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Solve Your Kubernetes Skill Gap Immediately with Crossvale Kubernetes Manager (CKM)

How CIOs and CTOs can leverage CKM to become container confident immediately to run critical workloads efficiently and securely

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Summary

As CIOs and CTOs navigate the digital transformation landscape, containerization with Kubernetes has emerged as a critical technology for modernizing application deployment and management. Gartner says 95% of organizations will be running containerized applications in production by 2028.

However, the path to successful Kubernetes adoption is fraught with complexity, especially for organizations attempting a do-it-yourself approach. The steep learning curve, resource-intensive setup, and ongoing maintenance challenges can significantly delay the realization of Kubernetes' benefits, potentially impacting their ability to deliver value to the business.

This white paper addresses these challenges head-on, exploring how Crossvale's Kubernetes Manager (CKM) can accelerate your journey from Kubernetes adoption to value creation. We'll examine how CKM mitigates common implementation hurdles, streamlines operations, and enables rapid deployment of critical workloads. By the end of this paper, you'll understand how Crossvale Kubernetes Manager can help you harness the full potential of Kubernetes, allowing you to focus on innovation and strategic initiatives rather than getting bogged down in the intricacies of container orchestration.

Overview

Kubernetes has rapidly become the cornerstone of container adoption and modernization in the tech industry.

Born from Google's extensive experience in managing large-scale distributed systems, Kubernetes was open-sourced in 2014 and swiftly established itself as the standard for orchestrating containers across various environments - be it cloud, on-premises, or hybrid. Its rich ecosystem of tools and services enhances its power, making it an attractive option for businesses of all sizes. With regular releases and a clear roadmap, Kubernetes has matured into a stable and reliable platform, adopted by both innovative tech giants and agile small to medium-sized enterprises.

The Challenges of Self-Managed Kubernetes

While powerful, running Kubernetes independently can be a complex endeavor. It requires setting up and maintaining infrastructure, software, networking, performance optimization, and storage systems. Regular cluster updates are necessary, and adherence to industry best practices like GitOps - which uses Git for declarative and automated Kubernetes cluster management - is crucial. These challenges can be resource-intensive, potentially diverting focus from core business objectives and customer value creation.

Kubernetes Distributions: A Double-Edged Sword

To simplify Kubernetes adoption, many organizations turn to Kubernetes distributions - versions of Kubernetes bundled with additional tools and features for easier use. Popular on-prem options include Red Hat OpenShift and VMware Tanzu. However, selecting and implementing a distribution comes with its own set of challenges, including compatibility issues, vendor lock-in concerns, licensing complexities (especially related to VMware from Broadcom's acquisition), and varying levels of support. Careful evaluation of organizational needs and thorough comparison of available options is essential. Partnering with an experienced provider can provide a solid foundation for this container journey.

Cloud-Based Kubernetes Services: Pros and Cons

Another approach to simplify Kubernetes deployment is leveraging cloud-based services like Amazon EKS or ROSA, Azure AKS or ARO, or Google GKE. These services allow for Kubernetes cluster creation and management in the cloud, eliminating infrastructure concerns. Users benefit from cloud scalability, reliability, security, and integration with other cloud services. However, this convenience comes with trade-offs in areas such as cost, control, security, customization, and portability. Organizations must carefully consider the implications of relying on a single cloud provider and understand how to add the additional projects and products needed to create an enterprise-grade Kubernetes environment with the processes and SOPs to ensure long-term reliability and efficient use of resources.

Persistent Challenges and the Need for Expertise

Even with cloud-based Kubernetes services, many challenges remain. Clusters still require management to meet specific security, governance, scale, and reliability requirements. Implementing GitOps best practices is crucial for improving deployment speed and consistency. Ongoing monitoring, troubleshooting, and issue resolution for clusters and applications demand significant time, skill, and knowledge. As well as a customized set of procedures that create an environment that integrates seamlessly into your Enterprise.

The Value of Partnership

Given the persistent challenges of Kubernetes management, many organizations find value in partneringwith Kubernetes experts. These collaborations provide crucial support, offer value-added services, and help navigate the complexities of Kubernetes ecosystems.

> By leveraging external expertise, businesses can focus on their core competencies while building internal container proficiency, without sacrificing the reliability of their Kubernetes infrastructure.

These partnerships ensure alignment with industry best practices, regardless of whether the deployment is cloud-based, on-premises, or in a hybrid environment. Expert guidance bridges the knowledge gap, enabling organizations to confidently adopt and manage Kubernetes while gradually developing in-house capabilities. This strategy facilitates a smooth transition to container-based infrastructure, maintaining optimal performance and reliability throughout the learning curve.

What is Crossvale Kubernetes Manager (CKM)?

Crossvale has developed two distinct offerings designed to address varying levels of expertise and management preferences in the Kubernetes ecosystem. These solutions aim to simplify cluster management, enhance operational efficiency, and provide scalable support options for businesses leveraging cloud Kubernetes services such as AKS, EKS, and GKE. The following section outlines these two solutions, highlighting their key features and benefits for different organizational needs.

1. Crossvale Kubernetes Manager (Use our stack, manage it yourself)

Crossvale Kubernetes Manager is a comprehensive, open-source Kubernetes management solution designed for DIY teams. It extends Kubernetes services (EKS, AKS, GKE) to improve cluster management and is ideal for teams looking to enhance their existing Kubernetes setup.

CKM is composed of several powerful platforms, each adding significant value to your Kubernetes operations solving the following aspects:

Application Governance

» Apply GitOps continuous delivery with ArgoCD. It automates the deployment of desired application states in specified target environments, enhancing consistency and reducing manual errors.

Observability

» Monitor cluster insights with Grafana, an open-source analytics and interactive visualization web application. It provides charts, graphs, and alerts for the web when connected to supported data sources, offering invaluable insights into your cluster's performance.

» Collect and store metrics as time-series data with Prometheus, an open-source systems monitoring and alerting toolkit. It provides a robust foundation for observability in your Kubernetes environment.

» Grant efficient log management and analysis capabilities in a simple way with **ElasticSearch, a powerful search and analytics engine.**

» Provide visualization capabilities on top of the content indexed on an Elasticsearch cluster with Kibana, a data visualization dashboard software for Elasticsearch.

Certificate Management

» Automate the management and issuance of TLS certificates in Kubernetes clusters with Cert Manager, enhancing security and reducing manual certificate management tasks.

Developer Experience

» Simplifies cluster management through a web-based UI, Kubernetes Dashboard, a web-based Kubernetes user interface that allows you to deploy containerized applications to a Kubernetes cluster, troubleshoot your containerized application, and manage the cluster resources.

Image Security

» Detect vulnerabilities in package dependencies, OS packages, and runtime issues scanning your application images with Trivy significantly enhancing your cluster's security posture.

Application Routing:

» Manage external access to the services in a cluster, typically HTTP, with NGINX Ingress Controller, it provides load balancing, SSL termination, and name-based virtual hosting, crucial for exposing applications securely.

Management and Support

» 24/7 Management and Support with guaranteed SLAs and enterprise-grade support from Crossvale's PodOps team. Our experts provide around-the-clock proactive monitoring and intervention, ensuring your Kubernetes clusters are always operational and issues are promptly addressed.

» Tailored configurations and integrations to meet specific enterprise needs. Crossvale engineers work closely with your team to design and implement solutions that fit your unique requirements, ensuring optimal performance and efficiency of your Kubernetes environment.

» Standard SOP and automated processes managed by the PodOps team to enhance cluster stability and operational efficiency. By leveraging best practices and automation, we ensure your clusters are maintained proactively, reducing downtime and increasing reliability.

These tools provide a robust Kubernetes management solution, offering enhanced monitoring, logging, continuous delivery, and visualization capabilities. This curated stack allows teams to significantly improve their Kubernetes operations.

2. Crossvale Kubernetes Manager Premium with PodOps (Use our stack, SOP, operationalization, proactive management, guaranteed SLAs)

This advanced version builds upon the foundation of CKM, adding several premium features and services:

- Includes a 24x7 management team that oversees the management of your clusters on EKS, AKS or GKE.

- Adds prebuilt accelerators that extend the management stack with our proprietary maintenance framework of procedures, that extend these platforms operational capabilities.

- Tailored for enterprise-level Kubernetes deployments

- Includes enhanced processes for improved operational success.

- Continuously evolving SOP to improve proactive automation.

Advantages of Crossvale Kubernetes Manager Premium with PodOps

- 24/7 management team for problem-solving with guaranteed SLAs

- Customization options to meet specific enterprise needs

- Standard SOP to follow so you don't have to figure out best practices for managing workloads in Kubernetes clusters.

- Proactive automation managed by PodOps team to increase cluster stability

- Backed by Crossvale's elite Kubernetes operations team, known as PodOps

These additional tools, coupled with Crossvale's PodOps expert management and tailored automations, deliver a comprehensive, enterprise-grade Kubernetes management solution. Our proven operational processes are designed to instill 100% container confidence in your organization.

This Premium offering caters to enterprises demanding top-tier support, robust security measures, and peak operational efficiency within their Kubernetes ecosystems. It's the ideal choice for organizations looking to maximize the potential of their containerized environments while minimizing operational overhead and risk.

Why Do I Need CKM?

When selecting a Kubernetes service, organizations must carefully evaluate the operational demands and resource commitments required. Even with managed Kubernetes offerings, significant responsibilities remain with the user. It's crucial to understand that while cloud providers handle certain aspects of cluster management, there are still numerous critical tasks that require internal expertise and attention. This includes areas such as application deployment, security configuration, performance optimization, and ongoing management. Therefore, companies should assess their in-house capabilities and readiness to manage these aspects before choosing a Kubernetes service, ensuring they can fully leverage the platform's benefits while meeting its operational requirements.

Cluster health is not everything

When cloud providers offer Kubernetes Services, the services are focused on cluster health, which means that the nodes are always running, the Kubernetes distribution is maintained by the cloud provider, and they provide version upgrades. Operating the cluster ensuring resources are properly allocated, networking, governance, permission management are some of the things that the cloud does not take care of that your team will need to have expertise in.

Support 24/7/365

Operations that are proactive and reactive can happen anytime. As these platforms become more adopted in your enterprise, service disruption becomes more costly. Having a dedicated monitoring team with the skills to fix problems or escalate them quickly is crucial to achieve workload reliability.

Running Kubernetes is challenging

Kubernetes consists of various technologies and solutions that coordinate containers. To run it effectively, you need to know technologies that are hard to learn, teach and keep up with.

Infrastructure cost

Using cloud Kubernetes services makes it very easy to use more resources than needed. Focusing on the right fit for workloads on the right kind of nodes with the right number of resources will ensure that the budgets are optimized.
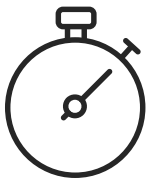
Innovation is very fast

The Kubernetes ecosystem is characterized by rapid innovation and continuous expansion, presenting both opportunities and challenges. While this constant evolution brings new features and capabilities to the platform, it requires teams to consistently stay abreast of new options, potential drawbacks, bugs, and releases. This ongoing learning process can be time-consuming, especially when team members have responsibilities beyond Kubernetes management.
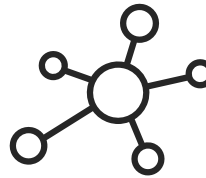
Observability

Crucial for effective Kubernetes management, observability is not included in standard Kubernetes distributions. This absence means users lack built-in tools for comprehensive monitoring, analysis, and alerting based on key performance indicators. Organizations must therefore implement additional solutions to gain necessary insights, and understand what are the important KPIs for your workloads to insure reliability and efficient use of resources.

Security of communications

Kubernetes does not have a certificate manager, which means that each application that is exposed needs a certificate that needs to be managed externally. Kubernetes needs to be augmented with a certificate manager that takes care of all ingresses, making it easier to encrypt ingress by default.

Security of applications

Kubernetes by default does not include any type of application vulnerability detection and ensuring your container images are free from threats is a hard and time-consuming task, if you do not have the proper skills, understanding the differences between your existing security governance and what you would need when running critical workloads in Kubernetes.

Interoperability of Supporting Stack

Kubernetes will need to operate within a broader stack of supporting technologies (this is what CKM has curated for you), each filling specific operational gaps for enterprise requirements. Managing the interoperability of Kubernetes with these ancillary platforms adds another layer of complexity, as all these technologies frequently update and upgrade. This dynamic environment demands not just technical skill, but also strategic resource allocation and a commitment to continuous learning and adaptation. Organizations must be prepared to invest in ongoing education, testing, and refinement of their Kubernetes implementations to fully leverage its benefits while managing its complexities and balancing the need to stay current against other pressing IT priorities

Analogy of Cluster Health vs Cluster Management

When choosing a cloud provider for Kubernetes like AKS, EKS and GKE make sure you fully understand clearly that cluster health is not cluster management. As we know cloud providers offering Kubernetes Services primarily focus on cluster health, ensuring nodes are operational, maintaining the Kubernetes distribution, and providing version upgrades. However, this doesn't encompass full cluster management.

Your team must develop expertise in several critical areas of cluster management.

Here are a few example areas:

1. **Resource Allocation**

   a. Optimizing CPU and memory usage across pods and nodes

   b. Implementing effective autoscaling strategies

   c. Setting appropriate resource requests and limits

   d. Managing storage resources and persistent volumes

   e. Balancing workloads across the cluster

2. Networking

a. Designing and implementing network policies

b. Managing ingress and egress traffic

c. Configuring and optimizing load balancing

d. Implementing service mesh architectures (e.g., Istio, Linkerd)

e. Troubleshooting network-related issues

f. Ensuring network security and encryption

3. Governance

a. Establishing and enforcing cluster-wide policies

b. Implementing multi-tenancy strategies

c. Managing namespaces effectively

d. Setting up and maintaining role-based access control (RBAC)

e. Ensuring compliance with industry standards and regulations

f. Implementing cost allocation and chargeback mechanisms

4. Permission Management

a. Creating and managing service accounts

b. Implementing fine-grained access controls

c. Managing secrets and sensitive information

d. Integrating with external identity providers (e.g., LDAP, Active Directory)

e. Regularly auditing and reviewing access permissions

f. Implementing least privilege principles

5. Monitoring and Observability

a. Setting up comprehensive logging and monitoring solutions

b. Implementing effective alerting mechanisms

c. Creating dashboards for real-time cluster insights

d. Utilizing distributed tracing for complex microservices architectures

e. Performing regular performance analysis and optimization

6. Security

   a. Implementing container security best practices

   b. Regularly scanning for vulnerabilities in images and running containers

   c. Setting up network policies to restrict pod-to-pod communication

   d. Implementing runtime security measures

   e. Managing and rotating cluster secrets

7. Disaster Recovery and Business Continuity

   a. Implementing backup and restore strategies

   b. Setting up multi-region or multi-cluster deployments

   c. Designing for high availability and fault tolerance

   d. Conducting regular disaster recovery drills

8. Continuous Integration and Deployment (CI/CD)

   a. Setting up robust CI/CD pipelines

   b. Implementing GitOps practices

   c. Managing configuration as code

   d. Ensuring smooth and reliable application deployments

To illustrate the distinction between cluster health vs. cluster management, consider managing a fleet of trucks: Cluster health is akin to hiring an engine mechanic when the issue you are solving for is cargo delivery which is analogous to cluster management.

Maintenance of the engine is only one part of the operation, related to cargo delivery, you also need to have skills, solutions, resources, policies and procedures for:

1. Loading and securing cargo

2. Optimizing trailer capacity and quantity

3. Scheduling deliveries

4. Planning routes

5. Maintaining non-engine truck components

6. Installing and managing GPS systems

7. Monitoring driver efficiency

8. Developing contingency plans for breakdowns

9. Scaling the fleet during peak times

10. Ensuring full trailer utilization

11. Automating toll payments

12. Planning preventive maintenance

While cloud providers ensure your Kubernetes cluster is healthy, your team is responsible for its effective management and operation. Developing expertise in these areas is crucial for effectively managing and operating a Kubernetes cluster.

Therefore, focusing solely on maintaining the engine of your truck (cluster health) is insufficient to ensure successful cargo delivery (application performance and reliability). Even with an impeccably maintained engine, you'll face significant challenges and potential failure if you neglect the other crucial components of cargo delivery (cluster management).

The Benefits of Crossvale Kubernetes Manager

Crossvale has created a stack based on technologies that are well maintained with a solid community behind them and are stable to be used in enterprises.

To help an enterprise with a DIY or fully managed solution for Kubernetes cluster management, regardless of whose version of Kubernetes you choose.

How does Crossvale do it?

» Stack design. Crossvale has designed the stack in way that provides the minimum tools required to have an Enterprise ready Kubernetes cluster.

» This stack is maintained and validated with each new version of those components and the Kubernetes core.

» Not all technologies are created equal, so we have a curation process before including anything into the stack.

» The stack evolves adding new features and/or replacing the ones that are being deprecated.

» All these technologies require deep understanding of how they work, how to debug them and how to do root cause analysis.

How does this affect the users?

» This will create stable clusters that can run for a very long time without restarts, rebuilds, etc.

» No or limited downtime required

» Simplify Cluster adoption

» Performance optimized workloads

» Ease of deploying applications

» Ease of configuring access

» Dashboards for monitoring

» Image vulnerability detection

» Alerts with reactive and proactive resolutions.

Do I need CKM or CKM Premium with PodOps?

Choosing between Crossvale Kubernetes Manager (CKM) and CKM Premium with PodOps depends on your organization's specific needs, resources, and Kubernetes expertise:

Consider CKM if:

1. Your team has strong Kubernetes skills and wants to maintain hands-on control.

2. You have the internal resources to manage and troubleshoot your clusters.

3. You're comfortable with a DIY approach but want a curated, open-source stack to streamline operations.

4. Your Kubernetes needs are relatively straightforward and don't require 24/7 support.

5. You're looking for a cost-effective solution to enhance your existing Kubernetes setup.

Opt for CKM Premium with PodOps if:

1. You require enterprise-grade support and guaranteed SLAs.

2. Your team lacks extensive Kubernetes expertise or is stretched thin with other responsibilities.

3. You need 24/7 management and proactive problem-solving for mission-critical applications.

4. Your Kubernetes environment requires custom solutions and advanced security measures.

5. You want to leverage expert-driven best practices and automation for optimal cluster performance.

6. You're seeking a comprehensive, fully managed olution to maximize operational efficiency and minimize risk, limiting your need to maintain internal SMEs.

Ultimately, CKM is ideal for teams with Kubernetes experience looking for enhanced tools, while CKM Premium with PodOps is best for organizations prioritizing high-level support, advanced features, and operational excellence in their Kubernetes deployments.

The Challenges of Managing Kubernetes Services

While it's technically feasible to build this stack independently, the real challenge lies in the ongoing stack maintenance and cluster management of Kubernetes plus these components being added. Crossvale leverages its extensive experience, gained from working with diverse Kubernetes customers for almost a decade, to offer a robust and well-maintained solution. Our specialized team focuses solely on container technologies, providing expert design, implementation, and operational support for clusters across various infrastructures and regions. This dedicated approach allows us to offer a level of confidence and support that would be difficult for individual customers to achieve on their own, making Crossvale Kubernetes Service (CKM) an ideal partner for your container journey.

As Kubernetes continues to gain traction in the world of container orchestration, businesses are turning to managed Kubernetes services like Amazon EKS, Azure AKS, Google GKE and OpenShift On-Premise, ROSA or ARO to streamline their containerized application deployments. However, managing Kubernetes clusters effectively comes with its own set of challenges, ranging from complexity and cost management to limited control and version compatibility concerns.

Challenge 1:
Complexity and Learning Curve

Kubernetes clusters are inherently complex, consisting of numerous components. This complexity often leads to a steep learning curve for teams new to Kubernetes, increasing the risk of errors and misconfigurations that can impact cluster stability, security, and performance.

PodOps by Crossvale tackles this challenge by providing a 24x7 SME team and guided workflows built into the platform. For instance, a global e-commerce company struggled with Kubernetes adoption due to the lack of in-house expertise. By partnering with PodOps by Crossvale, they were able to leverage the platform's best practices and expert support, enabling their developers to confidently deploy applications into Kubernetes clusters without the need for extensive training, speeding up there time to production by 900% over their prior try.

Challenge 2:
Cost Management

Cost management is a critical aspect of running Kubernetes clusters, as poor storage choices and improper application sizing can lead to suboptimal performance and wasted resources. Without proper oversight, businesses can quickly find themselves facing unexpected infrastructure costs, that continue to rise.

PodOps by Crossvale addresses this challenge by offering tailored recommendations and cost-effective solutions based on each customer's unique use case. A leading financial services firm, for example, struggled with escalating costs due to inefficient resource allocation. PodOps by Crossvale's custom monitoring solution and detailed workload reports provided the insights needed to identify and eliminate inefficiencies,

resulting in significant cost savings without compromising performance. Reducing their infrastructure use for their container ecosystem by 38%.

Challenge 3: Control and Customization

While managed Kubernetes services offer convenience, they can limit users' control and customization options, leading to vendor lock-in and hindering the ability to adapt to specific business requirements.

PodOps by Crossvale solves this problem by providing a customizable and portable solution that can be integrated with any Kubernetes cluster. A healthcare technology company, for instance, required a tailored logging and monitoring setup to comply with industry regulations. PodOps by Crossvale's flexible architecture, which includes Loki, Prometheus, and Grafana, allowed the company to maintain full control over their Kubernetes environment while ensuring compliance and a superior developer experience. Increasing the confidence in the clusters performance by 50%, due to the team needing only ½ the amount of hours meetings monthly, to relay what was going on to stakeholders.

Challenge 4: Version Compatibility and Updates

Keeping Kubernetes clusters up to date with the latest versions and security patches is crucial, but ensuring compatibility among all components can be a time-consuming and error-prone process, which is not part of the maintenance you would get from cloud providers.

PodOps by Crossvale simplifies this challenge by leveraging a team of Certified Kubernetes Administrators (CKAs) who perform compatibility checks and seamlessly roll out updates across clusters.

A digital media agency, for example, struggled with version compatibility issues during cluster updates, resulting in service disruptions. By partnering with PodOps by Crossvale, they were able to offload the update process to the expert team, ensuring smooth upgrades during off-hours without any compatibility issues. Reducing the downtime by 22%.

**Challenge 5:
Great Until It Fails**

While managed Kubernetes services offer a degree of reliability, preparing for failures is essential. With PodOps by Crossvale, customers benefit from automated backups, proactive monitoring, and failover strategies designed to minimize downtime and data loss.

A gaming company, for instance, experienced a critical failure in their Kubernetes cluster, resulting in significant data loss and extended downtime. After implementing PodOps by Crossvale's robust resilience measures, including regular backups and failover mechanisms, they were able to recover quickly from future incidents, ensuring uninterrupted service for their users. Resulting in reducing customer churn by 12%, due to service interruptions.

A Use Case for Adopting Crossvale Kubernetes Manager

A leading pharmaceutical company has been experiencing rapid growth driven by their innovative research and development, utilizing a self-deployed container-based solution to manage applications. However, as they expand into new markets and develop more complex applications, they face limitations with their current platform, particularly with applications requiring advanced AI/ML capabilities, multi-cloud deployment, and stricter compliance requirements. With no experience in managing container solutions like Amazon EKS, Google Kubernetes Engine (GKE), or Azure Kubernetes Service (AKS), the pharmaceutical company faced significant risks.

To start their journey adopting new a container solution, they contacted Crossvale, and that's when the Crossvale Kubernetes Manager (CKM) steps in, providing a management interface to manage Kubernetes clusters across multiple cloud providers like AWS, GCP, and Azure, automating deployment and scaling, integrating advanced security features, and offering ongoing support. CKM also helps optimize cloud spending through visibility into resource usage and costs.

The implementation of CKM results in increased flexibility, improved compliance, cost efficiency, and enhanced productivity, enabling the company to meet diverse market demands, enter new markets with stringent regulatory requirements, and ultimately drive business growth and innovation in the pharmaceutical industry.

Conclusion

In conclusion, leveraging Crossvale Kubernetes Manager (CKM) can significantly elevate the capabilities of CIOs and CTOs in managing Kubernetes clusters efficiently and securely.
By utilizing CKM, organizations can overcome the inherent complexities and challenges of Kubernetes management, such as infrastructure setup, cluster maintenance, and security compliance.

CKM's Premium features, including 24/7 support, optimized resource allocation, and integrated security measures, provide a robust foundation for maintaining high-performing and reliable Kubernetes environments. As demonstrated in the example use cases, CKM not only enhances operational efficiency and compliance but also drives innovation and business growth by enabling seamless multi-cloud deployment and advanced AI/ML application management.

> For any enterprise looking to streamline their Kubernetes operations and focus on core business objectives, Crossvale Kubernetes Manager Premium with PodOps offers a comprehensive solution that ensures stability, scalability, and strategic advantage in this rapidly evolving technological landscape.