Advantech
Wireless

Terrestrial Microwave Radios

Product Portfolio Presentation

January 06, 2011

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Advantech is a world leading provider
of wireless broadband communications

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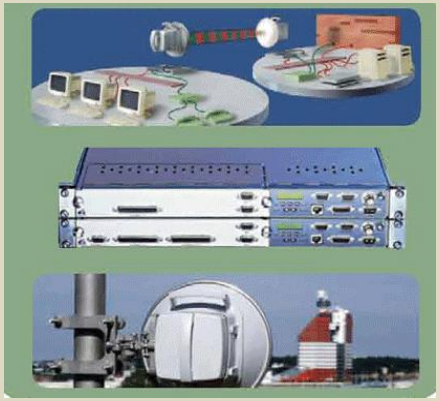

Microwave systems

Modems & terminals

Satellite equipment

Satellite networks

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- Founded in 1988
- 100% Canadian Owned
- Significant Acquisitions:
  - Signal Processors Limited (UK) – 2001
  - ACT Wireless Inc. (USA) – 2001
  - SpaceBridge Semiconductor Corp – 2005
  - Allgon Microwave (Sweden) – 2005
  - EMS – Satellite Networks – 2006
  - UTTC & Northern Radio – 2006

Worldwide Deployments & References

- Major microwave radio customers include
  - Tele 2
  - Lancom East
  - Plurin
  - State of Nevada
  - Tekonek
  - Verizon Wireless
  - US Military/Navy
  - NorthWestel
  - GTT
  - Mitac Inc
  - Versatel
  - Raycom Wireless
  - Network By Wireless
  - Woosh Wireless

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Full Turnkey EF&I Services

- System Engineering
  - Network Design
  - Path Analysis
  - Frequency Planning
- Application Engineering
  - Site Survey
  - System Drawings
  - Waveguide Design
- Installation & Commissioning
  - System Line-up and Testing
  - Waveguide and Antenna Test and Alignment
  - Equipment Installation

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Worldwide Customer Care

- Technical Support
  - Technical and operational assistance during local business hours
  - 7x24 hour emergency assistance
  - Guaranteed 30 minute call-back on emergency assistance
  - On-site support and upgrade services

- Repair & Return
  - Like for Like (non emergency)
  - Same for Same
  - Emergency Dispatch

- Training
  - In-house Training
  - On-site Training
  - Customized Training

- Service & Support Agreements
  - Control of costs
  - Reduced repair and response times
  - Efficient problem resolution

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Terrestrial Microwave Radios

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Transcend 800

Highest Performance SDH, PDH, IP and Broadcast Microwave Radio Solution

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Transcend 800

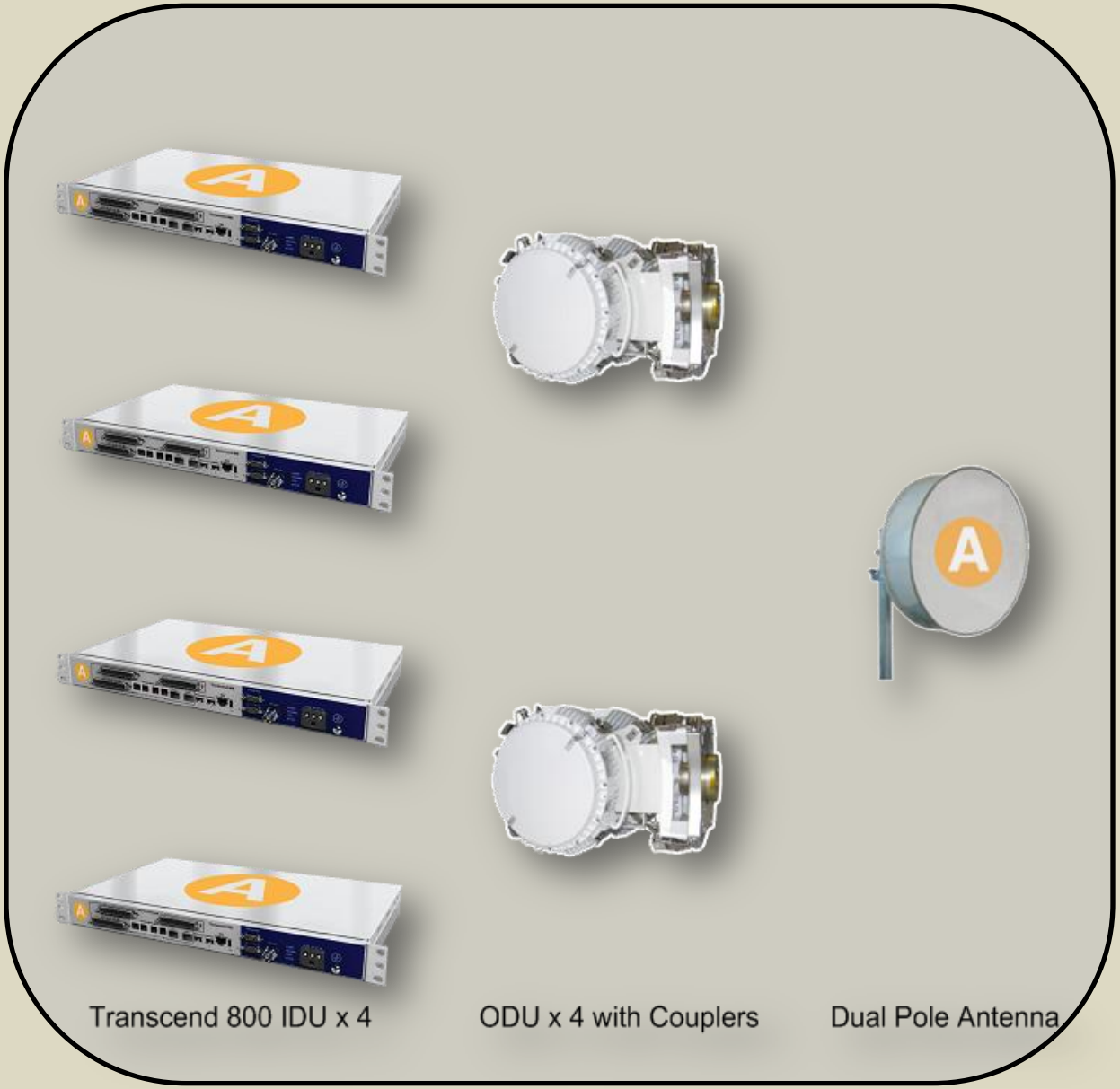
Key Features:

- 380 Mbps max modem throughput
- QPSK to 256QAM supported
- True ACM™
- Diversified interfaces
  - 4x DVB-ASI (2 Tx + 2 Rx)
  - 4x 10/100/1000 BaseT Layer 2 Ethernet Switch
  - 3x 10/100/1000 BaseT Layer 3 Ethernet Router
  - 2x STM1/OC-3 (optical or electrical) via SFP connectors
  - 16x E1/T1
  - 3x DS3
- 2x Aggregation/Protection interfaces
- RS232, RS485, Relays, Alarms
- High speed interface for protection and traffic aggregation

Transcend 800 – Optimized for Next Generation Telecom and Digital Broadcast Networks

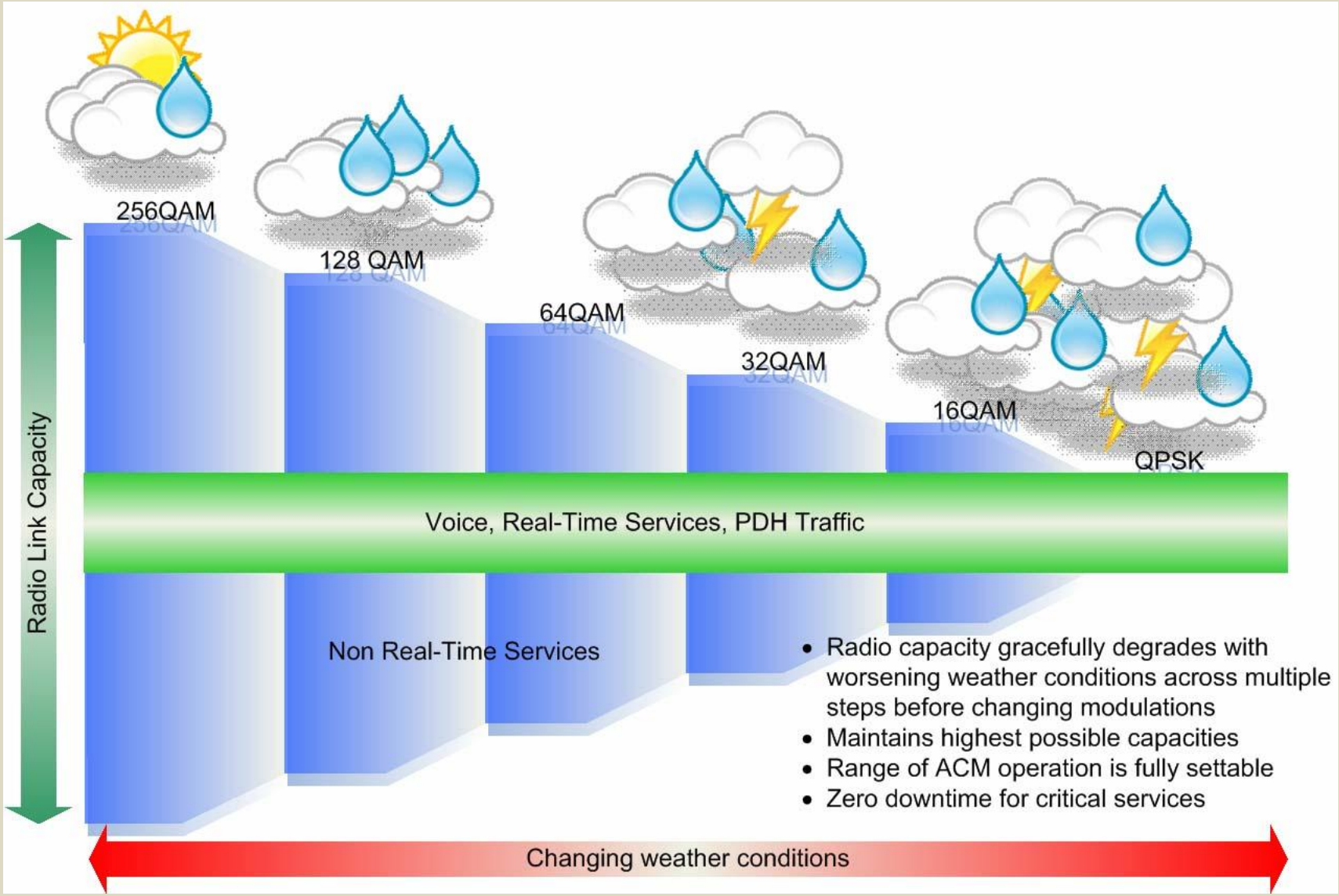
- Optimized for TDM and IP networks
  - Native Ethernet and Native TDM supported as well as mixed traffic
  - Layer 2 GigE switch for lowest latency Ethernet traffic
  - Layer 3 GigE router for highly integrated cost optimized network deployments such as GSM, LTE, mesh WiFi, and WiMax
- Optimized for shared backhaul networks
- Optimized for Broadcast applications
  - DVB-ASI integrated within the platform
  - Connects directly with broadcast equipment
    - MPEG data can be transmitted without encapsulation as IP

Transcend 800 Multi-Gigabit Microwave Radio



- Multi-gigabit over-the-air capability supported
- Example configuration shown supporting up to 1.5 Gbps
  - Four 56 MHz channels
  - Each radio contributes 380 mbps of capacity
- Redundancy schemes fully supported in aggregate radio configuration
  - Hot-Standby
  - Space Diversity
  - Frequency Diversity
  - Polarity Diversity

Transcend 800 - True Adaptive Coding and Modulation™



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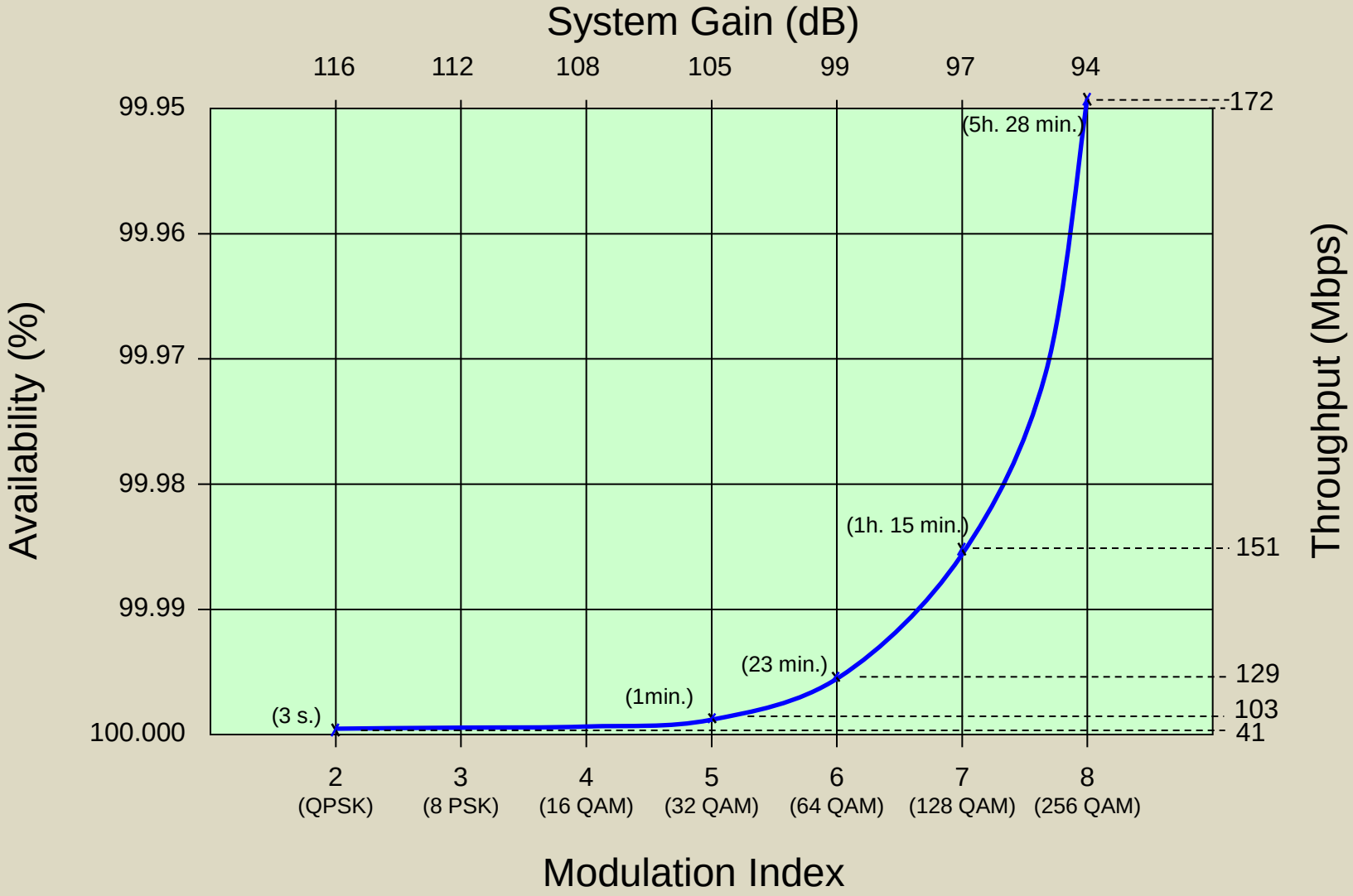
Advantech True Adaptive Coding and Modulation™

- Modulation and coding rates can be set to change automatically to mitigate fade conditions
- 18 dB improved System Gain through coding rate and modulation changes as radio seamlessly adjusts to counteract fade conditions from the highest coding rate at 256QAM to the lowest coding rate at QPSK
- No hits or introduced bit error during ACM operation
- Increases availability, reduces antenna sizes, and can increase hop lengths
- E1/T1 traffic and critical real-time Ethernet services can be prioritized and combined with Priority functionality of Ethernet

ACM Real World Example

7GHz, 28 MHz BW, High Power, 75.4 km Space Diversity Link (1.2m antenna)



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Advantech – First to Market with True Adaptive Coding and Modulation™

- Advantech pioneered ACM operation for microwave and VSAT systems
  - First Advantech True ACM™ microwave terminal introduced 3 years ago
- Adaptive techniques only recently being supported by other Tier 1 microwave suppliers
  - Most suppliers only support Adaptive Modulation and not Adaptive Coding and Modulation
    - Adaptive Modulation results in dropping from higher modulations to lower modulations without intermediate steps as a path fade counter measure resulting in significant traffic drops
    - Advantech's True Adaptive Coding and Modulation™ results in traffic gracefully degrading in extreme fade conditions across multiple coding steps and modulations resulting in higher overall sustained traffic capacity
  - Additionally, most competitive products do not offer errorless adaptive coding and modulation (or errorless adaptive modulation)
    - When changing modulations or coding rates as well as when performing 1+1 switchover, many products will introduce errors.
- Advantech's True Adaptive Coding and Modulation™ is completely under operator control with high and low limits settable and the feature disabled

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Maximized Availability

- True ACM™ capability in Transcend 800 includes sophisticated path fade countermeasures such as Low Density Parity Check (LDPC)
  - LDPC FEC supports data transmission close to the theoretical (Shannon) limit
  - LDPC configurable with various frame sizes to optimize system gain

- Advantech has been operating a True ACM™ link between Advantech buildings in Montreal and has never lost traffic over three years of operation in Summer torrential rain storms or Winter blizzards

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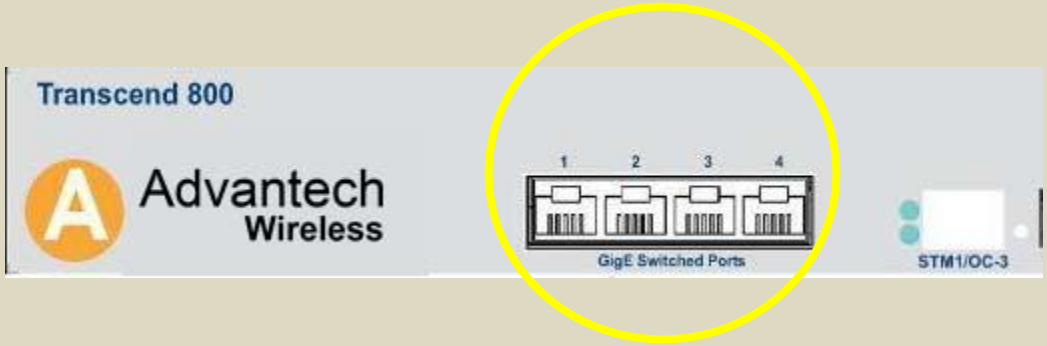
Outstanding Radio Performance

Transcend 800's advanced radio and DSP signal processing translate into extremely low thresholds and the highest system gains. See typical 10E-6 thresholds at 15GHz frequency band below.

Modulation	QPSK		8PSK	16QAM		32QAM		64QAM		128QAM		256QAM	
Code Rate	**3/4**	**7/8**	**3/4**	**3/4**	**7/8**	**3/4**	**7/8**	**5/6**	**10/11**	**6/7**	**10/11**	**7/8**	**10/11**
1.75 MHz	-101.2	-99.2	-97.4	-95.7	-93.8	-92.3	-90.3	-89.2	-87.8	-86.2	-85.2	-83.3	-82.6
3.5 MHz	-98.2	-96.2	-94.4	-92.7	-90.8	-89.2	-87.3	-86.2	-84.7	-83.2	-82.2	-80.3	-79.6
7 MHz	-95.1	-93.2	-91.3	-89.7	-87.8	-86.2	-84.3	-83.2	-81.7	-80.2	-79.2	-77.2	-76.6
14 MHz	-92.1	-90.2	-88.3	-86.7	-84.8	-83.2	-81.3	-80.2	-78.7	-77.2	-76.2	-74.2	-73.5
28 MHz	-89.1	-87.2	-85.3	-83.7	-81.8	-80.2	-78.3	-77.1	-75.7	-74.2	-73.1	-71.0	-70.3
56 MHz	-86.1	-84.2	-82.3	-80.7	-78.8	-77.2	-75.3	-74.1	-72.7	-71.2	-70.1	-67.6	-66.9

Transcend 800 – Ethernet Interfaces



- *Flat throughput regardless of the packet size*
- *Flat latency when carrying small amount of data*

Physical Ports

- 3x10/100/1000 Routed ports
- 4x10/100/1000 Switched ports
  - Total of 7 GigE RJ45 ports

Data Link

- LAN IEEE802.3 10/100/1000Base-T
- Bridging
- MAC level access lists
- Jumbo frame (9000 byte)
- Rapid Spanning Tree Protocol (RSTP), IEEE 802.1w
- VLAN, IEEE 802.1Q
- Static ARP
- Layer 2 flow control, IEEE 802.3x
- Transparently forward all layer 2 traffic including MPLS, QinQ

Services

- DHCP client and server
- DNS client
- NTP client
- FTP/TFTP client
- NAT (dynamic, static)
- CDP (Cisco Discovery Protocol)

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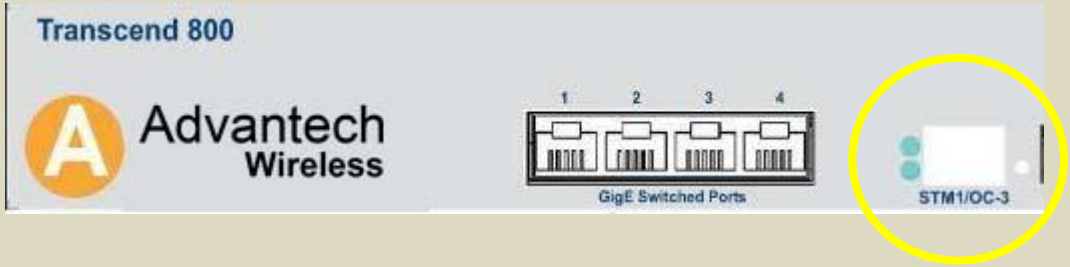
Transcend 800 – Router Features

TCP/IP stack:

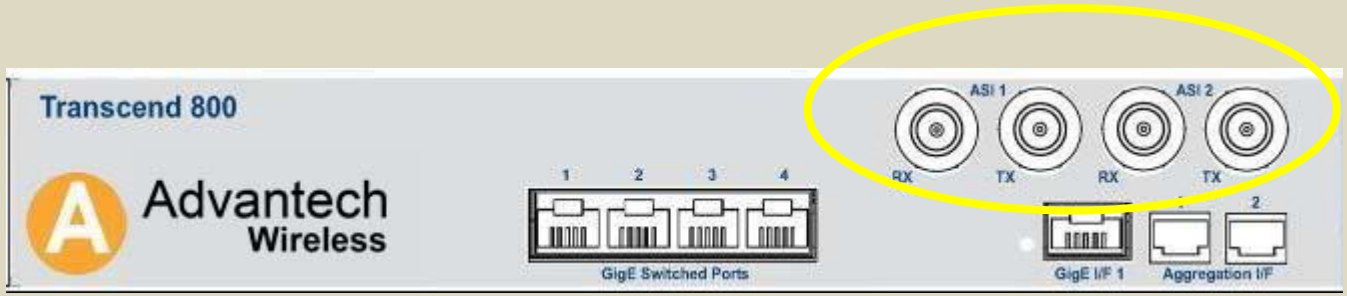
- IP routing: static, dynamic (RIP v.1, v.2, OSPF v.2)
- Packets filtering (firewall), access lists up to network layer 4
- IP tunneling (IP over IP, GRE)
- Static multicast forwarding
- Policy based routing
- Load balancing
- UDP broadcasts forwarding (DHCP, DNS, BOOTP, etc.)
- QoS network layer 3 :
  - FIFO queue (FIFOQ)
  - Priority queuing (PRIQ)
  - Class based queuing (CBQ)
  - Waited Fair Queue (WFQ)
- Configurable IP policy
  - ICMP policy
  - Routing policy
  - Switching policy
  - TCP policy
  - UDP policy
- IPSec

Transcend 800 SDH/SONET Radio



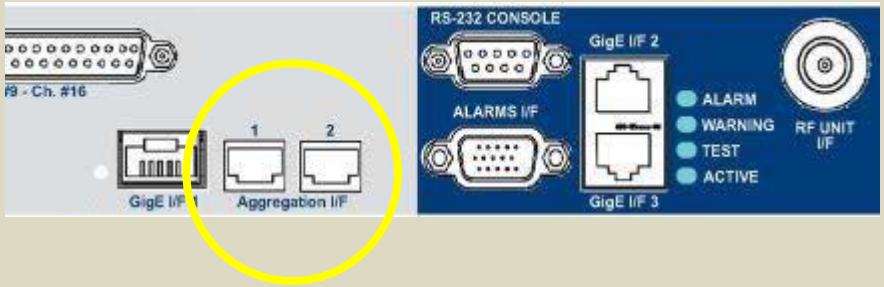
- STM-1/OC-3 supported through SFP plug-ins
  - Up to 2 x STM-1/OC-3
  - User-selectable clock source
  - Internal clock with holdover

Transcend 800 Broadcast Microwave Radio



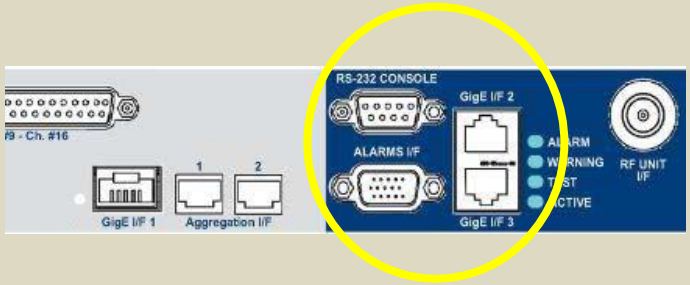
- Broadcast applications supported by DVB-ASI interfaces
  - MPEG data carried directly from broadcast equipment over the microwave link
  - No need for external ASI to IP converters or other elements that increase jitter
  - Up to 4 DVB-ASI (Asynchronous Serial Interface) connectors
  - 2 DVB-ASI Tx + 2 DVB-ASI Rx
  - 216Mbps MPEG-TS stream
  - Low latency interface
  - Full DVB-ASI line and radio protection with hot-standby, frequency diversity, and space diversity supported
    - Hitless and Errorless Rx Switching

Transcend 800 Aggregation and Protection Interfaces



- SERDES over HSSDC2 supports
  - Hot-Standby Redundancy
  - Space Diversity
  - Frequency Diversity
  - Polarization Diversity
  - Traffic Grooming
  - Expansion

Transcend 800 NMS Interfaces and Control



Management:

- Two traffic independent RJ45 ports (routed)
- 1 x RS-232 interface for serial port console and telnet console
- 1 x RS485 interface (high-density 15-pin DSUB) for external alarms
- Command line interface (Cisco like)
- WEB interface-assisted configuration
- SNMP agent v.1, v.2, v.3
- Interface statistic – Performance Monitoring
- Running and startup configurations saving and recovery
- AAA (Authentication, authorization and accounting):
- Local AAA (local user table)
- RADIUS, TACACS+ (Client, Remote server authentication)
- System log, local and remote storage support
- System alarms, ITU-T X.733
- Built-in diagnostic:
  - Ping, traceroute
  - Local statistics (interfaces, IP, TCP, UDP, ICMP and etc.)
  - Debugging functions

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Transcend VP

Key Benefits

- Software Controlled Capacity Selection
- Industry leader in System gain
- Fully Integrated Embedded Element Management
- Enhanced Superior Performance with Reed-Solomon Forward Error Correction and with link ID security codes
- Routing Management IP traffic
- Full support for L2 Layer 2 QoS Priority and VLAN support according to IEEE 802.1p and IEEE 802.1q, end-to-end flow control, statistics and performance monitoring
- 16xE1/T1 + 3xETH (up to 32Mbps w/ large packets)

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Outstanding Radio Performance

- Transcend VP patented CPM modulation technology translates into low thresholds and the highest system gains

Transcend VP/Transcend VP Enhanced			
Bandwidth		18 GHz	**10E-6 CPM Threshold**
	ETSI	**3.5 MHz**	-94.1 dBm
		7.0 MHz	-91.0 dBm
		14.0 MHz	-88.0 dBm
		28.0 MHz	-85.0 dBm
	ANSI	**2.5 MHz**	-95.5 dBm
		5.0 MHz	-92.5 dBm
		10.0 MHz	-89.5 dBm
		20.0 MHz	-86.5 dBm
		30.0 MHz	-85.0 dBm

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ODU

Common ODU platform for Advantech's licensed radios

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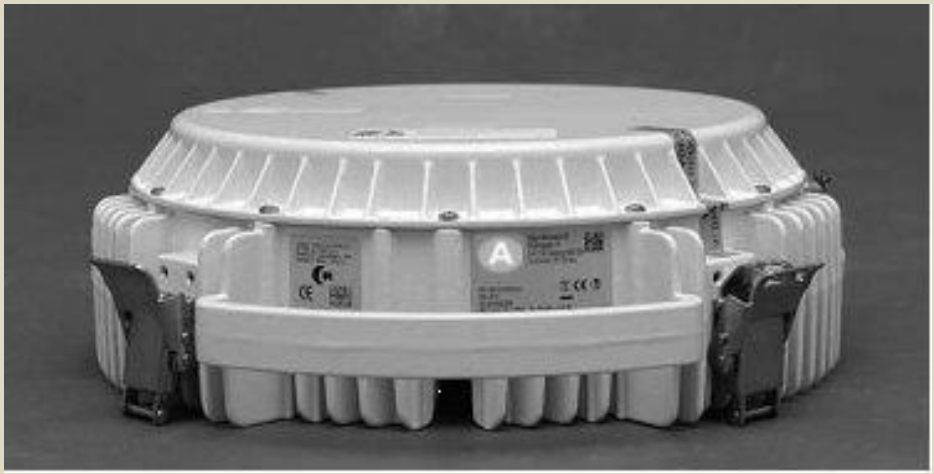
ODU

ODU platform covers all licensed bands from 6 GHz to 38 GHz



RF Band	T to R (MHz)
6 GHz	160/170*, 240, 252, 340
7 GHz	154, 160, 161, 168, 196, 245
8 GHz	119/126, 266, 311.32
11 GHz	490, 500, 530
13 GHz	266
15 GHz	315/322, 420, 490, 640, 728
18 GHz	1008/1010, 1092.5
23 GHz	1008, 1200, 1232
26 GHz	800, 1008
32 GHz	812
38 GHz	700, 1260

*6 GHz 160/170 TR spacing will be available in 2011

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Three RFU Models to Cover Complete Radio Need

Transmit power for High Power (HP), Standard Power (SP), and Low Power (LP) ODU models

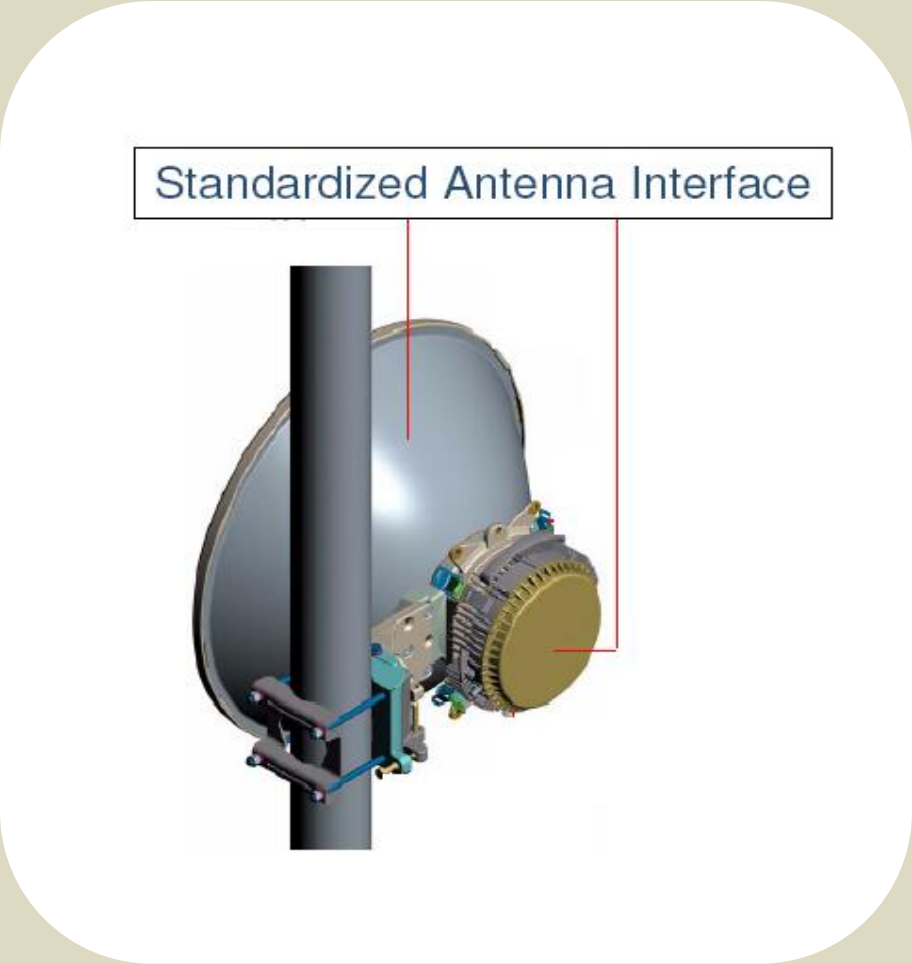
HP RFUs												
	Transmit Power (dBm) vs. Frequency											
Modulation	**6 GHz**	**7 GHz**	**8 GHz**	**11 GHz**	**13 GHz**	**15 GHz**	**18 GHz**	**23 GHz**	**26 GHz**	**28 GHz**	**32 GHz**	**38 GHz**
QPSK/PCM	30	30	30	28	26	26	25.5	25	25	25	23	23
16/32QAM	28	28	28	26	23	23	22	22	22	22	21	20
64/128QAM	24	24	24	21	18	18	17	17	17	17	16	16
256QAM	22	22	22	19	16	16	15	15	15	15	14	14

SP RFUs												
	Transmit Power (dBm) vs. Frequency											
Modulation	**6 GHz**	**7 GHz**	**8 GHz**	**11 GHz**	**13 GHz**	**15 GHz**	**18 GHz**	**23 GHz**	**26 GHz**	**28 GHz**	**32 GHz**	**38 GHz**
QPSK/PCM	-	27	27	26	26	26	25.5	24	23.5	-	22.5	22
16/32QAM	-	22.5	22.5	21.5	21.5	21.5	21.5	20.5	19.5	-	18.5	17.5
64/128QAM	-	16.5	16.5	15.5	15.5	15.5	15.5	14.5	13.5	-	12.5	11.5

LP RFUs												
	Transmit Power (dBm) vs. Frequency											
Modulation	**6 GHz**	**7 GHz**	**8 GHz**	**11 GHz**	**13 GHz**	**15 GHz**	**18 GHz**	**23 GHz**	**26 GHz**	**28 GHz**	**32 GHz**	**38 GHz**
QPSK/PCM	-	27	27	25	25	23	23	23	22	-	21	18
16QAM	-	22	22	21	21	21	21	20	19	-	18	16

- “HP” ODUs operate up to 256QAM and support wide band up to 56 MHz BW
- “SP” ODUs operate up to 256QAM and support standard band up to 28/30 MHz BW
- “LP” ODUs operate up to 16QAM and support standard band up to 28/30 MHz BW

ODU – Easy and Safe ODU Installations



- Compact & lightweight
  - One tool for all mast top commissioning
  - Extremely easy replacement of ODU
  - Polarization changed by simple rotation of RFU
- Compliant to ETSI environment standard ETS 300 019-1-4
- Standard ODU type for all radios opens easy and seamless path to future system expansion

ODU - Redundancy Protection (1+1) and Diversity Support

- Protection against hardware failure and propagation effects
- Transmitter Hot Standby
- Diversity operation using hitless switching
- Space Diversity
- Frequency Diversity
- Polarization Diversity
- Switching functionality built into IDU
  - No additional active units required
- Easy reconfiguration between 1+0 and 1+1
- Power Splitter, asymmetric and symmetric, for single antenna operation

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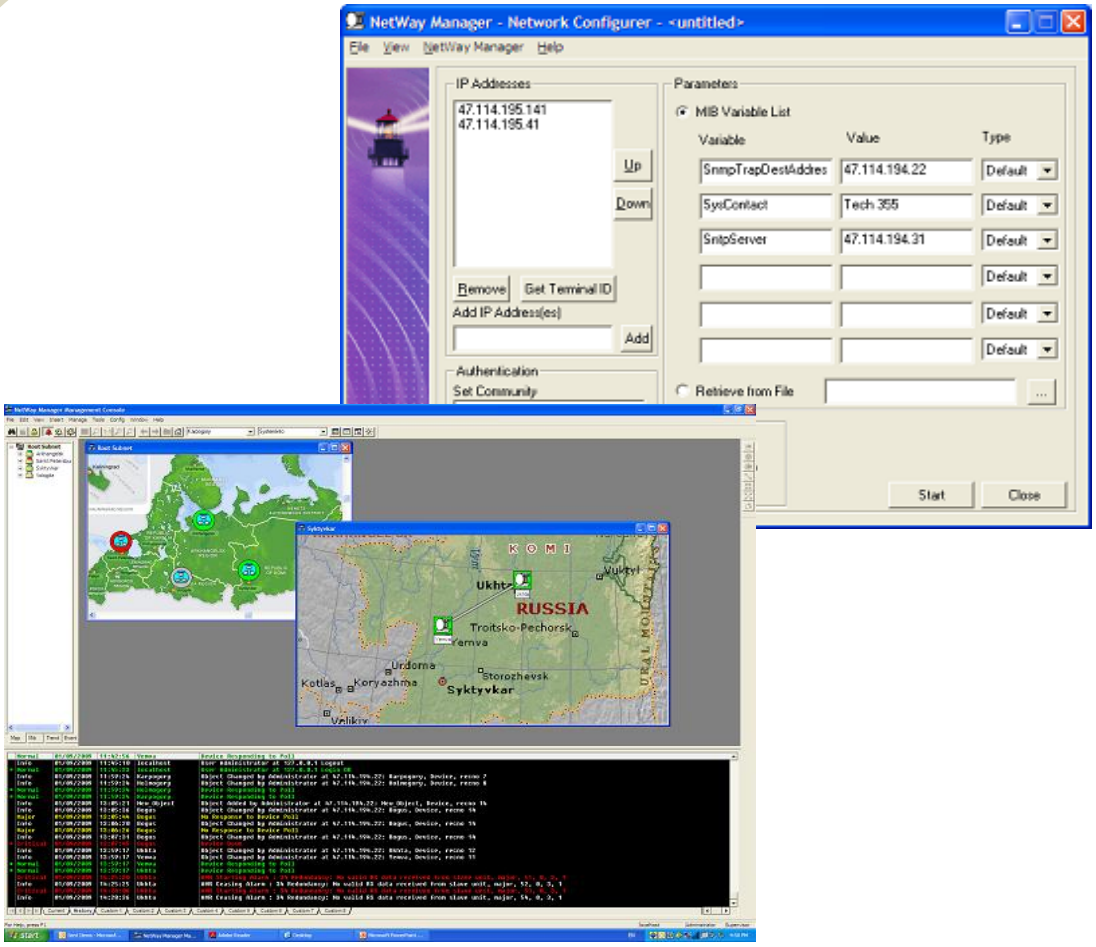
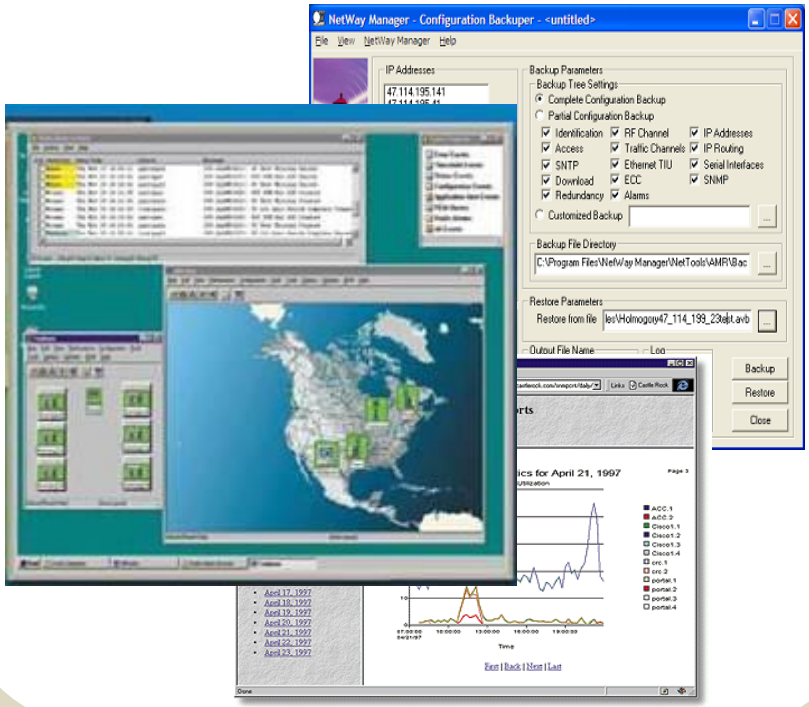
Network Management



Scale to manage any size of network

Network Management

Highlights



- Netway Manager™ (NWM) consistent management tool for all Advantech Wireless radios
- Secure distributed network management system that will monitor entire network infrastructure
- NWM can manage third party equipment including radios
- For large networks: supports integration into higher-level NMS
- For smaller networks: standalone NMS
- Two network size variants: Telecom and Enterprise

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Network Management

Key Benefits

- NetWay Manager™ uses a distributed architecture and scales to manage any size of network
- Distributed polling architecture makes it easy to manage networks that span multiple sites
- Collects long term network statistics and automatically generates custom Trend Reports
- Quickly and easily create installation files
- Secure network management through support of SNMP v3
- NetWay Manager™ is extremely easy to deploy and use
- Capable to manage other supplier radios and different telecom equipment

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