



devices, services and users. Another, less discussed, challenge is in maintaining the necessary skill sets to have subject matter experts across networks.

At almost every stage, overcoming these challenges requires new analytics capabilities. Nasehoglu said, "It has been a lot of work so far to make sure we have the tools for the analytics, but [without it] the problems will only get bigger and more out of control over time."

Ron Seager, senior manager of core network engineering at Cricket Communications, believes the industry is still in its infancy regarding analytics. "We are focused on what our subscribers are doing for now, then we can move on to what the handsets are doing. The next step will be to tie it all together," he said.

Seager confirms one of the unsung drivers of all the increased interest in network management solutions: improving the cost structure. He believes achieving a better customer experience and improving the cost structure can be done simultaneously by optimizing the network. For example, Cricket was able to lower the bandwidth requirement of a video stream from 400KBps to 200KBps, which lowered the cost of service delivery and improved the customer QoE.

"Back in 1994, all we measured was how fast, say, you were getting your picture message to your phone. That's a long way from where we are today," Seager said.

He cited different challenges for LTE, primarily the cost challenges of migrating to an Ethernet backhaul and the issue of interoperability. "Getting the tools in place to make sure everyone plays nice together is critical," he said.

He also cited better visibility into service and usage patterns. He said prior to Cricket's deployment of NetScout monitoring solutions, the company had very little visibility. "We needed to understand what our customers are doing because we wanted to enable whatever it was they wanted to do on our network. That's the value we deliver, we don't want to stop them from doing anything," Seager said.

Steven Shalita, vice president of marketing at NetScout, said he agrees that traditional network metrics on a per-link basis are no longer enough. But he said the network holds all the information service providers seek. Unfortunately, service providers are behind in some cases about what is going on the network, Shalita said. "The key is all in how service interrelate to each other and so it does go beyond network metrics."

## "Service providers need to learn the behavior of different handsets and devices on the network."

One of the systems with which services and the data about them needs to interrelate is the charging system, something else that old NOC folks never had to worry about, at least on a real-time basis.

"Whether you are talking about opening APIs or securing QoS mechanisms, it all has to be tied to the charging system. This is the biggest innovation in this area and makes billing real time rather than measuring bits once a month," said Peter Linder, head of network solutions at Ericsson in North America.

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