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Debate V:
Advances in Wireless and Beyond 802.11ac

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Research Vice President, Gartner

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Jacob Rapp	Global Leader of Marketing, HP
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Well, after your experiences of sending emails over the last couple of days and trying to receive messages, you'll be very eager to know when super-fast Wi-Fi is going to arrive. So, I've got three panel members here that have covered various different customer sets and whatever, so I think they can give three useful different opinions on this and what's happening with Wi-Fi.

Now, back in 2002 I wrote a Gartner research note, I'll tell you exactly what it was called, "What to expect from wireless LAN standards, and when" and that in fact turned out to be the most popular research note I ever wrote, I've ever written for Gartner in terms of the number of reads it received over the first month of publication. So, back in 2002 a lot of businesses really wanted to know what the heck was going on in Wi-Fi and what were all these standards and their interest was growing. Yes, I think the first IEEE 802.11 standards came out in 1999 and that was 11a and 11b, and by the time I wrote this report it wasn't too long, we'd got down to the letter 'I'. Back in those days there were still some potential competing standards, there was hyper-LAN in Europe and there was MMAC in Japan but the IEEE standard won through. I sort of joked at the time and said we're probably going to end up running out of letters of the alphabet here and in fact we did, and now so we've got to 11ac and in fact there's some emerging standards that go beyond that which we'll cover later on.

So the way I want to do this and structure it is basically I want to start off by looking at, why do enterprises and service providers, and public Wi-Fi as well as enterprise Wi-Fi, who needs 11ac? What's wrong with what they have, 11n, where the panel see the drivers? What parts of the industry are moving forward first? Then I want to go on and look at influences that we're starting to see now, for example the increase of video traffic in use both again with consumers and businesses, with the impact of things like 'bring your own device', is there an impact there and also things like the internet of things and what issues does that bring? And then go onto the future and what can we expect in the future, what's on the horizon now and what is starting to gain traction in the market and potentially offer lucrative opportunities for vendors, and useful services for the users?

So, before I ask the first question, I would like Dominique, Jacob and Roger here to briefly introduce themselves, their company and what their interest is in Wi-Fi.

Dominique Vanhamme

Yes, let me start then, I think first of all we all agree the three of us that we won't provide free upgrade to the hotel for the Wi-Fi, so that's definitely not part of the topics we are going to cover this morning, so let's be clear on this one.

I'm Dominique, I run networking for Dell. As usual we are the best company in the universe; we have the most important and most compelling solutions that all customers are buying in all industries. Joke aside, we combine Wi-Fi with security, with management, with services and of course with our client business, and we have a solution approach I would say most likely targeting to mid-market and enterprise customers as a primary market.

Jacob Rapp

Hi, Jacob from HP and we sell wireless enabled printers, we do as well, but I understand we'll talk about that in a minute. So, yes we sell complete unified wired and wireless solution to the enterprise. So we want everyone to upgrade their entire infrastructure with 11ac. Not really, but hopefully but I think in the end 11ac coming about, are you going to want it? Yes. Do you need it? It depends and how you transition to it also depends as well, but I think it's as important to look at the steps it takes to get there, because I don't actually believe that you're going to upgrade your entire infrastructure all at once because of it.

Roger Hockaday

Thank you and good morning everyone. For those of you who are shocked to see me sitting here with Ruckus in front of me, I apologise, I've been at Ruckus now for about three or four months. As some of you know I've been in the Wi-Fi industry for about eight years or so. Ruckus Wireless, the focus of Ruckus is actually split between both enterprise and carrier; it's about a two thirds business which is enterprise, one third carrier. So I'm going to try and take an approach here which looks at more of some of the service provider issues behind Wi-Fi. We are the number one provider both in terms of access points sold and market share in service provider, and we're number

two in Europe, number three worldwide, joint number three worldwide when it comes to Wi-Fi in the enterprise. Our market segment is actually small-medium enterprise, it's a very exciting marketplace to be in today, because a lot of people have deployed Wi-Fi extensively in the larger enterprise, but today people are arriving at work in the small enterprise and going, "Actually how do I connect my iPad? How do I connect my MacBook Air, it has no Ethernet connection?" It's something that the medium enterprise has just woken up to in recent times and it's now the fastest growing market sector, it's very exciting.

Ian Keene

Right, okay, so the question was advance, 802.11ac and beyond. So, what is beyond 802.11ac? Basically the answer is very simple, it's 802.11ac wave 2 because the standard's only half-baked so to speak. So first of all I'd like the panel, I guess we might as well just go round in the same order. Really, is there any point adopting 802.11ac wave 1? Is there any advantage? Should people hold off and wait for the whole standard to be finished? Generally what do you advise your customers, Dominique?

Dominique Vanhamme

By the way, beyond ac is ad, because that's the way the alphabet goes. So, yes I think there is a risk clearly from a technology perspective that wave 1 will fall into the pit of what I would call the Betamax pit. It's interesting transition technology, customers maybe saying, "I may want to delay my decision and may wait for middle of next year when wave 2 basically comes in, and reap the benefits of this quality of service, high bandwidth" that in fact wave 2 we see is providing. So there's a bit of that risk from a technology perspective.

The way that I think we try to handle is and the way we engage with CIO's and decision makers is the technology piece. Technology is never fixing a problem by itself, you have to provide a complete solution to make sure it's relevant and I think here if we compare to it 'n' and other previous letters of the Wi-Fi alphabet, the design was done for the cube. So in the past Wi-Fi was deployed really for a workspace which is a cube, you had two or three sockets, a couple of power sockets and let's get some Wi-Fi for those workers. I think now the design is really made for mobility and 'bring your own device' and it's a whole different ball game from that perspective. So there is business benefits, there is clearly also some type of applications that can be deployed more rapidly there. So if there is applications, if there is need there, if it's quality of services that needs to be deployed, clearly there's a path for that.

I think between 'n' let's say at that moment in time and 'ac' wave 1 and wave 2 and maybe even 'ad', I think the big change that the CIO's have found is that wireless is now business critical. It wasn't the case a couple of years back, it's now clearly business critical, everybody has tablets, everybody has mobile computing, so you need to connect basically the user in a very agile and mobility way. So the business criticality here is probably for me the deciding factor and once you get from that business criticality I think the solution gets behind it.

Ian Keene

Okay, thanks, Jacob, are there any particular areas where you see people very interested in 'ac' and you see areas of your business where people are saying, "Hang on, I'll just wait a while"?

Jacob Rapp

Yes, I think just to kind of answer the first question here is that the wave 1, I think it really depends on the business need and the driver. If you just want '11ac' probably chances are it's better off waiting. If there's a business need that's driving higher bandwidth such as e-learning or in healthcare we're seeing a lot more adoption of bandwidth. There may be actual needs for the adoption, if your business needs it, absolutely if it's available we can move you to it and then there's migration, interoperability that happens from there to wave 2.

Ian Keene

Is there an interoperability problem?

Jacob Rapp

I don't think so. I think even in the past if you look at a lot of the networks today and wireless used to have 'b', 'g' and 'n' interoperating together and they're generally running at 2.4 and not 5. So I think as you start moving to 'ac', everything will start to be running at 5 and wave 2 is going to be adding kind of that multiple user communication happening as well as a possible multi-gig back into the infrastructure. So, I think it's not a perfect storm but a perfect opportunity, I guess, because I promised not to say perfect storm. But I think in the end it really depends on the business drivers if you're going to be pushing that much bandwidth. If you're just having a coffee shop you may not need it right now.

Roger Hockaday

I'll just pick up on that last point and I think that is where it comes down to, it's price driven. There is a big difference in the marketplace today in some areas and not in others. If you look at the mid-range access points for 11n or 11ac, if you look at the high-end it's basically the same price. The one place where 11n has an advantage today is at the value end and there are no value 11ac access points. So, if I'm going to put in a coffee shop and I want a cheap access point, it's going to be an 11n access point. But given the fact that 11n and 11ac are basically the same price then I'm not going to buy an 11ac access point because there are incremental benefits, even for 11n on an 11ac access point, the radios are better, the silicone is better. So even if I'm just comparing 11n and 11n on an old AP and a new AP I'm going to get better performance on the new 11ac AP even if I'm using older Wi-Fi technology, 10%, 5%, 15% it's incremental.

The advantage to 11ac of course is that it potentially has much higher throughput, but a lot of that potential is negated by the fact that I have concerns over channel capacity,

or channel planning, particularly in public environments or high density environments. So, it's the same price, it's better for all Wi-Fi if you buy an 11ac access point.

Ian Keene

Right, yes gigabit plus throughputs and whatever one thing I think, well hang on, how's the backhaul network's going to cope here and is this just a great scheme to persuade enterprises that not only do they have to upgrade to the latest Wi-Fi standard, but they actually then have to upgrade their local area network backhaul infrastructure too and their wide area network needs to take advantage of it. So obviously I'll say if the applications are there and the question is, in my mind, 11ac comes about when there are lots of devices that work at 5GHz and the 2.4GHz bandwidth is crowded. So, do you see that happening and what influences?

Is it like the need for more video in the enterprise or in public spaces? Is it things like the internet of things applications? Is it an issue with 'bring your own devices' multiplying so you get on average more than one device per user coming about, maybe 1.5 maybe 2 devices per user where everyone has a tablet and everyone has their smartphone? And then of course you've got the things like wireless printers, there's an awful lot of different devices coming out that have Wi-Fi in them and bordering on the internet of things. There's an increasing amount of devices and increasing amount of traffic, so when do you see that influencing the need for people saying, 2.4GHz is full of noise and stuff that eventually gets through but it's not particularly high bandwidth stuff. People will accept that the fast lane, the Wi-Fi fast lane, is 5GHz and 11ac and you use that for high quality experience, can you see that happening Dominique?

Dominique Vanhamme

Yes, a couple of comments on that one, I think the spectrum piece is of course a critical one, crowded or less crowded in the 5 range, obviously, so I think that's a big factor, but I think it's already a very technology and technical oriented concern. Right, back to my design for the cube space where people were just dropping access points and connecting mobile devices, and then you would say, hey, I've got a wireless network. I think today the implication of deploying multi-gigabit, 1Gbps now and multi-gigabit to the future in 'ac' and other specs are far more reaching. It reaches also the fact that you have to redesign and re-architect your network, both in the access layers of your network, because all those traffic coming from all these multiple devices need to be concentrated in an access layer. What I said, the design of a Wi-Fi environment also has implication in the rest of the network, so on the design, on the speed side there's a factor.

I think customers also, the feedback we've heard, is that we have to go back again to a site survey, radio planning and go the whole motion again of radio planning and site survey and optimisation of location etc. So there's a lot of work, it's not just a simple upgrade from technology it is, but from a deployment perspective it's definitely not. So deployment issues, I would say design issues, but then you go into stuff which are more typical of the enterprise design, quality of service designs, bandwidth, multi-

media traffic handling, etc, etc, and of course security is still there and the kind of [inaudible] that you need to have in your security.

So, beyond I would say the spectrum space discussion that you have between 2 and 5 there's just a whole lot of other things that I think are also pretty critical for CTO's and CIO's to decide and make a call on. And I think we have to take that bigger picture there beyond the spectrum that has ramifications, there's many, many spaces in [inaudible]

Ian Keene

This is great news for LAN equipment vendors and [inaudible] resellers.

Dominique Vanhamme

Oh, absolutely that's why we are very excited about Wi-Fi.

Jacob Rapp

Yes, I see somewhat similar things, on just a need to kind of go, revisit and just take another look at the overall infrastructure when we're moving to 11ac and especially with wave 2. That doesn't necessarily mean everyone has to upgrade everything, but I think it's always important to understand the ramifications across the entire network when you do upgrades like this and when they're happening. But also I think more importantly as we go some of the drivers that we mentioned on, when we move in the enterprise to all wireless access, removing all the wired connections and I think that's a direction that a lot of enterprises are moving towards.

Ian Keene

Do you think they're subconsciously moving towards it, or is it an objective of theirs now?

Jacob Rapp

No, I think there's actual objectives to move in that direction and as we move in that direction we're also getting rid of things like phones as well and moving to unified communications. I know at HP we use Microsoft Lync and we use cell phones for most of our communication now and you move that all to a wireless environment as you're moving to 11ac and you also have all these 'bring your own devices' that support 5GHz now like the new iPhone. You just have a lot more out there that is going on all at once, so I think that's why it's really important to look at, what is your user quality objectives? Not necessarily look at what's my oversubscription ratio and how much bandwidth do I really need? It's what are my actual quality of service settings that I'm going to be making per those users as well? Things like with unified communication on a laptop, how do I do quality of service to the edge in the wireless?

Ian Keene

So maybe with this technology coming along which allows higher bandwidth applications and there's more bandwidth available, now is maybe the time to step back and make sure that your radio planning, your network design is really optimised for the future. What do you say about that, Roger?

Roger Hockaday

It's nice going last, because I can say I don't completely agree with what the others have said, they can beat me up afterwards. Absolutely, there are elements in here that are important in terms of the RF planning and designing the network, but the issue there is, I don't care whether it's 2.4 or 5GHz and nor should anyone else, that's not an issue here because it just works. If you put in the proper sort of Wi-Fi network the network will look after connecting those who can connect to 5GHz onto 5GHz, it's nice that there's more bandwidth, there's more channels available and those who can't they're going to connect to 2.4GHz. But I don't sell switches and I don't sell infrastructure so I can turn round here now, which I couldn't do previously perhaps and say, actually with 11ac you don't need more than 1Gbps, actually you probably don't need power over Ethernet plus. I'm not saying you shouldn't consider putting those in, but the reality is with 11ac both with wave 1 and probably with wave 2 as well, because of the number and types of clients you're going to have and because of the channel issues you're going to have in terms of spectral width you probably don't need more than 1Gbps because you only get 65% efficiency on a wireless network.

So you're not going to overload 1Gbps, remember this is half-duplex, you're not going to overload it with wave 1 and you're probably not, in most enterprise environments and public spaces, going to overload it with wave 2. You don't necessarily need power over Ethernet because the challenge here is a lot of enders just rush product to market. They think Wi-Fi is a commodity and therefore I must be first to market every time, so I will throw out power over Ethernet requirements and just ramp up the power. I won't bother to necessarily look at having the right channel utilisation on the network, and in practice these are things, with good design, you can get around and there are 11ac access points out today which happily run just on standard power over Ethernet without having to go POE plus. So you don't need to upgrade the infrastructure every time, but absolutely I do agree it's something you should be looking at and something you should be considering, but it comes down to design and not rushing it.

Wi-Fi isn't actually a commodity, it's a commodity if there's enough bandwidth, it's a commodity if there's enough range and there's not. There's big differences between solutions that are out there today.

Ian Keene

We've got time to look at what's on the horizon really, first of all from a technical point of view as opposed to an applications point of view, so I wanted to ask this question. From a technical point of view, do you see a role for example 802.11ad in the business or public environment? I think there are applications in the home maybe

for it, but outside of the home do you see that as something that the enterprise environment would ever adopt going forward? Or do you see interest in proprietary versions of let's say LTEU, LTE unlicensed, where one can start using the 5GHz spectrum for LTE or maybe proprietary methods where LTE does all the signalling, security and authentication and Wi-Fi does the heavy lifting of data? So, what are your thoughts for the future, what's on the horizon, not here yet but let's say where here three, four years time, what do you expect would be the technical topic of discussion regarding Wi-Fi?

Dominique Vanhamme

There's probably two angles to that one. I think when we did CIO surveys in what are the critical domains that you look at? No surprise mobility is always a recurring theme, 80% of the CIO's we surveyed mentioned mobility being in the top 10 priorities and that's been consistent for the past years and I'm sure it will be consistent for the future. The interesting bit behind that is when you ask them why, basically number one efficiency, productivity are all things that you would expect of employee efficiency. Number two costs and having a [inaudible] infrastructure, I think you would expect that. But number three is surprising because it has also been pretty consistent, it's customer intimacy. They want to use mobility and Wi-Fi technologies regardless of the alphabet for them about; can I bring my business closer to the customer? Can I use application download? Can I use any form of mobility, mobile devices that my customers are having, can I bring something to them? So, we have cases where insurance companies basically download a small app on the mobile device of a customer and use that basically as an advertisement platform, and I think that's an evolution that we have I think on the solution side to think of.

Then in terms of the technology side, I think if you look at the history of 802.11 and all the letters, there's been a few, I would say Betamax failures where some of the technologies of some of the letters there were not as successful as we think. Now, looking a few years in the future we believe more that the blending will happen between wired and wireless. Yes, we can mix and match mobile technology, LTE, 3Gs and others, we can share radio, we can share antennas, we can share some of the chip set and some of the product behind it, but in fact the blending we are expecting is probably more between wired and wireless. The fact that we have higher speed will also make it more easier to just create that blending between wired and wireless and have really an ultimate goal of having a mobility, regardless of the connectivity that you offer. I think the wire or the wireless is going to be in five years from now, a discussion of the past, you don't really need to think about, how do I connect, is it wireless or wired, it's just happening.

Jacob Rapp

Yes, I tend to agree with what you're saying but I think it's the terminology like unified wired and wireless is going to start going away and it's more like integrated wired and wireless where it's not necessarily a decision any more five years from now, the experience is the same. I think the letters are going to continue to go up, I'm sure,

we will have new and exciting standards that will come out. But I think what is also really exciting from a customers' standpoint is that what opportunities are unlocked with wireless that they didn't have before, because with the whole new digital enterprise and the new style of companies like Amazon taking hold, a lot of companies are trying to figure out how do they provide value by having a brick and mortar storefront for example? How can they take advantage of location based services to provide big data insights or provide unique user experience or shopping experiences to their customers or the like? So I think there's some interesting opportunities down the line for customers than what they're looking for as well to stay competitive.

Ian Keene

Maybe I'll bring this in as the applications too, because we're running out of time. But yes, certainly to add to it, Roger, where do you see things going forward, for example, Ruckus are in the carrier public Wi-Fi space as well as the enterprise space. So we have like adoption of things like hotspot 2.0 an importance there, we have location based services. There are lots of interesting applications there and you talked about the retail side, certainly in my experience, that is they're dipping their toes in the water but they're dead scared about getting it wrong, so it's a slow moving application, but there's plenty of opportunity there I believe. Other things and other enhancements that we might be going for, like policy enhancements and things like that, what do you see as important right now?

Roger Hockaday

What's important now, we can talk kind of three years time, four years time? First of all anyone who's under the age of 25 you talk about wired and they say, what the hell's that? They don't know what you're talking about in the same way that some people in this room may not understand what token ring was. I wouldn't want to be a wired vendor today because that's just backhaul infrastructure, people don't connect by wires any more. Certainly anyone coming out of university today doesn't even know what a cable is, that's the first thing. Secondly, when it comes to future technologies, 11ac, a lot of the technologies that have been developed are not even relevant to our enterprise marketplace, 160MHz wide channels and 11ac, that's a home technology it's never going to apply in an enterprise here, so we need to keep perspective of what is actually physically usable in an enterprise environment.

I think just to the last point there, I think the really interesting thing going forward is the ability to use things like hotspot 2.0 to bring together the weaknesses of the cellular world, so LTE, how many different implementations of LTE, how many chip sets are out there? Can I take my iPhone 6, which doesn't bend by the way because it's a smaller one, and take that down to Korea and run it on an LTE network there, probably the answer is no. But I can absolutely do that with the Wi-Fi because Wi-Fi is ubiquitous. On the other side of the coin cellular providers have got authentication to the network absolutely cracked. Whereas even those of us who are in the enterprise space, go okay, am I doing TTLS authentication here, am I doing X509 certificates,

am I doing [IPSIC]? That's really complicated and users are not interested in that, what they want is simple authentication to the network and just connect to whichever network is the best network to connect to, and really that's where hotspot 2 brings the two things together. It takes the best of the cellular world and the best of the Wi-Fi world, in one respect the connectivity, in one respect the authentication, merges them together and makes connectivity on any network very simple, and I think that's going to be one of the biggest drivers, and one of the biggest enablers for connectivity over the next few years.

Ian Keene

Great, thanks, okay we're running out of time but are there any questions? Fight amongst yourself who's first.

Hans Steeman

To what extent could license spectrum solve the issue? For instance I have seen that a network was not working and the end we discovered that an infra-red repeater was using the same frequency and completely capturing the whole bandwidth.

Ian Keene

I think one thing you have to remember is Wi-Fi is unlicensed spectrum. So you can't guarantee anything.

Hans Steeman

Okay, but keep in mind that a number of operators in the future will use Wi-Fi, for instance for Wi-Fi calling and then we need a certain amount of quality of service, so there will need to be a solution.

Ian Keene

Yes, anyone like to take that?

Roger Hockaday

There's many elements of that one of which is radio isolation, it's managing to keep the frequency I'm operating on clear of everyone else and even with multi-user MIMO in 11ac the ability for me to have a conversation with two or three people in this room is based around the fact simultaneously, it's based around the fact that I can keep that radio separation. That's an absolutely key element of him being able to switch to clean frequencies, then there's all the other things at the back end of this which infrastructure is important for, which is quality of service management as well. But yes, radio of course is unlicensed; anything could happen, but in practice it's not very often that that's a problem.

Jan Guldentops, BA Test Labs

We've seen a number of attacks in which basically wireless cameras were taken off by spectrum denial of service attacks which were basically built on very cheap hardware, [inaudible] hardware and they knock down the complete camera system with it. So I think spectrum is the only issue that matters in the wireless space, it's what's been killing off the wireless working for every generation and the industry doesn't help, because they want to sell more bandwidth, so they start bundling channels to sell more bandwidth. So we started out with 2.4 which is unworkable today, then we ended up in 5 which had enough channels and then you, the industry started bundling that and now we have three channels left. So what's the fix?

Roger Hockaday

So, spot on the channel issue, why do I want to bundle 160 or even 80 because every time I double the channel bandwidth I lose 3db's in signal which reduces my data rate through. So I actually want as small channels as possible and have as many channels available to me, that is absolutely design criteria. But just coming onto this issue of denial of service, yes guess what, there's all sorts of denial of services. If I switch off the transformer that supplies power to the building no-one's going to be working.

Dominique Vanhamme

Just as a reminder, there's also a lot of military grade type of technology that has fixed this problem, and I think as an industry we have not looked into it. There's a gigantic price tag attached to fixing those problems, but the solution does exist or has been existing in the past. Back to the frequency question, frequency hopping and securing the waves has been available, it's just damn complex and damn expensive and I think that would just hinder and block basically the Wi-Fi deployment in a big way. So I think there's a trade-off here between, can we do and fix this problem technology-wise, most probably yes, is it feasible and deployable, probably not, and I think that's the balance that we have.

From the Floor

There's more important issues, surely? We're talking about smart cities, smart connected homes, tele-health, the internet of things. Government are spending billions of pounds to put smart meters in peoples' homes and we're talking about minor differences between standards here. Surely the industry should be getting closer to government to actually set an agenda to sort all this out? Because in the US there used to be tighter control, tighter regulatory regime talking about wireless standards and there used to be in other countries as well. It seems to have been left to the market, I don't blame anyone on the panel, but surely someone needs to do something to actually set an agenda here to get it all sorted out, because we're talking about serious issues here.

Ian Keene

One thing I'd like to say on that, we've been talking about global standards and agreements for wireless regulations ever since I started working in IT. It used to be the fact that the armed forces and emergency services and broadcasters are very, very greedy and never want to give up any of their spectrum, and I think it's a nightmare for regulators. To actually get movement within one country is hard enough; you try and get global agreement on. In a way I think it's amazing that Wi-Fi has actually got global acceptance of the 2.4GHz and 5GHz spectrum, you're right it's a nightmare, absolute nightmare and there's no simple solution. A global government agreement, I can't see it ever happening there's too many interested parties in there lobbying. I don't know if you guys would agree?

Dominique Vanhamme

Violently agree and I think the European Commission I think, if memory serves me well, was on a digital agenda and that included high speed access but also high speed Wi-Fi and universal internet access, but that kind of dwindled down and disappeared for the reasons you mentioned, yes.

Ian Keene

Too many lobbyists, too many bits of trunk of spectrum owned by different interest groups. It's interesting, there are breakthroughs, take the white spaces idea and what's happening there, re-use some of the TV spectrum, but that's moving very slowly and there are people against that because all of a sudden people with cellular licenses start to see people using white spaces spectrum and they've paid practically nothing for it, so they've been lobbying against that. So there's a lot of conflicting interests around regarding spectrum. You're right, in a perfect world that would happen, but we're not in a perfect world.

From the Floor

So every few years when we have a new standard on wireless we have the same discussions. We talk about everything apart from the fundamental which is, why do people still deploy it so badly and we can't use it? That's the fundamental; if you can get a foolproof method of deployment we could still just use '.11b' let alone anything else, if it was actually managed and deployed properly. So that's the real question, at what point do you guys, regardless of what technology you have to enable people to deploy properly, every time we go to any kind of event the coverage is completely terrible, how do we resolve that?

Ian Keene

Yes, I've talked to these two guys and they say if you do this, do that, okay so they know how to fix the problem in a hotel like this. But you're right in practice do many hotels have a great design Wi-Fi network? No.

From the Floor

I actually get involved in doing some of this stuff and I tell them everything that needs doing, and then when the event actually happens it still hasn't been deployed correctly. So how do you actually just get some kind of stranglehold on that that says regardless of the software we've got and the site surveys, and it all should work beautifully, it doesn't.

Jacob Rapp

Yes, I think a lot of times we as the vendors need to be very prescriptive on particular verticals and hospitality is definitely one of them that need quite a bit of handholding through the process and at HP we provide services directly for that. And when we do go in with them or we have a channel partner go in with them we can actually go in and actually design something specifically around their environment that is that. But a lot of times you see hotels that just drop some access points.

Roger Hockaday

It depends whether it's a holiday hotel or whether it's a business hotel as well. There are hotels out there that understand that what people want when they get into the hotel room is, number one I think it's a decent shower, and number two is Wi-Fi and there's nothing better than turning up at a hotel and wherever you go in that hotel it says, hey welcome back, you're connected and I don't have to do anything else. Absolutely there are major chains out there that do that today.

Ian Keene

Okay, thank you. Please put your hands together for the panel, thank you very much guys. Let's go get some coffee.

[End]