AirMAX™
580/5800 Systems

Features

• Quality of Service
⇒ **Per-flow queuing and scheduling**
⇒ **Fair and dynamic bandwidth allocation**
⇒ **Traffic shaping and policing**
⇒ **Classes of Service**
⇒ **Packet Classification at Layer 3/4**
⇒ **Supports Real-time Voice/Video**

• Management
⇒ **CLI, SNMP and GUI management interfaces**
⇒ **Multi-tiered Service Management**
⇒ **Subscriber Management**
⇒ **Service level Agreement Support**
⇒ **Static IP, DHCP server, and NAT**
⇒ **Per subscriber, per service and per CPE accounting**
⇒ **System Configuration**
⇒ **Multiple Supported MIBS**
⇒ **Remote Software Updates**

• Security
⇒ **Operator Security**
⇒ **Rule-based Packet Filtering**
⇒ **128bit WEP with Dynamic Key Exchange**

• Robust Hardware
⇒ **Proven off-the-shelf components**
⇒ **Malibu value-added software and integration for an unparalleled feature set**
⇒ **Ruggedized chassis and antennas**
⇒ **Simple Installation**

Malibu Network's AirMAX™ systems offer unprecedented wireless broadband access services in the 5.725 to 5.825 GHz band, with a robust system architecture, and a full palette of system features. AirMAX is ideal for providing broadband access to businesses and residences, including multi-dwelling units.

Each AirMAX system is composed of a Base Station (BTS), one or more Customer Premises units (CPE), cables and antennas. Also included are Malibu's patent pending QoS implementation—*Maximum IP,*™ SNMP and CLI management tools, and a full featured optional Service Management System (SMS) for managing large networks with many subscribers. The 5.8 GHz system is constructed with AirMAX 5800 BTS and 580 CPE(s).
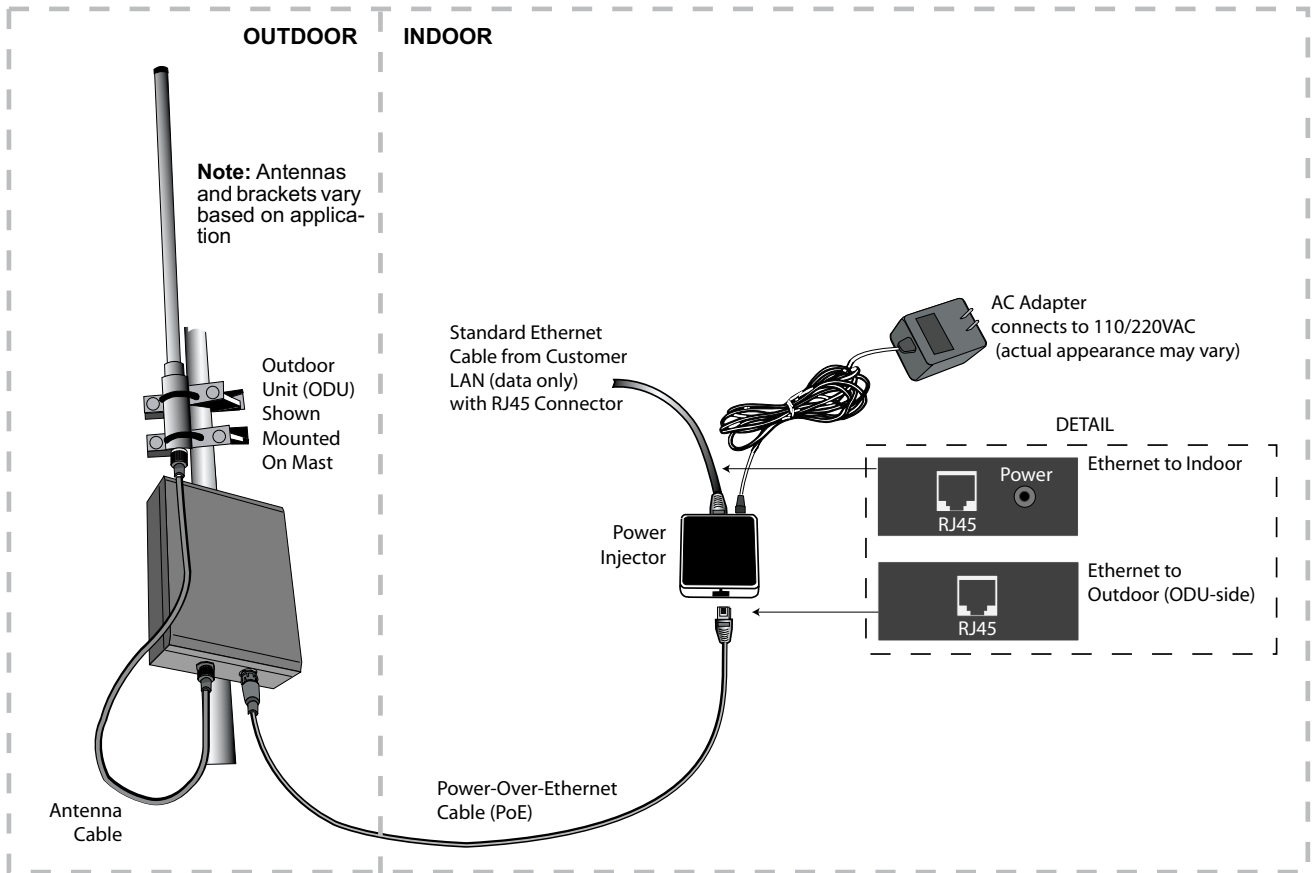
The CPE and BTS portions of the system are all out-door units (ODU), ruggedized for the harshest environments with an operating temperature range of up to 55 degrees C. With these features and Malibu's easy to use configuration software, installation times are quick, requiring no special skills.
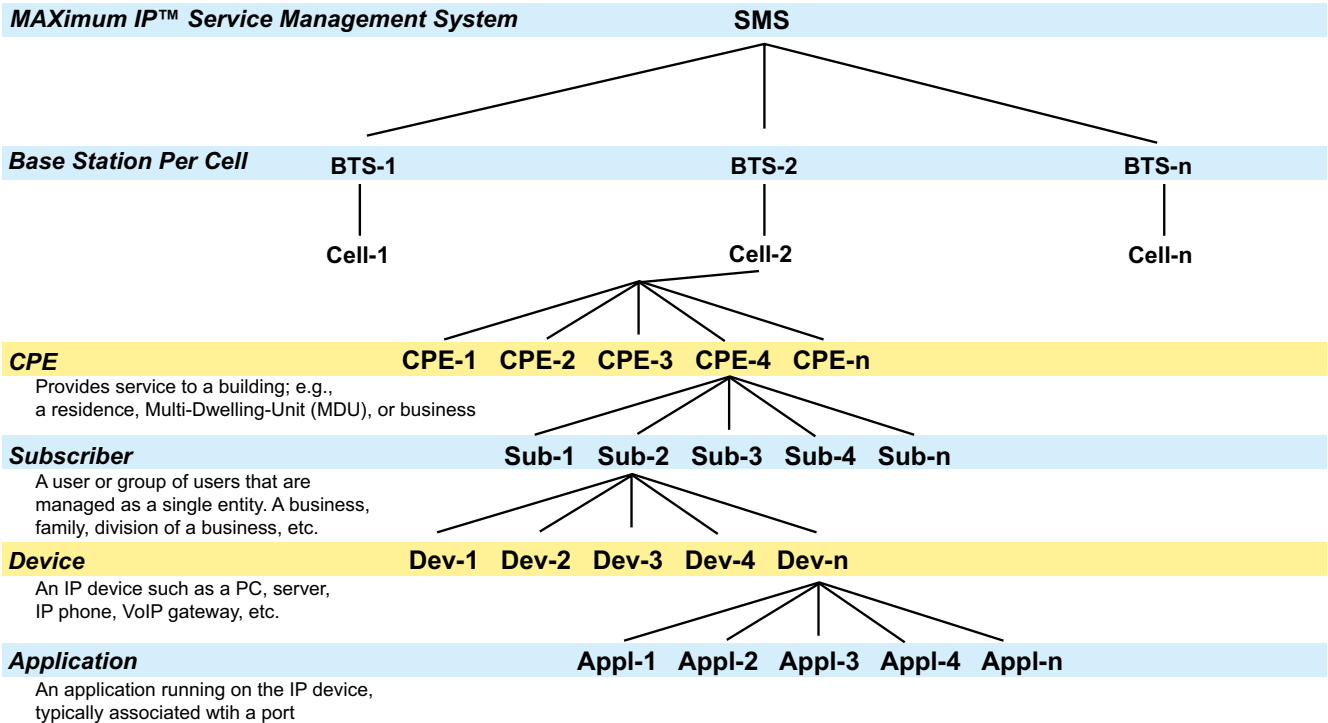
5.8 GHz Products
AirMAX 5800-B BTS
AirMAX 580-B CPE
ANT-58-11-D 11 dBi Directional CPE Antenna
ANT-58-14-D 14 dBi Directional CPE Antenna
ANT-58-8-O 8 dBi Omni BTS Antenna
ANT-58-10-O 10 dBi Omni BTS Antenna
ANT-58-14-S, 120 degree Sector BTS Antenna

System Options:
•Power-over-Ethernet Cables
    PoE-25: 25 ft. Power-over-Ethernet cable
    PoE-50: 50 ft. Power-over-Ethernet cable
    PoE-100: 100 ft. Power-over-Ethernet cable
    PoE-150: 150 ft. Power-over-Ethernet cable
    PoE-200: 200 ft. Power-over-Ethernet cable
    PoE-250: 250 ft. Power-over-Ethernet cable
•SMS: Service Management System

OUTDOOR INDOOR

Note: Antennas and brackets vary based on application

Outdoor Unit (ODU) Shown Mounted On Mast

Standard Ethernet Cable from Customer LAN (data only) with RJ45 Connector

AC Adapter connects to 110/220VAC (actual appearance may vary)

DETAIL

Power

RJ45

Ethernet to Indoor

Power Injector

Ethernet to Outdoor (ODU-side)

RJ45

Antenna Cable

Power-Over-Ethernet Cable (PoE)

AirMAX System Components (same for CPE and BTS)
—Antennas and Mounting Brackets Vary Based on Application

| *MAXimum IP™ Service Management System* | SMS |

Base Station Per Cell BTS-1 BTS-2 BTS-n

Cell-1 Cell-2 Cell-n

CPE CPE-1 CPE-2 CPE-3 CPE-4 CPE-n
Provides service to a building; e.g., a residence, Multi-Dwelling-Unit (MDU), or business

Subscriber Sub-1 Sub-2 Sub-3 Sub-4 Sub-n
A user or group of users that are managed as a single entity. A business, family, division of a business, etc.

Device Dev-1 Dev-2 Dev-3 Dev-4 Dev-n
An IP device such as a PC, server, IP phone, VoIP gateway, etc.

Application Appl-1 Appl-2 Appl-3 Appl-4 Appl-n
An application running on the IP device, typically associated wtih a port

Components of an AirMAX Cellular Deployment

AirMAX™ + MAXimum IP™

With AirMAX's MAXimum IP, a service provider increases their bottom line immediately. This happens because more subscribers can be supported per unit of bandwidth, with value added and differentiated services made possible by MAXimum IP. MAXimum IP provides minimum and maximum bandwidth control per CPE and per subscriber behind the CPE—a claim no other vendor can make today. But AirMAX with MAXimum IP does much more—providing control of jitter and latency per application flow. This capability enables real time traffic like voice to share bandwidth with normal data.

With the capabilities of AirMAX an MAXimum IP, the service provider can define service offerings just right for their customers. Add the optional SMS application and you can also have integrated creation, control and accounting for a rich set of customer services—capabilities never before available in a system at this price point. SMS can support multiple base stations and thousands of CPEs and subscribers.
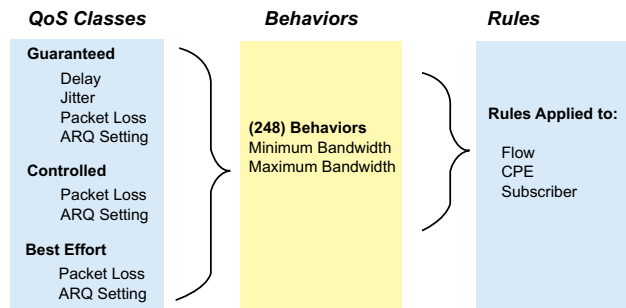
MAXimum IP Features

- No loss of usable bandwidth due to collisions or contention resolution, meaning more users at higher real data rates
- Ability to offer performance related SLAs in the access domain
- Quality of Service
    – Per-flow queuing and scheduling
    – Fair and dynamic bandwidth allocation
    – Traffic Shaping and Policing
- Min. and Max. Bandwidth Management
- Delay and Jitter Control
    – Multiple Classes of Service
- Guaranteed, Controlled and Best-Effort Traffic
    – Packet classification at Layer 3 and Layer 4
- Source and Destination IP Addresses
- Source and Destination Ports
- Protocol Type
- TOS
- RTP Payload Type
    – Supports Real-Time Voice and Video Traffic

AirMAX Management and Security

AirMAX provides powerful remote management features and a secure infrastructure to keep hackers and unintended visitors out of your network. Features include:

Management Features

- A variety of management user interfaces to better fit your administrative staff. Interfaces include:
    —Command Line Interface
    —SNMP
    —GUI based Centralized Management System
    —Optional Malibu Networks SMS
- Multi-Tiered Service Management
- Subscriber Management
- Service Level Agreement Support
- Static IP, DHCP Server and NAT Configuration
- Per subscriber, per service and per CPE accounting management
- System Configuration
- Supported MIBS
- Support for RFC 2863
- Support for RFC 1213
- Malibu Networks Proprietary MIBs
- Remote Software Updates

QoS Classes	*Behaviors*	*Rules*
Guaranteed Delay Jitter Packet Loss ARQ Setting	**(248) Behaviors** Minimum Bandwidth Maximum Bandwidth	**Rules Applied to:** Flow CPE Subscriber
Controlled Packet Loss ARQ Setting		
Best Effort Packet Loss ARQ Setting		

Security

- Operator Security
- Rule based Packet Filtering
- 128-bit WEP with Dynamic Key Exchange

AirMAX System Limits

- Sectors per Base Station
    – 1 to 3[1]
- Per Sector Limits
    – Instantaneously Active CPEs – 20
    – Provisioned CPEs – 100
    – Subscribers – 500
    – Instantaneously Active Flows – 200
    – Provisioned Flows – 2000
- Per CPE Limits
    – Subscribers – 100
    – Provisioned Flows – 200
- Per Subscriber Limits
    – Devices per subscriber – 250

[1]Initial implementation supports one omni sector per cell.

AirMAX 580/5800 System

5.8 GHz System Specifications

Specification	Value
Architecture	Point-to-multipoint Cellular deployment Omni and Multiple Sectors
Performance	11 Mbps data link rate per sector
Signaling	Direct Sequence Spread Format Spectrum (DSSS)
Data Interface	10/100 Ethernet, RJ-45
Protocols	Static IP Routing, NAT, DHCP Server, SNMPv2
QoS	MAXimumIP™ Management
Packaging	Outdoor mast mounted weatherproof enclosure Indoor power supply & data interface 300 feet (91.44 metres) maximum cable length
Operating Temperature	-30 to +55 degrees C
Electrical Mains Power AC Input	100-240 VAC 50-60 Hz
Unit supply requirements	24VDC @2.0A (maximum)
Operating Frequency	5.725 to 5.825 GHz band
Modulation Formats & Data Rates	DBPSK: 1 Mbps DQPSK: 2 Mbps CCK: 5.5 Mbps CCK: 11 Mbps

Usable Channels	U-NII Band 3 Channel	
	Channel#	Frequency
	1	5.750
	2	5.755
	3	5.760
	4	5.765
	5	5.770
	6	5.775
	7	5.780
	8	5.785
	9	5.790
	10	5.795
	11	5.800

Specification	Value
Adjacent Channel Rejection	-35 dBc

Specification	Value
Conducted Transmit Power to Antenna	160mW, +22dBm Compliant with FCC regulations Part 15 subpart E
Out-of-Band Emissions	Per FCC Part 15 subpart E 15.205, 15.209
Receiver Sensitivity	-92 dBm @ 1 Mbps -89dBm @ 2 Mbps -87 dBm @ 5.5 Mbps -83 dBm @ 11 Mbps
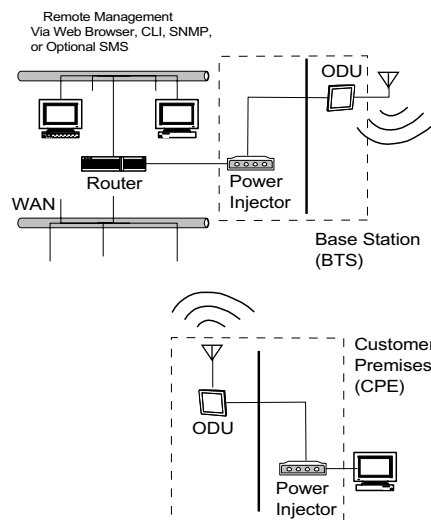
AirMAX Systems Coverage

The following table summarizes the theoretical maximum range where 90% of CPE sites can establish two-way communications with a base station, assuming line-of-sight conditions.

5.8 GHz System Coverage

Antenna Combination	EIRP	Range
BTS 8 dBi Omni CPE 11 dBi Directional	28.7 dBm 31.7 dBm	4.7 km
BTS 8 dBi Omni CPE 14 dBi Directional	28.7 dBm 34.7 dBm	6.7 km
BTS 10 dBi Omni CPE 11 dBi Directional	30.7 dBm 31.7 dBm	6 km
BTS 10 dBi Omni CPE 14 dBi Directional	30.7 dBm 34.7 dBm	8.4 km
BTS 14 dBi Sector CPE 11 dBiDirectional	34.7 dBm 31.7 dBm	9.4 km
BTS 14 dBi Sector CPE 14 dBi Directional	34.7 dBm 34.7dBm	13.3 km

5.8 GHz System Coverage

A log-normal shadowing model is employed to estimate the large scale path loss a signal may experience. The model describes both the average path loss for any arbitrary separation between the transmitter and the receiver, as well as the random shadowing effects that can occur at any location. The estimated range presented here is for a direct line-of-sight (path loss exponent = 2).

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