Enabling visibility into HetNets

A conversation with Jason Byrne, Senior Product Marketing Manager, JDSU

By Frank Rayal

Frank Rayal. Hello, and welcome to this conversation with Jason Byrne from **JDSU**. I'm Frank Rayal. This conversation is part of a Senza Fili report on deployments of heterogeneous networks and the latest solutions from the wireless ecosystem that will make HetNets a reality.

Today we're speaking with Jason Byrne, Senior Product Marketing Manager with JDSU. JDSU is a leading network and service enablement company that provides visibility and intelligence to manage and monetize the soaring growth of traffic, devices and applications.

Jason, I would like to start off by asking you to give us an introduction to JDSU's activities in the HetNet space.

Jason Byrne. JDSU has a long tradition in the mobile space. We have invested heavily both organically and inorganically and have, through many acquisitions, acquired and built up hundreds of man-years of investment in our product lines. We've built up a deep portfolio across the wireless space, and are actively selling it to almost every major carrier and equipment manufacturer across the planet. We've leveraged that investment into the small-cell space, and we are now actively optimizing networks across the world and trying to promote the use of HetNets as we go forward.

Frank Rayal. From your involvement now with your customers, what do you see as the main challenges to the deployment of HetNets?

Jason Byrne. There is a lot of talk about the challenges to HetNet or small-cell deployments. I think the biggest challenge right now is backhaul. Careful planning is required to achieve high performance. That's where I think the biggest bottleneck is. Then there is interference management, not just across the small cells but also with the macro-cell network. By introducing small cells, we may adversely affect the macro-cell network. So coexistence with macro cells becomes critical.

Another challenge is vendor interoperability. When we shifted from 3G to LTE, multiple vendors started popping up into different operator networks. The same thing is ringing true in small cells. For example, we might have an access point from one vendor, and backhaul from another vendor. So vendor interoperability is critical. There are plenty of challenges ahead, but there are plenty of solutions, and vendors are trying to address those challenges.

Frank Rayal. In terms of backhaul, what is JDSU doing to help operators deploy HetNets?

Jason Byrne. As background, JDSU covers the full life cycle of small-cell deployments. But before I get into the backhaul, let me emphasize where we fit in the life cycle. We have solutions for the pre-deployment phase, like planning and installation, all the way through to optimization and assurance. We have introduced products like Packet Portal,

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which is one of our biggest tools used to solve some of the backhaul issues. It provides visibility in blind spots, especially when there's a hub-and-spoke topology for backhaul. When you have an aggregator and an IPsec tunnel, you don't get the visibility all the way out to the small cell, so you basically can't troubleshoot. We have solutions that give you visibility all the way out to the small cell.

Frank Rayal. Why is there a lack of visibility all the way down to the small cells?

Jason Byrne. With regards to backhaul, not every operator owns their own backhaul network, instead relying on third-party providers. Sometimes it's a shared backhaul network, combining traffic from different operators and in some cases different services. With the transition to LTE, the backhaul network itself will now typically be an IP/MPLS network with an end-to-end tunnel (or label-switched path) connecting each small cell back to the core. In the case of outdoor small cells, we're seeing more complex backhaul network topologies – for instance, small cells can be daisy-chained together or may be pre-aggregated in a hub-and-spoke architecture at an upstream point in the network.

While it may be possible to assess the end-to-end performance of the tunnel, performance visibility at the intermediate points along the backhaul network (such as at a hub pre-aggregation point, or at one of the points along the daisy chain) is impaired. That is a blind spot. Given the criticality of backhaul performance to overall performance, being able to assess performance and isolate issues at each segment is critical. JDSU microprobes sit in the backhaul network and look deep into the tunneled traffic in order to provide high resolution into network and service performance at each point in the backhaul network, and supply network and application performance management, policy management, and customer experience management systems with insight.

Frank Rayal. Interference management is a major area. What are you doing in that space to address this issue?

Jason Byrne. Interference management is a big concern to operators, and we have actively invested in this space. CellAdvisor accelerates time to revenue by simplifying cell turn-up and cell management. Cell interference is a key challenge that we address, which is compounded by small cells and DAS. Having solutions that simplify the process of analyzing interference and PIM detection is crucial for cell-site deployments. Then, being able to do application testing with RANAdvisor, as well as walk-around testing for site location, is crucial.

Frank Rayal. What have you been working on in terms of vendor interoperability?

Figure 1. JDSU product portfolio designed to provide visibility into HetNets. Source: JDSU

Jason Byrne. In a lab environment, we have the CapacityAdvisor tool, which loads up the macro-cell network all the way across, through to the PGW. When different vendors are introducing small cells under the macro-cell network, we can see the effect of adding small cells and whether it is adversely affecting the network or contributing to interference.

The tools are agnostic to which nodes come from which vendor. When we test every node in the network, that helps identify problems. We also have other tools such as Packet Insight, which is a packet-capture tool. It identifies and captures traffic from all the interfaces. From there, we can replay the captured traffic to identify an issue on a particular interface. We have a signaling tool, as well, that can identify exactly what is the issue and on what node. JDSU is taking an end-to-end approach in optimizing the network, with a tool that loads the network, a tool that captures the traffic, and a tool that identifies exactly where the issue is and why.

Frank Rayal. One of the challenges in small cells is scalability. How do your tools scale to meet this challenge?

Jason Byrne. Let's start off with CapacityAdvisor products. It is a bladed architecture that's simple to scale by adding extra blades for capacity. Typically you start off with a half-loaded platform-bladed chassis, and then simply start popping in blades as they need more traffic and more testability. Also we have software solutions which will scale based on licensing. So there are a lot of different ways that we address scalability from software and hardware perspectives.

Frank Rayal. SON is another major area for HetNet deployments. What developments do you see on that side?

Jason Byrne. There's a huge interest in SON to make sure that the networks are optimized and not adversely affecting that macro-cell network. In SON, you have centralized or distributed architectures. I touched earlier on multivendor interoperability. The same applies to SON. In the distributed architecture, one SON solution needs to work cohesively with another vendor's SON solution. In practice, however, the combination might adversely affect the network. So multivendor SON is getting a lot of interest, and operators view it as critical. Small cells will not go very far unless the SON issue is fully figured out and realized to its full potential. So it is an extremely critical part of the HetNet.

From a JDSU perspective, we talk about optimizing the network from the RF side. We have interference analysis tools, and a critical part of SON is related to interference management. So our CellAdvisor and RANAdvisor tools are there to make sure that changes made by SON in a live network don't adversely impact it, and that the SON technology is actually working like it says it is from a user's perspective – not from the network's perspective but from the user's perspective. That's where we're bringing insight into the field.

Frank Rayal. One of the things that operators say is problematic is actually finding the traffic hotspots. Is that a space that JDSU plays in? And if you do, how do you do that?

Jason Byrne. Earlier this year JDSU acquired a business called Arieso. The ariesoGEO solution is an enterprise geolocation platform that captures every call and connection in the network, locating them to building-level resolution and analyzing the actual customer experience at that location. This allows us to build up a detailed map of the traffic over the entire network over all time periods, and to clearly identify traffic hotspots.

The solution goes beyond geographic location and allows the operators to understand the type and number of users and devices contributing to the hot spot, and this in turn allows them to select the

Figure 2. The CellAdvisor base station analyzer is a test tool for installation and maintenance of small cells. Source: JDSU

solution that will have the best business outcome, be that Wi-Fi, small cell, DAS or any other technology choice.

Frank Rayal. Can you tell me how the ariesoGEO compares with other traffic localization tools, such as those based on social media?

Jason Byrne. The fundamental difference is that ariesoGEO captures all the traffic. Social media applications will, for example, only provide information about users of that application, and only the locations where they use them. Such a technique might, for instance, miss a major hotspot for email use by corporate customers. ariesoGEO captures all traffic from all devices across both voice and all data usage, and covers a wider range of technologies than many similar solutions.

Another factor is scalability. We have deployments analyzing over a billion calls and connections a day, allowing the whole network to be studied in detail.

Finally, it has to be remembered that any solution depending on the GPS receiver in the handset will be less effective indoors. ariesoGEO does not need GPS to function.

Frank Rayal. What do you see as the major challenge that small cells bring in the testing space? How is testing for small cells different from that of macro cells?

Jason Byrne. That was one of the first things we had to address when we started engaging with some of the operators. What we found is that the same issues occur whether it's a large macro cell or a small cell – issues such as interference analysis.

Furthermore, SON is now introduced, so the question is, what effect does SON have on the network? Again, this is a live network, and just because it works today does not mean it's going to work in an hour, a day or a week from now. So from the RF perspective, it's typical interference analysis, signal analysis, multipath analysis, and spectrum analysis.

That's from the RF side, where we lead from the macro-cell network, and those same tools apply to the small cell. Those same analytics, the probing architectures we talked about from the backhaul, do give you that insight. It's all about visibility, and that's where JDSU is really starting to push away from some of its competitors. It's that network-wide visibility and selective visibility that we're starting to introduce into JDSU products. Those same tools that we've been using on the macro-cell network are now being used in the HetNet environment for the same reasons, and for the same values and benefits that they brought to the macro-cell network.

Frank Rayal. Can you discuss some of the main trends you see in the HetNet space?

Jason Byrne. I think carrier-grade Wi-Fi is certainly a hot topic right now. AT&T made another announcement that their small cells will be multimode – meaning 3G, 4G and Wi-Fi. The addition of Wi-Fi into the HetNet environment is also a key trend that's happening on a global basis. The ability to support intelligent offload solutions where the carrier is in control is a big change and shift from the subscriber turning on Wi-Fi.

So it is about making that Wi-Fi connection seamless. That's where carrier-grade Wi-Fi comes in: having that seamless mobility as well as some sort of traffic aggregation. Certain key applications will offload through Wi-Fi, while others requiring guaranteed quality of service are kept.

Content caching is another important topic. In speaking with a tier one operator in North America, the biggest issue they're having right now is the iOS7 upgrade. It is clogging their network and degrading service. The total increase in the traffic on the network is 5% to 10% just by upgrading to iOS7. So having the ability to do some intelligent traffic management is important.

Small cells are starting to add some intelligence with regard to content caching. iOS7 would be a great example. If you have content caching on a small cell and there are 50 UEs all looking to download, you only have to download it to the small cell once, so you have huge savings on backhaul. From then on after that, everyone else just communicates with the small cell, so the backhaul and the core are never affected. Those are big savings and big values to some of the operators.

Another trend is video transrating. Video traffic is clogging the network, and it's only growing; I think

we're at 53% of total network traffic this year. Depending on where you're traveling or how fast, the RF conditions will change. Having the ability to adapt a video rate to match the conditions provides cost savings on the RF side.

Finally you have intelligent traffic shaping, not just on the RAN, which we touched upon with carrier-grade Wi-Fi, but also in the core network, with traffic-shaping tools like LIPA and SIPTO that 3GPP specifications have introduced.

Frank Rayal. How did LTE change the landscape of network testing?

Jason Byrne. I think the biggest factor we've come across has been the multivendor. 2G was primarily a single-vendor network, and moving to 3G we started introducing some new nodes from different vendors. But LTE is definitely multivendor, and we come across two, maybe three, and at times even more vendors in an LTE network. Then, when you add in these different technologies like small cells, multivendor becomes even more prevalent. So I think the biggest factor is multivendor interoperability.

Then you have to add SON to this. That becomes even more complicated. One vendor is not going to talk exactly the way the other SON vendor does. So you'll need another SON layer. One question I still don't think the industry has addressed is that SON promotes vendor lock-in, because SON works within a single-vendor network – at least that's the practical implication of it. I think the industry is still trying to figure out a multivendor SON solution.

Frank Rayal. Well, Jason, thank you very much for a very informative conversation.

This conversation is part of the Senza Fili report on HetNet deployments and the latest solutions from the wireless ecosystem.

The report can be downloaded from the Senza Fili website at **www.senzafiliconsulting.com**.

Acronyms

2G	Second generation
3G	Third generation
3GPP	Third Generation Partnership Project
4G	Fourth generation
DAS	Distributed antenna system
GPS	Global position system
HetNet	Heterogeneous network
iOS7	iPhone operating system version 7
IP	Internet Protocol
IPsec	IP security
LIPA	Local IP access
LTE	Long term evolution
MPLS	Multi-protocol label switching
PGW	Packet gateway
PIM	Passive intermodulation
PS	Packet switched
RAN	Radio access network
RF	Radio frequency
SIPTO	Selected IP traffic offload
SON	Self-organizing network
UE	User equipment

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About the interviewer

Frank Rayal is founding partner at Xona Partners, a boutique management and technology advisory firm specializing in telecom, media and technology. He is a telecom industry professional with more than 20 years of experience working with network operators and system vendors to develop and deploy innovative wireless solutions. Frank co-founded small-cell backhaul pioneer BLiNQ Networks. He held senior product management, marketing and business development positions at Ericsson, Redline, and Metawave. He holds a BS in electrical engineering from Case Western Reserve University, Cleveland, Ohio, and an MASc in electrical engineering and an MBA from the University of Toronto, Canada. He is a senior member of IEEE, and a member of Professional Engineers Ontario.