

TESTING FOR THE BEST INDOOR EXPERIENCE

The integration of small cells into heterogeneous networks, and the increasing importance of in-building coverage and capacity, will change the way operators test and validate in-building wireless networks. Michael Carlberg Lax tells Keith Dyer what changes are required, what is driving them, and why they are important to next generation network performance.

KEITH DYER: What are the changing requirements that your customers are undergoing in terms of their in-building wireless coverage?

MICHAEL CARLBERG LAX: Certainly, I think indoor has become a hot topic recently, and for good reason. Network operators have publicly stated that the biggest challenge in their networks is dealing with the dramatic increase in data traffic. Not only that, traffic is increasingly moving indoors, and this in turn means that revenue is also moving indoors. This has become the main driver for network investments. As M2M traffic grows, as more users adopt smartphones, as application and service use increases, all of this is forcing the operators to invest in HSPA and 4G solutions to keep up. We are also seeing operators today offloading traffic to WiFi, to cope with dense populations of users and also to cope with what can be a difficult radio environment. Providing all that in indoor environments, with the effect modern building materials have on signal propagation, for instance, means operators have additional complexity to cope with. All these things exist in macro networks, of course, but on a completely different scale.

KEITH DYER: Where do you see operators heading in their network mix for in-building, to deal with these demands?

MICHAEL CARLBERG LAX: Worldwide the way that operators are coping with their capacity challenge is different, particularly in an indoor scenario, and that is one of the key challenges. That's why we try to provide the broadest toolset for the networks, because none of the operators we work with has yet seen all of the problems that they are likely to encounter.

I think we will most likely see a place for many different components, at least while the market settles and explores new ways to cope with the problem of data, how and where to offload it. There are a number of possible scenarios for coexistence; DAS for capacity in an office environment with high demands on traffic, picocells for coverage in more sparsely populated buildings with more open space and possibly femtocells for home or small business applications.

I think we will also be following application development in the femto space quite closely, as well as how LTE-Advanced is introducing heterogeneous networks that include picocells and femtocells, often at high frequency spectrum bands.

We want to provide solutions that enable operators to try different approaches, to explore all their options, and find



As traffic moves indoors, so do operator revenues

TEMS Pocket: Ascom's handheld verification tool



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the right combinations. One aspect of this approach to finding the right network mix is that operators need to be mindful of the concept of perceived quality of service. For example, WLAN is not always embraced by

users; it's viewed as something that is used if and when it's available. But users trust in 2G and 3G networks to give them a more consistent connection and a more graceful decline in service. I think the WLAN experience will improve in general as network operators try to put it to better use for offloading traffic. A more carrier-grade type of WLAN might help clear its name and make it more dependable and more seamless, so that users will not necessarily know if they are connected to a WLAN, femtocell or macro network. Seamless connectivity also has implications in terms of the user's perceived experience. This, of course, means that operators must have a firm understanding of these user experience issues.

KEITH DYER: What impact does the changing nature of indoor traffic have upon network performance?

MICHAEL CARLBERG LAX: Besides the migration of data and voice to indoor environments is of course the whole mobile applications boom, with location-based or augmented reality apps being very interesting. We will surely also see more around healthcare and M2M services, which means more devices and subscriptions per user to manage. There will also be an increasing issue around device diversity. I don't think the success of Android has escaped anyone, and there are other readily available operating systems out there, with some vendors still preferring to go their own way.

Different device OS, and even aspects such as different RF front ends, behave quite differently, so test equipment such as Ascom's has to cover these different scenarios. As device manufacturers behave differently it is not always straightforward to manage those differences within a network.

KEITH DYER: What does this changing network environment and traffic mix mean in terms of your customers' testing requirements?

MICHAEL CARLBERG LAX: When you are looking at an increased amount of traffic moving indoors, then you need to take into account building materials, propagation, and reflections as well as account for the relationship with the macro network. Coping with a lack of GPS coverage for measurement positioning is another area that has become essential, because device location is the element that ties all this together. This is crucial to the success of location-based services or mission-critical communications, for example, leading to new testing methodologies where indoor tools will differentiate from the classic drive test tool. There are also procedural issues facing operators, as a result of the increasing prioritisation of operating cost efficiencies. The previous approach has been to handle outdoor and indoor optimisation testing separately, with two different teams. This is becoming increasingly difficult to manage in a cost-effective manner. It also doesn't make sense logically in terms of the network. Operators are designing networks that co-exist, indoor and outdoor, as one entity, so your view of the network needs to reflect that. To deal with device diversity, what is required is a full range of solutions to offer a one-stop shop for the complete network environment. Adopting new devices and testing methodologies is something we at Ascom have been practicing since day one.

Once you have established a tool set to deal with the network and device diversity, data collection in itself is no longer the challenge: making it efficient, correct and complete is. The next step is to combine the indoor network data so that it coexists with the outdoor micro/macro site data. If there is a key point to understand in all of this, it's that indoor and outdoor are no longer separate items on the agenda. There will need to be a "one network" approach, and this places a lot of requirements on the tool set that you use. The constant cost crunch can be successfully addressed by ensuring that the solution portfolio you choose efficiently integrates all the different aspects. Now, with that said there is still a need in an indoor scenario to distinguish the macro network from the indoor network, so with an increasingly complex indoor environment this will require testing solutions to adapt to how data must be presented and visualised. It will also need to account for the vertical factor, giving the overall network presentation a 3D style approach as compared to what can be considered a 2D outdoor view.

KEITH DYER: Can you tell us about Ascom, and the solutions it has to meet these challenges?

MICHAEL CARLBERG LAX: Ascom is a Swiss-headquartered company whose products and solutions are used in situations where reliable monitoring, fast response times, high security standards and error-free transmission of data are essential for our customers. Our Network Testing division leads the world in helping mobile operators measure, analyse, and optimise their wireless networks. The

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TEMS™ Portfolio offers a complete set of trusted solutions for drive testing, benchmarking, monitoring, and analysing network performance. These state-of-the-art offerings facilitate the deployment, optimisation, and maintenance of mobile telecommunications networks. We have over 500 employees in 20 countries fully dedicated to serving more than 500 customers across 180 countries, including the top twenty mobile operators in the world. Through the use of our troubleshooting, monitoring, and benchmarking tools, we enable operators to maximise network performance and customer satisfaction.

KEITH DYER: So what is the scope of the TEMS Portfolio in indoor network testing?

MICHAEL CARLBERG LAX: It all starts with TEMS Pocket which is the most advanced and powerful hand-held tool on the market for verification, maintenance, and troubleshooting of mobile networks. This makes TEMS Pocket the ideal portable solution for customer-facing activities such as site commissioning, acceptance, and verification, and for coverage analysis in scenarios where accessibility is limited, most notably indoor testing, which also extends to trains, ferries, off the road trails, subways or other pedestrian scenarios. When not acting as a network testing tool it functions as an everyday cellular phone. Later this quarter, for example, we will be launching TEMS Pocket on the latest Android smartphone from Sony Ericsson, the Xperia Arc.

The amount of data and signalling generated in wireless networks can be staggering, so it is critical to quickly be able to pinpoint the trouble area, analyse the root cause and report the network status so that it is clear and understandable to many different functional layers within an organisation. The other half of our indoor testing solution, TEMS Discovery is a highly configurable and user-friendly post-processing solution for air interface measurement data such as that collected by TEMS Pocket. It allows engineers to easily assess wireless performance and quickly pinpoint network problems. With TEMS Discovery, the user has the flexibility to configure a wide range of items, from simple view layouts to sophisticated report templates and user-defined key performance indicators (KPIs).

These tools can be used separately, but by using them as a combined test and measurement solution for indoor network testing, customers can automate data collection, analysis, and reporting processes more effectively to reduce overall cost, save time, improve workflow and optimize resource utilisation.

As I stated before, the key point when considering the changing indoor environment is that it is now part of one network, and that is a view that needs to be replicated throughout an operator's technical and marketing functions. Our tools and solutions help establish, provide and manage that single network view.