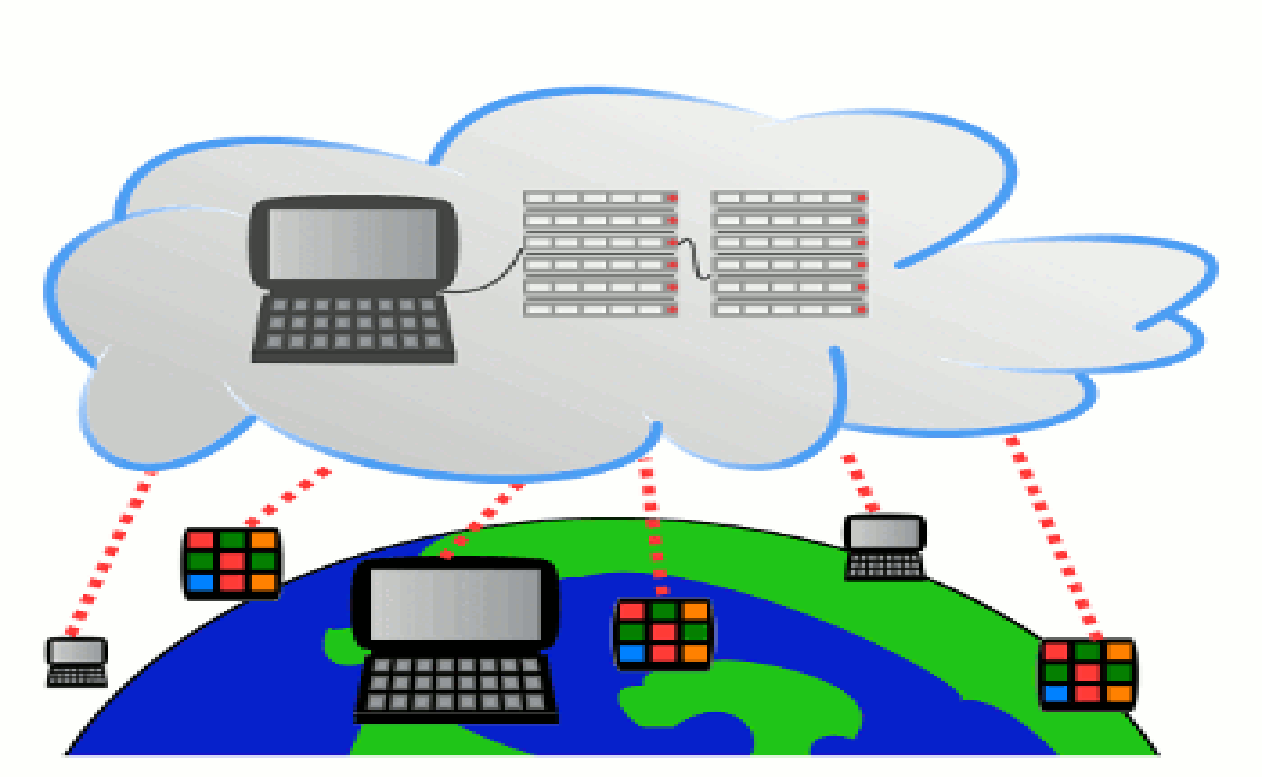
- **REPORT: CLOUD COMPUTING**



What is cloud computing?

Cloud computing means that instead of all the computer hardware and software you're using sitting on your desktop, or somewhere inside your company's network it's provided for you *as a service* by another company and accessed over the Internet usually in a completely seamless way. Exactly where the hardware and software is located and how it all works doesn't matter to you, the user—it's just somewhere up in the nebulous "cloud" that the Internet represents.

Cloud computing is a buzzword that means different things to different people. For some, it's just another way of describing IT (information technology) "outsourcing"; others use it to mean any computing service provided over the Internet or a similar network; and some define it as any bought-in computer service you use that sits outside your firewall. However we define cloud

computing, there's no doubt it makes most sense when we stop talking about abstract definitions and look at some simple, real examples—so let's do just that.

Simple examples of cloud computing

Most of us use cloud computing all day long without realizing it. When you sit at your PC and type a query into Google, the computer on your desk isn't playing much part in finding the answers you need: it's no more than a messenger. The words you type are swiftly shuttled over the Net to one of Google's hundreds of thousands of clustered PC's which dig out your results and send them promptly back to you. When you do a Google search, the real work in finding your answers might be done by a computer sitting in California, Dublin, Tokyo, or Beijing; you don't know—and most likely you don't care!

The same applies to Web-based email. Once upon a time, email was something you could only send and receive using a program running on your PC (sometimes called a mail client). But then Web-based services such as Hotmail came along and carried email off into the cloud. Now we're all used to the idea that emails can be stored and processed through a server in some remote part of the world, easily accessible from a Web browser, wherever we happen to be. Pushing email off into the cloud makes it supremely convenient for busy people, constantly on the move.

Preparing documents over the Net is a newer example of cloud computing. Simply log on to a web-based service such as Google Documents and you can create a document, spreadsheet, presentation, or whatever you like using Web-based software. Instead of typing your words into a program like Microsoft Word or OpenOffice, running on your computer, you're using similar software running on a PC at one of Google's world-wide data centers. Like an email drafted on Hotmail, the document you produce is stored remotely, on a Web server, so you can access it from any Internet-connected computer, anywhere in the world, any time you like. Do you know where it's stored? No! Do you care where it's stored? Again, no! Using a Web-based service like this means you're "contracting out" or "outsourcing" some of your computing needs to a company such as Google: they pay the cost of developing the software and keeping it up-to-date and they earn back the money to do this through advertising and other paid-for services.

\What makes cloud computing different?

It's managed

Most importantly, the service you use is provided by someone else and managed on your behalf. If you're using Google Documents, you don't have to worry about buying umpteen licenses for word-processing software or keeping them up-to-date. Nor do you have to worry about viruses that might affect your computer or about backing up the files you create. Google does all that for you. One basic principle of cloud computing is that you no longer need to worry how the service you're buying is provided: with Web-based services, you simply concentrate on whatever your job is and leave the problem of providing dependable computing to someone else.

It's "on-demand"

Cloud services are available on-demand and often bought on a "pay-as-you go" or subscription basis. So you typically buy cloud computing the same way you'd buy electricity, telephone services, or Internet access from a utility company. Sometimes cloud computing is free or paid-for in other ways (Hotmail is subsidized by advertising, for example). Just like electricity, you can buy as much or as little of a cloud computing service as you need from one day to the next. That's great if your needs vary unpredictably: it means you don't have to buy your own gigantic computer system and risk have it sitting there doing nothing.

It's public or private

Now we all have PCs on our desks, we're used to having complete control over our computer systems—and complete responsibility for them as well. Cloud computing changes all that. It comes in two basic flavors, public and private, which are the cloud equivalents of the Internet and Intranets. Web-based email and free services like the ones Google provides are the most familiar examples of public clouds. The world's biggest online retailer, Amazon, became the world's largest provider of public cloud computing in early 2006. When it found it was using only a fraction of its huge, global, computing power, it started renting out its spare capacity over the Net through a new entity called Amazon Web Services (AWS). Private cloud computing works in much the same way but you access the resources you use through secure network connections, much like an Intranet. Companies such as

Amazon also let you use their publicly accessible cloud to make your own secure private cloud, known as a Virtual Private Cloud (VPC), using virtual private network (VPN) connections.

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Types of cloud computing

IT people talk about three different kinds of cloud computing, where different services are being provided for you. Note that there's a certain amount of vagueness about how these things are defined and some overlap between them.

Infrastructure as a Service (IaaS) means you're buying access to raw computing hardware over the Net, such as servers or storage. Since you buy what you need and pay-as-you-go, this is often referred to as utility computing. Ordinary web hosting is a simple example of IaaS: you pay a monthly subscription or a per-megabyte/gigabyte fee to have a hosting company serve up files for your website from their servers.

Software as a Service (SaaS) means you use a complete application running on someone else's system. Web-based email and Google Documents are perhaps the best-known examples. Zoho is another well-known SaaS provider offering a variety of office applications online.

Platform as a Service (PaaS) means you develop applications using Web-based tools so they run on systems software and hardware provided by another company. So, for example, you might develop your own ecommerce website but have the whole thing, including the shopping cart, checkout, and payment mechanism running on a merchant's server. App Cloud (from salesforce.com) and the Google App Engine are examples of PaaS.

Advantages of cloud computing

The pros of cloud computing are obvious and compelling. If your business is selling books or repairing shoes, why get involved in the nitty gritty of buying and maintaining a complex computer system? If you run an insurance office, do you really want your sales agents wasting time running anti-virus software, upgrading word-processors, or worrying about hard-drive crashes? Do you

really want them cluttering your expensive computers with their personal emails, illegally shared MP3 files, and naughty YouTube videos—when you could leave that responsibility to someone else? Cloud computing allows you to buy in only the services you want, when you want them, cutting the upfront capital costs of computers and peripherals. You avoid equipment going out of date and other familiar IT problems like ensuring system security and reliability. You can add extra services (or take them away) at a moment's notice as your business needs change. It's really quick and easy to add new applications or services to your business without waiting weeks or months for the new computer (and its software) to arrive.

Amazon Web Services

- AWS sees 2019 as an investment year, as it ramps its technology buildout as well as add sales personnel. Amazon didn't quantify the higher investment, but said it would update throughout the year.

  On a conference call with analysts, CFO Brian Olsavsky said 2018 was a lighter than expected year for capital expenditures. "AWS maintained a very strong growth rate and continued to deliver for customers," he said. "2018 was about banking the efficiencies of investments in people, warehouses, infrastructure that we had put in place in 2016 and '17."

  The cloud provider is the leader in infrastructure-as-a-service and moving up the stack to everything from the Internet of Things to artificial intelligence, augmented reality, and analytics. AWS is far more than an IaaS platform these days. AWS grew 45 percent in the fourth quarter -- a clip that has been stable for the last year.

  When it comes to developers and ecosystem, AWS is hard to top. The company has a wide range of partners (VMware, C3, and SAP) and developers growing the ecosystem. AWS is typically the first beachhead for enterprise players before they expand to a multi-cloud approach.

  The big question is how far AWS can extend its reach. AWS can be a threat to Oracle on databases as well as a bevy of other companies. Via its VMware partnership, AWS also has a strong hybrid cloud strategy and can meet enterprise needs multiple ways.

  AWS' strategy was evident at its re:Invent conference. The show featured a barrage of services, new products, and developer goodies that was hard to track. Artificial intelligence is a key area of growth and a core sales pitch for AWS as it becomes a machine learning platform. According to 2nd Watch, AWS customers are going for these high-growth areas and seeing the cloud provider as a key cog for their machine learning and digital transformation efforts.
  In the first quarter of 2019, Amazon's profits were again powered by AWS. Amazon CFO Brian Olsavsky said AWS now has an annualized run rate of over $30 billion. He highlighted AWS's customer wins for the quarter, including deals with Volkswagen, Ford, Lyft and Gogo. By the second quarter, Olsavsky said AWS was on a $33 billion run rate. The big keep getting bigger.

AWS offers hundreds of services. Some of these • Virtual Private Cloud • EC2 • AWS Data Transfer • Simple Storage Service • DynamoDB, • AWS Key Management Service • AmazonCloudWatch • Simple Queue Service • CloudTrail • Simple Email Service etc.

Microsoft

Microsoft Azure is the solid No. 2 to AWS, but it's difficult to directly compare the two companies. Microsoft's cloud business -- dubbed commercial cloud -- includes everything from Azure to Office 365 enterprise subscriptions to Dynamics 365 to LinkedIn services. Nevertheless, Microsoft's strong enterprise heritage, software stack, and data center tools like Windows Server give it a familiarity and hybrid approach that wears well.

Indeed, Microsoft CFO Amy Hood noted that the company is landing larger cloud deals. "In FY '19, we closed a record number of multi-million-dollar commercial cloud agreements with material growth in the number of $10 million-plus Azure agreements," said Hood.

For differentiation, Microsoft has focused heavily on AI, analytics, and the Internet of Things. Microsoft's AzureStack has been another cloud-meets-data center effort that has been a differentiator.

Microsoft is selling a wide range of cloud products, but it's hard to break out software-as-a-service versus Azure, which would more directly compete with AWS.

Indeed, Microsoft's ability to target industries has also been a win. Notably, Microsoft has won over large retailers that don't want to partner with AWS since they compete with Amazon. Microsoft also began highlighting more customer wins including Gap as well as Fruit of the Loom.

Google Cloud Platform

Google Cloud Platform has been winning larger deals, has a new leader with Oracle veteran Thomas Kurian and is seen as a solid counterweight to AWS and Microsoft Azure. The biggest development for Google Cloud has been the company's move to give more guidance on the business. Google CEO Sundar

Pichai on the company's second quarter earnings conference call said the cloud unit is now on a $8 billion annual revenue run rate.
The disclosure was a long time coming.

On Google's fourth quarter earnings conference call, Pichai cited numerous data points for Google Cloud Platform (GCP). However, analysts were frustrated by the lack of revenue disclosed. To kick off 2018, Pichai said Google's cloud revenue was $1 billion a quarter evenly split between G Suite and GCP.

Pichai has outlined the following to give observers a better idea of where Google Cloud stands:

- Google isn't breaking out components of Google Cloud revenue where the last time it disclosed sales were roughly evenly split between G Suite and GCP.
- Pichai took a not-so-subtle dig at Amazon Web Services when he said "retailers like Lowe's are leveraging the cloud as one of the important tools to transform their customer experience and supply chain."
- AI and machine learning are Google Cloud's primary selling point.
- Google Cloud is "very competitive when we are there in the banks" and financial services is a big push for the company.
- Growth will be via acquisition where Google Cloud has gaps. Exhibit A is the Looker purchase.
- At google cloud next, the company forged more ties with hybrid cloud players via an effort called Anthos, outlined its industry efforts and leveraged its artificial intelligence knowhow. And Anthos is seen as Google Cloud's big multi-cloud and hybrid cloud play.

For now, Google is on a cloud hiring spree as it builds out the team under Kurian.

A recent hire is Hamidou Dia as Google Cloud's vice president of solutions engineering. Hamidou was most recently Oracle's chief of sales consulting, consulting, enterprise architecture and customer success. Google Cloud also named John Jester vice president of customer experience. Jester will lead a services team focused on architecture and best practices. Jester was most recently corporate vice president of worldwide customer success at Microsoft.

The additions of Dia and Jester come as Rob Enslin joined Google Cloud as president of global customer operations. Enslin was formerly at SAP. Google

Cloud's strategy rhymes with proven enterprise software sales techniques that revolve around industry-specific use cases.