HPE EZMERAL SOFTWARE SOLUTIONS

Delivering unique cloud experiences for data-intensive workloads from edge to cloud
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EXECUTIVE SUMMARY

The reality of data-driven transformation today
Data is the fuel of enterprise transformation. However, staging and applying data to decision-making is a complex task. Deploying new data analytic solutions quickly and in innovative new ways to build business value is another focus area. For both, legacy applications, data silos, and slow development cycles hamper progress. The more data that is required by an application, the harder it becomes to service that application from an isolated, siloed data source. For example, a complex machine learning (ML) environment relies on large amounts of data to be distilled down into models.

According to Gartner, over 60% of ML models developed with the intention of operationalizing them were never actually operationalized. There are many reasons for this, but a crucial one is a lack of tools to enable and facilitate operationalization, which is not just about deployment.¹

To more efficiently extract value from data, enterprises are transforming their silo-based on-premises solutions into more agile cloud-based deployments. To do this, they are turning to containerization of their workloads. Recent Gartner data shows that by 2022, 75% of all organizations would have deployed containers.² However, this is only part of the story. Containers are simply infrastructure—a means of organizing applications and data. Often when containerization is mentioned, we immediately think of everything running in some cloud. However, IDC reports that 54% of those new container-based workloads will in fact run on-premises.³ Clearly a unified cloud, on-premises and edge solution is needed.

By 2022, will have deployed containers
− Gartner

Of container deployments will be on-prem
− IDC

This paper addresses the challenges enterprises face as they strive to accelerate their digital transformation initiatives to improve analysis, decision-making, and market responsiveness while also yielding greater efficiency and portability. Best practices established through successful data-driven transformations are also shared.

Target audience
This document is intended for CTOs and infrastructure architects, and may be relevant to DevOps and data science teams considering containerized infrastructure operationalizing data.

Document purpose
This technical paper matches challenges to innovative yet straightforward approaches for deploying and scaling Kubernetes environments, upgrading analytics, and modernizing legacy monolithic applications.

¹ “Magic Quadrant for Data Science and Machine Learning Platforms,” Gartner Inc., 2019
³ “Container Infrastructure Software Survey,” IDC, 2018
CHALLENGES TO ACHIEVE DATA-DRIVEN TRANSFORMATION

Digital transformation is a strategic initiative for most enterprise organizations as they seek to gain business insights from their data. That data is often locked away in silos controlled by legacy applications, cached to support edge applications, or stored in a proprietary cloud. Breaking data out of its silos requires rethinking data placement as well as application transformation and/or modernization. By combining these ideas, AI and machine learning can access the data to produce the promised business insights. Data silos and legacy data-intensive applications are the key barrier to overcome.

Petabytes of enterprise data are the inputs that fuel AI/ML and yield business insights, and that data—more of it every year—is stored everywhere: in the core data center, at the edge, and across multiple public clouds. Securing and protecting data wherever it’s stored, ensuring applications access the data they need, meeting SLAs, and accounting for each organization’s resource use are all continuing challenges.

“The capabilities we’re able to deliver on this analytics platform are also about empowerment for our business customers. Data scientists are distributed all across the enterprise. We can empower them with access to analytics as a service wherever they are, and do that in a manner that’s fast, cost-effective, and architecturally sound—that all matters.”

– Dave Carlisle, Chief Technology Officer, HPE IT

On par with data access, pervasive workload deployment via containers offers many benefits over virtual machines (VMs). The proliferation of containers and need for workload resiliency created the need for container orchestration—and Kubernetes (K8s), an open source project, has become the de facto industry-standard container orchestration solution.

Kubernetes addresses many aspects of container management—service discovery and load balancing, automatic container restarts, automated rollouts and rollbacks, and host resource optimization among others. With that power comes complexity in deployment and changes to IT and development processes. However, the unique ecosystem offered by each major cloud vendor to support Kubernetes confounds organizations seeking consistency and efficiency.

Enterprises that want the flexibility to shift workloads between cloud providers are understandably concerned about vendor lock-in.

Hewlett Packard Enterprise has found that as organizations address data access and Kubernetes deployment in parallel, they commonly face the following challenges.

Overcoming data gravity

Large datastores exhibit gravity, tending to pull compute toward the data. Local data access to data is fast and efficient; sending large amounts of data over the network is not.

Taking advantage of all data: To get better insights, AI, machine learning and other data analytics frameworks need access to more data, but that data is scattered across the core data center, the edge, and in multiple public clouds.

Balance accelerated insights with cost: The solution that is used to manage and extract value from data must help an organization in two dimensions: cost and performance. If too much effort is placed on cost cutting, the resulting inferences come too late to be beneficial. If no checks are placed on costs, then profits are consumed for the sake of speed.

Melding different types of data: Enterprise data is stored in relational and nonrelational databases, spreadsheets, event logs, and other forms on a range of systems. A data access solution must support all of that variety.

^ HPE leverages elastic data analytics solution to bring advanced service to global users
Inconsistent IT silos
Data silos isolate and reduce the business value of the data they hold—behind stand-alone applications, nonstandard protocols, unique security, access control, and governance configurations. Breaking down silos is an ongoing challenge.

Complex data provisioning: Enterprises want to gain access to data isolated behind legacy applications without first having to modernize each application, which is time consuming and expensive. In addition, data created at the edge or stored in a proprietary public cloud must be easily accessible to all workloads that depend on it.

Inconsistent data governance: Maintaining consistent compliance across each data source with security, access controls, and governance policies is difficult.

Rigid application configuration: Enterprises struggle when each line of business application operates in a unique IT silo and requires complex migration whenever changes to infrastructure occur. Information such as IP addresses, security and access protocols, and access rights are often hard-coded and inhibit flexibility.

Addressing Kubernetes deployment complexity
Kubernetes (K8s) is an open-source system for automating deployment, scaling, and managing containerized applications. It is built upon 15 years of experience of running production workloads at Google™. Typically, Kubernetes deployments are a loosely integrated collection of software components hand-crafted to manage container clusters on host servers.

Specifying and then deploying Kubernetes and related software: Enterprises can deploy and configure many software components of an enterprise Kubernetes deployment but have found the experience daunting and expensive. For these DIY environments, staff costs are often high and staff acquisition difficult.

Inconsistent Kubernetes cluster management: Organizations with multiple clusters often run several versions of Kubernetes, deployed by the IT team or by public cloud providers. Delivering consistent services and ensuring cost accountability are difficult.

Tailoring clusters to business needs: IT, AI/ML, data science, and legacy application development teams each need different things from their clusters—for example, GPUs, storage, compute—and interact with their clusters differently. Each group also has different ideal hosting locations, deployment models, and day-to-day requirements. A one-size-fits-all Kubernetes experience has not met expectations.

Making legacy applications container friendly
Containers simplify application mobility by encapsulating an application and its dependencies—software libraries, configuration, and data. Containers are similar to virtual machines (VMs) but are free to create and use (no license cost) and are smaller than VMs. This enables a host server to run more containerized applications than equivalent VMs.

Predictable access to persistent storage: To meet established SLAs, enterprises need predictable performance and latency for containerized legacy applications as they access their persistent data, wherever those application containers run and wherever their data is stored.

Deployment agility: Enterprises want to be able to shift containerized legacy applications between cloud environments as business conditions evolve. This means migrating Kubernetes clusters currently running in isolation at the core data center, the edge, or public cloud.

Automated test and build: The benefits from using cloud development tools and techniques have not typically been available to legacy application teams.
RECOMMENDED APPROACHES

Optimizing data access and workload deployment to support rapid decision-making takes efficient processes and tight technology integration. Successful initiatives demonstrate common characteristics; these best practices can guide enterprises as they plan and execute their own transformations.

Unified workload management

Agility and efficiency are improved when enterprises can build anywhere, deploy anywhere, and manage everything together. This unified control plane can automate and manage every deployed Kubernetes cluster. The span of control should include external clusters hosted by public cloud providers like Amazon Web Services, Microsoft Azure, Google Cloud, and other cloud platforms, as well as existing K8s clusters (for example, open source K8s or third-party) already in place. The unified control plane abstracts away the details of each provider’s management interface.

The unified control plane also improves governance: it enables security policies and quotas on all resources available to each business unit, which the platform enforces across the enterprise, in the core data center, on the edge, and across multiple public clouds.

Consistent approach for applications such as AI and ML

Operationalizing data analytics workloads produces timely, actionable insights from those workloads. Typically, this includes one-click deployment of common analytics configurations to facilitate consistency and solution sharing. It can also include automating repetitive tasks such as getting access to data and scaling model training by replacing hand-crafted scripts and manual steps. When combined with a high-performance distributed file system to deliver the data, data scientists and ML engineers (MLEs) can work more efficiently and add value to the business. Taken together, these elements deliver a unified workflow and a common framework for working with the organization’s data, experiments, models, and tools.

Containerization of legacy applications

Enterprises gain operational agility with containerized legacy applications—including Hadoop—that can be deployed anywhere. This also avoids the cost of refactoring applications into microservices. When supported by a unified control plane, Kubernetes enables high-availability, resilient, and containerized legacy applications to be automatically deployed to any cluster. Integrating a high-performance distributed file system provides containerized legacy applications with access to their persistent data. Developer and test teams responsible for legacy applications can achieve accelerated development lifecycles using cloud-style automation with continuous integration and continuous deployment (CI/CD) tools and processes.

Consistency across edge, core, and public cloud

Unify monitoring and management of workloads running across the entire enterprise infrastructure—core data center, edge, and cloud. Simplify and secure data access using a distributed file system that provides a global namespace and enforces security policies. Optimize cost and performance by shifting workloads anywhere across the enterprise infrastructure as business conditions evolve. Achieve efficient and consistent operations across the entire enterprise infrastructure by using a single instance of tools and associated, automated, processes.

Enable each team to use the infrastructure without worrying about it

Boost productivity by addressing each team’s unique needs with team-specific configurations of the tools and automated processes they use. This allows teams to focus on their work instead of dealing with infrastructure. Encourage use of best practices by publishing and sharing new configurations as needs and best practices evolve. Apply a distributed file system to streamline team access to data while enforcing security and governance policies. Optimize utilization of key resources used by data science, AI/ML, and data analytics workloads through automatic provisioning—and dynamic reprovisioning—of valuable CPU and GPU resources.

Key requirements

In summary, best practices call for:

- A unified control plane that automates everything in a cloud-agnostic way
- A high-performance, enterprise-scale distributed file system
- The ability to connect containerized legacy applications to persistent data

The next section describes how HPE addresses these recommendations.
TECHNICAL OVERVIEW OF HPE EZMERAL CONTAINER PLATFORM

The HPE Ezmeral Container Platform is a complete software solution that makes it easier, faster, and more cost-effective to deploy large-scale AI and Big Data environments—including TensorFlow, Spark, Kafka, Hadoop, and more—whether on-premises, multiple public clouds, or edge.

Users of the platform can create distributed environments for ML, data science, and analytics in minutes, rather than months. Included is a self-service provisioning experience to deliver the data and tools that data science teams need while providing enterprise-grade security and reducing costs.

As Figure 1 illustrates, the HPE Ezmeral Container Platform is designed to support data engineers, data scientists, application developers, and DevOps personnel.

Several technologies integrated into the HPE Ezmeral Container Platform are key to accelerate your data-driven transformation.

**FIGURE 1.** HPE Ezmeral Container Platform functional layers

**Unified control plane—secured, scalable, multicluster**

The unified, secured, scalable, multitenant, and multicluster control plane streamlines management of enterprise-scale Kubernetes clusters and provides a single-pane-of-glass view of all enterprise clusters and infrastructure.

As Figure 2 illustrates, the control plane unifies management of clusters running on different Kubernetes releases, in different environments—in this case, on-premises and EKS.

Platform hosts are physical and/or virtual machines where the HPE Ezmeral Container Platform software is deployed. Hosts may reside on-premises, on the edge, and/or on one or more public clouds.

Each platform host fulfills one of the following roles:

- The controller host runs the control plane software and controls the rest of the hosts in the deployment. The platform controller service can run on-premises, on the edge, or on a public cloud. If platform high availability is enabled, then a shadow controller host and an arbiter host will also be used.

- Worker hosts (nodes) are located on-premises, on the edge, or on a public cloud, and are under the direct control of the platform controller. Clusters with more than 1,000 worker hosts are supported. If the control plane has high availability enabled, then one worker host will serve as the shadow controller and another worker host as the arbiter. Worker hosts run software (services) that automatically handle all of the back-end virtual cluster management, thereby eliminating the need for complex, time-consuming IT support.

- Gateway hosts map the controller host and the private service IP endpoints to publicly accessible IP addresses/ports when deployed using a private, nonroutable network for nodes and containers.
Key controller capabilities

The controller dynamically allocates the resources on worker hosts to the clusters and jobs of each tenant as needed based on user settings and resource availability. Dynamic resource allocation enables the platform to achieve a much higher host utilization rate than traditional Hadoop and Spark deployments. Clusters can be created to run a wide variety of Big Data and AI / ML / DL applications, services, and jobs.

The Kubernetes functionality in HPE Ezmeral Container Platform simplifies the creation and upgrade of virtual Kubernetes clusters that can be located on local physical hosts, virtual machines, or as cloud instances. The flexible multicluster and multitenant control plane allows you to deploy multiple open source Kubernetes clusters and/or manage cloud Kubernetes clusters (for example, EKS) with no lock-in or modification to native Kubernetes required.

The controller also provides monitoring and deployment services including in-place rolling upgrades and integrates with existing enterprise authentication and authorization services. Existing clusters can be imported for management by the controller. During upgrades, the controller implements a phased upgrade process to increase cluster uptime during upgrades using auth-proxy caching and granular handling of upgrade failures to maintain access to the cluster.

Data fabric—Persistent storage for AI, ML, and legacy workloads

The HPE Ezmeral Data Fabric is preintegrated into the HPE Ezmeral Container Platform to unify data access, security, and management. It provides the capability to handle trillions of files, thousands of nodes, and hundreds of petabytes across thousands of client hosts, clusters, and racks across different geographical locations. It has the unique ability to extend across on-premises enterprise data centers, edge clusters, and the public cloud. Together, with the tenant model described in the following, it provides seamless data and application security.
The standard container storage interface (CSI) is used to provide persistent container storage to Kubernetes-managed containerized workloads. This approach enables transparent integration with existing Kubernetes customers and tools.

Applications running within virtual clusters that can use the HDFS file system protocols can then access paths within that resource using a DataTap or Dtap connection. Providing a Dtap connection is a unique capability of the HPE Ezmeral Container Platform shown in Figure 3. It implements a high-performance connection to remote storage for containers. This enables unmodified Hadoop and AI / ML applications to run against data stored remotely without loss of performance.

DataTaps are associated with a tenant, so multiple applications and containers can share a DataTap while isolating the DataTap from other tenants. A special DataTap instance constructed from storage local to the platform hosts, known as tenant storage, provides persistent shared storage accessible by all nodes used by a given tenant.

Global shared volumes enable cross-tenant sharing for shared access to Data Lakes and ML models, as shown in the Figure 4.
The cluster file system is the storage where the platform reads and writes temporary data that is generated while running jobs within a given cluster. The cluster file system is built within the cluster on storage taken from the local storage of the underlying host.

**Unique file directories** for each tenant are automatically created as a sandboxed shared-storage area within the tenant storage space of the platform, whether on-premises or on the public cloud. This per tenant storage can be used to isolate data that should be accessible by only one tenant. Optionally, it can be used to enforce a quota on the tenant's use of storage.

**Topology awareness** enables HPE Ezmeral Data Fabric to keep track of nodes and racks across the data center. Data volumes are then placed on the appropriate nodes depending on their access frequency or temperature—hot, warm, and cold. Volumes are also automatically moved across data tiers as the temperature of data changes.

**A global namespace** gives end users a unified view and access method to files without having to be aware of their physical location.

The HPE Ezmeral Data Fabric exposes NFS and POSIX interfaces to external customers that enable you to deploy both legacy as well as newer applications on the same platform.

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**MODERNIZING HADOOP WORKLOADS**

The HPE Container Platform offers a path to bring agility to existing deployments of Hadoop solutions, backed by 24x7 enterprise support. This is an attractive alternative for solutions facing end-of-life migrations. Orchestration with Kubernetes enables scalability and a true hybrid cloud deployment for both the application and data components. Continue to access the existing HDFS environment using the DataTap technology of HPE Ezmeral Data Fabric.

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**Enterprise-grade security**

The HPE Ezmeral Container Platform includes integrations with security systems from the OS upward including Active Directory, LDAP, Single Sign-On (SSO), and Kerberos services.

Multitenant support enables you to restrict platform access as needed, for example, by business unit, department, or team. Each tenant has its own unique set of authorized users, DataTaps, applications, and virtual clusters that are never shared with other tenants. Users with access to one tenant cannot access or modify any aspect of another tenant unless they have also been assigned a role on that tenant.

Role-based security enables administrators to create groupings of users and resources that restrict access to jobs, data, or clusters based on department membership and/or roles resulting in an integrated, secure, and multitenant infrastructure. The platform includes three user roles—platform administrator, tenant administrator, and tenant member—that control who can see certain data and perform specific functions. Roles are granted on a per-tenant basis, and each user may have at most one role per tenant.

Strong data security is provided with built-in authorization, authentication, file access control entries (ACEs), integration with Kerberos-protected data sources, and encryption. TLS is used for secure access to the platform, unified control plane, and service endpoints.

**Service mesh for microservices**

The HPE Ezmeral Container Platform includes the preintegrated Istio service mesh to ensure microservice application service levels. As the number of microservice deployments grows, it can become harder to understand and manage, as complexity increases, so does the need for service discovery, load balancing, failure recovery, metrics, and monitoring.

The open source Istio service mesh platform addresses complex operational requirements including secure service-to-service communication with strong identity-based authentication and authorization. It also streamlines A/B testing, canary rollouts, rate limiting, access control, and end-to-end authentication.

Deployment and management of Istio services are fully integrated into the cluster-management interface. Tenant and platform admins can enable Istio at the tenant or cluster level with a single mouse click, thereby enabling IT teams to deploy applications that are service mesh aware while also supporting applications that do not utilize a service mesh.

**Sophisticated, automated cluster management**

The cluster-management interface works with services installed on each host to automatically handle all of the back-end cluster management. Secure, authenticated access to the feature-rich GUI provides easy point-and-click cluster management according to the user's role. A RESTful API enables development of custom tools. Together, they yield the flexibility to use either interface to create clusters, deploy applications, manage ML projects, and more.

Many useful dashboards are included in the HPE Ezmeral Container Platform to help manage and monitor Kubernetes clusters. These dashboards include detailed monitoring at the cluster level and then finer grain monitoring at the tenant level.
As shown in Figure 5, the cluster dashboard presents a cluster-wide view of resource utilization including CPU cores, node storage, memory, persistent storage, tenant storage, and network traffic.

![Kubernetes Dashboard](image1)

**FIGURE 5.** HPE Ezmeral Container Platform web UI—Kubernetes cluster dashboard

**App store**

The platform includes an app store that provides one-click deployment of ready-to-run solutions including Big Data and AI / ML tools as shown in Figure 6. These images are provided for reference to show the breadth of the applications that are built by our customers. Included with the HPE Ezmeral Container Platform is the integrated open source tool called KubeDirector. This tool makes it easy to bring in your own custom applications into your Kubernetes clusters. Also, since standard Cloud Native Computing Foundation (CNCF)-certified open source Kubernetes is utilized, users have many other standard options to bring in their own applications such as using operators and helm charts.

![App Store](image2)

**FIGURE 6.** HPE Ezmeral Container Platform web UI—app store
• **Big Data tools** Many popular open-source applications are provided out of the box by HPE when the HPE Ezmeral Container Platform is initially installed. These images contain open-source software that is unmodified and supported by HPE and these vendors. A user can also add their own applications at any time. The first line of support is provided by HPE.

• **ML/DL, analytics, and data science tools:** The app store also includes preconfigured open-source tools including TensorFlow and PyTorch. Other tools have also been tested for compatibility with the platform and can be made available to customers including both open-source and commercial applications.

• **Internally developed tools and applications:** Customers can add their own LOB applications and other tools to the app store. The platform includes an application workbench that enables customers to create and add new images that their users can then deploy; this is the same process HPE used to create the provided images.

App store images are independent of the platform itself. Any tool or application can be added or removed from your platform to suit your specific needs. HPE and application vendors may provide new images or new versions of existing images, which will be marked in the app store with a ‘New’ or ‘Upgrade available’ banner, and its application tile will provide a button for upgrading to the new version.

**HPE commitment to open source**

The HPE Ezmeral Container Platform implements CNCF-certified Kubernetes based on 100% open source upstream Kubernetes. Several leading open source projects are integrated into the platform including KubeDirector, Istio, Harbor™, SPIFFE, and SPIRE. These are 100% open source upstream versions, not forks, ensuring improvements made by the community to these open source projects will flow through to HPE customers.

HPE is a Gold member of CNCF and has actively collaborated with the open source community for many years on projects including KubeDirector, SPIFFE, and SPIRE. HPE is also a Kubernetes Certified Service Provider (KCSP), a prequalified service provider with deep experience helping enterprises successfully adopt and deploy Kubernetes.

**TRANSFORMATION POWERED BY HPE EZMERAL CONTAINER PLATFORM**

Many companies support open source technologies. The value of the HPE Ezmeral Container Platform comes from the investment in integration that yields an easy-to-deploy and fully featured, complete product that solves the business challenges enterprises face.

**One-click deployment of solutions for AI, ML Ops, and more**

Data science teams can run their data-centric workloads in containers with one-click deployment from the integrated app store using preconfigured container images of popular AI / ML tools. They can copy and modify those images to publish their own configurations or create entirely new images to publish, using the included app workbench—the same tool HPE used to create the preconfigured container images.

Deployment of containerized legacy applications is handled by the integrated open source KubeDirector. KubeDirector is in broad terms a Kubernetes Custom Controller. This approach enables transparent integration with Kubernetes user and resource management, and existing Kubernetes clients and tools. The alternative to using KubeDirector would be to write your own Kubernetes Operator (in Go code) for every stateful application that you want to add to your Kubernetes cluster.

The HPE Container Platform interface also makes it simple to scale up or down clusters and even control the amount of GPU and CPU resources provisioned to a cluster. This ensures maximum utilization of those valuable resources, simplifies deployments, and ultimately reduces the costs both in management and in deployment.

**OPERATIONALIZE ML WORKLOADS**

Increase speed and agility for ML by operationalizing end-to-end processes from pilot to production. HPE Ezmeral ML Ops is a software solution that extends the HPE Ezmeral Container Platform to enable enterprises to implement DevOps-style processes to standardize their ML workflows through the build, train, deploy, and monitor stages. This provides data science teams with a platform for their end-to-end data science needs with the flexibility to run their ML or deep learning (DL) workloads on-premises, in multiple public clouds, or a hybrid model and respond to dynamic business requirements in a variety of use cases.
Modernization of monolithic, stateful workloads
Most enterprise transactional or business process applications are both a struggle to move to the cloud and too complex to cost-effectively refactor into cloud-native microservices.

MODERNIZE LEGACY APPS—NO APP LEFT BEHIND
Modernize legacy applications using the same approach HPE and HPE customers have used to bring non-cloud-native applications to the HPE Ezmeral Container Platform.

HPE Ezmeral Container Platform provides access to the existing persistent data, a gap in earlier container platforms that blocked modernization of legacy applications. Avoid lock-in to a specific cloud ecosystem—the application containers can be deployed from the app store to the core data center, to the edge, or to any cloud platform. Reduce cost through increased infrastructure utilization, and by eliminating the need for virtualization and hypervisor licenses.

The HPE Ezmeral Container Platform was architected and optimized specifically to help modernize legacy stateful applications into containers and deploy anywhere using Kubernetes. The HPE Ezmeral Container Platform gives containerized legacy applications access to existing persistent data stored anywhere.

Customers can use the same tools and techniques as HPE to containerize and publish traditional Big Data applications in the app store. Users get one-click deployment of LOB and other traditional enterprise applications (stateful applications).

These unique capabilities of the HPE Ezmeral Container Platform enable enterprises to finally bring their legacy applications into the enterprise cloud environment.

Multicloud deployment
Organizations want to make cloud deployment decisions based on costs and service levels. They are not interested in dealing with competing sets of proprietary cloud silos with unique constraints. HPE Ezmeral Container Platform provides a universal deployment and console to deliver multicloud container and data management. This approach yields critical benefits:

- Organization can deploy applications to any cloud then move the application to a different cloud as business conditions dictate increasing business agility.
- The built-in governance features are enhanced by policies that enforce deployment constraints reflecting data sovereignty and other regulatory requirements. Consistent governance across cloud and on-premises environments reduces risk.
- Security policies enforce roles across the enterprise, separating tenant workloads and resources, and (optionally) applying business unit resource quotas. Centralized security policies, automatically applied across the enterprise and enforced by the platform, protect valuable business assets.

Unified management of all Kubernetes clusters on edge, core, and public clouds
As mentioned earlier, the HPE Ezmeral Container Platform includes a sophisticated cluster management dashboard. The predefined cluster dashboard provides a view of all clusters managed by the unified control plane, wherever those clusters are deployed—in the core data center, on the edge, or in multiple public clouds. All clusters are managed using the same tools, simplifying automation and improving consistency.

The unified control plane supports clusters running on any CNCF-certified Kubernetes environment including Amazon EKS clusters—with extensions for Google Kubernetes Engine (GKE) and Azure Kubernetes Service (AKS) clusters.

Application access to data is streamlined by platform and tenant administrators defining DataTaps for persistent data. The automated tiering of data provided by the HPE Ezmeral Data Fabric helps ensure invested storage capacity is efficiently managed and used every time. The platform enforces data security and governance policies.

The global namespace makes all data available to authorized users, wherever it is stored across the enterprise infrastructure.

The consistency and simplification of unified management requires less specialized skill sets to set up, configure, and manage, thereby reducing operational complexity and cost.
**GETTING STARTED WITH HPE EZMERAL CONTAINER PLATFORM**

Each organization has a unique set of priorities for their transformation journey. HPE can assist organizations to develop a road map based on the required business outcomes.

To create your next-generation analytics solution, we must first understand your existing platform. HPE can provide guidance and recommendations, as well as a step-by-step plan laid out and scoped so that you can make the right decision for your business. During an intense week of collaboration with our team called AMP, our experts analyze your current-state platform including your data workflows/pipelines, analytical applications, use cases, data sources and structures, and the underlying infrastructure. Later, we map the current state findings against the desired business outcomes, current platform limitations, performance requirements, and service-level agreements (SLAs). Finally, we prescribe a systematic plan to achieve the future-state goals.

**Identifying starter application set**

HPE Pointnext Services can assist with determining the best place to start. Examples include legacy applications that need to be modernized into containers or analytics that require faster deployment cycles. It can also include applications currently deployed across multiple public clouds that need to be brought into consistent governance and service-level accountability.

HPE Pointnext Services such as consulting, advisory, implementation, and support services have the expertise of more than 10,000 installs to deliver on your vision. And our HPE GreenLake as-a-service offerings provide choice on how to consume our solutions including new pay-per-use cloud services for containers and ML operations.

**Consulting and advisory services to accelerate initial success**

Deploying, operating, and maintaining containers can be complicated due to lack of skills, technology readiness, or organizational hurdles. From planning, application containerization, migration/development, POC, preproduction, to production, HPE can help you accelerate the transformation of your technology, people, and economics, so you can move fast as you drive innovation.

HPE Pointnext Services has years of experience transitioning the way customers develop and operate application workloads. We have created the right architectures, networking, storage, and automation to help you speed up innovation, leveraging our combined technologies and experience.

The services portfolio includes configuration, design, deployment, integration, education, and support for HPE Ezmeral Container Platform and mitigate the deployment project risk while simplifying the customer's operations.

The services include advisory, professional, and operational expertise. During the delivery of these services, HPE Pointnext Services experts work with the customers to coordinate planning, design, configuration, deployment, and validation of the solution in addition to the support and training of the organization. The services can be delivered both remotely and on-site.

**CONCLUSION**

Every enterprise realizes the value of data to drive their digital transformation. The HPE Ezmeral Container Platform provides the data fabric, security, and container deployment services required to put enterprise data to work and deliver valuable insights faster.

**For more information**

container-platform@hpe.com
ADDITIONAL RESOURCES

<table>
<thead>
<tr>
<th>Resource Name</th>
<th>URL</th>
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<tbody>
<tr>
<td>HPE Ezmeral Container Platform</td>
<td>hpe.com/containerplatform</td>
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<td>Request a demo</td>
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<td>KubeDirector</td>
<td>github.com/bluek8s/kubedirector/wiki</td>
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