LigoWave

LigoWave Training

2018

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Established in 2007

Worldwide Presence

R&D in Europe

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We Are Global

Selling to over 100+ countries worldwide

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Why LigoWave: Advantages

Software

Proprietary protocols for prioritized data transfer & cloud controller

Profitability

Substantial channel management, higher distributor margins

Support

Pre/post sales & technical engineering support with multiple channels available

Production

Own manufacturing facility: higher quality control, shorter lead-time.

Innovation

Products designed in-house under close collaboration to ensure innovation

Reliability

Less Than 1% Defective Rate

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Product lines

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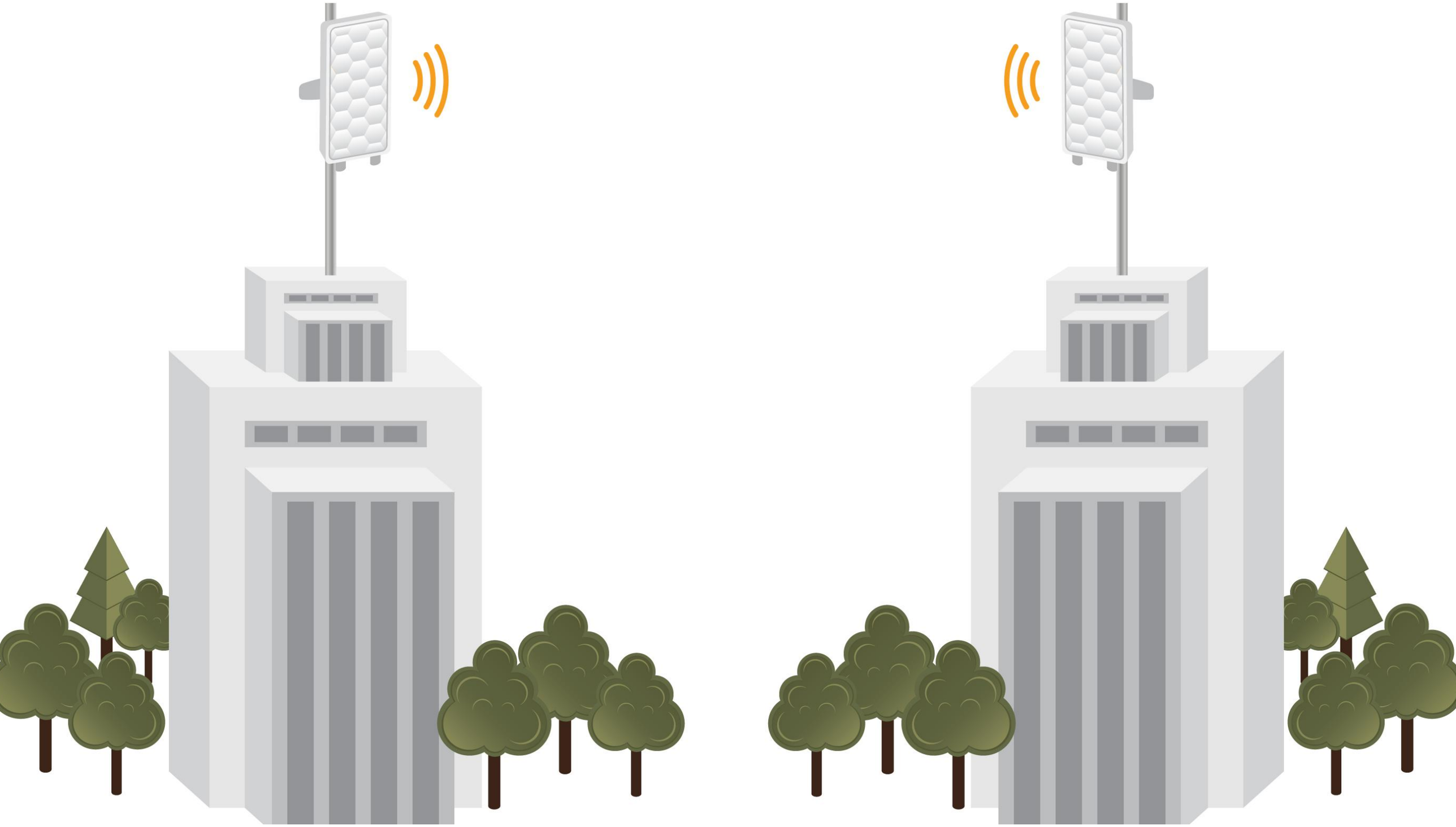
Our Product Portfolio

- LigoPTP - Carrier grade wireless Point-To-Point
- LigoPTMP - Carrier grade Point-To-Multipoint
- LigoDLB - Cost-effective Base Stations/CPE
- Infinity - AP series for small to large enterprises

LigoPTP product line



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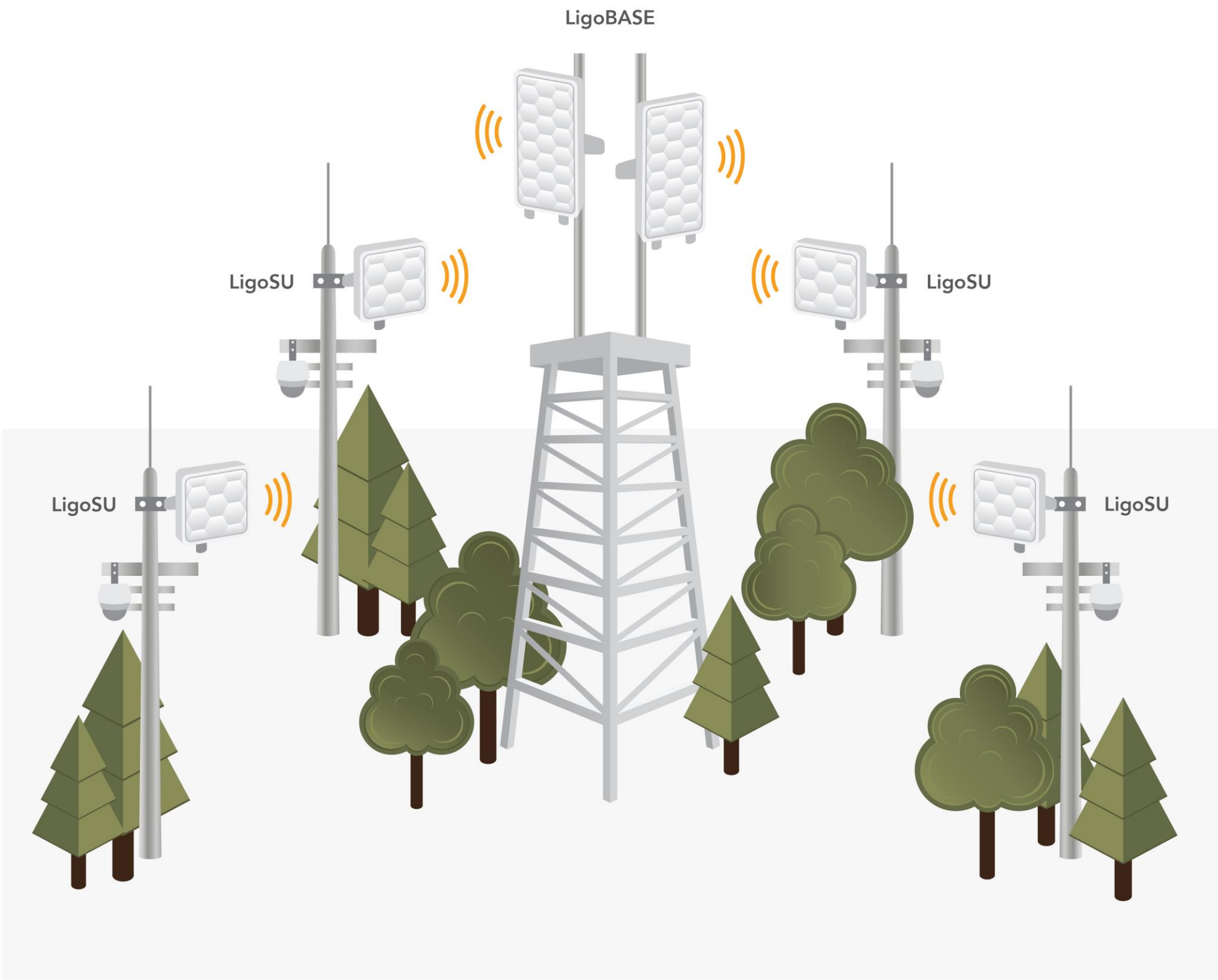
LigoPTMP product line



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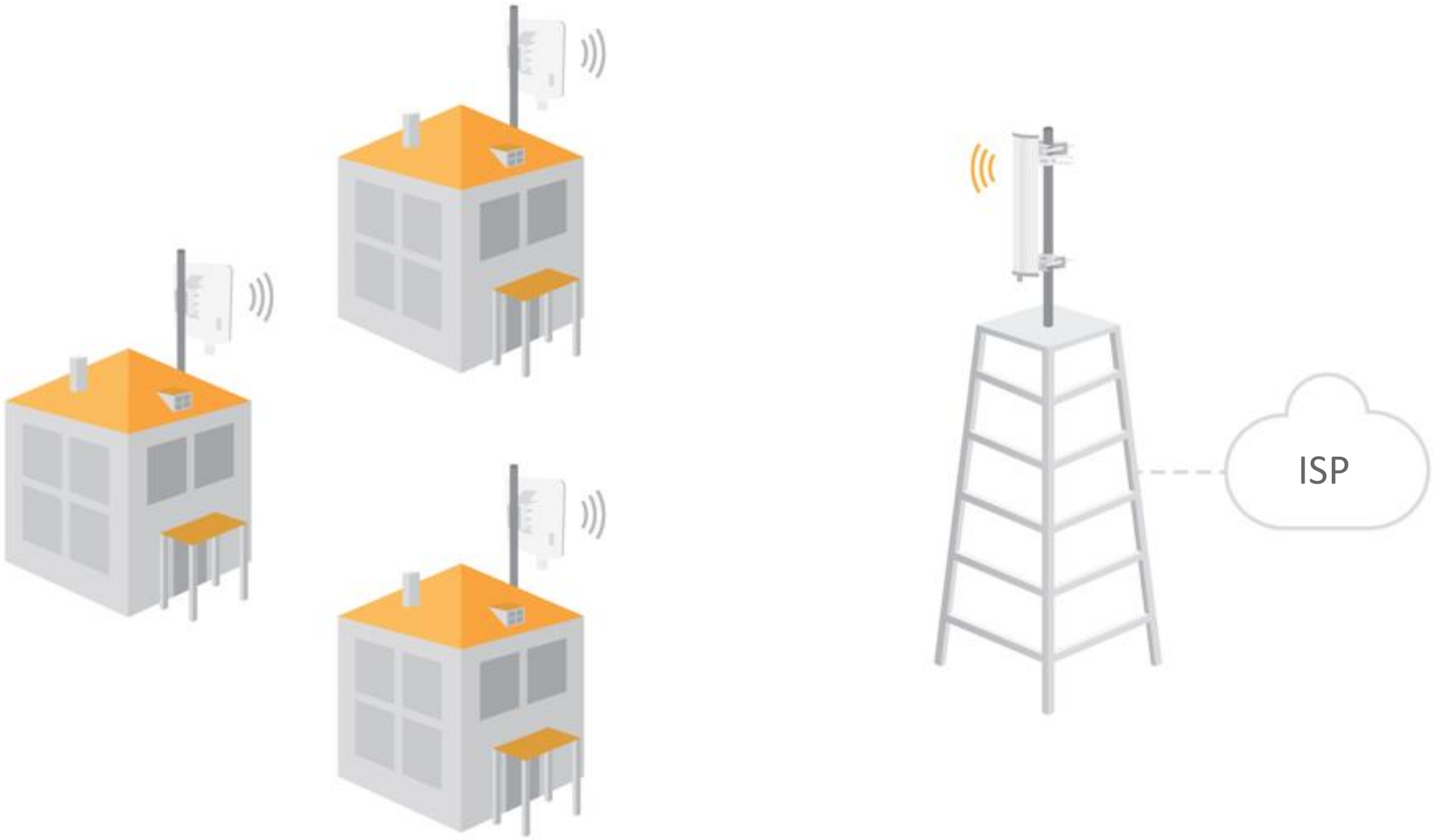
LigoDLB product line



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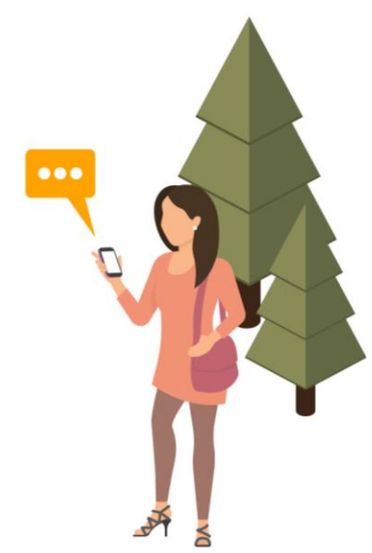
Infinity product line

1

2

NFT 2ac outdoor



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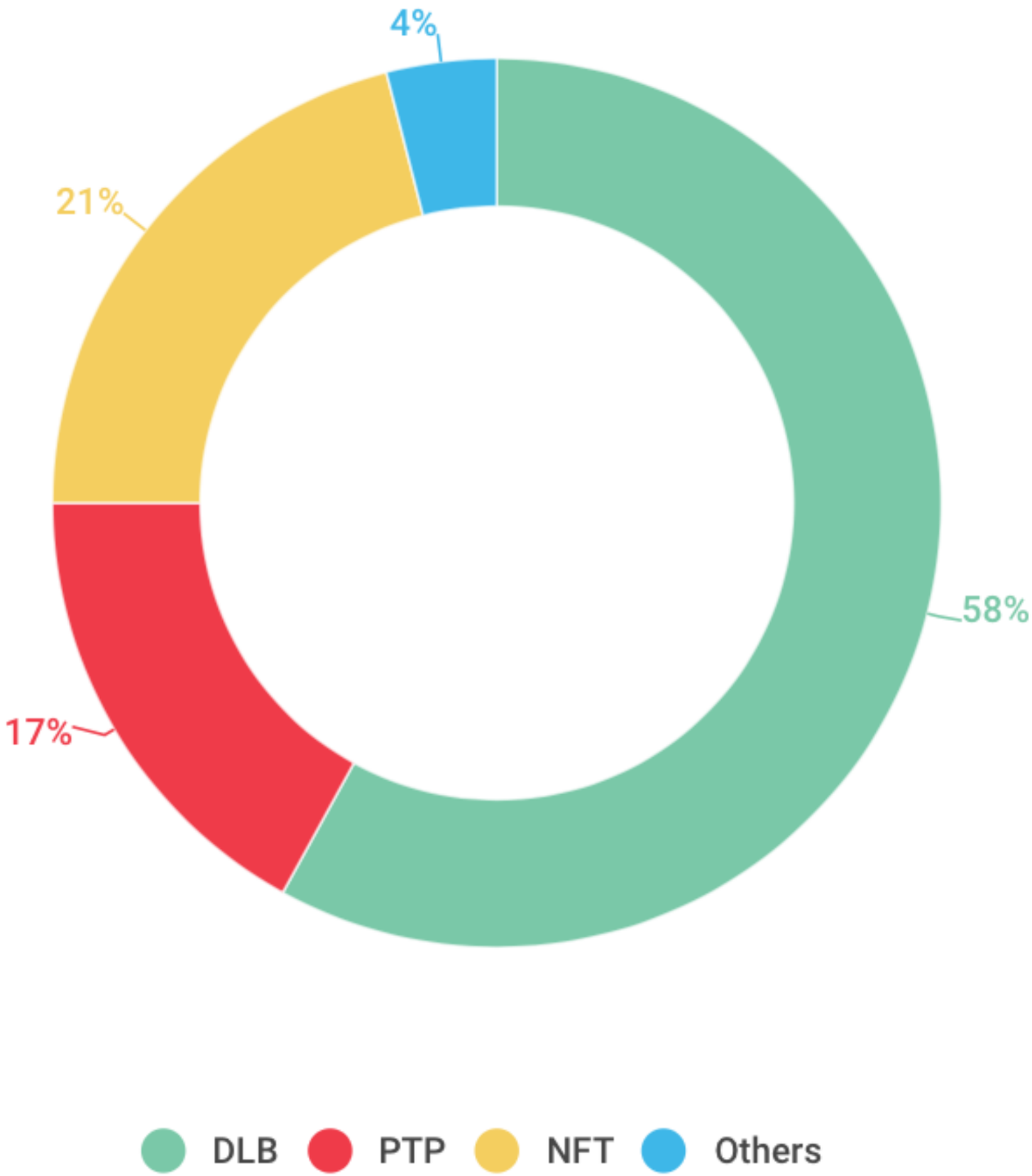
Product families distribution in Europe



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Access Points

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LigoWave Managed Wi-Fi Solution

Simplicity

Efficiency

Affordability

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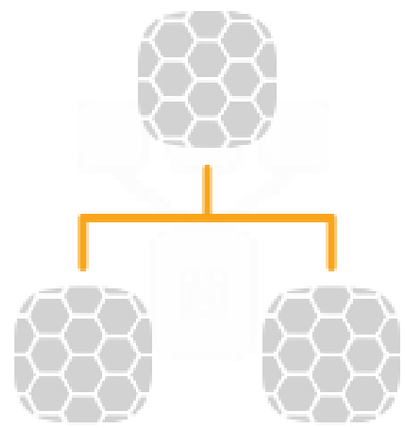
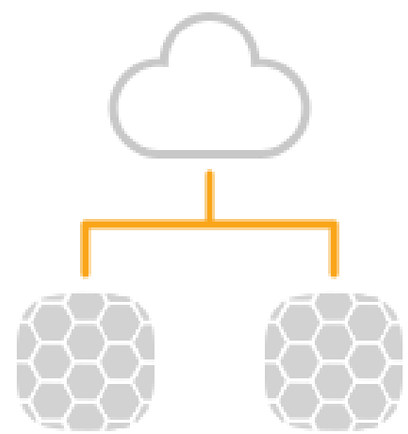
3

ways to setup and manage your network

Standalone



Integrated controller



External controller

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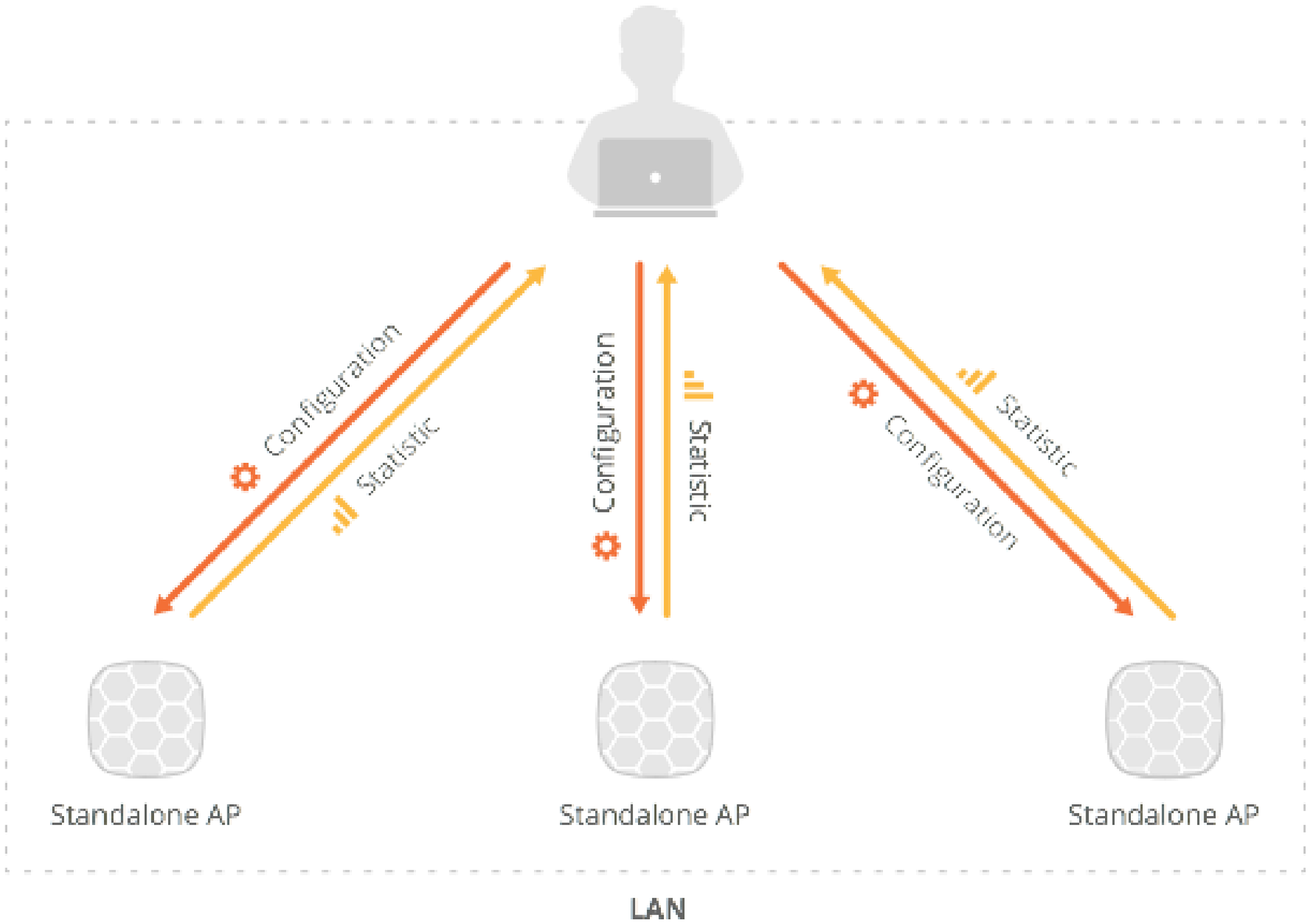
Standalone



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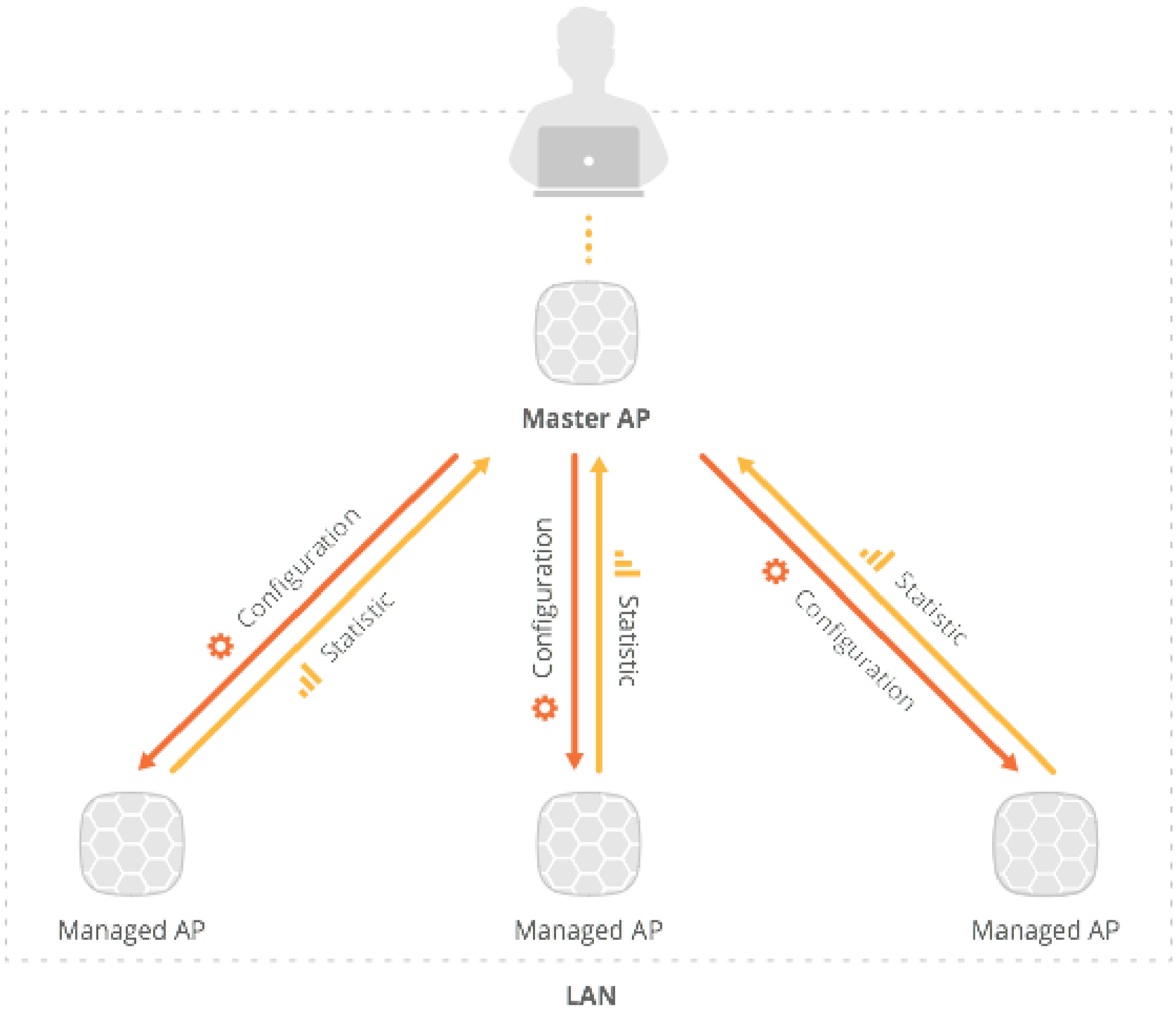
Integrated Controller



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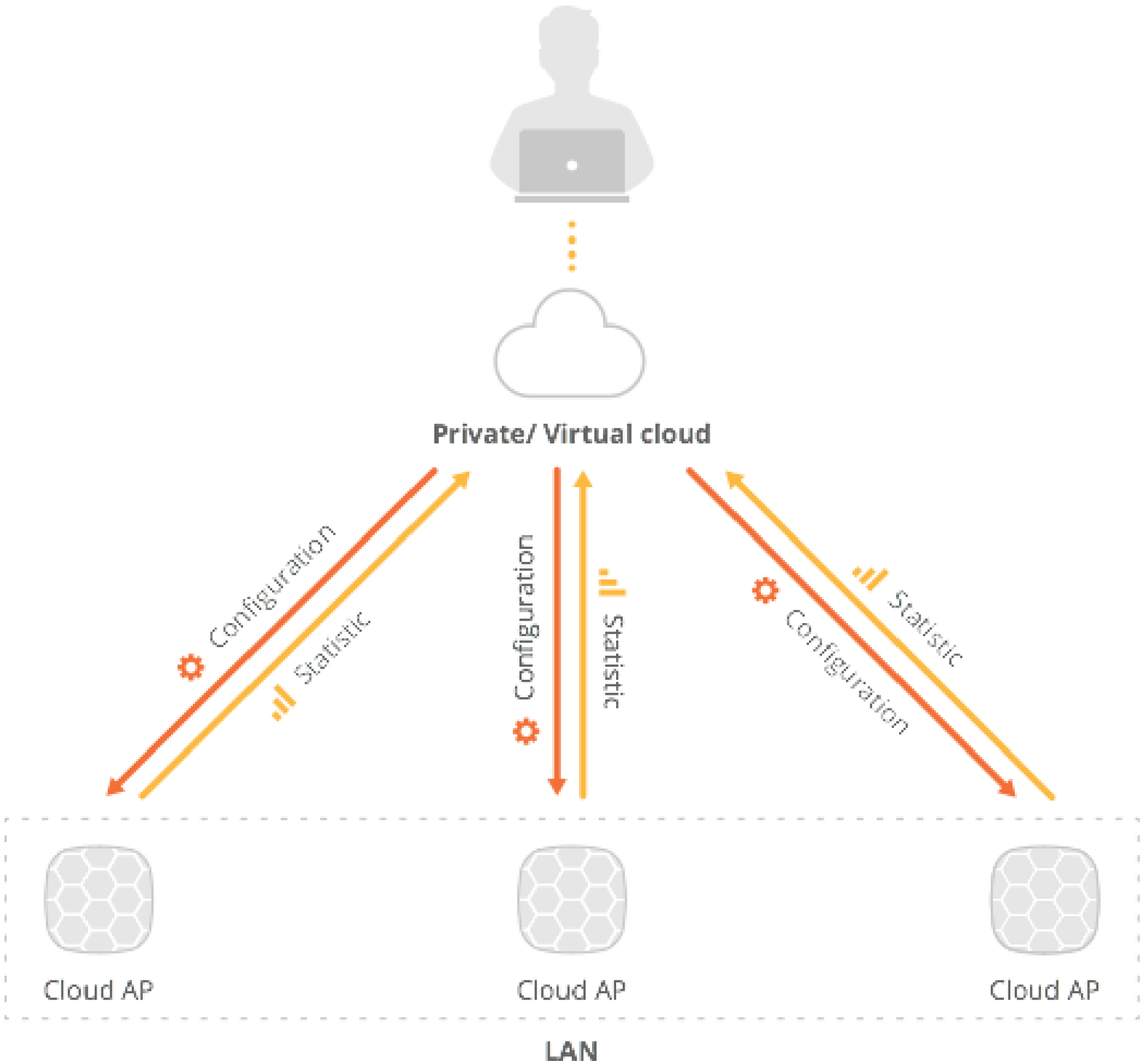
External Controller / Cloud



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Access Points

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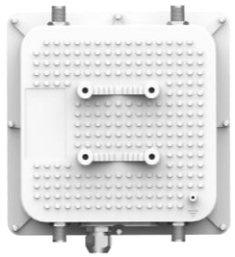
Model Comparison



	NFT 1Ni	NFT 1N	NFT 1N(af)	NFT 2AC	NFT 3AC	NFT 2AC outdoor
Use environment	Indoor	Indoor	Indoor	Indoor	Indoor	Outdoor
2.4 GHz data rate	300 Mbps (2x2) - 802.11N	300 Mbps (2x2) - 802.11N	300 Mbps (2x2) - 802.11N	300 Mbps (2x2) - 802.11N	450 Mbps (3x3) - 802.11N	300 Mbps (2x2) - 802.11N
5 GHz data rate	N/A	N/A	N/A	867 Mbps (2x2) - 802.11AC	1300 Mbps (3x3) - 802.11AC	867 Mbps (2x2) - 802.11AC
Antenna gain	3 dBi	3 dBi	3 dBi	3 dBi (2.4 and 5 GHz)	3 dBi (2.4 and 5 GHz)	N - connectors for external antenna
Security radio	No	No	No	No	Yes	No
ETH port	2 x 100 Base-T	3 x 100 Base-T	3 x 100 Base-T	3 x 1000 Base-T	2 x 1000 Base-T	1000 Base-T
PoE type	24V passive PoE	24V passive PoE	802.3af	802.3af/at	802.3af/at	802.3af/at
Mount type	Wall	Wall/ ceiling/ pole	Wall/ ceiling/ pole	Wall/ ceiling/ pole	Wall/ ceiling/ pole	Wall/ pole

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Single Radio (802.11N)

- NFT 1N/1Ni/1N(af)
- 2.4GHz band
- 29dBi transmit power
- 100 Base-T

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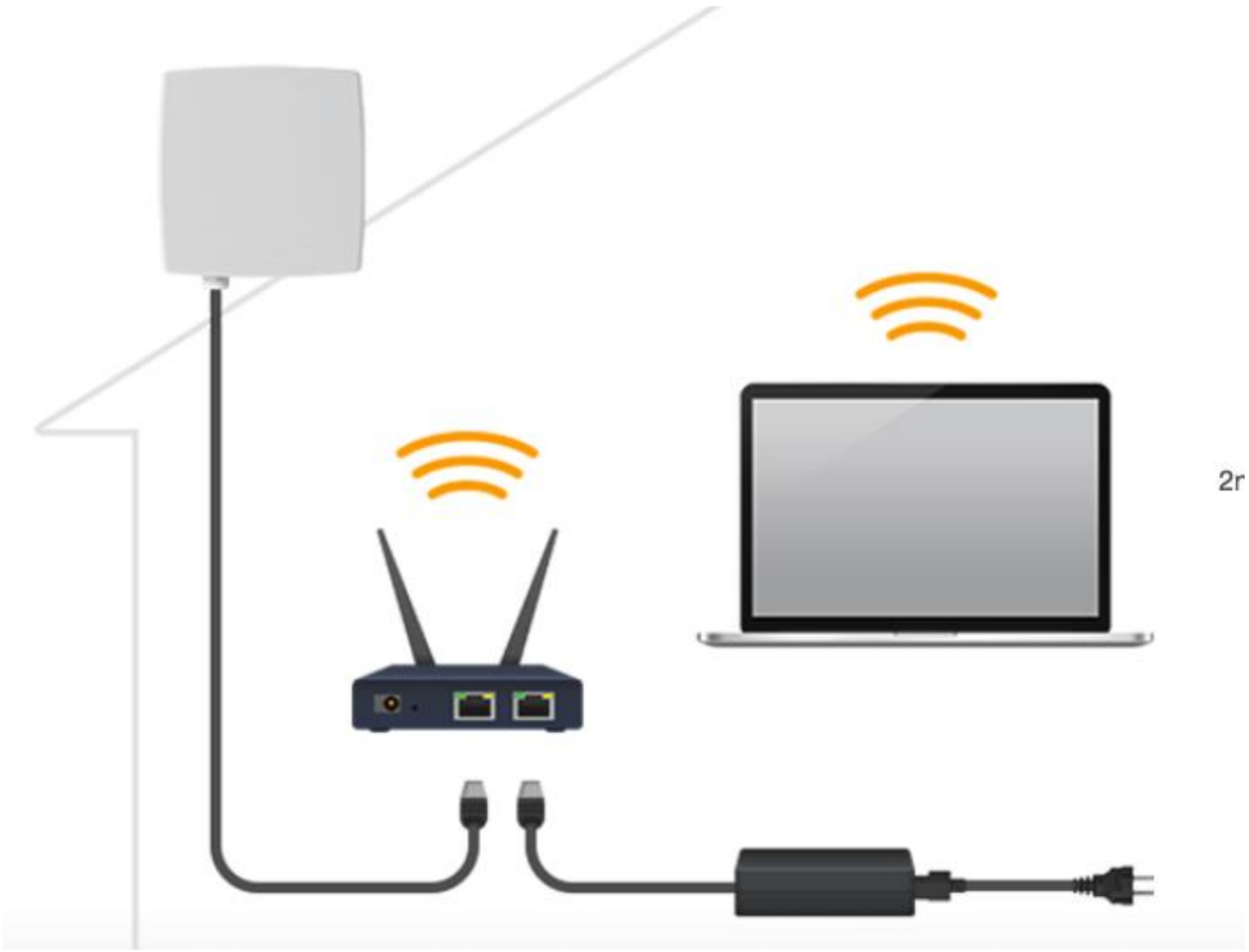
Single Radio (802.11N)



- NFT 1Ni
- 2 x 100 Base-T
- PoE passthrough

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NFT 2ac / 3ac Indoor APs

- NFT 2ac / 3ac
- 2.4GHz and 5GHz bands
- 27/29dBm transmit power
- 3× / 2× 1000 Base-T
- 300Mbps (2×2) / 450Mbps (3×3)
- 867Mbps (2×2) / 1300Mbps (3×3)
- 3 / 5dBi gain antennas (2.4GHz&5GHz)
- 802.3af/at

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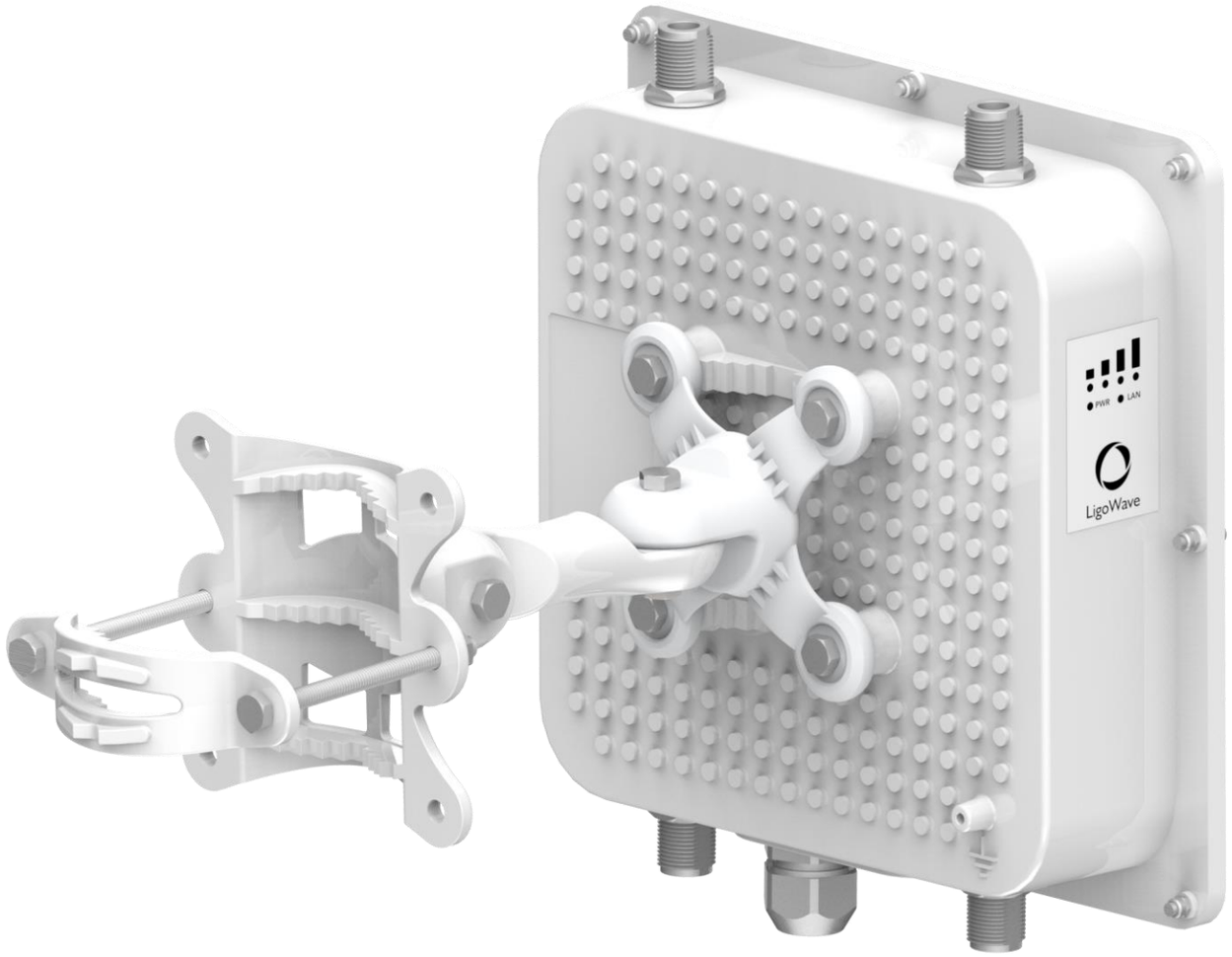
NFT 2ac Outdoor

- NFT 2ac outdoor
- 2.4GHz and 5GHz bands
- 29dBm transmit power
- 1× 1000 Base-T
- 300Mbps (2×2)
- 867Mbps (2×2)
- N-Connectors for external antenna
- 802.3af/at



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LigoDLB Series as Outdoor APs

LigoDLB devices can be used as outdoor APs with preloaded NFT software.

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OS Features

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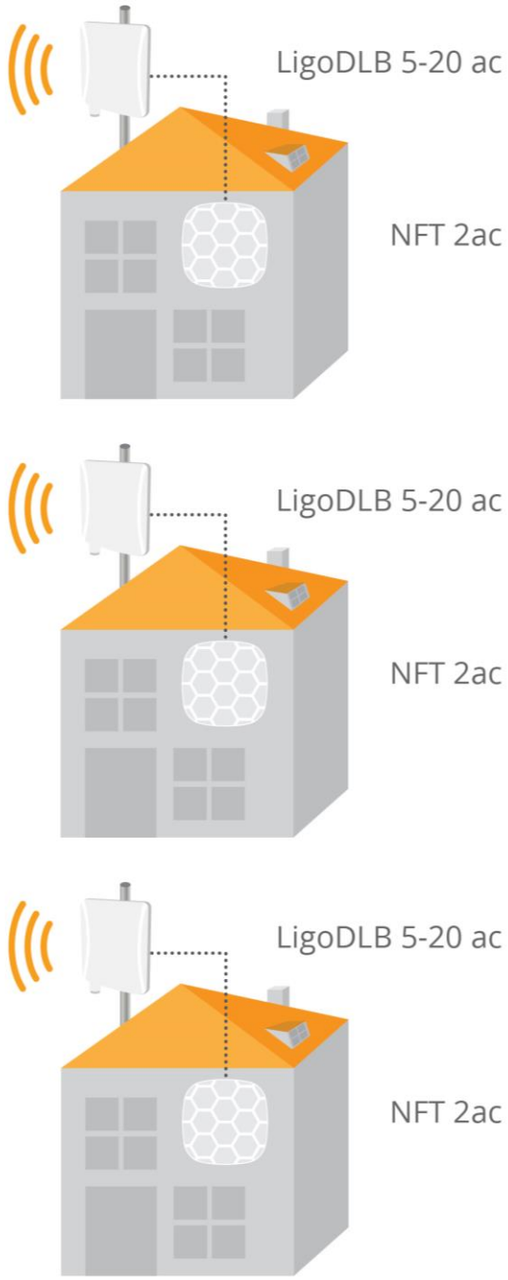
NFT OS Features (Network)

- Bridge / Router IPv4 / Router IPv6
- Static / Dynamic / PPPoE
- Built-in DHCP server
- NAT (Network Address Translation)
- Static routes
- Port forward
- DMZ (Demilitarized Zone)



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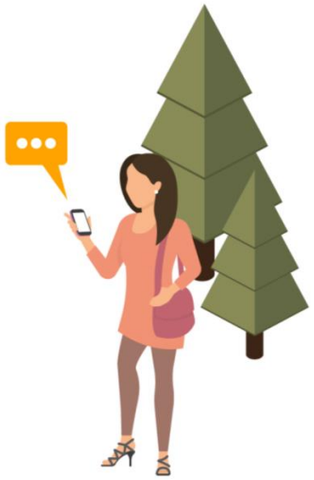
NFT OS Features (Wireless)

- Access Point / Repeater / Mesh
- Virtual AP support (up to 8 SSID per radio)
- WPA personal, WPA enterprise, WEB based login
- Bandwidth limitation per SSID
- Band steering & Beamforming
- Data and management VLANs
- WACL (Wireless Access Control List)
- Client isolation
- Radio scheduler

NFT 2ac outdoor



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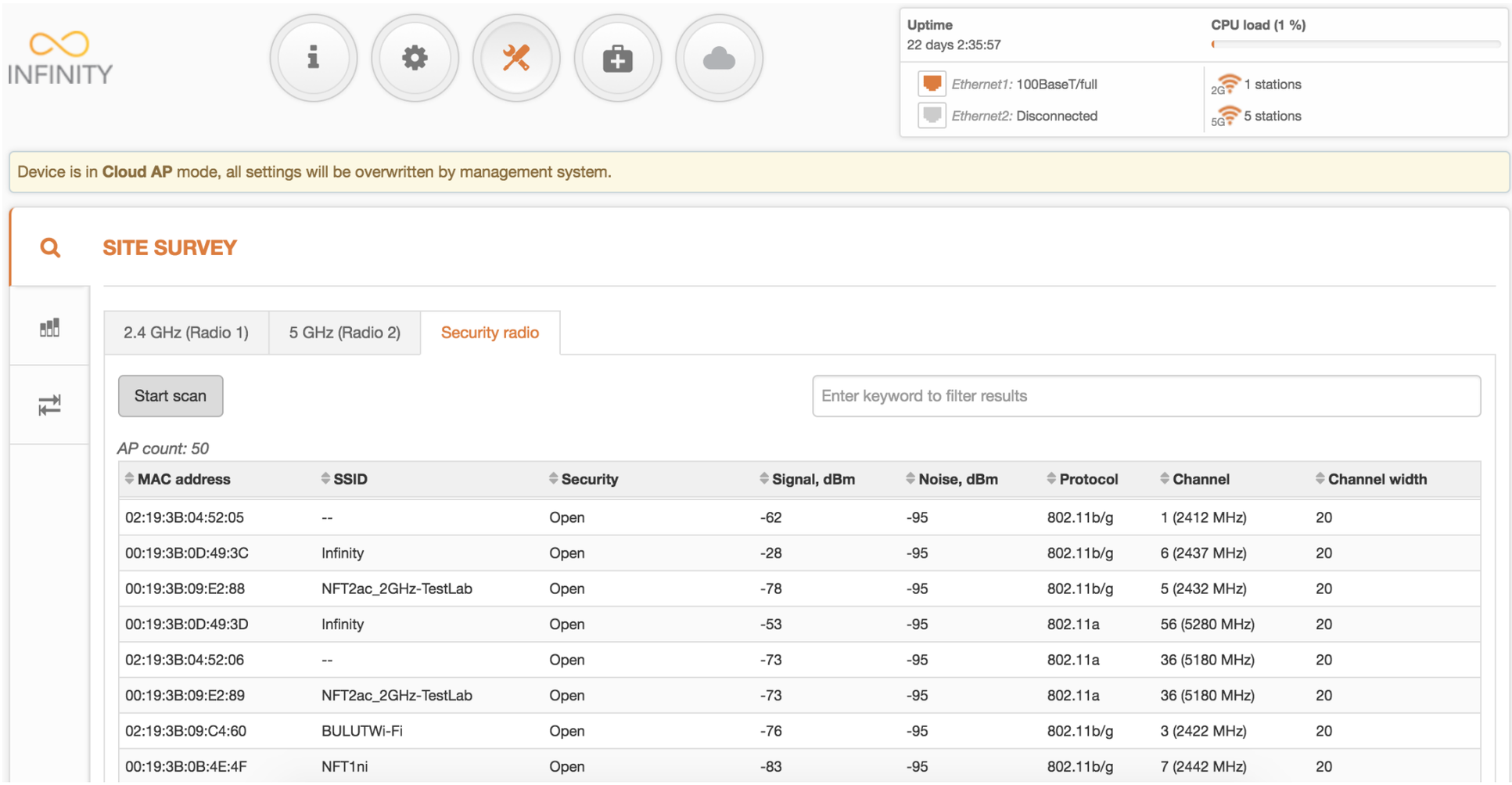
NFT OS Features (Tools)

- Tools (Site survey, Ping / Traceroute, Spectrum analyser)
- System alerts like SNMP traps
- Device discovery options mDNS / SSDP / CDP /LLDP



MAC address	SSID	Security	Signal, dBm	Noise, dBm	Protocol	Channel	Channel width
02:19:3B:04:52:05	--	Open	-62	-95	802.11b/g	1 (2412 MHz)	20
00:19:3B:0D:49:3C	Infinity	Open	-28	-95	802.11b/g	6 (2437 MHz)	20
00:19:3B:09:E2:88	NFT2ac_2GHz-TestLab	Open	-78	-95	802.11b/g	5 (2432 MHz)	20
00:19:3B:0D:49:3D	Infinity	Open	-53	-95	802.11a	56 (5280 MHz)	20
02:19:3B:04:52:06	--	Open	-73	-95	802.11a	36 (5180 MHz)	20
00:19:3B:09:E2:89	NFT2ac_2GHz-TestLab	Open	-73	-95	802.11a	36 (5180 MHz)	20
02:19:3B:09:C4:60	BULUTWi-Fi	Open	-76	-95	802.11b/g	3 (2422 MHz)	20
00:19:3B:0B:4E:4F	NFT1ni	Open	-83	-95	802.11b/g	7 (2442 MHz)	20

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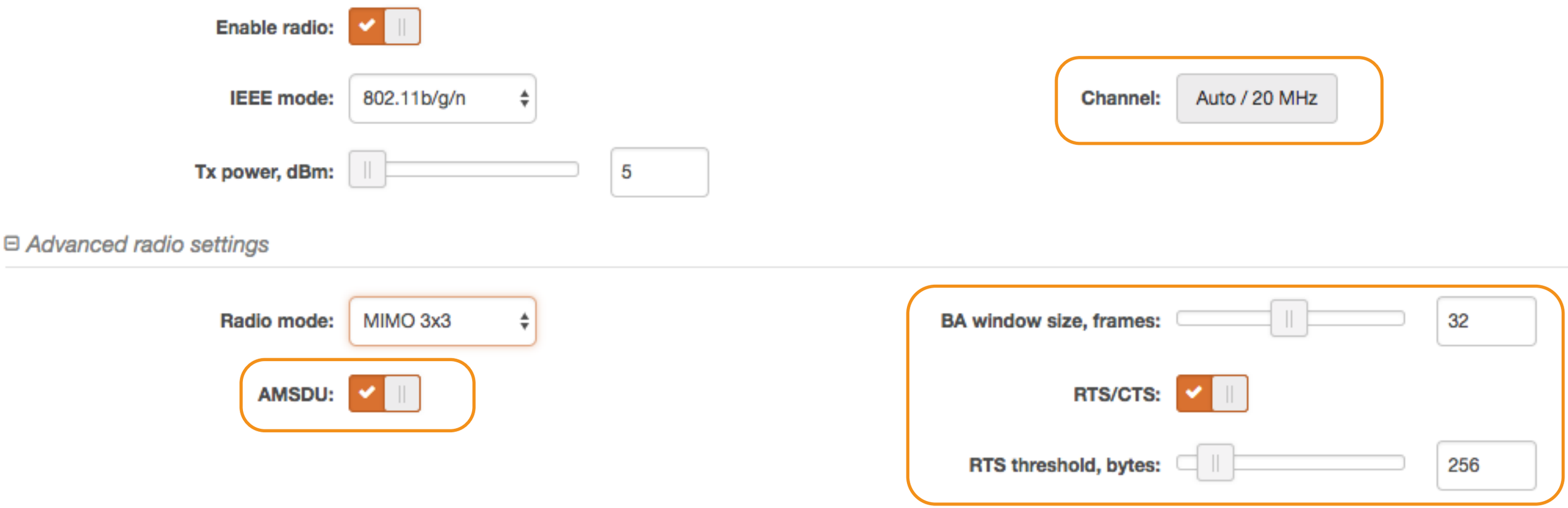
Advanced Software Features



1. Smart Auto-Channel
2. AMSDU and BA window size control
3. RTS/CTS

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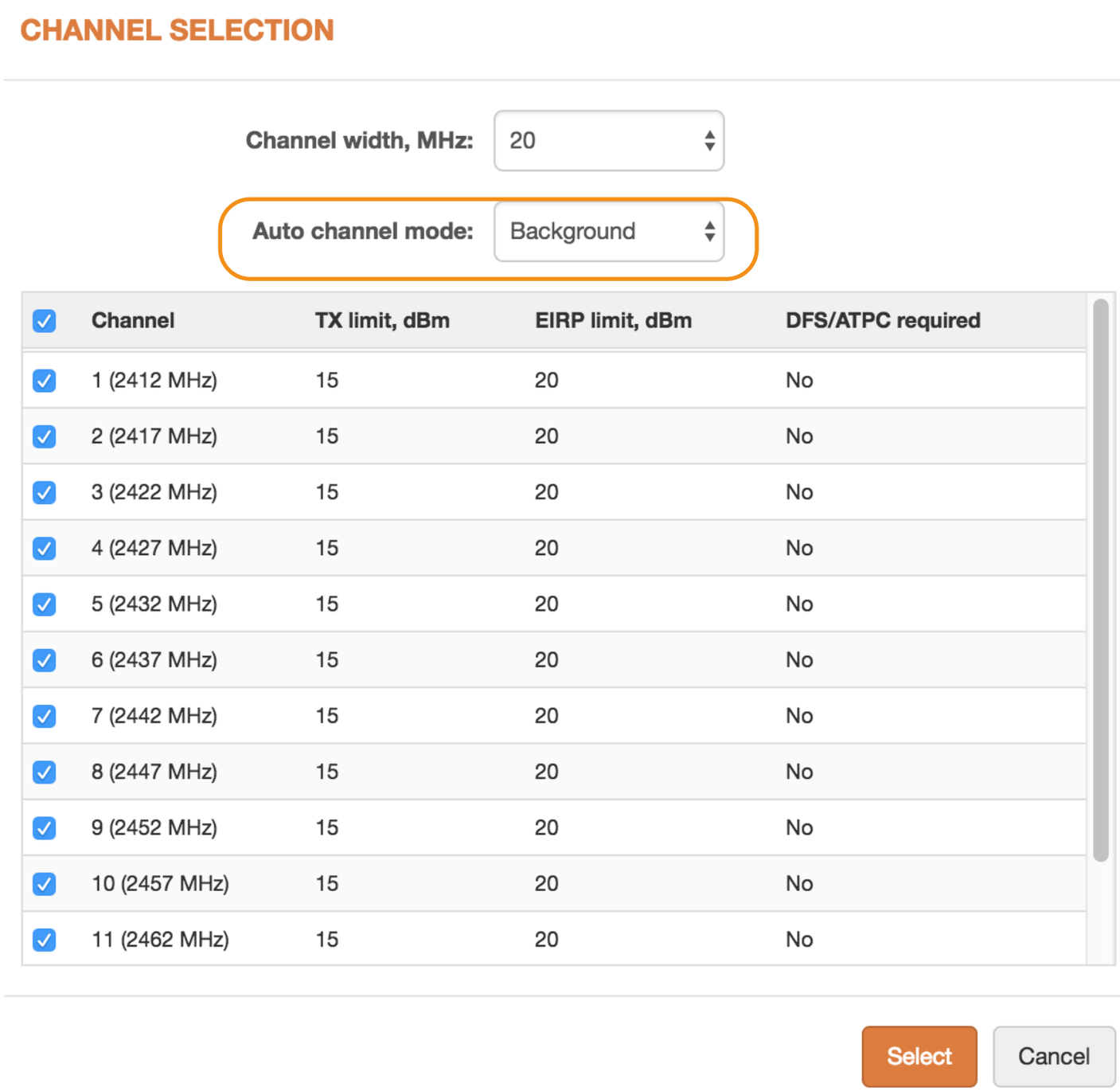
Advanced Software Features



1. Auto channel mode - Background / Default
2. Device will rescan for the best operating frequency when no client is connected

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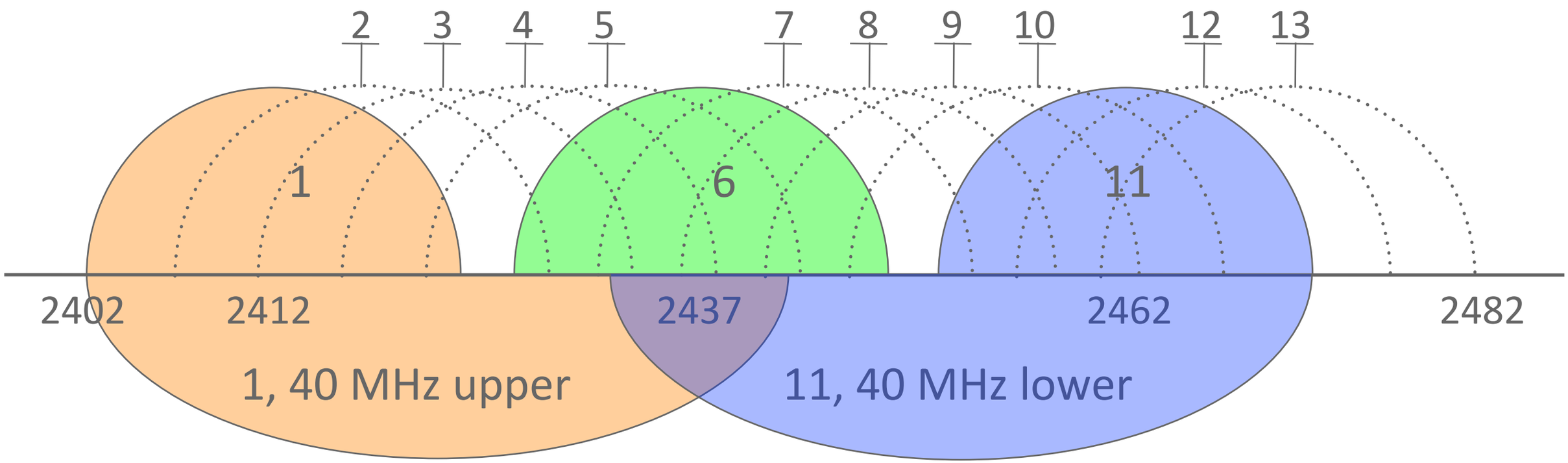
Channel planning - 2.4GHz (b/g/n)

- 20 MHz



- 40 MHz

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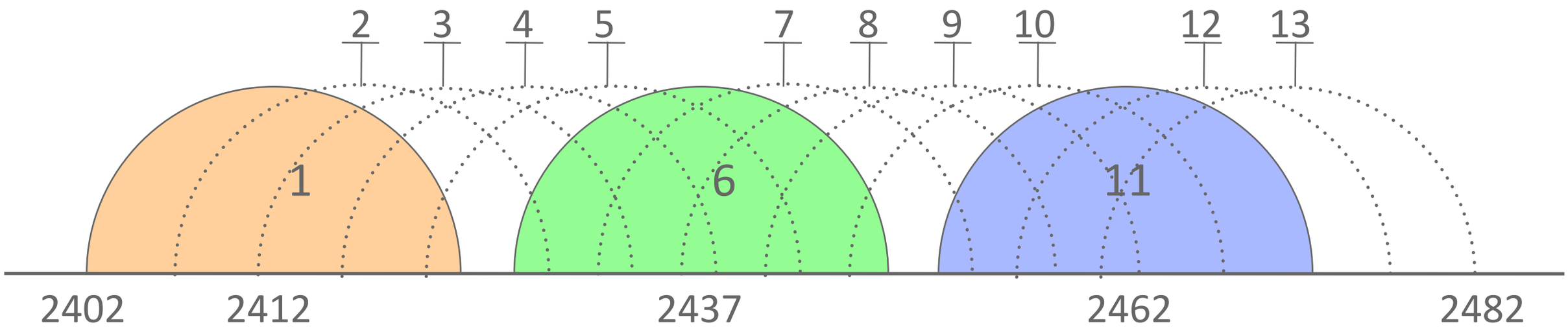
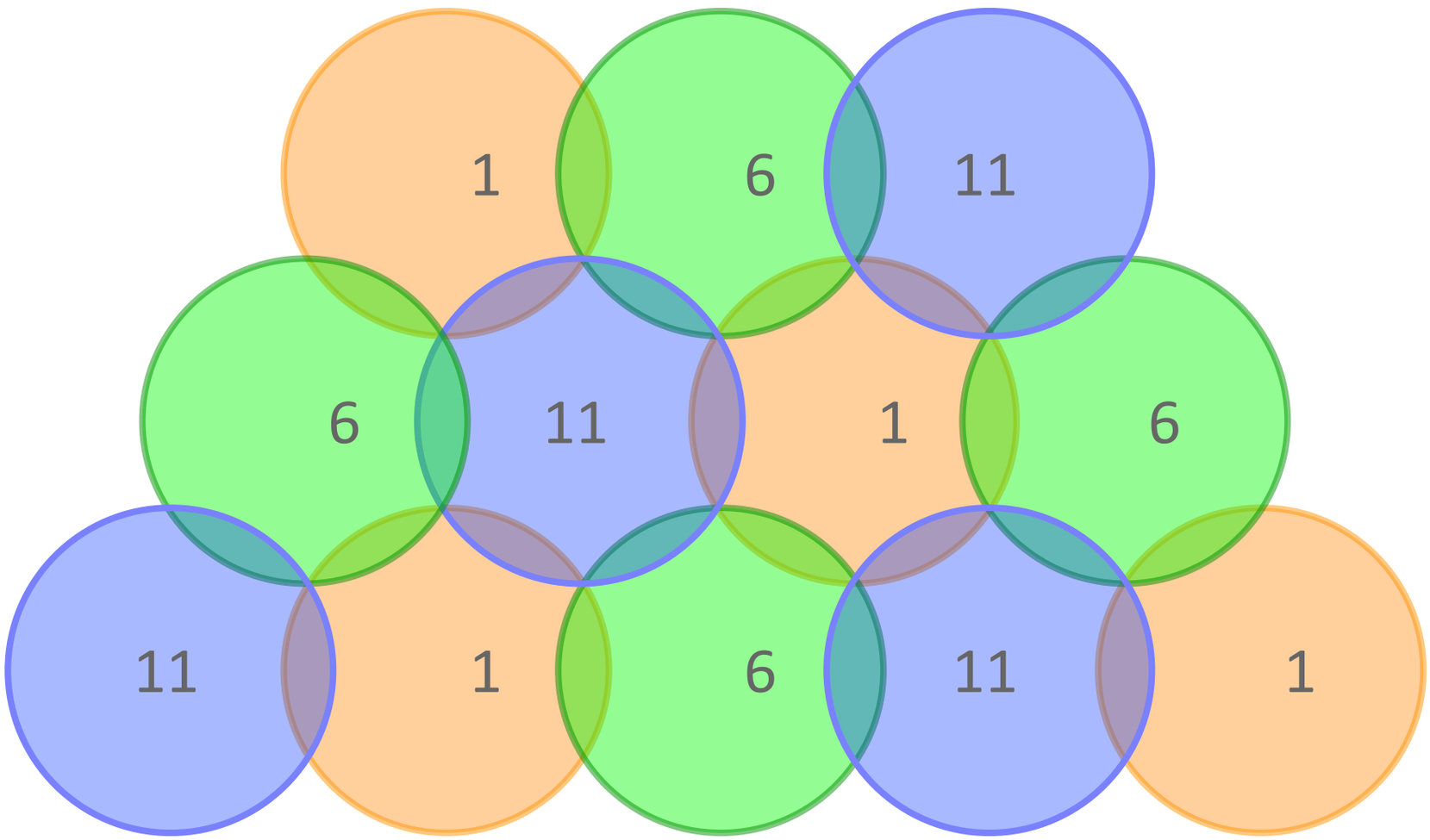
Channel planning - 2.4 GHz (b/g/n)





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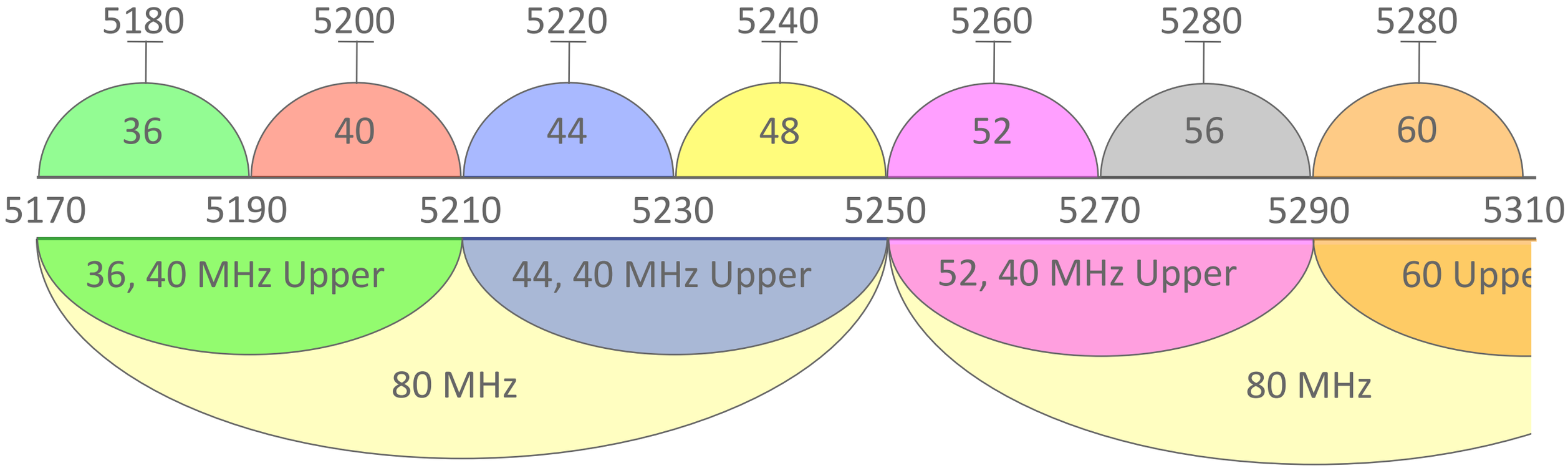
Channel planning - 5GHz (a/n/ac)



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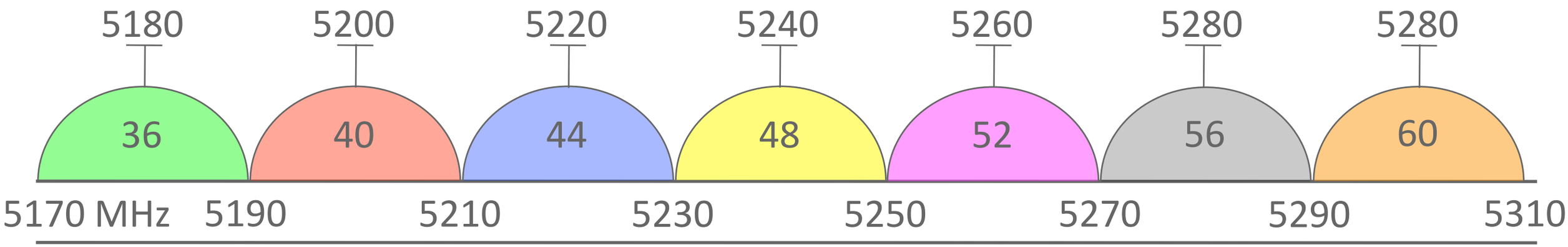
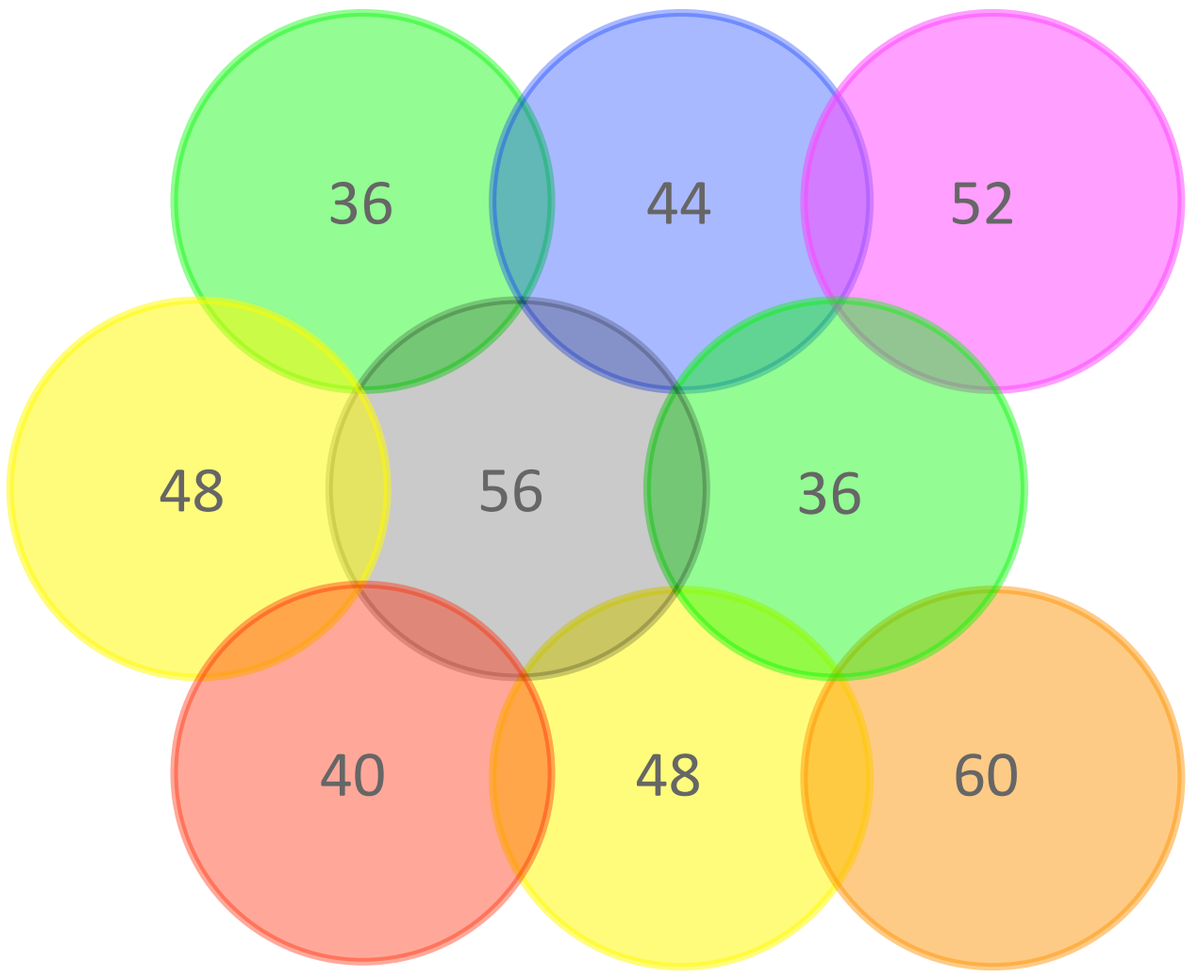
Channel planning - 5GHz (a/n)





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Channel planning - Spectrum analyzer

- Find the best operating frequency.
- Run spectrum analyzer at least for 3min.
- Select less occupied band.

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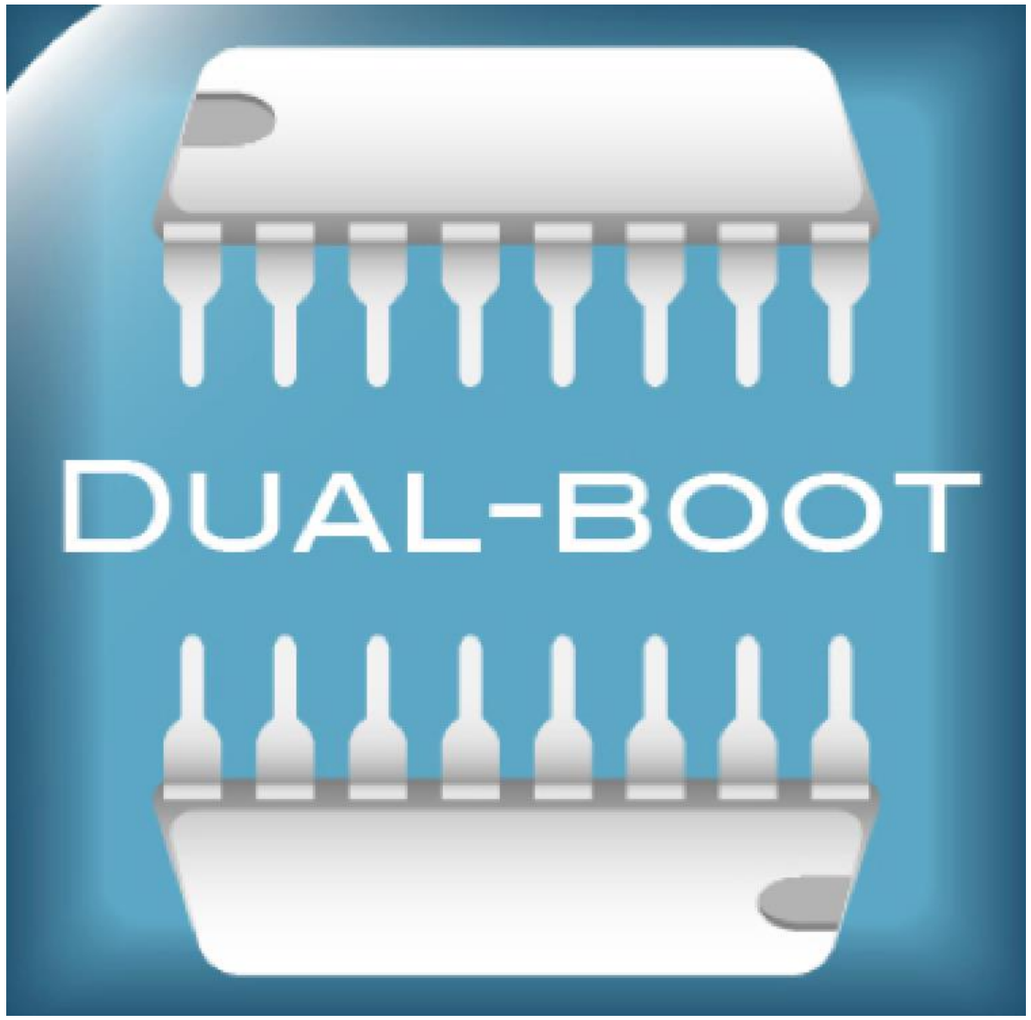
Dual-Boot



- Two firmware images in a one flash memory
- Device does not lock up during the firmware upgrade in case of electricity drop

Except NFT 2ac

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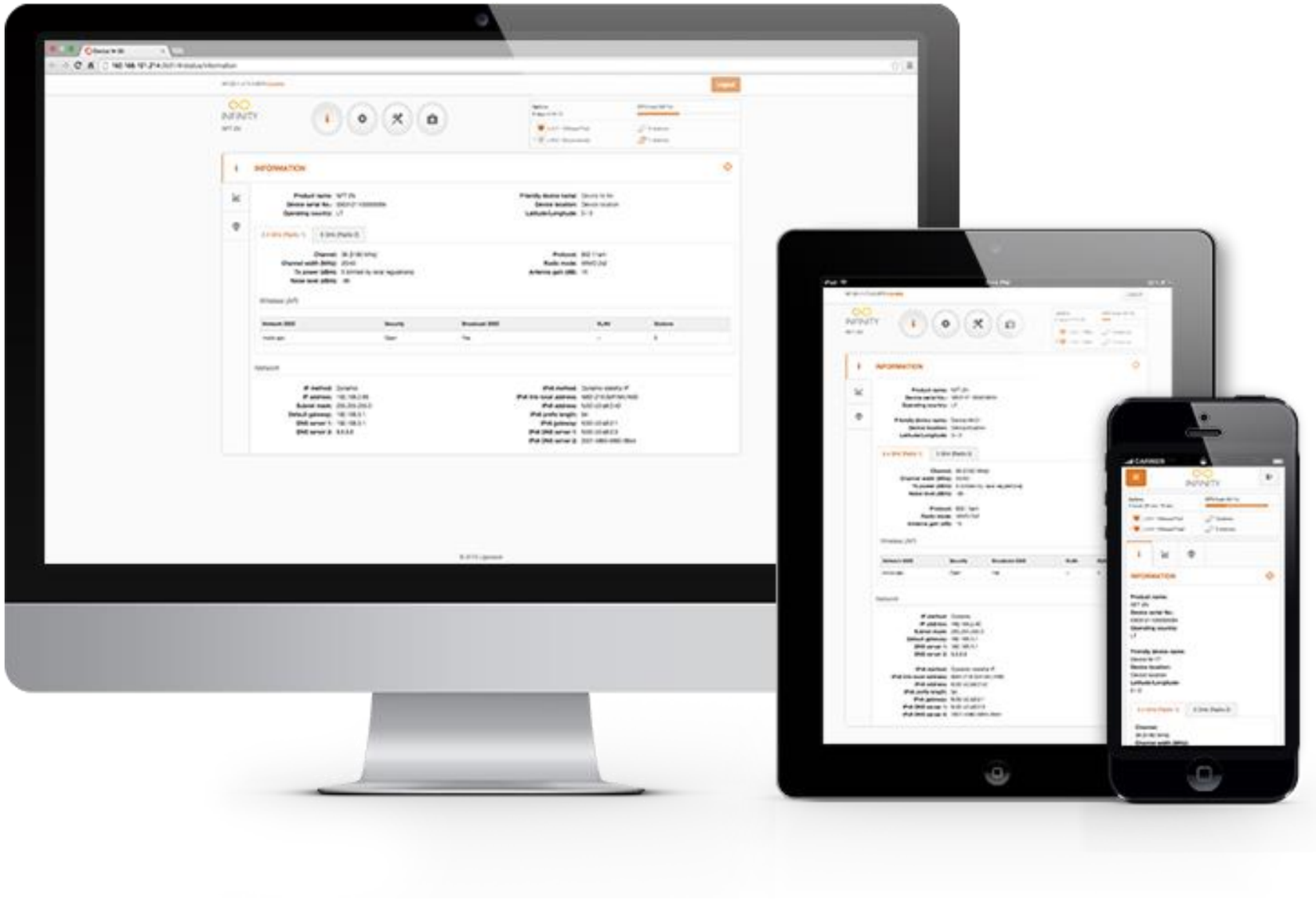
Infinity OS



HTML 5 Responsive Design

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Simple Installation

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NFT Installation

- Smart and universal design for easy installation

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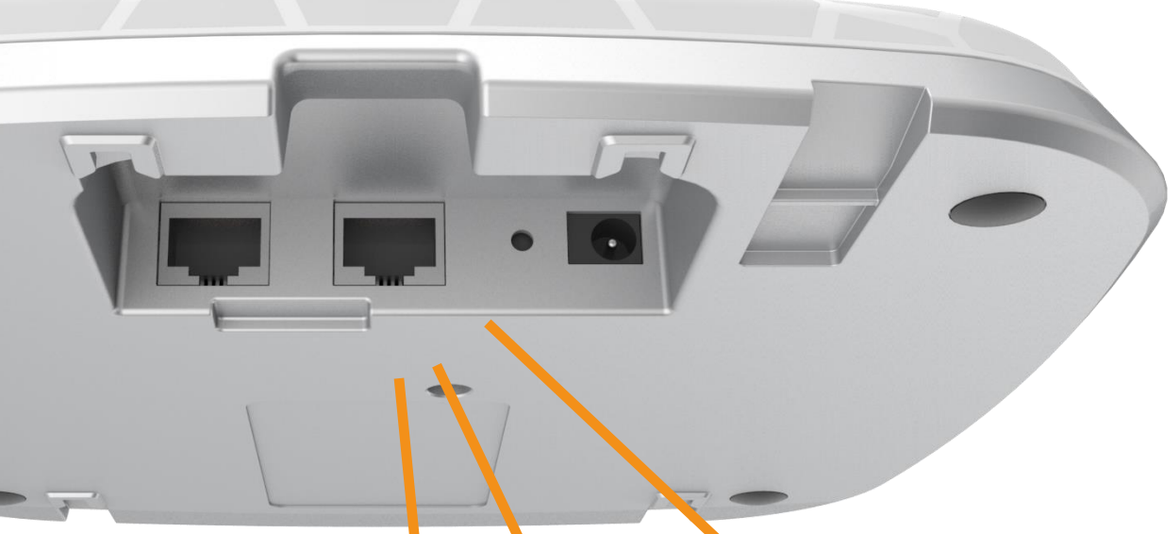
Powering Options

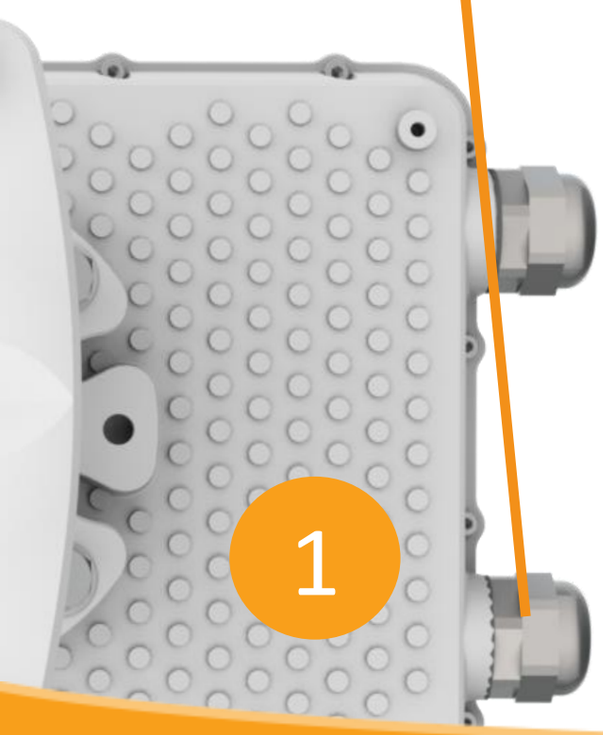


Using the included accessories:

1. From PoE adapter

Using other equipment:

2. From PoE switches
3. From other device with PoE passthrough



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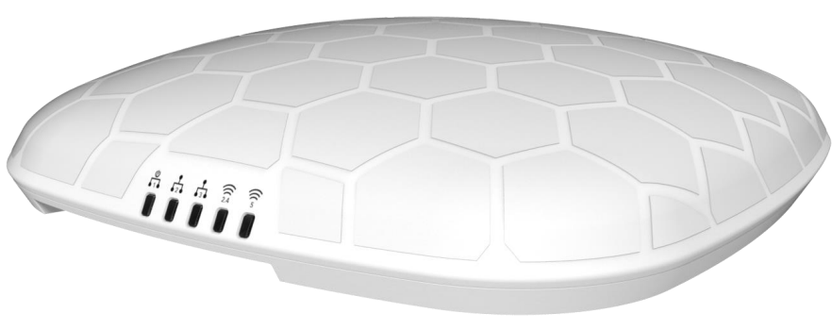
Power Supply

1 12 - 24 VDC passive PoE

1. NFT 1Ni
2. NFT 1N



2 37 - 56 VDC PoE 802.3af

1. NFT 1N (af)
2. NFT 3ac
3. NFT 2ac
4. NFT 2ac outdoor

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Twisted Pair Cabling

1

Use FTP cable

2

Use shielded RJ-45 plugs

3

Solder drain wire to RJ-45 plug

4

Cable length from LigoPTP to switch is up to 100 meters

5

Assemble the gland

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Wi-Fi Solutions

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INFINITY controller

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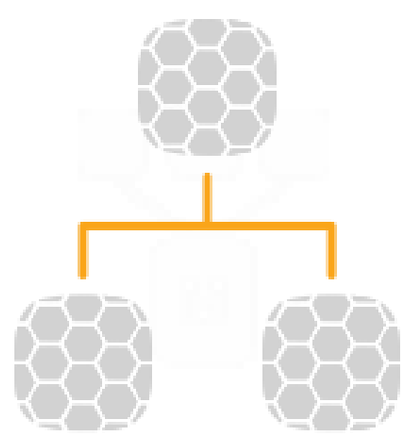
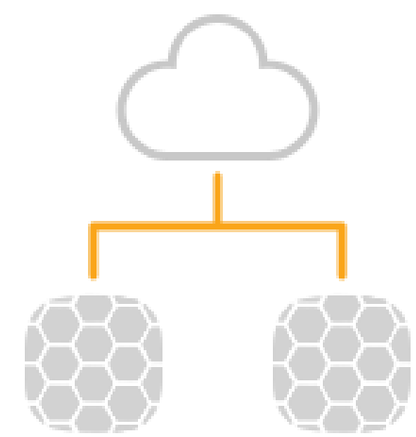
ways to setup and manage your network

Standalone



Integrated controller



External controller

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Predefined Scenarios on NFT Controller

Office AP

Mini Hotspot

Easy Mesh

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Office AP Scenario

- Regular AP bridge
- SSID with WPA-PSK or WPA-Enterprise
- Many AP in multi sites

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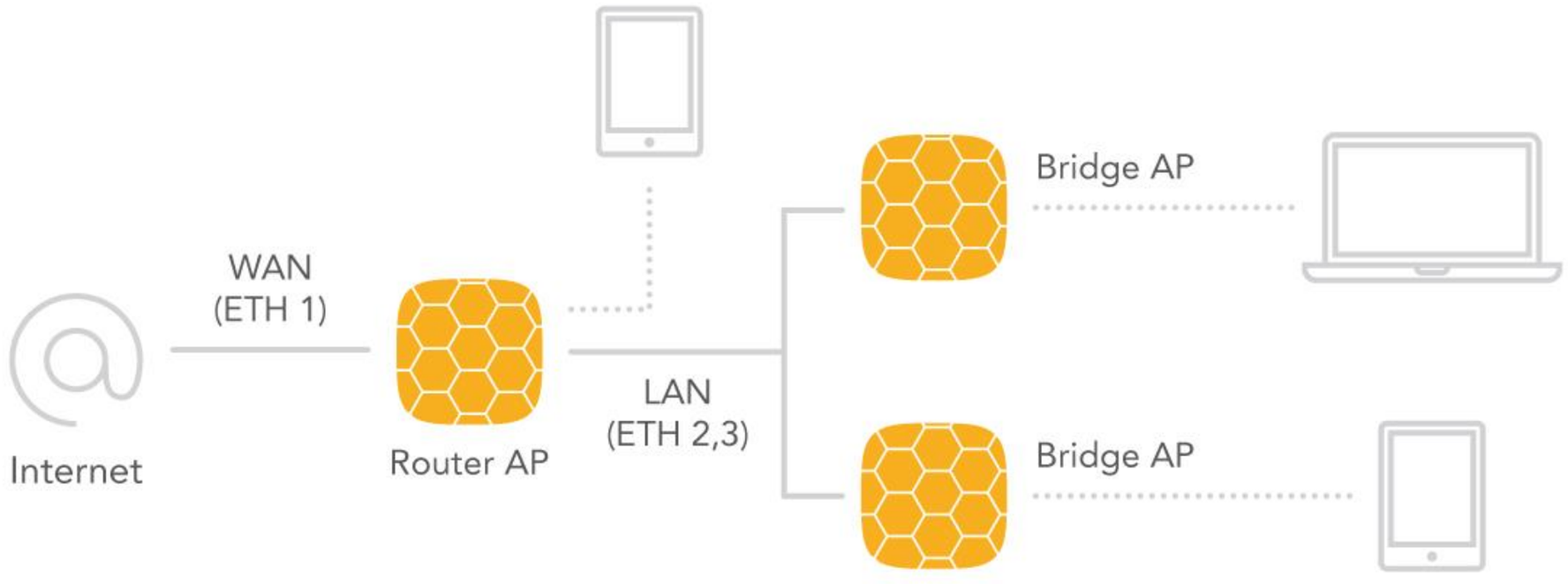
Mini Hotspot Scenario



- One NFT AP is designated as the gateway where UAM runs on
- Supports many AP in the same network
- Centralised web authentication
- Easy roaming
- Recommended up to 500 simultaneous users sessions

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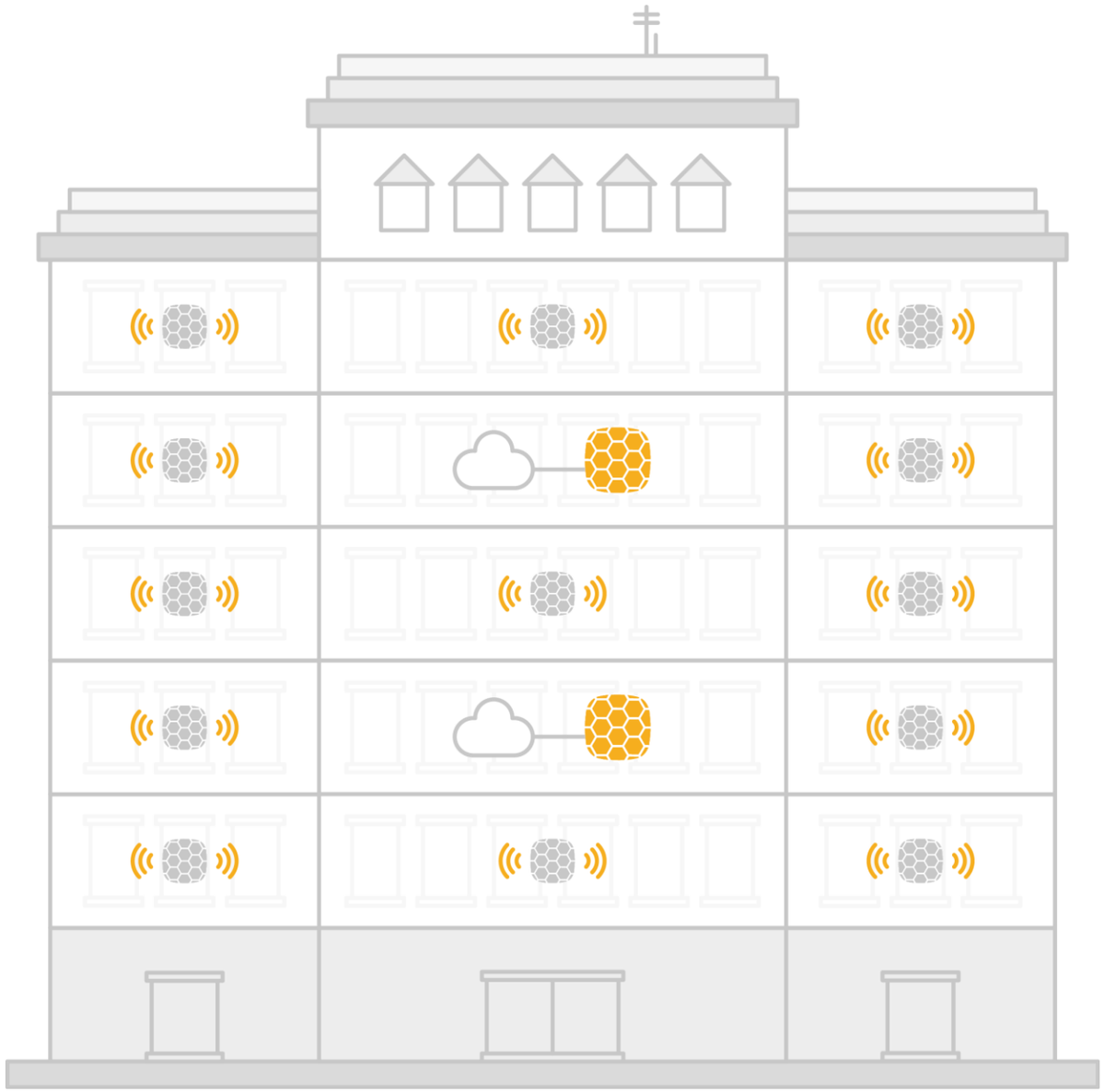
Easy Mesh Scenario



- Very fast installation
- Useful in locations without wired infrastructure
- Any AP can create a simple mesh network (including DLB models)
- Redundancy: multiple mesh AP supported

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Proximity

- Integrated mobile device detection
- MAC address and time is logged without any user interaction
- Real time data can be used to enhance services

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Typical Projects Examples

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Camping Park in Denmark

- Replaced existing Ubiquiti Unifi based network
- LigoDLB ECHO 5 was used for backhaul of the network
- LigoDLB PRO sectors with Infinity software for Wi-Fi coverage
- Total number of 16 access points servicing a network with a 600 user capacity

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Video surveillance network with handheld scanner data collection

- Implemented by T-Hansen Gruppen AS - a system integrator of Cisco and Cambium networks
- 9 HD cameras connected using LigoDLB devices (LigoDLB PRO and 9 x ECHO 5 CPE's)
- 5 x LigoDLB PRO sectors (2 GHz) for data collection from scanners using Infinity firmware

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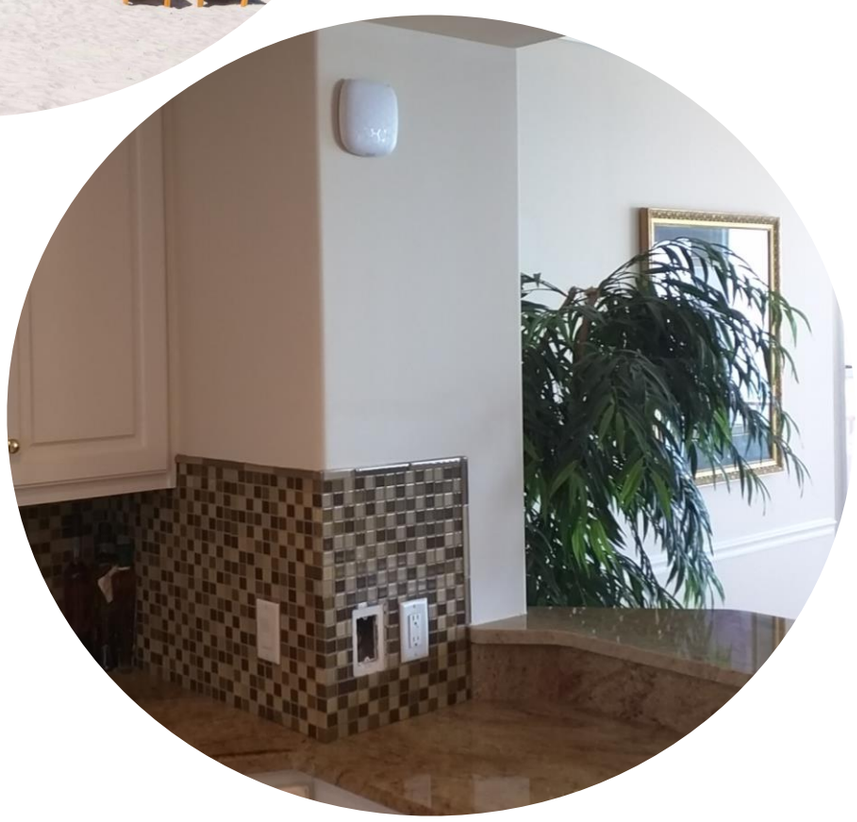
Hotel in Panama city, USA



- NFT-2AC's has been installed in guest rooms at a couple different resorts in Panama City Beach, FL
- "The new Access points are super good. They are cheaper, have cloud based administration and no license fees, while delivering similar performance to high-end solutions in the market”
- https://www.tripadvisor.com/Hotel_Review-g34543-d272756-Reviews-Osprey_on_the_Gulf-Panama_City_Beach_Florida.html

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Hospitals, China

- China Mobile, in China's Liaoning Province
- NFT-3ac devices for indoor coverage
- 1500 units installed by now

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Hands-on LABs

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Standalone Configuration

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Standalone

- Each device is configured and monitored individually
- Configuration is done by accessing the device via the UI

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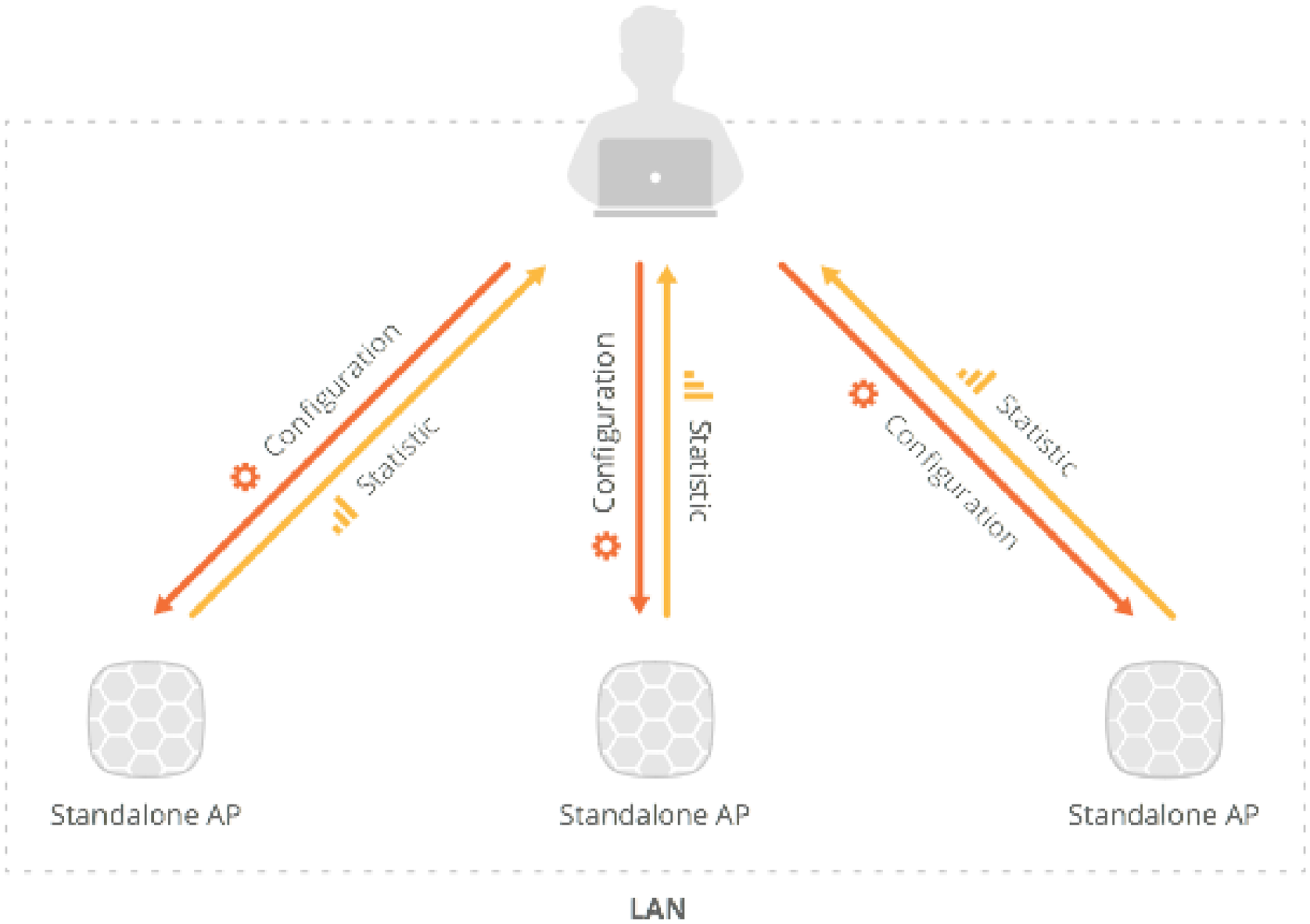
Standalone



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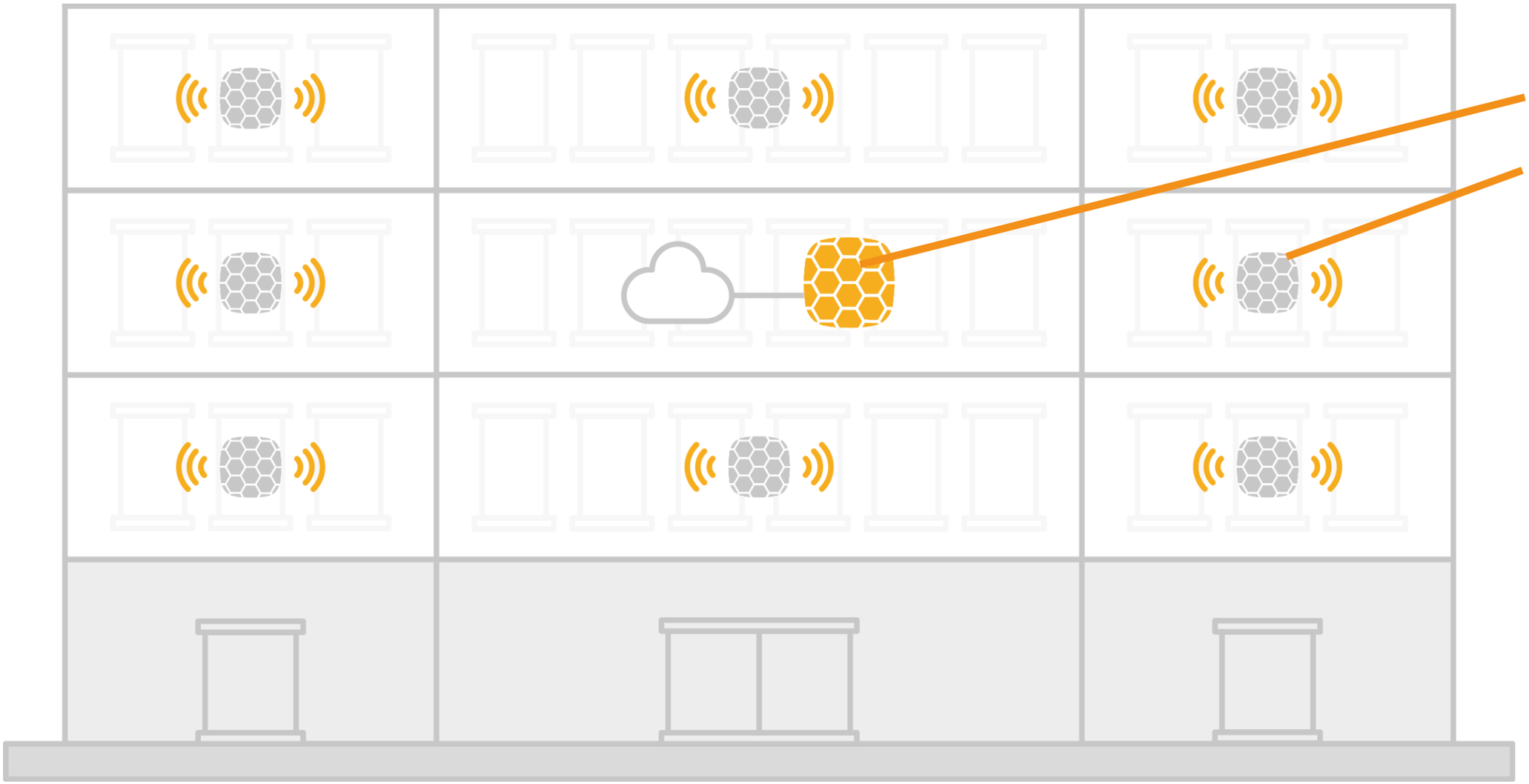
NFT Repeater Functionality



- Main AP
- Repeater

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NFT Repeater Functionality

- Repeater can be enabled on one radio (2.4 or 5 GHz) on dual-band AP
- Can repeat any AP (WDS and non-WDS supported)
- Repeated SSID and security can be equal to or different from the main AP
- Primary and failover SSID is supported on virtual repeater station
- On repeater AP, the performance is half of the main AP

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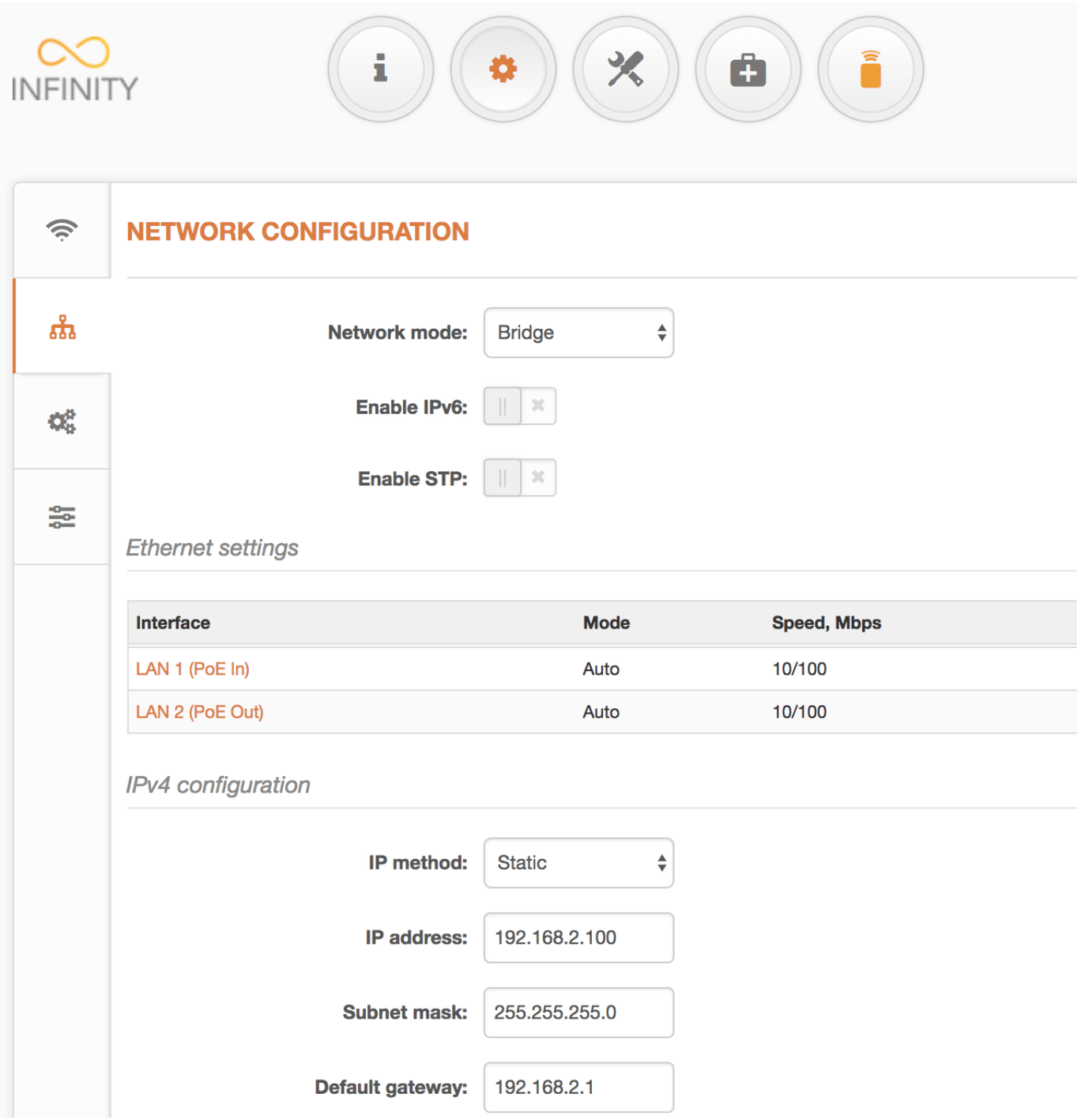
NFT Network Functionality



- Change the default IP on Access Point and Station in order to avoid duplicates (192.168.2.66)
- By default, IP method is dynamic with a fallback address to 192.168.2.66
- Tag/Untag VLANs on ethernet
- Device can operate in Bridge or Router Network mode

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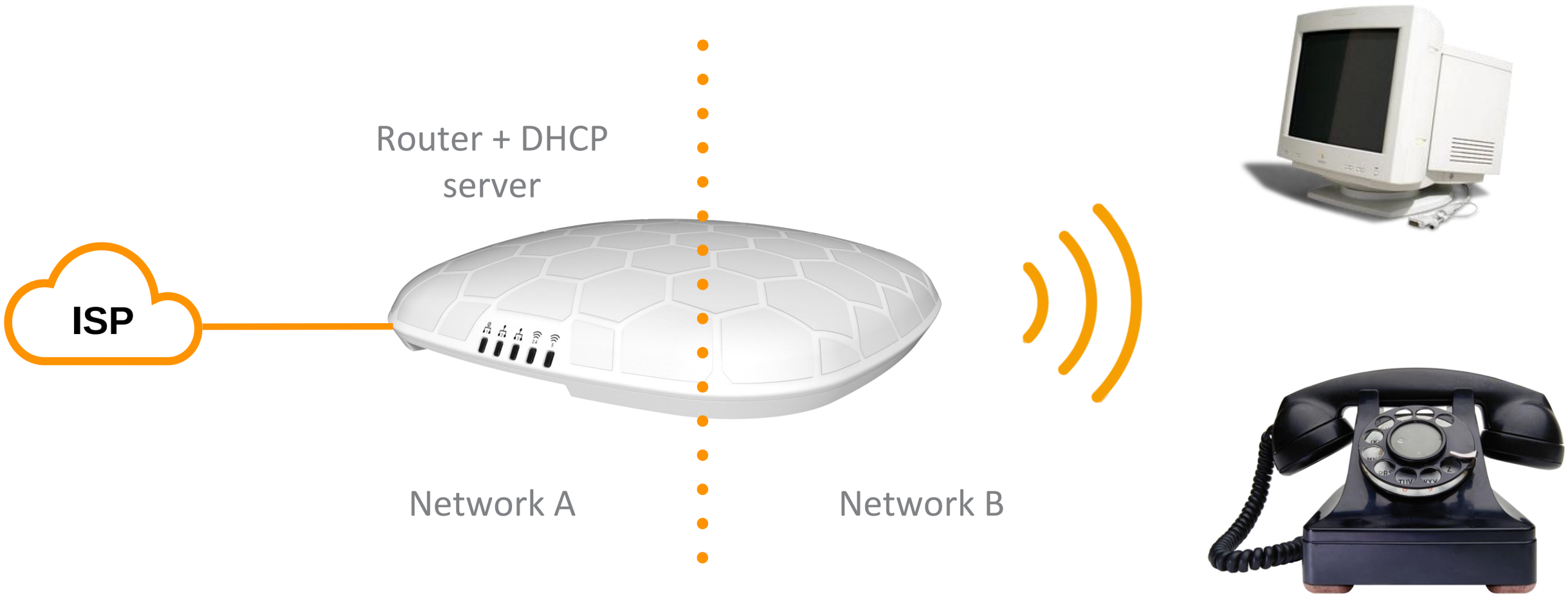
LAB 1 - Standalone Configuration



- Goal - Configure the NFT device as a Router and enable DHCP server

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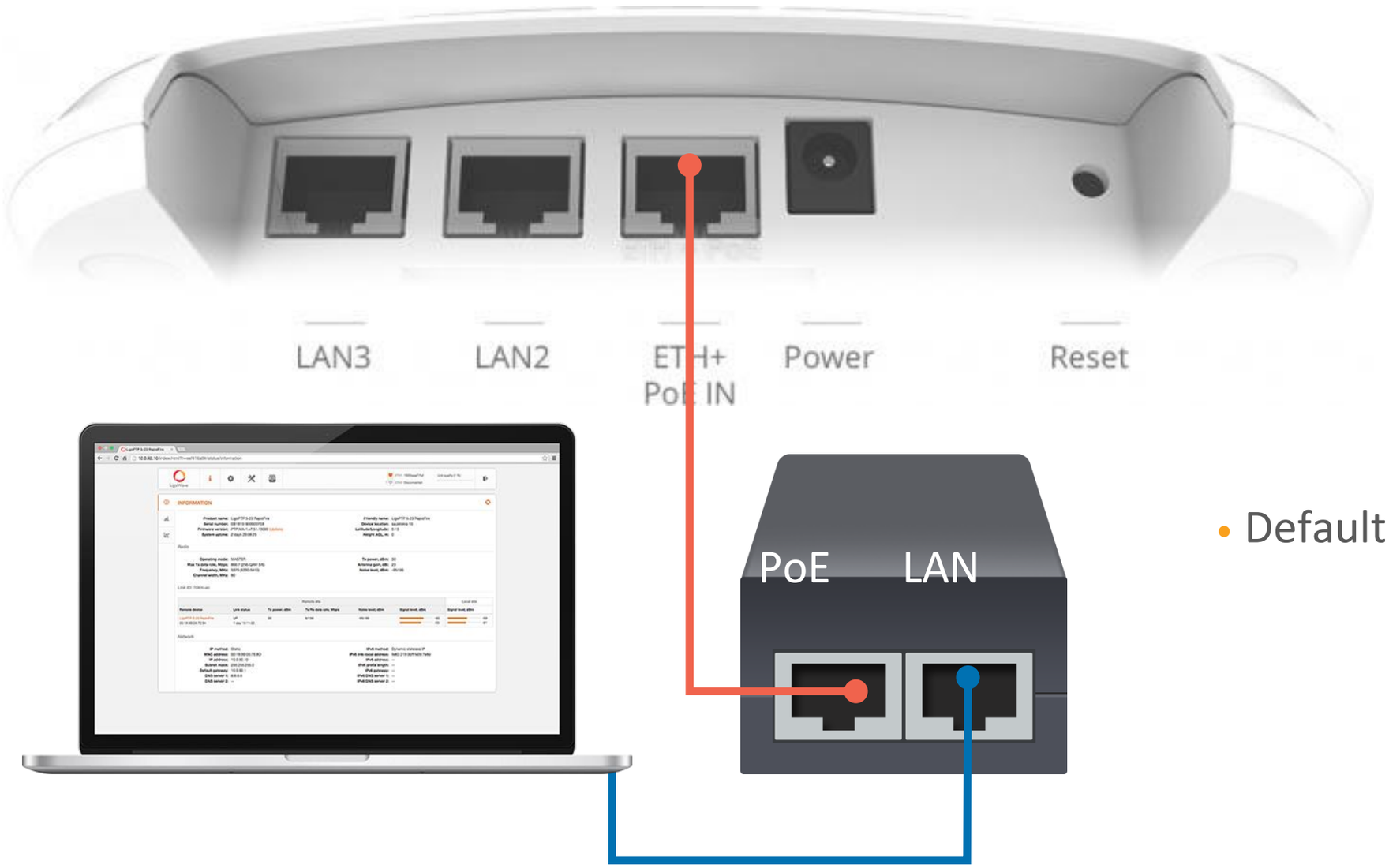
LAB 1 - Standalone Configuration



- Default IP - 192.168.2.66

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NFT Configuration Wizard

START — SYSTEM SETUP — CONFIGURATION — SYSTEM ADMIN — FINISH

Product name: NFT 1Ni

Serial number: 091916080000257B

Firmware version: AP.QM-2.v7.56.50345

MAC address: 00:19:3B:09:51:F7

START

UI Language: English

User agreement

The correct country code must be selected before using the equipment to meet the regulatory requirements for authorized channels, channel width, output power, Dynamic Frequency Selection (DFS) and Automatic Transmit Power Control (ATPC).

Installer or equipment owner takes all responsibility for proper product usage according to the regulatory rules.

Vendor or distributor/reseller is not responsible for illegal wireless equipment operation.

☑ I have read and agree

Operating country: United States

2.4 GHz Antenna gain, dBi: 3

Next

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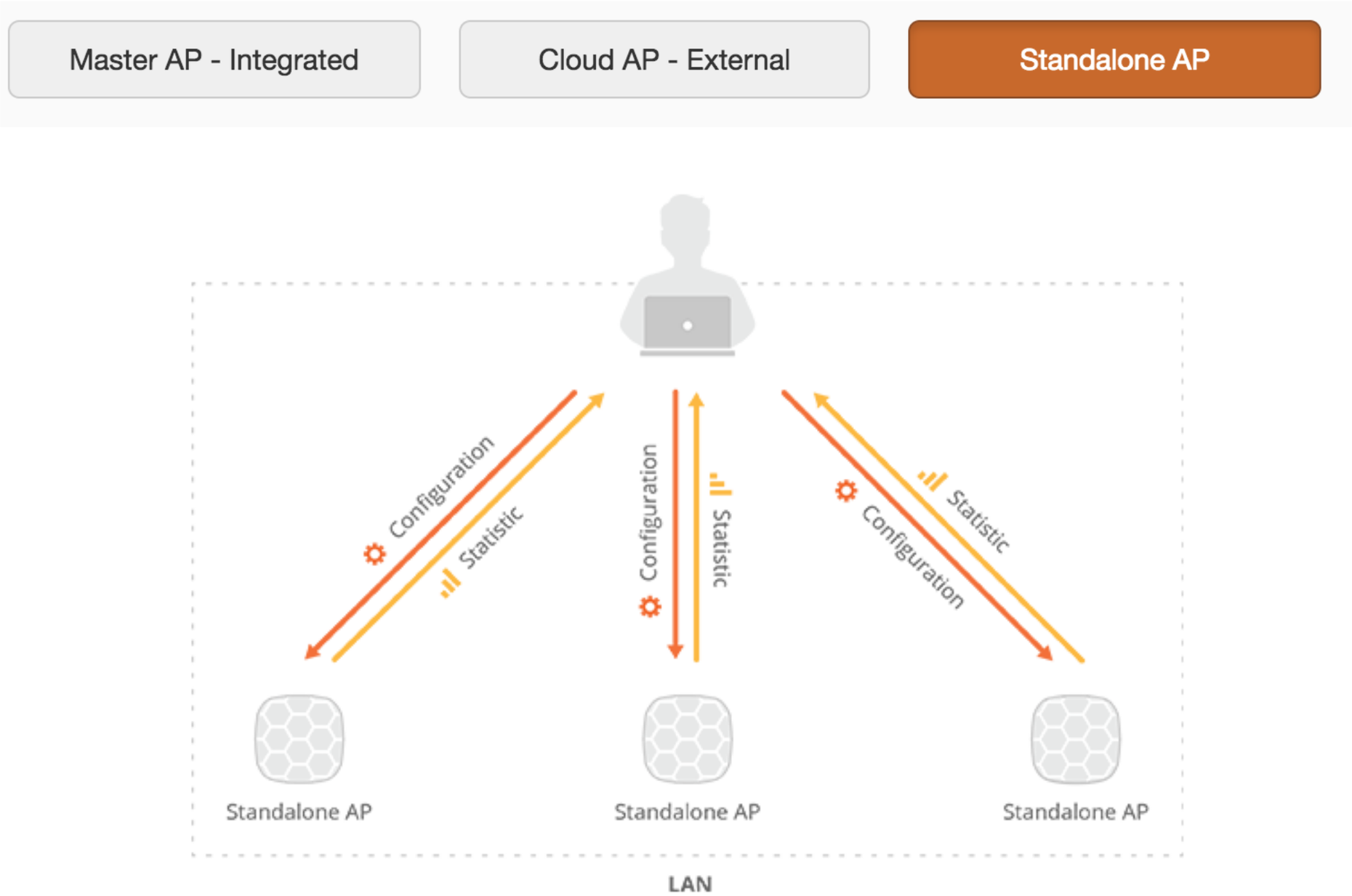
NFT Configuration Wizard

- Wizard mode:



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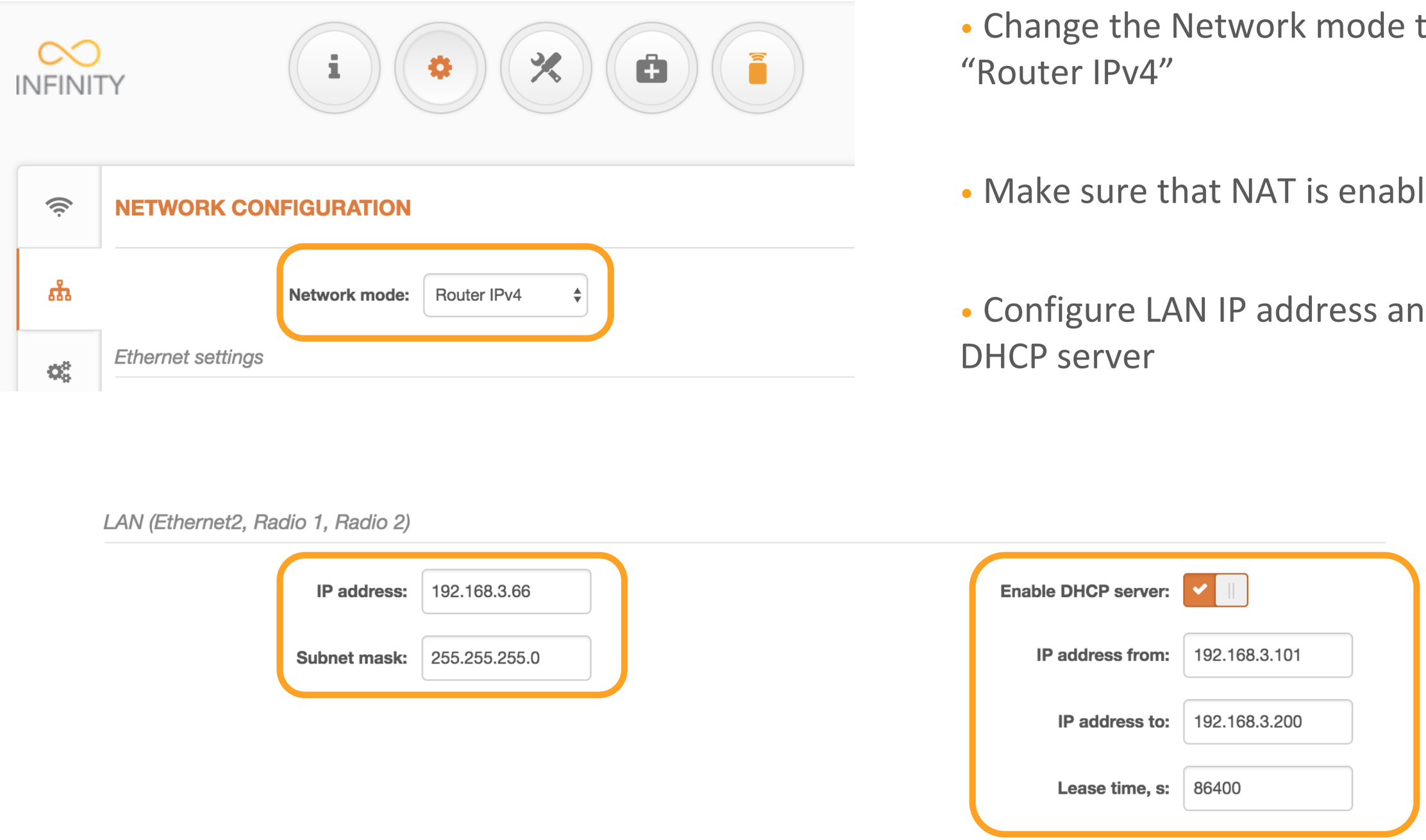
LAB 1 - Router Configuration



- Change the Network mode to "Router IPv4"
- Make sure that NAT is enabled
- Configure LAN IP address and enable DHCP server

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LAB 1 - Router Configuration

- Goal: Configure the NFT device as a Router AP and enable DHCP server

- Change the default settings: login, IP, SSID, power
- Configure WPA2 security on the VAP

- Change network mode to Router
- Enable DHCP server on LAN

- Finish line: Connect the end device to your NFT. Check if you know the answers to the questions in the doc file

- Reset devices to defaults via GUI

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INFINITY

Integrated controller

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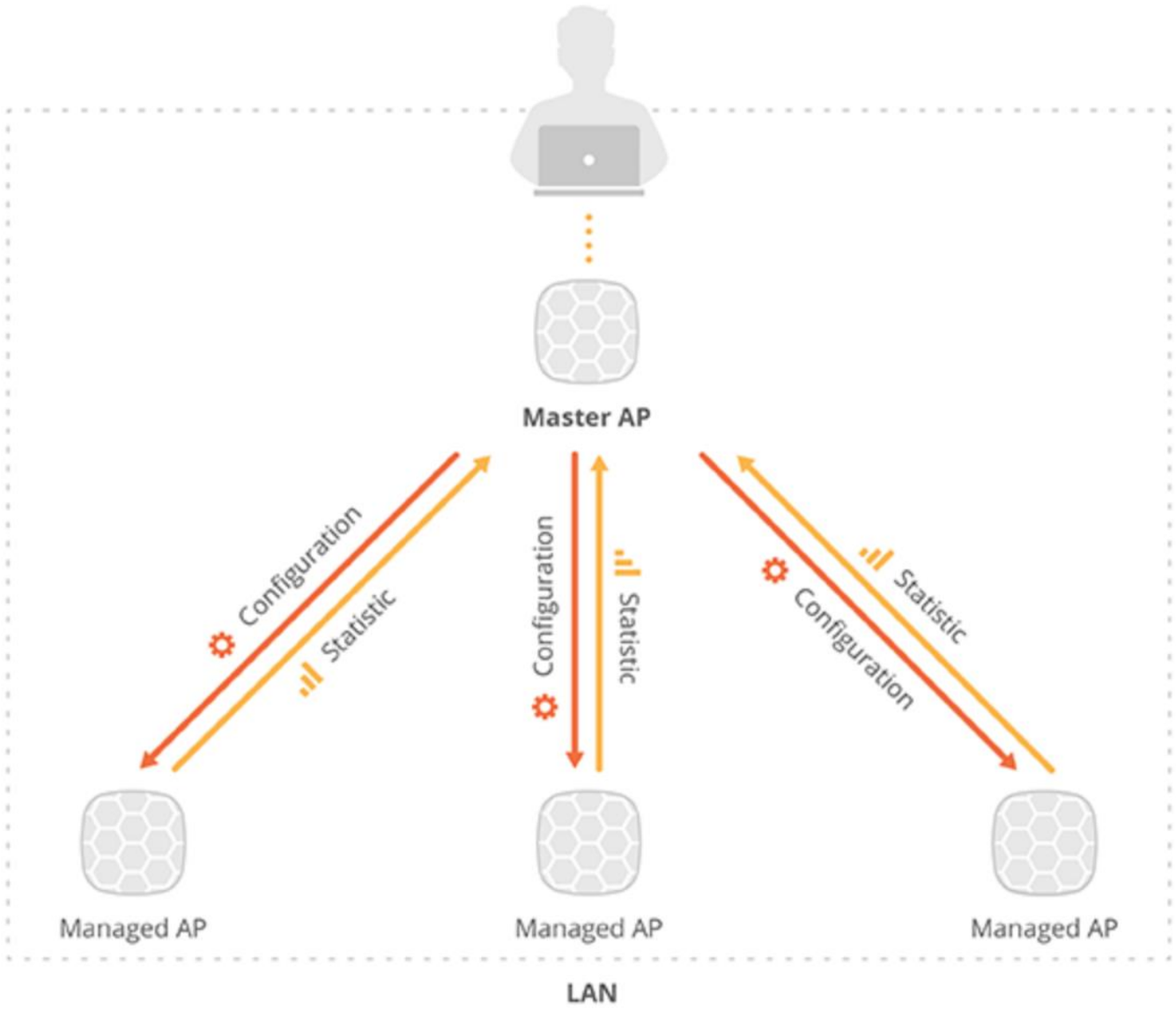
Integrated Controller



Steps:

1. Configure Master AP
2. Connect Managed AP's

Note: all new AP's can be connected to the network out of box. They will be automatically configured by the Master AP using Plug&Play functionality.

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Centralized configuration

- All managed APs receive the configuration from the Master AP
- Configuration changes are applied to the whole network automatically
- Individual parameter configuration per device

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Simplicity of use

- Smart auto-provisioning and auto-discovery mechanism
- Out of the box - ZERO touch configuration
- Simple expansion and replacement
- No additional hardware/software

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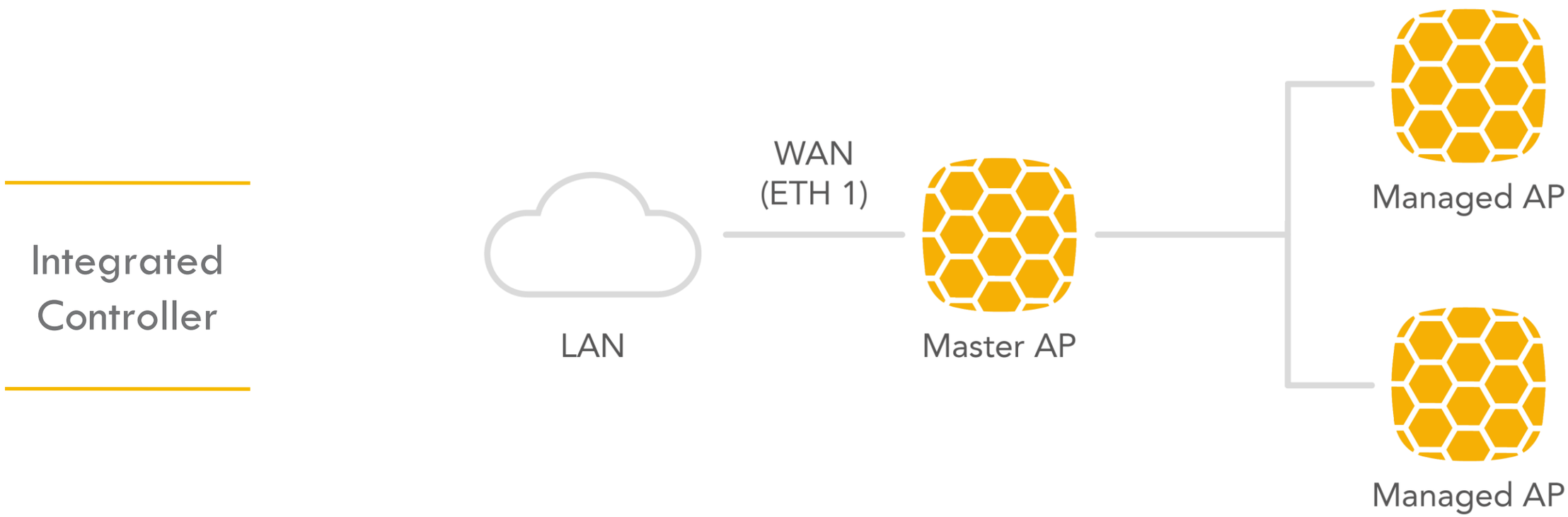
LAB 2 - Integrated Controller: Office AP



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INFINITY

Integrated controller
PART I - Master AP

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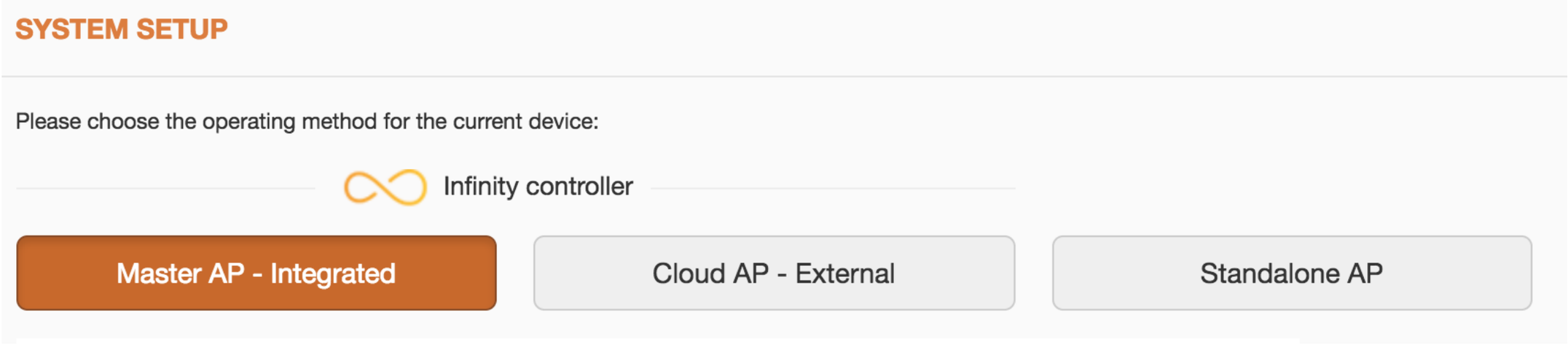
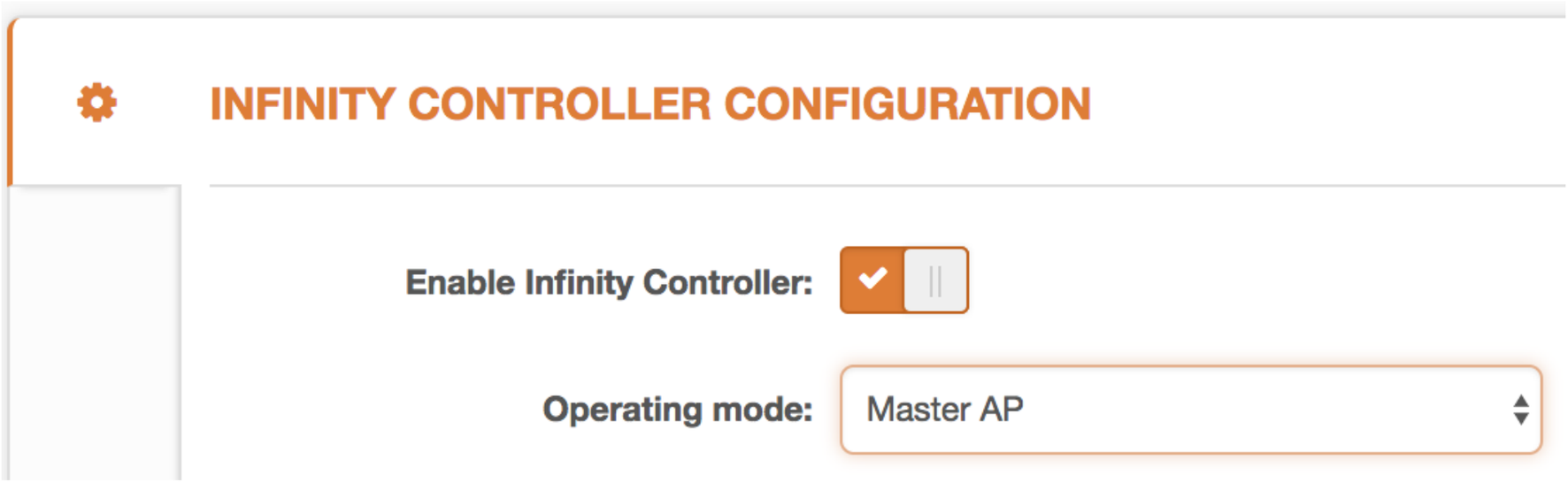
LAB 2 - Integrated Controller

- Wizard mode:



- Operating mode:



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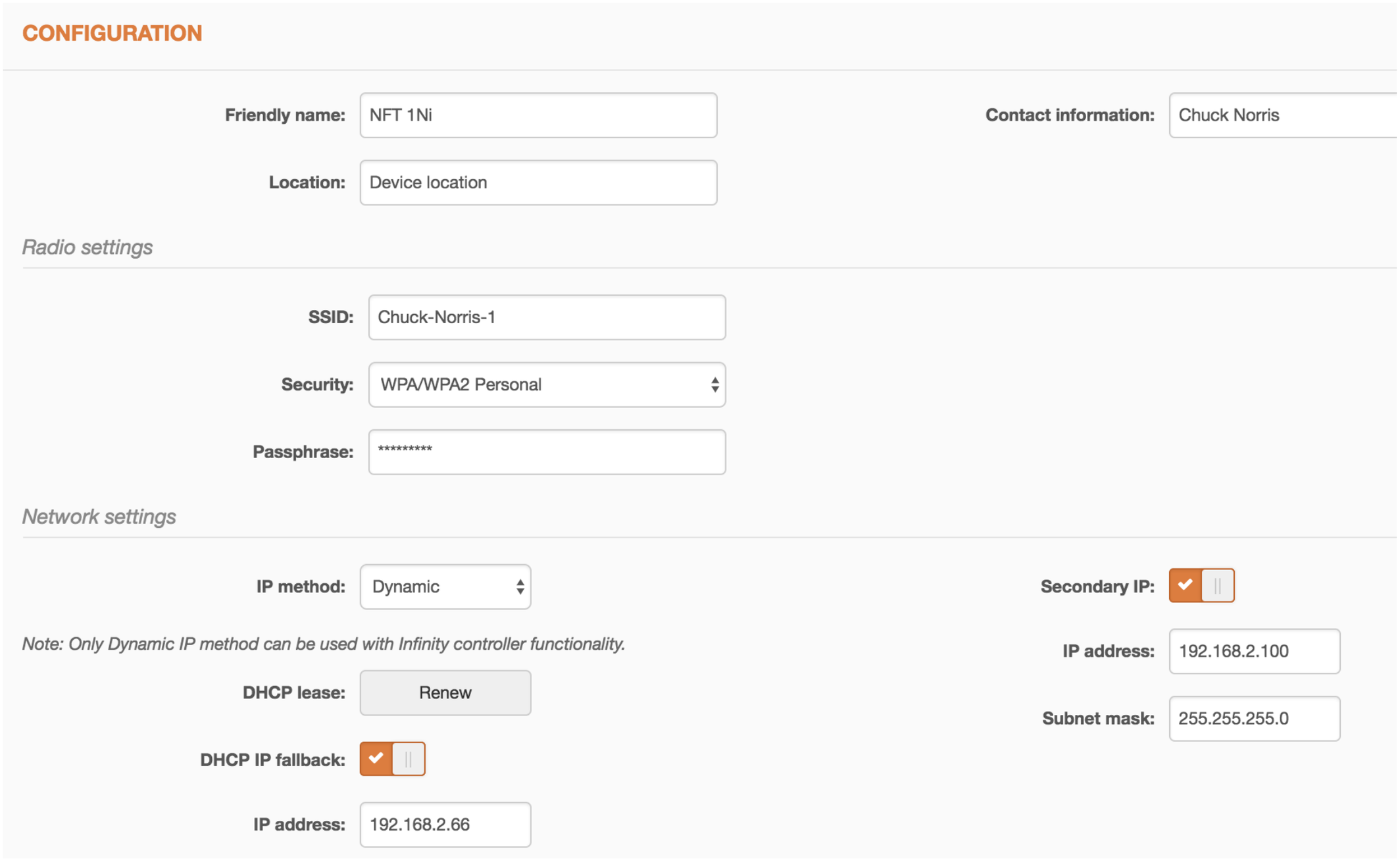
LAB 2 - Integrated Controller

- Wizard mode:



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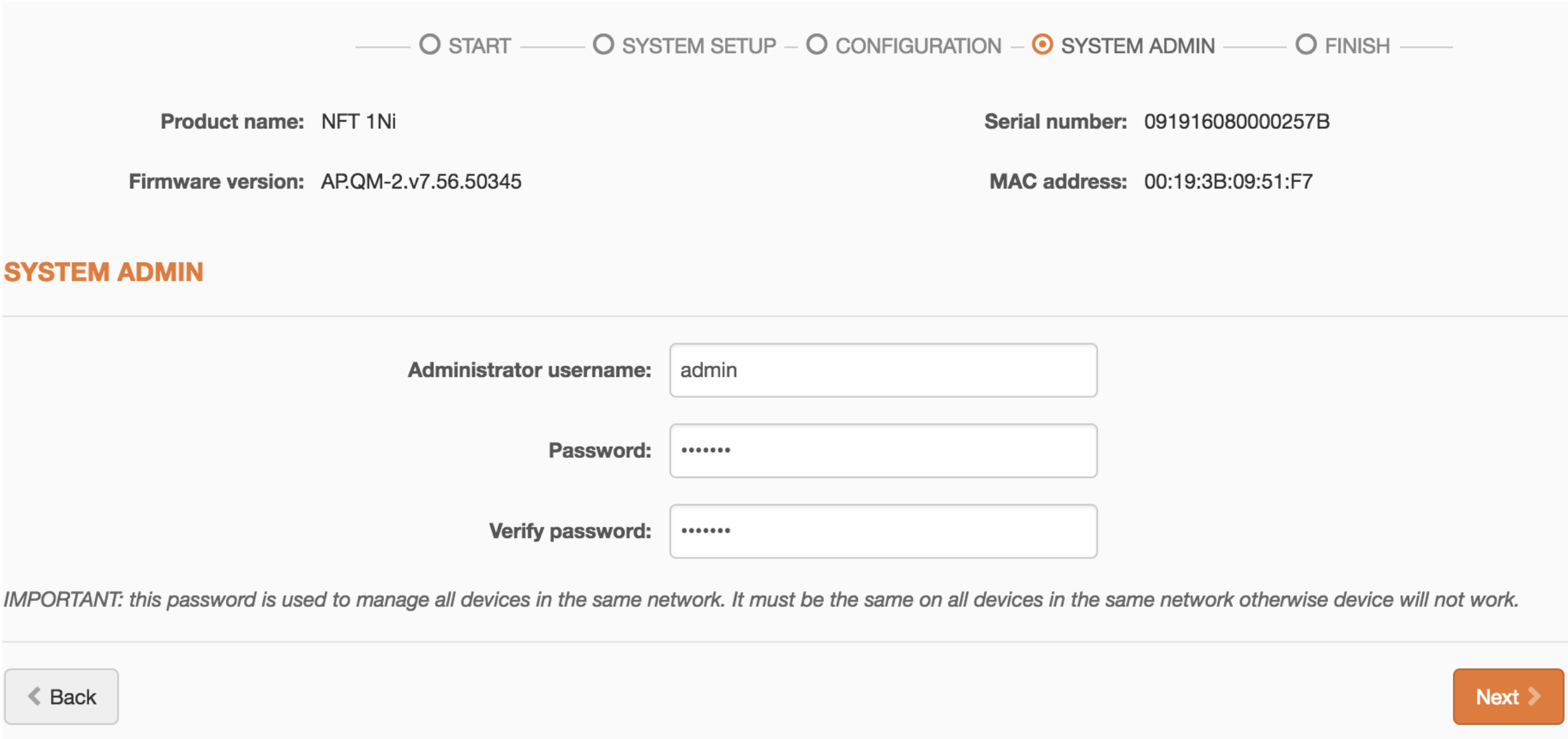
LAB 2 - Integrated Controller

- Wizard mode:



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LAB 2 - Integrated Controller

START — SYSTEM SETUP — CONFIGURATION — SYSTEM ADMIN — FINISH

Product name: NFT 1Ni

Serial number: 091916080000257B

Firmware version: AP.QM-2.v7.56.50345

MAC address: 00:19:3B:09:51:F7

FINISH

Password: admin01

Operating country: US

Device

Infinity controller mode: Master AP

2.4 GHz Antenna gain, dBi: 0

Friendly name: NFT 1Ni

Location: Device location

Radio

SSID: Chuck-Norris-1

Security: WPA/WPA2 Personal

Passphrase: tester123

Network

IP method: Dynamic

DHCP IP fallback

IP address: 192.168.2.66

Subnet mask: 255.255.255.0

Default gateway:

Back

Finish

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INFINITY

Integrated controller
PART II - Managed AP

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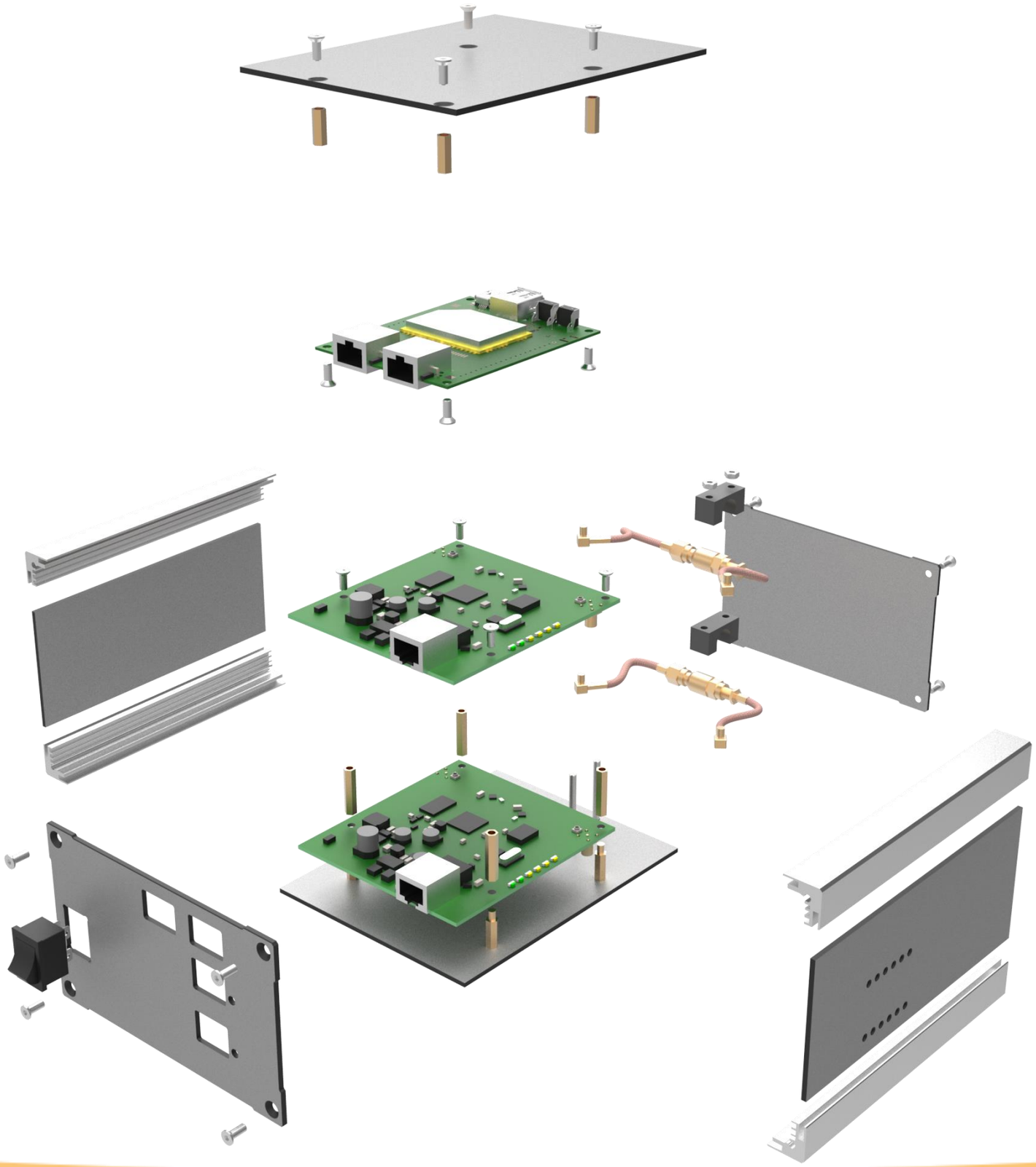
LigoDLB 5 Link Simulator



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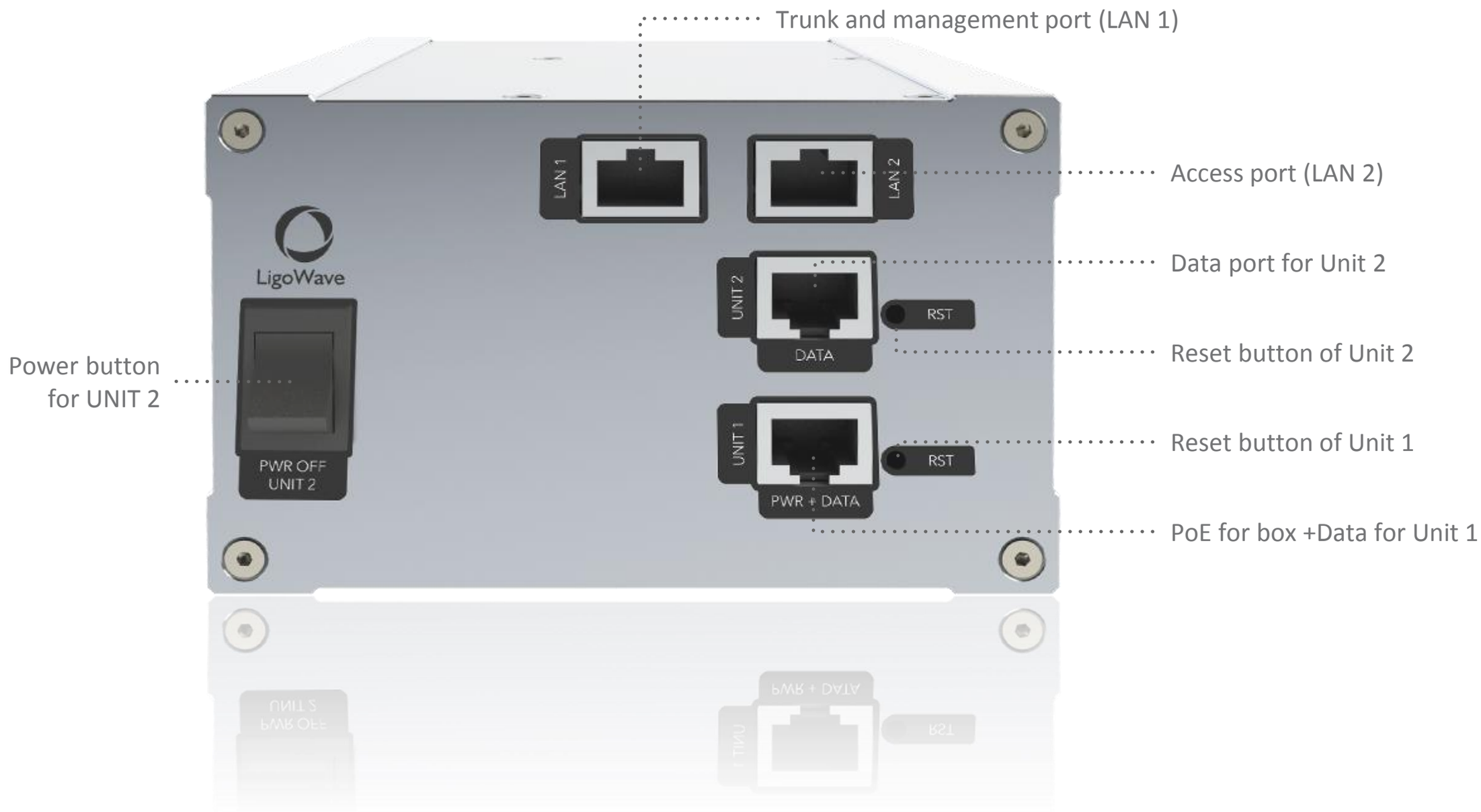
LigoDLB Link Box



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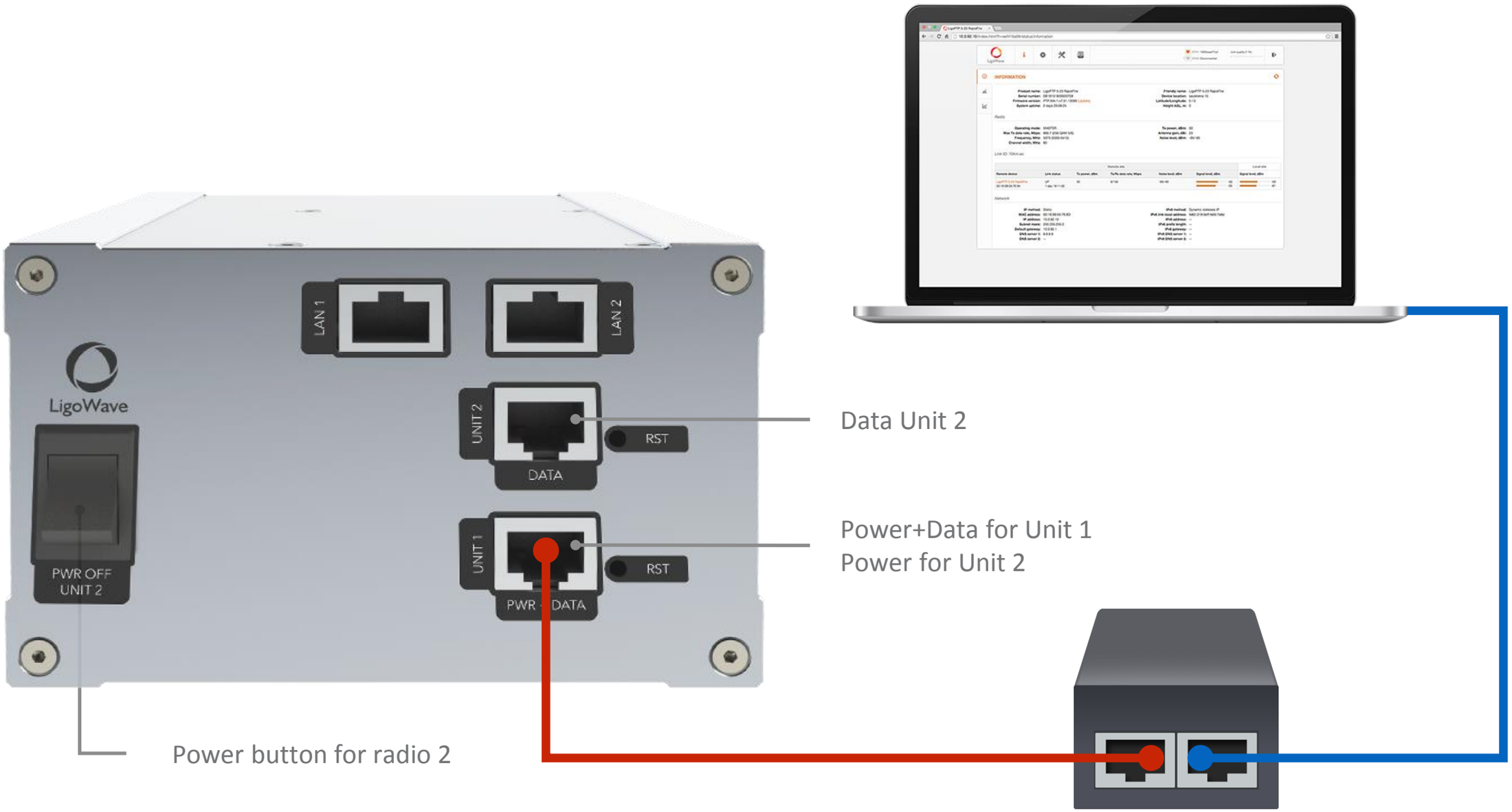
LigoDLB 5 Link Simulator



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Convert LigoDLB to NFT Software

Go to: https://www.ligowave.com/wiki

LigoDLB and LigoDLB ac series (7)

- LigoDLB and LigoDLB ac Firmware Release Notes
- LigoDLB Series Configuration Scenarios
- LigoDLB and LigoDLB ac Product Selection
- LigoDLB and LigoDLB ac Instalation Recommendations
- LigoDLB and LigoDLB ac Documentation
- LigoDLB and LigoDLB ac Declarations of Conformity
- LigoDLB Migration to NFT

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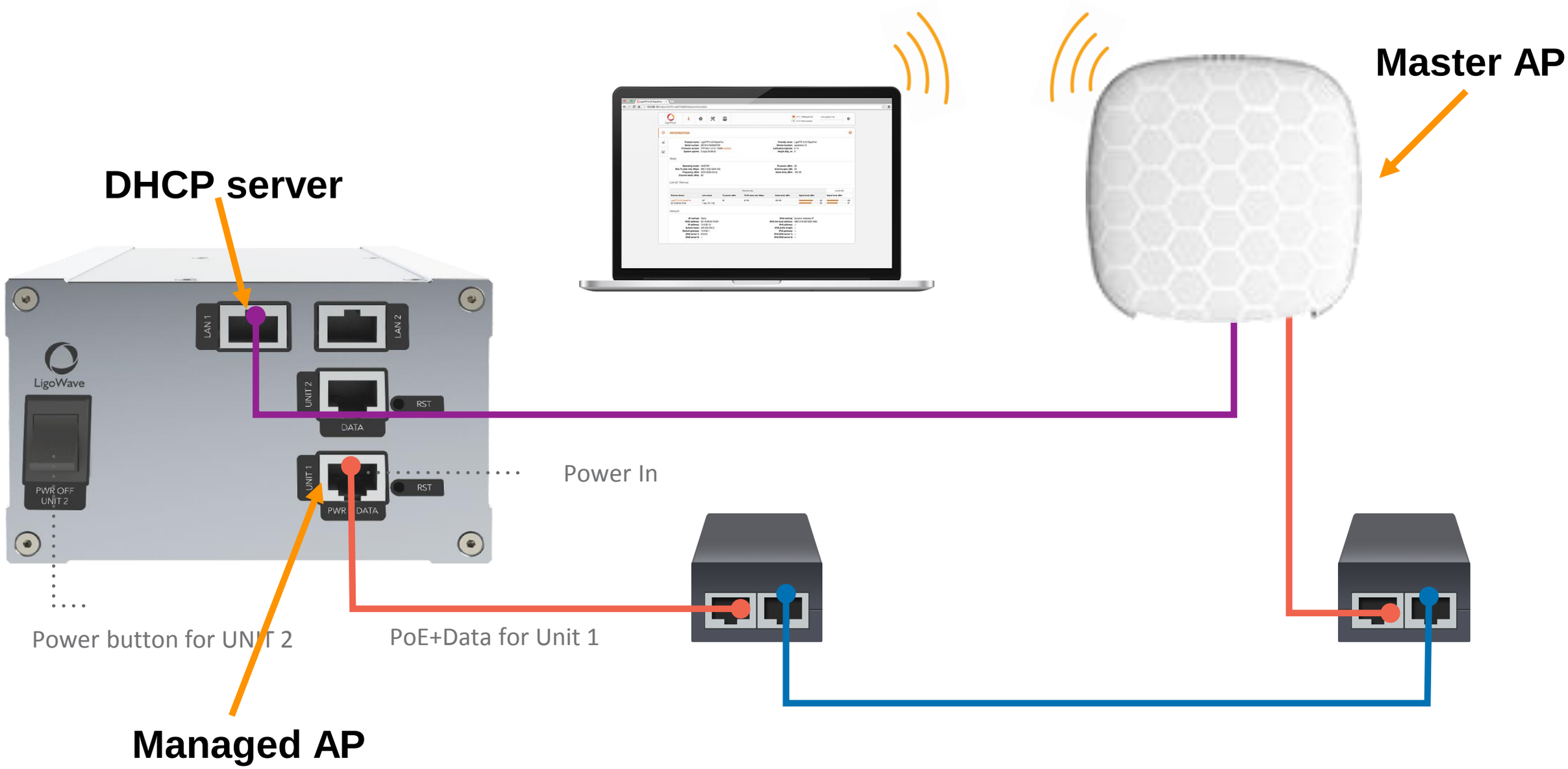
LAB 2 - Integrated Controller



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LAB 2 - Integrated Controller

- Goal: Configure the NFT device as a Master AP and connect the Managed AP

- Change the default settings on the Master AP: secondary IP, SSID, power
- Configure WPA2 security

- Convert DLB to Managed AP following a migration guide at LigoWave's wiki
- Check out of the box functionality

- Finish line: Connect wirelessly to the Master AP. Check the questions in the doc file

- Reset both devices to the defaults

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INFINITY

External Controller

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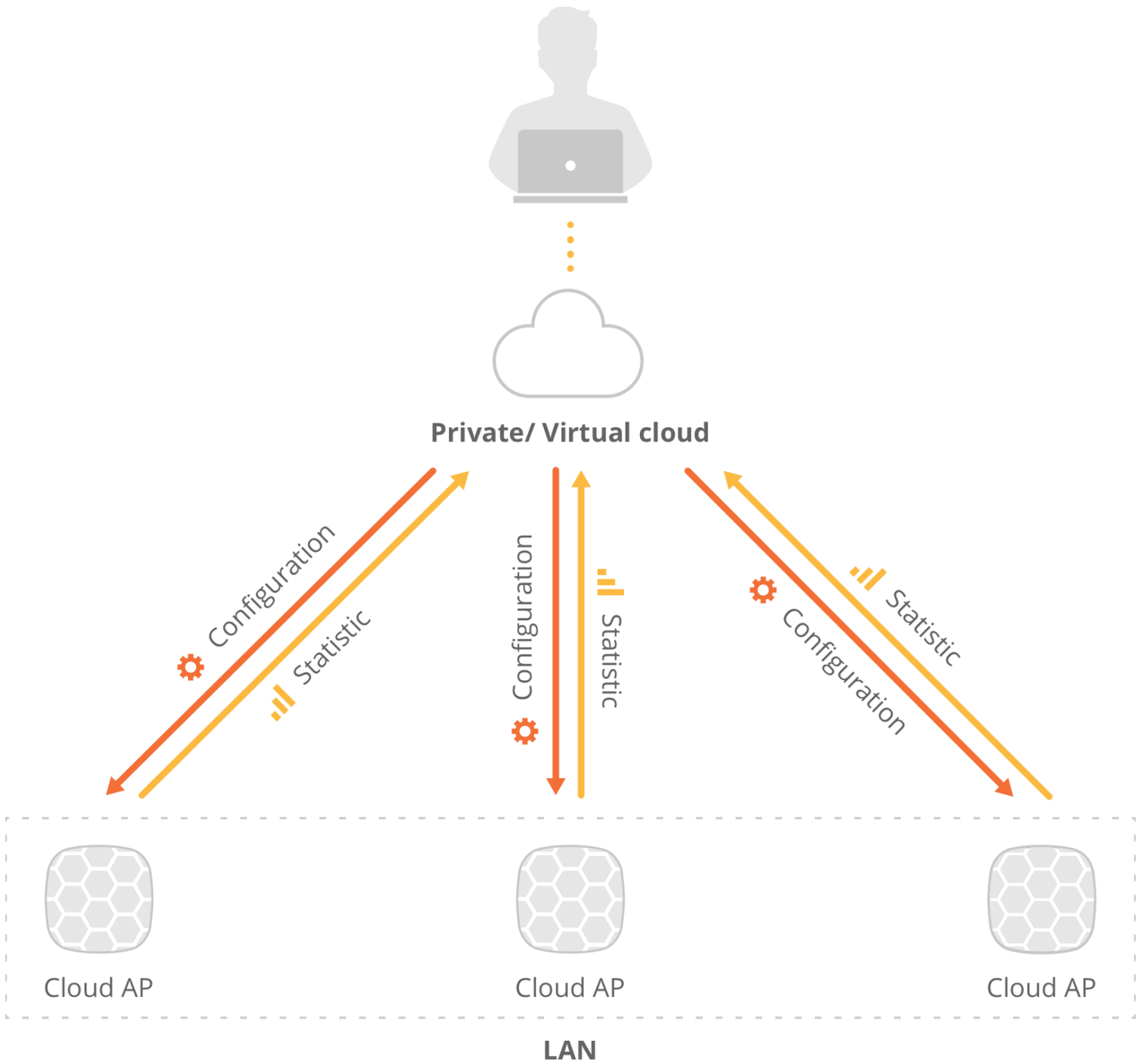
External Controller



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Virtual image for installation

- Works on all main OS’s (system virtualized on Docker container)
- Minimum hardware requirements:
    - CPU: Intel i5 (2.5+ GHz, dual or quad core)
    - RAM: 10 GB
    - Storage: 40 GB

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Simplicity of Use

- Smart auto-provisioning and auto-discovery mechanism
- DHCP option 43 enables ZERO touch configuration
- Simple expansion and replacement
- Scheduled firmware upgrade

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Centralized Configuration

- All managed APs receive configuration from the external server
- Configuration changes are applied to the whole network automatically
- Individual parameter configuration per device

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Centralized Maintenance

- Centralized statistics monitoring
- Simple troubleshooting

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Ideal for Large Networks

- Manage thousands of devices (sufficient hardware resources)
- Device grouping to networks
- Centralized configuration per network
- Historical data collection
- Google maps

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Highly Secure

- Encrypted communication channel (TLS v1)
- Multiple user levels

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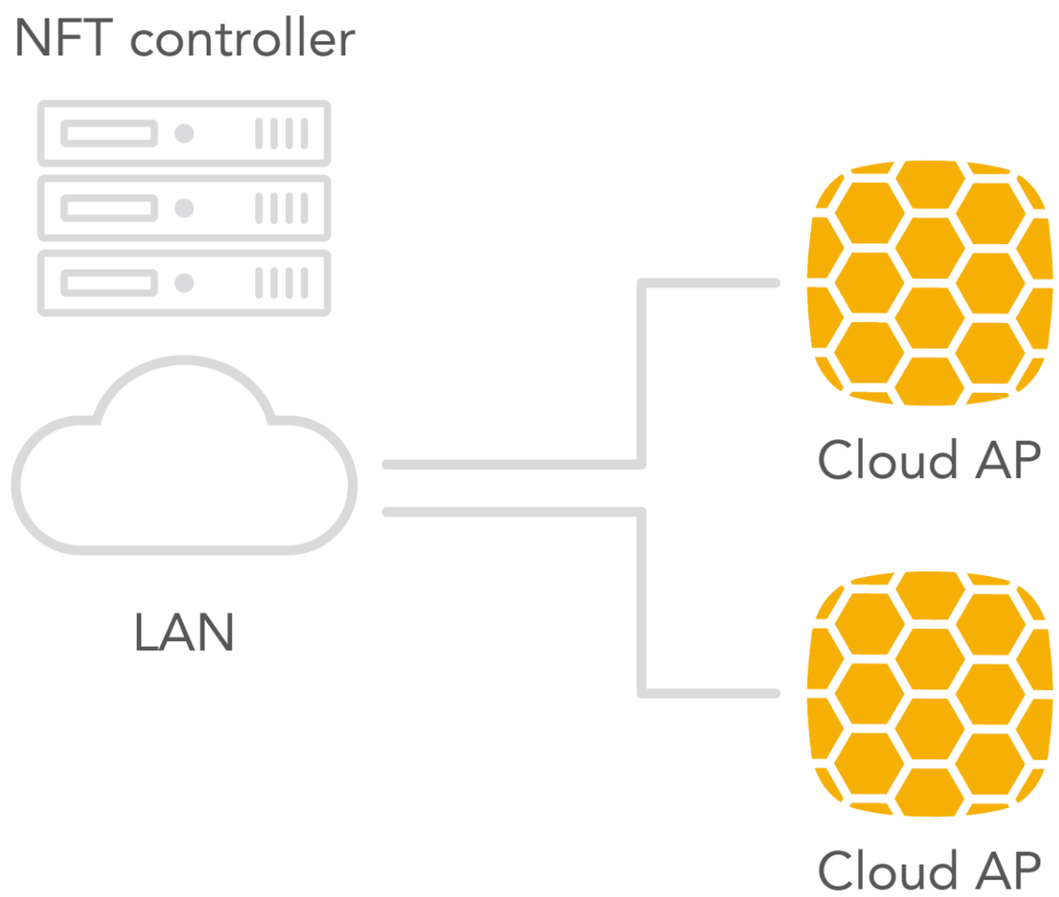
LAB 3 - External Controller: Office AP

External Controller

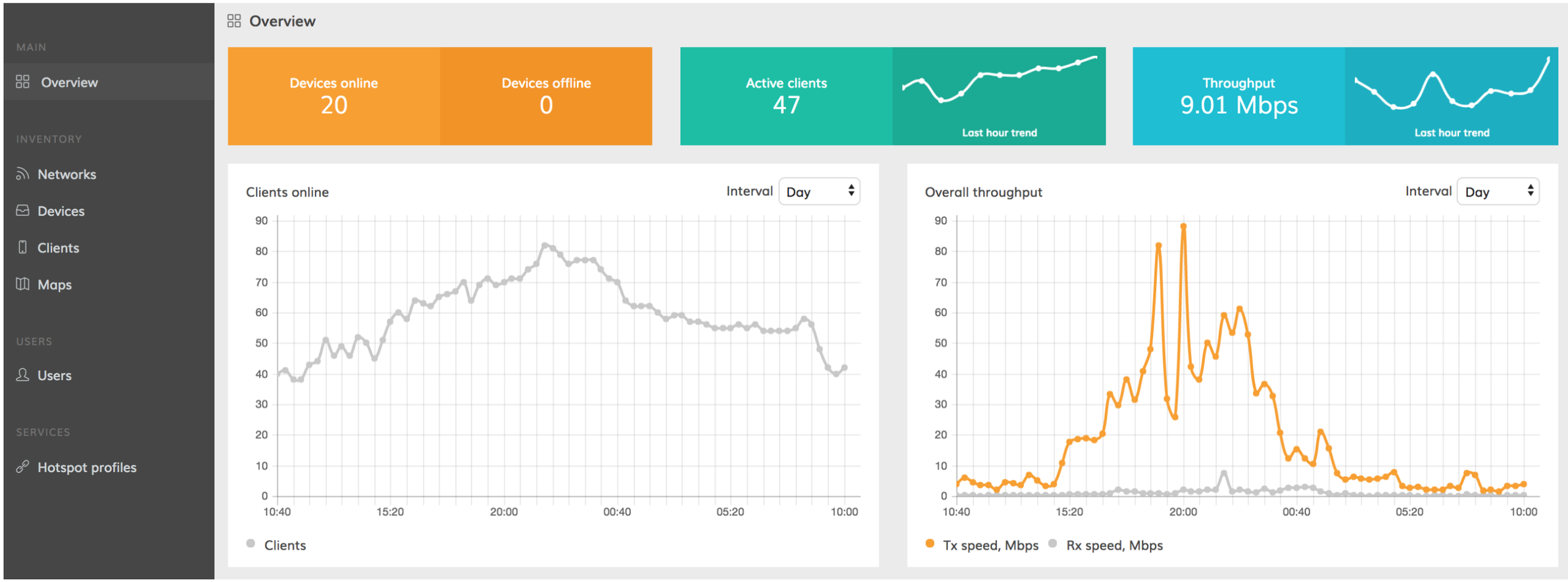


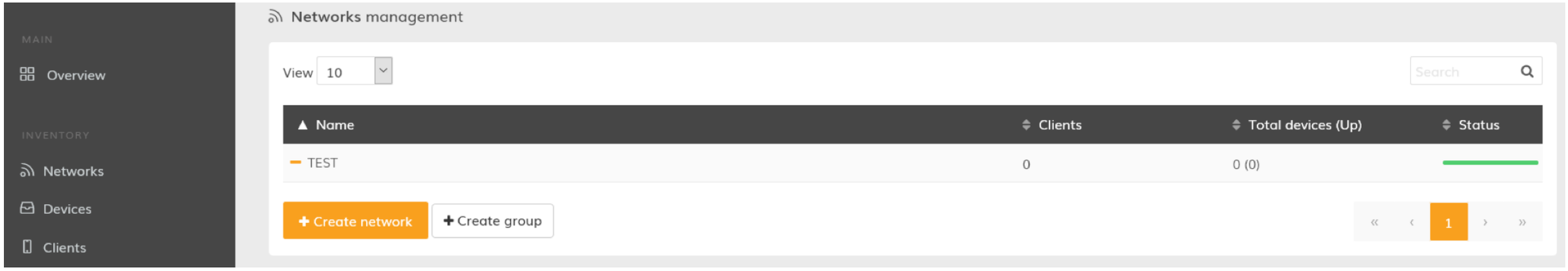
Copyright ©2018 LigoWave

LAB 3 - External Controller: Office AP

Copyright ©2018 LigoWave

LAB 3 - External Controller: Office AP





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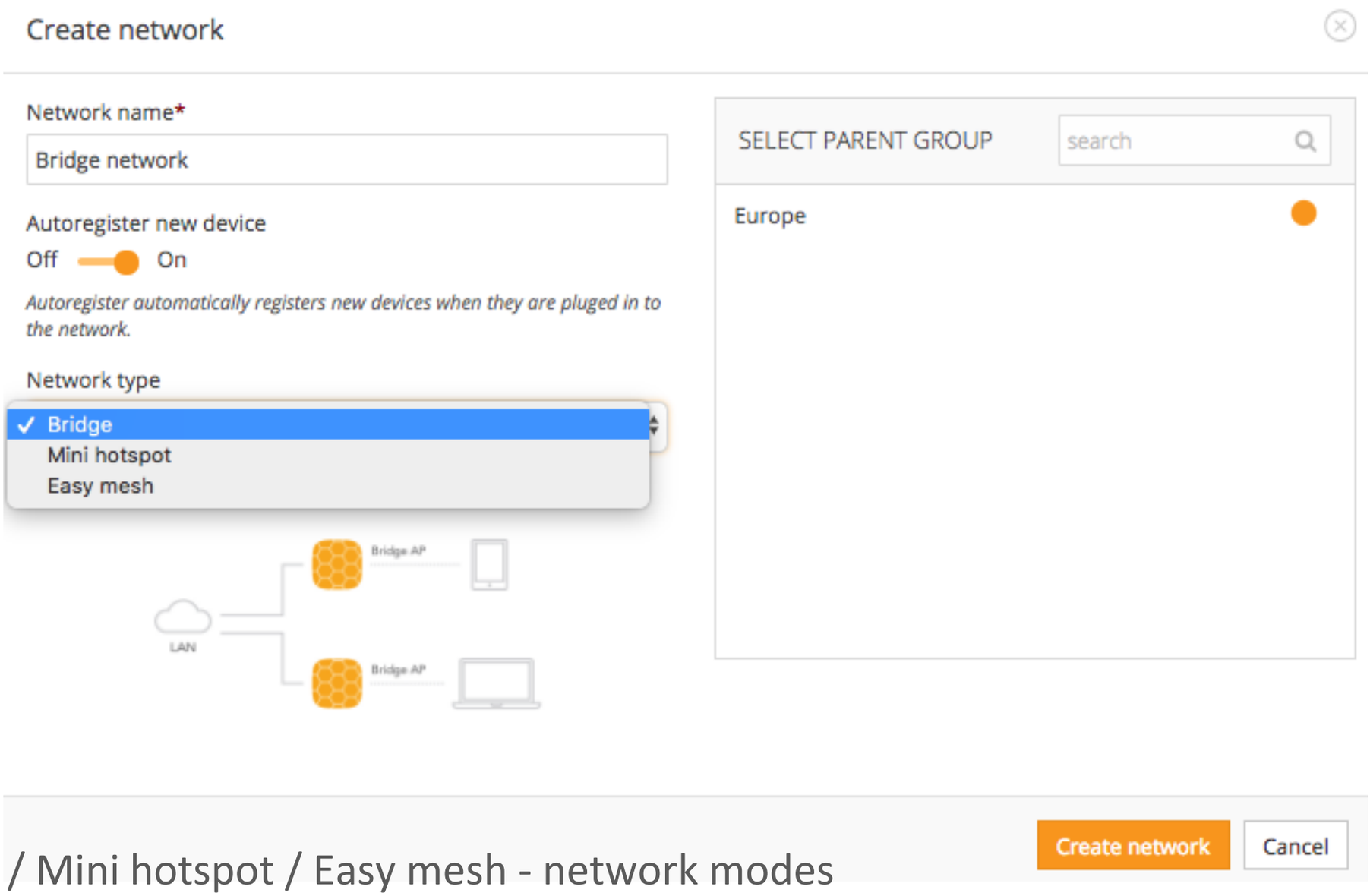
LAB 3 - External Controller: Office AP



- Bridge / Mini hotspot / Easy mesh - network modes
- Handy hierarchical structure
- Can fit any user scenario

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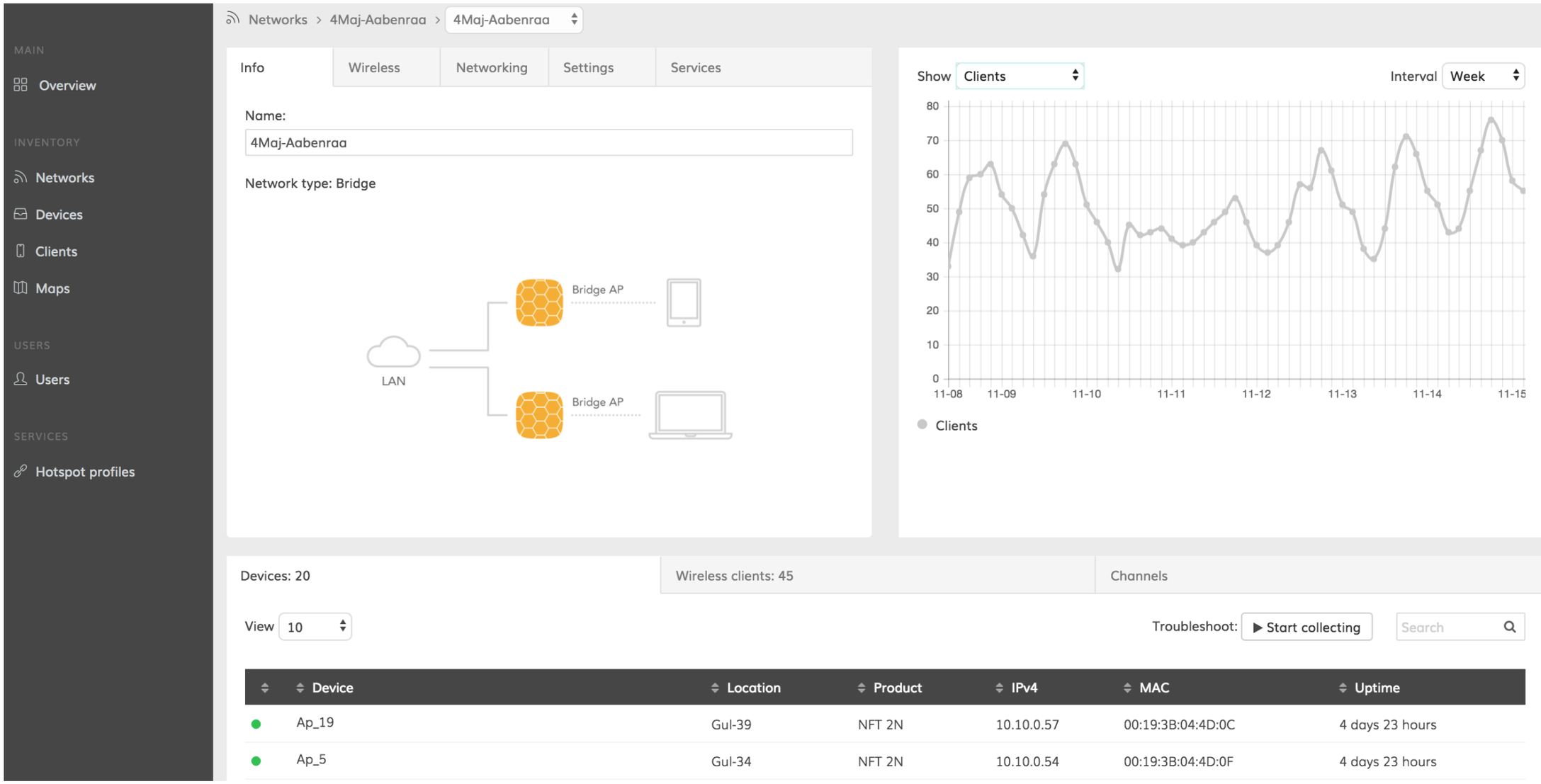
LAB 3 - External Controller: Office AP



- Network configuration / statistics window
- All basic information at a glance
- Global vs individual configuration

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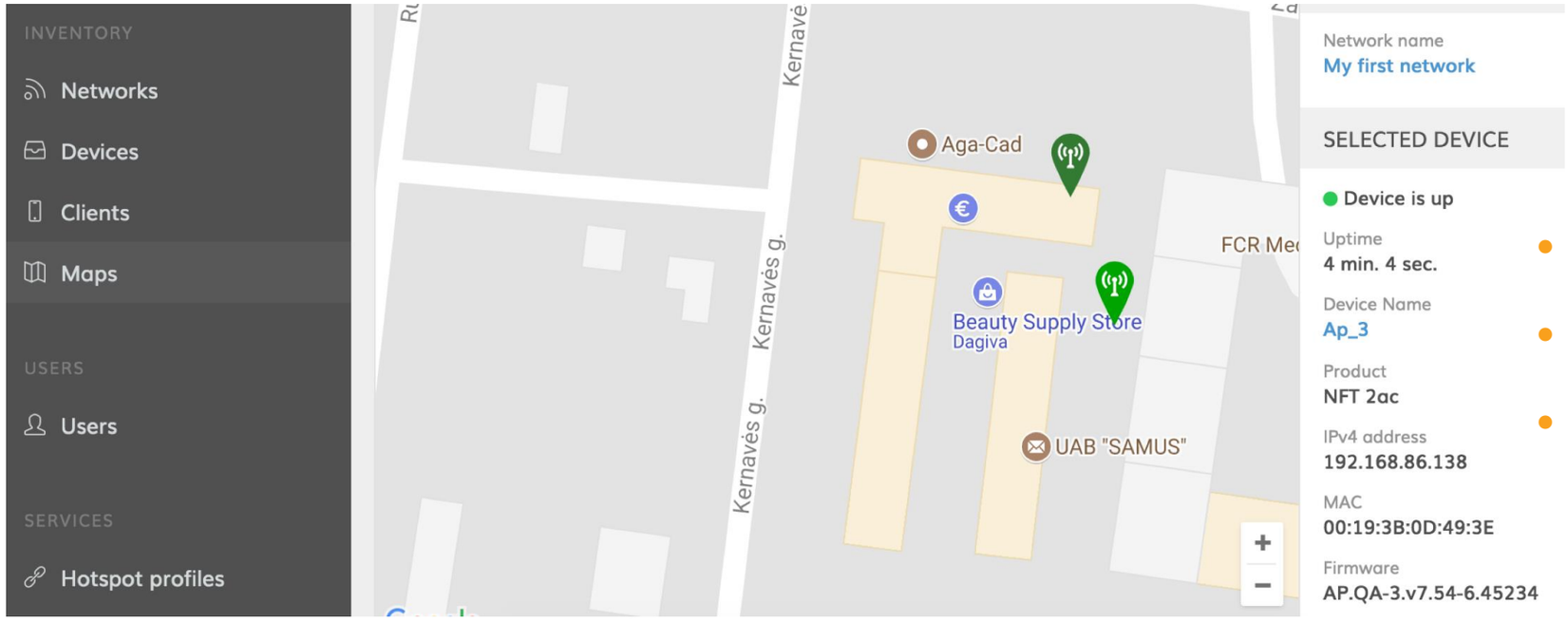
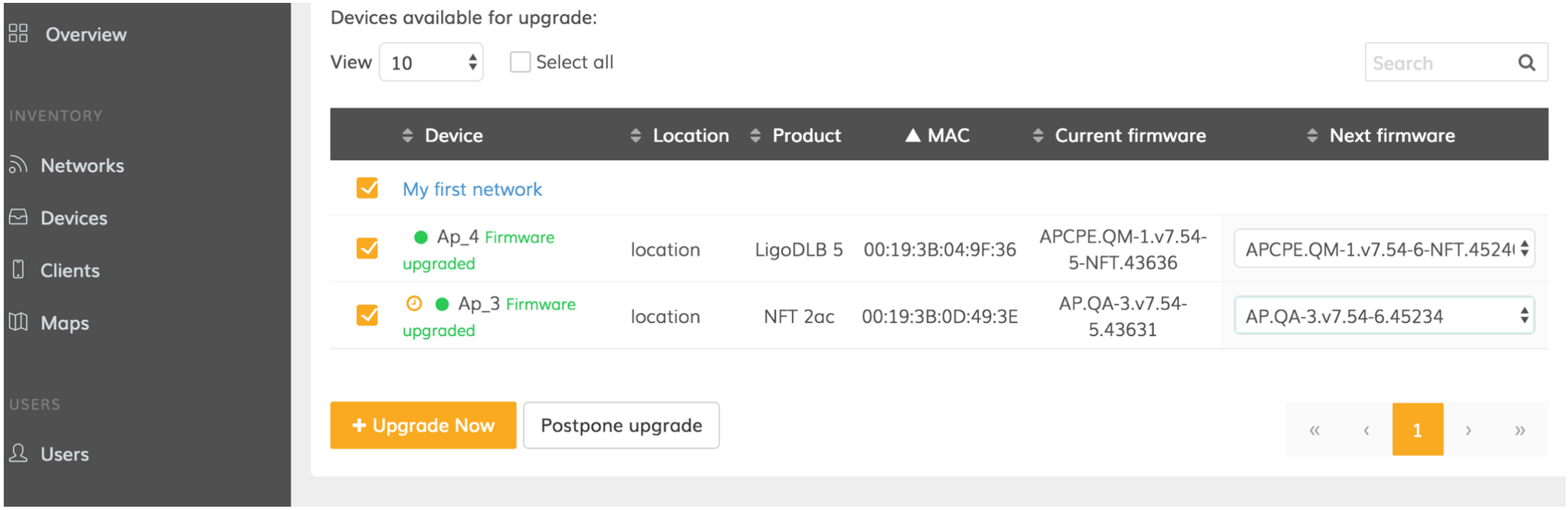
LAB 3 - External Controller: Office AP



- Centralised maintenance
- Scheduled firmware upgrades
- Visual representation



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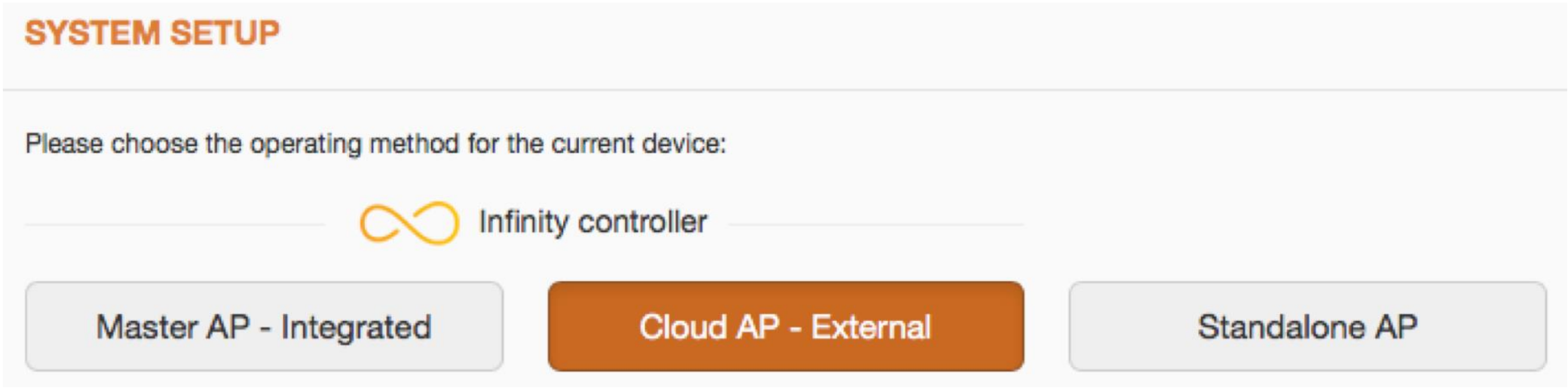
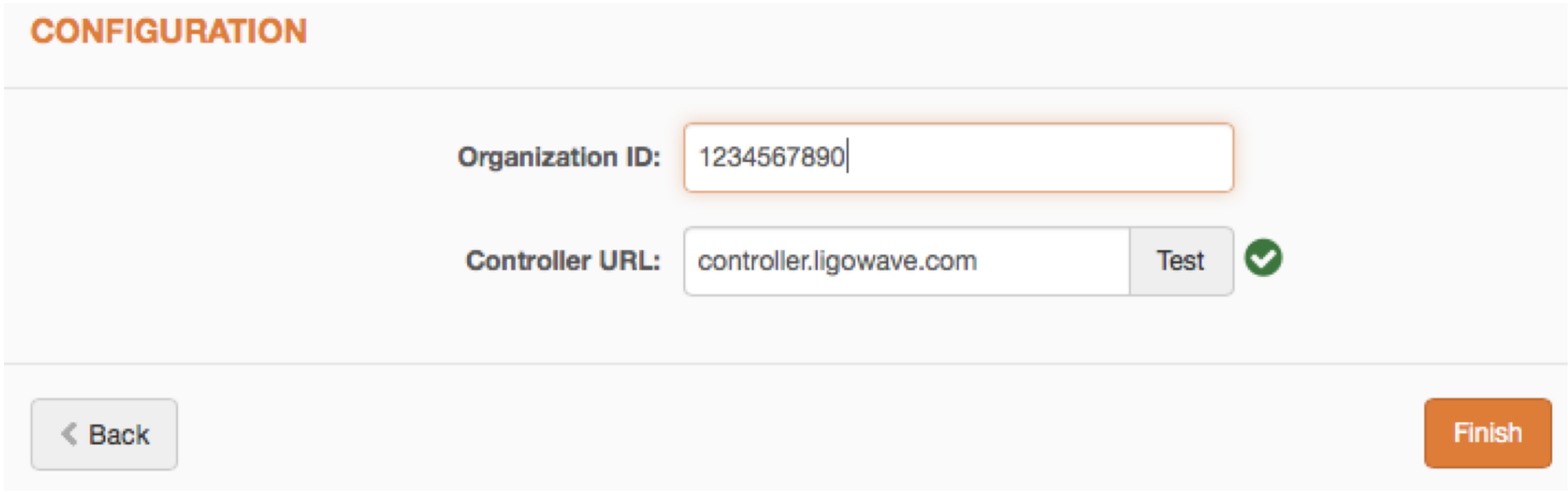
LAB 3 - External Controller: Office AP





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LAB 3 - External Controller: Office AP

- Goal - Configure the NFT device as a Cloud AP and register it on the Infinity Controller Cloud

- Register for you first NFT Controller account
- Create Bridge network and change the default settings
- Assign NFT and DLB_NFT devices to the controller. Perform tasks in the doc file.

- Finish line - Upgrade the latest firmware for both units from Cloud controller

- Delete both devices from the Controller. Select “reset to defaults" option

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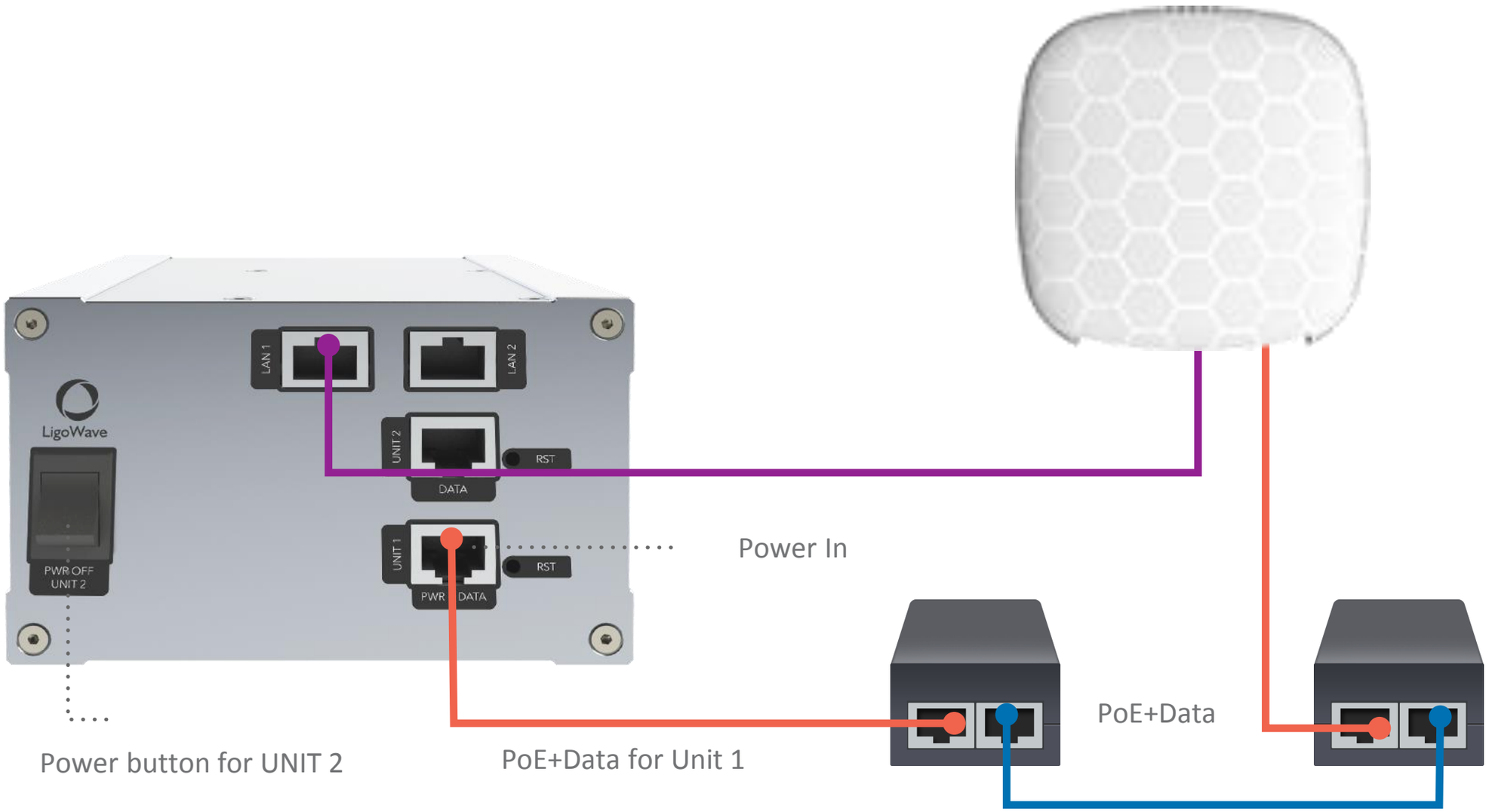
LAB 3 - External Controller



- Connect Internet to the first AP, then to second AP

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Mini-hotspot configuration

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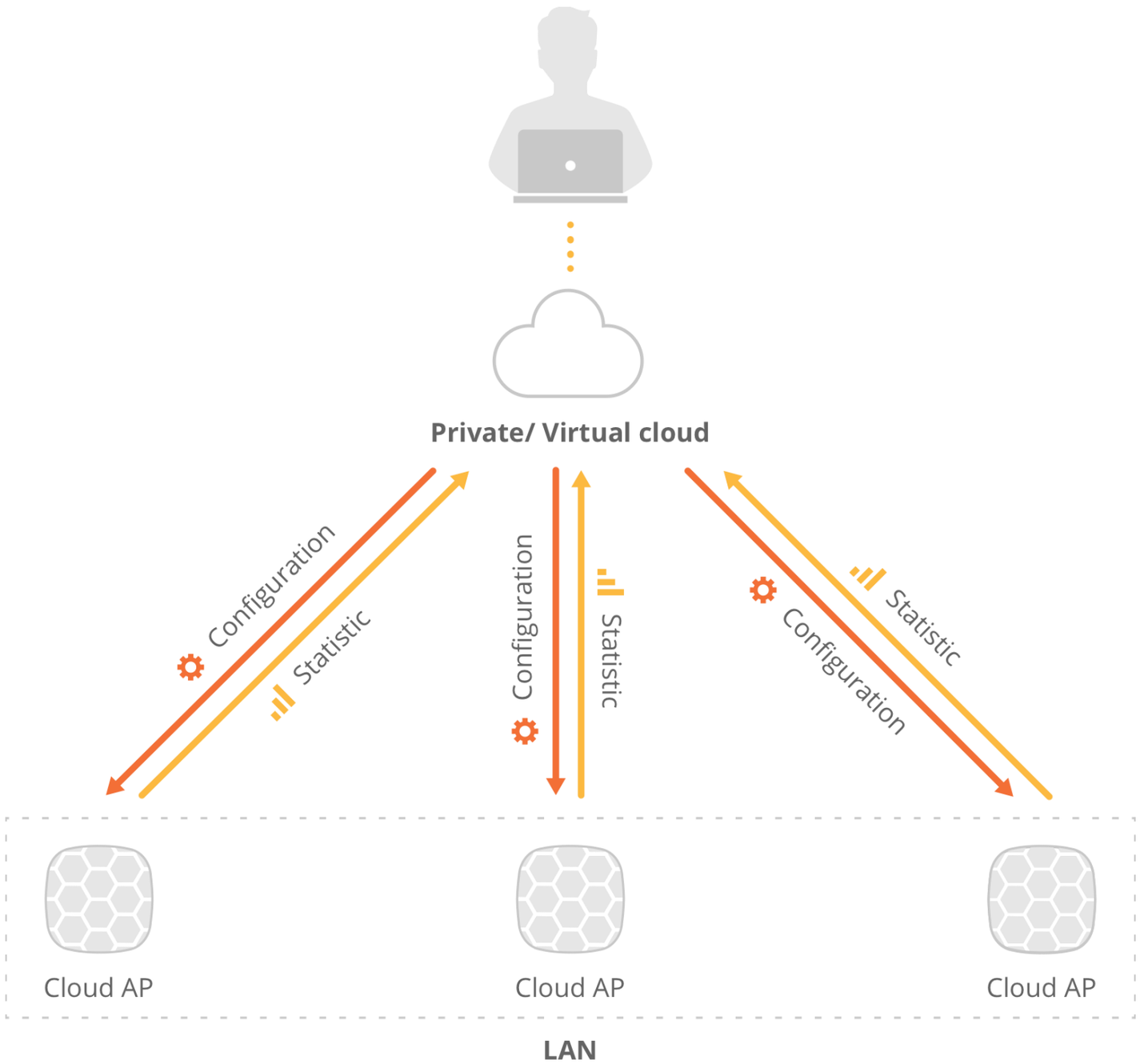
Mini Hotspot



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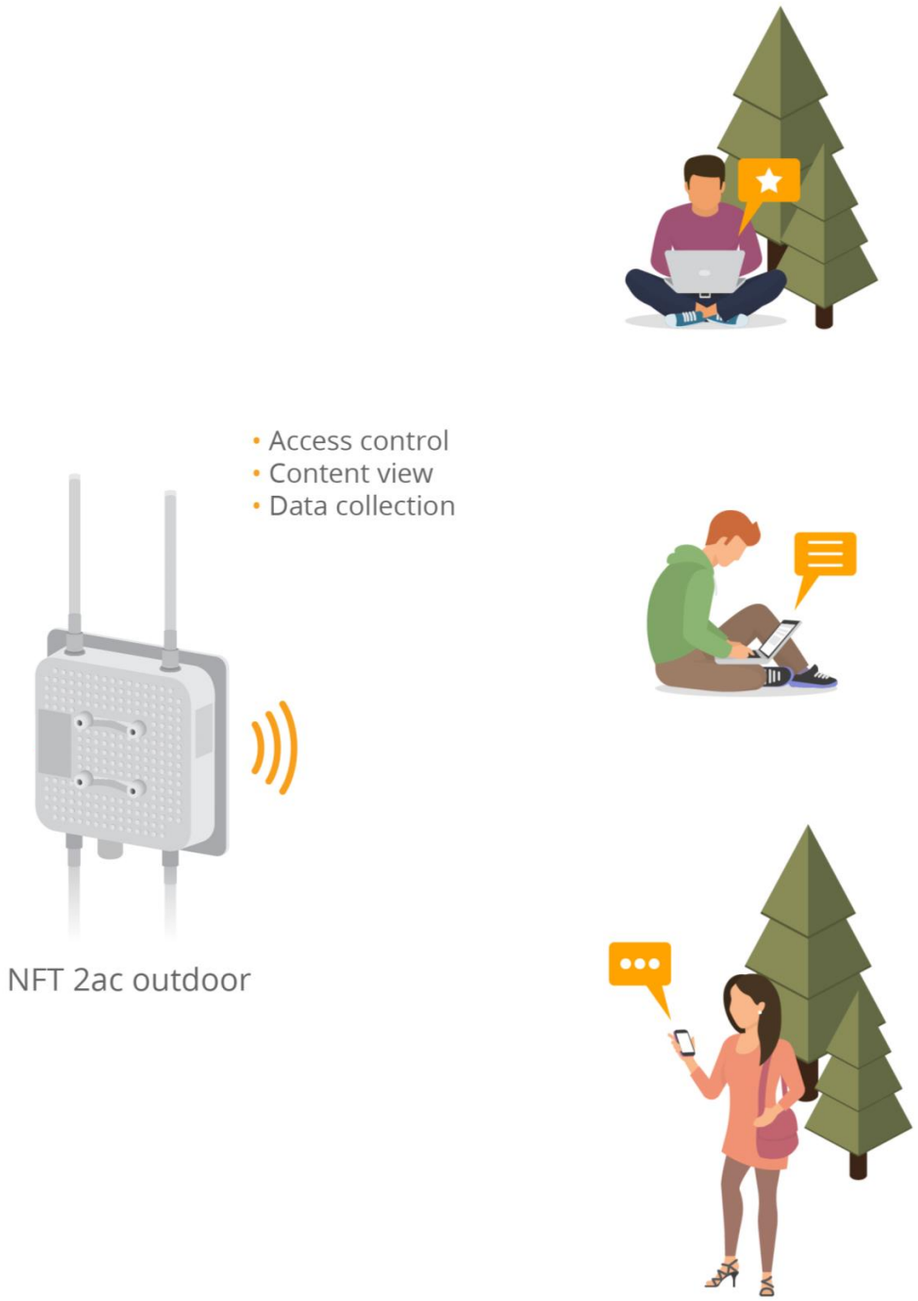
Mini Hotspot



- One NFT AP is designated as the gateway where UAM runs on
- Supports many AP in the same network
- Centralised authentication
- Easy roaming
- Recommended up to 100 simultaneous users sessions

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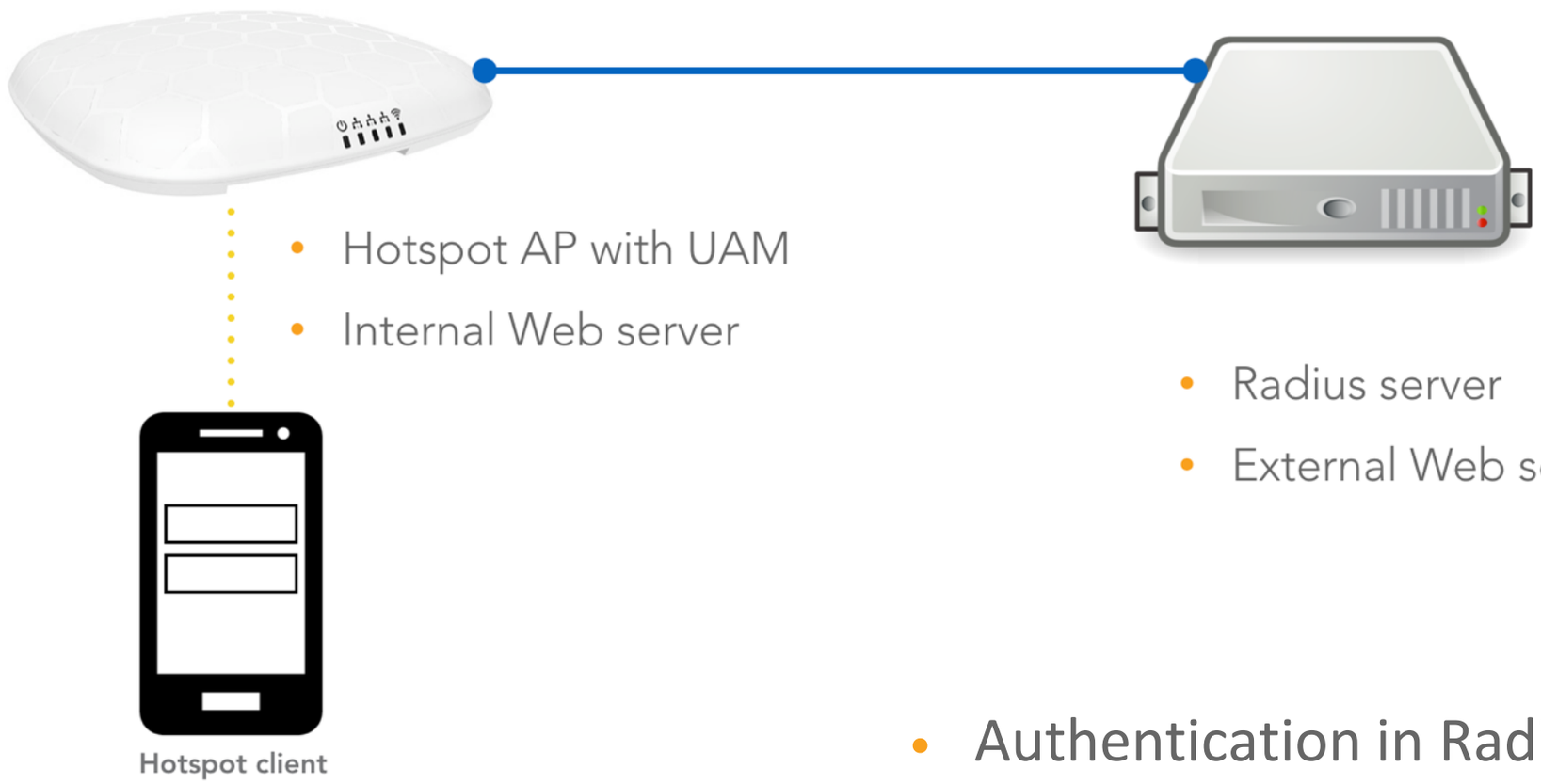
Mini Hotspot



- Hotspot AP with UAM
- Internal Web server

- Radius server
- External Web server

- Authentication in Radius server
- Internal / External web portal
- White / Black list feature

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INFINITY

Mini hotspot
PART I

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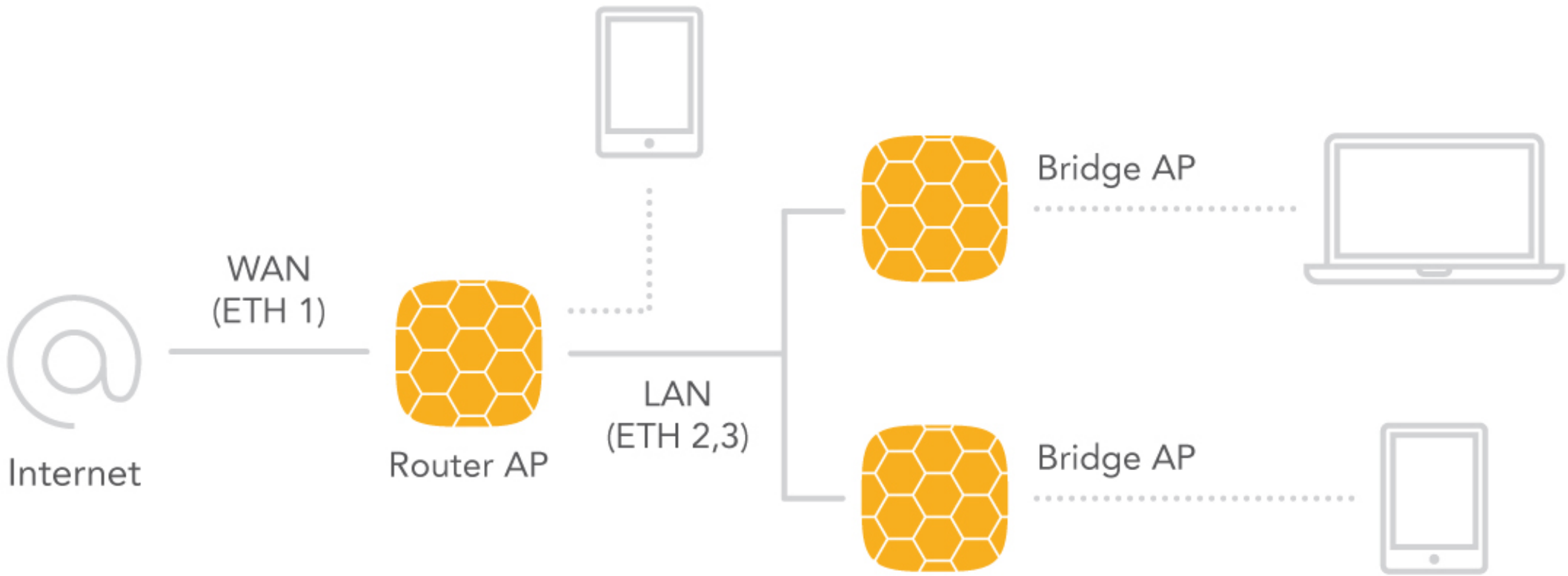
LAB 4 - External Controller: Mini Hotspot



- Centralized authenticator runs on Router AP
- AP can be interconnected without switches (on second ethernet ports)

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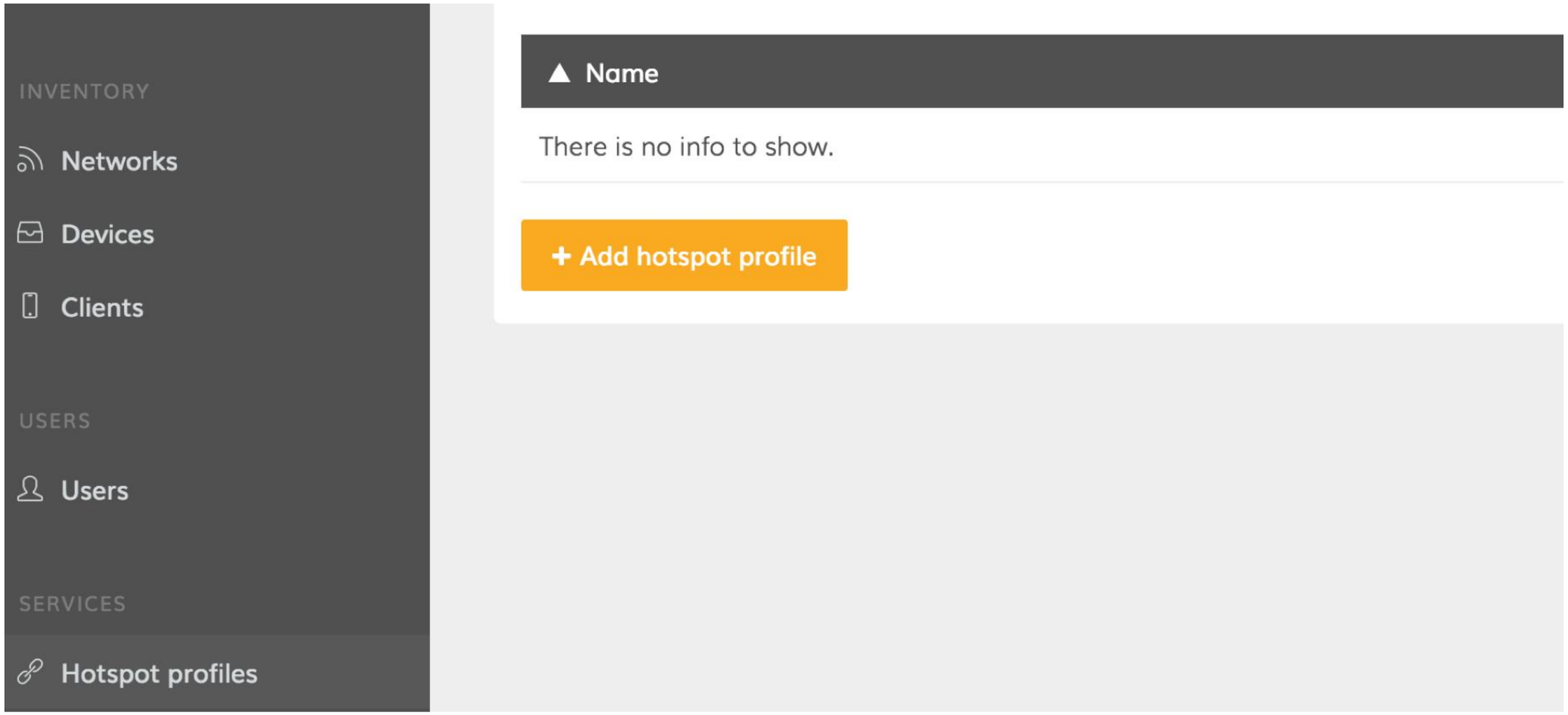
LAB 4 - External Controller: Mini Hotspot



- More than one Hotspot profile

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LAB 4 - External Controller: Mini Hotspot

Hotspot


```
      "mode": "interval",
      "url": ""
    },
    "blacklist": [],
    "whitelist": []
  },
  "radius": {
    "authport": 1812,
    "acctport": 1813,
    "secret": "tester321",
    "server2": "",
    "server1": "172.22.22.67"
  }
}
```


TEST

Save hotspot profile | Close

- Personalize default settings

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LAB 4 - External Controller: Mini Hotspot

- Radius server parameters
- Change web portal mode
- Empty blacklist


```
"radius":
  "server1": "54.247.117.188",
  "acctport": 1813,
  "secret": "secret_passsowrd",
  "server2": "79.125.111.180",
  "authport": 1812
 "nasid": "NFT",
 "web": {
  "internal": {},
"mode": "internal",
"external": {

  "blacklist": [],
  "whitelist": [}
   ],
```


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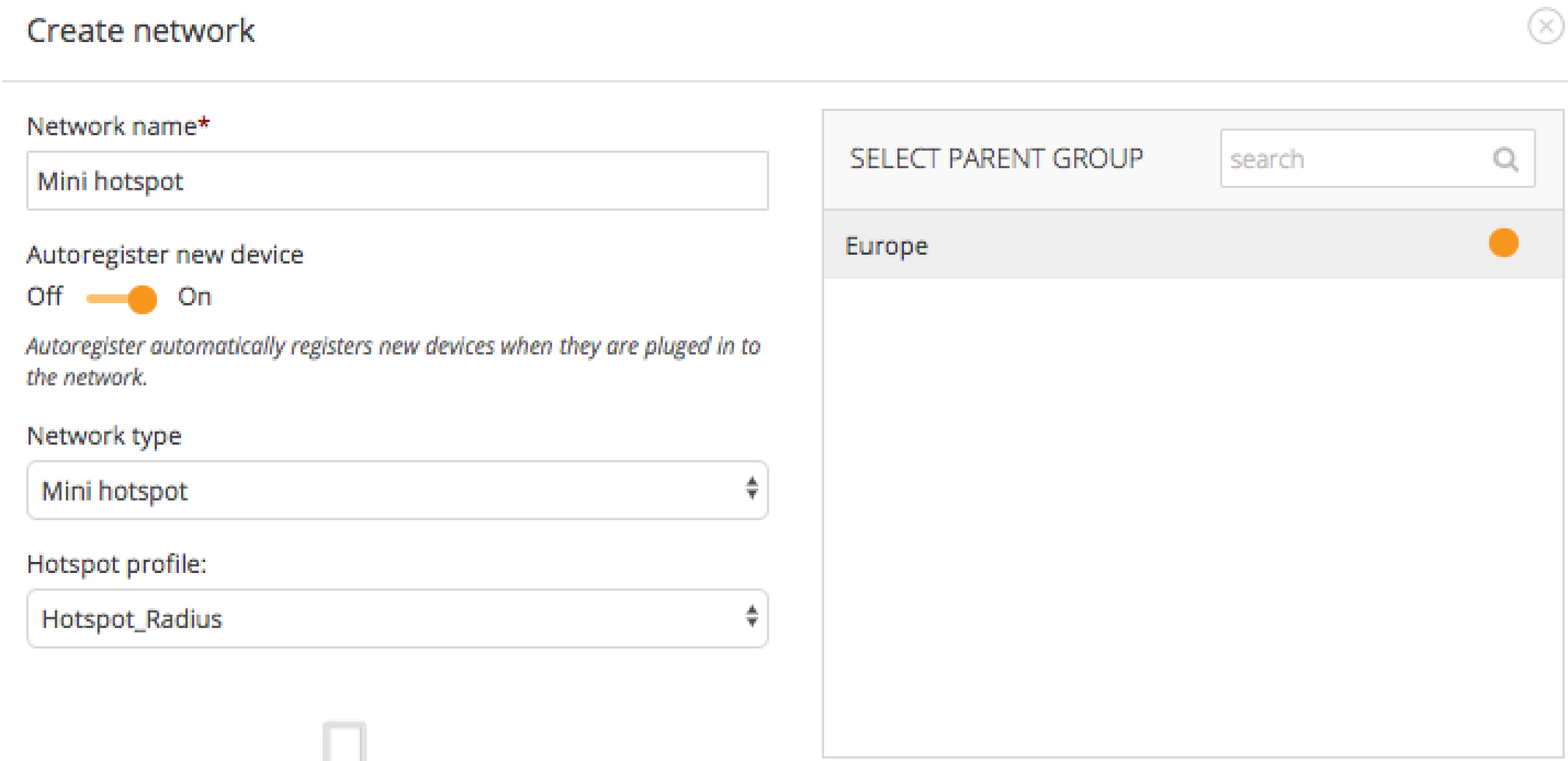
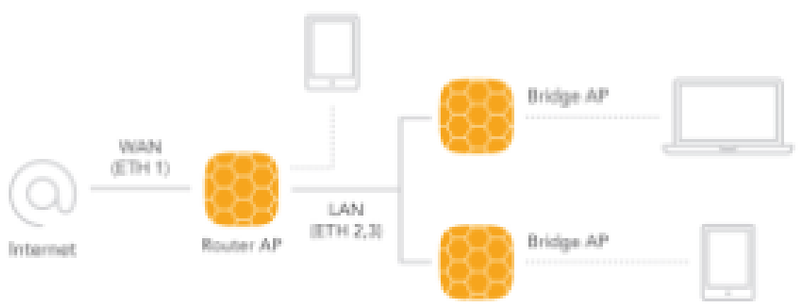
LAB 4 - External Controller: Mini Hotspot





- New network - Mini hotspot
- Assign created Hotspot profile

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LAB 4 - External Controller: Mini Hotspot

VAP Configuration

INFORMATION

Bands: 2G 5G

SSID:* RAMUUNAS

Broadcast SSID: Off On

SECURITY

Security mode:* UAM

Hotspot profile: Hotspot_Radius

Custom settings: Off On

NETWORKING

VLAN ID:* 30

Network address:* 192.168.4.0

Subnet mask:* 255.255.255.0

- Personalize wireless parameters
- Leave Security mode set to UAM!!!

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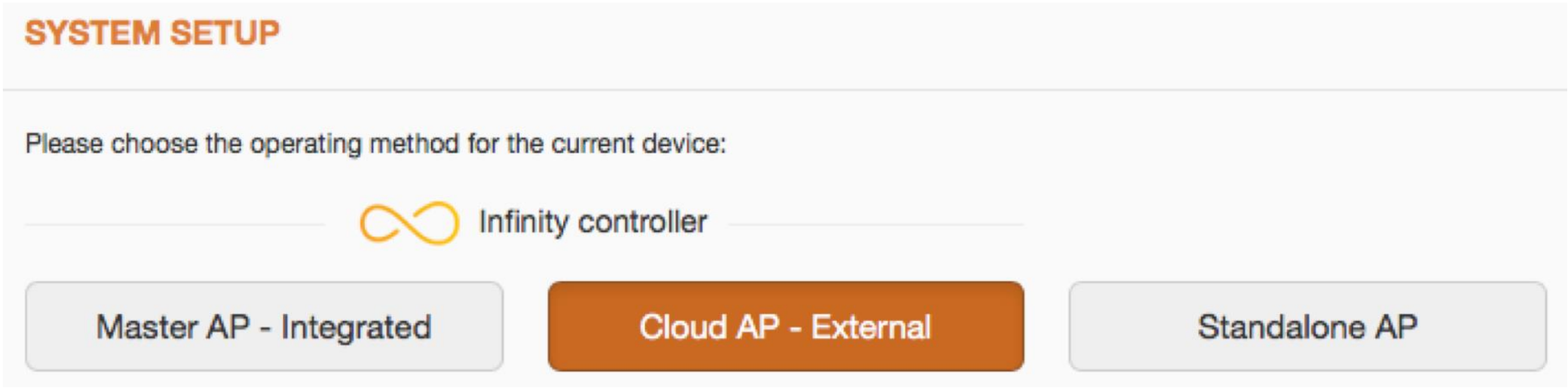
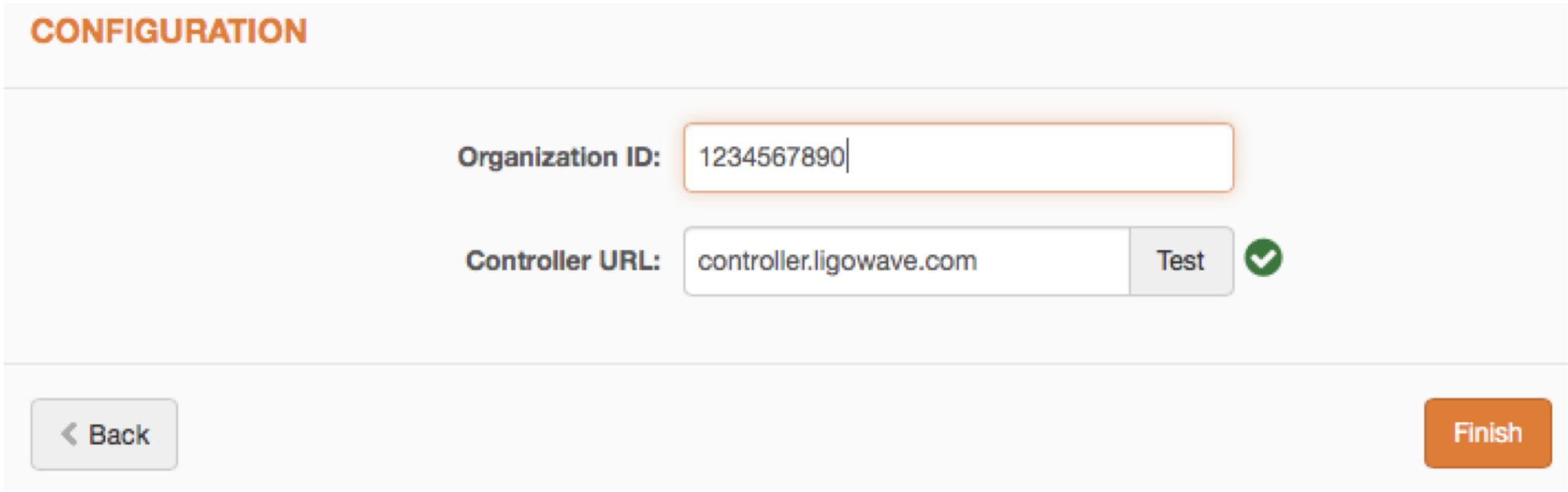
LAB 4 - External Controller: Mini Hotspot





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LAB 4 - External Controller: Mini Hotspot

- Goal 1 - Have the device assigned to the Mini Hotspot network

- Create new Hotspot profile and assign it to the Mini Hotspot network
- Change the default parameters: SSID, discovery, default login
- Assign the NFT device to the Mini Hotspot network, decrease Tx power

- Successfully redirect the end client to the web portal

- Finish line - Check White / Black list functionality

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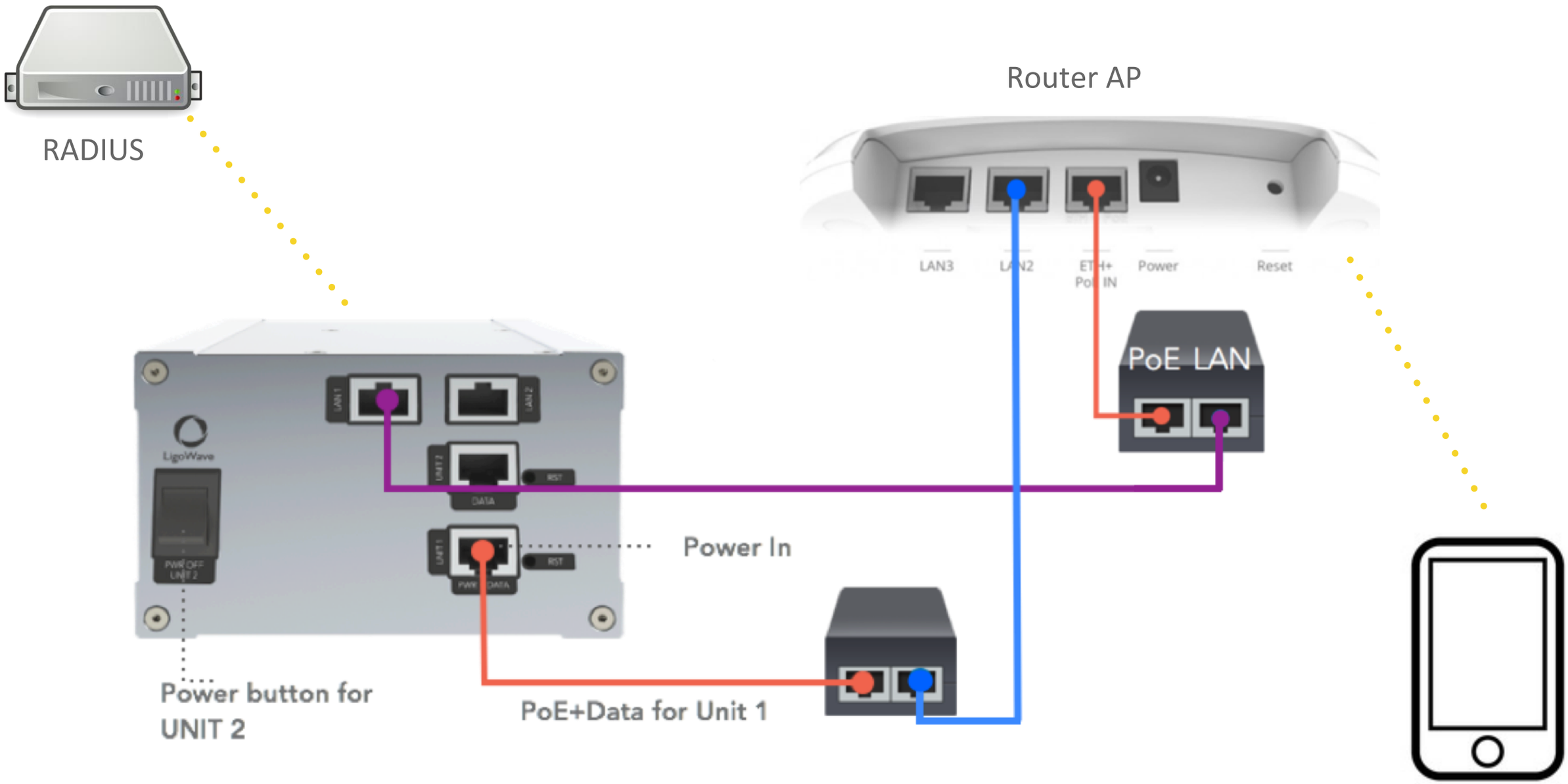
LAB 4 - External Controller: Mini Hotspot



1. Provide Internet access to the first AP, which will be a Router AP
2. Connect the second AP, which is Unit 1 on a training box

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INFINITY

Mini hotspot
PART II

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LAB 4 - External Controller: Mini Hotspot

- Goal 1 - Have the DLB.NFT device assigned to Mini Hotspot network

- Assign the DLB.NFT device to Mini hotspot network
- Know how to answer the questions in the doc file

- Finish line - Revert the DLB.NFT unit back to the LigoDLB 5 firmware

- Follow the steps on the LigoWave wiki page:

https://www.ligowave.com/wiki/faq/#faq-2581

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INFINITY

Easy-mesh configuration

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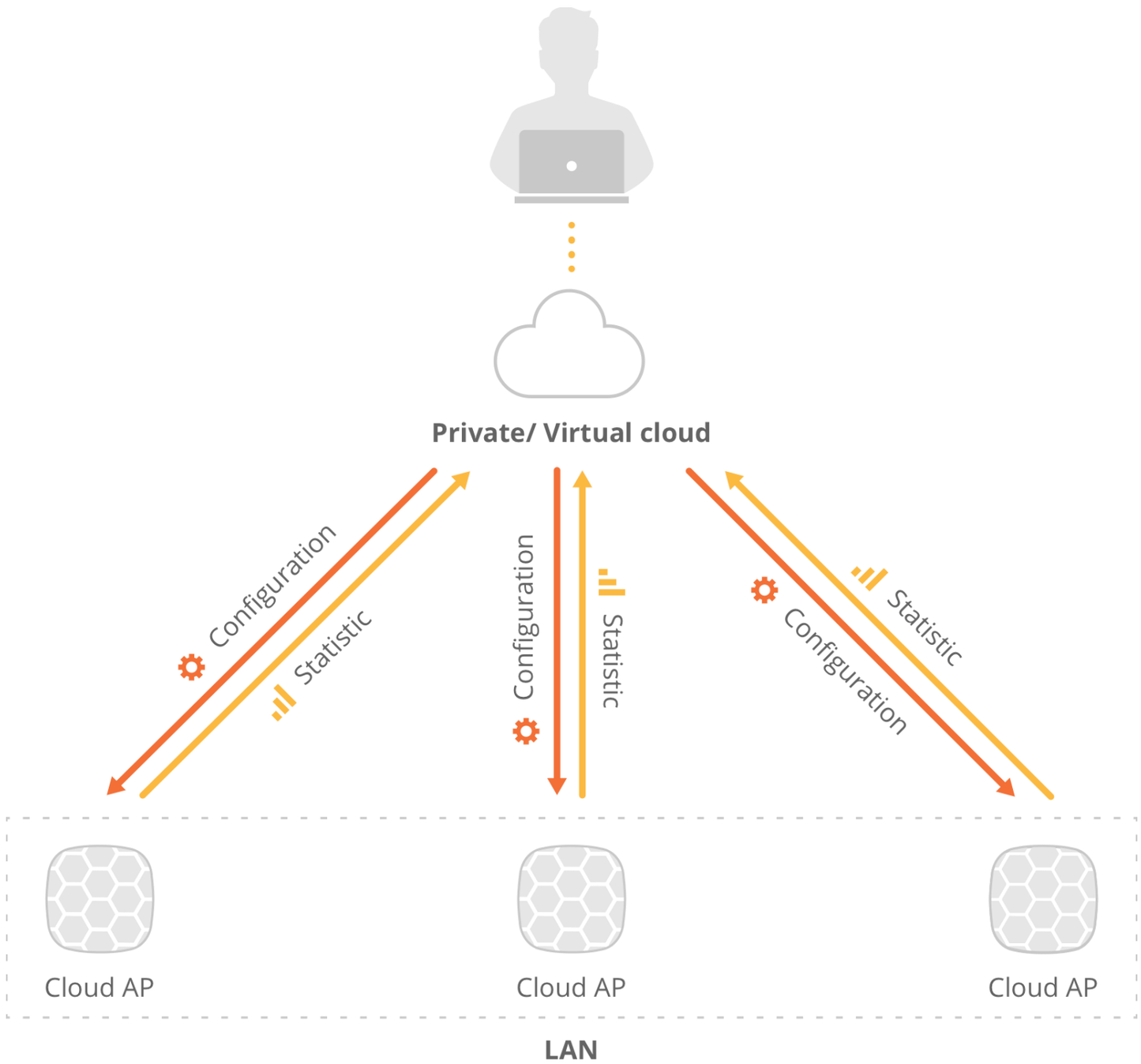
Easy Mesh



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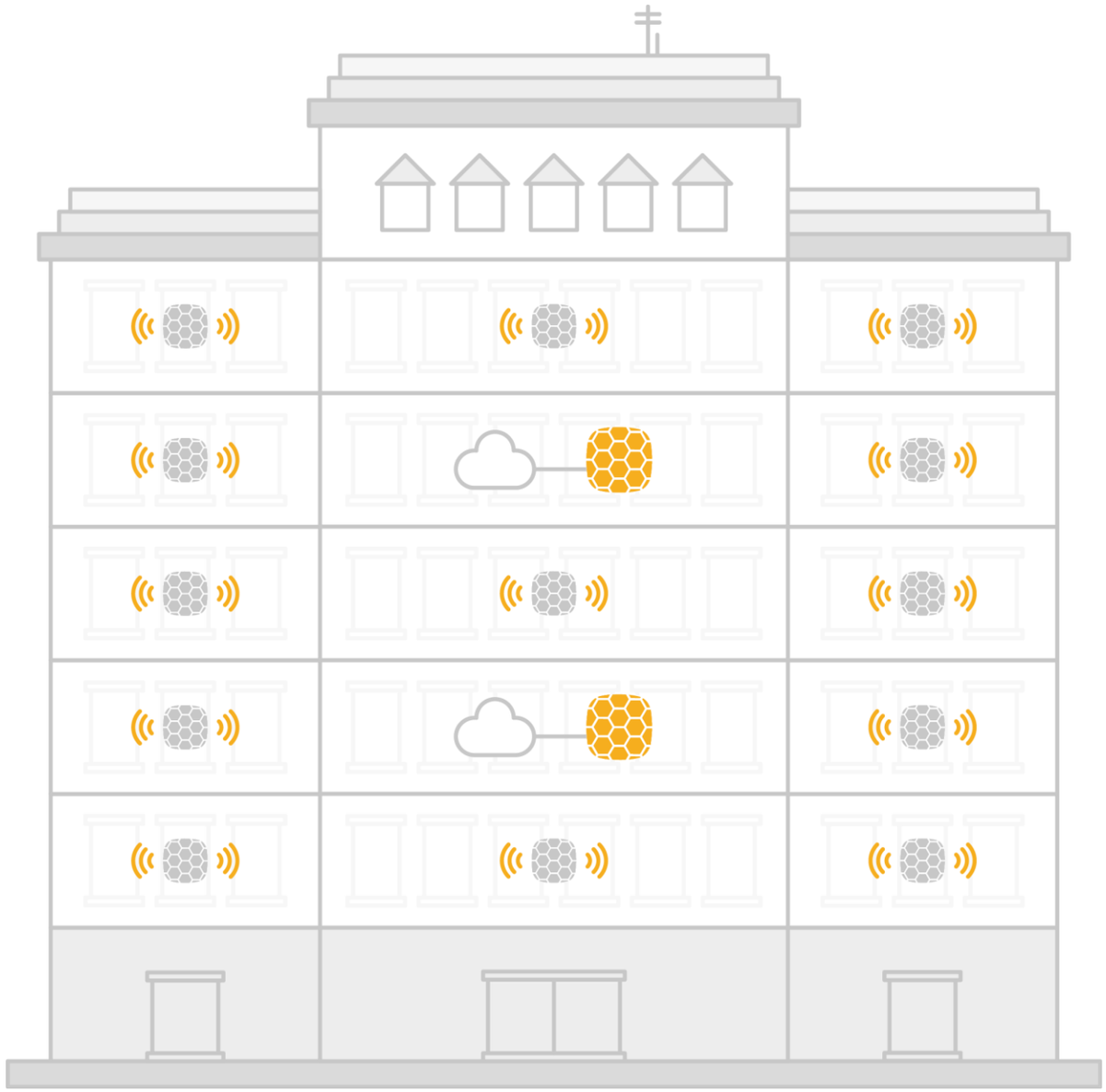
Easy Mesh advantages



- Very fast and easy installation
- Useful in locations without wired infrastructure
- Any AP can create a simple mesh network (including DLB models)
- Redundancy: multiple mesh AP supported
- Mesh can be enabled from the NFT Controller or from the default config
- It’s free. Available in standalone and cloud version of external controller

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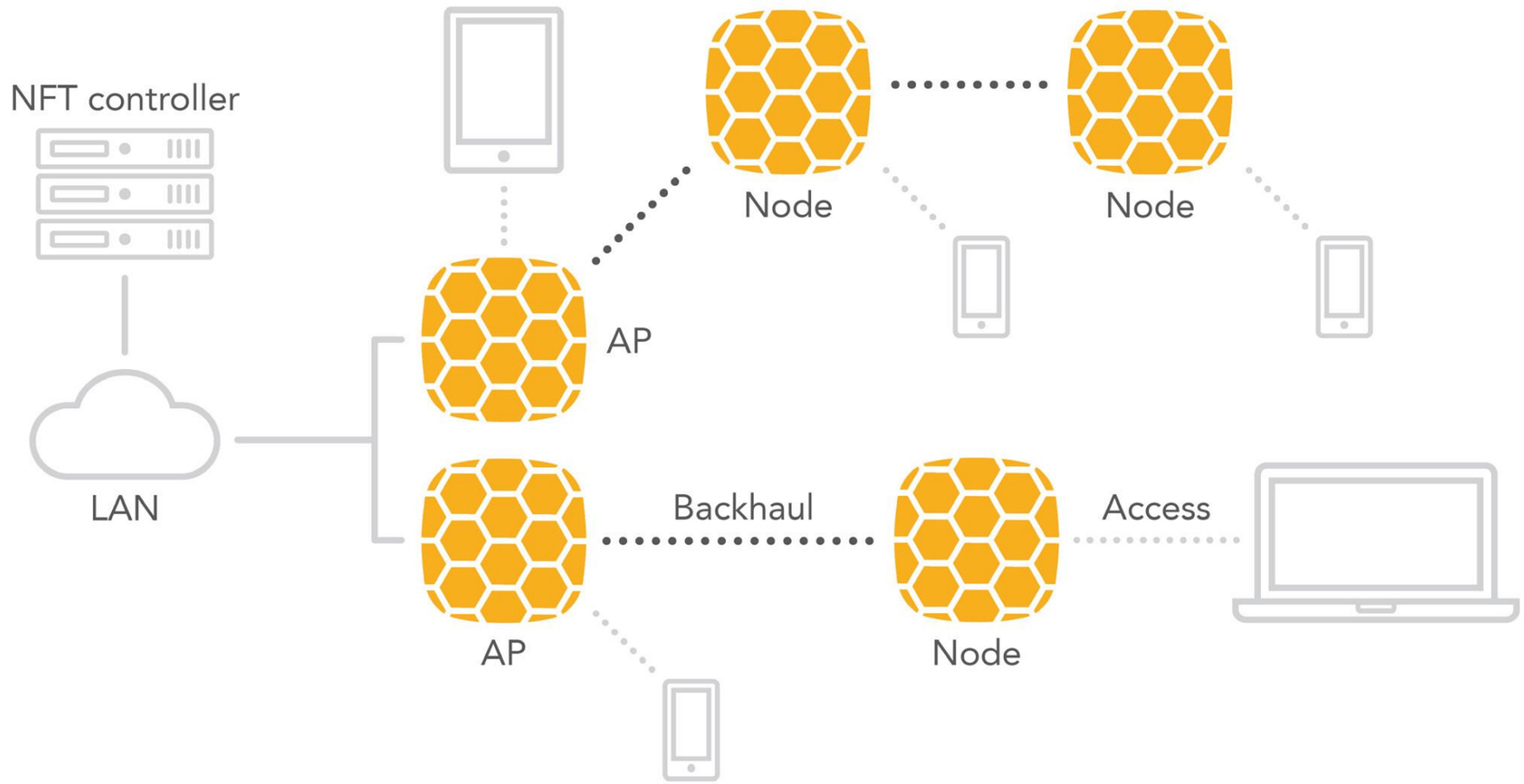
Easy Mesh terminology



- Mesh AP – an AP that has a wired connection to the network and which provides wireless access to end users as well to Node APs.
- Node AP – an AP that is connected wirelessly to another node AP or to a Mesh AP and which provides wireless access to end users and can serve as a backhaul connection to other Node APs.

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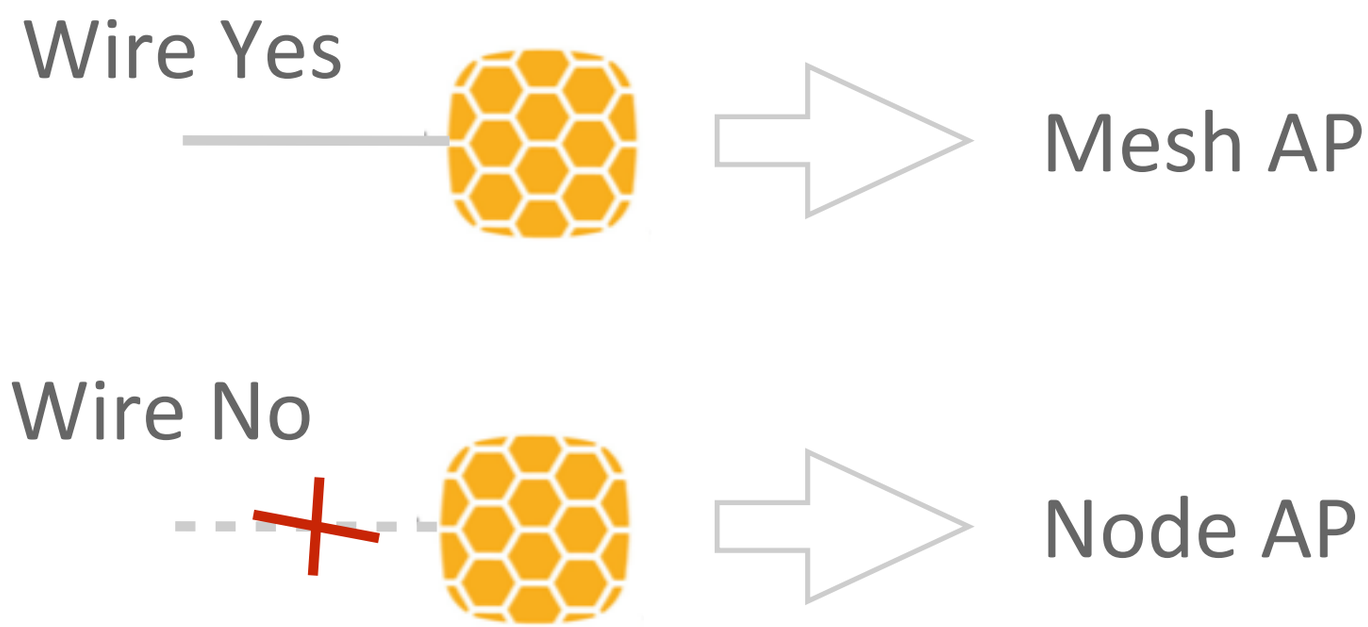
Understanding the algorithm

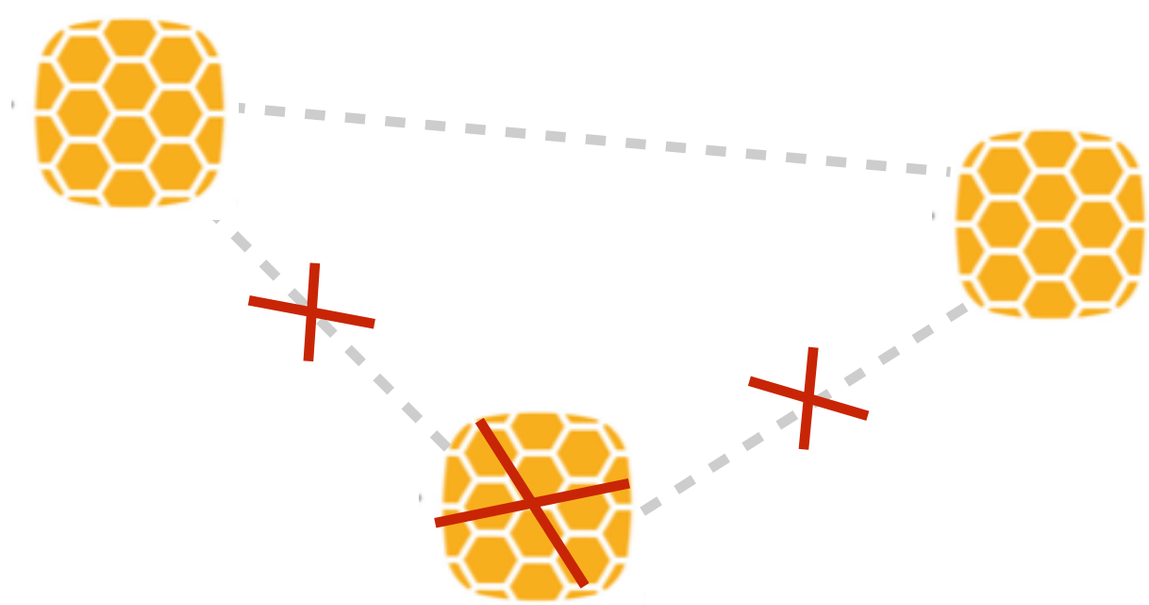
1

Auto switching



2

Redundancy



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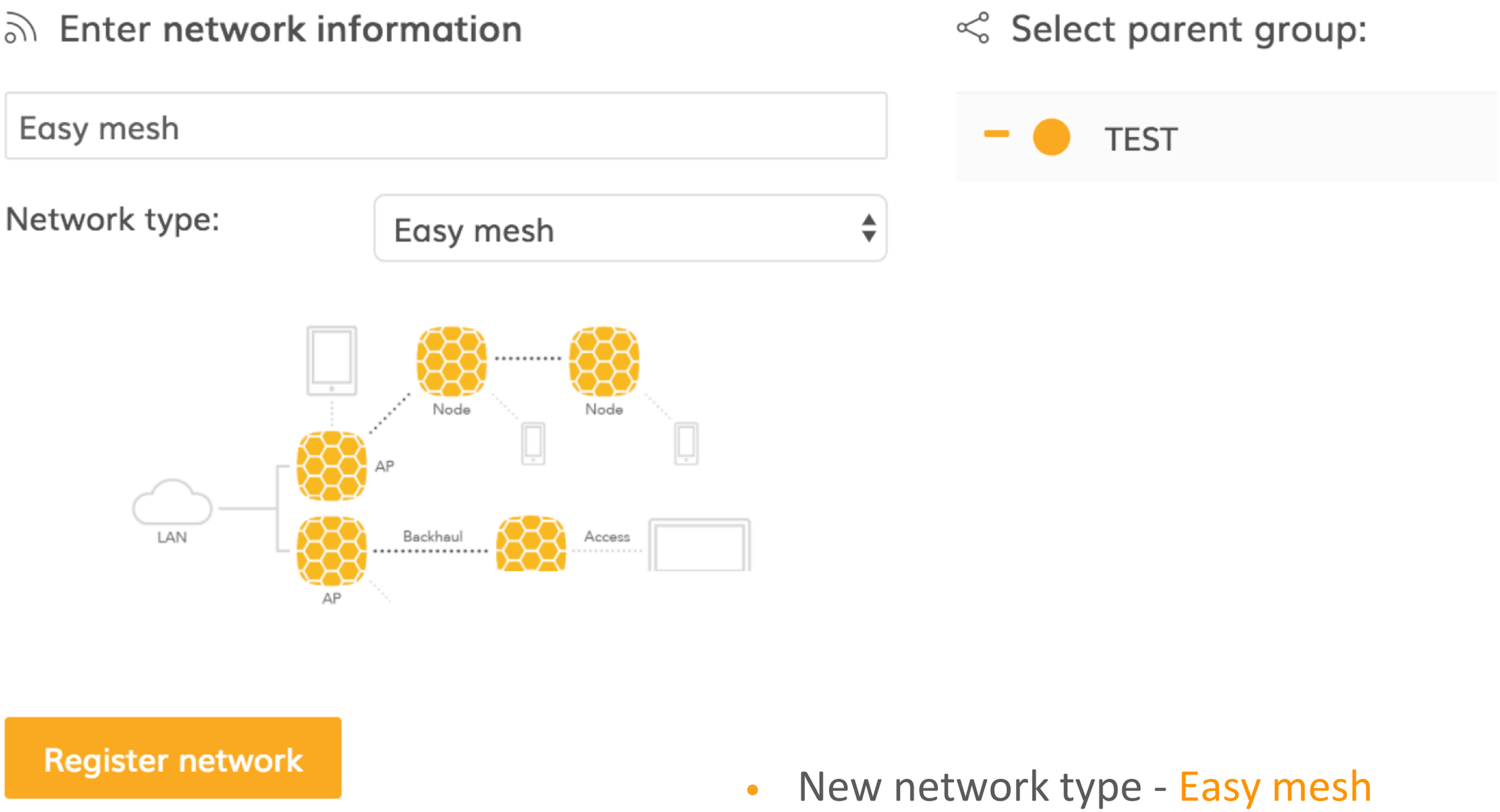
LAB 5 - External Controller: Easy Mesh



- New network type - Easy mesh

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LAB 5 - External Controller: Easy Mesh

VIRTUAL APS

SSID	Band	Broadcast SSID	Security	Type
RAMUUUNAS	2G / 5G	ON	WPA/WPA2 Personal	Access
Backhaul	2G / 5G	OFF	Open	Backhaul

- Two VAPs - for access and backhaul
- If the device has no wired connection, it will create an additional virtual station interface and will look for an access point with the “Backhaul” SSID.

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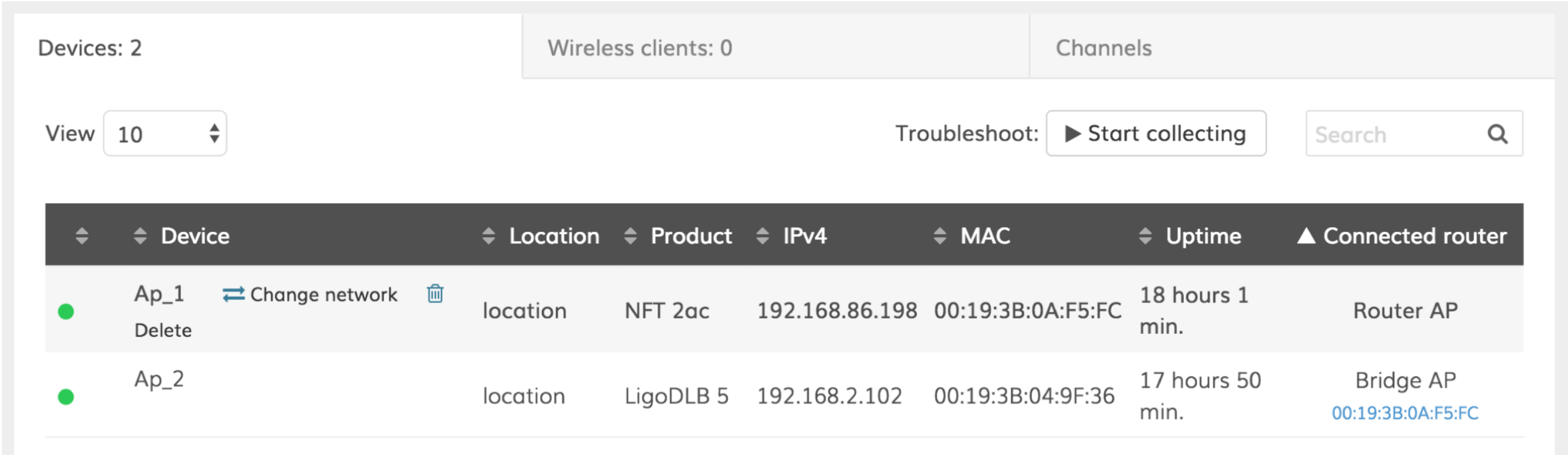
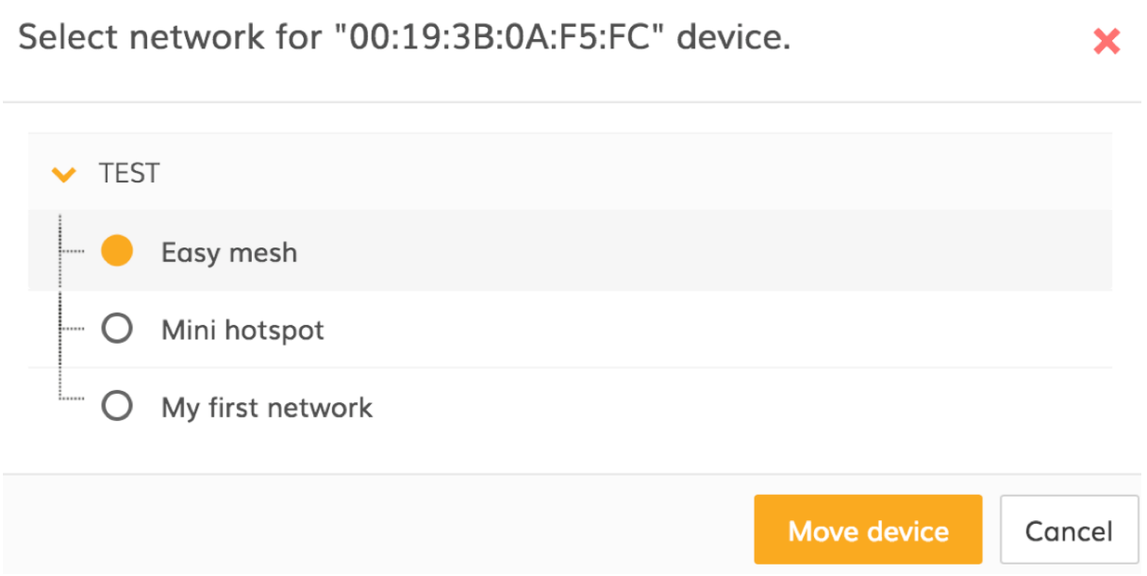
LAB 5 - External Controller: Easy Mesh



- Use another controller functionality and move the NFT unit from the Mini Hotspot network to Easy Mesh



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LAB 5 - External Controller: Easy Mesh

- Goal 1 - Have two NFT devices assigned to the Easy Mesh network

- Create a new Easy Mesh network
- Change the default parameters: SSID, discovery, default login
- Move the NFT device from the Mini Hotspot to the Easy Mesh network

- Assign second NFT device to the Easy mesh network
- Know how to answer the questions in the doc file

- Finish line - Reset both devices to the default configuration

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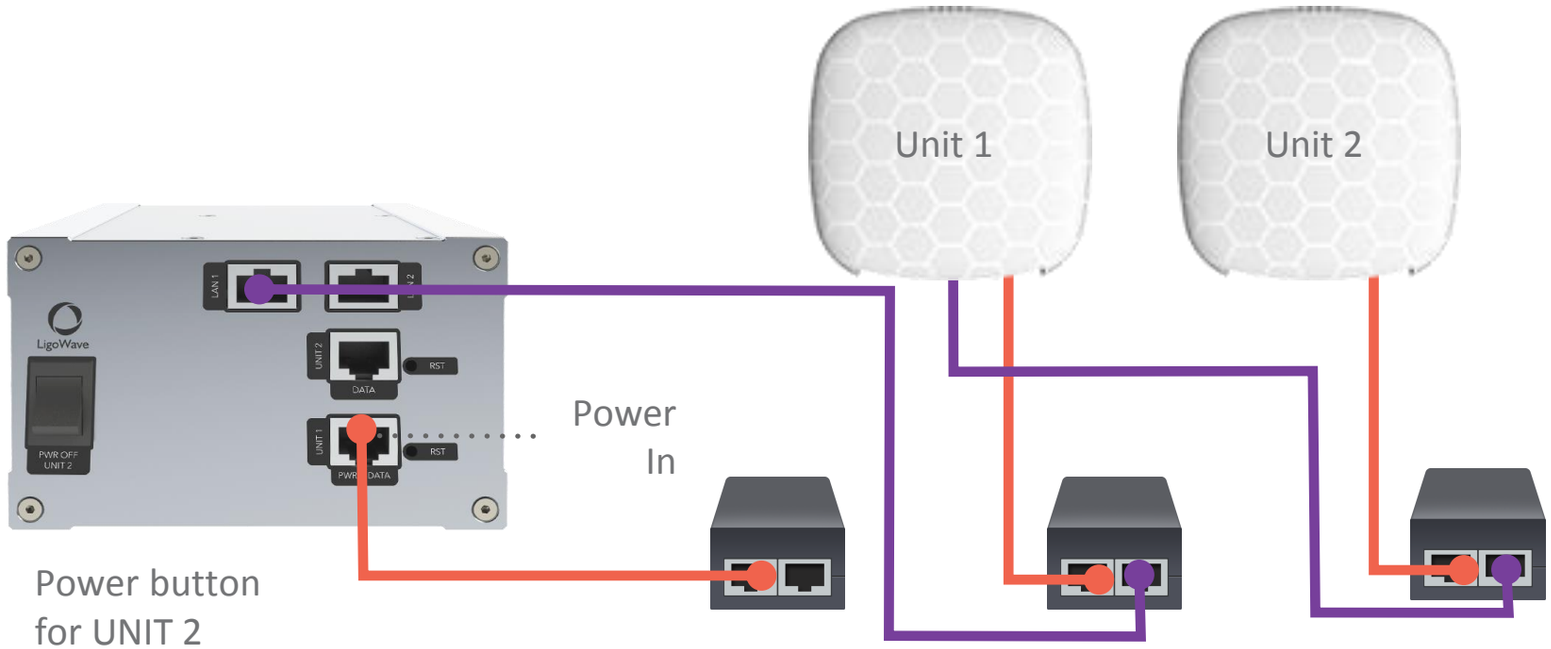
LAB 5 - External Controller: Easy Mesh

1



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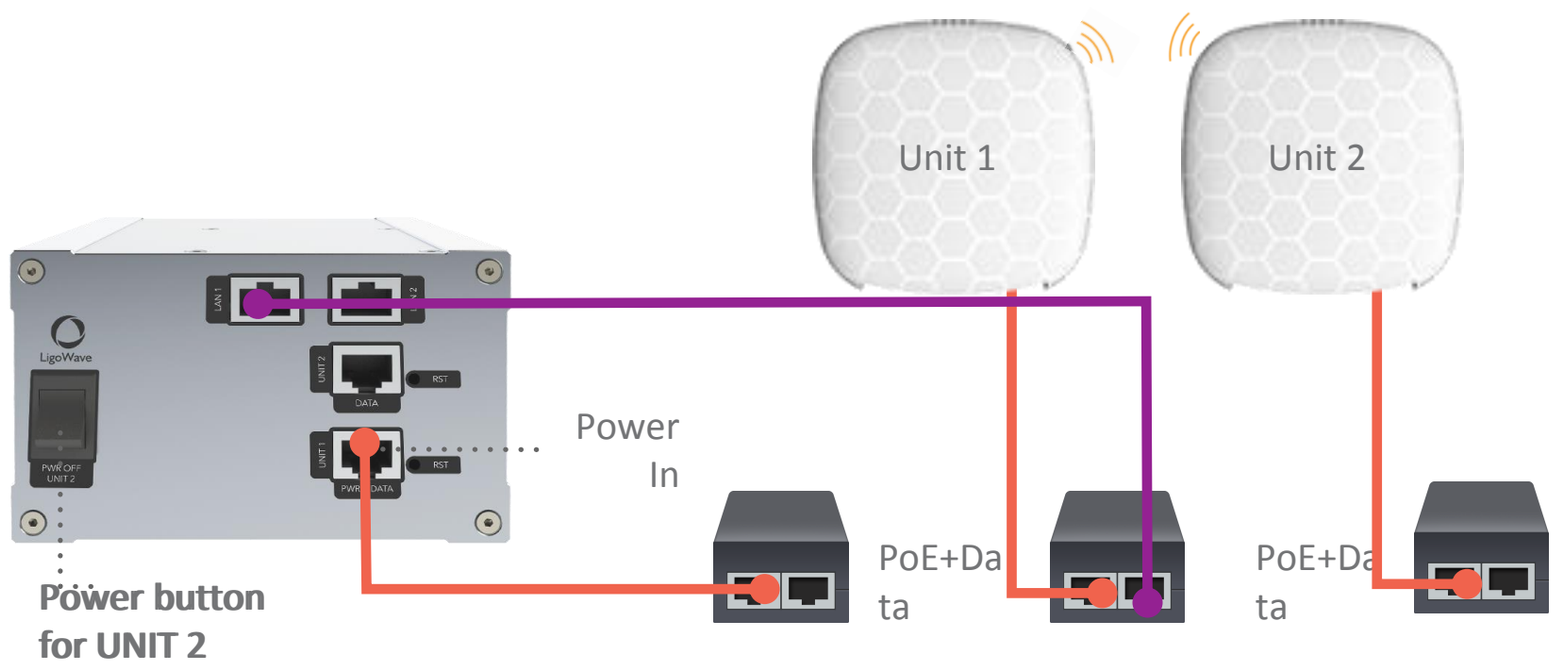

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THANK YOU

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GOOD LUCK :)

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