Finding Your Faults Before Mom…

Deploying Splunk For It Troubleshooting And Capacity Planning On Large Scale Integrated Data Center Infrastructure

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Cisco

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About…

Karthik Karupasamy

- Technical Marketing Engineer with Cisco UCS focusing on Big Data solutions and UCS Director Express for Big Data.
- Co-authored several Cisco Validated Designs with ISV and Hardware partners.
- Main focus areas: architecture, solutions, and emerging trends in big data and infrastructure in the Data Center.

Wissam Ali-Ahmad

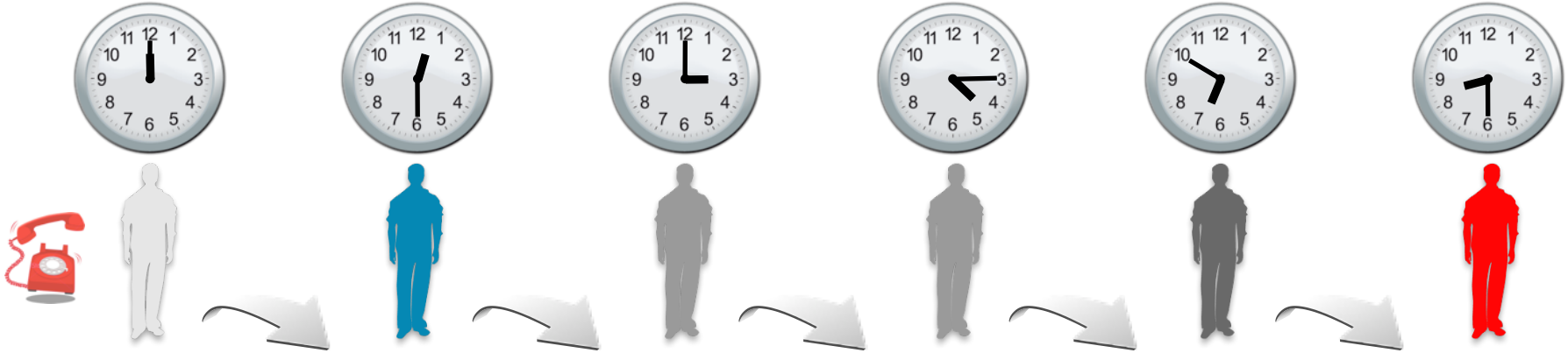
- Solution Architect, Technical Alliance Lead in Global Strategic Alliances team at Splunk.
- 15 years of technical experience in big data, security, cloud infrastructure and enterprise software.
- Prior to Splunk, held engineering leadership roles at AppSense, Infoblox, Qualys, Vernier Networks, PSS Systems and Verizon Labs.

Agenda

- IT Operational Analytics at enterprise scale
  - Current State
- Deployment of a large scale analytics platform
  - Challenges
  - How can Splunk and Cisco help?
- Splunk and Cisco UCS for IT Troubleshooting
  - Architecture
  - Data Collection and Mapping
  - Use Cases
  - Demo

IT Operations Analytics at Enterprise Scale

What It's Like in the IT Trenches



Service Desk	Application Support	Application Developer	Systems Administrator	Application Developer	Database Administrator
Log call. The console says everything is green. **Escalate.**	Java monitoring tools don't show anything either. Call the developer. **Escalate.**	Stop working on new code to troubleshoot. Need production logs! **Escalate.**	Stop what they're doing to identify & gather production logs for developer. **Respond.**	Manual investigation establishes not application problem. **Escalate.**	DBA analyzes audit logs which points to bad query. **Now what?**

IT silos create obstacles to consistent application, infrastructure performance

Obstacles to End-to-End Visibility, High Availability/Performance

Organizational silos

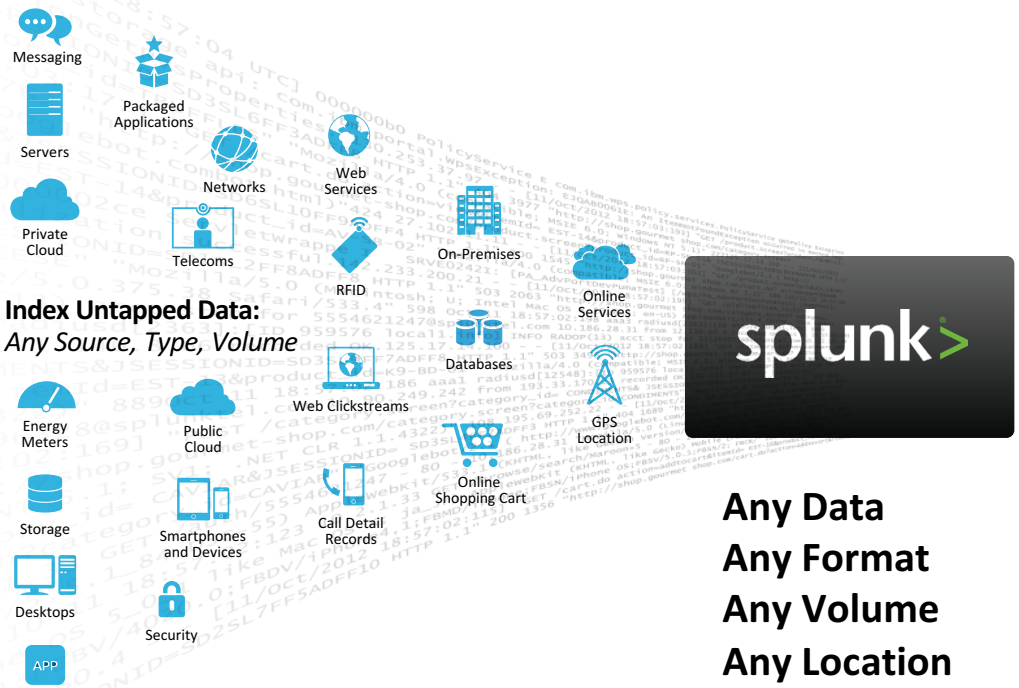
Different management and monitoring tools

Prevent IT from delivering predictive services, meeting SLAs

Lack of visibility puts SLAs in jeopardy

Required: Operational Intelligence at Scale

Data-Driven Insights To Enhance IT Performance with Splunk



Index Untapped Data:
Any Source, Type, Volume

Any Data
Any Format
Any Volume
Any Location

Real-time visibility across stack

Scalable platform

One software, many use cases

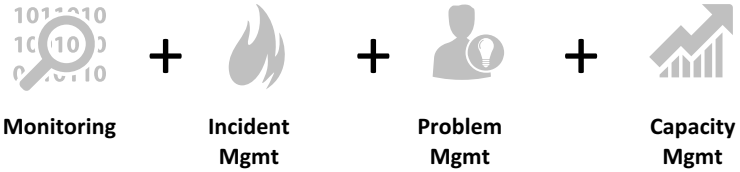
Quick root cause and issue resolution

Splunk and Cisco UCS

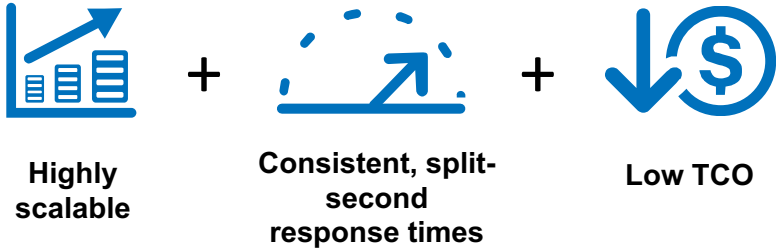
High Performance High Scale Infrastructure Platform for IT Operations Analytics

Analytics Software

- **Single software platform** integrates across infrastructure silos, enabling visibility to data anywhere
- **Flexibility** to identify, analyze new data sources
- **Fast time to value**
- **Comprehensive IT management functionality** to improve IT productivity



Analytics Infrastructure



Deployment of large scale analytics platform

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Cisco Unified Computing System

A differentiated, revolutionary approach

Simplified Architecture

- Networking with fewer components
- Lower cost and easier scaling
- Fewer management touch points
- Stateless: any resource, any time
- Better TCO/ROI

Unified Management

- Faster deploy/ provision
- Unification leads to reduced complexity
- Management via a single interface

Higher Performance

- Brings out the best of x86 architecture
- Optimized resource utilization for compute, networking, and management

Scale

- Ultimate Scalability
- Enhanced design capability
- Designed for the future, today

Cisco UCS: Industry-Leading Performance

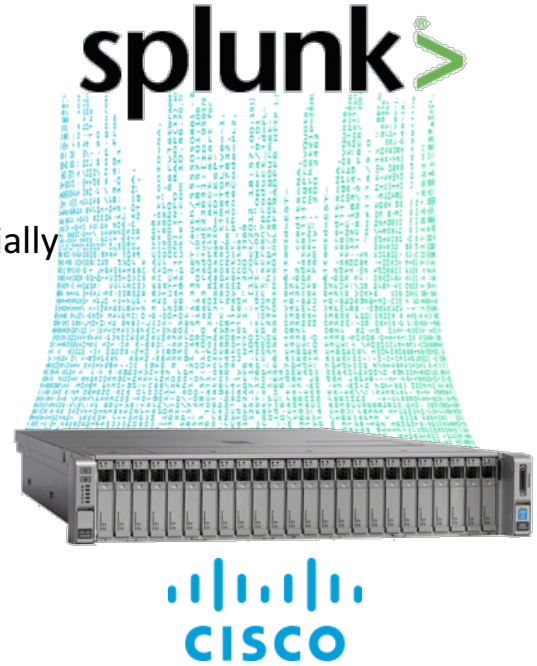
110 World-record Benchmark Results

26	17	9	18	15	19	6
CPU	Virtualization/ Cloud	Database	Enterprise Application	Enterprise Middleware	HPC	Big Data

Cisco UCS Benchmarks that held world record performance records as of date of publication For details, please see source document "Cisco Unified Computing System and Intel Xeon Processors: 100 World-Record Performance Results" at http://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/le_32801_pb_ucs_worldrecords.pd

UCS Enables Operational Intelligence at Scale

- Seamless Scalability Facilitates Rapid Growth
  - Ability to scale from a single instance to distributed deployment
  - Runs on the same UCS C-Series as other big data platforms
- Split Second Response Times
  - Exceptional performance for “needle-in-a-haystack” searches
  - Consistent performance as simultaneous users increase exponentially
  - Up to 6x search performance gains upgrading 6.2 to 6.3 on UCS
- Enterprise Class Analytics Infrastructure
  - Reliable, manageable server platform
  - 1/2 the datacenter footprint of reference hardware
- Simplified, Repeatable Deployments
  - Four pre-tested UCS Integrated Infrastructures, CVD



Cisco UCS Integrated Infrastructure for Big Data

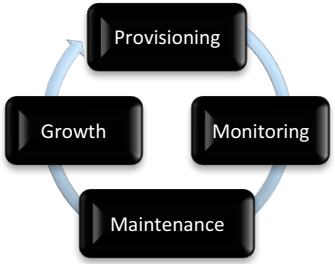
Optimized for Big Data Workloads Today and Tomorrow

UCS 6200 Series Fabric Internments
Installed in pairs, active-active.
UCS Manager is embedded

Support for direct connectivity to Fabric Interconnects or through Nexus 2232 10GE Fabric Extender

SingleConnect
- LAN
- SAN
- Management

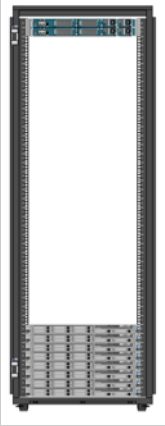
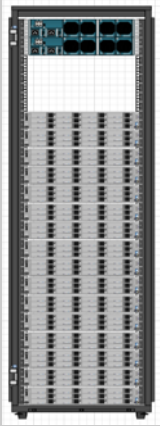
UCS C240 M4 Servers



- Pre-tested and pre-validated configuration
- Fabric-based infrastructure integrates computing, networking, and storage resources
- Designed for high performance and availability

Cisco UCS Integrated Infrastructure for Big Data

4th Generation of Reference Architectures and Bundles

UCS-SL-CPA4-S	UCS-SL-CPA4-H	UCS-SL-CPA4-P1	UCS-SL-CPA4-P2	UCS-SL-CPA4-P3	UCS-SL-CPA4-C1	UCS-SL-CPA4-C2	<TBD>
							
Network: 2x 6248 Servers: 8 X UCS-BD-C220M4-S1 Server Type: C220 M4 SFF CPU: 2x 2620v4 Memory: 128GB DDR4 Drives: 8 x 1.2TB 10K SAS HDD VIC: VIC 1227 RAID: 12Gps SAS, 2GB UCSD: no Cores: 128 Memory: 1024 Raw Storage: 76.8 I/O Bandwidth: 7.5 Gbytes/sec	Network: 2x 6332 Servers: 8 X UCS-BD-C220M4-H1 Server Type: C220 M4 SFF CPU: 2x 2680v4 Memory: 256GB DDR4 Drives: 8 x 960GB SSD VIC: VIC 1387 RAID: 12Gps SAS, 2GB UCSD: no Cores: 224 Memory: 2048 Raw Storage: 60 I/O Bandwidth: 20 Gbytes/sec	Network: 2x 6296 Servers: 16 X UCS-BD-C240M4-P1 Server Type: C240 M4 SFF CPU: 2x 2680v4 Memory: 256GB DDR4 OS: 2 x 240GB SSD Drives: 24 x 1.2TB 10K SAS HDD VIC: VIC 1227 RAID: 12Gps SAS, 2GB UCSD: yes Cores: 448 Memory: 4096 Raw Storage: 460.8 I/O Bandwidth: 45 Gbytes/sec	Network: 2x 6296 Servers: 16 X UCS-BD-C240M4-P2 Server Type: C240 M4 SFF CPU: 2x 2680v4 Memory: 256GB DDR4 OS: 2 x 240GB SSD Drives: 24 x 1.8TB 10K SAS HDD VIC: VIC 1227 RAID: 12Gps SAS, 2GB UCSD: yes Cores: 448 Memory: 4096 Raw Storage: 691.2 I/O Bandwidth: 48.75 Gbytes/sec	Network: 2x 6332 Servers: 16 X UCS-BD-C240M4-P3 Server Type: C240 M4 SFF CPU: 2x 2680v4 Memory: 256GB DDR4 OS: 2 x 240GB SSD Drives: 24 x 1.8TB 10K SAS HDD VIC: VIC 1387 RAID: 12Gps SAS, 2GB UCSD: yes Cores: 448 Memory: 4096 Raw Storage: 691.2 I/O Bandwidth: 48.75 Gbytes/sec	Network: 2x 6296 Servers: 16 X UCS-BD-C240M4-C1 Server Type: C240 M4 LFF CPU: 2x 2620v4 Memory: 128GB DDR4 OS: 2 x 240GB SSD Drives: 12 x 6TB 7.2K SAS HDD VIC: VIC 1227 RAID: 12Gps SAS, 2GB UCSD: yes Cores: 256 Memory: 2048 Raw Storage: 1152 I/O Bandwidth: 26.25 Gbytes/sec	Network: 2x 6296 Servers: 16 X UCS-BD-C240M4-C2 Server Type: C240 M4 LFF CPU: 2x 2620v4 Memory: 256GB DDR4 OS: 2 x 240GB SSD Drives: 12 x 8TB 7.2K SAS HDD VIC: VIC 1227 RAID: 12Gps SAS, 2GB UCSD: yes Cores: 256 Memory: 4096 Raw Storage: 1536 I/O Bandwidth: 26.25 Gbytes/sec	Network: 2x 6332 Servers: 9 X UCS-BD-C3220-HC1 Server Type: C3260 (2 x servers) CPU: 2 x 2680v4 Memory: 256GB DDR4 OS: 2 x 240GB SSD Drives: 424 6TB 7.2K SAS HDD VIC: VIC 1387 RAID: 12Gps SAS, 2GB UCSD: yes Cores: 504 Memory: 4608 Raw Storage: 2544 I/O Bandwidth: 57.97 Gbytes/sec

TO UPDATE

Splunk Reference Archittecture

Cisco Validated Design (CVD) for Splunk on UCS

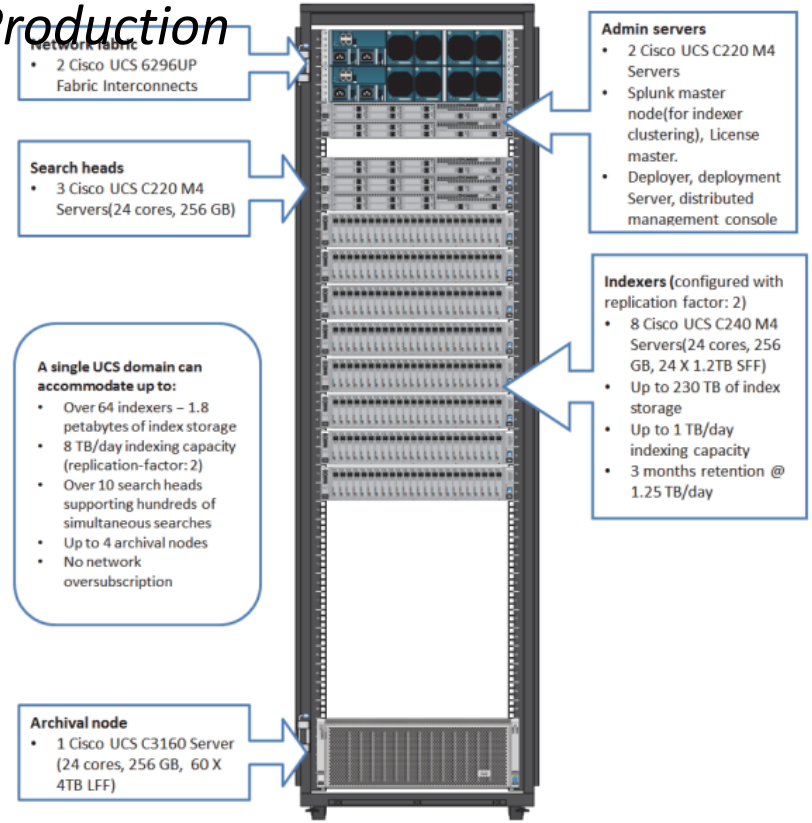
From Pallet to Production

Cisco UCS Integrated Infrastructure for Big Data with Splunk Enterprise

With Cluster Mode for High Availability and Optional Data Archival

Last Updated: June 8, 2015

http://www.cisco.com/c/dam/en/us/solutions/collateral/data-center-virtualization/big-data/splunk-enterprise.pdf



Indexer Reference Configurations

	Configuration 1		Configuration 2		Configuration 3	
Server Spec	C240 M4 with • RAID10: 24 1.2TB 10K SAS HDDs		C240 M4 with • RAID10: 24 1.8TB 10K SAS HDDs		C240 M4 with • RAID5: 8 x 960 GB SSDs (HOT/WARM) • RAID50: 16 x 1.8TB 10K SAS HDDs (COLD) RAID50: 4 HDDs per span RAID50: 5 HDDs per span + 1 spare	
Retention/ Storage	Duration (days)	Storage (TB)	Duration (days)	Storage(TB)	Duration (days)	Storage (TB)
HOT/WARM	30	14 TB	45	21 TB	30	6
COLD	60		90		120	21
Total Retention	90	14 TB	135	21 TB	150	27

C240 M4 servers with 2 E5-2680 v4 CPUs, 256GB RAM and 24 SFF HDD or SSD drives -- 250 GB per day

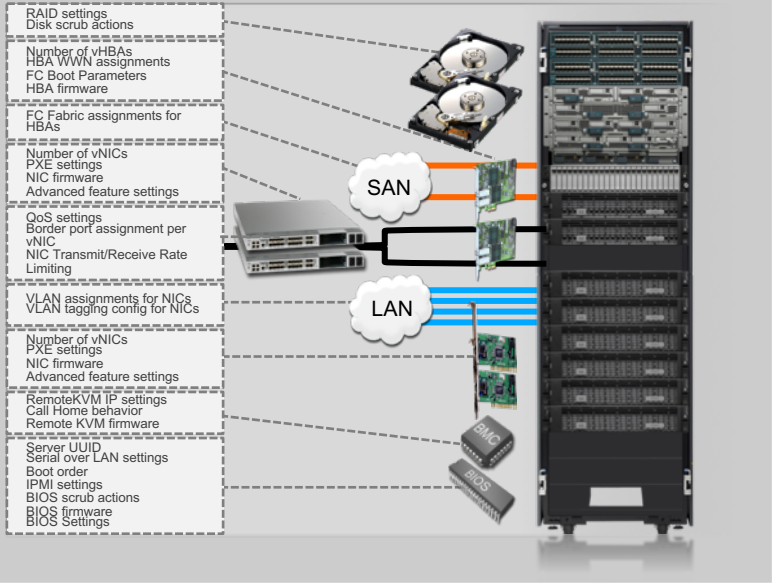
Splunk on UCS sizing

Daily Indexing Capacity (per day)	Number of Indexers Required (per above configuration and retention)		
	No Replication	Replication Factor(RF)=2 Search Factor(SF)=2	RF=3 SF=3
250 GB	1	2	3
500 GB	2	4	6
1 TB	4	8	12
2 TB	8	16	24
4 TB	16	32	48
8 TB	32	64	96

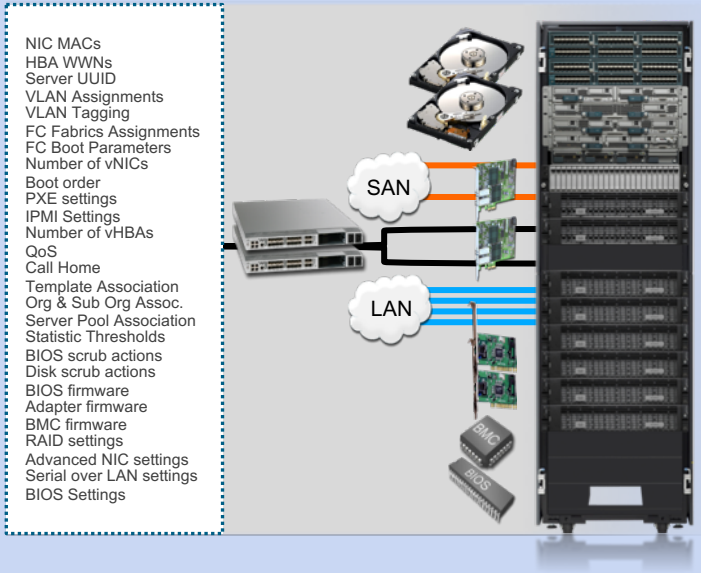
Cisco UCS Advantage - Unified Management

Robust management delivers superior programmability, scalability, and automation for Big Data deployments

Traditional

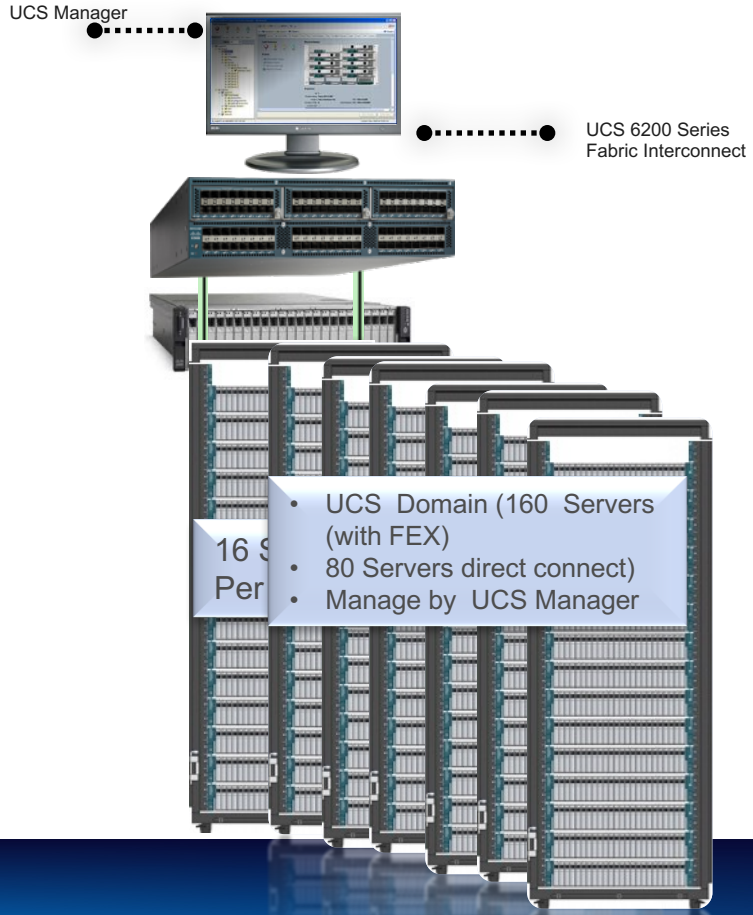


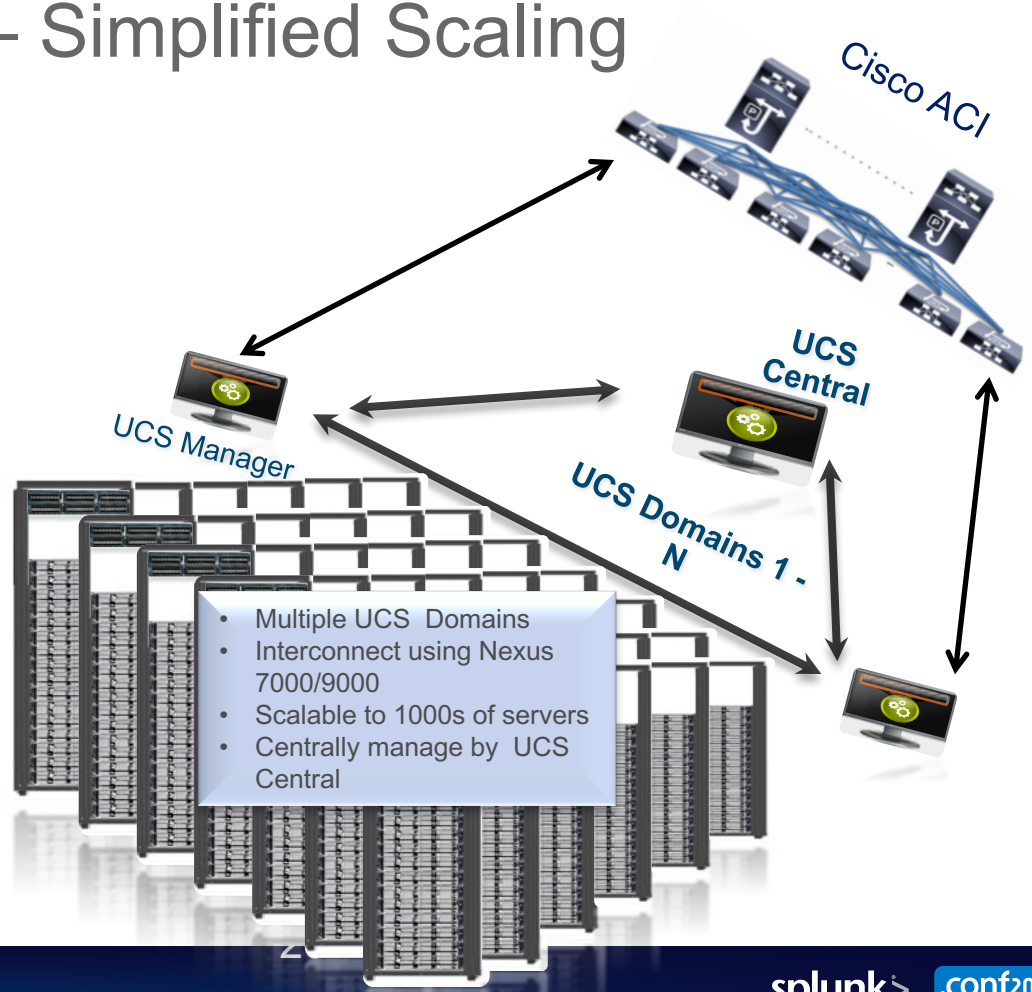
UCS Manager Service Profile



Abstraction of all configuration and identity information into a service profile speeds deployment, reduces errors, lowers costs

Cisco UCS Advantage – Simplified Scaling





UCS Director Express for Big Data

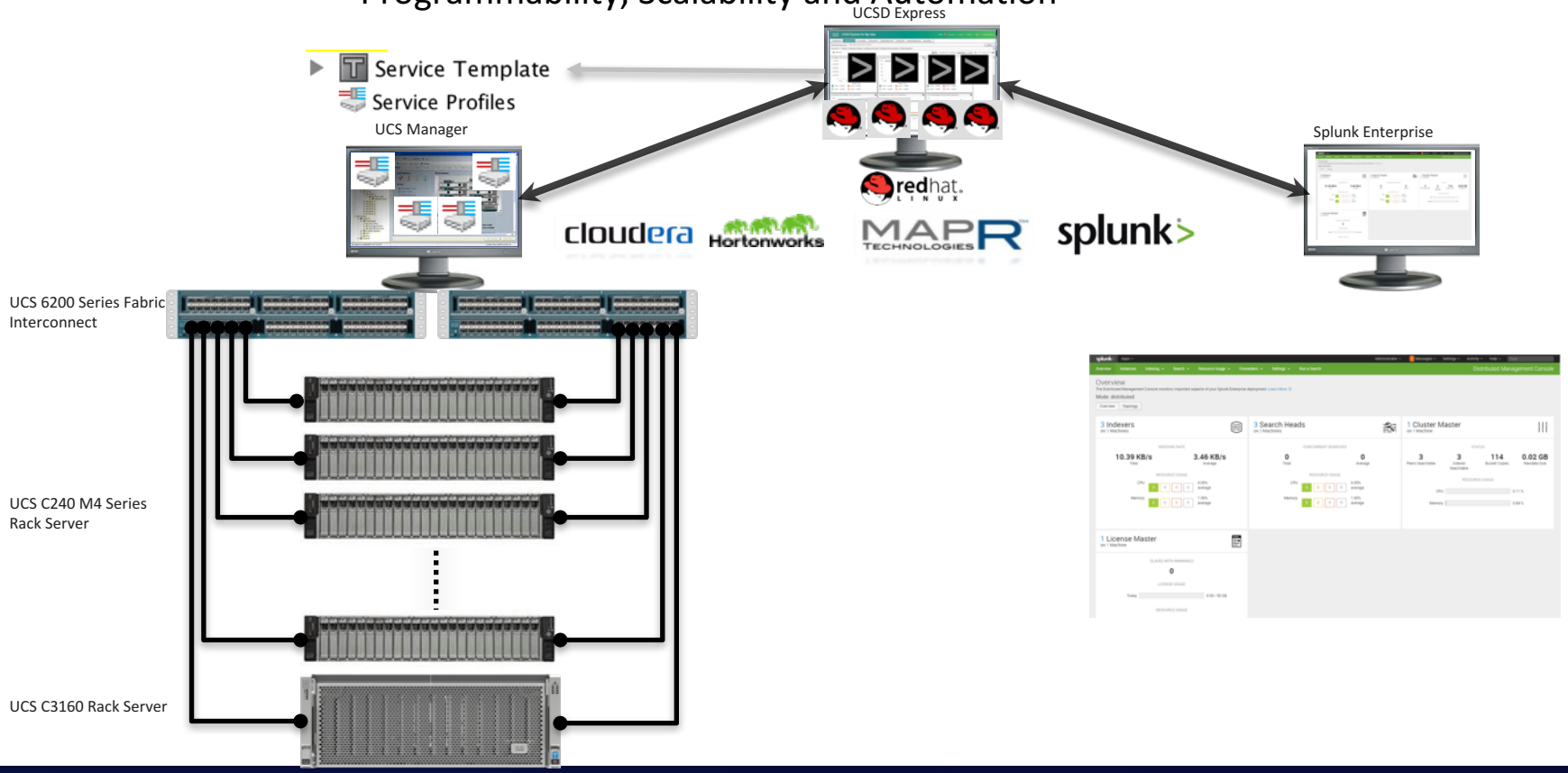
Deploy your Splunk Enterprise Cluster in hours – not in days or weeks

Features:

- Indexer clustering – customizable Replication and Search Factors
- Search Head clustering
- License Master, Deployer for SHC
- Ability to grow the Search Head, Indexer clusters.
- DMC
- Automates more than 90% of the CVD process.
- (Manual configuration required for completing the remaining 10%).

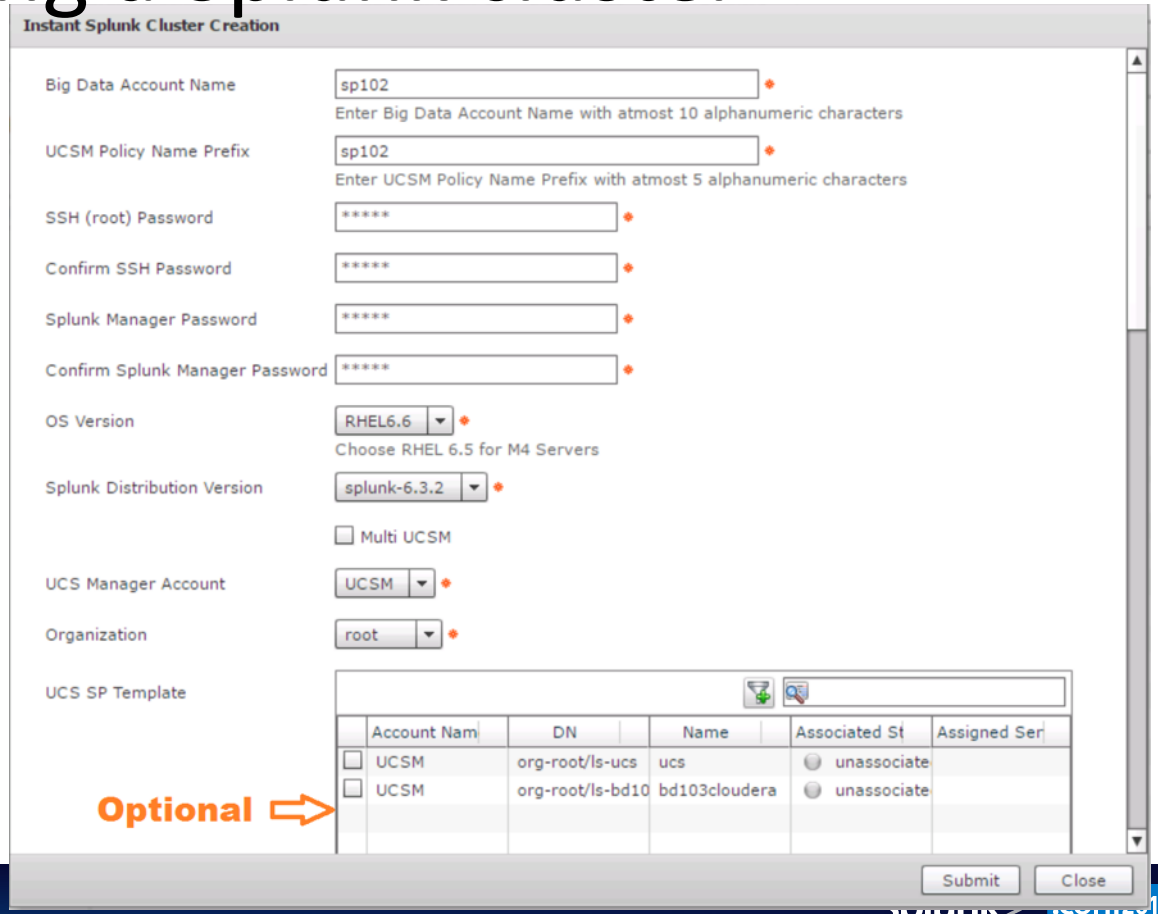
Unified Management with UCS Director Express for Big Data

Programmability, Scalability and Automation



Creating a Splunk cluster

- Cluster Name
- OS (RHEL)
- Splunk version
- UCS Manager
- Organization

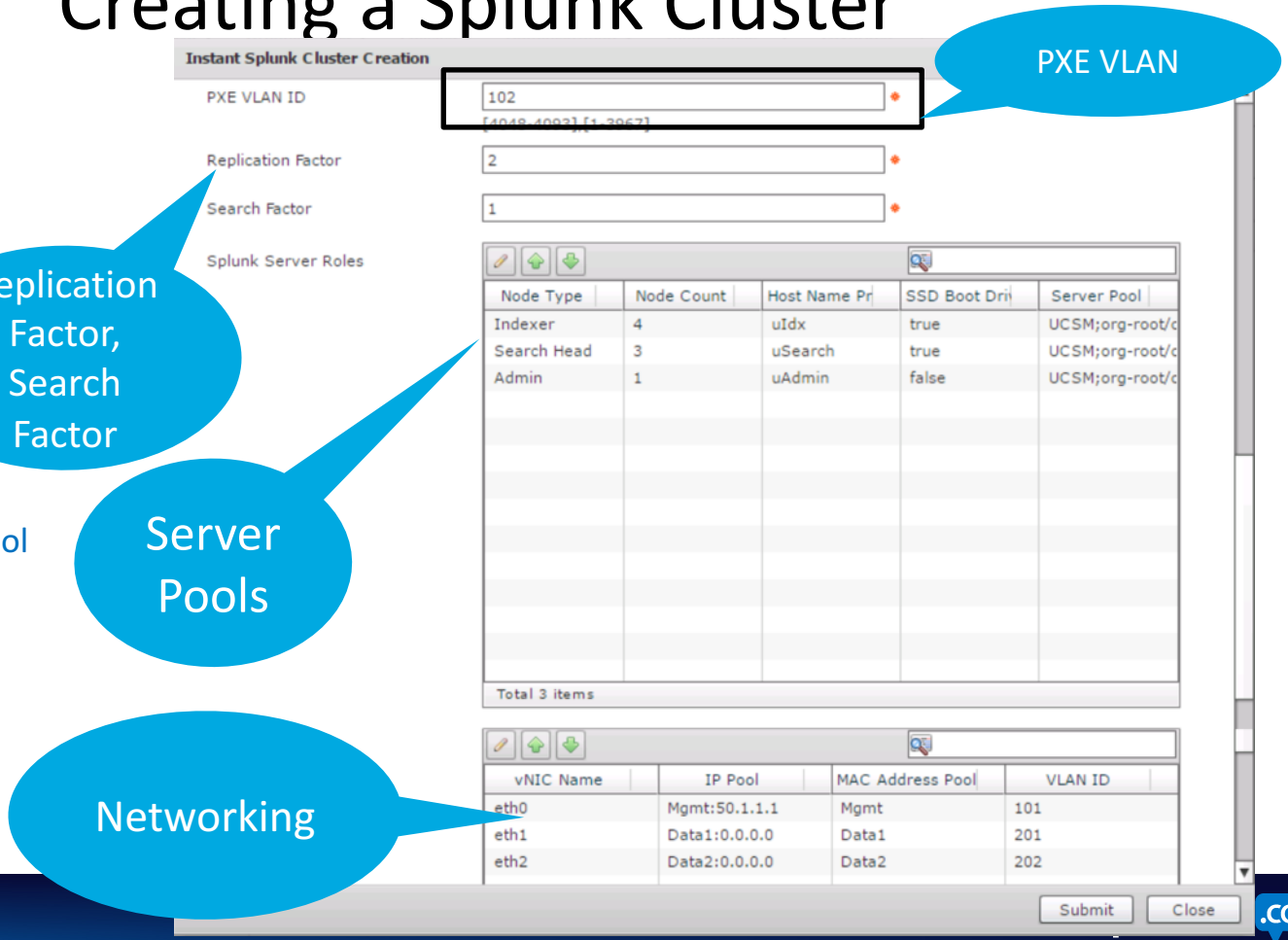


Creating a Splunk Cluster

- Server-pools (per role)
- Map vNIC to IP-Pools.
  - Mgmt,
  - Data1(Ingest),
  - Data2(Replication)

NOTE: eth0 → MGMT pool binding shown.

- Click **Submit**



Creating a Splunk Cluster -- Server Pool Selection

Server Pools

Hostna me Prefix

Server Pools

Edit Splunk Server Roles Entry

Node Type: Indexer

Node Count: 4

Host Name Prefix: uIdx

☑ SSD Boot Drives Available for OS

Server Pool

	ID	Server Pool	Server Pool F	Assigned	Size
☐	UCSM;org-root/	default		0	1
☑	UCSM;org-root/	test_indexers		0	4
☐	UCSM;org-root/	test_searchhead		0	2
☐	UCSM;org-root/	test_admin		0	1
☐	UCSM;org-root/	test_forwarder		1	1
☐	UCSM;org-root/	ucs		1	13
☐	UCSM;org-root/	Hadoop		8	8
☐	UCSM;org-root/	test_searchhead		0	3
☐	UCSM;org-root/	Splunk		10	21

Total 9 items

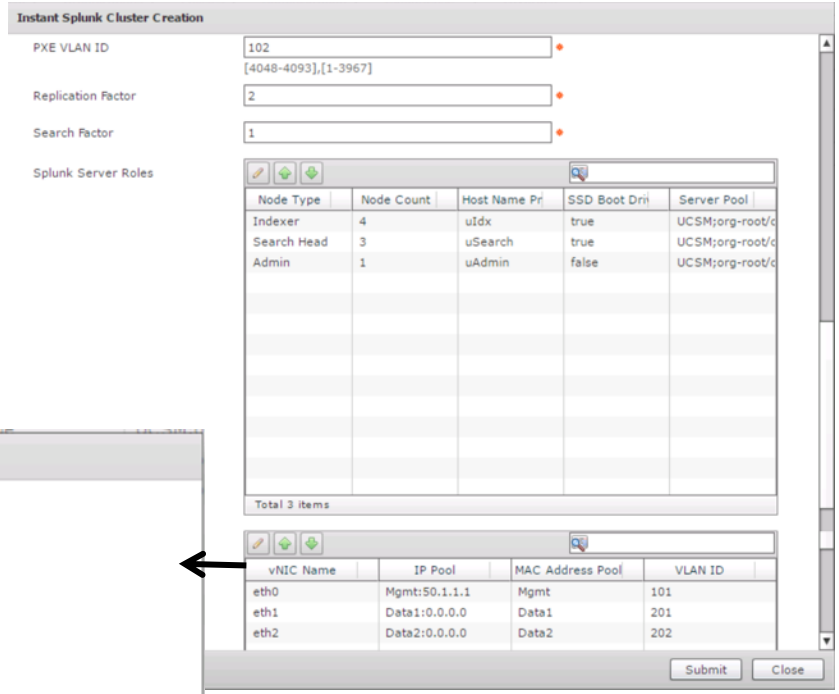
Submit Close

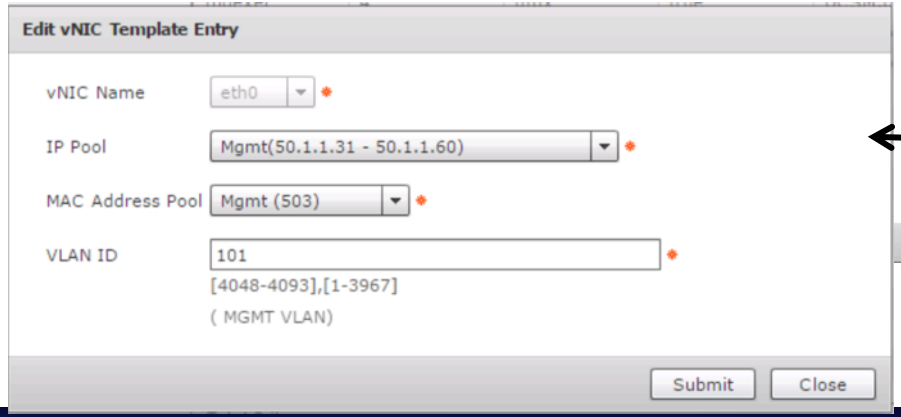
Creating a Splunk Cluster -- VNIC configuration

- Map vNIC to IP-Pools.

NOTE: eth0 → MGMT pool binding shown.

- Click **Submit**





The Secret Trick is Hidden in UCS Template

- Splunk Cluster is powered by Underlying UCS HW Template
- Splunk's UCS HW Template comes with Flexible RAID Policy
- RAID Policy Supported:
  - RAID1, RAID0
  - RAID5, RAID6
  - RAID10 (default)
  - Future (RAID50, RAID60)

Splunk UCS HW Template – RAID Policy

Modify UCS SP Template for Big Data

- UCS SP Template Specifica
- Create QoS Policy
- Create VLAN Policy
- Create vNIC Policy
- Create BOOT Order Policy
- Create UCS BIOS Policy
- Local Disk Configuration P

UCS SP Template for Big Data - Local Disk Configuration Policy

Local Disk Configuration Details

☐ Use LVM For Disk Configuration

Partition Configuration

Mount Point	Size(GB)
/boot	1
/	1 with grow
/tmp	5
/var/tmp	5
swap	2
/home	5

Total 6 items

Configure Splunk RAID Policy

Node Type	RAID Level[O	RAID Level[H	RAID Level[C	RAID Level[F
Indexer	RAID1	RAID10	Same Disk As H	Same Disk As C
Search Head	RAID1	NA	NA	NA

Back | Submit | Close

Custom Partitions

RAID Policy

Splunk UCS HW Template – Inside the RAID Policy

Edit Entry

Write Mode: Write back

Read Mode: Read ahead

Use Cache

Use Cache if Bad BBU

Strip Size(MB): 128

Disks for Hot Data

RAID Level[Hot Data]: RAID10

Disks Per Group: 12

Write Mode: Write back

Read Mode: Read ahead

Use Cache

Use Cache if Bad BBU

Strip Size(MB): 128

Data Disks for Cold Data

Same Disk As Hot Data

Data Disks for Frozen Data

Same Disk As Cold Data

Submit | Close

RAID10 for HOT/WARM

Cold data on the same RAID group

Splunk UCS HW Template – Inside the RAID Policy

RAID10 for HOT/WARM

Edit Entry

Disks for Hot Data

RAID Level[Hot Data] RAID10 *

Disks Per Group 10 *

Write Mode Write back *

Read Mode Read ahead *

☐ Use Cache

☐ Use Cache if Bad BBU

Strip Size(MB) 128 *

Data Disks for Cold Data

☐ Same Disk As Hot Data

RAID Level[Cold Data] RAID5 *

Disks Per Group 4 *

Write Mode Write back *

Read Mode Read ahead *

☐ Use Cache

☐ Use Cache if Bad BBU

Strip Size(MB) 128 *

Submit Close

RAID5 for COLD

Typical Big Data Deployment Challenges

- Paralysis by HW analysis
- Inconsistent configurations
- Repeatable results
- Justifiable costs/TCO/footprint
- Scalability and sustainability

Cisco UCS Delivers

- ✓ Accelerated Sales cycle/time to production
- ✓ Reduced architectural planning and calculation for the customer
- ✓ Consistent, repeatable results
- ✓ Comprehensive automated deployment
- ✓ Facilitates Splunk expansion at a reduced footprint

Towards a UCS "Appliance" Bundle*
(Splunk Enterprise Security)

Architecture (up to ~1.5TB)

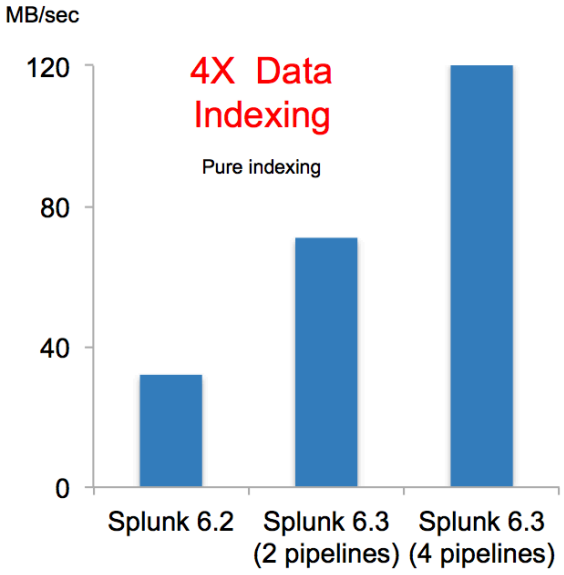
- Based on CVD
  - Search Head Cluster (3 x UCS C220-M4)
  - Index Cluster (16 x UCS C240-M4)
  - License Master
  - DMC + Deployment Server
- Sizing
  - For every 100GB/day ingest per indexer, you need 300GB extra storage

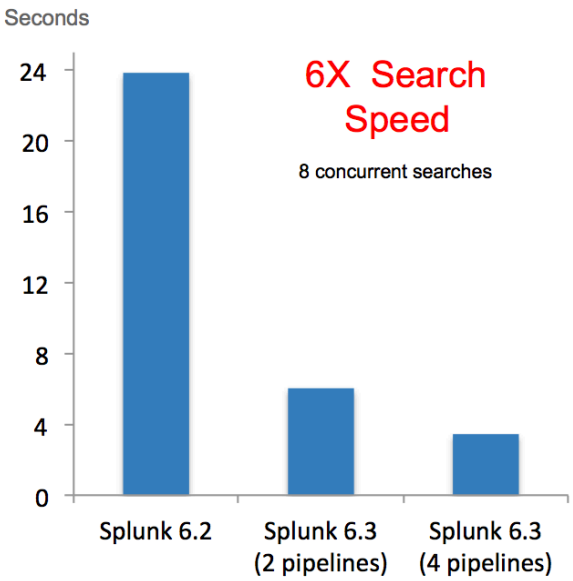
Performance Tips

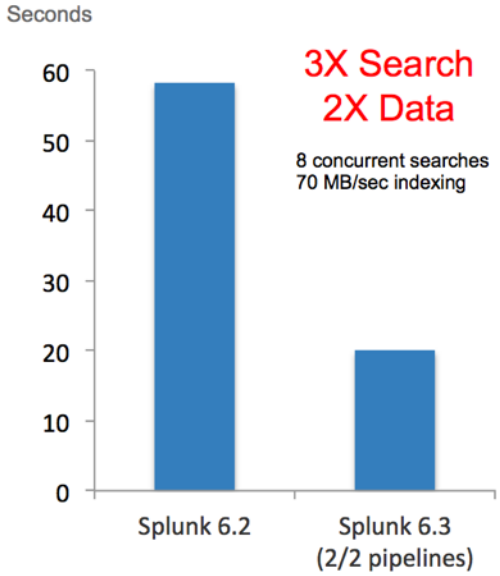
- Use parallelization of data model acceleration
- Performance affected by
  - # installed/enabled Add-ons
  - # enabled correlation searches
  - Types of data sources

** OnX*

Cisco UCS Benchmark Results (Splunk Enterprise 6.2 vs 6.3)





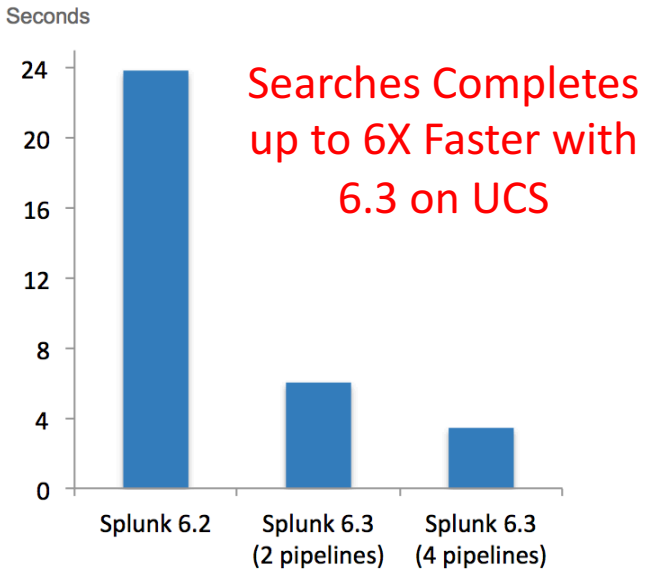


**Data for newer releases in time for .conf16*

Splunk and Cisco UCS: Better Together

- Proven at Enterprise Scale
- Exceptional Performance
- Seamless Scalability, TCO
- Splunk Supported Integration
- Faster, More Predictable Deployments

Splunk Enterprise on Cisco UCS
Performance Benchmark



Splunk and Cisco UCS for IT Troubleshooting

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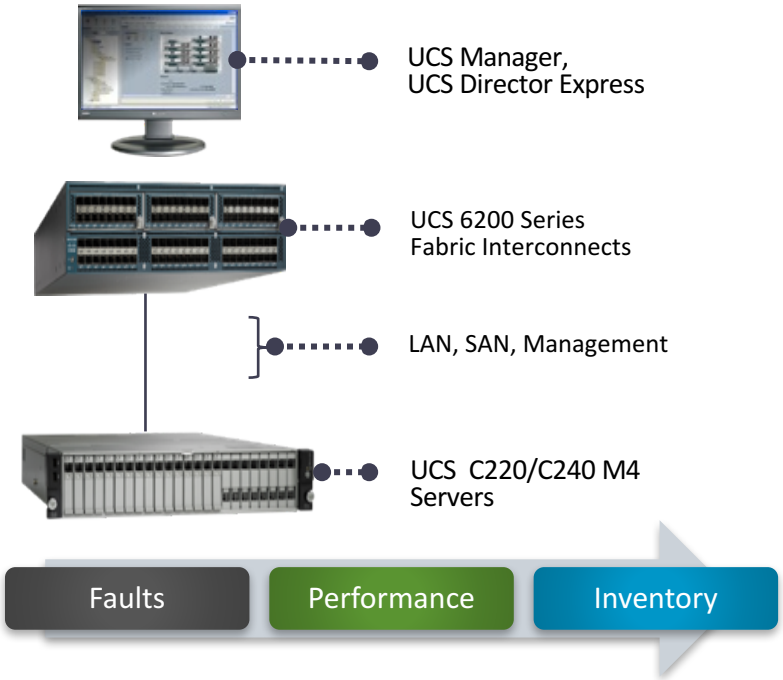
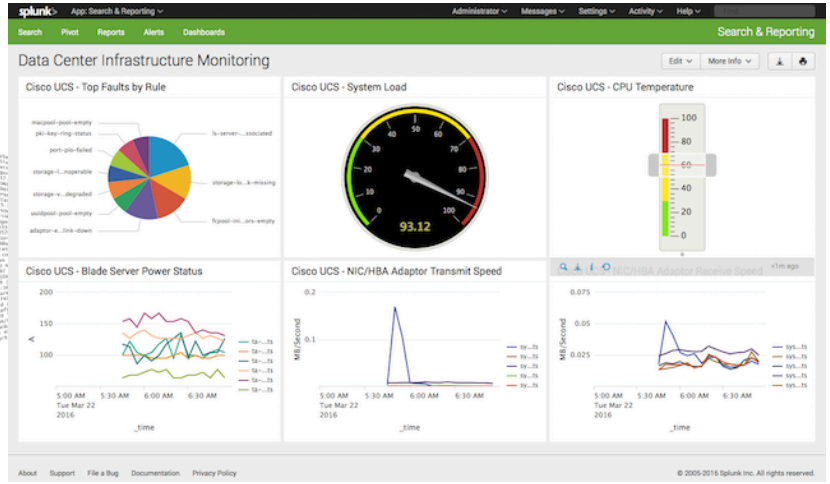
Splunk Add-on for Cisco UCS



- Collects, normalizes and analyzes events from Cisco UCS Managers
- Used for troubleshooting, monitoring and capacity planning across the data center infrastructure stack
- Scales to the largest environments
- Certified for UCS platform (Cisco IVT)

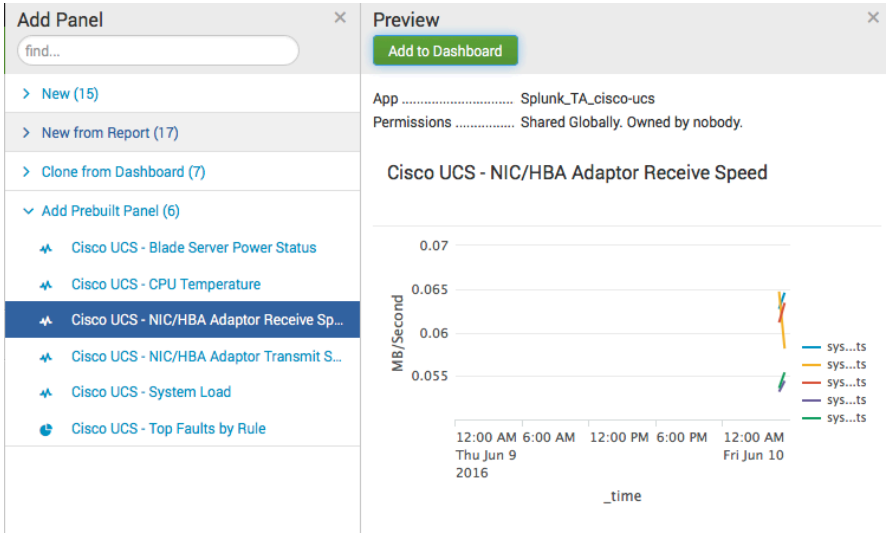
* IVT: Interoperability Validation Testing

IT Troubleshooting of Application Stack with Cisco UCS



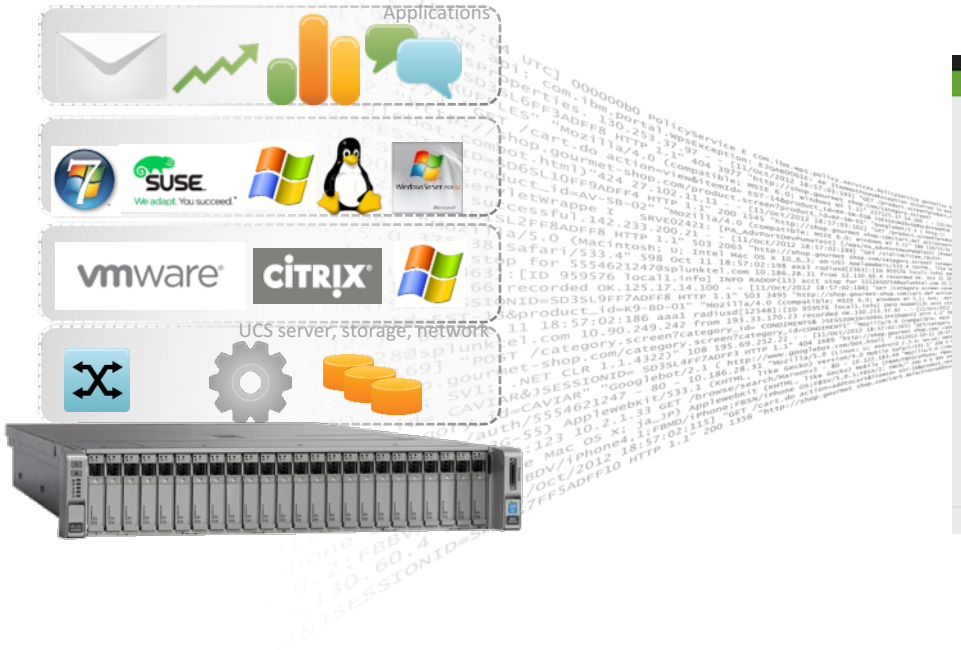
Analyze UCS Data in few minutes!

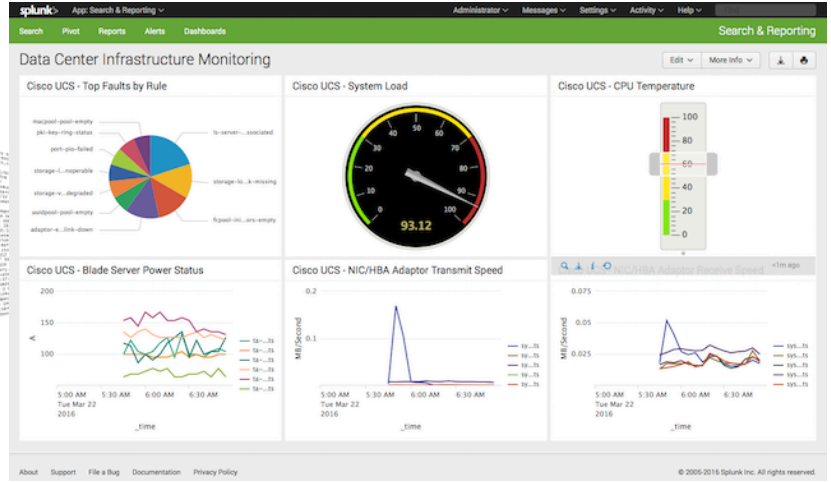
1. Download Splunk Add-on for https://splunkbase.splunk.com/app/2731/
2. Configure UCS Manager connectivity
3. Configure data collection task(s) for pre-defined event templates
4. Events should start showing up within 5 minutes - verify
   - `sourcetype=cisco:ucs source=*fault*`
5. Create a new dashboard
6. Add one or more pre-built panels

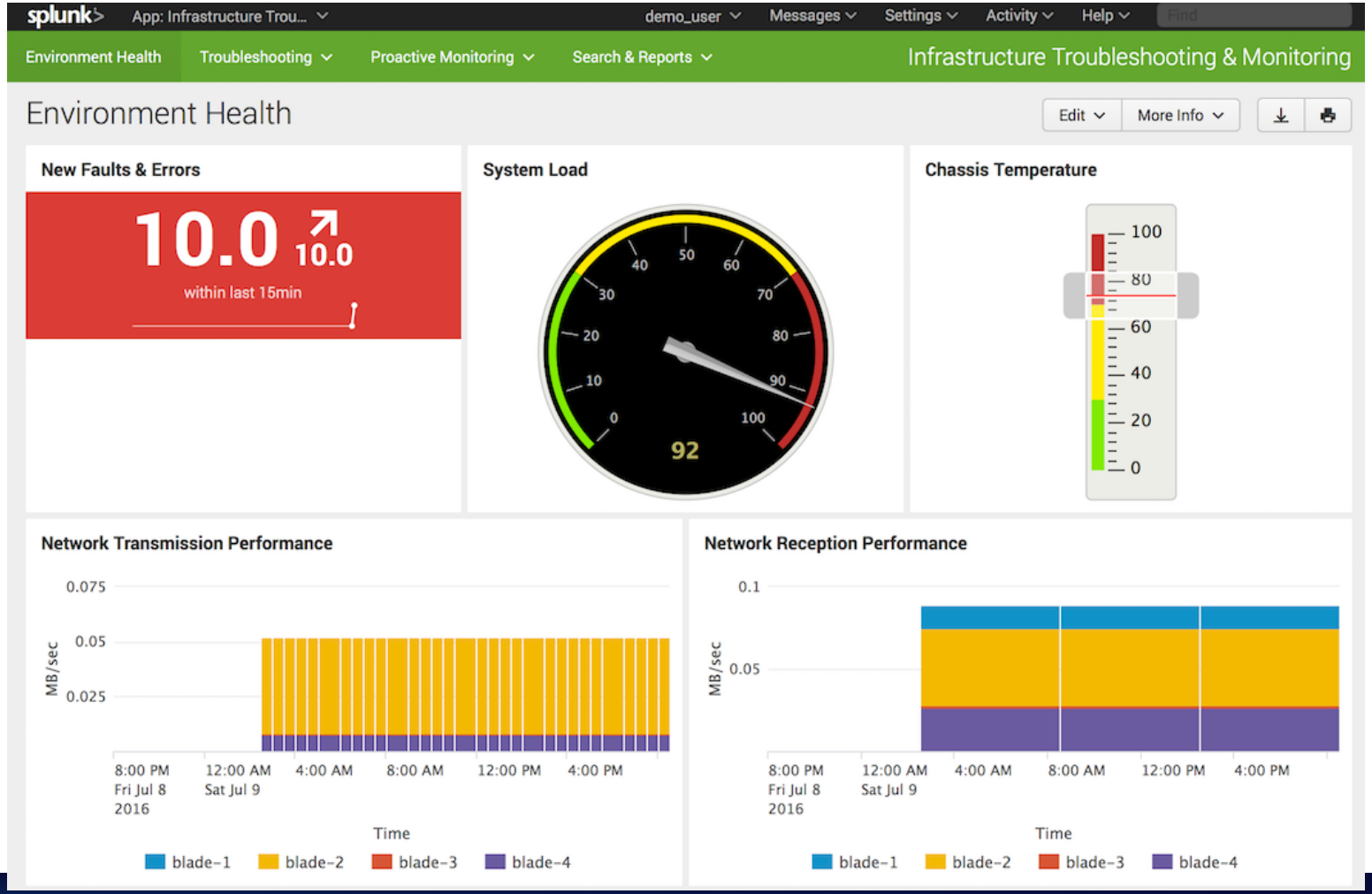


DEMO

IT Troubleshooting of Application Stack with Cisco UCS






splunk>
App: Infrastructure Trou...
demo_user
Messages
Settings
Activity
Help
Environment Health
Troubleshooting
Proactive Monitoring
Search & Reports
Infrastructure Troubleshooting & Monitoring
Environment Health
Edit
More Info
New Faults & Errors
10.0
10.0
within last 15min
System Load
0
10
20
30
40
50
60
70
80
90
100
92
Chassis Temperature
100
80
60
40
20
0
Network Transmission Performance
0.075
0.05
0.025
MB/sec
8:00 PM Fri Jul 8 2016
12:00 AM Sat Jul 9
4:00 AM
8:00 AM
12:00 PM
4:00 PM
Time
blade-1
blade-2
blade-3
blade-4
Network Reception Performance
0.1
0.05
MB/sec
8:00 PM Fri Jul 8 2016
12:00 AM Sat Jul 9
4:00 AM
8:00 AM
12:00 PM
4:00 PM
Time
blade-1
blade-2
blade-3
blade-4

Network Capacity & Monitoring

Finding clogged pipes…

New Search

Save As Close

```
(index=main OR index=cisco*) source=cisco:ucs:adaptorVnicStats | rex field=dn "host-eth-(?<fcVnic>\d+)" |
rex field=dn "blade-(?<blade>\d+)" | eval txAvgMB=bytesTxDeltaAvg/(1024*1024) | eval fcVnic="blade-"+blade |
timechart avg(txAvgMB) by fcVnic limit=4 useother=f
```

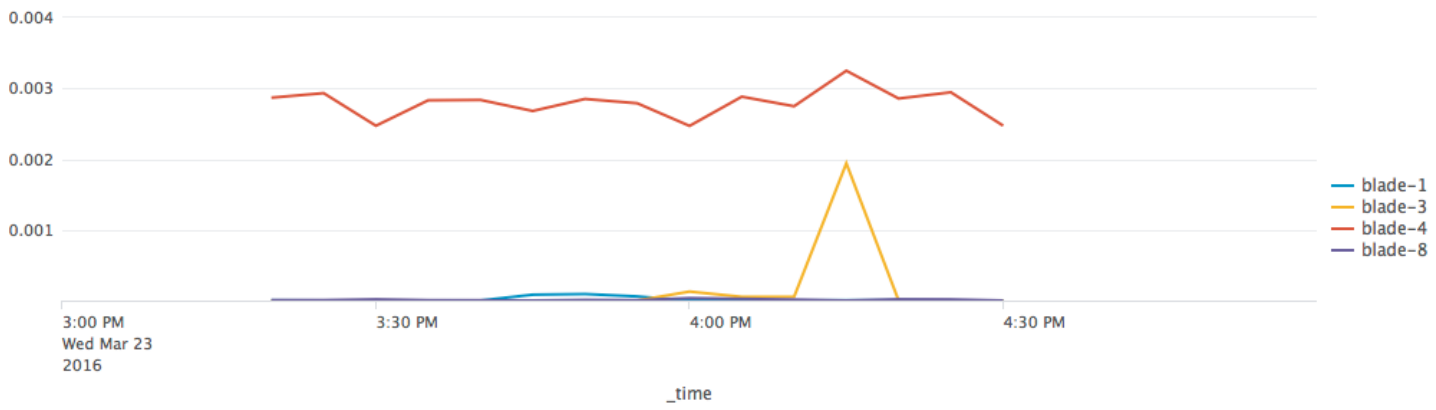
Date time range

✓ 522 events (3/23/16 3:00:00.000 PM to 3/23/16 5:00:00.000 PM)

Job Fast Mode

Events Patterns Statistics (24) Visualization

Line Format



splunk> .conf2016

Next Steps

Related breakout sessions and activities…

- Splunk and Cisco Architecture
  http://blogs.cisco.com/tag/splunk
  http://www.cisco.com/go/bigdata
- Troubleshoot your data center today

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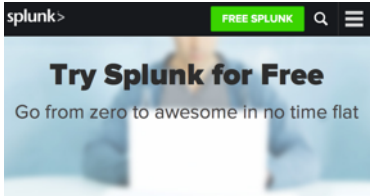
See your data shine!



THANK YOU

splunk>