Looking beyond Linux for IBM Z and LinuxONE

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Agenda

• A brief overview of IBM Z and LinuxONE
• The SUSE products available for Z and LinuxONE
• Open source options available for Z and LinuxONE
  • Infrastructure-as-a-Service
  • Container orchestration
  • Cloud native application development and deployment
• Additional items to be aware of
The IBM Z and LinuxONE Portfolio

IBM ZR1 and LinuxONE Emperor™ II

- The world’s premier Linux systems for highly secured data and cloud serving
- Engineered for performance and scale
- Foundation for data serving and next generation apps

Machine Type: 3906
Models: LM1, LM2, LM3, LM4, LM5
Up to 171 cores and 32TB

IBM LinuxONE Rockhopper™ II

- Machine Type: 3907
- Model: LR1
- Up to 30 cores and 8TB

Built on decades of trusted IBM Technology
Built for the cloud with Standardization and Simplicity
Lower cost than x86 for mission critical data serving
Right sized for your business needs
IBM LinuxONE: Engineered for Security, Scalability, and Cloud

TRUST
The world’s premier Linux® system for highly secured data & cloud serving

- Pervasive Encryption for data at rest and in flight
- Industry-leading workload and tenant isolation
- Secure Service Container technology to help protect data and applications from internal and external threats

GROWTH
Engineered for performance and scale

- Consolidate hundreds of x86 cores on a single system¹
- Dedicated I/O processors to move massive amounts of data with uncompromised data integrity
- Vertical Scale architecture for responsiveness and efficiency

DIGITAL TRANSFORMATION
Foundation for data serving and next generation apps

- Performance and scale to consistently deliver on client and business demands
- Security and reliability to keep businesses up and running
- Support for vast portfolio of IBM, ISV and open source SW to support new application development and deployment
- Ability to reduce costs over x86²
A Different Approach to IT Infrastructure
IBM LinuxONE

- Centralized
- Optimized
- Flexible
- Modern
SUSE products available for IBM Z and LinuxONE
## SUSE Linux Enterprise Server certification on Z and LinuxONE

<table>
<thead>
<tr>
<th></th>
<th>Emperor II</th>
<th>Rockhopper II</th>
<th>Emperor</th>
<th>Rockhopper</th>
<th>zEnterprise — zEC12, zBC12</th>
<th>zEnterprise — z196, z114</th>
<th>System z10, System z9</th>
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*Certified and tested by Linux partner, tested by IBM*

*Certified and tested by Linux partner, not tested by IBM*

Overview shows Linux distributions in service.

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

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

Last update: 10/16/2018
SUSE Linux Enterprise Server certification on Z and LinuxONE

The publication of the SLES15 certification was delayed but results are being reviewed.

https://www.ibm.com/it-infrastructure/z/os/linux-tested-platforms
Items included in a SLES subscription for Z and LinuxONE that may be overlooked

• SLE Common code base
• Support SLES running in an LPAR and as a z/VM guest
• KVM included and fully supported
• SLE Modules*
  • Server Applications - Development Tools - Containers
  • Web and Scripting - Public Cloud - Legacy
  • Desktop Applications
• Package Hub
  • Over 12,800 packages available**

* Module names may be different between SLES 12 and 15
** SLES15 Package Hub
SLE Extensions

• **High Availability**
  • Has been available for SLES for Z for many years
  • Is included in the SLES for Z subscription*
  • A use case is Oracle and DB2 database failover when Oracle RAC or DB2 pureScale is not needed
    • SHARE presentations are available on this topic

• **Live Patching**
  • Not available of SLES for Z
  • Customers are interested – contact SUSE if you are interested
  • Use case is delayed reboot after kernel patch of mission critical database servers

* Exceptions exist depending on special offerings
SUSE Manager

Easily manage large complex deployments

- **Formulas with Forms** improved/extended to model even complex parameters (e.g. for user management) and fully API-enabled
- **Salt states can now be created and edited completely from the UI**
- **Action chains for Salt minions** *(update Salt through Salt, reboots, …)*

SUSE Manager 3.x is supported on IBM Z and LinuxONE

- Look at the SUSE Manager Advanced Topic Guide for server installation details
- **Version 3.2 Includes**
  - Salt 2018.3.0
  - Spacewalk 2.8
  - PosgreSQL 9.6
  - SLE 15 enablement

Uyuni

New upstream project for SUSE Manager
https://www.uyuni-project.org
Infrastructure-as-a-Service
Virtual server options for Z and LinuxONE
Implementations that enable OpenStack to manage Z resources

- IBM Cloud Management Appliance (CMA)
- z/VM Cloud Connector
- libvirt virtualization APIs
Implementations that enable OpenStack to manage Z resources

- IBM Cloud Management Appliance (CMA)
- z/VM Cloud Connector
- libvirt virtualization APIs
- Deprecated
Information about the z/VM Cloud Connector

- z/VM Cloud Connector is open source
- Can manage guests, images, network, volume, etc.
- RESTful API implementation that interacts with z/VM
- Develop your own automation!

```bash
# curl -X POST -H "Content-Type: application/json" -d @create-guest-gst00001.json http://localhost/guests
{"rs": 0, "overallRC": 0, "modID": null, "rc": 0, "output": [{"size": "1g", "is_boot_disk": "True", "disk_pool": "ECKD:pool", "vdev": "0100"}], "errmsg": ""

# curl http://localhost/guests
{"rs": 0, "overallRC": 0, "modID": null, "rc": 0, "output": ["GST00001"], "errmsg": ""

# curl http://localhost/guests/GST00001
{"rs": 0, "overallRC": 0, "modID": null, "rc": 0, "output": [{"user_direct": ["USER GST00001 LBYONLY 1024m 2G G", "INCLUDE OSDFLT", "COMMAND DEF STOR RESERVED 1024M", "CPU 00 BASE", "IPL 0100", "MACHINE ESA 4", "MDISK 0100 3390 0001 1457 JM6015 MR", "]}, "errmsg": ""

# curl -X DELETE http://localhost/guests/GST00001
{"rs": 0, "overallRC": 0, "modID": null, "rc": 0, "output": ", "errmsg": ""
```
Using OpenStack with the z/VM Cloud Connector

- OpenStack Compute service (nova) driver for z/VM was merged into OpenStack Rocky
  - No extra step required to install a z/VM nova driver

- Openstack Networking service (neutron) and Telemetry Data Collection service (ceilometer) are installed as plugins
  - Packages are available on the Open Build Service
Lab diagram using SUSE OpenStack Cloud 9

- LCLDCONN guest (SLES15)
- public vswitch
- switch
- SOC9 OpenStack Control Node (SLES12 SP4)
- X86_64
- OpenStack created instances (SLES12 SP4 & SLES15)
- z/VM 6.4
Basic deployment and configuration steps

• Deploy z/VM Cloud Connector on SLES15 in a z/VM guest
  • Install zthin (z/VM Cloud Connector) – Available via Open Build Service
  • Install python-zvm-sdk (z/VM Cloud Connector) – Available via Open Build Service
• Deploy SOC9 admin and control nodes on x86_64 systems
• Deploy a compute node on x86_64 system
  • Manually install openstack nova-compute package
  • Install zthin (z/VM Cloud Connector) – Available via Open Build Service
  • Install python-zvm-sdk (z/VM Cloud Connector) – Available via Open Build Service
  • Install networking-zvm (z/VM neutron driver) – Available via Open Build Service
  • Create /etc/nova/nova.conf.d/200-nova-zvm.conf
  • Create /etc/neutron/neutron.conf.d/200-ml2.conf
  • Create /etc/neutron/plugins/zvm/neutron_zvm_plugin.ini
• Restart neutron service
• Start openstack-neutron-zvm-agent and nova-compute services
• Create image and test deployment
Container orchestration
Containers 101

Software packaging method which contains
• Software or application
• Dependencies
• Minimal runtime components

Comparing Virtual Machines and Containers
• VMs require a complete operating system whereas Containers share OS kernel

Benefits of Containers versus VMs
• Start up in seconds
• Portable and lightweight
• Require fewer resources

Where are containers being used
• Microservices
• Continuous integration and deployment
• Cloud native applications

Working with containers
• Container engine (open source docker project)
• Tools required to create, secure, maintain and orchestrate
Container support in SLES for IBM Z and LinuxONE

- docker container engine (part of Containers module)
- Base SLES images from registry.suse.com
  - SLES12 SP3 & 4: `docker pull registry.suse.com/suse/sles12spX`
  - SLES15: `docker pull registry.suse.com/suse/sle15`
- Local registry via `docker-distribution-registry` package
  - Enable SUSE Package Hub repo to install
- Portus is not available because lack of built packages
  - Authorization server and a user interface for the Docker registry
An example of orchestrating containers at scale
Kubernetes cluster basics

Master

Worker nodes
Kubernetes Master node

Master node is responsible for managing the cluster:
- Scheduling applications
- Maintaining application state
- Scaling applications
- Rolling out updates

Components:
- etcd
- kube-apiserver
- kube-scheduler
- kube-controller-manager
Kubernetes worker nodes

Where the containers (applications) run

Components
- kubelet
- kube-proxy
- container runtime
Document Kubernetes Cluster Deployment on LinuxONE

Goal

Successfully build, deploy, document and demonstrate Kubernetes on several Linux distributions running on IBM LinuxONE. LinuxONE has proven to be an extremely scalable system for container deployments. Kubernetes is also proving itself as a leader for container orchestration. Combining Kubernetes and LinuxONE needs better documentation that explains the options available to install and configure Kubernetes on LinuxONE.

Expected Outcome

• At least one deployment of Kubernetes on each of the IBM tested and support Linux distributions.
• All steps for each Kubernetes deployment are documented.
• Work with the s390x Kubernetes maintainers to resolve any issues found during each deployment.
• Publish the documentation for each deployment on the Community pages of the Open Mainframe Project.

Interns

• Rajula Vineet Reddy
• Asish Varanasi
Cloud native application development and deployment
SUSE Cloud Foundry on Z

Sakala Venkata Krishna Rohit / Vlad Iovanov

@rohitsakala
Why SUSE Cloud Foundry on Z?

- **SCF - PaaS**
  - Cloud Foundry -
    - Focus on workloads that will be built and run in containers.
    - Templated workflow which developers leverage.
    - Kubernetes
  - Kubernetes -
    - Ubiquitous answer for operational side.
    - Not primarily focused on what you are running in the container.
  - Advantage of Cloud Foundry workflow by installing it into your kubernetes clusters.

Why SCF on Z?

- **Linux On Z Benefits**
  - I/O and Cache Intensive
  - Banking sector - Security/Encryption.
  - Fault tolerant mainframe hardware capable of over 90,000 I/O operations per second.
  - Linux On Z was built for applications that need Reliability, Accessibility, Security, Stability and Scalability (RASSS).
  - IBM z can support more virtual servers than any other in a single footprint.
  - Few examples
    - **mongodb** - 17tb. spare cores on failover for scalability - not available on x86 servers.
    - 2000 + docker spawn, better than x86.
    - 50 percent higher performance on apache spark than x86.

- Cloud is an open source project. Enabling this will have a lot of impact on mainframes.

Ref - [https://mediacenter.ibm.com/media/1_je27z8u8](https://mediacenter.ibm.com/media/1_je27z8u8)
Key Achievements

• Building openSuse bosh linux stemcell.
• Building openSuse fissile stemcell.
• SCF on Z
  – All releases of SCF were compiled successfully except for one.
Problems Faced

- openSUSE image for Z needs to be maintained.
- Boring ssl and google protobuf support for Z.
Additional items to be aware of
Positive impacts on the mainframe ecosystem

Increased collaboration

More open source development

Renewed academic interest
The Open Build Service (OBS)

OBS has resources to build s390x packages!
openSUSE Tumbleweed for s390x

- Rolling release
- Continuously updated and tested
- Perfect for developers and power users

openSUSE Factory
Port for s390x

11951 packages

Open Build Service

openQA

Work is progressing to enable s390x continuous testing
Thank you!

Upcoming SUSECON sessions for more information

- Can You Trust Your Cloud? How to Build a Secure Hybrid Cloud with IBM LinuxONE and SUSE [SPO1423] – Wednesday
- SUSE Linux Enterprise 15+ - the Future of OS [FUT1434] – Wednesday, Thursday
- SUSE Linux Enterprise Mission Critical - Simple Can Be Powerful [FUT1436] – Friday
- The SUSE Manager Roadmap: SUSE’s Vision for Vendor-Neutral Infrastructure Lifecycle Management [FUT1437] – Wednesday
- SUSE OpenStack Cloud Roadmap [FUT1430] – Tuesday, Thursday
- SUSE CaaS Platform Roadmap [FUT1431] – Wednesday, Friday
- SUSE Cloud Application Platform Roadmap [FUT1428] – Thursday
- From source to the package [TUT1197] – Wednesday
- Why Developers Choose openSUSE [DEV1178] – Thursday