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Architecting Splunk For High Availability And Disaster Recovery

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About Me

- Principal Field Architect
- 6+ Years at Splunk
- Large scale deployments
- 8th .conf

Agenda

Disaster Recovery

Recover in the event of a disaster

High Availability

- Data Collection
- Indexing & Searching

Maintain an acceptable level of continuous service

Top Takeaways

Disaster Recovery (DR)

DR

What Is Disaster Recovery?

Set of processes necessary to ensure recovery of service after a disaster

DR

Disaster Recovery Steps

1	**Backup Necessary Data** Backup to a medium at least as resilient as source Local Backup vs. Remote
2	**Restore** Ensure this works Backup is worthless without restore

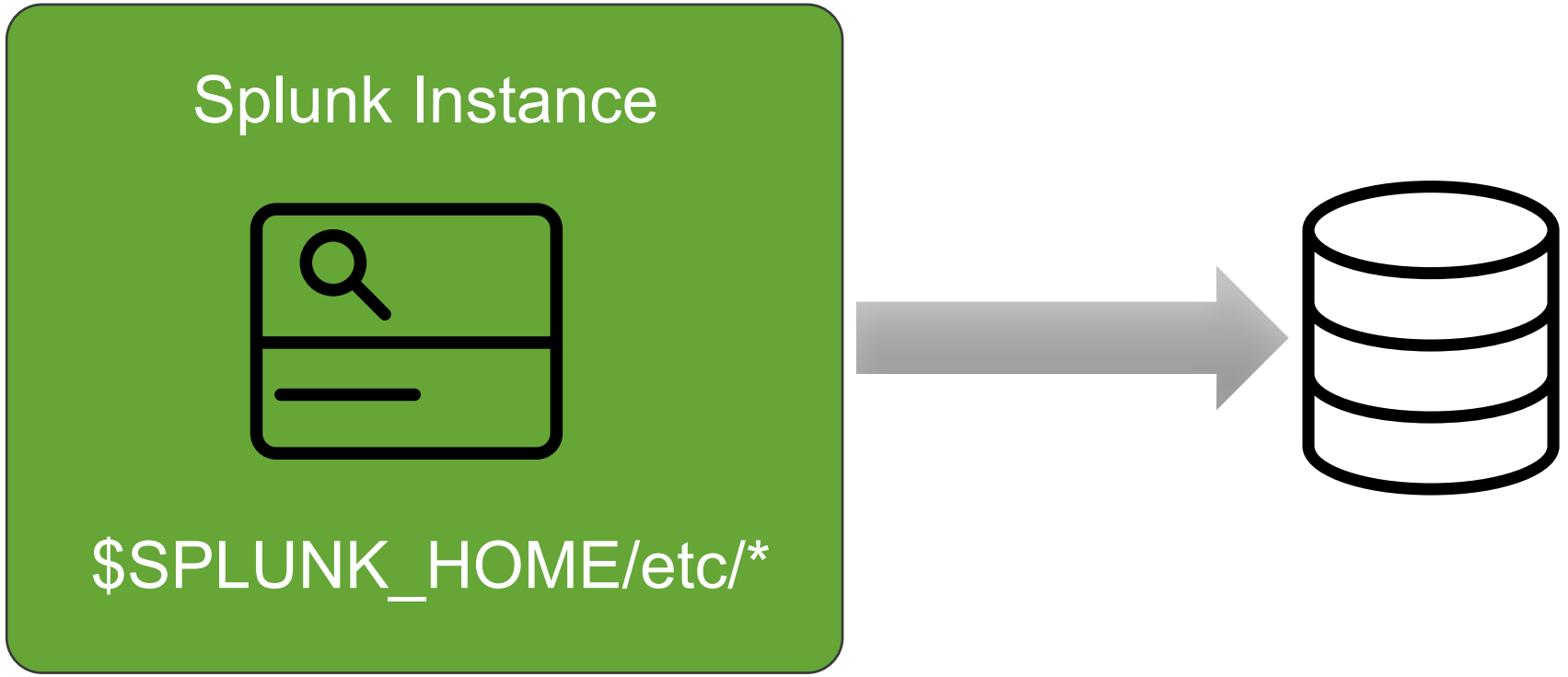
DR

Backup

1	a	Configurations $SPLUNK_HOME/etc/*
	b	Indexes Buckets: Hot*, Warm, Cold, Frozen

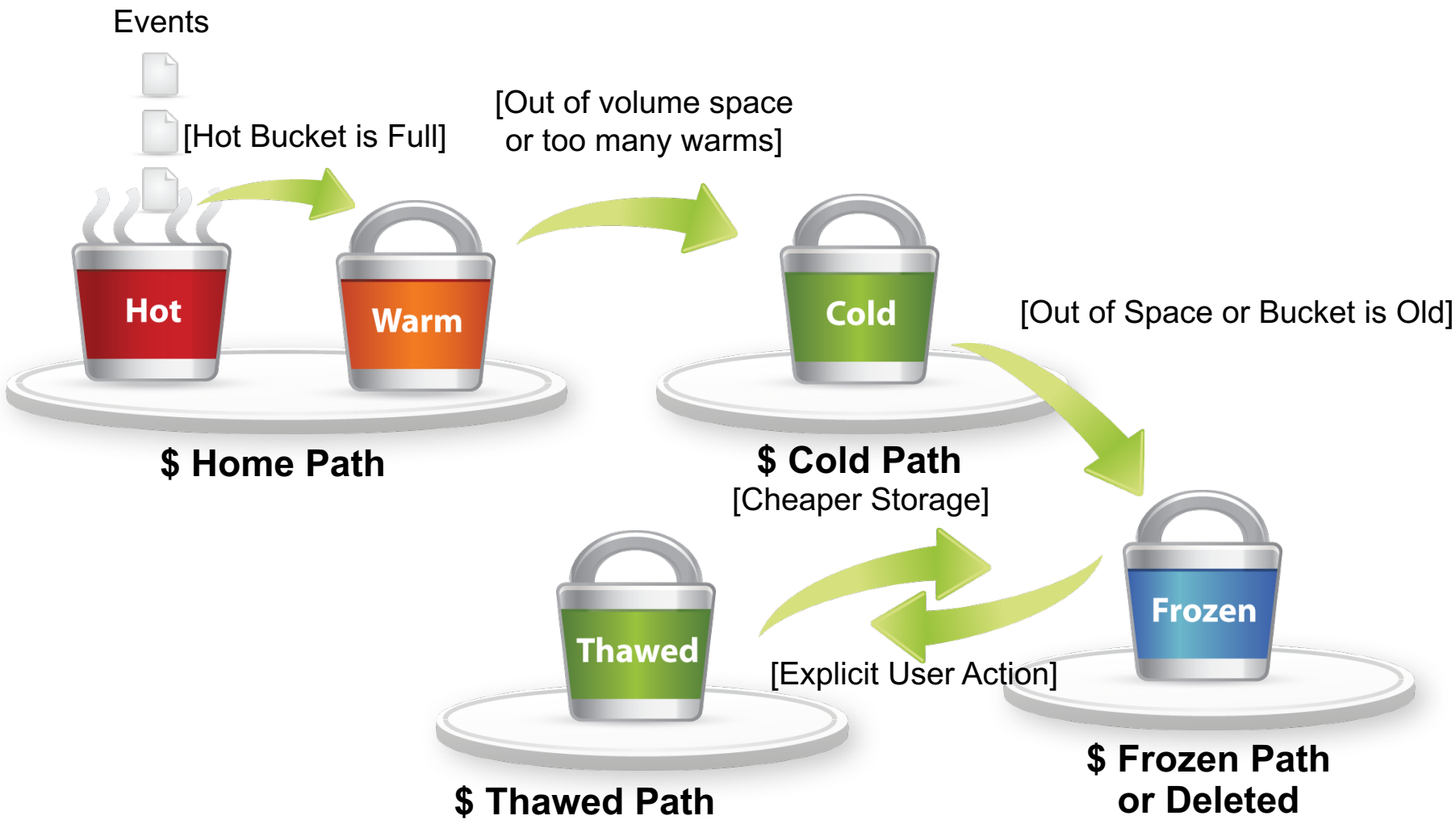
DR

Backup Configurations



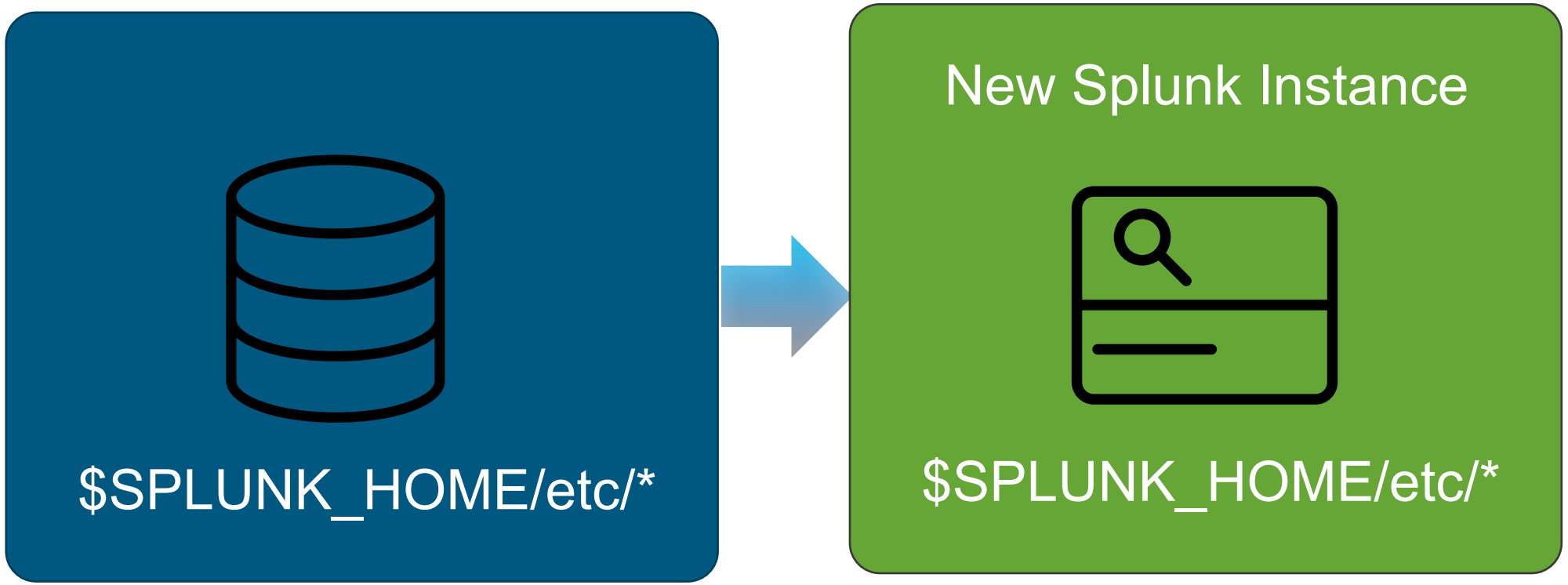
DR

Backup: Bucket Lifecycle



DR

Restore Configurations



DR

Backup Clustered Data

- **Option 1**: Backup all data on each node
  - Will also result in backups of duplicate data
- **Option 2**: Identify one copy of each bucket on the cluster and backup only those (requires scripting)
  - Decide whether or not you need to also backup index files

Bucket naming conventions

Non-clustered buckets: **db_<newest_time>_<oldest_time>_<localid>**

★Clustered original bucket: **db_<newest_time>_<oldest_time>_<localid>_<guid>**

Clustered replicated bucket copies:
rb_<newest_time>_<oldest_time>_<localid>_<guid>

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DR

Putting Restore Together

2	a	(New) Splunk Instance
	b	Configurations
	c	Data/Indexes

DR

Considerations

Recovery Time and Tolerable Loss

vs.

Complexity and Cost

Other Elements In Your Environment

- Job Artifacts, DM, Collections etc.
- Utility/Management Instances:
  - Deployment Server
  - License Master
  - Cluster Master
  - Deployer

High Availability (HA)

HA

What Is High Availability?

A design methodology whereby a system is continuously operational, bounded by a set of predetermined tolerances.

Note: “high availability” !=“complete availability”

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HA

Splunk High Availability

1	Data Collection/Reception
2	Searching
3	Indexing

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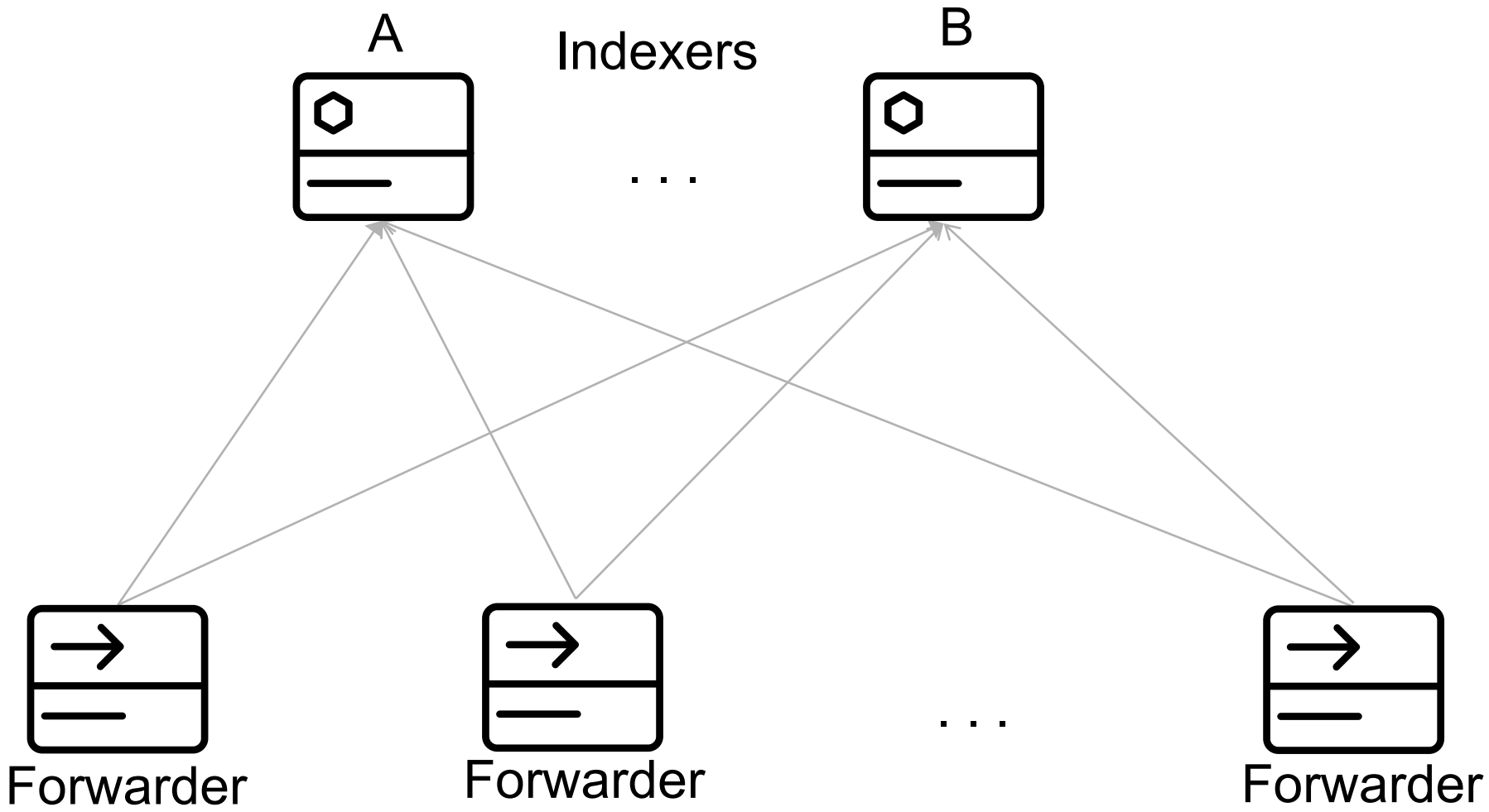
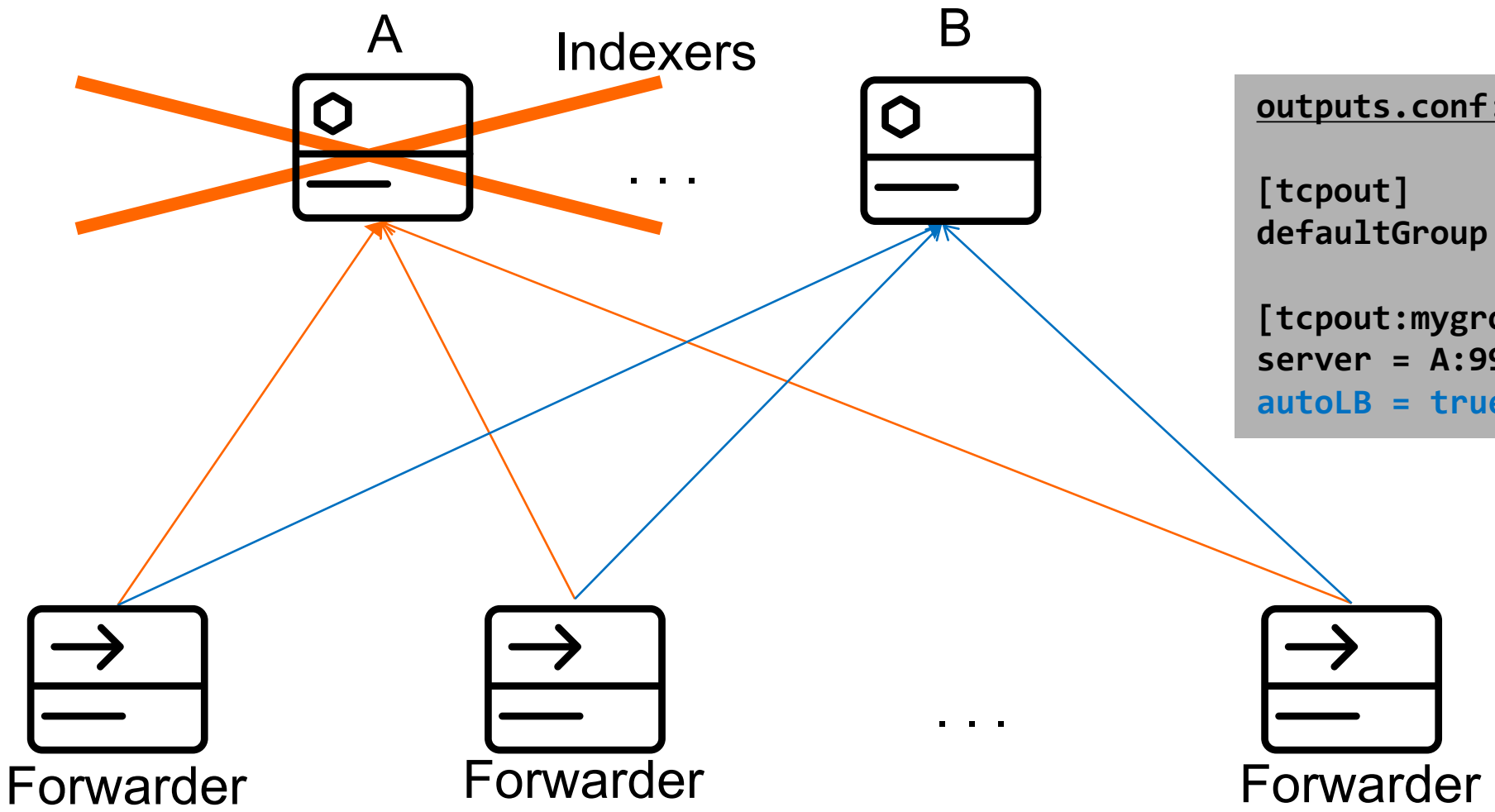
HA

Data Collection



Data Collection



outputs.conf:

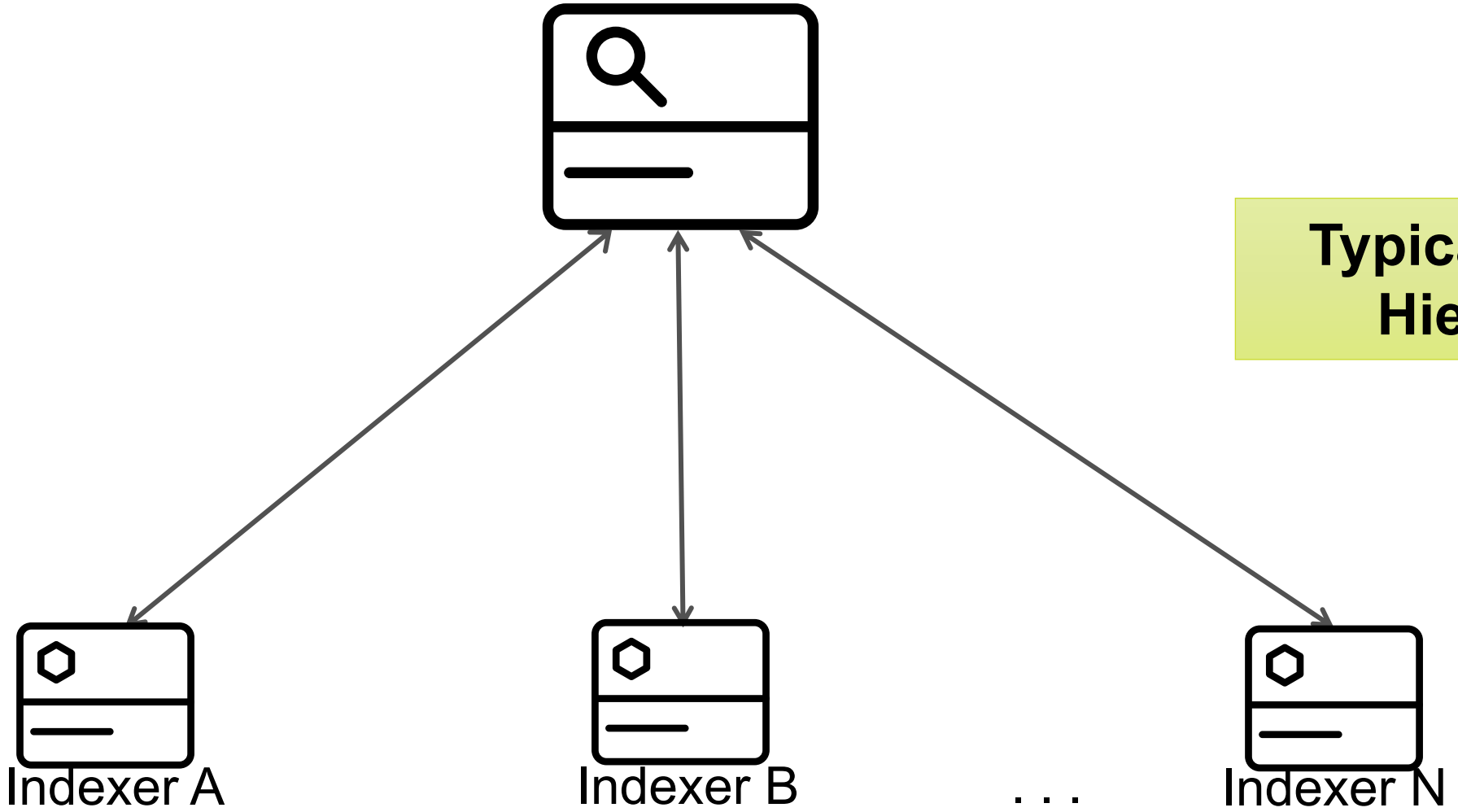
```
[tcpout]
defaultGroup = mygroup

[tcpout:mygroup]
server = A:9997, B:9997
autoLB = true
```

Searching

2	a	Search Head Clustering (SHC)
	b	Search Head Pooling (SHP)

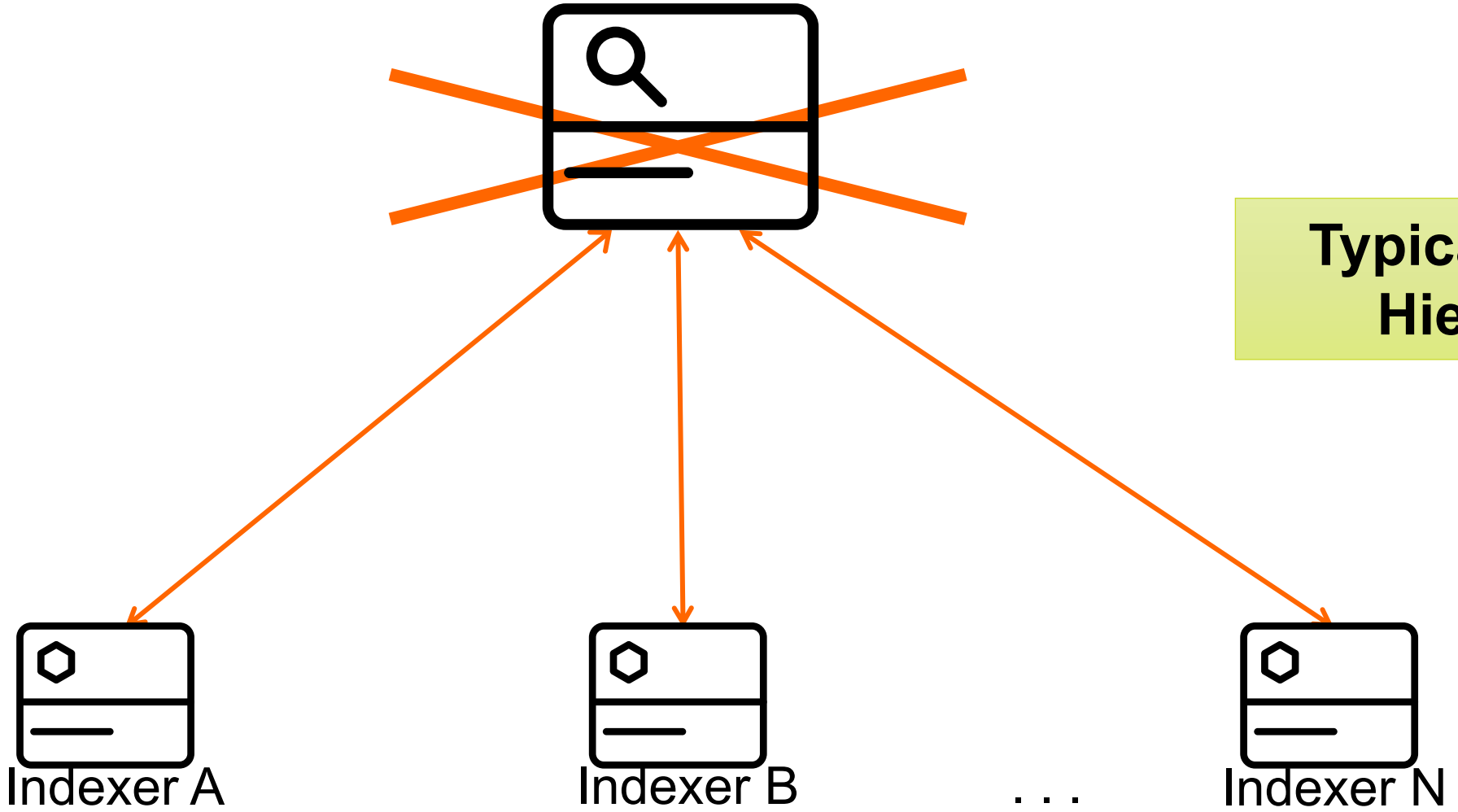
2 Search Head Clustering (SHC)

Searching



Typical Search Hierarchy

Searching



Typical Search Hierarchy

HA

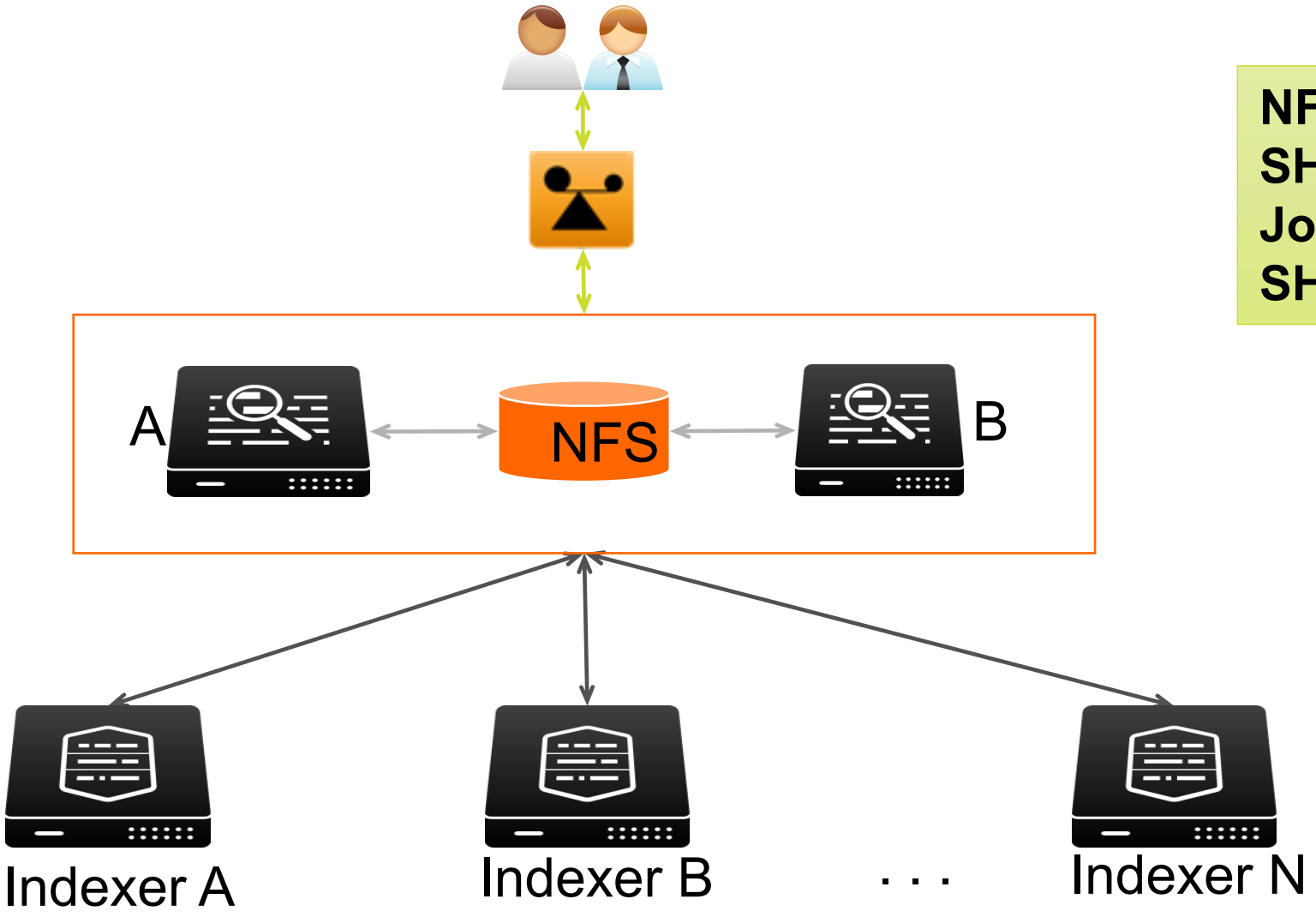
Search Head Pooling

NFS based Search Head Pooling
has been **deprecated***

*still works and supported for current Splunk version but plan for its eventual removal.

HA

SHP



NFS used to sync:
SH Configurations
Job Artifacts
SH Schedulers

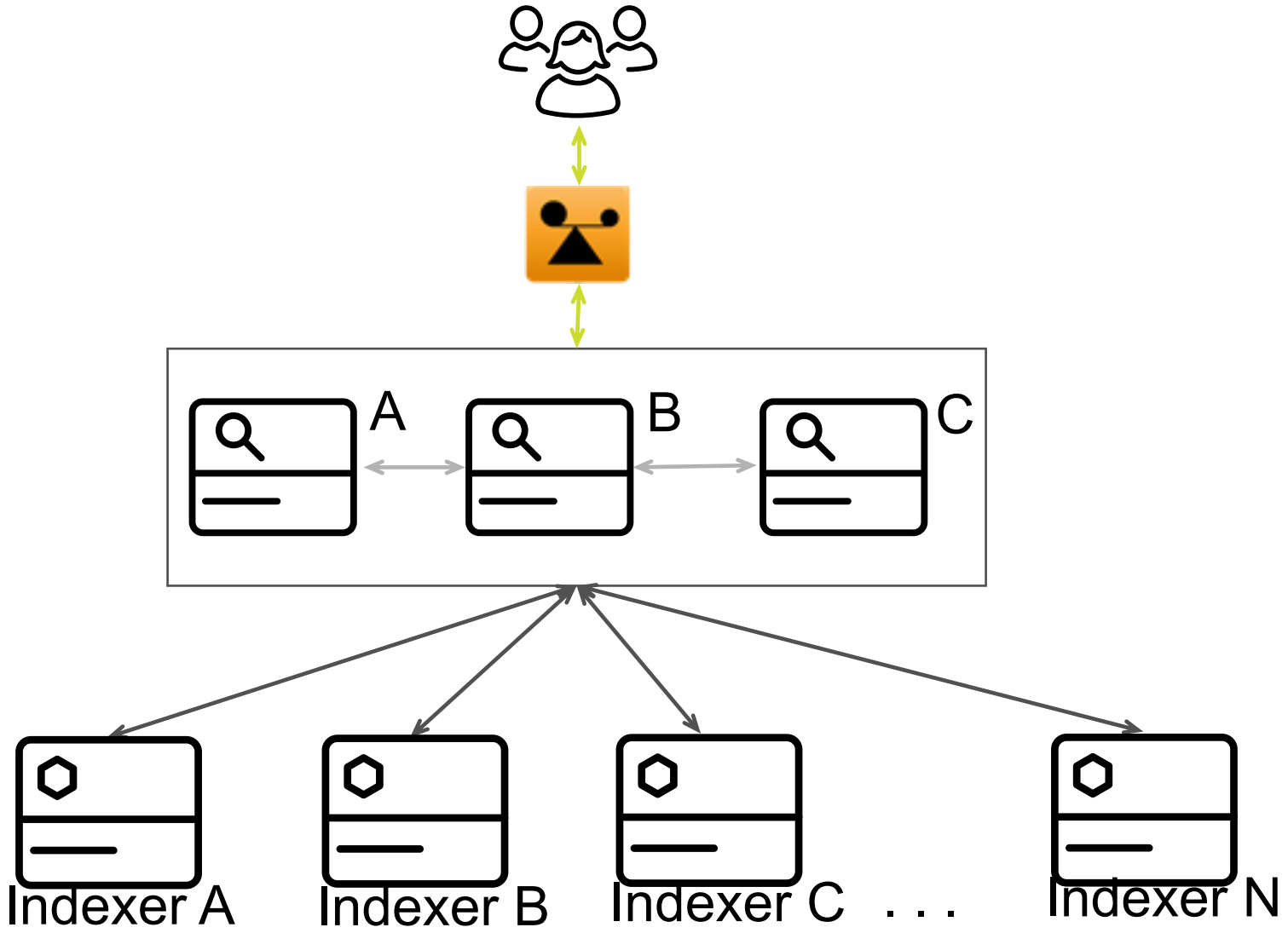
HA

Search Head Clustering (SHC)

- Improved horizontal scaling
- Improved high availability
- No single point of failure

HA

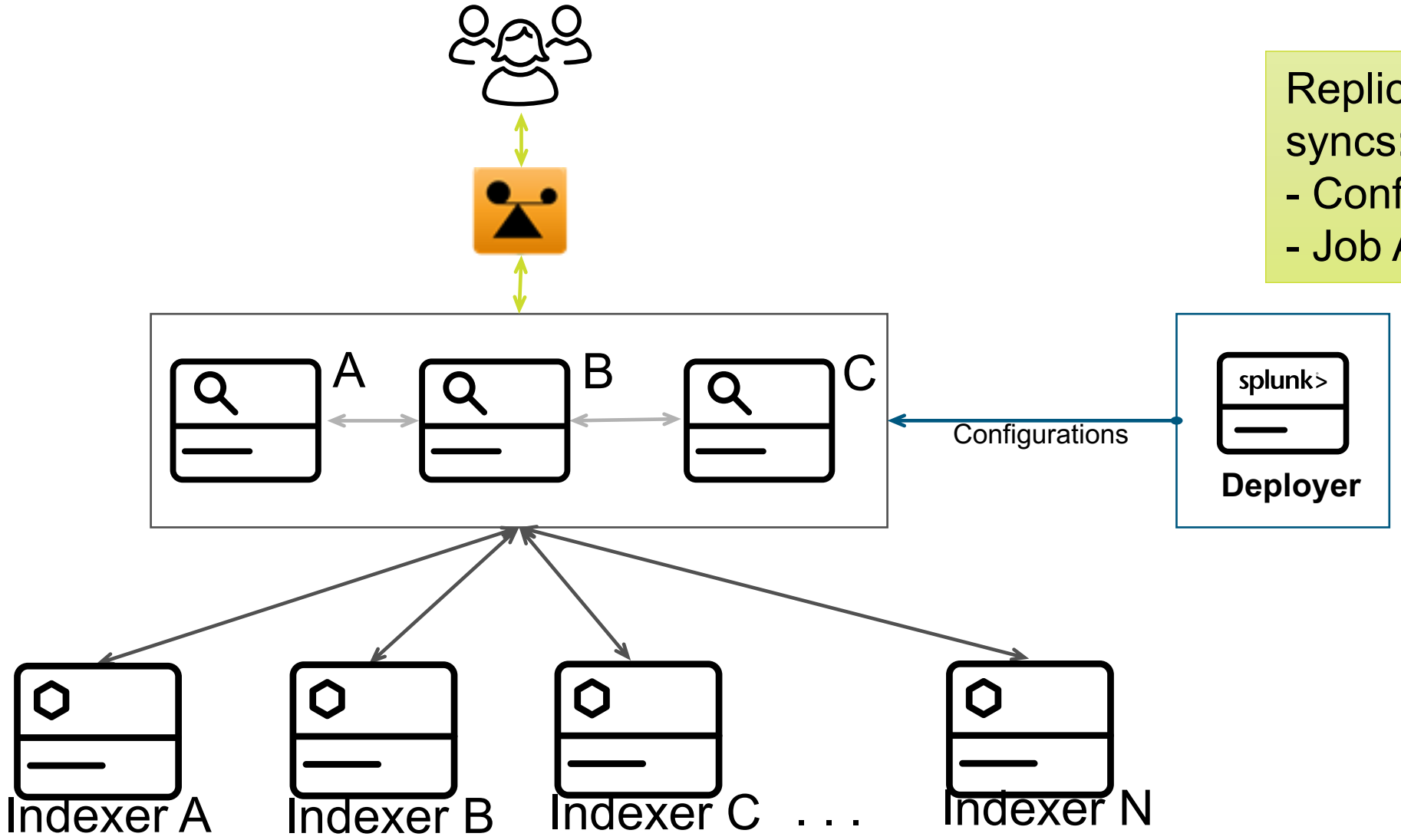
SHC



Replication **protocol** syncs:
- Configurations
- Job Artifacts

HA

SHC



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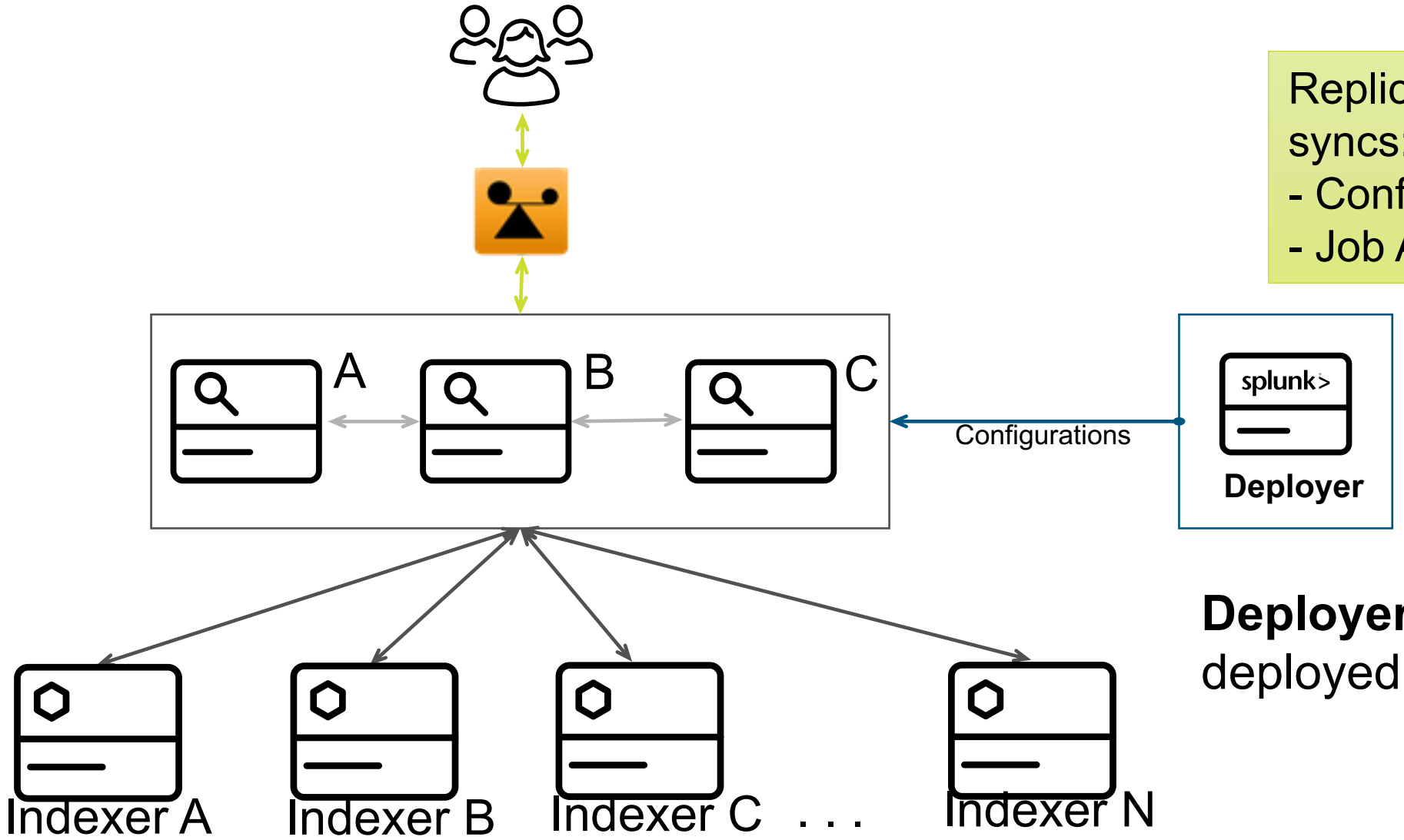
HA

SHC

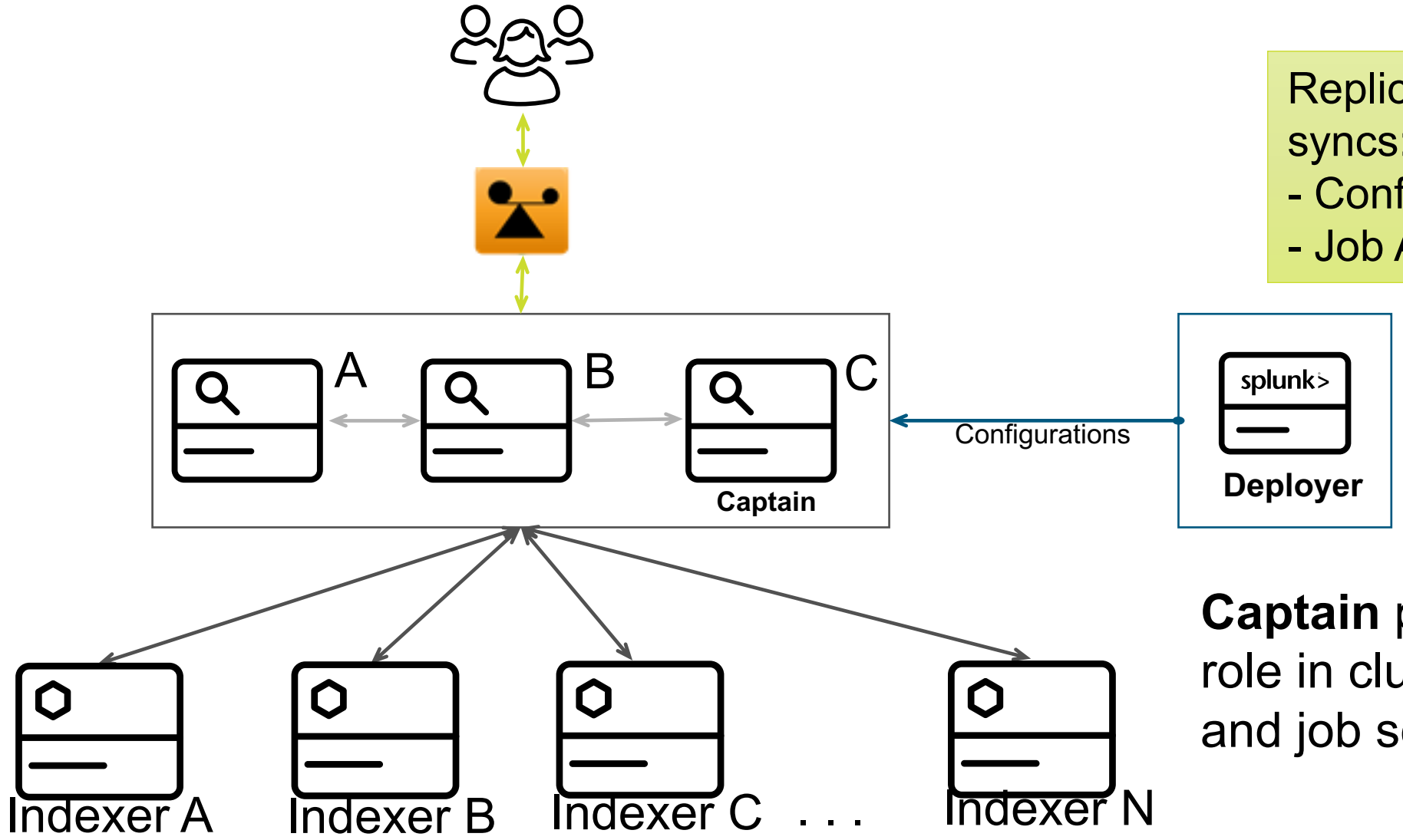


Replication **protocol** syncs:
- Configurations
- Job Artifacts

Deployer ensures identical deployed configurations

HA

SHC



Replication **protocol** syncs:
- Configurations
- Job Artifacts

Captain plays a special role in cluster orchestration and job scheduling

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HA

SHC Operation – High Level

- Deployer ensures all SHC members have identical baseline configurations
  - Subsequent UI changes propagated using an internal replication mechanism
- Job Scheduler gets disabled on all members but the Captain
- Captain selects members to **run scheduled jobs based on load**
  - Selection based on load statistics
  - Captain orchestrates job artifact replication to selected members/candidates of the cluster
- Transparent job artifact proxying (and eventual replication) if artifact not present on user's SH

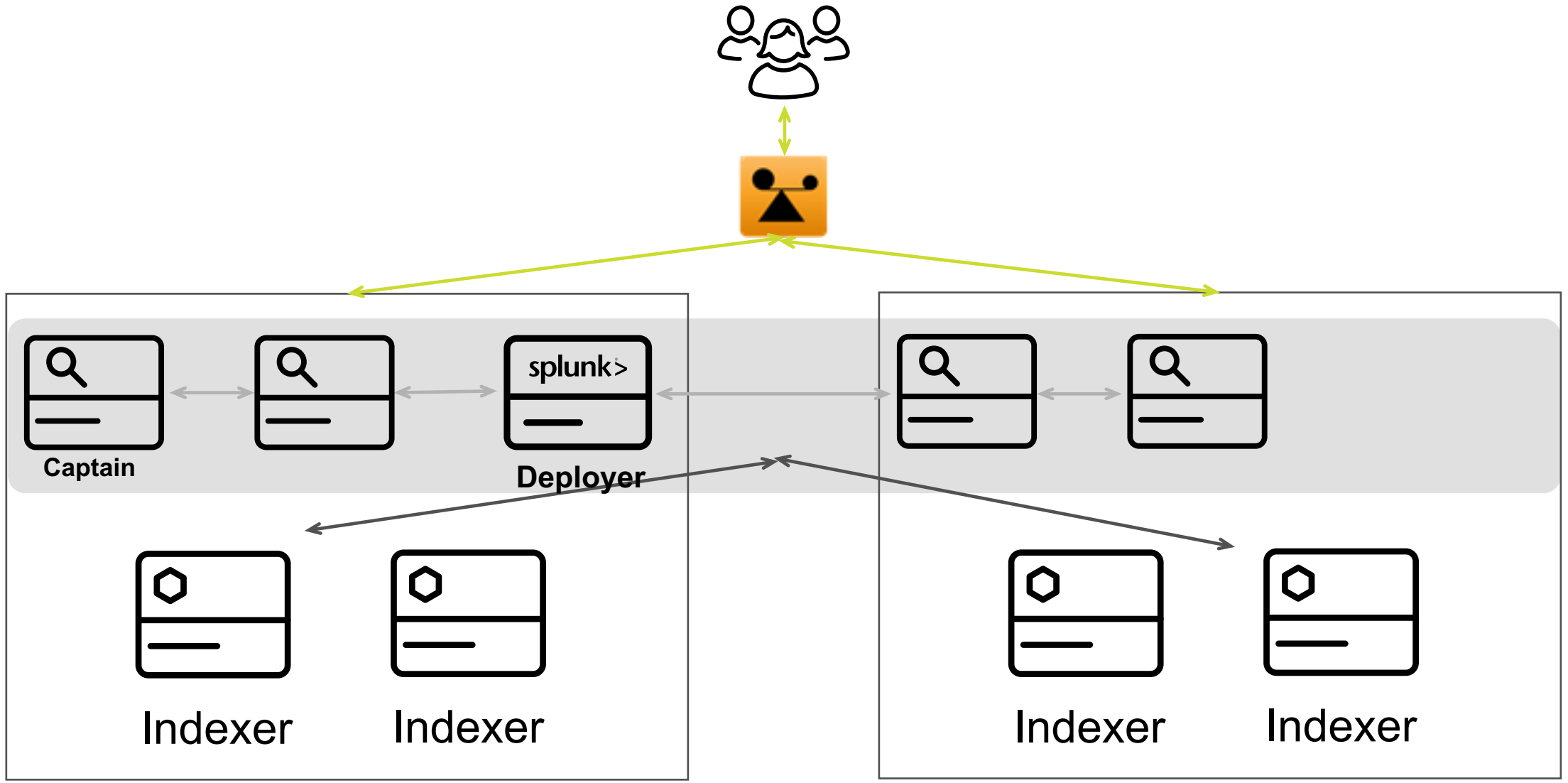
HA

SHC Operation – High Level

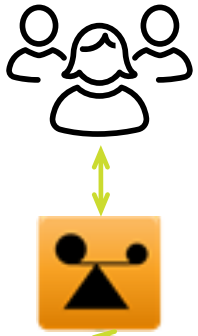
- Majority requirement and failure handling
  - Surviving majority (>=51%)
- Site-awareness gotchas
  - No notion of **site** in SHC (unlike in index replication)
  - Case for static captain election
- Latency and number of nodes

HA

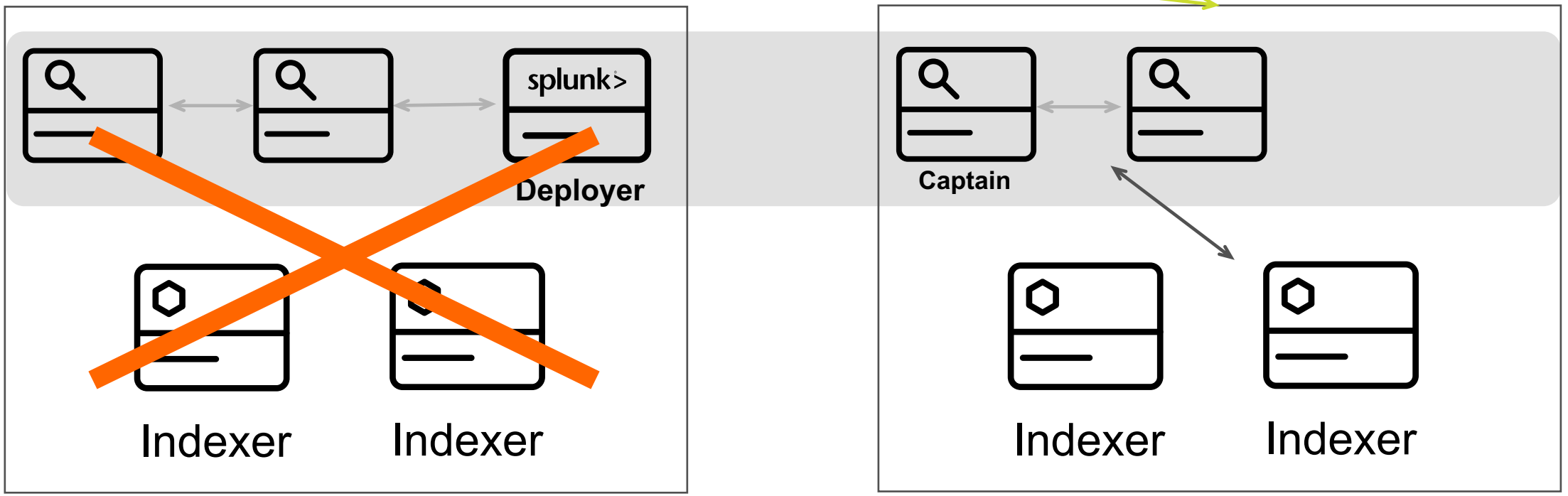
Stretched SHC



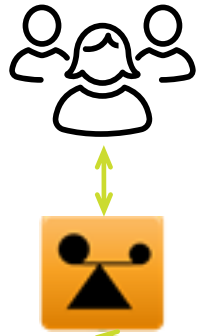
Stretched SHC



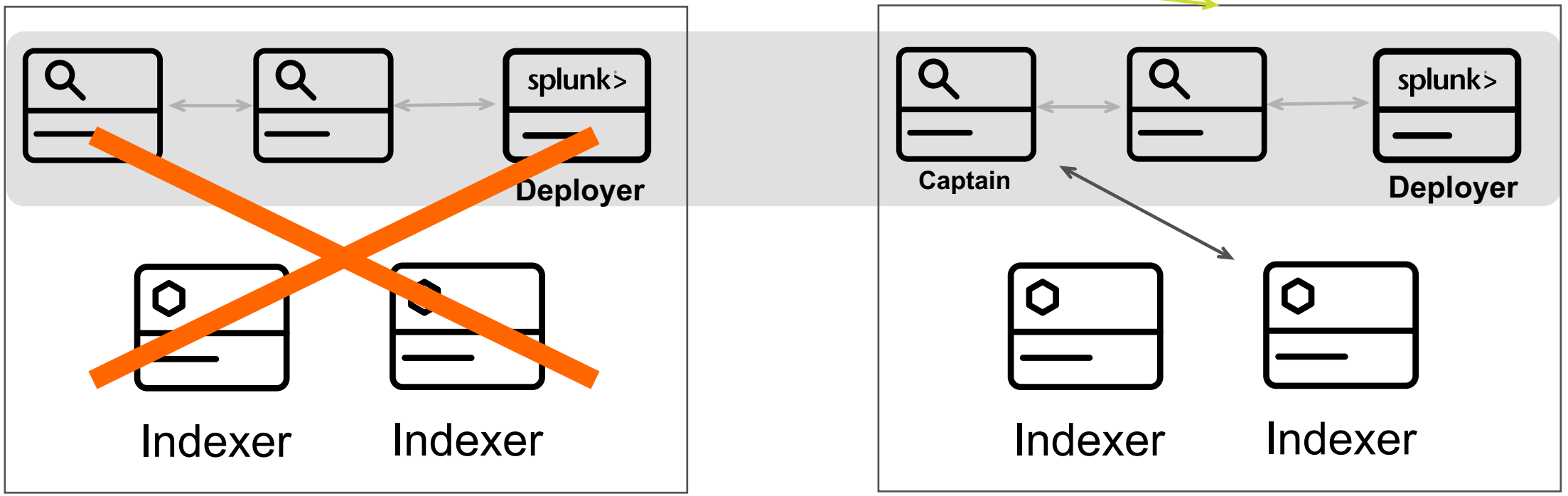
Captain must be statically elected as there is no SHC majority



Stretched SHC



Deployer launched in second site, if SCH updates required



Deploying SHC

- Same SH version and high speed network (LAN)
  - More storage required vs. stand-alone SHs. Linux/Solaris only
- Needs LB and a Deployer instance (DS or MN can also be used to fulfill this role)
- Select RF per your HA/DR requirements
- Configure Deployer first with a secret key
- Initialize each instance, point them to Deployer, then bootstrap **one** of them to become the cluster captain
- More details on Splunk Docs

3 Indexer Clustering

HA

Index Replication

- **Cluster** = a group of search peers (indexers) that replicate each others' buckets
- **Data Availability**
  - Availability for ingestion and searching
- **Data Fidelity**
  - Forwarder Acknowledgement, assurance
- **Disaster Recovery**
  - Site awareness
- **Search Affinity**
  - Local search preference vs. remote

Trade offs

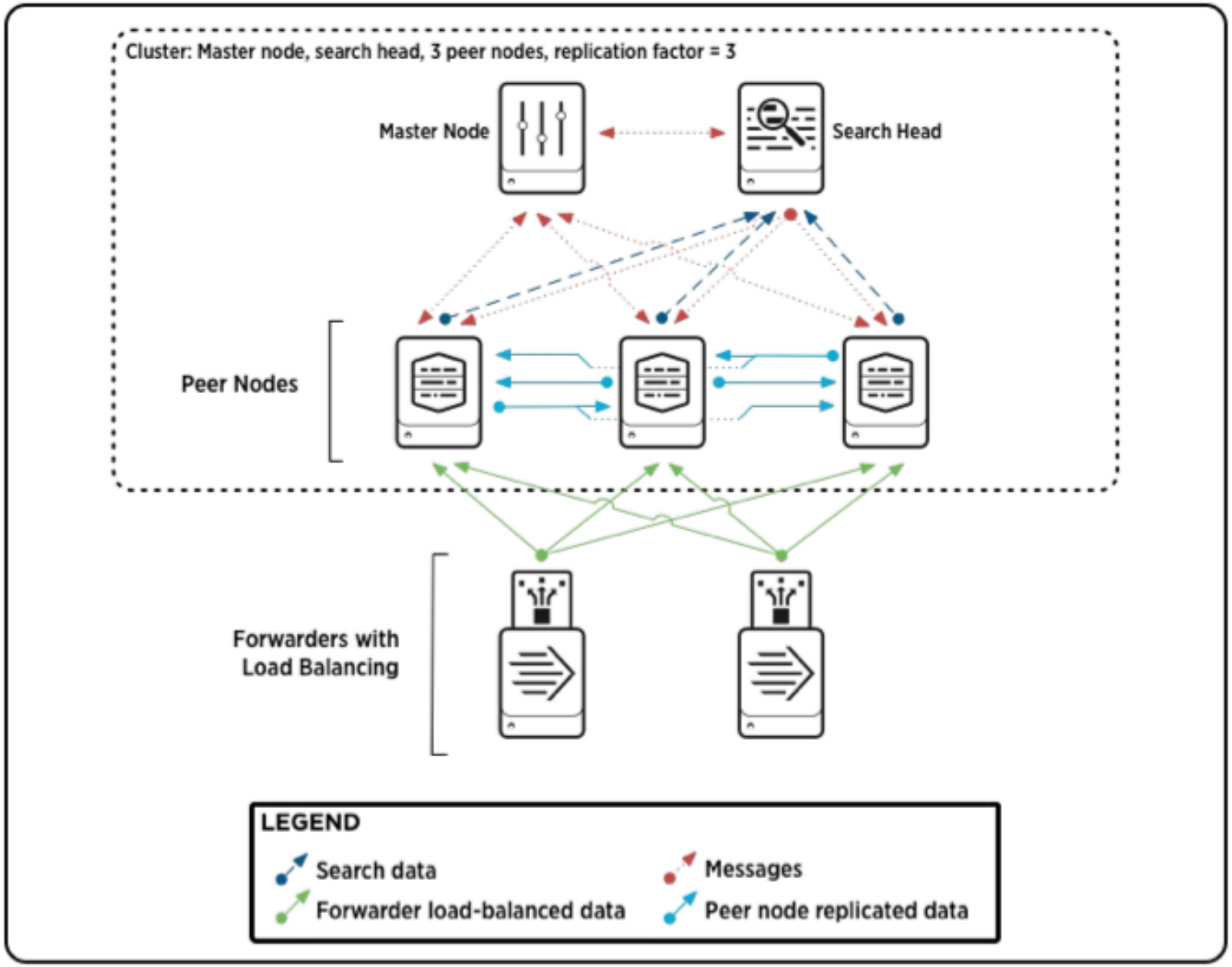
- Extra storage
- Slightly increased processing load

HA

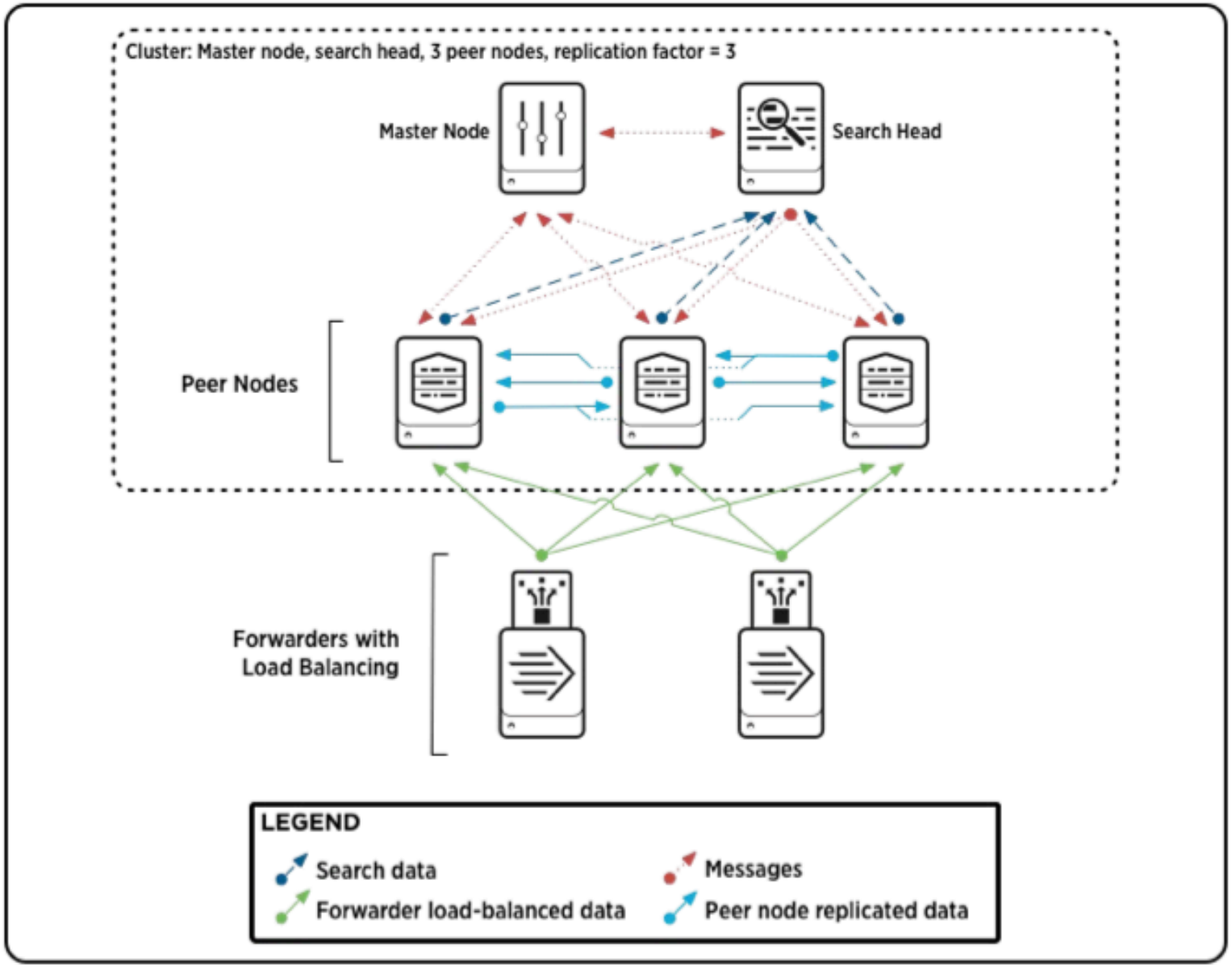
Cluster Components

- Master Node
  - Orchestrates replication/remedial process. Informs the SH where to find searchable data. Helps manage peer configurations
- Peer Nodes
  - Receive and index data. Replicate data to/from other peers. Peer Nodes Number ≥ RF
- Search Head(s)
  - **Must** use one to search across the cluster
- Forwarders
  - Use with auto-lb and indexer acknowledgement

Single Site Cluster Architecture



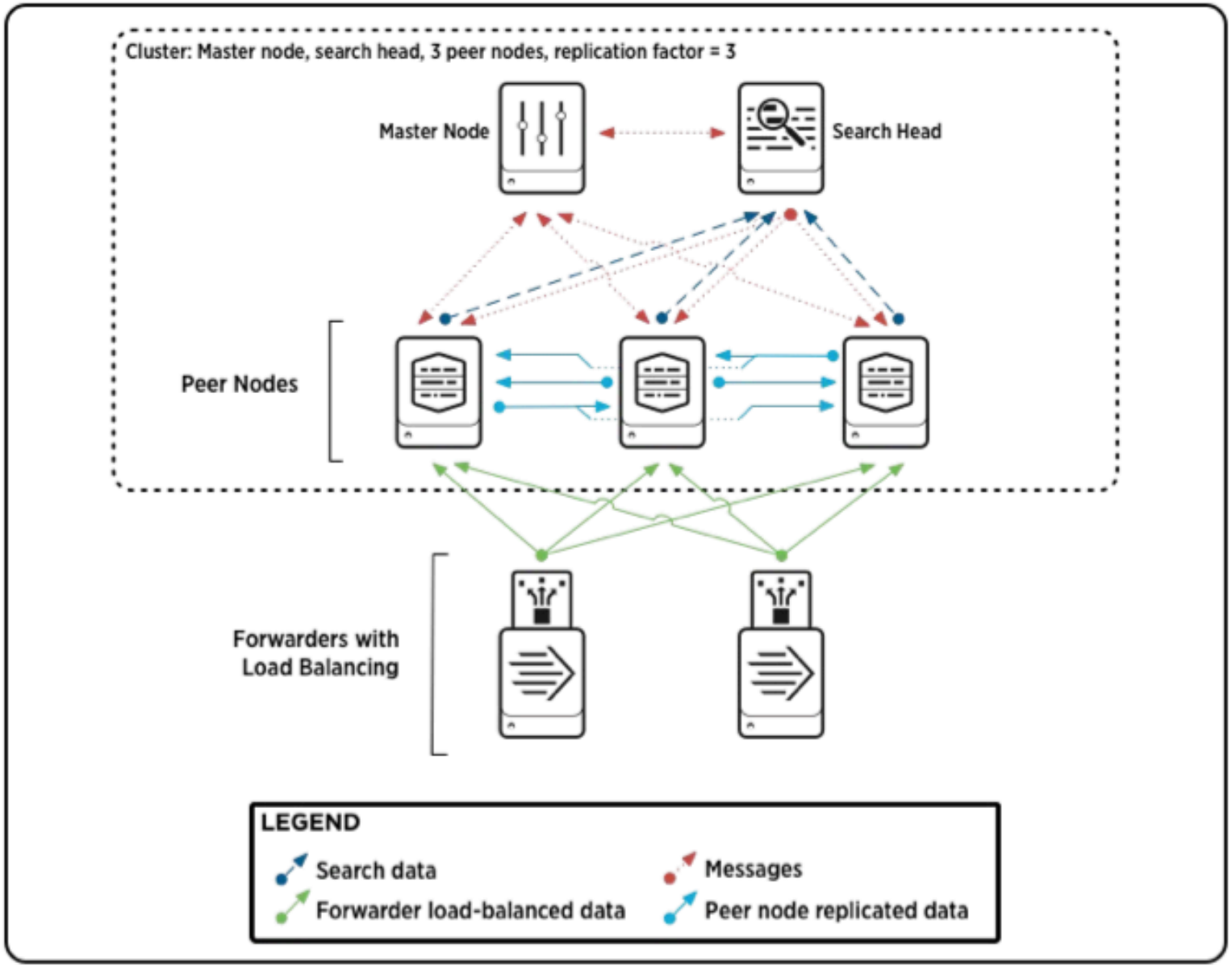
Credit: Splunk Docs Team



Credit: Splunk Docs Team

Replication Factor (RF)

- Number of copies of data in the cluster. Default **RF=3**
- Cluster can tolerate **RF-1** node failures



Credit: Splunk Docs Team

Search Factor (SF)

- Number of copies of data in the cluster. Default **SF=2**
- Requires more storage
- Replicated vs. Searchable Bucket

HA

Clustering Indexing

- Originating peer node streams copies of data to other clustered peers
  - Receiving peers store those copies
- Master determines replicated data destination
  - Instructs peers what peers to stream data to. Does not sit on data path
- Master manages all peer-to-peer interactions and coordinates remedial activities
- Master keeps track of which peers have searchable data
  - Ensures that there are always **SF** copies of searchable data available

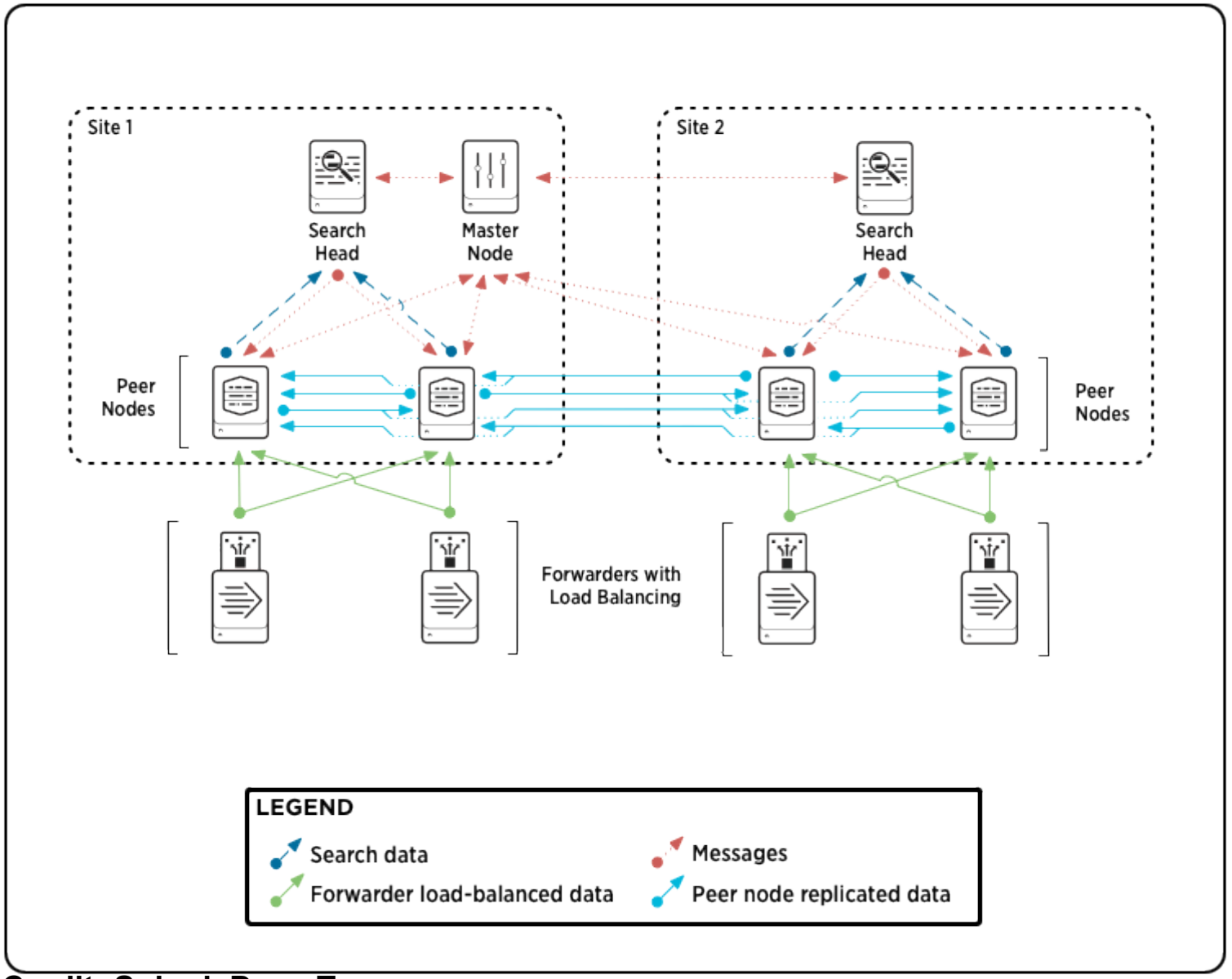
HA

Clustered Searching

- Search head coordinates all searches in the cluster
- SH relies on master to tell it who its peers are.
  - The master keeps track of which peers have searchable data
- Only **one** replicated bucket is searchable a.k.a. **primary**
  - i.e., searches occur over **primary** buckets, only
- Primary buckets may change over time
  - Peers know their status and therefore know where to search

Multisite Clustering

- Site awareness introduced in Splunk 6.1
- Improved disaster recovery
  - Multisite clusters provide site failover capability
- Search Affinity
  - Search heads will scope searches to local site, whenever possible
  - Ability to turn off for better thruput vs. X-Site bandwidth



Credit: Splunk Docs Team

Multi Site Cluster Architecture

Differences vs Single site

- Assign a site to each node
- Specify RF and SF on a site by site basis

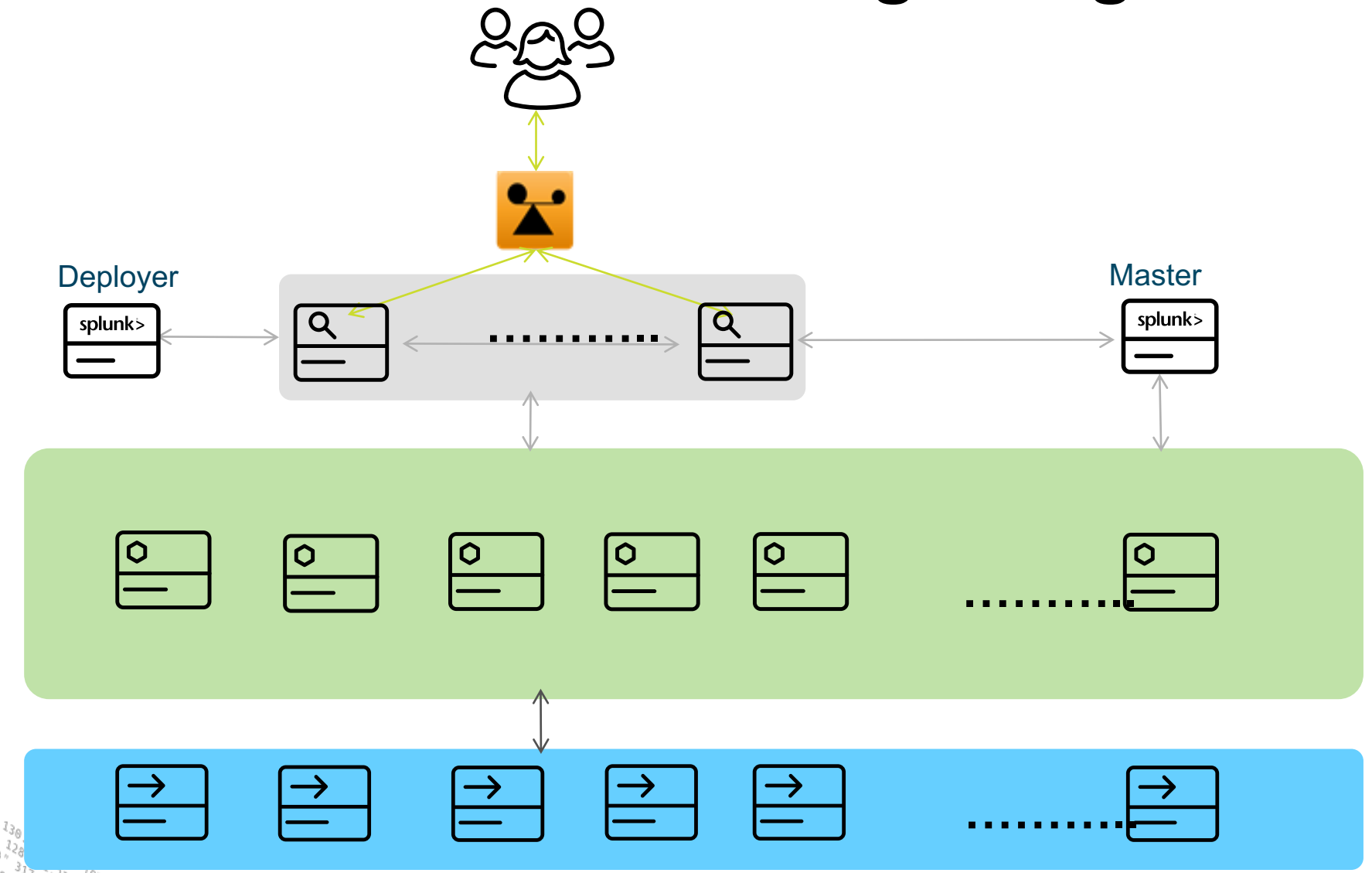
Multisite Clustering Cont'd

- Each node belongs to an assigned site, except for the Master Node, which controls all sites but it's not **logically** a member of any
- Replication of bucket copies occurs in a site-aware manner.
  - Multisite replication determines # copies on each site. Ex. 3 site cluster:

```
site_replication_factor = origin:2, site1:1, site2:1, site3:1, total:4
```

- Bucket-fixing activities respect site boundaries when applicable
- Searches are fulfilled by local peers whenever possible (a.k.a **search affinity**)
  - Each site must have at least a full set of searchable data

Putting It Together



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Top Take-Aways

- **DR – Process of backing-up and restoring service in case of disaster**
  - **Configuration files** – copy of $SPLUNK_HOME/etc/ folder
  - **Indexed data** – backup and restore buckets
    - Hot, warm, cold, frozen
    - Can't backup hot (without snapshots) but can safely backup warm and cold
- **HA – continuously operational system bounded by a set of tolerances**
  - **Data collection**
    - Autolb from forwarders to multiple indexers
    - Use Indexer Acknowledgement to protect in flight data
  - **Searching**
    - Search Head Clustering (SHC)
  - **Indexing**
    - Use Index Replication

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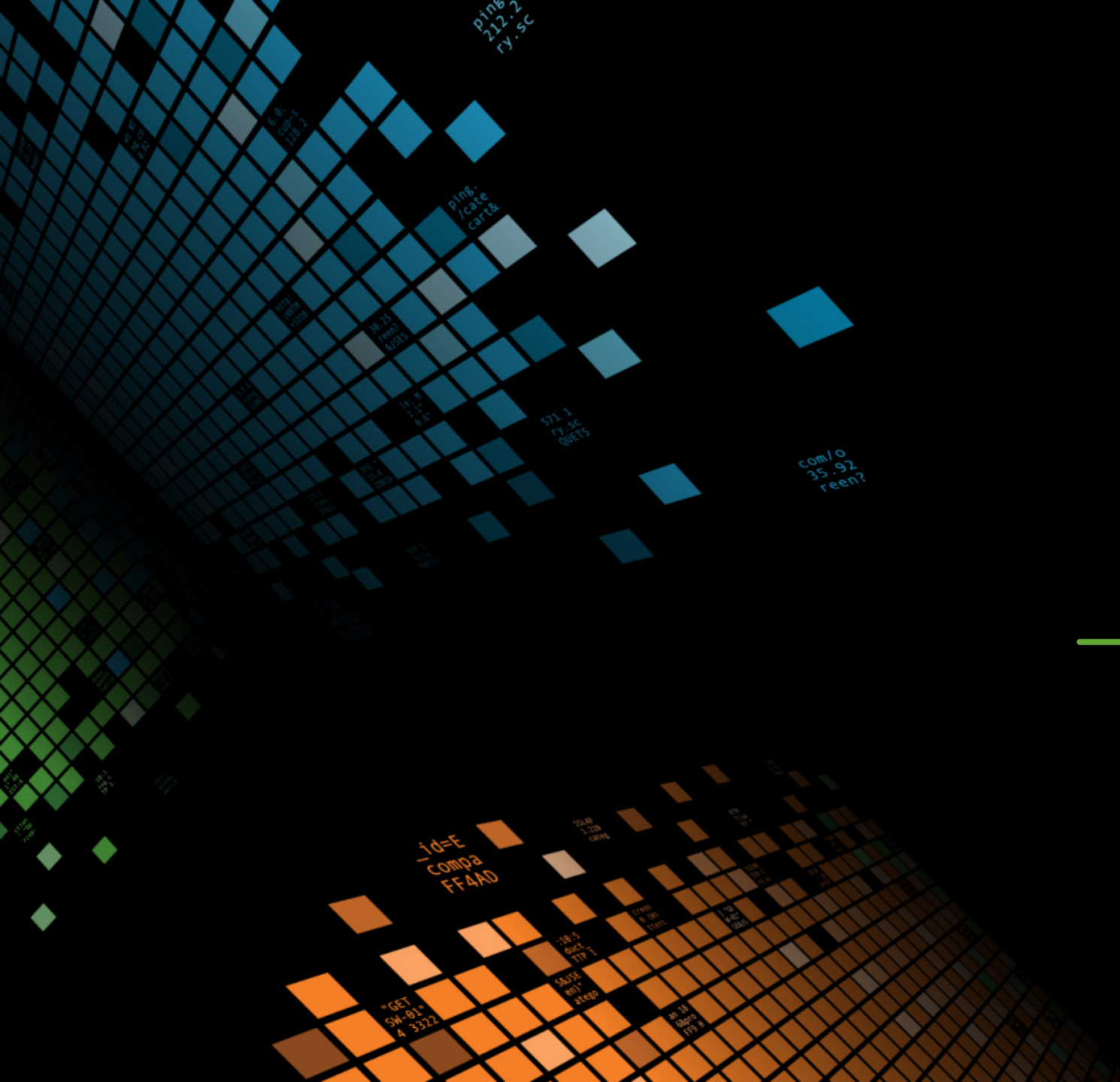

Q&A

Thank You

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