
TECHBRAINS INTERVIEW

Cloud Adoption with John Treadway

- **A must-read regarding cloud evolution and competition.** John Treadway has worked with large enterprises considering both private and public cloud implementations, first at Cloud Technology Partners, which was acquired by HPE, and now at Symphony Solutions, where he is CEO. Although hyperscaler revenue growth is moderating, he argues it is mostly due to tough comparisons as cloud approaches \$70bn of revenue. He says AWS's Andy Jassy might be right that only 3% of workloads are in the cloud by dollars.
- **Private clouds and workload repatriation not much happening.** He says that public cloud was never really a cost play but more about agility. Cloud spend often exceeds expectations because it is so easy to use. He sees little repatriation of workloads back on-premise: "I can tell you that in the work we did at CTP we never once saw a workload that we migrated moved back from the cloud." It can happen if it should not have gone off-prem in the first place. He has seen a few private clouds work at Wall Street banks, but private cloud implementations typically fail. Machine learning could take place on-prem if that's where the data resides. However, the hyperscalers are making it attractive to move data to the cloud.
- **Cloud margins could come under pressure.** Core infrastructure (servers/storage), which is a large percentage of AWS's business around migration assistance, should become more commoditized. However, innovation services—databases, blockchain, serverless—can be differentiated and more profitable. Eventually users will heavily depend on a hyperscaler and risk lock-in to benefit from more features and lower cost.
- **Bullish on Google, bearish on IBM, not sure about VMware.** Treadway sees Microsoft gaining share in Europe though its data centers are smaller than Amazon's. He thinks Kurian can overcome Google's enterprise phobia if the board gives him rope. He doesn't think IBM has the cloud services capabilities to win in Chapter Two, moving enterprise workloads. He saw many enterprises needing migration advice and implementation not going to IBM. OpenShift is the most promising aspect of the Red Hat deal in improving Big Purple's innovation position. Treadway initially thought Amazon would eat VMware's lunch in their partnership but is less down on VMware now. He sees AWS Outposts and Azure Stack as niche offerings driven by banks.

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Milunovich: Thanks for joining us for this TechBrains Interview with John Treadway. John has provided us with insights on cloud adoption in the past, and we thought it would be a good time to check in with him. John, your job has changed since we first got to know you a few years ago at Cloud Technology Partners (CTP). Can you take us through your background before we get into questions?

Treadway: Thanks for having me, and hello to everybody. I was at CTP for almost seven years, starting back in early 2012, and departed the CTP family at the end of January this year. In the time that I was at CTP, I worked closely with a lot of large enterprises, including brand names that most of you all know, on enterprise-level cloud adoption, cloud strategy and migration, and application work.

I ran the CTP software development activities. I built our digital innovation practice, which was a significant part of the business. Then on the heels of the acquisition of CTP by Hewlett Packard Enterprise, I became head of strategy, product management, and portfolio, working with the HPE portfolio management team in the Pointnext services group. We were acquired in September of 2017. HPE is a great company, a great team, and I left to go off and pursue some things that might be a little bit more entrepreneurial.

Last month I landed at a partner of CTP that we had worked with for many years called Symphony Solutions, which is a Netherlands headquartered company that provides digital innovation and software development services out of Eastern Europe, predominantly the Ukraine, Poland, and Macedonia. I'm now running that company as CEO. The owner asked me to come in and take the company to the next level. We're about 500 people now and growing quite well. Of course, a lot of the work that we're doing at Symphony is still in cloud. It's everywhere and part of our business, so I'm still heavily connected into this space.

Milunovich: Public cloud growth is slowing slightly but still impressive. AWS slowed from about 41% last quarter to 37% in 2Q, Microsoft from 73% to 64%. At the same time some of the legacy vendors claim that there's significant repatriation of workloads back on-prem. Could you give us a 30,000-foot view of what you see going on in terms of cloud adoption?

Treadway: It's natural that it's going to slow given the size of the overall market. The 2019 estimate that you have across the board for the big guys is nearing \$70 billion of revenue. Don't forget, this is revenue that is actually recognized on an MRR/ARR basis. It's recurring revenue, highly profitable, and growing still at a good clip.

Obviously, AWS is not growing as fast as it was, being the big dog that it is, coming in somewhere in the \$35 billion range at the end of this year. At that figure, putting 40% on top of \$25 billion is really adding another \$10 billion in revenue, which they're going to get close to doing. But next year, putting another 40% on top would be a pretty big pull, something like \$14 billion.

The number is really great if you look at the year-over-year growth. It grew \$8 billion from 2017 to 2018, and close to \$10 billion from 2018 to 2019. Nominal growth is big, but the denominator is getting a lot bigger, which makes it harder. I've heard anecdotally that Microsoft has been signing some very large enterprise deals. They probably talked about some of them on their earnings call, but if not, that's the whisper if you will on the street. Amazon is also signing some big deals.

Big deals in the past used to be in the mid-nine figure ranges, half a billion and up. They're now signing enterprise level commits for \$1 billion plus at AWS in their top tier enterprise discount program. People are signing up for very large strategic multi-year commitments, similar to what you saw in the old days of data center outsourcing where the pricing discounts that they're getting are tied. While the percentage growth may continue to erode based on the size of the market and the size of the players, the nominal growth continues to accelerate. I think that is what people should pay attention to in the market. I know that obviously when you're looking at growth rates, EBITDA growth, and all of the P/E forward multiples

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that you use to value businesses, the growth rate does matter. All signs are pointing up and to the right at this point.

Microsoft is growing faster than Amazon. I think Google is growing faster than both of them, but Google has the most amount of ground to make up after having so badly missed the market for the last several years. Now under new leadership they're putting some muscle back into the growth engine.

Milunovich: How are customers finding cloud now that we have a number of years of experience? In previous calls you've talked about 30-40% expected savings from cloud. Has that happened? Are they in fact moving some work back on-premise? What do you hear from large customers?

Treadway: It really has never been about a cost play. Cost matters, right? The CFO has to be engaged in the conversation of a \$1 billion commit and needs to understand the cost difference, but the cloud model has always had the most amount of value when it comes to agility and the ability to innovate at scale. If people focus only on the cost side, saving 30-40% is really hard to achieve. It is not about things being less expensive, but cost being offset by being able to do so much more and taking advantage of the cloud.

Then there are new programs and new clients coming onboard, so you need controls in place. There are a lot of ways to let your spending get out of control without controls. It is important to be efficient about it and run your cost profile really aggressively. This has given rise to a fairly strong industry of cost management. Last year we saw CloudHealth Technologies get taken out by VMware. There are several other players in that market.

At the end of the day, some of the largest clients that we work with start to get to a point where they spend \$3-8 million dollars a month. They then start having fairly big investments in cost control and containment because they're not meeting the nominal budgets that they claimed they would meet under the cloud. That isn't because cloud is less efficient, it's that cloud is so easy to do things that you end up growing faster than you'd expect to grow.

There are certainly some areas where people could get themselves in trouble. I have 50 VMs here on-prem. I put the same large 50 VMs in the cloud. Am I really saving any money? Probably not a lot, but you shouldn't have to put 50 VMs in the cloud. You should only have to keep on average 20 or 30 because you don't need the most capacity at any one time.

It's a complicated topic. At the core, why large companies like Capital One have publicly said that they are investing so strongly in public cloud is that they are able to out innovate the competitors in the market. They are a digital organization that happens to do banking. That is a very different opinion of themselves than how Citigroup looks at themselves. They are also in very different businesses. Capital One's got a much simpler business than Citi by far.

Now to discuss repatriation. This is one of those topics that having lived for 18 months inside of Hewlett Packard Enterprise, I heard a lot about. I can tell you that in the work that we did at CTP, we never once saw a workload that we migrated over moved back from the cloud. There's a number of factors that could be contributing to that, and I'm not going to claim that it's all because the vendors are lying or wanting to sell more hardware. There is a real need for a hybrid story, and people are buying equipment for on-premise. Otherwise, HPE would not be generating the revenue that it is.

The short answer is that by and large there isn't a broad model of applications moving off the cloud and back into on-prem. There are point cases, and those point cases fit into a few buckets. The first one is it never should have migrated in the first place. The data, the closeness or proximity that it needed to be to some other systems that weren't moving, wasn't fully thought through. It was part of a bad selection process, and when it went over, there were operational issues, latency issues, or costs that hadn't been

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planned out correctly. It was not a thoughtful decision to move that application. I'm not blaming the clients for that. Sometimes you don't know what you don't know until you try, and maybe they didn't have the right guidance from CTP, Accenture, Deloitte, or any of the other firms that know how to do this.

The second area is more along the lines of the execution of the move itself. If I move everything on-prem and I move it exactly as it is, and I don't take advantage or do anything to try to make it a better environment in the cloud, I may not get the savings that I want, but I also may not get the stability, performance, or agility either. This is because there are differences in the way that these things operate.

The last part, I believe there is a little bit of wishful thinking on the part of the OEMs and hardware vendors that are attempting to slow the growth of the market by saying "Hey, it's a bad world out there. You should come back in-house." The reality is that it is not a broad-based phenomenon by any stretch of the imagination. I don't know a single client that actually has done that on more than a couple of applications that were ill-placed in the first case.

Milunovich: I wanted to ask about artificial intelligence and big data. Where do you think a lot of that work is going to be done? Is it going to tend to be done on-premise or is it going to be done in the cloud?

Treadway: This is an easy one. It is going to be done where the data is. If I'm going to process large amounts of data, I don't want to be moving it back and forth. If all of my data is on-prem, I'm probably going to run a lot of my analytical workloads next to the data. If I've moved my data that I'm trying to work on into the cloud, then I'm going to do that work there. Finally, if I've got a hybrid environment, which a lot of traditional enterprises will have for some period of time, then I need to think through that strategy and decide where I'm going to put the data and how I'm going to run my analytical AI and machine learning.

That said, the tools and the innovation that's going on in machine learning and the cloud providers is robust and they're making it really easy. They're making it highly attractive to move that data over to use those tools because a lot of IT departments don't have the skills in-house to manage the machine learning and AI infrastructure software that's required. You need very highly specialized people to make that work.

If the cloud providers are providing this as a commodity service with tooling to make it easier for me and interfaces that allow my data analysts to actually work with advanced analytics techniques that are hard to work with internally, they can move a lot faster. The issue is, do you wait for your internal IT organization to be ready to do this on-premise or do you move it into the cloud when weeks, days, seconds can matter in decision making? That question is driving a lot of cloud-based adoption.

I think in the long run the trend favors public cloud because of the level of innovation that's happening. As workloads migrate, the data is migrating with it. There's more and more data in the cloud, but it's very much hybrid in the traditional enterprise right now. It's running in both places, but it depends on the workload. If it's an e-commerce app with a lot of consumer behavior that I'm trying to predict and it's running on public cloud, I'm going to do all that analytics there. I'm not going to bring it back in-house to do that.

Milunovich: There's been a fair amount of investor consternation about the pause in hyperscaler capex, which looks like it may be improving in the second half. What is your sense of utilization these hyperscaler data centers run at, particularly compared to the traditional on-prem data centers?

Treadway: A lot of what I'd say here is conjecture. I'll put my best effort forward on this, but I don't have any insights into the capex programs at the cloud providers. I know Google in the past has talked broadly about their capex strategy when it comes to public cloud, but I don't know if they've talked about the details, about the levels of investment. As a general rule, I would expect utilization to be higher than most enterprise

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data centers. I would expect it to be higher in the public cloud, and that's just because of their model in terms of how things scale and the elasticity.

Even if it's only moderately higher, it's going to be somewhat higher. Now everybody is in a land rush these days to get access to all of the clients and to be able to scale. AWS has US-East, then US-East1, then 2 in the availability zone. Now people are adding availability zones in lots of places in Europe due to GDPR requirements and local data sovereignty requirements. They've probably been forced into a mode of slightly over investing, a lot of that driven by regulatory issues more than anything else.

If I have to put a big data center in a market that's emerging, that has most of the services and capabilities that I would provide globally, particularly out of my lead data centers in the US, then I'm probably overbuilding capacity for that particular market. But I have to in order to create a landing zone or a place for people to run those workloads where they feel like, "Hey, I'm in Germany. I want my workload to run in Germany. I'm in France. I want it to run in France." That is a big issue.

That's probably a short term (a few quarters) phenomenon and then over time that will pick back up again as utilization in those data centers starts to get to their trigger points where they start building excess capacity. I certainly know in the US they're probably continuing to build up strongly, because of the level of growth. What I saw anecdotally is that Azure was growing faster in Europe and getting a bigger share of the new opportunities in Europe than AWS was.

I also saw that those deals were smaller than AWS's deals. I don't think that the European client base was buying as much. Microsoft touts how many data centers they have, but I'm not sure how big all of those data centers are. They don't give you that data, but if they've put lots of data centers in, they've spent a lot of capex. They are probably not dealing with the mass level of adoption that we've seen in the last couple of years in the US.

Milunovich: What about margins? Where do you think the margins go over time? Does it become a commoditized business? AWS has seen a bit of a margin deterioration recently. They blamed it in the quarter on sales force additions and stock comp.

Treadway: At some point margins are going to become more of an issue, which is why there's so much investment in the advanced technology side. I break down the service catalog of the cloud providers into three big buckets and there's many little buckets. The three big buckets are core, that's network storage and compute of its various forms. Then there's management, which is all of the tools that you need to operate from an IT perspective, like governance, which includes logging, auditing, and security, all the things that you need to be able to integrate with enterprise controls and scaling it. The last bucket, which is actually the most important, is innovation services. It's the big data services, databases, machine learning, blockchain services, serverless functions, and so on. Those are the areas where the margins are higher and the lock-in is greater.

This is because their platform level services when you integrate with them have no standardization. This VM and that VM are kind of similar, but there's no standardization of my API for serverless functions and your API for serverless functions are the same. There's no standards body driving that, nor will there be in the near term. Those things become really important. They're higher margin and stickier. As you're building new applications in the native platform services of the cloud provider, the more you get locked in but also the better the profitability. What you see is a short term/long term thing here and they may have a crossing point, but I think that the bulk of spend is focused on core right now.

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As you know, it's all the I/O on the data storage and then all of the compute instances. That is likely to be where the price and margin erosion is going to be a factor and that will show up in the financial results. Now when you go into the innovation side, a lot of the biggest clients have gone over to Google because of the big query and big data capability and also just generically the cost of storage. I can put many petabytes of data into Google and do advanced workloads and data analytics at a cheaper price than I could do it, for example, at Amazon. The problem with Google, and where they haven't been growing as much, is that they never really embraced the enterprise migration workloads.

Amazon is very heavily dependent on the migration market. They've had migration assistance programs with a bunch of integrators focused on migrating workloads. Those migrated workloads use mostly the core network storage and compute services. I think that's where the commoditization is going to occur. It'll probably have an impact on overall margins at some point. As new things get built, they will be built more likely with cloud native services and those margins will be a lot higher. They'll be more like SaaS margins in the 70-80% range as opposed to infrastructure margins in the 30-40% range.

Milunovich: The vendor battleground does seem to be shifting to so-called multi-cloud management. The legacy vendors never really made it in public cloud, so they focused on private cloud, and had a little bit of success there. Now everybody agrees it's about hybrid cloud or having multiple public clouds in addition to having an on-prem data center. Everybody's now got a software-based approach to help customers manage this traffic. On-prem vendors like IBM, Cisco, and newcomer Dell have their cloud approaches while new players such as Nutanix are entering. Do you have a sense of how this is going to play out?

Treadway: Multi-cloud, hybrid cloud, and hybrid IT are all real things, but we're still a little way away from where all this stuff starts to come together and gets integrated. I think it's a lot of pockets and pods of people managing the old stuff and some other different people managing the new stuff and not necessarily looking at it as a liquid environment with low friction of migration. The tools can only do so much in that respect. I think the investment is really huge, and I don't think the clients are there yet.

My contacts at AWS talked about the history of what happened with Accenture. Accenture's cloud platform was very heavy and was between the client and the cloud provider. They had to re-architect everything because the AWS sales reps wouldn't recommend it to anybody because it was disintermediating the client and AWS in terms of the technical integration. Once they fixed that, it started to get a little bit more traction, but even then a lot of Accenture's clients said while they liked the services, they didn't want to use the platform because they didn't want to get locked in.

That's an interesting dynamic because a lot of the clients now think, "Well the cloud platform itself is another lock-in." At the end of the day, you're going to have to decide, at some point you're going to get locked in because somewhere along the line there's just no way to avoid it. A lot of the large enterprises will have investments in this space. I think in the long run it will probably be a good strategy. In the short run, the vendors are finding that the results are not meeting their initial business plans. My gut is that it's unlikely to meet their business plans for a long time just due to the fact that we're still so early.

It seems like we've been doing this for a long time. It's been 13 years since AWS came out, but we're still very early because people are still figuring out how to consume public cloud at scale. Then integrating it is a whole different issue. If you use the Gartner model of bi-modal IT, the old on-prem infrastructure is your type one infrastructure. It's the business as usual. You manage it a certain way and it is very stable. It doesn't require a lot of handholding or automation.

Then you go to the public cloud and it's a very dynamic and wild type two environment. You use different tools and techniques and have different expectations about how it works. There's different pricing dynamics because one's capex and one's opex. If I want to merge these together, I'm trying to create an environment for two things that are not even remotely alike and try to manage them in a consistent way.

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It's a very difficult thing to do. I think that's the challenge, and I don't know that anybody has solved that challenge perfectly yet.

Milunovich: What level of success had firms had with private clouds, and what do you think about the public cloud efforts like Amazon Outpost and Azure Stacked to extend what they're doing on-premise?

Treadway: There have been a few notable success stories in private cloud. Goldman Sachs has had a great private cloud program for many years based on OpenStack, and they've been very successful with it. We saw time after time, private cloud programs at large enterprises be significantly over budget and underperform in terms of adoption. The dynamic there is that a lot of them are driven out of core IT, central IT infrastructure teams, and they're not driven by the business. The business almost doesn't care. Say I'm the Retail Division at XYZ Bank and I've got my stuff and it's running right, and you say, "I need \$50 million to move the retail bank systems onto my private cloud," and the CIO says, "Thou must do this. It must be done." Then the President of the retail bank goes to the CEO and says, "Can you tell this guy to go away because I've got bigger fish to fry. I'm competing against Capital One, and I really don't have time to spend \$50 million on that. I'd rather spend it on advertising."

These programs haven't been all that successful because they built them as infrastructures as opposed to platforms for innovation. It's changing a little bit now, so there's probably a little bit more of an interesting outcome coming from things like OpenShift now that IBM has it, though I know they're putting a lot of effort and emphasis into Red Hat and the fact that OpenShift is a platform for innovation and new development. I can migrate workloads onto it because I can just containerize them and move them over.

The only reason I've moved to a private cloud is that the cloud where I'm running today is being shut down and I have to move the workload somewhere. If you only give me a private cloud option, that's where I'll go, but that is rare. What's happening is when a data center contract is coming up, people are not going to private cloud, they are going to public cloud. We have had multiple conversations with clients who have said "I don't want to re-up my Managed Service Provider contract, which is due in 18 months. Please put a plan in place for me and help me migrate out of that data center over the next 18 months into AWS or Azure."

I just think that a lot of the private cloud scenarios fail. Now, Outpost and Azure Stack are two totally different things though they look the same on the surface. Outpost was created by AWS in specific response to a few of their very large financial services clients needing to satisfy regulators and risk compliance staff. The reality is the percentage of their spend with AWS that will be on Outpost versus the public cloud is intended to and will be small. It's not intended to be a replacement of your data center. It's intended to provide the option to have local deployment for remote offices, for remote data centers, for parts of my data center that I need to keep something locally for operational or risk and compliance reasons.

This isn't new. AWS has had their Edge strategy for a while. They added compute capability or CPU capability to it, though it's not the full-service catalog of AWS. A lot of clients have been running analytic workloads and data-centric workloads and just installing software on those in remote locations. That remote location thing is real, but I also need the option. It's going to be there, it's just not going to be a big percentage. If you look at worldwide Azure Stack shipments, they're more of a rounding error in terms of the overall data center hardware shipment business. Not that it doesn't exist or there aren't some big ones, but it's more of a rounding error.

I do know one large European bank that decided to go to Azure because they could use Azure Stack, and they actually have a reasonable size deployment of it. There's another bank that I know in Europe that also did a fairly large deployment of Azure Stack and they're having success with it as well. It's mostly in financial services and that's where the demand was coming from for AWS. I think it's still going to be

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an 80/20 thing, 80% in the public cloud and 20% on-prem when you're in an Outpost and AWS environment, or Azure Stack and Azure environment. Again though, it depends on the client.

Milunovich: IBM speaks of 20% of workloads having moved to a cloud with the hard 80% left. They argue that they're in a better position in what they call Chapter Two of the cloud, moving those hard-to-move enterprise applications given their background and recent investment in Red Hat. What are your feelings on IBM's prospect to play a bigger role in Chapter Two than they did in Chapter One, and do you think the Red Hat deal makes sense?

Treadway: In order for IBM to be credible in Chapter Two in helping people move those things, they need to have a really strong solid cloud services business, and they don't. They haven't had a strong professional service in the cloud business for a long time. We competed against them in 2012 and 2013 for cloud strategy work, and then never saw them again. As far as I know, unless they've acquired a cloud consultancy that I'm not familiar with, they are not in the cloud consulting business at any level.

That means that they're not in the catbird seat in terms of being able to help advise the CIO and the heads of the cloud programs in the business units on strategy. Red Hat is interesting because it gets them more play, but it's targeted at a different part of the business. Red Hat tends to have two persons that they sell to. They're selling to the infrastructure leads for their Linux operating system, but that's a commodity. It's a good business and they're doing fine, but that's not the interesting thing.

Then OpenShift was really targeted at the innovation side. Remember I broke down public cloud into core, management, and innovation; the innovation side is really where OpenShift has always been targeted. IBM is not known as a company that you go to do innovation work on. Even though they'll market the heck out of their Watson stuff in innovation, a lot of the work going on in machine learning is not happening there. It's happening at Google, Facebook, Amazon, and Microsoft.

I don't know if IBM is actually in good shape. I do know we didn't see them as a competitor in any sales calls, not before I left anyway, which could have changed in the last five months. Their private cloud, it's kind of a yawn. There are some clients that are IBM purists that will use it, but it's not particularly functional and it's not very interesting. OpenShift is the most interesting part, and potentially an interesting business. The issue is whether or not that business can move the needle in a company as big as IBM and whether the fact that having it helps them establish themselves more credibly. I haven't seen it yet. I'm not saying that it won't happen, but I haven't seen it yet.

Milunovich: I'm kind of surprised to hear your comments on IBM consulting. GBS is growing its consulting business pretty well overall, and they talk about having thousands of cloud consultants, and yet you just don't see them.

Treadway: I don't really know the factors. They didn't acquire a cloud native consulting firm, which a lot of other people have done. When HPE bought CTP, a number of people went over to Deloitte, who built a CTP level of consultancy for cloud, which is an interesting strategy. IBM did not come after people at CTP nor do I think that any of them would've responded to that very well.

I've talked to IBMers before, and some of them admit that they're not really in a strong position. They're not doing the strategy, they're not doing the migration assessments, they're not doing the migrations themselves. They are seen as favoring their own platforms. While they have a relationship with AWS, Azure, and probably Google, they are not anywhere near the dominant players in those markets. It's either some of the big guys that have really gone deep like Accenture and Deloitte or a lot of the born-in- cloud firms like Cloudreach and CTP, which are still growing. There's a whole tier of companies coming along that are doing really interesting work with Google, particularly on the big data space. The Google big data partner of the year is a company out of Ottawa, Canada, a very modest-sized company called

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Pythian. By the way, a lot of our clients were huge IBM shops and stock exchanges, and they weren't going with IBM to do this work.

Milunovich: A lot has changed at Google since we last talked. They're now claiming to be at about a \$2 billion quarterly run rate for the Google Cloud. Thomas Kurian is there and talking about expanding the sales force, providing more industry expertise. What's your perception of Google?

Treadway: Tom Kurian is a very different personality than Diane Greene, in both a good and bad way. He's considered to be relatively direct. I'm going to be politically correct and say he's very direct. He has very high standards. He has Oracle-level standards when it comes to sales and marketing and aggressiveness and going after the business. Now, that is antithetical to the culture of Google, but as long as he has Sundar Pichai and the board's support he can do very well, and he should be given a lot of rein. I would urge anybody that is in contact with Google's executive and board to encourage them to let him run, because he's the right kind of personality to make a change there.

Investment in sales is huge. As you pointed out, \$2 billion a quarter, that combines Google Apps and the G Suite. It's hard to break out what is actually Google Cloud. I think the big thing that I have yet to see them turn the corner on, but I think it's coming, is becoming a credible third player for enterprise cloud adoption. I expect given his background in traditional IT and large enterprise that he's working very hard to change that. That was the word out of Google GCP Next. I had been to GCP Next in the past seeing people talk about that they didn't want lift and shift and they didn't want data center migration, they only wanted a small number of interesting workloads. There's been a change in the way that they're messaging externally. I'm assuming the investments are following, and the sales and go-to-market investment is key.

They made a huge mistake a couple of years back when they collapsed the sales force and said, "Hey, you're not just selling GCP, but you're also selling apps and maps." This broke rule number one of a high growth business, that you need to have sales reps who don't make any money unless you sell the one thing that they're selling. They could not sell anything, and it diffused their value. They had a massive turnover in the sales force. Anecdotally, I'm hearing they're still suffering from some turnover, but I would not bet against Kurian on this one as long as he continues to have the support of the board and the CEO.

Milunovich: VMware's pretty dominant on premise with virtualization. They have a close relationship with AWS. They are working with a lot of different folks now, and yet some of their competitors will argue that if you take AWS and VMware, you're not getting additional cloud management capabilities. What's your perception of how VMware fits into this landscape?

Treadway: There's the short, medium, and long run. The AWS partnership was announced, and then it took about a year for them to deliver the first working environment that you could use outside of their closed beta program. It really felt like it was jammed together and similar to putting apples and meat products in the same place and calling it food. They didn't really go together. I think over time they've made the integrations a lot tighter.

One of the key things that they did, which I think really was a fantastic early move, is when they opened the door for VM workload to be able to use all the rest of the AWS service catalog. I could do Redshift data warehouse workloads connected to VMware on an AWS environment, as an example. Very interesting opportunities there. I wonder to what degree it helps or hurts VMware in the long run.

I've been historically in the mindset that Amazon is basically going to eat VMware's lunch over this relationship. I'm not as convinced of that as I was in the past, and I don't really know why, but I do know that they just announced a deeper relationship with Google as well. They are realizing cloud management solutions of putting things on premise, having that managed across to the public cloud environments that are VMware-based, on-prem with Outpost and the ability to run a VMware environment and Outpost.

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VMware on AWS on Outpost was one of the things that was announced back in December at re:Invent, in addition to the native AWS services on Outpost.

I think the good news is that they're trying everything, and they're embracing the new world as opposed to rejecting it like some of the hardware vendors have traditionally. I think that they've extended their runway a fair bit with this. What happens in the long run is TBD, but I'm a little less down on VMware with what they're doing now compared to what it looked like two or three years ago.

Milunovich: There was an interview with Andy Jassy of AWS in which he was asked what percentage of workloads have moved to the public cloud. He said 3%. I think the average investor would say 15-20%. Are we in a world where 3% could be the right number?

Treadway: It's really hard to get at that. It depends on the client segment that you're talking about. The firms with the largest number of total applications are the global financial services firms, the global industrials, including a lot outside of the US, and government. A bank has 5-10x more applications running than a similarly sized tech company. The penetration is still very low outside of a few big players like Capital One, who are very visible, but a lot of the larger global money center banks and particularly those in Europe are still very early. Less than 1% of their workloads are running in public cloud in a lot of cases.

I know one of the big money center banks in New York, they had a team that really wanted to do public cloud work and they were moving down the road, and they even hired some people from AWS to make it happen in one part of the business. Then the CTO of that organization, who owned their private cloud program, blocked their organization from going to public cloud entirely for about 3-4 years. He's since left and things have restarted at that firm, but he put a three-year delay on their public cloud programs because he was trying to promote his initiative, which was very much focused on private cloud. Unfortunately, the bank lost three years of opportunity.

If you look at the overall, it's most likely in the middle of 3-4% and 15-20%. Another way to look at it, and Andy Jassy may be right on the money on this one, is IT spend. Some 3% of IT spend on application infrastructure might be what's in the cloud versus what's spent off the cloud. That's probably a more realistic number. This could be important for you guys, who don't care about the number of apps, you care about the spend, you care about the revenue growth. The only question is, is the market 20% penetrated or is it only 3% penetrated? That's actually pretty material when thinking about what the upside is in this market.

The other comment leads back to IBM, where IBM said that the easy apps are in the cloud and the hard ones remain. They're right on. The easy apps have gone as they tend to be smaller. The big strategic applications, some of them will never go because it's just not worth the investment. They'll get replaced, and those replacements will be in the cloud. Effectively they'll go to the cloud, but they're not going to go as is. Others will get massive amounts of refactoring and application work, and those applications moving into the cloud will drive a lot of spend for years to come because they are big apps that will consume lots of infrastructure and they're the strategic applications

