Intel IDF – 3.7.06 Gelsinger Keynote Presentations

[Applause.]

[Video.]

Female Voice: Ladies and Gentlemen, please welcome Pat Gelsinger.

[Applause.]

Pat Gelsinger: Closer than you think. Last year we described compelling new platform technologies. This year we're delivering those. We're combining those with process technology, world-class and high-volume, at 65-nanometer, from our network of factories worldwide. Further adding to that is our next generation microarchitecture. Compelling, power-efficient, microarchitectural capabilities. It's a strong year for Intel when we launch a new process technology. It's a strong year for Intel when we launch a new microarchitecture. In 2006, we're doing both. New process, new products, and new platforms. Closer than you think.

I love IDF. It's all about technology. It's all about us getting together and talking about inventing the future together. It's one of the highlights of my year, This week, we get to come together and spend time at IDF. During our time together this morning, I wanted us to look at the key aspects of the enterprise. I wanted to start out by looking at communications infrastructure, storage systems, servers, and clients as well.

Let's start out by taking a look at communications infrastructure. In our history as a technology industry, we've had many great technology battles. Beta vs. VHS. USB vs. 1394. OS/2 vs. Windows. But in the communications area, battles have always been sort of boring, because they've always had the same conclusion: IP wins. In fact, as we were preparing for the speech today, we went up to the fountain of all knowledge, Wikipedia, and we found, in fact, that they had the title that's just the perfect match for this: "How IP Kills and Eats Competitive Networks." Because IP has won every networking battle -- X25, [DecNet], SNA, OSI -- all of those were just overwhelmed by IP. TCP/IP has won, and will continue to win, and now has become a fabric and a capability, for services to be offered on top of that capability. At our last IDF, we talked about Voice Over IP, and we described Skype, and demonstrated broadband, business-class audio. VoIP continues to grow very nicely. Today, Skype is adding 200,000 users per day, and it sits at almost 250 million downloads around the world. And, such as our announcement a few weeks ago between Skype and Intel, 10-way conference calling, adding features never before possible, as well. This is the first generation of services on top of IP.

The next one: IP TV, where TV is being laid on top of that IP infrastructure as well. As I travel around the world and meet with service providers, communications infrastructure providers, I'm amazed at the interest, momentum, and the growing enthusiasm and build out of IP TV capabilities. And it's not just about delivering TV over IP networks. It's all of the services that go with it -- gaming, shopping, music, pictures, video, all of those capabilities as adjuncts,

as addition, as revenue accelerators with the IP TV. Moore's Law-type growth of IP-based services.

This leads us to a very simple conclusion. It's everything over IP. A new services platform that becomes the applications of the future. Applications – and we're seeing an amazing number of these coming from all over the industry, from big players like Microsoft, making Office now a service over the live network, or mapping and location services with Google. Small startup players that some of us might have never heard of, such as Stream Card, with global financial services, or Airset calendars and management. And what does it take to deliver these next-generation services over IP? Requires a new service infrastructure on the client, new platform capabilities such as Ajax, broadband networks to deliver the capability, and finally, flexible and robust infrastructure capabilities.

We've talked about ATCA – modular communications platforms – and the benefits that it brings for service providers and TEMS, and in many regards, we've delivered on those benefits and those cost savings. But the uptake has been modest to date. Now we're seeing that the maturity of ATCA, along with this transition to services over IP is creating excitement, enthusiasm, and growth in the ATCA market segment. In fact, IDC predicts that ATCA will be a $6 billion hardware industry by 2010. We're also seeing the commercial deployments from megacarriers like NTT DoCoMo and Korea Telecom as the retool their infrastructure with ATCA.

We're seeing a wide array of ATCA products emerge in the industry, and I thought we'd have just a little bit of fun this morning and get to take a look at some of these new products, ATCA-based cards, coming from many different operators, many different platform providers in the industry. So, the first ever ATCA fashion show.

[Music begins.]

Male Voice: Norm's ready for anything with this ADL link 6890. This blade brings high performance to a new level with its dual Xeon configuration. Note the exquisite detailing with the Intel E7520 chipset. The Promenta ATCA 7010 from Radisys looks stunning on Kathy. Dual Intel processors and a powerful memory architecture for applications, such as traffic aggregators and high-bandwidth [line card] applications. Jeffrey's stepping out in style with the HP bc2100. This dual-Xeon-based server blade is a key component in HP's advanced open telecom platform, IMS applications and 3G core network elements. This is the blade for you. The [PFU AM710], an ATCA CPU blade features dual Xeon processors, so performance will never be a problem for Craig. He can count on Intel's best for his ATCA applications.

Check out Randall and his fetching 5320 ATCA note card with not one, not two, but three 64-bit 133-megahertz PMC interfaces and an intelligent platform [memory controller]. And here's Tom carrying the ATCA 4130 from DTI with dual Xeon processors, the latest in ATCA fashion. Dress it up or dress it down because the ATCA 4130 has auto negotiating Ethernet controllers. Chuck will turn heads with this

Motorola ATCA 717 with the 1.8 gigahertz Intel Pentium M processor and 16-port manage gigabit Ethernet switch, this blade is ideal for both wire line and wireless infrastructure. Targeting the needs of next generation telecommunications marketplace, Jim is resplendent with the CCPU flexcore ATCA-FM30 blade. This stunning beauty delivers high performance and high levels of redundancy. Finally, Doyle brings us the [Contron] AT 8001. Balance is key to any successful ensemble sporting dual [LV Xeon] processors, this baby delivers a striking blend of performance and high throughput IO. Ladies and gentlemen, the ATCA Fashion Show.

[Applause]

Pat Gelsinger: That was fun. Those were all cards from the industry. Intel, as well, is delivering ATCA products to the marketplace. We're delivering Damascus, our dual processor LV, dual core platform based on this [Sossoman] processor – a doubling of performance four X the performance per watt – almost three X the [SIP call] processing capabilities. That and as many as 10 other ATCA products coming from Intel such as [Thermopolis], our [DP Xeon EM 64] platform. [Barnegut], in chassis, deep packet inspection capabilities for IMS applications. A wide range of ATCA products from the industry as well as from Intel.

We've also launched several third-party vendor validation centers around the world, such that carriers and operators and TEMs can bring their products in to do testing and interoperability. We have those centers built up in China, Belgium and the United States to allow the

adoption and acceleration of ATCA into the infrastructure of tomorrow.

As IP applications grow, so do the growth requirements for those as well. Last year, Paul Otellini talked about the digitization of information and how it's been the driver for storage and bits and bandwidth. This year, we've also seen that new requirements driven by public policy, such as Sarbanes-Oxley, HIPAA, business continuity have driven storage requirements even further. Storage today is approximately a $60 billion industry. Tremendous need and opportunity in storage, and particularly an unmet need of bringing enterprise-class storage capabilities for SMB and SoHo applications as well.

To meet the needs for SMB and SoHo and home, today I'm very happy to introduce the storage capabilities of the entry storage system called the SS 4000E, also code-named "Baxter Creek." So here in this little baby, our energy efficient X-scale processor storage network-attached platform, offering up to two terabytes of storage in this small little box running RAID system level 5 capabilities – enterprise-class storage for the masses.

Also, see that there is a great opportunity for accelerating standards in the storage industry. With this in mind, the storage bridge bay working group was formed led by storage leaders such as EMC, Dell, Intel, LSI Logic; and this week announcing the SBB specifications. The specification defines mechanical and electrical interface standards that allow storage controllers to be standardized as well as many

controllers to be supported from a common hardware and mechanical infrastructure such as I-SCSI, Fiber Channel, Channel [SAN], [NAS], J-BOD, et cetera – addressing the mid-range requirements of the storage industry. Much like the establishment of standard high-volume servers a decade ago, we see the same opportunities and growth emerging as we bring standards to the storage industry as well.

Now let's take a step outward from the network. We've looked at network infrastructure. We've looked at storage and looked to the server platforms that allow us to deliver the content and the services based on that infrastructure. Today, the IT manager is under pressure from many, many different fronts. His data centers – crammed, full. Capacity management, asset management. He has the challenges of budget where almost 80 percent of the IT budget is spent just on running the services that they have in place today – with the cost of electricity being the second highest consumer of that budget and labor costs being the first. To respond to those pressures, we see that IT is investing in new capabilities like virtualization. Looking at virtualization as a means to deliver new usage models. Things like dynamic resource allocation inside of the data center, or fail-over services, or server consolidation of platforms.

With that in mind, Intel architected the VT Capabilities: virtualization enhancements that we put in hardware to complement the capabilities of the virtual machine manager layer. That reduces the size and complexity of the VMM, allows it to become more robust and, ultimately, like Centrino brought wireless mobility to the mainstream,

we believe that VT-enhanced hardware will bring virtualization to the mainstream of the data center of the future.

We began shipping VT hardware last year. Since then, the response from the industry has been very enthusiastic. Frankly, as we pulled together all of the people utilizing the VT capabilities in our hardware, I was shocked to see such a full list of companies now taking advantage of those capabilities. This is in our client products. We've just released updated to our server products, with Paxville that we now have virtualization enabled in our server hardware. We have rapid adoption throughout the ecosystem. Companies are bringing their products to market to utilize and take advantage of the VT capabilities. This year, we'll deliver over 13 million VT-enabled CPUs to the industry. Over 90 percent of all of our servers this year will be VT-enabled. VT: the industry standard reference hardware for server virtualization.

But we think of VT as a roadmap. This is just the beginning. We have many enhancements, refinements and improvements that we will deliver as part of virtualization in our platforms as we go forward. Today, I'm very happy to announce the next step in that roadmap, called Intel Virtualization Technology for Directed I/O. Today we're releasing the specification for VT, also known as VTd, or Virtualization Technology for Directed I/O. This extends the Intel Virtualization Technology to the I/O subsystem. It allows I/O devices to be assigned to virtual machines, and again improves robustness and performance of virtualization capabilities in the platform. The specifications are released and available today.

As we look to virtualization, it's all about working with the OS and VM providers. Today I'm very happy to have a major announcement between Intel and VMware, about our cooperation in virtualization. Please join me in welcoming Diane Greene, president of VMware.

[Applause.]

Diane Greene: Hi, Pat.

Pat Gelsinger: Hi, Diane. You know, we first started talking about virtualization seven years ago. I've been looking forward to this day for a long time.

Diane Greene: Yes. It's quite a privilege to be here on stage with you, Pat, discussing our joint collaborations. Today we'll talk about our roadmap, and how we're supporting the new VT technologies, and we'll also talk about how we're going to market together. I believe it was seven plus years ago that I sent that first e-mail, and here we are.

Pat Gelsinger: That's very good! Boy, I'm so glad to see our alignment on virtualization: the alignment with VMware, and the support for VT in our hardware capabilities. As you know, we've been shipping hardware with virtualization since last year. What kind of impact do you expect that to have on VMware, and on your customers?

Diane Greene: Our customers love virtualization, and anything we do to make virtualization more enhanced makes it all the better for them. We've been looking forward to the VT technologies for some time. In fact, in

2004, we announced that we would be supporting VT here at IDF. Now, today, we're shipping in our products, our power users' workstation product 5.5 ships, and then we also have a hosted basic partitioning server product that's freely available, VMware server, that's shipping. Then we also have an absolutely awesome rev to our virtual infrastructure, ESX3 Virtual Center 2, coming out shortly. This year we'll have support for VT in that as well.

Pat Gelsinger: That's very exciting, Diane. ESX support for VT in 2006 – this is the announcement that I've been looking forward to for quite a long time and a big deal for our mutual customers. Thank you very much for that support. Working together on VMware server – going free is a bold move. That's a pretty compelling price point.

Diane Greene: Yes, it is, and it really speaks to the traction that we're seeing with our virtual infrastructure, our bare metal ESX 3/Virtual Center 2, that we were able to take this hosted server product that does basic partitioning, make it freely available. Our customers have responded tremendously over a few weeks, over 100,000 downloads of that product.

Pat Gelsinger: Excellent.

Diane Greene: Yeah. It will really let people build interesting virtual machines and share them and really get a feel for the benefits of virtualization. To make that more concrete, we actually have a joint customer. They're a grape juice manufacturer, Welch's. And they've been able to drive their cost of ownership down by up to 30 percent. They've driven their

utilization on their servers from 5 to 10 percent on up to 60 percent. They can do instant provisioning with the virtual machines. And then they also – I mean they're a pretty broad user of the technologies and products. They've implemented disaster recovery. In fact they said that now their recipes are continuously available as they manufacture. So that's been a great customer. And, you know, we have 20,000+ customers, and a full 25 percent of them, for their Intel workloads, they've standardized on the virtual infrastructure. And we believe with the VT technology, it's going to drive it right up to 100 percent.

Pat Gelsinger: Not only the collaboration on today's products, but also the collaboration on some of the forward-looking technologies as well, such as the next step with VTd, the directed I/O capabilities. And what do you think that will add to our capabilities?

Diane Greene: Oh, that's tremendously exciting, the VTd. We've really been looking forward to the I/O virtualization. We've been giving you feedback on the specs as you've gone along, and we have the final spec, which you just announced. And we're already implementing and plan to have that support in '07.

Pat Gelsinger: Well that's tremendous. Exciting progress by our teams on this year's products, the '07 products. But the other piece of today's announcement, Diane, is the marketing and sales collaboration as well, bringing our teams together directly in the customers' opportunities.

Diane Greene: That's right. In addition to our complimentary virtualization technologies and products, we're going to go out there and tell the

world what this is, how to use it, what the benefits are, and just totally expand bringing the benefits to everybody.

Pat Gelsinger: This is great. Top to bottom VT capabilities, VMware is the leader in virtualization software in the industry, a broad partnership between us. This is an absolutely great day, Diane.

Diane Greene: Great for me as well. Thank you very much, Pat. Thank you.

Pat Gelsinger: Thank you so much, Diane.

Diane Greene: Thank you.

[Applause.]

Pat Gelsinger: Thank you, thank you, Diane. Great progress with Intel and VMware's announcement today. We're also extremely pleased with collaborations such as that with our long-term partner in IBM. IBM, a key industry partner who's excited about virtualization and also about the VTd capabilities that we're announcing today. IBM may be the deepest and longest heritage with over 40 years in mainframe virtualization experience. Not only are we collaborating with IBM around technology, but also around usage models as well. One of the key drivers for them for virtualization as well as for blades and high-density computing has been this move to server consolidation. And with that in mind, IBM has launched and delivered the blade center platform, which has been extremely well-received by the marketplace. They're announcing their intention to take our next-generation LP

Xeon processor and add it to the blade center line of products. Here I have the Sossoman-based blade or LP Xeon, and this is in the standard IBM Blade Center offering, the dual processors, with the high-density blade capabilities that they are going to be adding to the blade center family of products. Compelling performance per watt for high-density data-center computing.

We're also working with IBM to extend that capability through Woodcrest and our next-generation microarchitectures as well. New usages like fail-over, dynamic load balancing, and server consolidation. Key platform for server consolidation has been the multiprocessing platform. For this we launched our Truland platform last year. Truland has become the industry standard for MP platforms. We've delivered almost a quarter million of these platforms since its launch last year. We upgraded this platform with the dual core Paxville MP processor last year. Has world-leading RAS capabilities and now virtualization capabilities as well.

Today I'm very happy to announce that IBM, based on Paxville MP, is releasing the record-setting four socket, TPCC result. This is based on our dual-core Intel Xeon 7000, based on the DB2 database, 273,000 TPMCs. This is 15 percent faster than the prior record world-setting four socket performance using the Paxville MP processor. Building on that platform, we'll be delivering our next generation MP processor later this year. This is the Tulsa processor which will upgrade directly into the IBM platform and into the Truland platform. It has a 16-megabyte shared cache behind our dual processor capabilities. Also

Pellston improvements, cache reliability and permits to have world class RAS capabilities.

As you move to server consolidation usage models, virtualization where you have multiple environments, you'll end up relying more and more on the RAS and integrity of the underlying platform capabilities. As you can see by this brief comparison, Intel platforms are the unquestioned leader in delivering RAS capabilities – real time data cache error checking, DIM sparing, memory mirroring, and a broad set of capabilities in the platform that deliver RAS capabilities that are unrivaled in the marketplace today. MP platforms – the foundation for server consolidation.

These capabilities of RAS reliability are available not just in our MP platform, but also in our DP platforms as well. To help me show you our DP platforms, I'm very pleased to have Gary Campbell, the CTO for the storage and server division for HP, who's going to join me and help me describe our next generation Bensley platform. Please join me in welcoming Gary Campbell.

[Applause]

Gary Campbell: Hi Pat. Thanks for letting me come.

Pat Gelsinger: We've had such a long-term personal relationship as well as corporate collaboration. It's a great privilege for me to be able to share the stage with you here and talk about some of our next-generation technologies.

Gary Campbell: HP is really excited to be here. We've had a lot of joint collaborations over the years and many successful products. We're excited today to repeat that experience. We're going to launch our entire line of ProLiant platforms – seven of them: three work stations and our HP Blade Systems on Woodcrest and Bensley.

Pat Gelsinger: That's absolutely compelling and I'm excited to see that whole range of products. We're just making it easy for our mutual enterprise customers to take advantage of some of these next-generation capabilities.

Gary Campbell: The markets have really responded. Every 20 seconds, a new ProLiant comes off the assembly line.

Pat Gelsinger: So in the course of our keynote today, 300 more are coming off the assembly line. You guys have really embraced dual core vision and in a big way, haven't you?

Gary Campbell: We have. As Justin Rattner was saying, with dual core, 60 percent of the power is now in the platform. We've redesigned the ProLiant platforms to address that problem and to take advantage of the dual core. So we've enhanced the reliability, the memory subsystems with the storage. We've gone to small-form-factor SAS drives to both take power out and add performance. We're enhancing the SCSI and the Ethernet capabilities. This gives our platforms the ability to take power out of the platform and take advantage of the performance and the power savings of the Woodcrest processor.

Pat Gelsinger: So, system engineering to deliver a huge bang for the buck for your customers?

Gary Campbell: Yes. We believe that the HP ProLiant platforms, based on the Intel processor, are the most trusted server in the adaptive enterprise. We have a benchmark for you.

Pat Gelsinger: We can show them here? You brought them along?

Gary Campbell: Sure.

Pat Gelsinger: Let's take a look.

Gary Campbell: We have some of our new platforms. Here in the middle we have an XW 8400 dual processor, dual core workstation running Woodcrest. What it's showing is a Monte Carlo analysis spreadsheet and a trading application that's fairly typical of a power user in the financial industry needing a lot of information really fast to make trades. Here we have – these workstations don't have enough power by themselves to run the big simulations – so over here we have an HP ProLiant DL380 gen. 5 running the Bensley platform and the Woodcrest processor. It's running a SunGard risk modeling application. And over here we have some of our competition, one of our main competitors, Sun, and using chips from one of your main competitors, AMD. It's configured identically as the ProLiant. We had to take off the Sun operating system in order to do that, so it's running Windows 2003. And it's running the fastest available chipset we could get from Sun.

Pat Gelsinger: Okay, so we're going to do a bakeoff of these two.

Gary Campbell: Okay.

Pat Gelsinger: Right? And in the middle here we're going to show both performance as well as power, so we'll be able to look at performance per watt capability, and this is based on iPark, so we're measuring wall power coming into these two platforms. So every electron that goes by, we're counting it here. And we'll look at both the power performance and performance per watt.

Gary Campbell: Okay. And I'll give Sun a head start, if you want to give it a head start.

Gary Campbell: Go ahead.

Pat Gelsinger: Okay. Okay, off we go.

Gary Campbell: All right. We'll start the HP machine.

Pat Gelsinger: So typically these big financial simulations run a long time, Gary. These are big, huge simulations.

Gary Campbell: Yeah, we're using a sample database here, but if we used the full database we'd be here for hours. I'm sure we'd have to send out for lunch. But the results would be more pronounced on the savings on both the performance and the power.

Pat Gelsinger: Okay. And look, guess what, the HP box won, 24 seconds, and, well, the competitor's box is almost getting done here – there we go. So overall about a 35 percent performance difference between the two. That's pretty stunning.

Gary Campbell: Wow. But look at here. The power consumes about, what, 5 percent less?

Pat Gelsinger: So 1.4x the performance per watt as we go to the next-generation Bensley/Woodcrest systems from HP. This is really compelling, Gary.

Gary Campbell: Well it's exciting. We believe this is going to help us drive our blade system blades into more volume because, as you know, the blades are very dense and any performance increase that comes with a power savings is significant. But in addition to just Woodcrest enhancing our blades, Woodcrest is going to be very important across all of our servers, and we're launching all of them with Dempsey and Woodcrest starting now.

Pat Gelsinger: Well that's going to be a very compelling lineup this year, Gary. Thank you so much for joining us at IDF.

Gary Campbell: You're welcome.

[Applause.]

Pat Gelsinger: Gary introduced the Bensley platform and how HP is taking advantage of that in their portfolio this year, and the Bensley platform is rich with features and capabilities, move to, you know, delivering a dual independent BUS up to 1333, 1.3 gigahertz. Huge bandwidth increment. Right? Delivering RAID 6 capabilities. As we were showing here, scalable performance up to a doubling of performance, up to 3x performance per watt. Right? Delivering a platform for Dempsey and Woodcrest.

When we were here at IDF last year, we talked about 65 nanometers and how it enabled us to deliver many next-generation dual core products. You might remember this is the plaque I showed you. It says we have five of these dual core products in silicon today, when we spoke last year. I also promised that we had many more under development. These are the dual core products that we have in silicon today. All right, we have 12 of our products that will be delivered now or this year as dual core products in the marketplace today, a dozen of them here in silicon right now. The dual core ramp is well underway. By the end of this year over 85 percent of our server platforms will be dual core.

Our customers are very excited about this transition, our next-generation platforms and capabilities. In fact we today have the Dell platforms here, and the Dell platforms – they are taking advantage of the Bensley capabilities. The top one here, we have a Dempsey platform. So this is a Dempsey, which will be shipping this month, right, as a 65 nanometer dual core. The second platform, same platform design. Customer, longevity, stability, and upgradability is

the Woodcrest platform. And wonder what that third one is? Well, we have a little demonstration here. Let's see if we can figure it out. I'll just launch our rendering application here, a very demanding rendering application, and very quickly you'll see that we've launched eight threads of application. Eight threads on a DP dual-core machine. In fact this is our first ever quad-core DP demonstration. The Clovertown processor dropping into exactly the same Bensley platform. As you can see, the performance of a quad-core DP platform is simply stunning, compelling, and quite exciting for the platform longevity that this will offer to our customers. Quad-core is on track for 2007. We have our quad-core DP Clovertown, our quad-core MP, and UP and desktop products as well. Last year we showed dual-core; this year we're showing quad-core.

[Applause.]

Pat Gelsinger: Bensley platform will deliver balanced performance, leading performance, performance per watt, upgradeability, longevity, and compelling feature capabilities. Last year when we were here, we talked about a new capability called I/O AT: I/O Acceleration Technology. This year, I'd like to show it to you.

When Jim Allchin of Microsoft joined me last year onstage, we talked about I/O AT solving the problem of data efficiency, a movement inside of the platform. How to move that high-bandwidth workload from the network into the platform, and out of it. We talked about how I/O AT allowed us to make small changes in the CPU, and the chipset, and in the NIC, and in the software stack, to get huge gains in

performance. We're now able to demonstrate that as part of our Bensley platform. This capability is supported by Microsoft in their Network Service Pack for Server 2003, seeing significant improvement in performance. I'd like to demonstrate it today working on Linux.

What we have here are two Bensley platforms. This one on your right up here shows Bensley without IO AT enabled. In fact, it has a [TOE] card inside of it, but since the Linux community doesn't believe in TOE, it doesn't do a whole lot of good. So we have a TOE machine, and to utilize or to consume a full 6-gigabit stream, we have 6-gig cards inside of this, we're using to just process the packets, 41 percent of the CPU. However, when we go over here to Bensley with I/O AT enabled, we see that we're using less than 20 percent of the CPU. Less than half of the CPU load, when we've turned on the platform capabilities of I/O AT. Less than 50 percent of the CPU utilization. Half the front-side bus bandwidth load, and lower power and higher performance per watt as well. Overall, a major step in I/O as a native workload in Intel server platforms.

We're going to continue to enhance what we've done with I/O, with more protocols, more networking stacks, and more capabilities. The next big one that we're looking at is XML. XML, as the analyst data has shown here, has caught fire in the data center, and now exceeds email traffic in the enterprise as of 2004. It's predicted to exceed all web traffic in 2007. With this in mind, Intel made two acquisitions this year. One is an optimized XML software stack with Sarvega. The second is an XML hardware acceleration capability that we'll be

adding to our platforms and chipsets in the future: Conformative. Here is the Conformative XML acceleration chip, which we've begun the testing and inclusion into our next-generation platforms. As we shift in protocols, and now a major enhancement as we make XML standard for the support in Intel platforms in the future.

As we've seen the shift in protocols, we've also seen a continued shift in the Enterprise and the back-end architecture. The back-end architecture has historically been highly proprietary and highly closed systems, with architectures, operating systems, middle-ware and applications. Itanium has brought a whole new approach to that back-end architecture. Now, there's a horizontal capability, where Itanium-based solutions are reliable and scalable, provide performance and choice. The Itanium Solutions Alliance has come together in this last year and made very strong statements of the companies working together to deliver software applications and capabilities. In fact, just a few weeks ago, there was a major announcement of over $10 billion of investment, in the course of this decade, into the Itanium platform. The Itanium platform is widely supported today. Its performance, stability, and support for a broad range of applications mean Itanium is the choice of enterprises throughout the world.

[Video plays and ends.]

Pat Gelsinger: The ecosystem has responded with enthusiasm. Today, over 6,000 applications doubling in the last 12 months. Choice. These are the experts in mission-critical computing aligning and delivering against the Itanium architecture. Last week, the CEOs of Intel, HP and Oracle

hosted a webcast to announce further collaboration on Itanium. They announced the availability of the e-Business suite as well as the Fusion Middleware offering on the Itanium platform. They also announced that, not just the capability, but with compelling offer from the business aspects of it to allow the single license for multi-core operations of our next-generation platforms. This will make Itanium, by far, the most cost effective solution in the industry for those Oracle applications base.

We've seen this translate into revenue growth. We've seen that the value of choice – the industry innovation around the platform – has shown Itanium revenue growth to now be over $2.5 billion last year of system revenue built around the architecture. Industry experts like Vernon Turner have recently published and described what see as very strong growth this decade given the value proposition of Itanium. We believe that will continue as we deliver the next generation of the Itanium architecture – that being the Montecito CPU which will be released in Q2 of this year. We're also seeing a new area of growth for the Itanium platform: IT services and outsourcers seeing and embracing the platform. In particular, we've been delighted to see EDS planning a massive migration of their mainframe offerings to the Itanium offering. Let's hear it in their own words.

[Video begins.]

EDS is the company that invented the IT services industry. We manage just over three million desktops and comprehensive PCs, laptops and edge computing devices. We're the world's leading provider of desktop services.

It's essential for EDS to be able to understand innovations that are taking place all the way from the Silicon throughout the technology stack through the operating systems, through the OEM platforms and also to the applications layer. AMT technologies provides us the opportunity to address devices even when they're not powered on.

We run on one of the largest mainframes shops in the world. The reality is that our clients are looking for greater degrees of agility and flexibility. They're looking for greater price performance. They're looking for lower powered consumption devices, and they're looking for very innovative technologies. That's why Intel is so essential in our strategy.

Migrating applications from the mainframe requires proven, cost-effective, scalable, and reliable hardware platforms. It's essential that we mitigate risk from that process. This is where Itanium shines so brilliantly. We absolutely love the fact that Itanium was specifically designed and engineered to tackle the enterprise computing challenges that companies like EDS face on a day-by-day, minute-by-minute basis.

It's paramount that we keep our clients secure. Using a dual-core technology, which allows background processing to be happening without interrupting the user's experience with a task that they have currently at hand is a great advantage for us. With Intel technologies, the innovativeness that they show in their chipsets. Whether it's the processing power through dual core, whether it's the management

through AMT, or it's the future innovation they show in their Conroe product, we need to take advantage of those because at EDS, we're challenged every day to do more with less. We're absolutely confident that our collaboration with Intel will produce demonstrative business benefit and value to our clients.

[Video ends]

Pat Gelsinger: What you heard from EDS was a powerful statement of their commitment and plans around the Itanium platform offerings. But you also heard a commitment to huge TCO benefits of Intel's next-generation client offerings. EDS, 3 million desktops under management, and they see our next-generation platform as a key way for them to deliver improved service at lower cost.

The PC, today, is doing more than it ever has. In the background it needs to be dealing with security and manageability as background tasks. We see increasing migration to next-generation collaboration type capabilities such as we've described with Skype and voice-over IP. New productivity applications are emerging, like desktop search. And all of these while running the usual suite of Office applications. The conclusion, it's very simple: performance still matters at the client.

While performance has continued to skyrocket, we've also seen that power requirements have steadily risen over time as well. In 1989, a 486 PC would have cost less than $10 for the power cost to operate it over a year. Today almost $100 for today's high-performance PC. So the good news, performance has kept up. Now it's time to focus on

power and performance at the client level. In other words, power matters as well. By reducing power, we can lower TCO, improve system ergonomics and noise, and enable new, smaller form factors. With that in mind, we're simply delighted to introduce Conroe.

Conroe, the desktop version of our core microarchitecture that Justin Rattner described today, delivers up to 40 percent higher performance, huge step up in performance, but almost magically it does so while taking up to 40 percent less power. An enormous gain in performance per watt, delivering unparalleled experience of performance while doing so at substantial reductions in power. Conroe is the desktop member of the core microarchitecture family. It will be available in Q3 of this year. It's our third-generation dual-core client platform offering. And you heard Justin describe some of these capabilities. And being a microarchitect by trade – that's sort of what I grew up doing at Intel – this stuff is way cool, right? A next-generation CAS architecture, super fine-grain clock gating capabilities for power efficiency, memory disambiguation, digital memory boost, and a 128-bit-wide SSC capabilities.

All of these things – this isn't just a minor retooling of the microarchitecture. This is a huge leap in the microarchitecture capabilities. In fact this looks at the generational improvements going all the way back to the Pentium platform. What you see is that since the Pentium II, or when we brought out-of-order execution, we have not had as large a breakthrough in microarchitecture as we are today with the core microarchitecture. Since out-of-order execution, this is our biggest leap in microarchitecture improvements.

This is enormous and, you know, that was my chip, the out of order. I don't like being beat. This one is huge. We are going to be using this as part of our next-generation client offerings. The future is closer than you think. We're going to be taking Conroe and building it into our Pro platform offerings this year. This is the best client platform that we have built with the best. In that platform, we will include our active management technologies. It will also include the virtualization capabilities. It will be part of our stable image platform program based on our unified, tested and stable platform drivers. We've delivered over 100 million stable image platforms to the marketplace today.

Finally, it is Vista ready, the major next generation offering from Microsoft. Maybe the best way to describe that is actually to introduce Microsoft to join us. Please join me in welcoming Bob Muglia of Microsoft to IDF. [Applause]

Bob Muglia: Good morning, Pat, good to see you.

Pat Gelsinger: Good to see you, Bob. Thank you so much for joining us at IDF.

Bob Muglia: It's great to be here to see all these great new technologies you guys are introducing.

Pat Gelsinger: Thank you. Hey, could we just dive right into the demonstration?

Bob Muglia: Let's dive into the demo, yes.

Pat Gelsinger: So what we're going to here is show today's Pentium D processor versus tomorrow's Conroe processor.

Bob Muglia: You get the faster one.

Pat Gelsinger: Well, of course. Ready? One, two, three. Okay, what are we demonstrating here, Bob?

Bob Muglia: What this is, is a demonstration of the next version of Office, Office 12 EXCEL. One of the things we've done with Office 12 is we've really focused on taking advantage of multi-threaded performance. Office 12 is a major, major release for us. It has great new user interface, great integration into business applications and a whole set of new capabilities. One of the things we've focused on doing is taking advantage of multi-core where it's appropriate such as in EXCEL. Here, this is a demonstration of a simulation where the multiple threading capabilities of EXCEL are really running better, much better on Conroe.

Pat Gelsinger: This is stunning because taking advantage of some of the new instructions, the work that we've done together, I just promised the audience up to 40 percent performance improvements. This is almost 3X.

Bob Muglia: That's right, it's even better, that's right.

Pat Gelsinger: Just stunning.

Bob Muglia: These are the sorts of things that really matter for many, many types of applications, particularly financial simulations which typically are run on EXCEL and this performance makes a huge difference for financial analysts.

Pat Gelsinger: We've done great work together to make this platform run great with you but we've also – it's not just Windows XP like we're showing here, this is also Vista ready as well.

Bob Muglia: That's right. Vista, of course, is the next generation Windows operating system. It's really the biggest release we've done to Windows, at least since Windows 95. In some ways, it's even more significant than that. Let's take a look at it. One of the things you'll see when you look at Vista is incredible new graphics environment. We've really focused on taking advantage of 3-D graphics capabilities, providing background services such as desktop search, really focusing on improving end-user productivity while, at the same time, introducing the capabilities of a whole new generation of hardware.

Vista systems will be more demanding because of this high-level graphics support. We are really pleased that we've worked so closely with Intel and the Averill platform to ensure that the next-generation graphics capabilities in there are Vista ready and are up to the needs of this 3-D environment.

Pat Gelsinger: So this is cool, right? Compelling Conroe and Office 2007. We have Vista ready, that's pretty great.

Bob Muglia: Right.

Pat Gelsinger: But I know and I've heard, and we've talked before, you're really passionate about IT management solutions, as well, Bob.

Bob Muglia: The demos we showed are client-side desktop demonstrations. Of course, that's a huge part of what Microsoft does. My group is the server and tools group. We do many things on the servers but one of the most important things we do is focus on the IT community in ways we can reduce cost for IT managers. So a large part of that is all of the different sets of management tools Microsoft creates in an integrated way to provide both desktop and server management.

We've had a product out there for a while, SMS. It has about 50 percent penetration in enterprise right now. There are a lot of great things that SMS does to reduce desktop management costs. The cost of managing a desktop is one of the most expensive things that IT faces so anything we can do to reduce cost is a great thing.

Pat Gelsinger: Well, can you give us some examples of how that might work?

Bob Muglia: Sure. There is a lot we can do with SMS in terms of installing new software or installing patches and doing inventory things, et cetera, when the operating system is fully functional. But one of the most difficult problems that administrators face is when a machine is down and it's not available. In that case, obviously, the SMS agent is not running because the OS itself is down. Up until now, that really meant that when a user hits a condition like that, it required a service call

with a technician sent out to the desktop, which of course, is the most expensive thing you can do.

Pat Gelsinger: Can you show that to us?

Bob Muglia: Let’s do an example of a situation. We have a machine here – a PC that's down – and all it says on the screen is "hard disk malfunction." Of course, any user knows those are some of the worst words you can possibly see. Let me go ahead and give helpdesk a call and see what's up.

[Phone ringing]

Male Voice: Good morning, Mr. Muglia. How can I help you?

Bob Muglia: Good morning. My PC says the hard disk is down.

Male Voice: That's really no problem. Since your PC has Intel active management technology as part of the platform, I'm able to fix the problem from here using Microsoft's SMS 2003 Management Console. What's really nice about this technology is a feature called "Serial over LAN." I'll be able to configure the BIOS remotely to fix the system even though the PC is not responding. You'll actually be able to see me do this on the screen.

Bob Muglia: So Intel and Microsoft have worked together to incorporate AMT technology into SMS so that even though the system is not available from an OS perspective, AMT is available and can be accessed across

the network by the desktop administrator. In this case, going into the BIOS and reconfiguring the BIOS to boot the operating system off of a different hard disk. This is the kind of things that we can do together – two companies, hardware and software cooperating in industry – to really make life better for both end users and administrators.

Pat Gelsinger: Wow. That's impressive Bob. So AMT, huge advances in solving some of the gnarliest, most difficult TCO and manageability problems today. So time the market with the Averill launch – this is just fabulous, great cooperation. But what about some of our next-generation work?

Bob Muglia: We've done some really great stuff together. In some senses, it's great to see this AMT work that we did here; but over the last year-and-a-half or two years or so, Microsoft and Intel have been cooperating with other partners in the industry to build a next-generation management protocol called WS Management. This is a web services based protocol to really bring management forward into the next decade. The great thing about WS Management is it's an industry standard, it works in a homogenous environment – an all-Windows environment, it'll work in a heterogeneous environment – so managing Window, Linux, Unix, et cetera, systems; but it also has been built and designed so that it's efficient in small and can be incorporated into hardware like AMT. So your next-generation of AMT, I believe, is going to incorporate WS Management thus providing a consistent protocol across all those environments.

Pat Gelsinger: In fact, our '07 version of the pro platform that we described today will include native support for WS Man capability. So Intel, Microsoft collaborating on the standard and then our mutual products in delivering it to the marketplace.

Bob Muglia: We're already shipping WS Management support as a part of Windows Server 2003-R2 and our next generation of management products, MOM and SMS, will both incorporate WS Management support.

Pat Gelsinger: This is just fabulous. High performance clients showing off Vista and its capabilities on our platform, driving the next generation of manageability. One last thing before I let you go, Bob. We've covered a range of technologies today. Maybe you can just give Microsoft's view of dual core, 64 bits, Itanium, and how we're doing in those areas.

Bob Muglia: Sure. It's a lot of great cooperation with Intel on these things. We're very excited about the progress that we're seeing in the marketplace with Itanium. One of the interesting things we find is that right now there is a huge migration of systems onto industry-standard architecture from Unix and the mainframe environment. The high scalability, high performance and high reliability features available from Itanium are really appropriate for those sets of solutions. So we're seeing large business applications – things like SAP applications that run an organization – moving down onto the Windows platform from the mainframe or from Unix using Itanium-based systems both for business apps, database – those are all tremendous opportunities

where Itanium solutions are really making a difference for our customers.

At the same time, we're super excited about the dual core work that you're doing and the quad core things that will be coming next year. The fact that your systems are 64 bit enabled, we think is very important. There's a very critical platform transition happening over the next couple of years with the transition, particularly on the server, from 32- to 64-bit. What we find is when we move applications to the 64-bit on the server, the performance improvement is dramatic. And we also see lower I/O requirements and overall better availability for those solutions. So we're really excited that that's true across both the Xeon and Itanium product lines.

Pat Gelsinger: That's excellent. How about virtualization?

Bob Muglia: Virtualization is something I'm very deeply passionate about and we're putting a lot of focus on at Microsoft. Microsoft believes that virtualization technology will become ubiquitous over the next several years and become a very integrated part of the overall environment. So while today, we'll offer a product called Virtual Server and later this year, that will incorporation VT support, in the Longhorn generation of our server products, we'll be building a next-generation hypervisor as a direct feature of the operating system. The thing that's unique about this hypervisor is that it's the first technology that's been built, that was designed from the ground up to utilize only hardware technology virtualization technology such as VT. So it's a very, very important advance to have this as a part of the core operating system, always

taking advantage of these great capabilities that Intel is delivering with things like VT.

The other piece of our strategy overall for virtualization is to make sure that the management pieces of this are deeply integrated into the solutions. We think virtualization will be ubiquitous, and thus needs to be integrated into our management products, such as MOM/SMS, not requiring a whole separate set of management tools that cause IT to spend a lot of extra money, and have duplicate functions. Finally, we're really excited about VTd. We know that VTd will provide the next generation of support for virtualization, and provide a lot better performance overall. We've been working very closely with the Intel team on that spec, and we look forward to building that into our hypervisor in the future.

Pat Gelsinger: This is excellent, Bob. Thank you so much.

Bob Muglia: Thanks a lot, Pat. I appreciate it.

[Applause.]

Pat Gelsinger: This is a very strong and exciting alignment with Microsoft around these technologies. We showed today's AMT, and we're also working on AMT Version 2. Version 2 has a critical new feature called Circuit Breaker. The idea is that, sometimes, when you have outbreaks or certain kinds of security or liability situations, they spread in the enterprise so rapidly that centralized management solutions cannot respond to them fast enough. In fact, they're being bombarded with

denial of service situations, so often in many cases, that they can't even diagnose the situation. This is exactly what Circuit Breaker is intended to address. We've literally built intelligence into the client, such that based on profiles or filtering, it is able to identify these anomalous behaviors and isolate itself from the network in an intelligent and self-healing way. This would be a key capability to solving problems, such as the Nimda outbreak.

We're also working to deliver next-generation capabilities beyond AMT, as part of the Pro Platform. We're improving virtualization. Virtualization, as we've described today, is part of our server platforms, but also our client platforms as well. We'll bring VTD capabilities into the client. I'm also very happy to announce today the LT specifications. We're making LT specifications available today to the industry. LT is critical security enhancements to the platform. The best way to do security is by many eyes, and by careful scrutiny by the industry against those specifications. We're also releasing our Safer Computing book, written by one of Intel's key architects of LT capabilities. We think these are critical engagements to enable the developer community to take advantage of our next-generation platform capabilities, delivering virtualization, security, and next-generation manageability. Which are all part of the huge value proposition of the Pro Platform.

In summary today, we've shown you Intel 3.0. The next generation of Intel, delivering compelling new platforms, delivering stunning upgrades in our product performance, and doing so with high volume

process manufacturing that will deliver these things around the world in high volume, in industry-standard ways.

Just one more thing before I go here. Just one final surprise. What we've actually been doing today for our demonstration is that we've been running the keynote on our first client quad-core systems. What we have here is our Kentsfield system, our first public demonstration of quad-core in the client. In fact, let's do something a little bit more compelling than PowerPoint. Let's go start playing. Wow, this is pretty snappy. I might have a chance against my teenage boys when this comes out.

Female Voice: Excuse me, Mr. Gelsinger. The end of your keynote is "closer than you think."

Pat Gelsinger: Thank you very much.

[Applause.]

[Music.]