Best Practices for Reliability and Availability in Modern Data Management.

Abhishek Mishra, Developer Advocate, Yugabyte
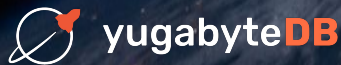
yugabyteDB

$ whoami: Abhishek Mishra

- 👨‍💻 Developer Advocate @Yugabyte🚀
- 🐍 Pythonista
- ☐ GDG Chennai, PyCon India
- Socials: @stalwartcoder

SELECT * FROM jokes WHERE creator='abhishek' AND senseofhumor = 'dry' LIMIT 2;

- **Why did the DBA cross the road?**

   To get to the other side of the 'view'!

- **Why don't we ever see SQL and UML in the same room?**

   Because they have different views on normalization.

Storms in the Cloud

Does cloud run 24x7?

"Everything fails, all the time".

– Werner Vogels

Going cloud native? Fasten your seat belts!

○ Zone-level outages are commonplace

○ Region-level outages become the new normal

○ Starting 2011, AWS alone had a major outage *at least once* a year:

    ○ It can take 4+ hours to recover

AWS Post-Event Summaries

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AWS Post-Event Summaries

The following is a list of post-event summaries from major service events that impacted AWS service availability:

- Summary of the AWS Service Event in the Northern Virginia (US-EAST-1) Region, December, 10th 2021
- Summary of AWS Direct Connect Event in the Tokyo (AP-NORTHEAST-1) Region, September, 2nd 2021
- Summary of the Amazon Kinesis Event in the Northern Virginia (US-EAST-1) Region, November, 25th 2020
- Summary of the Amazon EC2 and Amazon EBS Service Event in the Tokyo (AP-NORTHEAST-1) Region, August 23, 2019
- Summary of the Amazon EC2 DNS Resolution Issues in the Asia Pacific (Seoul) Region (AP-NORTHEAST-2), November 24, 2018.
- Summary of the Amazon S3 Service Disruption in the Northern Virginia (US-EAST-1) Region, February 28, 2017.
- Summary of the AWS Service Event in the Sydney Region, June 8, 2016.
- Summary of the Amazon DynamoDB Service Disruption and Related Impacts in the US-East Region, September 20, 2015.
- Summary of the Amazon EC2, Amazon EBS, and Amazon RDS Service Event in the EU West Region, August 7, 2014.
- Summary of the Amazon SimpleDB Service Disruption, June 13, 2014.
- Summary of the December 17th event in the South America Region (SA-EAST-1), December 20, 2013.
- Summary of the December 24, 2012 Amazon ELB Service Event in the US-East Region, December 24, 2012.

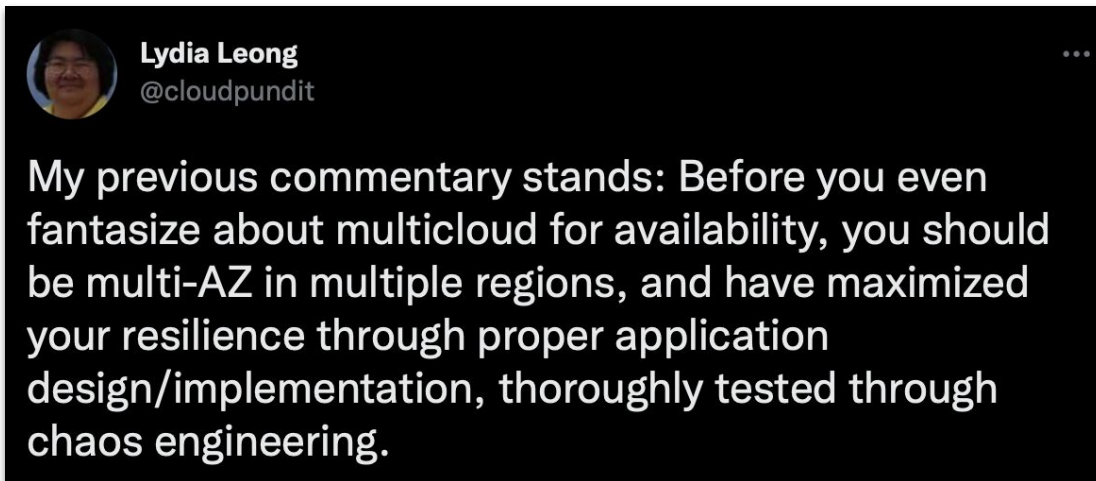https://aws.amazon.com/premiumsupport/technology/pes/

Stuff that is NOT under your control

- Or what causes major cloud outages

- Hardware & networking failures

- Bugs or outages in cloud services:

    - [Amazon Kinesis outage](#) that cascaded to dependent services

- Human errors:
    - [S3 outage](#) caused by a wrong command executed by an AWS team member

Stuff that is under YOUR control

1. Accept the fact that a cloud storm can happen to you

2. Design multi-AZ (at least) and multi-region (better) solutions

> **Lydia Leong**
> @cloudpundit
>
> My previous commentary stands: Before you even fantasize about multicloud for availability, you should be multi-AZ in multiple regions, and have maximized your resilience through proper application design/implementation, thoroughly tested through chaos engineering.

https://twitter.com/cloudpundit

How about speed and latency between zones and regions?

- ○ Zones are interconnected through a high-performance network:

  - ○ GCP: round-trip network latency is under 5 milliseconds on the 95th percentile

- ○ Regions are interconnected through a regional network (~latencies for GCP):

  - ○ US West (Oregon)->US East (North Virginia): 60ms

  - ○ US West (Oregon)->London: 130ms

  - ○ US West (Oregon)->Mumbai: 220ms

  - ○ US West (Oregon)->Tokyo: 90ms

Data Management Patterns for Reliability and Availability

yugabyte**DB**

Geo-distributed apps require reliable and HA data layer

Applications that **span multiple geographic locations** for high-availability, compliance and performance needs
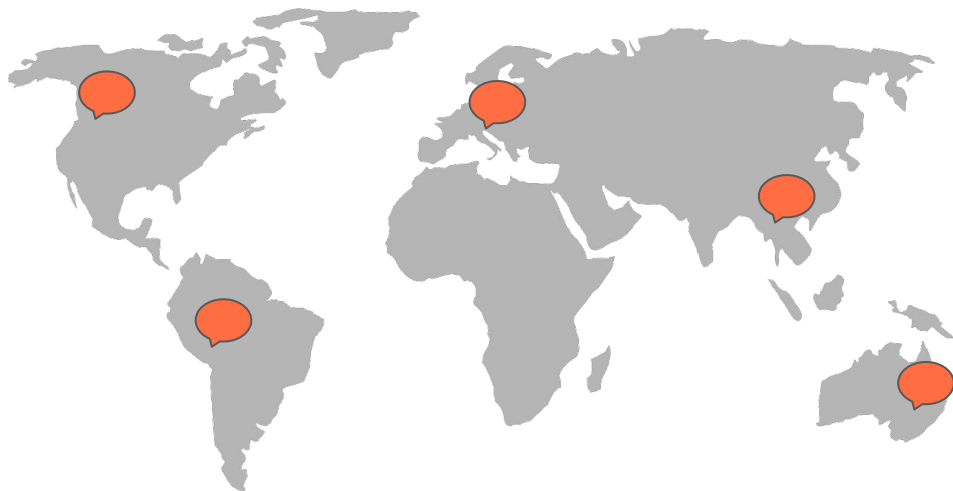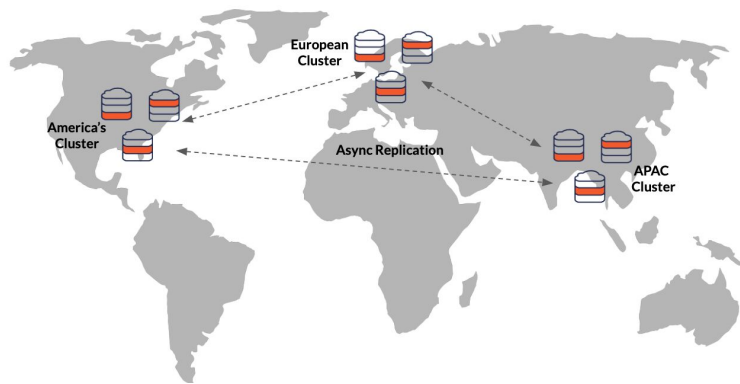
Multi-Region Database Deployment **With Read Replicas**

- Primary database instance is in one geography:

  - Spans multiple zones or local regions

  - Handles both reads and writes

- Read replicas are deployed in other distant locations:

  - Takes over in case of a primary instance failure

  - Serve reads faster for local users

Primary Cluster
Read Replica
Async Replication
Read Replica

Multiple Standalone Databases With Async Replication

○ Each distant geography has its own

distributed database instance

○ Async replication between standalone

databases:

    ○ Bidirectional and unidirectional

○ But synchronously within a single instance

European
Cluster

America's
Cluster

Async Replication

APAC
Cluster

Geo-Partitioned Multi-Region Database Deployment

- Single database instance that spans various geographies

- Data is pinned to a group of nodes from a specific location (NA, EMEA, APAC)

- Low latency for queries within a single geography
  - High latency for cross-region queries
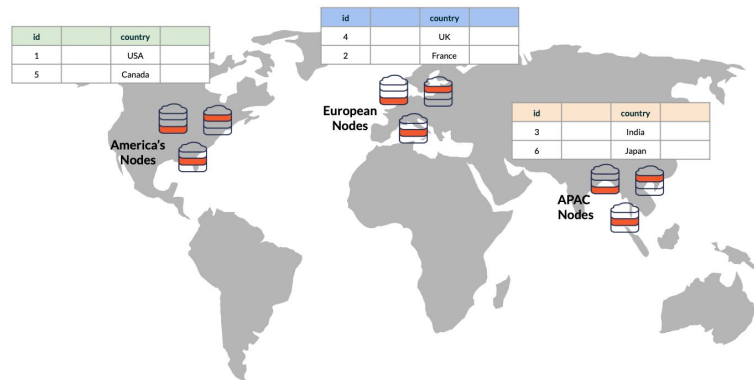
Summary

Learn More?!

- ○ [Architecting for Scale](#) by O'Reilly

- ○ [Designing Data-Intensive Applications](#) by O'Reilly

- ○ Deep dive into a [multi-region DBs deployment options](#)

Exploring Multi-Region Database Deployment Options With a Slack-
Messenger

Distributing data, maintaining messaging.

by Denis Magda · Apr. 16, 22 · Database Zone · Tutorial
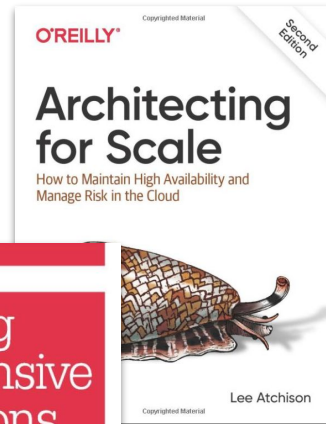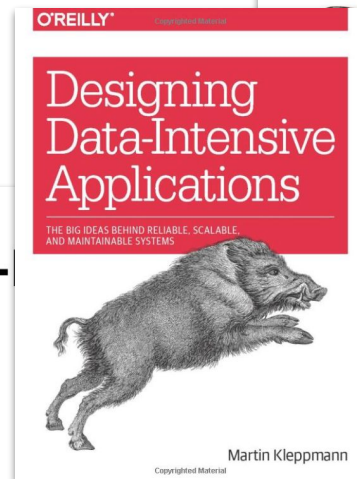
👍 Liked (3)   💬 Comment (0)   ⭐ Save   🐦 Tweet   👁 3.15K Views   ⚙

Read more a about incidents:

https://status.cloud.google.com/summary

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