



# Preface

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**September 4, 2014**

This document is a Cisco Validated Design (CVD) for Cisco Connected Mobile Experience (CMX) Solutions. It presents system-level requirements, recommendations, guidelines, and best practices for detecting, connecting, and engaging mobile users within your venue and leveraging your Wi-Fi network to fit your business needs. As Cisco continues to develop and enhance the technologies required to implement a CMX solution, this CVD will evolve and be updated to provide the latest guidelines, recommendations, and best practices for designing and deploying a CMX solution.

## How to Use this Document

This document is organized into five main parts after the initial [Chapter 1, “Connected Mobile Experiences Solution Overview.”](#)

## CMX Design Overview

The chapters in this part of the document describe the main components of Cisco CMX solution and explain how these components work together to form a complete end-to-end solution:

- [Chapter 3, “CMX Solution Components”](#)—Highlights the wireless (Wi-Fi) network infrastructure necessary for providing location services and CMX services within this design guide.
- [Chapter 4, “CMX Deployment Models”](#)—Introduces high-level models for the deployment of infrastructure components necessary for location services and CMX. Considerations around bandwidth utilization and scalability of the MSE are discussed.
- [Chapter 5, “CMX Security Considerations”](#)—Focuses on traffic isolation for guest wireless access as part of CMX Visitor Connect and also discusses the CMX Connect and Engage service.
- [Chapter 6, “CMX Additional Considerations”](#)—Highlights the additional considerations when deploying a CMX Solution such as fast location information, Apple IOS 8 devices, and considerations around 2.4 and 5GHZ frequency bands when deploying location services and CMX services.

## CMX Use Cases

The chapter in this part of the document describes the CMX use case examples tested and verified within this design guide. A chapter summarizing the use cases verified as well as Video On Demand (VoD)s of each of the use cases showcase the CMX solution components in several real world scenarios.

- [Chapter 7, “CMX Use Case Stories”](#)—Introduces several use cases that can be met through the deployment of CMX services. Each is designed to highlight the application of CMX services to address a realistic business scenario. The first two use cases involve the use of CMX Location Analytics with a large-sized retail scenario to analyze customer behavior to provide better service. The final two use cases involve the use of the CMX Visitor Connect service, as well as the use of CMX Presence Analytics within small-sized retail scenarios, to provide customer Wi-Fi access as well as analyze customer behavior to provide better service.

## RF and Location Based Design

The chapters in this part of the document describe various services in addition to the use cases described in the previous section:

- [Chapter 9, “Radio Operating Frequencies and Data Rates”](#)—Discusses RF operating frequencies that are used for WLAN Networks. 802.11 a/b/n/ac modulation techniques and the role of TPC and DCA in a RF network are discussed.
- [Chapter 10, “Radio Frequency Fundamentals”](#)—Discusses RF fundamentals that must be understood before deploying a Wireless LAN network that is location and CMX ready. The chapter explains various RF concepts such as spectrum bands, power level, signal strength, RSSI, etc.
- [Chapter 11, “Antenna Fundamentals”](#)—Discusses antennas, which are a fundamental part of any WLAN deployment, and how selecting the right type of antenna for deployment greatly enhances both coverage and location readiness.
- [Chapter 12, “802.11 Fundamentals”](#)—Discusses 802.11 fundamentals, namely the role of beacons, probe requests, and probe responses.
- [Chapter 13, “Location Fundamentals”](#)—Discusses location fundamentals, including definition of a location ready point, location currency, location accuracy, and location latency. We also discuss two methods of obtaining location from a client, i.e., the Probe RSSI method and the FastLocate method.
- [Chapter 14, “Pre-Deployment Radio Frequency Site Survey”](#)—Discusses the pre-deployment RF site survey. A good Cisco WLAN deployment is dependent on a good RF design, including doing a thorough site survey of the location, determining the best location for access points, making the right channel plans, planning for AP capacity, and performing a regular post deployment RF site survey
- [Chapter 15, “Access Point Placement and Separation”](#)—Discusses AP placement and AP capacity planning. Core concepts regarding the distance between APs in a network and its impact on location data and voice are discussed. Additionally designing for capacity is also discussed in the chapter.
- [Chapter 16, “Predictive Radio Frequency Planning”](#)—Discusses predictive RF planning that should be under taken after a pre-deployment RF Site Survey is completed. Two tools to perform RF planning are discussed, namely the Cisco Prime Infrastructure RF Planner tool and the Ekahau Site Survey tool.
- [Chapter 17, “Multi-Floor Deployments”](#)—Discusses challenges in deployments that involve multiple floors. Recommendations on what to keep in mind while designing for RF network are also discussed.

- [Chapter 18, “Capacity Planning and High Density”](#)—Discusses planning a network with capacity and need in mind. Today’s WLAN needs are heavily dependent on mobile devices and applications. Capacity planning involves looking at application needs and designing a network around them, while High Density networks may be required when too many clients are expected to connect in a location.
- [Chapter 19, “Location Voice and Data Co-Existence”](#)—Discusses the pertinent characteristics of voice and data designs only as they relate to co-existence with the location tracking capabilities of the Cisco UWN.
- [Chapter 20, “Post-Deployment Radio Frequency Tuning”](#)—Discusses post-deployment RF tuning that should be done regularly on the deployment and includes using RRM for channel planning, CleanAir to mitigate RF interference, and a regular post site survey assessment to ensure that optimum RF health is maintained.
- [Chapter 21, “Best Practices Checklist”](#)—Discusses the best practices check list while deploying a CMX solution.

## Configuring the Infrastructure

The chapters in this part of the document describe the network infrastructure design and configuration foundations to deploy a CMX solution in a customer environment:

- [Chapter 23, “Configuring Cisco Wireless LAN Controllers”](#)—Highlights the configuration of the Business to Consumer (B2C) guest WLAN necessary for providing guest wireless connectivity leveraging CMX Visitor Connect. In addition, information regarding how to enable presence on the WLC is provided.
- [Chapter 24, “Configuring Cisco Prime Infrastructure”](#)—Highlights the configuration of Cisco Prime Infrastructure for map integration and management of the CMX solution.
- [Chapter 25, “Configuring the Mobility Services Engine for CMX”](#)—Highlights the configuration of the MSE to collect and report the location-based information and analytics.
- [Chapter 26, “Configuring CMX Analytics”](#)—Highlights the configuration options for the three main functional areas of CMX Analytics—Dashboard, Analytics and Reports.
- [Chapter 27, “Configuring CMX Visitor Connect”](#)—Highlights the configuration required to enable CMX Visitor Connect on the MSE.

## Appendices

The appendices contain useful information that is not covered in the main chapters of this CVD:

- [Appendix A, “CMX Software Versions”](#)—Provides the software versions and devices leveraged in this design guide.
- [Appendix B, “CMX System Release Notes”](#)—Provides important information you should be aware of when designing and implementing this release of the CMX CVD.
- [Appendix C, “802.11 Data Rates”](#)—Lists the data rates for 802.11an/ac rates in 5GHz and 802.11bgn in 2.4 GHz.
- [Appendix D, “CMX Use Case Example—Upgrade VoWLAN Ready Network to Location/CMX Ready”](#)—Provides a use case to transition your already existing WLAN network to a location ready network to deploy CMX.

- [Appendix E, “CMX Troubleshooting”](#)—Provides several troubleshooting techniques when deploying this release of the CMX CVD.

## For Experienced Users

Readers who are familiar with previous versions of this CVD or who are experienced at designing a CMX solution can use this document as a reference source. Rather than reading every page or every chapter, this document has been broken into modules that can be easily searched for a particular topic. Updates to the topics in this CVD will be published periodically.

## For New Users

This document is long and contains an extensive amount of complex technical information. It can seem intimidating, particularly if you are a first time reader of this document or do not have much experience with a CMX solution.

To orient yourself to the document, we recommend you begin with [Chapter 2, “Summary of CMX Design Overview,”](#) which provides an overview of the major components required to deploy a CMX solution and typical use cases. From this section, you can then determine if you need particular design guidance around the infrastructure, the uses cases, or a set operation.

## Where to Find Additional Information

Because the document covers a wide spectrum of Cisco Network Infrastructure, Security, and Mobility products and possible solution designs, it cannot provide all the details of individual products, features, or configurations. For that type of detailed information, refer to the specific product documentation available at: <http://www.cisco.com>.

This document provides general guidance on how to design your own CMX solution. Cisco has developed, tested, and documented specific solutions for certain applications and has made those solutions available for customers to copy and deploy. They are part of the Cisco Validated Design program described and documented at: <http://www.cisco.com/go/designzone>.

## Revision History

This document may be updated at any time without notice. You can obtain the latest version of this document online at: [TBD](#).

Visit this website periodically and check for documentation updates by comparing the revision date of your copy with the revision date of the online document.

[Table 1](#) lists the revision history for this document.

**Table 1**      **Revision History**

Revision Date	Comments
September 3, 2014	Initial version of this CMX CVD.

# Command Syntax Conventions

Table 2 describes the syntax used with the commands in this document.

**Table 2**      **Command Syntax Guide**

<b>Convention</b>	<b>Description</b>
<b>boldface</b>	Commands and keywords.
<i>italic</i>	Command input that is supplied by you.
[ ]	Keywords or arguments that appear within square brackets are optional.
{ x   x   x }	A choice of keywords (represented by x) appears in braces separated by vertical bars. You must select one.
^ or Ctrl	Represent the key labeled <i>Control</i> . For example, when you read ^D or <i>Ctrl-D</i> , you should hold down the Control key while you press the D key.
screen font	Examples of information displayed on the screen.
<b>boldface screen font</b>	Examples of information that you must enter.
< >	Nonprinting characters, such as passwords, appear in angled brackets.
[ ]	Default responses to system prompts appear in square brackets.

