

**August 23, 2005 - 11.45 a.m to 12.30 p.m.**

**Sean M. Maloney, David Perlmutter**

[Music/Video plays]

Female Voice: Ladies and gentlemen, please welcome Executive Vice-President and General Manager Mobility Group, Sean Maloney.

[Applause]

Sean Maloney: Well, good morning, everybody, and welcome to the Moscone Center and to IDF, and it is my honor to be on stage here for the next 45 minutes with Dadi Perlmutter, my colleague and partner in the Mobility Group, to take a glimpse of where we, as an industry, are heading in mobile technology in the next three to four years, not just in the technology itself, but we're also going to try and take you on a trip around the world through the Internet to look at how our customers will be using this technology.

But before we take you where we think we're heading, let's look back a little bit at where we came from for a few minutes. And let me remind you of about 10 years ago when there was a confluence of two things. Firstly, there was a step function increase in the performance of the PC, as the Pentium processor really kicked in, at the tail end of the multimedia boom or during the multimedia boom. And then secondly there was a significantly increase in the growth rate of the PC. The combination of those two things, plotted here, was this rapid increase in computer performance that was shipped around the planet.

Now we knew at the time that would have an unintended consequence, something would come out of it, and of course what happened was that

mass availability of PCs ran smack bang into the maturing browser, and the applications that were running on the browser in '94 and '95, and The Economist just this year summarizes it ten years later as delivering on a fundamental power shift through the Internet over to the consumer.

If I were able to pick up this whole audience, turn the clock back 10 years, and we walked out of this building and we went into the cafes and bars within two or three miles of this place, where people were developing Internet applications, and you saw those caffeined crazy people who thought they were going to develop all these new applications, if you listened to most of what people were saying 10 years ago, most of it actually came true. And the Internet, to a rough approximation, has lived up to its hype.

Now it wasn't an Internet through a thin pipe that made this happen. It was really the alignment of the Internet with broadband technologies. When you got that instantaneous response on the web that was when the thing really took off, and continues to take off in almost every sector of the industries that are present in this room, that transformation is still taking place. Those of you in the media industry are not underestimating the significance of new technologies like [RSS] or the XML technologies, or the arrival of portals that aggregate news. This is still a dangerous and disruptive technology, a dangerous and destructive medium, which can also create new [wealth, new] opportunities, and transform these industries.

So it's kind of surprising that even though, to a large extent, the medium has delivered, almost nobody has broadband. And if you look at it on a global basis, there is actually a very low penetration rate of broadband. And this morning when we were talking with some of the investment community, people were saying well, why is this of any significance to the industry? And it's a very black-and-white answer because our growth, as an industry over the last ten years, has been directly linked to the growth of broadband and the ease of use with which people can get onto the Internet. This is a critical issue for all of us.

Now, you look at this and you may say, "Well, this is a global picture, so it's about emerging markets." Well, it's not just about emerging markets at all. It's also about the mature economies and what we call the Digital Divide. Here, you see the availability or the penetration of broadband, mapped against income levels back in 2002, and then a more recent update in 2004, and you see there was a direct correlation and income levels and whether or not people have broadband. So this is what I would characterize as opportunity and challenge for everybody in this room.

Now that trend of the growing importance of broadband and the difficulty of getting broadband out there that we have to address overlays the second technology transition, which Marty Cooper talked about in that opening video, which is that computing is going mobile. And what we're looking at here is a plot of the average megahertz per person computer power on the planet that all of us, aggregated, averaged around the world, carry. And you see an uncanny similarity

to the data in the early '90s which was really about desktop power. Computing is going mobile and it's happening very, very quickly over the next few years, and the likelihood is that within a five to six year period, even the dumbest phone is going to have some form of intelligence, and smart phones are going to be extremely intelligent indeed. But it has to be ubiquitous and it has to be broadband, and our belief is that it represents one of the biggest opportunities for the IDF technology community to address.

Now the way we look at it, there are two things that really, really need to happen to keep this going. If you look at the growth in the last three years of Wi-Fi, what it's done in notebook computers, what it's done in devices going into the home, what was essential to that was that it was an open global standard. So an open global standard where we as a community can work together, compete with each other, cooperate with each other, and keep this thing moving forward. That's essential.

And secondly, and maybe this is more of chip-head perspective, or microprocessor prospective, but it's true nonetheless, is we have to be fanatical about power consumption and performance, because that matters more and more and more. It's not just about being able to extend the battery life, but on yet another day when we walk in here with record gas prices, this gets to be a bigger and bigger issue for all of our customers. So I'm going to look at those two areas of the wireless networking standards and this power performance thing.

Now, clearly, power performance has been at the heart of what we've been working on with Centrino now for two generations. The original

generation and the current generation that is shipping, which is the Sonoma generation, which all of you probably see is growing very, very, strongly, and pulling through all kinds of peripherals and other components and technologies. We're right now moving into the final phases of the preparation for the next generation notebook Centrino technology, which is the Napa generation. And we are really excited about what this is going to do in 2006. Let me walk you through, item by item, the principle components of this technology.

First of all, we have put another major effort into power management, and coordinating the various components through the notebook so they work together, so they deliver better and more intelligent power management. Secondly, on the radio side, we are improving the performance of the radio. We are adding a series of new features, including some that I'll be talking about in a minute with some of our industry partners. And we're also significantly improving the graphics performance. Lastly, and maybe most significantly, we're moving to dual-core.

Marty said earlier on that people are fundamentally mobile. Computers are fundamentally multitasking, and if you look at what your computer is doing now, it is multitasking whether you like it or not. And it turns out that having that extra core is extremely useful, and you get interesting non-linear performance benefits that we're going to have a look at coming up soon.

Now all of this we will be delivering in the platform, but at the same time we're taking another big bite out of the total power consumption

of the platform, and we're also reducing the size of it by a further 20%. We feel that the components of the Napa platform are going to be exciting enough to our customers and consumers that we'll be able to keep this momentum moving ahead inside of the notebook industry, which is now very much happening around the world.

Now, clearly it's not just about the components inside of the notebook. As many of you know, we've been working together as an industry on some of the other peripherals and other elements of it. I'm delighted today to announce a partnership with Panasonic on battery technology. This is a two-part announcement. Firstly, it's a general cooperation with Panasonic on pushing battery technology ahead. Secondly, it's a specific announcement on technology that will be coming out in 2006 where we've worked to add some nickel to the positive element inside of the battery, which extends the voltage range of the battery. We believe this will give us as much as 30% improvement in the overall life of the battery. It's a critical step in our campaign to get towards eight hours in 2008. We're very happy to see this.

We've also got significant progress on the ramp of Napa. We have two notebooks up on stage that are Napa notebooks, we have a beautiful little Panasonic notebook, and this very slick, wide notebook from Samsung. A big thanks to the engineers at Panasonic and Samsung who really shifted it to get these products here and working. Overall, what you're seeing on the page here is a comparison of where the Napa ramp is in terms of total designs versus Sonoma. Now, Sonoma is the existing platform that is shipping. It's the one that is generating very strong demand. You'll see here that Napa, this next dual-core

technology, is moving even faster. We're up at over 220 different designs already underway. Those designs are going to cover multiple different segments – business computing, client computing, consumer, wide notebooks, very thin notebooks, and so on. It should be an exciting time.

The enterprise has continued to be very important. We've seen very rapid growth. Japan has continued to lead, in terms of business clients, on notebooks. But, we're also seeing significant movement in Europe and in the U.S. It's not that the desktop is dying or being replaced, but a significant base is shifting over to using notebooks.

The enterprise has very specific concerns that they like to have addressed that have to do with performance, security, and manageability. Over the last couple of years, we've obviously worked hard at that as a community. Intel has been proud of the partnership we have with many of you in addressing these problems. We've also put particular emphasis into working with Cisco who plays a unique role in the enterprise. I'm delighted today to announce an extension of that, which is the announcement of the Cisco/Intel Wireless and Mobility Alliance. To put that into some context, it's my honor to invite Charlie Giancarlo up on stage who's the Chief Development Officer and also the President of Cisco-Linksys. Good to see you, Charlie.

Charlie Giancarlo: Good to see you. Thank you very much for having us here today.

[Applause]

Sean Maloney: So, you guys are heavily involved in wireless enterprise issues, obviously, as well as consumer. What's your perspective on things?

Charlie Giancarlo: Well, you know, as your audience may know, we represent about 60% both of the enterprise wireless infrastructure, as well as about 60% of the consumer wireless infrastructure with Cisco and Linksys, respectively. We are seeing just a tremendous take-up on wireless overall. We're very pleased to be working with you to simplify the installation of wireless in both environments. Really, in both environments, the critical items are security and ease of use, out of the box. That's what our development together really seeks to accomplish is to create an out-of-box experience that is secure and easy to use in both environments.

Sean Maloney: Yeah, and I think the benefit we're getting of having two sets of engineers working together on open standards for the industry is that we see an end-to-end story and not just a compartmentalized story.

Charlie Giancarlo: Absolutely. We can try to make it easy to use inside the network, but if it's not easy to use on the laptop, of course, we don't get anywhere and vice versa. It's been interesting. It's been an interesting journey over the last five or six years. We've been working with Intel for a very long time. Cisco's relationship with Intel in terms of technology co-development started with 100 base T many, many years ago.

Sean Maloney:

Charlie Giancarlo: And went on to gigabit Ethernet and now with wireless and in fact, even with the security space as well. So very pleased to be doing that.

Sean Maloney: Well, good. Specifically, ladies and gentlemen, two of the things that we will be delivering over the next 12 to 15 months will be an enhanced [VoIP] quality technology right now over Wi-Fi. So right now, if you go outside there and kick off a series of VoIP calls, it's a kind of lucky draw on how much bandwidth you get for voice. And you really need the QoS, you need the guarantee of bandwidth so you can have the consistency of web service. So this first technology, which will be handled between the Cisco router and the client, will be handshakes so you can get guaranteed bandwidth available for the voice.

And in the second one, which is an interesting thing, is optimal IP selection. Right now, if you go out and you associate, you will associate with a stronger signal. That's not actually the smartest thing for your device to be doing. Your device should be associating with the IP that has the most available bandwidth. That's called optimal IP selection and those technologies will be along in 2006.

Charlie Giancarlo: Yeah. We've learned over the last several years in the enterprise space really what it takes to have an optimal experience in the enterprise. I'm sure we've all been in a location where we were on one access point and then all of the sudden, our laptop shifted to another one and we didn't quite get as good a service. We're going to be fixing that. And voice over IP on Wi-Fi turns out to be really, really tricky. And we've learned over several difficult years in that environment just what we

need to do to have an optimal voice over IP experience. And now this, we've together put that in place between the laptops which will be running voice over IP as well as the new Wi-Fi [phones] that will be running it and the network itself to create an optimal experience.

Sean Maloney: Great. Well, thanks very much.

Charlie Giancarlo: Thank you, [Sean]! I should just mention as well that another person from Cisco, [Jayshree Ulal], will be speaking with Pat Gelsinger tomorrow on what we're doing in the security space with Intel to tie together our self-defending network initiative around network access control and Intel's Advanced Management Technologies. So we're looking forward to that.

Sean Maloney: We're looking forward to that too. Thanks very much.

[Applause]

Sean Maloney: So as Charlie and the folks at Cisco and Linksys know really well, this wireless and notebook technology has also moved very strongly into consumer over the last 12 months, particularly over the last six months in Europe and in the United States; there's been a pretty rapid up-tick.

So all of this means that we have to design performance that can be used both for consumer and for business. And I want to take a few minutes now to look at why dual-core is different, why it's not just another linear increase on a single CPU, and what you can do with that. In order to put that in some context, I'd like to bring up on stage

my partner, Dadi Perlmutter, who's been working on dual-core now for many, many years and is really—

David Perlmutter: Central.

Sean Maloney: Right at the center of it, yeah. It's good to see you.

David Perlmutter: It's good to see you. Sean, what we're going to show the [audience] today is the benefit of a dual core. So this isn't going to be a glitzy kind of demo with things moving around, balls throwing from the inside of the screen - it's going to be a benign day in the life of an office. So what I'm going to do, on the left three you're going to see the dual-core [Yonah]-based system, and on the right-hand side, you're going to see the singular core.

So what we're going to do, first we're going to run an Excel spreadsheet which basically could be any background computation you're doing. It could be an engineering simulation, whatever. So while you run these Excel calculations, we'd really love to run a PowerPoint presentation. So we bring up the PowerPoint presentation and we work this one. So we see, first, how fast it's done. So when my stuff is already done, I want to covert it to PDF. Sean, so you do not feel miserable, you work on the second machine.

Sean Maloney: So the single-core machine's totally maxed out, so nothing is really happening there.

David Perlmutter: Yeah.

Sean Maloney: So I'll pull that one down.

David Perlmutter: So let's convert it to PDF to make it to something we could move around, shift over the Internet—

Sean Maloney: Which is now on a different one because that one's still working.

David Perlmutter: Yeah. To [be] first, so this one's still working on the other stuff. So you work on the PDF and you see that dual-core stuff is really progressing quite fast. So it's being done.

While we do that, we know that IT loves to run all kinds of things in your background. One of the things they do is backup. Backup is considered to be very much of a network thing but you need to know the CPU handles basically every frame and every packet, it computes and does a lot of kind things around this one. So let's do a backup in the middle while we are trying and we'll see how a backup is being done. And basically we all know how annoying a backup could be when you're trying to do something that you want to get done, and you slow down in a significant manner. So we are doing a backup on [my] machine. It's done. Yours is not done yet.

Sean Maloney: It's extremely nonlinear, which is an interesting side of this. So the benefit of dual core is not just in simple processing performance, but it's also your ability to handle the network. And you can see there, well, it's still got another two minutes to go, a minute and fifty seconds.

David Perlmutter: So we can definitely see a big gain in productivity by using a dual-core, and [all come in exactly the same form factors, all the work we have done on poor performance] really matters [over here].

But being live is not enough. Dual-core is also useful for consumer application. There's a nice example when you try to do a rendering of a picture using a specific application called [Cinebench]. So I'm going to use a different machine. Again, on the left you see the dual-core [unit, Napa-based on the right core], and we see visually the difference in computation between the dual-core machine and a single core one.

So the interesting thing about this one; the fact that you have a dual core means that you could process the picture two halves in parallel versus the whole picture at one time, which means you're essentially shortening the time by half the time it takes to process and render the picture. And that applies to many other applications that could be [threaded] across the board. So thank you very much, Sean. And I hope you are now convinced that dual-core is a wonderful thing.

Sean Maloney: Yeah. Okay, thanks, Dadi.

[Applause.]

Sean Maloney: So, you know, I encourage you to play around with these machines. Dadi will be coming up on stage a little bit later on to talk us through the next generation here that Paul mentioned briefly this morning.

Dual-core is a big deal. I've been working since the early 1980s, when I started as an applications engineer with Intel – on microprocessor applications one way or another, and this is a really major transition. We're very excited. The real tangible benefits it brings you to have another CPU in addition to one that may get preempted by systems tasks, and it's going to be a good thing for our consumers. And let's take full advantage of it.

Okay, so we'll pause there and come back to the notebook in a few minutes. But I want to spend a few minutes now talking about the other mobile computer, which is the phone that Marty briefly mentioned early on in that video clip. Intelligence is beginning to matter inside of phones. Now, there's an enormous amount of discussion about the bandwidth, GSM, GPRS-Edge, 2G, 2.5G, 3G. Those things all do matter, but also the performance matters inside of the device because the more capability to do applications, the more services that can be offered for the cell phone user. And there is a reasonable linear relationship between the amount of computing power in there and the ability to run some of these new applications that we're beginning to see.

Not surprisingly, we're beginning to see a fairly sharp ramp in smart phones. This was a very small category. It's going to become a very large category. The fact that you carry the device with you pretty much always just means it makes sense to be able to run more and more applications, provided they're good applications, because you have the device with you anyway so why not be able to use it for more things?

And so we are beginning to see a very sharp ramp in smart phones, and that's very much the market segment that we've been trying to help in our work with low-power microprocessors.

And we're beginning to see a substantial ramp. We talked a little bit earlier on in the year that we're heading towards a run rate of thirty million units. There are lots of new devices coming out. We had a big celebration with Motorola in Beijing a few days ago for the Motorola phone. That phone is now shipping in the millions of units, and there are a number of other phones, also, coming from Motorola and others. This particular one I'll hold up here – this is the Q-Phone that you may have read about. This is the world's thinnest full-keyboard phone. It's a beautiful device with a full quality keyboard. And it has a Bulverde microprocessor inside of it. It's a very, very powerful, flexible device.

Our focus here is this power performance fanaticism. How do we keep pushing ahead? Getting more and more performance while using less and less power? So I'm delighted today to tell you about our next generation of the processor designed for phones, smart phones, and PDAs. That is called Monahans, and we have here a demonstration of Monahans. It's in a kind of large breadboard. It's going to be shrunk over the next few months and going into phones.

This thing is another step ahead in terms of performance. And here it's running H264 D-code, full digital video. It's getting a very impressive performance, and what I'm going to do is dive in here and just see what the performance is. This is an ARM XScale core running] at 1.2 gigahertz. Now I know we're not really supposed to brag about

megahertz or gigahertz anymore, but I plead innocent for a couple of reasons. Firstly because this is a big deal inside of the phone industry; the fact that we can cram this performance into very small spaces. And secondly, the phone right now is in need of new types of applications and so on. So we don't know yet whether we're going to introduce the device at a gigahertz or above. We're not quite sure yet what configurations our customers will want, but we have enormous headroom in there to provide whatever performance will be needed over the next two years or so.

So for 2006, we see a range of components. We will supplement the Bulverde component with the [90 megahertz] Monahans that delivered the performance that you see there. We also have our base band UMTS chipset, Hermon, on target for launch in the second half of this year. All in all, we've really kept working on the power performance elements of this. What you're seeing is over the four years in this market, the phone market, we're running at about a four-times performance increase, and also a significant decrease in the total power required. So if you take an MPEG clip, for example, and decode it, a clip that would take, on the products two years ago, 300 milliwatts, the same thing can be done now in approximately 60 milliwatts. So, much faster performance, but much more efficient and a lower overall usage.

Now, having said that there is a strong interest, obviously, in video. But you don't want to decode and download little video clips all the time. It may not be the most efficient use of bandwidth. There's also a need for us to do broadcast video out to these devices, particularly in

areas where people are commuting or they want a handheld with a slightly larger screen, and they want to look at broadcast signals. So I'm delighted to be able to show you today the world's first DVBH on L-band demonstration working with Crown Castle and DiBcom.

Essentially what we have here – this is a live service, DVBH itself is capable of doing 16 video channels streamed. What we have here is five getting streamed live from Pittsburgh via satellite, and then from a [Crown Castle transmitter] – Crown Castle, by the way, are very significant in the U.S. in base station infrastructure. What we're doing is we're broadcasting live five different channels over DVBH. And I'll show you what you can get from this.

So you see this is running at 25 frames-per-second. It's a beautiful clear image. It's live, being broadcast over the L-band right now. And we're picking it up not just in this PDA, on these PDA devices here, we also have it going into this notebook computer here. This is a technology which is, again, a global standard. That's what we like about it. It's not just in the U.S.; there's a strong pickup in Europe. And we are partnering with both Crown Castle and also DiBcom. DiBcom are the silicon providers who have produced the world's first DVB-H silicon running here on Windows mobile. So, it's another interesting application. We'll be working with these two companies on applications, not just for hand-held but also for Centrino so that people moving around with notebook computers and with smart phones will be able to do, not just point to point, but also pick up broadcast signals, as well.

So, in conclusion, lots of technology developments in hand-held, more processing power coming along, more applications coming along. The phone is getting smarter. As a community, let's use that performance and use those smarts.

Okay, what I'd like to do now is to spend a few minutes talking about open standard wireless. Paul gave some interesting demonstrations this morning on wireless. I'm going to flesh those out a little bit and look at them in a little bit more detail.

If we look at the development of Ethernet going back to the early 1980s. What you see over a period of 15 or 20 years is orders of magnitude reduction in cost. The reason why that came about is that the industry put the effort in through the IEEE to develop the standard. The industry stayed together working through the IEEE on the following standards, for example the one Charlie mentioned – the 100 megabit and then moving on to gigabit. Collectively, we worked together for a global standard so that chip would work anywhere around the world. We saw exactly the same phenomenon with Wi-Fi.

We can compare Wi-Fi to the growth of wideband CDMA, a first rate technology that has been growing very rapidly. This is a combination of CDMA2000 and wideband CDMA. You can see that Wi-Fi, even though it started later, has grown as quickly, even faster than that did. That's been a very attractive thing for the industry as a whole, and we're still in pretty much the early, early days of deployment.

Paul showed you the map of San Francisco, as more and more of San Francisco deployed hotspots. But, that momentum, if anything, is still picking up pace. Today we will be announcing that we are working with UPS and SBC. UPS will be installing another 5,000 hotspots across the United States, with SBC technology. Intel and the folks in the Centrino mobile technology group will be working there on validation and joint marketing efforts. So, you're continuing to see rapid growth in hotspots, you're continuing to see the viral effects of Wi-Fi.

It's also, of course, appearing at the city level. Here is a map of the current best estimate of the U.S. urban momentum towards Wi-Fi in additional communities. This represents something like 199 programs either underway or planned, getting on towards 200 cities. It's not an area where Intel is involved in all of these, but we are working where we can to help facilitate the development of these digital communities. In Philadelphia and Corpus Christi, we have been working closely, looking at some of the benefits that Wi-Fi can bring to communities, whether it's addressing the digital divide that's described here in Philadelphia or in Corpus Christi where they see an amazing number of new applications and technologies coming out with Wi-Fi.

So, momentum is still moving ahead with Wi-Fi. It's a global thing; it's not just in the U.S. In Taiwan -- chosen pretty much at random -- we're working with the Taiwanese government. They intend, by the end of next year, to have all top seven major Taiwanese cities -- the major cities -- covered in Wi-Fi umbrellas. So, momentum for Wi-Fi

continues to move. We're moving ahead with the 802.11n process. It's a healthy ecosystem; there's a lot of innovation going on.

But, there's still a challenge to Wi-Fi in terms of lack of the signal reach and also issues like quality of service. This is why, for the last three IDF's now, we've been talking about the importance of WiMAX. We gave you an update at the last IDF where I think that we were just beginning to sample and ship Rosedale silicon.

What we wanted to do this time was not so much look at the technology, but look at how people use it. It was fascinating back in 2001 to look at the viral use of Wi-Fi here in San Francisco, the way Wi-Fi was spreading in San Francisco. It's interesting now to go out and see how people are actually going to go out and use WiMAX.

So I work with Chris Thomas from Intel mobile group on working on these key notes. And I challenged Chris to go out and look around the world and see some diverse uses for WiMAX. So we got a pretty ambitious series of demonstrations here. Hey Chris.

Chris Thomas: Thanks Sean, I'll take that from you. So what we wanted to do.

Sean Maloney: He deserves a round of applause. [Applause]. That really puts the pressure on you, right?

Chris Thomas: Thank you. The first time at Intel I've been applauded.

Sean Maloney: Don't hold your breath.

Chris Thomas: I thought the best way to show this would be to look at all four corners of the world, and take a look at some trials that are rolling out right now using both pre-WiMAX and WiMAX standard equipment, using the Intel Pro wireless 5116 from some OEM partners of ours, including Alvarion and Redline who helped us with this demonstration.

But more than just looking at the technology, what we wanted to do was actually take a look at how these different communities and different areas were actually using the wireless technology. What we wanted to do first is take you to a city that you and I recently visited. A city in central China, essentially the size of New York City, that's been undergoing a dramatic transformation over the last 50, 25, and even five years. In fact over the last five years, this economy has grown at over [15%] per year, and the level of capital investment has grown at over 20% per year over the last five years.

And what I want to do is actually show a number of pictures that show the dramatic transformation of one of these tier-2, inland Chinese cities that's actually going to have a major impact on the world economy over the next decade.

This is actually a city that's going to have a major impact on Intel over the next few years, as well. We're putting in a large manufacturing plant there, that's actually going to be assembling and testing many of the chips and the devices that you see on stage here today. The city is [Chengdu] in the Szechwan province of China. To explain what they're

doing there with broadband wireless, rather than me talking, I'd actually like to go to Chengdu right now.

Sean Maloney: Fasten your seatbelts.

Chris Thomas: Sean I'd like to introduce you to the vice mayor of Chengdu. Vice Mayor [Zhu] and Robin Martin, our factory manager there, to have a little conversation with you about WiMAX.

Sean Maloney: Hey Vice Mayor, great to see you again, and we're very honored for you to take time out from your busy schedule running one of the world's fastest growing cities. And it's a big honor for us to talk to you, particularly as I understand it's the middle of the night over there in Szechwan.

Robin Martin: Hi Chris and Sean. And greetings to everyone there at IDF. I have here beside me the Vice Mayor of Chengdu, Mr. Zhu, who is in charge of the IT industry as well in this city. We are standing here along the corridors of our newest Intel assembly and [chip] facility in Chengdu. A lot of preparations are going on right now to enable a successful start up at the end of the year. Now I must say that wireless broadband is going to be instrumental to ensure the success of Intel's Chengdu growth, just like the rest of Chengdu is also growing. I would like to turn over to Mr. Zhu.

Vice Mayor Zhu: [Chinese Language].

Robin Martin: [Chengdu] is one of the fastest growing [cities in China] determined by the Chinese Ministry of Information Industry. It has a perfect backbone network for communications and television, and an e-government portal that supports digital community and digital cooperation. According to a recent report, Chengdu is ranking the sixth among Chinese cities in [information migration] [unintelligible]. [Wireless] broadband is a technology enabling [connectivity with flexibility], efficiency, and economy for families and cooperates. It is a very effective solution for the last mile and has become a key measure to accelerate informatization. I see this technology to be an enabler of economic growth for the City of Chengdu and beyond. Through the use of wireless technologies, the city government expects the application in a wider scope of [distance communication], health [care], and ambulance services.

For example, hospitals can use wireless broadband for distance medical service to provide medical guidance and tracking services for ambulances at remote areas. The patient's symptoms and other key information can be timely transmitted from ambulance to the doctors at hospitals through the wireless broadband for rescue.

Sean Maloney: Okay, well thank you very much. Really appreciate it. Thank you.

Robin Martin: [Thank you, Sean.]

[Applause]

Sean Maloney: It's three o'clock in the morning for [the mayor] so you can forgive him for talking a little bit long there.

Chris Thomas: So for the next example, Sean, and it's already going here so we won't prelude it, but millions of chips will be rolling off that line over the next year. Many of them will get put into large containerships, and many of those containerships will end up at the port of Rotterdam, which is actually the largest port in Europe. And the port of Rotterdam is going wireless. In fact, the entire canal system geminating out of Rotterdam, the inland canal system of Europe will actually be enabled with WiMAX over the next year.

We'd actually like to go right now to Captain Benard van Baalen of the SS Villsingen, who's going to talk a little bit about how WiMAX is changing what it means to be a captain [with the system].

Sean Maloney: By the way, this is real.

Chris Thomas: This is all real. This is all live. And it's night. Captain, how are you?

Benard van Baalen: Hello, California. This is Rotterdam.

Chris Thomas: Hello. Can you talk a little bit about why WiMAX is changing what it means to be a captain there?

Benard van Baalen: This is the largest inland bunker vessel, [used] to fuel large containerships. That demands a lot of paperwork. In the past, our only choice was to send this information via [GSM mobile link], which is

very slow and expensive. We now have easy access to real-time schedules, weather and water depth reports. With WiMAX, we simply and quickly can send data through high bandwidth wireless. That saves a lot of time and expense for any ship traveling this harbor and inland.

Chris Thomas: Well, we know it's night there, so thank you, sir, for joining us, and thank you for taking the time out of your busy schedule to talk to us about WiMAX.

[Applause.]

Benard van Baalen: You're welcome.

Sean Maloney: So when I said come up with stuff from around the world, you really came up with stuff from around the world, right?

Chris Thomas: We did, but we're not done yet. [Laughter] WiMAX is not just about economic progress. It's actually extremely important for education as well.

Chris Thomas: I've shown you a couple the WiMAX is being used for education. I'd like to take you to Argentina.

Sean Maloney: Okay.

Chris Thomas: We've actually been working with our partner there, Ertach, who's actually planning to roll out a WiMAX network based on Intel technology.

Sean Maloney: Actually, what's amazing about this stuff is it actually works. Maybe we haven't quite choreographed it well, but the China one—what were we getting inside of Chengdu? The image was jolting around because there was an issue with getting bandwidth back out of China. But inside of China—

Chris Thomas: We're actually getting 10 megabits to the site live on standard equipment there. Very low jitter, very low latency, and actually, into Rotterdam, we were getting 5 megabits per second. So extremely high bandwidth rates over wireless broadband.

Now, going to Argentina, we'd like to actually talk to a school that was one of the very first schools enabled with WiMAX in Argentina. Outside of Buenos Aires in Argentina, pretty much, broadband is unheard-of, but Ertach is working to bring broadband across all of Argentina based on Intel technology. Let's go now to the school in San Miguel De Medeo and talk to the director of the school and a representative from Ertach. Ignacio and Senora Villar, could you talk to us a little about how WiMAX is being used to change education in Argentina?

Ignacio: Hello, Chris. Thanks for this great opportunity to show our progress with WiMAX on an extremely stormy day today here. As you mentioned, this is a remote rural town, but since WiMAX first arrived,

the town is extremely fast, with ten new cyber cafes and 150 new computers. But perhaps the biggest transformation is right here at the institute. This is the director of the school, Mrs. [Villar], and some of her students, as you can see.

Senora Villar: [Spanish language]

Ignacio: Mrs. Villar is saying it's been pretty exciting around here since WiMAX first arrived. All the school had before was analog dial-up connections which didn't support much more than two [PCs] on the Internet at once. Students now work in groups and have acquired further analytical word processors integrated with other educational institutes even as far away as Paris, France. Access to the Internet is so important for the educational experience. WiMAX is definitely changing how we do education [here].

Chris Thomas: Thank you for joining us and good luck with your studies.

[Applause]

Chris Thomas: I promised you four corners of the world, so we do have one more.

Chris Thomas: It's in Canada.

Chris Thomas: So Canada actually has the highest broadband penetration in the western hemisphere. We talked earlier about how we need to make

broadband ubiquitous, and even in that large country, there's large areas which simply don't have broadband access. And I'd like to talk to a representative from Rogers Wireless, the largest cable and wireless company in Canada, who's going to talk to us now about what they're doing in WiMAX to bring broadband to places where it hasn't been before. This is Senior Vice President David Roberson. David, how are you today? Could you talk for a few minutes about how Rogers is using WiMAX to bring broadband access to Canada?

David Roberson: Absolutely. Hi Chris, and thanks very much. It's a beautiful day here on Tobin's Island. It's sunny. I'm sitting on my deck with my shirt on doing something I never thought I'd ever be doing before.

WiMAX is a very exciting new technology for us, really because it does two very important things for us. First of all, it allows us to expand into areas that are not covered by our cable television footprint. That represents an almost tripling of our opportunity. It will also allow us to operate portable or ultimately a personal broadband experience to people allowing us to, again, likely triple the number of people we can sell to because now we're selling to individuals rather than households.

We think together that coverage and portability aspect will provide a very exciting opportunity for Rogers and provide tremendous new services to our customers across the country.

Chris Thomas: [Well thank] you. You have us sold. We appreciate your help and Rogers help in running the demonstration. Thanks a bunch.

[Applause.]

Chris Thomas: So as we promised, we brought it to you from the four corners of the world – that's the world's first four-continent broadband wireless demonstration. We'd like to thank Rogers, Enertel, Ertach, and China Netcom for all the hard work to do to make that demonstration possible.

Sean Maloney: [Great, thanks a bunch.]

Chris Thomas: Thank you.

[Applause.]

Sean Maloney: Okay, so that demonstration was a little bit longer than we would have liked, but it's extraordinary the stuff is working, and it's extraordinary how far the industry has come over the last year or so. All of that was live, as you can see, and it was all done over a 802.16d or pre-802.16d] stuff. So pretty good.

The next thing obviously there, which we'll talk about either the next time or the time after, is the mobile version 802.16e As ever, the Koreans are pretty much in the lead here. Korea Telecom has announced the plan to do a commercial deployment – the brand name is called [WiBro in Korea]. It's actually 1802.16e based. Dr. Hong spoke at the last WiMAX forum on it, so we'll be keeping a close eye on that to see how that rolls out.

What I'd like to do now is just to leave you with another word from Marty, and then Dadi will come and will talk through our next technology. Thank you.

[Video plays.]

David Perlmutter: There's not too many occasions when one [person can talk about the new microarchitecture]. It happens about once or twice a decade. So I'm lucky enough to have it in front of us.

We talked about it multiple times, but I want to repeat it again:

there's a continuous need for computing performance across all market segments. It's when doing media. It's when processing very complex [fast] communication packets going through the net at 10, 100, and more megabits per second. It has to do with big servers. It has to do with small notebooks running all these day-to-day life, in the office, or [when they're doing video stuff].

The problem that nothing comes for free, that increased performance comes with an increased power. We have seen that and kind of bounced against this wall, first in mobile, [where] you want to have your notebook really small light, good battery life. So back in 2003, we introduced [internal mobile] technology that we did not only flatten the power, but also reduced the power of the microprocessor on the rest of the platform. So the result – we ended up not only with a higher performance, but we basically took the thickness of the notebook from about 1.8 inches to about 1.1 inches today, and we're still trying to

push it even lower. And we put into that better and better microprocessors and graphics and other components to do that.

The same thing happens in servers and desktops today. In Paul's keynote, he talked about the growing power cost in really supplying all this electricity to the big server of Google. We talked about all these big things, and we talked about in the future continuing to do media stuff over desktops, the EPC in the digital home, etc., etc.

So, basically, the same thing that we've shown in the past with mobile technology, that we increase performance while shrinking the platforms, we're going to do the same for servers and we're going to do the same for desktops -- and Paul showed the wonderful example of the extremely thin desktop that is going to be used in many homes in the future. But, you cannot do that with today's technology. You really need to make the same paradigm shift that we have done with Centrino mobile technology two-and-a-half years ago. We're going to do it again next year, but that's going to be across the Intel market segments that we support.

So, we used to live in the world of single-core processors that have been growing in performance and improving in performance and, as I mentioned, increasing the power requirements. We realize that going to dual-core (we did it on a desktop, and we're going to do that later this year on a server) is one of the good techniques to improve performance but also improve the power performance. So, you could control the power better while still delivering better performance in a multitasking and multithreaded environment.

In mobile, this first generation dual-core is not sufficient because you have to be much more sophisticated in how you put the dual-core together and control the power of it with sophisticated power management so that you can really put it into the same power envelope as its single-core predecessor. Last, but not least, we're going to introduce a completely new microarchitecture that is going to support the whole spectrum of products from notebooks to desktops and to servers in the future.

This is resulting in a significant increase in power performance. I will not go into it in much length, but Paul mentioned that we are delivering at least 3X power performance compared to our optimized [Banias] architecture two-and-a-half years ago, which was already very well optimized for power performance. We're going to do much better in power performance in the desktop compared to a [notebook]-based Pentium 4 back in 2003, with the same range of 4-5X on a dual processor server compared to the technology we had in 2003.

But, power performance is not enough. I mentioned these additional requirements for performance. We do all that, keeping power flat or reducing it in a large manner, while still continuing to add more and more performance in the machine as required by the next generation applications.

This is a mobility group keynote, so I'm going to focus on the evolution or the revolution across the mobility group. We saw there is a power performance optimized microarchitecture in Banias. We

moved to Dothan, which was an improved version. Early next year, we're going to put the next fully optimized dual-core processor into our Napa platforms and we have shown, Sean and I, the [goodness] of this platform architecture going forward.

This one is really relying on [new innovation] of dual-core technology with shared SmartCache that enables the cache to be shared very effectively by the two cores and dynamically allocates very scarce cache space between the applications or threads running together. It also relies on the sharing of data across these two cores in future applications.

And the jewel of the crown will be when we move to the new microarchitecture which will serve products beyond mobile. And all being done by a team, which is -- you know, power performance is the bread and butter for the last 6 or 7 years, and they really capitalize on the knowledge and the ability to do very power optimized, good performing, while still very good performing architecture.

So I need to give you some glimpse of what was done in order to be able to do that. As Paul mentioned this [core] micro-architecture is going to be supporting three different products: Merom for mobile, the Conroe for the desktop, and the Woodcrest for the dual processor server applications.

So we have specific features for each of these products which are unique to these specific market segments. We have the specific file management, and some of them are unique to the Merom technology

to really manage the power to the next level, to really keep the power flat and improving on battery life, a most important thing for a mobile user. All the way and the Woodcrest will have [unintelligible] features, extended [addressing] and all the [unintelligible] that are needed in server applications.

So each of these implementations will have a specific for the needs for the specific event. But all of them are sitting on the big base of a common microarchitecture, which is a leap forward from what we have done before, which is really wider, and deeper pipeline. Deeper when compared to a Baniyas not to the [net burst]; it's way shorter than the [net burst]. Still relying on the basics of the [out-of-order] machine, but, in order to do a very effective power performance in an [out-of -order] machine, to really get all the benefits of the performance, one needs to balance the amount of speculation that's really done, because if you speculate too much, every speculation that is [not well speculated] is basically a waste of power. So we have done more and improved techniques to really improve some of the memory disambiguation that allows you to be able to do [writes] ahead of [reads] and doing that in a very efficient manner allows you to improve performance, while keeping the power limited.

We do have advanced power capabilities, because this will have way more transistors. So more transistors means more power, and we have enhanced the power capabilities of this device. We are moving or improving on the techniques what we call --normally off transistors; you turn them on only when they are needed.

The subsystem I mentioned earlier, relies on technology we developed for the Yonah, which is basically sharing the data across the two cores, but also the dynamically locating the space. So if you run a single [thread] application or a single task, you get the whole [unintelligible] supporting your application, and when running two or more applications, it's of course, dynamically allocated.

And last but not least, in order to be able to feed the data that such a powerful machine, powerful from a performance perspective, not from power dissipation perspective, you need to supply the data. And we improved significantly memory latency in order to be able to get more and more data. And we applied techniques in reduced latency, free fetching of data, and some other techniques to get the right balance performance between the microarchitecture and the memory on the other side.

And last but not least, since we're talking about a shared core, or shared core technology across the market segments, we are going to basically share all the [unintelligible] that Paul was talking about, and I bet Pat is going to talk about tomorrow, ranging from the VT, AMT, and EM 64T across all this market segments. So there is going to be way easier for the software community to develop something consistently across the market segment, let it be a mobile or desktop in a client space, or a server in a server space.

So, summarizing the whole talk between what Sean and I have been showing, it's clearly ubiquitous mobility is relying on two fundamental things. Extremely power performance efficient computing, whether

this one is a cell phone running these wonderful video streams that Sean was showing earlier, or a notebook, it's extremely important to get the performance needed [in] the right power envelope with the right power dissipation to get the battery not consumed too early.

Phones are getting smarter because of these capabilities of computing power, and we are getting tractions because of the unique performance that we can deliver without [CPUs today -- smart phones]. The other factor, which is the communication, and the more it is based on common standards globally, you can connect with the same device anywhere you go. And this is extremely important because this is the way you could get the networking and then the notebooks, or any communication device, to be spread around in a similar manner that have done in WiMAX.

So next year is an extreme opportunity for all of us to develop new mobility platforms and very successful – it's going to be a very exciting time. So as a finishing note, I would like to show a nice video animation of dual-core, which is running on the [Merome] box. So please run the audio so we can all see the [benefits] –

[Video plays]

Female Voice: Ladies and gentlemen, we are breaking for a brief intermission before the beginning of our lunch keynote. Please pick up your lunch outside the keynote doors. In addition, ladies and gentlemen, the sessions will not begin until the keynotes have concluded. Once again, ladies and

gentlemen, the sessions will not begin until the keynotes have concluded. Thank you.

[Music]

[End of recorded material]