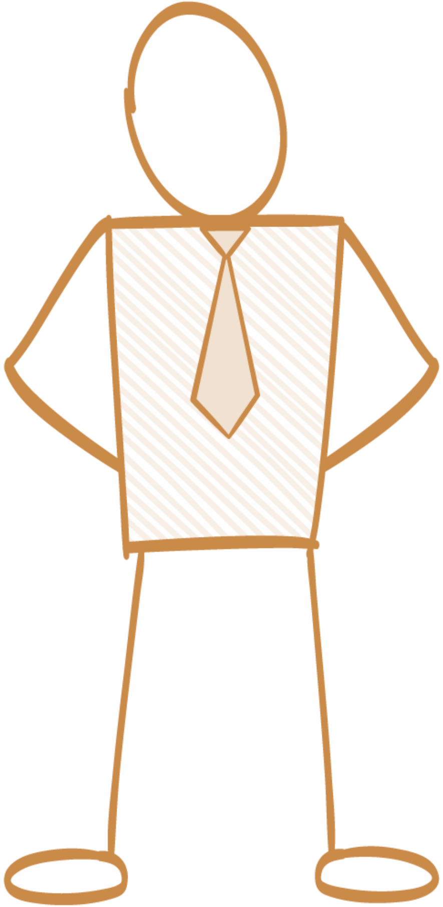
Training and Certification

Architecting on AWS Student Guide

Version 3.1

100-ARC-31-EN-SG



Module 2: Architecting in the Cloud

Topics

- Five benefits of the cloud
- Seven best practices for building systems with AWS

Topics

- **Five benefits of the cloud**
- Seven best practices for building systems with AWS

What makes the cloud attractive?

- Abstract Resources
  - Focus on your needs, not hardware specs. As needs change, so should your resources
- On-Demand Provisioning
  - Ask for what you need, exactly when you need it; get rid of it when you do not
- Scalability in Minutes
  - Scale out or in, up or down, depending on usage or needs

What makes the cloud attractive? (continue)

- Pay Per Consumption
  - No long-term commitments. Pay only for what you use
- Efficiency of Experts
  - Utilize the skills, knowledge and resources of experts

Topics

- Five benefits of the cloud
- **Seven best practices for building systems with AWS**

Seven best practices for building system with AWS

- Design for failure and nothing fails
- Loose coupling sets you free
- Implement elasticity
- Build security in every layer
- Don’t fear constraints
- Think parallel
- Leverage different storage options

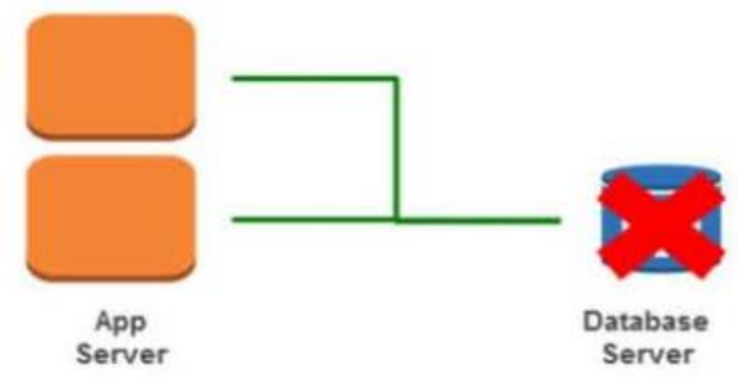
Seven best practices for building system with AWS

“Everything fails, all the time”

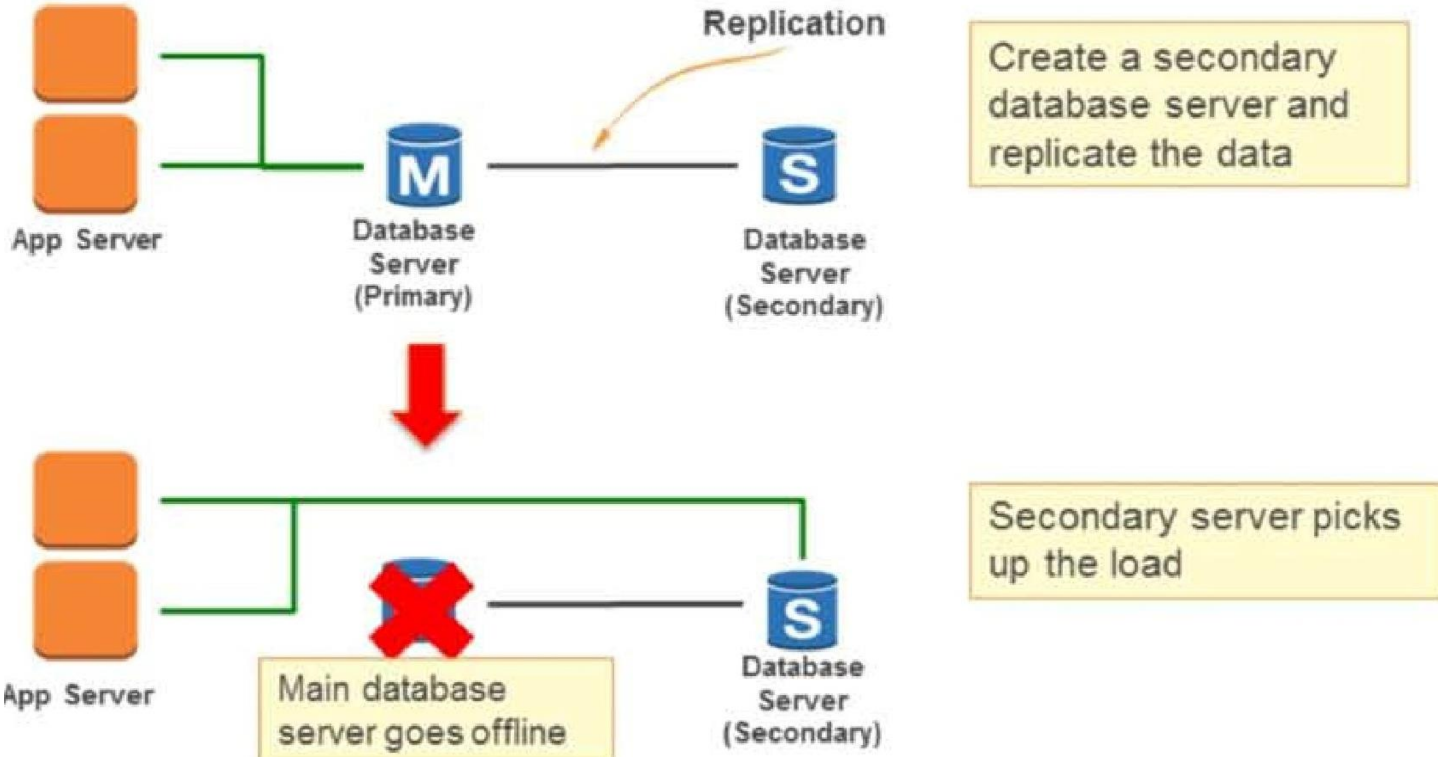
Werner Vogels, CTO, Amazon.com

Seven best practices: Design for failure

- Avoid single points of failure
- Assume everything fails and design backwards
  - **Goal**: Applications should continue to function even if the underlying physical hardware fails or is removed/replaced.



Seven best practices: Design for failure (continue)


Replication
App Server
M
Database Server (Primary)
S
Database Server (Secondary)
App Server
S
Database Server (Secondary)

Create a secondary database server and replicate the data

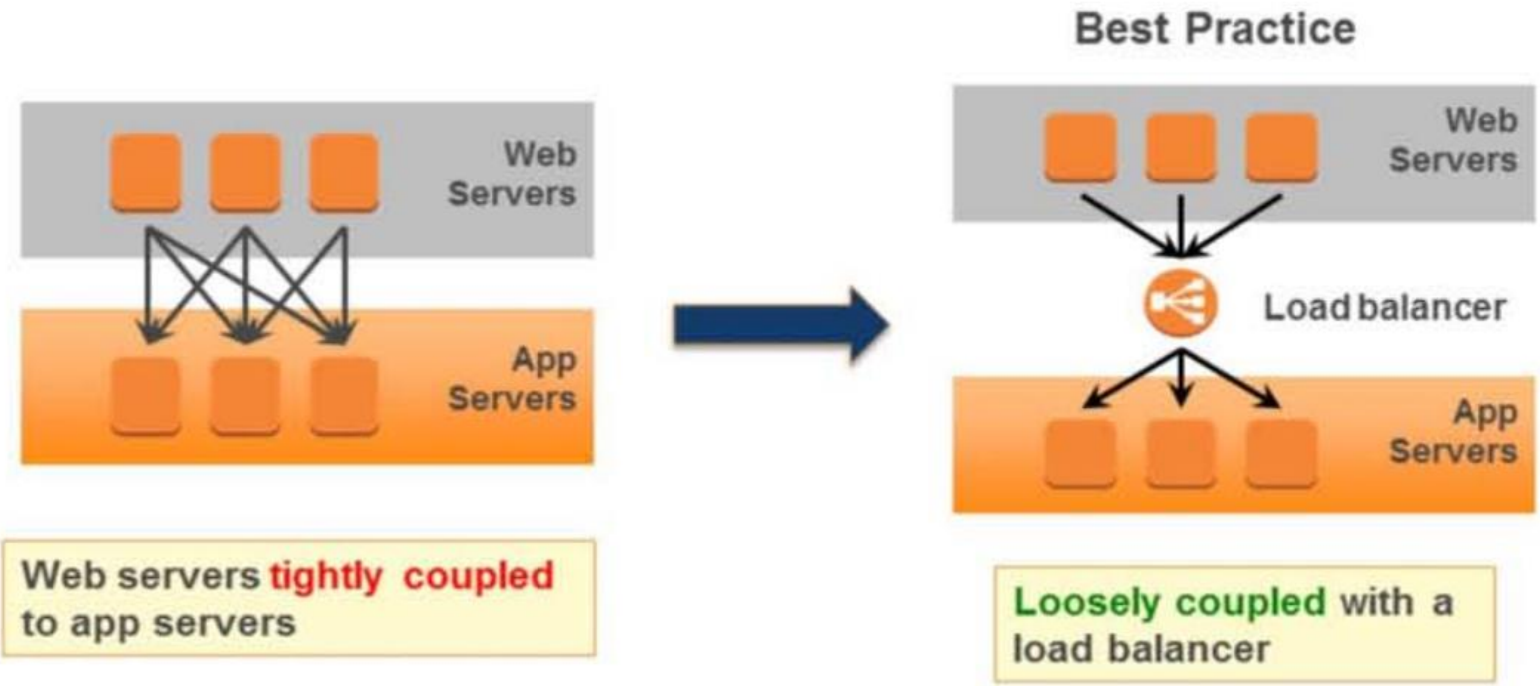
Secondary server picks up the load

Main database server goes offline

Seven best practices: Loose coupling

- Design architectures with independent components
  - The more loosely they are coupled, the bigger they scale
- Design every component as a black box
- Load balance clusters
- Use a queue to pass messages between components

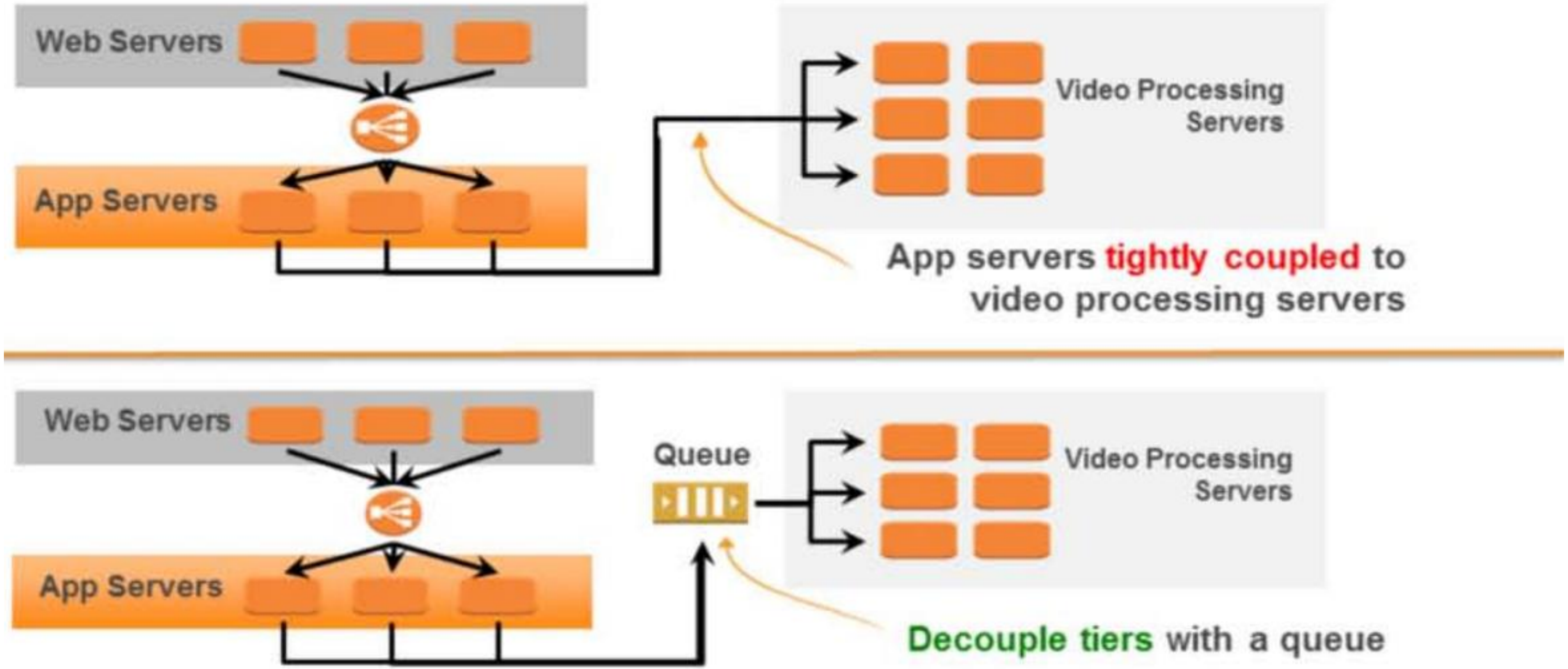
Loose coupling: Load balance the cluster



Web servers tightly coupled to app servers

Loosely coupled with a load balancer

Loose couping: Use a queue to pass messages



App servers tightly coupled to video processing servers

Decouple tiers with a queue

Seven best practices: Implement elasticity

- Elasticity is a fundamental property of the cloud
- Do not assume the health, availability, or fixed location of components
- Use designs that are resilient to reboot and
- re-launch
- Bootstrap your instances
  - When an instance launches, it should ask: *“Who am I and What is my role?”*
- Favor dynamic configuration

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Seven best practices: Build security in every layer

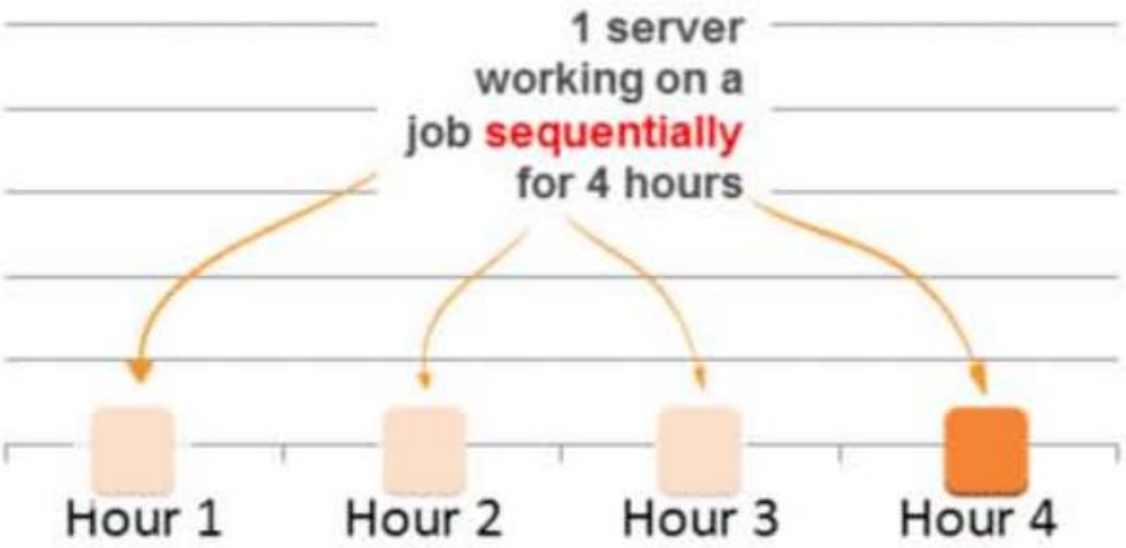
- Security is a shared responsibility. You decide how to:
  - Encrypt data in transit and at rest
  - Enforce principle of least privilege
  - Create distinct, restricted Security Groups for each application role
    - Restrict external access via these security groups
  - Use multi-factor authentication

Seven best practices: Do not fear constraints

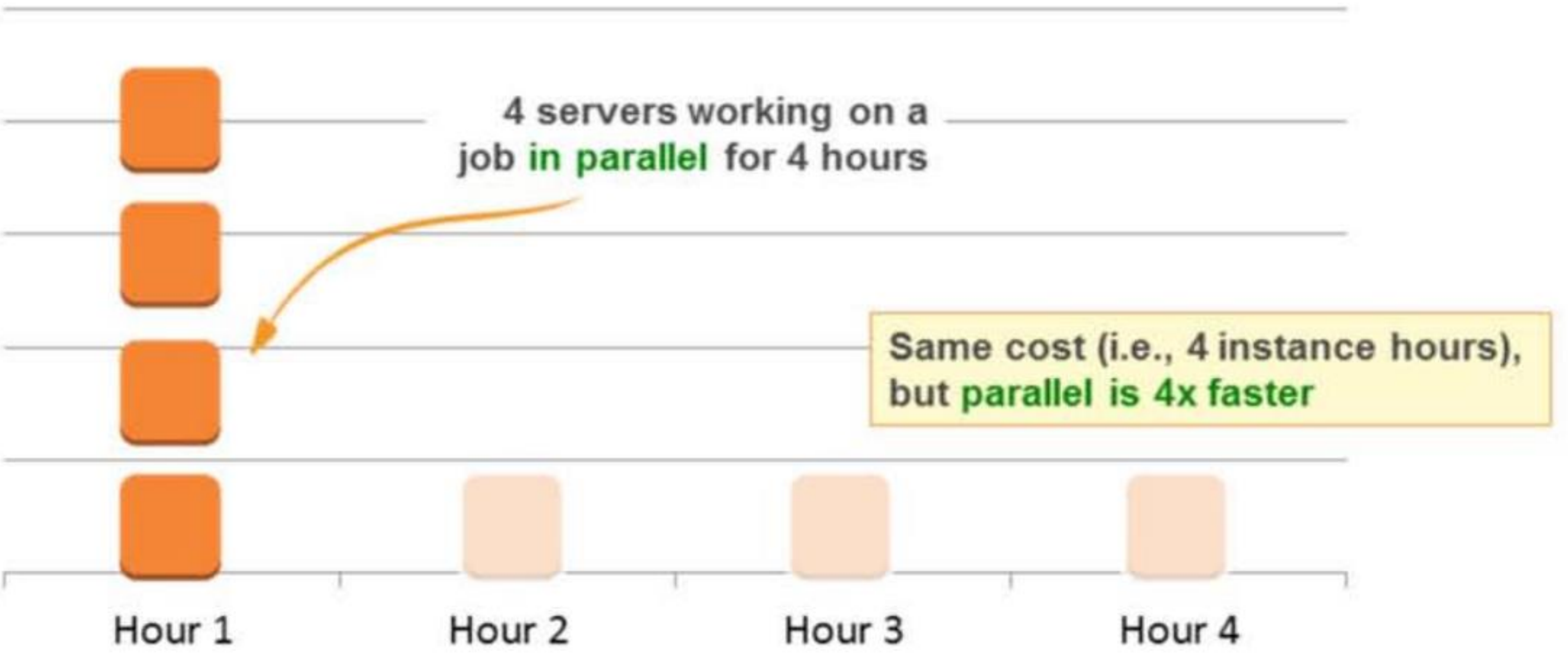
- Need more RAM?
  - Consider distributing load across machines or a shared cache
- Need better IOPS for databases?
  - Instead, consider multiple read replicas, sharding, or DB clustering
- Hardware failed or configuration got corrupted?
  - "Rip and replace" – Simply toss bad instances and instantiate replacement

Seven best practices: Think parallel

- Experiment with parallel architectures



Seven best practices: Think parallel (continue)



4 servers working on a job **in parallel** for 4 hours

Same cost (i.e., 4 instance hours), but **parallel is 4x faster**

Seven best practices: Leverage many storage options

- One size does not fit all
  - Object storage
  - Content delivery network/edge caching
  - Block storage
  - Relational database
  - NoSQL

Module review

- What are the benefits cloud services offer?
- List the seven AWS best practices