

## INTEL AND REDLINE COMMUNICATIONS

With the help of the Intel® Software Partner Program and the Intel® IXP2350 network processor, Redline Communications rapidly and cost-efficiently develops a high-capacity, scalable, and affordable carrier-grade mobile WiMAX base station.



### Challenge

Redline Communications, an industry leader in WiMAX access technology, wanted to develop an exceptionally scalable WiMAX base station for its customers in emerging markets. After considering a number of technologies, company executives decided to base the new product on the Intel® IXP2350 network processor, taking advantage of Intel® Software Partner Program support during development.

### Solution

Redline developers used the parallelization capabilities available through the Intel IXP2350 network processor engine to implement powerful predictive scheduling algorithms. To do this, they took advantage of tools and support available through the Intel Software Partner Program. As a result, they were able to make the RedMAX 4C™ SC-1000 Mobile WiMAX Base Station highly flexible, scalable, and affordable.

### Benefit

The RedMAX 4C SC-1000 Mobile WiMAX Base Station supports wireless data throughput of up to 300 Mbps across 10 sectors and more than 500 active subscribers per base-station sector, making it a powerful differentiator for Redline. In addition, the product was released six months earlier than expected and features a form factor that has helped open new markets for Redline.

Redline Communications is a leading provider of fixed and mobile standards-based wireless broadband solutions, including the RedMAX™ WiMAX Forum Certified™ system, RedMAX 4C™ SC-1000 Mobile WiMAX products, and RedCONNEX™ and RedACCESS™ families of Broadband Wireless Infrastructure products. With more than 100,000 installations in 85 countries and a global network of over 170 partners, Redline and its products enable service providers and other network operators to cost-effectively deliver high-bandwidth services including data, video, and voice communications.

### Business Challenge

Redline targets high-growth, emerging markets throughout the world, with a focus on parts of the Middle East, Africa, Asia, and the Americas. As such, the company is committed to delivering products that incorporate WiMAX IP technologies, with the promise of low-cost, open, efficient, and scalable solutions for data, video, and voice.

According to Frank Rayal, Director of Product Management for Redline Communications, three main factors, above all, are motivating the deployment of WiMAX-based technologies in the developing world:

- The need to connect the unconnected where existing copper and fiber infrastructure is limited.
- The need to address a growing demand for broadband connectivity in markets where the existing infrastructure does not support it.
- The need for cost-effective support of vertical applications that are based on a combination of fixed, portable, and mobile usage models.

“The opportunity to address these pressing needs makes us determined to stay on the forefront of developing WiMAX- and multi-core-based products for these markets,” Rayal says.

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RedMAX 4C™ SC-1000 Mobile WiMAX Base Station

One such product is the RedMAX 4C SC-1000 Mobile WiMAX Base Station, a carrier-grade mobile WiMAX base station for broadband wireless services based on the IEEE 802.16e mobile WiMAX standard. When he and his colleagues first envisioned this product—Rayal explains—they knew they wanted the flexibility to operate in diverse wireless frequencies and to support a wide range of mobile devices, the scalability to support a high data throughput and hundreds of subscribers, and a price point to make the product attractive to their highly cost-sensitive markets. With these goals in mind, they set out to find the technology and development support that would enable them to meet these requirements in a timely and cost-efficient manner.

## Business Solution

Rayal and his colleagues evaluated a number of processor technologies on which to base the RedMAX 4C SC-1000 Mobile WiMAX Base Station before selecting the Intel® IXP2350 network processor. To help them make the most of the processor's multi-core capabilities, they also took advantage of the many tools and benefits associated with their membership in the Intel® Software Partner Program. Rayal says the reasons for choosing the processor and the program were clear to the team from the beginning.

"Being ever-conscious of cost, we were impressed by the price/performance level of the Intel IXP2350 network processor," Rayal says. "We also appreciated Intel's commitment to WiMAX technology, and we liked the comfort level of collaborating with an established industry leader through the Intel Software Partner Program."

Elaborating on the suitability of the Intel IXP2350 network processor for the RedMAX 4C SC-1000 Mobile WiMAX Base Station project, Rayal says the processor "meshed well" with the overall architecture that his team was designing for the base station. "We were planning an OBSAI-based architecture mapped on a microTCA platform that would include Control and WiMAX baseband cards with carrier-grade features such as redundancy and hot swapping," he explains. "So we liked the fact that the processor's embedded IP security core and built-in encryption accelerator would enable us to avoid having to create these capabilities ourselves."

## Tools, Technologies, and Expertise

Rayal says a major advantage of Intel Software Partner Program participation for him and his team was the knowledge that "support would be there when we needed it". Hoping to optimize the performance of their code for the processor, they took advantage of one Intel Software Partner Program Technology Focus Area in particular: multi-core.

With immediate, 24/7 access to Intel technical support through the multi-core focus area, Rayal and his colleagues parallelized their code, as well as data, to be processed by that code and its execution. "As a result of having access to Intel Software Partner Program tools, technologies, and expertise, we were able to build in support for more than 500 active subscribers per base-station sector, a 6X throughput and capacity improvement over competing products," he says. "We also developed our higher-level code with the help of the processor's SDK, access to which is another advantage of being a member of the Intel Software Partner Program."

Rayal and his team had easy access to technology roadmaps—a significant benefit of the Intel Software Partner Program. "Technology roadmaps are very helpful for planning around future product development," he says. "When our customers want the performance and capacity improvements available through newer Intel technologies, we'll be ready to build those improvements into our next-generation products."

## Benefits

Rayal reports significant benefits from having used the Intel® IXP2350 network processor and having participated in the Intel® Software Partner Program for development of the RedMAX 4C™ SC-1000 Mobile WiMAX Base Station. In particular, he cites product scalability and rapid, cost-effective deployment, which in turn have helped increase sales and strengthen customer relationships.

*"By creating predictive scheduling algorithms that take advantage of the parallelization available through the Intel IXP2350 network processor microprocessor engine, our developers enabled the RedMAX 4C SC-1000 Mobile WiMAX Base Station to support 'over the air' wireless data throughput of up to 30 Mbps and more than 500 active subscribers per base-station sector,"*

**Frank Rayal**  
Director of Product Management  
Redline Communications



## Versatile and Powerful Base-Station Offering

Introduced to Redline customers in 2007, the RedMAX 4C SC-1000 Mobile WiMAX Base Station is based on a microTCA form factor with modules, or elements: one for indoor deployment, containing the baseband processing and Internet functionality; and another for outdoor deployment, including the radio-frequency functionality. The indoor chassis element includes two transport/clock/control modules, for redundancy, and up to 10 WiMAX baseband cards. Each baseband card is a single WiMAX base station compliant with the 802.16e standard and supporting a 2X2 MIMO sector to increase capacity and wireless range.

The indoor and outdoor elements of the RedMAX 4C SC-1000 Mobile WiMAX Base Station are connected by an optical-fiber cable that can span distances of up to 300 meters for multimode fiber and up to 4,000 meters for single-mode fiber, depending on the application and configuration. For indoor applications in convention centers, airports, and other large buildings, the base station can be installed in a basement, for example, and connected by fiber-optic cable that runs throughout the building, with a radio on each floor for wireless access. For outdoor applications, the base station can be installed at the base of a radio tower with wireless access through antennas—the classic outdoor deployment scenario.

The RedMAX 4C SC-1000 Mobile WiMAX Base Station uses the Intel IXP2350 network processors in two separate capacities: one on each baseband card for running the MAC layer, and one on the transport/clock/control module for traffic aggregation and distribution between the backhaul system and the appropriate WiMAX sector.

## Delivery Six Months Early

Developers were also able to deliver the RedMAX 4C SC-1000 Mobile WiMAX Base Station a full six months earlier than they had initially anticipated, thanks to a combination of processor functionality and Redline's participation in the Intel Software Partner Program. "Just as we had hoped, with the processor's embedded IP security core and built-in encryption accelerator, we avoided having to develop those capabilities ourselves," Rayal notes. "And, considering this was a brand-new technology, we really saw a difference in developer productivity thanks to the Intel Software Partner Program, which included Intel multi-core engineering expertise and access to one of the first prototypes of the processor."

Reduced development time also meant reduced development costs, but that was only the start of it, Rayal adds. "We also cut costs by being able to run two MAC layer instances on each processor, which gives the RedMAX 4C SC-1000 Mobile WiMAX Base Station a smaller form factor and lower price, both of which are vital for the emerging markets and often-rural applications that we target," he explains. "We were able to do this thanks largely to the Intel IXP2350 network processor's multithreading capability, multi-core engines, internal memory capacity, clock speed, and speed of accessing external memory—and our ability to make the most of these capabilities with the help of the Intel Software Partner Program."

## Tailor-Made for the Markets

Redline reached market six months ahead of schedule with a product that is significantly more scalable than its competitors', and with a form factor and price tailor-made for the market and applications—Rayal reports happier customers, and a great opportunity to create new ones. Rayal directly credits this success to basing development of the RedMAX 4C SC-1000 Mobile WiMAX Base Station on the Intel IXP2350 network processor and using the technology and expertise available through the Intel Software Partner Program.

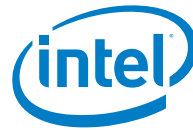
"Had we selected another processor for the RedMAX 4C SC-1000 Mobile WiMAX Base Station, or tried to build this product without the help of the Intel Software Partner Program, we would have been unable to implement the multi-core-based capacity and throughput, the scalability, the form factor, the price point—all of the factors that are making this product so successful," Rayal reports. "We look forward to achieving more of that success when we release the product in a different form factor, which we will also base on the Intel IXP2350 network processor. Of course, we will also engage with the Intel Software Partner Program on that project as well."

## About the Intel® IXP2350 Network Processor

The Intel IXP2350 network processor extends Intel's fully programmable architecture to new, lower cost/performance points for access and edge applications, including broadband access devices, wireless infrastructure systems, routers, and multiservice switches. To meet dataplane performance requirements, the Intel IXP2350 network processor provides a powerful, integrated control plane processor in the same chip. The high-speed core (up to 1.2 GHz) incorporates advanced I/O and memory features, enabling customers to eliminate an external control plane processor in many applications. Additional hardware-assisted features in the Intel IXP2350 network processor can increase performance and simplify development.

## About Intel® Multi-Core Processor Technology

Intel® multi-core processor technology provides new levels of energy-efficient performance, enabled by advanced parallel processing and next-generation hafnium-based 45nm technology. Incorporating multiple processor execution cores in a single package delivering full parallel execution of multiple software threads, Intel multi-core technology enables each core to run at a lower frequency, dividing the power normally given to a single core. As a result, ISVs that develop applications to take advantage of multi-core technology can more easily provide the high-performing solutions their customers need.



## About the Intel® Software Partner Program

The Intel® Software Partner Program is a membership-based program for independent software vendors (ISVs). Open to any software company developing commercial products or services for Intel platforms, the business-oriented program offers a portfolio of planning, technical, marketing, and sales resources designed to facilitate members' ability to grow their business, reach new customers, and remain competitive. Members of the partner program likewise have the opportunity to participate in the Intel® Business Exchange, providing access to Intel's vast network of channel partners, and a means to market and sell software.

## About WiMAX

WiMAX is an IP mobile Internet solution, the fourth generation of wireless technology, designed to enable pervasive, high-speed broadband mobile Internet access to an array of devices including notebook PCs, handsets, smartphones, and consumer electronics such as gaming devices, cameras, camcorders, music players, and more. WiMAX delivers low-cost, open, efficient, and scalable networks for data, video, and voice. As a major driver in the support and development of WiMAX, Intel has designed embedded WiMAX solutions for a variety of mobile devices.

## About Redline Communications

Redline Communications ([www.redlinecommunications.com](http://www.redlinecommunications.com)) is the leading provider of fixed and mobile standards-based wireless broadband solutions. The Redline RedMAX™ WiMAX Forum Certified™ system, RedMAX 4C™ SC1000 Mobile WiMAX™ products, and RedCONNEX™ and RedACCESS™ families of broadband wireless infrastructure products enable service providers and other network operators to cost-effectively deliver high-bandwidth services, including voice, video, and data communications.

Headquartered in Markham, Ontario, Canada, Redline is committed to maintaining its wireless industry leadership with the continued development of WiMAX and other advanced wireless broadband products. With more than 100,000 installations in 85 countries and a global network of over 170 partners, Redline brings experience and expertise to help service providers, enterprises, and government organizations roll out wireless broadband networks to support advanced communications.

## Learn More

**Redline Communications:** [www.redlinecommunications.com](http://www.redlinecommunications.com)

**Intel® Software Partner Program:** [www.intel.com/partner](http://www.intel.com/partner)

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