

GOVLOOP Pocket guide 2019

HYBRID CLOUD DELVERS INNOVATION FOR AGENCIES TODAY. IT PROVIDES FLEXIBILITY BY USING AN ARCHITECTURE THAT SPANS **SUPPORT ACROSS MULTIPLE** ENVIRONMENTS - FROM PHYSICAL **SYSTEMS AND VIRTUALIZATION, TO PUBLIC OR PRIVATE CLOUDS.**

FOREWORD FROM RED HAT

Current trends within digital transformation and application modernization are changing the way government operates and creating opportunities for innovation. New use cases focused on service delivery are driving government agencies toward efficiency and agility, and away from hierarchical, monolithic processes. An evolution toward Linux, hybrid cloud and containers is driving this innovation.

Hybrid cloud is an important part of the transformation taking place across government. There should be proper planning in place to overcome potential challenges of this change. One common issue is application portability. This happens due to a lack of interoperability between public cloud providers. There are technical differences in the systems and services they provide, such as the presentation of networking and storage to the guests operating in their environment. The result is cloud vendor lock-in and the inability to effortlessly move workloads from one cloud provider to another or between cloud and on-premise environments.

One option for application portability involves running containers across the hybrid cloud environment. Containers are a capability of Linux and provide a way of packaging applications and their dependencies, so they can run as isolated processes. The container host provides access to the kernel and the underlying network and storage subsystems but removes any environmental factors unique to the cloud, virtual or physical environment the container is running on. The Linux container host is also responsible for providing security to prevent malicious attacks from succeeding. Although containers can be run directly on a Linux system, for a true enterprise class container environment, an offering such as Red Hat OpenShift is needed.

At Red Hat, we have been focused on hybrid cloud solutions, such as containers, and helping our customers develop strategies that address challenges like application portability for several years. We believe that any successful hybrid cloud story begins with the operating system. A modern operating system needs to create a foundation based on control, confidence and freedom to succeed in hybrid cloud. Red Hat Enterprise Linux, our flagship operating system, gives customers control with builtin security and management, the confidence to run their application on a stable and supported platform and the freedom to innovate to meet tomorrow's demands.

We are excited to be partnering with GovLoop to develop this pocket guide that covers the importance of the operating system in meeting the IT challenges of today and tomorrow. As the government continues its journey toward modernization on hybrid cloud infrastructure, we are pleased to share our vision for a solution. We look forward to seeing how challenge gives way to opportunity and the solutions that lie ahead.

Ted Brunell Senior Principal Solutions Architect, Red Hat





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EXECUTIVE SUMMARY

Control, confidence and the ability to innovate are all qualities the public sector needs to keep up with the rapidly changing IT modernization landscape. But to balance the demands of today's mandates and citizens, agencies are often required to maintain existing IT infrastructure while innovating for the future.

Maintaining legacy infrastructures is no longer truly tenable for government. The question is no longer whether agencies will be moving applications to the cloud, but to which cloud and how.

Whether private, public or hybrid cloud, managing and implementing security and governance from a single cloud management platform (CMP) supports mission success.

In a changing world where agencies must meet many needs and missions, hybrid cloud delivers the greatest flexibility. It can provide interoperability with an architecture that can support multiple environments – from physical systems and virtualized workloads to public or private clouds.

And as agencies move to hybrid cloud, they are increasingly deploying containerized applications and services to increase agility and consistency across their IT environments. Agencies just need to write containerized applications and services

once, then they can deploy, move and scale them across infrastructure as needed to meet changing demand.

For containers to be an effective approach, however, IT teams need tools and infrastructure that address new challenges in stability, scale and security.

One way of moving forward for this stability and innovation is choosing a lightweight, modern, scalable operating system that can provide muchneeded capabilities like scaling; the ability to more easily move workloads and manage applications that run in multiple environments; and built-in predictive analytics and remediation.

But how can agencies create this foundation, enabling themselves to deploy applications on a footprint that can best fit their unique needs, with knowledge that the underlying operating system remains the same consistent and mission-criticalready platform? A lightweight, modern operating system that can support containerization will be key.

This new pocket guide from GovLoop will give you an overview of hybrid cloud in the public sector, why agencies need to update their operating systems, why it matters, how it can improve, as well as case studies and how-tos that will help you get to where you need to be.

BY THE NUMBERS



77%

of <u>IT leaders said</u> modernizing legacy applications to architectures like microservices, APIs, containers and cloud-native is a priority. of national government IT budgets are <u>spent on cloud</u>, while local governments spend 20.6%

22%

"When we started our modernization efforts, we quickly learned we needed to reassess the way we had traditionally procured and delivered IT services. We had to consider how to procure cloud technologies, Software-as-a-Service solutions, DevSecOps and other leading-edge technologies to support our goals for improved service delivery."

- David Shive, GSA Chief Information Officer

"Effective technology improves the way information is delivered and continues to transform how the government operates, allowing us to meet the public's expectations for online services."

- <u>Gundeep Ahluwalia</u>, Labor Chief Information Officer

100%

In 2019, <u>100%</u> of the world's supercomputers run on Linux, and out of the top 25 websites in the world, only two aren't using Linux.

\$7 BILLION

Spending on new systems or modernizing old ones has <u>declined</u> by \$7 billion since fiscal year 2010. Some 5,200 of the government's 7,000 IT investments now spend the totality of their funding on operations and maintenance.



Hybrid cloud adoption has increased by **13% year to year**, while overall cloud adoption has increased **2%**.

IT spending in government has risen to an <u>all-time high</u> of nearly

\$90 BILLION,

80% of which is spent on operations and maintenance – essentially keeping old systems running.

The <u>landscape</u> of cloud adoption is one of hybrid clouds and multiclouds. By 2020, 75% of organizations will have deployed a multicloud or hybrid cloud model.



TODAY'S LANDSCAPE OF HYBRID CLOUD & INNOVATION

This section dives into a variety of areas about modernizing legacy IT, hybrid cloud and how organizations are increasingly deploying containerized applications and services to increase agility and consistency across their IT environments.

Modernizing Legacy IT and Hybrid Cloud

For the public sector, the question is no longer whether to modernize applications and move to the cloud, but how. The private sector has already demonstrated the benefits of control, efficiency and innovation. And government organizations that modernize applications experience similar benefits.

One reason? Simply moving existing applications to the cloud lowers operations and maintenance (0&M) costs. Also, changing the application architecture – from monolithic to microservices – makes it faster to build, modify, scale and deploy applications.

But the prospect of modernizing a large portfolio of traditional government applications to run in the cloud is daunting. Where to start? How can you do it gradually, as staff time permits? What if you later choose a different cloud? During the transition, how can you make it simple to manage a mixed portfolio of monolithic and microservices applications?

Let's take a deeper look at how three areas address these issues and accelerate innovation for government: microservices, containers and the hybrid cloud.



Microservices are sets of application code that provide standard functionality, such as printing, that is used in many applications. Microservices change the concept of an application from a single, monolithic system to a collection of distinct processes, with some processes written specifically for that application and other processes using a standard microservice. Because microservices operate as independent components, IT teams can create them in parallel and share them in multiple applications for faster development.



Containers provide a dynamic runtime environment for microservice-based applications, instead of using specific physical or virtual servers. This environment orchestrates all hardware and services as the application needs them, including storage, networking and security.



Hybrid cloud makes application hosting and access universally and securely available over the internet, as opposed to hosting applications in an onpremise data center. The cloud also offers the advantages of a flexible and scalable infrastructure for application development and delivery.

In particular, containers are critical for the government to move forward. Applications are getting more complex. Demand to develop faster is ever-increasing. This puts stress on agencies' infrastructure, IT teams and processes.

Moving to containers helps alleviate issues and iterate faster – across multiple environments. Let's take a closer look.

Containerized Applications to Increase Agility

Imagine you're developing an application. You do your work on a laptop and your environment has a specific configuration. Other developers may have slightly different configurations. The application you're developing relies on that configuration and is dependent on specific libraries, dependencies and files.

Meanwhile, your agency has development and production environments that are standardized with their own configurations and their own sets of supporting files. You want to emulate those environments as much as possible locally, but without all of the overhead of recreating the server environments.

So how do you make your app work across these environments, pass quality assurance and get your app deployed without massive headaches, rewriting and break-fixing?

The answer: containers.

Containerized applications and services can be written once, then deployed, moved and scaled across infrastructure as needed to meet changing demand. In particular, Linux containers help agencies meet these needs. Linux containers are technologies that allow you to package and isolate applications with their entire runtime environment – all of the files necessary to run. This makes it easy to move the contained application between environments (dev, test, production, etc.) while retaining full functionality.

Containers are also an important part of IT security. Building security into the container pipeline and defending your infrastructure ensures your containers are reliable, scalable and trusted. Linux containers help reduce conflicts between your development and operations teams by separating areas of responsibility. Developers can focus on their apps, and operations can focus on the infrastructure. And because Linux containers are based on open source technology, by using them, agencies get the latest advancements as soon as they're available.

In order for containers to be an effective approach, however, IT teams need tools and infrastructure that address new challenges in stability, scale and security. As containerized deployments grow, new tools and infrastructure are required for security and stability at scale. This means adapting a modern, open-source operating system.

A Modern Operating System to Move Forward

Today in government, modernizing IT often means turning to hybrid IT and cloud. But turning a sprawling ecosystem into a true hybrid environment requires an intelligent operating system (OS).

An operating system is software that manages all of the hardware resources associated with your desktop or laptop. Put simply, the operating system manages the communication between your software and your hardware. Without the operating system, the software wouldn't function.

Linux is an open source, modern, intelligent, scalable and flexible operating system that can meet the needs of government agencies looking to innovate via the hybrid cloud.

As government moves to the hybrid cloud for IT modernization, a Linux operating system becomes critical to support the infrastructure foundation the public sector needs.

As we discussed, agencies are increasingly deploying containerized applications and services to increase agility and consistency across their IT environments. But for containers to be effective, IT teams need the tools and infrastructure that address new challenges in stability, scale and security. That's where a Linux operating system comes in. A Linux OS provides an intelligent, stable and security-focused foundation for modern, agile business operations. Consistency across infrastructure allows you to deploy applications, workloads and services using the same tools, regardless of location. As a result, you can deploy and operate the enterprise hybrid cloud environment your business needs faster and with less effort.

A Linux operating system is designed for hybrid cloud environments. It provides much-needed capabilities, including scaling; the ability to more easily move workloads and manage applications running in multiple environments, built-in predictive analytics and remediation. It can bring a level of simplicity to agencies as IT infrastructure rapidly grows more complex, while still delivering the speed agencies need to keep up with demand and the security capabilities to safeguard their data.

Linux containers can help your agency adapt faster and more easily to changing demands. Moving to a Linux operating system will provide innovative tools to improve container stability, security and performance, so your agency can get more from its investments.

INDUSTRY SPOTLIGHT Control, confidence and Freedom in Hybrid Cloud

An interview with Ted Brunell, Senior Principal Solution Architect at Red Hat

To deliver mission-critical services and be efficient in today's world, government agencies are shifting IT from traditional infrastructure operations to become service-delivery-ready organizations.

Hybrid cloud is an important part of the transformation that is taking place across government. But government organizations face several challenges when implementing the kind of IT modernization via the hybrid cloud that will improve service delivery to citizens.

To learn more about how a modern operating system can support containerization serves government today, GovLoop talked with Ted Brunell, Senior Principal Solution Architect at Red Hat. Red Hat is a leader in open source technology and innovation delivery for the public sector.

"Today, to meet government's needs, it really boils down to achieving agility, being able to do things faster and achieving a higher level of efficiency with the way that government is deploying and managing systems," Brunell said. To succeed with hybrid cloud, operational consistency is critical, Brunell said. A key to operational consistency is platform. Hybrid and multicloud users should be able to easily span and interoperate across private and multiple public cloud environments with security and portability.

The operating system agencies select in hybrid cloud environments is critical to success. When operating across on-premise and public cloud environments, government needs applications to work the same way. Making sure things like management, compliance and security work the same way across multiple, disparate environments is essential.

Having a common operating system powering hybrid cloud environments enables application consistency and portability, meaning that they should behave the same, can be managed using the same tools and processes, and accrue the same benefits regardless of whether they are deployed on-premise or in a public cloud. *"Agencies deserve an operating system that's flexible enough to operate in any cloud environment, whether it be a containerized environment or a virtual machine environment."*

"At Red Hat, we believe the platform technology to achieve this vision is Linux and Linux containers," said Brunell. "Our platforms, Red Hat Enterprise Linux and Red Hat OpenShift were designed to lead agencies to success in their hybrid cloud journey."

-Ted Brunell, Red Hat

Red Hat Enterprise Linux (RHEL) helps, as it provides agencies the consistent and more secure foundation across hybrid cloud deployments and the tools they need to deliver these services and workloads faster with less effort – with any application on any footprint at any time.

"With RHEL we include built-in security management," Brunell said. "It gives the customers confidence to run their critical workloads, it gives them stability, it's a very high-performance platform. And lastly, it gives agencies freedom to innovate and access their technology that they want to use and deploy it."

Through control, confidence and freedom, Red Hat Enterprise Linux reduces the friction and cost of this change while increasing agility and reducing the time to market of critical business workloads. "With Red Hat Enterprise Linux everywhere, providing you a common operating environment, you are preparing yourself for going to the next phase of the cloud journey," Brunell said.

Takeaway: Having a common operating system powering hybrid cloud environments enables application consistency, portability and security, meaning they should behave the same, can be managed using the same tools and processes, and accrue the same benefits regardless of whether they are deployed onpremise or in a public cloud.

LEARNING FROM OTHERS: HOW PUBLIC HEALTH ENGLAND **ACHIEVED HYBRID CLOUD** INNOVATION

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This section recounts how one government organization used a Linux platform to boost its access to data and enhance its service delivery. Public Health England is an executive agency of the Department of Health and Social Care in the United Kingdom, with a mission to protect and improve the nation's health and well-being, and reduce health inequalities. It has a national leadership role in developing and presenting new models of public health directly to the public, together with national and local government, the National Health Service (NHS), the volunteer and community sector, industry, the scientific and academic community and global public health partners.

PHE was established in 2013 to bring together specialists from more than 100 organizations into a single public health service, presenting a major challenge of structuring its central ICT department to merge the numerous disparate IT systems.

In consolidating, modernizing and preparing its IT environment for future needs, PHE had several technology requirements it wanted to address:

- An open, scalable, enterprise-grade Linux platform to serve as the foundation for its computing footprint today and into the future
- A scalable private cloud infrastructure to power its high-performance computing (HPC) clusters used to analyze the evergrowing amount of data required to deliver modern public health services
- A virtualization platform that could host the existing applications without relying on expensive proprietary technologies
- Hybrid and multicloud management and automation capabilities to host cloud-native workloads and applications that could span its deployments both on-premise and across multiple public cloud environments

To help meet these challenges and deliver computing needs that impact the overall welfare of the general public, PHE chose Red Hat Enterprise Linux to underpin its growing set of critical systems. It could help provide the necessary flexibility and capacity for hybrid cloud innovation without sacrificing the agency's need for production stability and support.

"The challenge for Public Health England is to keep abreast of the opportunities created by open source cloud technologies in order to help drive the public health principles of equity, openness and accessibility," said Francesco Giannoccaro, Head of HPC and Infrastructure at PHE. "PHE's ability to take better advantage of the opportunities created by open source technology is vital in its work in keeping the nation safe and healthy and ensuring that public health principles are maintained and developed. PHE's success in implementing multi- and hybrid cloud is based on the success of the open source community and the open source model."

With its open source cloud infrastructure platform, Public Health England is helping to accelerate service delivery, reduce operational costs, offer IT infrastructure resources as a service as well as manage hybrid and multicloud environments in a distributed cloud infrastructure. From supporting the NHS on reducing antibiotic prescribing and informing the public about sugar in food and drinks, to using whole genome sequencing for rapid identification of potentially aggressive pathogens, PHE can provide a more consistent DevOps experience and functionality across underpinning platforms, facilitating the development and maintenance of innovative public health services.

CHEAT SHEET

Consider these best practices for optimizing your hybrid cloud strategy for innovation.

Identifying Cloud Strategy Goals

Building an effective cloud strategy begins with identifying goals. Ask yourself, "What's a realistic end state?"

Define What Success Looks Like

By tying your cloud project to clear business outcomes and benefits, you define your yardstick for success. All your goals should have clear and specific key performance indicators (KPIs) and success criteria. That means making important decisions as you set your objectives. You must decide what represents success and how you'll measure its attainment.

Identify Possible Challenges

Starting with easy apps (low-hanging fruit), and identify your implementation challenges. Learn and then consider options to solve them. Can a public cloud handle your needs and concerns, or must you use a private cloud? Is hybrid the best solution? Whatever you decide, be sure it matches organizational goals for automation, management and scaling.

Take Culture Into Account

Modernizing applications to a hybrid cloud environment can change the relationship between development and operations teams. With so many moving parts, integration is critical. Work to foster a culture of autonomous, crossfunctional teams with approaches such as the DevOps methodology, which supports shared responsibility, shared decision-making, trust and collaboration.

Consider How Open Source Can Serve You

Where the term cloud native usually refers to developing, running and optimizing applications on a dynamic infrastructure, a cloud-native infrastructure is designed specifically to support cloud-native apps. Linux is often the heart (and soul and brains) of a cloud-native infrastructure. Open source code is everywhere in today's cloud environments. Open source software underlies cloud platforms. Cloud-native software is often developed, deployed and managed using DevOps practices, serving the need for highly flexible and agile development environments with reduced IT complexity. Developers increasingly package application components in Linux containers that run as microservices across many different types of clouds.

Look for Control, Confidence and the Freedom to Innovate

Red Hat offers the following best practices as you innovate through a modern operating system such as Linux:

- **Control** means the environment should be built with security in mind. As IT infrastructure becomes more complex and disconnected, it can be harder for agencies to quickly identify and respond to security threats.
- **Confidence** means agencies should be able to expect that the system will always work.
- And freedom to innovate means using a platform designed to enable agencies to experiment with emerging technologies and new approaches to IT modernization while maintaining a consistent foundation.

THANKS TO RED HAT FOR THEIR SUPPORT IN PRODUCING THIS PUBLIC-SECTOR RESOURCE. Abo



About Red Hat

Red Hat* is the world's leading provider of open source solutions, using a community-powered approach to provide reliable and high-performing cloud, virtualization, storage, Linux* and middleware technologies. Today, Red Hat is at the forefront of open source software development for enterprise IT, with a broad portfolio of products and services for commercial markets. That vision for developing better software is a reality, as ClOs and IT departments around the world rely on Red Hat to deliver solutions that meet their business needs. Solutions that provide technology leadership, performance, security, and unmatched value to more than 90 percent of Fortune 500 companies.

Learn more: <u>http://www.redhat.com/en/</u> technologies/industries/government



About GovLoop

GovLoop's mission is to inspire public sector professionals by serving as the knowledge network for government. GovLoop connects more than 300,000 members, fostering cross-government collaboration, solving common problems and advancing government careers. GovLoop is headquartered in Washington, D.C., with a team of dedicated professionals who share a commitment to the public sector.

For more information about this report, please reach out to **info@govloop.com**

Turning a sprawling ecosystem into a true hybrid environment requires an intelligent operating system that makes those things possible.



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