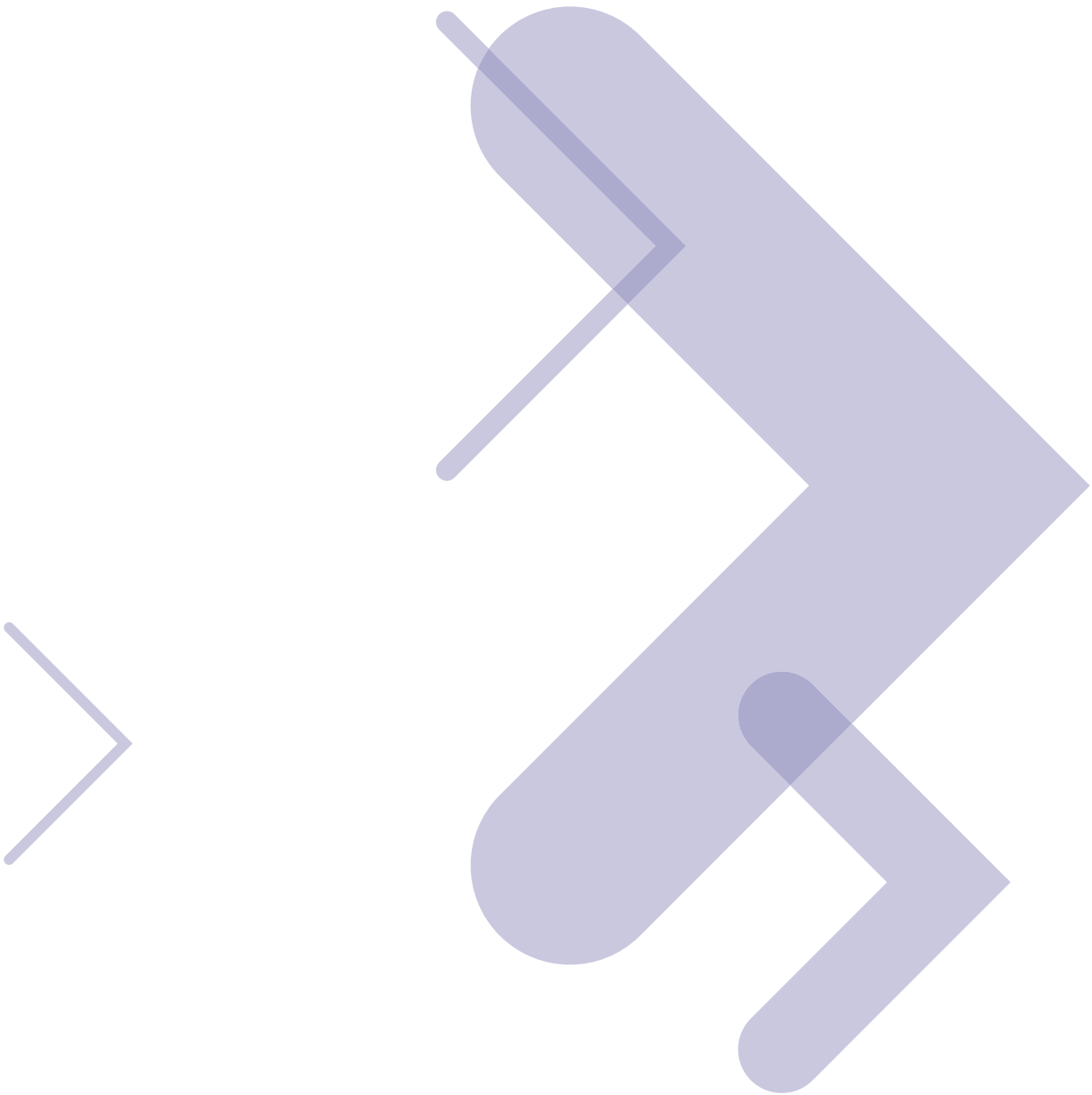
WHITE PAPER

Distributed Network Architecture for WiMAX

Digital, Converged, Mobile IP World



Distributed Network Architecture for WiMAX

Digital, Converged, Mobile IP World

The world is moving to IP and service providers in all geographies are embracing the shift. Leveraging the IP foundations of WiMAX technology and the demonstrated benefits of IP systems including rapid cost declines and ease of management, a distributed WiMAX network architecture takes the service provider community one step closer to differentiating their services in a digital, converged, mobile IP world.

With a distributed WiMAX network architecture, the WiMAX system simply becomes an extension of the IP network to the mobile user. Leveraging simple IP-based backhaul connections, service providers can very readily service a myriad of WiMAX base sites (e.g. large, medium, sectorized, omni, micro, pico) for varying coverage and capacity profiles addressing outside environments, inside buildings, fixed and fully mobile connections. Service Providers will very simply grow their networks based on system usage leveraging standard IP components.

A distributed WiMAX network architecture can be significantly lighter and easier to install than traditional cellular based network designs and can substantially reduce capital and operational expenses. By leveraging standard IP network equipment, operators will be able to deploy at greater speed and with reduced spend.

The high performance of the WiMAX technology paired with the cost advantages offered by a distributed WiMAX network architecture brings WiMAX solutions within reach of operators in all regions and segments. With WiMAX systems, markets in absence of basic voice connections can leapfrog to VoIP, high-speed data, and video delivery – further bridging the digital divide – and markets seeking advanced, bandwidth-intensive, mobile communications can realize true personal broadband experiences.

Wi4 WiMAX Distributed Network Architecture

Motorola's wi4 WiMAX systems benefit from a highly innovative solution to network design with the wi4 WiMAX distributed network architecture.

Motorola's wi4 WiMAX distributed network architecture provides a simple, peer-to-peer network architecture that is a flat, all IP-based design in a manner similar to that of current 802.11 Wi-Fi networks. The WiMAX distributed network architecture is supported by Motorola's WiMAX Access Point Control (WIMAX APC) to administer key functions best served by localized management such as security and mobility decisions and a separate bearer control path realized from standard IP routers and switches.

With Motorola's WiMAX distributed network architecture, operators are able to address full mobility applications, have the assurances of service quality and security, as well as benefit from substantially reduced CAPEX and OPEX models.

Departing from traditional cellular architectures that have relied on hierarchical architectures with multiple layers of control and interconnect platforms, Motorola's wi4 WiMAX distributed network architecture significantly reduces the complexity of the network and provides the foundation for a robust and versatile service delivery platform. In a dramatic shift from legacy wireless networks, the WiMAX distributed network architecture positions much of the network mobility functions at the very edge of the access network - within the WiMAX Access Points themselves.

Motorola WiMAX Access Points paired with the WiMAX APC deliver a full, carrier-class mobility network capable of delivering rich voice and multimedia content. The collection of wi4 WiMAX access points, the WIMAX APC platform, and the IP routers and switches managing the bearer path constitute the Access Service Network as identified in the WiMAX Forum reference architecture.

While many WiMAX vendors may consider more cellular-like network designs to realize their mobile WiMAX solutions, Motorola is leveraging the power of IP, the learnings from simple Wi-Fi networks, and advancements in mobility management to deliver a best-in-industry solution. With Motorola's wi4 WiMAX distributed network architecture operators will benefit from faster handovers, freedom in network scalability, and a truly distributed access network design.

Key Benefits

The WiMAX distributed network architecture approach offers the following benefits:

- Seamlessly integrates wireless technology specific functionality with IP networking equipment
- Allows for the use of a common IP network for multiple wireless access technologies
- Enables cost-effective implementation for deployments ranging from small to large scale
- Enables the use of mobile devices and optimizes handovers
- Eliminates high-cost centralized boxes
- Enables new types of transport networks such as metro Ethernet, and wireless point-to-point for backhaul
- Reduces latencies due to elimination of multiple boxes
- Enables distribution of "application level" functionality such as content delivery networks

Advantages of the Distributed Network Architecture

Deployment Ease

Capacity and coverage requirements will factor into network dimensioning to determine the initial scale of a network deployment. With the wi4 WiMAX distributed network architecture, operators can rapidly deploy their networks today and easily scale to meet the growing demands of tomorrow. As coverage or capacity needs grow, additional base sites can be readily deployed and seamlessly "dropped" into the distributed IP architecture.

Optimized mobility

Motorola's wi4 WiMAX distributed network architecture provides the intelligence in the control network to recognize those mobile subscribers that demonstrate likelihood for engaging in access point to access point handovers. By pre-determining the likelihood, the network can send the necessary context information regarding the subscriber's service flows and subscription profiles to the target access points ahead of initiation. The Access Point community in concert with the control plane management can identify the optimal handover scenario and process the admission controls well before the actual handover has been initiated. This allows for savings in actual handover time, reducing latency and improving the mobile link.

Network Scalability

Motorola's wi4 WiMAX distributed network architecture offers great advantage in scalability of operator's access networks by separating the control plane from the bearer path control. Motorola's WIMAX APC platform provides the control plane management also referred to as the ASN Decision Point while the bearer path, also referred to as the ASN Enforcement Point, can be supported by IP networking equipment. Where some vendors have elected to offer purpose-built solutions combining the control and bearer functions resulting in higher cost and limited scaling flexibility, Motorola's solution allows operators to scale the control plane and bearer path independent of one another while benefiting from the dramatic IP cost curves. Operators can deploy the solution that suits their network today and focus their investments over time on scaling the right components of their network without the penalty of overbuilding where it may not be timely.

Distributed Control

Motorola's wi4 WiMAX distributed network architecture allows the efficiency of having a single control platform to administer network functions across multiple deployment sites. This capability can be a great asset especially in those markets where subscriber penetration is expected to be light or moderate. A single WIMAX APC platform which can support up to a million subscribers and a thousand access points can partition its management over multiple markets while lower cost, reduced scale routers manage the bearer path for the data traffic. As opposed to building discrete ASN Gateways to support every individual deployment site, the distributed approach offered by Motorola allows the operator to manage their investment and build an optimally sized network to support their service demands.

End-to-End QoS

With the WiMAX distributed network architecture, Motorola's WiMAX systems are capable of administering an end-to-end QoS framework to meet the needs of true carrier-class deployments. A full suite of QoS parameters are available for application to user services flows throughout the network to provide optimal handling of the end-to-end service. The broad support of the end-to-end QoS framework enables a range of services including robust voice and data management and service level assurance.

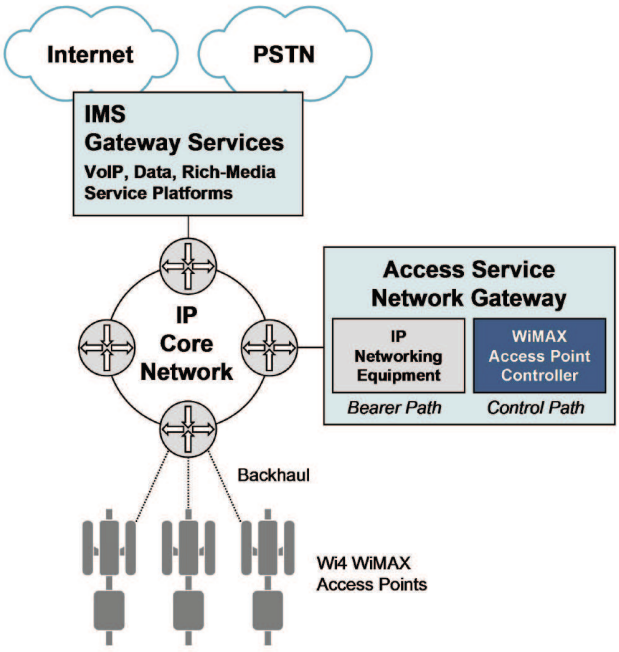
WiMAX Access Point Controller

As part of the WiMAX distributed network architecture, the Motorola WiMAX Access Point Controller (WiMAX APC) provides management of key security and mobility related functions in a WiMAX network deployment.

The WIMAX APC supports the following features:

- Authentication liaison between the user/device and the AAA server
- Security functions such as Local Key Distribution Function (LKDF) for delivering Authentication Keys
- Paging Controller (PC)
- QoS Policy Decision Point
- Flow admission control related to handovers
- Access Control
- Handover Decision Point
- Proxy Mobile IP Client Validation
- Context Repository (CR) function

The WIMAX APC is based on the ATCA platform architecture and designed to be highly scalable making it easy for operators to deploy in their networks. A deployment of Motorola WiMAX Access Points in conjunction with a WIMAX APC Controller and a separate bearer control path realized from standard IP routers and switches forms the Access Service Network as defined in the WiMAX Forum Reference Architecture.



Industry Transformation

Personal Broadband is the promise of always on, always available connectivity, allowing users to take their information and services with them when they leave the confines of their home or office.

Just as cellular technology freed the world to roam and talk - personal broadband services over mobile WiMAX frees the world to connect anywhere, any time. Compelling multi-modal devices will allow operators to seamlessly transition across multiple networks – 3G cellular, Wi-Fi, WiMAX, wireline. End-Users will have ubiquitous broadband connections that follow them wherever they may be for ready access to bandwidth-intensive, personalized, rich-media content.

The IP-based, flat wi4 WiMAX distributed network architecture is inherently more interoperable with legacy cellular or wireline networks in large part because the design is not encumbered by the requirement to support a number of proprietary components. This makes interconnectivity to existing operator systems more agnostic when integrating common subscriber management, messaging, and other services.

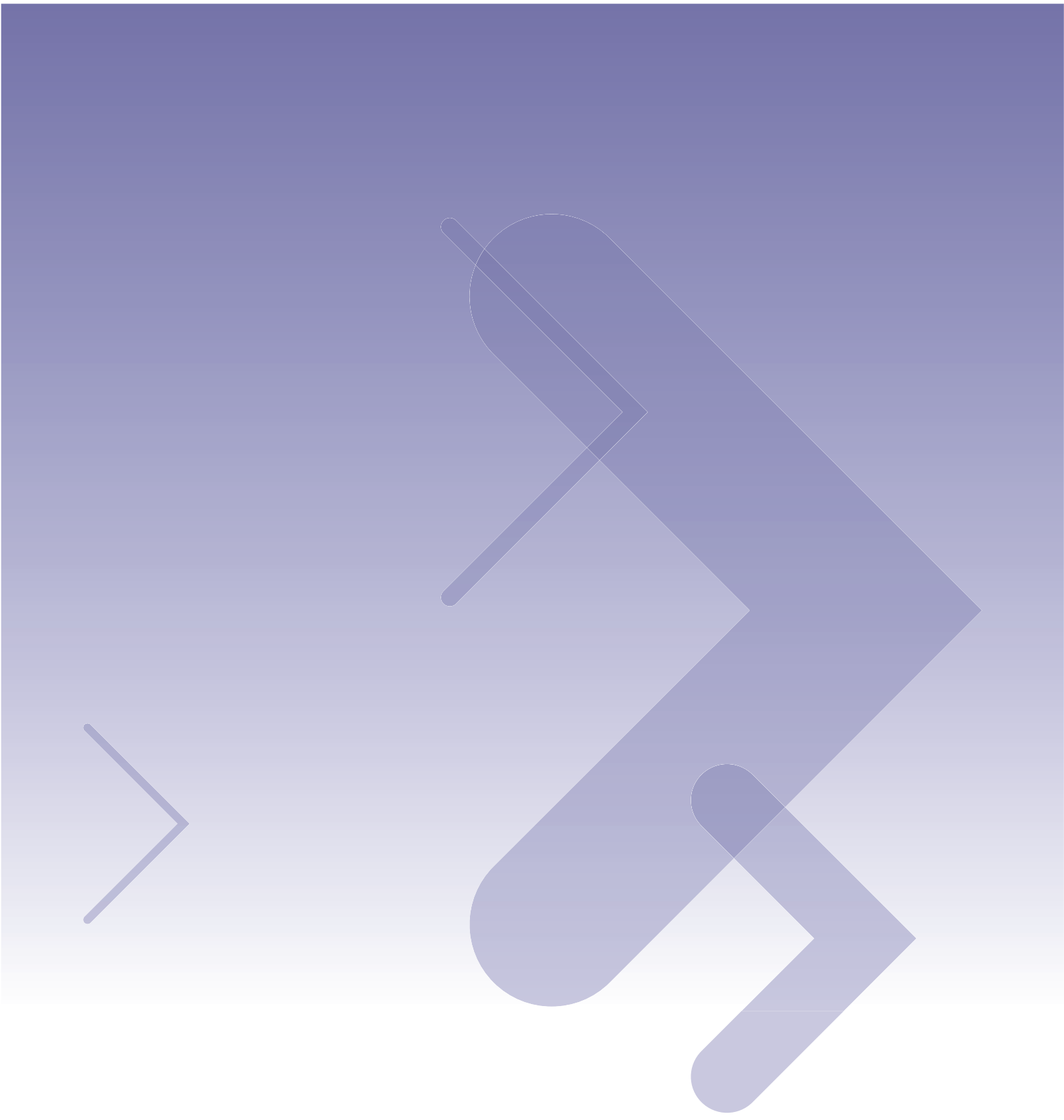
The wi4 WiMAX distributed network architecture is designed to support full mobility applications and effective service delivery. The flexibility of the all-IP wi4 WiMAX distributed network architecture facilitates core network integration and introduction of an IMS platform. By positioning a converged IP core, the network can connect across an operator's full portfolio of access solutions connecting to the end user in any environment by the most capable network and best device – delivering on the promise of Seamless Mobility.

Industry Benefits

With Motorola's WiMAX distributed network architecture, operators are able to address full mobility applications, have the assurances of service quality and security, as well as benefit from substantially reduced CAPEX and OPEX models. Throughput and latency-stringent applications such as VoIP, streaming video, and gaming will have enhanced performance in the all-IP network.

Motorola's wi4 WiMAX distributed network architecture delivers on the promise of personal broadband and rich service delivery. Paired with a converged IP core and communicating with feature-rich, multimodal devices – we build one network, we have one service delivery platform, we can offer one bill, and we offer a seamless experience that is transparent to the end-user.

Service Providers in all regions and segments will have the ability to differentiate their service and recognize revenue growth opportunities through Motorola's high-performing and cost-effective wi4 WiMAX network. Whether end-users in these markets are demanding access to increasingly rich, interactive and personalized content anytime and anywhere, or simply basic voice connections and the ability to access and share information with their communities and the world – with Motorola's wi4 WiMAX systems these experiences are now well within reach.



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