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Architecting and Sizing your Splunk Deployment

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Objective

Show you how to build a robust and scalable Splunk deployment

Introduction

Qualifications

- 7+ years @ Splunk
- Experience:
  - Building and running large scale Splunk deployments
  - Technical sales – OEMs, Strategic Accounts, MSPs
  - Current – Anything technical for Partnerships
- Based in San Francisco

Agenda

- Sizing fundamentals
- Architecting fundamentals
- Deployment topologies

Sizing Fundamentals

Sizing Fundamentals

- Understand the Sizing Factors
- Data Volume
- Search Volume

Sizing Factors

- How much data (raw sizes)?
  - Daily Volume
  - Peak Volume
  - Retained Volume (archive size)
  - Future Volume?
- How much searching?
  - Use Cases
  - How many people? How often?
  - Apps
- Background searches
  - Acceleration, Summarization, Alerting, Reporting, Data Models

Data Volumes

- Estimate Input Volume
  - Verify raw log sizes
  - Leverage _internal metrics and default views (license_usage.xml)
- Confirm estimates with actual data
  - Create a baseline with real or simulated data
  - Find Compression rates (range from 30%-120%, typically 50%)
  - Determine Retention needs
  - Clustering needs (SF vs RF)
- Document Use Cases
  - Use case determines search needs
  - Plan for expansion as adoption grows (Search and Volume)

Data Sizing Exercise

- Via Filesystem
  - Use a large enough data set. 100GB+
- Use the Splunk log files
  - metrics.log
  - license_usage.log
  - disk_objects.log
- Recommended:
  - Distributed Management Console

Search Volumes

- Gather Use Case information
  - How much Ad-Hoc searching?
  - How much background searching?
- Ad-Hoc searching
  - Evaluate the data being searched
  - Evaluate the time duration (real-time vs historic)
  - Real-time searches are typically less overhead
- Background Searching
  - Alerting and Monitoring
  - General reports
  - Data Models, Report Acceleration & Summary Indexing

Search Volume Exercise

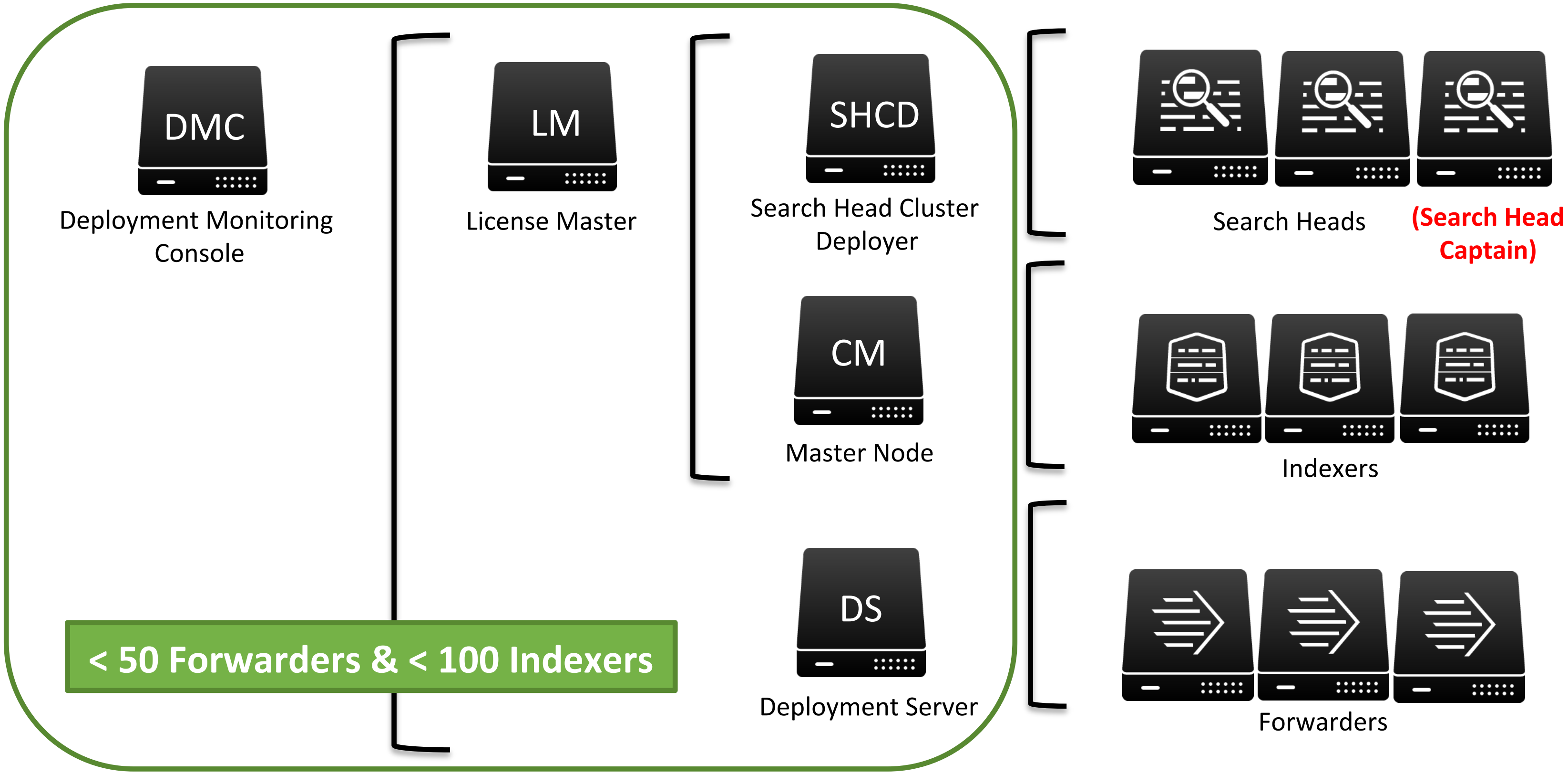
- Use the Splunk log files: audit.log
- Recommended:
  - DMC
    - Search Activity View
  - Introspection data
    - resource_usage.log

Architecture Fundamentals

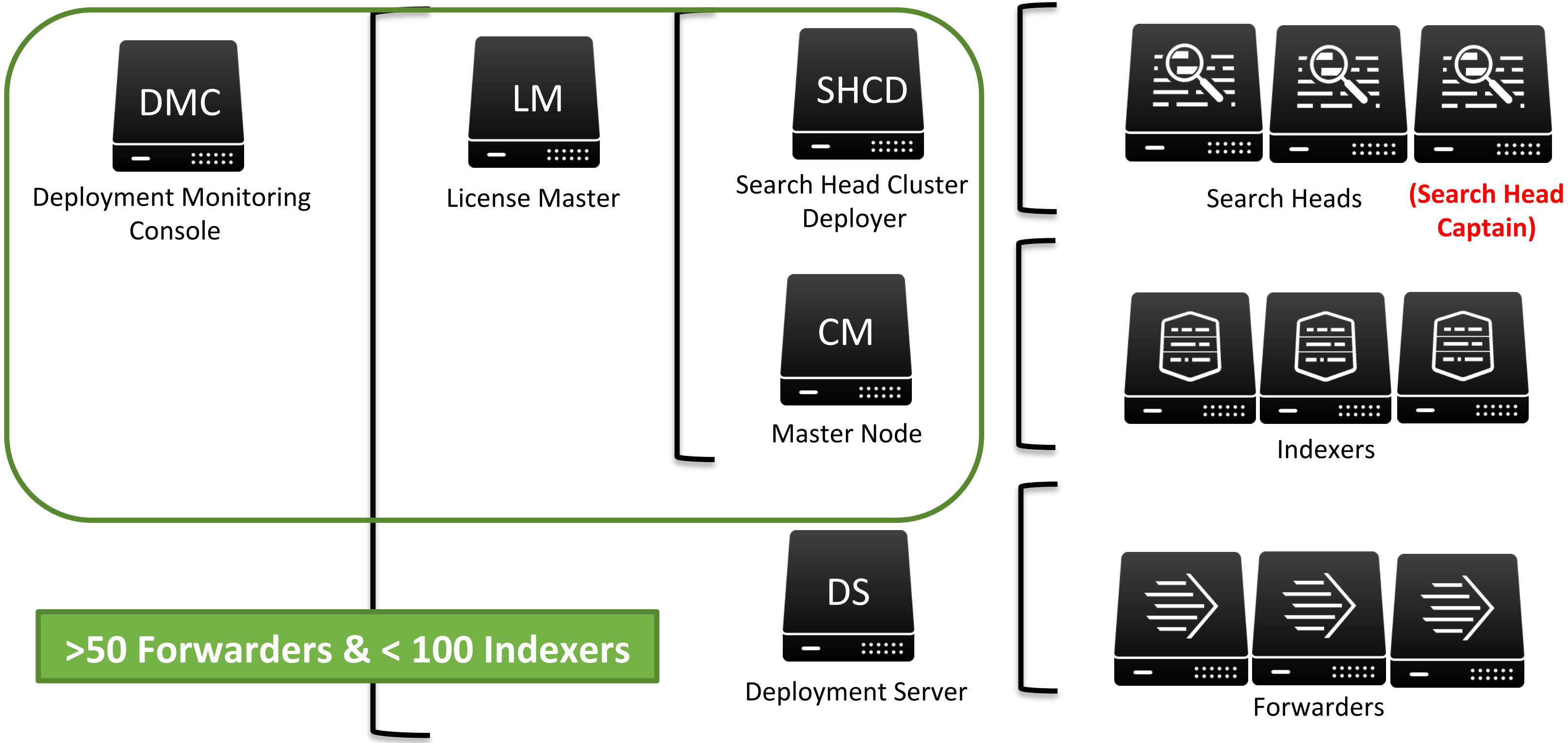
Architecture Fundamentals

- Splunk server roles: Distributed/Clustered Deployments
- Reference Server
- Rules of Thumb
- Hardware Factors

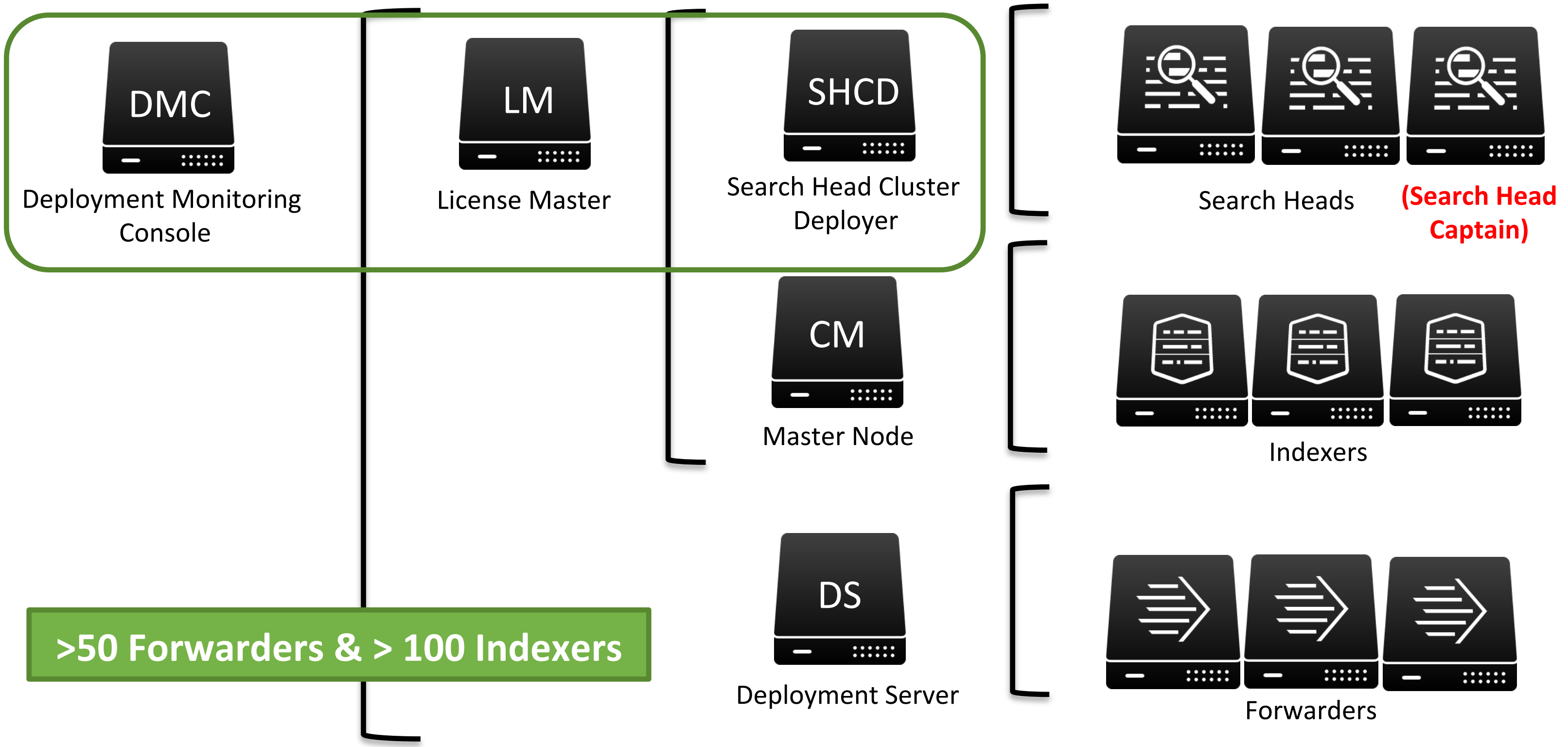
Splunk Distributed Roles



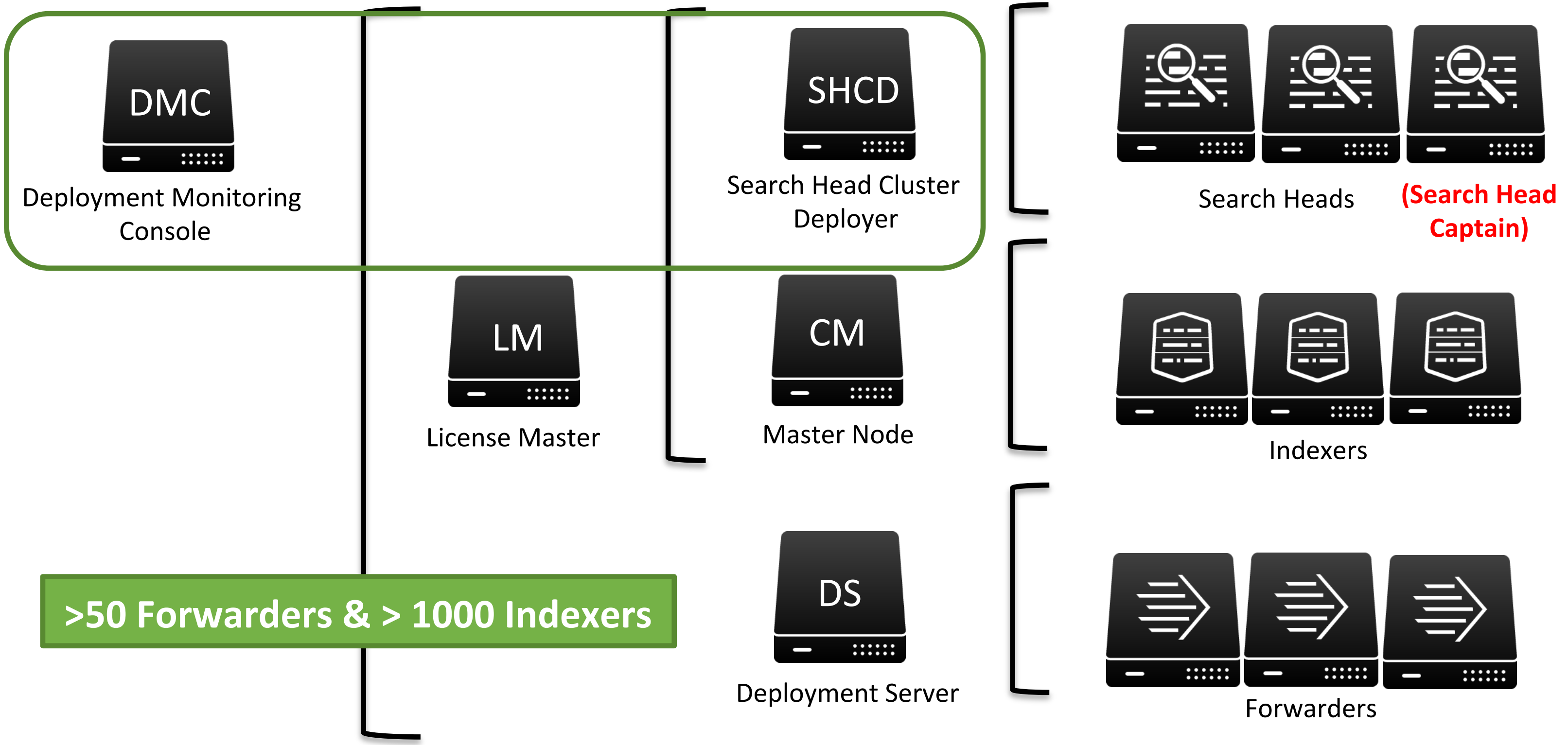
Splunk Distributed Roles



Splunk Distributed Roles



Splunk Distributed Roles



What's a "Search Head Reference" Server?

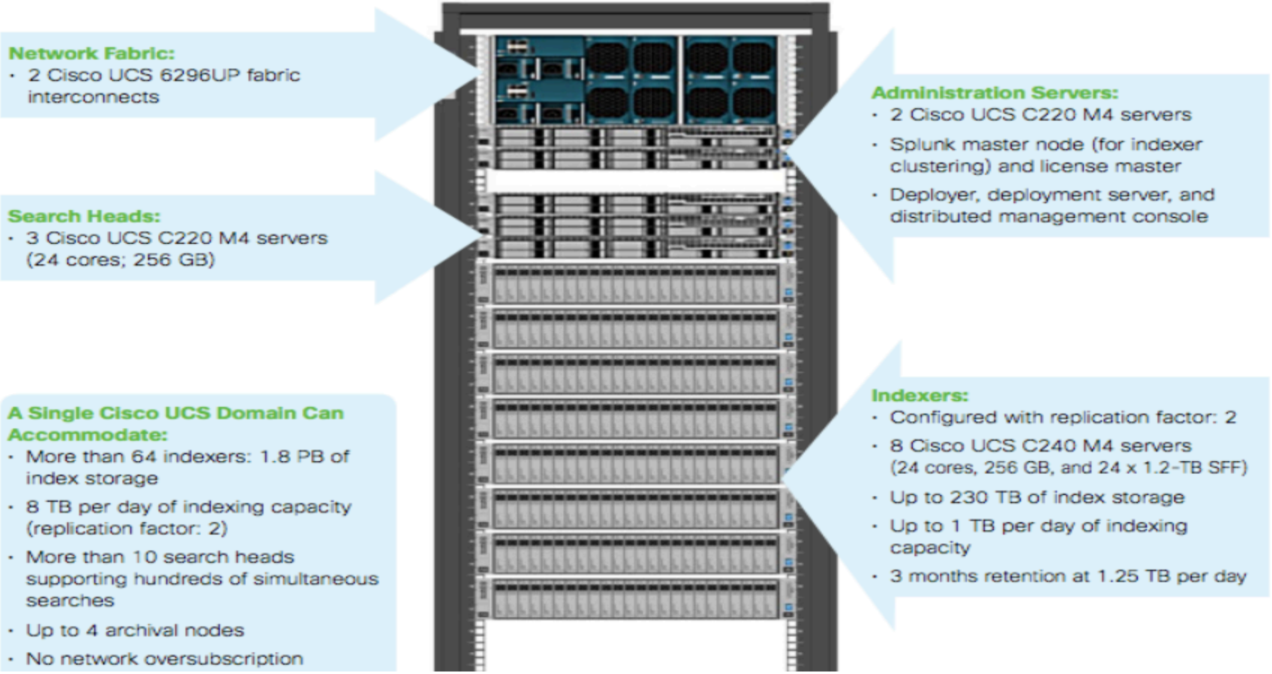
- Sizing based on commodity x86 servers – 64bit
- 4 x quad-core CPUs at 2.0 GHz
- 12 GB of RAM – (16 GB is common)
- 64-bit OS
- 2x10k RPM local SAS drives in RAID 1
- Variations cause corresponding changes in performance/ requirements

What's a "Indexer Reference" Server?

- Sizing based on commodity x86 servers – 64bit
- 2 x six-core CPUs at 2.0 GHz
- 12 GB of RAM – (16 GB is common)
- 64-bit OS
- Local or Attached storage (800+ IOPs)
- Variations cause corresponding changes in performance/ requirements

Real World Examples

- Cisco Unified Computing System (UCS)
  - Search Head:
  - UCS C220 M4
  - 24 cores
  - Indexer:
  - UCS C240 M4
  - 24 cores



Real World Examples

- Amazon Web Services EC2
  - Search Head:
    - c4.4xlarge + EBS storage
    - c4.8xlarge + EBS storage
  - Indexer:
    - c4.4xlarge + EBS storage
    - d2.4xlarge (IR)

Model	vCPU	Mem (GiB)	Storage	Dedicated EBS Throughput (Mbps)
c4.2xlarge	8	15	EBS-Only	1,000
c4.4xlarge	16	30	EBS-Only	2,000
c4.8xlarge	36	60	EBS-Only	4,000

Model	vCPU	Mem (GiB)	Storage (GB)
d2.4xlarge	16	122	12 x 2000 HDD
d2.8xlarge	36	244	24 x 2000 HDD

Rules of Thumb

- These all have exceptions and qualifications
- 1 reference indexer per 300 GB/day
- 1 reference search head per 20-40 queries concurrently
- 1 deployment server per 10k clients @ 10-15 min polling period

How Many Indexers?

- Rule of thumb says: 1 per 300 GB/day
- Leaves room for:
  - Daily peaks
- Need more indexers for:
  - Heavy reporting
  - More users
  - Slower disks, slower CPUs, fewer CPUs

How Many Search Heads?

- Rule of thumb says: 1 per 20 – 40 concurrent queries
- Limit is concurrent queries
- Search Query normally uses up to 1 CPU core
  – 6.3 Parallelization can leverage more
- Don't add search heads; add indexers: indexers do most work
  – Unless you want HA/Search Clustering
- Scale vertically if infrastructure allows it. Add CPU, add memory.

How Many Deployment Servers?

- Rule of thumb says: 1 per 10k clients @ 10 – 15 min polling period
- Adjust polling period to increase total clients supported
- Small deployments can share the same instance as other management instances (LM, CM, etc.)
- Low requirement for disk performance (good candidate for virtualization)
- Or use something other than deployment server
  - puppet, SCCM, cfengine, chef…

More Is Better?

- CPUs
  - 8, 12, 16, 24, 32, etc….
  - Pipelines - New 6.3 feature for parallelization!
  - Indexing can handle higher bursts with multiple index pipeline sets
  - Certain searches can be improved with multiple search pipeline sets
    - Historical batch – return the data without worrying about time order (… | stats count)
  - Indexers still need to do the heavy lifting (search exists on indexer AND search head)

More Is Better?

- Memory
  - Good for search heads and indexers (16+ GB)
    - Benefits from extra RAM used by OS for caching
- Disks
  - Faster is better - 10k – 15k rpm strongly recommended, SSD preferred
  - More disks in RAID 1+0 = Faster
  - RAID 5+1 or 6 can be good for Cold buckets
  - SSDs can also provide benefit for rare term searches and many concurrent jobs

Performance and Sizing Tips

System Change	Search Speed	Search Concurrency	Indexing Speed
Faster Disks	++	+++	++
Add an Indexer	++	+	++
Add a Search Head	+	+	
Report Acceleration/ Summaries	++	+++	

Performance and Sizing Tips

System Change	Search Speed	Search Concurrency	Indexing Speed
Optimize Searches	+++	+	+
Optimize Field Extraction	+		
Optimize Input Parsing			+
Faster CPU	++	+	+

Performance and Sizing Tips

System Change	Search Speed	Search Concurrency	Indexing Speed
Index Pipeline Parallelization			++
Search Pipeline Parallelization	++	+	

Capacity -> Architecture

- Sizing Recipe
  - Capacity
  - Rules of Thumb determines Number of Servers
- Building Blocks for Architecture

Architecture Factors

- What are my sizing requirements?
- Where is the data?
- Where are the users?
- What is the security policy?
- What are the retention and compliance policies?
- What is the availability requirement?
- What about the cloud?

Architecture Factors

- What are my sizing requirements?
  - Data capacity
  - Search capacity
  - User capacity
- Obtained from the sizing process

Architecture Factors

- Where is the data?
  - Local or Remote to the indexing machine
  - If remote – use forwarders when possible
  - Index in local data center (zone) or index centrally
  - Persist Network data to disk as a best practice
  - Use Intermediate Forwarders to distribute data
- Where are the users?
  - User experience affected by Search Head location
    - Time Zone tuning
    - Distributed search over LAN vs WAN

Architecture Factors

- What is the Security Policy?
  - Apply User security policies
    - Auth method
    - Roles
    - Filters
  - Apply physical security policies
    - Index location

Architecture Factors

- Retention, compliance, governance
  - Where is the data allowed to be?
  - Where is the data not allowed to go?
  - Where must the data go?
- Availability
  - Local failover, fault-tolerance, clustering
  - Geographic disaster recovery/fault-tolerance
  - Index replication and Search Head Clustering

Architecture Factors

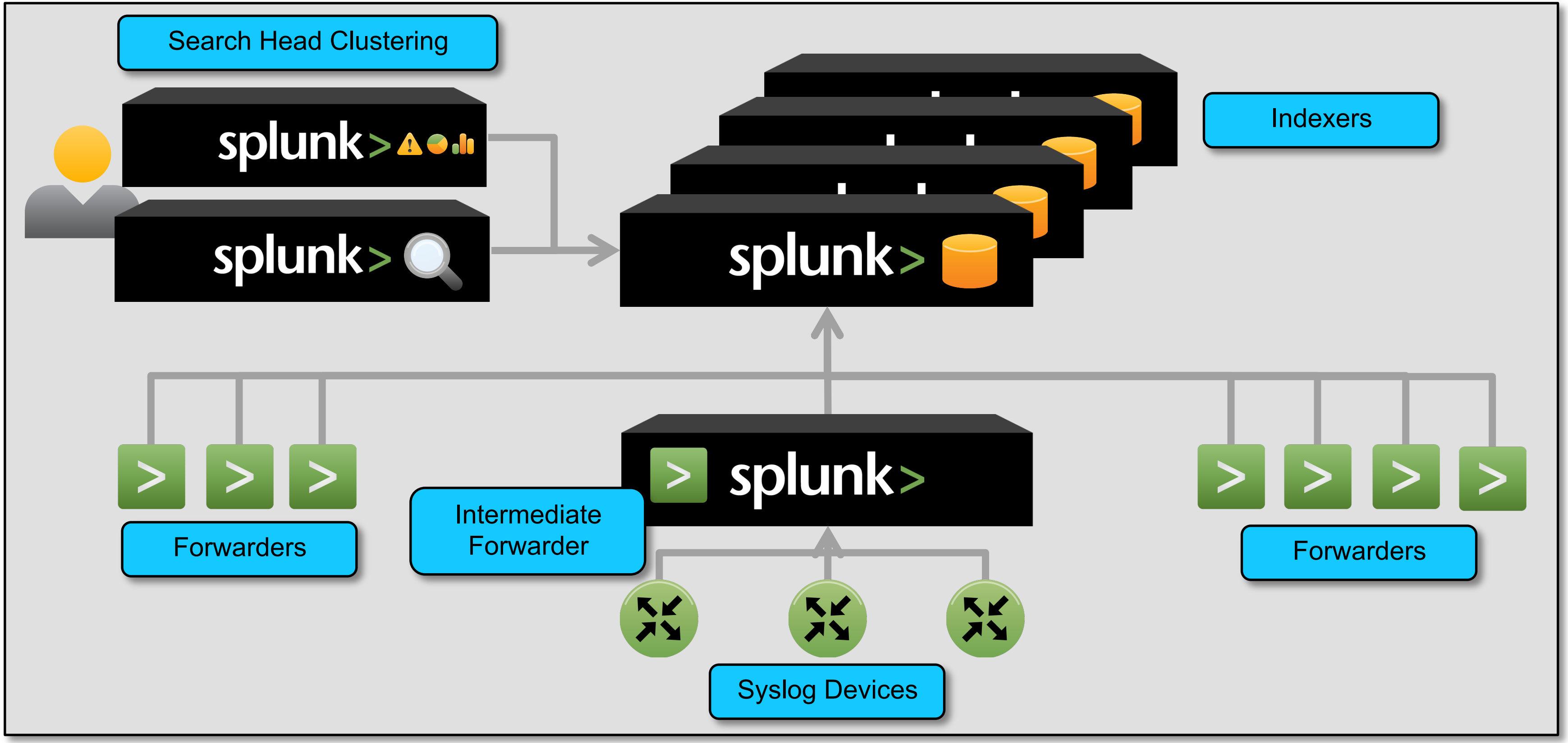
- Cloud Considerations
  - Authentication restrictions
  - Data transfer costs
  - Security – SSL Tunnel
  - Zones
  - Hybrid deployments

Topologies

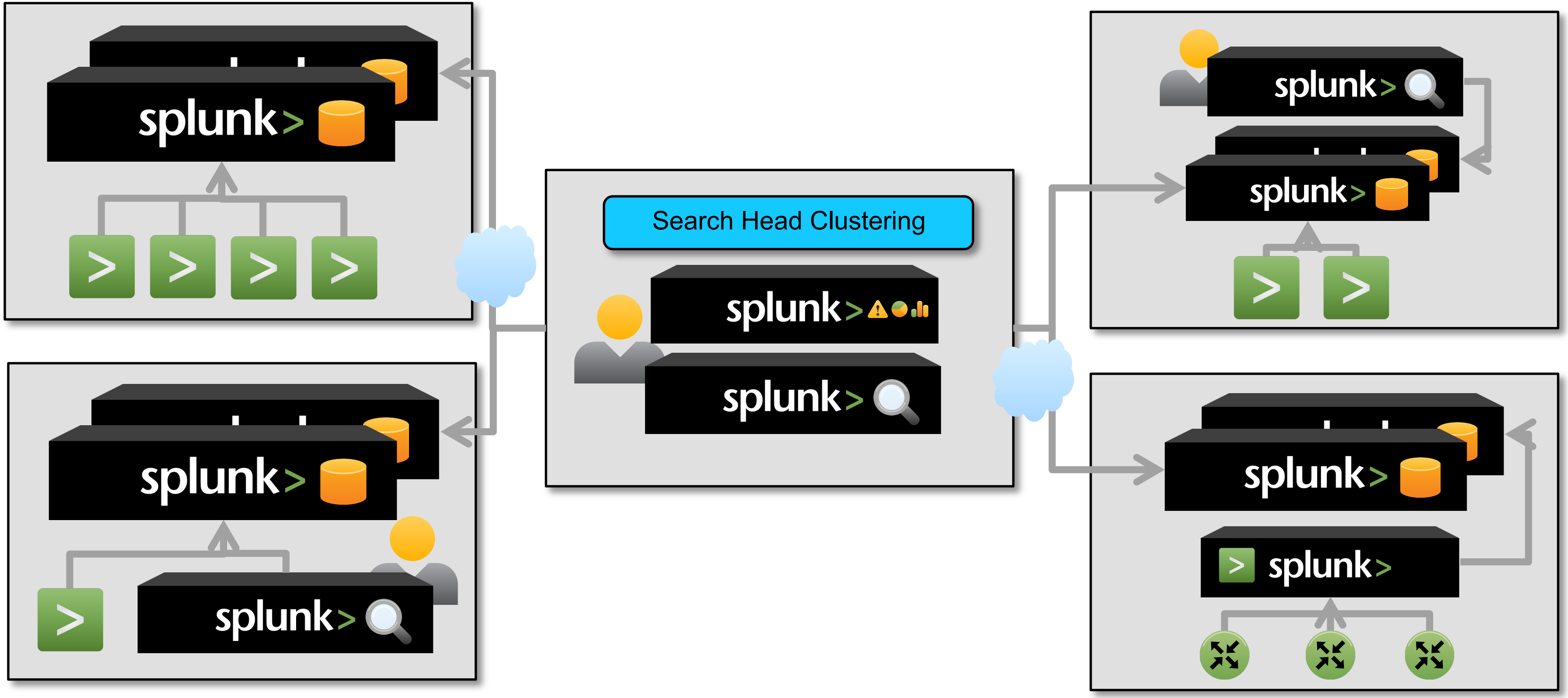
Architecture Factors -> Topology

- Topology Examples
  - Centralized
  - Decentralized
  - Hybrid

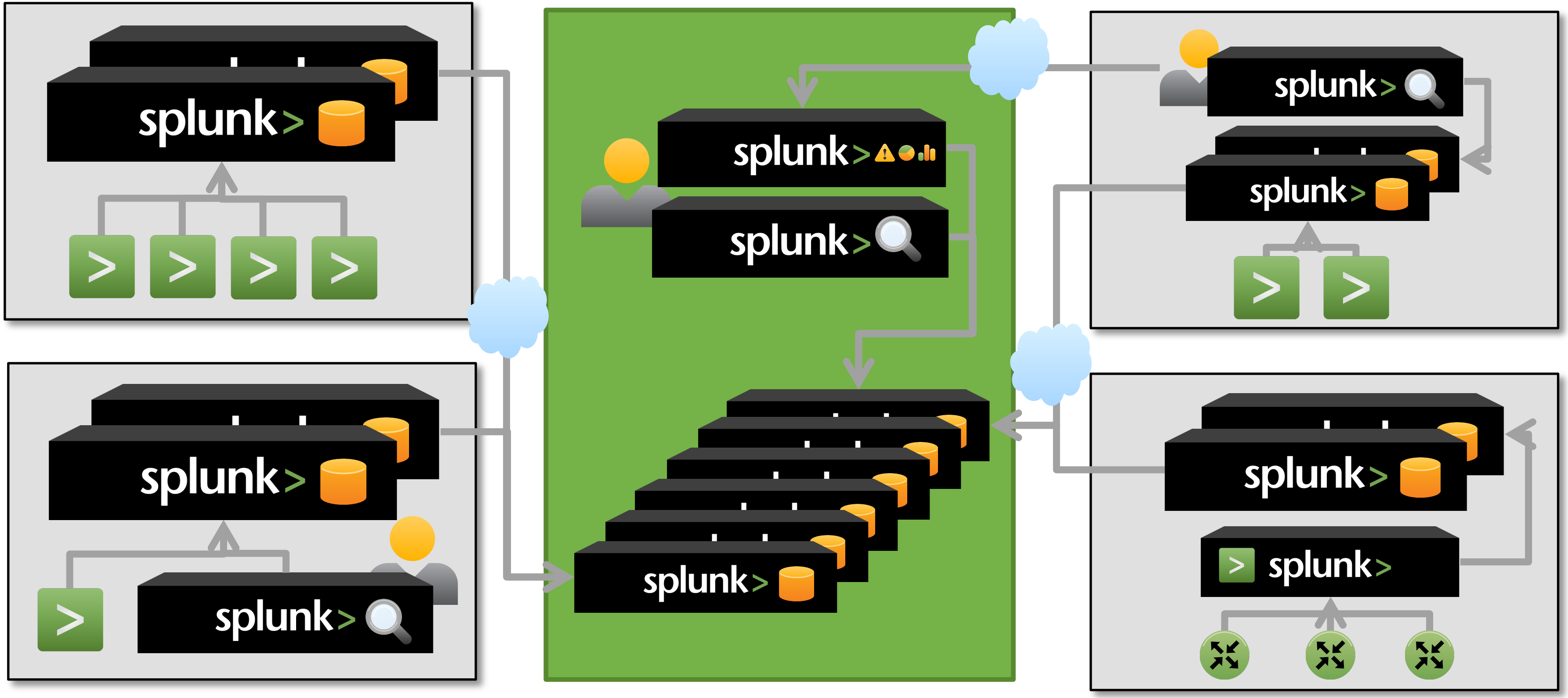
Centralized Topology



Decentralized Topology



Hybrid Topology



Scaling and Expansion

- Add to your indexer pool for more performance or capacity
  - Mixed Platform and Hardware is not recommended
- Use Search Clustering for more UI capacity and availability
  - Does not requires NFS
- Create new indexes based on retention and RBAC
  - Follows best practices
- As data retention needs increase
  - Cannot just add indexers, because we cannot rebalance data.
  - Dynamic storage can help (NAS or Cloud)

Index Replication (aka Index Clustering)

- What is it?
  - Data is replicated to 1 or more indexers based on indexes
  - Splunk Cluster Master controlled
- Basics
  - Master Node (manages indexing and searching location)
  - Horizontal Scaling
- HA vs DR
  - HA - Data is made available on 1 or more indexers in one location
  - DR – Multisite clustering. All data exists in multiple locations

Index Clustering

- Replication factor
  - ✓ Determine the number of rebuildable copies of data to maintain
- Search factor
  - ✓ Determine the number of searchable copies of the data
- Data Retention equation based on syslog data
  - ✓ Total disk usage across cluster in GB = (RepFactor * 0.096 + SearchFactor * 0.201) * DatasetSizeGB

Index Clustering

- Increase in I/O, CPU, and disk requirement
  - Means daily indexing volume per server will be lower
- Search factor increase disk usage by ~30% (rawdata + tsidx)
- Replication factor increases disk usage by ~10% (only rawdata)

Search Head Clustering

- What is it?
  - Group search heads into a cluster as a single entity
  - Provides HA at the Search Head layer
  - Splunk Head Captain controlled
  - RAFT protocol to pick captain
- Basics
  - A captain gets elected dynamically (pre 6.3) or can be defined manually (6.3)
  - Knowledge objects and search artifacts are replicated
  - Search workload distribution
  - Replication using local storage NOT over NFS

Final Thoughts

- Sizing is search load and data volume
- Centralized architecture is the baseline
- Variations on architecture are driven by
  - Sizing
  - Data location
  - User location
  - Retention/Access/Governance
  - Availability requirements

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THANK YOU

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