

The Evolution of Hadoop at Spotify

Through Failures and Pain



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Note: Our views are our own and don't necessarily represent those of Spotify.

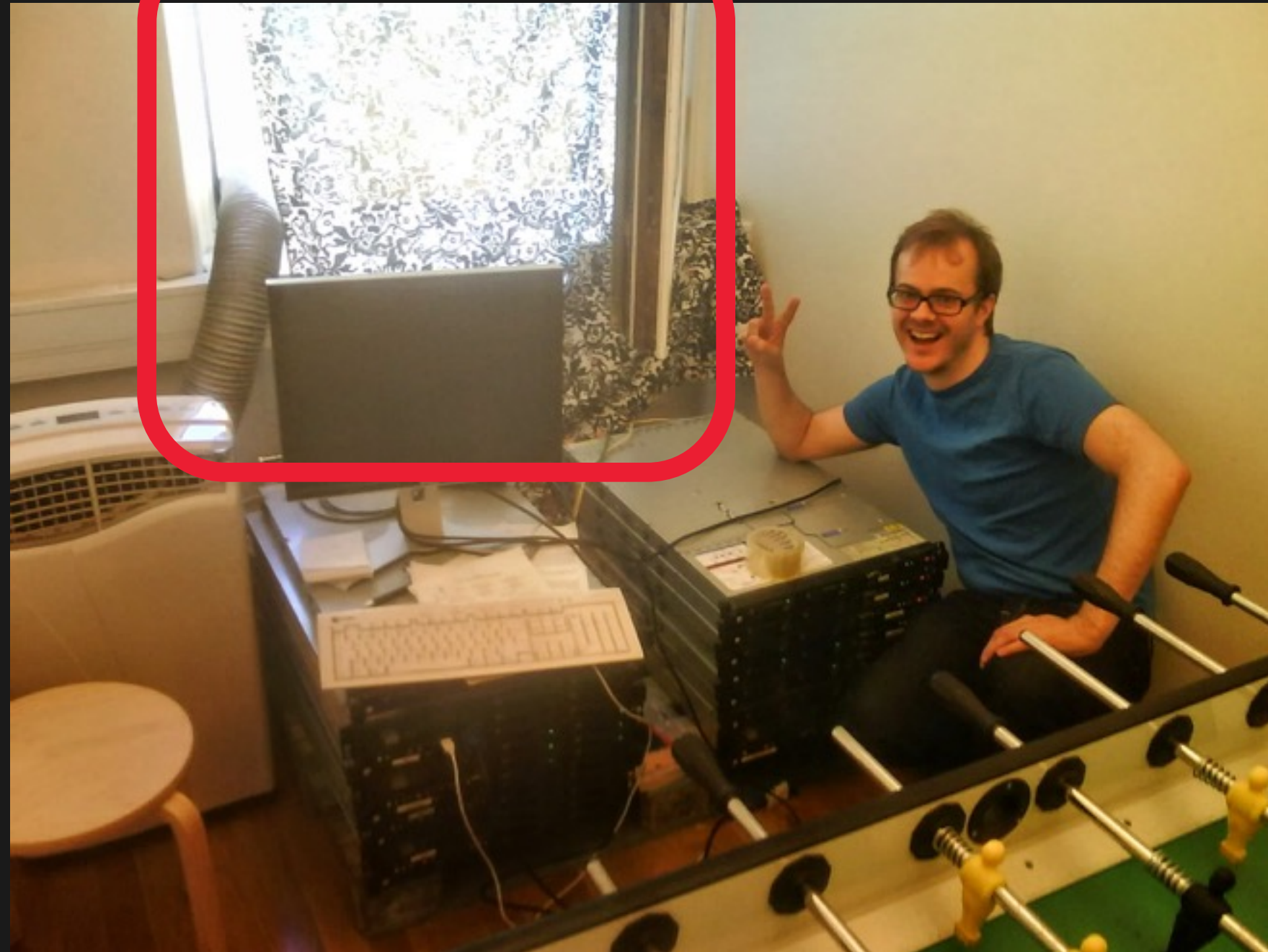
Overview

- Growing Pains (2009-2012)
- Gaining Focus (2013 - 2014)
- The Future (2015+)

Our First Major Hadoop Bug



Cluster 1.0



Cluster 1.0

What is Spotify?

- Music Streaming Service
- Browse and Discover Millions of Songs, Artists and Albums
- Launched in October 2008
- December 2014:
 - 60 Million Monthly Users
 - 15 Million Paid Subscribers



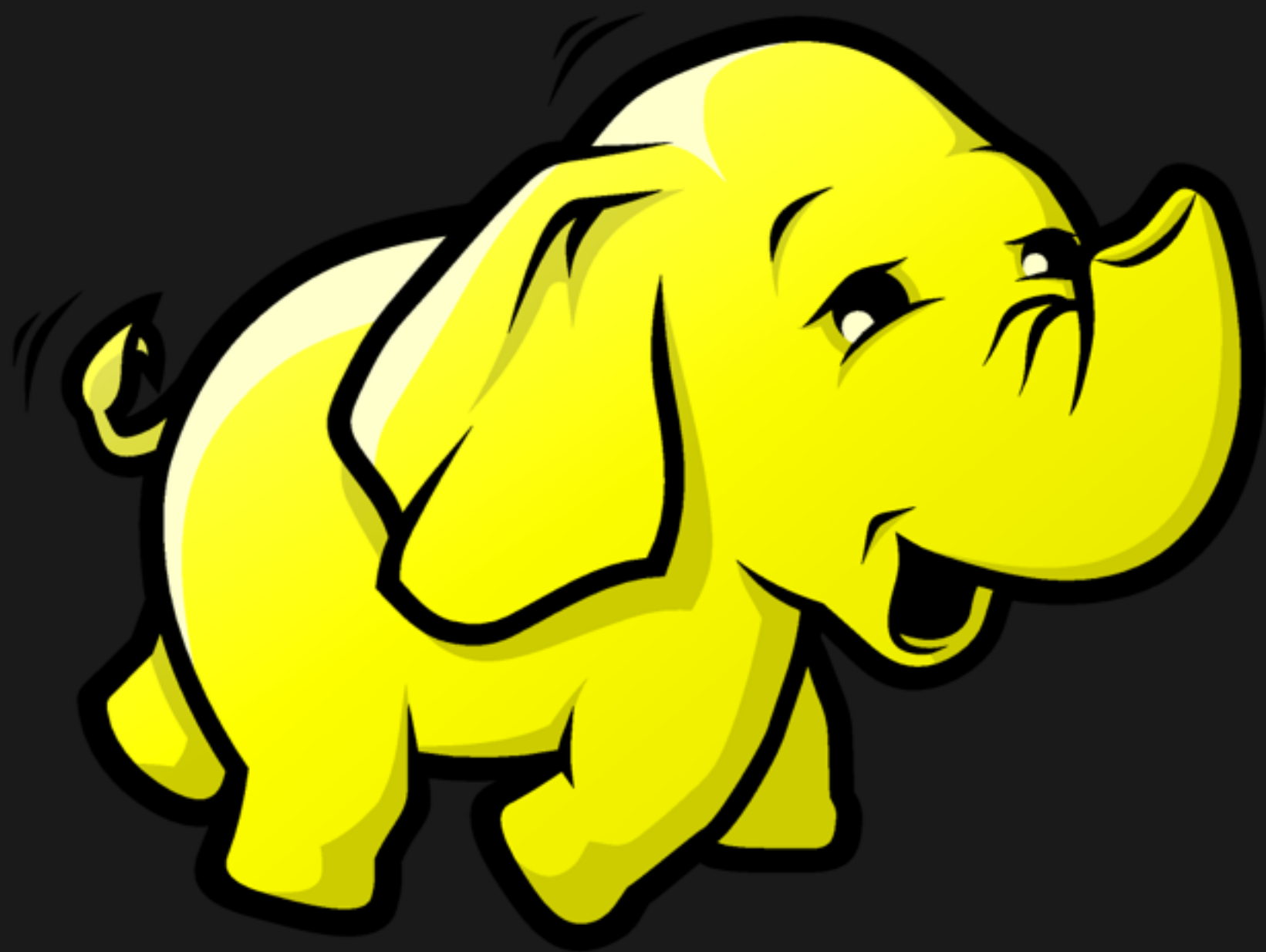
What is Spotify?

- Data Infrastructure:
 - 1300 Hadoop Nodes
 - 42 PB Storage
 - 20 TB data ingested via Kafka/day
 - 200 TB generated by Hadoop/day



```
select artist_id, count(1)
  from user_activities
 where play_seconds > 30
 group by artist_id;
```

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0	*	*	*	*	spotify-core	hadoop jar hourly_import.jar
15	*	*	*	*	spotify-core	hadoop jar hourly_listeners.jar
30	*	*	*	*	spotify-analytics	hadoop jar user_funnel_hourly.jar
*	1	*	*	*	spotify-core	hadoop jar daily_aggregate.jar
*	2	*	*	*	spotify-core	hadoop jar calculate_royalties.jar
*/2	22	*	*	*	spotify-radio	hadoop jar generate_radio.jar

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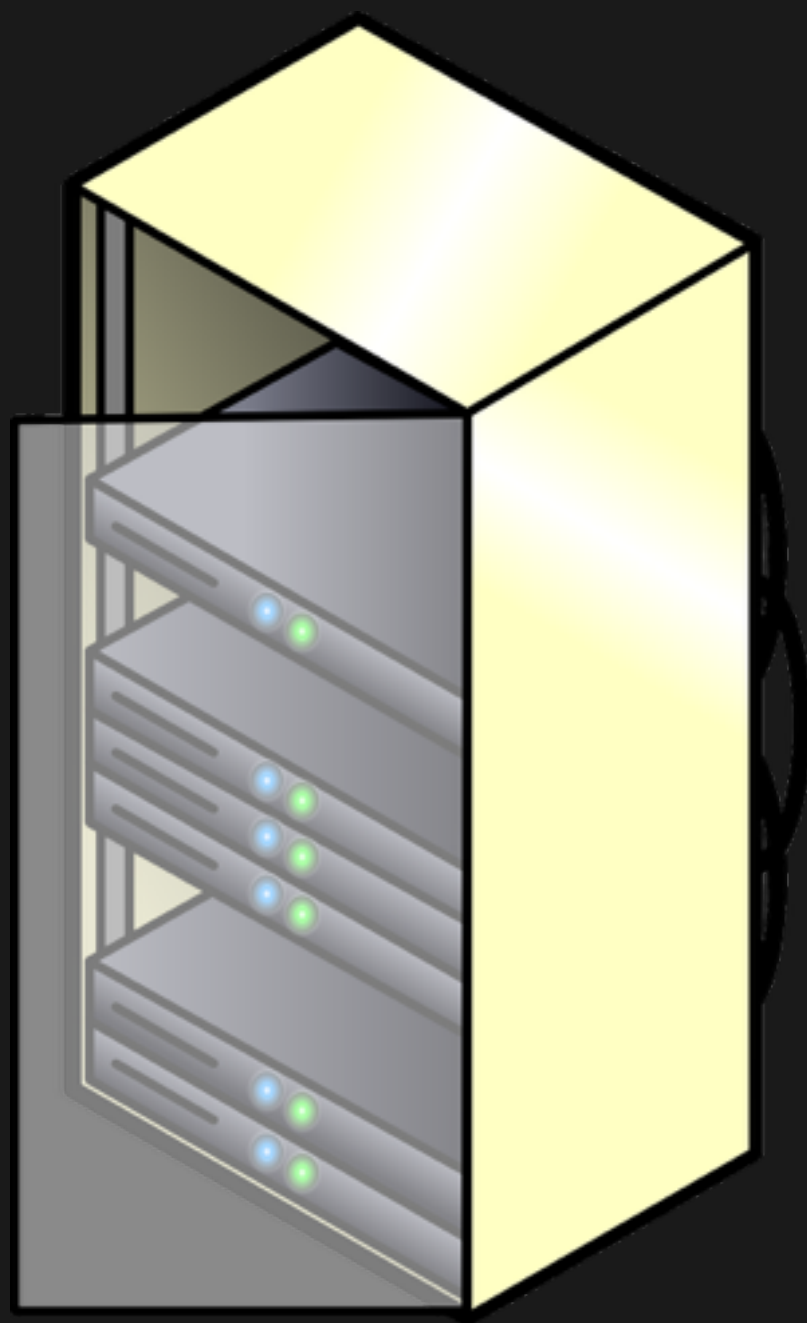
Handles the ‘plumbing’ for Hadoop jobs

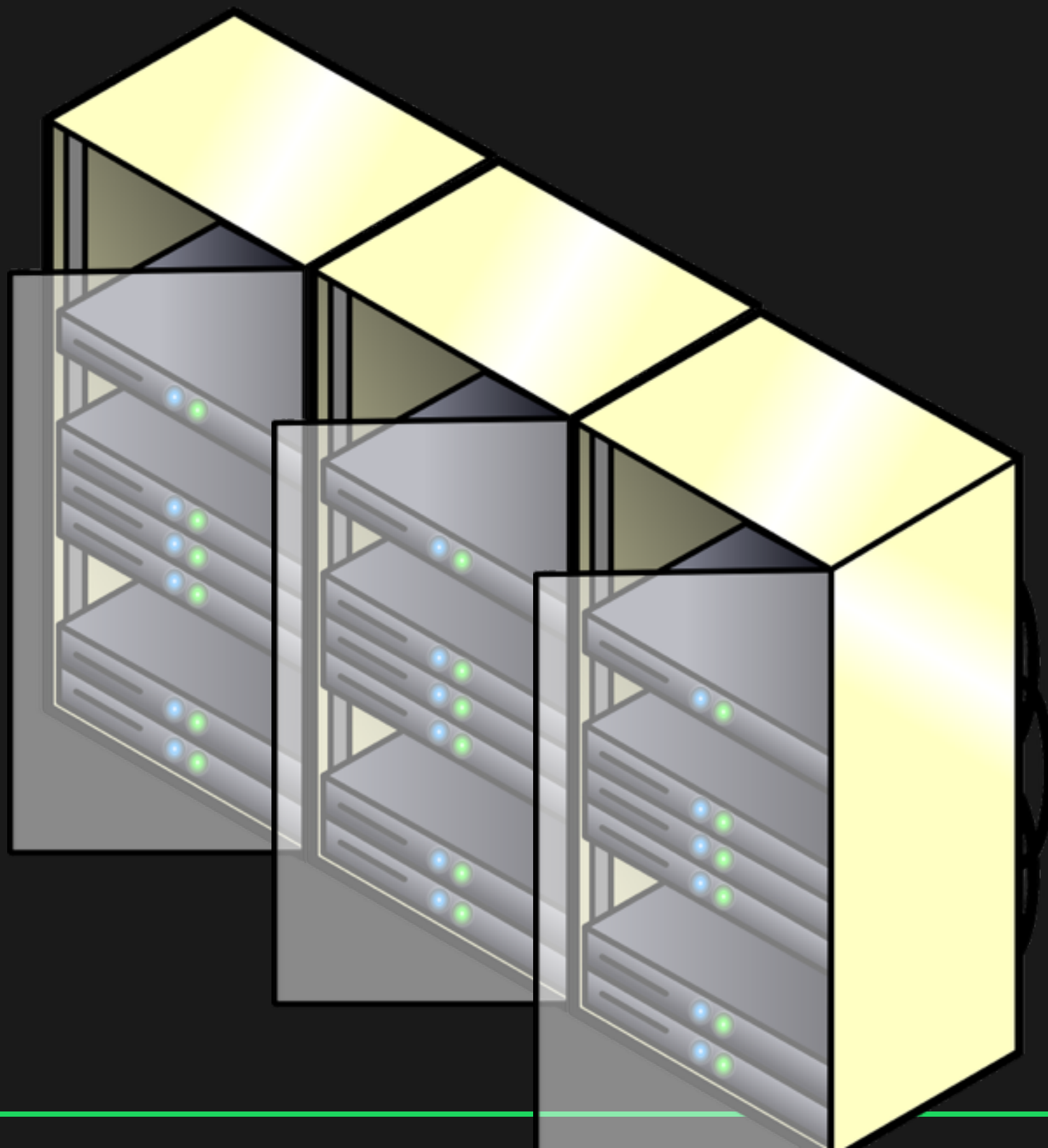
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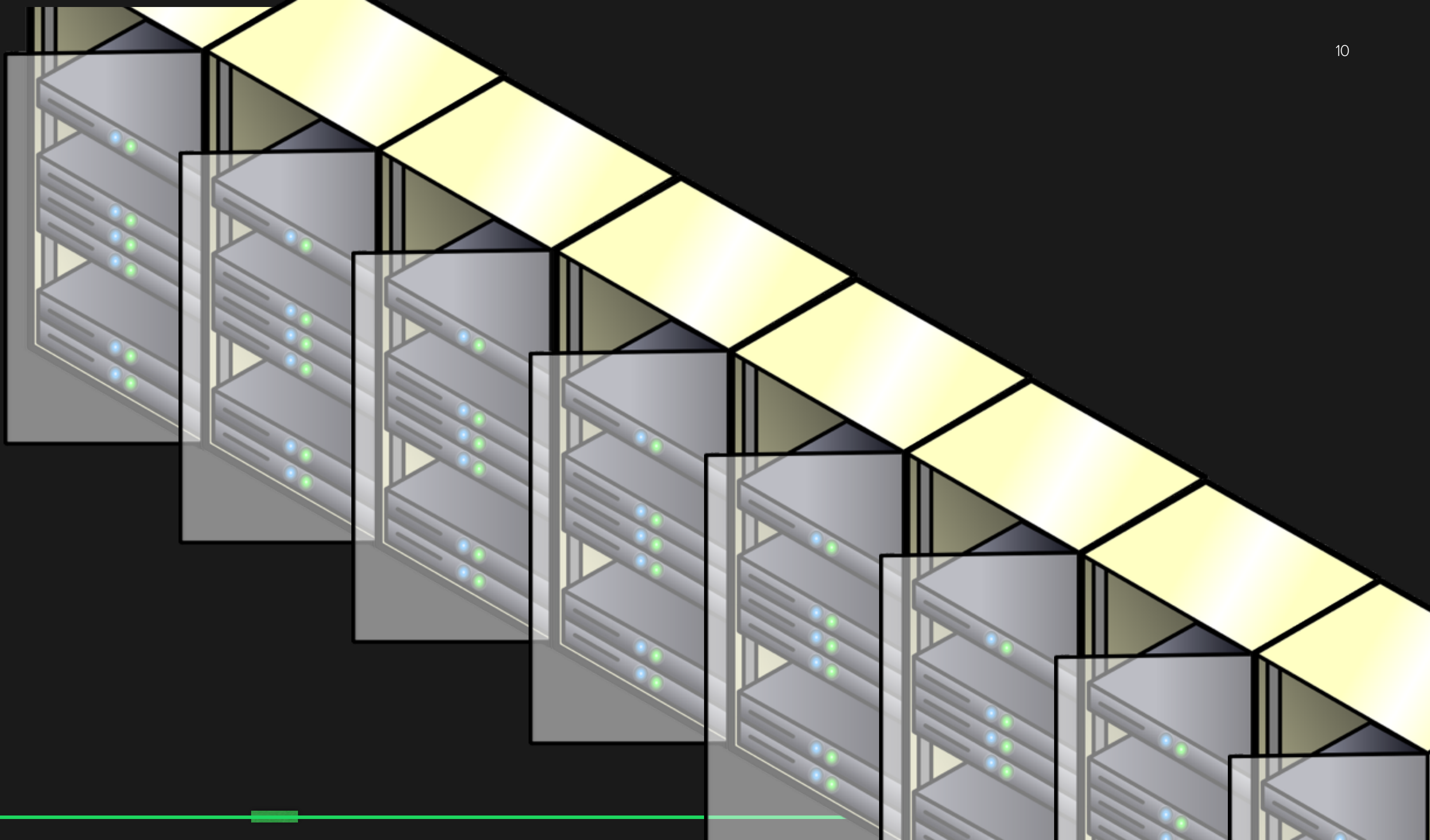


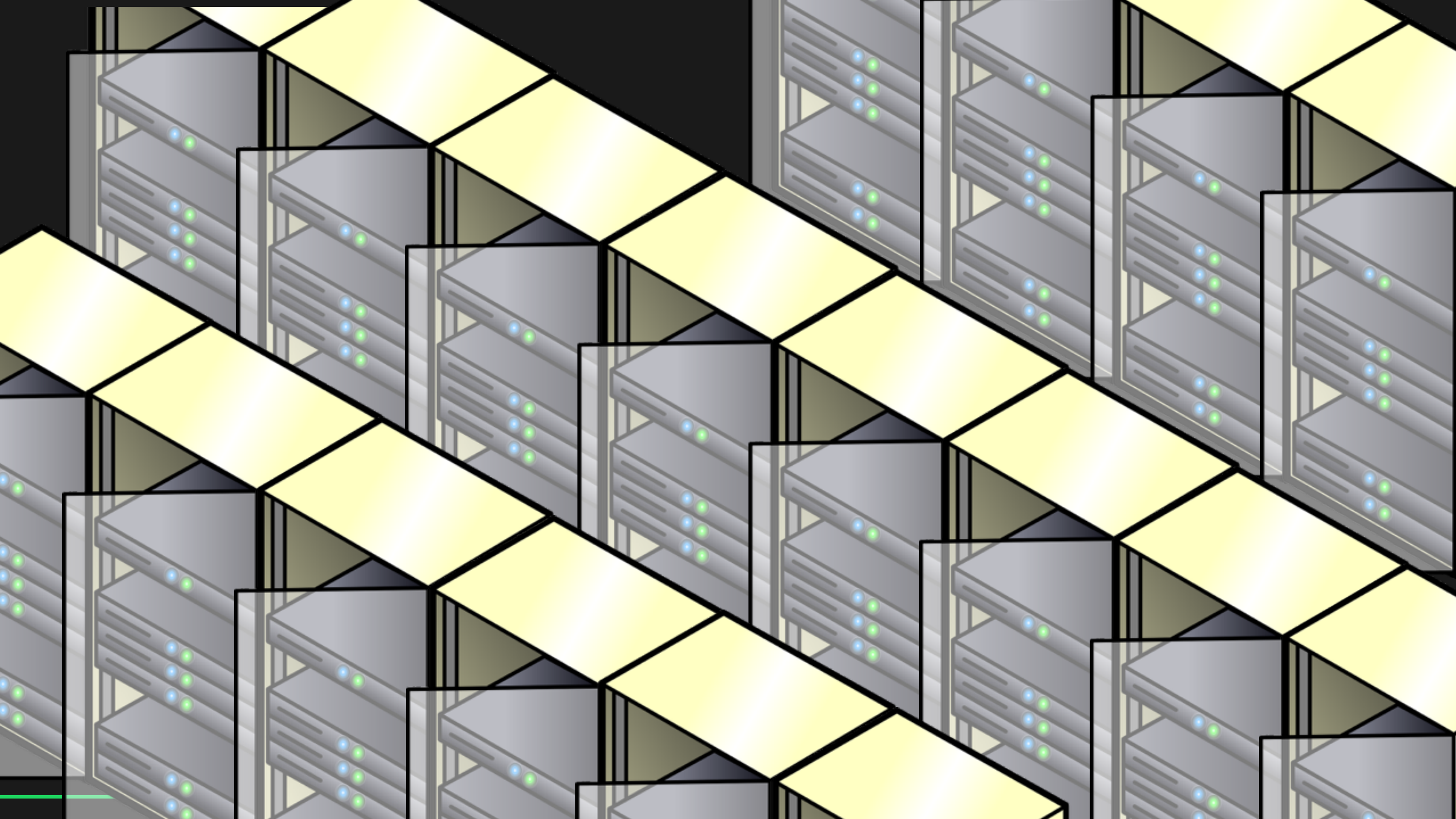
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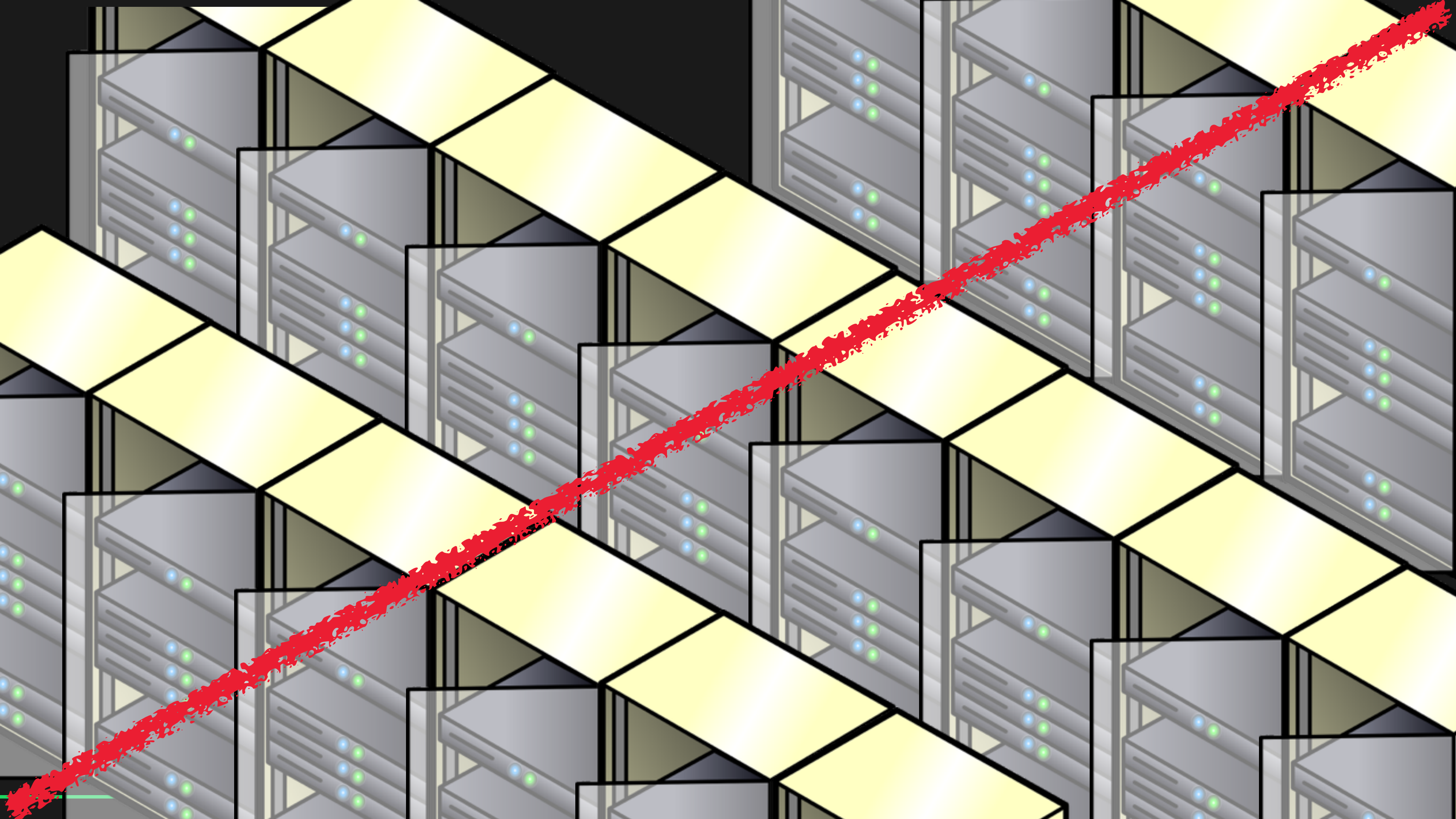
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1111



To the Cloud!



To the Cloud!

```
# sudo addgroup hadoop
# sudo adduser --ingroup hadoop hdfs
# sudo adduser --ingroup hadoop yarn
# cp /tmp/configs/*.xml /etc/hadoop/conf/
# apt-get update
...
[hdfs@sj-hadoop-b20 ~] $ apt-get install hadoop-hdfs-datanode
...
[yarn@sj-hadoop-b20 ~] $ apt-get install hadoop-yarn-nodemanager
```

```
# sudo addgroup hadoop
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```

Automated Config Management

(via Puppet)

```
[data-sci@sj-edge-a1 ~] $ hdfs dfs -ls /data
```

```
Found 3 items
```

```
drwxr-xr-x   - hdfs hadoop      0 2015-01-01 12:00 lake
drwxr-xr-x   - hdfs hadoop      0 2015-01-01 12:00 pond
drwxr-xr-x   - hdfs hadoop      0 2015-01-01 12:00 ocean
```

```
[data-sci@sj-edge-a1 ~] $ hdfs dfs -ls /data/lake
```

```
Found 1 items
```

```
drwxr-xr-x   - hdfs hadoop    1321451 2015-01-01 12:00 boats.txt
```

```
[data-sci@sj-edge-a1 ~] $ hdfs dfs -cat /data/lake/boats.txt
```

```
...
```

```
[data-sci@sj-edge-a1 ~] $ hdfs dfs -ls /data
```

```
Found 3 items
```

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drwxr-xr-x   - hdfs hadoop      0 2015-01-01 12:00 lake
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Found 1 items
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```

```
[data-sci@sj-edge-a1 ~] $ hdfs dfs -cat /data/lake/boats.txt
```

```
...
```




snakebite

```
$ time for i in {1..100}; do hadoop fs -ls / > /dev/null; done  
real    3m32.014s  
user    6m15.891s  
sys     0m18.821s
```

```
$ time for i in {1..100}; do snakebite ls / > /dev/null; done  
real    0m34.760s  
user    0m29.962s  
sys     0m4.512s
```

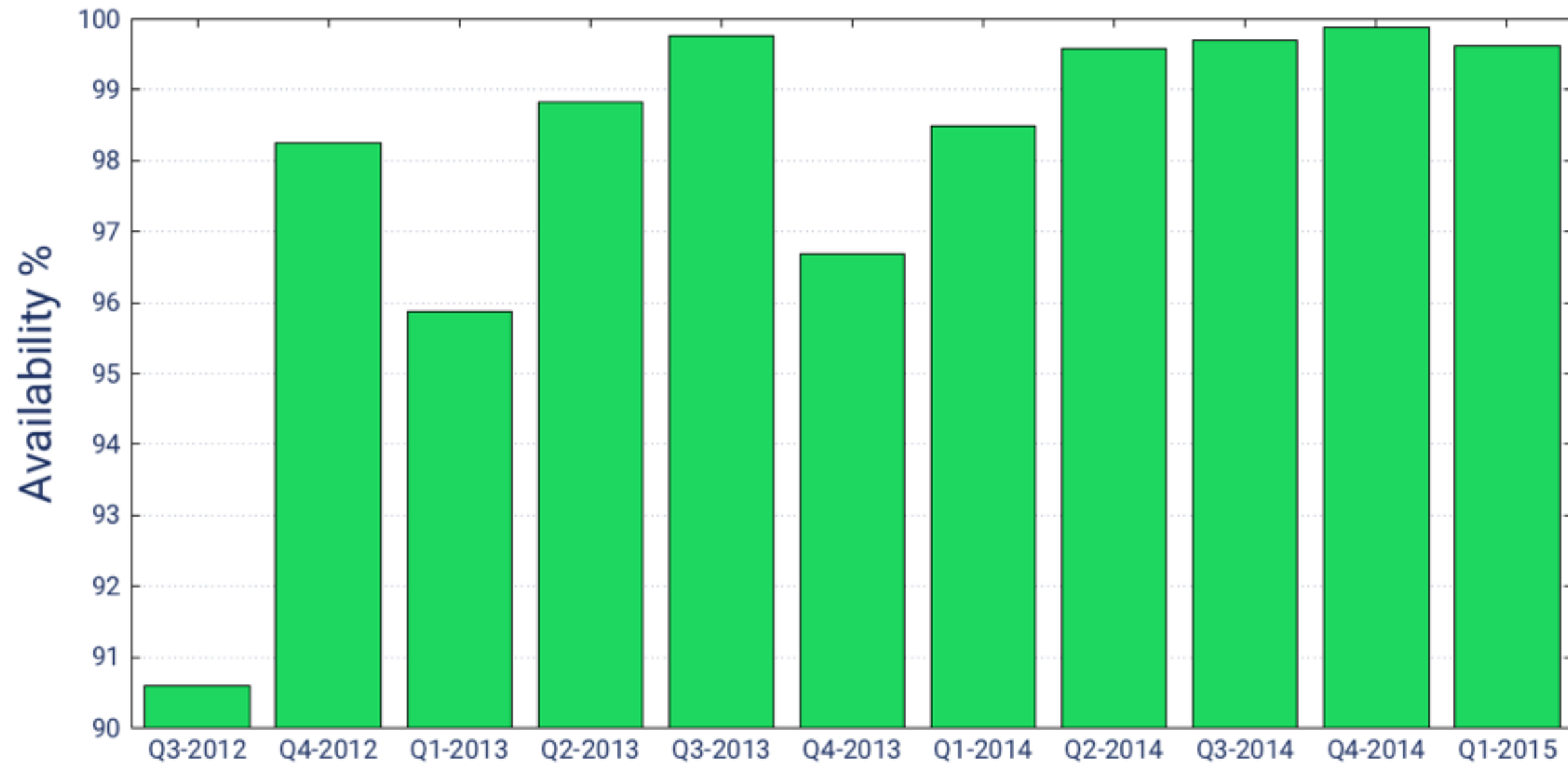
Gaining Focus

(2013-2014)

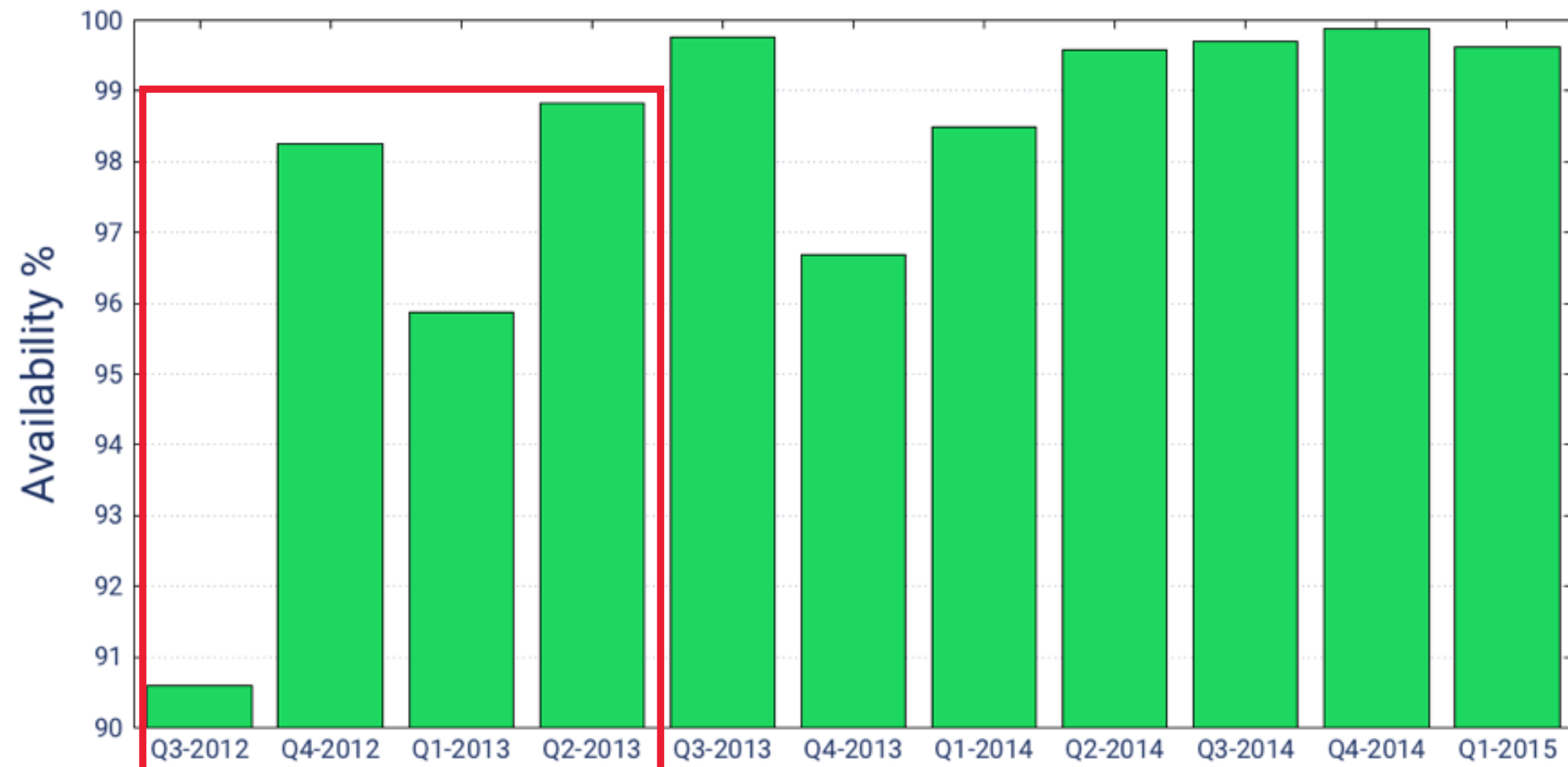
Forming a team

- In 2013, expanded to 200 nodes
- Hadoop critical
- Needed a team totally focused on it
- Created a 'squad' with two missions:
 - Migrate to a new distribution with Yarn
 - Make Hadoop reliable

Hadoop Availability by Quarter

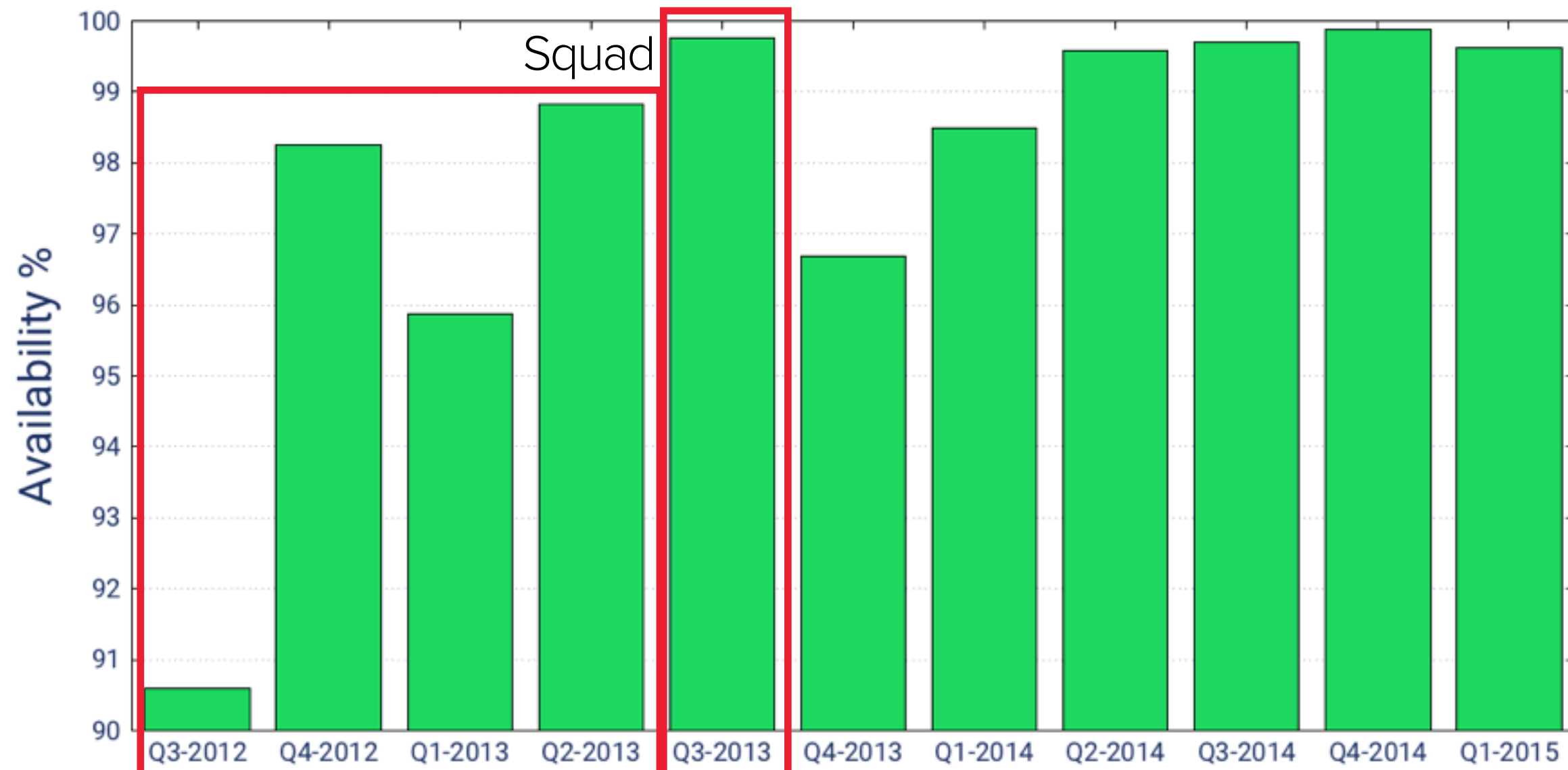


Hadoop Availability by Quarter



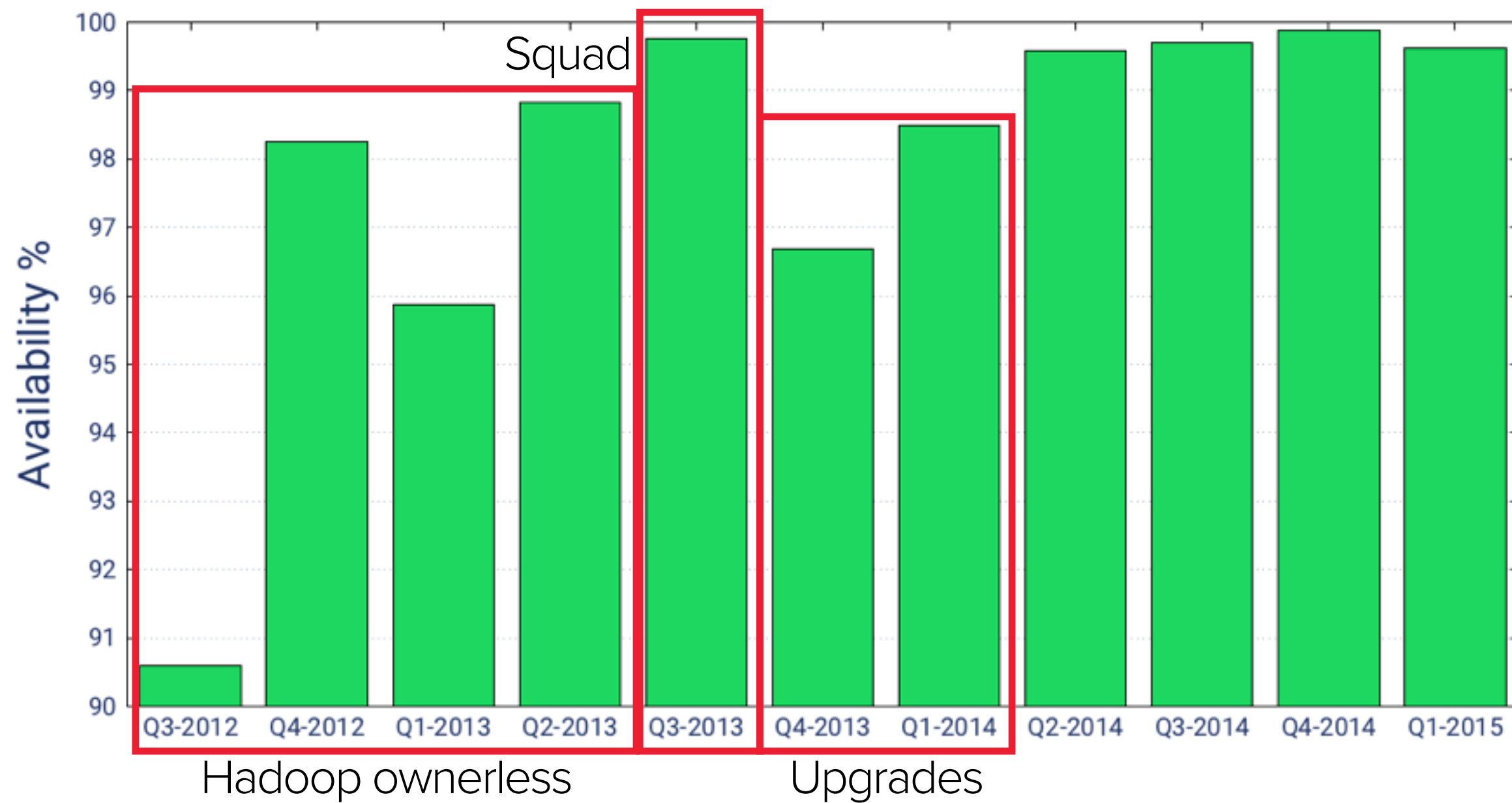
Hadoop ownerless

Hadoop Availability by Quarter

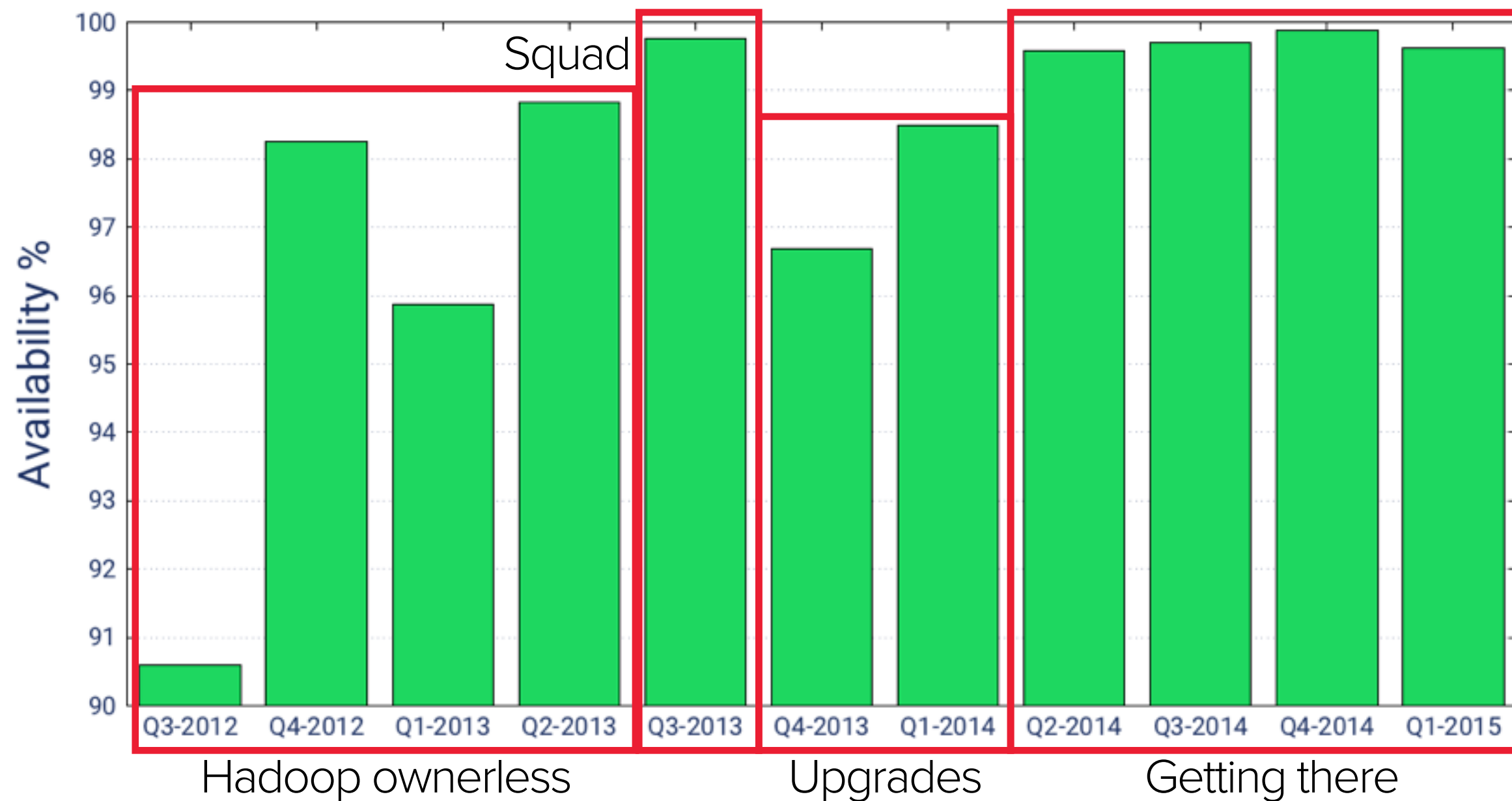


Hadoop ownerless

Hadoop Availability by Quarter



Hadoop Availability by Quarter



Alerting

Alerting

- Alert on service level problems (i.e. no jobs running)
- Keep your alarm channel clean. Beware of alert fatigue.

Uhh ohh.....
I think I made a mistake


```
[data-sci@sj-edge-a1 ~] $ snakebite rm -R /team/disco/ CF/test-10/
```

```
OK: Deleted /team/disco
```

Goodbye Data (1PB)

Lessons Learned

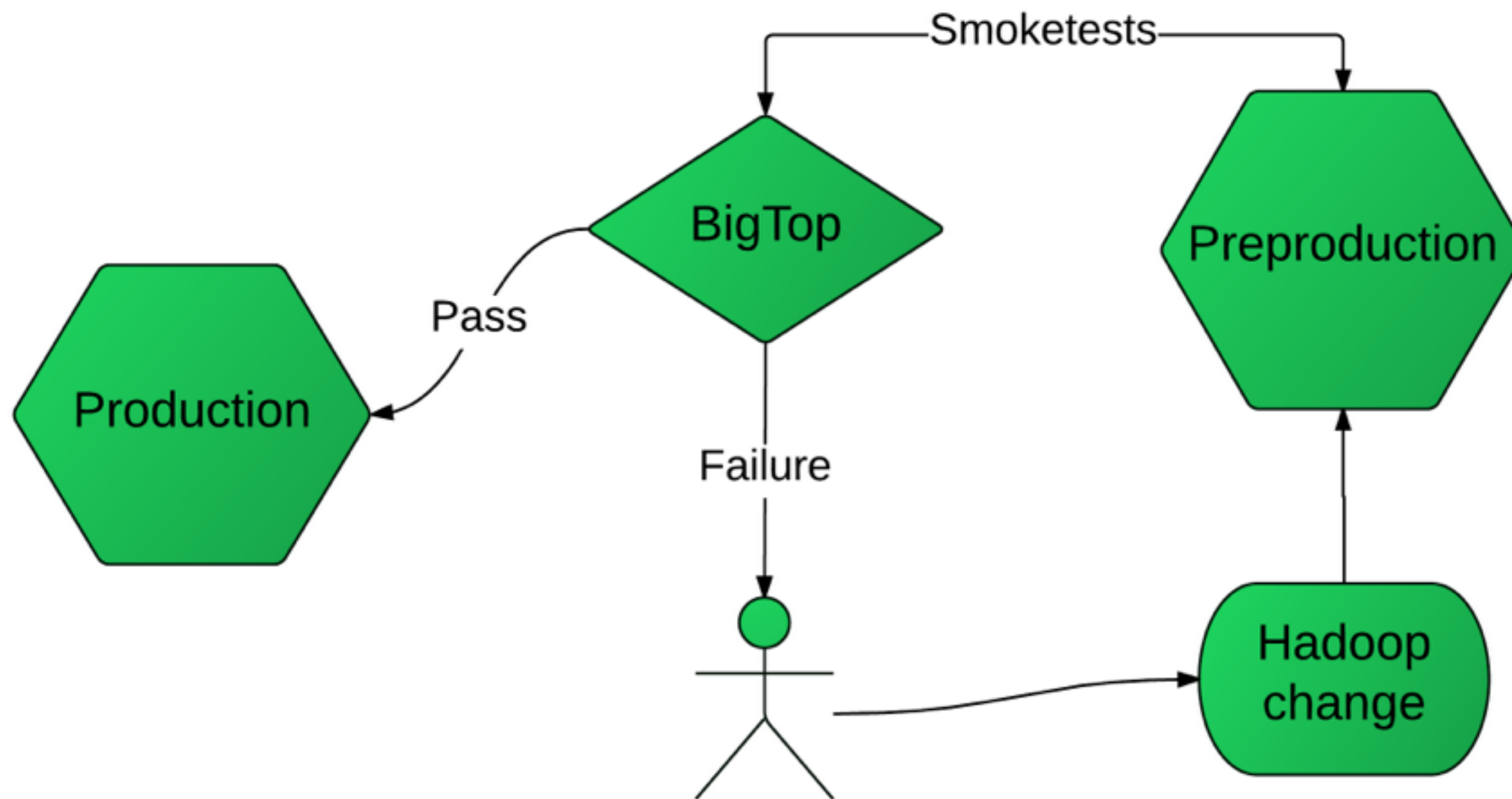
- “Sit on your hands before you type” - Wouter de Bie
- Users will always want to retain data!
- Remove superusers from ‘edgenodes’
- Moving to trash = client-side implementation

The Wild Wild West

Pre-Production Cluster

- Same hardware profile as production cluster
- Similar configuration
- Staging environment
- Reliable

Automated Testing



Moving Data

Apache Falcon

- Features:
 - Data discovery
 - Lineage
 - Lifecycle management
 - More
- We use it for data movement
- Uses Oozie behind the scenes

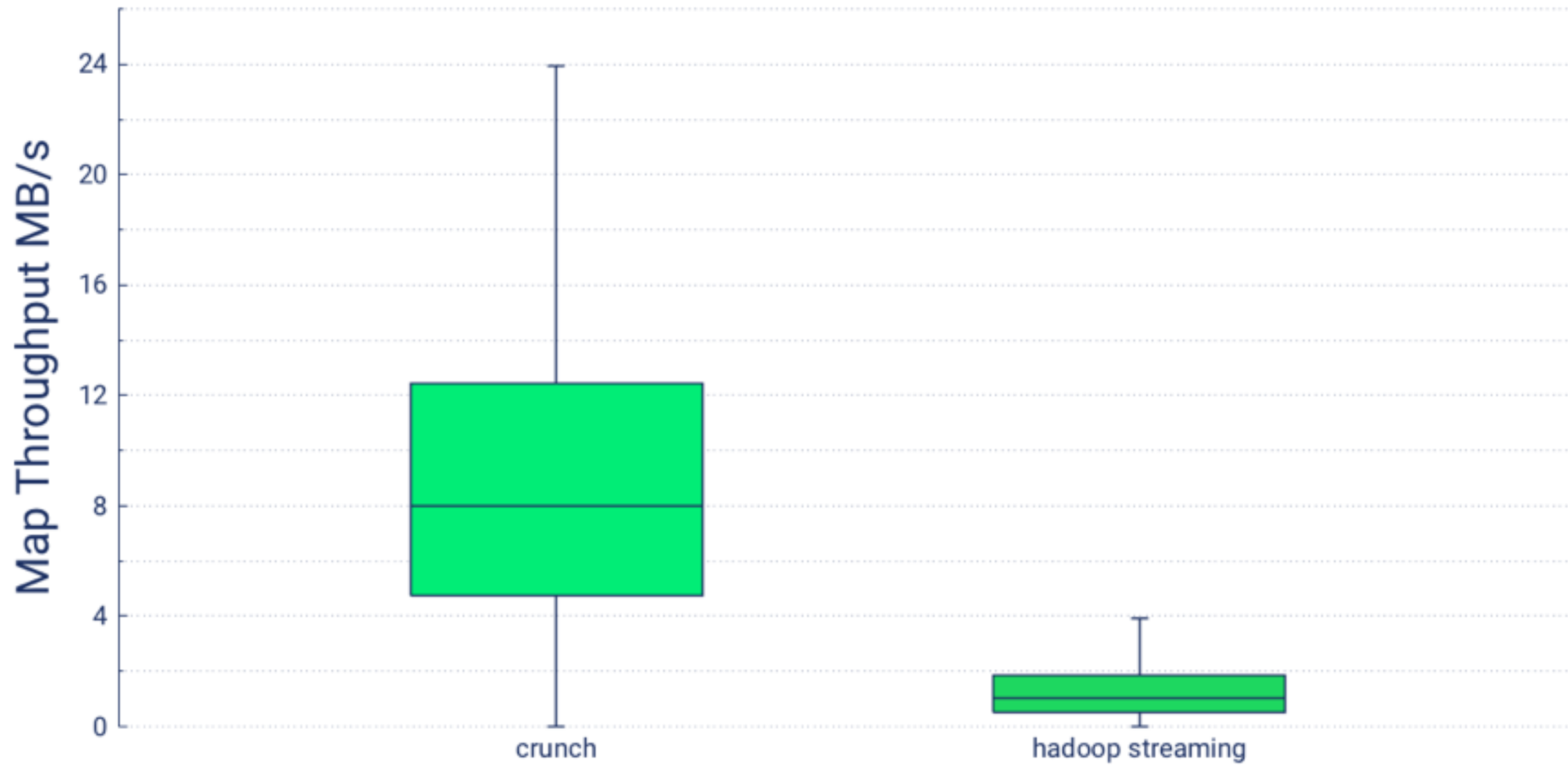
Improving Performance

- Most of our jobs were Hadoop (python) Streaming
- Lots of failures, slow performance
- Had to find a better way....

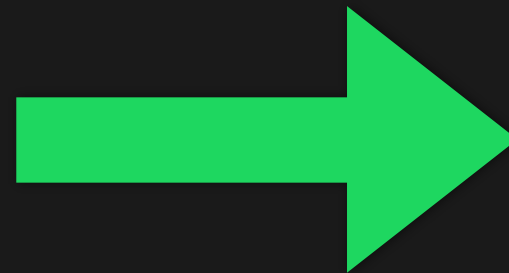
Improving Performance

- Investigated several frameworks
- Selected Crunch:
 - Real types!
 - Higher level API
 - Easier to test
 - Better performance #JVM_FTW

Crunch vs Hadoop Streaming Benchmark



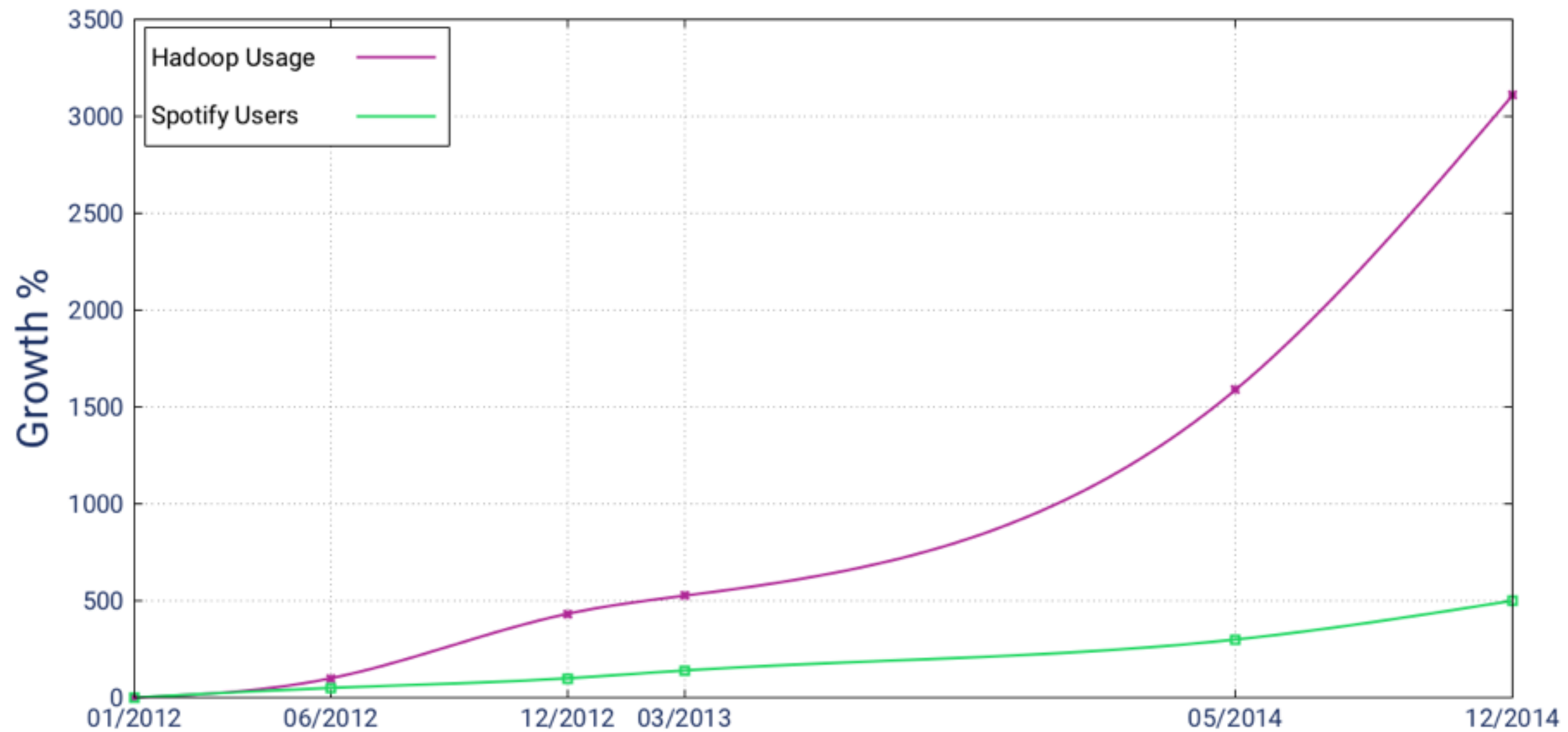
Let's Review



The Future

(2015+)

Growth of Hadoop vs Spotify Users



Note: Spotify users is based on publicly released numbers only

Explosive Growth

- Increased Spotify Users
- Increased use cases
- Increased Engineers

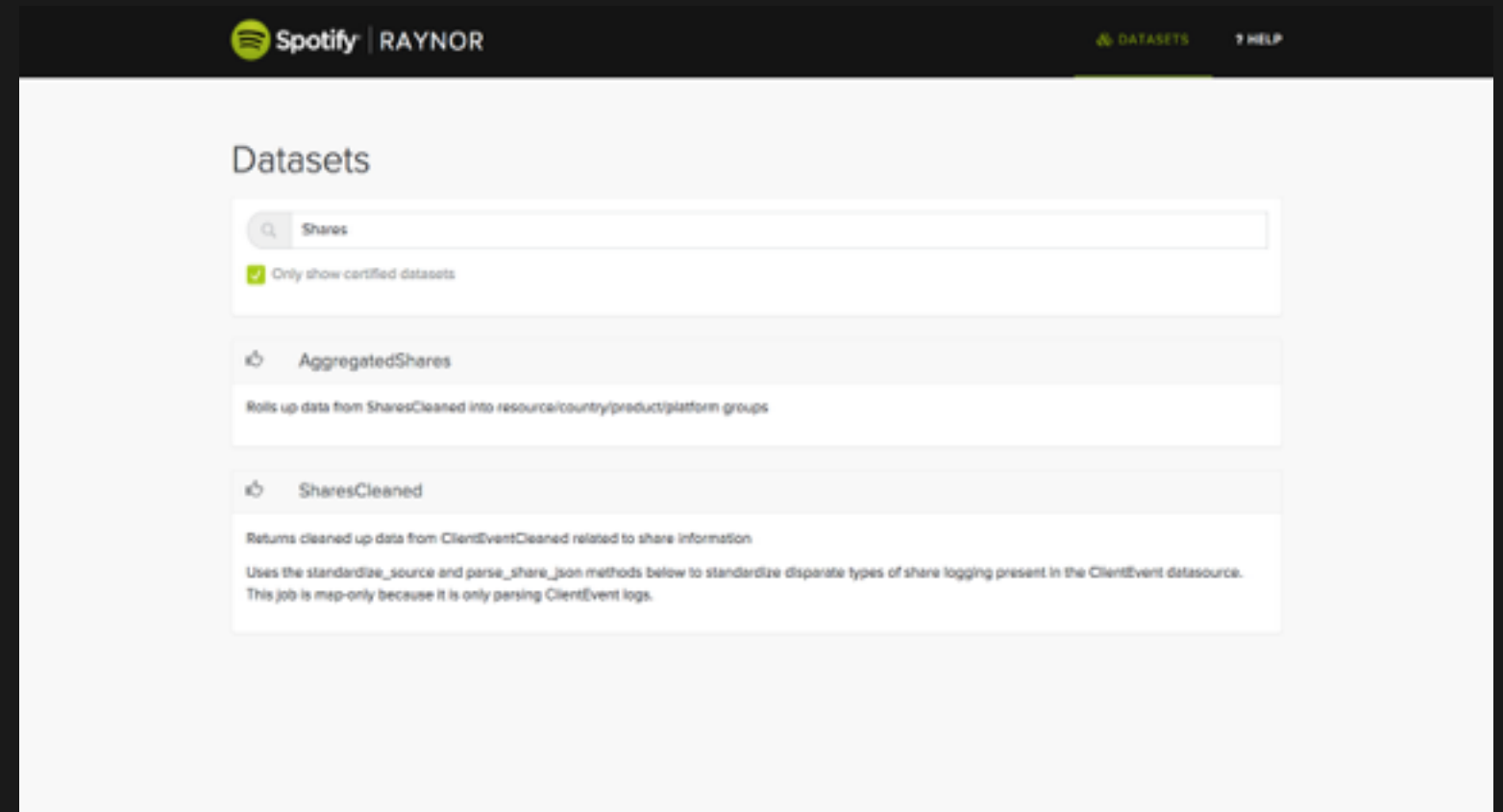
Scaling machines: easy
Scaling people: hard

User Feedback: Automate IT!

Data Management

Raynor

- Data-discovery tool
 - Luigi Integration
 - Find and browse datasets
 - View schemas
 - Trace lineage
-
- Open-source plans? :-)



Two Takeaways

- **Automate Everything**
 - More time to ~~play FIFA~~ build cool tools
- **Listen to your users**
 - Fail fast, don't be afraid to scrap work

Join the Band!

Engineers wanted in NYC & Stockholm

<http://spotify.com/jobs>

