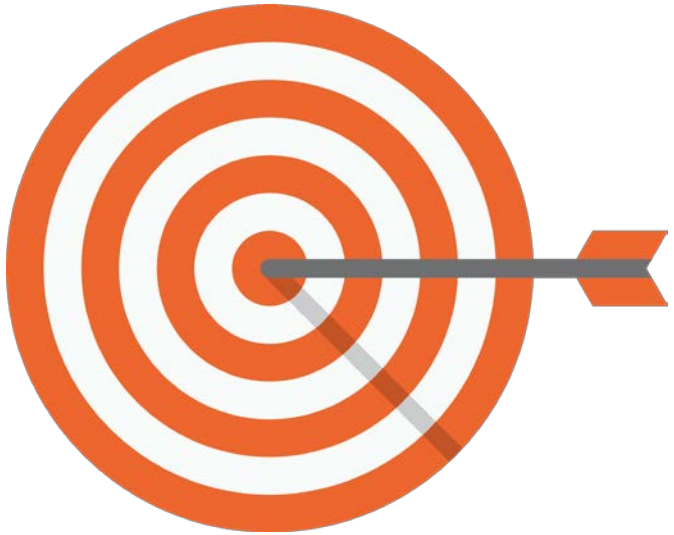
Storm Deep Dive

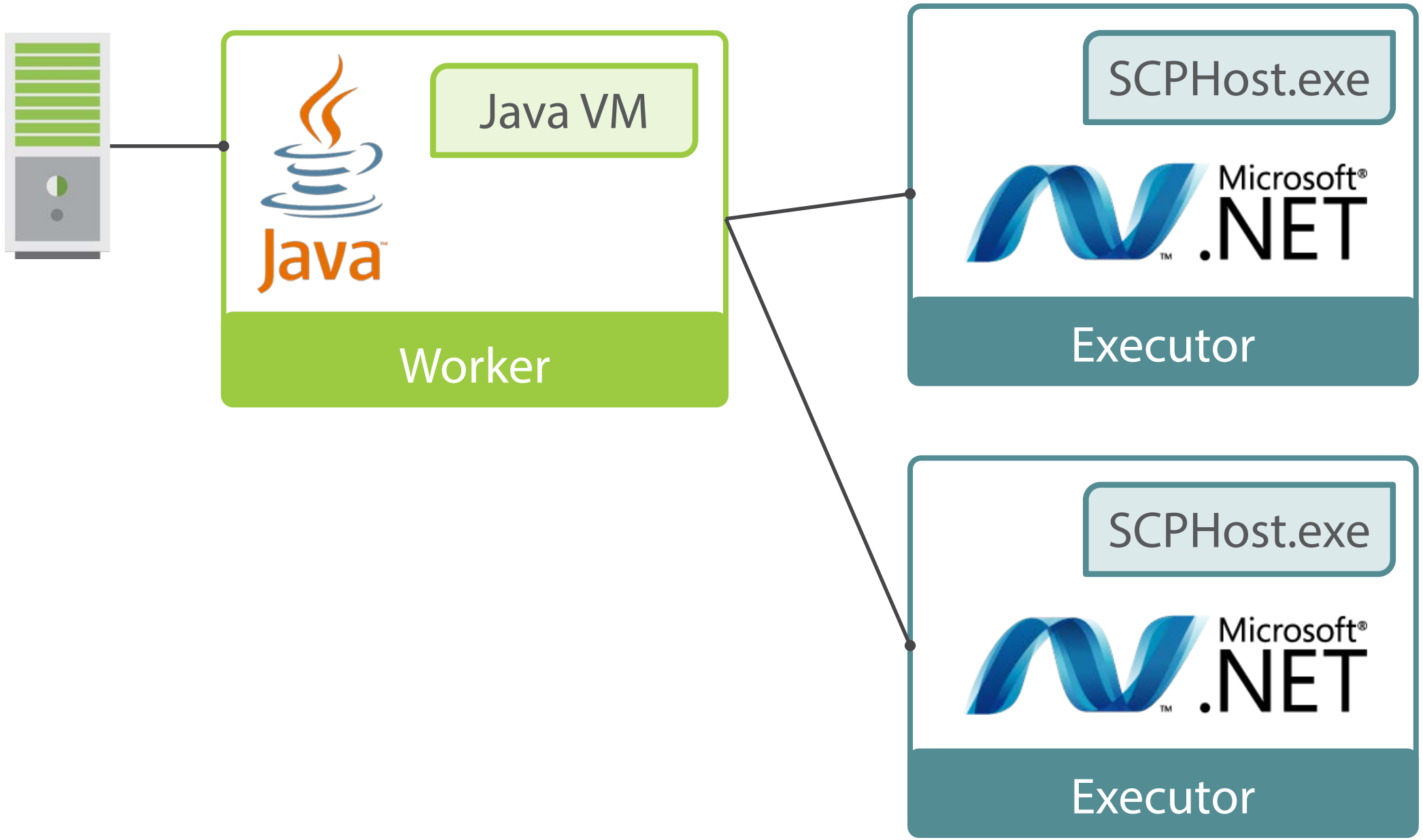
Elton Stoneman

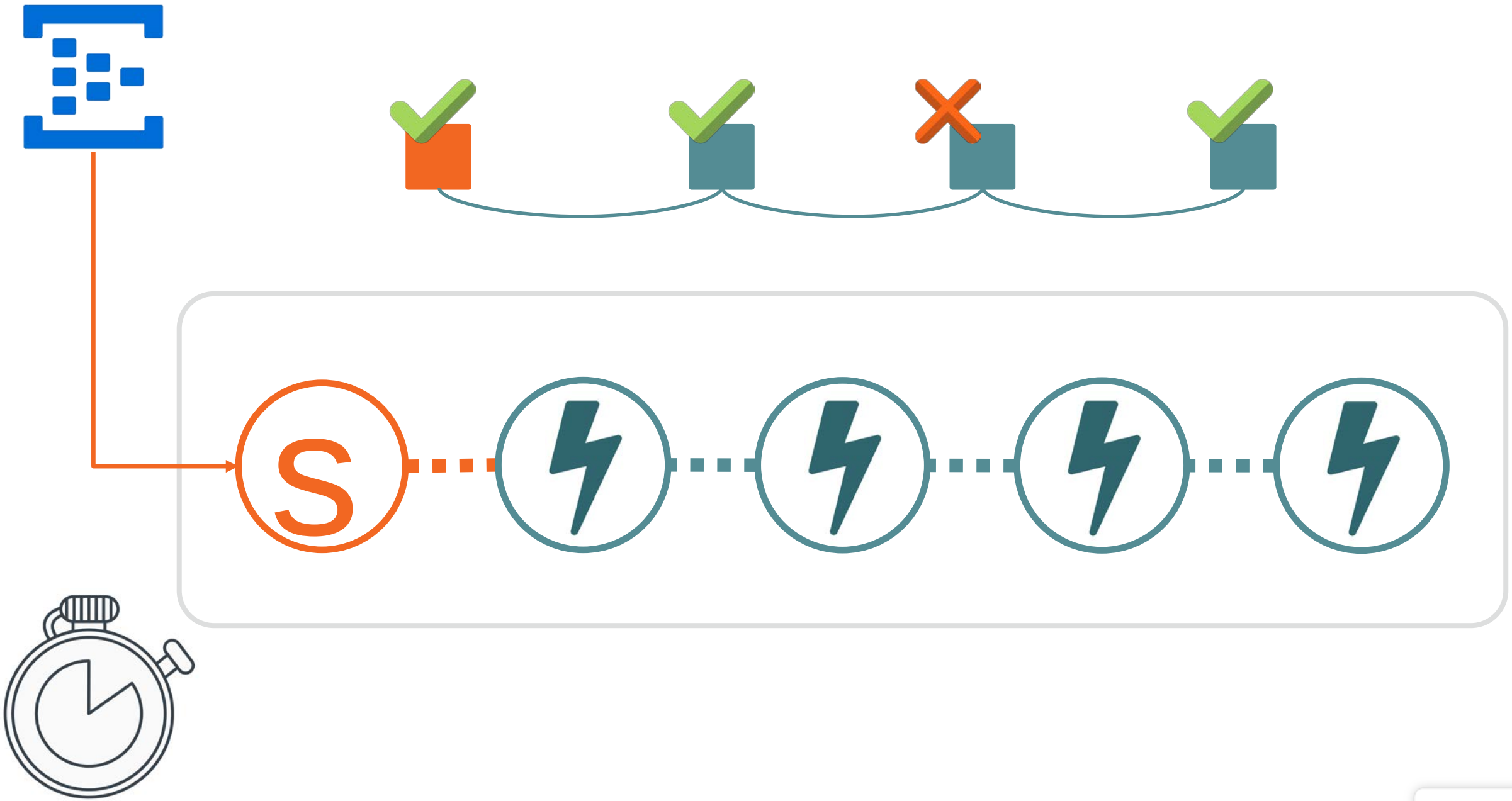
@EltonStoneman | blog.sixeyed.com

Module Goals



- Storm Cluster Architecture
- Runtime Compute Structure
- Performance Tuning
- Guaranteed Processing
- Monitoring & Testing


Java VM
Java
Worker
SCPHost.exe
Microsoft®
.NET
Executor
SCPHost.exe
Microsoft®
.NET
Executor

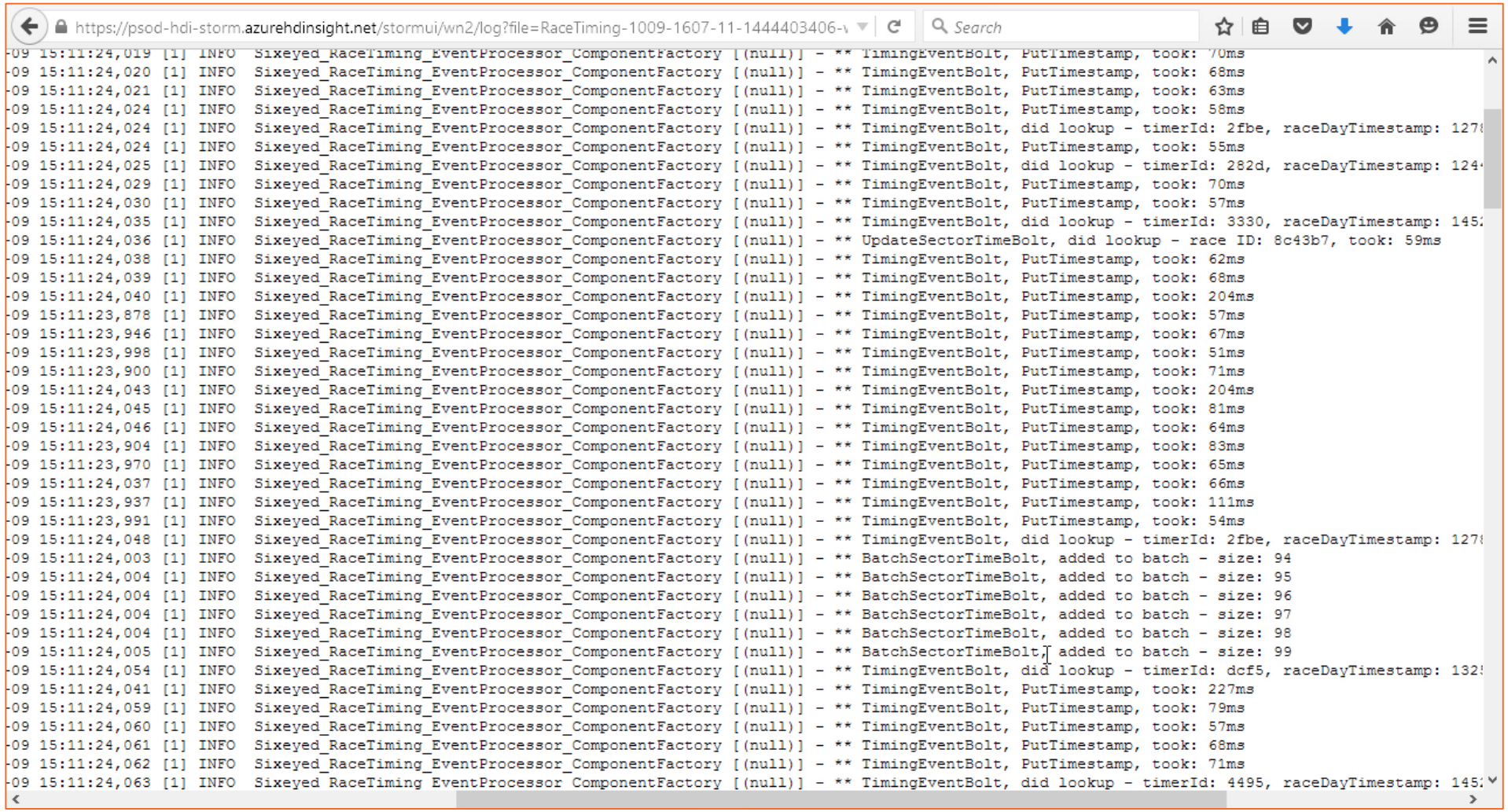

S

Spouts (All time)

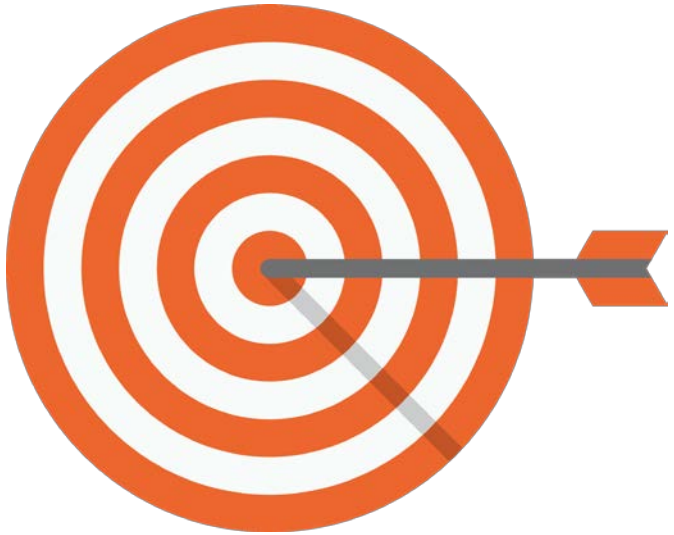
Id	Executors	Tasks	Emitted	Transferred	Complete latency (ms)	Acked	Failed	Error Host	Error Port	Last error
EventHubSpout	16	16	8160	8160	0.000	0	0			

Bolts (All time)

Id	Executors	Tasks	Emitted	Transferred	Capacity (last 10m)	Execute latency (ms)	Executed	Process latency (ms)	Acked	Failed	Error Host	Error Port	Last error
__acker	4	4	0	0	0.001	0.038	1060	0.019	1080	0			
__metricsbacktype.storm.metric.LoggingMetricsConsumer	1	1			0.000	0		0					
BatchSectorTimeBolt	64	64	20	0	0.000	0.000	200	0.000	0	0			
RaceResultBolt	32	32	0	0	0.000	0.000	0	0.000	0	0			
TimingEventBolt	256	256	880	780	0.342	13.705	880	20287.234	340	0			
UpdateSectorTimeBolt	128	128	0	0	0.000	0.000	0	0.000	0	0			



Module Goals



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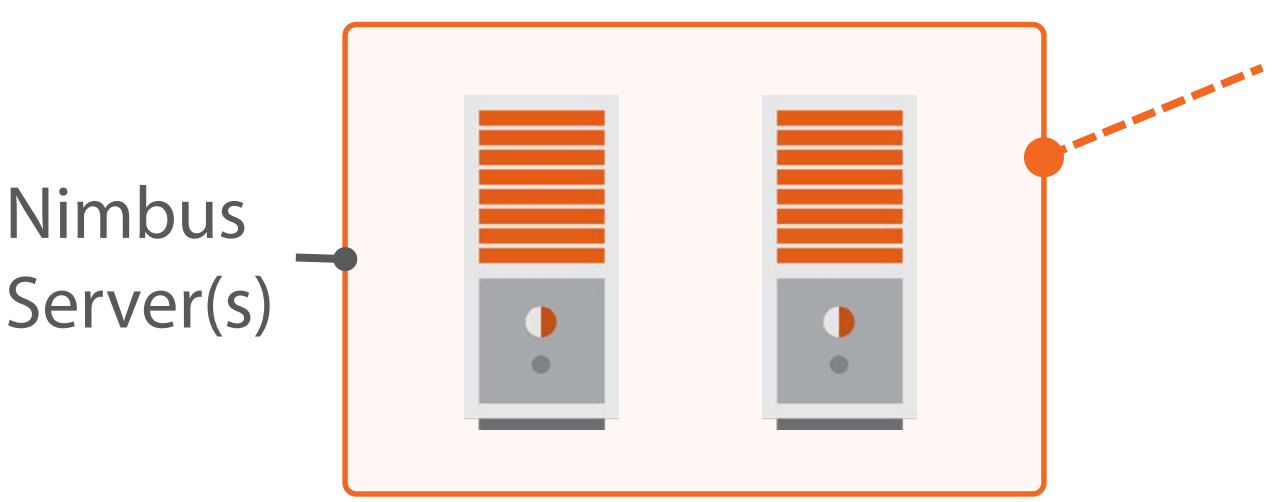
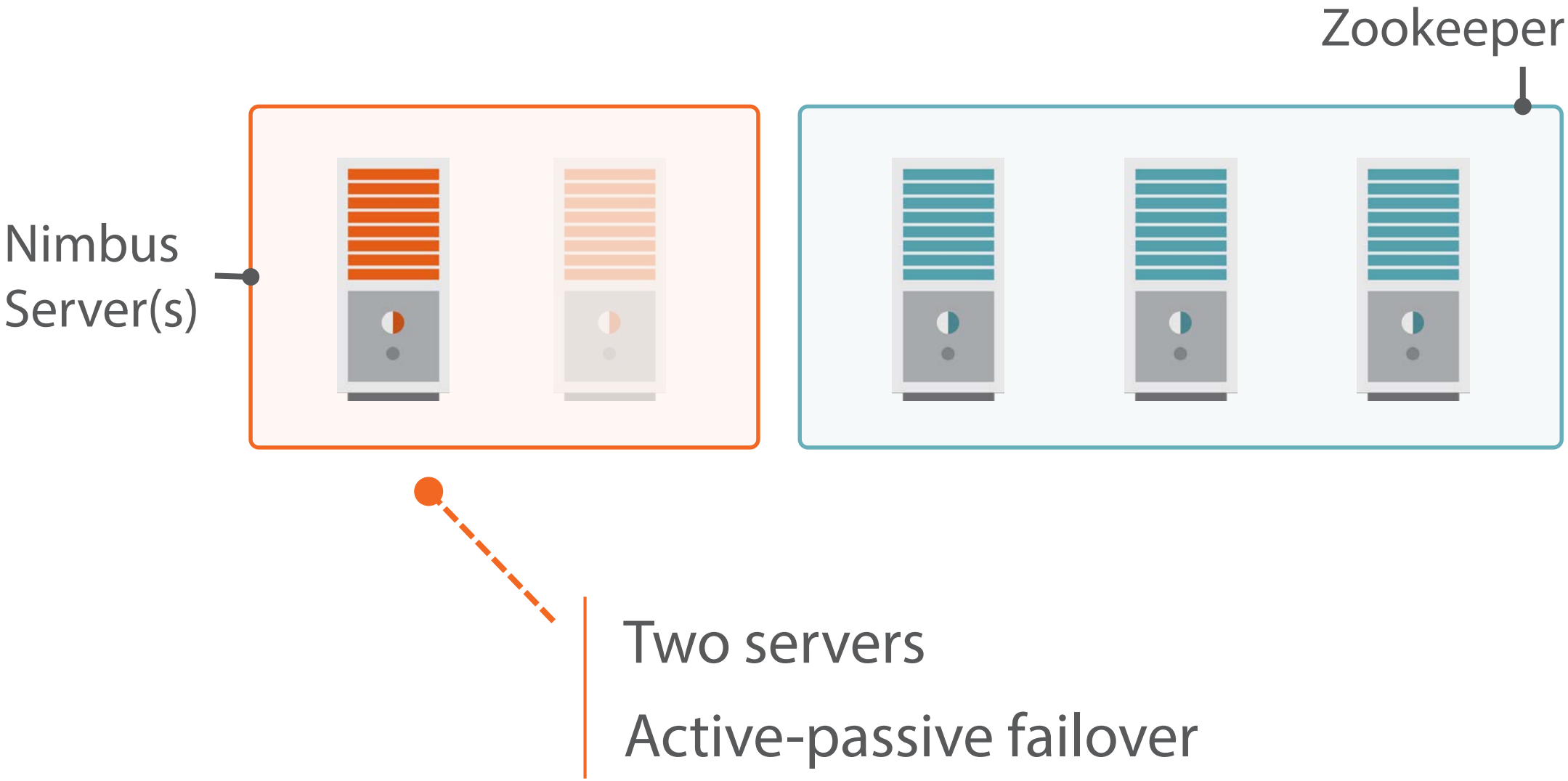
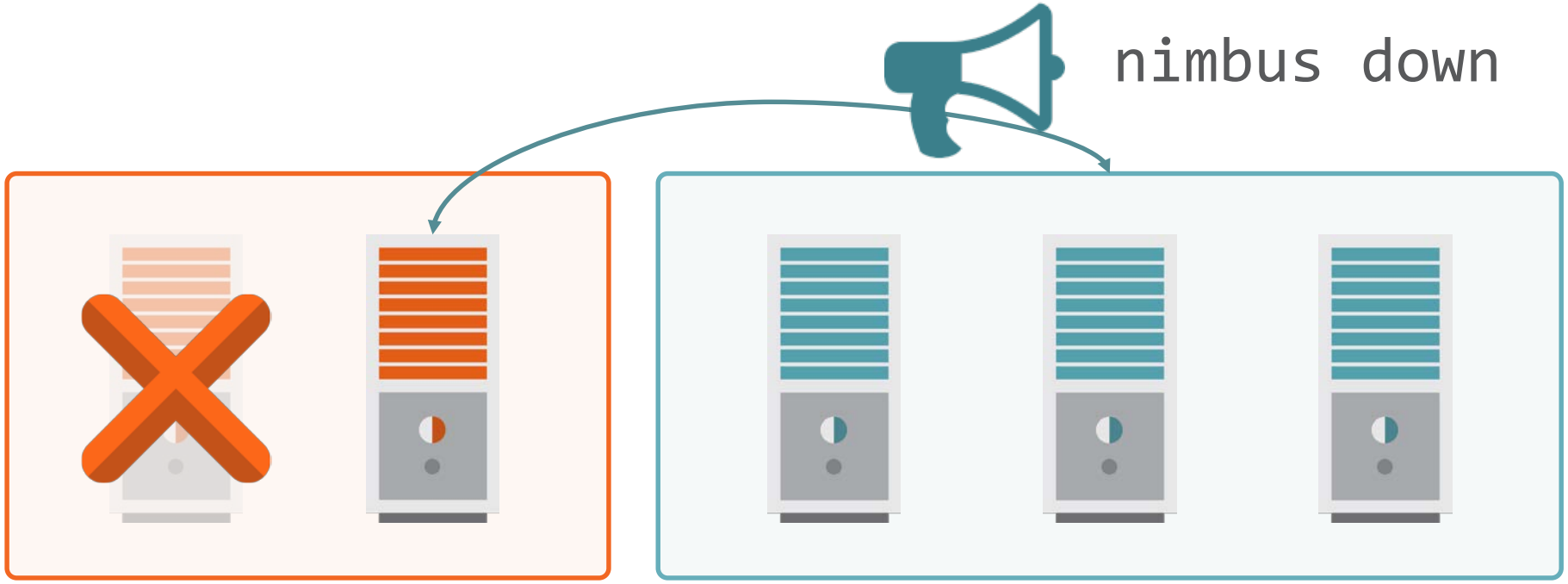


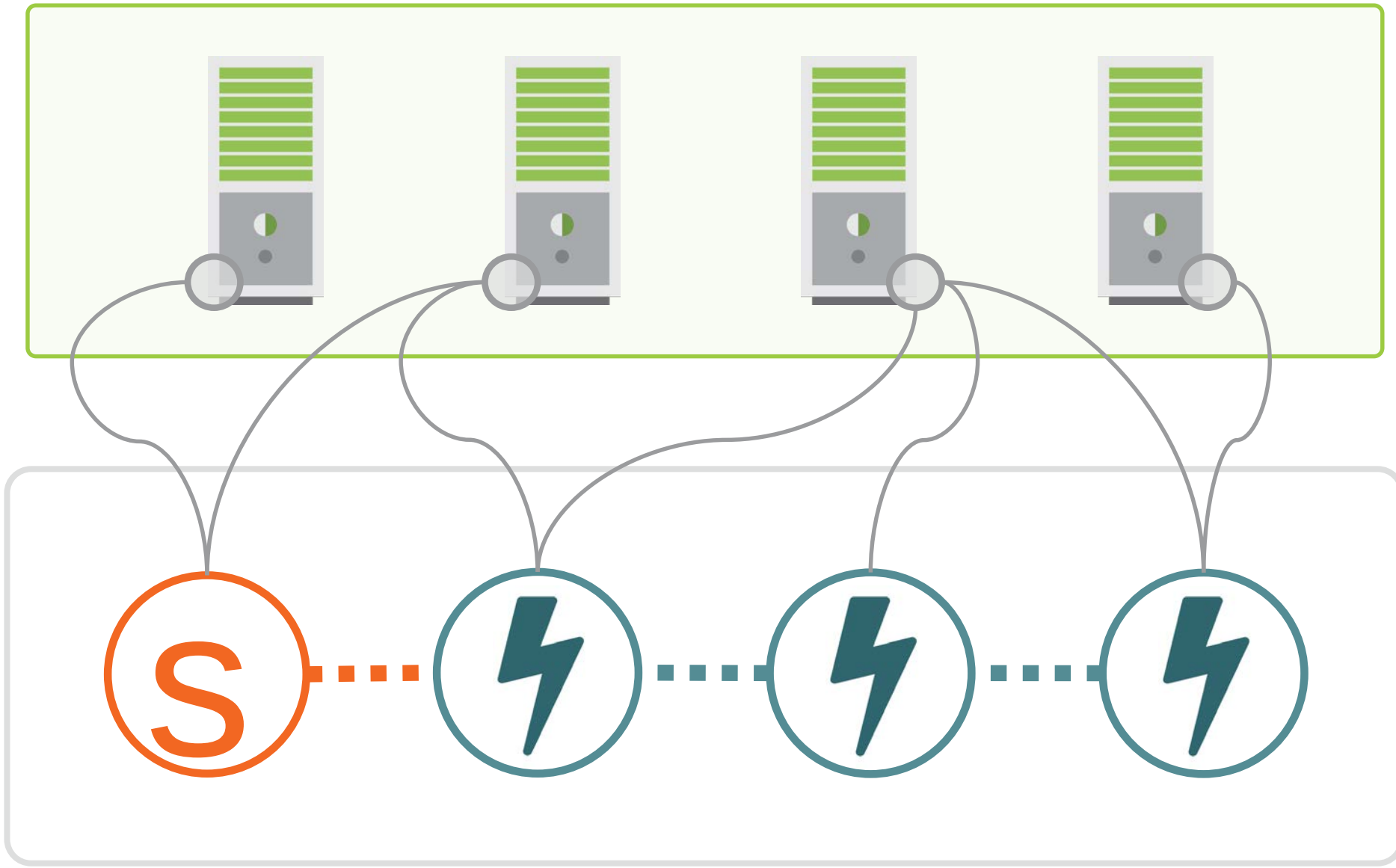
Component creation

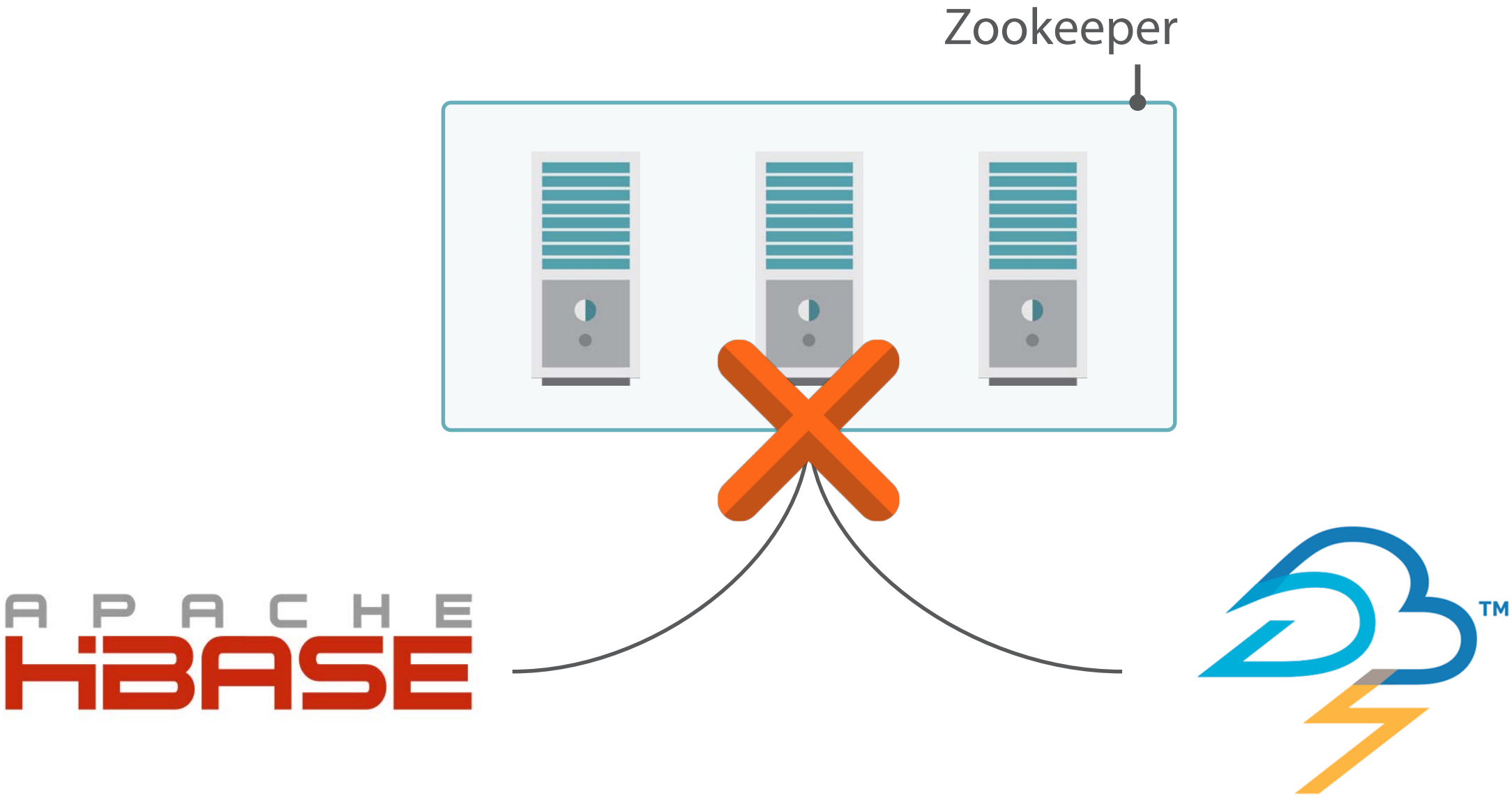
Component **monitoring**

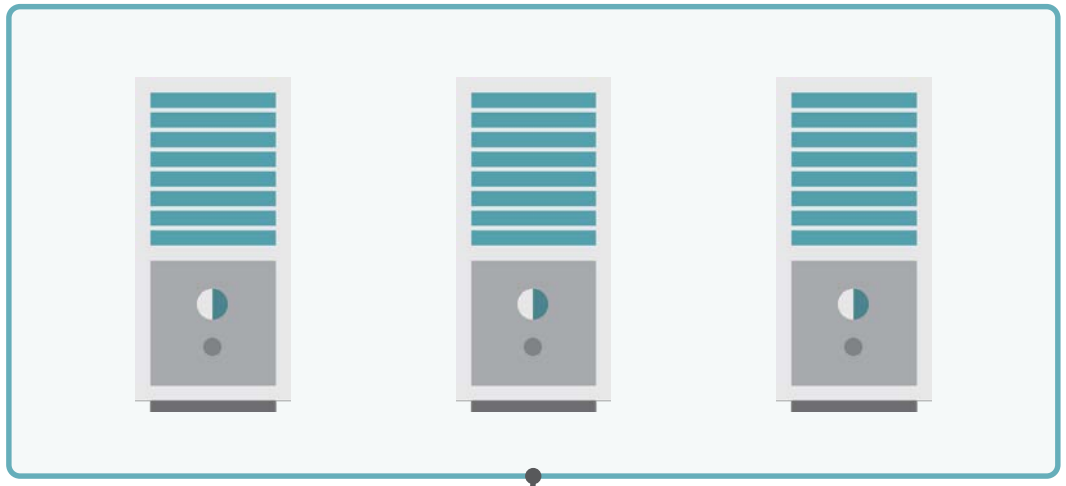
Work distribution

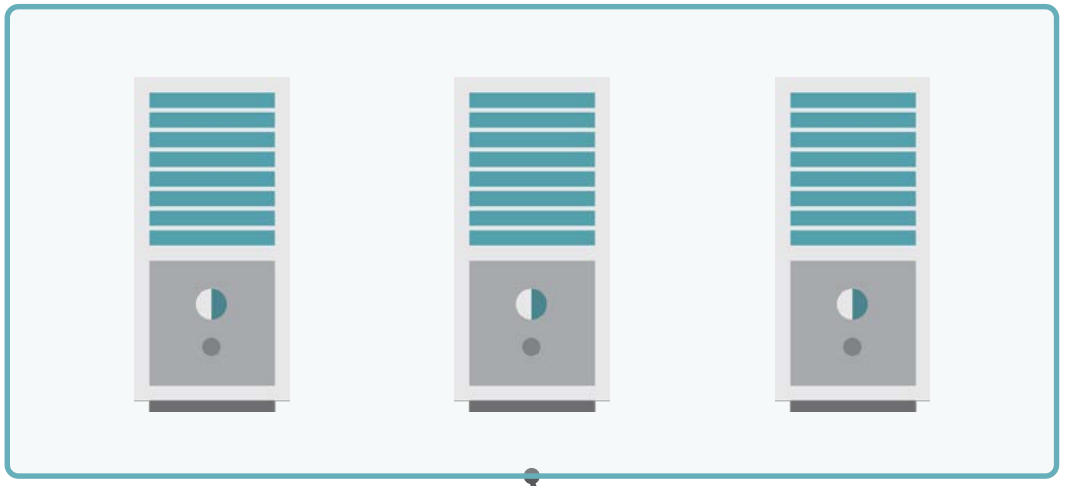




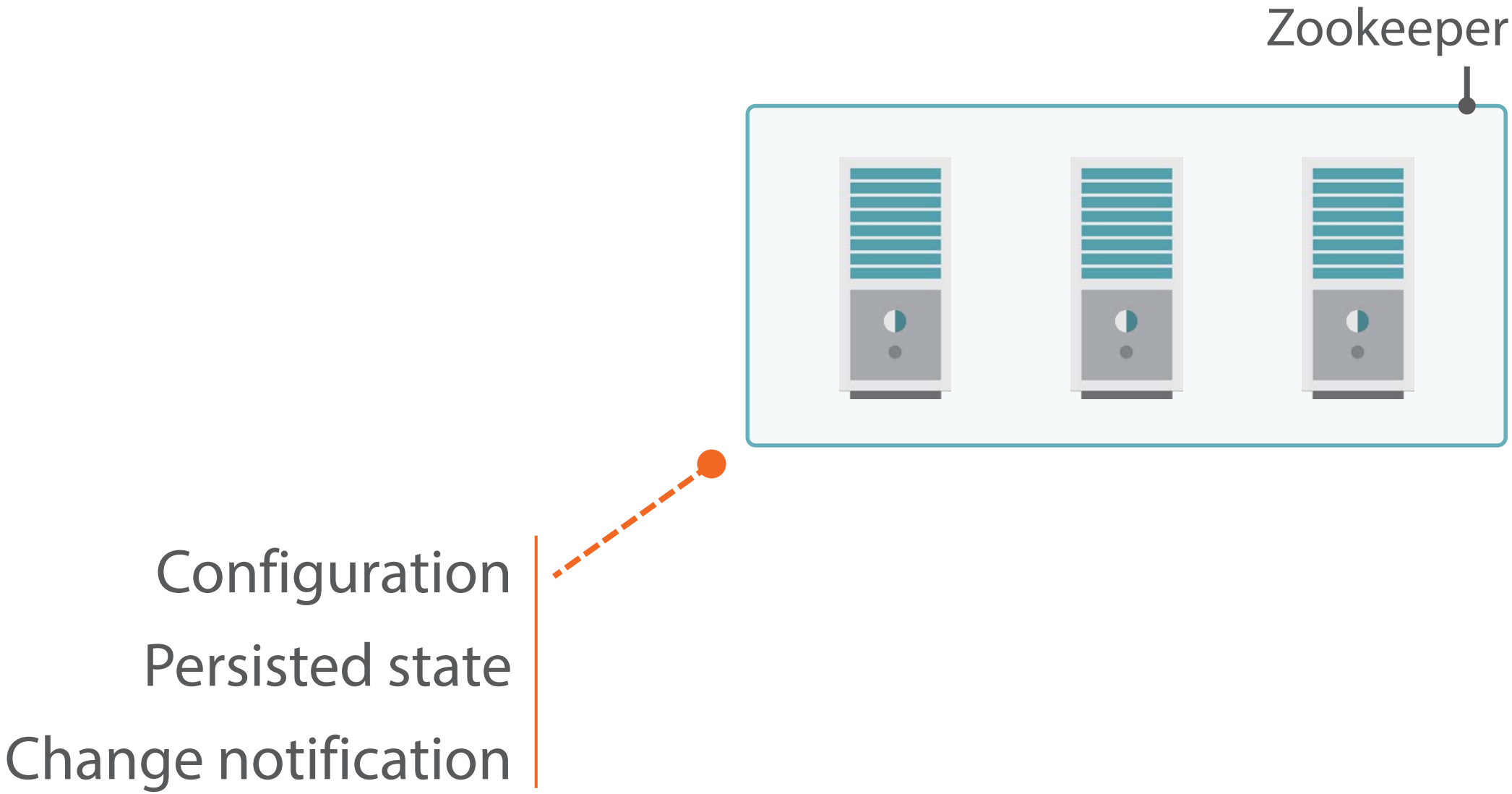








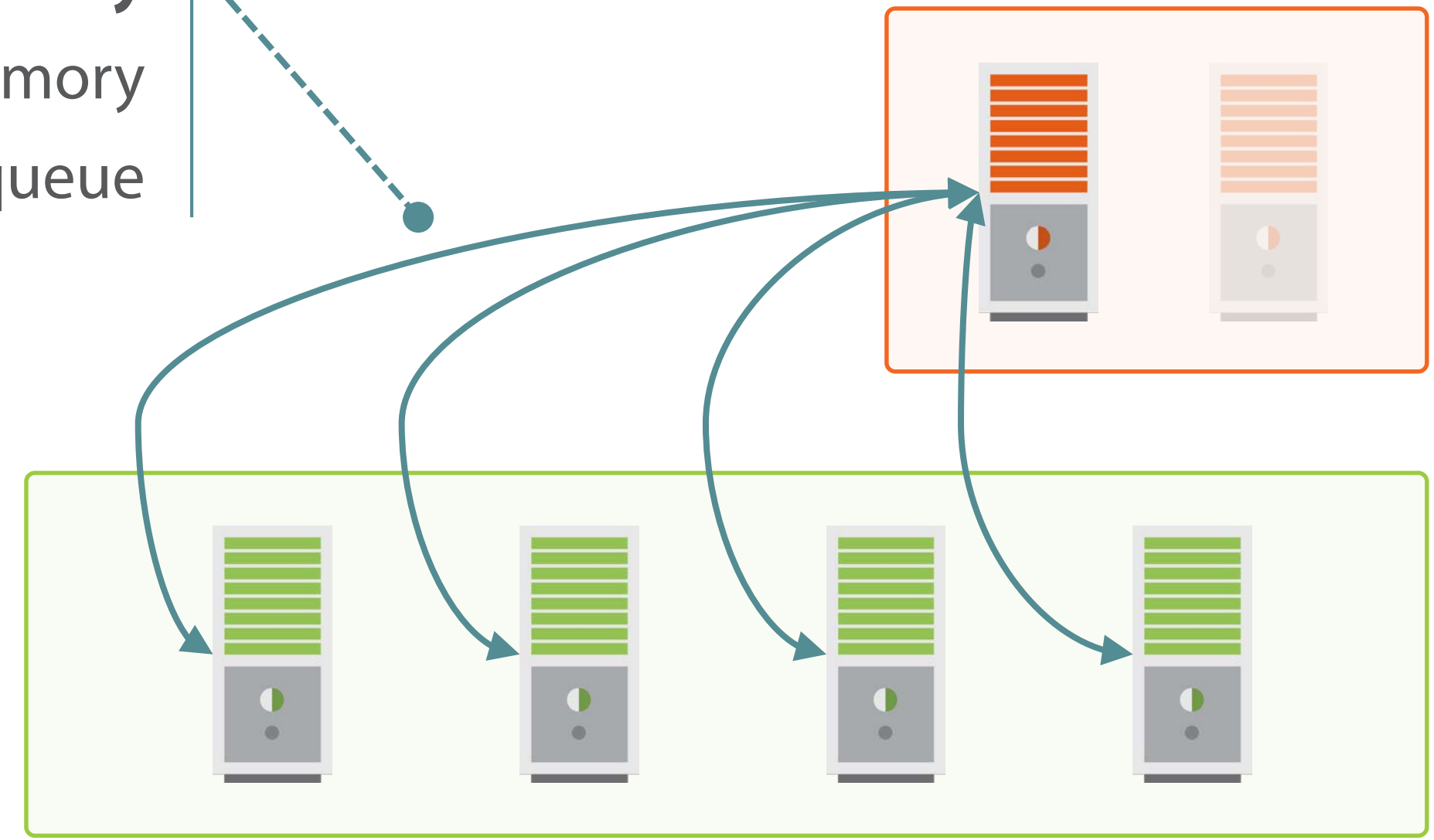
APACHE HBASE



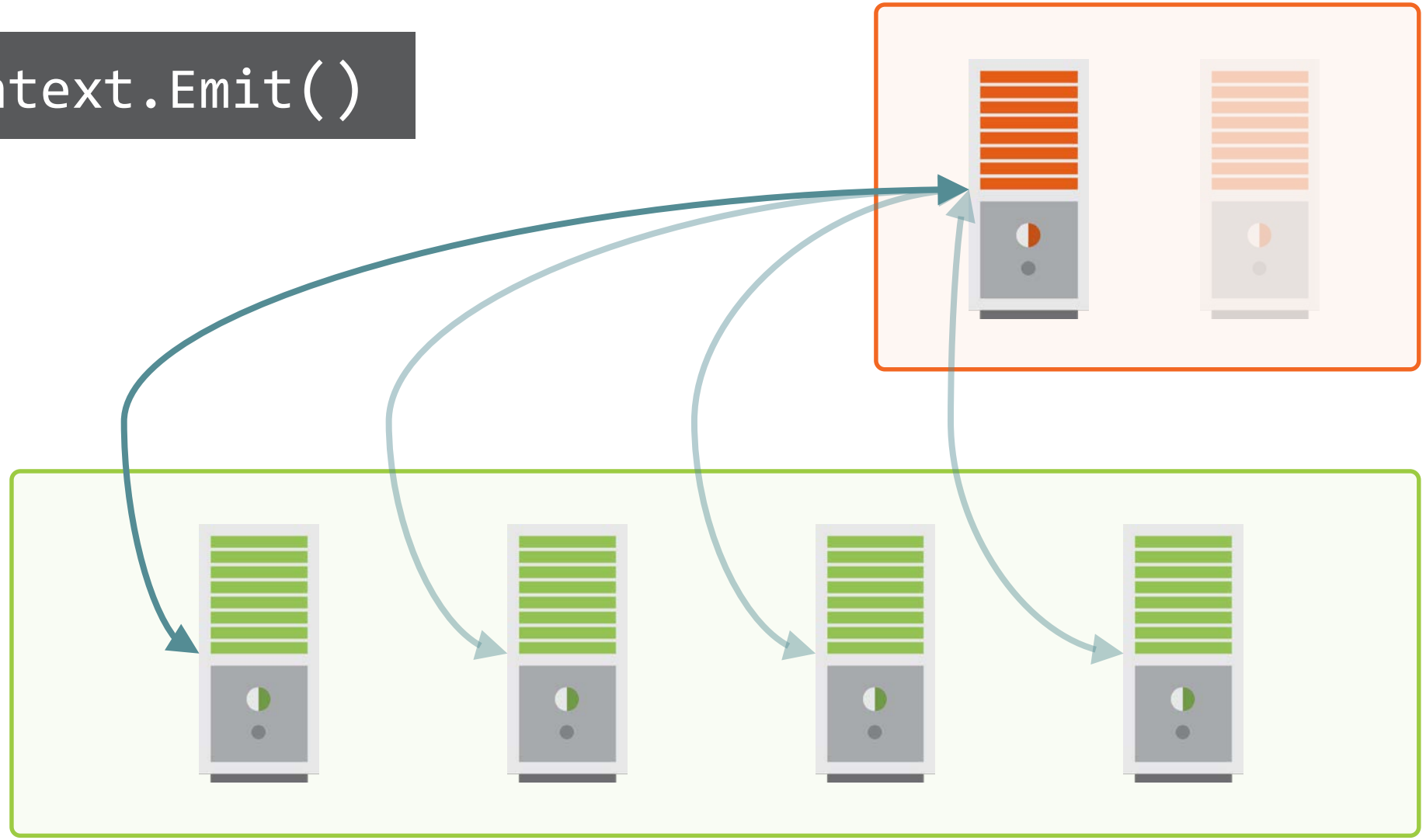
Netty

In-memory

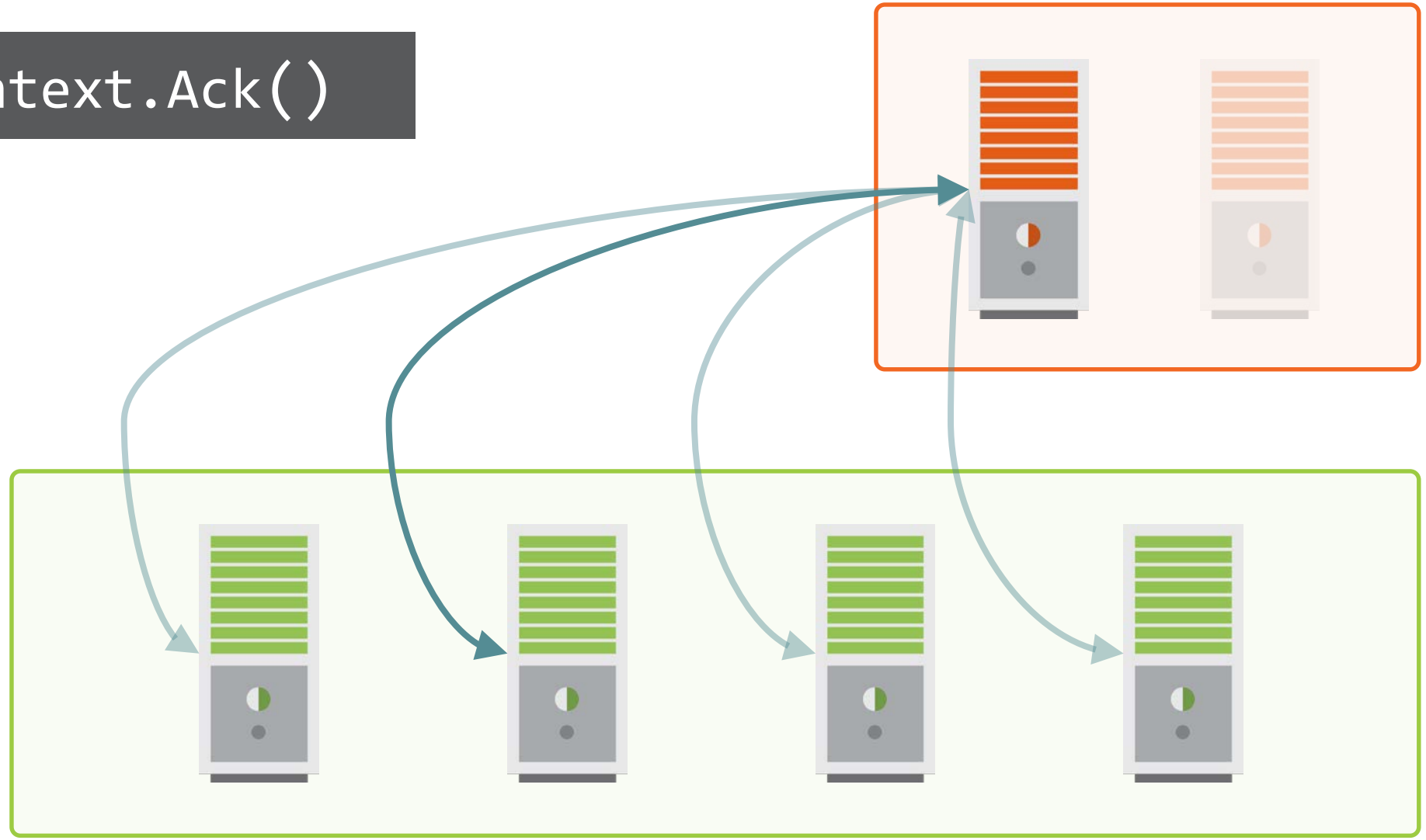
Message queue



```
_context.Emit()
```

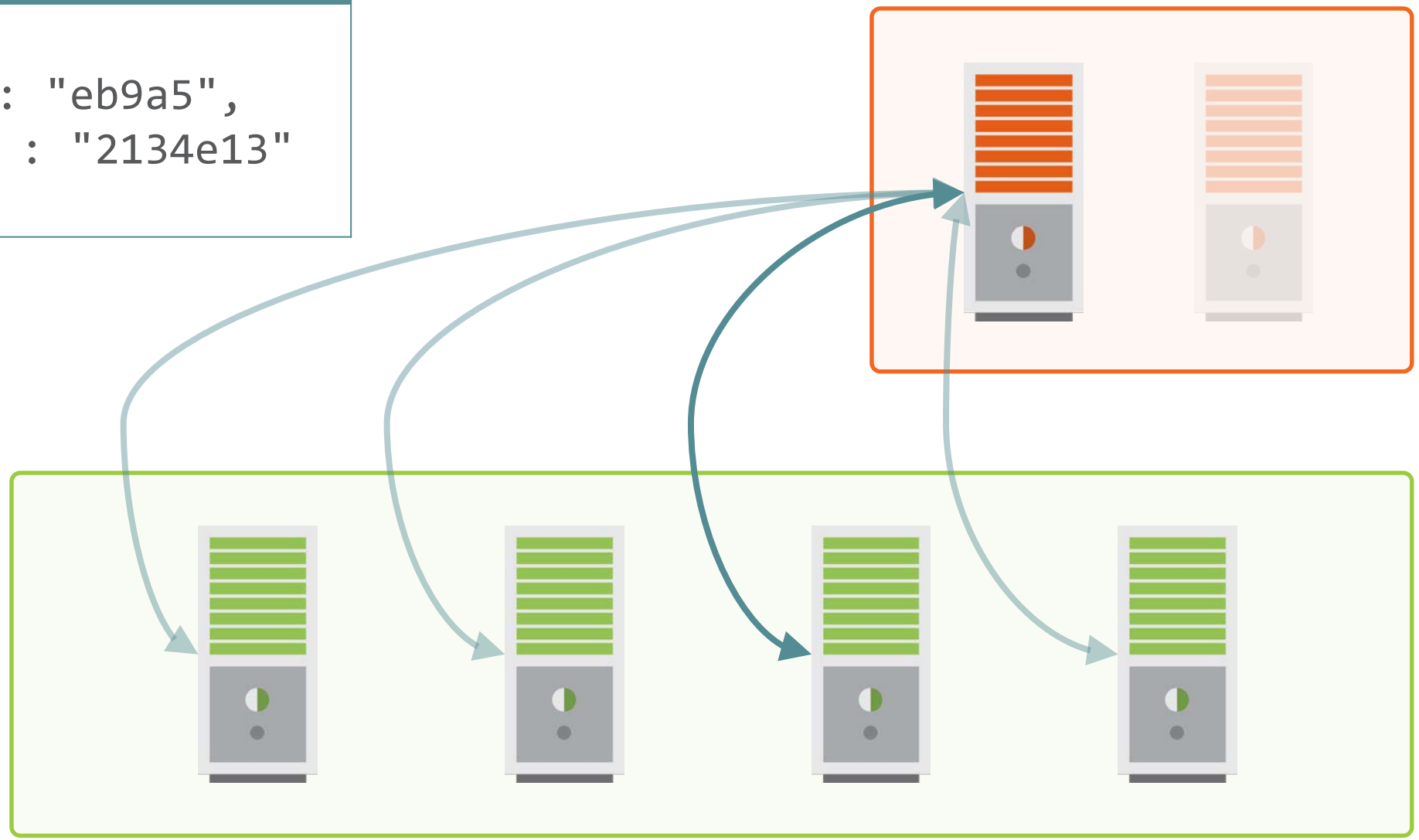


```
_context.Ack()
```



Tuple

```
{
  "raceId" : "eb9a5",
  "racerId" : "2134e13"
}
```



Tuple

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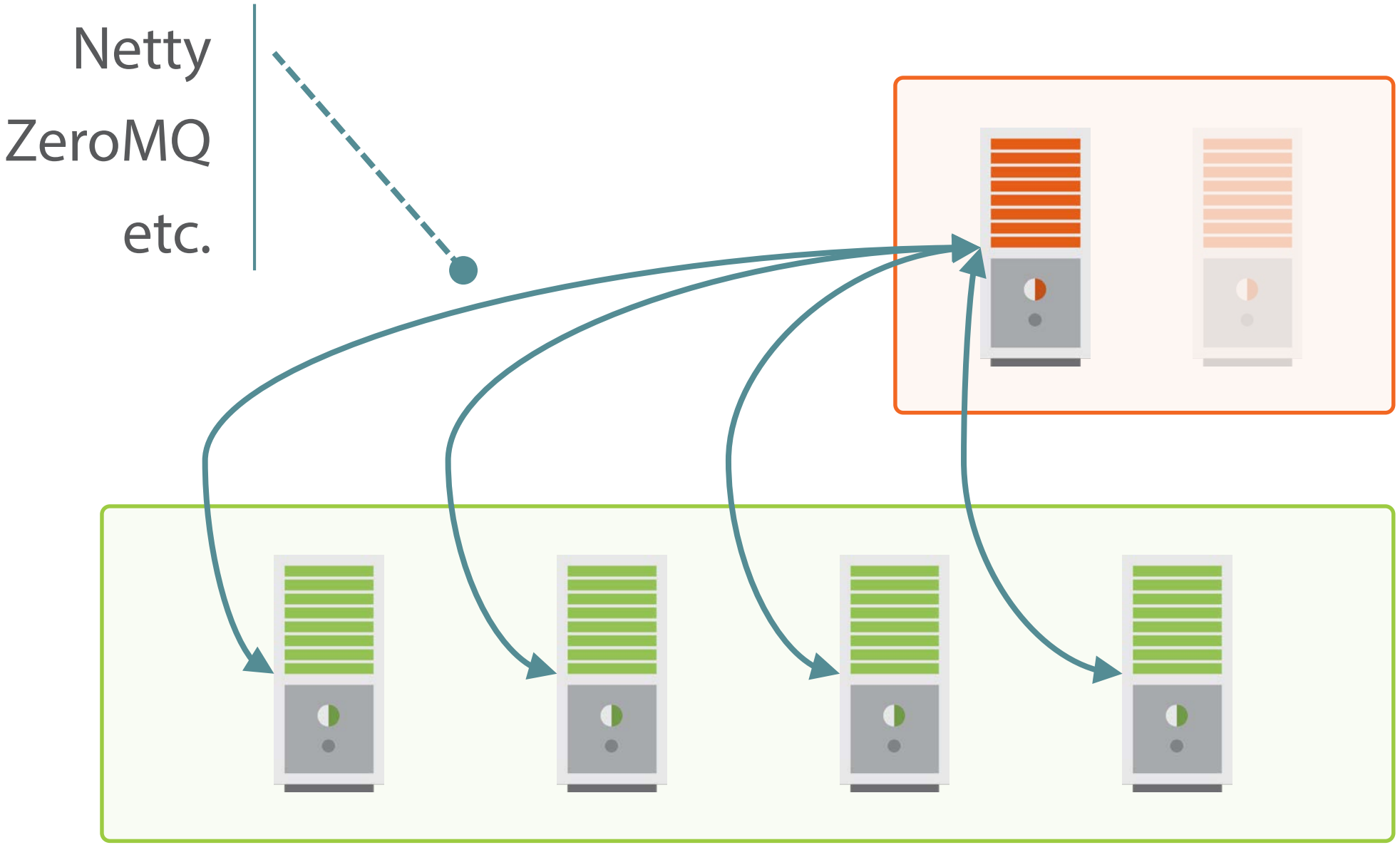
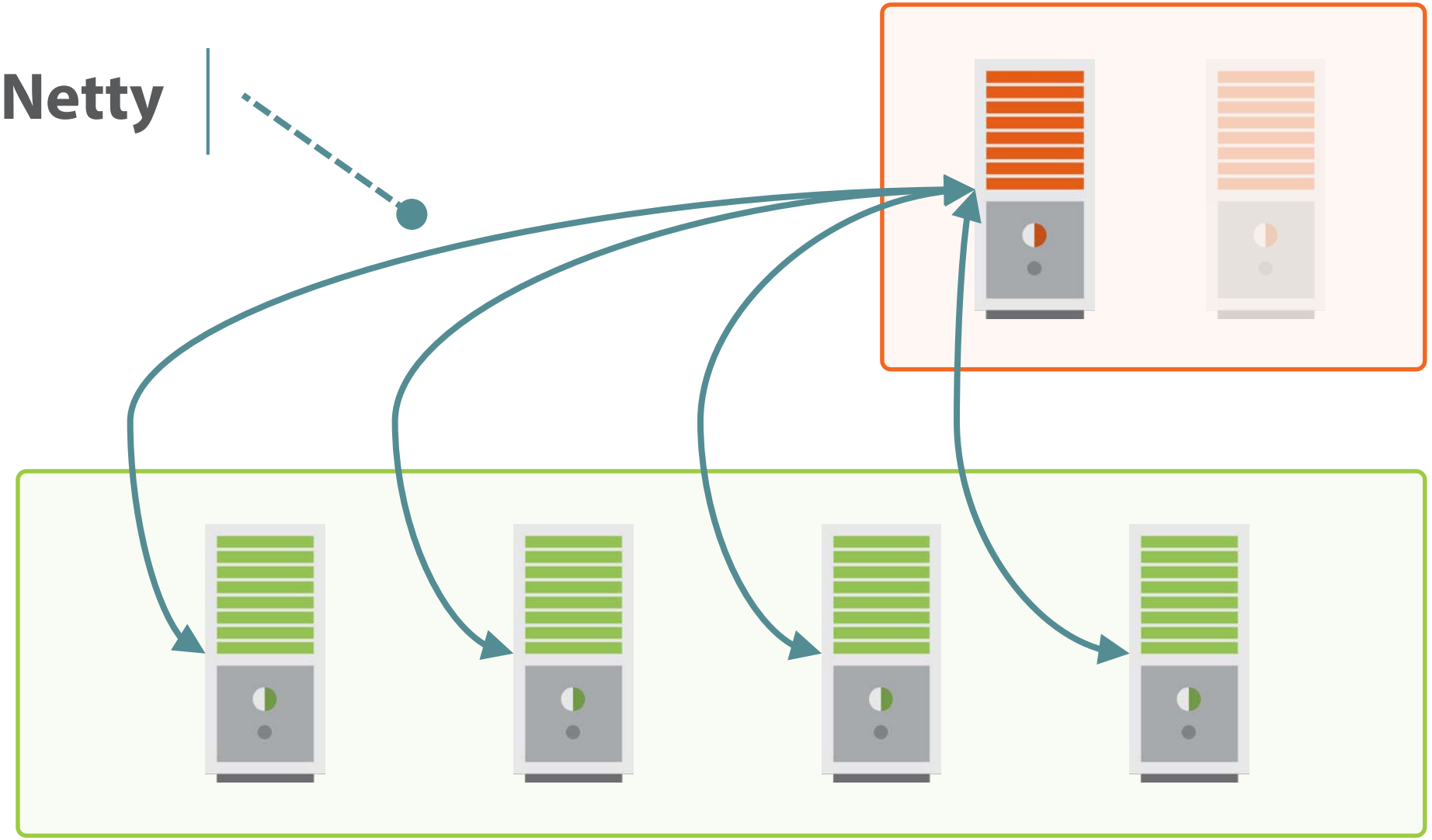


Usually **Netty**



.NET Message Queue Fundamentals

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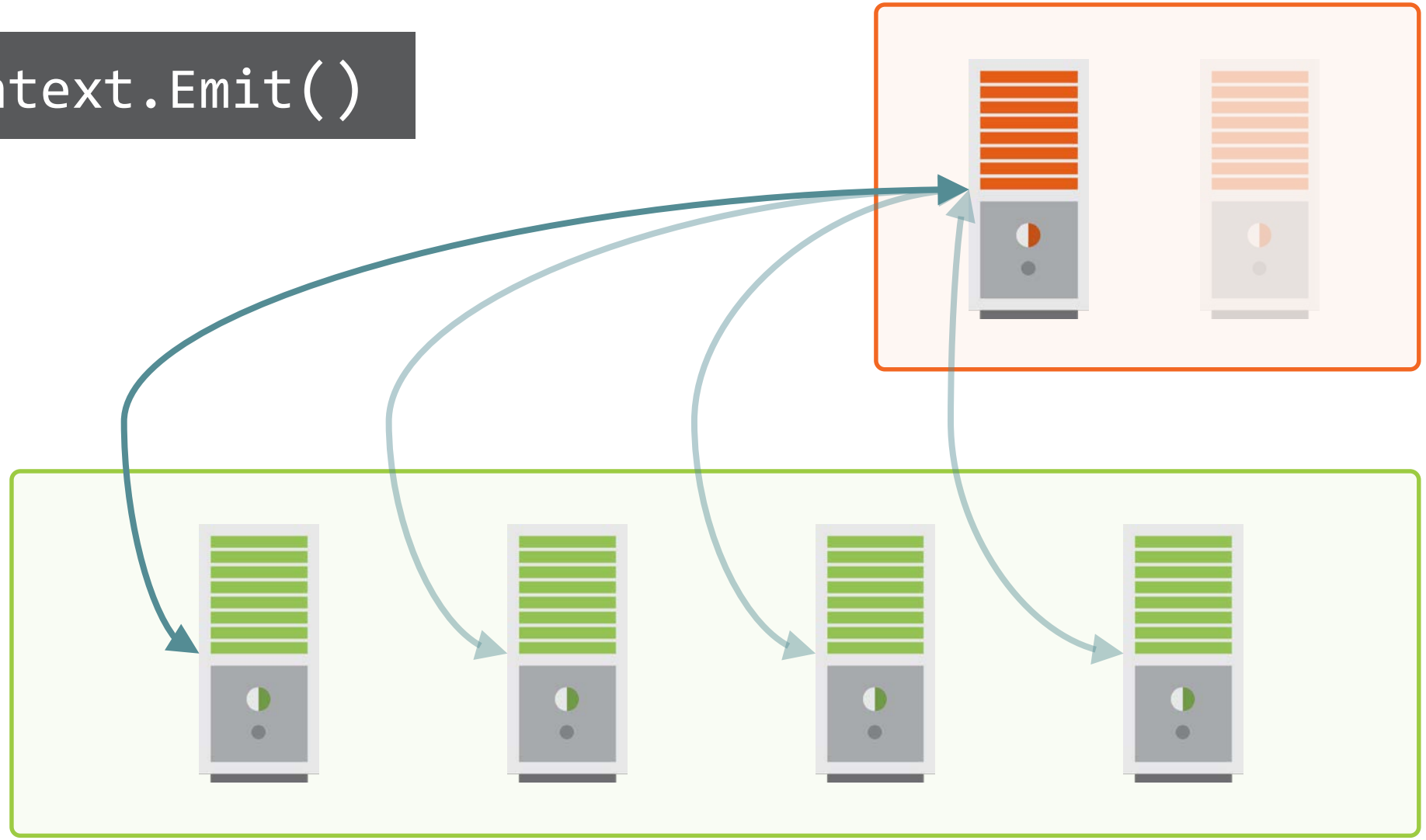
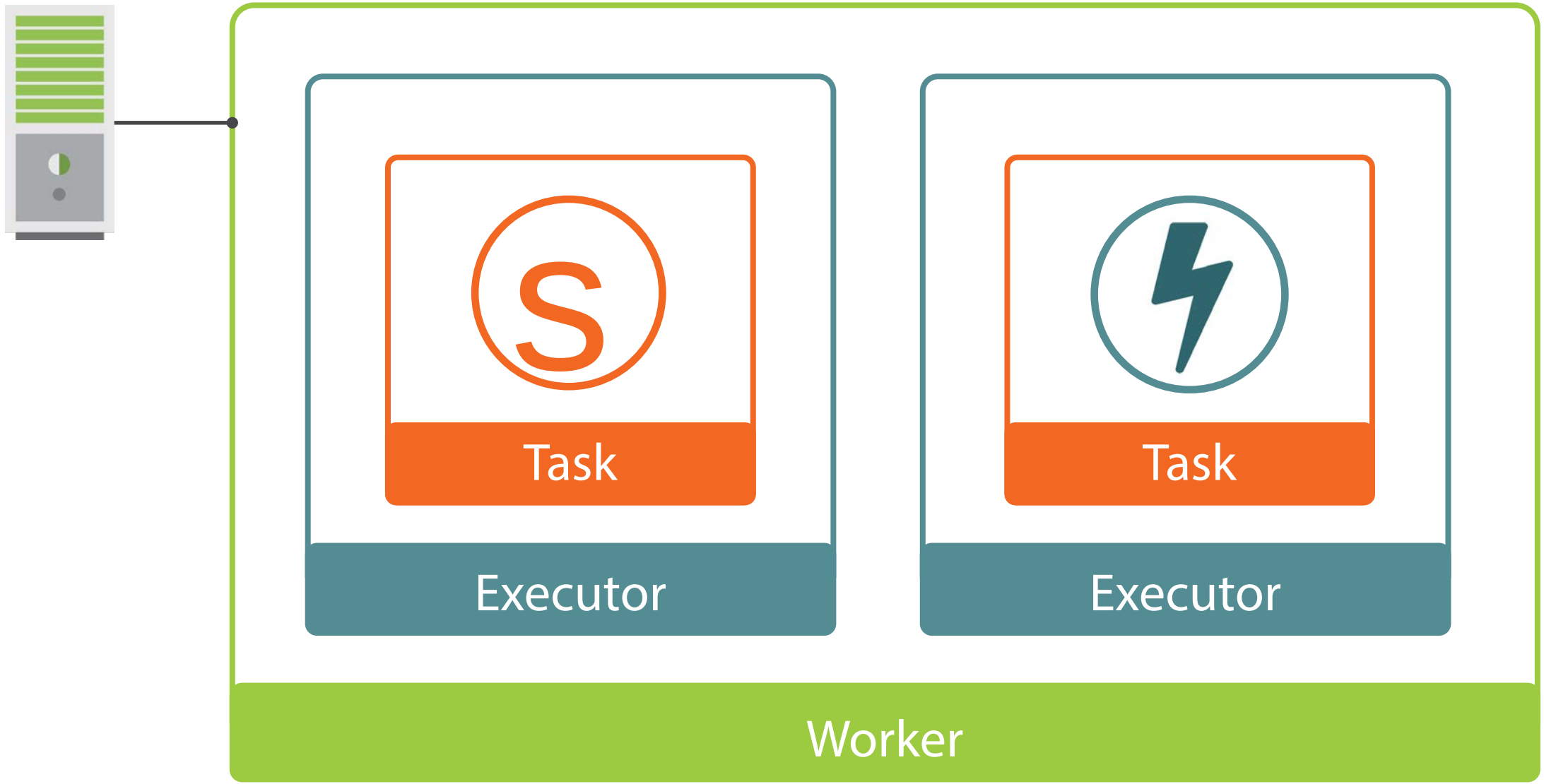
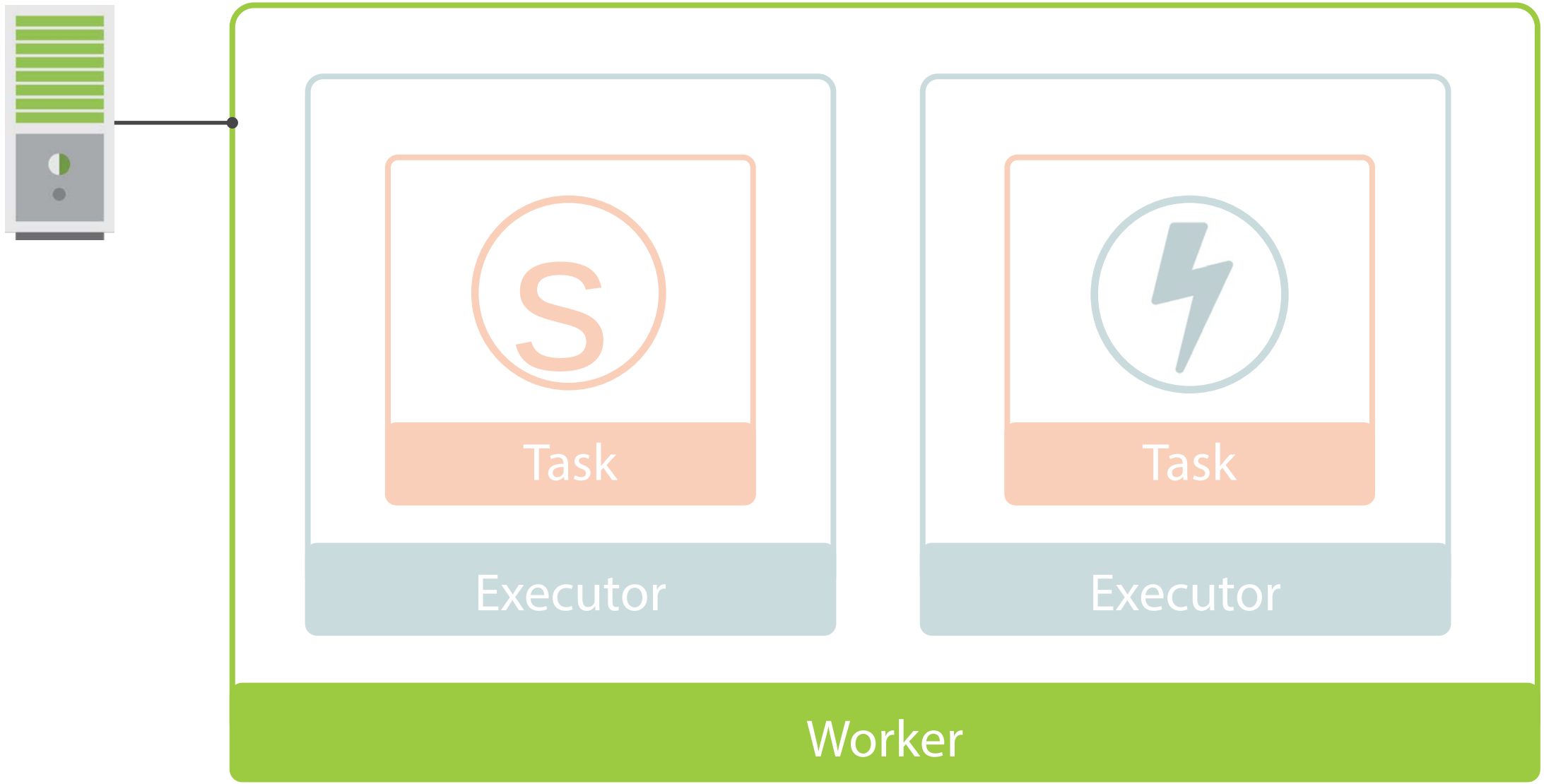
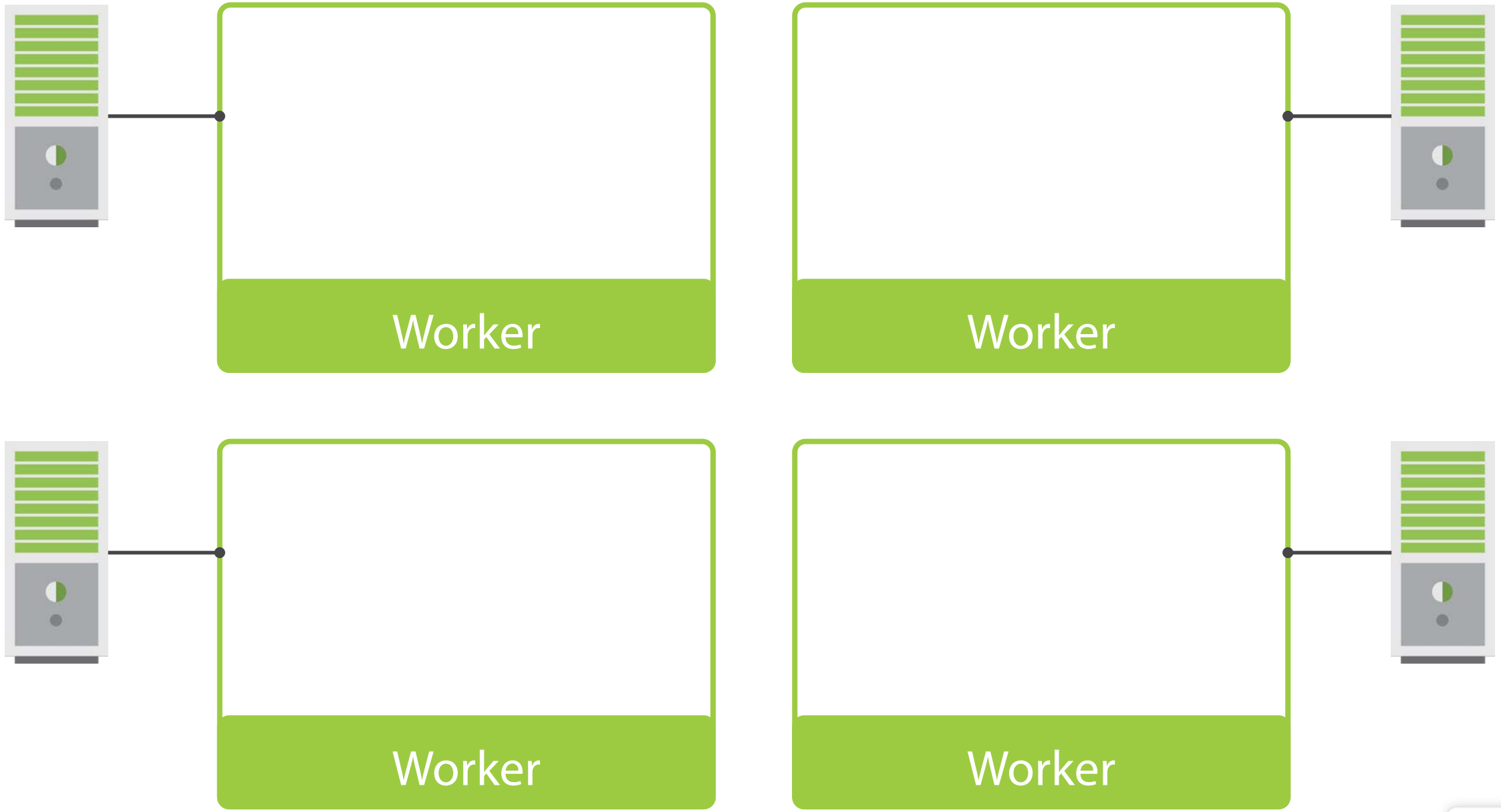
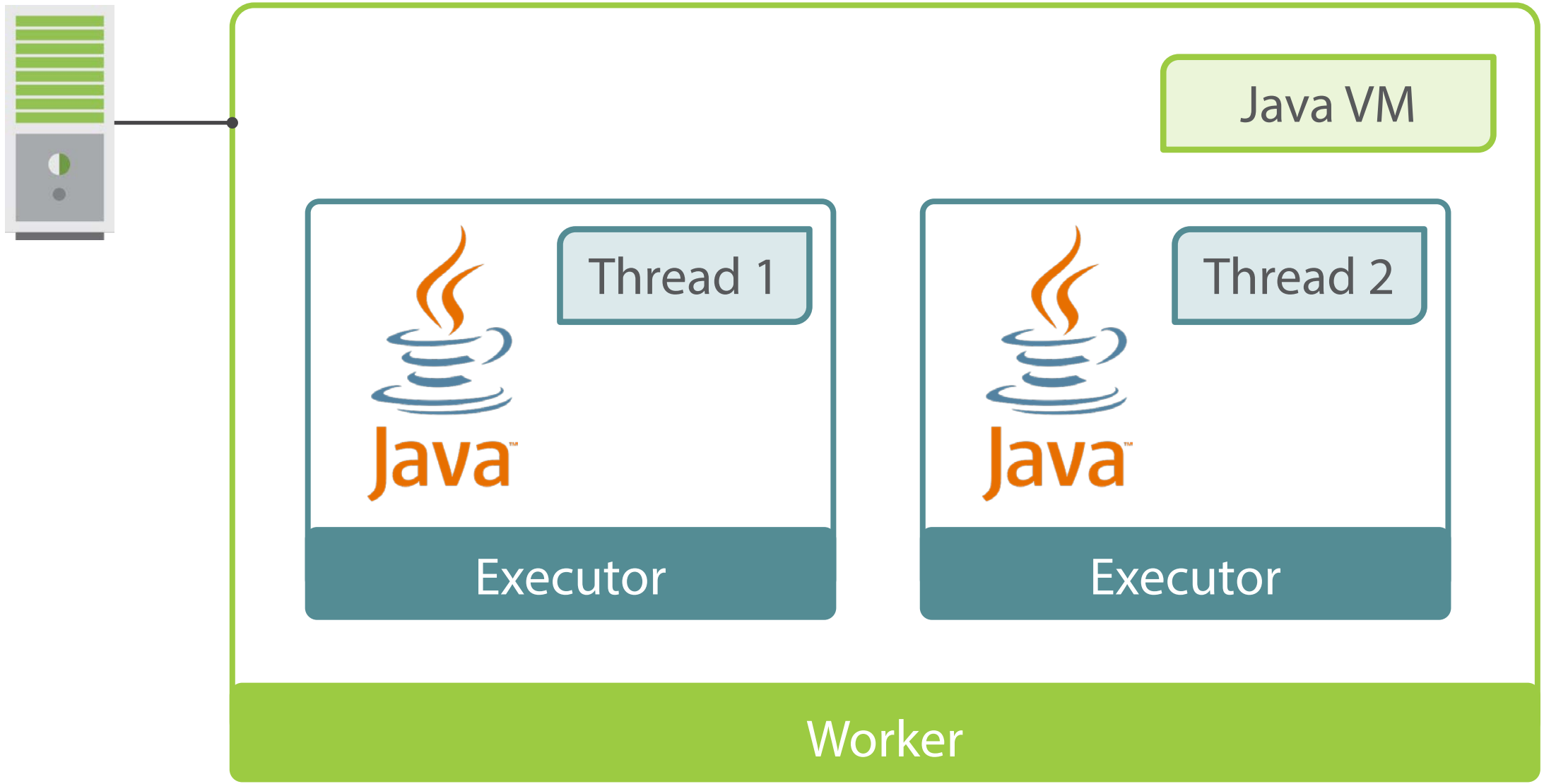
```
_context.Emit()
```

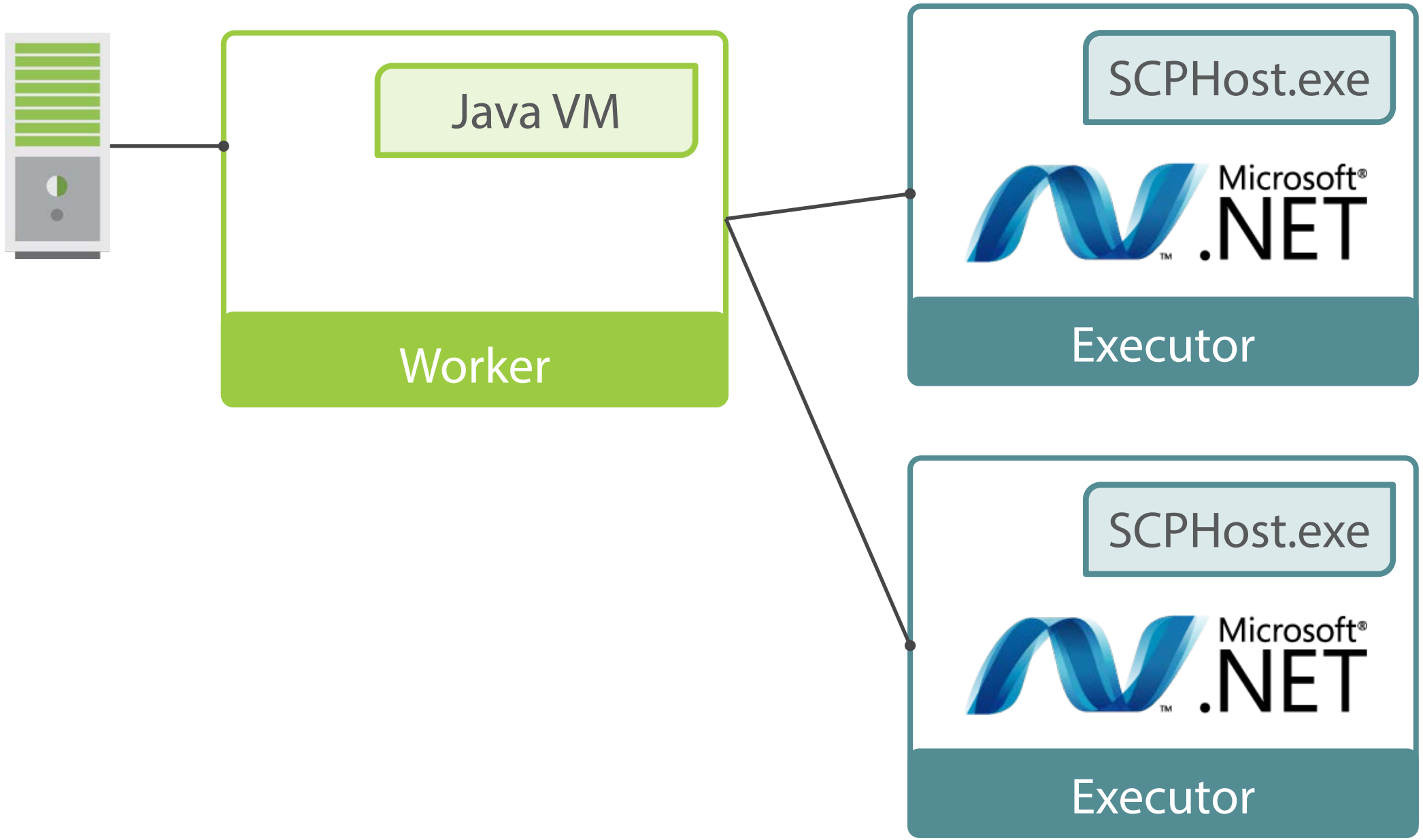


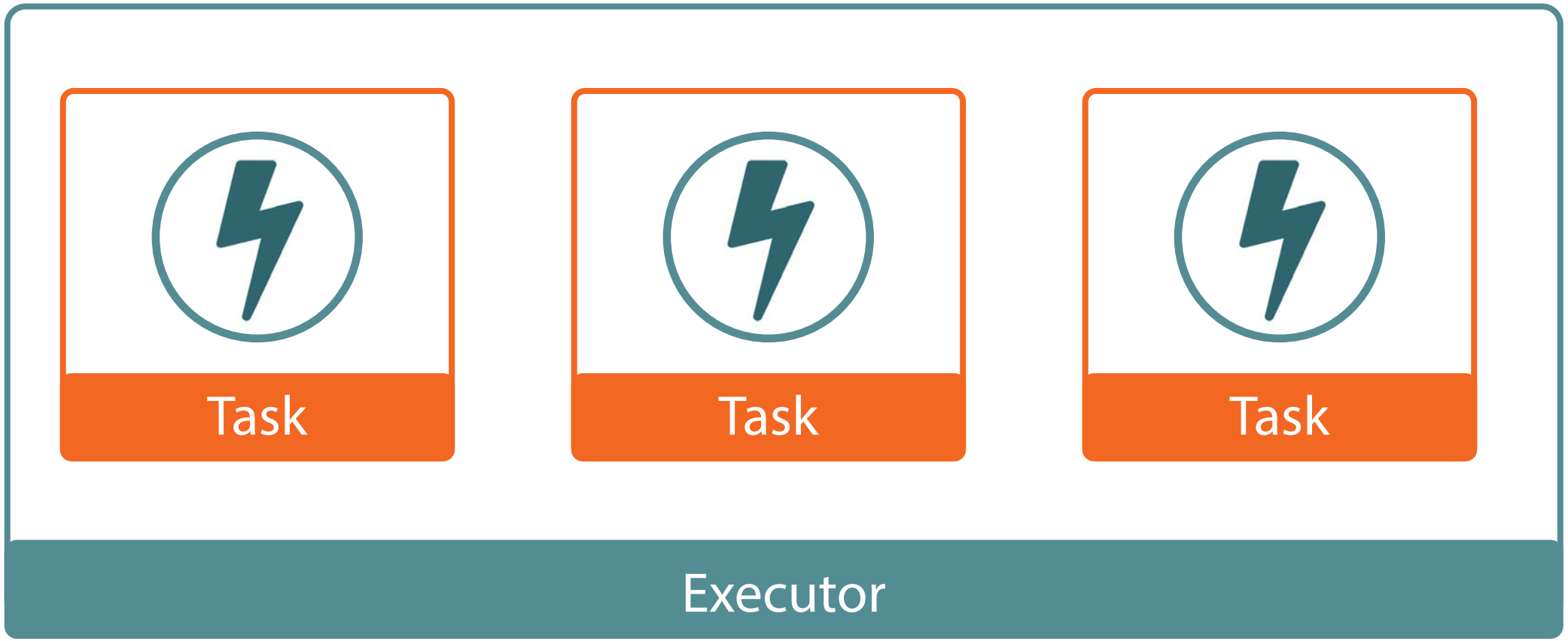


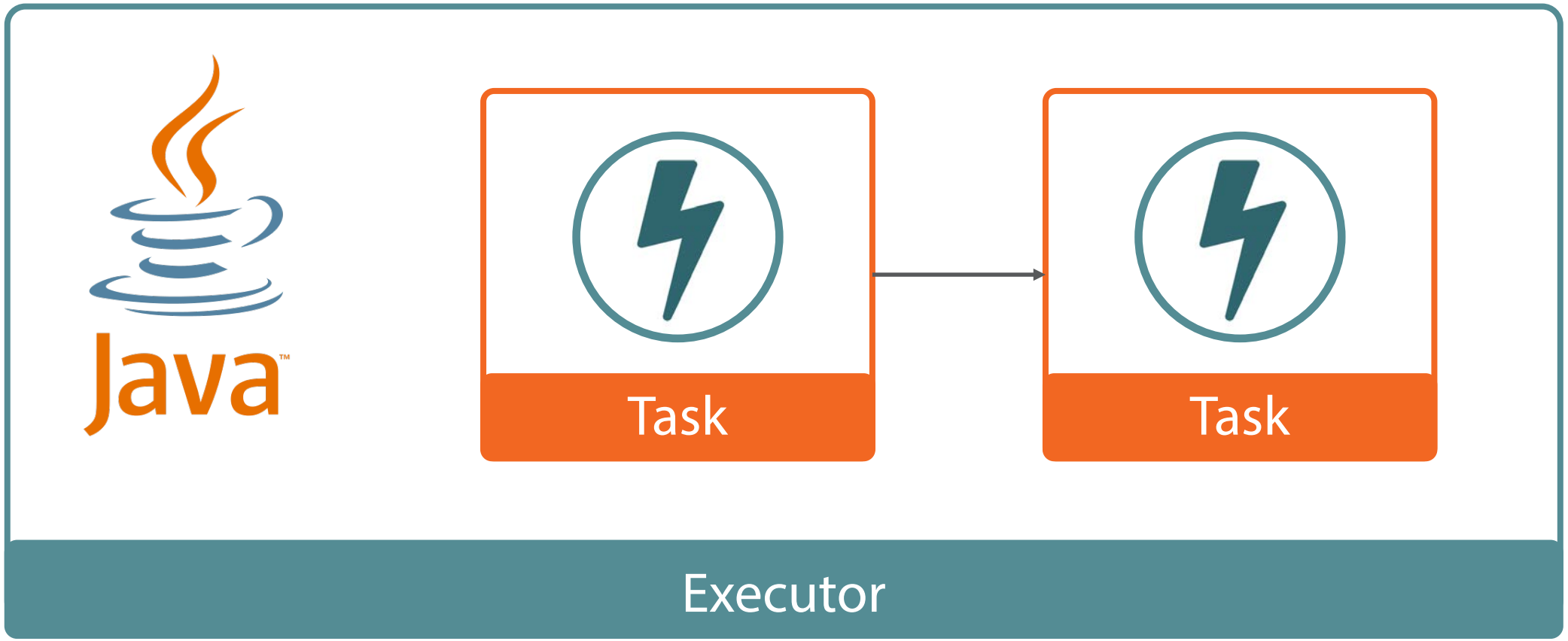


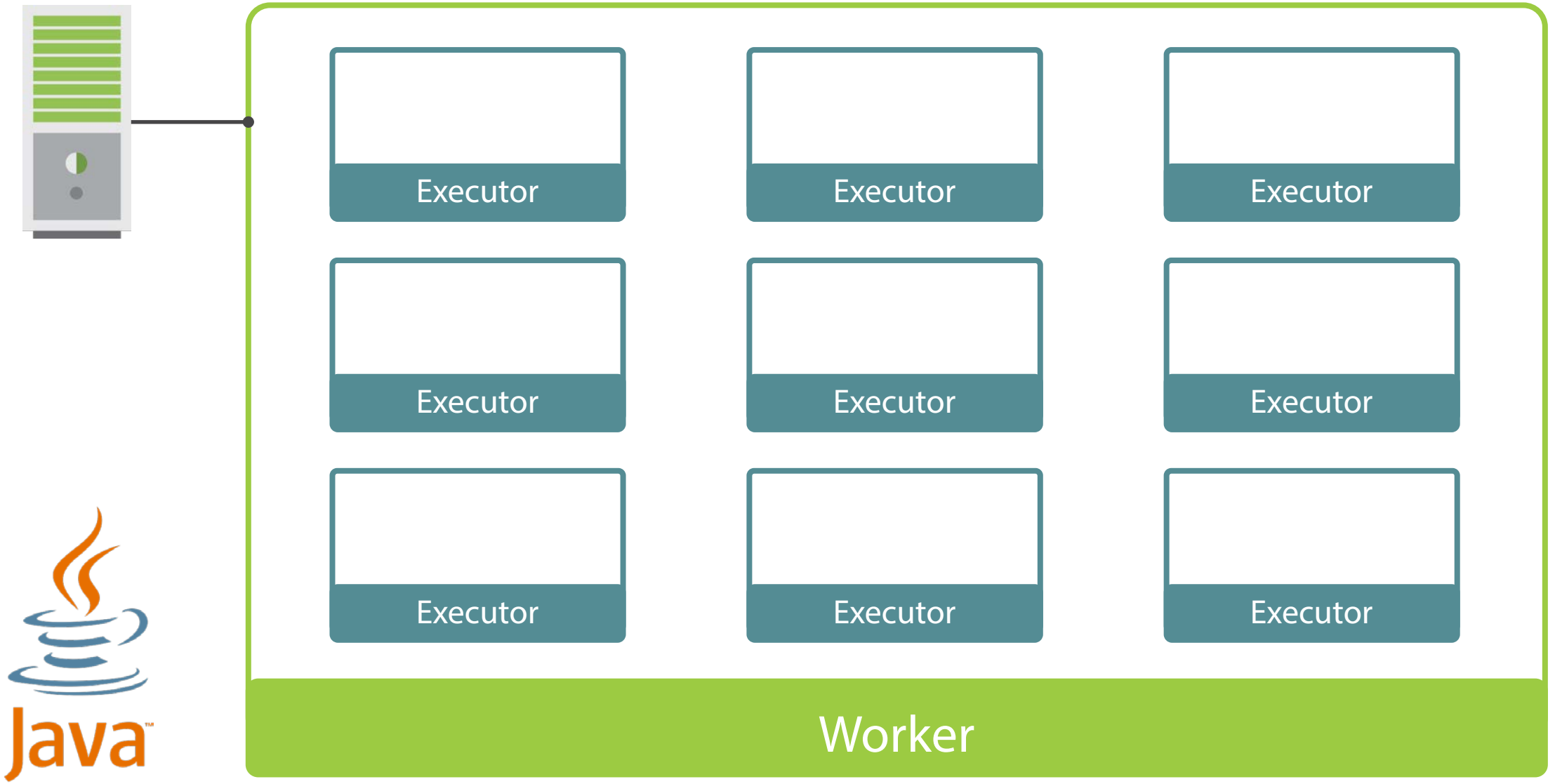

Worker
Worker
Worker
Worker

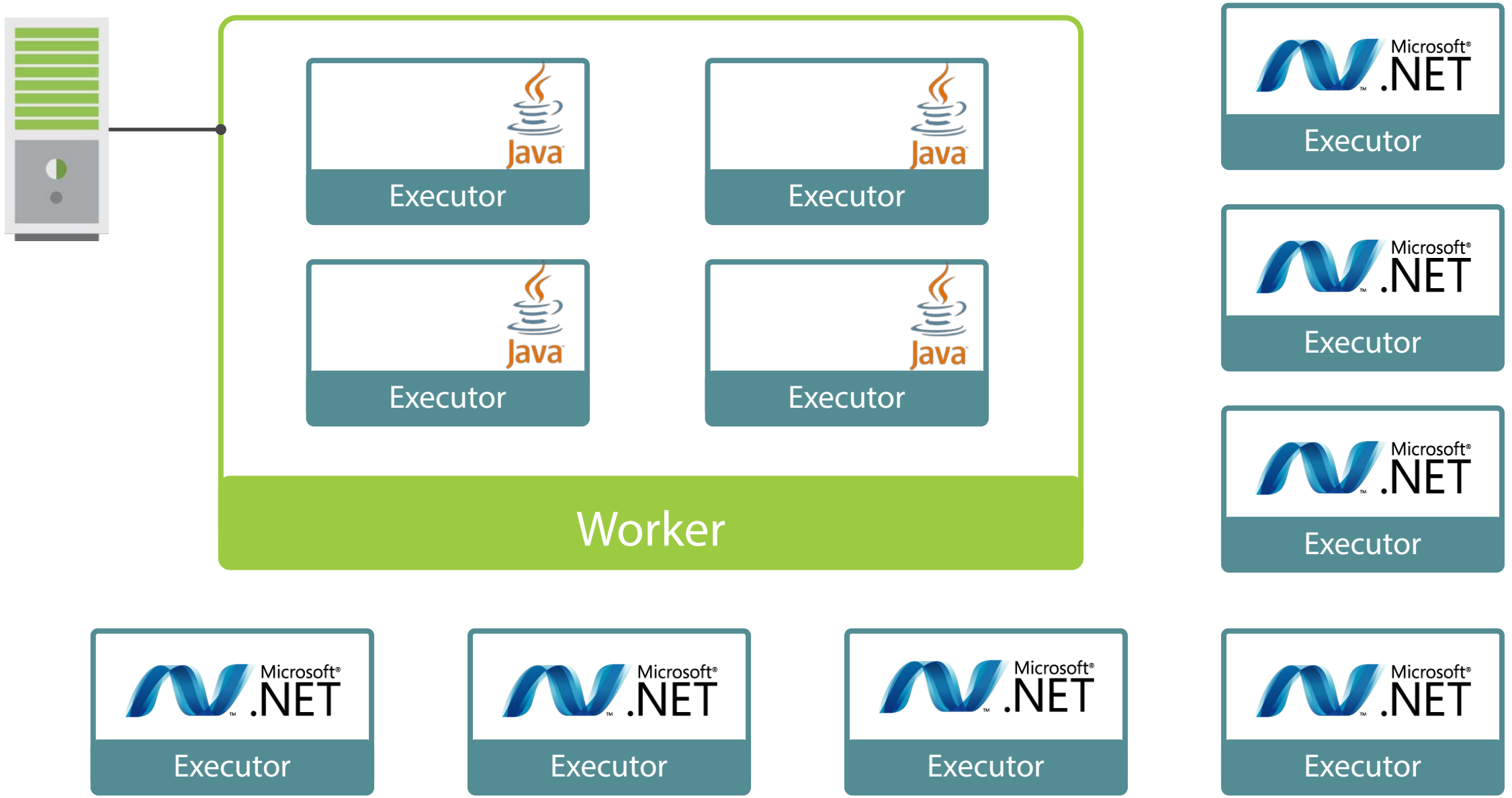


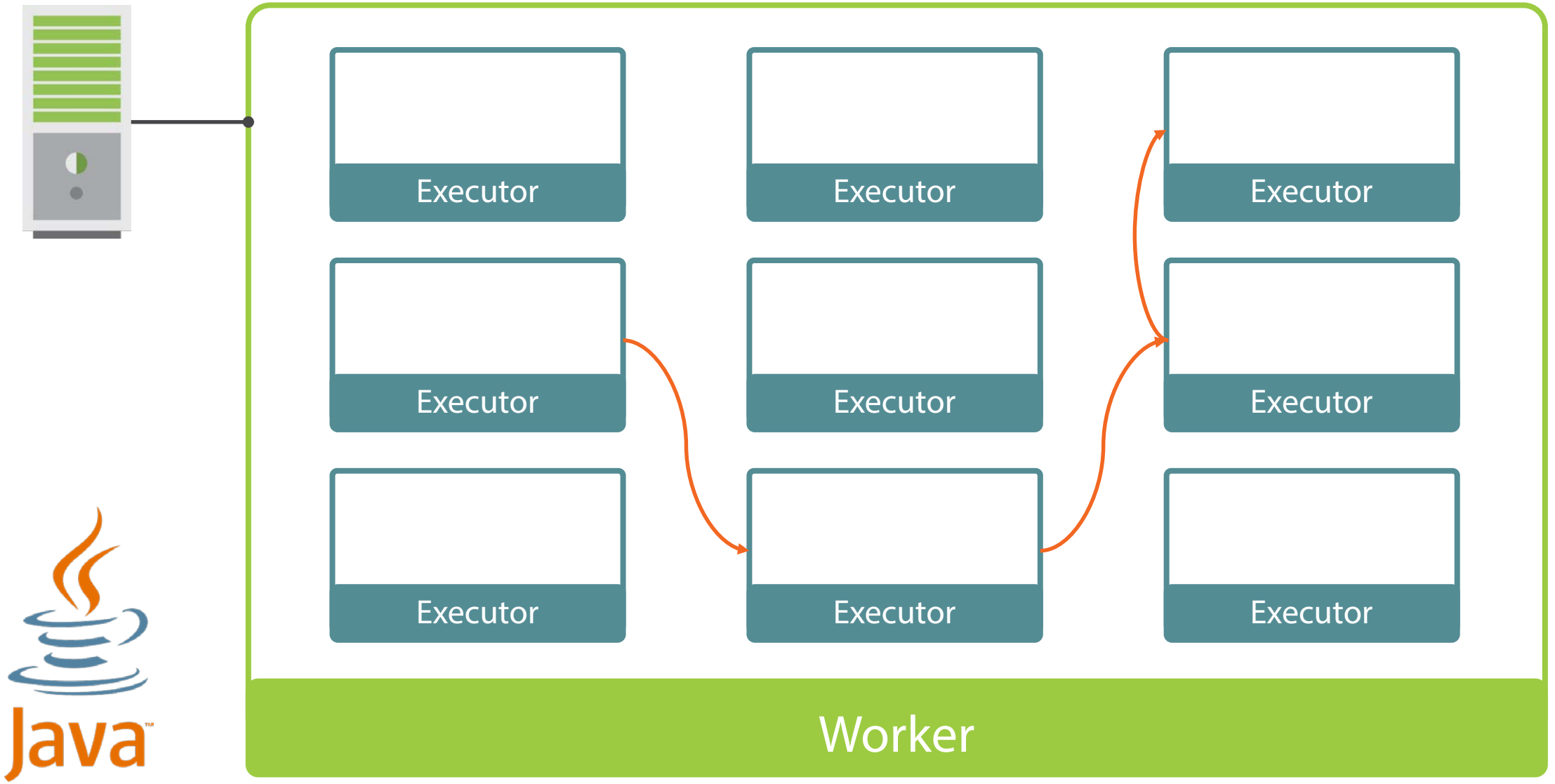


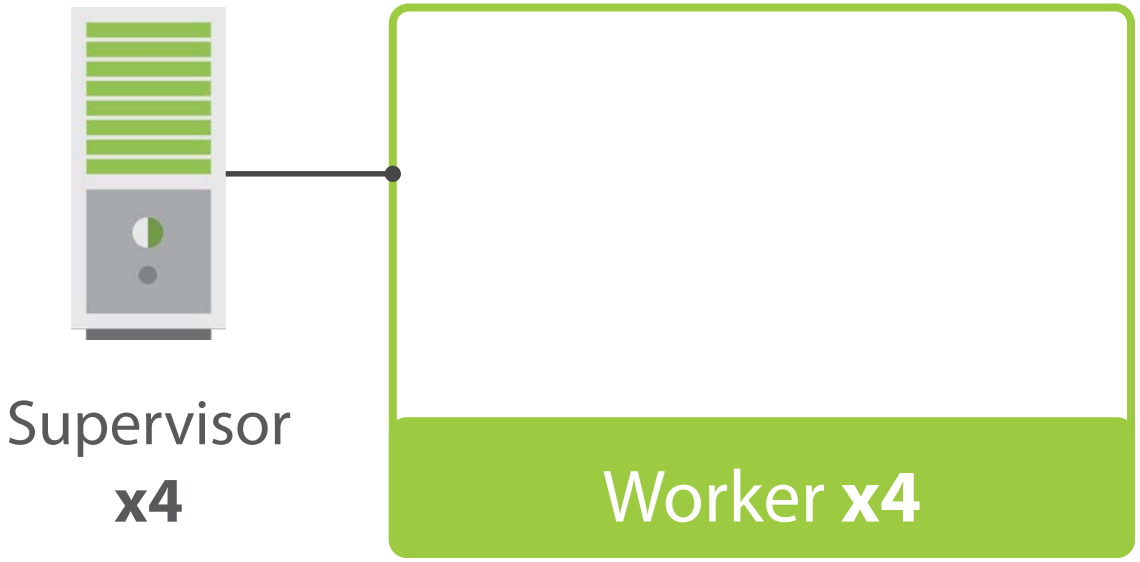


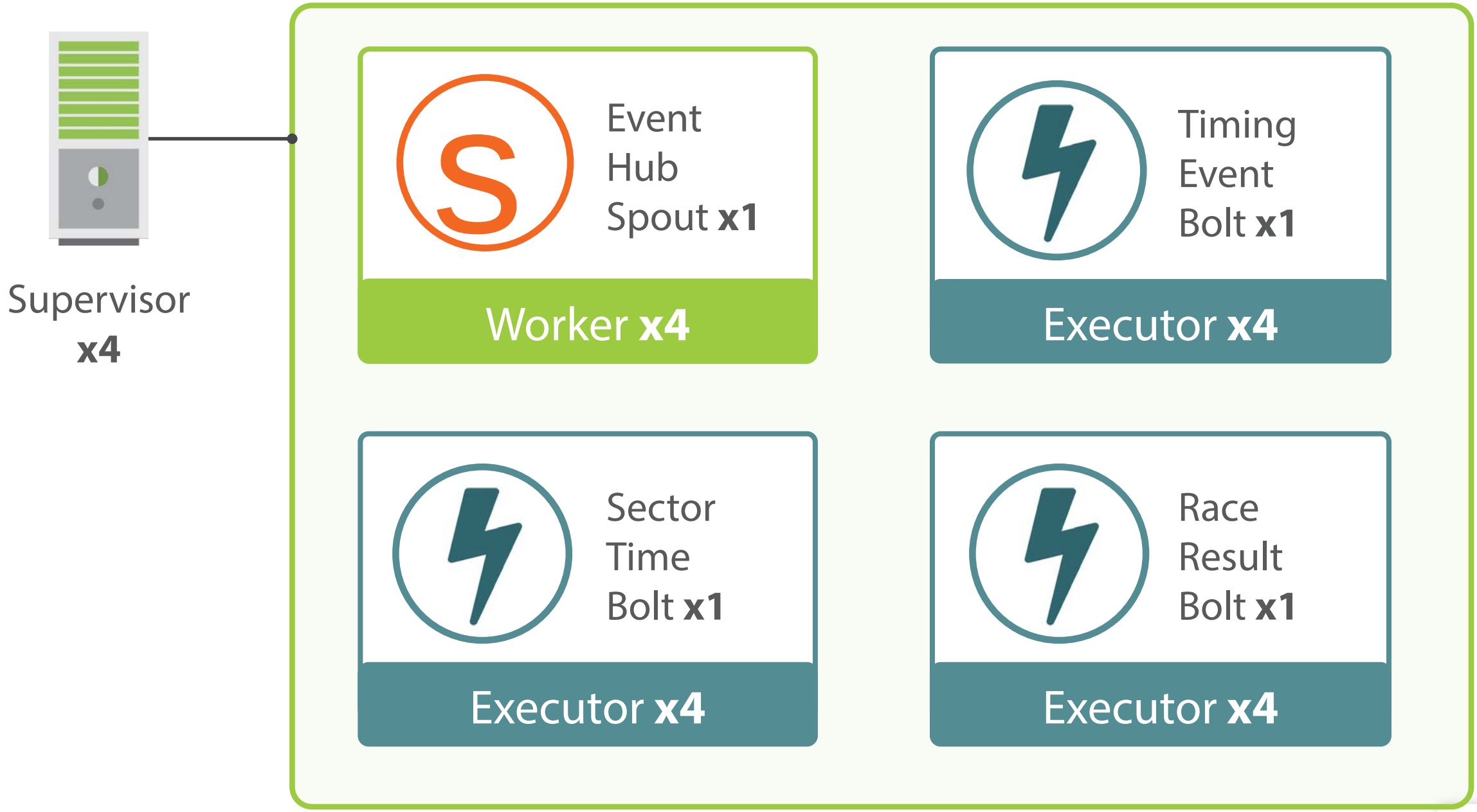


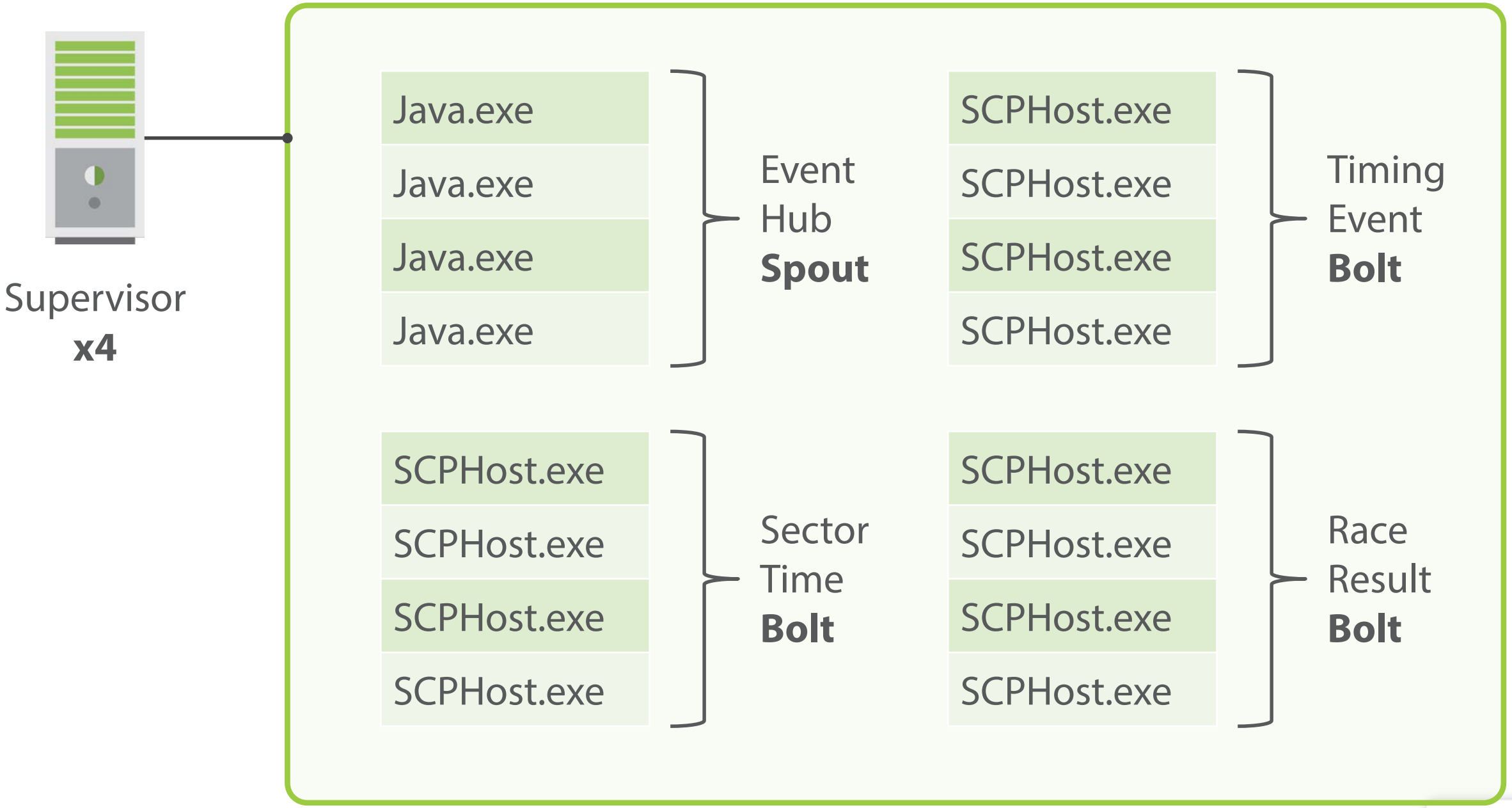









Supervisor
x4
Event
Hub
Spout x1
Worker x4
Timing
Event
Bolt x1
Executor x4
Sector
Time
Bolt x1
Executor x4
Race
Result
Bolt x1
Executor x4


Supervisor
x4
Java.exe
Java.exe
Java.exe
Java.exe
Event
Hub
Spout
SCPHost.exe
SCPHost.exe
SCPHost.exe
SCPHost.exe
Timing
Event
Bolt
SCPHost.exe
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SCPHost.exe
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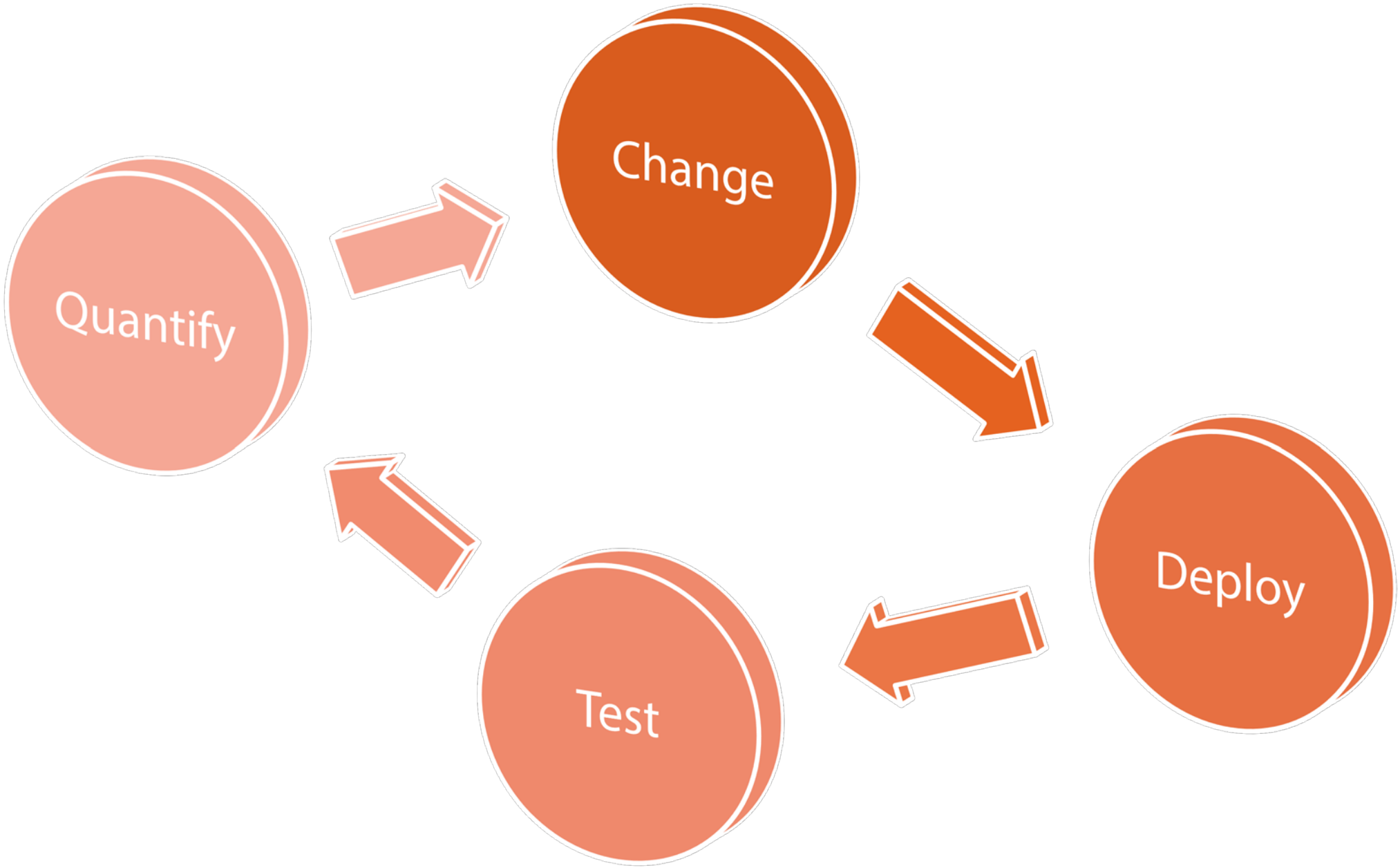
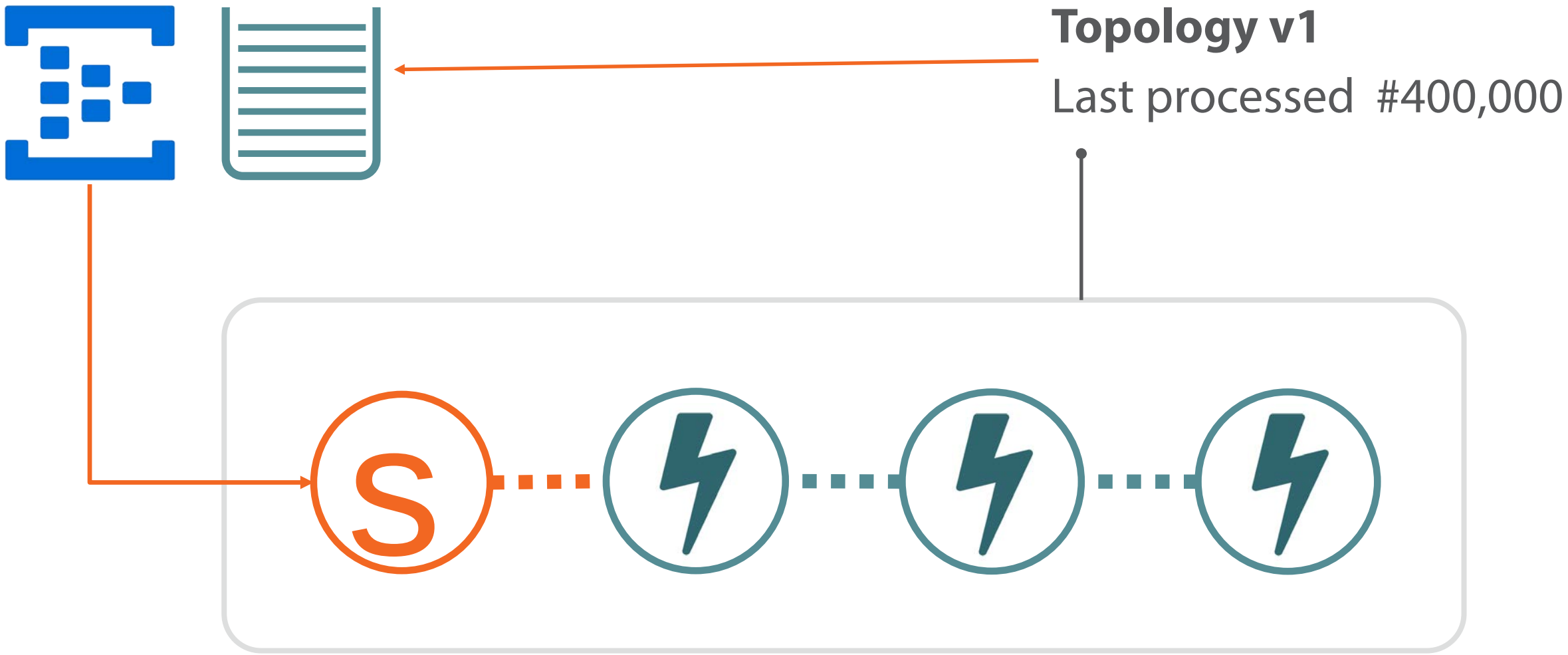
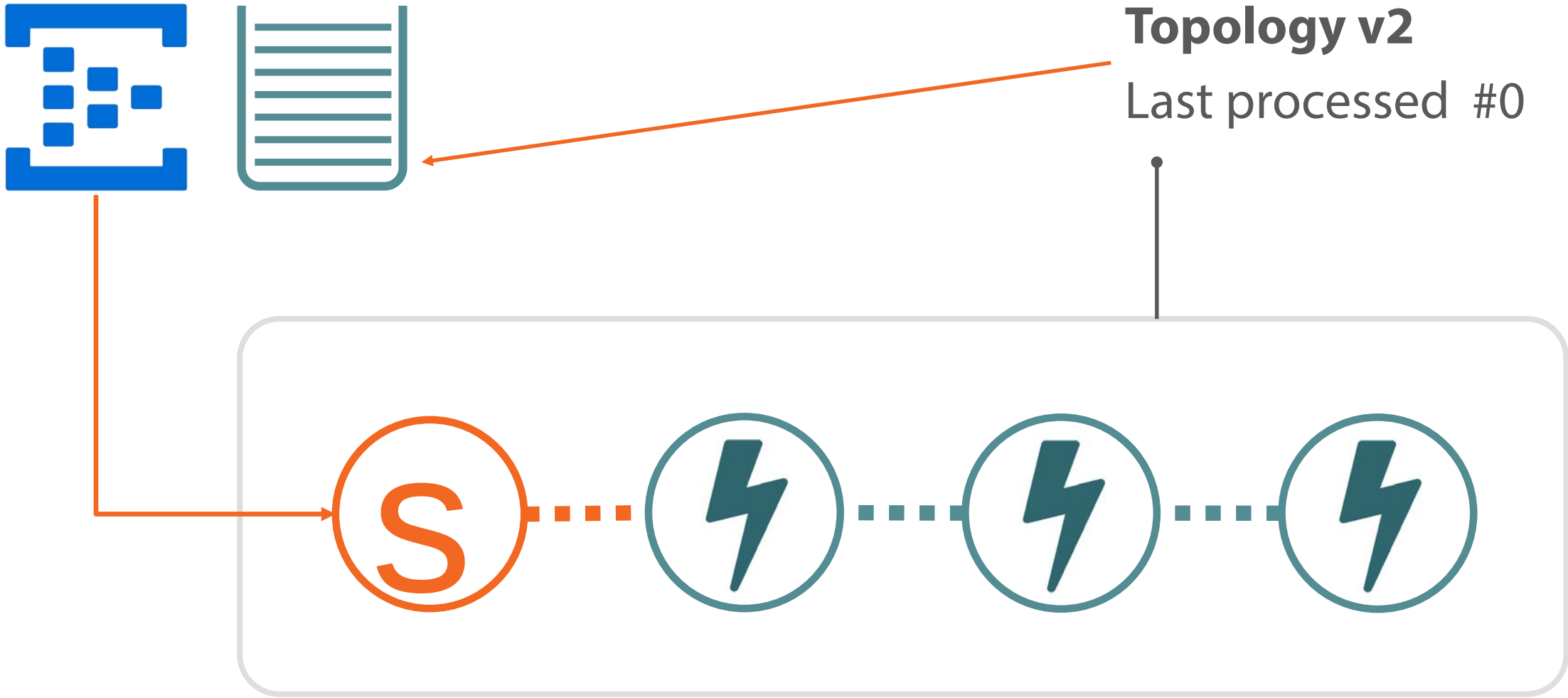
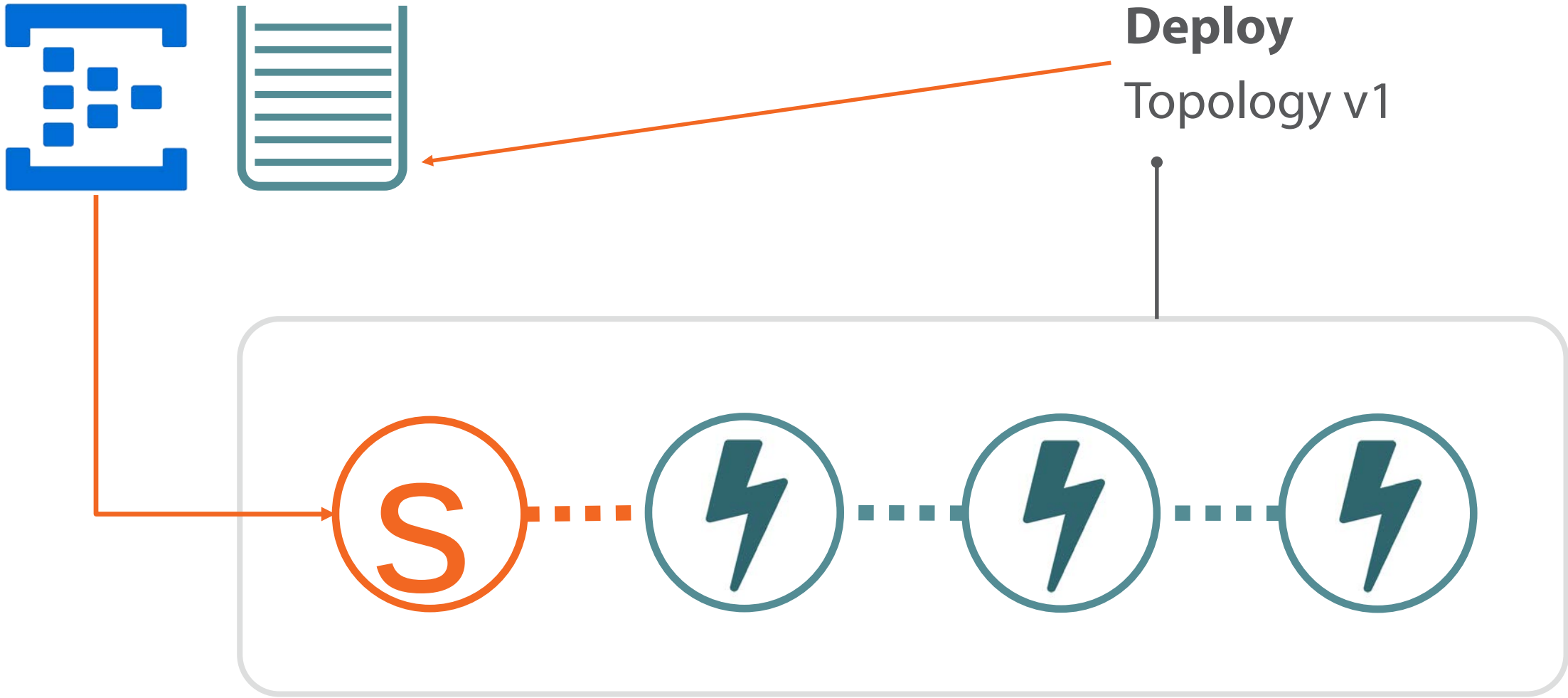
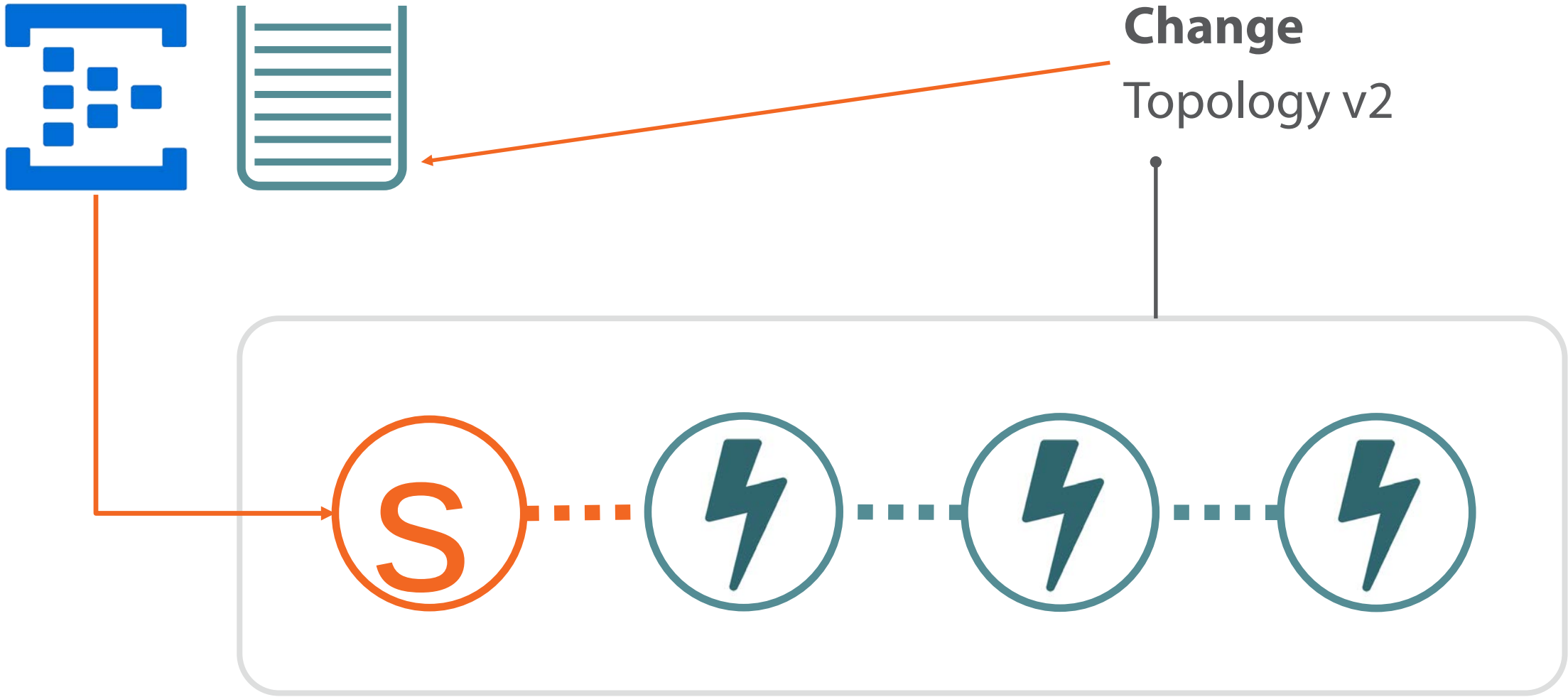
Race
Result
Bolt

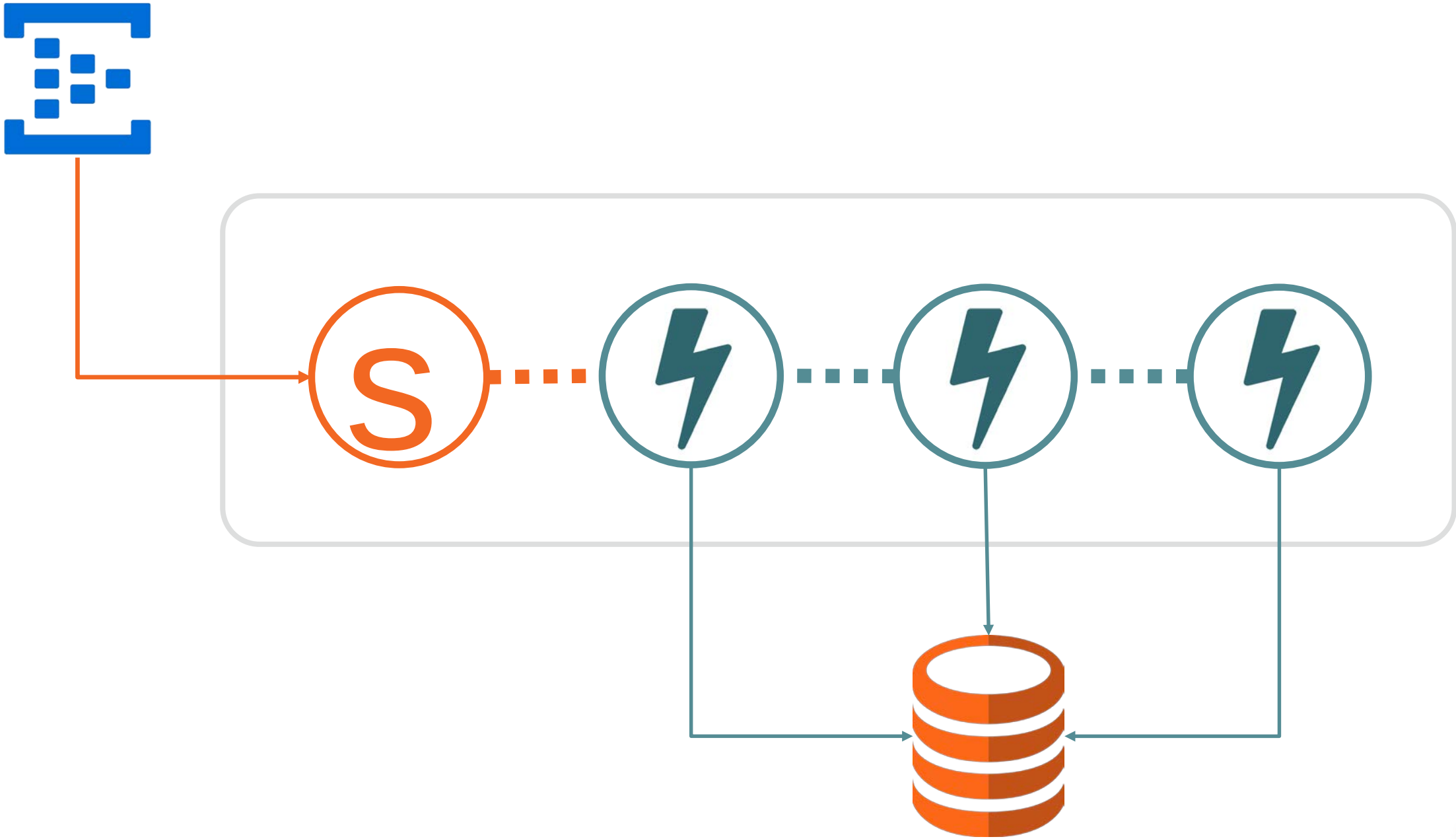


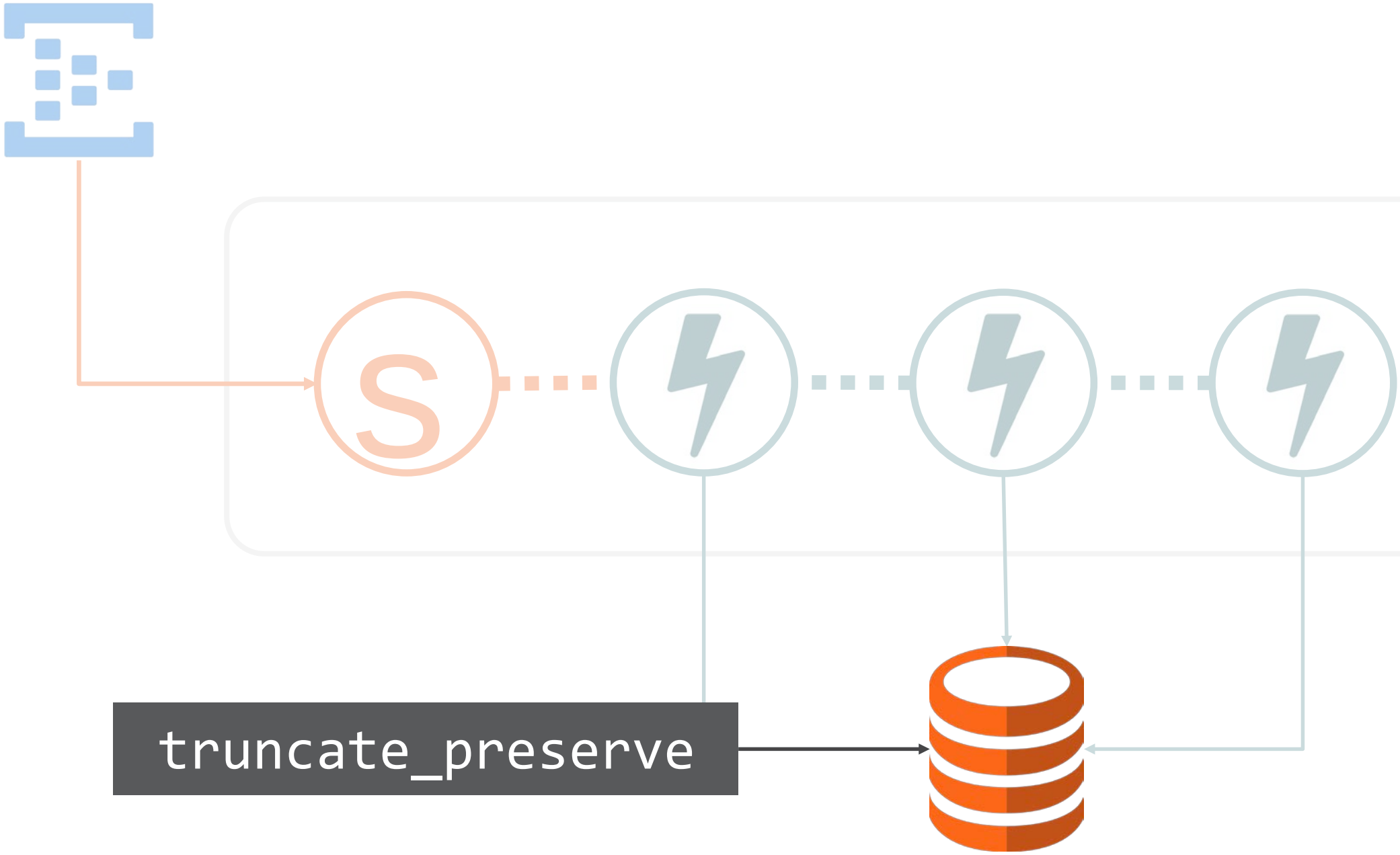


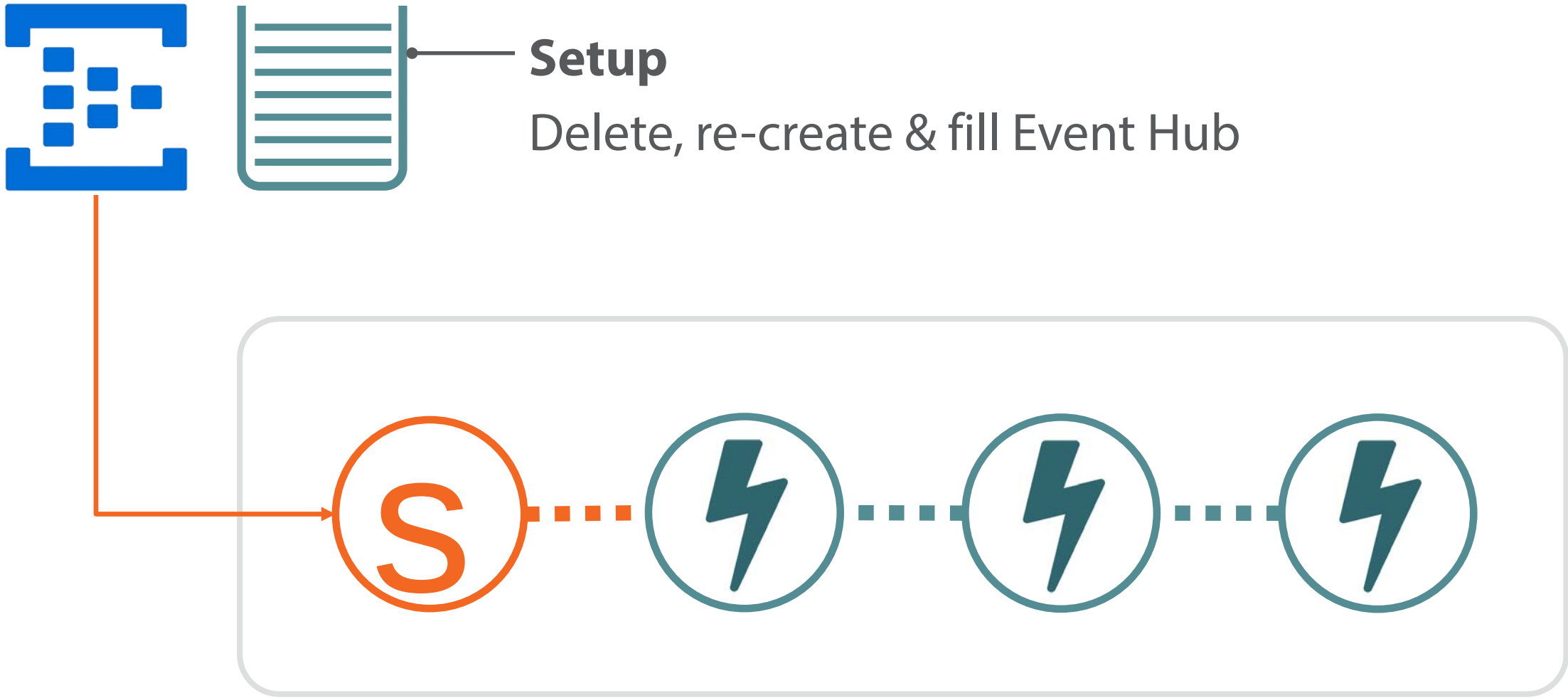


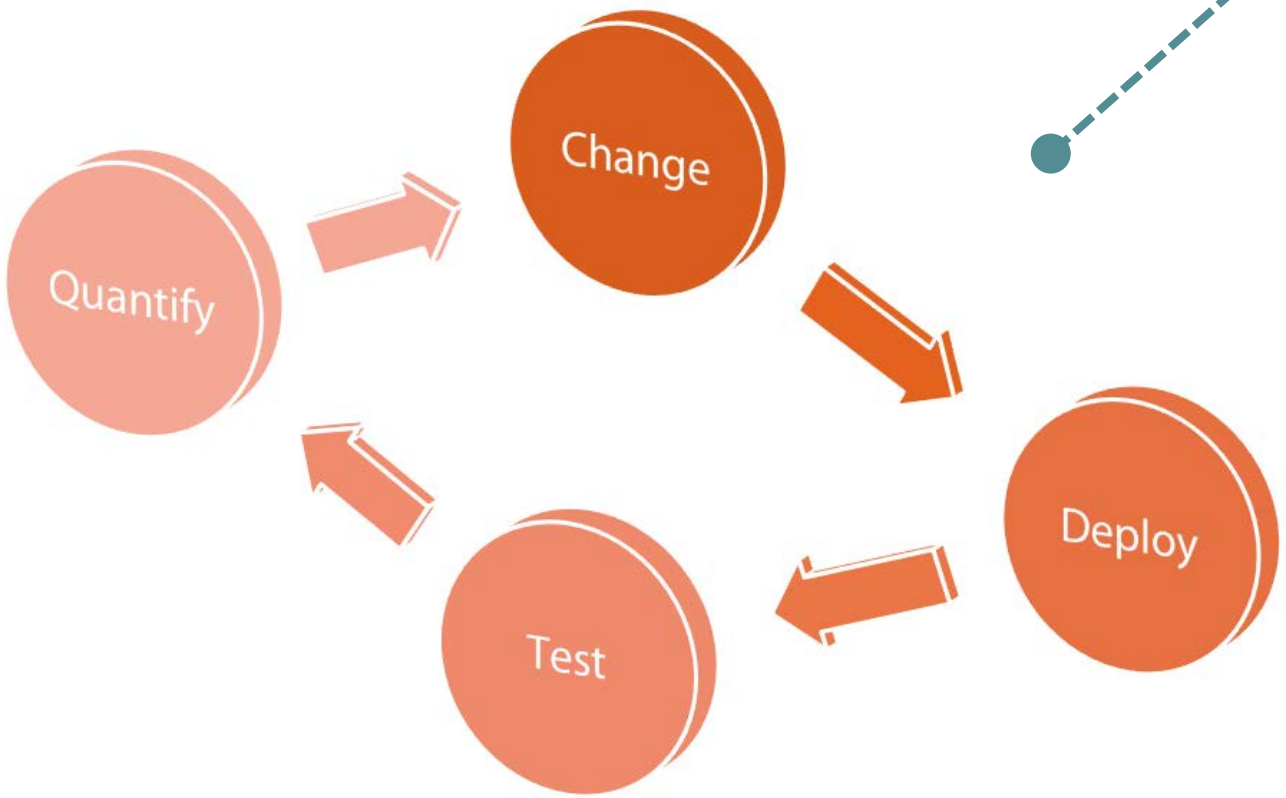








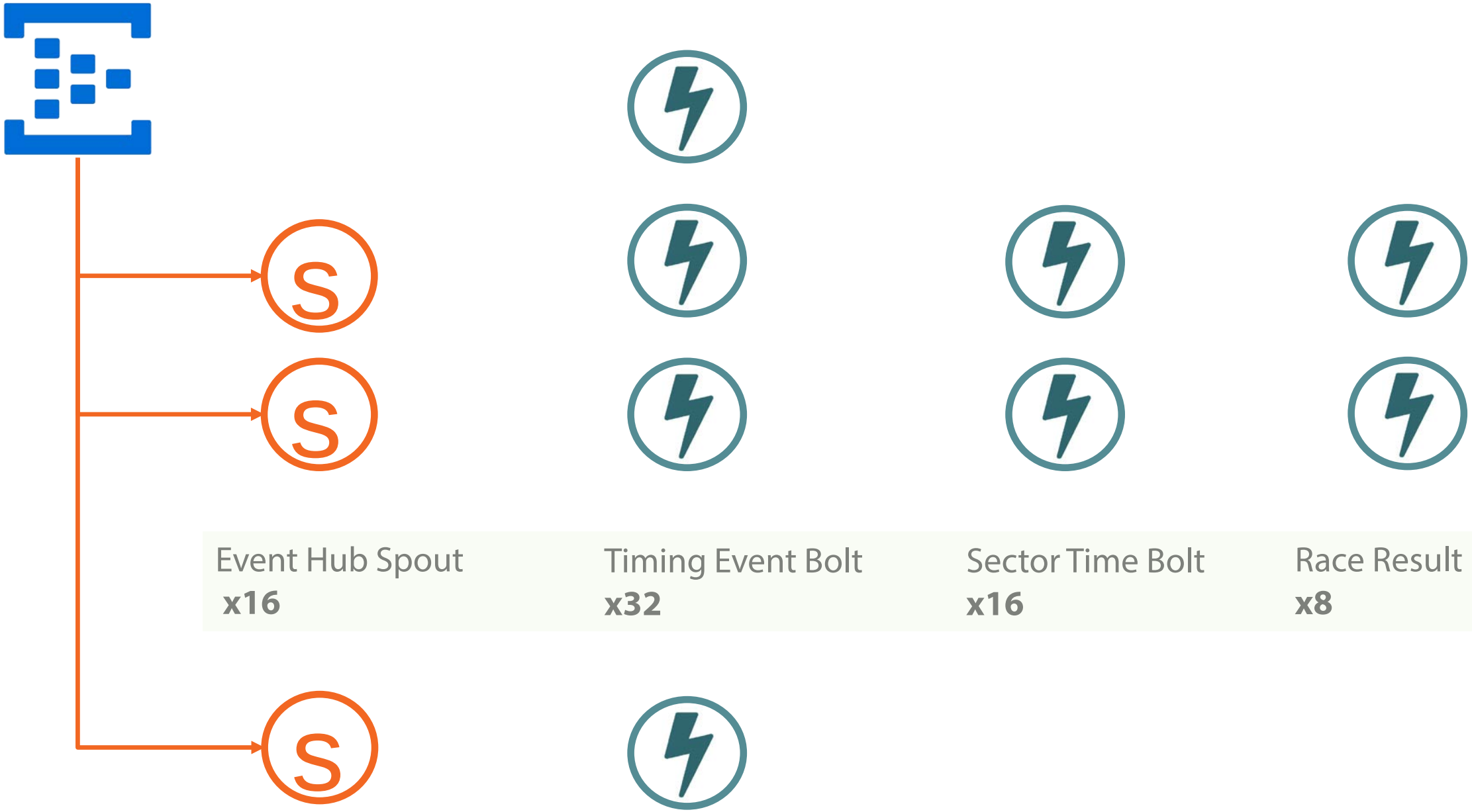




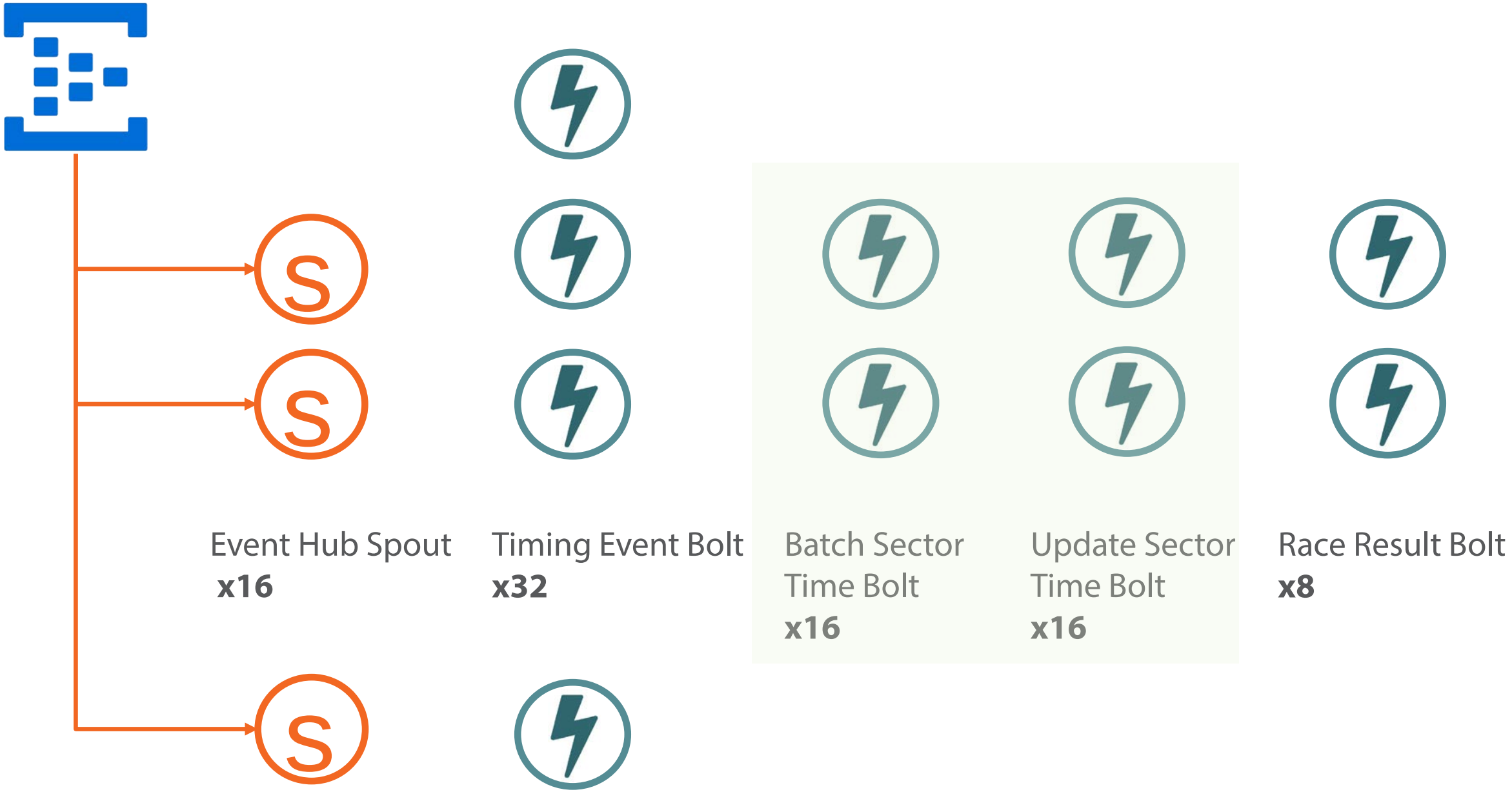
20min+ cycle

>720 permutations

70% improvement?



Event Hub Spout	Timing Event Bolt	Sector Time Bolt	Race Result Bolt
x16	**x32**	**x16**	**x8**



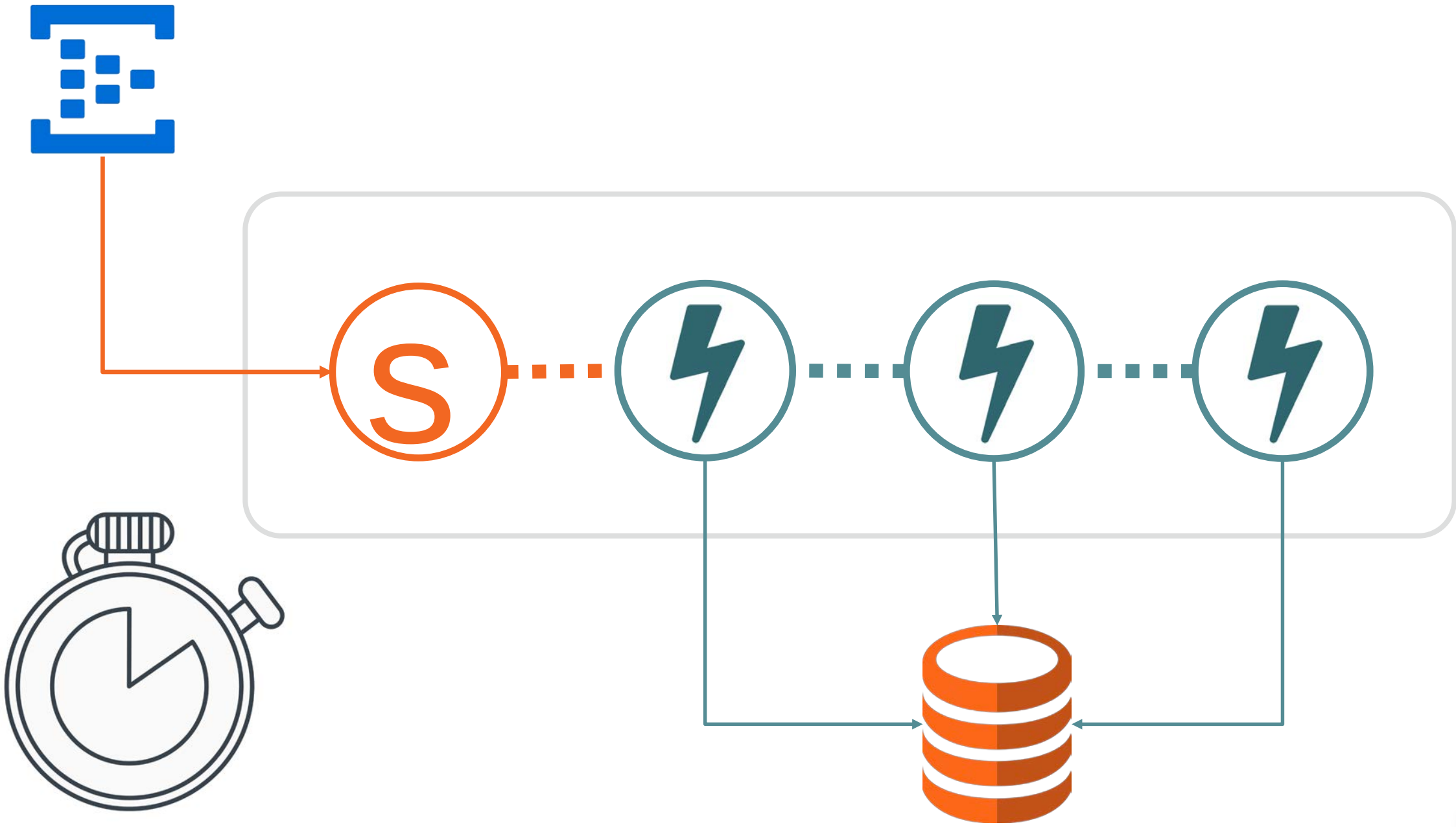
Event Hub Spout
x16

Timing Event Bolt
x32

Batch Sector Time Bolt
x16

Update Sector Time Bolt
x16

Race Result Bolt
x8


S

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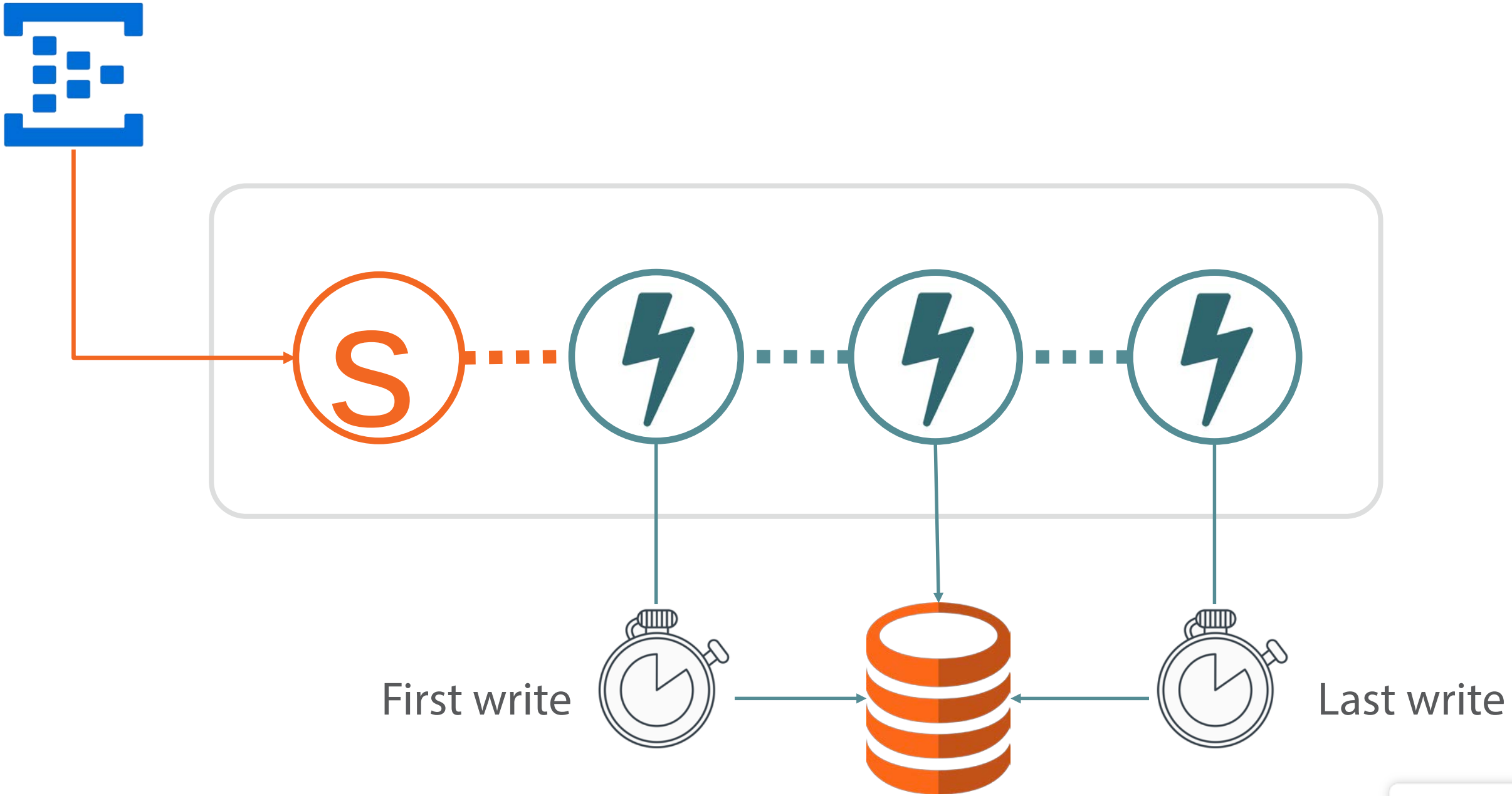
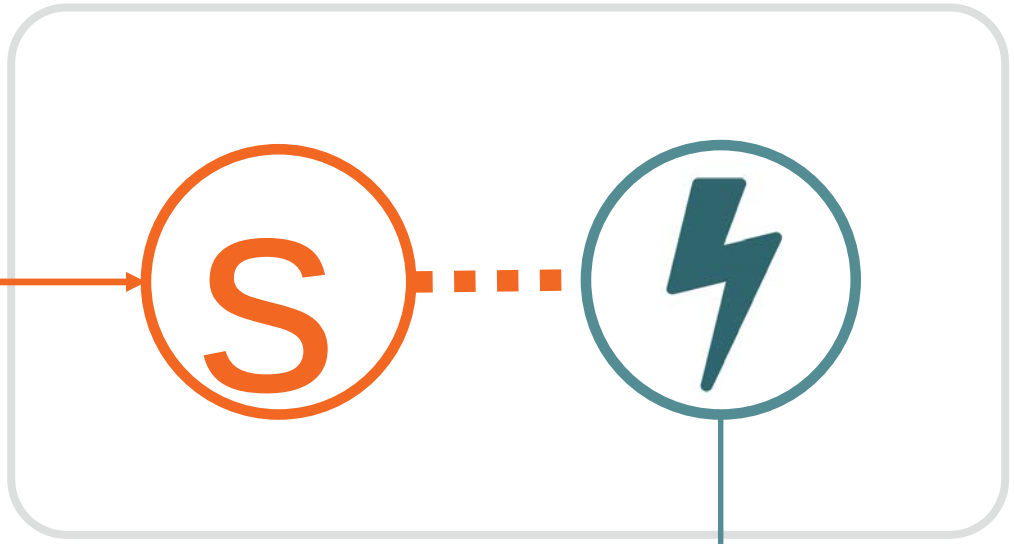
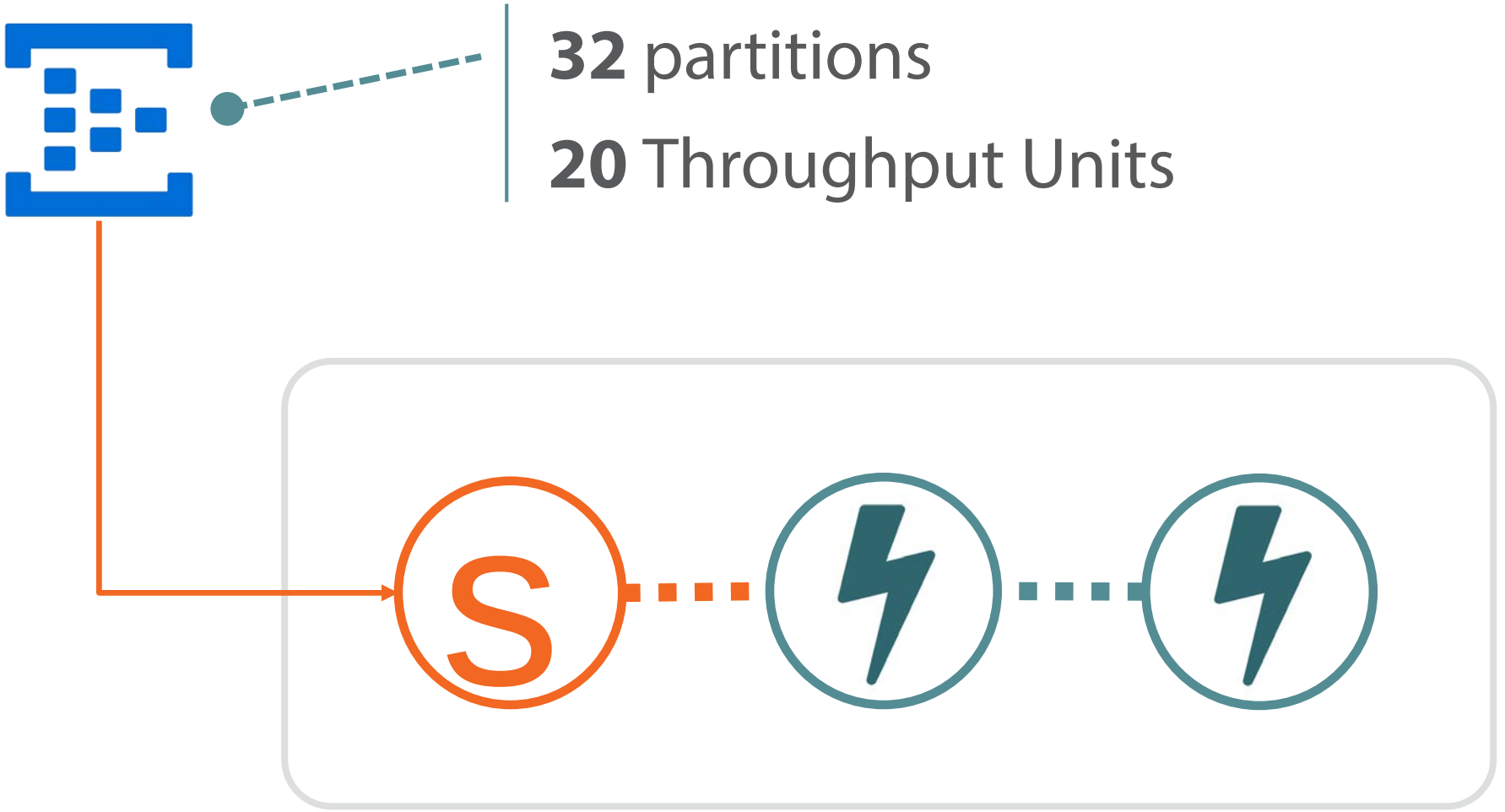
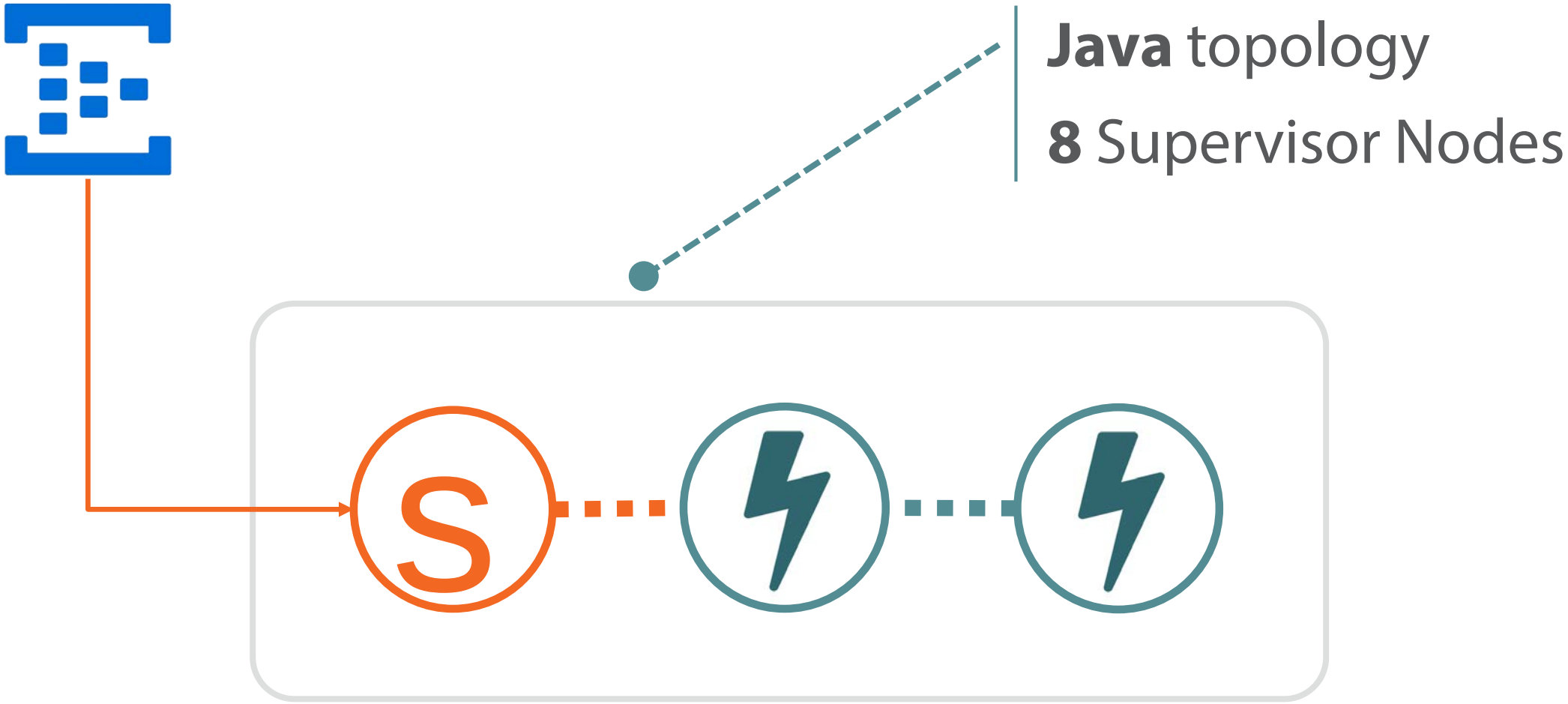
__acker	4	4	0	0	0.001	0.038	1060	0.019	1080	0			
__metricsbacktype.storm.metric.LoggingMetricsConsumer	1	1			0.000	0		0					
BatchSectorTimeBolt	64	64	20	0	0.000	0.000	200	0.000	0	0			
RaceResultBolt	32	32	0	0	0.000	0.000	0	0.000	0	0			
TimingEventBolt	256	256	880	780	0.342	13.705	880	20287.234	340	0			
UpdateSectorTimeBolt	128	128	0	0	0.000	0.000	0	0.000	0	0			

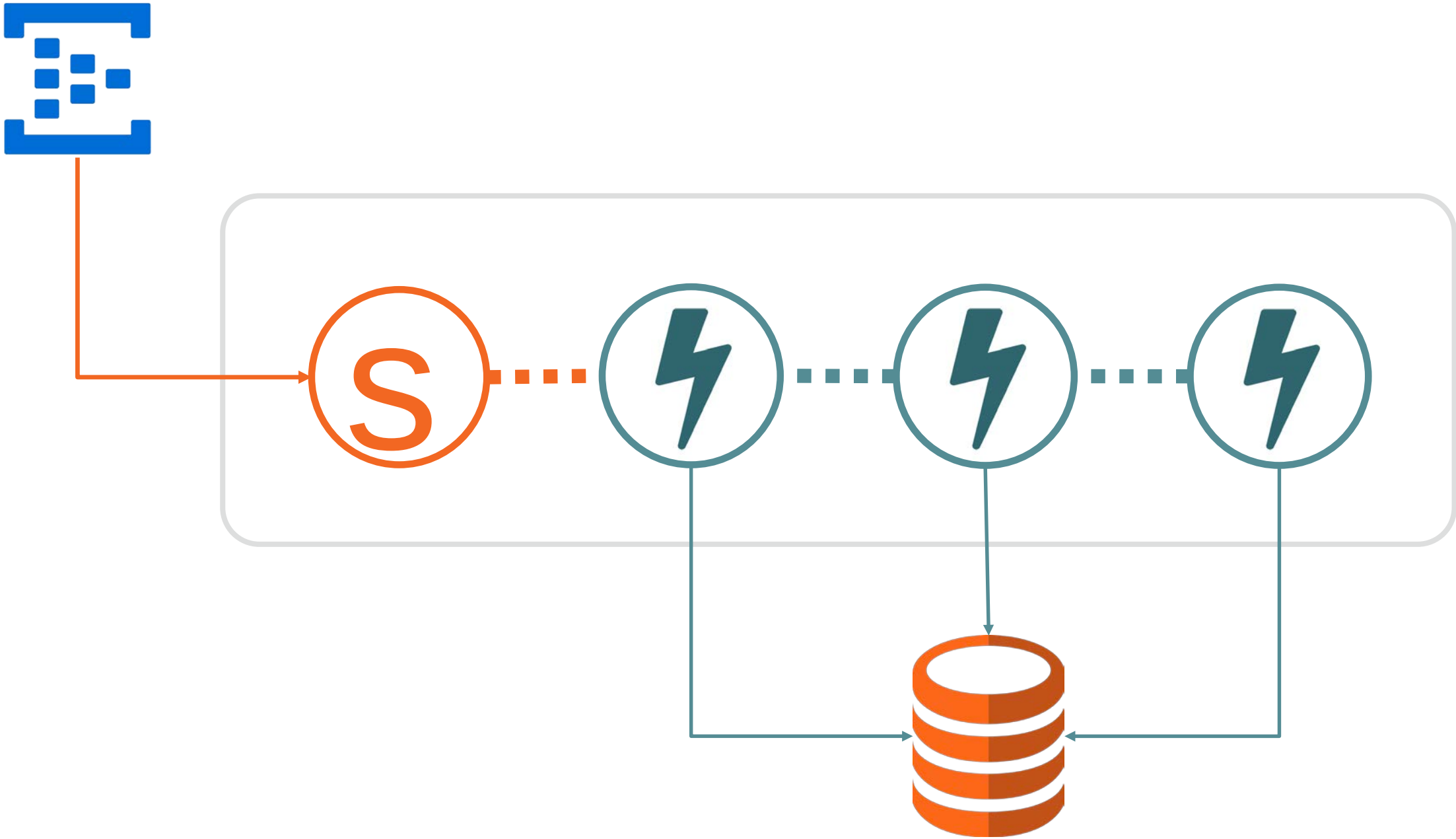

S
First write
Last write

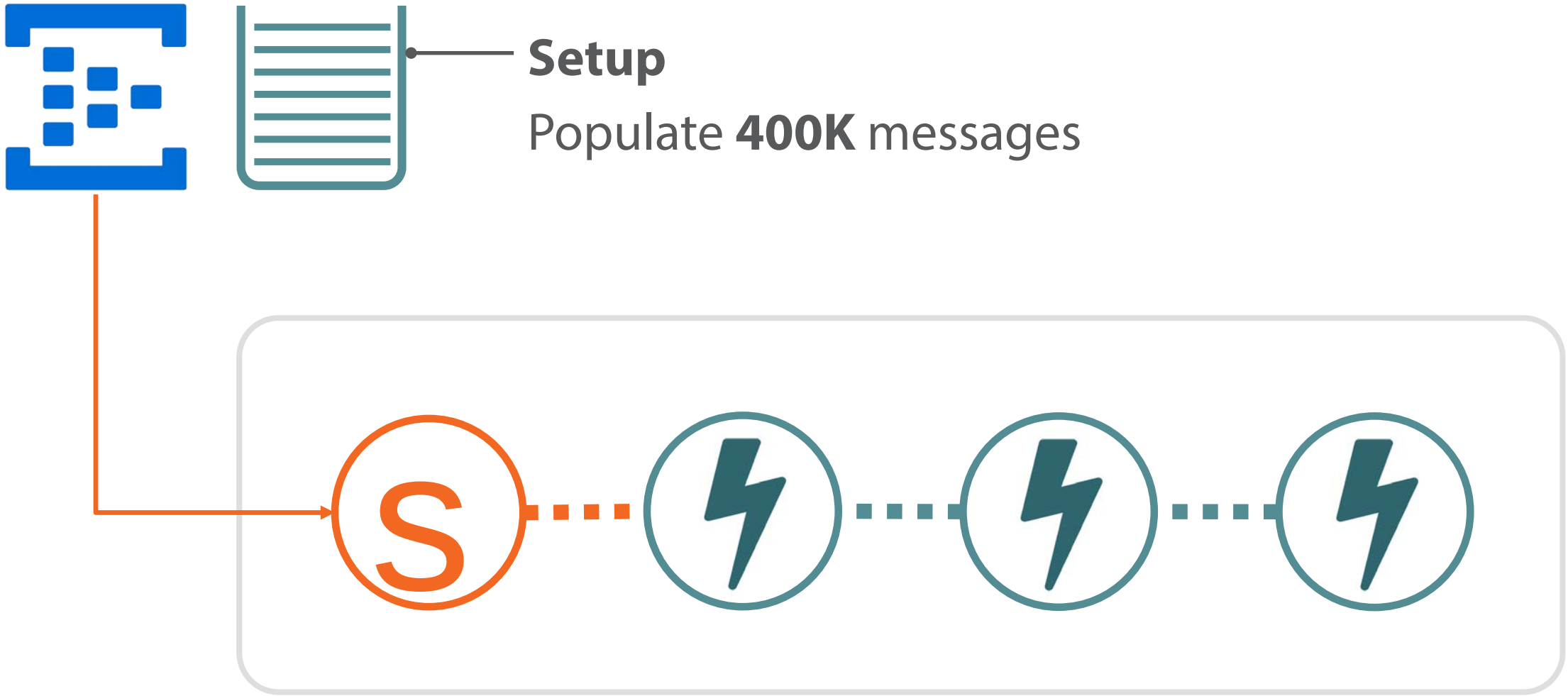


Baseline = **2.5K** msg/sec









Topology name

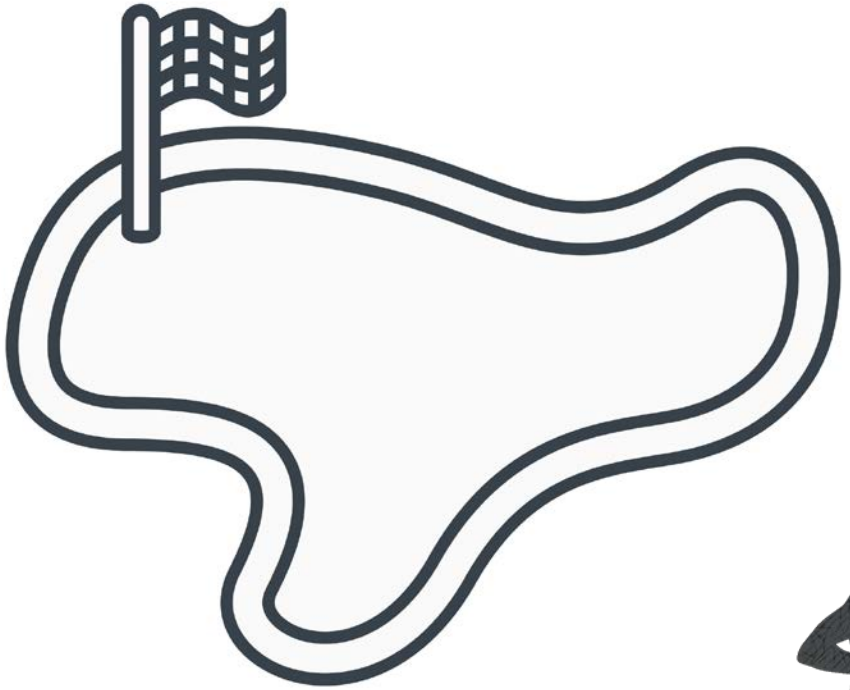
Write timestamp

races | **au**

RowKey	au:w	au:p
a6545da436	1444641212016	RaceTiming-1012-1210

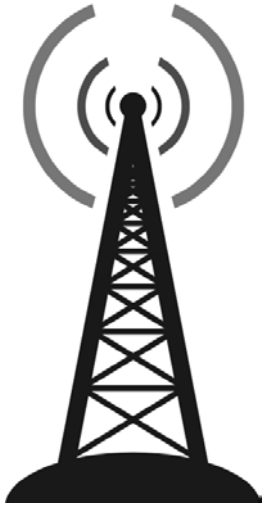
timing-events | **au**

RowKey	au:w	au:p
e4324|a31c4|a6545da436	1444641362204	RaceTiming-1012-1210



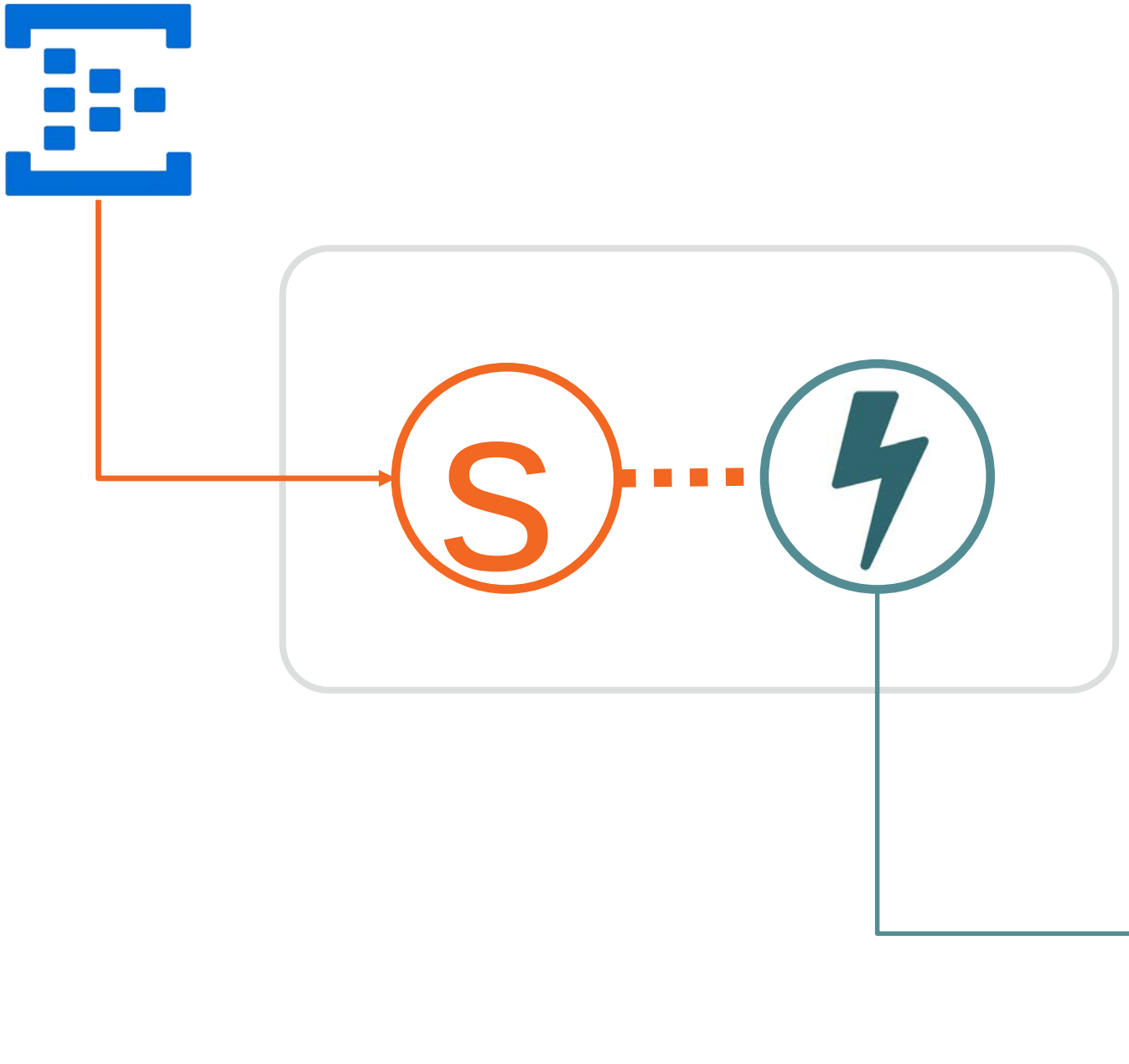
x40

x100

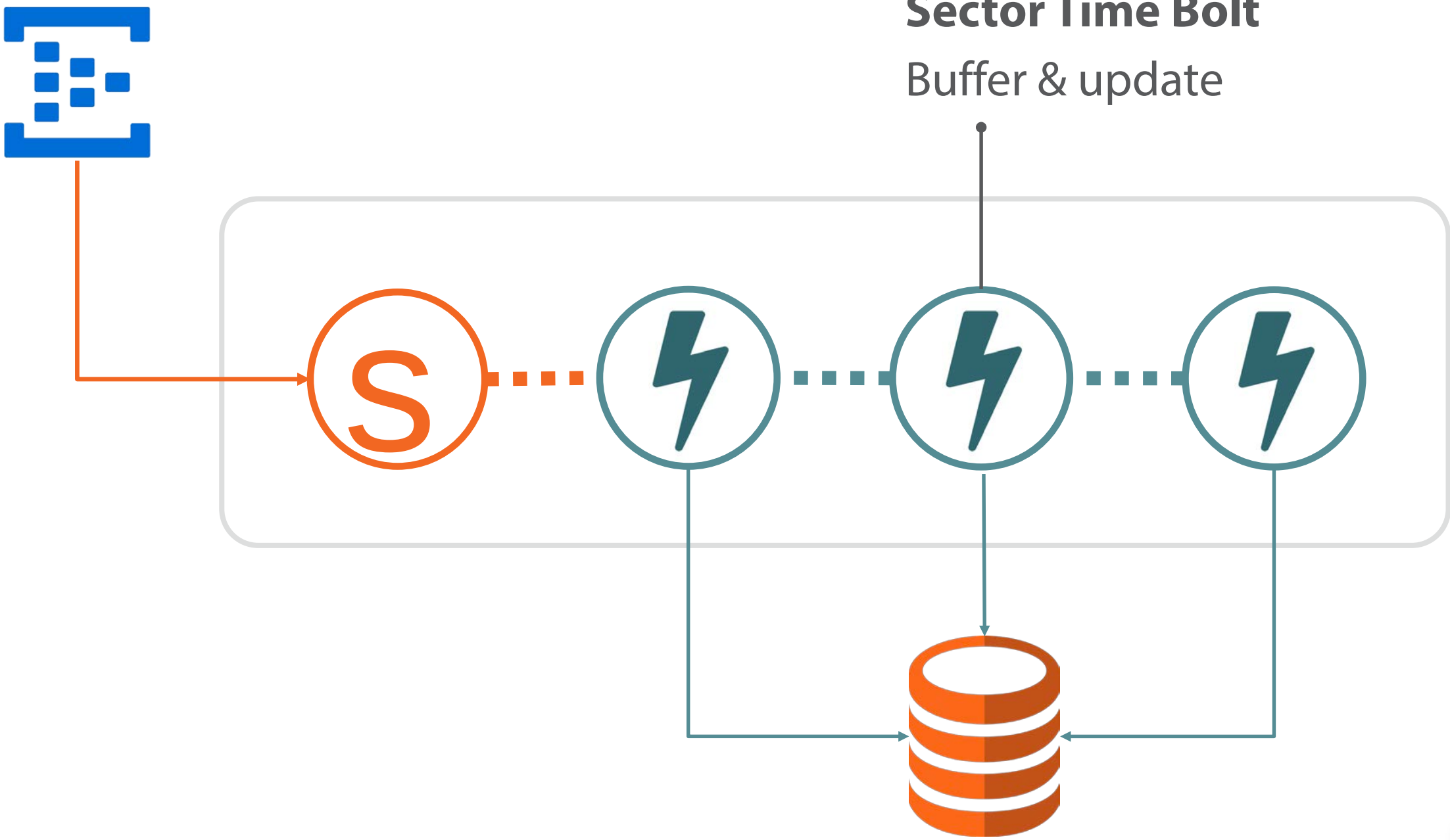


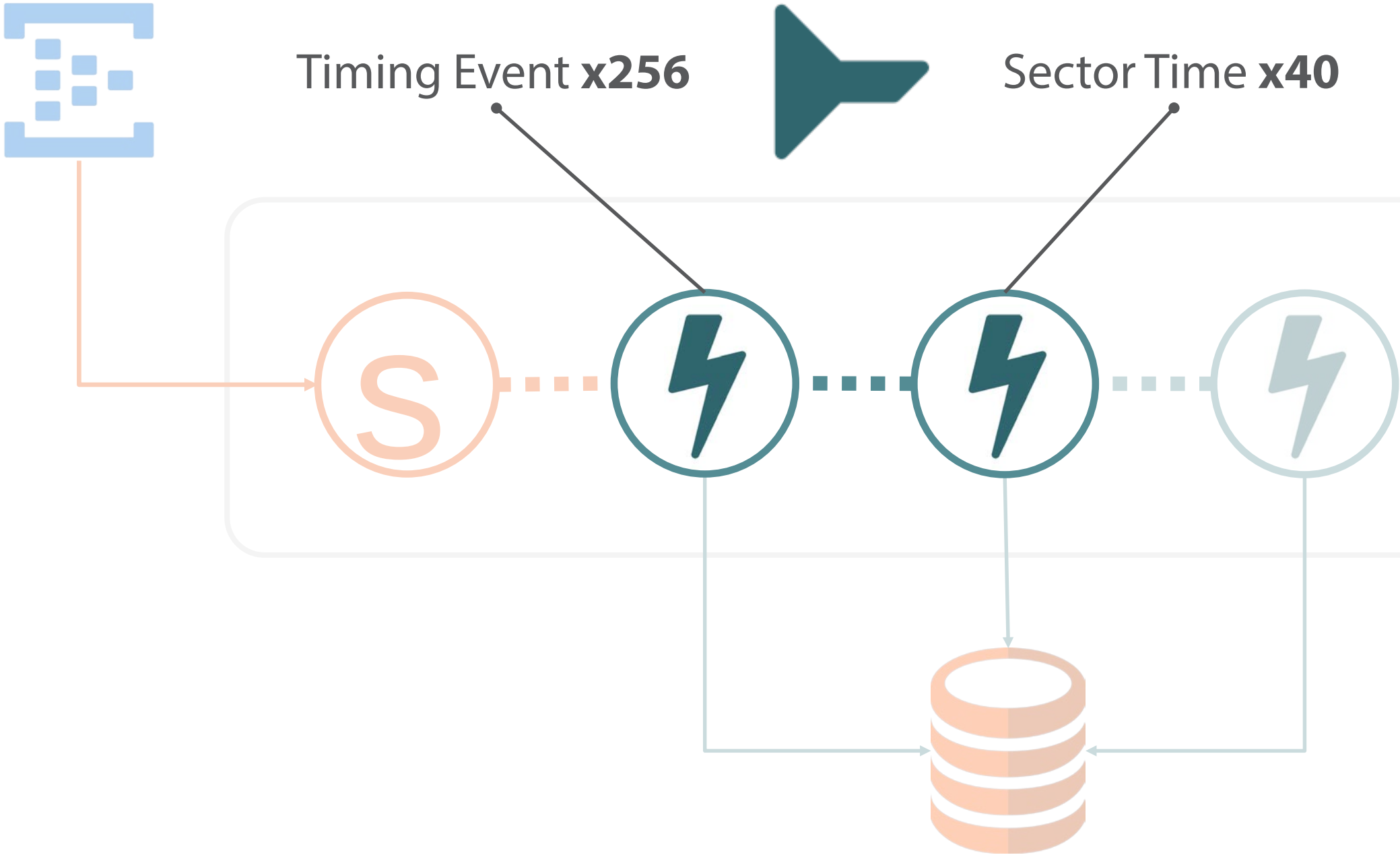
x10

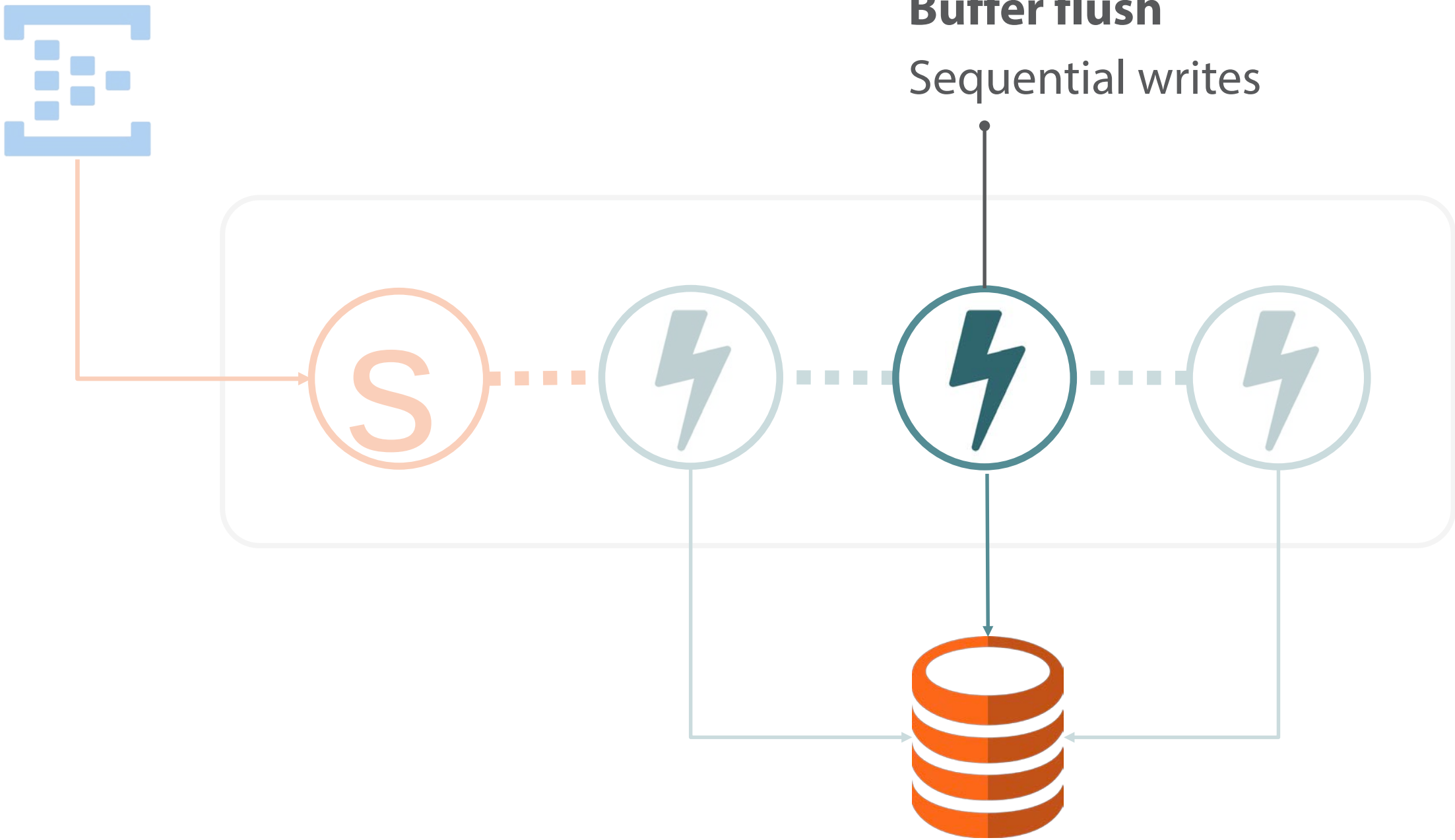
x10



Baseline = **156** seconds
= **2,560** msg/sec

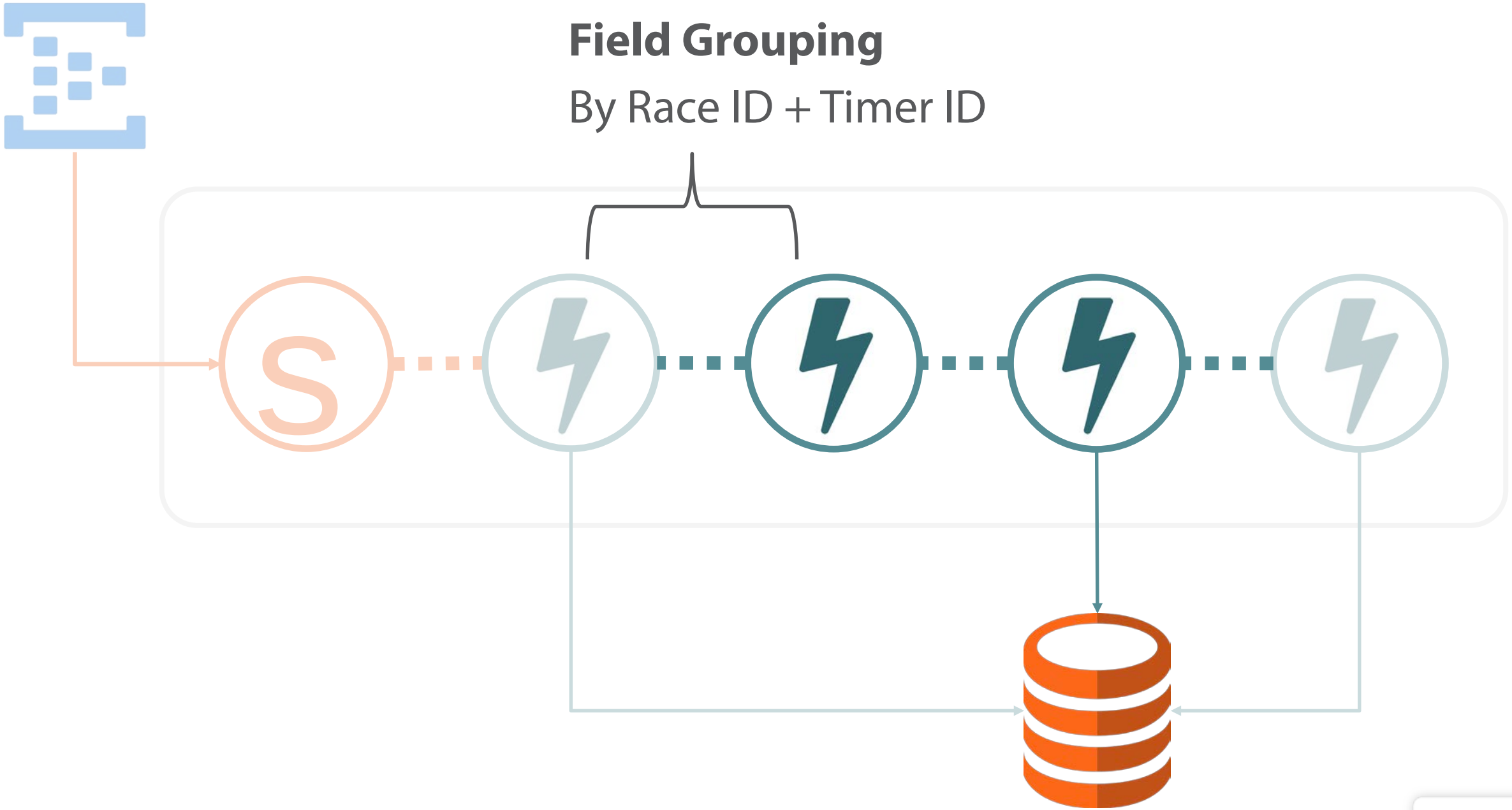





Buffer flush
Sequential writes
S

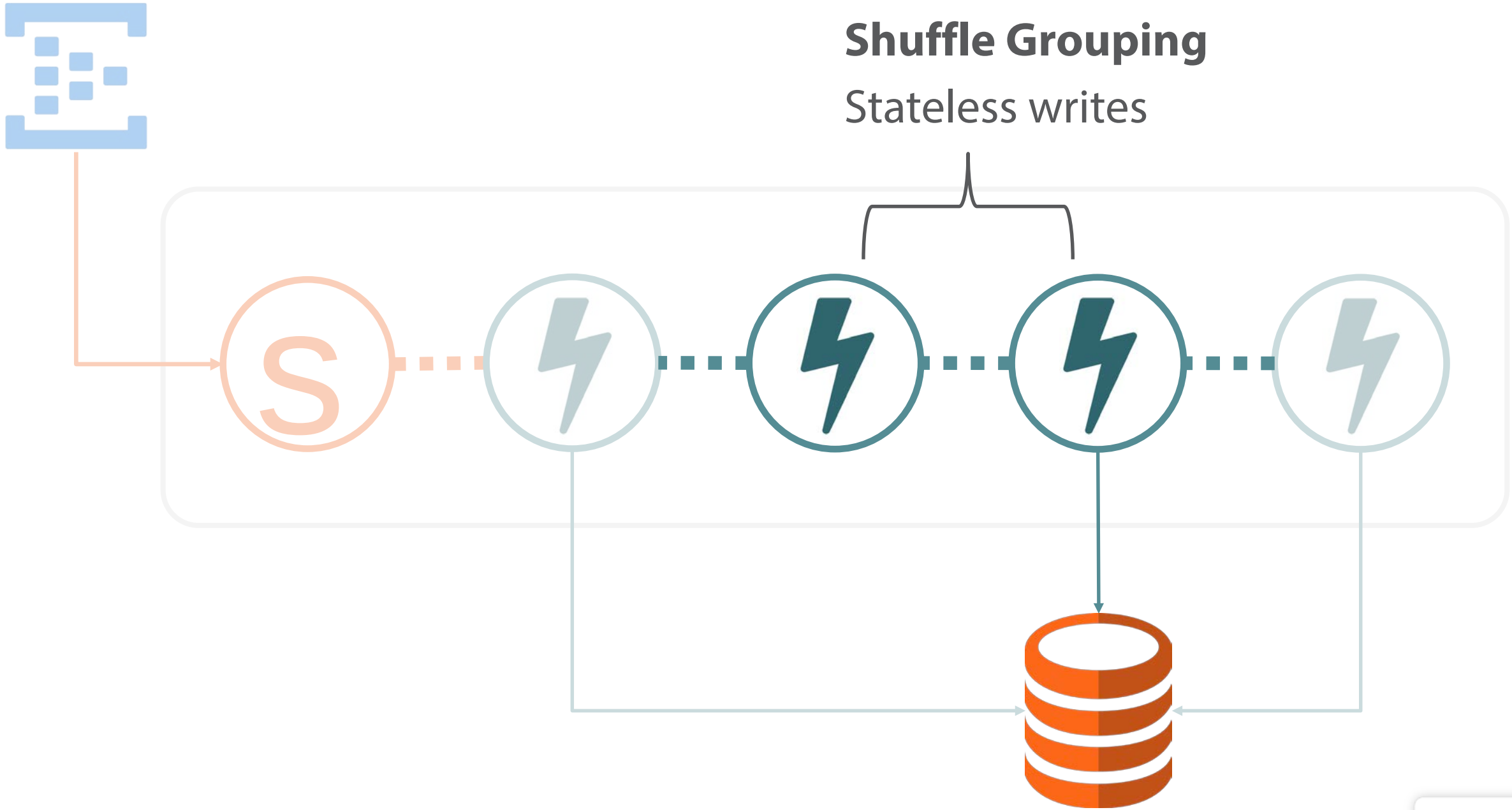
Field Grouping

By Race ID + Timer ID

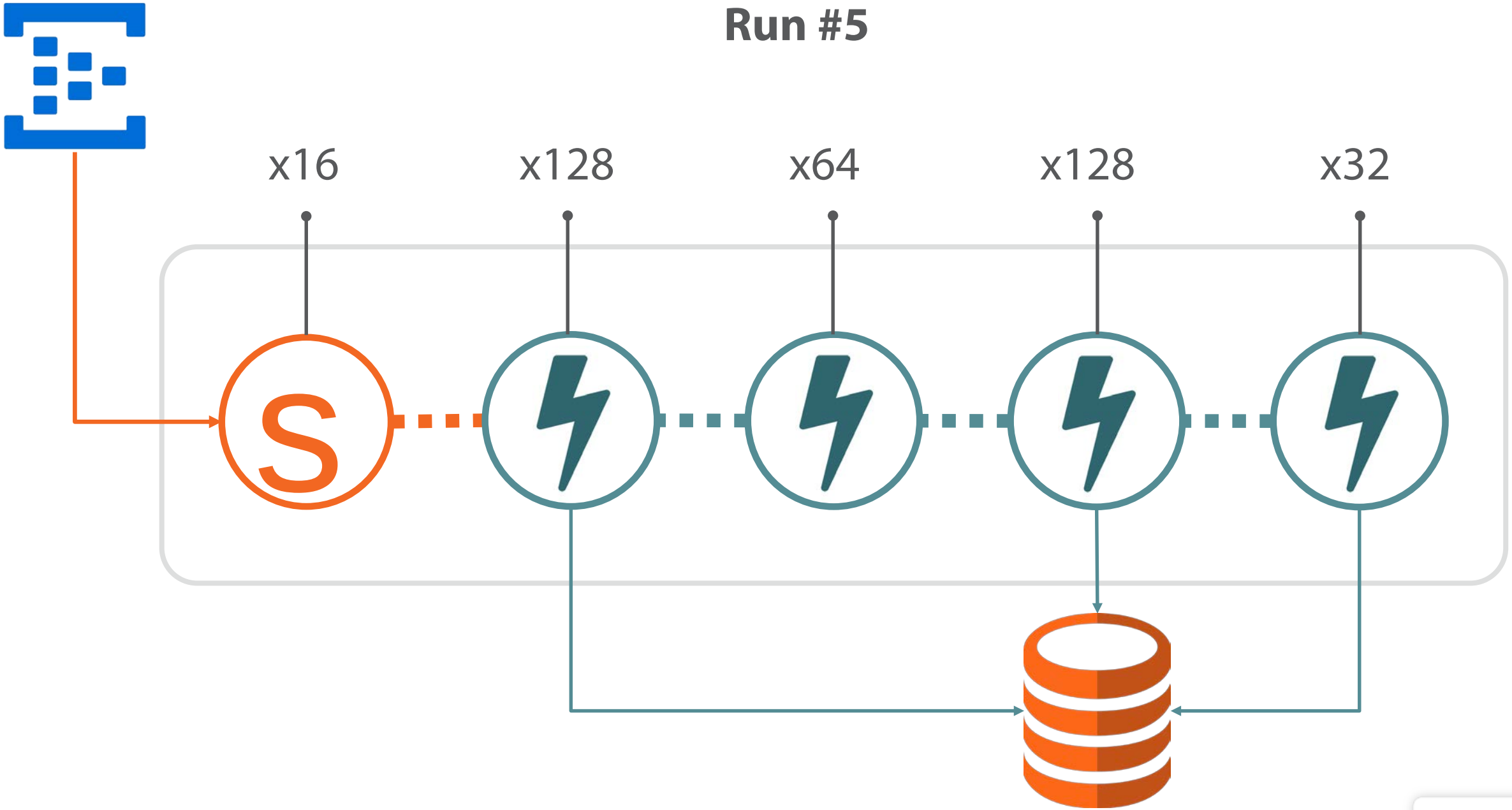


Shuffle Grouping

Stateless writes



Run #5

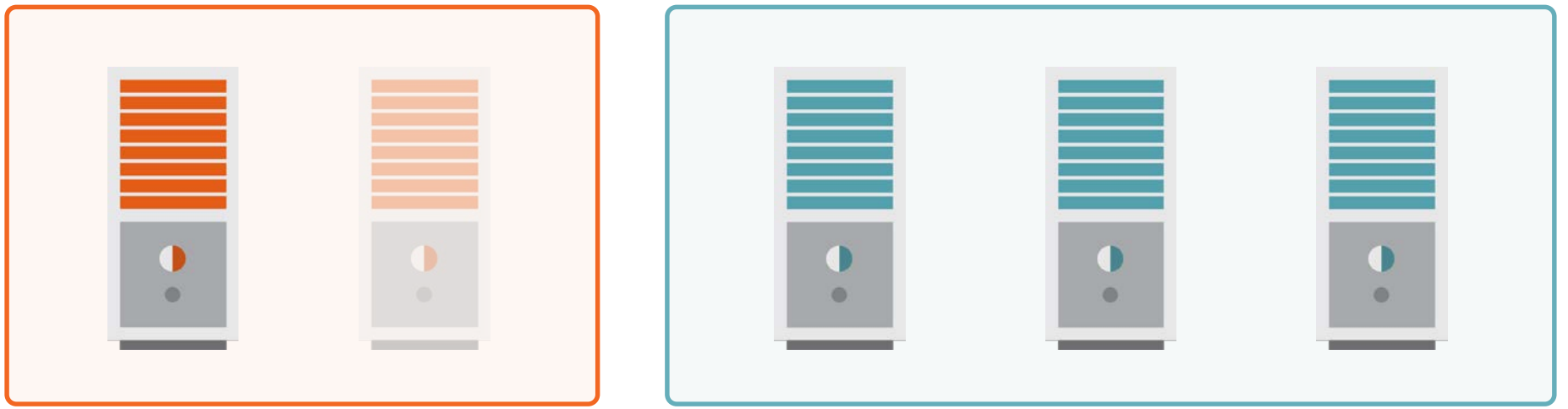


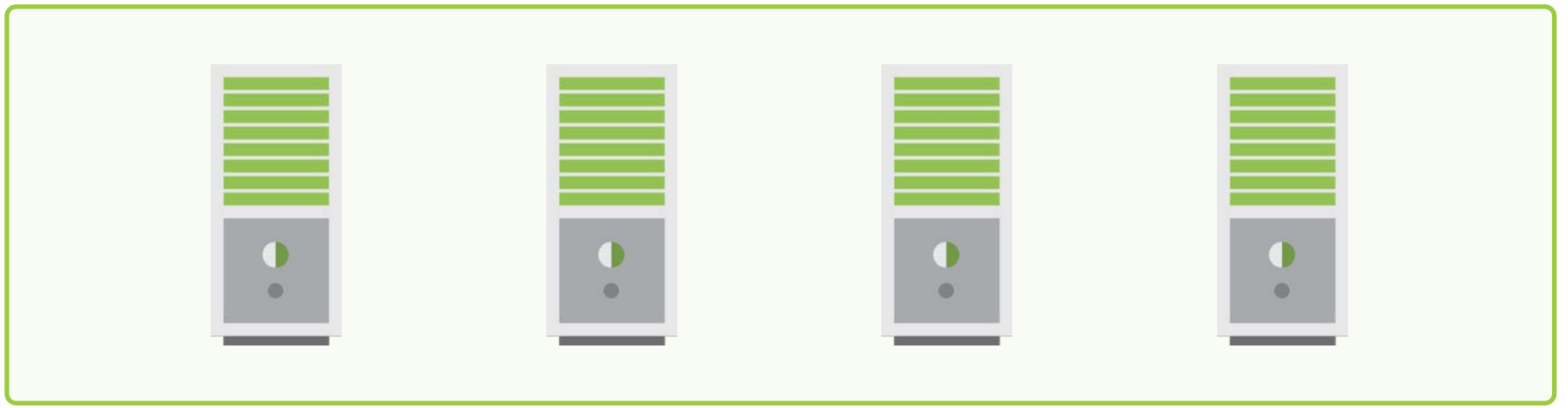
Demo: Scaling Storm

Adding Supervisor Nodes

Distributing More Workers

Performance Test

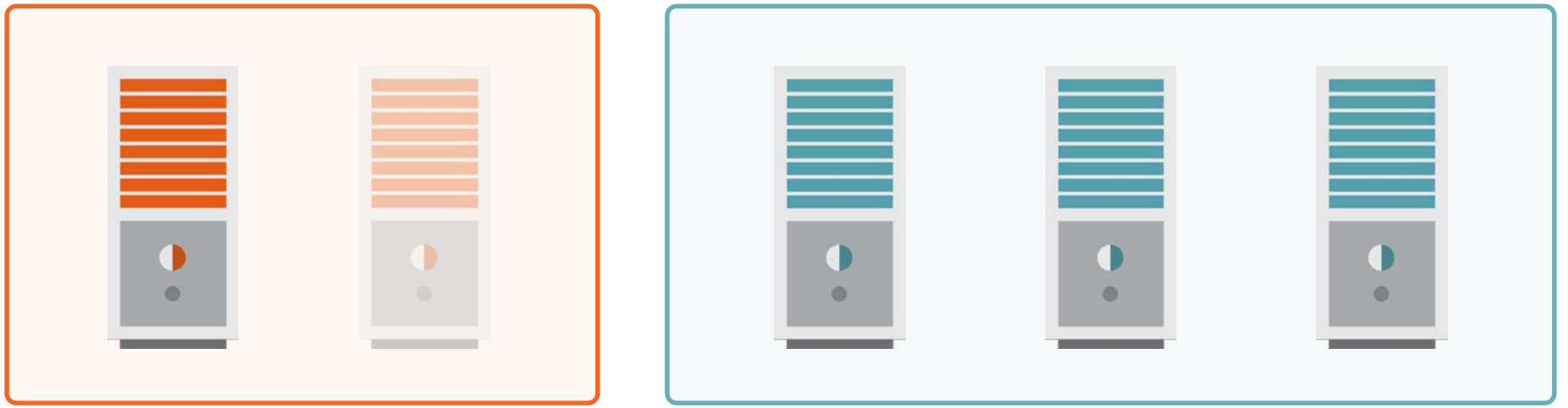




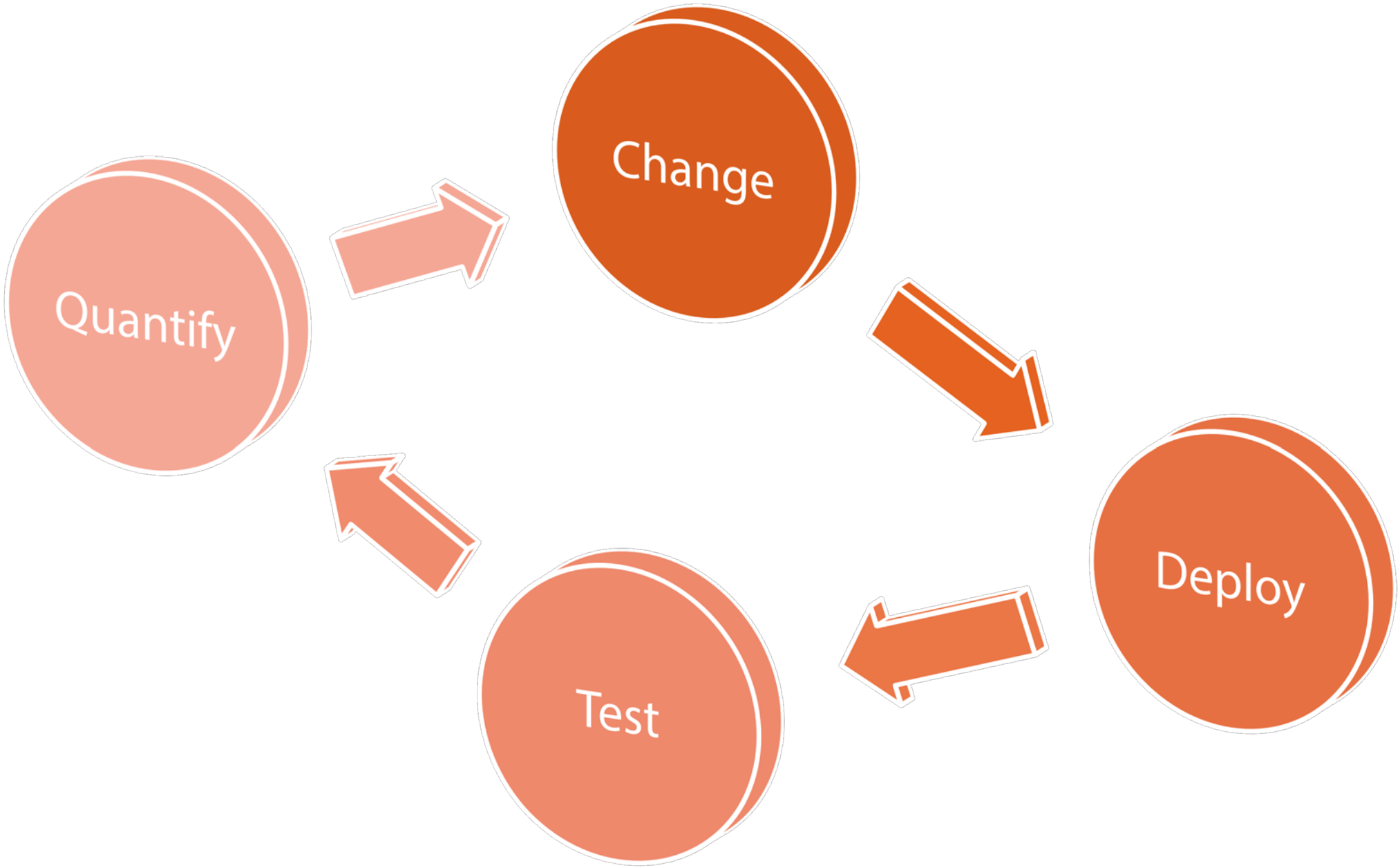
Supervisor Nodes = **44%** of compute

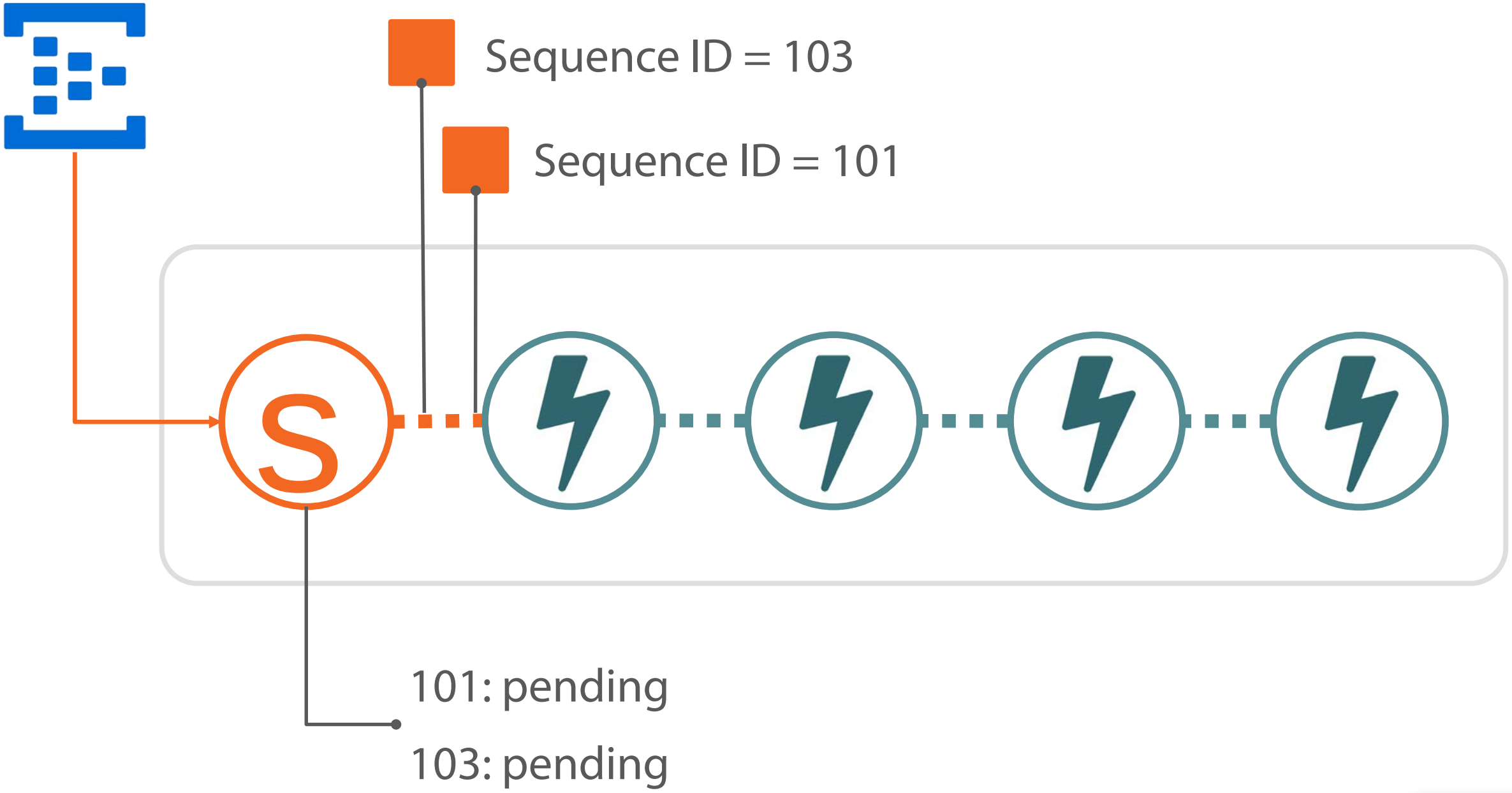
Supervisor Nodes = **62%** of compute

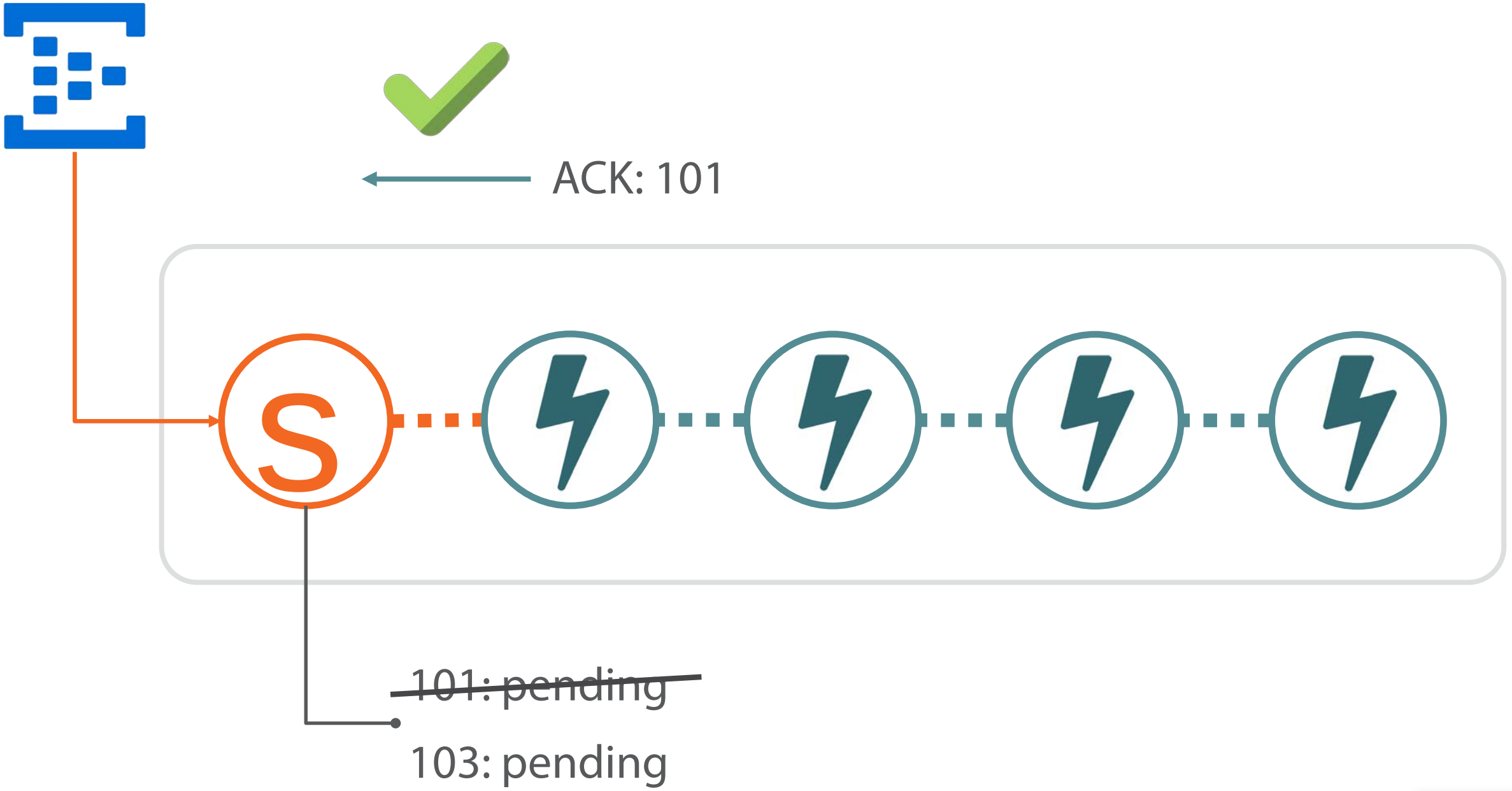
Partitions **x32**

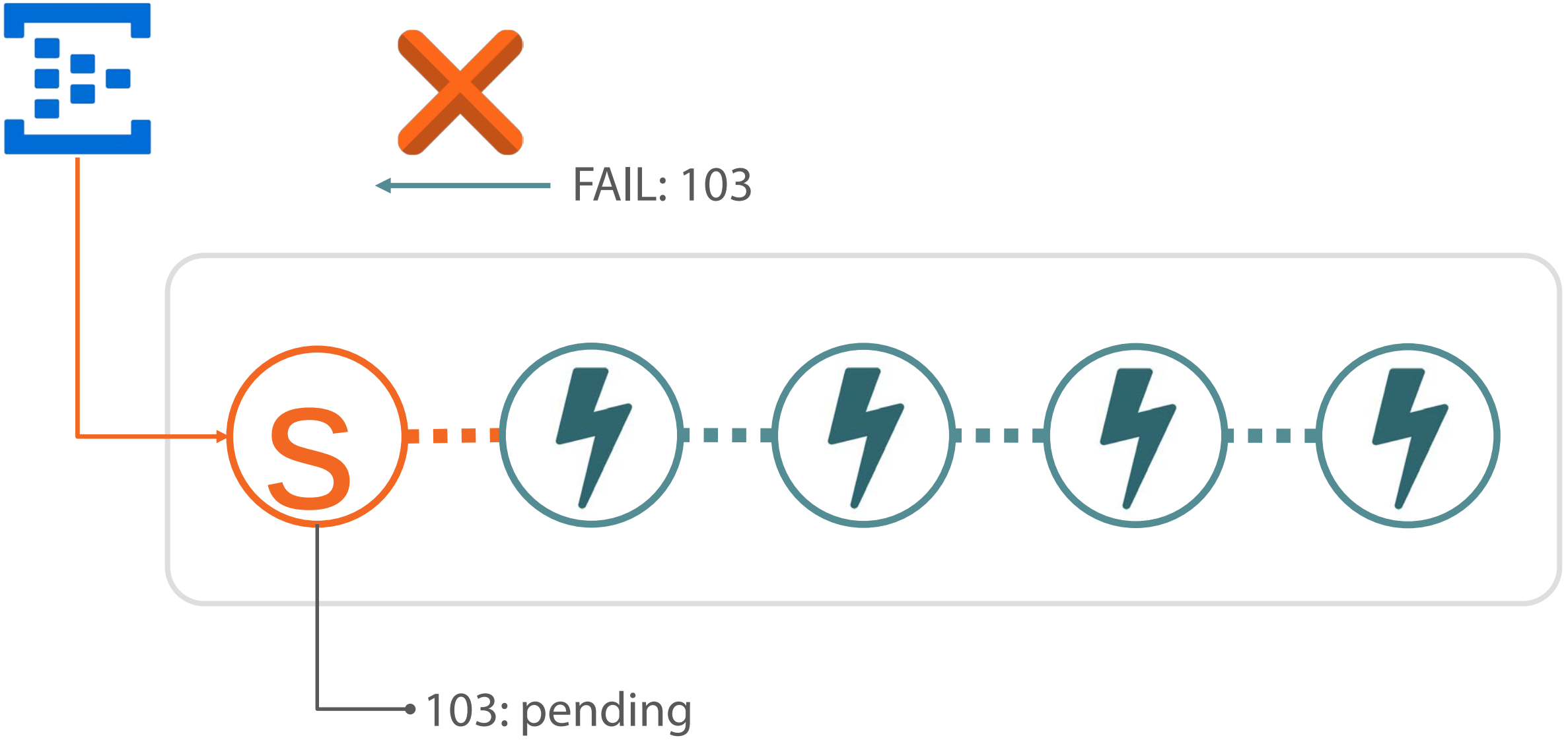


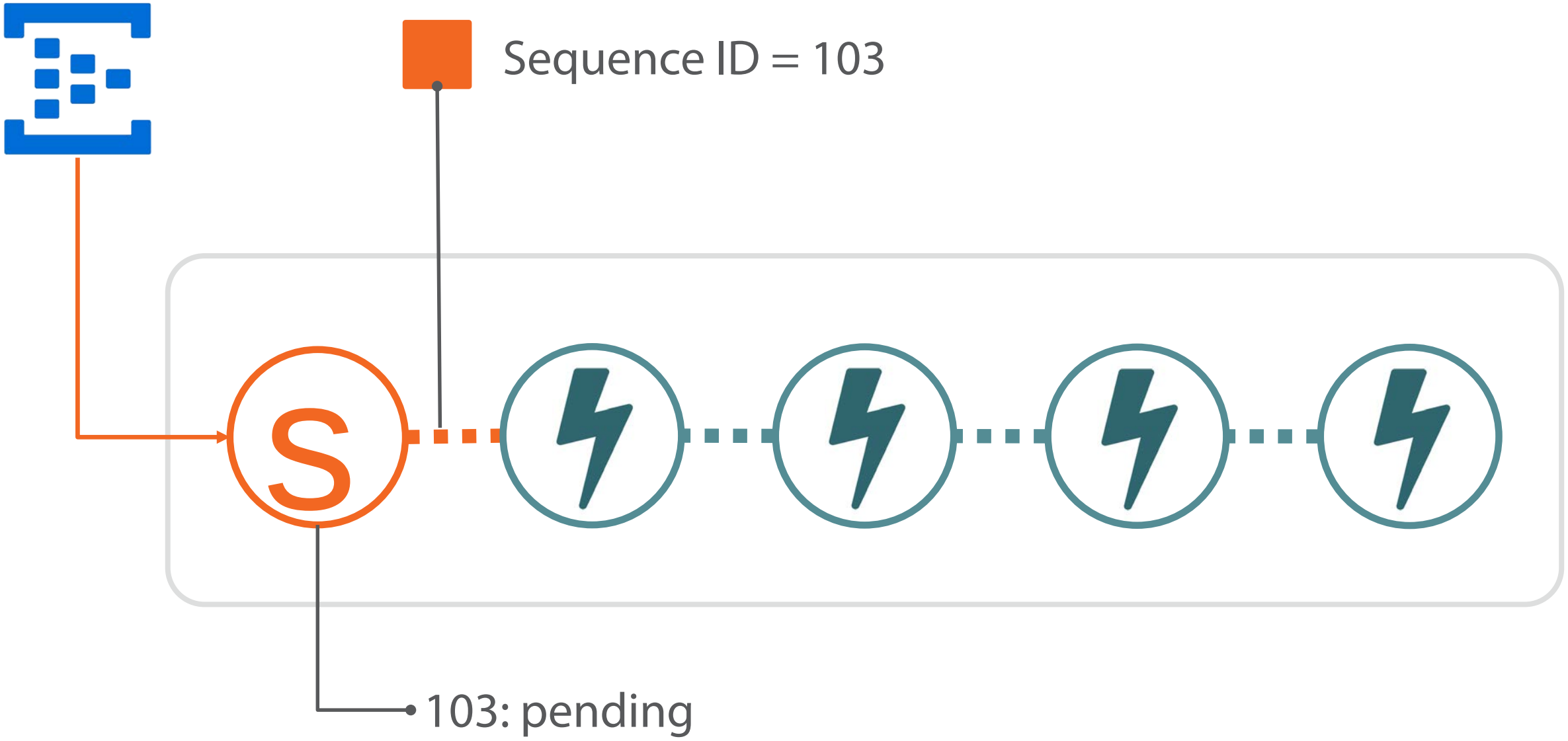
Supervisor **x8** => Workers **x8**

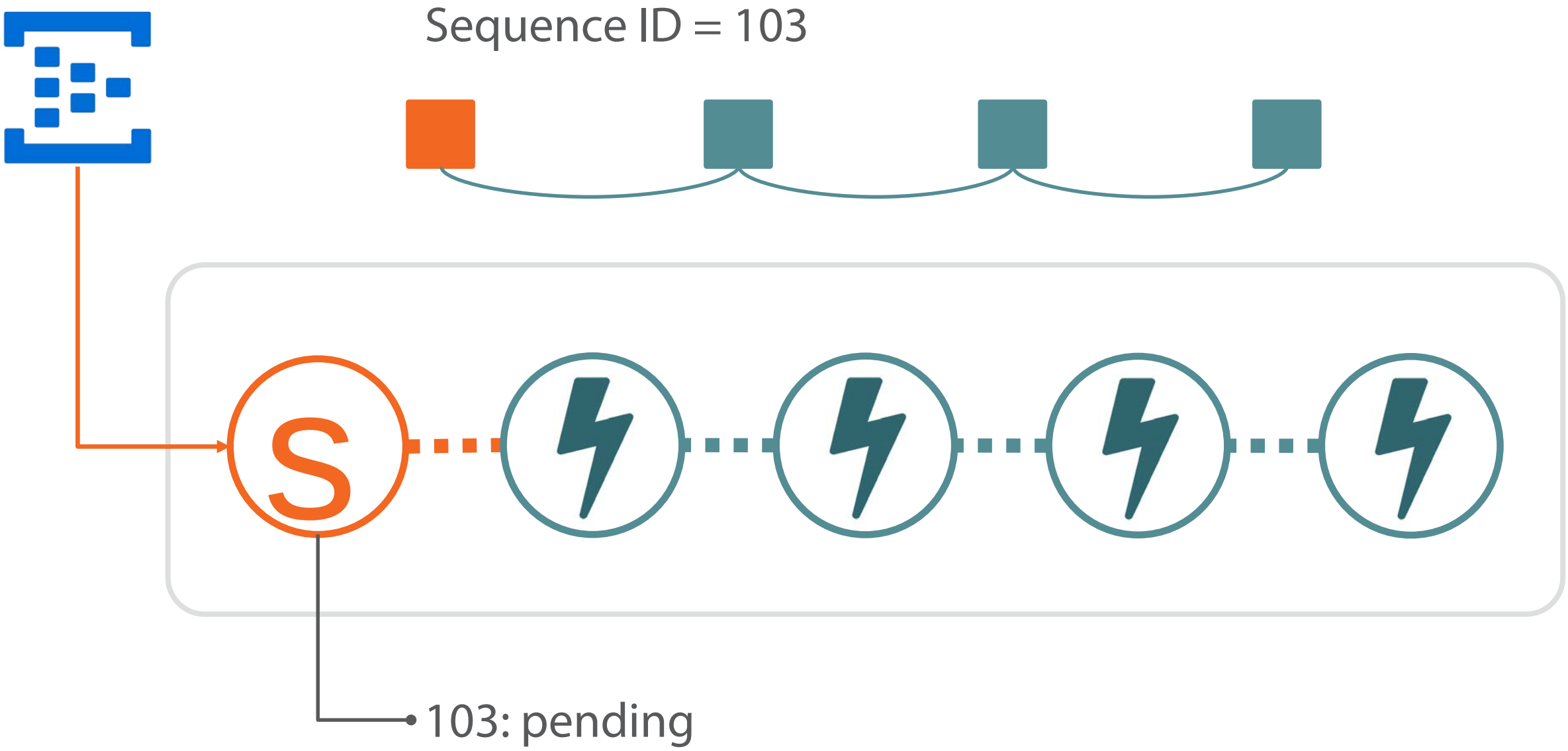


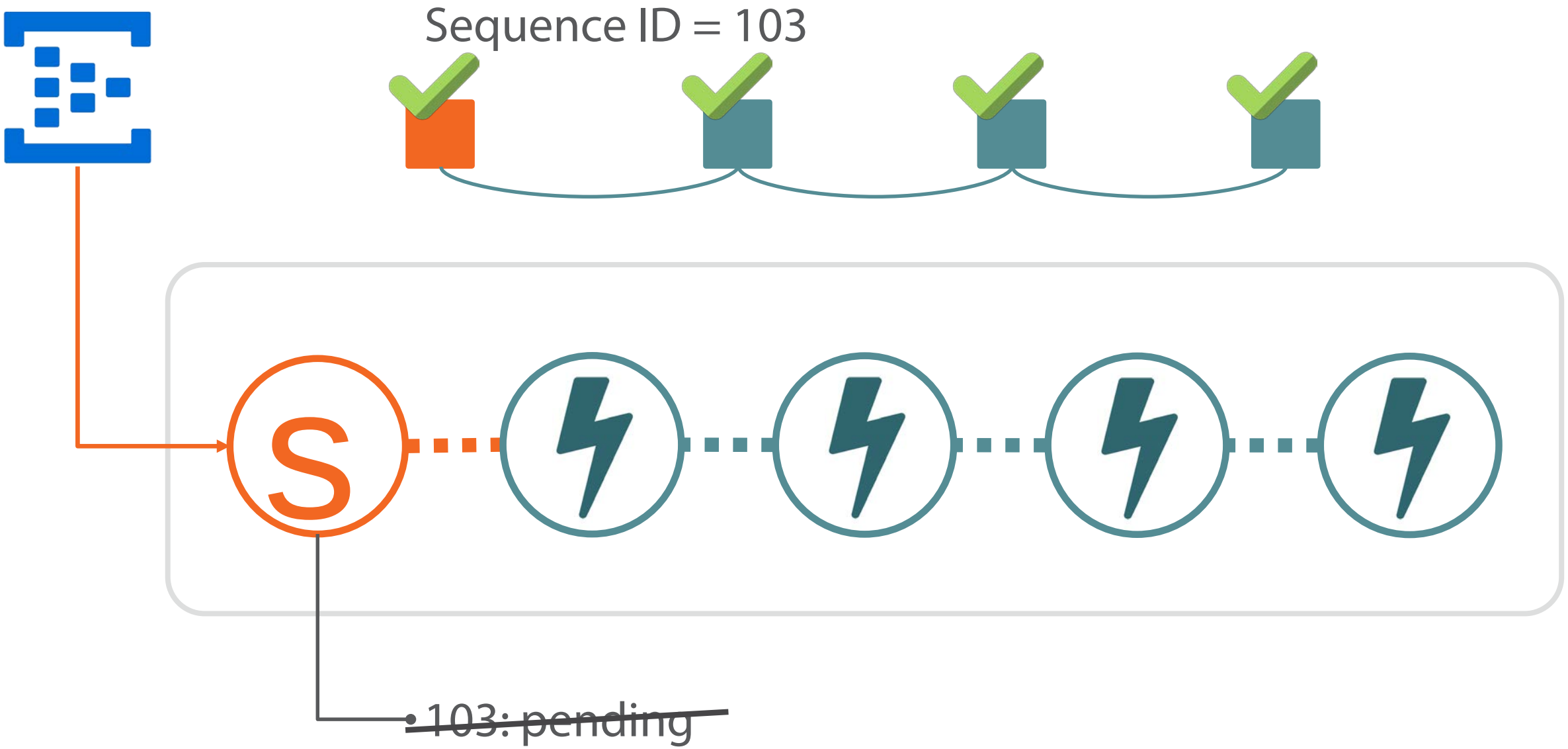

Sequence ID = 103
Sequence ID = 101
S
101: pending
103: pending

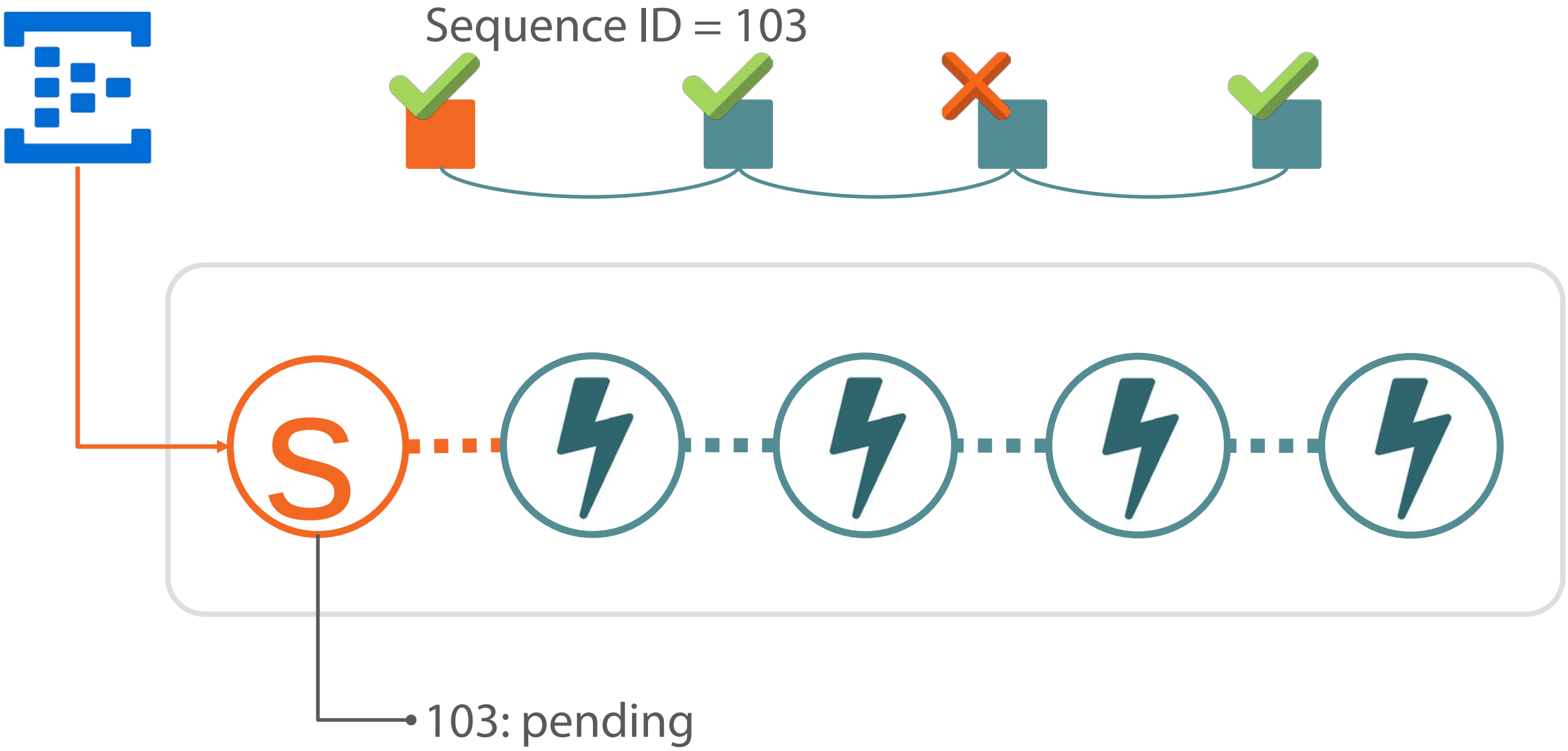

ACK: 101
S
101: pending
103: pending

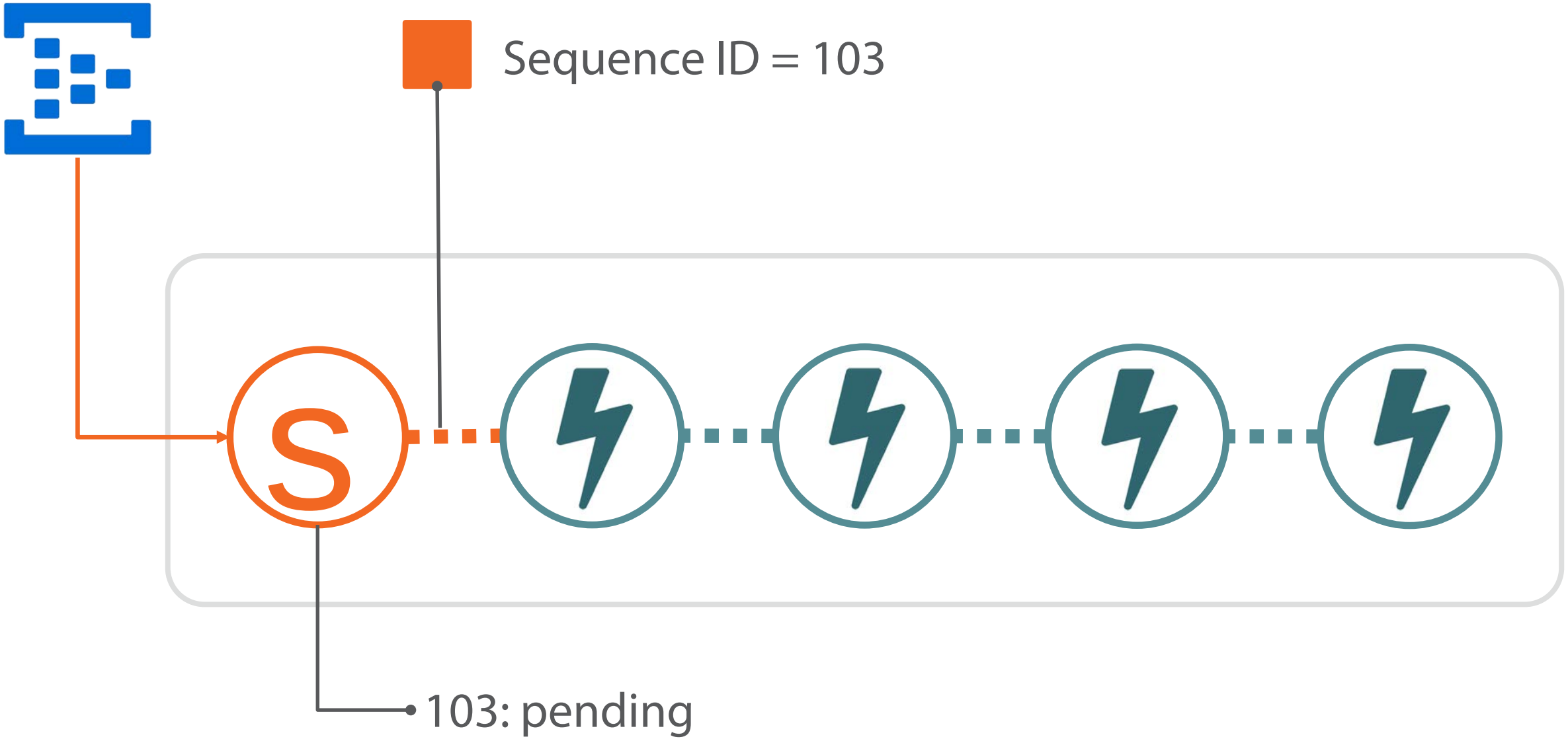

FAIL: 103
S
103: pending

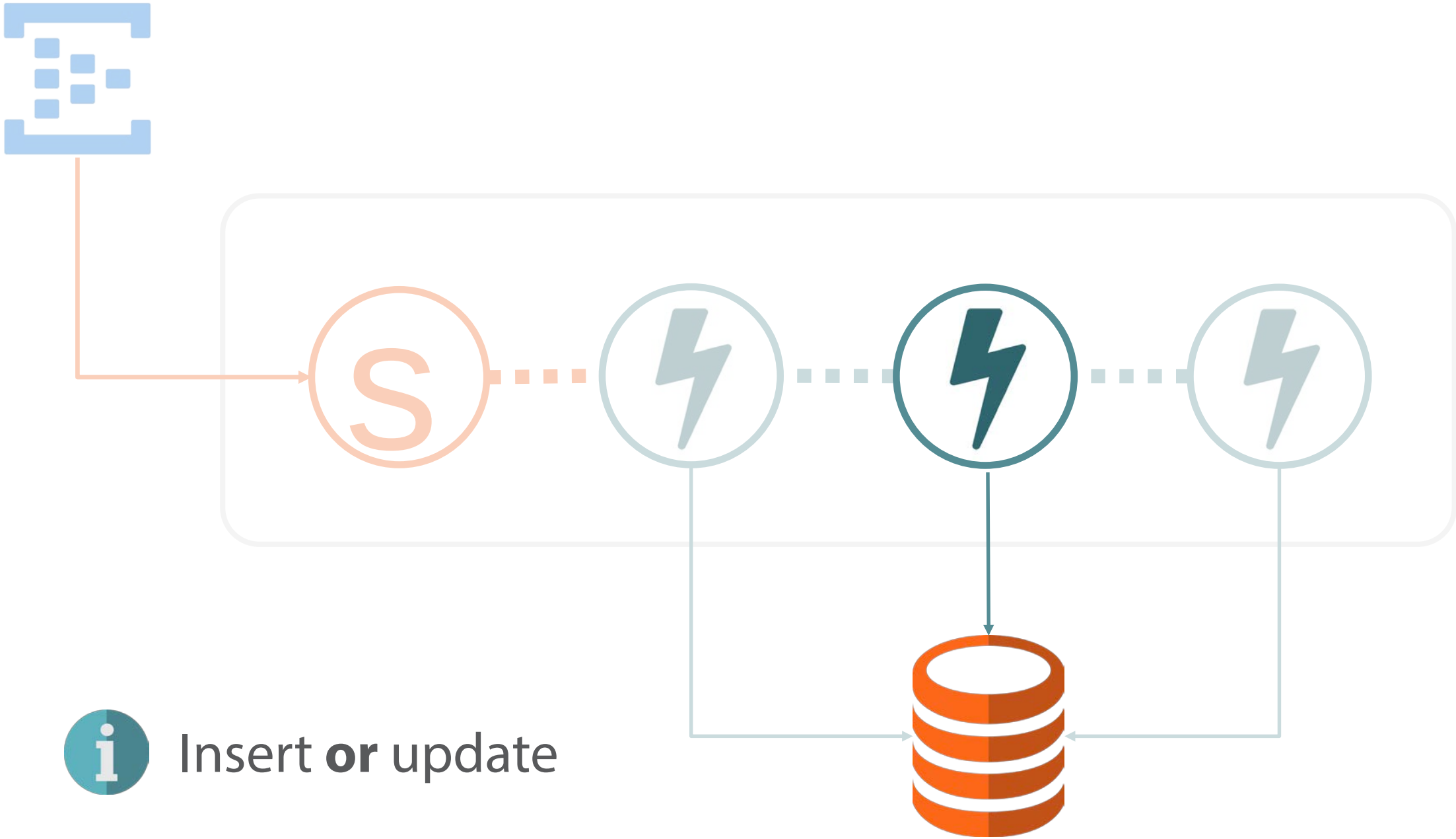





Sequence ID = 103
S
103: pending







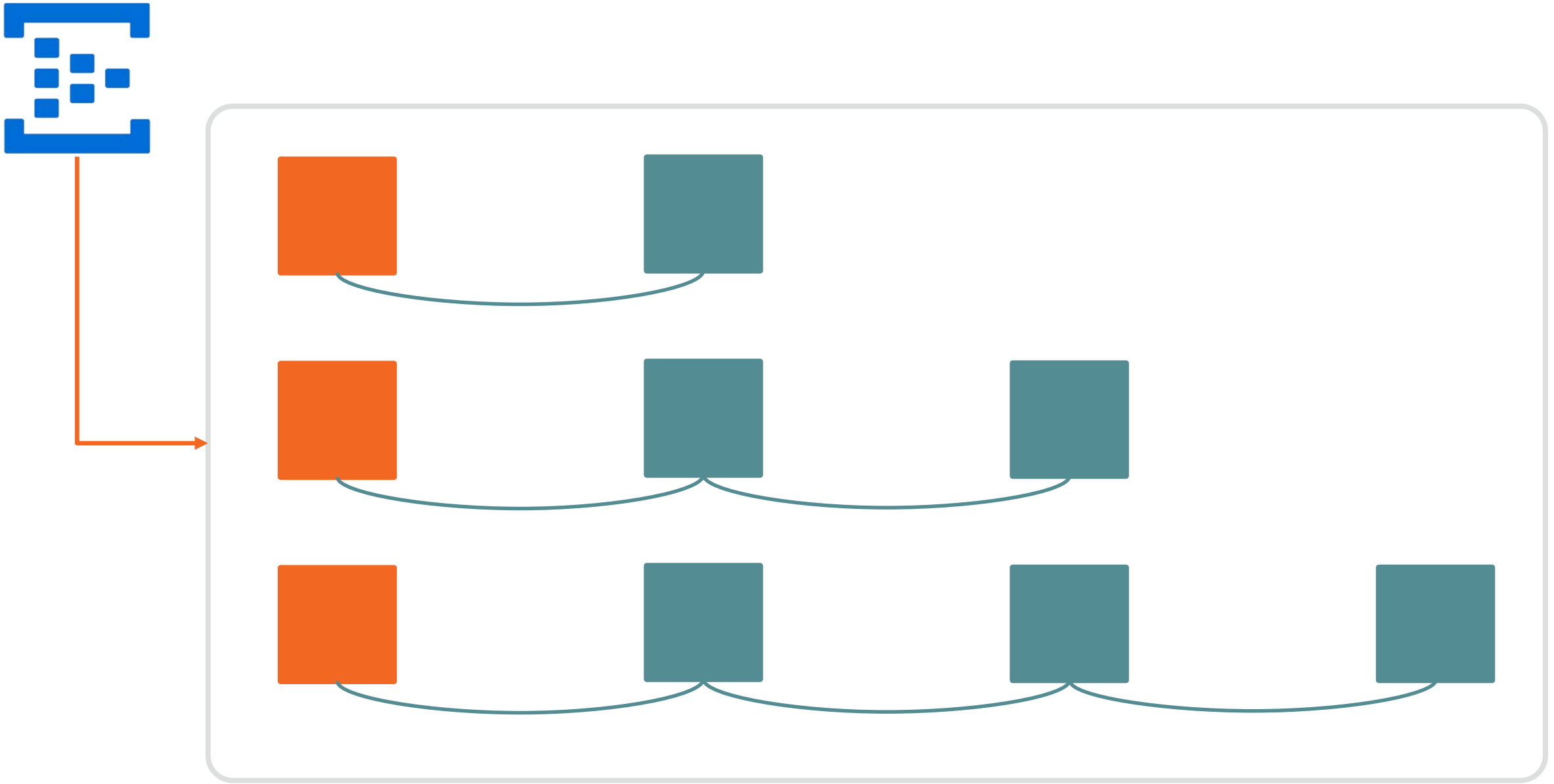
Insert **or** update

Demo: Reliable Processing

Tuple Tree

Ack and Fail

Performance Impact



Scenario 1 – Repeated data

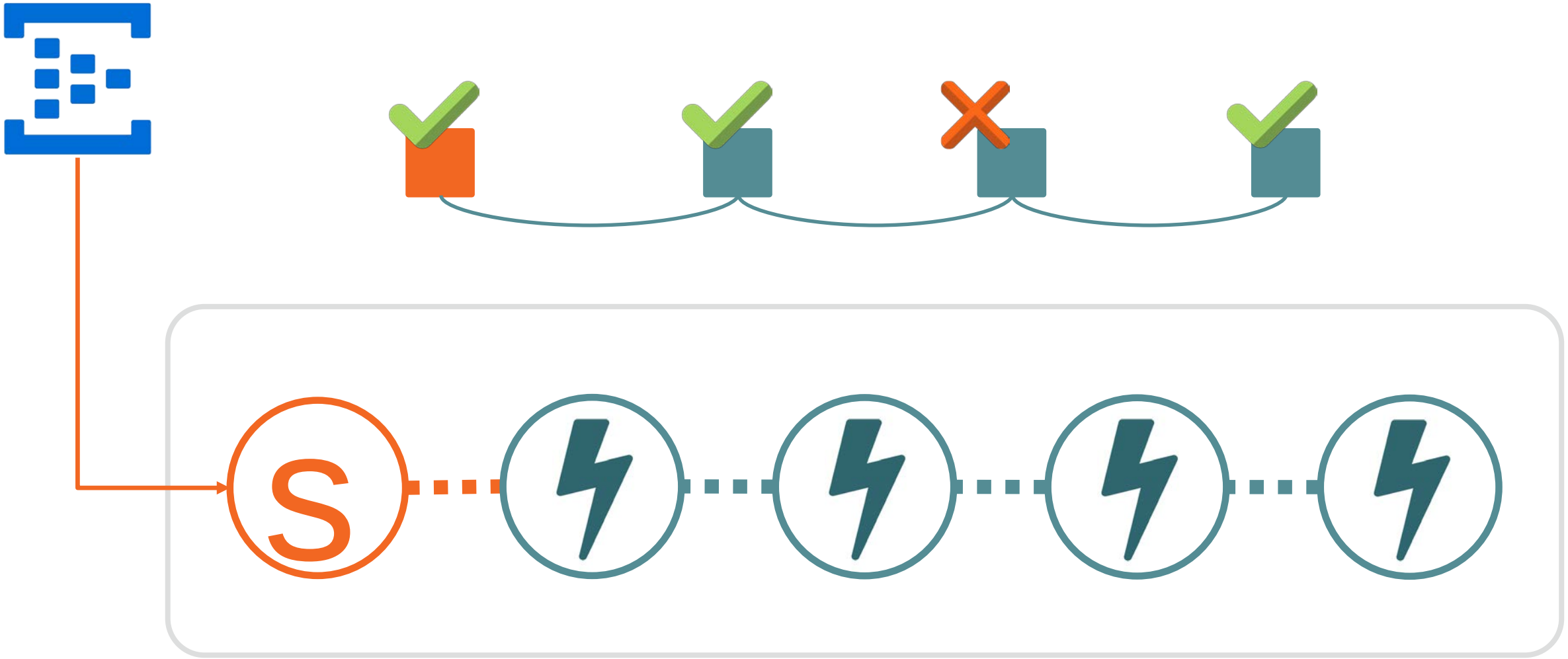
Two-tuple tree

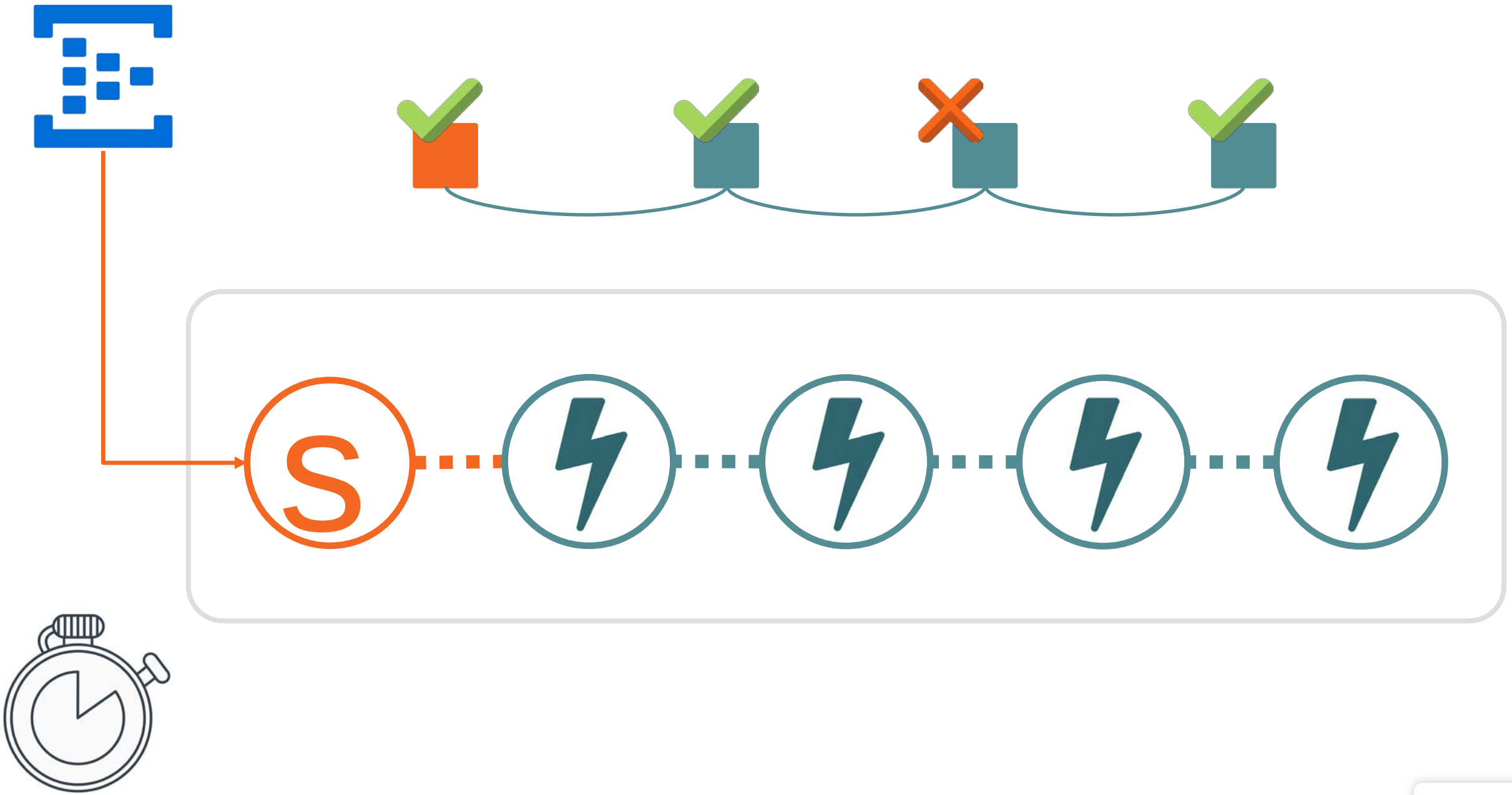
Scenario 2 – Racer Continuing

Three-tuple tree

Scenario 3 – Racer Finished

Four-tuple tree




S

Demo: Logging

Storm UI

Worker Log Files

Azure Table Storage

Demo: Custom Logging

Log4net Config

Accessing the Logger

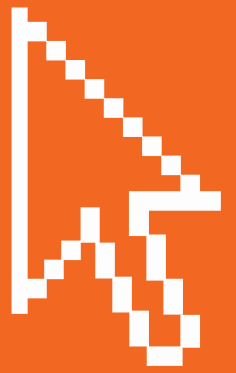
Writing Entries

Demo: Testing Storm

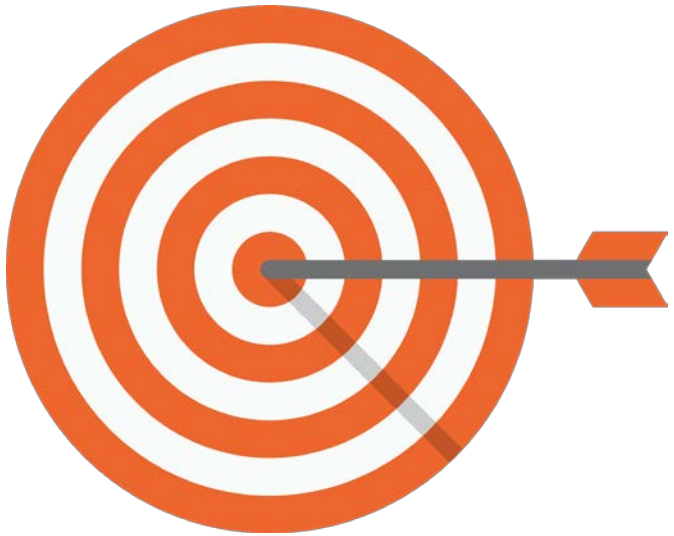
Component Unit Tests

Topology Integration Tests

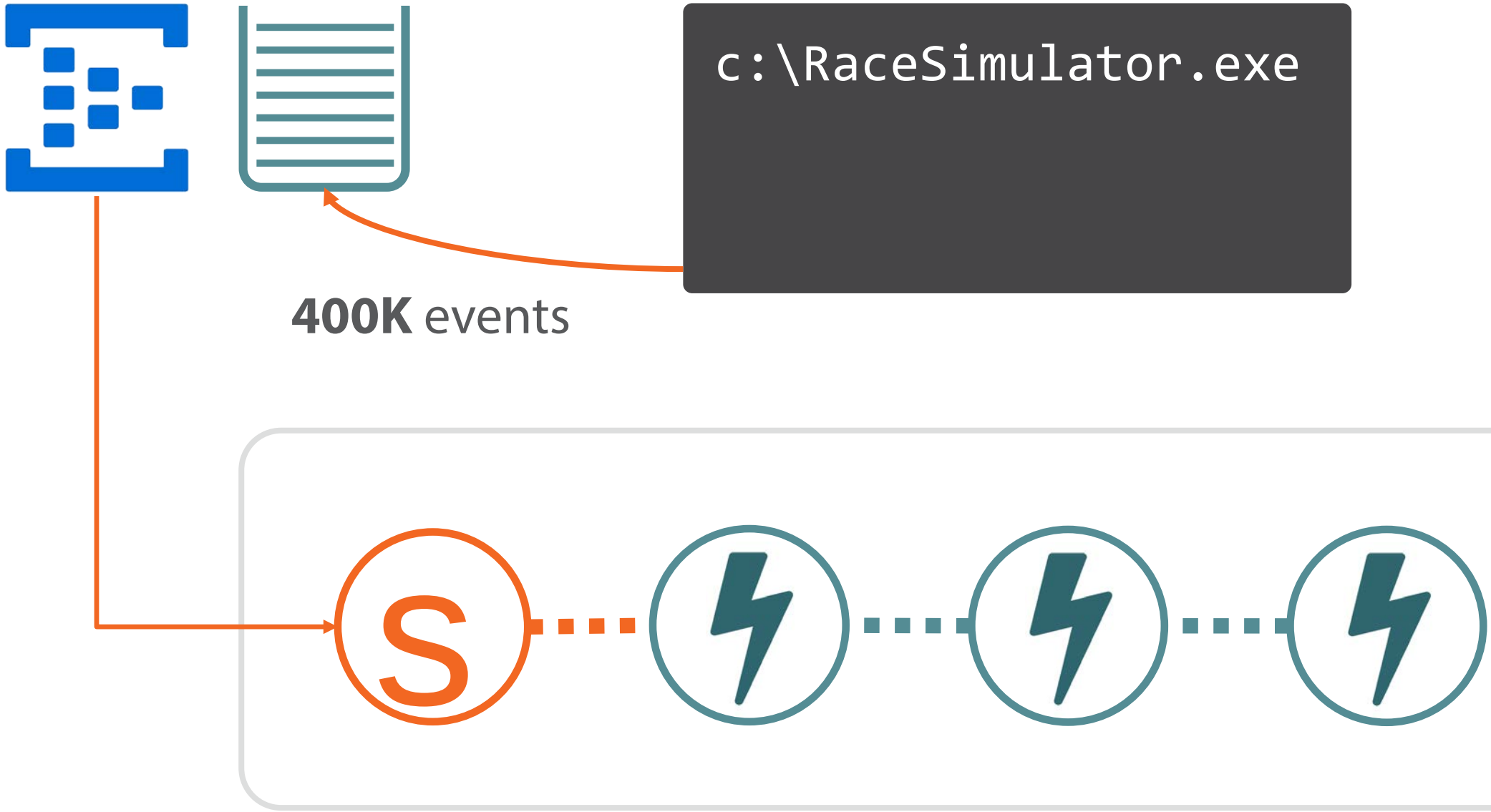
End-to-End Tests

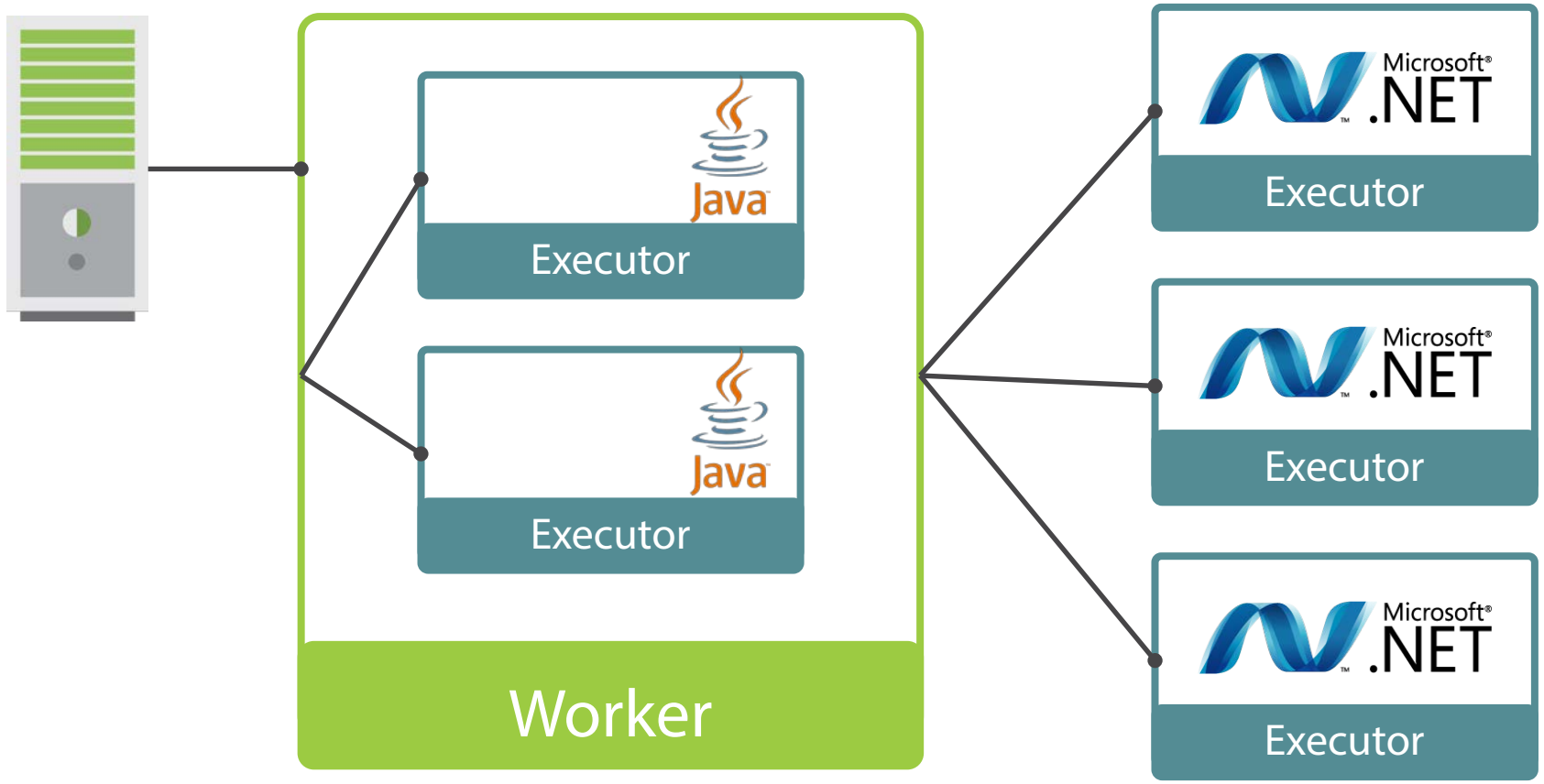


Module Goals



- Storm Cluster Architecture
- Runtime Compute Structure
- Performance Tuning
- Guaranteed Processing
- Monitoring & Testing





workers

executors

Tuning Guidelines

Workers: 1 per supervisor

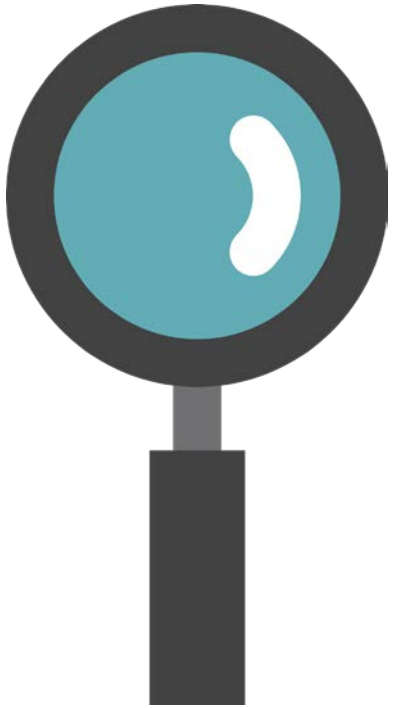
Spouts: 1 per partition

CPU-bound Bolts: 1 per core

I/O-bound Bolts: 1-10 per core

Or more...

Coming Next



- Apache Hive
- Mapping & Querying HBase
- Joining Across Stores
- Writing Output to Azure