

Team Four Milestone 2

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Executive Summary

This report will cover the network & telephone descriptions of the IT Infrastructure design for Geezertown Investments, including devices, services, planned configurations, and any additional assumptions made. The total cost of each section assumes a negotiated 20% discount, and rates of services were estimated based on comparable packages or licenses. Additional assumptions were made regarding existing cabling, the office building's layout, and compatibility with existing proprietary software. The specification of user equipment and the exact configuration of devices and software will be covered in a future milestone. The total cost is estimated at \$79,341.

The network infrastructure will consist of a Cisco ISR 4451-X router, which will be configured to prioritize VoIP traffic and interface with both ISPs. Our managed switches will enable VLAN segmentation ensuring the safety of company assets; we will use two different models, and utilize 2 core switches (10gbps uplink) and 5 access switches. We will use two Fortinet FortiGates as our standalone firewalls, which will host VPN connections for travelling consultants, and is easily managed with the FortiAnalyzer cloud. We also estimate about eight wireless APs to ensure proper coverage of the new office, which will support 10+ users each, allowing for guest access and future expansion. Cat6a cabling will be used to support end devices and switches, while fiber optic cables will connect the ISP, router, firewall, and core switches, ensuring an efficient backbone. All network devices will be configured to send data to the Cisco Catalyst Center, to be monitored and managed by the IT team.

The VoIP system revolves around an on-site PBX, achieved by servicing our router with the Cisco Unified Communications Manager (CUCM). Our design supports upwards of 100 employees. On-site employees will receive a Cisco 8845 VoIP phone, travelling consultants will get a company-issued smartphone, and conference rooms will harbor a Polycom RealPresence Trio 8800; each device will need a license for the CUCM. Travelling consultants are able to securely connect to the office's LAN through a pre-configured VPN on their smartphones. Network Device configurations, like QoS and PoE+ support on switches, ensure high quality VoIP calls and reliability. We have ordered additional units of network/telephone items to allow fast replacement in the case of equipment failure.

Additional Assumptions

Numerous assumptions were made regarding pricing, existing infrastructure/software, and Geezertown's expectations. Item prices are based on public vendor prices, though we assume negotiations lead to a 20% discount on average. The prices of our enterprise-level ISP services were estimated by increasing the price of business-level services by ~25%. Some items (such as Cisco licensing for APs) have prices estimated based on public prices of similar items/services. Our assumptions from the previous milestone still stand; devices and services were specified such that they meet Geezertown's goal of immediate customer service by minimizing downtime, while allowing for future expansion. We assume that both ISPs will supply the interface for the Internet Connection, and that they will use independent cables for redundancy. HTC was specified under the belief that negotiations will produce a Service Level Agreement (SLA) that is comparable to Spectrum's. The team has operated under the belief that existing cabling is not suitable for the design. Assumptions were made regarding the layout and size of the building and expected maximum network traffic; the desired capacity of our UPS (based on expected peak power consumption), the number and positioning of wireless APs, and the amount of cabling reflect this. Such decisions were made under the assumption that at any given time, about half of the on-premises staff will be in the office, though specifications were also made to permit growth.

Any existing infrastructure or software is assumed to be compatible with the Cisco Unified Communications Manager, and the Cisco Catalyst Center, allowing integration of these services. We assume that the Cisco Catalyst Center's management and monitoring features justify the investment, given the importance of protecting customer data and other company assets. We planned certain configurations of network devices and services, but we assume that the installation and specific configurations and network rules will be handled in later milestones. Similarly, we assume that further specification of user equipment, or software/accessories pertaining to this equipment, will be addressed in future milestones. This extends to pre-configuration of company-issued devices, such as VPN access for travelling consultants, to ensure compatibility with existing Geezertown applications and infrastructure.

Network Description

The new office for Geezertown Investments will need to support about 100 employees daily (in two separate shifts), including call center associates, traveling senior lifestyle consultants, IT staff, and the management team. With 100 employees, each requiring a phone and computer, we can assume that upwards of 100 devices will be connected to the network at a given time. Assuming each employee will require 5-10mbps to support utilization of two devices including VoIP calls, the network must support a throughput of 500mbps-1gbps. We also assume peak VoIP concurrency of about 75% to ensure lines are readily available, minimizing waiting times. Geezertown Investments prioritize customer satisfaction and immediate customer service; This means that it is of the utmost importance that our network has minimal downtime, while ensuring that our plan sufficiently supports all employees and their respective devices. High rates of up-time and reliability, fast speeds, strong security and allowing room for growth are our main priorities. Our solution will specify enterprise-grade equipment that will support Geezertown staff's business operations, provide monitoring and logging tools and devise contingency plans in the case of outages, equipment failure, etc. We will order additional units of specified items to allow for immediate replacement in case of equipment failure. The total cost of our network infrastructure design is estimated to be about \$45,585 assuming we can negotiate prices and receive discounts on bulk orders.

The first decision to be made was regarding the Internet Service Provider (ISP); after a careful comparison of local options, we've decided that Spectrum Enterprise services would be the best fit for our office. Spectrum offers a dedicated fiber plan with a Service Level Agreement (SLA) that promises 99.9% or better up-time and financial credit in the case of outages. This will 1 Gbps fiber service, ensuring that internet speeds will not be affected by high traffic (whether from emails, cloud-based apps, video/voice calls, etc.). We are also specifying a backup connection through a secondary ISP, Horry Telephone Cooperative (HTC) fiber services, as they offer competitive prices and comparable speeds. HTC provides limited public information regarding uptime, though their planned maintenance downtimes (12AM – 6AM) are almost entirely outside of business hours. Before confirming HTC as a backup ISP, we will

need to further question whether they provide an SLA like spectrum and ensure that they use a separate physical connection to our building from Spectrum, so that if one physical connection fails, both ISP connections do not fail simultaneously. We assume that both ISPs will provide their own unique physical connections to our building.

For the heart of our network, the router we specified is the Cisco ISR 4451-X Integrated Services Router, as it supports our required 1gbps throughput and dual internet links. The router interfaces with both ISPs (Spectrum and HTC) for failover redundancy; this allows us to fall back on our backup ISP for business operations in the case of an outage of our primary provider. Cisco offers long-term support and fast security updates and supports the Cisco Catalyst Center tool to help our IT team manage, monitor, and log communications. The router (as well as switches, wireless APs, etc.) will send data to the Cisco Catalyst Center, centralizing and streamlining the process of network monitoring; this means all active APs and switches require licensing. To ensure calls are handled quickly and efficiently, we plan to configure QoS on the router such that VoIP traffic is prioritized, even during periods of high traffic. Specifics of the pre-configuration of network devices and employee equipment will be handled at a later date.

We will use managed switches to enable the stream of data between our network and our routers, wireless access points, servers, and firewalls. This allows us to further segment the network, which serves to secure the company's assets and client information; we will ensure that the Guest Wi-Fi is segmented from the rest of the company's devices. Again, we will implement QoS configurations to prioritize VoIP within the LANs, and have data sent from switches to the Cisco Catalyst Center for logging and monitoring. We will use two core switches in the server room with 10 Gbps uplinks, so the backbone never slows down. Both core switches will be configured for redundancy, so if one switch were to fail, traffic can automatically route to the other switch. We also estimate to use about five 48-port access switches with 1 Gbps ports for users, and all switches will support PoE+ so they can power VoIP phones and wireless access points through the same cable, ensuring compatibility with the PBX service.

The Fortinet FortiGate will be installed as our stand-alone firewall, which will host VPN connections for remote users, block intrusions and malware, and inspect and filter traffic in real time. We plan to utilize two of these firewalls so that one can take over if the other fails, maintaining the security of assets. The Fortinet FortiGate provides the FortiAnalyzer cloud, which provides detailed logs and monitors interactions with the firewall. VPN hosting is necessary as it allows our traveling senior lifestyle consultants to securely connect to the main office's LAN. This device will also be responsible for specifying rules that complement the VLAN segmentation established by our network switches; we will limit access of users and block access to sites that are deemed inappropriate.

The entire office network will use Cat6a Ethernet cables, which support up to 10Gbps speeds, ensuring consistency and room for growth. Cat6a cabling will support PoE+, allowing wireless APs and VoIP phones to be powered through a single cable. All cables will need to be plenum-rated and comply with safety codes in case of a fire, since they will run above drop ceilings where air circulates. Fiber optic cables will connect core switches directly to the firewall and router, creating our networks' backbone.

Some additional network components that we've specified include Cisco Meraki Wi-Fi 6 (802.11ax) APs, with overlapping coverage for fast and stable wireless. We recommend about 8 of these wireless AP devices to balance the network load across multiple devices and allow room for expansion; this decision was made under the conservative assumption that each AP reliably supports ~10 users, including guests. This number assumes a large, multi-floor office, and may change after a survey of the building. We will connect the specified network devices to Uninterruptible Power Supplies (UPS) to prepare for brief outages, and protect the network equipment from surges, damage, etc. For the specified Switches, Router, and Firewall, we will order one additional device for storage, in case a device fails and must be replaced immediately. We assume that a backup power generator that can support the network is available on site, allowing the continuity of business operations.

Telephone Description

For the new Geezertown Investments office in Aynor, South Carolina, our team decided to select a Voice over Internet Protocol (VoIP) system over traditional landline and cellular alternatives. We based this decision on the organization's need for flexibility, scalability, and the economic efficiency that VoIP solutions offer. The system will leverage an on-site PBX (Private Branch Exchange) platform managed through Cisco Unified Communications Manager (CUCM), which enables features such as voicemails to emails, extension-based dialing, call routing, auto attendants, and conferencing. This setup ensures that all VoIP traffic benefits from the office's QoS & PoE+ configurations, and other features of the network infrastructure, supporting all 100 employees across all departments. The estimated final cost of the telephone section of the design is \$33,756, assuming we can negotiate prices down by about 20%.

We will integrate Cisco Unified Communications Manager (CUCM), enabling our office router to serve as an on-site PBX device, routing all VoIP traffic through the LAN, which will be preconfigured with VPN access and PBX integration. This approach allows for growth in the future, as we can add more licenses for additional users/devices. IT staff can manage voicemails, users, call routing, and conference settings via a local management interface. Features such as hunt groups, auto attendants, and voicemail transcription will improve the efficiency of the call center environment. Additionally, the system supports secure VPN connections for remote users, including traveling consultants, allowing them to access the VoIP system via mobile apps as if they were physically in the office.

In total, the employee count for the new office is 100; this includes 60 call center agents, 10 IT staff, 10 managers, and 20 senior lifestyle consultants who travel off site. The design aims for 80 VoIP desk phones to be deployed throughout the office, one for each of the on-site employees. The traveling consultants will instead receive a corporate issued smartphone, the Samsung Galaxy A36 5G Smartphone, which allows them to connect to the office LAN via VPN connections, access the web applications, and can be integrated with the on-site PBX system. The CUCM Enhanced User Connect License (UCL) are used to support all IP phones and smartphones, ensuring that each device and user can access PBX

services and centralize call management. Regarding internal team collaboration and virtual meetings, two conference rooms will be equipped with Polycom RealPresence Trio 8800 devices as it supports high quality audio conferencing and integrates seamlessly with SIP based VoIP systems.

The chosen standard VoIP desk phone is the Cisco 8845. This is a mid to high-end IP phone that features HD audio, a five-inch color display, headset support, and integrated video calling. This phone is compatible with Power over Ethernet Plus (PoE+), which allows it to draw power from the network switch, eliminating the need for individual AC power adapters and simplifying cable management. Our conference rooms will be using the Polycom RealPresence Trio 8800, a high-performance conference phone with built-in microphones and support for both voice and video conferencing via the on-site PBX system. Each of these IP phones will connect to the network using Cat6a cabling, which is specified in the network infrastructure. Since VoIP phones use the existing network cable runs and switches, no additional telephone-specific wiring is necessary, but these costs are excluded from the telephone budget.

The new office's Cisco Catalyst access switches support PoE+ and are configured with Quality of Service (QoS) rules to prioritize VoIP traffic. This guarantees that voice calls maintain high clarity and reliability, especially during periods of peak network usage. Our office router is also programmed to handle external VoIP traffic routing and NAT traversal for SIP communication, enabling seamless communication with clients and remote staff through the on-site PBX system, accessible via VPN. Since VoIP traffic is prioritized at the switch and router levels, we can ensure consistent call quality. This is a critical factor for Geezertown Investments given the company's commitment to providing exceptional customer service to its senior clientele.

Since the network uses Cat6a plenum related cabling for all workstations, the same cables/wall jacks have the ability to support the VoIP phones which eliminates the need for separate telephone wiring and reduces costs. The use of PoE+ gives phones the ability to receive both data and power through single cables.

Appendix A: Network Components



Enterprise Internet

Enterprise Internet (EI) enables fast, reliable, and cost-effective access to the internet with a range of speeds to meet your needs. EI is designed to deliver a consistent enterprise-grade experience locally, regionally, or nationally and is backed by an industry-leading service-level agreement (SLA) that provides for 99.9% uptime from the provided Customer Premise Equipment (CPE) located in your facility all the way to the internet. If an issue does occur, the SLA provides for a 6-hour mean time to restore (MTTR) commitment and unrivaled remedies.

Network

Enterprise Internet service runs over the fiber-rich Spectrum Hybrid Fiber-Coaxial (HFC) network and is provisioned utilizing DOCSIS 3.1 and fiber to the premises (FTTP) technology. This service delivers reliable internet connectivity into the client premises offering download speeds of up to 1 Gbps. An HFC network combines the best of modern internet infrastructure, bridging fiber optic cables and coaxial lines.

Internet access demarcation

Spectrum Enterprise will provide and install certified and tested CPE consisting of either a D3.1 (or better) Cable Modem (CM) (that supports DOCSIS 3.1 or higher), or an Optical Network Unit (ONU). All traffic is routed from the CPE in the client's suite over the Spectrum network to the internet exchange point.

The cable modem or ONU has a coaxial or fiber interface on the WAN (Wide Area Network) or network side and an Ethernet connection on the LAN (Local Area Network), or client side. The client is responsible for the LAN infrastructure and configuration, including the physical connection to the CPE. The CM or ONU will be automatically provisioned once installation is completed, and the device is powered on. Client-owned equipment is not supported.

Routing

Routing options are provided through LAN or static routing using Spectrum Enterprise-provided equipment. EI includes basic Dynamic Host Configuration Protocol (DHCP) IP addressing by default that is dynamically assigned to

provide the most accurate routing path to reach the Point of Presence (POP) gateway to the public internet. DHCP automatically signs the next available IP address to a client-owned device when it connects to the internet.

Static IP address space is available for additional add-on purchase and will be provided in accordance with American Registry for Internet Numbers (ARIN) IP allocation policies and delivered by a Spectrum Enterprise deployed router. Static IP (IPv4) addresses are supported for EI. Clients are only allowed one Static IP block per router.

Network monitoring

Spectrum Enterprise utilizes a variety of network management practices consistent with industry standards to ensure that all clients enjoy a high-quality online experience. Spectrum Enterprise provisions its devices and engineers its network to maximize our clients' ability to receive the fastest speed levels for each tier of service to which a client subscribes.

Site access

The client must provide access to the requested service location for installation and maintenance of services. This includes access to buildings and the point of demarcation for service installation and maintenance. For maintenance purposes, the CPE should be in an area accessible to Spectrum Enterprise technicians. If the equipment is not accessible, the client must provide access for troubleshooting and/or maintenance purposes.

Installation

Spectrum Enterprise will work with the client to design, install and understand the client's needs for connectivity and any pieces of a managed network. We will ensure a reliable and consistent experience for seamlessly connecting and securely scaling your network at completion of the installation. Spectrum Enterprise will deploy a local technician for the installation and will ensure connectivity and service turn-up upon completion.

Billing and technical support

Billing starts at the time of installation. From there, Spectrum Enterprise provides 24/7/365, 100% U.S.-based support for all billing, technical, or EI service-related issues for all network locations. This support is reached via a single contact point with target response times of 30 seconds.

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Residential Cable Modem Tier	Advertised Speed Download	Advertised Speed Upload	Performance Latency	Performance Packet Loss
Standard	500 Mbps	20 Mbps	15 ms	-1%
Premium	750 Mbps	20 Mbps	15 ms	-1%
Ultra	1000 Mbps	20 Mbps	15 ms	-1%
Residential Fiber Tier	Advertised Speed Download	Advertised Speed Upload	Performance Latency	Performance Packet Loss
Standard	500 Mbps	500 Mbps	15 ms	-1%
Premium	750 Mbps	500 Mbps	15 ms	-1%
Ultra	1000 Mbps	500 Mbps	15 ms	-1%
Residential Cable DSL	Advertised Speed Download	Advertised Speed Upload	Performance Latency	Performance Packet Loss
Standard	10 Mbps	1 Mbps	15 ms	-1%
Business Tier	Advertised Speed Download	Advertised Speed Upload	Performance Latency	Performance Packet Loss
Standard	750 Mbps	20 Mbps	15 ms	-1%
Premium	1000 Mbps	35 Mbps	15 ms	-1%

Members can test their actual speeds using the speed test found on the Cooperative's website <http://htcnetracer.speedtestcustom.com> or <https://www.speedtest.net>. HTC utilizes available systems and processes that allow the Cooperative to measure the performance of the HTC controlled network against advertised speeds.

VII. Specialized Services

HTC does not provide specialized services at this time.

VIII. Device Attachment Rules

HTC provides DSL modems, FTTH residential gateways and cable modems as part of its broadband services. Members may attach any industry standard device beyond the residential gateway, DSL modem or cable modem. If HTC discovers a member device is harmful to its network, HTC has the right to request that the member remove such device.

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Benefits	Description
	<ul style="list-style-type: none"> the Cisco IOS XE Software technology sets, which you can activate with a software license. With the Universal image your business can quickly deploy advanced features without downloading a new Cisco IOS XE Software image. The Cisco Unified Computing System™ (Cisco UCS®) E-Series modules allow you to reduce CapEx and deploy a variety of application services in an integrated general-purpose server.
High performance with integrated services	<ul style="list-style-type: none"> The Cisco 4451-X enables deployment in high-speed WAN environments with concurrent services enabled up to 2Gbps. The backplane architecture enables high-bandwidth module-to-module communication up to 10 Gbps without compromising router performance.
Network agility	<ul style="list-style-type: none"> The Cisco 4451-X gives you the performance and services needed to accommodate the changes in the business environment brought about by the migration to cloud-based services. Performance-on-demand licensing increases the router capacity without any hardware upgrades. Dual integrated power supplies provide power redundancy and industry-leading power efficiency. Modular interfaces offer increased bandwidth, a diversity of connection options, and network resiliency.
Investment protection	<ul style="list-style-type: none"> The Cisco 4451-X maximizes investment protection by supporting a rich set of Cisco IOS XE Software features delivered in a single, universal image. The Cisco 4451-X offers extensive growth possibilities as your network expands: <ul style="list-style-type: none"> The performance-on-demand licensing enables flexibility for future upgrades. Module density provides flexibility to add services as your business needs expand.

Platform Architecture and Modularity

The Cisco 4451-X is architected to meet the application demands of today's branch offices with design flexibility for future applications. The modular architecture is designed to support increasing bandwidth requirements, time-division multiplexing (TDM) connections, and fully integrated power distribution to modules supporting IEEE 802.3af Power over Ethernet (PoE) and 802.3at PoE Plus (PoE+). Table 2 lists the architectural features and benefits of the Cisco 4451-X.

Table 2. Architectural Features and Benefits of Cisco 4451-X

Architectural Features	Benefits
Modular platform	<ul style="list-style-type: none"> The Cisco 4451-X is a modular platform with several types of module slots to add connectivity and services for varied branch-office network requirements. The routers offer a breadth of LAN and WAN connectivity options through modules to accommodate field upgrades to future technologies without requiring platform replacement.
Processors	<ul style="list-style-type: none"> The Cisco 4451-X is powered by high-performance multicore processors that can support the growing demands of high-speed WAN connections to the branch office while also running multiple concurrent services. The Cisco 4451-X data plane uses an emulated Quantum Flow Processor (QFP) that delivers application-specific integrated circuit (ASIC)-like performance that does not degrade as services are added.
Embedded IP Security (IP sec) VPN hardware acceleration	<ul style="list-style-type: none"> Embedded hardware encryption acceleration is enhanced to provide higher scalability, which, combined with an optional Cisco IOS XE Software Security license, enables WAN link security and VPN services.
Integrated Gigabit Ethernet ports	<ul style="list-style-type: none"> The Cisco 4451-X provides four 10/100/1000 Ethernet ports for WAN or LAN. All four of the 10/100/1000 Ethernet ports can support Small Form-Factor Pluggable (SFP)-based connectivity in addition to RJ-45 connections, enabling fiber or copper connectivity. You also have the option of enabling PoE on 2 out of the 4 ports. An additional dedicated Gigabit Ethernet port is provided for device management.
USB-based console access	<ul style="list-style-type: none"> A mini type-B USB port supports management connectivity when traditional serial ports are not available. Traditional console and auxiliary ports are also available.
Optional integrated power supply for distribution of PoE	<ul style="list-style-type: none"> An optional upgrade to the internal power supply provides inline power (802.3af-compliant PoE or 802.3at-compliant PoE+) to optional integrated switch modules. Redundant PoE conversion modules provide an additional layer of fault tolerance. Optional PoE on two front Gigabit Ethernet interfaces provides power to external devices such as fourth-generation (4G) routers.
Optional integrated redundant power supply (RPS) and PoE boost	<ul style="list-style-type: none"> Power redundancy is available by installing an optional integrated RPS, thereby decreasing network downtime and protecting the network from power failures. Optional PoE boost mode increases total PoE capacity to 1000W.

Modularity Features and Benefits

The Cisco 4451-X provides significantly enhanced modular capabilities (refer to Table 3) while maintaining investment protection for customers.

A complete list of supported modules, including a list of supported SFPs for the Cisco 4451-X, is available at: http://www.cisco.com/en/US/products/ps10536/products_relevant_interfaces_and_modules.html.

Table 3. Modularity Features and Benefits

Architectural Features	Benefits
Cisco Enhanced Services Module (SM-X)	<ul style="list-style-type: none">Each service-module slot offers high data-throughput capability up to 10Gbps toward the router processor and to other module slots.Support for both single- and doublewide service modules provides flexibility in deployment options.You can increase interface density with a carrier card that supports network interface modules in a service-module slot.Service modules support online insertion and removal (OIR), reducing downtime required for new or replacement modules.
Cisco Network Interface Modules (NIMs)	<ul style="list-style-type: none">The Cisco NIM evolves the enhanced high-speed WAN interface card (EHWIC), increasing port density and module capability.Three integrated NIM slots on the Cisco 4451-X allow for flexible configurations.Each NIM slot offers high-data-throughput capability up to 2Gbps toward the router processor and to other module slots.NIMs support OIR, reducing downtime required for new or replacement modules.Special NIMs add support solid-state drives (SSDs) and hard-disk drives (HDDs).
Cisco Integrated Services Card (ISC) slot on motherboard	<ul style="list-style-type: none">ISC natively supports the new Cisco High-Density Packet Voice Digital Signal Processor Modules (PVDM4s), providing greater-density rich-media voice.Each ISC slot connects back to the system architecture through a 2-Gbps link.Future modules can be hosted on the ISC slot, improving system functions.
Flash memory support	<ul style="list-style-type: none">A single flash memory slot is available on the Cisco 4451-X to support high-speed storage densities upgradable to 32GB.Two USB type A 2.0 ports are supported, providing secure token capabilities and convenient storage.
DRAM	<ul style="list-style-type: none">You can upgrade the default 4-GB control-plane memory to 16GB to provide additional scalability for control-plane features.The default data-plane memory is 2 GB.

Cisco IOS XE Software

The Cisco 4451-X delivers innovative technologies running on industry-leading Cisco IOS XE Software. Cisco IOS XE Software is designed to provide modular packaging, feature velocity, and powerful resiliency. Developed for wide deployment in the world's most demanding enterprise, access, and service provider networks, Cisco IOS XE Software releases support a comprehensive portfolio of Cisco technologies. New innovations span multiple technology areas, including security, voice, high availability, IP Routing, IP Multicast, quality of service (QoS), IP Mobility, Multiprotocol Label Switching (MPLS), VPNs, and embedded management. For more information about Cisco IOS XE releases, please visit <http://www.cisco.com/go/ios>.

Cisco IOS Software Licensing and Packaging

A single Cisco IOS XE Universal image encompassing all functions is delivered with the platform. You can enable advanced features by activating a software license on the Universal image. Technology packages and feature licenses, enabled through Right-to-Use licenses, simplify software delivery and decrease the operational costs of deploying new features.

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Specifications

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Hardware Specifications				
GE RJ45 WAN / DMZ Ports	2 / 1	2 / 1	2 / 1	2 / 1
GE RJ45 Internal Ports	5	5	5	5
GE RJ45 FortiLink Ports (Default)	2	2	2	2
Wireless Interface	—	—	Single Radio (2.4GHz/5GHz), 802.11 a/b/g/n/ac-W2	Single Radio (2.4GHz/5GHz), 802.11 a/b/g/n/ac-W2
USB Ports	1	1	1	1
Console (RJ45)	1	1	1	1
Internal Storage	—	1 × 128 GB SSD	—	1 × 128 GB SSD
Trusted Platform Module (TPM)	—	—	—	—
Bluetooth Low Energy (BLE)	—	—	—	—
Signed Firmware Hardware Switch	—	—	—	—
System Performance — Enterprise Traffic Mix				
IPS Throughput ²			1.4 Gbps	
NGFW Throughput ^{2,4}			1 Gbps	
Threat Protection Throughput ^{2,5}			700 Mbps	
System Performance				
Firewall Throughput (1518 / 512 / 64 byte UDP packets)			10/10/6 Gbps	
Firewall Latency (64 byte UDP packets)			3.3 µs	
Firewall Throughput (Packets Per Second)			9 Mpps	
Concurrent Sessions (TCP)			700 000	
New Sessions/Second (TCP)			35 000	
Firewall Policies			2000	
IPsec VPN Throughput (512 byte) ¹			6.5 Gbps	
Gateway-to-Gateway IPsec VPN Tunnels			200	
Client-to-Gateway IPsec VPN Tunnels			500	
SSL-VPN Throughput ⁶			900 Mbps	
Concurrent SSL-VPN Users ⁶ (Recommended Maximum, Tunnel Mode)			200	
SSL Inspection Throughput (IPS, avg. HTTPS) ³			630 Mbps	
SSL Inspection CPS (IPS, avg. HTTPS) ³			400	
SSL Inspection Concurrent Session (IPS, avg. HTTPS) ³			55 000	
Application Control Throughput (HTTP 64K) ²			1.8 Gbps	
CAPWAP Throughput (HTTP 64K)			8 Gbps	
Virtual Domains (Default / Maximum)			10 / 10	
Maximum Number of FortiSwitches Supported			24	
Maximum Number of FortiAPs (Total / Tunnel Mode)			64 / 32	
Maximum Number of FortiTokens			500	
High Availability Configurations			Active-Active, Active-Passive, Clustering	
Dimensions				
Height x Width x Length (inches)			1.5 × 8.5 × 6.3	
Height x Width x Length (mm)			38.5 × 216 × 160 mm	
Weight			2.23 lbs (1.01 kg)	
Form Factor			Desktop	

Note: All performance values are "up to" and vary depending on system configuration.

¹ IPsec VPN performance test uses AES256-SHA256.

² IPS (Enterprise Mix), Application Control, NGFW and Threat Protection are measured with Logging enabled.

³ SSL Inspection performance values use an average of HTTPS sessions of different cipher suites.

⁴ NGFW performance is measured with Firewall, IPS and Application Control enabled.

⁵ Threat Protection performance is measured with Firewall, IPS, Application Control and Malware Protection enabled.

⁶ SSL VPN not supported on FortiOS 7.6.0 and above.



Specifications

	FORTIGATE 60F	FORTIGATE 61F	FORTIWIFI 60F	FORTIWIFI 61F
Operating Environment and Certifications				
Power Rating			12Vdc, 3A	
Power Required		Powered by External DC Power Adapter, 100–240V AC, 50/60 Hz		
Maximum Current			100Vac/1.0A, 240Vac/0.6A	
Power Consumption (Average / Maximum)	10.17 W / 12.43 W	17.2 W / 18.7 W	17.2 W / 18.7 W	17.5 W / 19.0 W
Heat Dissipation	42.4 BTU/hr	42.4 BTU/hr	63.8 BTU/hr	64.8 BTU/hr
Operating Temperature		32°F to 104°F (0°C to 40°C)		
Storage Temperature		-31°F to 158°F (-35°C to 70°C)		
Humidity		10% to 90% non-condensing		
Noise Level		Fanless 0 dBA		
Operating Altitude		Up to 7400 ft (2250 m)		
Compliance		FCC, ICES, CE, RCM, VCCI, BSMI, UL/cUL, CB		
Certifications		USGv6/IPv6		
Radio Specifications				
Multiple User (MU) MIMO	—	—	3x3	
Maximum Wi-Fi Speeds	—	—	1300 Mbps @ 5 GHz, 450 Mbps @ 2.4 GHz	
Maximum Tx Power	—	—	20 dBm	
Antenna Gain	—	—	3.5 dBi @ 5 GHz, 5 dBi @ 2.4 GHz	



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** Image may not exactly match product **



Fortinet FG-60F FortiGate Network Security-Firewall Appliance

Part Number: FG-60F

BRAND: [FORTINET](#) | [More NETWORKING from FORTINET](#)

\$320.00

Capacity: [10 PORT](#)

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| Product Overview

FORTINET FG-60F Fortigate Network Security-firewall Appliance :

Key Features :

- General : security Appliance



Storage :





C9300-48P-E Specifications:

Switching Capacity:	256 Gbps
Switching Capacity with Stacking	736 Gbps
Forwarding Rate:	190.47 Mpps
Forwarding Rate with Stacking:	547.62 Mpps
Stacking Support:	StackWise®-480
Stacking Bandwidth:	480 Gbps
Cisco StackPower	Yes
Max Stack Members	8 Switches
PoE Specification:	PoE+
Default PoE Support:	437W
Max PoE Support:	1440W
Uplink Ports:	Modular Uplinks
Flash:	16GB
MAC Address Table Size:	32K
VLAN ID's Available:	4K
Max Active VLANS:	1K
IPv4 Routes:	32,000 (24,000 direct & 8,000 indirect)
IPv6 Routing Entries:	16,000
Multicast Routing Scale:	8,000
QoS Scale Entries:	5,120
ACL Scale Entries:	5,120
Jumbo Frames:	9198 bytes
DRAM:	8GB
Virtual Networks:	256
Operating System:	Cisco IOS XE
Software:	Network Essentials
Energy:	Energy Efficient Ethernet (EEE)
Predicted Reliability:	277,770 hrs MTBF

Name: **C9300-48P-E**

Model: C9300-48P-E

Brand: [Cisco](#)

Detail: Catalyst 9300 48-port 1G copper with modular uplinks, PoE+, Network Essentials

★★★★★ 4.8/5.0 [60 Reviews](#) [53 Questions](#) 273/mo SoldList Price: ~~US\$11,680.20~~ (82% OFF)

Price: USD ↘ US\$2,075.00

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Availability: In Stock at Global Warehouses. [?](#)

Condition: New Factory Sealed

Related: [C9300-48S-E](#) [C9300-48S-A](#) [C9300-48UXM-E](#) [C9300-48U-E](#) [C9300-48U-A](#) [C9300-48T-E](#) [C9300-48T-A](#) [C9300-48P-A](#)

Warranty: 3 Years Warranty

Quantity:

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2-6 Days, via DHL, FedEx, UPS, etc.

Shop Bundles or Accessories Recommended by Experts

Second PS

Options

Uplink

SFP

+

Selected Combo Price

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[C9300-48P-E](#)Option: DNA-E-48-3 Year US\$695.00
This required item is a necessary accessory.US\$2,770.00 [PWR-C1-715WAC-P/2](#)715W AC 80+ platinum Config 1
Secondary Power SupplyUS\$376.00

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- Collaborating with FedEx, UPS, DHL

100,000+ Diverse Products for All Your Needs

Specifications

Category	Specifications
Radios	<ul style="list-style-type: none"> • 2.4 GHz 802.11b/g/n/ax client access radio • 5 GHz 802.11a/n/ac/ax client access radio • 2.4 GHz & 5 GHz dual-band WIDS/WIPS, spectrum analysis, & location analytics radio • 2.4 GHz Bluetooth Low Energy (BLE) radio with Beacon and BLE scanning support • Concurrent operation of all four radios • Supported frequency bands (country-specific restrictions apply) • Supported frequency bands (country-specific restrictions apply): <ul style="list-style-type: none"> ◦ 2.412-2.484 GHz ◦ 5.150-5.250 GHz (UNII-1) ◦ 5.250-5.350 GHz (UNII-2) ◦ 5.470-5.600, 5.660-5.725 GHz (UNII-2e) ◦ 5.725 -5.825 GHz (UNII-3)
Antenna	<ul style="list-style-type: none"> • Internal Antenna (5.1dBi max gain at 2.4 GHz, 5.9dBi max gain at 5 GHz)
802.11ax, 802.11ac Wave 2 and 802.11n Capabilities	<ul style="list-style-type: none"> • DL-OFDMA**, UL-OFDMA**, TWT support**, BSS Coloring** • 2.4GHz: 2 x 2 multiple input, multiple output (MIMO) with two spatial streams • 5GHz: 4 x 4 multiple input, multiple output (MIMO) with four spatial streams • SU-MIMO, UL MU-MIMO** and DL MU-MIMO support • Maximal ratio combining (MRC) & beamforming • 20 and 40 MHz channels (802.11n); 20, 40, and 80 MHz channels (802.11ac Wave 2); 20, 40 and 80 MHz channels (802.11ax) • Up to 1024-QAM on both 2.4 GHz & 5 GHz bands • Packet aggregation
Power	<ul style="list-style-type: none"> • Power over Ethernet: 42.5 - 57 V (802.3at) or 37 - 57 V (802.3af) - low power mode ** • Alternative: 12 V DC input • Power consumption: 30W max (802.3at) or 18W max (802.3af) - low power mode ** • Power over Ethernet injector and DC adapter sold separately



Warning: Please ensure that MR44 is connected to an **802.3at-capable (PoE+) switch/power injector** during the initial installation **OR** ensure that the network MR44 is added to is set to **MR 27.6** firmware (not yet available at the time of writing) or newer firmware.

This is because the default MR44 firmware image has support for the low-power mode, however, **MR 27.5/27.5.1 or lower firmware does not have low power mode support**. Using 802.3af switch/power injector with MR44 set to 27.5/27.5.1 or lower firmware might result in unexpected behaviors including but not limited to reboots or degraded performance.

Due to the reasons stated above, please **do not** downgrade the network with MR44 APs to 27.5/27.5.1 or lower firmware if they are being powered on by 802.3af (PoE) switch/power injector.

Interfaces

- 1x 100/1000/2.5G BASE-T Ethernet (RJ45)
- 1x DC power connector (5.5 mm x 2.5 mm, center positive)

Mounting

- All standard mounting hardware included
- Desktop, ceiling, and wall mount capable
- Ceiling tile rail (9/16, 15/16 or 1 1/2" flush or recessed rails), assorted cable junction boxes
- Bubble level on the mounting cradle for accurate horizontal wall mounting

Physical Security

- Two security screw options (included) (13.5 mm long and 2.5 mm diameter and 5 mm head)
- Kensington lock hard point
- Concealed mount plate with anti-tamper cable bay

Environment

- Operating temperature: 32 °F to 104 °F (0 °C to 40 °C)
- Humidity: 5 to 95% non-condensing

Physical Dimensions

- 12.05" x 5.06" x 1.74" (30.6 cm x 12.84 cm x 4.43 cm), not including desk mount feet or mount plate
- Weight: 26.07 oz (739 g)

Security

- Integrated Layer 7 firewall with mobile device policy management
- Real-time WIDS/WIPS with alerting and automatic rogue AP containment with Air Marshal
- Flexible guest access with device isolation
- VLAN tagging (802.1q) and tunneling with IPsec VPN
- PCI compliance reporting

	<ul style="list-style-type: none"> • WEP***, WPA, WPA2-PSK, WPA2-Enterprise with 802.1X, WPA3 - Personal**, WPA3 - Enterprise**, WPA3 - Enhanced Open (OWE)** • EAP-TLS, EAP-TTLS, EAP-MSCHAPv2, EAP-SIM • TKIP and AES encryption • Enterprise Mobility Management (EMM) & Mobile Device Management (MDM) integration • Cisco ISE integration for Guest access and BYOD Posturing
Quality of Service	<ul style="list-style-type: none"> • Advanced Power Save (U-APSD) • WMM Access Categories with DSCP and 802.1p support • Layer 7 application traffic identification and shaping
Mobility	<ul style="list-style-type: none"> • PMK, OKC, & 802.11r for fast Layer 2 roaming • Distributed or centralized layer 3 roaming
Analytics	<ul style="list-style-type: none"> • Embedded location analytics reporting and device tracking • Global L7 traffic analytics reporting per network, per device, & per application
LED Indicators	<ul style="list-style-type: none"> • 1 power/booting/firmware upgrade status
Regulatory	<ul style="list-style-type: none"> • RoHS • For additional country-specific regulatory information, please contact Meraki sales
Warranty	<ul style="list-style-type: none"> • Lifetime hardware warranty with advanced replacement included
Ordering Information	<ul style="list-style-type: none"> • MR44-HW: Meraki MR44 Cloud Managed 802.11ax AP • MA-PWR-30W-XX: Meraki AC Adapter for MR Series (XX = US/EU/UK/AU) • MA-INJ-4-XX: Meraki Gigabit 802.3at Power over Ethernet Injector (XX = US/EU/UK/AU) • MA-INJ-5-XX: Meraki Multigigabit 802.3at Power over Ethernet Injector (XX = US/EU/UK/AU) • Note: Meraki access point license required.



** features can be enabled via future firmware updates

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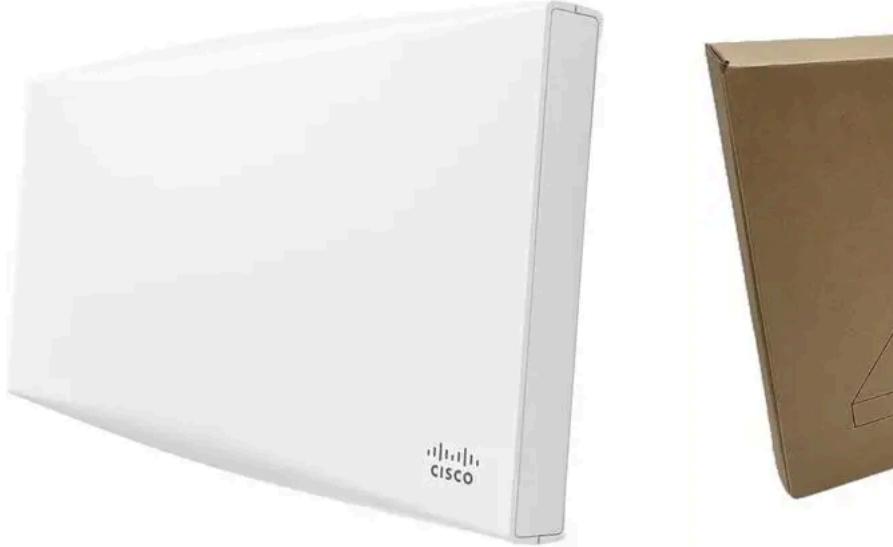
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Cisco MR44-HW Meraki MR44 Wi-Fi 6 AP

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* Product may have slight variations vs. image

~~\$410.40~~**\$304.00**

You save: \$106.40 (26%)

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SKU/MPN: **MR44-HW**Availability: In Stock

Processing Time: Usually ships same day

Manufacturer: **Cisco**Product/Item Condition: **Factory-Sealed New Retail in Original Box (FSB)** **6-Month (180 Days)**



* Refers to maximum over-the-air data frame rate capability of the radio chipsets, and may exceed data rates allowed by IEEE-compliant operation.

Specifications

Category	Specifications
Radios	<ul style="list-style-type: none">• 2.4 GHz 802.11b/g/n/ax client access radio• 5 GHz 802.11a/n/ac/ax client access radio• 6 GHz 802.11ax client access radio• 2.4 GHz, 5 GHz, and 6 GHz tri-band Air Marshal WIDS/WIPS, spectrum analysis, & location analytics radio• 2.4 GHz Bluetooth Low Energy radio with beacon and scanning support concurrent operation of all five radios
Antenna	<ul style="list-style-type: none">• Integrated omni-directional antennas (4.5 dBi gain at 2.4 GHz, 5.5 dBi gain at 5 GHz, and 5.5 dBi gain at 6GHz)
802.11ax, 802.11ac Wave 2 and 802.11n capabilities	<ul style="list-style-type: none">• DL-OFDMA, TWT support, BSS coloring*• 4 x 4 multiple input, multiple output (MIMO) with four spatial streams on 6 GHz• 4 x 4 multiple input, multiple output (MIMO) with four spatial streams on 5 GHz• 4 x 4 multiple input, multiple output (MIMO) with four spatial streams on 2.4 GHz• SU-MIMO, UL and DL MU-MIMO support• Maximal ratio combining (MRC) & beamforming• 20 and 40 MHz* channels (802.11n); 20, 40*, and 80 MHz channels (802.11ac Wave 2); 20, 40* and 80 MHz channels (802.11ax)
	<p>Note: *40MHz channels are supported only in 5 & 6 GHz bands.</p> <ul style="list-style-type: none">• Up to 1024-QAM on all three - 2.4 GHz, 5 GHz, and 6 GHz bands• Packet aggregation
Power	<ul style="list-style-type: none">• Power over Ethernet: 42.5 - 57V (PoE+ and 802.3bt compliant)• Alternative 54V DC input via DC adapter• Power consumption: 30W to 40W (802.3bt)

	<ul style="list-style-type: none"> • Minimum power requirement: 30W (PoE+, <i>USB is disabled</i>) • Maximum power consumption: 40W • Power over Ethernet injector and DC adapter sold separately. <p>Note: Actual power consumption may vary depending on the AP usage.</p>
Interfaces	<ul style="list-style-type: none"> • 2x 100/1000/2.5G/5G BASE-T Ethernet (RJ45) • 1x DC power connector (5.5 mm x 2.5 mm, center positive)
Mounting	<ul style="list-style-type: none"> • All standard mounting hardware included (AIR-AP-BRACKET-2) • Desktop, ceiling, and wall mount capable • Ceiling tile rail (9/16, 15/16, or 1 ½" flush or recessed rails), assorted cable junction boxes
Physical Security	<ul style="list-style-type: none"> • Kensington lock slot • Concealed mount plate with anti-tamper cable bay
Environment	<ul style="list-style-type: none"> • Operating temperature: 32 °F - 104 °F (0 °C - 40 °C) • Humidity: 5% to 95% non-condensing
Reliability	<ul style="list-style-type: none"> • Mean time between failure (MTBF): 998,440 hrs at +25° C operating temperature
Physical Dimensions	<ul style="list-style-type: none"> • 260 mm x 260 mm x 56 mm, including desk-mount feet or mount plate • Weight: 1.7 kg
Security	<ul style="list-style-type: none"> • Integrated layer 7 firewall with mobile device policy management • Real-time WIDS/WIPS with alerting and automatic rogue AP containment with Air Marshal • Flexible guest access with device isolation • VLAN tagging (802.1q) and tunneling with IPsec VPN • PCI compliance reporting • WEP*, WPA, WPA2-PSK, WPA2-Enterprise with 802.1X, WPA3 - Personal*, WPA3 - Enterprise*, WPA3 - Enhanced Open (OWE)* • EAP-TLS, EAP-TTLS, EAP-MSCHAPv2, EAP-SIM

	<ul style="list-style-type: none"> • TKIP and AES encryption • Enterprise Mobility Management (EMM) & Mobile Device Management (MDM) integration • Cisco ISE integration for guest access and BYOD posturing
Quality of Service	<ul style="list-style-type: none"> • Advanced power save (U-APSD) • WMM access categories with DSCP and 802.1p support • Layer 7 application traffic identification and shaping
Mobility	<ul style="list-style-type: none"> • PMK, OKC, and 802.11r for fast layer 2 roaming • Distributed or centralized layer 3 roaming
Analytics	<ul style="list-style-type: none"> • Embedded location analytics reporting and device tracking • Global layer 7 traffic analytics reporting per network, per device, and per application
LED Indicators	<ul style="list-style-type: none"> • One power/booting/firmware upgrade status
Regulatory	<ul style="list-style-type: none"> • RoHS • For additional country-specific regulatory information, please contact Meraki sales
Warranty	<ul style="list-style-type: none"> • Indoor access point • Lifetime hardware warranty with advanced replacement included
	<ul style="list-style-type: none"> • MR57-HW: Meraki MR57 cloud-managed 802.11a-compatible AP • MA-PWR-50WAC: Meraki AC adapter for MR series • MA-INJ-6: Meraki MR MultiGigabit 802.3bt Injector (Power Cord Not Included)
Ordering Information	<p> Note: Power cord - MA-PWR-CORD-XX (XX Country Code) should be ordered separately for the AC adapter and Ethernet injector</p> <ul style="list-style-type: none"> • Mounting bracket: AIR-AP-BRACKET-1 and AIR-AP-BRACKET-2 • Meraki access point license required.



* software features can be enabled via firmware updates

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MR57-HW Meraki Tri Band 802.11ax Wireless Access Point 8.35 Gbit/s - HW Meraki

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Mfg Part #: MR57-HW



* Product may have slight variations vs. image

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SKU/MPN: MR57-HW



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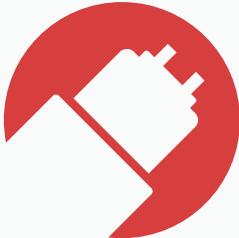
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Ferrule Type	Typical Insertion Loss	Maximum Insertion Loss	Return Loss
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Single-mode Elite:	< 0.12 dB	< 0.25 dB	> 60 dB
Multimode Standard:	< 0.20 dB	< 0.45 dB	> 25 dB
Multimode Elite:	< 0.12 dB	< 0.25 dB	> 25 dB

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25ft (7.6m) Cat6a 28AWG Snagless Unshielded (U/UTP) PVC CM Small Diameter High-Flex Ethernet Network Patch Cable, Blue

P/N:C6AUTPSGSPVC SKU:185693



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- Exceed ANSI/TIA-568.2-D Category 6A and ISO 11801 Class EA Standards
- Up to 550MHz with 1G/10G-T Speed, Support PoE/PoE+/PoE++ (IEEE 802.3af/at/bt)
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- Performance Tested with Fluke and Wired T568B
- 24K 50μ" Gold-plated Contacts, Resistant to Oxidation, Stable Transmission, Frequent Plugging and Unplugging, Longer Lifespan

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Cat6a Snagless Booted Unshielded (UTP) Slim Ethernet Network Patch Cable, 28AWG, 1/10G Base-T

The Cat6a slim patch cable is the perfect solution for high-density racks in data centers and out-of-band management in AI networks. Its compact 28AWG design simplifies installation and management. Smaller patch lead size helps alleviate congestion as well as improve airflow with in the racks. Snagless boot prevents unwanted cable snags during installation and provides extra strain relief, which provides easy access in high-density applications. Tested and verified to meet Cat6a component requirements for ANSI/TIA-568.2-D and ISO/IEC 11801 standards. They reduce the patch cord density by 33% when compared to typical Cat6a patch cords. The smaller diameter makes for a slimmer, more flexible cable that is perfect for cross-connects, workstations, or racks with higher-density and limited space.

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Connectivity Solutions

[Data Center Horizontal Cabling](#)[PoE Cabling Connections](#)[Cat6a to Servers](#)[Hybrid Cabling](#)[Remote Management Cabling Connections](#)

Combo ID: C14183 ⓘ

Features

550MHz Stable Transmission

This cable speeds up to 550MHz and supports 10GBase-T Ethernet, which allows for more reliable data transmission.

24K 50μ" Gold-plated Connectors
Stable Transmission

> 99.95% Oxygen-free Copper Conductors

Stranded 4 Twisted Pairs
Anti-electromagnetic Interference

Less Signal Loss

Triple Protection of Patch Cables

RJ45 modular plug, PVC Jacket and strain relief boot to increase the service life of the cable.

RJ45 Modular Plug

It is compatible with laptops, routers, TVs, TV boxes, switches, printers, etc.

PVC Jacket

PVC Jacket has good flame retardant performance.

Strain Relief Boot

The boot increases the friction for plugging and unplugging.

Save Cabinet Space and Facilitate Airflow Movement in Data Center

The slim cable diameter is over 33% smaller than regular cable, saving time and cost of expanding or replacing cable pathways.

High-Flex

Bend radius is a narrow 1.65 inches, versus 2.4 inches for typical Cat6a

Easy to Install

More space for your fingers during installs

Improve Airflow and Cooling

Slim patch cables reduce pathway congestion much

Application

Cluttered data centers and other places where space is tight

Fluke Networks-Channel Testing

The cables pass the Fluke Channel Test and deliver a testing report, which includes Insertion Loss, NEXT, FEXT&ELFEXT, Return Loss, Propagation Delay, etc. Ensure end-to-end network performance.

Videos



Cat6a Patch Cords Overall Introduction

▶ 01:26

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APC Symmetra LX 4 kVA Rack Mount – Scalable to 8 kVA

Brand: APC

Price: \$6,000.00

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Message *	
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SKU: SYA4K8RMP

Categories: LX, Single Phase

Description

APC Symmetra LX 4KVA, SYA4K8RMP scalable to 8kVA N+1 Tower, 208/240V provides higher availability to the UPS connected loads by giving redundant communication paths to critical UPS functions. Hot-swappable intelligence modules ensures clean, uninterrupted power to protected equipment during Intelligence Module replacement.

APC Symmetra LX 4kVA, scalable to 8kVA N+1 Tower, 208/240V provides higher availability to the UPS connected loads by giving redundant communication paths to critical UPS functions.

Output

- Output power capacity- 3.2 KWatts / 4.0 kVA
- Max Configurable Power (Watts)- 6.4 KWatts / 8.0 kVA
- Nominal Output Voltage- 120V , 208V
- Output Voltage Note- Configurable for 208 or 240 nominal output voltage
- Output Voltage Distortion- Less than 5% at full load
- Output Frequency (sync to mains)- 47 – 63 Hz



- Output Connections- (1) Hard Wire 4-wire (2PH + N +G) (Battery Backup)
- Bypass- Internal Bypass (Automatic and Manual), Optional External Bypass

Input

- Nominal Input Voltage- 208V
- Input frequency- 45 – 65 Hz (auto sensing)
- Input Connections- Hard Wire 4-wire (2PH+N+G)
- Input voltage range for main operations- 96-138 (Line to Neutral) V
- Input Total Harmonic Distortion- Less than 7% for full load
- Other Input Voltages- 240V
- Input Power Factor at Full Load- 0.98

Batteries & Runtime

- Battery type- Maintenance-free sealed Lead-Acid battery with suspended electrolyte : leakproof
- Included Battery Modules- 1
- Typical recharge time- 3 hour(s)
- Replacement Battery- SYBT5
- Battery slots empty- 1
- Extendable Run Time- 1
- Battery Volt-Amp-Hour Capacity- 864

Communications & Management

- Interface Port(s)- DB-9 RS-232 , Smart-Slot
- Control panel- Multi-function LCD status and control console
- Audible Alarm- Audible and visible alarms prioritized by severity
- Emergency Power Off (EPO)- Yes
- Available SmartSlot™ Interface Quantity- 1

Physical

- Maximum Height- 26.42 inches (671 , 67.1 cm)
- Maximum Width- 19.0 inches (483 , 48.3 cm)
- Maximum Depth- 28.6 inches (726 , 72.6 cm)
- Net Weight- 347.0 lbs. (157.73 kg)
- Shipping weight- 394.0 lbs. (179.09 kg)
- Shipping Height- 36.0 inches (914 , 91.4 cm)
- Shipping Width- 23.6 inches (599 , 59.9 cm)
- Shipping Depth- 39.25 inches (997 , 99.7 cm)
- Color- Black , Silver
- Units per Pallet- 1.0

Environmental

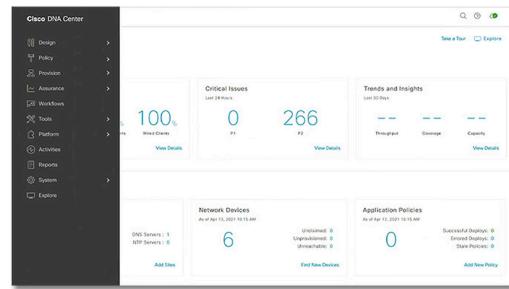
- Operating Environment- 32 – 104 °F (0 – 40 °C)
- Operating Relative Humidity- 0 – 95 %
- Operating Elevation- 0-10000 ft (0-3000 meters)

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Feature	Description and benefits
Events and notifications	The Catalyst Center platform webhooks allow third-party applications to receive notifications and listen to any events detected by Catalyst Center Assurance, automation, and other task-based operational workflows.

Table 6. Correlated insights

Category	Insights
Wireless insights and analysis	<p>Client onboarding</p> <ul style="list-style-type: none"> • Association failures • Authentication failures • IP address failures • Client exclusion • Excessive onboarding time • Excessive authentication time • Excessive IP addressing time • AAA, DHCP reachability <p>Client experience</p> <ul style="list-style-type: none"> • Throughput analysis • Roaming pattern analysis • Sticky client • Slow roaming • Excessive roaming • RF, roaming pattern • Dual-band clients prefer 2.4 GHz • Excessive interference • Apple iOS client disconnect <p>Network coverage and capacity</p> <ul style="list-style-type: none"> • Coverage hole • AP license utilization • Client capacity • Radio utilization <p>Network device monitoring</p> <ul style="list-style-type: none"> • Availability • Crash, AP join failure • High availability • CPU, memory • Flapping AP, hung radio • Power supply failures

Category	Insights
Sensor issues	<p>Sensor onboarding</p> <ul style="list-style-type: none"> • Association failures • Authentication failures • IP address failures • Sensor exclusion • Excessive onboarding time • Excessive authentication time • Excessive IP addressing time • AAA, DHCP reachability <p>Sensor experience</p> <ul style="list-style-type: none"> • Throughput analysis • Outlook web response time • Web server response time • SSH server response time • Mail server response time • FTP server response time • Excessive radio interference
Routing issues	<p>Router health</p> <ul style="list-style-type: none"> • High CPU • High memory <p>Routing technologies</p> <ul style="list-style-type: none"> • BGP AS mismatch, flap • OSPF adjacency failure • Enhanced Interior Gateway Routing Protocol (EIGRP) adjacency failure <p>Connectivity</p> <ul style="list-style-type: none"> • Interface high utilization • LAN connectivity down/flap • IP SLA to SP gateway connectivity

Appendix B: Telephone Components

Licensing

The IP Phone 8845 requires an Enhanced User Connect License (UCL) in order to connect to Cisco Unified Communications Manager.

Product specifications

Table 2 lists the features and specifications of the 8845.

Table 2. Features and specifications

Features	Specifications
Audio codec support	<ul style="list-style-type: none">• G.711a-law and mu-law, G.722, G.729a, Internet Low Bitrate Codec (iLBC), and Internet Speech Audio Codec (iSAC)
Call features	<ul style="list-style-type: none">• + Dialing• Abbreviated dialing• Adjustable ring tones and volume levels• Adjustable display brightness• Agent greeting• Application launch pad• Auto-answer• Auto-detection of headset• cBarge• Busy Lamp Field (BLF)• BLF Pickup• BLF speed dial• Callback• Call forward• Call forward notification• Call filter• Call history lists• Call park• Call pickup• Call timer• Call waiting• Call chaperone• Caller ID• Corporate directory• Conference, including traditional Join feature• Cross-Cluster Extension Mobility (EMCC)• Direct transfer• Extension mobility• Fast-dial service• Forced access codes and client matter codes• Group call pickup• Hold• Intercom• Immediate divert

Features	Specifications
	<ul style="list-style-type: none"> • Malicious-caller ID • Message-Waiting Indicator (MWI) • Meet-me conference • Mobility • Music on Hold (MoH) • Mute • Network profiles (automatic) • On- and off-network distinctive ringing • Personal directory • PickUp • Predialing before sending • Privacy • Private Line Automated Ringdown (PLAR) • Redial • Ring tone per line appearance • Service Uniform Resource Locator (URL) • Shared line • Silent monitoring and recording • Speed dial • Time and date display • Transfer • Uniform Resource Identifier (URI) dialing • Visual Voicemail • Voicemail • Whisper coaching
Mobility and remote access	<p>You can deploy the phones remotely with the following two options:</p> <ul style="list-style-type: none"> • You can have your phone remotely registered to the on-premises network through a built-in VPN client if the administrator has provisioned this VPN feature • You also can directly connect to the on-premises network without VPN through Cisco Expressway if you are provided with log-in credentials. Contact your system administrator
Electronic hookswitch	<ul style="list-style-type: none"> • You can control the hookswitch electronically with a third-party headset connected to the auxiliary port.
Cisco Intelligent Proximity	<ul style="list-style-type: none"> • Audio path moving sends audio through the IP Phone 8861 for a mobile device-connected call • Call-history synchronization allows you to view placed and missed calls of your mobile device from the IP Phone 8845 • Contact synchronization allows you to synchronize the contact objects from your mobile device to your 8845
Quality-of-Service (QoS) options	<ul style="list-style-type: none"> • The phone supports Cisco Discovery Protocol and 802.1Q/p standards, and you can configure it with an 801.1Q VLAN header containing the VLAN ID overrides configured by the Admin VLAN ID

Features	Specifications
Network features	<ul style="list-style-type: none"> • Session Initiation Protocol (SIP) for signaling • Session Description Protocol (SDP) • IPv4 and IPv6 • User Datagram Protocol (UDP) (used only for Real-Time Transport Protocol [RTP] streams) • Dynamic Host Configuration Protocol (DHCP) client or static configuration • Gratuitous Address Resolution Protocol (GARP) • Domain Name System (DNS) • Trivial File Transfer Protocol (TFTP) • Secure HTTP (HTTPS) • VLAN • Real-Time Transport Protocol (RTP) • Real-Time Control Protocol (RTCP) • Cisco Peer-to-Peer Distribution Protocol (PPDP) • Cisco Discovery Protocol • LLDP (including LLDP Media Endpoint Discovery [LLDP-MED]) • Switch speed auto-negotiation
Security features	<ul style="list-style-type: none"> • Secure boot • Secure credential storage • Device authentication • Configuration file authentication and encryption • Image authentication • Random bit generation • Hardware cryptographic acceleration • Certificate Authority Proxy Function (CAPF) • Manufacturer-Installed Certificates (MIC) • Locally Significant Certificates (LSC) • Ethernet 802.1x supplicant options: Extensible Authentication Protocol-Flexible Authentication via Secure Tunneling (EAP-FAST) and Extensible Authentication Protocol-Transport Layer Security (EAP-TLS) • Signaling authentication and encryption using TLS • Media authentication and encryption using SRTP • HTTPS for client and server • Secure Shell (SSH) Protocol server • SSL-based VPN client
Physical dimensions (H x W x D)	<ul style="list-style-type: none"> • 9.01 x 10.13 x 3.87 in. (228.78 x 257.34 x 98.39 mm) (excluding foot stand)
Weight (with handset)	<ul style="list-style-type: none"> • 2.97 lb (1.35 kg)
Phone-casing composition	<ul style="list-style-type: none"> • Polycarbonate acrylonitrile butadiene styrene (ABS) textured plastic; Cosmetic class A
Operating temperature	<ul style="list-style-type: none"> • 32 to 104° F (0 to 40° C)
Nonoperating temperature shock	<ul style="list-style-type: none"> • 14 to 140° F (-10 to 60° C)
Humidity	<ul style="list-style-type: none"> • Operating 10 to 90%, noncondensing • Nonoperating 10 to 95%, noncondensing

Support



United States | USD \$



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Description

Cisco 8845 Color IP Phone - Charcoal - Standard Handset with Warranty

Features:

- 5 line soft keys
- 5 Options soft keys
- Five-way navigation support
- Color display 800 x 480 pixel-based
- 720p HD video
- Four soft keys for screen based applications
- Dual-position foot stand
- Protocol support: (SIP)
- Power port for PWR-CUBE-4
- Gigabit ports

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The Cisco IP Phone 8800 Series delivers easy-to-use, highly secure voice communications. Cisco Intelligent Proximity integrates telephony features with your

Product Specifications

User interface features

- Gesture-based, multitouch-capable capacitive touch screen
- 5-inch color LCD (720 x 1280 pixel), 9:16 aspect ratio
- On-screen virtual keyboard
- 1 USB 2.0 Type A-compliant port USB battery charging BC1.2 compliant (requires full Class 4 power input on LAN IN for operation)
- 1x USB 2.0 Micro-B device port for use as USB audio device
- Integrated Bluetooth 4.0 and NFC
- 3 multicolored capacitive-touch mute indicators
- Unicode UTF-8-character support
- User interface localized in Arabic, Chinese, Danish, Dutch, English (Canada/US/UK), French, German, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Russian, Slovenian, Spanish and Swedish

Audio features

- 3 cardioid microphones
- Loudspeaker
 - Frequency: 100-22,000 Hz
 - Volume: 92 dB at 0.5-m peak volume
- 6-m/20-foot microphone pickup range
- Supported codecs:
 - G.711 (A-law and μ-law)
 - G.719
 - G.722, G722.1, G722.1C
 - G.729AB
 - Polycom Siren 7, Siren 14
 - iLBC (3.33Kbps and 15.2Kbps)
 - Opus (8Kbps - 24Kbps)
 - SILK
 - Polycom Acoustic Clarity technology provides full-duplex conversations, acoustic echo cancellation and background noise suppression – Type 1 compliant (IEEE 1329 full duplex)
- Polycom NoiseBlock
- Voice activity detection
- Comfort noise generation
- DTMF tone generation (RFC 2833 and in-band)
- Bluetooth device pairing for wideband speech and multimedia streaming (HFP/AD2P)
- Low-delay audio packet transmission
- Adaptive jitter buffers
- Packet loss concealment

Call handling features

- Up to 3 lines (max. one Skype for Business)
- Shared call/bridged line appearance
- Distinctive incoming call treatment/call waiting
- Call timer and call waiting
- Call transfer, hold, divert (forward), pickup
- Called, calling, connected-party information
- One-touch speed dial and meeting join
- Local 5-way audio conferencing
- Do-not-disturb function
- Local configurable digit map/dial plan
- Corporate directory access using LDAP
- Visual conference management

Network and provisioning

- Open SIP and Skype for Business
- IETF SIP (RFC 3261 and companion RFCs)
- Two-port gigabit Ethernet switch
 - 10/100/1000Base-TX across LAN and 2nd port
 - 2nd port supports IEEE 802.3af PSE
- Wi-Fi network connectivity
 - 2.4 – 2.4835 GHz (802.11b, 802.11g, 802.11n HT-20)
 - 5.15 – 5.825 GHz (802.11a, 802.11n, HT-20, 802.11n HT-40)
- Manual or dynamic host configuration protocol (DHCP) network setup
- Time and date synchronization using SNTP
- FTP/TFTP/HTTP/HTTPS server-based central provisioning
- RealPresence Resource Manager (v. 10.1 or above) based provisioning
- Polycom Zero Touch Provisioning
- Provisioning and call server redundancy support
- QoS support
 - IEEE 802.1p/Q tagging (VLAN), layer 3 TOS, and DSCP
 - WMM (Wi-Fi multimedia)
- VLAN – CDP, DHCP VLAN discovery
- LLDP-MED for VLAN discovery

Security

- 802.1X authentication and EAPOL
- Media encryption via SRTP
- Transport layer security (TLS) v 1.2
- Encrypted configuration files
- Digest authentication
- Password login
- Support for URL syntax with password for boot server address

HTTPS secure provisioning

- Support for signed software executables
- Wi-Fi encryption: WEP, WPA-Personal, WPA2-Personal, WPA2-Enterprise with 802.1X (EAP-TLS, PEAP-MSCHAPv2)

Power

- LAN IN: Built-in auto-sensing IEEE 802.3at PoE Device (Class 4) (requires full Class 4 power input on LAN IN for operation). Backward compatibility with IEEE 802.3af
- LAN OUT: Built-in auto-sensing IEEE 802.3af power sourcing equipment (requires full Class 4 power input on LAN IN for operation)

Approvals

- Japan MIC/VCCI Class B
- FCC Part 15 (CFR 47) Class B
- ICES-003 Class B
- CISPR22 Class B
- VCCI Class B
- EN 301 489-1, EN 301 489-3, EN 301 489-17
- EN61000-3-2; EN61000-3-3
- NZ Telepermit
- Australia A&C Tick
- ROHS compliant
- 19471-0715

Radio

- US
 - FCC Part 15.247
 - FCC Part 15.407
 - FCC Part 15.225
- Canada
 - RSS 247 Issue 1
- EU
 - ETSI EN 300 328 v1.9.1
 - ETSI EN 301 893 v1.7.1
 - ETSI EN 300 330
- Japan
 - Japan Item (19)
 - Japan Item (19)-3
 - Japan Item (19)-3-2
- Australia
 - AS/NZ4268

Safety

- UL 60950-1
- UL 62368-1
- CE Mark
- CAN/CSA-C22.2 No. 60950-1-03
- CAN/CSA C22.2 No. 62368-1-14
- EN 60950-1

- EN 62368-1
- IEC 60950-1
- IEC 62368-1
- AS/NZS 60950-1
- AS/NZS 62368-1-17

Environmental conditions

- Operating temperature: 0 to 40°C (+32 to 104°F)
- Relative humidity: 5% to 95% (non-condensing)
- Storage temperature: -20 to +70°C (-4 to +160°F)

Polycom Trio 8800 ships with:

- Either Phone Console (open SIP): 2200-66070-001 or Phone Console (Skype for Business): 2200-66070-019
- 7.6-m/25-foot network cable CAT 5e
- 2-m/6.5-foot USB 2.0 cable

- Cable wrap
- Tactile overlay for improved accessibility
- Setup sheet

Accessories (optional)

- Polycom Trio Expansion Microphones (2200-65790-001)
- Power kit incl. ext. single-port gigabit mid-span, 802.3at Type 2 compliant, local power cord and network cable (7200-23490-xxx)

Warranty

- 1 year

Country of Origin

- Mexico
- Thailand

Phone dimensions (L x W x H)

- 38.3 x 7.5 x 33.2 cm (15.1 x 2.9 x 13.1 in)
- Unit weight: 0.95 Kg (2.1 lbs)

Box dimensions (L x W x H)

- 48.3 x 11.5 x 39.4 cm (19 x 4.5 x 15.5 in)
- Box weight: 1.97 Kg (4.35 lbs)

Polycom Trio 8800 is also known as Polycom RealPresence Trio 8800.

Learn more

For more information about Polycom Trio Video Collaboration Kits, visit
www.polycom.com/trio

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Can it connect to multiple devices?

Is this phone easy to set up?

Ask something else

Polycom RealPresence Trio 8800 IP Conference Phone - Replaces Polycom IP7000

Brand: Polycom

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Brand Polycom

Color Dark Gray

Telephone Corded

Type

Number of 1 AA batteries required.

Batteries

Material Plastic

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About this item

- Conference Phone Flexibility: Video conferencing and content sharing can be easily added, ensuring future-proof flexibility. And USB and Bluetooth are built in—so feel free to bring your own device.
- Outstanding Audio: Hear every inflection, without the distracting background noise. Room filling audio up to 22kHz (clarity of voice) with industry leading full duplex, echo cancellation, and noise reduction with intelligent processing for superior audio quality. Microphones tuned for larger rooms, up to 20 foot pick-up range.
- Touch Display: 5 inch color touch display puts familiar easy-to-use icons and user controls at your fingertips.
- Platform Integration: Connect to the platform you like best - or choose more than one with Poly's hybrid registration.

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Solution specifications: System capacity

Table 1 lists hardware specs and typical system capacities of BE6000 and BE7000 appliance models. For detailed design guidance and deployment models, please refer to the [Solutions Reference Network Design \(SRND\)](#) guides and Preferred Architecture for Enterprise Collaboration, the [virtualization documentation](#), and the [QuoteCollab](#) tool.

Table 1. Cisco BE6000M, BE7000M, BE7000H Models – Hardware Specs and System Capacity

Attribute	Capacity
Physical hardware specifications	BE6000M, BE7000M, BE7000H: See Cisco Appliance examples at https://www.cisco.com/c/dam/en/us/td/docs/voice_ip_comm/uc_system/virtualization/cisco-collaboration-infrastructure.html#HW_Example .
Maximum capacity (users/devices)	BE6000M: Maximum deployment capacity of 1000 users, 1200 devices, 100 contact center agents across all appliances. BE7000M and BE7000H: No enforced limit; stack appliances as needed to accommodate application workloads or higher deployment capacity.
Maximum number of co-resident applications	After sizing your applications, use the QuoteCollab tool to help you identify how many appliances are needed. BE6000M: Varies but typically 5 to 7 per appliance in best practices designs. BE7000M: Varies but typically 6 to 8 per appliance in best practices designs. BE7000H: Varies but typically 12 to 15 per appliance in best practices designs.

Licensing

Each BE6000 or BE7000 appliance requires a license for VMware vSphere ESXi, which must be customer-provided.

Entitlement for the collaboration applications in the BE6000 and BE7000 appliances is sold separately. Each customer may purchase a Cisco Collaboration Flex Plan subscription under an Enterprise Agreement (EA) or Named User (NU) model for all of their users and common area devices. Cisco Collaboration Flex Plan provides simplified purchasing with flexible payment options, easily extensible functionality from calling and messaging to meetings and contact center, flexible migration to the cloud, and enhanced visibility into collaboration usage.

For more information, see <https://www.cisco.com/c/en/us/products/unified-communications/collaboration-flex-plan/index.html>.

[Home > Software > Licensing > Software Licensing](#)

> Cisco BE6K-UCL-ENH2ENHP Unified Communications Manager Business Edition 6000 Enhanced Plus User Connect License
- Product Upgrade License - 1 User



Cisco BE6K-UCL-ENH2ENHP Unified Communications Manager Business Edition 6000 Enhanced Plus User Connect License - Product Upgrade License - 1 User

SKU: **BE6K-UCL-ENH2ENHP** Availability: **9999**MSRP: **\$100.05**QTY: [Add to Quote](#)Need Pricing Options? [Learn More](#)[Product Details](#)

Cisco Unified Communications Manager Business Edition 6000 Enhanced Plus User Connect License -
Product Upgrade License - 1 User

Main Specifications

Product Type	Software Licensing
Manufacturer	Cisco Systems, Inc
Upgrade from	Enhanced
License Quantity	1 User
Software Name	Unified Communications Manager Business Edition 6000 Enhanced Plus User Connect License
License Type	Product Upgrade License

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- Rear Camera: 50MP, f/1.8 + 8MP, f/2.2 + 5MP, f/2.4, Front Camera: 12MP, f/2.2, 5000mAh Battery, Bluetooth 5.4
- 3G: 1/2/4/5/8, 4G LTE: 1/2/3/4/5/7/12/13/14/20/25/26/28/29/30/38/39/40/41/48/66/71, 5G: N2/5/25/41/66/71/77/78 - Dual SIM (SIM + eSIM)
- Global Connectivity – Plug & Play with an ACTIVE SIM on AT&T, Verizon, T-Mobile, and most U.S. carriers. New activations are only supported on T-Mobile, and Verizon in the U.S., as some carriers may not recognize Carrier Unlocked IMEI's as Compatible.

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Does it have a headphone jack?

Can the battery be removed?

Is this phone water resistant?

Ask something else

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Specifications

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Overview



Processor	Weight (g)
2.4GHz, 1.8GHz	195

Processor



CPU Speed	CPU Type
2.4GHz, 1.8GHz	Octa-Core

Display



Size (Main_Display)	Resolution (Main Display)	Technology (Main Display)	Colour Depth (Main Display)
170.1mm (6.7" full rectangle) / 165.5mm (6.5" rounded corners)	1080 x 2340 (FHD+)	Super AMOLED	16M
Max Refresh Rate (Main Display)			
120 Hz			

Camera



Rear Camera - Resolution (Multiple)	Rear Camera - F Number (Multiple)	Rear Camera - Auto Focus	Rear Camera - OIS
50.0 MP + 8.0 MP + 5.0 MP	F1.8 , F2.2 , F2.4	Yes	Yes
Rear Camera Zoom			
Digital Zoom up to 10x			
Front Camera - OIS			
No	Yes	No	UHD 4K (3840 x 2160) @30

Slow Motion

240fps @HD

Storage/Memory



Memory_(GB)	Storage (GB)	Available Storage (GB)
8	256	233.2

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2G GSM	3G UMTS	4G FDD LTE	4G TDD LTE
GSM850, GSM900, DCS1800, PCS1900	B1(2100), B2(1900), B4(AWS), B5(850), B8(900)	B1(2100), B2(1900), B3(1800), B4(AWS), B5(850), B7(2600), B8(900), B12(700), B17(700), B20(800), B25(1900), B26(850), B28(700), B32(1500), B66(AWS-3)	B38(2600), B40(2300), B4
5G FDD Sub6		5G TDD Sub6	
N1(2100), N3(1800), N5(850), N7(2600), N8(2000), N20(800)		N38(2600), N40(2300), N41(2500), N77(3700), N78(3500)	

Connectivity



USB Interface	USB Version	Location Technology	Earjack
USB Type-C	USB 2.0	GPS, Glonass, Beidou, Galileo, QZSS	USB Type-C
MHL	Wi-Fi	Wi-Fi Direct	Bluetooth Version
No	802.11a/b/g/n/ac/ax 2.4GHz+5GHz, HE80, MIMO, 1024-QAM	Yes	Bluetooth v5.4

PC Sync.

Smart Switch (PC version)

OS



Android

General Information



Form Factor

Touchscreen Bar

Sensors



Accelerometer, Fingerprint Sensor,
Gyro Sensor, Geomagnetic Sensor,
Light Sensor, Virtual Proximity
Sensing

Physical specification



Dimension (HxWxD, mm)	Weight (g)
162.9 x 78.2 x 7.4	195

Battery


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Audio and Video

^

Stereo Support	Video Playing Format	Video Playing Resolution	Audio Playing Format
Yes	MP4, M4V, 3GP, 3G2, AVI, FLV, MKV, WEBM	UHD 4K (3840 x 2160)@30fps	MP3, M4A, 3GA, AAC, OGG, WAV, AMR, AWB, FLAC, M4A, XMF, MXMF, IMY, RTTTL, R1

ECO Design

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Recycled Content (%)	Weight of Critical Raw Material - Cobalt (g)	Weight of Critical Raw Material - Tantalum (g)	Weight of Critical Raw Material - Neodymium (g)
9.33	10 <=	< 0.01	0.2 <=
Weight of Critical Raw Material - Gold (g)	Recyclability (%)		
< 0.02	11.2		

Services and Applications

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Gear Support	Samsung DeX Support	Bluetooth® Hearing Aid Support	SmartThings Support
Galaxy Ring, Galaxy Buds3 Pro, Galaxy Buds2 Pro, Galaxy Buds Pro, Galaxy Buds Live, Galaxy Buds+, Galaxy Buds3, Galaxy Buds2, Galaxy Buds, Galaxy Buds FE, Galaxy Fit3, Galaxy Fit2, Galaxy Fit e, Galaxy Fit, Galaxy Watch FE, Galaxy Watch Ultra, Galaxy Watch7, Galaxy Watch6, Galaxy Watch5, Galaxy Watch4, Galaxy Watch3, Galaxy Watch, Galaxy Watch Active2, Galaxy Watch Active	No	Android Audio Streaming for Hearing Aid(ASHA)	Yes

Mobile TV

No

Software Support

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Security Update Period (Valid until)

31 March 2031

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Reviews

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