Small cells that hold their own against macro cells

A conversation with Ronen Vengosh, Vice President of Marketing and Business Development, PureWave Networks

SENZA FILI CONSULTING

By Frank Rayal

Frank Rayal. Hello, and welcome to this conversation with Ronen Vengosh, Vice President of Marketing and Business Development at **PureWave Networks**. PureWave is a rapidly growing, innovative developer of small-cell solutions.

This conversation is part of a Senza Fili report on the deployment of heterogeneous networks and the latest solutions from the wireless ecosystem that will make HetNets a reality.

Ronen, I would like to start by asking you to give us an overview of your solution set.

Ronen Vengosh. PureWave has been in small cells since before the term "small cells" was coined. We have a pretty robust portfolio of small-cell solutions for a range of different applications, starting with our Constellation Leo product, which is intended for outdoor rural small cells and metro urban small cells. It's a pretty powerful solution. It comes in a number of different variants, from 2 x 5 W to 2 x 2 W power output. It can support a lot of simultaneous users – about 256 active users. So it's a pretty powerful small cell.

In addition, we have recently announced our family of small cells intended for enterprise and venue applications called Lyra. This product is not yet on the market, but it is coming in early 2014. It is based on the latest generation of silicon from TI and will be capable of running both LTE and 3G simultaneously. We think this is a very exciting development that essentially allows us to take our philosophy of macro base station parity, which we are big believers in, and bring it into an indoor

environment – something which we don't think has been done before, as far as we know.

Frank Rayal. Ronen, what is your understanding of what a HetNet consists of?

Ronen Vengosh. That's a pretty wide question. When we look at a heterogeneous network environment, we really believe that it is something that operators would like to see deployed because it gives them access to a lot of new possibilities and the ability to address network needs that probably cannot be achieved by deploying equipment from a single vendor. So the heterogeneous network concept can be taken all the way from deploying macro cells with small cells in the same network, to what some of the operators are talking about, which is deploying equipment from different vendors in the same network.

As a smaller company, and one that is very innovative in this space, we think that we have a lot to offer operators. That is because we move faster and have a more innovative product portfolio. Enabling the HetNet environment to operate in a multivendor setting is very attractive. We have made the strategic decision to be as open and standards based as we can, and to encourage standardization and facilitate multivendor

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deployments: play nice, so to speak, with all the other components of the network.

Frank Rayal. Can you highlight some of the benefits and some of the innovative solutions that you have developed?

Ronen Vengosh. We have a lot of different things that we're bringing to market. One of the key ones is the issue of macro parity–capable small cells. We don't believe that just because a customer is connected to the network through a small cell, he would be willing to accept degradation of the service, features, and functionality that he would like to see. We also don't believe that, other than in residential areas, it's effective to deploy small cells in a way that severely restricts the number of users that can be served by the small cell.

So, in everything we do, we look for ways to emulate the macro environment indoors, from connecting directly to the core network, to connecting to a central gateway, as necessary. It also means that we can support a very large number of active users, which is very beneficial if you're talking about enterprise and venue settings.

Another area that we bring a great deal of innovation to is multi-tenancy and multi-frequency small cells. We have spent a lot of time and resources at PureWave developing our infrastructure from the ground up to be able to support multi-tenant small cells. We think this is a very attractive proposition in an indoor enterprise and venue environment, where you might need,

as a venue manager or owner, to serve more than a single operator.

At the same time, we think this is very attractive for operators who, when they look at the small-cell environment and the need to deploy a small-cell network, are faced with challenges that include everything from site acquisition to ongoing site maintenance. It would be very beneficial to share that cost with other operators and reduce the time to market, yet remain independent. Everything that we've done in our small cells, from our management to our over-the-air services, enables this complete independence of operators. So the small cell is a part of an operator's own network, while a lot of the cost is shared in a multi-tenant environment.

Frank Rayal. With respect to multi-tenancy, there are different ways in which operators can share these small cells. Can you expand on these different aspects of sharing a small cell?

Ronen Vengosh. When you talk about sharing, there are many different types of sharing that exist. It starts from co-locating – essentially, placing multiple cells on the same tower or light pole, and so forth. You can take that another step and share the backhaul. You can even take that a step further and do what we're proposing here, which is essentially sharing the same physical box but retaining your own control of the spectrum, your own core network, and your own management capabilities. Or you can go all the way across and essentially deploy one cell that can

be shared among multiple operators, in which case you do give up some independence.

Frank Rayal. When it comes to infrastructure sharing, have you seen certain markets where they're more amenable to this versus other markets? What's your take on the market traction on infrastructure sharing?

Ronen Vengosh. I think definitely we see more acceptance and excitement about this concept abroad, and in Europe in particular. But I think we're also seeing American operators looking at

Figure 1. Constellation Leo compact outdoor base station. Source: PureWave Networks

this very seriously, especially indoors and for some specific applications that require sharing, or in cases where, for a variety of reasons such as municipal permitting, it is not possible for each operator to deploy his own small-cell infrastructure in the same geographical area.

Frank Rayal. PureWave's base stations can connect to the gateway versus connecting straight to the core. Tell us more about the different architectures that can be supported.

Ronen Vengosh. We do envision – if we're talking about indoors – that a central gateway is required. There are a lot of services provided by the gateway that will remove significant load from the network core. However, we do envision situations where you may want to connect directly to the core. In such cases, of course, we are capable of deploying in that environment as well.

Frank Rayal. I would like to ask you about the neutral-host model that has been proposed by some in the industry. From practical aspects, what do you think about a third-party gateway to which operators would connect base stations? How do you see that business model developing?

Ronen Vengosh. We are believers in the neutral-host model. We think there's a lot of interesting things that can be done with that. Obviously, it's not appropriate for all operators and in all situations. The challenge in this model, and these are some of the problems that we have solved in developing our own infrastructure, is when you're going to have multiple operators sharing the same

infrastructure, you need to make sure that the infrastructure is designed from the ground up to handle that environment – so that security is dealt with correctly, and management is dealt with correctly. If there is a need, for example, to reset part of the infrastructure, who does that? Is there a superuser that has that capability and responsibility, or is it the individual operator?

There are a lot of different and interesting ways to go about this. As long as the infrastructure is designed correctly to allow that flexibility, and to allow certain types of services that the operators are looking for, I think it's a very powerful model. It also enables new business models such as, for example, allowing the venue owners to deploy a

multicarrier or multivendor network without the initial investment cost to the operators, which we think is an interesting and exciting opportunity to look at.

Frank Rayal. I noticed in your base station lineup that indoor base stations are multimode – LTE, 3G and Wi-Fi – whereas the outdoor is only LTE and Wi-Fi. Can you explain the rationale behind this choice?

Ronen Vengosh. That is a very astute question, and it is a great point to discuss. We believe that the migration to LTE is happening pretty rapidly. There's a lot of incentive for operators to move to LTE, and we feel that by the time our outdoor

Figure 2. Enabling small-cell deployments in a multi-operator environment.
Source: PureWave Networks

small cells reach critical mass and get deployed on a wide scale, we are not certain that the need and the willingness will be there for operators to invest in 3G small-cell deployments. Be that as it may, we do have that capability built into our product portfolio, and we are capable of delivering it.

With the indoor solutions, we do see more of a need because of the coverage element that the indoor small cells fulfill, in addition to the capacity element. So we have invested more time and effort in incorporating 3G into the indoor solution.

In any case, you also bring up the point of Wi-Fi. We think that Wi-Fi is an integral part of the small-cell ecosystem. To be quite direct about it, it's free spectrum. It can add to the capacity. Of course, Wi-Fi has its own challenges that make it insufficient for operators, but we think it makes a fantastic addition to small cells, because it allows you to add capacity. In some cases and applications, it also allows you to provide access to an installed base of devices which are not LTE equipped. So we believe that multimode operation is a key pillar of small cells.

Frank Rayal. One issue with respect to Wi-Fi is, how do you deal with the traffic? How do you select traffic that goes on Wi-Fi from that which goes on the licensed band for better quality of service?

Ronen Vengosh. That's another very good point. I think what you're going to see in that area is an evolution that happens over time. We have designed our platform such that both Wi-Fi and

LTE traffic gets routed through our processor, so we do have control over scheduling into the technologies.

With time, we anticipate being able to allocate traffic across each layer intelligently, by application or by use case, to make sure that the right kind of traffic is carried by the right type of technology to provide the best end-user experience while also maintaining cellular resources for those applications that would really benefit from that service.

Frank Rayal. Earlier you mentioned that one of the challenges in deploying small cells is the deployment and installation process itself. What tools and processes have you developed to help operators with this process?

Ronen Vengosh. We think the only way to get the small-cell model to be successful is to allow for a very large-scale deployment, where you're essentially having thousands of these nodes being deployed, potentially by folks who are not your typical RF engineer. When we develop these base stations, we make sure that no specialized tools are necessary. A lot of the configuration happens behind the scenes automatically by the base station once it's connected to the network. That is something that we have been exploring for a long time and have had a long time to hone our skills.

 Again, if you're looking at the indoor small cells, the concept is you have one person coming in, connecting a single cable, mounting the base station on a wall or a ceiling, and then walking

away without further requirements. That is the place where the industry as a whole needs to get to, where one of the big cost parameters in the business case for small cells is this installation portion of the job, and so that is a critical factor.

Frank Rayal. There are a number of other issues that have large strategic consequences to the operator. One issue is whether small cells should be deployed in the same spectrum or in a different spectrum than the macro cells. What's your opinion on this, and what sort of technologies can you bring to market to help with this kind of deployment scenario, where interference can play a major role?

Ronen Vengosh. Everybody's talking about SON. SON is going to be critical for small-cell deployment, especially outdoors. There is a macro layer and it needs to be protected from interference. As a smaller organization, our strategy has always been to play nice with whatever ecosystem is already in place. We're not going to go in and pretend that we can push a SON solution with the operator. Of course, we do have solutions that we can offer, but our strategy is to work with whatever you've got in place. If you selected vendor X, our equipment will work with vendor X.

Indoors, things are less sensitive to interference. There is the benefit of walls that attenuate the signals on the way out, so interference is less of an issue. But there, too, we see that as being an important item that needs to be addressed, especially on the way to a multivendor

environment, which is where we think the industry is going in the long term.

Frank Rayal. Aside from SON, there are interference mitigation techniques that have been implemented, mainly in LTE Release 10 and 11. What's the readiness of PureWave's solutions to be upgraded to LTE-Advanced and to implement some of these inference mitigation technologies, like eICIC?

Ronen Vengosh. These days, anybody that's building small cells has to recognize the fact that there is a continued evolution for this. Right now, we support Release 9. As of early next year, we'll be supporting Release 10. This is an ongoing process that will continue, and the hardware needs to be able to deal with this ongoing evolutionary path. This is one of the key considerations we've looked at when designing our platform. It is part of the best practices. We do intend to keep on supporting these advanced features, as they mature, via software upgrades.

Frank Rayal. One question that comes with indoor small cells is that sometimes they are at a disadvantage against DAS solutions because they only support a single band. What's your take on this, and how do you make indoor small cells more competitive versus the solutions that support multiple bands?

Ronen Vengosh. This is a very important question and one we have tried to address head-on. We do believe that indoor small cells will need to support multiple frequencies, and you're right, where DAS

excels is in the ability to do that. But they do so at a cost, which at this point is capacity limitation and complexity of installation. However, when we talk about our family of indoor small cells, we built multi-frequency into the architecture. For example, if you look at our Lyra 400 model, it is capable of supporting up to two LTE carriers and two 3G carriers at the same time. These could be in different frequencies and potentially different operators, if you so choose. A lot of flexibility is built into that model. I do think you're correct in that small cells will ultimately need to be capable of multi-frequency operation, and we're moving in that direction today.

Frank Rayal. Do you think we need LTE-Advanced to deploy small cells, or can small cells be deployed with LTE and then migrate to LTE-Advanced?

Ronen Vengosh. I think this question has been put to rest. We are shipping LTE small cells today. Of course, they are upgradable to additional releases in the future, but there is no need to wait, and our partners and customers are moving forward with that.

Frank Rayal. If I would ask you to go back and highlight some of the key benefits and key attractions of your solutions, how would you summarize that?

Ronen Vengosh. We have macro parity–capable small cells. We also have multi-tenancy and multi-frequency built into the solution, and we have a high user count. Those are primary, headline-type differentiation factors. Our architecture can

essentially support up to three separate frequencies or operators in a single box. I think that is something that nobody else has looked at doing, and it addresses some very critical issues with the deployment and permitting of small cells.

Frank Rayal. If you have a wish list to ask your suppliers from the wireless ecosystem whether they're on the baseband side or the radio frequency side, what would you ask for?

Ronen Vengosh. I think that's a better question to ask our CTO. One of the big challenges that the industry faces as a whole is the fact that we're all looking for better filters and the ability to support wider bands and more frequencies. That's something that the industry is working very hard to try to resolve.

We are doing our share in that with a lot of innovative technology that we're looking at. Once that problem is solved, there are very innovative things that can be done, and I'm confident that we'll be moving in that direction in the coming years.

Frank Rayal. Speaking of moving forward in the coming years, what's your vision and growth effort for the future on these small-cell solutions?

Ronen Vengosh. Our big move in the next year is going to be the indoor platform that we're bringing to market. You'll start to see this in Q1 next year, which is well in advance of everybody else in the industry, based on this type of silicon which is a very advanced, fully integrated single-

board solution that's capable of very high performance. It's a very innovative solution, and it's very exciting for us.

Frank Rayal. Ronen, I would like to thank you very much for this candid conversation.

I would also like to thank the audience for watching this conversation with Ronen Vengosh, Vice President of Marketing and Business Development at PureWave Networks. This conversation is part of the Senza Fili report on HetNet deployments and the latest solutions from the wireless ecosystem that will make HetNets a reality. The report can be downloaded from the Senza Fili website at **www.senzafiliconsulting.com**.

Acronyms

3G	Third generation
DAS	Distributed antenna system
eICIC	Enhanced inter-cell interference coordination
HetNet	Heterogeneous network
LTE	Long term evolution
RF	Radio frequency
SON	Self-organizing network
TI	Texas Instruments

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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.