



# Cisco AssureWave Wireless LAN Controller

## Release 7.0.220.0 Test Results

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### Version History

Version number	Date	Notes
1.0	February 1, 2012	First Revision

### Executive Summary

AssureWave is a Cisco initiative that provides Wireless LAN service providers with their Cisco software version of choice.

The AssureWave program collects topology, application, and client information from various sources such as Sales Engineers, TAC and directly from customers to build test networks that simulate particular vertical environments. These test networks run additional scenarios based on this vertical information to better cover various interoperability matrices. The vertical test beds are built upon existing horizontal technologies such as Mobility, Voice, and Routing/Switching. In addition, existing Best Practices and Deployment Guides from the different technologies are referenced and deployed in the networks. This release tested the HealthCare, Retail, Enterprise and Higher Education vertical market scenarios.

The AssureWave program also proactively enlists additional testing from 3rd party partners in addition to any existing Cisco partnerships. This comprehensive testing of client and application interoperability results in a smoother introduction of a complete end-to-end wireless ecosystem.

This document summarizes what was tested for each market segment; in which specific combinations of devices and features were tested; a test summary and recommendation; and relevant open caveats.



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## HealthCare Vertical Market

### What Was Tested

- Cisco Wireless LAN Controller (4402, 4404, 5508, WiSM and 3750 Integrated) N-1 and N-2 upgrades (N-2, N-1 being previous major releases and N being current version).
- Cisco Wireless Control System (WCS) N-1 Upgrade (N-1 being the previous major release and N being current version).
- Cisco Mobility Services Engine (MSE) Appliance N-1 Upgrade (N-1 being the previous major release and N being current version).
- Simultaneous client encryption methods—Open, WEP, WPA and WPA2.
- Simultaneous client EAP authentication modes—LEAP, PEAP, EAP-FAST, EAP-TLS.
- Layer 2 (inter/intra controller) and Layer 3 roaming scenarios (with voice and data clients).
- High Availability—Controller/AP, access layer failover testing.
- Voice clients including the Cisco 7921/25/9971, Spectralink 8030, Ascom i62/i75 and Vocera badges with one-to-one, one-to-many (as applicable), wireless-to-landline, and PTT.
- Application-specific scenarios including Citrix Server/Client (ICA), Emergin/InformaCast messaging (to most voice clients) and DICOM/PACS server/modality simulations.
- Guest Access (wired and wireless) with Open/EAP authentication methods.
- Location tracking with data/voice clients and active RFID tags.
- Interoperability between various data, voice, and RFID devices on both the 2.4 and 5Ghz bands as applicable.
- Radio Resource Management (RRM) functionality
- SNMP stress



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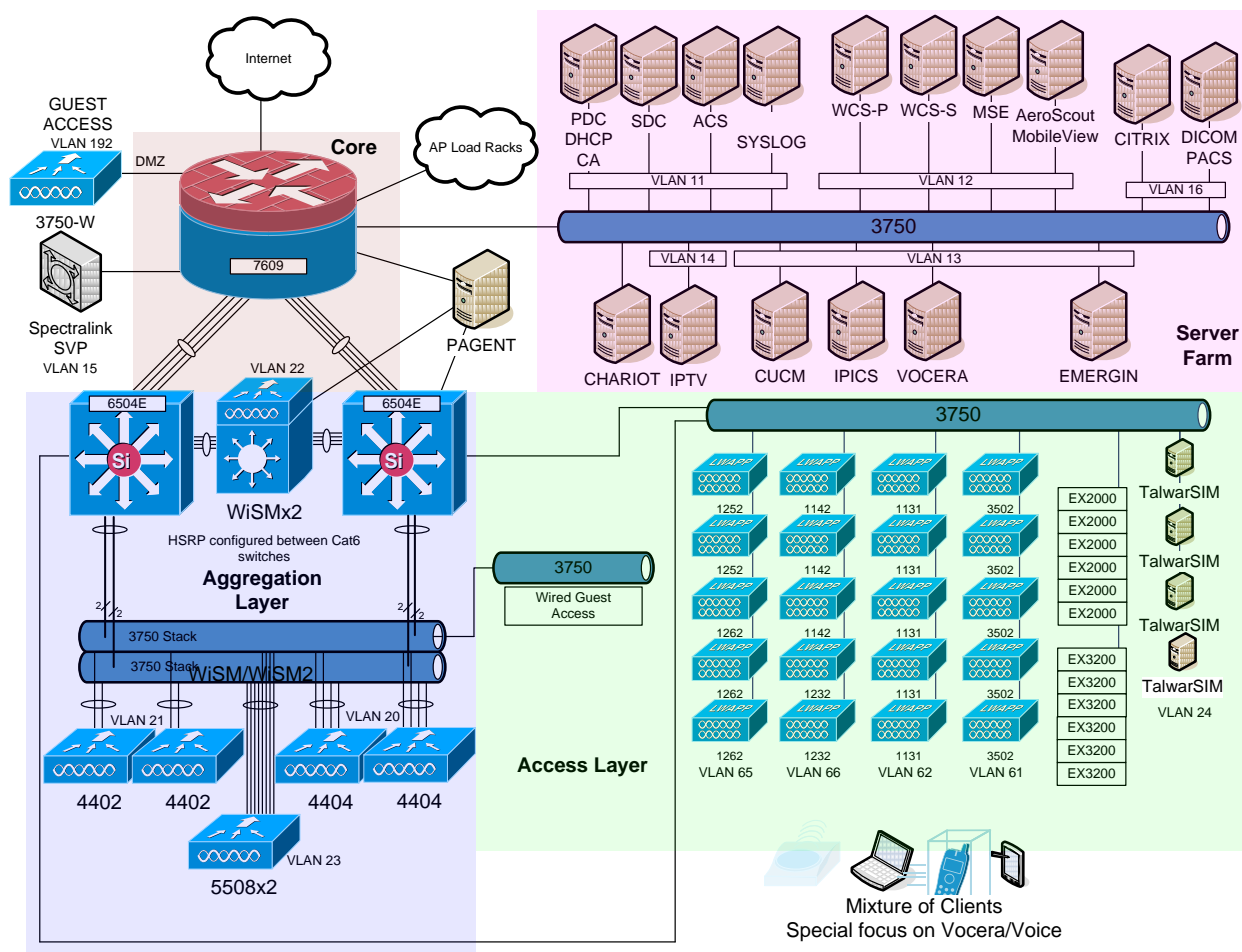
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## Healthcare Test Topology

Figure 1 shows the test topology for the Healthcare vertical market.



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## Devices and Software Tested

The following devices and software were tested as part of the AssureWave healthcare vertical market.

**Table 1 Infrastructure Devices Tested for Healthcare**

Infrastructure Device Information	
Device	Version
WS-C6504-E w/WS-SUP720-3B w/WS-X6548-GE-45AF w/WS-SVC-WISM-1-K9 x2	12.2(33)SX13
WS-C3750G-24PS-S WS-C3750G-48PS-S	12.2(44)SE
CISCO7609 w/WS-SUP720-3B w/WS-X6548-GE-45AF w/WS-SVC-FWM-1-K9	12.2(18)SXF8

**Table 2 Controller and Access Point Devices Tested for Healthcare**

Controller / Access Point Information	
Device	Version
AIR-WLC4402-50	7.0.220.0
AIR-WLC4404-100	7.0.220.0
AIR-WLC5508-500	7.0.220.0
WS-C3750G-24WS-S25	7.0.220.0
WS-SVC-WISM-1-K9	7.0.220.0
WS-SVC-WISM2-1-K9	7.0.220.0
AIR-LAP1131AG-A-K9	7.0.220.0
AIR-LAP1142N-A-K9	7.0.220.0
AIR-LAP1232AG-A-K9	7.0.220.0
AIR-LAP1242AG-A-K9	7.0.220.0
AIR-LAP1252AG-A-K9	7.0.220.0
AIR-LAP1262N-A-K9	7.0.220.0
AIR-CAP3502E-A-K9	7.0.220.0
AIR-CAP3502I-A-K9	7.0.220.0
AIR-AP1232AG-A-K9	12.3(8)JED1 (as WGB)
AIR-AP1242AG-A-K9	12.4(25d)JA (as WGB)



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Controller / Access Point Information	
Device	Version
AIR-AP1131AG-A-K9	12.4(25d)JA (as WGB)

**Table 3 Network Server Devices Tested for Healthcare**

Network Server Information	
Server Type	Version
Microsoft AD, DHCP, DNS, TFTP and FTP Services	Windows 2003 SE/SP2 Server
Microsoft CA Services	Windows 2003 SE/SP2 Server
Cisco ACS Radius Server	4.2(0) Build 124
Cisco ACS Radius Server	5.2.0.26
Cisco Identity Services Engine (ISE)	1.0.3.377
Cisco Unified Call Manager (CUCM)	7.1.5.33900-10
Vocera Server	4.1/SP5
Vocera Client Gateway	4.1/SP5
AeroScout MobileView Server	4.1.0.15.6423/SP1
VLC Media Player	1.0.7
Cisco WCS (Windows)	7.0.220.0
Cisco MSE 3350 Appliance	7.0.220.0
Cisco MSE 3355 Appliance	7.0.220.0
Cisco IPTV Server	3.5.7.1 (on Windows 2000/SP4 Server)
Linux RH SYSLOG/NTP Server	Linux RH Enterprise AS4
Spectralink SVP-100 Server (SRP)	230.009/071.002/173.037/174.037/175.037
Spectralink PRI GW	213.001/071.005/213.034/171.012/172.012
Ekahau RTLS Controller	5.1.5

**Table 4 Application Products Tested for Healthcare**

Application Information	
Application	Version
Emergin Orchestrator	7.02/SP6
IPICS	2.0(2)
Citrix Presentation Server	4.5
PacsOne DICOM Server (20 AE support)	6.1.2
DICOM Validation Tool	2.2.1

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Application Information	
Application	Version
AeroScout Tag Manager	4.02.20

**Table 5 Voice Client Devices Tested for Healthcare**

Voice Client Information	
Device	Version
Ascom i62 Phone	2.5.7
Ascom i75 Phone	1.8.0
Cisco 7921 Phone	1.4.2
Cisco 7925 Phone	1.4.2
Cisco 9971 Phone	9.2.3.27
Cisco Cius	9.2.2.49
Spectralink 8030	119.081/131.030/132.030 (SIP)
Spectralink 8450	4.0.0.15769 (SIP)
Vocera Badge B1000A/B2000	4.1/SP5 (Build 1942)
Vocera Smartphone	2.3.4.0119

**Table 6 Laptop Client Devices Tested for Healthcare**

Laptop Client Information			
Device	OS	Chipset	Driver
Acer Aspire 3624WXM	WinXP/SP3	Atheros AR5005G	4.0.0.14001
Acer Aspire 9500	WinXP Pro (x86)	Atheros 5005G	4.0.0.14001
Apple MacBook Air	MacOS 10.6.7	AirPort Extreme	5.10.131.36.9
Apple MacBook Pro	MacOS 10.5.8	AirPort Extreme	1.4.16.2
Asus Eee PC 1016PT	Win7 Pro (x86)	Intel 6200 AGN	13.5.0.6
Asus Eee PC 900	WinXP Home (x86)	Atheros AR5007EG	5.3.0.45
Asus R1F K018E	Win7 Ent (x86)	Intel 3945ABG	13.3.0.24
Dell Latitude E5410	Win7 Pro (x86)	Intel 6200 AGN	14.2.0.10
Dell Latitude E5410	Win7 Pro (x86)	Intel 6300 AGN	14.2.0.10
Dell Latitude E5410	Win7 Pro (x86)	Dell DW1520 AGN	5.60.48.35
Fujitsu Lifebook LH530	Win7 Pro (x64)	Atheros AR9285 GN	8.0.0.258
Fujitsu Lifebook T4215	Win7 Pro (x86)	Linksys WUSB600N	3.0.0.61

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Laptop Client Information			
Device	OS	Chipset	Driver
Fujitsu Lifebook T4410	Win7 Pro (x86)	Intel 5100 AGN	12.4.1.4
Fujitsu Lifebook T580	Win7 Pro (x86)	Atheros AR928X	8.0.0.341
HP EliteBook 6930p	Win7 Ent (x64)	Intel 5300 AGN	14.2.0.10
HP EliteBook 6930p	WinXP Pro (x86)	Intel 5300 AGN	14.2.0.10
HP ProBook 6455b	Win7 Pro (x86)	Broadcom 4313 BG	5.60.350.11
HP ProBook 6550b	Win7 Pro (x86)	Broadcom 43224 AGN	5.60.350.11
HP/Compaq Compaq 6530b	Win7 Ent (x64)	Intel 5100 AGN	13.3.0.24
HP/Compaq Compaq 6530b	WinXP Pro (x86)	Intel 5100 AGN	13.4.0.9
HP/Compaq Compaq 6730b	Win7 Ent (x86)	Intel 5100 AGN	13.3.0.24
HP/Compaq Compaq 6830s	Win7 Ent (x86)	Intel 5100 AGN	14.2.0.10
HP/Compaq Compaq 6910p	Win7 Ent (x64)	Intel 4965 AGN	12.4.1.4
Lenovo N100	WinXP Pro (x86)	Intel 3945 AG	13.4.0.139
Lenovo SL400 2743-89U	Win7 Ent (x86)	Intel 5100 AGN	13.3.0.24
Lenovo T61	WinXP/SP3 (x86)	Intel 3945 AG	13.3.0.137
Motion Computing MC-C5v	Win7 Pro (x86)	Intel 6200 AGN	14.2.0.10
Motion Computing MC-F5	WinXP/Tablet/SP3	Intel 3945 ABG	13.4.0.139
Motion Computing J3400	Win7 Pro (x86)	Intel 5300 AGN	13.3.0.137
Panasonic ToughBook CF-52	Win7 Pro (x86)	Intel 5100 AGN	13.4.0.9
Panasonic ToughBook CF-U1	Win7 Ent (x86)	Intel 5100 AGN	13.1.1.1
Sony Vaio PCG-6Q1L	Win7 Ent (x86)	Intel 3945 ABG	12.4.1.4
Sony Vaio/PCG-7133L	Win7 Ent (x64)	Intel 4965 AGN	13.3.0.137
Sony Vaio/PCG-7X1L	Win7 Ent (x86)	Intel 3945 AG	13.4.0.139
Toshiba Satellite A135-S2386	WinXP Pro (x86)	Linksys WPC600N	4.150.31.0
Toshiba Satellite A135-S4467	Win7 Ent (x86)	Intel 3945 AG	12.4.1.4
Toshiba Satellite U205-S5034	WinXP Pro (x86)	Intel 3945 AG	13.3.0.137
Toshiba Tecra A9-S9018X	WinXP Pro (x86)	Intel 4965 AGN	13.4.0.139
Toshiba Tecra M10-S3452	Win7 Ent (x64)	Intel 5100 AGN	13.4.0.9

**Table 7 Tablet/Smartphone Devices Tested for Healthcare**

Tablet/Smartphone Client Information		
Device	OS	Version
Apple iPod Touch	iOS	5.0.1 (9A405)

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Tablet/Smartphone Client Information		
Device	OS	Version
Apple iPad 2	iOS	5.0.1 (9A405)
Apple iPhone 4S	iOS	5.0.1 (9A405)
Archos 43 Internet Tablet	Android	2.3.26
Samsung Galaxy Tab 7	Android	2.2.1
Samsung Galaxy Tab 10	Android	3.1
Dell Streak 7	Android	2.2.2
Asus Transformer TF101	Android	3.1
Toshiba THRiVE Tablet AT105	Android	3.2.1.31.5.0002
Sony Tablet S SGPT111US	Android	3.2
Cisco Cius Tablet	Android	2.2.2
Motorola XOOM	Android	3.1 (HMJ37)
Blackberry Playbook	Blackberry	1.0.5.2342

**Table 8    Supplicant Devices Tested for Healthcare**

Supplicant Information	
Device	Version
Cisco AnyConnect	3.0.2052
Microsoft Windows ZeroConfig	Windows XP Pro, Win7

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Table 9 Other Client Devices Tested for Healthcare

Other Client Information	
PDA/Handhelds	Version/Comments
Motorola MC75A (Healthcare version)	WM 6.5 Classic/CE OS 05.02.21840
Tags/Exciters	Version/Comments
AeroScout Active RFID Tags	T2, T2 w/Call Button, T3, T4, T5h, T6
AeroScout EX2000 Exciters	BOOT 50009/DSP 216
AeroScout EX3200 Exciters	BOOT 60300/DSP 303
Ekahau Active RFID Tags (CCX Mode)	T301A, T301B, T301BD, T301Ex, T301i, T301is, T301t, T301W
Medical Devices	Version/Comments
CareFusion Alaris PC 8015 Series IV Pumps w/Systems Manager	PCU SW: 9.5.32.2, SM: 9.0
Dräger Infinity Delta Monitors w/Central Station	VFW-8
Dräger M300 Monitors w/Central Station	VF8.7
Nihon Kohden BSM-6501A/6701A Monitors w/Central Station	IPL: 01-03, CPU: 02-10, CHR: 01-04
Philips IntelliVue X2/MP2 Patient Monitors w/Central Station	H Version
Sigma Spectrum Smart IV Pumps	v6.01.00
WelchAllyn Spot Vital Signs LXi	Radio FW: 2.00.02 A0003
WelchAllyn Vital Signs Monitor (VSM 6000)	1.00.00
WelchAllyn Propaq LT	Radio FW: 2.30.00 A0003
WelchAllyn Micropaq	Radio FW: 2.30.00 A0002
Other	Version/Comments

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## Retail Vertical Market

### What Was Tested

- Cisco Wireless LAN Controller (4402, 4404, WiSM, WLCM, 5500 and 3750 Integrated) N-1 and N-2 upgrades (N-2, N-1 being previous major releases and N being current version).
- Cisco Wireless Control System (WCS) N-1 Upgrade (N-1 being the previous major release and N being current version).
- Cisco Mobility Services Engine (MSE) Appliance N-1 Upgrade (N-1 being the previous major release and N being current version).
- Simultaneous client Encryption/Authentication modes (e.g. WEP, WPA, 802.1x with various methods).
- Layer 2 (inter/intra controller) and Layer 3 roaming scenarios (inter/intra controller with voice and data clients).
- High Availability (including Controller/AP, access layer failover testing).
- Voice clients including the Cisco 7920/7921, Spectralink NetLink 8030 with PPT.
- Handheld clients including Symbol handhelds(MC9090, MC7090, MC3090, MC5590), Intermec handhelds(CK3, CN3, CK31), Psion 7535 G2, and PSC handhelds(Falcon 4420)
- Application-specific and Point of Sale scenarios with various Symbol, Intermec, HHP, Falcon handhelds, Zebra QL320 plus printers, Pioneer kiosks, Hobart wireless scales, Cisco's video surveillance solution.
- Hybrid-REAP with central and local switching, web-auth with roaming, voice, L2 roaming, CCKM, and IGMP snooping
- Guest Access (wired and wireless) with various authentication ( open / local account / RADIUS account )
- Location tracking with data/voice clients and active Intermec, AeroScout RFID tags.
- Client interoperability testing with CCX and non-CCX handhelds, smart phones, laptops.
- Radio Resource Management (RRM) functionality
- IRCM(Inter Release Controller Mobility) with Layer 2 / Layer 3 roaming
- ClientLink with legacy clients
- Passive-client feature verification on legacy passive-clients




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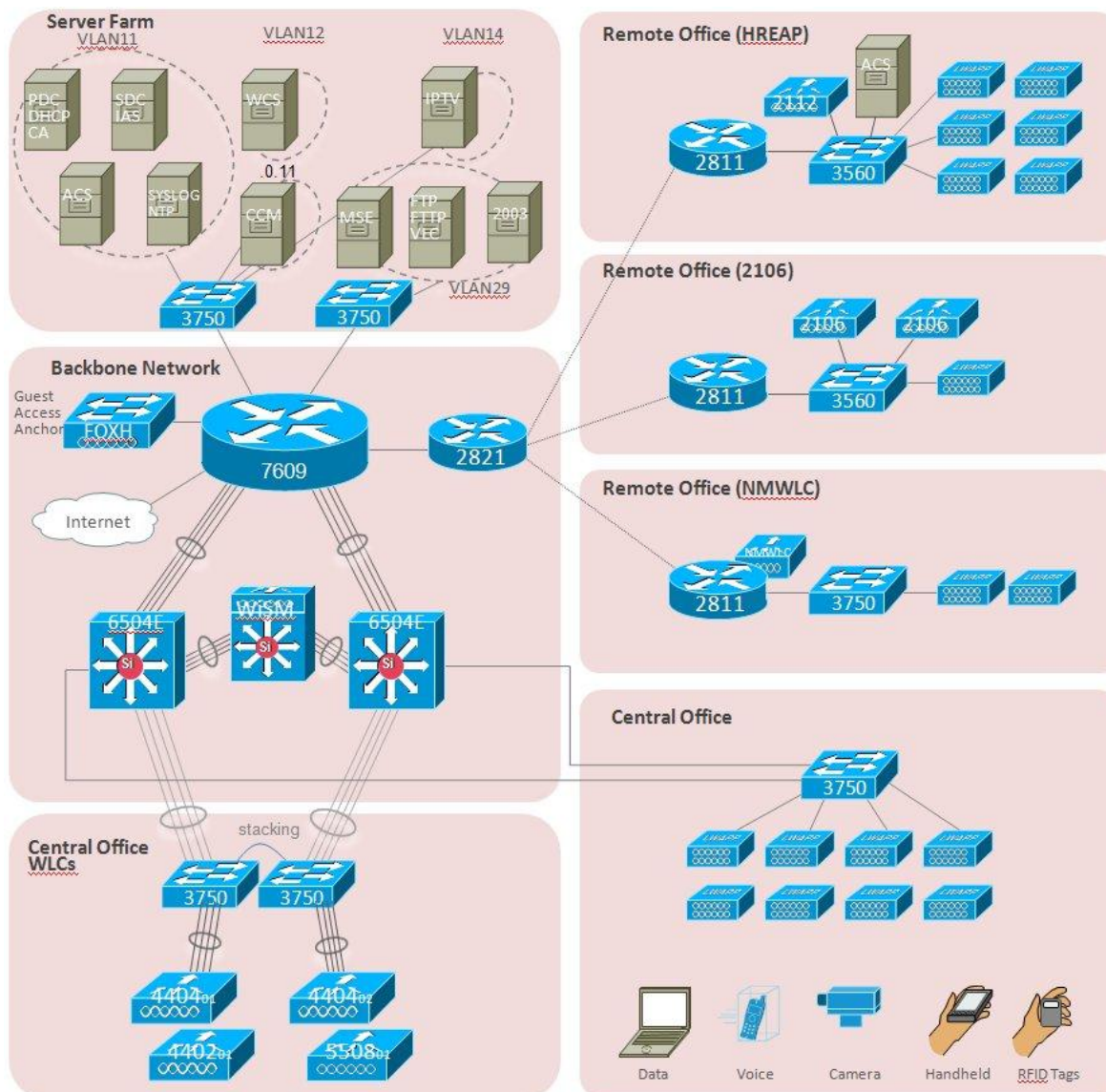
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## Retail Test Topology

Figure 2 shows the test topology for the Retail vertical market.



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## Devices and Software Tested

The following devices and software were tested as part of the AssureWave Retail vertical market.

**Table 10 Infrastructure Device Devices Tested for Retail**

Infrastructure Device Information	
Device	Version
WS-C6504-E w/WS-SUP720-3B w/WS-X6548-GE-45AF w/WS-SVC-WISM-1-K9	12.2(33)SXJ1
WS-C3750G-24PS-S WS-C3750G-48PS-S	12.2(25)SEE2
CISCO7609 w/WS-SUP720-3B w/WS-X6548-GE-45AF WS-SVC-FWM-1-K9	12.2(18)SXF8
Cisco 2611XM Terminal Servers (3)	12.3(6f)
Cisco 2811/2821 ISR	12.4 (24)T

**Table 11 Controller and Access Point Devices Tested for Retail**

Controller/AP Information	
Device	Version
AIR-WLC4402-50	7.0.220.0
AIR-WLC4404-100	7.0.220.0
WS-C3750G-24WS-S25	7.0.220.0
WS-SVC-WISM2-K9	7.0.220.0
AIR-CT5508-K9	7.0.220.0
AIR-CT7510-K9	7.0.220.0
AIR-CT2504-K9	7.0.220.0
WS-SVC-WISM-1-K9	7.0.220.0
NME-AIR-WLC8-K	7.0.220.0
AIR-WLC2106-K9	7.0.220.0
AIR-CAP3502E-A-K9	7.0.220.0
AIR-LAP1232AG-A-K9	7.0.220.0
AIR-LAP1242AG-A-K9	7.0.220.0
AIR-LAP1131AG-A-K9	7.0.220.0
AIR-LAP1252AGN-A-K9	7.0.220.0



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Controller/AP Information	
Device	Version
AIR-LAP1262N-A-K9	7.0.220.0
AIR-AP1232AG-A-K9	7.0.220.0
AIR-AP1242AG-A-K9	7.0.220.0
AIR-AP1131AG-A-K9	7.0.220.0
AIR-AP1232AG-A-K9	12.3(8)JEB (as WGB)
AIR-AP1242AG-A-K9	12.4(21a)JA1 (as WGB)

**Table 12 Network Server Devices Tested for Retail**

Network Server Information	
Device	Version
Microsoft DHCP Server	Windows 2003 SE/SP1 Server
Microsoft DNS Server	Windows 2003 SE/SP1 Server
Microsoft TFTP/FTP Server	Windows 2003 SE/SP1 Server
Cisco ACS Radius Server	5.2.0.26
Microsoft CA	Windows 2000 Server/SP4
Cisco Unified Call Manager (CCM)	v7.1.5.33900-10
Cisco WCS (Windows)	7.0.220.0 (on Windows 2003 SE/SP2 Server)
Cisco MSE 3350	7.0.220.0
Cisco IPTV Server	3.5.7.1 (on Windows 2000/SP4 Server)
Linux RH SYSLOG Server	Linux RH Enterprise AS4
Linux RH NTP Server	Linux RH Enterprise AS4
Spectralink SVP-100 Server	173.028/174.028/175.028
Cisco Unified Call Manager Express (CUCME)	4.1
Point Of Sale Server	Windows 2003 SE/SP1 Server
Cisco Video Surveillance Operations Manager	SUSE Linux / Cisco VSOM v6.3.1

**Table 13 Voice Client Devices Tested for Retail**

Voice Client Information	
Device	Version
Cisco 7921 Phone	1.4.2

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Voice Client Information	
Device	Version
Spectralink NetLink 8030	119.076/131.028/132.028 (SIP)

**Table 14 Laptop Clients Devices Tested for Retail**

Laptop Client Information			
Device	OS	Chipset	Driver
HP Compaq 6910p	WinXP pro/SP3	Intel 4965ABGN	13.2.0.30
IBM T61	WinVistaBus/SP2	Intel 4965AGN	13.2.0.30
IBM T61	Win XP pro/SP3	Intel 4965AGN	13.4.0.139
MacBookAir	MacOS 10.5.8	AirPort Extreme ABGN (Broadcom BCM43xx 1.0)	5.10.91.21
Asus Eee Box B202	WinXP home/SP3	Ralink 802.11n wireless	1.1.0
Dell E5410	Win7 pro	Intel 6300AGN	13.0.0.107
Dell inspiron 1525	Win XP pro/SP3	Dell 1505 draft 11n	4.170.25.12
Cisco	CB Adaptor	CB21ag	4.2

**Table 15 Supplicant Devices Tested for Retail**

Supplicant Information	
Device	Version
Cisco Secure Services Client	5.1.1.18
Intel ProSet	13.1.1.0
Cisco AnyConnect	3.0.0631
Cisco Aironet Desktop Utility	4.5.0.84
Microsoft Windows ZeroConfig	Windows XP Pro, Vista
OAC (Odyssey)	4.52, 4.60
Fusion (windows CE)	2.57.0.0.022B-CE-PHOTON
Fusion (Windows Mobile)	2.55.1.0.010R-WM-PHOTON
Intermec (Windows Mobile)	2.01.02.0305
Intermec (Windows Mobile)	2.01.06.0355
Intermec (Windows Mobile)	5.61.00.1635
Fusion (Windows Mobile)	Fusion Build 3.00.0.0.058R
Fusion (Windows Mobile)	Fusion Build 3.20.0.0.040R
Intermec (Windows CE)	2.5

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**Table 16 Other Client Devices Tested for Retail**

<b>Other Client Information</b>	
<b>PDA/Handhelds</b>	<b>Version/Comments</b>
Intermec CK31	WinCE 4.20.0/FW 3.00.19.0748
Intermec CK3	WinMobile 6.1
Intermec CN3	WinCE 5.0
Intermec CK30	WinCE 4.2
Intermec CN 70	WinMobile 6.5 Classic
Intermec CN 70e	WinMobile 6.5 Classic
Intermec CS 40	WinMobile 6.5 Professional
Intermec CK 70	WinMobile 6.5 Professional
Intermec CK 71	WinMobile 6.5 Classic
Intermec CN 50	WinMobile 6.1 Professional
Psion 7535 G2	WinCE 5.0
Psion Workabout Pro Gen II	WinCE 5.0
PSC Falcon 4420	WinCE 4.20.0/FW 1.80
Symbol MC9090	Windows Mobile 5.0
Symbol MC9090	WinCE 5.0
Symbol MC9060G	WinCE 4.20.0/Version 3.17
Symbol MC7090	Windows Mobile 5.0
Symbol MC3090R	WinCE 5.0
Symbol MC5590	Windows Mobile 6.5
Symbol MC 659B	Windows Mobile 6.5 Classic
Symbol MC 75	Windows Mobile 6.5 Professional
Symbol MC3190	Windows Mobile 6.0 Classic
Symbol PPT8846	WinCE 4.20
<b>Tags/Exciters</b>	<b>Version/Comments</b>
AeroScout Active RFID Tags	T2
AeroScout Active RFID Tags w/Call Button	T2
AeroScout Active RFID Tags	T3
AeroScout EX2000 Exciters	BOOT 50009/DSP 216
AeroScout EX3200 Exciters	BOOT 60300/DSP 303
<b>Other</b>	<b>Version/Comments</b>
Cisco VTAdvantage w/Camera	2.0.1
Intermec CV60	Mobile Vehicle Computer/WinXP
Intermec CV30	Mobile Vehicle Computer/WinCE 5.0
Motorola VC5090	Mobile Vehicle Computer/WinCE 5.0

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Zebra QL320	Wireless Printer (802.11b)
Zebra QL320plus	Wireless Printer (802.11bg)
Zebra QL420plus	Wireless Printer (802.11bg)
HP Officejet 6000 (Wireless)	Wireless Printer (802.11bg)
Cisco CIVS-IPC-2500W	Wireless IP camera v1.1 (802.11bg)
TRENDnet TV-IP410W/A IP Camera	Wireless IP camera (802.11bg)
Hobart QUANTUM	Wireless scale With Symbol Spectrum NIC (802.11b)



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## Higher Education Vertical Market

### What Was Tested

- Cisco Wireless LAN Controller (WiSM and 5508) N-1 and N-2 upgrades (N-2, N-1 being previous major releases and N being current version).
- Cisco Wireless Control System (WCS) N-1 Upgrade (N-1 being the previous major release and N being current version).
- Cisco Mobility Services Engine (MSE) N-1 Upgrade (N-1 being the previous major release and N being current version).
- Cisco Location Based Services (LBS) Appliance N-1 Upgrade (N-1 being the previous major release and N being current version).
- Simultaneous client Encryption/Authentication modes (e.g. WEP, WPA, WPA2, WebAuth, and 802.1x with various methods).
- Layer 2 (inter/intra controller) and Layer 3 roaming scenarios, with and symmetric tunneling.
- High Availability (including Controller/AP, access layer failover testing) with HSRP and redundant supervisors for WiSM modules.
- Guest Access (wired and wireless) with various authentication methods.
- Multicast Traffic to Wireless Clients.
- BitTorrent file sharing traffic to Wireless Clients.
- Networked Gaming Applications between Wireless Clients.
- Rogue Access Point and Rogue Client detection and containment.
- Security applications and appliances scanning/attacking network infrastructure including but not limited to Codenomicon, QualysGuard, NMAP, and Nessus.
- Radio Resource Management (RRM) functionality



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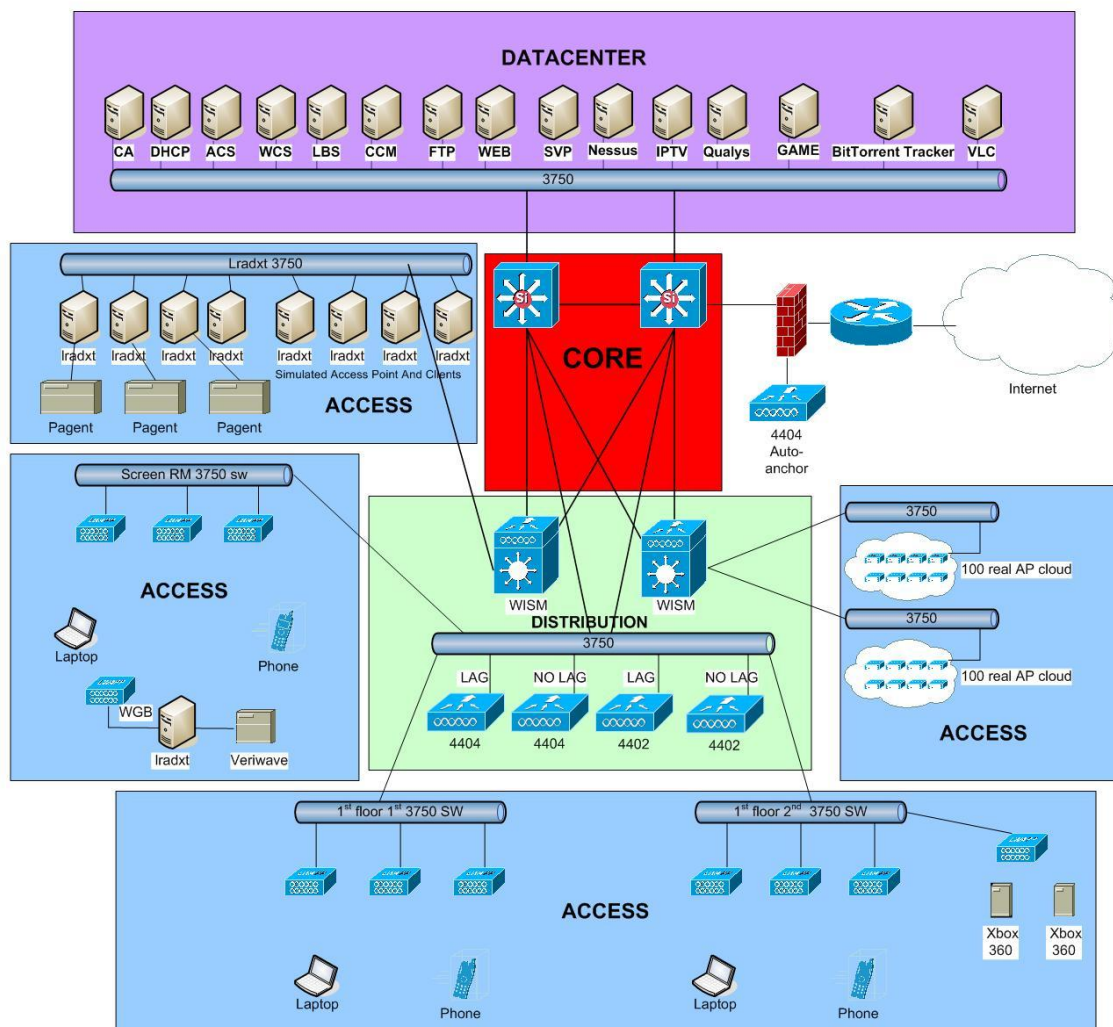
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## Education Test Topology

Figure 3 shows the test topology for the Higher Education vertical market.

### AssureWave: Education Vertical



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## Devices and Software Tested

The following devices and software were tested as part of the AssureWave Higher Education vertical market.

**Table 17 Infrastructure Devices Tested for Education**

Infrastructure Device Information	
Device	Version
WS-C6504-E w/WS-SUP720-3B w/WS-X6548-GE-45AF w/WS-SVC-WISM-1-K9	12.2(18)SXF7 12.2(33)SX13
WS-C3750G-24PS-S WS-C3750G-48PS-S WS-C3750E-24PD	12.2(25)SEE3, 12.2(44)SE, 12.2(37)SE1, 12.2(25)SEB4,
CISCO7609 w/WS-SUP720-3B w/WS-X6548-GE-45AF	12.2(18)SXF
Cisco 2611XM Terminal Servers (3)	12.4(12)
Catalyst 4506	12.2(40)SG(2.41)

**Table 18 Controller and Access Point Devices Tested for Education**

Controller/AP Information	
Device	Version
AIR-WLC5508-500	7.0.220.0
WS-SVC-WISM-1-K9	7.0.220.0
AIR-LAP1142N-A-K9	7.0.220.0
AIR-AP1131AG-N-K9	7.0.220.0
AIR-LAP1242AG-A-K9	7.0.220.0
AIR-AP1252AG-A-K9	7.0.220.0
AIR-LAP1252AG-A-K9	7.0.220.0
AIR-LAP3502E-A-K9	7.0.220.0
AIR-AP1232AG-A-K9	7.0.220.0
AIR-AP1242AG-A-K9	12.4(10b)JA (as WGB)

**Table 19 Network Server Devices Tested for Education**

Network Server Information	
Device	Version
Microsoft DHCP Server	Windows 2003 SE/SP1 Server



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Network Server Information	
Device	Version
Microsoft DNS Server	Windows 2003 SE/SP1 Server
Microsoft TFTP/FTP Server	Windows 2003 SE/SP1 Server
Cisco ACS Radius Server	4.1 (on Windows 2000/SP4 Server)
Game Server	Valve Steam Half-Life 2 Dedicated Server
Microsoft CA	Windows 2003 Server/SP2
Cisco Unified Call Manager (CCM)	5.1.3.7000-5
BitTorrent Tracker	BNBT EasyTracker 7.7r3.2004.10.27
VLC Media Player	0.9.9a
Cisco WCS (Windows)	7.0.220.0 (on Windows 2003 SE/SP1 Server)
Cisco LBS Appliance	7.0.220.0
Cisco MSE Appliance	7.0.220.0
Cisco IPTV Server	3.5.7.1 (on Windows 2000/SP4 Server)
Linux RH SYSLOG Server	Linux RH Enterprise AS4
Linux RH NTP Server	Linux RH Enterprise AS4
Qualys	QualysGuard Enterprise
BitTorrent Server/Client	Azureus 3.0.4.2

**Table 20 Laptop Client Devices Tested for Education**

Laptop Client Information			
Device	OS	Chipset	Driver
Apple PowerBook	10.6.7	Airport A/G/N	1.0 5.10.131.36.9
Apple MacBook	10.6.7	Airport A/G/N	1.0 5.10.131.36.9
Sony VGN-N350E	Microsoft Vista	Intel 3945ABG	13.4.0.139
Sony VGN-N250N	Microsoft Vista	Intel 3945ABG	13.4.0.139
Sony VGN-N1306	Microsoft XP	Intel 3945ABG	13.4.0.139
Compaq Presario C500	Microsoft Vista	Broadcom 802.11BG	4.102.15.56
Compaq Presario V6000	Microsoft Vista	Broadcom 802.11BG	4.102.15.56
Compaq 5201US	Microsoft Vista	Broadcom 802.11BG	4.10.40.1
HP Compaq nx9420	Microsoft Vista	Intel 3945ABG	13.4.0.139
HP Mini 1035NR	Microsoft XP	Broadcom 802.11B/G	4.170.77.3
Lenovo T60 ThinkPad	Microsoft Vista	Intel 3945ABG	13.4.0.139
Lenovo X60s ThinkPad	Microsoft XP	Intel 4965AGN	13.4.0.139

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Laptop Client Information			
Device	OS	Chipset	Driver
Lenovo 3000 N100	Microsoft Vista	Broadcom 802.11BG	4.102.15.56
Toshiba A135-S4427	Microsoft Vista	Intel 3945ABG	13.4.0.139
Toshiba A135-S4467	Microsoft Vista	Intel 3945ABG	13.4.0.139
Toshiba A135-S2386	Microsoft Vista	Atheros AR5006EG	7.1.0.90
Toshiba Satellite A205-S4639	Microsoft Vista	Intel 4965AGN	12.4.0.21
Toshiba Satellite P205-S6267	Microsoft Vista	Intel 4965AGN	12.4.0.21
Toshiba Satellite A205-S4577	Microsoft Vista	Intel 3945ABG	12.4.0.21
Toshiba Tecra A6-EZ6411	Microsoft Vista	Intel 3945ABG	12.4.0.21
Dell Latitude	Windows 7	Intel 6300 AGN	14.3.0.6
Toshiba Satellite A205-S4577	Microsoft Vista	Intel 5100 N	14.3.0.6

**Table 21 Supplicant Devices Tested for Education**

Supplicant Information	
Device	Version
Cisco Secure Services Client	5.1.0.56
Intel ProSet	12.4.0.21
ADU	4.4.0.69
ZeroConfig	(with Windows)

**Table 22 Other Devices Tested for Education**

Other Device Information	
PDA/Handhelds	Version/Comments
Microsoft Xbox 360	Microsoft Xbox 360 Wireless Adapters
Apple iPod Touch Gen2	Version 3.1.3(7E18) 802.11G connections
Brother MFC-845CW	Wireless Printer
Apple iPhone 4	Version 4.3 (8F190)
Apple iPad	Version 4.3 ()
Lexmark Wireless Printer	Pinnacle Pro 901
Kindle Fire	6.2.2
Kindle eBook	2.5
BlackBerry Playbook	1.05.2342
Barnes & Noble Nook Tablet	TBD
Motorola XOOM	3.1 (HMJ37)

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## Enterprise Vertical Market

### What Was Tested

- Cisco Wireless LAN Controller (5508, 4402, 4404, WiSM and 3750 Integrated) N-1 and N-2 upgrades (N-2, N-1 being previous major releases and N being current version).
- Cisco Wireless Control System (WCS) N-1 Upgrade (N-1 being the previous major release and N being current version).
- Cisco Location Based Services (LBS) Appliance N-1 Upgrade (N-1 being the previous major release and N being current version).
- Controller operation with LAG.
- Controller operation with multiple AP managers to cover different customer flavors (WISM-only support LAG).
- Multicast operation with unicast mode.
- Multicast operation with multicast mode.
- 16 WLANs configured with different types of security and class of service—802.1x, WPA/WPA2 (LEAP/PEAP/TLS), web-auth, etc.
- Multicast operation with PIM sparse-dense mode in wired network routing.
- Controller, AP, authentication servers operating across MPLS VPN network.
- Six controllers configured in one roaming domain.
- For layer3 roaming, both symmetric tunnel and un-symmetric tunnel cases are covered. The controllers are configured in the same mode, either symmetric tunnel or un-symmetric tunnel).
- Layer2 roaming (CCKM and non-CCKM).
- Auto-anchor and auto-anchor N+1.
- WGB (including layer 2 and layer 3 roaming).
- TACACS+ for controller administration and accounting.
- Wired guest access.
- IDS and IPS.
- Radio Resource Management (RRM) functionality
- Voice Calls with Cisco 7920/7921 IP phones and Spectralink.
- Network redundancy with HSRP and controller redundancy with configuring primary/secondary/tertiary controllers.
- Controllers trunked to Catalyst 3750 switches with the management interfaces of the controllers and access points deployed in different subnets.
- Hybrid-REAP support, including central switching and local switching.
- Controller access controller and traffic control via access-list.
- Longevity test with multiple SNMP walk to cause CPU as high as 90%




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- Lradxt to simulate 150 APs and 3000 clients.
- Roaming during heavy traffic.
- 120 simulated clients with Veriwave.
- Reliable multicast for video



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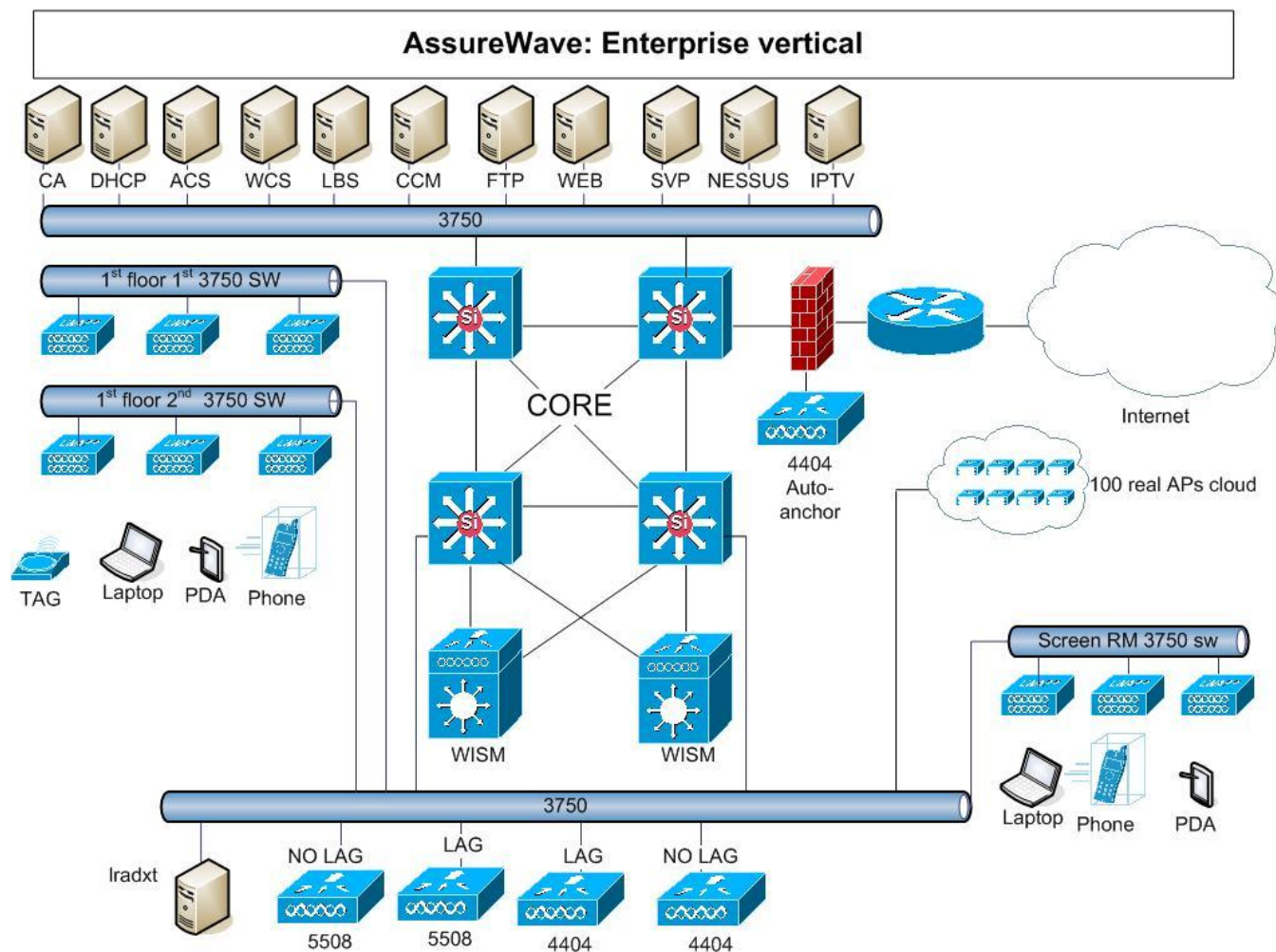
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Figure 5 shows the standard IP core network.



## Devices and Software Tested

The following devices and software were tested as part of the AssureWave Enterprise vertical market.

**Table 23 Infrastructure Devices Tested for Enterprise**

Infrastructure Device Information	
Device	Version
WS-C6504-E w/WS-SUP720-3B w/WS-X6548-GE-45AF w/WS-SVC-WISM-1-K9 WS-C6509-E w/WS-SVC-WISM-1-K9 w/WS-SVC-WISM-1-K9 w/WS-SVC-WISM2-1-K9	12.2(18)SXF12 122(33).SXJ
WS-C3750G-24PS-S WS-C3750G-48PS-S	12.2(40)SE
CISCO7609 w/WS-SUP720-3B w/WS-X6548-GE-45AF w/WS-SVC-FWM-1-K9	12.2(18)SXF7
Cisco 2611XM Terminal Servers	12.3(6f)

**Table 24 Controller and Access Point Devices Tested for Enterprise**

Controller/AP Information	
Device	Version
AIR-WLC4402-50	7.0.220.0
AIR-WLC4404-100	7.0.220.0
WS-C3750G-24WS-S25	7.0.220.0
WS-SVC-WISM-1-K9	7.0.220.0
WS-SVC-WISM2-1-K9	7.0.220.0
AIR-LAP1232AG-A-K9	7.0.220.0
AIR-LAP1242AG-A-K9	7.0.220.0
AIR-LAP1131AG-A-K9	7.0.220.0
AIR-LAP1240AGN-A-K9	7.0.220.0
AIR-LAP1142N-A-K9	7.0.220.0
AIR-LAP1262N-A-K9	7.0.220.0
AIR-LAP3502E-A-K9	7.0.220.0
AIR-LAP1042N-A-K9	7.0.220.0
AIR-AP1232AG-A-K9	7.0.220.0
AIR-AP1242AG-A-K9	7.0.220.0



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Controller/AP Information	
Device	Version
AIR-AP1131AG-A-K9	7.0.220.0
AIR-AP1232AG-A-K9	12.3(11)JX1 (as WGB)
AIR-AP1242AG-A-K9	12.4(10b)JA (as WGB)
AIR-AP1131AG-A-K9	12.4(10b)JA (as WGB)

**Table 25 Network Server Devices Tested for Enterprise**

Network Server Information	
Server Type	Version
Microsoft AD, DHCP, DNS, TFTP and FTP Services	Windows 2003 SE/SP1 Server
Microsoft CA Services	Windows 2000/SP4 Server
Cisco ACS Radius Server	3.2 (on Windows 2000/SP4 Server)
Cisco ACS Radius Server	4.0 (on Windows 2003 SE/SP1 Server)
Cisco ACS Appliance Server	5.0 appliance
Cisco Unified Call Manager (CUCM)	8.0.3
Cisco WCS (Windows)	7.0.220.0 (on Windows 2003 SE/SP1 Server)
Cisco IPTV Server	3.5.7.1 (on Windows 2000/SP4 Server)
Linux RH SYSLOG Server	Linux RH Enterprise AS4
Linux RH NTP Server	Linux RH Enterprise AS4
Spectralink SVP-100 Server	173.028/174.028/175.028 (SCCP)

**Table 26 Application Software Products Tested for Enterprise**

Application Software Information	
Application	Version
IPTV scheduled and on demand	v3.4
Vibrick media appliance	V2.0.0b

**27 Voice Client Devices Tested for Enterprise**

Voice Client Information	
Device	Version
Cisco 7920 Phone	3.0.2
Cisco 7921 Phone	1.41-SR1
Cisco IP Communicator	2.1.1
Spectralink i640/PTX110	110.036/091.047/104.025 (SCCP)

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Voice Client Information	
Device	Version
Spectralink e340/PTE110	110.036/091.047/104.025 (SCCP)

**Table 28 Laptop Client Devices Tested for Enterprise**

Laptop Client Information			
Device	OS	Chipset	Driver
Acer Aspire 3623WXCi	WinXP/SP2	Atheros AR5005G	4.0.0.14001
Acer Aspire 3624WXM	WinXP/SP2	Atheros AR5005G	5.3.0.35
Acer Aspire 5610-4537	Vista/HP	Intel 3945ABG	13.4.0.139
HP Probook 4710s	WinXP/SP2	Intel 5100 AGN	14.3.0.6
Toshiba Satellite A105	WinXP/SP2	Intel 3945ABG	13.4.0.139
Toshiba Satellite A135	Vista/HP	Intel 3945ABG	13.4.0.139
Toshiba Tecra 8000	WinXP/SP2	Cisco CB21ABG	4.5.0.305
HP 6530b	WinXP/SP2	Intel 5100 AGN	13.5.0.6
Toshiba U205	Vista/HP	Intel 3956ABG	13.4.0.139
Compaq 5201US	Microsoft Vista	Broadcom 802.11BG	4.10.40.1
HP Compaq nx9420	Microsoft Vista	Intel 3945ABG	13.4.0.139
Lenovo T60 ThinkPad	Microsoft Vista	Intel 3945ABG	13.4.0.139
Lenovo X60s ThinkPad	Microsoft XP	Intel 3945ABG	13.4.0.139
Lenovo 3000 N100	Microsoft Vista	Broadcom 802.11B	4.102.15.56
Fujitsu Lifebook A-Series	Microsoft Vista	Broadcom 802.11BG	7.1.0.90
Lenovo W510 ThinkPad	Windows 7	Intel 6300 N	14.2.0.10

**Table 29 Supplicant Devices Tested for Enterprise**

Supplicant Information	
Device	Version
Cisco Secure Services Client	4.2, 5.0.1
Intel ProSet	13.5.0, 14.2
Cisco Aironet Desktop Utility	4.5.0.84
Microsoft Windows ZeroConfig	Windows XP Pro, Vista

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