



# BreezeMAX™ Mini-Centralized ASN-GW

Managing Subscriber and Service Functions in Mobile WiMAX™ Networks

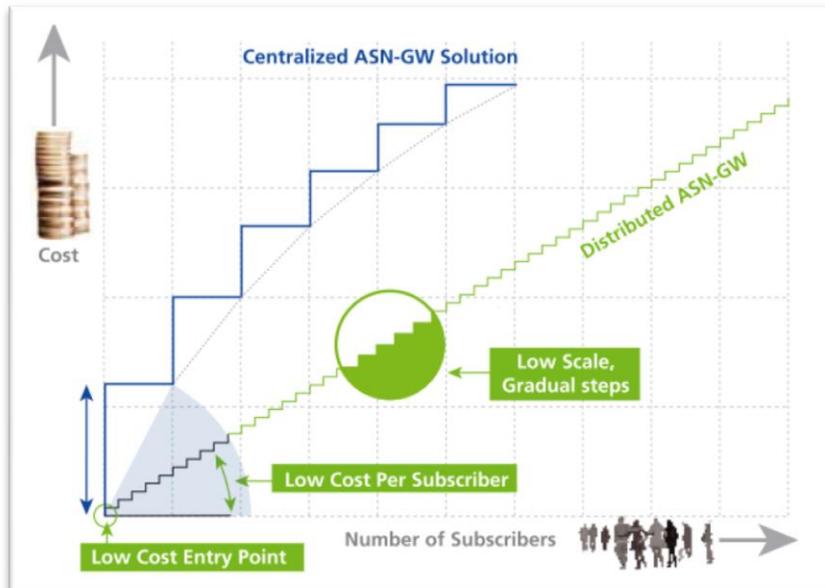
## Introducing BreezeMAX™ Mini-Centralized ASN-GW

The BreezeMAX™ ASN-GW performs the subscriber and service management functions required for Mobile WiMAX™ Radio Access Network (RAN) operation. It supports connection management and mobility across cell sites and inter-service provider network boundaries through the processing of subscriber control and bearer data traffic.

Based on the widely adopted WiMAX Forum NWG Profile C architecture, the BreezeMAX™ ASN-GW implements standard-compliant protocols and procedures. The offering encompasses a Mini-Centralized (MC-) and Integral ASN-GW packages, employing the same software, feature set, and look and feel.

This enhanced offering allows operators to enjoy the best of both worlds: the benefits of distributed RAN approach together with an option for mini-centralized topology achieving deployment flexibility and optimal Total Cost of Ownership (TCO).

The BreezeMAX™ ASN-GW is an integral part of the carrier-class, field-proven 4Motion Mobile WiMAX™ solution and shares a common management platform with its Base Stations (BS).



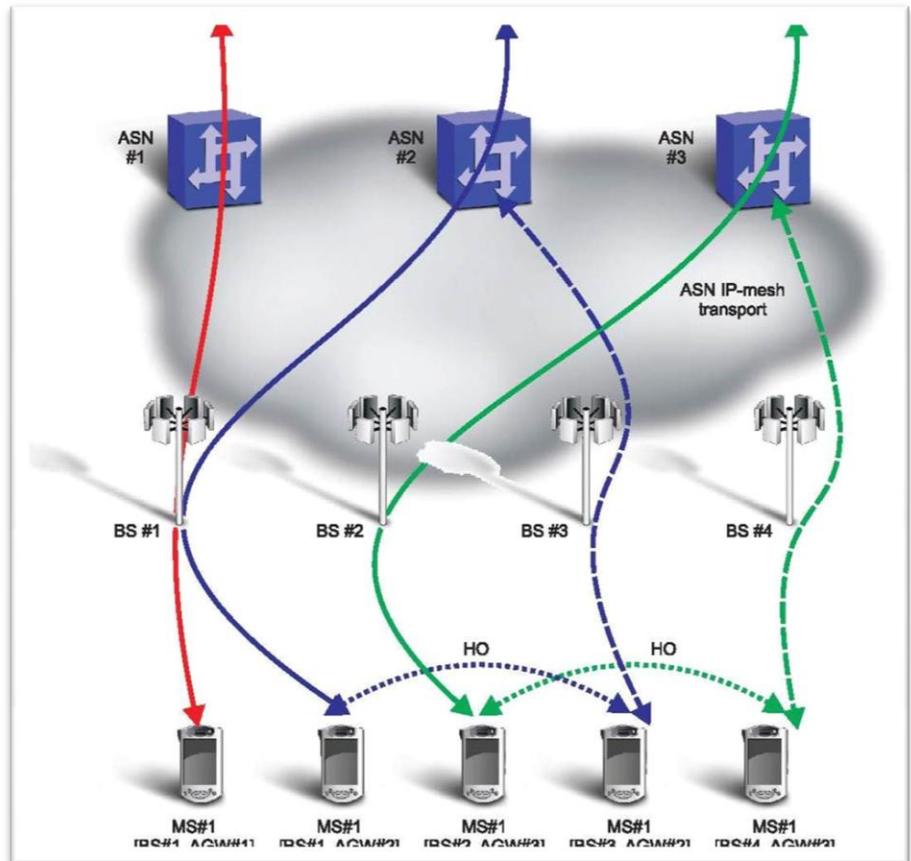
## Optimized TCO

The BreezeMAX™ ASN-GW is based on an innovative distributed architecture which optimizes capacity planning and allows a pay-as-you-grow implementation strategy. As a result of the fractal ASN-GW deployment approach, the ASN GW physical location sites and required capacity may be optimized to fit actual network needs, enabling operators to benefit from reduced CAPEX. OPEX is also decreased, thanks to the central network management solution controlling the entire radio access network (RAN).

The ASN-GW's license-based pay-as-you-grow pricing model starts from a 500-subscriber-sessions license and allows low entry-cost for initial deployments, low per-subscriber cost and low fixed costs of incremental extensions.

## Scalability and flexibility of deployment topology

The BreezeMAX™ RAN implements a unique networking approach based on the “Flex-R6” concept, providing a high degree of freedom—both in choosing the ASN-GW network location, and in mobility support. This approach enables a BS to associate with multiple ASN-GWs on a dynamic, per-active-session basis. This actually means that a BS may communicate with any ASN-GW in a “Flex-R6” domain, eliminating the need for inter-ASN communications and enabling practically unlimited network scalability and capacity, dependent solely upon the provisioned radio and network resources.



Flexibility in selection of ASN-GW location, and optimized, dynamic geography-based load balancing provides better transport topology fit, higher backhauling utilization and improved service availability, as the service edge is brought closer to a user. Scalable from just a few hundreds to millions of subscribers, it is an ideal way to service a mixture of fixed and mobile services.

## Variety of business models

The BreezeMAX™ ASN-GW enables fixed, nomadic and mobile wireless access deployment models and supports variety of IP and Ethernet services for residential and business customers:

### RESIDENTIAL SERVICES

Supports multiple IP/ multi-homing setup—the typical configuration for fixed-mobile convergence—providing multiple IP services for end users (such as VoIP, data, IPTV, etc).

### ENTERPRISE SERVICES

Allows allocation of static IP (e.g. for servers not using DHCP procedures) or multiple IP addresses (enterprise multi-host configuration). Support of Ethernet services—Virtual Private Wire Service (VPWS) or Virtual Private LAN Service (VPLS) with IEEE 802.1q VLAN and IEEE 802.1ad QinQ interfaces—delivers added value. Ethernet broadcast, multicast and flooding packets are supported using Multicast Service Flow, thus optimizing over-the-air bandwidth utilization.

### REACH SUBSCRIBER MANAGEMENT CAPABILITIES

Provides flexible offline accounting options, IP session hot-lining functionality, network-initiated CPE disconnection and many other features. Accounting is reported for IP sessions and WiMAX service flows with an option to enable/ disable per service groups (includes session time, volume information and other session parameters). Also supports interim accounting with a configurable interim interval, providing infrastructure for AAA-based online/ pre-paid accounting.

### WIMAX SECURITY FRAMEWORK

Implements WiMAX security framework as specified by IEEE 802.16 and WiMAX Forum with EAP-based user and device authentication enabling various EAP methods. Additionally, it allows local ASN GW CPE authorization mode, particularly useful for infrastructure providers.

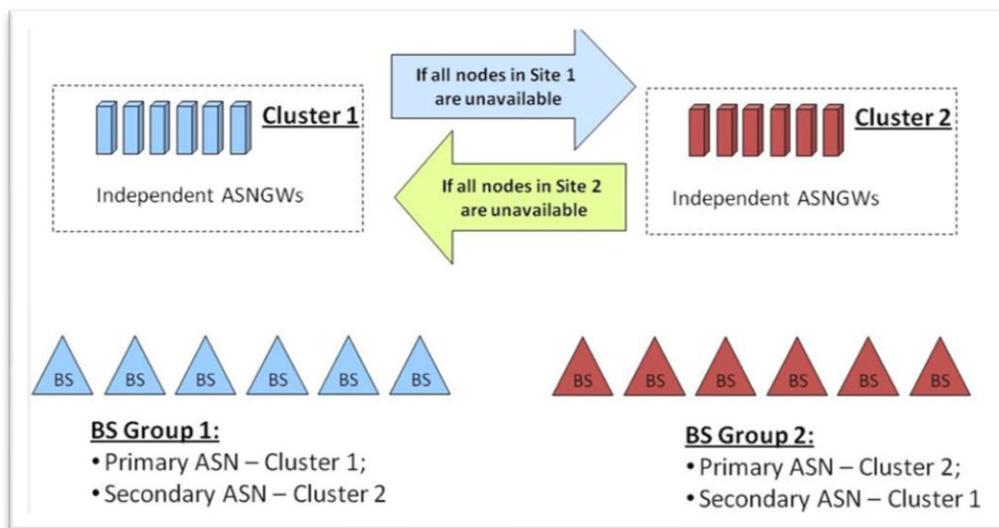
## WHOLESALE AND NAP SHARING

Enables a “wholesale” wireless access network deployment model allowing customers to serve multiple core service network (CSN) providers and interoperate with typical ISP back office infrastructure. It provides separation between operators IP domains and ensures correct forwarding of mobile station traffic to the corresponding Packet Data Network (PDN).

## Network Reliability

**HIGHLY RELIABLE HARDWARE** - the BreezeMAX™ ASN-GW uses solid state components (e.g. flash memory instead of a hard disk) to provide failure-free service for customers. MTBF of the stand-alone platform is longer than 15 years.

**LOAD BALANCING AND GEO-REDUNDANCY** – the BreezeMAX™ RAN implements ASN cluster-based load balancing and geo-redundancy, thus eliminating a single point of failure or overload. A



failure of a single ASN GW entity causes no system down time, but rather capacity downgrade. Providing spare capacity in a cluster ensures failure-less and non-blocking operation of the network and allows operators to build scalable and resilient ASN infrastructure.

**RAN RELIABILITY** - the BreezeMAX™ ASN-GW and BS implement supplementary mechanisms contributing to RAN’s reliability and survivability, such as a keep-alive procedure between a BS and an ASN GW, far-end restart detection, graceful entity shutdown, etc.

## Quality of Service

**ENHANCED QoS SUPPORT** - The BreezeMAX™ ASN-GW and BS implement standard WiMAX Forum defined QoS architecture for un-managed (pre-provisioned) services. As a part of this framework, each MS entering the network is authenticated and authorized for the particular service. The BreezeMAX™ ASN-GW supports flexible service provisioning using either local service profiles or “explicit” authorization parameters being received from WiMAX Home AAA server. Service authorization parameters are translated into WiMAX Service Flow classification rules and the corresponding QoS and accounting policies. The BreezeMAX™ ASN-GW and BS support all the five WiMAX QoS scheduling types - UGS, ERT-VR, NRT, RT and BE, and flexible service flow classification rules based on 5-tuple IP parameters and Ethernet IEEE 802.1p/ IEEE 802.1q fields enabling identification and management of user traffic on a per- subscriber, per- flow and per-application basis. These capabilities enable very efficient QoS support for un-managed voice by prioritizing it over other data flows.

**FLEXIBLE POLICY-BASED QoS MARKING** - The BreezeMAX™ ASN-GW supports provisionable, policy-based rules for control and data packets QoS marking, including DSCP code point and IEEE 802.1p priority bits setting.

## Manageability

**SUPERIOR MANAGEMENT SOLUTION** - as a part of the BreezeMAX™ RAN portfolio, ASN GW is managed by a tightly-integrated, cost-effective, field proven management solution called “Star Management Suite”. It is made up of the specific carrier-class set of tools that cover the entire

service life-cycle, from initial installation and up to full service provisioning, monitoring, reporting and troubleshooting tasks required for efficient network operation.

## Product Specifications

General	
WiMAX Forum compliancy	NWG Profile C
Mobility	Fixed, Portable, Mobile
Flex R6	Any-to-any association between BS and ASN GW
Deployment topologies	Distributed or Mini-Centralized
Stackable deployment	Up to 10 entities per ASN Cluster
Scalability	Practically unlimited number of ASN GWs and active subscriber sessions in the network without service degradation
Management	CLI, SNMPv2-based remote management by the BreezeMAX EMS platform (AlvariStar™)
Mechanics and Environmental	
Dimensions	Pizza box, 1U-high ETSI type shelf, 1U x 43.2 x 45 cm
Weight	3.4 Kg
Operational environment	Controlled temperature location. Optional placement within outdoor cabinet. Temperature: 0 - 55°C
Physical Interfaces	Gigabit Ethernet copper interface (100/1000 Base-T) - provides ASN-GW main network connectivity for control, in-band management and bearer traffic. Out-of-band (OOB) Management port – Fast Ethernet (100 Base-T).
Power	48 V DC, 100 W maximum power consumption
Standard compliance	EMC: ETSI EN 301 489-1/4, FCC Part 15 Safety: EN60950-1, UL 60950-1 Lightning Protection: EN61000-4-5 Environmental: ETS 300 019, Part 2-1 T 1.2, Part 2-2 T 2.3, Part 2-3 T 3.2
Redundancy and Reliability	
MTBF (single entity)	> 15 years
Redundancy scheme	Network redundant N+M configuration - load-balancing between the entities in the cluster, no single point of failure
Geo-redundancy	Primary/ Secondary clusters with switch-over between them.
Keep-alive mechanism	Periodic keep-alive polling of the far end
AAA redundancy	Automatic switch-over from a Primary AAA to a Secondary AAA server upon transactions failure detection.

Capacity and traffic throughput (per entity)	
Active WiMAX sessions	3000
Packet throughput	Aggregate traffic of ~200 Mbps
Services	
IPv4 services (IP-CS)	Single/ Multiple IP Hosts per MS, Multi-homing (multiple IP domains), Static IP support. Provisionable capability for local ASN GW peer-to-peer traffic switching. Multiple PDNs support - virtual IP segments with separate logical interface.
IP address allocation	DHCP Proxy mode – IP address allocation by AAA server. DHCP Relay mode. DHCP Option 82 with flexible configurations. DHCP Server mode - internal ASN GW-located DHCP server.
Ethernet services (VLAN-CS)	VPWS - Virtual Private Wire Service emulation (transparent VLAN, VLAN switching, QinQ) VPLS - Virtual Private LAN Service emulation (VLAN, QinQ). Broadcast packets replication using Multicast Service Flow over-the-air for optimal bandwidth utilization.
Subscriber Management	
Authentication & re-authentication	EAP-TLS, EAP-TTLS, EAP-AKA and other EAP methods. EAP re-authentication.
Authorization	Explicit authorization parameters from AAA or implicit local ASN GW -provisioned profiles
Accounting	IP session-based accounting for IP services, flow-based accounting for Eth services Time and Volume based accounting for IP sessions. Interim accounting support (configurable or AAA-controlled interim interval).
Session Hotlining	Provisionable IP filtering profiles – traffic drop, bypass, http redirect. Dynamic hotlining activation.
AAA-initiated MS disconnect	MS disconnect triggered by AAA using Radius DM (PoD) message.
Operational procedures	Manual MS session disconnection from CLI/ EMS. Real time query for the active MS sessions.
Subscriber location reporting	Reporting MS' Serving BS Identity (BSID) to AAA.
AAA-based Prepaid	Quota management in AAA.
Roaming support	Local traffic drop or routing to subscriber's home PDN using pre-provisioned IP-in-IP tunnels.
QoS	
Traffic Classification	5-tuples IP classification for IP-CS services. IEEE802.1q/p classification for VLAN-CS.
WiMAX QoS	UGS, eRT-VR, RT-VR, NRT-VR, BE WiMAX service flow scheduling types
QoS marking	DSCP code point and IEEE 802.1p priority bits policy-based QoS marking
Un-managed VoIP support	Pre-provisioned WiMAX Service Flows specially set to classify VoIP data.

Infrastructure support	
Logical R3 bearer interfaces	IP-in-IP, IEEE 802.1q VLANs, IEEE 802.1ad QinQ
Network topologies support	L2/ L3 forwarding engine. Proxy ARP. Gratuitous ARP
Product features	
Security	Implements IEEE 802.16 and WMF NWG security framework.
	IP spoofing protection for WiMAX IP sessions (UL packets inspection).
	Access Control List and Rate Control
Radius R3 interface	WMF NWG rel.1 ver.1.3.0
EMS functions	Remote configuration. Fault management. Performance management. Remote software update. Remote configuration backup and restore. Auto discovery by EMS. Remote access to LOG files. Various user privilege levels.

### **About Telrad**

Telrad Networks is a global 4G solution provider with hundreds of commercial 4G deployments. Telrad delivers industry-leading network solutions for broadband wireless, LTE-Advanced and WiMAX to telecom operators, enterprises and WISPs worldwide. Telrad Networks is committed to delivering best-of-breed products, service and support to our customers, and is backed by Fortissimo Capital, a group of private equity funds with nearly \$500 million under management.



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