JPMorgan Technology Forum

Company Participants

- Colette Kress, EVP

Other Participants

- Harlan Sur, Analyst, JPMorgan
- Unidentified Participant, Analyst, Unknown

Presentation

Harlan Sur {BIO 6539622 <GO>}

Okay, perfect. All right. Good morning. And happy new year to everybody. Welcome to JPMorgan's 14th Annual Tech Investor Conference here at the Consumer Electronics Show here in Las Vegas. My name is Harlan Sur. I'm the semiconductor and semiconductor capital equipment analyst here at JPMorgan.

We are pleased to have a solid, full day of semiconductor, automotive systems technology and other tech companies presenting. We've got 14 in total. So we've got a great lineup. Also joining me are my colleagues, Ryan Brinkman, who is the auto analyst here at JPMorgan; we've got Rod Hall, telecom equipment and IT hardware analyst; and we also have Paul Coster, who covers applied and emerging technologies for JPM.

CES this year, I think, is going to be much less focused on mobile devices and PC compute platforms. It will be more focused on things like intelligent cars, intelligent and connected home, next-generation display technologies. And other new and exciting technologies like virtual reality, much of which you will be hearing about today at our conference.

So I hope you enjoy and learn today. Now remember, this conference is for you guys. So I hope that you participate in the fireside chat Q&A. And again, thank you for your participation.

So with that, kicking off our conference this morning, we have Colette Kress, who is the Chief Financial Officer from NVIDIA, here with us today. NVIDIA held their big press event on Monday. So I've asked Colette to give us an overview of what NVIDIA unveiled on Monday and what they are showcasing here at the Consumer Electronics Show. I'll kick it off with the first few questions and then we'll turn it over to the audience.

So Colette, thanks for joining us this morning. And let me turn it over to you.

Colette Kress {BIO 18297352 <GO>}

So we scheduled our press conference on Monday night, where we discussed our latest developments in the automotive part of our overall business. We focused on that for a big part of our CES presentation but will also talk a little bit about our virtual reality that we are also demonstrating. At our conference our big launch was really about our next platform for autonomous cars, self-driving cars of the future. That was our Drive PX 2 platform. A year ago here at CES, we launched our first version. And this was our second version.

In this last year, it has been a big year focused on deep learning; deep learning for the data center and big, big types of involvement of many of our hyperscale providers around the world, really focused on using deep learning to solve a lot of different problems in the data center. Well we approach that same type of thing for the overall automotive industry, because essentially the car and self-driving cars is exactly the same thing.

So we launched the Drive PX 2 platform, which is using a complete end-to-end solution for self-driving cars. We have a development platform or a training box that can be used, a deep neural network to drive algorithms for self-driving cars of the future.

So the overall platform that we've put together incorporates two GPUs, two SOCs, our next-generation GPUs Pascal, that will come out; and as well as the next generation in terms of SOCs. This overall platform, together, can be used with overall software development kit, really working on producing some of the best results that we have seen in terms of accuracy, almost superhuman type of accuracy in terms of identification of things that you see on the road, whether it be pedestrians, signs and all that.

So the overall speed that we have learned through this approach of deep learning on creating self-driving cars of the future has been phenomenal in terms of creating the algorithms that we are going to need and build for the cars of the future. So it was one of our big announcements, as we announced on Monday.

But also at this conference, we are talking about virtual reality. That's off-site instead of not at the actual CES conference. But we have been working with more than 50 different partners and OEMs to get ready for the virtual reality that we think is here and ahead of us in 2016.

So NVIDIA's participation in virtual reality, as GPUs are some of the key underlying components to enable a virtual reality scenario. We are expecting the glasses from both Oculus HTC to come out in 2016. And one of the things that's very important is their ability to be behind a high-end PC to enable that experience. So the great thing for us is the overall underlying GPUs, that are necessary, are some of our top-end GPU's that we actually produce for gaming.

So we have been working with them on not only demonstrating what these GPUs are but also working with many of the OEM manufacturers to produce VR-ready types of PC, notebooks, as well as the cards to get ready for the VR experience that's ahead of us. The game portfolio, the content is also something that we have been working with. And software on top of what you see in terms of the glasses that actually improves the overall VR experience as well.

So those are our two key announcements for CES. Encourage you to come by the booth as well. So we can demonstrate some of the latest things. Those are where we have our cars and some of the largest infotainment demonstrations for the car as well that are set-up.

Harlan Sur {BIO 6539622 <GO>}

Great. That's great. Thanks for those opening comments. And I was at the press event on Monday. And a very impressive lineup of customers for your DRIVE PX as well as your DRIVE -- your second-generation DRIVE PX 2. I think you announced the partnership with Volvo, right? -- for DRIVE PX 2. But I think you also mentioned -- I pulled up my notes here -- that you guys are working with Audi, Mercedes, ZMP, BMW, Ford. And a multitude of others on various aspects of self-driving.

Colette Kress {BIO 18297352 <GO>}

Yes. So Volvo has announced that their next 100 SUV -- autonomous SUVs for Europe will come out using the DRIVE PX. That was one of the announcements that we announced. But also the key thing was those partners, whether that be Mercedes, BMW Auto, Ford, those that work with Toyota in Japan and others have really seen some strong performance from our platform that we have provided to them. And a real increase in terms of performance on using deep learning to solve some of these algorithms, aside from some of what we have today in terms of computer vision and just the cameras alone.

So we are extremely pleased with both their excitement. But truly about the performance of the platform has really shown through in terms of our work.

Harlan Sur {BIO 6539622 <GO>}

So sticking along that same topic, since autonomous driving does involve training the nodal network, training the AI. And deep learning, obviously, that you guys are enabling is a big part of that, all of this to kind of mimic how we as humans perceive the world and perceive threats as we are driving down the road -- I think it's fair to assume that driving behavior, terrain vary in different parts of the world. If you couple this with the technical difficulty and the security concerns as it relates to development of regulatory initiatives in different countries. So the question for you is which regions are we most likely to see the initial deployment of self-driving vehicles? And when is the earliest that we could see mass deployment of fully autonomous vehicles?

Colette Kress {BIO 18297352 <GO>}

Yes. I think that's a good question in terms of timing. I think the excitement that you see from all of the OEMs -- I don't think there is an OEM on the planet right now that isn't focused on autonomous driving, as they see this truly as a transformational piece that will occur in the future. There is a question, though, in terms of speed -- how fast will that actually get to market?

We are going to see parts of autonomous driving capabilities in the cars, in the next several years. Now, whether that is a full autonomous driving, it is really going to depend in terms of both the regions and the type of areas. I think there's a very big difference between an autonomous car on the freeway versus an autonomous car driving in downtown New York, for example -- a lot more complexity that we see in some of those areas such as downtown New York.

But what you are seeing is an entire group really focused on a partnership in terms of how to best solve this. The key thing about the deep-know net has proven really much, much faster ability to absorb all of those different types of terrains quickly. And to teach those overall networks all about that. It's -- it is possible to do it one by one through computer vision. But we really see this as a need to speed, of trying to solve all of these different problems for areas that you just haven't even touched yet or driven a car around to understand what the network needs to learn.

But I think you will see it come in pieces over this time. I think regulation is also going to be a key point that we will need to enable. But those will all come together, because I think the focus is truly -- and what they see as that transformation in the future will be there.

Harlan Sur {BIO 6539622 <GO>}

Do you think that we will be there within the next decade?

Colette Kress {BIO 18297352 <GO>}

In the next decade, I do believe, in some form, we will be. It's just a question about to what extent there is. But I do believe, in the next decade, you will start to absolutely see it, given the speed of what we see of the interest right now.

Harlan Sur {BIO 6539622 <GO>}

Great. Great. Then on the DRIVE PX announcement that you made on Monday, as you mentioned, a part of the -- and I think the one differentiator with NVIDIA is that you always go to market with a platform approach. Right? It's not just the GPU; it's the hardware that sits around the GPU, it's the subsystems design, it's the software, it's the firmware and so on.

But a part of the DRIVE PX platform that you announced includes the DRIVE PX 2 in-car module. And as you mentioned -- I mean, this is a pretty powerful machine. Right? It's got two 64-bit CPU chips. It's got two of your latest 16-nanometer Tegra processors based on a new Pascal GPU architecture. So significant processing power. I think Jen-Hsun said it's something like equivalent to six Tegra -- not Tegra -- Titan X GPU cards.

Colette Kress {BIO 18297352 <GO>}

Or another way that he actually spoke about, it was about 150 Mac books sitting inside of your car. So a very, very powerful system.

Harlan Sur {BIO 6539622 <GO>}

So in terms of Titan X dollars, six cards, that's $6,000 worth of compute power that's dealt into the DRIVE PX 2 module. So my question to you is, can you give us a rough sense for what the DRIVE PX 2 in-car module ASPs are like?

Colette Kress {BIO 18297352 <GO>}

Yes. So we did announce overall pricing at this time for the actual module. But you are correct -- there are a difference in terms of what we are currently selling into the cars, which may be just one SOC. We've really put two SOCs and a GPU together, connected also with a layer of overall software that works together.

We will get to that in terms of determining price when we get to the mass volumes that we need for the overall. But it will probably -- I think it is safe to say a higher ASP than what we already have going into the cars.

But our key point on that -- I think you alluded to the overall platform approach. So yes, there's a combination of GPUs, SOCs to give the right amount of balance of performance that is necessary for the car and with the fail-over needs that a car is going to have. If you are going to remove the actual driver from the car, you have to be assured that this can continue to work in all different types of circumstances.

But the second piece, which is also important, is that software, to make that the ease-of-use. So at this time, we are also supplying to the OEM manufacturers a set of software, a set of key tools for this development platform. As you know, our GPUs are programmable. But the key thing is helping them with a set of development tools to easily use the deep learning technics that we have found ever so successful to drive those algorithms that they need. And I think that's an important part of taking our knowledge of the data center, equipped with our knowledge in terms of the programming, to really help the OEM manufacturers.

Harlan Sur {BIO 6539622 <GO>}

Great. Then my last question on the automotive before we move on to your gaming segment -- your auto segment grew 55% year-over-year through the first nine

months of your fiscal year; solid growth there. The team has stated that it has 8 million cars on the road now that are Tegra-enabled. You've got 30 million more cars coming with your Tegra platform. Can you just give us a sense on how this 30 million-unit pipeline unfolds over the next kind of few years?

Colette Kress {BIO 18297352 <GO>}

Yes. I think we are even mentioning this time at the CES that our 8 million on the road is actually moving closer to actually 10 million different cars on the road. This is really our focus of our infotainment systems, either for the center console or the digital dashboards that you see in many of the topline cars. You'll find this in many, many of the Audi's, the BMW's, the Tesla's, Honda's in Europe. And we also announced Daimler in the future to come.

So our pipeline in terms of more than 25 million different cars also hit the road in terms of a pipeline is really focused over the next probably four to five years of additional cars that will hit the road. In some cars, we have more than one actual Tegra chip, as we have the console and the digital dashboard. But through a combination, that's about our range of what we are seeing in terms of cars in the future.

Harlan Sur {BIO 6539622 <GO>}

Okay. Great. Let's turn it over to your PC gaming segment. It's 60% of your overall business. It grew 40% year-over-year for the first three quarters of this fiscal year. Most recently at the Analyst Day of one of your partners, Activision -- the maker of the widely popular Call of Duty franchise -- the company spoke about growth in the gaming software industry and highlighted that consoles in PC gaming hardware/software is projected to grow at about a 5% CAGR over the next three years from $50 billion to $57 billion.

Now, if I assume that console growth is decelerating as the hardware platform gets mature. And given the almost yearly upgrade by PC gaming enthusiasts on the hardware side, it seems to us that the PC gaming hardware segment can potentially continue to grow at least double digit -- at least double the rate of the overall TAM or about kind of a low-double digits CAGR.

So I guess the question for you is, outside of the stellar year that you are having this year, looking out over the next three to five years, does the low-double digits growth CAGR for your gaming segment appear reasonable?

Colette Kress {BIO 18297352 <GO>}

Yes. So let's start back in terms of what are the fundamentals, what has been driving the overall PC gaming market? Why has it been so robust? What is evolving? PC gaming and high-end PC gaming is really an experience that can evolve, depending on what type of GPU platform you choose.

We have a wide range of different GPUs for gaming. You can start with a $100 GPU; you can move all the way up to a $1,000 GPU. And your experience in terms of gaming can evolve with the exact same game, with a very different GPU, to a better and different experience.

And that's what we are seeing with a lot of our gamers. And one, endorsing the overall platform that we have. We are currently in our Maxwell architecture. And we have been seeding the market with many different Maxwell cards over the last 18 months. And they have been just well, well-received across the PC gaming.

But what also fuels the overall gaming market is really about the games -- the games that have been available for the PC. Higher and higher-caliber production value ty.es of games continue to hit the market. Really high-end types of games are forcing those to say, I need a better GPU. It's all about winning in these games. It's all about playing to your heart's desire in terms of that. And they will literally look for a better GPU in terms of experience.

So it's able to improve itself much faster than the console can. The console is pretty static for the five/six years type of window over that. And that's why we've seen such an excitement about it.

It has also moved to actually a social platform. PC gaming -- we talk about it quite a bit and both with our kids. And how much it is a group of friends actually gaming. And being online with online strategic games. And really just wanting to be a part of that, you will have an entire group that is going out and purchasing. And taking part in terms of the PC gaming. Watching gaming now online has become a sport in itself.

So it's an amazing run in terms of what we see. And going forward, we still see the continuation of that, as there is still excitement of new games coming out and we will talk about later in terms of the VR.

Now, how to think about how fast it will grow -- I wish we had a crystal ball. We've seen those talk about just PC gaming, the combination of software and hardware, to be around the 8% to 10% type of growth rate for some time going forward. We hope to be a great part of that. We hope to really perform during that piece. But we know it's going to take, definitely, the innovation of our platform going forward as well as the games. But we are excited because we also see the excitement about PC gaming.

Harlan Sur {BIO 6539622 <GO>}

The US market is probably one of the smaller markets for PC gaming. It's estimated that there are about 200 million console gamers in the US. But this trend is starting to change rapidly with the onset, as you mentioned, eSport, social media, potentially things like virtual reality.

Does NVIDIA view the US market as an emerging growth opportunity? And we were talking about this at my breakfast. But I mean, you just mentioned it as well. But I've got a 16-year-old son; he's got seven friends. They all got Xbox 1's last Christmas. They all transitioned over to PC gaming. They bought your 980 GTX TI card in May. And ever since then, the game console has been gathering dust.

And so -- and I think this is a trend that is continuing to spread through the US amongst the enthusiast gamers. How much of a growth opportunity is this for NVIDIA, just given the installed base of console users? Does the team track PC gaming penetration or console cannibalization rates in the US?

Colette Kress {BIO 18297352 <GO>}

So we actually have a very solid PC gaming view across all three regions. We actually look at it as a one-third, one-third, one-third across there. So even though the US is very heavy in terms of consoles, the US is known to actually do both in terms of heavy console playing as well as also PC gaming.

In our Asia-Pacific and China, they have really endorsed the overall PC platform as their sole gaming platform. So it's a little bit different in there. Then Europe, again, is a little bit more mixed.

We see strong results in all three of our different regions in terms of what we are seeing in the growth of our overall gaming. And you are correct -- the enthusiasts have really started to endorse the PC gaming, primarily just because of the online strategic standpoint of the games that are coming out. And I think this will continue to go through. You are now in several years since the launch of the consoles. And the PC gaming just has the opportunity to improve itself almost every year in terms of what we want to do.

So we will continue to watch in terms of what we see around the world. But it has been interesting, I even think, on our side to see all three of those regions perform very, very well, both in strength of growth rate and overall size.

Now, we can see a good percentage of our gamers, as we have GeForce experience, which enables them access to drivers, things that enable them to plug in their GPU and immediately start with the game that they have just bought. And this is one of the reasons why they have really stuck with NVIDIA and the overall brand, because they know there is a full ecosystem around there of working with game developers of the games that are coming out, to assure that that experience, from the minute that you start the game, is absolutely top-end in terms of what we are doing. And this, I think, will continue and be a driver of our overall business.

Harlan Sur {BIO 6539622 <GO>}

Great. Let's move over to virtual reality. So several high-profile manufacturers -- as you mentioned, HTC, Oculus -- on the cusp of releasing their VR headsets to the market in the first half of this year, gaming companies are all very bullish on the long-

term prospects of the technology. We see that high-profile gaming partners like Epic are already helping developers design games in the VR environments.

Since the big VR adoption curve is probably going to be driven by PC gamers, the question I have for you is, does it really increase the addressable market opportunity for NVIDIA? Because the enthusiast gamers already have single or dual graphics cards configurations and high-performance PC platforms. So there's really no incremental upgrade needed. So what is NVIDIA's view on the GPU opportunity that VR brings to the team?

Colette Kress {BIO 18297352 <GO>}

Yes. That's a good set of questions on it. I think we definitely agree that those that will probably take part in virtual reality, the first movers will be the enthusiast gamers. It is the next extension of how they are currently playing games and thinking about that virtual reality.

But when we look at our overall installed base and try and analyze that, there still is a significant amount of gamers that continue to need to upgrade just to our current overall platform on Maxwell. And would then even also need to probably upgrade to one of our higher GPUs. You are going to need substantial frame rate refresh type of GPU for that overall gaming experience. This will be an opportunity. Just as we have seen them go to the store, buy a game, pick up a GPU at the same time, they will probably also, for a good part, go pick up a set of glasses. It's time for me to upgrade my overall GPU.

But you are correct -- some of them are already GPU-enabled. With the right GPU card right now, they can get the glasses and start moving. And we are excited to see those purchases even today. It has helped us already with our revenue growth that we've seen. But I do believe there's still a significant amount of the installed base that would have to upgrade. And you're having to upgrade not to something that they may have had before. But something in the higher end of our GPUs of what we've had.

Harlan Sur {BIO 6539622 <GO>}

Let's talk about the roadmap. You -- Pascal is next on the roadmap. It's interesting because usually we hear NVIDIA talk about your next-generation architecture when you roll out your PC gaming GPUs. But this year has actually flipped. We actually saw Pascal show up on Tegra for automotive.

And so I guess the question for you is, with Pascal your next-generation architecture, when will the team formally announce the PC gaming version of Pascal? When will it be available for the -- and will it be available for the upcoming blockbuster game season in October/November timeframe of this year?

Colette Kress {BIO 18297352 <GO>}

Yes. So we announced our Pascal architecture last year at our GTC conference in San Jose, in around the March and April timeframe. And you are correct -- in the CES, we announced Pascal will be used for our DRIVE PX 2. So we try, honestly, to look at our overall platform as a unified technology approach.

Our Pascal architecture is consistent through all of our different GPUs and through to our SOCs. It is the exact same, that drives the overall efficiencies that we can contribute in terms of our overall engineering costs, as it is that exact same architecture.

So we haven't announced in terms of when we will have Pascal for gaming, data center, enterprise or any of those different pieces. But you will expect it to be coming soon. And we will carefully watch all of those different market opportunities to make sure we are ready to go for those.

Harlan Sur {BIO 6539622 <GO>}

Perfect. Any questions from the audience? Wait for the microphone, please.

Questions And Answers

Q - Unidentified Participant

How do you -- the growth in the gaming side of the PC graphics for business has been fantastic. How do you figure out if a card is sold to a gamer or if it's a PC card that was sold to somebody that's not going to use it for gaming, especially in the laptop segment? Thanks.

A - Colette Kress {BIO 18297352 <GO>}

Yes. So we have a couple different ways that we actually analyze to look at that overall card sale. For one, we have the GeForce experience. So many of our card buyers actually, when they install the GPU, they have actually also enrolled in GeForce experience. And downloading the overall drivers. A lot of times we can see the drivers that they will need. And normally, those are to enable a lot of the games that they have actually purchased.

Number two, a lot of these are sold with a lot of the notebooks that are branded exclusively for gaming. Another very, very big part of our gaming growth has been associated with notebook gaming. You see customized high-end notebooks exclusively just for gaming and marketing as such.

So we have different GPU's that are both branded or are marketed for gaming at certain price points. And that's what we use generally to look at those overall gaming GPUs. There is probably some small percentage that are using it for dual that are either aimed possibly programming with them. But the majority use of them is definitely for gaming.

Q - Harlan Sur {BIO 6539622 <GO>}

Any other questions? Right here. Please wait for the mic.

Q - Unidentified Participant

Could you talk a little bit more about the competition for the automotive sector and your wins there? It seems like your platform, as mentioned earlier, is a very expensive but comprehensive system. We've heard some people like Xilinx and others say that they are getting into this market. Mobil, I think, has an inexpensive chip and is more of an iterative solution. Can you just talk about the dynamics that are going on? And when you are winning, who are you competing with?

A - Colette Kress {BIO 18297352 <GO>}

Yes, I think it's good to understand and distinguish between both assisted driving and autonomous driving. They are not necessarily the same. But they can use some of the same types of technology. Our focus has really been on autonomous driving. That is essentially removing the actual driver from the car. And making sure that you have something as capable of a human to be able to drive that car in the future.

So it is still early in the process of the right technology. And there is not ever one way to actually solve some of those problems. Computer vision for assisted driving with some of the competitors has been and continues to be a successful way to approach the problem.

We, in working with the OEM manufacturers, were really trying to help them in the speed of getting to market. And the speed of also producing something with the utmost accuracy in order to produce the results they need. And those deep neural networks and what we've seen in deep learning in the data center has absolutely been a phenomenal choice and taken a lot of interest in terms of the automotive providers.

Now, the concept of, is it costly removing the overall driver? -- is something that you have to consider, that you can't necessarily do this with a very simple option, because it probably would have been already developed. So really trying to put something together that is the computer, that lasts over a long period of time. And a platform that can be with them for a long time. And to continue to evolve it, is really the approach.

We haven't really talked about the overall pricing of it. So I wouldn't say we know if that is perceived at the expense. But we do believe that the importance of providing the overall strength in the computing platform is absolutely what the OEMs are actually looking for.

Q - Harlan Sur {BIO 6539622 <GO>}

I think -- well, we're basically -- sorry, I apologize; we are running a bit over time. So maybe we can have the discussions off-line.

Colette, thank you very much. We really appreciate it. And good luck to the team in 2016.