



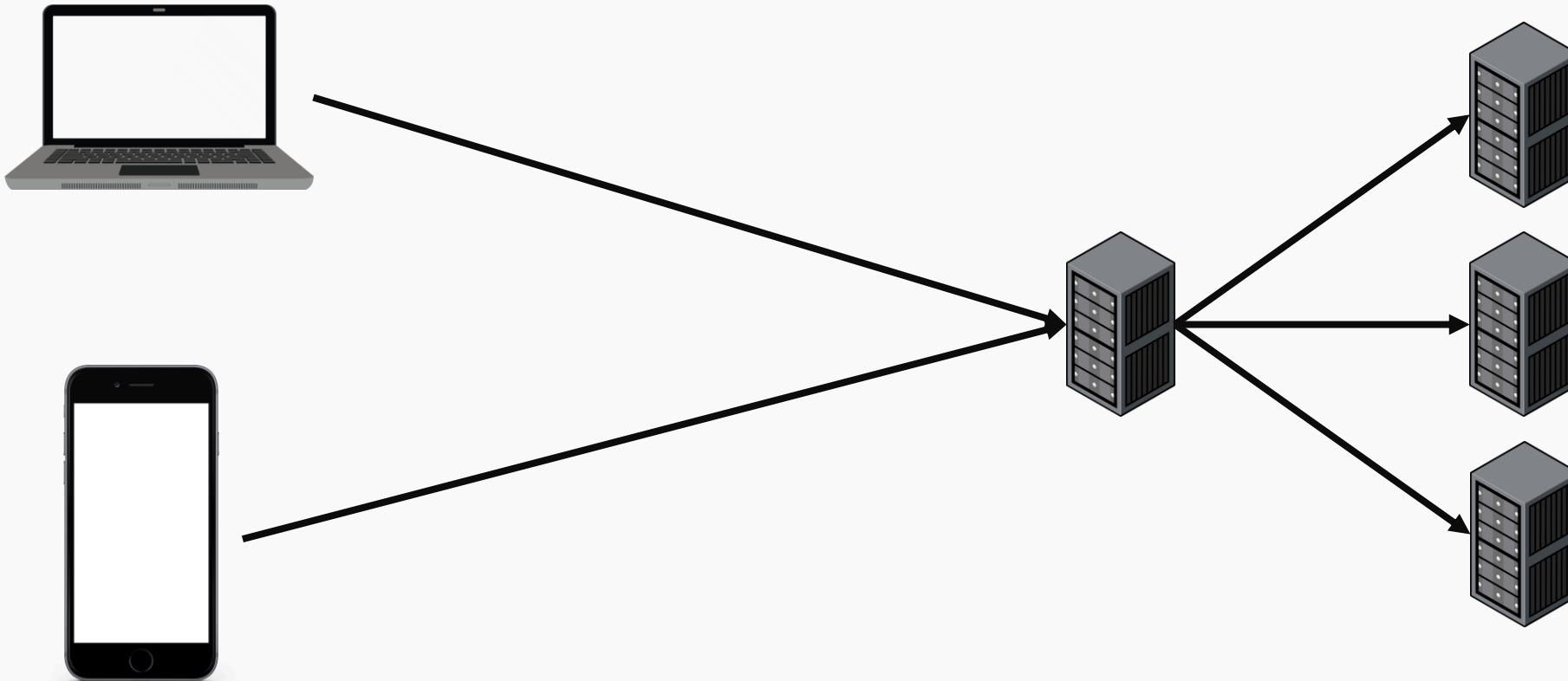
# Sisteme Tolerante la Defecte BIG Scale BIG Problems

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# Load balancer





# Load Balancer – Nivel Stivă Rețea (protocol)

- TCP/UDP
- HTTP/HTTPS
- DNS



# Load balancer - Algoritmi

- Round Robin
- Weighted Round Robin (Ratio)
- Least Connections
- Least Time
- Weighted Least Connections
- Random
- Hash
- IP Hash
- Dynamic Ratio (based on load)



# Load Balancer solutions

- Hardware
- Software: F5
- Software HTTP(S): Nginx
- Software:
  - Docker Swarm – network overlay
  - Kubernetes load balancer
- Cloud: Global Azure Load Balancer



# Cache





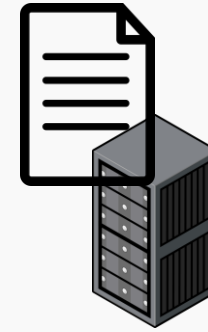
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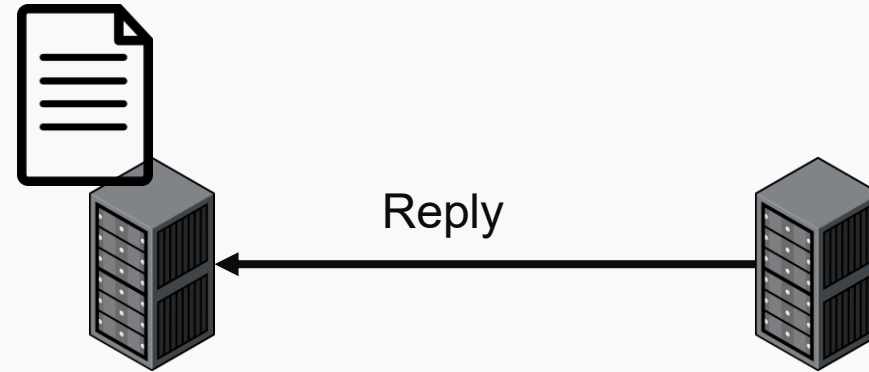


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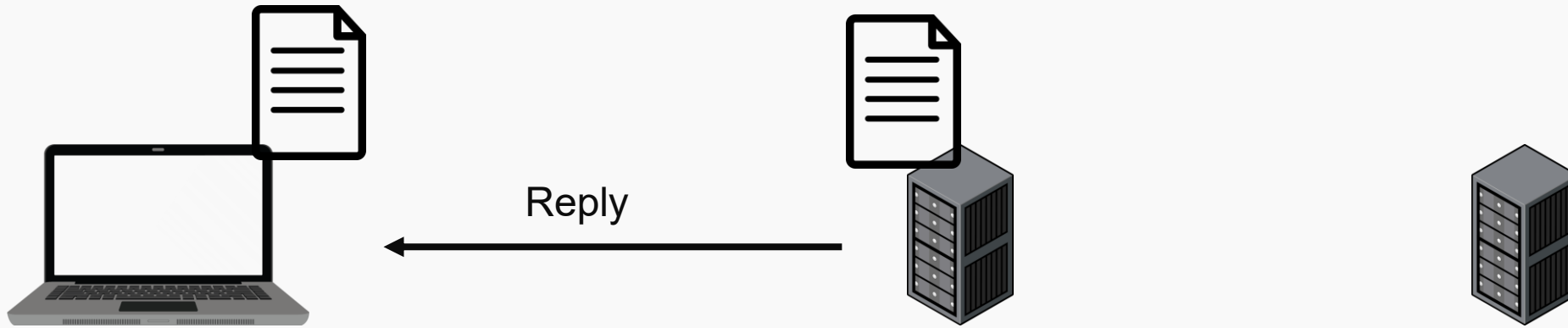


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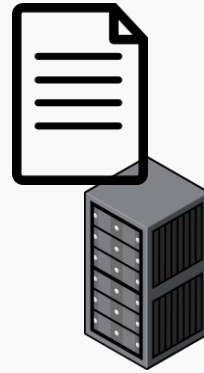
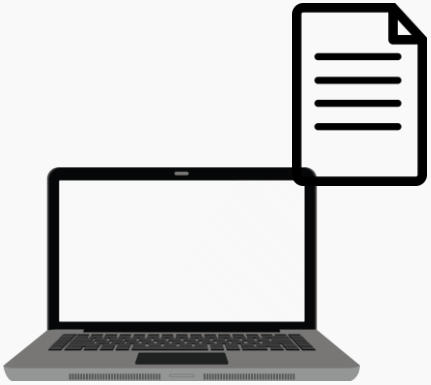


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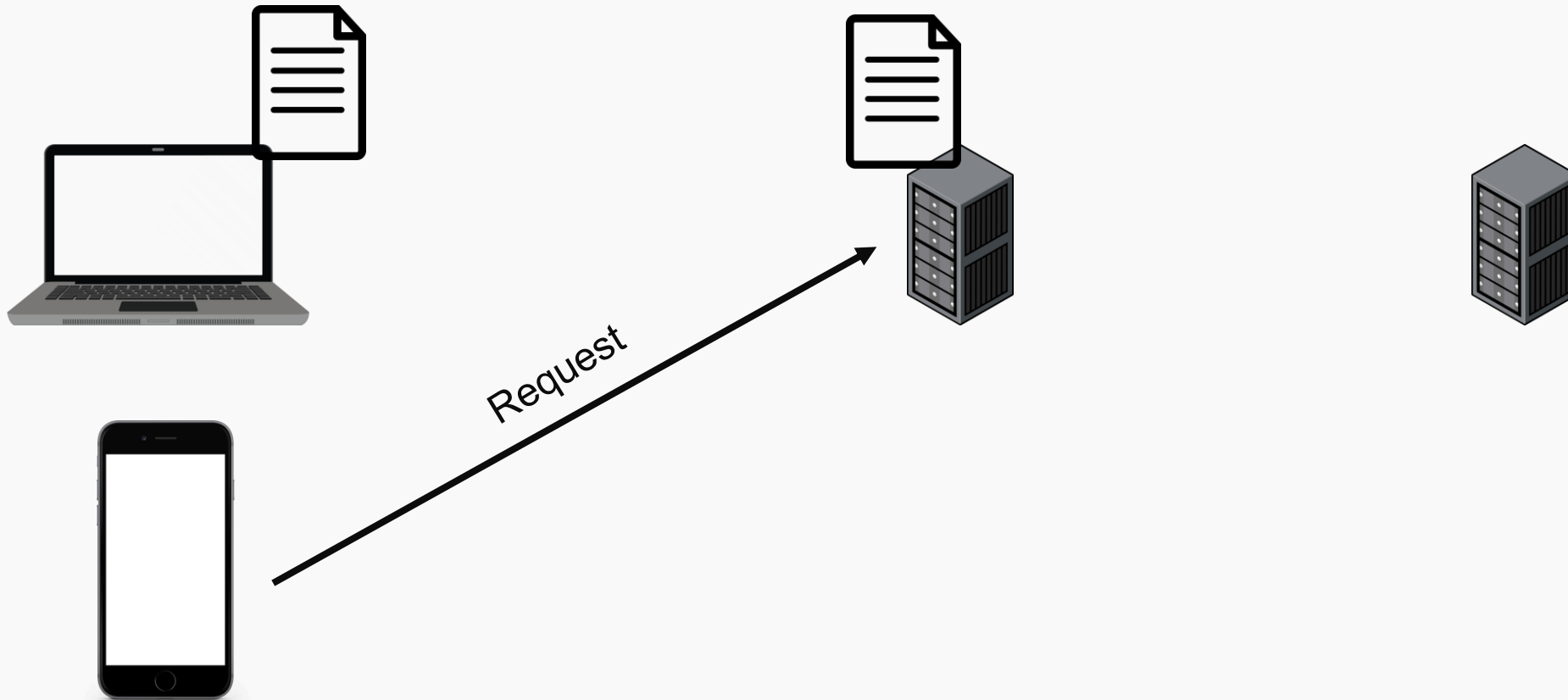


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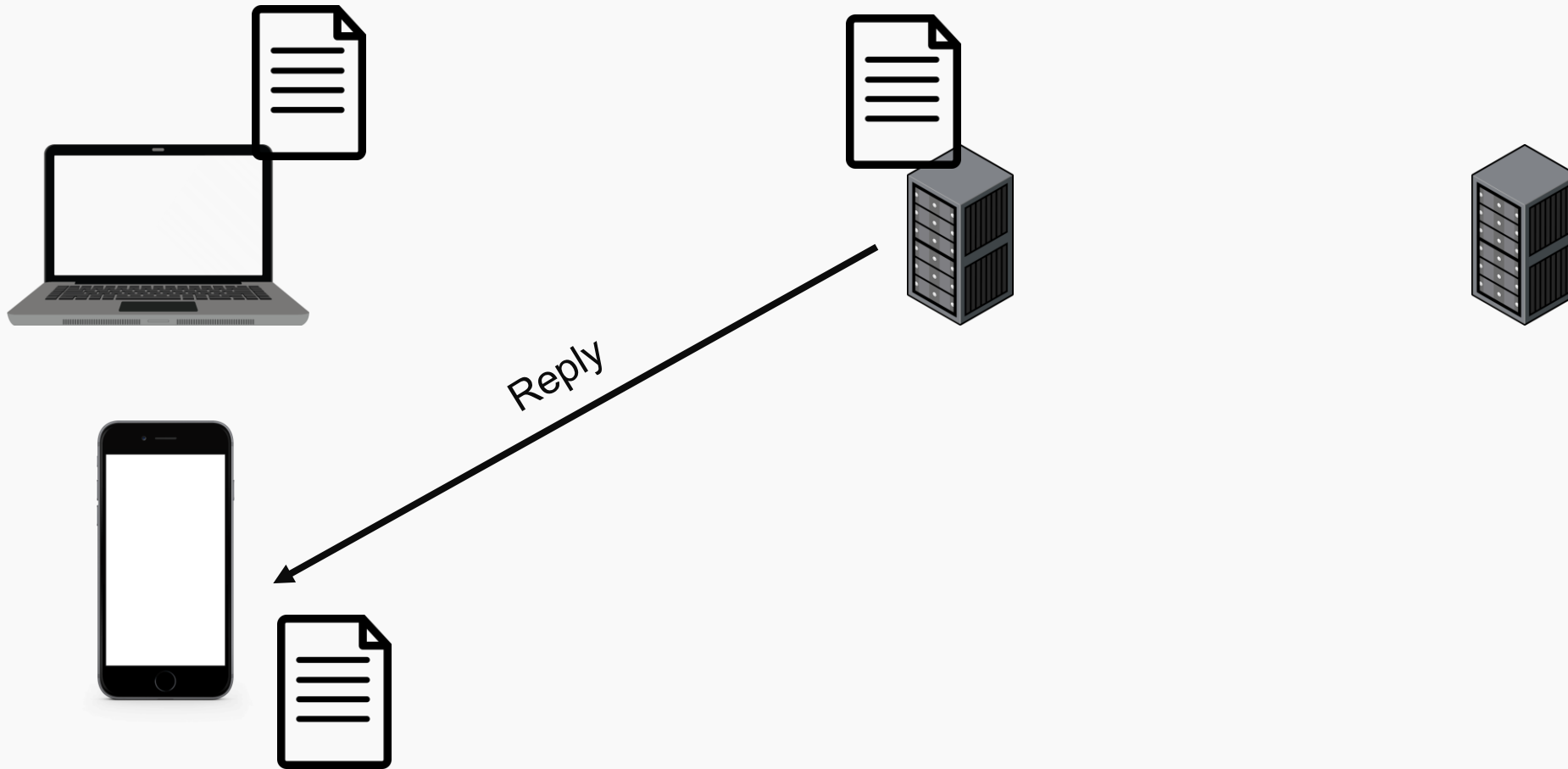


# Cache





# Cache





# Tipuri de cache

- Cache procesor
- Server de cache (activ/pasiv)
- Cache la client (în browser)
- DNS cache



# Probleme cache

- Expirare
- Spațiu limitat
- Dacă este făcut la client, acesta decide politica
  - ▣ Mulți clienți cu același bug pot crea mari probleme





# Cache replacement policies

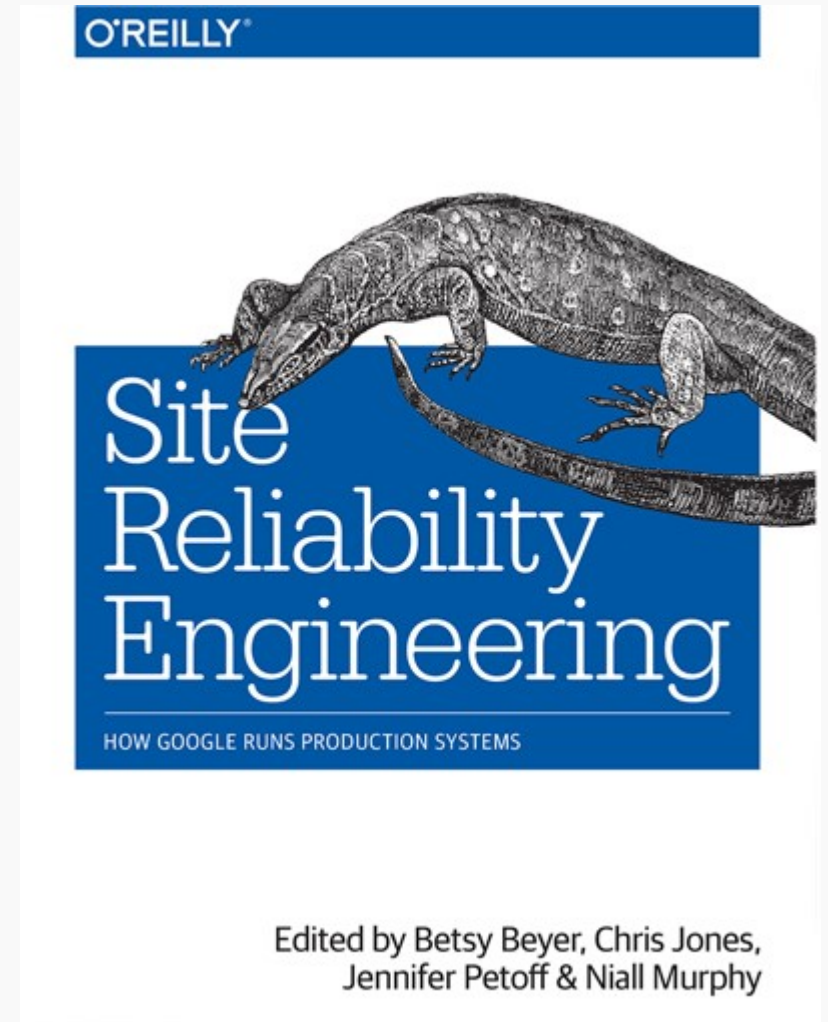
- Random
- FIFO/LIFO
- Least Recently Used/Most recently used
- Least Frequently Used
- Bélády (clairvoyant)



# Content Delivery Network



# Site Reliability Engineering





# Issues at scale

- Configuration
- Updates
- Certificates
- Software bugs
- Cascading Failures



# Traffic management

- Retry
  - ▣ Exponential backoff
  - ▣ Noise
- Throttling
- Graceful degradation instead of service failure
- Reject requests when overloaded
- Deadlines (time to live)
- Eliminate batch processes
- Counterintuitive:
  - ▣ Stop health checks
  - ▣ Change queues to stacks



# Operational patterns

## Operational patterns

### Control Systemic Failures



Bulkhead



Backpressure



Segmentation

### Assure Performance



Circuit Breaker



Quality of Service

### Deploy with Confidence



Quarantine



Canary

### Build Resilience



Fault Injection



Brownout



Blast Radius

[InfoQ talk](#)



# Proceduri

- Service Level Agreement (SLA)
  - ▣ Uptime 99.999% - five nines
  - ▣ Target și minim și maxim
- Chaos Monkey
- Postmortem – no blame
- Mean Time To Repair
  - ▣ Mean Time Between Failures
- Limitare timp on-call
  - ▣ Timp development (automatizare)



# Monitorizare

- White-box monitoring (din interiorul mașinii)
- Black-box monitoring (din exterior)
- Alerte
- Semnale
  - Latency
  - Traffic
  - Errors
  - Saturation (cât de “full” sunt sistemele)
- Colectare agregată și extensibilă pentru detalii





# Testare

- System Tests
- Integration Tests
- Unit Tests
- Sanity Checking - Smoke Tests
- Performance Tests –Stress test
- Regression Tests
- Canary Tests (faci update doar la o parte din infrastructură și autoamt rollback dacă sunt probleme)