QBR Summary: Scalable Web App Deployment on DigitalOcean Kubernetes (DOKS)

# Engagement Information

Customer: Fictional Industries

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Engagement Type: Technical Assessment

Use Case: Deploying a lightweight, scalable, and cost-efficnet web application using DOKS

# Executive Summary

We deployed a containerized Flask-based web application on DOKS to simulate a SaaS environment. This mockup application tracks user birthdays and displays them on a user interface. The architecture created prioritizes:

* **Scalability**, via horizontal pod autoscaling
* **Performance**, through scaling responsive to CPU loads
* **Reliability**, using a multi-node pool and high-availability control pane components
* **Cost optimization**, through efficient resource sizing and minimal idle compute through smart scaling

# Current Architecture

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The diagram above details the flow of system components:

* **App:** Python Flask web frontend
* **Hosting:** DOKS cluster (2-node pool)
* **Image Source:** DigitalOcean Container Registry (DOCR)
* **Networking:** DigitalOcean Load Balancer
* **Scaling:** Horizontal Pod Autoscaler (2-5 replicas based on CPU load)
* **Control Plane**: High-availability configured and managed by DigitalOcean

# Performance Observations

* Horizonal autoscaling scaled from 2 to 5 pods within 30 seconds under simulated CPU load
* Load balancer IP maintained 100% uptime during testing
* Response time remained stable throughout increased simulated traffic
* Node spread was balanced across both nodes

# Cost Comparison and Analysis

A direct cost analysis shows about 15% savings on technical components alone:

|  |  |  |
| --- | --- | --- |
| **Component** | **DOKS Managed** | **Self-Managed Kubernetes** |
| Worker Nodes | 2 x $24 = $48 | 2 x $24 = $48 |
| High-Availability Control Planes | $40 | 2 x $24 = $38 |
| Load Balancer | $12 | $15 |
| Monitoring/Telemetry | $0 | $5 |
| Networking | $0 | $10 |
| *Total Monthly Costs* | $100/month | $115/month |

Moreover, there are

* **Reduced Engineering Overhead:** No engineering hours spent on cluster setup or management, no time spent on manual upgrades, built-in high-availability and fault tolerance, and preconfigured networking solutions.
  + Time saved: ~10-20 hours per month of DevOps effort
  + Value: $1000+
* **Fewer Production Risks:** Built in control plane and node high-availability, tested metric servers and autoscalers, simple to implement security practices, and built-in monitoring and logging.
  + Time saved: ~5 hours/month
  + Value: $300-$500/month

# Risks and Mitigation Strategies

* **Risk:** Load balancer costs scale with number of services
  + **Mitigation:** Use a shared ingress with multiple host rules
* **Risk:** HPA scales slowly under heavy load
  + **Mitigation:** Set minimum replicas to 2 to prevent cold-start latency
* **Risk:** Pod restart delays due to large image size
  + **Mitigation:** Use multi-stage images to reduce file sizes

# Conclusion

This deployment showcases a scalable and cost-conscious approach to deploying Kubernetes-based architecture using DigitalOcean. This system is designed to support fluctuating degrees of traffic for a growing Saas product. While this application is a mockup and not intended for full production usage, with some minor feature implementation (such as ingresses and probes) it can be easily made production-grade.