JP Morgan CES Tech Forum

Company Participants

- Colette M. Kress, Executive VP & CFO

Other Participants

- Harlan Sur, Senior Analyst, JP Morgan Chase & Co, Research Division

Presentation

Harlan Sur {BIO 6539622 <GO>}

All right. Well I'm going to get started a couple of minutes early because I just wanted to say -- well, first of all. Good morning. And Happy New Year. And thank you to all of you. Welcome to JPMorgan's 16th Annual Technology Forum here at the Consumer Electronics Show in Las Vegas. My name is Harlan Sur. I'm the semiconductor and semiconductor capital equipment analyst here for the firm. And we're very pleased to have a solid day of semiconductor, automotive, automotive technology and general tech companies presenting. Also joining me from JPMorgan are some of my colleagues. I've got Bill Peterson, who covers the RF semiconductor value chain. We've got my colleagues, Ryan Brinkman, JosÃ© Asumendi and Samik Chatterjee who cover the U.S. and European automotive sectors; and Paul Coster, our applied and emerging technologies analyst.

Now over the past few years, CES has been much less focused on things like mobile devices and PCs and much more focused on things like intelligent cars, the proliferation of deep learning and artificial intelligence, smart connected homes, smart factory floor and next-generation gaming technology. Now especially in automotive, given the increasing intelligence and semiconductor content, we've included a number of the top-tier OEMs and subsystems companies who will talk about their technology development efforts. And this year, for the first time, we have companies like Ford, GM, Daimler, Continental, Aptiv, Autoliv to name a few. So we hope you enjoy the conference. And thank you for your participation. Hopefully, you guys will be asking a lot of questions. Remember, this conference is for you.

And with that, I'm pleased to introduce Colette Kress. She is the Chief Financial Officer of NVIDIA. It's been a tradition, the last few years, to have the NVIDIA team kick off our investor conference because the team is driving much of the trends that you will hear about today: artificial intelligence and deep learning, next-generation compute architectures in automotive and next-generation gaming technology. The team had their press conference on Sunday. I've asked Colette to start us off with an overview of what Jensen unveiled Sunday night. And then we'll kick off the Q&A. So with that, Colette, thank you very much for joining us this morning.

Colette M. Kress {BIO 18297352 <GO>}

Thank you. Thank you, Harlan. So welcome. If you didn't get a chance to see our press announcements on Sunday night, I'll do a tiny bit -- a quick recap. We did start with a summary, what we have seen over this last year, it's been a year since the last CES, in terms of building, in terms of our automotive. And we added more, in terms of this time.

Probably one of the key things that we started off with was to talk about the availability of our Xavier SoC. Now our Xavier SoC is engineered for AI, for automotive. So it's very important part for us to establish this, with sampling for our overall customers. This is a big breakthrough that we think is probably more than two years ahead of any type of competition in terms of the SOCs for the automotive. It improves in terms of energy efficiency 10x probably from our prior version. And it is looked at in terms of an overall wattage of less than 30 watts, which we think is uniquely engineered for AR cars moving forward.

So with that, in terms of the basis of what we had, we went on to talk about some of our key additional partnerships that we are working on in terms of automotive as we move forward. The first one that we announced is with Uber. Uber is using the NVIDIA DRIVE platform for its self-driving cars and was with us and is continuing to build more and more data from the roads in what they are collecting using our overall platform going forward.

Secondly, we announced a terms of work with Volkswagen. Volkswagen is looking to use our platform inside the car for an overall copilot. We're thinking about the AI inside the car, using anything from voice recognition, gestures and others and in terms of to help keep the driver focused in terms of on the road. But also being able to add AI with, inside the car.

Thirdly, we announced a collaboration with Baidu and ZF that they will also use our DRIVE platform for future automotive AI cars. All right?

Then fourthly, Aurora, a start-up, focused on self-driving cars will also use our DRIVE platform.

This adds to many of the additional partnerships that we've already announced and continues to be solidified with all the different people that we work with. We have probably more than 320 different automotive partners, Tier 1s, OEMs as well as start-ups that we are working with, which has increased from probably about 250 from where we were about a year ago. So we are continuing our work in what is a very important area of the transportation transformation as we see forward. This is a big area where a business more than $10 trillion is going through a massive transformation, a transformation in terms of both the technology but the overall ability to use AI in terms of in the car.

So those were most of our announcements. We also announced key things with our overall gaming. We have big-format gaming displays with our G-SYNC monitors, 65-inch that you could probably come to the convention center and see our big screen types of formats. These actually improve the overall latency with very, very large monitors for those AAA games.

We've also continued to talk about our GeForce NOW. GeForce NOW also right now is in beta with our overall Mac users and also in the future coming in terms with our overall PC users. This is an ability to expand overall cloud gaming that can overall stream to any types of device.

So those are some the great announcements that we had as of Sunday night.

Questions And Answers

Q - Harlan Sur {BIO 6539622 <GO>}

Great. Well thank you, for those opening remarks. And I think one of the key takeaways for me from the press conference on Sunday was Jensen's sort of summary of accomplishments in 2017. And his key takeaway was that, look, NVIDIA developed end-to-end AI, deep learning platforms, software, firmware enablers for your entire customer base, right, whether that's the cloud service providers, whether that's enterprise, whether that's researchers, end-to-end platform: hardware, software, firmware and support. And I think that -- and obviously, much of that is focused on the training side of AI and deep learning. And I think the market understands that NVIDIA does lead the way when it comes to AI deep learning training. The other part of the equation though, is on the inferencing side. And back in the May analyst conference, you sized the inferencing market as about a $15 billion market opportunity, even bigger than the training side of the market. And I often feel like the market doesn't appreciate NVIDIA's leadership on the inferencing side. You have the TensorRT platform, which is the platform that helps you take the training network, optimize it and then put it into the inferencing platform. So you've got that. You actually have hardware solutions that enable inferencing with Jetson platform, which is for embedded solutions like drones or factory automation or edge computing. Then again, I don't think people realize that your highly successful DRIVE PX, DRIVE Xavier platforms are inferencing platforms as well. And so I think as you -- as the team thinks about the inferencing side of the market, well, what are you -- what else is the team doing to continue to expand their presence and leadership on the inferencing side?

A - Colette M. Kress {BIO 18297352 <GO>}

Sure. So a good way to think about what we have developed in many times looking at AI and our work in terms of AI really focus in terms of the starts, in terms of the data center. So those expanded quite strongly. It is really not just about the overall processor or the overall (chip) we have designed in terms of data center. The key important part that you spoke there is it is a full stock. It is a full stock, starting with the best processor on the planet, the best processor in terms of its overall capabilities. But it is uniquely positioned to expand and work in terms of with AI. AI is

about significant amount of data. We need a processor to be able to handle that (inaudible). But most importantly, there is also the significant amount of development work, the development software that is necessary. We keep an overall development platform consistent across every single one of the products (that we overall shelf) . Both within the data center, both in terms of automotive as well as on the edge, inferencing or anything (may lead) to in terms of deep learning (in the center) of the overall data center. This is an important piece because there'd be more than 650,000 developers that are working on CUDA that they can have that consistency of that overall software platform (inaudible). But then that gets into our ability to further up that stack from that overall (buildware) to where we can actually help with the overall application and the use of our (inaudible) platform. You see that spin-off that we have in terms of -- with automotive. And we have the entire business focused on AI for automotive. When you think about that, that's not just automotive and thinking about the platforms that will be in the car. We're working with them today. We're working with them today in the data center. They're collecting significant amount of data on the road. They are using that in their data centers. They're using our overall platforms in their data centers to process in terms of all that data. So that we can get to a form factor that would be actually in the production cars. Xavier is that. Xavier is essentially inferencing inside the vehicle (actually moving forward). So our whole plan is to really think about democratizing AI as best as we can across many of the industries. We have chosen key industries that we think are very ripe to take advantage of the overall AI as we move forward. So yes, inferencing is a big focus of ours as long -- as well as in deep learning training. Yes. We started many years ago in terms of deep learning training. And we still hold a significant amount of market share regarding the overall deep learning and deep learning training. But inferencing is a great opportunity because of the overall complexity of inferencing that we'll see moving forward. The overall inferencing is much more advanced than what may have been seen in terms of 10 years ago in terms of inferencing, which is primarily a CPU market. The overall ability to now use different form factors as well as using the GPU to take advantage of that overall inferencing opportunity is right for us to (inaudible).

Q - Harlan Sur {BIO 6539622 <GO>}

Any other end markets -- Jetson, your embedded platform targets things like factories and drones; DRIVE PX, obviously, strong in the automotive markets. Any other areas where you can think of which can take advantage on the inferencing side of NVIDIA's capabilities, both on the silicon and on the platform side?

A - Colette M. Kress {BIO 18297352 <GO>}

Well probably, first one to see -- very similar to what we saw in terms of deep learning that your cloud service providers will be getting that, (will be getting) that in terms of whether they use it for internal usage in terms of their applications or they make it available in terms of with the cloud for others to take advantage. We'll still see in terms of key industries. But it's probably the exact same industries that are very focused right now in terms of the overall training market that we see. We've been focused in terms of on manufacturing. We've been focused on robotics. We've been focused on health care. We've been focused on the financial industry. These are very important things. One of the things that you see that keeps all those

industries all together is the significant amount of data and their ability to apply AI to that to quickly -- (or to some of the answer if needed).

Q - Harlan Sur {BIO 6539622 <GO>}

Great. Well let's focus on the other big announcements on Sunday, which was the new DRIVE platforms or your DRIVE Xavier, DRIVE IX, DRIVE Pegasus. And again, turning back to your analyst meeting back in May, I think the head of your auto business sort of put a dollar content opportunity per automotive for NVIDIA kind of 2020 -- 2025 time frame anywhere from $500 to $1,000 per car, Level 5 being $1,000 of opportunity for NVIDIA per automotive. And my sense was that back in May, that was just focused on the core DRIVE platforms, right, like DRIVE PX, DRIVE PX 2, DRIVE Xavier. But Jensen and you and the team announced another platform on Sunday, which is DRIVE IX, right, which is this compute and GPU platform which senses driver and passenger behavior, takes that behavioral information, maps it into the other functionality that's coming from your DRIVE PX platforms. And with that, the car is now able to actually make more intelligent decisions about what should the car be doing next, right? Then you also have -- you also announced another platform which was -- I think it was called Drive -- was it DRIVE AR, which is enabling richer content within the infotainment system as well. And so my sense is that these kinds of opportunities are not included in the dollar content opportunity that you laid out in May. Am I correct in that? Or do you have a sense of -- with all of these new platforms, has your dollar content opportunity per auto actually increased now as you think about it over the next kind of 3 to five years?

A - Colette M. Kress {BIO 18297352 <GO>}

Yes. The overall view that we had taken with our Analyst Day back in May is to really help people understand that the change in terms of where the dollars are in the car will likely change. There's a huge opportunity in terms of the ability to add the technology in there and move from the actual driver and the overall value that the driver has to the overall car. So you're not looking at extrapolating it from the overall tires and toward the steering wheel. You're actually looking to say, how do I add in terms of the value of that technology from the overall driver? These are all things that can overall improve both safety and improve just the overall experience inside the car. Now we are still in the early stages looking in terms of the next several years in terms of what those price points are, what do we think the overall value that we can (inaudible). It's still very early. But we do believe, based on where we are today in terms of just high-end infotainment systems, infotainment systems, which will be infused with AI going forward, whether that be the augmented reality or whether that be just used inside of the car with the driver and the passengers, can significantly increase the overall value of (inaudible) infotainment system. Then when we talk about what will occur outside of the car in terms of gathering that data, processing that data that is either, a, a Level 3, a Level 4, a Level 5, you're right, you have an overall exponential growth into the overall value that we can actually extrapolate and probably from overall price points. But there's significant amount of work in terms of software development between here today and what we'll see into the next couple of years.

Q - Harlan Sur {BIO 6539622 <GO>}

Great. Why don't we change it up a little bit? I continue to like the core business, which is the gaming business. It's near and dear to my heart. My son is a big enthusiast gamer. Your gaming business is going to be up greater than 30% calendar year '17, continue to remain relatively unchallenged at the high end of the enthusiast gaming segment. The GeForce 1080 Ti platform continues to lead the pack in terms of gaming performance. The Pascal architecture has been a huge success. That being said, the enthusiast community is anxiously awaiting the launch of the GeForce 20-Series platform this year. Some speculate it may not be Volta based. It might be another architecture called Ampere. Can you maybe give us a sneak peek on the 20-Series platform launch and architecture?

A - Colette M. Kress {BIO 18297352 <GO>}

Yes. I always love that we come here and (talk) about our next-generation products. And I think you just tried to name our next product in terms of that. But I'll take that back to the (team and review) and agree that we should call it the 20-Series. But I didn't know we were naming the products onstage. But we can take that into consideration. But we don't generally talk about new products. We'd love to (excite) on the consumer side, (win) our overall (inaudible). So what I can discuss, though, is yes, that overall success of the Pascal. The overall success of the Pascal, very similar to our prior versions in terms of we usually keep our architecture (inaudible) for a couple of years. We continue to dazzle them with new product launches across that, which you've seen us do in terms of new products that we brought out on the Pascal. You are correct, we probably have the majority -- more than the majority, a very sizable amount of the overall market as we both have the loyalty of the gamers, we have the overall performance that they require to play their high production (value) games. The AAA games that came out for the holiday season, many of them were top star games and many people spent a lot of their holidays doing that. But keep in mind, we're not done with our holiday season. We are maybe at the tail end of it here in the U.S.. But there are holidays across the world where we continue to see the ability for them to take advantage of the overall Pascal. Our overall goal is not just in terms of upgrading the most current. People that may have our prior version but we're also here for those that have been with us for several generations. And this is a great opportunity for them probably to take advantage of Pascal as we move forward. Now when you think about our unified architecture across the company, what we mean by that is we use the same architecture across every single one of our businesses. So essentially, what we have in gaming, what we have in automotive, what we have in data center is all the (same) overall architecture. But keep in mind, we make sure that we create (parts) or we create chips that are most efficiently and effective for the overall markets that we will serve. So yes, you could look at some of the things that we have done in data center. But we are going to concentrate on the gamers in terms of what they need for the overall (concept that we'll have).

Q - Harlan Sur {BIO 6539622 <GO>}

So 1080 Ti -- you have the 1080 Ti GeForce platform. We rolled out the 1070 Ti. Combined that with, as you mentioned, the second half of last year, which had a number of huge blockbuster games. And obviously, that's driving the strength in the GeForce business. But the interesting thing is that if we look at the first half of this year, there's actually more -- it's -- we're not seeing the normal seasonal pattern. There's actually more AAA blockbuster games coming out in the first half of this

year: Far Cry 5, for example, hugely popular, launching in March; Metro Exodus, which is another one launching later on this year as well. Does this potentially extend the customer buying cycle a bit, maybe smooth out the seasonality for the GeForce platform?

A - Colette M. Kress {BIO 18297352 <GO>}

So generally, our seasonality in terms of overall gaming as it relates to GeForce has generally been centered around in H1 and in H2. I would say that our H2 is probably a larger overall size than H1 due to seasonality. What that means is with the holidays, you're right, most games do hit the holiday season. This is an opportunity to buy a gift and all those different types of things and spend the time overall (paying) for those around holidays. So yes, that seasonality says that we see still probably we'll see that overall seasonality continue. Sure, new games have always come out, sometimes outside of that holiday window, which they come from time to time, sometimes in Q1, sometimes in Q2. So that doesn't overall surprise us. But no, we still do expect the overall seasonality (inaudible).

Q - Harlan Sur {BIO 6539622 <GO>}

Okay. Great. Well let me see if there's any questions from the audience before I continue my Q&A. Any questions from the audience? If you do, raise your hand. And I would ask if you just wait for the microphone. Okay, no? Let's turn to -- let's turn back to the data center and the HPC business. Tesla V100 compute platform, Volta architecture, huge performance boost versus Pascal-based architecture, 12-nanometer technology, biggest chip in the world. Demand has been strong. Has the team been able to keep up with demand? Have you been able to improve yields and overall manufacturability of this monster chip? And are you shipping to consumption now?

A - Colette M. Kress {BIO 18297352 <GO>}

Yes. We've actually definitely been able to keep up with demand. I think we were extremely pleased with the process that the company went through. You're right, it is the largest chip that has been built. Our ability to get from just the initial takeout to actually seeing it with customers to actually getting to an ideal yield that we can still move in terms of top production. It's probably some of the fastest (inaudible) that we've seen. We're extremely pleased with all of the teams and all of the partners that enabled us to overall do that. So yes, we have been, probably since Q2, shipping at full production in terms of V100. And demand continues in terms of the overall V100 across the board, both at the CSPs as well as also worldwide in terms of (inaudible) and in terms of the (inaudible).

Q - Harlan Sur {BIO 6539622 <GO>}

One of the things that Jensen mentioned on Sunday was that unlike prior generations of your AI and deep learning and HPC-based platforms, Volta was the first platform to be adopted by all of the cloud -- all of the major cloud service providers in the world. And back in May, again at the Analyst Day, you showed your -- the head of your data center business showed a pie chart, right, by customers in terms of enterprise, HPC, cloud service provider, where in terms of number of

customers, CSPs were the smallest percentage. But my sense is that as it relates to the overall revenue contribution, they're much higher than that. And so I'm just wondering if you can give us some rough quantification of your data center revenues by customer type.

A - Colette M. Kress {BIO 18297352 <GO>}

Yes. So think about our customers -- sometimes our customers wear multiple hats, okay? So when you think about the overall CSPs, in some cases, they are using it for their overall internal applications. Sometimes they're using it for their overall internal research or the research organizations. But sometimes they move to become partners for us in terms of being that conduit in terms of reaching in terms of the enterprises, reaching -- meeting small businesses, start-ups as well as also in terms of higher education, in terms of (that), meaning they put it in terms of the cloud. They're not the end user of it. But they are overall (establishing that) they're using for other customers. So to talk about them in only one case that says that they are the customer, yes, in some cases, they are. But a lot of times there in terms of the cloud, which is a massive amount of additional customers moving forward. Our business has been broken out between 5 different pieces in the data center. One, starting with the overall training and (inaudible); two, our overall emerging area of inferencing; number three, our focus in terms of the cloud and creating (hot) instances for many of these same areas; four, in terms of what we are doing with high-performance computing; and then fifth, what we see in terms of in the edge, in terms of creating data center and the overall AI capabilities in terms of the edge. All of those are extremely important pieces. But yes, the majority of our business does still stand from our overall training, our overall high-performance computing and our overall cloud. So those 3 things still make up the overall majority. But you'll hear us talk about the emerging areas because we do think they're very important, very important in terms of the overall market size that they represent as well as the overall shift and transformation that we've seen at these (inaudible) GPUs really end to end with the (overall AI).

Q - Harlan Sur {BIO 6539622 <GO>}

Let's turn to automotive. The business has grown at a 70% CAGR over the past three years, grew 52% in calendar '16, most of it on the heels of your infotainment leadership, right, with the Tegra platform. It's going to decelerate to kind of mid-teens-type growth calendar year '17. Does the deceleration imply that the Tegra pipeline is starting to mature? And where are you in terms of the infotainment design win pipeline? Do you expect that maybe there is some -- going to be some (win) acceleration? And when do we start to see the first big wins on your DRIVE PX platforms really start to take that growth curve up substantially?

A - Colette M. Kress {BIO 18297352 <GO>}

Sure. When you think about overall -- of the last three years in terms of our automotive business, it has been the lion's share of that has been the overall infotainment systems. Infotainment systems have been a great addition to the overall automotive industry. But it's reached a point in terms of its maturity. Most of the cars -- all of the major car companies all are providing infotainment systems, even in terms of their mainstream types of cars. Now when you think about the infotainment

systems that we concentrate on, the visual computer is a very key part of what we put together. And we will concentrate in terms of those premium types of areas. Meaning going in terms of all of the mainstream is probably not the area. But we will overall shift to incorporate the overall AI in terms of those infotainment systems as we move forward. So rather a mature area right now, a mature area that we'll probably see infotainment systems match in terms of the overall automotive (breadth). Historically, it's moving faster than the automotive because of this being introduced in terms of (inaudible). So as we move forward, the key partnerships that we've talked about both here at CES and at prior CESes and throughout the year in terms of our GDCs are important leading indicators in terms of what we'll see partnering moving forward. Those partnerships moving to both a possibility in terms of development agreements as we work jointly in terms of our AI platform inside of the car. Those are the key things that we see moving forward. Now the timing for those is still to be seen as working on building these AI cars take several years. They have -- they do find the overall importance of this market and in terms of the transformation on what they're seeing. But I think -- still think we're a couple of years away in terms of those production cars being a material part of our overall automotive business.

Q - Harlan Sur {BIO 6539622 <GO>}

Let's talk about crypto and blockchain. Cryptocurrency, mining, blockchain has emerged. It's small. I think I estimated about 3% to 5% of overall revenues but potentially increasing part of the revenue opportunity for the NVIDIA team. The underlying blockchain technology has many uses as a general transactional technology. Obviously, the underlying computational complexity is what lends itself to the usage of GPUs. And as the usage of blockchain expands, has the team tried to quantify the market opportunity? And similar to new market opportunities, what is the team doing to build an NVIDIA ecosystem to support crypto and new blockchain platforms?

A - Colette M. Kress {BIO 18297352 <GO>}

Yes. Answering cryptocurrency, we get a lot of (little) questions here and there about the overall market for cryptocurrency and/or in terms of blockchain. It's an interesting rising area type of interest. A lot of that has just been fueled by the overall valuations that we've seen. But it's a very hard market because it has market dynamics. We see a need. But it's not exactly overly clear in terms of where this overall market will long-term exist. What we do see is there is a demand. There is a demand where you see sometimes other -- they bring that currency. And therefore, there will probably still be an underlying pull. But it may have its ebbs and flows along the way, some of that tied to the overall valuations and what they can receive in terms of return on investment. We will continue to be able to produce GPUs that are well suited for this market. Again, we have the ability to produce so many different types of GPUs. It's very easy for us to again be able to support this overall market, as we have done (somewhat) today. Now are we at the stage, though, that we would say, "Let's move and create this large investment?" One, I don't think we need to, as our ability to support -- it is quite easy for us to do. But two, it still has market dynamics but not necessarily a (full payout) that we could see going forward. Right now, the current currencies support the use of GPUs. As you recall, going back to 2014, some of those currencies moved quite quickly in terms of (inaudible). We'll

see. There will likely be a new currency. Not sure when. But it's probably a good outlook to assume that something also will evolve and we'll have to look in terms of its use in the (inaudible) for that.

Q - Harlan Sur {BIO 6539622 <GO>}

Great. Then my last question, with the passage of the tax reform bill, how does this impact the team's long-term effective tax rate? And how motivated is NVIDIA to take advantage of the repatriation benefits?

A - Colette M. Kress {BIO 18297352 <GO>}

So I'm sure NVIDIA is not alone with many of the firms that have been working quite (ridiculously) over the holidays as well as also in terms of the (inaudible). We actually learned that corporate tax rate will be front and center, I think, quite quickly. So we are moving to incorporate this in. And the tax teams across the world are working very fast and furious. But what we see in terms of this is, overall, the overall goal of tax reform was to lower the overall U.S. rate, lower the U.S. rate because the U.S. rate is probably some of the highest in the world and definitely accomplish that. And that's something that will most likely be neutral as well as positive to us in terms of our overall tax rates moving forward. It does give us an ability now to not think about our overall cash and profits that we've received since this is U.S. cash and U.S. profit and that is overseas U.S. cash and profit. So I think it allows a better use in terms of that capital, in terms of possibilities, in terms of how we use that. But that doesn't necessarily change our overall top priorities in terms of our use of cash. Investment in terms of the business is still our #1 goal that we have. We have extremely large markets that we are focused on. And we have to make sure that our investment is rightsized for many of the competitive people that we work with as well. Number two, we'll look in terms of any types of tuck-ins and things that we can do in terms of (our) M&A. Nothing historically has been very large for us. But we will continue to work in terms of that. Our capital return program is still a big focus of ours. It's not a 1-year phenomenon. And we will continue to support that in terms of going forward. So our uses of capital are still intact and still important. But I think it allows the ease of use of many companies around the world to not have (inaudible) cash with the overall tax reform.

Q - Harlan Sur {BIO 6539622 <GO>}

Great. Well with that, we're out of time. Colette, thank you very much. Always appreciate you kicking off our conference. Thank you.

A - Colette M. Kress {BIO 18297352 <GO>}

All right. Thank you.

Q - Harlan Sur {BIO 6539622 <GO>}

Thank you.