Goldman Sachs Technology & Internet Conference

Company Participants

- Thomas Kurian, CEO of Google LLC

Other Participants

- Heath Patrick Terry, MD, Goldman Sachs Group Inc., Research Division
- Heather Anne Bellini, MD & Analyst, Goldman Sachs Group Inc., Research Division
- Unidentified Participant, Analyst, Unknown

Presentation

Heath Patrick Terry {BIO 3406856 <GO>}

(technical difficulty)

for all of the work and thought that went into this year's conference. I hope you'll all take advantage of the opportunities that you'll have this week to engage with them on the companies, industries and technologies that are their areas of expertise. So on behalf of Goldman Sachs, I ask that you, first, fully take in all of our legal disclosures; second, remember the #GSTech2019; and finally, join me in welcoming Thomas Kurian, Chief Executive Officer of Google Cloud. And my colleague, Heather Bellini, who'll be joining him in conversation. Thank you.

Thomas Kurian {BIO 3811076 <GO>}

Good morning. Thank you for having me here at this conference. Thank you, Heather, for inviting me.

I thought I would give you a quick view of what we at Google are doing with our cloud.

So industries in a number different places around the world are digitizing. As part of digitization, CEOs of these companies in those industries want 2 broad capabilities: either capability to optimize their infrastructure and their data center footprint to lower the cost and improve agility in the IT organization; or they want to get new capability so that they could transform their organizations to capture new market opportunities with new business models. We at Google Cloud enable that for some of the leading companies in the world. In a nutshell, we, at Google, are focused on enabling organizations to get 5 different capabilities from our platform that help them get brand new ways to exploit the digital revolution. We have 5 important technology differentiators from other providers in this market. We're seeing very

strong momentum with customers around the world in 6 industries. We're investing aggressively to grow our direct sales and distribution capacity, as well as striking a number of partnerships with partners who will not only provide value-add to our solutions. But also distribute our software and capabilities. And finally, we have remarkable customer loyalty. The customers that we work with love our technology. And as we go forward, we're putting in place a new Customers for life program that will attract, retain and convert more customers into advocacy.

So we -- let's look, first of all, at our strategy. Our strategy is fairly simple. We offer 5 important capabilities to customers: the ability to use our world-class data center footprint to optimize their infrastructure, reducing costs, improving agility. On top of that world-class infrastructure, we offer 4 important additional capabilities: the ability to manage vast quantities of data at scale, what we call database-as-a-service; the ability to build modern applications and deliver them on the web to mobile and to new forms of interfaces for customers, application platform-as-a-service; to be able to use data and translate data into information using artificial intelligence and analytic tools, we call that smart analytics-as-a-service; and then finally, to enable organizations to change the way people work together and transform their work culture.

We're differentiated in 5 important ways: security and reliability for mission-critical applications; we allow people to build an application once and run it in multiple places, what's called hybrid and multi-cloud; we offer very advanced artificial intelligence capabilities; we have vastly different capabilities than other providers in managing data at scale; and lastly, we're integrating a number of Google's technology advances with our cloud to deliver industry solutions.

The foundation of this is Google's world-class data center infrastructure. Even today, Google transmits and transfers over 25% of all Internet traffic in the world. Our world-class data center network allows us to share both the capability we're building to power other Google properties. But also from a cost point of view, gives us a material cost advantage relative to other cloud providers and is able to distribute workloads in ways that other cloud providers do not have.

Let's look at each of our solutions. Infrastructure modernization. Historically, we heard that Google does not support the sort of meat-and-potatoes workloads within IT organizations. Things like what's called lift and shift; take a legacy workload, move that to the cloud; offer disaster recovery-as-a-service; allow me to run my SAP instance in the cloud. All of those are older views of Google's technology. Today, we support all of the major lift-and-shift type workloads that customers want. And we provide a number of value-added solutions, whether it's disaster recovery, archival, backup-as-a-service, et cetera. Customers who use this include Cardinal Health, which has moved a huge part of their supply chain and IT infrastructure to Google Cloud; Air Asia, which is one of the fastest-growing airlines in Asia that's using us to transform their IT department; and then more in the health care field, the Broad Institute, which uses us to manage the genomics data and their data science infrastructure.

Second, one of the key capabilities that customers want as they move workload to the cloud is to manage vast quantities of data at scale. And in broad brush, involves 3 types of infrastructure: either allow me to migrate an existing database to the cloud, what's called hosting; allow me to deploy a new workload in the cloud and then build a new application in the cloud; or allow me to take an existing database and migrate it to a new infrastructure in the cloud. We support all 3 capabilities. And we support capabilities for transaction processing, analytic processing as well as for very specialized data source.

You should understand that because of the infrastructure requirement that Google has, we have world-class technology. In analytic processing, we have a solution called BigQuery that is used by many of the leading companies in the world to handle a data warehouse at scale. It can handle multiple petabytes in a single warehouse with amazing performance and scale. You can scale compute and storage independently of one another. You can do query processing with sub-second guaranteed response time on queries. So that's an example where Google's technology advantages in managing data at scale enables companies like Metro Group, one of the largest retailers in Europe, as well as Home Depot, to run their e-commerce estate on our cloud.

To build applications, we allow customers to use a variety of different open-source tools as well as other technology stacks, including things like OpenShare, Pivotal, Cloud Foundry. And so on and so forth. The heart of what we're trying to do with this is to eliminate the burden for developers and operators to have to manage open-source technology and have to manage infrastructure. By making it a fully managed infrastructure, you can simply write your apps and deploy it.

We have a number of customers doing this in large scale, both migrating legacy applications to this infrastructure and getting cost savings because they don't have to manage the infrastructure anymore; or building cloud-native applications. (Pella North), KeyBanc, HSBC are just examples of customers doing this. Some of them are doing more legacy application migration and re-platforming; HSBC is building a brand-new set of applications for regulatory reporting and various other purposes.

Managing information and getting information out of data. This is an essential problem that lots of organizations want us to solve for them as they move into this digital world. There are 2 broad capabilities we offer. The first one is capabilities around artificial intelligence. If you look at Sky Television, they're collecting data streams in real-time from millions of devices. And they want to take those data streams coming in and process them in real-time and identify patterns in human behavior coming off those data streams. Google's technology in artificial intelligence allows them to take those raw data streams, convert it into information that allows them to personalize the experience for their users.

At the same time, we also have traditional analytic processing technology, things like data warehouse-as-a-service, OLAP-as-a-service, information visualization-as-a-service. And so we combined the 2 into an offering that offers our customers enormous advantages. And examples of people doing that, for example, The

Telegraph, a large publication in the United Kingdom, just moved from another cloud provider to us, their entire IT estate because of the advances we offer in analytics and AI.

Lastly, in the area of productivity, for many, many years, people were focused on productivity for professional workers. There's about 1 billion professional people on earth, people who work in corporate offices. But there are 2 billion-plus frontline workers. Front-line workers are people like pilots, field service technicians, the person who comes to repair your television, the person in the retail store. Our productivity and collaboration solutions not only meet the needs of the people in the corporate offices, allowing them to create information, share them with other people and collaborate in a secure way. But it also brings collaboration to the front line. And when I say the front line, the people who use a mobile phone and want to ask the retail store manager, "Can you tell me if you're stocked out of this particular product because I'm helping somebody in the store?" The field service technician who's trying to repair a device in a factory and is asking for when the spare parts will get there. Examples of people doing this: Whirlpool is using us as an enterprise collaboration solution; Colgate uses us as their enterprise solution; and then in the public sector, the City of Los Angeles, for example, uses us as their enterprise solution. So these are examples of ways that we're helping organizations digitize themselves. Our differentiators are fairly simple. And for people in the technology business, very easy to understand. First, if you're moving workloads to the cloud and your IT estate to the cloud, people are worried about 2 things: risk and capability. With risk, the 2 biggest risks they're worried about are availability and security. From an availability point of view, public statistics are available that show we have 1/10 of the downtime of every other cloud provider. In other words, we are 10x more reliable. Number two, we're vastly more secure because Google's advances in security around protecting your infrastructure, protecting your data as a customer, protecting your users. And also giving you transparency, these are important to customers like Scotiabank and Target, who use us as their IT infrastructure provider.

Second, lots of organizations want to build applications that are deployed in 2 different ways. One is called hybrid cloud, where they want the cloud to run inside their data center. The reason they want that is for latency reasons. They want something that's very close to an on-premise system; for example, a mainframe. It could be because of regulatory reason, or it could be because of a national jurisdiction.

At the same time, many companies also want to support what's called multi-cloud, the ability to write an application once and deploy it on multiple cloud providers. We have a technology called Google Cloud Services Platform that can be run inside a customer's data center, on Google Cloud, as well as on other cloud providers, allowing a customer to write an application once. And without any changes, be able to deploy it in any of these environments. It gives us a material difference in capability compared to other cloud providers. And most importantly, it offers customers extraordinary choice in how they can deploy their application workloads and to separate the need of choosing where to deploy it from the time when they write the application. This is important to customers like HSBC and Airbus. And frankly, is an important factor for almost every Fortune 500 CIO.

Next, we want to make it easy for people to adopt the cloud. And for customers like Bloomberg and BNP Paribas, they choose us because we take away the burden for customers to have to operate either infrastructure, databases, application platforms, analytic tools. All we want them to focus on is building applications, getting information from their data. And we take care of managing that infrastructure, thereby reducing the cost burden for them and improving the speed and ease with which they can adopt the cloud.

You are probably familiar with Google's advances in AI and machine learning. We have material capability that is vastly differentiated from other providers in the market, whether that's in raw infrastructure with things like our Tensor processing hardware. And TensorFlow, which is the dominant machine learning algorithm framework in the market; but we've also moved up the stack with computer vision, understanding images, documents and video. And we're now applying them to arrive at different solutions. Many, many companies are beginning to adopt this, whether that's in pharmaceutical industry to identify patterns from drugs and genetics, whether that's in the entertainment business, or for example, like LG, which is using it to look at different pieces of information from their manufacturing shop floor.

We have also taken this technology and integrating it with other capabilities from Google. So an example is with KLM and the Domino's Pizza. We put together an AI framework called cloud Dialogflow. What it is, is a digital assistant that talks 28 languages and can offload a contact center. It both improves the experience of somebody ordering a pizza, because you never have to wait in line anymore. A virtual agent comes up. And you can spawn as many as 10,000 virtual agents, they speak 28 languages, they take your order and fulfill it. It improves customer service. It lowers cost for people in a contact center because you don't need as many agents. So all of these are unique differentiators, we, at Google, bring. And they have material advantages for customers compared to other providers.

What are we doing to take this to market? First of all, we're seeing very strong customer adoption in all of our geographies and in 6 different industries. We are going to significantly expand our sales and direct sales and distribution capability. We're also expanding the number of channel partnerships we have to get broader reach through our channel partners.

If you look at Google Cloud. And you look at different industries around the world, historically, people have thought Google has an extremely strong presence in the digital-native community. So for example, in Internet companies, in social media companies. We obviously have an incredibly strong presence in those companies. We're the dominant cloud provider in a number of those industries. But but, over the last 12 months, we have also shifted our focus to go after more traditional companies. And we have seen very strong adoption in a number of industries. Not just in small companies in those industries. But among the largest companies in those industries. And you will see us continue to focus our go-to-market effort on going after some of the largest customers on earth. And here are some examples, just a few examples of some of our leading customers.

What are we doing about distribution? We have increased our sales and distribution by almost 4x. You will see us further accelerate the growth even faster than we have to-date. We are focused on 15 countries, 6 industries. So we have now -- we get focus in how we're deploying our distribution resources. And we get critical mass. Most importantly, we're tiering our account structure so that we have named accounts at the top and enterprise accounts. And we're specializing our sales teams to talk to specific industries in the language of that industry. So a person who talks to a financial institution can talk the language of banking; a person who talks to a media company can talk to them in the language of the concerns of a media company.

We are hiring some of the best talent from around the industry to grow our sales organization. And you will see us competing much more aggressively as we go forward.

We have built a brand-new channels program that we're introducing to our channel partners. We're making a big investment in growing the channels organization and our distributions organization through partners, whether that's global or regional system integrators, 2-tier or 1-tier value-added resellers and distributors, managed service providers, as well as ISVs. Some of the largest ISVs, SAP, Salesforce, et cetera, are partners of ours. And you will see us continuing to expand our presence there.

Finally, one of the great advantages that we have is that our customers are extremely loyal to us. We have very, very, very low churn. And as a result of it, we are able to -- once we attract the customer and they use our platform, they are able to deploy a number of different solutions on top of it. And we are able to not just land in the account. But expand. Now as we go forward, to make this easier for customers, we are building out a capability called Customers for life. This is a very well-defined methodology, not just within Google. But with our partners. We attract a customer, help them onboard to our cloud, get them to put their first workload, derive business value. And then convert them to advocacy so that they can talk within their organization and with other customers in the industry about their happiness with our cloud.

So just in closing, we're very focused on this business. In a nutshell, as industries digitize, we give them 5 unique capabilities with 5 unique differentiators. We're focused on 16 major markets, 6 industries. And we're substantially growing our go-to-market capability, whether it's direct or indirect.

With that, Heather, I'll be happy to take questions.

Questions And Answers

Q - Heather Anne Bellini {BIO 2268229 <GO>}

Yes. You want to -- so first off, just to make Nicole and Jim happy, they're there -- they're getting nervous. I'm going to read the safe harbor. That's going to keep everybody, your lawyers happy as well. Okay. So some of the statements that Thomas may make today could be considered forward-looking. They involve a

number of risks and uncertainties that could cause actual results to differ materially. Any forward-looking statements that Mr. Kurian makes are based on assumptions as of today and Alphabet undertakes no obligation to update them. Please refer to the company's Form 10-K for a discussion of the risk factors that may affect the results.

So to that -- look, I think everybody here is already well aware of who you are. But I just -- again, Thomas, for those of you who may not be familiar, he joined Google in November of this past year. He's the CEO of Google Cloud. And prior to that, had a very long and successful career at Oracle, where he was there for 22 years. And his last position there was President of Product Development. So Tom, thank you, first of all, for making this your inaugural appearance in your new role. And I think we are going to save some time for Q&A. So if you want to think about those, we'll go to those in about 10 to 15 minutes. But one of the things that I think people are wondering is, what was it about the opportunity at Google that made you want to leave a place where you've been for 22 years? What excited you about the opportunity to know that, that was the time to make a move?

A - Thomas Kurian {BIO 3811076 <GO>}

I'd left Oracle before I talked to Google. But what attracted me to Google uniquely was talking to customers. I talked to some of the largest companies and said, why did you choose Google? And uniformly, the feedback I got is, by far, the best technology in the market. Technology is amazing. I've never seen anything like it. It's what I heard over and over again. And there's a lot of operational knowledge. Technology in cloud is not just the software, it's the data center designs, it's also the operational history of running a cloud at scale. Now as a very simple example, when was the last time you found Google search down?

Q - Heather Anne Bellini {BIO 2268229 <GO>}

Can't think of a time.

A - Thomas Kurian {BIO 3811076 <GO>}

Can't think of a time. And that's because of an amazing architecture in how we design the network and how we distribute search over the world, that you've never ever, ever, ever experienced it down. So as I talked to customers, I realized Google's greatest strength is the technology infrastructure and the assets they have. The biggest opportunity was to build a real world-class go-to-market capability. And that's what we're all about.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

So you've mentioned in your slides, you talked about the 4x increase in direct sales. Is that -- did that already happen? Or is that what you're planning going forward?

A - Thomas Kurian {BIO 3811076 <GO>}

That's what we've already done.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

That's what you've already done. So what do we expect over the next 2 to three years? How do you think about where this needs to be?

A - Thomas Kurian {BIO 3811076 <GO>}

Yes. So a lot of our focus, Google's historic focus was around what in the industry people call digital native. Digital native is a company that was born on the Internet. And those companies typically have very sophisticated technology by users. And frankly, the developers find Google on the Web. And of course, they're going to try it. And they understand it. And they get on-boarded. Most of those companies also don't have what's called legacy systems because they're born on the cloud. Now over the last several years, Google has been shifting the capabilities in its cloud not just to serve the digital natives. But also to service large customers in financial services, telecommunications, healthcare, retail, et cetera. So a lot of our focus as we go forward is making sure that our sales organization has the background and the ability to sell to large, more traditional companies as much as digital natives. And to make sure our solutions work for those companies. And there's enormous appetite in those companies to consider Google, both because the general sense from a lot of customers is Google has great technology. It's -- the key thing is do they understand how to sell, support and help an enterprise company adopt the technology. And that's a lot of what we're doing.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

So a lot going forward might be on the verticalization of your efforts. Is that...

A - Thomas Kurian {BIO 3811076 <GO>}

Exactly. You'll see us specializing a lot more in these verticals. Because if you look at a telecommunications company talking to us, they're probably very keen on how can you monitor my network with your streaming capability? How can you help offload my contact center? Because some of the telecommunications companies still have the largest contact centers in the world. That would be very different than what a financial institution wants. And so having these solutions that not just combine the best of Google's cloud technology. But also broader Google, things like our AI technology, our digital system, et cetera, we're going to bring that to market around specific industries.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

And how about on the customer support side, because it would seem to me if you look at how Google's ad business evolved, there wasn't as much -- you didn't necessarily pick up the phone to talk to someone. And that seems like that would have to change in this environment. Where do you think you are in that evolution?

A - Thomas Kurian {BIO 3811076 <GO>}

We specialize -- at the broad-brush level, within Google Cloud, there are 2 broad sets of products: one is the productivity suite. And the other one is the infrastructure. The productivity suite, many of you probably use Gmail, many of you use Documents, many of you use Drive. If you run into an issue, it is most likely that you need help with the problem, right? "Hi. my mail didn't go out. I don't know how to

make bold font in a slide." So that's more answering questions. It's not about resolving a technical problem. In the Google Cloud platform, it's much more about, "My application doesn't appear to be performing very well. I'm having an issue with streaming something." So the second kind of person who's handling customer service needs to be much more technical. And so we are specializing the 2 support organizations. And even within the Google Cloud platform organization, which is the much more technical person, we're further specializing around, for example, infrastructure, networks, compute, et cetera. So people get real specialists on the phone.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

And you mentioned incentivizing the partners and making it more advantageous for them to work with Google Cloud. How do you -- is it purely monetary? Is it support to them? How do you think about differentiating it? Because they do have big businesses with people like Microsoft and Amazon, already.

A - Thomas Kurian {BIO 3811076 <GO>}

Yes. A great question. The general thing, I think, is -- I'll just give you 2 examples. The first one is with some of the global system integrators, we're working on building -- codeveloping some industry-specific solutions. That's different than just, say, a distributor. They have a lot more domain expertise in what we would call the application business process layer. We bring a lot more capability to the infrastructure. So we're building some joint solutions around some industries. Second thing is if you look at the open-source community, we're taking the approach to partner with the open-source community and bring them into the market, as opposed to just taking the technology and offering it as a service. And that's a very different approach than other players, I think, in the market.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

Okay. I'm going to questions in a second. But before we do that, if you want to get the mics ready. We would agree with you when we talk to CIOs, that the view on Google's technology is always really strong. There does seem to be kind of a misperception in the market about the strength. How do you think about kind of bridging those -- bridging the gap and bringing them closer together?

A - Thomas Kurian {BIO 3811076 <GO>}

I think there are 2 important things. I think nothing speaks more importantly to a global CIO than other global CIO. And as we get a lot more references live, we have a ton of people going live, it helps when they talk about it. And you'll see us do that a lot more at our conferences, rather than have Google people talk about it, have customers talking about it, because they can talk about their journey a lot more effectively than a person who just told them that we have great technology. So that's number one. Number two is we're also going to use the partners to do that. The partners bring a lot of capability that's required in the journey to the cloud. As a very simple example, I'm a customer with a data center. I've got a bunch of applications over here. I'd like to move them to the cloud. But once I move it, I don't want to have to run and manage it. Let somebody do the run and manage. Now Google is very

clear that we're here to enable partners, we're not here to compete with partners. Lots of companies are talking to us about running and managing things. So that's an example. And their ability will be also part of the testimony to customers about risk, how easy it is to adopt, et cetera, et cetera. So as we mature this sort of enterprise readiness framework and use this Customers for life program as a vehicle to get customers to understand how we'll work with them, I think you'll see some of those issues going away.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

Okay. Great. I'm going to see if there's any questions in the audience. There's one right there.

Q - Unidentified Participant

(Margie Macklin), The Telegraph. There's been a lot of talk about ethics, legality of AI and machine learning. And that's something you talked about in your product. But I wondered, going forward, is Google Cloud going to pick and choose customers based on whether, at some point along the line, they might present some kind of ethical minefield, therefore, bringing (inaudible) -- tarnishing the reputation of the Google brand?

A - Thomas Kurian {BIO 3811076 <GO>}

Just 2 points on that. First of all, we published a set of AI principles on what we believe organizations around the world should use as a guiding principle behind AI. Second, those AI principles are encapsulated within Google Cloud's terms of service. So if you're a customer who is worried about what does Google allow or not, it's captured in our terms of service. And we allow customers to -- that's part of the contract to adopt those terms of service. And people have not had any issue with that.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

Question up here, please.

Q - Unidentified Participant

If you go back to, let's say, the origin story of Google Cloud, which I know predates you. And talk maybe about like the motivators for the company getting into this business, I could see like a lot of different reasons. There's sort of because we can, because we have this great technology, because this is a good way to leverage our infrastructure and lower the cost overall, because the data is required to be really good at artificial intelligence, machine learning. There are a lot of different reasons that I could see the company being interested in this opportunity and probably because (of its significant speed to) market. But building out an enterprise sales force, obviously, isn't a natural thing. So there must be some really good reason. I'm just curious when you dug into this as you were getting familiar, talk to us about what some of the motivators have been historically?

A - Thomas Kurian {BIO 3811076 <GO>}

I'm not going to spend a lot of time going back in history, because history is something that everybody interprets in their own way, right? It's a very simple thing. Google's mission, if you read the Web, it's very simple: To organize the world's information and make it accessible to everybody. Many of the workloads that run in the cloud, almost all of them, are about putting data in there and understanding it in some fundamental way, whether it's to build an application, whether it's to do analytics, whether it's to change a business function like a contact center, it's still at the heart of it. So why are we building an enterprise sales force? It's really important. In order to serve large corporations well, it's important that those organizations have a person to talk with. And Google understands their needs and support them as they adopt our technology. So it would not be right to say that our mission is to organize the world's information and serve it to all the people in the world, if you then promptly say, "Well but if we actually need somebody like a sales person to talk to, we're not going to give you that."

Q - Heather Anne Bellini {BIO 2268229 <GO>}

There's a question right up here.

Q - Unidentified Participant

Thomas, I just have 2 quick questions. One, can you give us an update on what run rate revenues look like for Google Cloud today, or at least share some type of growth rate, what that looks like? Then second question, I guess, over the past couple of years, a lot of people have talked about sales and support as 2 areas of improvement for Google Cloud relative to some other players. But we haven't seen, I guess, significant changes in the market structure. What more do you think needs to be done today to just kind of see Google become a significantly larger player today?

A - Thomas Kurian {BIO 3811076 <GO>}

So on the sales and support structure, I mean, you've seen our numbers, we've increased it by 4x. That's a large increase. We've also hired in...

Q - Heather Anne Bellini {BIO 2268229 <GO>}

In three years, right?

A - Thomas Kurian {BIO 3811076 <GO>}

Yes. And so that's a very large increase. If you look at an average sales organization's enterprise sales, they're not growing even 15%. Growing 400% in three years is a big number. Remember, we have to absorb the people, we have to enable them, we have to train them, we have to understand the product. It's not a simple thing to grow an organization that fast. I would say, when I talk to our customers, they feel that we've come a long way. There's always more to be done. Just like other companies wish they had Google's technology, technology, trust me, is far harder to build than a sales organization. We are building a sales organization with a go-to-market function. And you'll see us continuing to grow it. With regards to the numbers, I think we've never disclosed those numbers except 4 to 6 quarters ago. It's not my goal at this event to disclose any numbers. I think Ruth and Sundar will do it at a future event if they choose to.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

Great. Thank you. There's a question behind you, sorry.

Q - Unidentified Participant

It looks like it's been, obviously, a very strong spending environment for Google as a group over the course of the last 24 months. I'm just wondering, as you've come in from experience with a more mature business, whether you are seeing any signs of or opportunities for efficiencies over the course of the time you've been there and looking forward in 2019, '20?

A - Thomas Kurian {BIO 3811076 <GO>}

Yes, I'll give you just an example of -- we are very focused as we grow, not just on having the best technology. But having the lowest-cost delivery vehicle for that technology. So I'll give you a very simple example. If you look at data centers. And these numbers have been published by Google as part of their research, on an average data center today in the world, if you look at the power consumed by the computers in that data center and the power that goes into that data center, typically, 3.2x the amount of power consumed in that data center goes into the data center from the power network. And that means almost 2.2x that power is lost and wasted. That's a lot of money. But Google has publicly published that our data center runs at about -- if you need 1 megawatt of power in the data center, we need only 10% more. And that's because of the enormous work that's gone in and great discipline to optimize how we use power in our data center and the design of the data center. And most recently, some advances that we've talked about in using AI to optimize how the machines consume power and load balance the power consumption. Now that's an example of -- if you look at Google's data centers, they consume a lot of power. And if you look at the spend on that, we've spent enormous time optimizing it. Even as we grow our business and we invest for growth, we are paying extraordinary attention to making sure we're very cost-optimized to be competitive.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

I think there's one right there.

Q - Unidentified Participant

Thomas, thanks for highlighting kind of the differentiation with some of your peers. I want to get your thoughts in terms of when you look at kind of Amazon and Microsoft, obviously, we're seeing Amazon kind of move up the stack from the infrastructure and adding more on the path side. And also on database. And we're are also seeing Microsoft kind of -- I mean, they've been historically very strong in productivity apps and they are also going up stack on the infrastructure side. So would love to hear about your thoughts in terms of where the players are moving. And in order to address the needs of your customers -- there's strong differentiation on the infrastructure side. But would love to hear about, more broadly speaking, where you think, in terms of the stack, GCP can continue to add and improve in order to be able to address more needs on a holistic level for customers?

A - Thomas Kurian {BIO 3811076 <GO>}

We have a number of solutions up the stack, above infrastructure and above platform. Examples are -- we're building it out for each industry. We have a health solution for health care companies called Google CloudHealth that provides, using AI, the ability to extract information from medical health records. We have a solution, contact center as a service, which is targeted to complement an existing contact center. But to offload costs for people. That's adopted in a number of industries. We have a solution for marketing on top of our base platform. So we already have a number of solutions above the base infrastructure and platform that are targeted to specific industries. And you will see us continue to expand our footprint there as well.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

All right. And I think with that, we're out of time. Thank you, Thomas, very much.

A - Thomas Kurian {BIO 3811076 <GO>}

Thank you.

Q - Heather Anne Bellini {BIO 2268229 <GO>}

We appreciate it.