Cisco Aironet 2600 Series Access Point

Industrial Design

- Sleek design with internal antennas, ideal for office environments
- Rugged metal housing and extended operating temperature, ideal for factories, warehouses, and other indoor industrial environments
- Versatile RF coverage with optional external antennas
- UL 2043 plenum-rated for above-ceiling installation options or suspended from drop ceilings

Cisco ClientLink 2.0™ Beamforming

- Faster mobile client connections
- Support for all client types without any client requirements or dependencies
- More efficient use of mobile device batteries
- Accelerates one-, two-, and three spatial stream devices

Cisco CleanAir™ Spectrum Intelligence

- Classifies over 20 different types of interference, including non-Wi-Fi interference, within 5 to 30 seconds
- Automatic remedial action and less manual intervention
- 24/7 monitoring with remote access reduces travel and speeds resolution
- Locates and visualizes interference and zone of impact
- Historic interference information for back-in-time analysis and faster problem solving
- Air Quality Index provides a snapshot of network performance and the impact of interference

Cisco VideoStream Technology

- Efficient multicast-to-unicast conversion
- Video call admission control to prevent oversubscription
- Queue prioritization to ensure best user experience for corporate videos
- Perfect 5.0 mean opinion scores (MOS scores) in testing
- Double the client session scalability of competitors

The new Cisco® Aironet® 2600 Series Access Point delivers the most advanced features in its class - with great performance, functionality, and reliability at a great price. The 802.11n based Aironet 2600 Series includes 3x4 MIMO, with three spatial streams, plus Cisco CleanAir™, ClientLink 2.0™, and VideoStream technologies, to help ensure an interference-free, high-speed wireless application experience. Second only to the Cisco Aironet 3600 Series in performance and features, the Aironet 2600 Series sets the new standard for enterprise wireless technology.

Designed with rapidly evolving mobility needs in mind, the Aironet 2600 Series access point is packed with more Bring Your Own Device (BYOD)-enhancing functionality than any other access point at its price point. The new Cisco Aironet 2600 Series sustains reliable connections at higher speeds farther from the access point than competing solutions resulting in more availability of 450-Mbps data rates. Optimized for consumer devices, the Aironet 2600 Series accelerates client connections and consumes less mobile device battery power than competing solutions.

RF Excellence

The Cisco Aironet 2600 Series is ideal for enterprise networks of any size that need high-performance, secure, and reliable Wi-Fi connectivity for consumer devices, high-performance laptops, and specialized industry equipment such as point-of-sale devices and wireless medical equipment. Enterprise-class silicon and optimized radios deliver a robust mobility experience that includes:

- 802.11n with 3x4 multiple-input multiple-output (MIMO) technology with three spatial streams, which sustains 450-Mbps rates over a greater range for more capacity and reliability than competing access points.
- Cisco ClientLink 2.0 technology to improve downlink performance and range for all mobile devices, including one-, two-, and three- spatial stream devices on 802.11n, while improving battery life on mobile devices such as smartphones and tablets.
- Cisco CleanAir technology, which provides proactive, high-speed spectrum intelligence to combat performance problems due to wireless interference for a self-healing, self-optimized network.

All of these features help ensure the best possible end-user experience on the wireless network.

Cisco also offers the industry's broadest selection of 802.11n antennas delivering optimal coverage for a variety of deployment scenarios.

Scalability

The Cisco Aironet 2600 Series is a component of the Cisco Unified Wireless Network, which can scale to up to 18,000 access points with full Layer 3 mobility across central or remote locations on the enterprise campus, in branch offices, and at remote sites. The Cisco Unified Wireless Network is the industry's most flexible, resilient, and scalable architecture delivering secure access to mobility services and applications, and offering the lowest total cost of ownership and investment protection by integrating seamlessly with the existing wired network.

Cisco Network Assistant

For quick and easy setup of your access points, Cisco Network Assistant provides a centralized network view with a user-friendly GUI that simplifies configuration, management and troubleshooting. Using Cisco Network Assistant you can easily discover and initialize your network of stand-alone access points.

Cisco Network Assistant is available free, and can be downloaded here: http://www.cisco.com/go/cna.

Product Specifications

Table 1 lists the product specifications for Cisco Aironet 2600 Series Access Points.

Table 1. Product Specifications for Cisco Aironet 2600 Series Access Points

Item	Specification
Part Numbers	**The Cisco Aironet 2600i Access Point: Indoor environments with internal antennas** • AIR-CAP2602I-x-K9: Dual-band controller-based 802.11a/g/n • AIR-CAP2602I-xK910: Eco-pack (dual-band 802.11a/g/n) 10 quantity access points • AIR-SAP2602I-x-K9: Dual-band autonomous 802.11a/g/n • AIR-SAP2602I-x-K95: Eco-pack (dual-band 802.11a/g/n) 5 quantity access points **The Cisco Aironet 2600e Access Point: Indoor, challenging environments with external antennas** • AIR-CAP2602E-x-K9: Dual-band controller-based 802.11a/g/n • AIR-CAP2602E-xK910: Eco-pack (dual-band 802.11a/g/n) 10 quantity access points • AIR-SAP2602E-x-K9: Dual-band autonomous 802.11a/g/n

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td></td><td>
AIR-SAP2602E-x-K95: Eco-pack (dual-band 802.11a/g/n) 5 quantity access points
Cisco SMARTnet® Service for the Cisco Aironet 2600i Access Point with internal and External antennas
CON-SNT-y - SMARTnet 8x5xNBD 2600i/e access point (dual-band 802.11 a/g/n)
(e.g. CON-SNT-C262IE for AP2600 internal antenna for E Domain)
Cisco Wireless LAN Services
AS-WLAN-CNSLT - Cisco Wireless LAN Network Planning and Design Service
AS-WLAN-CNSLT - Cisco Wireless LAN 802.11n Migration Service
AS-WLAN-CNSLT - Cisco Wireless LAN Performance and Security Assessment Service
Regulatory Domains: (x = regulatory domain)
Customers are responsible for verifying approval for use in their individual countries. To verify approval and to identify the regulatory domain that corresponds to a particular country, visit: http://www.cisco.com/go/aironet/compliance.
Not all regulatory domains have been approved. As they are approved, the part numbers will be available on the Global Price List.
</td></tr>
<tr><td>Software</td><td>Cisco Unified Wireless Network Software Release 7.2.110 or later.</td></tr>
<tr><td>Supported Wireless LAN Controllers</td><td>Cisco 2500 Series, Cisco Wireless LAN Controller Module (WLCM) on Cisco Services Ready Engine (SRE) for Integrated Services Router Generation 2 (ISR G2), Cisco Wireless Services Module 2 (WiSM2), Cisco 5500 Series, Cisco Flex 7500 Series</td></tr>
<tr><td>802.11n Version 2.0 (and Related) Capabilities</td><td>3x4 multiple-input multiple-output (MIMO) with three spatial streams
Maximal ratio combining (MRC)
802.11n and 802.11a/g beamforming
20- and 40-MHz channels
PHY data rates up to 450 Mbps (40-MHz with 5 GHz)
Packet aggregation: Aggregated MAC Protocol Data Unit (A-MPDU) (Tx/Rx), Aggregated MAC Protocol Service Unit (A-MSDU) (Tx/Rx)
802.11 dynamic frequency selection (DFS)
Cyclic shift diversity (CSD) support</td></tr>
<tr><td>Data Rates Supported</td><td>
802.11a: 6, 9, 12, 18, 24, 36, 48, and 54 Mbps
802.11bg: 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, and 54 Mbps
802.11n data rates (2.4 GHz[1] and 5 GHz):
<table>
<tr><th rowspan="2">MCS Index[2]</th><th colspan="2">GI[3] = 800ns</th><th colspan="2">GI = 400ns</th></tr>
<tr><th>20-MHz Rate (Mbps)</th><th>40-MHz Rate (Mbps)</th><th>20-MHz Rate (Mbps)</th><th>40-MHz Rate (Mbps)</th></tr>
<tr><td>0</td><td>6.5</td><td>13.5</td><td>7.2</td><td>15</td></tr>
<tr><td>1</td><td>13</td><td>27</td><td>14.4</td><td>30</td></tr>
<tr><td>2</td><td>19.5</td><td>40.5</td><td>21.7</td><td>45</td></tr>
<tr><td>3</td><td>26</td><td>54</td><td>28.9</td><td>60</td></tr>
<tr><td>4</td><td>39</td><td>81</td><td>43.3</td><td>90</td></tr>
<tr><td>5</td><td>52</td><td>108</td><td>57.8</td><td>120</td></tr>
<tr><td>6</td><td>58.5</td><td>121.5</td><td>65</td><td>135</td></tr>
<tr><td>7</td><td>65</td><td>135</td><td>72.2</td><td>150</td></tr>
<tr><td>8</td><td>13</td><td>27</td><td>14.4</td><td>30</td></tr>
<tr><td>9</td><td>26</td><td>54</td><td>28.9</td><td>60</td></tr>
<tr><td>10</td><td>39</td><td>81</td><td>43.3</td><td>90</td></tr>
<tr><td>11</td><td>52</td><td>108</td><td>57.8</td><td>120</td></tr>
<tr><td>12</td><td>78</td><td>162</td><td>86.7</td><td>180</td></tr>
<tr><td>13</td><td>104</td><td>216</td><td>115.6</td><td>240</td></tr>
<tr><td>14</td><td>117</td><td>243</td><td>130</td><td>270</td></tr>
</table>
</td></tr>
</table>

[1] 2.4 GHz: 2 GHz **does not** support 40 MHz.

[2] MCS Index: The Modulation and Coding Scheme (MCS) index determines the number of spatial streams, the modulation, the coding rate, and data rate values.

[3] GI: A guard interval (GI) between symbols helps receivers overcome the effects of multipath delays.

Item	Specification				
	15	130	270	144.4	300
	16	19.5	40.5	21.7	45
	17	39	81	43.3	90
	18	58.5	121.5	65	135
	19	78	162	86.7	180
	20	117	243	130	270
	21	156	324	173.3	360
	22	175.5	364.5	195	405
	23	195	405	216.7	450
Frequency Band and 20-MHz Operating Channels	**A (A regulatory domain - FCC):** • 2.412 to 2.462 GHz; 11 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz, 8 channels (excludes 5.600 to 5.640 GHz) • 5.745 to 5.825 GHz; 5 channels **C (C regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.745 to 5.825 GHz; 5 channels **E (E regulatory domain - ETSI):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz, 8 channels (excludes 5.600 to 5.640 GHz) **I (I regulatory domain):** • 2.412 to 2.472 GHz, 13 channels • 5.180 to 5.320 GHz; 8 channels **K (K regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.620 GHz, 7 channels • 5.745 to 5.805 GHz, 4 channels			**N (N regulatory domain - Non FCC):** • 2.412 to 2.462 GHz; 11 channels • 5.180 to 5.320 GHz; 8 channels • 5.745 to 5.825 GHz; 5 channels **Q (Q regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz; 11 channels **R (R regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5,660 to 5,805 GHz, 7 channels **S (S regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz; 11 channels • 5.745 to 5.825 GHz; 5 channels **T (T regulatory domain):** • 2.412 to 2.462 GHz; 11 channels • 5.280 to 5.320 GHz; 3 channels • 5.500 to 5.700 GHz, 8 channels (excludes 5.600 to 5.640 GHz) • 5.745 to 5.825 GHz; 5 channels **Z (Z regulatory domain):** • 2.412 to 2.462 GHz; 11 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz, 8 channels (excludes 5.600 to 5.640 GHz) • 5.745 to 5.825 GHz; 5 channels	
Note: Customers are responsible for verifying approval for use in their individual countries. To verify approval and to identify the regulatory domain that corresponds to a particular country, visit: http://www.cisco.com/go/aironet/compliance.					
Maximum Number of Nonoverlapping Channels	**2.4 GHz** • 802.11b/g: ◦ 20 MHz: 3 • 802.11n: ◦ 20 MHz: 3		**5 GHz** • 802.11a: ◦ 20 MHz: 21 • 802.11n: ◦ 20 MHz: 21 ◦ 40 MHz: 9		
Note: This varies by regulatory domain. Refer to the product documentation for specific details for each regulatory domain.					
Receive Sensitivity	• 802.11b (CCK) ◦ -100 dBm @ 1 Mb/s ◦ -99 dBm @ 2 Mb/s ◦ -92 dBm @ 5.5 Mb/s ◦ -88 dBm @ 11 Mb/s	• 802.11g (non HT20) ◦ -91 dBm @ 6 Mb/s ◦ -91 dBm @ 9 Mb/s ◦ -91 dBm @ 12 Mb/s ◦ -90 dBm @ 18 Mb/s ◦ -87 dBm @ 24 Mb/s	• 802.11a (non HT20) ◦ -92 dBm @ 6 Mb/s ◦ -92 dBm @ 9 Mb/s ◦ -92 dBm @ 12 Mb/s ◦ -92 dBm @ 18 Mb/s ◦ -89 dBm @ 24 Mb/s		

Item	Specification			
		◦ -85 dBm @ 36 Mb/s ◦ -80 dBm @ 48 Mb/s ◦ -78 dBm @ 54 Mb/s	◦ -86 dBm @ 36 Mb/s ◦ -81 dBm @ 48 Mb/s ◦ -79 dBm @ 54 Mb/s	
	2.4-GHz • 802.11n (HT20) ◦ -91 dBm @ MCS0 ◦ -90 dBm @ MCS1 ◦ -90 dBm @ MCS2 ◦ -88 dBm @ MCS3 ◦ -85 dBm @ MCS4 ◦ -80 dBm @ MCS5 ◦ -78 dBm @ MCS6 ◦ -75 dBm @ MCS7 ◦ -90 dBm @ MCS8 ◦ -90 dBm @ MCS9 ◦ -89 dBm @ MCS10 ◦ -86 dBm @ MCS11 ◦ -82 dBm @ MCS12 ◦ -78 dBm @ MCS13 ◦ -77 dBm @ MCS14 ◦ -75 dBm @ MCS15 ◦ -90 dBm @ MCS16 ◦ -89 dBm @ MCS17 ◦ -87 dBm @ MCS18 ◦ -84 dBm @ MCS19 ◦ -81 dBm @ MCS20 ◦ -76 dBm @ MCS21 ◦ -75 dBm @ MCS22 ◦ -74 dBm @ MCS23		**5-GHz** • 802.11n (HT20) ◦ -92 dBm @ MCS0 ◦ -91 dBm @ MCS1 ◦ -90 dBm @ MCS2 ◦ -87 dBm @ MCS3 ◦ -84 dBm @ MCS4 ◦ -80 dBm @ MCS5 ◦ -78 dBm @ MCS6 ◦ -75 dBm @ MCS7 ◦ -92 dBm @ MCS8 ◦ -90 dBm @ MCS9 ◦ -88 dBm @ MCS10 ◦ -85 dBm @ MCS11 ◦ -81 dBm @ MCS12 ◦ -77 dBm @ MCS13 ◦ -76 dBm @ MCS14 ◦ -74 dBm @ MCS15 ◦ -91 dBm @ MCS16 ◦ -89 dBm @ MCS17 ◦ -86 dBm @ MCS18 ◦ -83 dBm @ MCS19 ◦ -80 dBm @ MCS20 ◦ -75 dBm @ MCS21 ◦ -74 dBm @ MCS22 ◦ -73 dBm @ MCS23	**5-GHz** • 802.11n (HT40) ◦ -89 dBm @ MCS0 ◦ -88 dBm @ MCS1 ◦ -87 dBm @ MCS2 ◦ -84 dBm @ MCS3 ◦ -81 dBm @ MCS4 ◦ -76 dBm @ MCS5 ◦ -74 dBm @ MCS6 ◦ -73 dBm @ MCS7 ◦ -89 dBm @ MCS8 ◦ -87 dBm @ MCS9 ◦ -85 dBm @ MCS10 ◦ -81 dBm @ MCS11 ◦ -78 dBm @ MCS12 ◦ -74 dBm @ MCS13 ◦ -72 dBm @ MCS14 ◦ -71 dBm @ MCS15 ◦ -88 dBm @ MCS16 ◦ -85 dBm @ MCS17 ◦ -83 dBm @ MCS18 ◦ -79 dBm @ MCS19 ◦ -76 dBm @ MCS20 ◦ -72 dBm @ MCS21 ◦ -70 dBm @ MCS22 ◦ -69 dBm @ MCS23
Maximum Transmit Power	**2.4 GHz** • 802.11b ◦ 22 dBm: 3 Antennas • 802.11g ◦ 22 dBm: 3 Antennas • 802.11n (HT20) ◦ 22 dBm: 3 Antennas		**5 GHz** • 802.11a ◦ 23 dBm: 4 Antennas • 802.11n (HT20) ◦ 23 dBm: 4 Antennas • 802.11n (HT40) ◦ 23 dBm: 4 Antennas	
Note: The maximum power setting will vary by channel and according to individual country regulations. Refer to the product documentation for specific details.				
Available Transmit Power Settings	**2.4 GHz** • 22 dBm (160 mW) • 19 dBm (80 mW) • 16 dBm (40 mW) • 13 dBm (20 mW) • 10 dBm (10 mW) • 7 dBm (5 mW) • 4 dBm (2.5 mW)		**5 GHz** • 23 dBm (200 mW) • 20 dBm (100 mW) • 17 dBm (50 mW) • 14 dBm (25 mW) • 11 dBm (12.5 mW) • 8 dBm (6.25 mW) • 5 dBm (3.13 mW)	
Note: The maximum power setting will vary by channel and according to individual country regulations. Refer to the product documentation for specific details.				
Integrated Antenna	• 2.4 GHz, Gain 4 dBi, internal omnidirectional, horizontal beamwidth 360° • 5 GHz, Gain 4 dBi, internal omnidirectional, horizontal beamwidth 360°			
External Antenna (Sold Separately)	• Certified for use with antenna gains up to 6 dBi (2.4 GHz and 5 GHz) • Cisco offers the industry's broadest selection of 802.11n antennas delivering optimal coverage for a variety of deployment scenarios			

Item	Specification
Interfaces	• 10/100/1000BASE-T autosensing (RJ-45) • Management console port (RJ-45)
Indicators	• Status LED indicates boot loader status, association status, operating status, boot loader warnings, boot loader errors
Dimensions (W x L x H)	• Access point (without mounting bracket): 8.69x8.69x2.11in. (22.1x22.1x5.4)
Weight	• 2.3 lbs (1.04 kg) (2.7 lbs for external)
Environmental	**Cisco Aironet 2600i** • Nonoperating (storage) temperature: -22 to 158°F (-30 to 70°C) • Nonoperating (storage) Altitude Test 25˚C, 15,000 ft. • Operating temperature: 32 to 104°F (0 to 40°C) • Operating humidity: 10 to 90% percent (noncondensing) • Operating Altitude Test: 40˚C, 9843 ft. **Cisco Aironet 2600e** • Nonoperating (storage) temperature: -22 to 158°F (-30 to 70°C) • Nonoperating (storage) Altitude Test: 25˚C, 15,000 ft. • Operating temperature: -4 to 131°F (-20 to 55°C) • Operating humidity: 10 to 90 % (noncondensing) • Operating Altitude Test: 40˚C, 9843 ft.
System Memory	• 256 MB DRAM • 32 MB flash
Input Power Requirements	• AP2600: 44 to 57 VDC • Power Supply and Power Injector: 100 to 240 VAC; 50 to 60 Hz
Powering Options	• 802.3af Ethernet Switch • Cisco AP2600 Power Injectors (AIR-PWRINJ4=) • Cisco AP2600 Local Power Supply (AIR-PWR-B=)
Power Draw	• AP2600: 12.95W **Note:** When deployed using Power over Ethernet (PoE), the power drawn from the power sourcing equipment will be higher by some amount depending on the length of the interconnecting cable. This additional power may be as high as 2.45W, bringing the total system power draw (access point + cabling) to 15.4W.
Warranty	Limited Lifetime Hardware Warranty
Compliance Standards	◦ UL 60950-1 ◦ CAN/CSA-C22.2 No. 60950-1 ◦ UL 2043 ◦ IEC 60950-1 ◦ EN 60950-1 ◦ EN 50155 • Radio approvals: ◦ FCC Part 15.247, 15.407 ◦ RSS-210 (Canada) ◦ EN 300.328, EN 301.893 (Europe) ◦ ARIB-STD 66 (Japan) ◦ ARIB-STD T71 (Japan) ◦ EMI and susceptibility (Class B) ◦ FCC Part 15.107 and 15.109 ◦ ICES-003 (Canada) ◦ VCCI (Japan) ◦ EN 301.489-1 and -17 (Europe) ◦ EN 60601-1-2 EMC requirements for the Medical Directive 93/42/EEC • IEEE Standard: ◦ IEEE 802.11a/b/g, IEEE 802.11n, IEEE 802.11h, IEEE 802.11d • Security: ◦ 802.11i, Wi-Fi Protected Access 2 (WPA2), WPA ◦ 802.1X ◦ Advanced Encryption Standards (AES), Temporal Key Integrity Protocol (TKIP)

Item	Specification
	• EAP Type(s): ◦ Extensible Authentication Protocol-Transport Layer Security (EAP-TLS) ◦ EAP-Tunneled TLS (TTLS) or Microsoft Challenge Handshake Authentication Protocol Version 2 (MSCHAPv2) ◦ Protected EAP (PEAP) v0 or EAP-MSCHAPv2 ◦ Extensible Authentication Protocol-Flexible Authentication via Secure Tunneling (EAP-FAST) ◦ PEAPv1 or EAP-Generic Token Card (GTC) ◦ EAP-Subscriber Identity Module (SIM) • Multimedia: ◦ Wi-Fi Multimedia (WMM™) • Other: ◦ FCC Bulletin OET-65C ◦ RSS-102

Limited Lifetime Hardware Warranty

The Cisco Aironet 2600 Series Access Point comes with a Limited Lifetime Warranty that provides full warranty coverage of the hardware for as long as the original end user continues to own or use the product. The warranty includes 10-day advance hardware replacement and ensures that software media is defect-free for 90 days. For more details, visit: http://www.cisco.com/go/warranty.

Cisco Wireless LAN Services

Realize the full business value of your technology investments faster with intelligent, customized services from Cisco and our partners. Backed by deep networking expertise and a broad ecosystem of partners, Cisco Wireless LAN Services enable you to deploy a sound, scalable mobility network that enables rich media collaboration while improving the operational efficiency gained from a converged wired and wireless network infrastructure based on the Cisco Unified Wireless Network. Together with partners, we offer expert plan, build, and run services to accelerate your transition to advanced mobility services while continuously optimizing the performance, reliability, and security of that architecture after it is deployed. For more details, visit: http://www.cisco.com/go/wirelesslanservices.

For More Information

For more information about the Cisco Aironet 2600 Series, visit http://www.cisco.com/go/wireless or contact your local account representative.

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Printed in USA C78-709514-03 02/14

Cisco 5700 Series Wireless Controller

The Cisco® 5760 Wireless Controller (Figure 1) is an industry-leading platform designed for 802.11ac networks with maximum performance and services at scale, combined with high availability for mission-critical wireless networks. Through the Unified Access Data Plane (UADP) application-specific integrated circuit (ASIC), it delivers wire-speed performance with services such as advanced quality of service (QoS), flexible NetFlow v9, and downloadable ACLs. Delivering on the One Network component of the Unified Access vision, the Cisco 5760 offers:

- Wire-speed 60-Gbps throughput with services
- Up to 1000 access points per controller and 72,000 access points in a cluster
- Up to 12,000 clients per controller and 864,000 clients in a cluster
- Network traffic visibility through flexible NetFlow v9
- RF visibility and protection
- Cisco CleanAir® technology
- ClientLink 3.0
- VideoStream
- Access Point Stateful Switchover(AP SSO)
- Application Visibility with AVC
- Service Discovery Gateway

Figure 1. Cisco 5760 Wireless LAN Controller

Features

The 5760 Wireless Controller can operate in both converged access mode and centralized mode. Converged access mode provides a hierarchical network design that distributes the wireless data plane at the access layer on Cisco Catalyst® switches for maximum performance and scale. Converged access mode provides maximum resiliency by constraining outages to smaller failure domains. Additionally, converged access mode delivers high availability with access point stateful failover (access point SSO), making sure SSIDs are highly available and have minimal effect on wireless clients. (See Tables 1 and 2)

Table 1. Cisco 5760 Wireless LAN Controller Features

Feature	Benefits
Scalability	• Supports up to 1000 access points and 12,000 wireless clients for business-critical wireless services. • Unparalleled scalable wireless solution including multiple controllers can support up to 72,000 access points and 864,000 wireless clients.
High performance	• Optimized for 802.11ac standard. • 6 10G SFP+ uplinks. • Hardware processing to provide up to 60 Gbps throughput with services such as downloadable ACL, granular QoS queues, fairness algorithm, NetFlow v9 processing, and so on.
High resiliency	• Converged access deployment mode provides hierarchical network design that constraints outages to smaller failure domains, thereby providing higher resiliency. Wireless clients will recover quickly from switch failures within the Cisco 3850 or 3650 Series switch stack automatically through stateful failover (access point SSO). • Cisco 5760 in centralized deployment mode (also known as local mode) supports 1+1 and N+1 resiliency. • Multiple link aggregation (LAG) support to protect against link failures while maintaining the optimal network connectivity. • 5760 also supports stateful switchover to the standby 5760 controller using the StackWise technology
Service Discovery Gateway	• Enables Apple Bonjour® services to be advertised and utilized in a separate Layer 2 network. Supports mDNS and DNS-SD standards for full interoperability.
Application Visibility	• Supports Cisco Application Visibility and Control(AVC), the technology that includes the Network-Based Application Recognition 2 (NBAR-2) engine, Cisco's deep packet inspection (DPI) capability
Controller based on Cisco IOS Software	• Proven and security hardened Cisco IOS® Software operating system. • Well known Cisco IOS Software CLI allows customers to use existing management tools for operations. • Cisco's rich NetFlow ecosystem enables customers to use reporting, monitoring, traffic analysis, and troubleshooting tools for wireless network.
ClientLink 2.0	• Cisco ClientLink 2.0 technology to improve downlink performance to all mobile devices, including one-, two, and three-spatial-stream devices on 802.11n while improving battery life on mobile devices such as smartphones and tablets.
CleanAir	• Cisco CleanAir technology, which provides proactive, high-speed spectrum intelligence to combat performance problems due to wireless interference.
RF management	• Provides both real-time and historical information about RF interference affecting network performance across controllers using systemwide Cisco CleanAir technology integration.
Comprehensive end-to-end security	• Offers Control and Provisioning of Wireless Access Points (CAPWAP)-compliant DTLS encryption to make sure of encryption between access points and controllers or between controllers.
High-performance video	• Optimized video delivery using single stream for both wired and wireless clients. • Supports Cisco VideoStream technology to optimize the delivery of business-critical multicast video applications across the WLAN.
End-to-end voice	• Supports unified communications for improved collaboration through messaging, presence, and conferencing. • Supports all Cisco Unified Communications Wireless IP Phones for cost-effective, real-time voice services.
Advanced QoS	• Consistent configuration CLI for both wired and wireless QoS through modular QoS CLI (MQC). • Granular QoS policies per access point, SSID, radio, and client. • Fair bandwidth allocation across wireless clients on an access point. • Uses Cisco's proven Cisco IOS Software and ASIC technology to provide line-rate performance.
Advanced ACL	• Simplifies and centralizes security policies through downloadable ACLs. • ACLs are processed in hardware to provide line-rate performance.
Flexible NetFlow v9	• Networkwide visibility with flexible NetFlow for wireless clients.
Environmentally responsible	• Organizations may choose to turn off access point radios to reduce power consumption during off-peak hours. • Integrated wireless LAN controller avoids the deployment of additional device in the network.
Mobility and security	• Secure, reliable wireless connectivity and consistent end-user experience. • Increased network availability through proactive blocking of known threats.
IPv6	• Supports IPv6 addressing on interfaces with appropriate show commands for monitoring and troubleshooting. • IPv6 ACLs are processed in hardware to provide line-rate performance.

Table 2. Product Specifications for Cisco 5700 Series Wireless Controllers

Item	Specifications
Wireless	IEEE 802.11a, 802.11b, 802.11g, WMM/802.11e, 802.11h, 802.11n, 802.11r, 802.11k, 802.11w, 802.11ac
Wired/switching	• IEEE 802.3u 100BASE-TX specification • 1000BASE-T • 1000BASE-SX • 1000-BASE-L • IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports • IEEE 802.1Q Vtagging • IEEE 802.1AX Link Aggregation
Data request for comments (RFC)	• RFC 768 UDP • RFC 791 IP • RFC 2460 IPv6 • RFC 792 ICMP • RFC 793 TCP • RFC 826 ARP • RFC 1122 Requirements for Internet Hosts • RFC 1519 CIDR • RFC 1542 BOOTP • RFC 2131 DHCP • RFC 5415 CAPWAP Protocol Specification • RFC 5416 CAPWAP Binding for 802.11
Security standards	• WPA • IEEE 802.11i (WPA2, RSN) • RFC 1321 MD5 Message-Digest Algorithm • RFC 1851 The ESP Triple DES Transform • RFC 2104 HMAC: Keyed Hashing for Message Authentication • RFC 2246 TLS Protocol Version 1.0 • RFC 2401 Security Architecture for the Internet Protocol • RFC 2403 HMAC-MD5-96 within ESP and AH • RFC 2404 HMAC-SHA-1-96 within ESP and AH • RFC 2405 ESP DES-CBC Cipher Algorithm with Explicit IV • RFC 2406 IPsec • RFC 2407 Interpretation for ISAKMP • RFC 2408 ISAKMP • RFC 2409 IKE • RFC 2451 ESP CBC-Mode Cipher Algorithms • RFC 3280 Internet X.509 PKI Certificate and CRL Profile • RFC 3602 The AES-CBC Cipher Algorithm and Its Use with IPsec • RFC 3686 Using AES Counter Mode with IPsec ESP • RFC 4347 Datagram Transport Layer Security • RFC 4346 TLS Protocol Version 1.1
Encryption	• WEP and TKIP-MIC: RC4 40, 104 and 128 bits (both static and shared keys) • AES: CBC, CCM, CCMP • DES: DES-CBC, 3DES • SSL and TLS: RC4 128-bit and RSA 1024- and 2048-bit • DTLS: AES-CBC • IPSec: DES-CBC, 3DES, AES-CBC

Item	Specifications
Authentication, authorization, and accounting (AAA)	• IEEE 802.1X • RFC 2548 Microsoft Vendor-Specific RADIUS Attributes • RFC 2716 PPP EAP-TLS • RFC 2865 RADIUS Authentication • RFC 2866 RADIUS Accounting • RFC 2867 RADIUS Tunnel Accounting • RFC 2869 RADIUS Extensions • RFC 3576 Dynamic Authorization Extensions to RADIUS • RFC 3579 RADIUS Support for EAP • RFC 3580 IEEE 802.1X RADIUS Guidelines • RFC 3748 Extensible Authentication Protocol • Web-based authentication • TACACS support for management users
Management	• SNMP v1, v2c, v3 • RFC 854 Telnet • RFC 1155 Management Information for TCP/IP-Based Internets • RFC 1156 MIB • RFC 1157 SNMP • RFC 1213 SNMP MIB II • RFC 1350 TFTP • RFC 1643 Ethernet MIB • RFC 2030 SNTP • RFC 2616 HTTP • RFC 2665 Ethernet-Like Interface types MIB • RFC 2674 Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering, and Virtual Extensions • RFC 2819 RMON MIB • RFC 2863 Interfaces Group MIB • RFC 3164 Syslog • RFC 3414 User-Based Security Model (USM) for SNMPv3 • RFC 3418 MIB for SNMP • RFC 3636 Definitions of Managed Objects for IEEE 802.3 MAUs • Cisco private MIBs • SSH • SFTP
Management interfaces	• Web-based: HTTP/HTTPS • Command-line interface: Telnet, Secure Shell (SSH) Protocol, serial port • Cisco Prime™
Interfaces	• Uplink: 6 ports **Supported interfaces:** • 10GBASE-ER • 10GBASE-LR • 10GBASE-SR • 10GBASE-LRM • 10GBASE-CX1(1m) • 10GBASE-CX1(3m) • 10GBASE-CX1(5m) • 10/100/1000BASE-T • 1000BASE-SX/LX/LH/EX/ZX • 1000BASE-BX10-D • 1000BASE-BX10-U • 100BASE-FX

Item	Specifications
SFP+/SFP (only Cisco SFPs supported)	• SFP-10G-ER • SFP-10G-LR • SFP-10G-SR • SFP-10G-LRM • SFP-H10GB-CU1M • SFP-H10GB-CU3M • SFP-H10GB-CU5M • GLC-BX-D • GLC-BX-U • GLC-SX-MM • GLC-SX-MMD • GLC-T • GLC-LH-SM • GLC-ZX-SM • CWDM-SFP • DWDM-SFP • SFP-GE-L • SFP-GE-S • GLC-LH-SMD • GLC-EX-SMD • GLC-GE-100FX
Interface indicators	• LED indicators: link • Service Port: 10/100/1000 Mbps Ethernet (RJ45) • Service Port: 10/100/1000 Mbps Ethernet (RJ45) For High Availability for future use • LED indicators: link • Utility Port: 10/100/1000 Mbps Ethernet (RJ45) • LED indicators: link • Expansion Slots: 1 (5760) • Console Port: RS232 (DB-9 male/RJ-45 connector included), mini-USB • Other Indicators: Sys, ACT, Power Supply 1, Power Supply 2
Regulatory Compliance: Products Should Comply with CE Marking per Directives 2004/108/EC and 2006/95/EC	
Safety	• UL 60950-1 Second Edition • CAN/CSA-C22.2 No. 60950-1 Second Edition • EN 60950-1 Second Edition • IEC 60950-1 Second Edition • AS/NZS 60950-1
EMC: emissions	• 47CFR Part 15 (CFR 47) Class A • AS/NZS CISPR22 Class A • CISPR22 Class A • EN55022 Class A • ICES003 Class A • VCCI Class A • EN61000-3-2 • EN61000-3-3 • KN22 Class A
EMC: immunity	• EN55024 • CISPR24 • KN24
Physical Specifications	
Dimensions (H x W x D)	1.75 x 17.5 x 17.7 in. (4.45 x 44.5 x 45.0 cm)
Weight	19.6 lbs (8.9 kg) with two power supplies installed 17.1 lbs (7.8 kg) with a single power supply installed

Item	Specifications
Environmental Ranges	
Operating temperature	23 to 113°F (-5 to 45°C)
Storage temperature	-40 to 158°F (-40 to 70°C)
Relative humidity	5 to 95% (noncondensing)
Operating altitude	Up to 10,000 ft (3000m)
Storage altitude	Up to 15,000 ft (4600m)
Input power	100 to 240 VAC; 50/60 Hz

Table 3 lists the ordering information for Cisco 5700 Series Wireless Controllers.

Table 3. Ordering Information for Cisco 5700 Series Wireless Controllers

Part Number	Product Description	Cisco SMARTnet Service 8x5xNBD
AIR-CT5760-25-K9	5700 Series Wireless Controller for up to 25 Cisco Access Points	CON-SNT-CT576025
AIR-CT5760-50-K9	5700 Series Wireless Controller for up to 50 Cisco Access Points	CON-SNT-CT576050
AIR-CT5760-100-K9	5700 Series Wireless Controller for up to 100 Cisco Access Points	CON-SNT-CT576100
AIR-CT5760-250-K9	5700 Series Wireless Controller for up to 250 Cisco Access Points	CON-SNT-CT576250
AIR-CT5760-500-K9	5700 Series Wireless Controller for up to 500 Cisco Access Points	CON-SNT-CT576500
AIR-CT5760-1K-K9	5700 Series Wireless Controller for up to 1000 Cisco Access Points	CON-SNT-CT57601K
AIR-CT5760-HA-K9	Cisco 5760 Wireless Controller for High Availability	CON-SNT-CT5760HA

Additive Capacity Upgrade Licenses

The simplified right-to-use (RTU) licensing model allows customers to buy only the required number of access point capacity licenses and then add the licenses through a simple CLI on the controller.

Tables 4 and 5 list additive capacity upgrade licenses for the Cisco 5700 Series.

Table 4. Ordering Information for Cisco 5700 Series Wireless Controllers Additive Capacity Licenses (E-Delivery)

	Part Number	Product Description	Cisco SMARTnet Service 8x5xNBD
e-License	L-LIC-CT5760-UPG	Primary upgrade license SKU for Cisco 5760 Wireless Controller (e-delivery)	CON-SNT-CT5760UP
	L-LIC-CTIOS-1A	1 access point adder license for the wireless controller based on Cisco IOS Software (e-delivery)	CON-SNT-LCTIOS1A

Table 5. Ordering Information for Cisco 5700 Series Wireless Controllers Additive Capacity Licenses (Paper)

	Part Number	Product Description	Cisco SMARTnet Service 8x5xNBD
Paper license	LIC-CT5760-UPG	Primary upgrade license SKU for Cisco 5760 Wireless Controller	CON-SNT-CT5760UP
	LIC-CTIOS-1A	1 access point adder license for the wireless controller based on Cisco IOS Software	CON-SNT-LCTIOS1A

The additive capacity licenses allow for the increase in access point capacity supported by the controller up to a maximum of 1000 access points. As an example, if a controller was initially ordered with the 250 access point support, that capacity could be later increased to up to 1000 access points by purchasing a 750 access point additive capacity license (750 * "LIC-CT5760-1A" or "L-LIC-CT5760-1A"). The single access point adder license SKU for the 5700 Series Wireless Controller allows customers the flexibility to purchase the exact number of licenses at a time. (See Tables 6 and 7)

Table 6. Accessories for Cisco 5700 Series Wireless Controllers

Part Number	Product Name
PWR-C1-350WAC/2	350WAC Redundant Power Supply Bay 2
AIR-CT5700-CCBL	5700 Series Wireless Controller Console cable
AIR-CT5760-RK-MNT	5760 Wireless Controller Rack mount kit

Table 7. Power Cords for Cisco 5700 Series Wireless Controllers

Part Number	Product Name
CAB-TA-NA	North America AC Type A Power Cable
CAB-TA-AP	Australia AC Type A Power Cable
CAB-TA-AR	Argentina AC Type A Power Cable
CAB-TA-SW	Switzerland AC Type A Power Cable
CAB-TA-UK	United Kingdom AC Type A Power Cable
CAB-TA-250V-JP	Japan 250V AC Type A Power Cable
CAB-TA-EU	Europe AC Type A Power Cable
CAB-TA-IT	Italy AC Type A Power Cable
CAB-TA-IN	India AC Type A Power Cable
CAB-TA-CN	China AC Type A Power Cable
CAB-TA-DN	Denmark AC Type A Power Cable
CAB-TA-IS	Israel AC Type A Power Cable
CAB-TA-JP	Japan AC Type A Power Cable

Table 8. Stacking cables for the Cisco 5700 Series Wireless Controllers

Part Number	Product Name
C STACK-T1-50CM=	Cisco StackWise-480 50cm stacking cable spare
STACK-T1-1M=	Cisco StackWise-480 1m stacking cable spare
STACK-T1-3M=	Cisco StackWise-480 3m stacking cable spare

DTLS Cisco 5700 Series Wireless Controllers

Datagram Transport Layer Security (DTLS) is required to encrypt the data plane traffic. If a customer chooses the software option “SW5760K9-xxxx” (for example, SW5760K9-32SE), DTLS data encryption is enabled by default. Customers planning to install this device physically in Russia must order the controller with DTLS disabled by choosing the DTLS disabled software version (for example, SW5760LPE-K9-32SE). Consult your local government regulations to make sure that data DTLS encryption is permitted.

Service and Support

Realize the full business value of your wireless network and mobility services investments more quickly with intelligent, customized services from Cisco and our partners. Backed by comprehensive networking expertise and a broad ecosystem of partners, Cisco professional and technical services enable you to successfully plan, build, and run your network as a powerful business platform. Our services can help you successfully deploy the Cisco 5700 Series Wireless Controller and integrate mobility solutions effectively to lower the total cost of ownership and secure your wireless network.

To learn more about Cisco wireless LAN service offers, visit http://www.cisco.com/go/wirelesslanservices.

Summary

The Cisco 5700 Series Wireless Controller is designed for 802.11ac networks, delivering wire-speed performance with services through hardware (ASIC) processing while offering maximum scalability and high resiliency for enterprise wireless deployments. The hierarchical wireless network design through the new converged access mode of deployment offers unparalleled scalability and future-proofs Wi-Fi networks.

The Cisco 5700 Series Wireless Controller is a controller based on Cisco IOS Software that enables customers to use the rich and proven features of Cisco IOS Software and its ecosystems. The Cisco IOS Software CLI allows customers to continue to use their existing tools to manage the wireless network. Cisco IOS Software makes sure of maximum security and stability.

All of these benefits are provided while maintaining Cisco's wireless innovations such as CleanAir, ClientLink 2.0, and VideoStream.

For More Information

For more information about Cisco wireless controllers, contact your local account representative or visit http://www.cisco.com/en/US/products/ps6366/index.html.

For more information about the Cisco Unified Wireless Network framework, visit http://www.cisco.com/go/unifiedwireless.

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Printed in USA C78-722607-02 11/13

Cisco Catalyst 3850 Series Switches

The Cisco® Catalyst® 3850 Series is the next generation of enterprise-class stackable access-layer switches that provide full convergence between wired and wireless on a single platform. Cisco's new Unified Access Data Plane (UADP) application-specific integrated circuit (ASIC) powers the switch and enables uniform wired-wireless policy enforcement, application visibility, flexibility and application optimization. This convergence is built on the resilience of the new and improved Cisco StackWise-480. The Cisco Catalyst 3850 Series Switches support full IEEE 802.3at Power over Ethernet Plus (PoE+), Cisco Universal Power over Ethernet (Cisco UPOE), modular and field-replaceable network modules, redundant fans and power supplies.

Product Overview

- Integrated wireless controller capability with:
  - Up to 40G of wireless capacity per switch (48-port models)
  - Support for up to 50 access points and 2000 wireless clients on each switching entity (switch or stack)
- 24 and 48 10/100/1000 data PoE+ and Cisco UPOE models with energy-efficient Ethernet (EEE)
  - Cisco StackWise-480 technology provides scalability and resiliency with 480 Gbps of stack throughput
  - Cisco StackPower™ technology provides power stacking among stack members for power redundancy
  - Three optional uplink modules with 4 x Gigabit Ethernet, 2 x 10 Gigabit Ethernet, or 4 x 10 Gigabit Ethernet ports
  - Dual redundant, modular power supplies and three modular fans providing redundancy
  - Full IEEE 802.3at (PoE+) with 30W power on all ports in 1 rack unit (RU) form factor
  - Cisco UPOE with 60W power per port in 1 rack unit (RU) form factor
- Software support for IPv4 and IPv6 routing, multicast routing, modular quality of service (QoS), Flexible NetFlow (FNF) Version 9, and enhanced security features
- Single universal Cisco IOS® Software image across all license levels, providing an easy upgrade path for software features
- Enhanced limited lifetime warranty (E-LLW) with next business day (NBD) advance hardware replacement and 90-day access to Cisco Technical Assistance Center (TAC) support

Switch Configurations

All switches ship with one of the four power supplies (350WAC, 715WAC, 1100WAC, or 440WDC). Figure 1 shows the Cisco Catalyst 3850 Series Switches.

Figure 1. Cisco Catalyst 3850 Series Switches

Table 1 shows the Cisco Catalyst 3850 Series configurations.

Table 1. Cisco Catalyst 3850 Series Configurations

Models	Total 10/100/1000 Ethernet Ports	Default AC Power Supply	Available PoE Power	StackPower
WS-C3850-24T	24	350WAC	-	Yes
WS-C3850-48T	48			
WS-C3850-24P	24 PoE+	715WAC	435W	
WS-C3850-48P	48 PoE+			
WS-C3850-48F	48 PoE+	1100WAC	800W	
WS-C3850-24U	24 UPOE	1100WAC	800W	
WS-C3850-48U	48 UPOE	1100WAC	800W	

Network Modules

The Cisco Catalyst 3850 Series Switches support three optional network modules for uplink ports. The default switch configuration doesn't include the uplink module. At the time of switch purchase the customer has the flexibility to choose from the network modules described in Table 2.

Figure 2 shows various network modules:

- 4 x Gigabit Ethernet with Small Form-Factor Pluggable (SFP)
- 2 x 10 Gigabit Ethernet with SFP+ or 4 x Gigabit Ethernet with SFP
- 4 x 10 Gigabit Ethernet with SFP+ (supported on the 48-port models only)

Figure 2. Network Modules with Four Gigabit Ethernet, Two 10 Gigabit Ethernet SFP+, or Four 10 Gigabit Ethernet SFP+ Interfaces

Table 2. Network Module Numbers and Descriptions

Product Number	Product Description
C3850-NM-4-1G	4 x Gigabit Ethernet network modules
C3850-NM-2-10G	4 x Gigabit Ethernet/2 x 10 Gigabit Ethernet network modules
C3850-NM-4-10G	4 x Gigabit Ethernet/4 x 10 Gigabit Ethernet network modules

The C3850-NM-4-10G module is supported on the 48-port models only.

The SFP+ interface supports both 10 Gigabit Ethernet and Gigabit Ethernet ports, allowing customers to use their investment in Gigabit Ethernet SFP and upgrade to 10 Gigabit Ethernet when business demands change without having to do a comprehensive upgrade of the access switch. The three network modules are hot swappable and can be used in any of the combinations shown in Table 3.

Table 3. Network Module Configurations

	Interface Options	
Network Module	**10 Gigabit Ethernet SFP+ Ports**	**Gigabit Ethernet SFP Ports**
4 x Gigabit Ethernet	0	4
4 x Gigabit Ethernet/2 x10 Gigabit Ethernet network modules	2	0
	0	4
	2	2
4 x Gigabit Ethernet/4 x10 Gigabit Ethernet network modules	4	0
	0	4
	2	2
	3	1
	1	3

Dual Redundant Modular Power Supplies

The Cisco Catalyst 3850 Series Switches support dual redundant power supplies. The switch ships with one power supply by default, and the second power supply can be purchased at the time of ordering the switch or at a later time. If only one power supply is installed, it should always be in power supply bay 1. The switch also ships with three field-replaceable fans. (See Figure 3.)

Figure 3. Dual Redundant Power Supplies

Table 4 shows the different power supplies available in these switches and available PoE power.

Table 4. Power Supply Models

Models	Default Power Supply	Available PoE Power
24-port data switch	PWR-C1-350WAC	-
48-port data switch		
24-port PoE switch	PWR-C1-715WAC	435W
48-port PoE switch		
48-port full PoE switch	PWR-C1-1100WAC	800W
24-port UPOE switch	PWR-C1-1100WAC	800W
48-port UPOE switch		

In addition to the power supplies listed in Table 4, a 440WDC power supply is available as a spare (should be ordered separately) on all switch models. The DC power supply also delivers PoE capabilities for maximum flexibility (refer to Table 5 for available PoE budget with DC power supplies). Customers can mix and match the AC and DC power supplies in the two available power supply slots. Any of these power supplies can be installed in any of the switches.

Table 5. Available PoE with DC Power Supply

Model	Number of 440WDC Power Supplies	Total Available PoE Budget
24-port PoE switch	1	220W
	2	660W
48-port PoE switch	1	185W
	2	625W

Power over Ethernet Plus (PoE+)

In addition to PoE (IEEE 802.3af), the Cisco Catalyst 3850 Series Switches support PoE+ (IEEE 802.3at standard), which provides up to 30W of power per port. The Cisco Catalyst 3850 Series Switches can provide a lower total cost of ownership (TCO) for deployments that incorporate Cisco IP phones, Cisco Aironet® wireless LAN (WLAN) access points, or any IEEE 802.3at-compliant end device. PoE removes the need for wall power to each PoE-enabled device and eliminates the cost for additional electrical cabling and circuits that would otherwise be necessary in IP phone and WLAN deployments. Table 6 shows the power supply combinations required for different PoE needs.

Table 6. Power Supply Requirements for PoE and PoE+

	24-Port PoE Switch	48-Port PoE Switch
PoE on all ports (15.4W per port)	One PWR-C1-715WAC	One PWR-C1-1100WAC or two PWR-C1-715WAC
PoE+ on all ports (30W per port)	One PWR-C1-1100WAC or two PWR-C1-715WAC	Two PWR-C1-1100WAC or one PWR-C1-1100WAC and one PWR-C1-715WAC

Cisco Universal Power over Ethernet (UPOE)

Cisco Universal Power over Ethernet is a breakthrough technology, offering the following services and benefits

- **60W per port** to enable a variety of end devices such as Samsung VDI client, BT IP turret systems in trading floors, Cisco Catalyst compact switches in retail/hospitality environments, personal Cisco Telepresence® systems, and physical access control devices
- High availability for power and guaranteed uninterrupted services, a requirement for critical applications (e911)
- Lowering OpEx by providing network resiliency at lower cost by consolidating backup power into the wiring closet
- Faster deployment of new campus access networking infrastructures by eliminating the need for a power outlet for every endpoint

Table 7. Power Supply Requirements for UPOE

	24-Port UPOE Switch	48-Port UPOE Switch
UPOE (60W per port) on all (24 port switch) or max. 30 ports (48 port switch)	One PWR-C1-1100WAC and one PWR-C1-715WAC	Two PWR-C1-1100WAC

Benefits

Converged Wired plus Wireless Access

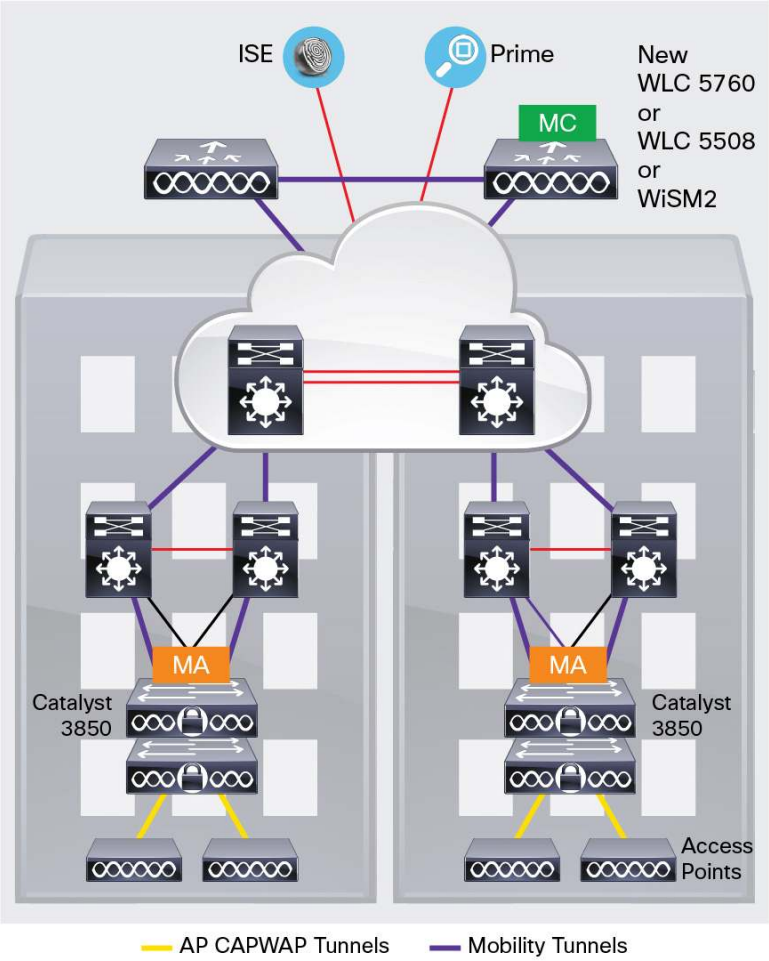
The Cisco Catalyst 3850 is the first stackable access switching platform that enables wired plus wireless services on a single Cisco IOS XE Software-based platform. With this, Cisco has pioneered a host of rich capabilities such as high availability based on stateful switchover (SSO) on stacking, granular QoS, security, and Flexible Netflow (FNF) across wired and wireless in a seamless fashion. Also, the wired plus wireless features are bundled into a single Cisco IOS Software image, which reduces the number of software images that users have to qualify/certify before enabling them in their network. The single console port for command-line interface (CLI) management reduces the number of touch points to manage for wired plus wireless services, thereby reducing network complexity, simplifying network operations, and lowering the TCO to manage the infrastructure.

Converged wired plus wireless not only improves wireless bandwidth across the network but also the scale of wireless deployment. Each 48-port Cisco Catalyst 3850 provides 40 Gbps of wireless throughput (20 Gbps on the 24-port model). This wireless capacity increases with the number of members in the stack. This makes sure that the network can scale with current wireless bandwidth requirements, as dictated by IEEE 802.11n-based access points and with future wireless standards such as IEEE 802.11ac. Additionally, the Cisco Catalyst 3850 distributes the wireless controller functions to achieve better scalability. Each Cisco Catalyst 3850 switch/stack can operate as the wireless controller in two modes:

- **Mobility agent (MA):** This is the default mode in which the Cisco Catalyst 3850 switch ships. In this mode the switch is capable of terminating the CAPWAP tunnels from the access points and providing wireless connectivity to wireless clients. Maintaining wireless client databases and configuring and enforcing security and QoS policies for wireless clients and access points can be enforced in this mode. No additional license on top of IP Base is required to operate in the mobility agent mode.
- **Mobility controller (MC):** In this mode, the Cisco Catalyst 3850 switch can perform all the mobility agent tasks in addition to mobility coordination, radio resource management (RRM), and Cisco CleanAir® coordination within a mobility subdomain. The mobility controller mode can be enabled on the switch CLI. IP Base license level is required when the Cisco Catalyst 3850 switch is acting as the mobility controller. A centrally located Cisco 5508 Wireless LAN Controller (WLC 5508), Cisco Wireless Services Module 2 (WiSM2) (when running AireOS Version 7.3), and Wireless LAN Controller 5760 can also perform this role for larger deployments.

  With mobility agents located in the wiring closets providing 40 Gbps of wireless per switch (*n* x 40 Gbps for a stack of *n* switches) and mobility controllers managing some of the central wireless functions, the converged access-based wireless deployment provides best-in-class scalability for wireless and significantly improved wireless throughput.

Figure 4. Mobility Controller (MC) and Mobility Agent (MA)



Distributed Intelligent Services

Flexible NetFlow (FNF)

Full visibility into the wired plus wireless traffic is achieved because of the access point Control and Provisioning of Wireless Access Points (CAPWAP) tunnel termination on the switch. This helps identify users and user traffic flows in order to identify potential attackers and take corrective action at the access layer before the attack penetrates further into the network. This is achieved using FNF, which monitors every single flow entering and exiting the switch stack for wired and wireless users. It also helps identify the top wired/wireless talkers and enforce appropriate bandwidth provisioning policies.

QoS

The 3850 switch has advanced wired plus wireless QoS capabilities. It uses the Cisco modular QoS command line interface (MQC). The switch manages wireless bandwidth using unprecedented hierarchical bandwidth management starting at the per-access-point level and drilling further down to per-radio, per-service set identification (SSID), and per-user levels. This helps manage and prioritize available bandwidth between various radios and various SSIDs (enterprise, guest, and so on) within each radio on a percentage basis. The switch is also capable of automatically allocating equal bandwidth among the connected users within a given SSID. This makes sure that all users within a given SSID get a fair share of the available bandwidth while being connected to the network. The UADP ASIC enables the hierarchical bandwidth management and fair sharing of bandwidth, thereby providing hardware-based QoS for optimized performance at line-rate traffic.

In addition to these capabilities, the switch is able to do class of service (CoS) or differentiated services code point (DSCP) based queuing, policing, shaping, and marking of wired plus wireless traffic. This enables users to create common policies that can be used across wired plus wireless traffic. The 3850 also supports downloadable policy names from the Cisco Identity Services Engine (ISE) when a user successfully authenticates to the network using the ISE.

Security

The Cisco Catalyst 3850 provides a rich set of security features for wired plus wireless users. Features such as IEEE 802.1x, Dynamic Host Configuration Protocol (DHCP) snooping, IP Source Guard and control plane protection, wireless intrusion prevention systems (WIPSs), and so on enable protection against unauthorized users and attackers. With a variety of wired plus wireless users connecting to the network, the switch supports session-aware networking, in which each device connected to the network is identified as one session, and unique access control lists (ACLs) and/or QoS policies can be defined and applied using the ISE for each of these sessions, providing better control on the devices connecting to the network.

Resiliency

Cisco StackWise-480 Technology

Cisco StackWise-480 technology is built on the highly successful industry-leading StackWise® technology, which is a premium stacking architecture. StackWise-480 has a stack bandwidth of 480 Gbps. StackWise-480 uses Cisco IOS Software SSO for providing resiliency within the stack. The stack behaves as a single switching unit that is managed by an “active” switch elected by the member switches. The active switch automatically elects a standby switch within the stack. The active switch creates and updates all the switching/routing/wireless information and constantly synchronizes that information with the standby switch. If the active switch fails, the standby switch assumes the role of the active switch and continues to the keep the stack operational. Access points continue to remain connected during an active-to-standby switchover.

A working stack can accept new members or delete old ones without service interruption. StackWise-480 creates a highly resilient single unified system of up to nine switches, providing simplified management using a single IP address, single Telnet session, single CLI, auto-version checking, auto-upgrading, auto-configuration, and more. StackWise-480 also enables local switching in Cisco Catalyst 3850 Series Switches.

Cisco StackPower Technology

The Cisco Catalyst 3850 Series uses the Cisco StackPower technology present on the Cisco Catalyst 3850 Series. StackPower is an innovative power interconnect system that allows the power supplies in a stack to be shared as a common resource among all the switches. Cisco StackPower unifies the individual power supplies installed in the switches and creates a pool of power, directing that power where it is needed. Up to four switches can be configured in a StackPower stack with the special connector at the back of the switch using the StackPower cable, which is different than the StackWise-480 cables. (See Figure 4.)

Figure 5. StackWise-480 and StackPower Connectors

StackPower can be deployed in either power-sharing mode or redundancy mode. In power-sharing mode, the power of all the power supplies in the stack is aggregated and distributed among the switches in the stack. In redundant mode, when the total power budget of the stack is calculated, the wattage of the largest power supply is not included. That power is held in reserve and used to maintain power to switches and attached devices when one power supply fails, enabling the network to operate without interruption. Following the failure of one power supply, the StackPower mode becomes power sharing.

StackPower allows customers to simply add one extra power supply in any switch of the stack and either provide power redundancy for any of the stack members or simply add more power to the shared pool. StackPower eliminates the need for an external redundant power system or installation of dual power supplies in all the stack members. StackPower is available in LAN Base license level (or higher). For LAN Base, cables need to be purchased separately.

Foundation for Open Network Environment

The heart of the Cisco Catalyst 3850 is the UADP ASIC with programmability for future features and intelligence with investment protection. The new ASIC provides the foundation for converged APIs across wired and wireless, Cisco Open Network Environment, software-defined networking (SDN) readiness and OnePK SDK through software updates over the product lifetime.

Software Features and Services on Cisco Catalyst 3850 Series Switches

Software services supported on the Cisco Catalyst 3850 Series Switches can be classified into five broad categories:

- Ease of operations
- Advanced security features
- Resiliency
- Application visibility and control

Ease of Operations

The Cisco Catalyst 3850 help reduce the operating costs through:

- Cisco Catalyst Smart Operations
- Easy-to-use deployment and control features
- Efficient switch operations
- Network management tools

Cisco Catalyst Smart Operations

Cisco Catalyst Smart Operations are a comprehensive set of capabilities that simplify LAN deployment, configuration, and troubleshooting. In addition to adaptive, always-on technologies such as StackWise-480 and StackPower, Cisco Catalyst Smart Operations enable zero-touch installation and replacement of switches, fast upgrade, and ease of troubleshooting with reduced operational cost. Cisco Catalyst Smart Operations are a set of features that includes Smart Install, Auto Smartports, Smart Configuration and Smart Troubleshooting to enhance operational excellence:

- Cisco Smart Install is a transparent plug-and-play technology to configure the Cisco IOS Software image and switch configuration without user intervention. Smart Install utilizes dynamic IP address allocation and the assistance of other switches to facilitate installation, providing transparent network plug and play.
- Cisco Auto Smartports provide automatic configuration as devices connect to the switch port, allowing auto-detection and plug and play of the device onto the network.
- Cisco Smart Troubleshooting is an extensive array of debug diagnostic commands and system health checks within the switch, including Generic Online Diagnostics (GOLD) and Onboard Failure Logging (OBFL).
- Embedded Event Manager (EEM) is a powerful and flexible feature that provides real-time network event detection and onboard automation. Using EEM, customers can adapt the behavior of their network devices to align with their business needs. This feature requires the IP Base feature set.

Easy-to-Use Deployment and Control Features

- User experience:
  - IP service-level agreements (SLAs) enable customers to assure new business-critical IP applications, as well as IP services that utilize data, voice, and video, in an IP network. This feature requires the IP Services feature set.
  - DHCP autoconfiguration of multiple switches through a boot server eases switch deployment.

    - Automatic QoS (AutoQoS) simplifies QoS configuration in voice over IP (VoIP) networks by issuing interface and global switch commands to detect Cisco IP phones, classify traffic, and help enable egress queue configuration.
    - Autonegotiation on all ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.
    - Automatic media-dependent interface crossover (MDIX) automatically adjusts transmit and receive pairs if an incorrect cable type (crossover or straight through) is installed.
- Simplified configuration and connectivity:
    - Dynamic Trunking Protocol (DTP) facilitates dynamic trunk configuration across all switch ports.
    - Port Aggregation Protocol (PAgP) automates the creation of Cisco Fast EtherChannel groups or Gigabit EtherChannel groups to link to another switch, router, or server.
    - Link Aggregation Control Protocol (LACP) allows the creation of Ethernet channeling with devices that conform to IEEE 802.3ad. This feature is similar to Cisco EtherChannel technology and PAgP.
    - Unidirectional Link Detection Protocol (UDLD) and aggressive UDLD allow unidirectional links caused by incorrect fiber-optic wiring or port faults to be detected and disabled on fiber-optic interfaces.
    - Cisco VLAN Trunking Protocol (VTP) Version 3 supports dynamic VLANs and dynamic trunk configuration across all switches.
- Efficient switch operation:
    - Switching database manager (SDM) templates, VLAN template (specific to LAN Base license level), and advanced template allow the administrator to automatically optimize the ternary content-addressable memory (TCAM) allocation to the desired features based on deployment-specific requirements.
    - Local proxy Address Resolution Protocol (ARP) works in conjunction with private VLAN edge to minimize broadcasts and maximize available bandwidth.
    - Stacking master configuration management with Cisco StackWise-480 technology helps make sure that all switches are automatically upgraded when the master switch receives a new software version. Automatic software version checking and updating help ensure that all stack members have the same software version.
    - Trivial File Transfer Protocol (TFTP) reduces the cost of administering software upgrades by downloading from a centralized location.
    - Network Timing Protocol (NTP) provides an accurate and consistent timestamp to all intranet switches.
- Multicast:
    - Optimized multicast for wired plus wireless: Cisco Catalyst 3850 offers greater multicast efficiency by receiving only one multicast stream and replicating it for all connected wired plus wireless devices connected to that switch.
    - Internet Group Management Protocol (IGMP) v1, v2, v3 snooping for IPv4: multicast listener discovery (MLD) v1 and v2 snooping provides fast client joins and leaves of multicast streams and limits bandwidth-intensive video traffic to only the requestors.
- Monitoring:
    - Remote Switch Port Analyzer (RSPAN) allows administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network.

- For enhanced traffic management, monitoring, and analysis, the Embedded Remote Monitoring (RMON) software agent supports four RMON groups (history, statistics, alarms, and events).
- Layer 2 traceroute eases troubleshooting by identifying the physical path that a packet takes from source to destination.
- Wireless RF management provides both real-time and historical information about RF interference affecting network performance across controllers using systemwide Cisco CleanAir technology integration.

Efficient Switch Operation

Cisco Catalyst 3850 Series Switches, designed and engineered by Cisco, provide optimum power-saving, EEE, low-power operations for industry best-in-class power management and power consumption capabilities. The Cisco Catalyst 3850 ports are capable of reduced power modes so that ports not in use can move into a lower power utilization state. Other efficient switch operation features are:

- Cisco Discovery Protocol Version 2 allows the Cisco Catalyst 3850 Series Switches to negotiate a more granular power setting when connecting to a Cisco powered device such as IP phones or access points than what is provided by IEEE classification.
- Per-port power consumption command allows customers to specify maximum power setting on an individual port. Per-port PoE power sensing measures actual power being drawn, enabling more intelligent control of powered devices.
- The PoE MIB provides proactive visibility into power usage and allows customers to set different power-level thresholds.

Environmentally Responsible

Organizations may choose to turn off access point radios to reduce power consumption during off-peak hours. The integrated wireless LAN controller avoids the deployment of additional devices in the network.

Network Management Tools

The Cisco Catalyst 3850 Series Switches offer both a superior CLI for detailed configuration and Cisco Prime™ infrastructure for unified wired plus wireless management. Prime infrastructure provides day 0 and ongoing provisioning, ongoing monitoring and maintenance, configuration templates, and device and user 360-degree views and serves as the FNF collector for user traffic views using the Prime Assurance Manager module.

For detailed information about Cisco Prime infrastructure, go to http://www.cisco.com/en/US/products/ps12239/index.html.

Advanced Security Features

Cisco Catalyst 3850 Series Switches support advanced security features including but not limited to:

- Protection against attackers:
  - Port security secures the access to an access or trunk port based on MAC address. It limits the number of learned MAC addresses to deny MAC address flooding.
  - DHCP snooping prevents malicious users from spoofing a DHCP server and sending out bogus addresses. This feature is used by other primary security features to prevent a number of other attacks such as ARP poisoning.

    - Dynamic ARP inspection (DAI) helps ensure user integrity by preventing malicious users from exploiting the insecure nature of ARP.
    - IP source guard prevents a malicious user from spoofing or taking over another user's IP address by creating a binding table between the client's IP and MAC address, port, and VLAN.
    - The Unicast Reverse Path Forwarding (RPF) feature helps mitigate problems caused by the introduction of malformed or forged (spoofed) IP source addresses into a network by discarding IP packets that lack a verifiable IP source address.
    - Bidirectional data support on the SPAN port allows the Cisco intrusion detection system (IDS) to take action when an intruder is detected.
- User authentication:
    - Flexible authentication that supports multiple authentication mechanisms, including 802.1X, MAC authentication bypass, and web authentication using a single, consistent configuration.
    - RADIUS change of authorization and downloadable calls for comprehensive policy management capabilities.
    - Private VLANs restrict traffic between hosts in a common segment by segregating traffic at Layer 2, turning a broadcast segment into a nonbroadcast multiaccess like segment. Private VLAN edge provides security and isolation between switch ports, which helps ensure that users cannot snoop on other users' traffic.
    - Multidomain authentication allows an IP phone and a PC to authenticate on the same switch port while placing them on appropriate voice and data VLAN.
    - MAC address notification allows administrators to be notified of users added to or removed from the network.
    - Mobility and security for secure, reliable wireless connectivity and consistent end-user experience. Increased network availability through proactive blocking of known threats.
    - IGMP filtering provides multicast authentication by filtering out nonsubscribers and limits the number of concurrent multicast streams available per port.
- ACLs:
    - Cisco security VLAN ACLs on all VLANs prevent unauthorized data flows from being bridged within VLANs.
    - Cisco standard and extended IP security router ACLs define security policies on routed interfaces for control-plane and data-plane traffic. IPv6 ACLs can be applied to filter IPv6 traffic.
    - Port-based ACLs for Layer 2 interfaces allow security policies to be applied on individual switch ports.
- Device access:
    - Secure Shell (SSH) Protocol, Kerberos, and Simple Network Management Protocol Version 3 (SNMPv3) provide network security by encrypting administrator traffic during Telnet and SNMP sessions. SSH Protocol, Kerberos, and the cryptographic version of SNMPv3 require a special cryptographic software image because of U.S. export restrictions.
    - TACACS+ and RADIUS authentication facilitates centralized control of the switch and restricts unauthorized users from altering the configuration.
    - Multilevel security on console access prevents unauthorized users from altering the switch configuration.

- Bridge protocol data unit (BPDU) Guard shuts down Spanning Tree PortFast-enabled interfaces when BPDUs are received to avoid accidental topology loops.
- Spanning Tree Root Guard (STRG) prevents edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.
- Wireless end-to-end security offers CAPWAP-compliant DTLS encryption to make sure of encryption between access points and controllers across remote WAN/LAN links.

Resiliency

Borderless networks enable enterprise mobility and business-grade video services. Industry's first unified network (wired plus wireless) location services enable tracking of mobile assets and the users of those assets for both wired plus wireless devices. The true borderless experience is enabled by the following feature sets in the Cisco Catalyst 3850 Series Switches:

- High availability
- High-performance IP routing
- Superior QoS

High Availability

In addition to StackWise-480 and StackPower, the Cisco Catalyst 3850 Series supports high-availability features including but not limited to the following:

- Cross-Stack EtherChannel provides the ability to configure Cisco EtherChannel technology across different members of the stack for high resiliency.
- Flexlink provides link redundancy with convergence time less than 100ms.
- IEEE 802.1s/w Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP) provide rapid spanning-tree convergence independent of spanning-tree timers and also offer the benefit of Layer 2 load balancing and distributed processing. Stacked units behave as a single spanning-tree node.
- Per-VLAN Rapid Spanning Tree (PVRST+) allows rapid spanning-tree reconvergence on a per-VLAN spanning-tree basis, without requiring the implementation of spanning-tree instances.
- Switch-port autorecovery (Err-disable) automatically attempts to reactivate a link that is disabled because of a network error.

High-Performance IP Routing

The Cisco Express Forwarding hardware routing architecture delivers extremely high-performance IP routing in the Cisco Catalyst 3850 Series Switches:

- IP unicast routing protocols (static, Routing Information Protocol Version 1 [RIPv1], and RIPv2, RIPng, Enhanced Interior Gateway Routing Protocol [EIGRP] stub) are supported for small-network routing applications with the IP Base feature set. Limited static routing with the LAN Base feature set. Equal-cost routing facilitates Layer 3 load balancing and redundancy across the stack.
- Advanced IP unicast routing protocols (Open Shortest Path First [OSPF], EIGRP, Border Gateway Protocol Version 4 [BGPv4], and Intermediate System-to-Intermediate System Version 4 [IS-ISv4]) are supported for load balancing and constructing scalable LANs. IPv6 routing (OSPFv3, EIGRPv6) is supported in hardware for maximum performance. OSPF for routed access is included in the IP Base image. The IP Services feature set is required for full OSPF, EIGRP, BGPv4, and IS-ISv4.

- Policy-based routing (PBR) allows superior control by facilitating flow redirection regardless of the routing protocol configured. Virtual routing and forwarding (VRF)-Lite enables a service provider to support two or more VPNs, with overlapping IP addresses. The IP Services feature set is required.
- Protocol-independent multicast (PIM) for IP multicast routing is supported, including PIM sparse mode (PIM-SM), PIM dense mode (PIM-DM), PIM sparse-dense mode, and source-specific multicast (SSM). The IP Services feature set is required.
- IPv6 addressing is supported on interfaces with appropriate show commands for monitoring and troubleshooting.

Superior QoS

The Cisco Catalyst 3850 Series offers Gigabit Ethernet speed with intelligent services that keep traffic flowing smoothly, even at 10 times the normal network speed. Industry-leading mechanisms for cross-stack marking, classification, and scheduling deliver superior performance for data, voice, and video traffic, all at wire speed.

The following are some of the QoS features supported in the Cisco Catalyst 3850 Series Switches:

- Granular wireless bandwidth management and fair sharing use Cisco's proven Cisco IOS Software and UADP ASIC technology to provide hierarchical bandwidth management at line rate (per access point, per radio, per SSID, per client-based policies). Fair sharing across the users within an SSID makes sure that no single user is starved because of other heavy-hitting users. Fair sharing is automatically enabled for wireless at user level as well as SSID level.
- 802.1p CoS and DSCP field classification is provided, using marking and reclassification on a per-packet basis by source and destination IP address, MAC address, or Layer 4 Transmission Control Protocol/User Datagram Protocol (TCP/UDP) port number.
- Shaped round robin (SRR) scheduling helps ensure differential prioritization of packet flows by intelligently servicing the ingress queues and egress queues. Weighted tail drop (WTD) provides congestion avoidance at the ingress and egress queues before a disruption occurs. Strict priority queuing helps ensure that the highest priority packets are serviced ahead of all other traffic.
- The Cisco committed information rate (CIR) function provides bandwidth in increments as low as 8 Kbps.
- Rate limiting is provided based on source and destination IP address, source and destination MAC address, Layer 4 TCP/UDP information, or any combination of these fields, using QoS ACLs (IP ACLs or MAC ACLs), class maps, and policy maps.
- Eight egress queues per port for wired traffic and four egress queues for wireless help enable differentiated management of different traffic types across the stack for wired traffic. Up to 2000 aggregate policers are available per switch.

Application Visibility and Control Using Flexible NetFlow

Cisco IOS Software FNF is the next generation in flow visibility technology, allowing optimization of the network infrastructure, reducing operation costs, and improving capacity planning and security incident detection with increased flexibility and scalability. The Cisco Catalyst 3850 provides optimized application visibility with FNF across wired plus wireless. The switch is capable of 48,000 flow entries on 48-port models and 24,000 flow entries on 24-port models across wired plus wireless. With UADP ASIC, Cisco Catalyst 3850 delivers next-generation flow technology with unprecedented flexibility and comprehensive visibility extending from Layer 2 (MAC and VLAN) to Layer 4 (TCP/UDP) flags and so on across wired plus wireless traffic. The Cisco Catalyst 3850 switch is Medianet capable to provide visibility and troubleshooting capabilities across wired plus wireless video traffic. Specific Medianet features will be enabled in future software updates.

The flow data collected by FNF can be exported to an external collector for analysis and reporting or tracked by the EEM. The Cisco Catalyst 3850 enables powerful on-box and customizable event correlation and policy actions with EEM, allowing the switches to trigger customized event alarms or policy actions when the predefined condition is met. With no external appliance required, customers are able to use existing infrastructure to perform traffic monitoring, making traffic analysis economical even on a large IP network.

Details about Cisco FNF are available at http://www.cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6555/ps6601/ps6965/product_data_sheet0900aecd804b590b.html.

High-performance video over wireless integrates Cisco VideoStream technology to optimize the delivery of video applications across the WLAN.

Wired plus wireless IP telephony supports unified communications for improved collaboration through messaging, presence, and conferencing and supports all Cisco Unified Communications wireless IP phones for cost-effective, real-time voice service.

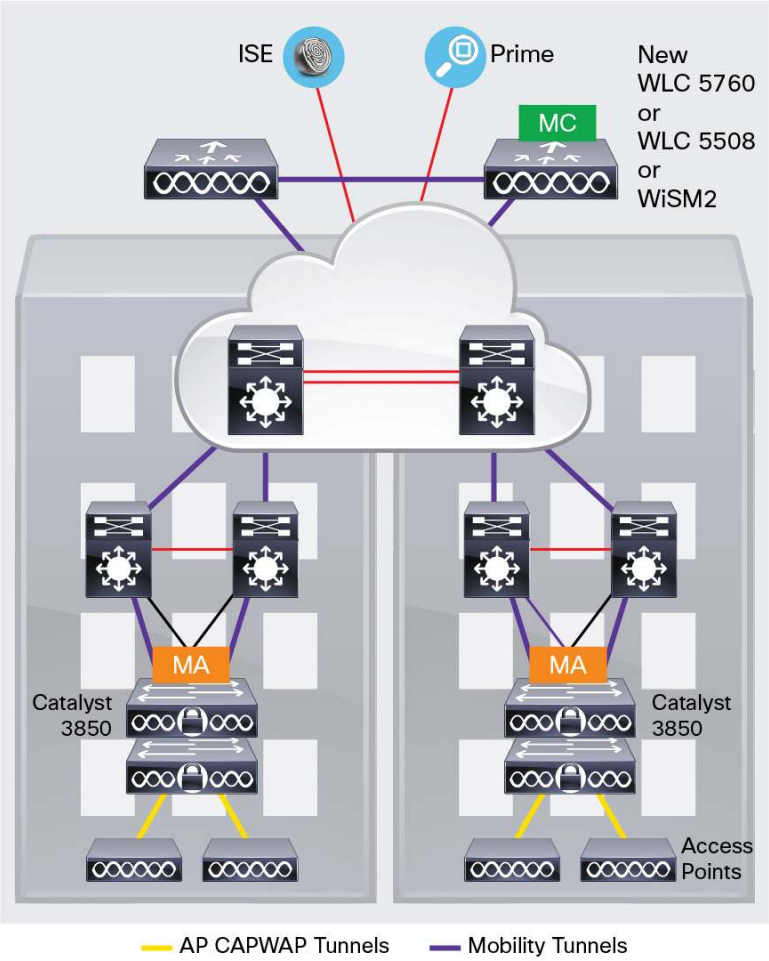
Deployment Options

Campus

In a campus-type deployment, operating the Cisco Catalyst 3850 in the mobility agent mode and centralizing the mobility controller functionality in a WLC 5760, WLC 5508, or WiSM2 helps achieve better scalability and performance. The Cisco Catalyst 3850 provides CAPWAP termination for access points, uniform policy enforcement for wireless clients, better wireless bandwidth, and uniform Cisco IOS Software-based configuration and monitoring for wired plus wireless features. The mobility controller provides central mobility, RRM, and CleanAir coordination.

Backward compatibility with traditional centralized wireless deployment mode on the WLC 5508, WiSM2, and WLC 5760 ensures that customers can migrate to the Cisco Catalyst 3850-based converged access approach in phases, providing a continued controller for existing access points. This migration also provides investment protection on the existing wireless controller infrastructure. A phased adoption of the new Cisco Catalyst 3850 ensures that migration to the converged access mode of wireless is seamless. Figure 6 shows **Catalyst 3850 in the campus type deployment.**

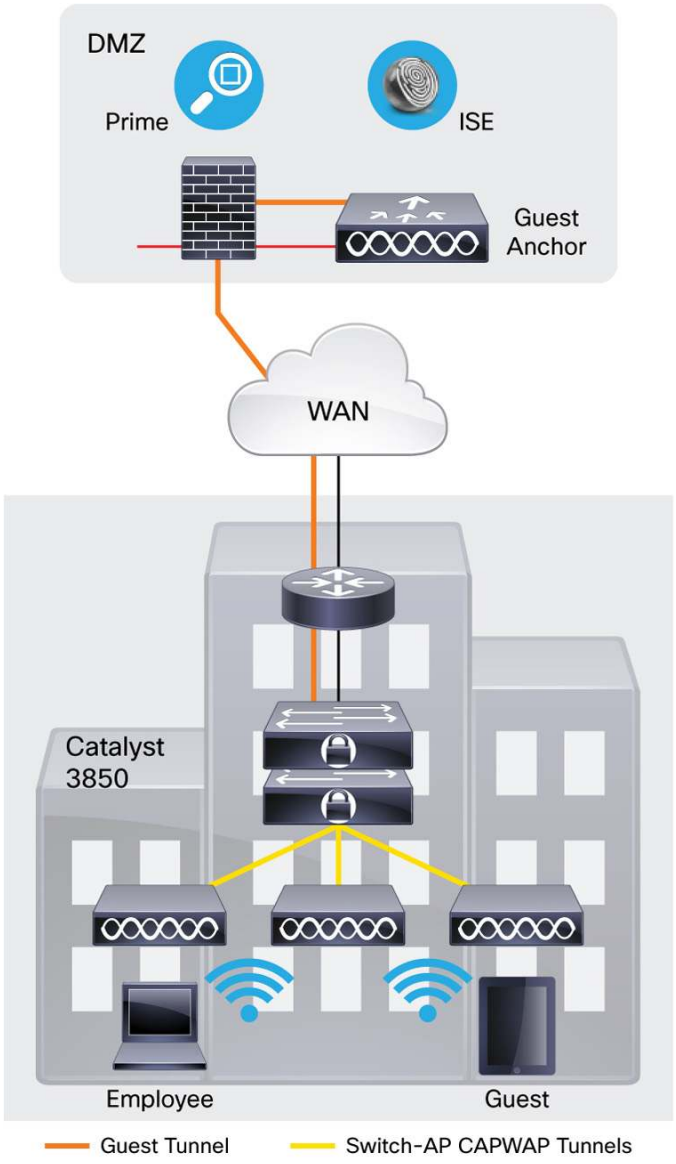
Figure 6. Mobility Controller (MC) and Mobility Agent (MA)



Branch

3850 is optimized for branch deployments when it operates in mobility controller mode. In this mode, not only can the switch terminate CAPWAP tunnels from the access points and provide client connectivity, it can also manage mobility within the branch. This eliminates the need for a local controller in every branch in addition to the access-layer switches. Also, complete visibility into the wired plus wireless traffic means that the WAN router can prioritize the right wired plus wireless traffic in and out of the branch. Figure 7 shows **Cisco Catalyst 3850 in the branch type deployment.**

Figure 7. Deploying Cisco Catalyst 3850 in the Branch



Cisco Catalyst 3850 Series Specifications

Switch Performance

Table 7 shows Cisco Catalyst 3850 Series Switches performance specifications.

Table 8. Cisco Catalyst 3850 Performance Specifications

Performance Numbers for All Switch Models	
Switching capacity	176 Gbps on 48-port models 88 Gbps on 24-port models
Stacking bandwidth	480 Gbps
Total number of MAC addresses	32,000
Total number of IPv4 routes (ARP plus learned routes)	24,000

Performance Numbers for All Switch Models	
FNF entries	48,000 flow on 48-port models 24,000 flows on 24-port models
DRAM	4 Gb
Flash	2 Gb
VLAN IDs	4,000
Total switched virtual interfaces (SVIs)	1,000
Jumbo frame	9198 bytes
Total routed ports per 3850 stack	208
Wireless	
Number of access points per switch/stack	50
Number of wireless clients per switch/stack	2000
Total number of WLANs per switch	64
Wireless bandwidth per switch	Up to 40 Gbps on 48-port models Up to 20 Gbps on 24-port models
Supported Aironet access point series	3600, 3500, 2600, 1600, 1260, 1140, 1040
Forwarding Rate of Switch Models (with 2 x 10 Gigabit Ethernet Uplinks for 24-Port Models and 4 x 10 Gigabit Ethernet Uplinks for 48-Port Models)	
Model	**Forwarding Rate**
3850-24T **3850-24P**	65.47 Mpps
3850-48T **3850-48P** **3850-48F**	130.95 Mpps

Dimensions, Weight, Acoustic, Mean Time Between Failure, and Environmental Range Specifications for Cisco Catalyst 3850 Series Switches

Table 8 shows dimensions, weight, acoustic, mean time between failure (MTBF), and environmental range. Weight does not include an uplink FRU. Weight includes the chassis assembly as it is shipped (with fans), one power supply and, and one power supply slot blank.

Table 9. Dimensions, Weight, Acoustic, MTBF, and Environmental Range

Dimensions (H x W x D)	Inches	Centimeters
WS-C3850-24T **WS-C3850-24P** **WS-C3850-48T** **WS-C3850-48P**	1.75 x 17.5 x 17.7	4.45 x 44.5 x 45.0
WS-C3850-48F	1.75 x 17.5 x 19.2	4.45 x 44.5 x 48.8
Weight	**Pounds**	**Kilograms**
WS-C3850-24T	15.9	7.2
WS-C3850-24P	16.3	7.4
WS-C3850-24U	16.5	7.5
WS-C3850-48T	17.0	7.7
WS-C3850-48P	17.4	7.9
WS-C3850-48F	17.6	8.0
WS-C3850-48U	17.6	8.0
C3850-NM-4-1G	0.66	0.30

C3850-NM-2-10G	0.71	0.32
C3850-NM-4-10G	0.75	0.34
MTBF Hours		
WS-C3850-24T	303,230	
WS-C3850-24P	269,450	
WS-C3850-24U	237,310	
WS-C3850-48T	303,660	
WS-C3850-48P	241,050	
WS-C3850-48F	241,050	
WS-C3850-48U	205,110	
PWR-C1-350WAC	580,710	
PWR-C1-715WAC	664,055	
PWR-C1-1100WAC	392,174	
PWR-C1-440WDC	469,350	
C3850-NM-4-1G	7,052,100	
C3850-NM-2-10G	4,315,970	
C3850-NM-4-10G	3,835,330	
Environmental Ranges		
With AC power supply **Operating environment and altitude**	Normal operating temperature* and altitudes: • -5ºC to +45ºC, up to 5000 feet (1500m) • -5ºC to +40ºC, up to 10,000 feet (3000m) * Minimum ambient temperature for cold start is 32℉ (0 ℃). Short-term* exceptional conditions: • -5ºC to +50ºC, up to 5000 feet (1500m) • -5ºC to +45ºC, up to 10,000 feet (3000m) • -5ºC to +45ºC, at sealevel with single fan failure * Not more than following in one-year period: 96 consecutive hours, or 360 hours total, or 15 occurrences.	
With DC power supply **Operating environment and altitude (NEBS)**	Normal operating temperature and altitudes: • -5ºC to +45ºC, up to 6000 feet (1800m) • -5ºC to +40ºC, up to 10,000 feet (3000m) • -5ºC to +35ºC, up to 13,000 feet (4000m) Short-term* exceptional conditions: • -5ºC to +55ºC, up to 6000 feet (1800m) • -5ºC to +50ºC, up to 10,000 feet (3000m) • -5ºC to +45ºC, up to 13,000 feet (4000m) • -5ºC to +45ºC, at sealevel with single fan failure * Not more than following in one-year period: 96 consecutive hours, or 360 hours total, or 15 occurrences.	
Relative humidity	10% to 95%, noncondensing	
Acoustic noise **Measured per ISO 7779 and declared per ISO 9296** **Bystander positions operating to an ambient temperature of 25℃**	With AC or DC power supply (with 24 PoE+ ports loaded): • LpA: 43dB typical, 45dB maximum • LwA: 5.2B typical, 5.5B maximum Typical: Noise emission for a typical configuration Maximum: Statistical maximum to account for variation in production	
Storage environment	Temperature: -40ºC to 70ºC Altitude: 15,000 ft	
Vibration	Operating: 0.41Grms from 3 to 500Hz with spectral break points of 0.0005 G2/Hz at 10Hz and 200Hz 5dB/octave roll off at each end. Non-operating: 1.12Grms from 3 to 500Hz with spectral break points of 0.0065 G2/Hz at 10Hz and 100Hz 5dB/octave roll off at each end.	

Shock	Operating: 30G, 2ms half sine Non-operating: 55G, 10ms trapezoid

Connectors for Cisco Catalyst 3850 Series

Table 9 shows connectors.

Table 10. Connectors

Connectors and cabling	• 1000BASE-T ports: RJ-45 connectors, 4-pair Cat-5E UTP cabling • 1000BASE-T SFP-based ports: RJ-45 connectors, 4-pair Cat-5E UTP cabling • 100BASE-FX, 1000BASE-SX, -LX/LH, -ZX, -BX10, DWDM and CWDM SFP transceivers: LC fiber connectors (single-mode or multimode fiber) • 10GBASE-SR, LR, LRM, CX1 (v02 or higher) SFP+ transceivers: LC fiber connectors (single-mode or multimode fiber) • Cisco StackWise-480 stacking ports: copper-based Cisco StackWise cabling • Cisco StackPower: Cisco proprietary power stacking cables • Ethernet management port: RJ-45 connectors, 4-pair Cat-5 UTP cabling • Management console port: RJ-45-to-DB9 cable for PC connections
Power connectors	• Customers can provide power to a switch by using either the internal power or StackPower from another member in the power stack. The connectors are located at the back of the switch. • Internal power supply connector: The internal power supply is an auto-ranging unit. The internal power supply supports input voltages between 100 and 240VAC. Use the supplied AC power cord to connect the AC power connector to an AC power outlet.

Management and Standards Support for Cisco Catalyst 3850 Series Switches

Table 10 shows management and standards support for the Cisco Catalyst 3850 Series.

Table 11. Management and Standards Support for the Cisco Catalyst 3850 Series

Description	Specification	
Management	BRIDGE-MIB	CISCO-SNMP-TARGET-EXT-MIB
	CISCO-AUTH-FRAMEWORK-MIB	CISCO-STACKMAKER-MIB
	CISCO-BGP4-MIB, BGP4-MIB	CISCO-MEMORY-POOL-MIB
	CISCO-BRIDGE-EXT-MIB	CISCO-STP-EXTENSIONS-MIB
	CISCO-BULK-FILE-MIB	CISCO-SYSLOG-MIB
	CISCO-CABLE-DIAG-MIB	CISCO-TCP-MIB
	CISCO-CALLHOME-MIB	CISCO-UDLDP-MIB
	CISCO-CEF-MIB	CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB
	CISCO-CIRCUIT-INTERFACE-MIB	CISCO-VLAN-MEMBERSHIP-MIB
	CISCO-ENTITY-VENDORTYPE-OID-MIB	CISCO-VTP-MIB
	CISCO-CONTEXT-MAPPING-MIB	EtherLike-MIB
	CISCO-DEVICE-LOCATION-MIB	HC-RMON-MIB
	CISCO-DHCP-SNOOPING-MIB	IEEE8021-PAE-MIB
	CISCO-EIGRP-MIB	IEEE8023-LAG-MIB
	CISCO-EMBEDDED-EVENT-MGR-MIB	IF-MIB
	CISCO-ENTITY-FRU-CONTROL-MIB	IGMP-MIB
	CISCO-ENTITY-SENSOR-MIB	IGMP-STD-MIB
	ENTITY-MIB	IP-FORWARD-MIB
	CISCO-ERR-DISABLE-MIB	IP-MIB
	CISCO-CONFIG-COPY-MIB	IPMROUTE-STD-MIB
	CISCO-FLOW-MONITOR-MIB	LLDP-EXT-MED-MIB
	CISCO-FTP-CLIENT-MIB	LLDP-MIB
	CISCO-HSRP-EXT-MIB	NOTIFICATION-LOG-MIB
	CISCO-HSRP-MIB	OLD-CISCO-MEMORY-MIB
	CISCO-IETF-ISIS-MIB	CISCO-CDP-MIB
	CISCO-IF-EXTENSION-MIB	POWER-ETHERNET-MIB

Description	Specification	
	CISCO-IGMP-FILTER-MIB	RMON2-MIB
	CISCO-CONFIG-MAN-MIB	RMON-MIB
	CISCO-IP-CBR-METRICS-MIB	SNMP-COMMUNITY-MIB
	CISCO-IPMROUTE-MIB	SNMP-FRAMEWORK-MIB
	CISCO-IP-STAT-MIB	SNMP-MPD-MIB
	CISCO-IP-URPF-MIB	SNMP-NOTIFICATION-MIB
	CISCO-L2L3-INTERFACE-CONFIG-MIB	SNMP-PROXY-MIB
	CISCO-LAG-MIB	SNMP-TARGET-MIB
	CISCO-LICENSE-MGMT-MIB	SNMP-USM-MIB
	CISCO-MAC-AUTH-BYPASS-MIB	SNMPv2-MIB
	CISCO-MAC-NOTIFICATION-MIB	SNMP-VIEW-BASED-ACM-MIB
	CISCO-MDI-METRICS-MIB	TCP-MIB
	CISCO-FLASH-MIB	UDP-MIB
	CISCO-OSPF-MIB	CISCO-IMAGE-MIB
	CISCO-OSPF-TRAP-MIB	CISCO-STACKWISE-MIB
	CISCO-PAE-MIB	AIRESPMACE-WIRELESS-MIB
	CISCO-PAGP-MIB	CISCO-LWAPP-IDS-MIB
	CISCO-PIM-MIB	CISCO-LWAPP-AP-MIB
	CISCO-PING-MIB	CISCO-LWAPP-CCX-RM-MIB
	CISCO-PORT-QOS-MIB	CISCO-LWAPP-CLIENT-ROAMING-MIB
	CISCO-PORT-SECURITY-MIB	CISCO-LWAPP-DOT11-CCX-CLIENT-DIAG-MIB
	CISCO-PORT-STORM-CONTROL-MIB	CISCO-LWAPP-DOT11-CCX-CLIENT-MIB
	CISCO-POWER-ETHERNET-EXT-MIB	CISCO-LWAPP-DOT11-CLIENT-CCX-REPORTS-MIB
	CISCO-PRIVATE-VLAN-MIB	CISCO-LWAPP-DOT11-CLIENT-MIB
	CISCO-PROCESS-MIB	CISCO-LWAPP-DOT11-MIB
	CISCO-PRODUCTS-MIB	CISCO-LWAPP-DOWNLOAD-MIB
	CISCO-RF-MIB	CISCO-LWAPP-LINKTEST-MIB
	CISCO-RTP-METRICS-MIB	CISCO-LWAPP-MFP-MIB
	CISCO-RTTMON-MIB	CISCO-LWAPP-MOBILITY-EXT-MIB
	CISCO-SMART-INSTALL-MIB	CISCO-LWAPP-QOS-MIB
		CISCO-LWAPP-REAP-MIB
		CISCO-LWAPP-ROGUE-MIB
		CISCO-LWAPP-RRM-MIB
		CISCO-LWAPP-SI-MIB
		CISCO-LWAPP-TSM-MIB
		CISCO-LWAPP-WLAN-MIB
		CISCO-LWAPP-WLAN-SECURITY-MIB
Standards	IEEE 802.1s	RMON I and II standards
	IEEE 802.1w	SNMPv1, SNMPv2c, and SNMPv3
	IEEE 802.11	
	IEEE 802.1x	
	IEEE 802.1x-Rev	
	IEEE 802.3ad	
	IEEE 802.3af	
	IEEE 802.3at	
	IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports	
	IEEE 802.1D Spanning Tree Protocol	
	IEEE 802.1p CoS prioritization	
	IEEE 802.1Q VLAN	
	IEEE 802.3 10BASE-T specification	
	IEEE 802.3u 100BASE-TX specification	
	IEEE 802.3ab 1000BASE-T specification	
	IEEE 802.3z 1000BASE-X specification	

Power Supply Specifications

Table 11 lists the power specifications for the Cisco Catalyst 3850 Series based on the kind of power supply used.

Table 12. Power Specifications for Cisco Catalyst 3850 Series

Description	Specification			
	PWR-C1-1100WAC	**PWR-C1-715WAC**	**PWR-C1-350WAC**	**PWR-C1-440WDC**
Power supply rated maximum	1100W	715W	350W	440W
Total output BTU (Note: 1000 BTU/hr = 293W)	3793 BTU/hr, 1100W	2465 BTU/hr, 715W	1207BTU/hr, 350W	1517BTU/hr, 440W
Input-voltage range and frequency	115-240VAC, 50-60 Hz	100-240VAC, 50-60 Hz	100-240VAC, 50-60 Hz	-36VDC to -72VDC
Input current	12-6A	10-5A	4-2A	<8A@-72VDC <16A@-36VDC
Output ratings	-56V@19.64A	-56V@12.8A	-56V@6.25A	-56V@7.86A
Output holdup time	10 ms minimum @ 102.5VAC	16.7 ms minimum @ 100VAC	16.7 ms minimum @ 100VAC	> 2ms@-48VDC
Power-supply input receptacles	IEC 320-C16 (IEC60320-C16)	IEC 320-C16 (IEC60320-C16)	IEC 320-C16 (IEC60320-C16)	Terminal strip
Power cord rating	13A	13A	10A	20A @ 100VDC
Physical specifications	(H x W x D): 1.58 X 3.25 X 13.7 in Weight: 3 lb (1.4 kg)	(H x W x D): 1.58 X 3.25 X 12.20 in Weight: 2.8 lb (1.3 kg)	(H x W x D): 1.58 X 3.25 X 12.20 in Weight: 2.6 lb (1.2 kg)	(H x W x D): 1.58 X 3.25 X 12.20 in Weight: 2.6 lb (1.2 kg)
Operating temperature	23 to 113℉ (-5 to 45℃)			
Storage temperature	-40 to 158℉ (-40 to 70℃)			
Relative humidity operating and non-operating noncondensing	5 to 90% noncondensing			
Altitude	10,000 ft. (3000 meters), up to 45℃			
MTBF	Calculated MTBF must be greater than 300,000 using Telcordia SR-332, Method 1, Case 3. Demonstrated MTBF is 500,000 hr (with 90% confidence level).			
EMI and EMC compliance	FCC Part 15 (CFR 47) Class A ICES-003 Class A EN 55022 Class A CISPR 22 Class A AS/NZS 3548 Class A BSMI Class A (AC input models only) VCCI Class A EN 55024, EN300386, EN 50082-1, EN 61000-3-2, EN 61000-3-3 EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN 61000-6-1			
Safety compliance	UL 60950-1, CAN/CSA-C22.2 No. 60950-1, EN 60950-1, IEC 60950-1, CCC, CE Marking			
LED indicators	“AC OK”: Input power to the power supply is OK “PS OK”: Output power from the power supply is OK			

Power Consumption of Standalone Cisco Catalyst 3850 Series Switches

Table 12 shows power consumption of standalone Cisco Catalyst 3850 Series Switches based on Alliance for Telecommunications Industry Solutions (ATIS) testing using IMIX distribution stream traffic, with input voltage of 115VAC @ 60 Hz and no PoE loading. The values given are the maximum possible power consumption numbers under the respective test scenarios.

Table 13. Power Consumptions (in Watts) of Standalone Cisco Catalyst 3850 Series

Models	Uplink Module	Power Consumption (W) (No More Than)			
		0% Traffic	10% Traffic	100% Traffic	Weighted Average
WS-C3850-24T	C3850-NM-4-1G	83.47	82.86	83.76	83.04
WS-C3850-24P		86.81	86.22	87.11	86.40
WS-C3850-24U		81.5	81.4	82.1	81.5
WS-C3850-48T		117.74	116.62	117.59	116.89
WS-C3850-48P		125.35	124.15	125.15	124.43
WS-C3850-48F		130.10	128.91	129.85	129.18
WS-C3850-48U		114.8	114.7	115.6	114.8
WS-C3850-24T	C3850-NM-2-10G	81.97	81.83	84.97	82.16
WS-C3850-24P		85.22	85.04	88.32	85.39
WS-C3850-24U		82.8	82.6	84.8	82.9
WS-C3850-48T		117.56	116.74	120.40	117.23
WS-C3850-48P		123.78	122.90	126.75	123.42
WS-C3850-48F		129.89	129.06	132.36	129.18
WS-C3850-48U		116.8	116.9	119.9	117.2
WS-C3850-48T	C3850-NM-4-10G	120.56	120.28	127.24	121.02
WS-C3850-48P		129.59	129.64	135.96	130.27
WS-C3850-48F		137.57	137.06	143.77	137.81
WS-C3850-48U		119.9	121.2	127.7	121.5

Safety and Compliance

Table 13 lists the safety and compliance information for the Cisco Catalyst 3850 Series.

Table 14. Safety and Compliance Information for Cisco Catalyst 3850 Series

Description	Specification
Safety certifications	UL 60950-1 Second Edition CAN/CSA-C22.2 No. 60950-1 Second Edition EN 60950-1 Second Edition IEC 60950-1 Second Edition GOST NOM (obtained by partners and distributors)
Electromagnetic emissions certifications	47CFR Part 15 (CFR 47) Class A (FCC Part 15 Class A) AS/NZS CISPR22 Class A CISPR22 Class A EN55022 Class A ICES003 Class A VCCI Class A EN61000-3-2 EN61000-3-3 KN22 Class A KCC CNS13438 Class A EN55024 CISPR24 KN24

Description	Specification
Environmental	Reduction of Hazardous Substances (ROHS) 5
Noise specifications	Office Product Spec: 48dBA at 30℃ (refer to ISO 7779)
Telco	CLEI code

Cisco Enhanced Limited Lifetime Hardware Warranty

The Cisco Catalyst 3850 Series Switches come with an E-LLW that includes NBD delivery of replacement hardware where available and 90 days of 8x5 Cisco TAC support.

Your formal warranty statement, including the warranty applicable to Cisco software, appears in the Cisco information packet that accompanies your Cisco product. We encourage you to review carefully the warranty statement shipped with your specific product before use.

Cisco reserves the right to refund the purchase price as its exclusive warranty remedy.

For further information on warranty terms, visit http://www.cisco.com/go/warranty. Table 14 provides information about the E-LLW.

Table 15. E-LLW Details

	Cisco E-LLW
Device covered	Applies to Cisco Catalyst 3850 Series Switches.
Warranty duration	As long as the original customer owns the product.
EoL policy	In the event of discontinuance of product manufacture, Cisco warranty support is limited to 5 years from the announcement of discontinuance.
Hardware replacement	Cisco or its service center will use commercially reasonable efforts to ship a replacement for NBD delivery, where available. Otherwise, a replacement will be shipped within 10 working days after receipt of the RMA request. Actual delivery times might vary depending on customer location.
Effective date	Hardware warranty commences from the date of shipment to customer (and in case of resale by a Cisco reseller, not more than 90 days after original shipment by Cisco).
TAC support	Cisco will provide during business hours, 8 hours per day, 5 days per week basic configuration, diagnosis, and troubleshooting of device-level problems for up to a 90-day period from the date of shipment of the originally purchased Cisco Catalyst 3850 product. This support does not include solution or network-level support beyond the specific device under consideration.
Cisco.com access	Warranty allows guest access only to Cisco.com.

Licensing for Cisco Catalyst 3850 Series Switches

The three feature sets available with all Cisco Catalyst 3850 Series Switches are:

- LAN Base: Enterprise access layer 2 switching features
- IP Base: Enterprise access layer 3 switching features
- IP Services: Advanced enterprise layer 3 switching (IPv4 and IPv6) features

The LAN Base feature set offers enhanced intelligent services that include comprehensive Layer 2 features, with up to 255 VLANs. The IP Base feature set provides entry-level enterprise services in addition to all LAN Base features, with 1K VLANs. IP Base also includes the support for wireless controller functionality (mobility agent and mobility controller role; additional access point license required for mobility controller role), routed access, smart operations, FNF, and so on. The IP Services feature set provides full enterprise services that include advanced Layer 3 features such as EIGRP, OSPF, BGP, PIM, and IPv6 routing such as OSPFv3 and EIGRPv6. All software feature sets support advanced security and MQC-based QoS.

The Cisco Catalyst 3850 Series Switches with LAN Base feature set can only stack with other Cisco Catalyst 3850 Series LAN Base switches. The same applies to IP Base and IP Services as well. A mixed stack of LAN Base switch with IP Base or IP Services feature set is not supported.

Customers can transparently upgrade the software feature set in the Cisco Catalyst 3850 Series Switches through Cisco IOS Software CLI using the right to use (RTU)-based software upgrade process. Software activation enables the Cisco IOS Software feature sets. Based on the license's type, Cisco IOS Software activates the appropriate feature set. License types can be changed, or upgraded, to activate a different feature set.

Access Point License for Cisco Catalyst 3850

An access point license is required for Cisco Catalyst 3850 operating in mobility controller mode. No access point license is required for 3850 operating in mobility agent mode. This functionality is included in the IP Base feature set. Other devices that can act as mobility controller are the WLC 5760, WLC 5508, and WiSM2 wireless controllers. Access point licenses can be transferred only between two 3850 switches or between 3850 and 5760 controller and vice versa.

Software Policy for Cisco Catalyst 3850 Series Switches

Customers with Cisco Catalyst LAN Base and IP Base software feature sets will be provided with maintenance updates and bug fixes designed to maintain the compliance of the software with published specifications, release notes, and industry standards compliance as long as the original end user continues to own or use the product or up to one year from the end-of-sale date for this product, whichever occurs earlier. Customers with licenses for our IP Services software images require a service support contract such as Cisco SMARTnet® Service to download updates. This policy supersedes any previous warranty or software statement and is subject to change without notice.

Cisco and Partner Services for Next-Generation Cisco Catalyst Fixed Switches

Enable the innovative, secure, intelligent edge in the Borderless Network Architecture using personalized services from Cisco and our partners. Through a discovery process that begins with understanding your business objectives, we help you integrate the next-generation Cisco Catalyst fixed switches into your architecture and incorporate network services onto that platform. Sharing knowledge and leading practices, we support your success every step of the way as you deploy, absorb, manage, and scale new technology. Choose from a flexible suite of support services designed to meet your business needs and help you maintain high-quality network performance while controlling operational costs. (See Table 15.)

Table 16. Technical Services Available for Cisco Catalyst 3850 Switches

Technical Services
Cisco SMARTnet Service • Around-the-clock, global access to the Cisco TAC • Unrestricted access to the extensive Cisco.com knowledge base and tools • Next-business-day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement and onsite parts replacement and installation available • Ongoing operating system software updates within the licensed feature set • Proactive diagnostics and real-time alerts on Smart Call Home-enabled devices
Cisco Smart Foundation Service • NBD advance hardware replacement as available • Business hours access to SMB TAC (access levels vary by region) • Access to Cisco.com SMB knowledge base • Online technical resources through Smart Foundation Portal • Operating system software bug fixes and patches

Technical Services
Cisco SP Base Service • Around-the-clock, global access to the Cisco TAC • Registered access to Cisco.com • NBD, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement; return to factory option available[2] • Ongoing operating system software updates[1]
Cisco Focused Technical Support Services • Three levels of premium, high-touch services are available: ◦ Cisco High-Touch Operations Management Service ◦ Cisco High-Touch Technical Support Service ◦ Cisco High-Touch Engineering Service • Valid Cisco SMARTnet or SP Base contracts on all network equipment are required

Notes:

1. Cisco operating system updates include the following: maintenance releases, minor updates, and major updates within the licensed feature set.
2. Advance hardware replacement is available in various service-level combinations. For example, 8x5xNBD indicates that shipment will be initiated during the standard 8-hour business day, 5 days a week (the generally accepted business days within the relevant region), with NBD delivery. Where NBD is not available, same day ship is provided. Restrictions apply; for details, review the appropriate service descriptions.

Ordering Information

Table 16 lists ordering information for the Cisco Catalyst 3850 Series. To place an order, visit the Cisco Ordering homepage at http://www.cisco.com/en/US/ordering/or13/or8/order_customer_help_how_to_order_listing.html.

Table 17. Cisco Catalyst 3850 Series Ordering Information

Product Number	Product Description
Cisco Catalyst 3850 Series	
WS-C3850-24T-L	Stackable 24 10/100/1000 Ethernet ports, with 350WAC power supply 1 RU, LAN Base feature set (StackPower cables need to be purchased separately)
WS-C3850-48T-L	Stackable 48 10/100/1000 Ethernet ports, with 350WAC power supply 1 RU, LAN Base feature set (StackPower cables need to be purchased separately)
WS-C3850-24P-L	Stackable 24 10/100/1000 Ethernet PoE+ ports, with 715WAC power supply 1 RU, LAN Base feature set (StackPower cables need to be purchased separately)
WS-C3850-24U-L	Stackable 24 10/100/1000 Ethernet UPOE ports, with 1100WAC power supply 1 RU, LAN Base feature set (StackPower cables need to be purchased separately)
WS-C3850-48P-L	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 715WAC power supply 1 RU, LAN Base feature set (StackPower cables need to be purchased separately)
WS-C3850-48F-L	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 1100WAC power supply 1 RU, LAN Base feature set (StackPower cables need to be purchased separately)
WS-C3850-48U-L	Stackable 48 10/100/1000 Ethernet UPOE ports, with 1100WAC power supply 1 RU, LAN Base feature set (StackPower cables need to be purchased separately)
WS-C3850-24T-S	Stackable 24 10/100/1000 Ethernet ports, with 350WAC power supply 1 RU, IP Base feature set
WS-C3850-48T-S	Stackable 48 10/100/1000 Ethernet ports, with 350WAC power supply 1 RU, IP Base feature set
WS-C3850-24P-S	Stackable 24 10/100/1000 Ethernet PoE+ ports, with 715WAC power supply 1 RU, IP Base feature set
WS-C3850-24U-S	Stackable 24 10/100/1000 Ethernet UPOE ports, with 1100WAC power supply 1 RU, IP Base feature set
WS-C3850-48P-S	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 715WAC power supply 1 RU, IP Base feature set
WS-C3850-48F-S	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 1100WAC power supply 1 RU, IP Base feature set

Product Number	Product Description
WS-C3850-48U-S	Stackable 48 10/100/1000 Ethernet UPOE ports, with 1100WAC power supply 1 RU, IP Base feature set
WS-C3850-24T-E	Stackable 24 10/100/1000 Ethernet ports, with 350WAC power supply 1 RU, IP Services feature set
WS-C3850-48T-E	Stackable 48 10/100/1000 Ethernet ports, with 350WAC power supply 1 RU, IP Services feature set
WS-C3850-24P-E	Stackable 24 10/100/1000 Ethernet PoE+ ports, with 715WAC power supply 1 RU, IP Services feature set
WS-C3850-24U-E	Stackable 24 10/100/1000 Ethernet UPOE ports, with 1100WAC power supply 1 RU, IP Services feature set
WS-C3850-48P-E	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 715WAC power supply 1 RU, IP Services feature set
WS-C3850-48F-E	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 1100WAC power supply 1 RU, IP Services feature set
WS-C3850-48U-E	Stackable 48 10/100/1000 Ethernet UPOE ports, with 1100WAC power supply 1 RU, IP Services feature set
Cisco Catalyst 3850 Bundles	
WS-C3850-24PW-S	Cisco Catalyst 3850 24-port PoE IP Base with 5 access point license
WS-C3850-48PW-S	Cisco Catalyst 3850 48-port PoE IP Base with 5 access point license
Network Modules for the Cisco Catalyst 3850 Series	
C3850-NM-4-1G=	4 x Gigabit Ethernet network module spare
C3850-NM-2-10G=	4 x Gigabit Ethernet/2 x 10 Gigabit Ethernet network module spare
C3850-NM-BLANK=	Network module blank spare
C3850-NM-4-10G=	4 x Gigabit Ethernet/4 x 10 Gigabit Ethernet network module spare
Software Licenses	
C3850-24-L-S	Cisco Catalyst 3850 24-port Switch LAN Base to IP Base paper license
C3850-48-L-S	Cisco Catalyst 3850 48-port Switch LAN Base to IP Base paper license
C3850-24-L-E	Cisco Catalyst 3850 24-port LAN Base to IP Services paper license
C3850-48-L-E	Cisco Catalyst 3850 48-port LAN Base to IP Services paper license
C3850-24-S-E	Cisco Catalyst 3850 24-port IP Base to IP Services paper license
C3850-48-S-E	Cisco Catalyst 3850 48-port IP Base to IP Services paper license
L-C3850-24-L-S	Cisco Catalyst 3850 24-port LAN Base to IP Base e-license
L-C3850-48-L-S	Cisco Catalyst 3850 48-port LAN Base to IP Base e-license
L-C3850-24-L-E	Cisco Catalyst 3850 24-port LAN Base to IP Services e-license
L-C3850-48-L-E	Cisco Catalyst 3850 48-port LAN Base to IP Services e-license
L-C3850-24-S-E	Cisco Catalyst 3850 24-port IP Base to IP Services e-license
L-C3850-48-S-E	Cisco Catalyst 3850 48-port IP Base to IP Services e-license
Access Point Licenses	
L-LIC-CT3850-UPG	Primary upgrade license SKU for Cisco 3850 wireless controller (e-delivery)
L-LIC-CTIOS-1A	1 access point adder license for Cisco IOS Software based wireless controller (e-delivery)
LIC-CT3850-UPG	Primary upgrade license SKU for Cisco 3850 wireless controller (paper license)
LIC-CTIOS-1A	1 access point adder license for the Cisco IOS Software based wireless controller (paper license)
Power Supplies and Fan for the Cisco Catalyst 3850 Series	
PWR-C1-350WAC=	350WAC power supply spare
PWR-C1-715WAC=	715WAC power supply spare
PWR-C1-1100WAC=	1100WAC power supply spare
PWR-C1-440WDC=	440WDC power supply spare

Product Number	Product Description
PWR-C1-BLANK=	Power supply blank spare
C3850-FAN-T1=	Fan module spare
StackWise-480 and StackPower Cables for the Cisco Catalyst 3850 Series	
STACK-T1-50CM=	Cisco StackWise-480 50cm stacking cable spare
STACK-T1-1M=	Cisco StackWise-480 1m stacking cable spare
STACK-T1-3M=	Cisco StackWise-480 3m stacking cable spare
CAB-SPWR-30CM=	Cisco Catalyst 3850 StackPower cable 30cm spare
CAB-SPWR-150CM=	Cisco Catalyst 3850 StackPower cable 150cm spare
Spare Power Cords for the Cisco Catalyst 3850 Series	
CAB-TA-NA=	AC power cord for Cisco Catalyst 3850 (North America)
CAB-TA-AP=	AC power cord for Cisco Catalyst 3850 (Australia)
CAB-TA-AR=	AC power cord for Cisco Catalyst 3850 (Argentina)
CAB-TA-SW=	AC power cord for Cisco Catalyst 3850 (Switzerland)
CAB-TA-UK=	AC power cord for Cisco Catalyst 3850 (United Kingdom)
CAB-TA-JP=	AC power cord for Cisco Catalyst 3850 (Japan)
CAB-TA-250VAC-JP=	Japan 250VAC power cord for Cisco Catalyst 3850 (Japan)
CAB-TA-EU=	AC power cord for Cisco Catalyst 3850 (Europe)
CAB-TA-IT=	AC power cord for Cisco Catalyst 3850 (Italy)
CAB-TA-IN=	AC power cord for Cisco Catalyst 3850 (India)
CAB-TA-CN=	AC power cord for Cisco Catalyst 3850 (China)
CAB-TA-DN=	AC power cord for Cisco Catalyst 3850 (Denmark)
CAB-TA-IS=	AC power cord for Cisco Catalyst 3850 (Israel)
CAB-C15-CBN	Cabinet jumper power cord, 250 VAC 13A, C14-C15 connectors
Spare Accessory and Rack Mount Kits for the Cisco Catalyst 3850 Series	
C3850-ACC-KIT=	Accessory kit for Cisco Catalyst 3850 Series
C3850-RAC-KIT=	Rack mount kit for Cisco Catalyst 3850 Series
C3850-4PT-KIT=	Extension rails and brackets for four-point mounting for Cisco Catalyst 3850 Series

Optics Compatibility Information

The Cisco Catalyst 3850 Series supports a wide range of optics. Because the list of supported optics is updated on a regular basis, consult the tables available here for the latest SFP compatibility information: http://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html.

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Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
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Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.

Printed in USA C78-720918-03 1/14

Cisco Aironet 3700 Series Access Points

Dual-band 2.4 GHz and 5 GHz with 802.11ac Wave 1 support on the integrated 5-GHz radio

Cisco Aironet 3700i Access Point

- Sleek design with internal antennas
- Ideal for office environments

Cisco Aironet 3700e and 3700p Access Points

- Rugged metal housing and extended operating temperature
- Ideal for factories, warehouses, and other indoor industrial environments
- Versatile RF coverage with external antennas
- UL 2043 plenum rated for above-ceiling installation or for suspending from drop ceilings
- Classify over 20 different types of interference, including non-Wi-Fi interference, within 5 to 30 seconds
- Automatic remedial action and less manual intervention

Investment Protection with Flexible Modular Architecture Design

- Cisco Aironet Wireless Security and Spectrum Intelligence Module now shipping
- Cisco 3G Small Cell Module (available CY2014)
- Cisco Aironet 802.11ac Wave 2 Module (target CY2015)

Troubleshooting Forensics for Faster Interference Resolution and Proactive Action

- Historic interference information for back-in-time analysis and faster problem solving
- 24x7 monitoring with remote access reduces travel and speeds resolution
- Cisco Spectrum Expert Connect provides real-time, raw spectrum data to help with difficult-to-diagnose interference problems
- Air quality index in Cisco CleanAir® technology provides a snapshot of network performance and the impact of interference

Robust Security and Policy Enforcement

- Industry's first access point with non-Wi-Fi detection for off-channel rogues
- Supports rogue access point detection and detection of denial-of-service attacks
- Management frame protection detects malicious users and alerts network administrators
- Enables policies to prohibit devices that interfere with the Wi-Fi network or jeopardize network security

Secure Interoperability

- Controller-based deployment only

With the industry's only enterprise class 4x4 MIMO, three-spatial-stream access points that support the IEEE's new 802.11ac specification, the Cisco® Aironet® 3700 Series delivers industry-leading performance and a High Density Experience (HD Experience) for both the enterprise and service provider markets. The Aironet 3700 Series extends support to a new generation of Wi-Fi clients, such as smartphones, tablets, and high-performance laptops that have integrating 802.11ac support.

In its first implementation, 802.11ac wave 1 provides a rate of up to 1.3 Gbps, roughly triple the rates offered by today's high-end 802.11n access points. This provides the necessary foundation for enterprise and service provider networks alike to stay ahead of the performance and bandwidth expectations and needs of their wireless users.

Due to its convenience, wireless access is increasingly the preferred form of network connectivity for corporate users. Along with this shift, there is an expectation that wireless should not slow down users' day-to-day work, but should enable a high-performance experience while allowing users to move freely around the corporate environment.

By Utilizing a Purpose-built Innovative Chipset with the Best-in-class RF Architecture for a High Density Experience (HD Experience).

High Density Experience (HD Experience)

Building on the Cisco Aironet heritage of RF excellence, the 3700 Series utilizes a Purpose-built Innovative Chipset with the Best-in-class RF Architecture. This chipset provides a High Density Experience for enterprise network designed for mission critical, high performance applications. The 3700 is a series of flagship access points, delivering industry-leading performance for highly secure and reliable wireless connections and delivers a robust mobility experience that includes:

- 802.11ac with 4x4 multiple-input multiple-output (MIMO) technology with three spatial streams, offering sustained 1.3-Gbps rates over a greater range for more capacity and reliability than competing access points.
- Cross AP Noise Reduction is a Cisco innovation that enables Access Points to intelligently collaborate in real-time to allow more users to connect with optimized signal quality and performance.
- Optimized AP Roaming ensures clients will associate with the best AP offering the best data rate available.
- Cisco ClientLink 3.0 technology to improve downlink performance to all mobile devices, including one-, two-, and three-spatial-stream devices on 802.11ac while improving battery life on mobile devices such as smartphones and tablets.
- Cisco CleanAir technology enhanced with 80MHz Channel Support, provides proactive, high-speed spectrum intelligence across 20-, 40-, and 80-MHz-wide channels to combat performance problems due to wireless interference.
- Modular architecture design that is carried forward from the Cisco Aironet 3600, enabling flexible add-on options in the form of the Cisco Aironet Wireless Security and Spectrum Intelligence Module, the upcoming Cisco 3G Small Cell Module, and the future Cisco Aironet 802.11ac Wave 2 Module, which are tightly integrated with the Aironet 3700 Series Access Point platform and are completely field-upgradable.
- MIMO equalization optimizes uplink performance and reliability by reducing the impact of signal fade.

The new Cisco Aironet 3700 Series sustains reliable connections at higher speeds farther from the access point than competing solutions, resulting in up to three times more availability of 1.3-Gbps rates and optimizing the performance of more mobile devices. The 3700 Series carries forward the modular architecture first introduced with the Aironet 3600 Series and offers unparalleled investment protection, with support for the Cisco Aironet Wireless Security and Spectrum Intelligence Module and the upcoming Cisco 3G Small Cell Module.

All of these features help ensure the best possible end-user experience on the wireless network.

Cisco also offers the industry's broadest selection of 802.11n and 802.11ac antennas, delivering optimal coverage for a variety of deployment scenarios.

Scalability

The Cisco Aironet 3700 Series is a component of the Cisco Unified Wireless Network, which can scale to as many as 18,000 access points with full Layer 3 mobility across central or remote locations on the enterprise campus, in branch offices, and at remote sites. The Cisco Unified Wireless Network is the industry's most flexible, resilient, and scalable architecture, delivering highly secure access to mobility services and applications and offering the lowest total cost of ownership and investment protection by integrating smoothly with the existing wired network.

Product Specifications

Table 1 lists the specifications for the Cisco Aironet 3700 Series Access Points.

Table 1. Product Specifications

Item	Specification
Part numbers	**Cisco Aironet 3700i Access Point: Indoor environments, with internal antennas** • AIR-CAP3702I-x-K9: Dual-band, controller-based 802.11a/g/n/ac • AIR-CAP3702I-xK910: Eco-pack (dual-band 802.11a/g/n/ac) 10 quantity access points **Cisco Aironet 3700e Access Point: Indoor, challenging environments, with external antennas** • AIR-CAP3702E-x-K9: Dual-band controller-based 802.11a/g/n/ac • AIR-CAP3702E-xK910: Eco-pack (dual-band 802.11a/g/n/ac) 10 quantity access points **Cisco Aironet 3700p Access Point: high-density environments, with narrow-beamwidth, high-gain, antennas** • AIR-CAP3702P-x-K9: Dual-band controller-based 802.11a/g/n/ac • AIR-CAP3702P-xK910: Eco-pack (dual-band 802.11a/g/n/ac) 10 quantity access points **Cisco SMARTnet® Service for the Cisco Aironet 3700i Access Point with internal antennas** • CON-SNT-CAP3702x: SMARTnet 8x5xNBD for 3700i access point (dual-band 802.11a/g/n/ac) • Qty(10) CON-SNT-CAP372Ix: SMARTnet 8x5xNBD for 10 quantity eco-pack 3700i access point (dual-band 802.11a/g/n/ac) **Cisco SMARTnet Service for the Cisco Aironet 3700e Access Point with external antennas** • CON-SNT-CAP3702x: SMARTnet 8x5xNBD for 3700e access point (dual-band 802.11a/g/n/ac) • Qty(10) CON-SNT-CAP372Ex: SMARTnet 8x5xNBD for 10 quantity eco-pack 3700e access point (dual-band 802.11a/g/n/ac) **Cisco SMARTnet Service for the Cisco Aironet 3700p Access Point with external antennas** • CON-SNT-CAP3702x: SMARTnet 8x5xNBD for 3700p access point (dual-band 802.11a/g/n/ac) • Qty(10) CON-SNT-CAP372Px: SMARTnet 8x5xNBD for 10 quantity eco-pack 3700p access point (dual-band 802.11a/g/n/ac) **Regulatory domains: (x = regulatory domain)** Customers are responsible for verifying approval for use in their individual countries. To verify approval and to identify the regulatory domain that corresponds to a particular country, visit http://www.cisco.com/go/aironet/compliance. Not all regulatory domains have been approved. As they are approved, the part numbers will be available on the Global Price List. **Cisco Wireless LAN Services** • AS-WLAN-CNSLT: Cisco Wireless LAN Network Planning and Design Service • AS-WLAN-CNSLT: Cisco Wireless LAN 802.11n Migration Service • AS-WLAN-CNSLT: Cisco Wireless LAN Performance and Security Assessment Service
Software	Cisco Unified Wireless Network Software Release 7.6 or later
Supported wireless LAN controllers	• Cisco 2500 Series Wireless Controllers, Cisco Wireless Controller Module for ISR G2, Cisco Wireless Services Module 2 (WiSM2) for Catalyst® 6500 Series Switches, Cisco 5500 Series Wireless Controllers, Cisco Flex® 7500 Series Wireless Controllers, Cisco 8500 Series Wireless Controllers, Cisco Virtual Wireless Controller • Cisco 5760 Wireless LAN Controller, Cisco Catalyst 3850 Series Switches
Module options	Cisco Aironet Wireless Security and Spectrum Intelligence Module - now shipping • Provides full-spectrum, off-channel scanning for a comprehensive wireless intrusion prevention system (wIPS), including Cisco CleanAir technology, rogue detection, context awareness, and radio resource management (RRM) solutions. Scans 2.4- and 5-GHz channels while serving data clients on the base dual-band access point platform Cisco 3G Small Cell Module (available CY2014) • 3GPP band 1 (2100 MHz), 16 users, voice (R99), packet data (HSPA/HSDPA+) Cisco Aironet Access Point 802.11ac Wave 2 Module (target CY2015)

Item	Specification		
802.11n version 2.0 (and related) capabilities	• 4x4 MIMO with three spatial streams • Maximal ratio combining (MRC) • 802.11n and 802.11a/g beamforming • 20- and 40-MHz channels • PHY data rates up to 450 Mbps (40 MHz with 5 GHz) • Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Tx/Rx) • 802.11 dynamic frequency selection (DFS) • Cyclic shift diversity (CSD) support		
802.11ac Wave 1 capabilities	• 4x4 MIMO with three spatial streams • MRC • 802.11ac beamforming • 20-, 40-, and 80-MHz channels • PHY data rates up to 1.3 Gbps (80 MHz with 5 GHz) • Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Tx/Rx) • 802.11 DFS • CSD support		
Data rates supported	**802.11a: 6, 9, 12, 18, 24, 36, 48, and 54 Mbps**		
	802.11g: 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, and 54 Mbps		
	802.11n data rates on 2.4 GHz:		
	MCS Index[1]	**GI[2] = 800 ns**	**GI = 400 ns**
		20-MHz Rate (Mbps)	**20-MHz Rate (Mbps)**
	0	6.5	7.2
	1	13	14.4
	2	19.5	21.7
	3	26	28.9
	4	39	43.3
	5	52	57.8
	6	58.5	65
	7	65	72.2
	8	13	14.4
	9	26	28.9
	10	39	43.3
	11	52	57.8
	12	78	86.7
	13	104	115.6
	14	117	130
	15	130	144.4
	16	19.5	21.7
	17	39	43.3
	18	58.5	65
	19	78	86.7
	20	117	130
	21	156	173.3
	22	175.5	195

[1] MCS Index: The Modulation and Coding Scheme (MCS) index determines the number of spatial streams, the modulation, the coding rate, and data rate values.
[2] GI: A guard interval (GI) between symbols helps receivers overcome the effects of multipath delays.

Item	Specification							
	23		195		216.7			
	802.11ac data rates (5 GHz):							
	MCS Index[3]	**Spatial Streams**	**GI[4] = 800ns**			**GI = 400ns**		
			20-MHz Rate (Mbps)	**40-MHz Rate (Mbps)**	**80-MHz Rate (Mbps)**	**20-MHz Rate (Mbps)**	**40-MHz Rate (Mbps)**	**80-MHz Rate (Mbps)**
	0	1	6.5	13.5	29.3	7.2	15	32.5
	1	1	13	27	58.5	14.4	30	65
	2	1	19.5	40.5	87.8	21.7	45	97.5
	3	1	26	54	117	28.9	60	130
	4	1	39	81	175.5	43.3	90	195
	5	1	52	108	234	57.8	120	260
	6	1	58.5	121.5	263.3	65	135	292.5
	7	1	65	135	292.5	72.2	150	325
	8	1	78	162	351	86.7	180	390
	9	1	-	180	390	-	200	433.3
	0	2	13	27	58.5	14.4	30	65
	1	2	26	54	117	28.9	60	130
	2	2	39	81	175.5	43.3	90	195
	3	2	52	108	234	57.8	120	260
	4	2	78	162	351	86.7	180	390
	5	2	104	216	468	115.6	240	520
	6	2	117	243	526.5	130	270	585
	7	2	130	270	585	144.4	300	650
	8	2	156	324	702	173.3	360	780
	9	2	78	780	780	-	400	866.7
	0	3	19.5	40.5	87.8	21.7	45	97.5
	1	3	39	81	175.5	43.3	90	195
	2	3	58.5	121.5	263.3	65	135	292.5
	3	3	78	162	351	86.7	180	390
	4	3	117	243	526.5	130	270	585
	5	3	156	324	702	173.3	360	780
	6	3	175.5	364.5	-	195	405	-
	7	3	195	405	877.5	216.7	450	975
	8	3	234	486	1053	260	540	1170
	9	3	260	540	1170	288.9	600	1300

[3] MCS Index: The Modulation and Coding Scheme (MCS) index determines the number of spatial streams, the modulation, the coding rate, and data rate values.
[4] GI: A guard interval (GI) between symbols helps receivers overcome the effects of multipath delays.

Item	Specification		
Frequency band and 20-MHz operating channels	**A (A regulatory domain):** • 2.412 to 2.462 GHz; 11 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz) • 5.745 to 5.825 GHz; 5 channels **C (C regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.745 to 5.825 GHz; 5 channels **D (D regulatory domain):** • 2.412 to 2.462 GHz; 11 channels • 5.180 to 5.320 GHz; 8 channels • 5.745 to 5.865 GHz; 7 channels **E (E regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz) **H (H regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.150 to 5.350 GHz; 8 channels • 5.745 to 5.825 GHz; 5 channels **I (I regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels **K (K regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.620 GHz; 7 channels • 5.745 to 5.805 GHz; 4 channels	**N (N regulatory domain):** • 2.412 to 2.462 GHz; 11 channels • 5.180 to 5.320 GHz; 8 channels • 5.745 to 5.825 GHz; 5 channels **Q (Q regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz; 11 channels **R (R regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5,660 to 5,805 GHz; 7 channels **S (S regulatory domain):** • 2.412 to 2.472 GHz; 13 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz;, 11 channels • 5.745 to 5.825 GHz; 5 channels **T (T regulatory domain):** • 2.412 to 2.462 GHz; 11 channels • 5.280 to 5.320 GHz; 3 channels • 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz) • 5.745 to 5.825 GHz; 5 channels **Z (Z regulatory domain):** • 2.412 to 2.462 GHz; 11 channels • 5.180 to 5.320 GHz; 8 channels • 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz) • 5.745 to 5.825 GHz; 5 channels	
Note: Customers are responsible for verifying approval for use in their individual countries. To verify approval and to identify the regulatory domain that corresponds to a particular country, visit http://www.cisco.com/go/aironet/compliance.			
Maximum number of nonoverlapping channels	**2.4 GHz** • 802.11b/g: ◦ 20 MHz: 3 • 802.11n: ◦ 20 MHz: 3	**5 GHz** • 802.11a: ◦ 20 MHz: 21 • 802.11n: ◦ 20 MHz: 21 ◦ 40 MHz: 9 • 802.11ac: ◦ 20 MHz: 21 ◦ 40 MHz: 9 ◦ 80 MHz: 5	
Note: **This varies by regulatory domain. Refer to the product documentation for specific details for each regulatory domain.**			
Receive sensitivity	• 802.11b (CCK) ◦ -101 dBm @ 1 Mbps ◦ -98 dBm @ 2 Mbps ◦ -92 dBm @ 5.5 Mbps ◦ -89 dBm @ 11 Mbps	• 802.11g (non HT20) ◦ -91 dBm @ 6 Mbps ◦ -91 dBm @ 9 Mbps ◦ -91 dBm @ 12 Mbps ◦ -90 dBm @ 18 Mbps ◦ -87 dBm @ 24 Mbps ◦ -85 dBm @ 36 Mbps ◦ -80 dBm @ 48 Mbps ◦ -79 dBm @ 54 Mbps	• 802.11a (non HT20) ◦ -93 dBm @ 6 Mbps ◦ -93 dBm @ 9 Mbps ◦ -93 dBm @ 12 Mbps ◦ -92 dBm @ 18 Mbps ◦ -89 dBm @ 24 Mbps ◦ -86 dBm @ 36 Mbps ◦ -82 dBm @ 48 Mbps ◦ -80 dBm @ 54 Mbps

Item	Specification			
	2.4 GHz • 802.11n (HT20) ◦ -90 dBm @ MCS0 ◦ -90 dBm @ MCS1 ◦ -90 dBm @ MCS2 ◦ -88 dBm @ MCS3 ◦ -85 dBm @ MCS4 ◦ -80 dBm @ MCS5 ◦ -78 dBm @ MCS6 ◦ -77 dBm @ MCS7 ◦ -90 dBm @ MCS8 ◦ -90 dBm @ MCS9 ◦ -89 dBm @ MCS10 ◦ -86 dBm @ MCS11 ◦ -82 dBm @ MCS12 ◦ -78 dBm @ MCS13 ◦ -77 dBm @ MCS14 ◦ -75 dBm @ MCS15 ◦ -90 dBm @ MCS16 ◦ -89 dBm @ MCS17 ◦ -87 dBm @ MCS18 ◦ -84 dBm @ MCS19 ◦ -81 dBm @ MCS20 ◦ -76 dBm @ MCS21 ◦ -75 dBm @ MCS22 ◦ -74 dBm @ MCS23		**5 GHz** • 802.11n (HT20) ◦ -93 dBm @ MCS0 ◦ -93 dBm @ MCS1 ◦ -92 dBm @ MCS2 ◦ -89 dBm @ MCS3 ◦ -86 dBm @ MCS4 ◦ -81 dBm @ MCS5 ◦ -80 dBm @ MCS6 ◦ -79 dBm @ MCS7 ◦ -93 dBm @ MCS8 ◦ -93 dBm @ MCS9 ◦ -90 dBm @ MCS10 ◦ -87 dBm @ MCS11 ◦ -84 dBm @ MCS12 ◦ -80 dBm @ MCS13 ◦ -79 dBm @ MCS14 ◦ -77 dBm @ MCS15 ◦ -93 dBm @ MCS16 ◦ -92 dBm @ MCS17 ◦ -89 dBm @ MCS18 ◦ -86 dBm @ MCS19 ◦ -83 dBm @ MCS20 ◦ -79 dBm @ MCS21 ◦ -77 dBm @ MCS22 ◦ -76 dBm @ MCS23	**5 GHz** • 802.11n (HT40) ◦ -90 dBm @ MCS0 ◦ -90 dBm @ MCS1 ◦ -89 dBm @ MCS2 ◦ -86 dBm @ MCS3 ◦ -83 dBm @ MCS4 ◦ -78 dBm @ MCS5 ◦ -77 dBm @ MCS6 ◦ -76 dBm @ MCS7 ◦ -90 dBm @ MCS8 ◦ -90 dBm @ MCS9 ◦ -87 dBm @ MCS10 ◦ -84 dBm @ MCS11 ◦ -81 dBm @ MCS12 ◦ -77 dBm @ MCS13 ◦ -76 dBm @ MCS14 ◦ -74 dBm @ MCS15 ◦ -90 dBm @ MCS16 ◦ -89 dBm @ MCS17 ◦ -86 dBm @ MCS18 ◦ -83 dBm @ MCS19 ◦ -80 dBm @ MCS20 ◦ -76 dBm @ MCS21 ◦ -74 dBm @ MCS22 ◦ -73 dBm @ MCS23
	802.11ac Receive Sensitivity			
	802.11ac (non HT80) • -86 dBm @ 6 Mbps • -76 dBm @ 54 Mbps			

MCS Index[5]	Spatial Streams	VHT20	VHT40	VHT80	VTH20-STBC	VHT40-STBC	VHT80-STBC
0	1	-94 dBm	-91 dBm	-86 dBm	-94 dBm	-91 dBm	-86 dBm
8	1	-77 dBm			-77 dBm		
9	1		-72 dBm	-69 dBm		-73 dBm	-70 dBm
0	2	-94 dBm	-91 dBm	-86 dBm			
8	2	-75 dBm					
9	2		-71 dBm	-67 dBm			
0	3	-94 dBm	-91 dBm	-86 dBm			
9	3	-71 dBm	-70 dBm	-65 dBm			

[5] MCS Index: The Modulation and Coding Scheme (MCS) index determines the number of spatial streams, the modulation, the coding rate, and data rate values.

Item	Specification	
Maximum transmit power	**2.4 GHz** • 802.11b ◦ 23 dBm, 4 antennas • 802.11g ◦ 23 dBm, 4 antennas • 802.11n (HT20) ◦ 23 dBm, 4 antennas	**5 GHz** • 802.11a ◦ 23 dBm, 4 antennas • 802.11n (HT20) ◦ 23 dBm, 4 antennas • 802.11n (HT40) ◦ 23 dBm, 4 antennas • 802.11ac ◦ non-HT80: 23 dBm, 4 antennas ◦ VHT20 23 dBm, 4 antennas ◦ VHT40: 23 dBm, 4 antennas ◦ VHT80: 23 dBm, 4 antennas ◦ VHT20-STBC: 23 dBm, 4 antennas ◦ VHT40-STBC: 23 dBm, 4 antennas ◦ VHT80-STBC: 23 dBm, 4 antennas
Note: The maximum power setting will vary by channel and according to individual country regulations. Refer to the product documentation for specific details.		
Available transmit power settings	**2.4 GHz** • 23 dBm (200 mW) • 20 dBm (100 mW) • 17 dBm (50 mW) • 14 dBm (25 mW) • 11 dBm (12.5 mW) • 8 dBm (6.25 mW) • 5 dBm (3.13 mW) • 2 dBm (1.56 mW)	**5 GHz** • 23 dBm (200 mW) • 20 dBm (100 mW) • 17 dBm (50 mW) • 14 dBm (25 mW) • 11 dBm (12.5 mW) • 8 dBm (6.25 mW) • 5 dBm (3.13 mW) • 2 dBm (1.56 mW)
Note: The maximum power setting will vary by channel and according to individual country regulations. Refer to the product documentation for specific details.		
Integrated antenna	• 2.4 GHz, gain 4 dBi, internal omni, horizontal beamwidth 360° • 5 GHz, gain 6 dBi, internal omni, horizontal beamwidth 360°	
External antenna (sold separately)	• Certified for use with antenna gains up to 6 dBi (2.4 GHz and 5 GHz) • Cisco offers the industry's broadest selection of antennas, delivering optimal coverage for a variety of deployment scenarios	
Interfaces	• 10/100/1000BASE-T autosensing (RJ-45) • Management console port (RJ-45)	
Indicators	• Status LED indicates boot loader status, association status, operating status, boot loader warnings, boot loader errors	
Dimensions (W x L x H)	• Access point (without mounting bracket): 8.7 x 8.7 x 2.11 in. (22.1 x 22.1 x 5.4 cm)	
Weight	• 2.5 lb (1.13 kg)	
Environmental	**Cisco Aironet 3700i** • Nonoperating (storage) temperature: -22°to 158℉ (- 30°to 70℃) • Nonoperating (storage) altitude test: 25˚C, 15,000 ft. • Operating temperature: 32°to 104℉ (0°to 40℃) • Operating humidity: 10% to 90% percent (noncondensing) • Operating altitude test: 40˚C, 9843 ft. **Cisco Aironet 3700e/3700p** • Nonoperating (storage) temperature: -22°to 158℉ (- 30°to 70℃) • Nonoperating (storage) altitude test: 25˚C, 15,000 ft. • Operating temperature: -4°to 122℉ (-20°to 50℃) • Operating humidity: 10% to 90% (noncondensing) • Operating altitude test: 40˚C, 9843 ft.	
System memory	• 512 MB DRAM • 64 MB flash	

Item	Specification
Input power requirements	• AP3700: 44 to 57 VDC • Power supply and power injector: 100 to 240 VAC; 50 to 60 Hz
Power draw	• AP3700: 15W **Note:** When deployed using a Power over Ethernet (PoE) specification, the power drawn from the power sourcing equipment will be higher by some amount dependent on the length of the interconnecting cable.
Powering options	Aironet 3700 without an add-on module • 802.3at PoE+ • Enhanced PoE • Cisco AP3700 power injectors (AIR-PWRINJ4=) • Cisco AP3700 local power supply (AIR-PWR-B=) **Note:** If 802.3af PoE is the source of power, the access point will dynamically shift from 4x4 to 3x3 and come up under PoE. Aironet 3700 with an add-on module • 802.3at PoE+ • Enhanced PoE • Cisco AP3700 power injectors (AIR-PWRINJ4=) • Cisco AP3700 local power supply (AIR-PWR-B=) **Note:** If 802.3af PoE is the source of power, the access point with module will dynamically shift from 4x4 to 2x2 and come up under PoE.
Warranty	Limited lifetime hardware warranty
Compliance standards	◦ UL 60950-1 ◦ CAN/CSA-C22.2 No. 60950-1 ◦ UL 2043 ◦ IEC 60950-1 ◦ EN 60950-1 ◦ EN 50155 • Radio approvals: ◦ FCC Part 15.247, 15.407 ◦ RSS-210 (Canada) ◦ EN 300.328, EN 301.893 (Europe) ◦ ARIB-STD 66 (Japan) ◦ ARIB-STD T71 (Japan) ◦ EMI and susceptibility (Class B) ◦ FCC Part 15.107 and 15.109 ◦ ICES-003 (Canada) ◦ VCCI (Japan) ◦ EN 301.489-1 and -17 (Europe) ◦ EN 60601-1-2 EMC requirements for the Medical Directive 93/42/EEC • IEEE standards: ◦ IEEE 802.11a/b/g, 802.11n, 802.11h, 802.11d ◦ IEEE 802.11ac Draft 5 • Security: ◦ 802.11i, Wi-Fi Protected Access 2 (WPA2), WPA ◦ 802.1X ◦ Advanced Encryption Standards (AES), Temporal Key Integrity Protocol (TKIP) • Extensible Authentication Protocol (EAP) types: ◦ EAP-Transport Layer Security (TLS) ◦ EAP-Tunneled TLS (TTLS) or Microsoft Challenge Handshake Authentication Protocol Version 2 (MSCHAPv2) ◦ Protected EAP (PEAP) v0 or EAP-MSCHAPv2 ◦ EAP-Flexible Authentication via Secure Tunneling (FAST) ◦ PEAP v1 or EAP-Generic Token Card (GTC) ◦ EAP-Subscriber Identity Module (SIM) • Multimedia: ◦ Wi-Fi Multimedia (WMM) • Other: ◦ FCC Bulletin OET-65C ◦ RSS-102

Limited Lifetime Hardware Warranty

The Cisco Aironet 3700 Series Access Points come with a limited lifetime warranty that provides full warranty coverage of the hardware for as long as the original end user continues to own or use the product. The warranty includes 10-day advance hardware replacement and ensures that software media are defect-free for 90 days. For more details, visit http://www.cisco.com/go/warranty.

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For More Information

For more information about the Cisco Aironet 3700 Series, visit http://www.cisco.com/go/wireless or contact your local account representative.

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Printed in USA C78-729421-02 12/13