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Debate Session V:

*Rock, Not Sand –
Laying a Solid Foundation for 4G Networks*

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| <u>Panellists:</u> | |
| Ian Keene | Vice President, Gartner |
| Carsten Rossenhoevel | Managing Director Research & Development, EANTC AG |
| Nan Chen | President, MEF |

Okay so I've got my panel on and we're here to talk about 4G, LTE. The easiest thing to do is to waste our time and ask who hasn't heard of LTE, but I'm not going to do that because it's not worth it. So five years ago there were pretenders. We had [iBurstt]. It won a few customers in South Africa. We had UMB. Some expected that UMB was going to be the natural progression of the CDMA standard in the US but that was dead on arrival. And then we have the biggest of the pretenders, WiMAX, WiBro, call it whatever you want to call it. And the jury's out, but at Ovum we have our opinion on what's going to happen to WiMAX. I'm not going to bother you with that.

But the reality is that LTE has become the de facto 4G standard. It is no longer subject to debate. The only thing we are debating now is how is it going to evolve. Is it worth it, are people going to make money from it and what next? We expect that LTE connections will start approaching the one billion mark by 2017. Of course the US is in the dominant lead. Verizon Wireless has over 10 million customers as at the end of June this year. And then we have the South Korean telcos. We even have Telstra in Australia. So LTE is picking up. And you have pockets of LTE rollouts whether it's in Kazakhstan, Angola, Nigeria, in Germany. Surprising that the UK is

kind of a laggard and all the big carriers, [within] Ofcom and the telcos, if you've been following the UK press you would have heard enough of it by now.

So what next? So I'm not going to waste our time. We will dive then, dive immediately to see what our panellists think about the LTE ecosystem and what they think this technology can bring to the market, what it can bring to the consumers, what it can bring to the vendors and what it can bring to practically every one of us.

So, without further ado, I've got Ian Keene from Gartner, I've got Nan Chen from MEF and I've got Carsten. I'm going to have to look up your surname so that I don't make a mistake pronouncing it. And that's Carsten Rossenhoevel from EANTC in Germany.

Gentlemen, LTE, is it worth it; are we wasting our time. So give us a brief introduction of yourself and kick us off.

Ian Keene

Okay. I think you know me by now, Ian Keene from Gartner. I don't cover LTE in great detail personally and I think WiMAX is wonderful and it's going to make a comeback. No but seriously, absolutely why LTE, and that is a question a lot of service providers are asking themselves across the globe. In some countries, the US, you gave an example, it's because of the conditions in the country they've gone the LTE route now. And you've got to look at what conditions are there. There are regulations, there is available bandwidth. How congested are the existing networks? How old are their existing networks? What is the coverage like, what is the competitive landscape like? And what are their customer habits too, is another important thing. There's a lot of -- and of course how much budget do they have to build out new infrastructure. So a lot of reasons why a service provider would go with LTE or not go with LTE.

And why LTE? It is the next generation of technology. So if you're going to build a new network maybe it's pretty stupid to use an old technology; why not use a new one. There should be more life in it. It's got some good aspects. It's apparently better -- but I'm told this by people with vested interests -- but it's apparently better for designing networks. It's easier to design cell reuse and things like that. It's got less delay, lower jitter and it's an all-IP network. And I'm not sure if that's good or bad because what you do is switch voice which, don't forget switch voice is a cash cow for mobile operators and it's worth a lot of money still. But, yes, there's also plenty of life left in 3G and HSPA; with HSPA Plus an awful lot of life left in 3G networks.

But I think the landscape's changed and we always think of mobile cellular, it's a mobile operator's god-given right to own the customer and carry on succeeding with the same business plan they've had for the last 15 years. I'm not so sure about that. Things have changed a bit and it's a changed a bit, if I want to be very cynical, because of the cellular operators' own greed. For example we started off with 2G networks -- we started off with 1G networks, but anyway, we, most of us will know and remember 2G networks. And then we needed data, people needed data connectivity on the move, or at least they desired it. So what they did, the WiFi came

out and things like WiFi hotspots so you could connect up your PC to the Internet, I don't know, it could be in an airport lounge, in a hotel or maybe and increasingly in places like cafes, bars, restaurants and so on and it was great. People actually paid good money for this and used to cuss and swear for having to type in their credit card details and log on messy. So then 3G came out and 3G networks were pretty empty things. So this band of travelling business people, mainly although some high-end geeky consumers, thought I don't want to use WiFi anymore, that's yesterday's technology, I've got my PC dongle, my 3G dongle. And that went wild and whatever and hotspots, WiFi hotspots died. Well they didn't actually die, this is the thing you see, you can't charge people for them anymore, but you might as well just let people use them, and a lot of them just went free.

Emeka Obiodu

Ian, I'm going to stop you there. Let's hear from Nan. Nan, tell us, 4G LTE is it worth it?

Nan Chen

I was hoping you'd just keep going and fill up the gap here. But I think Ian covered a lot of the general ideas of where is it going and I actually wanted to hear the rest of the story.

Ian Keene

Well I could really tell you in two seconds, okay. I'll be very, very brief. So anyway, Apple bring out this iPhone thing. Right. All of a sudden people want to do lots of data over 3G. Networks fill up, but cellular operators don't want to turn away new customers and say, sorry, we've got to limit how many people, the data you can use on this; we've got to cut the network back. No, we want all these new customers buying iPhones, and then other smartphones that came out, and so our network [inaudible] is congested. What do we do? Encourage people to offload on to WiFi networks by WiFi network service providers, build WiFi networks, go into agreements with them. And now what they're doing is they've lost control of their customer. They want to gain it back -- and we'll talk later about two ways of gaining the customer back and 4G is one of those ways, not the only way, okay. But they lost control of the customer. And so that is the situation we're in now and that is why 4G, for a number of service providers, is going to be important because they've got to win that customer back and that's one way of doing it.

Emeka Obiodu

Okay. Thank you very much.

Nan Chen

Well in US the 4G deployments started with Verizon. And then what ended up happening is -- well the reason they started is because they really wanted to get into the mainstream of cellular technology instead of going down the CDMA. But I have

to say the network is really good in terms of the coverage, the CDMA. It's better technology supposingly. But nevertheless I think LTE is the way to do that. And once they start doing it, AT&T has to do it, Sprint has to do it and T-Mobile has to do it from a marketing campaign perspective. When people deployed they said well, instead of engineering doing the deployment, why don't we have marketing figure this out, doing 4G deployment. But, in general, I personally feel like the 4G is really in the US because they were behind in terms of the mobile communication networks' perspective they were really trying to leap-frog to the latest grade of technology. And competition pressure was the second reason that 4G started deploying in the US.

Emeka Obiodu

Okay, thank you very much. Carsten, a view from someone involved with the?

Carsten Rossenhoevel

Well in my company, since we're an independent test lab we're seeing those implementations coming up. And we've started to see more backhaul and LTE or mobile core, next generation, three years ago. Yes, the technology is going ahead very nicely. But this morning when we had the rehearsal, I came out a little depressed and I thought, well, we had all these thoughts, is it really worth it. It's just the next round in the same game and so on.

But I remembered after that this wonderful hype cycle that your company, Ian, created. And I think it clearly showed in this morning's rehearsal we are in what is called the trough of disillusionment. LTE is there now, it's being deployed at scale which means people are getting more realistic about it. But I would expect, in the battle of gaining the customer back and also in the battle, in Europe at least, of giving every citizen 100 megabits to their home, it actually has a good point. So I think there is yet a lot of things to be done, but it's probably going -- in ten years from now we'll probably still see 2G because there are lots of things we discussed, machine to machine communication this morning, that are needed, but we probably will not see 3G used much any more and specifically for new applications like video conferences and stuff.

Emeka Obiodu

Okay. So you guys believe that LTE is worth it. That has really convinced me, but then I've got a big question, who's going to pay for it. Where's the money? LTE is worth it. It enabled them to get back their customers. It would provide another iteration of testing opportunities for you guys within the MEF or the backhaul and all the increased video traffic and everything. It's supposed to be bountiful opportunities for everyone, but who is going to pay for it and how are the carriers going to make money from LTE? Who wants to start?

Nan Chen

I'd be happy to start. The way I see it, if you look at Verizon, sure, everything planned, the plans that came out recently, which have a component of voice and data. And if people, if you're moving 100 million customers on to that plan -- I'm not sure

everybody is going to be, but let's say a family of two or whatever -- you have 50 million, let's say it is 50 million people move in to that plan. I actually think that's a chunk of change could pay for LTE if they feel that -- Verizon has the lowest churn of all the networks in the US. It's roughly about 1.1%. So because the network has reliability, now they can actually attract a lot of unhappy iPhone customers on AT&T's network over and really helping them to pay for the LTE in terms of the growth. I feel like that's how they'd pay for it.

But from the MEF member perspective, there's a significant amount of deployment going on right now in the US, both from the equipment perspective, as well as the services perspective. Many members are actually experiencing the bloom of mobile backhaul. And there's quite a bit of [inaudible] investment into the start-ups which are actually related to the mobile backhaul. So I certainly feel there's enough money to pay for it from a carrier's perspective.

Emeka Obiodu

Okay.

Carsten Rossenhoevel

It certainly stirs up the market. And I think all these evolutionary steps always are a good chance for new start-ups, as you mentioned. They are a good chance to realign or reassess their market shares. We see that in microwave. Microwave technology is improving very fast and they are now at gigabit speeds almost. They have lots of management capabilities and so on. We see that also in policy. And to answer your question how are the carriers going to make money, I think they're going to try, of course, avoiding commoditisation of their data service. So that means they have to differentiate. They have to, let's say, provide teenagers with a Facebook free service where Facebook doesn't account to your monthly quota. Or they have families, they have to provide families with a -- if you're in your home zone, you can use your data plan also in a certain way. Some plans; I'm just making them up you know. And we're seeing a lot of policy gateways being created which can handle tens of thousands of requests every minute where the mobile network would ask, I have this customer with this type of application, how should I treat it. Should it be premium, is it paid movie, for example, or is it bulk, or should it be blocked, or should I actually send an SMS? I got an SMS the other day from T-Mobile. You have used up your gigabit worth of data for this month. Do you want to buy another 300 meg for €5? So there was just one click, and that is the way the policy management actually helps the mobile operator to be profitable.

Emeka Obiodu

Ian you want to add anything to that?

Ian Keene

Yes. I mean given a reasonable period of time, let's say about five years, there aren't many cases of where mobile operators have not made money. It's a matter of if they

have available spectrum, they've got frequency bands, they can stick data on it, or voice, come to that, then the chances are they'll make money. It doesn't matter if it's LTE or a piece of string; they'll make money.

Nan Chen

One of the things I do want to emphasize, or one of the things that [MEN] has helped, and, I think, through the briefings with everybody, we've seen that the mobile backhaul is a key piece of expenditure in the United States. For example, if you want to cover the US and you need roughly about 40,000 to 60,000 cell sites, just macro sites you need to cover the US, then that constitute probably about \$1.5 billion a year, just OpEx cost, just in terms of if you actually lease a portion of that backhaul. With the growth of data -- and that's where the cost savings start becoming more important because of the fact that the growth of data you can't really just buy everything premium class; you have to really separate so that you can actually buying cheaper. Also the access provider would run the network more efficiently, instead of multiplexing real-time data just hoping the mobile operator wouldn't even notice that. But as the industry we're lining up, hopefully, the multiple class of service, it would carry out not only have the mobile operator understand the benefit for them in terms of savings when they grow -- when their traffic growing and they're growing the backhaul capacity, but as well the backhaul operators. And, hopefully, they're really gaining that efficiency by doing the multiple class of services.

Emeka Obiodu

Right. It is interesting because one of the slides that I had in my presentation, which you're going to get when you access the NetEvents website, it shows a survey that we did at Ovum where we asked, what exactly are you expecting from LTE, because there is this hype that suddenly you're going to make new revenue from LTE. But what the panellists are alluding to is that LTE is more likely to help you to optimize your processes, to differentiate yourself, to save money.

All well and good, very fabulous or fantastic, but I guess the challenge then becomes if you are the banker a [telco] comes to you and says, okay, I need a billion dollars, a billion euros to build, or to pay for to buy the spectrum and then build the LTE network. Are you able to show me incremental revenue cash flow forecast from LTE? And that becomes the challenge that LTE is no longer supposed to be a revolution but more of an evolution in the industry, helping the telcos to continue to do what they've been doing all along which is essentially make sure that you and I have our mobile phones, we have networks and we have everything that we need to communicate.

Okay. I will ask them one more question and then throw it open to the audience. If LTE is not going to be a revolution, it's only just going to be an evolution, why should I invest so heavily into achieving that when they could easily embrace small cells. WiFi, picocells, femtocells, what have you, whatever. Why should a telco spend -- in Germany, I think, they spent close to EUR4.7 billion something buying LTE spectrum and they are obviously going to spend more than EUR1 billion amongst themselves

building out an LTE network. Why do that when there is an alternative to use small cells? Why.

Nan Chen

Well in the US there's no really choice. It's competitive pressure. When you have one guy start moving, everybody else will have to move. And also, I think, the LTE people may have -- under the impression that there's a potential of providing home services and [home] wireless. That's one of the things some of the carriers are talking about that. And enterprise as well, riding on the same network which -- build a cohesive network between the wireline and wireless backhaul. So I think, at least in US, the competitive pressure has left no choice for everybody so that they have to do the LTE, although some of them it maybe just a marketing campaign and others are really doing deployment. But, either way, 4G is here to stay.

Carsten Rossenhoewel

Yes. And the small cells are great and I think it's important to understand that small cell technology is independent from 3G or LTE, it works with both. But let's not forget, after all, technology-wise 3G technology is inferior, right. You have to deploy small cells anyway in the race for urban coverage at high speed. And in this case if you deploy small cells only with 3G, you will always be behind one step with your competition that deploys LTE small cells. Right? And I live in Berlin where our coverage is nice because we don't have too tall buildings, but I have tried to use my data in Manhattan; it just doesn't work, although I am sure there are tons and tons of small cells deployed. So there is a problem if you try to just use 3G technology. LTE certainly -- I'm not the expert for that one -- but LTE certainly, from all I hear from our vendor customers, has much better ways to use spectrum efficiently and to align neighbouring cell sites.

Emeka Obiodu

Okay. Ian?

Ian Keene

Yes. I'm told that it's much easier to do network design and frequency reuse. And having worked in the mobile industry, I've actually designed the mobile data networks in the past. It looks very, very likely that that is the case. So LTE it's going to be easier to design networks that are built on a small cell overlay of a macro-cell architecture, which is the talk right now; that is the way that people expect the mobile market are going with their network design. Don't take it for granted because you alluded to backhaul, and backhaul of a huge number of small cells is a nightmare in terms of costs, and this is where the cost thing could come in, and the budget may not be there for many service providers to do that architecture. So there's a question regarding that.

But otherwise whether it's LTE or not, yes, if you've got greenfield use spectrum or you want to re-farm your old 2G spectrum, it seems silly to build a separate 3G

network these days. It seems to make more sense these days to build a -- use a new technology, LTE. But people are at different positions. If you're already using your frequency for 3G and you just want to expand the number of users or the bandwidth that you have, you've got to stick with 3G; you haven't got any choice, okay. You've -- it's only when you say okay I've got this clean, empty piece of spectrum that I can take a technology jump -- and that's happened in the US that hasn't happened in all countries. So it very, very much is country dependent. It's not just which technology is best; it's what is just the most appropriate business case for a particular country at a particular point in time.

Emeka Obiodu

Cool. So can we get some questions from the audience?

Q&A Session

From the floor

Hello [inaudible]. Why are you messing up 4G with LTE? As far as I know 4G is a service level and you can reach that with 3G technology as well.

Emeka Obiodu

Does anyone want to start up on that?

Ian Keene

There's all sorts of semantics on what is 4G. It's probably best never to use the term, to be honest. There are a couple of different definitions of it. I don't know what -- you want to define it whatever way you want really. But it's the next generation; I would consider LTE the next generation of mobile technology the same way as I would consider small cell architectures a next generation of mobile/wireless technology. Whether you call that 4G or not is entirely up to you.

Emeka Obiodu

Yes, I think if we had our way we would stick with LTE. But I don't think the marketing departments would like it. They want to go to market and scream out, go LTE. Because I think I've seen several advertising agencies clamping down on it. You've got to tell people the exact speed you're offering and other things so that you don't necessarily exaggerate what you've got to offer in the market. Nan or Carsten do you want to add anything to that?

Nan Chen

I will just try to give you examples. I thought it was funny; I had a personal example. I use a particular carrier -- I will just keep that nameless now -- on my phone. I can't tell you which phone I've got; if you know which phone, you know which carrier. But anyway, so through the hype of the marketing campaign, my phone was requested to be upgraded for the firmware, which I did. And overnight my phone changed from 3G to 4G overnight, and everywhere I go I either have a Edge or 4G. So the entire -- my entire phone is supposedly supporting 4G, which I know is not LTE.

Carsten Rossenhoewel

It was just 3.9G and they rounded the wrong way.

Nan Chen

Okay. Whatever it is, I figured what happened was instead of having engineering doing the 4G upgrade, they gave that job to the marketing department.

Ian Keene

Quite a lot of consumers now think they're on 5G with the launch of the new Apple iPhone.

Emeka Obiodu

Okay. More questions?

Kendrick Struthers Watson, InkSlinger News

Hi this is Kendrick Struthers Watson. You mentioned about the all the costs of building networks. Do you think this will start to see some consolidations between operators? We've had EE in the UK, like T-Mobile joining up with Everything Everywhere.

Ian Keene

Yes. We've also seen -- there are also cases of carriers who have done 3G as a joint partnership and decided that's a good reason to go to 4G to get out of the partnership. So it's debatable. It can reduce costs, it can also reduce competitive edge. You can argue it. If you're not going to fully invest in the network, do you want to part invest in it, invest in half the cost, or do you just want to be a virtual operator and just ride on the back of someone else's investment? There's lots of different business models out there. So, yes, joint ownership is one way of doing it. It depends on people's -- on service providers budgets', how many customers they want to get, and their overall strategy. And we talked before; in the US, Nan said you've got to go for LTE now because your competitor is doing it. The cable MSOs aren't; they're riding on the back of other things and they have high hopes too.

Emeka Obiodu

Yes. {Inaudible}.

Carsten Rossenhoevel

Just to add to that. I recently had a service provider customer who, which I said before, and they said well you know we have three types of assets. Number one is our network, you know the infrastructure, and it's excellent. Number two is our engineers and how they innovate. And number three is our customer base. So currently we plan to outsource number one and number two. Yes. So, for me, that was the death for the service provider. They felt really fine about it, but I think, especially in Germany, LTE deployment and planning is a technology race. It's also a race like who has the best network and who has the best engineers. So T-Mobile is currently winning because they have this large, still pretty large base, number of engineers. Vodafone is running up, but they have lots of call, high-tech call interruptions. So you can see it's not an easy game. Then O2 Telefonica is following up. And E-Plus has basically stopped and said, okay, we're out of the game; not deploying LTE at all. So that's too much and maybe one of them will go away soon.

Emeka Obiodu

Yes. Well I think our research at Ovum was that it's almost inevitable that the carriers have to think of how to batten down themselves at least with joint ventures. And we came up with a projection that in the next five years at least 50% of all new LTE networks would invest in some form of active network sharing because, without that, it's unlikely they'll be able to convince the bankers, or whoever is funding them, to give them the money to build for the spectrum and buy and build the network.

I think we've run out of time so, sorry, I couldn't take the last question from the other side. I had wanted to -- I think we've run out of time. Or you're going to make it very quick and snappy.

From the floor

Yes. No one has really mentioned the mobile handset providers. I find it quite amazing that the iPhone 5 is being sold in the UK with 4G capacity when there isn't a 4G network there. It's the last thing I'd do, buy a bit of hardware if there's something that can't be used. I'm just wondering, are the handset manufacturers ready?

Emeka Obiodu

Quick answer? Any quick answer?

Ian Keene

From a Gartner point of view I'm not the best to answer that, I know. But any new technology that's introduced into handsets there are quite a lot of teething problems involved. So battery life may not be as good as one would hope and things like that. So I'm sure as the integrated circuits get refined and they scale up in terms of volume,

things will get better than they are now. I'm not saying they're not good enough now, but things will certainly get better as volumes scale up.

Emeka Obiodu

Okay. I think we have to end it there. So, in summary, our panellists think LTE is good. It's necessary, it's an evolution, it would enable carriers to save some money, optimise their processes. It might not necessarily create new revenues for them, what they require if they needed to remain competitive in the future. And so, with that, thank you very much.

[End]