
# Deep dive into the world of federated searches

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Data Fabric Search is a new, extended search platform that leverages compute assets from anywhere and accesses and executes on data regardless of origin or type.

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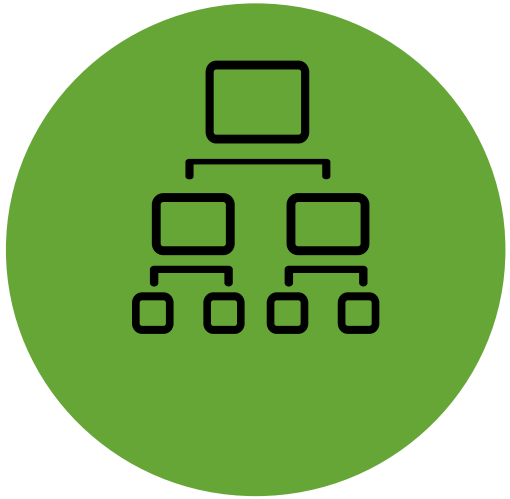
# Features

# Two main features of DFS

## Big Data Analysis

*Processing massive amounts of data*



## Federated Searches

*Reaching data where it resides*

- Other Splunk Deployments

# Big Data Analysis

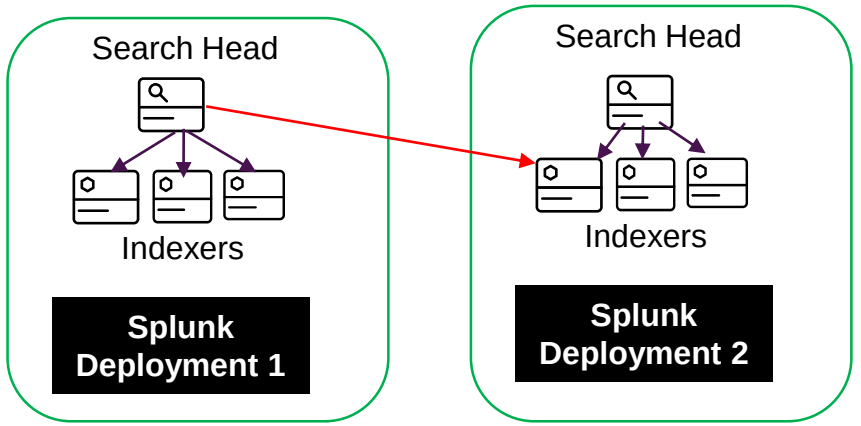
*Processing massive amounts of data*

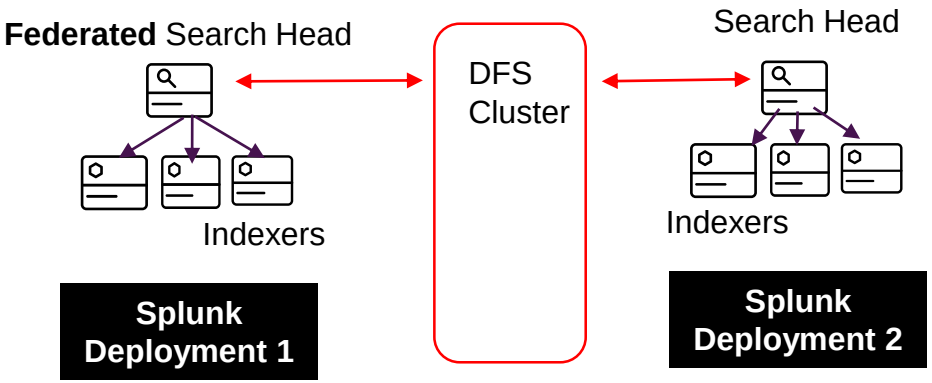
- **Current Scenario**:
  - Ex:- 40 mil cardholders
    - Stats (high cardinality); join / union (data mashup); sorting
  - Scale Constraints
    - When using Splunkd, the join commands is limited to 50,000 events in sub-search
- **Solution:**
  - DFS has a powerful query orchestration engine that:
    - Leverages Splunkd for first mile compute
    - Workload offloaded from Splunk Search Head enabling better performance of the system
    - Leverages DFS SearchPipeline for large-scale parallel and distributed data processing on compute cluster (currently Spark)
    - Ex:  handled searches successfully which have resulted in output of  267 billion events.

# Federated Searches across Splunk

*Reaching data where it resides - other Splunk Deployments*

- **Current scenario with multiple deployments**:
  - Unified Search across Splunk Deployments
    - Requires search head directly interact with Indexers of other deployments
    - Bypassing security configuration and resource usage of other deployments
    - Need replication of knowledge objects to to provide a unified view across all search heads
- **Federated Search**:
  - Seamlessly search across all deployments
    - Ability to correlate and run join/unions to search across datasets in disparate deployments
    - Enables scale and improves the performance by offloading the workload from search head to Spark worker nodes
    - Better management of security configurations



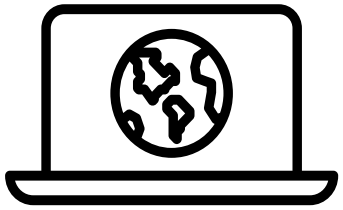



# When do I use DFS?

## **Customer ABC** has three LoBs

**Video**

- 20 mil subscribers



**Internet**

- 18 mil subscribers

**Wireless**

- 11 mil subscribers

- Each LoB has a separate Splunk deployment
- Outage over the weekend affecting customers in California

# DFS Use-Cases

- Use-Case 1: Massive Scale Computation
  - Number of “Video” Customers that were affected by this outage.
  - Index = Video | **stats** count (customer_id) OR ip_address where state is CA

- Use-Case 2: Federated Searches (Splunk Deployments)
  - Number of Video AND Internet customers that were affected by this outage
  - Index = Video | **join index=Internet**

# Technical Deep Dive

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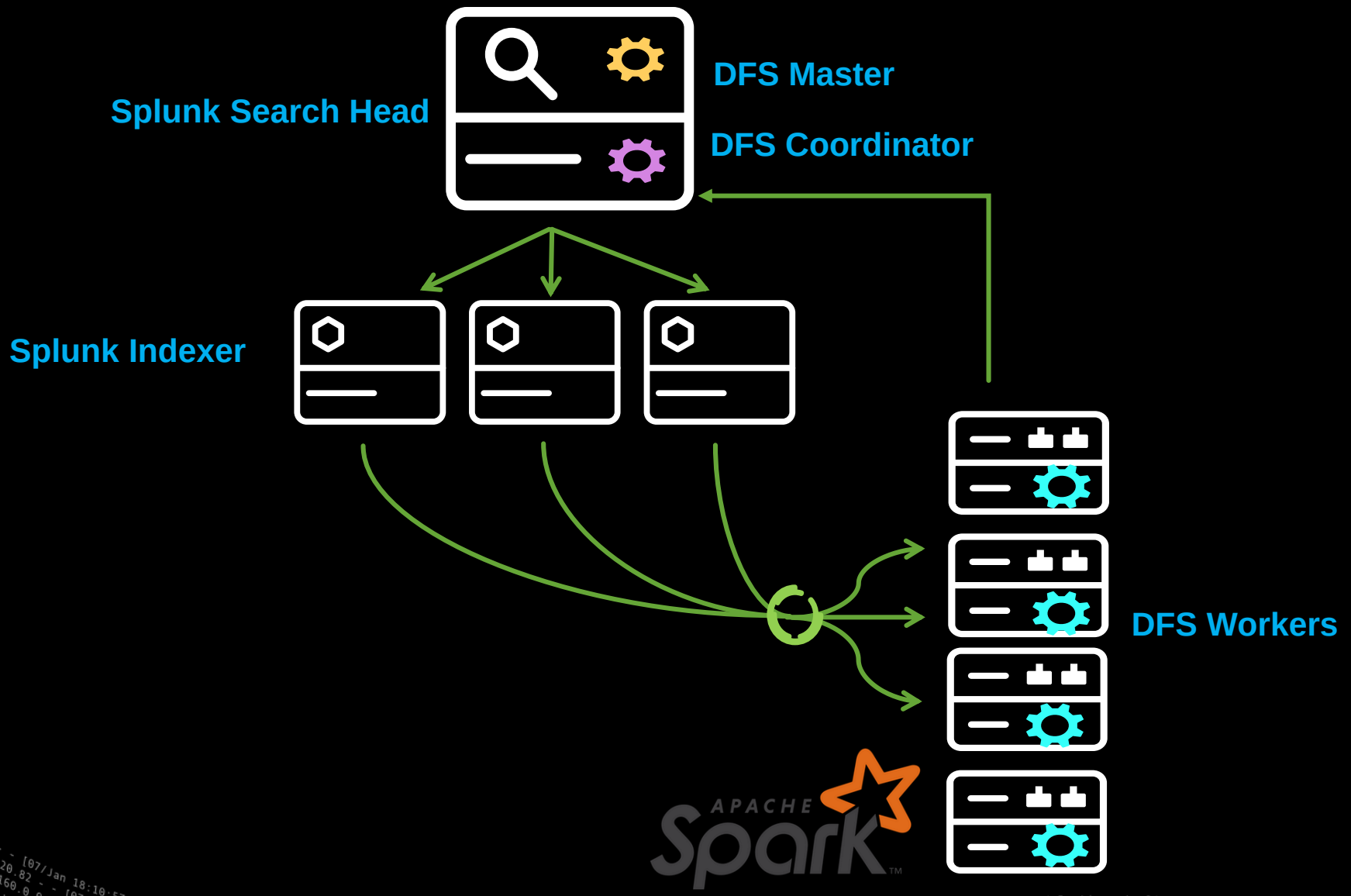
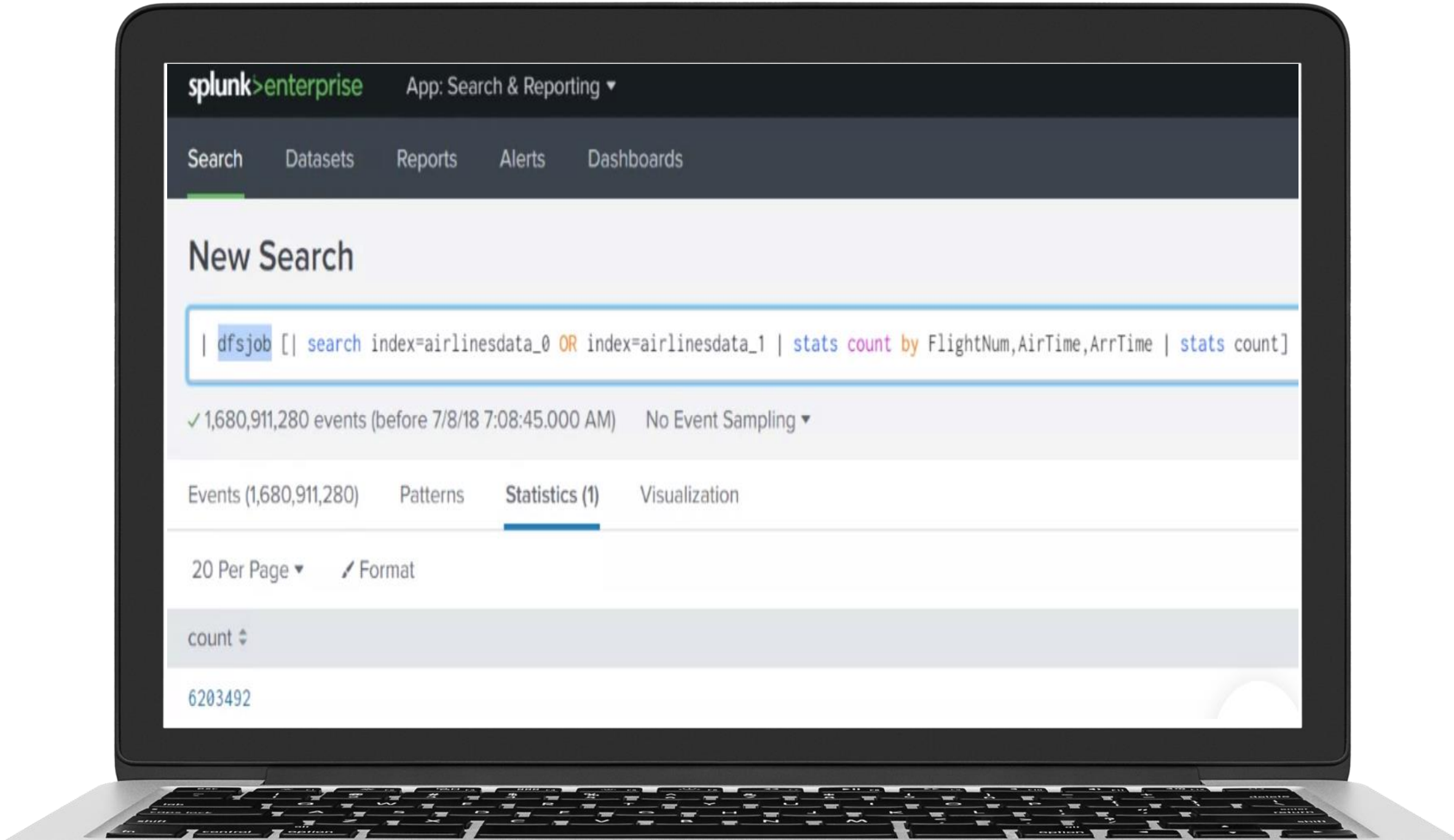
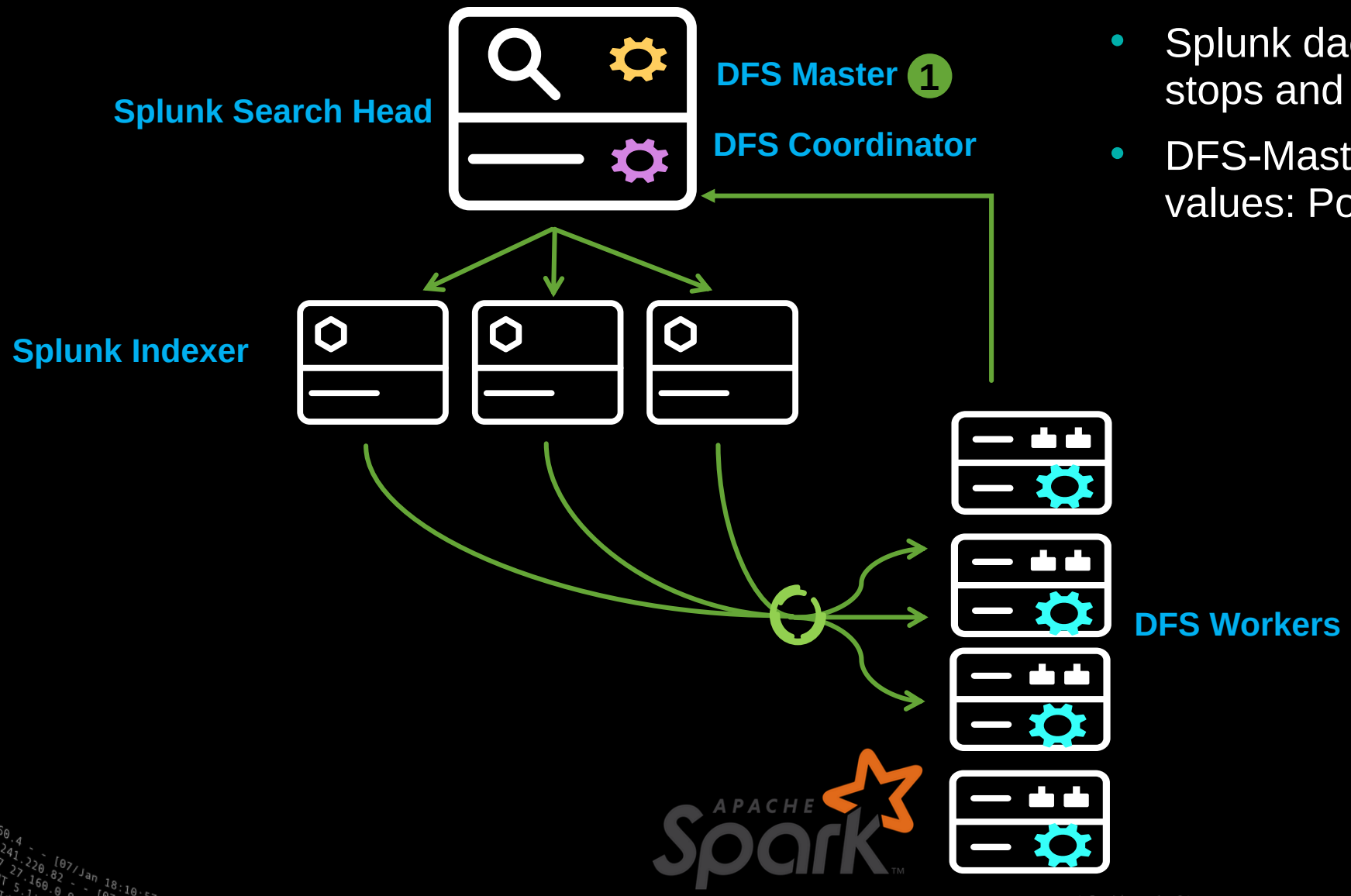
# Big Data Analysis



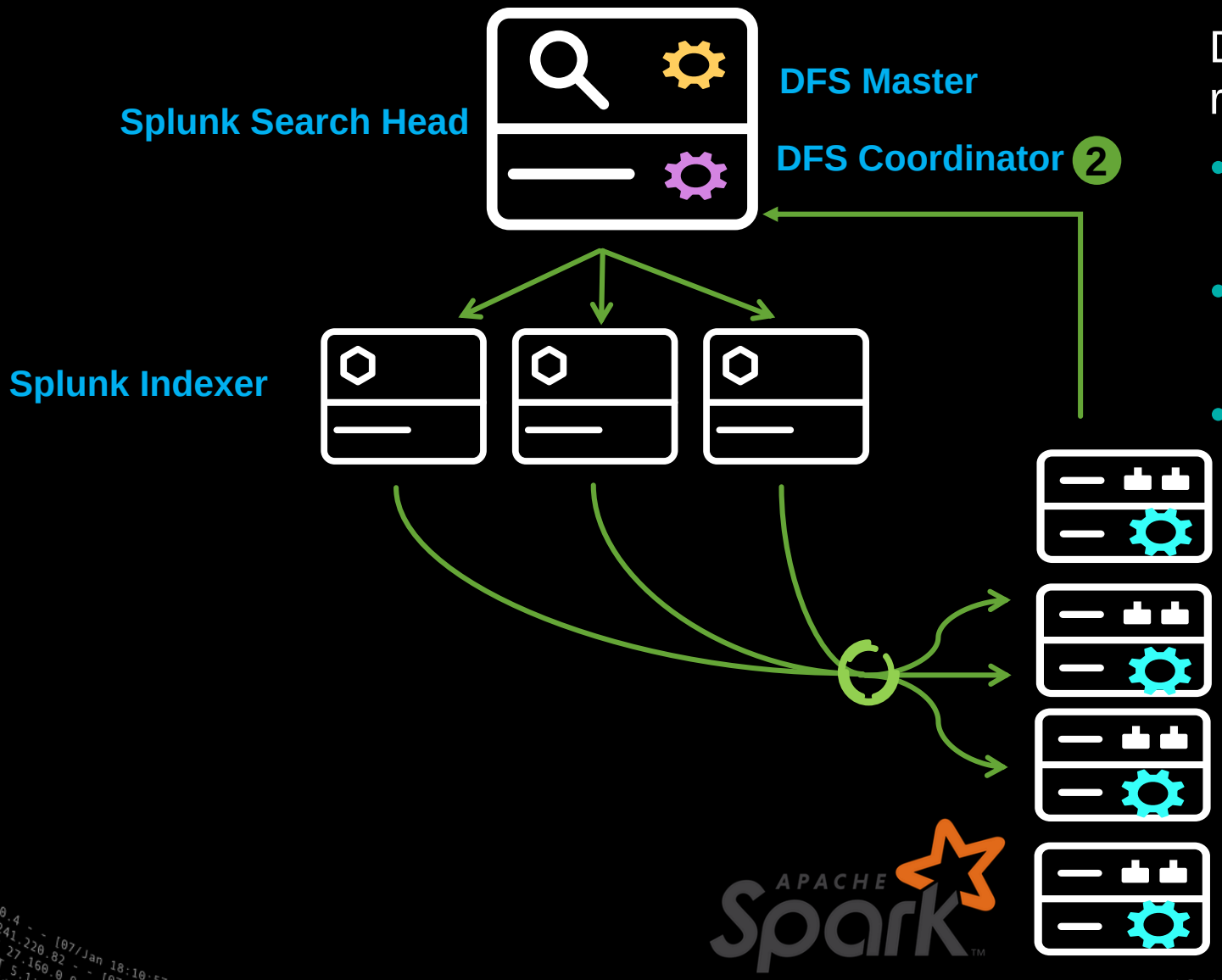


# Step 1: Life Cycle Management of Data Fabric Search Master




- Splunk daemon process stop / start also stops and starts DFS-Master
- DFS-Master is initialized with several values: Ports, Number of Executors, etc

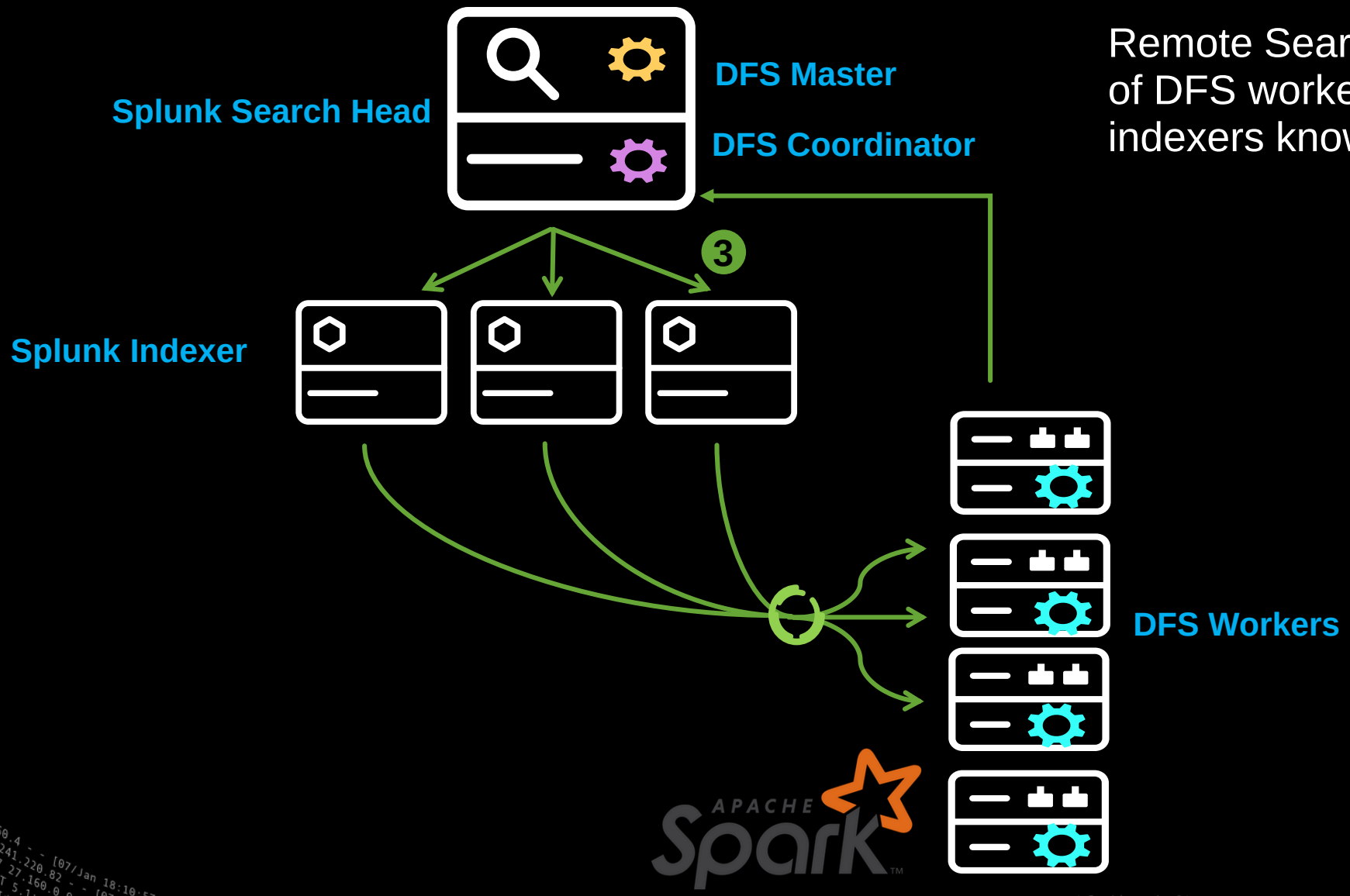
# Step 2: DFS Query Planning




DFS Coordinator partition the search requested into 3 phases:

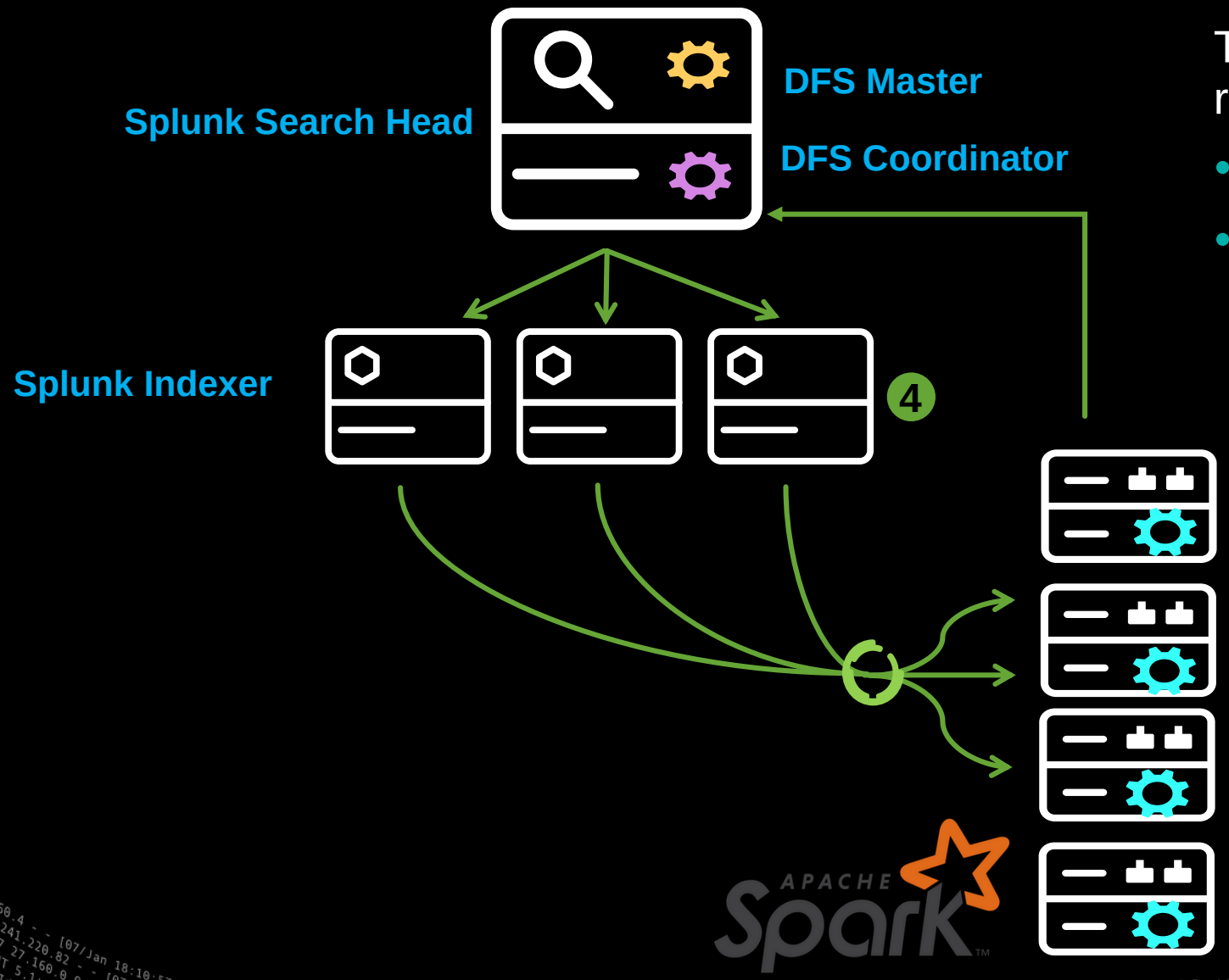
- Splunk Indexer Job aka Remote Search Job
- DFS job or the execution which will be executed on the spark cluster
- Search Head (SH) job - which will be executed if any on the SH

# Step 3: Dynamic Partition Setup and Query Update




Remote Search job is updated with the list of DFS workers listeners such that the indexers know where to send the data

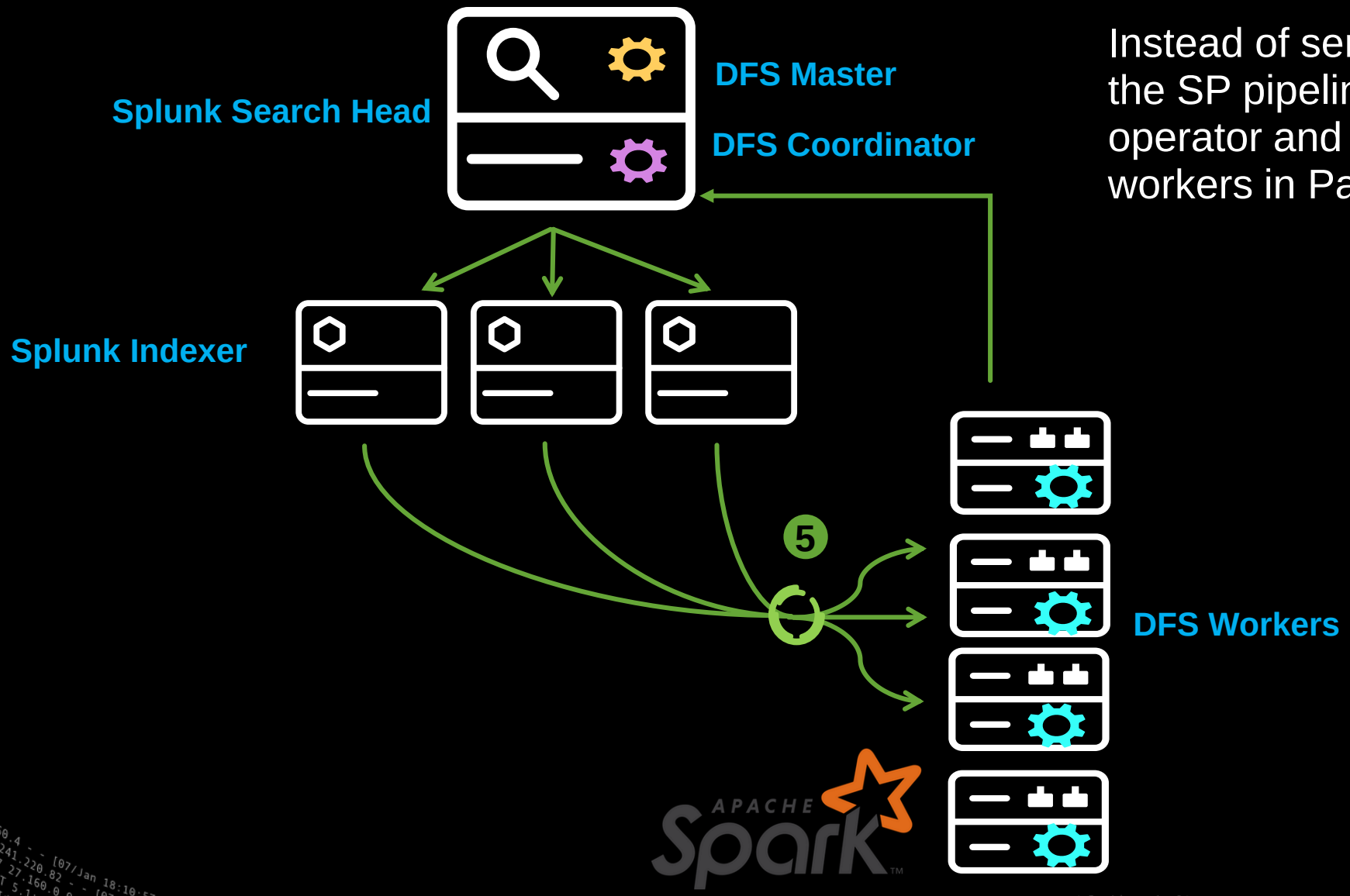
# Step 4: Splunk Indexer layer execution




The remote search processes execute the remote pipeline

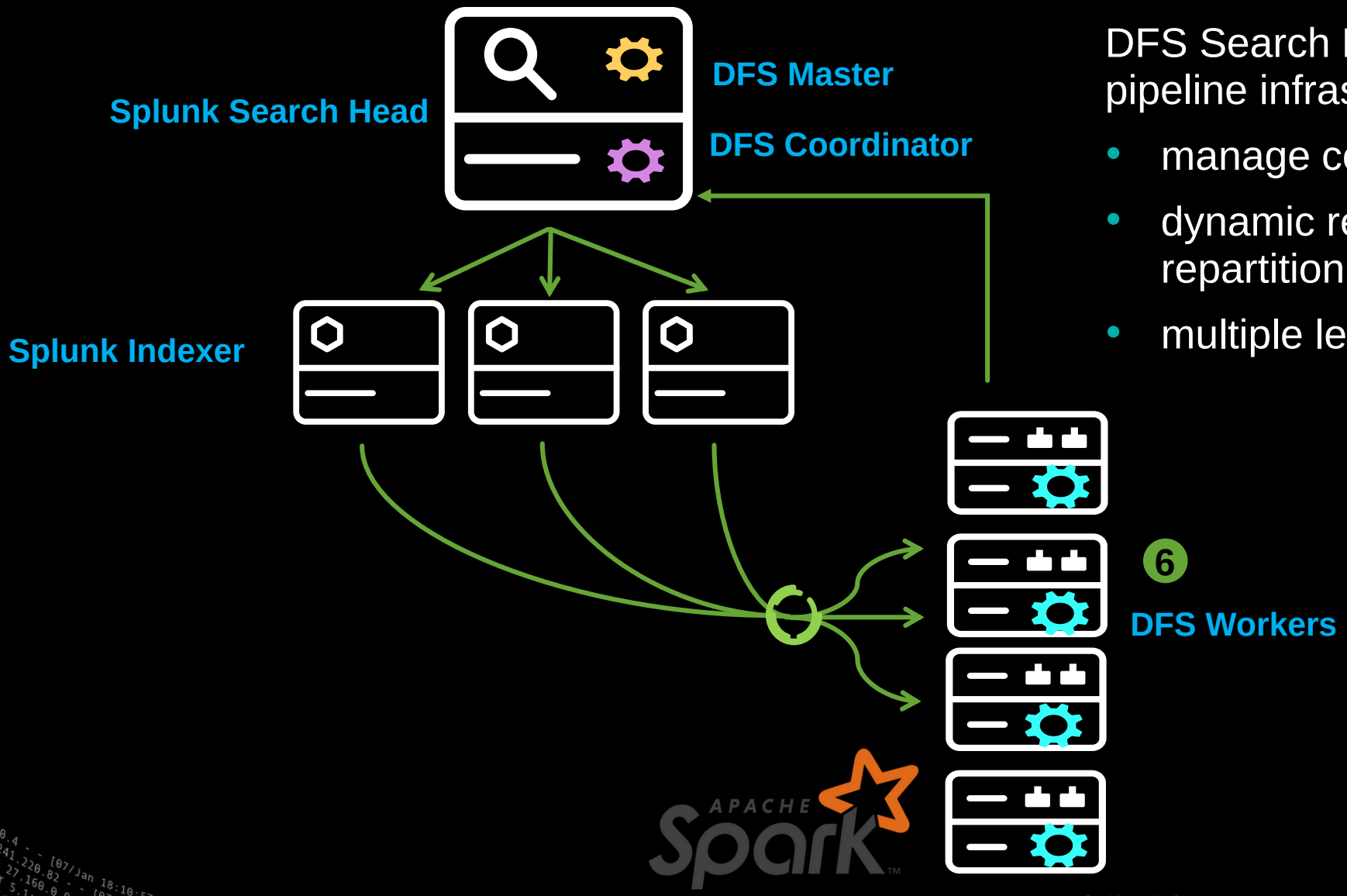
- reading data from the buckets
- applying extractions, kv, lookups, and other streaming search processors (pre-stats)

# Step 5: Shuffle to DFS workers




Instead of sending the data back to the SH, the SP pipeline executed redistribute operator and shuffle the data to the DFS workers in Parallel (RD_OUT)

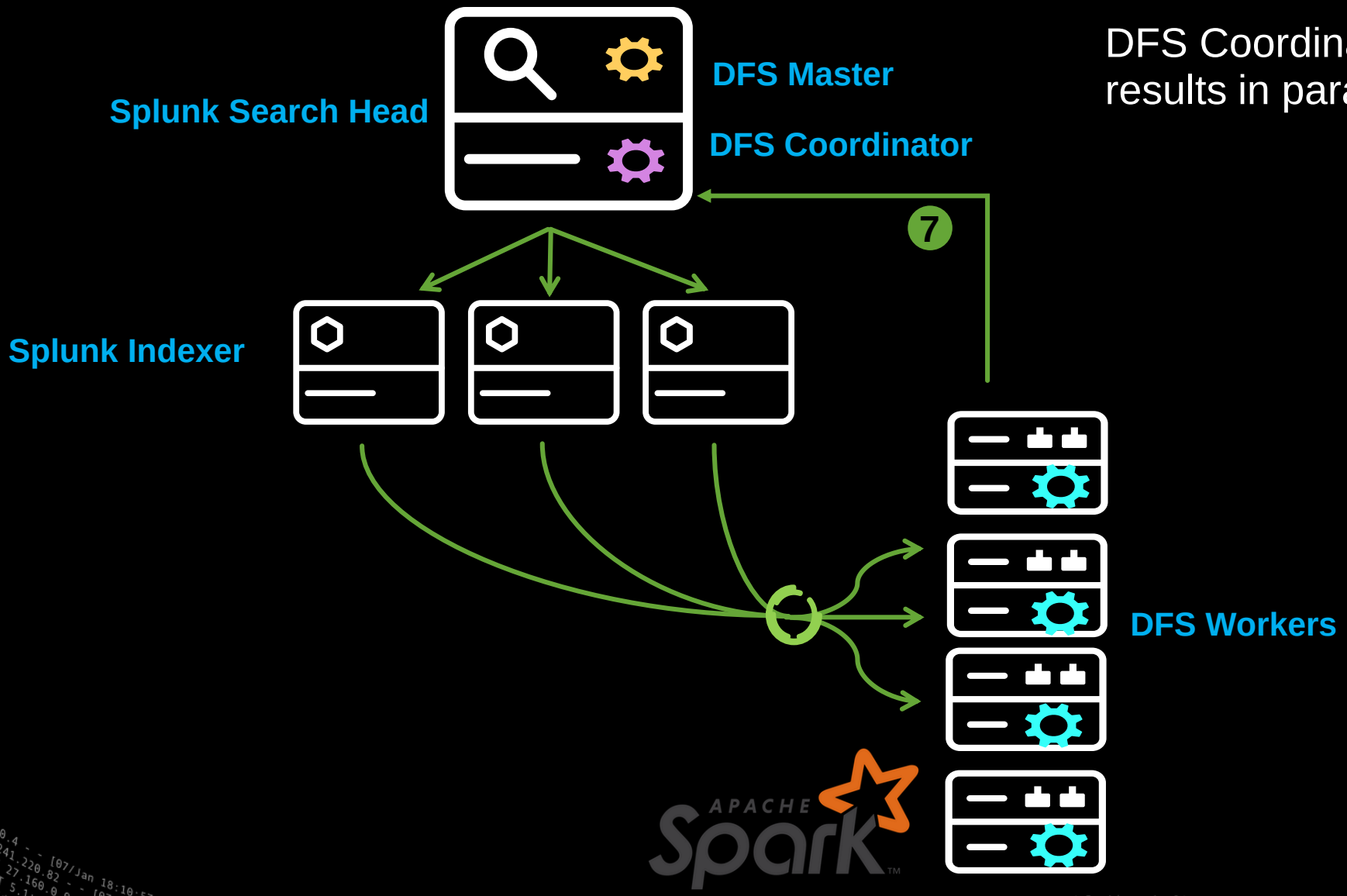
# Step 6: DFS Workers Job execution




DFS Search Pipeline are Java lambdas and pipeline infrastructures

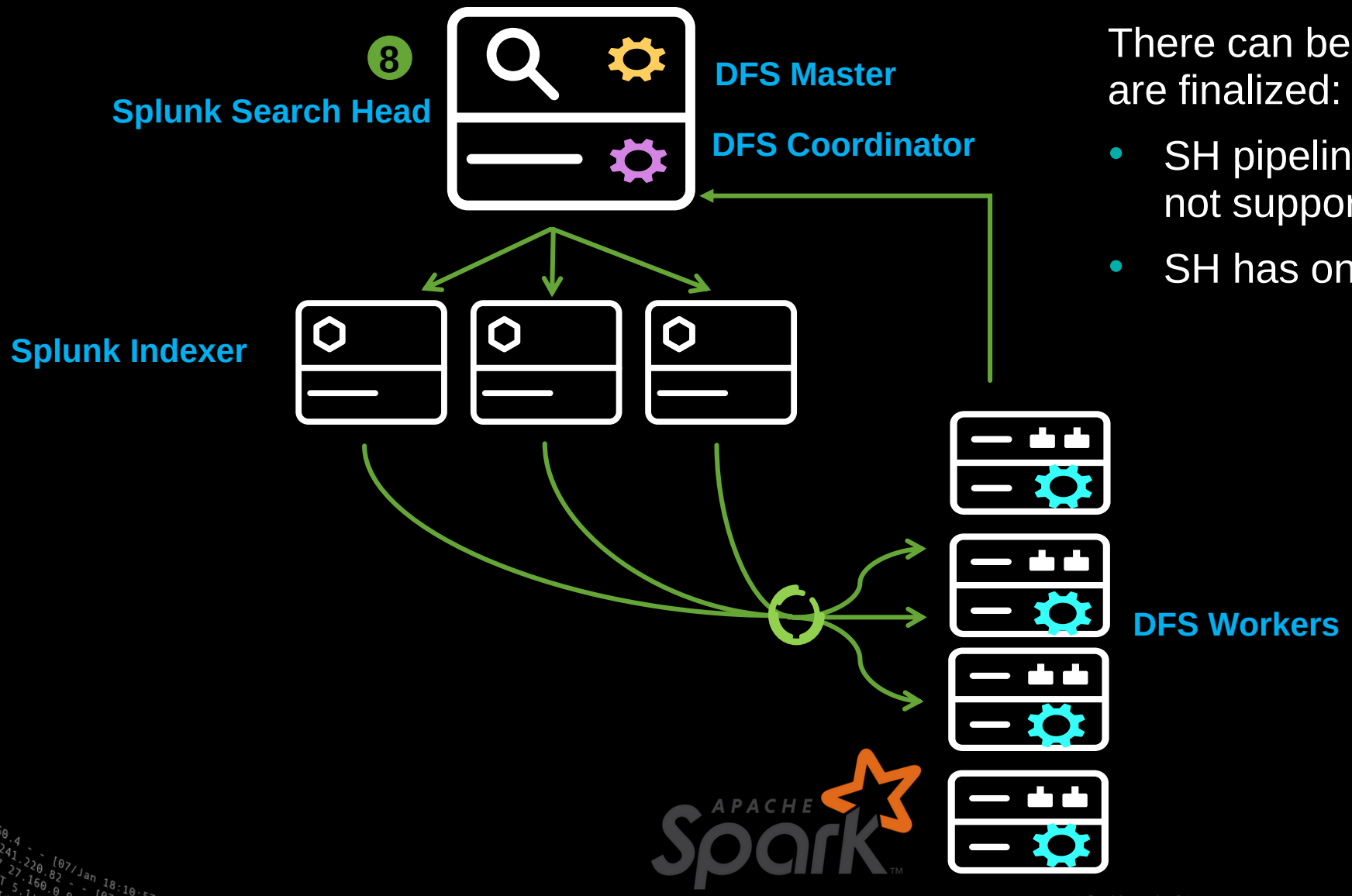
- manage core scaling (memory or disk)
- dynamic repartitioning (Spark RDD repartitioning) based on data skews
- multiple levels of shuffle as needed

# Step 7: Parallel Data Retrieval




DFS Coordinator retrieves the search results in parallel from the DFS workers

# Step 8: SH Job execution and Job finalization




There can be two scenarios before results are finalized:

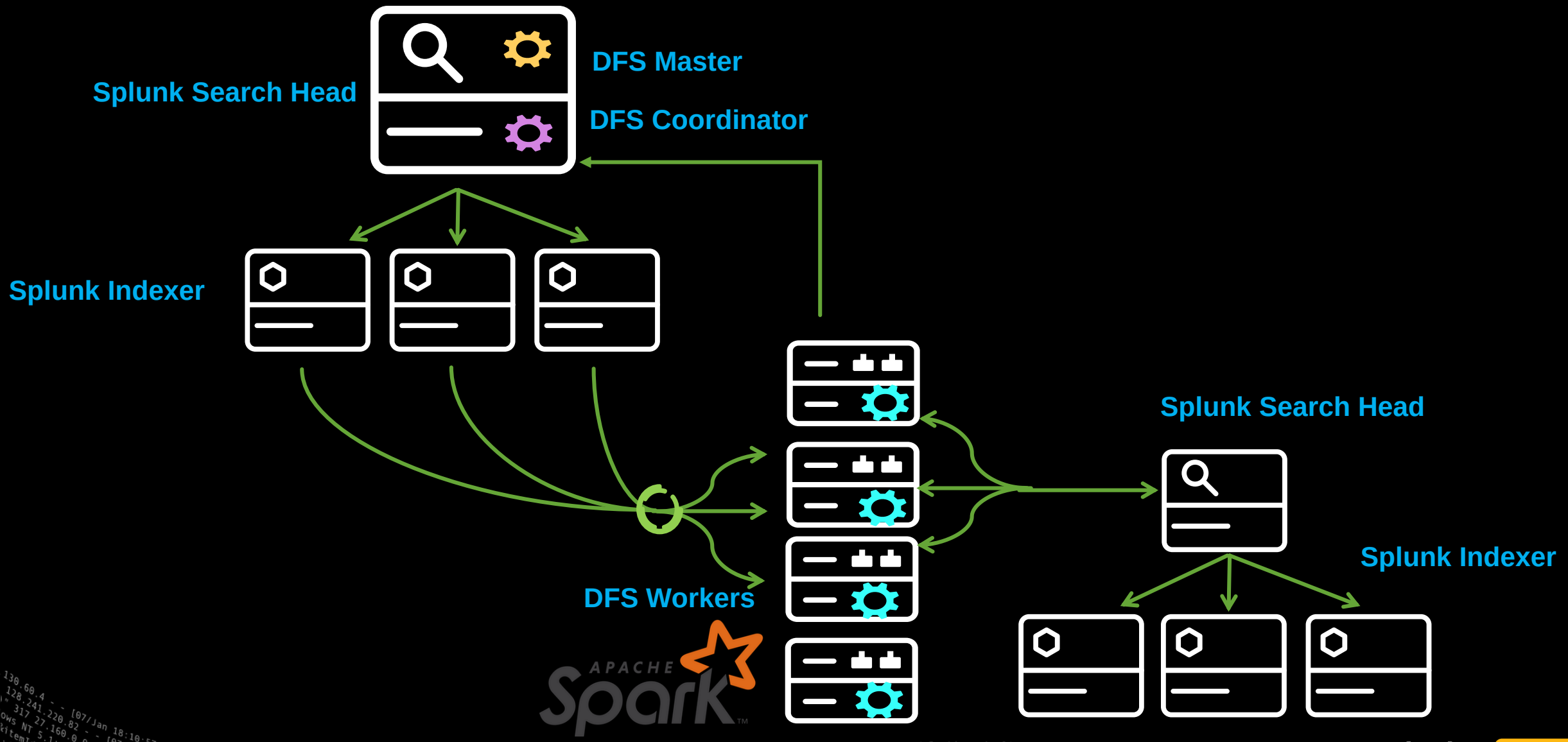
- SH pipeline has processors which were not supported in DFS pipeline
- SH has only the collection processor

# DFS – Performance

**JOIN and Stats 1.5 trillion record**

- **1,500,000,000,000 in-flight, not at-rest**
- **Ran in ~50 minutes on a ~100 node Spark cluster**

# Federated Searches – Splunk Deployments

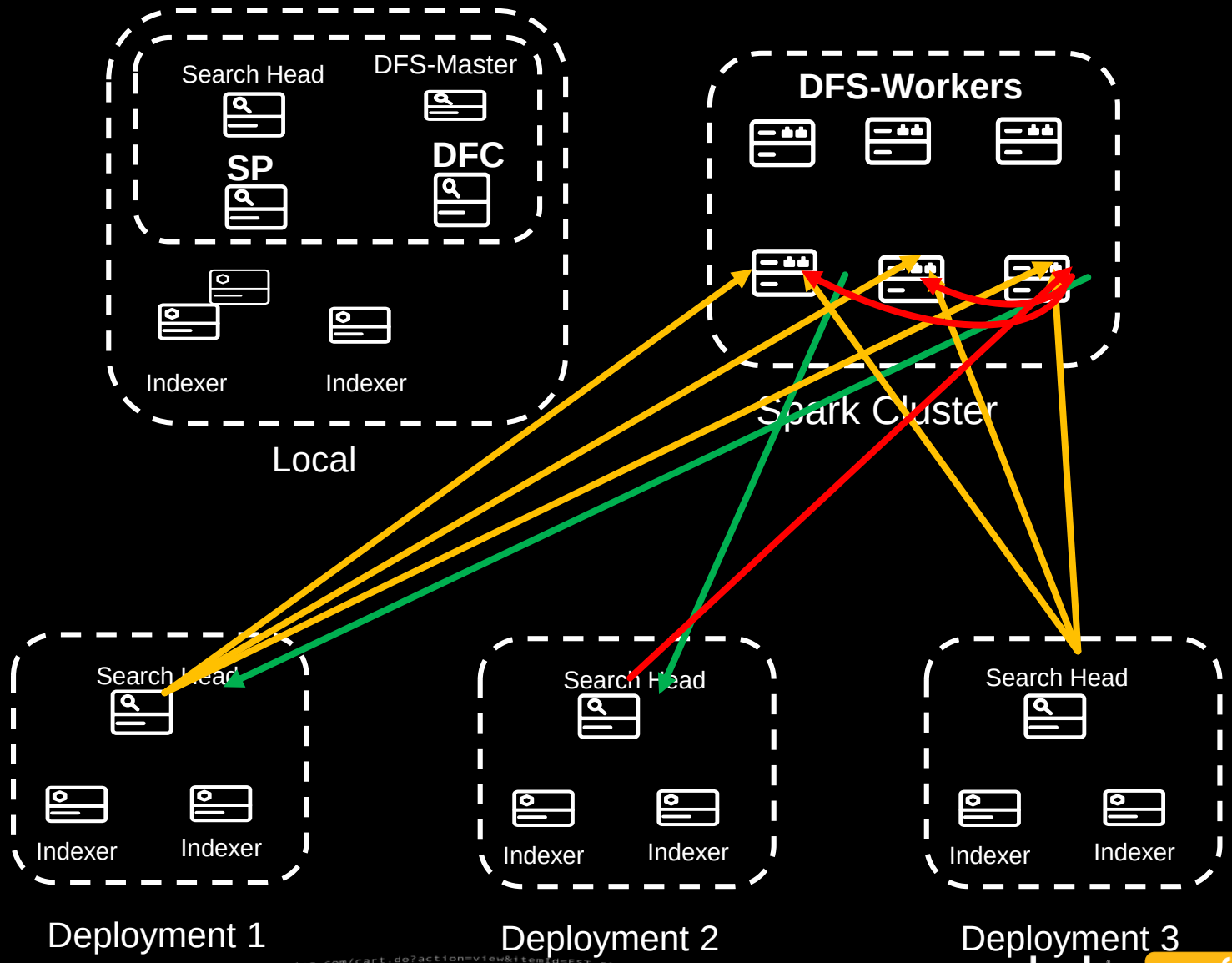


# Federated Search – Execution Flow

**SP**:
Start Query Execution Flow

**DFC**:
Information Map Generation
Access Control
Job Partitioning

**DFS-Workers**: Create Data Layer and Execute Triggers
**Version fetch**
Triggering the query
Sid Management

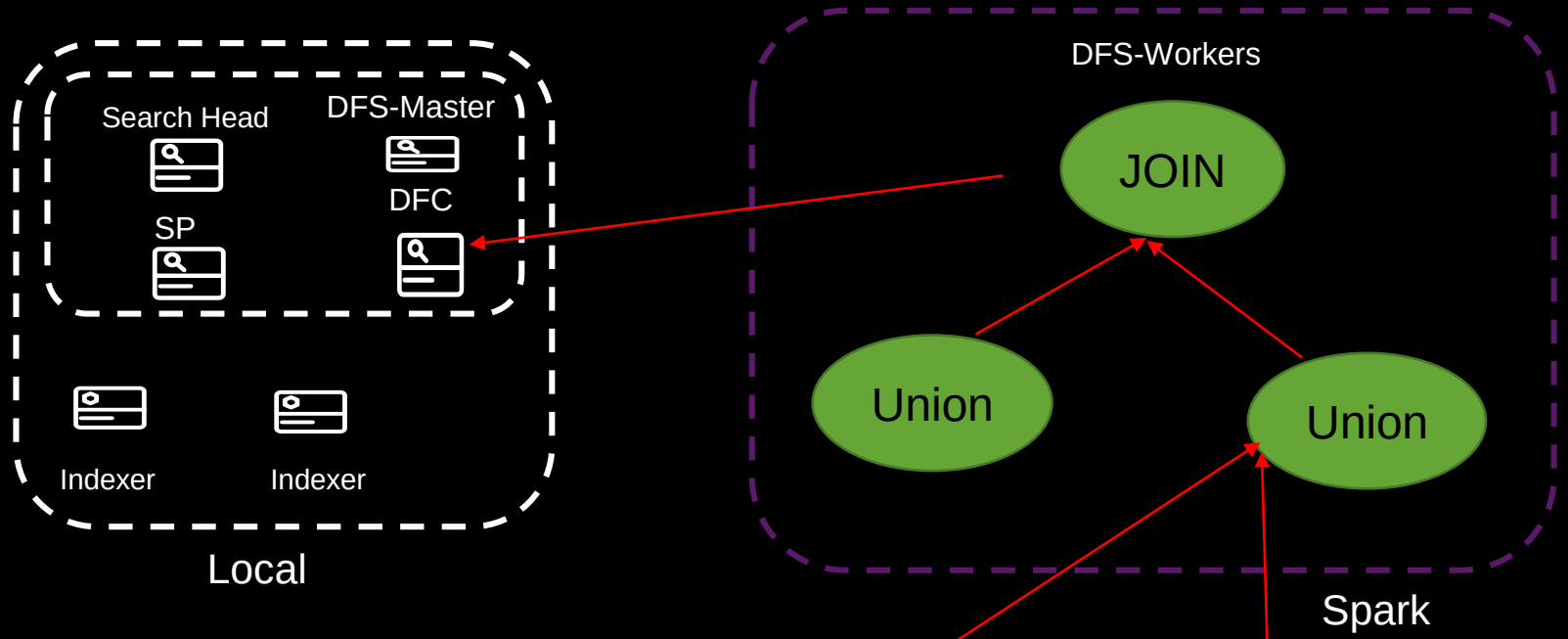


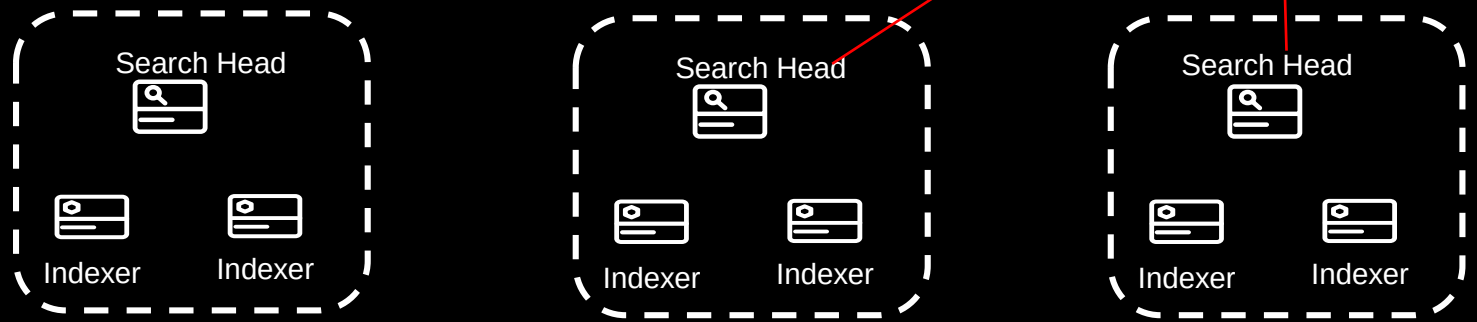

**DFS SH (RD_OUT)**
**Non-DFS SH (REST API)**

# Federated Search – Query Example

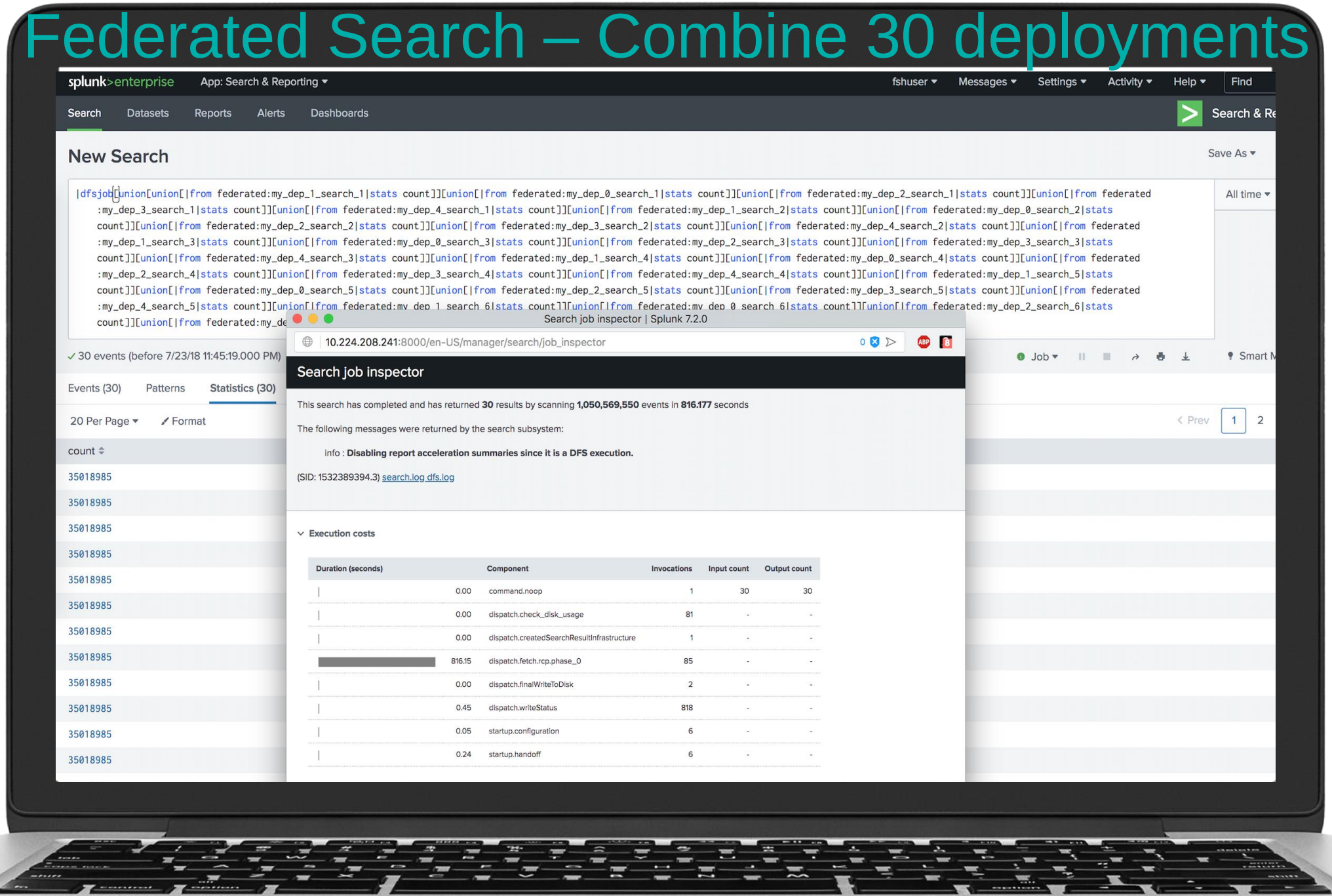
## Join across multiple deployments

```
|dfsjob[
| union [|search Local| ][
|from federated:dep_1]
| join
[| union [|from
federated:dep_2][|from
federated:dep_3]]
|stats count
```



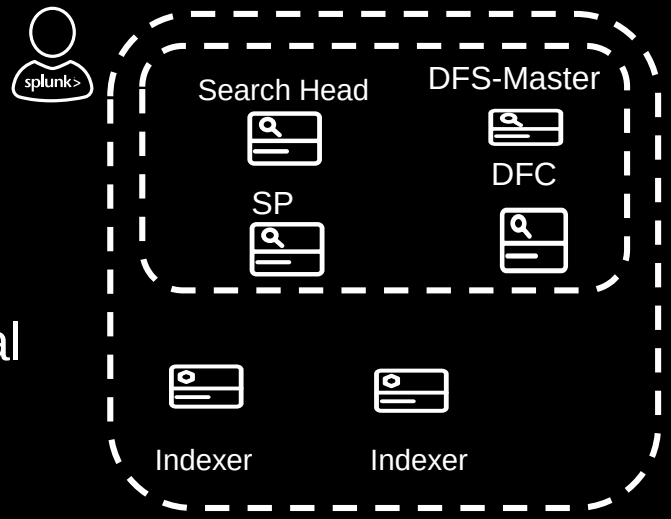
# Federated Search – Combine 30 deployments

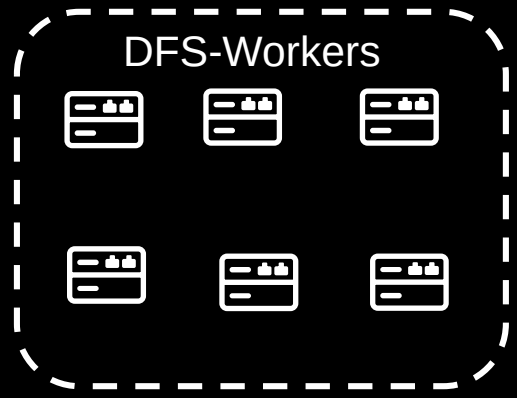


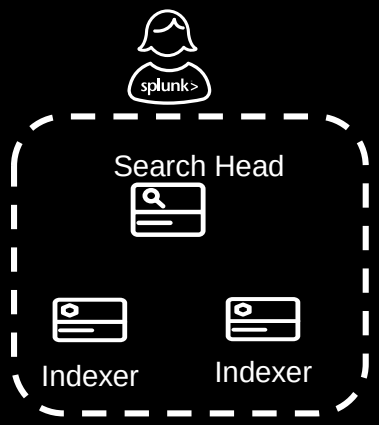
# Federated Search – Access Control Security

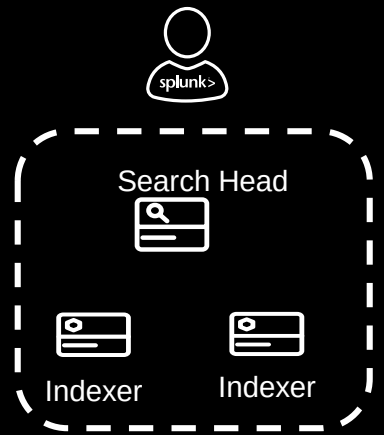
**Service Account Setup**

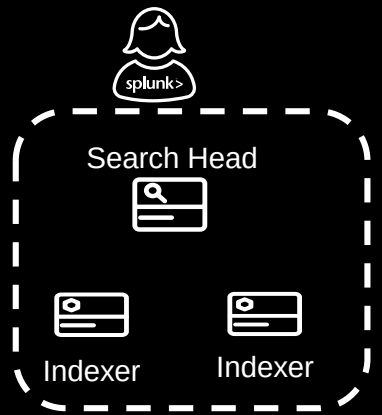
- Remote User and Password = Local User and Password
- Remote Role != Local Role

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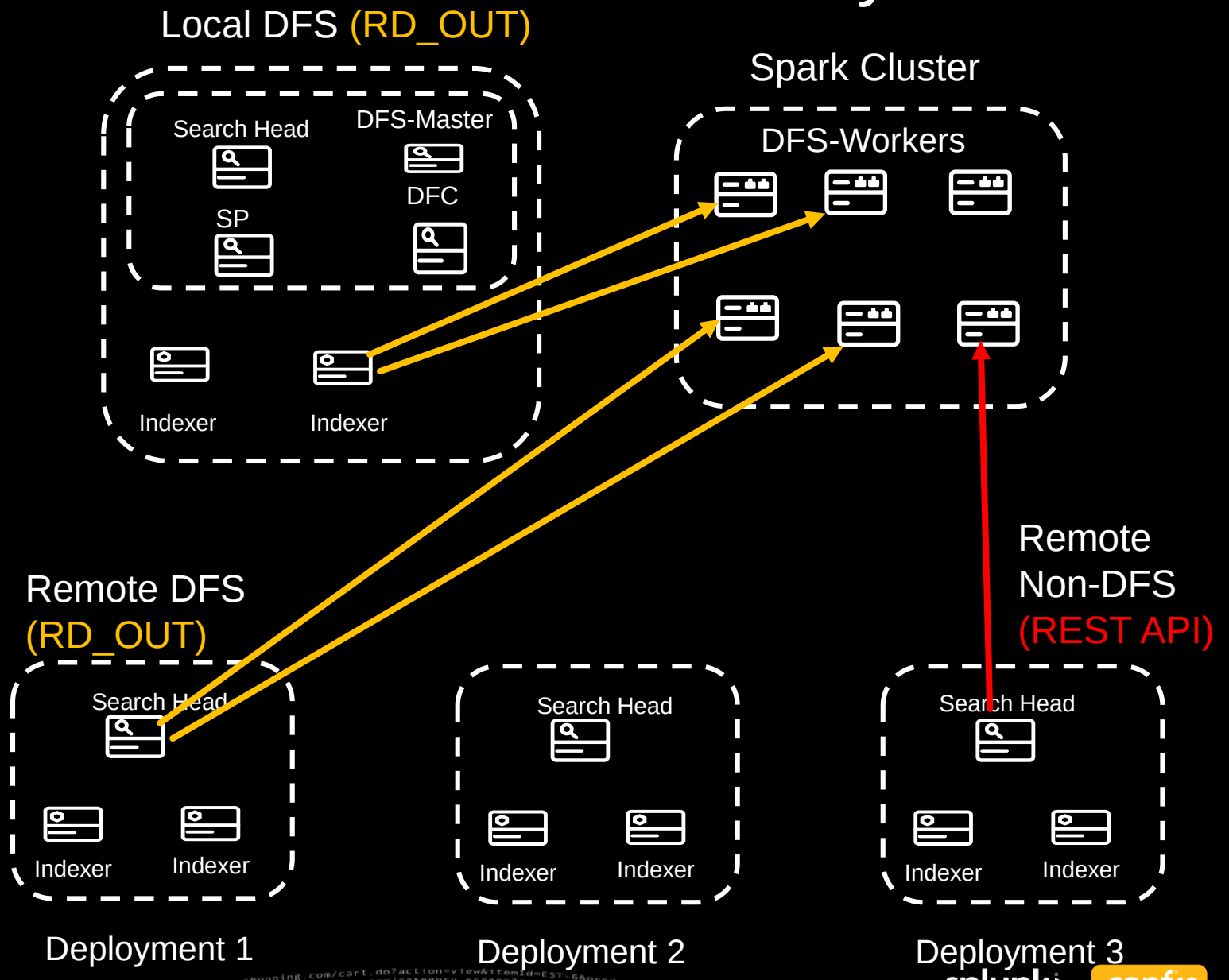
# Federated Search (FS) – Security

| Components | Responsibilities |
|---|---|
| **Management via Service Account** | • On Remote Search Heads, create a new service accounts (user/password) and roles to limit the set of indexers and other resources<br>• This new remote service account will need to match the DFS Master Search Head service account<br>• Example = Users “remotefsh” and Role “role_myfsh1”<br>• Management via Single Identity Provider (LDAP) is not part of the first release and will be added at a later date |
| **FS feature introduces new roles** | • fsh_manage (Admin), fsh_search (User), fsh_remote_deployment (User)<br>➢ [role_myfsh1]<br>➢ importRoles = user;power<br>➢ fsh_search = enabled<br>➢ fsh_remote_deployment = remote_deployment_1 |
| **FS feature new Password Management** | • encrypted in the fshpassword file<br>• Allows Search, we check if user has either the fsh_search or fsh_manage capabilities<br>• Allows Manage, we check if admins has fsh_manage |
| **Runtime Authorization and Authentication** | • FS retrieves the password for remote deployment and proceeds for execution<br>• The authentication and authorization for the remote deployment is based on the default policies executed on the remote Search Head deployment |

# Federated Search – Network Security

- **Default**: All Network is Secured just like normal Splunk. **No configuration required**.
- Data flows are authenticated and encrypted via default symmetric key over a TLS communication

- **Additional Security**:
- Spark Sasl Encryption,
- Spark key stores certificates,
- DFS key stores in limits.conf/server.conf



# Federated Search – Configuration

| Components | Example |
|---|---|
| **Catalog.conf** | [**remote_deployment_1**]<br>IP = 10.0.0.3<br>ServiceAccount = remotefsh<br>Type = Splunk<br><br>[federated:**my_dep_1_search_1**]<br>search = “search index=myindex \| stats count by ip”<br>deploymentName = **remote_deployment_1** |
| **Authorize.conf** | [role_myfsh1]<br>importRoles = user;power<br>fsh_search = enabled<br>fsh_remote_deployment = **remote_deployment_1** |
| **Search** | \|union [\|from federated:**my_dep_1_search_1**] [\|from federated:my_dep_2_search_2] \| stats count |

# Splunk Demo

# Thank You

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