# Citigroup Global Technology Conference

## Company Participants

- Colette Kress, Executive Vice President and Chief Financial Officer

## Other Participants

- Atif Malik, Analyst, Citi
- Unidentified Participant

## Presentation

### Atif Malik {BIO 7312618 <GO>}

Welcome to day two of Citi Global Technology Conference. My name is Atif Malik. I cover equipment and semiconductor stocks here at Citi. It's my pleasure to welcome Colette Kress, CFO; also Simona Jankowski, VP, Investor Relations, to our first keynote of the day. I will go first with my questions and then we'll open it up to the audience to ask their questions. Welcome, Colette.

### Colette Kress {BIO 18297352 <GO>}

Thank you.

### Atif Malik {BIO 7312618 <GO>}

I'm going to start off with gaming. It's still your core market with the biggest percentage of sales. In July, you announced the new GeForce RTX supercomputing -- super gaming GPUs based on Turing architecture. These new cards increase performance by 25% and makes ray tracing even better. How big is the ray tracing market? Can you talk a little bit about the improvement in this architecture and why ray tracing is so important in this latest generation of gaming cards?

### Colette Kress {BIO 18297352 <GO>}

Great. Thanks for the question. So we did, over the summer, refresh our stack of GeForce RTX cards for the

market. We launched these at Computex this summer. We're extremely excited about both the reception from reviewers as well as from the overall gamers. As mentioned, there is an increase in terms of performance just in less than a year from the original cards that we came out for the overall ray tracing Turing architecture. It allows people to continue to enjoy what we believe is the snowballing effect of ray tracing in the overall industry.

We have now a significant amount of ecosystem partners, all of the game developers, all of the key game engines, all supporting ray tracing. What you'll see is probably now more than 20 different ray tracing games have been launched to support these overall cards. Now, these cards are influenced not only by real time ray tracing with the overall hardware, but the software also enables us. What you're seeing is we're the only cards on the market right now that support ray tracing. So a lot of questions is what is ray tracing? What does it look like? How do we see in terms of the overall difference? And we actually brought a video today to kind of show you what does it mean in terms of ray tracing.

Probably if some of the most famous games in the industry have launched using ray tracing and one of the most popular ones being Minecraft. Let's show you the video and then you can see for yourselves what real ray tracing looks like. (Video Presentation)

## Atif Malik {BIO 7312618 <GO>}

Thank you, Colette. That was very cool. How big is your lead in ray tracing? A competitor came out with their latest cards this year, it did not have ray tracing. How big is your lead at ray tracing?

## Colette Kress {BIO 18297352 <GO>}

Yes, the lead in ray tracing is an important thing. This is something that we have been working on for some time. Most of them, a lot of the features, a lot of the work that we do in the ecosystem is 7, 10 years worth of work in order to bring it to market. It's not associated with just the overall chip. It's really associated with the work that we do in terms of the software to make this happen. So all of the games coming out have definitely been influenced by our cards that are available, so they can take advantage of ray tracing. Much of the ecosystem is just as excited on ray tracing as we are, as they know that this is the next generation of gaming and the next opportunity for a lot of the overall graphics and design world.

## Atif Malik {BIO 7312618 <GO>}

Great. And where do you see the biggest opportunity within your gaming segments. You have eSports. Users who want faster GPUs for faster frames. You have developers who want to improve frame speed and add new features to games like ray tracing. And you also have movie studios using ray tracing on Turing for advanced CGI.

## Colette Kress {BIO 18297352 <GO>}

Yes, that's right. What we're seeing is ray tracing is not just for the industry of overall gaming. We have this opportunity to take ray tracing also to a key part of our enterprise customers and also key important part in terms of what we refer to as the prosumer. When we think about one of the largest markets that we're focused on leading into the second half of the year is our focus in terms of mobility and our focus in terms of ray tracing laptops. Beginning early in terms of CES, we had started

the launching of specific gaming laptops for this overall market featuring overall ray tracing. What that means is the consumer is very focused in terms of on those thin and light laptops. But with now the ability for them to also have the same performance of what we would have in a desktop or a workstation.

So we have ray tracing laptops coming out. We have a new line that we've introduced for the overall studio or the overall designer that we see in this market as well. These laptops allow you for the film industry or any type of designer or creative out there that is building content for these overall markets. There's probably more than 125 different laptops in market or coming into the market for the overall back to school and holiday season. We're very, very enthused for this market in terms of driving what we need for the holidays.

## Atif Malik {BIO 7312618 <GO>}

Great. Your gaming sales are starting to approach normalized levels. What are your expectations for demand heading into the holiday season? Or maybe, I can rephrase the question. Which games are your teenage sons most excited about into the holidays?

## Colette Kress {BIO 18297352 <GO>}

So we are definitely set up well for the overall holidays. We have fueled the overall market not only with our desktop boards, but what we also need in terms of laptops for this market. We've also seen Nintendo Switch come to market with two platforms for the overall holidays. So we're very excited in terms of how we're set up. Our normalization of the business, it feels that it's here. We feel we have really been able to fuel the overall channel with a full stack of our overall ray tracing cards. And we're excited for the market.

## Atif Malik {BIO 7312618 <GO>}

Great. Can you share your thoughts on cloud gaming? Citi published a nice report this year on Cloud Invaders. Is cloud gaming going to be attractive market for NVIDIA? How is NVIDIA's approach different with GeForce NOW ?

## Colette Kress {BIO 18297352 <GO>}

Yes, GeForce NOW, for those here, GeForce NOW is our cloud gaming overall service that we have had in a beta opportunity for more than two years. We have more than 300,000 users. We have as tremendous wait list for people that are interested and we have a very long list of games that we also have. This is an area of our expertise. We know the gamers, we know the type of experience that they're looking for, the reliability. Cloud gaming really allows us to open up to a market that we have not been exposed to in the past, exposed to people that don't have the opportunity to have a dedicated PC or a dedicated laptop solely to just overall gaming, gives them an opportunity to purchase an overall service that they can be with their friends, be online in overall gaming.

It opens up in terms of that probably already do not have access to that gaming. So we're excited to bring this to market in terms of full time. In the meantime, we continue to work in terms of the infrastructure partnerships, in terms of with the telcos as well, as they enable overall cloud gaming for the future.

## Atif Malik {BIO 7312618 <GO>}

Great. Moving on to data center. Industry saw a slowdown in data center CapEx and spending in first half of this year after strength in second half last calendar year. Is AI still a big market?

## Colette Kress {BIO 18297352 <GO>}

Absolutely. AI is still an enormous market and will be an enormous market for the future. We're still in a very, very early stages of AI over the last couple of years. Excluding just a few overall hyperscale, we have broad based growth in our overall data center business. This is being fueled by a lot of different new technologies in AI and new HPC as we move forward. Probably one of the key most influential areas is the introduction of BERT, a very, very large overall AI system that has been put together building larger and larger data sets, that allow you to understand natural language and natural language understanding. A key area called conversational AI. This gives us an opportunity to show you our next video to demonstrate what do we mean by conversational AI and what areas is that starting in the industry?

(Video Presentation)

## Atif Malik {BIO 7312618 <GO>}

Great. Collette, can you talk about your addressable markets within the $50 billion data center TAM you highlighted at your last Analyst Day? You're super-strong in training, but sounds like it has come down this year. How big is training? And what's the opportunity within inferencing?

## Colette Kress {BIO 18297352 <GO>}

Yes. So we still have very important pieces in terms of in our data center business. Not only is it focused on just selling the overall cards. But remember, we also influence the market by producing full end to end systems that enable them to do high performance computing too many forms of overall AI. We began this market in high performance computing many years ago, more than 10 years ago. We moved over the last three years to five years to incorporate AI and a very big piece of that was the training market.

The training market is still a very important market, a very large market, and will be here definitely in the future. We also had the opportunity to expand in an area that we really didn't have a presence with, as it had been focused primarily by other types of processors. And that is inference. Inference is an ability for us to take many of the learnings what we had built in terms of the training and apply it to many other

different workloads that we're seeing. Much of this conversational AI will take place in terms of in that inferencing piece. That's inferencing that will happen not only in the data center, but also what we're seeing in terms of the edge data centers where there is not going to be that connection back to the main overall data center.

And what we'll probably also see in devices or autonomous types of machines as we go forward. These are large markets in front of us. We have a huge opportunity to demonstrate not only the performance that we have, but also the software that enables so many of these different workloads.

## Atif Malik {BIO 7312618 <GO>}

Great. You recently made an announcement with VMWare bringing GPU accelerated AI and data science to enterprise IT. Where are we in the GPU adoption curve for the enterprises?

## Colette Kress {BIO 18297352 <GO>}

Yeah. So first let's start in terms of what we have put in market with VMware. VMware is an important piece of so many of the data centers, enterprise data centers, but also a key part in terms of the hyper scales. We've already been in the virtualized market helping work with overall PCs in the cloud, working in terms of cloud computing overall, that virtualization fact is so key for so many of these workloads. We introduced a virtual compute server for this market, very similar to what we have with our grid software, very similar to what we have in terms of workstation and the cloud. So really showing and demonstrating our ability to produce more and more software to enable so much of this key market.

For the enterprises, in terms of AI and HPC, still a vast growing market in terms of the enterprise. And we're seeing many of the industries, very focused industries begin to do their work not only in the cloud, but also in hybrid types of environments and or on premise. We saw a significant retailer, Walmart really focus in terms of AI, in terms of how they do business, how they manage their overall supply chain or how they manage their overall demand planning. We'll see more of this in terms of in health care. We'll see this certainly in terms of the automotive as well as in terms of manufacturing and higher education, too. So the industries are again, one of the fastest growing parts of the market that we see in data center.

## Atif Malik {BIO 7312618 <GO>}

Great. And then we had Intel here yesterday and they talked about strength in cloud or hyperscale with some weakness in the enterprise segment. You mentioned GPU is little bit different, it's early in its adoption curve. Are you seeing weakness in enterprises as well?

## Colette Kress {BIO 18297352 <GO>}

What we're seeing in terms of our work, in terms of GPUs in this market. We've had such a running start, not only in terms of in the AI market, but in terms of the market overall, in terms of the needs that they need in the data center for accelerated computing. It's more than just AI as we look in of the future of what the end of Moore's Law will create. There needs to be that additional compute capability, and we are well positioned. Not just well positioned in terms of our full end-to-end stack that we have, but the overall size of the developers that we have in this market. We have over 1.4 million developers that focus on CUDA, and CUDA is on every single one of our GPUs that we've had in this market.

## Atif Malik {BIO 7312618 <GO>}

Great. That's a good segue to my next question. Edge computing sounds like an attractive opportunity for some of your competitors who are late to the AI market. Is edge computing market interesting to NVIDIA? You're offering CUDA to ARM. Can you talk about your partnership?

## Colette Kress {BIO 18297352 <GO>}

Sure. So what we choose to do is think about the entire world where we think this high end computing will go and where the accelerates will need. It is just important to think about that edge computing. Different from saying a simplistic device, but looking at the autonomous machines that will be out there in the future. Probably

one of the key areas of in terms of the large transportation industry and possibly the overall delivery industry in that last mile of delivery. How are we going to do that without a strong amount of AI to support that overall system.

Our work in terms of with ARM is to focus on bringing the ability of using a GPU in essentially every different type of form factor that may be in the data center. We already support X86, but this now gives an opportunity when we see ARM servers and overall supercomputing for the future that there was also be supported in terms of with our GPUs and supporting in terms of CUDA. So excited about that announcement.

## Atif Malik {BIO 7312618 <GO>}

Great. I know NVIDIA talk about new products, but a competitor is out talking about smaller geometry GPU products. Do you need smaller geometry products to stay ahead of competition?

## Colette Kress {BIO 18297352 <GO>}

Yeah. So there's a lot of discussion about whether in this case a smaller form factor or maybe even a smaller node change really, really influences what is necessary needed in the market. What we have been able to do over so many different years, even in this last year, you've seen us continue to improve performance with our overall GPUs by just concentrating on what we have available, looking at the overall

software capabilities that we can do to improve that, we've the improvement not only with cost, not only with yield to improve the overall performance. But one of the key things that makes our GPUs important is not only their top performance that we have demonstrated with MLPerf and many of the benchmarks that are out there is we also have the ability to leverage the full stack and stitch things together that are needed for the workloads that we support.

It's not just about this like hardware. So much of this is influenced by the ability to have an overall view of libraries, a view of content that enables so many of the specific industries that we are going after.

## Atif Malik {BIO 7312618 <GO>}

Great. Colette on that point, can you just talk about how many software developer engineers like you're hiring these days versus your focus on hardware?

## Colette Kress {BIO 18297352 <GO>}

We focus on both of them. Both of them are an important piece. But you're correct that we actually have more software engineers at the Company than we do in terms of hardware. It influences our whole system in terms of how we think about what we're bringing to market, when we think about the overall pricing strategy that we have and how we influence that with the overall software that we've enabled with our overall R&D to produce the overall margins that we do.

## Atif Malik {BIO 7312618 <GO>}

Okay. And then again, Intel yesterday, they have ambitions to enter the GPU market in a couple of years. I get asked this question quite a lot that if having a CPU and a GPU helps competition in some way or form?

## Colette Kress {BIO 18297352 <GO>}

Not necessarily. What you see is, there are so many important pieces that merge those two things together as the overall systems and the channels and the buses in between theirs. And actually the time that is spent in between the two is probably more important than the two standalone pieces. This is again where expertise is extremely important as we think about not only creating some of those interconnects ourselves, and it also feeds into why we think the overall Mellanox acquisition is so key. It enables us to think past just the GPU or the CPU. But looking at the entire network that is out there to how to influence overall performance and connectivity across many of these different workloads. It's not going to be just about a workload on a single server, but a workload, for example, on a super pod, a full DGX or a full system. So that layer of networking is going to be a key component as well.

## Atif Malik {BIO 7312618 <GO>}

Great. And so Mellanox. I was at Flash Memory Summit in August, and I was super-impressed by the two teams, putting presentation together and clearly shows the value of interconnect and computing. Can you just talk about little bit more about the rationale of the BU? Also, what are your expectations in terms of closing the deal?

## Colette Kress {BIO 18297352 <GO>}

Yes. Our overall expectations was the deal was really finding such a unique partner that we had been working so many years together with and now looking in terms of the influence that we can do, both focused on very important markets, whether it be super computing, whether it be overall computing in terms of in the enterprise. They are a key component, we are as well. And we see such an ability for us to work together in the future producing products for this overall market. As we've indicated, we do expect this deal to close before the end of the calendar year. We are excited about this deal. The market is also excited about this deal and we will look forward to this closing soon.

## Atif Malik {BIO 7312618 <GO>}

Great. Let's move on to Auto. At your Analyst Day, Jensen stated that he believes that every vehicle will be autonomous in the future and that autonomous vehicles represent a 30 billion TAM in 2025 between three growth verticals driving, training and validation. Driving represents the biggest market opportunity at 25 billion TAM. Auto is smaller or less than 10% of your current sales, when do you think Auto becomes a material opportunity for NVIDIA?

## Colette Kress {BIO 18297352 <GO>}

When you look at our overall autonomous vehicle work that we are doing, we're probably the only system in the market today for end-to-end system that allows a view with inside the car. But additionally, we have an end-to-end platform that allows not only the development, but also the testing and overall simulation of what can be done in the car. These are important pieces that allow the OEMs, that allow the tier ones, that allow many of the startups to begin their work. We have key overall partners working with us. Volvo Trucks is a key one that has adopted not only our platform, but our full end-to-end stack in terms of software. This is one more video that we have to kind of show our work in terms AV, so let's see if we can show that now.

(Video Presentation)

## Atif Malik {BIO 7312618 <GO>}

Great. Colette, can you map for us how you expect your auto ASP opportunity to grow over time?

## Colette Kress {BIO 18297352 <GO>}

Yeah, our overall ASPs in this market are largely influenced by the type of overall software and the type of overall production that we'll have inside of the cars. The more highly advanced in terms of the work that we are doing from level two, all the way up to level five, whether that be in passenger vehicles or truck influences the ability for us to sell a more deeper and deeper end to end stack for them. So our ASPs really just have the ability to probably double as we continue to move up that overall stack of what we'll be able to produce.

## Atif Malik {BIO 7312618 <GO>}

Okay. And do ASPs vary by the type of vehicle trucks versus cars. You announced a partnership on trucks this year or is the main variance in ASP based solely on the level of autonomy?

## Colette Kress {BIO 18297352 <GO>}

It can be both. It really just depends in terms of what will go in to the type of the overall vehicle going forward. But those are probably something more in the future. And what we're seeing right now is a significant amount of development support that we give them, not only in terms of on the infrastructure that we provide, in terms of thinking about the DGXs that they need in their overall data centers, what they need in terms of support, training, what they need in terms of really testing a lot of the work that they are doing. That's where we also are working with them. It influences both the end-to-end ability for them to complete the work, but will also work in terms of producing production inside of the car going forward.

## Atif Malik {BIO 7312618 <GO>}

Great. Another question I get asked by investors is what will NVIDIA look like, let's say in five years. How big of an impact to revenue you expect software is becoming? And could the software development for autonomous platforms be deployed in other areas of AI?

## Colette Kress {BIO 18297352 <GO>}

Yes, software is an important piece and although we don't monetize a truly separately in a lot of different scenarios, it is available. It's an important part of our overall data center business as we think about supporting our DGXs as you see in terms of our work with VMWare as well as all of our existing things that we have in terms of virtualize GPUs in terms of the overall cloud environment.

The overall software is a key component. We'll continue to not only update, but you'll see over time bringing new and new capabilities from our overall software for things that are possibly already in the car or already in the data center. This will again allow us an opportunity to continue to improve, even though we've already had the platform inside the car. So you'll see this more and more as we go forward of the importance of that software.

## Atif Malik {BIO 7312618 <GO>}

Moving on to the financial model. Gross margin was a positive surprise last earnings. What's driving better gross margins? And how should we think about the sustainability of gross margins moving forward?

## Colette Kress {BIO 18297352 <GO>}

So our gross margins, as we moved between Q4 to Q1 and then also Q1 to Q2, continue to move in terms of upwards. You're correct, we also have continued growth as we move into our guidance for our Q3. A lot of that is fluids [ph] in terms of just a normalization of our overall businesses. We believe we're getting back to where we have the growth, both sequentially across all of our platforms and we're able to really take advantage of the mix in terms of our overall portfolio, really selling the full stack of what we have from all of the different rate race cards to what we have in terms of the data center, mix is probably the largest driver in our overall mix within gaming should be quite positive influencing that Q3 gross margin increase.

## Atif Malik {BIO 7312618 <GO>}

Great. And in the OpEx line, you guys have kind of plowed through the correction that you've seen in the first half this year in gaming and data center, which is probably the right strategy given how big these markets are going to be in the future. And just talk about the OpEx to sales ratio. Are you paying yourself depending [ph] on ratio? Or are you spending more strategically?

## Colette Kress {BIO 18297352 <GO>}

So what we do in terms of the go-to market with overall sales, it's a different model than probably a normal overall enterprise company, because what we are doing is really industry led, industry types of folks that are trying to understand the problems out there as we work in terms of an overall partnership.

We spend a significant amount of time working with our partners that enable us to bring our markets, excuse me, bring our products to market in that fashion, meaning we work in terms of the channel partners, in terms of enabling it with inside of overall servers or inside of overall desktops in terms of overall notebooks. So no, we don't gear in terms of an overall ratio on that perspective. We work in -- really in terms of influencing developer relations in the overall industry. Developer relations not only on the gaming, but a very important part in terms of what we're seeing in the enterprise.

Everything from the overall studio line, in terms of the film industry, the design industry, as well as also what we're seeing in terms of AI.

## Atif Malik {BIO 7312618 <GO>}

Okay, and then if you can touch on your capital allocation strategy. I understand, it's -- the share repurchase bit on hold because of Mellanox acquisition.

## Colette Kress {BIO 18297352 <GO>}

Yeah. So what we're, we will always look at returning our available or free cash to our shareholders as we can and in terms of the future. Right now, we are getting ready in terms of the close for overall Mellanox. We're going to make sure that we close that deal and then we'll work in terms of rethinking our overall capital return and starting back after that once we finish.

## Atif Malik {BIO 7312618 <GO>}

Okay. And then on the China - US trade friction, are you seeing any impact to your business? You know, China is a big part of the gaming market?

## Colette Kress {BIO 18297352 <GO>}

So our China business in this last quarter did quite well. We saw a nice uptick as we moved from Q1 to Q2. We are well set up now for the overall holiday as we know that the overall gaming market in China is quite an important market for us. So we have seen the overall normalization probably worldwide as we have finished the end of Q2 and moving into Q3.

## Atif Malik {BIO 7312618 <GO>}

Great. And just on your manufacturing strategy that this various news that you're partnering with different foundry for your next platform, maybe just talk about what your strategy is in terms of supply chain management, especially on foundries?

## Colette Kress {BIO 18297352 <GO>}

So our overall foundries, we've always had a dual foundry overall approach. We use this opportunity to not only take our new architectures, but often split the architecture between our dual foundries. It allows us the opportunity for look at multiple different processes and at any point in time, we'll have a single overall chip or a single overall architecture being tested in both of our overall foundry approaches.

It's a good balance for us to really understand the processes around the world in terms of the foundry. So we'll continue to do that going forward.

## Atif Malik {BIO 7312618 <GO>}

Great. Let me pause here and see if there're any questions in the audience. If you have a question, please raise your hand. Over here.

## Unidentified Participant

Thank you. Colette, when you presented during a year ago, you unveiled two technologies. You talked about ray tracing at the beginning, but also DLSS. Can you give us a little bit more color about how this technology has been making progress in terms of improving the performance of the games and the ecosystem as well? And then I have just a second quick question. You also unveiled a technology called RAPIDS for machine learning, which expands the time in terms of AI workload. So maybe, can you comment a little bit on this please?

## Colette Kress {BIO 18297352 <GO>}

Absolutely. So DLSS allows us the opportunity in ray tracing to actually influence the work of the overall ray tracing in the rays in a faster way. Essentially using AI with inside of gaming. What it does is it takes in terms of two different pixels that may be a couple centimeters or inches away and fill in the center of those two with overall AI using DLSS.

It allows us to improve the overall performance instantaneously once overall RTX is on. We continue to do this work hand-in-hand with the overall ecosystem and many of the games that are out there. So moving quite strongly through. Additionally, your question was about our overall RAPIDS approach, and really looking at the data science overall market, a super large market in front of us, really to be supported with the overall software enabling this market and really understanding how they put this together. We're in multiple versions of the overall RAPIDS software and we'll continue to work in providing.