Patrick Moorhead: I just suspect more ahead, with Moor Insights & Strategy. And we are here for another Six Five Summit, 2021 segment. And I am so pleased to introduce and welcome for his second straight year, Tom Caulfield, CEO of GLOBALFOUNDRIES. Tom, how are you?

Tom Caulfield: Hey, Pat. Really good. Hey, thanks for having me back for the second year.

Patrick Moorhead: Absolutely. You knocked it out. A lot of video views and our listeners and viewers wanted more. We wanted more Toms. So here we are. Tom, it's hard to read a semiconductor article or watch a segment on TV without seeing your face or seeing one of your quotes out there. You have been just pervasive in talking about semiconductor competitiveness, but if we could, let's just start at the top.

There is a chip shortage and whether it's cars, PCs, Chromebooks, TVs, 5G infrastructure - there is a chip shortage. And where is the chip shortage coming from? And how did we get into this supply and demand imbalance? And I think, most importantly, what people want to know is: What is GLOBALFOUNDRIES: going to do about it?

Tom Caulfield: Well, first I think, irrespective if it's me talking about it or not, can you imagine three years ago, if someone tells you every day, whatever your newsfeed internet print, that every day you would find at least one or two articles on the chip shortage or the chip industry. You would have said, "Come on." That happens every year, we get an article and I guess maybe it takes a crisis to recognize how integral something is. And in this particular case, the chip industry is so integral into a $91 trillion world economy. And it's not until you see you have a crisis that it becomes really important for everybody to understand it.

So how did we get here? It's like everything else: It just doesn't happen overnight. It's a confluence of a number of events, and usually they start a lot further back and it builds, and then maybe there's a catalyst that will accelerate it.

So let me tell you my view of the world. And by the way, I always felt that we would get to this imbalance of supply and demand because of the seat that we sit in, right? As a supplier of semiconductors and looking at the... Where markets were growing and where investments were not being made, that eventually we would cross the Rubicon and have less supply to demand. I think what we're seeing is it's happened a lot sooner and a lot more dramatic.

But I think it really started with these mobile devices. And why is that? These mobile devices created a singularity of a device for us, as a society's businesses, that it had everything for us. It was feature rich, it had cameras for pictures, it had audio, it had chips to connect to both wifi and cell towers.

So we were always connected. It had the ability to do secure transactions. It had the ability for us to communicate to other devices. It's these rich features that started to make this, "Wow, I could do so much more with the digital transformation. I can do so much more with technology." The whole reason we have the internet of things is because we now had a device that we can use, do something with all our devices being connected. What would I care if my thermostat was connected to in my house, to the internet, if I still had a roll out of bed, walk downstairs and change the temperature setting. But now I had a device that I can do all this. And what happened is: Fundamentally our industry went in an evolutionary way, and maybe an explosive way now, from a compute-centric deployment of semiconductors, everything around compute, to a pervasive deployment.

In fact, that pervasive deployment of semiconductors is 70% of the market, where the traditional compute, following Moore's Law, now went to single digit nanometers, is 30% of the market. And we all know most of the investments in capacity have all been addressing very significant, and necessary, but not sufficient part of the market, which is that compute center.

And so what happened is we... This was a jury, a date with destiny, this industry is going to have. COVID comes. The digital transformation becomes accelerated with... we talked about last year... and it pulls in that intersection point and it makes the mismatch that much higher.

Patrick Moorhead: Yeah. The irony is-

Tom Caulfield: The nest explanation I've heard of it, just because it happens to be mine, because it pulls everything together.

Patrick Moorhead: The irony is incredible, Tom. And I remember at... Listen, the software is eating the world and it still eats the world. But I always said that software has to run on something. And as we've seen, some of the large platform players are getting strategic with Silicon. So strategic that they have their own development teams out there. And the... And that to me says: People have learned that they can use Silicon to be strategic, not just to ship a generic widget out there. And I do agree with you that sometimes it does take... A challenge is out there to get us to where we need to go.

So are you planning to build more fabs? And is that a GLOBALFOUNDRIES solution to the problem?

Tom Caulfield: Yeah, I think there's a couple of things here. There's always... What can we do, tactically? What we can do strategically. Tactically, we're trying to get as much capacity on as we can. We have, unfortunately, a lot more demand today than we can handle for our customers. And we're doing the best we can.

For us, it means sole-source business, which is a big part of our business, where we're the only foundry that can make that, that we made it as a proprietary offering to our customers and they chose it because it created great differentiation for them and the products they make. We have to service that first and foremost and do as best we can. I think it's more about what this inflection point is going to change. Look, we're a half a trillion dollar industry, and whether you believe it's six, eight, or 10 years, we're going to a trillion dollars. And this industry could do two things.

We could say, "Hey, stick a fork in us. We're done. Let's stay to half a trillion dollars, milk our assets, and do the best we can." Or it could say, "No, we need to go grow as a trillion dollar industry." The only way we grow is we need more manufacturing capacity. We need it everywhere: Analog, digital, RF, single digit, [inaudible]. And the only way we can do that is the economics of foundry investment and capacity. That got us to a half a trillion dollar industry. Cannot get us to a trillion. And it's going to be more partnership. Partnerships with between the foundry and a fabulous customers in the following way:

It's about certainty, profitability and durability. Let me say the middle one first: Profitability. Profitability is just about return on invested capital. The economics for any capacity have to work for the ecosystem. For the fabulous, for the foundries. We have to find a better way of doing that.

We want certainty. If you're going to make investments this "build it and they shall come," is... It can't happen anymore. It's just too risky for everybody. So we need all of us in the semi-finished. You have to get certainty around the capacity. We're going to build and the commitment to it. It's not enough just to say, "It's a forecast," it's owning that forecast, right?

And then the last thing: Durability. Let's make sure when we're adding capacity, it's an areas and segments that we really have strong belief in, that we can be differentiated. And I will tell you over the first five months of this year, GF has really done, I think, a remarkable job working with our customers in partnership to create these partnership models, to go give security supply and real output over the next three, four, five years in partnership to create capacity that our customers need. And I think that is the model that will get us from a half a trillion dollars to a trillion dollar industry.

Patrick Moorhead: Yeah, the certainty. I don't know if I've been doing this as long as you have, but I guess over 30 years, but always inter-strong. Either working for chip companies or close collaboration with chip companies, and that certainty, the idea that you would lay down $10 billion, not knowing what the end result was going to be, with a high degree of confidence. It was like Las Vegas and big risks.

And one of the things that I'm seeing and I've seen, even out of GLOBALFOUNDRIES, is those companies that might have been two or three clicks down the value chain from you, directly interacting with you. And I saw this even coming out of the auto industry. I think I even talked to auto

manufacturers that said, we need to be closer to the people who manufacturer our semiconductors. And I think that's one of the big learnings that I've seen.

So, Tom, so much has happened in the last year when, when we had you on here. You talked about the pandemic, and different geopolitical forces out there. In addition, here we are now. We can't get enough. Put a focus on the criticality of the semiconductor industry. And that, you had said and I had said ,is driving the digital transformation out there.

So from where you sit, Tom, what is the current landscape out there? I know you had talked about it, a little bit of what's going on, and have this... Have the same forces continued to affect the industry or has something big changed over the last year?

Tom Caulfield: So, the geopolitical dimension has only grown. And I think, if we didn't have this crisis, you could see it kind of plodding along. It's a great thought, something we're going to have to get around. And then get to eventually and maybe do something about it. And now you have the big chip shortage that says, "Okay, we really need to get serious about it." And it's about supply chain security. And we have a highly concentrated industry in one part of the world. 70% of all foundries from one part of the world. A very tiny part of the world. And that creates risks in its own right.

We talk about national security or sovereign security for regions and there's economic security. And I think that's the big epiphany. The first two were obvious, but to see how important semiconductors are in the world economy, and when you don't have them, the carnage it creates in different industries, creates this is impetus. We need to get this moving forward.

And, as you know, GF has a global footprint, and, a little bit back to your last question, we're getting to the point now where all the brick and mortar we have is full and you will see announcements coming from GF that we will start to add to the brick and mortar, because we need to do our part in any capacity to get this industry to $1 trillion industry.

But you... Politically, there are partnership opportunities. Singapore EDB, great partners with GF, and they will continue to be great partners with us as we continue to expand in that part of the world. Just in the news yesterday, it looks like we're getting closer and closer to getting the chips bill finally funded. And once that's off, there's a smart way of doing that. And my advice to Washington is, has been very consistent.

First and foremost, be ambitious. Don't, you're not going to impress anybody by going from 12% to 10. Want manufacturing of 14%, especially when 50% of the demand for the semiconductor industries is from U.S. headquartered companies. Be ambitious, "Hey, in a decade, let's make that 20, 24%, right? Let's double that."

Be thoughtful in the in understanding that this industry is very broad. It's not one thing. It's not a 12,000 way for a month fab in single digit nanometer that solves your problem. It's about analog mixed signal, single digit nanometer, NAND flash. Make sure you invest in a portfolio of technologies if you really want to have semiconductor sovereign security, national security, and economic outcomes.

And so the U.S. will get to this point. And I believe there'll be a number of companies that will be able to leverage that and do their part, and take a 12% and "Let's drive this to 24%."

And then of course in Europe, we have a global footprint, very big facility. In fact, it was our birthplace. When GF was born, it was a spin-out from AMD. And that was our first facility. It's called Fab 1, in Dresden. And... Give you an idea of the kinds of investments we're making there.

The number of waivers we shipped in 2020 and the capacity we're adding that facility by the time we exit fourth quarter of 2022... And this is gated, by the way, by how fast we can get equipment, install it, and qualified. It's not because we don't want to run faster. That output of that facility run rate fourth quarter of 2022 will be two and a half times more than it was in all in 2020. Even 90 of the rate of pace at which we need to add capacity.

So geopolitically, the issue is still there. It's been elevated to a higher level of crisis, and in driving quicker actions. And I think the proof of that is what you're seeing in the chips bill. And we will, as a company, continue to leverage the fact that we have a global footprint, it's a real feature for GF, and to not add capacity in only one region, but all the regions we offer.

Patrick Moorhead: Yeah, Tom, I love the aggressive approach that you're taking. And as I said, in your introduction, it's hard to open up a... And kudos to you and your PR team... It's hard to read a intelligent article without seeing you in many of them. So, hats off to you. And I do think we should go for it here. And, I don't want to say go bigger, stay home, but let's... I do think it's valuable to go home and also appreciate that other regions have the go big mentality as well. You talked about Singapore, you talked about Western Europe, and the United States. And everybody wants to make sure that they have the supply because Silicon is strategic. I'm just going to keep saying that until more people, it doesn't say [crosstalk]

Tom Caulfield: No push back from me, Pat. No push back from me.

Patrick Moorhead: It doesn't say that cloud and software aren't important, but let's just put these all. And, I said this in a recent Forbes article, that when you align semiconductor, software, and the cloud, the real magic happens out there.

So, Tom, you had alluded to this a little bit before, but I've heard you say this... That, that the industry is painting itself in the corner. This maniacal, crazy focus on single node scaling, single nanometer manufacturing. I think I know what you mean by that, but I want, for the sake of our viewers and listeners, for you to explain what you mean by that. And does it create an opportunity for GLOBALFOUNDRIES?

Tom Caulfield: Yeah, I'll get to that. Let me... You mentioned it twice, a little bit about me, "Do you have an the news on this issue?" And look, let me not talk it... I think the reason why maybe we have to be the one talking if there's a chip shortage. You go to the people who make the chips to talk about it, right?

Patrick Moorhead: Exactly.

Tom Caulfield: He can be the spokesperson. And look, for an industry, I don't think it's fair for our industry to be the kind of cross hairs for everybody saying, "It's all because there aren't chips." We need people to understand our industry, so they understand what we're doing about it. And I think it's as much that GF is an important part of that industry, is an important part of telling the story of what happened and what we're going to go do about it. And maybe it's more for me an obligation to represent, then discuss whereas we talk about it. So, you brought it up twice and I thought I would just suggest that. Yeah, look [crosstalk]

Patrick Moorhead: Can I just... For the sake of the audience, the biggest shortage was not in single nanometer. The biggest shortage is 1428-

Tom Caulfield: 40s, 90s, 65.

Patrick Moorhead: Yeah. So... And people are missing that. And strategic doesn't mean bleeding edge. Strategic means anything that can... Is require to deliver the holistic product and service, which is a combination of not only nanometer and geometries, but tech. Very important focused technologies out there, which Tom, I know when it comes to 5G or, or IOT, a lot of your focused areas, that's what's required to, to be most successful.

Tom Caulfield: Yeah, and let's get back to this, what I talked about: The industry painted itself into a corner. When we were compute-centric, that was the lion's share of the innovation. It was to scale the transistor, make it half the size, twice the speed. And that was the game. And then we started to see all these other rich features we needed. We went from a node-centric industry to platform industry, where we take a node and add features to it, whether it's IP device types, features like embedded memory, high voltage, low voltage. And it's those attributes where we innovate every day. And we have thousands of engineers that do this. And the last thing they want to hear is what? "You're not innovating if you're not making the smallest transistor." We say "We beg to differ."

We're 70% of the market, as I spoke about before. And it's these features that are enabling the explosion of semiconductor deployment around the globe. And I think it's a very important element, is... We should talk about with got us here, a compute-centric industry. It's still an important leg of innovation to continue to scale. But more and more of what will drive this industry is the 70% of the market that's feature rich application requiring these kinds of solutions.

Patrick Moorhead: That's right. It's really hard to ship any smartphone or anything that requires RF on even bleeding edge or leading edge technology. And well, it's bleeding edge technology is... As some of the advanced techniques you've added to it, but just not single nanometer nodes. And we're experiencing this right now.

Tom Caulfield: No, it looks... Like it's an important segment. One of the challenges we have is, once we crossed the Rubicon to EBV, the cost point is really hard to do anything about. And remember, EBV is a proxy for quad patterning, and that's expensive to do one process. We have to do it four times and you EBV reduces the cost a little bit. Maybe it's 80% or 20% more cost-effective. And so the use cases, the applications, for that are coming smaller and smaller, but they're... Maybe the use cases are growing, but the volume is there and data centers and compute are a very important part of the segment. But again, innovation has to happen everywhere if we're going to really drive the digital transformation and the wonderful things ahead for society and humankind that semiconductors can enable.

Patrick Moorhead: So Tom, we're coming to an end here, but I wanted to give you the opportunity... The viewers of this are your customers, your ecosystem, government officials, VCs, investors... Here, any final words you'd like to share with the audience before I take us out?

Tom Caulfield: Now I'll just repeat a little bit in summary, what I said before, and it goes something like this: There are others. And you said it, your words, that was software is going to eat the world. And some of the feelings, "Well, semiconductor, it ran its course." I think this is now the golden age of semiconductors. I think the first 50 years kind of set the foundation for what we can become and all the things we did to get us to a half a trillion dollar industry. The focus only on scaling, the kinds of relationships in the ecosystem, the value capture of semi for what it creates for the world. All of that has to be rethought, if we're going to get successfully from a half a trillion dollar industry to a trillion dollar industry. And I'm bullish. I'm excited. But what the next 50 years are going to bring for this industry. I may not have all 50 left in me, but I'm going to stay as long as I can.

Patrick Moorhead: Tom, I want to thank you for spending time here with us. Really appreciate this. This is Pat Morehead with More Insights and Strategy. Keep on tuning in. We literally have the most important companies in the technology ecosystem, including semiconductors, as part of our program. So please tune in there and thank you so much. Thank you, Tom. Thank you.