

From Virtual Machines to Immutable Metal: Migrating from RHV and VMware to Talos

Rushan Ratha – Head of Platform Engineering

17th October 2025

Singapore Exchange

Commodities | Equity Derivatives | Fixed Income | FX | Indices | Securities

Topics

- Legacy Stack
- Breaking Point
- Pivot
- On-premise Architecture
- Migration Path
- VM Migration with KubeVirt
- Battle Scars

The Icebreaker!

- VMs are great but working with them is like moving a piano up a staircase.
- Traditional virtualisation taught us a lot... mostly about emotional resilience.

The Legacy Stack

- RHV and VMWare
 - 100+ hypervisors spread across 6 countries
 - 1000+ VMs
 - A mix of terraform, ansible and ClickOps for day 2 changes.
 - Heavy use of NFS.
 - Upgrades and patching are not seamless. Requires a lot of weekend work between infra and app/services teams.

The Breaking Point

We wanted cattle, not pets — but in a rack, not the cloud.

- RHV End-of-Life looming.
- VMware licensing costs increasing.
- Need a single platform standard to simplify ops and training.
- Bare-metal performance for latency-sensitive workloads.
- Security & immutability: No ssh, no root, no sudoer rules, no audit finding write up!

The Pivot Point 🥁 dum dum duuum... Enter Talos.

- We needed something radically different — not another Linux with bash glue.
- Talos + Omni stood out: Single plane of glass, no SSH, API-driven, declarative to the bone.
- Treats nodes as disposable — rebuild, don't repair.
- Perfect alignment with GitOps and our infrastructure-as-code mindset.
- Every system state (from kernel args to kubelet config) lives in YAML.



Omni
Machine
Config



Git



CI/CD



Node
Bootstrapped

Our Architecture and Tools

- **Multi-zone layout:** split across DC cages each with independent power and network.
- **Redundancy baked in:** MLAGs, dual 25 Gb links per host, fallback mode for isolated operation.
- **Storage:** NFS and Object using Pure; future integration with Portworx for performance and replication.
- **Networking:** Cilium providing eBPF-based overlay, observability, and security.
- **Observability:** VictoriaMetrics stack aggregating metrics from all zones via Vector collectors.
- Other tools:
 - Falco for runtime security.
 - Kyverno for policy management.
 - Cert-Manager
 - External Secrets

The Migration Path

We didn't lift-and-shift — we lifted, stripped, and rebuilt the entire stack.

- **Phase 1** - Buy, rack, stack new hardware.
- **Phase 2** - Bootstrap & GitOps Foundation
 - PXE boot new servers and register into Omni.
 - Bootstrap the cluster.
 - Integrated FluxCD for continuous reconciliation.
 - All cluster and machine configuration stored in Git — no manual tweaks.
- **Phase 3** - Setup all platform workloads using Helm + customize overlays.
- **Phase 4** - Container Workload Migration:
 - Move workloads in our cloud environment to on-prem.
 - Verified observability and alert parity before cutover.
- **Phase 5** - VM Workloads:
 - Evaluating KubeVirt and selective re-platforming for critical legacy apps.
 - Gradual migration off hypervisors toward containerized or VM-as-Pod models.

VM Migration with KubeVirt

KubeVirt gave us a way to treat VMs like any other workload — no exceptions, no handholding, just GitOps.

- **Bridging the Gap:**
 - KubeVirt lets us run traditional VMs as Kubernetes workloads.
 - Perfect for apps that couldn't yet be containerised (legacy services, stateful workloads).
- **Migration Workflow:**
 - Export VM definition from RHV or VMware (OVF/OVA).
 - Convert image to QCOW2 and import into our internal image registry.
 - Create KubeVirt VirtualMachine manifest (with labels, StorageClass, network).
 - Deploy through Git — Flux reconciles it into the cluster.
 - Validate network + storage performance parity, then decommission the old VM.
- **Benefits:**
 - Full GitOps lifecycle for VMs — no click-based provisioning.
 - Simplified backups and replication via standard K8s tools (Velero, VolumeSnapshots).
 - Unified monitoring through VictoriaMetrics — VMs and containers on the same plane.
 - Seamless path to eventual containerisation.

The Battle Scars

Engineering Out the Pain (Without Losing Resilience)

- Networking Resilience, Simplified
 - Still using port-channels and MLAGs for high throughput and redundancy.
 - Introduced fallback modes — if a peer fails, each NIC gracefully reverts to individual mode.
 - Now we can destroy and rebuild a host with zero switch-side config changes.
- NFS is not great, but we hope to use Portworx for next-gen storage.
 - Predictable IOPS, zone-level replication, and simplified recovery workflows.
 - In the meantime, we're squeezing every last drop out of our NVMe backplane.
- Lesson Learned
 - Talos removes “quick fixes.” You either fix it properly in Git or rebuild cleanly.
 - The discipline hurts at first — then it pays off forever.

The hook: “We didn’t simplify by cutting corners — we simplified by making failure predictable.”

Thank you

Questions?

Singapore Exchange

Commodities | Equity Derivatives | Fixed Income | FX | Indices | Securities

[sgx.com](https://www.sgx.com)

This material is not intended for distribution to, or for use by or to be acted on by any person or entity located in any jurisdiction where such distribution, use or action would be contrary to applicable laws or regulations or would subject Singapore Exchange Limited ("SGX") and/or its affiliates (collectively with SGX, the "SGX Group Companies") to any registration or licensing requirement. This material is not an offer or solicitation to buy or sell, nor financial advice or recommendation for any investment product. This material has been published for general circulation only. It does not address the specific investment objectives, financial situation or particular needs of any person. Advice should be sought from a financial adviser regarding the suitability of any investment product before investing or adopting any investment strategies. Use of and/or reliance on this material is entirely at the reader's own risk. Investment products are subject to significant investment risks, including the possible loss of the principal amount invested. Past performance of investment products is not indicative of their future performance. Any forecast, prediction or projection in this material is not necessarily indicative of the future or likely performance of the product. Examples (if any) provided are for illustrative purposes only. While each of the SGX Group Companies have taken reasonable care to ensure the accuracy and completeness of the information provided, each of the SGX Group Companies disclaims any and all guarantees, representations and warranties, expressed or implied, in relation to this material and shall not be responsible or liable (whether under contract, tort (including negligence) or otherwise) for any loss or damage of any kind (whether direct, indirect or consequential losses or other economic loss of any kind, including without limitation loss of profit, loss of reputation and loss of opportunity) suffered or incurred by any person due to any omission, error, inaccuracy, incompleteness, or otherwise, any reliance on such information, or arising from and/or in connection with this material. The information in this material may have been obtained via third party sources and which have not been independently verified by any SGX Group Company. No SGX Group Company endorses or shall be liable for the content of information provided by third parties (if any). The SGX Group Companies may deal in investment products in the usual course of their business, and may be on the opposite side of any trades. Each of SGX, Singapore Exchange Securities Trading Limited and Singapore Exchange Bond Trading Pte. Ltd. is an exempt financial adviser under the Financial Advisers Act 2001. The information in this material is subject to change without notice. This material shall not be reproduced, republished, uploaded, linked, posted, transmitted, adapted, copied, translated, modified, edited or otherwise displayed or distributed in any manner without SGX's prior written consent. Please note that the general disclaimers and jurisdiction specific disclaimers found on SGX's website at <https://www.sgx.com/terms-use> are also incorporated into and applicable to this material. © Singapore Exchange Limited