What is the Wi-Fi Alliance Wi-Fi CERTIFIED EasyMesh™ Program about?

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About Me

- Ian Wheelock
- Based in Cork, Ireland – http://goo.gl/QPM2gt
- Engineering Fellow with ARRIS for over 15 years
- ARRIS contributor to the initial Multi-AP spec provided to WFA
- Continue to support WFA/EasyMesh v2 as well as other programs like prpl

Agenda

- Some background on WFA and Wi-Fi Issues
- Why we need Multi-AP/EasyMesh
- What EasyMesh is
- Summary

WFA, MAP, EasyMesh
Who or what are they?

- **WFA** is the Wi-Fi Alliance
  - Standards creation body specifically for Wi-Fi topics – they created/trademarked the term “Wi-Fi”
  - They also create new standards to provide usable functionality on top of Wi-Fi
  - Over 800 global members (SoC, manufacturers and SW companies)

- **MAP** is the Multi-AP Technical Specification
  - This WFA specification defines how multiple Wi-Fi APs can be connected/configured together in a home
  - The standard includes a network protocol to allow interoperability between vendor devices
  - https://www.wi-fi.org/file/multi-ap-specification-v10

- **Wi-Fi CERTIFIED EasyMesh** is the certification program for MAP
  - The Wi-Fi EasyMesh certification validates the operation of the MAP network protocol in a device
  - WFA (and members) developed the cert program, over 170 test cases, for ATLs to conduct cert testing
  - WFA members (manufacturers and SW companies) can submit product for testing

Why do we need a multi-access point standard?

Fantastic products, but physics rules!!

- Speeds increasing daily!
- 400-1000Mbps+ speeds are available now
- Single GW with Wi-Fi cannot match speeds
- Wireless backhaul desirable
- N600, AC1200, AC1750, AC3200
- Practical throughput is **very** different

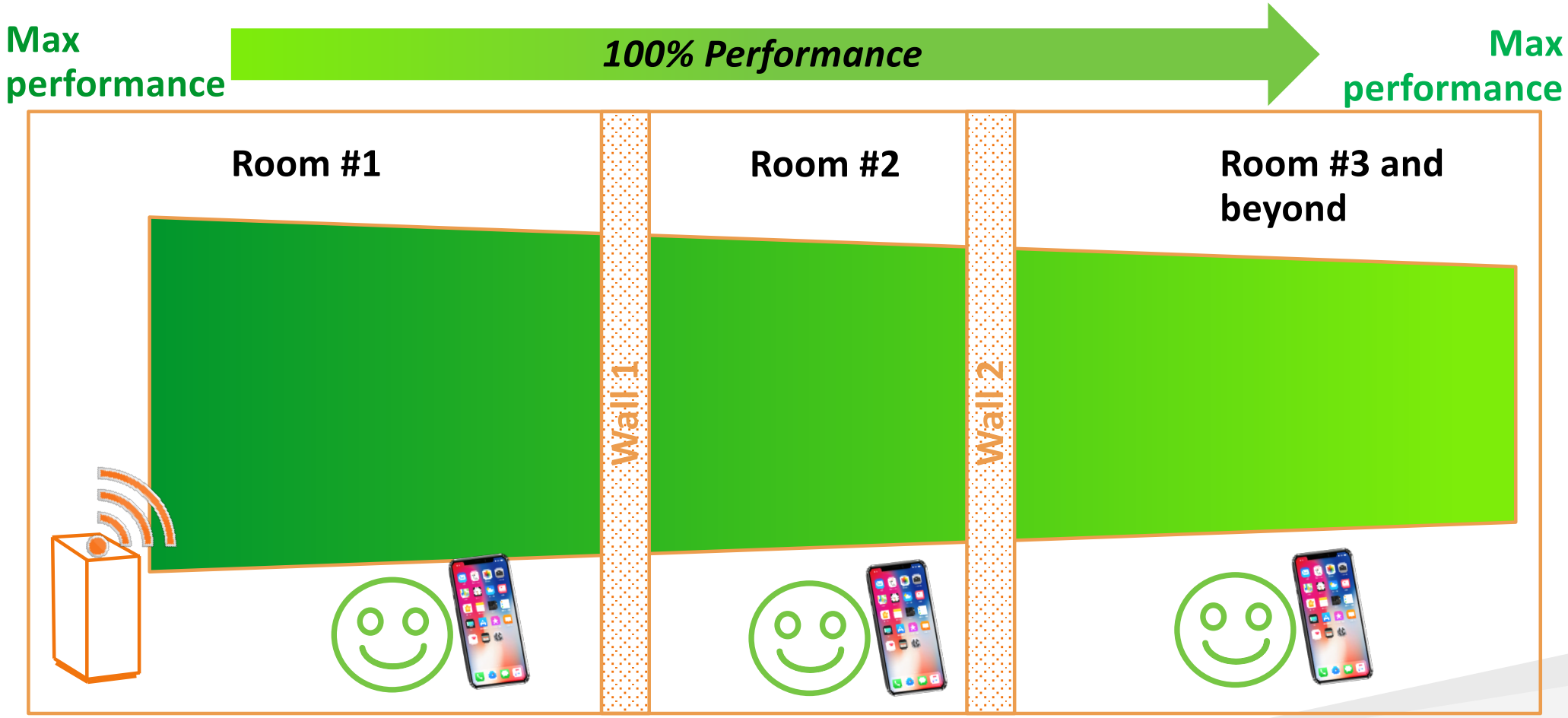
AC1200

AC1750

AC3200

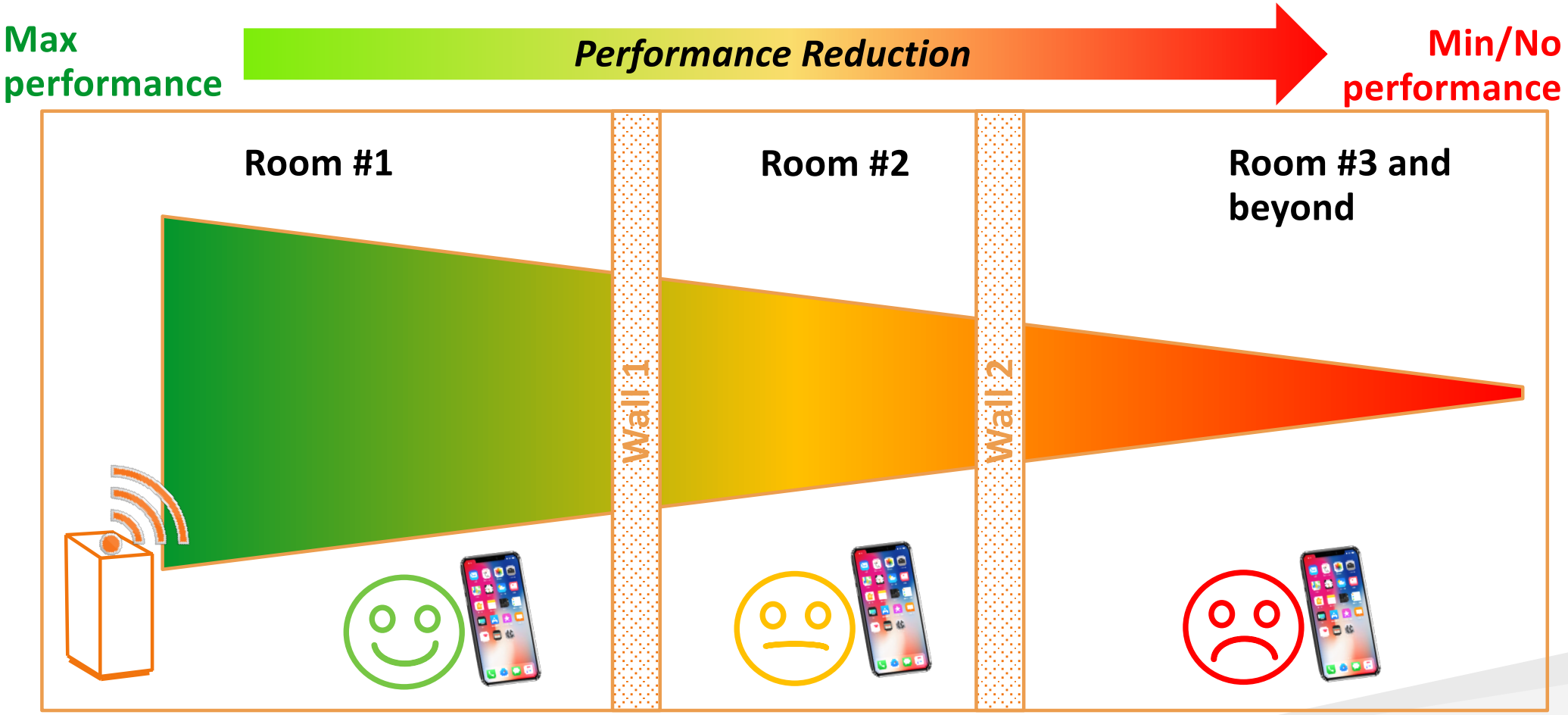
Why does anyone need Multiple Access Points?

Expected Home Wi-Fi Experience – using SINGLE-AP



Why does anyone need Multiple Access Points?

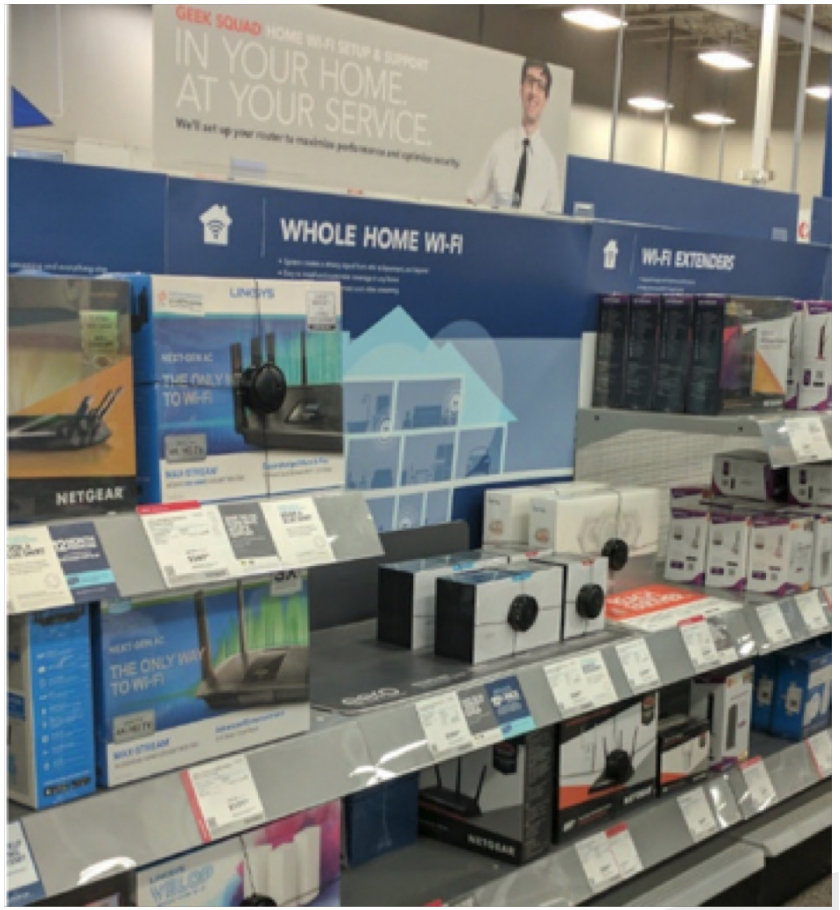
Typical Home Wi-Fi Experience – using SINGLE-AP



Why do we need a Multi-AP standard?

- MAP spec developed in response to **huge** growth in retail whole-home Wi-Fi solutions

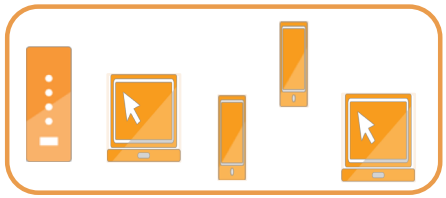
- None are interoperable!
- Service Providers help subscribers deal with issues in their home networks – extra retail devices complicate this function due to lack of visibility
- Wi-Fi support is a huge Opex cost in operators
  - Industry suggests a figure of about $1B annually
- **Multi-AP Spec designed to provide interoperability and manageability of home AP devices (SP or retail)**

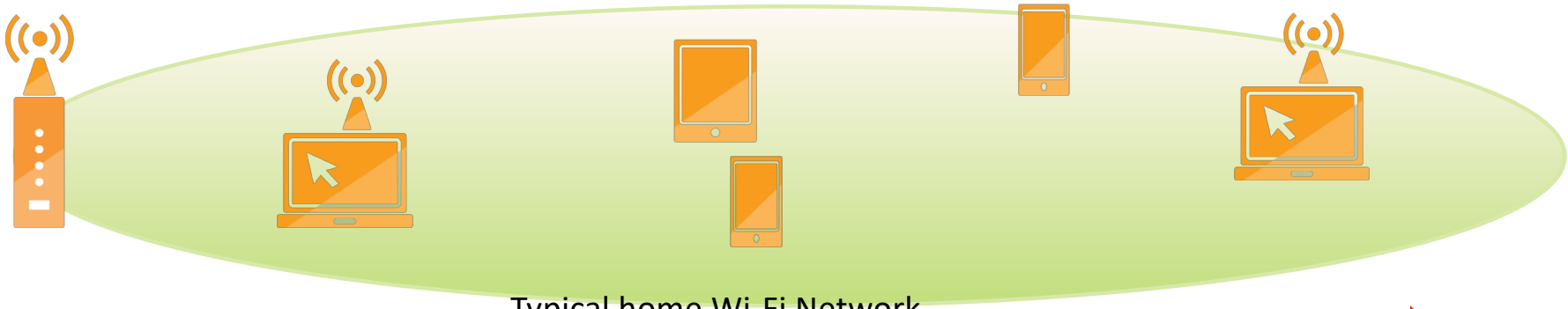


Manageability of network with SP Gateway
Pretty much full visibility in the home, some Wi-Fi issues!

Operations Centre

Before Retail Extender

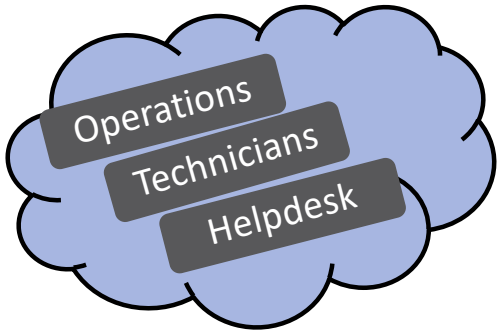




Typical home Wi-Fi Network

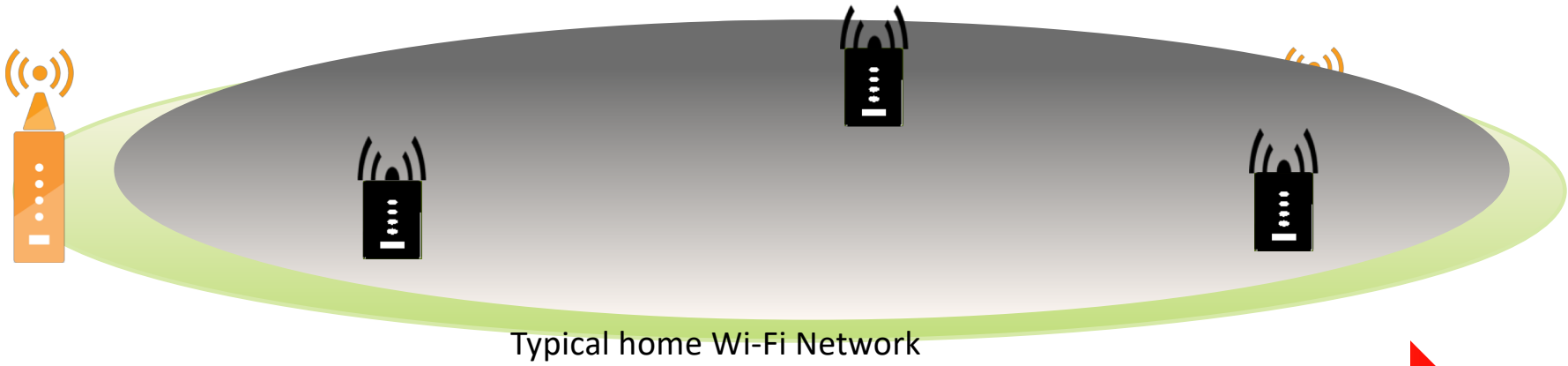
Max performance — ***Performance Reduction (no extenders)*** — **Min/No performance**

When retail routers added to home…
Little to no visibility in the home, maybe improve Wi-Fi?



Operations Centre

After Retail Extender



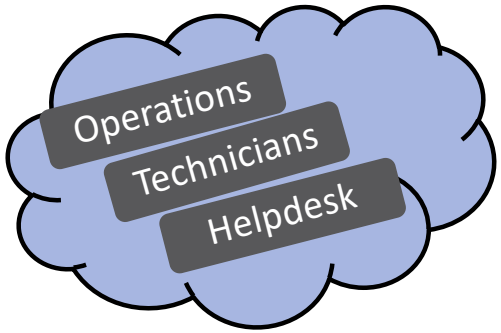
Typical home Wi-Fi Network

Max performance

Performance improvement ??? – not clear!

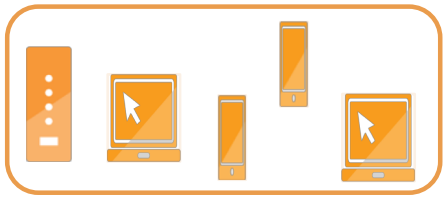
Min/No performance

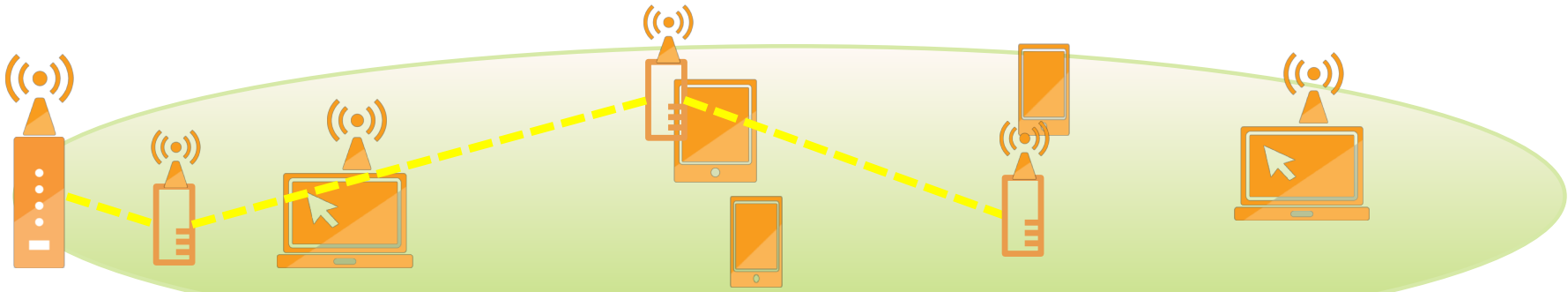
When MAP extenders added to home…
Full visibility, better Wi-Fi, better control over Wi-Fi



Operations Centre

After MAP Extender





Typical home Wi-Fi Network

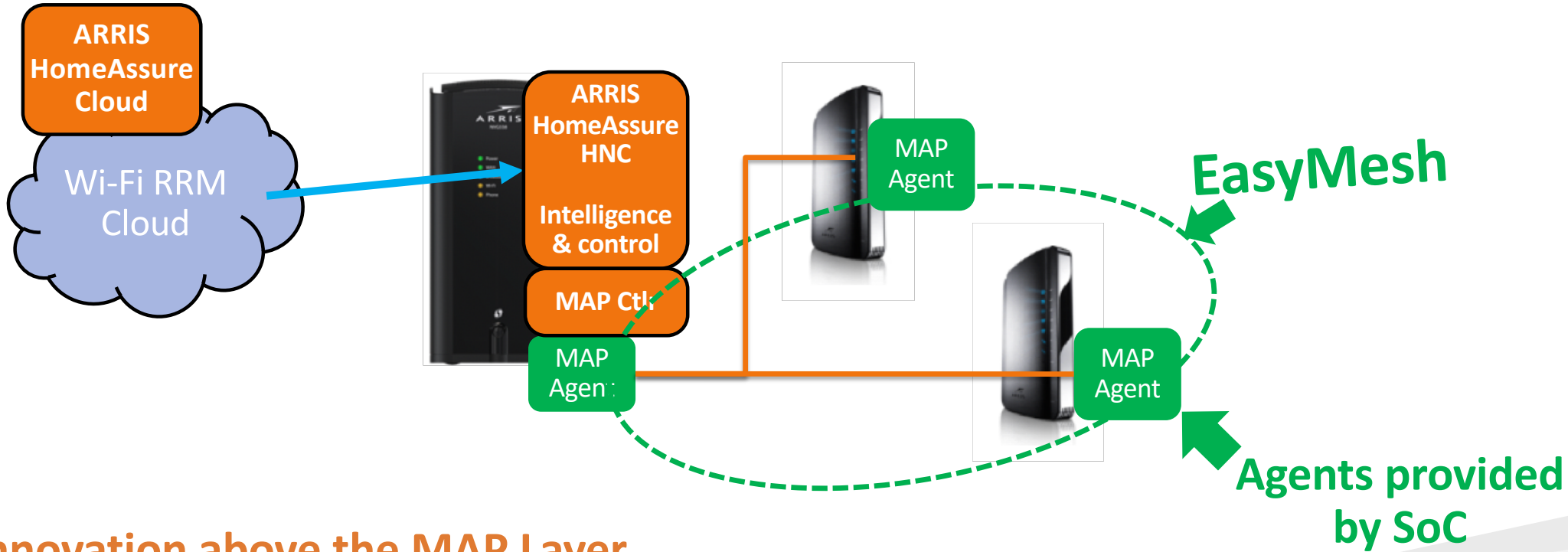
Max performance ***Improved performance/range (EasyMesh Extenders)*** **Max performance**

Why MAP is an alternative to adding retail extenders
Costs of proprietary Wi-Fi solution on legacy HW platforms

- Lots of proprietary development/integration per device and Cloud/Firmware decisions

Why MAP is an alternative to adding retail extenders
Leverage SOC agents, intelligent controller algorithms

- SIMPLE – SoC Agents – more options/platform for intelligent algorithms



Innovation above the MAP Layer

MAP/EasyMesh Details

WFA MAP Specification

- Defines the MAP network protocol operation, reusing IEEE 1905.1 standard
- Two key components

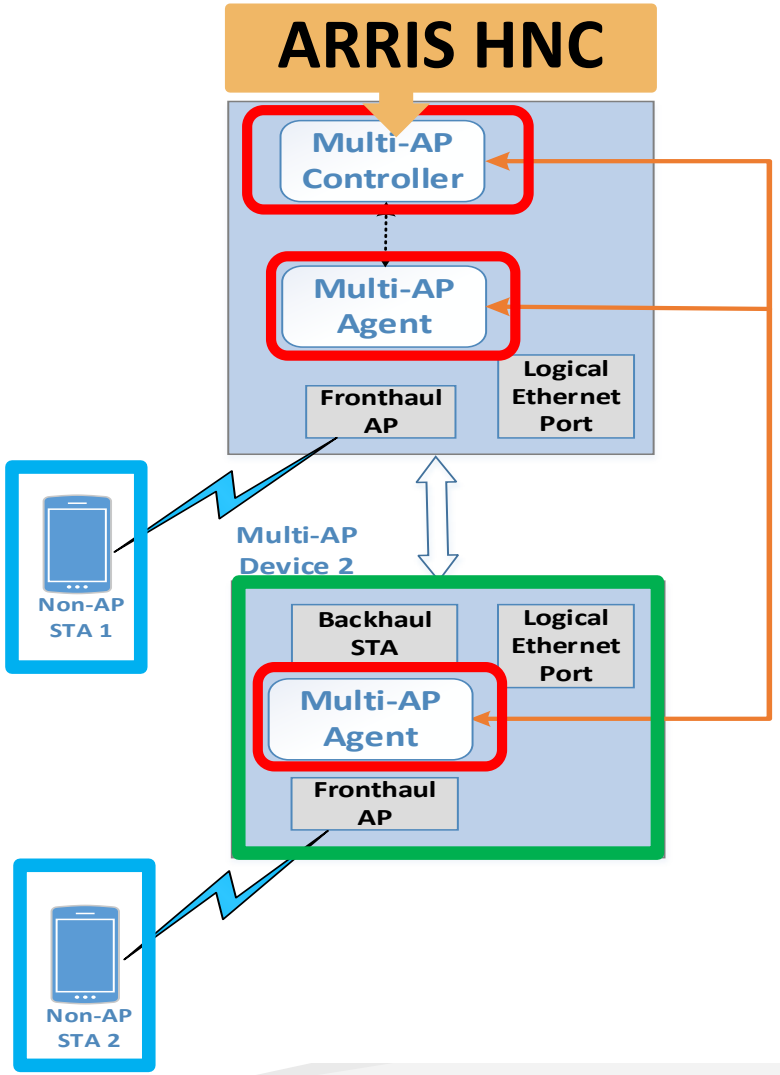
MAP CONTROLLER + MAP AGENT

- MAP protocol adds many tools to manage the details of the Wi-Fi network
  - On-boarding guarantees Wi-Fi passwords are setup correctly – no more misconfiguration
  - Enables the best fronthaul Wi-Fi channel to be configured on each extender
  - Enables steering of Wi-Fi devices to the best/most appropriate 2.4/5GHz band
  - Introduces standard way of communicating 4-address WDS operation between extenders
  - Enables reconfiguration of wired/wireless backhaul between extenders
- MAP has no built-in intelligence
  - more of a "**toolbox**" that intelligent layers can use to optimize and maximize the performance of the home Wi-Fi network
  - About 30 new messages and TLVs added to 1905.1 for Wi-Fi management

MAP Components

- **MAP CONTROLLER** – Intelligent layer uses the controller to process MAP messages used to configure the MAP network devices. Normally resident in the primary Gateway
- **MAP AGENT** – handles MAP protocol messages to make Wi-Fi/Network changes in the Access Point it is linked with

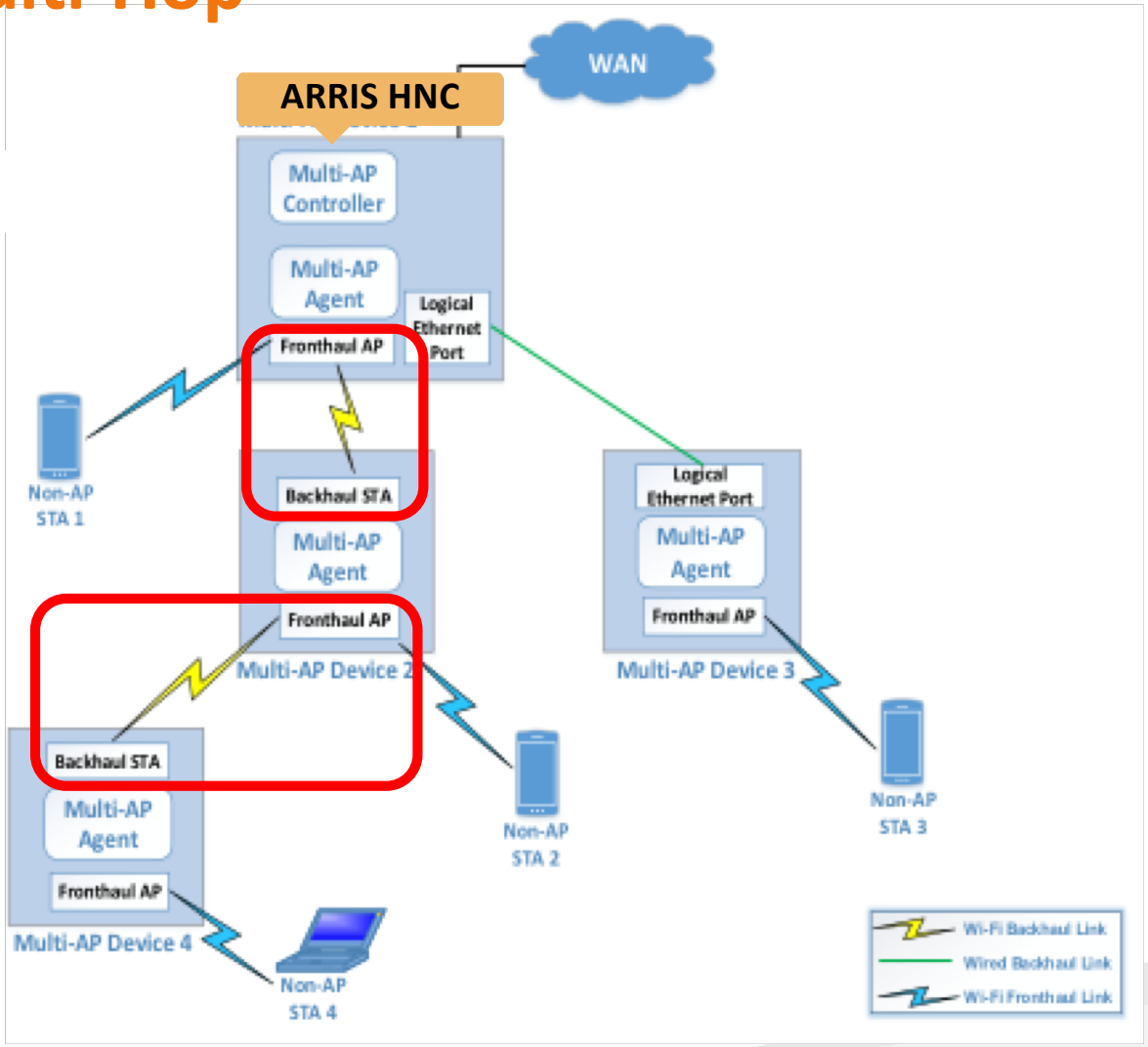
- Controller manages the onboarding and configuration of new MAP devices added to the network
- Intelligent layer interacts with MAP Agents (via Controller) to make steering decisions based on system wide Wi-Fi information



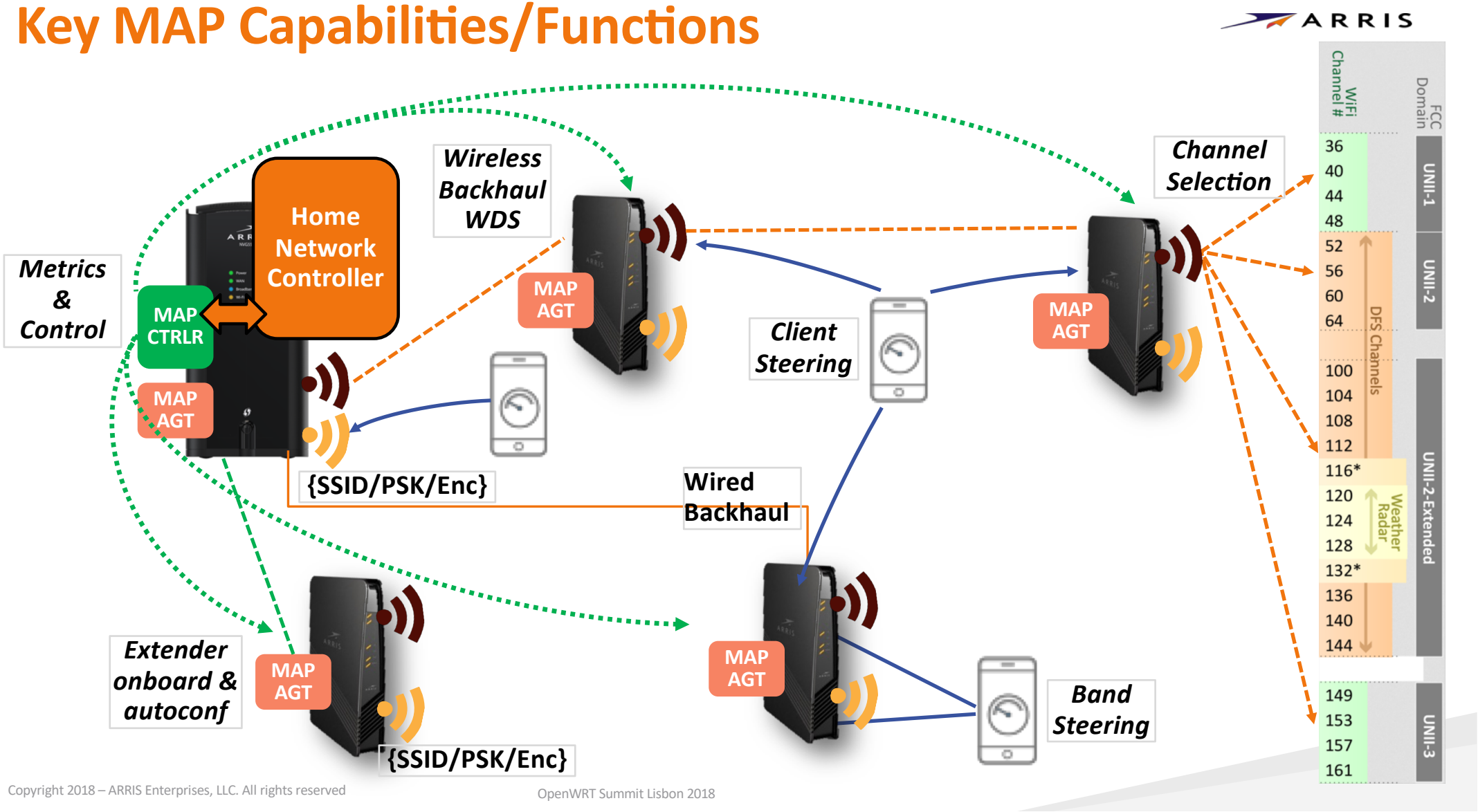
Wi-Fi Backhaul – Wi-Fi Multi-Hop

Wi-Fi Backhaul

- Defined & tested in MAP
- Interoperable between EasyMesh devices
- Multiple hops supported
  - Uses 802.11 WDS
  - 4-address mode
  - Avoids proprietary options
- Complete “wire-less” extender deployment possible



Key MAP Capabilities/Functions



Wi-Fi Certified EasyMesh Program

- Wi-Fi Alliance Certification program
- Industry acceptance of MAP standard
- Service Providers can now use EasyMesh certification/MAP support to define new products

- Conducted by WFA ATLs dotted around the world
- WFA Staff and MAP contributors developed program
- Significant work and effort involved
  - Creation of Test Specification and automation system
  - Cert program was launched June 18, 2018
  - ***ARRIS VAP4641 certified Aug 1, 2018***
  - ***MediaTek AP3B-MT7615-MAP1TBV1 certified Sep 17, 2018***

ARRIS VAP4641

Wi-Fi CERTIFIED Data Elements

ARRIS

- Data Elements is a data model of Wi-Fi state information
- Based on data used by single-AP/multi-AP systems to optimise Wi-Fi
  - In reality, a lot of data extracted from EasyMesh TLVs
- Provides topology, device info and active Wi-Fi/networking state
- Data used by operators to help manage Wi-Fi networks
  - Large analytics/machine learning platforms expected to consume data

- Uses JSON encoding of data over basic HTTP interface *(for testing)*
- Likely to be mapped to CWMP TR-181 extensions or other protocol
- Publicly available
  - https://www.wi-fi.org/file/data-elements-draft-specification-package

Ongoing work

WFA MAP/EasyMesh Release #2 feature summary

- Upgrade to MAP being targeted for *December 2019* release
- Multi-AP R2 is enhancing to solve even more whole home coverage features
  - **Traffic Control** – *Prioritize, Separate, Direct (QoS)*
  - **Secured Onboarding, Configuring and Messaging –** *EasyConnect/DPP*
  - **Spectrum Optimization** – *better use of DFS channels*
  - **Increased Diagnostics –** *WFA Data Elements R2*
- R2 Program being developed like MAP R1,
- Upgraded Certification program (EasyMesh R2) will be developed

OpenSource Community
PRPL Foundation

- **Multi-AP Release 1 Open Source**
- Portable framework targeting reuse on multiple platforms
- Building on top of existing Linux framework (cfg80211, nl80211) and 1905.1 opensource stack
- Testing and validation work also part of development
- Future extension will likely include Data Elements
- Also being used as part of joint Broadband Forum effort for ”intelligent Wi-Fi Mesh Networks” - https://goo.gl/tYP6Gr
- Broadband Forum launched their “Open Broadband (OB) Multi-AP” project

Any Questions?