The improved Nokia WiFi Mesh

White paper

The Wi-Fi EasyMesh™ certification program gives consumers better choice when selecting Wi-Fi access points by ensuring interoperability based on common standards. It certifies products that comply with the Multi-AP Specification. This paper explains why and how Nokia have complemented the Multi-AP Specification to provide additional functionality while protecting interoperability and consumer choice.
Contents

Wi-Fi EasyMesh™ explained 3
Nokia-improved Wi-Fi EasyMesh 3
  Mesh topologies 3
  Channel selection and band steering 3
  Spectrum scanning and analysis 4
  Zero-touch onboarding 4
  Support for Wi-Fi 6 4
  Nokia WiFi Cloud Controller 4
  Other capabilities 5
Acronyms 5
Wi-Fi EasyMesh™ explained

On 14 May 2018, the Wi-Fi Alliance announced their Wi-Fi EasyMesh™ certification program. The stated objective is to create a standards-based approach for Wi-Fi networks with multiple access points (AP). Multiple APs improve the Wi-Fi performance and extend Wi-Fi coverage compared to single AP Wi-Fi networks. This certification allows communications service providers (CSPs) and consumers to mix and match Wi-Fi access points and other related hardware from multiple vendors, and still retain basic network-managed routing capabilities.

The Wi-Fi EasyMesh certification is granted to technology that supports the Wi-Fi Alliance (WFA) Multi-AP specification. This specification defines the control protocols between Wi-Fi APs as well as the data objects to enable onboarding, provisioning, control, and management of multiple APs. That specification also defines the mechanism to route traffic between Wi-Fi APs within the Multi-AP network.

The Multi-AP specification brings together several existing standards such as IEEE 1905.1, WFA Wi-Fi Agile Multiband based on IEEE 802.11r/k/v, Data Elements, and Wi-Fi Protected Setup™.

A Wi-Fi EasyMesh network contains one Wi-Fi EasyMesh controller and one or more Wi-Fi EasyMesh agents. The controller onboards, provisions and manages the agents. The controller receives metrics and capability data from the agents and controls the operating parameters of the agents in the network, such as channel of operation, data flow topology, and client roaming between agents. The agent executes commands from the controller and reports measurements and capabilities to the controller and other agents in the network. It should be noted that a Wi-Fi EasyMesh network has a tree network topology, not a true mesh.

Nokia-improved Wi-Fi EasyMesh

Wi-Fi EasyMesh was defined to allow interoperability with certified devices while also allowing vendor differentiation by extending controller and agent functionality. For example, Wi-Fi EasyMesh defines the metrics that agents provide to controllers, but it does not specify the algorithms controllers use to determine how to configure the agents.

Nokia controllers are compatible with third party Wi-Fi EasyMesh agents and Nokia agents are compatible with third party Wi-Fi EasyMesh controllers. But at Nokia, we believe that users should be able to get the service they subscribe to anywhere in their home. Nokia has, therefore, extended the basic Wi-Fi EasyMesh capabilities with additional features to guarantee the best possible performance for the end-user under any conditions.

You only need to ensure that the “controller” has the Nokia-improved version of Wi-Fi EasyMesh, and the whole mesh network will benefit from these additional features, called Nokia Value-Added Features.

Mesh topologies

Wi-Fi EasyMesh supports a tree or daisy chain topology, with the root device typically acting as the controller for the system and the other hardware units are subordinate. We follow this topology to ensure interoperability.

Channel selection and band steering

Wi-Fi EasyMesh specifies the interoperability of the steering, but it doesn’t specify how to select the optimal channel or band. The Nokia WiFi Gateways and Beacons use an algorithm called Intelligent Channel Selection (ICS). This algorithm takes into account the multiple capabilities and metrics collected from neighboring APs and associated/unassociated stations (STA).
The ICS algorithm then uses this information to identify the best possible channel. This happens at boot-up (called automatic channel selection (ACS)) and during the operation of the Wi-Fi Beacons (called dynamic channel selection (DCS)).

Hence, adding ICS capability to Wi-Fi EasyMesh ensures that the optimal channel is always used, resulting in the best possible performance.

Nokia’s load balancing implementation ensures that clients are driven to the optimal band. Usually, this is the 5 GHz band (if clients support this band), but the 2.4 GHz band may be preferable if the range is too wide.

**Spectrum scanning and analysis**

Wi-Fi EasyMesh currently does not specify how to implement spectrum scanning and analysis. This functionality is essential in order to implement the mitigation of interference sources.

The Nokia WiFi Beacon 3 has a dedicated antenna for spectrum analysis that can provide information about the spectrum (and potential interference sources) in real-time without impacting Wi-Fi traffic. The other Nokia WiFi Beacons use channel utilization to provide this information.

**Zero-touch onboarding**

Wi-Fi EasyMesh requires all devices to support Wi-Fi Protected Setup (WPS)-based Push Button Configuration (PBC) onboarding. Nokia also supports two kinds of zero-touch onboarding: QR code scanning onboarding and Group-ID based onboarding.

It should be as easy as possible for an end-user to install and configure their Wi-Fi network. Nokia provide a mobile app that guides the end-user through the process. The only action the end-user needs to take is to scan the QR code of the first Nokia WiFi Beacon. The mobile app then knows all the default values (SSID, passwords, etc.). Installing additional Beacons of a multi-pack is as simple as switching them on, since all the Beacons of a multi-pack have been pre-paired. So, the second Beacon will find the first one, and the first Beacon will automatically configure the second one, and so on for subsequent Beacons.

**Support for Wi-Fi 6**

Wi-Fi EasyMesh does not take full advantage of 802.11ax capability of Wi-Fi 6 APs.

In Nokia, we will enable Wi-Fi EasyMesh also on the Wi-Fi 6-capable portfolio and try to make maximum use of 802.11ax capability, with the Nokia WiFi Beacon 6 as the first of these APs.

**Nokia WiFi Cloud Controller**

The Nokia WiFi Cloud Controller gives end-to-end, network-wide, Wi-Fi control. This allows the performance of multiple Wi-Fi EasyMesh networks to be optimized.

- The Home Console is typically used by the CSP’s helpdesk and provides level 1 support on a per-home basis. It gives a real-time, holistic view of the in-home network.
- The Network Console is typically used by the Network Operations team for Level 2 support and gives a network-wide view, but also allows the management of a group of access points together.
Other capabilities

In addition to the previously listed capabilities, the Nokia Value-Added Features include:

• Dual Backhaul (Wi-Fi and Ethernet) with automatic switchover
• Dedicated 5 GHz-high backhaul (on the Nokia WiFi Beacon 6)
• Remote management
• Firmware upgrades

Acronyms

ACS  Automatic channel selection
AP    Access points
CSP   Communications service provider
DCS   Dynamic channel selection
ICS   Intelligent Channel Selection
IEEE  Institute of Electrical and Electronics Engineers
PBC   Push Button Configuration
QR    Quick response code
SSID  Service Set Identifier
WFA   Wi-Fi Alliance
WPS   Wi-Fi Protected Setup