CISCO VALIDATED PROFILE

Wireless Retail Vertical

April 2016

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Profile Introduction

The Enterprise market segment can be divided into five broader verticals: Education, Healthcare, Retail, Service Provider, and Government. This document focuses on a typical Retail deployment profile, and you can use it as a reference validation document.

Retail network environments combine the technology requirements of a specialized set of demands that includes security needs, enhanced network services, efficient network management, seamless mobility, network high availability, and location services. The following sections describe the challenges specific to these environments.

SECURITY

Retail providers need to protect personal data and customers' transactions with security-rich features such as rogue detection/containment, Intrusion Prevention (WDS/wIPS), dot1x, and guest-access.

SPECIALIZED SERVICES

Retail infrastructures must enable traditional and specialized resources in order to provide accessibility and speed. Network services such as PTT, AVC, and Quality of Experience with custom QoS are deployed.

EFFICIENT NETWORK MANAGEMENT

The network administrators should be able to efficiently manage and monitor their networks. The administrators could use Cisco-provided tools such as Cisco Prime Infrastructure and WebUI to quickly deploy, manage, monitor, and troubleshoot the end-to-end network.

MOBILITY

Seamless mobility throughout the store is essential for retail customers. Fast roaming such as CCKM and 802.11 r/k/v is enabled for this vertical.

HIGH AVAILABILITY

Retail infrastructures cannot afford downtime in their networks. The network should be able to sustain catastrophic events such as AP or Controller outage. Self-healing RF network and Client SSO are deployed.

LOCATION SERVICES

It is critical for retail customers to be able to send promotions to their customers and to analyze location analytics, such as repeat customers and prime locations in the department store. BLE Beacon along with Connected Mobility Experience (CMX) can be used to manage and monitor the location of the devices.

The following table summarizes key areas on which this Retail profile focuses.

Table 1 *Retail Profile feature summary*

Deployment areas	Features
Security	Intrusion Prevention (WDS/wIPS) Dot1x Guest Access (CWA, LWA).
Network services	Video Content Delivery (L2/L3 Multicast) BYOD PTT AVC Custom QoS
Network planning & troubleshooting	NetFlow RF Sniffer AVC (Application Visibility)
Efficient network management	Cisco Prime Infrastructure, WebUI
Mobility	Fast Roaming OKC, CCKM 802.11 r/k/v Fast SSID
High availability	Client SSO N+1 Redundancy
Location services	Cisco Connect Mobility Experience (CMX) Location Analytics CMX Presence

Network Profile

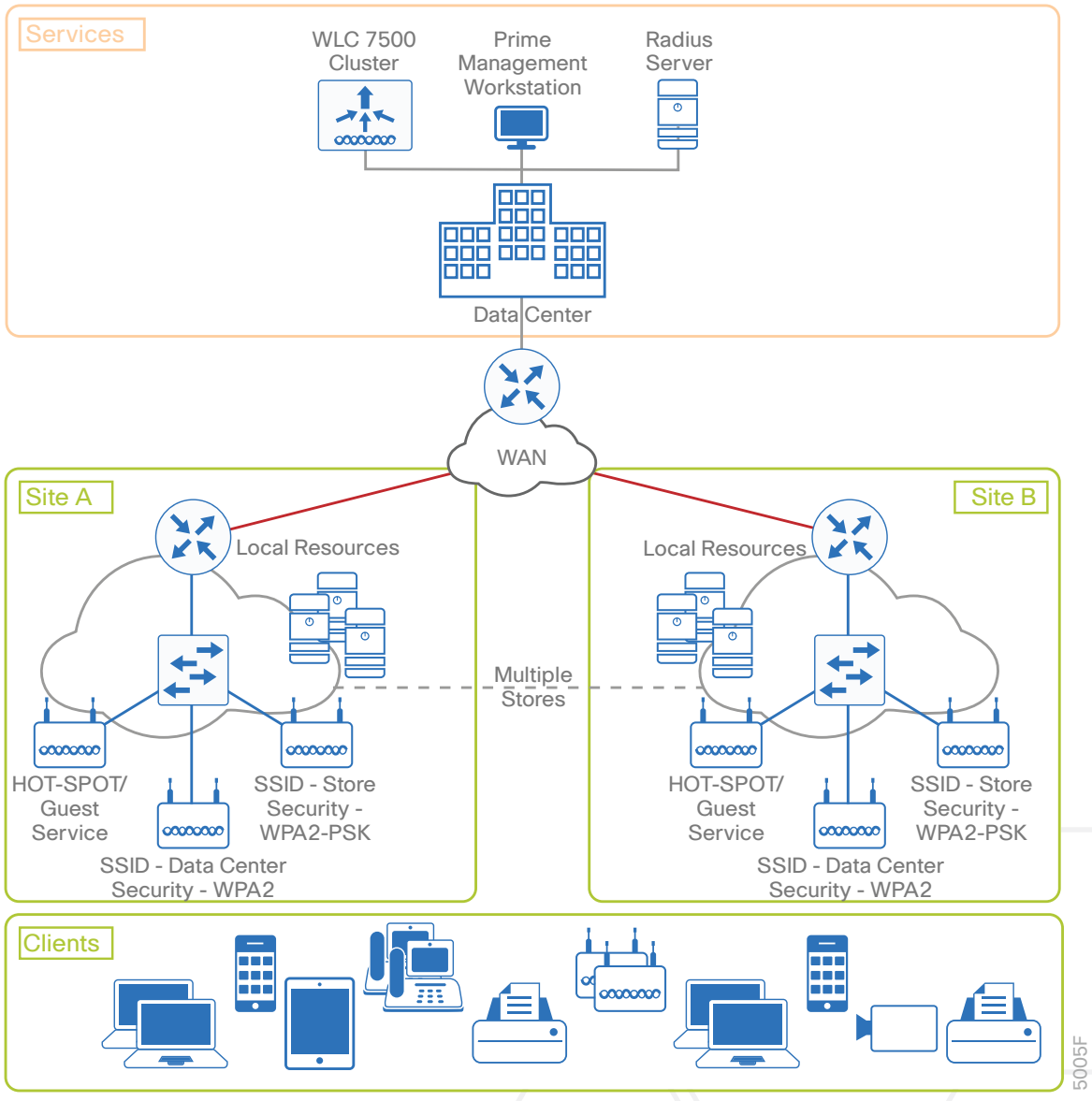
Based on the research, customer feedback, and configuration samples, the Retail Vertical Profile is designed with a deployment topology that is generic and can easily be modified to fit any specific deployment scenario.

TOPOLOGY DIAGRAM

Figure 1 shows the Retail network design that is used for the validation of the Retail Vertical Profile.

The topology represents a typical Retail deployment with multiple stores across the WAN. Based on the size of the network (both its geographical location and user-scale), there might be more distribution switches connecting to the core/distribution layer.

Figure 1 *Retail Vertical Profile: topology overview*



HARDWARE PROFILE

Table 2 defines the set of relevant hardware, servers, test equipment and endpoints that are used to complete the end-to-end Retail Vertical Profile deployment.

The list of hardware, along with the relevant software versions and the role of these devices, complement the actual physical topology defined in Figure 1.

Table 2 Hardware profile of servers and endpoints

VM and HW	Software versions	Description
Cisco Prime	Version 3.0	For Network Management
Cisco ISE	Version 1.3/1.4	Radius Server used for authentication, authorization
CUCM	Version 10.1	CUCM Server for managing IP phones
CMX	Version 10.2.1	Location Services
DNS/AD Server	Windows 8 Enterprise Server	Windows External server for DNS and Active Directory management
WAN Emulator		Emulate WAN Bandwidth and latency
APIC-EM Plug-n-Play	Version 1.0.1	For Day0 Config and Image Management
Cisco UCS Server	ESXi 5.5	To manage and host the Virtual Machines
Ixia	IxNetwork/ixExplorer	Generate traffic streams and to emulate dot1x clients
Spectralink		Endpoints
Cisco Unified IP Phones 796x, 796x, 9971	Cisco IP phones	Endpoints
Laptops	Windows 8, Windows 10	Endpoints
iPhone/iPad		Endpoints
Macbook	Mac OSX	Endpoints for SDG
IP camera		Endpoints
Wireless printers		Endpoints

TEST ENVIRONMENT

This section describes the features and the relevant scales at which the features are deployed across the physical topology. Table 3 lists the scale for each respective feature.

Table 3 *Retail Profile: feature scale*

Feature	Scale
Access points	5000 APs (WLC-7500) (Real and simulated)
Clients	50K clients (WLC-5520) (Real and simulated)
WLANs	450
AP groups	500
Wireless interface	500
Trap receivers	6
IPv4 ACLs	64
IPv6 ACLs	64
Mobility groups	10
Flex group	10
NetFlow	6 monitors+2k flows
SNMP	PI/MIB walks

In the following table, the recommendation (per Design and confirmed with Product Management) is 24 kbps/AP, but we tested at 12.8 kbps, which was in some of the deployment guides.

Table 4 *WAN link matrix*

Num APs	Link bandwidth (kbps)	WAN link RTT (ms)	MTU (bytes)	Flex AVC	Test scenario
1	15	300	1500	Enabled	Twenty-five clients sending traffic on Local Switch WLAN, Flex AVC enabled, wIPs, rogue detection on all APs and Clean Air
5	64	300	1500	Disable	Local Switch WLAN, wIPs, rogue detection on all APs and Clean Air
40	512	300	1000	Disable	WAN link with smaller MTU size, Local Switch WLAN, wIPs, rogue detection on all APs and Clean Air
50	640	300	576	Disable	WAN link with smaller MTU size, Local Switch WLAN, wIPs, rogue detection on all APs and Clean Air
6	128	300	1500	Disable	L2 intra-controller roaming on two APs in same Flex-Connect Group with one hundred clients

Use Case Scenarios

TEST METHODOLOGY

The use cases listed in Table 5 are executed using the Topology defined in Figure 1, along with the Test environment shown in Table 3.

With respect to the longevity for this profile setup, the CPU and memory use are monitored overnight and during the weekends, along with any mem-leak checks. In order to test the robustness, certain negative events would be triggered during the use-case testing.

USE CASES

Table 5 describes the use cases that were executed on the Retail Vertical Profile. These use cases are divided into buckets of technology areas to show the complete coverage of the deployment scenarios.

These technology buckets are composed of system upgrade, security, network services, monitoring & troubleshooting, simplified management, and system health monitoring along with system and network resiliency.

Table 5 *List of use case scenarios*

No.	Focus area	Use cases
System upgrade		
1	Upgrade	Network Administrator should be able to perform WLC upgrade and downgrade between releases seamlessly. ▪ All of the configuration should be migrated seamlessly during the upgrade/downgrade operation ▪ SW Install, Clean, Expand
Security		
2	On-Wire Attacks	Network admin wants to detect and mitigate on-wire attacks. ▪ Rogue on wired detection, containment
3	Over-the-Air Attacks	▪ Network admin wants to detect and mitigate wireless thread. ▪ Adaptive wIPS ▪ Enhanced Local Mode (ELM) wIPS
4	Guest-Access	Network admin wants to provide temporary guest access using the LWA and CWA. ▪ LWA–Custom/Default Pages ▪ CWA–Self Register Guest Portal

Table 5 continued

Network services		
5	Push-To-Talk	Retail employees should be able to instantly communicate with each other using Push-To-Talk (PTT). ▪ Spectra Link
6	Custom QoS	Network Admin needs to enhance user experience by ensuring traffic and application delivery using custom QoS policies. ▪ Traffic types: VOIP, Call Control, Transactional Data, Bulk Data, Scavenger ▪ Policing Ingress and Priority & BW Management in Egress
7	Location	Retail customers should be able to analyze and to use their customers' shopping behavior to increase the revenue. ▪ Hyper location with Halo ▪ RFID ▪ BLE Beacon
8	Plug-n-Play	Simplify network provisioning of new switches by Zero-Touch-Deployment for Day0 using NG-PNP app via APIC-EM for image and configuration management.
Monitoring & troubleshooting		
9	Client Troubleshooting	Network admin should be able to troubleshoot client connectivity issues. ▪ Service Assurance
10	NetFlow	Enable IT admins to determine network resource usage and capacity planning by monitoring IP traffic flows using Flexible NetFlow. ▪ Traffic types: L2, IPv4, IPv6 ▪ Lancope ▪ Prime Collector, Live Action
Simplified management		
11	Prime-Manage-Monitor	Network admin wants to manage and monitor all the devices in the network using Cisco Prime Infrastructure
12	Prime-SWIM	Network admin should be able to manage images on network devices using Cisco Prime Infrastructure for upgrade/downgrade.

Table 5 continued

13	Prime-Template	Network admin wants to configure deployment using Cisco Prime Infrastructure. ▪ Import ▪ Configuration using config-templates
14	Prime-Troubleshooting	Simplify network troubleshooting and debugging for IT admins ▪ Monitor & troubleshoot end-end deployment via maps & topologies ▪ Monitor network for alarms, syslogs and traps ▪ Troubleshoot network performance using traffic flow monitoring
System health monitoring		
15	System Health	Monitor system health for CPU usage, memory consumption, and memory leaks during longevity
System & network resiliency, robustness		
16	System Resiliency	Verify system level resiliency during the following events: ▪ Active WLC failure ▪ Standby WLC failure ▪ RP link flaps ▪ Power failure ▪ High WAN Latency ▪ WAN failure ▪ AP Failure
17	Negative Events, Triggers	Verify that the system holds well and recovers to working condition after the following events are triggered: ▪ Config Changes–Add/Remove config snippets, Default-Interface configs ▪ Link Flaps, SVI Flaps ▪ Burst client association ▪ Radius failure ▪ DHCP failure

Appendix A

You can find example configurations at the following location:

http://cvddocs.com/fw/cvpconfig

Please use the feedback form to send comments and suggestions about this guide.

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