***Technical white paper** from*
***Go Networks** and*
Gambit Communications

MIMIC® helps testing of Wi-Fi NMS

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Executive summary

The Wi-Fi management applications in today's cellular network environments are critical to successful business operations, ranging from providing reliable customer support to ensuring that all devices function at peak efficiency. More than ever, organizations depend on network management solutions to make certain that their cellular network's health, performance and availability meet the rigorous demands of the business.

GO Networks provides Carrier-Class Cellular Wi-Fi Solutions. GO MBW NMS manages Wi-Fi base stations and outdoor access points and connected end points. The company chose Gambit Communications' MIMIC Simulator to ensure that the NMS software not only scales and manages hundreds of devices with real-time performance, but also correctly tracks faulty conditions of the devices proliferated all over the Metro area.

Background

Go Networks develops cellular Wi-Fi devices and management applications to enable next generation services for metro networking. GO's Metro Broadband Wireless (MBW) system is an outdoor Wi-Fi solution that enables carriers to deploy metropolitan networks that deliver robust wireless connectivity to residential and urban areas, schools and corporate campuses, and public spaces.

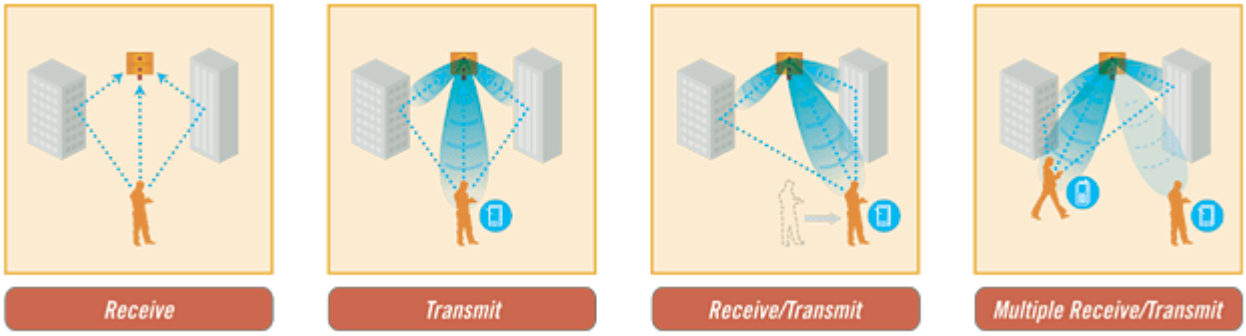
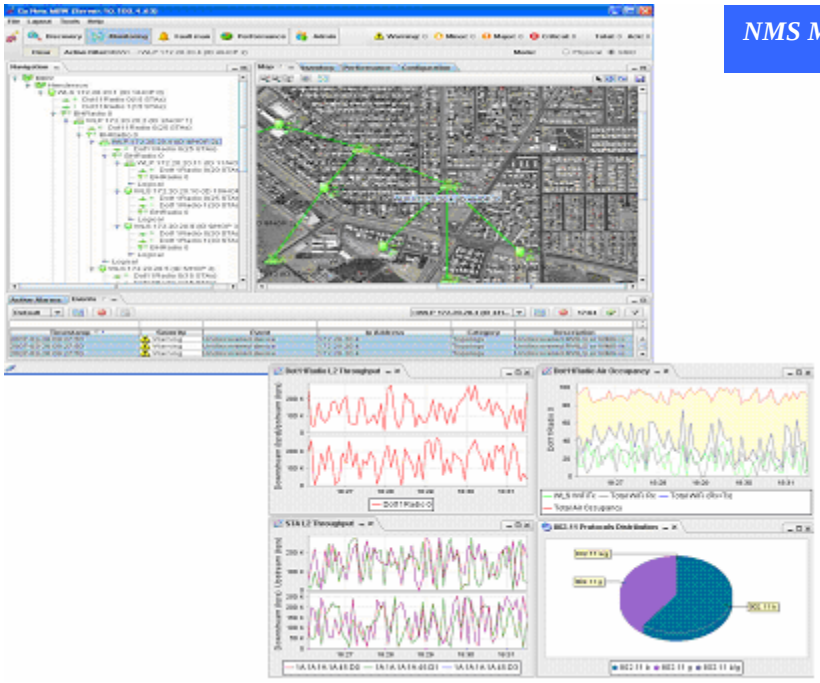


Figure 1 Metro Broadband Wireless System

Go MBW Network Controller (NMS) is a multiplatform, carrier grade network management solution. It provides the operator with a rich comprehensive and intuitive solution to automatically discover, configure, and monitor the status and performance of the metro broadband wireless network. It scales up from small

enterprise deployments up to large-scale Telco networks of 1,000 managed devices. It is based on Client/Server distributed architecture and uses standard SNMP to remotely manage the devices over wired and wireless backhaul links. GO NMS manages all MBW macro/pico cellular base stations and monitors associated WIFI clients and CPEs.



NMS Main Window

NMS Performance Management

Figure 2 NMS managing a large metro broadband wireless network

The software provides high security management with custom user privileges groups' support. Powerful performance management including real time and historical performance reports, remote bulk firmware upgrade with scheduling option, geographical map as well as two logical topology views, Inventory, fault management with active alarms and event views, customized alarm notifications (emails) and NBI interface via SNMP.

Problem statement

There are many concerns relating to the management of a cellular –mesh broadband Wi-Fi network. The monitored resources are not located at one place, but distributed all over the metro area with many different environments. Most of them are mounted on lampposts on the street. The real-time management of those devices is very difficult. The NMS has to manage the base stations along with keeping track of Wi-Fi Clients. Wi-Fi clients connect and disconnect at any

time and have different traffic patterns and mesh topology changes. The management software needs to be able to gather data from multiple sources and help IT managers quickly isolate and resolve network disruptions, and plan for demand spikes likely to occur during peak workloads.

It is even harder for the testing group to generate all these possible conditions and make sure that the management application passes them without any issues. It is a difficult task to create real life situations like multiple data sources, various traffic patterns and network delays for each of the managed devices in the test lab. It costs a lot of time and money to setup and maintain such a lab but even after that the testing is never complete.

Here are some of the challenges that GO's NMS testing group had to address. These concern testing of a high degree of dynamic behavior and complex scenarios:

- Mesh topology changes, e.g., Mesh node change to a different "father" as a result of radar detection on the mesh radio frequency at the 5.8 GHz band and as a result the path of its "children" devices route toward the backbone changes.
- WIFI clients associates, dissociates and being handed off by the access points (APs).
- WiFi clients violate service level agreement (SLA).
- The SNMP exchange is done over the air, which introduces delay, based on the number of hops the managed devices is distanced from the backbone.
- When a mesh node gets inaccessible all its sub tree child devices subsequently stop answering to SNMP queries.
- Device level behavior, such as when an access radio gets faulty the associated WIFI clients dissociate from it and associates to another radio having same SSID profile. Devices configuration is restored to its factory default and it loses its IP address.
- Simulation of air interference and consequent performance degradation.

Go Networks overcame these problems by turning to MIMIC Simulator, which made it easy to test their NMS.

Solution – MIMIC Simulator

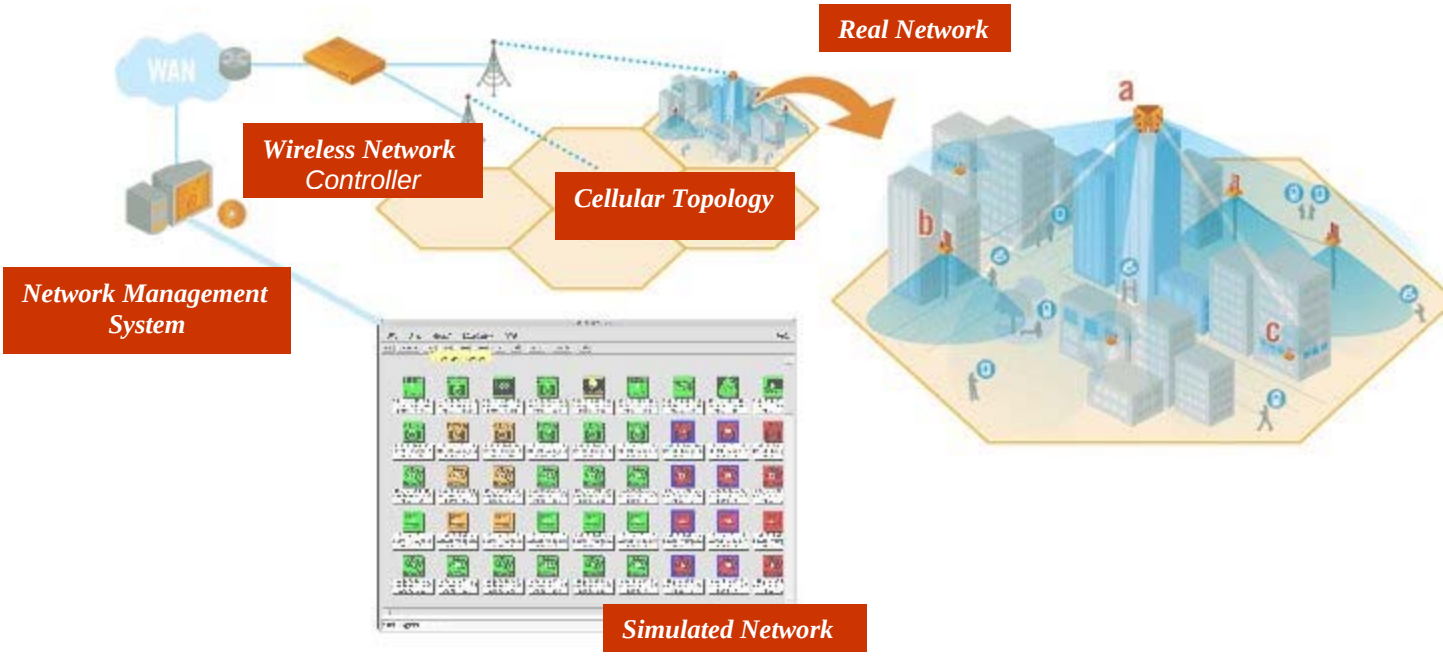


Figure 3 MIMIC simulating the same large metro broadband wireless network as the real network

It was impossible to create the real world environment in a lab, so Go Networks chose MIMIC Simulator from Gambit Communications. They wanted to make sure that they had tested every possible condition, and that their product was robust before releasing it to customers.

The MIMIC Simulator network simulation software can simulate up to 20,000 devices in one workstation. Each device can have its own device type, IP address and run-time parameters. The devices can be configured independently or in a group. They can be simulated to be geographically local or remote. The configuration and run-time changes can be done interactively using the MIMIC GUI, or programmatically using scripts.

Go Networks simulated many types of micro/pico base station devices. They created many scripts to setup many different types of scenarios. They used the delay function to create delays caused by connections over varying wireless hops to the managed devices.

MIMIC is used 24/7 by the development and testing groups. The developers could create simulations of devices under development, which are not ready for testing. They could easily simulate their proprietary Wi-Fi MIB, which keeps all the statistics about the links and clients.

Testers could do large-scale simulation and test all the features in different network topologies. The engineers wrote many action scripts to create complex and dynamic topologies. Basically, their one device can support many end points like laptops, PDA or other Wi-Fi devices. So if one device goes down, many routes can fail. The MIMIC action and timer scripts simulate all these conditions by dynamically creating and removing the clients, creating a mesh topology, creating and changing the necessary routes, and generating thousands of events like linkUp and linkDown notifications.

Benefits

MIMIC saved both time and money, since the testers didn't have to wait to test until deployment in the real world. This guaranteed high customer satisfaction with the released NMS software.

The flexibility of the MIMIC software allowed them to test all types of real and pathological conditions without the use of traffic generators, analyzers or any other tools. They could even create scenarios that are almost impossible to setup with the test lab.

Having multi-user access to the virtual lab meant they didn't have to worry about sharing the devices like real test labs. Each engineer could configure their own lab at any time and in any way they wanted, without worrying about disrupting anybody else's testing.

With a highly scalable scenario, they could generate the thousands of events, which can occur in normal working conditions and in disaster situations, like a power outage in a geographic region.

Go Networks' sales representatives can now confidently tell the customers that their software is scalable and will work in a variety of bad conditions. Also, sales can use the same scenarios created by the testing group for customer demos and training.

The best part is that all the test conditions they created are stored so they can share it with different testers. They can also run those regression tests every time there is a new release, and incrementally keep adding more test scenarios.

Summary

The Wi-Fi environment is a very unpredictable one, compounded by the inaccessibility and remote location of the devices to be managed. To be effective, a network management application has to take into consideration the unique challenges of such dynamic and complex scenarios. GO Networks' MBW NMS is specially suited for these requirements.

Gambit's MIMIC allows Go Networks to exercise the NMS application thoroughly to make sure that all real-world environments and conditions are tested. MIMIC enhanced their ROI many folds by simulating a real world network in their lab, capable of duplicating the required conditions at a fraction of the cost and effort.

About Authors

Gabby Tal is a NMS Project Manager at Go Networks. For more information on Go Networks' cellular Wi-Fi devices or management applications, please visit www.GoNetworks.com.

Pankaj Shah is the CEO and co-founder of Gambit Communications, Inc. In order to learn more about **MIMIC Simulator** and how to create a "**virtual lab**", please visit www.gambitcomm.com.