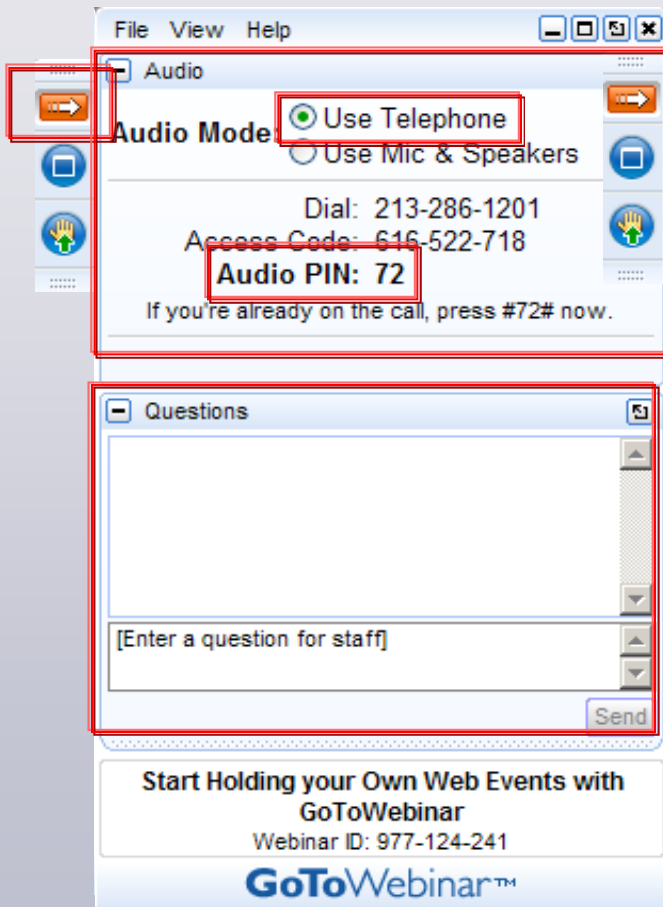# Wireless Backhaul Solutions
Licensed Class Product Training

Scott Chester – Sr. Network Engineer

Complete **Solutions**

How to Participate Today

- Open and close your Panel

- View, Select, and Test your audio
  (You should be able to hear me now.)

- Submit text questions

- Q&A addressed as we go and at the end.

- Technical questions that don't pertain to the entire audience will not be addressed. Please email techsupport@trangosys.com for help.

Corporate Overview

- Leading Manufacturer of Wireless IP Backhaul Solutions

- Focused on Licensed Bands 6-40 GHz

- Based in San Diego, California

- Delivering wireless solutions since 1996

World Class Manufacturing

Poway, California (USA) Facility

- 30,000 square foot facility
- Experienced manufacturing team
- Long history of producing RF and IP equipment
- Dedication to quality
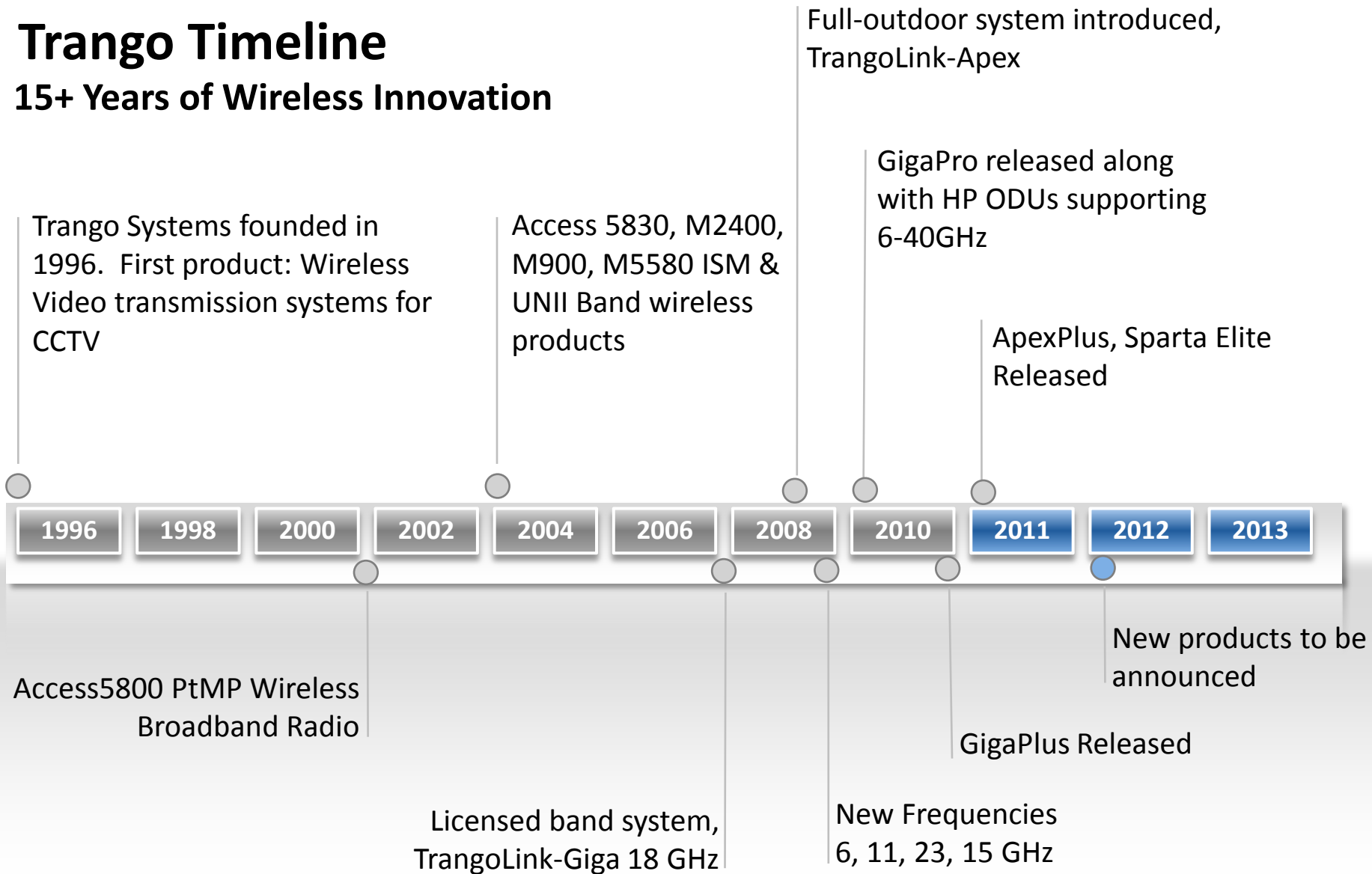- ISO9001 Certification

- State-of the art, fully automated SMT lines.
- Full AOI capability
- Full comprehensive system and subsystem testing (over temperature range)
- 100% Customer link configuration and verification prior to shipment
- Worldwide Distribution

Trango Timeline
15+ Years of Wireless Innovation

Full-outdoor system introduced, TrangoLink-Apex

GigaPro released along with HP ODUs supporting 6-40GHz

Trango Systems founded in 1996. First product: Wireless Video transmission systems for CCTV

Access 5830, M2400, M900, M5580 ISM & UNII Band wireless products

ApexPlus, Sparta Elite Released

1996	1998	2000	2002	2004	2006	2008	2010	2011	2012	2013

New products to be announced

Access5800 PtMP Wireless Broadband Radio

GigaPlus Released

Licensed band system, TrangoLink-Giga 18 GHz

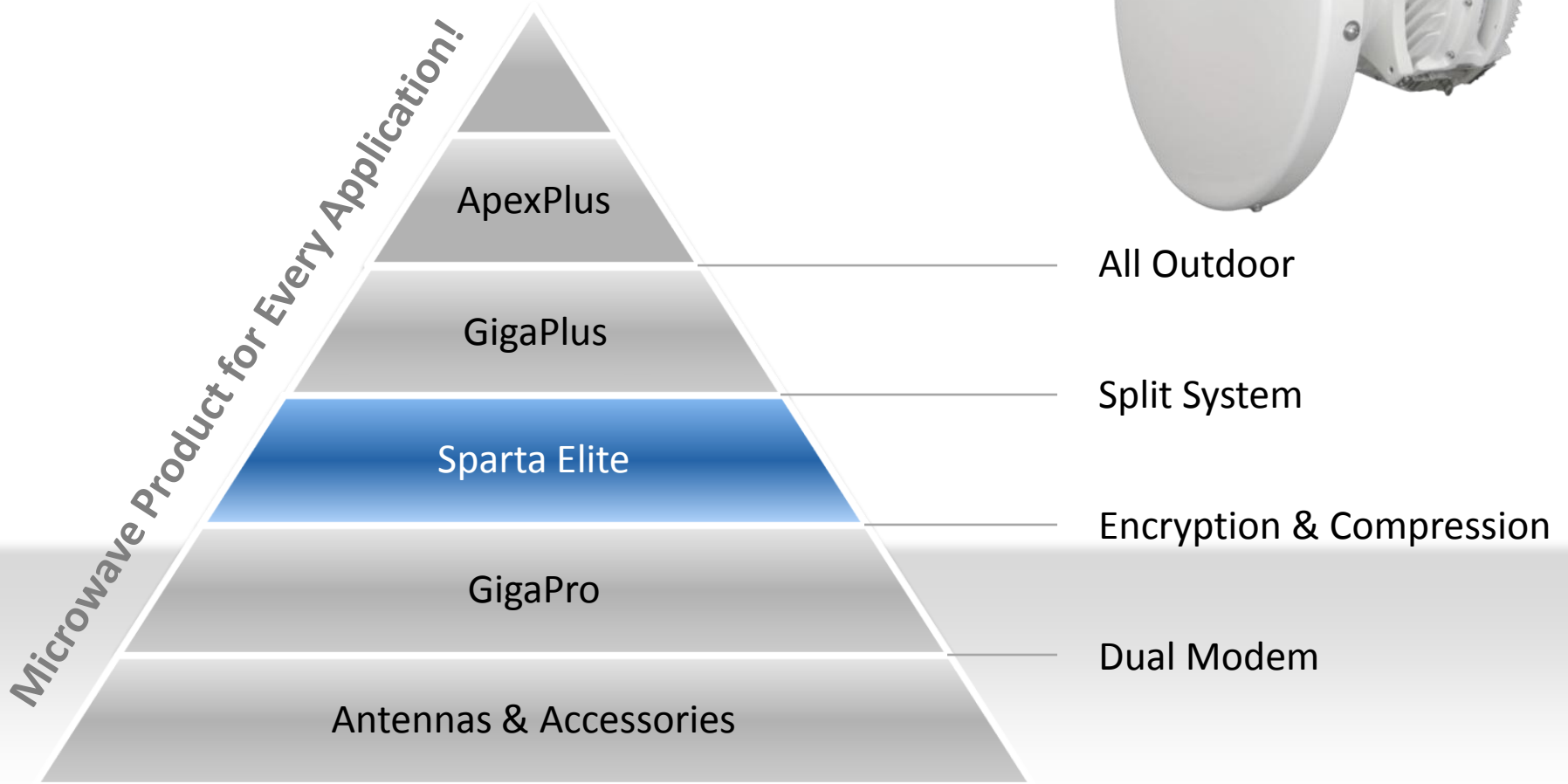New Frequencies 6, 11, 23, 15 GHz

TRANGO SYSTEMS

Trango's Focus

Elements of Success

- We deliver a **Quality** product! Both from Trango's manufacturing facility as well as from our world class ODU OEM partners. Historic return rates <0.5%

- Every link undergoes final testing and configuration to customers specifications.

- Presales technical assistance for professional path analysis, product selection, & frequency coordination.

- Excellent customer service & post-sale technical support.

- Comprehensive product range with best-in-class features and **Performance!**

100% Customer Satisfaction

TRANGO SYSTEMS

2011 Product Line

Microwave Product for Every Application!

- ApexPlus
- GigaPlus
- Sparta Elite
- GigaPro
- Antennas & Accessories

- All Outdoor
- Split System
- Encryption & Compression
- Dual Modem

TrangoLINK ApexPlus™

Full Outdoor, High Performance

- Compact form factor, requires no rack space

- Flexible port options including GigE copper & Fiber

- Same RF and throughput specifications as GigaPlus

- Integrated high power ODU

- Industry's highest temperature spec. for full outdoor unit +65°C (149°F)

- Industry's best system gain

- All Licensed band frequencies available 6-40 GHz

- 2 GigE Data Ports, 1 T1/E1

TrangoLINK ApexPlus™ Features

Innovative Mechanical Design & Multi Port Versatility

- ApexPlus consists of High Power ODU
- Innovative bracket & IF connection to outdoor modem unit (OMU)
- Patent Pending design
- Allows for field replacable ODU or OMU (reduced sparing)
- Allows better RF Isolation & Heat Dissapation

- Power over Ethernet & Lightening Surge Protection in single wall mountable POE device
- POE data interfaces: GigE Data, Mangement (10/100), T1/E1
- Dual / Redundant power supply support
- Radio features GigE SFP Port for fiber or copper
- Direct Power connector on radio, as alternative to POE

TrangoLINK GigaPlus™

High Performance, Full Featured Split Architecture System

- Native IP

- Full Duplex, Layer 2 Throughput up to 375 Mbps

- Ultra low packet latency & jitter

- Supports 10/100/1000BaseT & Fiber Interfaces

- Compact ½ Rack Unit IDU. Same IDU for all frequencies

- High Power ODU & Industry leading system gain

- T1/E1 interfaces for timing or legacy TDM

- Hitless ACM

- QoS

TrangoLINK GigaPlus™

Multitude of Ports, Interfaces, & Functionality
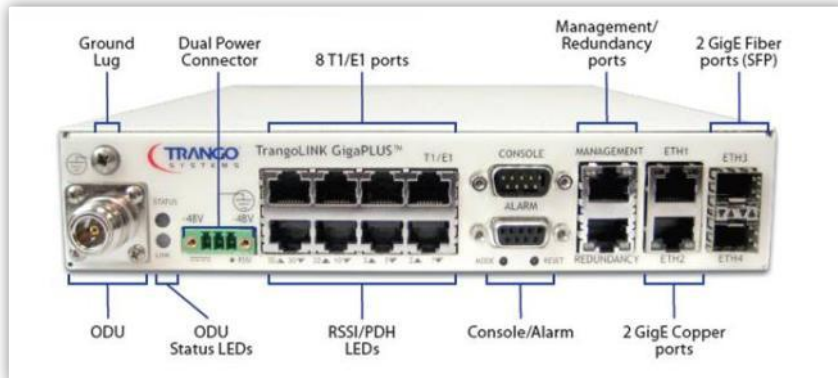
- 2 GigE Copper RJ45
- 2 GigE SFP (all 4 ports VLAN port mapped)
- 8 T1 / E1 RJ45 (native TDM)
- Out-of-band management port
- Serial console management/alarm port
- Redundancy (1+1) port
- Dual Power (true redundancy) connectors
- N Connector for ODU
- Status LEDs (RF Link status, ODU Status)
- RSSI/PDH LEDs
- Mode/Reset button
- Up to 1000 Ft Cable between IDU & ODU
- ODU RSSI BNC Voltage Out

TrangoLINK Sparta Elite™

Intelligent Payload Compression & Advanced Encryption

- Includes hardware based compression and encryption engine

- Encryption level is highest in the industry – NSA Suite B Compliant

- Identical RF, Port & Interface specifications as GigaPlus

TrangoLINK Sparta Elite™
NSA Suite B "Top Secret" Encryption

- The only product on the market with real time AES256-GCM NSA Suite B Compliant Encryption

- IPSEC tunnel allows encryption through non-encryption network devices

- Automated key management using IKE v2

- AES 128/256, FIPS-197 Certified, FIPS 140-2 compliant

- Encryption Latency 4-20 µSec

- Exceeds HIPPA Requirements

TrangoLINK Sparta Elite™

IPSec Tunnel Capability for Encryption & Compression
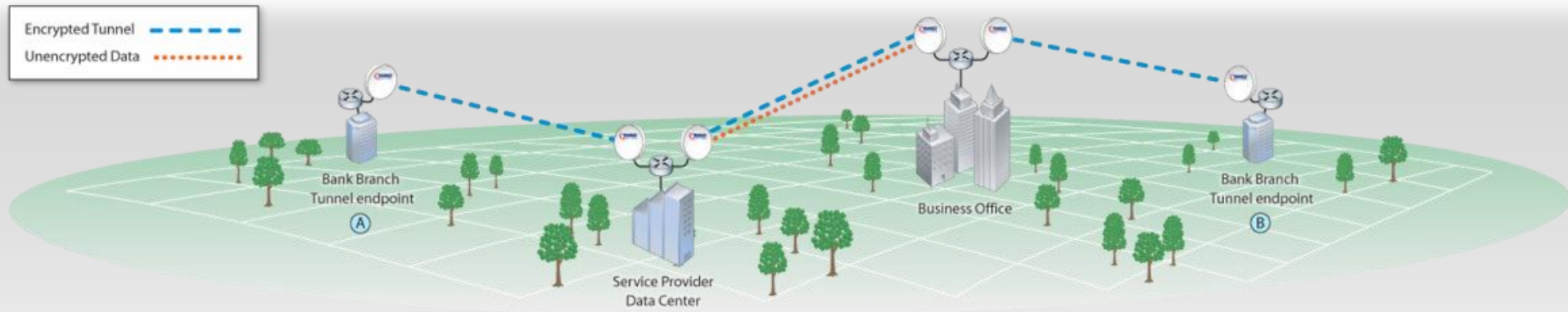
- IPSec Tunnelling allows for data data to be encrypted at the endpoints only. Data remains encrypted even while passing through multiple unsecured points & networking devices along the path.

- IPSec Tunnelling may also be used to send compressed data through multiple points.

TrangoLINK **GigaPro**™

Dual Modem & Advanced Functionality

- Up to 750 Mbps Full Duplex (2+0 Mode)
- Link Protection Modes
  - 1+1 Hitless Hot Standby
  - Frequency Diversity
  - Space Diversity
- Relay (East / West) Mode

- 4 GigE Copper / 2 Gige SFP Data Ports
- 16 T1/E1 & 1 OC3/STM-1 per modem
- Hitless ACM
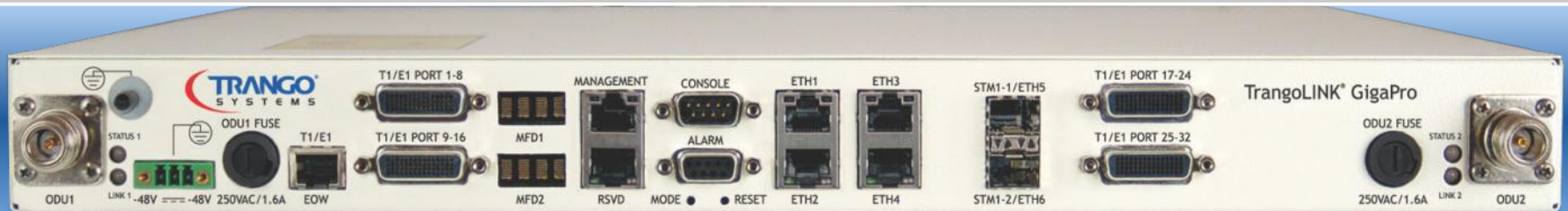
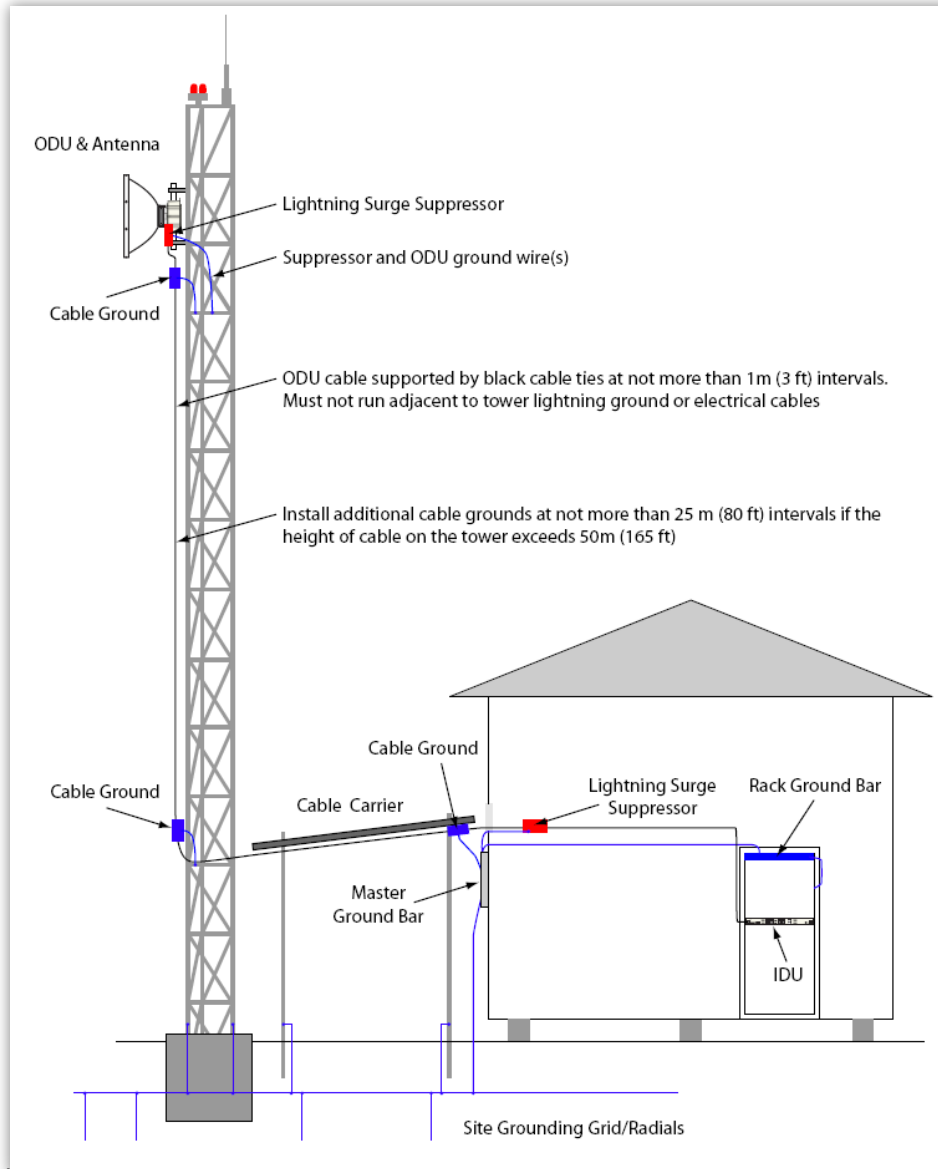# Grounding Requirements – Split System

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Grounding Requirements – All outdoor

ODU & Antenna

ApexPlus/Orion Elite ground wire

Cat5e/Cat6 Shilded Twisted Pair (STP) outdoor rated cable up to 100 meters supported by black cable ties at not more than 1m (3 ft) intervals.
Must not run adjacent to tower lightning ground or electrical cables.

Install additional cable grounds at not more than 25 m (80 ft) intervals if the height of cable on the tower exceeds 50m (165 ft)

PoE-GigE-48

Cat5e/Cat6 Ethernet Cable

Cable Carrier

Earth Ground wire

Master Ground Bar

Network Switch/Router

Site Grounding Grid/Radials

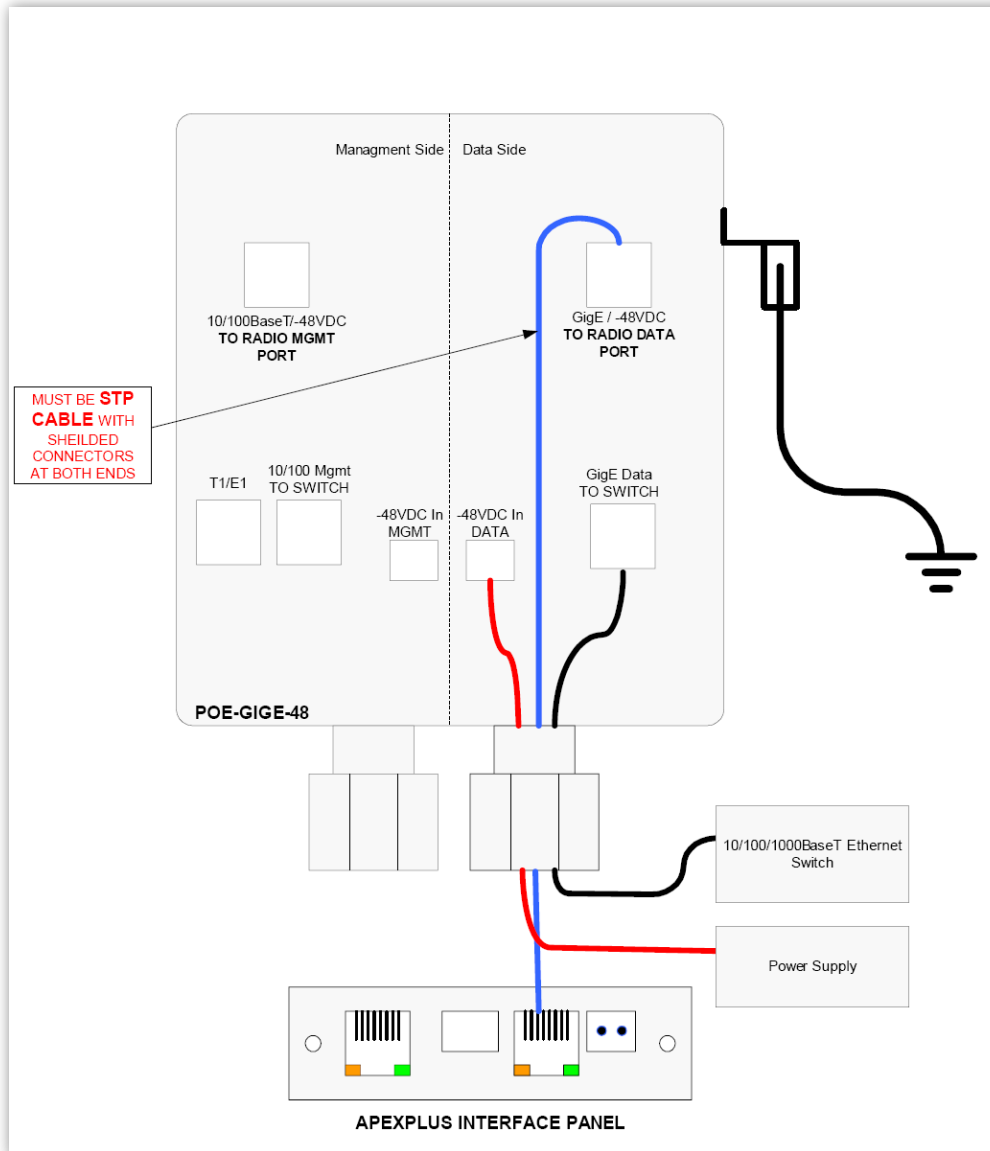# ApexPlus PoE – Single Power Supply, Data & Mgmt

ApexPlus PoE – Single Power Supply, Data Only/IBM

ApexPlus PoE – Redundant Power Supply

Copyright Trango Systems, Inc, 2011 Proprietary and Confidential
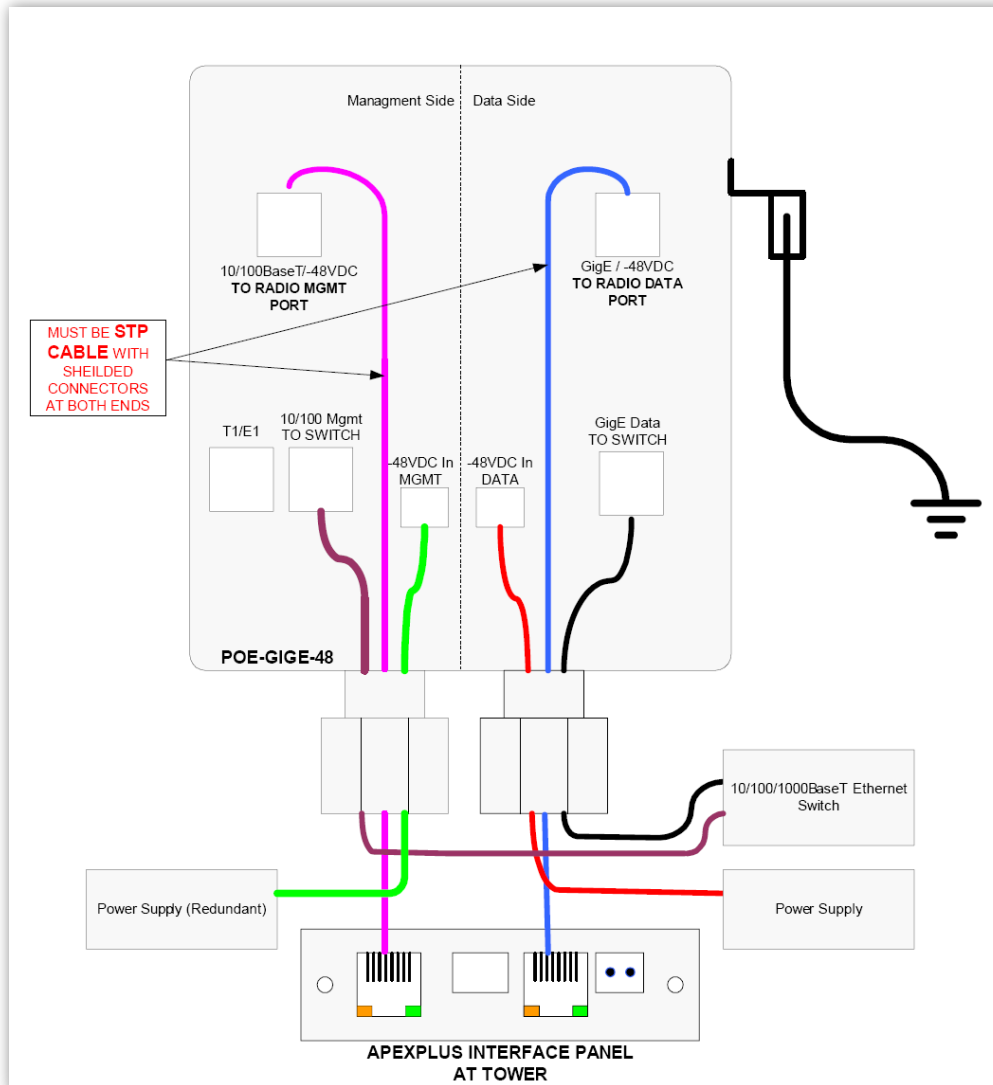
RSSI – Voltage BNC

Formula or Table

The following equation can be used to determine the RSL within 3 dB accuracy:

RSL (dBm) = 15.77 x VBNC -91.58

Voltage at BNC (Volts)	Receive Signal Level (dBm)
0.1	-90.0
0.25	-87.6
0.5	-83.7
0.75	-79.8
1	-75.8
1.25	-71.9
1.5	-67.9
1.75	-64.0
2	-60.0
2.25	-56.1
2.5	-52.2
2.75	-48.2
3	-44.3
3.25	-40.3
3.5	-36.4
3.75	-32.4
4	-28.5
4.25	-24.6
4.5	-20.6

Management Access

Default IP Address: 192.168.100.100

Web Interface – standard browser, Chrome, Firefox, IE

Telnet – from command prompt

SSH – SecureCRT, Putty

SNMP – SNMPc, PRTG

Serial – 115200, 8, n, 1, none

Access Levels

Default user: admin password: trango

View Node	Config Node	Crypto Node (Elite only)
■ Allows viewing of various radio settings. ■ Able to monitor & clear port statistics. ■ No setting or reboot.	■ Allows viewing and setting of various radio settings. ■ Full access to all radio parameters. ■ Able to reboot. ■ Aable to access debug> for ping, ssh, etc. (cli) ■ View all passwords (except crypto) & snmp strings (cli)	■ Control encryption & compression settings

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Simple Configuration!

Step-by-step instructions to configure a link

Only needed if not done prior to shipping (pre-configured)!

Log in via:
-Web Interface
-CLI (ssh/telnet/console)
-SNMP

ODU Power on

Set Frequency,
Modulation, Tx power

Opmode ON

Align Antennas

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 |

Set Management IP &
other relevant settings

Repeat on other end

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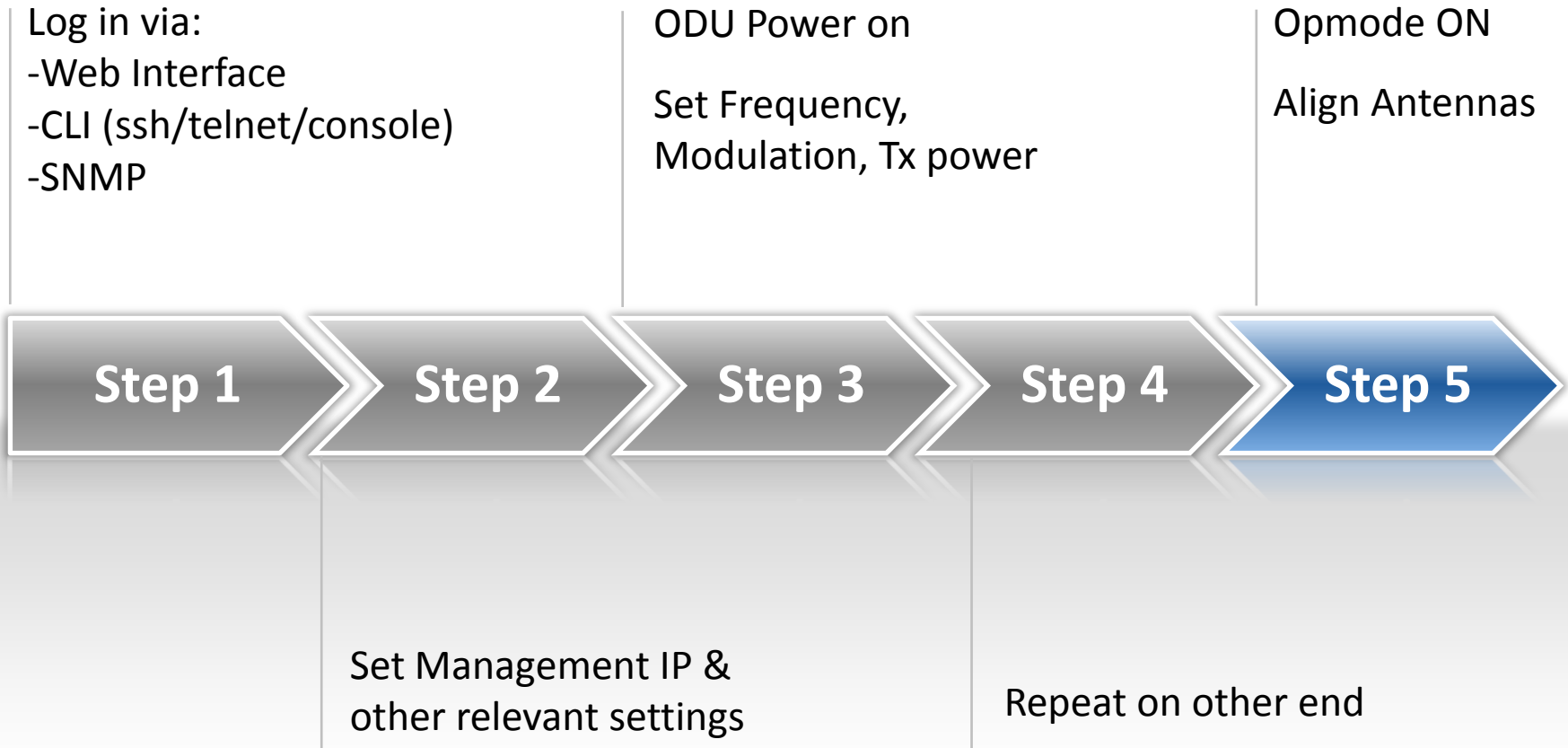
System Monitoring

- Full SNMP MIB

- SNMP Traps

- User Configurable Actions, Thresholds

- Syslog

Actual data from 220 km link over water using frequency diversity

Copyright Trango Systems, Inc, 2011 Proprietary and Confidential
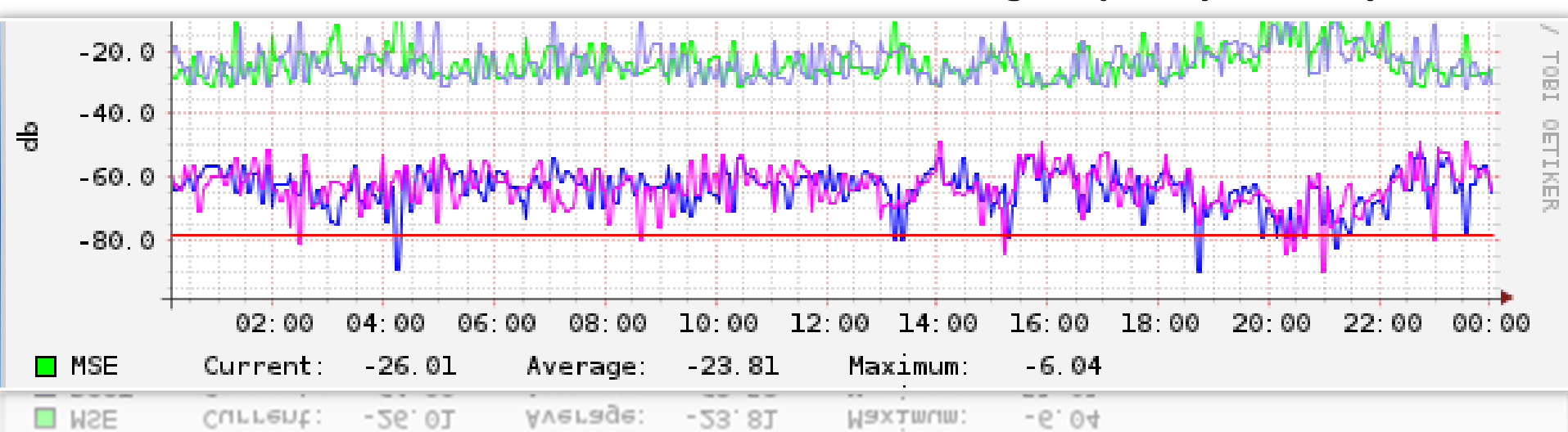
Troubleshooting

Linktest	Status	Siglevel
▪ Lock Status	▪ Status Modem	▪ IDU RSSI
▪ RSSI	▪ Status Port	▪ Norm/Radial MSE
▪ MSE	▪ Status PLL	▪ Decoder Stress
▪ BER	▪ Status TDM	▪ Carrier Offset
▪ Tx Modulation		▪ Power Sensors
▪ Rx Modulation		

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Mean Squared Error (MSE)

Similar to Signal-to-Noise Ratio (SNR)

Accounts for distortion & interference in addition to noise power

MSE Expected and Maximum Values (dB)						
	QAM256	QAM128	QAM64	QAM32	QAM16	QPSK
Maximum Expected value IF loopback	-36	-36	-36	-36	-36	-36
Maximum Expected value Normal operation at max power	-34	-33	-32	-30	-30	-29
Absolute Maximum for 1E-6 BER Sensitivity Threshold	-28	-25	-22	-19	-16	-9

Demo: Loopback IF & DIG

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Check RSSI and MSE with Datasheet

MSE Expected and Maximum Values (dB)						
	QAM256	QAM128	QAM64	QAM32	QAM16	QPSK
Absolute Maximum for 1E-6 BER Sensitivity Threshold	-28	-25	-22	-19	-16	-9

				Band of Operation (GHz)					
	Capacity (Mbps)	Channel BW (MHz)	Mod	**6**	**11**	**15**	**18**	**23**	**38**
T/R Spacing supported				160, 170, 252.04, 340	490, 500	475, 640	1560	1200, 1232	700
Max Transmit Power (dBm)		All	QPSK	30	28	26	25	25	23
		All	16QAM	28	26	23	22	22	21
		All	32QAM	28	26	23	22	22	21
		All	64QAM	25	22	21	20	20	17
		All	128QAM	25	22	21	20	20	17
		All	256QAM	24	21	20	19	19	16
Receive Sensitivity (dBm) For BER = 1E-6	62	40	QPSK	-86.0	-86.0	-86.0	-86.0	-86.0	-83.0
	128	40	16QAM	-79.8	-79.8	-79.8	-79.8	-79.8	-76.8
	158	40	32QAM	-75.8	-75.8	-75.8	-75.8	-75.8	-72.8
	193	40	64QAM	-73.4	-73.4	-73.4	-73.4	-73.4	-70.4
	224	40	128QAM	-70.3	-70.3	-70.3	-70.3	-70.3	-67.3
	256	40	256QAM	-67.3	-67.3	-67.3	-67.3	-67.3	-64.3

Legend

Basic Package = 118 Mbps max
License Key 1 = 196 Mbps max*
License Key 2 = 375 Mbps max*

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Receiver Maximum Input

Modulation Level	Max RSSI
256 QAM	-24 dBm
128 QAM	-22 dBm
64QAM	-20 dBm
32QAM	-18 dBm
16QAM	-16 dBm
QPSK	-14 dBm

Troubleshooting Tools

Linktest

- Lock Status
- RSSI & MSE

Syslog & Loglevel

- Set, Event & Status logging
- Check for error reporting
- Remove status logging for more history

Loopback

- Allows testing IDU/OMU
- Also useful for TDM termination

Debug>

- Linux Command Prompt
- Ping, SSH, Telnet, Route

Diagnostic

- Check some hardware functions
- Create a .bin with current radio state

Uptime

- How long radio has been running
- CPU usage monitoring

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Status Command

Status modem	Status pll	Status port/tdm
▪ MSE	▪ ODU RF PLL	▪ Ethernet port counters
▪ RSSI	▪ ODU IF PLL	▪ RF Port Counters
▪ BER - Bit Error Rate	▪ ODU Tx PLL	▪ Follow packet path
▪ FER – Frame Error Rate	▪ ODU Rx PLL	▪ Check for errors on ports
▪ Receive Lock Status	▪ IDU/OMU Tx Rx PLL	
▪ Tx/Rx Modulation	▪ All should be 1's (locked) or n/a	▪ TDM Errors

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Troubleshooting

No Link	Poor MSE	Low RSSI
▪ Frequencies match?	▪ Tx power too high?	▪ Alignment?
▪ Opmode off?	▪ Target RSSI?	▪ Polarization?
▪ Polarization?	▪ IF Cable Issue?	▪ Waveguide?
▪ ACM setting?	▪ Interference?	▪ Target RSSI?
▪ Datapath setting?		
▪ IDUs or ODUs swapped?		
▪ Loopback mode?		
▪ Fuses?		

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Antenna Alignment

- The #1 source of installation frustration and low RSSI

  - High performance antennas have very low or no side lobes (see pattern)

  - Antenna beam widths are very small, on the order of 1 degree

  - Very small adjustments in elevation or azimuth can result in huge RSSI change

- When is Alignment finished?

  - When RSSI is symmetric and within 3 dB of the expected RSSI
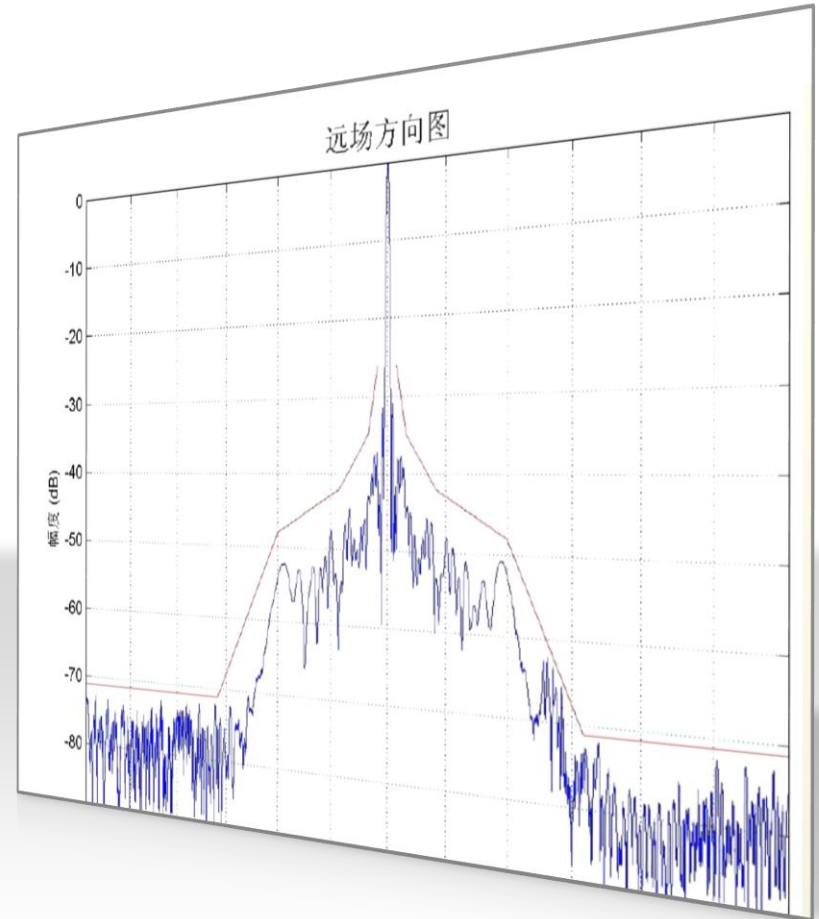
TROUBLESHOOTING – Siglevel

IDU RSSI: **-11**

➢ HP ODU maintains constant output, -10 dBm ± 2 dB

➢ Typical -8 to -11 for short cables

➢ 0' -10, 100' -12, 250' -14, 500' -17, 1000' -25

Normalized MSE: **-324**

Radial MSE: **-323**

➢ Expressed in 1/10th of dB. -324 = -32.4 dB. Under normal operation, MSE should be -32 or better. -29 is a worse number.

➢ Norm-MSE = Radial MSE phase noise residue is minimal

➢ Norm-MSE > Radial MSE there is some amplitude noise (AM distortion)

➢ Norm-MSE < Radial MSE phase noise residue exist, that the PLL did not fully correct

TROUBLESHOOTING – Siglevel

LDPC Decoder Stress: **0**

- ➤ Forward error correction engine.
- ➤ Corrects normal multipath, phase noise, channel noise, linearities in power amplifier and receiver circuitry.
- ➤ May burst to hundreds or thousands under normal operation.
- ➤ Larger the number, the greater it is working.

External AGC: **1652**

- ➤ Sets the correct signal level into A-D converter.
- ➤ Based on 140 MHz receive IF coming into IDU/OMU.

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TROUBLESHOOTING – Siglevel

Carrier Offset: **-22393**

- ➢ Expressed in Hz.
- ➢ How far off the center frequency is from expected.
- ➢ Normal range is within ±5 ppm, ex. 10 GHz would be ± 50 kHz.

Rx Symrate: **17422930**

- ➢ What symbol rate the receiver has locked onto.
- ➢ Should match set symbol rate from speed cmd closley.
- ➢ If number is changing or is not close to set rate, may be physical problem with ODU or IDU.

TROUBLESHOOTING – Siglevel

Block Counter: 0

- ➢ Accumulated data blocks since last link establishment.
- ➢ Collected on 20 second periodic basis.
- ➢ Cleared when read using siglevel cmd.

Uncorrect Block: 0

- ➢ Accumulative demodulated data block errors since last link establishment.
- ➢ Tracks errors reported by modem when passing traffic.
- ➢ Should be 0.
- ➢ Collected on 20 second periodic basis.
- ➢ If non-zero, packets are being dropped over RF link.

TRANGO SYSTEMS

TROUBLESHOOTING – Siglevel

LDPC Avg Iteration: 0

Output corrected bytes: 0
  - ➢ Bytes corrected using forward error correction.

Return Loss: 0x07D6
  - ➢ Analog measurement of reflected energy on IF cable.
  - ➢ Used to detect severe mismatch on the cable.

Siglevel is not supported on Giga and will show different information based on fw version and ODU.

TROUBLESHOOTING – Siglevel

Power Sensors

- ➢ Check accuracy of transmit and receive.
- ➢ Supported items vary.
- ➢ Will show OK or alarmed.
- ➢ Tx Power Alarm
- ➢ Tx PA Alarm
- ➢ PA on/off alarm
- ➢ Tx Power Range alarm
- ➢ Tx Power actual – should match within a few dB of set tx power.
- ➢ Rx Power actual

Pass or Fail:

- ➢ Channel test
- ➢ Telemetry debug

Traffic Conversion

- Traffic is carried in native format.

- No conversion devices

- No conversion overhead

- No added latency

- Also means we can't convert TDM framing or TDM to Ethernet.

Bandwidth

Data & VoIP

Legacy Voice

No Extra Conversion Devices

Direct to Radio IDU

GigE ports

TrangoLINK IDU

T1/E1/STM-1

TROUBLESHOOTING – T1/E1

T1 Line Codes (AMI or B8ZS) must not conflict between mapped ports (i.e. Near End T1 Line Code on Port #1 must match Far End T1 Line Code on Port #1)

Site 1	Site 2	Results
AMI	AMI	👍
B8ZS	B8ZS	👍
B8ZS	AMI	☹

TROUBLESHOOTING – TDM

➢T1 Framing Type: ESF only.

➢Adding custom binary support to future release.

➢Giga Pro: SFP Ports must be the same

  ➢ STM1 or Ethernet

  ➢ Port type set by data path.

TROUBLESHOOTING - DIAGNOSIS

No Link (Lock =0 during linktest)

➤TX Frequency must EXACTLY match the RX frequency on the remote side. Type *freq* command to view. Verify that the frequencies used match the regulatory body (FCC) approved frequencies.

➤Opmode is off. Run *opmode* command to view, and run *opmode on* to enable. If the unit was rebooted and the default opmode is not on, the unit will come back on but the opmode will be off. To prevent, run *default_opmode* on command and *save* (Apex) or *config save* (GigaPlus/Pro).

➤Are the frequencies configured correctly on each radio (TX and RX)? High frequency on the ODU B model and low frequency on the ODU A model.

➤Is the waveguide transition installed properly (SP ODUs only)? The rectangular openings on the ODU and transition must be lined up, and the transition tightened properly. Remove and reconnect if not. This is shown in the manual.

➤Where the IDUs and ODUs swapped when the link was taken to the field? The frequencies may need to be reassigned and saved if so.

TROUBLESHOOTING - DIAGNOSIS

<u>No Link (Lock =0 during linktest) cont'd</u>

➢Are both ODUs mounted on the same polarization? ODUs must be mounted with matching polarizations at each end of the link. If one side is mounted on the antenna differently than the other side, the link will not lot or the signal level will be 30 or more dB lower than expected.

➢If ACM is being used, ACM or Rateshift may not be enabled on both ends of the link. Enable the ACM and reset the speed on each end. The speed must be set the same on both ends.
NOTE: For Giga, the downspeed must match on both ends and the target RSSI must be set to a level just below the unfaded RSSI (normal operating RSSI)

➢Fuses OK? GigaPlus has self-healing fuse.

➢Loopback enabled on one side?

TROUBLESHOOTING - DIAGNOSIS

MSE is too high and/or bit errors are showing when running linktest

NOTE: MSE= -32 dB or lower is typical for 256 QAM, -29 is a worse number and is not typical

➢Is the transmitter power set too high for the modulation being used. Consult the license information to verify that the power level is no higher than the maximum allowed for the highest modulation that will be used.

➢Target RSSI setup may be set incorrectly It should be set about 3 to 5 dB lower than the actual RSSI so the in the ODU will set it's RX gain for optimum Noise figure and input level. ODURXAGC should be turned on after this is done and the link verified.

➢Are the ends on the LMR400 cable terminated properly? Have you tested your cable for return loss and insertion loss? – Improperly terminated cable will cause degraded MSE and more loss than expected, potentially making the link unusable. Additionally, some cables have inferior ground shield that can allow noise to enter the transmit and receive intermediate frequency circuits and cause low MSE. Ensure only cables with shielding levels of 90 dB or more at 350 MHz are used. Conduct a "wiggle" test on the IF cables to ensure that they are tight at the connection to the IDU and ODU.

TROUBLESHOOTING - DIAGNOSIS

<u>MSE is too high and/or bit errors are showing when running linktest , cont'd</u>

➢Are the loss values correct for the length of cable being used? Reset them if not.

➢Are both ODUs mounted on the same polarization? ODUS must be mounted with matching polarizations at each end of the link. If one side is mounted on the antenna differently than the other side, the link will not lot or the signal level will be 30 or more dB lower than expected.

➢Is the waveguide transition installed properly (SP ODUs only)? The rectangular openings on the ODU and transition must be lined up, and the transition tightened properly. Remove and reconnect if not. This is shown in the manual.

➢Presence of microwave transmitters on same frequency (uncommon): To check for possible interference from other licensees, turn off the opposite end transmitter and run the *rssi* command. The signal level should be -90 for HP ODUs, and -60 or lower for SP ODUs. The level should be steady within a dB or so.

TROUBLESHOOTING - DIAGNOSIS

Receive Signal Level is too low

➢Target RSSI setup may be set incorrectly It should be set about 3 to 5 dB lower than the actual RSSI so the in the ODU will set it's RX gain for optimum Noise figure and input level. ODURXAGC should be turned on after this is done and the link verified.

➢Reported RSSI more than 3 dB off the expected RSSI: There may be a alignment problem with the antenna, especially if both sides of the link show the same symptom . Solution : Realign the antenna(s). Opmode must be on at the remote side of the link to do alignment of the local side. Ensure that ATPC is off and that after the alignment is completed, the alignment mode is turned off.

➢Are both ODUs mounted on the same polarization? ODUS must be mounted with matching polarizations at each end of the link. If one side is mounted on the antenna differently than the other side, the link will not lot or the signal level will be 30 or more dB lower than expected.

➢Is the waveguide transition installed properly (SP ODUs only)? The rectangular openings on the ODU and transition must be lined up, and the transition tightened properly. Remove and reconnect if not. This is shown in the manual.

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TROUBLESHOOTING - DIAGNOSIS

<u>RF Link is good but packet loss is occurring:</u>

➢Verify the duplex and speed settings in the Ethernet port are correct (100 or 1 Gbit) and match the connected equipment, and that no CRC errors on the port are occurring.

➢Verify that the Ethernet ports are connected properly. The Giga and Apex family of Radios are port mapped, meaning that the traffic going into Ethernet Port 1 on the local side will only appear at port 1 of the remote side, local side port 2 traffic will appear on the remote side port 2, etc..

➢Check the Ethernet cables for correct wiring. If 1000BaseT is being implemented, Cat6 cable should be used.

<u>No Radio Management connection over the link</u>

➢Verify the In-Band management is set up properly - Check to see if the IP configuration is correct, the VLAN ID is set and matches on both ends, and that IBM is enabled. (See How-To on IBM).

➢Ping from one radio's IBM to the other. Then try pinging switch/router.

➢Try a different vlan/subnet/ip address.

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In Band Management

- Allows management of the link **in-band** with the data traffic, without use of the (OBM) Management port.

- Must use a VLAN tag (trunk port)

- Best practice: Dedicated management vlan

- Separate IP subnet from OBM interface

- Both OBM & IBM can work at same time

- Set default gateway for off subnet access in IBM or OBM subnet.

- Use IBM as a backup channel between radios if far end switch seems to be down

- Consider OBM backup for loopback testing and management with RPS.

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Reset Config/Password

Reset Passwords, IP Addresses & SNMP community strings:

➢Hold mode for more than 2 seconds, but less than 6 seconds
- ➢The CLI management passwords will be reset to default
- ➢The Web interface passwords will be reset to default.
- ➢The SNMP read/write/trap community strings will be set to defaults.
- ➢The CLI prompt will be reset.
- ➢The IP Address will be reset.

Reset all other config

➢Hold mode for 6-10 seconds
- ➢The unit will reset the system configuration to the factory default
- ➢Will NOT reset the items above.
- ➢The unit WILL REBOOT automatically.

TRANGO SYSTEMS

Firmware Upgrade

When to Upgrade

- We will notify you when new firmware is available.
- Not necessary to install every update,
- Install if it addresses an issue you're having or provides a feature you'd like to use.
- Read release notes.
- Each and every install/swap – firmware should match – check your spares!
- When equipment is returned from RMA/Repair.

How to Upgrade

- Download firmware and detailed instructions from our ftp.
- Ensure you have copies of pertinent system information just in case.
- Availability of a console connection recommended.
- Perform during maintenance window or failover traffic.
- Turn on tftpd in radios: *tftpd on*
- Transfer all files with tftp from your PC.
- Issue *bootimage upgrade x* command from config mode.
  x is idu, odu, or file number – use ? to see per system
- *Reboot* – Firmware is not applied to IDU until reboot. ODU applied during bootimage upgrade.
- Problems? Use *bootimage toggle* command.

Firmware Upgrade

FTP Upgrade

- Newer firmware versions support FTP upgrade.
- No need to tftp the files from your computer to radio!
- Read release notes and detailed instructions from our ftp.
- Ensure you have copies of pertinent system information just in case.
- Availability of a console connection is always recommended.
- Perform during maintenance window or failover traffic.
- Pull the files from our public FTP server (or your own) using ftp command in the radio.
    - Need a route to internet using default gateway – IBM or OBM.
    - Not taking your login? – Try pinging the IP first.
- Issue *bootimage upgrade idu/odu* command from config mode.
- *Reboot* – Firmware is not applied to IDU until reboot. ODU applied during bootimage upgrade.
- Problems? Use *bootimage toggle* command.

Support Portal – support.trangosys.com

KnowledgeBase

- FAQ

- Forums

- Community Help

- Documentation

- Announcements

- Feature Requests

- Firmware

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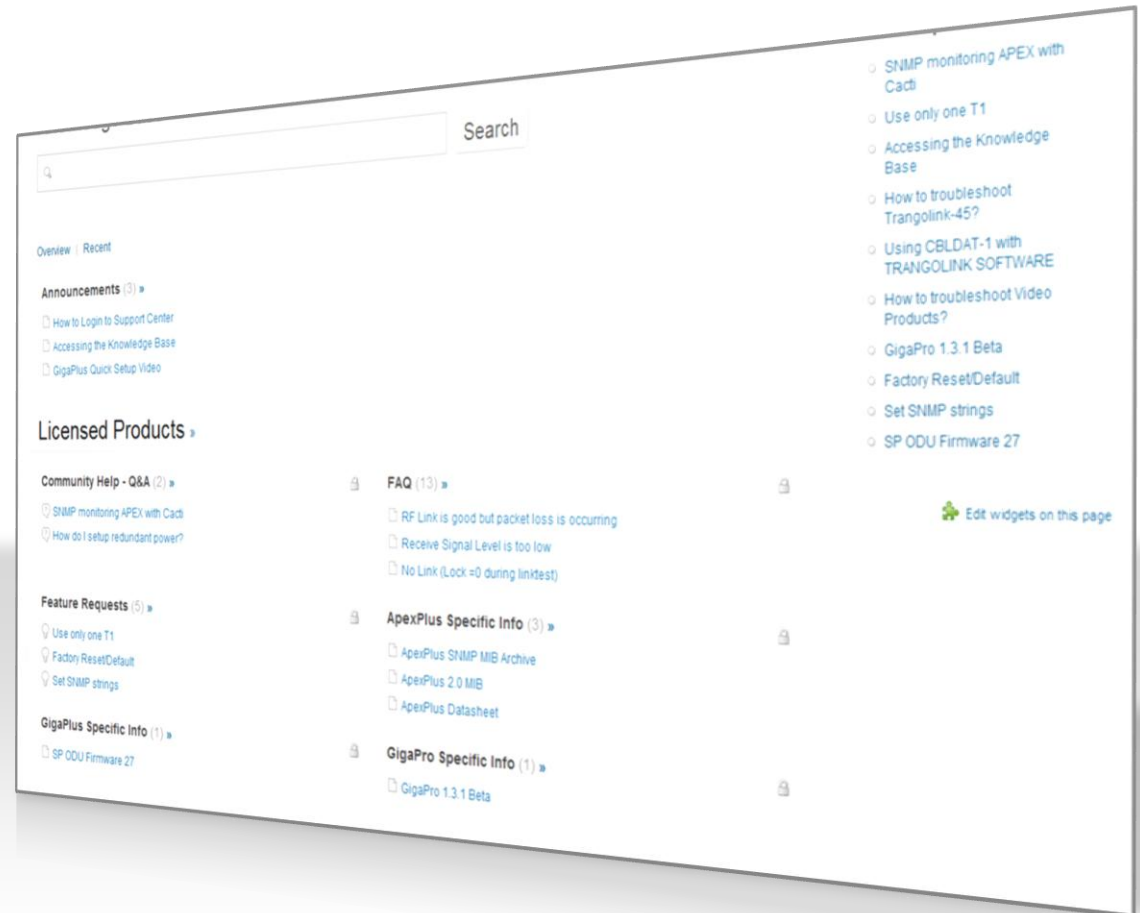
Other Webinars

Register for an upcoming webinar

- Intro to Trango Microwave: Datasheet, RF Performance, Link Planning

- Link Configuration

- Installation: Grounding, Power, Link Validation & Commissioning

- Antenna Install: Antenna & Combiner Installation, Alignment

- Traffic Management, QoS, ACM, DSCP

- Troubleshooting & Diagnosing Link Conditions

- Monitoring Links with SNMP, PRTG Demo

- 1+1 Hot Standby & GigaPro Configuration

    » http://support.trangosys.com

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Thank you!

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