Introduction to OpenStack Swift

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Yuji Hagiwara
hagiwarayuj@nttdata.co.jp

Platform Engineer, NTT DATA Corp.

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Agenda

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1. What is Swift?

2. Swift's Latest Information

3. Swift's Future

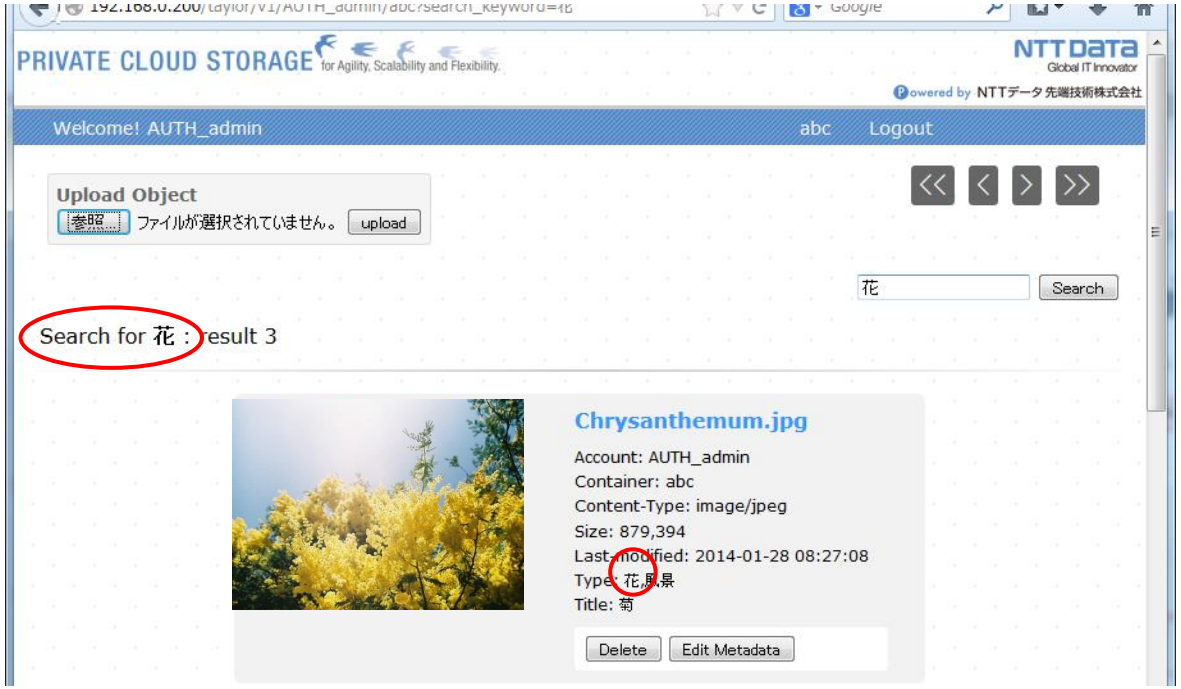
Who am I

Yuji Hagiwara – Platform Engineer, NTT DATA Corp.

Since 2011 -
Using OpenStack

Since 2013 -
Developing Searching on Swift

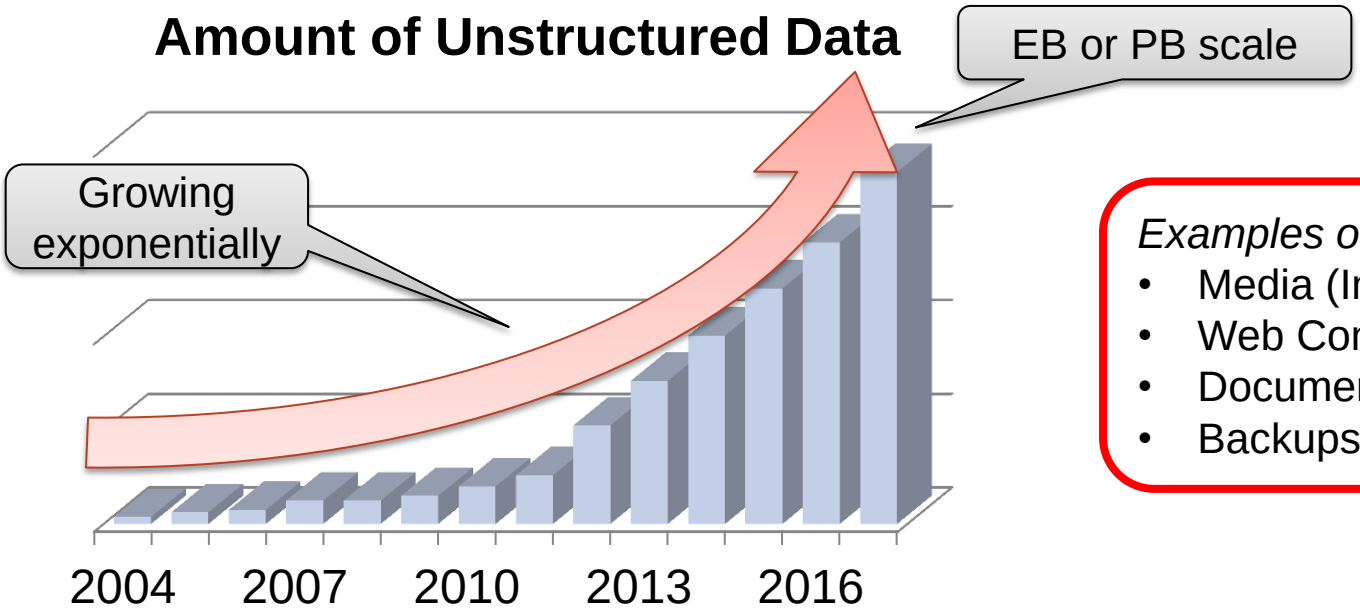
Demo App for Searching on Swift



Background

Data Explosion on Enterprise – Amount of Unstructured Data has been growing.

- We need storage with ***Scalability, Durability, Availability***.



Examples of Unstructured Data

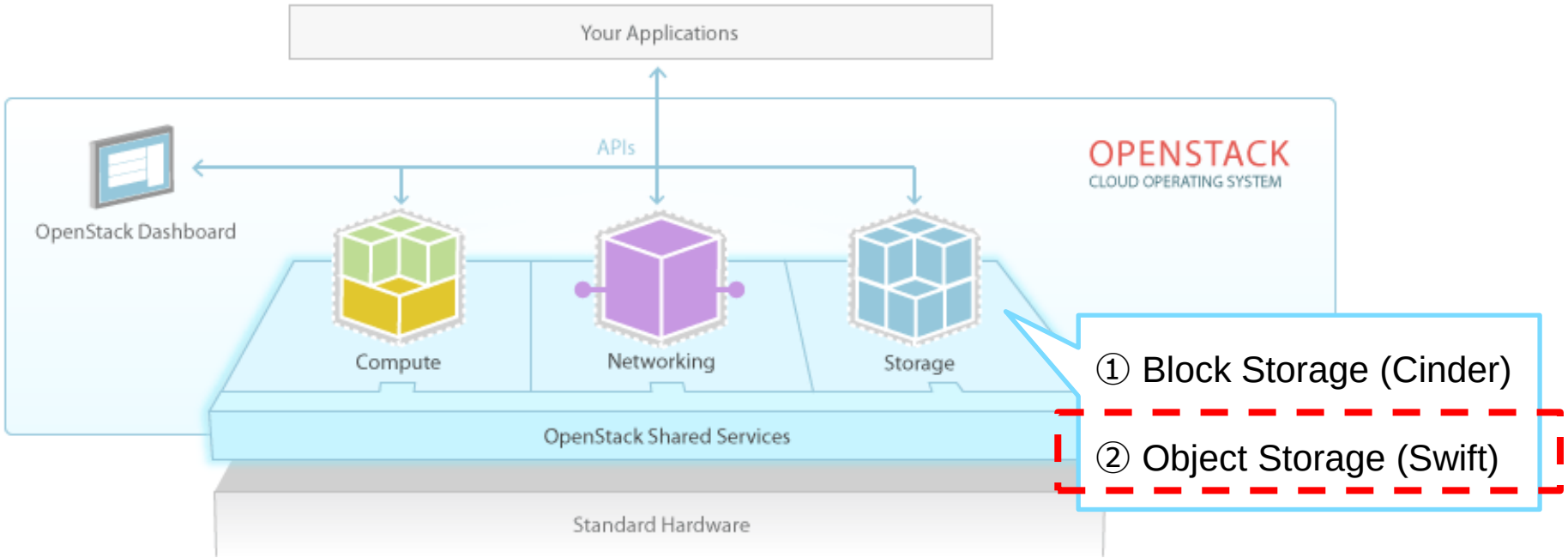
- Media (Images, Videos, Audios)
- Web Contents
- Documents
- Backups/Archives

Where should we store these data?
One of the Solutions is **Swift**.

What is Swift?

Swift is...

- A storage system with ***Scalability, Durability, Availability.***
- The REST-ful **Distributed Object Storage** likely Amazon S3.
- One of **OpenStack** Core Components.
- Implemented by **Python**.
- A **Open Source** Software.



Usage

so simple.

```
$ curl -XPUT --data-binary '@mydoc.txt'
  http://swift.example.com:8080/v1/account/container/object
```

```
$ curl -XGET
  http://swift.example.com:8080/v1/account/container/object
```

```
$ curl -XDELETE
  http://swift.example.com:8080/v1/account/container/object
```

Use cases of Swift

Swift as a storage for a variety of applications

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System Backup

CMS

FTP-like use

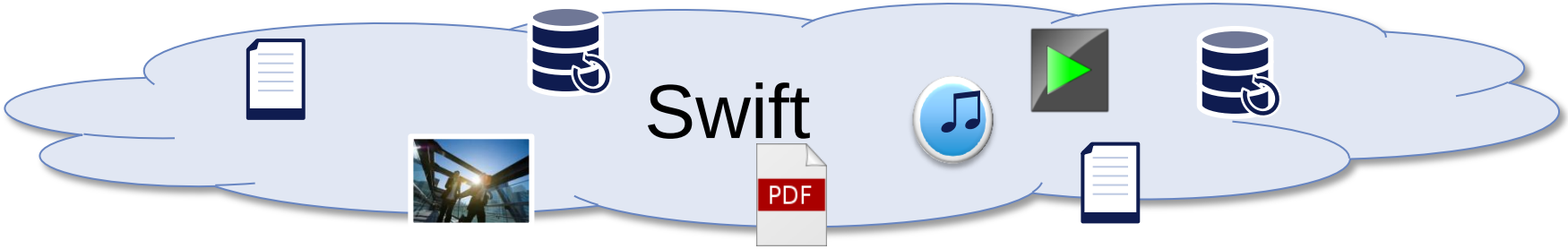
Cyber Duck

Digital Distribution

Web Apps

. . .

REST API



OpenStack Swift deployments and use cases

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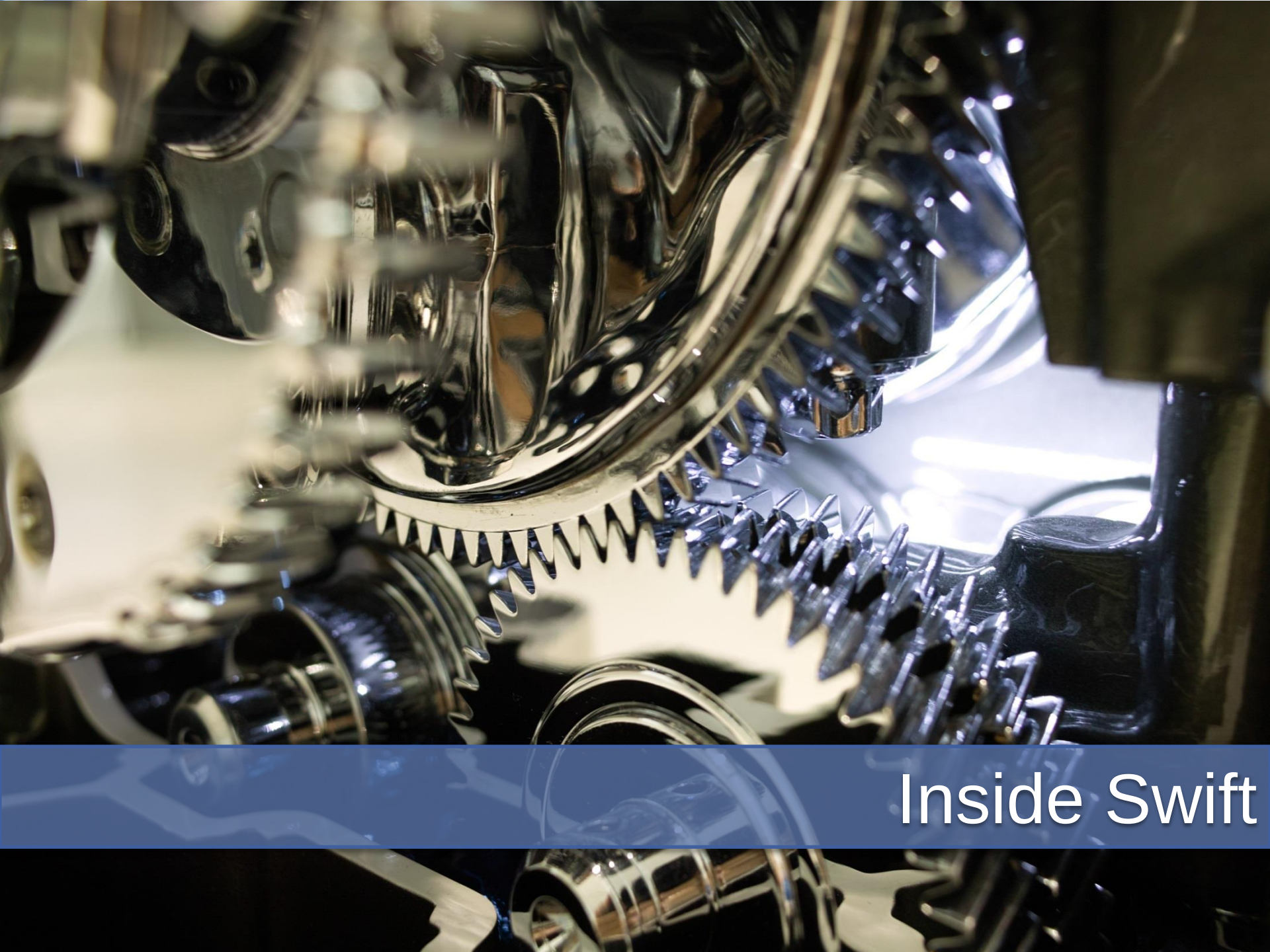
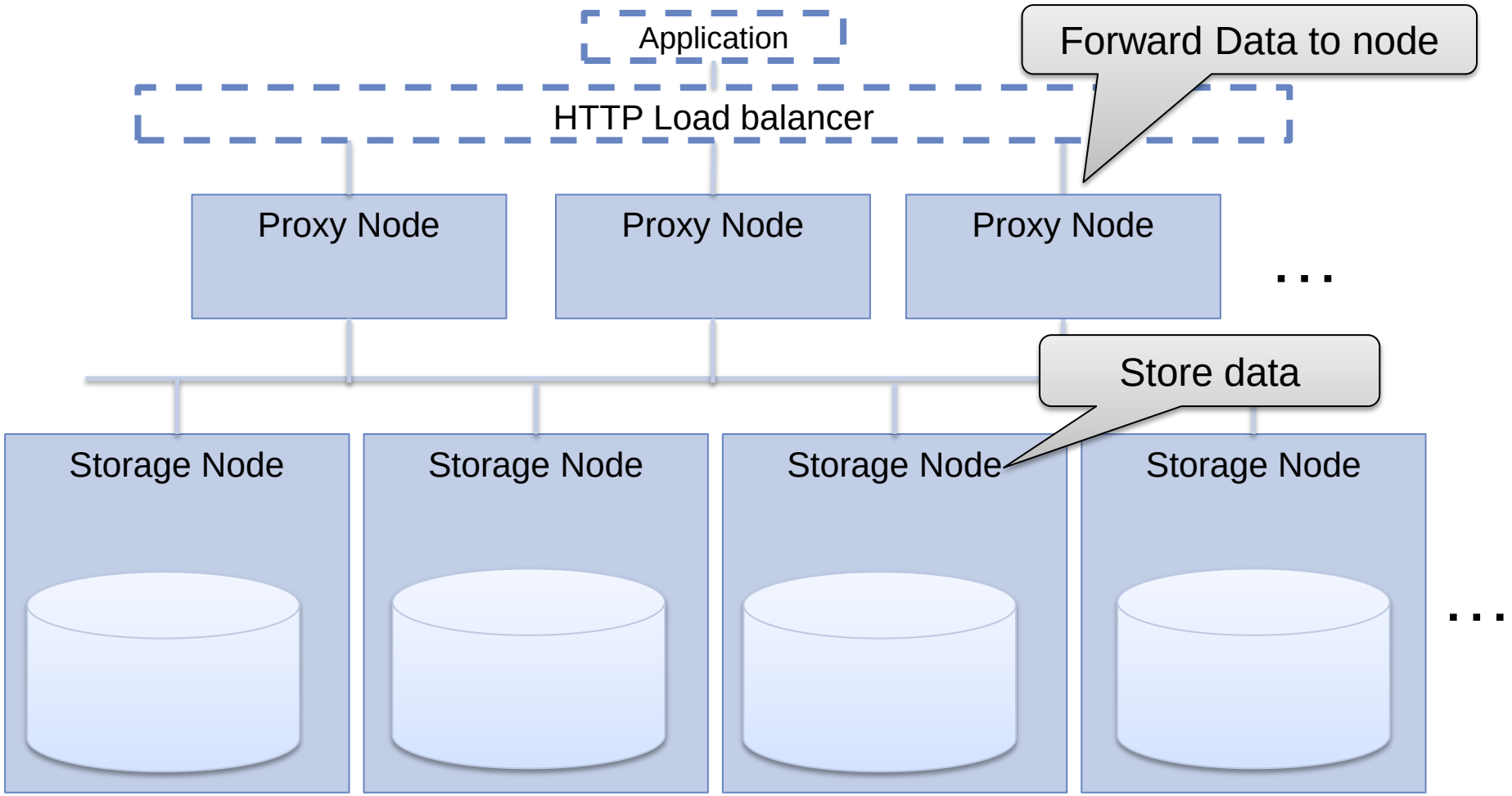
Name of enterprise	Product/ service	Description
Rackspace（USA）	Cloud Files	Cloud file share service by Rackspace itself. They use same code as OSS except for features such as authentication, Accounting and CDN （<500PB）
Korean Telecom （Sourth Korea）	ucloud storage service	Object storage service using OpenStack/Swift （16PB+ size）
Sina （Republic of China）	Sina App Engine（SAE）	Public storage service. They moved to OpenStack from another technology MongoDB in 2012.
San Diego Supercomputer Center （USA）	SDSC Cloud Storage Services	Cloud storage service on SDSC. Users can select Amazon/S3 or Rackspace Swift.
SME Storage （USA）	SMEStorage Open Cloud Platform	Cloud storage service based on Rackspace Cloud File
SoftLayer （USA）	SoftLayer Object Storage	Public object storage service. Acquisition by IBM
SwiftStack（USA）	Swift Stack	Provide professional service and Operation and management product
HP（USA）	HP Cloud	Private cloud storage service uses OpenStack.
Wikimedia（USA）	Wikimedia storage	Media files store for Wikipedia.
NII（JAPAN）	Academic Cloud service	Academic cloud service by National Institute of Informatics in Japan （ＮＩＩ）(Integrated and supported by NTT Data)



Inside Swift

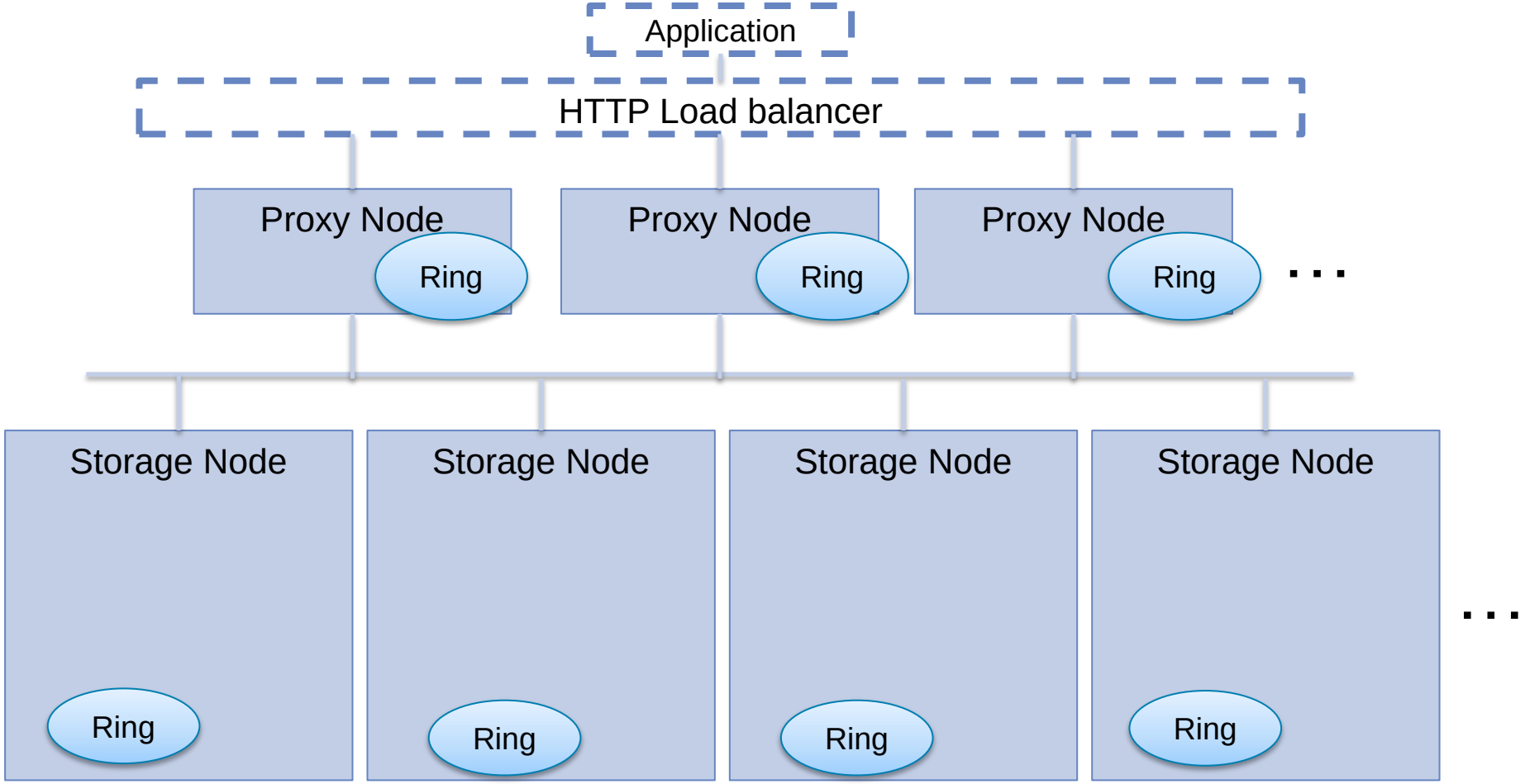
Architecture: Nodes

Swift consist of 2-type Nodes: **Proxy Node** and **Storage Node**.



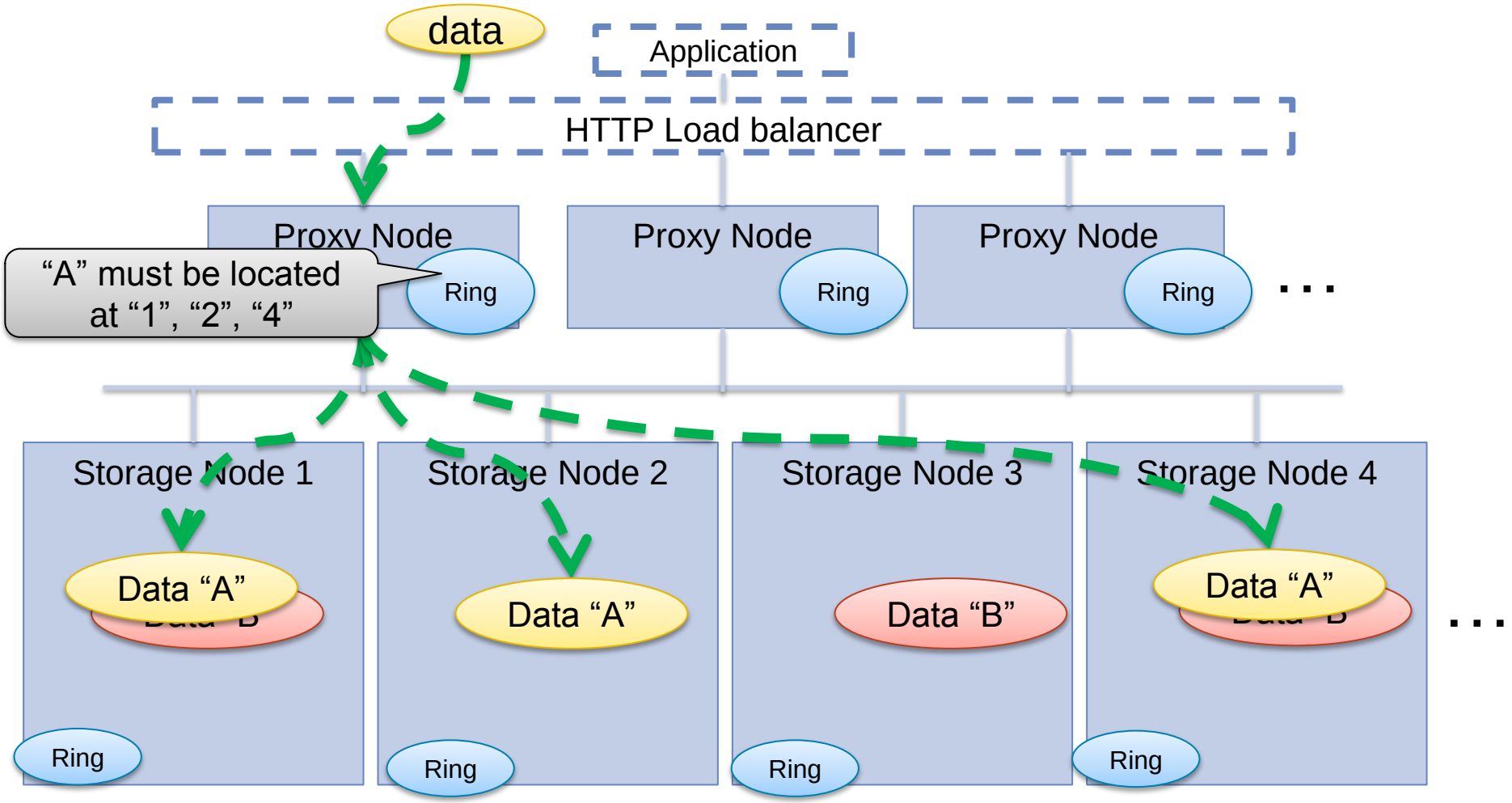
Architecture: The Ring

The *Ring* (static table for data allocation on storage node)
decide the optimal Storage Node by *Name*.



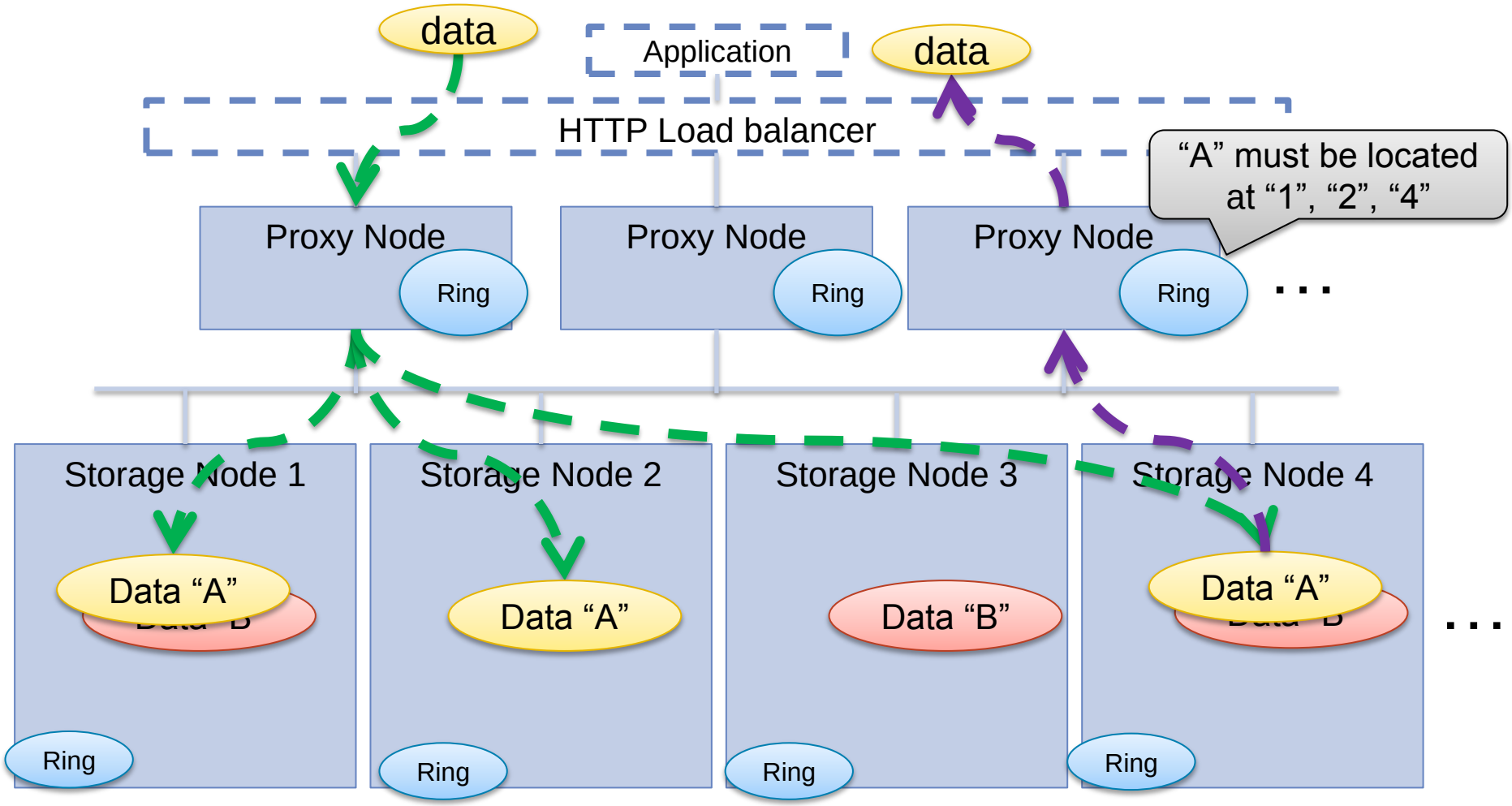
Architecture: The role of Ring

If you requested to **Store** the data “A”, 3 Replica nodes store the data “A”.



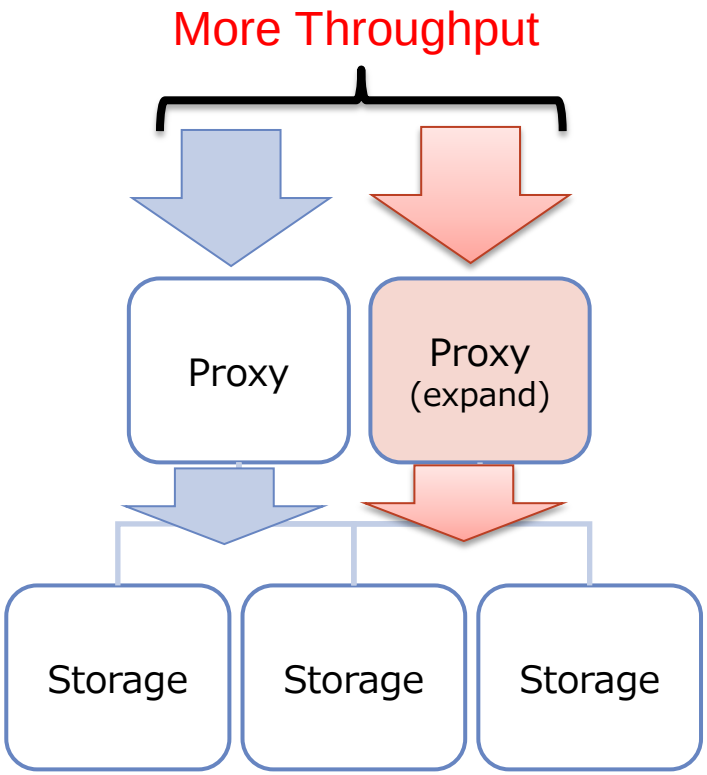
Architecture: The role of Ring

If you requested to **Get** the data “A”, One of Nodes reply the data “A”.

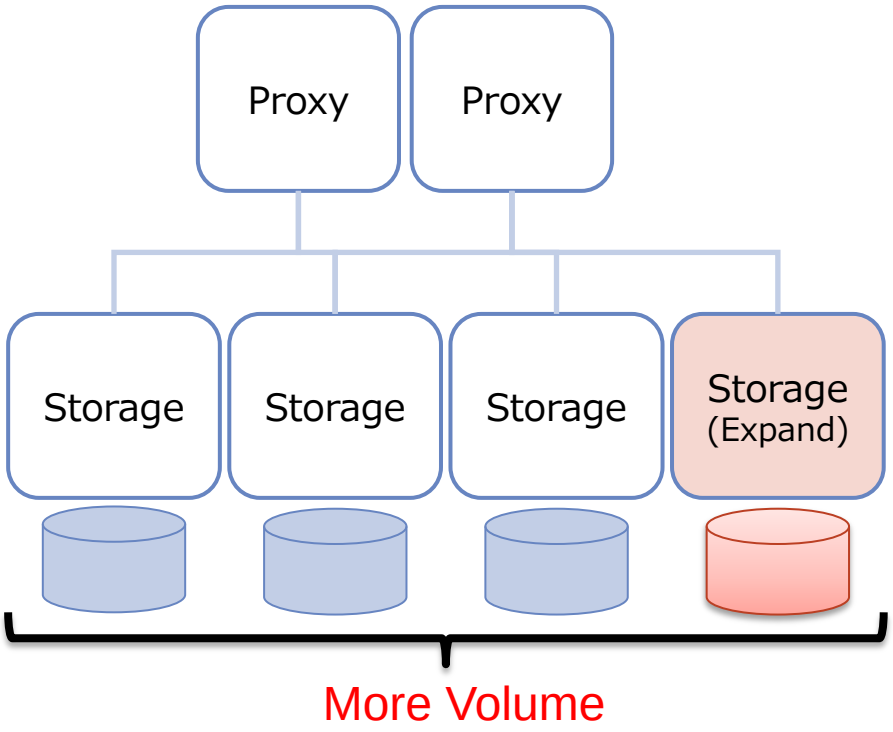


Scalability

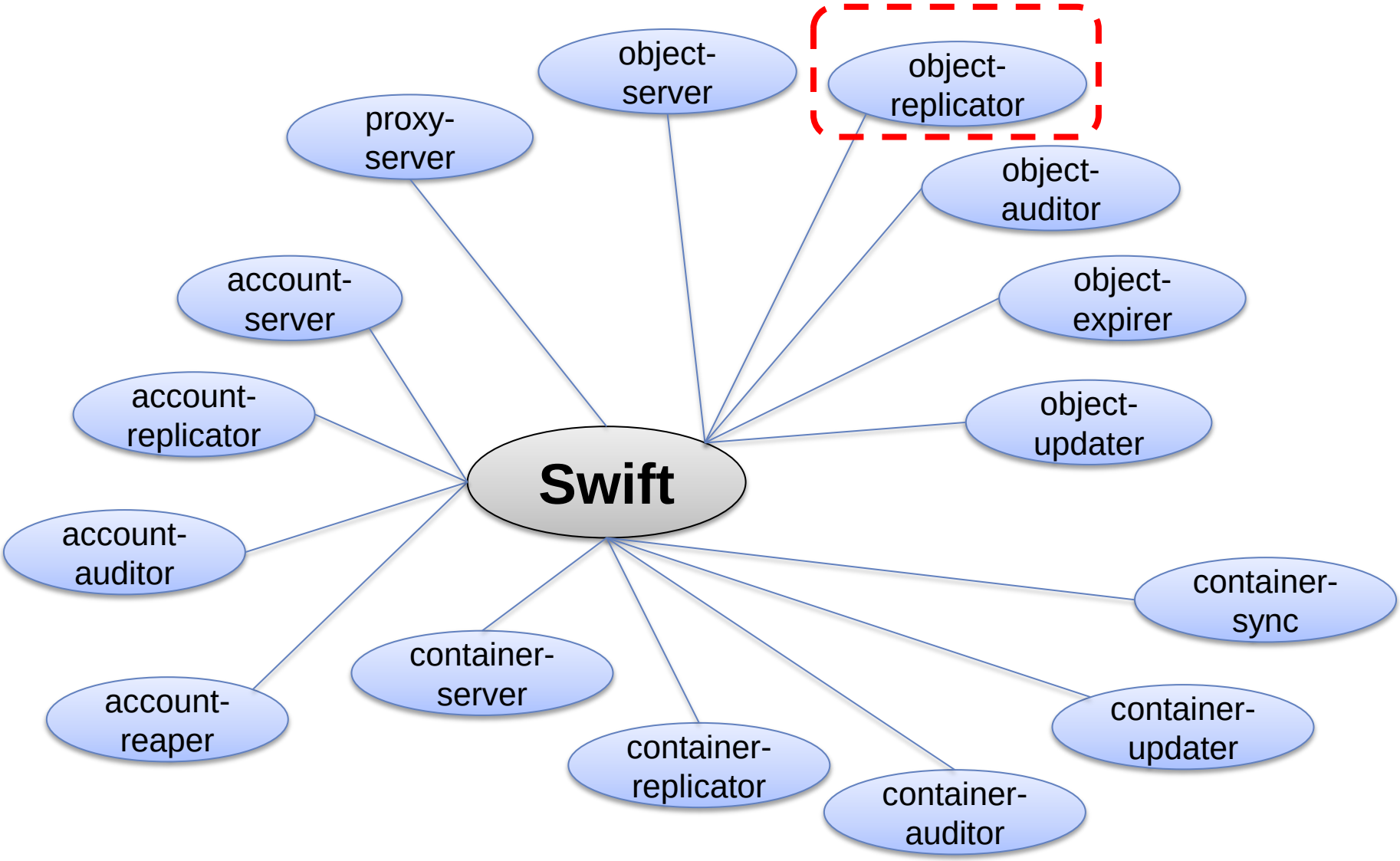
（1） Expand proxy server “Throughput”



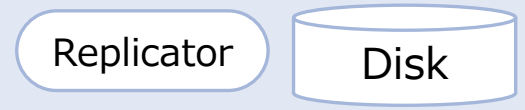
（2） Expand Storage servers or disks “volume”



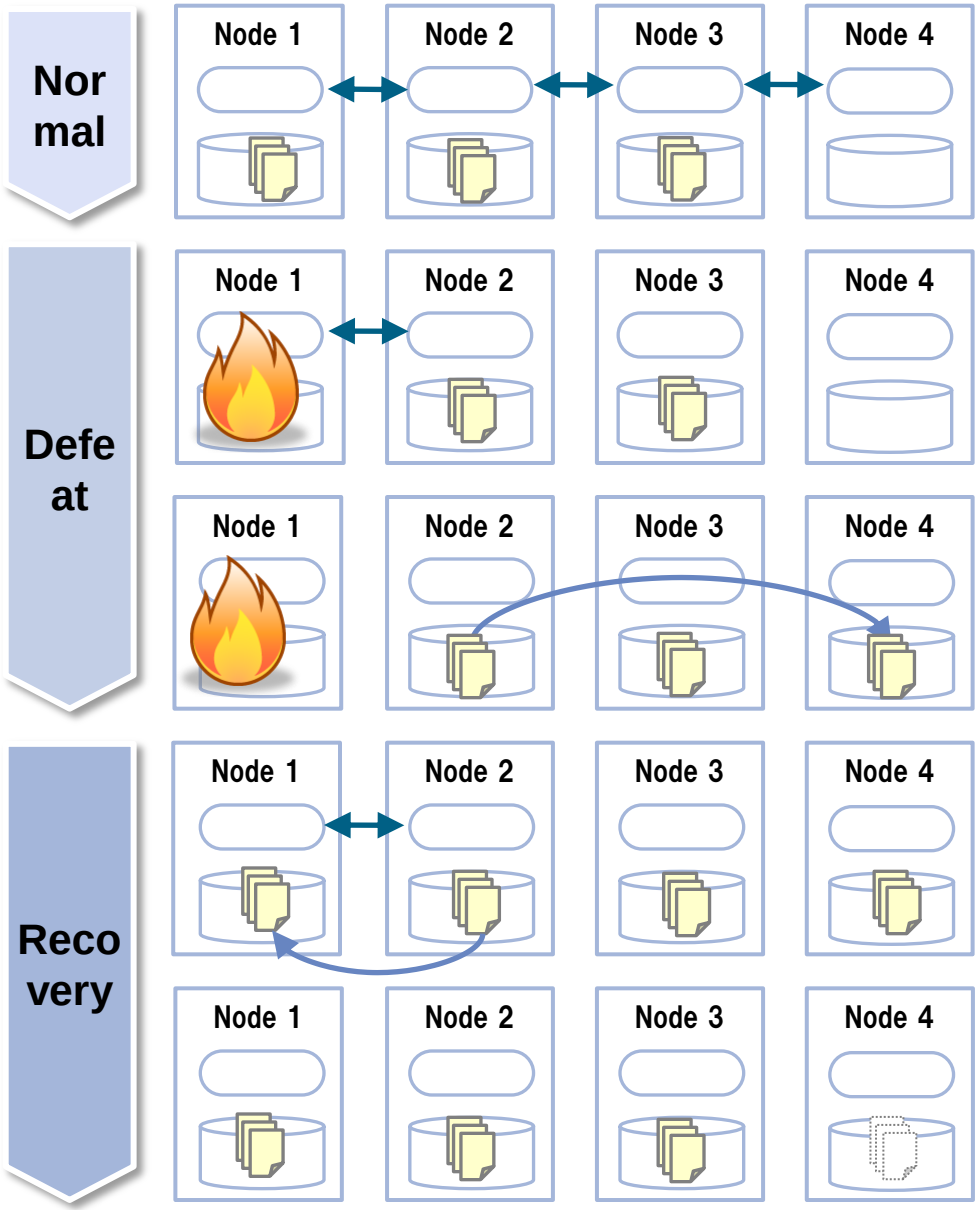
Many processes working together



Replicator



NTT DATA



(1) Each nodes checks data in others

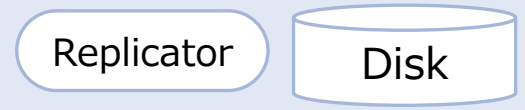
(2) Disk defeat
(3) Detect disk trouble

(4) Copy data to another node

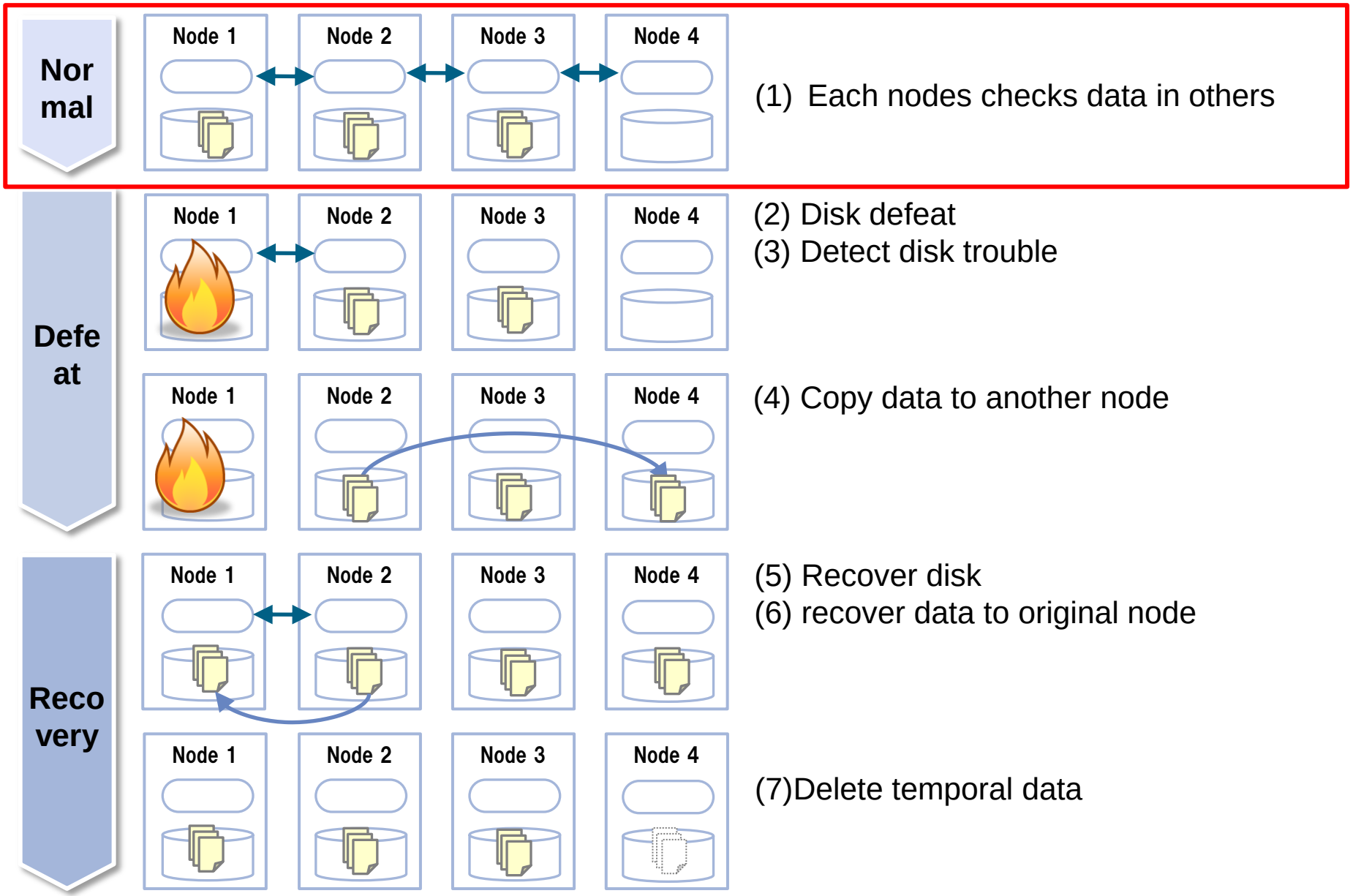
(5) Recover disk
(6) recover data to original node

(7)Delete temporal data

Replicator

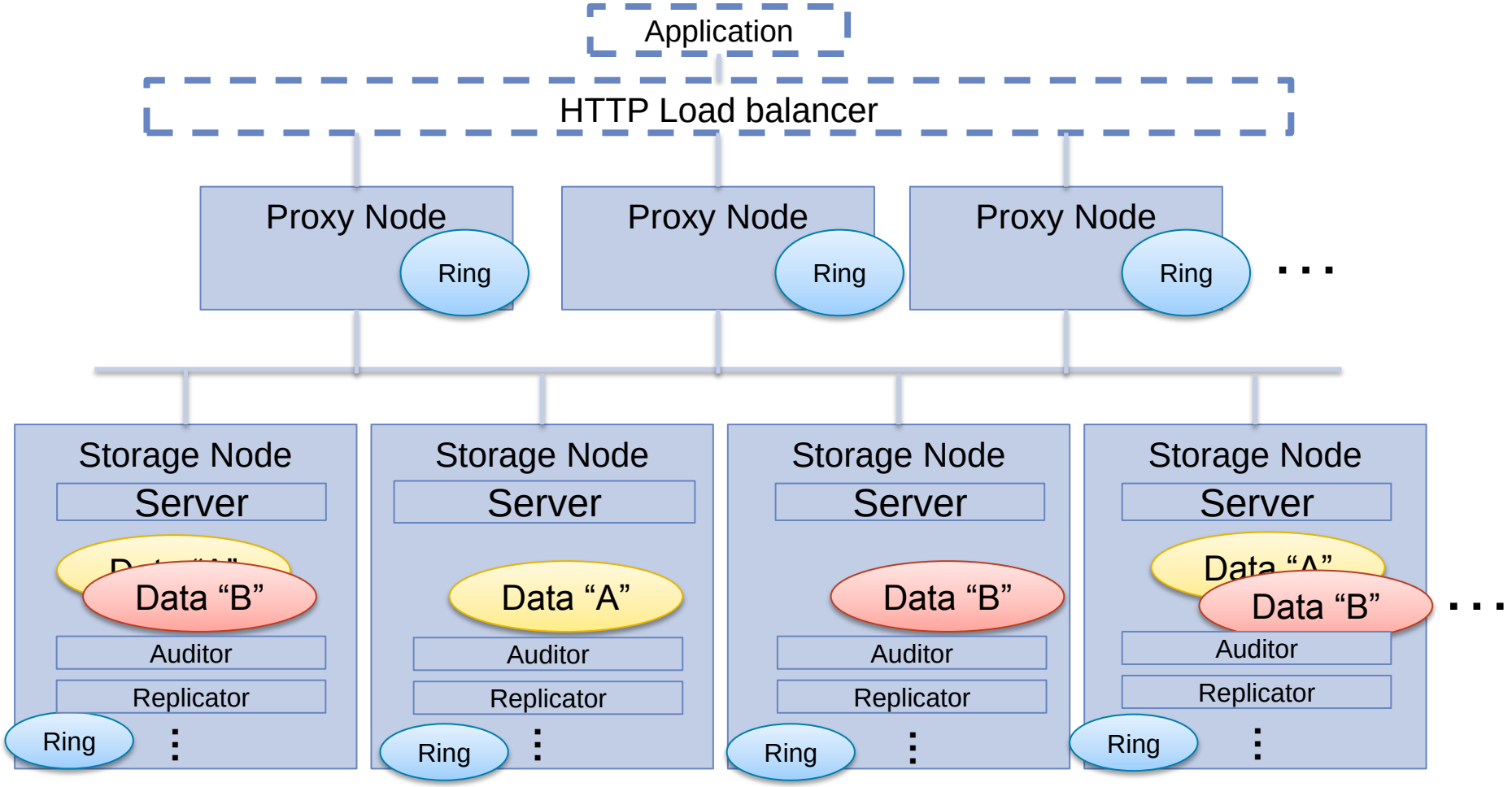


NTT DATA

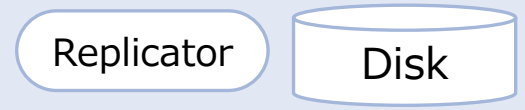


Normal state

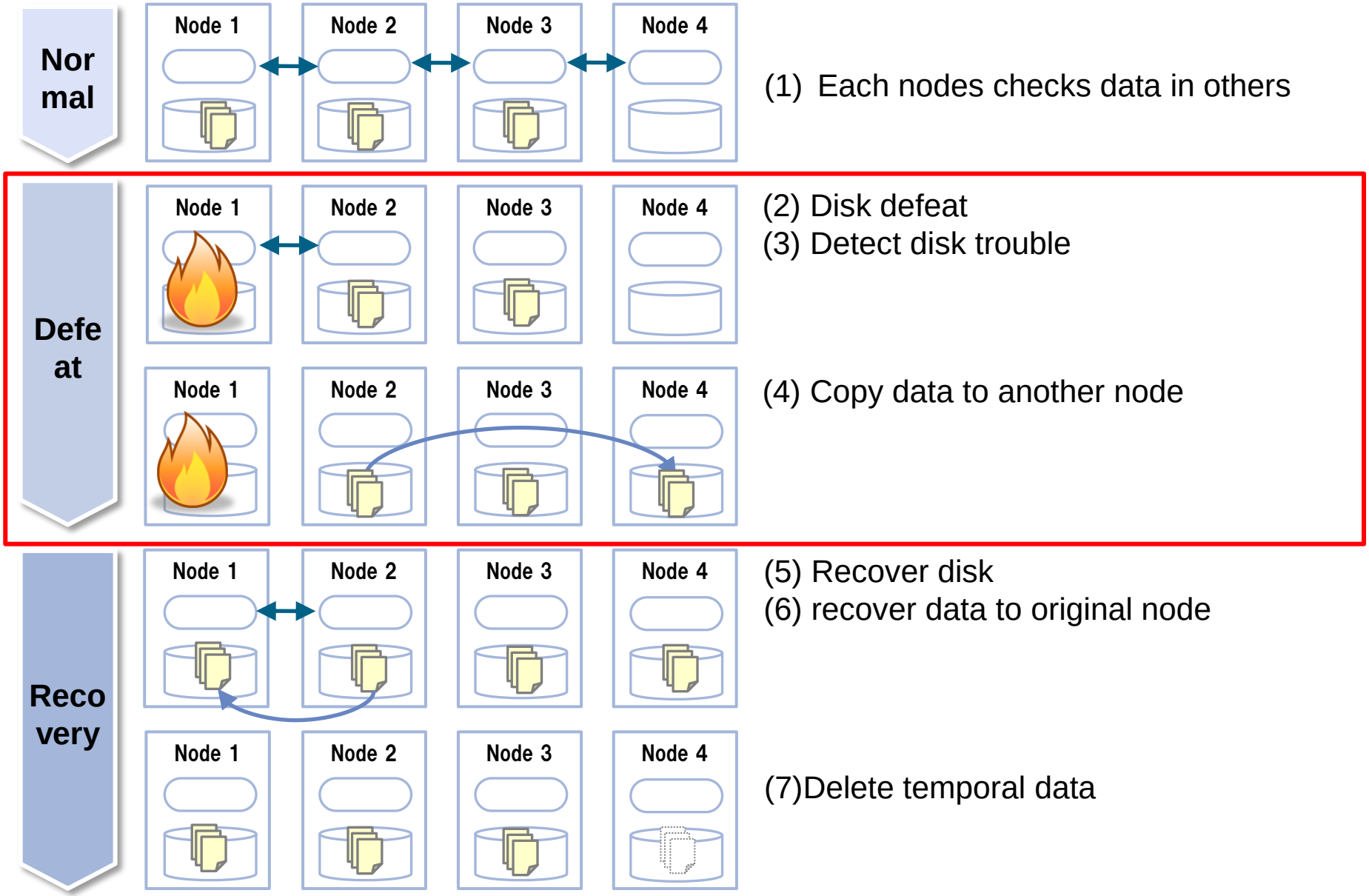
Each Data has replicated.



Replicator

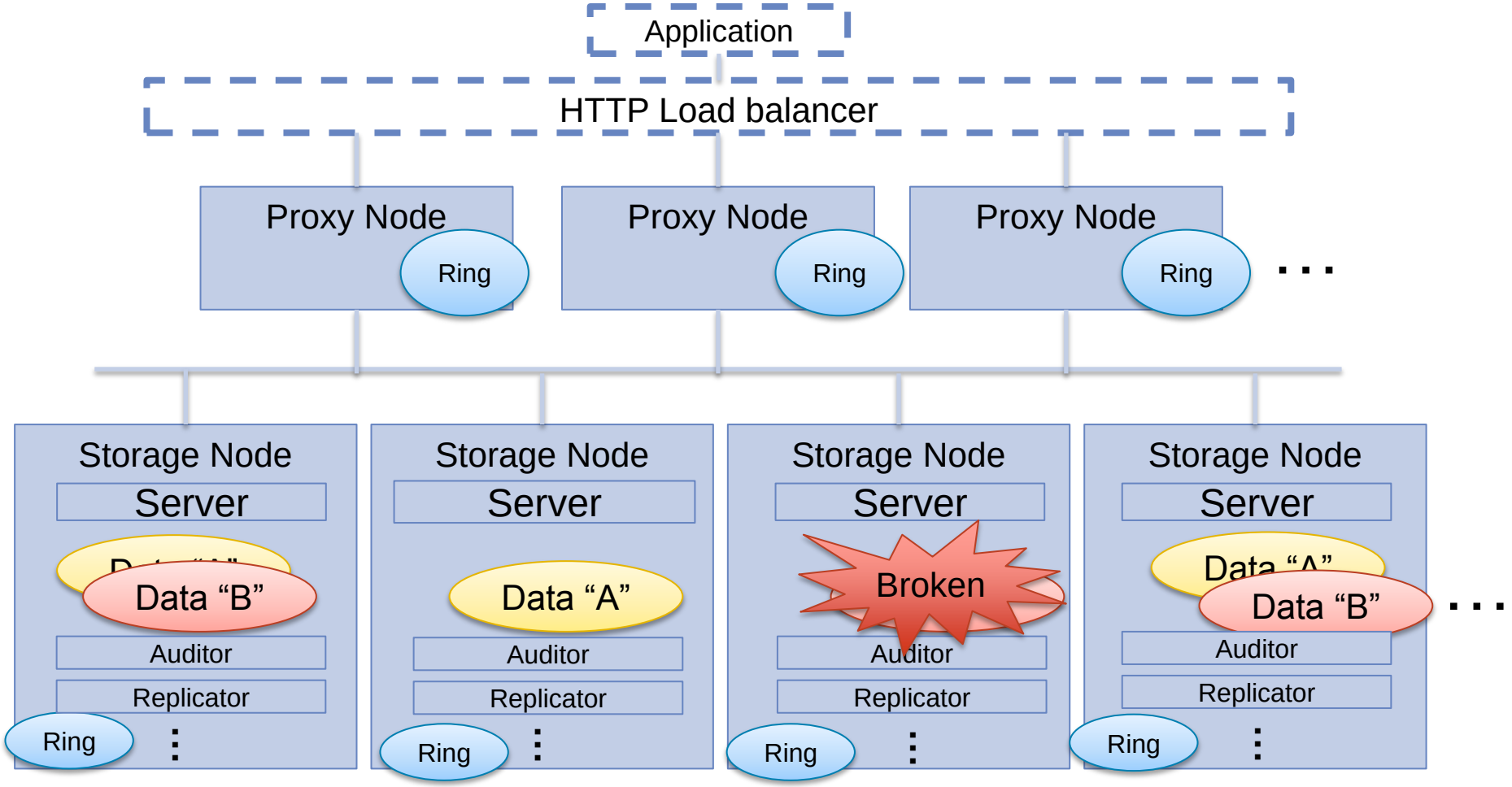


NTT DATA



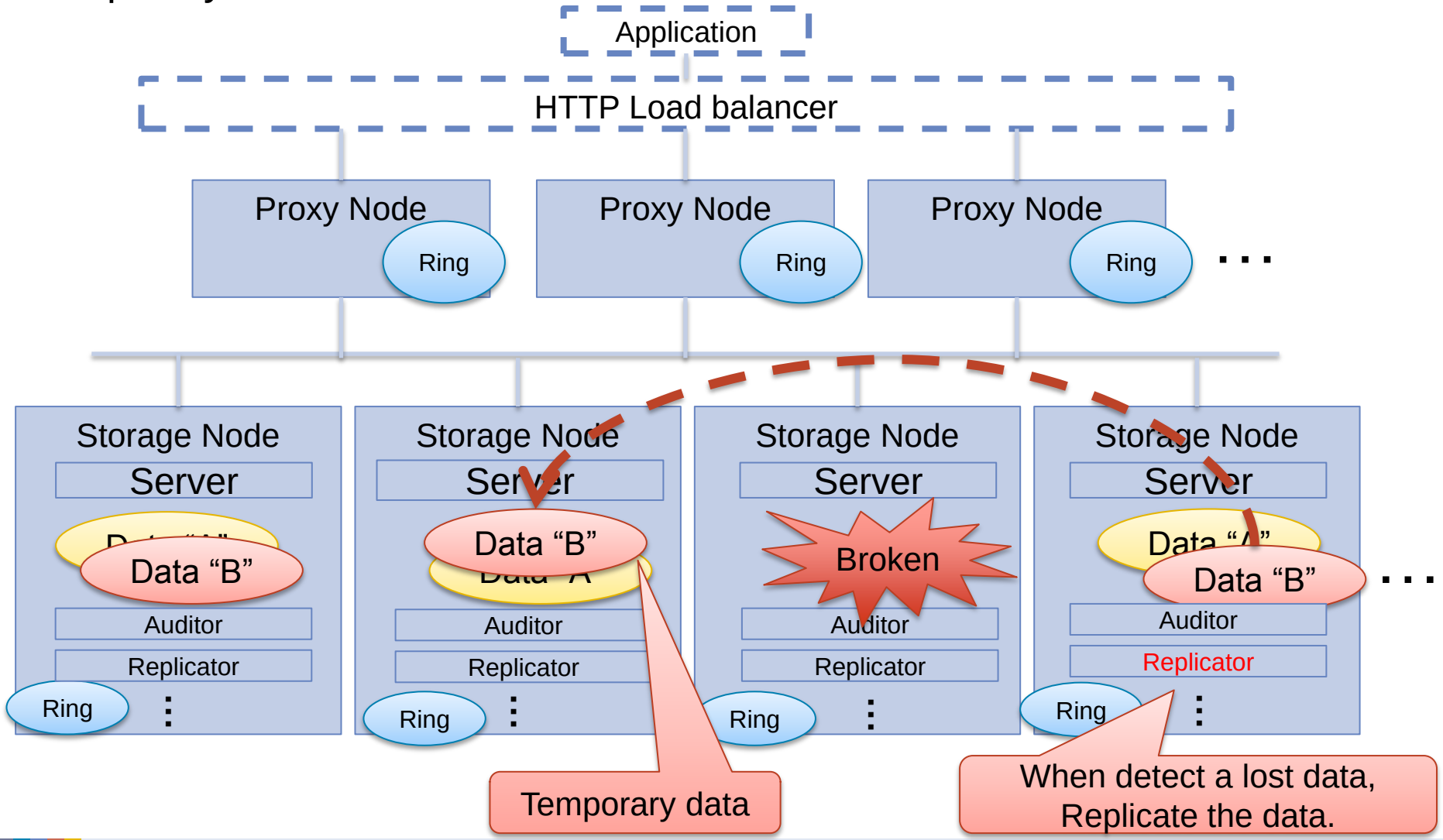
Defeat state

If a disk is broken...

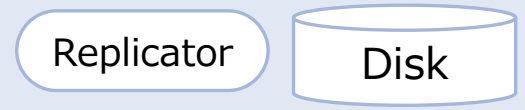


Defeat state

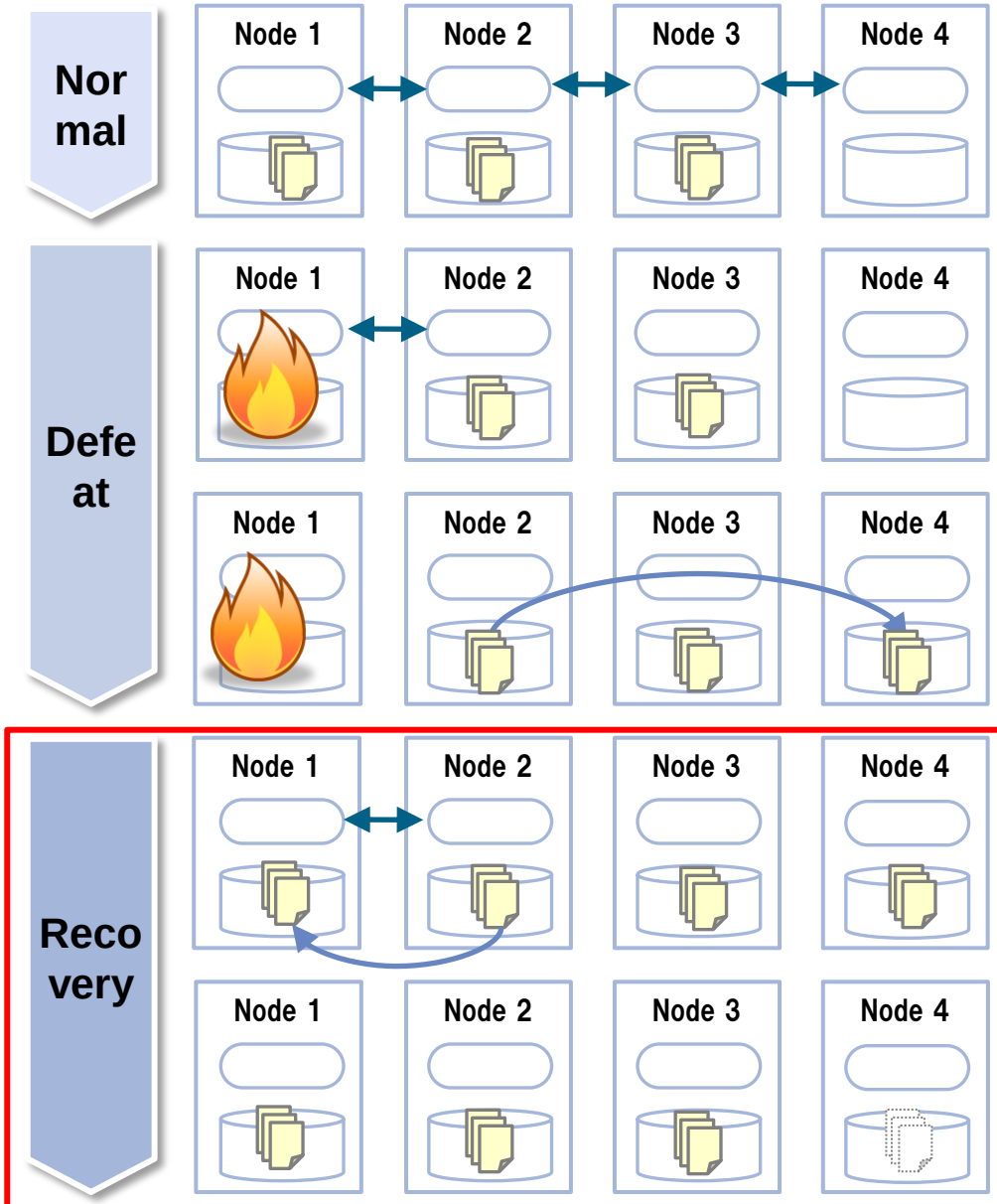
Replicator detects the lost data and replicates the data to another node for temporary.



Replicator

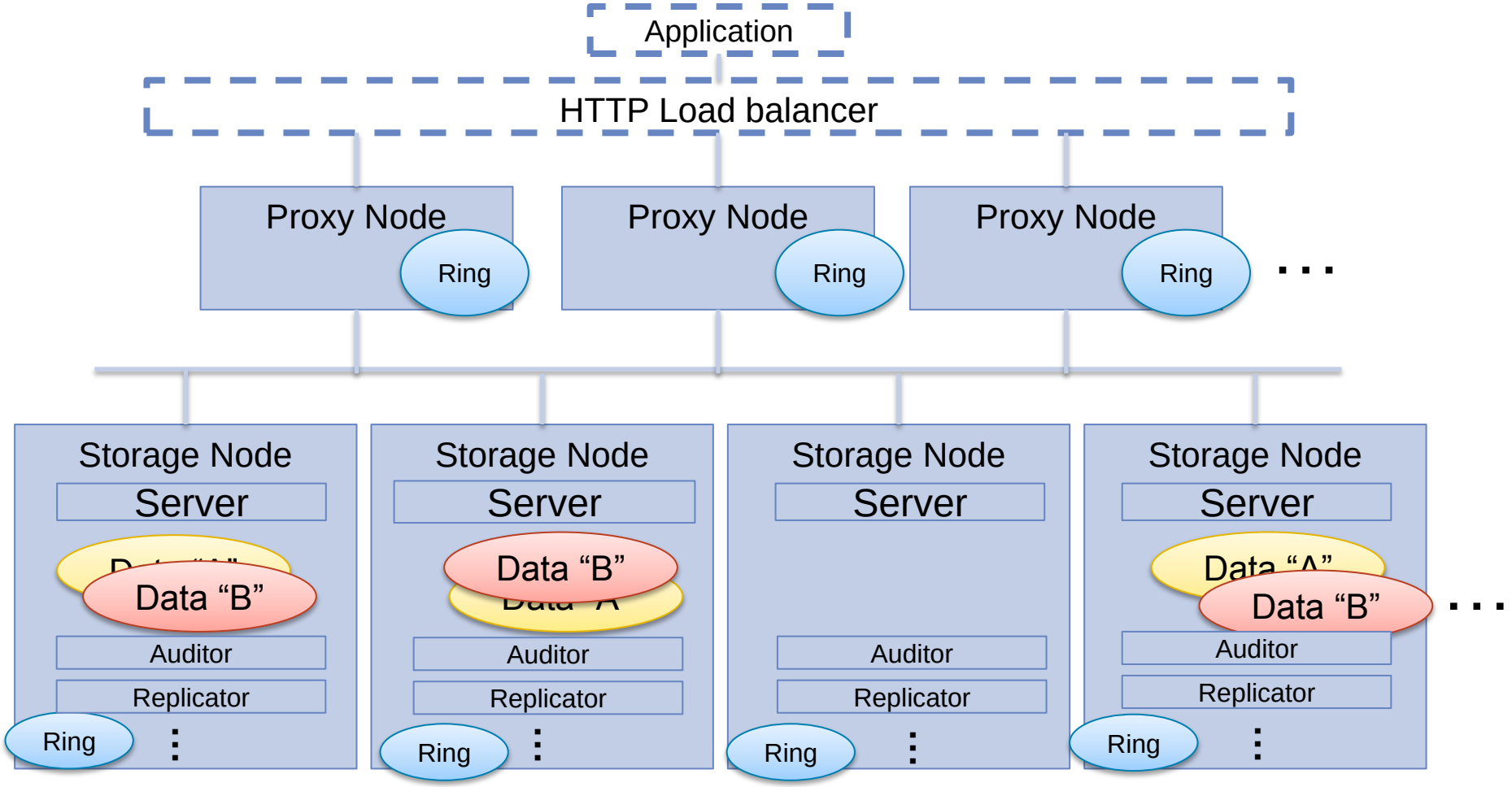


NTT DATA



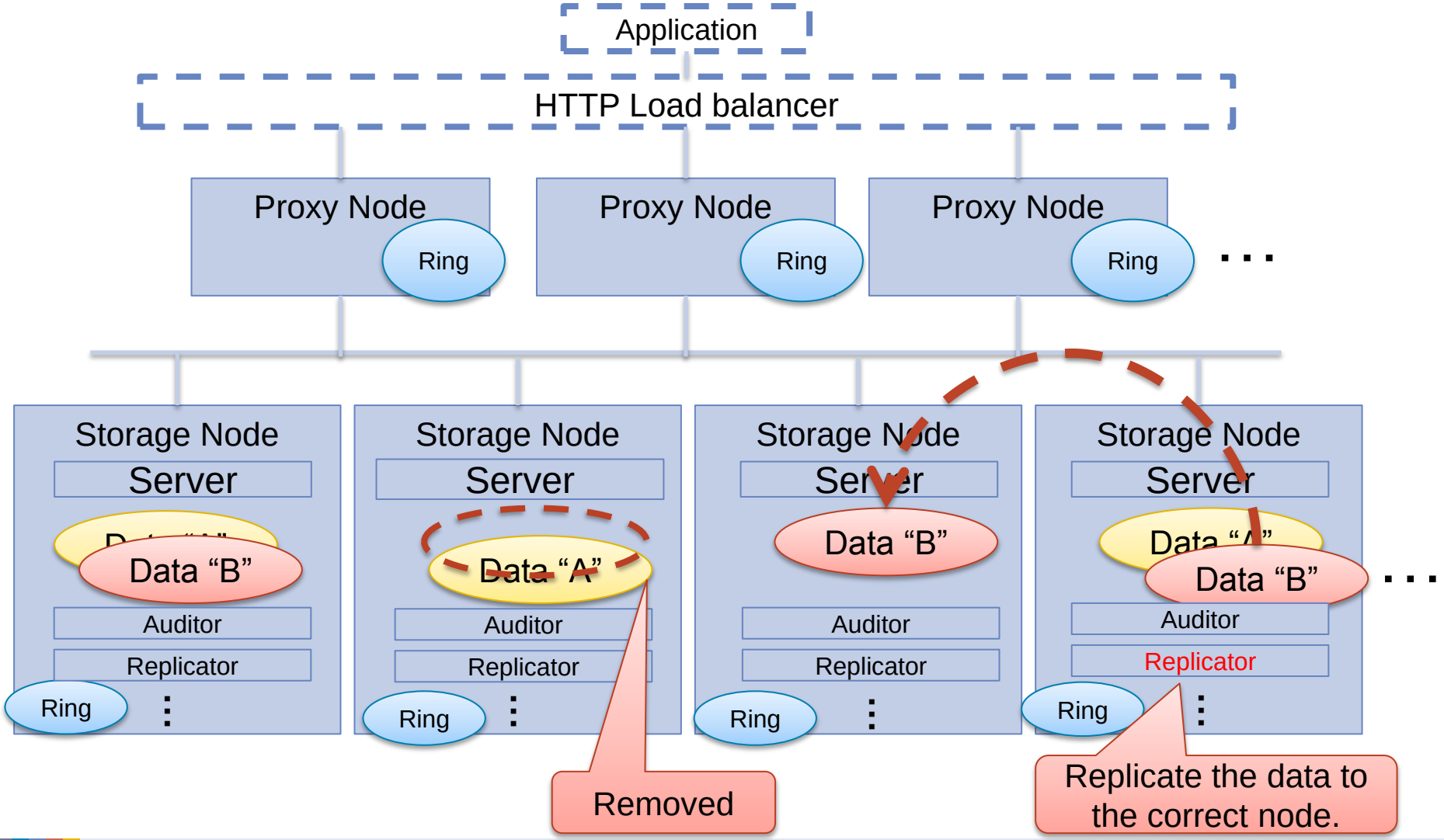
Recovery state

When the broken disk is replaced to a fresh disk...

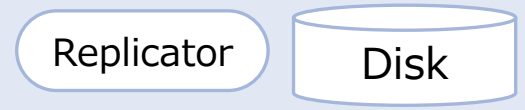


Recovery state

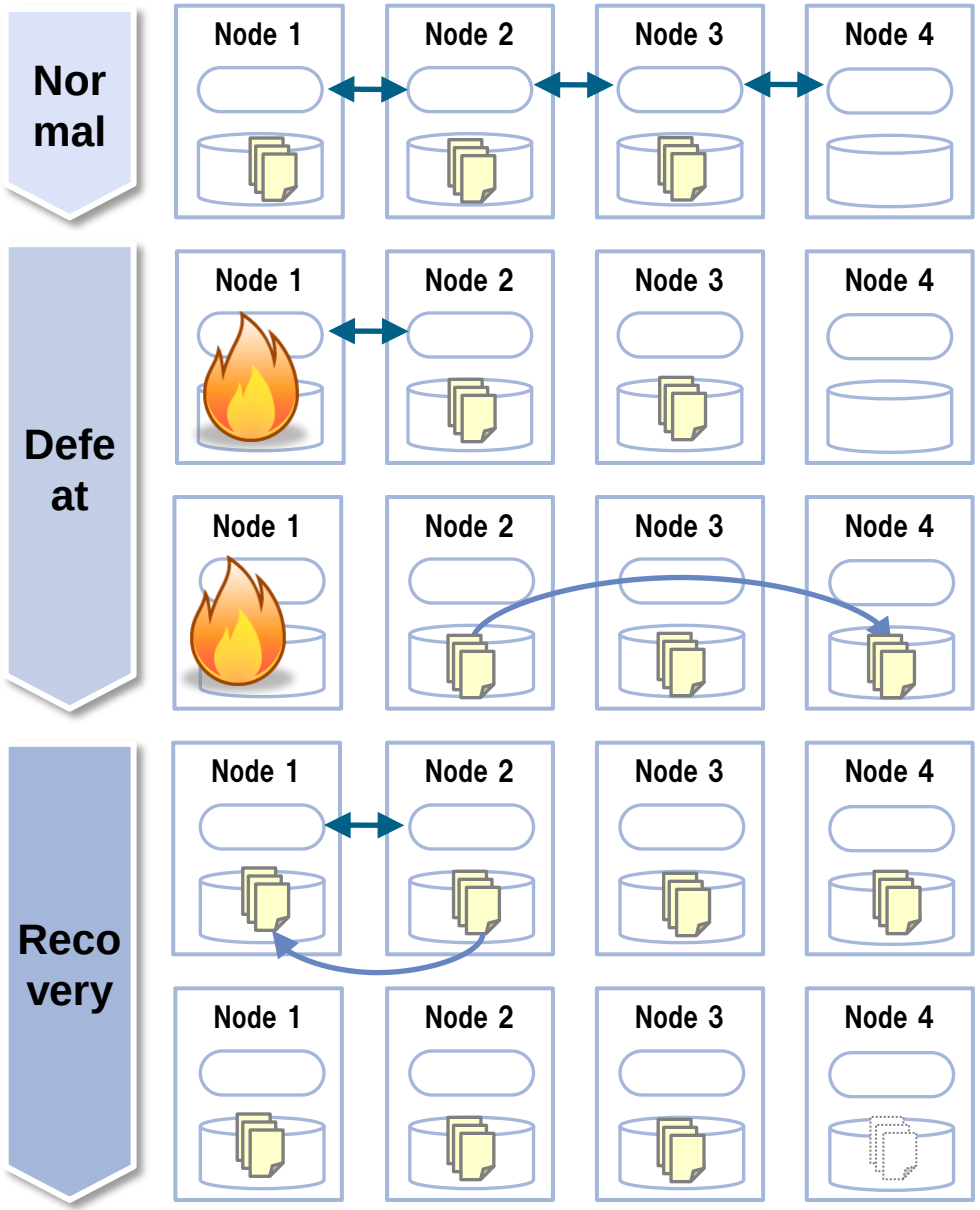
Replicator replicates the data and removes the temporary data.



Replicator

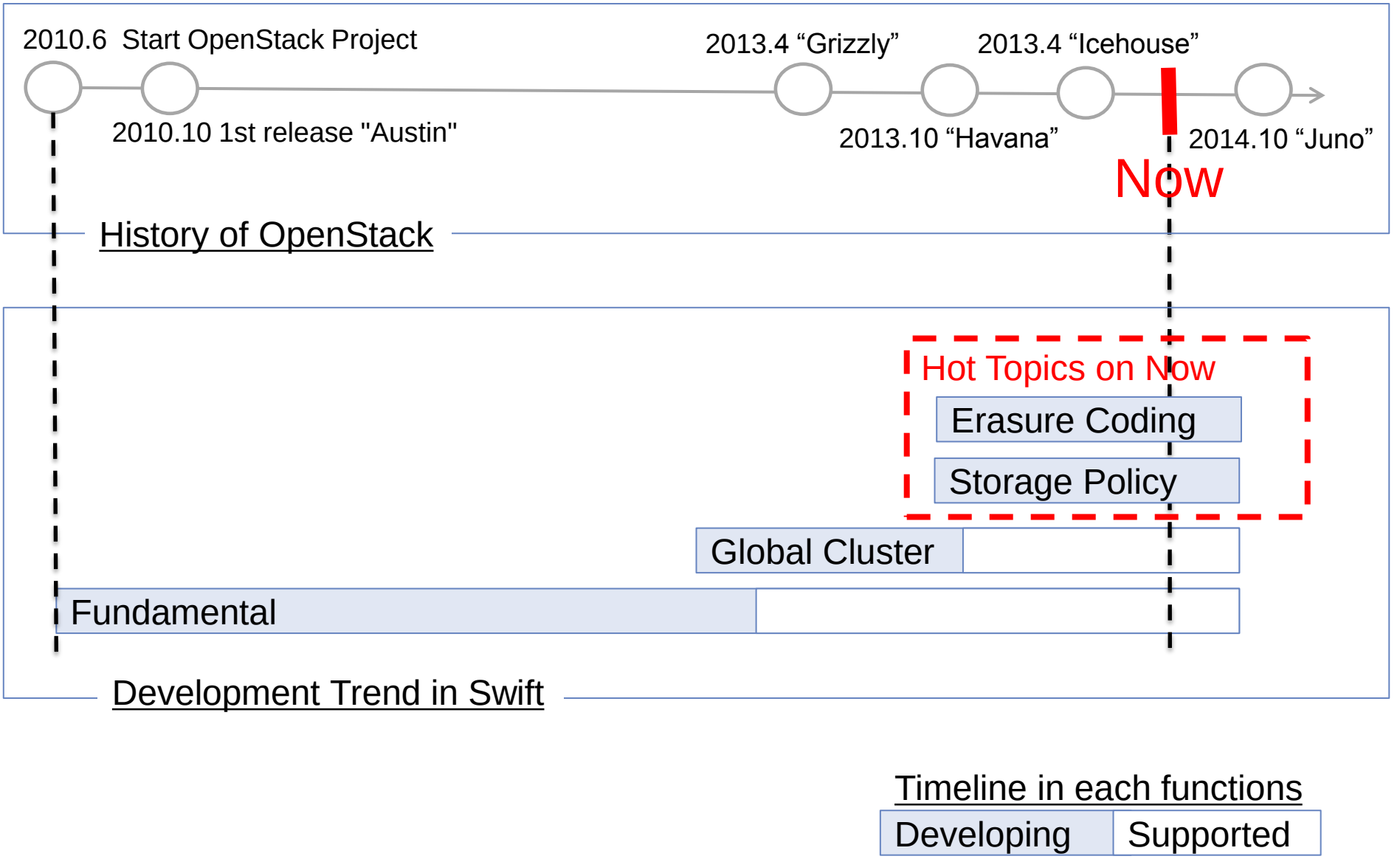


NTT DATA

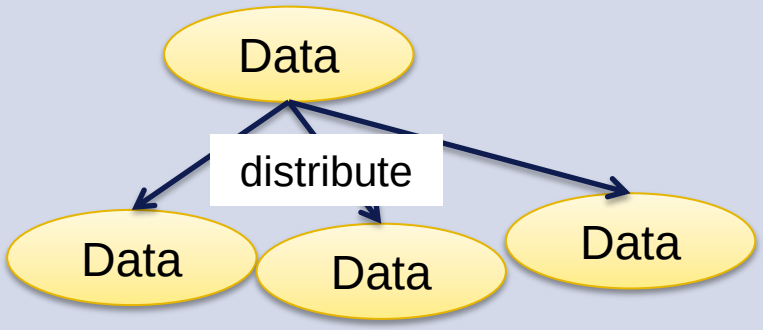
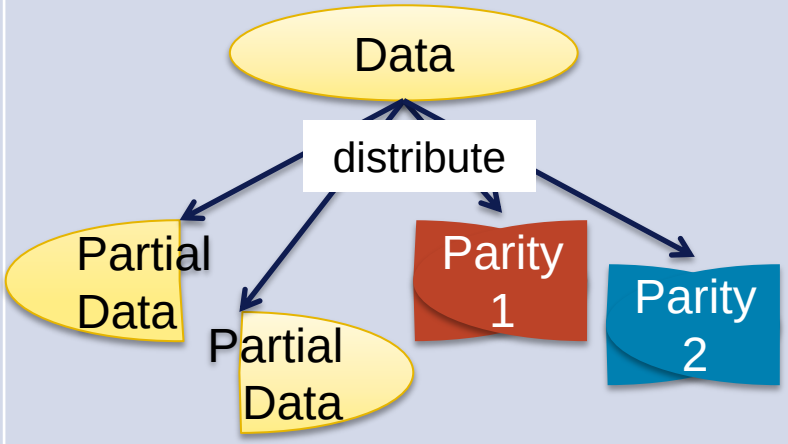


Latest Information

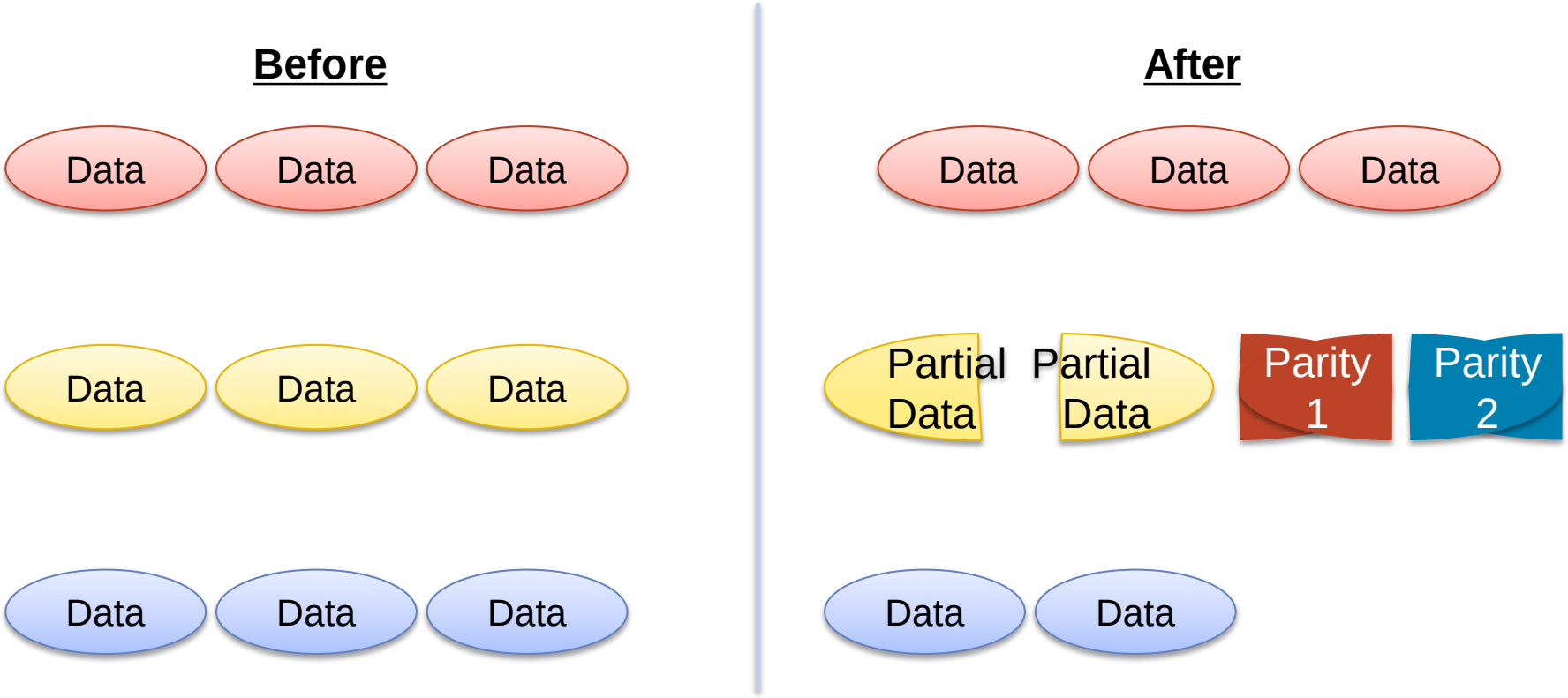
History and Trend of Community



Latest info: Erasure Coding

	Replication	Erasure Coding
		
Size	3x original	2x original

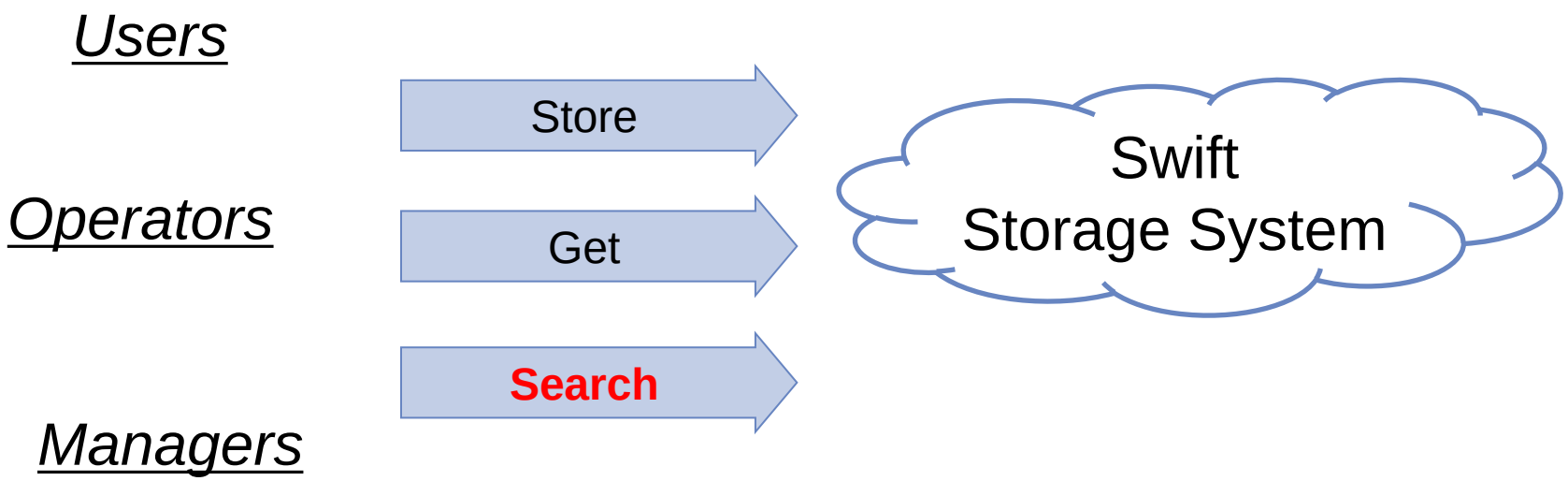
Latest info: Storage Policy




2 concepts:
Integrated Searchable Storage
Intelligent Resource Management
Future Direction of Swift

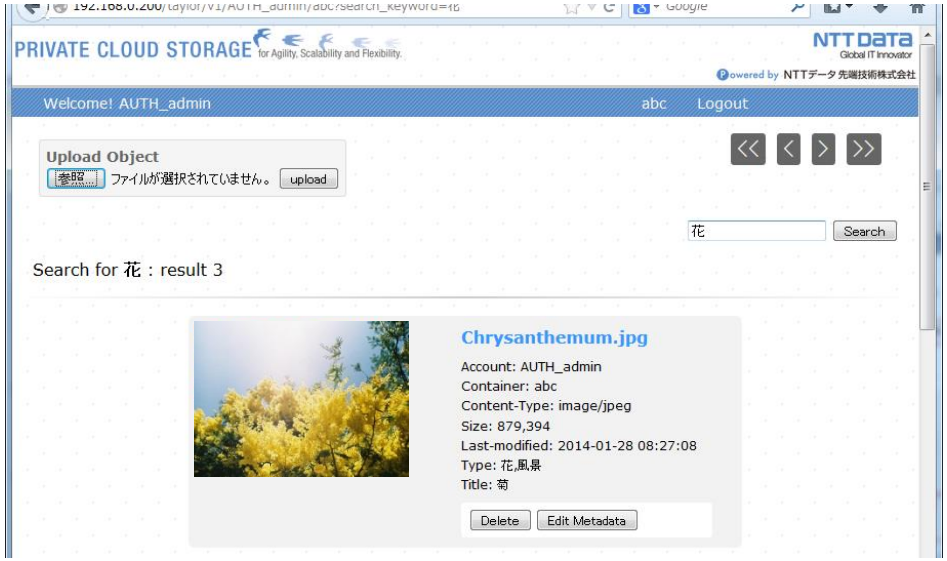
Integrated Searchable Storage

Swift should be integrated with Searching.
It means to need searching as ***Scalable, Durable, Available*** as Swift.

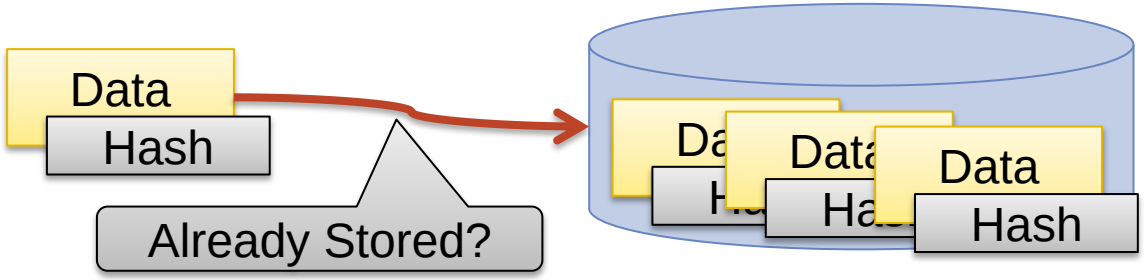


Use cases of Search

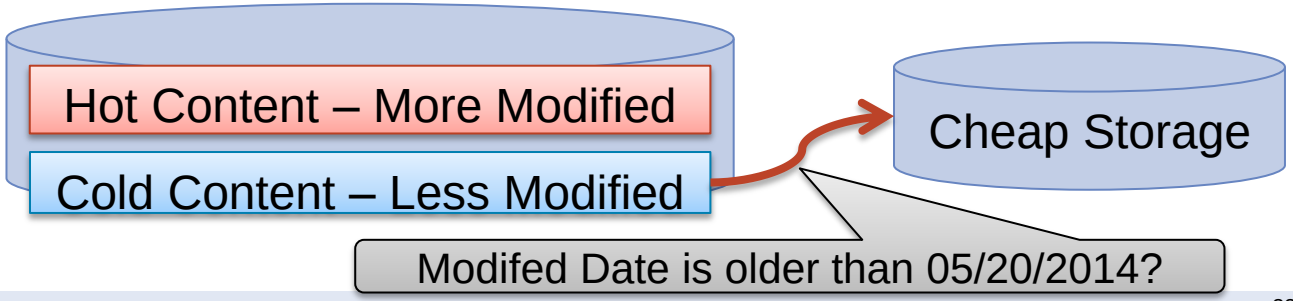
1.Content Search



2.Detection for de-duplication



3.Tiered storage



Future: Integrated Searchable Storage

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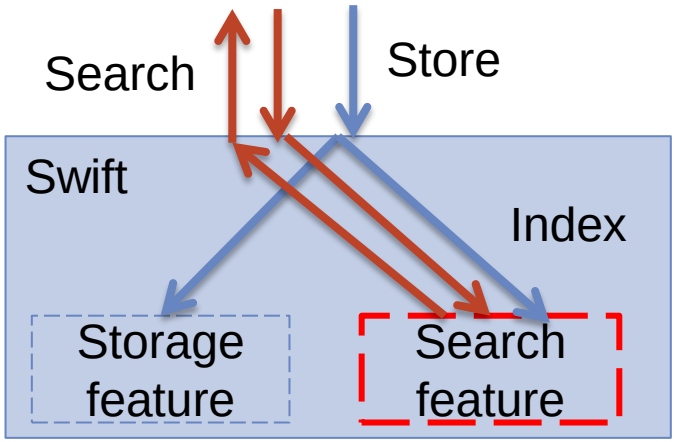
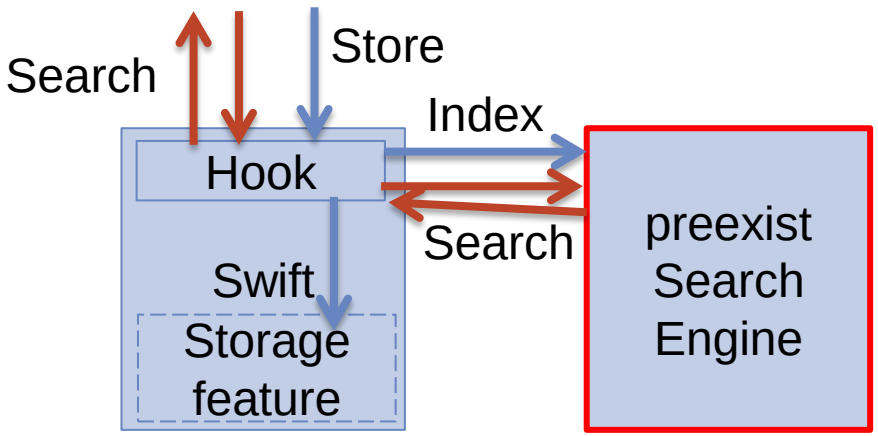
How do we implement?

Internal



External



	Internal	External
Where do search	Swift with search library (such as Lucene)	Search Engine (such as Solr)
Redundancy	High	Depend on Search engine
Availability	High	Depend on Search engine
Scalability	High	Depend on Search engine
Difficulty of implementation	Hard	Easy

Our Implementation

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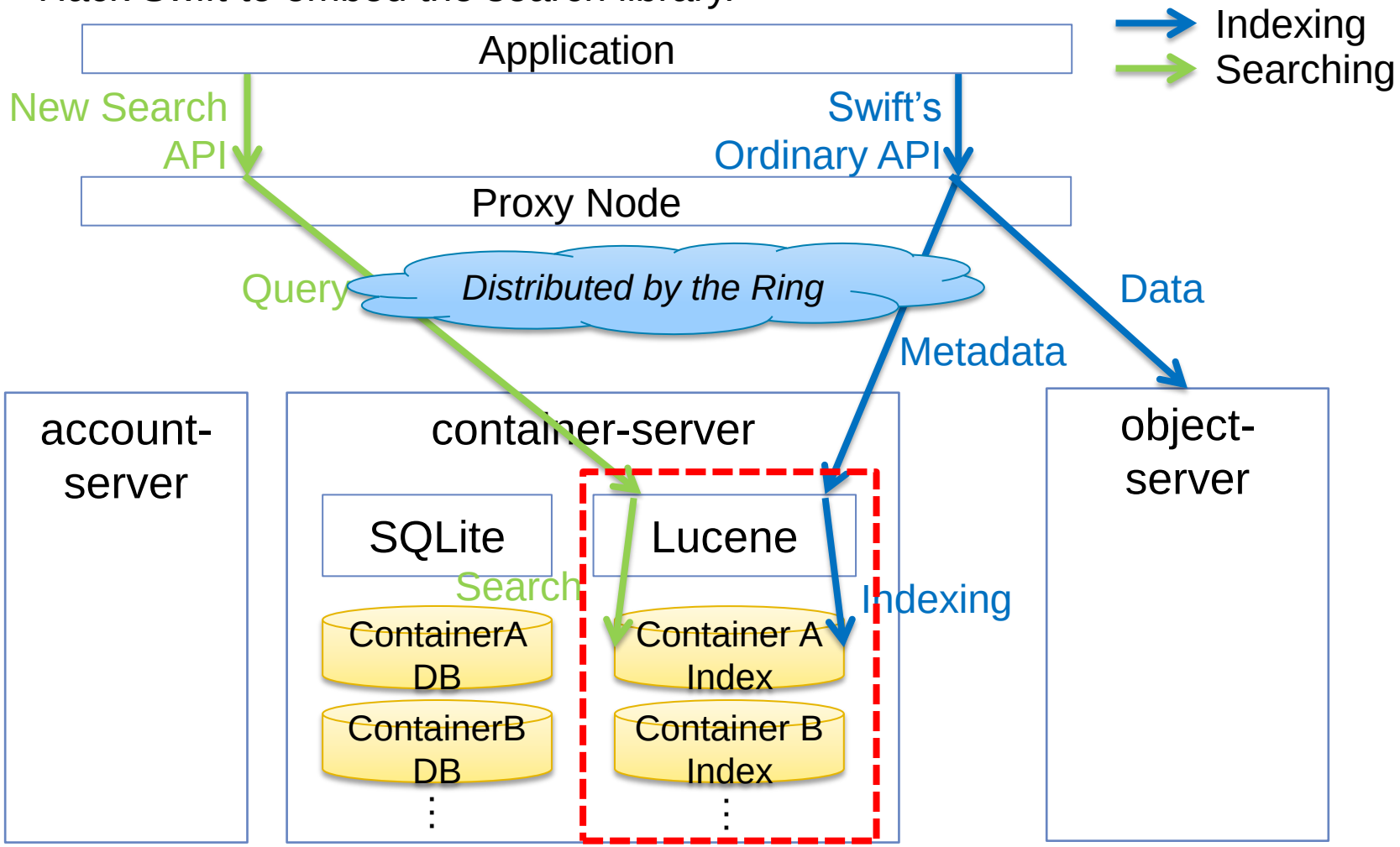
Internal Approach

- Hack Swift to embed the search library.



Future: Intelligent Resource Management

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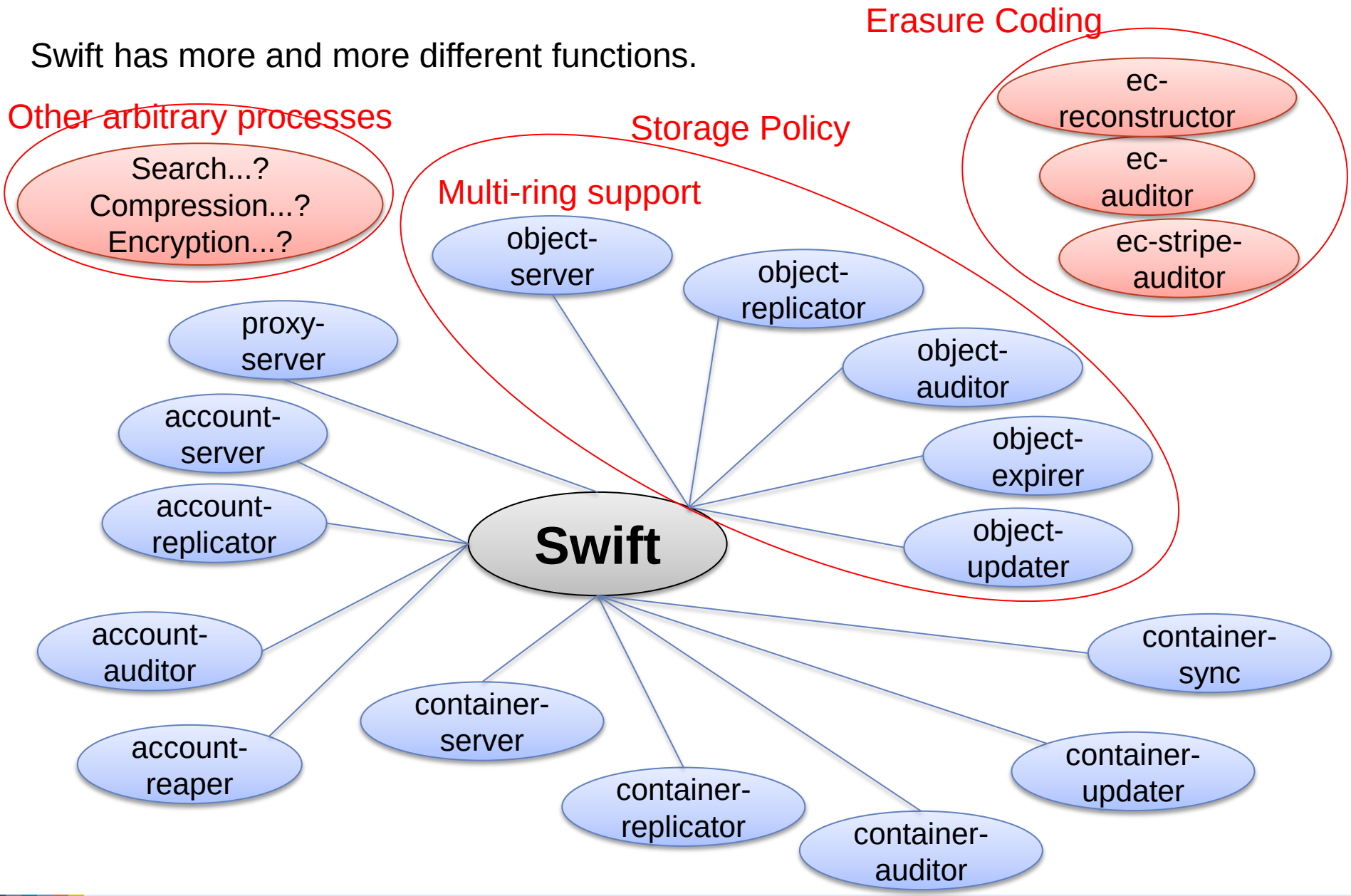
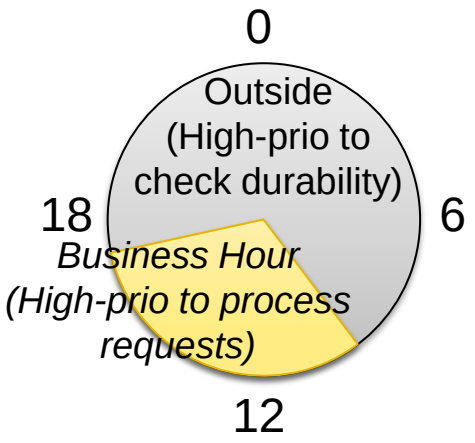
Swift has more and more different functions.



Future: Intelligent Resource Management

- ✓ Resources are drained! – IOPS, CPU, Network, Memory
- ✓ Performance Priorities of these functions are different by the Requirement.
  - Ex1) Store performance *VS* Search performance
  - Ex2) Service Level on Business Hour *VS* on Outside Hour



More Intelligent Resource Management is necessary.

with ***cgroups***

Summary

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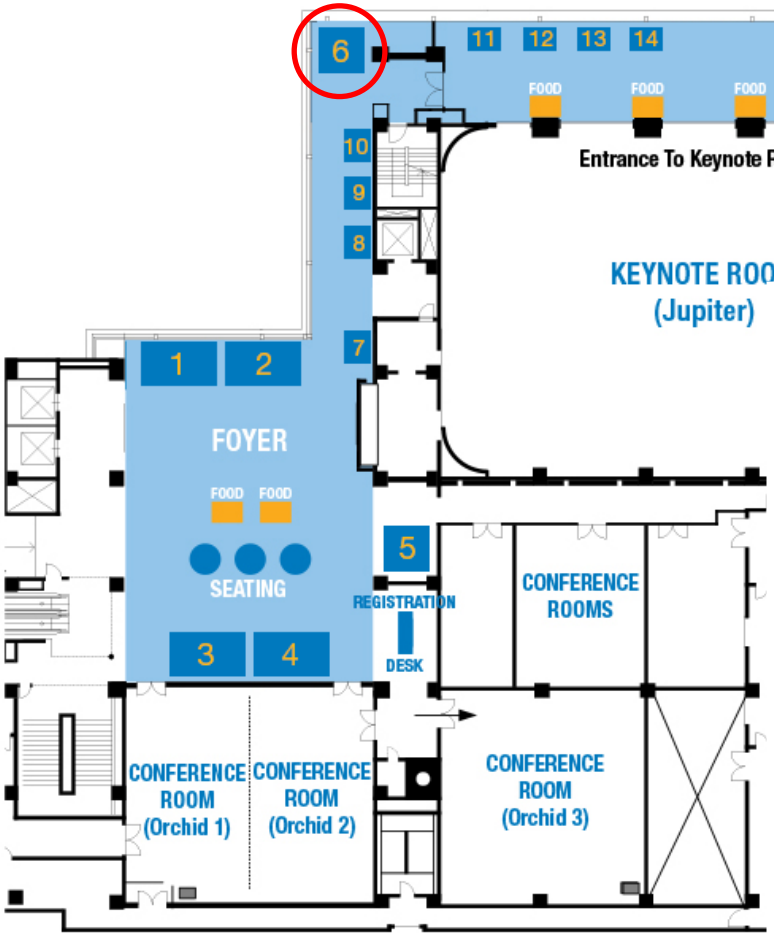
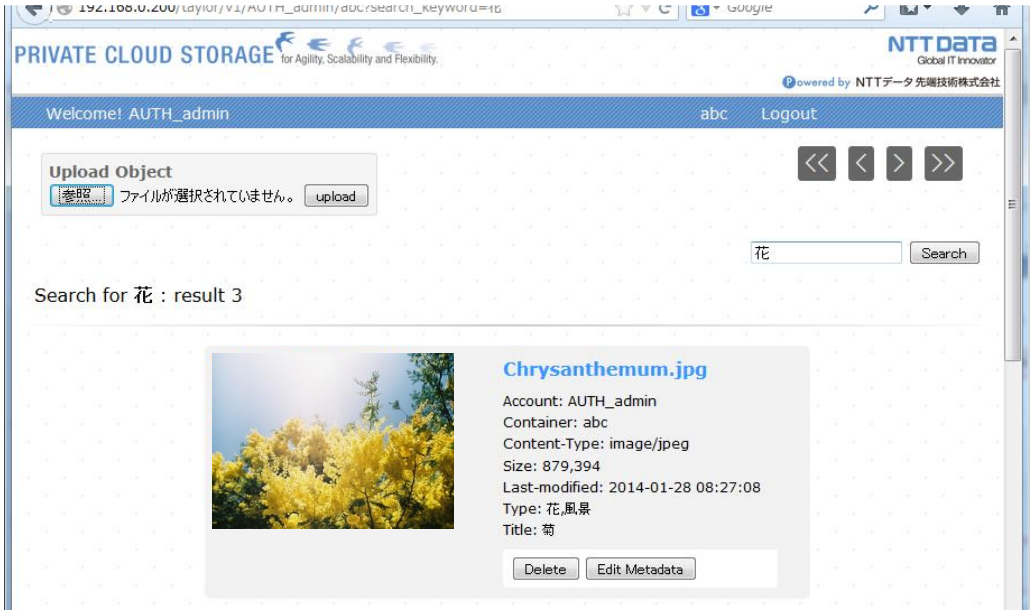
1. What is Swift?
   - Swift is a Great OSS, for storing unstructured data.
2. Swift's Latest Information
   - Erasure Coding
   - Storage Policy
3. Swift's Future
   - Integrated Searchable Storage
   - Intelligent Resource management

PR: Demonstration is Now Available!

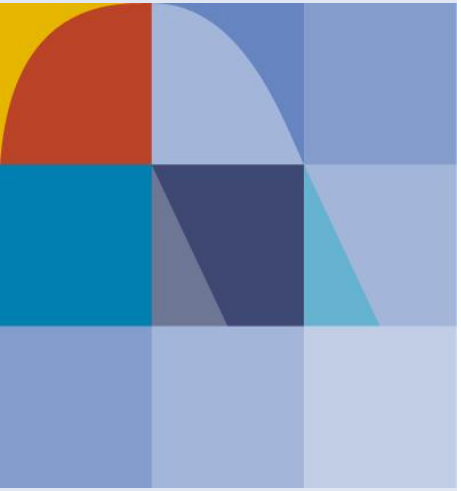
We exhibit the Demo Application(Contents delivery system) built with Swift.

- On-demand Delivery a lot of contents(Pictures or movies) stored at Swift.
- Implemented Searching on Swift. *(Our original implementation)*





Q&A: Do you have any question?



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Global IT Innovator

Thank you for your attention!
Please contact to
hagiwarayuj@nttdata.co.jp,
if you have any questions or comments.

Challenges and Questions

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How to integrate Swift with cgroups?

- How to use cgroups?
- What is the best toolset for cgroups?
  - VFS?
  - libcgroup?
  - systemd?
- How to control multiple hosts with cgroups dynamically?

How to integrate Swift with search?

- What is the best implementation way?
- What is the best search middleware?
- How to search Multilingual?