Future of the auto industry Conference, Newstreet Research

Company Participants

- Ali Kani, Vice President and General Manager

Other Participants

- Pierre Ferragu, Analyst, New Street Research

Presentation

Pierre Ferragu {BIO 15753665 <GO>}

Hi, everybody again, and good afternoon or good evening now to all of you. Thanks for attending this discussion and comparing [ph] on the Future of Mobility. It's now my pleasure to welcome, Ali. He is NVIDIA's Vice President and General Manager of the Automotive business, the automotive product line. He is overseeing their product engineering and marketing, and also drives end-to-end platform NVIDIA has been developing and has introduced in the automotive industry for a few years.

Now, Ali is going to give us like a quick presentation like an intro on his perspectives and after that, we will have a Q&A. So as always, if you want to pass straight to the Q&A, feel free to email me questions and I'll do my best to introduce -- to integrate them into the flow of questions that I'll ask Ali.

Ali, with that, thanks a lot for joining and the floor is yours.

Ali Kani

Hi, everyone. How are you? And my pleasure to be here today to talk to you guys about NVIDIA's automotive products and strategies.

I'm going to jump in here and just sort of say that you guys know that everything we're talking about here today is subject to our disclosures and forward-looking statements. And in our financial statements, we talk about risks and uncertainties that provides more detail within that.

I'm going to jump in and just talk about NVIDIA's strategy. So this slide really is the cornerstone of what makes NVIDIA unique in automotive and instead, we're providing products and services that support partners in their automotive ecosystem from sort of we can say end-to-end. And what that means is people need to design their cars and NVIDIA has solutions that help customers design their cars, train their

AI models, simulate their AV stack. And we use drive Omniverse to help customers build their automotive factory -- design their automotive factories, also build retail configurator. In the engineering side, we use Omniverse to help people do synthetic data generation, such that they can sort of augment the data they have from their real fleet with synthetic data so that their AV product is better. And so that's what sort of sets us apart.

It's not -- we're not just sort of -- we're actually not selling chips in the car and go build that yourself. We're selling this end-to-end platform for development of our partners. And so we're always thinking how do we make it easier for partners to develop their end-to-end requirements and how do we create those tools and software and services that accelerate their flow. And we've said this many times, but the company that has the best development flow, the fastest will be the company that is most successful in automotive because it's so hard to build sort of Level 4 and Level 5 software to build sort of a concierge experience inside the car, where there is an AI who knows everything about you, knows everything about the car and can sort of talk to you and sort of build this end time framework. And so the more we can make that lifecycle better, the better our customers will be, the more differentiated NVIDIA versus other players in the system.

And this kind of shows you how we think about the ecosystem then. So it's not just like OEMs where we say, oh, we won this OEM. We want to work with the entire ecosystem, their software company that are building AV software. I'm just showing a few of them on this slide, but the point is NVIDIA is designed to be the best platform for anyone to build their self-driving software on our platform. And we take all the learnings from our own development because as you guys know, we also build AV software and cockpit software. But we have many partners who are building AV software and cockpit software on our platform and so we take the learnings of that entire ecosystem and we put it into the platform for the industry, to share and benefit from.

Same thing for simulation. There is all these simulation options. It doesn't just have to be DRIVE Sim. DRIVE Sim actually has APIs for the entire validation ecosystem, such that you can hook into our platform and accelerate your intent development cycle. The other thing to notice is we're quite successful across the stack. When customers are building NEVs that are software-defined, we happened to play in the majority of those platforms. We have partnerships with many of the major Tier 1s. We're in eight of the largest robotaxi and also truck companies. We have partnerships with all of the mapping companies and simulation companies. So the point of it is across the ecosystem, some of them are buying our products in the large, but other than just looking into our ecosystem such that other partners can take advantage of it for their EV development.

This just shows you guys some of the product roadmap inside the car. I think the key point that I want to stress here is that the needs of AV are constantly increasing in compute requirements because L4-L5 is not even close to being solved. Sensor resolutions are growing. The complexity of networks that people are developing in the car is growing in sophistication. We now have people who are building BEV

transformers in their self-driving cars. We have customers now who are trying to build like a single model, almost like we say, large language models, but it's like an end-to-end AV network in the cars.

When you have a situation like this, you need a general-purpose programmable architecture because you don't know what algorithm you want to use, and you just want to be flexible to be able to change rapidly. And so we have these products. Their performance is growing significantly, but what we ensure is that the APIs, CUDA, the same CUDA APIs, the same TensorRT APIs are architecturally compatible, not just like from a high-end SKU to a low-end and SKU up for [ph] but across generation storage software compatible to oriented software compatible to Xavier. And so then when a customer takes a car, you could essentially imagine someone takes a Orin car, takes up the Orin computer, swaps into Thor computer and the software will just run. So now you just have more performance headroom to be able to create new software and services over the life of the car. That's the platform we're building in automotive.

And then I think one other trend that I want to talk about is that we lived in this world where every new service or feature a car had was solved with a new computer in the car in the past. We were getting to a point where people had 100 computers in their car, and what happens there is, it's super hard to program, super hard to sort of improve that experience, maintain it and ensure the security of a car which is supercritical. And so now what we see as the industry is moving towards centralization such that multiple computers are being integrated with unified with one central computer. And that's what Thor was designed to do. And we're taking a lot of the innovation we have in the data center and we talk about sort of things like multi-instance GPU, which essentially means that Thor actually has like multiple compute clusters inside it and you can run one application on one, keep it separate from another. And so some of those data center technologies and innovation that NVIDIA has is being put in the car. And the reason is fundamentally this next-generation self-driving car is truly a data center on wheels, we call it, and so we get the benefit from the innovation we have in infrastructure by being able to pull it into our vehicle roadmap.

The other value of this is the customers now have a lower-power, lower-cost solution that they can sort of program efficiently over the life of a car. Range of an electric vehicle is better when you sort of can integrate all these vehicles into one core architecture. So there is value to the customer beyond just programmability. It's also lower-cost and lower power.

One other thing I wanted to talk about is, when we have such a huge investment in platform strategy that you guys kind of now see when we talk about ecosystem platform and we have such a huge investment in software, we care about increasing the installed base of our platform. And so we're excited about the partnership we announced with MTK, MediaTek where essentially our GPUs, CUDA, TensorRT gets integrated into their SOCs for automotive. And so now if a customer wants to use tab access to CUDA, TensorRT or DRIVE software, the operating system, the middleware,

the application software we built, we can support that platform with our software -- our platform ecosystem advantages. And this is just the beginning.

This chiplet that we essentially sort of gave access to MediaTek is available for other partners in the ecosystem, not just in automotive. The point is when the platform is so valuable and such a huge part of our investment software, such a huge part of our investment in CUDA and TensorRT, the more we can sort of increase the scale and installed base of that platform, the better for the industry and where we're holding and expanding the footprint. And jump away from this slide.

This slide just gives you guys a picture of how our pipeline. We've announced that the pipeline is $14 billion over the next six years. This shows how the pipeline ramps. And if you sort of take a look at this slide, what I mean by this is XPan and NEO [ph] have ramped in production. But over time, you'll start to see new Hyundai Kia models ramp will start to see Polestar line, will start to see sort of some of the NEVs, Spike, Lucid, BYD start to ramp and then you'll see Mercedes and Jaguar, Land Rover.

So, you know, with automotive wins that you announced start to ramp many years in the future, and that's why we have a six-year pipeline that gives you a sense of sort of the value of the wins in the system it takes time to ramp. And this kind of shows you how that pipeline ramps and ramps down over time.

Those are all the slides and now I open up to Q&A.

Questions And Answers

Q - Pierre Ferragu {BIO 15753665 <GO>}

Thanks, Ali. Thanks for the slides, and thanks for bringing in like broader perspective. So like in the pilots, the DRIVE platform is much more than just a chip in a car. It's very useful. And so maybe I'd like to focus my first two questions on better understanding that and helping investors understanding it.

So how does like your DRIVE products strategy translates in terms of business model? Do you at the end-of-the-day sell mostly chips? Or do you think like the revenue split in your automotive division is actually going to be -- to make like the money you make out there selling chips like a minority of your overall revenue opportunities?

A - Ali Kani

Yeah. So let me try to summarize the types of products we have. When someone buys our chips, there is our chip ASP and there is a software ASP always. So even if you have DRIVE operating system, if you go to production, it needs to be safe. And so there is revenues for just the operating system being safe or license for that. And then as you go up the stack, we have a customer who might say, I want you to build the entire stack end-to-end, so we want you to do the L2 plus or L3 software. Then in

those cases, the value of the software can grow to be larger than the value of the hardware, and it just depends on what the customer wants.

One of the things we talked about is our architecture is designed to be modular such that you take what you want. And when you look at that slide of all the partners that we have and how they ramp, note that the vast majority of them take our chip and operating system and middleware, not full stack. Full stack partners are like Jaguar, Land over and Mercedes. So the point of it is, for us, it's open. It's whatever is best for the partner and we can layer in more software and services based on what they need. And so in aggregate, it ends up being somewhere in the middle of that, but if someone wanted us to do all the software work, then the value of the software can be more than the value of the hardware.

The other thing is, those are not our only products, right, like if someone wants DRIVE Sim synthetic data generation, then in that case, it's only software, right? We're giving them access to simulate their software and they're just using that to stimulate their AV experience. Same thing with if someone wanted -- and then there's other hybrid products like OVX constellation. And so then people buy our hardware, so it's like a replica of an Orin or a Thor that you would have in the car, or it could be x86 CPUs and discrete GPUs because we have some customers who architect their robotaxis like that. And then they want some of our DRIVE Sim software, and so then that would be our software revenue on top.

So it really depends. One of the things is we have so many products. It can start with hardware, but actually, in some cases, a customer could not buy any hardware from us and just pay for software because DRIVE Sim, you could actually just license the software, not use our hardware at all. So we've kind of run the gamut and I think the one thing that's consistent across the stack actually is the software.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Okay. That was very helpful.

A - Ali Kani

(multiple speakers) from us. Yeah.

Q - Pierre Ferragu {BIO 15753665 <GO>}

That's very helpful. And then you mentioned you know, it's a very important like ecosystem aspect of what you do. So you're not aiming to be a platform just so like the NVIDIA products, but you're very open to a broad ecosystem of third parties. And the question I was wondering is, do you open also this ecosystem in terms of hardware? So you kind of answered that question already partly, but I'd like to push it a bit further.

So do you have clients who choose like an on board hardware that is not NVIDIA but then use NVIDIA elsewhere? And as I was thinking of the question, likey let's talk about Tesla, who is a very well known -- very, very large client of NVIDIA because they run amongst larger GPU clusters in the worldwide. Why is they have that

ownership in the (inaudible) I'm pretty sure you can't comment too specifically on NVIDIA, but yes, tell us about how open you are to altentative on both hardware, and how NVIDIA can help an OEM that will choose like Mobileye or Moto or Qualcomm, or another solution on board that you still want to have NVIDIA in the road? [ph]

A - Ali Kani

Yeah. So we're very open. That's a great question by the way because I think that explains our strategy. Most of our partners actually, if you think about sort of the partner with that we have, we have many cases of customers who do not use our computers in the car, and they're really important customers for us in the cloud.

You gave an example of Tesla. So we help Tesla with training and simulating their AV model using our hardware and cloud, but they don't use us in the car, and that's perfectly fine. That's a great thing or a great customer of ours. And so we architect our stack such that it's -- that's totally fine. Now, of course, if someone used this in the car and someone used this in the cloud, there's some like advantages for them like they can train on CUDA, and TensorRT in the cloud, and those same APIs, the same algorithms that are developed there can actually run inference in the car. But you can always train on GPUs in the cloud and then change it up to your exact architecture, Mobileye or Qualcomm in the car and that's perfectly fine.

We have many cases of that and we're very open to that. We're very supportive of that. And so the way I would say it is, we want to help partners regardless of where they use us. And because we have so many layers of software, it's perfectly fine, right? Someone may say, I only want your help on simulation.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Yes.

A - Ali Kani

I'm using someone else. We would say, that's great. Let us talk to you about how we can help you on simulation. We can give you synthetic data generation. We can help you with retail configurator. We can help you with training of your software -- of your own software on Mobileye in the cloud. Those are all great opportunities for us and so we're very open to it. We architect like that.

The other thing you kind of mentioned and you hinted is that -- and of course, there's cases where someone says, well, I'd love to have access to some of this capability in the car, but I don't want to buy your chip. Is there a way that I could sort of license some of the things that you have in your car and put it in my own SOC? And the answer to that of course is yes because that's what we just announced with MediaTek, right, that yeah, that's fine. If you want to have access to some of our capability put it in your car, it could be a competitor, it could be just an OEM, and we would be happy to sort of give them access to the GPU and let them build their own solutions in the car, and then, of course, then we can help them in the cloud based on that.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Yeah. Okay, that's very useful. So now I'm going to ask you like the really tough question on this one. You mentioned like $14 billion or $16 billion pipeline, and now as you can imagine, I want to (inaudible) and I'm wondering, you know, how you split -- how this sideline splits between like hardware and software and platforms and full stack and operating system and middleware. Can you comment on that in ways?

A - Ali Kani

Yeah. I think let me answer it slightly differently. I feel like the pipeline, if you kind of saw the way I showed it to you, you saw the full stack customers are at the very end of this forecast period, right? And so the majority of what you see are the customers that sort of skew more on SOC and lower software revenue. And then, like I said as we scale up and we do the full stack, then those numbers can be larger than SOC. I'm just kind of answering like that and not kind of say the average across the six years. But I think it's just more of customer base and what you end up wanting, and there's a mix in that pipeline and it's true that some of the partners, the software revenue is larger than the hardware revenues.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Okay. And before we move on to a lot of big one, very last question like a, like an OEM customer who partners with you for like training or like simulation cluster, so it would be more of a data center client at the end of the day. Is that typically a customer recognizing your division, or is that the customer that will be more like sitting in the data center division of?

A - Ali Kani

Yeah. Okay. So the way I would answer this is, first, we recorded in data centre, the cloud, the infrastructure after we reported in data center. But actually as a internal business unit like how do we run the business, we actually manage it within the automotive team because we are constantly working together, right? We're talking to a customer in the car and we talk to them about the cloud at the same time. And so internally we manage it as one business, but just to keep it simple to the investor community, we just choose to take the cloud and put it in the data center revenues.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Okay. And the same logic applies to your pipelines. So all the pipeline you talk about is always a pipeline that will be -- that's the revenue that will be reported in the domestic division.

A - Ali Kani

Yeah. [ph]

Q - Pierre Ferragu {BIO 15753665 <GO>}

Okay, great. Thanks for these clarifications. So let me ask you one question. So if we look at the broader like passenger car opportunity is really NVIDIA, Tesla, Mobileye.

Today, Tesla is as integrated as can be. They do everything in house. And Mobileye is offering a scale-integrated package. It opens its a bit over time, offering APIs, the customization opportunity because very clearly there was a need for that in the market. And you are like the most like open player. And so the question I have for you is, how do you think about that potentially creating a dependency for the adoption of your technology, which is that if you offer a more open environment, then that means OEMs will -- one of the reasons why they will choose you because they will want to develop their own technology, has their own -- makes their own system integration.

And we unfortunately know that sometimes these companies struggle to do a good job at that and might end up delaying the technology and we set out. And I'm not going to give any names but we've heard news flow about like large car manufacturers throwing themselves into the initiatives and actually failing to deliver. So do you see that as a risk to your open strategy versus offering more turnkey solution to your OEM clients?

A - Ali Kani

So first, let me sort of say that, just remember that our strategy is all of the above.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Yes.

A - Ali Kani

So we have customers who want to sort of have someone just build the full stack for them, and so in that case, of course, we can deliver that solution. And we might have someone who wants a slight half-and-half. They want to be really building the software and also taking some software from us. And we have some cases where customer say, I'm going to build full stack, just want to develop on their hardware. And so I think for each of those, there is a risk, but it's the risk that the OEM wants to take because it's most aligned to their strategy.

And what I would say is that we started with Mobileye is like this and which the point is there are cases where some customers say, this is our strategy. We do not want you to force us to take your perception software. We want to build it ourselves. And so, of course, for us, that's okay because we do that all the time. And for some partners, it doesn't work like that way. There's no such case that a Mobileye customer who is taking a good chunk of their stack. You would never do that. And so the risk is really more about what does an OEM want and we support them. But the value of our approach is that if a customer does have challenges and they later come and they say, can you help us, let's say, they wanted to do everything, but they just aligned Hyperion architecture.

We actually just come in later and say, oh, yeah, like we could -- like if you're having problems with parking, we can just give you the parking stack because we've developed on the platform and so there is an opportunity for us to help them if some of those risks come to fruition. But it's of course not even something they

envision doing at the beginning. And there are cases where partners come to us later and say, hey, it ended-up harder than I thought, can you help us. And then in our case, we're like, yeah, we're happy to help and we sort of add more of the software to the offering that we provide them.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Okay. And do you see a trend in the market? Would you say like OEMs are more-and-more like moving towards like a more integrated approach where they will want NVIDIA to do more?

A - Ali Kani

I would say that the OEM strategy -- the OEM strategy long-term is to be able to have this competency in house long-term like I don't mean like the next SOP. I just mean in 15 years or in the future. I think all OEMs, feel like the software that runs in their car is something that they should be responsible for. And it just so happens that there's a lot of investments OEMs are making right now, the electrification of their fleet, software-defined cars, the cockpit software, the AV software. And not all of them can make all these investments at the same time and not all of them actually have the know-how to hire the world-class team for each of these functions. And so we try to partner in those places where it helps them. But I think long-term, everyone wants to be able to do, well, let's say it's for L4-L5. I think what we've seen is it's far harder than anyone imagines and I don't believe that we're going to see an OEM doing that in the short term themselves. I think they're going to be partnering. But then in the future, after it's in production and their team is ramped up, you could imagine that in a 20-year horizon that an OEM might have the ability to be able to do something, but that's after it's been proven and after all the training and all those things. And so it will take a long-time.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Okay, so that's interesting. So even if you see maybe a trend of them coming back to you to ask some more of the stack, the long-term ambition is still to be able to develop internal competencies, that's great.

A - Ali Kani

Yeah. The ambition is absolutely right. I think every OEM wants to be able to do it. And I think I'm just saying, it's a lot harder than people think and when that happens, it's hard to predict. But I'm sort of telling you I think it's like 20 years out.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Very good. I'm going to try and sneak in like two last questions in training [ph] that might be a bit challenging. So the first one is, our work on NVIDIA shows the cost base for NVDA, especially on the cost-of-goods-sold like on bill of material basis is very, very competitive. The hardware you have in the car because when you have vision because they have their own chip is very competitive.

Mobileye this morning, really talked about their cost competitiveness has ben very stronger like underlying driver or their very strong market share today and what's deployed and also and underlines their confidence in having a very strong market position going forward. So we -- like -- I would say total systems cost to $3,000 to $4,000, and we slice the actual electronics and semiconductor parts that cost between $1,000 and $2,000. What can you tell us about like the cost positioning of NVIDIA? And it's of course a difficult question because you have an open ecosystem. It's like really not on card, [ph] but how do you think about your competitiveness on cost on a like-for-like kind of future basis?

A - Ali Kani

Yeah. So again there I would sort of say two things. One is our focus is on L2+ so L2+ and higher. And we believe that every entry car will be L2+ over time like we're going to see that shift just because there is software and service opportunity for a fleet. And if you're building an L2+ car, our position from a cost perspective is very competitive, and you kind of see that right, who is really building the L2+ cars in the industry. There is Tesla and then outside of Tesla, there is like a bunch of Chinese OEMs. There's Volvo, Mercedes, Jaguar Land Rover. Those are the guys who are really building L2+ software-defined vehicles. And as you see, our share is very successful in those markets. And so the price performance and positioning of NVIDIA is quite good in that segment.

And then as far as sensors stack goes, our strategy is unique like we've shown a Hyperion architecture but that architecture is scalable. That's the L3 configuration. Some people say they just want to build a single Orin computer with just cameras and radar, and they can do that. And so then the cost of the sensors is super-low cost, the cost of the computer is low, and so people are building systems in the L2+ market at really attractive price.

So I think our positioning is good and it's scalable. Does that makes sense? It's scalable. It's good for L2+. It's good for L3. It's good for L4, and it scales up. You certainly don't need Lidar now to up. You just need camera and a couple of radar and our architectures sports that. The other thing is, each customer for our platform can choose the sensor set themselves because we don't have to deliver the software for them. And so there are some customers who say hey, I want even a lower-cost sensor set and they're able to do that. And that's why our architecture is quite successful. We never force a sensor set on you. You can actually come up with your own sensor set and use that as you wish.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Okay, that's very clear. And my last question would be, we've talked mostly about like the passenger car opportunity on the robotaxi like the driverless experience. I have just one question from you based on the -- all the projects and teams which you do entire at different levels. What's your view on the past side options? So where do you see the first like significant rollouts of these vehicles and timeline as well?

A - Ali Kani

Okay. So first, I'll say that. I think we'll find a couple of cities that well sort of green light these trials and we just need to see how successful they are. We're already seeing it in some of the cities where it could be at night a robotaxi allowed to operate just because it turns out that they are proving that they're safer than drivers in the real world, and then I think that we'll see rollout in commercial goods delivery because then there is no one in the car and you are just transporting goods from one place to the other and so I think we'll see adoption start there. And I think for this as the whole industry needs to be super cautious, need to be super responsible, don't rush anything because you know even one accident kind of become such a big deal for the industry.

So as we believe it will take time. You'll get some early success, but then we just need to take our time and make sure we're doing it right. I don't expect like passenger cars in this decade. That's a much harder problem. It's unrestricted. It's undefined. It could be anywhere. And so I think that, that will take longer.

It's not just about the technology being better than a human. It's -- you need to be even much better than a human because you know if a human makes an accident, we're sympathetic to it, but if AI makes an accident, I think we're just a little bit less sympathetic to it. So I do think there'll be trials starting. Now, we're in the next year or two in certain cities. I think sort of the L4 true consumer car is next decade and could even take longer. It just depends on how could it gets. And we really can't make any mistakes. It's super, super charging. This by the way -- is why you need not just validation but simulation because you can't (multiple speakers) And then we help partners with that. And I think we have to come up with even better ways to stimulate all the scenarios that could possibly happen to make sure it's safe.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Ali, I would like to spend like two more hours stretching this year about this fantastic opportunity in the industry, but unfortunately, we're already out of time. So thank you very much for making the time for participating to the comparison and bringing your perspective and the perspective of NVIDIA. And I hope we'll stay in touch.

A - Ali Kani

Thank you.

Q - Pierre Ferragu {BIO 15753665 <GO>}

Thanks.