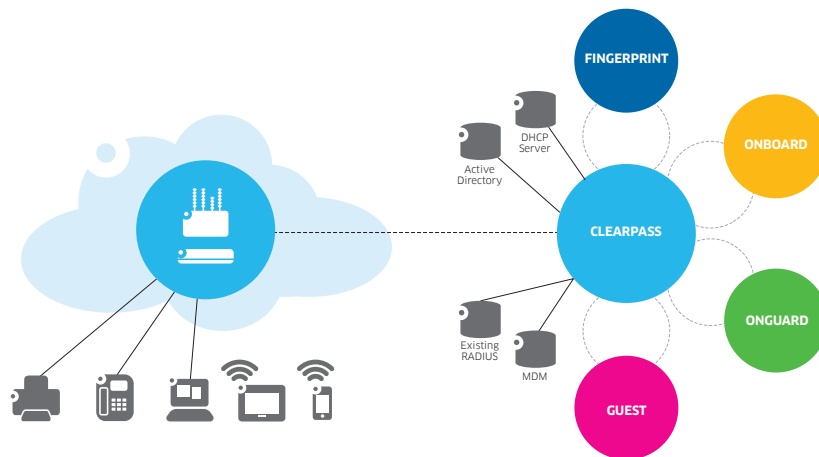
ClearPass also makes it possible to define sophisticated policies based on a combination of the user’s identity, their device, and other conditions, such as location and time of day.

WIDESPREAD SECURITY

A high-quality user experience can only be provided if the network is always running and the information is protected. Security is a fundamental component in the corporate network architecture, especially now that companies are embracing BYOD and exploring new applications from the cloud.

More than ever before, security needs to be built in from the ground up and applied universally across all methods of access for the network, wired or wireless. Network edge security services provided with the Alcatel-Lucent Enterprise solution are applied to each individual or device, rather than fixed just to the switch port. Using role-based profiles, a user connecting to the network is first authenticated, after which they are assigned

Figure 6: Premium BYOD and Guest Access services with ClearPass



a user profile that specifies all the network security behavior including access control lists (ACLs) and firewall rules. With this capability, wherever the user goes, unique security rules will follow.

The network security framework also includes pre- and post-admission device health check with automatic network quarantine, rogue device detection and isolation, automatic device configuration with IEEE 802.1x client and certificate installation, and application policy enforcement (more details in the Network Analytics section) to prevent non-compliant applications from being used.

UNIFIED MANAGEMENT

IT departments are under unprecedented stress. They need to support more devices with a variety of operating systems, more applications, BYOD, more multimedia, and maintain a high-quality user experience – all while IT budgets remain flat or shrink. Given these challenges, a key component needed to achieve these objectives is a comprehensive and unified management system.

Alcatel-Lucent Enterprise solutions leverage our extensive experience to manage carrier networks and to provide end-to-end network and application visibility, as well as carrier-class troubleshooting tools. The Alcatel-Lucent OmniVista® 2500 provides a common network management experience for network access, core and data center. It allows corporate, branch and home office sites to be easily managed for both wired and wireless users. It also offers a single point of analytics collection and policy enforcement across both the wired and wireless LAN networks. Administrators have a customizable dashboard providing visibility into users and devices connected to the network, to the applications being used, and to how much bandwidth they are consuming. IT can then create policies to:

- Reserve bandwidth and guarantee special QoS for business-critical applications
- Limit bandwidth consumption for low-priority applications

Figure 7: OmniVista 2500: one management for wired and wireless



- Enforce security by preventing harmful applications from been used
- Offer differentiated experience based on the user profile

INTELLIGENT FABRIC - SIMPLIFIED DESIGN, INSTALLATION AND OPERATIONS

Intelligent Fabric (iFab) is one of the key technologies of AFN. Intelligent Fabric speeds up network infrastructure deployments and simplifies network operations with game-changing automation, improving the agility of IT operations. The award-winning iFab technology enables simpler network design, comprehensive interoperability, plug-n-play deployment, and automation of moves, adds and changes.

Figure 8: The award winning Intelligent Fabric Technology



NETWORK DESIGN MADE SIMPLE

The iFab technology simplifies the process of designing a network by eliminating the need to set many details. A simple input based on the locations of network equipment, the number and type of access ports, as well as interconnection distance and bandwidth enables the designer to choose the appropriate Alcatel-Lucent Enterprise technologies for the design. Details of complex protocols are not required. iFab recognizes the network protocols and self-configures to provide the desired outcome.

NETWORK DEPLOYMENT MADE STRAIGHTFORWARD

The iFab technology by default includes self-configuration of the network equipment through Auto Fabric, which eliminates many manual tasks during the deployment process. The fabric is autonomously created simply by unpacking, mounting, connecting and powering up the systems. Elimination of the manual setup processes shortens the time-to-production of the infrastructure and reduces the chances of errors in the deployment process.

The iFab technology makes the network components aware of their physical and logical topologies through self-attachment. The fabric can attach itself to the existing adjacent systems including infrastructure, Wi-Fi® or LAN, servers, and the user's devices to automatically configure the appropriate connectivity settings.

MAINTENANCE MADE EASY

The iFab technology enables seamless operation with its self-healing capability, which enables continued operation for critical enterprise networks even in the case of failure. Any component failure, link or node, is detected in real time with automated re-routing of the traffic. The network can be upgraded while in service, significantly reducing or eliminating the need for disruptive maintenance windows.

MOVES, ADDS AND CHANGES MADE AUTOMATIC

Manual moves, adds and changes (MAC) are an important part of the day-to-day burdensome activities that hold the IT back from achieving their full potential of operational effectiveness. The iFab technology relieves the IT organizations from this manual process through built-in intelligence.

Movement of the users, devices and applications becomes non-intrusive through network profiles. For instance, introducing, moving and deleting Virtual Machines is automatically detected and adapted across the Intelligent Fabric in order to adjust security, bandwidth and priority without requiring IT involvement.

Adding new components to expand the infrastructure transforms into a plug-n-play workflow. The Auto Fabric feature within iFab enables the new components to be detected and self-configured based on the physical and logical topology.

INTEGRATED WORKFLOW MANAGEMENT

Programmability of networks (Software Defined Networking, SDN) enhances the capabilities of a company to support business agility. Modern networks must be programmable to interact with applications, fit into workflow management, and support special customization. The iFab technology promotes three major features to support these needs: OpenFlow™, OpenStack® and Python® scripting.

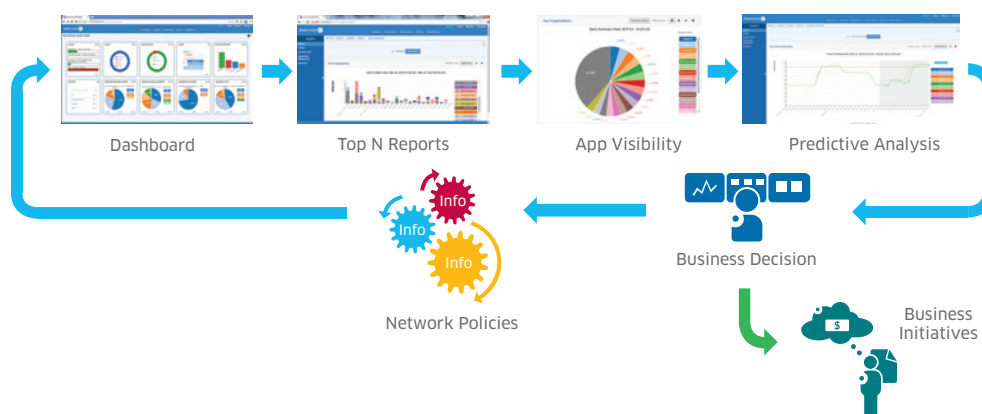
COMPREHENSIVE NETWORK ANALYTICS

Visibility, monitoring and reporting are the key ingredients for company infrastructure management. Both the Unified Access and iFab technology ensure that all the aspects are visible to the IT organization through a single pane of glass: OmniVista 2500.

These technologies enable complete visibility of the infrastructure. Together with logical and physical topologies, any component of the access and core fabric, applications and the workflows can be examined both in general and in detail. Overlay technologies, such as virtual extensible LAN (VXLAN), that are typically invisible to the infrastructure teams, are made completely observable through OmniVista 2500. The correlation of overlay technologies and physical components allows the IT teams to better understand application workflows and proactively plan infrastructure requirements.

The Alcatel-Lucent Enterprise network analytics technology enables companies to analyze the infrastructure information in a meaningful manner. The vast information available from the infrastructure is summarized by OmniVista 2500 in a customizable dashboard. From this dashboard, IT can expand its analysis in more details through multiple graphs and reports. The data collected includes information for the users, devices and applications traversing the network. It also includes network device status, traffic behavior, warnings and key statistics. This information is very important to assist in the network fine-tuning and consequently provide the best user experience. Furthermore, user behavior and application adoption information provides important insights to help on company decisions outside of the IT realm.

Figure 9: Network Analytics



APPLICATION VISIBILITY AND CONTROL

Fueled by the growth of cloud applications and BYOD, the number and type of applications used in enterprises is growing rapidly, requiring IT teams to be armed with new tools and capabilities to ensure business goals are met and the network remains secure.

The Alcatel-Lucent OmniSwitch® 6860 and the Alcatel-Lucent OmniAccess® WLAN provide application analytics using integrated deep packet inspection (DPI) technology. DPI provides IT with detailed visibility into the applications being used and bandwidth consumed and the ability to immediately enforce policies to control prioritization, QoS and security of these applications right at the edge of the network, both wired and wireless.

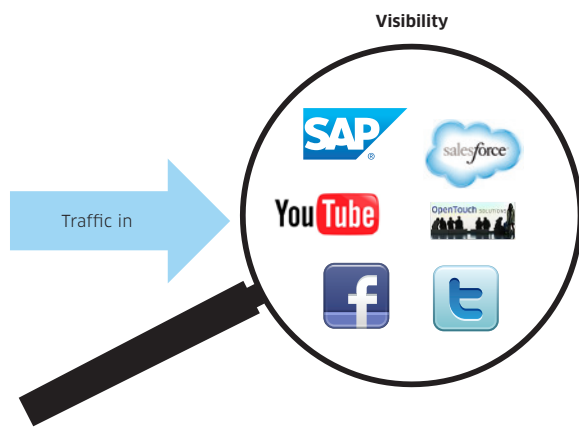
Application analytics empower IT to prioritize business-critical applications, stop non-compliant applications, and manage the coexistence of business and personal applications. It enables an open environment where employees can explore new applications, and IT can secure and optimize the delivery of key applications to employees and customers.

POWERFUL REPORTING

OmniVista 2500 offers a variety of valuable reports. It includes top-N reports that gather information on the top users and top applications that are generating more traffic, or even the top network nodes and ports utilization. These reports can help IT to quickly identify potential issues and greatly simplify any troubleshooting efforts.

Nowadays application visibility is essential. OmniVista 2500 offers visibility on the applications being used both at a network level and at a user group level. It also indicates how much bandwidth these applications are consuming.

Figure 10: Application Visibility and Control



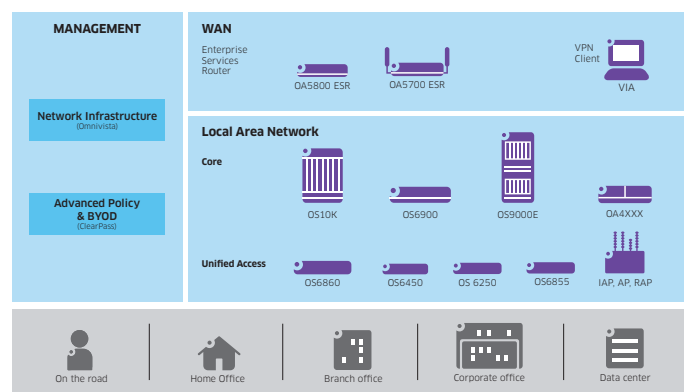
PREDICTIVE ANALYSIS

OmniVista 2500 has the unique ability to offer predictive analysis reports. It analyzes traffic patterns over a large period of time and uses sophisticated algorithms to predict future behavior. It provides visibility into potential future bottlenecks, enabling proactive planning of the network capacity and expansion. The system can also detect abnormal traffic behavior and alert administrators of a potential network security attack.

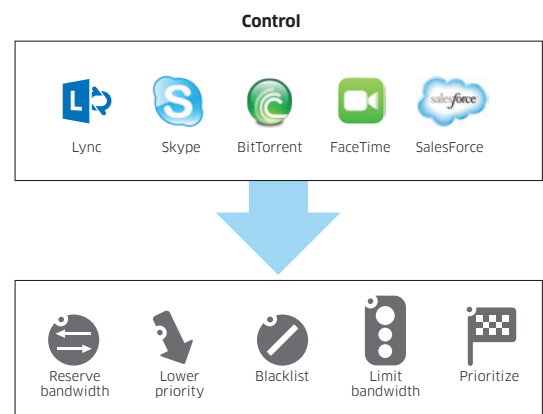
A COMPLETE SOLUTION WITH A COMPREHENSIVE PORTFOLIO

Figure 11 depicts the converged campus equipment and software portfolio that inherit the key technologies. This is the base for a modern Converged Campus Network.

Figure 11: Converged Campus Portfolio



The main characteristics of the portfolio are described below in order to provide a better understanding of where it fits in the modern enterprise.



A PERVASIVE NETWORK ACCESS

The network access includes both wireline and wireless equipment:

- Wireline access is provided by stackable Gigabit LAN switches like the advanced OmniSwitch 6860E and the value OmniSwitch 6450 Stackable LAN Switch. It also includes the OmniSwitch 6250 Stackable Fast Ethernet Switch, and the OmniSwitch 6855 Hardened LAN Switch.
- Wireless access is provided by a variety of high-performance 802.11ac Wi-Fi APs. Models include instant, controller-based, remote, indoor, outdoor and ruggedized APs.

All these access products include the Unified Access technology so that when they are combined in one network, they can offer a consistent quality experience to users, and a simplified operation for IT.

A RESILIENT AND HIGH-PERFORMING CORE

The network core counts with high-performance wire-rate 10 GE / 40 GE network switches that provide unparalleled port density and switching capacity. It includes the market-leading Alcatel-Lucent OmniSwitch 6900 Stackable LAN Switch family which comes in a compact 1U form factor, the OmniSwitch 9700E Chassis LAN Switch, and the OmniSwitch 10K Modular LAN Chassis.

Virtualization techniques are used in order to eliminate inefficiencies introduced by protocols like the spanning tree. Instead of disabling all redundant links and using them only if the main link or switch fails, virtualization enables the network to keep multiple links active and to fully utilize all available resources. The Alcatel-Lucent Enterprise virtual chassis (VC) enable up to six OmniSwitch 6900 Stackable LAN Switches to be combined and behave as a single fully redundant unit. In many cases this can replace expensive chassis, require less space and power, and be delivered at a lower cost. The VC also provides fast re-convergence if equipment fails, without impacting real-time application user experience, such as voice and video.

The core products incorporate the award-winning Intelligent Fabric technology offering a set of capabilities, including automation techniques that simplify the design, deployment and operation of the network.

RELIABLE AND FLEXIBLE WAN CONNECTIVITY

The Alcatel-Lucent Enterprise campus solution uses the OmniAccess Enterprise Services Routers (ESRs) for branch office wide area network (WAN) connectivity. The ESR offers in a single compact form factor an integrated WAN router, LAN switch and Wi-Fi access point, providing savings in space and cost. It includes multiple options of WAN connectivity with ample redundancy, comprehensive QoS, Security, virtual private network (VPN) capabilities and even Telephony over IP (ToIP) survivability. Multiple models are available to support the need from the small, medium and large branch offices, including some ruggedized models for the industrial and transportation verticals.

A software-based VPN client for laptops completes the solution by providing secure connectivity to employees on the road.

END-TO-END NETWORK MANAGEMENT

The management suite includes all tools needed to provision, monitor, analyze and troubleshoot the network. The OmniVista 2500 is capable of managing the LAN, WLAN, core, WAN and data center from a centralized single pane of glass. It is through this platform that the Network Analytics technology is delivered. It is also an essential component of the Unified Access and Intelligent Fabric technologies.

The management suite also expands the network services provided in the converged campus solution. The ClearPass Policy Manager provides authentication, authorization and accounting (AAA), BYOD-related services, premium guest access and advanced policy services.

PROTECTING YOUR INVESTMENT WITH OPEN STANDARDS

The Alcatel-Lucent Enterprise Converged Campus Network solution supports open standards and interfaces – including software defined networking (SDN) support on the entire campus portfolio – to ensure interoperability, future alternative network architecture, and investment protection.



ENJOY THE ADVANTAGES OF AN APPLICATION FLUENT CONVERGED CAMPUS NETWORK

The Converged Campus Network offers many benefits to the business, the employees and the customers by delivering on the Application Fluent Network (AFN) strategy and leveraging the technologies mentioned above.

Here are some highlights of these benefits:

DELIVER A HIGH-QUALITY USER EXPERIENCE

The Alcatel-Lucent Enterprise Application Fluent Network vision delivers an enhanced user experience.

- Application analytics offers guaranteed QoS for business-critical applications, while allowing employees to explore new applications – business or personal.
- Unique, dynamic tuning of network performance for real-time multimedia applications ensures a high-quality user experience.
- Comprehensive BYOD network services provide users the freedom to choose between corporate or personal, wired or wireless devices.
- The Unified Access approach ensures a consistent and seamless experience when switching from wired to wireless, and vice versa, by enabling the same policies and network services for both.

- Market-leading resiliency allows recovery from switch and link faults without impacting real-time applications such as voice and video.
- Widespread security protects corporate information and avoids compromised performance or downtime due to network infection.

STREAMLINE YOUR IT OPERATIONS

- Embedded security at the edge increases user, device and corporate security without the operational complexity associated with many security systems.
- Automated provisioning of edge switches and endpoints as well as integrated carrier-class troubleshooting tools minimize the IT personnel time required to support the network.
- Automation embedded in the iFab technology considerably reduces the effort to design and deploy the core fabric.
- Automated end-user device connectivity and guest self-registration further reduces IT workload.
- Unified wired and wireless management avoids provisioning duplication and minimizes inconsistencies between networks.
- Network analytics provide ample visibility of critical points in the network and accelerates the time to troubleshoot.
- Predictive analysis offer visibility into potential problems before they happen, so IT can plan expansion and avoid trouble tickets.

REDUCE NETWORK INFRASTRUCTURE COSTS

- Network virtualization offers flatter network architecture and better use of switch and network links, requiring less equipment and reducing capital costs.
- Market-leading low power consumption reduces operational costs.
- All-in-one branch routers consolidate the router, switch and wireless AP into a single device.
- The self-healing capability and the automation of moves, adds and changes provided by the iFab technology reduce operational costs considerably.

PROTECT YOUR INVESTMENT

- Software-enabled licenses for the OmniSwitch 6450 access switches allow customers to start with Fast Ethernet (FE) access and 1 GE uplinks, upgrading to s access and 10 GE uplinks when required
- Instant APs can be upgraded to operate with a WLAN controller when the customer network scales up
- Flexible license scheme on BYOD platform provides BYOD capabilities that fit initial customer requirements and can gradually expand as needs grow
- SDN support on all LAN switches and the WLAN allow customers to continue using the same equipment for future SDN architectures
- Our research that compared Alcatel-Lucent Enterprise solutions to competitor solutions shows the total cost of ownership (TCO) of competitors' solutions can be up to 60 percent higher than the Alcatel-Lucent Enterprise Converged Campus Network Solution

A CONVERGED CAMPUS NETWORK READY FOR YOUR BUSINESS

The Alcatel-Lucent Enterprise Application Fluent Converged Network that includes the unique key technologies: Unified Access, Intelligent Fabric and Network Analytics. It delivers a simplified, virtualized network with industry-leading performance, intelligent automation, and a consistent, high-quality user experience across wired and wireless networks. By providing an open and engaging environment for employees, creating new operational efficiencies, achieving cost savings, improving productivity and helping companies differentiate from their competition, the solution enables enterprises to use technology to accelerate their business objectives.

It offers both innovation to meet immediate organizational needs and prepares networks for future evolution with the ability to gradually increase mobility, support BYOD and move to the cloud. Most importantly, this transformation can be achieved while maintaining the same hardware and protecting existing investments.

Of course the continuity of your business is supported not only by our solution, but by our excellent support services.

Because of these benefits, the Alcatel-Lucent Enterprise solutions offer an outstanding return on investment and a sustainable solution for the years to come. Enjoy the benefits of the Alcatel-Lucent Enterprise Application Fluent Converged Campus Network Solution now. To learn more, visit our website.