IBM PowerVC
(Power Virtualization Center)

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Washington Systems Center
Agenda

• The Power Cloud Management Stack
• PowerVM NovaLink
• PowerVC Standard Edition
• IBM Cloud PowerVC Manager (for SDI)
• KVM on Power
• Requirements
• Live Demonstration
• Backup Charts
Power Systems Cloud Management Stack

**Cloud Orchestration Solutions**
- IBM Cloud Private
- vRealize
- Terraform
- SAP LVM
- Alternate OpenStack solutions

**IBM PowerVC**

**Cloud and Virtualization Management**
- Build Power Systems private clouds
- Quickly capture and deploy VMs
- Virtual machine resiliency and more...

**OpenPOWER™**

**Enterprise Power**
- Linux
- SUSE
- Red Hat
- AIX
- PowerVM™
- docker
- Ubuntu

**Example:** Using Terraform, customers can deploy a IBM Cloud Private cloud on PowerVC in minutes.

**Link:** [https://t.co/q0jUTFDeQ](https://t.co/q0jUTFDeQ)
IBM Power Systems Management

**Infrastructure as a Service**
- Cloud user self-service provisioning, projects & multi-tenancy as part of IBM Cloud PowerVC Manager
- Upstream with VMware vRA/vRO, VMware vROPS, IBM Cloud Private Cloud Automation Manager

**Virtualization Management with PowerVC**
- Leadership solution for PowerVM virtualization
- Virtual Image Management and Deployment
- Resource Pooling and Dynamic VM Placement
- Standard Edition has extended capabilities

**Power Systems Platform Management**
- PowerVM configuration and VIOS installation
- Firmware update, service and hardware maintenance
- HMC hardware appliance or VM (x86 or PowerVM)
- NovaLink LPAR running Ubuntu or RHEL

Providing comprehensive and consistent management experience for Power Systems
VMware vRealize for Power

- **vROPS for Power (VMware vRealize Operations for Power)** is a comprehensive data center operations management platform design to unify management from apps to infrastructure and across private, public and hybrid clouds.

- **vRA (VMware vRealize Automation)** allows the cloud admin to publish and build Blueprints in vRA for deployment of AIX, Linux on Power or IBM i VMs through PowerVC

IBM PowerVM NovaLink

- PowerVM NovaLink is a new path for on-host virtualization management (but not service/hardware management).

- Highly scalable management with up to 200 hosts and 5000 VMs under a single PowerVC server.

- Runs as a set of software packages installed on a Linux partition (Ubuntu or RHEL)

- Available starting on POWER8

- HMC still provides non-virtualization management functions like non-disruptive firmware update, Serviceable Event management (co-management)
**PowerVC Features**

- **Key Capabilities**
  - VM Capture and Deployment
  - VM Relocation
  - Policy-based VM placement
  - Optimization and rebalancing

- **Based on OpenStack**
  - Latest release: Queen

- **Capabilities beyond OpenStack**
  - Simplified user interface
  - Platform Resource Scheduler (EGO)
  - Reliability and serviceability
PowerVC Features

• PowerVM LPAR Guest management as virtual machine
  - No operating system installed agents
• Lifecycle management of VMs
  - Start, stop, delete (with full cleanup)
  - Host Maintenance Mode (evacuation)
• Volume Management
  - Zoning to facilitate VM creation with NPIV
  - SAN LUN creation, attach, detach, mapping and deletion
  - SSP LU creation, attach, detach, mapping and deletion
  - File-backed Disks in Software Defined Storage
• Other Supported Features
  - Dual HMCs, multiple Shared Processor Pools, AME
Advanced Virtualization Management for Power

Leveraging PowerVM to provide superior management and optimization

Differentiated with deep integration with IBM Power Systems...

Managing a pool of resources with single system simplicity

Vertically integrated and workload aware...

Image Deployment and Capture

VM Resilience and High Availability

VM Monitoring, Management, Mobility

On-Going Optimizations and Rebalancing

Policy based VM Placement

Security including Isolation and Multi-Tenancy

Integrated Server, Storage and Network Provisioning and Mobility

Horizontally integrated across server, storage and networking...

Key Infrastructure as a Service (IaaS) elements required for Cloud...
Capture and Deploy

- With traditional PowerVM-based SAN infrastructure
- Add PowerVC management server
- Manage ...

Capture ... Deploy ...

* With SDI instead of SAN it is all file-backed disks and NovaLink

HMC or NovaLink

PowerVM

SAN Storage*

Manage

Manage: LPAR becomes VM

Virtual Machine

Capture

Deploy

Captures creates image LUNs

Deploy: Creates VM and LUNs

* NPIV, Classic vSCSI and SSP are supported for NPIV all zoning is automated

Animated

Not all steps shown for simplicity
Host Groups allow the PowerVC administrator to create a logical boundary around a group of physical servers

- Each server can only be in one host group
- Deployment, mobility and remote restart are only allowed within the group
- Each group has its own placement policy
- Hosts are placed in the default group when added
## Placement Policies

- Placement Policy enabled per Host Group
- Migration, remote restart and maintenance mode relocations allowed only within Host Group

<table>
<thead>
<tr>
<th>Policy Description</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Packing</strong></td>
<td>YES</td>
</tr>
<tr>
<td>- Pack workload on fewest physical servers</td>
<td></td>
</tr>
<tr>
<td>- Maximizes usable capacity, reduces fragmentation, reduce energy consumption</td>
<td></td>
</tr>
<tr>
<td><strong>Striping</strong></td>
<td>YES</td>
</tr>
<tr>
<td>- Spread workload across as many physical servers as possible</td>
<td></td>
</tr>
<tr>
<td>- Reduce impact of host failures, higher application performance</td>
<td></td>
</tr>
<tr>
<td><strong>CPU Balance</strong></td>
<td>YES</td>
</tr>
<tr>
<td>- Place VMs on the hosts with the least allocated CPU</td>
<td></td>
</tr>
<tr>
<td>- Higher application performance</td>
<td></td>
</tr>
<tr>
<td><strong>Memory Balance</strong></td>
<td>YES</td>
</tr>
<tr>
<td>- Place VMs on the hosts with the most available memory</td>
<td></td>
</tr>
<tr>
<td>- Improve application performance</td>
<td></td>
</tr>
<tr>
<td><strong>CPU Utilization</strong></td>
<td>YES</td>
</tr>
<tr>
<td>- Lowest CPU Utilization in the Host Group</td>
<td></td>
</tr>
<tr>
<td>- Averaged over the last 15 minutes</td>
<td></td>
</tr>
<tr>
<td><strong>Affinity</strong></td>
<td>YES</td>
</tr>
<tr>
<td>- Affinity specifies that VMs should be placed on the same host or few hosts</td>
<td></td>
</tr>
<tr>
<td>- Useful for collocating VMs on the same host(s)</td>
<td></td>
</tr>
<tr>
<td><strong>Anti-Affinity</strong></td>
<td>YES</td>
</tr>
<tr>
<td>- Do not place VMs on same host</td>
<td></td>
</tr>
<tr>
<td>- Useful for ensuring VMs are not collocated</td>
<td></td>
</tr>
<tr>
<td>- Availability cluster support (e.g. PowerHA)</td>
<td></td>
</tr>
</tbody>
</table>
Move VMs from designated host to others in the same Host Group
- Supported on both PowerVM and KVM (no migration between hypervisors!)
- The host group policy determines destination locations
  - A targeted selection may override collocation rules
- Administratively driven operation, not automated, not designed for failure
  - For failure, see Automated Remote Restart on the next slide
- Can optionally NOT move, but disable the host as a target for deploy, migration and remote restart operations
Automated Remote Restart

- Restart VMs from a failed server on others in the same Host Group
  - Supports all operating systems
  - Source and Destination hosts must be same type (PowerVM, PowerVM+NovaLink or KVM)
    - Hosts must have "Remote Restart" enabled (PowerVM)
    - PowerVM LPARs must be set with “Remote Restartable” option
  - The host group policy determines destination locations
- Automated (or administratively) driven operation with customer timers
- Supported with both HMC and NovaLink-managed hosts
Dynamic Resource Optimizer

*Policy-based automation to balance workloads*

Dynamic Resource Optimizer allows for automated rebalancing of workloads between servers
- Server workload can be automatically balanced two ways:
  - Relocating Virtual Machines between servers
  - Moving processor capacity between servers in Power Enterprise Pools
- Works with AIX, IBM i or Linux VMs
- Advisory and Active mode; Scheduling based on time/calendar
- **Memory** and CPU usage based thresholds (Memory for NovaLink only)
IBM Cloud PowerVC Manager

➢ Role based access controls
  • Cloud Administrator for full control
  • Cloud User for Self-service access

➢ Multi-tenancy
  • Resource isolation by project
  • Resource usage tailored to Service Level Agreements, performance requirements, security, etc

➢ Deploy templates
  • Administrator-customized image templates, further controlling (limiting) self-service access

➢ Approvals and expiration
  • Optional administrator control
  • Enforce oversight and resource management

➢ Project resource allocation - also by user
  • Exportable via CSV
User roles are set to limit users’ capabilities within a project.

* networks can be cross-project
Managing All Types of Power...

- Traditional PowerVM-based configuration, i.e. dual VIOS, NPIV, SAN-based storage
- Support for all three PowerVM operating systems, AIX, Linux and IBM i
- Hardware Management via HMC (physical or virtual)
- PowerVC server runs on x86 or on Power RHEL
Managing All Types of Power...

- Alternative PowerVM-based configuration; still dual VIOS, NPIV, SAN-based storage **BUT** PowerVM NovaLink provides virtualization management (HMC still does the "other" stuff)
  - Optional: NovaLink using Software-Defined Networking (can use both SEA and Open vSwitch)
  - Support for all three PowerVM operating systems AIX, Linux and IBM i
  - Mix HMC-managed and NovaLink-managed hosts
  - PowerVC server runs on x86 or on Power RHEL
Managing All Types of Power...

- Software-Defined Networking (Open vSwitch) and Software-Defined Storage (Spectrum Scale)
- All I/O virtualization via NovaLink, VIOS is a MSP-only VM's use vSCSI
- Support for AIX, Linux (IBM i is a tech preview)
- Manage HMC- and NovaLink-managed plus Software-Defined hosts
- PowerVC server runs on x86 or on Power RHEL, also part of Spectrum Scale cluster
Managing All Types of Power…

- KVM on Power support on POWER8 servers running NovaLink software in the Host OS: RHEL or Ubuntu
  - No VIOS, VM's use virtio
  - KVM only supports Linux LE VMs
  - Mix PowerVM (all three) and KVM Hosts under one server; Only SDI hosts use file-backed I/O
  - PowerVC server runs on x86 or on Power RHEL, also part of Spectrum Scale cluster

PowerVC Server via HMC

PowerVM Hosts:
- AIX VM
- Linux VM
- IBM i VM
- VIO1
- VIO2

PowerVM Hosts:
- AIX VM
- Linux VM
- IBM i VM
- VIO1
- NovaLink
- VIO2

PowerVM Hosts:
- AIX VM
- Linux VM
- IBM i VM
- VIO1
- MSP
- NovaLink

KVM on Power:
- Linux VM
- NovaLink in Host OS

SAN Storage (block)

SAN or iSCSI (Spectrum Scale)
IBM Cloud PowerVC Manager for SDI

- Enables a Software Defined Infrastructure private cloud, optionally without a SAN
  - Can utilize storage-dense nodes (i.e. local disks) to build the shared global file system

- Includes IBM Spectrum Scale Data Management Edition
  - Can use “shared-nothing” FPO model to provide storage over the Ethernet OR SAN-based storage (not both)
  - Up to 2TiB per socket (on a per server basis) license included; more storage requires more IBM Spectrum Scale DME license
  - Cluster configuration including software installation and file system creation is completely automated by PowerVC; can add new disk via PowerVC UI and grow the file system

- Utilizes Software Defined Networking and PowerVM Open I/O
  - Traditional VIOS is no longer used for storage and network virtualization; PowerVM NovaLink takes over for PowerVM systems

- KVM on Power also supported (not PowerKVM, that's gone)

- Same capabilities as IBM Cloud PowerVC Manager plus the Spectrum Scale DME license

- Requires system firmware FW860.30 and NovaLink 1.0.0.8, or later; prefer later levels
# PowerVC Features

<table>
<thead>
<tr>
<th>PowerVC Features</th>
<th>Standard</th>
<th>IBM Cloud PowerVC Manager</th>
<th>SDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC or NovaLink managed (vSCSI, NPIV, VIOS SSP)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PowerVM with NovaLink</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(software-defined storage)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KVM on Power</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(software-defined storage)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managed LPAR Type</td>
<td>Linux AIX IBM i</td>
<td>Linux AIX IBM i</td>
<td>Linux *AIX *IBM i</td>
</tr>
<tr>
<td>Managed From OS</td>
<td>RHEL 7.4 BE or LE Power or x86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highly available VIOS configs</td>
<td>✓</td>
<td>✓</td>
<td>n/a</td>
</tr>
<tr>
<td>Policy-driven VM Placement</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Multi-tenant with Projects</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Self Service UI</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SAN-less</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Software-Defined Networking</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**PowerVC Standard Edition**

Simplified advanced virtualization for Power Systems running PowerVM with either HMC or NovaLink virtualization management.

**IBM Cloud PowerVC Manager**


**IBM Cloud PowerVC Manager for SDI**

Includes IBM Spectrum Scale DME license for Software-Defined Storage and uses native Linux Open vSwitch for Software-Defined Networking.

*Only on PowerVM, not KVM*
Programmable Switch (Open vSwitch) handles the configuration and traffic flow on a host:

- Overlay networks (next slide) can be configured "instantly" and exist across the enterprise
- L3 Gateway handles the bridging across the LAN/WAN so the overlay network is transparently large; PowerVC manages this on a Ubuntu 16.04 OS “network node”
- Quality of service rules implemented in the vSwitch for the workloads
- Security Groups can act as a hard firewall to allow/disallow only selected traffic to a given workload

Physical connectivity is done once and is forgotten

- Configure the I/O Server...
Overlay Networks (vxLAN)

- Overlay technology allows a VM to communicate to another location independent of backing physical network
  - Even cross-datacenter
- Virtualizes the client VM’s network onto the I/O hosts network (via the programmable vSwitch)
- Floating IPs can be used for in-bound communication (ex. a database) and moved dynamically
SR-IOV Virtual NIC (vNIC) and PowerVC

- Ethernet virtualization that allows for LPM (Direct assignment of LPs = no LPM)
- QoS capable
- Requires NovaLink and SR-IOV capable adapters (v1.4.2 supports HMC)
- AIX support; limited Linux support, no IBM i
PowerVC – LPM with SDI

- No LPM between hypervisor types (includes Remote Restart, Maintenance Mode, etc)
- No LPM from RHEL-KVM to Ubuntu-KVM
- LPM between HMC-managed and NovaLink-managed okay (assuming all standard LPM requisites have been met).
  - No LPM in-between Traditional SAN and SDI (Spectrum Scale)
PowerVM NovaLink SDI: Mover Service Partition

• PowerVM NovaLink mode uses a pre-configured VIOS image LPAR for Live Partition Mobility purposes

• This LPAR is backed by a file-based disk image using Linux I/O (LIO)

• You add or remove this MSP LPAR as padmin from NovaLink:
  
  pvmutil -o create_msp
  pvmutil -o delete_msp

• No other configuration is needed.

• You aren’t given the password to login to the MSP!
### PowerVM NovaLink SDI: VIOS and MSP

#### Before the MSP installation

```
$pvmctl vios list
```

Virtual I/O Servers

<table>
<thead>
<tr>
<th>Name</th>
<th>ID</th>
<th>State</th>
<th>RMC</th>
<th>Ref Code</th>
<th>Mem</th>
<th>CPU</th>
<th>Ent</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-1E10A</td>
<td>1</td>
<td>running</td>
<td>----</td>
<td>Linux ppc64le</td>
<td>32768</td>
<td>4</td>
<td>2.0</td>
</tr>
</tbody>
</table>

```
$pvmutil -o create_msp
```

#### Create the MSP

```
$pvmctl vios list
```

<table>
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<tr>
<th>Name</th>
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<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td>MoverServicePartition</td>
<td>2</td>
<td>running</td>
<td>active</td>
<td></td>
<td>3072</td>
<td>2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

#### After the MSP installation

This is the NovaLink LPAR! Why?

Because it handles I/O for client VMs!
PowerVM NovaLink SDI with MSP

- After running "pvmutil -o create_msp"...
Updating IBM Spectrum Scale in PowerVC

- Manually place the updated code on the PowerVC server
- Fully automated, rolling updates; uses Maintenance Mode

# ls -l /opt/ibm/powervc/images/spectrum-scale
-rw-r--r--  1 5830 Mar  6 12:40 ibmpowervc-powervm-gpfs_1.4.0.1-ubuntu1_all.deb
-r-xr-xr-x 16847 Mar  6 12:40 install
-rwxr-xr-x 724829334 Dec 10 20:28 Spectrum_Scale_Data_Management-5.0.0.0-ppc64LE-Linux-install
-rwxr-xr-x 725037082 Mar  7 11:27 Spectrum_Scale_Data_Management-5.0.0.1-ppc64LE-Linux-install
## File-Backed Disks in IBM Spectrum Scale

- Command-line on PowerVM NovaLink LPAR, padmin user

```
$ pvmctl scsi list
Virtual SCSI Mappings
+-----------+-------------+-----------+-----------------+--------------------------------------------------+
| LPAR      | LPAR Slot   | VIOS      | VIOS Slot       | Storage                                          |
+-----------+-------------+-----------+-----------------+--------------------------------------------------+
| MyLPAR    | 2           | sde-nova  | 7               | /gpfs/powervc_gpfs/infrastructure/disk_MyVM       |
+-----------+-------------+-----------+-----------------+--------------------------------------------------+
```

This is where PowerVC puts file-backed disk images.
KVM on Power with PowerVC

• KVM on Power from a PowerVC perspective looks nearly the same as PowerVM

• KVM on Power means Software Defined Infrastructure (SDN and SDS)

• No support for AIX or IBM i VMs

• Basic Installation Steps
  - Install the base OS and virtualization packages (i.e. KVM or RHEV)
  - Add the NovaLink repository to the KVM host; install NovaLink
  - Set SMT mode (P8)
  - Install and configure the Open vSwitch
  - Add the Host to PowerVC
Image Agility – aka Import and Export

PowerVC and Images
- Images are storage (typically LUNs in PowerVM world) that hold an OS and/or other “stuff”
- Images are “locked into” the storage they come from
- Capture/Deploy makes new copies on the same storage provider

Image Agility
- Now an official method to copy an Image between storage
- Also opens the door for DR and/or multisite ease of use

Supported Storage
- Any SAN
Image Import and Export

• Export an existing Image (captured VM) to file/set-of-files
  - Useful for backing up existing Images for archival
  - Can be used to transport an Image between PowerVC managed domains (i.e. Disaster Recovery) when storage-based methods are not available
• Import (create new) an Image from file/set-of-files
  - Copying an Image between storage subsystems (PowerVC does not have one-click “storage migration” capability)
• Big differences between GUI and Command Line
• Note: VIOS Shared Storage Pools are NOT supported at this time
  - Use existing documentation on transferring disk images to/from SSP
• Backup Repository can be OpenStack Object (swift)
Image Import and Export

Basic export capabilities:
• Export images from a storage provider → backup repository [GUI]
• Export images from a storage provider → OVA package [CLI]

Basic import capabilities:
• Import volumes from backup repository → new volume(s) + Image [GUI]
• Import volumes from an OVA package → new volumes(s) + Image [CLI]

Key Requirement for SAN! For SAN, must be configured as follows:

PowerVC Server ⟷ PowerVC-managed SAN ⟷ PowerVC-managed storage
Why Software-Defined and Power?

- SDN networking adds flexibility and ease-of-use (no networking group needed to re-wire every time).
  - ex. Lift and Shift of AIX LPARs to the Skytap cloud: https://www.skytap.com/partners/ibm-cloud-skytap-solutions/ IBM Cloud for Skytap Solutions

- Software-Defined Storage with PowerVC SDI
  - Systems folks can’t get the agility they need from the storage team and/or can’t get access to the storage (i.e. impenetrable silos)
  - VIOS Shared Storage Pools aren’t acceptable or have too many limitations
  - Customer wants a lower cost of entry and is comfortable with the shared-nothing type cluster with SDI + local storage (SAN is an option too).
  - One of the fastest ways to private Cloud with the least infrastructure (networking only versus networking+SAN)

- Customer has Linux workloads only and wants a lower-cost, more-powerful KVM solution (KVM on Power)
PowerVC FlexVolume Driver

Why?
- Kubernetes Cinder driver has limitations for Power
- Device naming logic for Guest OS doesn't work on Power
- No multi-attach volume support

A Helm chart in IBM Cloud Private
(ibm-power-k8s-volume-driver)

Driver Provides:
- Flex volume driver for attaching/mounting volumes
- Volume Provisioner for creating volumes and referencing flex driver
- Helm chart allows user to enter PowerVC configuration info
As the architecture of PowerVC and OpenStack technology has begun to stabilize and the number of Power Systems clients using PowerVC has increased, IBM has extended the service life of PowerVC releases from v1.3.0 to 18 months.

The v1.3.x stream of releases will also be supported for at least five (3+2) years.

https://www.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=POW03150USEN
Requirements for KVM Host under PowerVC

- Ubuntu 16.04 (POWER8) or 18.04+FP1 (required for POWER9)
- RHEL 7.5 with RHV 4.2
  - Watch the updates (i.e. don’t go too current)!
    For example: IBM Spectrum Scale v5.0.1.1 only supports
    kernel up to level 4.14.0-49 (RHEL 7.5 ALT) or 3.10.0-862
    (RHEL 7.5). Similar tested levels for Ubuntu.
    Check the Spectrum Scale FAQ!
- Client VMs will be Linux LE only (no AIX, IBM i or Linux BE)
- A server that can run KVM on Power bare-metal mode
  - IBM Power Server LC or L [in Opal mode]
  - OpenPower-branded
- Not using the OpenStack-based libvirt for a consistent
  programming/usage stack using NovaLink
- No LPM between Ubuntu KVM and RHEL KVM
Server Requirements for SDS

- CPU requirement: Power Server with at least 10 cores
  - For KVM, 2 vCPUs are allocated for NovaLink

- Memory requirement: 256GB or more; 64GB assigned to NovaLink

- Note: PowerVC Server requirements will also increase when using SDS (because of IBM Spectrum Scale)

- No support for managing/modifying the Spectrum Scale cluster or file systems, etc, outside of PowerVC!

**WARNING:** Do so at your own risk!
Network Requirements for SDS

- 10Gb Ethernet or higher; 25+ Gb Ethernet recommended
- 40Gb (minimum, 100Gb recommended) between frames if using 10Gb TOR switches and local-only disks
  - FC-backed SAN disks won’t require large network bandwidth
- KVM on Power can use VLANs, flat or overlay networking and will always use Open vSwitch (no SEA)
  - No support for SR-IOV vNIC on KVM on Power
  - Need two network connections (one for Host/NovaLink, one for the Open vSwitch bridge)
- DNS with reverse lookup is required
  - Not recommended to use /etc/hosts (too prone to syntactical mistakes or differences between hosts)
Storage Requirements for SDS Hosts

- If using local disks (i.e. not SAN), then a minimum of 5 disks (one for OS)
  - One of the 4 drives for Spectrum Scale should be SSD for metadata (system pool) and local cache (LROC)
  - There should be NO FC or iSCSI disks attached to host at “Add Host” time
- Local disk sizes, speeds and numbers per host should be the same across the cluster for more than just allocation and performance reasons
  - Starting small may limit nodes you can add later
- Maximum number of hosts is PowerVC maximum
- No mixing of local and SAN disks
Storage Requirements for SDS Host

- If using SAN-backed disks
  - Can be Fibre Channel or iSCSI, no mixing
  - 4 disks minimum, 10 disks recommended.
  - Must be mapped to ALL SDE nodes; must be empty (i.e. no partitions defined)
  - Can add/remove disks later on (grow/shrink file system)
- Maximum of 20 SDE nodes (testing)
- No mixing of local and SAN disks
- IBM Spectrum Scale v5.0 Data Management Edition
  - License included in IBM Cloud PowerVC Manager for SDI for up to 2TiB per socket per node
  - Can mix x86 PowerVC server with ppc64le KVM Hosts
  - Spectrum Scale code needs to be separately uploaded to PowerVC server for distribution and installation on SDI Hosts
Additional Features in PowerVC v1.4.1

- PowerVC Backup/Restore supported when using SDI
- Add modification of Partition Page Table to Host Properties and Compute Template
  - In large memory LPARs, modification improves performance
  - ex. SAP HANA uses a higher ratio (1:1024) than default (1:4096)
- Can now manually set MSP partitions for HMC-managed Hosts via `powervc-config compute mover-service-par`
- Enable Performance Data Collection now a Compute Template option
- Change from OpenStack ceilometer to gnocchi for metric collection
- New test (-t) flag to `install` command to verify pre-req availability
Enhancements in PowerVC v1.4.2 (GA Dec 14, 2018)

- SR-IOV Support via HMC
- Built on Fall 2018 OpenStack release
- Automated storage port load balancing
- AIX Secure boot supported on POWER9 running AIX 7.2TL3
- Fibre Channel tape pluggable driver (zoning for VMs)
- OpenStack Nova Availability Zones can be defined for upper level Orchestrators like IBM Cloud Private, VMware vRA
- VMAX REST storage driver technical preview
- Ability to copy existing compute or deploy templates
- Some UI columns can be customized
- Project selection at user logon time
Enhancements in PowerVC v1.4.1

- NPS survey launcher
- Add/remove data and metadata disks from an IBM Spectrum ScaleTM cluster
- SDN security groups
- SQL-based authentication for service users
- Affinity score checking
- Dual-initiator target zoning: Automatically configure candidate port groups for EMC VMAX storage devices
- Support for asynchronous copies on IBM DS8000 storage devices
- Ability to set the storage template ID for an existing volume
- SDN Quality of Service (QoS) Technology Preview
- IBM Cloud Private integration, with new FlexVolume driver to specify PowerVC managed volumes
Demonstration Backup Slides

Screenshots of demonstration
PowerVC Navigation

- Left-Hand icons
  - Home
  - Images
  - Virtual Machines
  - Hosts
  - Networks
  - Storage

- Top icons
  - Configuration
  - Messages
  - DRO Events
  - Requests
# VM Details

## VM: SSPlpar

### Information

<table>
<thead>
<tr>
<th>Name</th>
<th>SSPlpar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>Active</td>
</tr>
<tr>
<td>Health</td>
<td>OK</td>
</tr>
<tr>
<td>Host</td>
<td>sys7</td>
</tr>
<tr>
<td>Owner</td>
<td></td>
</tr>
<tr>
<td>Created</td>
<td>October 17, 2017 at 12:17:56 PM CDT</td>
</tr>
<tr>
<td>Expiration date</td>
<td>None</td>
</tr>
<tr>
<td>Memory</td>
<td>2 GB (Dedicated)</td>
</tr>
<tr>
<td>Processors</td>
<td>1</td>
</tr>
<tr>
<td>Processing units</td>
<td>0.1 (Shared)</td>
</tr>
</tbody>
</table>

### Processor Utilization

0%
Project Resource Totals

- Project Totals for VMs (and state), Virtual Processors, Memory, Processing Units and Storage (GB used)
PowerVC GUI – Adding a KVM Host

- Adding a KVM host