Security Potentials & Challenges of Micro-Service Architectures

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About eSentire

- CyberSecurity Service Provider
- Managed Detection Response
- Integrated “grey-matter” / silicon solution
- Protecting SMBs

Motivation

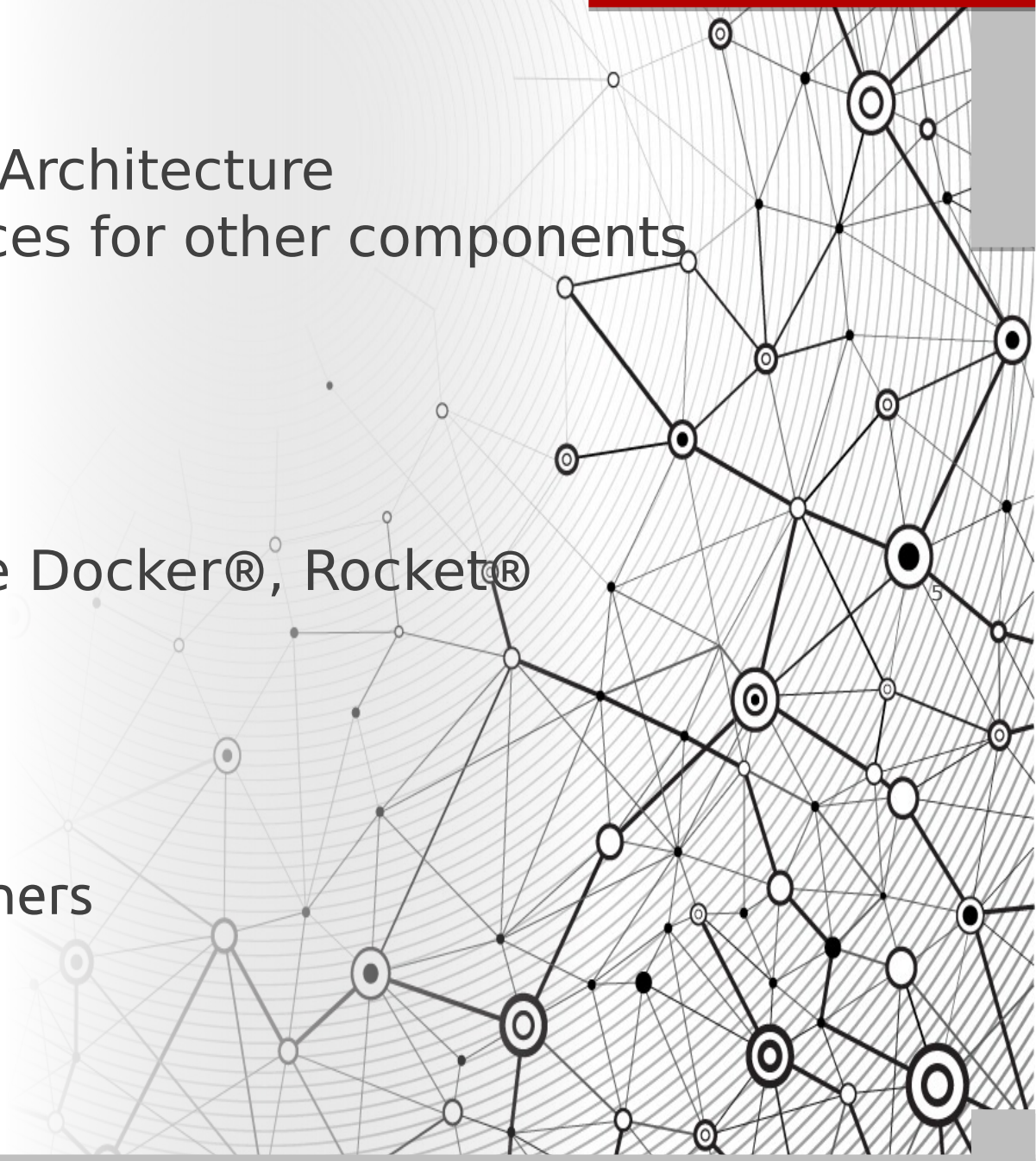
- Service Oriented Architecture are often implemented through Microservices
- Architecture of scalable solutions
- Management of scalable solutions
- Arising aspects for security

Introduction

- Microservices
  - Example Architectures
- Areas of Security Posture
  - Services
  - Environment

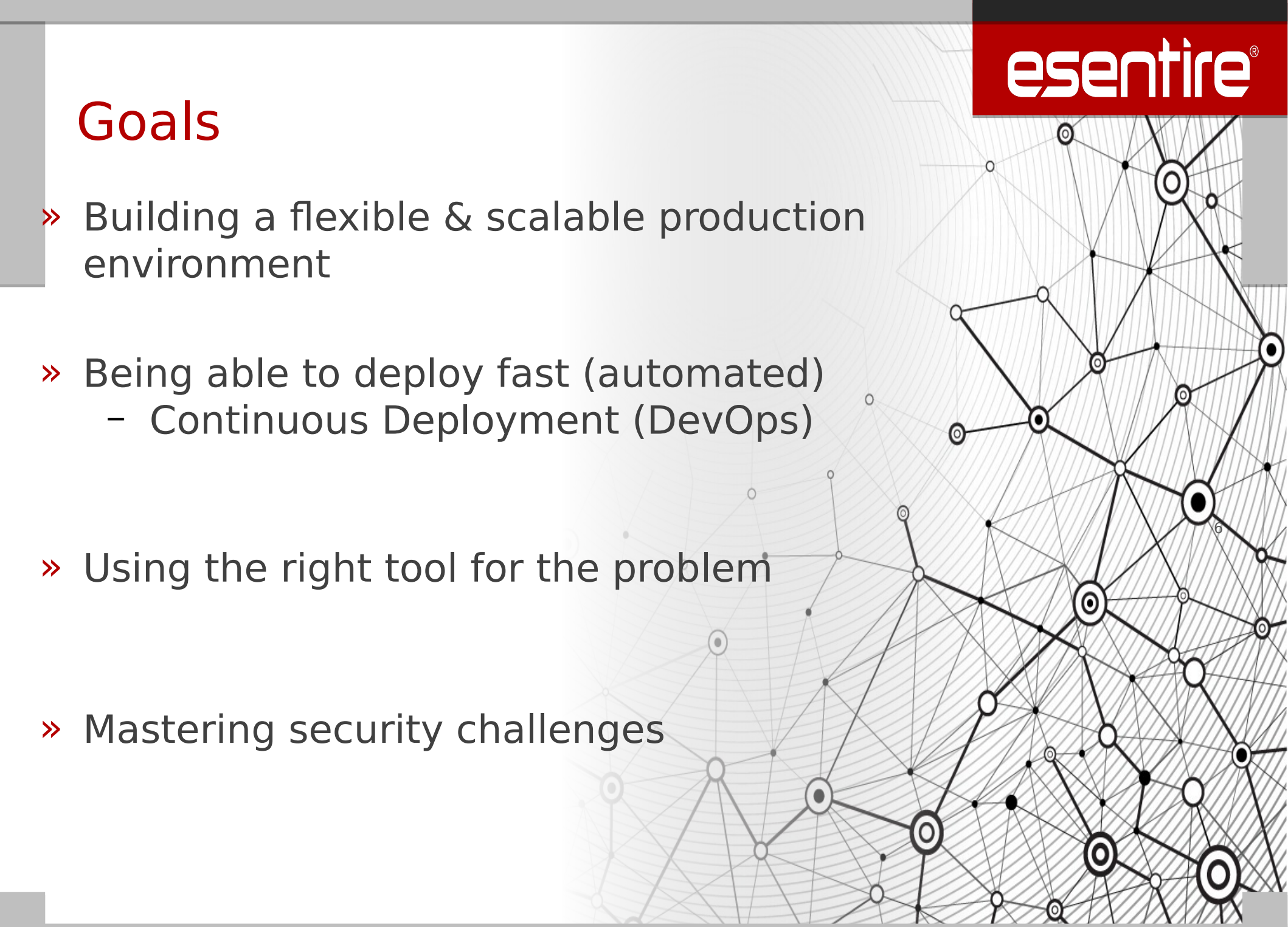
Terminology

- SOA – Service Oriented Architecture
  - Self-contained services for other components
- Containers
  - Linux Containers like Docker®, Rocket®
- Orchestration
  - Deployment of Containers



Goals

- Building a flexible & scalable production environment
- Being able to deploy fast (automated)
  - Continuous Deployment (DevOps)
- Using the right tool for the problem
- Mastering security challenges



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Micro-Services

Micro-services

- Ideal implementation of SOA
- Each micro-service is independent service
- Each service provides responses to request either from outside the services or another service

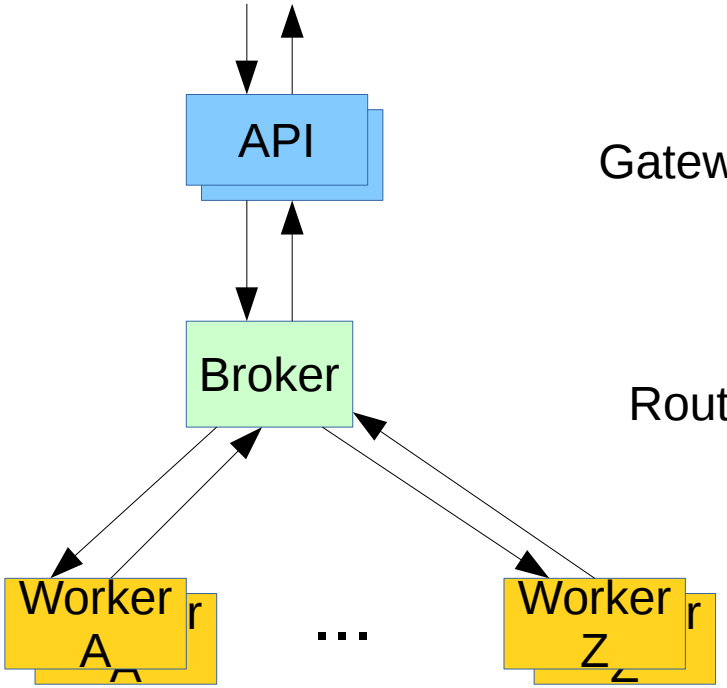
Micro-services

- Mostly 2 different architectures
  - Synchronous (API) services
  - Asynchronous data pipeline

Synchronous / API Services

- Mostly 3 parts
  - Front end receiving requests
    - i.e AWS API Gateway
  - Messaging Broker
    - i.e. 0MQ, AMPQ Implementation
  - Workers serving requests
    - i.e. AWS Lambda services
- Bi-directional communication
- Good for interactions (Uis)
- Can have performance adverse properties

Synchronous / API Services



Gateway

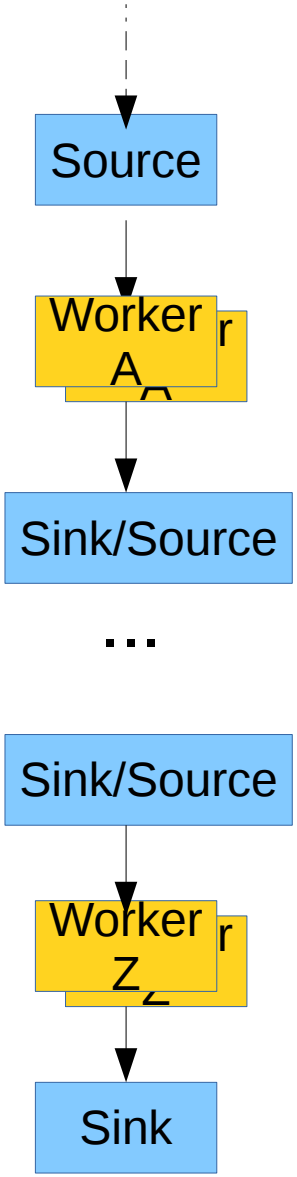
Router

Service

Asynchronous / Data Pipeline

- Mostly chain of services
  - Messaging Broker connecting chain links
    - i.e. Kafka, 0MQ, AMPQ Implementation
    - AWS Kinesis, Google PubSub
  - Workers serving requests
    - i.e. AWS Lambda services
- Uni-directional communication
- Good for performance
- Does not support interactivity

Asynchronous / Data Pipeline



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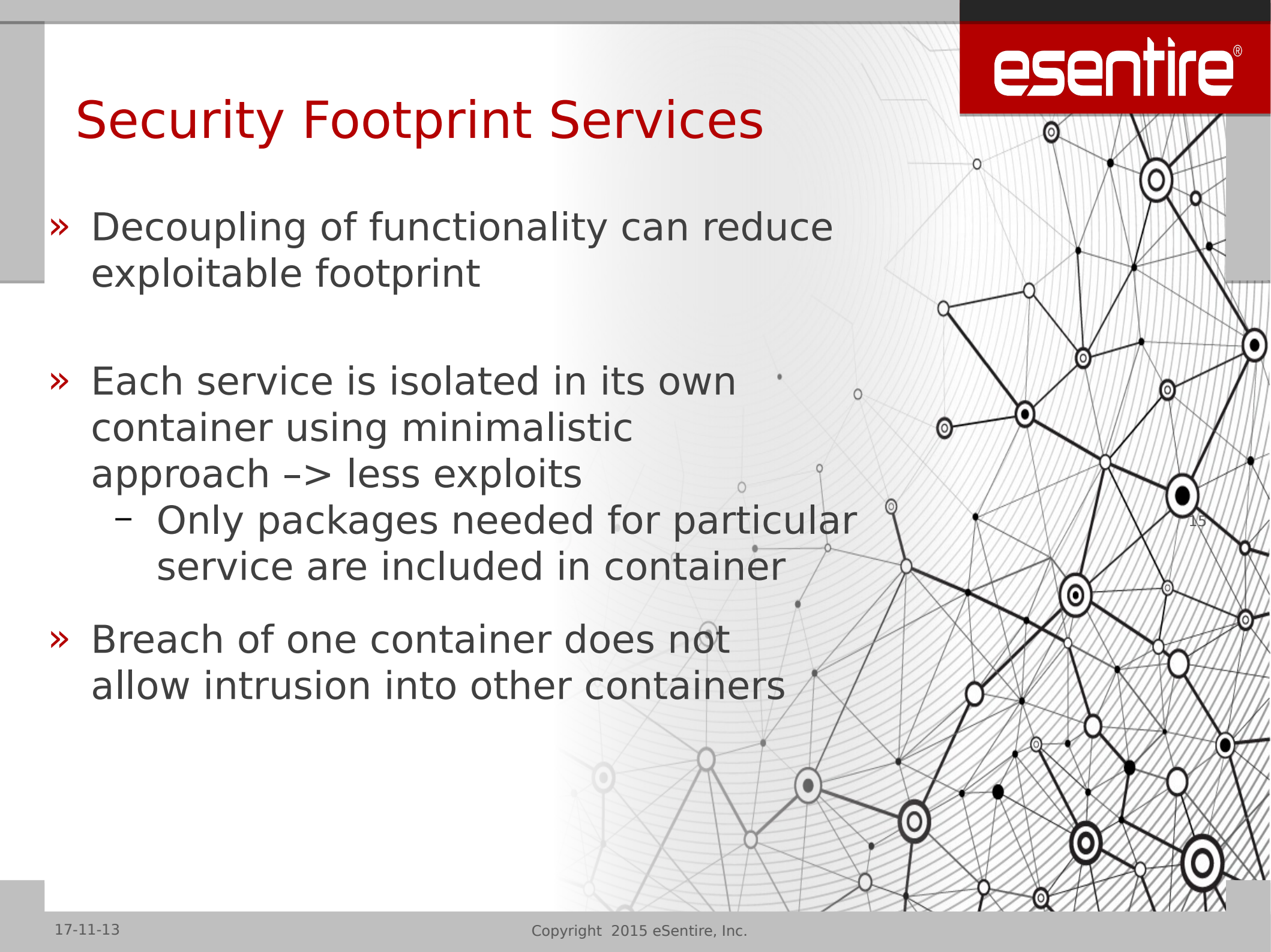
Security

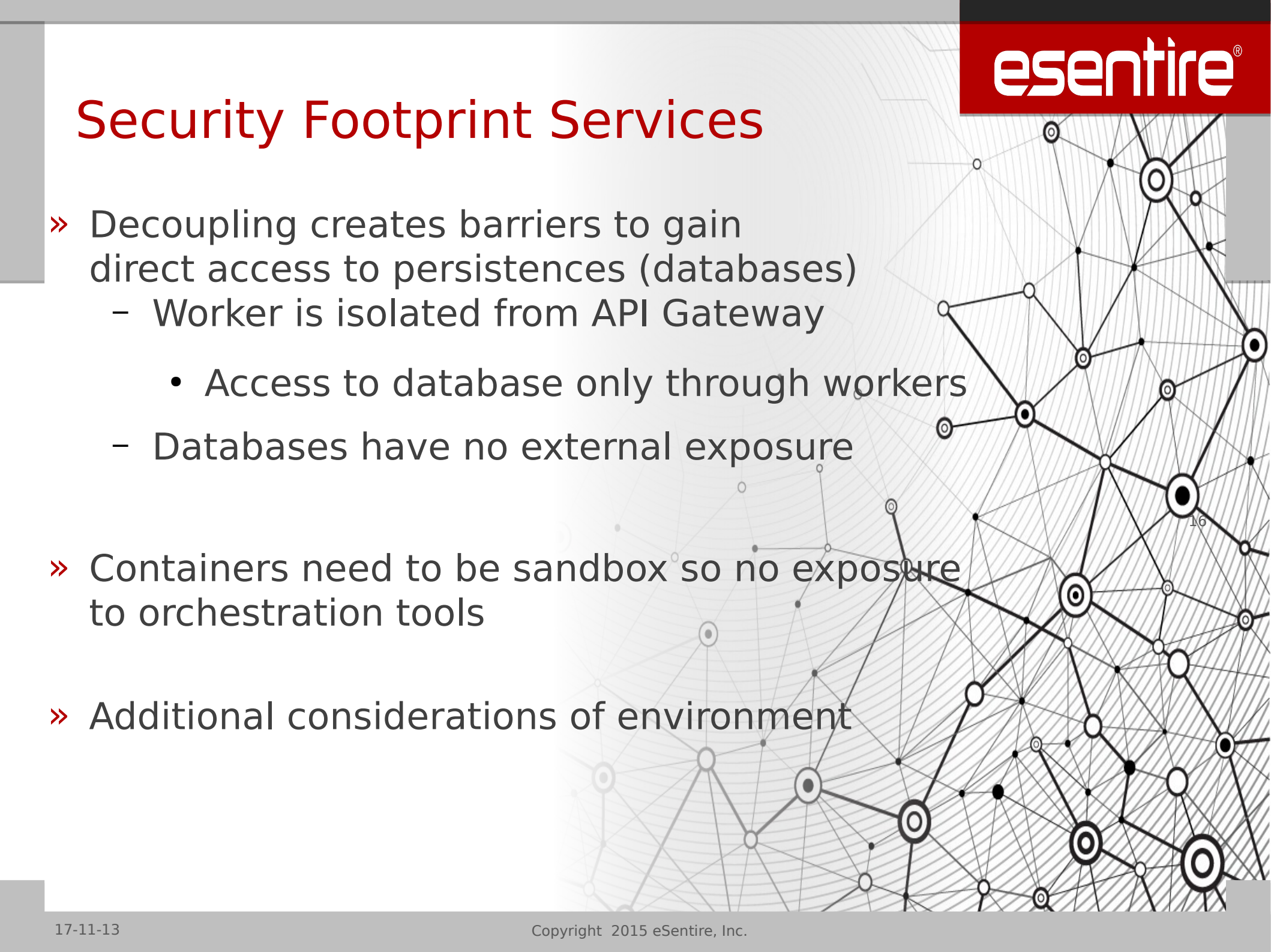
Security Footprint Services

- Decoupling of functionality can reduce exploitable footprint
- Each service is isolated in its own container using minimalistic approach –> less exploits
  - Only packages needed for particular service are included in container
- Breach of one container does not allow intrusion into other containers



Security Footprint Services

- Decoupling creates barriers to gain direct access to persistences (databases)
  - Worker is isolated from API Gateway
    - Access to database only through workers
  - Databases have no external exposure
- Containers need to be sandbox so no exposure to orchestration tools
- Additional considerations of environment

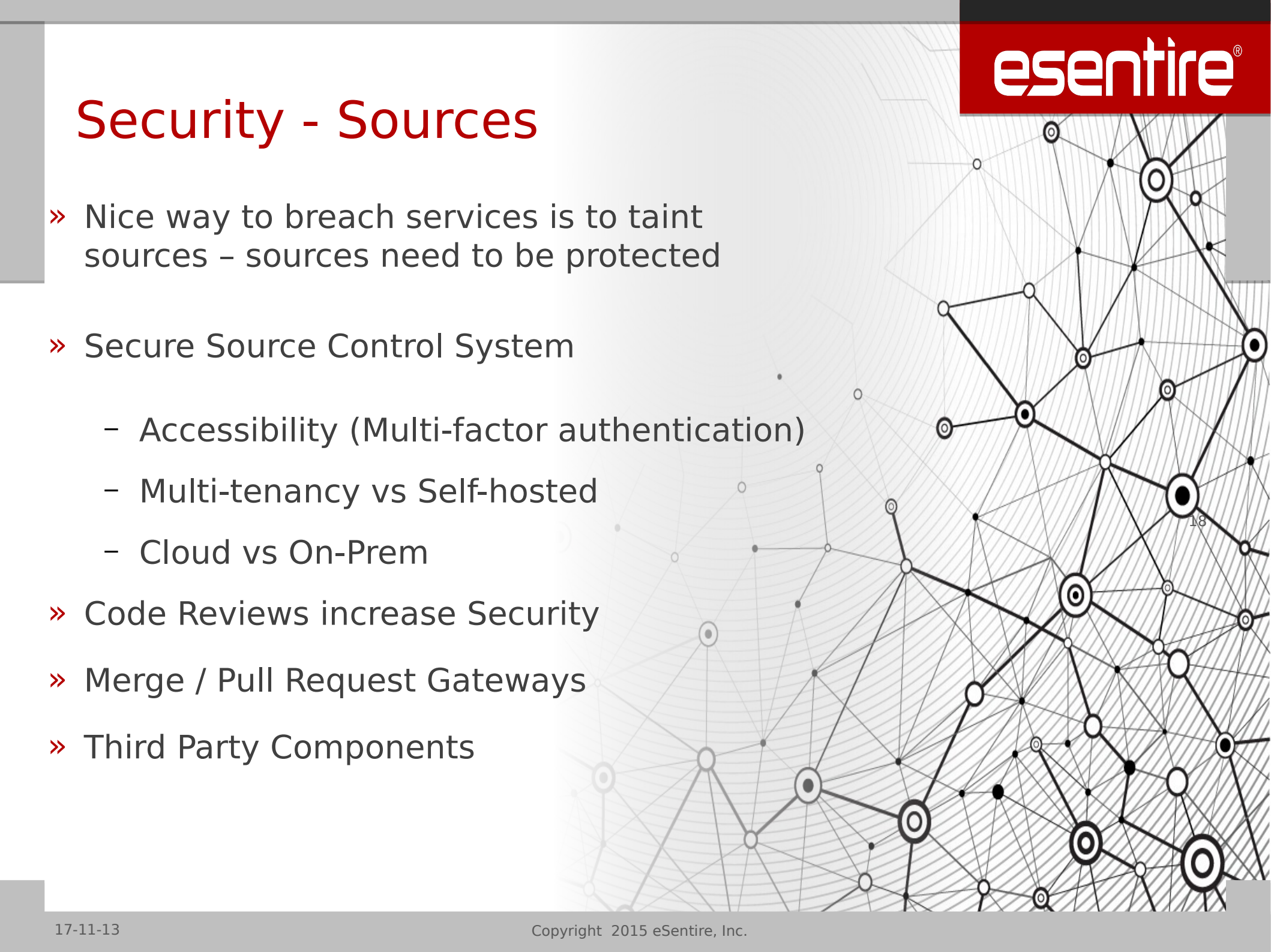


Security Posture

- Control of sources
- Control of build system
- Control of container images
- Control of Infrastructure
- Control of orchestration

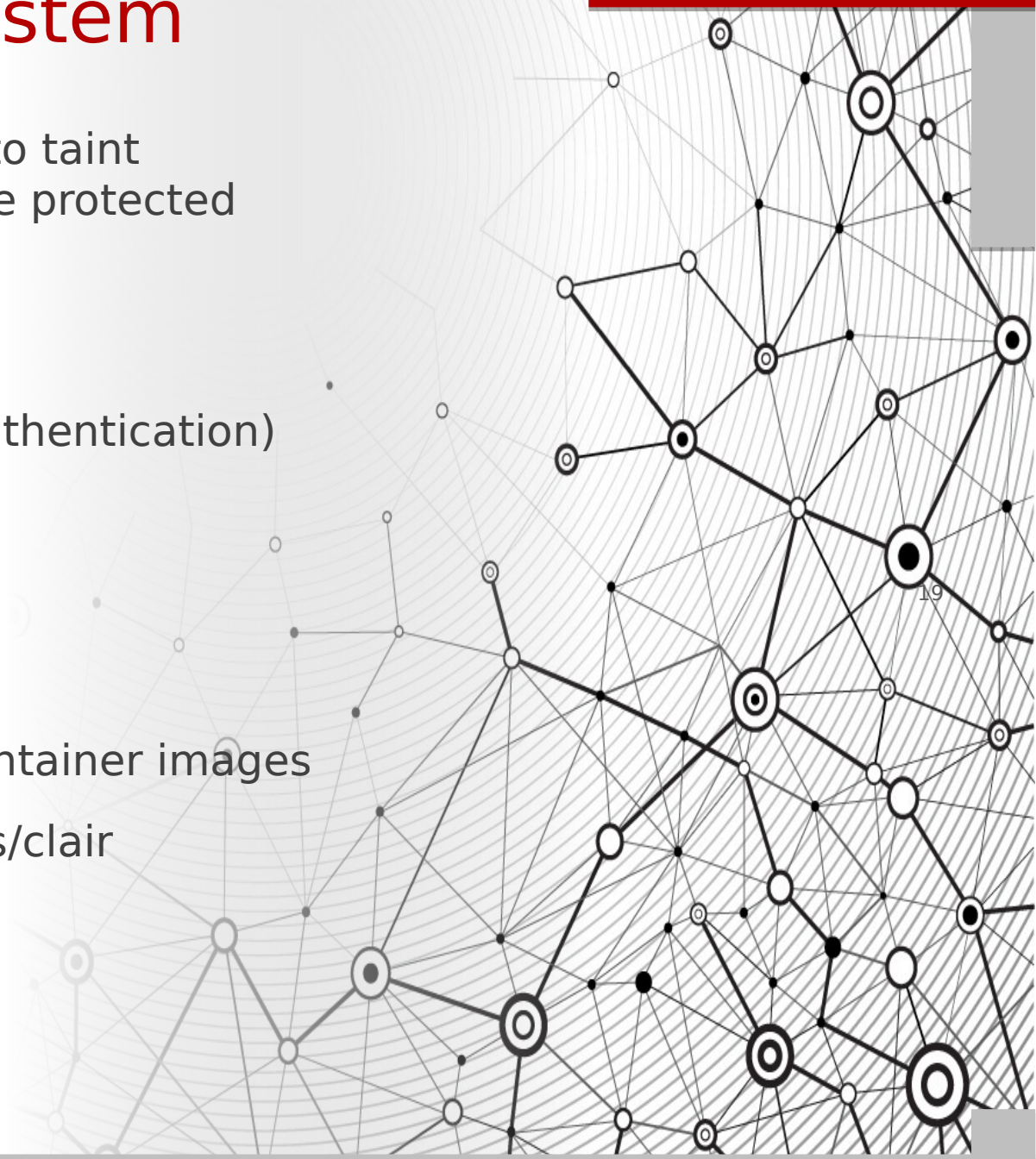
Security - Sources

- Nice way to breach services is to taint sources – sources need to be protected
- Secure Source Control System
  - Accessibility (Multi-factor authentication)
  - Multi-tenancy vs Self-hosted
  - Cloud vs On-Prem
- Code Reviews increase Security
- Merge / Pull Request Gateways
- Third Party Components



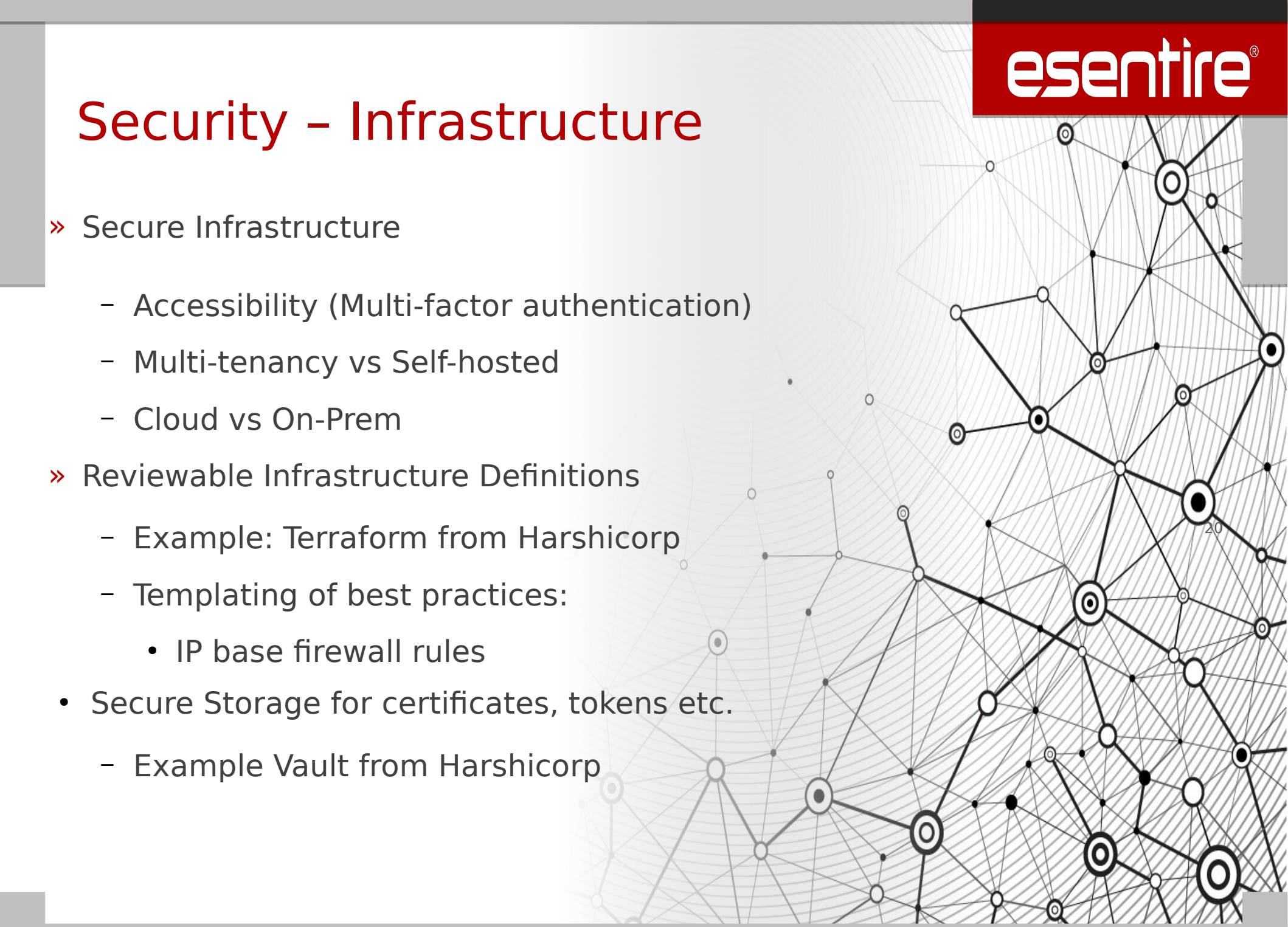
Security – Build System

- Nice way to breach services is to taint build system – build needs to be protected
- Secure Build Control System
  - Accessibility (Multi-factor authentication)
  - Multi-tenancy vs Self-hosted
  - Cloud vs On-Prem
- CVE Scanners
  - Claire allows scanning of container images
    - https://github.com/coreos/clair
- Merge / Pull Request Gateways



Security – Infrastructure

- Secure Infrastructure
  - Accessibility (Multi-factor authentication)
  - Multi-tenancy vs Self-hosted
  - Cloud vs On-Prem
- Reviewable Infrastructure Definitions
  - Example: Terraform from Harshicorp
  - Templating of best practices:
    - IP base firewall rules
- Secure Storage for certificates, tokens etc.
  - Example Vault from Harshicorp



Security – Orchestration

- Secure Orchestration
  - Accessibility (Multi-factor authentication)
  - Multi-tenancy vs Self-hosted
  - Cloud vs On-Prem
- Sandboxing can reduce vulnerabilities
  - Example: Kubernetes vs. Docker compose
  - Docker Volume Mount Vulnerability

General Security Considerations

- Generally good lock down of services (only open up what is needed)
  - ACLs
  - Containers
  - IP-based restrictions
  - No default password !!!!!!!
- Always use encrypted communication
- Public-Apis:
  - Authentication through Tokens

Authentication

- Periodic Renewal of Tokens, Certificates, Secrets
- MFA (Multi-factor authentication)

Conclusion

- Micro-services fit very well the scalable and fast-pace nature needed for security
- Sandboxing through containers can reduce exposure
- Continuous Deployment allows faster reaction after detection of vulnerabilities
- Main parts of security management:
  - Source / Build / Container Images
  - Infrastructure
  - Orchestration
  - Services
- Good security practices

Conclusion

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- Main parts of security management:
  - Source / Build / Container Images
  - Infrastructure
  - Orchestration
  - Services
- Good security practices

Recruiting

- We are always looking for smart and passionate people that want to make a difference in the security of our networks
- Talk to us !!!!