



# The Rising Wave of Stateful Container Applications in the Enterprise

## The 451 Take

Driven primarily by technology advancements and enterprise demand, a new wave of stateful container applications is building in the enterprise. No longer are container applications limited to primarily web and stateless applications, which represent the first wave of container software. Instead, many organizations are focused on containerization of a variety of stateful applications and components, primarily databases and data services such as Apache Cassandra and Kafka. This second wave of container applications has arrived as enterprises are looking to extend container advantages such as speed, simplicity and portability to more of their many development teams and applications.

A fast pace of innovation and new releases of Kubernetes, including support for persistent data volumes, have also fueled the containerization of stateful applications. As more enterprises use containers for stateful applications, it also opens up containerization for a much broader swath of enterprise application portfolios, beyond net new applications to include more existing applications as well. There are still challenges in deploying cloud-native software, including complexity, cost and security, but we expect to see increasingly data-rich applications being developed and deployed in containers going forward. In our recent Voice of the Enterprise: DevOps, Workloads & Key Projects 2020 survey (see figure below), over 55% of enterprise organizations reported that more than half of their container applications are stateful.

## A Substantial Portion of Container Applications are Stateful

Source: 451 Research's Voice of the Enterprise: DevOps, Workloads & Key Projects 2020

Q: What percentage of your container applications are stateful vs. stateless?

Base: All respondents (n=430)





## Business Impact

**TECHNOLOGY IS ENABLING STATEFUL CONTAINER APPLICATIONS.** The inclusion of stateful applications developed and deployed in containers is reflective of the technological evolution and innovation occurring with cloud-native software, such as the open source Kubernetes project. With the addition of features and capabilities such as persistent data storage volumes, the Kubernetes community and software are moving fast. However, enterprise IT does not typically move at the same speed, which presents both technical and cultural challenges to the adoption and effective use of cloud-native technology and methodology.

**ENTERPRISES ARE DEMANDING CONTAINERIZATION OF STATEFUL APPLICATIONS.** Despite the challenges, enterprises do seem to be leveraging technology such as persistent data volumes in Kubernetes to extend cloud-native advantages – e.g., developer productivity, speed and portability – beyond stateless applications to more data-rich, stateful applications. Organizations are also leveraging containers to increase agility and responsiveness, which has emerged as critical amid the current coronavirus pandemic and resulting economic conditions. Containers are also proving to be economically beneficial as a virtualization layer that is more efficient than legacy architectures. Organizations are under more pressure than ever to respond quickly to changes in the market. The more applications that are in containers – regardless of state – the more likely the organization is to be truly agile and flexible in responding to challenges and opportunities. The containerization of stateful applications means a much greater number of applications across a large enterprise's portfolio are suitable for containers. Organizations tend to start with new applications as they wade into cloud-native use, but they are typically just as focused on including legacy applications in their new approach. With containerized, stateful applications, they can leverage cloud-native advantages across more of their applications.

**SEVERAL ASPECTS OF SUPPORT ARE REQUIRED FOR STATEFUL CONTAINER APPLICATIONS.** There are several critical aspects to running stateful applications in containers, including data persistence across storage venues, performance, latency, high availability and security. Stateful applications by their nature require a different operational paradigm that goes beyond stateless application management, which centers on simply restarting the container. With stateful applications, organizations must consider data security, data protection and disaster recovery. These aspects become even more critical as enterprises seek to maintain control and consistency across a wide array of application software components, services and deployment venues, which include on-premises, private cloud and multiple public cloud environments.

## Looking Ahead

Given that enterprises are seeking to containerize more applications, including stateful ones, we expect continued growth of data-rich applications and services in containers, as well as expanded use of data services in container applications. We also expect the trend toward stateful, containerized applications to be fueled by continued evolution and maturation of cloud-native software such as Kubernetes, which continues to provide innovations in compute, orchestration, networking, storage and other capabilities. Kubernetes also presents a platform-agnostic way to extend capabilities via plug-ins such as the Container Network Interface and Container Storage Interface. These open source plug-ins are designed to allow multiple vendors to extend built-in capabilities to address customer and community priorities.

Cloud-native compute, storage, networking and other capabilities such as those critical to stateful container applications will become increasingly important as organizations seek to increase developer productivity and speed. The need to support applications across hybrid and multicloud infrastructures that include on-premises, private cloud and multiple public cloud environments will also drive more containerization given the portability advantages. This means most organizations will need to adopt containerization beyond stateless applications and include more stateful legacy applications to compete in today's market.



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