



LEADING CLOUD PROVIDER SPOTLIGHT

Amazon's Cloud Journey

Stephen Orban, General Manager, Amazon Web Services

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Amazon Web Services (AWS) gets credit for being early to the game. Stephen Orban, General Manager at AWS, writing in his book *Ahead in the Cloud* states, “I genuinely believe that cloud computing is the single most meaningful technology advancement in my lifetime.” Stephen tells the story of Amazon’s cloud transformation and how it scaled to meet unexpected demand.

In the words of Stephen Orban:

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The software that Amazon used to run its retail website was massive and monolithic. Its size made it hard for the company to move as quickly as it wanted and to develop the new features it needed. Our teams began to trip over each other and, if somebody made a change and it broke the build, everybody else who had a change backed up behind it was delayed as well.

Amazon made a deliberate move across the organization to transition into what we all know now as a service-oriented architecture (SOA). We broke up the software that ran retail into hundreds—and now even thousands—of services that all communicate with each other in a loosely coupled way via hardened APIs.

That idea also changed the way the engineering teams were organized. We call it a “two-pizza team” size, meaning that a team should be no larger than would consume two pizzas at one sitting. In this system, all the folks who were required to own and operate a service existed in one team, and they communicated with all the other teams by the APIs they published for the services.

That allowed us to move a lot quicker, but pretty soon we realized that a lot of these two-pizza teams were still spending a disproportionate amount of time managing the operating system, the databases, the storage, and the infrastructure that they were using.

So the founders of AWS, Andy Jassy and others, thought, “If Amazon is having this issue—even though we’re really good at running a world-class data center and infrastructure—other companies must be having this problem, too.” We saw that we could develop some services that we could use ourselves to make our teams faster, and that would make developers all over the world faster, as well.

That was the premise behind how AWS came to be. And what started off as a very small handful of simple storage, compute, and database options back in 2006 has become a platform offering more than 125 services that range from compute, storage databases, and networking security, all the way up to DevOps, mobile tools, artificial intelligence, and machine-learning services. We also built a world-class team

of customer support and account managers to help customers use the services and platforms so that they, too, can free more of their resources to focus on things that matter most to their customers.

Three factors that have contributed to AWS' growth

Jeff Bezos, our founder, would say that there are at least three things attributable to the company's growth. The first is that we're customer obsessed. If you translate that to AWS, 90% of our roadmap and the features and services that we've built over the last 12 years have been directly influenced by the things our customers have asked of us. It was our customers who requested a set of services that would make it easier to develop mobile apps. Machine learning and artificial intelligence are other examples. Those things are hard to build infrastructure for; things that we could do and provide as a service, such as SageMaker.

The second factor is that we like to invent new things. I think it's safe to say that AWS is largely known as the inventor of public cloud computing and other services.

And then, the third thing is that we are oriented for the long term. One of the things that Jeff says is that we're willing to be misunderstood for long periods of time. I think in 2006 when Amazon first launched a simple storage service, there were a lot of people who didn't understand it and thought maybe Amazon should stick to selling books. We continued to take a long-term view and believed that if we kept listening to customers and inventing features on their behalf, this could turn into something. Nobody had the audacity to predict it would become as big as it became.

The importance of resiliency

We build reliability, operational excellence, and security into our services from the very beginning. It's not a situation where we develop some feature or service and then, just before we're about to release it, we try to figure out how to make it reliable, durable, secure. We have a team of engineers across the business who think very deeply about these things throughout the process of designing our services.

As I mentioned, we listen to our customers and continue to add new features. So, as customers tell us that they need better reliability in one particular area or a new

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feature, we listen and try to follow very quickly with features that will meet those needs.

Another thing we think about is that we operate our services on a global scale with many, many different regions all over the world. Within each region, there are several availability zones, and within each availability zone, there are several data centers. We design our services across that global infrastructure so that we can build fault tolerance and redundancy into them. And then, of course, the service level agreements (SLAs) that we advertise on our services—we actually meet them.

We continue to scale to meet customer needs

At the moment, we have 55 availability zones inside 18 geographic regions covering the world. We've announced 12 more availability zones for four more regions in Bahrain, Hong Kong, Sweden, and another region in the U.S. for our government customers. It's called GovCloud, and it's used by millions of customers every single day.

Enterprise support fuels our customers' success

We have large sets of account teams that consist of account managers and solutions architects. The solutions architects are really the engineers who have a broad view of how our customers are using the platform, and they help them design, implement, and operate the things they're building on AWS.

We also have a large and fast-growing professional services team that consults on larger-scale migrations or digital transformation projects. To help customers on a longer-term basis, we have teams of support engineers and technical account managers with in-depth knowledge of how systems were designed and how they operate on our platform. As customers ramp up, these teams help customers optimize their workloads.

We've also developed a number of programs over the years that are designed to help customers achieve a particular business outcome. The best example I would give is a program that I built with my former team. Starting back in November of 2014, we created the migration acceleration program or MAP. The idea behind MAP was to serve those customers who were saying: *Okay, I get it. I'm doing all my new workloads on the cloud, but I have a lot of technical debt that I have accrued over the course of the*

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last 10 or 20 or 50 years. I’ve got a number of data centers all over the world and I want to get out of these data centers, and I want to retire a lot of this technical debt so that I can focus more on doing the innovative things that my customers and my business really need.

We built MAP to pull together all of the best practices around large-scale migrations to the cloud—those that involve thousands of applications at a time or dozens of data centers at a time. The best practices include those from our partner ecosystems, from our professional services teams, from our solutions architects, and from our customers themselves—all places where we can help a customer assess their portfolio, understand what’s in it and all the dependencies. We have to know that this application talks to that application or database. Then, we build a business case so that the customer understands the financial implications of what a large-scale move to the cloud might mean. In short: connect the dots, then build a plan in which they can execute a really large migration.

A common theme we are seeing is customers moving 75% of their application portfolio to the cloud over the course of the next three years in an effort to save some tens of millions of dollars. They expect to increase developer productivity by anywhere between 30% and 70%.

These savings reflect what I accomplished when I was at Dow Jones, right before I joined Amazon. Our business case was across News Corp. We moved 75 percent of our infrastructure to the cloud over about a three-year period for a savings of \$100 million a year. We were then able to devote that savings back into things that mattered to our business.

Building in privacy and GDPR

We look to build the necessary compliance framework into all of our services. We advertise which services support which compliance framework—GDPR or PCI or HIPAA or whatever the compliance framework may be. Through our various account teams, we also help customers to architect and build their applications so that they remain compliant with whatever security, regulatory, or privacy requirements that customer has.

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In our business, we have a shared responsibility model. Where that line of responsibility is drawn depends on the service, so we're responsible for the security and the privacy of everything up and to a particular point. For example, for IaaS, we manage the facility, the actual physical instance, and the hypervisor, and then the customers decide which operating system they want to deploy and which software they want to put on top of that to run their application. So, they're responsible for everything from that layer above and we're responsible for everything below.

Picking a cloud service provider

If you believe as we do that a lot of that IT infrastructure over the course of the next decade is going to move to the cloud, it's not surprising that many of the large, traditional enterprise IT vendors are trying to build a replica of what AWS has built over the course of the last 12 years. There really is no compression algorithm for experience. Every day, we have more customers using more services on our platform, giving us more feedback, helping us see more ways where we can become operationally excellent and help them save money. While it may not be surprising that everybody's trying to build a replica, it is surprising how much of a head start they gave us.

When customers are thinking about where they want to move their mission-critical and production IT workloads, they should consider which platform is going to have the most experience, and the best practices, to help them do that.

Significant cost savings

We have yet to find a case where we couldn't save a customer money. I would say in lift-and-shift migration scenarios, where you're not substantially changing anything about the application, the savings can range anywhere from 25 to 40%. And when you start to think about a larger-scale architecture, where you move to microservices or serverless architectures—where you're only provisioning the resources that you need when you need them as opposed to over-provisioning servers like you would have had to do in a data center—the savings can be much more substantial than that. I've seen customers shave off 80% by moving to a serverless architecture.

One or many cloud service providers?

It's definitely not winner take all. There will continue to be multiple cloud providers, but it's a capital-intensive business, and I don't think that there will be dozens. I think there's going to be a small number. In my view—10 years from now, let's say—it's pretty hard to imagine that many companies will be running anything like the data center footprints they have today.



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About Zscaler Zscaler was founded in 2008 on a simple but powerful concept: as applications move to the cloud, security needs to move there as well. Today, we are helping thousands of global organizations transform into cloud-enabled operations.

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