

WHITE PAPER

Microservices with Redis Enterprise on Kubernetes



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Executive Summary

As organizations look to modernize their application architecture, many are turning to microservices, an architectural style that consists of a distributed collection of loosely coupled services. This rapid shift away from monolithic application architecture has had a ripple effect across the application development landscape, with other technologies such as containers and container orchestration tools (e.g. Kubernetes) emerging to facilitate the adoption and management of microservices.

Redis Enterprise is uniquely suited to a microservices application environment. In this paper, we'll discuss the reasons why organizations are rapidly adopting microservices and Kubernetes, as well as the key benefits Redis Enterprise brings to these organizations.

Microservices Are the Future of Application Delivery

It is astonishing when we take a moment to ponder the prominence and influence of digital technology in our daily lives. Not only do we rely on digital technology for everyday services, information, and connection, we also expect it to deliver these experiences instantly. It's become perfectly commonplace to "Uber" a ride and watch in real time as the driver approaches, stream content on demand, or receive notification that someone is checking out our dating profile at the exact moment we're checking out theirs.

But while users may have the luxury of taking these real-time experiences for granted, application providers do not. Creating innovative, responsive, real-time digital experiences requires a fundamental shift in application development and delivery. This shift has arrived in the form of microservices.

A microservice architecture is an architectural style in which an application consists of a distributed collection of loosely coupled services. Each service is autonomous, independent, and highly specialized. As a result, services can be updated or scaled independently of one another, allowing enterprises to more efficiently allocate resources and achieve faster time to market for new applications or updates.

As organizations like yours look to modernize their application architecture platforms, many are turning to microservices. A recent survey of development professionals shows that 86% expect microservices to be the default architecture within five years, with 60% already having microservices in pilot or production.¹

The Rise of Kubernetes

Microservices typically run in containerized environments. The portability offered by containers enables effortless relocation or replication of a microservice across heterogeneous platforms.

But while a container in isolation can be quite easy to implement, applications can conceivably consist of hundreds of containers spread across dozens of physical nodes and interdependent containerized services. Managing these large sprawls of containers is a tremendous operational burden.

As a result, organizations are turning to container orchestration tools such as open source Kubernetes to efficiently deploy and manage containers at scale. Originally developed by Google, the Kubernetes platform has become the de facto standard for container orchestration. A recent survey of IT leaders shows that of those who have deployed (or are planning to deploy) containers, 30% are working with Kubernetes, making it the most widely used container orchestration tool in the world.²

Building blocks for modern applications

60% of development professionals surveyed have microservices in pilot or production.¹

Kubernetes is the most widely used container orchestration tool in the world.²

¹Source: "<https://go.lightstep.com/global-microservices-trends-report-2018>"

²Source: "https://diamanti.com/wp-content/uploads/2018/07/WP_Diamanti_End-User_Survey_072818.pdf"

Data Complexities Challenge the Adoption of Microservices

As is so often the case, new technologies that solve problems in one area introduce problems in others. And microservices are no exception. For two years running, IT professionals have named persistent data storage the most difficult challenge to overcome in a containerized microservices environment,³ making it clear that finding the right database is critical to any successful microservices design.

Other key data challenges that microservices architectures present include maintaining high availability and data consistency across the distributed environment, as well as acquiring an unmanageably large number of specialized databases, due to its loosely coupled design.

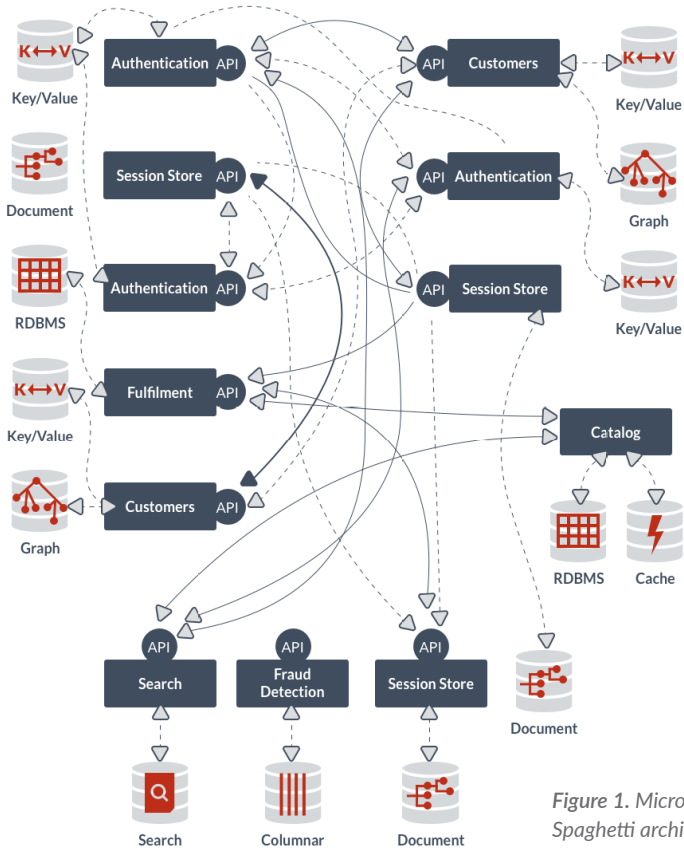


Figure 1. Microservices - Spaghetti architecture

Ideal for Microservices Architectures

Redis Enterprise is purpose-built for microservices architectures. Not only does it overcome the inherent challenges of a highly distributed application environment, it delivers the extreme flexibility and wide array of features needed to further power the limitless possibilities that microservices were designed to facilitate.

A Paradigm Shift in Data Architecture with Redis Enterprise

As your organization transitions to a modern application architecture, you need to choose a database that can overcome the challenges of microservices in order to fully unleash the benefits of today's agile development technologies.

Look no further than Redis Enterprise. Developed by Redis, Redis Enterprise extends the capabilities of open source Redis, the most popular in-memory NoSQL database, to provide the performance, innovation, reliability, and return on investment demanded by the world's most forward-thinking application providers.

³Source: "https://portworx.com/wp-content/uploads/2017/04/Portworx_Annual_Container_Adoption_Survey_2017_Report.pdf"

Ideal for Microservices Architectures that Leverage Kubernetes

Redis Enterprise is also purpose-built for microservices architectures that leverage the Kubernetes container orchestration tool. Available as a ready-to-deploy Kubernetes service, Redis Enterprise database instances are easily created and efficiently managed as a stateful service in any public, private, or hybrid cloud—or on-premises—environment.

The Benefits of Redis Enterprise in a Microservices and Kubernetes Environment

As application development and delivery architectures shift, so too must data architectures. Redis Enterprise has made this shift, and, as a result, brings many key benefits to organizations running microservices—and the Kubernetes container orchestration tool. While by no means an exhaustive list, these key benefits include low TCO, unmatched business continuity, and faster time to market.

The Lowest TCO of Any Database

In a microservices architecture, organizations are no longer limited to a single database deployed across a monolithic application; instead, each service can decide its own storage. The flexibility of being able to choose the most efficient data storage method for the task at hand is one of the big draws of microservices.

But the fragmented data management environment that results from running a myriad of different data storage products, known as polyglot persistence, dramatically increases the complexity of both operations and development.

Redis Enterprise effectively removes the operational and development hurdles associated with managing numerous disparate data structures. As a multi-model database, Redis Enterprise not only solves for a variety of different use cases such as cache, session store, or message broker to name a few, it also extends itself to serve as a document store, key-value store, graph database, search engine, and so on. With Redis Enterprise, polyglot persistence—and its tremendous benefits—are still achieved, but at the much smaller operational cost of a single, elegant database platform.

Redis Enterprise also incorporates many features specifically designed to make the most efficient use of your hardware in order to minimize overhead and maximize savings. These include a multi-tenant architecture that reduces server sprawl, on-demand cluster expansion with zero downtime so that there's never pressure to over-provision in anticipation of future load, and an extension to Flash as a low-cost storage alternative for infrequently accessed data.



Netflix, one of the earliest and most famous adopters of microservices,

transitioned from a monolithic, Oracle-based database to a microservices architecture that, today, consists of more than 500 services.⁵ Considering that each one of these services has the potential to introduce a unique data storage technology, it's easy to see how polyglot persistence can lead to a big operational price tag.

Business Continuity You Can Depend On

You've probably heard the phrase "software is eating the world." Originally penned in 2011 by venture capitalist Marc Andreessen,⁶ this observation is even more true today as businesses across every industry are increasingly being run on software and delivered as online services.



Figure 2. Redis Enterprise on Kubernetes offers seamless portability across any cloud-native platform including Amazon Elastic Container Service for Kubernetes (EKS), Google Kubernetes Engine (GKE), Azure Kubernetes Service (AKS), Pivotal Container Service (PKS), and Red Hat OpenShift.

⁵Source: "<https://www.slideshare.net/InfoQ/scalable-microservices-at-netflix-challenges-and-tools-of-the-trade>"

⁶Source: "<https://www.wsj.com/articles/SB10001424053111903480904576512250915629460>"

Your applications are your organization's face to the world—and likely key revenue generators. Data loss, data discrepancies, and application downtime can quickly lead to loss of revenue, customers, and reputation. Redis Enterprise, already known for its no-hassle high availability in any deployment scenario, has several features that specifically safeguard data and application reliability within a microservices environment.

Tight Integration with Kubernetes Ensures Data Persistence

Microservices typically run in containerized environments. But containers, by design, aren't built to persist the data inside them; they're built to be easily brought up or down as the application scales. As you may have already discovered, this contrast between the stateless nature of microservices and the stateful requirements of data introduces considerable complexity.

The Kubernetes container orchestration tool alleviates some of this complexity through its ability to orchestrate stateful applications (e.g. databases), but achieving reliable data persistence remains a challenge.

To help overcome this challenge, Redis Enterprise offers native integration with Kubernetes. This integration explicitly informs Kubernetes of the existence and state of Redis Enterprise containers so that, when bringing down these containers, Kubernetes can look to Redis Enterprise for unique failover sequencing instructions that ensure there is no data loss or interruption to data availability.

Active-Active Replication Ensures Data Consistency Across Geographically Distributed Databases

Microservices are deployed independently and in parallel with the other microservices. Transactions are spread across multiple services and the only way for these services to communicate with each other is through their published interfaces. It's precisely this modular design that allows one microservice to be updated with little risk of compromising others, and, therefore, allows for accelerated delivery and improved stability.

However, the nature of this distributed design means that careful coordination is required to ensure consistent views of persisted data. Redis Enterprise's unique approach to data consistency (based on CRTD Active-Active replication) oversees seamless data conflict resolution. This alleviates the need for developers to tackle consistency issues at the application level, and still delivers superior performance, regardless of where the microservice resides. This approach makes Redis Enterprise an ideal candidate for distributed database architectures.

Faster Time to Market

Continuous delivery of new features and enhancements is critical to staying ahead of the competition. In fact, 60% of application development experts surveyed across 51 countries and 12 industries named faster time to market as their primary impetus for adopting microservices.⁴

Redis Enterprise also speeds time to market, further sharpening the competitive edge for enterprises that have embraced microservices. Redis Enterprise's no-hassle operations allow developers to focus on building applications rather than performing operational heavy lifting, while its flexible data models, language agnostic operations, cloud portability, and open source Redis compatibility all dramatically simplify application development.

Top challenges inhibiting microservices adoption

For two years running, IT professionals have named persistent data storage the most difficult challenge to overcome in a containerized microservices environment.³

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About Redis

Redis is the world's most popular in-memory database, and commercial provider of Redis Enterprise. Consistently ranked as a leader in top analyst reports on NoSQL, in-memory databases, operational databases, and database-as-a-service, Redis is trusted by over 8,500 enterprises, including six of the Fortune 500's top ten.

⁴Source: "<https://camunda.com/pdf/camunda-microservices-orchestration-survey-report-2018.pdf>"



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