FishOS – Integrated Solution: Collaborative Infrastructure and Use Case

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Executive Summary

The cloud management market today demands open source infrastructure that is not only manageable but also cost-effective, sustainable, and scalable for future business growth. This document introduces a transformative approach: FishOS – Integrated Solution, which advances cloud infrastructure management by integrating open source hardware and software into a single bundle.

The whitepaper highlights Sardina Systems' unified approach, which views infrastructure as an indissoluble process. In this way, the cloud provider acts as a medium, connecting all parts and negotiating the best terms through industry connections, as well as advising on hardware configuration for optimal future workload performance.

By adopting this customized solution, companies can achieve a 50% or more reduction in cloud costs while significantly enhancing system scalability and performance. The product simplifies procurement and maintenance processes by providing a single point of contact through Sardina Systems, eliminating the need for clients to piece together their infrastructure components independently. This whitepaper also presents the successful use case of the Integrated Solution for the German IT service company.

The FishOS – Integrated Solution combines software from Sardina Systems company with reliable hardware, in a particular use case from Vespertec. Both companies are active members of the Open Compute Project (OCP) community, while Vespertec is also an OCP Experience Center provider. FishOS – Integrated Solution is available at rack scale on an OCP Accepted™ infrastructure.

One of the objectives of this document is to share the insights and methodologies and show that the OCP community can adopt and adapt similar strategies, fostering collaboration and accelerating the evolution of open source cloud infrastructure. This collective advancement enhances the overall value proposition for all OCP members, promoting a more efficient and sustainable approach to cloud management.

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1. Introduction

In today's IT landscape, there is a significant push towards optimization and automatization. Sardina Systems extends this trend to the infrastructure itself, starting from the advisory stages. We perceive infrastructure selection, deployment, and operation as integral parts of a unified whole.

FishOS – Integrated Solution embodies this holistic optimization approach to cloud infrastructure management by combining the strengths of open source hardware and software. This product is designed to meet the evolving demands of the cloud management market, which increasingly prioritizes manageability, cost-effectiveness, sustainability, and scalability for future business growth. With configurations ranging from small to large, the solution is tailored to meet the specific needs of any organization, whether launching a new data center or scaling an existing facility.

This whitepaper explores the benefits of integrating hardware and software seamlessly, highlighting efficiencies gained through unified management and optimized operations.

This document details the practical application of the FishOS – Integrated Solution through a specific implementation for the German IT service company GRASS-MERKUR. It begins with identifying particular needs and selecting the appropriate hardware partner, progresses through the deployment process, and concludes with the operational benefits realized.

The FishOS – Integrated Solution in this use case brings together FishOS by Sardina Systems, an innovative cloud management software built on OpenStack, Kubernetes, and Ceph, with high-performance hardware from Vespertec, a reliable data center infrastructure provider. Both Sardina Systems and Vespertec are committed members of the Open Compute Project (OCP) community, which advocates for openness, collaboration, and innovation in data center technology.

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GRASS-MERKUR's implementation of the FishOS – Integrated Solution showcases its transformative impact. The deployment of a new 30-node cluster enhanced their system capacity by more than 4 times, resulting in significant energy savings and a 50% reduction in cloud costs. This case study underscores how the Integrated Solution's modular and scalable architecture aligns with the principles of the OCP — openness, efficiency, impact, scale, and sustainability — to create a robust, scalable, and sustainable cloud management framework.

This whitepaper illustrates how the FishOS – Integrated Solution, by leveraging open source technologies and strategic partnerships, provides a superior alternative to public cloud services, ensuring businesses can focus on their core priorities with an optimal and reliable cloud infrastructure at their fingertips.

2. Compliance with Open Compute Project Tenets

2.1. Openness

FishOS – Integrated Solution aligns with the OCP's commitment to openness by offering a pre-built, highly customizable cloud management platform. It integrates open source technologies such as OpenStack, Kubernetes, and Ceph, allowing users to modify and tailor the system to meet specific needs. Providing access to all relevant design elements, firmware, and software utilities, it ensures third parties can build upon and personalize their cloud infrastructure.

In collaboration with Vespertec, a specialist in the design, configuration, delivery, and support of open, high-performance data center infrastructure, FishOS – Integrated Solution leverages Vespertec's expertise to enhance system openness and performance. This approach facilitates collaboration and feedback, promotes continuous improvements, and removes barriers to open platform adoption.

2.2. Efficiency

Efficiency is a cornerstone of the FishOS – Integrated Solution, designed to reduce operational costs and improve resource utilization. The solution offers significant cost savings, with potential reductions of up to 86% compared to publicly available pricing information for popular public

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cloud alternatives. On average, Integrated Solution provides a 50-60% reduction based on proven customer feedback.

GRASS-MERKUR's experience underscores this, achieving a 50% reduction in cloud infrastructure expenses and a 10-15% energy savings compared to their previous setup. Modern hardware utilization also contributed to approximately 10% lower energy consumption.

This efficiency is achieved through streamlined procurement processes, automated cloud management, and optimized hardware configurations. The solution's modularity and scalable architecture allow businesses to align their infrastructure with evolving needs, enhancing performance and reducing both OpEx and CapEx. Metrics such as server utilization, energy consumption, and total cost of ownership (TCO) are clear indicators of the efficiency gains provided by the FishOS – Integrated Solution.

2.3. Impact

FishOS – Integrated Solution has a transformative impact on the cloud infrastructure landscape, offering a robust and scalable alternative to traditional public and private cloud services. By integrating advanced cloud management software with reliable hardware, the solution accelerates deployment time and reduces the complexity of cloud infrastructure management. This enables organizations to achieve faster time-to-market, enhanced scalability, and significant cost savings.

The collaboration with Vespertec and other hardware providers ensures a reliable supply chain, making this transformative product accessible to a broad range of customers.

2.4. Scale

Scalability is integral to the FishOS – Integrated Solution, designed to meet the demands of large enterprises and hyperscale customers. The solution is available in three customizable configurations — small, medium, and large — each tailored to specific requirements in terms of CPU threads, memory, storage, and network capacity. This flexibility ensures that organizations

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can scale their infrastructure seamlessly as their needs grow. The streamlined deployment process, supported by a unified agreement and comprehensive technical support, further enhances the solution's ability to scale efficiently. The Integrated Solution's design ensures it can support the infrastructure needs of Fortune 100 companies and large-scale data centers alike.

GRASS-MERKUR's deployment of a new 30-node cluster, which enhanced their system capacity in 4 times, highlights the solution's scalability. The support from Vespertec and Sardina Systems, from design to deployment and ongoing technical assistance, ensures that the solution can be scaled efficiently and effectively, accommodating the growth and expanding needs of any organization.

2.5. Sustainability

FishOS – Integrated Solution places a strong emphasis on sustainability, prioritizing the responsible use of natural resources and striving to minimize environmental impact. Through advanced hardware and software integration, the solution promotes energy-efficient operations, leading to a reduction in carbon footprint. By maximizing server utilization and optimizing resource allocation, the solution actively reduces waste and fosters sustainable practices.

The use of open source technologies aligns with principles of transparency and ethical resource management, further enhancing the solution's sustainability credentials. FishOS – Integrated Solution not only meets current environmental standards but also pursues continuous improvement in sustainability metrics over time.

The implementation of modern hardware and energy-efficient technologies enabled GRASS-MERKUR to achieve a notable 10-15% reduction in energy consumption. Additionally, the solution supports GRASS-MERKUR's initiative to offer 100% CO2-free hydropower energy options, aligning with broader sustainability goals.

By always looking for improvements and being transparent about its environmental impact, the FishOS – Integrated Solution sets a standard for sustainable cloud infrastructure management.

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3. FishOS – Integrated Solution Product Overview

The FishOS – Integrated Solution seamlessly combines FishOS, an automated cloud management software built on OpenStack, Kubernetes, and Ceph, pre-built on reliable hardware and ensuring unparalleled efficiency and performance. The FishOS software stack includes innovative components like the ML-enabled FishOS Workload Manager and FishOS Health Monitoring, which address specific client needs and optimize operations.

This solution is designed for high customizability, enabling users to modify, extend, and tailor the system to their specific requirements. By offering access to all relevant design elements, firmware, and software utilities, the FishOS – Integrated Solution facilitates the development and personalization of cloud infrastructure by third parties.

Key features of the FishOS – Integrated Solution include:

- **Cost reduction**: Significant savings compared to popular public cloud alternatives, with potential reductions in operational costs up to 86%.
- **Simplified procurement and maintenance**: A single point of contact for both software and hardware simplifies the procurement and maintenance processes. This streamlined management reduces administrative overhead associated with managing multiple vendors, making life easier for both clients and hardware partners.

Customers no longer need to search for hardware providers independently and piece together their infrastructure components. Sardina Systems streamlines communication and sources the appropriate hardware vendor to meet client requirements within the desired timeframe and budget. Hardware providers also benefit by optimizing their management processes; it is more efficient for them to work with a cloud provider advising on system selection rather than directly with clients who may lack specific infrastructure expertise.

- **Customization**: Users can choose from three primary configurations (small, medium, large) or request individual configurations tailored to their needs. This flexibility ensures that the solution can be adapted to meet diverse business requirements.

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- **Zero-downtime upgrades**: The system supports zero-downtime OpenStack upgrades, eliminating the need for scheduled maintenance downtime. This feature is crucial for maintaining high availability and minimizing disruptions.
- **Technical Support**: Comprehensive support including unlimited tickets, direct communication channels, and fast emergency response times.

3.1. FishOS – Integrated Solution configurations

The FishOS – Integrated Solution offers three primary configurations to cater to different organizational needs in terms of CPU threads, memory, storage, and network capacity:

Table 1. FishOS – Integrated Solution configurations

FishOS – Integrated Solution S	FishOS – Integrated Solution M	FishOS – Integrated Solution L
11 Servers	21 Servers	61 Servers
456 CPU threads	904 CPU threads	2696 CPU threads
2.7 TB memory	7.1 TB memory	24.7 TB memory
377 TB Ceph storage	629 TB Ceph storage	1258 TB Ceph storage
4x 10Gbps network	4x 25Gbps network	4x 25Gbps network
Lifetime FishOS Software	Lifetime FishOS Software	Lifetime FishOS Software
Basic FishOS Support	Basic FishOS Support	Basic FishOS Support

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3.2. The FishOS – Integrated Solution designed with hardware from Vespertec

The collaboration with Vespertec, a UK-based company specializing in open high-performance data center infrastructure, offers clients access to a range of hardware solutions tailored to their specific needs. Vespertec's expertise in cluster design and testing ensures that clients receive optimized hardware configurations, supported by streamlined logistics and technical assistance.

3.2.1. Customized hardware selection and deployment process:

1. Evaluation of requirements: At the outset, we meticulously assess the customer's needs to propose the ideal hardware and configuration. Whether it's GPUs, server additions, removals, or diverse storage necessities, together with Vespertec we tailor the solution to their unique specifications. Each server undergoes a rigorous 24-hour soak test before installation to ensure reliability.
2. Quotation and finalization: Based on the customer's requirements, budget allowance, and our recommendations, they select the 'building blocks' for their system. If the client's needs extend beyond standard configurations, we create an individualized system to suit those requirements.
3. Unified agreement: We simplify the process with a unified agreement, negotiating FishOS license terms and formalizing hardware provider details to solidify our contract.
4. Hardware preparation and base OS deployment: Off-site and under our control, we handle the preparation of hardware and base OS deployment, ensuring a seamless experience for the client.
5. Deployment and FishOS integration: Our expert team swiftly installs hardware and deploys FishOS within a day. Rigorous post-deployment testing over several days guarantees a flawless experience. Vespertec's rigorous testing protocols guarantee the reliability and performance of the hardware, ensuring seamless integration with FishOS – Integrated Solution.

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Vespertec's full-service approach, coupled with Sardina Systems' collaborative efforts, ensures clients receive comprehensive support throughout the hardware deployment process.

4. GRASS-MERKUR Use Case

GRASS-MERKUR, an innovative IT service company based in Germany, sought to enhance its cloud infrastructure to accommodate its expanding business operations. The company provides comprehensive Data Center Services, Consulting, and Software Development, and operates its ISO 27001-certified data center in Hanover. This facility offers a range of services, including collocation, managed, and cloud services, while adhering to stringent cloud security and data privacy regulations.

In 2022, the company encountered limitations with its existing 8-nodes infrastructure: the most significant one was the announcement of the discontinuation of the OpenStack drivers. The company needed a new solution that could rapidly deploy a production-ready cloud platform while ensuring multi-tenancy and segregated spaces for diverse client needs.

This all prompted GRASS-MERKUR's leadership to seek a scalable, cost-effective solution aligned with their open source ethos and deep expertise in OpenStack.

The primary objectives included improving scalability, reducing operational costs, and achieving higher energy efficiency. To meet these goals, GRASS-MERKUR leveraged the FishOS – Integrated Solution designed by Sardina System in collaboration with Vespertec. The goal was to streamline the process for the client by assessing their needs and recommending the optimal hardware and configuration solution. As GRASS-MERKUR had specific design preferences, Vespertec focused on technical validation and swiftly presented various commercial options for evaluation.

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4.1. FishOS – Integrated Solution deployment for GRASS-MERKUR

The deployment process of FishOS – Integrated Solution for the client was meticulously structured and involved several stages:

1. **Finalizing hardware specifications**: An initial evaluation of GRASS-MERKUR's requirements led to the proposal of optimal hardware configurations. This assessment considered specific needs such as GPUs, server additions, and storage capacities to ensure the infrastructure met their operational demands.
2. **Quotation and finalization**: Based on the detailed requirements and budget, GRASS-MERKUR selected the necessary components for their system. The selection process included options for individual configuration beyond the standard offerings, allowing for tailored solutions.
3. **Unified agreement**: The process was streamlined through a unified agreement encompassing FishOS license terms and hardware provider details.
4. **Preparing virtual machines:** Migrating virtual machines from the old infrastructure presented challenges. GRASS-MERKUR and Sardina Systems collaborated to prepare automated relocation scripts in advance, streamlining the migration process and ensuring efficient transitions.
5. **Network design workshop:** Sardina Systems conducted a series of workshops on network design to ensure proper infrastructure preparation. These workshops, while not obligatory for system deployment, facilitated the process due to GRASS-MERKUR's proactive engagement.
6. **Delivering hardware:** Vespertec ensured that the hardware was delivered promptly and in line with the agreed specifications.
7. **Deployment and FishOS integration**: The final stage involved the swift on-site installation of hardware and deployment of FishOS. Given GRASS-MERKUR's extensive expertise in the field, they opted to handle software configuration internally.
8. **Testing and validation**: Post-deployment testing was conducted to guarantee a flawless operational experience. This rigorous testing phase ensured that the system met all performance and reliability standards.

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4.2. Operational benefits realized

The implementation of the FishOS – Integrated Solution with the hardware from Vespertec provided the customer with several significant improvements:

- **Enhanced capacity**: The system's capacity was increased by more than four times compared to the previous 8-node setup.
- **Energy savings**: Achieved a reduction in energy consumption by 10-15% compared to the previous infrastructure.
- **Cost reduction**: Realized a 50% reduction in cloud-related operational costs.
- **Scalability and Performance**: Improved scalability and overall system performance, ensuring the infrastructure can support future business growth and demands.

5. Conclusion

The FishOS – Integrated Solution effectively meets the critical demands of modern cloud infrastructure management by merging advanced software with high-performance hardware. Integrating FishOS, built on OpenStack, Kubernetes, and Ceph, with Vespertec's robust data center infrastructure, this solution offers a comprehensive, scalable, and cost-effective approach to cloud management.

This solution provides significant cost reductions, with potential savings of up to 86% compared to public cloud alternatives, enabling organizations to reallocate resources towards core business objectives. Its advanced hardware integration and optimized resource allocation also boost efficiency and sustainability, reducing energy consumption and operational costs while supporting global environmental goals. Utilizing open source technologies allows for extensive customization and continuous improvement, enabling organizations to tailor their cloud infrastructure to meet specific needs and drive innovation. In addition, the unified approach to hardware and software streamlines procurement and maintenance processes, reducing administrative overhead and ensuring seamless management of cloud infrastructure.

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A notable application of the FishOS – Integrated Solution is seen in the case of GRASS-MERKUR, a German IT service company. Facing limitations with their existing infrastructure, they adopted the FishOS – Integrated Solution to enhance scalability, reduce operational costs, and improve energy efficiency. The deployment increased their system capacity by over four times, achieved a 10-15% reduction in energy consumption, and halved their cloud operational costs. This case proves the transformative potential of the FishOS – Integrated Solution in real-world scenarios.

In summary, the FishOS – Integrated Solution marks a significant advancement in cloud infrastructure management. Its integration of open source software with high-performance hardware sets a new standard for efficiency, scalability, and sustainability. As the cloud management landscape continues to evolve, this solution offers a forward-looking, reliable, and cost-effective framework that empowers organizations to achieve their business goals while adhering to principles of openness and sustainability.

6. Glossary

Term/acronim	Definition
FishOS	Cloud management software by Sardina Systems built on OpenStack, Kubernetes, and Ceph.
OpenStack	A cloud operating system that controls large pools of compute, storage, and networking resources throughout a datacenter, all managed and provisioned through APIs with common authentication mechanisms.

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Kubernetes	A portable, extensible, open source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation.
Ceph	An open source distributed storage system designed to evolve with data.
FishOS Health Monitoring	FishOS service designed to safeguard cloud infrastructure. It continuously analyzes real-time metrics and logs data collected by the Time Series Database, FishOS Grafana Loki, and Pipeline and Conditional Engine. It uses advanced proprietary algorithms and a 'computer immunology' approach to predict and prevent critical system states.
FishOS Workload Manager	A solution for optimizing resource utilization and cloud operations. It contains three decision engines that allocate VMs, balance workloads, and enhance system performance.
ISO 27001	International standard for information security management.
OpEx (Operational Expenditure)	The ongoing cost for running a product, business, or system.
CapEx (Capital Expenditure)	Funds used by an organization to acquire or upgrade physical assets such as property, industrial buildings, or equipment.
Total Cost of Ownership (TCO)	The comprehensive assessment of the total cost of acquiring, operating, and maintaining a system over its entire lifecycle.

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7. References

1. Revolution in Cloud Economy: How FishOS – Integrated Solution Reduced Enterprise's Cloud Costs by 50%
2. Integrated Solution: Hardware and Software as a one pack
3. FishOS: Ultra-Reliable Cloud Platform for Enterprises
4. https://www.grass-merkur.de/
5. https://vespertec.com/
6. https://vespertec.com/products/ocp/
7. https://www.opencompute.org/
8. https://www.itgovernance.co.uk/iso27001
9. https://www.openstack.org/software/
10. https://kubernetes.io/docs/concepts/overview/
11. https://ceph.io/en/

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9. About Open Compute Foundation

The Open Compute Project (OCP) is a collaborative Community of hyperscale data center operators, telecom, colocation providers and enterprise IT users, working with the product and solution vendor ecosystem to develop open innovations deployable from the cloud to the edge. The OCP Foundation is responsible for fostering and serving the OCP Community to meet the market and shape the future, taking hyperscale-led innovations to everyone. Meeting the market is accomplished through addressing challenging market obstacles with open specifications, designs and emerging market programs that showcase OCP-recognized IT equipment and data center facility best practices. Shaping the future includes investing in strategic initiatives and programs that prepare the IT ecosystem for major technology changes, such as AI & ML, optics, advanced cooling techniques, composable memory and silicon. OCP Community-developed open innovations strive to benefit all, optimized through the lens of impact, efficiency, scale and sustainability.

Learn more at www.opencompute.org.

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