SOSE2018

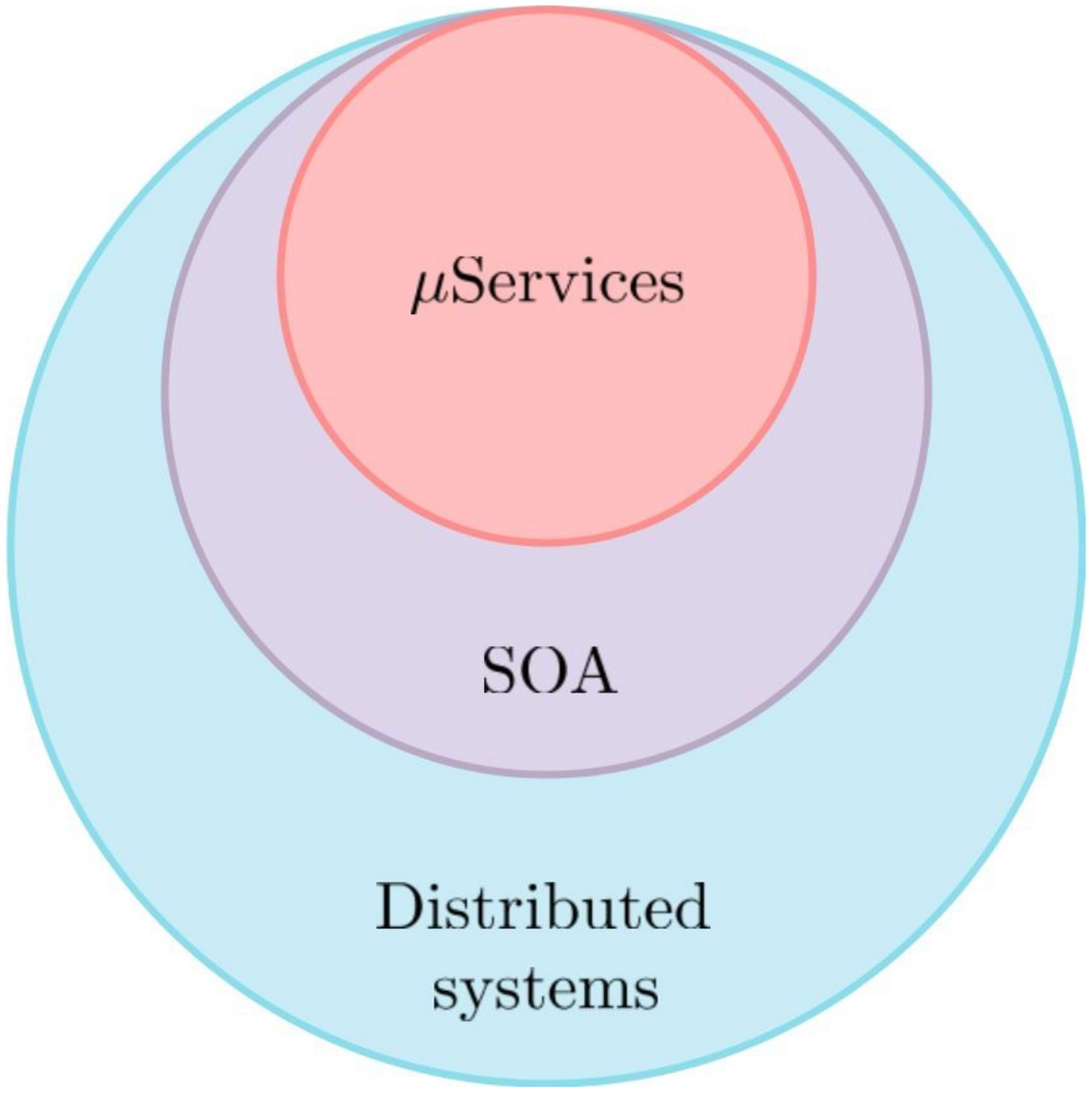
Overcoming Security Challenges in Microservice Architectures

by Tetiana Yarygina and Anya Helene Bagge

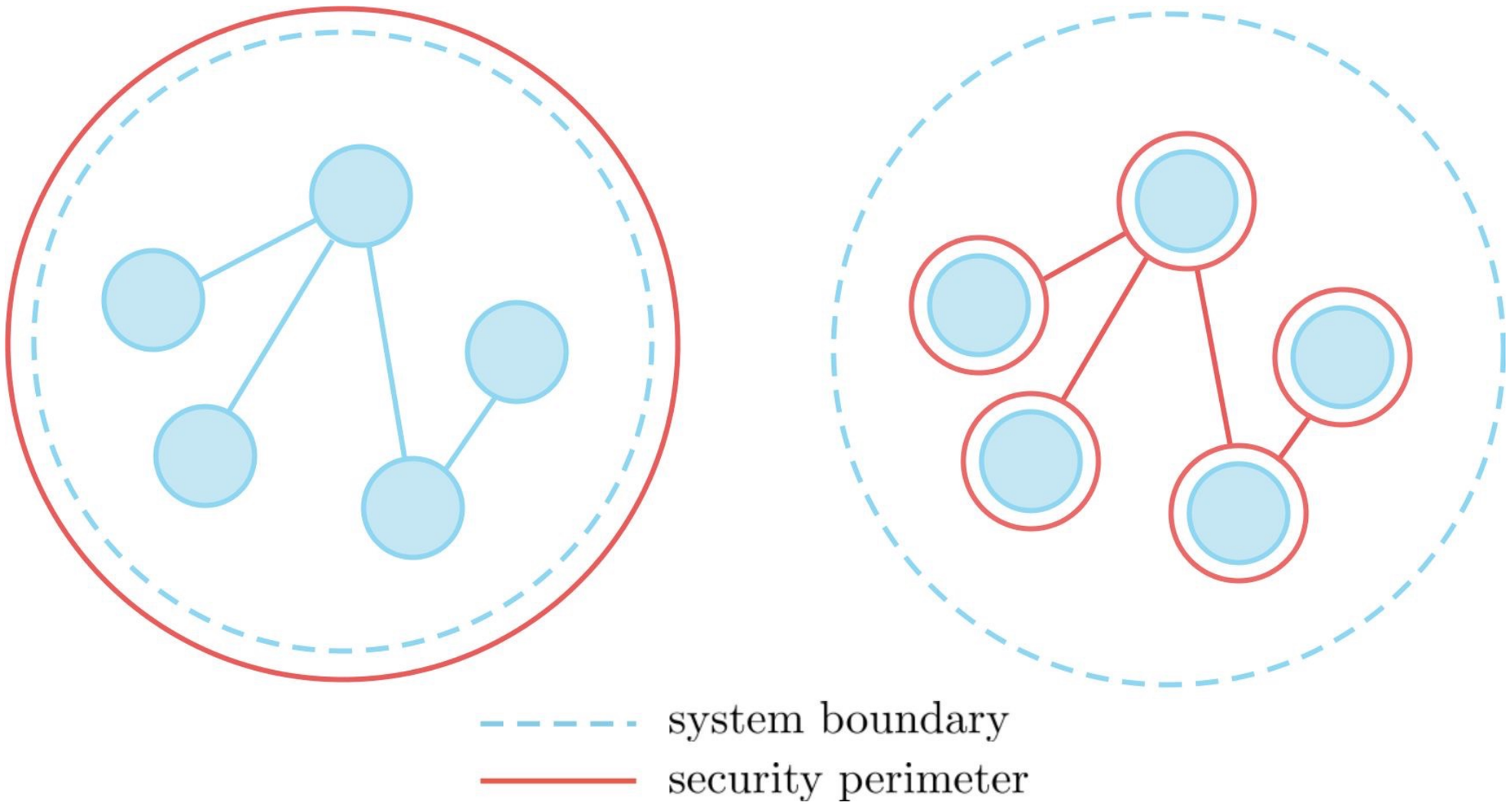
University of Bergen
Norway


single-purpose
separate-processes
circuit-breaker
coarse-grained
lightweight
scalability
stateless
virtualization
isolation
observable
decentralization
idempotent
fail-fast
SOA
style
diverse
small
discoverable
microservices
API
unikernels
REST
reusable
frequent-releases
modularity
containerization
loosely-coupled
composable
automation
independently-deployable
vendor-diverse
self-contained

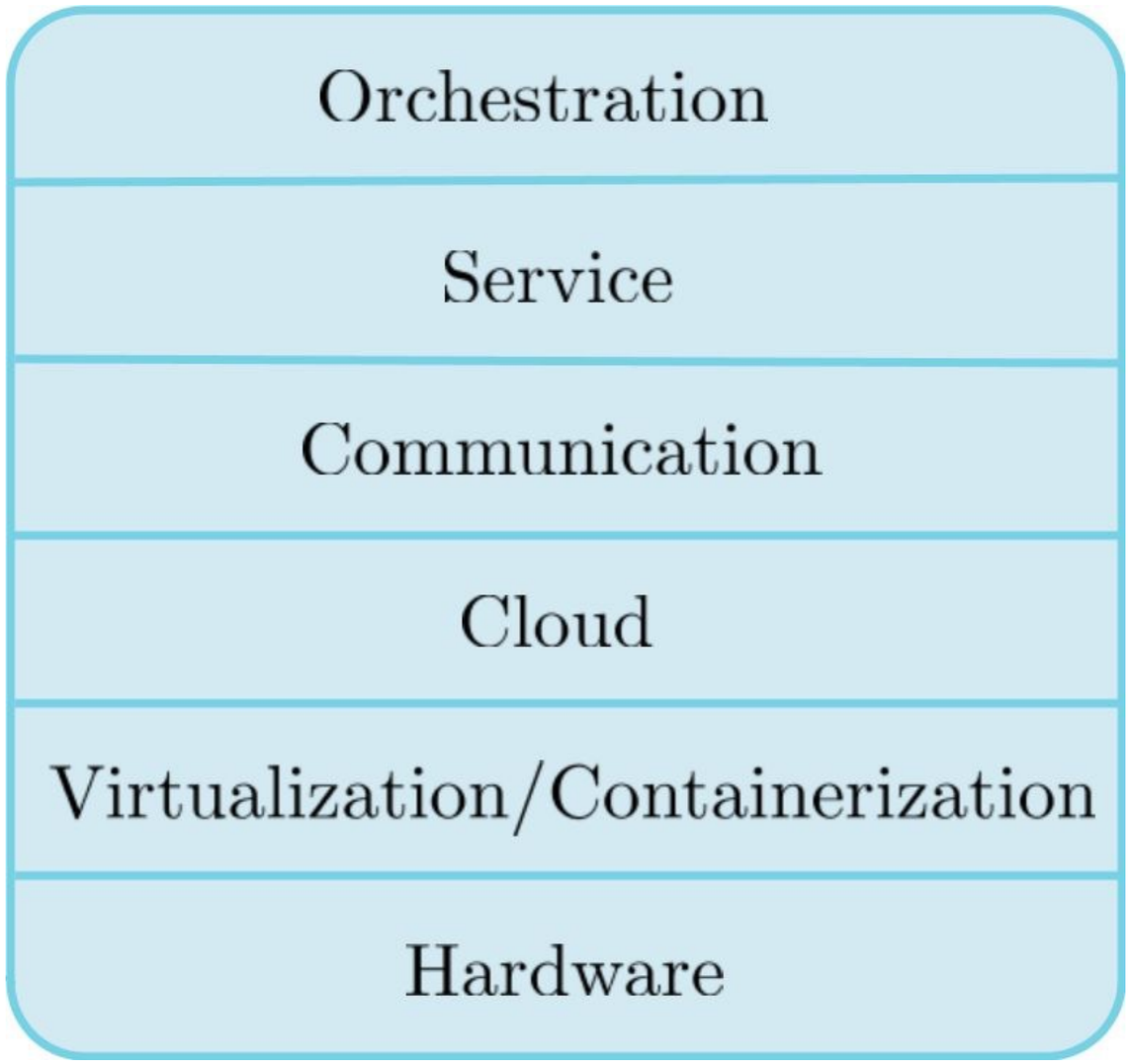
Microservice architecture in perspective



Microservices redefine the notion of perimeter security and move towards defense in depth



Taxonomy of microservice security



Security implications of microservice design

- Do one thing and do it well
- Automated, immutable deployment
- Isolation through loose coupling
- Diversity through system heterogeneity
- Fail fast

Emerging security practices

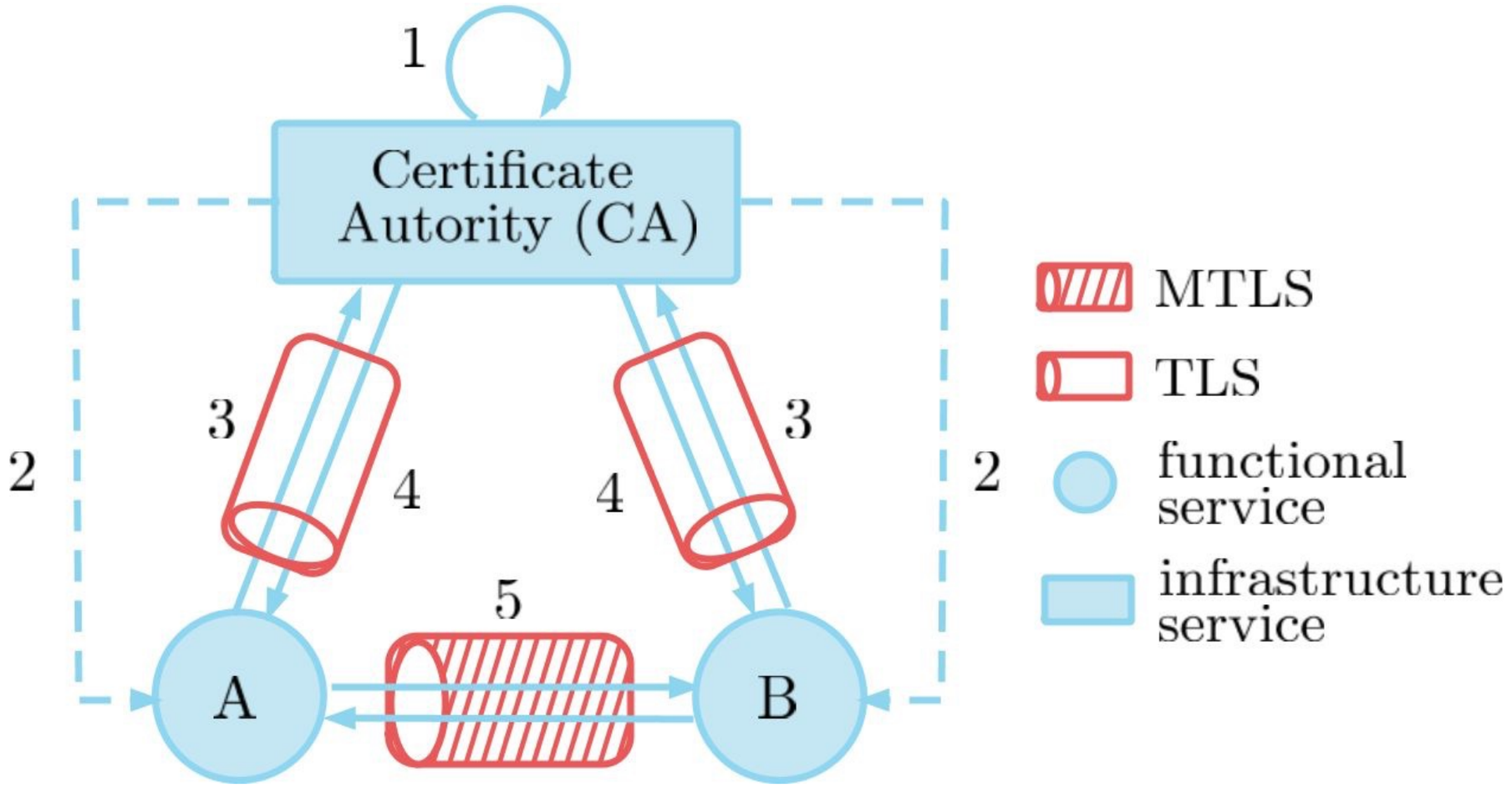
- Mutual authentication of services using MTLS (Docker Swarm and Netflix)

- Principal propagation via security tokens (OAuth and JWT for Reverse STS)

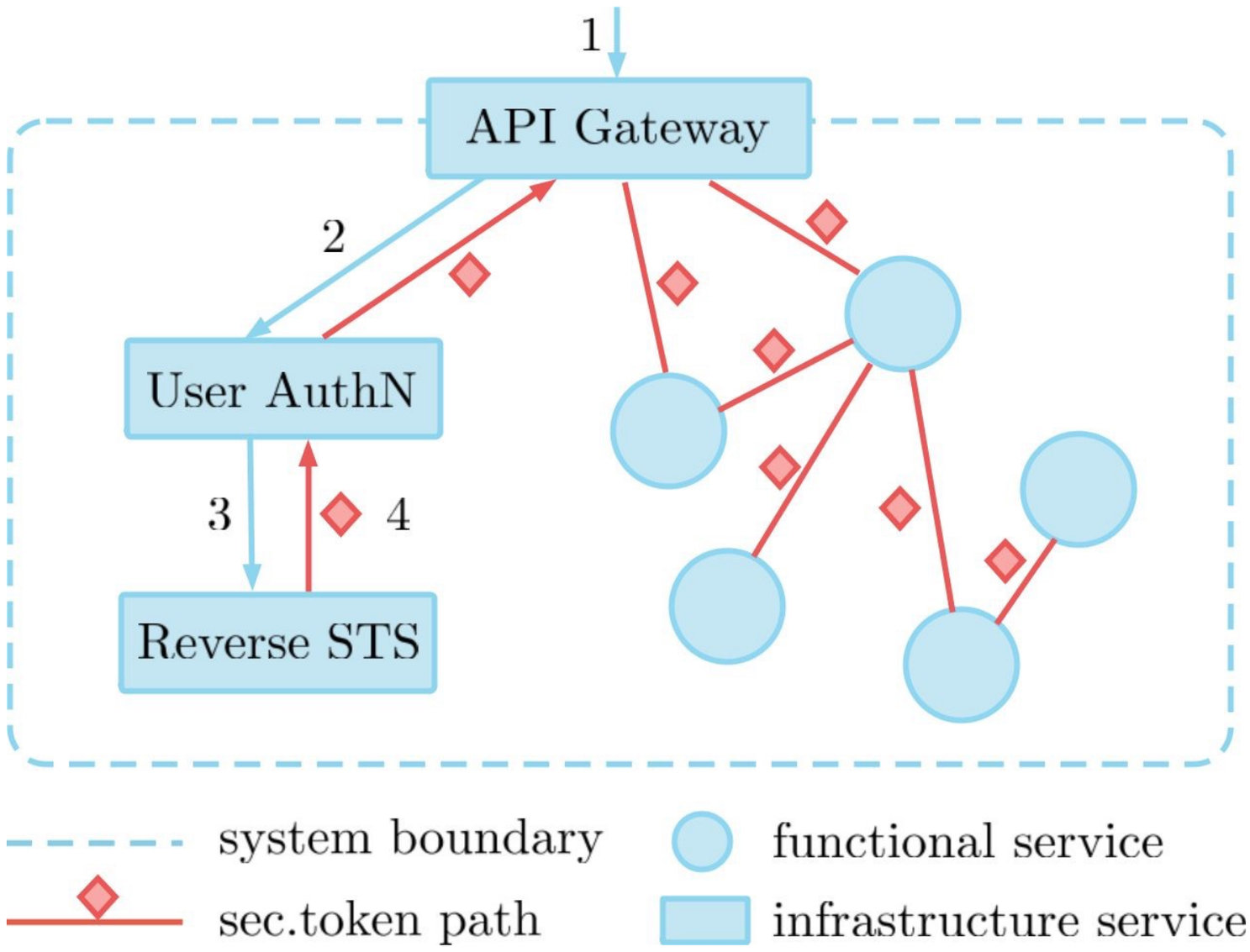
MiSSFire:
microservice security framework

- Two infrastructure services: CA and reverse STS
- A template for a regular functional service
- Technologies: Python, REST APIs, JSON, OpenSSL, JWT, Docker, web framework Flask and WSGI HTTP server Gunicorn

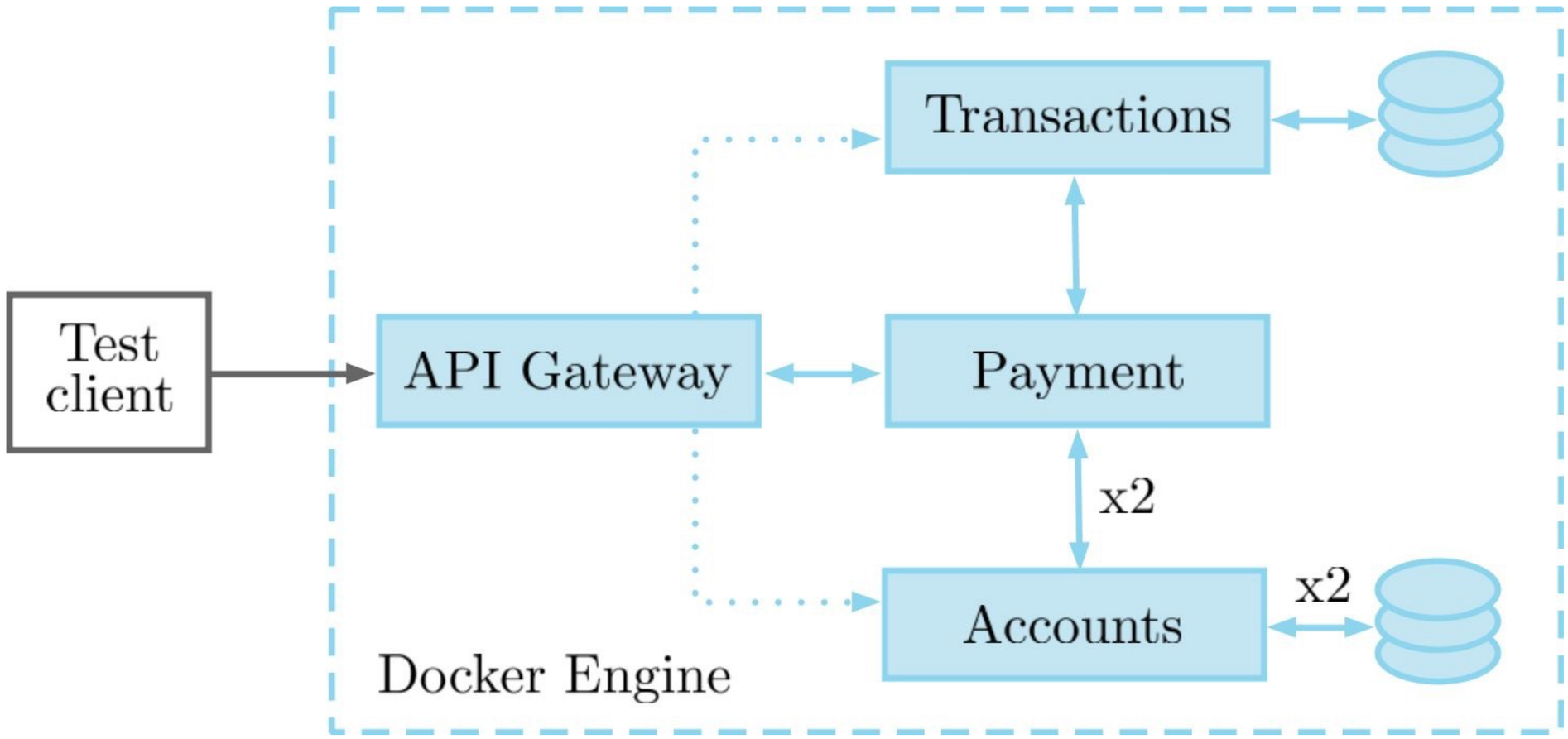
Mutual authentication of services using MTLS



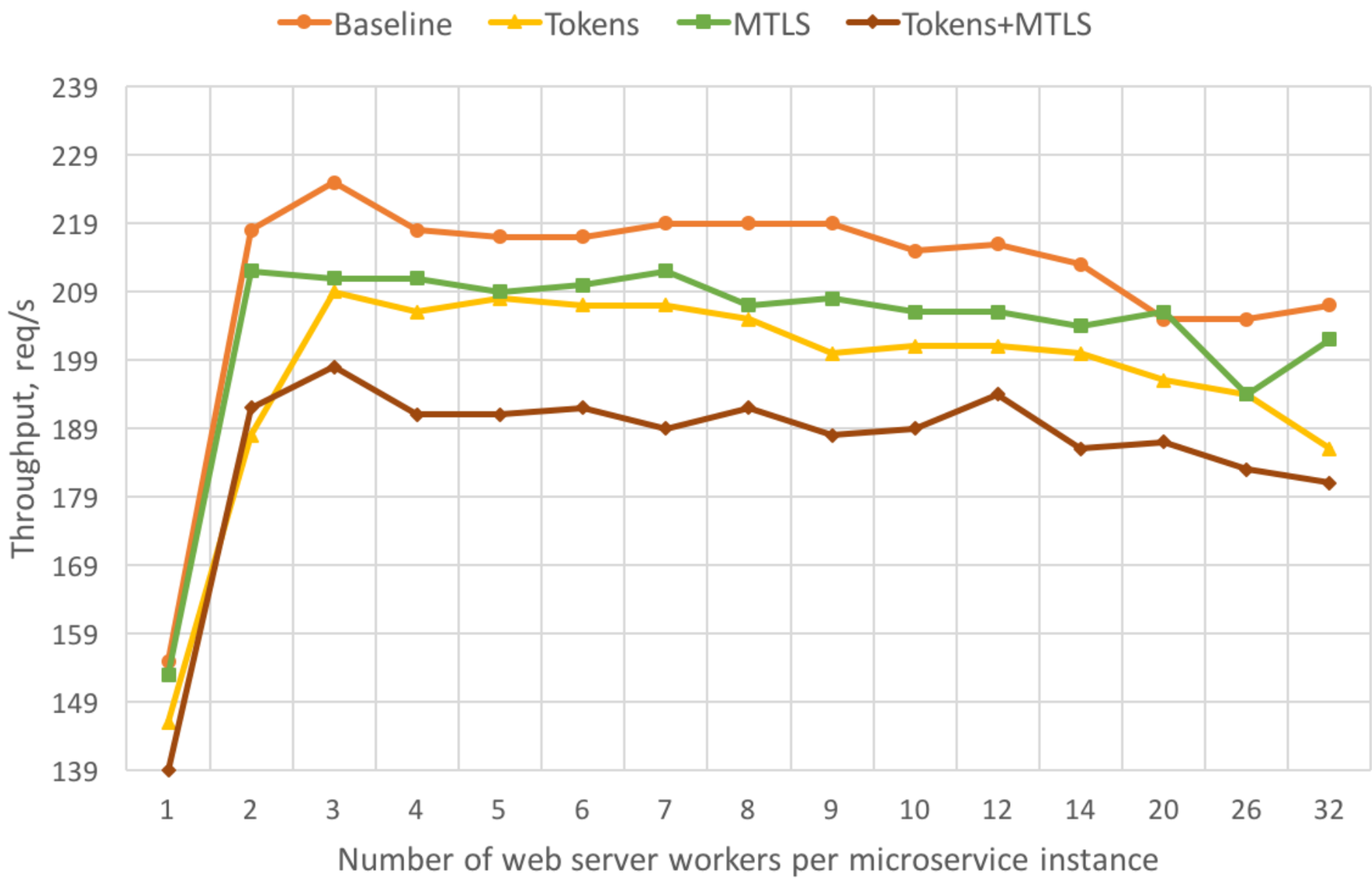
Reverse Security Token Service



MiSSFire in action: MicroBank case



Performance of the bank model under load of 50 test clients making payments



What we did

- put microservices and their security in the bigger context of SOA and distributed systems
- decomposed the notion of microservice security into smaller and more familiar components, with a formalized attack model
- analysed the security implications of microservice design
- identified several prominent microservice security trends in industry
- presented an open source prototype security framework for microservices

https://github.com/yarygina/MiSSFire

Questions?