

KVM for IBM z Systems

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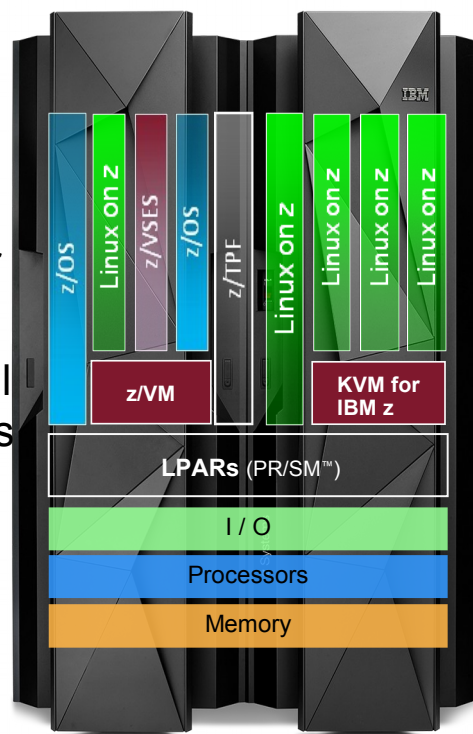
Agenda

- Why KVM for IBM z
- What is KVM for IBM z
- Systems Management Tooling for KVM for IBM z

IBM z/VM and KVM for IBM z

z/VM

- World class quality, security, reliability - powerful and versatile
- Extreme scalability creates cost savings opportunities
- Exploitation of advanced technologies, such as: Hipersockets, Hiperswap, ...
- Highly granular control over resource pool
- Provides virtualization for all z Systems operating systems



KVM for IBM z

- Simplifies configuration and operation of server virtualization
- Leverage common Linux administration skills to administer virtualization
- Flexibility and agility leveraging the Open Source community
- Provides an Open Source virtualization choice

Expanding the audience for z Systems

Target Customers for KVM for IBM z (New) Linux Clients that ...

- Sold on Open Technologies, Open Source Oriented
- x86 centric – familiar with KVM
- Linux admin skills
- Need to integrate into a distributed Linux/KVM environment, using standard interfaces

Target Customers for z/VM Linux Clients that ...

- Already use z/VM for Linux workloads
- Skilled in z/VM and prefer proprietary model
- Invested in tooling for z/VM environment
- Require technical capabilities in z/VM (e.g. I/O pass-through, HiperSockets, HiperSwap, SMC-R, ...)
- Installed pre-zEC12/zBC12 machines

When is KVM for IBM z the right fit ?

For a new Linux client that is ... Open Source oriented; Not z/VM knowledgeable; KVM already in use; x86 Linux centric admins

For existing IBM z Systems customers who ... do not have z/VM, but have KVM skills and potentially large x86 environments

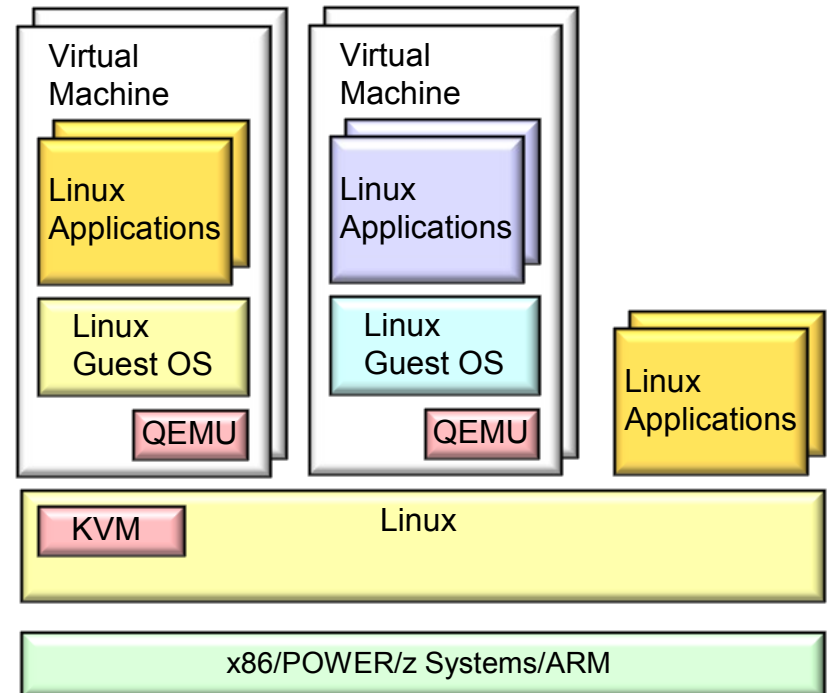
Kernel Based Virtual Machine (KVM)

- **An open source hypervisor based on Linux**

- Linux provides the base capabilities
- KVM turns Linux into a hypervisor
- QEMU provides I/O device virtualization and emulation

- **Provides flexibility in technology choices**

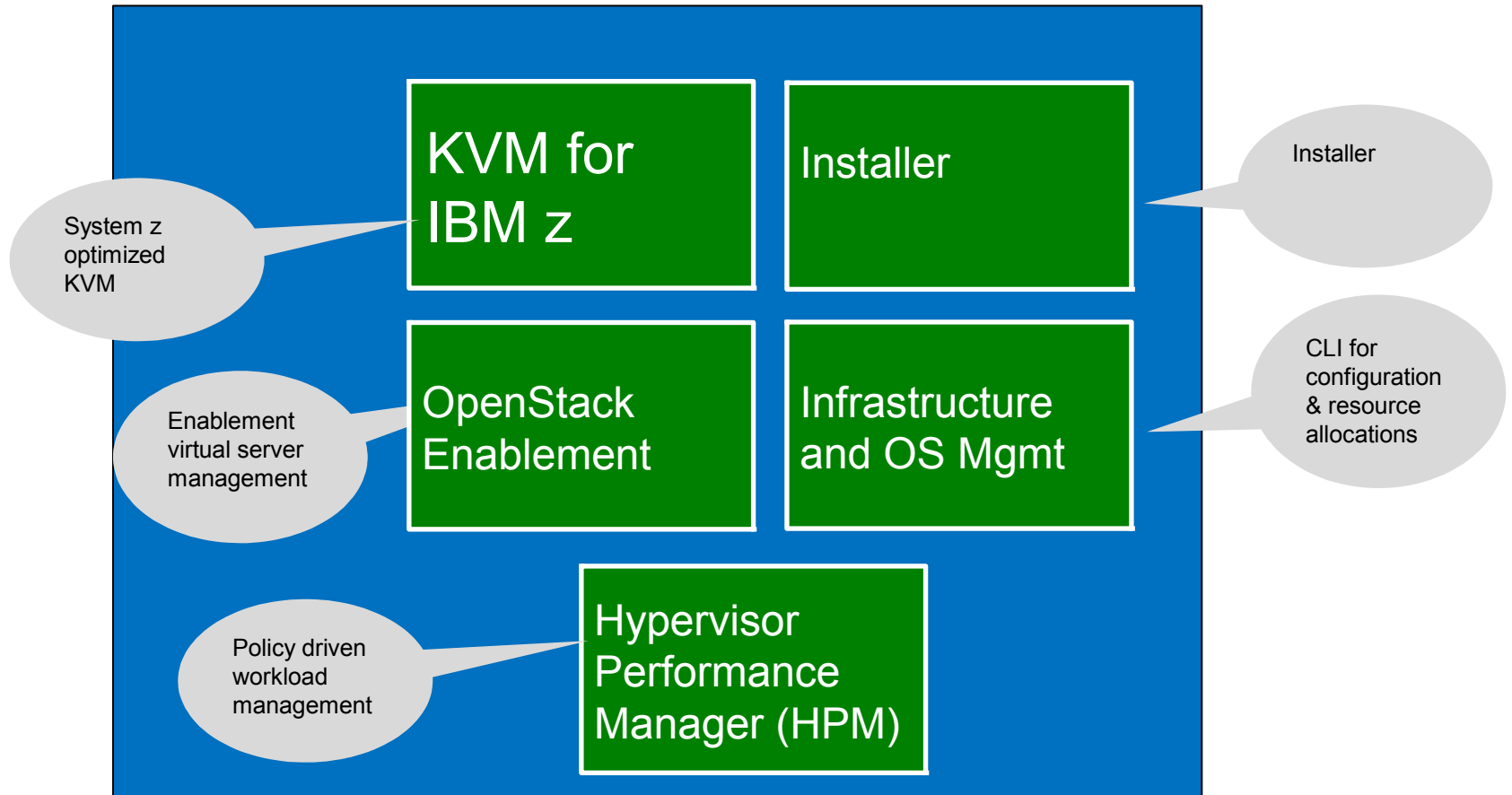
- Open
- Scalable
- Economical



KVM for IBM z Systems

- Product Names:
 - Long Name: KVM for IBM z Systems / Short Name: KVM for IBM z
- First released 9/2015, an update roughly every 6 months
- Available via ShopZ: 5648-KVM
Charges for S&S only 5648-KVS; www.ibm.com/support/fixcentral/
- Platforms supported
 - zBC12/zEC12 or LinuxONE Rockhopper
 - z13 or LinuxONE Emperor
- Supported Networking:
 - OSA plus following MCLs
 - z13: N98805.011 OSA Level 717 Bundle 27b
 - EC12/BC12: H49525.014 OSA level C9B Bundle 52a
- Supported storage platforms
 - DS8K, XIV, SVC, SV7K, Flash Systems
 - ECKD
- Initial Guest Support: SUSE SLES12SP1
- IBM currently in negotiation with
 - Ubuntu on guest OS support
 - RedHat on guest OS support

A look inside



Installer

- KVM for IBM z Systems: 1.1.0

```
Welcome to KVM for IBM z

TERMS AND CONDITIONS FOR SEPARATELY LICENSED CODE

KVM for IBM z Systems V1.1.0

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details
concerning terms and conditions applicable to code identified as

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<Tab>/<Shift-Tab> between elements | <Space> selects
KVM for IBM z 1:installer* 2:shell 3:debug C-right/C-left to switch
```


KVM for IBM z Functionality

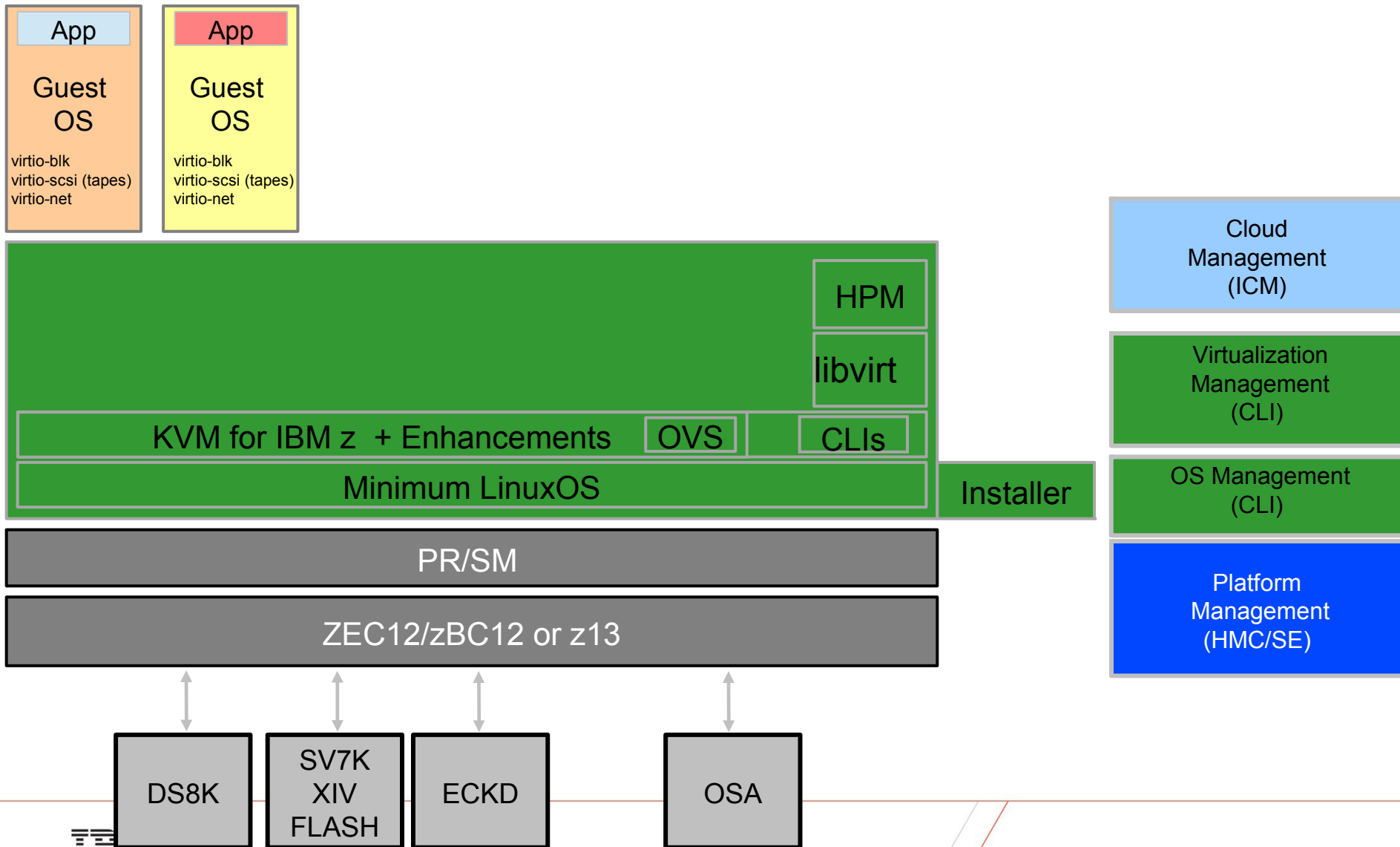
KVM for IBM z

- Virtual Machine life cycle and device management
- Live Guest Mobility / Live Migration
- Memory/CPU overcommit
- Thin provisioned virtual servers
- Hypervisor optimizations
 - virtio dataplane, scheduler
- RAS capabilities
- Transactional execution support
- I/O:
 - Block-based and File-based (raw, qcow2)
 - Networking Virtualization via OpenVSwitch and MacVTap
- SELinux

Add-on's

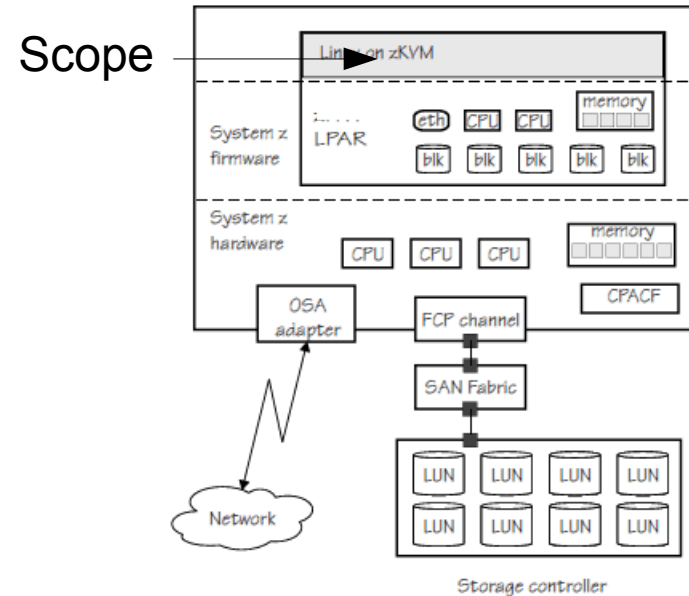
- Perl, Ruby, PHP, Python
- EPPIC Scripts
- s390-utils
- vhostmd
- nagios, AD-Client, ...

Solution View



Standard Interfaces for Infrastructure/OS Management

- Tasks performed by Linux HostOS/Hypervisor Administrator to manage a system
- Boot / Shutdown the Host operating system
- Setup Security and Crypto support
 - Firewalls, SELinux, PAM config
- Manage System Resources
 - configure systemd
 - automate system tasks
- Manage Users and Groups
- Configure Network
 - configure attached devices including bonding
 - focus on administering connectivity via libvirt between guest/host network
- Configure Storage
 - format/partition devices, configure attached devices including multipathing
 - manage file systems, LVM,
- Standard Linux CLIs and config files

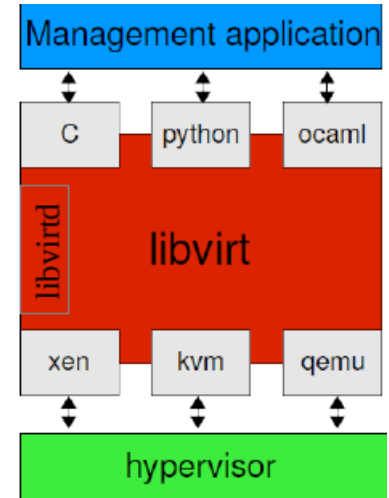


Standard Interfaces for Infrastructure/OS Management (cont...)

- Enable FFDC/Problem Determination
 - Configure on panic behavior
 - sosreport / logs / logrotate / dumps
- Performance Measurement and Diagnosis
- Optionally manage client side of services like dns, dhcp, OpenLDAP, ...

Standard Interfaces for KVM Virtualization Management

- c-library to interact with hypervisors
 - **KVM**, Xen, LXC
- Virtual machine management API
 - create, destroy, start, stop, suspend, resume VMs
 - basic support for static and live migration
- Basic management of virtual networks and storage
- **virsh** is a command-line front-end to libvirt
 - **Virt-manager is a simple UI**
- Support for Linux Control Groups, i.e. fine grained resource management
- SELinux Support with sVirt
- Every KVM management application uses libvirt



Standard Interfaces for Cloud Management

OpenStack
Enablement

SD Infrastructure APIs

- Services and Resources
- Server, Storage and Network
- Broad Ecosystem Forming



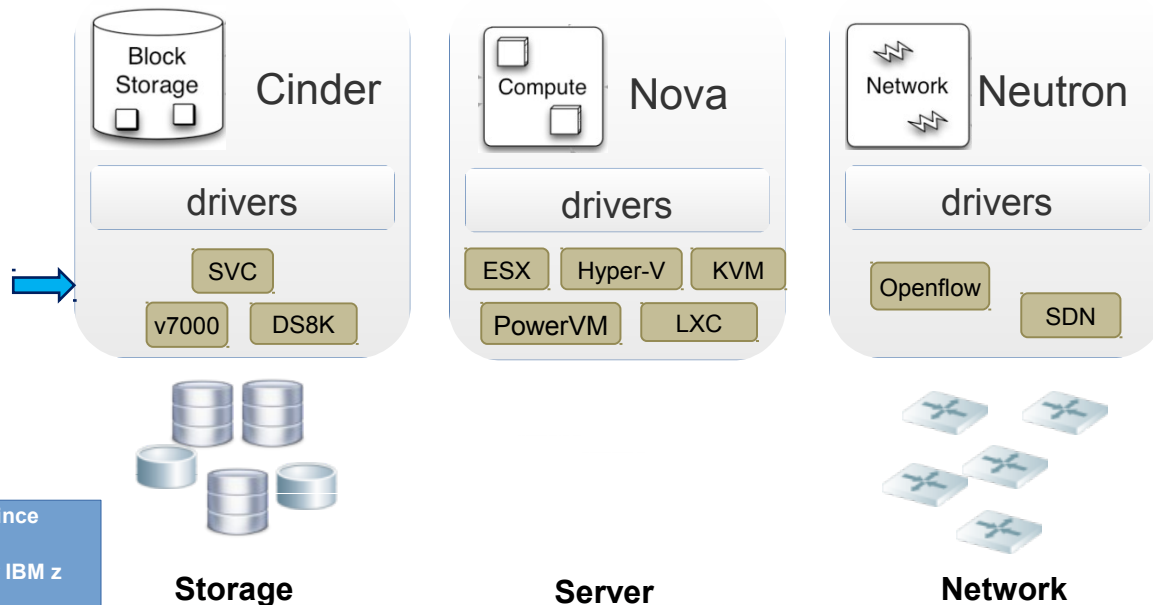
SD Infrastructure Services

- Software Image Services
- Infrastructure Patterns
- VM Placement Intelligence



Vendor Led Scalable Model

- Drivers provided by the vendors
- Broad Ecosystem
- Management standardization



Code enabling KVM for IBM z is in the upstream code base since the OpenStack Kilo release*
OpenStack distribution vendors can add support for KVM for IBM z based on that code




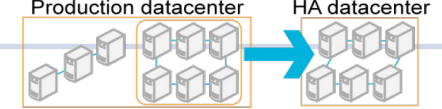



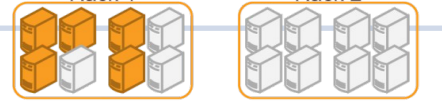



IBM Cloud Manager (ICM)

OpenStack
Enablement

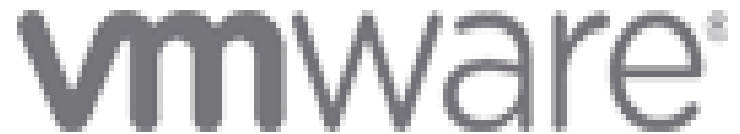
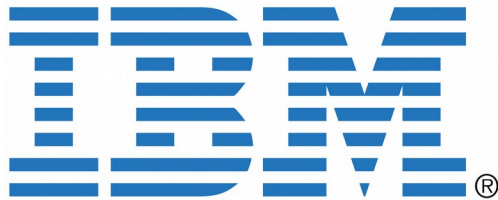
- ICM 4.3 based on OpenStack Kilo release - GAed in 6/2015
- ICM 4.3.0.3 FixPack supports KVM for IBM z
- for KVM for IBM z: Compute Node support only
 - Nova libvirt driver
 - Neutron Agent for OpenVSwitch
 - Ceilometer support
- Cinder Support
 - for SVC and SV7K
 - for XIV
 - for DS8K (FCP only)

Placement and Optimization with Platform Resource Scheduler

Packing	<ul style="list-style-type: none"> Pack workload on fewest number of physical servers Maximizes usable capacity, reduces fragmentations, reduce energy consumption 	
Striping	<ul style="list-style-type: none"> Spread workload across as many physical servers as possible Reduce impact of host failures, higher application performance 	
Load-Aware	<ul style="list-style-type: none"> Allocate physical servers with lowest load to new workloads Higher application performance 	
HA-Aware	<ul style="list-style-type: none"> Allocate HA-enabled resources to critical workloads Match availability levels to service requirements and costs 	
Energy-Aware	<ul style="list-style-type: none"> Place workload according to energy indices and datacenter hot spots Reduce energy consumption 	
Affinity-Aware	<ul style="list-style-type: none"> Place workload close to critical resources such as storage Higher application performance 	
Server Model-Aware	<ul style="list-style-type: none"> Allocate resource to workload according to model types Maximize utilization of higher performing & more expensive resources 	
Topology-Aware	<ul style="list-style-type: none"> Allocate resources on the same interconnect to the same application Improve application performance 	
Service Chain Aware	<ul style="list-style-type: none"> Allocate a multi-tier virtual infrastructure, including network appliances used between those tiers. Configure all the associated virtual infrastructure (VMs, virtual appliances, virtual storage) 	

VMware vRA support

IBM and VMware have each announced a cooperative effort to give our shared clients the ability to provision and manage virtual machines and applications running on IBM Power Systems and IBM z Systems with VMware's vRealize™ Automation™ 6.2 (vRA) solution through OpenStack enabled APIs.



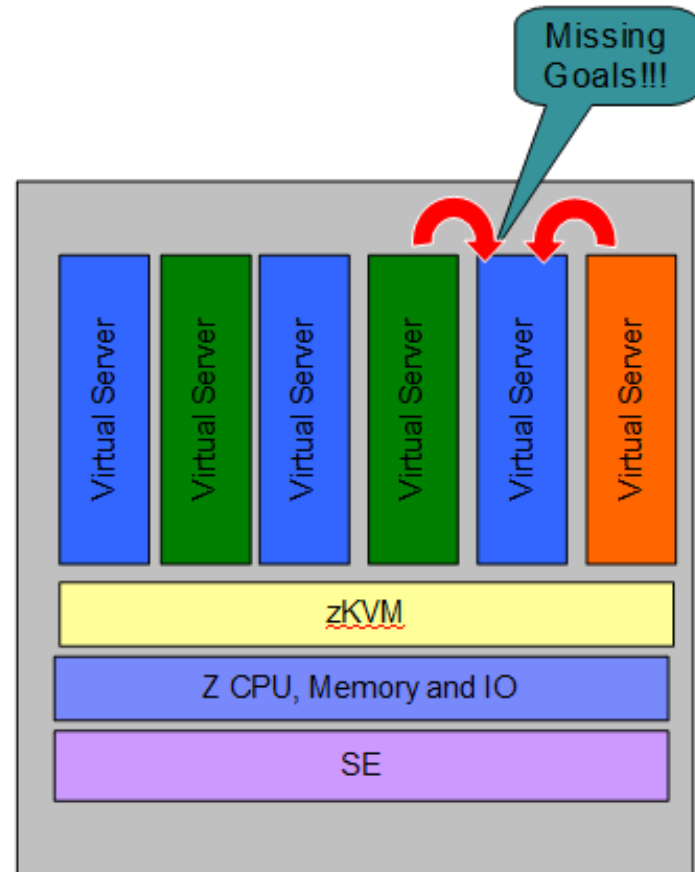
Support Details – Matrix, Post-Deploy Action Options

Platform	VM Guest	Post-deploy Actions	Pre-Requisites	OpenStack Version
PowerVM*	AIX & Linux	Power On, Off, Destroy, Reboot	PowerVC 1.2.2	Juno
PowerKVM	Linux	Power On, Off, Destroy, Reboot	ICM 4.2	Juno
z/VM	Linux	Power On, Off, Destroy, Reboot	ICM 4.2	Juno
KVM for IBM z	Linux	Power On, Off, Destroy, Reboot	ICM 4.3	Kilo

Managing Resources across Virtual Servers on KVM for IBM z via zHPM

Hypervisor
Performance
Manager (HPM)

- Manage CPU resources across virtual servers to achieve performance goals
 - Detect that a virtual server when a member of a Workload Resource Group is not achieving goals
 - Determine that the virtual server performance can be improved with additional resources
 - Project impact on all affected virtual servers of reallocating resources
 - If good trade-off based on policy, redistribute processor resources
 - Current support for CPU management, potential to extend to other resources



System z Hypervisor Performance Manager

- Supports policy-based goal-oriented monitoring and management of CPU resources
- Shipped as part of the KVM for IBM z delivery
 - Optionally enabled
- Scope of management is single KVM for IBM z instance
 - zHPM will have no knowledge outside of its KVM for IBM z instance
- Controlled through RESTful Web Services APIs and CLI
 - APIs
 - Point of integration with higher-level virtualization management solutions
 - Support for scripting
 - Fully documented external interface
 - CLIs provide support for local administration

SAP Application Server on KVM for IBM z

Monitoring Category	Description	Value	Unit
	<u>Manufacturer</u>	IBM	
	<u>Model</u>	KVM/Linux	
Info	<u>Operating system</u>	Linux ihlsvg5 3.12.43-52.6.1.8830.2.PTF-default	
	<u>Timestamp</u>	Mon Aug 3 11:01:38 2015	
	<u>Hostname</u>	ihlsvg5	
Virtualization Configuration	<u>Enhanced Monitoring Access</u>	TRUE	
	<u>Enhanced Monitoring Details</u>	ACTIVE	
	<u>Host System Information</u>	ihlskvm1	
	<u>Solution</u>	VIRT_METHOD_LINUX_KVM	
	<u>Solution Version</u>	QEMU 1.2.13	
	<u>Type</u>	Virtual Machine	
CPU	Average processes waiting (5 min)	0,35	
	Number of CPUs	2	
	System Utilization	12 %	
	User Utilization	10 %	
	Idle	77 %	
CPU Virtualization Virtual System	Available Capacity	2,00	CPUs
	Additional Capacity Available	1,84	CPUs
	Guaranteed Capacity	0,00	CPUs
	Capacity Maximum	2,00	CPUs
	Capacity Consumed	0,16	CPUs
	Available Capacity Consumed	8,0	%
Memory	Physical memory	8.250.904	KB
	Configured swap size	762.876	KB
	Free swap size	762.876	KB
	Maximum swap size	762.876	KB
	Actual swap size	762.876	KB
	Physical	8.057	MB
	Free (Value)	5.573	MB
	Swap Free	744	MB
	Swap Configured	744	MB
	Swap Size	744	MB
	Swap Maximum Size	744	MB
	Free Including Fs Cache	6.613	MB
	Free	69	%
	Page In	0	KB/s
	Page Out	0	KB/s
	Page In of RAM	0	%/h
	Page Out of RAM	0	%/h
Memory Virtualization Virtual System	Memory Consumed	8.192	MB
	Guaranteed Memory	0	MB
	Memory Limit	8.192	MB

KVM for IBM z Systems

Open source virtualization hypervisor

KVM for IBM z Systems provides open source virtualization for IBM z Systems and the LinuxONE platforms. Using the combination of KVM virtualization and IBM z Systems and LinuxONE, you have the performance and flexibility to address the requirements of multiple, differing Linux workloads. KVM's open source virtualization on IBM z Systems and LinuxONE allows businesses to reduce costs by deploying fewer systems to run more workloads, sharing resources and improving service levels to meet demand.

Highlights

- **Open virtualization:** Take advantage of the performance, scalability and security built into Linux and KVM and gain a cost effective alternative to proprietary x86 virtualization.
- **Quality of service:** Gain easy provisioning for predictability of delivery of service at high utilization rate.
- **Operational efficiencies:** Use familiar Linux interface to gain greater operational efficiency.

Benefits

- Reduce operating costs through x86 server consolidation and deployment of Linux workloads.
- Simplify systems management through familiar interfaces to enable a single cross platform virtualization.
- Accelerate cloud deployments by seamlessly working with OpenStack.
- Run your Linux workloads on the most trusted, scalable, available, and secure platform.
- Meet changing server demands with automatic provisioning of computing resources.
- Gain high virtualization and consolidation for price performance advantage, scalability on demand, security and extreme availability.

Learn more

- [Announcement letter](#)
- 📄 [Data sheet \(192KB\)](#)
- 📄 [FAQ \(1.55MB\)](#)
- 📄 [Technical Information \(250KB\)](#)

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For More Information

- **Portal**
<http://www.ibm.com/systems/z/solutions/virtualization/kvm/>
- **Product Documentation** at http://www-01.ibm.com/support/knowledgecenter/linuxonibm/liaaf/lnz_r_kvm.html
 - KVM for IBM z Systems: Planning and Installation Guide SC27-8236-00
 - KVM for IBM z Systems: Administration Guide SC27-8237-00
 - Linux on z Systems: Virtual Server Management SC34-2752
 - Linux on z Systems: Virtual Server Quick Start SC34-2753
 - Linux on z Systems: Device Drivers, Features, and Commands for Linux as a KVM Guest SC34-2754
 - Linux on z Systems: Installing SUSE Linux Enterprise Server 12 as a KVM Guest SC34-2755
- **Redbook: Getting Started with KVM for IBM z Systems**
<http://www.redbooks.ibm.com/redpieces/abstracts/sg248332.html?Open>
- **Performance Data / Planning Tools**
 - Large Systems Performance Reference (LSPR):
 - <https://www-304.ibm.com/servers/resourcelink/lib03060.nsf/pages/lspriTRKVMonZv110?OpenDocument>
 - zPCR
 - <http://www-03.ibm.com/support/techdocs/atmastr.nsf/WebIndex/PRS1381>

Questions?

