November 7, 2013

openstack™
CLOUD SOFTWARE

OpenStack Summit Hong Kong

DAN WILSON
Global Operations Architecture, **Concur**

dan.wilson@concur.com
@tweetdanwilson

Concur

JOE ARNOLD
CEO, **SwiftStack**

joe@swiftstack.com
@joearnold

SwiftStack

Introduction (Concur / SwiftStack)

OpenStack Swift: Introduction

Concur User Story

Swift + Global Replication

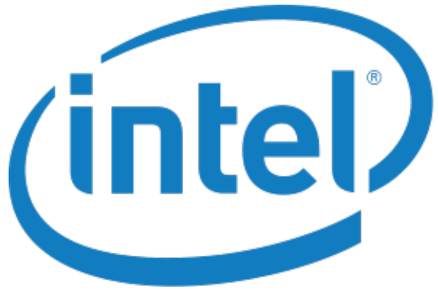
OpenStack Swift

Global Replication in Swift

An Introduction to Concur

- Leader in integrated travel and expense management
  - Founded in 1993, headquartered in Redmond, Washington, U.S.
  - >50% of Fortune 500 use Concur
  - >$50B in T&E spend
    - Some of you in the audience will be expensing this trip with us!

EMC² where information lives®

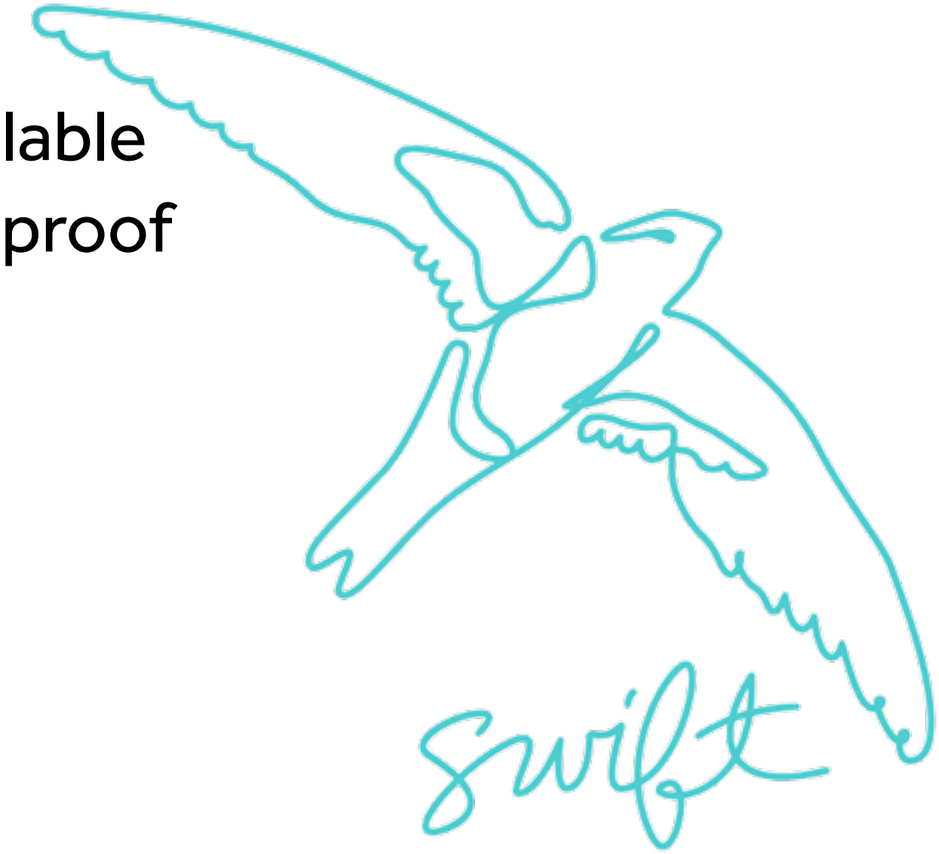


SwiftStack

What is OpenStack Swift?

Storage created specifically for heavy use and unstructured data

- Reliable
- Highly scalable
- Hardware proof



SwiftStack

What is SwiftStack?

Flexible, private cloud storage for today's applications

- Start fast, operate easy
- Simplicity at scale
- No lock-in

STORAGE POWERED BY

1. **Foundation**
2. **Integration**
3. **Control**

SwiftStack Controller 3

Operates, manages & monitors hardware, storage software & middleware

SwiftStack Nodes

Integrations & Interfaces 2
End-user web UI, legacy interfaces, authentication,utilization API, etc.

Swift Runtime 2
Integrated storage engine with all node components

OpenStack Swift 1
Released and supported by SwiftStack

Standard Linux Distribution
Any Linux admin can install Ubuntu. Red Hat. CentOS

Standard Hardware
Multiple channels hardware procurement

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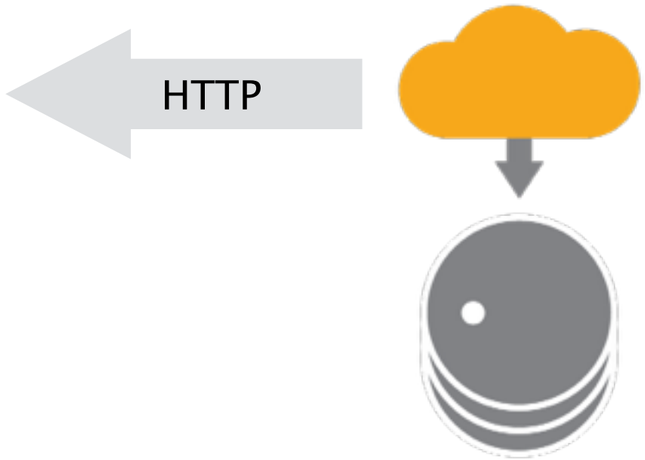
Global Replication in Swift

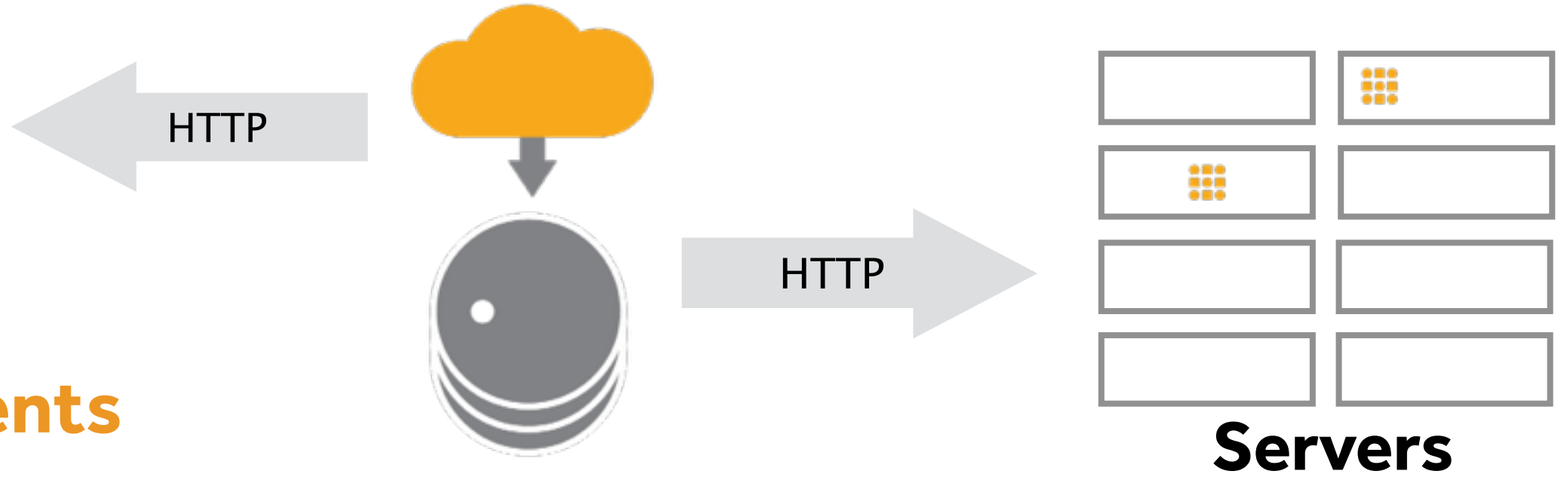
http://example.com/v1/account/container/object



Swift's Design Goals

Reliable	Configurable replica model with zones & regions Easy to use HTTP API – Developers don't shard High Concurrency (Supports lots of users)
Highly scalable	Multi-tenant – each account has own namespace Tier & scale any component in the system
Hardware proof	No Single Point of Failure (High Availability) Assumes unreliable hardware Mix & match hardware vendors

OpenStack Swift



Direct to Clients

Data is sent directly over HTTP to a browser, mobile device, etc.

Broad Language Support

- Java
- Javascript
- Python
- C#
- Ruby
- PHP
- Node.js

Services & Software

Filesystem Gateways

Desktop Clients

Backup Software

Archive Software

Filesharing Software

In the data center

Servers contact the storage system

Application Data

Backups / Archive

Log Data

SwiftStack

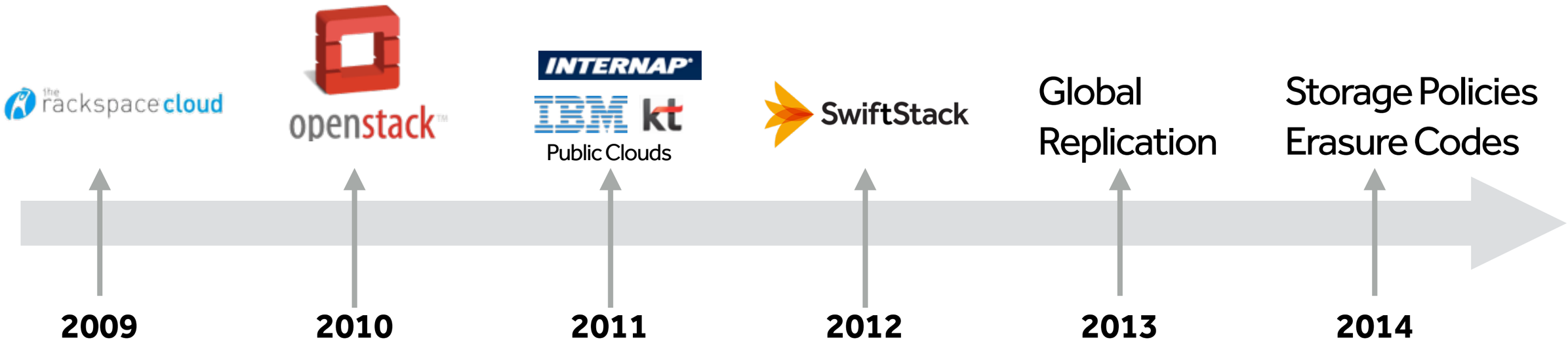
OpenStack Object Storage

(code named Swift)

- Object storage system similar to Amazon S3
- Apache 2 License

136+

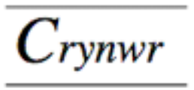
DEVELOPERS



MATURE, PRODUCTION-GRADE STORAGE SYSTEM

SwiftStack

OpenStack Swift Ecosystem



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Swift + Global Replication

OpenStack Swift

Global Replication in Swift

Scale = Tens of Millions of Images Monthly

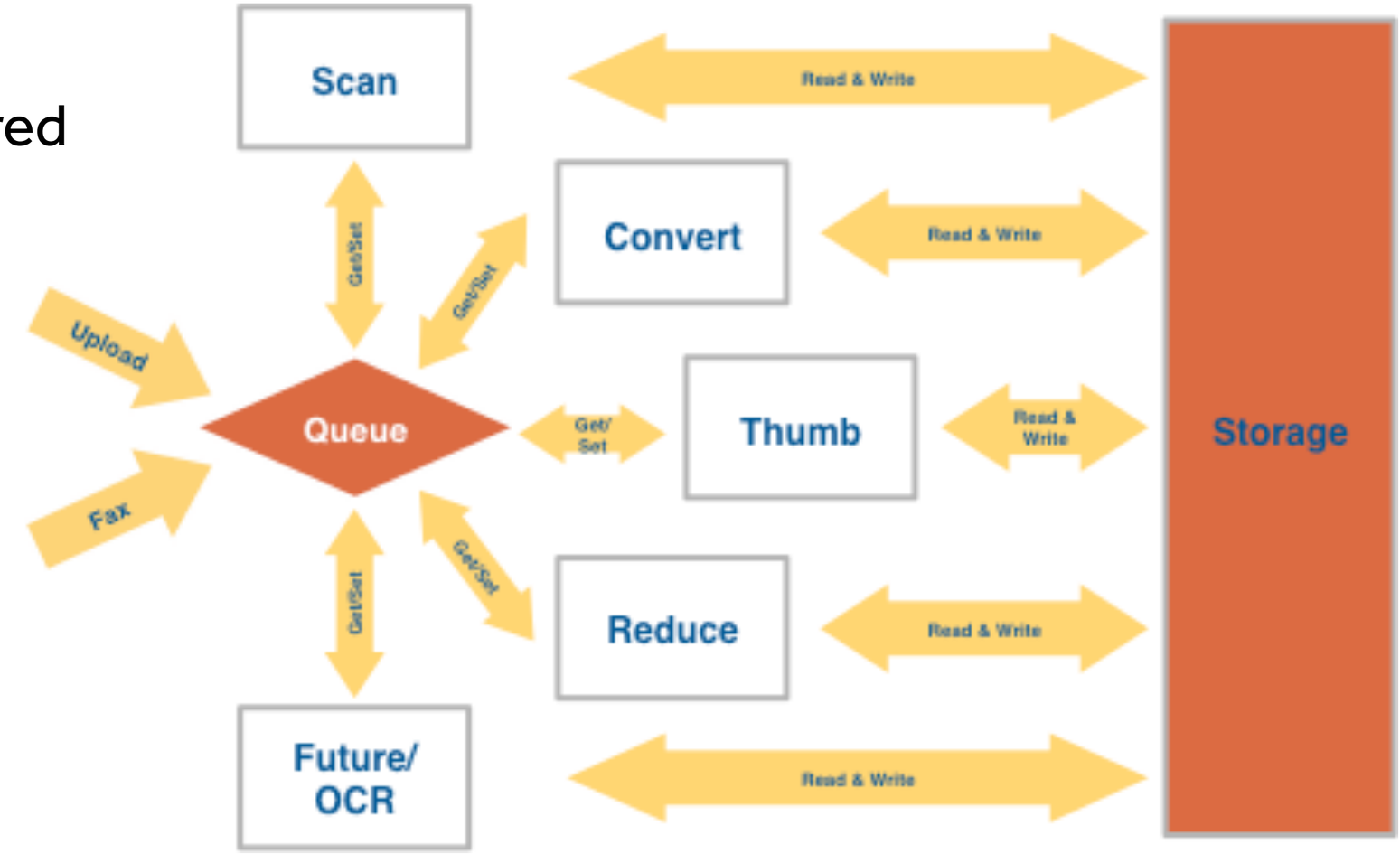
SwiftStack

Concur Imaging Application: Previous Workflow

Images processed first, then stored
Extract data, resize, etc.

Core part of the business
Disaster tolerance a must

Handling objects vs. files
Minimal difference for developers



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Concur Imaging Infrastructure

Linear image processing

Mixed stack including Microsoft

Designed for flexibility

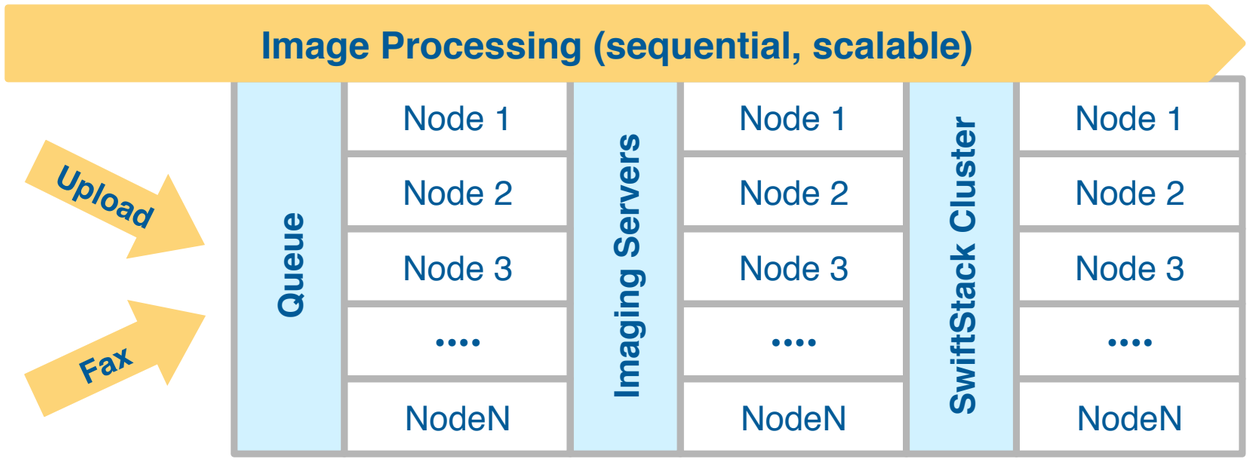
Abstracted services

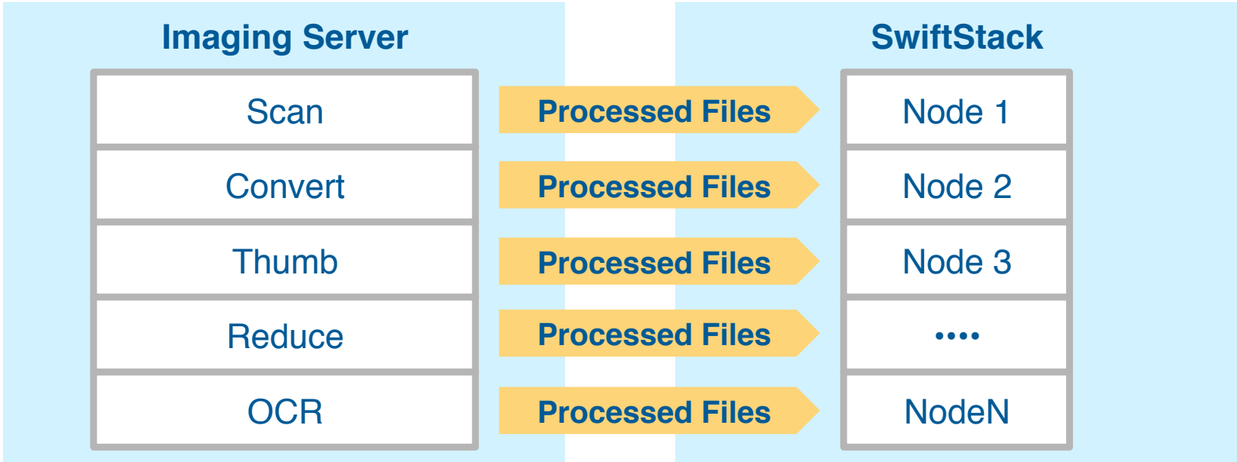
3-tier architecture

Web, application, database

Images encrypted individually

Flexibility to use any storage





SwiftStack

Challenges with Traditional SAN/NAS

Availability

- Handling failures of a single-node

Cost

- Tied to specific vendor pricing

Performance

- Unbalanced performance
- Each application server goes to the same node when reading/writing data

Black box when troubleshooting

- Limited visibility, reliant on vendor

SwiftStack

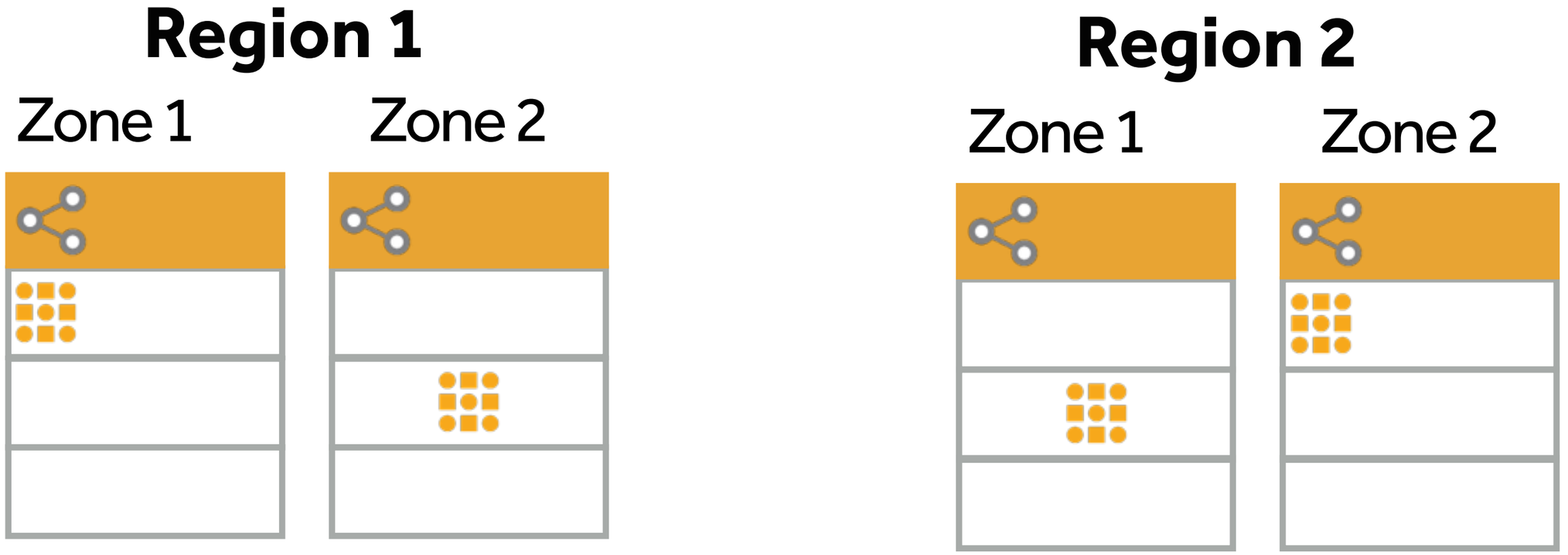
Global Cluster Setup

Availability

- Two site replication strategy
- Designed for failure

Performance

- Quickly acknowledged writes
- Local Reads



SwiftStack

Visibility under the hood

Open Source

- Storage functions entirely open source
- Go under the hood

Flexibility

- Can choose private, public
- Future proof infrastructure

Open Stack

- Open community
- Give back

Ecosystem Partners

- Many choices in the ecosystem

Hardware Configuration

Scalability

- Standard Server Hardware
- Scale by adding nodes

36-drive 4U storage node

Intel Xeon Processor

Seagate Constellation SATA or SAS Disks

LSI HBA Controller + Expanders

96 GB RAM

Mirrored boot drives

Dual 10GbE Intel NIC

1U Proxy Node

Dual Intel Xeon Processor

48 GB RAM

Mirrored boot drives

Dual 10GbE Intel NIC

SwiftStack

TCO - Less Expensive than Public Cloud

$0.027
per GB / Mo.

- 4 replicas for redundancy (2 in each data center)
  All the power / space / cooling costs
- Our management costs
- SwiftStack + other license costs

Less expensive than public cloud.

Less expensive than traditional storage.

Ready for BILLIONS of Images in the Future!

What this means for the business

- Best experience for our users as possible.
- Amass data in a cost-effective way

What this means for our architecture

- Business growth forced finding a better way
- Architecture can now support growth

OpenStack Swift + global cluster functionality, enables us to achieve these goals.

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Global Replication in Swift

Global Clusters

Multi-Site with OpenStack Swift

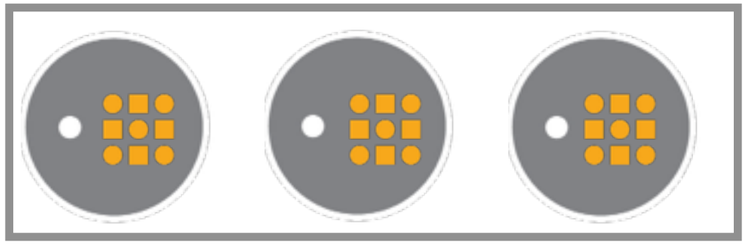
SwiftStack

Global Clusters

Data placement: as unique as possible

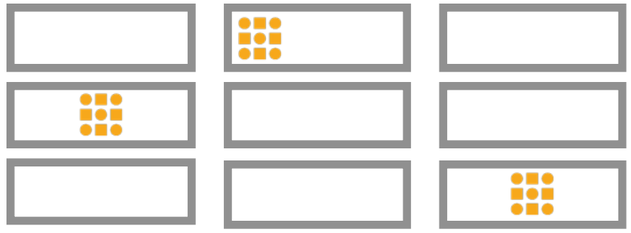
Single Node Cluster

Disks are “as-unique-as-possible”



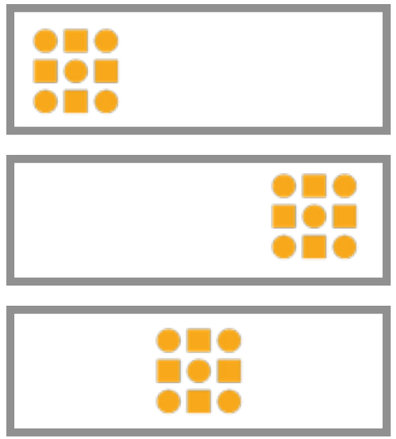
Large Cluster

Storage Racks are “as-unique-as-possible”



Small Cluster

Storage Nodes are “as-unique-as-possible”

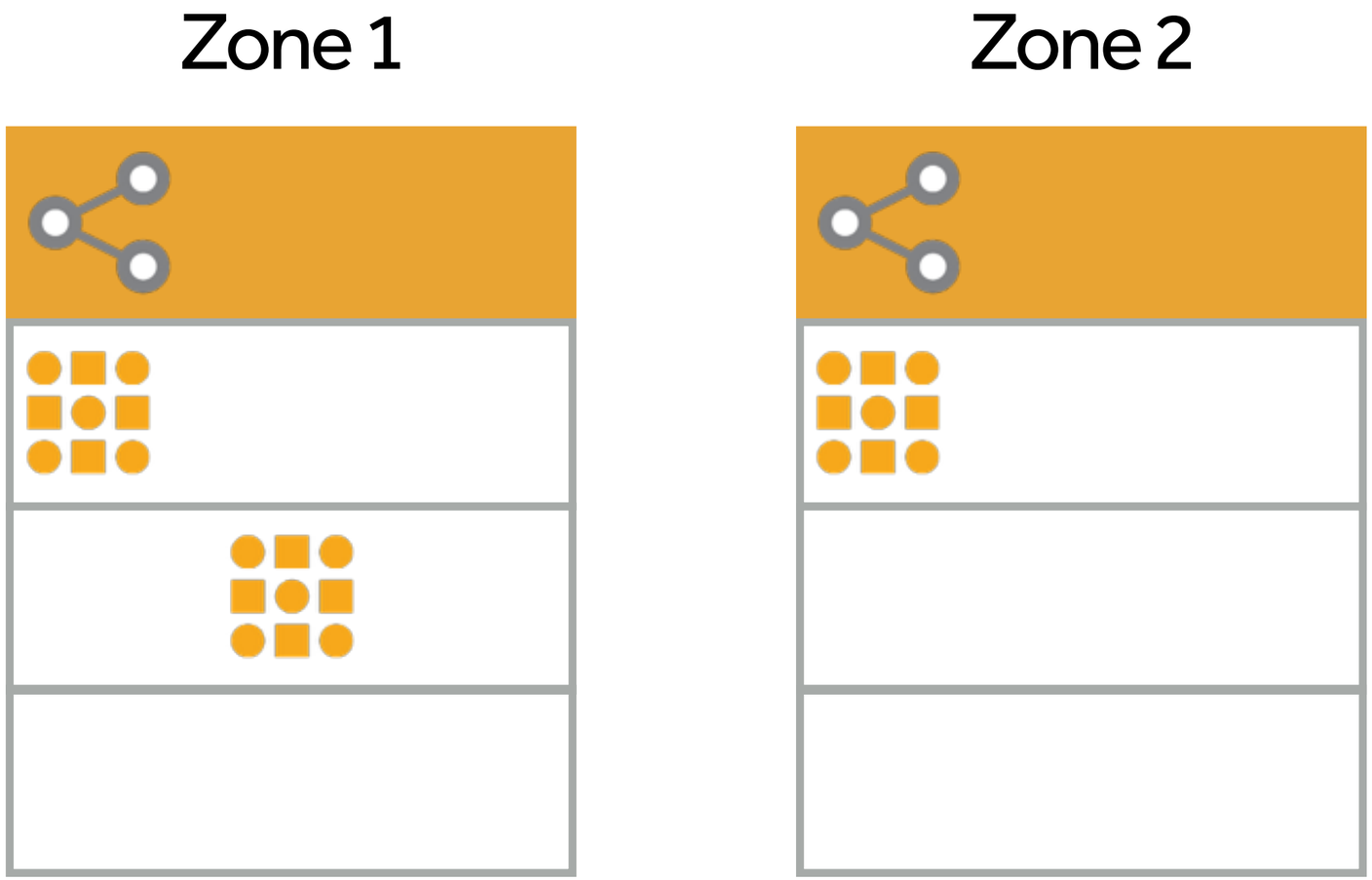


Muti-Region

Distributed data centers are “as-unique-as-possible”

SwiftStack

Data Center Zones



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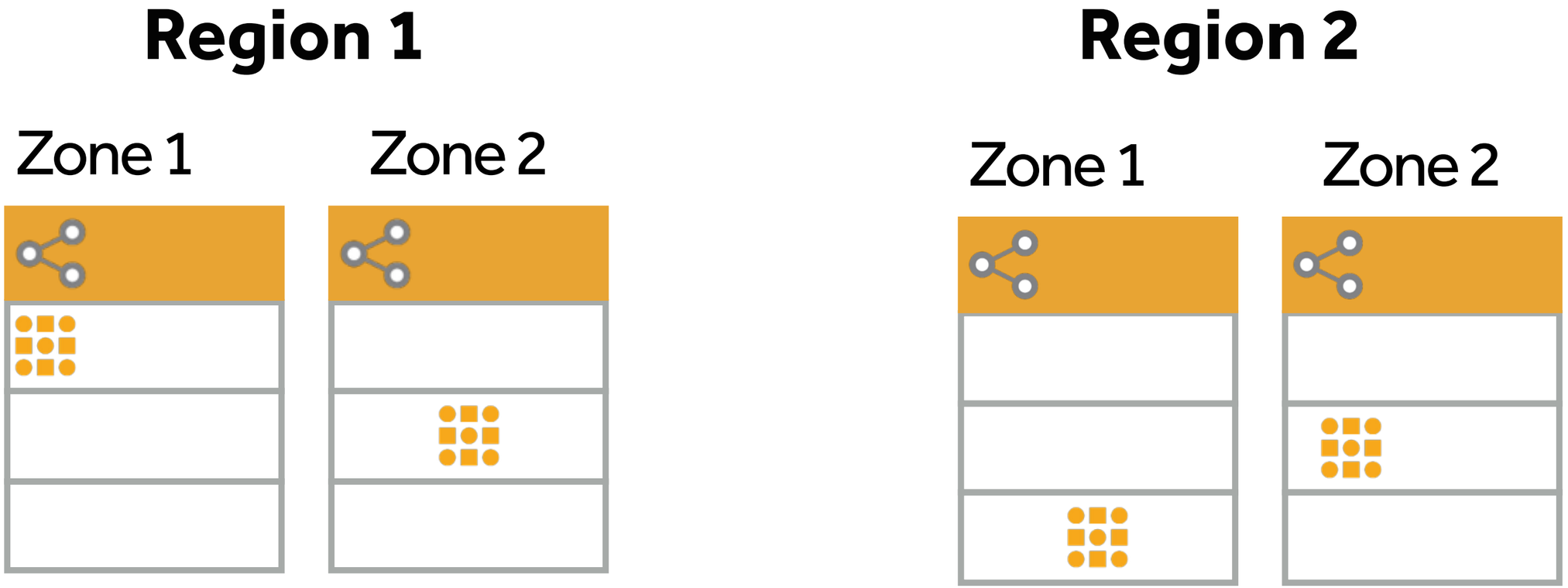
Regions & Zones



SwiftStack

Global Clusters

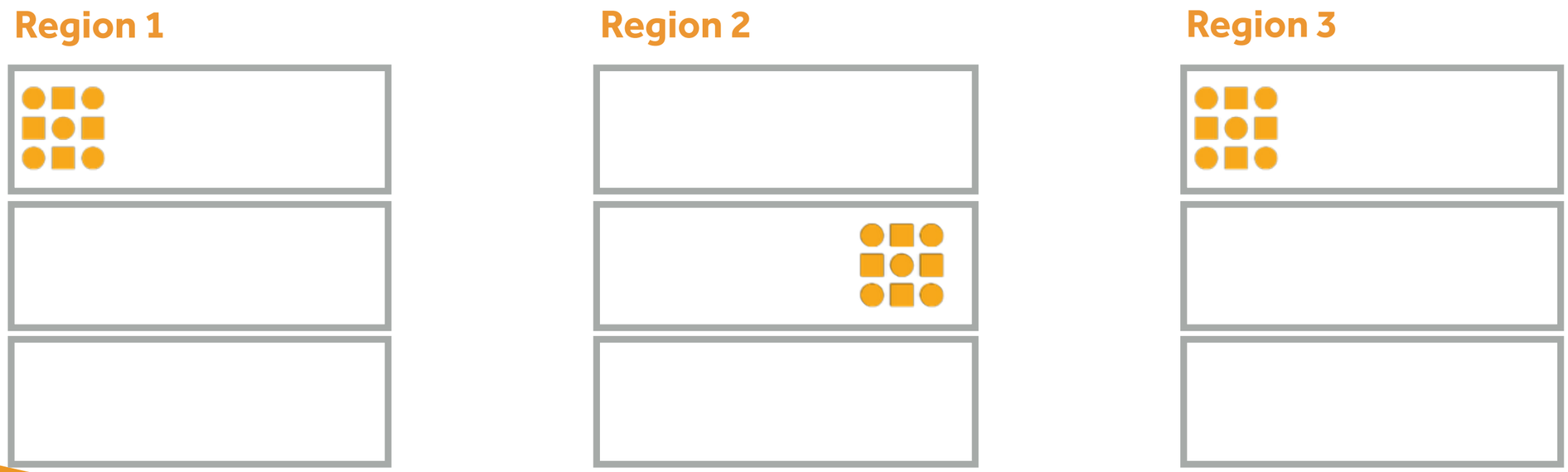
Distribute data across data center regions and zones

Software automatically routes around storage or network failures

Tolerate failures across regions and data center zones

Utilize all available capacity to serve users vs. Traditional DR

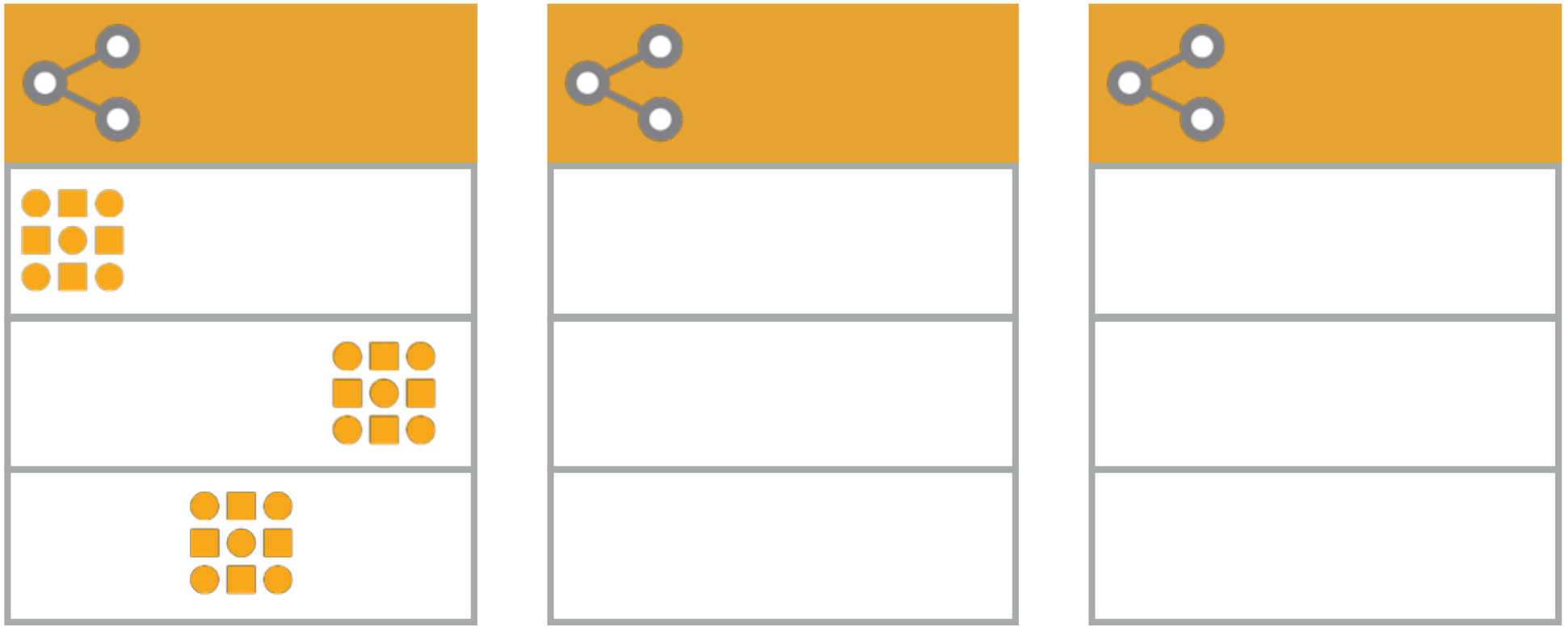
Send requests to ‘closest’ region



SwiftStack

Global Clusters

Affinity Write



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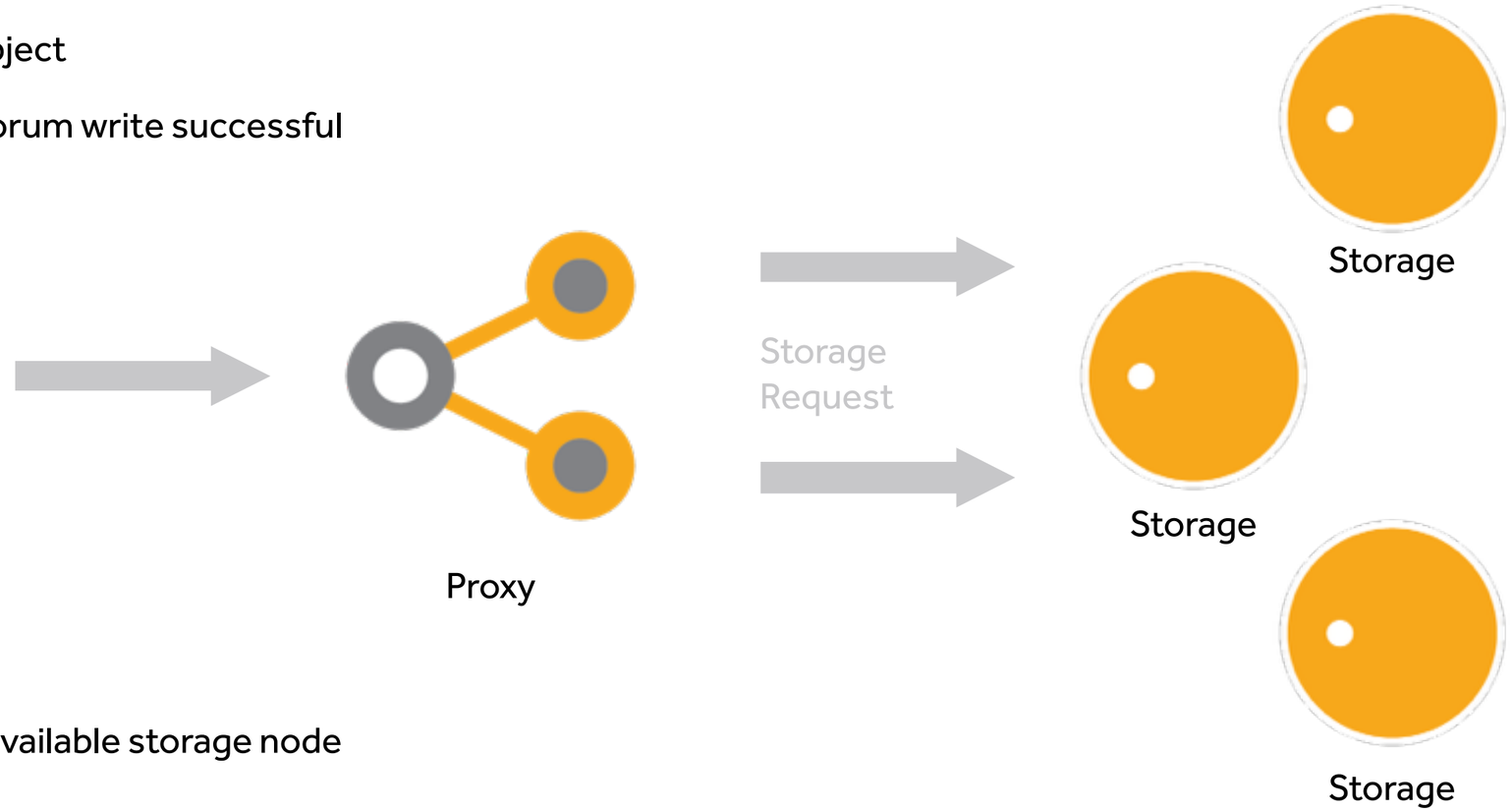
Proxy Service

Write

Proxy streams writes to each storage location simultaneously

There is not a ‘master’ object

Client receives ‘OK’ if quorum write successful



Read

Proxy contacts a single available storage node and streams back data

Will try alternate replicas when there is failures

SwiftStack

Proxy Read Affinity

Proxy Prioritizes “Nearby”

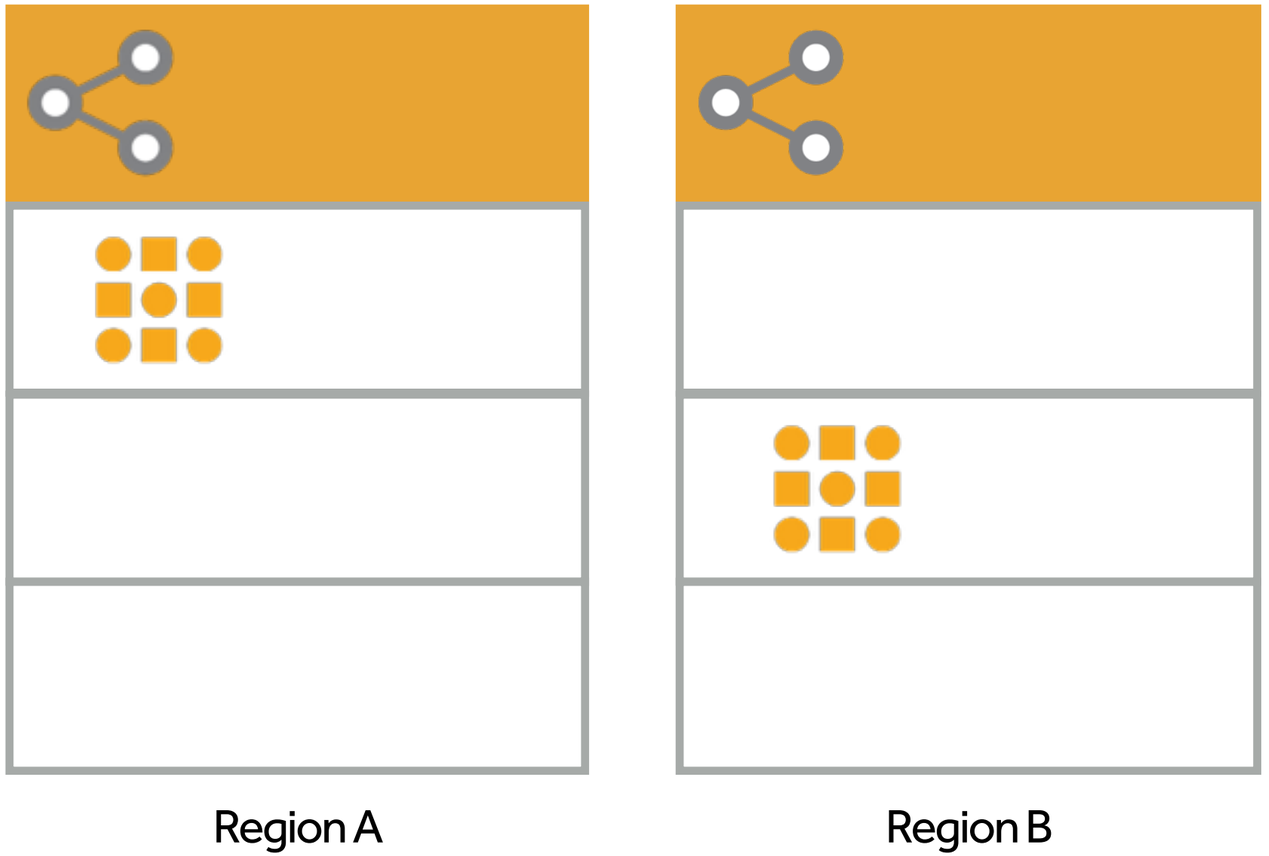
Zone / Region, Where am I?

Latency to Storage Node

Global DNS Routes User

Each proxy pool has it’s own hostname

Routes users to closest region



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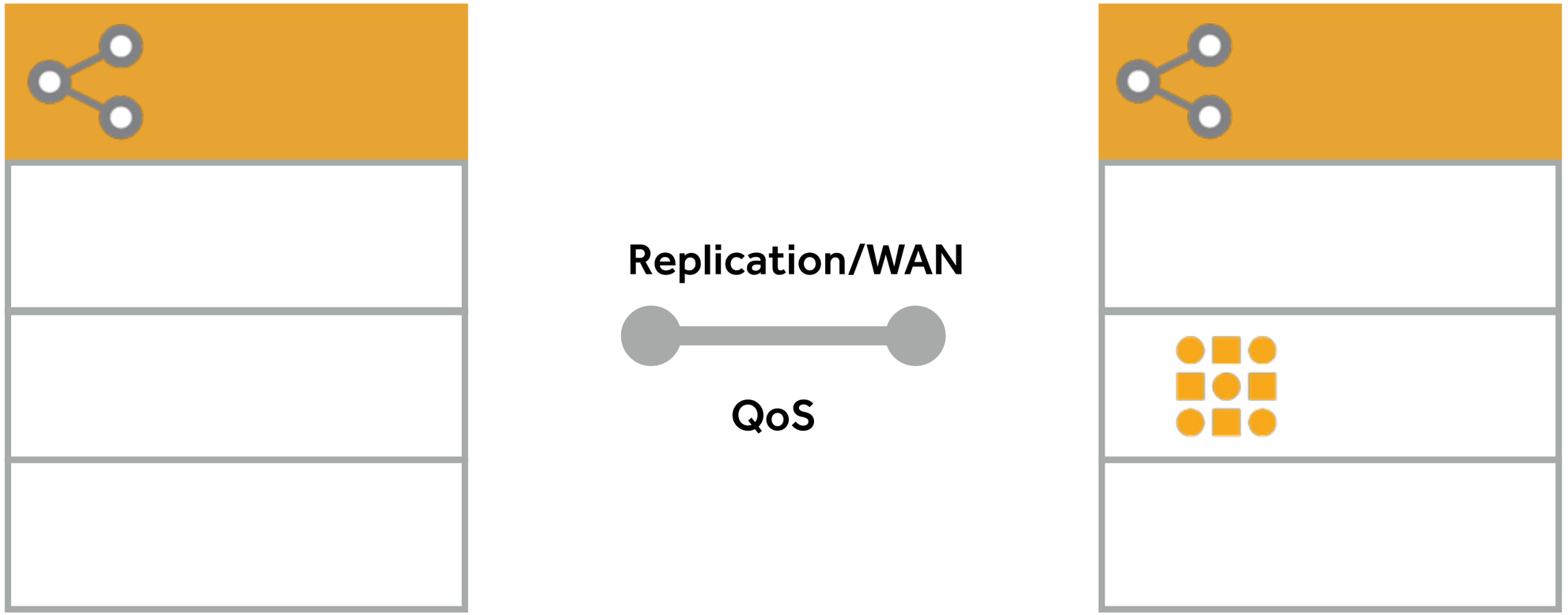
Separate Replication Network



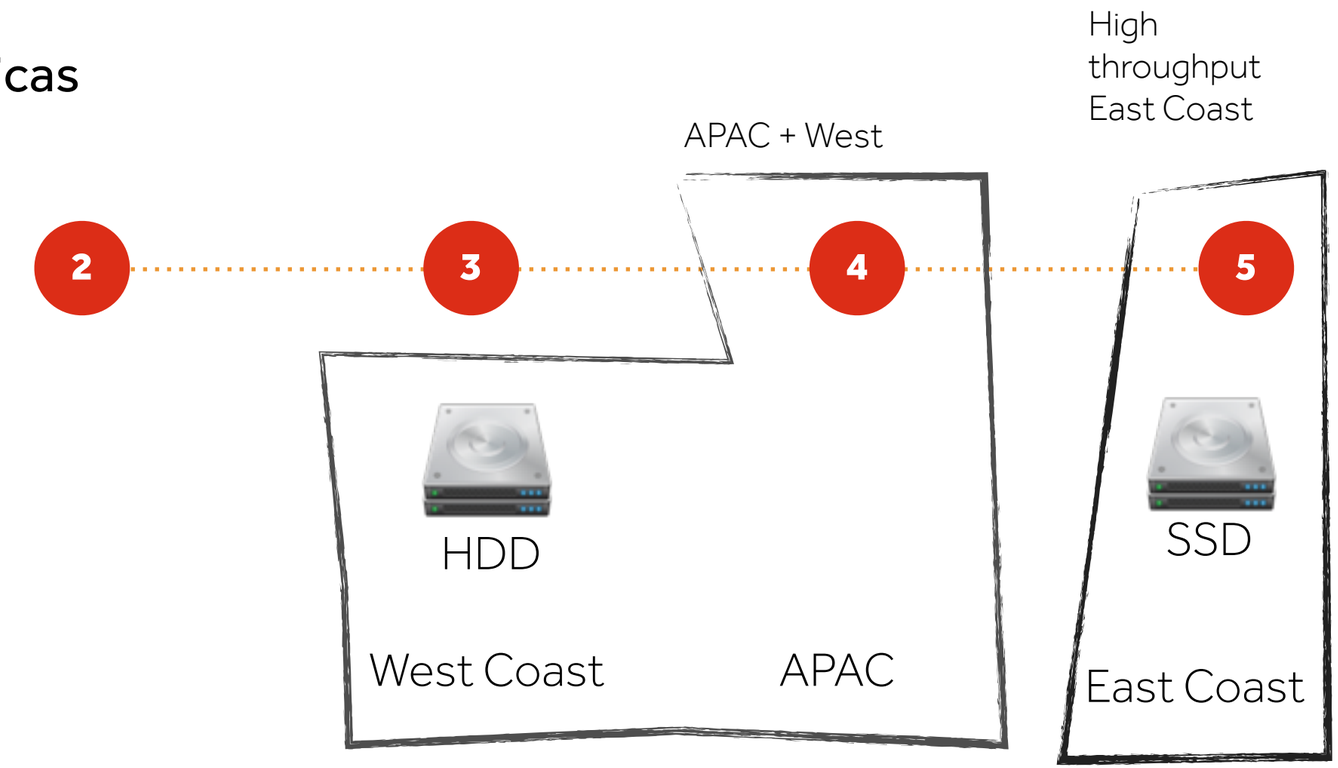
SwiftStack

Next: Storage Policies

Across Regions

Various Media

Number of Replicas



SwiftStack

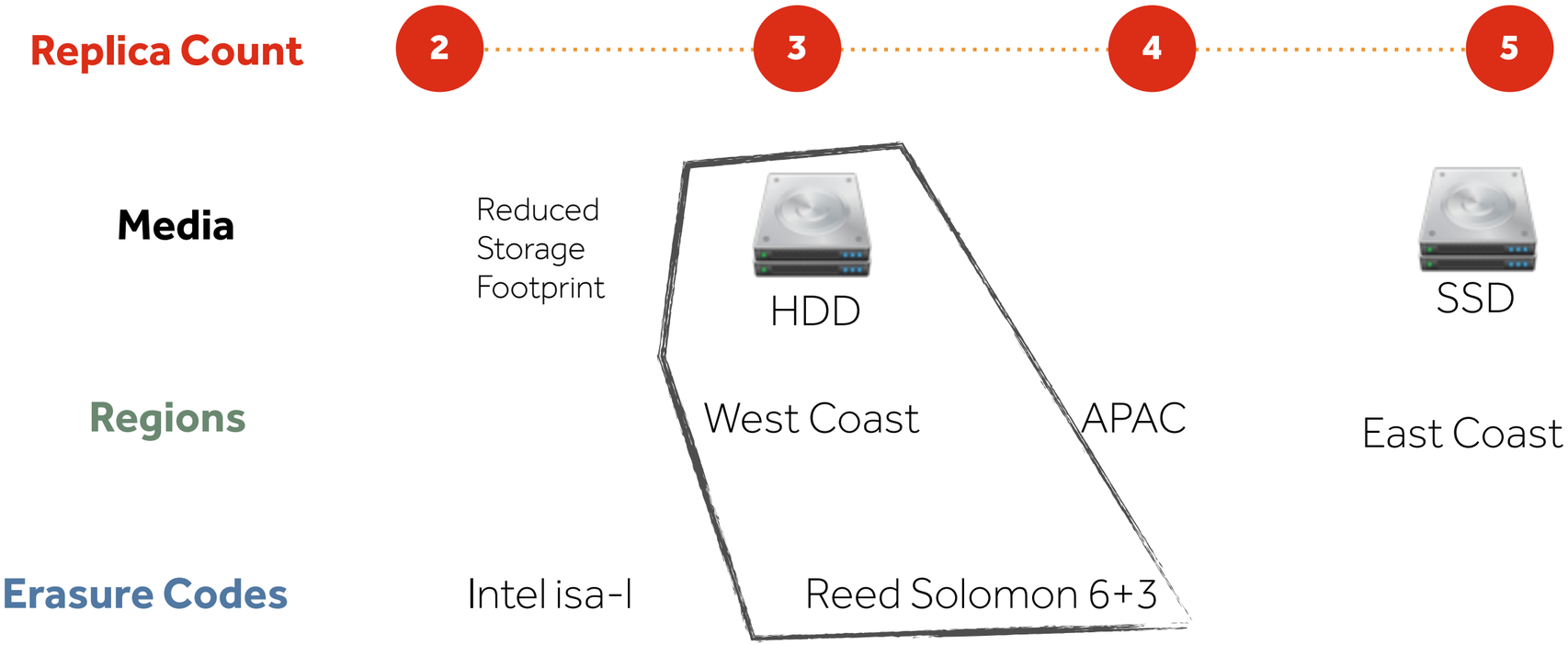
Next: Erasure Codes

Reduce Storage Footprint

Pluggable encoding schemes

http://swiftstack.com/blog/2013/07/17/erasure-codes-with-openstack-swift-digging-deeper/

box + intel + SwiftStack



DAN WILSON

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@tweetdanwilson

Thank You!

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