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Picking The Right Cloud Container Platform

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In this e-guide:

The cloud container services race in today's technology market is heating up as Google, Amazon, and Azure are putting a strong effort into developing their services in a bid to capture the market.

This comprehensive guide walks readers through in-depth comparisons of the 3 different cloud container platforms to ultimately help you decide which is right for your enterprise.

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Cloud containers race heats up between Amazon and Google

Beth Pariseau, Senior News Writer

The heaviest hitters in Docker Linux cloud containers are still Amazon and Google, whose battle is reaching a fever pitch, as Microsoft Azure gears up to join in.

Amazon Web Services and Google are aggressively developing their cloud containers services in a bid to capture enterprise app dev business.

The companies' cloud containers services abstract elements of Docker container management away from users, making it easier to deploy and scale applications built on them. However, there are key differences between their maturing offerings, including where each has chosen to implement autoscaling, redundancy and interoperability with third-party tools and clouds.

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Autoscaling a key point of contention

Google Container Engine (GKE)consists of pods, replication controllers and nodes. Pods are a logical grouping of containers that model an application-specific logical host. Replication controllers ensure that a specific number of pod replicas are running at any one time. Nodes are the Google Compute Engine virtual machines that underpin the containerized environment.

GKE is based on Google's Kubernetes container orchestration platform. Kubernetes version 1.1, released Nov. 24, four months after 1.0 made its debut, was the first on the market to autoscale pods with horizontal pod autoscaling, a feature highly sought by users to justify many use cases for GKE.

"We use the autoscaling quite a bit for all types of projects," said Tim Kelton, co-founder and head of cloud architecture for Descartes Labs Inc., a machine learning startup based in Los Alamos, N.M., which processes petabytes of satellite data.

Autoscaling pods come in handy running a large batch job, Kelton explained. At times, his company processes a petabyte of data, which requires scaling up to 30,000 cores. In the first release of Kubernetes -- which was incorporated soon after by GKE -- "that wasn't part of the core feature set," he said.

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GKE doesn't support vertical container scaling or node autoscaling, but these features are coming soon, according to David Aronchick, senior product manager for *GKE*, who also leads product management for Kubernetes.

Amazon's EC2 Container Service (ECS), meanwhile, consists of services, tasks and instances. Services are groups of tasks that make up an application, while instances are the Elastic Compute Cloud VMs that underpin the containers -- much like nodes in GKE.

Amazon ECS' autoscaling capabilities are the inverse of how it works with GKE: Services can be autoscaled using Amazon CloudWatch and Amazon Web Services (AWS) Lambda, and instances can be autoscaled based on CloudWatch metrics as well, but tasks -- the rough logical equivalent of pods -- cannot be autoscaled.

While all the types of autoscaling are important, Amazon users want task autoscaling added to ECS.

"Spinning up an extra instance means you have extra capacity to run additional tasks, but it doesn't mean that any new tasks will be spun up," said Chris Moyer, vice president of technology with ACI Information Group, a Web content aggregator based in New York, and a TechTarget contributor.

"If you're only autoscaling your instances, it's not really doing anything to help you handle extra load -- you have to actually spin up extra tasks to scale out."

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Redundancy across zones

In the development of ECS, Amazon prioritized the ability to natively span availability zones (AZs) in the same cluster for redundancy over task autoscaling based on customer demand. When the ECS service scheduler launches new tasks, it also attempts to balance them across the AZs in a cluster automatically.

"That's important, because a single AZ is allowed to fail, so if both tasks were in the same AZ, that could easily take down your service," Moyer said.

Google can span multiple zones in GKE through the command-line interface (CLI), according to Google's Aronchick.

"It's really easy -- two or three commands," he said.

However, this touches on GKE customers' biggest wish list item: improvements to the Web UI, including scaling clusters across zones.

"The UI needs a ton of work," said Dale Hopkins, chief architect at Vendasta Technologies in Saskatoon, Sask., which builds sales and marketing software for media companies. The UI currently allows for cluster creation and little more, Hopkins said. "And it's non-intuitive how you scale the cluster."

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Interoperability

ECS was built as an extensible platform, designed to be dropped into a customer's existing workflow, mainly to handle cluster state on users' behalf. Part of this integration into existing workflows accommodates tools that customers already use, such as Apache Mesos for advanced scheduling. Amazon also boasts an extensive network of Container Partners that contribute features, such as monitoring, continuous integration and security, to Amazon ECS.

Google, meanwhile, has built a coalition of cloud containers partners that allow Kubernetes to be deployed across multiple cloud providers -- also a CLI feature today, according to Aronchick. Google led the creation of the Cloud Native Computing Foundation when Kubernetes 1.0 was released last summer. Foundation members include enterprise cloud services companies, such as IBM and Red Hat, as well as end-users Box, eBay and Twitter.

"[With] Kubernetes, I can actually go deploy on Amazon, I could deploy on Azure, I could deploy on IBM, I could deploy on premises on my own physical hardware," Descartes' Kelton said. "That's very attractive, since we have options."

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Google also has an open source project, with hundreds of committers and thousands of commits a month, allowing Kubernetes to quickly add new features, such as horizontal pod autoscaling.

"Google is the origin of Kubernetes, and Google's done a really good job enlarging that community," said Jay Lyman, analyst with 451 Research.

The rich get richer

Still, integration with established and familiar secondary Amazon services makes Amazon ECS particularly appealing for new customers.

One New York-based company that consults with large enterprises on IT projects plans to use ECS in two new projects, according to its founder, John D'Esposito. "The main advantages that drove us to use ECS [included] seamless integration with existing, proven infrastructure services, such as [Elastic Load Balancing, Virtual Private Cloud, Identity and Access Management, and Elastic Block Store]."

GKE and Compute Engine pricing also can be attractive to customers. In addition to charging in 10-minute increments for underlying VM resources, GKE includes the Kubernetes master for free -- something that particularly appeals to Vendasta's Hopkins.

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"I don't pay a premium for Kubernetes until I get into huge numbers of machines -- GKE offers me the Kubernetes master for free for the first set of machines," he said.

Both Hopkins and Kelton already used Google cloud services, including Google App Engine, before Kubernetes and Container Engine were introduced. Thus, data gravity also plays a role in which cloud containers service they choose to deploy.

"Most of our data sets are in the petabyte scale, so you can't just move them or copy them, you have to actually move the compute next to the data," Kelton said. Most of that data currently lives in the Google Cloud Platform, though Descartes does work with partners in AWS.

Microsoft Azure Container Service waits in the wings

While Google and AWS are at the forefront of the cloud containers battle so far, Amazon's closest competitor remains Microsoft Azure, which has its own Linux-based cloud containers service in limited preview, as well as a new version of Windows Server due out this year that will support Windows-based containers.

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"The majority of our clients ... are either in Azure or in Amazon," said Chris Riley, a founding partner at HKM Consulting LLC, in Rochester, Mass. "[Microsoft] has got some interesting tools that they're developing. If we were to look at a secondary one, it would probably be Azure before Google."

As with many Microsoft products, simplicity and ease of use are the design priorities, according to Kristian Nese, CTO of Lumagate, a Microsoft Azure systems integrator in Norway.

"When we're deploying the Azure Container Service today, it's 100 lines of code," Nese said. "Once you have deployed the Azure Container Service, you actually have 23 resources deployed ... if you would do this manually, it would most likely result in many thousands of lines of code."

The Azure Container Service also has autoscaling in the works in the form of a separate service also in preview, called VM Scale Sets.

Azure also will have the benefit of offering established and familiar tools to manage containers, such as Azure Resource Manager, Nese added.

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Evaluating Azure Container Service vs. Google and AWS

David Linthicum, Cloud Technology Partners

AWS, Google and Azure all offer their own container service. And while they each have their pros and cons, the best service for you depends on your application needs.

As more organizations use container technology to deploy cloud applications, it seems containers and cloud will become joined at the hip. So it's no surprise that the three big cloud providers -- Amazon Web Services, Microsoft Azure and Google -- have their own container services on the market. However, these services are not created equal.

For the purposes of this article, Cloud Technology Partners, a cloud consulting firm based in Boston, performed an internal review of the Amazon Web Services (AWS), Google and Azure container services, polling consultants around the technology and examining use cases. The firm looked at several features that are important when evaluating or using cloud-based container services, including data management, scalability, performance, security, DevOps and integration with management and operations (results shown in Table 1).

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The uses cover development and operations -- in short, what you should experience if you build and deploy applications using each of these three technologies.

	Data	Scalability	Performance	Security	DevOps	Integration withMgmt/Ops	Total
Google Container Engine (GKE)	4	4	4	3.5	4	5	24.5
Azure Container Service (ACS)	4	2	3	3	4	3	19
AWS EC2 Container Service (ECS)	3	3	3	3	3	4	19

For the 1-5 scale, 1 is the lowest score and 5 is the highest. A designation of 1 means the technology does not provide support for the category at all, whereas 5 conveys that the technology meets most of the feature and function requirements for that category. One of the requirements we looked at for the DevOps category, is the ability for the container subsystem to support DevOps operations, or provide an integrated repository.

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For enterprises evaluating Google, AWS or Azure container services, this article provides some of the basics. Individual application requirements should ultimately drive your final product decision.

Integration and data considerations

Azure Container Service (ACS) is based on Apache Mesos, an open source container orchestration system. That means you can make some good assumptions about the features and functions of ACS, considering the features and functions of Mesos, which pre-dates ACS. ACS, which is not generally available yet, is the newest of the three container services previously mentioned. Much will change as we obtain more data points around the Microsoft container offering going forward.

With the AWS EC2 Container Service (ECS), we're seeing a number of operational issues, such as the inability to monitor containers at a fine-grained level. When looking at ECS integration with management and ops, which should be as strong as any AWS offering, we had to knock it down to 4 points, relative to Google Container Engine (GKE)'s 5 points. ECS does, however, include CloudWatch integration, which could give it a leg up compared to ACS. Also, at this time, ACS supports Linux containers only. While Windows support is coming soon, as Microsoft ports Mesos over, .NET developers are left behind the curve for now.

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On the data side of things, all of these services offer native data connections, without forcing the use of external APIs -- but there's room for improvement. One concern is they will bind containers with native data services and not provide open data access, which enhances portability. It's difficult to create portable containers if the data is tightly coupled to the containers. This is an emerging area that we're keeping an eye on for now.

AWS, Google and Azure container security

When considering security, we found Google's service, through its Kubernetes container orchestration system, has a "Secrets" functionality and some additional resource limitations that the other two services lack. As a result, GKE was given a higher ranking for security. Keep in mind that Microsoft also uses Kubernetes, but does so in different ways. Much of the technology itself is abstracted from the users.

However, when looking at the host platform -- or the public cloud platform where the container service resides -- it's interesting to note that the Google platform, when it comes to security, is less advanced in some ways than AWS or Azure. While Google can work with third-party identity access management (IAM) tools, it lacks native IAM support. Although this did not impact the rankings indicated in the table, it's something to consider as you move forward with any of these platforms.

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DevOps and scalability

When it comes to DevOps, GKE and Amazon ECS have their own registries now, but Azure Container Service does not. Google and AWS provide better DevOps integration, when considering container services in their respective clouds.

Scalability is relative to the needs of your applications, so we made assumptions based upon the mechanisms they provide, such as Mesos, and some use cases that we see on projects. You can use the same approach when you look to these technologies to host and execute your containers. For instance, ACS, which uses Mesos, should provide fair scalability, but not as good as GKE, which provides better clustering capabilities.

Amazon ECS is known to provide quality scalability, driven largely by the highly scalable platform features that AWS brings to its container engine.

In summary, the Google offering is more advanced overall due largely to Google's tight integration with its own Kubernetes container cluster, and Google's development and operational support. However, Google is not so far ahead that AWS and Microsoft can't quickly catch up. Considering the hold that AWS has on the market, it will likely provide some better container tricks in the near future.

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How ECS containers stack up to Google and Azure platforms

Dan Sullivan

As containers grow in ubiquity, cloud providers are developing their own services to manage them. AWS, Azure and Google all offer container services, but how do they compare?

Containers are lightweight, virtualization mechanisms built on features of the Linux operating system. While they enable enterprise teams to exploit even greater efficiencies of virtualization, management can be tricky.

Managing clusters of machines that host containers can be difficult. IT teams have a few options: run cluster management tools, such as Docker Swarm or Kubernetes, or use container services from providers, such as Amazon, Google and Microsoft that offer container management services in addition to VM instances. Amazon EC2 Container Service (ECS) enables customers to run containerized applications in an AWS-managed cluster of EC2 instances. By running ECS containers, IT teams can take the guesswork out of installing and managing cluster management infrastructure.

Like other AWS products, customers use API calls to create clusters, launch Docker containers and monitor the state of the cluster. The service is built on

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EC2 instances, so developers and application administrators can take advantage of other AWS features, such as AWS Identity and Access Management, Elastic Block Store, security groups and Elastic Load Balancing. AWS does not impose a separate charge for using AWS container services; customers are billed for the underlying compute, storage and other metered services the container applications use.

ECS containers are well-suited to applications that may not require the full resources of an EC2 instance. Microservices, for example, are good candidates to use in conjunction with ECS containers. IT teams can run any application without time limits on when an operation completes, and they can deploy applications developed on any platform or in any language. The service manages availability and scalability, so IT teams can adjust the number of ECS containers running at any time, according to demand.

ECS containers are configured using an abstraction called tasks. Tasks specify a Docker image, the processor and memory resources, data volumes, port mappings, links to additional containers and other parameters. Tasks enable developers to divide services down to the microservices level while still coordinating a number of services to complete a processing operation.

Diving into Google's container engine

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Google Cloud Platform also offers a container service for Docker called Google Container Engine (GKE). GKE uses Kubernetes as a cluster management platform. Kubernetes is an open source platform, which gives customers the option to run the same cluster management platform on premises and in the cloud. Other vendors, such as Red Hat, VMware, Microsoft and IBM support Kubernetes integration; OpenStack is also working to support Kubernetes.

GKE allows admins to specify containers and resource parameters. The service then manages the scheduling of those jobs. A welcome feature of GKE is the ability to specify containers in a declarative JSON format.

GKE includes a private Docker registry, giving IT teams the option to use public repositories, such as Docker Hub, as well as their choice of an image repository. Administrators can easily integrate Google's logging service with deployed containers. And the ability to reserve a range of IP addresses means clusters can be integrated over virtual private networks with private, on-premises networks.

Unlike AWS, Google charges for its container service, depending on the size of the cluster. Container management is free for up to five nodes in a cluster. A cluster of six or more nodes is billed at $0.15 per hour per cluster.

A peek at Azure Container Service

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Microsoft is currently offering Azure Container Service in preview mode. Microsoft Azure allows IT teams to choose between Docker Swarm and Apache Mesos for cluster management. Apache Mesos abstracts features of OSes and applies them across clusters.

With Mesos, applications use resources that are running across clusters or across data centers. Customers can also use Marathon for service orchestration on Mesos. Chronos is a distributed job scheduler that is used with Mesos; it is often described as a CRON job scheduler for clusters.

Mesos is known to scale to the order of 10,000 nodes and uses ZooKeeper--part of the Hadoop ecosystem -- to ensure fault tolerance.

Like AWS, Microsoft does not charge for container services. Customers are billed only for the metered resources used within the cluster.

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