Introduction

The **LMS3000** is another breakthrough member of WaveRider Communications Inc.'s Last Mile Solution® wireless Internet product line. The LMS3000 is the first system in the world that brings non-line-of-sight and high-speed wireless Internet access directly to businesses and home users. The LMS3000 enables Wireless Internet Service Providers to provide multimedia services that include e-mail, web browsing, file transfer, voice over IP, audio and video.

WaveRider's **LMS3000** is fully certified to operate in the 900MHz ISM band (license-exempt in the U.S., Canada, and many other countries). Using Direct Sequence Spread Spectrum technology, the LMS3000 is extremely robust and resistant to interference, delivers raw data rates up to 2.75Mbps or data throughput speed up to 1Mbps, and covers an area with radius up to 1.5 miles (2-3 km) without rooftop antenna.

The **LMS3000** has three key modules: the **End User Modem (EUM)**, the **Communications Access Point (CAP)** and the **Network Access Point (NAP)**, which also provides system management, access to Internet and system wide services.
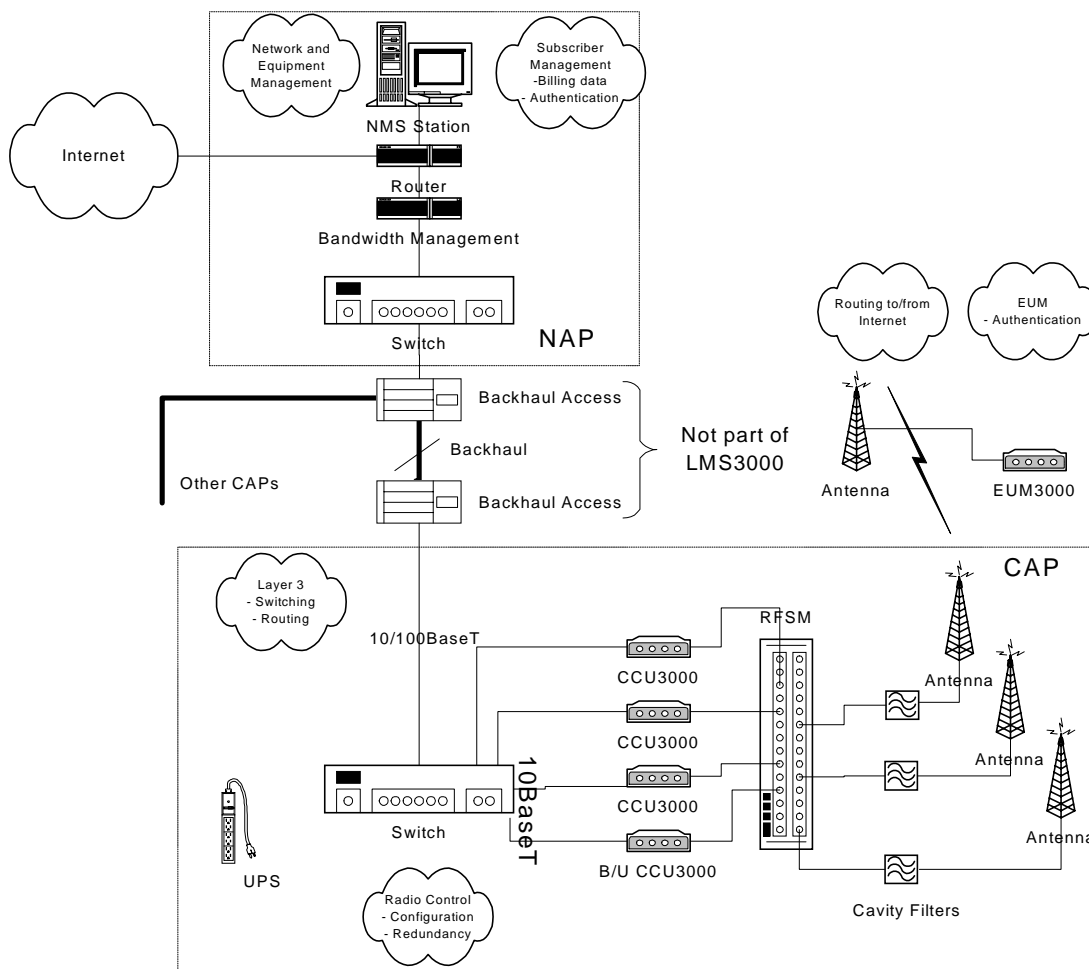

Figure 1: LMS3000 System Architecture

Network Access Point (NAP)

The NAP provides the Wireless Internet Service Provider (WISP) with the necessary software and hardware to manage and maintain the LMS3000 system. The NAP also provides the following features to the LMS3000 system:

- Network Security
- Subscriber Management
- Operations, Alarms and Maintenance
- Data Distribution and Bandwidth Management
- Interface with the service provider's network
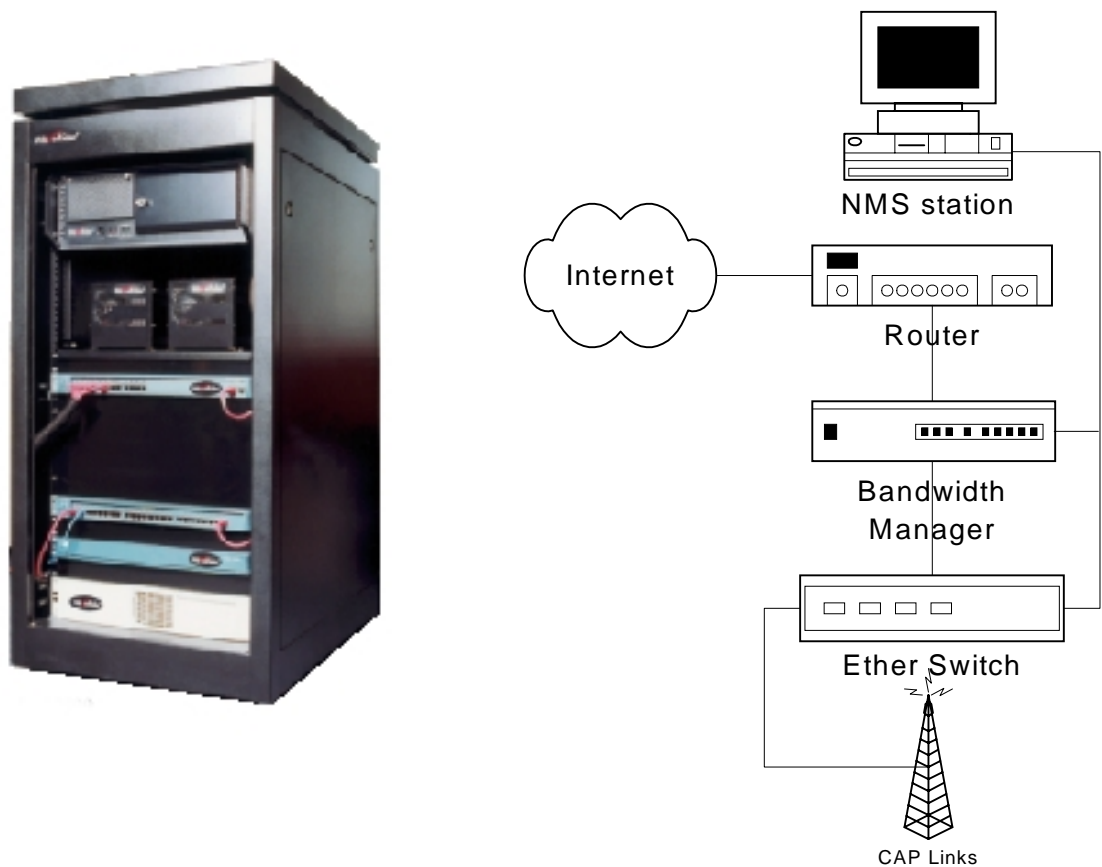
Figure 2: Network Access Point

The standard connection from the NAP to the service provider's network or the Internet is 100BaseT. Other connection options are available.

Connection between the NAP and CAPs is standard 10/100BaseT to provide a flexible interconnection strategy. Backhaul options include a variety of RF backhaul devices (part of WaveRider's offerings) or a number of wire line options such as DSL and T1/E1 which have been tested and verified by WaveRider for this application.

Network Security

Network security is achieved with the use of Direct Sequence Spread Spectrum (DSSS) RF technology. DSSS is a highly secure, FCC approved communication technique for the ISM band. In addition, RADIUS authentication of end user modems at start up and periodic authentication at CCU prevent unauthorized access of the system. All configurable devices are protected by passwords and can be configured to be accessible from NAP/NMS only. Additional system security can be provided through the use of firewalls and application layer encryption where necessary.

Subscriber Management

Subscriber management is implemented with RADIUS. RADIUS supports billing, feature and security aspects in the wireless environment. In large LMS3000 systems, RADIUS provides the flexibility to support distributed or centralized subscriber management.

Operations, Alarms and Maintenance

Maintenance features of the LMS3000 NMS allow the operator to verify the operation of modules in the network and to support maintenance of system components. Using the NMS, the service provider is able to:
- Verify data connectivity between the NAP and a specific CAP
- Verify data connectivity between the NAP and a specific CAP radio
- Verify data connectivity between the NAP and a specific EUM
- Verify operation of the CAP RF switch
- Display MIBs for the CAP and EUM
- Monitor CAP Channel Units for failure
- Monitor data traffic for indications of other types of CAP failures
- Monitor power supplies
- Provides operating statistics to the NAP
- Generate alarms on equipment failure
- Co-ordinate operation of optional redundant RF equipment

Data Distribution and Advanced Bandwidth Management

The NAP, equipped with a 100BaseT router and a 10/100BaseT switch, distributes and gathers all data streams to and from up to 15 CAPs. It can also remotely administer and maintain data traffic between the CAPs and the local Internet access points.

The Advanced Bandwidth Management makes Guaranteed Level of Service available. Subscribers can be classified into different categories with SLA (Service Level Agreement) policies defined by WISP (Wireless Internet Service Provider). Bandwidth SLA policies can be richly defined for IP traffic from both directions, expressed in terms of:
- Committed Information Rate (CIR)
- Maximum Burst Rate (MBR)
- Priority Bursting
- Schedules (time of day, day of week)

Protocol Support

- LMS3000 is a layer 3 network supporting the IP protocol routing to ensure the greatest degree of flexibility and scalability in network design. Applications supported by the network include E-mail, file transfer, web-browsing, streaming audio & video and VoIP. Static routing capabilities are also supported in the end user modem.
- Network Management (Operation, Alarms, Maintenance and Provisioning) is provided using SNMP v2.c.
- Equipment Management is provided using Telnet, TFTP and HTTP.
- Subscriber Management, including service restriction, is provided using RADIUS.
- Communication between the LMS3000 CAP and end user modem use Direct Sequence Spread Spectrum RF techniques, with WaveRiders' proprietary protocol that optimizes system performance in outdoor environments over extended range.
- Routing feature supported: End-user to Network, Network to End-user, End-User to End-User via CAP-NAP-CAP, End-User to End-User CAP(s).

Communication Access Point (CAP)

The CAP provides the following features:
- Air link to the End User Modems
- Data connectivity between the NAP and EUMs
- Support for user authentication
- Data distribution to end users in the CAP serving area
- Enhanced Operations, Alarms and Maintenance support
- Redundancy and hot-swap in CAP Channel Unit

End User Modem (EUM)

The End User Modem is the wireless customer premises equipment that provides RF connectivity between the LMS3000 CAP and the user's network or computer. Connectivity is realized via a 10BaseT interface. The 10BaseT version EUM provides layer 3 static routing functionality and allows fast and easy end user installation.

The first release EUM is a compact design for desktop use (8.2" x 5.2" x 1.5"). It comes with an indoor directional panel antenna, approx. 6.2" x 6.2" x 2.2" size plus a mounting bracket to mount the antenna on window or wall. The antenna can be easily directed to get an optimized signal from the CAP with a receiving signal indication LED on the EUM. Alternative outdoor antennas can be used in line-of-sight applications to achieve connections with greater distances.

Applications

The **LMS3000** is a turnkey wireless Internet system that provides reliable, high-speed connectivity to the end user. The interface to the end user modem is standard twisted pair Ethernet and includes layer 3 routing. Built in system bandwidth management allows the service provider to provide differentiated service packages to individual end users. The **Network Management System (NMS)** is an easy to use package that supplies the service provider with the tools to operate and maintain all elements of the LMS3000, define and implement service offerings, mange end uses and accounts, and maximize serviced and optimize revenues. The advance billing package gathers account information based on time of day, amount and type of data provided, and throughput rates which way be used to generate comprehensive usage reports for billing purposes.

WaveRider's **LMS3000** is targeted to residential users, SOHO users and small businesses located in suburb or rural areas. Competing in some areas where existing, high-speed services are available, LMS3000 can be positioned as a cost-effective solution.

The **LMS3000** is also suitable to serve as complementary solution to expand existing service portfolio or as infrastructure to quickly roll out new services – particularly in markets where wired broadband options are not available or are not cost effective.

Features

- FCC approved for license exempt operation in the 900 MHz ISM band using DSSS (Direct Sequence Spread Spectrum) technology
- Layer 3 routing equipment
- Complete solution to WISP start-ups
- Centralized control and maintenance of all equipment in the network with easy-to-use GUI
- Centralized subscriber management
- Up to 2.75Mbps raw data rate or 1Mbps data throughput
- Advanced bandwidth management enabled multiple service grade definitions
- Highly scalable architecture
- Up to 15 CAPs per NAP
- Up to 3 active channel units per CAP

- Redundant channel unit with automatic fail over
- Up to 75 active end user modems per channel; subscriber number up to 350 per channel unit
- Centralized software/firmware upgrade
- Advanced billing package available
- Range 2-3km (1.5 miles) non line of sight; 7km (4 miles) line of signt
- Capability of CAP co-locating with other LMS family CAPs (CAP2000 and CAP4000)
- Expandability ensured by frequency reuse

Benefits

- Increased revenues
- No access lease fees
- High reliability
- Extremely flexible and highly scalable network architecture
- Low maintenance cost
- Ease to install and use
- Service grade solution
- Fast initial deployment and easy to re-deploy
- New features and service offerings can be introduced easily and reliably
- Fast Return on Investment

Turnkey Solutions

WaveRider Communications Inc. is able to provide complete turnkey solutions to the service provider that include all aspects of system design, specification and installation, training and ongoing support. WaveRider can provide all equipment necessary for a fully integrated and tested solution or can assist the service provider with integration into infrastructure facilities such as DSL or fiber providing a Last Mile Solution component or range extension to these services.

Additional Information

For additional information contact your WaveRider sales representative or visit us on the Internet.

www.WaveRider.com