splunk> .conf2017

Worst Practices…

And How To Fix Them

Jeff Champagne | Staff Architect, Splunk

September 26, 2017 | Washington, DC

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Who’s This Dude?

Jeff Champagne

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Staff Architect

- Started with Splunk in the fall of 2014
- Former Splunk customer in the Financial Services Industry
- Lived previous lives as a Systems Administrator, Engineer, and Architect
- Loves Skiing, traveling, photography, and a good Sazerac

Am I In The Right Place?

You’ll find this session helpful if you…

Target Audience: Splunk Admin or Knowledge Manager

- You should be familiar with general Splunk architectures
  - N00bs, you’ll learn a lot...but some topics won’t be explained in-depth

▶ Questions you may have…

- What is the best way to collect my syslog data?
- Why are my searches running slowly?
- How can I speed up indexing?
- Are there limitations to clustering?
- What are the best practices for HA/DR?

What Will I Learn?

Agenda

- Data Collection
- Data Management
- Data Resiliency

Lossless Syslog/UDP

Busting The Myth…

“I want to collect 100% of my UDP syslog data”

Lossless data transmission over UDP does not exist

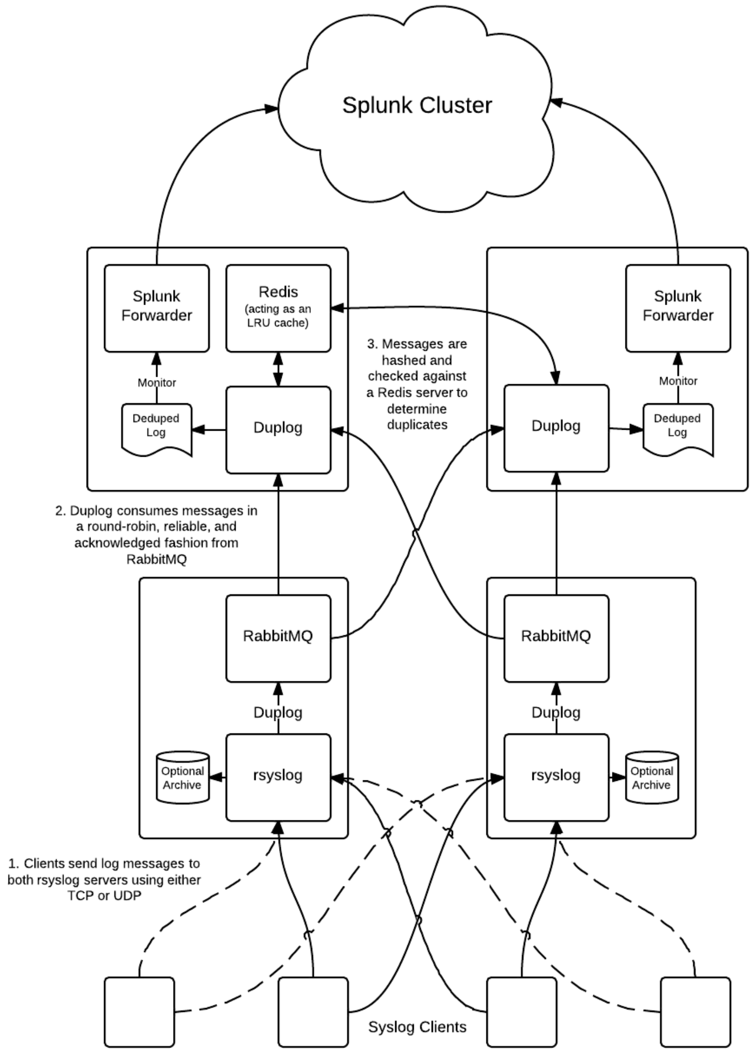
- UDP lacks error control AND flow control
  - Delivery cannot be guaranteed
  - Packets may be lost
    - They never arrived due to network issues
    - They were dropped due to a busy destination
  - Retransmits can result in duplicates
- You can engineer for redundancy
  - Loss can still happen
  - Avoid over-engineering

Worst Practice

Over-Engineering

Don’t engineer a solution for syslog that is more complex than Splunk itself!

- Loss of data is still possible
  - UDP does not guarantee delivery…make peace with it
- Design for redundancy while maintaining minimal complexity



3. Messages are hashed and checked against a Redis server to determine duplicates

2. Duplog consumes messages in a round-robin, reliable, and acknowledged fashion from RabbitMQ

1. Clients send log messages to both rsyslog servers using either TCP or UDP

Best Practice

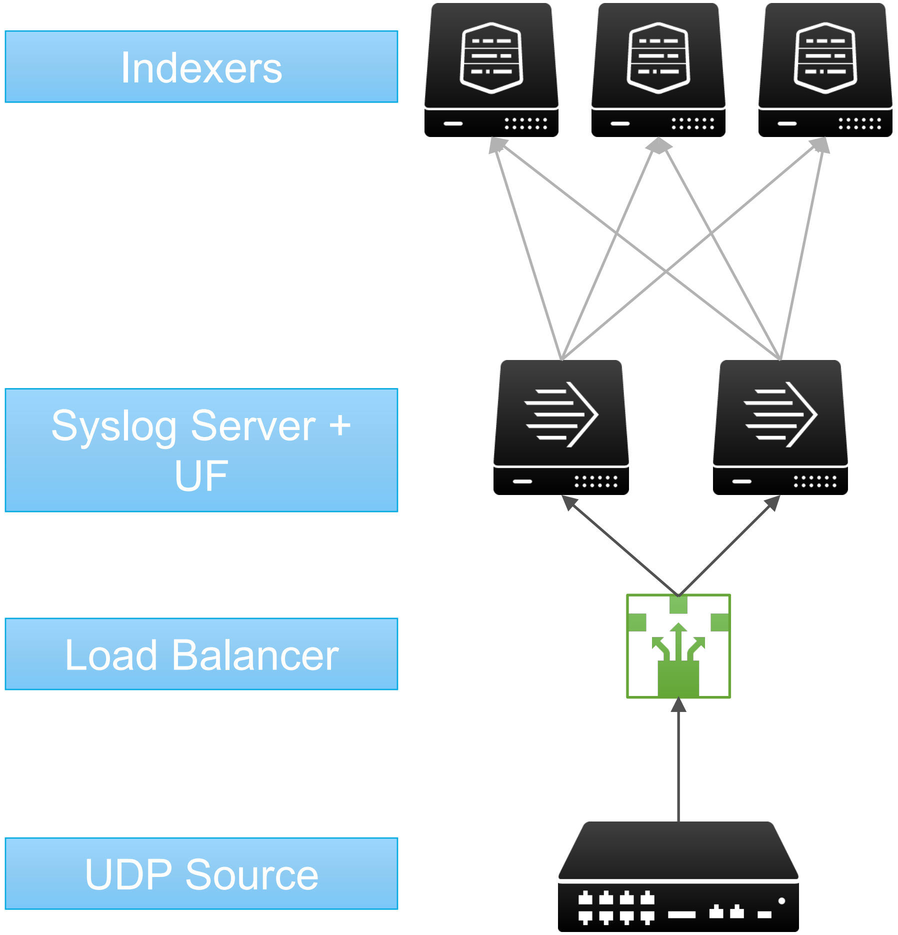
Simplified syslog collection

Goal: Minimize Loss

- K.I.S.S. – Keep it Simple…Silly

Incorporate redundancy without making it overly complex

- Utilize a syslog server
  - Purpose built solution
  - Gives more flexibility
    - Host extraction, log rolling/retention
- Minimize # of network hops between source and syslog server



Want To Know More?

Check out these sessions…

The Critical Syslog Tricks That No One Seems to Know About

- **Wednesday, September 27, 2017 | 4:35 PM-5:20 PM**
  - **George Barrett,** Splunk Consultant, Rational Cyber
  - **Jonathan Margulies,** Splunk Consultant

To HEC with syslog! Scalable Aggregated Data Collection in Splunk

- **Thursday, September 28, 2017 | 10:30 AM-11:15 AM**
  - **Mark Bonsack,** Staff Sales Engineer, Splunk Inc.
  - **Ryan Faircloth,** Professional Services Consultant, Splunk Inc.

Direct TCP/UDP Data Collection

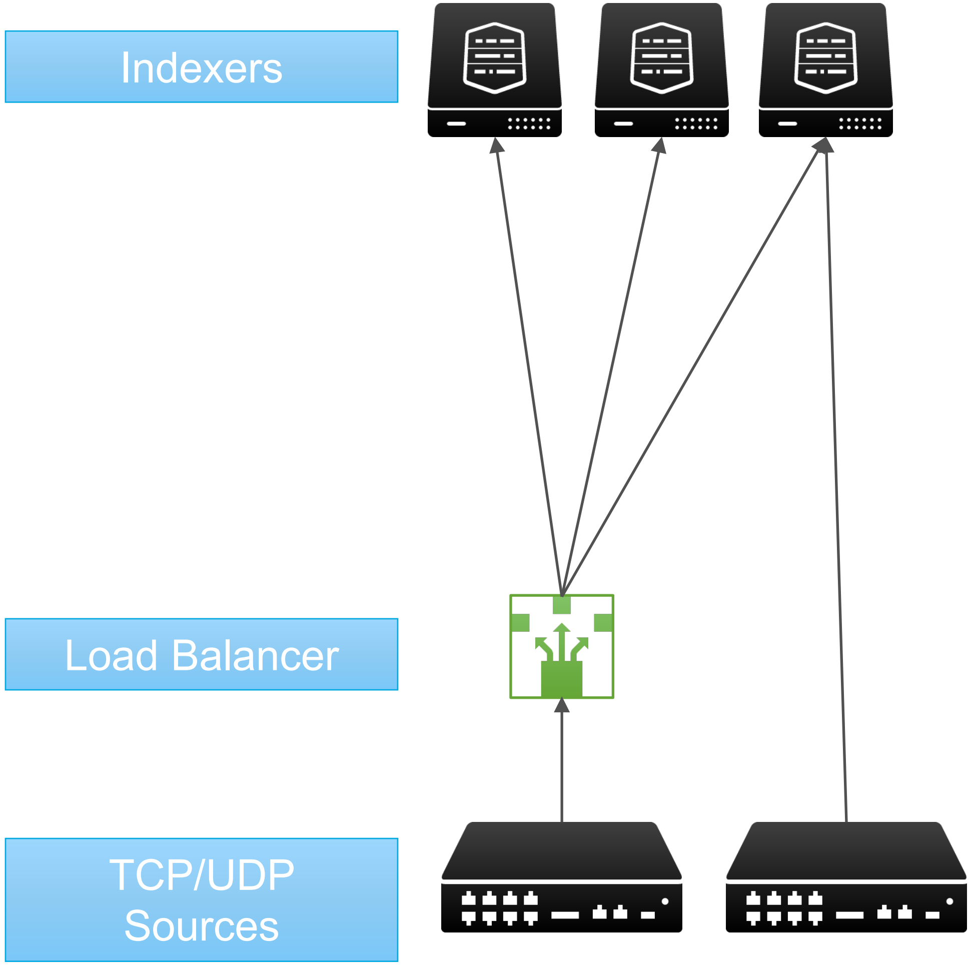
Worst Practice

Sending TCP/UDP straight to Indexers

- TCP/UDP stream sent to Indexers
  - Directly or via Load Balancer

Event distribution on Indexers is CRITICAL

- Distribute your search workload as much as possible across Indexers
- Load Balancers
  - Typically only DNS load balancing
    - Large streams can get stuck on an Indexer
  - Don't switch Indexers often enough



Best Practice

Use Splunk Auto Load Balancing

This looks familiar…

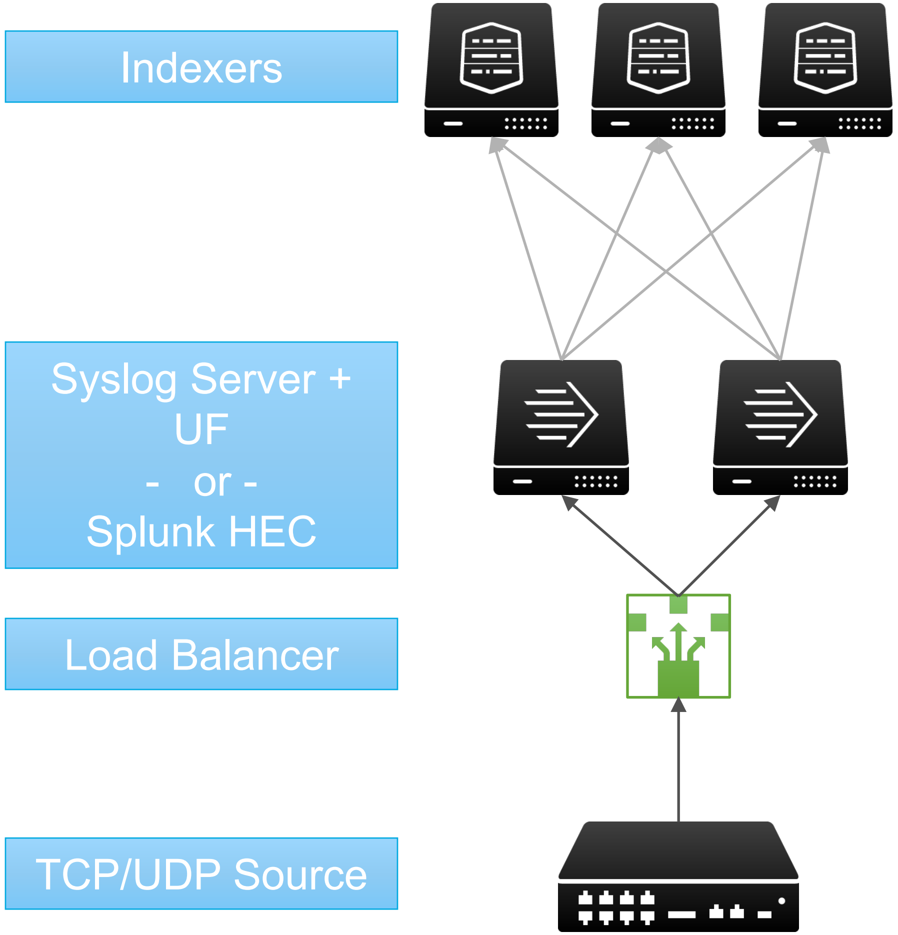
- It should, it's the same as the recommended UDP/Syslog configuration

Splunk AutoLB

- Handles distributing events across Indexers automatically
- [forceTimebasedAutoLB] or [event_breaker]
  - Can be used for large files or streams

▶ Utilize a syslog server

- For all the same reasons we discussed before



Forwarder Load Balancing

Load Balancing

A Primer…

What is it?

- Distributes events across Indexers

outputs.conf

```
autoLB = true
autoLBFrequency = 30
autoLBVolume = <bytes>
```

Why is it important?

- Distributed Processing
  - Distributes workload
  - Parallel processing

When does it break?

- Large files
- Continuous data streams

How does it break?

- Forwarder keeps sending to the same Indexer until:

inputs.conf

```
[monitor://<path>]
time_before_close = 3
  * Secs to wait after EoF
[tcp://<remote server>:<port>]
rawTcpDoneTimeout = 10
```

  - Regardless of autoLB settings

Why does that happen?

- UF doesn’t see event boundaries
- We don’t want to truncate events

splunk> .conf2017

Worst Practices

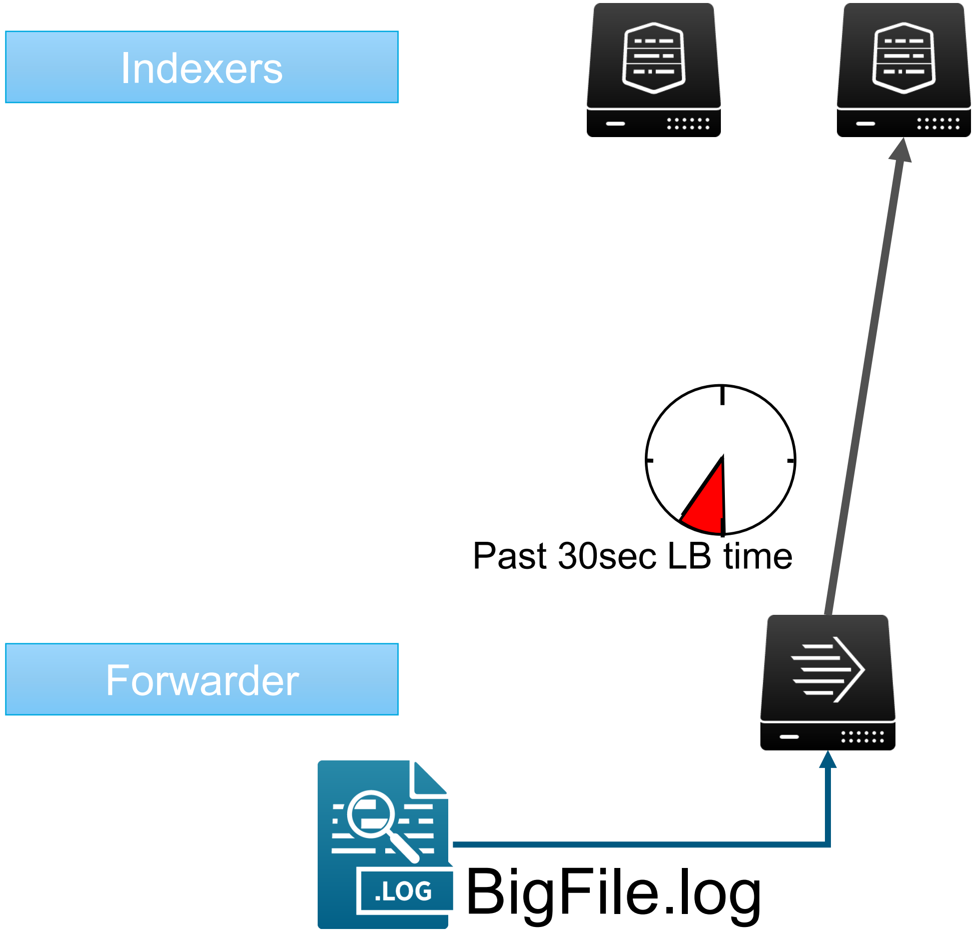
Sticky forwarders

Using the UF to monitor…

- Very large files
- Frequently updated files
- Continuous data streams

…Without modifying default autoLB behavior

- Forwarder can become “locked” onto an Indexer
  - We have settings that can help



Best Practices

Un-stick your forwarders

- If you're running 6.5+ UFs…
  - Use UF event breaking
    - Applied per sourcetype
      - Default behavior is followed if not configured

props.conf New!

```
[<sourcetype>]
EVENT_BREAKER_ENABLE = true
EVENT_BREAKER = <regex>
```

- If you're running a pre-6.5 UF...
  - Use [forceTimebasedAutoLB]

Events may be truncated if an individual event exceeds size limit

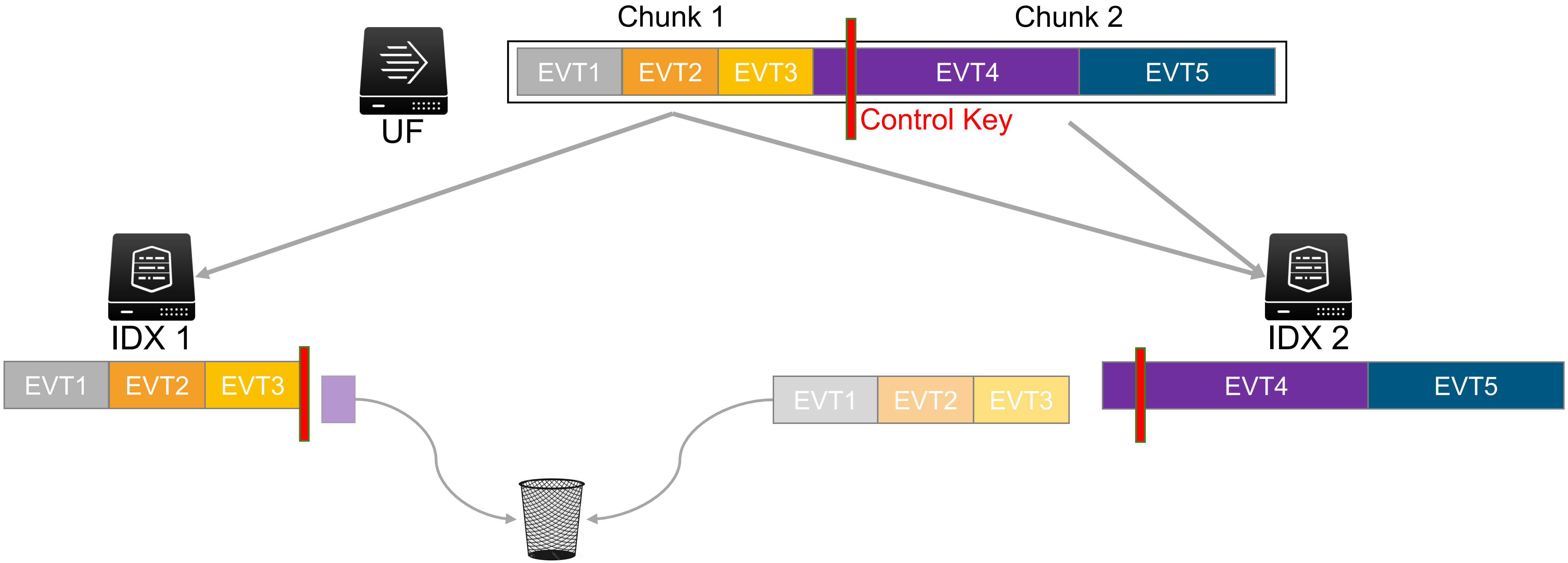
- Know the limits
  - File Inputs: 64KB
  - TCP/UDP Inputs: 8KB
  - Mod Inputs: 65.5KB (Linux Pipe Size)

outputs.conf

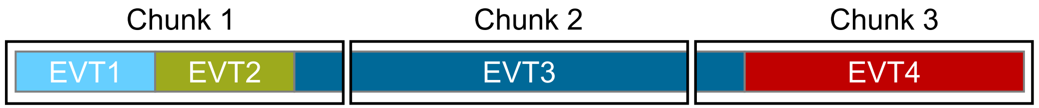
```
autoLB = true
autoLBFrequency = 30
forceTimeBasedautoLB =
true
```

forceTimebasedAutoLB

How does it work?



Problem Event:



UF Event Breaking

A better way to get un-stuck

- Available in Splunk 6.5+
  - Only available on the Universal Forwarder (UF)

What does it do?

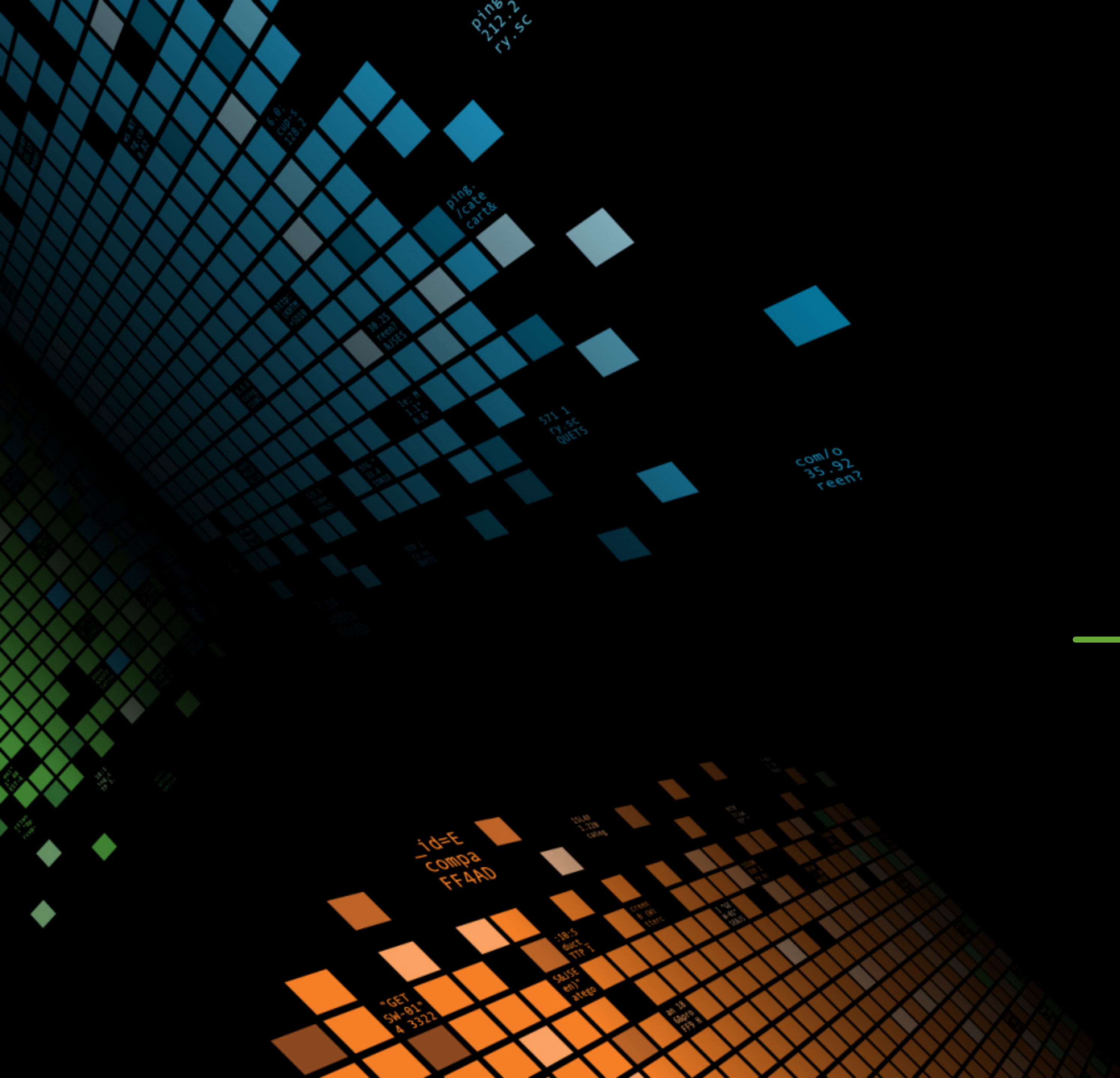
- Provides lightweight event breaking on the UF
  - AutoLB processor now sees event boundaries
    - Prevents locking onto an Indexer
    - [forceTimeBasedautoLB] not needed for trained Sourcetypes

How does it work?

- Props.conf on UF
- Event breaking happens for specified Sourcetypes
- Sourcetypes without an event breaker are not processed
  - Regular AutoLB rules apply

props.conf

```
[<sourcetype>]
EVENT_BREAKER_ENABLE = true
EVENT_BREAKER = <regex>
```



Intermediate Forwarders

Gone Wrong

Intermediate forwarder

noun

: A Splunk Forwarder, either Heavy or Universal, that sits between a Forwarder and an Indexer.

Worst Practice

Using Heavy Forwarders vs. Universal Forwarders

Only use Heavy Forwarders (HWF) if there is a specific need

- You need Python
- Required by an App/Feature
  - HEC, DBX, Checkpoint, etc…
- Advanced Routing/Transformation
  - Routing individual events
  - Masking/SED
- Need a UI on the Forwarder

What's Wrong with my HWFs?

- Additional administrative burden
  - More conf files needed on HWFs
  - Increases difficulty in troubleshooting
- Cooked Data vs. Seared

Cooked: ~20% larger over the network

- UFs can usually do the same thing
  - Intermediate Forwarding
  - Routing based on data stream

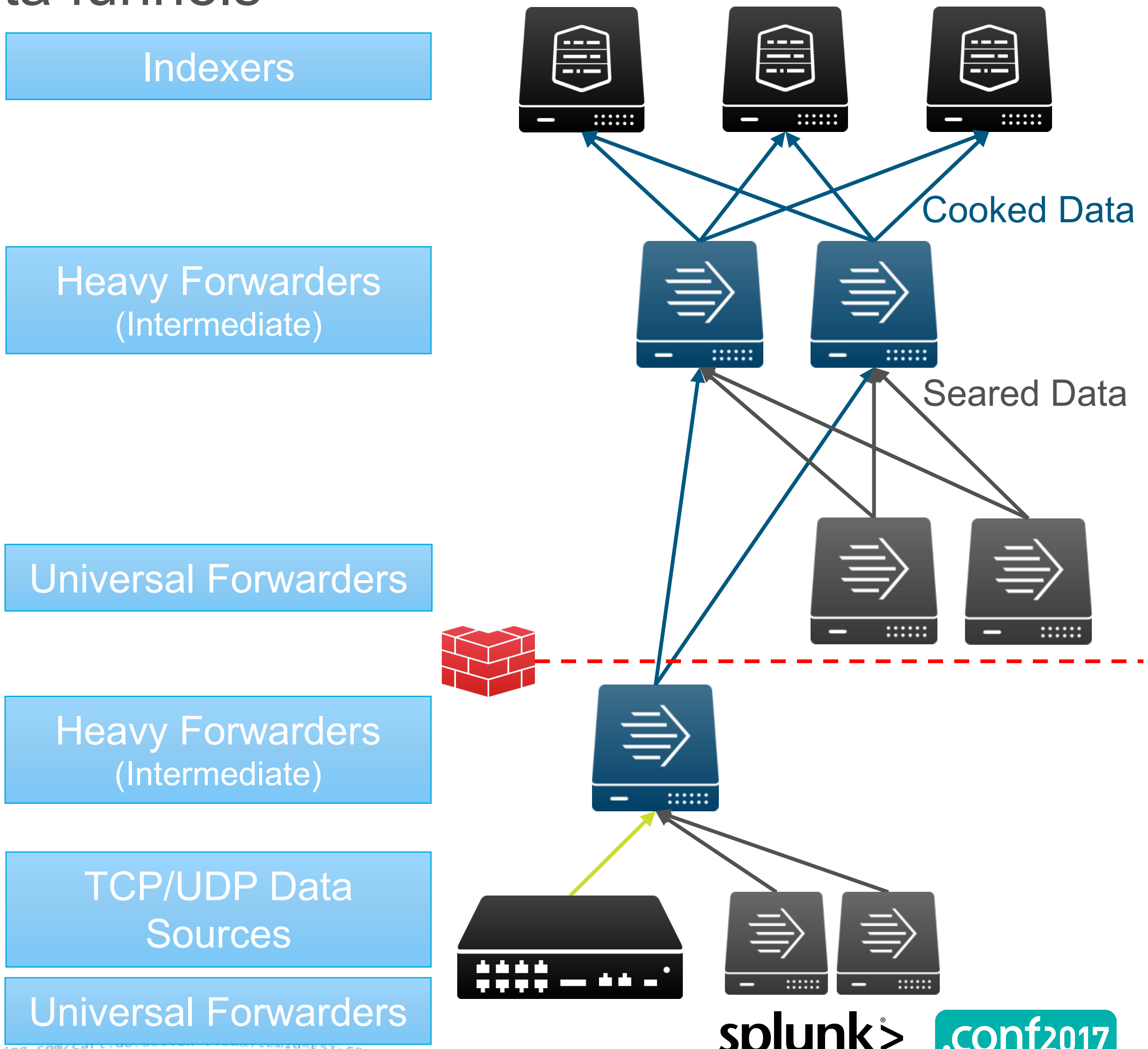
Worst Practice

Creating data funnels

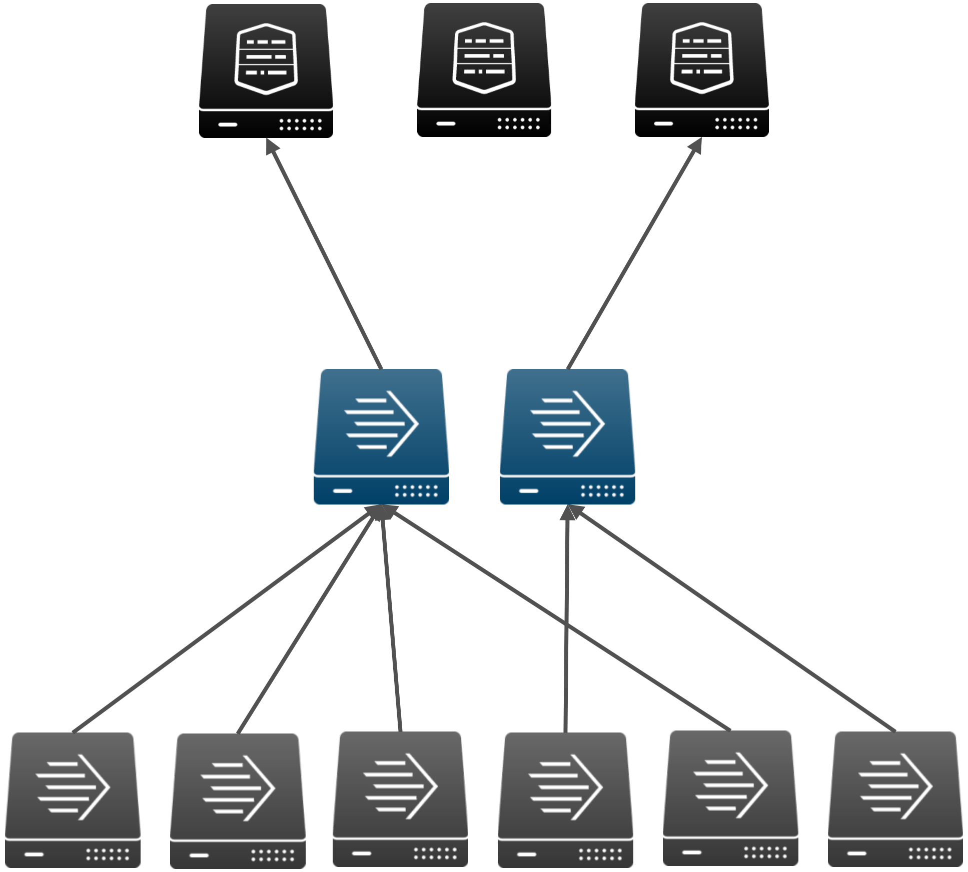
- Intermediate Forwarders
  - No data is being sent directly to indexers
  - HWFs are used when UFs will do

Avoid data funnels

- Forwarders sending data to a handful of intermediate forwarders
- Causes indexer starvation
  - Indexers aren’t receiving events for periods of time
  - Results in data imbalance and poor search performance



The Funnel Effect



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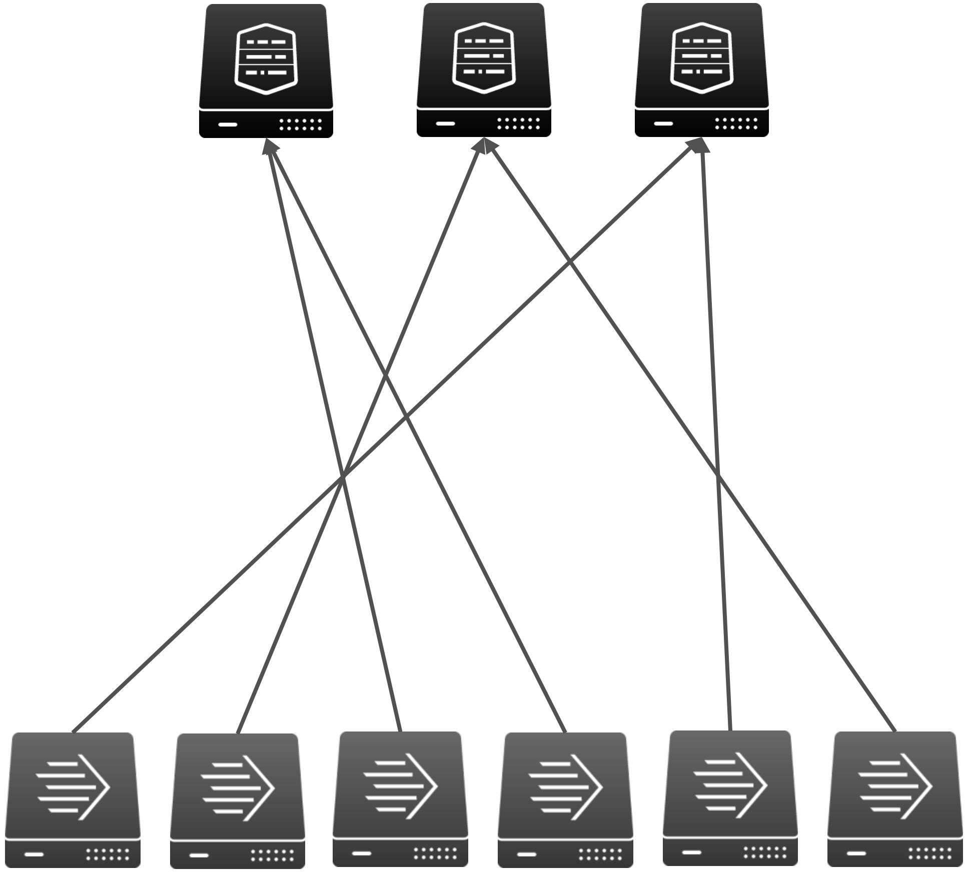
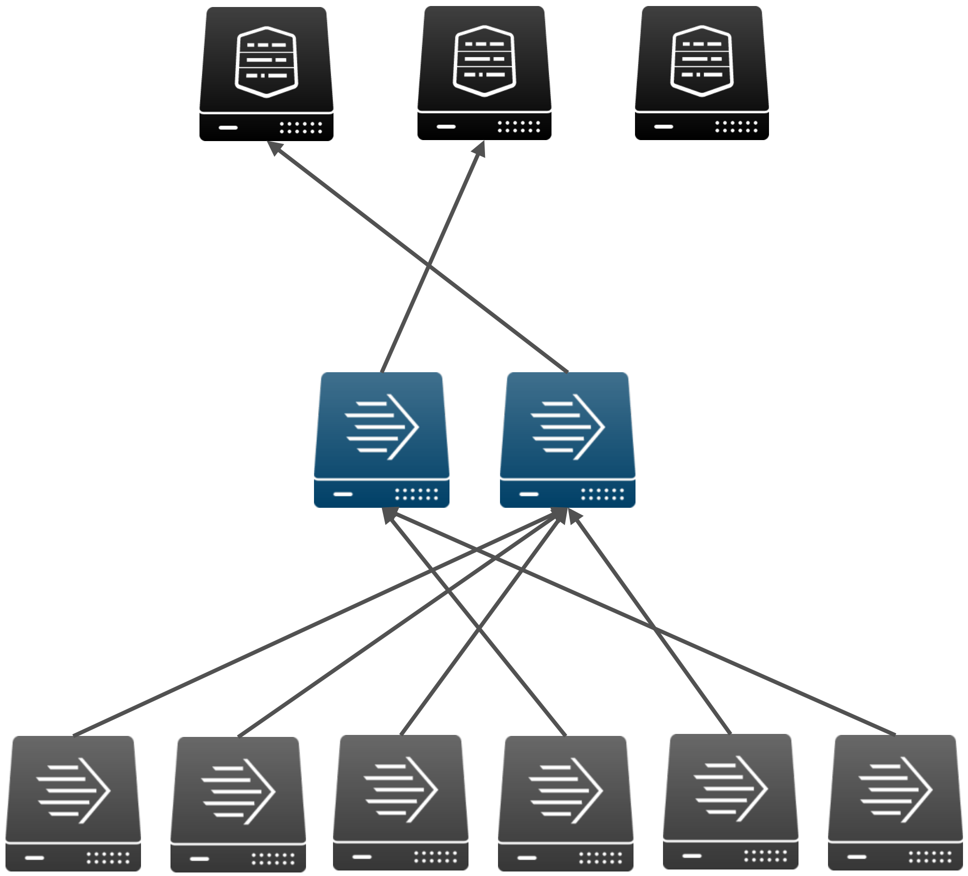
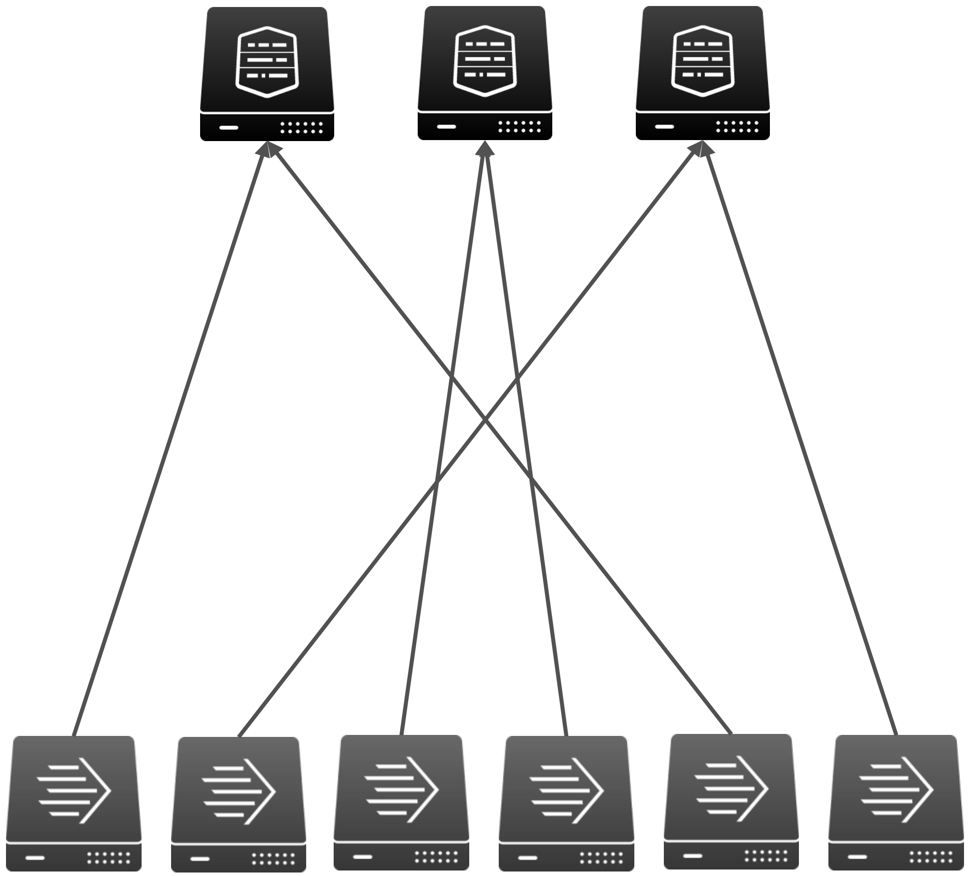


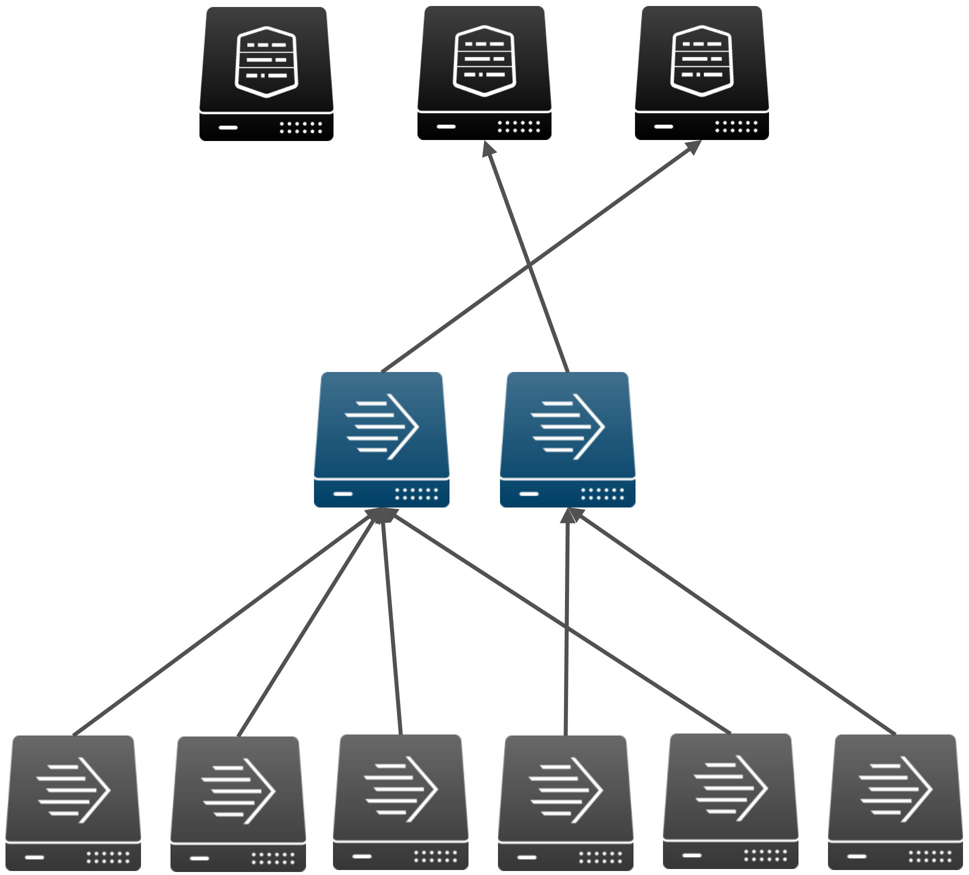
The Funnel Effect



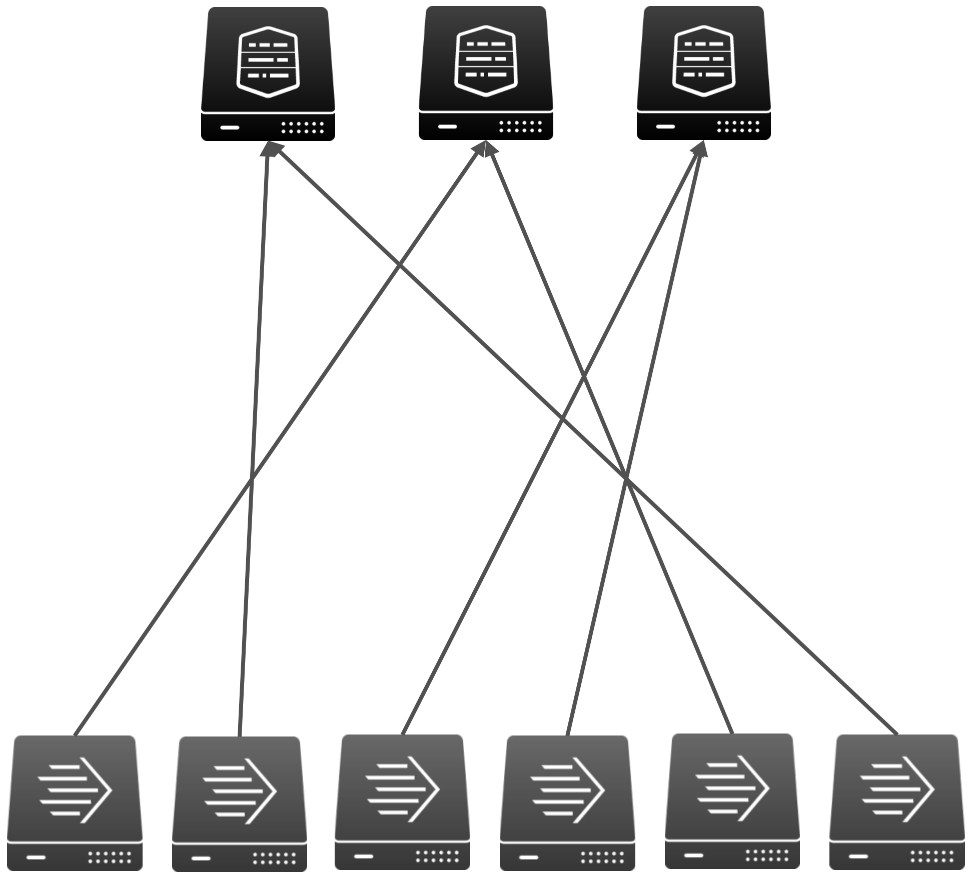
-VS-



The Funnel Effect



-VS-



Best Practice

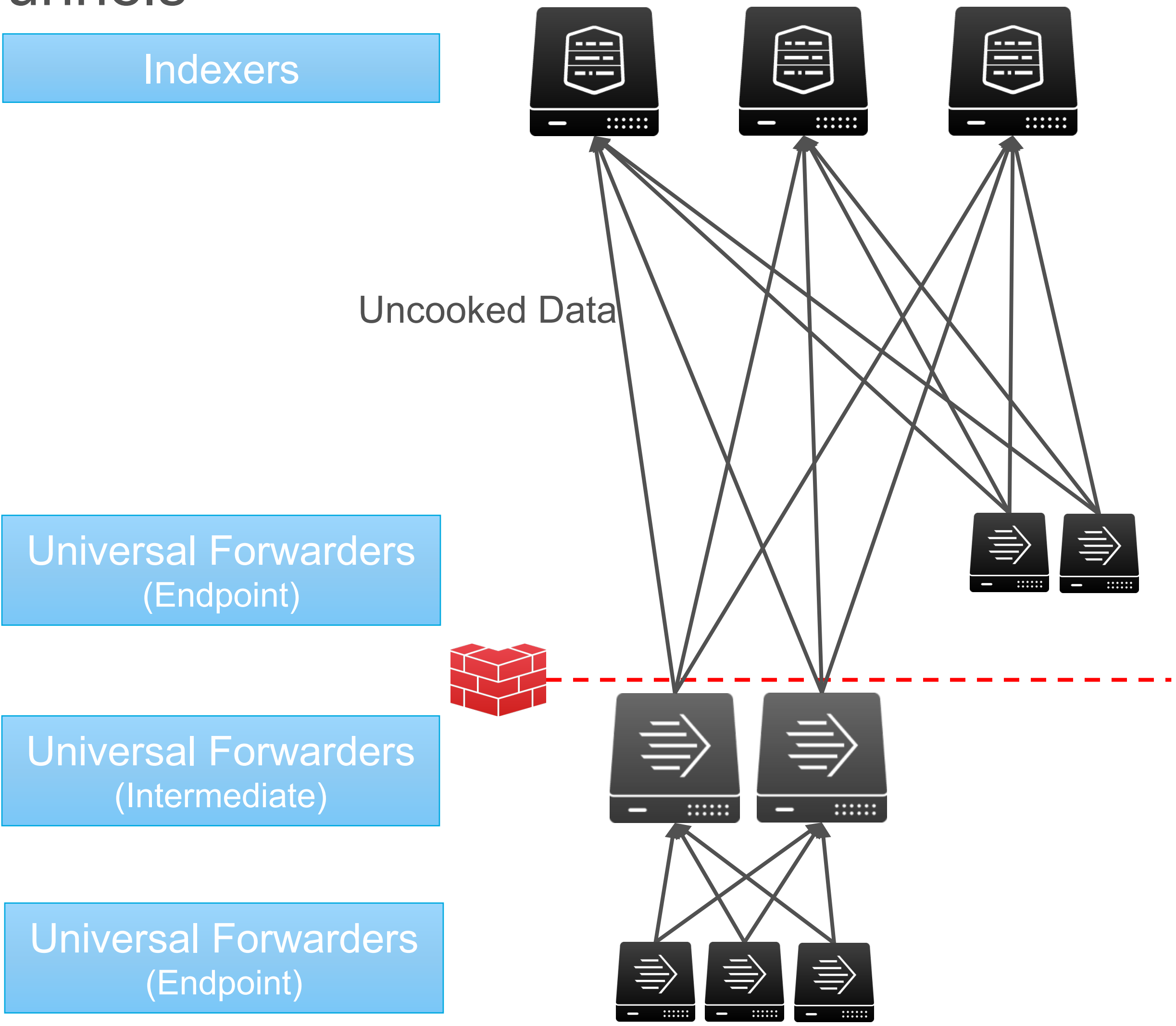
Reduce funnels

- Intermediate Forwarders
  - Limit their use
    - Most helpful when crossing network boundaries

Utilize forwarder parallelization

  - Avoid the “funnel effect”

- UFs → Indexers
  - Aim for 2:1 ratio
    - Parallelization or Instances
  - More UFs avoids Indexer starvation
- UF vs. HWF
    - Seared data vs. cooked
    - Less management required for conf files


Indexers
Uncooked Data
Universal Forwarders (Endpoint)
Universal Forwarders (Intermediate)
Universal Forwarders (Endpoint)

Data Onboarding

Get it tight, get it right

Sourcetype Recognition

Who is your daddy and what does he do?

Avoid automatic sourcetype recognition where possible

- Specify the sourcetype in inputs.conf

Inputs.conf

```
[monitor:///var/log]
sourcetype = mylog
```

- Don’t let Splunk guess for you
  - Requires additional processing due to RegEx matching
    - “too small” sourcetypes may get created

Timestamps

What did this happen?

Don’t let Splunk guess

- Are you sensing a theme?
- Side Effects
  - Incorrect Timestamp/TZ extraction
  - Missing/Missed Events
  - Bucket Explosion
- These parameters are your friends

Props.conf

```
[mySourcetype]
TIME_PREFIX =
TIME_FORMAT =
MAX_TIMESTAMP_LOOKAHEAD =
```

What comes before the timestamp?

What does the timestamp look like?

How far into the event should Splunk look to find the timestamp?

Event Parsing

Break it down

- Line Breaking

Avoid Line Merging

  - SHOULD_LINEMERGE = true
  - BREAK_ONLY_BEFORE_DATE, BREAK_ONLY_BEFORE, MUST_BREAK_AFTER, MUST_NOT_BREAK_AFTER, etc…

LINE_BREAKER is much more efficient

Props.conf

```
[mySourcetype]
SHOULD_LINEMERGE = false
LINE_BREAKER = <regex>
```

- Uses RegEx to determine when the raw text should be broken into individual events

Indexed Extractions and Accelerations

Speeding things up

What is an Indexed Extraction?

Splunk stores the Key-Value pair inside the TSIDX

  - Created at index-time

- Lose Schema-on-the-fly flexibility
- Can improve search performance
  - Can also negatively impact performance

▶ Example

- KV Pair: Trooper=TK421
- Stored in TSIDX as: Trooper::TK421

Worst Practice

Indexed Extractions Gone Wild

- Indexing all ”important” fields
  - Unique KV pairs are stored in the TSIDX
  - KV Pairs with high cardinality increase the size of the TSIDX
    - Numerical values, especially those with high precision

Large TSIDX = slow searches

- Statistical queries vs. filtering events
  - Indexed extractions are helpful when filtering raw events
  - Accelerated Data Models are a better choice for statistical queries
    - A subset of fields/events are accelerated
    - Accelerations are stored in a different file from the main TSIDX

Best Practice

When should I use Indexed Extractions?

- The format is fixed or unlikely to change
  - You loose schema on the fly with indexed extractions
- Values appear outside of the key more often than not

```
index=myIndex Category=X1
```

```
2016-11-12 1:02:01 PM INFO Category=X1 ip=192.168.1.65 access=granted message=Access granted to X1 system
```

```
2016-11-15 12:54:12 AM INFO Category=F2 ip=10.0.0.66 message=passing to X1 for validation
```

- Almost always filter using a specific key (field)
  - Categorical values (low cardinality)
  - Don’t index KV pairs with high cardinality
- Frequently searching a large event set for rare data
  - KV pair that appears in a very small % of events
  - foo!=bar or NOT foo=bar and the field foo nearly always has the value of bar

Restricted Search Terms

Lock it down

What Are Restricted Search Terms?

Nothing to see here…

- Filtering conditions
  - Added to every search for members of the role as AND conditions
    - All of their searches MUST meet the criteria you specify
  - Terms from multiple roles are OR'd together
- Where do I find this?
    - Access Controls > Roles > [Role Name] > Restrict search terms
- Not secure unless filtering against Indexed Extractions
  - Users can override the filters using custom Knowledge Objects
  - Indexed Extractions use a special syntax
  - key::value
    Ex: sourcetype::bluecoat

splunk> .conf2017

Worst Practice

All the hosts!

- Inserting 100s or 1,000s of filtering conditions
  - Hosts, App IDs
- "Just-In-Time" Restricted Terms
  - Built dynamically on the fly
    - Custom search commands/Macros
  - Can be complex/delay search setup

```
host=Gandalf OR host=frodo OR host=Samwise OR
host=Aragorn OR host=Peregrin OR host=Legolas OR
host=Gimli OR host=Boromir OR host=Sauron OR host=Gollum
OR host=Bilbo OR host=Elrond OR host=Treebeard OR
host=Arwen OR host=Galadriel OR host=Isildur
```

Best Practice

When should I filter?

- Filter based on categorical fields that are Indexed
    - Remember…low cardinality
  - Indexed extractions are secure, Search-time extractions are not
    - Use key::value format

Less is more

- Reduce the # of KV-Pairs you're inserting into the TSIDX
  - Larger TSIDX = slower searches
- Limit the # of filters you're inserting via Restricted Search Terms
  - Find ways to reduce the # of roles a user belongs to
  - Don't create specific filters for data that doesn't need to be secured
    - Use an "All" or "Unsecured" category

Want To Know More?

Check out these sessions…

A Trip Through the Splunk Data Ingestion and Retrieval Pipeline

- **Wednesday, September 27, 2017 | 12:05 PM-12:50 PM**
  - **Harold Murn,** Chaos Monkey, Atlassian

Splunking with Multiple Personalities: Extending Role Based Access Control to Achieve Fine Grain Security of Your Data

- **Wednesday, September 27, 2017 | 3:30 PM - 4:15 PM**
  - **Sabrina Lea,** Senior Sales Engineer, Splunk Inc.

Multi-Site
Search Head Clusters

Search Head Clustering

A Primer…

- SHC members elect a captain from their membership
- Minimum of 3 nodes required
  - Captain election vs. static assignment
- Odd # of SHC members is preferred
- Captain Manages
  - Knowledge object replication
  - Replication of scheduled search artifacts
  - Job scheduling
  - Bundle replication

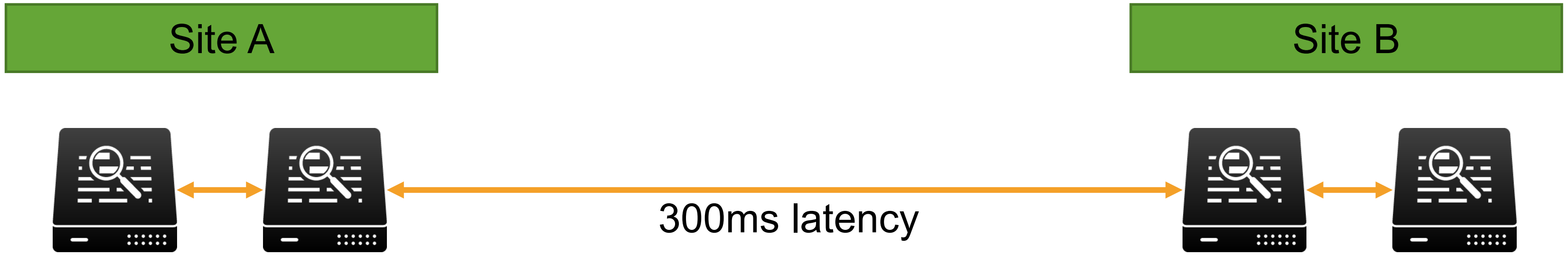
Multi-Site SHC does not exist

- What?!
- SHC is not site-aware
  - You're creating a stretched-SHC

Worst Practice

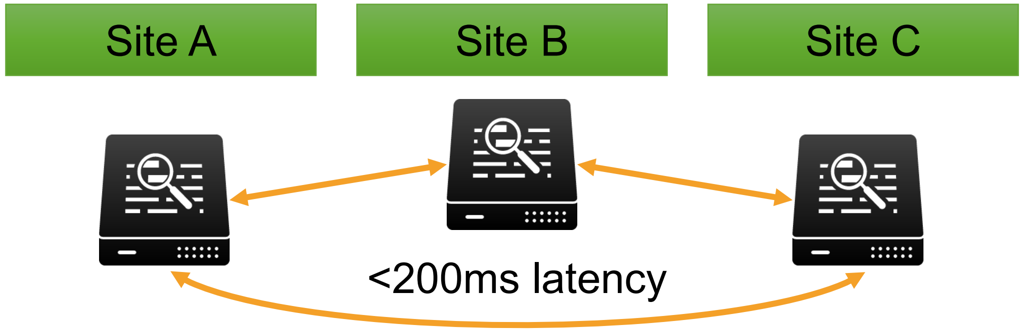
A ship without a captain

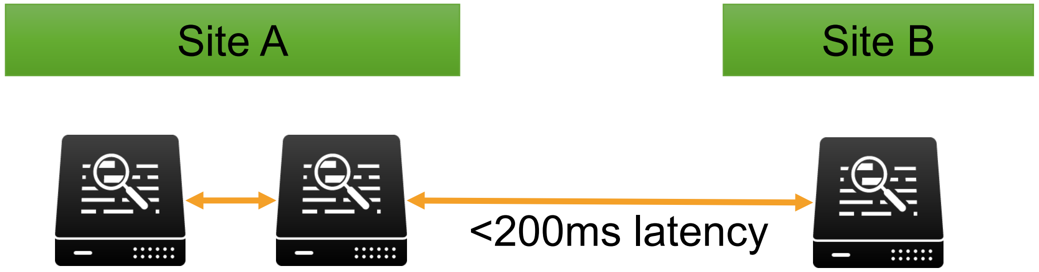
- Captain Election not possible with site or link failure
  - No site has node majority
    - Original SHC size: 4 Nodes
    - Node Majority: 3 Nodes
  - Odd # of SHC members is preferred
- WAN Latency is too high
  - We've tested up to 200ms



Best Practices

Designing a better Search Head Cluster





Three Sites: Fully Automatic Recovery

- Node majority can be maintained with a single site failure
  - Keep Indexers in 2 sites
    - Simplifies index replication
  - Limit workload on SH in 3rd site

server.conf

```
[shclustering]
adhoc_searchhead = true
preferred_captain = false
no_artifact_replication = true
```

Two Sites: Semi-Automatic Recovery

- Site A has node majority
  - Captain can be elected in Site A if Site B fails
  - Captain must be statically assigned in Site B if Site A fails
- WAN latency is <200ms

Want To Know More?

Check out these sessions…

Search Head Clustering – Basics to Best Practices

- **Wednesday, September 27, 2017 | 1:10 PM-1:55 PM**
  - **Bharath Aleti,** Sr Product Manager, Splunk Inc.
  - **Manu Jose**, Sr Software Engineer, Splunk, Inc.

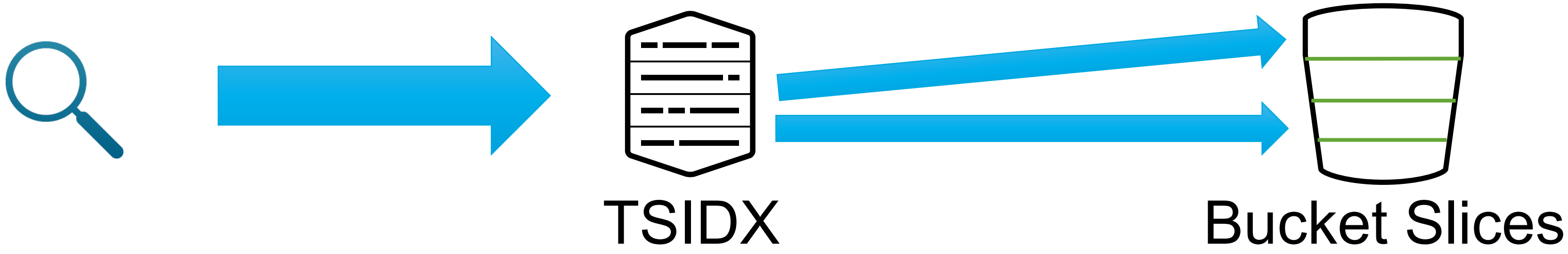
Index Management

Where should you put your data?

Search Goals

How do I make my searches fast?

- Find what we're looking for quickly in the Index (TSIDX)
  - Lower cardinality in the dataset = fewer terms in the lexicon to search through
- Decompress as few bucket slices as possible to fulfill the search
  - More matching events in each slice = fewer slices we need to decompress
- Match as many events as possible
  - Unique search terms = less filtering after schema is applied
  - Scan Count vs. Event Count

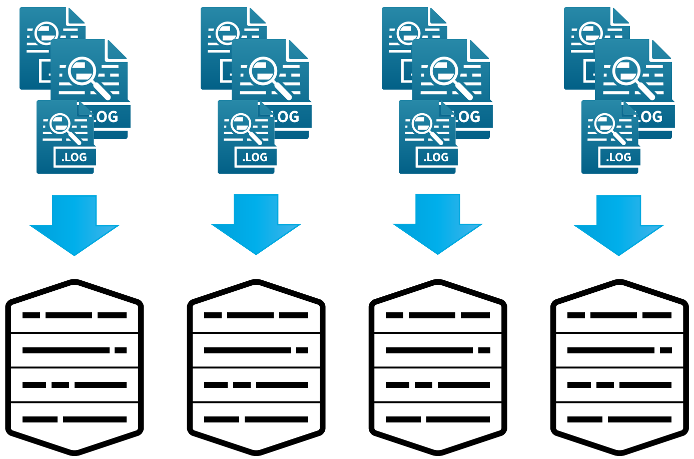


Worst Practice

When should I create Indexes?

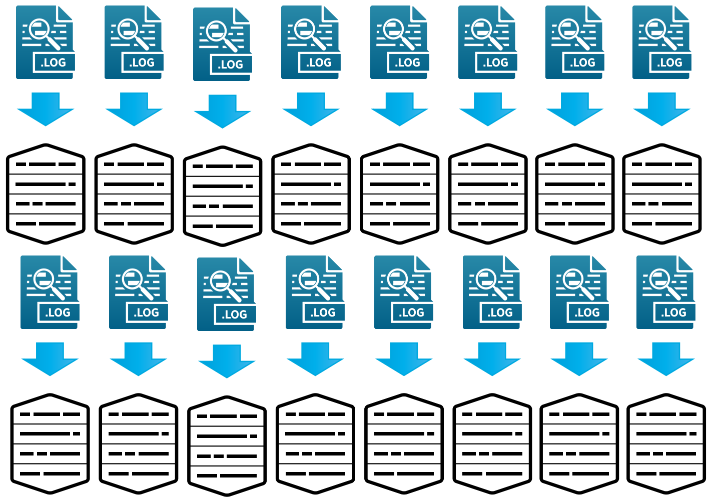
Goldilocks for Your Splunk Deployment

Mix of data in a handful of Indexes



This deployment has too few Indexes…

Dedicated Indexes for Sourcetypes



This deployment has too many Indexes…

Too Few Indexes

…and the problems it creates

- What do we write to the Index (TSIDX)?
    - Unique terms
    - Unique KV Pairs (Indexed Extractions)
- Higher data mix can mean higher cardinality
    - More unique terms = Larger TSIDX
        - Larger TSIDX files take longer to search
- More raw data to deal with
    - Potentially uncompressing more bucket slices
    - Searches can become less dense
        - Lots of raw data gets filtered out after we apply schema

Too Many Indexes

If small indexes are faster, why not just create a lot of them?

- Complex to manage
- Index Clustering has limitations
  - Cluster Master can only manage so many buckets
    - Total buckets = original and replicas

Version	Unique Buckets	Total Buckets
6.3 & 6.4	1M	3M
6.5	1.5M	4.5M
6.6+	5M	15M

- What if I’m not using Index Clustering?
  - Create as many indexes as you want!

Best Practice

When to Create Indexes

- Retention
  - Data retention is controlled per index
- Security Requirements
  - Indexes are the best and easiest way to secure data in Splunk
- Keep “like” data together in the same Index
  - Service-level Indexes
    - Sourcetypes that are commonly searched together
    - Match more events per bucket slice
  - Sourcetype-Level Indexes
    - Data that has the same format
    - Lower cardinality = smaller TSIDX

What If I Need Thousands Of Indexes To Secure My Data?

- Don’t. ☺
    - More indexes = more buckets = bad for your Index Cluster

Look for ways to reduce the complexity of your security model

- Organize by Service
    - Collection of apps/infrastructure
- Organize by groups
    - Org, Team, Cluster, Functional Group

- Consider Indexed Extractions & Restricted Search Terms

Index Replication

Give me 10 of everything!

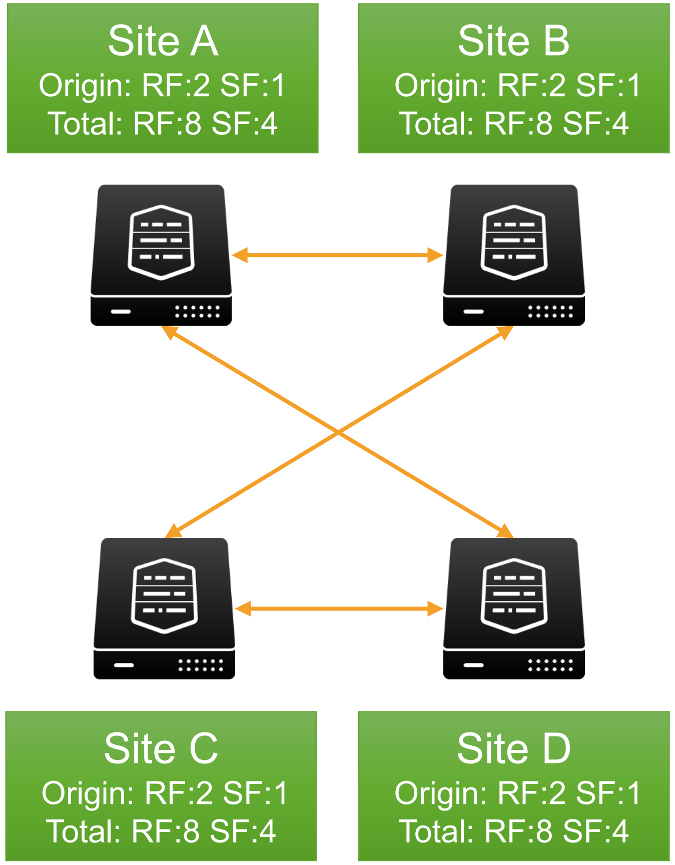
Worst Practice

Replicate all the things!

- Lots of Replicas & Sites
  - 8 replicas in this example
  - 4 sites

Index Replication is Synchronous

- Bucket slices are streamed to targets
  - Excess replication can slow down the Indexing pipeline
- Replication failures cause buckets to roll from hot to warm prematurely
  - Creates lots of small buckets



Site A
Origin: RF:2 SF:1
Total: RF:8 SF:4

Site B
Origin: RF:2 SF:1
Total: RF:8 SF:4

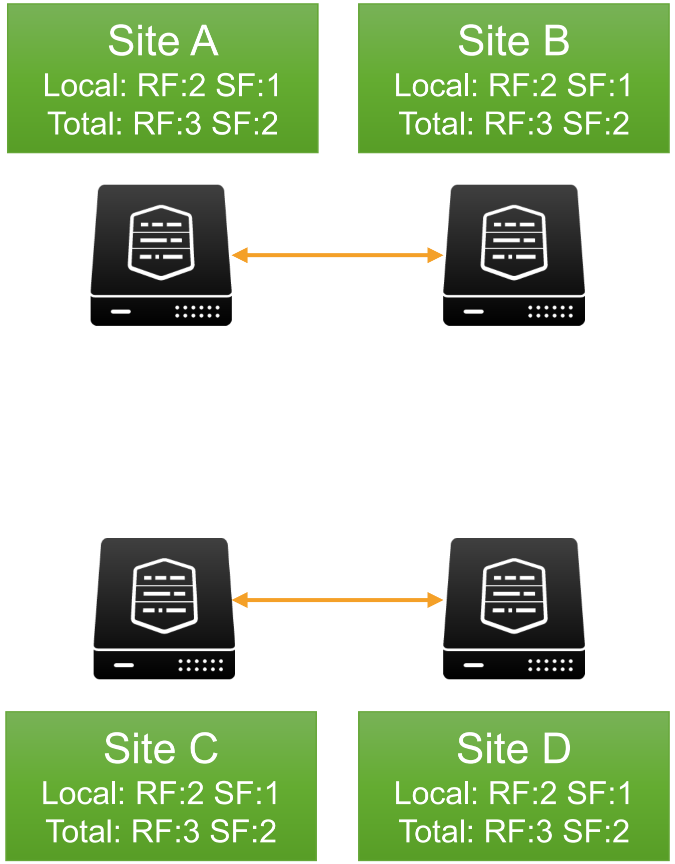
Site C
Origin: RF:2 SF:1
Total: RF:8 SF:4

Site D
Origin: RF:2 SF:1
Total: RF:8 SF:4

Best Practice

K.I.S.S.

- Reduce the number of replicas
    - 2 local copies and 1 remote is common
- Reduce the number of remote sites
    - Disk space is easier to manage with 2 sites
- WAN Latency
    - Recommended: <75ms
        - Max: 100ms
- Keep an eye on replication errors
    - Avoid small buckets



Site A
Local: RF:2 SF:1
Total: RF:3 SF:2

Site B
Local: RF:2 SF:1
Total: RF:3 SF:2

Site C
Local: RF:2 SF:1
Total: RF:3 SF:2

Site D
Local: RF:2 SF:1
Total: RF:3 SF:2

High Availability

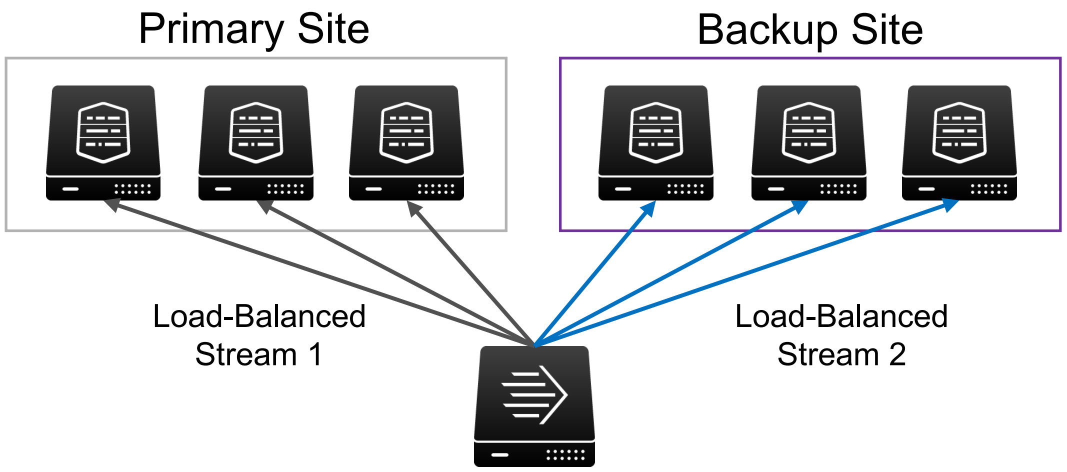
MacGyver Style

He is the DR plan

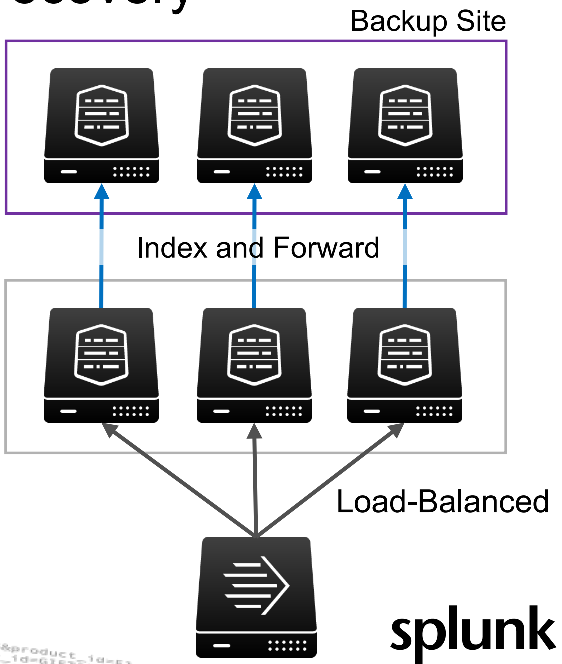
Some Worst Practices

Quick ‘n Dirty HA

- Cloned Data Streams
  - Data is sent to each site
  - Inconsistency is likely
    - If a site is down, it will miss data
  - Difficult to re-sync sites



- Index and Forward
  - RAID1-style HA
    - Failover to backup Indexer
  - Forwarders must be redirected manually
  - Complex recovery

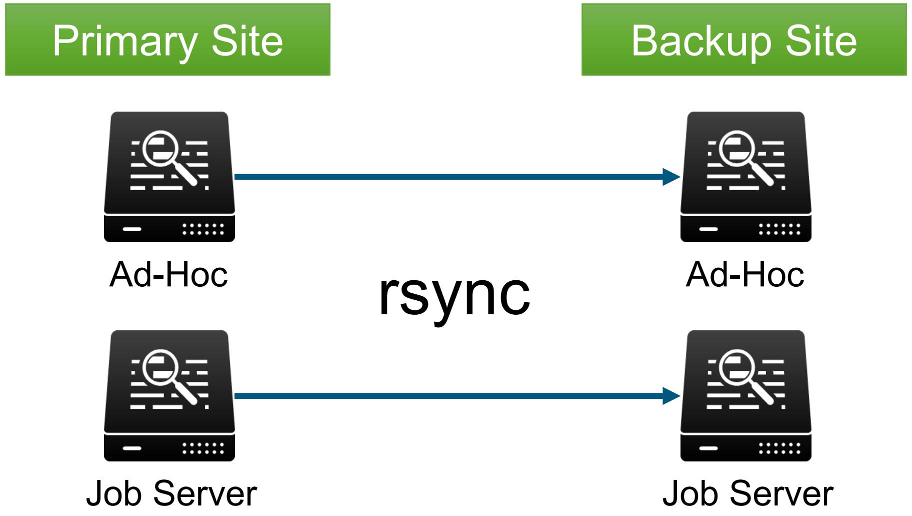


Another Worst Practice

Job servers are so 2006

Rsync & Dedicated Job Servers

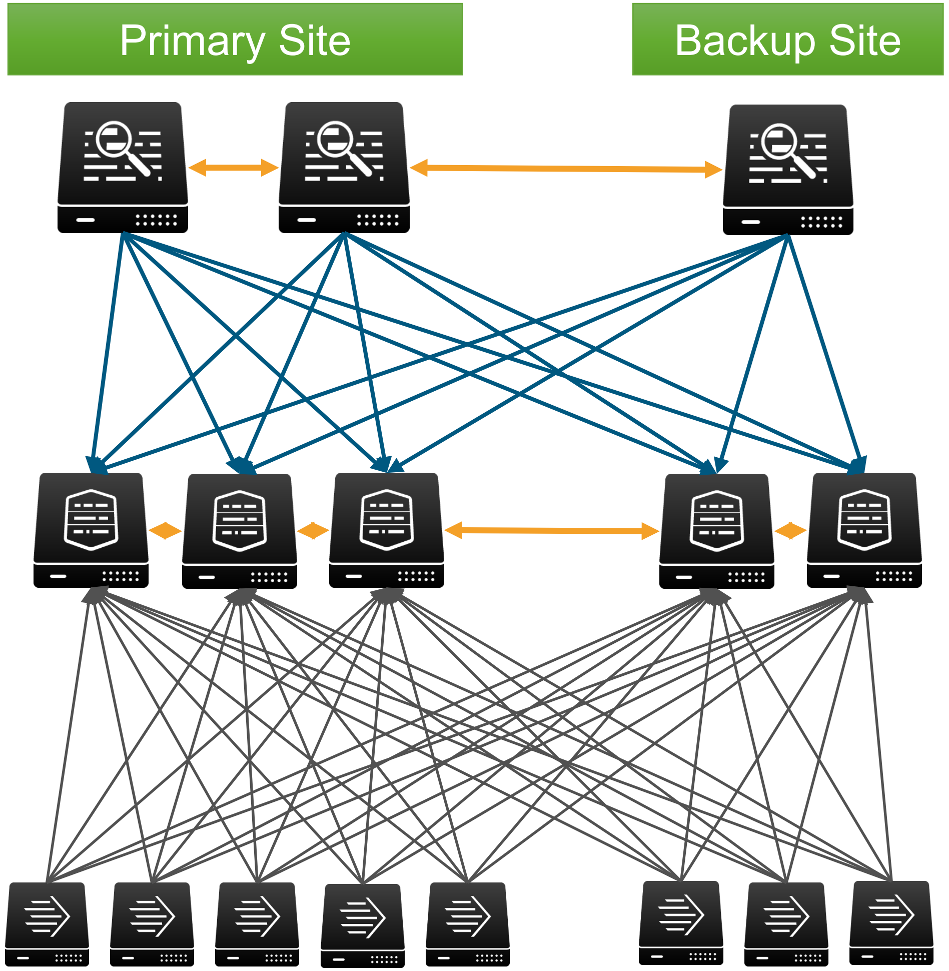
- Wasted ”standby” capacity in DR
- Inefficient use of resources between Ad-Hoc and Job Servers
- Conflict management is tricky if running active-active
- Search artifacts are not proxied or replicated
  - Jobs must be re-run at backup site



Some Best Practices

Splunk HA

- Index Clustering
  - Indexes are replicated
  - Failure recovery is automatic
- Search Head Clustering
  - Relevant Knowledge Objects are replicated
  - Search artifacts are either proxied or replicated
  - Managed Job scheduling
    - No dedicated job servers
    - Failure recovery is automatic
- Forwarder Load Balancing
  - Data is spread across all sites
  - Replicas are managed by IDX Clustering
  - DNS can be used to ”failover” forwarders between sites or sets of Indexers



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- **Wednesday, September 27, 2017 | 3:30 PM-4:15 PM**
  - **Stefan Sievert,** Staff Architect, Splunk Inc.
  - **Sean Delaney**, Principal Architect, Splunk, Inc.

Architecting Splunk for High Availability and Disaster Recovery

- **Tuesday, September 26, 2017 | 1:10 PM-1:55 PM**
  - **Sean Delaney,** Principal Architect, Splunk Inc.

Indexer Clustering Fixups - how a cluster recovers from failures

- **Thursday, September 28, 2017 | 11:45 AM-12:00 PM**
  - **Da Xu,** Principal Software Engineer, Splunk Inc.

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Questions?

Ask me anything

(well, not *anything*)

Thank You

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