
Red Hat Update: IBM Z/LinuxOne

VM Workshop 2019

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AGENDA

This session will provide a brief update on:

- Red Hat and IBM partnership & pending acquisition (all public info, of course)
- Technical topics
 - Red Hat's Multi-Architecture Initiative
 - Updates on Offerings & Development Tools for IBM Z and LinuxOne
 - RHEL 8 for Z

Red Hat, (a perhaps soon to be)....IBM Company

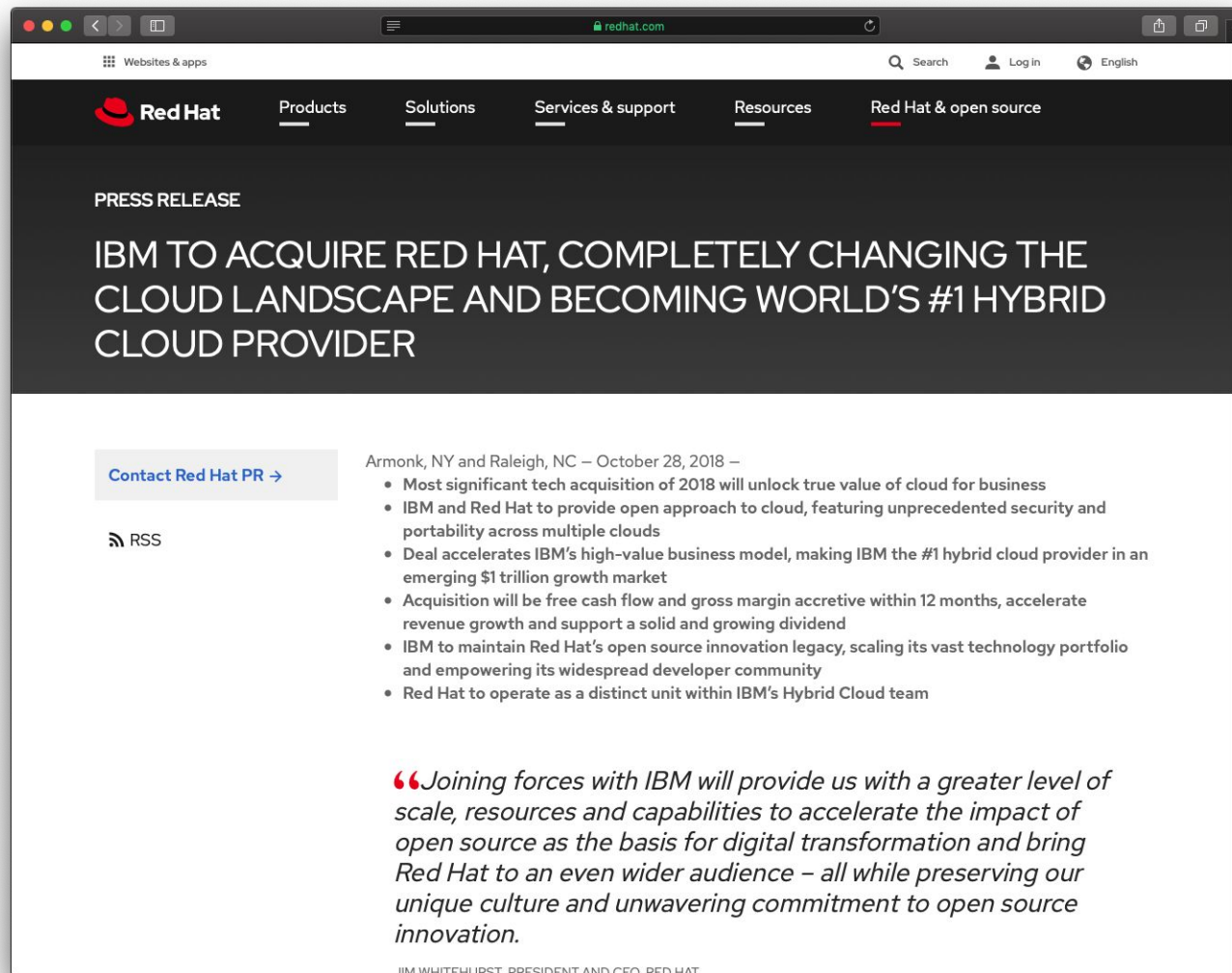
Long standing 18+ year partnership

- Strategic Alliance Partner
 - HW (OEM) & SW (ISV)
- Business Partner - OEM, ISV & Services
- Co-Customers
- Frenemies

IBM's largest-ever acquisition

Current Status:

- Approvals, Approvals, Approvals
 - **Red Hat Shareholders** [Yes, Jan 2019]
 - **US/DoJ** [Yes, May 2019]
 - **Brazil** [Yes, June 2019]
 - **EU** [Yes, this morning]



The screenshot shows the Red Hat website with a dark navigation bar containing the Red Hat logo and links for Products, Solutions, Services & support, Resources, and Red Hat & open source. The main content area features a large black banner with the text "PRESS RELEASE" and "IBM TO ACQUIRE RED HAT, COMPLETELY CHANGING THE CLOUD LANDSCAPE AND BECOMING WORLD'S #1 HYBRID CLOUD PROVIDER". Below the banner, there is a "Contact Red Hat PR" button and an RSS feed icon. The main text of the press release is dated "Armonk, NY and Raleigh, NC – October 28, 2018 –" and lists several key points: the acquisition is the most significant tech acquisition of 2018, it provides an open approach to cloud, accelerates IBM's business model, and will be free cash flow and gross margin accretive within 12 months. A quote from Jim Whitehurst, President and CEO of Red Hat, is also included, stating that joining forces with IBM will provide a greater level of scale and resources to accelerate digital transformation.

Armonk, NY and Raleigh, NC – October 28, 2018 –

- Most significant tech acquisition of 2018 will unlock true value of cloud for business
- IBM and Red Hat to provide open approach to cloud, featuring unprecedented security and portability across multiple clouds
- Deal accelerates IBM's high-value business model, making IBM the #1 hybrid cloud provider in an emerging \$1 trillion growth market
- Acquisition will be free cash flow and gross margin accretive within 12 months, accelerate revenue growth and support a solid and growing dividend
- IBM to maintain Red Hat's open source innovation legacy, scaling its vast technology portfolio and empowering its widespread developer community
- Red Hat to operate as a distinct unit within IBM's Hybrid Cloud team

“Joining forces with IBM will provide us with a greater level of scale, resources and capabilities to accelerate the impact of open source as the basis for digital transformation and bring Red Hat to an even wider audience – all while preserving our unique culture and unwavering commitment to open source innovation.”

JIM WHITEHURST, PRESIDENT AND CEO, RED HAT



Multi-Architecture Initiative

Introducing Red Hat's Multi-Architecture Initiative

Red Hat aims to deliver identical experiences across multiple products and architectures beyond base OS. Dedicated cross-organizational team focused on working closely with our hardware partners was formed in 2016



Feature Parity

Deliver an **identical** Red Hat experience regardless of underlying hardware



Dedicated Focus

Ensure that **all** architectures receive adequate attention



More Choice

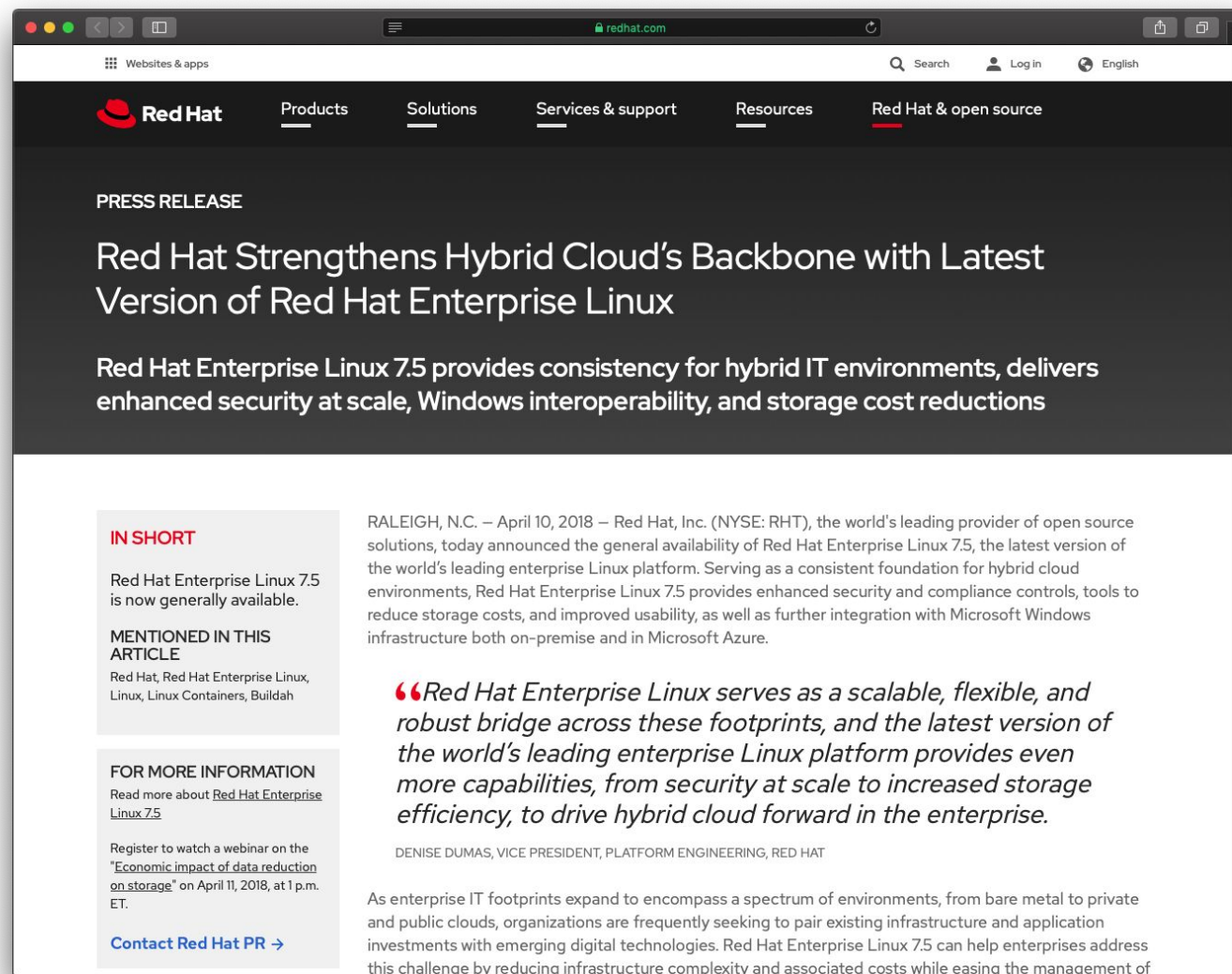
Expand the Red Hat product and solution offerings **beyond Red Hat Enterprise Linux**

Press Release: KVM and Containers support for IBM Z

“Availability across multiple architectures

To further support **customer choice** in computing architecture, Red Hat Enterprise Linux 7.5 is simultaneously available across all supported architectures, including x86, IBM Power, **IBM z Systems**, and 64-bit Arm. This release also brings support for single-host KVM virtualization and Open Container Initiative (OCI)-formatted runtime environment and base image to IBM z Systems.”






Shift in how RHEL is delivered with 7.5 release



The image shows a screenshot of a web browser displaying a Red Hat press release. The browser's address bar shows 'redhat.com'. The page has a dark header with the Red Hat logo and navigation links: Products, Solutions, Services & support, Resources, and Red Hat & open source. Below the header, the text reads 'PRESS RELEASE' followed by the title 'Red Hat Strengthens Hybrid Cloud's Backbone with Latest Version of Red Hat Enterprise Linux'. A sub-headline states: 'Red Hat Enterprise Linux 7.5 provides consistency for hybrid IT environments, delivers enhanced security at scale, Windows interoperability, and storage cost reductions'. The main body of the release includes an 'IN SHORT' section stating that Red Hat Enterprise Linux 7.5 is now generally available. It also features a quote from Denise Dumas, Vice President of Platform Engineering at Red Hat, which is highlighted in red. The quote reads: 'Red Hat Enterprise Linux serves as a scalable, flexible, and robust bridge across these footprints, and the latest version of the world's leading enterprise Linux platform provides even more capabilities, from security at scale to increased storage efficiency, to drive hybrid cloud forward in the enterprise.' Below the quote, it identifies Denise Dumas as Vice President, Platform Engineering, Red Hat. The release concludes with a paragraph about how RHEL 7.5 helps enterprises address the challenge of expanding IT footprints across different environments.

Multi-Architecture Integration Approach

Several years ago we laid the groundwork for broader architecture support with Red Hat Enterprise Linux for Power and Red Hat Enterprise Linux for IBM Z and IBM LinuxONE.

 Red Hat Enterprise Linux	 Red Hat Virtualization	 Red Hat OpenStack Platform	 Red Hat OpenShift Container Platform	 Red Hat Middleware
x86_64	x86_64	x86_64	x86_64	x86_64
ppc64be				ppc64be*
ppc64le	ppc64le	ppc64le	ppc64le	ppc64le
s390x	s390x (native KVM*)		s390x (native Container*)	s390x
arch64				

Additional Red Hat Solutions

Take advantage of the IBM JDK optimized on Red Hat Enterprise Linux for IBM Systems (Z and Power)

Take advantage of Red Hat Satellite Server to manage RHEL on Z/LinuxONE

- Satellite Server available on x86_64 can manage RHEL IBM Z as clients using Smart Management add-on

Take advantage of Ansible Automation to manage RHEL on IBM Z/LinuxONE and IBM Power Systems

- Ansible Automation (Engine/Tower/Networking Modules, etc.) available on x86_64 can manage RHEL IBM Z as clients



How IBM and Red Hat Partner on Enterprise Linux

Red Hat Enterprise Linux has been supporting IBM Z and LinuxONE servers for many years.

RHEL brings...

Control

- Security and compliance
- Platform manageability

Confidence

- Stability and reliability
- Performance & efficiency

Freedom to Innovate

- Application experience
- Multiplatform support
- Ecosystem

IBM Z Brings...

Resiliency, Availability & Scalability

- Dynamic Resource Allocation
 - IBM HCM, Dynamic Partition Mgr
- Non-Disruptive Scalability
- Continuous Business Availability
- Trusted Security (Hardware Encryption, etc.)
- Data & Transaction Serving
- Reliability, No SPOF

RHEL on System z Certification Status*

● Certified by Linux partner

Overview shows Linux distributions in service.

Extended support is available for Linux distributions that are out of service.

RHEL 8
 Supported on
 z13 & z14

	Emperor II	Rockhopper II	Emperor	Rockhopper	zEnterprise – zEC12, zBC12	zEnterprise – z196, z114	System z10, System z9
	z14 M0x	z14 ZR1	z13	z13s			
RHEL 7	●	●	●	●	●	●	
RHEL 6	●	●	●	●	●	●	●
RHEL 5			●		●	●	●
SLES 15	●	●	●	●	●		
SLES 12	●	●	●	●	●	●	
SLES 11	●	●	●	●	●	●	●
Ubuntu 18.04	●	●	●	●	●		
Ubuntu 16.04	●	●	●	●	●		

Last update 04/12/2019

<https://www.ibm.com/it-infrastructure/z/os/linux-tested-platforms>

Updated RHEL Strategy for IBM Z

RHEL 7.5 introduced **kernel-alt** packages (which includes kernel version 4.14)

KVM virtualization and Containers, now supported on IBM z Systems

- KB Article: [New RHEL kernel 4.14 is released for IBM z Systems known as "Structure A"](#)

EOL November 30, 2020

RHEL-KVM on Z

- On IBM Z hosts, the KVM hypervisor has to be installed in a dedicated logical partition (LPAR)
 - LPAR also has to support the start-interpretive execution (SIE) virtualization extensions.
- Running KVM on the z/VM OS is not supported

HA Support for IBM Z and LinuxONE

Red Hat Enterprise Linux for IBM Z and IBM LinuxONE (GA with RHEL 7.4)

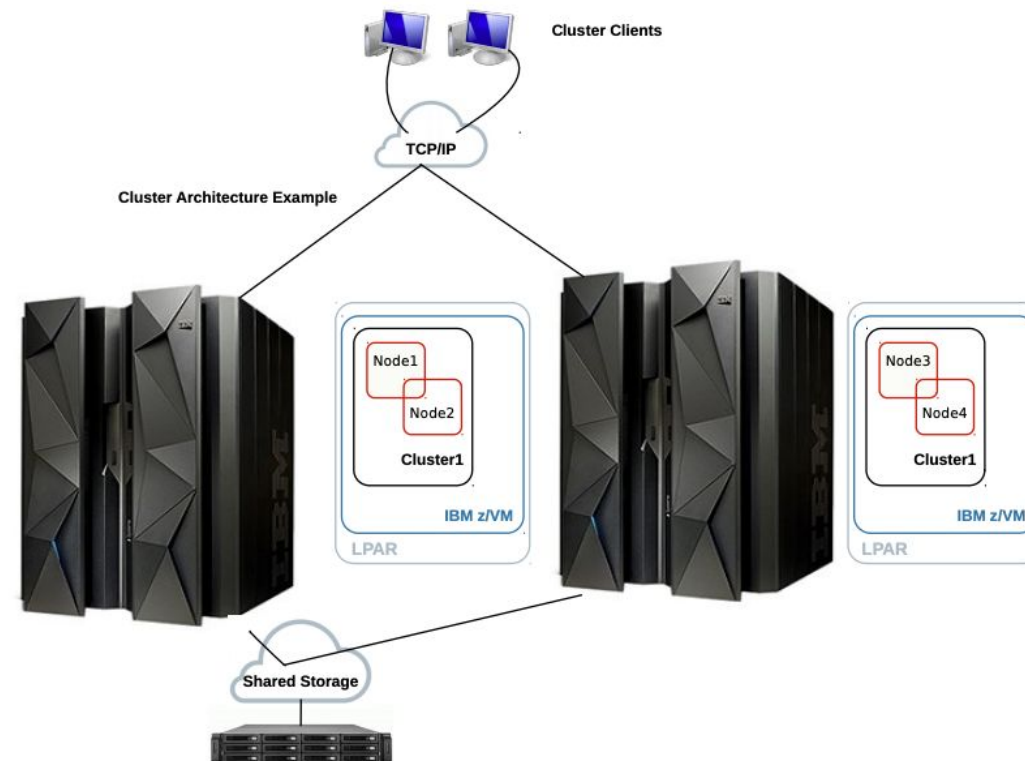
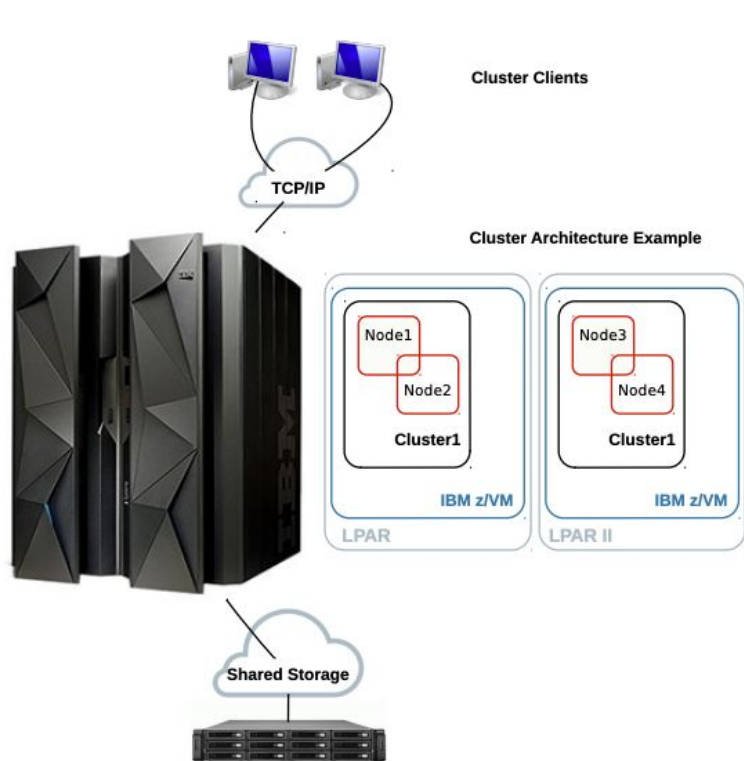
- High Availability (Fail-over), based on Pacemaker & Corosync
- Resilient Storage (GFS2)
- IBM Z specifics:
 - Up to 4 nodes per Cluster
 - SSI Support
 - Requires IBM z/VM 6.3 or newer (Recommended IBM z/VM 6.4)
 - Dirmaint and SMAPI Required
 - DASD Support only
 - Multiple LPARs and/or Multiple CECs

[Red Hat Enterprise Linux Cluster, High Availability, and GFS Deployment Recommended Practices](#)

[Support Policies for RHEL High Availability Clusters - IBM z Systems z/VM Guests as Cluster Members](#)

[Configuring z/VM SMAPI Fencing with fence_zvmip for RHEL 7 IBM z Systems Cluster Members](#)

HA Support for IBM Z and LinuxONE



RH Software Collections & Developer Toolset

Red Hat Software Collections 3.x (3.3 current version) is available for all supported releases of Red Hat Enterprise Linux 7 on AMD64 and Intel 64 architectures, the 64-bit ARM architecture, IBM z Systems, and IBM POWER, little endian.

Example Components:

- Ruby, Python, Perl, PHP
- MariaDB, MongoDB, MySQL, Postgres, Redis
- Node.js, Nginx, Maven, Git

Red Hat Developer Toolset included (8.1 version). Provides

- Development tools - ie. GCC, etc.
- Debug tools - ie. GDB, etc.
- Performance tools - ie. SystemTap, OProfile, etc.

Red Hat Enterprise Linux 8

RHEL 8 for Z announced at Red Hat Summit - May 2019



Easier adoption

for staff new to Linux®



More subscription value

with Red Hat Insights, now included in all Red Hat Enterprise Linux subscriptions



Increased speed and ease

of deployment



A consistent experience

across bare-metal, virtual, and public and hybrid cloud environments



Eased transition

to and adoption of containerized workloads with community-driven, new container management tools



Broad ecosystem

of supported applications



RHEL 8 Update

At a glance

KERNEL VERSION	4.18+
SYSTEM COMPILER	GCC 8.2, LLVM 6.0
HARDWARE ARCHITECTURES	Intel/AMD 64-bit, IBM Power LE, IBM z Systems, ARM 64-bit
DEFAULT FILE SYSTEM	XFS
PACKAGE MANAGEMENT	Yum v4
TIME SYNCHRONIZATION	Chrony
NETWORKING	NetworkManager

Simplified access to software

Red Hat Enterprise Linux 7 repositories



Red Hat Enterprise Linux 8 repositories



Recording user terminal sessions

The image displays two screenshots from the Red Hat Enterprise Linux 8 graphical user interface. The left screenshot shows the 'Session Recording' configuration page for a user named 'cloud-user'. The configuration includes fields for Shell (/bin/bash), Latency (10), Payload Size (2048 bytes), and various logging options like 'Log User's Input', 'Log User's Output', and 'Log Window Resize'. The 'Logging Limit Action' is set to 'Pass'. The 'Writer' is set to 'Journal'. A 'Save' button is visible at the bottom. The right screenshot shows the 'Session Recording' playback interface. It features a video player with a progress bar and playback controls. Below the player, a 'Recording' table lists session details:

ID	Hostname	Boot ID	Session ID	PID	Start	End
74e3069799604-c2792af9705cf363667-4cc4b523	rhel8-1.example.com	74e3069799604-c2792af9705cf363667	4	19661	2019-04-02 11:51:17	2019-04-02 11:51:40

```
$ ssh cloud-user@rhel8-1.example.com
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Tue Apr  2 13:10:47 2019 from 192.168.122.1

ATTENTION! Your session is being recorded!

[cloud-user@rhel8-1 ~]$ sudo ls /etc/sss/conf.d
sssd-session-recording.conf
[cloud-user@rhel8-1 ~]$ sudo cat /etc/sss/conf.d/sssd-session_recording
[session_recording]
scope=some
users=cloud-user
groups=
[cloud-user@rhel8-1 ~]$ exit
logout

Connection to rhel8-1.example.com closed.
$
```

Audit activities

Create a record of actions taken for review against security policies

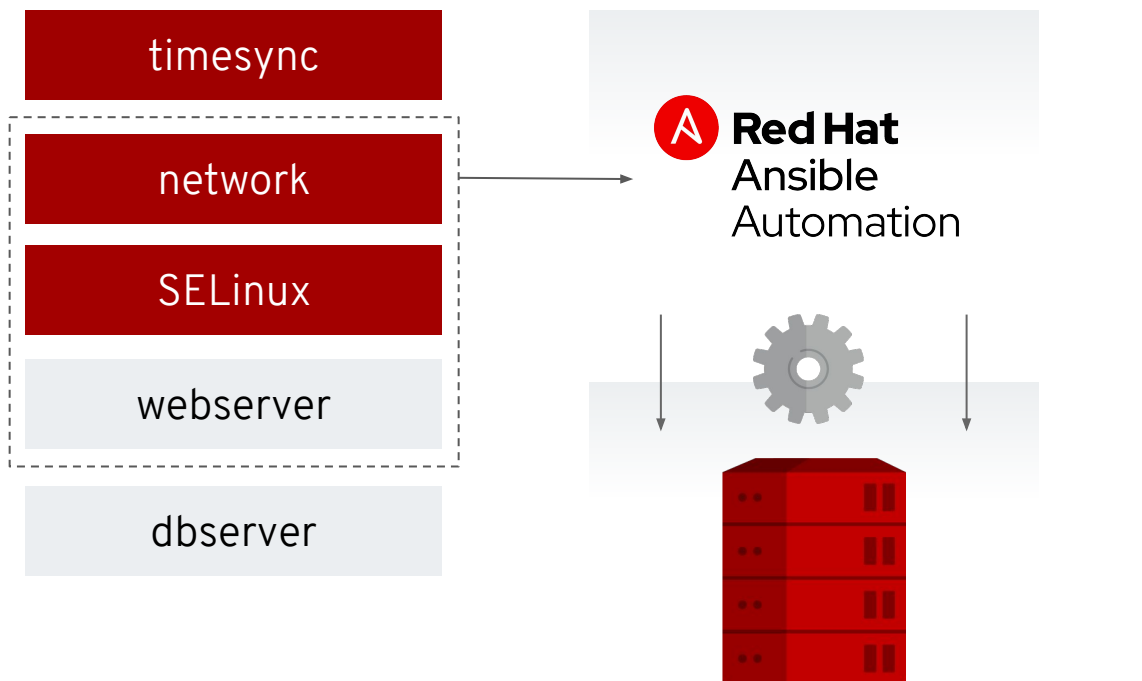
Create visual guides

Build run books and training materials with demonstrations

Record and play back

Logged via standard channels with multiple playback options

Speed automation creation with system roles



Common automation

Manage multiple versions of Red Hat Enterprise Linux from a single role

Reduced rework

Import provided roles to eliminate task creation in playbooks

Easy switching of providers

Change between default and optional tools quickly and safely

Remote single-system views in the web console

The screenshot displays the Red Hat Enterprise Linux 8 web console interface. The top navigation bar shows 'RED HAT ENTERPRISE LINUX' on the left and 'Privileged' and 'Cloud User' on the right. A sidebar on the left contains a menu with items: 'rhel8-1.exempl...', 'System', 'Logs', 'Storage' (highlighted), 'Networking', 'Virtual Machines', 'Accounts', 'Services', 'Session Recording', 'Applications', 'Diagnostic Reports', 'Kernel Dump', 'SELinux', 'Software Updates', 'Subscriptions', and 'Terminal'. The main content area is divided into several sections:

- Performance:** Two line graphs showing 'KIB/s Reading' and 'KIB/s Writing' over time (13:25 to 13:29). Both graphs show zero activity.
- Filesystems:** A table with columns 'Name', 'Mount Point', and 'Size'.

Name	Mount Point	Size
/dev/vda1	/	1.63 / 9.99 GiB
cidata	-	366 KiB
- NFS Mounts:** A section with a '+ ' button and the text 'No NFS mounts set up'.
- Storage Logs:** A log viewer for 'Storage Logs' dated 'April 2, 2019'. The log entries are:

```
13:16 g_object_notify: object class 'UDisksObjectS... udisksd
13:16 g_object_notify: object class 'UDisksObjectS... udisksd
13:16 Loading module libudisks2_lvm2.so... udisksd
13:16 Loading module libudisks2_iscsi.so... udisksd
13:16 Acquired the name org.freedesktop.UDisks2 on... udisksd
13:16 udisks daemon version 2.8.0 starting udisksd
```
- RAID Devices:** A section with a '+ ' button and the text 'No storage set up as RAID'.
- Volume Groups:** A section with a '+ ' button and the text 'No volume groups created'.
- VDO Devices:** A section with an 'Install VDO support' button and the text 'VDO support not installed'.
- iSCSI Targets:** A section with a '+ ' button and the text 'No iSCSI targets set up'.
- Drives:** A list of drives:
 - VirtIO Disk: 10 GiB Hard Disk, R: 0 B/s, W: 0 B/s
 - QEMU DVD-ROM (QM00001): Optical Drive, R: 0 B/s, W: 0 B/s

Browser-based interface

Offers remotely accessible user interface using host security mechanisms

Consolidated view

Provides single view of tasks to speed understanding and completion

Standard management tools

Uses system tools to change state, not a separate workflow

New in the web console

The screenshot displays the Red Hat Enterprise Linux 8 web console interface. The top navigation bar shows 'RED HAT ENTERPRISE LINUX' and user information 'Privileged' and 'Cloud User'. The left sidebar contains a menu with items: 'rhel8-1.exempl...', 'System', 'Logs', 'Storage', 'Networking', 'Virtual Machines', 'Accounts', 'Services', 'Session Recording', 'Applications', 'Diagnostic Reports', 'Kernel Dump', 'SELinux', 'Software Updates', 'Subscriptions', and 'Terminal'. The 'Storage' section is active, showing two line graphs for 'Reading' and 'Writing' I/O rates. Below the graphs is a 'Filesystems' table:

Name	Mount Point	Size
/dev/vda1	/	1.63 / 9.99 GiB
cidata	-	366 KiB

Below the table are sections for 'NFS Mounts' (No NFS mounts set up) and 'Storage Logs' for April 2, 2019:

```
13:16 g_object_notify: object class 'UDisksObjectS... udisksd
13:16 g_object_notify: object class 'UDisksObjectS... udisksd
13:16 Loading module libudisks2_lvm2.so... udisksd
13:16 Loading module libudisks2_iscsi.so... udisksd
13:16 Acquired the name org.freedesktop.UDisks2 on... udisksd
13:16 udisks daemon version 2.8.0 starting udisksd
```

On the right side of the console, there are several management panels: 'RAID Devices' (No storage set up as RAID), 'Volume Groups' (No volume groups created), 'VDO Devices' (Install VDO support button, VDO support not installed), 'iSCSI Targets' (No iSCSI targets set up), and 'Drives' (listing VirtIO Disk and QEMU DVD-ROM).

Virtual machines

Create and manage virtual machines

Network-bound disk encryption

Enroll disks with Tang server and manage LUKS keys

Single sign-on configuration

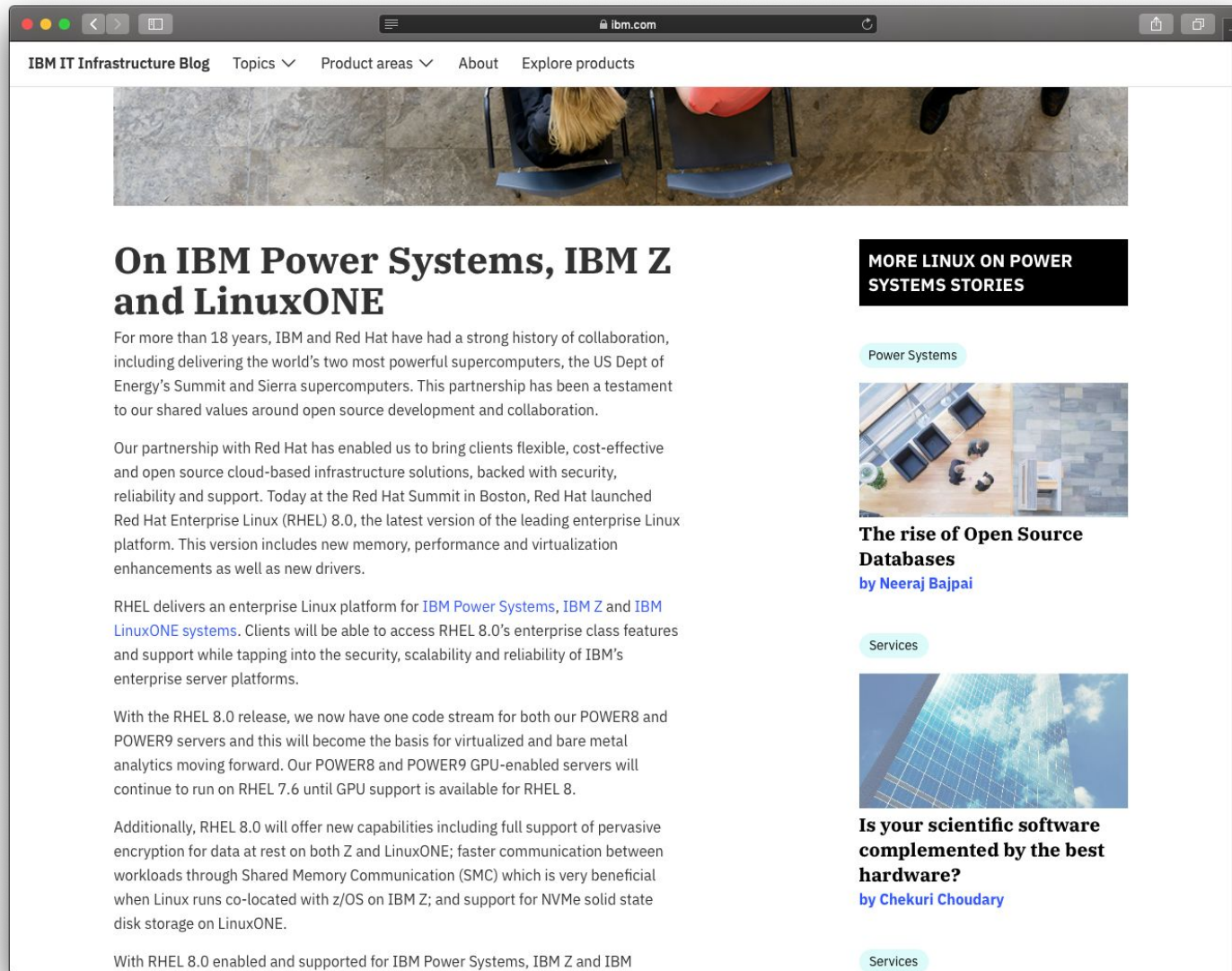
Automatically configure when joining a domain



New features in RHEL 8 for Z

RHEL 8 for IBM Z

- Full support of pervasive **encryption** for data at rest on both Z and LinuxONE
- Faster communication between workloads through **Shared Memory Communication (SMC)**
 - *Beneficial when Linux runs co-located with z/OS on IBM Z*
- Support for **NVMe solid state disk storage** on LinuxONE



The screenshot shows a web browser window displaying an article from the IBM IT Infrastructure Blog. The article title is "On IBM Power Systems, IBM Z and LinuxONE". The main text discusses the collaboration between IBM and Red Hat, highlighting the launch of Red Hat Enterprise Linux (RHEL) 8.0 on IBM Power Systems, IBM Z, and IBM LinuxONE systems. It mentions that RHEL 8.0 includes new memory, performance, and virtualization enhancements, as well as new drivers. The article also notes that RHEL 8.0 will offer new capabilities, including full support of pervasive encryption for data at rest on both Z and LinuxONE, faster communication between workloads through Shared Memory Communication (SMC), and support for NVMe solid state disk storage on LinuxONE. The article is dated May 2019.

IBM IT Infrastructure Blog Topics Product areas About Explore products

On IBM Power Systems, IBM Z and LinuxONE

For more than 18 years, IBM and Red Hat have had a strong history of collaboration, including delivering the world's two most powerful supercomputers, the US Dept of Energy's Summit and Sierra supercomputers. This partnership has been a testament to our shared values around open source development and collaboration.

Our partnership with Red Hat has enabled us to bring clients flexible, cost-effective and open source cloud-based infrastructure solutions, backed with security, reliability and support. Today at the Red Hat Summit in Boston, Red Hat launched Red Hat Enterprise Linux (RHEL) 8.0, the latest version of the leading enterprise Linux platform. This version includes new memory, performance and virtualization enhancements as well as new drivers.

RHEL delivers an enterprise Linux platform for [IBM Power Systems](#), [IBM Z](#) and [IBM LinuxONE systems](#). Clients will be able to access RHEL 8.0's enterprise class features and support while tapping into the security, scalability and reliability of IBM's enterprise server platforms.

With the RHEL 8.0 release, we now have one code stream for both our POWER8 and POWER9 servers and this will become the basis for virtualized and bare metal analytics moving forward. Our POWER8 and POWER9 GPU-enabled servers will continue to run on RHEL 7.6 until GPU support is available for RHEL 8.

Additionally, RHEL 8.0 will offer new capabilities including full support of pervasive encryption for data at rest on both Z and LinuxONE; faster communication between workloads through Shared Memory Communication (SMC) which is very beneficial when Linux runs co-located with z/OS on IBM Z; and support for NVMe solid state disk storage on LinuxONE.

With RHEL 8.0 enabled and supported for IBM Power Systems, IBM Z and IBM

MORE LINUX ON POWER SYSTEMS STORIES

Power Systems

The rise of Open Source Databases
by Neeraj Bajpai

Services

Is your scientific software complemented by the best hardware?
by Chekuri Choudary

Services

<https://www.ibm.com/blogs/systems/open-innovation-accelerated-with-red-hat-enterprise-linux-8/> (May 2019)

New: 'Pervasive encryption' for data at-rest with LUKS2

- Using standard interfaces for enhanced security of 'protected key' cryptography
- Protection of volume keys – can't be stolen!
- Allow for automatic opening of encrypted volumes
- Key management supported by the new 'zkey' and 'zkey-cryptsetup' tools
 - Available from s390-tools package

Red Hat Enterprise Linux Capabilities

- Centralized identity management
- SELinux Mandatory Access Control

IBM z14 Capabilities

- On-chip hardware accelerated encryption
- Tamper-responsive key management
- True Random Number generator
- Galois Counter Mode (GCM) encryption

IBM Z Certifications

- Common Criteria (EAL)
- FIPS 140-2

New: Shared Memory Communication (SMC)

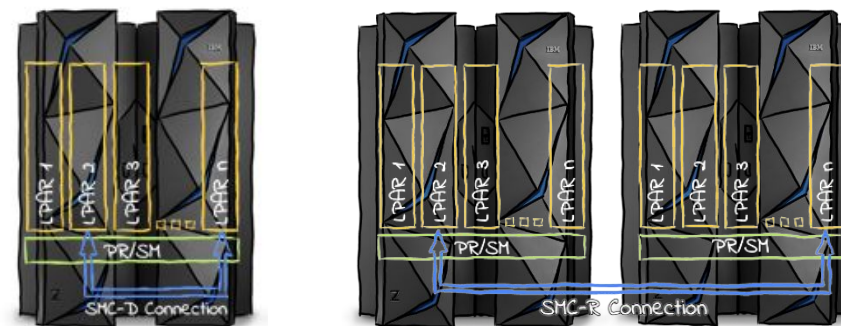
- SMC provides high-speed, low-latency memory-to-memory communications.
- SMC provides processor consumption benefits and improves latency and throughput for network communication between Linux instances, and between Linux and z/OS instances.

Red Hat Enterprise Linux Capabilities

- Optimized performance and scalability

IBM Z Capabilities

- SMC-Direct (SMC-D) supports intra-system communication of Linux and z/OS running in LPAR and z/VM, using virtual ISM devices
- SMC-Remote (SMC-R) supports cross-system connectivity of Linux and z/OS running in LPAR and z/VM, using RoCE Express cards



RHEL 8 for IBM Z

Pre-req/Install info [\[1\]](#)

- Red Hat Enterprise Linux 8 runs on z13 or later IBM mainframe systems
- The installation process assumes that you set up logical partitions (LPARs) and-or z/VM guest virtual machines.
- Installing RHEL from a DVD using SE and HMC, fully supported on IBM Z
- For installation of Red Hat Enterprise Linux on IBM Z, Red Hat supports Direct Access Storage Device (DASD) and Fiber Channel Protocol (FCP) storage devices.

GETTING STARTED WITH VIRTUALIZATION IN RHEL 8 ON IBM Z [\[2\]](#)

- How virtualization on IBM Z differs from AMD64 and Intel 64 [\[3\]](#)
- The KVM hypervisor now supports the CPU model of the IBM z14 ZR1 server
- KVM supports connecting to VM on the host (RHEL 8) via Telnet 3270 on IBM Z

Other Updates to note

- **binutils version 2.30** - Support for new IBM Z architecture extensions has been improved
- **GCC** now defaults to z13 on IBM Z
 - IBM Z architecture builds code for the z13 processor, and the code is tuned for the z14 processor (by default)
- **GDB** on the IBM Z architecture has been extended with support for tracepoints and fast tracepoints, vector registers and ABI, and the Catch system call
 - GDB now supports more recent instructions of the architecture
- Single **strace** tool - now possible to trace both 64-bit and 32-bit binaries on the IBM Z architecture
- **java-1.8.0-ibm** packages are distributed through the Supplementary repository
- Interactive boot loader for KVM virtual machines on IBM Z

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.



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