



THE BENEFITS OF CCX FOR MOBILE DEVICES

A Devicescape White Paper
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List of Acronyms

ACS	Cisco Access Control Server
API	Application Programming Interface
AP	Access Point
ASD	Application Specific Device
CCX	Cisco Compatible Extensions
GUI	Graphical User Interface
IE	Information Element
IP	Internet Protocol
OID	Object Identifier
OS	Operating System
QoS	Quality of Service
STA	Station
UI	User Interface
VoIP	Voice over IP
WFA	Wi-Fi Alliance
Wi-Fi	Wireless Fidelity, aka 802.11
WPA	Wi-Fi Protected Access
WME	Wireless Multimedia Extensions
WMM	Wi-Fi Multimedia (same as WME)
WZC	Windows Zero Config

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Introduction

The WLAN market has grown exponentially as more users demand mobility in and out of the office. Numerous client devices have been introduced to meet the challenges of device mobility; these devices must interoperate securely with leading WLAN infrastructure and must consistently provide the features that organizations require.

With the Cisco® Compatible Extensions program (CCX), WLAN client device suppliers (the program's participants) license, at no charge, Cisco WLAN technology innovations in the CCX specification. Participants implement all elements of the specification and undergo extensive testing at an independent third-party test lab. The testing helps to ensure support for innovative features pioneered by Cisco, as well as interoperability with Cisco WLAN infrastructure products.

The CCX program does not include the software to actually implement the CCX. Participants usually license CCX technology from an approved vendor, such as Devicescape. The Devicescape implementation of CCX is known as Devicescape Easy Wi-Fi.

Devicescape Easy Wi-Fi is an embeddable software product that provides Supplicant, CCX, Wi-Fi Projected Setup (WPS), Connection Management and Hotspot Login capabilities for all types of Wi-Fi enabled devices. While this whitepaper focuses on CCX, a more general description of Easy Wi-Fi can be found at http://www.devicescape.com/learn/device_mfgs.

The Cisco Compatible Extensions program helps to ensure that client devices from a variety of suppliers will work with Cisco-based WLANs. To make it easy to find these devices, Cisco has licensed the Cisco Compatible logo for use by participants whose products pass all tests at an independent third-party test lab. Locating approved wireless devices is as easy as looking for the logo.

The CCX certification logo is quickly becoming a mandatory requirement for mobile devices in the enterprise environment. This white paper describes CCX and the benefits of implementing CCX on a mobile device.

What is CCX?

CCX is a group of extensions to the Wi-Fi Alliance WPA/WPA2 specification designed to address wireless roaming performance, reliability, diagnostics, security and network statistics gathering. Cisco developed the original CCX version (CCXv1) in 2002 when it was apparent the current wireless standards did not address enterprise-grade wireless connectivity requirements. Cisco Systems continues to update and maintain the CCX specification, which is currently at version 5 (CCXv5). Devicescape supports CCX up to version 5.

The following table describes the main features of CCX:

Feature	Description
AP control of client transmit power	Minimize interference in dense AP networks
AP-assisted roaming	STA receives information from AP to make intelligent roaming decisions
Fast re-authentication	Expedited WPA key handshake to reduce roaming time to 125 msec or less
Radio measurement requests	STA submits radio signal/bandwidth data to AP to optimize network reliability
Single Sign-on support	Support for single sign-on to Windows network
Proxy ARP with notification via IE	Support for STA advanced power management
L2 Roaming enhancements	Dynamic updates of AP roaming information to improve network edge performance
Network admission control	Enhances security for authenticating devices on the wireless network
SSID List support	Enhances STA roaming performance
Call admission control	Maintains VoIP call quality during network congestion
U-APSD	Support for STA power save when using WME
Voice and traffic stream metrics	Detect and correct packet latency and packet loss problems in the wireless network
Wireless Intrusion Detection System	Enhances security of wireless network
Multi-BSSID support	Enhances STA roaming performance
Location-based services	STA location reporting to enable location-specific services
Keep alive support	Allows a STA to stay associated to the AP after a period of inactivity, if desired
Link test support	Tests the quality of the wireless link
Diagnostic channel	Support for a separate channel for diagnostic support
Client reporting	STA provides detailed hardware, capability and network statistics information to the AP
Roaming and real-time diagnostics	STA provides diagnostic information to AP to fix performance or connection problems
Management Frame Protection	802.11 management frames are encrypted to provide additional network security
Expedited bandwidth request	Provides priority for VoIP or emergency wireless traffic
Status and result code support	Specific AP requests that are performed by the STA to address network security or performance
Performance	Specific performance requirements for VoIP roaming, network capacity, and radio characteristics that exceed other QoS specifications such as WMM

A CCX implementation requires one or more Cisco Access Points and a Cisco ACS authentication server, as well as a CCX-enabled mobile device to connect to the network. Cisco wireless infrastructure is already deployed on over 65% of enterprise and business networks, therefore the majority of enterprise networks can immediately benefit from the value of using CCX-enabled mobile devices.

The CCX specification includes two device classes: Laptop and ASD. An ASD (Application Specific Device) would be an embedded device such as a smart phone, bar code reader or other portable device designed for a specific purpose. The Laptop device class generally needs to implement most of the CCX requirements, while the ASD device class generally has fewer CCX requirements.

CCX is backwards-compatible with existing WPA/WPA2/WME devices, which means mobile devices without CCX will still work on a Cisco AP infrastructure, but will not have the valuable features that CCX provides.

Why is CCX needed?

The current Wi-Fi Alliance WPA/WPA2 specification performs basic wireless connectivity tests using various authentication methods. Many of these tests fall short of the performance requirements of an enterprise wireless system. For example, the WPA/WPA2 roaming test between two APs will *pass*, as long as the mobile device will roam from one AP to the other within 90 seconds. In contrast, the CCX specification requires a maximum 125 millisecond roam time between APs in order to adequately support VoIP calls.

The Wi-Fi Alliance WPA/WPA2 specification also does not test for network reliability and congestion. The CCX specification includes many features such as Call Admission Control, which limits the number of new wireless connections to avoid network congestion.

Therefore, simply having a mobile device certified for WPA/WPA2 is not enough to ensure enterprise-grade wireless roaming, reliability and VoIP performance. The end customer is paying a premium for an enterprise-grade handset and should expect premium performance, not WPA/WPA2 "consumer grade" performance with a supplicant such as WZC.

How is CCX implemented?

Because CCX solves a large number of difficult wireless problems such as fast roaming and wireless reliability, it is complex to implement.

On the AP side, Cisco includes CCX functionality with newer Cisco APs or with a firmware upgrade on older Cisco APs. CCX is only available on Cisco APs, and also requires a Cisco ACS authentication server.

On the mobile device side, a CCX-enabled supplicant such as the Devicewise Easy Wi-Fi is required. In addition, a CCX-enabled WLAN driver (provided by the chipset manufacturer) is also required. The CCX specification does not specify an API between the supplicant and the driver, and therefore some custom integration between the supplicant and driver is required for each mobile device CCX implementation.

A typical CCX implementation on a mobile device would consist of the following:

- Implementation of the CCX supplicant on the mobile device and platform OS. The Devicewise Easy Wi-Fi supports all popular operating systems.
- Integration of the CCX supplicant with the mobile device CCX-enabled WLAN driver. Devicewise can provide professional services to perform this work. In addition, Devicewise Easy Wi-Fi works with all popular chipsets and both Funk and Meetinghouse OIDs to minimize the integration effort required.
- Development of a GUI component for managing wireless networks on the mobile device. The Devicewise Easy Wi-Fi includes a production-ready reference GUI that can be easily re-branded by the customer. Otherwise, the customer can use the well-defined Easy Wi-Fi GUI API to develop their own GUI.
- Pre-testing of the CCX implementation before submission to the CCX test lab. This step is important for saving testing time and money. Devicewise can provide CCX pre-testing as part of professional services integration work.

CCX testing and certification

In order to implement CCX on a mobile device, the device OEM must first register with Cisco in the Cisco Compatible Extensions program. More information on the registration process is available here:

http://www.cisco.com/web/partners/pr46/pr147/partners_pgm_application_guidelines.html

A device OEM must be approved by Cisco prior to being able to receive CCX technology from Devicewise. Since the Cisco approval and review process can take several months to complete, Devicewise encourages prospective licensees of Easy Wi-Fi to register as soon as possible with the Cisco CCX program.

Once a CCX-enabled supplicant has been integrated onto the mobile device, it must be submitted by the company to a Cisco certified test house. More information on the Cisco CCX test program and test house partners is available from the above link. Note that although Devicewise can pre-certify a mobile device, Devicewise is not a certified testing house.

The Devicescape Advantage

Devicescape has many years of experience helping devices OEMs successfully develop CCX enabled Wi-Fi devices. Our deep knowledge of device driver and chipset dependences, the complexities of development and testing, and our ability to take on the complete design, integration and pre-certification of your Wi-Fi product make Devicescape Easy Wi-Fi the logical choice.

For more information of Devicescape Easy Wi-Fi go to www.devicescape.com, or contact Devicescape at dsbizdev@devicescape.com

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