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TQ Cloud Introduction

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Introduction to Cloud

Hi, and thanks for tuning in to our cloud channel on TQ. I'm Paul Daugherty, and I'm excited to be your host. I've been a long-time cloud advocate. I guess you could say I've had my head in the clouds for quite a while now, even before the world was calling it the cloud or cloud computing. In fact, back in the 1980s when I was in university, I worked to help connect my university, the University of Michigan, with the ARPANET, which was a predecessor of the internet in accessing resources in a way much like we do with the cloud today. And if you fast forward, without question, cloud is everything, and everything will be impacted by the cloud. It's one of our greatest opportunities, and we're a major player in the cloud space. It's relevant to our clients. Just the other day I was speaking to the CEO of one of our large clients about his strategy for the cloud, and this is the CEO talking about how he was going to access the cloud in North America, and how he was going to use it in China to enter new markets. And that's why the cloud is relevant to all of us, and it's why cloud is our first topic on TQ. Cloud is over a 400 billion dollar market, and it's vital that we all get our heads around it. And wherever you work in this great company, it's time for each one of us to become cloud fluent so we're all singing off the same song sheet when we talked about cloud and our cloud leadership. And we're all cloud users, cloud ambassadors, cloud translators, and cloud whispers to our teammates, our ecosystem partners, and definitely our clients.

Why the Cloud Matters



Now, before we dive in, let me just do a little scene setting. Nearly all businesses have dipped their toes into the cloud. Think of Google Docs, or think of OneDrive, which, of course, we're all using, right? Or iCloud. Our everyday world is increasingly in the cloud, but here's the thing. Sometimes businesses think cloud is just about reducing costs, but it's so much more. Just look at companies that were born in the cloud, and that are using cloud in new ways. Twitter, Uber, DiDi, Flipkart, Facebook, Instagram, Snap. They're firing on all cylinders with cloud because they understand the full value and potential of cloud. They get that cloud allows you to scale ideas of all sizes lightning fast, resulting in bringing innovations to the masses, changing the way we do just about everything, and jumping way ahead of competitors. It allows you to get an idea off the ground in months instead of years. Think about Airbnb. That's cloud with a vengeance, and that's why seeing cloud as just a way to save money is pretty much missing the point. There's a reason why 62% of CEOs say technology is having a revolutionary impact in their companies.

The Cloud. You're Already Here. Do You Know Where Here Is?

What We'll Cover What We'll Avoid

If you've read anything about the cloud or cloud computing, there is a phrase you may have already encountered, a few words some people use to describe this. And if you haven't seen this phrase yet, you'll probably see it soon. You might see it first on a laptop sticker or on a t-shirt or on a coffee mug, and it'll say, There is no cloud. It's just someone else's computer. It's become quite popular. You can find dozens of products with this saying on it. There is no cloud. It's just someone else's computer. There is no cloud. It's just someone else's computer. There is no cloud, just someone else's computer. It is short, it's memorable, and there is an element of truth to it, but there's also a problem. This completely misses the point. This puts our attention on the wrong thing. And let's be honest. This isn't an objective and neutral definition. It's a bit of an insult. It's a little dig. It's dismissive. Oh, the cloud. What's the big deal? It's just someone else's computer. Now, to be clear, my issue isn't that I need everyone to be polite and respectful about it. No, if you want to poke fun at any technology, be my guest. And if you are coming into this with some criticisms or doubts or just feeling completely unsure about all this cloud stuff, that's perfectly fine. What I'm going to suggest is that an oversimplification like this one just isn't useful here. It doesn't help because this can encourage you to trivialize and underestimate how important the cloud already is and definitely how important it's becoming. There's a recent Gartner report that talks about yearly revenue of commercial cloud services is now on track to hit 330 billion dollars by 2022. For some perspective, if that was the revenue of just one business by itself, it would still be the fourth or fifth biggest business on the planet. There is real substance here, and that's even if yes, this term cloud can sometimes seem vague or ambiguous. So let's deal with that. Is cloud a technology buzzword with a lot of hype? Yes. Yes, it is. But

there's good reason for all that hype, and not just one good reason, but many. But to get a little deeper into those reasons, the benefits of this and even the risks and challenges of it, we need to get clear on some terminology, some jargon, all these different phrases and acronyms we can't avoid here, like Software as a Service or Infrastructure as a Service. We'll talk about public clouds and private clouds and hybrid clouds and more besides. We'll cover the current marketplace and see a lot of the different companies offering cloud services and how to recognize and understand what it is they actually provide. But we need to begin at the beginning. What exactly do we mean when we say the cloud or cloud computing? Can we even be exact about those terms? This will be about more than just understanding a few pieces of technical jargon because if you want to go beyond that and actually feel comfortable with this, to feel fluent when you're talking about it, it helps to intentionally widen how you think about it. And here's what I mean by that. As we go through this, I'll ask you to consider cloud computing from a personal and individual perspective. How could you, just yourself, get more out of this? What are the products and tools? What are the ways of thinking? But then we'll widen that perspective and think about how this could apply to your team because that will be different. We then widen that perspective and think about your organization and the different roles and what they'd want and then be able to push that viewpoint outwards to think about how this could solve issues for your clients or your customers. And it's from doing this, from combining some technical understanding with an intentional awareness of the different audiences and their reasons and their motivation can we get a real sense of what cloud computing is, why it's become so important over the last few years, and how you could use it in different situations. Because there is a cloud, and it is much more than just someone else's computer.

A Few Reasons for Using Cloud Computing

When I first started teaching about cloud computing, I realized one of my big challenges is I'd go over one or two examples, they would often be just a little bit too quick to say, okay, I'm good, I've got it, I understand now, and that can be an issue because unlike some technologies, cloud computing is not something that can be explained well with just one or two examples. In fact, that's a very good way to get the wrong impression about it. But let me unpack that statement because let's face it, usually when you want to know more about a technology, it is pretty helpful to just go over one or two examples. So you might wonder, why do I say that's not the right way here? Well, good question, dear viewer. Let's imagine I've gathered four volunteers together, four people who've told me they're already well informed about cloud computing and work with it every single day, and they're in different roles. I have a student, an IT professional, a software developer, and a chief information officer. And then I ask them to explain it to me, to assume I know nothing about this, and to just give me a simple explanation in a few words, what's the main benefit of cloud computing? What's this for? The student says, well, I use the cloud to back up all my stuff so my documents, photos, and videos are all safe, and I'll get them anywhere I need them. Oh, and I use it for streaming music and movies too. That's a cloud thing. The person in IT operation says, since we moved to the cloud, it's so much quicker to push out new applications. We don't have to spend as much time and updates and maintenance, and it's so easy to scale the systems up when things get

busy. The software developer says, we're using the cloud as a machine learning and data mining platform. It's been great. We just didn't have the capability to do any of this before. And the CIO might just say, cloud computing is a strategic focus for us. We've reduced expenses by outsourcing IT functions, and we've improved cash flow. Now, if I was indeed completely new to this, I'd be entitled to say, you people are useless. I asked for a simple description. You all describe totally different unrelated things. There's no crossover at all in anything you talked about. But now imagine if my introduction to this had been just from one of these people. I might think I understood it, but I'd actually have a very narrow and limited understanding. And this is a key idea as you get started. The reasons for using cloud computing, the use cases and the benefits and even the risks and challenges can be incredibly different between individuals and across teams and organizations; incredibly different. And this is why many people find this technology a bit tricky to understand at first, why it can seem vague and really hard to define. Because we're human, we want a straightforward explanation. The cloud is for doing this thing, or the cloud is for doing that thing. But it evades that kind of simple description, and anyone who says it can be explained with just one basic sentence is doing you a disservice in giving you a limited view of it. But even if we can't describe it in just a few words, that doesn't mean we have to go to the other extreme and say, oh, you can't even define the cloud. It's so loose and nebulous, it could mean anything. No, we can get to a better idea about this, the general reasons that anybody finds this useful, by taking a few of those examples, those scenarios, but then asking a couple of additional but simple questions like, couldn't you do that already? Let me show you what I mean.

Different Reasons—Same Benefits

Let's go back to our hypothetical student. Now he said his reasons for cloud computing were backup and streaming. So let's take backup because that's not some new thing. We've talked about backup for decades, so I might ask him, why do you say you need the cloud for that? I mean, couldn't you do that already? And he says, well, I mean, I used to have to plug my phone into my laptop and then manually copy things across. Sometimes I'd copy that to an external drive in case anything happened, and sometimes I just forget, but yeah, I could back up before. The thing is, now if I back up to the cloud, well, first, I don't have to do all the manual plugging and unplugging, so it's a little faster. I don't have to be at my desk, I just need an internet connection so it's a bit more convenient. There's software on my phone, so it happens automatically in the background, so it's easier. I don't have to buy and take care of any hardware, so it's cheaper. Oh, and my photos and files aren't just backed up, they're also automatically synchronized to all my other devices and that wouldn't have happened before. What is often described as the reason for cloud computing, like doing backup, isn't actually the reason because we could have already done that thing. Now the real benefit is when we add cloud computing to the picture we can often do the same thing, but do it easier, do it faster, do it cheaper, and with a few additional features we didn't have before. And of course, this doesn't just apply to backup. When you explore any specific use case for cloud computing, they will all lead to these same high-level benefits, which I'll describe as cost, convenience, speed, and features. And there is a split here. The first three benefits, cost, convenience, and speed, can let us

recognize that what we're doing here often isn't brand new and groundbreaking. We're dealing with applications and websites and databases and storage. These are all things we might have been doing already, either before cloud computing or without cloud computing. But when we add it, those things can become cheaper, easier, and/or faster, sometimes a little, and sometimes much cheaper, easier, and/or faster. But with the fourth benefit, features, and I could have also said capabilities or options, this allows us to recognize that adding cloud computing will often enable us to do extra things we simply couldn't do before, or even if it had been technically possible, something that would have been so cost prohibitive or so time consuming we would never have actually done it. Now I'm not pretending that just by adding cloud computing everything instantly becomes cheaper and easier and faster and more fully featured, no, because these four benefits can be prioritized differently. For some organizations, it's all about the cost benefits where the only thing they want to get from cloud computing is efficiencies in capital expenditure or cash flow. Now I'll admit I dislike it when I hear someone explain cloud computing as nothing but a way to reduce expenses. True, that may be the number one reason for some organizations, it's not the only reason. Many companies go into this fully expecting it to be an expense because their priority might be in the new capabilities or the new features or in just being able to reduce time to market. And I'll argue that anyone's specific reasons for using the cloud can be explained in benefits in either cost, convenience, speed, and features, just with different combinations and priorities of those. But if that's the high level of why, why are we doing this, now we can get to the next level of what, what exactly is the cloud or cloud computing, and how will it let us get to these benefits?

Cloud Products And Services

If I search the web for commercial products and services with the word cloud, the results might include Apple's iCloud, Adobe Creative Cloud, Alibaba Cloud, Google Cloud, IBM Cloud, VMware Cloud, Oracle Cloud, SAP Cloud Platform, Accenture Cloud Platform, EastWest Composer Cloud, there's companies like Cloudera and Cloudflare, and this very incomplete list only includes things that actually have cloud in the name. If I expanded this list to include, say, companies often mentioned in articles about cloud computing, names would include Amazon, Microsoft, Dropbox, Salesforce, media companies like Netflix and Spotify. And if I expanded that further still to include a few business publications and their lists of top 100 cloud-focused companies, you'd find an abundance of names, many of which you've never even heard of. But if you recognize any of these businesses, you'll know that some are aimed at individuals where I might get out my own credit card and pay for a subscription for myself. Others are more for professionals and teams. Some target small businesses. Others are at the corporate or enterprise level. Some are aimed at specific kinds of businesses, like startups or agencies or restaurants. Some deal with just one thing like invoicing or fleet management. And this just reinforces very different reasons, very different audiences, very different solutions. But, they do have things in common. None of them are products in the classic sense, meaning they're not physical or touchable. I can't hand you a CD with a copy of Apple's iCloud on it. I can't give you a flash drive with Salesforce on it. They can't be delivered that way. They are all some kind of service delivered over the internet, and we use the word service all the time when

we're talking about cloud computing. And, okay, some companies might describe what they sell as a product, but I'm going to use the term cloud services to describe all of these. These companies are all providers of cloud services, and we can be consumers of those cloud services, sometimes as individuals, sometimes as teams or organizations. They might seem completely unrelated, but there are several common characteristics, several qualities we can expect. And okay, there's a few exceptions and edge cases, so right now let's just focus on just what is true 99% of the time about every single one of these cloud service providers.

Internet Connected

The first and simplest quality of all cloud services, we're going to need to be connected to the internet. And okay, this may go without saying, if you know one thing about the cloud you know it's something to do with the internet. It doesn't mean that every single cloud service will now require us to be connected 100% of the time. For example, I might have my phone using a cloud-based backup service like Dropbox or OneDrive or iCloud, and I could still be disconnected from time to time on a flight or by choice. If I'm using a service that's provided over the internet, at some point I'm going to need to reconnect to continue using it. And this can lead to this sometimes unspoken question of is the cloud just the same thing as the internet? And if not, what's the difference? Short answer, no, it's not the same thing. Sure, there are people who will say things like the cloud is just a metaphor for the internet, but it's not a very good metaphor and it doesn't stand up to any kind of analysis. The internet is much broader and encompasses more than what we're talking about here. Not everything on the internet can also be considered cloud computing. Now, does cloud computing require the internet? Yes, the same way that the world wide web requires the internet and email requires the internet. It doesn't mean they're all the same thing, but we can assume that the internet is the underlying background, the network that makes this possible, that allows us to have this connectivity between devices, whether those devices are phones or laptops or servers, game consoles, smart TVs, cars, fridges, whatever we have. And we need that connection because when we use any kind of cloud service, that means we're going to be using some computing resource that isn't running on our own machine.

Third Party Hardware

One characteristic of using a cloud service is that it will involve using someone else's computer hardware. But, we need to refine that statement because, well, anytime we send an email or just visit a website, we're going to be using someone else's computer hardware along the way. And we don't want to fall into that misconception of the cloud is just someone else's computer because that description is so loose, it describes the next door neighbor's laptop. No, what we're talking about here begins with the idea that a large tech organization like Microsoft or Google or Amazon or IBM or Oracle or Alibaba or Apple, and there are plenty of others, they have built and staffed datacenters, dedicated buildings, sometimes entire complexes of buildings full of computing hardware, thousands of servers and hard drives, networking hardware, multiple redundant connections to the internet, cooling systems and security systems and independent power backups for power failures, and these

are in locations all around the world. But unlike, well, let's say 20 years ago where if a company built a datacenter, they were building it for themselves for their own private internal use. These datacenters weren't. They were built with the intention that the resources inside them would be made available to outside users, for a price. So, I could pay to be able to use a part of the resources and computing power in those datacenters, for whatever reason was important to me. Maybe to use it for storage for files, documents, data, off-site backups, or use it to run a website, use it to host an email server or a database, use it to develop and run internal applications. Or I may be uninterested in all of that, I just want to use some piece of software that somebody else is running in that datacenter. But there is a caution that I want to make here because when you first hear about all these massive cloud-focused datacenters, it's very easy to think cloud computing is all about the impressive buildings and the cameras and the biometric security, all these power backups and cooling systems and these incredible racks of hardware. But no, all that stuff, all that equipment is not the most important thing here, because if all we had was the physical infrastructure of buildings and servers and drives and networking, that's just a datacenter, and we've had those since the 1940s. No, what transforms this into cloud computing is what has then been added on top of all that equipment, an additional layer of software, the management systems to connect and control and automate everything in that datacenter because that's what we will interact with. We don't get direct access to the computer hardware. We deal with the software, it will take care of what's actually going on behind the scenes.

Self-Service On-Demand

If I want to start using a cloud service, and whether that's signing up for a personal account with some backup service or using one of these impressive cloud-computed datacenters to host my website, well, here's what I don't have to do. I don't have to make a phone call, wait for a sales rep to call me back, sit through an appointment, get a written quote, write a purchase order, wait for approval, etc., etc. No, with cloud computing I should be able to get what I need immediately because all of these cloud services, from the personal consumer-focused ones up to the high-end enterprise level ones, they all have software, typically this management website or portal that I will interact with. I can go onto their website, create a new account, fill in the payment details, select the service or feature I want, and click. And whether it's a web server or an area of storage or a database or access to some global content delivery network, within seconds, occasionally a few minutes, it will be provisioned and made available to me. And it's one of the most important qualities or characteristics of cloud computing is that it is self-service and on-demand. But I don't want to suggest that the software part is just a way to automate you ordering and purchasing something. No, it goes far beyond that. It removes the need for human interaction in almost every part of this because the software also takes care of immediately provisioning and allocating any of those resources I'd asked for and makes so that they aren't accessible by anybody else. It monitors the hardware and takes care of any issues or faults, usually without me even knowing there was an issue or a fault. It continually monitors what my usage is. Some cloud services might be charged at a flat rate per month or per hour or per day, but other resources, like network bandwidth, they

might be metered, kind of like electricity where you'll pay for the amount you use. But again, what makes this all possible is not just the hardware in the datacenters, it's all the software that manages that hardware. That's what simplifies everything. That's what leads to these great improvements in cost and convenience and speed. And one of the most important ways that we'll get cost efficiencies is that the computing resources in these cloud-focused datacenters, like the actual servers or hard drives, they are not allocated one by one to every user who comes along. Instead, they are pooled and shared, and we need to talk about that idea.

Resource Pooling

Before cloud computing, if you didn't have your own datacenter, but you wanted to use somebody else's, there were a few ways to do it. First is where you just basically rent some empty space in that building, sometimes an entire room, sometimes just one space in a server rack. So the company who runs the datacenter would take care of the building, the power, the internet connectivity, the air conditioning, the rack itself, but where I'd have to bring along my own server that I'd already set up, we'd have to plug it into that space, hook everything up, this is what's referred to as colocation, or colo. Another option is where the company who own the datacenter might provide a bank of servers on where I could arrange to rent one or two or three of those specific servers, and that server would then be dedicated to me where nobody else would have access to it, but where what I was paying for was the use of individual, specific, dedicated pieces of hardware. But with cloud computing, that's not how any of this works. With cloud computing, we are typically not dealing with dedicated resources. Instead, we get access to a large pool of shared resources. If I sign up for a personal account on one of these cloud-based storage services like OneDrive or iCloud or Dropbox, that doesn't mean someone at those companies has to walk down to the basement, unwrap a new hard drive just for me, write my name on it, and plug it into the datacenter somewhere. No, what I'll get is access to use a part of their existing massive storage and computing infrastructure. They may still have hundreds or thousands of individual servers and hard drives, but they've all been connected together as part of a larger system. I get access to that system. Whatever files or documents I upload to the cloud, they will end up actually being stored on some hard drive somewhere. In fact, stored across multiple hard drives so there's redundancy in case of failure. But the thing is, I'll never know exactly what hard drives my data is stored on. And at the personal and consumer level, I probably don't even have any idea of the location of the datacenter of where that is, and that's okay. If I'm uploading a document to the cloud, whether that document actually ends up being stored in a hard drive in Texas or North Carolina or Germany, that shouldn't matter at all. And one of the benefits of pooled resources is it's much more tolerant to any kind of failure. So if one hard drive fails in this bigger system, it just doesn't matter because the cloud service provider, they all expect the hard drives to fail. The system itself can detect a failed drive, it can avoid it, it can allocate another drive in the pool to do what that first drive was doing, and that kind of thing won't even require human intervention. It will all be managed by the software running in those datacenters. But when resources are pooled, we can support a lot more users at the same time because most of the time you don't need any computing resource you're using to run at full capacity. Think of your own desktop or laptop. It might spend



most of its lifetime running at just a few percent of what it's capable of. That's a lot of wasted potential, but in a cloud computing environment, it can be reallocated to other users who will pay for that. So, resource pooling makes things more efficient, which makes it cheaper and better protected from any single point of failure in the hardware. To summarize, the general characteristics of any cloud servers, yes, first we expect to be connected to the internet because it'll be involving using somebody else's computing resource. We expect that whatever service we want to use will be on-demand and self-service and that it's typically a pay-as-you-go model, but that we're also dealing with pooled resources we don't have direct access to the underlying hardware.

Everything as a Service

"Everything" as a Service

There's a massive amount of companies providing cloud services of some kind, so it can be useful to have a way to categorize these services in a bit more detail to just broadly recognize what it is they do. So if I'm reading about some new cloud-based company, can I quickly understand what service they provide, and why might I care? Now we already talked about the fact that you can think of some cloud services as focused on individual end users where others are focused on small businesses, some are at the enterprise level, and others are specific types of business like transportation or hospitality. But beyond the audience, there are also several common general categories in the cloud computing world, and you can recognize these categories whenever you see the phrase "Something as a Service". And the three you'll hear most are Software as a Service, Infrastructure as a Service, and Platform as a Service, and you'll see the abbreviations SaaS, IaaS, and PaaS, usually with the two A's written lowercase. And yes, people will say them aloud as sass and pass. Now you will see other "Something as a Service" phrases, for example Databases as a Service or Mobile Back End as a Service or Business Process as a Service, but these first three are by far the most common, they're the most widely used, and I'm going to say that whenever I see a different "Something as a Service" phrase, it's really just a slightly specialized version of one of these first three.

Software as a Service (SaaS)

Software as a Service, or SaaS, is usually the simplest one to understand because most business users are using SaaS already, even if they don't think of what they're doing as cloud computing. But if you use a web-based email provider like Gmail or Outlook or Yahoo Mail, if you use a web-based document creation tool like Office 365 or Google Docs, a collaboration tool like Box or Slack, file backup and synchronization services like Google Drive, Dropbox, Microsoft OneDrive, Amazon Drive, customer relationship management software like Salesforce and Hub Spot, human resources software like Workday and Zenefits, these are all Software as a Service. There are hundreds of others, but what's common about all of them is when you use them, you're using an application in

the simplest sense of the word. It's a complete piece of software with functionality, things you can actually accomplish. You or your company didn't have to design and build that application, it already exists. You just use it. But instead of it being an application you would download and then install and then run completely on your own computer, the software for these applications is running on servers in a datacenter somewhere, and you're connecting to it to use it, often, but not always, through a web browser. The important part of all of these is still running somewhere else, it's running in the cloud, so it satisfies all those qualities of cloud computing. You need to be connected to the internet. The actual code and functionality for this is running on their servers, not on your machine. It is on-demand, self-service, sign up for what you need when you need it, and it's using pooled resources. So when you sign up for any of these SaaS applications, you're not getting your own server, you're sharing those resources with a bunch of other people and other organizations. Now, one of the things that is very common is that with Software as a Service, you don't own the software. It's most commonly a subscription model. And if I stop paying for access to Office 365 or Salesforce or Netflix, I won't be able to continue using it. Now, a few SaaS applications you may not directly pay for, they might be subsidized through ads or be free for personal use, but charge for business use, or free up to a certain amount of usage. Now, while it's true that you interact with many SaaS applications primarily using a web browser, it's not always the case. Some of the file backup synchronization services, for example, will ask you to install a lightweight app that will run on your computer or your phone, and that app is connecting to the software running in the cloud, it's uploading and downloading in the background, but what that means is some people might be using these services without ever visiting the website. They are still using Software as a Service. It's a finished application running in the cloud.

Infrastructure as a Service (IaaS)

We may also be interested in having deeper access to the resources of a cloud computing datacenter where we could work with servers and storage and networking, typically because we'd want to then build something using those. And when the cloud service provider offers us that option, we call it Infrastructure as a Service. Now, some companies only provide Software as a Service, some only provide Infrastructure as a Service, some companies might do both, and/or also provide Platform as a Service, which we'll talk about next. The companies I might consider as classic examples of this area would be Amazon AWS, Google Cloud Platform, Microsoft Azure, Alibaba Cloud, these are all providing Infrastructure as a Service. But again, they're all still self-service and on-demand. I can log into any of these sites, create an account, add a payment method, and then just start configuring the resources I'd want to use. So if I wanted a server, I could actually say how much RAM do I want that server to have, how fast a CPU, what size of hard drive? Also, I could choose where this would be located, which region or which datacenter of that cloud provider. But, here's an important point. When I do this with any of these cloud service providers, I am not going to get dedicated access to one actual physical machine sitting in that datacenter. Instead, I'll have use of an emulated or a virtual machine, or VM. It looks and behaves to me just like a dedicated computer. I can have whatever operating system I want, I could install whatever software I need, I can run applications and save data, but a virtual machine is basically a program that's running on a real

physical computer, but is completely emulating another computer. And one of the great things about virtual machines is they can be saved, just like saving a document. And you can then move them from one computer to another, or even duplicate them. And the thing is, each physical server in a cloud computing datacenter can support several virtual machines at the same time, and it's back to this idea of resource pooling. It's one of the things that allows cloud computing providers to automatically pool these resources, automatically re-balance and move things around as needed. It makes things flexible, it makes it more efficient, which makes it cheaper. And it makes it more fault tolerant, because if there is an issue on any of the physical servers, any of the VMs can simply be moved to another machine, and where these virtual machines might belong to completely different customers, but each customer's individual experience is identical to having their own dedicated machine, their own operating system, their own libraries and applications. And there's a term for this. If somebody rents a house, we call them a tenant. Well here, if you are one of multiple users renting and spending time on the same shared computing resource, that is multitenancy. We support multiple tenants on the same server. But, in a managed cloud environment, all these different tenants have no idea that the other tenants even exist, even if it's right beside them because they're all isolated from each other. So the programs running on one virtual machine cannot access the code or the storage space or the traffic of another one unless they're explicitly allowed to. And using Infrastructure as a Service, which also includes things like storage and networking, this allows you to place almost anything into the cloud, including doing what's called a lift and shift. That's where you would take systems that you currently have running on your own hardware, on your on-premises, or on-prem, and without re-architecting or redesigning anything, just directly moving those systems into virtual machines running in the cloud.

Platform as a Service (PaaS)

We can think of Software as a Service of being at the top of the cloud services stack simply because we're dealing with fully finished applications. They're delivered via the internet, running in the cloud, but with the downsides that they're not your applications. So when you're dealing with your most unique and most important business needs, there may not be a SaaS for that. So if we need to work at a lower level, there's Infrastructure as a Service where configuring servers and storage and networking so you can use them to build whatever you want, but if you've configured a server in the cloud, it may be a virtual machine, but it's still your responsibility. You need to configure it. You need to take care of updates and service fixes. And if something you installed isn't working the way you wanted, that's your problem. It's not the problem of the cloud service provider. They just provided you with the infrastructure. The rest is up to you. But somewhere in between the two of these, there's also Platform as a Service, or PaaS. Now the easiest way to think about Platform as a Service is to think about the initial years of cloud computing when what we now call Infrastructure as a Service was kind of the first option you had. You could configure a bare bones virtual machine server with perhaps just an operating system, and then the rest was up to you. But let's say you wanted a server for doing web development. That's a very, very common reason. But what that meant is a lot of people were configuring these very basic servers and then

immediately having to do exactly the same things to get that server ready to build and run web applications, which would mean things like, first, install web server software; next, install database management software; now, install a web development framework like ASP.NET or Node or PHP; now, install source control; now, install security software; now, go and configure everything so it all talks nicely to each other. And the thing is, your typical software developer doesn't really want to do all that stuff, they want to do what comes next, what comes after that. So, the cloud service provider said, well, seeing as a lot of this is just repeated tasks, how about we automate that part of it. For example, if what you want is a server for doing web development, then the cloud service provider can also take care of installing and configuring all those extra necessary pieces, the web server software, the database software, the web framework, and they can take care of keeping everything patched and updated so you don't need to directly manage the virtual machine. You don't need to update or patch the operating system. Instead of just getting a server in the cloud, what you're getting is a complete development environment in the cloud, a development platform, Platform as a Service, and getting away from having to think about that underlying infrastructure, the details of the server and the storage and the networking, that's hidden a little bit further away. And because these PaaS options are often very targeted at specific kinds of development, you have options for web development, other ones are for mobile development, others for data analytics, that means you can also get very good reporting built into them, you can also get options for automatically scaling those apps, so if the website you're building gets hit by a lot of users and suddenly you're running at 95% capacity, you can have a setting that would say this application will automatically scale up and allocate more resources so it behaves like a faster, more powerful machine and then scale back down when it's no longer needed. Now, you are still going to have to build something on top of all this to make it do anything, but with Platform as a Service, you're getting that full development platform.

The Marketplace: Cloud Solutions and Cloud Vendors

Making Sense of Cloud Providers

Let's go back to that idea of a stack of cloud services, but before you can provide a service of a finished application, you need some kind of development platform to build it on, and to have a development platform, you need some kind of infrastructure. But another useful perspective is just to consider the typical users of these different cloud service categories. For Infrastructure as a Service, the typical audience would be IT professionals, network administrators or sysadmins. You step up to Platform as a Service, that typical audience is more often a software developer. And up one more level to Software as a Service, the audience is now anyone. But, all this pyramid represents is the idea that they logically build on each other, it does not show popularity or revenue. In fact, if I wanted to show you these different categories, either by say the number of companies

offering this kind of cloud service or indeed the revenue generated by these kinds of cloud services, that's a very different story. Software as a Service generates the most revenue by far, followed by Infrastructure as a Service, followed by Platform. Now that shouldn't be a surprise as SaaS is the most straightforward revenue model with the widest audience potential. It's a finished app. Charge people to use the app. If you just wanted to explore what is on offer from the major providers of cloud infrastructure, and even who those providers are, well first, the most common names you'll see are Amazon Web Services, or AWS, Microsoft Azure, Alibaba Cloud, Google Cloud Platform, IBM Cloud, and Oracle Cloud. Now there certainly are others, but currently the top four of these have the biggest global market share. But if you just visit any of these websites and look to see what services they offer, it can be incredibly daunting. A challenge for anyone working with the major cloud providers is just the immense number of options, making sense of them, and keeping up with how quickly they change. For example, if an IT professional goes to any of these cloud providers because she wants to research using that provider for just storage in the cloud, she won't find just one option for storage, but perhaps a dozen different options. Maybe there's one option for storage that's intended for long-term backup, another option for storage that's for disaster recovery, a different storage option for high performance. And this all matters because they're often different pricing tiers. And when you first start to use any of these major cloud providers, you're immediately presented with perhaps 10 or 15 different categories where each category might have 10 to 15 different services. And we can't even begin to cover everything in a course like this, but there are a few words I do want to cover, some terms you'll see across many of these providers. First is when you see phrases like public cloud, private cloud or hybrid cloud. You'll also see the term elastic computing being used on several of these sites. You'll see the term serverless computing in multiple places. So I quickly want to go over all of those terms.

Cloud Deployment Options

We have these terms public cloud, private cloud, hybrid cloud, you'll also see multi-cloud. Now the first one is easy because when we talk about or use cloud computing, we're most often talking about public clouds. It's the most common, it's the default option. If we're having a conversation about cloud and if you haven't used any of those extra words, I'm just going to assume you mean a public cloud because all that refers to is that basic characteristic that the datacenters and everything in them are owned by a third party and they are available to the public. So we have that idea of multitenancy, other companies, other tenants, using the same servers and storage and networking we're using. But, a private cloud, and this is a much less common option, it's usually for larger enterprise-level organizations, this is where a set of computing resources in the cloud will be dedicated to just one organization or company and not shared. Now this isn't the same thing as just your own equipment in your own server room. A private cloud can still be hosted by a public cloud provider. They'll then reserve a set of resources just for that organization, and then they'll set it up with a private network with an extra layer of authentication, so it does allow another layer of security and control, so it allows more customization. But it's also going to be much more expensive. And then we have hybrid cloud, which as the name might suggest is a mix. Now it can mean using both public and private clouds, but it also refers to the idea of incorporating your own

on-premises applications and equipment into the picture. Now this doesn't mean that you're just using a few unrelated options. So, oh, we have some internal applications running on-premises, we're also using a SaaS, and we're also hosting a website in Microsoft Azure, but nothing talks to each other. No, that's not hybrid cloud. Hybrid cloud refers to the idea that you're setting up communication or orchestration between the different parts of your larger system. So the applications themselves will talk to each other using APIs and you're sharing the workload between on-prem and public cloud, and possibly also private cloud. And finally, there's multi-cloud. Simply put, that's using cloud services from more than one provider. So perhaps your organization decides they want to use the machine learning Platform as a Service in Microsoft Azure, but also prefers the archival cloud storage options in AWS from Amazon, and you'd make both of them part of the larger architecture, that's multi-cloud. It adds some architectural complexity, but it's becoming more and more of an expectation that organizations don't have to completely commit to just one cloud service provider.

Elastic and Serverless Computing

A word you'll see on multiple websites for cloud service providers is elastic computing. You'll see references to elastic servers and elastic storage and elastic networking. The basic idea of elasticity is straightforward. It's the same reason we might use elastic for anything because it allows us to expand and contract, and expand again and contract again without additional effort on our part. In cloud computing, it refers to the ability of our servers and our storage and our networking to automatically adjust to different levels of demand. But Simon, you might say, we've been scaling up and scaling out computers to meet increased demand forever. So, what's the difference between scaling and elasticity? Okay, elasticity is having the ability to scale up and also scale back down and do this automatically. But within the administration website of that cloud service provider, I could set up rules to say if the system detects it's running at more than 95% CPU, then automatically reallocate the virtual machine to act as if it's running on a faster processor or has more cores, or even duplicate the entire virtual machine to have another instance of it running. But we can also set up rules to say that when demand dies down, reduce the resources. And this can all be set up with a few clicks of a mouse, and that's just handled automatically by the cloud provider. Elasticity is another one of the key benefits of cloud computing. It's one of the great side effects of having this pooled and virtualized infrastructure because when you're not using those additional resources, you don't have to pay for them. Now you may also see references to serverless computing. This is an aspect of computing that's targeted mainly at software developers, and the first thing I need to clear up about it is the name serverless computing. It's a terrible name. It does not mean no server. It still uses a server, but for a software developer, this is a way to run code without caring or even thinking about the server. Now earlier I talked about having Platform as a Service as a way to get a full development environment in the cloud, including a web server and a database and application frameworks, but where as a software developer, I'd still have to think about building and running a full application on that platform. Now, serverless takes it one step further than that to the point where if I wanted to, I could just say I have a few lines of code. I want to run them in the cloud. On some websites you'll even see the term FaaS, or Functions as a Service. Now personally, I think of

FaaS as just a specialized kind of Platform as a Service, but it gives me the ability to have just a few lines of code I could call on-demand, perhaps from a website or even from a mobile app where we'd only be charged for the computing time the code actually uses whenever it's called.

Service Level Agreements in the Cloud

One of the most common concerns people have when moving to the cloud is about availability and uptime. But with software development in general, we know there will be outages and hardware failures and network issues, but we can still have high expectations of those cloud service providers and we can measure those expectations because they all have service level agreements, or SLAs, to describe what expectations we can have as a paying consumer of that particular cloud service. For example, this is a basic service level agreement for one of the Amazon Cloud services. If it's less than 99.99% availability, then you get 10% off the bill. If it's less than 95% availability, it's 100% off the bill. Now if you're not used to working with percentage numbers for availability and uptime, understand that what might sound like a pretty good number to the general public is often not a good number for software developers. For example, if a website was available 99% of the time, a lot of people think that sounds pretty good, or at least acceptable. But 99% availability means between 7 and 8 hours of downtime a month. The question any development team needs to ask is, is that okay? I mean, is this a critical application? How much revenue could we lose? What are our service level agreements with our own external customers. And improving this number can be costly, not just by resources, but also terms of system and architectural complexity. But, you know, that's a topic for a whole other course. Thanks for joining me for this one, this Executive Briefing on Cloud. I hope I've convinced you it's a bit more than just someone else's computer. See you next time.

TQ Cloud Aftershow

Introduction

Hello, and thank you for sticking around for our after show, right here at your TQ home base, TQHQ. Now, you've learned a lot about cloud already, but we have a fantastic show lined up for you today where you're going to hear from several of our own Accenture experts, and you're going to learn even more about what we do for our clients and how we take them on their cloud journey. You're going to hear again from Paul Daugherty and Simon Allardice, and we have some very special guests, our own Kishore Durg and Adam Burden are going to join us. So don't go away, it's all on the TQHQ, and it starts now. Welcome to all of our guests. Paul, thanks for co-hosting with me. It's great to be here on a cloudy day at TQHQ. I know, right, it's appropriate. And we're really lucky to have two of our own Accenture learners here with us, Puja and Christian, who are just starting out on their cloud journey. How's the journey going so far, guys? Going really well. I've been learning a lot, and so far the training



has been great. I'm ready to dive a little deeper and learn about some more concrete examples. Great. Great. And specifically I'm more excited to learn about how we're using the cloud to our own advantage, as well as how we can help our clients get the most out of it. Well, I think we're all in the right place. We're going to find those answers today. And to make sure we get the right answers, we're going to be joined a little later by some of Accenture's best cloud experts.

Demystifying the Cloud

First, let's turn to Simon, who you all know from the instructor in the Executive Briefing. Let's take it back to the beginning and have Simon help us understand the cloud. Simon, welcome, and thanks for beaming in. You know, Simon, going into this, I thought I knew about the cloud. I mean, I think we all thought we know about the cloud, but it is really interesting to learn more. I use OneDrive, I use my iPhone, but I realize that's really just barely scratching the surface. Thanks, Sarah. And yes, absolutely. And I think almost everyone who learns about the cloud realizes just how easy it is to begin with. Well, it's not the wrong idea as such, but to begin with a very limited idea about it where you're only seeing part of the picture, and it's usually from however you were introduced to it. So if your first exposure was through a product like iCloud or Dropbox or OneDrive, then it's very easy to internalize this idea of yeah, I understand the cloud, it's all about storage. And it is about storage, but that's just one reason out of many. And that's why a lot of this has been about trying to shift to different perspectives and look at different reasons so we can avoid that temptation to oversimplify what cloud computing is and what it's capable of. Yeah, I mean, it's a great point. We need to break it down so it's simple enough to understand, but it is complex. So, as you guys have been going through your learnings, Puja, Christian, what are some questions that you still have? Yeah, to be completely honest, I do get a little overwhelmed with all of these "as a Service" terms. Yeah, I hear you. There's a lot of buzzwords, right? No matter what we do, there's a buzzword. "As a service" is one of those concepts we hear a lot about, but do we truly understand it? Simon, can you talk a little more about that? Yes. I will see a lot of these "as a Service" phrases. You know, Databases as a Service, Business Process as a Service, Mobile Back End as a Service, and there does seem to be more every year and it can feel a bit like they are marketing terms as much as anything else. But one thing that is useful about them is if you think about them as a shortcut. You know, if the term cloud is vague, and it kind of is, then using any of these "X as a Service" phrases just let's just get a bit more specific. Okay, we're talking about the club, but what particular aspect of cloud computing are we talking about? Because if a company tells me they either sell cloud services or a client says they're looking to buy cloud services, that's really vague. But if they tell me they're selling or want to buy DNS as a Service or Storage as a Service, that's now specific. It's still cloud, but it's specific. I'm going to say that there's really only three that you need to worry about at the beginning, and that's Infrastructure as a Service, Platform as a Service, and Software as a Service. Because all the others pretty much describe either specialized versions of those first three or combinations and arrangements of them. And I'm going to say them in that order, Infrastructure, then Platform, then Software because they build on each other. They're not independent and totally detached. Great. Thanks, Simon. That

really does help start to shape and understand what that concept "as a Service" means. Now, Paul, we listened to Simon's Executive Briefing, we learned all about the cloud, but you are our resident technology expert. So tell me, like how do you describe what the cloud is? You know, I think Simon put it pretty well, but I think of cloud in simple terms as a way to plug in to access shared resources, plug in to access shared resources, and what's another way we do that? Think about electricity. You plug into a wall and you get electricity. It wasn't always that way. If you go back over 100 years, you had to have your kerosene or your whale oil, whatever you might be providing, if you wanted to build a factory, you had to put it on a river so you could have the water wheel spinning. And eventually we had the standard access to the shared resources of electricity, and now you can just plug in. And that's what's happening with cloud computing, with accessing compute and technology capability wherever it is. But it's more come more complex and more complicated with technology as Simon just explained. So you have Infrastructure and Platform as a Service, which is accessing the hardware and the software in the cloud. And this is companies like Microsoft, Amazon, Alibaba, Google, and companies like that with that kind of infrastructure and software available, it's applications, Software as a Service. This is Salesforce.com, Workday, SAP, Oracle, and many more who provide their business applications as a service. And then it's also things like Solutions as a Service, which, as Simon said, you put all those together and you have things like Accenture's INTIENT platform that's an end-to-end business platform for the life sciences research and development space that puts all those capabilities together, makes it makes it easier for our life sciences clients to plug in to that R&D capability. Great, yeah, so it's complex, it's involving ecosystem partners, it's taking all these different components and kind of putting them together. What do you think, guys? Is it becoming clearer? So I think I'm getting it more, but I guess one question I have is why is this such a big deal for businesses? Yeah, that's a good question. It's good that that question is out there because that gets back to Accenture and why they need us. So we like that question. And there's really two things about cloud that you have to think about from a business perspective. It can drive efficiency or it can help you grow, and it's really often the combination of those two things that makes it valuable to businesses. On the efficiency side, you can do things cheaper and faster by accessing those shared resources again, which is very, which is very powerful. And it's a way of shifting the capital expenditures, the CapEx, of a company to operating expenditure, or OpEx, that's very attractive to CEOs, CFOs, and others. So that's on the efficiency side. But the more attractive feature, what really makes a difference for our clients is the growth capability. How can you do new things? Think about new capabilities like maps, the mobile maps, Google Maps, Apple Maps, like we didn't have before that you couldn't do without the cloud. Think about the way that the cloud platforms are our vehicles for innovation, the latest advances in artificial intelligence to new technologies are often coming through the clouds, so if you want to access the latest innovation as as a company, you often have to be tapped into a cloud to do that. And that's why CEOs are getting strategically interested in the decisions on how they're utilizing the cloud, not just from an efficiency perspective, but to be competitive, strategic, and define the next generation of their companies. I mean, it's almost the sky's the limit. That's where the clouds are, in the sky, but almost helping our clients understand. I mean, in some ways that can be scary when the possibilities can be almost endless, like really helping them figure out what they need and how it can help their business.

Accenture and the Cloud

So now, let's focus more on what cloud specifically means for Accenture and our clients. So Paul, I know you see the cloud as a big enabler for innovation, but why is it a big deal for Accenture? You know, it's a big deal for us because it really needs every part of our business, or better stated, our clients need every part of Accenture's capability to deliver on the cloud transformations and achieve success in the cloud, which makes it a great opportunity for us because that end-to-end nature of what we do is really what differentiates us. We're the ones who can provide everything from the strategy to the business processes to the industry in sight to the technology to make it happen. And that's what we've been doing in our business is building cloud capability into everything we do. What that means is we need the technology capability to develop the cloud solutions, the industry specialization because the cloud for our banking clients in North America is going to look different than one in Europe, and that's going to look a lot different than a manufacturing a retail company. And we have to bring that industry insight to our clients. And then it's about the innovation and bringing the new ideas to our clients. How can you start a new business or launch a new product with the cloud, and that leverages a lot of our innovation capability as well. So it's really that end-to-end perspective that we bring that's really valuable in the C Suite to the CEOs, and also to every individual in the company in the workforce that's touched by cloud. And really, moving to the cloud is much more than just technology. I mean, you have to work in a whole different way, so I can see where it brings all of Accenture really to life to help our clients. I think it's starting to make sense. Good, that's great. Puja, what do you think? Yeah, so I know we're using the cloud a lot in our day-to-day jobs here at Accenture. I'm curious about what our journey was really like. That's great, and it's great you say that you're using it a lot in your day-to-day work at Accenture because you are. Accenture itself is about 95% in the cloud with the way we built our own cloud infrastructure and business processes. So, it's been a key part of our journey from that perspective. But we've been involved in the cloud early. So we started with the cloud many years ago, 20 or 30 years ago where we were working with concepts around grid computing, we have patents that came out of our intellectual property, that came out of our research labs, Accenture Labs, on grid computing and some of the underlying concepts of cloud computing. So we were there early. And then when we saw the leading early companies form and we saw what Salesforce was doing, what Amazon was doing early, we started working with them early and built strong businesses with them, so we're now the leader in many of those businesses. The Salesforce business has been a great example. We started working with them shortly after they were formed and started going after the corporate market with their software, and we built a very large business that was really the leading edge of all of our work in cloud was that early business we built, and then many others followed. And now we're the number one provider to all of the companies, we have a leading capability with all the cloud companies, with Amazon, with Google, with Microsoft, with Alibaba, with Salesforce, with Workday, with SAP, Oracle, and others in the cloud, we have that leading capability. So, that's been through conscious strategy investment with those partners and by focusing on it for the last 10 or 15 years as we've watched the cloud journey evolve. Yeah, and I know our own internal story is something we tell to our clients all the time. It's a great credential as we talk to our clients to explain our journey and what we've done. Yeah, you could say it's the eat your own dog food, drink your own Kool-Aid user example. But we believe in the cloud, and

the cloud is very important to our business. Exactly. Okay, so Paul, can you talk to us a little bit more about what we do for our clients? You've already kind of sprinkled in these stories about how we provide this end-to-end service, but maybe elaborate a bit on that. Yeah, you know, nearly all companies are using the cloud one way or another today, but almost two-thirds of clients tell us that they're not realizing the full benefits of the cloud that they hope to get from the cloud. And why is that? Because there's a lot of challenges. It's not easy and because it involves every part of the company, it's hard to get it right. Getting the right skills, there's getting different units of the company together, there's security and complexity, getting aligned with the business, and these are all challenges that our clients face and things that we help them with as we work on cloud projects. But if you don't get all that pulled together, it means that you're not getting the maximum benefit from the cloud or you're not moving to it fast enough, and that's where we can really help our clients. And sometimes these challenges don't really reveal themselves right away and you need an agile approach to do it as well, and that's something we're often helping clients with is how do you move to the cloud and do it in an agile way so you can continue to adapt as you need to get the value. And, that end-to-end message is important. Again, we're a full-service provider. So when our clients come to us and want to do a cloud journey, we can bring them all the capabilities. We can help them with the cloud migrations, getting things to the cloud, building new products and services in the cloud, the road map and strategy, how to use Software as a Service partners to build new parts of their their business processes, and then managing it all, managing the cloud infrastructure, the cloud providers is something we do at scale for a lot of our clients. And then finally, we can play a critical role in protecting our client's information. When you're moving things outside your own datacenter, sometimes clients view that as security issues. The reality is the cloud can be more secure than our client's own systems, and we help clients manage that end-to-end to make sure that they're moving to the cloud in a way that protects their data, protects their employees, protects their consumers, and does it in a safe manner. Yeah, so it is much more than just lift and shift, it's that full service and it's a big change, right? So helping our clients navigate through that change and making sure that they're doing it in the right way. Yep, from strategy to result. Perfect. Well, more on that. I think we have another special guest joining us, Paul, to talk a little bit more about how we serve our clients. Yes, not just a special guest, it's a friend of mine, Kishore Durg. I'm very excited to welcome Kishore to join us. Kishore is all about technology and our technology business in the cloud, and he's been leading a lot of the journey for us. So, Kishore, what do you think? Very excited to be here. Cloud is very important for Accenture, and that's why we want everybody in Accenture to learn more about it. It's not about technology, it's not about savings alone, it's about enabling innovations that will drive growth for us. A lot of our clients use cloud to disrupt their industries and also they can get disrupted with the cloud. But when we go to talk to them about cloud, they do get very overwhelmed with the complexity and navigating this complexity. With Accenture, we have come up with a platform called myNav that helps you navigate this complexity with finding the right solution for our clients and getting to the right answers, and that's what myNav is for our clients. Wow, Kishore, that sounds amazing. So myNav sounds like it's something new. I think, Christian and Puja, we're going to have to check this out. MyNav is all about giving the end-to-end view from discover, assess, architect, simulate, which is where the bulk of the decisions are made in the cloud that clients need to do, and essentially about then migration and

management of it. And these decisions that are made, discover, assess, architect, and simulate, helps our client decide the right solution and getting to the right answers and helps them navigate this complexity that Paul was talking about. I want to add a point if I could to Kishore and what he was saying, which is that myNav really becomes your expert in the cloud. It's for us, it's our expert to help us advise our clients better and from our client's perspective it allows us to be their expert in planning their journey and understanding the best way across all the choices available to navigate through your cloud journey. Interesting. Yeah, it sounds powerful. It sounds like something we all need to be aware of. That's great, Kishore. Thanks for joining us today. Thank you very much.

The Cloud and Other Technologies

Okay, so we've got myNav, we've got this complex cloud system that we're working in. There was one thing that I learned when I went through the TQ Cloud Channel. You went through the whole channel? I did. I'm pretty much an expert now. Excellent. As I've been going through the Cloud Channel, what I've really learned is that cloud doesn't need to stand alone. And in fact, we really get more value and innovation when you combine it with other technologies. So let's hear a little bit more about this. Now joining us is Adam Burden, our Chief Software Engineer, all the way from Singapore. Adam, can you tell us a little bit more about how we really get the power from cloud when we combine it with other technologies? Sure thing, Sarah, I'd love to. You know, I think one of the very best examples of this is actually artificial intelligence. Do you remember earlier when Paul said that cloud isn't really new? Well, you know, neither is AI. It's actually been around for over 70 years at this point, and in fact it's quite maybe just a little bit older than Paul is at this point. Hey, wait a minute, Adam. All right, my bad, Paul. Not quite. So, but seriously, though, we're just starting to see the true power of artificial intelligence, and that's really because cloud is putting AI actually in the hands of business. So something that had historically really been an academic nature, and it's been a pursuit of folks that had the capacity or the access to incredible technology, the democratization that cloud offers has really put this power in the cloud in the hands of anyone that wants to use it, and most importantly in the hands of businesses. In fact if you step back from that, in just a few hours these days, any business really can seamlessly connect to almost an unlimited amount of resources, whether it's storage or applications or cloud compute power. They've never been able to do that before. If you look back even a decade ago, that was kind of a foreign concept. These days, though, it's lowered the barriers for anyone, a startup or adjacent industries, to get in and compete very differently. And that's one of the things that the digital era is really all about. Now, all of us here have heard the stories of like Uber and how it's disrupted the taxi industry, right, and how Airbnb has actually done the same thing with hotels. You know, one of my personal favorite stories in this space is actually Dollar Shave Club where I'm not just a fan, I'm actually a member of the Dollar Shave Club too. And how this has really reinvented personal care is remarkable. You know, me personally, I hate going to the store and buying razors, and when Dollar Shave Club came out about 2012 or so, I signed up immediately. It was dropping razors into my mailbox, it was like 2 bucks to be able to do that, and it was great. And that's something that they did perfectly. They signed up millions of customers very rapidly in 2012. In

fact, they challenged an over 100-year-old industry that Gillette was really kind of the the father in that industry, and they ran circles around them being able to do this. Within a couple of years, Dollar Shave Club had a valuation of over a 1 billion dollars more than that 100-year-old company, and that, that is what the digital era really brings possibilities about and how it really has lowered that barrier to entry that existed before for these startups to come in with great ideas and to help me with my shaving problems. That's a great story, Adam. I'm glad to hear that you've got success with your shaving. But I love how those client examples really come to life in those success stories. So, Paul, what other success stories have you seen with our clients? There's a lot of great examples, and I think one of the interesting things is when you combine cloud with other technologies, and one of the hot technologies for a while has been Internet of Things, and a great story is what we've done with Carnival Cruise Lines with their Ocean Medallion program. The Ocean Medallion is something you can wear and take around with you, which is an interesting device. But what the device allows Carnival to do in the highly competitive cruise industry is individualize and personalize services for you. If they know where you are, they know what your preferences are, they know all the experiences that are available on the cruise that you're going on, and they can make sure you and your children get the personalized experiences you want at the right time in the way that you want them. And it's really combining, the Ocean Medallion in that case with the power of the cloud to create those individualized experiences. Yeah, that's great. It's amazing. That sounds like the MagicBands you get at Disney World. Yeah, that's great point. We were involved in that as well. So, the same team that worked with Carnival Cruise Lines had earlier helped Disney with the MagicBand program, which is a similar way. It's bringing more individualization and greater experiences, better experiences, to everyone that visits the Magic Kingdom and the Disney parks and Disney activities. So it's another great example of putting the two together. Yeah, so I mean, it's easy to see you take cloud, you take AI, it's pretty powerful. But Adam, thinking about other technologies, how do cloud and mobile work together? It's a great question. It's one of these many areas where just like AI and others, this combinatorial effect that you have a cloud plus disruptive technologies working together, you know, it's $1 + 1$ is greater than 2 where both of them are feeding off of each other and creating greater and greater and even more remarkable experiences and capability that either one could actually do more independently. And one of the clients that that we work with here in Singapore, Singapore Pools, they're kind of a gambling and betting type of agency, they do horse races and other things, and they were moving to mobile applications because they wanted to put more capability for people to actually place wagers on their mobile phones. Now they have all kinds of restrictions around that and they actually have to make sure they're inside of betting agencies and things, but they have the technology, and we actually helped build that to make that happen. But the reason that cloud was such a great use case for that is because of the erratic nature of that kind of demand. So think about like the elasticity of cloud, like just before a horse race is run, you're going to have a massive number of wagers that actually come in that have to be processed very quickly, and then afterwards it's actually relatively quiet. That is the perfect use case for an elastic cloud. It expands and then contracts back, and it's completely as a service. So you, as Singapore Pools, you don't have to own this massive infrastructure that's otherwise idle most the time, you just pay for what you actually consume in cloud. And that's a game changer for a lot of clients. And it creates better experiences for gamblers, better

outcomes for Singapore Pools, and hopefully more winnings for the people that are wagering as well. Adam, you seem to know a lot of details about how that betting really works. So, I'm glad to hear that you're testing the system. Those are great client examples. I've actually been there. I've been there. I don't doubt it. I don't doubt it. I'm really proud of it. It was a really remarkable project that Accenture did. And, you know, there are some real breakthroughs in making sure, for example, that the mobile technologies were inside of buildings where was actually permitted, and then you were able to submit bets from there, but not anywhere else. So we had to use geofencing and all kinds of things like that to happen. Couldn't imagine even doing that without the capabilities of cloud behind us to do it. So yes, absolutely, I gave it a shot, but I was just testing out the technology. I wasn't actually wagering. No. Of course. I mean, it was all part of your job. You were always cleanly shaved when you went to those casinos. Yeah, exactly. Okay. Well, these are great clients stories, and they really do help bring it to life. It makes it much easier to now understand like what is the cloud and how does it work. So, thank you, Adam, for bringing those stories to life.

Client Stories

Let's go to Salesforce and hear about some work we're doing at ENGIE in France, and we'll go to Emilie, our ____ at ENGIE, to tell us a little bit more about some recent new work we're doing with Salesforce. Thanks, Paul. Happy to be here and tell our story. As you said, our partnership with Salesforce has been strong for many years, and I'd like to tell the story of when we partnered with them to help ENGIE. Because climate change is a reality, because there is a way to reconcile the end of the month with the end of the world by providing new energies for all at a low price, because you can choose as a company to be part of the problem or to be part of the solution. For all these reasons, ENGIE is engaged in a massive transformation with courage and purpose. Responding to the critical challenge of climate change, ENGIE set a goal in 2016 to become the world leader in the zero-carbon position and began shifting from a utility company to a provider of low-carbon energy and services for global corporation, privileged services, and consumers. Because utility companies are traditionally built around building operation and systems, ENGIE needed to digitally transform and reimagine the way it engaged with customers to be trusted and long-term relationship. The company was one of the first CAC40 in France to adopt a cloud-first strategy and tests to respond to the one company ____ designed by Isabelle Kocher, the group's CEO. Thanks to the Salesforce platform and the power of cloud, Accenture and Salesforce deployed a global unified CRM platform, putting its customer at the center of the business model and empowering employees around the globe to drive customers success, transitioning them to zero-carbon energy. Accenture helped to define the business model, operational processes, IT architecture, and has being implementing and deploying the technology globally. The new Serum System, based on cloud technologies, is now available for more than 15,000 people around the globe from a desktop or a mobile device, which allow ENGIE to be really connected to their clients with a very high degree of data encryption and in a real time way. ENGIE is now ready to continue to scale and to develop very easily a few strategies around zero carbon as a service. I want to repeat that ENGIE was able to be where they are today thanks to the cloud. The cloud enabled

ENGIE to move fast. And as you said earlier, Paul, it's not just about being a cheaper solution. It's about growth and being able to do things, to trade solutions, to solve world problems, to innovations they were not ever to do before the cloud. Cloud helped them to shine again. Now, back to you at TQHQ, and thanks for letting us showcase the work this great team did for ENGIE in the cloud. Well, those were great client stories. We're going to hear about one more client story that we have here at a fast food giant in the United States and around the world. We've got Beth joining us, our ____ at McDonald's. Sure, Sarah. It's pretty easy to explain because there is simplicity about what we're doing and how we help companies like McDonald's get the most out of the cloud. The bottom line is that we're helping McDonald's build a scalable, agile data platform with clean, trusted data that can be used to personalize the customer experience and provide insights to the business in support of their growth agenda. All of this is really only possible because of cloud technologies. I'll go into more detail in our McDonald's overview video. That's fantastic, and I can't wait to see how all this comes to life with McDonald's, given that I'm a frequent customer. I encourage everyone to take a further look at that video back on your Accenture TQ home page. Yes, Beth. Thanks for joining us.

Summary

So, you know, I think I'm really starting to feel like I could explain cloud to anyone. I mean, maybe even my parents. Then they could maybe understand what we actually do at Accenture. Yeah, I have the same challenge. Don't worry, you're not alone. But that's exactly why we're doing these channels, so that any one of us can explain cloud to anyone, whether it be family members, friends, colleagues, and hopefully our clients as well. Yeah, although I have a feeling my 12-year-old boys could probably explain the cloud to me, but that's how it works. Well, before we wrap up, I would love some final thoughts from all of our guests. So, Paul and Adam and Kishore, I'd love to hear from you. What's your kind of one headline? What would you say is something that everyone needs to understand about the cloud? Kishore, let's start with you. Hey! Navigating the cloud is complex. I would like all of Accenture to leverage myNav to navigate the complexity and support our client to innovate in the cloud and ignite growth for our clients. I love it. So we're giving you all the answer, myNav. Adam? Look, there's so much that we've done to raise our TQ here. You know, to pick one for me is a bit hard, but I'm going to go with that I really believe cloud is food for the digital era. I mean, think about all the examples that we've talked about today about how cloud plus this disruptive technology, cloud plus a client's transformation lead is enabling those things to happen. It genuinely is a catalyst. It is the food that makes those things happen, so the elasticity, the things that we have with multitenancy inside of cloud, the public cloud providers and the innovations that they're putting at the fingertips of people, the democratization of this technology. There are so many things that cloud is really unleashing, the potential is remarkable, and the future for our clients and the possibilities for our business is really unlimited. So that's my takeaway. Cloud is absolutely food for the digital era. And finally, Paul, what would be your takeaway headline? Oh, Adam, made me hungry with his answer. True. But I'd say the number one thing to take away for everybody at Accenture is opportunity. This is an immense opportunity for Accenture because it's an opportunity for our clients. The cloud journey is only about 20%

complete. Our clients are only about 20% in the cloud and a lot more to go. So we've just been doing the warm-up with all the success and everything to date. The real game is starting, and the opportunity ahead for every one of our people, everybody learning TQ is really immense, which is why cloud TQ is important for all of us. Wow, that is amazing, Paul. There is an immense opportunity there, and I think there's opportunities for all of us. Christian, Pooja, what are you thinking as you've learned all of this and where you're headed in your journey? This was already so much more helpful, and I can't wait to start using all the tools provided to us and continue with the series. Definitely. But what do I do if I want to get more involved with the cloud or if I want to learn more about it? Well, I know I'm going to get both of you, Pooja and Christian on cloud projects really soon, so I'm glad we have the TQ here. But to learn more, what you can do is visit the Go Deeper section of the TQ Cloud Channel. There you're going to find links to our cloud websites and lots of other learning materials. The Accenture TQ home page also has more client stories, which I think are a great way to learn this, you know, hearing how our clients do it and how we do it at clients and also stories that are specific to your business or industry. And here's the address for all of that. And, of course, you should always talk to your friends, colleagues, and your leads about the cloud and the work you're doing. No matter what people do at Accenture, were all cloud ambassadors. So true, so true, and great advice. Well, Paul, thanks so much for being here. It's been great talking to you today and learning more about cloud. I also want to thank Adam and Kishore and Simon for helping us better understand the cloud and Beth with our great client example. It's amazing all the great work that Accenture is doing in this space. And of course, our learners, Pooja and Christian, thank you for joining us. Good luck on the rest of your journey. I hope everyone out there is learning as much as we are. And until next show, that's it from here in the TQHQ. Thanks for joining us, and happy learning.

Accenture's Role in the Cloud

Accenture's Role in the Cloud

So what is Accenture doing to help clients take advantage of the cloud? The short answer is a ton, and all of it. Many of you know that we tested cloud on our own Accenture systems first, and then used what we learned to design cloud solutions for our clients. Our Accenture systems are now 95% of the cloud and leading the way among companies. But it wasn't always that clear. Think back and rewind to the year 2010. We're in New York City convening a meeting with top investors and analysts and we're asked would Accenture embrace the cloud? Could we having built our business and technology leadership on on-premise systems? What was the answer? Just look at us today. We're innovating and leading in the cloud. Now we help clients with all things cloud. We migrate them from legacy systems to the cloud as the leader in Azure, AWS, Google Cloud Platform, Aliyun, and many more. We build new capabilities and business solutions in the cloud, using Software as a Service partners such as Salesforce, Workday, SAP S/4, Oracle Cloud Apps, and many others. We also help our clients in the cloud by managing and securing all aspects of their cloud environments. And more importantly, we

help them develop their cloud strategy and transform their businesses. And yet, only 20% of all workloads are in the cloud, 20%. The opportunity is here, and it's now go time for the cloud. Here are a few examples of where we've helped our clients successfully use the cloud. We helped Radisson in the Americas develop and implement a new digital customer relationship management platform and mobile application on Salesforce, bringing them a new, scalable system that makes it easier for the company's franchises and owners to do business with the global group. We worked with YouView, a UK-based hybrid TV platform that delivers the world content and services. We worked with them to create and deliver one of the world's first next-generation, cloud-based TV platforms using AWS. And here's an example that's beautiful inside and out. L'Oreal, the world's largest cosmetics company, wanted state-of-the-art architecture to optimize costs and create space for innovation and agility. Cloud to the rescue. This was our first major SAP deployment in public cloud. You'll find many more incredible examples of how Accenture has helped other clients right here on the TQ Cloud Channel.

A Cloud First Moment

Cloud First Introduction

-Cloud First, hybrid cloud solutions, edge computing, myNav, and french fries? What do all these things have in common? Well, they're all major updates around cloud, and we're talking with our clients about these things. And now you can join in the conversation on the new TQ Cloud Aftershow. Hey Paul! Welcome back to the virtual TQ HQ. I love that you're cohosting with me again today. But I have to say, when I saw the topic of the show today, I thought I'm pretty sure we already did our TQ Cloud Aftershow. -Yeah, you were a master at cloud the first time around, Sarah, so I'm looking forward to going through it again. But I think we'd all agree a lot's changed since the last time we talked, even though it wasn't that long ago. -Well, that's true. I mean, I pretty much am thinking I don't have anything more to learn about cloud, but we'll see, because as you said, pretty much every aspect of our life has changed since we were together back in, gosh, it's been over a year, back in New York doing our first cloud show, and I guess TQ is no different. We're virtual now, and as they say, let there be change. So, we're going to talk about everything that's happened around cloud since we were together in our last show. So many changes in the industry and within Accenture. -Yeah, and there's a few key messages that I think people will learn through this, Sarah. So you'll learn that there is there is a lot of change that's happened in the cloud. And one thing that's really happened, and the first thing is that there's been a real acceleration in clients moving to the cloud. Cloud is happening faster. We're moving from 20% in the cloud to 80% in the cloud, our clients are, and they're doing it in a compressed period of time. We're going to talk about that, the implications for Accenture. So that's one key message. Covid's really accelerated the move to the cloud. A second thing that I want to make sure people really understand is that we're approaching cloud differently. We've announced Cloud First. Everybody's heard about that. What does that mean? And that's what we're going to go into in this segment today is, talk about Cloud First and why it brings together the full power of

Accenture to deliver on this need to move at speed from our clients. And then the third thing that the team's going to talk about, that we'll talk about a lot today is some new messaging around the cloud. What's multi-cloud? What's hybrid cloud? What does it mean when we talk about the edge, and why is infrastructure more important? These are things that all of us at Accenture need to need to understand a lot better. And I think everybody will come away from this, and, Sarah, I think you'll agree, that the moment is now for us to move in a cloud first fashion as we look to the future. -Okay, okay, you've proved your point, Paul. We have a lot to learn in today's show, and I am really excited about diving into Cloud First because everyone's heard about that. So understanding that a little bit more will be really exciting. And I think we have just the team of people joining us today to help us learn all about that. Joining us today we have Karthik Narain, our Cloud First Global Lead, Kishore Durg, our Cloud First Global Services Lead, Teresa Tung, our Cloud First Chief Technologist, and Ashley Skyrme, our Cloud First Global Strategy and Consulting Lead. Karthik, Kishore, Teresa, Ashley, thank you for joining us, and welcome to our TQ Cloud Aftershow, which is called our Cloud First Moment. -Good to be here. -Delighted to be here. -Awesome. Well, this is going to be our Cloud First Moment. And, Paul, you did a great job teeing up the topic. There is a lot that we need to talk about, and we knew we needed to do another TQ Aftershow because so much has changed. We've gone through one of the biggest disruptions of all time. And as we think about everything that's happening with cloud and with Accenture and really all of the changes that our clients are going through, I think it'll be really interesting to find out what is the biggest thing we're doing. If our clients need to get to this 80% in the cloud, how are we helping them make that move? -There's one whole set of it that we actually talked about on a really recent TQ topic when we talked about our enterprise platforms. We talked about software as a service and what's happening. So as we look at the acceleration to cloud overall, that's one thing that we've already talked about, is the accelerated move to the enterprise platforms, the role of software as a service, and everything happening there. So everybody's mastered that element of TQ already. Today we're talking about this other thread, which is Cloud First and the major step we've taken to make a big investment and rally a lot of our capability across Accenture to help our clients with the problems that they solve. And this is all about our clients. This is just about us moving things around internally. Our clients need to move to the cloud faster to close the digital achievement gap that's widened during Covid and to accelerate the transformation of their businesses. And Cloud First is our way of putting together the capabilities that we can provide to help our clients make this journey more simply and with greater speed. And that's really what Cloud First is all about. And rather than hearing from me, Karthik, maybe you can add a little bit of color around Cloud First and tell us a little bit more about what it means. -Cloud First is the new organization that brings together the cloud capabilities that we always have. Cloud is not a new business that we are entering in. We were leaders in cloud, but there's a reason why we are trying to accelerate that leadership now. And the prime reason why we called this Accenture Cloud First is because we strongly believe that our clients, for them to win and triumph in this current marketplace, they have to think about cloud first in everything and anything that they do. But what is happening now is foundational and fundamental, where enterprises are making an intrinsic transformation of changing everything within their organizations and are thinking about their entire business as though it was born in the cloud. For that kind of a change to happen, it needs to be multidiscipline, and it needs


to be multidimensional within their organization. And the speed and the scale of change will also have to be ginormous. And to do this, adoption plays a key role. That's where Accenture Cloud First comes in. And Accenture Cloud First is this new multidisciplinary organization where we bring all the capabilities that are required for our customers to move to cloud as though they were reborn in the cloud.

Multi-Service Approach

-What do you really mean when you say multidisciplinary or multi-service, and how does it help them really enable the replatforming of their business? -The reason why we call this multi-service is because, like I said, for an enterprise to reimagine their business as though they were reborn in the cloud, they need to change multiple aspects of their business. Their organization structure and design needs to change as though they were a digitally born firm and all their processes operate with a digital mindset. For that, you need the capabilities of strategy and consulting and advisory that Ashley will talk about to come in and design that organization and the strategy to move to cloud. You need core capabilities to re-uplift your your platform into cloud, which requires all our capabilities of applications, infrastructure, data, and so on and so forth. There's also a big talent and cultural change that needs to be undergone by these enterprises, and we need to bring our Cloud First change and Cloud First talent capabilities so that you bring different kind of talent dimension to different parts of the organization. The IT organization needs a different talent overhaul versus the users of the cloud. Services need a different kind of a talent and cultural change. So that is the reason we brought all of this under one group. -Okay, I love it. So I think I'm starting to get it. So this multi-service that you talked about, this idea that we're creating those preconfigured solutions is a great solution, so we bring that all together. We pull from all the parts of Accenture, package that together, and really bring a multi-service approach to our clients. And then, as we've talked about before, they have to replatform, so moving their business to the cloud. And as you said, infrastructure is really the backbone of that business, so they need to think about that. And then, of course, I love when we talk about our people and talent and skills and how we can't forget about helping our clients think about their people and what they need in order to be successful. Because it's not just about technology; we've got to think about the people as well. So this is interesting. So Ashley, as our strategy and consulting lead on the Aftershow, maybe you could talk to us a little bit, what are you seeing in terms of cloud and the importance of this being a multi-service-led movement within Accenture? -Our clients are asking us for different things, so we also need to show up differently. And when I think about, while all those industries were impacted differently, one thing is constant, they're all changing, and it's all pretty disruptive. So if we think about travel, as an example, one of our large clients is figuring out how to get back and fight for the leisure or local market, and they're competing with with companies like Airbnb. Or we think about kind of life sciences, this momentous occasion, where a company like Motiva can go toe to toe with J&J or Pfizer. Or we think about one of our clients' 50 billion-plus food distribution, half of their business is local restaurants, and what those local restaurants went through to the pandemic to be able to meet their customer needs. These are like game-changing opportunities for their businesses. And the one thing that they are talking about is they are talking about cloud. They don't

always name it as cloud, but they talk about it as technology. And so oftentimes, what they come to us and say is how can I meet my customers' needs across every channel? How do I monetize loyalty? How do I offer new products based on what our customers want? Or the big one in life sciences was how can my supply chain predict where those products need to be? So these are the kind of questions that, they're coming to us, and cloud is a prerequisite to all of those. I think another set of questions that we hear is around the technology. So oftentimes my clients say to me, they don't say exactly I need to get to cloud, but they say often my technology is not flexible, we were not able to adapt, we're having security challenges. So to me, these are all the signals that our clients are telling us they need something different. And before I move on, the reality check for many of them is 70% of all their spending is nondiscretionary, which means they don't have a lot of options, and so they are looking to us to show up differently. They want us to think about the applied business value, they want us to think about the security and the scalability and the technology challenges of their legacy, and they also want us to think about speed and cost because many of our clients have constraints. So when I think about all of that, that's calling us as Accenture to think differently. So then I put my Cloud First lens on. And, Karthik, you said it, which is it isn't just like putting a dose of strategy and sprinkling a little consulting on. This is truly rethinking about the proposition that we create for a client, which means we have to put all of these things together into a repeatable approach. And so what do I mean by that? It means our clients want us to sign up for the outcome. They want us to be able to define the value, pull it through, know their business, and deliver like no-kidding technology execution at scale, which requires us to think differently. So that would be my take on multi-service.

-Ashely, just adding a point on what you just said, I think you made the point very well, there's some research we just did that everybody has access to that talks about the fact that 67%, two-thirds of companies aren't getting the value of their cloud investments right now. Two-thirds aren't getting the value. That's why everything that you just talked about, Ashley, is so important, because this one Accenture approach, the multi-service approach, gives the clients the industry, depth, and insight, the ability to make the change and transformation happen, the talent, ability, to help them bring their people along in the journey, the experience layers to generate these new experiences for their workforce and their consumers and their business partners, which is really what they're trying to do, and bring that together with all the technology and everything else we do. So I just wanted to emphasize that point, that this is really important. This is what our clients need, and they're not getting the value without this kind of approach we bring, so it's really differentiating. And that's also why we're investing a lot of money, putting a lot of money behind this transition. We're investing \$3 billion. You may have seen this in our announcement. You've heard us talk about \$3 billion of investment in these capabilities to help accelerate our clients' transformation, to fill some of the gaps we have and make sure we got everything we need to deliver on these outcomes that Ashely just talked about. So that's a big part of the formula for us, is bringing together the multi-service, bringing together the capabilities, approaching the replatforming, and putting the investment behind this so we can do this faster and be in a better position than any of our competitors to help our clients deliver on these outcomes. -Yeah, I love that. And Paul, I'm glad you mentioned that press release, because I remember seeing that and thinking, wow, that is a lot of money to invest. But I think that really reflects that we

 really believe in this and we know it's something that our clients need and we know it's important for them to

move to the cloud, and this is where we can really make a difference for them. -That's right. I'll just make the point, Karthik use the word ginormous earlier, I like that word a lot. And you might say that's a ginormous investment in the cloud. Accenture, nobody in our industry has announced an investment that started with a billion-dollar investment, so this is a big deal and it speaks to the important moment ahead of us and the, and again, the conviction and confidence we have that this is what our clients need to move to the next step.

Client Example

-Maybe we can talk a little bit more about some client examples, and Teresa, maybe we could get you to join us here and talk to us a little bit about the work we're doing with Takeda, because I think that really epitomizes what a cloud-first transformation entails and also a great example of where we're actually impacting people's lives. Could you tell us a little bit about that? -Yeah, sure, Sarah, happy to. Takeda's a global pharmaceutical leader and where we're working with one of our amazing cloud partners, Amazon Web Services, or AWS, and we're helping Takeda accomplish a massive transformation and a cloud adoption. And it really sets the stage for Takeda to continue leading in their business with research and development, clinical trials, patient care. And it's a true example of multidisciplinary, multi-services, because we're helping Takeda with a whole company transformation. And we're bringing together innovative technologies like artificial intelligence, Internet of Things, applying automation, virtualization, advanced security, doing this all ethically and responsibly. We're even helping Takeda new skill their workforce to address all these changes. In particular, Takeda's chief digital information officer has said that our ability to help with the talent transformation is one of the reasons why Takeda wanted to work with us. And so you can see how Accenture needs to bring the best of our business to help big Takeda with their transformation. And so let me give you four key examples of how we're helping Takeda. Starting with their technology and architecture, we're helping Takeda move to a cloud-based, data-driven approach that will be more secure and more agile than a data center-based approach. Second, helping Takeda become data-driven with a data and analytics platform at its core. Third, that talent transformation we keep talking about, helping Takeda upskill their people to become digital literate, become the workforce they really need in the future. And then finally, now that they have this great platform, how do you drive innovation and insight so that Takeda can continue improving their patient lives and developing therapies that save lives? So you can see how Accenture needs to bring our one Accenture multi-services approach to help our clients like Takeda think holistically about their cloud transformations.

Types of Cloud

-Different forms of the cloud, so there's public, there's private, and there's hybrid, is that right? -I'll explain it in simple terms. A private cloud is exactly how it sounds. It's a cloud model, essentially, where it's implemented or a private service owned and operated by the business itself, and it is exclusively for that business. However, the public cloud is exactly the opposite of private. What we're talking here is, the whole cloud environment is fully

managed, owned, and operated by the cloud service providers. I'm sure all of you have heard about the MAAGs, Microsoft, Amazon, Alibaba, and Google. Of course, there are obviously a lot of companies which provide this service, but these are the big four that we are aware of. Now public clouds serve many businesses. Although a lot of the data stays private, the service they extend to are for many businesses. There's another variation to this, which is the multi-cloud. In multi-cloud, what we refer to as businesses using more than one public cloud from different service providers for their businesses, and this is a type of, I would say, a hybrid cloud. Now, let me define, I've used another term for hybrid cloud. What is hybrid cloud? Hybrid cloud means a business will use a cloud model that mixes both the private that I just defined, as well as public, and, of course, multiple service providers. Now, a lot of the clients that Ashley was talking about, Karthik and Paul were talking about, use a mix of hybrid and multi-cloud approaches because it essentially gives businesses the best of both worlds. What do we mean by best of both worlds? A lot of the businesses want to have greater benefits from the public cloud. However, they also really want to have the flexibility to retain some element of control. So they can choose the best of, I would say, the multi-cloud service providers, as well as some of the private cloud elements. So when we mix public and private, this basically gives businesses ultimate control over a lot of the critical data that the organizations want to kind of maintain with the super control or supreme control over them and also maximizing the benefits of using some of the features and functionalities of the public cloud that the public cloud providers give us. Now, let me tell you in practical terms how does it work. I've used a lot of terminology here. Let's take a company, let's take a business. Let's say that they choose Amazon Web Services because they provide, I would say, the best of cloud-native services in terms of developing cool new apps and then getting them quickly to the market. But however, the same client decides that, look, I would like to choose Microsoft as their client collaboration tool because they realize that Microsoft has the best collaboration tool around, Teams. So then finally, the same business may decide that, as a client they will decide that they want to implement a private cloud to store a lot of the customer data which is very confidential, and they want to keep that secret ingredient, as we call it, for their business. -Okay, okay, that makes sense. I love that example because it really brings it to life. So clients can think about a hybrid cloud approach, and they can get the benefits from both public service providers and multiple service providers but then also maintain the security control over the things they want to keep private with the private cloud. So that makes sense because they get the best of both worlds, and they get to select the things that work well for them. -Yeah, that's right, Sarah, and I think Kishore just gave a great explanation of the landscape. So it gives our clients some flexibility over what technologies, what providers to work with and some flexibility in how to work with different providers. And as you'll hear in a little bit, hybrid is also very important as we talk about edge computing and the extension of the cloud to the edge, which is where things are headed, in another key message that we'll get into in a little bit.

myNav Update

-So when we talk about this, though, with hybrid and multi-cloud service providers, it does seem to get a little bit complicated, and I am digging back in my memory again from our first cloud aftershow, and I think this is where

myNav came in as a way to help our clients choose the best cloud solution for their needs. So Kishore, did I get that right? -Yes, Sarah, you're absolutely, correctly right. This is exactly what myNav is. I explained to you the choices. Clients can use private, public. What do I keep within the databases that I have, what do I make invisible to our clients? So myNav is all about navigating this complexity for our cloud. And we've been steadily evolving myNav since the last cloud aftershow. I want to talk to you a little bit about what are the great enhancements and improvements that were made from the last time. As a reminder, I just want to kind of share ____ myNav is actually a proprietary tool which was developed to support the full spectrum of cloud solutioning. What do we mean by that? The client wants to understand how do I discover my existing landscape? They want to assess where I am right now, they want to understand what does my architecture look in the cloud? How do I migrate to the cloud? How do I run my operations in the cloud? But as we were talking to our clients, we also realized there's a lot of talent transformation that has to take place. So there's a talent transformation element, as well as change element, as Paul was saying. Two-thirds of our clients to realize full value of cloud. So we have gotten a lot of those elements into myNav. Now it also helps our clients obviously get the right cloud solution because the businesses and our clients are investing millions of dollars, and we want to make sure that the solution that we provide for our clients, they are very confident in terms of the solution that we have, as well as the cloud investments that they make. One of the things that I'm absolutely excited about is a new module that we're bringing in, and this is the sovereign cloud advisor. As you may be aware, particularly in Europe as well as in North America, when we create a cloud architecture, there's a lot of local data regulations and compliance that you need to adhere to because wherever your landing zone goes, we need to make sure that our clients understand the implication of global data sovereignty laws and ultimately create a cloud architecture that complies with a lot of these data sovereignty regulations, the element of green cloud, and a lot of net new modules that have come in. And that is coming through what we call as myNav 2.0. And we're working very closely in terms of, as we call as one Accenture. And Paul and Karthik say that we're working very closely with Ashley from S&C, and she'll help explain what are the new modules that are out there. -Thanks, Kishore. It's been---so first of all, this is kind of a high passion area for some of the S&C folks, because first of all, I think when we think about pairing up with Kishore and his team, what we've been able to do with the multi-service pods to create myNav 2.0, is pretty exciting. From an S&C standpoint, again, we used to have our tradecraft, but it always wasn't embedded entirely in a tool, and now we're doing that more and more. Some of the things that we looked at with Kishore and the team, if you think about it, having an industry myNav module. The power of the Accenture people and how many people are thinking about this and getting it into one place so that it's reusable not just within that industry, but some of the learnings across industry is so important, so that's a big focus area for us. Kishore talked about the talent and the org and the change advisor module. There's a lot of exciting stuff in those modules, particularly if I think about the talent adviser. You can profile, predict, create, all those different learning paths for our client in that module. There's a couple that we're also thinking about going forward around green cloud. So if we think about our clients really understanding how their cloud journey is going to also give them sustainability points and thinking about carbon credits, that's going to be embedded in there. And then finally, a big one is the economic model. In the past, we would look at, well, what's the cost to get

to cloud, and we'd be able to model that pretty quickly. But we need to be able to show what value the cloud's going to have on the business, so we're creating value trees that will live in myNav. The one thing I wanted to say about this is it is a live learning lab. The whole point of TQ is about getting our people embedded in this thinking, and if you think about it, all of our people can go in and use these modules. So it is a live learning lab, not just of your own tradecraft, but, for example, the technical teams could have a better understanding of what's happening in the talent module. It makes us much more in tune to what Accenture does across the board. And then finally, the reason why we're doing this is because I think about what we can do with these tools, what took us 10 weeks now takes us 4 or 3. Our whole goal is to use this to accelerate our clients' journey. So we're super excited Kishore to be a part of the myNav 2.0 team, and it only goes up from here. -Wow, that is really exciting and pretty amazing the amount of change that we've implemented in myNav in the last little while, it's a great testament of how we continue to evolve and innovate with our own proprietary tools. And I love the inclusion here of the connection to sustainability and compliance with local laws, and always near and dear to my heart is thinking about talent and skilling. And, Ashley, the idea of the tech teams learning about talent and skilling and vice versa, I mean a great example of one Accenture. I feel like myNav is definitely going to be a game changer. It's something that will differentiate us and help our clients in a tremendous way. And I love that we continue to think about ensuring that all of our people have access to it, making sure that we're all continuing to learn, which is what TQ is all about, really. So that's amazing. -I couldn't agree more, Sarah. And I'd encourage everyone to just find out more about myNav. And the other thing that's, I think, illustrated by all the points we just talked about is, this really is about 360-degree value, and myNav's our tool of delivering 360-degree value to our clients powered by the cloud. You think about the data sovereignty, solving for very specific challenges that clients face based on the countries they operate in, think about talent modules, helping with the new skilling, upskilling our people. Think about the people, think about the sustainability. We're helping our clients deliver the business value and deliver the rest of the 360-degree value they need to think about, which is why I think this is super exciting and so well tied into the overall strategy we're driving. And the other exciting thing is that this is out there in scale now, as Ashley was just talking about, used by a lot of our teams, over 200 client teams using it today. And I think it'd be great if we maybe just roll the video here and show people a little bit more about myNav and how it works. -Okay, let's do it. -A little more than a year ago, we introduced myNav to help clients make the right cloud choices for their business faster and with confidence. Now we're in an era of compressed transformation, and we're expanding myNav to support all aspects of a cloud-first strategy. Our first release of myNav focused on taking the guesswork out of cloud migration by discovering, designing, and simulating a complete solution at scale. Clients can make confident cloud decisions, lowering risk, cost, and the time required to deliver value from day one of their cloud journey. For a North American insurance company, myNav generated multiple customized business cases in less than a quarter of the time and 83% faster than before. Analysts agree: myNav is a hit. It enhances Accenture's cloud offerings to help customers navigate the cloud landscape more effectively. We continue to add new features. This past year we added support for more platforms, data discovery, more business cases, and sustainability. For example, we worked with a large automobile company in Europe and found carbon savings of \$33 million per year across 157 data centers. And later this year, myNav's

capabilities will include industry cloud to support cloud advisory discussions. We're also adding a talent adviser and a change advisor to enable our clients and their employees to implement the culture and operating model changes needed to drive more value in the cloud. At one year old, myNav has grown to be a huge asset for our clients' journeys to cloud. Happy birthday, myNav! -Okay, well, I think everyone's got one takeaway already from this show. If you aren't familiar with myNav, you need to go out and learn more about it. So take a look at the myNav website and really become familiar with it.

Edge and Cloud

I want to go back to a topic we were talking about earlier, Karthik, as we think about the continuum. So you mentioned that there are more capabilities now available to businesses when they're on the cloud. So what do you really mean by that? -So Sarah, when we think about cloud, it's easy for people to resonate that it provides this immense capability to provide cost elasticity. It provides capability for our organizations to innovate faster, and also it processes so much data that it could provide a lot of insights. But there's also, in everybody's mind, there's a picture that cloud is somebody else's data center, that it's all connected and sitting in a physical big building and in locations like that. But Gartner is also predicting that 80% of the data over the next 5 years is going to be generated and consumed closer to where the users and the devices are, and there needs to be an ability to process that data faster and provide more experience closer to where the consumers or the creators of this data is. Enter edge computing. Paul talked about it. It's becoming an extremely important area. And this is not a Gartner prediction but a Karthik prediction that the growth in edge is going to be faster than every other place. It's because of the proliferation of devices, and every device is going to move from being an unintelligent device to a more intelligent device. And when I say unintelligent to intelligent, just means it has power and connectivity. If you have power and connectivity, any device becomes an intelligent device and there's going to be a lot more that's going to happen here, and edge is going to provide that kind of experience. That's also going to converge the physical and digital worlds much better than how it is happening through browsers and mobile phones and so on and so forth. So that's where the future is in my opinion. -Okay, I think we need to explore the edge computing a little bit more because I've heard it, but I don't think I could explain it. -So Teresa, could you talk to us a little bit more about this concept? -Yeah, let me start by giving an example of what edge is and what it can do. So I heard a rumor that Paul likes french fries? -Yeah, you've been watching carefully, or at least checking out my dietary patterns. -It's creepy. I have not been checking the dietary patterns. I have been watching the aftershows. So now that I have your attention, let me explain edge computing using french fries. -Well, I have to say, Teresa, you have my attention now too, because now I'm hungry. So I definitely want to hear this story. -Okay, great. So when people talk about edge computing, you often hear about self-driving cars or autonomous robots, but my favorite example comes from a fast-food chain. Every restaurant location runs in-store analytics on its smart kitchen equipment data to make decisions like exactly when to put the fries in the fryers for the perfect crispness. Now, the company can run forecasts on sales transactional data in the cloud, and they can predict how many fries should be cooked per minute per day. But it's at the edge where each

store micro-adjusts that initial prediction based off the on-site, real-time data from their smart kitchen point-of-sale systems, and edge computing is what's making sure that everyone's fries are crispy, whether it's a slow afternoon or there's a crush of families from a little league game. Delivering services quickly and with a personal touch; that's what edge computing can do. Generally, there are three scenarios where you would apply edge, where it doesn't make sense to send the data into the cloud for processing. First scenario, when there's limited bandwidth or no internet connectivity, like when you're on an oil rig in the middle of the ocean. Second, when you can't move the data offsite, maybe the data gravity, the size is too big, or there's security or privacy concerns or regulation. Third is just when you have to make a split-second decision that just has to work. With robotic surgery. In that case there's no risk, there's no latency that makes it worthwhile to move it with a round-trip to cloud. So these are just some scenarios. I'm sure we'll see many more exciting edge cases that are highly interactive, highly personalized. So I'm yet to be surprised. But it'll be really hard to talk the crispy fries use case as my favorite. -Yeah, I mean, I agree. I thought that was going to be a real stretch to tie edge computing to crispy fries, but that actually made sense, Teresa. So, to hear you talk about this, it seems like there could be a lot of scenarios that would fit into those reasons of why you'd use edge. So do you think edge computing's going to eventually replace cloud computing? -Oh, no, definitely not. Edge computing has real value and so does cloud computing. We're going to need both, and we're going to need them to work together. Think about cloud and edge sitting on a new computing continuum, where cloud sits at the center, and then edge complements it as it radiates out along the ends of the network. We'll continue to need cloud because it has better cost and performance. So this is where you're going to create your apps and your AI, because cloud will have better scale and agility that edge can never offer. In the same way, edge is going to unlock new unique workloads. It's going to have access to unique data. It's going to be able to act on that data immediately. And so, in fact, edge is going to drive more cloud than ever, because, again, the apps and the AI that run on the edge, that's developed in the cloud. Cloud is where you centralize the data so that you can make those AI and apps to begin with. That is then pushed back to the edge on site with the customer that generates a great experience sharing more data that needs to be fed back to the cloud to improve that experience. It's a virtuous cycle. -Okay, I love it. And that totally makes sense. And so interesting how they work together. So cloud is really enabling edge, and edge is continuing to force us to use cloud. So, Karthik, I think the prediction that you had is going to possibly come true. So we can use cloud to bring more capabilities to the business.

Key Takeaways

-I have to say, I didn't think I had much to learn about cloud, but this has been an incredibly enlightening show, and I think we're probably at the end of time now. We're going to wrap up our TQ Cloud First Moment Aftershow. -Wait a minute, Sarah. Aren't we going to do one of our Aftershow quizzes? Well, I mean Paul, we've already done one of these shows. I didn't really think we needed to do another quiz. Plus, this is a pretty important topic. -Yeah, but I have all sorts of fun facts to share. Like, did you know that the public cloud market is going to double in the next couple of years? -Wow, I didn't know that. And that is a lot, considering that today spend is roughly... -Uh,

don't tell me. Today's market is about 250 billion, and if you think about that doubling in a couple years, that's a massive opportunity for us. And did you know from our research that one of the most frequently cited reasons that CEO'S cite for the lack of cloud adoption is the lack of the appropriate talent, which is, again, where we come in. -I mean, I could've maybe predicted that one, because I think people and skills are important, and that's why we're equipping our people with deeper cloud skills. -Exactly. And I'm going to hold back the last fun fact for you, which is how many Os are in the word ginormous. -Well, I mean, Paul, you were ready for a trivia game. I am sorry I didn't deliver. But I promise, the next time you join me on an aftershow, I will have a game for us to play. -Fantastic. -Well, thanks, Paul, for being a fantastic co-host, and all of our guests, Karthik, Kishore, Teresa, and Ashley, a tremendous show. But there is one thing that we always do on an aftershow, and I didn't give this part up. We like to end with one takeaway moment that all of you would like to leave the people that are watching the show with. So, Kishore, let's start with you. What would be the key takeaway you would want everyone to leave today with? -If you hear through this session, you heard private, public, edge, there's a lot of change that's happening. I would say changes exponentially happening in terms of technologies that our clients are using and also what you as a person need to have as skills. The cloud moment is right now. I think it's a tremendous opportunity for you to influence and kind of change how businesses are run. And that is something that I would take away from this, that the opportunity, the ability to learn and ability to make phenomenal difference for our clients is now, and Cloud First is the right way to do it. -Great. An opportunity for all of us to capitalize on, and there's always more to learn. Thank you, Kishore. All right, Teresa, what's your takeaway besides crispy french fries? -Well, Cloud First is going to help our clients with cloud transformations that are going to extend along this new continuum from cloud to edge. And to help that, we're going to need to bring a multi-services approach that will be able to imagine these new experiences that are going to be more interactive and more personalized than ever. -Love it, bringing it all together. And Ashley, how about you? -So just listening to everybody, my takeaway would be there's room for everybody. And this is a really exciting learning moment for Accenture too in Cloud First. So if you're sitting there wondering whether you should get involved in cloud learning or Cloud First, I would say jump in. There is so much training that is coming out soon that I think there's something for everybody in cloud. -Great. And Karthik, your takeaway? -Yeah. My takeaway is that cloud is probably the most disruptive technology or capability of our lifetime. -All right, Paul, since you came up with the name Cloud First, what would be your key takeaway? I don't think I can improve on the takeaways from my other colleagues here. I'd just say Cloud is our future, and Cloud is your future, for everybody listening. So Karthik and I were joking when we were talking last week about how much more we both have to learn about cloud and how we're learning every day, so don't be afraid to learn. That's what this program and others are about. We're all learning, we're going to continue to learn. It is our future. Accenture is the leader today. We're going to be the leader. This is going to be an exciting business for us going forward as we continue to lead. And this is a great career opportunity for everybody at Accenture, those in Cloud First and across Accenture to really look at how you build your career in this exciting future of ginormous opportunity ahead of us. -It is exciting. And Paul and Karthik are learning right along with us, so that is even exciting. So I hope everyone took something away today. We had

3 so much information packed into this show. And cloud is not going anywhere, and it seems to just be getting

hotter. So feel confident that you can talk about cloud with your teams and your clients. And even better yet, start to think about how you can put all these principles and mindsets to work for your area of the business. So, everyone knows if you're looking to learn more, go to the TQ homepage. You can find client stories, there's a cloud study guide, and lots of links to more cloud learning. So I hope you'll tune in again soon for our next topic. I mean, it might be cloud again. You never know. But until then, keep growing your TQ to help you power change.

Cloud In Review

What Is Cloud?

What is cloud? Cloud allows businesses to share, share servers, share networks, share apps and development tools, as well as data storage. Businesses use the cloud to quickly get new ideas up and running, protect their data, and boost the creation of new products and services. There's not one cloud, and it isn't located in just one place. The cloud can be accessed on any device connected to the internet. There are all sorts of clouds run by all sorts of providers. Some clouds are public, like when a third party, such as Microsoft, AWS, or Google hosts your resources on their servers. Others are private. And still others might be shared by a small community. Many businesses use a blend of cloud environments to limit their risk and increase their capability. These are known as hybrid clouds. When hybrid cloud users buy services from multiple public cloud providers, they're using a multi-cloud approach that lets them operate in the cloud strategically. That's cloud!

What Does Cloud Do?

What does cloud do? Cloud is an on-demand self service environment. This allows businesses quick access to services without manual setup. Cloud uses shared resource pooling. This means a single application can be shared among many users, yet uniquely customized without requiring each user to have their own copy. Cloud has rapid elasticity. Companies can scale their usage levels up or down as needed. Cloud is a measured service. Cloud services are often pay as you go. In other words, customers only pay for what they use. Cloud has internet access. Because users of public clouds can plug into their data and applications through the internet, they have 24/7 access anywhere from any device. Cloud is reliable. Cloud is an optimized platform, making sure you don't have to experience an error, like this. Cloud is secure. Best security practices from hyperscalers like Google, Microsoft, Amazon, and Alibaba can offer bleeding edge security that a single enterprise could never afford to maintain. These seven characteristics allow businesses to be more agile, work with greater flexibility, and innovate quicker. Thanks Cloud!

Why Does Cloud Matter?



Why does cloud matter? We've got four reasons. Number one, it's fast. Cloud offers the flexibility to quickly adjust the amount of computing resources a business needs, while paying only for what it uses. Because the cost and time it takes to develop and deploy new applications is lower. It allows faster speed to market. Number two, it enables innovation. Cloud provides affordable, unrestricted access to cutting-edge technologies and capabilities. This gives businesses capabilities that would normally be out of reach, reducing their barriers to entry. Number three, you choose the scale. Cloud lets businesses scale up or down. When there are people around the world that need access to data and apps, the cloud provides companies with the tools to do business globally. Number four, it'll save you money. Building a proprietary IT infrastructure and staffing it is incredibly expensive, and a business might not always use it fully. With an optimized cloud environment, a company can focus on its core business and pay only for the computing resources that it uses. There you have it, four reasons cloud matters.

How Is Cloud Applied?

How is cloud applied? Cloud is applied in three ways, infrastructure as a service, or IaaS, platform as a service, or PaaS, and software as a service, or SaaS. Let's start with Infrastructure as a service. In this model, a company rents servers and data storage. They migrate everything to the cloud so they can stop paying to maintain their own infrastructure and focus on new value-added activities. The next model is platform as a service. In this model, the business accesses a predefined environment for software development that can be used to build, test, and run its own applications. The developers don't need to start from scratch. Then we have software as a service. In this case, the organization accesses a software application that is hosted on a remote server through a more affordable pay-as-you go model. The SaaS third-party provider manages compatible access, updates, availability, and performance. How a business applies cloud computing is its own decision, but no matter what level of service it needs, there is a solution, thanks to cloud.

How Does Cloud Work?

How does cloud work? You might think that migrating to the cloud is simple. Just copy and paste your files onto the cloud and voila. And to be fair, there is some truth to that. A simple cloud migration can often happen quickly for 70% to 80% of workloads, but the remaining 20% to 30% is typically considered critical but complex and requires the business to determine the optimal path to the cloud. So before moving workloads, a business asks critical questions about how it can best take advantage of cloud technology. Depending on the answers, most workloads are simple. They can be re-hosted, retired, or replatformed. But on top of this, the business can now identify the critical and complex workloads that may need to be revised, redesigned, or replaced. The goal is to have a set of applications that are more efficient, resilient, and add value to the business. Finally, once the migration is done, a business doesn't just stop. They must evolve to continually enhance and build new workloads that unleash the power of the cloud. A business never really finishes its migration. It is always adapting, optimizing, and innovating in the cloud.

What Is Accenture's Role with Cloud?

What is Accenture's role with cloud? Most businesses are at least partially in the cloud these days. Despite that, almost two-thirds of those businesses aren't achieving the value they expected from the cloud. That's where Accenture comes in. Our role is to help our clients do three things. Number one, we help our clients realize the value of the cloud. We show them how to use the cloud to do more than reduce costs. We help them unleash new levels of innovation, analyze data for greater intelligence, and drive enhanced business performance. Number two, we help clients migrate to the cloud purposefully and with a clear strategy. We help them determine the best fit for their business requirements and assist them in their migrations using our accelerate methodology. And number three, we provide management and security solutions that help businesses operate safely in the cloud. We consider their risks and offer ways to protect and maximize their investment in the cloud with cybersecurity services. Accenture brings deep industry expertise and a full spectrum of cloud capabilities that can help any client, no matter where they are in their cloud journey.

How Does Cloud Combine with Other Technologies?

How does cloud work with other technologies? The cloud accelerates emerging technologies like artificial intelligence and the Internet of Things. Cloud environments provide the vast scalable data sets that machines use to analyze and learn. Major cloud providers are evolving their platforms to add AI capabilities so they can offer competitive AI to their customers. The Internet of Things, or IoT, generates a huge amount of data, and that puts a tremendous strain on the internet infrastructure. Cloud computing provides the scale, flexibility, and remote processing power needed to transport and manage all that data. AI and IoT are the most widely integrated cloud technologies, but all sorts of technology can be combined with the cloud to unlock even greater potential.

TQ Cloud Wrap Up

TQ Cloud Wrap Up

Wasn't that a great way to learn about the cloud? It's clear, the cloud is more than just another technology. It's one of the most amazing innovations of our time, and it has so much potential. I hope you feel more confident sparking cloud conversations and telling our success stories. Do you want more? Just visit the Go Deeper section and make sure to tune in again soon. We'll be adding more resources so you can increase your Accenture TQ, and until then, happy learning.





Course author



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Course info

Level	Beginner
Rating	★★★★☆ (1317)
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