TELEPHONY ONLINE

spreading the wealth around spread spectrum

by Tim McElligott

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The wireless test market officially has a new player. Dyaptive Systems launched its first product earlier this month, taking itself out of an unofficial stealth mode. The company, recognizable to the handful of companies it has worked with since its founding in October 2001 in Vancouver, British Columbia, makes its formal debut at the 2004 DCMA America Congress this week in Miami.

The company's admission ticket to the still-large club of test companies vying for the business of wireless network equipment manufacturers and network operators is a high-density, software-defined radio-based load and performance instrument to test CDMA wireless infrastructure, particularly base stations.

Dyaptive's product? The DMTS-8000.

“The DMTS allows operators and network equipment manufacturers to set quality bench-marks for how they measure performance of network gear,” said Steve Szabo, vice president of business development for Dyaptive.

As CDMA evolves and allows for the proliferation of data services, the system can be used to simulate real traffic patterns for voice and various types of data applications to more realistically depict how users are affecting the network.

The company's exclusive focus on CDMA-based technologies is both strategic and opportunistic. Co-founders Szabo and Chief Technology Officer Todd Sankey worked together at Phillips Semiconductors developing mobile station baseband ASIC technologies. They worked on a project that grew to include signal processing, the protocol stack, applications and a full reference design.

“That's how CDMA came to be in our blood,” Sankey said.

Dyaptive supported its product development with cash earned through consulting services and a contract with a large equipment manufacturer that supported its early development until January 2003 when it closed on venture capital financing. The company is being led by ex-Hewlett-Packard/Agilent executive Walter Stein and currently has approximately 40 employees.

Dyaptive is already working with CDMA operators such as Alltel and Sprint to help them load test their network elements.

To carve out its niche, Dyaptive focused on what it calls the three pillars of testing in a CDMA environment: density, deterministic and repeatable testing, and reconfigurability. These three features could go a long way in reducing the need for drive testing and could help eliminate the cumbersome and insufficient method of phone-bank testing some operators and equipment manufacturers use to simulate network loads.

Density

As the density and processing power of base stations have increased to support hundreds of calls at a time and busy-hour loads of up to 60,000 calls, the methods used to test base stations to their advertised limits must also increase.

The average ad hoc test system can generate about 3000 calls per hour, and Szabo says he's seen one that did maybe 15,000. Dyaptive's system, which can simulate the equivalent of 2000 mobile terminals, can generate up to 2 million calls per hour.

Phone bank testing, which has a realistic limit of about 200 phones, also requires a lot more than just those phones. Sankey pointed to the RF shielding to make sure they don't shut each other down and the cables (four per phone), splitters, combiners, RF switching gear, channel simulators, etc.

Determinism

The key to any kind of testing — in fact, the key to most scientific experimentation — is dealing with a known state at some point in the experiment and being able to repeat the process to achieve the expected result.

Dyaptive has applied for patents around the technology it uses for deterministic and repeatable testing. It uses advanced scripting mechanisms that execute test scenarios that represent real-world conditions. The system can introduce independent impairments of the forward and reverse links for every virtual mobile terminal (VMT), including inter-cell interference and the attenuation of pilot signals. It also simulates mobility by modeling different RF paths and fading profiles for each VMT.

“It is important in both an optimization environment and a manufacturing design and development environment to be able to do deterministic and repeatable testing and drive the network into a known state or some kind of error state,” Sankey said.

Reconfigurability

What happens when you have a 200-phone testing system set up, with all the ancillary equipment in place and you determine that you have to test a different parameter or configuration? Sometimes it can take two or three days to break the test down and rebuild it, Szabo said.

Such a scenario is compounded by the ever-changing nature of air-interface standards. “Every two years there is a major air interface change for CDMA, and every six months there are minor changes,” Sankey said. “So manufacturers and operators want a system that can protect their capital investment as the standards change. Our platform is designed to support that.”

These three pillars still need a fourth component to be effective in the unique CDMA environment, especially as it morphs into its various 3G and 4G forms. Even with its three pillars of deterministic testing, it must go beyond the ability to generate high call volumes and be able to simulate actual traffic on an individual VMT basis.

The thing about most simulated tests is they mostly just place calls and maybe simulate certain conditions, but sound is not playing, Sankey said. “The adaptive nature of CDMA is such that a phone that has no sound reduces its transit rate down to a bare minimum and doesn't generate any real traffic. That's a double whammy because you're really not putting a load on anything.”

And without a load, you're really not testing a CDMA network. Other technologies such as GSM assign a frequency and time slot to each active phone and reserve it for the duration of a call regardless of the amount of traffic. In CDMA, where things are dynamic, once you stop talking, the network can re-allocate that bandwidth on a very fine-grained basis.

“But the cost is complexity,” Sankey said.

Even more important than merely generating traffic, the system must be able to simulate a mix of both voice and data traffic moving around and in between base station coverage areas. And that's what it does.

“The strength of what they are doing is giving people a way to test how voice and data applications will interact on the network,” said Deb Mielke, managing director of consulting firm Treillage Network Strategies.

One important interaction is that data users, especially those on a 1xRTT networks, use eight times the bandwidth as voice users. And in a CDMA world, rather than other technologies that block calls when a cell site gets overloaded, the site “shrinks” as the amount of usage grows.

One data user moving through the network can create bigger holes in coverage and create problems by impacting the quality of service for the users around him. In the near future, as operators follow Sprint's lead and begin offering enterprise customers rebates (of up to 30% in Sprint's case) for missing certain performance metrics, service quality will become as important as all the new revenue-generating services an operator can muster.

Mielke said that as more data users come on board, voice and service quality will be affected. “It's a dicey game trying to guess what loading will look like, but because Dyaptive's systems can mimic actual traffic patterns in the network for both voice and data, it gives operators a lot more room to react to trends and keep quality higher,” she said.

John Fessler, principal engineer for customer equipment certification at Sprint PCS, is familiar with the benefits and challenges of the phone-bank testing model. He sees potential for the Dyaptive system to complement the system Sprint uses today.

“They are the only mobile base station tester with their kind of capacity,” Fessler said.

He said one important problem with phone-bank testing the capacity of a mobile base station that the Dyaptive system could resolve is the introduction of unpredictable anomalies from the phones, which points back to the second pillar of deterministic and predictive testing.

“If you are testing a base station, you don't want too many anomalies from the phones. It is more reliable to have a constant, predictable and programmable interface for mobile behavior,” Fessler said.

The DMTS-8000 is currently being used by Sprint's R&D lab to test network equipment before it is deployed in the network. It also can be used to simulate the scheduler, which is a system for allocating spare capacity for data users.

Fessler said the product also has potential for operations personnel and those who work in the Sprint technology integration center doing regression testing for after each new software load.

However, a product such as this, he said, really needs departmental tender loving care. “A tool like this needs to have a director, a nice budget and a dozen employees that can take it to the limit,” Fessler said.

Sankey admits that one can't really tune a network for data, only for particular profiles of data usage, and every data application from e-mail to Web browsing will have different impacts on the network.

It remains to be seen what kind of impact Dyaptive will have on the wireless testing space.

Dyaptive Piece of the Pie

- 2003 — $36 billion wireless infrastructure sales
- 12% of infrastructure sales toward optimization ($4 billion annual market for network optimization)

Source: InCode Telecom, Frost & Sullivan

$670
network test solution

$2338
network optimization at deployment

$610
mobile station test equipment

$382
base station test equipment