# Product Announcement: LMS2100

Today WaveRider is announcing an extension to its Last Mile Solution® family: The LMS2100 for Wireless Internet Service Providers. The LMS2100 provides high speed IP networking links between ISP's and their commercial customers. A single LMS2100 can provide up to 24 Mbps of wireless data capacity. Each LMS2100 connects up to 90 commercial subscribers though high-speed wireless routers while allowing ISPs to avoid the ongoing cost of paying for telephone lines.

Highlights

- Up to 90 commercial subscribers per system
- 8 Mbps data capacity per channel
- 24 Mbps data capacity per system
- Wireless router functionality
- Range – up to 10 miles (16 km)
- Eliminates expensive telephone line costs
- No radio license required
- Connects to a standard IP router
- Convenient 19" rack mounting
- Upgradeable to a fully network managed WaveRider LMS2000 system
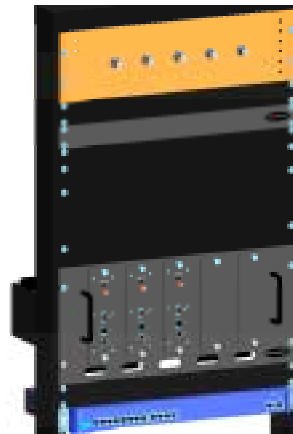
Overview

The LMS2100 is designed to build high-speed wireless links connecting a central access point to numerous wireless local access points. Three communication channel radios provide 8 Mbps of data capacity each, for a total of 24 Mbps of data capacity.

The LMS2100 is an economical entry point into WaveRider's Last Mile Solution (LMS) family. It allows an ISP to start with a low cost solution that can later be upgraded to the larger LMS network solutions while protecting your initial equipment investment.

A LMS2100 connects to a standard IP router through a 100BaseT connection port. Subscribers can be connected to each other in a private network, or can use the system for high-speed access to the Internet. Subscribers use the same LMS2000 End User Modems used in WaveRider's larger LMS systems, so there is no end user upgrade required if customers later upgrade to our larger systems.

WaveRider's Professional Services Group will provide comprehensive RF and IP training, as well as providing help desk support to all customers.

Product Features:

90 commercial subscribers per system – Each channel on the LMS2100 can support up to 30 subscriber modems, for a total of 90 modems per system.   This eliminates the cost of land based telecommunications lines or cable lines, providing high speed IP network connections without the burden of monthly line charges.

8 Mbps Throughput– The proprietary access method used by WaveRider is designed specifically for outdoor use, and provides throughput of up to 8 Mbps from an 11 Mbps radio channel.

Wireless Router Functionality – Each subscriber unit is a wireless router, providing maximum flexibility and performance.

10 Mile (16km) range – Links can be designed that reach distances of up to 10 Miles (16 km).

24 Mbps data capacity per system – The system supports 3 channels, each of which can support up to 8 Mbps of bandwidth for a total system capacity of 24 Mbps per LMS2100.

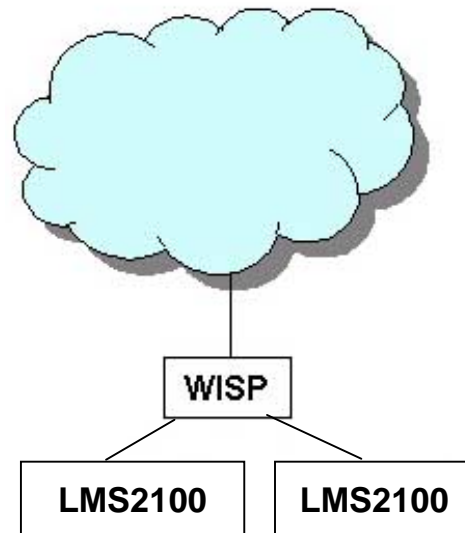A Wireless ISP (WISP) can connect one or more LMS2100's to the public Internet or private IP networks.

No radio license required – The LMS2100 uses the 2.4 GHz ISM band allocated by the FCC as well as many other countries as a license exempt radio band. This eliminates the up front investment required to reserve radio spectrum in licensed bands.

Connects to standard IP router – The LMS2100 is designed to be attached to a standard IP router. The customer can provide their own router, or WaveRider recommends and sells a Cisco 2621 router that offers the additional benefit of being useable in other WaveRider LMS configurations in the event that the customer upgrades to a full LMS system at a later date.

Convenient 19" rack mounting – Most configurations can be mounted in an optional WaveRider provided 19" standard equipment rack. Other rack and closed cabinet configurations are available.

Network Monitoring through SNMP - WaveRider provides MIBs that allow the access unit and the remote modems to be monitored using an optional SNMPc management workstation. WaveRider offers the Castle Rock SNMPc enterprise edition that will operate on a standard Windows NT/2000 workstation. For further information, visit the CastleRock web site at www.castlerock.com.

Configurable through Windows based Config GUI Utility – The LMS2100 and the attached end user modems can be configured through a GUI. Remotely attached modems can be linked via a TCP address. Diagnostic and installation tools can be conveniently displayed using the GUI tool.

Upgradeable to a fully network managed WaveRider LMS2000 system – A LMS2100 can be upgraded to the full WaveRider LMS2000 system via a software change at the access point CCU modems, plus the addition of the WaveRider LMS NAP.   No change is required at end user modems. This important feature keeps your initial investment cost low, while protecting your investment when your business grows to the point where the additional management and capacity capabilities of the LMS2000 system are desired.

Technical Information:

The **LMS2100** is shipped as a standard 19" rack mountable kit. Customers can use their own racks, or purchase a standard open rack or closed cabinet from WaveRider. A minimum of 33.25 inches (19U) of vertical rack space is required.

The minimum kit includes a single channel WaveRider CCU (Cap Control Unit) in a 5-slot module, an RF cable connector panel, and a 12-port Cisco Catalyst 1900 series switch.

The **CCU shelf** (as shown right) is an integral component in the LMS2100. The unit will support up to 5 CCU's in the LMS2100. Most installations will accommodate a maximum of 3 co-located channels in the 2.4GHz ISM band. Additional 2 slots are available for special requirements.


A Sample SNMP Display

One **CCU** (CAP Control Unit) is standard with the system. Additional CCU's can be added. Three CCU's are the normal maximum per rooftop/tower site, however in some situations, a 4th or 5th CCU could be co-located with proper RF engineering.

This LMS2100 is designed to be connected to an ISP's existing IP equipment, usually connecting the 100BaseT port on the LMS2100 to a 100BaseT connection on the ISP's existing switch.

For configuring and monitoring the equipment, the WaveRider CCU, the WaveRider End User Modems, and the Catalyst switch each provide MIBs that send SNMP data to a SNMP workstation. WaveRider does not provide the SNMP workstation but does make available the SNMPc workstation software from CastleRock as an optional component. This software would be installed on a customer provided Windows NT or 2000 workstation.
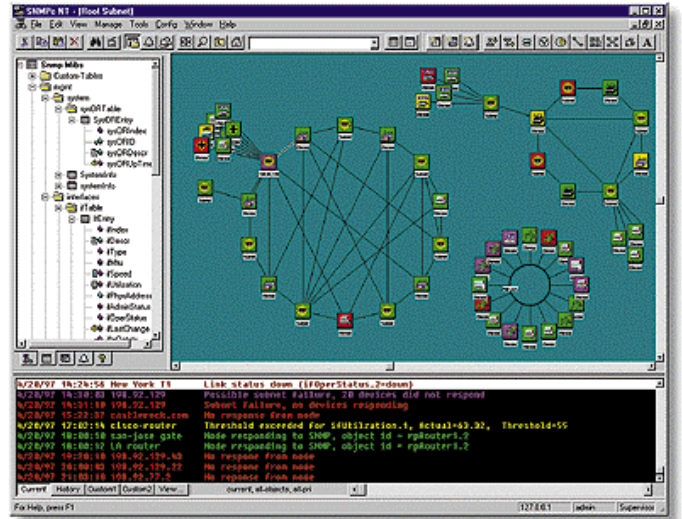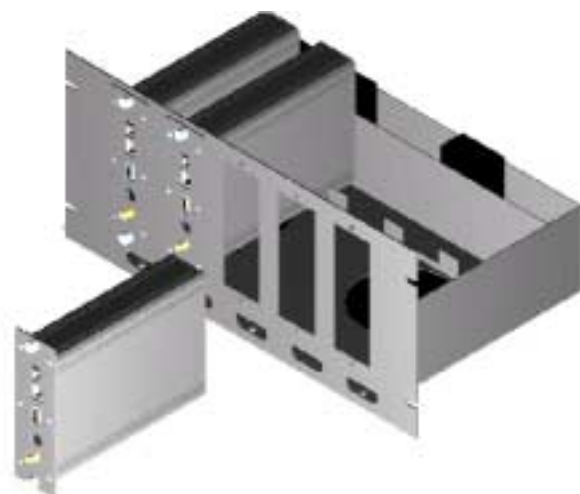
The **EUM (End User Modem)** is a Layer 3 device with standard routing capabilities. It has a compact design, and is shipped with wall mounting brackets.

WaveRider provides a Windows based **GUI Configuration Utility** for configuring the CCU and End User Modems. These devices can be controlled remotely or through a local computer connection. Refer to the User Guide Manual for more details. The Cisco Catalyst switch is configured and controlled by the Cisco provided software.

Upgrading To Network Managed LMS2000

The LMS2100 can be easily upgraded to a network managed WaveRider LMS2000 system with the addition of an LMS Network Access Point. This includes the additional functionality of WaveRider's Network Management System, provides a central access point for Internet Access, and offers optional Advanced Bandwidth Manager.

The customer then can optionally purchase additional LMS2000 CAPs to fan out more communication access points and extend service regions.

Ordering Information:

Mandatory – Order one

SKU	Description
200-2014	Base System includes: 19" CCUshelf, one CCU, 12-port Cisco Catalyst 1900 IP Switch, surge protection power bar and RF panel

Optional Components

SKU	Description
200-2020	Additional CCU (up to 5 maximum)
200-0200	Optional Cisco 2621 Router with 2 100BaseT ports
200-6001	Optional Bandwidth Shaper – Amplify.net Splitter
700-0001	Castle Rock SNMPc Software – Enterprise Edition (requires Windows NT/2000)
200-0601	UPS (110V) – 10 Minutes Standby Power 19" Rack Mount
200-0602	UPS (220V) – 10 Minute Standby Power 19" Rack Mount
200-0401	Enclosed cabinet incl cable harness, power bar, etc
200-0402	¾ Height 19" open rack (self standing) incl cable harness
200-0403	Full height 19" rack incl cable harness, power bar
290-1200	Firmware upgrade from CCU for LMS2100 to an NMS managed CCU
	Antenna and RF Cable Options: See the WaveRider Price List

Pricing: Contact your WaveRider representative

Availability: The LMS2100 can be ordered immediately, and will be available for shipment in 3 weeks ARO.

Services

WaveRider's service includes product training for planning and installation, help desk support and return to depot warranty service. For most LMS2100 customers and partners, that will be all the assistance they will require.

Enhanced services available from WaveRider's Professional Services Group include on-site Feasibility Analysis, Detailed Design and Implementation assistance, on site maintenance services, and Project Management services. WaveRider can also act as a prime contractor to arrange on site services such as end user modem installation and rigger services.

Training

WaveRider has implemented a training department comprised of certified IP and RF technologists who are available to provide WaveRider customers with the best quality of training possible.

The objective of WaveRider's training is to ensure that customers are competent and qualified and self sufficient to ensure that the LMS2100 installation meets expectations.

Training participants are provided a hard copy of the training manual used during the training session, which includes presentations on IP Networking, RF Primer, WaveRider products, the WaveRider Link Path Analysis Tool Manual and Product Manuals. Training sessions conducted in the Toronto or Calgary facilities also make use of WaveRider's Training lab, which consists of test equipment and various accessories, allowing Training Participants to work 'hands-on' with WaveRider products.

After training, customers are provided with Help Desk Support to assist with any questions they may have during the installation.

Documentation

Item	Item Description and Where to Get It
Product Data Sheet	Item 791-0003 available at: www.waverider.com
System Description	LMS2100 System Description
User Guide	LMS2100 User Guide
EUM Booklet	EUM2000 Quick Start Card
Sample Presentation	Contact Lyon Li at WaveRider – email lli@waverider.com tel: 416 502-3215
This Announcement	Contact Lyon Li at WaveRider

Warranty Information: WaveRider equipment is warranted for 12 months from date of purchase. The standard support is a return to depot service. Additional service offerings are available from WaveRider.

Shipping Information: All major products are packaged separately and shipped from our Calgary facility. Components are shipped separate from the 19" racks for assembly on site.

For Additional Information:

Contact: Your WaveRider Representative
        Or
      Mark Smith (Canada and United States)
      WaveRider Communications Inc.
      Toronto, Ontario, Canada
      Phone: (416) 502-0379   marksmith@waverider.com

      Lesley Gaensewig (International)
      WaveRider Communications Inc.
      Toronto, Ontario, Canada
      Phone: (416) 502-8657   lesley@waverider.com

APPENDIX – BUSINESS CASE

Wireless ISP - Revenue and Typical Equipment Costs

		Mthly Charge	Mthly Rev
Install Charges			
- 10 Standard Speed	$3,000		
- 10 High Speed	$7,500		
Monthly Charges 24 Months			
- 10 Standard Speed	$72,000	$300	$3,000
- 10 High Speed	$180,000	$750	$7,500
Revenue 24 Month	$262,500		$10,500

Incremental Costs		Assumptions:
LMS Equipment Cost	20,000	MicroLMS2000, 2 CCU, 3/4 Rack
Installation Central Site	7,500	Use same internet uplink
Install 20 EUM's	8,000	Labor, antennas
Buy 20 EUM's	30,000	Use existing servers, routers
Rooftop Rent	7,200	24 Months
Incremental Expenses	72,700	
Incremental Gross Profit	$189,800	Breakeven: 6 months

APPENDIX – COMPETITIVE INFO.

The LMS2100 will compete primarily with the BreezeAccess II product line, the Cisco Aironet Product Line, and the Lucent Orinoco Products.

Competitive Product	Key Advantages / Disadvantages
BreezeAccess II	Hopper vs Sequencing Hoppers have limited 2.5 Mbps bandwidth per channel Hoppers interfere with each other (limits multi unit bandwidth) Breezecom support is limited to a select group of large customers
Cisco Aironet / Lucent	Limited by 802.11 designed for indoor LANS Limited bandwidth capacity – 5 Mbps per channel vs. WaveRider's 8 Mbps No system approach, such as user authentication / network management Limited security due to 802.11 interoperability Availability of low cost PCI/PC Card versions for CPE
DSL	Limited by distance and the quality of the copper wire Limited peak data rates Expensive to install Not accessible to many ISPs.
Cable	Limited by availability of Cable to the commercial user Limited peak data rates Security concerns and reliability issue Expensive to install Not accessible to many ISPs.
Satellite	Limited channel capacity High monthly cost Latency (performance) issues

Aggregate Throughput of Collocated Systems
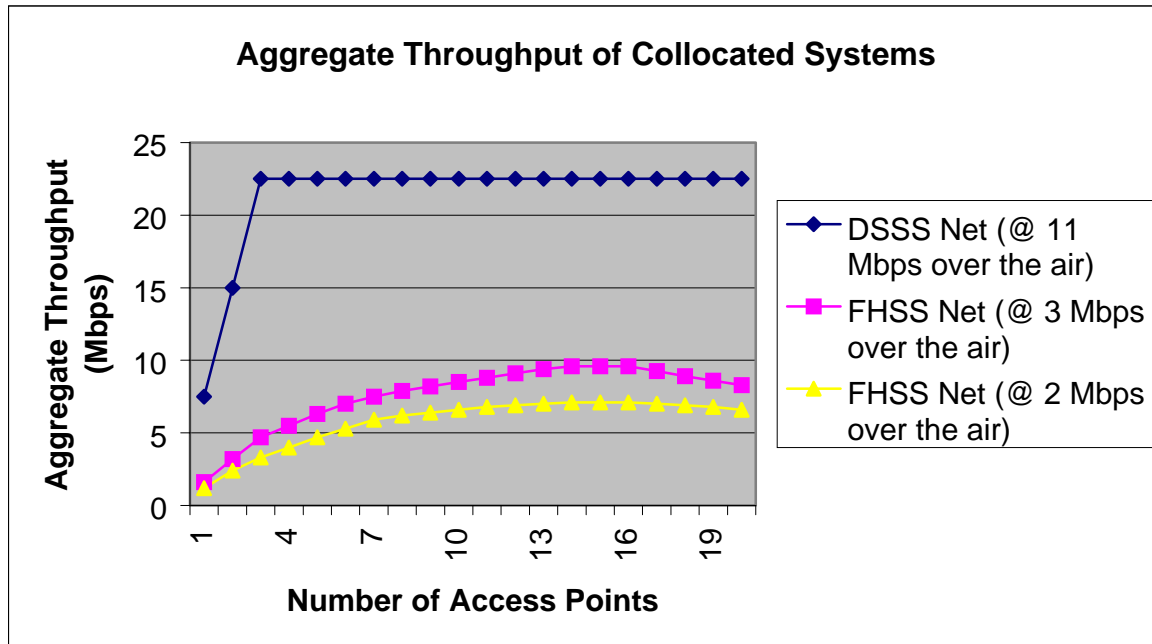
The LMS2100 is comparable to the BreezeAccess II in that they are both low cost system approaches.

WaveRider's LMS2100 Advantages:
- Upgradable to a full configured LMS system
- Much higher bandwidth per access point
- Better technical support from WaveRider and its partners

The BreezeAccess II allows users to rack mount multiple master units in a 19" inch shelf, similar to the WaveRider CCU shelf. Key differentiators include:
- Frequency Hopping versus Sequencing (FHSS vs DSSS)
- A VoIP option
- Outdoor mounted radio option
- A lower price point

The disadvantages of BreezeAccess is that Frequency Hopping limits their performance to approximately 2.5 Mbps per access point (ie per master unit), compared to 8 Mbps for a WaveRider access unit.

Although you can add multiple access points into a BreezeAccess unit, hoppers sharing the same space interfere with each other. The more hoppers added to the same CAP unit, the lower the performance of each hopper in the system. With more than about 3 master units in the BreezeAccess, a characteristic known as inter-modulation distortion makes it increasingly more difficult to do the RF engineering.

As indicated in the chart above, 3 WaveRider CCU's in a LMS2100 will provide approximately 25.5 Mb/sec of maximum throughput, while 3 BreezeAccess units will provide about 4.5 Mb/sec of throughput.

Breezecom provides a method to synchronize multiple hoppers to improve performance, but synchronization is strictly illegal according to FCC and IC authorities.

Breezcom's BreezeAccess is their top of their line with limited network management. The WaveRider LMS2100 is an entry point into the full LMS system, providing growth to a fully networked managed system.

WaveRider's also offers a comprehensive suite of services from its Professional Services Group. Breezcom's level of support is more of a distribution model. Availability of support is generally limited to a select group of very large customers.

802.11 Competitors

Other key competitors to the LMS2100 will be Cisco Aironet and Lucent 802.11 products.

The key differentiators of these products are lower price and brand name recognition. They are quite competitive for use in point to point links, where the lower bandwidth is not a problem, or where systems management features are less valued.

Their weakness is that they are pure 802.11 products. As an indoor LAN standard designed to promote interoperability, these products offer lower throughput, systems management features, and lower security.

Since 802.11 products are generally interoperable with each other, for such applications as hotel and airport indoor LAN applications, they are generally not as secure as WaveRider's products which only link with each other, and only with proper user authentication. Although the 802.11 products generally include DES encryption, this technique has been compromised by researchers, and in any case only protects the local radio link. For highly secure applications, end-to-end encryption must be provided at the application level, by such products as SSL encryption within browsers.

These 802.11 products were not designed for larger systems, and therefore lack the layer three routing capability, and the upgradeability to Network Managed systems, and have limited capabilities for such things as user authorization.

Cisco and Lucent customer support is generally limited to a select group of very large customers.

APPENDIX - LMS2100 CUSTOMER PROFILE

The ideal LMS2100 customers will be:

- An existing ISP offering dial up modem services
- They may resell some DSL services in their area
- May already have some initial wireless clients
- Sees at least 10 to 90 commercial customer potential within the local area
- All within 1 or 2 communities of up to 5 miles radius from the CAP site

Another typical LMS2100 customer

- Expects to grow beyond 50 or 60 commercial customers
- Appreciates the capability of the full LMS system
- Maybe plans to add LMS3000 residential capability
- But – needs to start smaller to reduce expenses

Another typical LMS2100 customer would be a private IP network

- A group of 5-90 school board buildings in a local community
- A local government with multiple buildings
- A private or school campus of multiple buildings

APPENDIX - SAMPLE RACK LAYOUT

Full Height Rack

1U	RF Distribution Panel
1U	Placeholder
2U	Placeholder
	V2E Shelf
1U	Cisco Switch
1U	BWM
1U	Cisco Router
22U	
1U	Power Distribution Bar
1U	UPS

19U
48U

3/4 Height Rack

1U	RF Distribution Panel
1U	Placeholder
2U	Placeholder
	V2E Shelf
1U	Cisco Switch
15U	
	Power Distribution Bar
1U	UPS

36U

**WaveRider Cabinet
Side View**

4U	RF Dist. Panel
1U	Placeholder
2U	Placeholder
	V2E Shelf
1U	Switch
1U	Power Distribution Bar
1U	UPS

22U

☐ - Waverider specific hardware

▨ - Optional hardware

1U = 1.75"