JPMorgan Global Technology, Media and Communications Conference

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>}

I will start it from here. All right. Great. Why don't we go ahead and get started? And good afternoon. Welcome to JPMorgan's 46th Annual Technology, Media and Communications Conference. My name is Harlan Sur. I'm the semiconductor and semiconductor capital equipment analyst for the firm. And we're very pleased to have, as our lunch keynote speaker, Colette Kress, Chief Financial Officer of NVIDIA.

Many of the trends that you will hear about over the next three days, things like artificial intelligence and deep learning, the significant growth opportunities in things like PC gaming and the move to semi and a fully autonomous driving, all of these trends are being powered by NVIDIA's silicon and system solutions. And given these growth trends, it's not a surprise to see the solid growth and profitability that the company has delivered over the past three years. So for example, 3-year revenue CAGR for NVIDIA, 28%; 3-year earnings per share growth for NVIDIA, 51%; and just in calendar year '17 alone, the team grew their revenues 41% and EPS 61%. So one of the fastest-growing semiconductor companies in my universe. One of the fastest-growing semiconductor companies in the world, driving and powering some of the fastest growth trends in the technology markets today. So what I've asked Colette to do is to start us off with an overview of maybe some of the more recent financial results. And then to discuss some of the key takeaways from NVIDIA's recent GPU Technology Conference. So with that, Colette, thank you very much for joining us today. And I'll turn it over to you.

Colette M. Kress {BIO 18297352 <GO>}

Thank you. So much for the introduction. So I would love to start out with our results that we just finished our Q1 late last week. And in terms of announcing that, for those that weren't aware, let me just kind of start on a high-level summary. That was a great summary in terms of where we've been in terms of this last year, in the last three years and Q1 was just a continuation of some of those great results that we've seen.

We announced revenue growth of more than 66% year-on-year, topping more than $3.2 billion for the overall quarter. This was fueled by our growth in terms of our gaming business that reached more than $1.7 billion, fueled by our overall Pascal architecture available for many of our gamers worldwide. You see a gaming industry that has completely transformed over the last 10 to 15 years to be a very important social platform for how many of our teenagers as well as our gamers that have reached more than 40 years old spend their time gaming. And the Pascal architecture has been tremendously successful. Additionally, in terms of our results, our data center business grew more than 71%. And topped over $700 million for the overall quarter or approaching an annualized number of nearly $3 billion.

Our overall data center business has grown astronomically in terms of both its breadth and depth in terms of what it's accomplishing. Very different than our overall gaming business, which is focused on our graphics capability, which is to our true self in terms of how we developed as a company over the last 20 years. We focus in the data center regarding our compute capabilities. Focusing on using our overall architecture our platform to help in terms of many of the very important workloads that are in front of us. Important workloads that need the accelerated computing of the future as the slowdown of Moore's Law has become front and center over the last couple of years. You've seen accelerated computing hit high-performance computing. You've seen accelerated computing each -- hit a very important industry referred to as artificial intelligence.

Our overall GPUs are being used widely for overall deep learning training as well as what we've seen in terms of the quarter, in terms of the use of them also for inference and inference for AI. We've expanded the globe with our overall platform focused on each and every hyperscale and cloud service provider across the world, each one of them using our overall GPUs in many different arenas.

We're seeing them used both at an overall board level. But we've also completed the development of full systems, which we refer to as our DGX to tackle a market of an end-to-end system or a containerized version that you can just plug in and begin your work on supercomputing and/or in terms of the field of AI.

So moving back to our results for the quarter. Our gross margin also hit record levels for the quarter in reaching about 64.7%, growing primarily focused on our value-added platforms. Many people understand that our overall value proposition in terms of what we've developed in these platforms is a significant amount of software that enables the overall user to concentrate on the work they're doing as we finish the overall development platform, establishing the use with the overall application. Those continue to grow, which has fueled our overall gross margins.

Our profitability for the quarter. Profitability grew more than 140% to about 150% depending on which version of your overall profitability that you choose. We have a unique leveraged model that we are able to leverage an engineering workforce that really focuses on one thing, a GPU. That GPU allows us to span across all 4 of our different markets and leverage the overall design engineering that it takes to build out our platforms for each one of that.

So we're very excited with the overall progress that we made this quarter. That was a follow-on to some of the great work in the announcements that we had announced at our GTC. Our GTC stands for GPU Technology Conference that we held back in March. Now this conference is essential. It's not necessarily a place where we're dealing with our end-to-end consumers of our overall products. It is a conference that we are focused on our developers. Our developers are absolutely essential to the markets that we've established and the market growth and size that we have going forward. A record performance this year at our GTC, reaching more than 8,500 people in attendance, more than 20% growth over what we've seen in the prior year, all filled with developers coming to find the newest and best techniques to leverage the (overall) GPU, whether that be developers for gaming, whether that be developers in terms of professional visualization or our work in terms of what we're seeing in terms of the data center, absolutely a sellout crowd coming to listen to our story.

We made some very important announcements, both taking our current flagship Volta architecture that we have for the data center and focusing on the next set of products. Our next set of products, our V100 32-gig is really focused on the large data sets that are continuing to arise. The (deepness) of the deep neural networks that continue to be used, the complexity of that data. The 32-gig is extremely popular and interesting in terms of our cloud service providers for allowing them to use these higher data sets to solve a significant amount of their problems. And they're very excited to see this coming. Additionally, we announced our next version of our DGX system, DGX-2. This is essentially 10x its predecessor of DGX-1s in terms of overall performance and has moved to incorporating not just 8 GPUs but now moving to 16 GPUs with an NVSwitch capability as well.

Our other types of announcements were focused on our world of autonomous driving. And focused of taking some of the very similar work that we had seen in the data center to a very important industry of autonomous driving. Autonomous driving is really about safety and of providing safety. As you think about this vast world of how everybody drives, uniquely how we drive here in the East Coast versus the West Coast, or in terms of many of the countries worldwide, there is a significant amount of data collection that is going to be required to be processed to come up with the algorithms in terms of how we drive or self-drive the cars in the future. So we announced our overall DRIVE Constellation and our overall ability to create an ability to collect data using simulation.

So now taking our best-of-breed understanding of what we've done for 20 years, focused on simulating games, focused on simulating many of those corner cases out there in the world in terms of driving. We're now able to put that altogether so we can actually process algorithms that can help us drive going in the future.

So these were some of our key announcements that we've focused on as well as the announcements of our inferencing concentration in terms of in the data center. We've talked quite a bit about the use of deep learning training in the data center for AI, which is taking extremely large data sets and just through inferring from those large data sets millions and millions of images, you can actually train a computer to

understand each and categorize those images. Inferencing talks about the overall incremental data that comes on board and what you need to do with that, how you need to sort and complete that. It's about a speed factor there. We have concentrated on our TensorRT 4 version of our software, which is more about influencing the inferencing market. And even in our current quarter results, you've seen us doubling our overall inferencing revenue, focused on using inferencing, which primarily has not been a GPU market. But yet a very large market for us to attack going forward. And RT 4 really takes us there.

Then lastly one of our key highlights, just before our GTC conference at our gaming developer conference was the focus on ray tracing. Now ray tracing, for those that don't know, is essentially considered to be the holy grail of graphics. Essentially using lights of rays bouncing off to make it look and feel almost like film and video. The use of light is what really creates that dimension in so much of your overall graphics. So after more than 10 years of working to develop this overall technology, we're bringing it into realtime. We're excited to announce this and see the overall partnerships in the industry, both on the gaming side as well as on the enterprise side focus on use cases of ray tracing that will be coming market. You'll see these probably in the second half of the year. And we're first coming out with our overall GV100 Quadro focused on what we can enable in terms of in the pro visualization or the enterprise market of the use of overall ray tracing.

So I know that's a lot in terms of digesting. But I think, those are some of the key initial highlights following our earnings and our GTC.

Questions And Answers

Q - Harlan Sur {BIO 6539622 <GO>}

No. I think that was a great overview. And what I'd like to do is I'd like to delve into each of those different areas that you guys have a leadership focus in, right. Gaming, deep learning and artificial intelligence, automotive and then if we have time, we can dive into the financials as well. But let's look at your flagship gaming business. For those of you that don't know, NVIDIA is the market share leader in graphics processors for gaming PCs and gaming platforms worldwide. This is about 60% of their overall business. And this was a business that grew 36% in calendar year '17. And if I look at some of the statistics, right, of gaming -- and this is not just PC gaming, right, this is console gaming, this is things like eSports. So if I look at some of the statistics last year, NPD estimated that U.S. video gaming market grew 18%. That's split out by 18% growth in software, 19% growth in hardware. If I look at some of the other analyst estimates eSports, right, which is more of a relatively new development in the market, that market grew 26% last year. NVIDIA grew their gaming business 36% in calendar year '17. So in addition to correlation to game sales, there's an expansion of your installed base, there's penetration of new platforms into your installed base. And so -- and then you also have as games get more complex, your users are motivated to move up the stack to buy your higher performance gaming solutions. So you have ASP increase as well. And so as you think about growth in your gaming franchise going forward, how do you think about

putting all these vectors together to figure out what are the biggest contributors to drive the growth for the GeForce business?

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

Sure. So when we think about our overall gaming business, it's been an amazing transformation, probably over the last 10 years. For the folks that had originally thinking back in their past and their time they were young in terms of gaming, it is much different. Gaming has really moved to a social platform. Even farther from that, it's actually an entertainment industry. We're seeing a tremendous move to it is really about spending your time online with your friends and playing overall games on the overall side. It's not about playing with your computer, it's about playing with your overall friends. The games have massively changed in terms of the complexity, what we commonly refer to as the production value. One, they've gotten to the point where you can walk by and you may be a little bit confused. Is that real or is that a game, just due to the overall advancement in terms of the graphics. But secondly, they have also gotten quite complex in terms of their strategic focus. When you are playing with multiple players online, they have come to determine that it's a volume base of the actual game as you go from stage to stage in terms of trying to win the games. What's really popular right now is Battle Royale games. Battle Royale games, Fortnite, PUBG are extremely, extremely popular. I'm sure there's a lot of nods in the rooms in terms of the teenagers or others that you know that have to get home or have to get to the backseat of the car...

Q - Harlan Sur {BIO 6539622 <GO>}

I'm sure there are a lot of people that -- in the audience that play Fortnite and PUBG.

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

So I guess I'm dating myself. So -- but they are extremely popular as hundreds of people, all together, trying to win the overall grand prize. This drives our overall platform. We see eSports. We see people focused not only on playing the game. But believe it or not, watching others play the game. It's an exciting space to fill an entire stadium, filled with people that are watching people down at the field playing games. Teams are being formed that earn larger purses, larger purses in terms of the latest golf tournaments, in terms of playing games. This is what we are working with in terms of an overall market. The drivers are big, the drivers are strong. The overall gaming architecture, Pascal, that we have is best-of-breed. It is the market leader. It is established in terms of the significant amount of our installed base. The number in terms of installed base that we have is probably more than 100 million GPUs that are focused around the world. It's a gaming market that allows the connection across any part of the world. Everybody is a gamer worldwide, whether that be here in terms of in the U.S., in Europe or in the overall AsiaPac area. All areas are growing strong. We believe these will still be characteristics that we'll see going forward. What continues to drive us in going forward, gamers are coming on. They come on 2-by-2. They're not coming on 1-by-1 because it's about bringing your friends along in terms of gaming. It is about continuing to upgrade to the latest and greatest technology to play your favorite game that's coming. Your favorite game that's here or the favorite game that you actually lost to the night before. But you'd actually probably play better if you got a new gaming card. We have that ability to have an

infrastructure that's, that easy to update over time. Additionally, our focus in terms of a platform is focused on a gaming card for everybody. As you know, the world dynamics -- there is different discretionary income in terms of what they can do. It's your choice. How much of a gamer do you want to be? We have a card, anything from $100 to a $1,000 for those overall gamers. And we continue to see people buy the higher end. The higher end is focused on the high-end types of games that we are actually producing. And those work very well with our high-end types of cards that we have. But all of them do support the latest games and things that are coming together. So a very important market. It has expanded tremendously just from gaming. It is an entertainment sport.

Q - Harlan Sur {BIO 6539622 <GO>}

When we think about the mid; to high-end gamer or what we like to call the enthusiast market. One of the fastest-growing segments has been the notebook compute market, right. If you look at the conventional enthusiast gamer today, they've got a big desktop computer that's water cooled and SSD and fancy keyboard and all this kind of stuff. But more recently the trend has been for these gamers to want to take their compute experiences mobile. And last year, the NVIDIA team rolled out an architecture that allows a high-performance graphics processor to be integrated into a thin and light notebook, 20 millimeters down to 18 millimeters thick. This platform was called Max-Q. It was offered in more than a dozen thin and light notebook models in the second half of last year. Can you quantify the uptake penetration popularity of this new architecture?

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

Sure. So it's a very important area of focus for us. Definitely focused on thin and light. People aren't going to go back to having something else other than thin and light. But the other key part of it is the mobility that a notebook gives you for the overall gamer, for many of the other use cases, it's extremely, extremely important. So our ability to work on the base band -- and work on the baseboard of what can be put into there, some of our higher-end GPUs has been an extreme focus of ours. Now we have the capability that you can get both. You can have thin and light. But you can also have a high-end overall GPU. This is extremely important to the overall gamers. The gamers that want to take and go to their friends' house and bring their mobile with them to be able to game everywhere and anywhere is an extremely important market to us. So we're continuing in terms of our work with the OEMs. They have all adopted and well love what we are bringing to market in there. And you're going to see more and more platforms come to market using our Max-Q in terms of in the notebook. More to come as we look in terms of the rest of this year as well as we set up for the next holiday. But it is a key driver in terms of the growth that we are seeing in our notebooks for gaming.

Q - Harlan Sur {BIO 6539622 <GO>}

This next question is for all of the enthusiast gamers in the audience, for all the enthusiast gamers worldwide. And my son as well who is an enthusiast gamer. But we're coming upon the 2-year anniversary of the launch of your Pascal-based gaming architecture, 1070, 1080 graphics processors. You had a hugely successful 1080 Ti platform, which was launched last year. Typically, the cadence for new

products is two years. We're coming up on that 2-year window this year. So what should we expect? Should we expect an extension of the Pascal or the current-based architecture or will we see new gaming platforms this year that's based on the Volta architecture?

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

Yes, I think I'm not sure much is going to change here. We like to surprise you. I know we're just you and I here talking and there's just a small group out there. But we're still going to wait for a nice surprise to surprise you in terms of our newest architecture. Pascal is still king. Absolutely, still king in terms of the architecture. We have a great installed base on Pascal. The demand out there for gaming, it is still the best card in terms of there. So stay tuned. We'll have a great surprise for you.

Q - Harlan Sur {BIO 6539622 <GO>}

Great. Well we're looking forward to it. Let's switch over to the data center business. Here NVIDIA supplies silicon and system solutions that accelerate and execute artificial intelligence and deep learning workloads and other compute-intensive workloads as well. And you've got the #1 position. You're the category killer in this market. Your customers include all of the cloud and hyperscale titans, many of the high-performance computing platform customers as well. And the list goes on and on and on. It's 20% of your revenues last year. It was up 133%. At your recent GTC, your developers conference, you provided a $50 billion TAM for this segment of your business in 2023, $10 billion high-performance computing, $20 billion hyperscale, $20 billion cloud services. How do we think about the TAM from NVIDIA's hardware perspective, right. What does NVIDIA include in the TAM number? It's clearly not just silicon in boards, right. We also know that you sell some high-end compute systems as well. But is the TAM number an estimation of all the AI and compute clusters at the system level? Maybe help us parse through what the TAM numbers really mean.

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

Sure. So the TAM we're referring to, as we discussed at our GTC and Investor Day together, are really trying to outline not necessarily what we see for the next month, the next several quarters. But really focused on where is this market going for GPU computing and the data center over the next five years, focusing on, yes, a large market in front of us. We're in the early days of AI. We're in the early days of accelerated computing and GPU computing as we move forward. $50 billion can be broken down into 3 areas. Focus first in terms of our high-performance computing market, we consider that to be about a $10 billion market going forward. The focus in supercomputers, the largest supercomputers in the world, the TOP500 as well as those in terms of in the industry is an important area where accelerated computing will be front and center. The deep computational mathematics that needs to occur that their overall market is influenced by how fast they can get their work done, how fast that these jobs can get done, that leave us with the overall results of their work. So they are highly focused in terms of using accelerated computing. But they are interested in accelerated computing in new form factors. Accelerated computing with the supercomputers are there. But we are also seeing the adoption of DGX systems or end-to-end systems to do that. We also see them focused in terms of the

use of the cloud, in terms of moving these high-performance computing into cloud instances to get the work. So we incorporated that in the first $10 billion. The next is another $20 billion type of focus. Focus in terms of our hyperscales and focus on an area that we call the consumer Internet companies. The hyperscales we all know well and dear across both here in the U.S., focus those on the West Coast in terms of the Googles, the Amazons, the Microsofts as well as the focus in terms of the ones internationally in the AsiaPac area as well that are focused in terms of this very important market. Just as big companies over there as we do have here in the U.S. Those companies as well as what we consider to be the next tier, those that are focused outside of just internal development in cloud. But also focused on applications that are front and center. These folks are working on internal applications that serve you each and every day. For example, many of the search commands that you see today, particularly those that are voice recognition search commands is an AI application that is fueled by GPUs across the world. In other parts of the world in terms of the AsiaPac region, more than 25% of the overall search commands are now done by voice. And that is a complex work that both has to determine the voice, determine the language, determine what you said, dissect that and then come back with an answer and your expectation is probably about a second. That is fueled by the significant power of the overall GPUs to do that. And that is incorporated with one of the many different types of workloads focused on natural language processing, speech recognition, image detection, video encoding. And what is new serving in terms of these consumer Internet companies is recommendation engines. You no longer have to choose your next restaurant. They will actually probably provide you an example of where that will be. This is a very large and fast-growing market and has been very instrumental in terms of the birth of deep learning within our data center. The last $20 billion is really focused in terms of on the enterprise and the cloud. 15, 20 years ago, enterprises would go and build different clusters within their overall infrastructure to begin new types of workloads. That would be a very, very common way of how they would do that using their IT departments. What you see now is cloud instances being very readily available. Our V100 architecture is widespread with each and every major cloud provider looking to establish V100 and qualify it for their overall cloud instances. Why? The overall demand for enterprises, the demand for researchers, the demand for higher education to focus on using the cloud for the easy access to get started and thinking about the future applications is front and center. And that's what makes up our last $20 billion. So as you can see, the breadth of our platform is growing quite astronomically in terms of many different form factors but many different other types of workloads. But why has it reached this level? What has occurred that has enabled the use of GPU and the excitement about it? You talked about the differential of what is part of our hardware and what is the full stack? What is key and most important probably to our overall platform is our software. We enable, yes, the best overall technology and innovation in terms of the processor. We are the most complex processor probably on the planet. But what that comes together is a decision that we made more than 10 years ago to reach this point. More than 10 years ago, we established CUDA. CUDA is our software development platform that allows the programmability of the hardware. It allows the programmability as though you were at the software level. You don't have to be a hardware designer. You have to be a software engineer. We began 10 years ago teaching this in institutions worldwide, starting with our higher education, starting with the high-end research. Well after 10 years, you establish a pretty heavy base of overall developers. We have more than

850,000 developers with growth astronomical. Growth in terms of our overall CUDA downloads in the millions each year, those wanting to focus in terms of what others are doing. It's not always just about the hardware. But it is where do the developers want to work. The developers want to work where there are other developers and our stack is important. That stack is important for many different reasons. It both just enables the use across many and each and every type of operating system that is out there, every network. But also each and every one of the AI frameworks that are popular and current right now. Those AI frameworks are changing very, very fast, very focused in terms of what are the latest trends in terms of AI. We have a promise that we will continue to support each and every single one of those different frameworks. We're not aligned to one, we're agnostic to them all. That allows us to be spread worldwide. We have one single software platform that allows you to do each and every single one of our platforms today, our GPUs of yesterday and our GPUs of the future that will continuously work on the exact same software platform. That is what is enabling the breadth and the speed of the adoption that we're seeing today. We fuel the stitching of together everything from that GPU up to the application for it to work quite effectively in this world.

Q - Harlan Sur {BIO 6539622 <GO>}

Yes. And I would say that in covering NVIDIA for over a decade now, I'd say that, that's the biggest differentiator relative to the many of the semiconductor companies I cover is that, I think the NVIDIA team realized early on that it's not just excellence in designing best-in-class silicon, right, or software or firmware, for that matter, it was actually even more important to develop the ecosystem, right, for those end customers to take advantage of this best-in-class software and silicon chips. And so on and so forth. And whether it's been your graphics platform, your deep learning and AI platforms and even your automotive platforms, I think the team -- I think, that's what sets the team apart is that you guys figured out before anybody that being able to seed and develop and grow the ecosystem is the key to eventual demand pull for your devices.

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

Yes. Absolutely. What we do in terms of the data center is very instrumental in terms of what we've done in terms of establishing in gaming and our gaming developers. Our game developers, we are usually well ahead before that game is actually coming to market. We are working with those developers in terms of features inside of their overall games to have them better run and better reach the overall needs of high-end graphics and what is available. But that really kind of moves us also in terms of automotive. Our automotive business, for example, is really just an extension of what we've learned in terms of the data center. It is essentially a vertical with inside many of the same features that we are doing in data center. Autonomous driving is essentially a data center problem or essentially what we refer to as an AI problem. The amount of compute that will be necessary to process all of the things that are going on around the car is absolutely essential. We have a DRIVE PX platform, our platform for autonomous driving. We're on our third generation of that platform. And we will continue to work with overall the 380 different partners, tier 1s, automotive leads in terms of focusing on the development of these autonomous platforms for the safety needs that it needs so that we can bring this to market in the next couple of years.

Q - Harlan Sur {BIO 6539622 <GO>}

Did you want to highlight to the audience what's your current engagements and the customer list looks like for DRIVE PX?

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

So we have a broad list. There is more than 380 that are using our overall platforms in different forms. Again, we focus in terms of AI inside of the cockpit as well as focusing in terms of autonomous driving, stemming anywhere from a high-end level to probably to what we're going to see in the future in terms of Level 5 or what we refer to as robo taxis. A lot of people constantly ask in terms of what will come first. What will you see in terms of high-end Level 3 versus what you'll see in terms of Level 5. And they're both really important. In Level 5, you can probably move your overall focus in terms of a smaller community, possibly a square mile. Something that you may see in terms of on a university campus, what you may see in a retirement community, that you could use autonomous driving in those areas to be quite effective and bring that to market almost in the same manner that you may be a Level 3. The focus in terms of improving the safety around the world in terms of driving is our #1 focus. And we do know that this is an extremely hard problem. And our work in terms of assisting automotive companies of the use of the software, the advancements in terms of AI has been very, very well received. Our focus in terms of Constellation, where we first focused our discussion of finding all those corner cases that need to be mapped out and understood, we have that availability of understanding what we've done in terms of gaming. So we're excited. And it's probably one of the largest transformations that we will see in the next 10 years in terms of how cars will be driven.

Q - Harlan Sur {BIO 6539622 <GO>}

Well Colette, thank you very much for joining us this afternoon, really appreciate it.

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

Thank you. Thank you. So much.