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*The follow pages are excerpted from **The CDMA Endgame** by Steven Titch, a white paper written for the GSM MoU association, September 2003.*

Something startling occurred in the wireless industry on June 3, 2003. In a presentation to a Sanford Bernstein Strategic Decisions Conference on the evolution path for third generation wireless, Irwin Jacobs, chairman and CEO of Qualcomm Inc., champion of the cdmaOne and CDMA2000 standards, appeared to concede the future to his GSM rivals.

Eighteen years ago, Jacobs co-founded Qualcomm to perfect code division multiple access (CDMA), a digital radio air interface originally developed for the military, for commercial cellular phones. Since then, Jacobs, Qualcomm and the CDMA Development Group (CDG), the confederation of wireless service providers and vendors that operate CDMA systems or manufacture equipment for them, have touted the superiority of CDMA to other digital formats, particularly the Global System for Mobile Communications (GSM).

Through aggressive marketing and strong alliances with major telecom manufacturers such as Motorola, Lucent Technologies and Nortel Networks, La Jolla, Calif.-based Qualcomm was able to position CDMA as a home-grown “American” technology against GSM, which had its origins in Europe. The battle over standards was often bitter, but by the mid-1990s, Qualcomm, U.S. manufacturers and U.S. carriers had worked successfully to make narrowband CDMA, know by its industry specification as IS-95 and branded as cdmaOne, the digital choice for most U.S. wireless companies. It built on that success to extend cdmaOne to South Korea and China.

Qualcomm was just as aggressive in promoting its third generation, or 3G, evolution path, CDMA2000. CDMA2000, which increases the capacity and data handling capabilities of cdmaOne systems, consists of a subset of stages starting with CDMA 1X Radio Transmission Technology (RTT), progressing through 1X Enhanced Version-Data Only (EV-DO) and 1X Enhanced Version-Data and Voice (EV-DV), each more robust than its predecessor. In the original CDMA2000 vision there had been plans to go beyond 1X to a format called 3XRTT, but this final stage disappeared from evolution scenario sometime in 2001, in part because the International Telecommunication Union placed 1X under an umbrella group of recognized 3G wireless formats, IMT-2000. As such, 1X gained the 3G cachet, even though when compared side-by-side with other IMT-2000 technologies, such as Wideband CDMA (W-CDMA) and the Chinese-developed TD-SCDMA, it fails to match them in data capacity, bandwidth or sophistication (see sidebar).

Nonetheless, the ITU gave Qualcomm and the CDG the right to legitimately say CDMA2000 was 3G. Although 1X more closely matched the upgraded versions of GSM, namely General Packet Radio Service (GPRS) and Enhanced Data for GSM Evolution (EDGE), the CDG capitalized on the IMT-2000 designation to proclaim that while others dithered, it had reached 3G today.

That's what made the Sanford Bernstein presentation so surprising. Jacobs began predictably enough. During the first 12 slides, he walked the audience through the CDMA2000 evolution path described above right up to 1X EV-DV. That was slide 12. On Slide 13, Jacobs said there was a wireless format beyond 1X – W-CDMA.

The segue seemed natural. Qualcomm and CDMA are practically synonymous. And it is easy for an audience, especially one that has not closely followed the battle over digital wireless standards, to assume that W-CDMA is a natural extension of the Qualcomm's vision. But until then – publicly at least – Qualcomm had never placed W-CDMA at the end of the 1X path. In fact, until that point, W-CDMA was a rival technology against which Qualcomm and the CDG had been pitting all of their resources.

By any other name

Jacobs' presentation, coupled with remarks he and other Qualcomm officials have been making in the press since earlier this year, signal a strategic shift in Qualcomm's approach to the wireless market. Throughout its history, Qualcomm has always presented CDMA2000 evolution path as a superior alternative to GSM. While manufacturers and service providers with stakes in other digital formats, most recently TD-SCDMA, have attempted to make their technology backward compatible with GSM, Qualcomm and the CDMA Development Group have remained resolutely incompatible.

Lately, however, Qualcomm has begun to modify this position, especially now that the company has introduced chipsets for W-CDMA phones. In the new scenario, CDMA and GSM are two paths that will converge at W-CDMA.

“W-CDMA is still a little a little slow to market, but there's more and more activity,” Jacobs told financial analysts during Qualcomm's July 23, 2003, earnings call. “In '04 and '05 we expect that to become a significant part of our business.”

The CDG also has also picked up the message. “The CDMA community will probably be phased into W-CDMA,” says Perry LeForge, CDG executive director. Qualcomm, along with South Korean companies such as Samsung, which together have done the most work with CDMA, should be expected to be market leaders in W-CDMA, LeForge states. “They will take experience with CDMA2000 and apply it to W-CMDA.”

Although he stops short of saying outright that a conversion to W-CDMA from a CDMA2000 system will be easier than from GSM, he hints that operators can “port” some technology know-how.

But W-CDMA has long been the evolutionary endpoint of GSM, dating back to when CDG was promoting 3X, an incompatible wideband format. W-CDMA, although a different radio interface, ties back to the core network architecture of GSM. The GSM Association, for its part, is calling the technology “3GSM” to create some distance from the CDMA label. “Essentially they are now saying what we’ve been saying all along – that 3GSM will be the worldwide 3G standard.” says Craig Ehrlich, chairman of the GSM Association board and a member of the board of Sunday Communications Ltd., a GSM service provider in Hong Kong. “If this is so, it’s new,”

Has Qualcomm finally conceded that no matter how the technologies grade out, GSM has won because of its sheer market dominance? Are Qualcomm and the CDG hopping on the GSM bandwagon?

Not quite. Historically, Qualcomm has used audaciousness to paper over technical subtleties. The subtleties in this case all relate to W-CDMA, which Qualcomm, after years of criticizing, is now trying to adopt as its own original brainchild.

It *is* confusing, because W-CDMA is a form of CDMA. So in one way, Qualcomm has every right to claim a stake. This is where Qualcomm’s audaciousness comes in. Qualcomm is not merely trying to hop on the W-CDMA bandwagon; it’s trying to claim ownership of it.

“There’s no question Qualcomm will be part of 3GSM. They do own intellectual property,” says Ehrlich. “That’s well-documented.” More questionable, Ehrlich says, are hints that CDMA 1X operators will have an advantage when it comes to deploying W-CDMA. “That’s nonsense,” he says. “They are two different systems.”

But Ehrlich also puts his finger on the question that the CDMA community can’t help but raise with its sudden embrace of W-CDMA, the GSM vision. “It means that CDMA 1X is going to be nothing but a niche technology,” says Ehrlich.

The CDMA side disagrees. “W-CDMA will do very well, but it will take some time. It’s got its aspects to be worked out,” says LeForge. In the meantime, he adds, CDMA systems will continue to grow. “CDMA will be in a significant market position by the time W-CDMA rolls out,” he says.

Likewise, in its June 23 analysts call, Sanjay Jha, president of Qualcomm CDMA Technologies, the company’s chip manufacturing arm, predicted CDMA handsets would grow “quite healthily” in 2004.

Still outnumbered

Yet for all of the enthusiasm and optimism that Qualcomm and the CDMA community have for cdmaOne and CDMA2000, the subscriber numbers are a reality that they can’t avoid.

As of mid-year, EMC, a U.K.-based wireless market research firm, put the number of worldwide CDMA subscribers at 158 million. Their figure for the global GSM community was just shy of 880 million.

According to the GSM Association, there are 550 GSM operators in 173 countries. According to the CDG, there are 159 CDMA operators in 57 countries. A closer look at the distribution of subscribers reveals an even bigger advantage for GSM. GSM systems cover widespread areas on every continent. With the exception of North America and South Korea, CDMA systems are largely localized. They exist in only a handful of countries that can be considered major economic powers -- the U.S., Canada, China, South Korea, Japan, Australia, New Zealand and, if human capital is a measure, India and Brazil. But India and Brazil also are examples of the other CDMA market characteristic -- predominant deployment in developing countries, where discretionary income -- the important driver of average revenue per user (ARPU) -- is low.

Indeed, of the 158 million CDMA subscribers, 107 million -- 68 percent -- are concentrated in North America, South Korea and China, according to CDG's numbers and data from the CDMA operators themselves. Of these three markets, only in South Korea does CDMA operate without competition from GSM. But even here, KT Freetel's launch of a W-CDMA system means that GSM, through capability, will extend into the market.

The CDG proudly points to China Unicom's 10 million CDMA subscribers, but neglects to mention the other 56 million Unicom customers who use GSM. Combined with China Mobile's 125 million subscribers, all GSM, GSM users outnumber CDMA users 18 to 1 in China, which Qualcomm and the CDG routinely cite as a CDMA hotbed.

Qualcomm is a leader, but in a technology that is rapidly being marginalized. In a world that is overwhelmingly following the GSM path to W-CDMA, Qualcomm faces a tricky standards endgame. It must cultivate a viable position in W-CDMA, which may not pay off until 2005 or 2006. In the meantime, it must convince its customers, partners and shareowners that there is a future for 1X.
