

Function Description

Location in Ascom VoWiFi System

Contents

1 Introduction	1
1.1 Abbreviations and Glossary.....	1
2 Technical Solution	2
2.1 Access Point (AP) Location.....	2
2.2 Real-Time Location System (RTLS).....	2
2.3 Alarm from VoWiFi Handset.....	3
3 Ekahau RTLS Solution	4
4 Cisco RTLS Solution.....	6
5 Related Documents	8
6 Document History	9

1 Introduction

Location in Ascom VoWiFi system is aimed at locating a person, such as the whereabouts of an employee.

Two types of location are supported, either a basic location solution that gives an approximate location, or a personal security solution that gives a more accurate location. Refer to the chapter [2.1 Access Point \(AP\) Location](#) on page 2 and chapter [2.2 Real-Time Location System \(RTLS\)](#) on page 2.

1.1 Abbreviations and Glossary

AMC	Alarm Management Client: operator's panel with graphical alarm presentation.
AMS	Alarm Management Server: Unite module that enables advanced event handling.
AP	Access Point: a radio transceiver providing LAN connection to wireless devices.
BSSID	Basic Service Set Identifier
DFS	Dynamic Frequency Selection
IMS2	Integrated Wireless Messaging and Services: Unite module that enables wireless services to and from the VoWiFi handsets in a WLAN system. It also includes the Device Manager.
MAC	Medium Access Control
RFID	Radio-frequency identification: An automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags.
RFID tag	An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.
RSSI	Received Signal Strength Indication measurement of the power present in a received radio signal.
RTLS	Real-Time Location System
Unite CM	Unite Connectivity Manager: Unite module that enables messaging and alarm handling in a WLAN system. It also includes the Device Manager.
VoWiFi	Voice over Wireless Fidelity
WLAN	Wireless Local Area Network

2 Technical Solution

The Ascom VoWiFi location solution uses standard Ascom Unite infrastructure components, as well as dedicated WiFi and RTLS equipment. The architecture and message flow of the solution is similar to “traditional” Ascom security solutions based on DECT or narrow-band proprietary solutions, but uses a high-speed WLAN network for data transmission.

2.1 Access Point (AP) Location

In a solution where only an approximate location is needed (for example an area in a certain building), RTLS equipment can be excluded and Access Point (AP) location can be used. Since the locations of the APs can be registered, the location of a portable device can be determined to be within a certain area around one specific AP. The condition is that each AP has a unique BSSID¹. Then, if an alarm is sent from the portable device, the BSSID will be included in the alarm message.

There are two ways to register the locations of the APs:

- If a Unite CM is used, a conversion table in the Unite CM can convert the identities of the APs into locations. See Installation and Operation Manual Unite CM, TD 92735GB.
- If an IMS2 is used, a translation table in the AMS can translate the identities of the APs to locations, and a map in the AMC can display the approximate locations of the alarming devices. See Installation and Operation Manual AMS, TD 92047GB, and Installation and Operation Manual AMC, TD 92145GB.

2.2 Real-Time Location System (RTLS)

In a personal security solution a location with higher precision is needed, since it is of high importance to minimize the time to find a person in trouble. If the location of the alarming device is known, the time can be reduced significantly. In this case the Ascom VoWiFi system uses third-party RTLS equipment together with Ascom Unite infrastructure components. See chapter 3 [Ekahau RTLS Solution](#) on page 4 and 4 [Cisco RTLS Solution](#) on page 6.

2.2.1 Battery Lifetime with Location Scanning

In a real-time location system the VoWiFi handset is scanning at specified intervals for information that can be used as input to the real-time location system. The location scanning will affect the speech-time/stand-by time, and consequently how often the battery must be charged.

2.2.2 Location Accuracy

The location calculation is done completely by the third-party location application, and the accuracy may vary over time. Since the location calculation also depends on the number of APs in the vicinity and their relative position, the accuracy may vary at different locations.

In an environment where DFS channels in the 5.0 GHz band are used, the accuracy might become deteriorated, since the VoWiFi handset cannot scan actively on the DFS channels. It can only use passive scanning on the DFS channels, and the RTLS equipment may therefore not get the data needed for an accurate calculation of the location.

The factors described above are only partially tied to the behaviour of the VoWiFi handset. This means that the location performance in terms of accuracy and update speed needs to be tested and tuned in the customers live environment.

1.This excludes some vendors.

2.2.3 Fall-back Location Accuracy to Closest AP

As part of the default behaviour, the VoWiFi handset always includes the identity of the associated AP, which can be used to make a coarse estimation of the location in case of location appliance failure or unreasonable location calculation results.

2.3 Alarm from VoWiFi Handset

Alarms can be sent from handsets in the VoWiFi system, either manually (push-button) or automatically (built-in no-movement and man-down sensors¹). The alarms are then forwarded to people acting upon it. The Ascom VoWiFi system can forward alarms to user groups and create escalation chains, as well as forward alarms to external systems such as GSM, sirens, and flashlights.

In case of an alarm, the handset provides the following details in the alarm message:

- Identity (usually the call number) of the device. This can be converted to user name.
- Type of alarm (Push-button/Man-down/No-Movement).
- Time of the alarm.
- Identity of the associated AP. For AP location the identity of the associated AP is converted to indicate a coarse location of the alarming device.

Example of an alarm message flow for AP location:

- 1 The VoWiFi handset transmits an alarm message upon triggering of any alarm type.
- 2 The alarm is forwarded to the responsible backup team.
- 3 Optionally, the alarm can be presented on the AMC (Alarm Management Client), and a map with an approximate location of the alarming device can be viewed.
- 4 If the alarm is not acknowledged within a certain period, the alarm can be escalated and sent to the next group etc.

Example of an alarm message flow for RTLS:

- 1 The VoWiFi handset transmits an alarm message upon triggering of any alarm type.
- 2 The Unite system queries the RTLS equipment for the latest calculated location for the alarming device with MAC address XX.
- 3 The alarm is forwarded to the responsible backup team, now including the location of the alarming device as retrieved from the RTLS equipment.
- 4 Optionally, the alarm can be presented on the AMC, and a map with the location of the alarming device can be viewed.
- 5 If the alarm is not acknowledged within a certain period, the alarm can be escalated and sent to the next group etc.

1.i75 VoWiFi handsets.

3 Ekahau RTLS Solution

Ekahau RTLS is a complete tracking solution for asset and people tracking. It involves the Ekahau Positioning Engine that uses the WLAN network topology to calculate the location of mobile devices. It is the internal algorithms of the positioning engine that calculate the location, and uses RSSI measurements to define the location of mobile devices within the WLAN environment. It needs reference data from a site survey to calculate the location.

802.11 WiFi APs are used as reference points for locating tags, and as the communication link between tags and the Ekahau Positioning Engine. Tags are small battery-operated devices that are attached to tracked objects. They measure the signal strengths from the APs to the tags, and transmit the measurements through an 802.11 network to the Ekahau Positioning Engine in real-time.

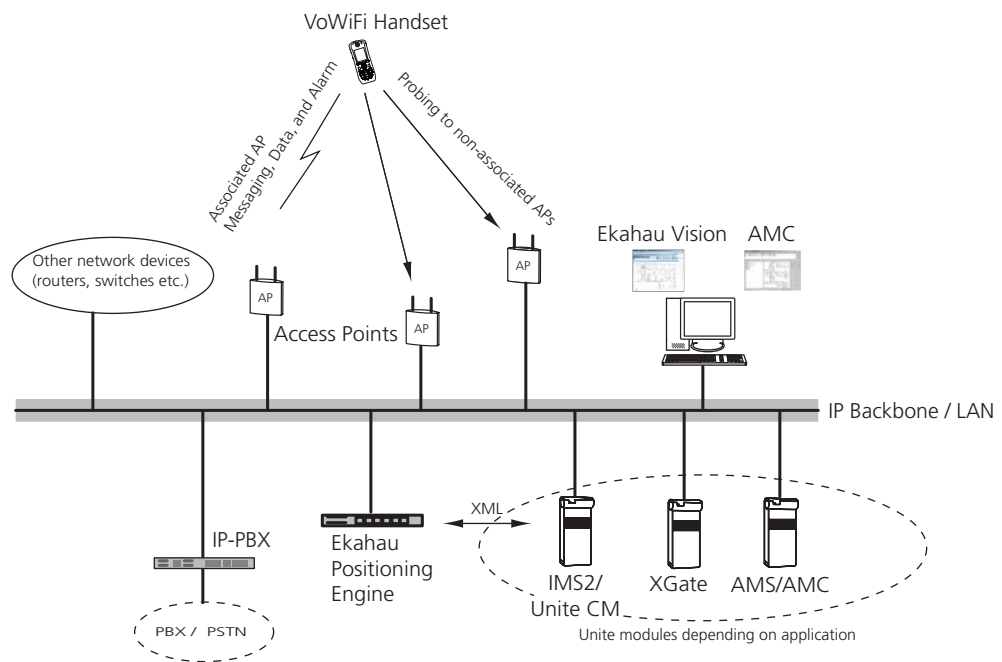


Figure 1. Improved accuracy with Ekahau RTLS

In this case the VoWiFi handset works in the same way as an Ekahau tag. At a configurable interval, the handset scans the environment for APs. All APs and their measured radio field strength are collected and reported to the positioning engine according to the Ekahau location protocol.

The Ekahau Positioning Engine calculates the location of the handset as soon as the AP report is received. This means that the location update speed depends on the configured handset scanning interval.

For other Ekahau internal mechanisms to improve accuracy, refer to Ekahau documentation.

Specific settings in IMS2/Unite CM, XGate, and AMS/AMC required for the Ekahau RTLS solution are described in Configuration Notes for Ekahau RTLS, TD 92646GB.

Ekahau Components

Ekahau Positioning Engine	<p>runs on a dedicated Windows® server and provides the following functional elements:</p> <ul style="list-style-type: none">• A Location Engine that receives signal strength measurements from tags, compares the measurements to existing reference data and calculates accurate location estimates.• An Event Handler that receives events such as tag-originated call button alarms or tamper switch alerts and routes them to designated applications.• Systems and device management for automating management tasks and monitoring the system through a web-based user interface.• Open application APIs for integrating third-party applications to the system. These provide location feeds, location queries and events to the application using industry-compliant standards.• Ekahau Location Survey for recording reference data during the deployment phase.
Ekahau Client	<p>a software agent that can be used to enable location for wireless devices. It works similarly as tags but runs in the background on existing PDAs, tablet PCs, or laptops. Note that an Ekahau client is included in the Ascom VoWiFi handset.</p>
Ekahau Site Survey	<p>a software tool for WiFi network planning and administration. Ekahau Site Survey gives users a ground-level view of coverage and performance, enabling them to create, improve, and troubleshoot WiFi networks.</p>
Ekahau Vision	<p>an end-user application for monitoring location, managing tags, and creating location history reports through an easy-to-use Rich Internet Application user interface.</p>

4 Cisco RTLS Solution

The Cisco RTLS solution involves the Cisco Mobility Services Engine that uses the WLAN network topology to calculate the location of the VoWiFi handset. It is the internal algorithms of the Mobility Services Engine that calculate the location, and uses RSSI measurements to triangulate or fingerprint mobile devices within the WLAN environment.

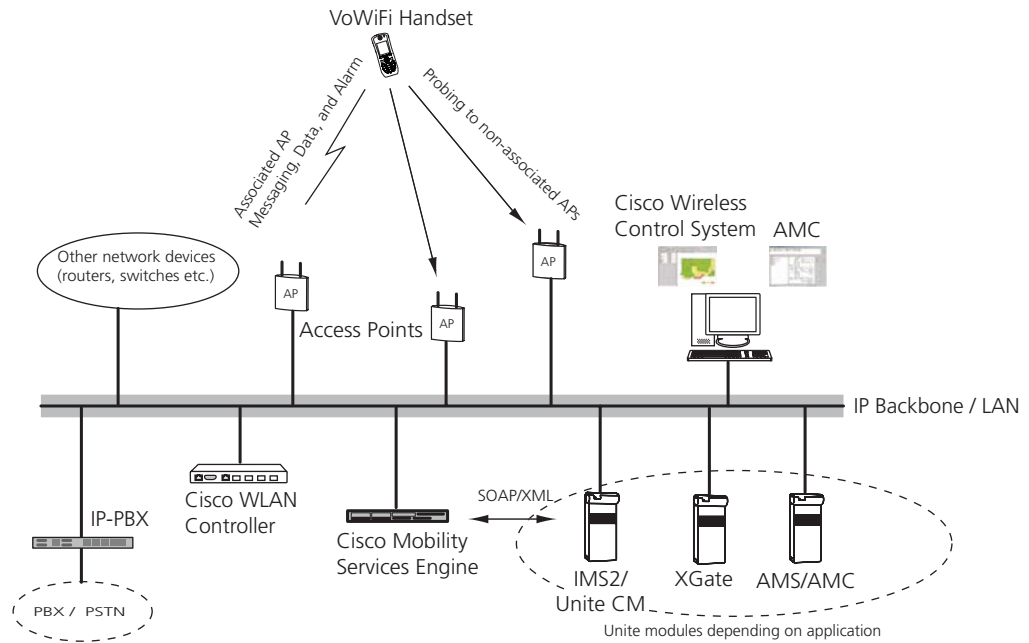


Figure 2. Cisco WLAN solution overview

APs in a Cisco environment measure the client signal strength (RSSI) for received data packets and forward those measurements to the Cisco Mobility Services Engine.

Since the Cisco Mobility Services Engine makes use of these AP-measured RSSI values, all data traffic between the VoWiFi handset and the AP contributes to the location calculation. More data traffic, such as when the VoWiFi handset is in call mode, improves the statistical function that forms the location calculation algorithms.

The VoWiFi handset in idle mode transmits very rarely in order to minimize power consumption and preserve the battery. In order to improve the location performance, the VoWiFi handset can be configured to transmit small packets (probe requests) at regular intervals and thereby increase the statistical basis for the location calculation. The packets are small and will only be transmitted on selected deployed channels to minimize the radio channel load. The possibility to configure the transmission interval gives full flexibility to optimize the location performance need versus battery lifetime and traffic load.

For other Cisco internal mechanisms to improve accuracy, refer to Cisco documentation.

Specific settings in the VoWiFi handset required for the Cisco RTLS solution are described in Configuration Manual i62 VoWiFi Handset, TD 92675GB, and Configuration Manual i75 VoWiFi Handset, TD 92431GB.

Cisco Components

Cisco Mobility Services Engine	an end-user application that supports a suite of mobility services programs. This includes context-aware applications that feature a wide range of location options, including real-time location, presence detection, historical visibility and impact of interferers, and telemetry of an asset. Support for enhanced RSSI and time difference of arrival technology delivers accuracy and performance for a broad range of environments.
Cisco WLAN Controller	an application responsible for system wide wireless LAN functions, such as security policies, intrusion prevention, RF management, quality of service (QoS), and mobility.
Cisco Wireless Control System	a software application for managing the Cisco Mobility Services Engine through an intuitive and visually rich GUI providing centralized management and configuration.

Note: Whereas the Cisco Mobility Services Engine shows an accurate location it has not the ability to send this information to the Unite system, and hence the location shown in the AMC will only be approximate.

Note: For information about the exact Cisco product series to use for RTLS, refer to Cisco documentation.

5 Related Documents

System Description VoWiFi System	TD 92313GB
System Description Unite	TD 92243GB
User Manual i62 VoWiFi Handset	TD 92599GB
Configuration Manual i62 VoWiFi Handset	TD 92675GB
User Manual i75 VoWiFi Handset	TD 92319GB
Configuration Manual i75 VoWiFi Handset	TD 92431GB
Configuration Notes for Ekahau RTLS	TD 92646GB
Installation and Operation Manual Unite CM	TD 92735GB
Installation and Operation Manual AMS	TD 92047GB
Installation and Operation Manual AMC	TD 92145GB
Function Description Push-To-Talk in Ascom VoWiFi Systems	TD 92493GB

Refer to the documentation delivered by the supplier for third-party equipment.

6 Document History

For details in the latest version, see change bars in the document.

Version	Date	Description
A	1 February 2009	First released version.
B	13 December 2010	<ul style="list-style-type: none">• Replaced IMS/IP-WiFi with IMS2 throughout.• Added Unite CM throughout.• Added information about AP registration in chapter 2.1 Access Point (AP) Location on page 2.• Removed the figure in chapter 2.2 Real-Time Location System (RTLS) on page 2.• Added information about DFS channels in chapter 2.2.2 Location Accuracy on page 2.• Adapted the message flow for AP location and RTLS respectively in chapter 2.3 Alarm from VoWiFi Handset on page 3.• Removed battery lifetimes for the Ascom i75 VoWiFi handset in chapter 2.2.1 Battery Lifetime with Location Scanning on page 2.• Added site survey and Ekahau Vision in chapter 3 Ekahau RTLS Solution on page 4.• Replaced the Cisco Location Appliance with the Cisco Mobility Services Engine, added a description of Cisco WLAN Controller, removed specific product series, and added document references in chapter 4 Cisco RTLS Solution on page 6.