

## REPORT REPRINT

# Pivotal pushes digital transformation with PaaS, Kubernetes and serverless

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The company is providing a variety of software-deployment options within its Pivotal Cloud Foundry platform portfolio for enterprise customers that are leveraging varying levels of control and abstraction to effectively create, release and operate cloud-native applications.

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Pivotal continues to evolve with the cloud-native trends of containers, Kubernetes and hybrid cloud while offering support for customers seeking control and integration with other software they are running, as well as for customers that are prioritizing abstraction and managed services. The Pivotal Cloud Foundry (PCF) platform portfolio includes the Pivotal Application Service (PAS); Pivotal Container Service (PKS), with support for containers and Kubernetes; and the Pivotal Function Service (PFS), which was recently released in alpha and is based on Pivotal's open source project riff and its work with partners on the Knative serverless project.

Pivotal's promise is deployment and operation of applications (and the platform itself) in a consistent manner across hybrid and multi-cloud infrastructures using PCF, which also includes the Pivotal Services Marketplace. Updates and enhancements to Pivotal's software include simplified functionality for operators, expanded multi-cloud capability and enhanced support for .NET applications. Pivotal has also added PCF Healthwatch, an operational dashboard, as well as security capabilities across runtimes.

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## THE 451 TAKE

Pivotal makes the point (and we agree) that today's large enterprises must support a variety of applications and data services. This typically requires a variety of platforms, whether traditional PaaS and VMs with PAS, containers and Kubernetes with PKS, serverless with PFS, or combinations thereof. In providing its customers various levels of control and automation, we believe Pivotal is effectively addressing the spectrum of abstraction that characterizes today's cloud-native application development and deployment paradigms. In addition to giving customers access to emergent technologies, such as Kubernetes distributed orchestration, serverless and Envoy service mesh proxy, Pivotal integrates familiar technology and support, such as its BOSH Cloud Foundry infrastructure automation software. This allows enterprises to better address the reality of different teams at different stages of their digital transformations. In addition to its support for enterprises facing a dynamic IT landscape that is increasingly evolving to cloud-native, we believe Pivotal may also benefit from defecting customers or employees amid cloud-native consolidation that includes IBM's acquisition of Red Hat.

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## CONTEXT

Pivotal says that, while the term 'PaaS' may have somewhat negative or ambiguous connotations in the market, it is still a concept and offering that is appealing to enterprise customers. This is particularly true since PaaS offers customers various levels of control of the software stack and its operation, including the application layer, service brokering, runtime layer, operating system image, embedded operating system and other variables. Pivotal continues to advance its PaaS software with Pivotal Cloud Foundry enhancements that include simpler operator functionality; expanded multi-cloud support that includes AWS, Azure and Google; and deeper support for the .NET Framework, as well as full support for running applications on Windows Server. Another PCF enhancement is Healthwatch, an operator dashboard to make distributed systems more observable and maintainable. PCF also features security enhancements across runtimes, including compliance and simplified audits, the ability to repair software as soon as updates are available, the ability to 'repave' servers and applications from a known good state, and rotation of user credentials to reduce risk. Pivotal has also introduced PAS for Windows to better support running applications and workloads on Windows Server.

In its previously released PKS 1.2, VMware and Pivotal added support for management with vRealize automation, backup and restore of Kubernetes cluster state, optimized cluster creation and scaling, and choice of IaaS (including native AWS support, vSphere and Google Compute Platform). Other improvements centered on deeper integration with NSX networking and security enhancements, such as integration of LDAP at the cluster level and TLS termination for load balancers. In a recently released PKS 1.3 update, key improvements include native support for Azure and networking enhancements such as network profiles for applications that need load balancing and capacity, as well as support for the flannel overlay network for containers. Other PKS 1.3 updates include security enhancements, such as Routable Pods that improve full-path trace auditing, and streamlined integration with vRealize Operations. The latest PKS 1.3 also includes Harbor 1.7 registry, which features enhanced Helm charts, image control and image deletion.

Pivotal has also been expanding increasingly into functions as a service (FaaS) or serverless, primarily with its open source project, riff, which is the basis for its contribution and participation in the Knative serverless project with Google and other partners. Project riff is also key to Pivotal's own serverless offering, Pivotal Function Service (PFS).

Recently released in alpha, PFS is Pivotal's commercially supported and opinionated version of its riff and Knative software that runs on Kubernetes, including vSphere, GKE and PKS. PFS is event-oriented and supports built-in components to enable loosely coupled streaming systems. PFS is aimed at both developers with buildpacks to simplify packaging, and operators with a secure and simplified experience on top of Kubernetes. PFS is built on Knative's three main components: a pluggable model for building containers from source code in the cloud or in a cluster; a request-driven compute runtime using Istio for traffic routing; and an 'eventing' system that allows applications and functions to consume and publish event streams from a variety of sources, enabling an asynchronous, loosely coupled architecture. In addition to the major public clouds, PFS is also supported on-premises – in-line with enterprise customer demand to retain control of software but manage it in a manner similar to public cloud.

Underlying Pivotal's different services is the open source Cloud Foundry BOSH infrastructure automation and embedded operating system software. BOSH provides some much-needed familiarity for organizations facing the newness and complexity of Kubernetes. Pivotal says BOSH does for Kubernetes VMs what the open source Kubernetes does for containers. BOSH sits between the different infrastructures supported – public clouds, private clouds and on-premises environments – and the services from each to provide a unified, consistent experience.

## STRATEGY

Although there is typically a chronological order to adoption of technology that starts with containers and microservices, we do see some organizations going straight to serverless for some applications. Pivotal says this has to do mainly with resource efficiency and speed. Narrow units of code and built-in event integration drive software development efficiency. Code that does not consume resources while idle improves resource efficiency, and use of serverless for distributed applications can drive operational efficiency through automated, event-based scheduling and self-scaling.

Pivotal also indicates that, while serverless is being considered for applications that may include about 30 microservices and a dozen or so functions, it is also focused on functions at scale, whereby hundreds or thousands of functions can be supported. The company says the three main serverless use cases among its customers are: web events with back-end services, data services and automation; event-based integration for scheduled tasks, file processing, complex event processing, and change data capture with monitoring, notifications and alerting; and large-scale data processing, including IoT streams and machine learning.

## COMPETITION

Pivotal faces competition primarily from other PaaS and CaaS providers. Its primary PaaS competition, Red Hat with OpenShift, was recently acquired by IBM, and this may impact the competitive landscape as IBM pushes a hybrid cloud strategy across the major public clouds – similar to Pivotal. The Kubernetes commercial market also provides a number of competitors for Pivotal, including the hyperscale public cloud providers and established giants. This includes Kubernetes market leaders AWS, Microsoft, Google, Huawei and IBM. Other large vendors also competing for enterprise cloud-native customers include Cisco, Samsung's Joyent, Oracle, Rackspace, SAP and SUSE.

Smaller players that are nonetheless competition for Pivotal include: Canonical, ContainerShip, Docker, HashiCorp, Kublr, Mesosphere, Platform9, Rancher Labs and Univa. Its integration and partnership with VMware also gives Pivotal broader access to clients with investments in VMware technology, but with an eye on emergent and cloud-native trends such as Kubernetes and serverless.

## SWOT ANALYSIS

### STRENGTHS

Pivotal is pushing ahead to add new Kubernetes and serverless products while it continues to provide a streamlined developer experience for running cloud-native containerized workloads on a mature application platform. This positions it well for large enterprise customers on the journey to digital transformation.

### WEAKNESSES

Pivotal is sometimes perceived as too opinionated for enterprise customers focused more on flexibility to accommodate the wide range of tools and components in today's environments.

### OPPORTUNITIES

Pivotal's main opportunity is hybrid support of its software across the major hyperscale public clouds, which it is doing well. The acquisition of rival Red Hat by IBM may create opportunities for talent, customers and mind share.

### THREATS

Dominance by the hyperscale public cloud providers, even though they are among Pivotal's partners, is a challenge for nearly all vendors, particularly as these vendors extend more to hybrid support of their clouds and on-premises environments, although extension to one another's clouds is unlikely.