TRANSFORMING THE NETWORK WITH RUCKUS CAMPUS FABRIC

Traditional Campus Architectures Struggle to Meet Today's Application Requirements

RUCKUS™ an ARRIS company

WHITE PAPER

HIGHLIGHTS

- Ruckus Campus Fabric technology brings campus networks into the modern era to better support seamless wireless mobility and network security and to ease application deployment.
- This innovative technology collapses multiple network layers into a single logical switch, flattening the network and eliminating deployment complexity while simplifying network management and reducing operating costs.
- Ruckus Campus Fabric technology reduces unnecessary network layers to create large management domains that eliminate individual switch touch points, reducing maintenance time and costs.
- This technology allows premium and entry-level switches to mesh together into a single logical switch and share advanced Layer 2 and Layer 3 (L2/L3) services, delivering lower price-per-port functionality without compromising performance.
- Ruckus Campus Fabric technology integrates high-performance, fixed form factor switches to create a single distributed logical switch that is independent of physical location and that allows organizations to add ports whenever and wherever needed across the campus without adding complexity.

For the past two decades, campus network design has seen little innovation, as market leaders have promoted the status quo with no significant investments beyond incremental "speeds and feeds" enhancements. Years of incremental technology upgrades have turned traditional legacy campus networks, into a complex and fragmented patchwork of network devices.

Campus networking has reached a point where traditional network architectures are struggling to keep up with users' relentless demands for seamless mobility across the campus and pervasive access to latest-generation applications. It is increasingly challenging for IT departments to maintain network Service Level Agreements (SLAs) and to enforce specific access policies across a broad range of wired and wireless users and devices. Legacy campus networks suffer from various issues as technology advances, including:

- **Complex:** Legacy campus networks are managed one switch at time. Network teams are required to connect to each individual network device to provision resources, apply configuration changes, and deploy network policies. The burden is on the network administrator to keep the network consistent and all network device configurations in sync.
- **Inefficient:** A typical legacy campus network includes multiple network layers that run inefficient legacy protocols such as Spanning Tree Protocol (STP), where only half of the links between layers are active, and the remaining links act as backups in case the primary link fails. Overcoming the limitations associated with STP requires the use of Layer 3 protocols, which add to the management complexity of such solutions.
- **Fragmented:** Legacy networks include many different network devices running various network Operating System (OS) platforms and versions. Each network device offers different levels of Layer 2/Layer 3 network services, based on the capability of each device and the types of software licenses that are activated.
- **Rigid:** Traditional three-tier network designs with "big-box" chassis at the aggregation and core layers require a significant upfront investment. Also, they are frequently deployed with vacant slots to support additional capacity that might be required in the future. Modular chassis solutions also provide limited deployment flexibility and require a "fork-lift" upgrade to move up to the next capacity level.

Just like data center networks experienced a transformation a few years ago to support virtualization and virtual machine mobility, the time has come for campus networks to undergo a similar transformation to support seamless user mobility and pervasive access to applications anytime and anywhere.

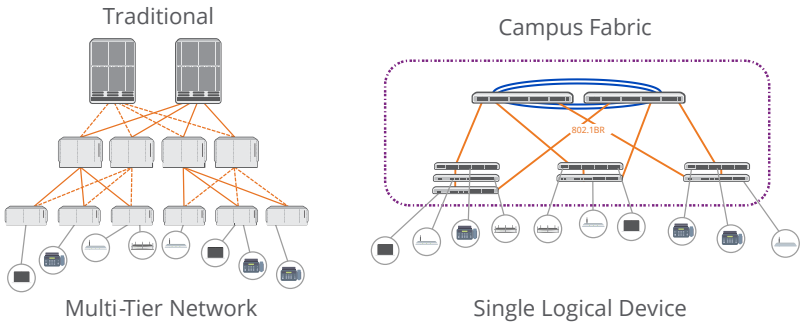

Figure 1. Ruckus Campus Fabric architecture versus a traditional multi-tier campus network.

RUCKUS CAMPUS FABRIC: A RADICALLY DIFFERENT APPROACH TO CAMPUS NETWORKING

Ruckus Campus Fabric collapses multiple network layers into a single logical device, combining the power of a "distributed chassis" design with the flexibility and cost-effectiveness of fixed form factor switch building blocks.

- **Centralized control:** The traditional aggregation/core layer is replaced by a stack of high-performance 10 Gigabit Ethernet (GbE)/40 GbE fixed form factor switches that are connected together through a high-speed "campus ring" that can span up to 10 kilometers (km). These switches are the Control Bridge (CB) devices. Together they deliver a unified network control plane that acts as the central management and traffic forwarding authority for the entire campus fabric domain.
- **The edge extends the core:** At the edge of the network, the access layer is replaced by a set of Port Extender (PE) devices connected directly or indirectly to the stack of CB devices. Using the "distributed chassis" metaphor, you can consider these PE devices to be "virtual line cards." They are transparently managed and controlled by the CB, eliminating the need to manually provision and configure individual edge switches. In fact, the entire campus fabric domain is managed as one logical device from a single point of management within the CB.

The CB and PE devices use the standard based 802.1BR protocol to communicate between themselves. From the outset, the whole Ruckus Campus Fabric domain appears as a single logical switch to the edge devices connected to it and from the core.

RUCKUS CAMPUS FABRIC COMBINES THE BENEFITS OF CHASSIS AND STACKABLE DESIGNS

Simplified Operations

- **Simplified deployment:** Ruckus Campus Fabric collapses multiple network layers into a single logical device, flattening the network and eliminating deployment complexity and arbitrary network segmentation between office floors, buildings, and other geographical locations.
- **Simplified management:** The entire network is managed from a single point, including all ports attached to the CB and PE devices. The network administrator can deploy network policies across the campus from a single point of management.
- **Simplified application provisioning:** The flattened network simplifies the deployment of applications and the implementation of network services. To enable security, unified communications, voice, or multi-tenancy services no longer requires tedious Virtual Local Area Network (VLAN) provisioning across multiple switches and closets. This is because Ruckus Campus Fabric offers a single logical device across the campus network. The VLANs only need to be provisioned once and are shared across the fabric.

Improved Scalability and Performance

- **Elimination of STP inefficiency:** The entire domain runs from a unified control and forwarding plane, eliminating the need to deploy a loop avoidance protocol, such as STP within the fabric domain, or complex Layer 3 protocols such as Open Shortest Path First (OSPF). Multi-pathing is supported by design within a campus fabric domain: All links between switches are active at all times, and traffic is load balanced, optimizing performance while delivering fast failover recovery from link failure with no impact on network service.
- **Seamless mobility:** Ruckus Campus Fabric architecture flattens the network, eliminating arbitrary Layer 3 boundaries between physical locations. This architecture simplifies the deployment of wireless access points and delivers a better user experience. For example, seamless roaming is enabled between Wi-Fi access points across the campus. Users can enjoy uninterrupted access to their favorite applications, including voice and streaming video services, while they roam across the campus with their portable devices.
- **High Availability Design:** Ruckus CB technology at the core of the fabric delivers high availability and enables instantaneous hitless failover to a standby CB in the event of a failure of the master CB. Organizations also can use hot-insertion/removal of fabric units (CBs or PEs) to avoid interrupting service when adding a unit to increase the capacity of the fabric or replacing a unit that needs servicing.

Support for ring topology within the stack of CB core switches and between CB core switches and PE edge switches combined with active/active multipath design insures high-availability in the event of link failure.

Lower Cost of Acquisition and Operation

- **"Pay as you grow" design:** The Ruckus fixed form factor based design enables cost-effective scale-out networking. It adds PE devices when more ports are needed at the edge and adds CB devices when more ports are needed at the aggregation layer. Unlike traditional chassis-based aggregation switches, no excess idle capacity is required, and no "fork-lift" upgrade is needed to advance to the next capacity level.
- **Seamless migration:** Ruckus Campus Fabric interoperates with traditional networks, so there is no need to migrate the whole network at once. Ruckus ICX(r) 7750 or ICX 7650 Switches can act simultaneously as a CB on ports that are connected to PE devices and as a regular Layer 2/Layer 3 aggregation switch on ports that are connected to regular access switches, enabling a gradual migration strategy.
- **Unified features and services:** All devices within a Ruckus Campus Fabric domain offer the same level of network services and software features, since they are all part of the same logical switch. All advanced services running at the aggregation layer, such as premium Layer 3 features, are available seamlessly from all network edge ports. Additionally, software images running on the various devices are automatically updated and kept in sync, so that there is no risk of version mismatch between the various devices, thus eliminating potential network downtime.

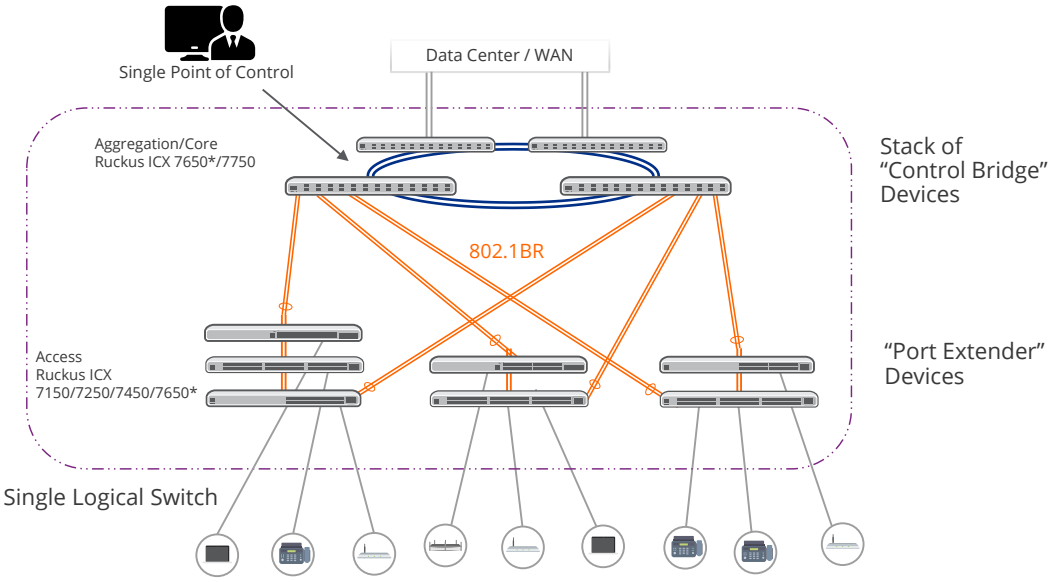

Figure 2. Ruckus Campus Fabric combines multiple network layers into a single logical device.

RUCKUS CAMPUS FABRIC GOES BEYOND COMPETITIVE SOLUTIONS

The Ruckus Campus Fabric goes beyond competitive 802.1BR based campus solutions with the following features:

- **Distributed Control Bridge Architecture:** Competitive chassis-based solutions require a significant upfront investment, because the large chassis-based CB that represents the core of the solution is expensive to acquire and maintain. Ruckus takes the architecture to the next level by offering a Distributed Chassis based solution as the aggregation/core CB, including a "pay as you grow" model that allows customers to start small and upgrade as needs grow.
- **Multi-Purpose Port Extender Devices:** Unlike competitive solutions that require single-purpose and custom-built extender devices with limited functionality, Ruckus offers PE mode on standard, full-featured ICX 7150, ICX 7250, ICX 7450 and ICX 7650* switch families. Customers can easily store spares, manage inventory, and evolve the network architecture as needs grow. Customers can also use the same devices in multiple deployment scenarios, use devices as standalone switches, and use devices in a stack or as part of a Ruckus Campus Fabric.

RUCKUS CAMPUS FABRIC TECHNOLOGY SUPPORT ACROSS THE RUCKUS ICX 7000 PRODUCT LINE

The Ruckus ICX product portfolio is designed to address a broad range of use cases, catering to different markets with solutions for campus access and aggregation. The Ruckus Campus Fabric solution was conceived with maximum flexibility in mind and is intended to cover the needs of existing and future customers using the latest ICX 7000 Series switches. Ruckus intends to support Ruckus Campus Fabric on all existing and future ICX 7000 Series switches.

Unlike competitive solutions, ICX 7000 switches are flexible enough to operate both as regular Layer 2/Layer 3 switches, as well as running in PE mode (with the ICX 7150, ICX 7250, ICX 7450 and ICX 7650* switches) or CB mode (with the ICX 7650* or ICX 7750 switches). No licensing cost is associated with Ruckus Campus Fabric technology, and the technology comes with Ruckus ICX FastIron® software running on ICX 7000 Series switches.

* ICX 7650 Campus Fabric support to be offered in a future software release.

RUCKUS CAMPUS FABRIC ENABLES SEAMLESS MOBILITY AND EFFORTLESS NETWORKING

Ruckus Campus Fabric offers a radically different approach that simplifies the deployment of campus networks, providing a single point of management, configuration, and monitoring. It also unifies features, network services, and software images across the campus. Unlike competitive solutions, Ruckus fixed form factor based 802.1BR solutions enable scale-out networking with a "pay as you grow" deployment model.

Table 1. Campus Fabric platform support and scalability specifications.

Feature	Specification
Fabric Control Bridge (CB) platform support	ICX 7750 ICX 7650*
Fabric Port Extender (PE) platform support	ICX 7150 ICX 7250 ICX 7450 ICX 7650*
Maximum CB units per fabric	4 (stacked)
Maximum PE units per fabric	36
Maximum PE cascade depth	6
Maximum distance between PE or CB units	10 km
Fabric port links (CB to PE and PE to PE)	10 Gbps links, 40 Gbps links, Link aggregation supported, 802.1BR protocol

ABOUT RUCKUS

Ruckus networking solutions help organizations achieve their critical business initiatives as they transition to a world where applications and information reside anywhere. Today, Ruckus is extending its proven data center expertise across the entire network with open, virtual, and efficient solutions built for consolidation, virtualization, and cloud computing. Learn more at www.ruckuswireless.com.

* ICX 7650 Campus Fabric support to be offered in a future software release.

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