

# Apache Tajo on Swift

Bringing SQL to the OpenStack World

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Jihoon Son

Apache Tajo PMC member

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# Who am I

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- Jihoon Son
    - Ph.D candidate (Computer Science & Engineering, 2010.3 ~)
    - Apache Tajo PMC and Committer (2014.5.1 ~)
    - Mentor of Google Summer of Code (2013)
  - Contacts
    - Email: jihoonson AT apache.org
    - LinkedIn: <https://www.linkedin.com/in/jihoonson>
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# Outline

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- OpenStack Swift
  - Apache Tajo
  - Tajo on Swift
  - Demo
  - Our Roadmap
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# OpenStack Swift

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- Popular object storage
  - Images, videos, logs, ...
- Enterprises store objects on Swift to provide their services
  - Usually private clusters

# SQL on Swift

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- Data analysis is important to improve the quality of their services
    - SQL is one of the most powerful and popular query language
  - Many enterprise data analysis tools relying on SQL
    - OLAP, visualization, data mining, ...
  - Need for using SQL on Swift
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# Apache Tajo

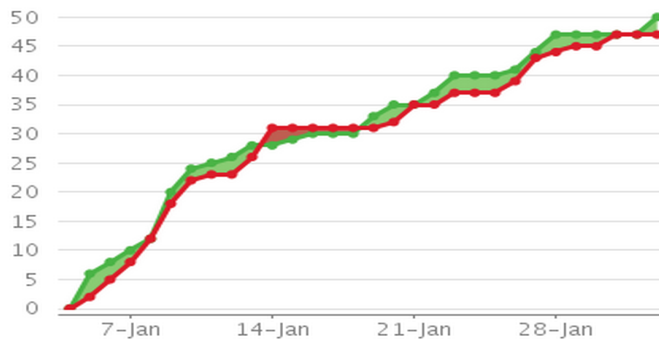
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- Scalable, efficient, and fault-tolerant data warehouse system
    - Support SQL standards compliance
    - Efficient batch execution and interactive ad-hoc analysis
      - Low latency and high throughput
      - No use of MapReduce
    - No single point of failure
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# Apache Tajo

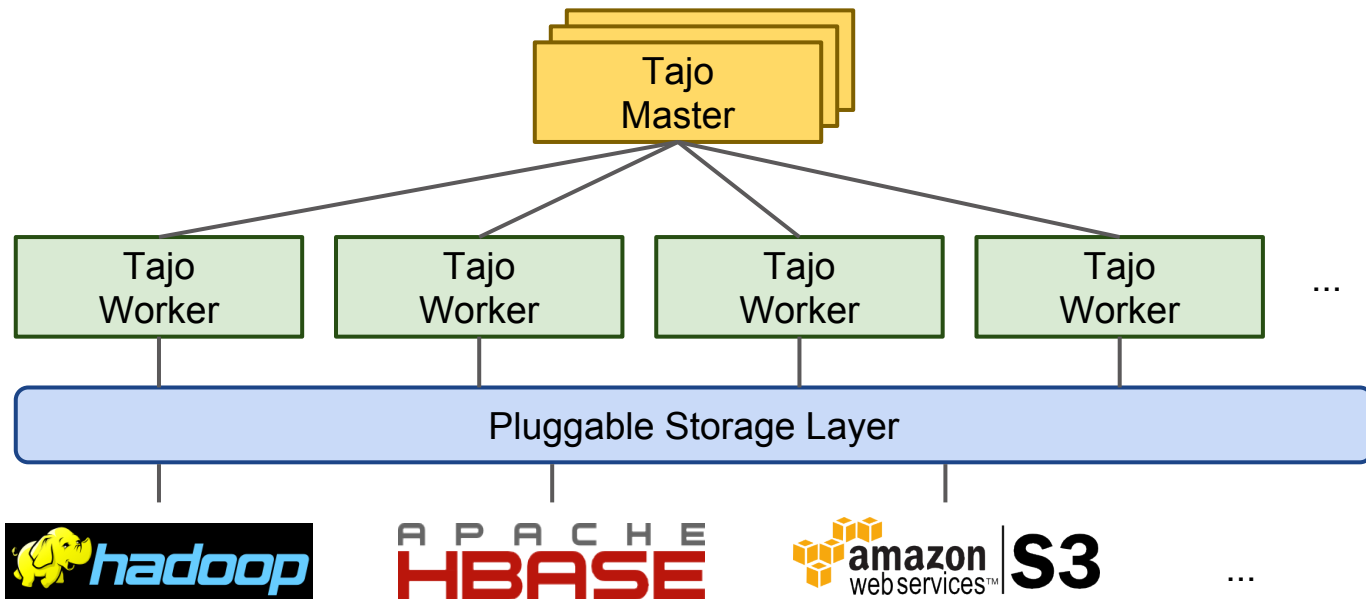
- Active open source project
  - 18 committers and 16 contributors
  - Activity summary

Issues: 30 Day Summary



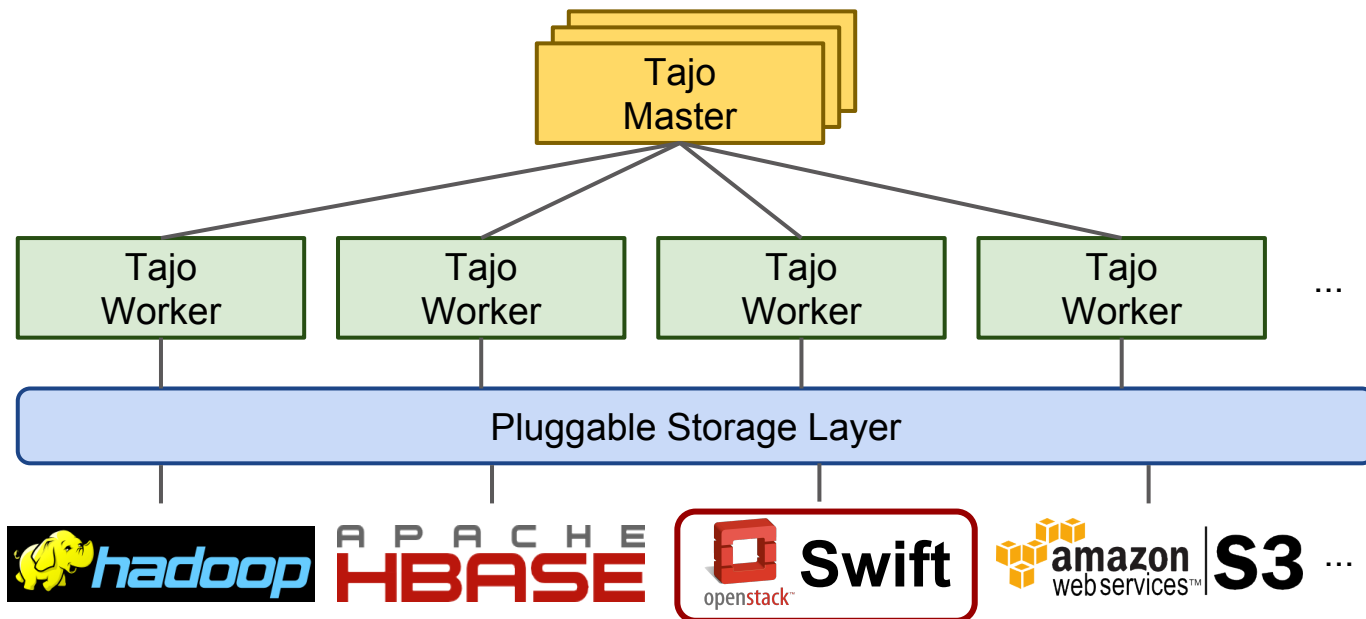
Issues: **47** created and **50** resolved

# Apache Tajo



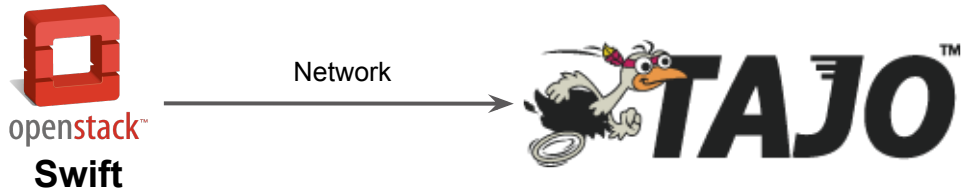


# Tajo on Swift



# Tajo on Swift

- No need to modify code of Tajo and Swift
  - Tajo can access Swift with the Hadoop-openstack library
    - But, doesn't need to install or run Hadoop
  - Just use it



# Tajo on Swift

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- Configuration highlights
  - Swift configuration
    - Need the keystone authentication for the Hadoop
    - No additional configurations
  - HDFS configuration
    - Different cloud providers support
      - Key name pattern
        - `fs.swift.service.${provider}`

# Tajo on Swift

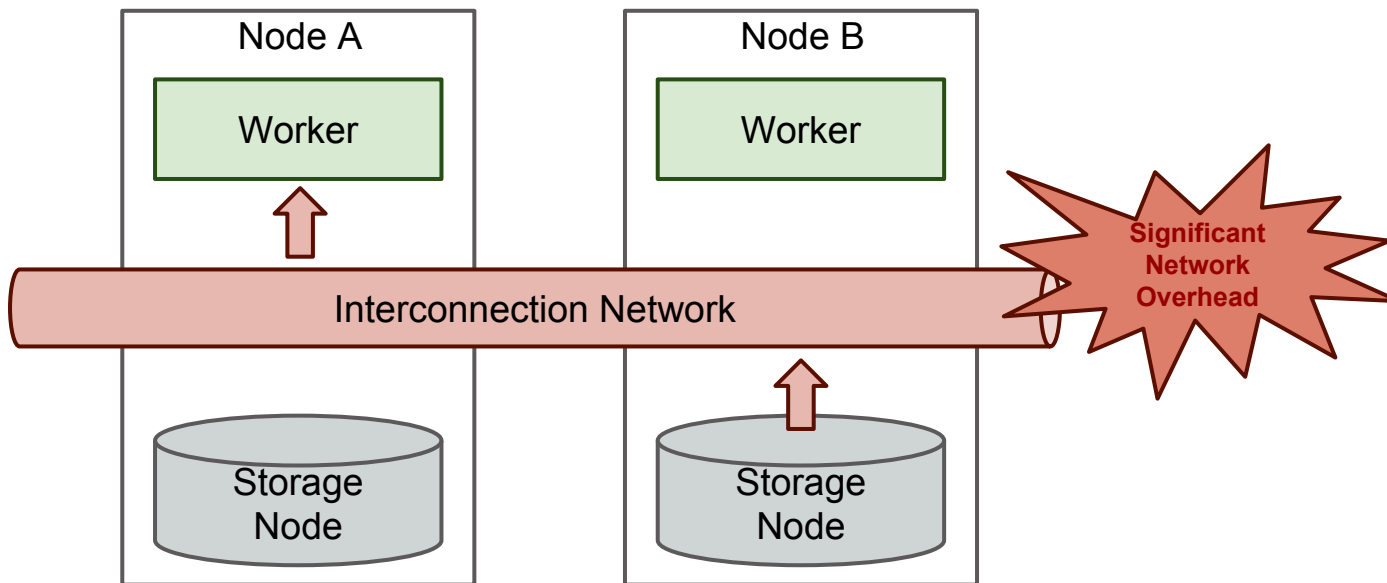
- Configuration highlights
  - Swift configuration
    - Need the keystone
    - No additional co
  - HDFS configuration
    - Different cloud p
      - Key name pat

fs.swift.ser

```
<property>
  <name>fs.swift.impl</name>
  <value>org.apache.hadoop.fs.swift.snative.SwiftNativeFileSystem</value>
</property>
<property>
  <name>fs.swift.blocksize</name>
  <value>131072</value>
</property>
<property>
  <name>fs.swift.service.tajo.auth.url</name>
  <value>http://192.168.0.1:5000/v2.0/tokens</value>
</property>
<property>
  <name>fs.swift.service.tajo.tenant</name>
  <value>demo</value>
</property>
<property>
  <name>fs.swift.service.tajo.username</name>
  <value>hadoop</value>
</property>
<property>
  <name>fs.swift.service.tajo.password</name>
  <value>{password}</value>
</property>
```

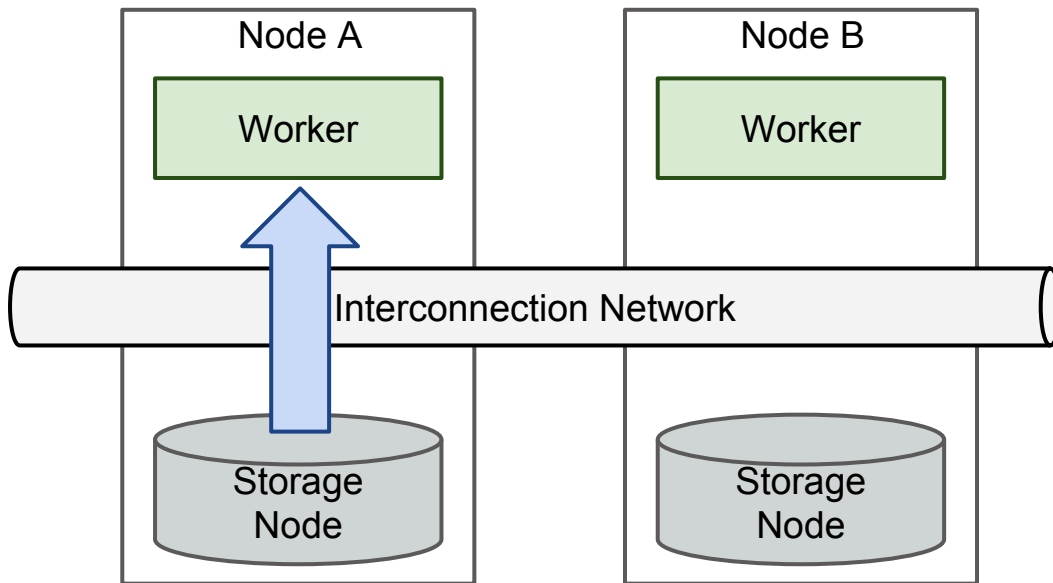
# Tajo on Swift

- Data locality problem



# Tajo on Swift

- Data locality problem



# Advanced Integration

- List endpoints middleware
  - Providing the location information of objects, accounts or containers
    - Tajo workers can directly access each object
  - Example

```
hadoop@t1 ~/tajo-0.10.0-SNAPSHOT $ curl -i -H "Accept: application/json" -H "Content-Type: application/json" -X GET http://192.168.0.1:8080/endpoints/v2/tajo/tpch/customer/customer.tbl.1
HTTP/1.1 200 OK
Content-Length: 278
Content-Type: application/json
X-Trans-Id: tx198d9332f1184d51881b1-0054cc763e
Date: Sat, 31 Jan 2015 06:29:19 GMT

{"headers": {"X-Backend-Storage-Policy-Index": "0"}, "endpoints": ["http://192.168.0.5:6000/sdb1/866/tajo/tpch/customer/customer.tbl.1", "http://192.168.0.6:6000/sdb1/866/tajo/tpch/customer/customer.tbl.1", "http://192.168.0.10:6000/sdb1/866/tajo/tpch/customer/customer.tbl.1"]}hadoop@t1 ~/tajo-0.10.0-SNAPSHOT $
```

# Advanced Integration

- List endpoints middleware
  - Swift configuration

```
[pipeline:main]
pipeline = authToken cache healthcheck keystoneauth list_endpoints proxy-logging proxy-server
[filter:list_endpoints]
use = egg:swift#list_endpoints
```

- Hadoop configuration

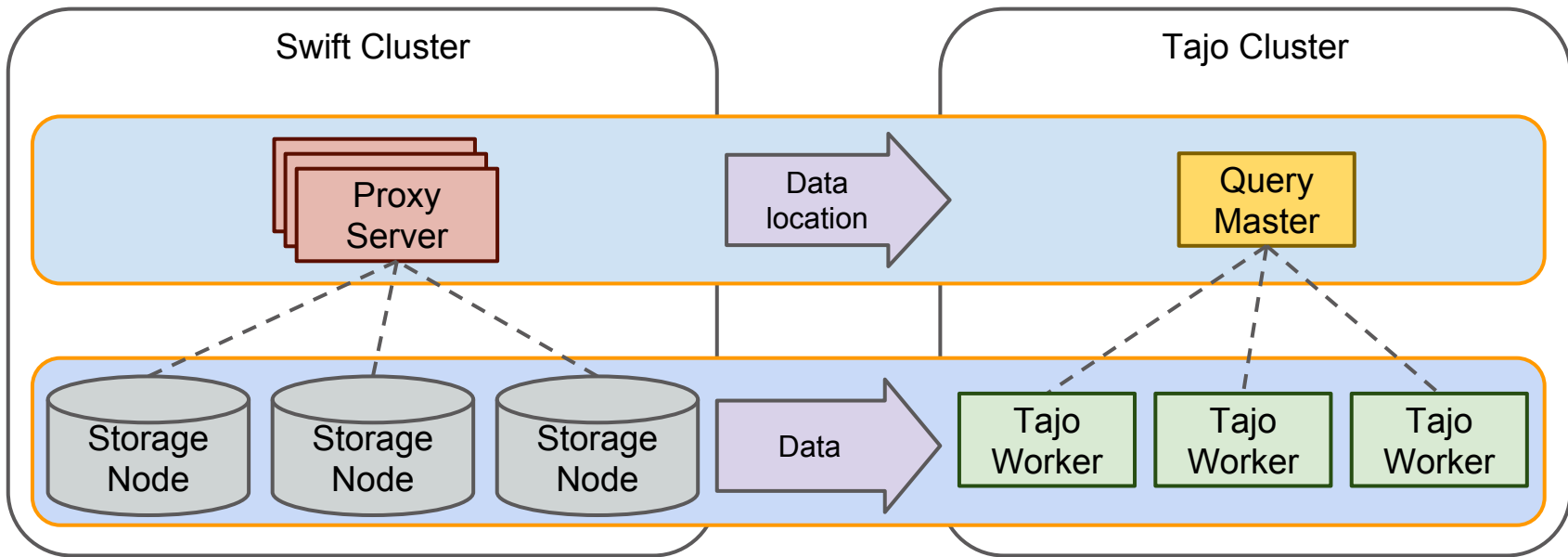
```
<property>
  <name>fs.swift.service.tajo.auth.endpoint.prefix</name>
  <value>/endpoints/AUTH_</value>
</property>
<property>
  <name>fs.swift.service.tajo.location-aware</name>
  <value>true</value>
</property>
```



# Advanced Integration

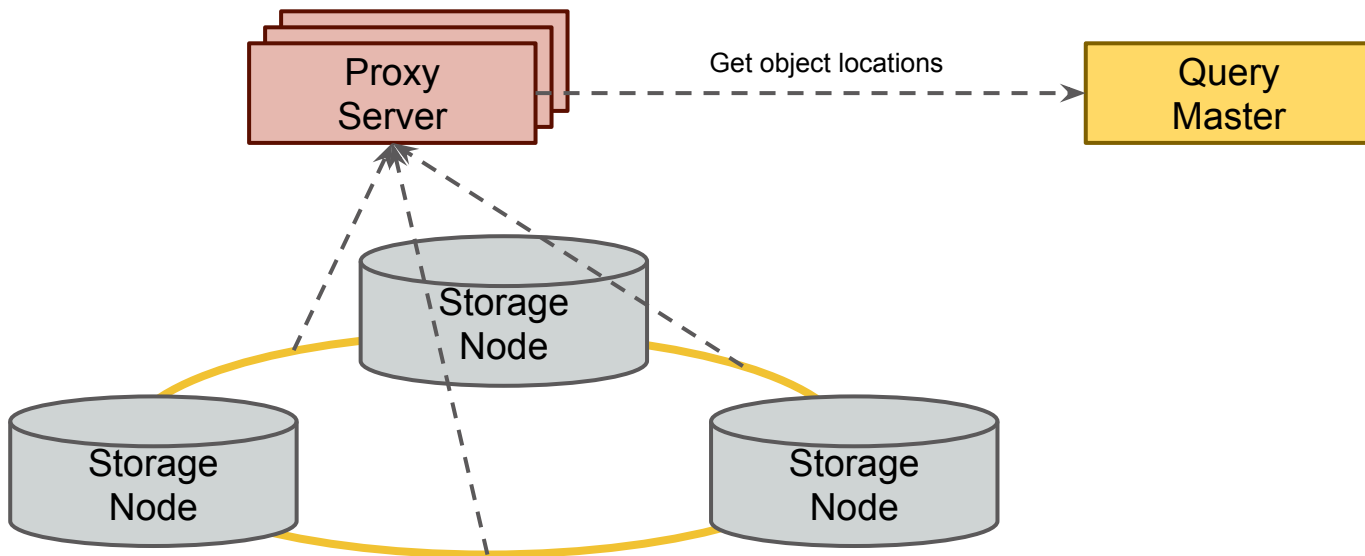
- Location-aware computing
  - Moving the processing close to the data
    - Avoiding the performance degradation due to the data transfer over the network
  - Important issue when Tajo and Swift share the same cluster

# Location-aware Computing



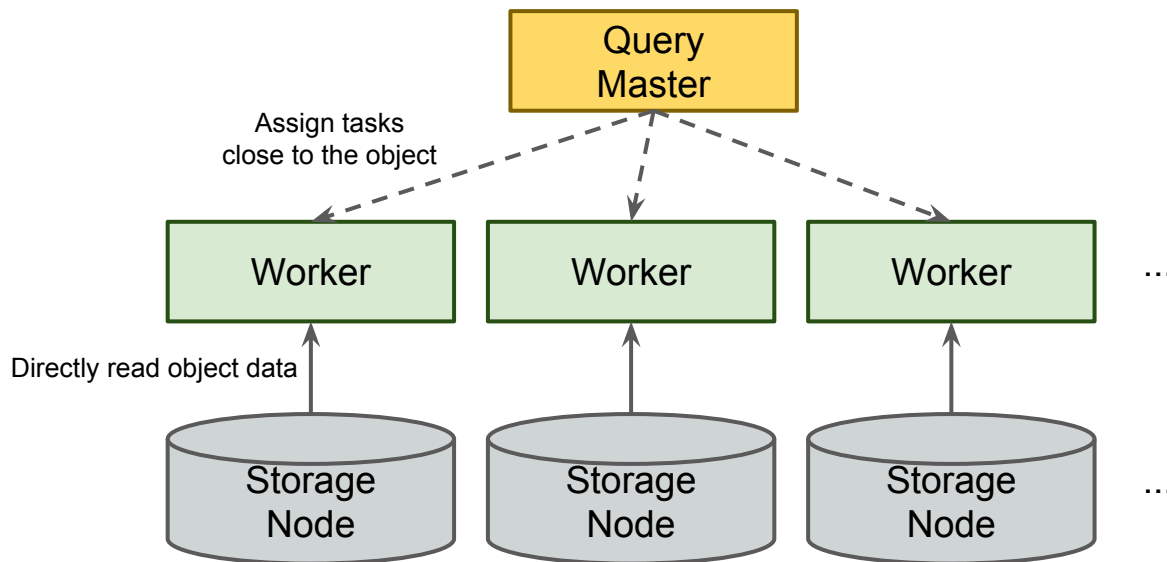
# Location-aware Computing

## 1. Getting object locations from the ring



# Location-aware Computing

## 2. Assigning tasks based on object locations



# Demo

# Our Roadmap

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- Storage layer specialized for Swift
  - Block storage support
    - Cinder and Ceph
  - Provisioning Tajo clusters
    - Sahara
    - Heat, TOSCA
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# Thanks!

<http://tajo.apache.org/>