Cisco catalyst 3850 x datasheet

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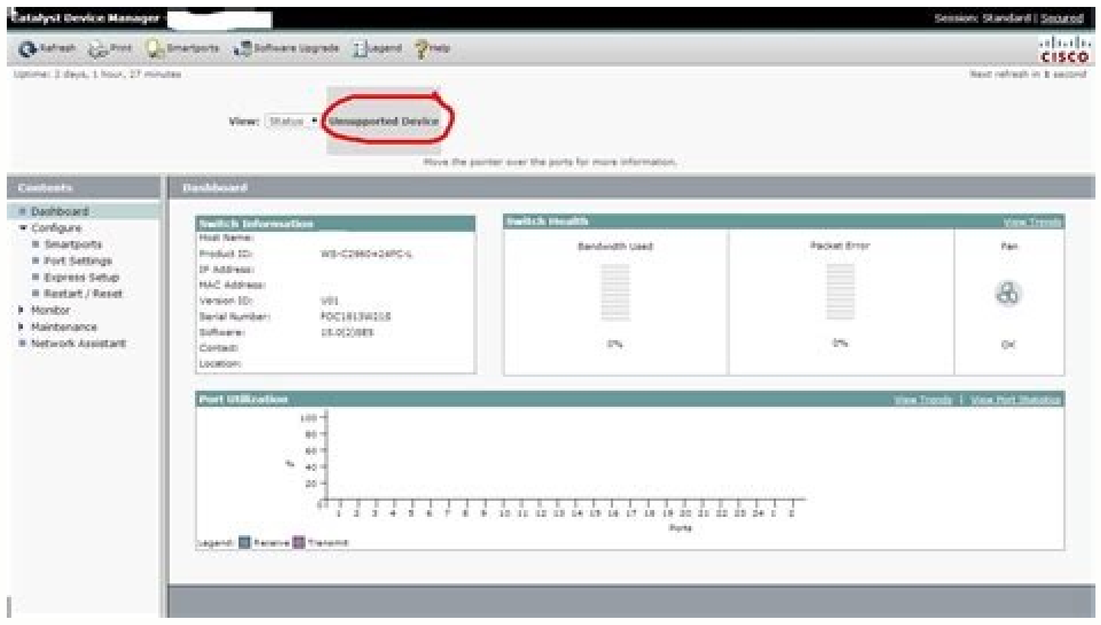

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Cisco catalyst 3850 xs datasheet. Cisco catalyst 3850 4 x 10ge network module datasheet. Cisco catalyst 3850 4 x 1ge network module datasheet.

The digital transformation: Converged wired and wireless access and aggregation The promise of digital for your business is all about innovating more quickly while reducing risk, cost, and complexity. It will be your network that forms the foundation of your business's transformation. But supporting your digital organization will require your network to move beyond just connectivity to be a platform for insights, automation, and security. This is the power of the Cisco® Digital Network Architecture (Cisco DNA). Cisco DNA is a monumental shift on how to design and build networks. The Cisco Catalyst® 3850 Series, as part of the Cisco DNA portfolio of next-generation enterprise-class stackable Ethernet and Multigigabit Ethernet access and aggregation layer switches, securely enables time-saving virtualization, greater automation, and valuable analytics data that directly address your evolving business needs, including less cost to install and operate. The Cisco Catalyst 3850 Series provides capabilities that ideally suited to support the convergence of wired and wireless access. The new Cisco 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 technology. 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, RJ-45 and fiber-based downlink interfaces, and redundant fans and power supplies. Product Overview ● Integrated wireless controller capability with: ◦ Up to 40G of wireless capacity per switch (48-port RJ45 models) ◦ Support for up to 100 access points and 2000 wireless clients on each switching entity (switch or stack) ● 24 and 48 10/100/1000Mbps data PoE+ and Cisco UPOE models with Energy-Efficient Ethernet (EEE) ● 24 and 48 100Mbps/1/2.5/5/10 Gbps Cisco UPOE models with Energy-Efficient Ethernet (EEE) ● 12- and 24-port 1 Gigabit Ethernet SFP-based models ● 12- and 24-port 1/10 Gigabit Ethernet SFP+-based models ● 48-port 1/10 Gigabit Ethernet SFP+ model with 4 fixed 40 Gigabit Ethernet QSFP+ uplinks ● Cisco StackWise-480 technology provides scalability and resiliency with 480 Gbps of stack throughput[1] ● Cisco StackPower® technology provides power stacking among stack members for power redundancy1 ● Five optional uplink modules[2] with 4 x Gigabit Ethernet, 2 x 10 Gigabit Ethernet, 4 x 10 Gigabit Ethernet[3], 8 x 10 Gigabit Ethernet4, or 2 x 40 Gigabit Ethernet QSFP+[4] ports ● Dual redundant, modular power supplies and three modular fans providing redundancy ● Full IEEE 802.3at (PoE+) with 30W power on all copper ports in 1 Rack Unit (RU) form factor ● Cisco UPOE with 60W power per port in 1 Rack Unit (RU) form factor ● IEEE 802.3bz (2.5/5 G/s BASE-T) to go beyond 1 Gb/s with existing Cat5e and Cat6 ● IEEE 802.1ba AV Bridging (AVB) built-in to provide better AV experience for including improved time synchronization and QoS ● Software support for IPv4 and IPv6 routing, multicast routing, modular Quality of Service (QoS), Flexible NetFlow (FNF), and enhanced security features ● Single universal Cisco IOS® Software image across all license levels, providing an easy upgrade path for software features ● Cisco DNA services delivered through Cisco ONE™ Software, providing simplified, high-value solutions with license portability and flexibility ● Support for AES-256 with the powerful MACSEC 256-bit for SFP+ and Multigigabit models and 128-bit encryption algorithm available on all models ● 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 Models and Configurations All switches ship with one of the five power supplies (350WAC, 715WAC, 750WAC, 1100WAC, or 440WDC)[5]. Figures 1 through 4 show the Cisco Catalyst 3850 Series Switches. Cisco Catalyst 3850 Series Switches Cisco Catalyst 3850 Series Switches with 12 and 24 1/10 Gigabit Ethernet SFP+ ports Cisco Catalyst 3850 Series Switches with 12 and 24 1 Gigabit Ethernet SFP ports Cisco Catalyst 3850 Series Switches with 10 Gigabit Ethernet 48 ports Table 1 shows the Cisco Catalyst 3850 Series configurations. Table 1. Cisco Catalyst 3850 Series configurations Model Total 10/100/1000 or SFP or SFP+ ports Default AC power supply Available PoE power POE budget with 1100W secondary PS StackWise-480 StackPower WS-C3850-24T 24 350WAC - Yes Yes WS-C3850-48T 48 WS-C3850-24P 24 PoE+ 715WAC 435W 1535W WS-C3850-48P 48 PoE+ WS-C3850-48F 48 PoE+ 1100WAC 800W 1900W WS-C3850-24U 24 UPOE 1100WAC 800W 1900W WS-C3850-48U 48 UPOE 1100WAC 800W 1900W WS-C3850-24XU 24 UPOE (100Mbps/1/2.5/5/10 Gbps) 1100WAC 580W 1680W WS-C3850-12X48U 48 UPOE (with 12 100Mbps/1/2.5/5/10 Gbps Ports) 1100WAC 630W 1730W WS-C3850-12S 12 SFP 350WAC WS-C3850-24S 24 SFP WS-C3850-12XS 12 1/10G SFP+ 715 WAC - WS-C3850-48XS 48 1/10G SFP+ 750WAC (front to back) - No No Network modules The Cisco Catalyst 3850 Series Switches support five optional network modules for uplink ports. The default switch configuration does not include the network module. At the time of switch purchase the customer has the flexibility to choose from the network modules described in Table 2. Figure 5 shows the following network modules: ● 4 x Gigabit Ethernet with Small Form-Factor Pluggable (SFP) receptacles ● 2 x 10 Gigabit Ethernet with SFP+ or 4 x Gigabit Ethernet with SFP receptacles ● 4 x 10 Gigabit Ethernet with SFP+ receptacles (supported only on the 48-port Gigabit Ethernet models or on the 12-port or higher 10 Gigabit Ethernet models) Network modules with four Gigabit Ethernet, two 10 Gigabit Ethernet SFP+, or four 10 Gigabit Ethernet SFP+ interfaces Figure 6 shows the following network modules: ● 8 x 10 Gigabit Ethernet with Small Form-Factor Pluggable+ (SFP+) receptacles ● 2 x 40 Gigabit Ethernet with Quad Small Form-Factor Pluggable+ (QSFP+) receptacles Network modules with two 40 Gigabit Ethernet QSFP+ or eight 10 Gigabit Ethernet SFP+ interfaces The C3850-NM-4-10G module is supported only on the 48-port Gigabit Ethernet models or on the 12-port or higher 10 Gigabit Ethernet models. The C3850-NM-8x10G and C3850-NM-2x40G modules are supported on the 24-port and 48-port multigigabit switches and also on the 24-port 10G SFP+ switch model. The C3850-NM-4-1G and C3850-NM-2-10G modules are not supported on the 12-port and 24-port SFP+ models. Table 2. Network module compatibility matrix Model Network modules WS-C3850-24T C3850-NM-4-1G, C3850-NM-2-10G WS-C3850-48T C3850-NM-4-1G, C3850-NM-2-10G, C3850-NM-4-10G WS-C3850-24P C3850-NM-4-1G, C3850-NM-2-10G WS-C3850-48P C3850-NM-4-1G, C3850-NM-2-10G, C3850-NM-4-10G WS-C3850-48F C3850-NM-4-1G, C3850-NM-2-10G, C3850-NM-4-10G WS-C3850-24U C3850-NM-4-1G, C3850-NM-2-10G WS-C3850-48U C3850-NM-4-1G, C3850-NM-2-10G, C3850-NM-4-10G WS-C3850-24XU C3850-NM-4-1G, C3850-NM-2-10G, C3850-NM-4-10G, C3850-NM-8-10G, C3850-NM-2-40G WS-C3850-12X48U C3850-NM-4-1G, C3850-NM-2-10G, C3850-NM-4-10G, C3850-NM-8-10G, C3850-NM-2-40G WS-C3850-12S C3850-NM-4-1G, C3850-NM-2-10G WS-C3850-24S C3850-NM-4-1G, C3850-NM-2-10G WS-C3850-12XS C3850-NM-4-10G WS-C3850-24XS C3850-NM-4-10G, C3850-NM-8-10G, C3850-NM-2-40G WS-C3850-48XS None An SFP+ receptacle supports both 10 Gigabit Ethernet and Gigabit Ethernet modules, allowing customers to use their investment in Gigabit Ethernet SFP modules and upgrade to 10 Gigabit Ethernet when business demands change without having to do a comprehensive upgrade of the access switch. In contrast, SFP receptacles can be used only as Gigabit Ethernet ports, as shown in the examples in Table 3. Table 3. Network module configuration examples 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 1 3 2 2 0 4 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.[6] 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 7.) Dual redundant power supplies Table 4 shows the different power supplies available in these switches and available PoE power. Table 4. Power supply models Model 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 24-port Multigigabit UPOE switch PWR-C1-1100WAC 580W 48-port Multigigabit UPOE switch PWR-C1-1100WAC 630W 12-port SFP switch PWR-C1-350WAC - 24-port SFP switch 12-port SFP+ switch PWR-C1-350WAC - 24-port SFP+ switch PWR-C1-715WAC - 48-port SFP+ switch (WS-C3850-48XS-S and WS-C3850-48XS-E) PWR-C3-750WAC-R - 48-port SFP+ switch (WS-C3850-48XS-F-S and WS-C3850-48XS-F-E) PWR-C3-750WAC-F - In addition to the power supplies listed in Table 5, a 440WDC power supply is available as a configuration option and also as a spare (that is, it can be ordered separately) on all switch models. The DC power supply also delivers PoE capabilities for maximum flexibility (refer to Table 6 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 24-port Multigigabit UPOE switch 2 360W 48-port Multigigabit UPOE switch 2 410W 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 (Cisco UPOE) Cisco UPOE (Table 7) 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 Cisco UPOE 24-port UPOE switch 48-port UPOE switch 24-port Multigigabit UPOE switch 48-port multigigabit 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 Two PWR-C1-1100WAC Two PWR-C1-1100WAC Cisco Catalyst Multigigabit Ethernet technology Cisco Multigigabit Ethernet is a unique Cisco innovation to the new Cisco Catalyst Ethernet access switches. With the enormous growth of 802.11ac and new wireless applications, wireless devices are promoting the demand for more network bandwidth. This creates a need for a technology that supports speeds higher than 1 Gbps on all cabling infrastructure. Cisco Multigigabit technology allows you to achieve bandwidth speeds from 1 Gbps through 10 Gbps over traditional Cat 5e cabling or above. In addition, the Multigigabit ports on select Cisco Catalyst switches support UPOE, which is increasingly important for next-generation workspaces and Internet of Things (IoT) ecosystems. Cisco Multigigabit technology offers significant benefits for a diverse range of speeds, cable types, and PoE power. The benefits can be grouped into three different areas: ● Multiple speeds: Cisco Multigigabit technology supports autonegotiation of multiple speeds on switch ports. The supported speeds are 100 Mbps, 1 Gbps, 2.5 Gbps, and 5 Gbps on Cat 5e cable and up to 10 Gbps over Cat 6a cabling. ● Cable type: The technology supports a wide range of cable types, including Cat 5e, Cat 6, and Cat 6a or above. ● PoE power: The technology supports PoE, PoE+, and UPOE for all the supported speeds and cable types. For more information, visit . SD-Access architecture What if you could give time back to IT? And provide network access in minutes for any user or device to any application – without compromise? Cisco Software-Defined Access (SD-Access) is the industry's first intent-based networking solution for the enterprise, built on the principles of Cisco's Digital Network Architecture (Cisco DNA). SD-Access provides automated, end-to-end segmentation to separate user, device, and application traffic without the need to redesign the network. SD-Access automates user access policy so organizations can make sure the right policies are established for any user or device with any application across the network. This is accomplished with a single network fabric across LAN and WLAN, which creates a consistent user experience anywhere without compromising on security. Organizations have many challenges today in managing the network to drive business outcomes. These limitations are due to manual configuration and fragmented tool offerings. SD-Access provides: ● A transformational management solution that reduces operational expenses and enhances business agility ● Consistent management of wired and wireless network provisioning and policy ● Automated network segmentation and group-based policy ● Contextual insights for fast issue resolution and capacity planning ● Open and programmable interfaces for integration with third-party solutions For an overview of key use cases that SD-Access addresses, refer to the SD-Access Solution Overview. SD-Access licensing To be able to benefit from the SD-Access architecture, you must purchase an add-on licensing package. Such licensing package includes the Cisco DNA Essentials and Cisco DNA Advantage options. Add-on licenses have to be purchased for a 3-, 5-, (and hence are also known as term-based licenses). Product SKUs for these packages are given in Table 10 below. Ordering and managing licenses with smart accounts: Creating smart accounts by using the Cisco Smart Software Manager (SSM) enables you to order devices and licensing packages and also to manage your software licenses from a centralized website. You can set up Cisco SSM to receive daily email alerts and to be notified of expiring add-on licenses that you want to renew. When the license term expires, you can either renew the add-on license to continue using it or deactivate the add-on license and then reload the switch to continue operating with the base license capabilities. Note: You are not required to deploy Cisco DNA Center just to use one of the license packages. Table 8 shows the features included in the Essentials and Advantage packages. Table 8. Essentials and Advantage package features Feature Cisco DNA Essentials Cisco DNA Advantage Day 0 network bring-up automation Cisco Network Plug-and-Play application, network settings, device credentials ✓ ✓ Element management Discovery, inventory, topology, software image, licensing, and configuration management ✓ ✓ Element management Patching ✗ ✓ Network monitoring Product Security Incident Response Team (PSIRT) compliance, end-of-life/end-of-sale reporting, telemetry quotient, client 360, device 360, top talkers/ NetFlow/streaming telemetry collection and correlation ✓ ✓ Static QoS configuration and monitoring EasyQoS application ✓ ✓ Policy-based automation SD-Access, group-based policy for access, app prioritization, monitoring, and path selection; SD-Access with integrated wireless ✗ ✓ Network assurance and analytics Insights gained from analytics and machine learning for the network, clients and applications that cover onboarding, connectivity, and performance ✗ ✓ Table 9 shows the product IDs for these licenses. Table 9. Essentials and Advantage package product IDs Product ID Description 12-port C3850-DNA-E-12 C3850 Cisco DNA Essentials, 12-port term licenses C3850-DNA-E-12-3Y C3850 Cisco DNA Essentials, 12-port, 3-year term license C3850-DNA-E-12-5Y C3850 Cisco DNA Essentials, 12-port, 5-year term license C3850-DNA-A-12 C3850 Cisco DNA Advantage, 12-port term licenses C3850-DNA-A-12-3Y C3850 Cisco DNA Advantage, 12-port, 3-year term license C3850-DNA-A-12-5Y C3850 Cisco DNA Advantage, 12-port, 5-year term license 24-port C3850-DNA-E-24 C3850 Cisco DNA Essentials, 24-port term licenses C3850-DNA-E-24-3Y C3850 Cisco DNA Essentials, 24-port, 3-year term license C3850-DNA-E-24-5Y C3850 Cisco DNA Essentials, 24-port, 5-year term license C3850-DNA-A-24 C3850 Cisco DNA Advantage, 24-port term licenses C3850-DNA-A-24-3Y C3850 Cisco DNA Advantage, 24-port, 3-year term license C3850-DNA-A-24-5Y C3850 Cisco DNA Advantage, 24-port, 5-year term license 48-port C3850-DNA-E-48 C3850 Cisco DNA Essentials, 48-port term licenses C3850-DNA-E-48-3Y C3850 Cisco DNA Essentials, 48-port, 3-year term license C3850-DNA-E-48-5Y C3850 Cisco DNA Essentials, 48-port, 5-year term license C3850-DNA-A-48 C3850 Cisco DNA Advantage, 48-port term licenses C3850-DNA-A-48-3Y C3850 Cisco DNA Advantage, 48-port, 3-year term license C3850-DNA-A-48-5Y C3850 Cisco DNA Advantage, 48-port, 5-year term license Spares C3850-DNA-E-12= C3850 Cisco DNA Essentials, 12-port term licenses spare C3850-DNA-A-12= C3850 Cisco DNA Advantage, 12-port term licenses spare C3850-DNA-E-24= C3850 Cisco DNA Essentials, 24-port term licenses spare C3850-DNA-A-24= C3850 Cisco DNA Advantage, 24-port term licenses spare C3850-DNA-E-48= C3850 Cisco DNA Essentials, 48-port term licenses spare C3850-DNA-A-48= C3850 Cisco DNA Advantage, 48-port term licenses spare 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/12-port models). 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 (Figure 8): ● Mobility Agent (MA): This is the default mode in which a 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 48-port Gigabit Ethernet RJ45 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. Mobility Controller (MC) and Mobility Agent (MA) For more information about Converged Wired plus Wireless Access, refer to the Q&A document here: . 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 Cisco Catalyst 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 Cisco Catalyst 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, port security, Dynamic Host Configuration Protocol (DHCP) Snooping and Guard, Dynamic ARP Inspection, RA Guard, IP Source Guard, Control Plane Protection (CoPP), 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. AES-256 MACsec encryption is the IEEE 802.1AE standard for authenticating and encrypting packets between switches and endpoints. The Cisco Catalyst 3850 Series switches support 256-bit (SFP+ and Multigigabit models only) and 128-bit Advanced Encryption Standard (AES) on all ports at all speeds, providing the most secure link encryption. 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[7]. 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, autoversion checking, autoupgrading, autoconfiguration, 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[8] 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[9]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 9.) 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 ● Audio Video Bridging Ease of operations The Cisco Catalyst 3850 helps reduce the operating costs through: ● Cisco Catalyst SmartOperations ● Easy-to-use deployment and control features ● Efficient switch operations ● Network management tools Cisco Catalyst SmartOperations Cisco Catalyst SmartOperations is 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 SmartOperations enable zero-touch installation and replacement of switches, fast upgrade, and ease of troubleshooting with reduced operational cost. Features 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 autodetection 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. ◦ AV Bridging provides reliable time synchronized transmission with no pops or clicks or video dropouts. ● 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. ◦ AV Bridging provides reliable A/V streaming without the need for the installer to perform extensive hand tuning of the network. ●

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 primary configuration management with Cisco StackWise-480 technology helps make sure that all switches are automatically upgraded when the primary 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 (on RJ45 ports), 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. Environmental responsibility 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 . 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 (that is, taking over) another user's IP address by creating a binding table between the client's IP and MAC address, port, and VLAN, and by using it to selectively block bogus packets. ◦ The Unicast Reverse Path Forwarding (uRPF) 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 a 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 VLAN edge restricts traffic between hosts in a switch 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,[10] 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 Multiple Spanning Tree Protocol (MSTP) provides rapid spanning-tree convergence independent of spanning-tree timers and also offers the benefit of Layer 2 load balancing and distributed processing. ● Per-VLAN Rapid Spanning Tree (PVRST+) allows rapid spanning-tree (IEEE 802.1w) reconvergence on a per-VLAN spanning-tree basis, providing simpler configuration than MSTP. In both MSTP and PVRST+ modes, stacked units behave as a single spanning-tree node. ● Switch-port autorecovery ("err-disable" recovery) 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. The IP Base feature set is required for PBR. 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 for VRF-Lite. ● 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 up to 48,000 flow entries on 48-port models and up to 24,000 flow entries on 12-port and 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 . 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. Audio video bridging With Cisco IOS® XE Software Release 16.3, Cisco Catalyst 3850 Multigigabit and 3850 10G SFP+ now support the IEEE 802.1 AVB standard. This standard provided the means for highly reliable delivery of low-latency, time-synchronized AV streaming services through Layer 2 Ethernet networks. The standard also makes it easier to integrate new services and for AV equipment from different vendors to interoperate. Whether the AV endpoint connections are analog or are inflexible digital one to one, the network transport enables many-to-many transparent plug-and-play connections for multiple AV endpoints. Benefits ● Improves quality of experience by lowering jitter and latency for time-synchronized delivery of high-quality AV ● Provides scalability of applications across networked deployments, including expansive and complex AV infrastructure ● Lowers Total Cost of Ownership (TCO) with reduced cabling (lowers CapEx) and no license fees (lowers OpEx) 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 helps ensure 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 helps ensure that migration to the converged access mode of wireless is seamless. Figure 10 shows a Cisco Catalyst 3850 Series Switch in a campus-type deployment. Mobility Controller (MC) and Mobility Agent (MA) Branch The Cisco Catalyst 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 11 shows a Cisco Catalyst 3850 in a branch access type deployment. Deploying the Cisco Catalyst 3850 Series for branch access The new 12-port and 24-port SFP+ or SFP-based Cisco Catalyst 3850 models as well as the nonstackable 48-port SFP+ model can also be used in the branch to aggregate traffic from smaller access switches through fiber links for more secure and EMI-sensitive deployments (Figure 12). Deploying mixed copper and fiber connections with a Cisco Catalyst 3850 stack in the branch Specifications Switch performance Table 10 shows the Cisco Catalyst 3850 Series Switches performance specifications. Table 10. Cisco Catalyst 3850 Series performance specifications Performance numbers for all switch models Switching capacity 176 Gbps on 48-port Gigabit Ethernet model 92 Gbps on 24-port Gigabit Ethernet model 68 Gbps on 12-port Gigabit Ethernet model 640 Gbps on 24-port Multigigabit Ethernet model* 472 Gbps on 48-port Multigigabit Ethernet model 1280 Gbps on 48-port 10 Gigabit Ethernet SFP+ model* 640 Gbps on 24-port 10 Gigabit Ethernet SFP+ model* 320 Gbps on 12-port 10 Gigabit Ethernet SFP+ model* Stacking bandwidth 480 Gbps Total number of MAC addresses 32,000 Total number of IPv4 routes (ARP plus learned routes) 24,000 FNF entries 48,000 flow on 48-port Gigabit Ethernet models 24,000 flows on 12-port and 24-port Gigabit Ethernet models 96,000 flows on 48-port 10 Gigabit Ethernet SFP+ model 48,000 flows on 24-port 10 Gigabit Ethernet SFP+ model 24,000 flows on 12-port 10 Gigabit Ethernet SFP+ model DRAM 4 GB (8 GB on 48-port SFP+ model) Flash 2 GB (4 GB on 12-port and 24-port SFP+ models, 8 GB on 48-port SFP+ model) 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 100 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 Gigabit Ethernet model Up to 20 Gbps on 24-port Gigabit Ethernet model Supported Aironet access point series 3600, 3500, 2600, 1600, 1260, 1140, 1040 Forwarding rate of switch models (with 2 x 10 Gigabit + 2 x 1 Gigabit Ethernet uplinks for 12-port and 24-port models and 4 x 10 Gigabit Ethernet uplinks for 48-port models) Model Forwarding rate WS-C3850-12S 50.5 Mpps WS-C3850-24T WS-C3850-24P WS-C3850-24S 68.4 Mpps WS-C3850-48T WS-C3850-48P WS-C3850-48F 130.95 Mpps WS-C3850-24XU 500 Mpps (80B packets) WS-C3850-12X48U 460 Mpps (64B packets) WS-C3850-12XS 227.28 Mpps WS-C3850-24XS 454.55 Mpps WS-C3850-48XS 909 Mpps Dimensions, weight, acoustic, mean time between failures, and environmental range specifications for Cisco Catalyst 3850 Series Switches Table 11 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 11. Dimensions, weight, acoustic, MTBF, and environmental range[11] Dimensions (H x W x D) Inches Centimeters WS-C3850-12S WS-C3850-24S 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 WS-C3850-48U WS-C3850-24U WS-C3850-24XU WS-C3850-12X48U 1.75 x 17.5 x 19.2 4.45 x 44.5 x 48.8 WS-C3850-12XS WS-C3850-24XS 1.75 x 17.5 x 17.7 4.45 X 44.5 x 45.0 WS-C3850-48XS 1.75 x 17.5 x 20.1 4.45 X 44.5 x 51.1 Weight Pounds Kilograms WS-C3850-12S 15.48 7.02 WS-C3850-24S 15.5 7.03 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 WS-C3850-24XU 17.6 8.0 WS-C3850-12X48U 17.6 8.0 WS-C3850-12XS 12.9 5.8 WS-C3850-24XS 13.5 6.1 WS-C3850-48XS 16.42 7.45 C3850-NM-4-1G 0.66 0.30 C3850-NM-2-10G 0.71 0.32 C3850-NM-4-10G 0.75 0.34 C3850-NM-8-10G 0.74 0.34 C3850-NM-2-40G 0.62 0.28 MTBF hours WS-C3850-12S 315,840 WS-C3850-24S 300,760 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 WS-C3850-24XU 203,150 WS-C3850-12X48U 202,030 WS-C3850-12XS 371,440 WS-C3850-24XS 307,990 WS-C3850-32XS 307,990 WS-C3850-48XS 286,900 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 C3850-NM-8-10G 6,544,410 C3850-NM-2-40G 9,303,100 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°F (0°C) 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 sea level 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 sea level 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°C 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. Nonoperating: 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 Nonoperating: 55G, 10ms trapezoid Connectors for Cisco Catalyst 3850 Series Table 12 shows the supported connectors. Table 12. Connectors Connectors and cabling ● 1000BASE-T ports: RJ-45 connectors, 4-pair Cat-5E UTP cabling ● Multigig-T ports: RJ-45 connectors, 4-pair Cat-5E, Cat-6, Cat6A 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, ER, ZR, DWDM SFP+ transceivers: LC fiber connectors (single-mode or multimode fiber) ● CX1 cable assemblies: SFP+ connector ● 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 autoranging 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. For the latest Cisco transceiver module compatibility information, refer to . Management and standards support for Cisco Catalyst 3850 Series Switches Table 13 shows management and standards support for the Cisco Catalyst 3850 Series. Table 13. Management and standards support for the Cisco Catalyst 3850 Series Description Specification Management BRIDGE-MIB CISCO-AUTH-FRAMEWORK-MIB CISCO-BGP4-MIB, BGP4-MIB CISCO-BRIDGE-EXT-MIB CISCO-BULK-FILE-MIB CISCO-CABLE-DIAG-MIB CISCO-CALLHOME-MIB CISCO-CEF-MIB CISCO-CIRCUIT-INTERFACE-MIB CISCO-ENTITY-VENDORTYPE-OID-MIB CISCO-CONTEXT-MAPPING-MIB CISCO-DEVICE-LOCATION-MIB CISCO-DHCP-SNOOPING-MIB CISCO-EIGRP-MIB CISCO-EMBEDDED-EVENT-MGR-MIB CISCO-ENTITY-FRU-CONTROL-MIB CISCO-ENTITY-SENSOR-MIB ENTITY-MIB CISCO-ERR-DISABLE-MIB CISCO-CONFIG-COPY-MIB CISCO-FLOW-MONITOR-MIB CISCO-FTP-CLIENT-MIB CISCO-HSRP-EXT-MIB CISCO-HSRP-MIB CISCO-IETF-ISIS-MIB CISCO-IF-EXTENSION-MIB CISCO-IGMP-FILTER-MIB CISCO-CONFIG-MAN-MIB CISCO-IP-CBR-METRICS-MIB CISCO-IPMROUTE-MIB CISCO-IP-STAT-MIB CISCO-IP-URPF-MIB CISCO-L2L3-INTERFACE-CONFIG-MIB CISCO-LAG-MIB CISCO-LICENSE-MGMT-MIB CISCO-MAC-AUTH-BYPASS-MIB CISCO-MAC-NOTIFICATION-MIB CISCO-MDI-METRICS-MIB CISCO-FLASH-MIB CISCO-OSPF-MIB CISCO-OSPF-TRAP-MIB CISCO-PAE-MIB CISCO-PAGP-MIB CISCO-PIM-MIB CISCO-PING-MIB CISCO-PORT-QOS-MIB CISCO-PORT-SECURITY-MIB CISCO-PORT-STORM-CONTROL-MIB CISCO-POWER-ETHERNET-EXT-MIB CISCO-PRIVATE-VLAN-MIB CISCO-PROCESS-MIB CISCO-PRODUCTS-MIB CISCO-RF-MIB CISCO-RTP-METRICS-MIB CISCO-RTTMON-MIB CISCO-SMART-INSTALL-MIB CISCO-SNMP-TARGET-EXT-MIB CISCO-STACKMAKER-MIB CISCO-MEMORY-POOL-MIB CISCO-STP-EXTENSIONS-MIB CISCO-SYSLOG-MIB CISCO-TCP-MIB CISCO-UDLDP-MIB CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB CISCO-VLAN-MEMBERSHIP-MIB CISCO-VTP-MIB EtherLike-MIB HC-RMON-MIB IEEE8021-PAE-MIB IEEE8023-LAG-MIB IF-MIB IGMP-MIB IGMP-STD-MIB IP-FORWARD-MIB IP-MIB IPMROUTE-STD-MIB LLDP-EXT-MED-MIB LLDP-MIB NOTIFICATION-LOG-MIB OLD-CISCO-MEMORY-MIB CISCO-CDP-MIB POWER-ETHERNET-MIB RMON2-MIB RMON-MIB SNMP-COMMUNITY-MIB SNMP-FRAMEWORK-MIB SNMP-MPD-MIB SNMP-NOTIFICATION-MIB SNMP-PROXY-MIB SNMP-TARGET-MIB SNMP-USM-MIB SNMPv2-MIB SNMP-VIEW-BASED-ACM-MIB TCP-MIB UDP-MIB CISCO-IMAGE-MIB CISCO-STACKWISE-MIB AIRESPMACE-WIRELESS-MIB CISCO-LWAPP-IDS-MIB CISCO-LWAPP-AP-MIB CISCO-LWAPP-CCX-RM-MIB CISCO-LWAPP-CLIENT-ROAMING-MIB CISCO-LWAPP-DOT11-CCX-CLIENT-DIAG-MIB CISCO-LWAPP-DOT11-CCX-CLIENT-MIB CISCO-LWAPP-DOT11-CLIENT-CCX-REPORTS-MIB CISCO-LWAPP-DOT11-CLIENT-MIB CISCO-LWAPP-DOT11-MIB CISCO-LWAPP-DOWNLOAD-MIB CISCO-LWAPP-LINKTEST-MIB CISCO-LWAPP-MFP-MIB CISCO-LWAPP-MOBILITY-EXT-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 802.1as IEEE 802.1s IEEE 802.1w IEEE 802.11 IEEE 802.1x IEEE 802.1x-Rev IEEE 802.3ad IEEE 802.3af IEEE 802.3at IEEE 802.3bz 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 802.1Qat Stream Reservation Protocol IEEE 802.1Qav 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 RMON I and II standards SNMPv1, SNMPv2c, and SNMPv3 Power supply specifications Table 14 lists the power specifications for the Cisco Catalyst 3850 Series based on the kind of power supply used. Table 14. 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

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