# Credit Suisse Technology, Media & Telecom Conference

## Company Participants

- Jason Zander, Corporate VP of Azure

## Other Participants

- Brad Alan Zelnick, MD, Crédit Suisse AG, Research Division

## Presentation

### Brad Alan Zelnick {BIO 16211883 <GO>}

I'm Brad Zelnick. I'm the software analyst here at Crédit Suisse. And we are truly delighted to have with us today Jason Zander from Microsoft Corporation for our software keynote this morning. Jason is Executive Vice President of Microsoft's Azure business. He's been with Microsoft since 1992, started out in engineering. Before Azure, I think you ran the Visual Studio business.

### Jason Zander {BIO 20468487 <GO>}

That's correct.

## Questions And Answers

### Q - Brad Alan Zelnick {BIO 16211883 <GO>}

And really, really excited to have you. Why don't we get comfortable? Format of today's presentation is going to be a fireside chat. And we're going to see what we can learn about Microsoft's efforts in the public cloud. So Jason, maybe just to open it up, get to my notes. But I know what I wanted to ask you, Microsoft's mission statement, it's quite bold. And every time I open up your filings or listen to Satya speak. And I'm reminded to empower every person in every organization on the planet to achieve more. With that, I just think boundless opportunity. But as it relates to Azure, what is unique about Azure that best enables you to deliver on this very bold vision?

### A - Jason Zander {BIO 20468487 <GO>}

Yes. And thank you, Brad, for having me here today as well. Good morning, everybody. I would say there are several things that I would point out. But I want to start off from an Azure perspective and I'd really push on hybrid. Hybrid is something that we have made part of our product plan since day 1. And some of that comes from the fact that we had 20 years experience providing software into data centers, the data center and enterprise environments. And then we've done the hyperscale

cloud. And so that's a really great solution that we have and we've done everything full spread on hybrid. We also have a very broad portfolio. So going even beyond Azure, we, of course, have Office 365. When you think about how one uses that, I have Azure-acted directory. So I have identity, I have security, et cetera. And the products all come together. So the Microsoft Cloud, have a look at Office 365, Dynamics and the identity that underpins all of these, all of these things compose well. The last thing I would say is it's not even really a technical differentiator. But we are a software company. And one of the key things I always tell potential customers and partners, we're not your competition. We're here to help support you in a world where -- I think a lot of customers that I talk to, they don't want to get technology on one hand from a provider and have that provider turn around and compete with them on another. And so to us, just being at the core and having that breadth, that hybrid, those are differentiators that I think resonate.

## Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Excellent. And if we think about your global presence, 54 global regions, the largest presence in the marketplace as I understand it. As we think about the various data centers that comprise those regions and we think about that driving your success, is there a theoretical limit to the number of regions that we should expect? And how do you think about the decision to expand further into different areas?

## A - Jason Zander {BIO 20468487 <GO>}

And this one is kind of region how we've gotten into cloud as well. I mean, with 54 regions worldwide, these are the big hyperscale regions that we run all these big workloads in. Now we do this in order to get close as possible to your potential customers as well as your employees. And so being able to be in these regions around the world is super important. Also having more region counts helps us with things like data sovereignty. Now if you think about our history in cloud, one of the key reasons we need to do that, we're doing Office 365. And we're one of the first big commercial SaaS services out there, the most popular one out there today. And it turns out if you're doing people's e-mails and SharePoint document, et cetera, you need to be close and you need to have that kind of coverage. And so we've done that worldwide thing since day 1. If you think about it, if I was a retailer and I was only serving a couple of markets, I don't really need that. So I start off with a smaller footprint. If I was just doing search, you don't need full coverage. In fact, even with Bing, we really only have about 5 regions around the world that we run Bing out of. We have full coverage. But it's just -- if I'm shredding the Internet and you're searching for a laugh out loud cats, I don't need to worry about having one in Luxembourg, right. So you can just basically service it that way. So our history is kind of rooted in that. That's one of the other ways we chose to differentiate because we needed it. We recognized customers and ISVs with worldwide reach needed it. And so from a theoretical limit, right now, 54 regions is the ones we've announced. We do have more that are underway that we haven't disclosed yet. I expect us to continue to do that. There is a point at which, probably don't need to put a data center in every single location that would be cost prohibitive. And we have good solutions in regions like the European Union and U.K. after Brexit and things like that as well. Then we move into things like Azure Stack, which allow people to get down to the very last mile. If you want one in the basement of Parliament, we can hook you up.

## Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Helpful. And Jason, as we think about your CapEx investments, I think everybody, many in this room, we look and listen very carefully to what Microsoft is doing and where it's allocating its capital. But specific to the Azure business and the build-outs that you do, can you maybe talk a little bit about your capacity planning process? How its evolved over time? And how the approach and cycle time might be different today versus what it was years ago?

## A - Jason Zander {BIO 20468487 <GO>}

Yes. And let's look at it at a top level. I mean, I think the interesting thing from a business perspective, the TAM here is just huge. I mean, it's a tectonic shift. 26 years at Microsoft and I lived through DOS to Windows and I lived when Office was created. This might be the biggest one I've seen and even with that kind of background. So the TAM is actually huge. And we are, no question, taking share and growing, which is fantastic. And so we do expect that our capital spend, our CapEx will continue to rise because we're meeting that demand. I need to go do that. The other thing to remember is, when I build out for Azure, I'm also doing it on behalf of the Microsoft properties. So when we expand these data centers, all the servers we put in, the networking connectivity that we do, we're also serving Office 365. We're even serving Xbox. I mean I can watch kids come home on the East Coast and go to the West Coast because I can see when Xbox kind of picks up and then you have to go do your homework. And then it drops down there and then all of a sudden California, it's up again. So we're supporting all of these kind of platforms. So that capital spend is for all us. But it's built on top of, Azure's the core. Then of course, there are customers that aren't Microsoft properties that are running on top of it. So expect that to go. Now your question was then around efficiencies and how are we dealing with this. And so we're absolutely, every semester, do semester planning. I book new wins on COGS improvements. That includes things like tidying up our supply chain, our capacity planning, getting better and better at figuring out what the windows are in long-range positioning and kind of your 101 kind of stuff on that. And I would say we've grown so massively that we're also now trying to grow those internal systems we get more and more efficiencies over time. So we've continued to go do that. There's lots of different angles in there you can pick apart.

## Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Is there any rule of thumb to think about $1 spend today versus $1 five years ago or five years from now and the productivity that you would expect to get out of it?

## A - Jason Zander {BIO 20468487 <GO>}

Yes. No. We absolutely the kind of -- the real core of that is are we getting more efficient? And the answer is, absolutely, right. We're absolutely getting more efficient as we go through. A couple different things we do. One, like I said, shortening lead times and being able to do a better job of predicting where capacity comes through is something we concentrate on heavily. We have won some pretty massive deals. I mean, I'd say the cloud has transitioned. And we had cases where people would come in and run risk management, they do 100,000 cores and kind of run those through. But you're now getting into the largest enterprises that are replacing entire

data centers. That winds up being a huge shift. So we do a lot of intentional planning and getting efficiencies on that. Then within the fleet itself, we look at the combination of utilization, our power utilization, et cetera. We have machine learning algorithms that we run internally to optimize all this stuff. So we're making maximum usage of that. Plus we do a lot around our SKU mix and things like that as well so we can get the best possible planning. We'll even do this, of course, at a worldwide scale. So all of those things are actually part of what we're doing for efficiencies. And we'll get better and better and better over time.

## Q - Brad Alan Zelnick  {BIO 16211883 <GO>}

And just to pivot to a different topic that is I know on just about everybody's minds. In the headlines all the time is security. And security is clearly an important design criteria for any cloud service and it's becoming more and more topical and part of Microsoft's message. And no matter how much we spend on security, some estimates, $80 billion, $90 billion, $100 billion a year, we continue to wake up to these breaches. What is Microsoft seeing specific to Microsoft Cloud as your responsibility? How much of this is opportunity in its own right versus something that needs to be inherent in your platform?

## A - Jason Zander  {BIO 20468487 <GO>}

Yes. And this is a super important one. Obviously, security has never been more important, especially as we have even more connectivity devices around the web and they wind up taking even more control over some of our everyday functions that we all interact with. Now I think the estimates that I've seen are in 2020, the world economy could get hit by about $1 trillion worth of impact from cybersecurity. Wow. Okay. So we need to make sure we're all doing a very, very good job on that. From a Microsoft perspective, we spend about like $1 billion in R&D. That's all of our professional engineers, men and women that are working on these tasks. We have over 3,500 full-time employees, they only do security. Our digital crimes unit and all the rest that kind of stuff that we do. 3,500 full-time employees that are there. Now one of the interesting things to think about from security from a Microsoft perspective, we see a lot of unique signals around the globe. We see, for example, everyone using Office 365. We have to produce security technology to protect our own customers and our own products. So we invest in that. We have 1.2 billion sockets out there with Windows, we see that as well. And you probably have seen Microsoft publicly work with law enforcement agencies around the world to take down the illegal botnets, phishing sites and all those sort of bad actors. It's, again, part of that security investment that we do. Now from a cloud perspective, think about how old those signals. And we get about 6.5 billion signals a day. We pull all of those signals in that we see for our own products on the public net as well as things from the client, the botnets and all the rest of that stuff. And we include it in our own data and analytics. We run machine learning algorithms over it. We figure out bad patterns and anti-patterns. And that's how we protect our own properties, Office and Xbox. Then we turn around and make those, your market question, we take some of the same tech to protect our own customers and we make some of those products that are available for our customers so they can also have those advanced protection as well. So that's -- those are just some examples of some of the things that we invest in. And as you pointed out, I mean the bar is going to continue to go up.

## Q - Brad Alan Zelnick {BIO 16211883 <GO>}

In terms of monetizing that investment, can we expect increasingly we'll see you going after security dollars earmarked within a customer budget versus monetizing just through the adoption of customers feeling more confident in Office 365 and Azure and all the various cloud services that you offer? Implicit versus explicit, sorry.

## A - Jason Zander {BIO 20468487 <GO>}

Sure. No, absolutely. Yes. And I think you should think of this as, over time, is we'll continue to evolve. And so in some ways, security is just table stakes, right. You have to have security in your cloud. And we do. It's going to be built in. So as you see the kind of re-factoring of the kind of value proposition that the cloud brings. I mean you're no longer worrying about your hardware, you're no longer worrying about the underlying management, that just comes with. Of course, a certain element of security has to just come with. That's the table stakes part of this. And we provide that as well. So some default protection, it's just got to be in there. People can take advantage of it. And that would be something, as you point out, would be recognized more through people leveraging Infrastructure-as-a-Service and our as-a-service offerings from database to PaaS. That's just a core part of what is built in. Now that said, today, if you're protecting -- if a CIO is looking at her portfolio of how she's running your data center, chances are she's actually leveraging 12 separate products from lots of vendors, stitching a bunch of these stuff together and trying to figure out how to go make all of that stuff work. And you're paying for those products that are there. A certain amount of that value will waterfall into that's just part of what the cloud provides. But there is a lot of advanced threat analytics that's available for that. And we expect that people can and will want to be able to do that. So our strategy here is twofold. One, you'll see us introduce products. I mentioned Azure Security Center, there's also -- Office has a threat analyzer as well for O365. There's a bunch of this technology that we expect that customers will want that value because it helps protect them and, in some cases, simplify that portfolio that was mentioned. Now I also a very strong ISV ecosystem. So those 12 products that our CIO was using in her data centers, it turns out in this Hybrid state where we expect to see Hybrid across the board, we want to make sure we're meeting her where she is and then also working with those ISVs so they can bring their products along as well. So I think you will see us core table stakes. We have some more of our own differentiated offerings that we think simplify the world and really do a good job managing out there. But then we're also going to have that healthy ecosystem that helps everybody bridge that gap. Then for those ISVs, to also modernize their products.

## Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Excellent. Thank you. So much. In your opener, Jason, you talked about hybrid as being a distinct attribute and differentiator for your offering. And as I also think about Intelligent Cloud, that's often talked about in the context as well of intelligent edge. Many talk about edge computing being the next generation of growth and opportunity in technology, more broadly. And as we think about edge, there are going to be various players. There are going to be horizontal winners. There are going to be specific specialized edge players like security edge players, et cetera. And I've heard from Satya all the way and down through the rest of the organization,

examples like precision agriculture, precision medicine. Can you talk a bit about the edge opportunity as you see it today? Why is it so important? And why is Microsoft so well positioned to capture it?

## A - Jason Zander  {BIO 20468487 <GO>}

Yes. That's a great one. And you'll see our world view at Microsoft. And we've used this framing for the last couple of years, actually. And I think you captured it quite well. We took a world view of the Intelligent Cloud and the intelligent edge. Why do you do that? I think one thing you need the cloud on the back end is really kind of your substrate. I mean it knows who I am no matter what device I'm using, if it's my phone or tablet or my car. I mean so the cloud helps with that, gives us that global reach, that maximum processing power. The edge, as you point out, is all different sorts of form factors that we have available for that. And so that could be anything from, again, the devices that we're carrying, the stuff on the table and in your bag, out to things like the sensors that are running this building. I mean all of those things can be part of that edge. The intelligent piece has to come down to -- do we do believe that it has to be smart. I mean you can't just have a bunch of signals coming off of dumb devices. We'll have sensor measures. Those things have to be there. But we also want smarts at the edge. My favorite example of this, if you think about self-driving cars, like there's a point at which we want enough smarts on board so that if that car sees a red bouncing ball come out in front of it, it hits the brakes right away, just like you would as a driver because there's a high probability there's a kid coming out right behind it. Like, I don't want that making a round-trip to the cloud to figure out, should I hit the brakes? Is that okay? I mean, like, no. I mean, like, do it right then and right there. And so I think that intelligence piece is something that's super important. So that's a topical taxonomy. And let's mention the kind of hybrid aspect of this because I think that plays in and maybe we can come back to the edge, if that's okay. From a hybrid perspective, what does this mean? It means that you're going to have, again, think about that edge taxonomy. I am going to have this hybrid kind of solution and this is, again, been part of our solution since day 1. And we think that hybrid is super important, that's identity, it's your data, it's your security and then it's also the form factors. It's not just can I run a couple of software applications here or there, it's got to be all those things put together. And that's been a core part of what we've done. Our hybrid offerings are actually really, really strong. And again, it comes from 20 years of experience of having actually done software for data centers and we're structurally positioned quite well no matter what that mix looks like our customer. In particular, I will tell you one really great example. We are seeing -- we have the single Azure Hybrid Benefit. What that means is you can take your SA license for Windows Server or SQL Server, you can run that on premises. But you can also bring it with you to the Azure cloud. And only the Azure cloud. And if you look at that from a pricing perspective, that means running that workload with that SA, Amazon could be up to 5x more expensive for that same workload, right. And so I'm seeing this really good dynamic in the market, which is there's a lot of people that have server workloads that might be running SQL Server, they're on the 2008 product lines. And those are coming to end of service. And so having a lot of conversations with customers right now about, well, how do I modernize? Do I just like upgrade it in place on my existing equipment? Or but I was also doing a data center migration. And if I can come along and give you Azure Hybrid Benefit, I can help you actually pull that tech forward, you can actually run it flexibly and much, much cheaper. Then I'm seeing a whole bunch of companies that

are now starting to zero in on, gosh, maybe this is a great time to move those workloads, get them modernized up to the latest version, kind of get an evergreen solution plus the cloud with the savings, a great combination. So those are just some examples. And then Azure Stack is both sides. Let me stop there on the hybrid because I want to get back to your edge question.

## Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Please.

## A - Jason Zander {BIO 20468487 <GO>}

Okay. So from the edge -- so that's the basis. I wanted to go hit that just so you can see how that lines up. Now with that in the background, okay. So now I've got this combination of the cloud, I've got the hybrid components that I can run with my own data centers, now we can get into things like Azure Stack which is, again, our third-generation appliance that we've actually done. I joined Azure in 2012 and we already had that as part of our strategy back then which has been there since day 1. So now I can start getting to this edge thing. Let's take a great example, like a connected factory. It's one of my favorites because if you think about a factory, it's out there and running it. Stopping a production line in the factory could cost me $1 million a minute or an hour, depending from what you're doing. But it could be really, really expensive to be able to do that. And so now like let's get an IoT scenario. When I come back onto the edge, I can have a combination of my controllers and things on the floor, hooked up. But I can put an Azure Stack on the shop floor, make sure that everything is nice is connected. Even if there's a fiber connection, massive storm, hurricane, I don't know, something like that, my factory keeps running. And because of the intelligent edge part, I'm also doing a lot of the AI and the machine learning locally, that we've actually got people doing production manufacturing. Jabil is a good example. They put cameras on their production line. They actually take pictures of components as they go through the different manufacturing stage and they use ML models to actually look at what should it look like and what isn't. So image recognition. And they'll actually flag defects early and fix the line as it goes. That's a great example of intelligent edge right there. But now I get Azure Stack components. And those things come together. Then of course, those same machines, the things that are running in the factory, I can upload all the logs into the public cloud, the hyperscale cloud, cheap storage, lots of compute and I can start running big analytics jobs to tune my production runs. Like is it worse manufacturing in Germany, in the middle of December, if it's been cold for five days in a row. It depends upon your factory and your materials. But I can make those decisions and tune it. So when you put all this stuff together, I believe we have this really awesome solution for all of this. It all dovetails quite well. It's been part of the strategy since day 1. And I mentioned the industrial one because we absolutely have a lead in industrial IoT with Azure IoT. We've got over 70 major partners if you look at things like Schneider and Johnson and GE and Siemens and all the rest of these folks that do that part of the house. Then also companies, I mentioned Jabil, the Cummins and even coffee makers and stuff like that, that do this in factories. So that's kind of like the world view. Now applied to smart cities and smart buildings and smart everything. And it kind of lights out. It sounds like the possibilities become endless. It's really cool. I love it.

## Q - Brad Alan Zelnick {BIO 16211883 <GO>}

As it all comes together. And I appreciate the consistency of Azure Stack with a very seamless experience as it relates to an Azure Cloud and the customer benefit that they get with Azure Hybrid Benefit, as it all comes together and enables customer to adopt the architecture that's best for them based on their requirements and constraints, I know every investor in this room and whoever's listening in has made a bet on what that rate and pace of cloud migration looks like. When we look back at 3, five years, 10 years down the road, how much of the enterprise estate will be "on-premise" versus in "the cloud" however you define that? I'd be curious, from all the data that you look at, all of your experience, what is your world view on where -- I mean we just saw IBM make a massive acquisition in Red Hat. And one of the justifications being, hey, only 20% or so of the enterprise today lives in public cloud, what are your thoughts here?

## A - Jason Zander {BIO 20468487 <GO>}

Yes. And this is one -- and I mentioned this hybrid taxonomy, like we actually view this, again since day 1, as more of a persistent hybrid state. We've never viewed this as snap your fingers and then some number, you're -- everybody's in the hyperscale cloud. In fact, this factory example that I gave, smart city critical infrastructure, that's an example. You're always going to be in the hybrid mode. And we've always anticipated and expected that, that would be there, that's why it's been our strategy since day 1 and we've made that investment. So from that perspective, we're going to help customers meet whatever that demand looks like. I think there's places where what I'm seeing is people really looking at the hyperscale clouds as a great way to go run their workloads. And they're seeing the cost savings, there's hybrid benefit I mentioned, keeping up-to-date, being able to actually save money, those are things that are absolutely driving that growth in the hyperscale piece. Then from an on-premises side, like I mentioned all the way down to sometimes sovereignty or disconnected scenarios, those things, you're absolutely going to want to run things that way. The good news. And if you think about evaluating our product portfolio and how we're operating, we're structurally set up well for all of it. We've been doing the on-prem stuff for 20 years. A lot of the world's workloads run on our software. And so the fact that we have those assets and we have parlayed that as part of our strategy into the cloud with symmetry between them really sets us up to be -- we're the first-class thing. You mentioned some of the M&A activity, in some ways, what I'm seeing now is a lot of folks that, frankly, did a lot of hybrid washing originally that have a slide on it. But it really just meant put your workloads in my data center and then we're happy. And there's a title that says hybrid. But not really hybrid. And I'm starting to see some of those -- some validation actually back on our strategy with some of the moves that we've made. So I think you're seeing a lot more in market where people are now trying to get back to where we started with hybrid. In some cases, vendors that never actually made it into the hyperscale public cloud. In other cases, hyperscale cloud companies going through partnerships to try and figure out, "Well okay, great. How do I backtrack and get some of the stuff onboard?" And so you'll see more and more of that coming through. In some ways I just view that as a validation of the strategy we've been on since day 1. Now with respect to the IBM and Red Hat, which was the last comment that you made from there, what I would tell you is we've got a really good relationship with Red Hat. That's been going really well. We've got great adoption of RHEL to Enterprise Linux. We actually created

differentiated support solutions with Red Hat. We have Red Hat engineers on the Microsoft site. So if a customer calls up, they have an issue, you're going to talk to both of us. You don't have to get phone tagged. That's the unique thing that we've had with Red Hat. We have a ton of mutual customers and we're going to keep supporting our customers. So frankly, from that perspective, the news doesn't really change that. We're going to keep up with that momentum. We're going to keep supporting our customers.

## Q - Brad Alan Zelnick {BIO 16211883 <GO>}

On the topic, Microsoft has embraced open architecture over the last several years in a way that 5, six years ago, I think, nobody could have imagined. Why is this so critical to the strategy?

## A - Jason Zander {BIO 20468487 <GO>}

Yes. It's -- and we have. And hopefully, people are seeing this kind of cultural transformation with Microsoft. It's with kind of our attitude, how we work with partners. And in some ways, I think of again, with the benefit of a couple of decades at the company kind of a maturation of how we've won of just wisdom kind of gained, I hope. And I hope people see that. I would say part of this, also, is I want to make sure from an open source perspective, we are going to meet our customers where they live and they're absolutely using open source. That's important. I want to make sure I've got a first-class solution for them. And we do. Now we have a higher run rate now for Linux creates and virtual machines in the public cloud. It's massive. So that means we're going to support things like the operating systems. But also the middleware, the developer stack, the DevOp tools, all the parts of the stack that need to be there. We're also -- and this surprises people sometimes, we're also a huge contributor to open source. In fact, there's over 16,000 full-time Microsoft engineers that contribute into GitHub. It's actually the highest of any corporation out there. So you can see that. And so we've actually really embraced that. We're supporting the entire thing. Again, I think it's really about that customer choice that's enabling it. And really, at the end of the day, the platform we're having you go towards is the cloud. And we want to make sure all of your workloads run on top of it.

## Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Just while we're the topic -- thanks, Jason. The relationship that you've had in embracing Red Hat in open source and Linux, specific to the IBM deal, is there any thoughts in terms of what impact that may or may not have and the way that you think about Red Hat going forward as an IBM company?

## A - Jason Zander {BIO 20468487 <GO>}

Yes. And as I say, we have a huge overlap, I believe, with customers. And that was what really drove us to have this deeper relationship with Red Hat where, if you look historically, maybe it wasn't such a deep relationship over the last few years. It's been actually really great. We've had really good programs on that. And so given that we have those mutual customers in there, then we're absolutely going to continue to support those customers. I believe Red Hat is going to want to be able to do the

same thing. They have their own reasons for being able to make sure that, that happens. And so as far as we're concerned, that means we're full steam ahead on that part of the partnership. And if things change over time, we'll reevaluate. But for right now, we want our customers to know -- our mutual customers to know, we're absolutely full steam going to support you.

## Q - Brad Alan Zelnick  {BIO 16211883 <GO>}

Excellent. Just to pivot, a slightly different question. KPIs, metrics that you use to run the business. Other than what we can see externally, what are the key measures of success for the Azure business inside of Microsoft?

## A - Jason Zander  {BIO 20468487 <GO>}

Yes. And we've got a ton. But here's what I would say, the number one thing I want to look at is our customers happy with the platform and are they experiencing that. Now one of the first things we would then measure from a business perspective is consumed revenue. Because if you think of it from cloud services, we're more interested in when people are actually using it, the meters are spinning because we're solving problems. So we'll absolutely look at the consumed revenue. And that is a stat that we publish. You saw a 76% growth in Q1 on Azure revenue growth that comes through. And that's an example. Again, that's recognized because people are using it, not any kind of commit. So that's number one and I also measure that one internally. Now if you look at the internal side of what we do, we'll also look at a combination of, am I making customers happy on the platform. So I've got existing customers, is their usage starting to increase which would mean and be a sign of a healthy customer relationship where they're moving more workloads, they're finding more value on the platform. We want to make sure that, that goes up. We're also going to track, from a business perspective, the mix of services that people use. So as they get more and more into their cloud journey, if they're able to then take advantage of some of the services we have, Database as a Service or Platform as a Service, then how is that usage increasing because that's also a good sign of that healthy thing. Now for me, internally, owning product as well. There's a few other ones that are super interesting. I measure satisfaction. I'm very, very customer obsessed. I want to make sure that they're happy. We look at Net Promoter Score to make sure that our customers, like would you recommend this to your friends? Yes. It's the same thing on the kind of client side. But we do the same thing for commercial here. I want to make sure those things are going quite well as well. And of course, the other metric that we would look at is net customer additions. So if I've got healthy customers and they're growing and their mix is healthy, are we actually adding new customers as well? Those are the sort of things that we track internally. And I won't even get into all of the perf and stress and a whole bunch of other engineering stuff that's like 2 inches off the deck. I do that once a month with the entire division. It's a lot of fun. We call it fundamentals. We always say we put the fun in fun day. Engineers love it. It's great. But anyway, from a business perspective, for this audience, those topical ones are the ones that I think are most relevant.

## Q - Brad Alan Zelnick  {BIO 16211883 <GO>}

Excellent. And as we think about measuring customer success, satisfaction and then we think about that in the context of what elements of the offering they've actually

gone ahead and adopted, you've got premium services, data services, we've talked a little bit about IoT at the lower levels, you've got infrastructure. Can you maybe just talk a little bit about the adoption pattern and the economics of customer that goes all the way up and graduates to Nirvana of Layer 7, or however you think about the world. And the economics of that customer, the stickiness of that relationship and how we should think about that and the various adoption curves.

## A - Jason Zander  {BIO 20468487 <GO>}

Layer 7 is your networking dev background showing up. Okay, I can see that. Software engineers recognize that one. Now I mean -- so obviously, we're going to meet customers exactly where they are. So the infrastructure, if they just want to come in, they just want to get some hardware, compute networking storage, absolutely support that. Like the as-a-service things that we've got, Database as a Service, PaaS, Azure IoT, media. And then also AI and ML. So prebuilt services for facial recognition and speech and text and all those kind of stuff. What those things do is they actually take away a lot of the TACs that you otherwise use as a business to get things going. So you think the benefit that one gets, like take the data solutions, those are great. We do things like automatic backup and point-in-time recovery, like we make sure all those things just work. We keep you patched and up-to-date. Those are things that cost you today because you're probably spending a lot to your personnel time on actually making sure that goes. If the service just does that for you, now I get that benefit. So you get less kind of toil that comes through and now I can actually get that through. So there's a very good value there that we find as customers move up into those higher-level services that they can actually save money, if you're from an all-up perspective. And that's good. Now from a business -- if you're evaluating our business, of course, these services are structurally higher margin and they're also stickier. And so what that means is we hope that it's a win-win. Our customers get a better solution that actually saves them money on the way in which they operate their overall estate and they can actually take that savings and apply to new things. From our business perspective, since you're looking at Microsoft, again, structurally higher margins, kind of a stickier environment, happier customers, again, NSAT, et cetera, then all these things kind of come together. Now a couple of great examples on this one, SQL-managed instance, awesome example. I can take SQL Server including 2019, which is the latest version, it has a bunch of big data tech just built in. I can run that on premises. The SQL-managed instance allows me to take those same apps and move those up into the public cloud. And when I land those things there, we'll take care of all that toil, those backups and patching and all that kind of stuff just happens. A great example of that. Also again, there's end-of-life service support, fantastic impetus for people to make that move. But also things like Cosmos DB. This a worldwide NoSQL database, first of its kind out there. And today, it's actually a lot of work for the engineers to go set up. Say I want to run something in 3 continents, you've got to do a lot of work to make sure that data can get replicated around the world and fast and keep the customers up and running. Cosmos DB, I just go in the portal, create a Cosmos DB, start writing data. We do all of it for you. Very unique, very differentiated, first-to-market with that kind of solution, great example. On the analytics side, SQL DW G2, cheaper and faster than Redshift, a great solution there as well, all wrapped into the AI stack. So that's how we kind of think about the structure and where it comes through and there's a lot of really, really nice product offerings in there.

### Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Just a related question. If we think about, as measured by win rates or insights that you have in data on your customers, your success in Microsoft and historical Microsoft-centric customers running a ton of SQL Server in the data center versus Oracle or whatever the alternative might be versus non-Microsoft-centric versus greenfield-type cloud prospects, any commentary just in terms of success in mix? And what -- it would seem naturally Microsoft-centric accounts are easier to kind of welcome in the door. But any commentary along those lines?

### A - Jason Zander {BIO 20468487 <GO>}

And I have -- and I should -- and thank you, it's a good thing to point out. We do support all of the platforms and all of those other vendors that you mentioned before, even when I have something that I compete with in that category like relational databases. And so -- and I have customers, to be clear, they don't use a lick of Microsoft Software except Azure. They're 100% Linux. They're 100% Java or they're using MySQL or PostgreSQL. They were using Oracle. It's 100% non-Microsoft stack. The only thing they're using is our cloud for that. And like I mentioned, our run rate on Linux virtual machines is actually higher now than Windows Server machines that are coming through. And so we absolutely support all of it. Very healthy mix. I'm very excited about that because they're always -- you wouldn't want people to think of us as just the Microsoft stack cloud. That's not actually what we are. We support everything. And I think our healthy run rate and mix has proved that. Then on top of that, as we point out, the fact that we did actually create all of that other software and there's a lot of companies out there, high percentage of companies running Microsoft Server or running SQL Server as well, that makes us a natural home. So having that awesome third-party support, open source support and then also being a natural home for Microsoft workloads, I think this is a great balance.

### Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Then from a vertical perspective as well, I imagine there were some obvious synergies and areas of opportunity, retail, for example, being one, right?

### A - Jason Zander {BIO 20468487 <GO>}

Absolutely. Retail is a really good one, actually. As I mentioned before, I think a lot of the customers that we have, they don't want to go spend money and get technology from a provider that turns around and uses that money to compete with them. And so you're actually seeing a lot of companies. And the more verticals that you start seeing covered by some of these other -- some my competition, the more they become the competition of people they're otherwise serving. And so I see more and more inquiries come in. So those verticals are absolutely there. We just finished up Black Friday and Cyber Monday. We had really, really major companies we work with, ASOS in the U.K., Walmart, jet.com, just a whole set of big retailers that had a fantastic kind of holiday shopping season they went through, another great example. But there's a lot more in fin sector, in manufacturing and energy, take a pick.

### Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Awesome. In terms of the supply chain, as we think about infrastructure sourcing, can you talk a little bit about how those decisions get made when you design in a specific chipset or whatever that component might be, what's the philosophy behind choosing A versus B?

### A - Jason Zander {BIO 20468487 <GO>}

Yes, great question. And there's kind of 2 angles that I think about this in. The first one is just supply chain 101, capacity management 101. I mean anybody, done your MBA, done any of that kind of work, I mean, we have to make sure we're absolutely great at that. And we've had massive, massive scale really, really fast. We keep building the systems up. And this is big scale business. This is not something where I can just get off the shelf components and just go run it. So we're also building those systems. And the nice advantage on a hyperscale cloud is I can build software for capacity and the supply chain work that we do. And I can actually have that work very well with the control fabric that runs the fleet, which means I can get signals immediately and it all just kind of comes together in an integrated way. From a vendor perspective, normal kind of hygiene, we pick from multiple vendors. We make sure we're doing the good job from a sourcing perspective. We've also had open source projects here. We have this project called the SONiC, which is basically -- it's a networking thing we contributed back. We ran that on top of switches. I don't have to pay high premiums for switching inside of the data center because we did SONiC. We open sourced it. We made it available. I can run it on equipment. So as examples on the software side where we can reduce cost and I'm not going to pay high margin. And frankly, you'd never do that with your own data center. It'd be cost prohibitive. But when you're running at my scale, you do. From a hardware perspective, then we also partner with a lot of the hardware manufacturers. We buy -- there's enough scale. You buy 1 million of something, not only do you get a discount. But you can also probably influence the design. And we'd actually do that. And we also do some of our custom hardware as well. We do things like we've deployed FPGAs across the fleet for networking. And we actually -- I have a whole silicon design team, that's virtually all they do. They design hardware. They design silicon. Happens to be the same group that also does things like HoloLens and they do the Surface. And they actually do that for the rest of it. Same team also works in our data centers to figure out, okay, what is the silicon improvements we should put in the data centers as well. So we have all of those.

### Q - Brad Alan Zelnick {BIO 16211883 <GO>}

Can you talk a little bit more about the advantages of using FPGAs and going that deep into the design?

### A - Jason Zander {BIO 20468487 <GO>}

Yes. FPGA is really, really cool. I mean a field programmable gate array. So what that really means is I have hard burned in silicon, fastest kind of performance, software at the top, probably a little bit slower. FPGAs are right down here. They kind of come in just on the top of that. Key thing is it gives me flexibility. I can actually go off and do additional tweaks. But I get hardware-level speeds, not as fast as burnt in silicon. But the next notch up. We can leverage this for networking. We get 100-gigabit connectivity for all of our virtual machines and we can continue to improve that. We

can also leverage it for things like AI. So for example, our Brainwave project leverages FPGAs and does a really awesome job at things like image recognition, fantastic. So we can go make those go. Then of course, from a silicon design perspective, the more of those algorithms that we run at FPGAs as they get hardened, then we turn around to the silicon team and we turn that into a custom silicon, custom ASICs. We'll actually load that up into the fleet and then we actually make more real estate available on our chips to do the next set of algorithms for the next set of wins.

## Q - Brad Alan Zelnick  {BIO 16211883 <GO>}

Awesome. And by the way, I recently read about some of your efforts looking at building subsea data centers. And it wasn't intuitive to me. I would just assume that it's a lot less expensive to build a data center on top of solid ground terra firma. What are the advantages you see there? And is this a science project? Or are we going to wake up one day and everybody's going to have data centers with SpongeBob underneath the sea?

## A - Jason Zander  {BIO 20468487 <GO>}

In your pool or your backyard with boat drinks. Yes. No. I think -- so this particular project, this is Project Natick is the code name for it. And this is a research project to be clear it. And so our Microsoft Research folks are pulling this back together. And what they really have done is they've taken the actual data center and put it under water, like literally, like in off the coast of Scotland is the most recent one the guy dropped in. A couple of different things that, that does, one, 50% of the world's population actually lives near water. I mean this is actually near a coastal line of some sort, which means that access to cities, you can put the data and compute capacity very, very, very close. You also, of course, have natural insulation and you have potentially perpetual energy off of waves and everything like that. This also gives us some experience on the lights-out perspective. So for example, just to be clear, we don't actually can go greenlight Johnny Quest in the scuba gear to go down and fix a hard drive. We don't do that. So there's a lights-out kind of opportunity where you have to figure out how can I run that hardware with a minimal amount of any touch. In fact once it's down, no one touches it until it's done and decommissioned. And I think if you think about that in our, essentially, production which are on terra firma and near-cheap energy and stable ground and everything else. So those are the massive 2-square-mile sites that we build up, then even that experience that we gain from this helps us do a better job operationalizing the fleet and doing a really great thing. And as we start doing more and more innovation, we're starting to find that, that even dovetails with stuff we do around quantum computing and other things as well. That knowledge we gain is actually quite interesting.

## Q - Brad Alan Zelnick  {BIO 16211883 <GO>}

Jason, my only disappointment is that we don't have more time because I got a zillion other questions to ask you. But with that, thank you immensely. This was tremendously insightful, really appreciate your time at the CS Technology Conference.

## A - Jason Zander  {BIO 20468487 <GO>}

Thank you. So much for having me. I appreciate it.

## Q - Brad Alan Zelnick  {BIO 16211883 <GO>}

You're welcome.

## A - Jason Zander  {BIO 20468487 <GO>}

Thank you, everybody.