

Daniel Newman: Matt Murphy, CEO at Marvell. Welcome to The Six Five Summit. I'm so pleased to have you here today with us as part of this event this year.

Matt Murphy: Hey, happy to be here at the summit. Thanks for inviting me. It's my first time. So really appreciate it.

Daniel Newman: It is your first time, although Marvell, I'm very pleased to say played a big part in our 2020, our inaugural edition. So it's great that you were able to clear up your schedule. I know it's been busy just coming off earnings, a pretty big acquisition. I've got a bunch of questions for you, Matt. And if you give me the all clear, I'm going to fire when ready.

Matt Murphy: Let's do it. Sounds great.

Daniel Newman: So five years you've been at Marvell, not quite, but it's coming up really soon and anyone that's read my assessment tends to be bullish on the company, but seeing that this company's gone through a major transformation under your leadership. Can you talk a little bit about the time that you spent at the company? The broad changes that you've been making over the past five years? And sort of what are the macro trends and ideas that are really driving your strategy?

Matt Murphy: Sure. Well, it's pretty amazing to think that five years have gone by I think I got announced as the CEO on June 20th. So it was probably right around this time I was making my commitments to come and informing my former company that I was going to be taking on something new, which at the time was a big challenge in front of me. It was quite risky actually. And I joined formerly on July 11th, 2016. I think a couple of things, Daniel, if you sort of reflect back on the last five years what I'm really proud of is myself and the team that joined me and that we've put together, I think is driven one of the most important strategic transformations of any major technology company over the last five years.

And the reason I say that is if you go back to Marvell this time five years ago, we probably had 70, 75% of our revenue was in consumer type devices. These would have been things like going into laptops, mobile phones, tablets, consumer gadgets. In fact, I remember my first month in the company, there was an employee that was very proud that he posted on LinkedIn that Marvell was the official supplier of wifi IoT devices for the first connected Mattel Barbie house, Barbie Doll house. Okay? So that was sort of where we were and that was really not where I thought the world was going to head for us which was not going to be a future in consumer, but a future where the biggest end market growth drivers that I believed back then we're going to be in what we call the data infrastructure opportunity.

So in markets like Cloud Computing, like wireless infrastructure, networking in the enterprise and then longer-term automotive. And I had that view, even when I started now, it's been a big lift to get the company to basically flip. It's

consumer focused to this data infrastructure focus, but we've more than done that. And we find ourselves today upon closing in five years later, we've basically doubled the revenue of the company. We're going to be one of the leading companies in Digital Silicon for the 5G build out that's happening on the infrastructure side.

I would argue, and we could talk about it later. We have one of the most exciting and complete data center portfolios in the world in terms of semiconductor companies. And then we've got this call option on automotive, which has really gained a lot of traction for us for future growth. So when you add it all up, we think we're in really the key grow spots. We've got a phenomenal team, both from organic Marvell and the acquisitions we've done and happy to talk more about those drivers, but it's been a lot of work. It's been a labor of love, but I think our best days are actually ahead of us.

Daniel Newman:

Yeah. A lot of those were key momentum factors when I was looking at the big semiconductor companies on the rise. I actually wrote an op-ed about it a few weeks back and Marvell has been one of these companies that it doesn't always have the same sort of household name, but it's getting there and you're starting to see that being included in more and more of these big data stories. We're going to talk about that data side. You were really early on the DPU for instance, and that's turning out to be a trend setting new products, and it's got a ton of opportunity wrapped around it. And by the way, you're also making some really ambitious plays in the way you're communicating to the market, Matt.

And I thought this was worth mentioning, but in your earnings this quarter, you guys took a big risk that the market seems to be responding really well to making some commitments about the way you're going to report your revenue, which I think is bold. And I think it's also a very strong indicator of your confidence that you're saying, "Hey, we're going to start taking 5G. We're going to start taking data center. We're going to take automotive. We're going to break these things out. We want the market to see where our business is growing, how our investments are shining." Just quickly because I don't want to get too far off the script if we have one, but what drove that decision? Was it about transparency? Confidence? What got you guys there?

Matt Murphy:

Yeah, I think it's actually born out of something fairly simple, which is going back to my original comments about how I even thought about our strategic roadmap and our investment decisions five years ago. It's all about the market. In fact, I wrote an all employee email sometime last year during the pandemic. I started this habit of writing emails once a week to various topics for our employees because everybody was at home and there was just a lot of concern. And so I decided to over communicate. So I wrote an email one week, which was titled, "The Market Always Wins." Okay. And this is a concept that was drilled into me a long time ago, which is you can have a great team. You can have a great product or you can have a great market. And in the end, and you sort of match up market forces to any of those dynamics market always wins.

So we've looked at things like, how do we invest in data center or for example, 5G or automotive from an organic standpoint? And it's informed all the acquisitions we've done. So I've been running this company with that mindset. And so how we report today is actually not easy for investors to figure out because we report by product. We recorded storage revenue segment and we report networking. And invariably, we get these questions. Well, how much of your storage is in data center? How much of your networking is in automotive? How much is in 5G? How much is processor? How much is DPU? And it gets very confusing and ultimately what investors are looking for, but also the market and folks like yourself, when you want to follow the company and you want to keep apprised of what we're doing, it's much more helpful and transparent to show up by market.

So we actually are breaking it into five segments now, and you'll see a data center segment, you'll see a carrier infrastructure, which is where the 5G will be. You'll see an auto, industrial and enterprise networking, and then a consumer, which has all the computing consumer type of businesses in it. We're going to give seven quarters of historical results when we report our earnings sometime at the end of August. And then we'll guide our third quarter purely by end market. And you're right. It's much easier to have just two gigantic segments and then just sort of talk around it. It's another thing to make the step to actually provide the transparency, but that's how we run the company. I think it helps investors understand our business and our employees and just our broader stakeholders. And I think when the numbers are all available, it'll be an even more exciting story when you can sort of actually unpack the growth and what we've accomplished over the last several years.

Daniel Newman:

Yeah, that's great, Matt. If anyone tracks my sort of opinion pieces around earnings and markets, you'll always see one of my biggest boldest complaints is always when there's a lack of transparency. So when the commentary and the numbers are hard to kind of audit or line up and say, "Hey, you're saying your cloud business is growing a bajillion percent, but I can't tell because your cloud number is 63 pieces into it." What's really growing? So like I said, I think the market's going to really appreciate it. Of course, it's also going to hold you and the board more accountable for the results because they're going to look at everything and match it up. So I think it's great. I'm excited by what you said. I want to look at those historic and really get a runway. And it also helps inform my own predictions and the things that I've said about where the company's going.

So congratulations on that. Congratulations on the quarter. Let's pivot over now, Matt, to that data topic. You made that big pivot. You've moved from consumer and data infrastructure over the past few years clearly has, has taken shape. You know, as I mentioned, I believe the company is taking a strong leadership in the DPU space. You sort of alluded to this, but what drove Marvell? What was the factor that you said we have to make this pivot. This is it.

Matt Murphy:

Sure. Well, a couple of things I think very, very early on as I mentioned with a market-based focused in mind, we needed to make a choice which way we're going to take this company. So the decision was actually relatively easy when I went through the first set of reviews, about six weeks after I became CEO of all of our businesses, all of our investments, we had spent a billion dollars in the prior 12 months on research and development. And basically what I did is we unpacked every dollar of that. And where was it going? And how was it being allocated? And what were the historical returns and performance of those businesses that were allocated to that R&D and how are we doing? And so, even though the bulk of the revenue was coming from this consumer and computing area, the profitability, the market position, the chance of succeeding was actually low.

And so we bet on basically two pieces of what I would call our data infrastructure strategy. At that time, we actually had a market-leading and still today we are the market leader in storage product, storage SOC. So that was an area I felt like we could build on. We also had a very good solid enterprise networking business, both in switches, as well as Ethernet PHYs. And that was something I believe we could build on. And so early in 2017, maybe six months after I joined, we put out the Marvell mission statement, which was super simple, but it basically said we want to be the leading semiconductor company in solutions that move data, store data, process data, and secure data. So everything about move data, that's networking, store data is the storage space, process data which you alluded to with DPUs that's one that we did have a processor business.

If you remember Marvell historically had a 64 bit ARM-based SOC product line, that was kind of at the lower end, this was sort of like two core, four core types of devices, the smaller business, but that was our process piece. And then secure. So later on, when we did our first big acquisition, it was Cavium. And the reason we did that was they were the leader in high-end ARM-based microprocessors. And that bolstered our business there significantly. Later on we did Aquantia that both bolstered our presence in the move data, the networking side, we already had a five business. We added a bigger team to that. We did [inaudible], which got us customer [inaudible]. Those are almost all high-end compute processing type of solutions albeit they're [inaudible] in nature, but still you have to have those types of IPs.

And then finally in PHY, which again was on the move data, move data at very high speeds on interconnect. So it started with a strategy, it took a bold bet to basically get out of what we were in and get into something that we thought was going to be bigger. And we augmented that through M&A as well as our own investments. And now, if you look at all those pieces, which I think are the essence of data infrastructure in any of these major applications, you need to have networking IP, storage, processing, and then security embedded in all of it, which is another topic, but we're very good at as well. And we've ended up as basically the pure play company with all those pieces under one roof. No one else has all these pieces today under one roof.

Daniel Newman: Which is a pretty big part of this story too, was how you put it all together. And I was going to ask all about acquisitions and I might have you elaborate a little bit more on what you just said with the acquisitions, but just quick step back, when you made that pivot, was it met largely by acceptance? Where do you think the proof point was when everyone said, "Got it. This is working." Because when you take your biggest part of your business, and then you say, we're going to move away from that, and we're going to move to a part of the business that's got a lot more upside, more profitability, but a lot of times, like you said, the market isn't going to okay that. Did you get acceptance right away or did it take some time?

Matt Murphy: Yeah. It's an interesting one that you ask. I think I'll give you two answers. The first one is really around the internal reaction. The employees, the longtime Marvell people. That was kind of interesting. So when I started the company, it was in a lot of trouble, the morale was low, there was lots of problems with it. And yet people had really hung in and sort of believed that they were willing to give it a shot. And so, I joined in July, we did these strategic reviews in August, actually gave the board a preview of it in September of kind of my thinking. And then in October I held what was Marvell's first ever leadership conference, where I actually brought in all the senior leaders from around the world, be surprised to know that really hadn't happened on a regular basis, but I brought them all in and myself and the rest of the senior team, just walked everybody through every one of these businesses.

I showed them what I had been shown. And the true kind of state of each of these businesses, did you know we're number six in this market? Do you know that we're losing a hundred million dollars a year on this product line? Do you know that? And so shining the light was very, was very helpful for everyone to understand. And so I kind of took everybody through a couple of days where this is where we're at and then here's where I think we can go. And in the end, I remember we did this big round table where everybody got to stand up and we did what I call a pre-mortem, which is, we said, "Okay, if we're going to make all these changes, what are the things that can go wrong?"

Instead of doing a post-mortem, but it's already gone wrong, let's actually sit here and figure out what could go wrong. And I remember one of the most senior people there who is today still there. He's one of our strongest technical vice-presidents. Stood up in front of the whole leadership team of the company, which was about 80 people and said, "You know something? Everything you're saying obvious. Should have been done eight years ago, fully with you, we're all with you." Oh my goodness. Can you imagine the power of that? And so, so by, by taking everybody through the journey, people were willing to go through some pain because we had to do a bunch of restructuring to actually get the company set up right. So that part actually, I give a ton of credit to the Marvell team.

Almost all of them are still there. The key leaders from that meeting that were in the engineering roles that really controlled the bulk of the spending and the bulk

of the outcome of our future. But then the other challenge I had was remember when we had these issues, we had a new board that came along with me and we had an activist investor in the stock and he was on the board. And by the way, great guy, got to know him really well over the years. But was obviously, if you think about it, what happened is phase one was kind of cleaning up and repivoting. Then I went to them, maybe six months after this leadership meeting and said, "Now I want to go do M&A." And the first thing I proposed was basically that got traction with the board was to do Cavium, but we paid 85% of our enterprise value, Daniel for Cavium.

I mean, this was a swing for the fences type of thing, if you think about me as a first year CEO, the thing was in trouble the year before an activist on the board who tend to be more, value-oriented not sort of, "Hey, go growth." And there's nothing wrong with that, by the way, that's a valid philosophy. And if not, for actually the intervention that occurred in early 2016 in Marvell, I wouldn't be standing here today. Marvell wouldn't be here today. So you actually have to give him and that team credit. And there was a lot of sort of challenge to get everybody over the hump that we could be as Marvell, a low multiple company, paying a very high, multiple for Cavium and not destroying value. And as it turned out, it worked out beautifully and it's been a home run acquisition.

And it was well received by the market and Peter Feld, who was from Starboard was thrilled with the outcome. And then about a year later, he said my work here is done and you guys have done a great job and I'm going to move on to other things. So it all worked out Daniel, but it certainly was actually easier to get the internal team on board because we had the burning platform. It was a little more of a challenge as a first time CEO with such a dramatic sort of first time M&A, but I felt like we had no other choice.

Daniel Newman:

Well, you read the tea leaves correctly. And it ends up serving for a great transformational story. A lot of people probably haven't heard it maybe here is the first time they're going to hear it. So glad you were able to share that here, glad to all of you out there that are maybe learning about Marvell more for the first time, got to hear it because the company is on really stable footing right now and is gaining a lot of momentum. And in fact, one of the areas are gaining a lot of momentum is in 5G. You mentioned the carrier infrastructure and breakout that's happening, but when you're not making devices and handsets, and you're working behind the scenes, building the technologies that make these devices work that make a fixed 5G access a possibility, all the things you're doing, people don't necessarily know. Talk a little bit about the Marvell 5G strategy, where you see this going, how big is this going to become for the company?

Matt Murphy:

Sure. Yeah. This is a huge opportunity for us. And I think if you had gone back certainly pre-Cavium, I mean, we had no carrier 4G exposure to speak of. I mean, it was diminimous level of revenue and even Cavium when we bought it, they had basically one custom for the baseband processor only. Now, again, we're talking about base stations, not handsets.

Daniel Newman: Yeah.

Matt Murphy: And that was kind of it. So that transformation was pretty interesting. If you think about the base station market and the rand market, there's a tremendous amount of Digital Silicon that goes into all of this infrastructure. Just to give you an example, an average sort of macro cell base station has around \$4,000 of digital content. Those could be [inaudible], those could be base band processors. Those could be layer two processing for transport. You have FPGA's that do some of that. So that whole kind of bill of materials is just big round numbers, 4,000 bucks, and then big round numbers there's about 1.5 million base stations a year sold.

So you multiply the two, you get about a \$6 billion opportunity. One of the players in the market is captive and that's Huawei. They've historically done everything themselves. So you have to take that out. Their historically about a third of the market. So you get about a \$4 billion opportunity. So what was exciting for Marvell plus Cavium was you got a \$4 billion opportunity in front of you. We have all the pieces between the two companies and virtually no exposure in 4G. So what's happened is we've had significant design wins this has kind of been well known, but we have all the key pieces. We have leadership in baseband processing, leadership in the high-end CPU's for layer two, which is largely transitioning now across the whole industry to arm. We have [inaudible] capability, which we can do for things like digital front ends actually up in the radio head.

We have massive MIMO beamforming. We announced with Samsung, actually they announced on their letterhead, their press release that we were supplying a customized C for them with Marvell IP in it for massive MIMO beamforming for their rollouts in North America. As you go from 4G to 5G back planes have moved to Ethernet conductivity. So there's Ethernet switches now in all these space stations, we've won big share in that market. So when you think about all the digital pieces, Daniel inside these base stations, we've come from out of nowhere in this telecom 5G area to being what you would argue is probably going to be one of the largest suppliers of semiconductors into 5G in this entire cycle. And we're just at the beginning, by the way, I mean, you really only had a big build in Korea two years ago. China started last year, but those are going to continue. And then you've got North America, you've got India, you've got Japan, Southeast Asia, and then Europe finally. So we're in the very early innings of that market rollout in our content and our design position is extremely strong across multiple OEMs and multiple products.

Daniel Newman: And of course you'll have releases, you'll have updates, still upgrade the infrastructure and sounds like you'll be there as they continue... These cycles last seven to 10 years. And so while the visionaries want to start throwing the... I'm remiss to even say it as a serious technologist, but 6G as a topic out there. I mean, it will be a thing. We're in the year one, two, three of a minimum tenure cycle. And only in really some of the most advanced countries and biggest markets have we really started deploying any infrastructure at scale. And if

you're looking as an outsider in and saying, "How big is the 5G opportunity?" It's big.

Matt Murphy:

It really is. And if you think about the technology that feeds it, just to give you a sense. The first wave of these 5G radio base stations were pretty much all built on either 4G chip sets with a big, heavy software overlay to get it to work for the 5G standards or on the hardware side, very complex, FBGAs, which by the way, every cycle starts this way, 2G to 3G did this, 3G to 4G. This is nothing new. So just to give you a sense of where we are. So the FPGAs we're sort of in the last few years. We're now coming to market and others and more custom purpose built ships and what I would call 12 to kind of 16 nanometer technology. I mean, that's basically what we're going to be shipping the next couple of years behind all of that, which is what's really exciting is we've had significant design traction on our five nanometer platform.

And so all those chips are now in flight. They're in design. Actually we taped one of them out probably about a month ago. So just to give you a sense, there's so much more to come as you're pointing out that even the latest, greatest state-of-the-art base stations today are not even on the latest node. So there's going to be tremendous improvement in this market and affordability and capacity that these base stations can deliver at the right cost points because the Silicon is going to finally catch up. And then there's going to be another wave after that, right before you get to 6G's. So I think it's a 10 year cycle. We've certainly got a small group already looking at the next generation standards.

We'd be remiss not to be doing that, but this is going to be a very, very long cycle. And I think the exciting thing about 5G is you're going to see it expand into industrial applications, into automotive applications, enterprises, private networks and IoT. I think these are all expanded use cases for the technology, which probably is much broader, certainly than 3G, which was voice only with a little data behind it, 4G which embraced data for the first time. And now you've got kind of a very data centric, 5G world.

Daniel Newman:

Basically 4G brought the OTT world to life. It brought social media to life. I mean, so many innovations that people don't realize came as a by-product of that level of connectivity. We're online connected with high data through, but pretty much anywhere and everywhere and 5G only exacerbates that makes it better no matter where you are. I think the analogy you kind of were calling for is, "Hey, just because you bought the latest greatest device, doesn't mean it's the last one you'll ever buy." And the infrastructure is the same. And sometimes I think people don't realize that infrastructure continually has to be improved too. And I'm not just talking about roads and bridges, which is what the world seems to think infrastructure is sometimes.

I only got a minute or two left with you, Matt, and by the way, it's been great. I'd like to take it home, just talking about one part of your business. It ties into the 5G pretty well, but automotive. You guys with your whole business model, networking, connectivity, I mean, that's going to fuel the future of automotive.

You're not building cars, you're not necessarily touting an infotainment system. So the name Marvell doesn't always get thrown in, but you're in a lot of vehicles and you're in the story for a growing automotive business. Just share a little bit about your place in automotive, a great way to take us home both literally and figuratively we'll take a ride.

Matt Murphy: Sounds great.

Daniel Newman: In the last few minutes.

Matt Murphy: Sounds great. Well, I think it's a good one to end on because as we discussed 5G a lot, we didn't have a chance to cover the cloud, but that's going to be an enormous cycle for us. And then beyond that is really automotive. So if you think of the waves of sort of growth for the company, that's kind of how it layers in. And in fact, I was in a present part of a meeting, recently, and one of the English price Waterhouse, their view was by 2040, which I know you say, "Well, that's 20 years away. Oh my goodness." But in automotive, that's actually a reasonable period of time that you could argue automotive will be the largest end market for semiconductors. Just based on, not on unit growth, obviously, but based on the content growth.

So with that in mind, let me just take you through where we're at. I've been involved in automotive semiconductors since 2004. So at my prior company, we went through a similar journey I'm taking Marvell through, which is when I was at Maxim we were not an automotive supplier in 2003, 2004. Now in that inflection, what we saw was that the consumer device experience was making its way into automotive. I mean, if you go sort of the prior 10, 15 years before early 2000s, let's call it. The innovations in automotive were things like electrifying, windshield wipers, and door locks and transmission control, and fairly basic kind of body electronics features. The 2000s brought in this wave of infotainment which became actually a key selling feature for vehicles when consumers are buying cars. And the reason is they wanted their iPhone like experience to be in the car. Makes sense.

But that whole wave actually, and I was in the middle of it because Maxim had extremely good consumer technology for things like smartphones and laptops, battery management, LED drivers, power management, you name it. And we basically got pulled into automotive. And as a result by automotive rising, all these consumer-based technologies, it became a very large business. I think the next 10 to 15 plus years is the wave of the connected car, okay? Cars that are going to be rearchitected differently. They're going to have high speed computer networks. The storage requirements are going to go through the roof. There's talk of doing centralized storage, petabytes of storage, the compute requirements, especially as the cars are now differentiated, not on the infotainment. And they're certainly not differentiated on the miles per gallon or the horsepower zero to 60. They're going to be that differentiated on the ability to run your apps, to be self-driving, to be secure, to be autonomous, to be connected.

And so guess what the key fundamental elements of all of that are going to be? Move data, which is our networking. Store data, which is storage. Process data, which is CPU's. And then secure, which is secure it all. Daniel, we're active in every one of those areas today. The one that gets the most, kind of press today because it's where the real revenue is, is in the networking side. So five years ago, we set up an automotive business unit after I became CEO to focus on automotive networking that business today we've said, will be a hundred million dollar run rate business exiting this year. And in our investor day, we showed it going to over \$200 million in revenue with a market size going to a billion. That's just for the in-car networking based on Ethernet.

We're now involved very actively as more and more of these large OEMs decide that they need much more intense compute capabilities. So guess what? Our DPUs that we designed for the cloud, we're now looking at... And by the way, TSMC just recently announced their five nanometre automotive flow. So we're aggressively investing in that. So we intend to provide compute as well into automotive. And then with our storage portfolio, particularly in SSD controllers, the world's moving to flash inside of the car for centralized storage. And then we've also got great security offerings that we offer in the cloud today, hardware, security modules, that's all getting a [inaudible]. So I see a really bright future Daniel. We're going to be a major player in automotive and we'll look back when you go out but it takes time. But I think we're very focused on that as a market because I think that can be and will be the next great growth driver for Marvell after 5G and after cloud the gifts should keep on giving is the way that we look at it.

Daniel Newman: Matt I could probably spend another half hour. I could have you run through the cloud business. And actually we'd love to do that. We're going to have to make another time for that, but I'm so pleased that you were able to spend some time here. Really tell the Marvell story. Congratulations on all the success that you've had so far. And thank you so much for being part of our 2021 Six Five Summit.

Matt Murphy: Excellent. Thank you, Daniel. And thank you for having me and giving me the opportunity.

Daniel Newman: Everybody that wraps up this conversation with Matt Murphy CEO at Marvell, but stay with us. We've got a great day of executives here at Six Five Summit. Our whole semiconductor day is loaded with insights and of course, five days, more speakers and all these sessions are available on demand, whether it's during the week of, or sometime after we hope you tune in, we hope you share. We hope you keep coming back. But for now, we'll see you later. Goodbye.