State of Michigan Tech Day
July 17, 2019

Brian Lynch: Client Executive, Public Sector

Bill Hirsch: Principal Solutions Architect

Frank DiMizio: Cloud Platforms Architect

Brian Payton: Sr. Solution Architect

Ryan Kraus: Sr. Specialist Solutions Architect

Ajay Chenampara: Sr. Specialist Solutions Architect

Agenda

 9:00 - 9:30 a.m.   - Red Hat Overview / MI Partnership

 9:30 - 10:30 a.m - Open Innovation Labs Overview

10:30 - 10:45 a.m. - Break

10:45 - 11:45 a.m - Emerging Technology Overview & Roadmap

11:45 a.m. - 1:00 p.m. - Lunch

 1:00 - 2:00 p.m. - Modern App Dev / Hybrid Cloud

 2:00 - 2:15 p.m   - Break

 2:15 - 3:30 p.m. - Network and Security Automation

Red Hat Overview / MI Partnership

THE WORLD'S LEADING PROVIDER OF OPEN SOURCE ENTERPRISE IT SOLUTIONS

MORE THAN
90%
of the
FORTUNE
500
use
RED HAT
PRODUCTS &
SOLUTIONS*

~13,360
EMPLOYEES

105+
OFFICES

40+
COUNTRIES
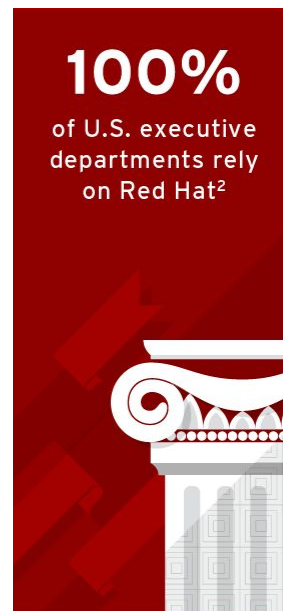
S&P
500
COMPANY

NYSE
RHT

THE FIRST
$3
BILLION
OPEN
SOURCE
COMPANY
IN THE WORLD

Note: CDWG, SHI, Insight Public Sector & Dell are Authorized Red Hat resellers as members of MMCP Contract in MI

*Red Hat client data and Fortune 500 list, June 2018.
Note: Currency in U.S. dollars.

Open Unlocks the World's Potential

F16625-190530

Red Hat

TRIED. TESTED. TRUSTED.

100% of airlines in the Fortune Global 500 rely on Red Hat[1]

100% of telcos in the Fortune Global 500 rely on Red Hat[1]

100% of healthcare companies in the Fortune Global 500 rely on Red Hat[1]

100% of commercial banks in the Fortune Global 500 rely on Red Hat[1]

100% of U.S. executive departments rely on Red Hat[2]

Source:
1. Red Hat client data and Fortune Global 500 list, September 2018.
2. Red Hat client data, June 2018.

Open Unlocks the World's Potential

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Red Hat

A ROBUST PARTNER ECOSYSTEM

CLOUD PARTNERS

TECH PARTNERS

SI PARTNERS

F16625-190530

OPEN HYBRID, MULTI-CLOUD CAPABILITY & VISION

Open Unlocks the World's Potential
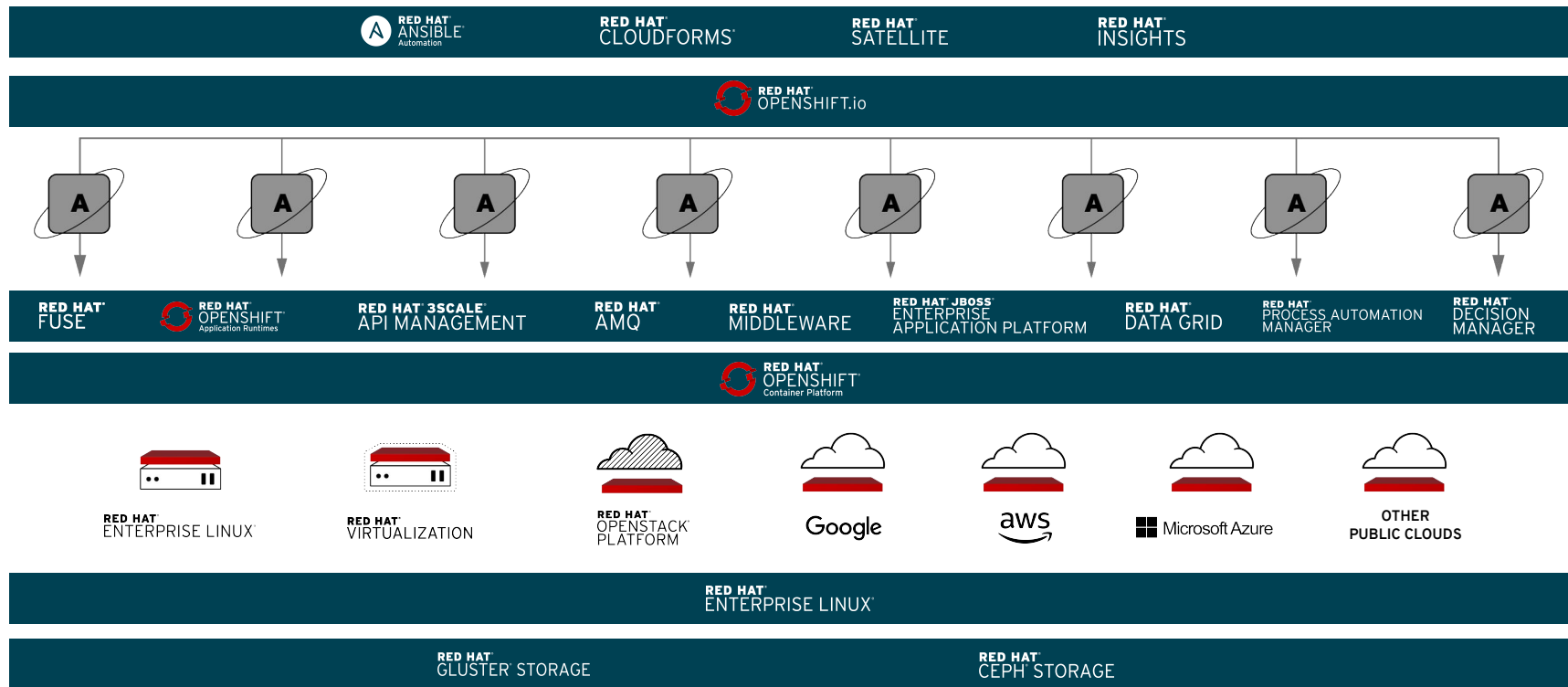
# OUR VISION IS YOUR REALITY

HYBRID & MULTI-CLOUD ARE HERE TO STAY

"The landscape of cloud adoption is one of hybrid clouds and multiclouds.
By 2020, **75% of organizations will have deployed a multicloud or hybrid cloud model.**
Technology product managers at cloud service providers must seize this revenue opportunity."

GARTNER
September 2018

Open Unlocks the World's Potential

Red Hat

ADVANCING RED HAT'S HYBRID CLOUD LEADERSHIP

Combination with IBM delivers significant benefits to Red Hat and will enable the company to:
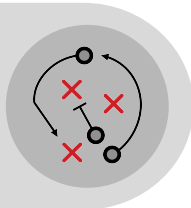
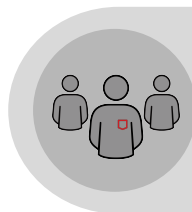Accelerate the expansion of Red Hat's leading open source portfolio
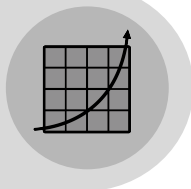
Maintain Red Hat commitment to open source and accelerate the impact of open source as the foundation of digital transformation strategies
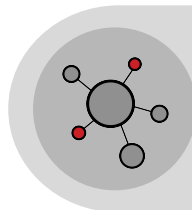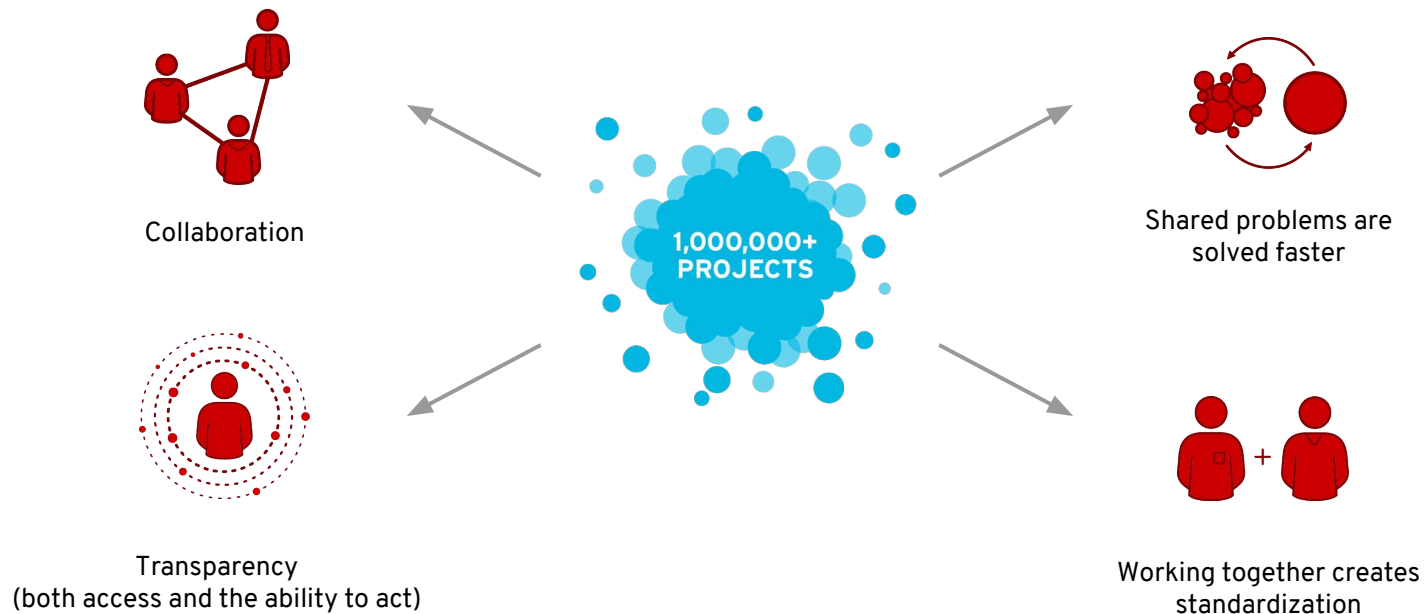
Provide significant cross-selling opportunity through expanded delivery of industry-leading open source solutions

Operate as an independent, distinct unit and preserve our unique culture

F16625-190530

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OPEN SOURCE CULTURE

1,000,000+ PROJECTS

Collaboration

Transparency
(both access and the ability to act)

Shared problems are
solved faster

Working together creates
standardization

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Red Hat

OPEN SOURCE DEVELOPMENT MODEL = INNOVATION
FROM COMMUNITIES TO ENTERPRISE

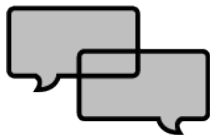Open Unlocks the World's Potential

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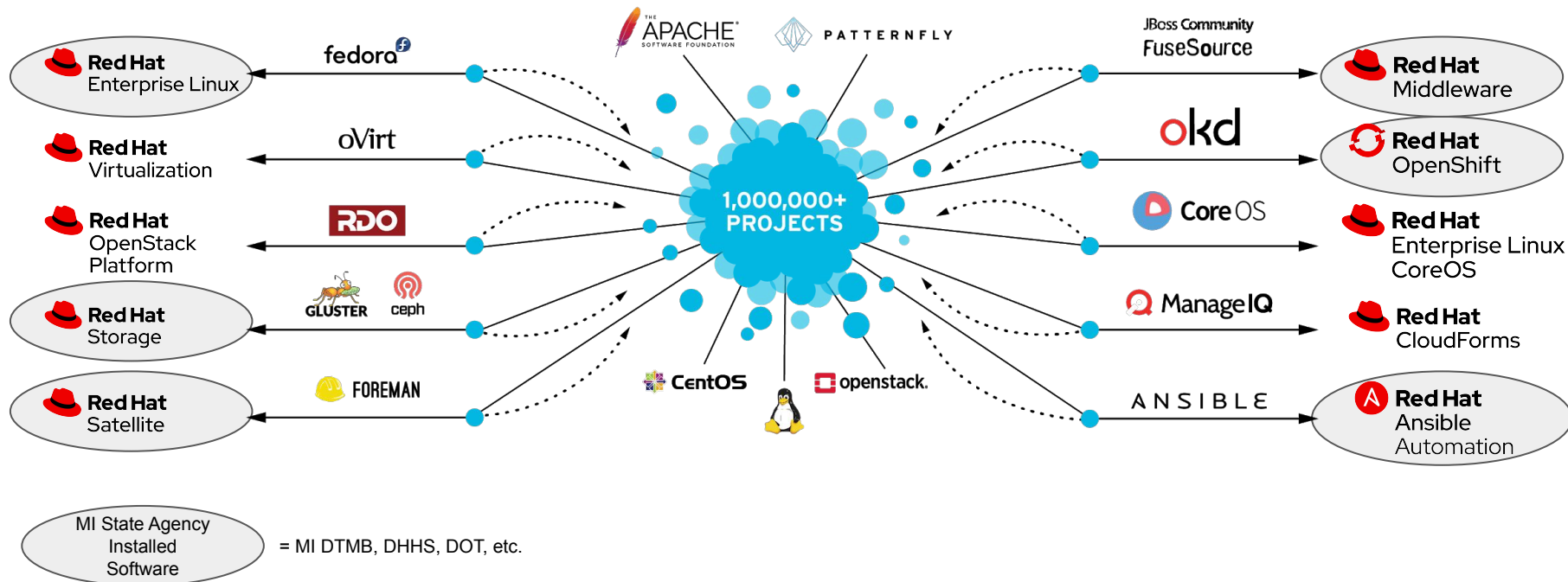
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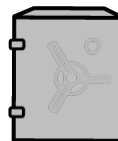
WHAT ARE WE DOING FOR YOU TODAY?

STABLE TECHNOLOGY

- Hardened & tested
- kABI/ABI
- QE/DCI

EXPERIENCE

- Award-winning support
- Customer portal
- Training
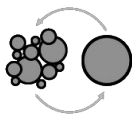
SECURITY

- Product Security Team
- Supply chain
- As a lifestyle

LIFE CYCLE

- Subscription model
- 10+ year support
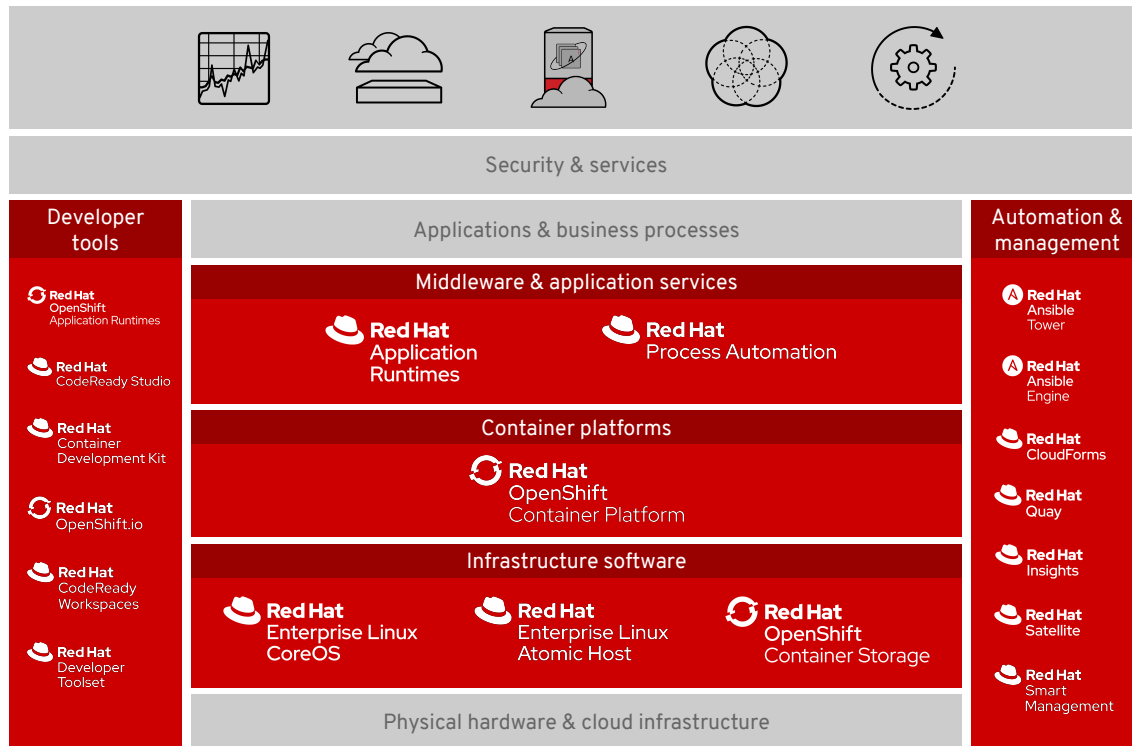- In-place upgrades

WHAT ARE WE DOING FOR YOU IN 5 YEARS?

- Upstream leadership
- Advocacy for your requirements

- Hardware, software, cloud, & service partners
- Security & compliance certifications

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Red Hat

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A COMPLETE TECHNOLOGY STACK

Security & services

Developer tools

- **Red Hat** OpenShift Application Runtimes
- **Red Hat** CodeReady Studio
- **Red Hat** Container Development Kit
- **Red Hat** OpenShift.io
- **Red Hat** CodeReady Workspaces
- **Red Hat** Developer Toolset

Applications & business processes

Middleware & application services

Red Hat Application Runtimes

Red Hat Process Automation

Container platforms

Red Hat OpenShift Container Platform

Infrastructure software

Red Hat Enterprise Linux CoreOS

Red Hat Enterprise Linux Atomic Host

Red Hat OpenShift Container Storage

Physical hardware & cloud infrastructure

Automation & management

- **Red Hat** Ansible Tower
- **Red Hat** Ansible Engine
- **Red Hat** CloudForms
- **Red Hat** Quay
- **Red Hat** Insights
- **Red Hat** Satellite
- **Red Hat** Smart Management

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STATES MUST DRIVE OPEN SOURCE RFX LANGUAGE

SAMPLE:

"Agency X is issuing this RFX to procure a new system for (i.e. Child Welfare, Integrated Eligibility, Adult Services, etc.) that delivers all the functional capabilities of the legacy systems, while providing improved security, performance, and user experience aimed at improving State business operations.

The new System will be provisioned as an open source modular solution with the ability to be hosted on-premises in the State's private cloud environment (or with a public cloud service provider) and shall meet all the business and technical requirements as described in this RFX.

The proposed open source modular application must support open standards, plus commodity open source components and tools where available. All new source code developed will be made open and reusable and published with an appropriate license.

Definitions:

Open Platform: A platform that is open and supports vendor-neutral IT standards and certifications in a variety of subject areas critical to the enterprise.

Open Source System: An open source system describes a software system, which is based on open standards, such as published and fully documented external application programming interfaces (API) that allow using the software to function in other ways than the original programmer intended, without requiring modification of the source code. Using these interfaces, a third party may integrate with the platform to add functionality.

Open Standards: "Open Standards" are the standards made available to the general public and are developed (or approved) and maintained via a collaborative and consensus driven process. "Open Standards" facilitate interoperability and data exchange among different products or services and are intended for widespread adoption."

STATE OF MICHIGAN / RED HAT PARTNERSHIP

Why Red Hat?

- Commitment to Open Source
- Availability of Resources & Training
- Ease of Doing Business

Why OpenShift?

- Multi-Tenancy
- Resource Availability
- Scalability and Performance
- Security

Red Hat Enterprise Linux = Standard Operating Environment & Foundation for the Future!

CUSTOMERS ARE INNOVATING WITH OPENSHIFT

Over 1000 customers │ 90 presented at Summit │ 110 in Public Sector

MODERNIZE APPS

WEB APPS

CLOUD NATIVE APPS

MULTI-CLOUD

MOBILE

BIG DATA │ ANALYTICS

AI │ ML

IOT

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THE RED HAT DIFFERENCE

PORTFOLIO BUILT ON LINUX

OPEN SOURCE LEADERSHIP

OPEN HYBRID CLOUD

ENTERPRISE SECURITY

OUR PEOPLE & CULTURE

F16625-190530

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Public Sector References

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CHALLENGE

Maryland Health Benefit Exchange (MHBE) was using multiple closed source software and commercial off-the-shelf software components which were inordinately complicated resulting in higher than normal end user response times and operational barriers.

SOLUTION

MHBE implemented an open source solution to support the agency's need for a flexible architecture that could be modified with relative ease to meet the emerging needs of interoperability with other state agencies or sharing of technology platforms.

WHY RED HAT

- Red Hat's leadership in open source innovation and "high end commercial support", which is promoted by our open source development model, enabled MHBE's close visibility into their end products and helped tremendously in utilizing the skilled staff of MHBE.

RESULTS

- Reduced TCO by 82.25% from a proprietary solution to Red Hat Linux, JBoss EAP, and JBoss Fuse.
- Increase agility by using an open source, modular, and flexible architecture which facilitated interoperability and cross platform collaboration between the agencies.

PRODUCTS & SERVICES

- Red Hat Enterprise Application Platform for application development
- Red Hat Fuse for data and services integration
- Red Hat Enterprise Linux for security, reliability, availability, and performance

Open Unlocks the World's Potential

CHALLENGE

Maryland's human services programs were supported by "silo", stand-alone systems with little or no interface to other systems, including public health, juvenile systems, and other critical federal and state partners.

SOLUTION

Implemented a cloud-based data repository that is leveraging Red Hat technologies to break down traditional silos and data barriers between state agencies and provide integrated access to HHS programs administered by several agencies.

WHY RED HAT

- CTO was comfortable with proven enterprise open source technologies used in MD Health Benefits Exchange modernization initiative.
- Delivered on the vision of a flexible architecture to facilitate interoperability and cross platform collaboration between state agencies and other technology platforms

RESULTS

- Significant TCO savings and increased agility were achieved using open source solutions
- Streamlined application modernization by using automation for cloud provisioning, configuration management, application deployment, & intra-service orchestration.

PRODUCTS & SERVICES

- Red Hat Enterprise Application Platform for application development
- Red Hat Fuse for data and services integration
- Red Hat Ansible for automated application deployment and intra-service orchestration

Red Hat

New York Metropolitan Transportation Authority

CHALLENGE

The New York MTA had a critical business requirement to dispatch field engineers to conduct inspections and make repairs to critical infrastructure on a priority basis. They also needed to provide medical assistance to improve and sustain on time performance and safety.

SOLUTION

Implemented an enterprise solution to not only support critical mobile platform needs but address all security, integration, and agility as part of a comprehensive enterprise asset management program.

WHY RED HAT

- Red Hat understood MTA business and IT executive sponsors' vision to support broader enterprise standards for both mobile and enterprise asset management program
- Red Hat collaborated with MTA developers to define and deliver a meaningful demo and proof of concept for the mobile application use case(s)

RESULTS

- An increase in ridership due to improved safety, reliability, and on-time performance
- Fewer delays due to increased productivity of field engineers on inspections and repairs

PRODUCTS & SERVICES

- Red Hat Mobile Backend as a Service Platform (MBaaS) for mobility integration
- Red Hat Fuse and AMQ for data and services integration
- Red Hat 3Scale for API management

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Red Hat

CHALLENGE

OH DPS needed to orchestrate, streamline, speed-up, test and repeat operational and application changes across its hybrid cloud infrastructure to be more responsive to the business.

SOLUTION

Implemented an enterprise automation solution to track all operational and application changes so change data can be quickly sorted through to identify successes, errors, anomalies, change dates etc. within private and public cloud infrastructure.

WHY RED HAT

- OH DPS desired an enterprise automation solution capable of intra-service orchestration for a variety of environments (i.e. Windows, Linux, network, etc.) without using an agent
- The solution was easy to use and capable of being implemented quickly.

RESULTS

- Enabled all changes to be tracked to sort and remediate non-production and production environment pre and post deployments.
- Improved productivity & streamlined application deployment, intra-service orchestration, and configuration / change management between private cloud and Microsoft Azure.

PRODUCTS & SERVICES

- Red Hat Ansible Engine & Tower
- Red Hat Learning Services

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CHALLENGE

Central IT could not effectively address the backlog of 3,500+ requests (4 months) from state agencies

SOLUTION

Implemented standard operating environment (i.e. RHEL) and PaaS (OpenShift) to drive efficiency, innovation, and responsiveness for the agencies it serves.

WHY RED HAT

- Supported modernization effort with significant expertise in Unix to Linux migrations
- Offered comprehensive subscription model as part of enterprise agreement
- Collaborated with NYS ITS enterprise architects to build innovation lab for application/development testing

RESULTS

- Collaboration and Openness between Operations teams and Agencies
- Significant cost reduction associated with reducing number of operating environments

PRODUCTS & SERVICES

- Red Hat Enterprise Application Platform
- Red Hat Enterprise Linux for VDCs
- Red Hat Learning Subscription

- Red Hat Satellite
- Red Hat OpenShift
- Red Hat Consulting

Tennessee State Government

CHALLENGE
TN enacted legislation that required government data sets to be provided on state websites in open formats without the burdensome and repetitive trips to a variety of databases.

SOLUTION
A flexible enterprise service bus with data virtualization and in-memory data grid technology increased application performance and quick access to multiple sources of data across the enterprise without building out a variety of data warehouses.

WHY RED HAT
- TN was comfortable with Red Hat middleware application development software and found our data virtualization technology integrated well with their current environment
- TN did not want to invest in proprietary software technology since this was an Open Data initiative lead by Chief Data and Informatics officer for public use

RESULTS
- A cost effective solution was deployed for integration of federated applications and data
- Faster application performance for public use was achieved by minimizing round trips to federated databases across agencies

PRODUCTS & SERVICES
- Red Hat Data Virtualization for data integration from multiple data sources
- Red Hat Data Grid for scalable, fast, and consistent in-memory data views
- Red Hat Fuse for lightweight agile integration

Open Unlocks the World's Potential

CHALLENGE
CA DOJ was facing some major lock-in issues due to proprietary development languages and environments driving their operating costs higher year after year.

SOLUTION
Converted proprietary legacy application environment to enterprise open source technologies from Red Hat to take advantage of standard interfaces and languages for better application integration and data access internally, and externally across several state departments.

WHY RED HAT
- CA DOJ had confidence in Red Hat middleware application migration tools and assistance to convert the organization's applications and data to be more accessible.
- Offered an enterprise subscription model to significantly reduce TCO near & long term.

RESULTS
- Enabled CA DOJ to provide valuable criminal history, work authorizations, as well as gun and drug histories to a variety of external state departments.
- Drove availability of public facing applications to support transparency on gun control and access to Megan's Law for rape and arson.

PRODUCTS & SERVICES

- Red Hat Enterprise Application Platform
- Red Hat Business Process Management Suite
- Red Hat Business Rules Management

- Red Hat Enterprise Linux
- Red Hat Technical Account Manager
- Red Hat Consulting

Open Unlocks the World's Potential

Red Hat

"At the end of the day, when we talk about technology change — whether it's the Internet of Everything, big data, or machine learning — **it's really about people and organizational cultures, first and foremost.**"
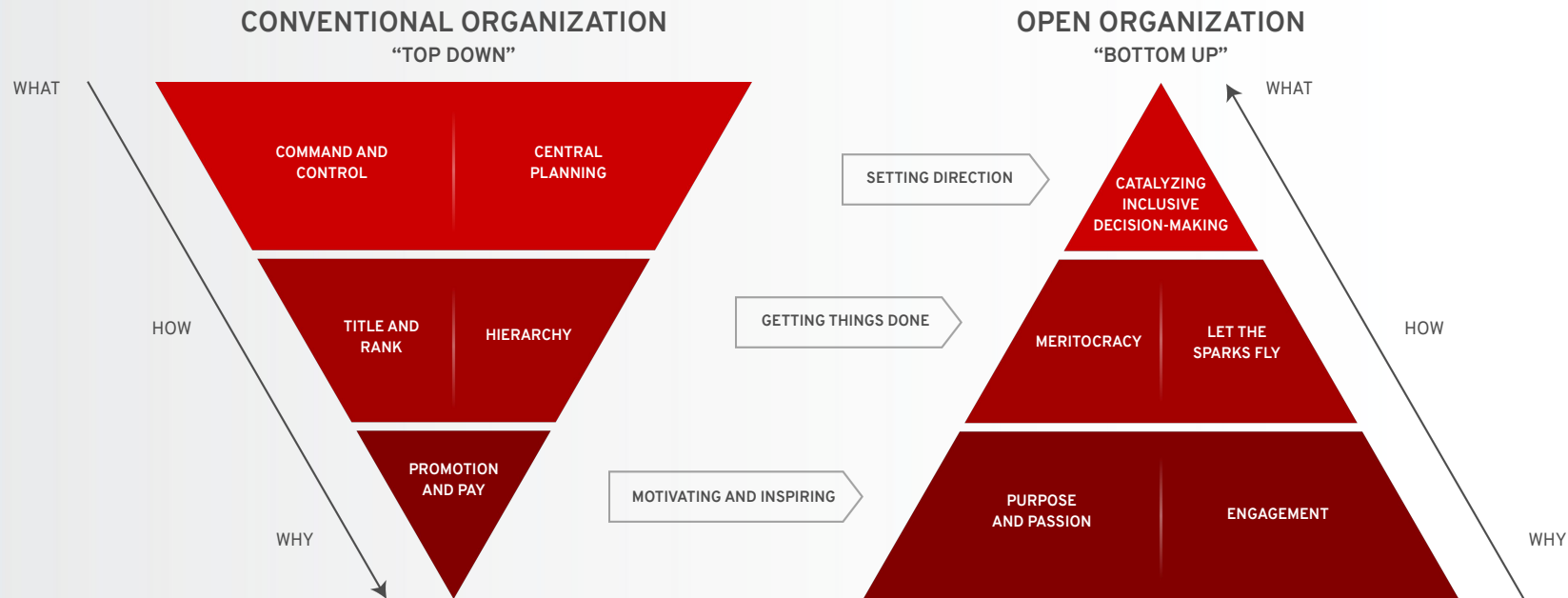
- Dr. David Bray, Exec Director, People-Centered Internet

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" Then it's about how those people
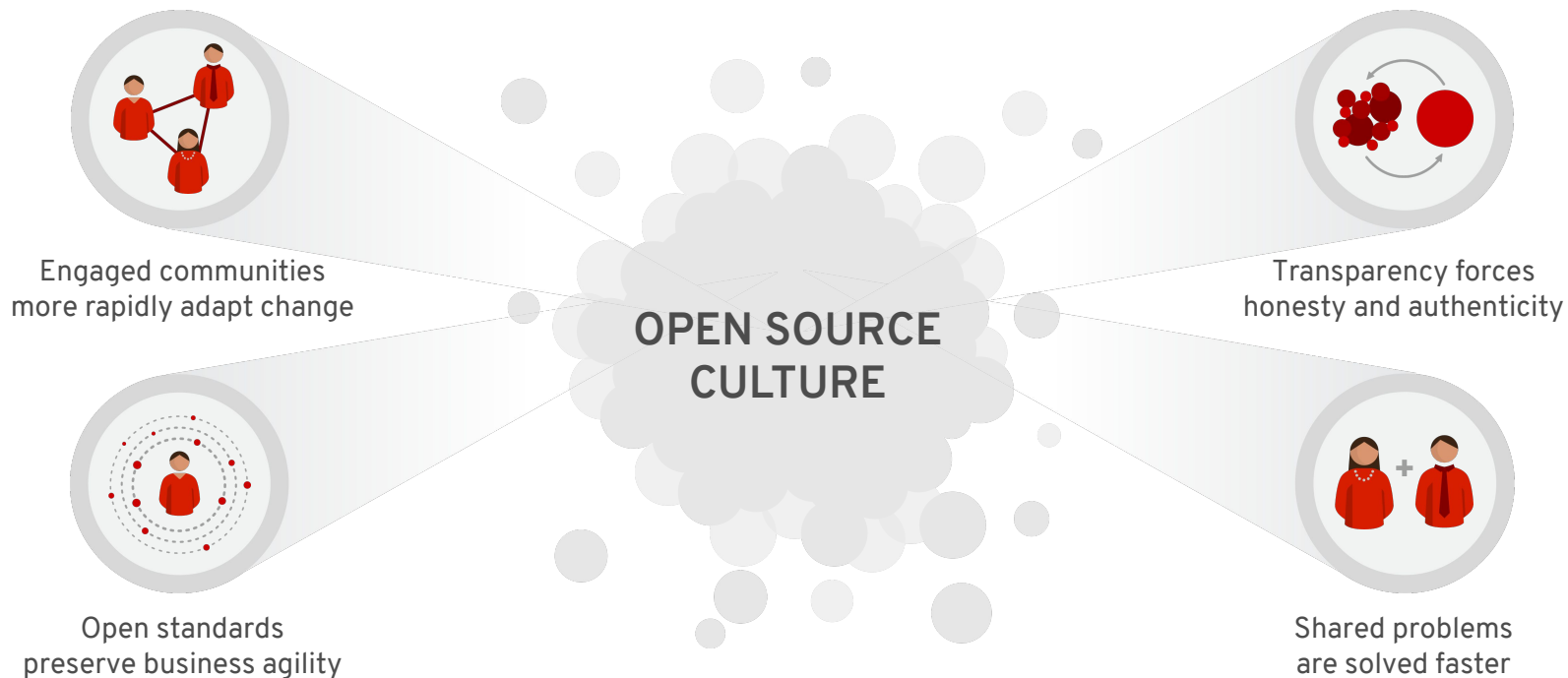
get stuff done together ...

- Dr. David Bray, Exec Director, People-Centered Internet
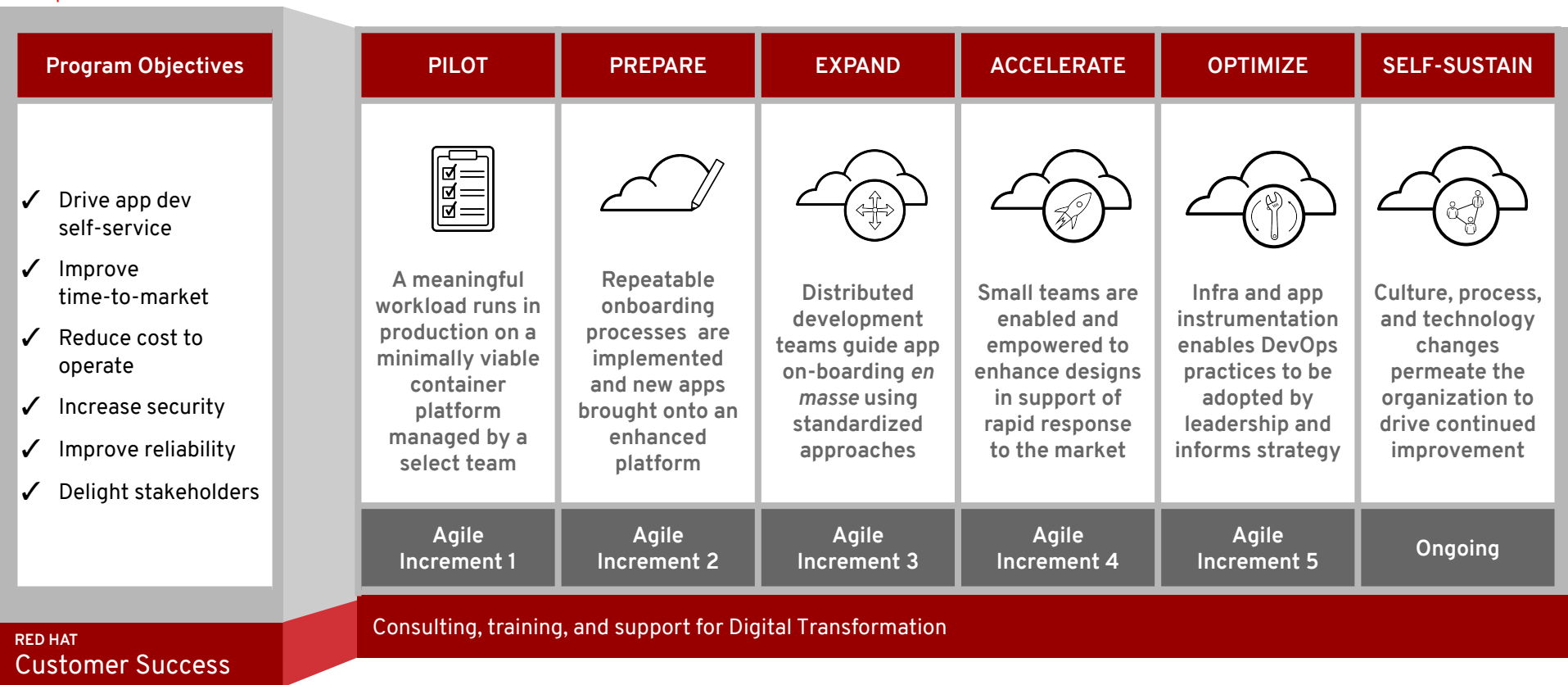
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The Open Organization

JIM WHITEHURST, RED HAT CEO

CONVENTIONAL ORGANIZATION
"TOP DOWN"

WHAT

COMMAND AND CONTROL   CENTRAL PLANNING

HOW

TITLE AND RANK   HIERARCHY

WHY

PROMOTION AND PAY

OPEN ORGANIZATION
"BOTTOM UP"

SETTING DIRECTION

GETTING THINGS DONE

MOTIVATING AND INSPIRING

WHAT

CATALYZING INCLUSIVE DECISION-MAKING

HOW

MERITOCRACY   LET THE SPARKS FLY

WHY

PURPOSE AND PASSION   ENGAGEMENT

Red Hat

Open Source is more than just code. It's Culture

OPEN SOURCE CULTURE

Engaged communities more rapidly adapt change

Open standards preserve business agility

Transparency forces honesty and authenticity

Shared problems are solved faster

Red Hat

Container Adoption Journey Map

Program Objectives

✓ Drive app dev self-service

✓ Improve time-to-market

✓ Reduce cost to operate

✓ Increase security

✓ Improve reliability

✓ Delight stakeholders

PILOT	PREPARE	EXPAND	ACCELERATE	OPTIMIZE	SELF-SUSTAIN
A meaningful workload runs in production on a minimally viable container platform managed by a select team	Repeatable onboarding processes are implemented and new apps brought onto an enhanced platform	Distributed development teams guide app on-boarding *en masse* using standardized approaches	Small teams are enabled and empowered to enhance designs in support of rapid response to the market	Infra and app instrumentation enables DevOps practices to be adopted by leadership and informs strategy	Culture, process, and technology changes permeate the organization to drive continued improvement
Agile Increment 1	Agile Increment 2	Agile Increment 3	Agile Increment 4	Agile Increment 5	Ongoing

RED HAT
Customer Success

Consulting, training, and support for Digital Transformation

Red Hat

Open Innovation Labs

Open Sourcing our DNA to Accelerate Application Development

Mission

To **accelerate the delivery** of our customer's innovative ideas, and **create infectious enthusiasm** for building applications **the Red Hat Way,** by leveraging community-powered innovation to **deliver an outstanding labs experience.**

Vision

To empower our customers to **deliver the most innovative software success stories of the 21st century.**

RED HAT
OPEN INNOVATION LABS

An Unlikely DevOps Journey

Genomic HPC for
Women's Health
Care

5 separate HPC
clusters for
Genomics

Build the team,
meet weekly

Build trust
Find common ground
Discover benefits

Day 2

Day 10

Day 27

90 days later

Day 1

Day 5

Day 20

Day 34

"Can you help me
run fiber out the
Window?"

Stop the money

Create the group
vision

Provide cost-efficient,
multi-tenant solution
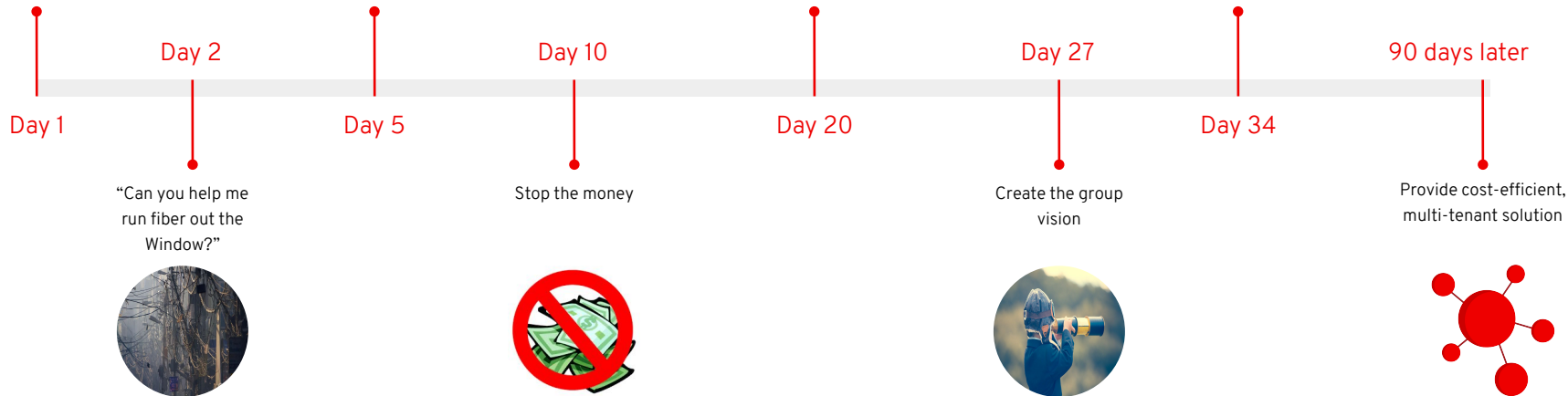
Red Hat

Build Software the Red Hat Way in Open Innovation Labs

EXPERIMENT
Rapidly build prototypes,
do DevOps, and be agile.

CATALYZE INNOVATION
Bring modern application
development back to your team.

IMMERSE YOUR TEAM
Work side-by-side with experts
in a residency-style engagement.

RECIPE

RECIPE

RECIPE

Red Hat

Multi-track approach for Rapid Innovation
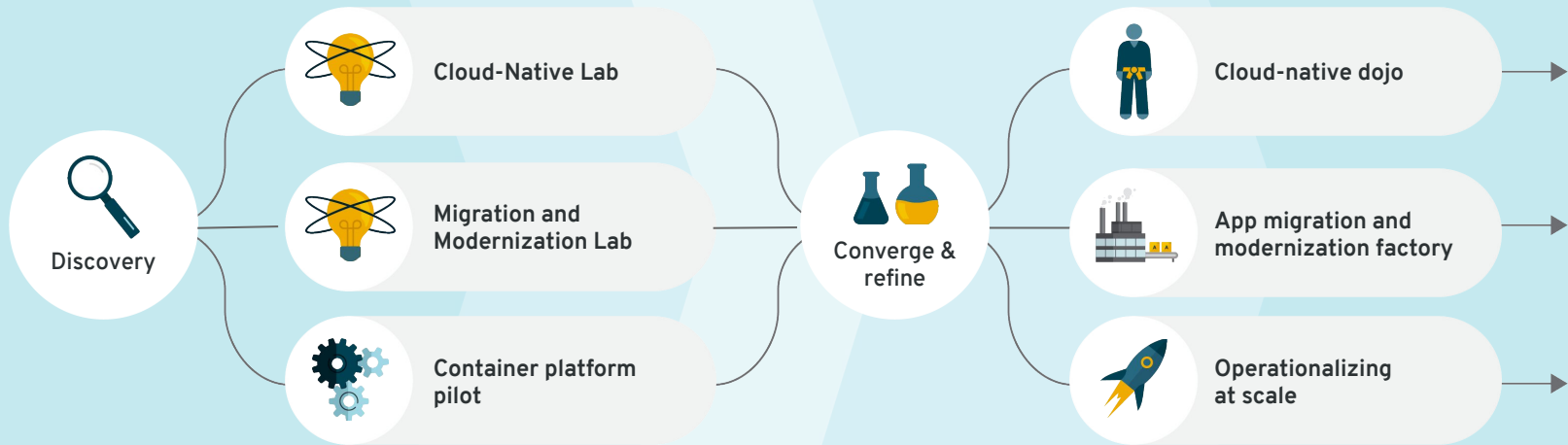
Modes of Operation

DISRUPTION

RAPIDLY CO-CREATE AN INNOVATIVE
OR DISRUPTIVE PRODUCT

TRANSFORMATION

CREATE THE CATALYST TO CHANGE
THE CARGO SHIP'S COURSE

THE ROAD TRIP

EXPERIENCE STATE-OF-THE-ART
APPLICATION DEVELOPMENT AND DEVOPS

Customer Success

Labs in Action

BUSINESS MOTIVATORS

- Transform a traditional bank to a digital bank
- Accelerate delivery of new applications and services to customers
- Reduce costs and increase quality of digital services

LABS ACCOMPLISHMENTS

- Changed the development process to be inclusive, fast, and accurate
- Developed a real-time payment capability
- Reduced development time of an MVP from 18 months to 10 weeks

CUSTOMER QUOTES

- "We didn't have the processes, we didn't have the technology, we didn't have any skills in this space, so we had to make significant change," Marchant said. We chose Red Hat because we knew Red Hat across our stack could do almost everything that we needed."

--Wayne Marchant, CIO of Heritage Bank
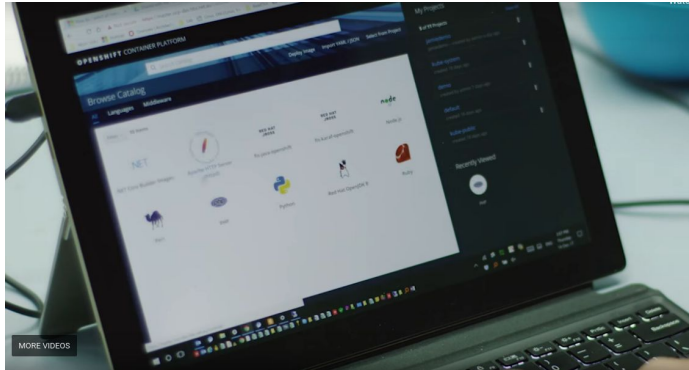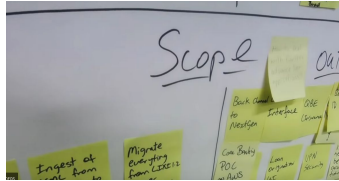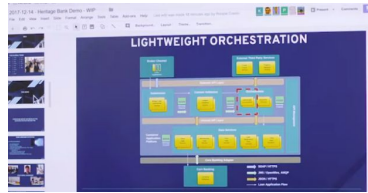
Labs in Action

BUSINESS MOTIVATORS

- Drastically reduce time to deliver new capabilities
- Supply the most advanced fighter jet in the world
- Need to adopt Agile engineering principles to transform business

LABS ACCOMPLISHMENTS

- Reduced delivery time from 5-7 years to 2 years
- Scaled Agile methods from a 5 person to 100 person team
- Designed a dedicated physical space for learning and problem-solving

CUSTOMER QUOTES

- "By working with the Red Hat Open Innovation Labs team, we changed everything — our toolchain, our process, and most importantly, our culture."

-- *Michael Cawood, vice president, F-16/F-22 Product Development, Lockheed Martin*

Life at

Open Innovation Labs

Our Process

PRE-WORK

Discovery session and prep

RESIDENCY

Agile, Lean, DevOps

CONTINUOUS LEARNING

RETROSPECTIVE

Backlog and roadmap

PUSH-BUTTON
INFRASTRUCTURE
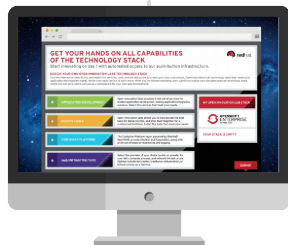
DEMO DAY
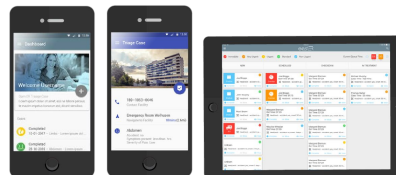
Ready to Innovate?
Let's Get Started.

🔍 Set up a discovery session

💬 Request more info

in linkedin.com/company/red-hat

▶ youtube.com/user/RedHatVideos

f facebook.com/redhatinc

🐦 twitter.com/RedHat

Red Hat

Building Organizations of the Future

Leverage Red Hat's Community-Powered Innovation Workshop

- Discuss how open culture and open principles can drive innovation for PHEAA
- Improve team speed and efficiency to deliver capabilities faster
- Educate IT leaders about embracing enterprise open source software and the agile work methodology (DevOps)
- Workshop designed to answer some of the following key questions:

How do you build an open organization with innovative and engaged people?

How can software enhance and optimize the performance of your organization?

How are open source technologies shaping the future?

Red Hat

DevOps Culture & Practice (DO500)

Description

Many organizations are making or want to make a shift towards a modern application development and delivery model. This model, called DevOps, promises to provide streams of new features in shorter delivery windows by employing techniques such as Continuous Integration, Continuous Delivery, and Agile development practices. Entering the world of digital transformation requires not only a technology shift but a cultural shift.

DevOps Culture and Practice (DO500) provides the student an immersive experience of DevOps culture, modern software development practices, and modern application development architectures. Through teamwork the students engage in modern practices, experience a new culture, and complete hands-on labs that deploy modern, containerized applications featuring foundational DevOps principles and Red Hat OpenShift Container Platform.

Mobile Portfolio Center (MPC)

The MPC is coming to PA July 29!

What is the MPC: A self-contained demo center truck and trailer housing all Red Hat solutions. MPC includes on-board generator, Wi-Fi, Internet access, heating and air conditioning. Red Hat offers a comprehensive open source software portfolio, covering 5 key technology areas: cloud, middleware, operating platform, storage, and virtualization, provided with a subscription model.

What is inside the MPC: Three (3) Servers - TranquilPC V6XD+ Micro Cluster, Master node with 32GB RAM, 1TB SSD, Compute nodes with 128GB RAM, 1 TB SSD. Four (4) 65" flat screen monitors. Six (6) kiosks with eight (8) touchscreens. Smart-board with video conferencing. Smart podium. Digital Graffiti Board. Customer attendees receive a commemorative MPC sticker.

PERSONA	DISCOVER	PILOT	PREPARE	EXPAND	ACCELERATE	OPTIMIZE	SELF-SUSTAIN
ADOPTION CORE TEAM	DO080 DO500 DO180	DO700					RHLS
SYSTEM ADMINS		DO500	DO180 DO280/EX280 DO407/EX407	DO380 DO425/EX425			RHLS
SITE RELIABILITY ENGINEERS		DO500	DO700 DO407/EX407	DO380 DO425/EX425 DO288/EX288			RHLS
Enterprise DEVELOPERS			DO500	DO700 or: DO180 DO288/EX288 DO292			RHLS
MICROSERVICES DEVELOPERS				DO101 + Existing skills	1) DO180 + DO288/EX288 or DO292 2) JB283/EX283		RHLS
INFOSEC ENGINEER		DO180 DO280/EX280	DO425/EX425				RHLS

11

Emerging Tech Overview and Roadmap

Frank DiMuzio
Cloud Platforms Specialist

Emerging Technology Interest Areas

Cloud-native Applications

AI & Machine Learning

Blockchain

Internet of Things

Innovation Culture

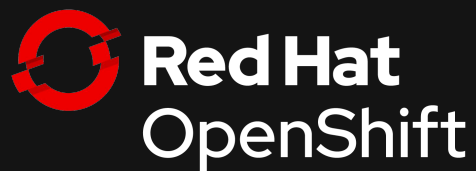CONTAINERS, KUBERNETES, MICROSERVICES & DEVOPS ARE KEY INGREDIENTS

Open Unlocks the World's Potential

Red Hat

Our Vision: Open Hybrid Cloud

DEVELOPER TOOLS

APPLICATION PLATFORMS

INFRASTRUCTURE PLATFORMS

BARE METAL

VIRTUALIZED

PRIVATE CLOUD

PUBLIC CLOUD

SOFTWARE-DEFINED STORAGE

MANAGEMENT & AUTOMATION

Open Unlocks the World's Potential
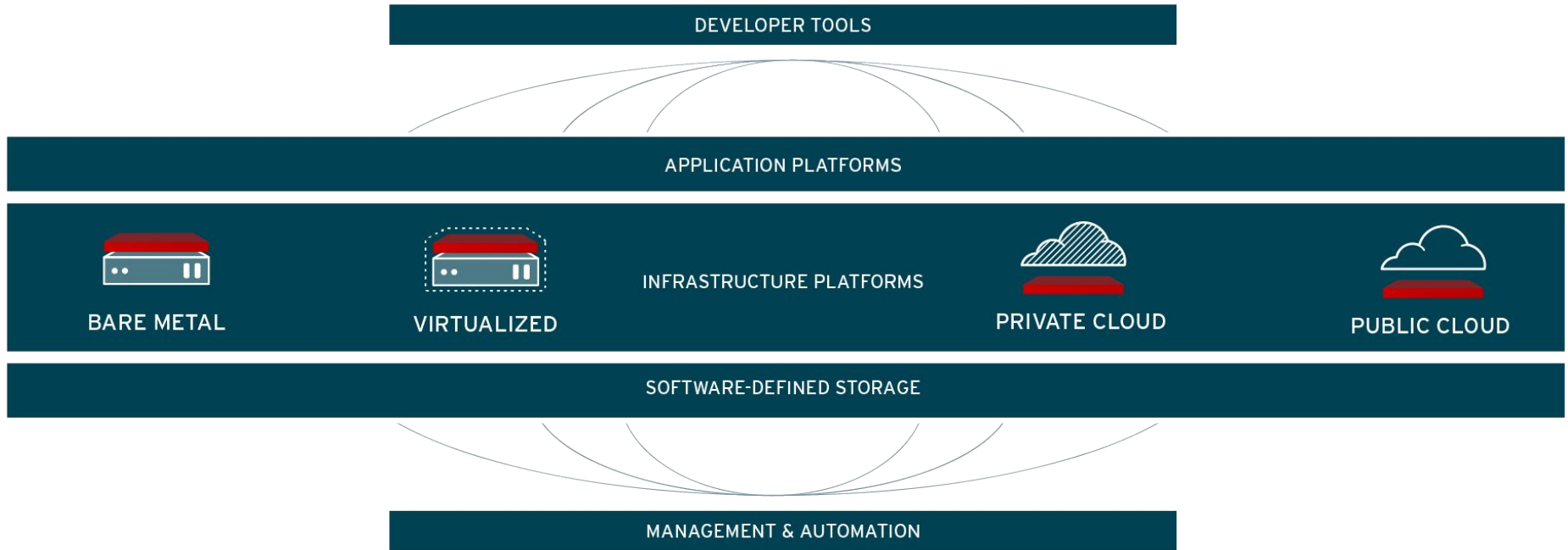
Open Hybrid Cloud Starts with the Platform

RED HAT ANSIBLE Automation   **RED HAT CLOUDFORMS**   **RED HAT SATELLITE**   **RED HAT INSIGHTS**

RED HAT OPENSHIFT.io

RED HAT FUSE   **RED HAT OPENSHIFT** Application Runtimes   **RED HAT 3SCALE API MANAGEMENT**   **RED HAT AMQ**   **RED HAT MIDDLEWARE**   **RED HAT JBOSS ENTERPRISE APPLICATION PLATFORM**   **RED HAT DATA GRID**   **RED HAT PROCESS AUTOMATION MANAGER**   **RED HAT DECISION MANAGER**

RED HAT OPENSHIFT Container Platform

RED HAT ENTERPRISE LINUX   **RED HAT VIRTUALIZATION**   **RED HAT OPENSTACK PLATFORM**   Google   aws   Microsoft Azure   **OTHER PUBLIC CLOUDS**

RED HAT ENTERPRISE LINUX

RED HAT GLUSTER STORAGE   **RED HAT CEPH STORAGE**

Open Unlocks the World's Potential

Red Hat

A cloud-like experience, everywhere

Operator Framework

Operator Hub &
ISV ecosystem

Multicluster
management

Red Hat
OpenShift

Red Hat

OpenShift is trusted enterprise Kubernetes

Kubernetes release

Production Ready

OpenShift release
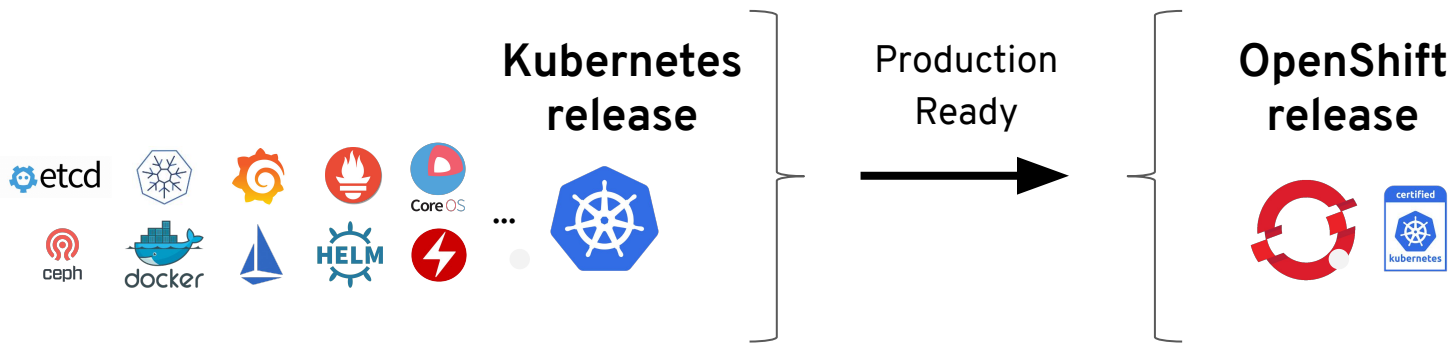
- Hundreds of defect and performance fixes
- 200+ validated integrations
- Certified container ecosystem
- 9-year enterprise life-cycle management
- Red Hat is a leading Kubernetes contributor since day 1

More Than A Tool, Openshift Is A Platform

INSTALL

- Templating
- Validation
- OS Setup

DEPLOY

- Identity & Security Access
- App Monitoring & Alerts
- Storage & Persistence
- Egress, Ingress & Integration
- Host Container Images
- Build/Deploy Methodology
- Multi-environment Rollout
- Cluster and App Elasticity

Container	Container	Container	Container	Container

Self-service

Service Catalog (Language Runtimes, Middleware, Databases, …)

Build Automation	Deployment Automation

Application Lifecycle Management (CI / CD) (Jenkins)

Container Orchestration & Cluster Management (Kubernetes)

Networking	Storage	Registry	Logs & Metrics	Security

Container Runtime & Packaging (Docker, CRI-O)

Linux (RHEL)

Physical	Virtual	Private	Public

HARDEN

- Platform Monitoring & Alerts
- Platform Security Hardening
- Image Hardening
- Security Certifications
- Network Policy/Segmenting
- Disaster Recovery

OPERATE

- Platform Upgrade & Patch
- Image Upgrade & Patch
- App Upgrade & Patch
- Security Patches
- Continuous Security Scanning
- Enterprise Container Registry
- Log Management

Red Hat

Kubernetes done right is hard

INSTALL	DEPLOY	HARDEN	OPERATE
• Templating	• Identity & security access	• Platform monitoring & alerts	• OS upgrade & patch
• Validation	• App monitoring & alerts	• Metering & chargeback	• Platform upgrade & patch
• OS setup	• Storage & persistence	• Platform security hardening	• Image upgrade & patch
	• Egress, ingress, & integration	• Image hardening	• App upgrade & patch
	• Host container images	• Security certifications	• Security patches
	• Build/Deploy methodology	• Network policy	• Continuous security scanning
		• Disaster recovery	• Multi-environment rollout
		• Resource segmentation	• Enterprise container registry
			• Cluster & app elasticity
			• Monitor, alert, remediate
			• Log aggregation

⚠ **75%**
of enterprise users identify
complexity of implementation and
operations as the top blocker to adoption

Source: The New Stack. *The State of the Kubernetes Ecosystem*, August 2017.

Red Hat

A consistent container application platform

FROM YOUR DATACENTER TO THE CLOUD

| Automated operations | Multi-tenant | Secure by default | Network traffic control | Over-the-air updates | Monitoring & chargeback | Pluggable architecture |

RED HAT OPENSHIFT

Bare metal, VMware vSphere, Red Hat Virtualization, Red Hat OpenStack Platform, Amazon Web Services, Microsoft Azure, Google

Red Hat

OpenShift 4 - A smarter Kubernetes platform

Best IT ops experience

CaaS ⟷ PaaS | FaaS

Best developer experience

Cluster services
Monitoring,
showback,
registry, logging

Application services
Middleware, functions, ISV

Service mesh

Developer services
Dev tools,
automated builds,
CI/CD, IDE

Automated operations

kubernetes

certified

kubernetes

Red Hat
Enterprise Linux
CoreOS

Any infrastructure

Physical

Virtual

Private

Public

Automated, full-stack installation from the container host to application services

Seamless Kubernetes deployment to any cloud or on-premises environment

Autoscaling of cloud resources

One-click updates for platform, services, and applications

Red Hat

Automated container operations

FULLY AUTOMATED DAY-1 AND DAY-2 OPERATIONS

INSTALL	DEPLOY	HARDEN	OPERATE
AUTOMATED OPERATIONS			
Infra provisioning	Full-stack deployment	Secure defaults	Multicluster aware
Embedded OS	On-premises and cloud	Network isolation	Monitoring and alerts
	Unified experience	Audit and logs	Full-stack patch & upgrade
		Signing and policies	Zero-downtime upgrades
			Vulnerability scanning

Red Hat

Kubernetes-native day 2 management

OPERATOR FRAMEWORK

Flexible app architectures
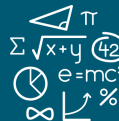
No reinvention of core concepts

Uniform deploy and debug

Truly hybrid

Operators codify operational knowledge and workflows to automate life-cycle management of containerized applications with Kubernetes

Red Hat

OPENSHIFT SERVICE MESH / ISTIO
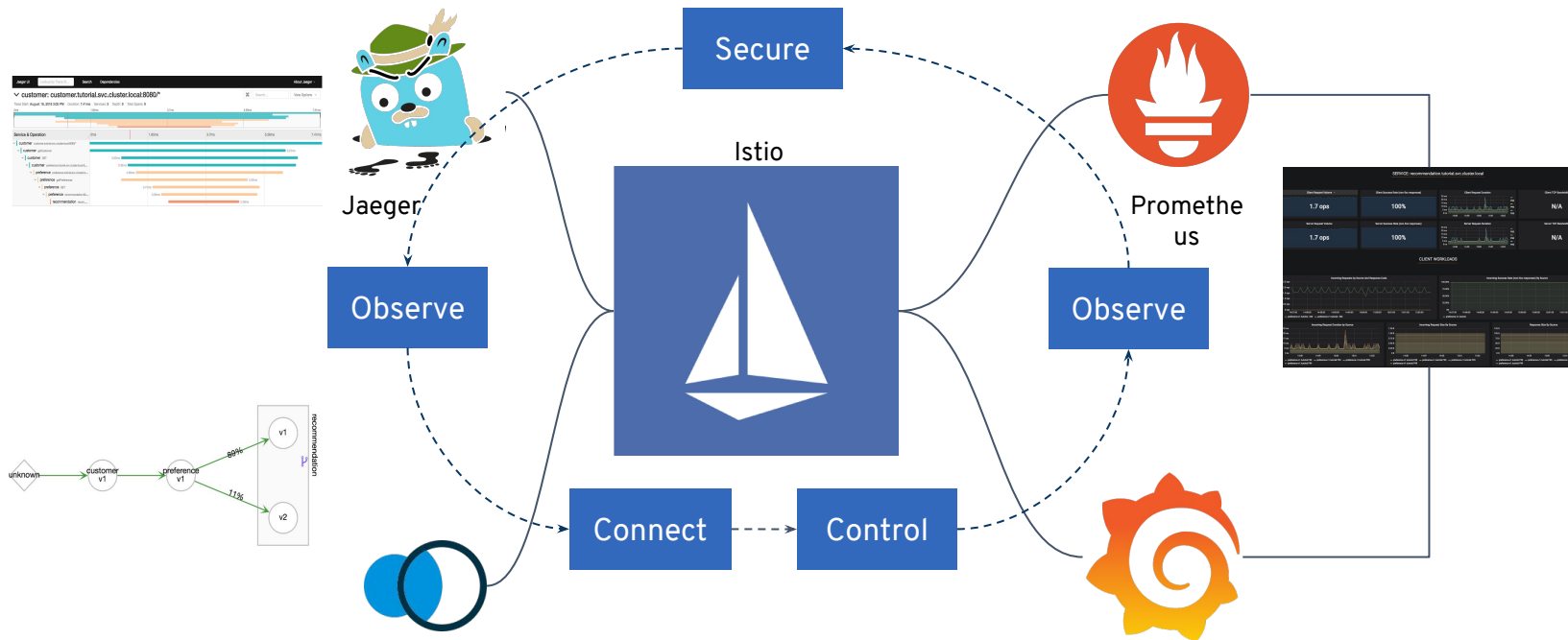
With OpenShift you can deliver all your applications in a whole new way
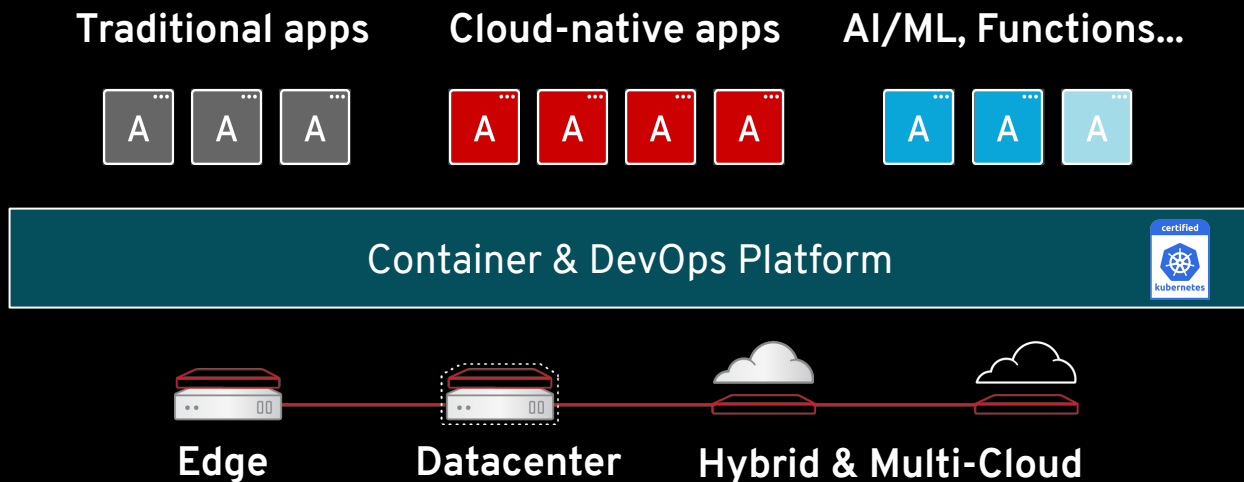
Why Is Red Hat The Best Choice?

CODE

Kubernetes commits

- Others 17%
- Independent 18%
- Red Hat 19%
- Google 46%
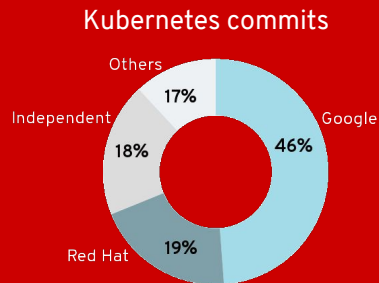
Red Hat is a leading Kubernetes developer & contributor with Google[1].

We make container development easy, reliable, & more secure.

CUSTOMERS

Most reference customers running in production.

We have years of experience running OpenShift Online & OpenShift Dedicated services.

CLOUD

Strong partnerships with cloud providers, ISVs, CCSPs.

We have an extensive container catalog of certified partner images.

COMPREHENSIVE
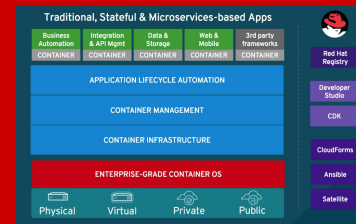
Our comprehensive portfolio of container products and services includes developer tools, security, application services, storage, & management.
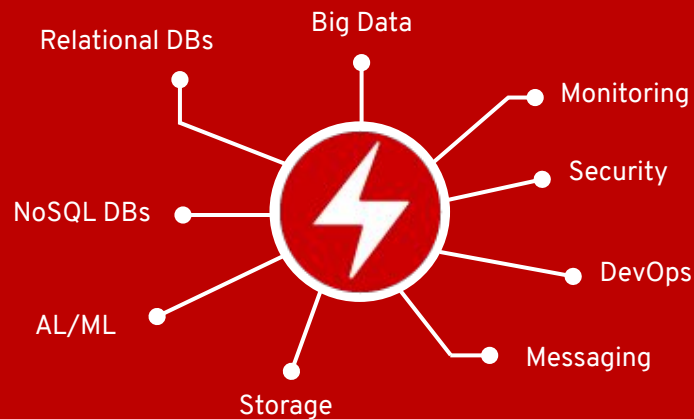
Customers Are Innovating With Openshift

MODERNIZE APPS

WEB APPS

CLOUD NATIVE APPS

MULTI-CLOUD

MOBILE

BIG DATA | ANALYTICS

AI | ML

IOT

Modernize Apps

Red Hat

Migration And Modernization Approaches

MODERNIZING EXISTING APPS

- Reuse existing functionality and data as much as possible

- Move existing workloads to a modern deployment platform supporting automation and CI/CD

- Apply new processes, products, and technology to existing apps

DEVELOPING NEW APPLICATIONS

- API-centric polyglot microservices architecture

- Autonomous development teams

- Agile development, continuous deployment, DevOps culture

- Containerized & orchestrated cloud deployments

Red Hat

Patterns In Modernizing Workloads

LIFT & SHIFT	CONNECT & EXTEND	RIP & RE-WRITE
Containerize existing workloads	**Legacy remains intact**	**Legacy is totally replaced**
Deploy them on a **PaaS**	New layer - new capabilities	New interfaces and data
Keep external integrations and data on legacy	Deploy on **PaaS**	Use **PaaS** to run
Legacy applications have to be well written and suited	**New integration points** between legacy and new layers **(Need for Agile Integration)**	Some data and features can be re-wrapped, but mostly are retired.

Red Hat Middleware

APPLICATION RUNTIMES

RED HAT® OPENSHIFT Application Runtimes

SUPPORTED MICROSERVICES RUNTIMES

TESTED & VERIFIED MICROSERVICES FRAMEWORKS

RED HAT® DATA GRID

RED HAT® AMQ BROKER

INTEGRATION

RED HAT® FUSE

| CLASSIC | ONLINE |
| OPENSHIFT | |

RED HAT® AMQ

INTERCONNECT

| STREAMS | ONLINE |

RED HAT® 3SCALE®

| API MANAGEMENT | API GATEWAY |
| MONETIZATION | |

PROCESS AUTOMATION

RED HAT® PROCESS AUTOMATION MANAGER

| PROCESS/CASE MANAGEMENT | BUSINESS RULES |

ENTANDO UX PLATFORM

RED HAT® DECISION MANAGER

BUSINESS OPTIMIZATION

COMPLEX EVENT PROCESSING

RED HAT® OPENSHIFT

RED HAT ENTERPRISE LINUX ECOSYSTEM
Hardware, Virtualization, Cloud and Service Provider Certifications

Open Unlocks the World's Potential

Red Hat

Lift And Shift Monolith To Cloud
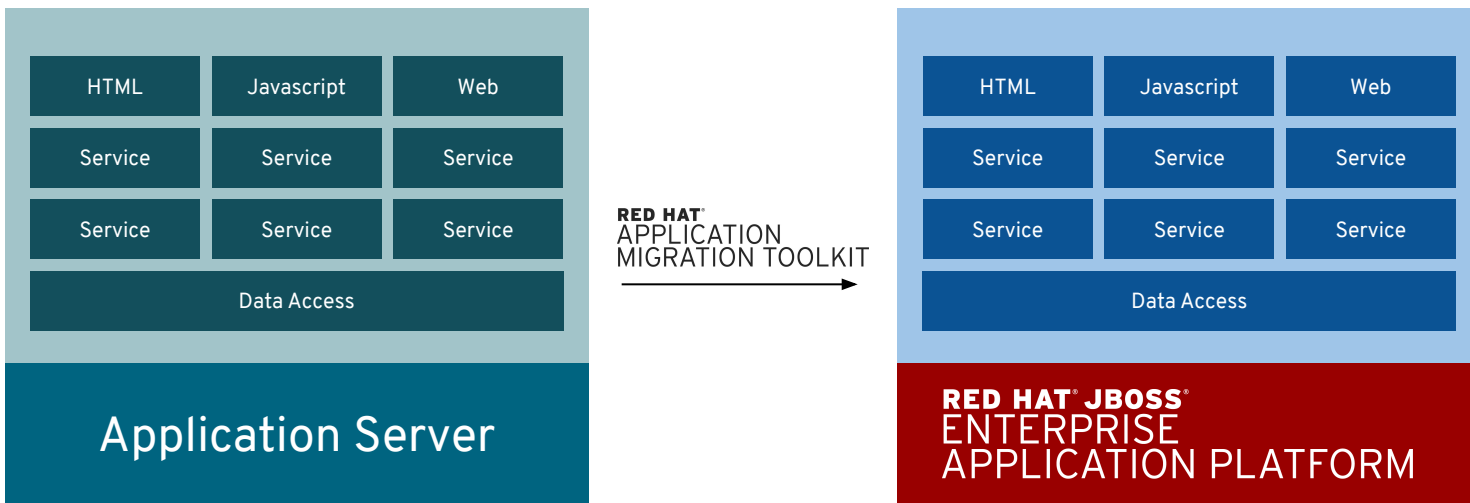
Lift And Shift To Monolith To Cloud
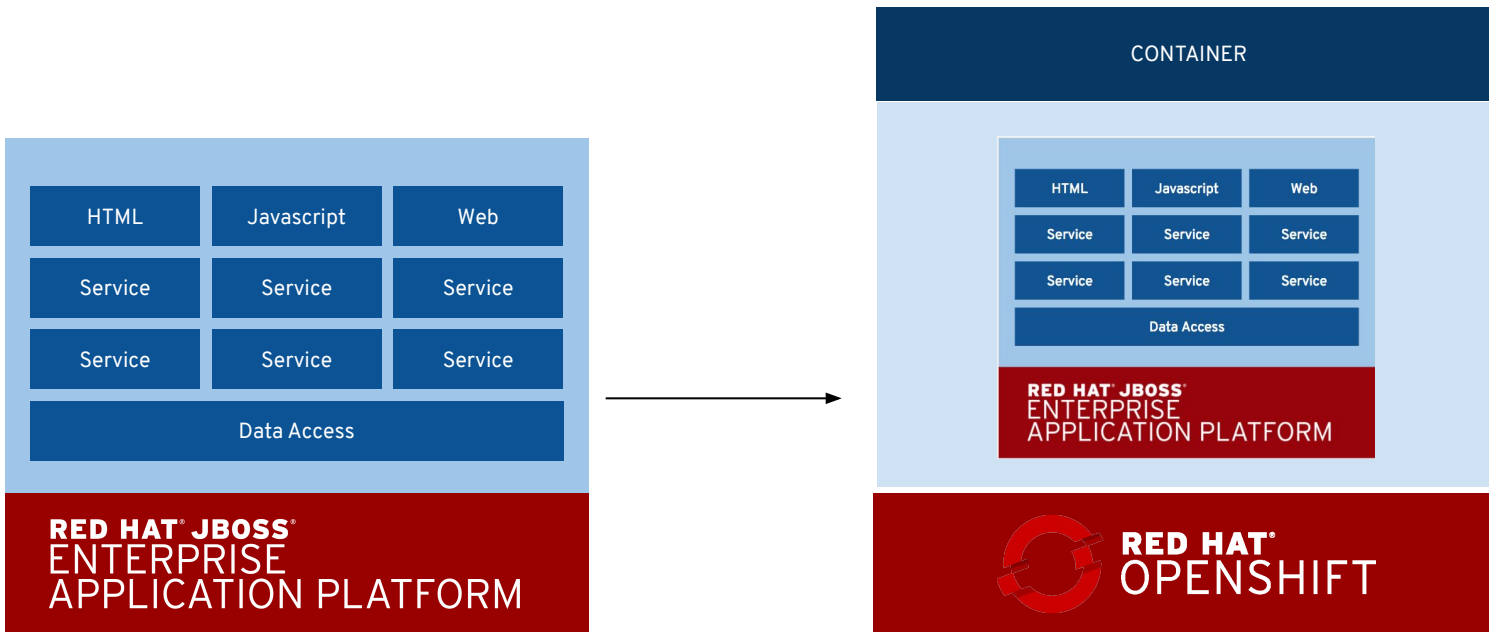
IoT

RED HAT INTEGRATION PORTFOLIO

ENABLE CUSTOMERS IN THEIR DIGITAL TRANSFORMATION JOURNEY

| Mobile enablement | IoT enablement | Business process management | Decision services (Business Rules) |

DISTRIBUTED INTEGRATION

- LIGHTWEIGHT
- PATTERN BASED
- EVENT ORIENTED
- COMMUNITY SOURCED

Red Hat Integration

CONTAINERS

- CLOUD-NATIVE SOLUTIONS
- LEAN ARTIFACTS, INDIVIDUALLY DEPLOYABLE
- CONTAINER-BASED SCALING AND HIGH AVAILABILITY

RED HAT OPENSHIFT

APIs

- WELL-DEFINED, REUSABLE, AND WELL-MANAGED ENDPOINTS
- ROBUST ECOSYSTEM

Red Hat Integration

Culture, tools, processes, & automation

Red Hat

Red Hat AMQ

Standard Protocols

Polyglot Clients

Flexible, standards-based messaging for the enterprise, cloud and Internet of Things

Common Management

Broker

- Store & Forward
- Volatile & Durable
- Full JMS 2.0 Support
- Best-in-class perf

Interconnect

- High-performance direct messaging
- Distributed messaging backbone

Streams

- Streaming platform
- Durable pub/sub
- Replayable streams
- Based on Apache Kafka project

Self-service Messaging

- Scalable, easy-to-manage messaging utility based on OpenShift container platform
- Enable developers to provision messaging infrastructure through a web console.

Red Hat AMQ Streams

What is Apache Kafka?

Apache Kafka is a distributed system designed for streams. It is built to be an horizontally-scalable, fault-tolerant, commit log, and allows distributed data streams and stream processing applications.

Artificial Intelligence

AI, ML, DL, + Predictive Analytics

Artificial Intelligence
computers leverage code to
perform tasks

Machine Learning
without being explicitly
programmed

**Deep
Learning**
the network
adapts to
new data
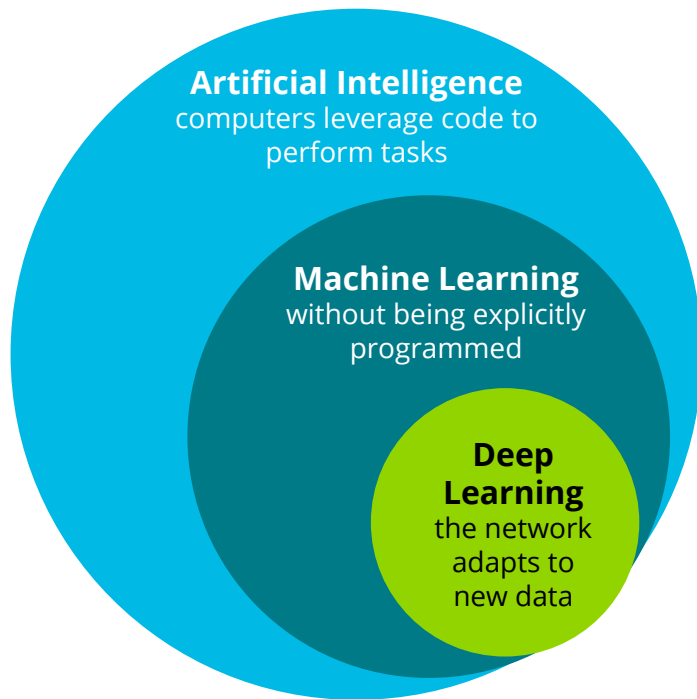
Predictive Analytics
is the application of statistical methods to find patterns in data that predict the future.

AI Ecosystem Strategy

Mission: *With partners, make best-in-class AI/ML hybrid/multi-cloud ready for mainstream and enterprise markets*

- **Primary Focus on OpenShift** - kubernetes-powered multi/hybrid-cloud AI/ML platform
- **Hardware Ecosystem for Performance** - GPUs
- **SW Ecosystem Enablement**
  - Projects w/ Vendor Support - Certified vendors w/ commercial support
  - Balance Platforms & Components - Provide choice
- **Cloud-Like Experience -** Operators, operatorhub.io, embedded operatorhub

Via:

- **AI Reference Architecture** - Open Data Hub - RH Ref Arch for AI for upstream/products/partners
- **AI Use Case Definitions** - define core use cases - RH + Partners Enable these use cases

The Open Data Hub Project

Collaborate on a Data & AI platform for the Hybrid Cloud - https://opendatahub.io/

- Meta-Project to integrate Open Source projects into a practical service oriented solution.
- Red Hat's internal Data Science and AI platform.
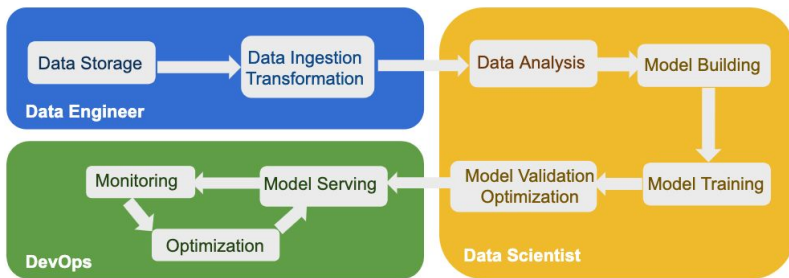
AI Workflow - Open Data Hub

https://opendatahub.io/arch.html
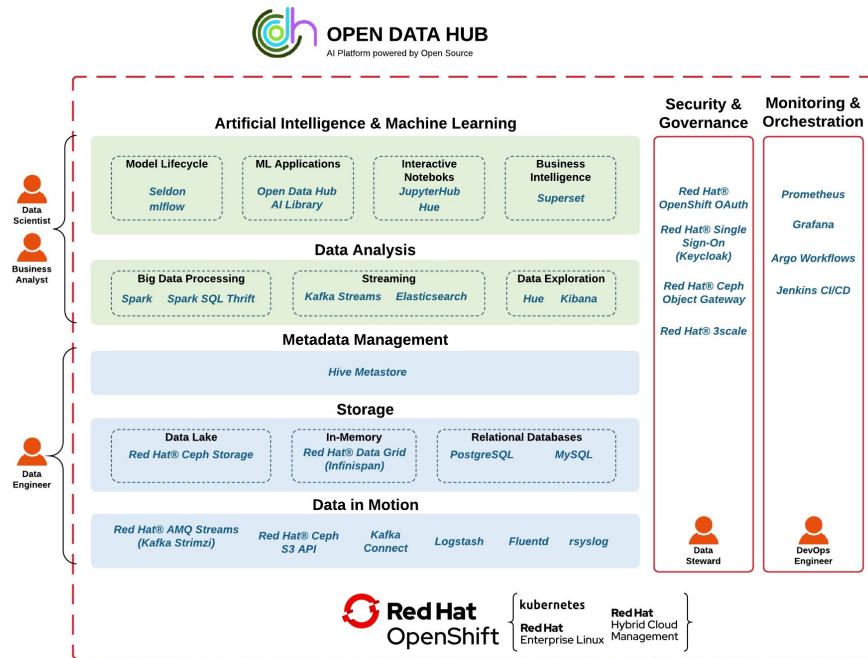
Open Data Hub Architecture

OPEN DATA HUB
AI Platform powered by Open Source

Reference Architecture for AI on OpenShift

Left-side workflow diagram

- *Transform Data & Create Models* — ceph
- jupyter, Spark, TensorFlow
- *Run Experiments*
- mlflow
- *Deploy Model as a Service* — SELDON, OPENSHIFT
- *Gather Metrics & Store Results* — Grafana, Prometheus, ceph

Main architecture

Security & Governance

Monitoring & Orchestration

Artificial Intelligence & Machine Learning

Data Scientist

Business Analyst

Model Lifecycle	ML Applications	Interactive Notebooks	Business Intelligence
Seldon *mlflow*	*Open Data Hub AI Library*	*JupyterHub* *Hue*	*Superset*

Data Analysis

Big Data Processing	Streaming	Data Exploration
Spark *Spark SQL Thrift*	*Kafka Streams* *Elasticsearch*	*Hue* *Kibana*

Metadata Management

Hive Metastore

Storage

Data Engineer

Data Lake	In-Memory	Relational Databases
Red Hat® Ceph Storage	*Red Hat® Data Grid (Infinispan)*	*PostgreSQL* *MySQL*

Data in Motion

Red Hat® AMQ Streams (Kafka Strimzi) *Red Hat® Ceph S3 API* *Kafka Connect* *Logstash* *Fluentd* *rsyslog*

Security & Governance

Red Hat® OpenShift OAuth

Red Hat® Single Sign-On (Keycloak)

Red Hat® Ceph Object Gateway

Red Hat® 3scale

Data Steward

Monitoring & Orchestration

Prometheus

Grafana

Argo Workflows

Jenkins CI/CD

DevOps Engineer

Red Hat OpenShift

kubernetes

Red Hat Enterprise Linux

Red Hat Hybrid Cloud Management

RED HAT CONFIDENTIAL

Thank you

Red Hat is the world's leading provider of enterprise open source software solutions. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.

linkedin.com/company/red-hat

facebook.com/redhatinc

youtube.com/user/RedHatVideos

twitter.com/RedHat

Red Hat

Trusted Software Supply Chain
A Modern Build Process

Brian Payton
Cloud Solutions Architect

Frank DiMuzio
Cloud Specialist

AGENDA

- Core Technologies
- Trusted Software Supply Chain
- Accreditation Feedback Loop
- OpenShift CI/CD Demo

Core Technologies

RAPID SECURITY PATCHING USING CONTAINER IMAGE LAYERING
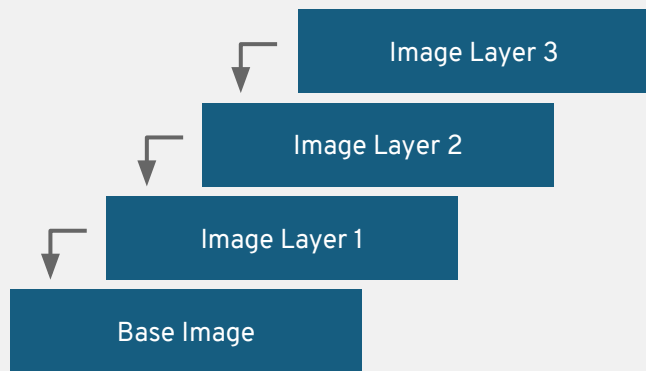
Container Image Layers
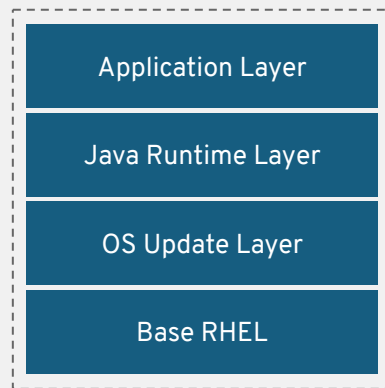
Example Container Image

CONTAINERS ENABLE SYSTEMS THINKING

- Environment (binary) never changes

- Only deltas go through CI/CD

- Automated testing is accelerated

- Reduce WIP

- Focus on the constraints!

(Business)   (Customer)

Dev ➔ *Ops*

redhat.

- Runtime: v1.0.0 (GA) July 2017
  - Includes core for Linux, Windows, and Solaris
  - https://github.com/opencontainers/runtime-spec/
- Image Format: v1.0.0 (GA) July 2017
  - Seeded with Docker registry v2.2 specification
  - https://github.com/opencontainers/image-spec/

KUBERNETES THE ORCHESTRATION STANDARD

- Robust scheduling
- Auto-scale based upon CPU, Memory, etc
- Self-healing
- Supports stateful applications
- Secret and configuration management
- Automate rollouts and rollbacks

Very complex applications can be guaranteed to run the EXACT same way they ran in dev with a single press of a button

KUBERNETES WAS NEVER INTENDED TO BE THE PLATFORM

Kubernetes Founder →

Joe Beda
@jbeda

Following

💯Kubernetes is fundamentally a tool box. The real power is what you can build with it.

brendandburns
@brendandburns

amen!

Bryan Liles @bryanl
The real wins of @kubernetesio are the abstractions that it enables you to create. Everything else is plumbing.

4:41 PM - 30 Jun 2017 from Menlo Park, CA

Gabe Monroy @gabrtv
Kubernetes was never intended to be the top of the architectural layer cake.

2:20 PM - 4 Apr 2017

redhat.

OPENSHIFT IS ENTERPRISE READY KUBERNETES
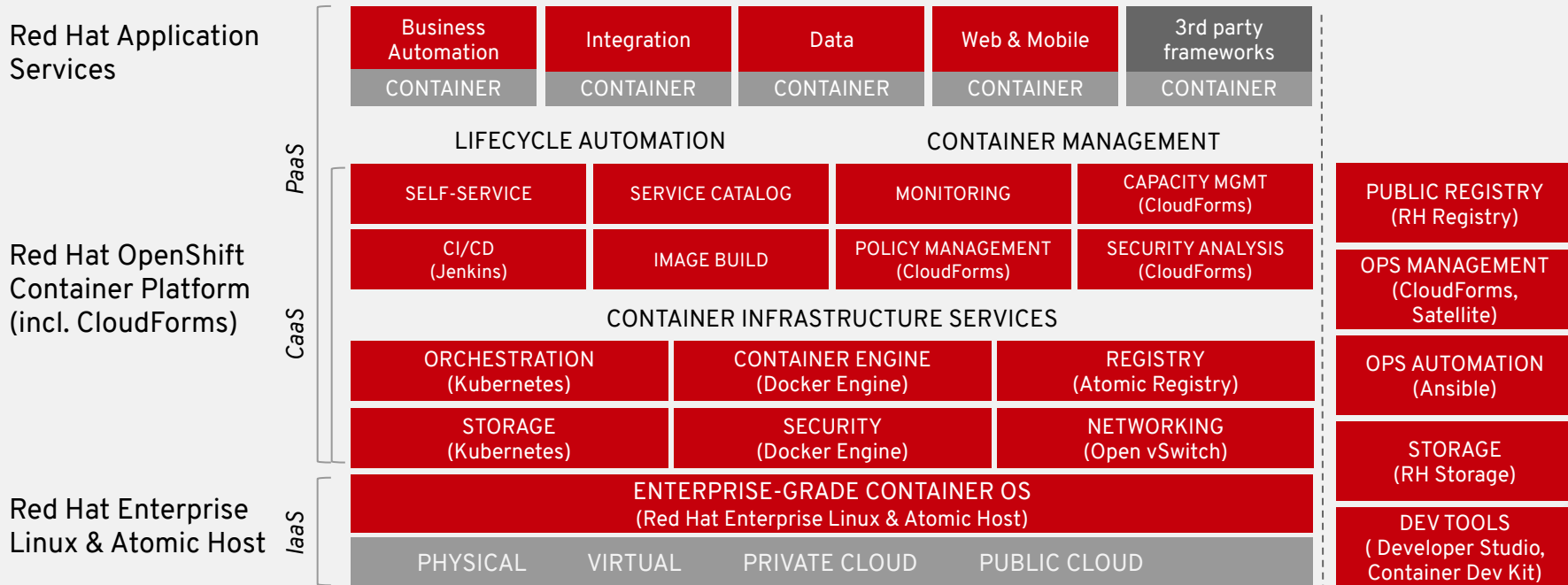
OPENSHIFT CONTAINER PLATFORM IS MORE THAN JUST OPENSHIFT

	OCP	FUNCTION
Apps	OpenShift	App Management
Infra	OpenShift Container Storage	Persistent Storage
	Ansible	Ops Automation
	RHEL/Windows	Secure OS

redhat.

Enabling DevSecOps
Trusted Software Supply Chain

CI/CD WITH BUILD AND DEPLOYMENTS

BUILDS

- Webhook triggers: build the app image whenever the code changes
- Image trigger: build the app image whenever the base language or app runtime changes
- Build hooks: test the app image before pushing it to an image registry

DEPLOYMENTS

- Deployment triggers: redeploy app containers whenever configuration changes or the image changes in the OpenShift integrated registry or upstream registries

redhat.

OPENSHIFT LOVES CI/CD

**JENKINS-AS-A SERVICE
ON OPENSHIFT**

**HYBRID JENKINS INFRA
WITH OPENSHIFT**
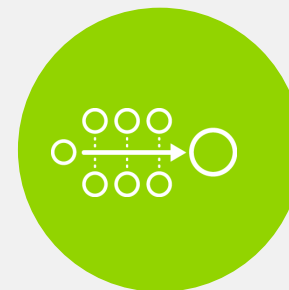
**EXISTING CI/CD
DEPLOY TO OPENSHIFT**

redhat.

DOCKER HUB VULNERABILITIES

36% of official images available for download contain high priority security vulnerabilities

100%
80%
60%
40%
20%
0%

28%

36%

All Images (n=962)
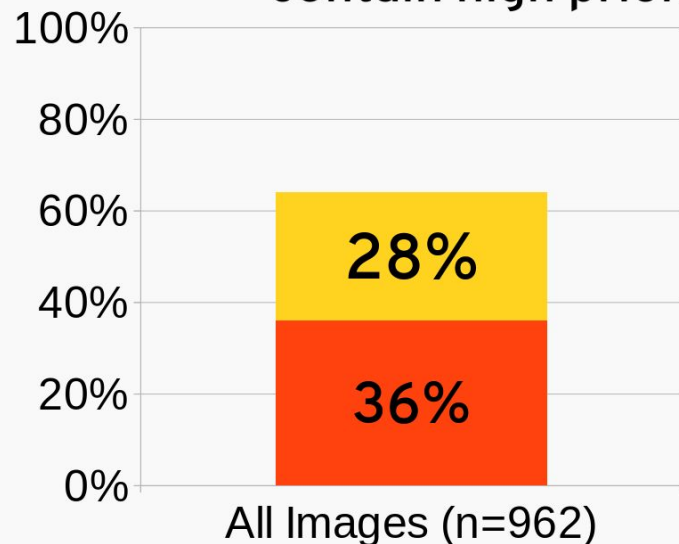
- High vulnerabilities: ShellShock (bash), Heartbleed (OpenSSL), etc.

- Medium vulnerabilities: Poodle (OpenSSL), etc.

- Low vulnerabilities: gcc: array memory allocations could cause integer overflow

■ Medium priority

https://access.redhat.com/containers/ redhat.

START WITH QUALITY PARTS

PACKAGING APPS AS A CONTAINER IMAGE

How do we package applications in containers for deployment?
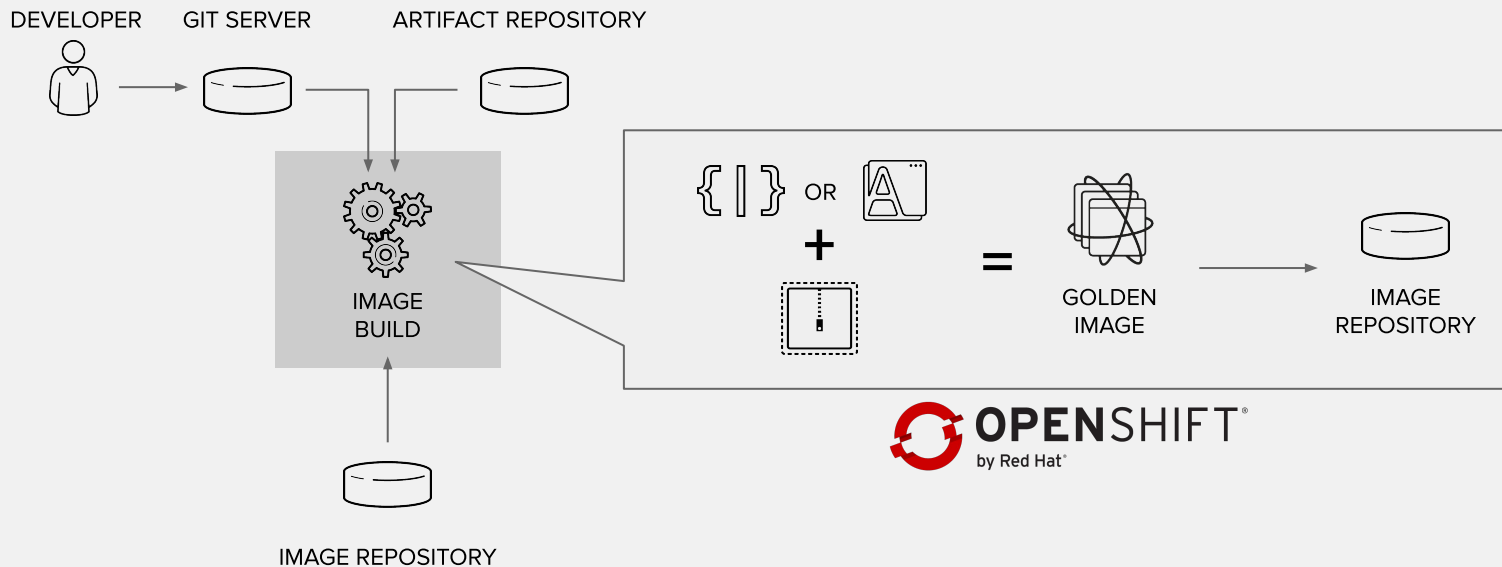
Never {pass} known defects to downstream work centers.

* The Phoenix Project by George Spafford, Kevin Behr, and Gene Kim

redhat.

CONTINUOUS INSPECTION

Start with quality parts
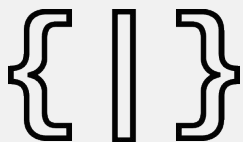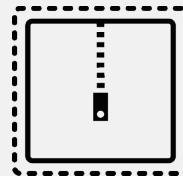
	CODE	BINARY	CONTAINER
REPOSITORY	GitLab	Sonatype | Nexus	OPENSHIFT by Red Hat INTEGRATED REGISTRY
INSPECTION TOOL	sonarqube	BLACKDUCK	Twistlock

redhat.

THE TRUSTED SOFTWARE SUPPLY CHAIN POWERED BY OPENSHIFT
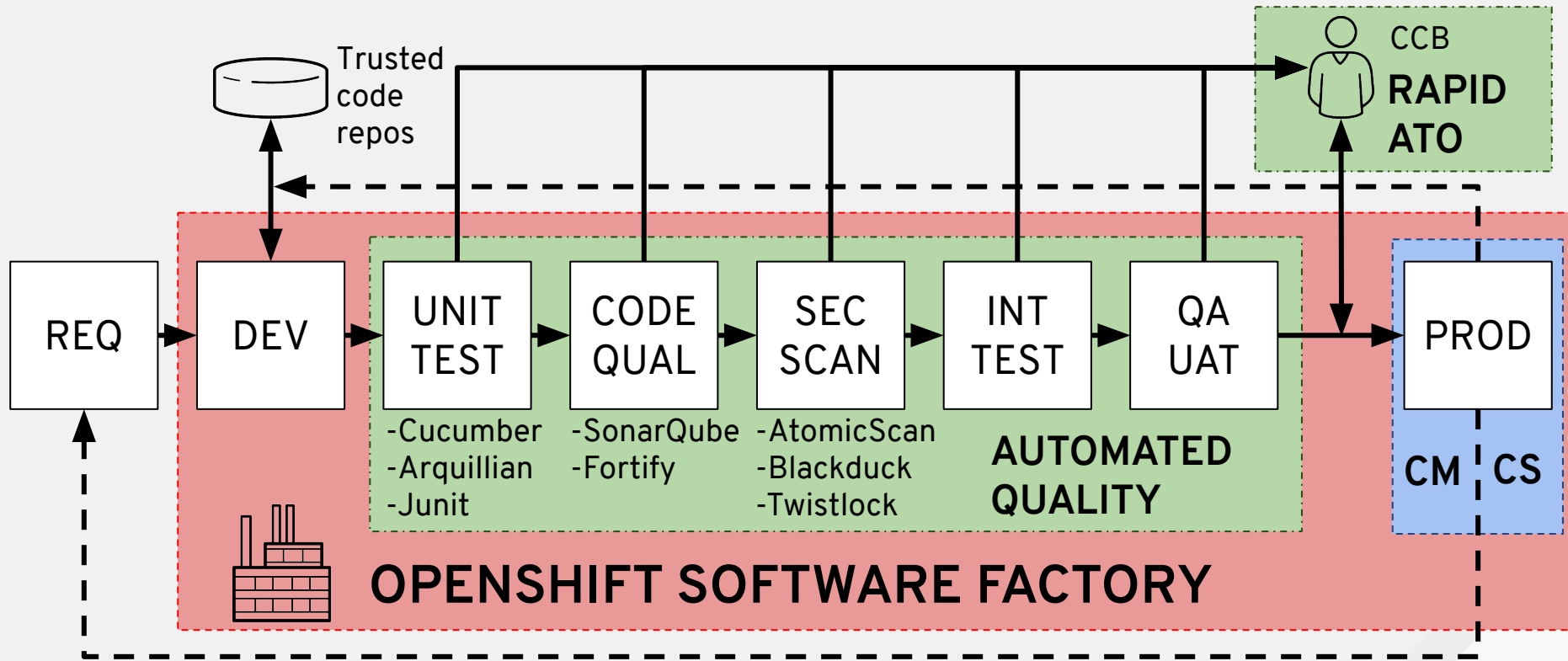
The last thing most managers think about is how to get a new product back if something goes wrong.

* A Strategic Approach to Managing Product Recalls by N. Craig Smith, Robert J. Thomas, and John Quelch for HBR

THE TRUSTED SOFTWARE SUPPLY CHAIN POWERED BY OPENSHIFT
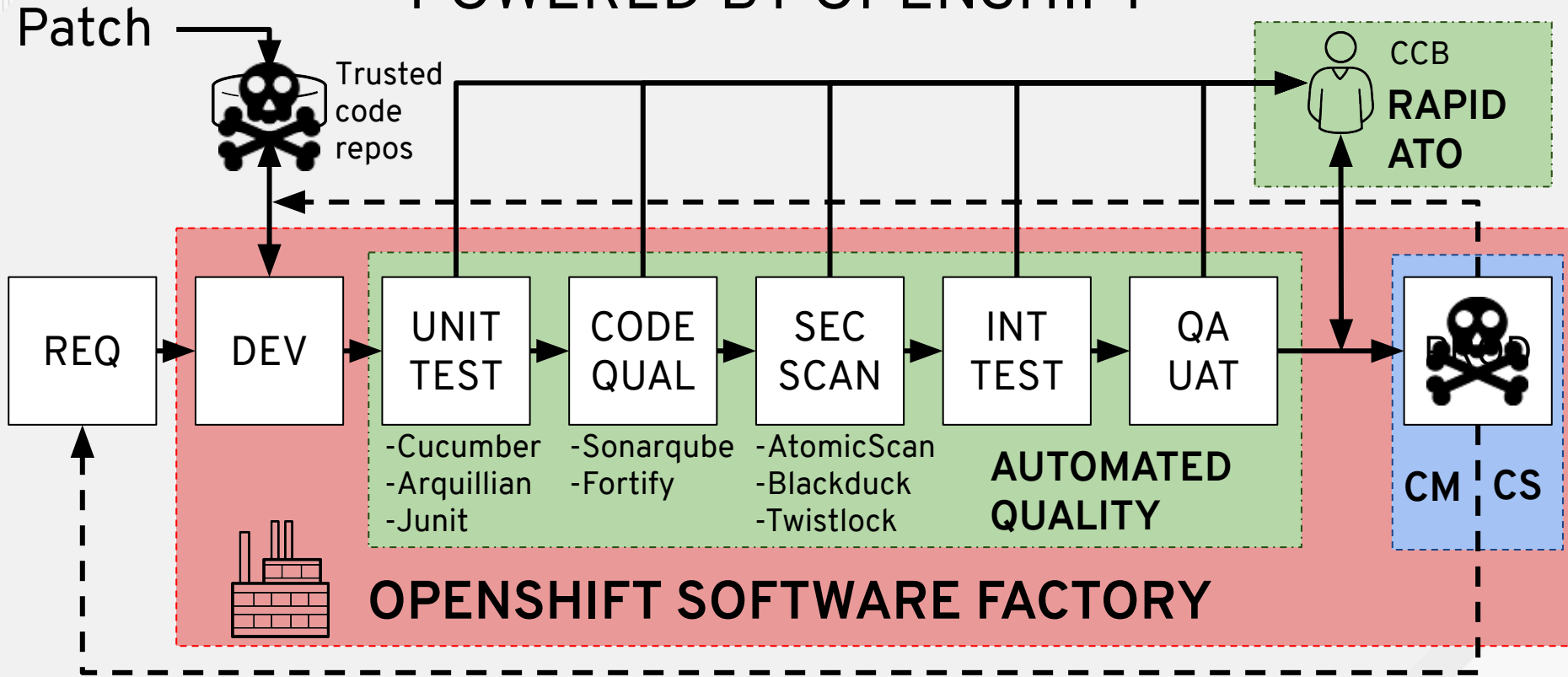
Patch

Trusted code repos

CCB
RAPID ATO

REQ

DEV

UNIT TEST
-Cucumber
-Arquillian
-Junit

CODE QUAL
-Sonarqube
-Fortify

SEC SCAN
-AtomicScan
-Blackduck
-Twistlock

INT TEST

QA UAT

AUTOMATED QUALITY

PROD

CM | **CS**

OPENSHIFT SOFTWARE FACTORY

redhat.

THE TRUSTED SOFTWARE SUPPLY CHAIN POWERED BY OPENSHIFT

Patch

Trusted code repos

CCB
RAPID ATO

REQ → DEV → UNIT TEST → CODE QUAL → SEC SCAN → INT TEST → QA UAT → PROD

- Cucumber
- Arquillian
- Junit

- Sonarqube
- Fortify

- AtomicScan
- Blackduck
- Twistlock

AUTOMATED QUALITY

OPENSHIFT SOFTWARE FACTORY

CM | CS

redhat.
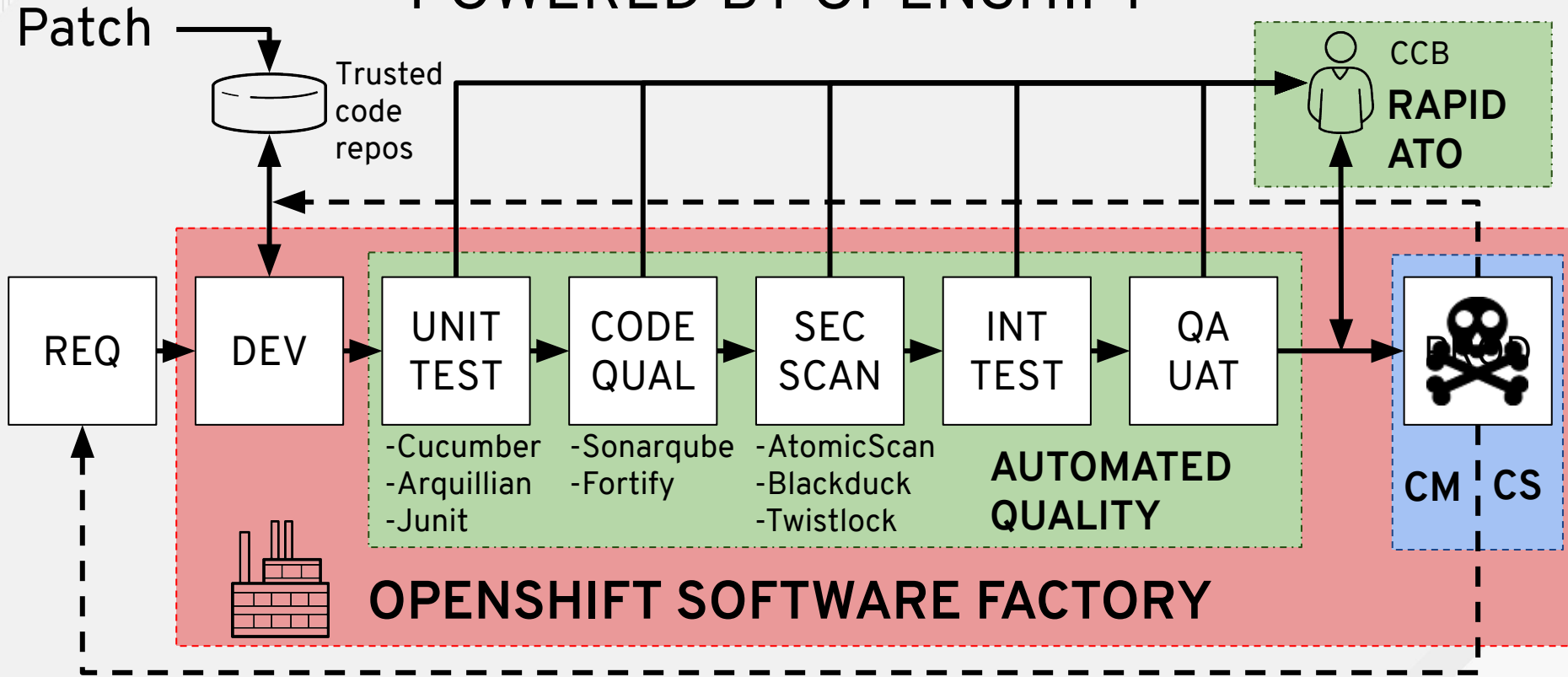
THE TRUSTED SOFTWARE SUPPLY CHAIN POWERED BY OPENSHIFT
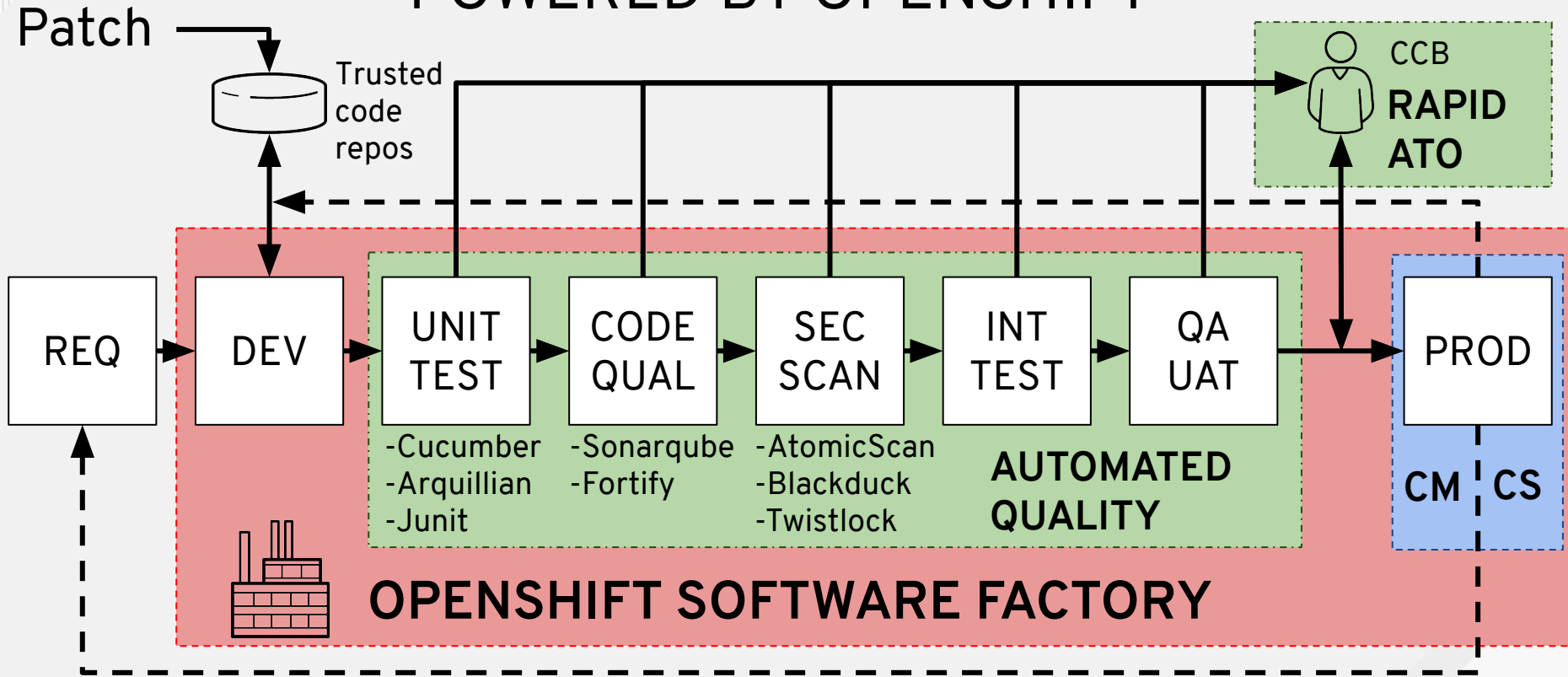
INFORMATION ASSURANCE AS A 1ST CLASS CITIZEN

- OpenShift ImageStreams ensure approved image is immutable (using sha256 digest not arbitrary tags)
- Easily roll out patches to base OS, web server, application on demand without bothering the developers
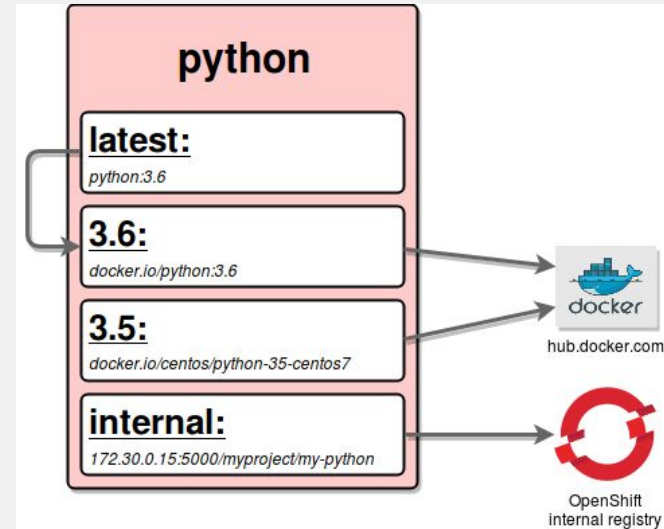
DevSecOps and Feedback Loops

DevSecOps IS SITUATIONAL AWARENESS
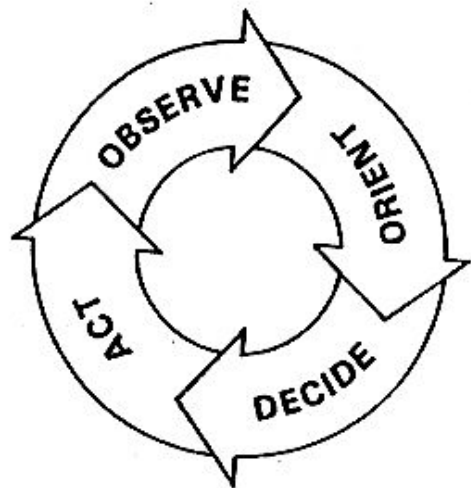
Figure 2. The command and control process: The OODA loop.

"Our architecture must enable experimentation and learning, optimizing how quickly we can execute our OODA loop" - Adrian Cockcroft
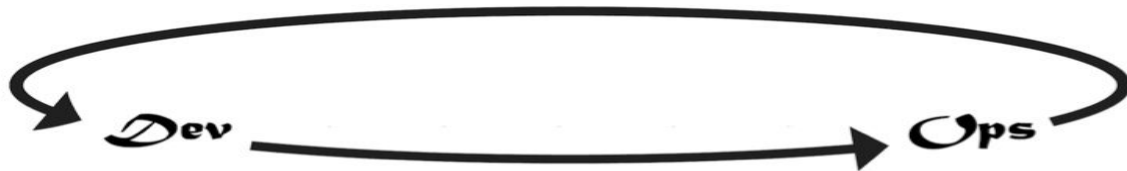
OPENSHIFT Enables DevSecOps
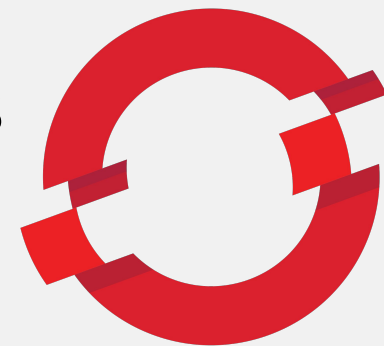
- DevSecOps Self Service Prerequisite
- DevSecOps Pipeline Best Practices
  - Environments are identical
  - Deployments are identical
  - Smoke testing (Liveliness, readiness probes)
  - Consistency of non functional requirements
    - Infra: auditing, logging, metrics(auditing,
    - Database, Language versions, etc
  - Built in end-to-end pipeline capabilities

OPENSHIFT Enables DevSecOps

- No such thing as fixing upstream
- Cross functional teams
- Easily stay in compliance
- Smaller attack surfaces, mitigate threats

redhat.

OPENSHIFT Enables DevSecOps
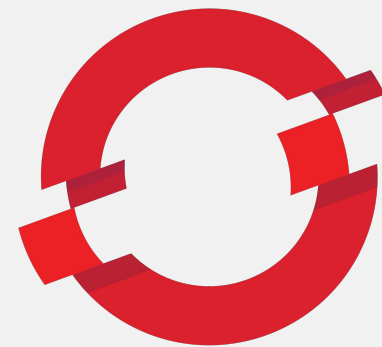
- Built-in Situational Awareness (Events, Metrics, EFK)
- Reduce Risk with Blue/Green or Canary Deployments
- Easily rollback within seconds
- Built-in end-to-end pipelines
  - Integrate any system
- Security
  - Automate scans
  - Protect that pipeline!

OPENSHIFT

In 2004, this was described as the absence of a "culture of causality," 1 noting that high-performing organizations recognize that typically, 80% of all outages are caused by change, and that 80% of MTTR is spent trying to determine what changed.

redhat.

Demo

Network and Security Automation
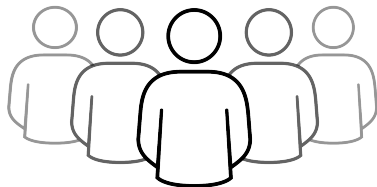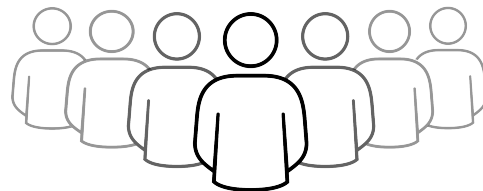
Red Hat
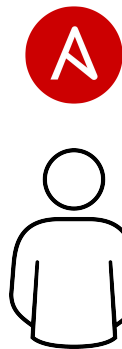
Automation happens when one person meets a problem they never want to solve again
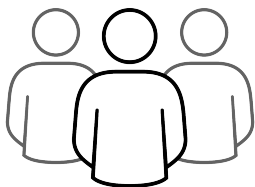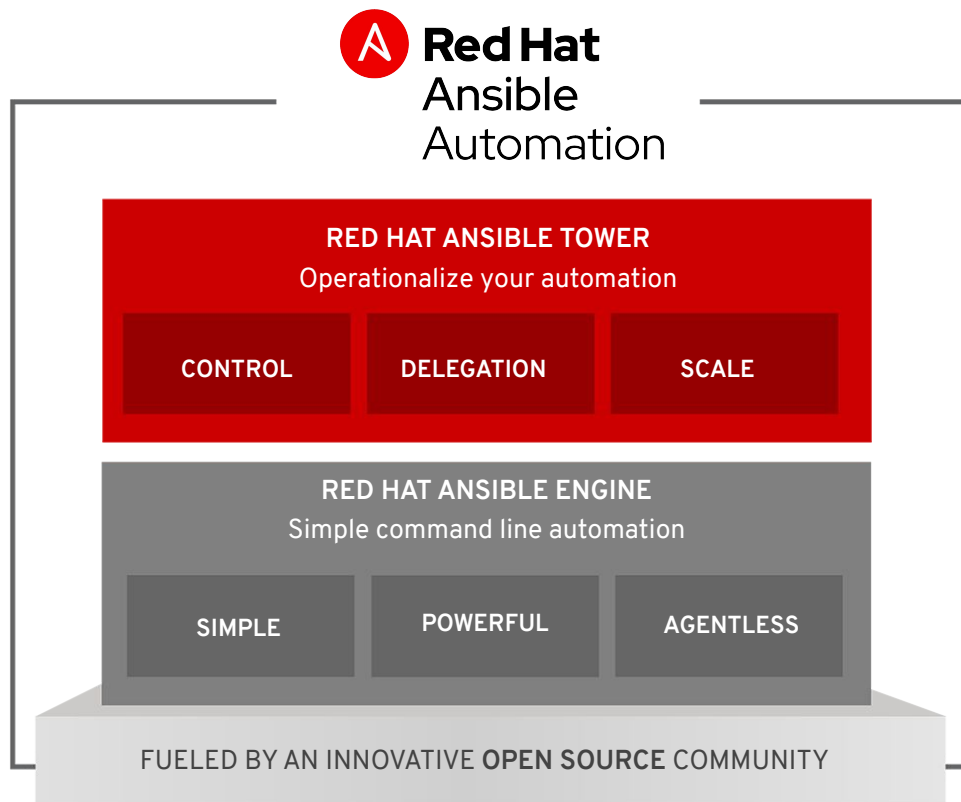
ACCELERATE   INTEGRATE   COLLABORATE

What is Ansible Automation?

Ansible Automation is the enterprise **framework** for automating across IT operations.

Ansible Engine runs Ansible Playbooks, the automation **language** that can perfectly describe an IT application infrastructure.

Ansible Tower allows you **scale** IT automation, manage complex deployments and speed productivity.

**Red Hat
Ansible
Automation**

RED HAT ANSIBLE TOWER
Operationalize your automation

| CONTROL | DELEGATION | SCALE |

RED HAT ANSIBLE ENGINE
Simple command line automation

| SIMPLE | POWERFUL | AGENTLESS |

FUELED BY AN INNOVATIVE **OPEN SOURCE** COMMUNITY

Red Hat

Why Ansible?

Simple

Human readable automation

No special coding skills needed

Tasks executed in order

Usable by every team

Get productive quickly
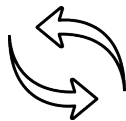
Powerful

App deployment

Configuration management

Workflow orchestration

Network automation

Orchestrate the app lifecycle

Agentless

Agentless architecture

Uses OpenSSH & WinRM

No agents to exploit or update

Get started immediately

More efficient & more secure

Red Hat

What can I do using Ansible?

Automate the deployment and management of your entire IT footprint.

Do this...

Orchestration	Configuration Management	Application Deployment	Provisioning	Continuous Delivery	Security and Compliance

On these...

Firewalls	Load Balancers	Applications	Containers	Clouds
Servers	Infrastructure	Storage	Network Devices	And more...

Red Hat

Red Hat Ansible Engine

Cross platform

Agentless support for all major OS variants, physical, virtual, cloud and network devices.

Human readable

Perfectly describe and document every aspect of your application environment.

Perfect description of application

Every change can be made by Playbooks, ensuring everyone is on the same page.

Version controlled

Playbooks are plain-text. Treat them like code in your existing version control.

Dynamic inventories

Capture all the servers 100% of the time, regardless of infrastructure, location, etc.

Orchestration plays well with others

Orchestration plays well with others: ServiceNow, Infoblox, AWS, Terraform, Cisco ACI and more

What is Ansible Tower?

Ansible Tower is a UI and RESTful API allowing you to scale IT automation, manage complex deployments and speed productivity.

• Role-based access control

• Deploy entire applications with push-button deployment access

• All automations are centrally logged

• Powerful workflows match your IT processes
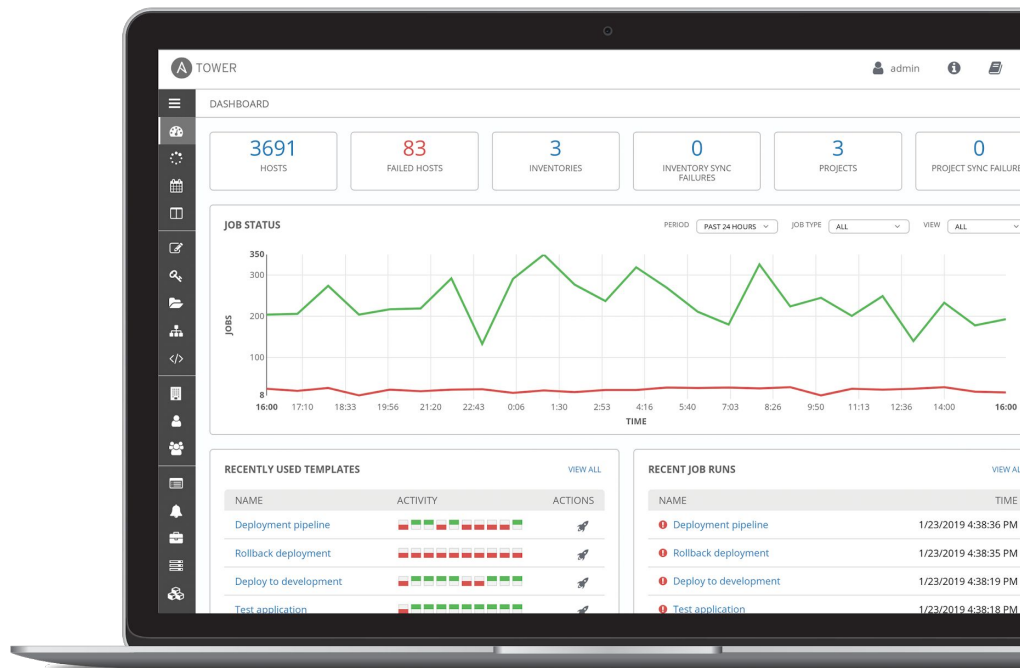
Red Hat Ansible Tower

RBAC

Allow restricting playbook access to authorized users. One team can use playbooks in check mode (read-only) while others have full administrative abilities.

Push button

An intuitive user interface experience makes it easy for novice users to execute playbooks you allow them access to.

RESTful API

With an API first mentality every feature and function of Tower can be API driven. Allow seamless integration with other tools like ServiceNow and Infoblox.

Workflows

Ansible Tower's multi-playbook workflows chain any number of playbooks, regardless of whether they use different inventories, run as different users, run at once or utilize different credentials.

Enterprise integrations

Integrate with enterprise authentication like TACACS+, RADIUS, Azure AD. Setup token authentication with OAuth 2. Setup notifications with PagerDuty, Slack and Twilio.

Centralized logging

All automation activity is securely logged. Who ran it, how they customized it, what it did, where it happened - all securely stored and viewable later, or exported through Ansible Tower's API.
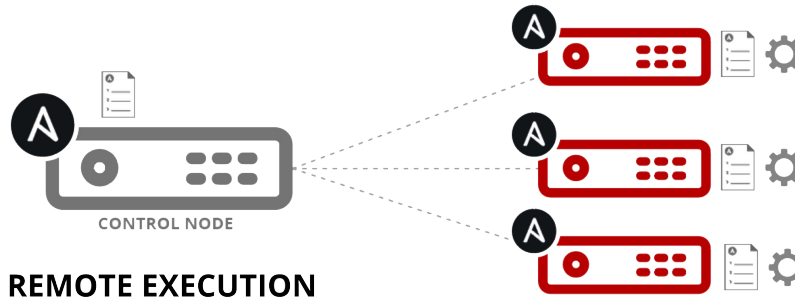
How Ansible Works

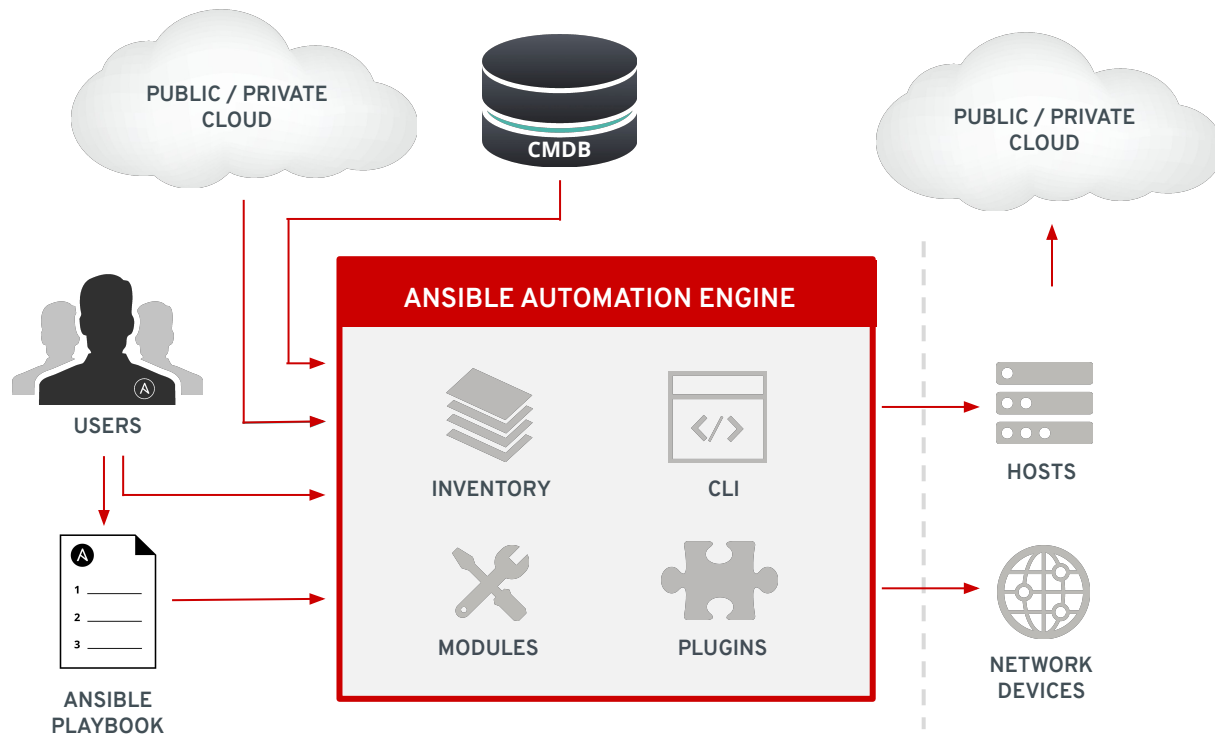*Module code is executed locally on the control node*

LOCAL EXECUTION
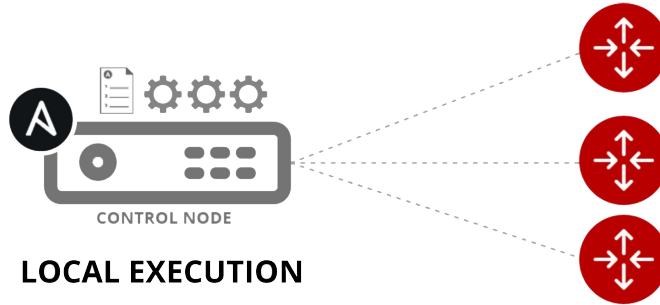
NETWORKING DEVICES

Module code is copied to the managed node, executed, then removed

REMOTE EXECUTION

LINUX/WINDOWS HOSTS

How Ansible Works

PUBLIC / PRIVATE CLOUD

CMDB

PUBLIC / PRIVATE CLOUD

USERS

ANSIBLE AUTOMATION ENGINE

INVENTORY

CLI

MODULES

PLUGINS

ANSIBLE PLAYBOOK

HOSTS

NETWORK DEVICES

Red Hat

Red Hat Ansible Automation

Demos

- Automated Compliance Mitigation
- Building a Dynamic Documentation Report
- ChatOps
- Provisioning Secure Cloud Infrastructure on Azure
- Secure Technical Implementation Guide (STIG)