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EnGenius Networks Singapore Pte Ltd
M-Series Products Launch

Oct., 2009

What is Wireless Mesh Network?

A collection of wireless devices maintaining RF connectivity to create a seamless path for data packets to travel.
At least one wireless device (or node) is connected to a wired Internet backbone and each data packet is bound for the same destination but not necessary using the same sequential path of nodes

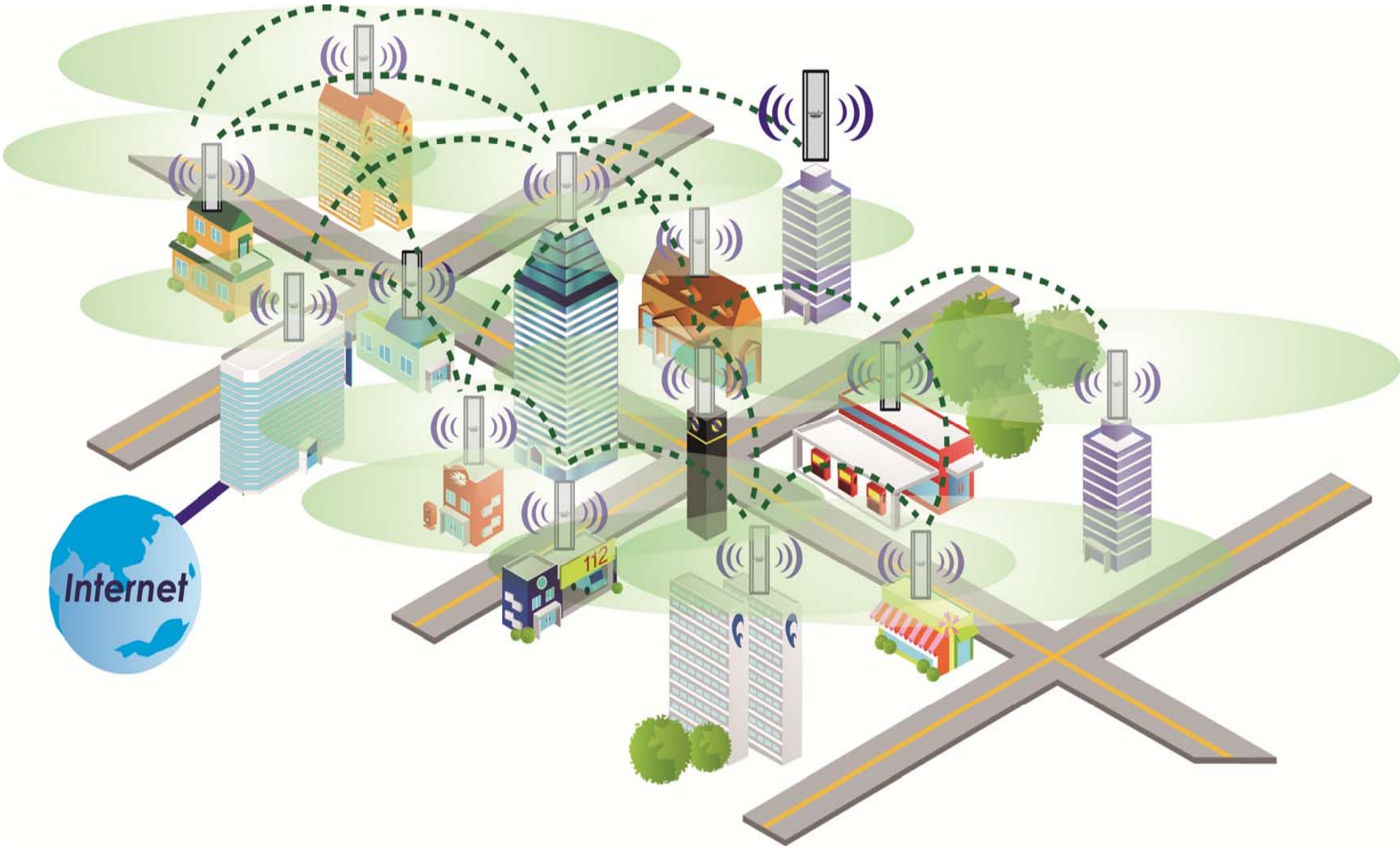
The Internet router determines a path between the user and the physical backbone
In the wireless mesh environment, a network can be envisioned as a collection of access points, routers, or end users (equipped with wireless receiver/transmitters) that are free to move arbitrarily but maintain a reliable communication that sends and receive messages

A semi-mobile system
The connectivity position among the nodes may vary with time due to node departures, new node arrivals, and roaming nodes

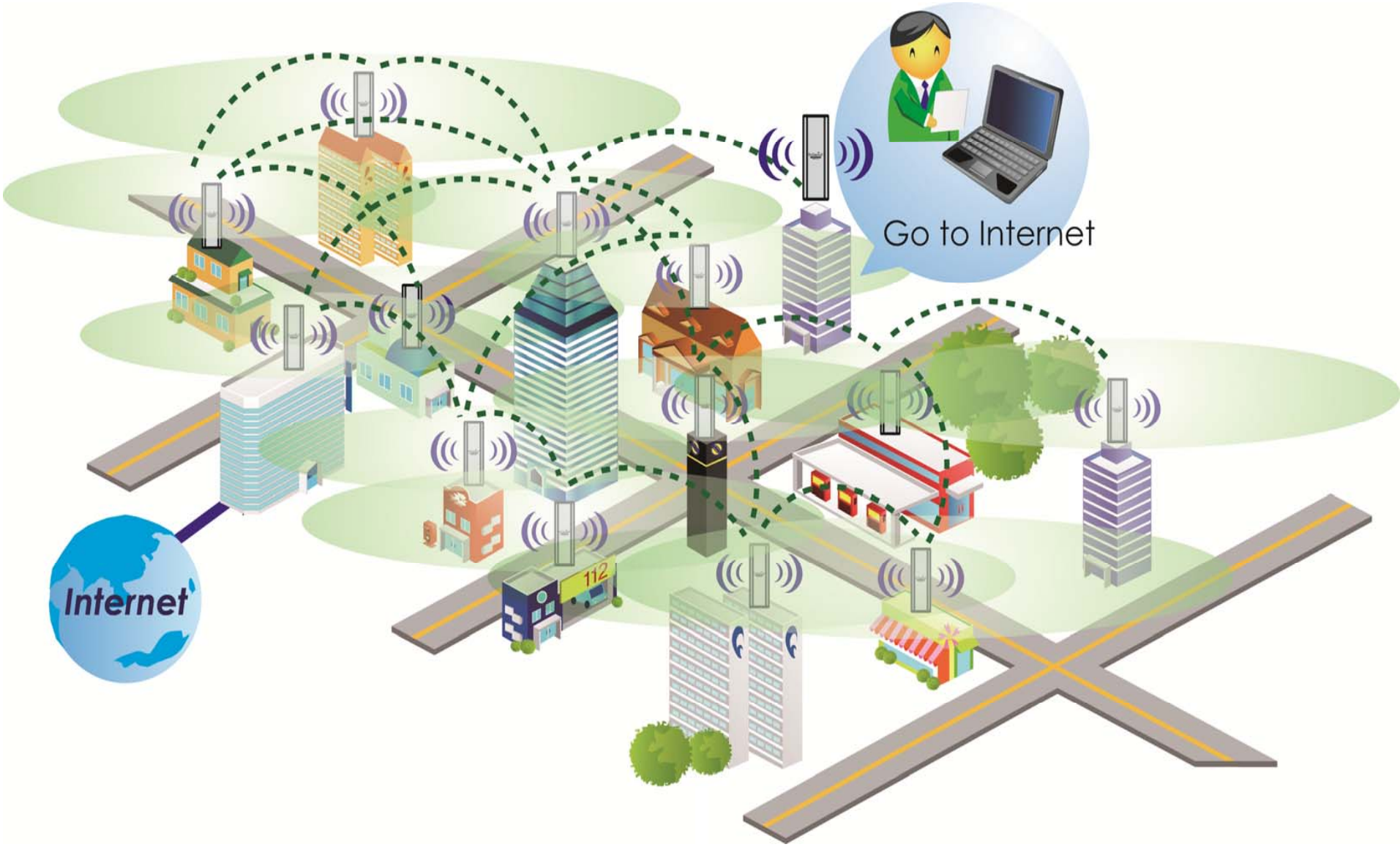
Combining Point-to-Point or Point-to-Multi-Point wireless cells create a roaming effect
Roaming is the ability to maintain network connectivity while moving from one access point to another

WiFi Mesh Network Action (1)

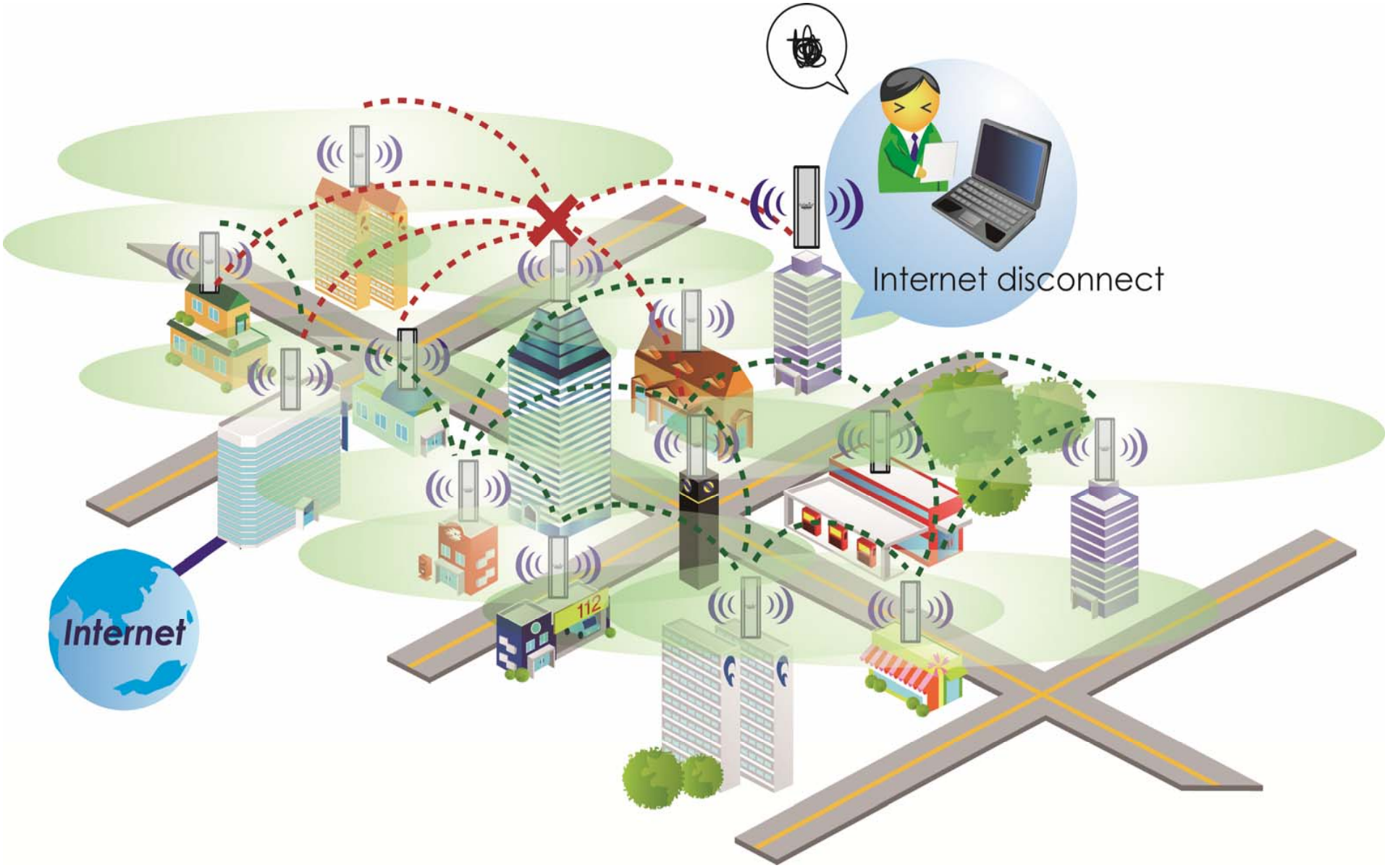
WiFi Mesh Network Action (2)



WiFi Mesh Network Action (3)



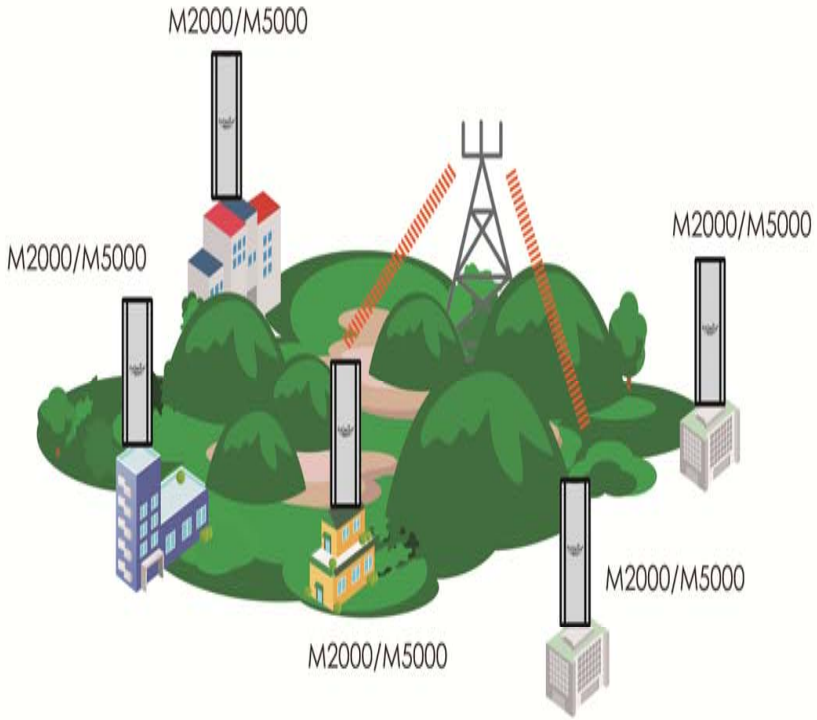
WiFi Mesh Network Action (4)



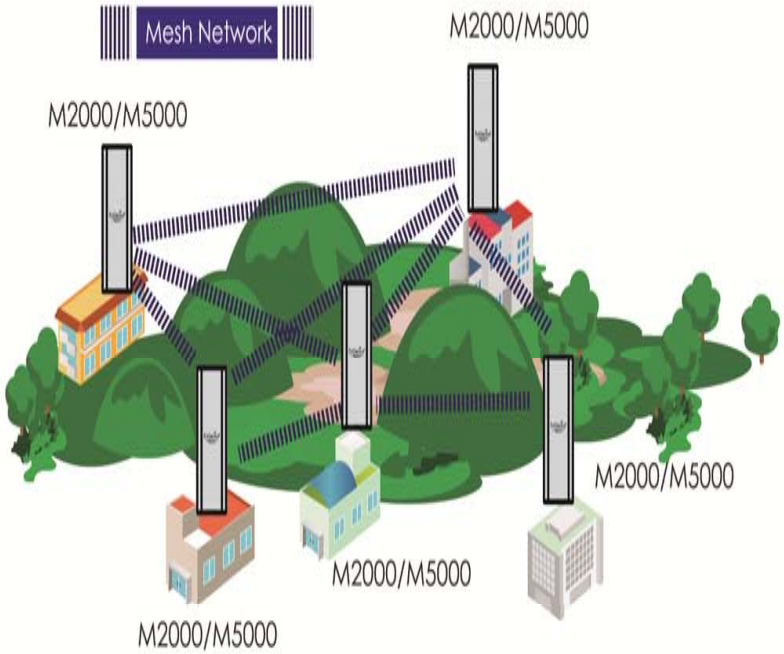
WiFi Mesh Network Action (5)

Solving Coverage

PMP Approach :
Focus is on RF and Deployment
Blast Over & Through Obstacles



MESH Approach :
Focus is on Smart Software
Skip Around Obstacles



Advantages

A Wireless Mesh Network constructed from WiFi Technology alleviate a number of roaming challenges from laptops, IP phones, PDAs, and IP base devices:

- ***No geographical limitations*** *– User can take a handheld or laptop computer anywhere without losing the connection in their home*
- ***No physical connection required*** *– Mobile IP connect automatically and obtain local IP router information*
- ***Supports security*** *– Authentication is performed to ensure that rights are being protected*
- ***Access Anytime, Anywhere*** *– Network access is assured at all times and from all locations. No missed E-mails and increase productivity due to constant connectivity.*
- ***Emergencies*** *– Rapidly deployable and robust communications between each member when emergencies are involved in difficult operations inside buildings, towers, or surrounded in forest fires*
- ***Military Usage*** *– Soldiers in a battlefield are exchanging information about their position and giving and receiving orders, or the instructions*

M-Series Product Specification

M2000

- High Power up to 28dBm
- Super G, 108Mbps
- CB/AP/CR/WDS
- Mesh Application
- Integrated 10dBi 2.4GHz Antenna
- Dual Polarization
- Power Control & LED Indicator

M5000

- High Power up to 26dBm
- 802.11a/b/g
- CB/AP/CR/WDS
- Mesh Application
- Integrated 15dBi 5GHz Antenna
- Dual Polarization
- Power Control & LED Indicator

M36

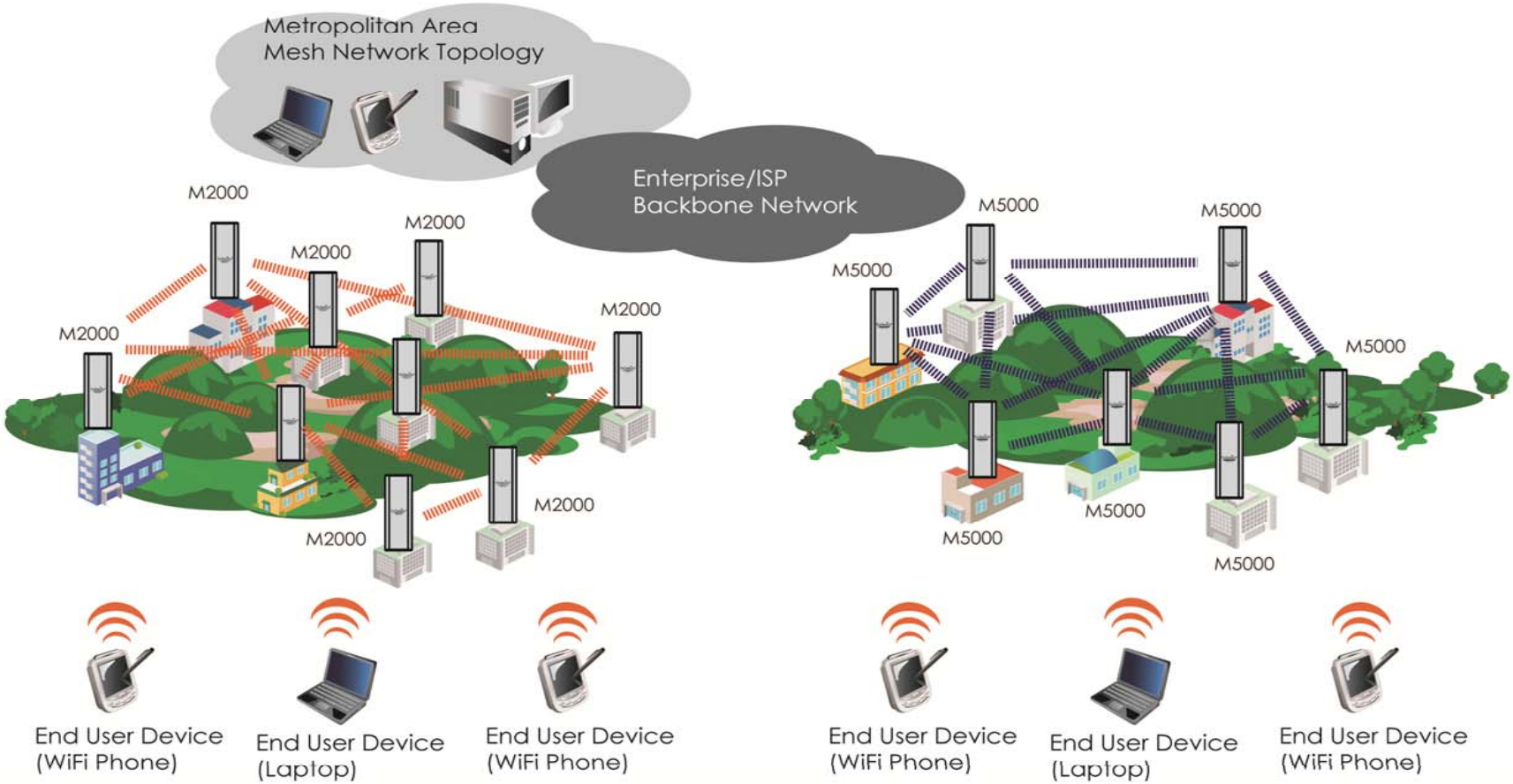
- High Power up to 28dBm
- AP/WDS/Repeater
- MESH Application
- Network Management System
- Embedded 5dBi Smart Antenna
- PoE 802.3af Support
- Full Security Support

M35

- High Power up to 28dBm
- AP/CB/CR/Router/WDS/Repeater
- MESH Application
- Network Management System
- External 2 x 5dBi Antenna
- PoE 802.3af Support
- Super Speed up to 108Mbps

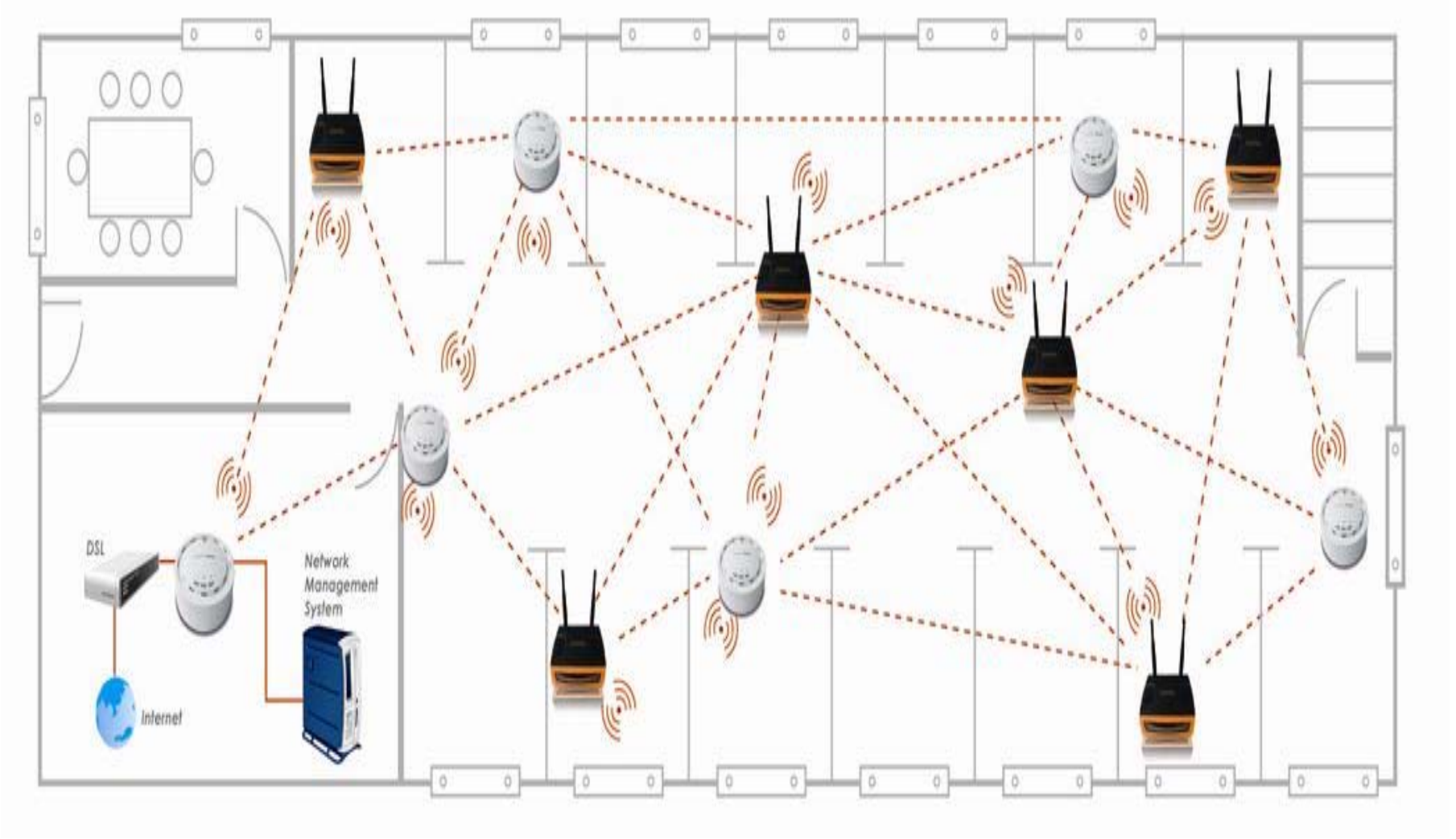
Mesh Topology

Outdoor MESH Products Topology :: M2000 & M5000



Mesh Topology

Indoor MESH Products Topology :: M36 & M35



Mesh Topology

EnGenius WiFi Mesh Metropolitan Area Network Solution includes

- Point-to-point and Point-to-Multipoint architecture
- External omni-direction or directional/sector antenna
- Integrated routers with adaptive routing and security capabilities
- Single Equipment with Software configurable to Gateway or Relay
- EnGenius also equips with feature for (wired or wireless) LAN extension via LAN port connection

Engenius Mesh Network – Backbone WAN connection can be via ADSL, Lease Line, Cable, VSAT, etc…

Recommended 1 Gateway with 4 Relay Linear deployment scenario

MESH Specification

The fundamental architecture of EnGenius M-Series Products are built to separate one radio to two,

- One half is the Radios provides the backhaul mesh connectivity between all Mesh AP, forming the backbone Layer2 routing for the entire Mesh Network
- The other provides the user/subscriber/clients wireless access connectivity for up/down stream

Each product with worked MESH function form an individual operational "Node", where the EnGenius MESH AP will automatically locate & associate with the required designated backhaul mesh links and "Join-In" the Mesh Network

Optimal Link State Routing (OLSR) Protocol form the fundamental routing algorithm on the Backhaul mesh network infrastructure, to provide optimal network throughput to the WAN access

MESH Specification

The fundamental operation of EnGenius is based on IEEE802.11 (b/g/a) standard and RF (2.4GHz, 5GHz) technologies.

In particular, EnGenius MESH AP separate one radio to two with Business Class High Power Technology to provide Backhaul Mesh and Client-end access.

- Backhaul mesh connection radio on IEEE802.11b/g(M2000, M36, M35) or IEEE802.11a (M5000) with RF output power of 28dBm (M2000) or 26dBm (M5000) and with external Omni Antenna or other Directional Patch Antenna depending on backhaul interconnection range and coverage requirement
- Client access wireless link on IEEE802.11b/g (M2000, M36, M35) or IEEE802.11a(M5000) with RF output power up to 28dBm(11b/g) and 26dBm(11a)

Mesh AP Architecture

M-Series separate one radio to 2 application for AP and MESH

Access Point

Client access wireless link on IEEE802.11b/g (M2000, M36, M35) or IEEE802.11a(M5000) with RF output power up to 28dBm(11b/g) and 26dBm(11a)

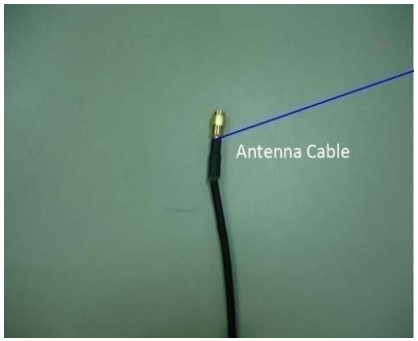
MESH Link

Backhaul mesh connection radio on IEEE802.11b/g (M2000, M36, M35) or IEEE802.11a (M5000) with RF output power of 28dBm (M2000) or 26dBm (M5000) and with external Omni Antenna backhaul interconnection range and coverage requirement

Robust Design for Water Proofing

IP54 Compliant Design Rules :: M2000 and M5000

Device:
M2000 & M5000



RF/Antenna Cable

With Ethernet Cable and RF Cable

With back cover

Hole Rubber

With hole Rubber

Cover Rubber

IP54 Protection

Power over Ethernet

Power over Ethernet (Proprietary)

- Combine cable and power line, and only **ONE WIRE** from indoor to outdoor
- Supports over **100m** cat5 Ethernet cable for your deployment
- Work well with carrier's equipment to **SAVE OPERATING COST**

M2000

M5000

+

EPE-1212
(24V)

M36

M35

+

EPE-4818
(48V)

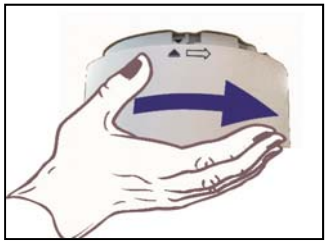
Mounting

M36 Wall Mount/Sky Mount

(1)

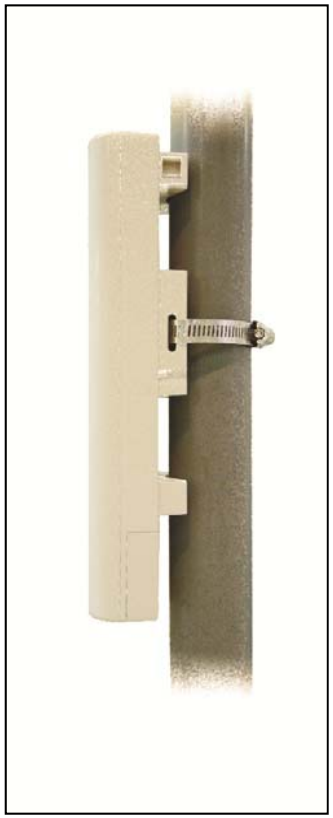
(2)

(3)



(4)

M2000 and M5000
Wall Mount and Pole Mount



Security

EnGenius built-in with standard and enhanced security features for which protecting the Backhaul mesh connection as well as the Client end-user access

Privacy & Security is established via the different combination of the following features provided

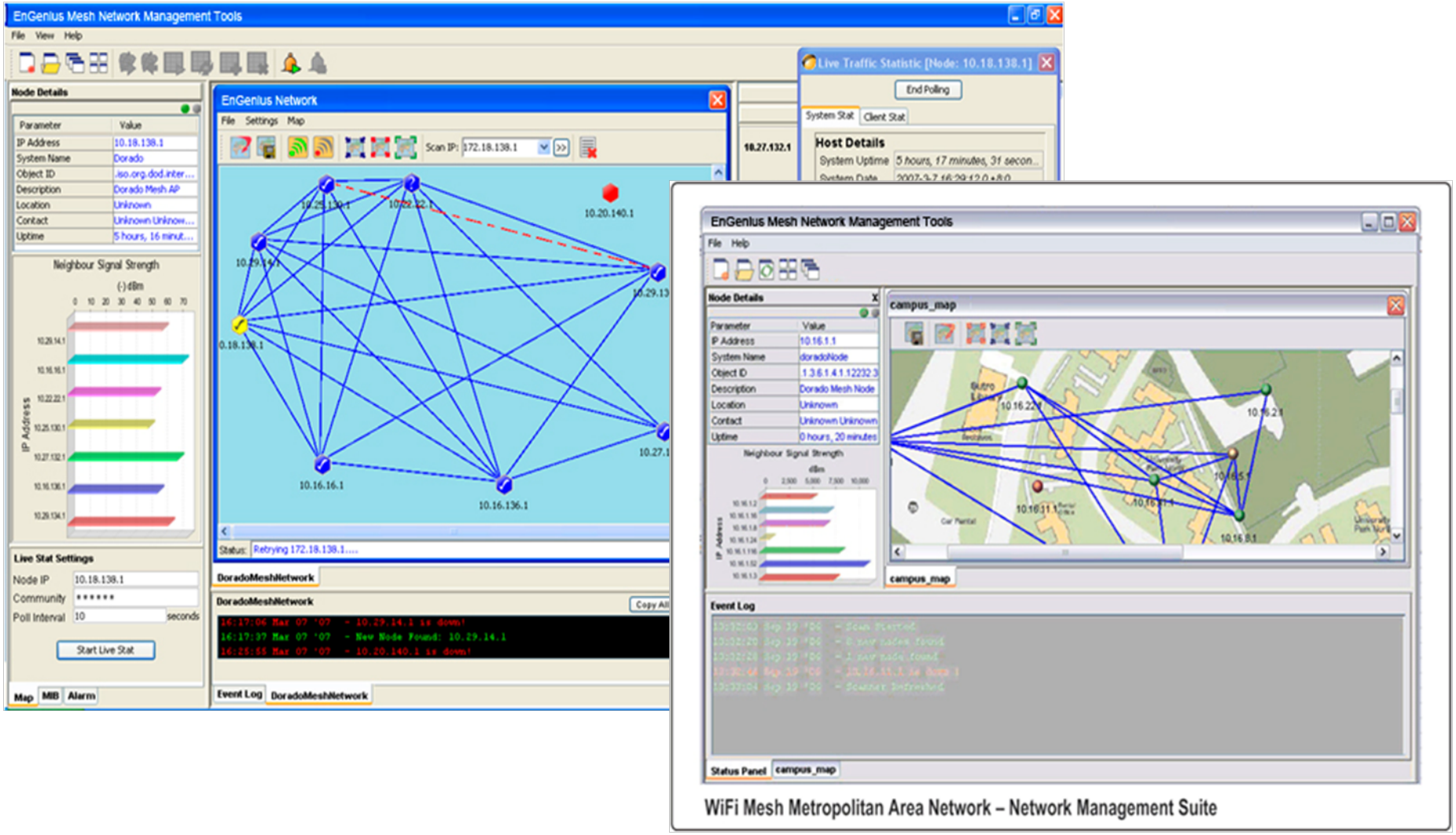
- 64/128 Bit WEP encryption
- AES and IEEE802.1x
- Both WEP and AES and WPA, WPA2
- VPN (all VPN protocol pass though, such as PPTP, L2TP) .
- HTTP Login
- Authentication via RADIUS server

Network Services

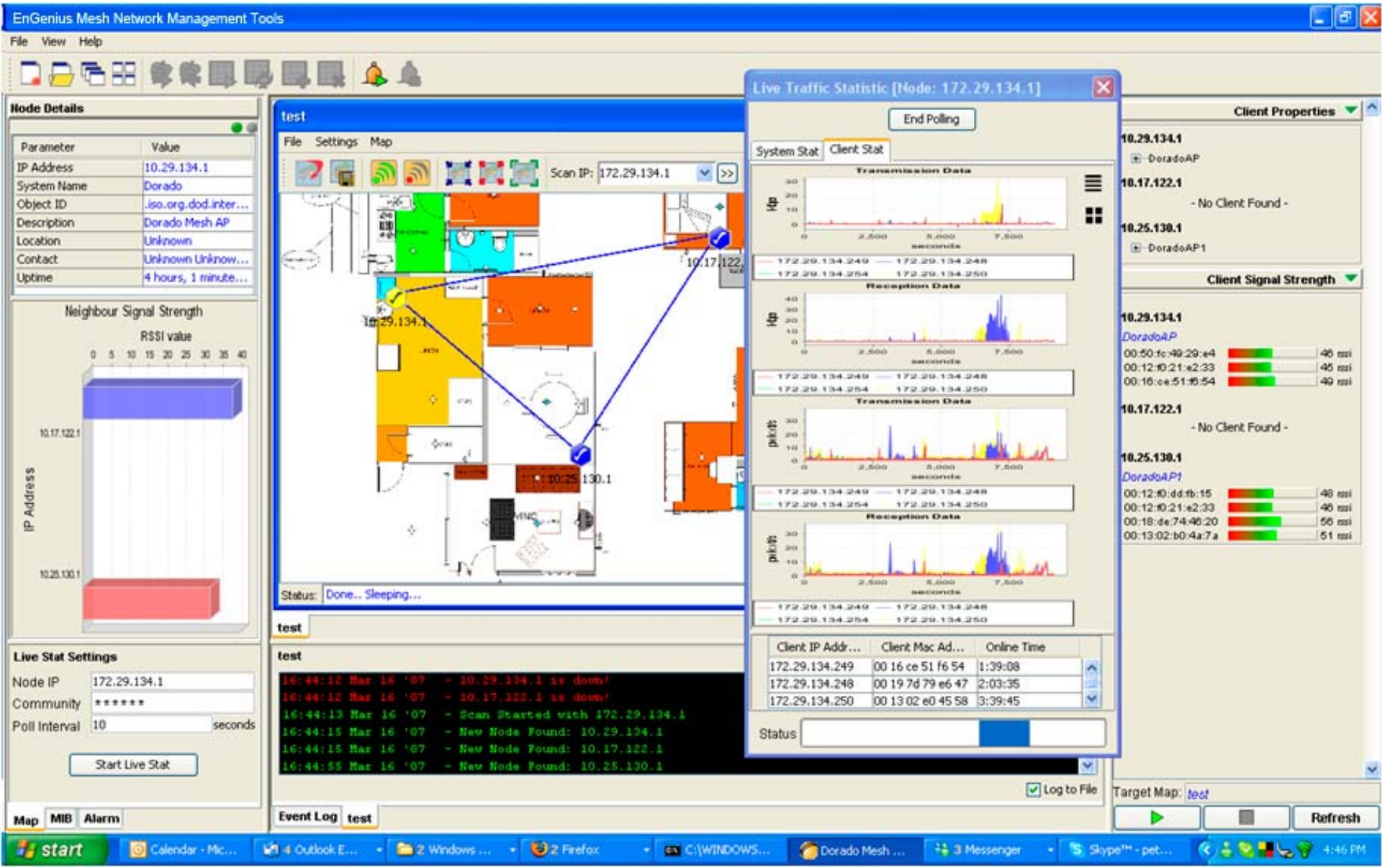
- Mesh AP equips with 1 x 10/100Mbps RJ-45 Auto-negotiation network interface for WAN and/or Local Server connection, and also to provide network extension via UTP Cable (when necessary)
- PoE via WAN Port or Alternative DC Power Supply via Adapter
- The following are the Services that provided within the EnGenius MAP Solution
  - Static IP address, DHCP Server/Client
  - PPPoE client with PAP, CHAP
  - PPTP Client
  - NAT
  - VLAN (Depending on Customer Specification)

Network Management Software Tool

EnGenius M-series provides Network Management System Tool to manage , control and monitor all units in mesh network.



Network Management Software Tool



M2000 & M5000 Features

M2000 & M5000

- Transmit power table
- Antenna Diversity with Dual Polarization
- Signal Strength indication using LEDs
- Auto/Best Channel Selection
- AP Detection
- Traffic Shaping
- PPPoE(CR mode) and PPTP
- Narrow Bandwidth 5MHz/10MHz/20MHz Support
- PING function and Trace Route function
- BSSID Support
- MSSID Support
- VLAN Support
- Keep latest setting when f/w update
- WEP Encryption-64/128/152 bit
- WPA/WPA2 Personal (WPA-PSK using TKIP or AES)
- WPA/WPA2 Enterprise (WPA-EAP using TKIP)
- 802.1x Authenticator
- Hide SSID in beacons
- L2 isolation
- MAC address filtering, up to 50 field
- Wireless STA (Client) connected list
- QoS(WMM)
- MIB I, MIB II (RFC1213) and Private MIB
- NTP (Auto-setting of time) & Time setting manually
- SNMP V1, V2C
- VPN – pass through

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M36 & M35 Features

M36	M35
Super G solution up to 108Mbps	Super G solution up to 108Mbps
SNMP Remote Configuration Management	7+1 Multi Functions
QoS (WMM) support	Point-to-multipoint Wireless connectivity
Embedded Antenna	WDS (Wireless Distributed System)
Point-to-point, Point-to-multipoint Wireless Connectivity	Repeater
WDS (Wireless Distributed System)	Support Multi-SSID function (4 SSID) in AP mode (BSSID)
Repeater Support	Antenna diversity support
Support Multi-SSID function (4 SSID) in AP mode	WPA2/WPA/ IEEE 802.1x support
Antenna diversity support	802.1x Supplicant support (CB mode)
WPA2/WPA/ IEEE 802.1x support	MAC address filtering in AP mode(up to 50)
MAC address filtering in AP mode(up to 50)	User isolation support (AP mode)
User isolation support (AP mode)	PPPoE/PPtP function support (CR mode)
Power-over-Ethernet (IEEE802.3af)	Power-over-Ethernet (IEEE802.3af)

Summary

- EnGenius M-Series solution addresses the market requirements for
  - Protected Design
  - Highly scalable
  - Self Configurable
  - Self Healing
  - Self Adaptation
  - Mobility
- In general, EnGenius Mesh Solution offers end users with secure, seamless roaming beyond traditional WLAN boundaries and our solutions provides easy deployment in areas that do not support (or do not have sufficient) wired backhaul.
- WiFi Wireless Metropolitan Mesh Network solution is well-suited for providing broadband wireless access in areas that traditional WLAN systems are unable to cover or there is/are limitation in deployment (such as limited backbone or unable to deploy).

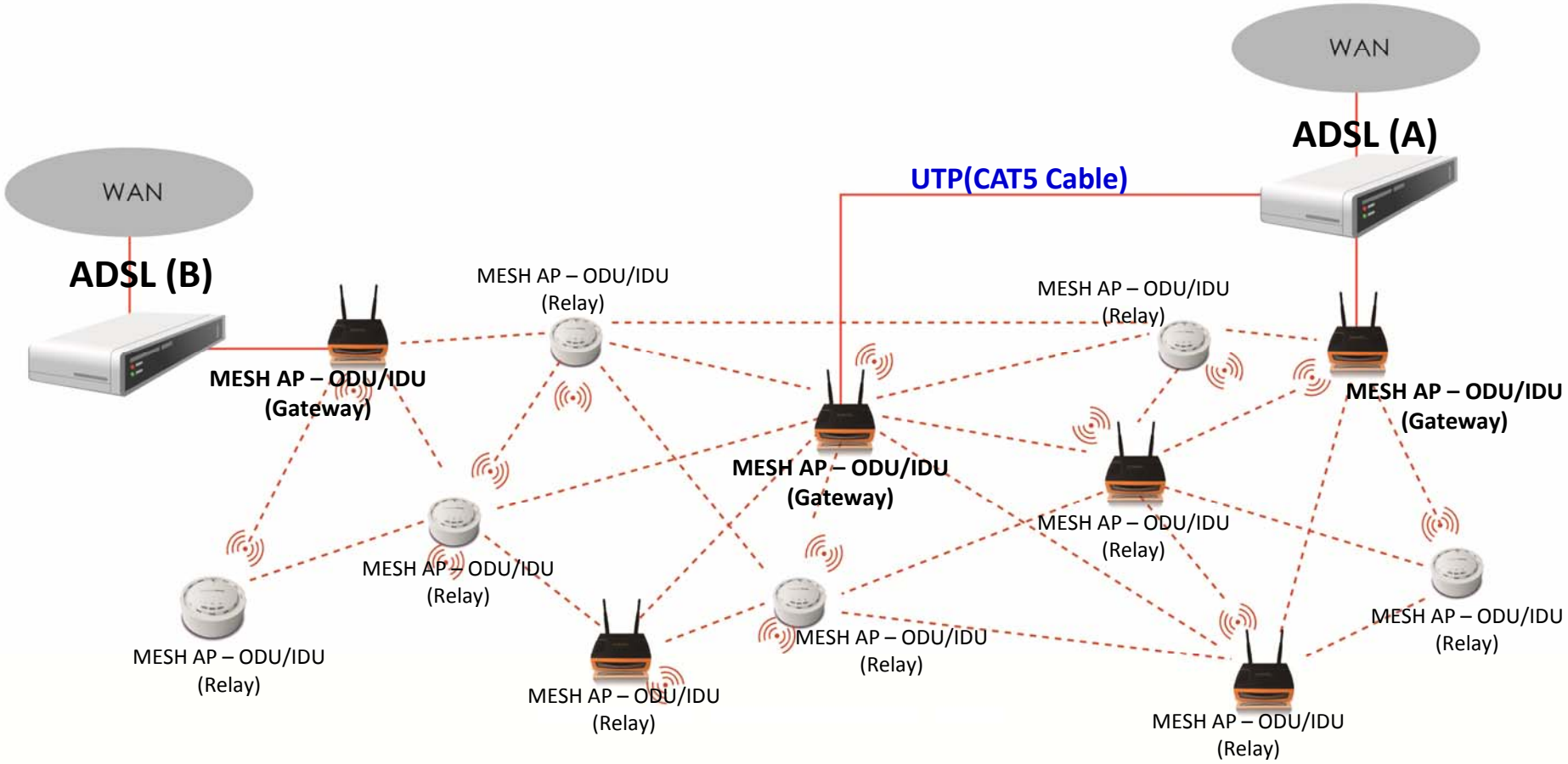
Application of Mesh Network

- In general, EnGenius Mesh Network is designed for both Enterprises as well as Residential to have wireless broadband connectivity. EnGenius Mesh AP comes with both Outdoor and Indoor housing, offering wireless broadband access with new revenue generation opportunities, and in particular, the solutions can be deployed with the following applications:
  - **WiFi City or Public Catchments Area Deployment,**
  - **WiFi Campus,**
  - **WiFi Wireless Local Loop,**
  - **WiFi Intra-local area network**

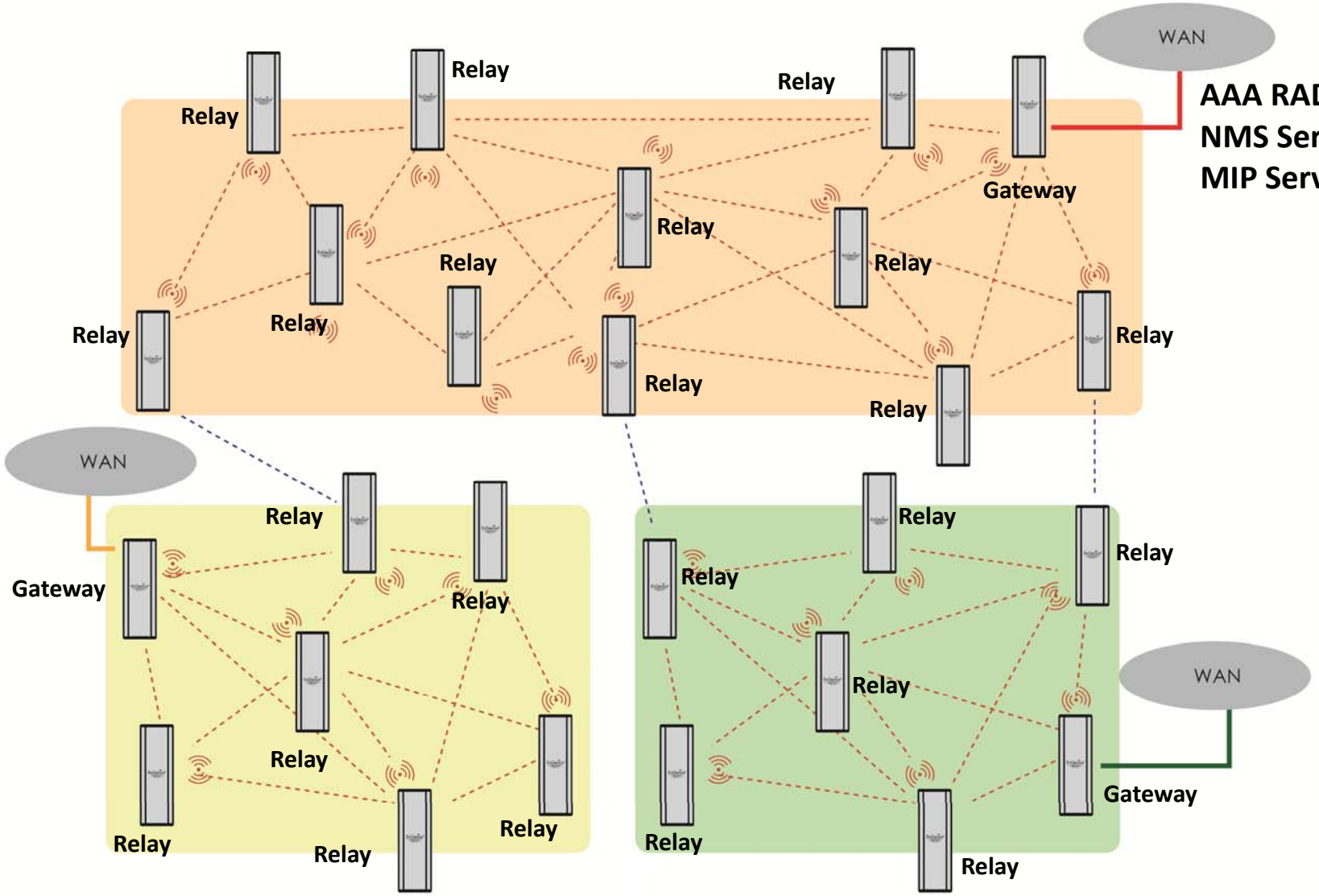
Typical Example of Mesh Network

Wireless MESH Network – Network Architecture with 3-Gateway Units and 9-Relay Units

Note: backbone is provided by two Telcom (A) and (B). Two of the ADSL Modem are from (A), and one is from (B). In fact these backbone can also from VSAT (if necessary)



Mesh Architecture



THANK YOU