Deploy and scale orchestrated container infrastructures on your own
TUT1166
Speaker Introductions

Who we are plus our backgrounds

• **Kishore Gagrani** works at DellEMC as Product Manager for PowerEdge Servers. He has worked extensively for past 7 years in Software Defined Storage and is responsible for making Dell's PowerEdge servers the best platform for Software Defined Storage including vSAN, Microsoft Storage Spaces Direct, VxRack Flex and Ceph to name a few. Kishore also manages several Software Products including Host Based Caching software. In addition, Kishore manages Road to Market strategy for emerging technologies for DellEMC with current focus on Blockchain and IoT Edge.

• **Bryan Gartner** is a Sr. Technology Strategist at SUSE for the past 6 years, working with major hardware and software partners plus embedded solution providers. This includes leveraging the SUSE portfolio to design, create, install and support proof-of-concept/production pilots, along with reference architectures, white papers and bench-marking deliverables plus sales enablement and training assistance. Core focus areas include cloud, containers, big data, distributed storage and high performance, technical computing realms. Bryan has been involved in the FOSS community for over two decades.
Agenda

Welcome to this journey … fasten your seatbelts

Overview
  - Context, Why/What/Who this addresses

IT Planning Pillars Relevant for Software-Defined Infrastructure
  - System, Network, Storage, Software, Automation

Target Phases
  - Crawl (proof-of-concept), Walk (extrapolate), Run (production)

Wrap-up
Overview
# Changing Business Demands are Transforming IT

## IT Infrastructure
- **Datacenter**
- **Hosted / Managed**
- **Cloud**

## Application Deployment
- **Physical Servers**
- **Virtual Servers**
- **Containers**

## Application Architecture
- **Monolithic**
- **N-Tier**
- **Microservices**

## Development Process
- **Waterfall**
- **Agile**
- **DevOps**
Containers Help Enterprises Accelerate IT

Accelerate application development and delivery

Build and deliver new cloud native applications

Modernize legacy applications
Container Usage is Growing

Containers Market 5x in 5 years

Enterprises Want Container Workloads in Production

27% Running Today

44% Planning to Run Within 1 year

17% Planning to Run Within 2 years or more

Cloud Adoption Trends Driving IT Transformation Research Report, Insight Avenue, 2017
1412 IT decision makers in companies with 250+ employees, across all sectors, interviewed in 2017
(55% VP / C-level / Director level, 45% Senior Manager level)
Deploying at Scale Requires Automation

Orchestration
• Scheduling
• Service discovery

Performance and availability
• Scaling
• Load balancing
• Self-healing
• Monitoring

Maintenance
• Rollout
• Rollback
SUSE CaaS Platform
Speed application delivery to improve business agility

SUSE CaaS Platform is a Kubernetes-based container management solution used by application development and DevOps teams to deploy, manage, and scale container-based applications and services.
1 Install Admin node
MicroOS one-step installation
AutoYaST profile autocreated
Admin Dashboard ready

2 Connect to Admin Dashboard

3 Deploy Nodes
Leverage AutoYaST profile

4 Bootstrap Cluster
With configured kubernetes, etcd, CNI/flannel, ...
DellEMC PowerEdge portfolio - a 40K Feet view

- Intel based portfolio of 1U/2U/4U, 1S, 2S and 4S Rack and Tower Servers
- AMD based portfolio of 1U/2U, 1S, 2S Rack Servers
- Intel based portfolio of Modular Servers and Storage Sleds
IT Planning Pillar Considerations
IT Planning Pillars

Beyond the shiny objects, there are still the standard aspects/considerations of IT

Required Attributes, Recommended Configurations, Best Practices across

- System
- Network
- Storage
- Software
- Automation

… which we’ll respectively address over each stage of the implementation
Target Phase : Proof-of-Concept
Target Phase

Crawl : Proof-of-Concept

Goal

• Developer:
  - My manager asked me to evaluate containers for future applications. I’ve been playing with containers on my system, but now I’d like to have a simple, deployment platform to target where I can utilize orchestration in order to demonstrate this to my peers

• IT
  - Okay, let me setup a virtualized environment for you to use and evaluate
Deployment: Proof-of-Concept
Server Considerations

1U/2S PowerEdge R640 Server
- 3.5” Chassis with up to 4 Hard Drives and 3 PCIe slots
- >Intel® Xeon® Gold 6126 2.6G, 12C/24T, 10.4GT/s, 19.25M Cache, Turbo, HT (125W) DDR4-2666
- >384Gb Memory (32Gb X 12)
- >240GB SSD SATA Mixed Use 6Gbps 512e 2.5in Hot plug, 3.5in HYB CARR S4610 Drive X 2
- BOSS controller card + with 2 M.2 Sticks 240G (RAID 1), LP

Virtualization/BIOS Recommendations
- Default BIOS Setting
  - Enables Virtualization Technology; allows IOMMU mapping to VMs
Network Considerations

Physical Infrastructure
- Intel X550 Quad Port 10GbE, Base-T, rNDC
- Top-of-Rack (ToR) 10GbE switch; Dell Networking S4128T
- Otherwise, pretty straightforward, since mostly internal to VMs on the physical host
  - But do plan ahead for capacity of internal service networks

Critical Services
- Network Time Protocol (NTP)
- Domain Name Service (DNS)

Recommended Services
- Updates
  - Can either use Subscription Management Tool (SMT) or direct access to SUSE Customer Center
- Load Balancer (LB)
  - In anticipation of later scale-out, use LB or setup HAProxy for Kubernetes Master Node APIs
Less relevant pillars for this crawl phase

Storage
- Mostly stateless microservices being deployed
- Container images are from public repositories

Software
- Already covered overarching software solution

Automation
- Deployment is pretty easy, and most IT Admins are familiar with these processes
Accomplished Target Phase Goals

Crawling : Nailed it!

Functional Status

- Stateless microservices can now deployed at will
  • CLI access from remote client systems, based upon a simple, user-specific configuration file
- Can visit cAdvisor URLs to assess worker node resource utilization
Target Phase : Extrapolate Out
Target Phase

Walk: Extrapolate out to handle increased usage

Goal

• Developer:
  - Okay, I'm liking how this works and have gotten most of my team engaged on this approach and we'd like to have more resources to target with our containerized workloads

• IT
  - Okay, let me scale out the existing environment for your team to continue using
Deployment : Extrapolation
Server Considerations

1U/2S PowerEdge Servers > 12

- 3.5” Chassis with up to 4 Hard Drives and 3 PCIe slots
- > Intel® Xeon® Gold 5122 3.6G, 4C/8T, 10.4GT/s, 16.5M Cache, Turbo, HT (105W) DDR4-2666
- > 8GB RDIMM, 2666MT/s, X 12 = 96Gb
- > 240GB SSD SATA Mixed Use 6Gbps 512e 2.5in Hot plug, 3.5in HYB CARR S4610 Drive Fifth X 2 : RAID 1

- BOSS Considerations
Network Considerations

Physical Infrastructure
- Intel X550 Quad Port 10GbE, Base-T, rNDC
- ToR 10Gbe switch; Dell Networking S4128T (Consider 2 to distribute servers in two racks)
Less relevant pillars for this crawl phase

Storage

• Still mostly stateless microservices being deployed
• Container images are still from public repositories
Software Considerations

HAProxy / LB

• Ensure, as Kubernetes Masters are added, that these nodes/API ports are configured

Role-Based Access Control

• Create distinct user accounts (see SUSE CaaS Platform Administration Guide)

• Use the fine-grained attributes of Kubernetes to limit who can do what

Monitoring

• Install, via Helm, simple tools like Heapster to augment cAdvisor and provide CLI access to node/pod resource usage
Accomplished Target Phase Goals

Walking: Can do that all day long, everyday!

Functional Status

• Stateless microservices deployed at will
  - CLI access from remote client systems, based upon a simple, user-specific configuration file
  - More granular access controls to limit who can do what
  - Sophisticated combinations of orchestrated services possible, including leveraging outside examples

• Easily add more powerful compute nodes
  - Basic resource utilization tools in place
Target Phase: Full Production Instance
Target Phase

Run: Production requirements addressed

Goal

• Line of Business Manager:
  - Given our current state of development and plans to productionize this approach, I want to have the confidence of the solution platform having the resiliency and availability necessary for our customer base. I now need to have this platform maintained. I also need to migrate/transition existing monolithic workloads to containers.

• CIO
  - We need to address security, updates for this infrastructure, plus integrate it with monitoring and other portions of our overall software-defined-infrastructure (SDI) strategy

• IT
  - Okay, let me pull in the required components to create a full production infrastructure for microservices
SUSE Enterprise Storage
A Ceph-based, award-winning, enterprise-grade solution

Intelligent software-defined storage – highly scalable and resilient storage that is cost-efficient to purchase, simple to manage and, enterprise consumable and will:

- Deploy a Highly Scalable and resilient environment
- Reduce IT Costs both CAPEX and OPEX
- Automatically Optimize and add storage without disruption
Server Considerations – For Storage Nodes

2U/2S PowerEdge Servers <= 150 / cluster instance (for container nodes)

- Chassis with Up to 12 x 3.5” Hard Drives for 2CPU Configuration
- > Intel® Xeon® Platinum 8180M 2.5G, 28C/56T, 10.4GT/s, 38M Cache, Turbo, HT (205W) 1.5TB DDR4-266
- > 32GB RDIMM, 2666MT/s, X 16 = 512Gb
- BOSS controller card + with 2 M.2 Sticks 240G (RAID 1), HP
Storage Cluster Topology Considerations

OSD Nodes

Public N/W

Private N/W

Monitor Nodes

Solution Admin Host

Public/Gateway Client Node

PowerEdge R740XD

DellEMC Switch S5248-F

DellEMC Switch S4112-ON

PowerEdge R640
Network Considerations

Physical Infrastructure

- Channel bonding across the servers and switches
- Broadcom 57414 Dual Port 25Gb, SFP28, rNDC
- Broadcom 57414 Dual Port 25Gb, SFP28, PCIe Adapter, Full Height
- Dell Networking S5248F-ON (25G ToR, 48 Ports)
- Distribute Servers and Switches over multiple racks
Software Considerations

Security Updates
• Easily applied as they become available
• erasure

Graphical User and Admin Dashboards

Leverage native integration between Kubernetes and Ceph
• For both dynamic and persistent volumes
• And for logging/monitoring usage
Automation Considerations

PowerEdge Systems Management for Automation

• Configure deployment automation for
  - BIOS Settings: For example PXE Boot, Right Boot Order, Power Management, OS Provisioning
    • Use Server Configuration Profile (SCP) via iDRAC
    • Install OpenManage Ansible Modules and Libraries
    • Create NFS for SCP file sharing
    • Create scripts, github has some guidelines
  - Switch Configuration [dellos10]: Build and Run Container image:
    • $ cd src/os10-configuration
    • $ docker build –t ansible25
    • Update inventory group [dellos10] with credentials and IP addresses

• Links to APIs
  - Dell OME APIs: https://github.com/dell/OpenManage-Enterprise
  - iDRAC RedFish scripting: https://github.com/dell/iDRAC-Redfish-Scripting
  - Dell Open Manage SDK: https://github.com/dell/omsdk
Automation Considerations

PowerEdge Systems Management for Automation

- Dell OME APIs: https://github.com/dell/OpenManage-Enterprise

Get list of groups
Get list of devices
Get device Inventory
Get group details (including devices in this group)
Get group details using Filter constructs
Get list of alerts by group
Get list of alerts by device
Add IP / Hosts to discovery range
Perform firmware update on devices / groups using a single DUP file
Run a pre-defined report
Automation Considerations

PowerEdge Systems Management for Automation

• iDRAC RedFish scripting: https://github.com/dell/iDRAC-Redfish-Scripting
  iDRAC REST API with Redfish Scripting Library for following actions:
  - BIOS operations • Get / Set BIOS attributes • Get / Set BIOS boot order, boot source state • Set next one-time boot device
    • Set BIOS to default settings
  - iDRAC operations • Change an iDRAC user password • Set iDRAC to default settings • Get iDRAC Lifecycle Controller
    logs • Get / Set iDRAC, Lifecycle Controller, and System Attributes
  - Firmware operations • Get server firmware inventory • Perform a single server device firmware update
  - Server operations • Export / Import Server Configuration Profile (SCP) • Preview SCP Import • Get / Set server power state
    • Get server storage inventory
  - Prerequisites • PowerEdge 12G/13G/14G servers • Minimum iDRAC 7/8 FW 2.40.40.40, iDRAC9 FW 3.00.00.00 • Python
    2.x or later • PowerShell 5.0 or later

• Dell Open Manage SDK (OMSDK): https://github.com/dell/omsdk
  - A python library helps automate PE's lifecycle management
  - Leverages iDRAC's REST APIs
  - Based on DMTF Redfish standards, WS-Man and SNMP protocols for configuration, deployment, updates and monitoring
    of PowerEdge Servers
Deployment: Production

Solution Admin Host

- SES Admin
- CaaS Admin
- K8s Workers
- K8s Masters
- Ceph Mons
- Ceph OSDs

- Bond

- NTP
- DNS
- SMT
- LB
- iDRAC

- Client

- Ceph gw(s)

- Import
- SES Private
- SES Public
- CaaS/Service
- CaaS/Cluster
- CaaS/Public
- Import
- etcd
Accomplished Target Phase Goals

Running: Keeping up with agile, DevOps is no sweat now!

Functional Status

• Updates (including security issues) of the underlying infrastructure handled easily
• Redundancy of core node roles accomplished
• Scale-out possible for high node counts
• Stateful gamut of microservices can now deployed at will, leveraging a software defined storage backend.
• Complete resource monitoring utilities in place
Wrap-up
Wrap-up

Whew, we’ve covered a lot of ground/topics

Transitionary Implementation Covered
- From Proof-of-Concept to Scale Out to Production Infrastructure
- Taking in to account IT Pillars of System, Network, Storage, Software, Automation

Possible next steps and other considerations
- Multiple Instances
- Additional Workloads
References

Where to get more details

Dell EMC

• Network Switches
• PowerEdge Rack Servers

SUSE

• SUSE CaaS Platform
  - https://www.suse.com/products/caas-platform/ (Guides)
• SUSE Enterprise Storage
  - https://www.suse.com/products/suse-enterprise-storage/ (Guides)

Reference Implementation

Relevant SUSECon Sessions … search CaaS Platform, SUSE Enterprise Storage
⇒ SPO1419 for more details on the storage aspect
Questions
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