About SR Telecom & Co.

SR Telecom & Co. is a leader in innovative broadband wireless access (BWA) solutions for voice, Internet and enterprise services. Our team has over 25 years of experience in designing, developing and deploying wireless access networks for top-tier organizations around the world.

SR Telecom & Co. focuses on delivering premium broadband technology and business-driven services that exceed operators' expectations and drive their business forward. SR Telecom is the only BWA vendor with a decade of experience deploying advanced WiMAX technologies in end-to-end solutions. Operators rely on us for rock-solid network stability. With networks of 200,000 subscribers built on our technology, real-world experience drives our product innovation. Our solutions and support strategies are key enablers for large-scale WiMAX rollouts.

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symmetry*MX* access network

Putting WiMAX to work for enterprise, residential, and mobile customers

symmetry*MX*™ offers operators a suite of optimized solutions for mobile, nomadic, and fixed networks. The **symmetry*MX*** family is based on SR Telecom's massively scalable CBS5000 base station, running **symmetry*MXe*** software for mobile and nomadic applications and **symmetry*MXd*** software for fixed applications. All of our solutions leverage SR Telecom's industry benchmark NMS to provide cost-effective WiMAX services that maximize subscribers' Quality of Experience and drive operator profits.

CBS5000 Base Station

Superior performance and features in a compact form factor

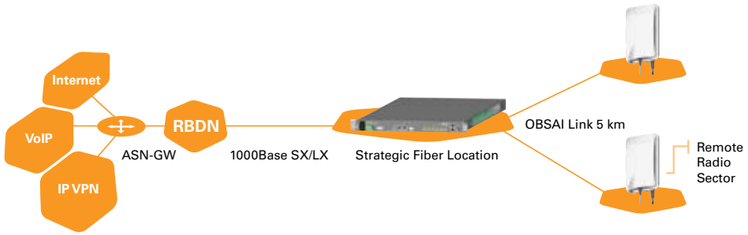
The CBS5000 is the building block of a network of broadband WiMAX cells, providing subscribers with multi-megabit data rates for Internet, video and VoIP applications. Offering proven radio diversity technology, an innovative form factor, and complete support for mobile (802.16e-2005) and fixed (802.16d-2004) WiMAX, the CBS5000 allows operators to cost-effectively roll out mobile, residential and enterprise services.

The CBS5000 is an advanced WiMAX base station platform built around a carrier-grade gigabit router and an array of powerful digital signal processors. A single CBS5000 indoor unit can support up to three separate WiMAX radio sectors, with 2-channel diversity on each sector (STC / MIMO Matrix A), and a roadmap to AAS. Thanks to its massive packet processing capacity and ability to support an unlimited number of service flows – each with its own queue and QoS parameters – a single CBS5000 can ensure quality of experience for thousands of subscribers.

The CBS5000 is compact, consumes little power and occupies a small footprint, making it extremely easy and cost-effective to deploy in existing infrastructures, such as buildings and shelters.

- Supports both the mobile WiMAX 802.16e standard and the fixed/nomadic 802.16d standard, allowing operators to deliver mobile, nomadic, and fixed broadband services using a single hardware platform.
- Software upgradeable, so that a migration from 802.16d to 802.16e or later revisions can easily be implemented with minimum network impact.
- Proven STC diversity technology; provides support for MIMO 2X2 and 4X4 technologies.
- Optical network and radio interfaces for easy deployment of remote base stations and remote radio sectors using metropolitan optical networks as backhaul.

CBS5000 Platform



Electrical, mechanical, environmental features

Mechanical (W x H x D)
Indoor: 440 x 44.5 x 323.85 mm
(17.3" x 1.75" x 12.75")
Outdoor: 280 x 510 x 110 mm
(11" x 20" x 4.5")

Operating temperature
Indoor digital shelf: -5 to +45° C (23 to 113° F)
Outdoor WBRU: -45 to +60° C (-49 to +140° F)

Humidity
5% to 95 % non-condensing

Weight
Indoor digital shelf: 3 sectors = 3 kg (6 lbs)
Outdoor WBRU: 7 kg (15 lbs)

Power supply
-48 Vdc nominal (-40 to -60 Vdc)

Power consumption
Indoor digital shelf: 3 sectors = 75W Typical
Outdoor TDD:
40W/sector typical; (2.5GHz, 3.5GHz)
52W/sector typical; (10.5GHz)

Optical network interfaces

With optical core network interfaces (1000 Base SX/LX), the CBS5000 base station can connect directly to high speed optical transport networks, simplifying deployment of remote base stations.

The CBS5000 indoor unit connects to the transceivers over standard Open Base Station Architecture Initiative (OBSAI) interfaces, with a range up to 5 Km. This extended range facilitates deployment of remote radio sectors, while the OBSAI standard interface allows operators to benefit from the evolution of industry-standard radio modules.

Mission-critical applications with 1+1 redundancy

The CBS5000 can optionally be equipped with full IDU redundancy to ensure high system availability and end-user satisfaction.

Cost-effective

- Compact base station that can be deployed in small footprint.
- Up to three sectors per base station, with two transceivers per sector to support STC and 2x2 MIMO.
- Delivers RF power at the antenna for a high link-budget at a fraction of the power consumption and cost of larger, ground-based stations.
- Two backhaul options: 10/100/1000 optical fiber or 100/1000BASE-T.
- Embedded GPS synchronization eliminates need for separate GPS receiver.
- High-reliability, rugged and weatherproof design of ODU.

symmetry*MXd*

symmetry*MXd* is the ideal solution for operators deploying fixed networks in the 2.5 GHz, 3.5 GHz, or 10.5 GHz bands, particularly if FDD operation is a must. **symmetry*MXd*** is an agile platform for residential, small office, enterprise, and multi-dwelling applications that delivers the service quality and reliability that builds customer satisfaction.

symmetry*MXd* enables operators to provide a wide range of profitable voice and broadband data services–like VoIP, high-speed Internet, IP VPN, videoconferencing, streaming audio and video, and gaming–or to backhaul WiFi Hot-zones. Thanks to its unique Quality of Service and service creation capabilities, **symmetry*MXd*** delivers the dependable Internet and voice services residential and enterprise users demand, and offers benchmark performance as a video surveillance platform for governments, municipalities, and security agencies.

With a range of channel bandwidths available from 1.75 MHz to 7.0 MHz, **symmetry*MXd*** permits operators to deploy high-capacity broadband networks in as little as 7 +7 MHz of spectrum. Operators that have access to 10.5 GHz spectrum can use **symmetry*MXd*** to serve enterprises and multi-dwelling units at price points that that will radically change their business cases.

Highlights

- The only platform that is WiMAX Forum certified for FDD and TDD operation.
- Proven interoperability with a range of 3rd party CPEs allows operators to access a deep and mature ecosystem of cost-effective suppliers.
- Reliable, differentiated Internet access services with patent-pending Quality of Service features.
- Primary line voice services using Dynamic SIP Service Control that is compatible with any CPE or VoIP gateway.
- Enhanced **symmetry*MX*** air interface offers better Non-Line of Sight (NLOS) performance, superior in-building coverage, and higher capacity, using proven STC technology.
- Configurable TDD uplink/downlink partition to optimize system performance for uplink-intensive applications like video surveillance and industrial monitoring (SCADA).
- Patent-pending QoS system increases subscriber capacity, enables innovative services like Video Surveillance, and ensures customer satisfaction.
- A unique WiMAX service creation environment permits operators to create new services and applications quickly and easily.
- Flexible, VLAN translation supports enterprise services, simplifies integration with operator networks, and enables the "carrier's carrier" business model.

Airlink profiles

- 2.5 GHz, TDD
- 3.5 GHz, TDD
- 3.5 GHZ FDD
- 10.5 GHz FDD
- Multiple channel bandwidths: 1.75 MHz, 3.5 MHz, 5.0 MHz, 7.0 MHz

symmetry*MXd* seamlessly integrates key advanced WiMAX technologies–including sub-channelization, antenna diversity, adaptive modulation, power control, space time coding, ARQ, and bandwidth optimization–to optimize spectrum usage, and improve NLOS coverage and in-building penetration.

Security

DES Encryption with secure subscriber station authentication.

symmetry*MXe*

With **symmetry*MXe***, operators will tap into the explosive demand for ubiquitous mobile and nomadic broadband IP services. **symmetry*MXe*** offers operators the choice of a full mobile solution using ASN Profile A with a standards-compliant R6 interface to ASN Gateways, and a standalone nomadic ASN Profile B solution that simplifies deployment and reduces both the up-front investment and operational expense of a WiMAX 802.16e network.

- Advanced **symmetry*MXe*** air interface offers better Non-Line of Sight (NLOS), superior in-building coverage, and larger capacity, using proven STC technology.
- Delivers a full range of services: VoIP, high-speed Internet, IP VPN, videoconferencing, streaming audio, video, and gaming.
- Optional layer 2 convergence sublayer to support Ethernet bridge operation and VLAN applications.
- Optional 64QAM uplink support improves capacity and user experience for fixed/nomadic applications.
- Nomadic Profile B can be easily integrated with operators' existing OSS and BSS, without upgrading systems to support Mobile IP and WiMAX-specific extentions of the Radius protocol.

Product Highlights

Services

Economical deployment of IP applications, including: VoIP, multimedia conferencing, instant messaging, Web browsing, media content download and eMail, interactive gaming, streaming media, managed VPN and FTP.

Supports Metro Area Network VLAN Services. Provides a low-cost QoS-enabled backhaul.

Delivers IMS, multicast and broadcast services.

Airlink profiles

2.5 GHz and 3.5 GHz, TDD duplexing with dynamic uplink and downlink ratio control.

5 and 10 MHz channels.

Smart antenna systems: STC and 2X2 MIMO that optimize spectrum usage, improve link budget, mitigate interference and improve in-building penetration.

WiMAX ASN Profile Compliance

ASN Profile A

ASN Profile A architecture for mobile IP services, including: dynamic QoS, with Policy Server function interface.

- Supports ASN-BS functions and standard R6 interface (ASN-GW, ASN-BS).
- Roaming from home and visited networks using GRE tunnels to support Mobile IP, and inter-BS and inter-Gateway handoff for low total-handover latency.
- Security: including mobile SS and end-user authentication

ASN Profile B

Extended ASN Profile B architecture for Nomadic and Fixed IP services, including: built-in policy database, policy decision, and enforcement point.

- Self-contained, ready to deploy, WiMAX ASN and CSN in a box.
- Interoperability with standard 802.16e CPEs
- Integrated or external WiMAX AAA function allows operators to keep their existing fixed-line AAA
- OSS/BSS Interface for service instantiation, update, deletion and bulk provisioning.
- On-the-fly Service Creation.
- L2 or L3 operation ensures transparency to tunnelling protocols -- PPPoE and VPN support

Common Characteristics

- Simultaneous support of mobile and nomadic subscriber stations within the same cell .
- Advanced Service profiles and Service creation tools.
- Radio resource management including service flow authorization and airlink admission control with two possible models (ASN-GW RRM or BS RRM) to support various ASN-GW profiles and handover models.

Mobility

To enable mobility, the **symmetry*MXe*** base station implements a series of functions including Mobile IP sessions, as well as handover functions. The base station is capable of doing intra-and inter-BS handoff and relies on the interaction with an Access Service Network to handle both Mobile IP sessions and handovers.

The CBS5000 supports WiMAX Forum Network Working Group Profile A, which is suitable for large cellular deployments. Thanks to its standards compliant R6 interface, the CBS5000 ensures that operators can choose from a range of ASN-GW suppliers.

SymmetryMXe Deployment Models

Layer 3 operation (IP routing)
Layer 3 operation is based on IP (either IPv4 or IPv6) links between the MS/SS and external data networks which is the default WiMAX Forum NWG architecture model.

Layer 2 operation
Layer 2 operation is based on Ethernet (IEEE 802.3) bridged links between the MS/SS and external data networks.

AAA
Support of the WiMAX NWG specification for AAA interface with support for both L2 (e.g. PPPoE) and L3 (IPoE) services.

Nomadicity

Nomadic users can access broadband WiMAX services whenever they power up their terminal in the WiMAX coverage area.

symmetry*MXe* offers a unique self-contained core network solution for nomadic deployments. The **symmetry*MXe*** nomadic profile B solution integrates ASN-GW functions and CSN functions into the base station and network management system to create a stand-alone solution that eliminates the expensive gateways and servers that are normally required to roll out a WiMAX 802.16e network. Moreover, our Profile B solution integrates seamlessly into operators' existing infrastructure, whether it consists of a mobile core network, an ADSL-based ISP architecture, or a Telco voice network. The result is that service providers can deploy a future-proof WiMAX 802.16e network that preserves their operating model rather than forcing a major network upgrade.

Highlights

- Profile B solution allows operators to build a base of nomadic subscribers without the cost, complexity, and regulatory hurdles involved in deploying a full mobile network.
- Low-cost solution for smaller-scale networks that allows operators to scale their WiMAX investment to initial subscriber densities and revenue streams.
- The solution is also ideal for Enterprise and Industrial deployments.

Fixed Services

Operators planning to deploy WiMAX 802.16e for fixed services face a challenge. Mobile WiMAX relies on mobile IP sessions and is not transparent to many of the protocols, such as PPPoE and VPN, used in fixed networks. Moreover, the requirements of a mobile airlink impose a heavy loss of capacity in fixed networks. For fixed applications, **symmetry*MXe*** implements features that are optional in the mobile WiMAX 802.16e standard, as well as specific enhancements for fixed networks.

Layer 2 convergence sublayer:

The Layer 2 CS ensures transparency to tunneling protocols such as PPPoE and offers VLAN support, which is necessary for deployments where multiple ISPs share a common infrastructure.

64QAM uplink modulation:

Optional in the WiMAX forum 802.16e profiles, 64QAM uplink modulation permits more spectrum efficient, higher-rate uplink services, such as those required by business subscribers and backhaul applications.

Services

Network Segmentation and Network Prioritization	VLAN: IEEE 802.1Q; Q-in-Q [802.1ad]; 802.1D [802.1p]
Convergence Sub-layer Service	Ethernet/802.3 and IP over Ethernet
Packet Switching	Low-latency Layer-2 switching and policy switching that enables easy inter-working with Routers, Gateways, Firewall/NAT, IP PBX, Media Gateway, Demilitarized Zone (DMZ) Host, Multicast Routers, Diffserv networks and MPLS switches.
User Traffic Protocol	IPv4, PPPoE, L2TP, IPSec, PPtP, MPLS
IP Configuration	Dynamic Host Configuration Protocol (DHCP) support or static configuration
Grade of Service (GoS)	Configurable and predefined GoS profiles SLA Protection: Admission Control and Maximum Over Subscription Ratio protection
Backhaul network port	100/1000Base-SX/LX [SFP] 100/1000Base-T
WBRU interfaces (IDU-ODU Interconnect)	Open Base Station Architecture Initiative (OBSAI), • Delay compensated for long range support to 5 Km
Synchronization source	GPS antenna port; Internal synchronization source: Stratum 3; Accuracy +/- 4.7ppm; Capture range +/- 4.7ppm; Stability 0.37ppm/24 hours
Synchronization cascade interface	Cascade Input: LVDS [RJ-45 Shielded] Cascade Output: LVDS [RJ-45 Shielded]
Network segmentation and prioritization	VLAN: IEEE 802.1Q; Q-in-Q [802.3ad]; 802.1D [802.1p]
Typical Applications	Fixed and nomadic applications; including: IP (video surveillance, distributed gaming, VoIP and multimedia conferencing, streaming media, instant messaging, Web browsing, media content download, managed VPN, FTP, and E-mail, SCADA system) Metro Area Network VLAN services Agile QoS-enabled Enterprise VPN, Industrial applications and Backhaul solution.

MAC layer features

Convergence Sub-layer Packet Classification	Extensive Packet Classification Layer 2: IEEE 802.3, IEEE 802.1Q, IEEE 802.1D (802.1p) Layer 3: IP, Differentiated Services Code Point / TOS Layer 4: Port number and/or range
Convergence Sub-layer Traffic Conditioning	Traffic priority marking Per flow, Multimedia queuing, Traffic conformance metering Token Bucket Traffic shaping, Congestion control (WRED) Latency and jitter control
Filters	Source and Destination Mac filters; Broadcast, Multicast filters, Broadcast Strom Filters, Access control list defined through classifier rules.
QoS Scheduler Options	Advanced Scheduling Algorithm with full WiMAX QoS support. Airlink Optimization Automatic Retransmission reQuest (ARQ), Uplink power control Payload Header Suppression, Dynamic Bandwidth Admission Control Maximum Over Subscription Ratio Control, Multicast group polling
Security Options	Encryption: 3DES and AES (future) Secure Authentication

Physical layer

Air Interface	802.16d-2004 Software upgradeable to specific 802.16e profiles
Frequency Ranges	2.5 GHz TDD (2500 - 2695 MHz) 3.5 GHz TDD (3300 - 3800 MHz) 3.5 GHz FDD (3300 - 3800 MHz) 10.5 GHz FDD (10.15 GHz - 10.65 GHz)
Channel Bandwidths	2.5 GHz TDD – 3.5, 5.0, 7.0 MHz 3.5 GHz TDD - 3.5, 5.0, 7.0 MHz 3.5 GHz FDD - 1.75, 3.5, 7.0 MHz 10.5 GHz FDD – 3.5, 7.0 MHz
Adaptive Modulation	64 QAM (3/4, 2/3), 16 QAM (3/4, 1/2), QPSK (3/4, 1/2), and BPSK (1/2)
Frame Size	5ms, 10ms
Maximum RF Transmit Power	31 dBm (3.5GHz, 2.5GHz)
Antenna type (typical)	Sectoral
Cyclic Prefix	1/4, 1/8, 1/16, and 1/32 (configurable)
Diversity	Polarization Diversity: Two-branch Tx/Rx, with MRC and STC
Sub-channeling	2, 4, 8, and 16 channels
ATPC (Automatic Power Control)	Uplink closed loop power control with adaptive modulation
Sectors	Up to 3 sectors with diversity

Services

ASN-BS functions

ASN Profile A functions, services and interface:	ASN-Profile B functions, Services and Interface:
• Data Path Function • Handover function • Context Function • Radio Resources Agent • Authentication relay • Key receiver • Service. Flow management • Paging Agent in the BS • R6 support • 802.16e-2005 MAC common part support	• Data Path Function • Nomadic Functions • Context Function • Radio Resources Control and Management • Authentication (EAP based) with Radius support • Key Management • Service. Flow management • Nomadic network support • R3 support • Policy database and control support OSS/BSS Provisioning Interface. 802.16e-2005 MAC common part support

Low-latency Layer-2 switching and Layer-3 routing with QoS class support:	• GRE Tunnel for Mobile IP • PMIP and Client MIPS over R6
Backhaul network port	100/1000Base-SX/LX [SFP] 100/1000Base-T
WBRU interfaces (IDU-ODU Interconnect)	Open Base Station Architecture Initiative (OBSAI), • Delay compensated for long range support to 5 Km
Synchronization source	GPS antenna port; Internal synchronization source: Stratum 3; Accuracy +/- 4.7ppm; Capture range +/- 4.7ppm; Stability 0.37ppm/24 hours
Synchronization cascade interface	Cascade Input: LVDS [RJ-45 Shielded] Cascade Output: LVDS [RJ-45 Shielded]
ASN-GW interface	R6 to ASN-GW (signaling and data plane) CID Update R6 HO control trigger R6 tunnel management
CSN Interface (B Profile)	R3 to AAA (Integrated option or external OSS/BSS Interface, Please contact SR Telecom for details)
Network segmentation and prioritization	VLAN: IEEE 802.1Q; Q-in-Q [802.3ad]; 802.1D [802.1p]
Typical Applications	Mobile, nomadic and fixed applications; including: IP (Video surveillance, distributed gaming, VoIP and multimedia conferencing, streaming media, instant messaging, Web browsing, media content download, managed VPN, FTP, and E-mail, , SCADA system) Metro Area Network VLAN services Agile QoS-enabled backhaul for Enterprise VPE, Industrial applications, and backhaul solution. IMS, multicast, and broadcast services
User traffic protocol	MIP GRE tunneling. (IPv4 initially, IPv6 future) IPv4, PPPoE, L2TP, IPSec, MPLS
Grade of service (GoS) SLA protection	• Configurable and predefined GoS profiles • Dynamic provision via R6 interface (future) • Admission Control

MAC layer features

QoS scheduler options	• Advanced Fast Scheduling Algorithm implements per flow queuing and complies fully with all IEEE 802.16 QoS options.
Airlink optimization and radio resources management	• ARQ and HARQ • Radio Resource Agent Management and control • Dynamic Bandwidth Allocation • Air Link Admission Control (Network admission control in the ASN-GW) • Multicast group polling
Policy management	• Service flow management • Multiple classes of service for each SS
Security options	• AK Receiver • TEK and SA management • Authentication relay/ EAP Proxy • Authentication based on X.509 certificate

Physical layer

Air interface	802.16e-2005 Frequency range 2.5 GHz TDD (2500 - 2695 MHz) 3.5 GHz TDD (3300 – 3800 MHz) Channel bandwidth 2.5 GHz: Scalable 5.00, 10.00 MHz 3.5 GHz: 5.0, 10.0 MHz
RF access scheme	SOFDMA (512, 1024 point FFT)
Adaptive modulation	64-QAM 5/6, 3/4, 2/3, 1/2 16-QAM 3/4, 1/2 QPSK 3/4, 1/2
Frame size	5 ms (TDD)
Maximum RF transmit power	31 dBm per transceiver
Antenna type	Omni, sectoral, or panel
Cyclic prefix	1/4, 1/8, 1/16 (Fixed application)
Smart antenna system / RF path diversity	MIMO, AAS, STC Alamouti coding
Channel coding	Convolutional coding with tail biting Convolutional Turbo Coding
ATPC (Automatic Tranceiver Power Control)	Closed loop power control with adaptive modulation Open Loop Power control
Sub-carrier allocation	PUSC, FUSC, Fractional Frequency reuse.
Sectors	Up to 3 sectors with diversity
DL: UL ratio	Configurable