Cloud Service Lifecycle—Service Monitoring
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Executive Summary

“As-a-service” seems to echo today in almost every corporate corridor. Enterprise IT and lines of business are deploying and buying hybrid cloud services, and many executives are driving an “everything-as-a-service” mentality.

Cloud services, or any service for that matter, have a lifecycle: plan, design, build, and operate. However, most of the action to date has been focused on deployments of technology and self-service portals, i.e., the “build” phase. While “build” is an essential phase, much more is required for IT to be able to succeed in delivering, scaling, and remaining relevant as the premier service provider during this service-oriented transformation.

This is all happening against the backdrop of “the digital business,” characterized by connecting smart consumer technologies with embedded software and sensors with digital marketing systems and digital technology systems—such as cloud and software-defined data centers. Applications are becoming more composite, the infrastructure more dynamic, the amount of data more overwhelming, and the consequences of poor service performance and availability more severe. How you approach cloud service monitoring will depend on whether you are a public cloud provider, a consumer of public cloud services, or a broker managing both private and public cloud services on behalf of your users. But in a world where customers—and their experience and perception of value—rule supreme, service monitoring is no longer a luxury; it is a necessity.

Figure 1. The digital revolution is here
Why Is Service Monitoring So Important?

To best examine this question on the importance of service monitoring, one only needs to look for the word most associated with cloud. This word is “service.” Cloud is the No. 1 catalyst in the evolution of “everything-as-a-service.” It is cloud that opened the door on the ability to consume, for instance, infrastructure or software as a service. Consuming a service fundamentally changes the experience and perceived value of the consumer.

Business services are complex where the whole is greater than the sum of its parts. A good illustration of this principle is going to a restaurant. Even though the primary reason for going to a restaurant is eating, the quality of the experience depends on more than just the taste of the dish. When eating at home, it is really just about the dish. But at a restaurant, you could have a tasty dish and a friendly waiter but still be disappointed if the queue to be seated was long, or your dish took a while to arrive, or the price was too high. You could even be disappointed if parking—a service the restaurant itself neither provides nor controls—was difficult to find. A great restaurant, therefore, is one where every component combines to deliver a pleasant experience.

Therefore the only way to ensure services deliver what your consumers demand is through service monitoring, covering the totality of everything—from the infrastructure components to the quality of service—contributing to or impacting the user experience and business value.

Who Are You?

There are several roles that may apply to you in context of cloud. You could be a:

- **Cloud provider**: These are public cloud companies selling hybrid cloud services, using a public cloud platform, to IT organizations or lines of business.
- **Cloud consumer**: These are IT organizations or lines of business consuming cloud services from the public cloud.
- **Cloud broker**: This role combines both the consumer and the provider. It is, typically, the IT organization delivering services to the lines of business by combining private, public, or hybrid cloud offerings.

How you approach cloud service monitoring and what is important for you to monitor will vary depending on the role you play.
What Is Service Monitoring?

IT has been monitoring its environment for many years. However, this style of monitoring has traditionally focused on monitoring the discrete elements, such as the network, servers, and applications. While end-user or transaction monitoring is no longer rare, it is still not nearly as pervasive or extensive as it needs to be, and certainly not at adequate enough levels to support the full-blown adoption of cloud. True service monitoring is far less common than even end user monitoring, yet it is the crucial mindset shift needed to ensure the quality of experience for consumers of cloud services.

In this day and age of DevOps, monitoring is designed by developers, and may even performed by resources outside of IT operations. Modern monitoring solutions must thus help to put the “O” in DevOps, but improving collaboration and sharing of IT operations information to improve the instrumentation and overall monitoring.

When you think about how cloud services are constructed, assembled, and consumed, it becomes clear that there are three layers involved in the end-to-end service delivery:

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Supply</td>
<td>Manages all resources used in the delivery of the service. It includes functions such as resource health management, resource configuration, and resource pooling.</td>
</tr>
<tr>
<td>2. Delivery</td>
<td>Brings together services by orchestrating and automating the combination of multiple service elements. It includes functions such as service health management, service repository and modeling, request activation, and service brokering.</td>
</tr>
<tr>
<td>3. Demand</td>
<td>Exposes the services/products to the consumer. It includes functions such as service-level agreement (SLA) compliance, service catalog, order management, billing, and usage reporting.</td>
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The monitoring of cloud services should incorporate monitoring at each of these functional layers. Most organizations gravitate to the supply layer, i.e., monitoring infrastructure resources, as their first monitoring step. While this is a good start, it is insufficient. You also need to monitor at the delivery (e.g. service health) and demand (e.g. quality of experience) layers to ensure your customers get the experience they want. As mentioned, what you specifically need to monitor will vary on the role you play within the cloud context.

Monitoring Cloud Services Is a Little Different

Monitoring cloud services presents some nuances and challenges. Addressing those will require you to adopt or mature three capabilities:

**Defining and Modeling Services**

The same way a doctor needs to know the anatomy of the human body in order to monitor its health, you need to know the anatomy of a service to monitor its health. The anatomy of a service describes all the components that play a part in delivering the service and the dependencies between them.
This representation of a service is called the "service model." Each service will have many components, points of failure, performance bottlenecks, and dependencies, all of which need to be clearly understood so that a service can actually be monitored, while in production, and deliver on both its functional and non-functional requirements. When things go wrong it is the service model that allows you to remediate the situation with minimal business impact.

For example, Operations Bridge software uses the service model to propagate status and determine service health by aggregating the health of its underlying components. So when a service is experiencing issues, it is easy to determine and resolve the root cause.

The service model is not specific to cloud. In fact, modeling services is very beneficial to traditional monitoring. However, while IT operations can and has been getting away without it until now, this will no longer be an option with cloud and "everything as a service." Another advantage of the service model is that it allows you to define the method by which a cloud component impacts your management services.

For example, if your service depends on transaction processing provided by a third party, the service model will help you determine what data you need from your provider to be able to effectively model and monitor your service. It will also allow you to integrate monitoring data from third parties and include it in the determination of service health, as well as root-cause analysis and remediation.

Last but not least, the service model provides both the ability to define and measure underpinning contracts, operating level agreements (OLAs), and service level agreements (SLAs).

Creating the service model is a combination of discovery, modeling, and data integration (if you are using third parties). Once you have defined the service model, you store it in a configuration management system (CMS). Based on the model, you can then drive all the lifecycle management of the service, from design to operation—including costing, change and configuration management, and more.
“Shift Left” Monitoring

The prevailing approach to monitoring used by most IT organizations is predicated on certain assumptions:

1. IT owns the environment and is therefore in full control over monitoring deployment and configuration.
2. IT controls provisioning and release and can therefore time monitoring and deployment to happen concurrently.
3. Once provisioned, services are rarely de-provisioned and monitoring continues in perpetuity.

However, with cloud, none of these assumptions hold true. If you are using public cloud services, you don’t own or control the entire environment. If you are offering self-service provisioning, users—not you—decide when services are provisioned. Lastly, cloud services don’t last forever. They can also be de-provisioned manually or automatically, and monitoring needs to commence or end in concert.

The way to deal with these constraints and challenges is to “shift left” your monitoring and adopt a “monitoring by design” approach. In most cases currently, monitoring is an after-the-fact activity. Applications and services are built (or bought), released, and then handed over to IT operations for monitoring. “Shifting left” means starting to think about how and what to monitor much earlier than has traditionally been the case, even if you are just using SaaS. It means incorporating monitoring into the requirements and the design, so that when you deploy to your users, everything is already instrumented and in place to allow you to collect the data you need.

You should begin by asking “What data do we need, who will use it and how?” You will still need to collect the same monitoring data and feed events into a console the way you do today. But you will also need to think about, for instance, topology, SLA, capacity, or usage data. You should then define how you will provide the data and to whom. Some data will be consumed by your customers as reports (e.g. SLA compliance), some data will be fed into an analytics tool (e.g. capacity planning), and so on.
Once you have an understanding of what data you need, the next step would be to decide what the best source is for it and how you can collect it. You may be able to get the data yourself or you may need to work with your service providers to see if and how they can help you. In many cases you will need to activate, or at least enable, data collection as soon as the service is instantiated. This can be achieved by building monitoring capabilities into what you deploy—for example, by including monitoring activation as part of your provisioning workflow or instrumenting your code so you can remotely get the data you need irrespective of where the application runs.

If you need to get the data from a service provider, make this a requirement and an evaluation criterion for selection. While it may be tempting to relinquish responsibility to the provider, as far as your consumers are concerned, you are still on the hook for service delivery.

**Big Data for Monitoring**

In an environment where users on mobile devices are everywhere, applications in the cloud are everywhere, and services are real time and 24x7, the answer to the question “What should I monitor?” is simple, yet daunting. The reality is that you should monitor everything.

Unlike a traditional IT environment, being able to figure out the root cause of a production issue is much harder in a cloud-based environment. The complex and dynamic nature of the environment is such that you can no longer rely on what used to be relatively static. Knowing, for example, the exact path a transaction takes, the location of users, or the network topology at a given point in time is far harder. When you need to respond quickly to an unforeseen event, you need the data at your fingertips, which means you need to have either already collected it or be able to—in real time—interrogate the system (e.g. by increasing log levels). This is yet another reason why you must incorporate monitoring into your designs.

But monitoring everything isn’t just about isolating and fixing outages. In the old outsourcing world, the engagement model was multi-year, labor-based contracts. Cloud is changing this by enabling an outcome-based consumption model, which consumers are adopting at everincreasing rates. In such a model, consumers care to know that they indeed got what they paid for. While this is not monitoring in a traditional sense, it is a natural extension of it. Usage, cost, value, and service levels are all parameters that cloud consumers care about. It is not just about performance; it is also about constantly evaluating what you get against what you pay to ensure you are getting the best value. Providers, on the other hand, want to ensure they are charging the right price and are getting paid for what is being used. In other words, monitoring now drives not only operational decisions but business decisions.

Monitoring everything means you need a big data platform that not only can deal with data collection and storage but also provide the advanced analytics necessary to turn these volumes of data into useful information. This will allow you to quickly find root causes and use predictive analytics to identify trends, predict capacity, and preempt performance degradation, enabling you to constantly improve the quality of your services. It will also afford you the opportunity to assess whether the value and the outcomes you were expecting are in fact being delivered.
What Does It Mean To Me?

As mentioned earlier, monitoring of cloud services will depend on the role you play within the cloud context.

Cloud Provider
As a service provider you need to, first of all, monitor your cloud stack. Does it work? Is provisioning working as it should? Can your users access what they need? You also need to ensure you are indeed providing the SLAs you have committed to and are able to expose this information to your customers, should they demand it.

This would require you to:

■ Monitor your infrastructure the way you would normally
■ Interrogate your platform’s internals to detect any issues (e.g. errors in service activation)
■ Monitor your environment from the end-user perspective

Finally, you need to continuously collect usage and capacity data so you can identify trends, predict when you will need more (or less) capacity, and plan accordingly.

Cloud Consumer
From a consumer perspective you want to understand the quality of services. You are not concerned with their internals but you want to ensure services meet the SLAs you are paying for and that performance and availability are what they are supposed to be. To determine this you need to monitor from the end-user perspective. This may mean you need to monitor the application itself (in case of SaaS) or the instances you activate (in case of IaaS/PaaS). Under most circumstances this would be very similar to how you are currently monitoring your own environment, but you may need to coordinate with your provider to ensure you are not in violation of your business terms.

Cloud Broker
As a service broker you are effectively both a provider and a consumer. You need to monitor the individual services you consume to ensure your providers are meeting their commitments. You then need to monitor the end-to-end services you assemble and provide to your own users. Therefore, your monitoring becomes a combination of both, with two key additional aspects playing a more prominent role than for either a provider or consumer:

■ Service modeling to help you implement monitoring and manage your services
■ Capacity monitoring to preempt peak/trough loads and flex up and down as needed
From Silos to Services

While this paper focuses on the monitoring aspect of cloud services, the truth is that it is only part of a larger transition IT needs to make. IT has historically been organized along technology lines, with teams dedicated to and specializing in specific technology domains. While this approach served IT well in the past, technology is now so ubiquitous it is—paradoxically—almost irrelevant, at least to the users. As long as IT was the sole provider and remained a backend function, this structure worked. However, IT is now front and center, operating in an environment where users have other options. This requires IT to change from a technology-focused organization (information technology) into a customer-focused one (business technology). To make this fundamental shift, IT needs to be able to pivot away from managing by technology stacks and into managing by services.

Key Takeaways

An always-on digital business fuels growth. It affords your company a great opportunity to grow your revenues, provide an exceptional user experience, and radically improve operational efficiency, speed, and agility. Cloud is a key enabler of the digital business. But making this vision a reality hinges on delivering business value and a great customer experience. Service monitoring is a crucial ingredient in helping you achieve this. You already know how to monitor traditional environments but there are a few key capabilities you will need to extend it into cloud service monitoring. Service modeling, “shifting left,” and big data for monitoring will help you on your journey. However, cloud service monitoring is not something you undertake in a silo. You need to extend and mature your existing capabilities to cover cloud services so you can manage all your services within a single, service-oriented framework.
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