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Cloud Security Through Threat Modeling

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Key Points

- Introduction
- Threat Model Primer
- Assessing Threats
- Mitigating Threats
- Sample Threat Model Exercise
- Conclusions and Questions

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INTRODUCTION

Everything as a Service

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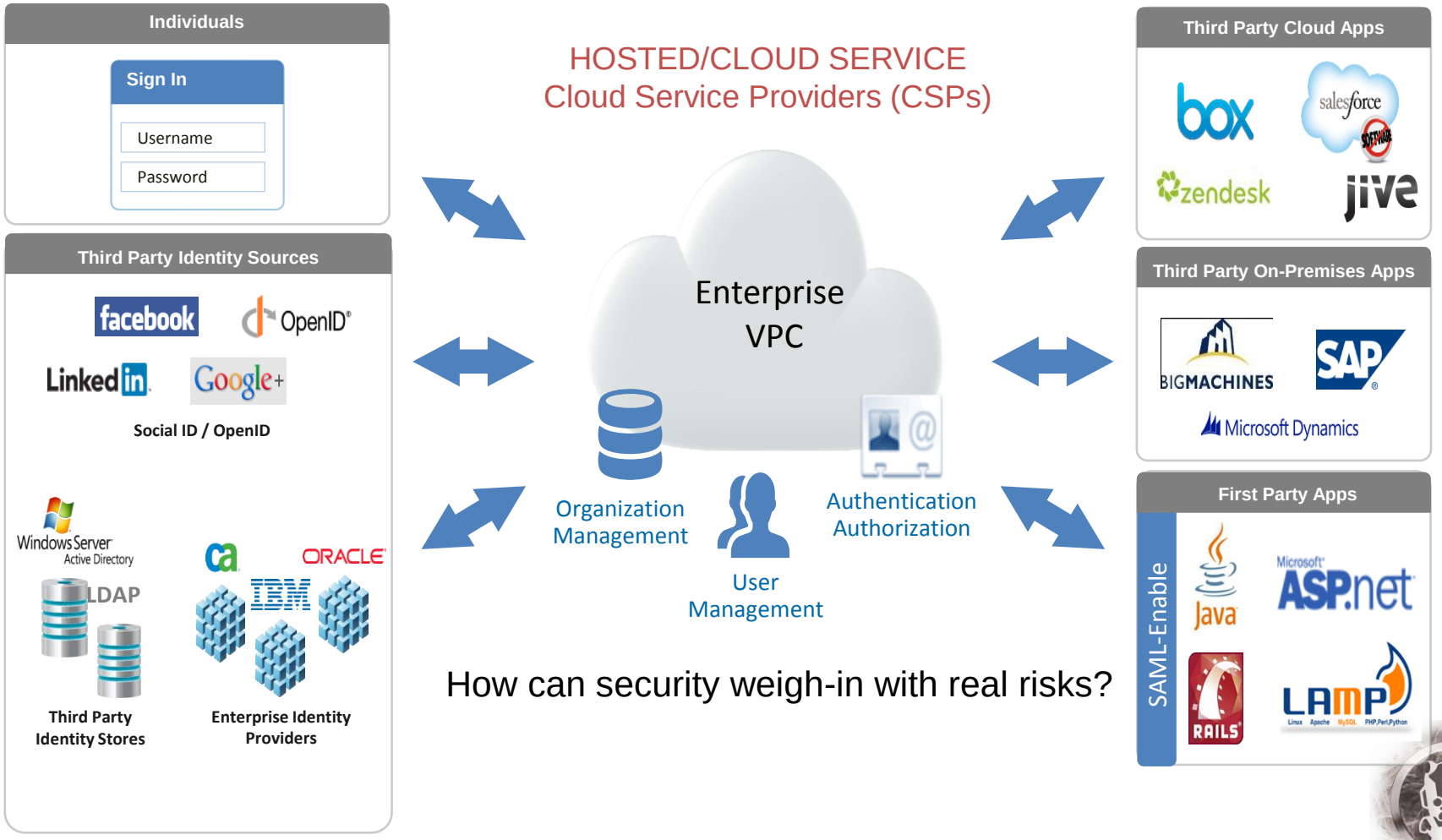
FLEXIBILE AUTHENTICATION METHODS

MANAGED APP INTEGRATIONS Service Providers (SPs)



How can security weigh-in with real risks?

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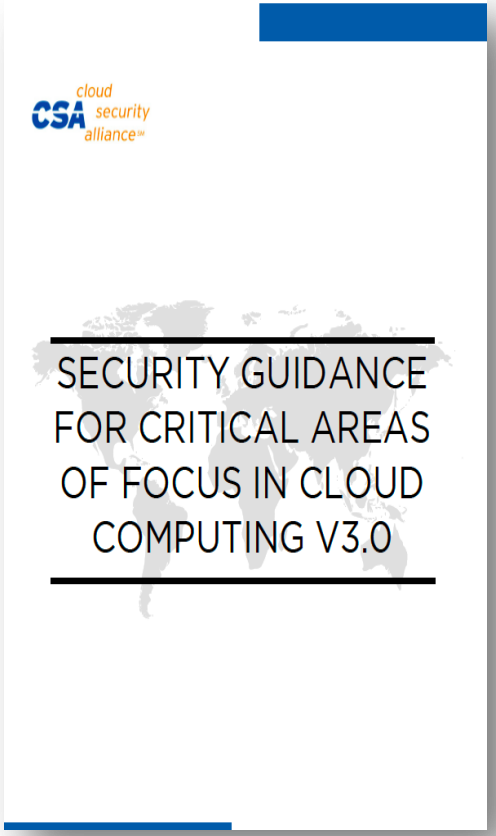
Cloud Security Wisdom

This wisdom is captured best here:



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Cloud Security Wisdom
What Is It?

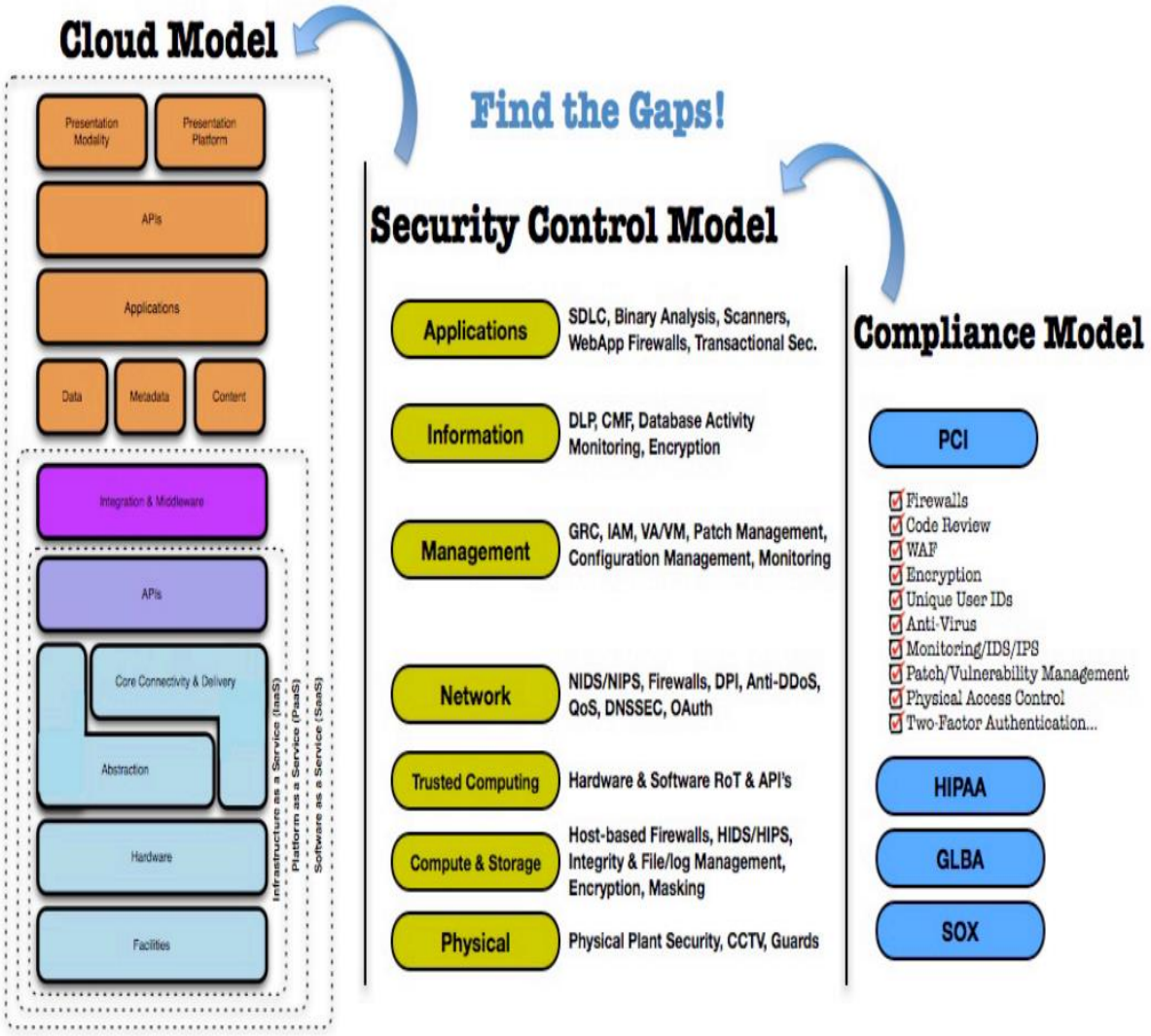
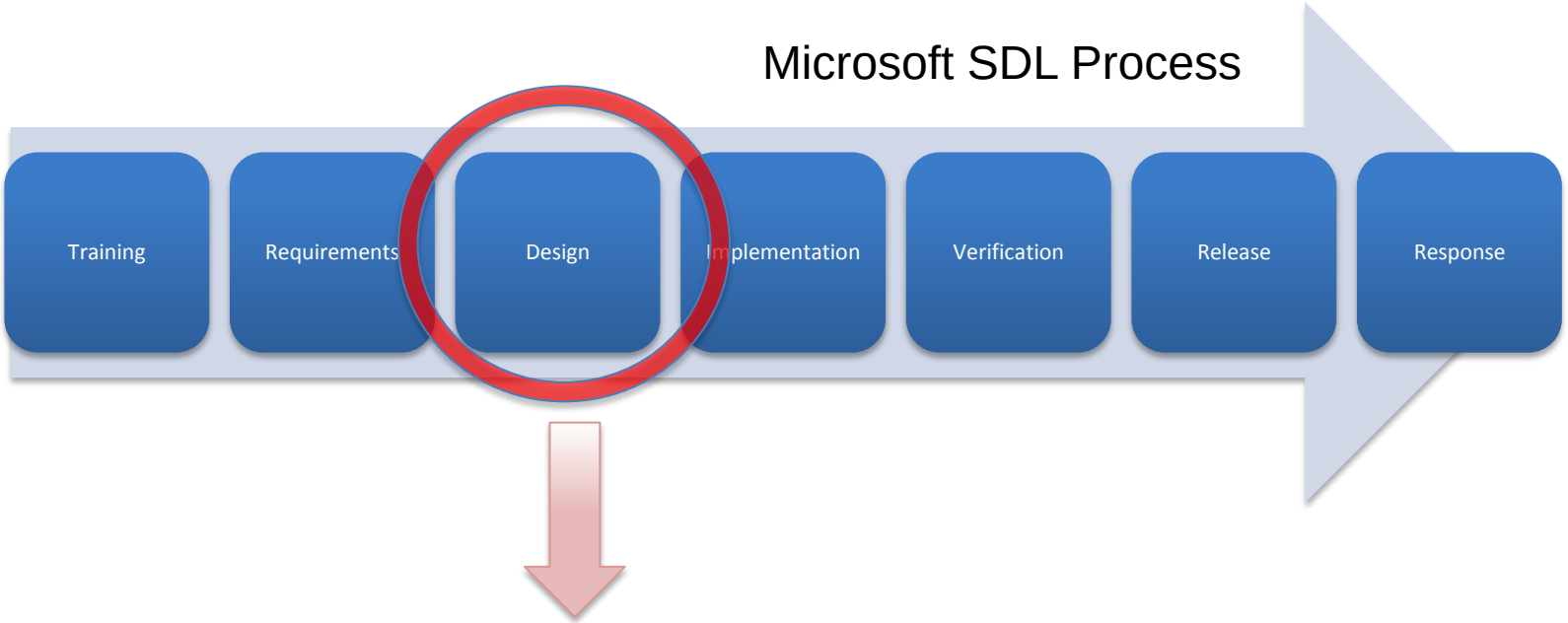


Figure 5—Mapping the Cloud Model to the Security Control & Compliance

Modeling Risks Programmatically



Developing Threat Models

- Structured approach
- Repeatable way to identify attack surfaces (i.e. risk)
- Develop mitigations and acceptance criteria
- Can be applied to anything–even Cloud environments

Threat Modeling Cloud Environments

DOMAIN 10 //
APPLICATION SECURITY

Threat analysis guidance provided in this domain

10.6 Recommendations

10.6.2 Risk Analysis Recommendations

- Risk analysis of the applications for security and privacy (confidentiality, integrity and availability) are undertaken, and threat models should be built and maintained.
- Risks from the perspective of development and deployment in the cloud should be analyzed and related threat models maintained.

…good thinking, now let's talk about how to create threat models

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THREAT MODEL PRIMER

Why Threat Model?

- Threat modeling is not just for code
  - Anything can be Threat Modeled
  - Output will drive risk analysis and business decisions
- Implementing in the Cloud is still code
  - Deploying and managing servers is all software
  - It has driven the rise of Dev-Ops personnel

When to Threat Model

- Not a one time event
- Adding or removing assets/components
  - It is never too late!
- What you need to know before you start
  - What are you building?
  - What needs to be protected?
- You can be too early, especially on new projects

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Threat Modeling Tools

- The tool used is less important than the data recorded
- Using a tool already? Keep doing so!
- Whiteboards are a favorite
  - Do not forget longer term retention
- Data Flow Diagrams

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Assessment and Identifying Threats

- Identify Data Assets
  - Determine Each Assets Relative Value
- Identify Actors and Data Asset Visibility
  - Internal Personnel
  - CSP Personnel
  - Government?

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Assessment and Identifying Threats

- Data Flow Diagram
- Identify Points of Trust Boundaries
  - Points at which control changes
- Identify Points of Vulnerability
- Know Where Your Data Is
  - To the best of your visibility

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ASSESSING THREATS

CSP Responsibilities–IaaS

- Hardware Layer
- Network Layer (IDS, DDoS, Guest Instances)
- Instance Access Control Rules

CSP Responsibilities–PaaS

- Hardware Layer
- Operating System Layer
- Network Layer
  - May not be inherited from IaaS
- Access Control Rules

CSP Responsibilities–SaaS

- All asset integrity and visibility is dependent upon the CSP regardless of service

CSP Threats–IaaS

- Data Visibility
  - Government requests
  - May be able to be mitigated
- Network Traffic Shaping and Manipulation
- Hypervisor Trust

CSP Threats–PaaS

- IaaS threats included
- Like a Managed Service Provider
  - Shared Root/Admin
- Less control over data
  - Depends on nature of PaaS
- Data Storage vs. Application Hosting
- Depends on how the data is used

CSP Threats–SaaS

- IaaS and PaaS threats included
- No guaranteed control over data
  - CSP must be completely trusted

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MITIGATING THREATS

Mitigating CSP Threats–IaaS

- Data Storage
  - Storage location
  - Encryption and key management control
  - Avoid using ephemeral disks
- Authentication and Authorization
  - Use your own system whenever possible

Mitigating CSP Threats–IaaS

- Data transit
  - Encryption with your own certificates if possible
  - Pass through load balancers instead of terminating connections there
  - Includes administration
- Network segmentation and firewalls, if available

Mitigating CSP Threats–PaaS

- Monitor all access, regardless of who
  - It might not be a critical event–but then again, it might
- Use encrypted transit with your certificates/keys
  - Be careful where you store the private keys
- Encrypt before storing
- Log where possible

Mitigating CSP Threats–SaaS

- There is no control
- Deleted vs. non-visible
- Legal might help

The Fun Part: Multiple Services

- Most Cloud implementations use multiple services
- Data Flow Diagrams show their worth
- It is necessary to break the components down
  - Take each service on its own merit
  - They might not be from the same CSP
    - Could be a good thing

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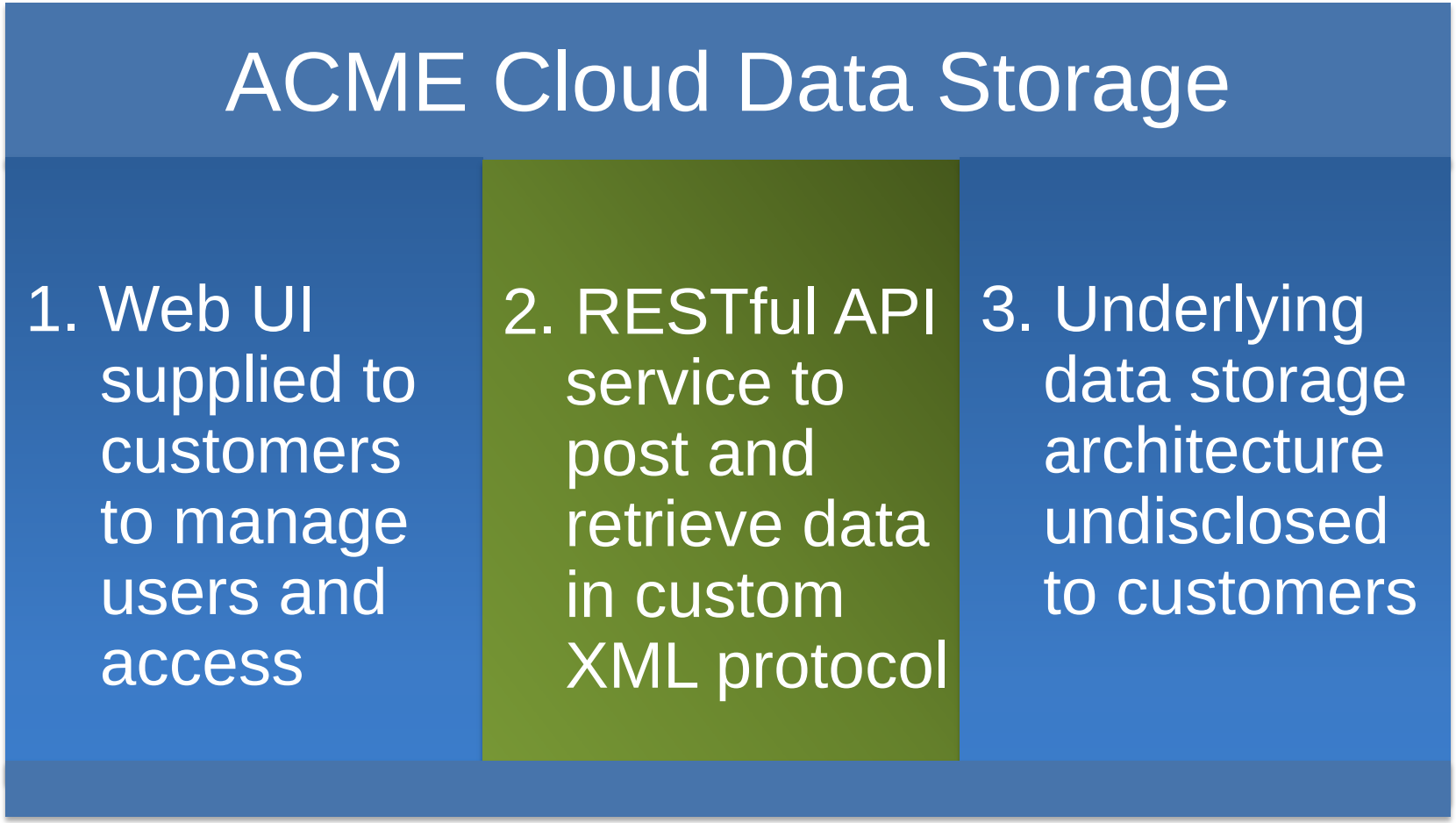
SAMPLE THREAT MODEL EXERCISE

Exercise: CSP Service Definition



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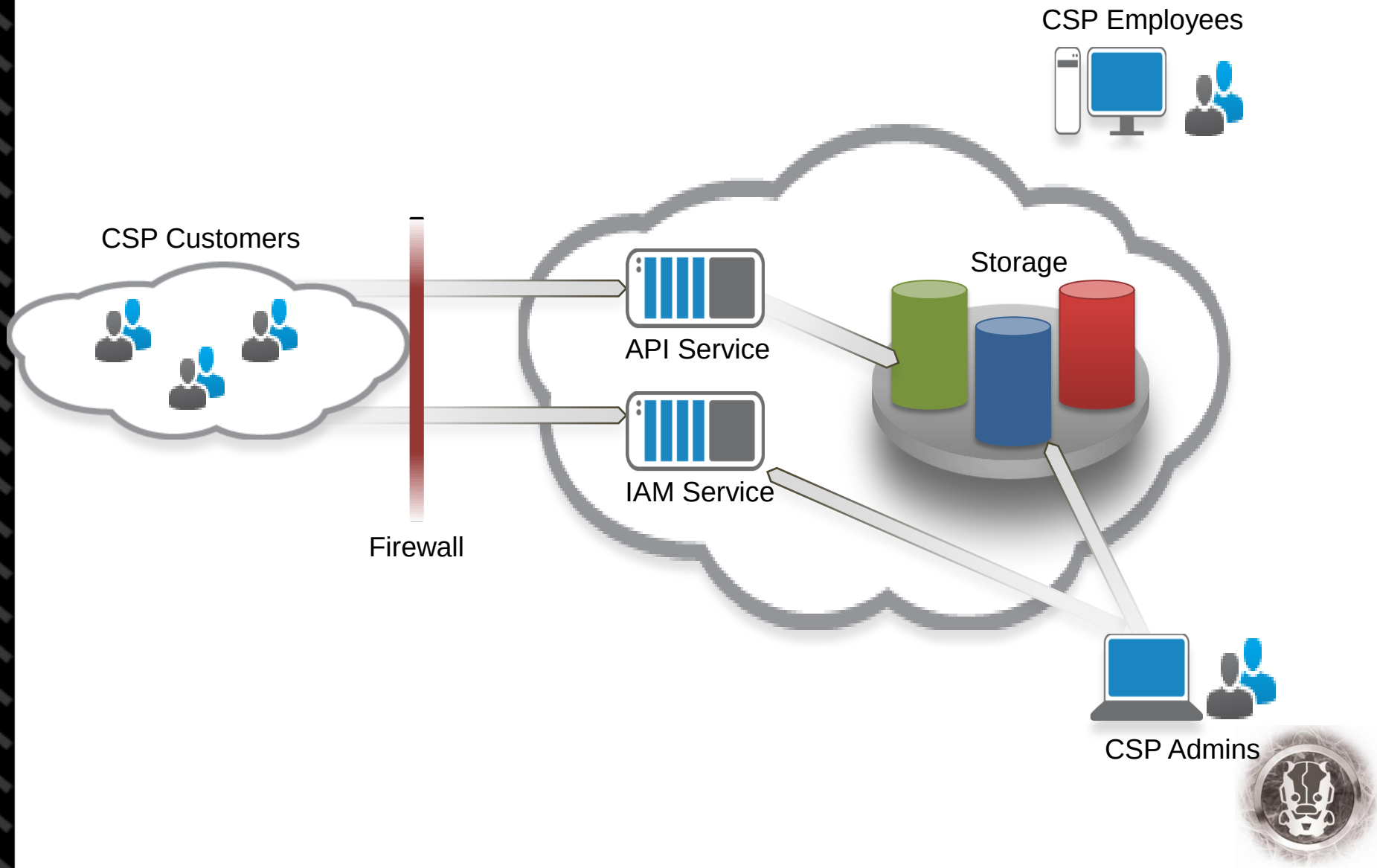
Exercise: Data Flow Diagram



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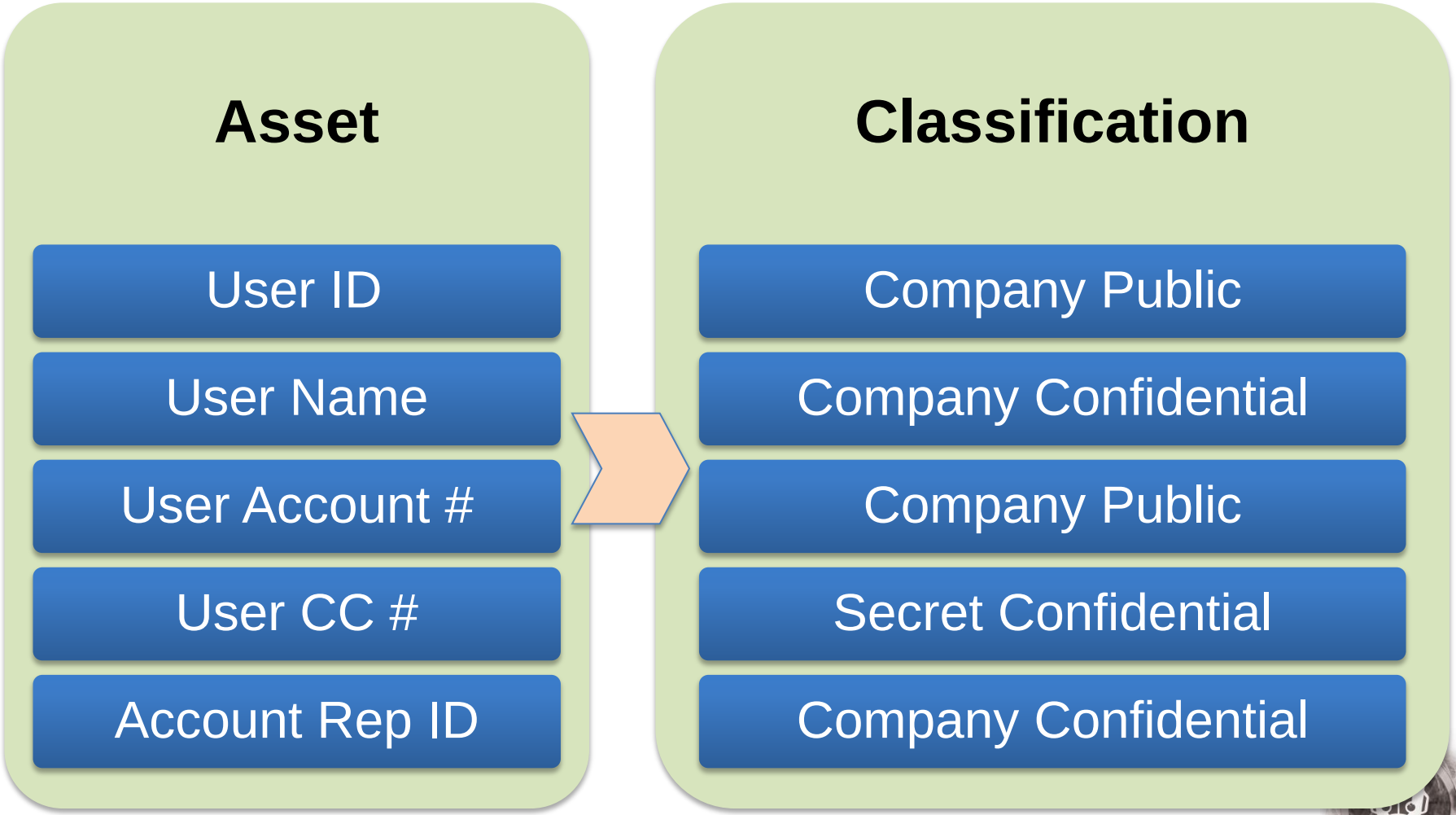
Exercise: Identifying Assets



Exercise: Identifying Actors

Actors	Classification
Anonymous	Anyone not authenticated
Account Rep	Authenticated account representative
Account Manager	Account representative managers
Account Administrator	Controls account rep & managers access
CSP Personnel	CSP employees and administrators
CSP Customers	Other customers using similar interfaces

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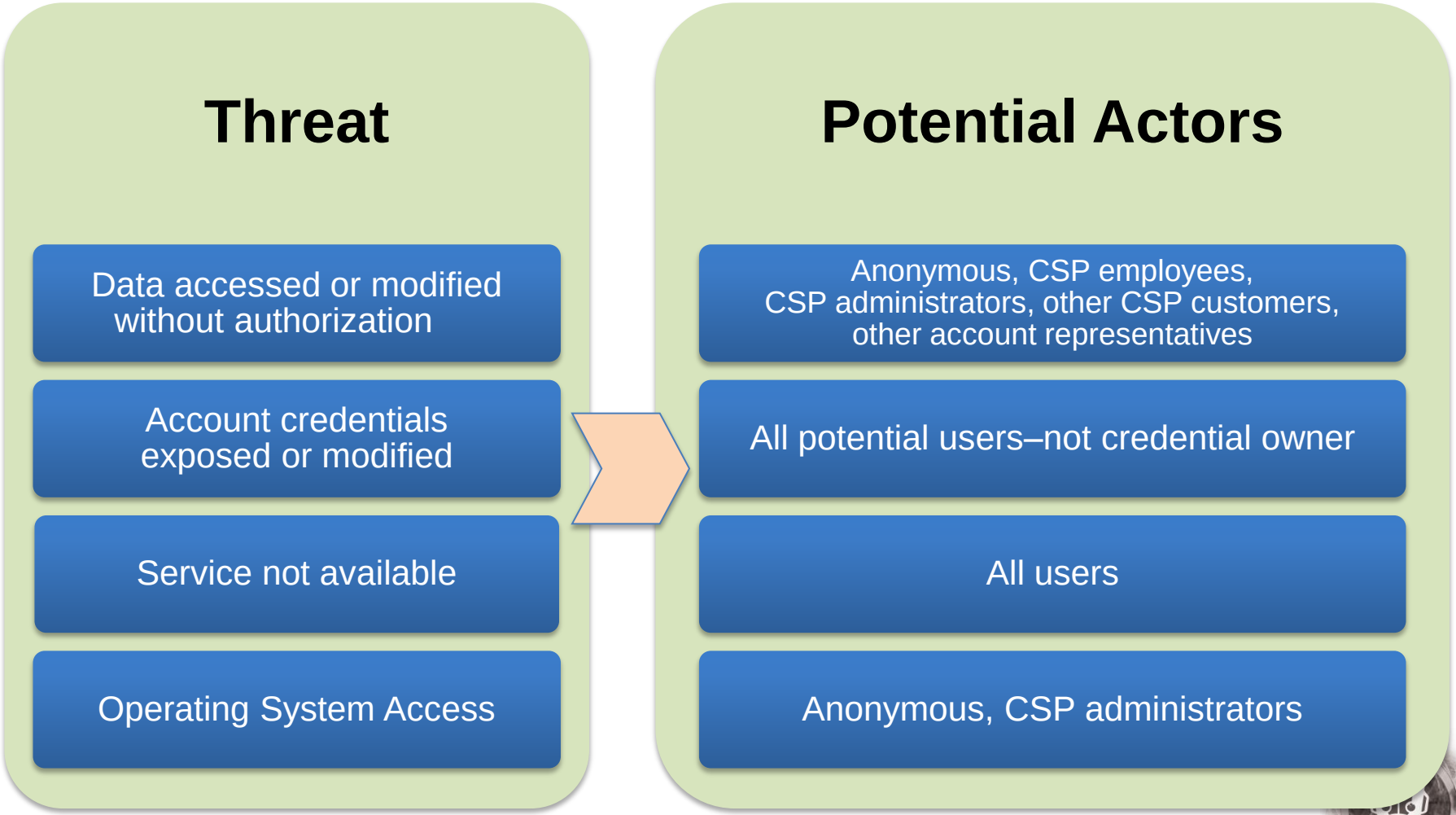
Exercise: Identifying Threats



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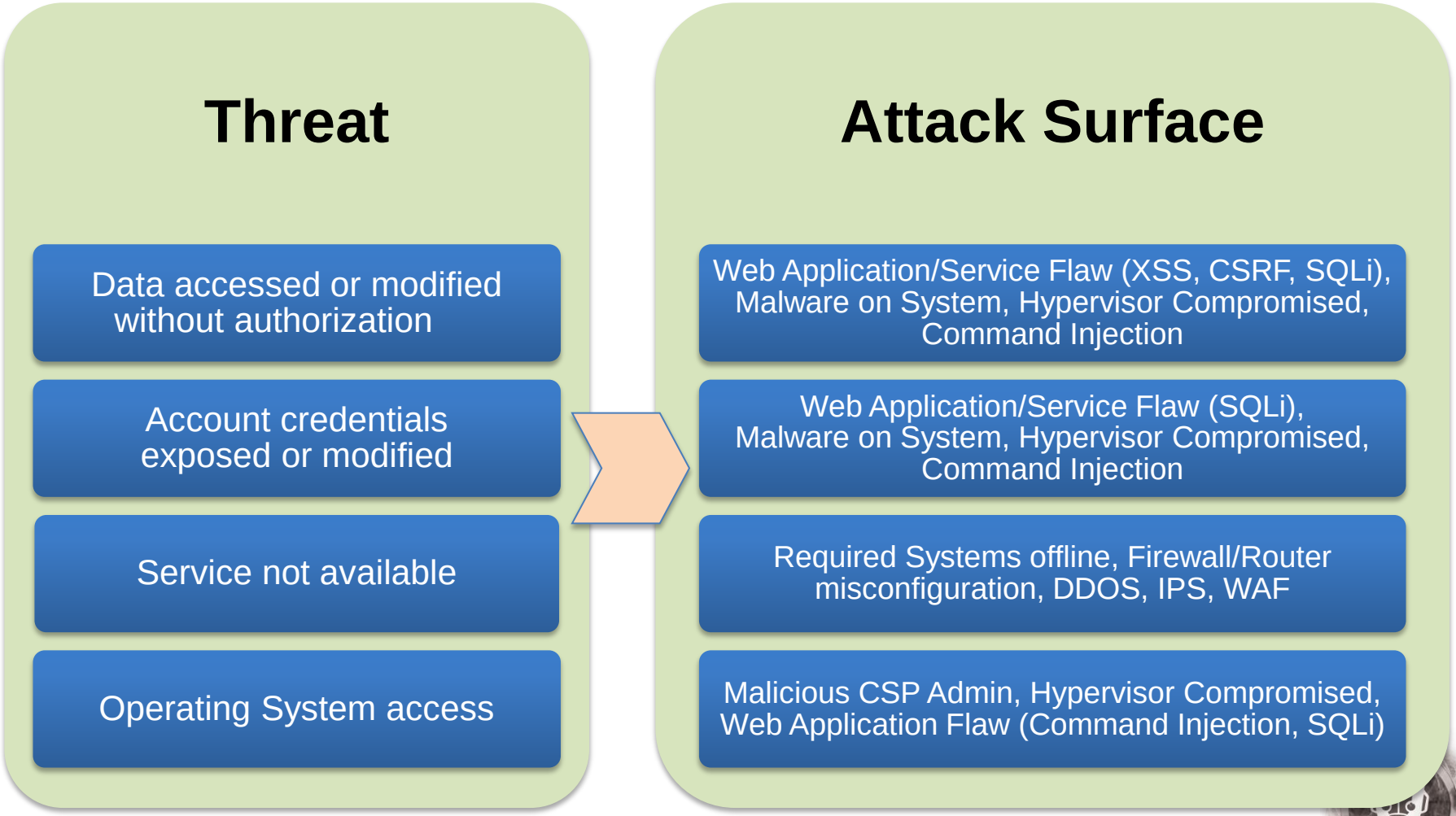
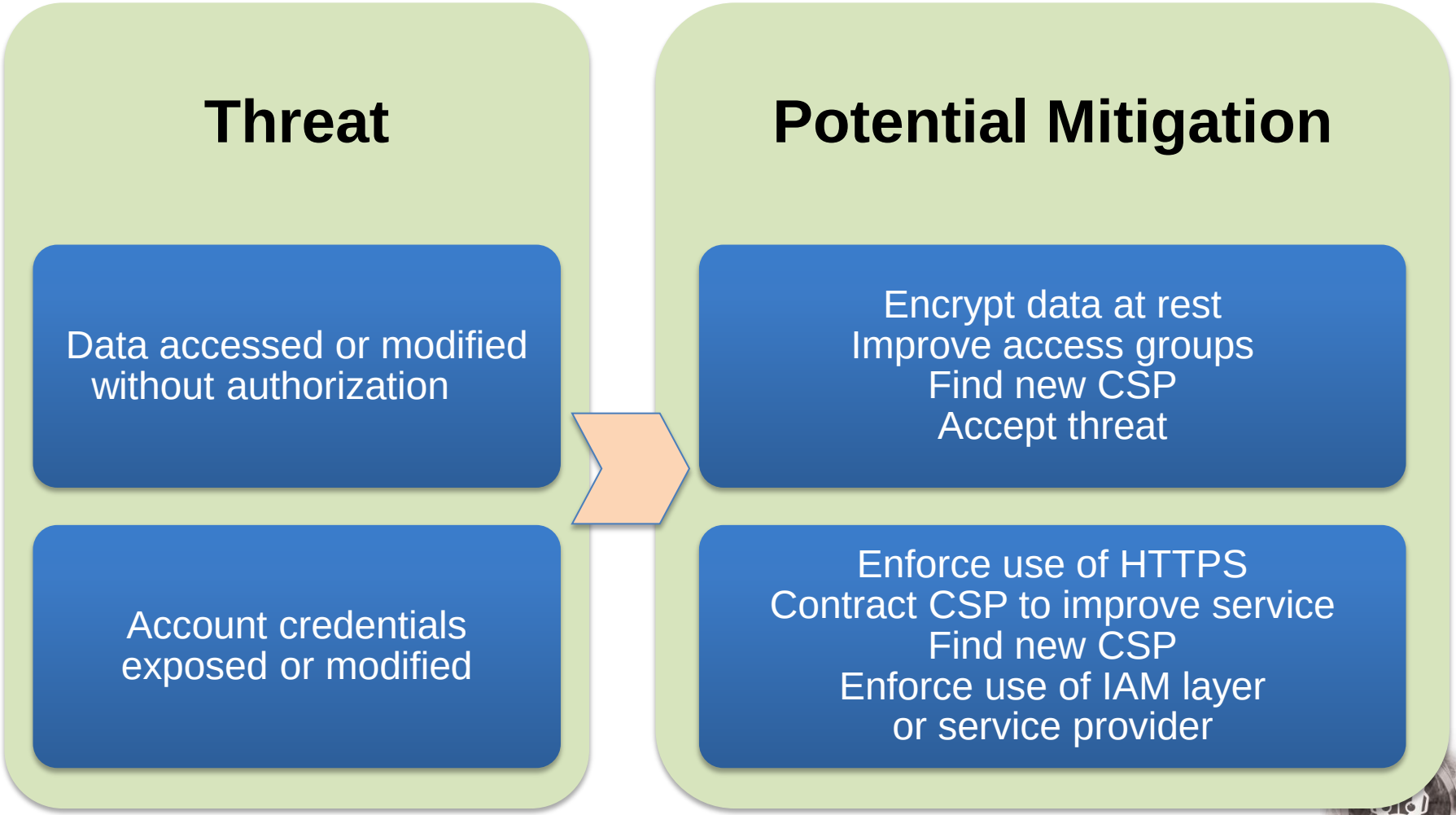
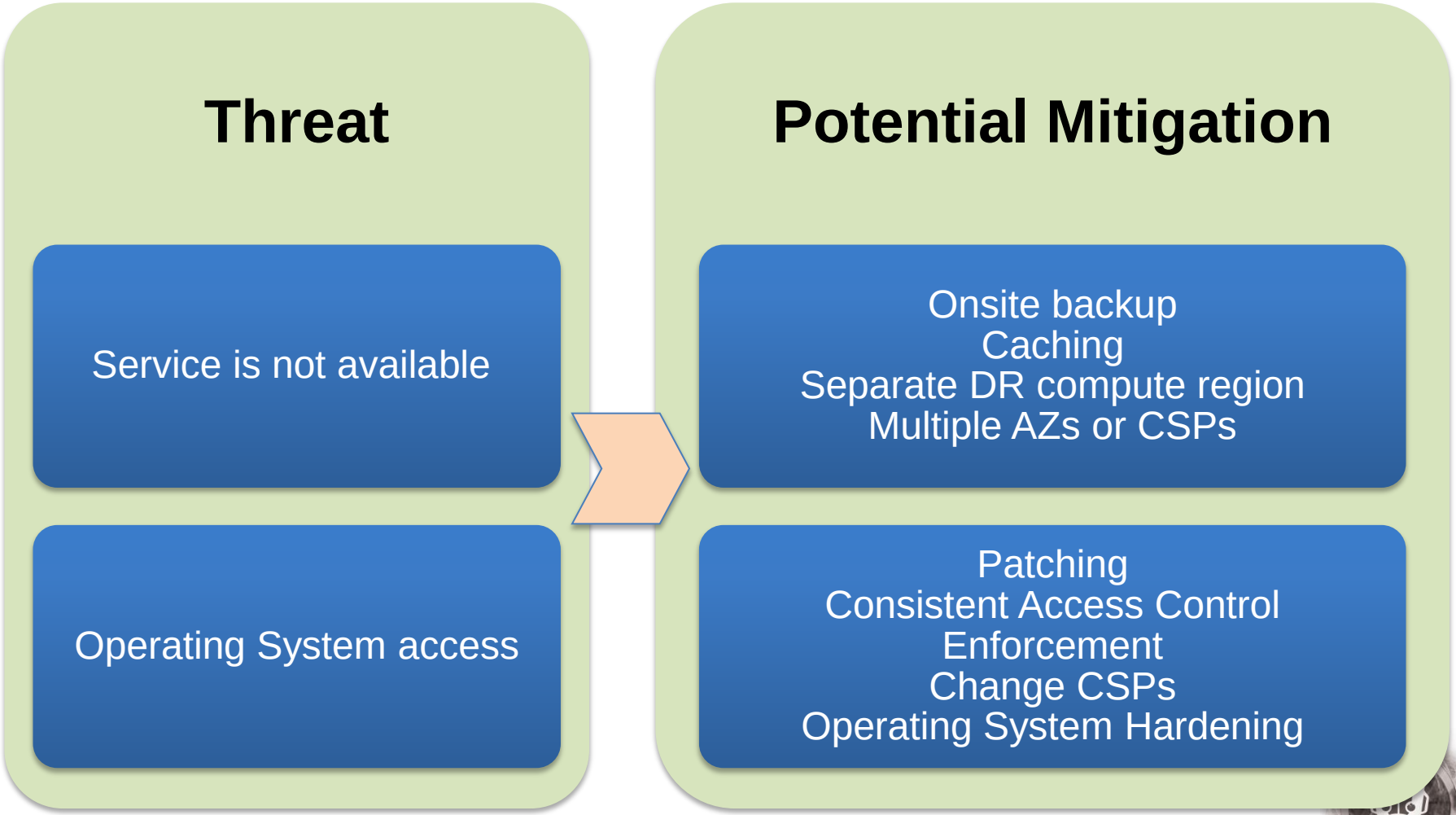
Exercise: Identifying the Attack Surface



Exercise: Mitigate or Accept



Exercise: Mitigate or Accept



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CONCLUSIONS AND QUESTIONS

Conclusions

- Risk vs. Reward
  - Identify risk to minimize it
  - Increase reward–leverage CSPs that work
- Cloud Projects will involve discrete backend services
  - Lots of API interaction at SaaS, PaaS, and IaaS levels
  - Focus on permissions, authentication, and authorizations
- Leverage legal contracts and compliance assurances

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Questions

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Thank You!

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