Cisco Connected Mobile Experiences

This document details the specifications for Cisco® Connected Mobile Experiences (CMX) 10.x. Cisco CMX is a software solution that uses location and other intelligence from Cisco wireless infrastructure to generate analytics and deliver relevant services to customers on their mobile devices. With CMX, your organization can easily onboard users to the wireless network directly, serve personalized content to users on their mobile devices, enhance the in-venue experience, and generate better insights into customer behavior and venue space utilization.

Product Summary

CMX capabilities are delivered via three components: **Location, CMX Connect**, and **CMX Analytics**.

Location: CMX uses existing wireless infrastructure to calculate the location of the Wi-Fi devices and interferers (ie BLE Beacons, microwave ovens, etc.) in the network. It offers location capabilities from proximity-based (presence) to highly accurate X,Y coordinates on a map (Hyperlocation) (Figure 1).

Figure 1. CMX Location Capabilities



Table 1. CMX Location Benefits Summary

Feature	Benefits
Presence	• Locate a Wi-Fi device by gauging the access point nearest to that device. This method provides less granular location accuracy than triangulation; however, it can be deployed in venues with fewer access points or can extend Wi-Fi location analytics to outdoor access points. Presence is recommended for outdoor access points. • Refresh rate:* Not applicable. • Latency:** Not applicable.

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Feature	Benefits
	• Accuracy:*** Tags: Not applicable; Clients: 10 to 30 meters (based on the received signal strength indicator [RSSI] levels reported by the access point and the thresholds defined).
RSSI triangulation	• Locate connected and unconnected Wi-Fi devices, interferers, and active RFID tags. With Cisco CleanAir® technology, non-Wi-Fi interferers and BLE beacons can be decoded and identified. • Refresh rate:* Tags: Not applicable; Clients: Up to 60 seconds from client probe(client dependent). • Latency:** Tags: 10 seconds typical; Clients: Up to 90 seconds from client probe (client dependent). • Accuracy:*** Tags: 5 to 7 meters 90% of the time; Clients: 10 meters typical 90% of the time.
Hyperlocation	• Precise location of connected Wi-Fi devices within 1 to 3 meters (dependent on deployment) using advanced angle-of-arrival (AoA) technology combined with FastLocate. With FastLocate, Hyperlocation locates connected Wi-Fi devices by RSSI triangulation of probing signals as well as network data packets for faster refresh and greater location detail. • Refresh rate:* Tags: Not applicable; Clients: Up to 10 seconds (client dependent). • Latency:** Tags: Not applicable; Clients: 10 to 20 seconds (client dependent). • Accuracy:*** Tags: Not applicable; Clients: 3 meters typical 50% of the time.
Flexibility and programmability	• API and notifications available to allow external consumption of the location information.

* Refresh rate is the time between location updates after a device has been static within a zone. A refresh of a location is normally calculated after enough data is acquired to calculate a new location.

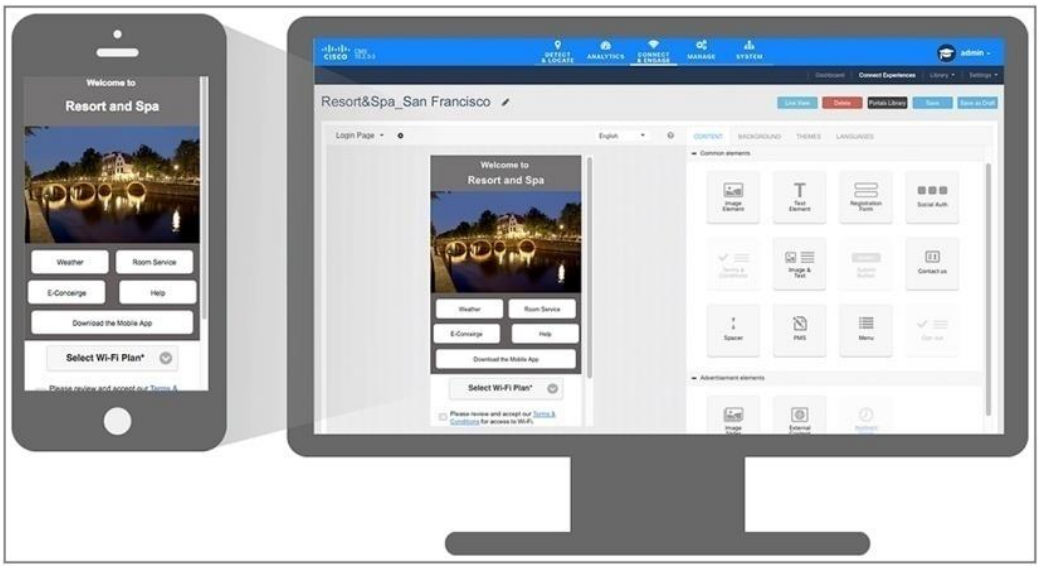
** Latency is measured as the time between when a device moves and the time a new location is calculated and can vary depending on system load and when a device sends a probe packet. Latency is usually less than 20 seconds from when a device sends a probe packet but can be higher in situations of high load or system stress. Devices can send probe packets very infrequently.

*** Accuracy: 50% of the time, a statistically valid sample of data (at least 400 data points) if all input data (locations of access points, etc.) is correct and in an open-air, indoor environment.

Note: To achieve the results as outlined in Table 1, the network design and prerequisites must follow the Cisco Validated Design at https://www.cisco.com/c/en/us/td/docs/solutions/Enterprise/Borderless_Networks/Unified_Access/CMX.html.

CMX Connect delivers targeted, context-specific experiences to on-site visitors (Figure 2). It provides an easy way to create customizable captive portals and capture visitor information through multiple onboarding options. Through the data collected, CMX Connect allows organizations to engage with the visitor on the captive portal or through external media such as mobile applications, digital signage, or offline marketing.

Figure 2. CMX Connect Guest Portal



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Table 2. CMX Connect Benefits Summary

Feature	Benefits
Customizable and modular user interface	• Prebuilt templates allow you to get started quickly with Wi-Fi guest portals. • With easy drag-and-drop components, you can create a custom look and function for the portal pages that work across all mobile devices and computers; no web programming skills required. • Multiple language option allows easy creation of portals specific to user language preference.
Opt in and opt out	• Easy way to add terms and conditions that must get consent to track user location and use the information they provide for marketing or other intended use. • Location opt-out: Allows users to opt out of location tracking by CMX.
Multiple onboarding options	• Simple registration options to capture customer-specified name, email, phone number, or any other custom field or option to do quick polls. • SMS option allows you to verify customer phone number, which is a common and useful customer identifier • Social login (Facebook, Instagram, Foursquare) option not only allows for better verification but also gathers additional social media data on that user. • Information collected through these onboarding methods provides insights into visitor demographics for follow-up marketing and engagement.
Location-based policy	• Create bandwidth-rate-limiting policies dynamically applied on a per-location basis.
Engage	• Create a better engagement experience with clickable menu items that allow a variety of relevant information accessible on the guest portal, giving it a web app experience. • Create unique pages on a site or venue basis and engage guest users with relevant advertisements and external content. • Automatically allow repeat visitors to access your site, and engage with them on a dedicated Success page.
Property management system (PMS) integration	• In hospitality, centralize and provide a uniform wireless onboarding experience across properties. • Eliminate gateways at each property and save on equipment and operation costs. • Introduce complimentary or paid plans by integrating into the PMS of a hotel. • Onboard a visitor using room number, last name, guest code, or username/password. Enforce bandwidth and session time per plan.
Guest analytics	• Guest-user analytics tell you whether visitors to the site are new or repeat visitors; you can learn their network usage, the portal and SMS success ratio, and the language they prefer. • User database is available for export in CSV format.

CMX Analytics generates insights into the WIFI devices of visitors in the venue based on their location and movement patterns. There are two flavors of analytics – Presence Analytics and Location Analytics.

Presence Analytics uses the proximity information of Wi-Fi devices to generate real-time and historical insights into visitor and passerby behaviors. This proximity is determined by the signal strength and time duration of Wi-Fi devices detected by the nearest access points. Presence Analytics captures metrics such as device counts, dwell times, and repeat visitors breakdowns. Figure 3 shows a sample Presence Analytics dashboard, and Table 3 summarizes the benefits of Presence Analytics.

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Figure 3. Presence Analytics

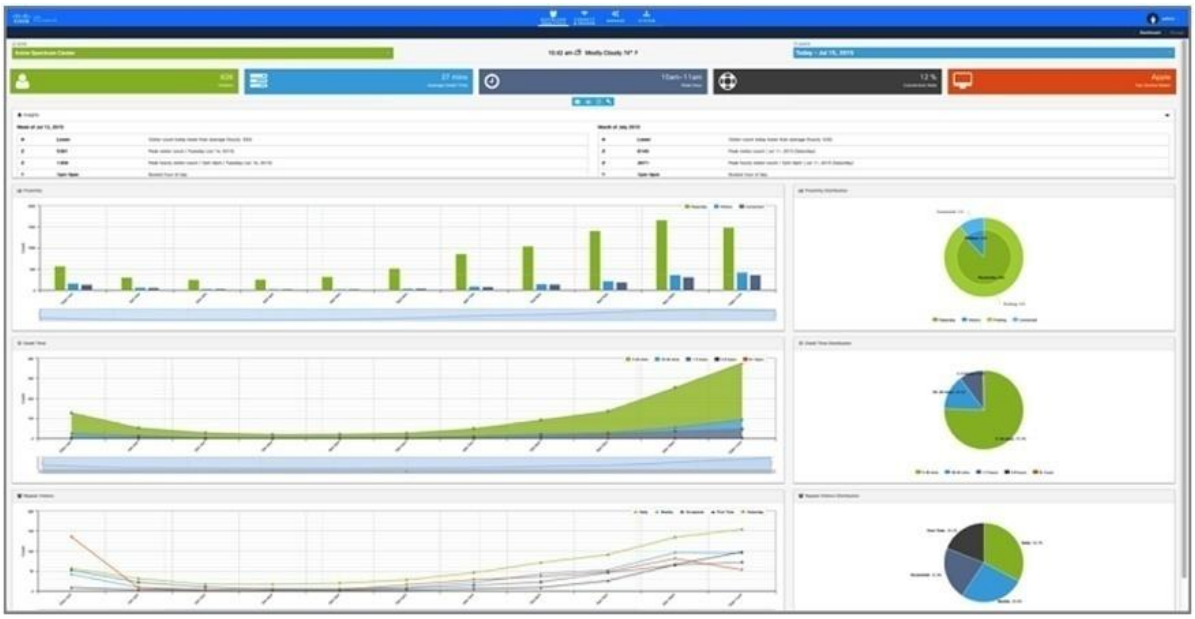


Table 3. CMX Presence Analytics Benefits Summary

Feature	Benefits
Dashboard	• The dashboard helps you discover quick insights into both the current and historical number of visitors, average dwell time, the busiest hour and day, the conversion rate, and the top device manufacturer.
Presence based	• The solution is easy to deploy; you simply add access points to a “presence site” and generate analytics based on the RSSI of Wi-Fi devices detected by those access points. • No need for maps. Recommended analytics solution for outdoor access points.
Visitor count	• Quick insights into the number of passersby and visitors in the venue help you understand traffic in the venue on an hourly basis across sites and site groups. This helps you understand and compare the popularity of the venues and their effectiveness in conversion.
Dwell time	• Understand how long visitors stay in the venue on average and their distribution by dwell times. Comparing this data across venues and over time provides insights into venue busyness and opportunities to optimize for revenues and venue operations.
Repeat visitor	• Insights into the frequency of the visitor as first time, yesterday, daily, weekly, and occasional. This information, when analyzed over time and across venues, is useful to understand popular days and time internals by visit frequency. It can help guide the timing and location of store interactions.
Flexibility and programmability	• Ability to ignore MAC addresses, wireless networks (SSIDs), or devices with certain dwell times or repeat behavior. • API and notifications are available to allow external triggers or to export data for custom analytics.

Location Analytics uses XY coordinates calculated by the CMX Location engine to provide real-time and historical location data at a more granular level and subsequently generate better insights (Figure 4). Table 4 summarizes the benefits of CMX Location Analytics.

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Figure 4. Location Analytics Data Displays

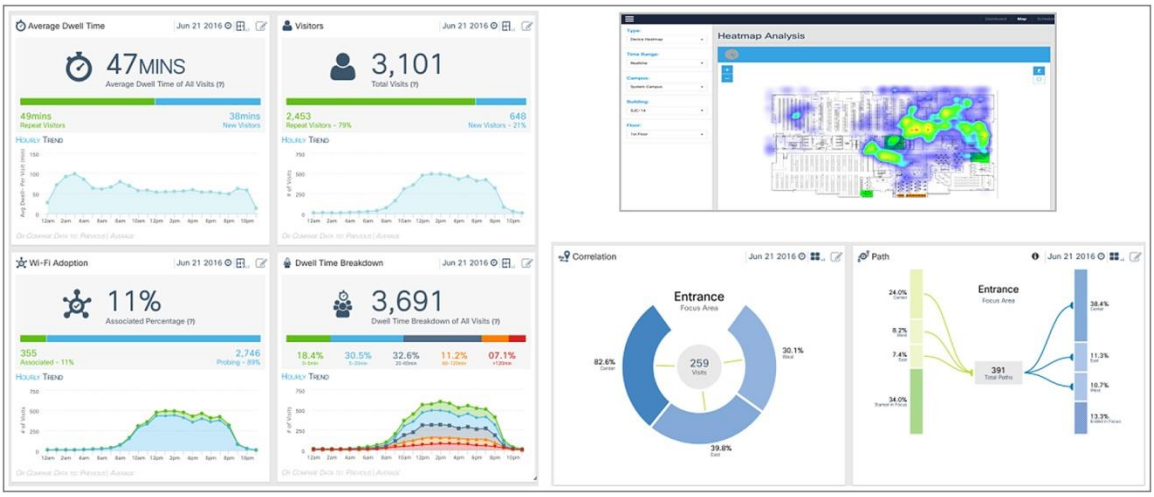


Table 4. CMX Location Analytics Benefits Summary

Feature	Benefits
Modular dashboard	• The widget-based dashboard allows the flexibility of adding multiple widgets by type of insights, location hierarchy, or tags for custom time periods.
Location-based Insights	• Generate better analytics with higher resolution and accuracy, using Cisco's state-of-the-art Wi-Fi indoor location technology. • Allows customers to add tags to a location and generate location analytics on a tag basis.
Visitor count	• Gain campus, building, floor or zone-specific insights into the number of visitors and passersby with WIFI devices within a venue. Not only does this measure popularity but it also provides trending information on visitor counts by easily comparing this data with average visitors or a previous period. Raw visitor counts need to have appropriate filters applies so that the data is approporate for the use case.
Dwell time	• Understand how long visitors devices stay in the venue on average and their distribution by dwell times. Comparing this data across venues and over time provides insights into venue foot traffic patterns and opportunities to optimize revenues and venue operations.
Correlation	• Correlation of visitors devices across locations or tagged zones provides insights into how many of the visitors devices that were seen in one zone were also seen in other zones. This is useful in optimizing promotions, offer composition, venue operations, etc.
Path analysis	• Path analysis provides insights into the starting and ending zones of all the paths taken through a focus section. It can provide insights that can benefit product placements and also improve venue operations.
Verticalization	• Through an easy setup wizard, create reports that are relevant to the industry a business belongs to. This helps create the default widget settings and nomenclature consistent with the business terms.
Heatmap (device count)	• Heatmaps provide a visual representation of total activity on a floor map in real time but also can be viewed as a playback over time. This is very useful to understand the space utilization and popularity of different sections of a location or zone.
Flexibility and programmability	• Reports can be scheduled in PDF, Excel, or HTML format to be sent as an email on a one-time or recurring basis. • API and notifications are available to allow external triggers or to export data for custom analytics.

Product Benefits across Industries

Industries of all kinds can unlock value from their wireless network with Cisco CMX (Table 5).

Table 5. Benefits for Various Industries

Industry	Benefit
Retail	• Guest Wi-Fi/access: Captive portal to capture shopper personal information and deliver relevant promotions and ads. • Analytics and insights: Understand traffic flows to optimize space planning for promotions and campaigns. • Experiences/engagement: Indoor navigation through a large shopping mall or entertainment venue

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Industry	Benefit
Healthcare	• Guest Wi-Fi/access: Connect visitors and patients to guest Wi-Fi for increased patient satisfaction. • Analytics and insights: Keep track of staff and Wi-Fi-enabled medical equipment to optimize staff efficiency. • Experiences/engagement: Indoor navigation through hospital or medical center to find services (pharmacy, labs, parking lot, etc.) and notifications for patient status updates.
Transportation	• Guest Wi-Fi/access: Provide guest Wi-Fi to travelers while they wait or connect to flights. • Analytics and insights: Queue time analytics to get insights into traveler wait times and adapt/adjust staffing accordingly. • Experiences/engagement: Provide updated flight status notifications to travelers.
Education	• Guest Wi-Fi/access: Visitor Wi-Fi access. • Analytics and insights: Provides insights into vacant and occupied rooms (lecture halls, labs, event space, etc.) to improve space utilization and utilities management. • Experiences/engagement: Provide campuswide notifications to students, faculty, and staff.
Hospitality	• Guest Wi-Fi/access: PMS integration for guest Wi-Fi onboarding and check-in based on location, last name, and room number. • Analytics and insights: Insights to understand how visitors devices move through the property to improve staff efficiency, especially in peak queue times during check-in/check-out. • Experiences/engagement: Provide loyalty program guests with relevant promotions and engagement through services.

Ordering and Deployment

CMX can be deployed as on-premises software or as a cloud-delivered software-as-a-service (SaaS) model. Table 6 summarizes these options.

Table 6. Connected Mobile Experiences Software Deployment Options

Options	Deployment Options
On-premises software	CMX Base License include the following capabilities; • CMX Connect • CMX Location • High Availability – Requires CMX 10.3 and two identical servers acting as an active/standby pair over Layer 2 or Layer 3 connection CMX Advanced License includes the following capabilities • All CMX Base license capabilities • CMX Analytics • CMX Connectors
On-premises hardware	• Virtual appliance: Cisco MSE Virtual Appliance (vMSE). • Physical appliance: Cisco 3365 MSE.
Cloud-delivered SaaS	**CMX Cloud has two SaaS licensing tiers, as follows.** Both licenses include software and technical support. Click Here for the CMX Cloud data sheet. • CMX Connect • CMX Connect with Presence Analytics

For CMX Cloud ordering, please visit https://www.cisco.com/c/en/us/solutions/collateral/enterprise-networks/connected-mobile-experiences/datasheet-c78-736407.html. The deployment guide is at https://support.cmxcisco.com/hc/en-us/.

For CMX on-premises, please refer to the CMX ordering guide at https://www.cisco.com/c/en/us/solutions/collateral/enterprise-networks/connected-mobile-experiences/guide-c07-734430.html.

CMX on-premises software can be deployed in a preinstalled Cisco Mobility Services Engine (MSE) appliance or as a virtual machine on a generic server such as a Cisco UCS® appliance. A configuration guide is available at https://www.cisco.com/c/en/us/support/wireless/mobility-services-engine/products-installation-and-configuration-guides-list.html.

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CMX On-Premises: MSE Virtual Appliance Product Specifications

All listed server resources should be reserved or dedicated for the virtual machine running the MSE virtual appliance. For hard-drive configuration, a thick configuration should be used.

All listed specifications are minimum requirements (Table 7).

Table 7. Cisco MSE Virtual Appliance Product Specifications

Feature	Cisco MSE Virtual Appliance
Virtual appliance versions (virtual appliance on a customer-supplied server)	VMware ESX or ESXi version 5.1 or higher
Minimum server requirements	**Cisco High-End Virtual MSE** • CMX Base/Advanced license: 10,000 access points • Maximum number of tracked devices: 90,000 (regardless of the number of access point licenses) unique MACS per day. Note that the end device scaling guidelines differ if using hyperlocation and/or FastLocate as a method for determining device location. See the MSE ordering and licensing guide for more details. • Maximum number of zones: 900 zones or a total of 1000 hierarchy items (zones + buildings+ floors) • Maximum number of API requests: 60 per second with v3 API of mac location requests • Minimum RAM: 64 GB • Minimum hard disk space: 1-TB SAS HD or SSD (in RAID configuration) • Processors: 20 vCPUs (equivalent to Intel® E5-2650-V3 CPU or higher) **Cisco Standard Virtual MSE** • CMX Base/Advanced license: 5000 access points • Maximum number of tracked devices: 50,000 (regardless of number of access point licenses) unique MACS per day. Note that the end device scaling guidelines differ if using FastLocate as a method for determining device location. See the MSE ordering and licensing guide for more details. Hyperlocation is not supported as a method for determining device location on the Standard Virtual MSE. • Maximum number of zones: 600 zones or a total of 750 hierarchy items (zones + buildings+ floors) • Minimum RAM: 48 GB • Minimum hard disk space: 500-GB SAS HD or SSD (in RAID configuration) • Processors: 16 vCPUs (equivalent to Intel E5-2650-V3 CPU or higher) **Cisco Low-End Virtual MSE** • CMX Base/Advanced license: 2000 access points • Maximum number of tracked devices: 25,000 (regardless of number of access point licenses) unique MACS per day. Note that the end device scaling guidelines differ if using FastLocate as a method for determining device location. See the MSE ordering and licensing guide for more details. Hyperlocation is not supported as a method for determining device location on the Low-End Virtual MSE. • Maximum number of zones: 150 zones or a total of 200 hierarchy items (zones + buildings+ floors) • Minimum RAM: 24 GB • Minimum hard disk space: 500-GB SAS HD or SSD (in RAID configuration) • Processors: 8 vCPUs (equivalent to Intel E5-2650-V3 CPU or higher)

Cisco 3365 MSE Physical Appliance Product Specifications

The Cisco 3355 MSE will not ship with CMX 10, as it has reached end of life; however, customers will have the option of installing CMX 10 software on the MSE 3355. Some features, such as Hyperlocation, are not supported on the MSE 3355 appliance.

Table 8 provides the specifications for the physical Cisco 3365 MSE appliance.

Table 8. Cisco 3365 MSE Product Specifications

Feature	Cisco 3365 MSE
Supported services	• CMX Base/Advanced License: 10,000 access points • Maximum number of tracked devices using RSSI triangulation: 100,000 (regardless of number of access point licenses) unique MACS per day. Note that the end device scaling guidelines differ if using hyperlocation or FastLocate as a method

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Feature	Cisco 3365 MSE
	for determining device location. See the MSE ordering and licensing guide for more details. • Maximum number of tracked devices using FASTLocate: 24,000 • Maximum number of tracked devices using Hyperlocation: 10,000 devices • Maximum number of zones: 1100 zones or a total of 1000 hierarchy items (zones + buildings+ floors)
Evaluation support	• MSE: The physical or virtual appliance ships with a 120-day evaluation license for all services, with no limitation on the number of access points or tracked clients.
Processor	• 10-core Intel e5-2650 2.4 GHz
Memory	• Four 16 GB DDR4 2133 MHz
Hard disk	• Four hot-swappable 600-GB SAS drives
Removable media	• None
Ports	• One RJ-45 management port for out-of-band management • RJ-45: Two rear RJ-45 connectors for connection to two Gigabit Ethernet network adapters
Connectivity	• Network: Two embedded multifunction Gigabit Ethernet network adapters with a TCP/IP offload engine
Management	• Simple Network Management Protocol (SNMP) v1, v2c, and v3
Management interface	• Cisco Prime™ Infrastructure
Network devices	• See MSE release notes for software interoperability with Cisco wireless controllers and access points
System specifications	• Number of MSEs per Cisco Prime Infrastructure: 20
Programming interfaces	• Representational state transfer (REST) APIs
Form factor	• 1 rack unit (1RU)
Physical dimensions	• Height: 1.7 in. (4.3 cm) • Width: 16.89 in. (43.0 cm) • Including handles: 18.98 in. (48.2 cm) • Depth: 29.8 in. (75.6 cm) • Including handles: 30.98 in. (78.7 cm) • Weight: 38 lb (17.2 kg)
Power	• AC power supply wattage: 770W • AC power supply voltage: 100V to 120V at 50 to 60 Hz; 200V to 240V at 50 to 60 Hz • 92% efficient • Autoswitching, hot-swappable • Redundant power supplies
Cooling fans	• Six dual-redundant hot-swappable fans for front-to-rear cooling
Environmental	• Operating temperature: ◦ 41° to 95°F (5° to 35°C) ◦ Decrease the maximum temperature by 1°C per 1000 ft. (305 m) of altitude above sea level
	• Nonoperating temperature: ◦ -40° to 149°F (-40° to 65°C)
	• Humidity (RH) operating ◦ 10% to 90%, noncondensing at 82°F (28°C) • Humidity (RH) nonoperating ◦ 5% to 93% at 82°F (28°C) • Altitude operating ◦ 0 to 3000 m (0 to 10,000 ft.) • Altitude nonoperating ◦ 0 to 12,192 m (0 to 40,000 ft.) • Sound power level, Measure A: weighted per ISO 7779 LWAd (Bels) operation at 73°F (23°C) ◦ 5.4 • Sound pressure level, Measure A: weighted per ISO 7779 LpAm (dBA) operation at 73°F (23°C) ◦ 37

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Feature	Cisco 3365 MSE	
Approvals and compliance	Safety	UL 60950-1 Second Edition CAN/CSA-C22.2 No. 60950-1 Second Edition EN 60950-1 Second Edition IEC 60950-1 Second Edition AS/NZS 60950-1GB4943 2001
	EMC - Emissions	47CFR Part 15 (CFR 47) Class A AS/NZS CISPR22 Class A CISPR22 Class AEN55022 Class A ICES003 Class A VCCI Class A EN61000-3-2EN61000-3-3KN22 Class A CNS13438 Class A
	EMC - Immunity	EN55024CISPR24EN300386KN24

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For More Information

- For more information about Cisco Connected Mobile Experiences, visit https://www.cisco.com/go/cmx.
- For details regarding the MSE with software version 8.0 or older, see the MSE 8.0 data sheet.

As of June 2015, the Cisco 3355 MSE has reached end of sale. CMX 10.2 supports the 3355 MSE.

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

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

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

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