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SEPTEMBER 3, 2007

THE FUTURE OF TECH

The Road To WiMAX

How Intel's Sean Maloney shepherded through the technology that's poised to rewrite the rules of wireless



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The \$90 billion gardening bill was a deal killer. Intel corp. ([INTC](#)) Executive Vice-President Sean M. Maloney sat in stunned silence after a telephone company executive told him it would cost \$1,100 per home just to replace landscaping and sidewalks if the industry installed fiber-optic cabling and brought superfast broadband Internet access to every single-family home in America.

This was in 2002, during a secret meeting organized by Maloney at a hotel near Intel's Silicon Valley headquarters. He had offered a handful of telecom executives Intel's help in paying for the massive fiber-laying project. Sales growth for Intel's microprocessors had flattened during the tech slowdown, and Intel was hoping wide broadband adoption by consumers would goose demand for new PCs with the company's most powerful chips in them. Maloney was willing to help get things started. Then they shocked him with the price tag: \$300 a foot for gear and installation, and a gardening bill on top of that. That seemed like an insurmountable hurdle to Maloney and his companions.

As things turned out, some of the telecom giants ultimately did make massive investments in fiber networks. But all of that was still in the future. So it was a disillusioned Maloney who drove back to his office down Route 101, Silicon Valley's main drag, past buildings left empty by the shattering of dot-com dreams. A few weeks earlier, Intel's then-chairman, Andy Grove, had put Maloney in charge of the company's broadband strategy. He even gave him a T-shirt with the name "Broadband Man" printed on it. Suddenly that seemed apt—Maloney's task would be a superhuman feat.

Then something Grove had asked came back to him: "Can we do it with wireless?" Could they? Intel was already a leader in the effort to speed adoption of Wi-Fi technology, used for broadband wireless networks in confined spaces: homes, airports, and coffee shops. Could the company help extend the range of wireless networks, essentially create a nationwide hot spot with superfast phone and Web-surfing capability—and avoid that huge gardening bill?

Today, the answer is clearly yes, and that's largely thanks to Maloney. He has led an industrywide effort to develop and market what was in 2002 an obscure wireless broadband technology only a few hundred engineers had heard of. Indeed, after logging hundreds of thousands of air miles, he has rounded up a remarkable coalition of chip, PC, consumer electronics, networking, and software companies in an effort to radically reshape the future of broadband with what's now called WiMAX.

Intel faced withering criticism from tech analysts when it first cast its lot with WiMAX, but the critics have toned down their rhetoric. That's because dozens of wireless telecom operators around the globe have also placed bets on WiMAX and plan to spend \$13 billion over the next few years to build 300 such networks. In July, Sprint Nextel Corp. ([S](#)) teamed with Clearwire Corp. ([CLWR](#)) to create a nationwide network covering 100 million potential customers by the end of 2008. Already the first transmitters are appearing on light poles and towers in Chicago and Washington, test markets expected to begin service early next year. Major rollouts are planned everywhere from Pakistan to Australia to China by 2009.

WiMAX technology and businesses built upon it still have a lot to prove. But once these networks are finished, WiMAX will be poised to deliver video entertainment and voice telephone services that will compete with traditional telecom and cable-television services. It also will extend the range of wireless e-mail and Web-surfing services in mobile computers. Beginning next year, stores will stock new laptop computers equipped with Intel's WiMAX-capable chips, code-named Echo Peak.

Intel's role as head WiMAX cheerleader makes sense. WiMAX is similar to Wi-Fi, which was embedded in Intel's Centrino line of chips, but it offers dramatic improvements. Wi-Fi extends traditional wire-based broadband networks for just a few hundred feet, and Internet access speeds slow to a crawl when lots of people are online in the same area. Meanwhile, high-profile schemes for blanketing whole cities with cheap or free Wi-Fi networks aren't working out.

WiMAX provides superfast connections for up to 30 miles. You could stroll from your house conducting a conference call, pause to exchange hefty data files, and later dial in to your TiVo to download an episode of *CSI*. WiMAX avoids digital traffic jams by using licensed radio waves that guarantee each customer a certain level of service. "You will be able to access all your own content and get access to other content in many different ways, in many different places," says Philip Solis, principal mobile broadband analyst at ABI Research.

Still, WiMAX'S emergence fights the iconic image of tech invention, a lonely entrepreneur toiling away in a dorm room or garage. WiMAX, which stands for Worldwide Interoperability for Microwave Access, grew out of work in the 1990s by engineers at dozens of companies. It remained on the back burner for years, until by happenstance several major tech companies were looking at the same time for a wireless technology that could help them boost sales. Intel was looking for something that would prompt consumers to buy new computers running its chips. Sprint needed an edge to set it apart from larger rivals Verizon ([VZ](#)) and AT&T ([T](#)). Mobile handset maker Nokia ([NOK](#)) wanted to expand into providing communications services. And Samsung Group wanted to get into the networking equipment business. The interests of these four companies resulted in a pooling of patents and money to create the WiMAX phenomenon.

Without Intel's broadband man behind it, though, WiMAX might never have gone anywhere. After Maloney had his revelation about the potential of wireless broadband in 2002, he set up a small group to explore alternatives. At first, nothing seemed too wacky to consider—even using giant blimps as airborne radio transmitters. But after meeting with Martin Cooper, considered the father of the cell phone, Maloney became convinced the most economical idea was to emulate cellular networks and send wireless signals from fixed transmitters.

AT&T had tried that approach, using a precursor of WiMAX, in Project Angel, an ill-fated effort in 2000 to provide wireless broadband connections to homes. The project was a non-starter because there was no industry standard at the time, thus no assurance that equipment made by different companies could work together or be produced cheaply. Maloney studied Project Angel and concluded that WiMAX could work because of its range and bandwidth, but only if he could line up industry support.

Maloney's first hurdle was Intel itself. WiMAX was so lightly regarded that when he raised it as a possibility to a group of top managers, all he got were blank stares. His pitch: Intel and allies could create a standard technology for long-range wireless transmissions, much as Intel and Microsoft ([MSFT](#)) had created the so-called Wintel standard for the personal computer. With a lot of companies building products based on the same ground rules, economies of scale in manufacturing could be achieved quickly. Intel would build tiny radios into laptops that could connect easily to a worldwide WiMAX network. Also, he proposed, the chipmaker should lay the groundwork for a mammoth WiMAX ecosystem by investing more than \$1 billion in carriers and other companies.

The proposal provoked hot debate within Intel. In developing countries, WiMAX seemed like a sure winner. Governments there were grappling with massive costs of building fiber-optic or wire-based networks; a cheap, powerful wireless infrastructure was just what they needed. But in North America, the source of much of Intel's business, many consumers were becoming connected by other means—including fiber-optic cable to the home and high speed cellular networks.

Intel's then-CEO Craig Barrett and No. 2 Paul Otellini told Maloney to keep exploring, but they reserved the right to kill the project if he failed to sign up other industry leaders. Otellini, now CEO, worried that Intel didn't have the skills for WiMAX and suggested that Maloney would have to hire or buy them. In a December, 2005, interview, he said: "That stuff takes decades of experience, and we needed to get the best and brightest." Maloney later obtained key technology by purchasing a company called Iospan Wireless from Stanford University engineering professor Arogyaswami Paulraj.

Before Maloney got very far, though, Samsung suddenly muddied the waters with its own ideas about how to use WiMAX. Intel was focusing on it as an alternative to installing fiber-optic cables to homes and businesses, but Samsung saw it as a way to deliver broadband wireless data services to mobile devices. Maloney saw he had to win Samsung over as an ally. He flew to South Korea and wined and dined Lee Ki Tae, then head of the telecom unit and now the company's vice-chairman. Maloney argued that the two companies should combine their technologies and get them accepted by a respected world standards body, the Institute of Electrical & Electronic Engineers (IEEE). Intel, he reasoned, could sell more chips, while Samsung would steal a march by selling WiMAX everything—network equipment, cell phones, and consumer electronics.

Samsung was persuaded, but Maloney needed to get other big-name players on board fast to keep Intel's show-me-the-money executives from dropping the project. The strain extended beyond conference tables and negotiating tactics. On a commercial flight to meet NTT DoCoMo Inc. ([DCM](#)) execs in Japan in early 2004, the plane's landing gear at first refused to deploy, and Maloney penned a hasty goodbye to his wife and children.

Another big fish proved especially elusive. Maloney spent Christmas 2004 in Helsinki, winning a lukewarm commitment from Nokia, the world's largest cell-phone maker. Nokia had its own goals to consider. It and other phonemakers were beginning to chafe at what they deemed onerous royalties paid to another chip company, Qualcomm Inc. ([QCOM](#)), for key technologies being used in their phones. In the interest of keeping costs down, many tech companies swap their prized patents for those held by others, rather than paying licensing fees. But Qualcomm has long insisted that companies using its technologies pay cash. Qualcomm had few patents related to WiMAX technology, so Nokia saw that it could either use WiMAX as leverage to force Qualcomm to drop its royalty fees, or it could switch over to the new technology.

With Nokia execs announcing they were studying WiMAX, Otellini and Intel's other senior execs signalled their support, calling it "a classically disruptive technology." Maloney's next step was to forestall potential competitors. A small group of chipmakers and network

equipment companies had formed the WiMAX Forum in 2001 to promote it. In 2003, Intel joined. In less than two years, membership in the forum swelled from 65 companies to over 300. Today, it tops 400, including some big phone carriers eager to hedge their bets. On Aug. 9, Vodafone Group PLC ([VOD](#)), the world's largest wireless company, signed up. Vodafone CEO Arun Sarin had warned in a speech in February that WiMAX and other new technologies threatened "to eat our lunch."

Qualcomm remains the chief opposition to WiMAX. No surprise there. It banked more than \$6 billion in 2005 from sales of wireless chips and royalty fees on its technologies. Qualcomm took the battle to a committee of the IEEE that was reviewing proposals for technologies that could deliver high-speed Internet access for laptop computers and other mobile products. Intel and Samsung presented their WiMAX proposal in late 2005 but were voted down repeatedly in favor of a rival wireless broadband technology backed by Qualcomm and Kyocera Corp. ([KYO](#)) Intel and its allies suspected foul play and complained that Qualcomm had stacked the committee with people on its payroll, including engineers flown in from a Russian paper mill who had little knowledge of wireless issues. Those allegations weren't proven, but the standards body in mid-2006 replaced four members, including its chairman, Jerry Upton, who was a paid Qualcomm consultant. After that, the committee approved WiMAX as a mobile communications standard.

An unapologetic Qualcomm CEO Paul Jacobs insisted the company had been unfairly accused, saying that companies routinely send employees to standards committees to guard their interests. Qualcomm's rivals, he added, were desperate to gain an advantage—by whatever means: "Everybody looks at us, and they're trying to figure out how to compete."

Qualcomm suffered another blow in July, 2006, when Intel, Motorola ([MOT](#)), and Bell Canada ([BCE](#)) teamed up to invest more than \$1 billion in Clearwire, the biggest holder worldwide of spectrum that could be used for WiMAX. The company, founded in 2004, was backed by "the wizard of wireless," Craig O. McCaw, who started the first major U.S. mobile phone service company, McCaw Cellular. McCaw sold that to AT&T for \$11.5 billion in 1994. Ten years later, McCaw was at it again. He had quietly purchased the spectrum and assets owned by Texas-based Clearwire, and took its name for his new company. With it and other holdings, he could create a nationwide network to compete with cable TV's and telephone companies' broadband offerings. The cash from Intel, Motorola, and Bell Canada enabled Clearwire to buy additional radio spectrum and equipment, giving it a huge head start over companies—such as Web search giant Google—that are lining up to bid in the next government spectrum auctions.

That investment also forced Sprint Nextel to choose between WiMAX and Qualcomm's technology. It had been testing both. At a splashy New York event in August, 2006, Sprint announced it would hook up with Intel, Motorola, and Samsung to build the network and develop devices that will provide access to it.

The battle over the future of wireless broadband services is far from over. Qualcomm Chief Operating Officer Sanjay Jha insists the chip designer is still in a good position. In April it hedged its bets by purchasing WiMAX technologies from chipmaker TeleCIS Wireless Inc., raising the possibility that it could demand royalties on WiMAX devices.

Much of WiMAX's hopes in the U.S. rest with the weakest of the phone carriers, Sprint. And right now, the technology gobbles power and limits battery life on portable devices, so improvements will be needed to speed adoption. "To get to the mass market, with better devices and lower prices, we'll have to wait at least another year, to 2009," cautions analyst Monica Paolini, with market researcher Senza Fili Consulting.

Perhaps then we'll find out whether the forces behind WiMAX can alter the communications landscape, or if this is simply the latest over-hyped phenomenon in an industry that sees big ideas come and go with dizzying speed. For his part, Maloney looked supremely confident recently as he sipped a glass of sauvignon blanc in a Valley restaurant. He also seemed relieved. His five-year forced march was over. "That's done," he said. "Now we have to prove it was worth it."

By Cliff Edwards, with Moon Ihlwan in Seoul

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A WIMAX PRIMER

● **What is WiMAX?**

WiMAX, or Worldwide Interoperability for Microwave Access, is a technology for rapidly transmitting large amounts of digital bits via radio signals. It's an improvement on today's Wi-Fi wireless networks for mobile computers and handhelds. It's also an economical alternative to coaxial cable and telephone lines for bringing broadband entertainment and Internet access to homes and businesses.

● **How is it different from Wi-Fi?**

Those Wi-Fi networks in people's homes and the hotspots in airports and coffee shops have a range of only a few hundred yards. WiMAX is designed to extend up to 30 miles. Internet access speeds could be up to 50 times as fast.

● **How does it change things for consumers?**

WiMAX backers plan to build it into TVs, TiVos, notebook PCs, and smart phones. Services offered by wireless carriers will include ultrafast Web surfing, video telephone calls, and movie viewing. Theoretically, that means you can take a call on the street and download major data files while talking. Increased competition is expected to reduce prices to consumers.

