APPLICATION NOTE

Automated Network Monitoring of Trango Microwave Equipment using SNMP

Overview

Service providers and System Administrators need to have an easy way to monitor the health of their network including the microwave links present in the network. Most devices include a built in web server to individually examine the various parameters used to measure performance and health, but an easier solution that manages 100s or 1000s of devices automatically using SNMP is preferred. All Trango Microwave gear includes built in SNMP support which allows remote management and monitoring using any SNMP manager. This Application note specifically addresses the use of the PRTG Network Monitor to monitor Trango radios in a live network.

What is SNMP?

SNMP is Simple Network Management Protocol and allows for a standards based way of monitoring and configuring network equipment. Most network devices support some level of SNMP integration; however the amount and type of things that can be monitored via SNMP can vary greatly from product to product.

Why should I be using SNMP?

There are many reasons to use SNMP regardless of network size. Even with a single host, SNMP can provide historical data than it would be impractical to keep on the device. For example, even with a single Point-to-Point microwave link, there are hundreds of sensors than can be monitored. Yes, one could leave the system status page of the configuration utility open for each side of the link to always know the status, but with a SNMP utility like PRTG, you can leave the monitoring to the monitoring software. When there is an abnormality or problem, the NMS (Network Management Station) can alert the necessary parties via software pop-ups, email, text messages, etc.

In addition to providing alerting for critical errors and metrics that get outside of a normal range, SNMP tools typically provide the ability to store historical data for long periods of time. If the data is of a nature that can be graphed, graphs are typically provided to show the collected values over time, be it a few hours, a few days, a month, a year or more. For example, see this graph of ODU temperature over two days:

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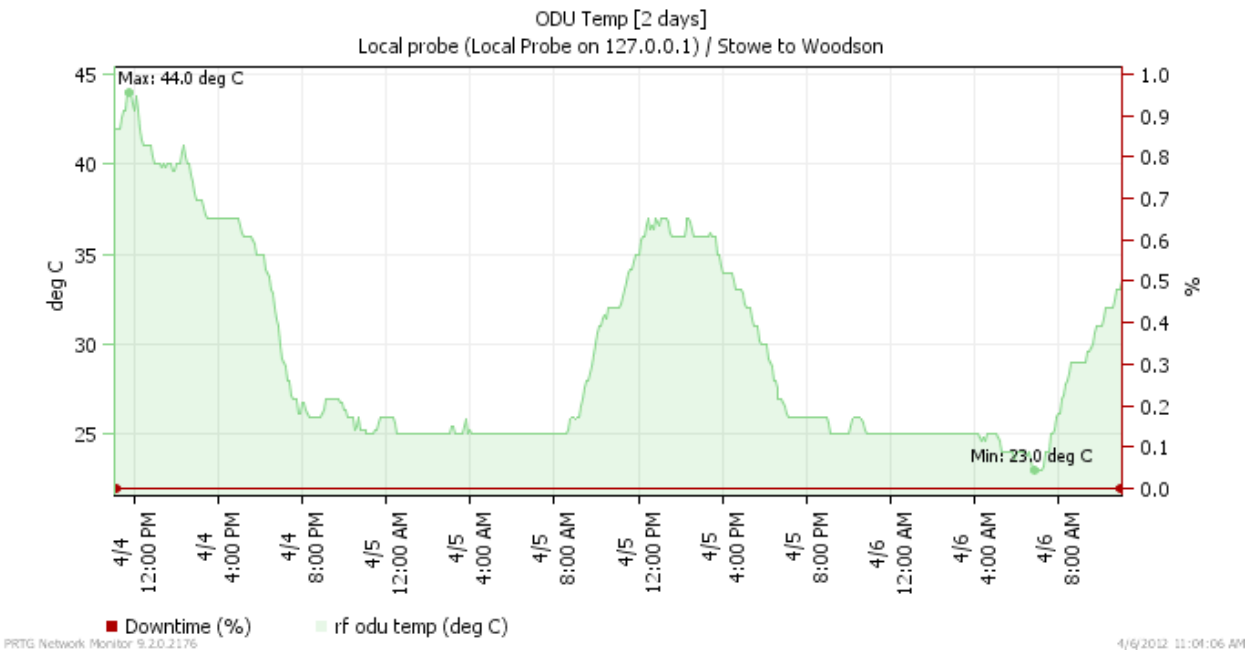

Trango provides a proprietary MIB, or Management Information Base, that in addition to standard SNMP objects provides up to 700 sensors or monitoring points per device! From critical health information like is the link locked and providing an ability to check for any dropped packets to seeing the number of packets or octets per second per gigabit interface, chances are there is an OID (object identifier) in our MIB to allow this data to be monitored.

The following are some of the common items that can be monitored via SNMP for Trango radios:

- RF Performance Monitoring
  - RSSI
  - MSE
  - Throughput in Mbps and percentage of RF capacity
  - RF Modulation (if using ACM)
  - IDU & ODU Temperatures
  - Transmit power (if ATPC used)
- GigE Bandwidth Monitoring
  - Octects In & Out per port
  - Unicast & non-unicast packets in & out per port.
  - Interface status (up/down, speed, duplex)
  - Collisions & CRC Errors
- T1/E1 Port Monitoring
  - Port Status
  - Error Counters
  - Status Indications

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- Diagnostic Health Info
    - PLL Lock Status
    - Individual modem lock status (in addition to overall)
    - IDU RSSI
    - LDPC Decoder Stress

There are many other objects that can be configured and monitored in addition to the common ones listed above. In fact, a GigaPlus has nearly 800 different OIDs in the MIB alone! This is in addition to standard SNMP objects like system uptime that can be monitored as well as ICMP monitoring (ping) built into most NMS applications.

SNMP Monitoring Accounting & Change Compliance Tracking

Many of the OIDs in the MIB are not typically useful for monitoring and graphing applications, but are useful for accounting controls. For example, it is possible to monitor the firmware version of the radio and receive an alert if it changes. Nearly all settings can be monitored this way, so there is an accounting control and history of what was changed when, which is located outside of the radio so it can exist independent of hardware assets.

Hardware/Platform Independent Monitoring

Speaking of independent hardware, due to the standard MIB used across all Trango Point-to-Point products, it is even possible to switch out the actual hardware with another unit, be it replacing GigaPlus with GigaPlus or swapping from say GigaPlus to Giga Orion, the SNMP monitoring can pick up right where it left off, with all the history intact! Imagine seeing the before and after RSSI data when upgrading a link to Giga Long Haul!

Some NMS programs also provide the ability to configure settings on the radios from a centralized point. For example, imagine you wanted to disable telnet on all of the radios, you could have the NMS make the change on all configured radios.

SNMP Traps for Immediate Notification of Events

TrangoLINK products also feature the ability to send SNMP traps to up to five different IP addresses. SNMP traps are different from the SNMP objects that have already been discussed in that the traps are sent by the radio to a specific host when something occurs. For example, if the radio loses link lock, a trap can be sent. Likewise, a trap can be sent if the temperature or utilization crosses a certain threshold along with other objects like RSSI and MSE.

SNMP trap receivers are simple programs that accumulate the traps from many devices and present a list to the user. Some trap receivers can then trigger other notifications like an email or text message to alert the necessary engineers of a condition.

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Aside from traps being sent, SNMP normally works on a polling basis. The NMS, or central SNMP server, sends a request to all configured devices on a specified interval and asks for the status of a certain object. For example, every minute the server could ping the management IP address of all radios, and ask for RSSI, MSE, throughput usage and link lock status. The NMS may only poll the temperature every fifteen minutes to reduce the load on the central server and network traffic.

So how do I get started?

Trango has partnered with Paessler to offer PRTG with a prebuilt library for our customers. Other NMS programs can be utilized like Castle Rock SNMPc, MRTG, Solarwinds, Cacti and others. PRTG offers an easy monitoring interface and is fairly feature rich. After a free thirty-day trial, the software can be purchased in easily attainable increments based on the number of sensors monitored. PRTG is a monitoring only application, which means it does not provide the functionality to set or configure parameters of the radio. For microwave point to point equipment, this is typically not required since the link is typically only configured once at initial deployment. Built in web, SSH, telnet and console support allows changes to be made remotely should it be required.

Once PRTG or your software of choice is installed, it is possible to configure a device. Enter the IP address or hostname of the radio to monitor and let PRTG scan for standard interfaces. You can also skip scanning and once the device is setup, go to add a sensor. Then in the sensor library pick the Trango PTP MIB (this should be loaded during the install of PRTG to the appropriate folder). A list should appear with all the valid OIDs for the product you're monitoring based on the current configuration. Simply select the objects to monitor and PRTG will start monitoring the selected sensors.

Sensors can then be setup with thresholds or ranges at which an alert or warning should be sent and where and how that message should be sent. For example, one may want to configure a RSSI warning threshold at -70 dB and an alarm threshold at -80 dB. Further, the warning could be configured to only send the notification if the -70 dB threshold is exceeded for longer than five minutes, while the -80 dB alarm threshold would trigger a notification immediately.

This sounds great, but do I really need to monitor 800 sensors per device? That's 1600 per link!

Absolutely not. It is only necessary to monitor the sensors that are important to you. Trango typically suggests monitoring the following items:

- Link Lock Status
- Packet Drops (RF In Dropped Packets)
- RSSI
- MSE

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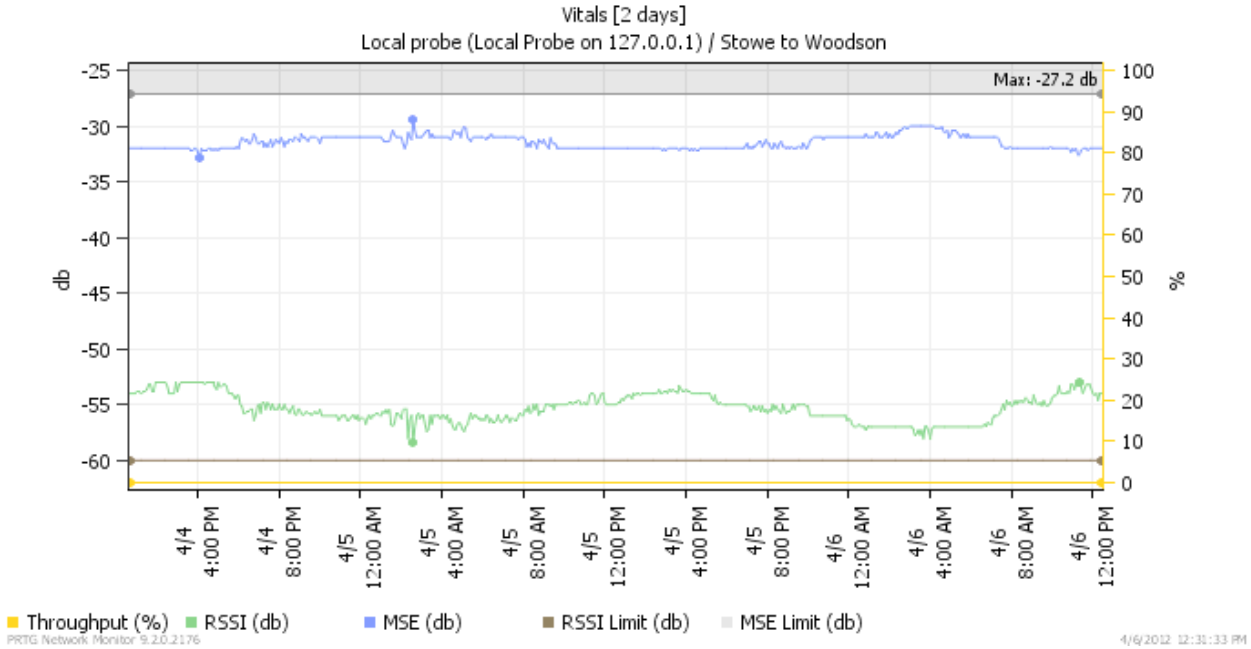
- Current Speed/Modulation (especially the modulation if using ACM so you can correlate the change in modulation to traffic capacity)
- Temperatures of ODU & IDU
- RF Port Rate in Mbps
- RF Port Utilization in % of available bandwidth
- If using ATPC on a short range link, Tx Power

In addition, if the link is experiencing problems, additional insight may be provided by monitoring:

- Individual PLL Status
- Ethernet Port Statistics including ingress rates per port
- RF Port Statistics (if not doing so above already)
- IDU RSSI
- LDPC Decoder Stress
- Uncorrected Blocks

Some may find that to limit active sensors (for licensing purposes) some of the above sensors need not be monitored all the time or on multiple radios. For example, the RF out utilization on radio A of a link should match the RF in utilization on the same link's B radio, so it may not be necessary to monitor both sensors at all times.

It is possible to make graphs that contain multiple sensors, in what PRTG calls a sensor factory. For example, in one of our links, we have a sensory factory graph that shows RSSI, MSE and throughput with some guidance lines so we can detect if the graphed values are out of standard performance range.



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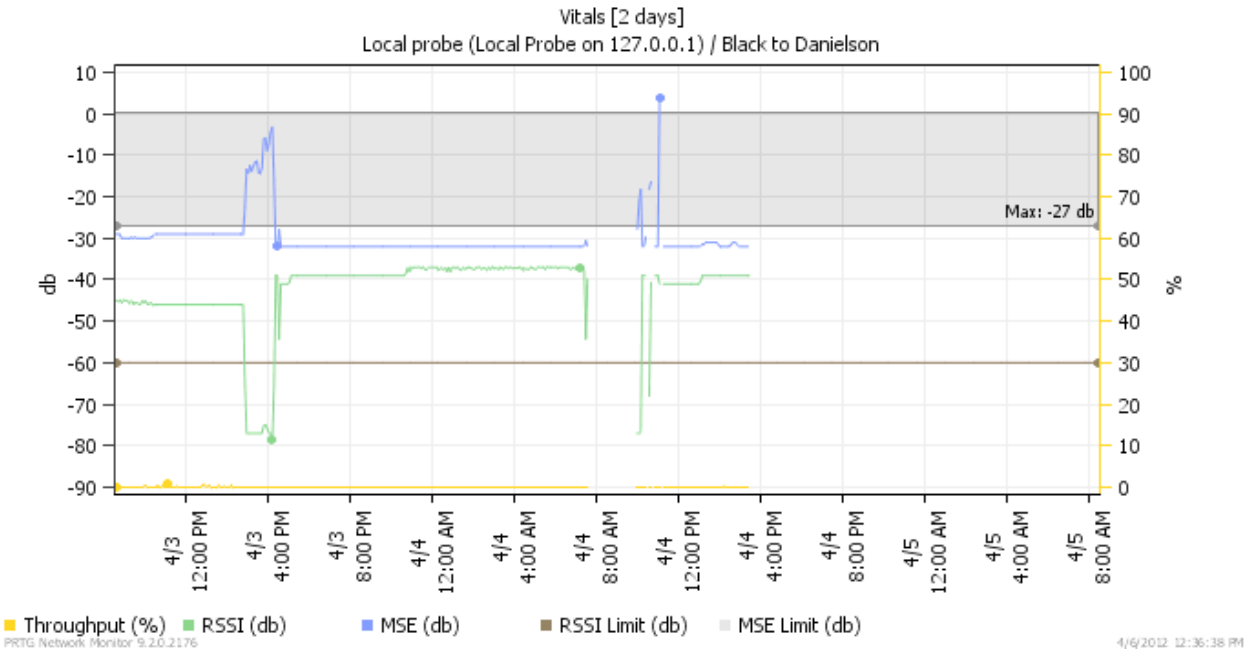
For an example of a link that is outside of tolerance, see this graph:



Because of the fixed limit lines for RSSI & MSE, it is immediately clear that something is wrong when the graph leaves the center area.

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