

ENGENHARIA DE SOFTWARE

41492-ES

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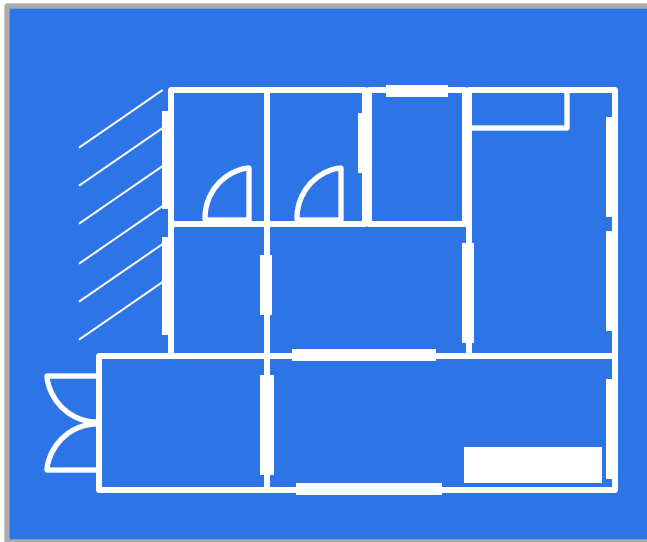
UNIVERSITY OF AVEIRO (UA), PORTUGAL

2024

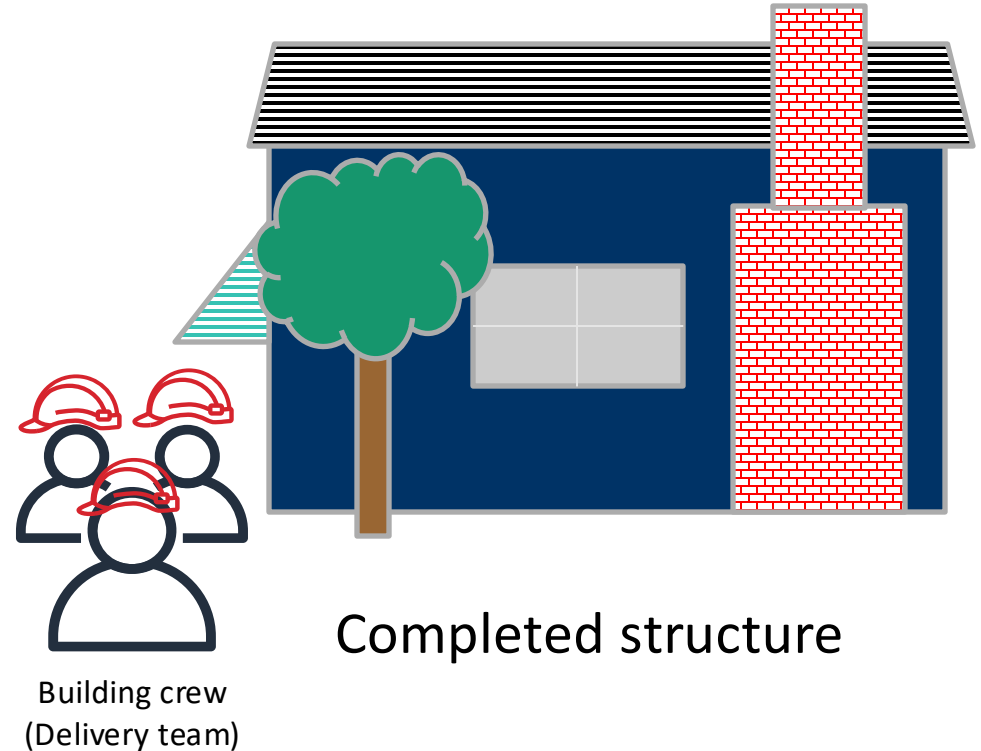
Module 9: Cloud Architecture

SECTION 1: AWS WELL- ARCHITECTED FRAMEWORK

Architecture: designing and building



Structure design

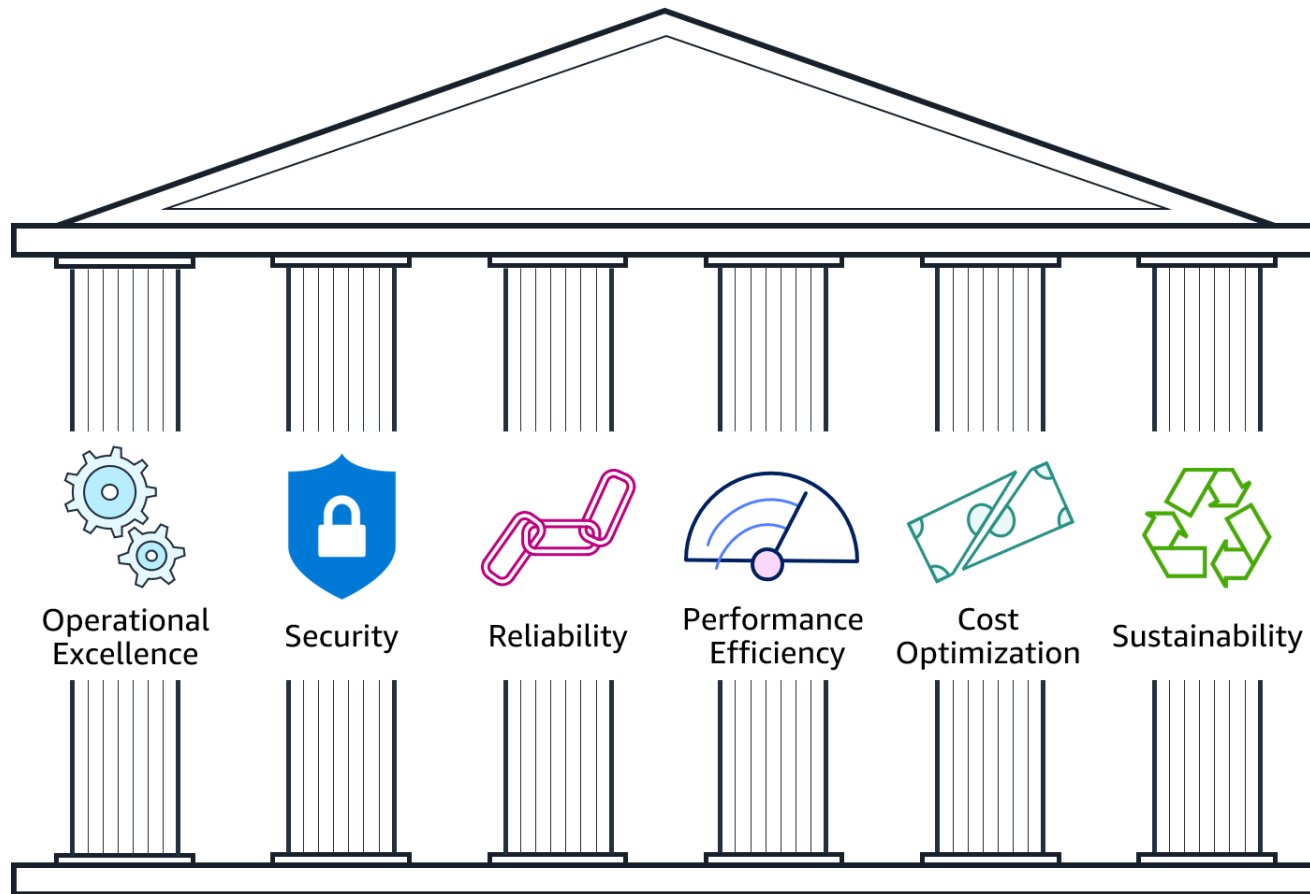


Completed structure

What is the AWS Well-Architected Framework?

- A guide for designing infrastructures that are:
 - ✓ Secure
 - ✓ High-performing
 - ✓ Resilient
 - ✓ Efficient
- A consistent approach to evaluating and implementing cloud architectures
- A way to provide best practices that were developed through lessons learned by reviewing customer architectures

Pillars of the AWS Well-Architected Framework



Pillar organization

Best practice area

Question text

Question context

Best practices

Identity and Access Management

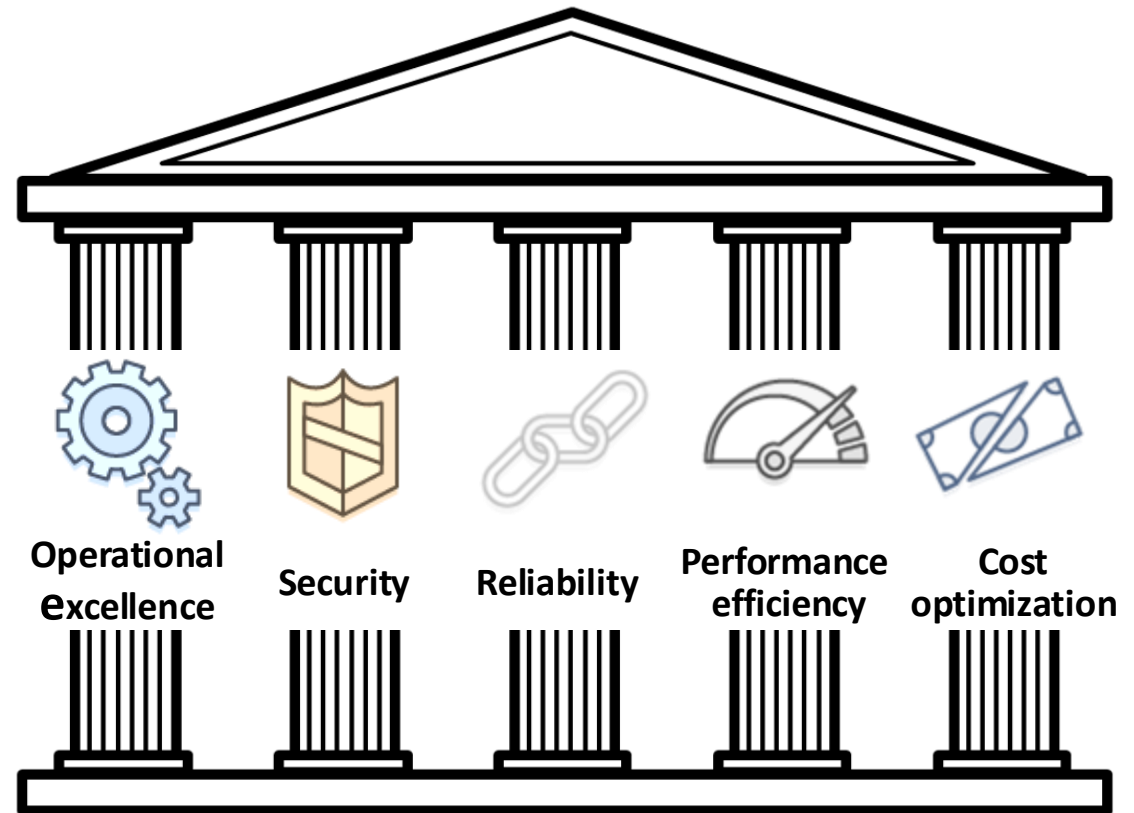
SEC 1: How do you manage credentials and authentication?

Credential and authentication mechanisms include passwords, tokens, and keys that grant access directly or indirectly in your workload. Protect credentials with appropriate mechanisms to help reduce the risk of accidental or malicious use.

Best practices:

- Define requirements for identity and access management
- Secure AWS account root user
- Enforce use of multi-factor authentication
- Automate enforcement of access controls
- Integrate with centralized federation provider
- Enforce password requirements
- Rotate credentials regularly
- Audit credentials periodically

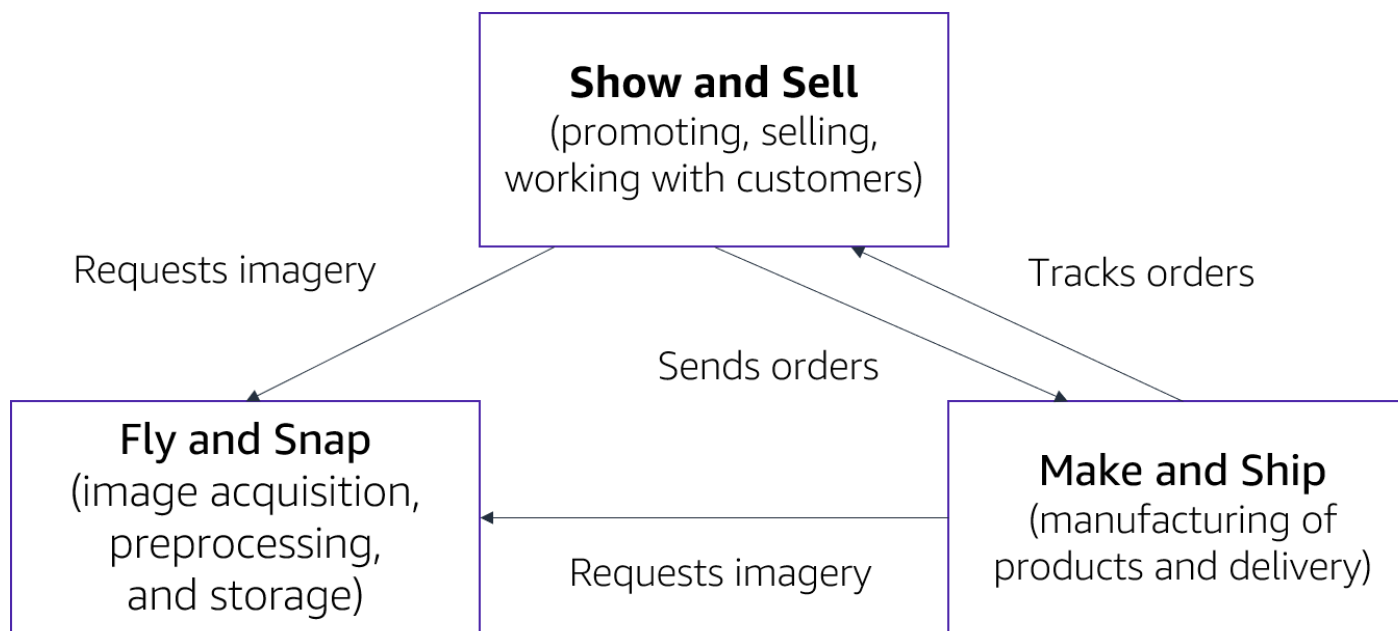
Introduction to the AWS Well- Architected Framework Design Principles Activity



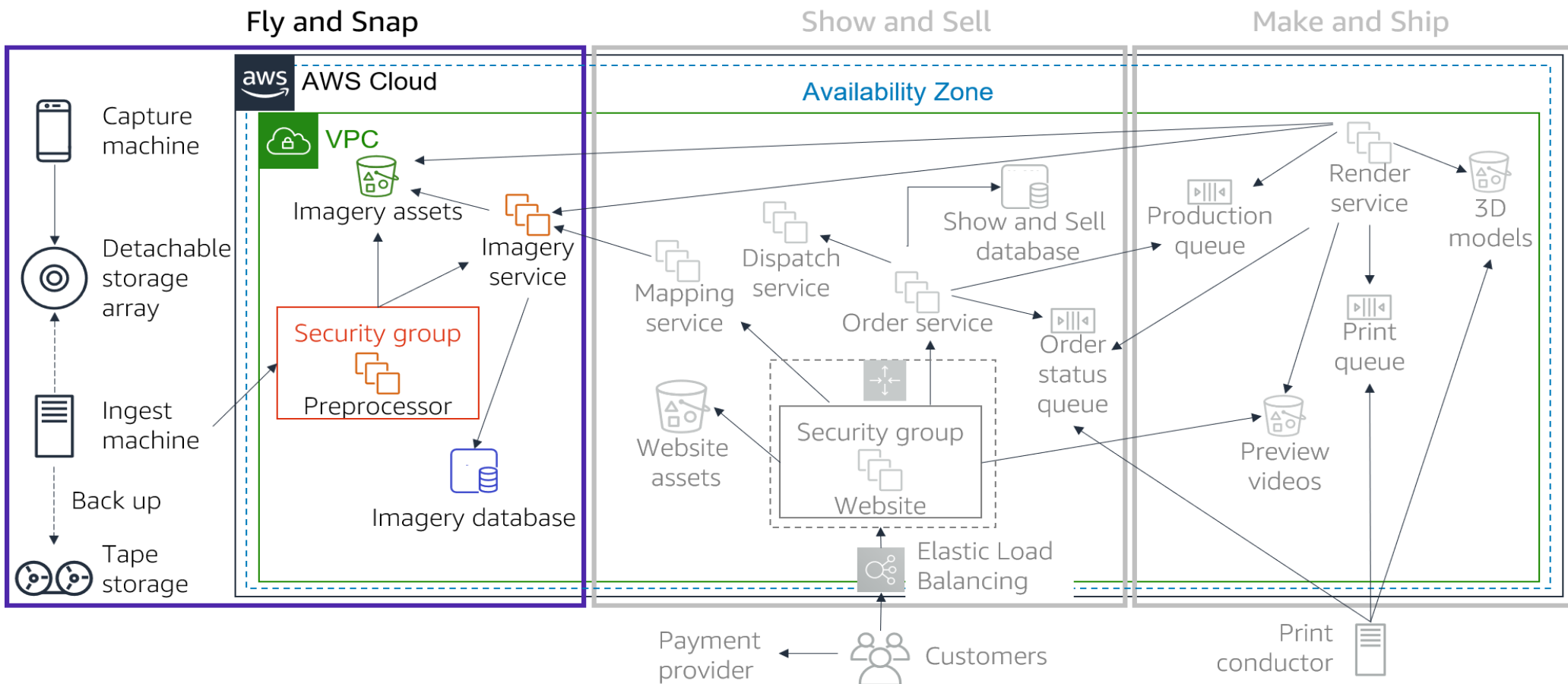
AnyCompany background

- AnyCompany Corporation: *"Cityscapes you can stand over"*
- Founded in 2008 by John Doe
- Sells 3D-printed cityscapes
- About to apply for investment
- Has asked **you** to perform a review of their platform as part of their due diligence
- Cloud native

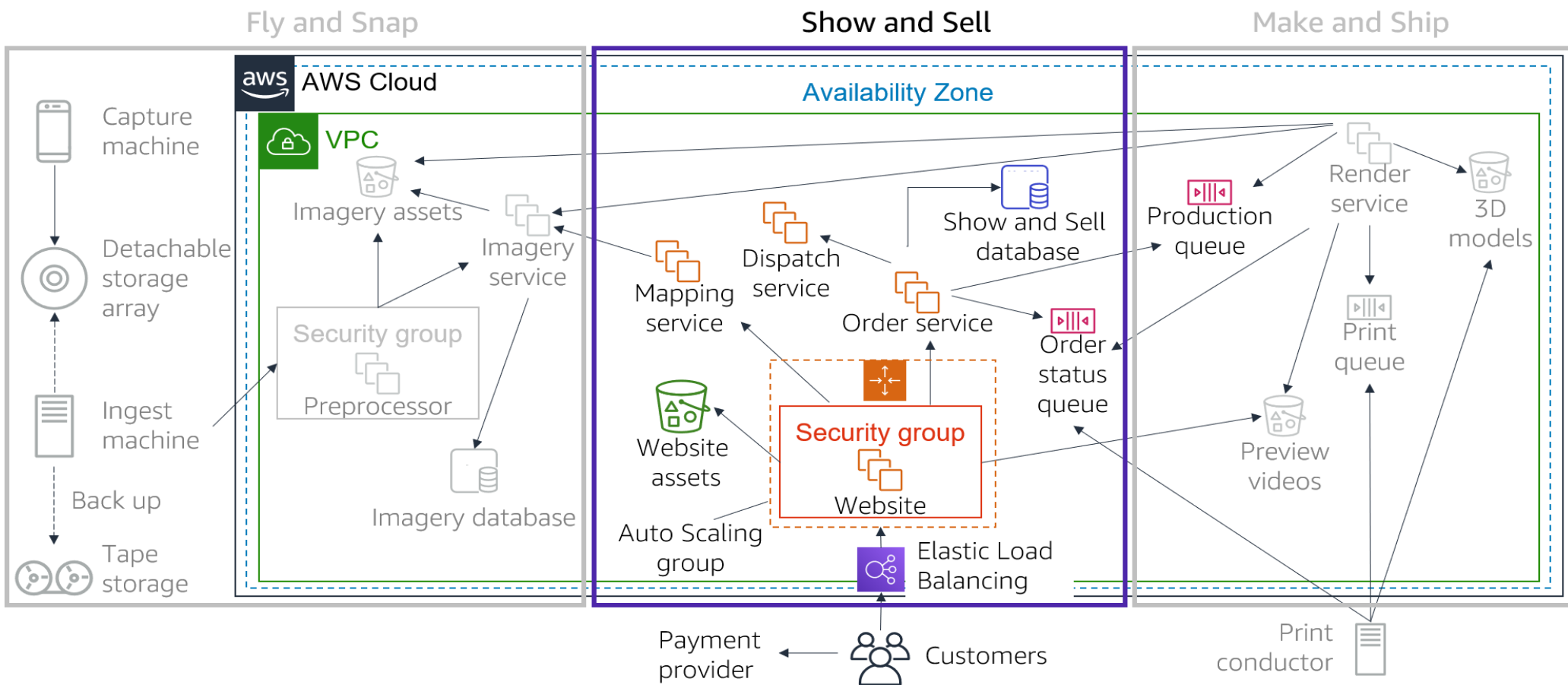
AnyCompany background (continued)



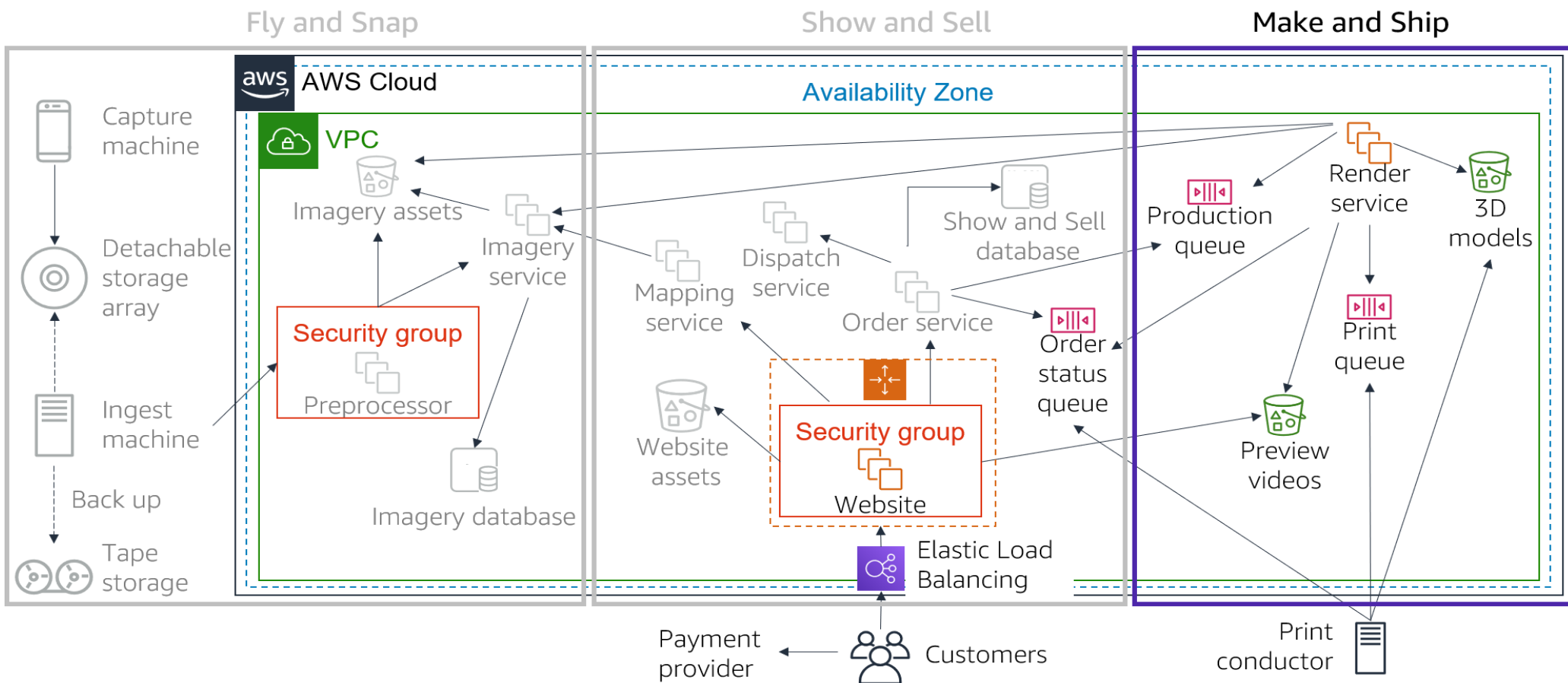
AnyCompany architecture: Fly and Snap



AnyCompany architecture: Show and Sell



AnyCompany architecture: Make and Ship



Activity overview

- Break into small groups.
- You will learn about each of the pillars. At the end of each pillar, there is a set of questions from the AWS Well-Architected Framework for you to work through with your group. Use these Framework questions to guide your review of the AnyCompany architecture.
- For each Well-Architected Framework question, answer the following questions about the AnyCompany architecture:
 - What is the CURRENT STATE (what is AnyCompany doing now)?
 - What is the FUTURE STATE (what do you think AnyCompany should be doing?)
- Agree on the top improvement that AnyCompany should make to its architecture for each set of Well-Architected Framework questions.
- Hint: There are no right or wrong answers.

Operational Excellence pillar

Operational Excellence pillar – deliver business value

Operational Excellence pillar



Deliver
business
value

- Focus
 - Run and monitor systems to deliver business value, and to continually improve supporting processes and procedures.
- Key topics
 - Automating changes
 - Responding to events
 - Defining standards to manage daily operations

Operational excellence design principles

Operational Excellence pillar



Deliver
business
value

- Perform operations as code
- Make frequent, small, reversible changes
- Refine operations procedures frequently
- Anticipate failure
- Learn from all operational events and failures

Operational excellence questions

Organization

- How do you determine what your priorities are?
- How do you structure your organization to support your business outcomes?
- How does your organizational culture support your business outcomes?

Prepare

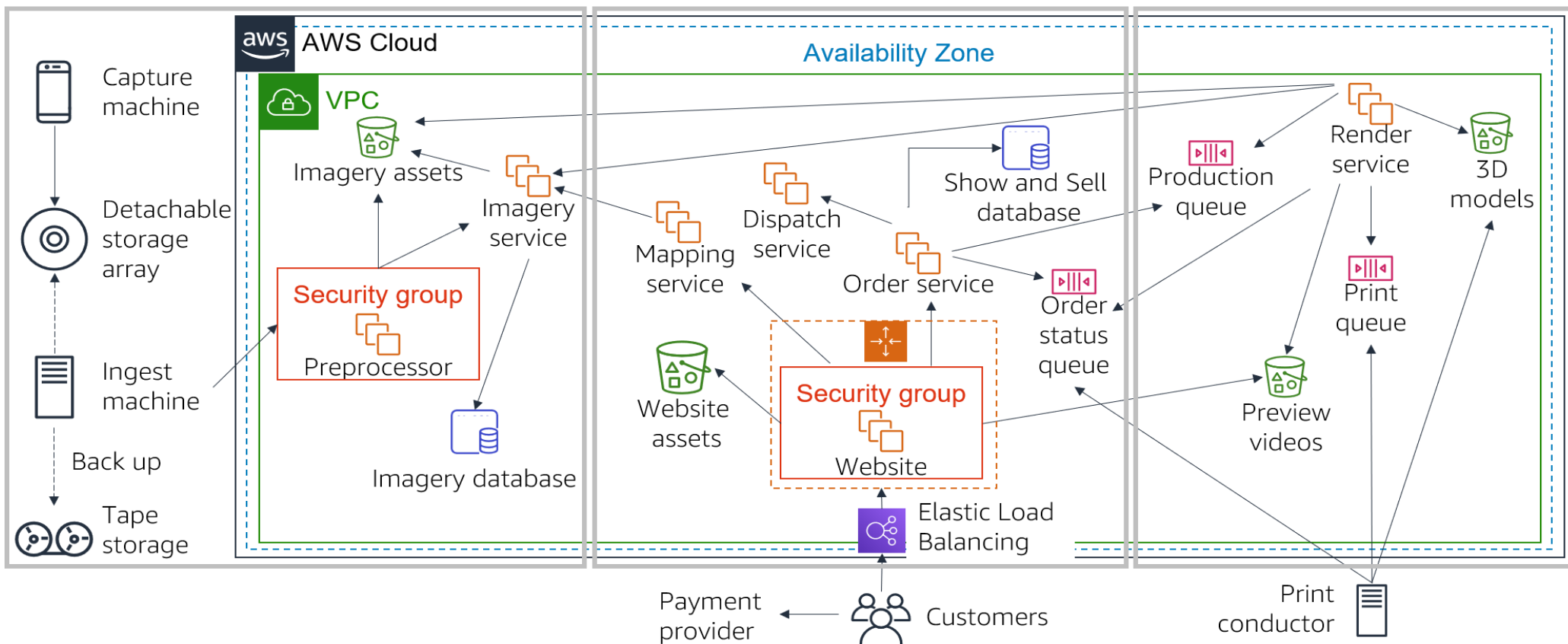
- How do you design your workload so that you can understand its state?
- How do you reduce defects, ease remediation, and improve flow into production?
- How do you mitigate deployment risks?
- How do you know that you are ready to support a workload?

Operational excellence activity breakout

Fly and Snap

Show and Sell

Make and Ship



Security pillar

Security pillar – protect and monitor systems

Security pillar



Protect and
monitor
systems

➤ Focus

- Protect information, systems, and assets while delivering business value through risk assessments and mitigation strategies.

➤ Key topics

- Protecting confidentiality and integrity of data
- Identifying and managing who can do what
- Protecting systems
- Establishing controls to detect security events

Security design principles

Security pillar



Protect and
monitor
systems

- Implement a strong identity foundation
- Enable traceability
- Apply security at all layers
- Automate security best practices
- Protect data in transit and at rest
- Keep people away from data
- Prepare for security events

Security questions

Security

- How do you securely operate your workload?

Identity and access management

- How do you manage identities for people and machines?
- How do you manage permissions for people and machines?

Detection

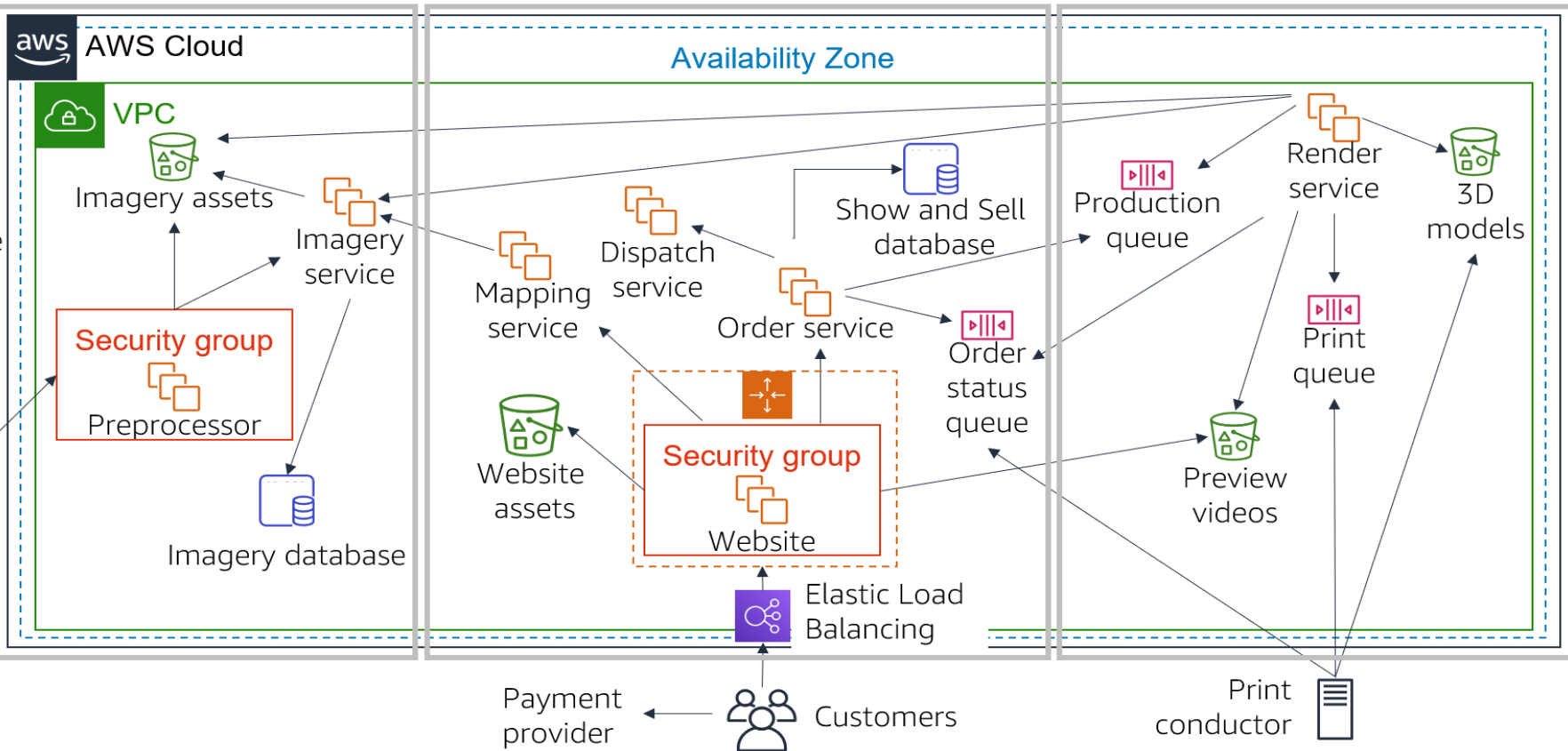
- How do you detect and investigate security events?

Security activity breakout

Fly and Snap

Show and Sell

Make and Ship



Reliability pillar

Reliability pillar – recover from failure and mitigate disruption

Reliability pillar



Recover from
failure and
mitigate
disruption.

- Focus
 - Ensure a workload performs its intended function correctly and consistently when it's expected to.
- Key topics
 - Designing distributed systems
 - Recovery planning
 - Handling change

Reliability design principles

Reliability pillar



Recover from
failure and
mitigate
disruption.

- Automatically recover from failure
- Test recovery procedures
- Scale horizontally to increase aggregate workload availability
- Stop guessing capacity
- Manage change in automation

Reliability questions

Foundations

- How do you manage service quotas and constraints?
- How do you plan your network topology?

Workload architecture

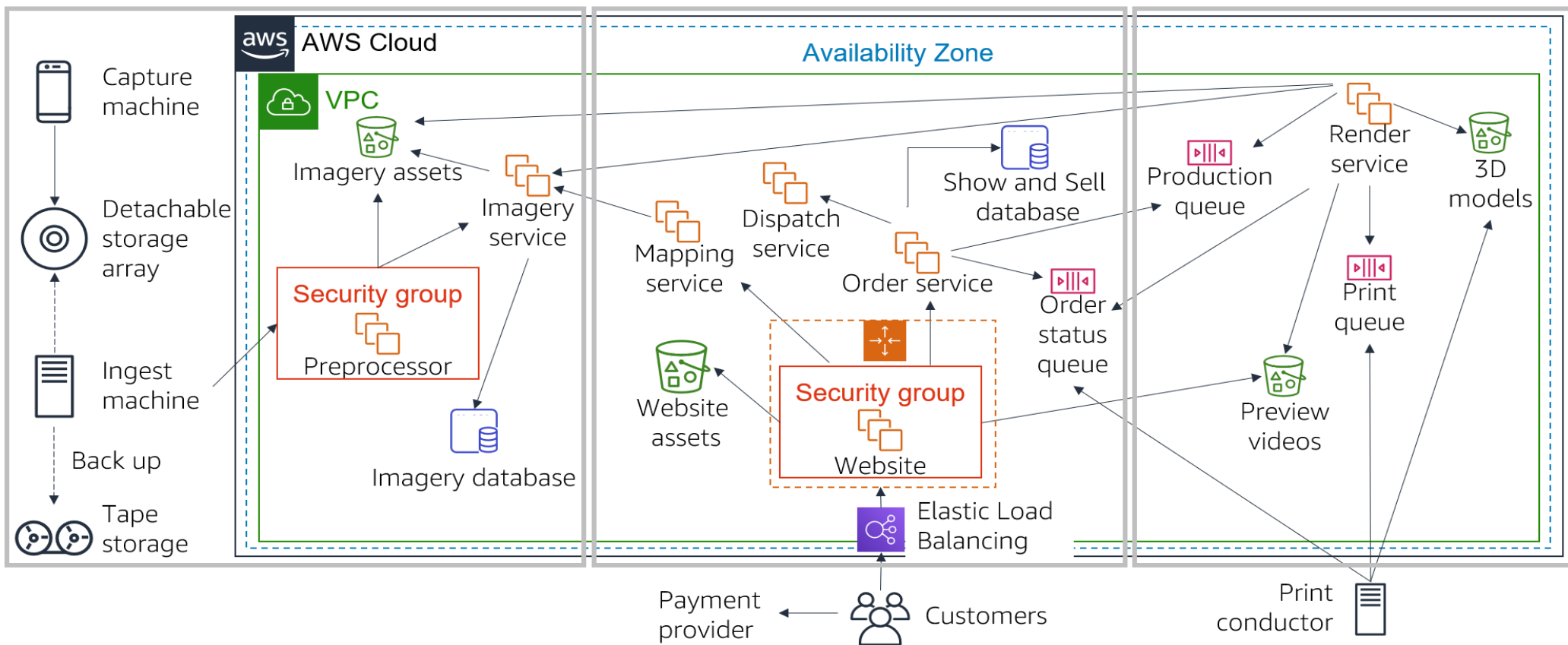
- How do you design your workload service architecture?
- How do you design interactions in a distributed system to prevent failure?
- How do you design interactions in a distributed system to mitigate or withstand failures?

Activity breakout

Fly and Snap

Show and Sell

Make and Ship



Performance Efficiency pillar

Performance Efficiency pillar – use resources sparingly

Performance Efficiency pillar



Use
resources
sparingly.

➤ Focus

- Use IT and computing resources efficiently to meet system requirements and to maintain that efficiency as demand changes and technologies evolve.

➤ Key topics

- Selecting the right resource types and sizes based on workload requirements
- Monitoring performance
- Making informed decisions to maintain efficiency as business needs evolve

Performance efficiency design principles

Performance Efficiency pillar



Use
resources
sparingly.

- Democratize advanced technologies
- Go global in minutes
- Use serverless architectures
- Experiment more often
- Consider mechanical sympathy

Performance efficiency questions

Selection

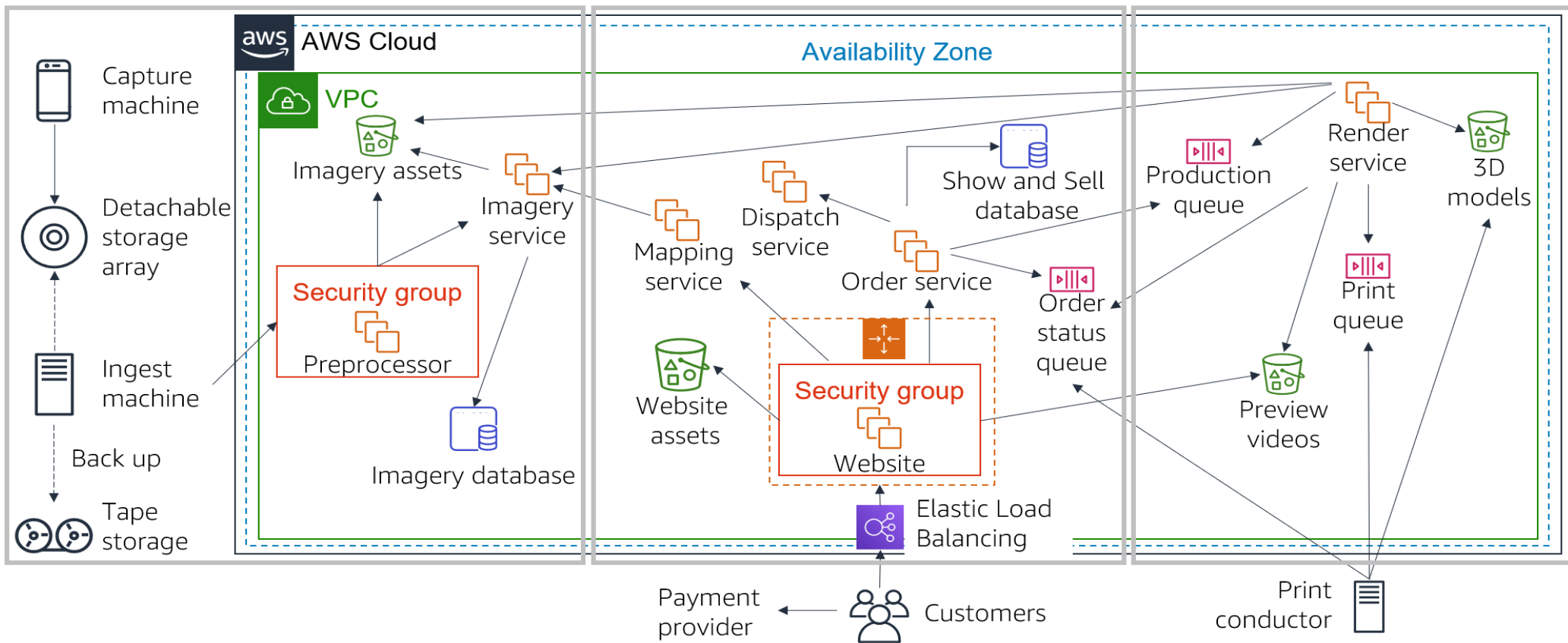
- How do you select the best performing architecture?
- How do you select your compute solution?
- How do you select your storage solution?
- How do you select your database solution?
- How do you configure your networking solution?

Activity breakout

Fly and Snap

Show and Sell

Make and Ship



Cost Optimization pillar

Cost Optimization pillar – eliminate unneeded expense

Cost Optimization pillar



Eliminate
unneeded
expense.

- Focus
 - Avoid unnecessary costs.
- Key topics
 - Understanding and controlling where money is being spent
 - Selecting the most appropriate and right number of resource types
 - Analyzing spend over time
 - Scaling to meeting business needs without overspending

Cost optimization design principles

Cost Optimization pillar



Eliminate
unneded
expense.

- Implement Cloud Financial Management
- Adopt a consumption model
- Measure overall efficiency
- Stop spending money on undifferentiated heavy lifting
- Analyze and attribute expenditure

Cost optimization questions

Practice cloud financial management

- How do you implement cloud financial management?

Expenditure and usage awareness

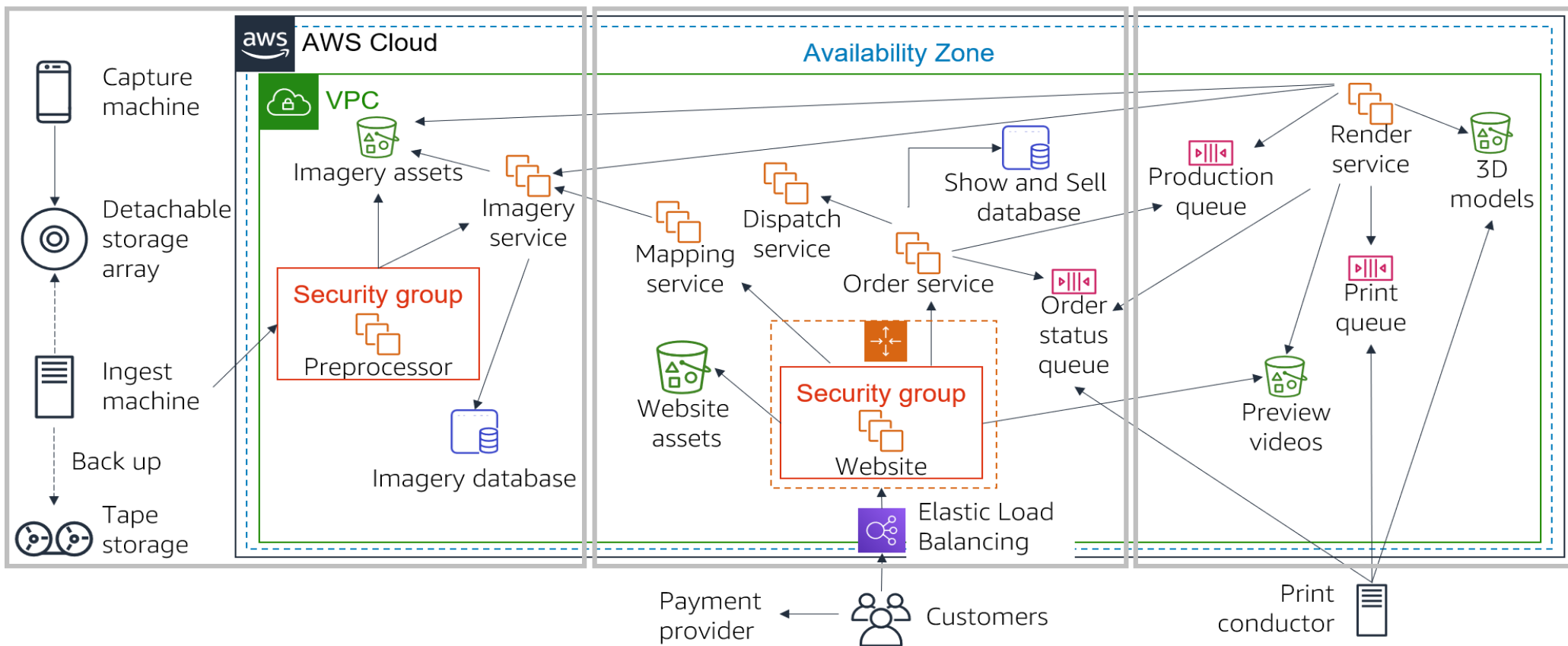
- How do you govern usage?
- How do you monitor usage and cost?
- How do you decommission resources?

Activity breakout

Fly and Snap

Show and Sell

Make and Ship



The AWS Well-Architected Tool

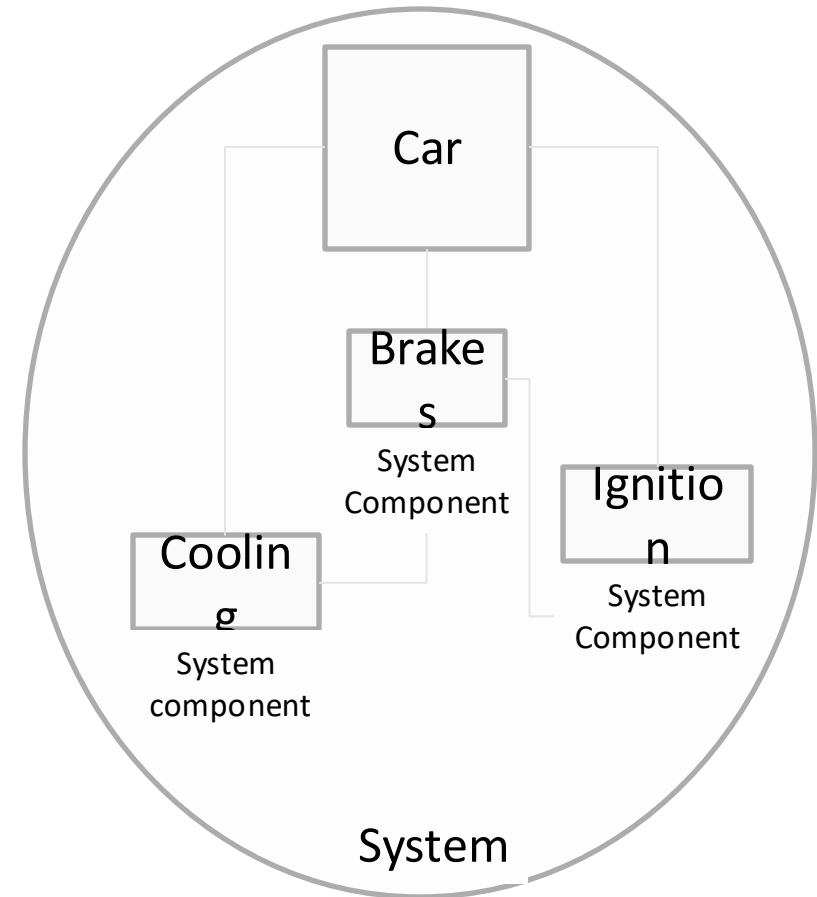
- Helps you review the state of your workloads and compares them to the latest AWS architectural best practices
- Gives you access to knowledge and best practices used by AWS architects, whenever you need it
- Delivers an action plan with step-by-step guidance on how to build better workloads for the cloud
- Provides a consistent process for you to review and measure your cloud architectures

Module 9: Cloud Architecture

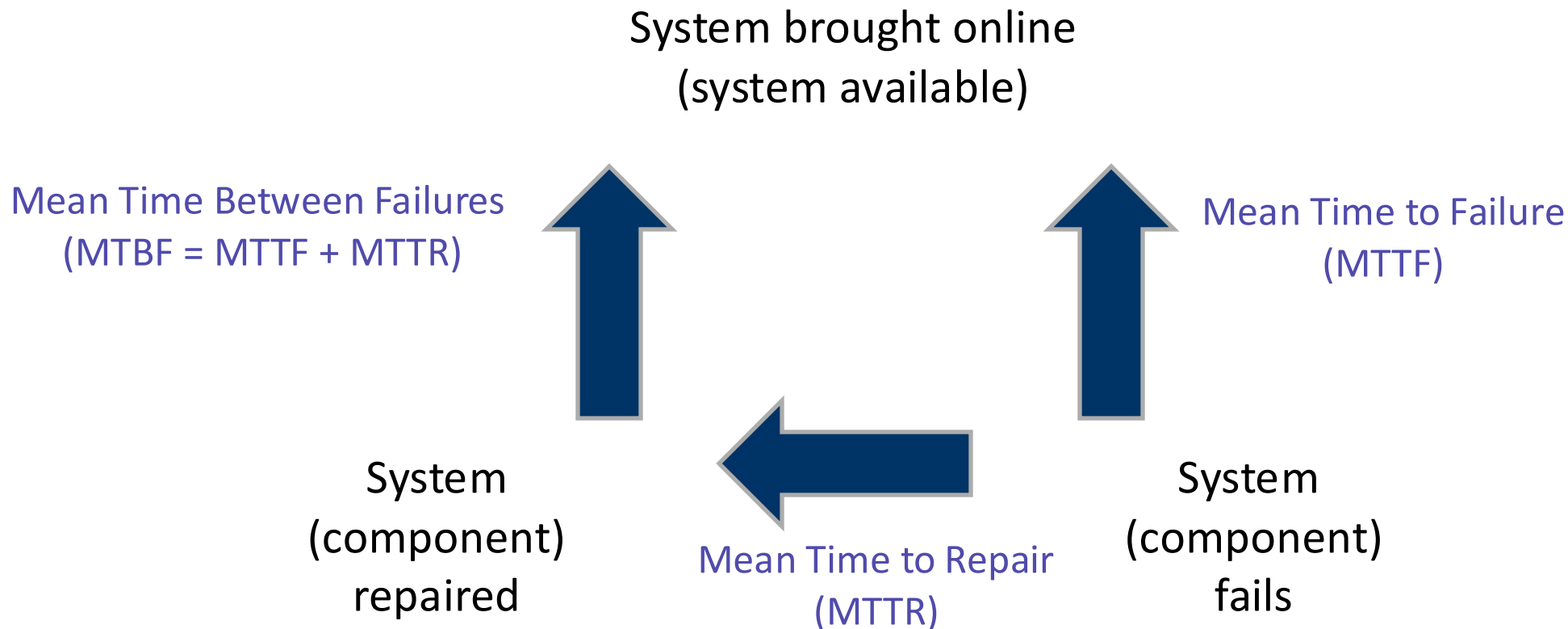
SECTION 2: RELIABILITY AND AVAILABILITY

Reliability

- A measure of your system's **ability to provide functionality** when desired by the user.
- **System** includes all system components: hardware, firmware, and software.
- **Probability** that your entire system will function as intended for a specified period.
- **Mean time between failures (MTBF)** = total time in service/number of failures



Understanding reliability metrics



Availability

- Normal operation time / total time
- A percentage of uptime (for example, 99.9 percent) over time (for example, 1 year)
- Number of 9s – Five 9s means 99.999 percent availability

High availability

- System can withstand some measure of degradation while still remaining available.
- Downtime is minimized.
- Minimal human intervention is required.



Availability tiers

Availability	Max Disruption (per year)	Application Category
99%	3 days 15 hours	Batch processing, data extraction, transfer, and load jobs
99.9%	8 hours 45 minutes	Internal tools like knowledge management, project tracking
99.95%	4 hours 22 minutes	Online commerce, point of sale
99.99%	52 minutes	Video delivery, broadcast systems
99.999%	5 minutes	ATM transactions, telecommunications systems

Factors that influence availability

Fault tolerance

- The **built-in redundancy** of an application's components and its **ability to remain operational**.

Scalability

- The ability of an application to **accommodate increases in capacity needs** without changing design.

Module 9: Cloud Architecture

SECTION 3: AWS TRUSTED ADVISOR

AWS Trusted Advisor



AWS Trusted
Advisor

- Online tool that provides real-time guidance to help you provision your resources following AWS best practices.
- Looks at your entire AWS environment and gives you real-time recommendations in five categories.

Cost Optimization



0 ✓ 9 ⚠ 0 !

\$7,516.85

Potential monthly savings

Performance



3 ✓ 7 ⚠ 0 !

Security



2 ✓ 4 ⚠ 11 !

Fault Tolerance



0 ✓ 15 ⚠ 5 !

Service Limits



37 ✓ 0 ⚠ 1 !

OFF TOPIC



IF YOU ARE
NOT BUILDING SW
YOU ARE
NOT LEARNING!