



Inovatian Mesh Technology

InoMesh Specifications & System Performance Sheet

Inovatian had developed in house a unique mesh technology: The InoMesh™ which is a substantial improvement over OpenWRT mesh with a lot of enhancements to the user interface. The InoMesh is a firmware that gets installed on existing off the shelf rugged WiFi routers, currently ported to a number of Ubiquiti Networks products, such as the nanoStation M5, and M2, and the Bullet HP M2 and M5. Inovatian recommends that the mesh units operate in the 5GHz band since it is less crowded and we need the mesh throughput to be at the highest possible values not suffering from interference.

InoMesh provides a mesh that is basically a wireless replacement for the wires connecting WiFi access points (APs) together. The APs can be either running the mesh protocol as well or can be regular APs. There is a little advantage to having them running the mesh protocol that is not justified by the high price of the firmware. The APs of concern here will be the Bullet HP M5/UniFi AP which is a 5GHz AP.

Overall System design:

The mesh will provide the backhauling for the WiFi AP traffic. An area to be covered with WiFi will have a gateway connected to the internet. There will be a Mikrotik Intelligent Networking Switch between the mesh and the internet. The purpose of the switch is to provide control functions over the entire system including:

- establishing a hot spot with a walled garden, authenticating the users,
- giving the users their subscribed data rate and maximum capacity,
- monitoring the way the users use their connection as in if they are doing VoIP or video downloads
- monitoring the health of the network by providing alerts when a node is down
- Other control functions required by the customer.

The switch will be the main point of contact with the network. A centralized network management system with a controller over the cloud will be mostly only getting information from the various switches that reside before every mesh network.



After the switch immediately, will be a gateway or a host that will distribute the traffic to the other nodes. For low number of hops, InoMesh will be used. The network will be designed in general with not more than 2 hops. More than 2 hops should occur only if there is a problem with a node or something.

We recommend that nodes not be more than 200m apart with a clear line of site. The longer the distance is the lower the speed of the mesh.

Each mesh unit will be connected to at least one AP. If more than one AP is to be connected to a single mesh unit, another switch will have to be installed between the mesh node and the APs.

Introduction

Wi-Fi mesh networks are quite different from traditional Wi-Fi networks in regards to their installation and design. Instead of all wireless access points (APs) having to be wired back to the network via Ethernet cables like in a traditional network, a mesh network is designed to have some of the APs wirelessly communicating between each other for their network and Internet connection.

A mesh network approach is useful for GSM operators where there's no existing wired infrastructure, or lacking of wired infrastructure, and installing cabling for the APs isn't possible or desired. This could apply when a network needs to be installed quickly, or when setting up a temporary network for an outdoor network where running cables is costly.

InoMesh™: is a proprietary customization of open source mesh firmware that primarily made it more user friendly and more suitable for mobile operator use. Bandwidth halved with each hop.



InoMesh – An Innovative Mesh Technology by Inovatian

Just like a virtual switch

- Supports Multiple Mesh Routing Algorithms
- Automatic Network Configuration Discovery
- The ability to measure almost all performance parameters of the mesh: the speed of a particular hop, the RSSI at both ends, etc.

- We have DHCP server capability in any of the mesh node to allow locally available IP addressing Scheme for client subnet
- We have the ability to test nodes availability by MAC addresses allowing connectivity/reach ability even if IP address is not reachable
- We can upgrade the devices remotely without needing physical access to the devices
- We can limit the link bandwidth per hop to improve performance of mesh
The change in topology/failure of mesh node is discovered and recovered in under 9 seconds
- Each mesh node can be configured to serve clients at the same time as it can act as part of the mesh
- InoMesh supports standard security features as in Available APs in market.
- InoMesh supports efficient multi casting for multimedia and VoIP traffic.
- InoMesh supports saving / loading of configuration and uploading to all nodes of the mesh to reduce deployment time.
- InoMesh provides real-time bandwidth availability and nodes availability status along with signal quality information.
- We have features like per hop speed test and can test end to end speed test from Gateway to any mesh node.
- We can establish backbone network without requirement of IP addressing on mesh nodes individually.
- We have already fixed the looping problem, It's using STP
- Just install and connect and it become part of mesh
- We can limit bandwidth on each hop
- Establish multiple gateways per mesh, And load is distributed over the gateways according to their proximity to the gateways
- It has all the features that are not available in other mesh
 - Proprietary Customization, Optimization and Features
 - Plug-and-Play Mesh Technology works out of the box
 - No end user networking experience required
 - End to End and per Hop Performance measurements
 - Transparent Mesh Technology for all types of IP traffic
 - Network Applications work without any configuration



- InoMesh Nodes Connect automatically to form Mesh
 - Layer-2 Mesh forwards any IP payload as a Package
 - Does Not require IP address assignment to Mesh
 - Nodes can act as Client AP as well as Mesh Node
 - Mesh Servers Receive and forward Internet traffic
 - Mesh Clients forward traffic on the mesh
 - Supports Multimedia Streaming over Mesh
 - Supports SSH and Encrypted Tunnels
 - Automatic Firmware upgrade retaining configuration

PERFORMANCE OPTIMIZATION

Superior Performance with Kernel implementation

- Layer-3 Daemons work in user space
- Faster forwarding based on MAC
- Hardware optimized Mesh Features
- End-to-End Mesh Performance Measurement
- Per Hop Wireless Signal & SNR Measurement
- Maximum Mesh Performance iPERF Testing
- Ping IP/MAC, Trace route IP/MAC and iPERF
- DHCP Server support for Multiple Mesh Segments

Using AAA to Provide Authorization, Authentication and Accounting for Inovatian Mesh Network

Using AAA

- We integrated with AAA to create customer profile, provision service and assign credential
- We also integrate with AAA to collect usage and bill services.
- We also control sessions, speed, landing page, usage volume
- Post Paid and Pre-Paid could be supported



- Real – time and near real time charging

Inovatian NMS

InoMesh uses two controllers:

- A switch controller that is based on the presence of a switch before the gateway of each mesh network.
- A UnFi Controller Software for Client’s Wireless Access Management and Optimization if a switch is not used. This only controls the APs and users under them.
- Single Console to manage entire network
- Supports Custom Maps and Google Maps for Visualization
- Remote upgrade of device firmware

Inovatian NMS

- Hotspot authentication and Customer Portal
- Real-time Statistics for Performance Monitoring
- Alerts on important events
- Tracking of users and guests
- No Licenses / No recurring Costs for the switch controller.
- A cloud management using the UniFi system will require a paid license from Ubiquiti.