Red Hat® OpenShift® Virtualization Migration

with Red Hat Services

Team 3

Red Hat

Executive Summary

Red Hat has successfully completed the assessment of Department ETX's VMware environment and has built a proposal to migrate approximately 20,750 of Department ETX's 25,000 VMs running on VMware using a scaled migration factory over a period of three years. This deck highlights the key findings, recommendations, and migration approach.

Phase	Deliverables / Outcomes	Duration	Estimated Pricing
Foundation	OpenShift Virtualization and Migration Factory Build and Operationalization	6 Months	$632,00
Accelerated Migration	Successful Migration of the existing 25k VMware Virtual Machines	40 Months	$18,560,000
Containerization and Testing Squads	Teams focused on containerizing, testing and skills transfer to product teams *Best effort, replatform viable applications	12 Months	-
Red Hat Subscriptions after migration	Subscription growth for: OpenShift Platform Plus	3 year projection	$304,876

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Objective and Executive Summary

Department ETX Objectives

1. Profile Workloads for Migration and Analyze for Migration Complexity

2. Design the Target Virtualization Environment

3. Build a Scaled Migration Approach and Timeline

Red Hat Response

1. The workload assessment has shown an 32%/42%/11% breakdown of easy/medium/hard migrations, and red flags for the migration have been identified. Detailed recommendations for specific workload types are included in the report.

2. Red Hat has completed an in-depth review of Department ETX's existing environment and designed the target landing zone, including the supporting hardware, storage systems, and networking, based on the smoothest and fastest migration path.

3. Red Hat has successfully mapped out the migration journey and timeline of Department ETX's 20,750 Virtual Machines from VMware to OpenShift Virtualization, Containers or to retiring. With our automated migration factory and teamed migration squad approach, we estimate the optimal journey duration at **40 months**, assuming no resource or process constraints.

Target Architecture and Infrastructure Considerations

▸ Department ETX's existing physical server, networking, and storage architecture is an acceptable landing zone for OpenShift Virtualization. This has been used as the starting point for the infrastructure design, but with some things to consider.

▸ Red flags have been identified with the existing infrastructure, and our partners will assist in reviewing and providing guidances on the migration of their components, for example: network microsegmentation and SAP workloads.

▸ No new hardware will be procured as part of this effort. We will do a rolling migration on existing infrastructure.   With a mixture of hosts with different generations of CPU architecture, we are recommending host isolation to reduce possible interoperability issues and to maximize VM performance.

▸ The topology will be laid out so there are multiple failure domains across the racks and multiple OpenShift clusters to ensure hardware segmentation

▸ This design also allows for Department ETX to support their current "no SPOF" for workloads. In the future, the data center can be easily converted to a three failure domain model for workloads through scaling operations rather than redeployment of clusters.

▸ Ecosystem management will be achieved through RHACM, providing automation and visibility into the entire environment.

Network Infrastructure Considerations

▸ **Current Situation:** The Department ETX currently leverages NSX for microsegmentation across their Virtual Machines (VMs).

▸ **Important Consideration:** Granular microsegmentation for VMs is not available out of the box with OpenShift Virt.

▸ **Opportunity for Improvement:** To further strengthen the security posture and match the current capabilities, we recommend partnering with Tigera for an advanced microsegmentation solution.

▸ **Key Benefits of Partnering with Tigera**
  · Leverages Tigera's proven track record in complex microsegmentation deployments.
  · Applies zero-trust workload security for a strong security posture.
  · Provides auditing and visualization of real-time workload communication and security violations.
  · Can be used in conjunction with OpenShift Service Mesh.

Modernization Considerations

Looking Ahead: Modernization through Native Containerization: We identified VMs running Datagrid, MongoDB, and NodeJS as prime candidates for future modernization. By containerizing these workloads directly within OpenShift, we can unlock significant benefits.

Advantages of a Unified OpenShift Environment: Consolidating both your VMs and containers on OpenShift offers a streamlined and efficient operational model, providing:

- **Reduce cost and optimized resource utilization and allocation.**
- **A consistent management experience across all your workloads.**
- **Simplified scaling and high availability configurations.**
- **Centralized governance and security policies.**

Other Considerations: Currently, SAP HANA is not certified to run on VMs running on OpenShift Virtualization. Further investigation to Department ETX's use case will be needed; however, our immediate recommendation is to deploy a dedicated RHEL cluster to run these workloads.

Key Takeaway: Our migration strategy ensures a smooth transition of your existing VMs and Kubernetes containers to OpenShift. We also highlight the future potential to further optimize specific VM workloads through native OpenShift containerization.
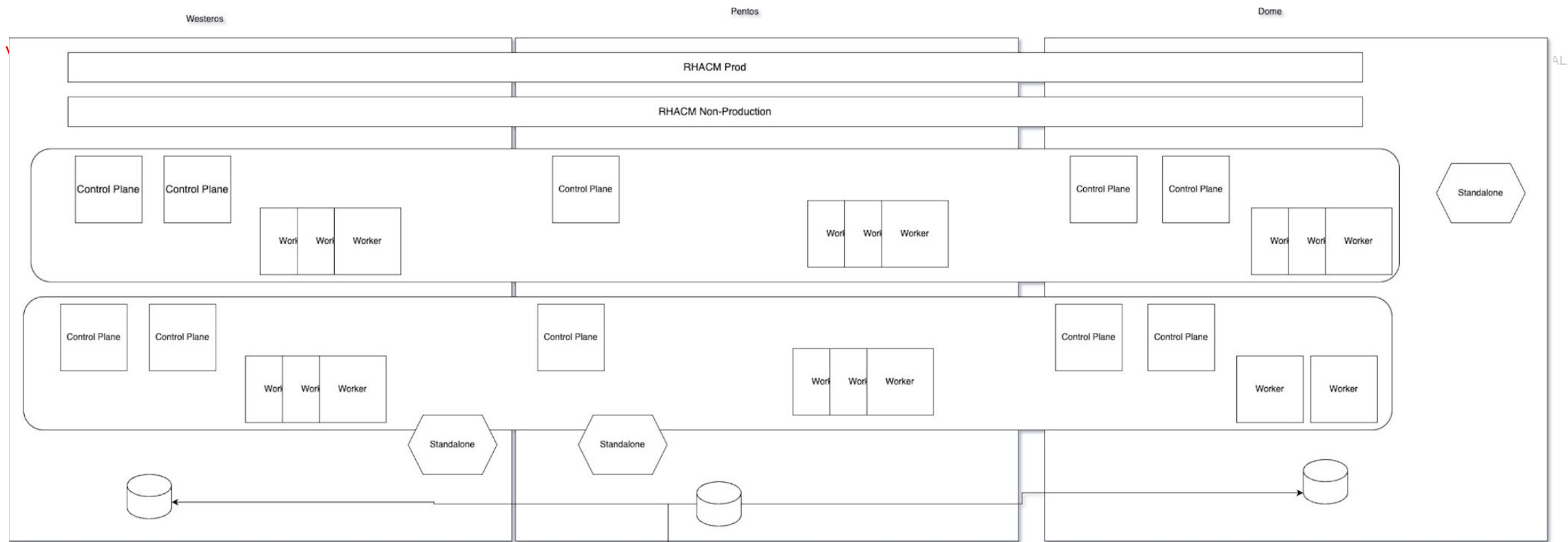
High Level Design
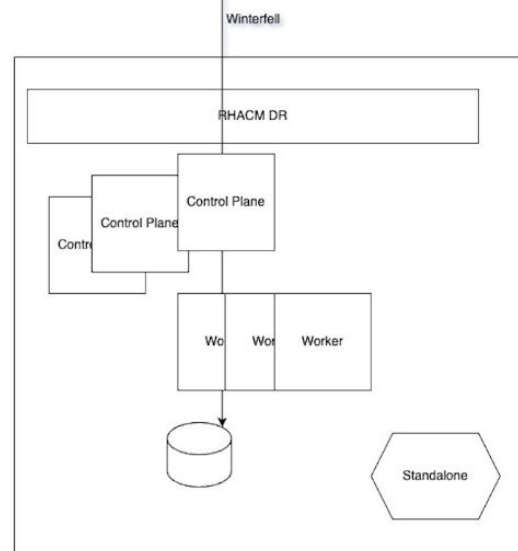
VM Workload Breakdown and Planning

Complexity Analysis

▶ The workload analysis shows easy/medium/hard distribution of workloads

- 34% of VMs are sized as easy to migrate

- 42% of VMs are medium complexity migration concern, e.g. large size

- 9% of Linux VMs are running non-RHEL distros, and will need to be further evaluated during the Production Build

- 15% of VMs are not supported on OpenShift Virtualization, due to operating system EOL or have not been certified by their respective vendor

- During the Production Build, we will design patterns for the applications and COTS migrations and determine what can be containerized
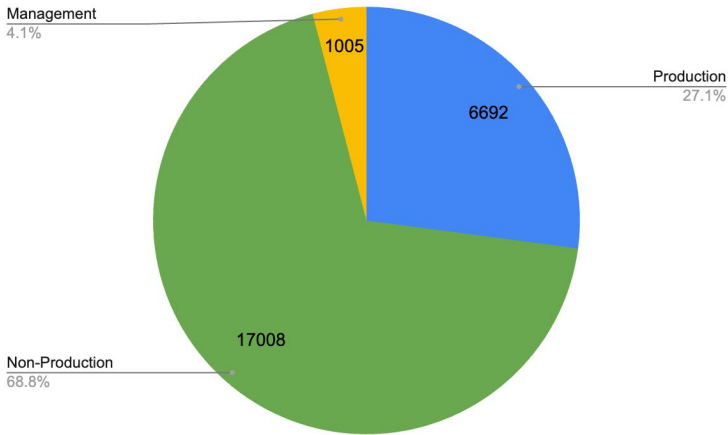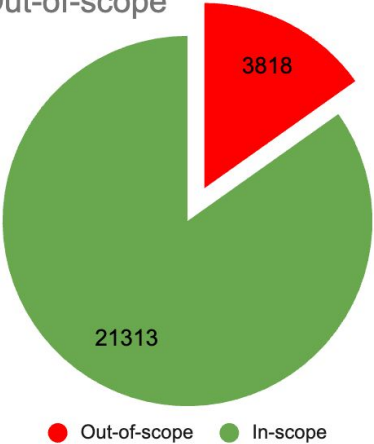
Low Complexity (34%)	Medium (42%)	High (9%)	Unsupported (15%)
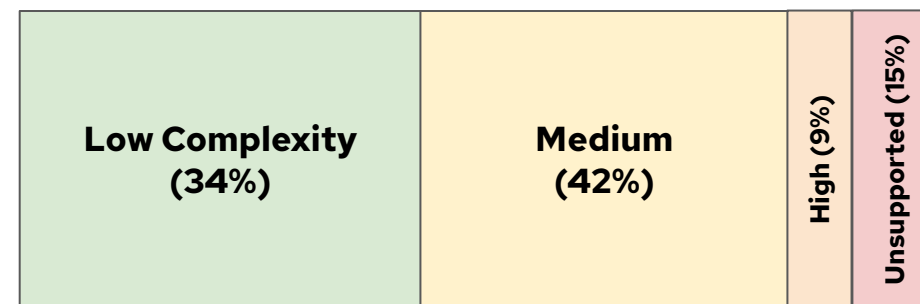
Factor	Easy	Medium	Hard	Not Supported
Storage Size	8,438	10,622	1,691	
Workload Type	11500	8000	2780	200
Operating System	8,438	10,625	5,943	3,693

*Assumed average workload size ~ 2000 Gb

Certified Guest Operating Systems in OpenShift Virtualization

VM Workload Analysis

Complexity Analysis

In-scope vs Out-of-scope

3818

21313

● Out-of-scope ● In-scope

In Scope Workloads by OS

- SLES
- RHEL 9
- Ubuntu Server
- Windows Server 2022
- Windows Server 2019
- RHEL 8
- RHEL 7
- Windows 2016

Number of Workloads

563
1125
1688
2500
2500
3375
3938
5625

Out of Scope Workloads by OS

- Windows Server 2k
- Windows Vista
- Solaris
- Windows XP
- Other Linux
- Other Unix
- Windows Server 2003

Number of Workloads

250
375
375
563
875
1250

Operating System

Management
4.1%

1005

Production
27.1%

6692

17008
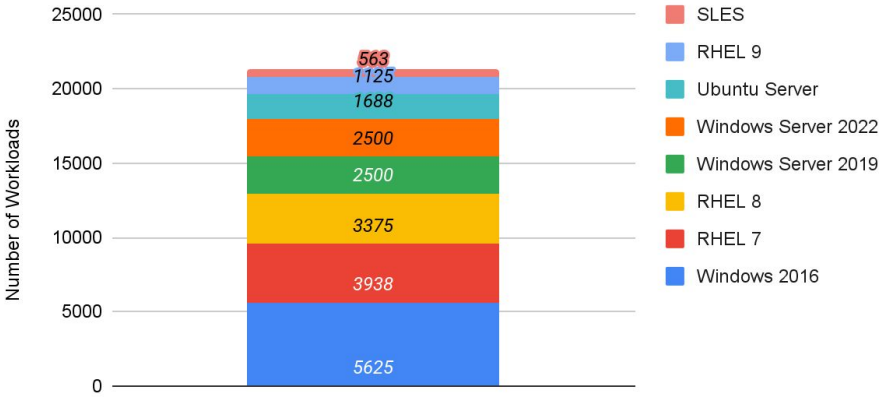
Non-Production
68.8%

Phased Approach

Foundation Phase

Foundation Phase　　　　　**Expand Phase**

Foundation Phase

▸ This initial phase will identify a representative subset of non-production VMs to develop migration plans applicable to most of Department ETX's VMs during the Expand Phase.

▸ Deploy initial set of ACM and ACS Clusters and create automation.

▸ Given the initial hardware limitations, the Foundation Phase will focus on establishing a rapid migration pathway to available infrastructure and developing a testing plan to build confidence in our deployment.

▸ We will also create a plan to decommission existing infrastructure post-migration to free up resources for future migrations.

▸ Red Hat would assist in the creation of the Migration Plans while upskilling our teammates at EXT.

Expand Phase

▶ Expand and accelerate VM migrations.

▶ Leverage Openshift Virtualization
Platform

▶ Utilize automated migration solutions
developed in foundation.

▶ Red Hat remains engaged for
immediate issue support.

▶ Bulk migrations begin after initial beta
sites success.

Migration Estimate Assumptions

▸ All security approvals to operate the platform will have been obtained during the Proof of Value implementation or early in the production build.

▸ First wave of workloads will consist of a cross-section of easy and medium instances. Working closely with the third party vendors to review the Hard instances.

▸ Change management will be integrated with the migration process through a "standard change" or similar process that will allow migration of virtual machines during at least four hours of every day.

▸ The supported migration back-out procedure consisting of powering the source VM back on and deleting the migrated VM (losing any changed disk state) is acceptable for at least 60% of VM workloads.

▸ Recommissioning of ESXi hosts to OpenShift will happen in-place, be automated through Ansible, and can happen through a standard change at any time.

▸ Windows Machines don't have windows disk encryption and don't use windows shared disk feature.

▸ VMs are spread equally across all ESXi hosts.

▸ A dedicated service account per vCenter will be available.

▸ NSX is only used for a subset of the VMs.

Department ETX VM Migration Velocity Projection

1. Department ETX's global infrastructure consists of more than 25,000 virtual machines (VMs) distributed across 3 data centers.

2. These VMs can be categorized into three main types:

   - Production: 6992 VMs

   - Non-production: 17008 VMs

   - Management: 1005 VMs

3. Approximately 2000 VMs are under the responsibility of the IT operations team while the remaining VMs are owned by various product teams within the Department ETX organization.

| Date	VMs Migrated (V2V)	VMs Retired (V2C, V2P, Decomm)	vSphere VMs Remaining
PILOT PHASE BEGINS			
06/01/25	0	0	20600
12/01/25	100	20	20500
PILOT PHASE ENDS / MIGRATION FACTORY BEGINS			
12/01/25	100	20	20500
11/01/26	4000	300	15,500
10/01/27	10000	500	5,500
10/01/28	20700	1000	0
MIGRATION FACTORY ENDS / ONGOING SUPPORT BEGINS			
10/01/28	~20700	~1000	0

* Velocity is based on optimal rate, without resource or process constraints.
** Assumes production workloads can be migrated on weekdays
*** Assumes migration windows of 8 hours per day, 5 days per week
**** Full assumptions in Appendix

Department ETX Migration Timeline with Containerization
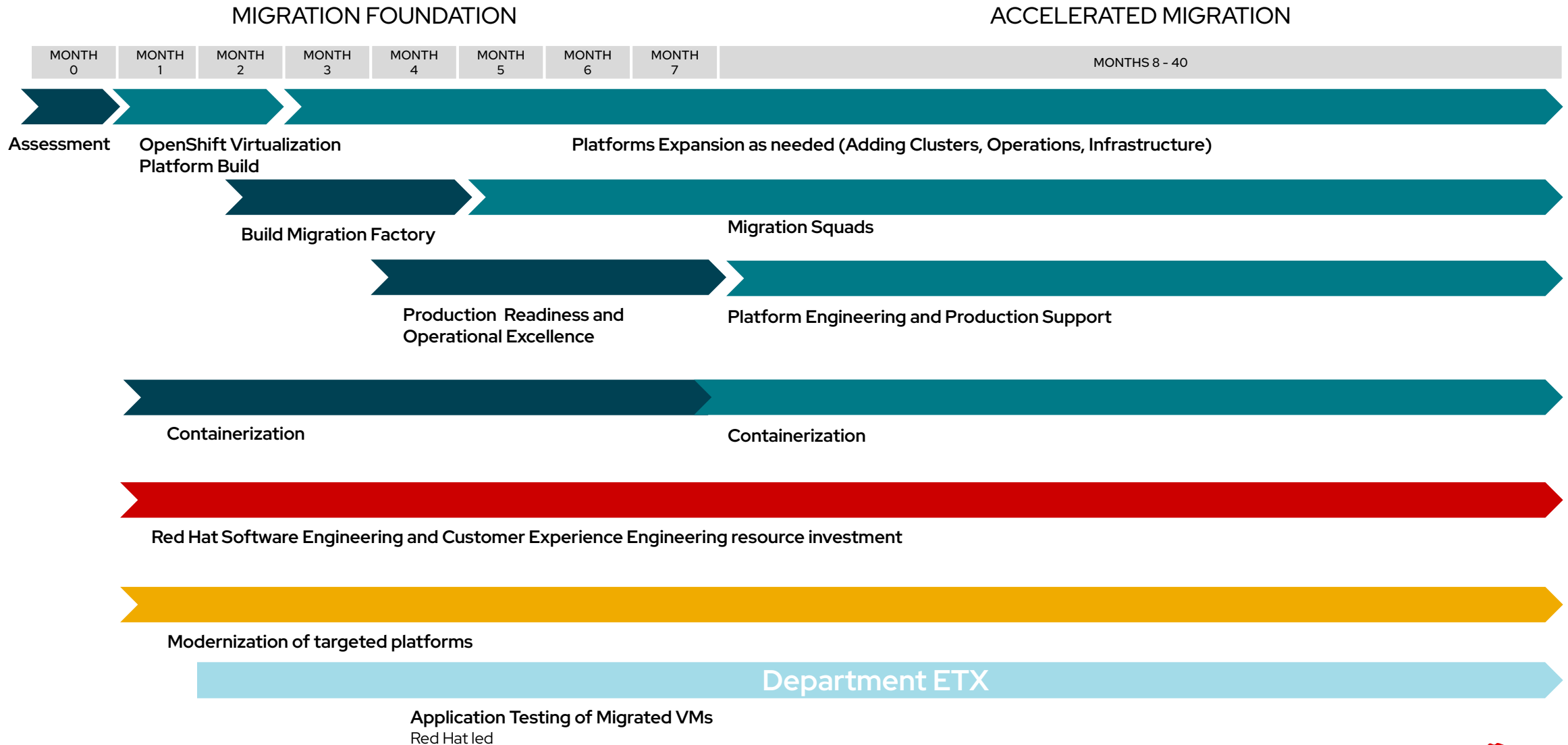
Next Steps: Proof of Value (PoV)

Virtualization Migration PoV

Prove the value of the OpenShift Virtualization as a landing zone for VMware Migrations

Objectives

- **Prepare infrastructure and evaluate workloads for replatforming**

- **Develop procedures for basic platform operations**

- **Test manual VM migration with real workloads**

Approach

- Red Hat works with Department ETX to implement the PoV infrastructure designed during the assessment workshops

- Red Hat builds out a lab, non-prod environment (PoV)

- Red Hat and Department ETX migrate an application to PoV

- PoV persists into the production build

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Next Steps: Production and Migration Factory

OpenShift Virtualization Migration Factory

Deploy production infrastructure and migrate at scale

Objectives

- **Prepare infrastructure, evaluate workloads, test migration**
- **Achieve production readiness**
- **Build automated platform provisioning process**
- **Build Migration Factory and complete first migration wave**

Approach

- Red Hat builds production platform and processes for automated, repeatable, and scalable provisioning
- Red Hat deploys and configures OpenShift Virtualization in preparation for Migration Factory
- A Red Hat delivery team directs multiple squads to support VM owners through the migration
- Red Hat deploys Advanced Cluster Management (ACM) for cluster fleet management

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Scaling Examples

NVIDIA
Running VMs on KubeVirt
~40 datacenters
28M Users
100s of nodes per cluster
1000s of VMs and pods per cluster
source: NVIDIA OpenShift Commons preso

Large FSI
Globally distributed datacenters
1,000+ OpenShift Clusters
200+ nodes per cluster

Goldman Sachs
Running VMs on KubeVirt
Sources:
- Goldman Sachs discusses virtues of Kubernetes for virtual machine management
- Virtualization meets Kubernetes

Large Energy Provider
2500 clusters
15 VMs per VM Hypervisor
80% Windows Servers

Thank you

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