

2021 Deutsche Bank AutoTech Conference

Company Participants

- Ali Kani, Vice President & General Manager, Automotive Business
- Stewart Stecker, Investor Relations

Other Participants

- Ross Seymore, Analyst, Deutsche Bank

Presentation

Ross Seymore {BIO 20902787 <GO>}

Good afternoon, everybody. I'm Ross Seymore, the Semiconductor Analyst here at Deutsche Bank in the U.S. We're very honored to have NVIDIA with us for the next presentation slot at the AutoTech 2021 Conference. Today from the company we have the Vice President and General Manager of the Automotive business at NVIDIA, Ali Kani joining us. We also have Stewart Stecker from Investor Relations. So we're going to turn it over to Stewart to read a brief forward-looking statement comments and then we're going to go to Ali for some slides, and then we'll wrap it up with Q&A after that. I have a list of questions and then if you have any questions, please feel free to email me those, and I will ask them. It's ross.seymore@db.com.

So without any further ado, why don't I pass it over to Stewart to read the forward-looking statement. Stewart?

Stewart Stecker {BIO 17308457 <GO>}

Great. Thanks, Ross. And thanks for having us. As a reminder, this presentation contains forward-looking statements. And investors are advised to read our reports filed with the SEC for information related to risks and uncertainties facing our business. Over to you, Ali.

Ali Kani

Excellent. I'm not able to see the slides that are being shared. No, now I can see them. Okay. Hey, everyone. I'm going to quickly talk about our DRIVE platform. So we always talk about NVIDIA's entire strategy is to be an end-to-end provider for automotive solutions. So this means from the computer in the car to the data collection apparatus, to be able to take data into a car properly calibrated and synchronize the data, sending up to the cloud where we then build AI models. We build models for perception, for mapping, planning and control. And then we build a platform where we help simulate that vehicle. And so we have a DRIVE Sim

platform that runs on constellation based on Omniverse, and we use that platform to accelerate the end-to-end flow of AV development.

We believe that most important differentiator for any company in AV because it's so challenging to develop a safe AV experience is a company that has a really efficient development flow that helps them very easily find the issue, root cause the issue, fix the issue, test the issue and then be able to okay it in the car. And the faster you can do that, the more successful of an AV company you'll be, and you'll see that NVIDIA is unique and that we're investing in every part of that flow.

Let's jump to the next slide. At the center of that strategy in our platform is Hyperion 8. And the way I think about this is that Hyperion 8 is, essentially we think of it as like the ATX form factor of PCs, but it's the form factor for automotive. And so it's a computer architecture, it's the sensor set, it's the software platform that runs in the car. We have this drive works middleware software that is fully integrated into our cloud. We call it DGX infrastructure that runs on MagLev in software that we have.

And so how do you take all that data that comes from the car and in an automated way, label it and curate it, train our models and simulate it. Everything is connected to this Hyperion platform architecture. And so when we have customers, if they are aligned to that Hyperion architecture, we can help them across all of the stack and we design our platform, so it's easy to go from one generation to the next. So you could have an architecture based on Xavier computer, you can remove that Xavier computer and slide in a form factor compatible Orin computer into your vehicle and we design our software such that it's API compatible. So it's really easy to transition from generation to generation and leverage your investment, not just across your cars at one generation but across generations. Hyperion is central to that strategy and we always talk about it because we can help our customers accelerate to time to market as long as we sort of aligned to our Hyperion architecture.

Next slide. Okay. So as to the developing AV at the core, you need simulation and you need real world driving. And simulation ends up being ground truth for our AV development. And so -- and some types of data that we need is just so hard to find in the real world. It's really hard to come across, let's say, something like road debris, because there is like millions a difference of kind of debris that you might find on the road, if you're actually driving, trying to get that data yourself, you never going to be able to find it.

And so we have to use synthetic data generation to build that kind of data and that data actually is then perfectly labeled and photorealistic, and we built it on Omniverse. And so at this GTC, we announced having the ability to build that synthetic data generation platform, we call it, Omniverse Data Replicator for DRIVE Sim. But the reason why we build it is we need to do it for AV development ourselves. And so then when we have partners and they align to our Hyperion architecture, we actually have synthetic data for them that they can immediately take and it helps them build models that can handle those hard to find scenarios in the real world.

We just sort of give that for our partners. It accelerates their development and we kind of appreciate those problems because we're dealing with them ourselves as we're building this end-to-end platform. And so this Omniverse Replicator is something very exciting that we're building for our ecosystem in our customer base, such that we can help accelerate their development just like it's accelerated arts.

Go to the next slide. So I think we just really liked when NEO announced a vehicle that they're building on Orin. It's going to have four Orins, and it's going to go to production next year. They mentioned that Tops is the new horsepower for automotive. And I think what he really means by that, we don't actually think Tops is the most important thing in the automotive, but the point is computing power is incredibly important for automotive, because the vehicles are software defined and they're going to get better over their life.

And so we build our platform to consistently be upgradable. And so when we talk about going from Xavier to Orin, and for it being Hyperion compatible, what we mean is that Orin, form factor and computer is designed to be exactly form factor compatible to the Xavier. So you can just swap it in and then you can provide new features and functions to your customer base and have new revenues that you can generate off of your vehicle.

And the same thing with Atlan. Atlan will be form factor compatible to Orin, such that it's really easy to go from generation to generation. And what we're doing is we're constantly upgrading that platform. Here we're talking about chips, but the sensor set also increases with each of these generations' higher resolution, more sensors, more diversity of sensors, more advanced networks. And so all of those things drive the need for higher compete in the cars and that's what we're trying to do is make it easy for customers to sort of have a partner that can consistently give them higher performance and make it easy to leverage their investment across generations.

Next slide. Okay. So, at the core of our strategy and our view is that, there is two fundamental disruptions in automotive outside of electrification which is of course happening. One is the AV experience, so doing self driving software, and we talk about building a stack end to end that delivers that AV experience, we call it Drive Chauffeur because we want the car to be able to essentially have a virtual chauffeur that drive you from place to place, parks you from place to place. And so you'll see that we're building that entire stack for our partner ecosystem and we design it in modules such that if you don't want the entire stack, all you want is the computers. You're more than welcome to just take that from us. But if you actually wanted some of the software either it could be active safety or parking or AV, we give you the ability to scale what you take from us based on what is your need and how you want to differentiate.

And we also see huge innovation inside the car and we talk about that as the Concierge experience. What we mean is, once you take all these technologies like our intelligent virtual assistant who has natural language processing. Once you have a vehicle that can do that, you can now talk to your car and the car should know everything about the automobile. So if there is something wrong with light it should

know. I got a sign last week that said that my rear light was broken in my car. You should just be able to say what is the rear light that's broken? It should tell you, it's like a halogen or Xenon type of light. And then you could just order it on the spot.

It's fully integrated with everything about you as well as your vehicle and you can fundamentally change the experience inside a car. These are the two areas that all AV -- like automotive companies need to invest, and is redefining the experience inside the car. We call that your concierge. And then redefine how your car can drive you from place to place, your chauffeur experience and NVIDIA is investing in the full stack for both of those areas.

Next slide. And so with this Hyperion platform, what we're most proud of is the type of companies we'd like, when we look at this we think these are the companies building the most disruptive forward thinking software defined platforms in the industry. Volvo is doing some really exciting work, Mercedes-Benz, Hyundai, and then all the NEVs, whether it's Nio or Xpeng or Li Auto, where it's the full self driving companies like Zoox or DiDi or Cruise.

We're kind of partnering, all these guys are our partners because they believe in software defined development, they are building really advanced solutions. And so NVIDIA is very successful in both platforms, whether it's Level 2, Level 3, Level 4 or full self driving across robotaxi or trucks. So when we go to the next slide, when we sort of take all of those wins together, we have a huge pipeline that's going to be quite a bit larger than where we're at today. So over the next six years, over an \$8 billion pipeline, and it sort of spans all of those types of vehicles that we talked about from passenger vehicles to commercial vehicles. And it deals with both situations where we sell just the chips to our partners to full stack situations where we're building the chips, the full self driving solution and we're providing the end to end infrastructure that lets you sort of find these issues which cause them and fix them and OTA them in the car as quickly as possible.

Okay, that's all the material that we had planned.

Ross Seymore {BIO 20902787 <GO>}

Great. Thanks, Ali. Why don't we run the video? Christian, can you hit the button and run the video. I think we have plenty of time for it. (Video Presentation) Ali, let me know when the video is done and we can jump into Q&A.

Ali Kani

It's done.

Questions And Answers

Q - Ross Seymore {BIO 20902787 <GO>}

Okay, great. Well, when we jump into Q&A, again if anybody has any questions just email me at ross.seymore@db.com. But why don't I kick it off a little bit with, your approach, the end-to-end approach, open and modular that you had on your very first slide, you have to be the best at every one of those aspects to pull that off. So where do you believe NVIDIA is truly the most differentiated? Is it the attempt and the actual success at being fully end to end, or is there one attribute, whether it's the software, the simulation, the training, the hardware, the semiconductor side that is the focus more so on the semiconductor analyst like myself? Where do you think you are truly differentiated the most?

A - Ali Kani

I think it's in an integrated infrastructure that lets you develop code both in simulation and the real world with the same software stack, so that you could actually OTA really quickly. Basically what I'm saying is the secret sauce is in having a software development flow that is safe and secure which is needed for automotive safety standards. There is no one in the world that does that. Like how do you build AI code that needs to be safe and secure with every drop. You can't release buggy code in an OTA and self-driving vehicles. Well, how do you build code that is AI heavy in a safe and secure way, it's that software development flow that's end to end in the infrastructure, and essentially being able to do that is really, really hard. No one has figured it out and that's where I think NVIDIA is most differentiated putting the development of a vehicle, and in a virtual vehicle together so that you have really high quality and efficient software development. So I think that's the core differentiator.

Q - Ross Seymore {BIO 20902787 <GO>}

And given that historically the automotive companies would iterate at the natural pace that they could handle by just driving real world miles and it be the more cars you have on the road with your sensors, the more situations you could record, et cetera, for mapping in incidents, prevalence and diversity, those sorts of things. Are the OEMs trusting of a more SIM diversion of getting to the same endpoint or is that kind of something where you've had to earn their trust over the years?

A - Ali Kani

I think the whole industry knows that you need to do SIM and real world together now. It's just -- it's too hard of a problem when you have a heavy vehicle and it's supposed to do self-driving. You can't make any mistakes. And it's impossible to come across every real-world scenario just by driving your fleet of vehicles. It's just -- it's too hard, right, like imagine in each of our lives, how many times have we seen something random on the road. And now you're building AI code that's supposed to figure it out, if it's never seen it before, how will it handle it, which you have to in some cases do synthetic data generation. And only if you take synthetic generation and couple it with what you see in the real world, can you feel like you have enough diversity such that your AV experience is diverse.

And I say on top of that, you also need a diverse AV stack, not everything is based on AI. Some of the code that you need in a vehicle needs to use legacy methods just for that sake, that you might not recognized something, you might not have trained a

network. And so you need maybe in addition to an AI network that sees objects but something a little bit more legacy that just is optical flow base and you fuse both of them together. So having a stack that it's not just synthetic generation by real world, but also has some elements of legacy architecture as well as a modern deep learning based architecture, you fuse it together, then you -- the combination of both of those, then you have a really disruptive safe self driving experience.

Q - Ross Seymore {BIO 20902787 <GO>}

And from an NVIDIA technology point of view, are your customers also -- are you basically running all of this for them? You have the DGXs, you have the constellation, you have all of that. Are they wanting to take on some of the technology themselves, whether it's your supercomputer enabled development, so you sell them DGXs. How does the kind of the relationship across this open and modular capability reside with NVIDIA or with the customer or is that the part that you really are ambivalent between -- or agnostic between each of those?

A - Ali Kani

Yeah, that's a great question, and it's always up to the customer. And part of it's good to kind of be able to explain this. We have cases where customers don't use us at all in the car. But they buy infrastructure from us to train their networks. And some of them are our biggest customers. So you don't even need to use us in the car, you have to buy our chips in the car to be someone that we can help with DGXs and simulation.

We have some customers who just who buy chips from us and they had their own strategy for training and simulation. We have many cases where people are buying chips from us and using us for training and simulation. And we have some cases where people are buying chips from us, as well as the software in the car and using us for training and simulation. And so it literally is based on what the customer wants and where they feel they need. And the fact that we're developing at full stack in end to end, it gives us the opportunity to help them in more places, but it's just up to them. In many cases, they have the expertise and they don't need our help and that's great. And we sort of say just tell us how we can help you and we will just help you in those specific ways.

Q - Ross Seymore {BIO 20902787 <GO>}

If we look 10 years down the road, where do you think NVIDIA would be adding the most value in the car or in the development side of the equation?

A - Ali Kani

It's balanced. It's mix, and I think both of them are huge once in a lifetime generational opportunities. And I believe that both of them are just starting because today most of the cars are active safety cars, right. It's just like it keeps you from getting in an accident. It's not really driving you, but that will change over time where essentially every car one day will be able to drive you from any place to any place. And so that needs much higher performance computers and much more advanced

software in the car. And we're uniquely positioned to be able to deliver that kind of a computer and software driving solution.

And then in the infrastructure, the training and simulation that you need for active safety is really minor. But then you look at what Tesla talks about in terms of another building in L2 plus experience. And they have a really big infrastructure, right. They have announced, they have close to 10,000 GPUs. They've announced it themselves. So that's how big their infrastructure is. That's just L2 plus and a million cars a year. There is a 100 million cars a year, which can be not just L2 plus but L4. And so that market is going to be many 10 times larger. I think of it as there's only a few million cars a year that needed today an L2 plus, while every car will need an L4. So it's going to be like a 100 times in size and it's already a very large business for us. So I think it's not one, I think it's both, and I think they're both generational opportunities.

Q - Ross Seymore {BIO 20902787 <GO>}

Within the car itself, how do you see the processing power being delivered? Do you think there is one chip to rule them all the supercomputer in the trunk more diversified or more distributed around the vehicle closer to the sensors? How does NVIDIA envision that because there's different companies seem to be attacking it in different ways. And it of course depends if they're trying to enable L2 plus or L4/5, but how do you envision the distribution of the processing power?

A - Ali Kani

Well, so when we think about a software-defined car, the decisions and criteria of platform architecture selection will change. And we're seeing it already with some vendors like Volvo and Mercedes-Benz and the NEVs like Tesla, Nio, Li Auto, XPeng. They are centralizing their architecture. And the reason why you do that is that it's easier to support and maintain that vehicle over its life.

If you have like -- there is vehicles that have a 100 computers in them. How do you OTA, how do you update and manage that over the life of the car. It's really, really hard. But when you centralize the architecture and you sort of have more centralized approach, it's easier to maintain and update that vehicle and to do it in a safe and secure way, which is critical for AV. And so I think you will see more and more data. I think it's just to me, it's no doubt that the whole industry will move that way and it's already happening and it's because the industry is starting to recognize that there really is a great transformation where these cars are becoming software defined vehicles that will get better after the day they leave the lot. And you going to have to kind of create new features and functions over the life of that vehicle. It's not like the car is at its best, the day it sold. But it will get better after you buy it. And so then you want to have an architecture that's easy to program and update. And so then you get that bigger computer in the middle. So I think that will definitely happen, and we're still starting to see that transition already in a big way.

Q - Ross Seymore {BIO 20902787 <GO>}

You mentioned when you're watching the video that that vehicle was self-driving and it is a vision-based system, talk about the sensing modalities that NVIDIA supports. I know you don't have the sensing side itself, but you'd be the processor for the data

that those create. So talk about which of the sensing modalities you believe will be most prevalent going forward as we move to L 4/5?

A - Ali Kani

So we do have the sensing. So like Mercedes-Benz as an example, we're going to be doing all of the camera perception, radar perception and light our perception and driving stack. But so I think there is a place for camera radar for passenger cars and I believe that when we get to self-driving, we need to see if there is innovation in radar. There's some really exciting radars coming up on the imaging radar side. And it's possible to do full self driving with camera and imaging radar. And I believe that you have to have at least two sensor modalities, because there are some cases that a camera will not see something and you want a redundant way to see it, right. And so you want that second modality.

And so at least camera and radar, and once you get full self-driving, we see a need for lidar, we're certainly going to support lidar in our Hyperion architecture. And one of the platforms that we're taking to market will have camera radar and lidar. And I think lidar does have a good role when you deal with stationary small objects, because a camera can see it and our radar is not so good at seeing like a piece a brick on the floor because it's not moving. And radar won't even see it. So you kind of benefit from having that lidar to see that. And so I do see value in lidar as well when you get to sort of full self driving functionality.

Q - Ross Seymore {BIO 20902787 <GO>}

So we did have a question from one of the investors. And so I'll just read it verbatim. How does NVIDIA system compared with Tesla self driving software live updated data and ecosystem with over 1 million cars on the road creating and storing real data, not just the synthetic data that NVIDIA is talking about?

A - Ali Kani

Okay. So I think from a platform side, we're much more open, right. So, NVIDIA's platform is we have a developer platform, we see to the entire community and people are building AV software on our platform themselves. And so the rate of innovation and speed that you'll see on the DRIVE platform is really, really fast and fastest in the industry in my opinion, because it's not just NVIDIA software development speed versus Tesla. There is all these customers that we just talked about the Zoox and the cruises. They're building some great software on our platform and sometimes, some people want L4 and you get the benefit from that developer ecosystem that is on the DRIVE platform that you don't have on Tesla because the only person programming at Tesla is Tesla.

Then as far as self-driving experience, I mean, we showed you guys that drive it's an L2 plus drive. You can't do it on a Tesla today. So I feel like we are best-in-class. They're doing some really great work. I think, Tesla and XPeng are building production cars today, the best self-driving software. But I think other than them we are the other best option available on the market. And where we try to differentiate is there is a developer ecosystem. They can differentiate even faster than us.

And then of course we tried to progress faster. And I think the two years ago, Tesla was driving better than we were. But today we're doing scenarios that they can do. And so we'll see who ends up full self driving faster. But we feel really good about the investments we're making in our strategy and we think that speed of development flow really is critical to be successful long terminating.

Q - Ross Seymore {BIO 20902787 <GO>}

Great. Thanks for that answer, Ali, and thanks for the questions from the audience. If anybody else has any questions just email me. Why do we switched to the business model side of the equation because there some interesting implications on that. Some of the move to autonomy has taken longer. We've been talking about this. I think we've been holding this AutoTech Conference for seven years or something. But it seems to be rapidly approaching finally.

The rub [ph] I sometimes get into is who pays for this functionality. You guys look like you're getting -- taking a different business model at least with one of your partners with Mercedes and more of a subscription model. But if we start from the beginning, what's the general cost adder you see to adding autonomy to a vehicle, Ali? And how do you think that gets passed along and offset in some way, shape or form. Does it have to be a change in the business model with your customers, not necessarily just the sharing of revenues between a supplier NVIDIA and the customer but also between the customer and their end-user as well?

A - Ali Kani

Okay. So first, you know, I think there is a fundamental transition here where the industry recognizes that these vehicles are software defined. And when you do that it has a fundamental change in your business model pricing strategy. First, if you have a software defined platform, you want the highest performance computer and sensor set that you can have in that computer every time you release a vehicle. You guys see that iPhone does that, right. It's always the best newest SLC first launches on the iPhone and then they put the best sensors they can for the camera, and they launched that vehicle. And then over time, and they tried to sell that product relatively aggressively, because there is a lot of features and functions and services they can provision after the device is sold. And so what we find is these customers when they're making their decisions, think of it like that, hey it used to be -- by the way some people still do this, they say, hey, I just want like the cheapest and cap car that I could build. It's not something NVIDIA is building because they are not thinking about it software defined. But when you start thinking about a software defined, you say I want to put the best computer and the best sensor set on this car, and we want to sell that car cost effectively to our customer base and then we're going to sell services over time.

And so then the business model and the pricing model changes where you want to sell as many cars as you can, because the value of your platform is the size of your installed base. So they're not trying to take this investment, just raise the price of the vehicle. They want to take that investment and sell as many of those platforms as they can. Over the life, they'll have a larger installed base. And the value of that installed base is far more important and valuable to our partners, then they spend

like an extra \$100 on the computer in the car. So I think we see that transition and we see customers thinking of it as that kind of a platform. So they are not trying to increase the price of the vehicles as much as increase the installed base of vehicles that have the ability to be upgraded and add new features and functions over the life of the customers.

Q - Ross Seymore {BIO 20902787 <GO>}

Got it. We have about one to two minutes left. So why don't I just ask the last question which is, you are running -- your automotive business at NVIDIA is running \$500 million, \$600 million a year right now. You talked about an \$8 billion pipeline that's I think a six-year pipeline. Walk us through, going from \$600 million to \$8 billion or \$1.5 billion or so on an annual basis? What's the sort of trajectory that we should as investors follow?

A - Ali Kani

I think first it starts with Orange ramp which happens sort of in the second half of next year. So just as it ramps up, we've announced wins with many companies. You'll find that China NEVs will go to production fastest because they are more start up [ph] and have a faster development flow than what you would expect from a typical traditional OEM. And so we talked about how you will see that transition happen in the second half of next year. You will see an uptick there, and then you'll see the pipeline numbers. So you know if the -- if we're running at \$500 million to \$600 million a year today, the average over six years is over \$1 billion a year, you're going to see uptick over those six years, and we will see some attractive growth over this pipeline timeframe.

Q - Ross Seymore {BIO 20902787 <GO>}

And do the margins expand too with that or that whole size of the installed base being the focus initially with that subscription model and services model mean maybe the margins don't go up initially, but over time there is a nice tailwind behind them?

A - Ali Kani

Yeah, that's the right way to think about it is that hardware margins are hardware margins and they are fairly consistent, but the software potential scales up over the life of the car after the car is sold and that will provide increased profit opportunity for NVIDIA.

Q - Ross Seymore {BIO 20902787 <GO>}

Perfect. Well, Ali, thank you so much for your time. I know you're exceedingly busy these days, and we'd like to see your dog popping in and saying hi, behind you as well. If anybody has any questions on this just email me, we can get them through to the folks at NVIDIA. Thanks to Stewart as well. And with that we're out of time, so we'll wrap it up. Thanks, again.

A - Ali Kani

Thank you, guys.

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