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Software radio lowers cost of CDMA basestation test

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Manhasset, N.Y. - Citing its new system's density, determinism, repeatability and reconfigurability, startup Dyaptive Systems Inc. has introduced a software-defined test rig that it believes will lower the risk and cost of CDMA basestation testing. Based on a shared-physical-layer approach, the system obviates the need for banks of discrete handsets and allows CDMA vendors and operators to optimize their equipment for a market where the users' quality experience is everything, the company said.

"It's a very competitive market and ARPUs [average revenues per user] are falling," said Steve Szabo, co-founder and vice president of business development of Dyaptive (Vancouver, British Columbia). Operators want new sources of revenue, which implies higher data rates for newer services. But "quality is key," Szabo said. "How do you benchmark quality? That's what we do."

Incorporated in 2001 and venture capital-funded in 2002, Dyaptive has been working on benchmarking quality in collaboration with "one of the top three" CDMA basestation vendors for three years, Szabo said. Lucent, Nortel and Motorola comprise that trio, he said.

The issue of quality is important because basestation vendors want to test their equipment in a reliable and cost-efficient manner, while operators such as Alltel, Sprint and Verizon want to tune and optimize their basestations for loads in the field, Szabo said. And although code-division multiple access is spectrally efficient, there are more ways to optimize the network than with the older time-division multiple-access scheme, he said. "CDMA has complexity in that you can trade quality, capacity and coverage," he explained.

So far, the testing and optimization of basestation equipment has been an inefficient process involving racks of discrete handsets in a lab and roving technicians in the field who sample network operation. "The technician can't modify and test the impact of modifications accurately and in real-time, while the handsets in the lab are all in shielded boxes that never get to the level of loading that a real network sees," Szabo said. "And they're not predictable and accurate in terms of how they access the network and behave."

A lab can generate between 3,000 and 15,000 calls per hour, according to Szabo, but a real network at a busy time must handle up to 60,000 calls/hour. For this reason, a real-world deployment is the only way to test a basestation, said Szabo.

RF leakage is another issue with current test rigs, Szabo said, because it can cause a handset to register with the wrong basestation. "Figures show that up to 30 percent of handsets can behave in a nonmeaningful way," he said.

The basic problem is density, and the key to getting around it was a fundamental shift in thinking, said Todd Sankey, Dyaptive's chief technology officer. "We didn't want to generate the signal of a thousand mobiles-we wanted to generate the signal the basestation would see from a thousand mobiles," he said.

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This required a shared physical layer that connected directly to the basestation sector ports. The result is the DMTS-8000 software-defined multiblade radio rack system, which generates predictable composite signals that will simulate multiple thousands of users, the company said. "It's all done digitally and mathematically," said Szabo.

Because it's software-based, the system "can be upgraded to support new features and air interfaces, and traffic can be programmed to more accurately represent actual deployments with mixtures of 2G, 3G, low-rate and high-rate users," said Sankey.

Each virtual mobile terminal has its own RF environment and behavioral model that can be programmed by the tester. "We can simulate AWGN [additive white Gaussian noise], intracell interference, multipath and fading environments," said Sankey, "so it looks like a real mobile and can do handoffs between basestations." The system can handle as many as 2 million calls per hour.

Each blade comprises one PowerPC controller, two Texas Instruments 6416 DSPs and two Xilinx Virtex-II Pro FPGAs, one each for the forward and reverse links. The initial implementation is targeted at CDMA, "because the CDMA guys know what they need, since they've been doing this for a while," said Szabo. Dyaptive plans to rapidly migrate the system to W-CDMA.

Although pricing was not available by press time, Szabo said it will be comparable to that of current systems, which he said cost $1,800 to $2,500 per phone.

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