KVM for IBM z Systems and LinuxONE

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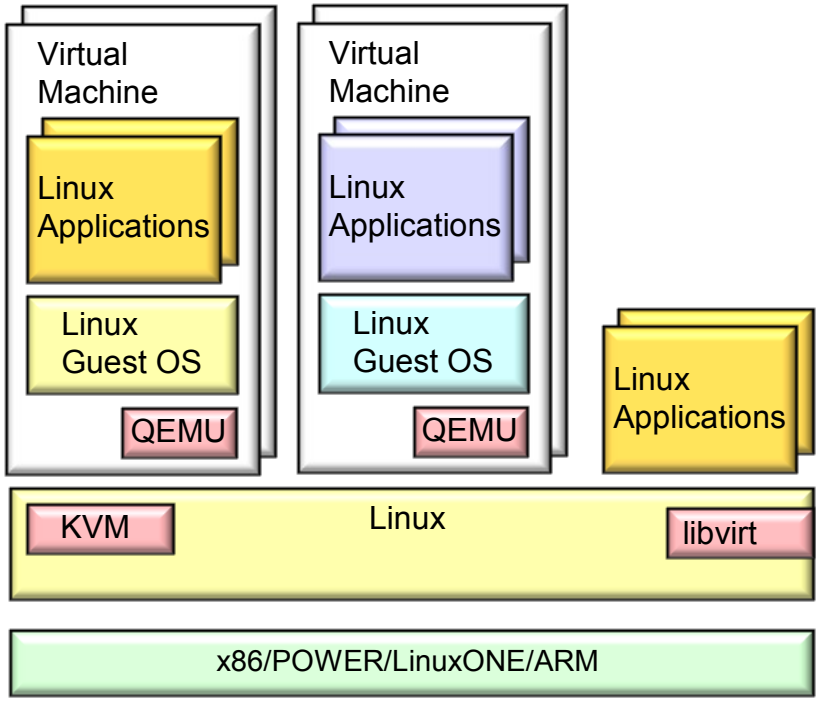
Agenda

- What is KVM
- What is KVM for IBM z Systems and LinuxONE
  - What is in 1.1.1
- What is new in 1.1.2
- What could come therafter
- Existing Systems Management Tooling

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



LinuxONE Virtualization Options

LinuxONE has three strategic virtualization platforms

- KVM for LinuxONE
- IBM z/VM
- IBM Processor Resource/System Manager (PR/SM)

KVM

KVM for LinuxONE provides an open source choice for LinuxONE virtualization for Linux workloads. Best for clients that are not familiar with z/VM and are Linux centric admins.

z/VM

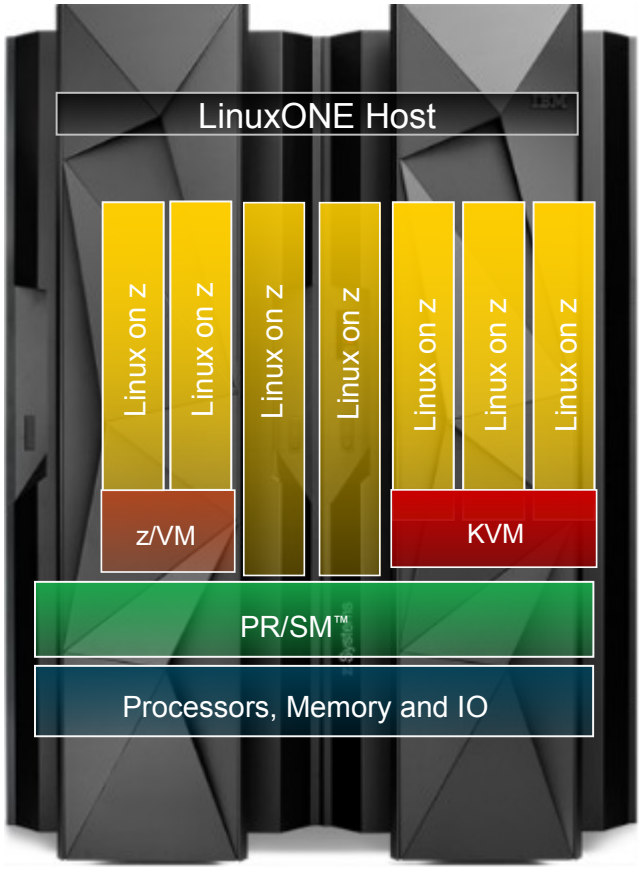
Proprietary Server Virtualization that is deeply integrated into System z. Complete hardware awareness. Supported on all IBM z Systems and LinuxONE servers. z/VM will continue to be enhanced to support Linux Workloads.

PR/SM

Divide one physical server into up to 85 logical partitions (LPAR) running a mix of multiple z/VM, Linux and KVM for LinuxONE instances isolated and secured in parallel. Share resources across LPARs or dedicated to a particular LPAR. Instances are isolated and secured.

Standards based virtualization with KVM for LinuxONE

- **Standard** Linux management and operation controls leading to greater operational efficiencies
- **Standard** KVM interfaces allow for quick startup for clients who are familiar with x86 Linux
- KVM-based virtualization LinuxONE allows businesses to reduce costs by deploying fewer systems to run more workloads, sharing resources, and improving service levels to meet demand
- KVM open source solution for running virtual servers on LinuxONE enables cloud deployments and big data solutions while reducing complexity and cost



KVM Positioning

Target Customers for z/VM :
Linux Clients that …

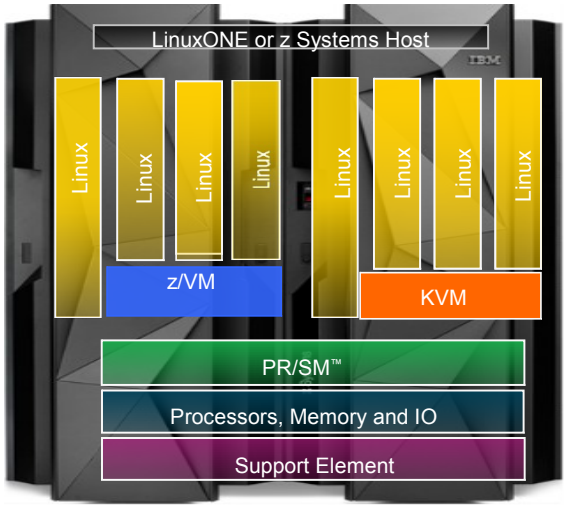
- Already use z/VM for Linux workloads
- Skilled in z/VM and prefer proprietary model
- Invested in tooling for z/VM environment
- Require technical capabilities in z/VM (e.g. I/O pass-through, HiperSockets™, SMC-R, …)

Target Customers for KVM :
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 Cloud environment, using standard interfaces

z/VM

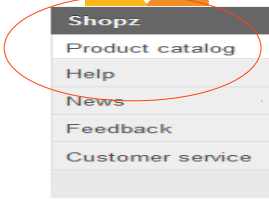
- World class quality, security, reliability - powerful and versatile
- Extreme scalability creates cost savings opportunities
- Exploitation of advanced technologies, such as:
  - Shared memory (Linux kernel, executable, communications)
- Highly granular control over various resources
- Improves productivity by hosting non-Linux workloads such as z/OS, z/VSE, and z/TPF



KVM

- Standard skills, terminology and technology makes configuration and operation of server virtualization easier/faster
- Leverage common Linux administration skills to administer virtualization
- Flexibility and agility leveraging the Open Source community
- Provides an Open Source virtualization choice

How to order the product / obtain Fixpacks



Product catalog

NOTE: You must login to Shopz and click on the 'My downloads' page to display Standalone product fixes.

Catalog view (Products in this view: 1)

Country/Region: United States

Package type: KVM for IBM z - Standalone products and fixes

Group: KVM for IBM z - All (1 Product)

Language: All languages

Search field: Product ID / Product description

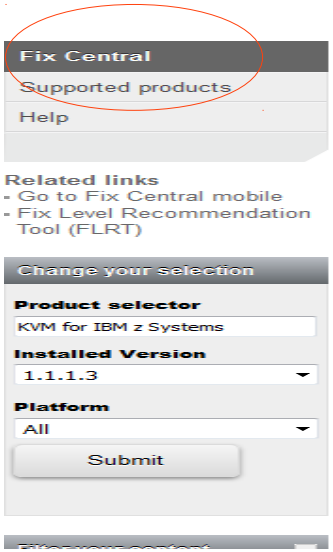
Search for:

Sort by: Product ID / Product description

Show catalog

KVM for IBM z: Operating Systems

	Product	Description	Version	Language	Notes
◆	[5648-KVM]	KVM for IBM z	1.01.01	English (US)	



Select fixes

Virtualization software, KVM for IBM z Systems (1.1.1.3, All platforms)

Select fixes

The following results match your request. Select the fixes you want to download.

- To try a different query, go to the Identify fixes page.

Share this download list

Clear selections | Continue

Show fix details | Hide fix details

1-1 of 1 results

1. **fix pack:** KVMIBM-1.1.1.4-20160614-s390x → Jun 17, 2016

KVM for IBM z Systems 1.1.1.4 Updates
Platforms:
Applies to versions: 1.1.1, 1.1.1.1, 1.1.1.2, 1.1.1.3
Upgrades to: 1.1.1.4
Severity:
Categories:
Abstract: The fix pack contains cumulative fixes.
Restrictions: license

README RESTRICTIONS

KVM for IBM z Functionality – looking back

1.1.0

x86 equivalence
- Live Guest Migration
- OpenStack (ICM) 'managed to' support
- Block/file based
- OpenVSwitch/MacVtap
- SAP Application Server

Differentiation
- HPM

HW Exploitation
- Guest Tx Support
- Guest Large Page Support
- Upto 8TB host memory

x86 equivalence
- SLES 12SP1 guest support

1.1.1

x86 equivalence
- iSCSI, NFS Client
- Unattended install
- Guest watchdog
- SDK

Differentiation
- Kimchi/Ginger host management

HW exploitation
- SMT
- SIMD
- Crypto
- Enhanced RAS
- Host Watchdog
- HyperPAV

x86 equivalence
- Ubuntu 16.04 Guest support

KVM for IBM z Systems (1.1.2) supports

Servers	IBM z13™ IBM z13s™ IBM LinuxONE Rockhopper™ IBM LinuxONE Emperor™ IBM zEnterprise® zEC12 IBM zEnterprise® zBC12
Guest Operating systems supported	SUSE Linux Enterprise Server (SLES12 SP1) Ubuntu 16.04 LTS
Networking features supported (NICs)	IBM OSA-Express5S IBM OSA-Express4S
Crypto Coprocessor supported	Crypto Express4S Crypto Express5S
Storage devices are supported .	ECKD™ DASD ▪ DS8870/DS8880® (FICON®-attached) FCP SCSI disks: ▪ DS8870/DS8880® (FCP - attached) ▪ XIV® ▪ Storwize® V7000, V5000, V3700, V3500, SAN Volume Controller ▪ FlashSystem™ ▪ ISCSI ▪ NAS

Note: Refer to the KVM for IBM z Systems: Planning and Installation Guide (SC27-8236-02) for the most current information

KVM for LinuxONE

Industry standard KVM hypervisor *enables single cross-platform virtualization to help simplify systems management*

Eliminate downtime by dynamically *modifying I/O device configuration for virtual servers so business applications remain active*

Live virtual server workload migration *for minimal impact to your business while workloads are relocated*

Save on storage cost *with copy-on-write virtual disks by not needing full disks until used*

Policy-based goal-oriented monitoring and management (HPM) *of virtual server CPU resources so critical workloads receive priority*

Memory and CPU overcommit *to achieve higher VM density per host*

KVM for LinuxONE

Tx Support

Security

- SELinux
- firewalld
- Auditd

Availability Monitoring

- Nagios plugins
- ELK: Elasticsearch, Logstash and Kibana (remote)

Performance monitoring

- ELK (remote)
- Sysstat Sar and kSar(remote)

Guest I/O

- Block-based and File-based (raw, qcow2)
- Networking Virtualization via OpenVSwitch and MacVTap

KVM for LinuxONE

Support new analytics workloads *with Single Instruction Multiple Data (SIMD) for competitive advantage*

Deliver higher compute capacity *with support for* Simultaneous Multithreading (*SMT) to meet new business requirements*

Secure and protect *business data with Crypto exploitation that leverages hardware acceleration for cryptographic functions – increases entropy*

Provide clients with choices for flexibility *based upon their storage environment*

- *Connect a variety of peripherals, especially storage devices drives, with Internet Small Computer System Interface (iSCSI)*
- *Access files on remote hosts exactly the same way a user would access any local files with Network File System (NFS) which works across a variety of server and host architectures*

KVM for LinuxONE

Unattended installation of the KVM hypervisor simplifies administration

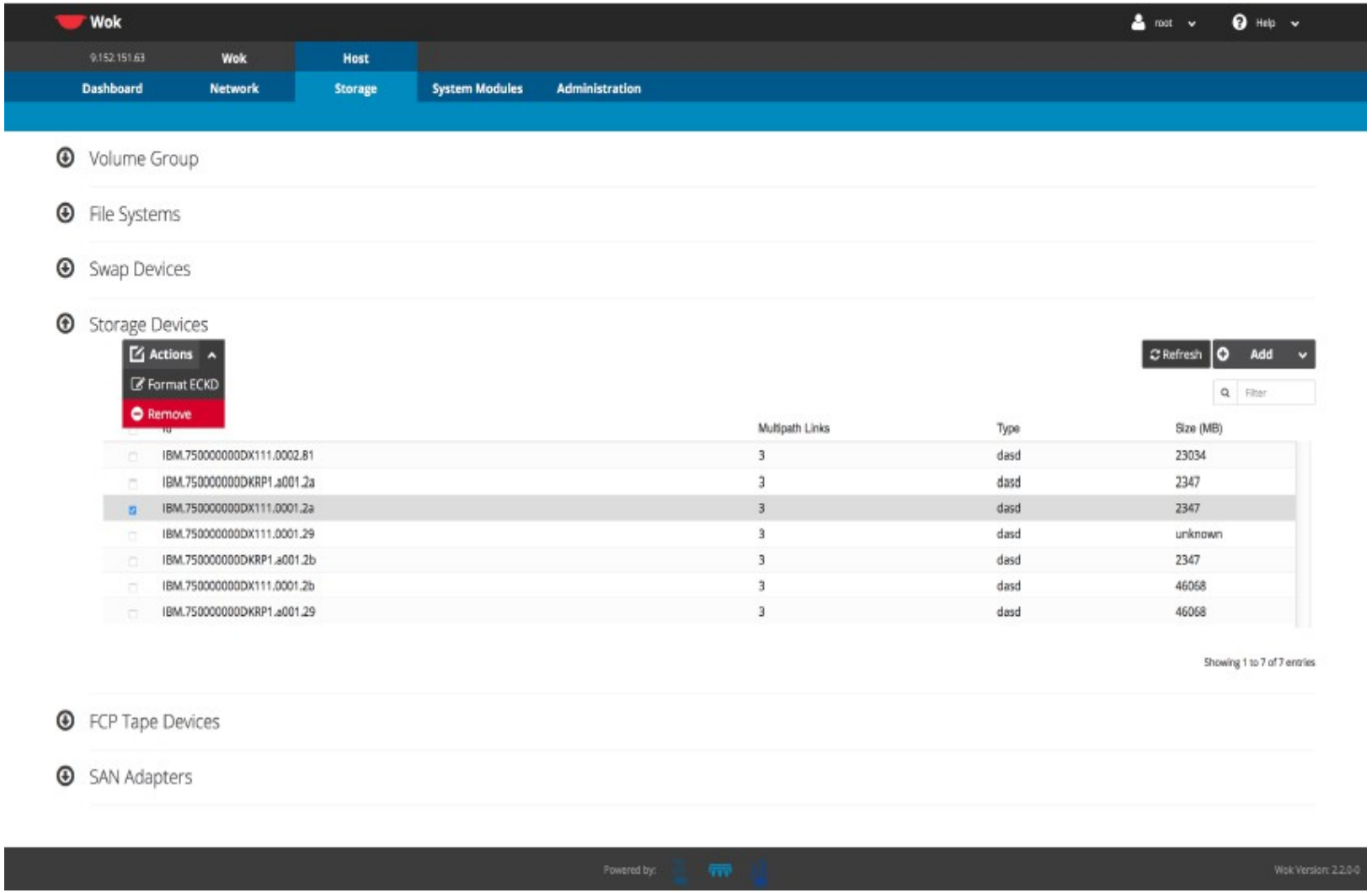
Supported by DPM simplified interface for platform management. KVM for IBM z is the only supported hypervisor. Modify system resources without disrupting running workloads

Upgrade tool easy upgrade from 1.1.1 to 1.1.2

Software Development Kit (SDK) enables clients and IHV/ISVs to extend the hypervisor with their applications. For example they can build management agents which need to run on the hypervisor.

Single Hypervisor Management GUI (Kimchi) manage attached storage and networks without deep system z knowledge

Kimchi UI


Wok
root
Help
9.152.151.63
Wok
Host
Dashboard
Network
Storage
System Modules
Administration
Volume Group
File Systems
Swap Devices
Storage Devices
Actions
Format ECKD
Remove
Refresh
Add
Filter
Multipath Links
Type
Size (MB)
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IBM.750000000DKRP1.a001.2a 3 dasd 2347
IBM.750000000DX111.0001.2a 3 dasd 2347
IBM.750000000DX111.0001.29 3 dasd unknown
IBM.750000000DKRP1.a001.2b 3 dasd 2347
IBM.750000000DX111.0001.2b 3 dasd 46068
IBM.750000000DKRP1.a001.29 3 dasd 46068
Showing 1 to 7 of 7 entries
FCP Tape Devices
SAN Adapters
Powered by:
Wok Version: 2.2.0-0

KVM for IBM z and LinuxONE v 1.1.2 (GA 10/28/16)

NEW

Enhancements to text based installer

- add DASD dynamically
- optional encryption of page volumes
- support for http, https and nfs protocol support for installing packages

Easier and accessible Installer

an additional web browser based installer to simplify installation and fulfill IBM accessibility guidelines

Simplify management of resources on hypervisor

Kimchi/Ginger tool:
- user management
- kernel modules list/load/unload
- user activity log
- multi-cultural support

Monitor Virtual Servers Status via Nagios

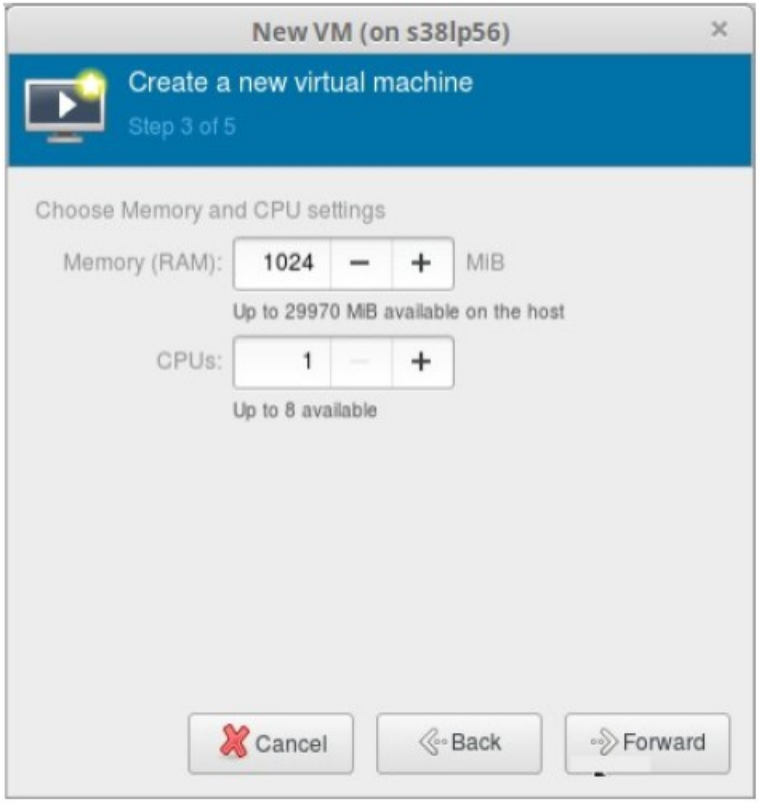
additional Nagios plug-in (check_kvm)

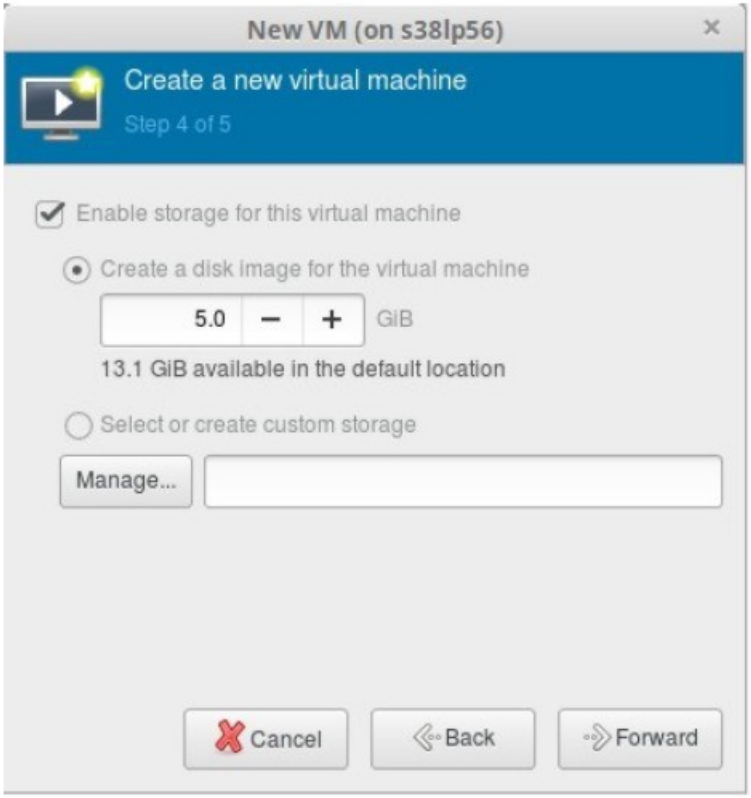
Make virtualization management simpler and familiar

provides same virt-manager and virt-install tooling experience as on x86

virt-manager UI

NEW





KVM for IBM z and LinuxONE v 1.1.2 (GA 10/28/16)

NEW

Dynamic addition of vCPUs to Guests
CPU hotplug capability to virtual servers

Guest boot from ISO
Simplifies installation of guest operating systems

Support for IBM License Metric Tool (ILMT)
Customers can determine their full and sub-capacity PVU licensing for IBM software

Identify potential problems in hypervisor configuration
Recommendations made by Healthchecker / included plugins

Provides high availability of resources – especially guests

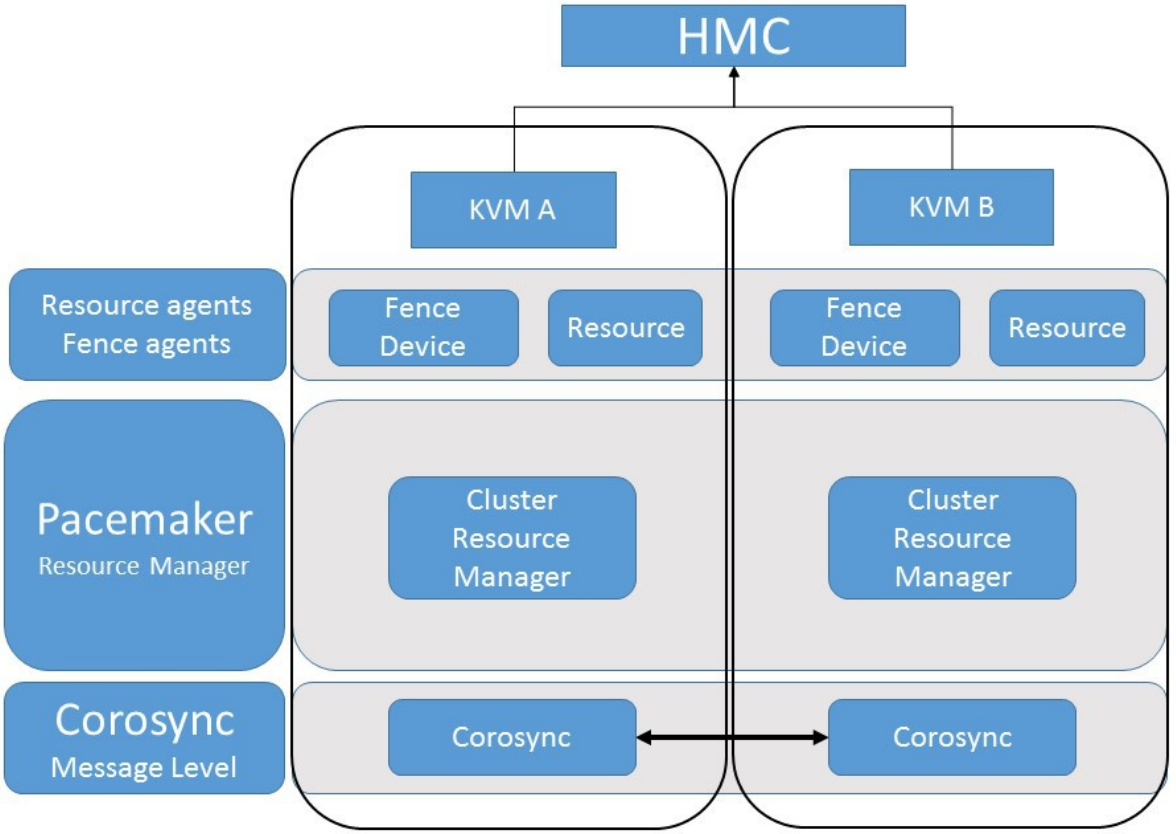
Includes industry standard Pacemaker and Corosynch and System z specific fencing agent

Pacemaker Overview - Structure

NEW

Supported resource agents:
1. VirtualDomain
2. MailTo
3. ethMonitor
4. Filesystem
5. symlink

Fence agent:
- Activates fence device when a node needs to be shutdown to prevent data loss
- fence_ibmz is the fence agent shipped in KVM for IBM z Systems



Candidates for future releases

There are **no** IBM commitments in place at this point to deliver these capabilities. We do not recommend basing any plans on these capabilities

- Ceph support
- Spectrum Scale (GPFS) support
- Hipersockets support
- Mellanox ConnectX (RoCE) Support
- Guest Network boot

- Nested Virtualization

- OpenStack compute node
- Kimchi guest management
- HPM memory management
- Zabbix agent
- GDPS support

We welcome YOUR input;
become a sponsored user !

Agenda

- What is KVM
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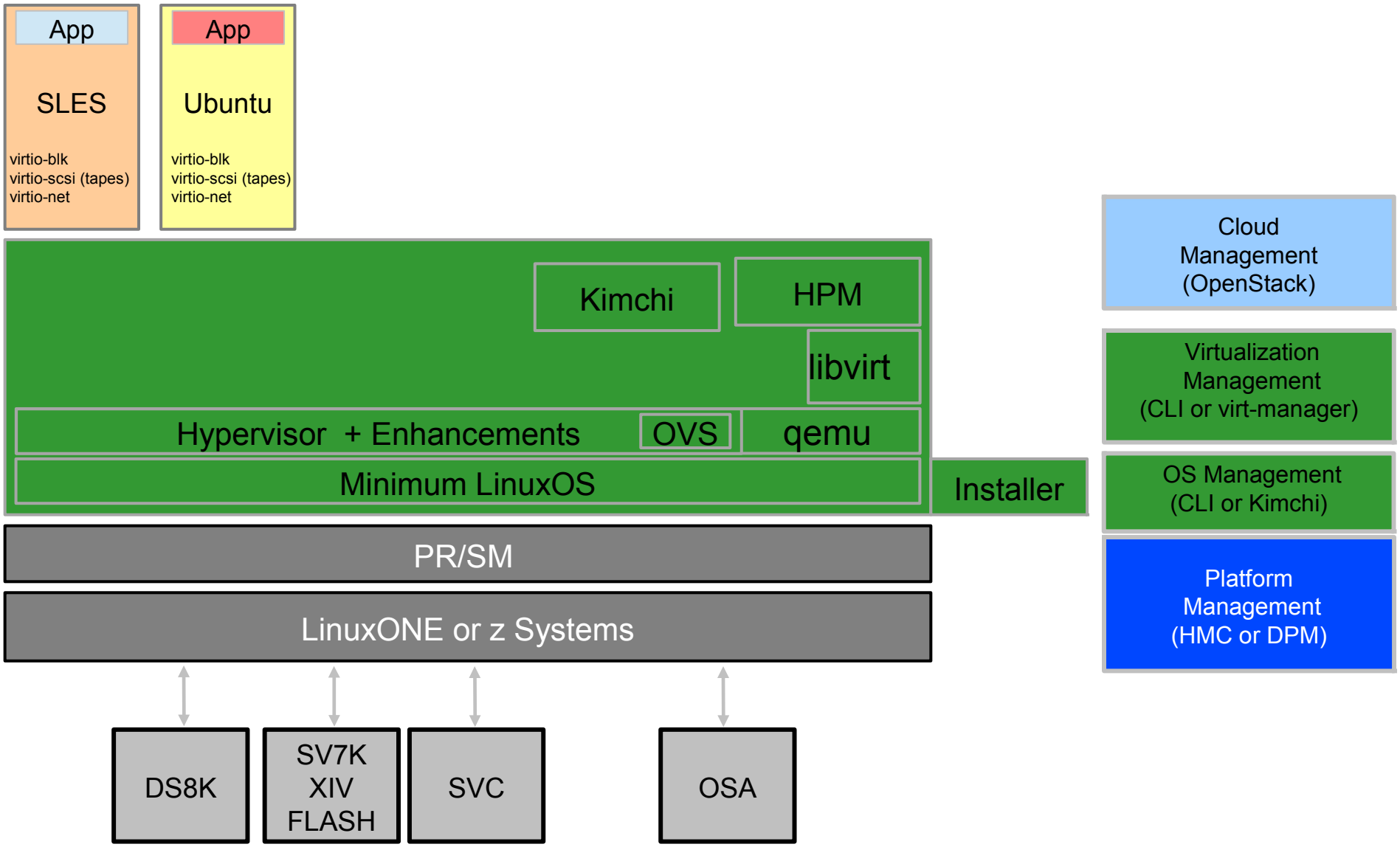
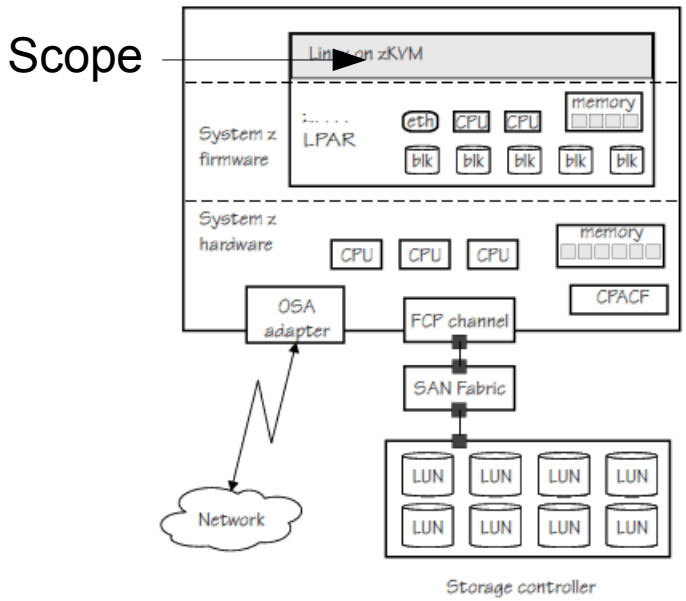
- Existing Systems Management Tooling

Solution View



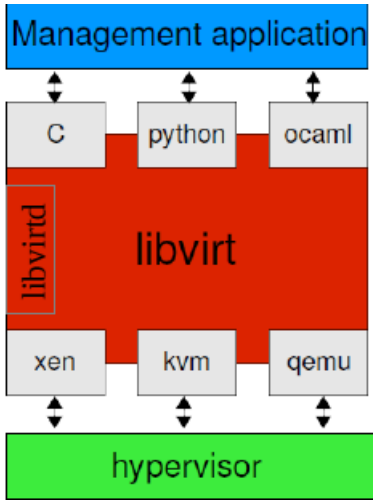
Standard Interfaces for Infrastructure Management

- Tasks performed by Linux HostOS/Hypervisor Administrator to manage a system
- Boot / Shutdown the Host operating system
- Setup Security
  - 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



▶ Use standard Linux CLIs and config files
and/or
▶ Use Kimchi UI

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
- Support for Linux Control Groups, i.e. fine grained resource management
- SELinux Support with sVirt
- Every KVM management application uses libvirt

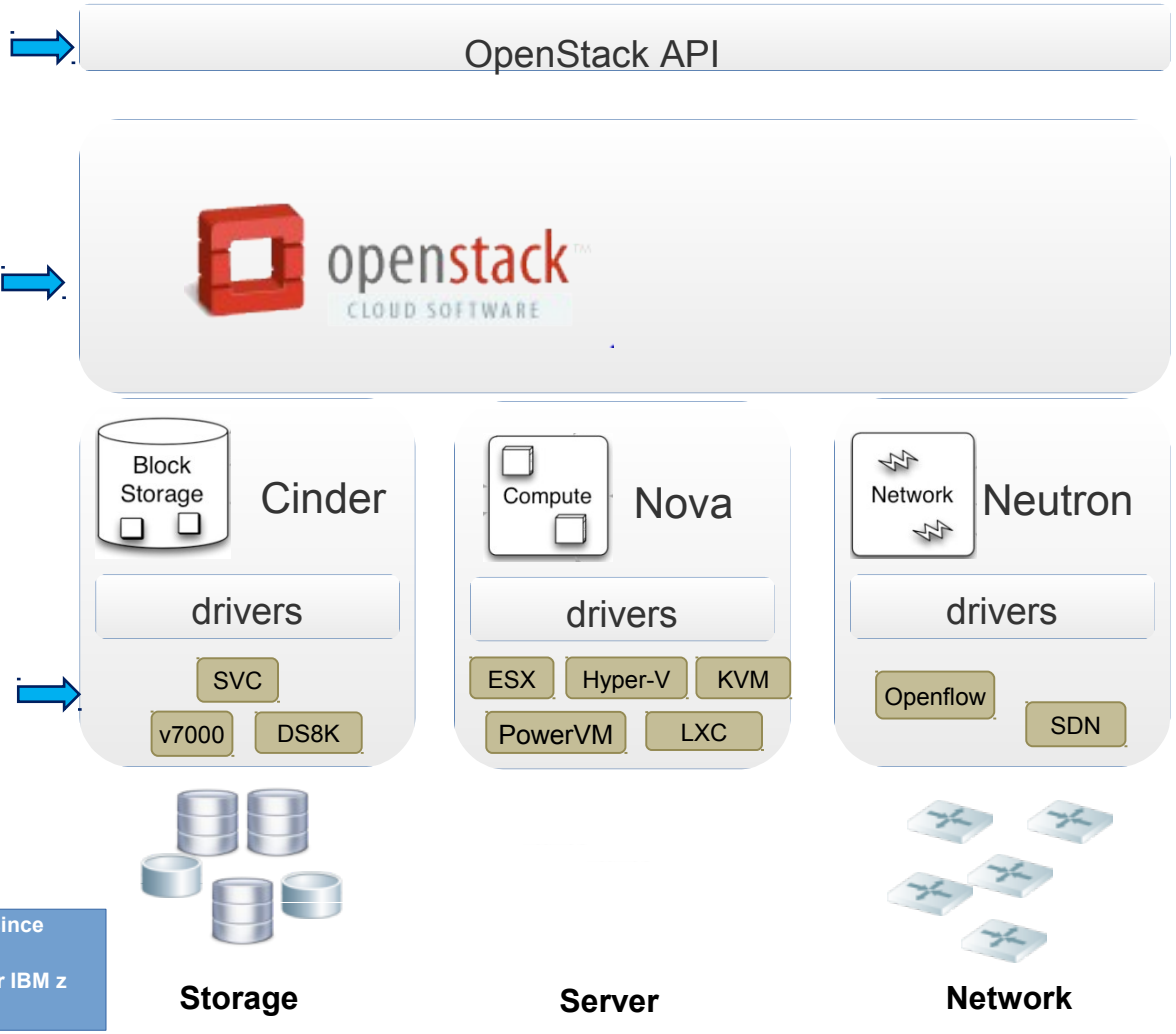
▶ Use virsh as a command-line front-end to libvirt
and/or
▶ Use virt-manager UI

Standard Interfaces for Cloud Management

SD Infrastructure APIs
- Services and Resources
- Server, Storage and Network
- Broad Ecosystem Forming

SD Infrastructure Services
- Software Image Services
- Infrastructure Patterns
- VM Placement Intelligence

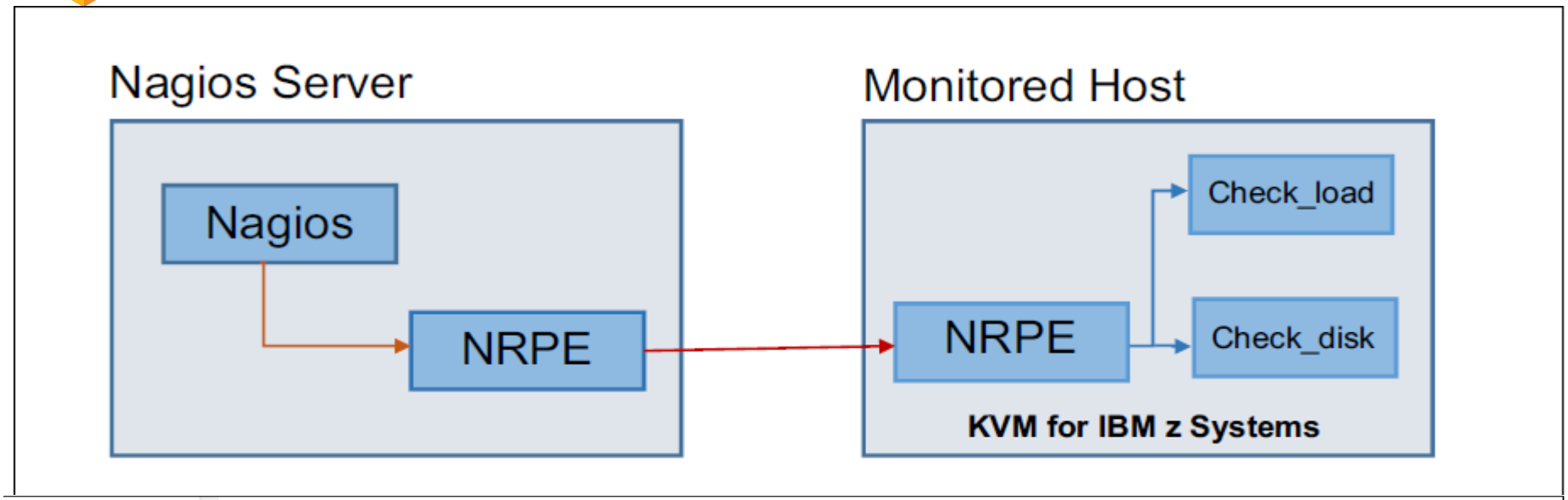
Vendor Led Scalable Model
- Drivers provided by the vendors
- Broad Ecosystem
- Management standardization

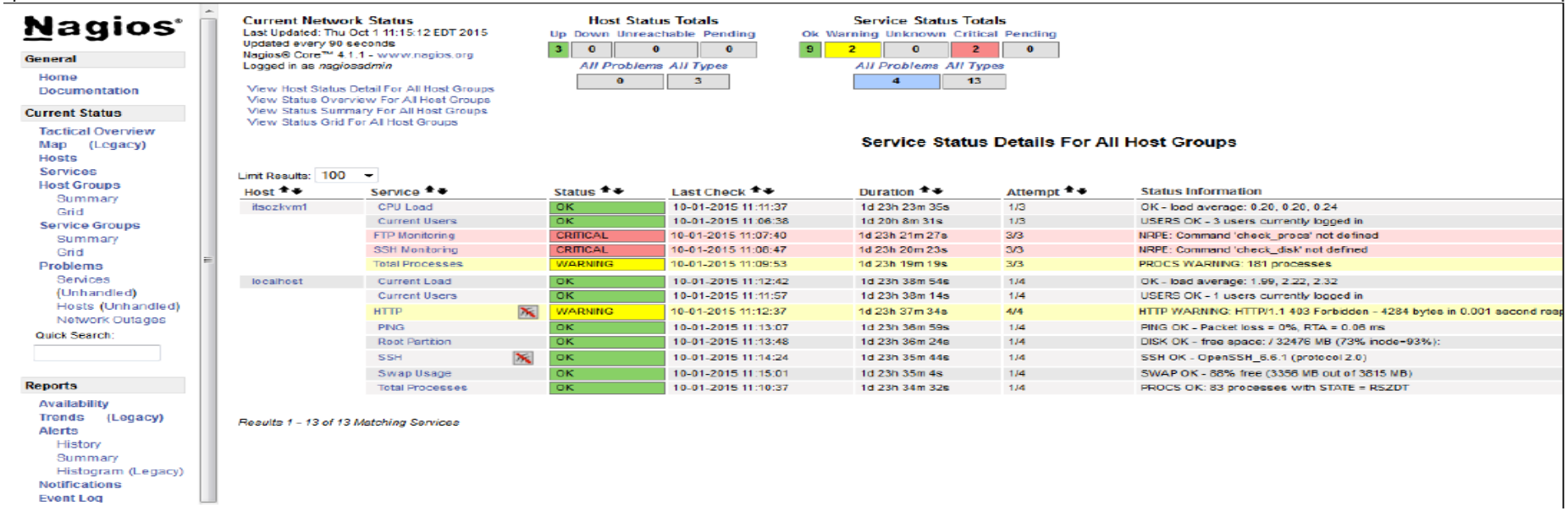


Code enabling KVM for IBM z is in the upstream code base since the OpenStack Kilo release*
OpenStack distribution vendors can add support for KVM for IBM z based on that code

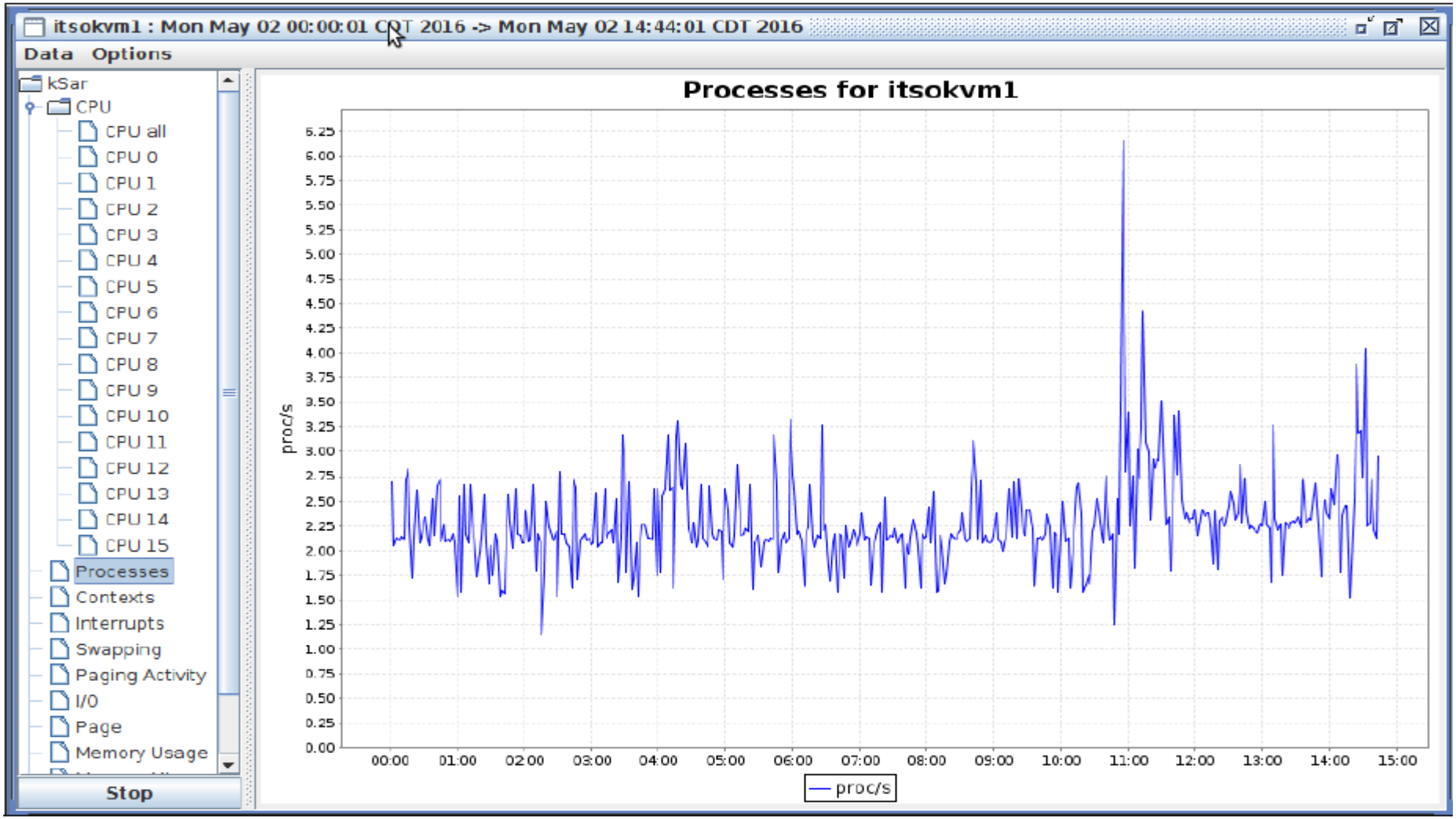
*http://docs.openstack.org/developer/nova/support-matrix.html

Availability Monitoring via Nagios

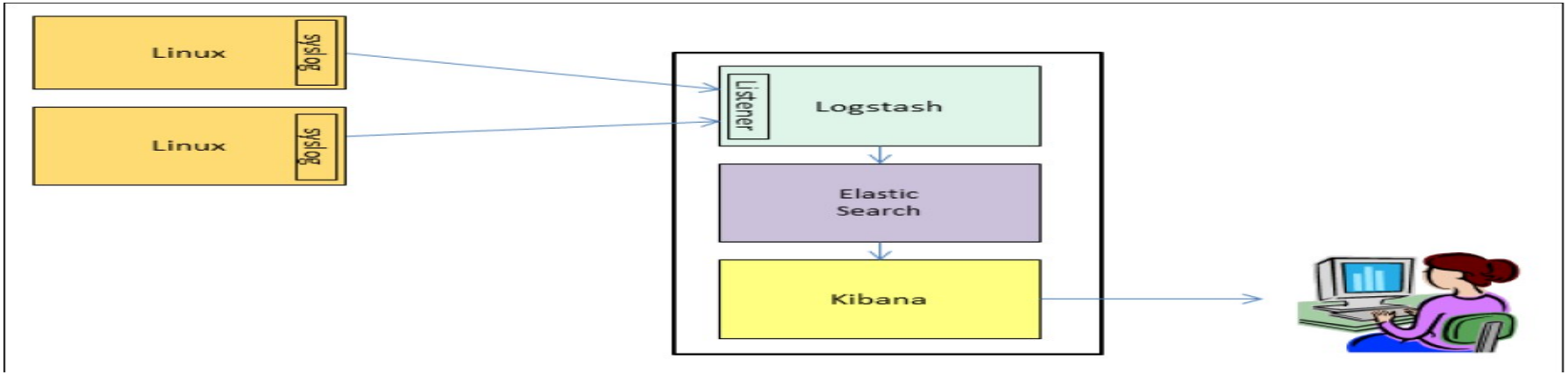


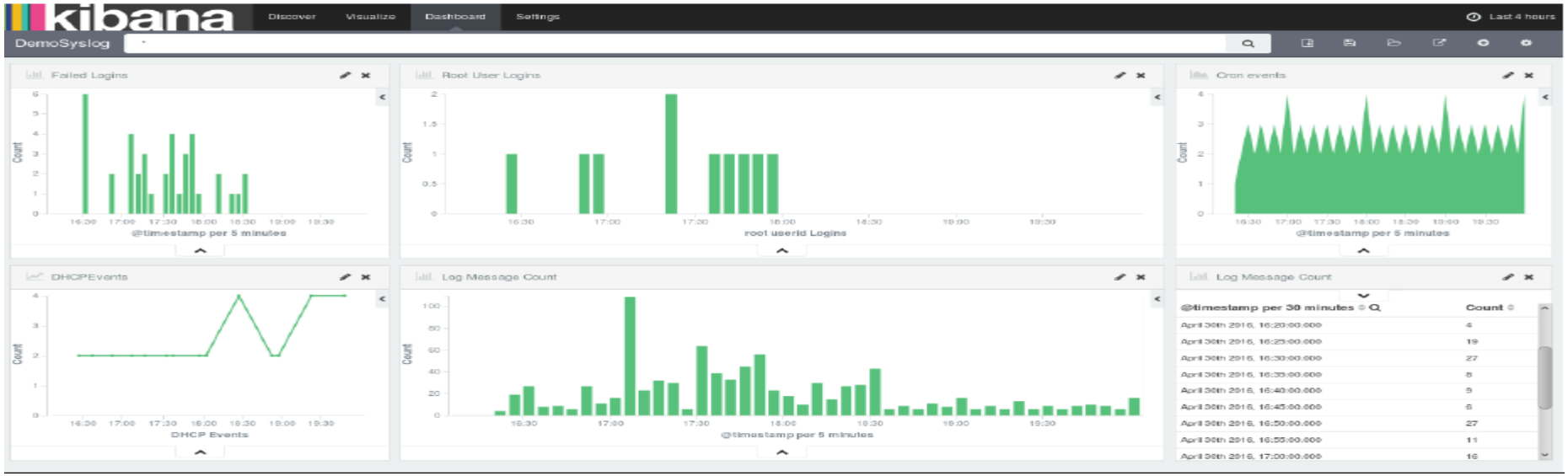


Performance Monitoring via Sar/kSar



Availability/Performance Monitoring via ELK





Hypervisor Performance Manager

- Supports policy-based goal-oriented monitoring and management of CPU resources
- Introduces the concept of workload resource groups, which define the context for monitoring and management
- Shipped as part of the KVM for IBM z delivery
  - Optionally enabled
- Scope of management is single KVM for IBM z instance
  - zHPM has 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

Where to get detailed Information

- **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 SC27-8236-02
  - KVM for IBM z Systems: Administration Guide SC27-8237-02
  - Linux on z Systems: Virtual Server Management SC34-2752-02
  - KVM Virtual Server Management Tools SC34-2763-00
  - Linux on z Systems: Virtual Server Quick Start SC34-2753-02
  - Linux on z Systems: Device Drivers, Features, and Commands for Linux as a KVM Guest SC34-2756
  - ...
- **Redbook: Getting Started with KVM for IBM z System**
  https://www.redbooks.ibm.com/abstracts/sg248332.html?Open
- **Performance Data / Planning Tools**
  - Limits: http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS5331
  - 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/atsmastr.nsf/WebIndex/PRS1381
- **List of supported IBM SW:**
  http://www.ibm.com/software/reports/compatibility/clarity/productsOnVe.html
- **Request for Enhancement (RFE) Community on developerWorks**
  https://www.ibm.com/developerworks/rfe/execute?
  use_case=changeRequestLanding&BRAND_ID=0&PROD_ID=1532&x=17&y=18

Questions?