

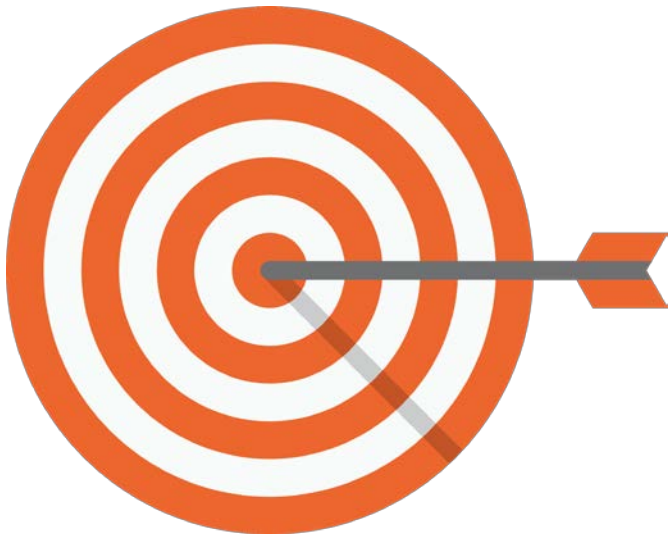
# Hive Deep Dive



Elton Stoneman

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# Module Goals



Hive Processing Model

Monitoring Queries in YARN

APACHE  
HBASE



timing-events

t

RowKey

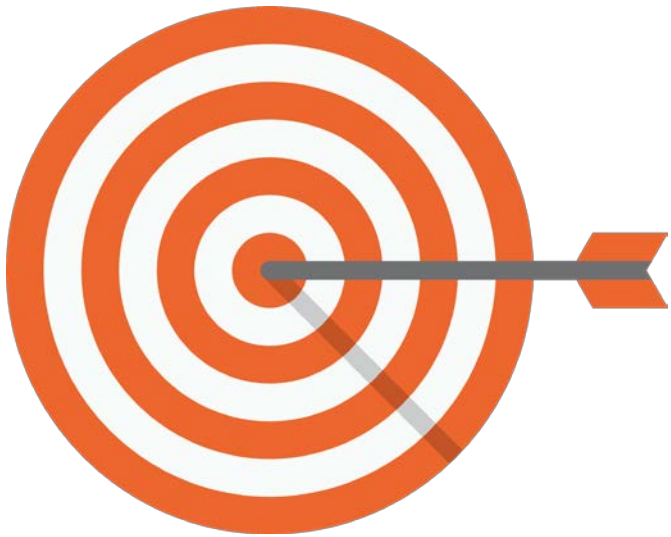
t:a3b3

e4324|a31c4|a6545da436

1231412412

x41M rows

# Module Goals



Hive Processing Model

Monitoring Queries in YARN

Query Plans & Optimization



```
INSERT INTO TABLE  
racer_starts ...
```



Compiler

Execution  
Engine



ODBC

Remote Machine

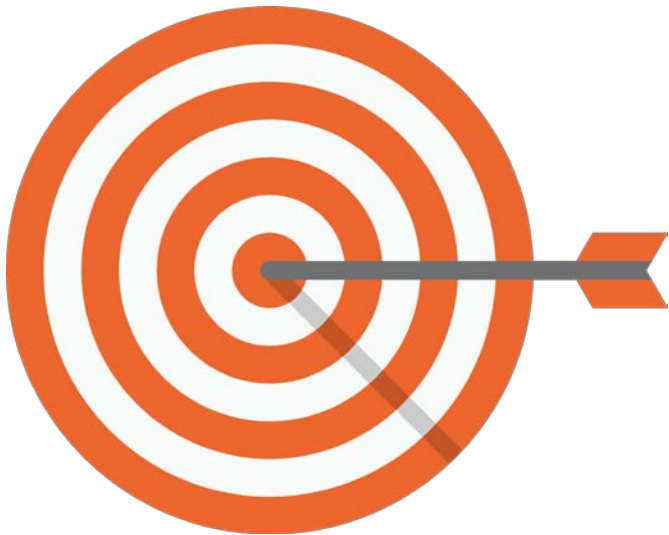


HiveServer2



HDInsight Cluster

# Module Goals



Hive Processing Model

Monitoring Queries in YARN

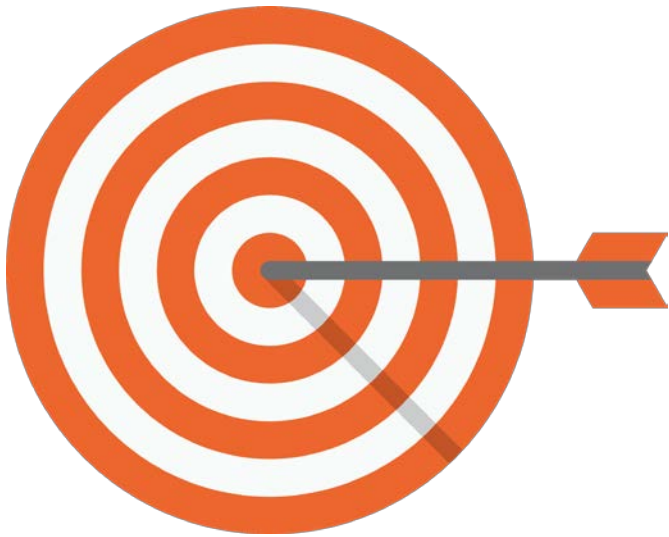
Query Plans & Optimization

Hive with PowerShell & .NET





# Module Goals



Hive Processing Model

Monitoring Queries in YARN

Query Plans & Optimization

Hive with PowerShell & .NET

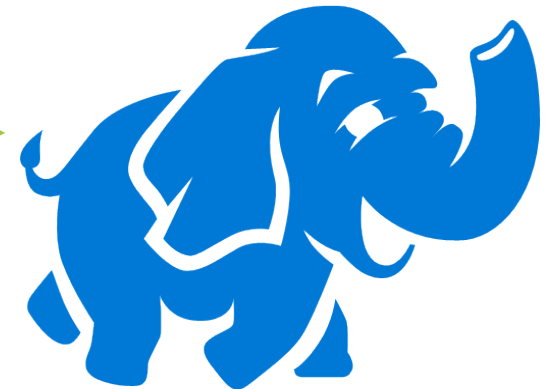
Initialising Hive in HDInsight

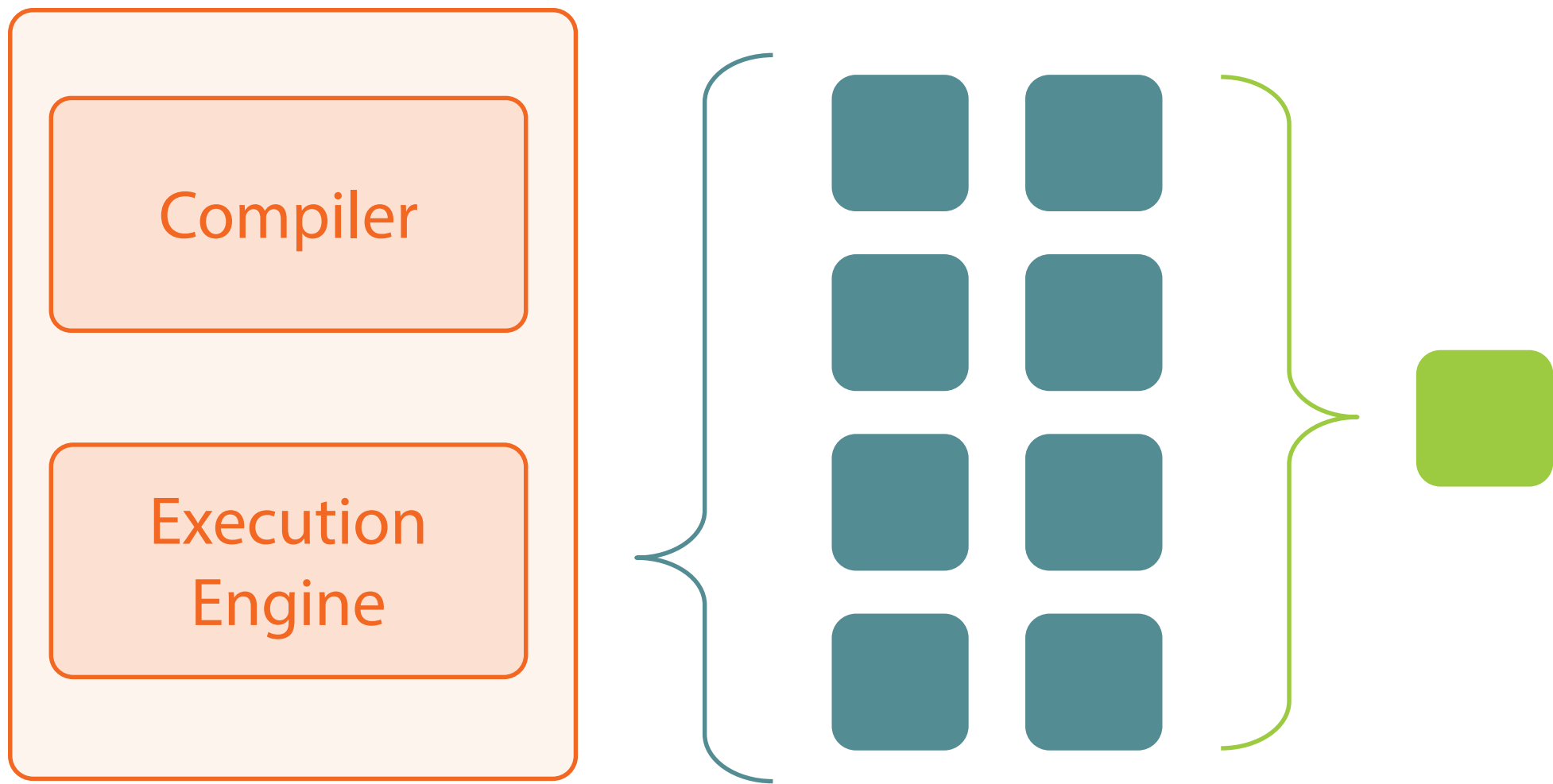
```
SELECT COUNT(*)  
FROM timing_events;
```



Compiler

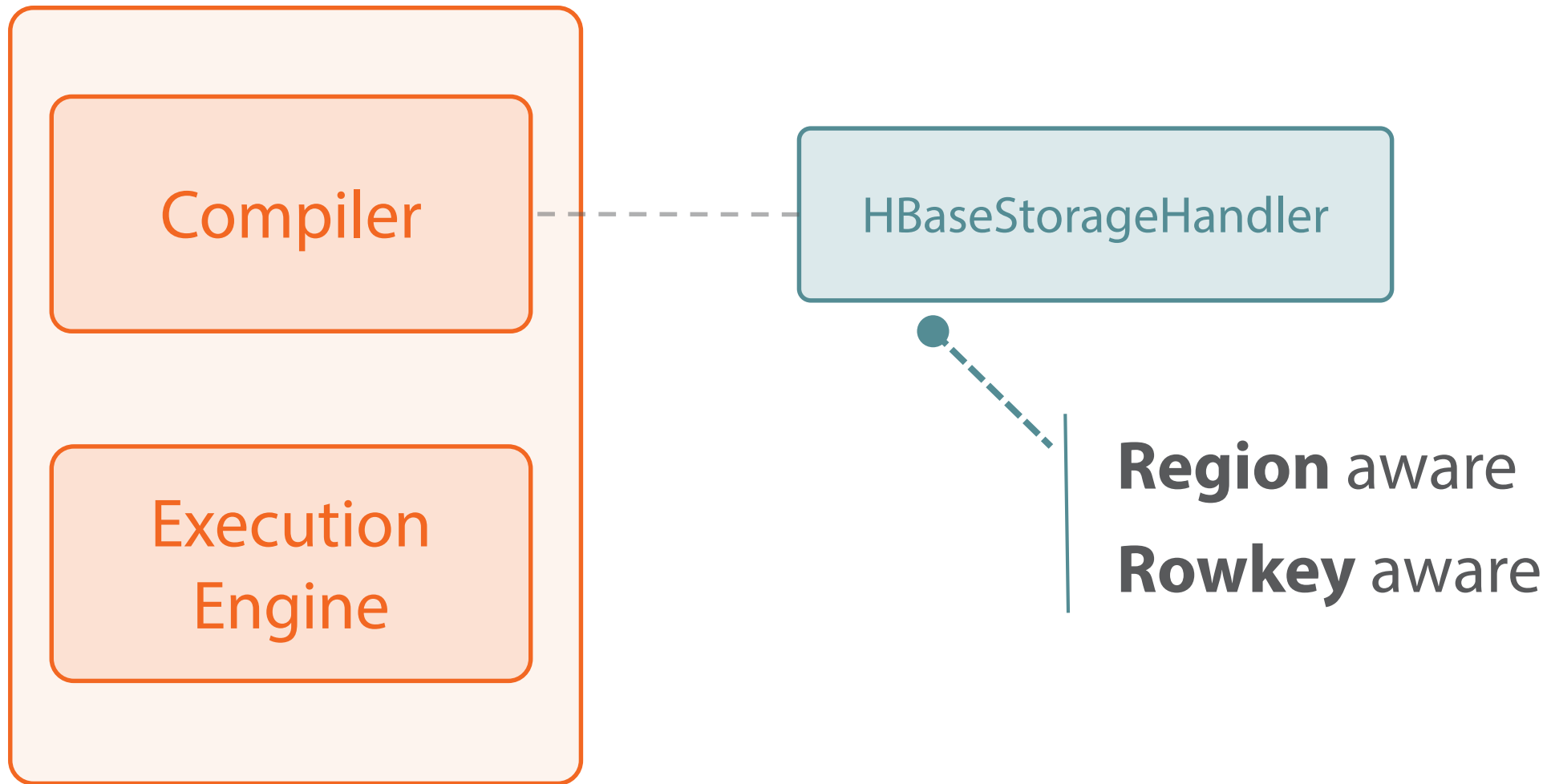
Execution  
Engine





Map

Reduce



```
SELECT COUNT(*)  
FROM timing-events;
```

timing-events															
00	01	02	03	...											
					...										
						...									
							...								
								...							
									...	fc	fd	fe	ff		



APACHE  
HBASE

```
SELECT COUNT(*)  
FROM timing-events;
```



count rows  
timing-events  
partition 1

count rows  
timing-events  
partition 2

count rows  
timing-events  
partition 3

...

count rows  
timing-events  
partition 256



count rows  
timing-events  
partition 1

=165K

count rows  
timing-events  
partition 2

=170K

count rows  
timing-events  
partition 3

=160K

...

count rows  
timing-events  
partition 256

=165K

sum map  
totals

= 41M



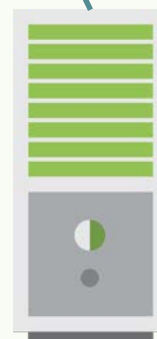
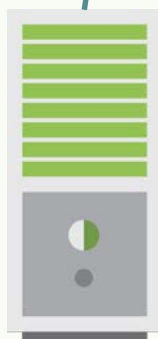
count rows  
timing-events  
partition 1

count rows  
timing-events  
partition 2

count rows  
timing-events  
partition 3

...

Region  
Servers







count rows  
timing-events  
partition 1

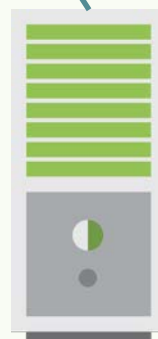
count rows  
timing-events  
partition 2

count rows  
timing-events  
partition 3

...



Region  
Servers





count rows  
timing-events  
partition 1

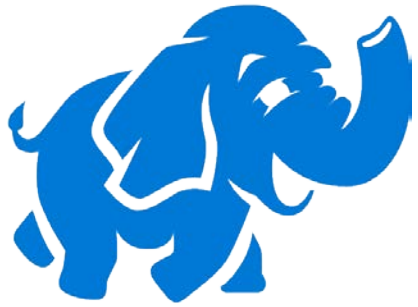
count rows  
timing-events  
partition 2

count rows  
timing-events  
partition 3

...

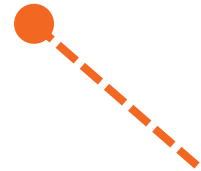
Region  
Servers



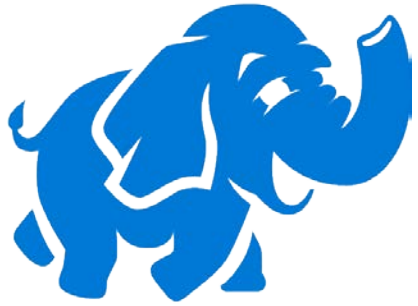


# YARN

Yet Another Resource Negotiator



**Job** scheduling



# YARN

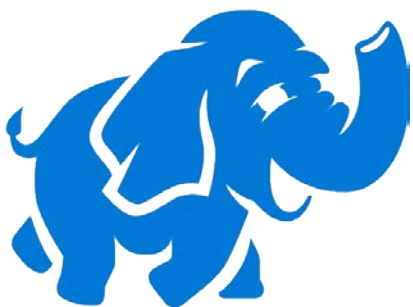
Yet Another Resource Negotiator

# HDFS

Hadoop Distributed File System




APACHE  
**HBASE**



# YARN

Yet Another Resource Negotiator

 **MapReduce Job job\_1445192252771\_0034**

Logged in as: gopher

Cluster

Application

Job

- Overview
- Counters
- Configuration
- Map tasks
- Reduce tasks
- AM Logs

Tools

Job Overview

**Job Name:** select count(\*) from timing\_events(Stage-1)  
**State:** RUNNING  
**Uberized:** false  
**Started:** Mon Oct 19 11:33:54 GMT 2015  
**Elapsed:** 42mins, 44sec

**ApplicationMaster**

Attempt Number	Start Time	Node	Logs
1	Mon Oct 19 11:33:48 GMT 2015	workernode1.psod-hdi-hbase.f7.internal.cloudapp.net:30060	<a href="#">logs</a>

Task Type	Progress	Total	Pending	Running	Complete
Map	<div><div></div></div>	257	202	2	53
Reduce	<div><div></div></div>	1	0	1	0

Attempt Type	New	Running	Failed	Killed	Successful
Maps	202	2	0	0	53
Reduces	0	1	0	0	0

# Demo: YARN UI

Hive Query

HBase Regions

YARN Jobs

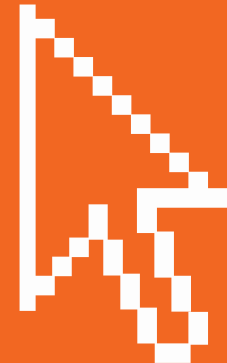


# Demo: Execution Plan

Hive EXPLAIN

HBase row keys

Filter push-down



```
EXPLAIN
```

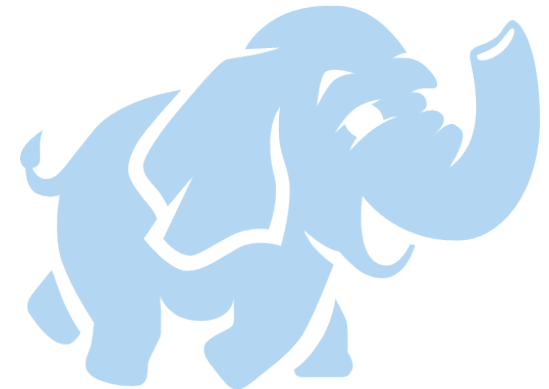
```
SELECT COUNT(*)
```

```
FROM timing_events;
```



Compiler

Execution  
Engine







```
...  
JOIN earliest_timing_events t1  
  ON t1.timerid = rt.firstTimerId  
  AND t1.raceid = rt.raceid  
  AND t1.racerid = rd.racerid
```

**timing-events** **t**

**RowKey**

**t:a3b3**

e4324|a31c4|a6545da436

1231412412

...

```
JOIN earliest_timing_events t1
```

```
ON t1.rowkey = rd.racerid + '|' + rt.firstTimerId + '|' + rt.raceid
```



Rowkey filter



Table scan

**timing-events**

**t**

**RowKey**

**t:a3b3**

e4324|a31c4|a6545da436

1231412412



Filter push-down only on **constant values**

...

```
JOIN earliest_timing_events t1
```

...

```
WHERE t1.rowkey BETWEEN '08e54e|dc1c|04b4dd' AND 'fe2994|dc1c|04b4dd'
```

<i>First Name</i>	<i>Last Name</i>	<i>Racer ID</i>
Dallas	Miyashiro	08e54e
Janna	Przybyl	0a3ec3
Olene	Skubis	0e7ee4
...		
Nell	Pao	fbdd74
Arlyne	Dellinger	fe073a
Chana	Perera	fe2994

...

```
JOIN earliest_timing_events t1
```

...

```
WHERE t1.rowkey BETWEEN '08e54e|dc1c|04b4dd' AND 'fe2994|dc1c|04b4dd'
```



Rowkey filter



Table scan

**timing-events**

**t**

**RowKey**

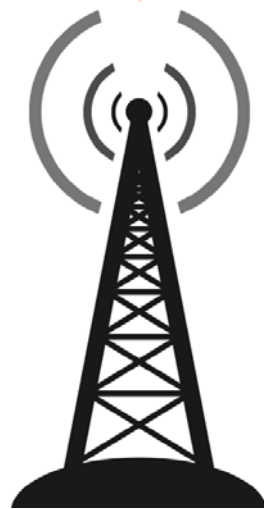
**t:a3b3**

e4324|a31c4|a6545da436

1231412412

## timing-events

00	01	02	03	04	05	06	07	08	09	10	11	12	13
...													
...													
...													
...													
f2	f3	f4	f5	f6	f7	f8	f9	fa	fb	fc	fd	fe	ff



Random IDs  
**Multiple** regions  
High **concurrency**

## timing-events

00	01	02	03	04	05	06	07	08	09	10	11	12	13
...													

Skip **9** regions

Scan **248** regions

...													
f2	f3	f4	f5	f6	f7	f8	f9	fa	fb	fc	fd	fe	ff

```
INSERT INTO #race_rowkeys
SELECT racerId + '|dc1c|04b4dd'
FROM racer_details...
```

```
FOR rowkey IN (
  SELECT * FROM #race_rowkeys
)
LOOP
  --process racer
END LOOP;
```

First Name	Last Name	Racer ID
Dallas	Miyashiro	08e54e
Janna	Przybyl	0a3ec3
...		
Arlyne	Dellinger	fe073a
Chana	Perera	fe2994

**timing-events** **t**

RowKey	t:a3b3
e4324 a31c4 a6545da436	1231412412



# Demo: Hive and PowerShell

Submitting Query Jobs

Parameterising Queries

Reading Results





```
INSERT INTO TABLE  
racer_starts ...
```



60+ seconds



Compiler

Execution  
Engine

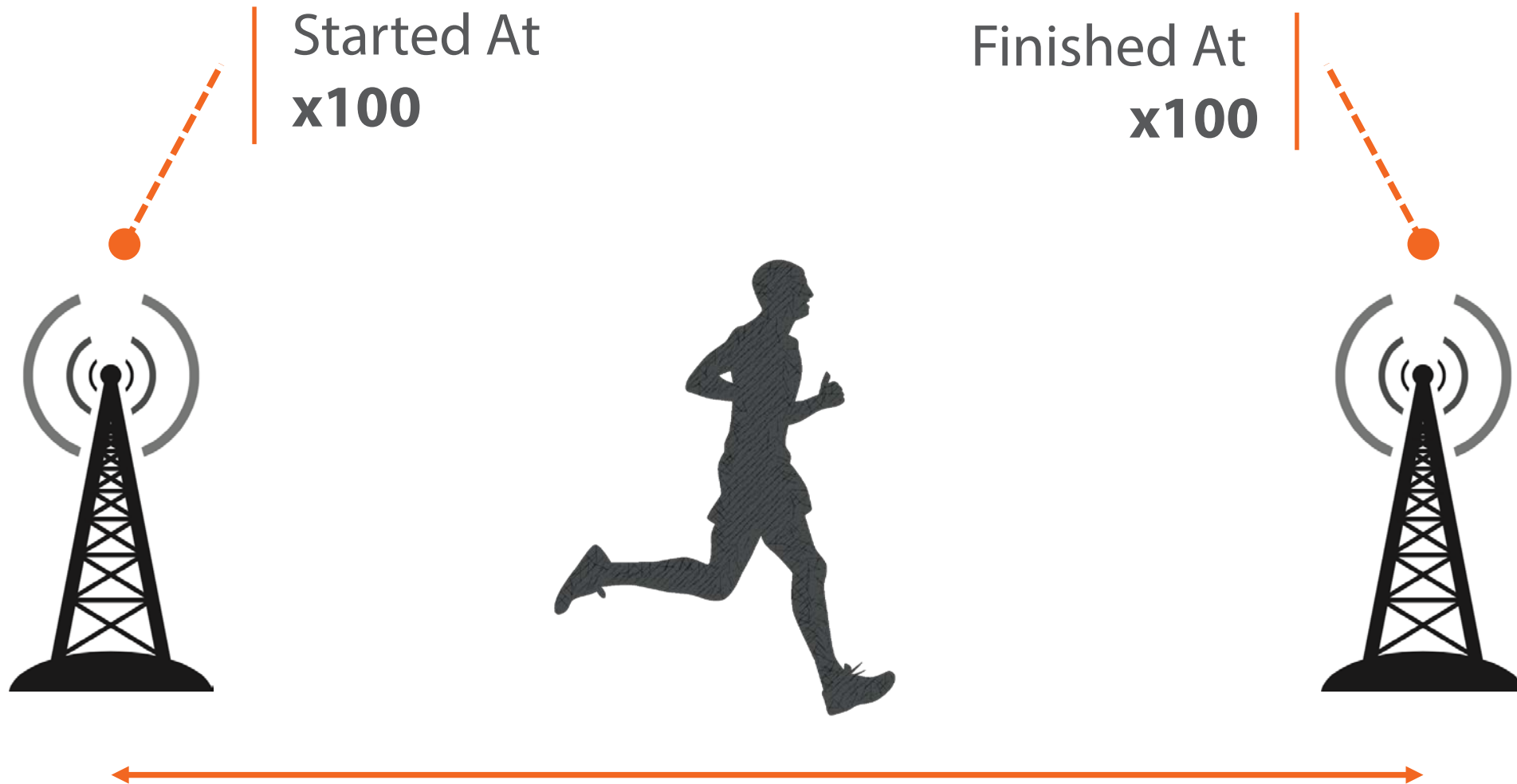
# Demo: Multiple Hive Jobs

Bulk INSERTs

Multiple Queries

Running in Parallel







```
INSERT INTO TABLE  
racer_starts ...
```

x200



```
INSERT INTO ...
```

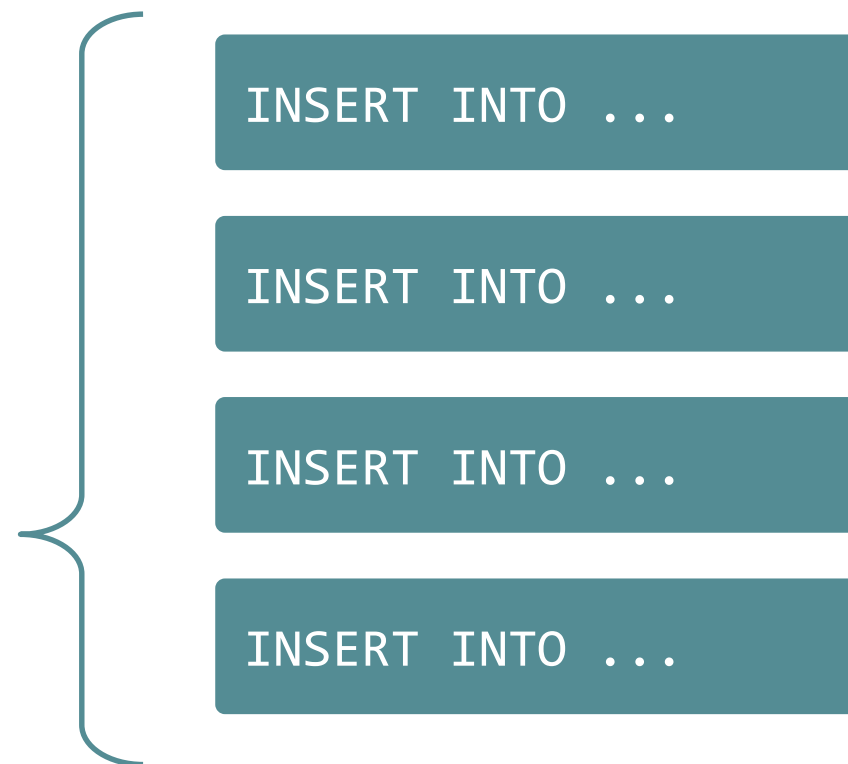
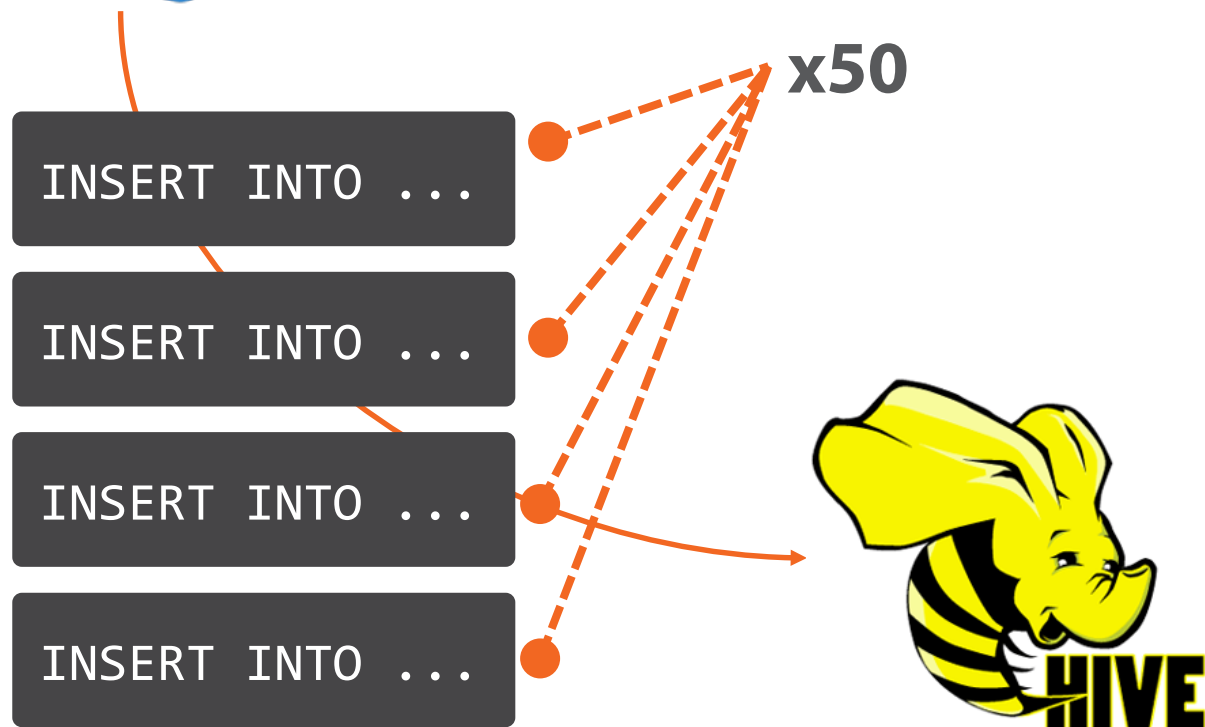
```
INSERT INTO ...
```

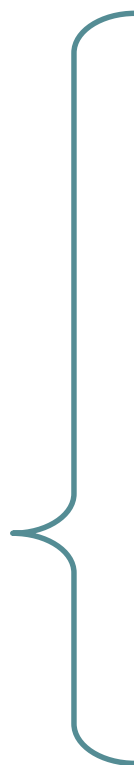
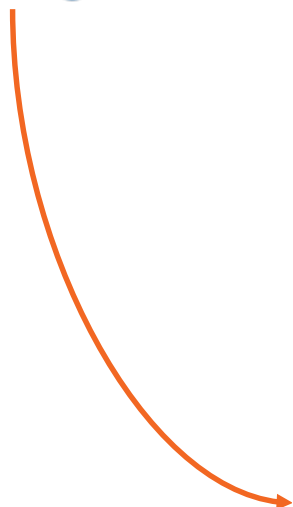
```
INSERT INTO ...
```

```
INSERT INTO ...
```

...

```
INSERT INTO ...
```



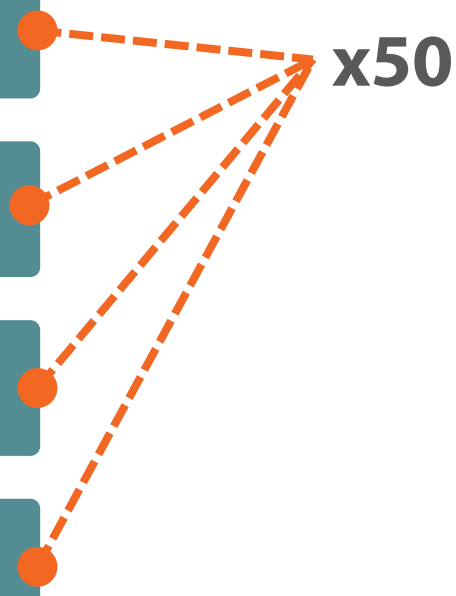


```
INSERT racer_starts ...
```

```
INSERT racer_starts ...
```

```
INSERT racer_finishes ...
```

```
INSERT racer_finishes ...
```



**x50**



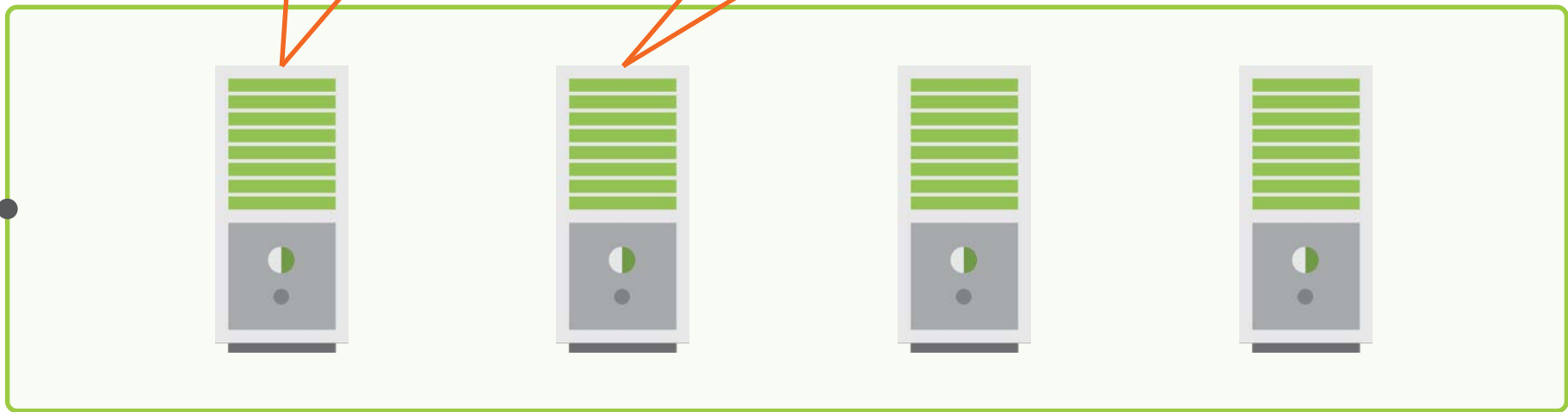
```
insert...;  
insert...;  
insert...;
```

```
insert...;  
insert...;  
insert...;
```

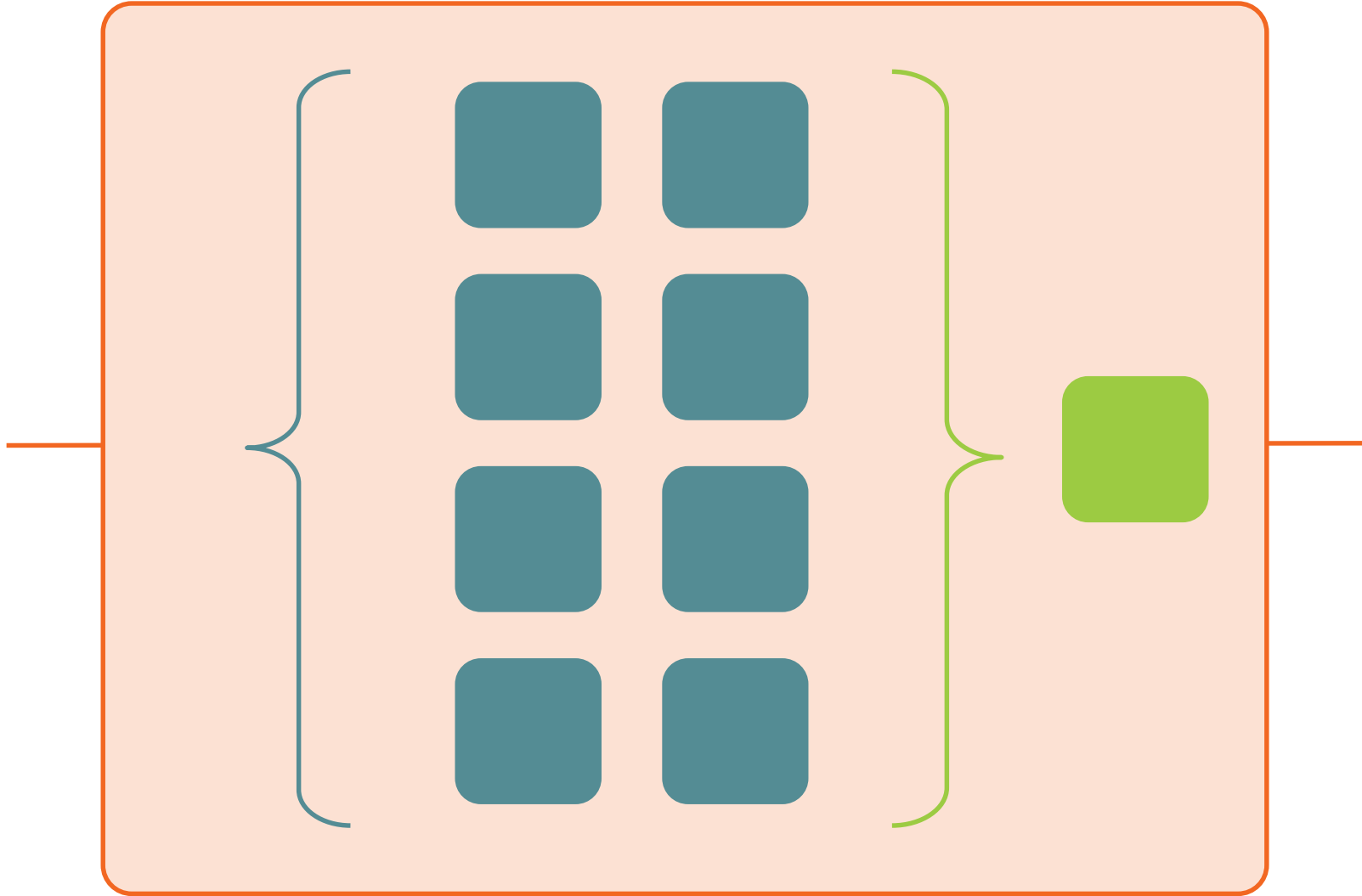
```
insert...;  
insert...;  
insert...;
```


```
insert...;  
insert...;  
insert...;
```

Region  
Servers









```
INSERT INTO TABLE racer_starts PARTITION (raceId = '{1}')  
SELECT racerId, earliestTimestamp  
FROM earliest_timing_events  
WHERE rowkey = '{2}'
```



Rowkey filter



Table scan

**timing-events**

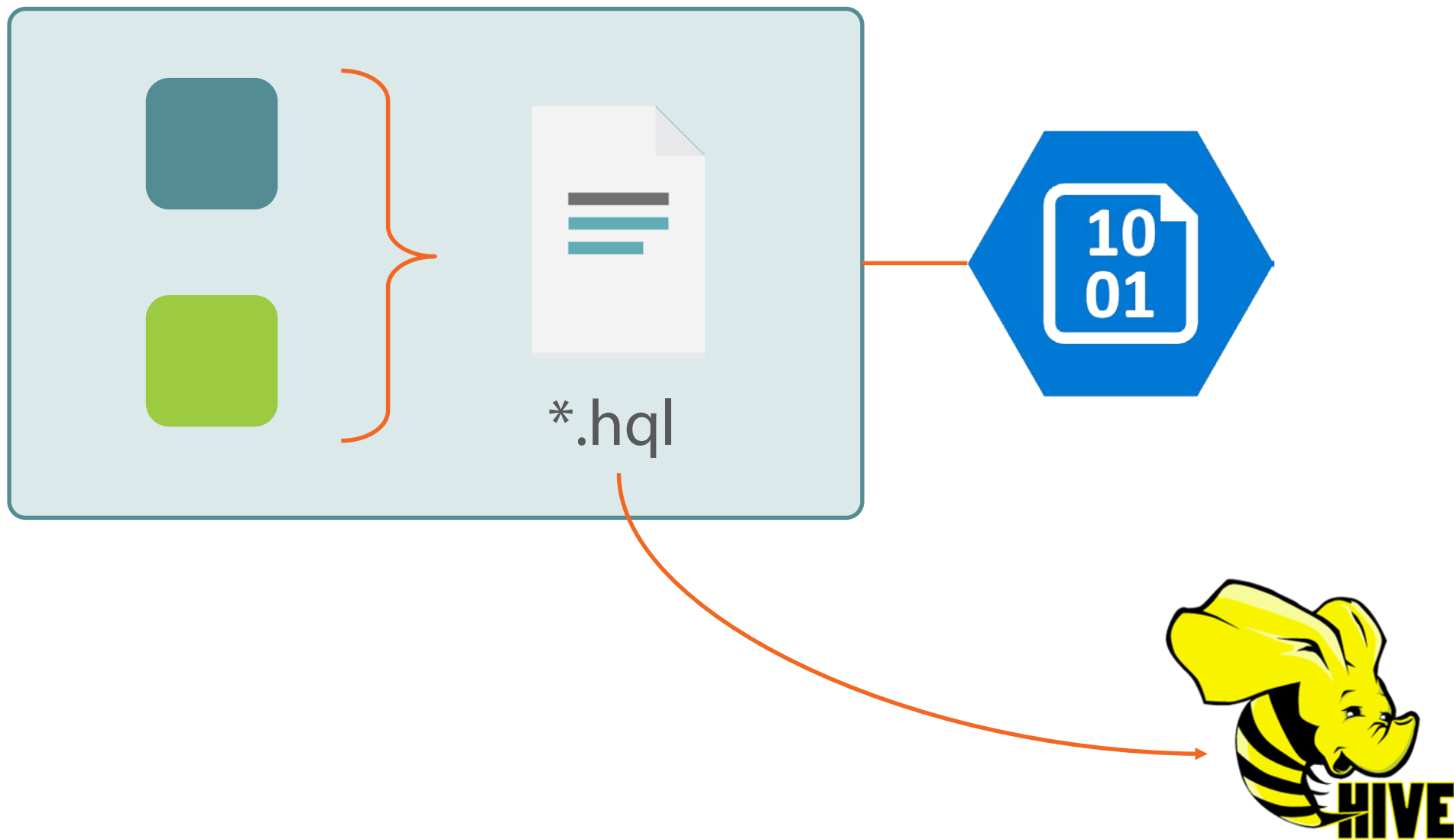
**t**

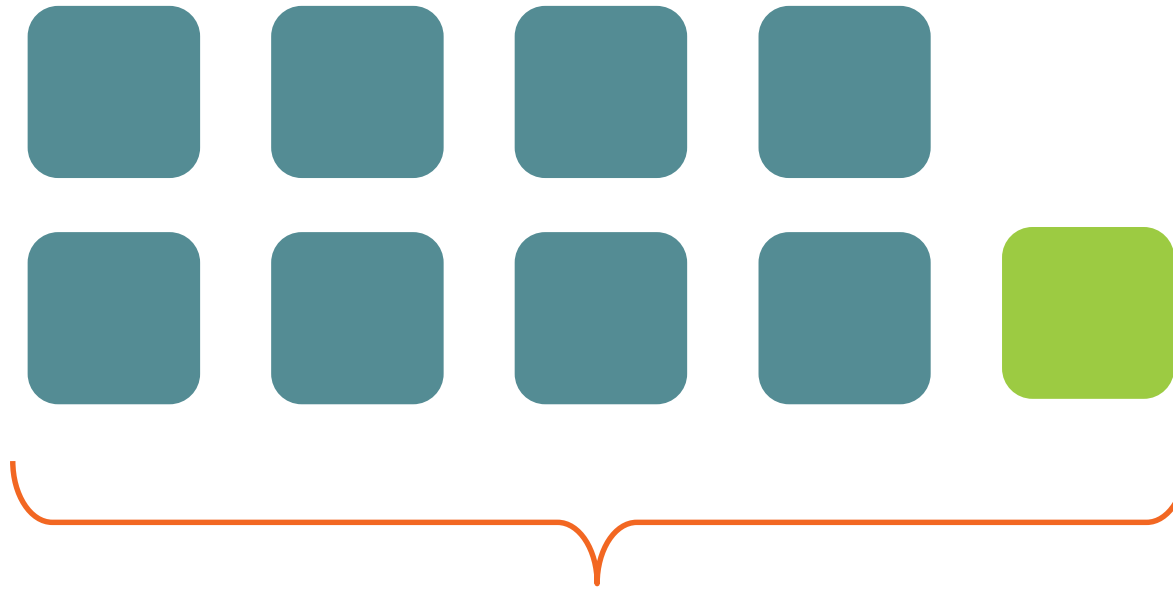
**RowKey**

**t:a3b3**

e4324|a31c4|a6545da436

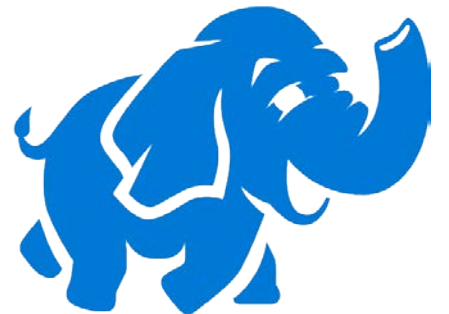
1231412412

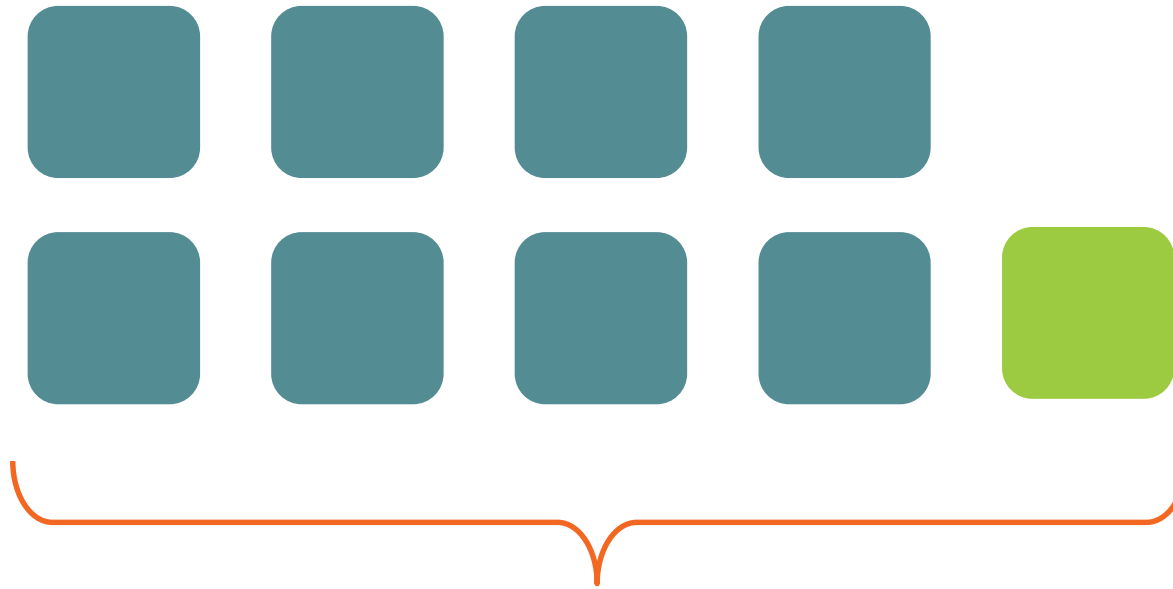




# YARN

Yet Another Resource Negotiator

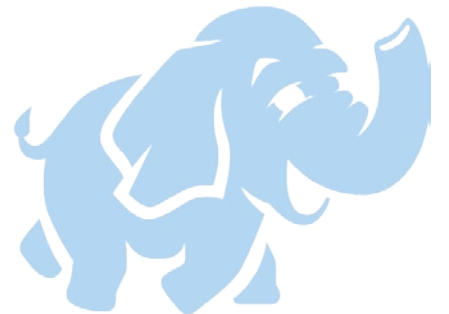


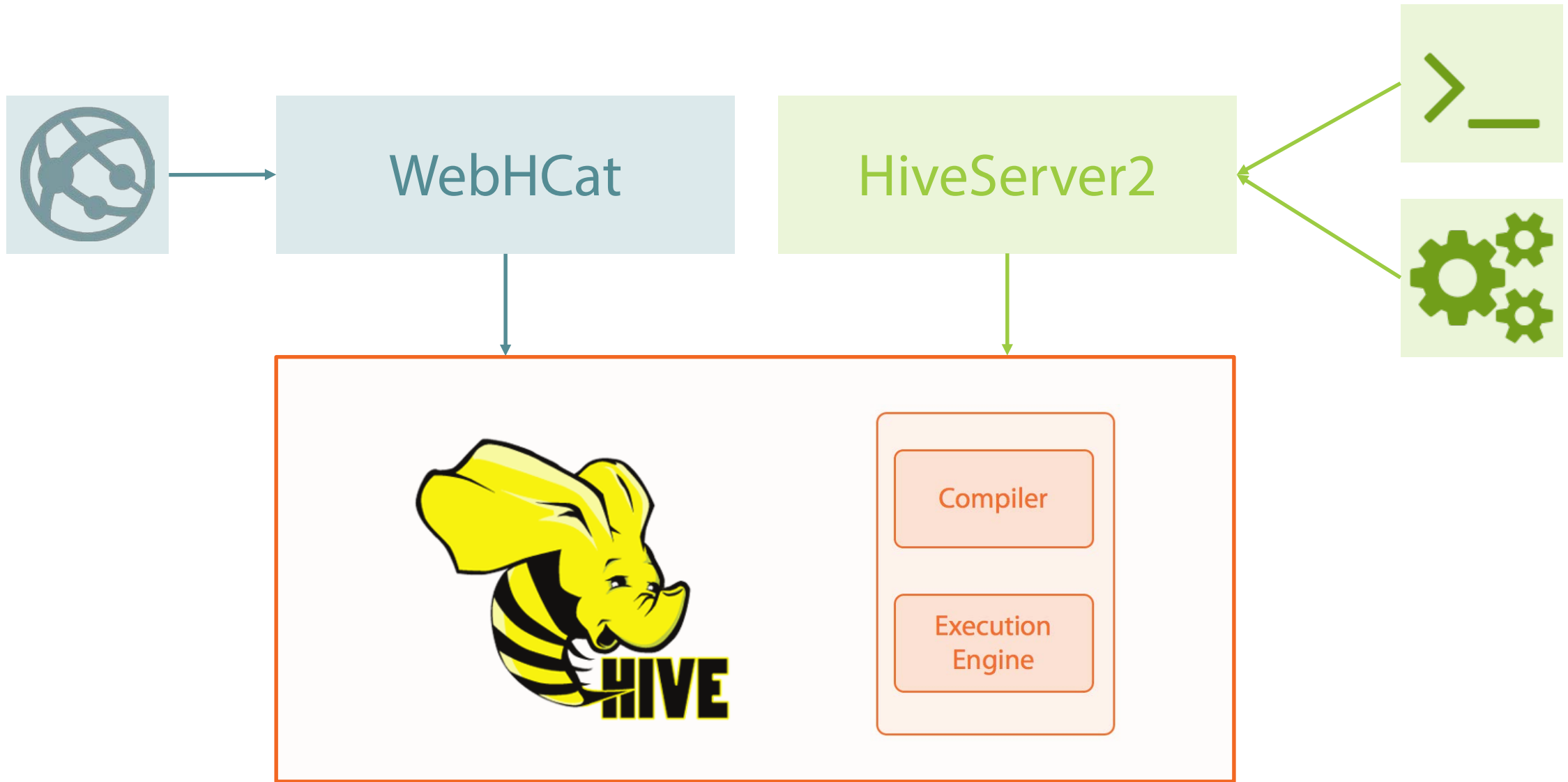


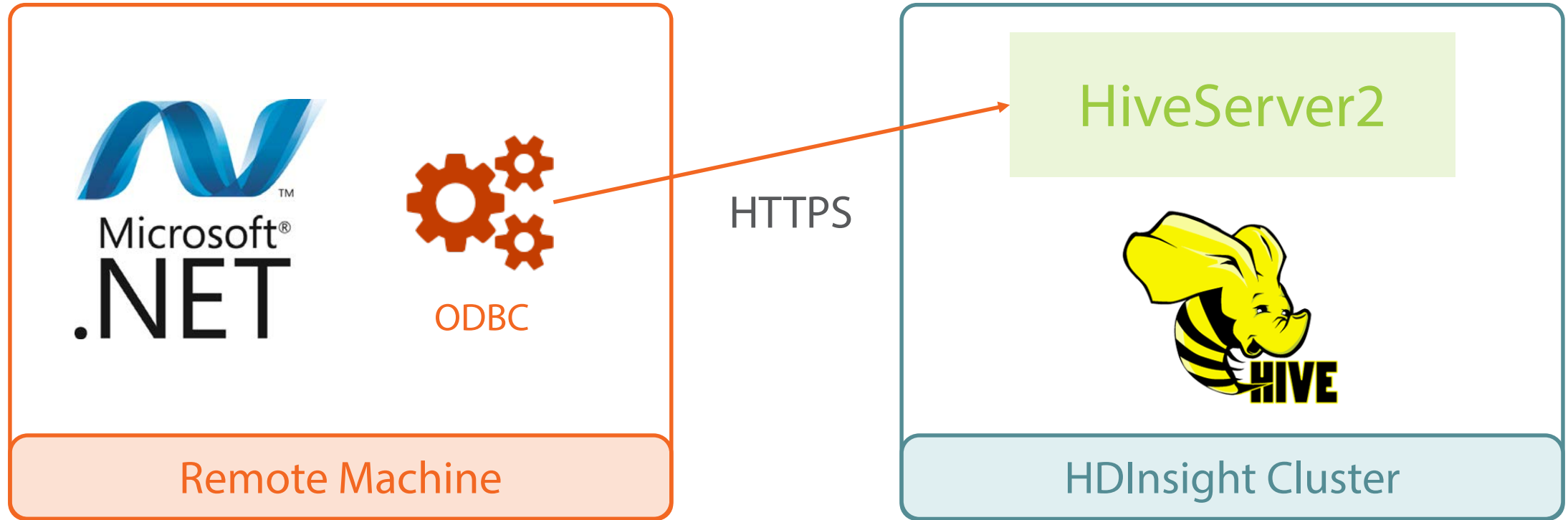
**27+** minutes

**YARN**

Yet Another Resource Negotiator





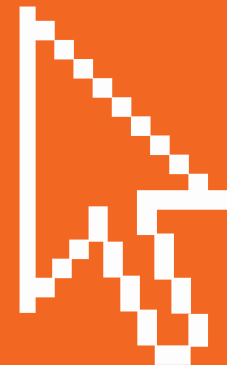


# Demo: User Defined Functions

Hadoop Streaming Interface

.NET Console App

HiveQL Integration





# Demo: Cluster Setup

Additional Storage Accounts

Hive Metastore Setup

PowerShell Script







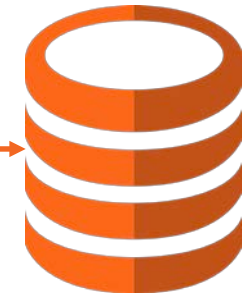


[http://\*\*timing.sixeyed.com\*\*//\*\*public\*\*/race\\_results/\*\*raceld=e399\*\*](http://timing.sixeyed.com/public/race_results/raceld=e399)



**Tables**

**Views**



Metastore

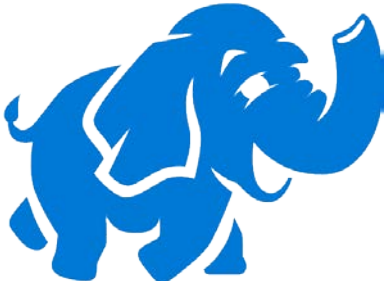
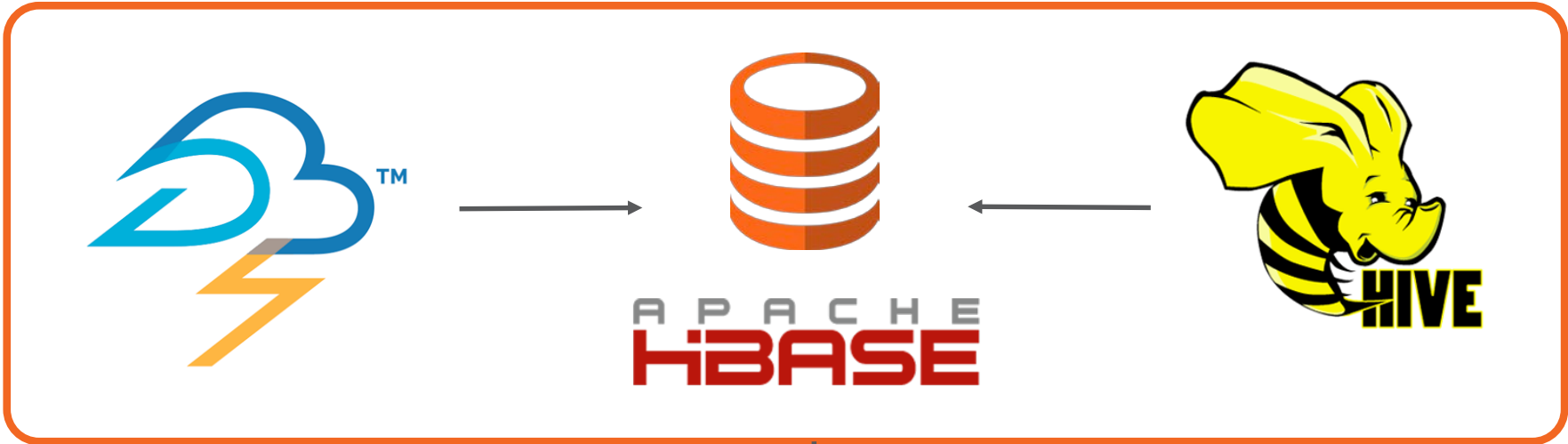
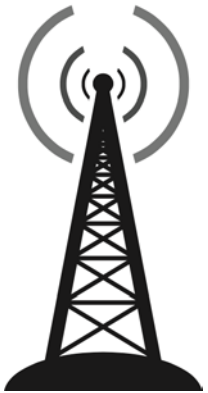


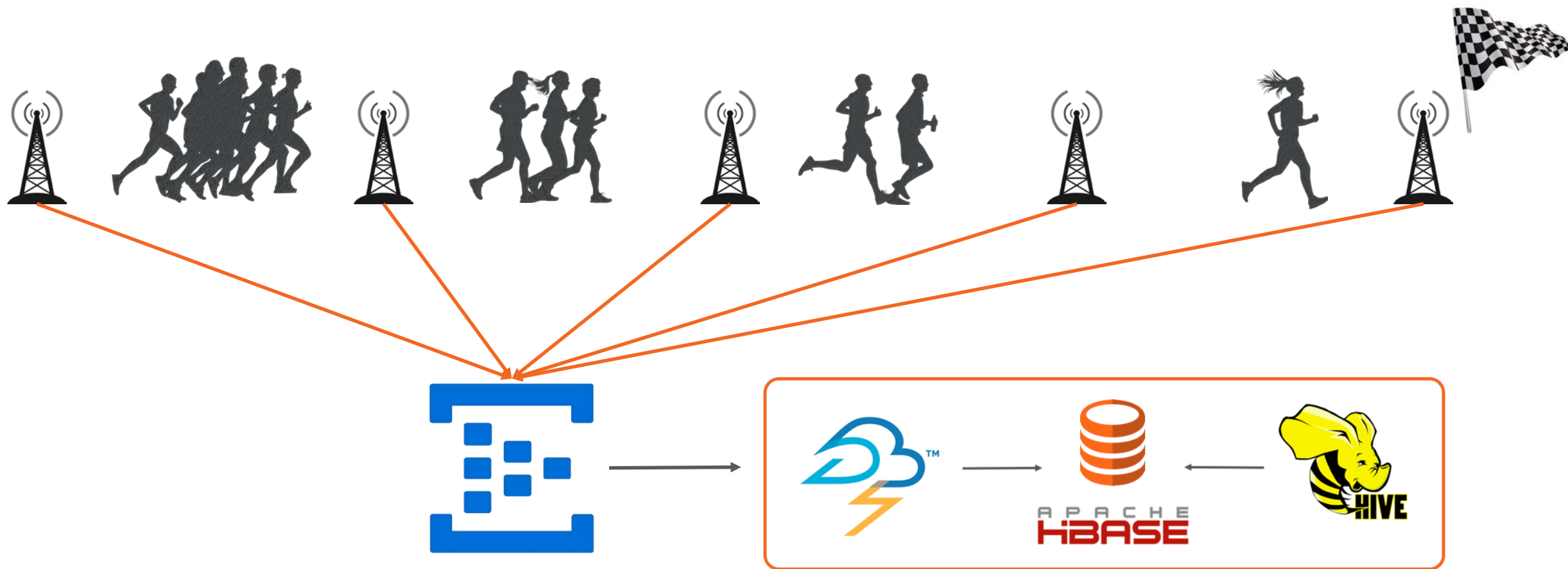
**Tables**

**Views**

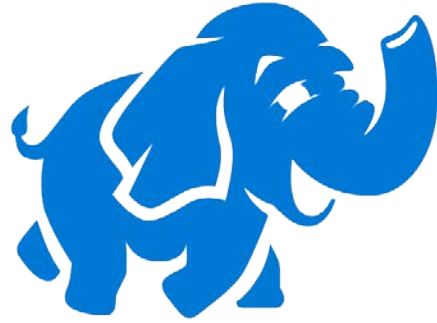


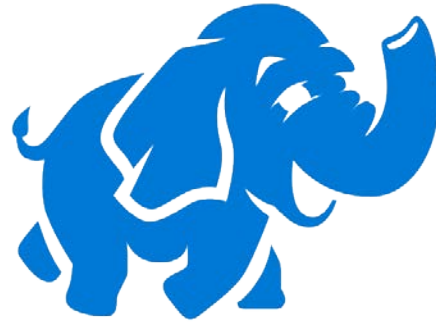
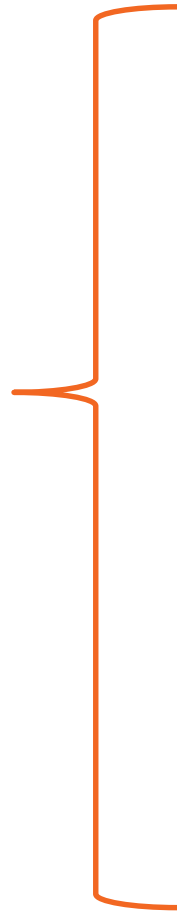
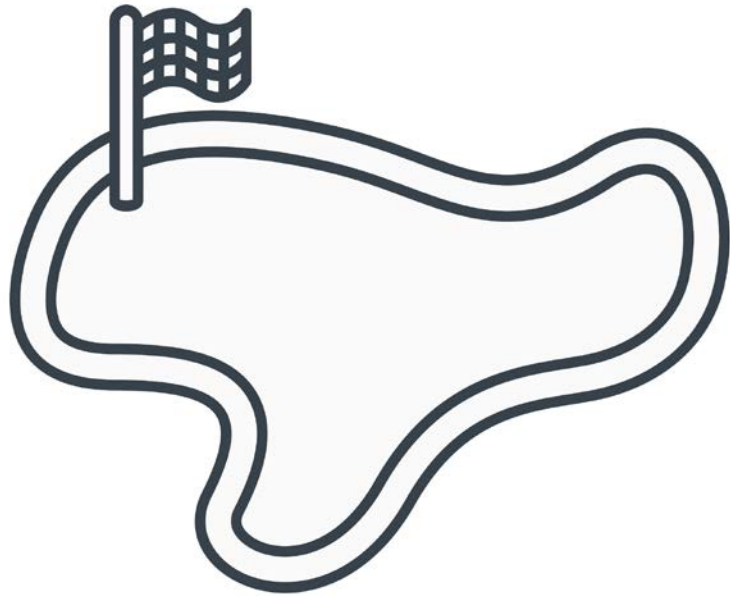
Metastore





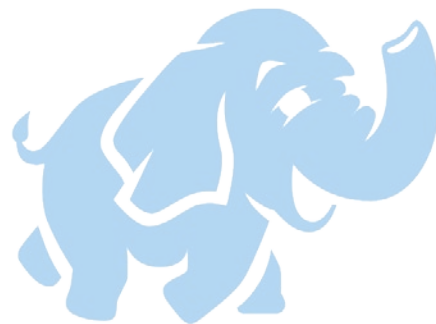
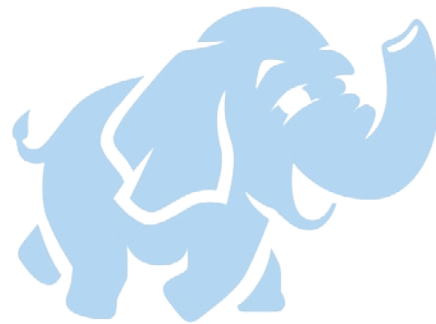
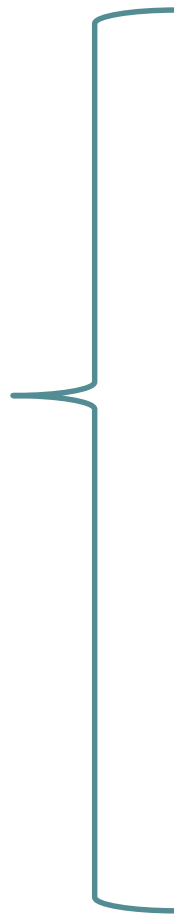


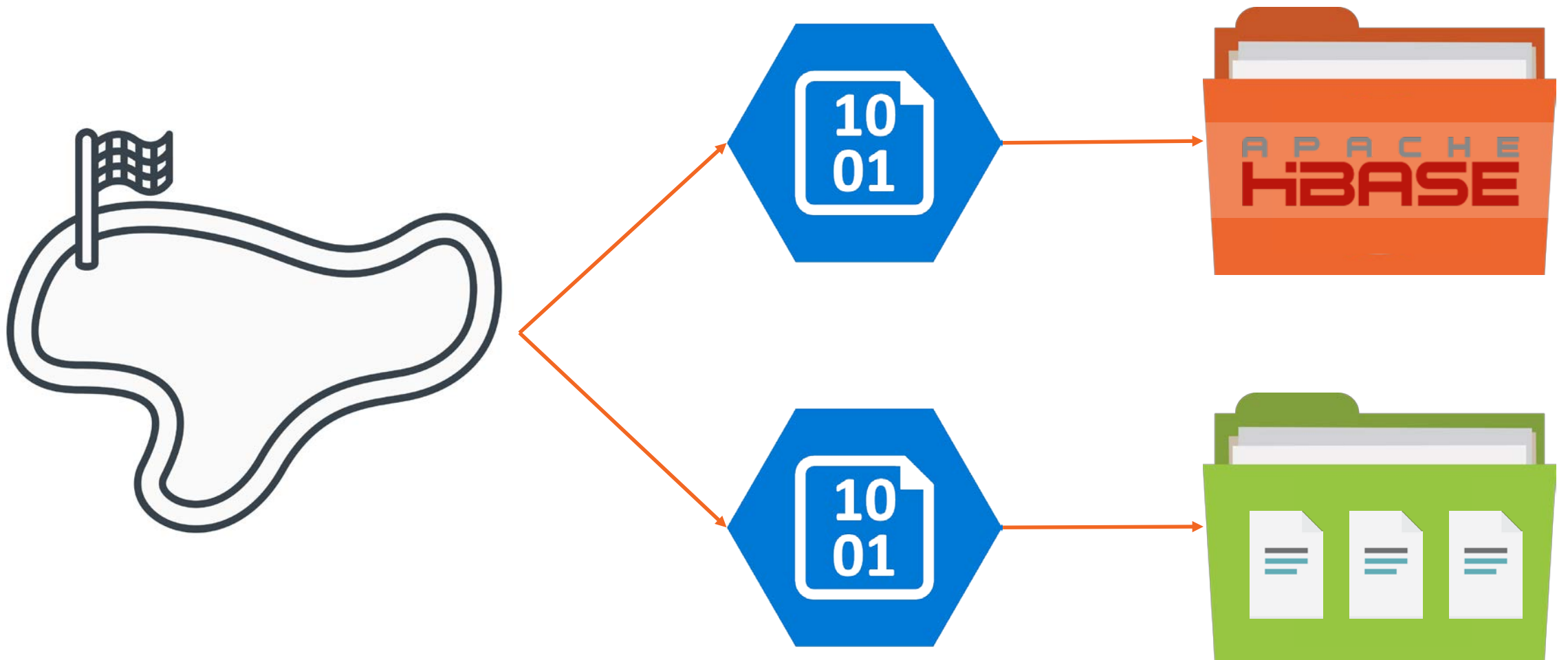


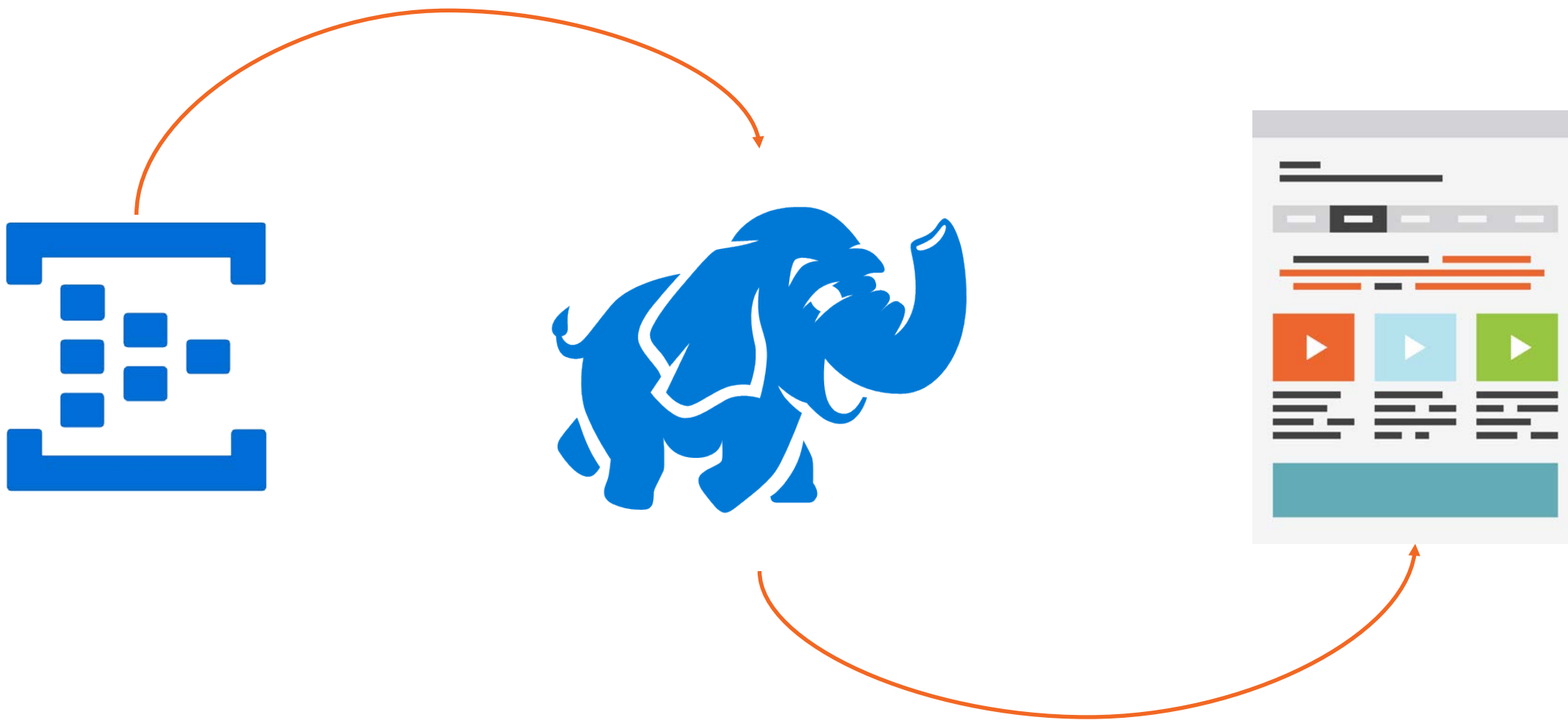


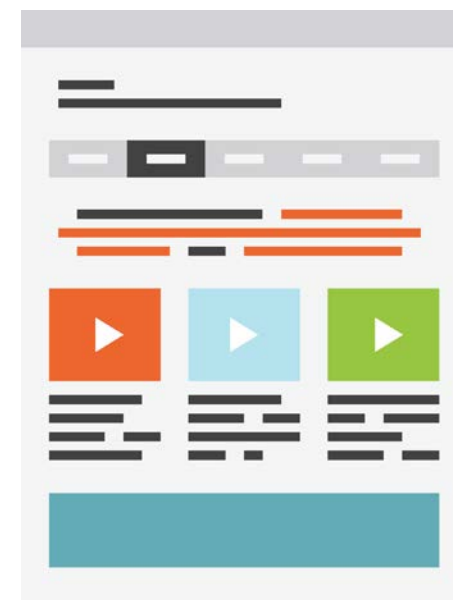
APACHE  
**HIBASE**













08:00

16:00



