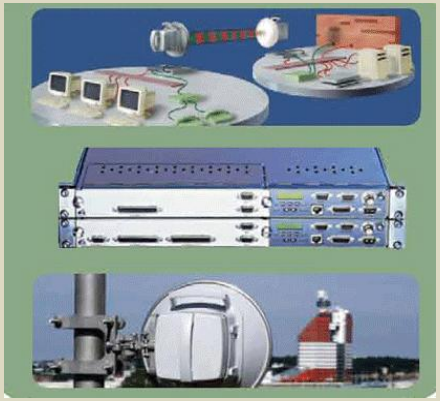
Advantech Wireless

Satellite & Terrestrial Backhaul Solutions

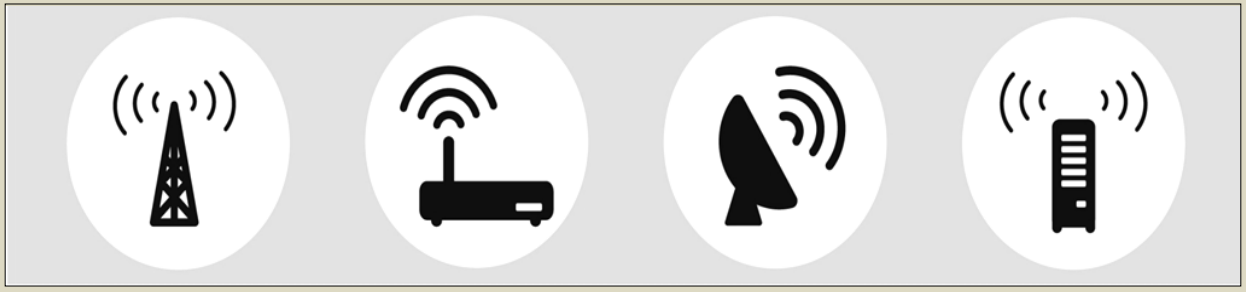
January 2011

Advantech is a world leading provider of wireless broadband communications

Advantech
Wireless



- Microwave systems
- VSAT networks
- Satellite equipment
- Routers



Advantech Wireless

- 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

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

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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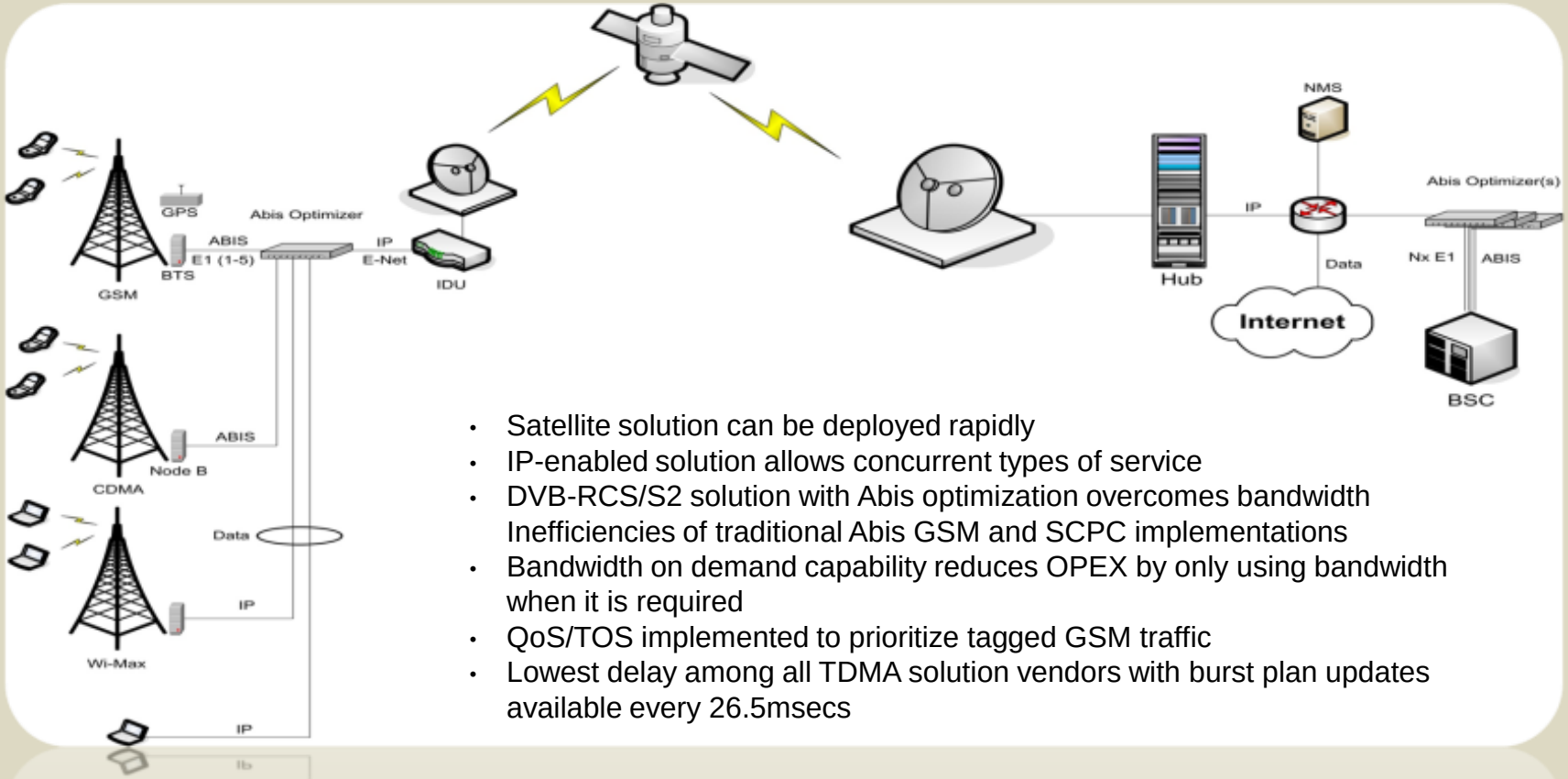
Satellite Backhaul Solutions

Implementing GSM Backhaul, 3G & 4G



- Satellite solution can be deployed rapidly
- IP-enabled solution allows concurrent types of service
- DVB-RCS/S2 solution with Abis optimization overcomes bandwidth Inefficiencies of traditional Abis GSM and SCPC implementations
- Bandwidth on demand capability reduces OPEX by only using bandwidth when it is required
- QoS/TOS implemented to prioritize tagged GSM traffic
- Lowest delay among all TDMA solution vendors with burst plan updates available every 26.5msecs

Implementing GSM Backhaul, 3G & 4G

The Advantech Wireless satellite GSM backhaul solution provides the following value proposition to Network and Mobile Service Operators:

- Ubiquitous satellite coverage
- Terrestrial infrastructure can be insufficient, poor quality or non-existent, particularly in very remote areas
- Satellite solution can be deployed rapidly, allowing fast service rollout and revenue generation.
- Independence from competitive carriers, from whom terrestrial lines must be leased
- Supports GSM, UMTS and CDMA, as well as combined 2G, 2.5G and 3G & 4G LTE networks
- Enables additional revenue streams by allowing profitable deployment of EDGE broadband data services in low density and remote areas
- DVB-RCS/S2 solution with Abis optimization overcomes bandwidth inefficiencies of traditional Abis GSM and SCPC implementations

Continued…..

Implementing GSM Backhaul, 3G & 4G (Continued)

- Bandwidth on demand capability reduces OPEX by only using bandwidth when it is required
- IP-enabled, providing excellent bandwidth efficiencies and allowing the addition of IP-based services, such as internet access, VoIP, WiFi, WiMax and LTE
- Ideal solution for applications such as disaster recovery and mobile events with the use of suitably equipped vans
- Overall bandwidth utilization is based on that of the entire network, which is further reduced using higher order modulations, Abis optimization, bandwidth on demand and shared bandwidth, dramatically reducing associated costs

Thus for emerging markets with low call utilization, the Advantech Wireless satellite GSM/3G/4G backhaul solution provides the ideal cost effective method of transport and extends the geographic coverage of cellular networks while providing the capability to add other revenue generating services.

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Terrestrial Microwave Radios

Transcend 800

Highest Performance SDH, PDH, IP and ASI (Broadcast) Microwave Radio Solution with built-in powerful IP/MPEG router

or

High performance router (3Gbps, 200,000 pps, flat throughput) with a built-in powerful wireless WAN interface

Transcend 800

Key Features:

- 380 Mbps max modem throughput
- QPSK to 256QAM modulation
- True ACM™
- Diversified interfaces
  - 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
  - 16/20/32/52/84x E1/T1(balanced)
  - 3x DS3
  - 4x DVB-ASI (2 Tx + 2 Rx)
- 2 high speed Protection/Traffic Aggregation interfaces
- RS232, RS485, Relays, Alarms

Transcend 800 – Optimized for Next Generation Telecom GSM, 3G/4G

- 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 EDGE, LTE, mesh WiFi, and WiMax
- Optimized for shared backhaul networks

- Transcend™ 800 is the low cost high capacity, high performance, and flexible solution to demanding transmission and telecom networks, including backhauling 3G/4G traffic and Wireless Broadband Networks such as WiMAX, Metro WiFi, UMTS TDD, and private communication networks carrying data, voice, and high definition video.

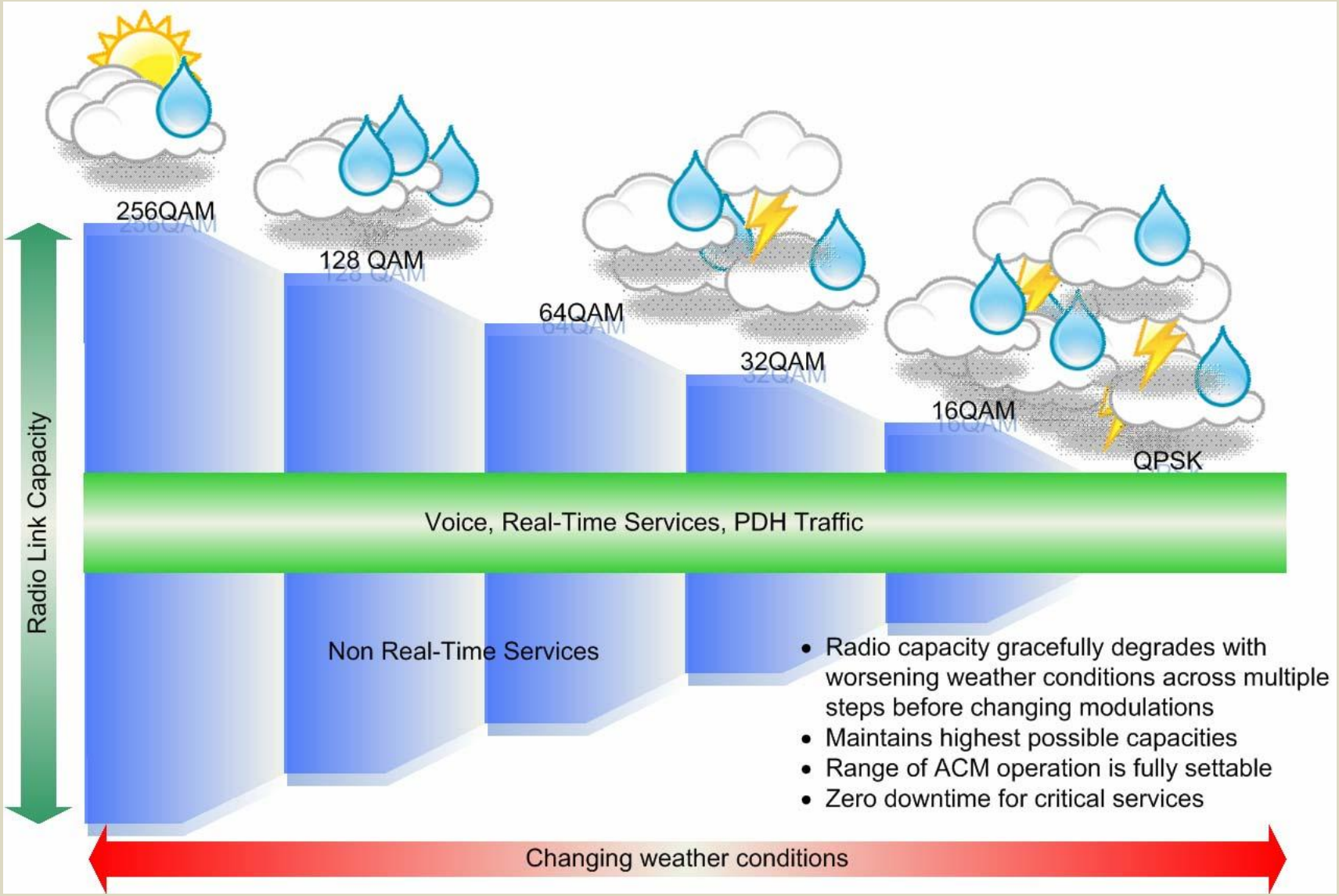
Transcend 800 – Optimized for Digital Broadcast Networks

- Optimized for Broadcast applications
  - DVB-ASI integrated within the platform
  - Connects directly with broadcast equipment
    - Video data can be transmitted as native MPEG TS or encapsulated in IP
    - Built-in encapsulation from MPEG TS to IP
    - Built-in de-encapsulation from IP to MPEG TS

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™



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
- Hitless operation: No hits or bit errors introduced during ACM activity
- Significantly increases availability, and therefore simultaneously can reduces antenna sizes, TX output power and increase hop lengths
- E1/T1 traffic and critical real-time Ethernet services can be prioritized and combined with Priority functionality of Ethernet

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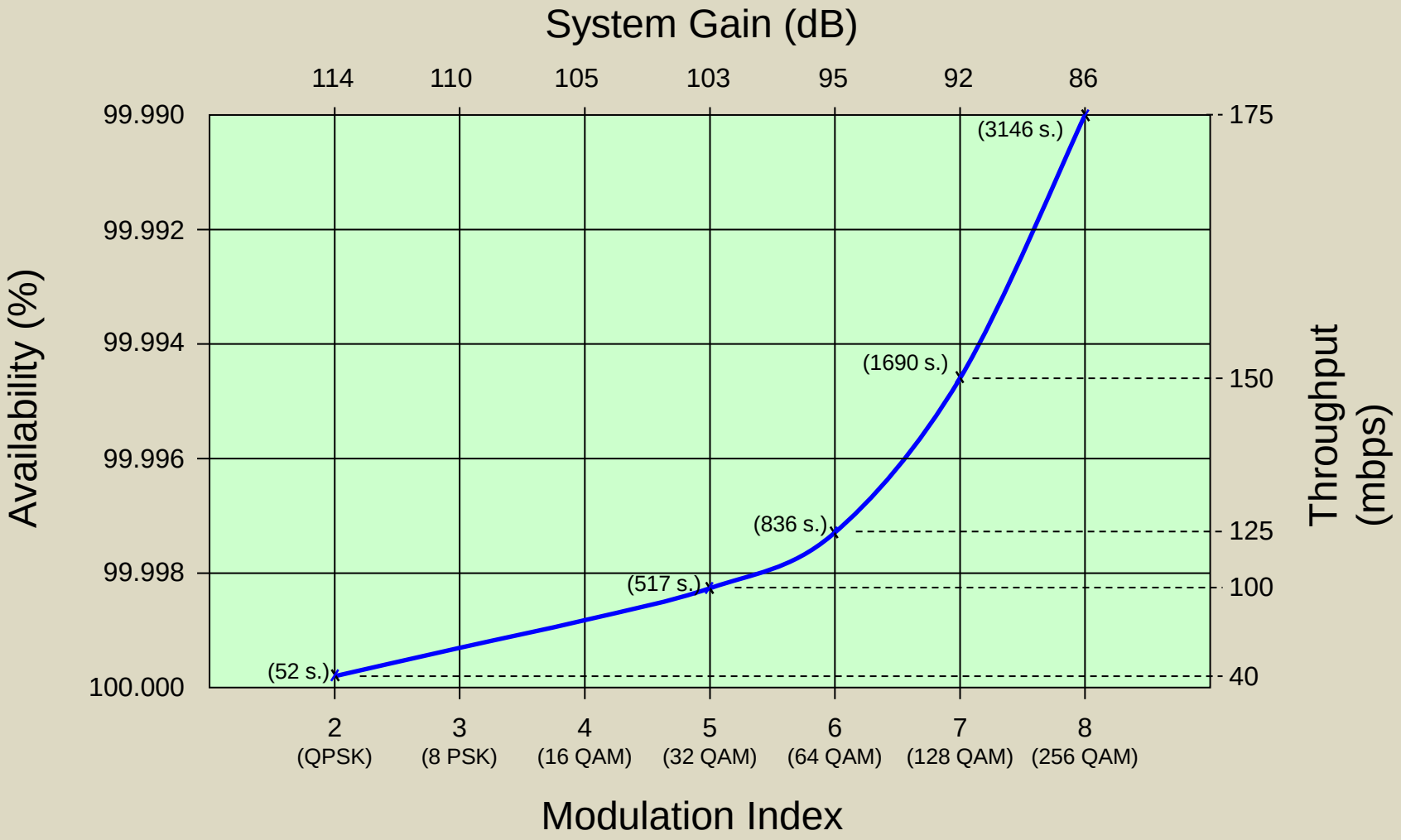
True Adaptive Coding and Modulation™ Real World Example

7GHz, 28 MHz BW, High Power, 75.4 km Space Diversity Link in Brazil

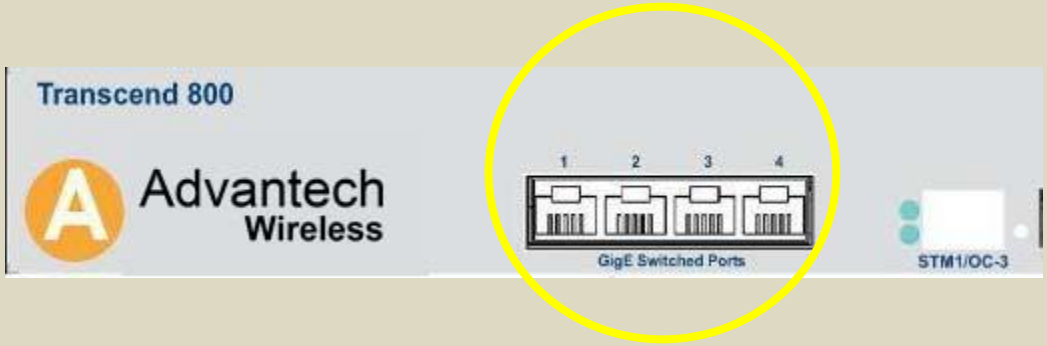


First to Market with True Adaptive Coding and Modulation™

- Advantech pioneered ACM operation for microwave and VSAT systems
  - First Advantech True ACM™ microwave terminal introduced 5 years ago

- Adaptive techniques only recently and mostly partially (Adaptive Modulation only) 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 (seamless and errorless) degrading in extreme fade conditions across multiple coding steps and modulations, resulting in higher overall sustained traffic capacity**
  - **Always simultaneously achieves highest possible throughput and highest possible availability for any given physical link, as it can always operate just above the error (S/N) threshold for any modulation/coding**
  - Additionally, most competitive products do not offer errorless adaptive coding and modulation (or errorless adaptive modulation) or diversity
  - When changing modulations or coding rates as well as when performing space/frequency diversity or 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 or the feature disabled

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 auto selectable 10/100/1000Base-T,
- Bridging, Switching and Routing
- MAC level access lists
- Jumbo packets (9000 bytes)
- 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

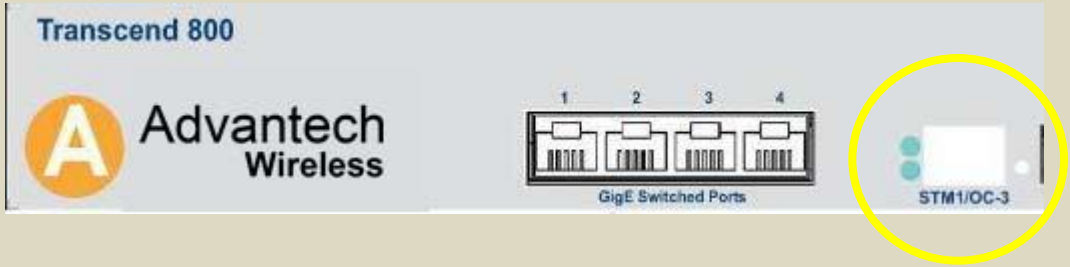
- DHCP client and server
- DNS client
- NTP client
- FTP/TFTP client
- NAT (dynamic, static)
- CDP (Cisco Discovery Protocol)

Transcend 800 – Router Features

TCP/IP stack:

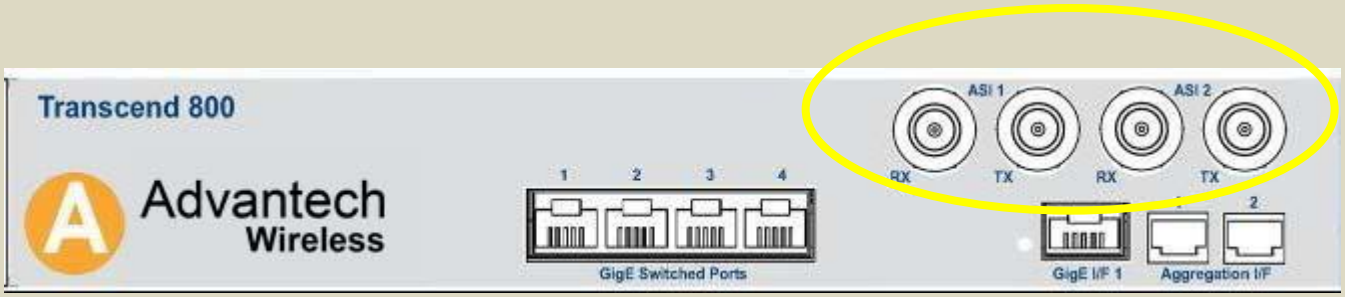
- IP routing: static, dynamic (RIP v.1, v.2, OSPF v.2)
- Packets filtering (firewall), access lists up to network Layer 4
- VLANs
- IP tunneling (IP over IP, GRE)
- Static multicast forwarding
- Policy based routing
- Load balancing
- UDP broadcasts forwarding (DHCP, DNS, BOOTP, etc.)
- QoS network Layer 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



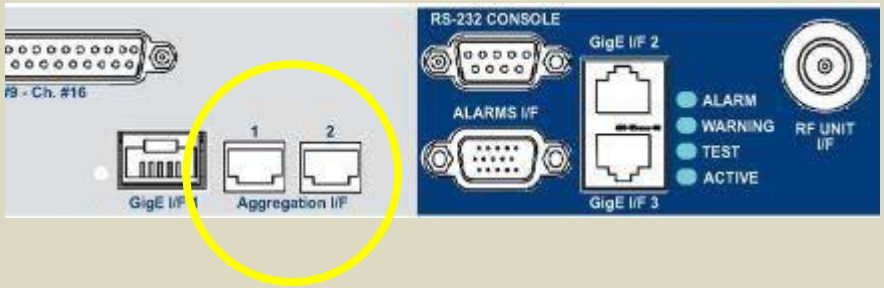
- STM-1/OC-3 supported through SFP plug-ins
  - Up to 2 x STM-1/OC-3
  - User-selectable clock source
  - Internal clock with holdover

Transcend 800 Broadcast Microwave Radio



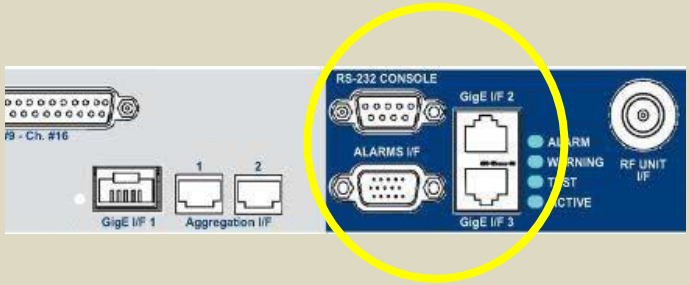
- Broadcast applications supported by DVB-ASI interfaces
  - MPEG data carried directly from broadcast equipment over the microwave link
  - No need for external ASI to IP converters or IP to ASI converters, or other elements that increase jitter
  - Up to 4 DVB-ASI (Asynchronous Serial Interface) connectors
  - 2 DVB-ASI Tx + 2 DVB-ASI Rx
  - Can carry full 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
  - Can distribute high stability Stratum 2 clock (Rubidium or GPS sourced) through the entire network, providing **10MHz and 1pps** at each site for **SFN** operation, hence eliminating the need of expensive GPS

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:

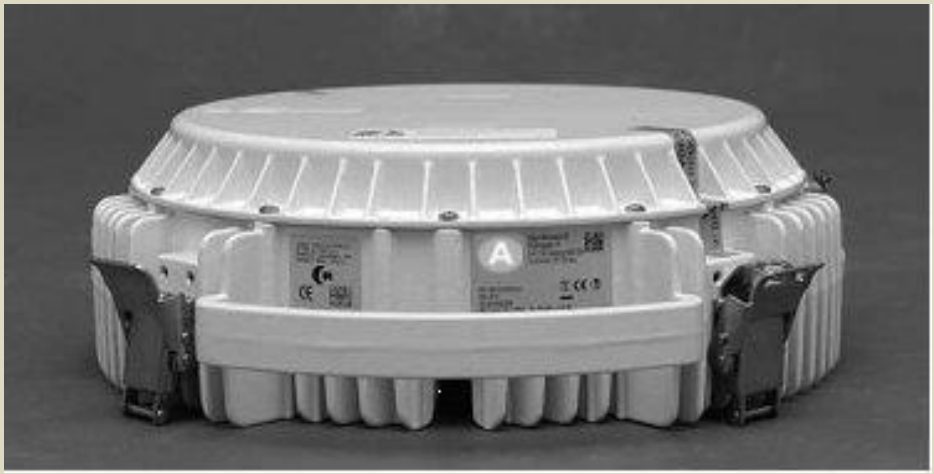
- Two traffic independent RJ45 ports (routed)
- 1 x RS-232 interface for serial port console and telnet console
- 1 x RS485 interface and alarms dry relay contacts on high-density 15-pin D-SUB connector for external NMS communication
- WEB interface-assisted configuration; or
- Command Line Interface (Cisco like **CLI**)
- 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

ODU

Common ODU platform for Advantech's licensed radios

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 Q1 2011

Three RFU Models to Cover Complete Licensed Radio Needs

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

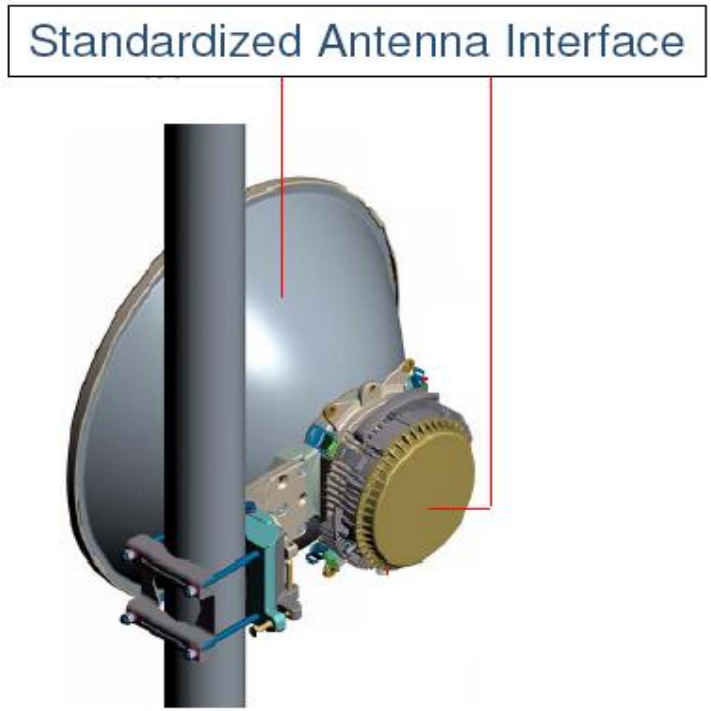
HP RFUs												
	Transmit Power (dBm) vs. Frequency											
Modulation	**6 GHz**	**7 GHz**	**8 GHz**	**11 GHz**	**13 GHz**	**15 GHz**	**18 GHz**	**23 GHz**	**26 GHz**	**28 GHz**	**32 GHz**	**38 GHz**
QPSK/PCM	30	30	30	28	26	26	25.5	25	25	25	23	23
16/32QAM	28	28	28	26	23	23	22	22	22	22	21	20
64/128QAM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

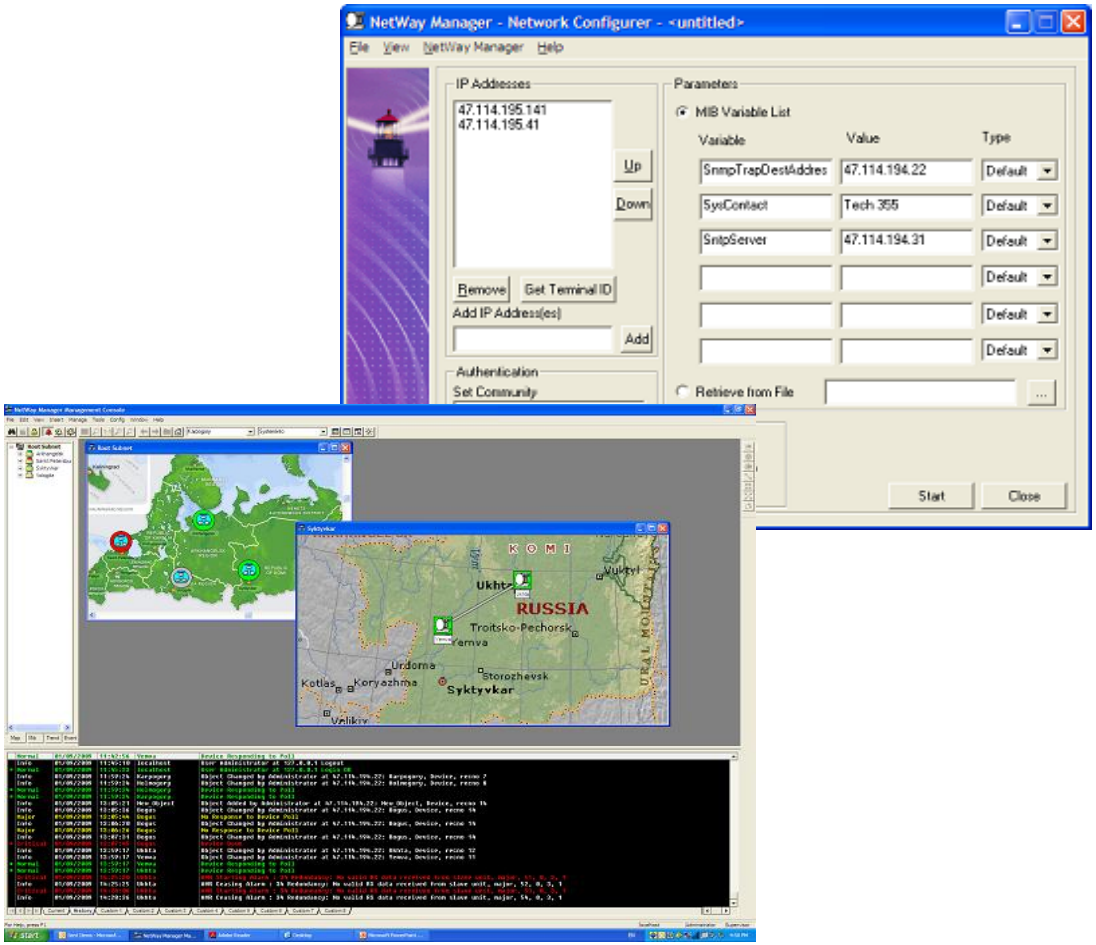


- Compact & lightweight
  - One tool for all mast top commissioning
  - Extremely easy replacement of ODU
  - Polarization changed by simple rotation of RFU
- Compliant to ETSI environment standard ETS 300 019-1-4
- Standard ODU type for all radios opens easy and seamless path to future system expansion

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 (could be remote reconfiguration between frequency/polarization diversity and 1+1 HSBY
- Includes Power Splitters, asymmetric and symmetric, for single antenna operation or dual polarized antennae

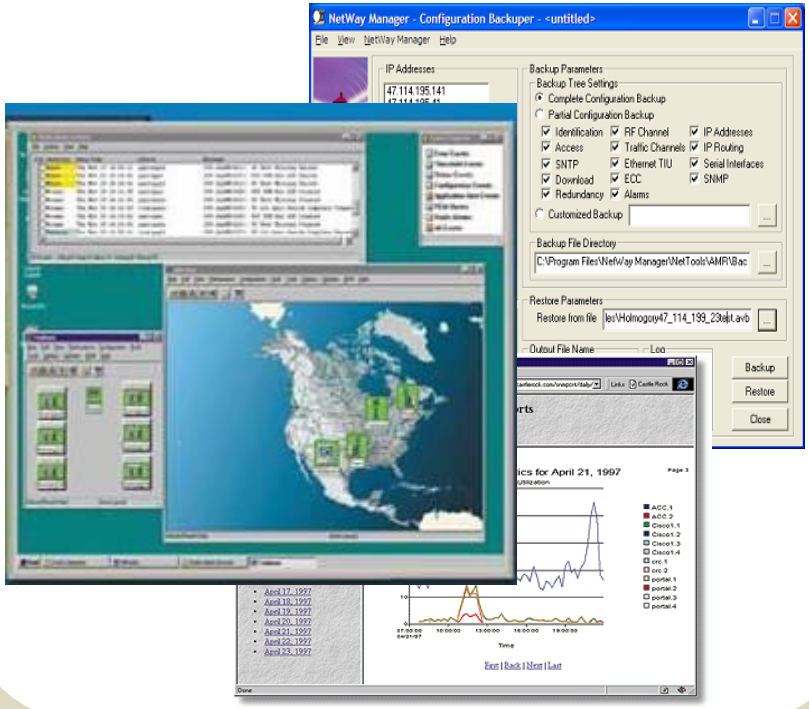
Network Management



Scaled 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 northbound higher-level NMS
- For smaller networks: standalone NMS
- Two network size variants: Telecom and Enterprise

What is Transcend 800?

It is

Highest Performance SDH, PDH, IP and MPEG TS Broadcast (ASI or IP) Microwave Radio Solution with built-in powerful IP/MPEG router

for microwave professionals; or

High Performance L3 router and L2 switch (3Gbps, 200,000 pps, flat throughput) with a built-in powerful wireless WAN interface

for IT specialists

Conclusion

1RU low footprint, low power consumption, single box solution, replacing multivendor, multibox alternatives with significant cost advantages

Future proofed product, as it natively, simultaneously and seamlessly, supports legacy PDH (T1, DS-3) and SONET (OC-3 or STS-3); and IP traffic (bridged, switched or routed) as well as Video Broadcast to the handheld

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One-stop shopping for all your cellular backhauling needs

www.advantechwireless.com