Monitoring Containerized Microservices? Elevate Your Metrics

by Rich Lane
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Why Read This Report

As enterprises continue to rapidly adopt containerized microservices, infrastructure and operations (I&O) teams need to address the growing complexities of monitoring these highly dynamic and distributed applications. The scale of these environments can pose tremendous monitoring challenges. This report will guide I&O leaders in what to consider when developing their technology and metric strategies for monitoring microservices and container-based applications.

Key Takeaways

Metrics For Containerized Microservices Shift From Mere Status To Overall Outcomes
Given the highly ephemeral nature, large volume, and intricate interdependencies of microservices, monitoring approaches have had to evolve. Rather than looking at a discrete service from an up/down perspective, key metrics need to address the aggregate health of a service, such as overall response times between a microservice and downstream components.

Containerized Microservice Monitoring Solutions Are Ready For Prime Time
Most monitoring product vendors have jumped on the bandwagon to deliver support for microservices and containers, and their capabilities continue to advance. From the ability to track interdependencies in real time or via machine learning to distributed tracing and integration with container orchestration engines, enterprises can now better equip themselves to monitor and manage these volatile environments.

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Microservice And Container Proliferation Creates Monitoring Challenges
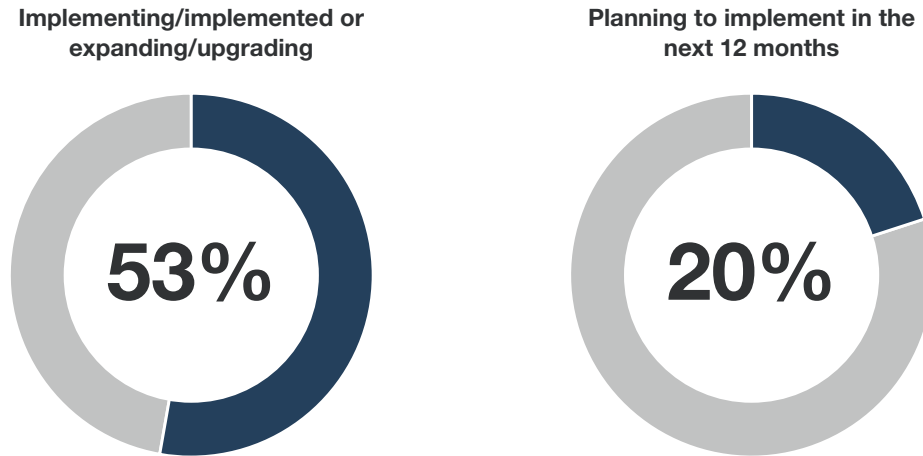
Development teams continue to adopt microservices and container technologies, challenging I&O to effectively monitor these highly dynamic environments. In 2018, 53% of global infrastructure decision makers reported that their organizations are implementing or have implemented microservices/container architecture to some degree (see Figure 1). The complexity of monitoring these assets and the exponential amount of data that needs analyzing pose significant challenges because:

› **Monitoring highly transient things is difficult.** Containers are an ephemeral workload by design, as containers automatically come online to meet capacity demand or are torn down after performing a specific function. Monitoring ephemeral workloads becomes difficult for traditional infrastructure monitoring tools and dashboards that rely on consistent identity names to show status and track dependencies. And if containers are being built and torn down at accelerated rates, traditional metric-gathering methods of polling for CPU, memory, and process utilization for each container become impractical.[1]

› **The volume of objects and metrics to monitor has skyrocketed.** For a typical nonservice-based application with a unified code base, the number of system elements and metrics to monitor typically ranges in the dozens. At the scale that containerized microsystems present, the volume of data points to directly track becomes unmanageable, approaching tens of thousands (see Figure 2).

› **Intricate interdependencies thwart traditional root-cause analysis.** An application performance monitoring (APM) solution can easily traverse the application stack of a three-tiered architecture and pinpoint, for example, a long-running SQL statement as the root cause of a performance issue. With containerized microservices, transactions span multiple containers, often linked by dynamic API calls. More complex multiservice workflows pose challenges in measuring the performance of a transaction end to end.

FIGURE 1 Enterprises Are Rapidly Adopting Modern Microservices And Container Architectures

"What are your firm's plans to adopt the following technology and/or operational initiatives?"
Microservice/container architecture

Implementing/implemented or expanding/upgrading

Planning to implement in the next 12 months

53%

20%

Base: 3,391 infrastructure decision makers
Source: Forrester Analytics Global Business Technographics® Infrastructure Survey, 2018

FIGURE 2 Containerized Microservices Drive Metrics Volumes Skyward

An illustrative example of how containerized microservices exponentially impact metric volumes

One host	Number of metrics
Operating system	100
Application	50
Total number of metrics collected:	**150**

One host with 10 containers	Number of metrics
Operating system	100
Orchestrator	50
Container	500 (50 per container)
Microservices	500 (50 per container)
Total number of metrics collected:	**1,150**

Two-host cluster with 100 containers	Number of metrics
Operating system	200
Orchestrator	50
Container	5,000 (50 per container)
Microservices	5,000 (50 per container)
Total number of metrics collected:	**10,250**

Take Advantage Of Intelligent Automation To Monitor At Scale

While containerized microservices help digital businesses support the scale and speed they need to readily innovate and adapt to change, this shouldn't come at the expense of application and system resilience and performance. Operations teams will need to:

› **Adopt event-based monitoring and remediation using intelligent tools.** Scale and complexity make it impossible for mere humans to correlate the symptoms of a problem. Modern monitoring systems need an intelligent, machine-assisted layer of analysis to make sense from the chaos. Machine learning algorithms are applied to the entirety of an enterprise's IT monitoring data and, ultimately, will keep an operations team informed on how its technology stack (including the containers and microservices that are now a part of it) is performing. Machine learning/AI boosts a team's ability to filter for only meaningful alerts instead of dealing with "noise." This leads to far better business outcomes, which fosters a growing sentiment of success for the team.

› **Base microservices health metrics on aggregate service behaviors and outcomes.** Organizations can measure the health of an application service in many ways. For instance, the development team at an insurance broker may want to measure performance for users signing up on its online portal and the time for the commit of each activity on the form. A peak validation processing volume drop of 50% from the norm for a given time slice would indicate a problem. This alternative (or additional) type of view differs from the method of testing to see if the process ID exists and reporting the CPU it's consuming.

› **Automate the drudgery of low-level, repeatable operations tasks.** IT is inundated daily with huge numbers of monotonous tasks, including a massive influx of items to tend to when resolving issues. Integrations into container management and orchestration technology (Apache Mesos, Docker Swarm, Kubernetes, or Red Hat Ansible) by monitoring tools allow automated actions to take place for remediation. This frees up help desk and engineering operations staff to focus on higher-value activities.

Containerized Microservices Monitoring Solutions Are Advancing

It's not unusual for monitoring and management tools to lag behind new technology innovations. In the early days of containerized microservices, there were few choices in how you could measure the performance of your environment. Fortunately, the next generation of machine learning or AI- powered monitoring solutions that can account for the dynamic nature, velocity, and scale of containerized microservices has arrived to help.

› **Monitoring solution providers have stepped up to cover containerized microservices.** Almost all IT monitoring software vendors have a module, an add-on, or native support to tackle the basic capabilities to monitor containers and also offer features to track orchestration metrics, number of user requests per container over time, and distributions of the amount of time each service

request takes. Check first to see what your preferred monitoring vendor offers, both for speed-to-implementation and for what should more readily integrate into your "one source of truth" monitoring framework. If you're looking for just a pure open source tool set to minimize licensing cost during the experimental phase of application development, solutions such as Prometheus and Zabbix also exist. However, be aware that adding a one-off tool set that monitors only containerized microservices can lead to fragmentation of metrics and events correlation across an application stack.

› **Comprehensive microservice-based application visibility is now possible.** Monitoring solutions with advanced capabilities can give operations teams further visibility into microservice-based application behaviors. Tools that provide automated instrumentation as well as highly scalable, real-time dependency mapping across the application and infrastructure stack and that can perform distributed tracing to track composite service transactions can provide more depth and root-cause analyses capabilities.

› **The future begs for even tighter integrations with the continuous delivery pipeline.** Given the continued expansion of DevOps practices across IT enterprises, the need to integrate continuous integration/continuous delivery (CI/CD) tools such as Jenkins, Puppet, and Vagrant into the monitoring ecosystem is an imperative. Operations teams, site reliability engineers, and DevOps teams need continuous visibility into the state of the environment and how activities, such as a new code push, may impact monitoring baselines and performance.[2] Having integrations to continuous delivery and release automation (CDRA) tools, such as Electric Cloud or XebiaLabs, that can correlate pushes to performance degradations, avert false positive alerting, and then take meaningful action will be a must.[3]

Recommendations

Establish An Adaptive, Business-Oriented Monitoring Strategy

Laying the groundwork for what your I&O team hopes to gain from a new monitoring standard is key to its successful deployment and adoption. The world has shifted from looking at enterprise infrastructure performance from the bottom up to a top-down, service outcome model. Customer and employee experience are now key metrics. Don't be left behind because you're focusing on server uptime when overall time to service a user request is far more important.

› **Select monitoring technologies that can address your enterprise's evolving needs.** It's always best to have a view of current and future states of your computing environment and look for solutions that have capabilities beyond what you need today. Avoid implementing a stopgap microservices monitoring solution and look for a solution that's part of, or can readily integrate with, your core IT monitoring platform. Consider the needs of all enterprise stakeholders, as various teams will want to drill into various service layers for more precise metrics and troubleshooting.

› **Evaluate and reset baseline metrics.** Assess and establish critical metrics to associate with overall and component service health. Understand what outcomes matter to both IT and business stakeholders, such as sales conversion rates and number of completed transactions per minute versus things like disk I/O to judge service performance. When evaluating a containerized microservices monitoring strategy, take the time to ask, "What will we measure?" "Outside of what data-value ranges do we classify an anomaly?" and "What metrics are a true measurement of customer experience?"

› **Align your development and operations teams' views with the services they support.** Look at where your core monitoring needs lie within the company's organizational structure. Is there one operations team, or do many IT disciplines have or need to have access to tools for dedicated purposes? What's most important for these varying roles and teams to observe? Some enterprises using containers and microservices have smaller development or cross-functional product teams that will want focused visibility. Look for solutions with federated capabilities and assign access to assets within the monitoring platform so each microservice team can isolate metrics, alerts, and dashboards tailored to their needs.

› **Create an enterprise monitoring platform team.** Given the crucial need to produce exacting business insights from enterprise infrastructure and application data, consider building an enterprise monitoring team or center of excellence. Having one team dedicated to the overall monitoring architecture, which includes support for containerized microservices, will help standardize efforts and avoid proliferation of siloed solutions. This team would also be in an ideal position to support cross-team service-based applications and supply the enterprise with broader business-level insights.

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Supplemental Material

Survey Methodology

The Forrester Analytics Global Business Technographics® Infrastructure Survey, 2018, was fielded between July and September 2018. This online survey included 3,391 respondents in Australia, Canada, China, France, Germany, the UK, and the US.

Forrester Analytics' Business Technographics ensures that the final survey population contains only those with significant involvement in the planning, funding, and purchasing of business and technology products and services. Research Now fielded this survey on behalf of Forrester. Survey respondent incentives include points redeemable for gift certificates.

Please note that the brand questions included in this survey should not be used to measure market share. The purpose of Forrester Analytics' Business Technographics brand questions is to show usage of a brand by a specific target audience at one point in time.

Endnotes

[1] Source: Joe Beda, "Containers At Scale," Speaker Deck, May 22, 2014 (https://speakerdeck.com/jbeda/containers-at-scale?slide=2).

[2] See the Forrester report "How To Apply Google's Site Reliability Engineering Approach To Your Infrastructure."

[3] See the Forrester report "The Forrester Wave™: Continuous Delivery And Release Automation, Q4 2018."

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