

99,99%

Many Layers of Availability

99,999%

how to achieve so many nines in practice

1. Migrate to microservices
2. ???
3. PROFIT

Ilya Kaznacheev, PhD

Cloud-Native App Architect *Capgemini* 

Ex. **#CloudMTS**  Deutsche
Telekom 

 GDE on Google Cloud

12 years in software engineering



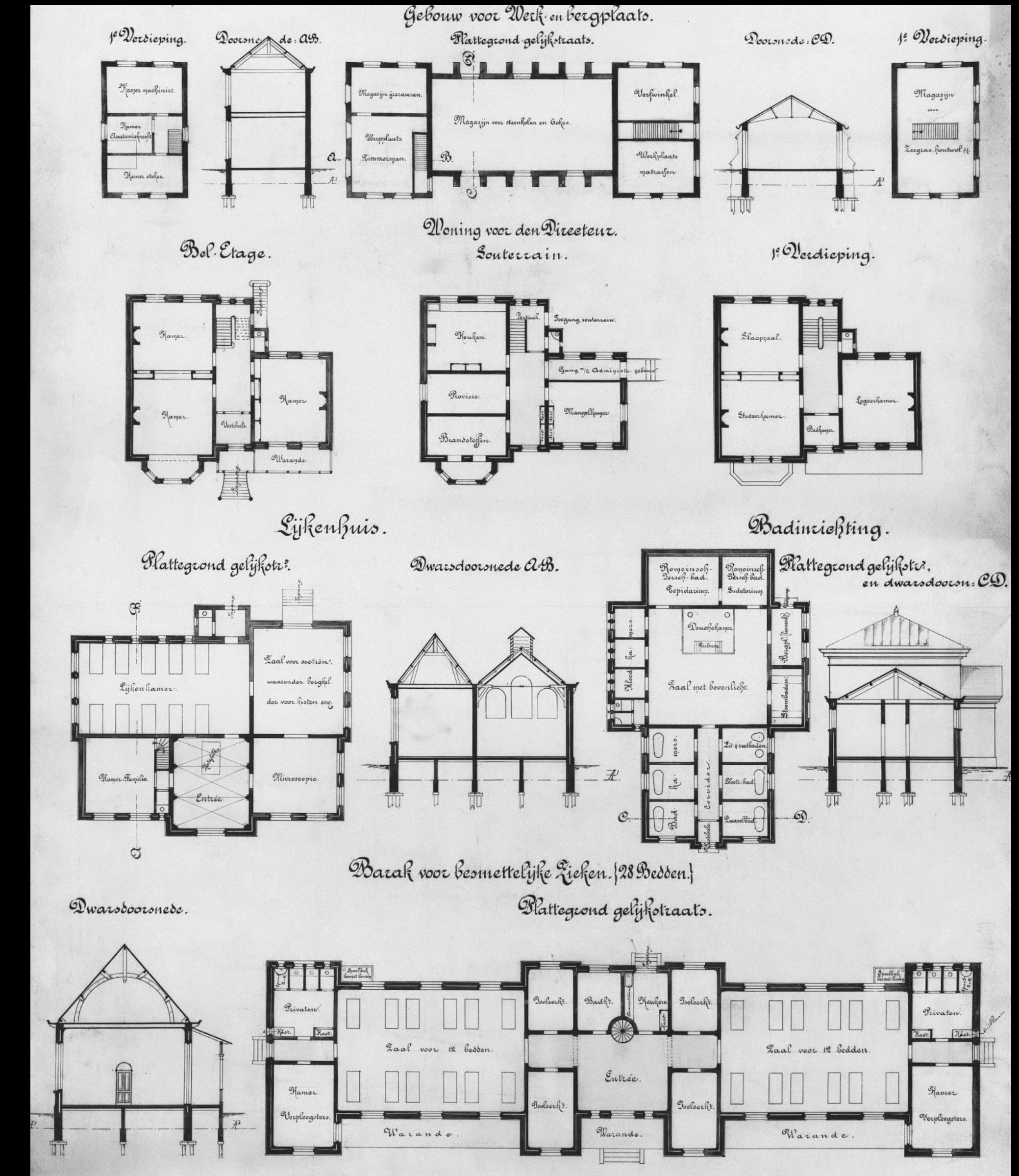
So, what about the nines?

Application level 1



Architecture

- independent modules
- avoid single point of failure



Redundancy

- component replication
- concurrent computing
- resource scaling



Load Balancing

- request distribution
- smart balancing
- dynamic scaling



Reducing Dependencies

- interaction over APIs
- eliminating implicit depd.
- consolidating features



Sync. vs Async.

- message-based
- event-based



application

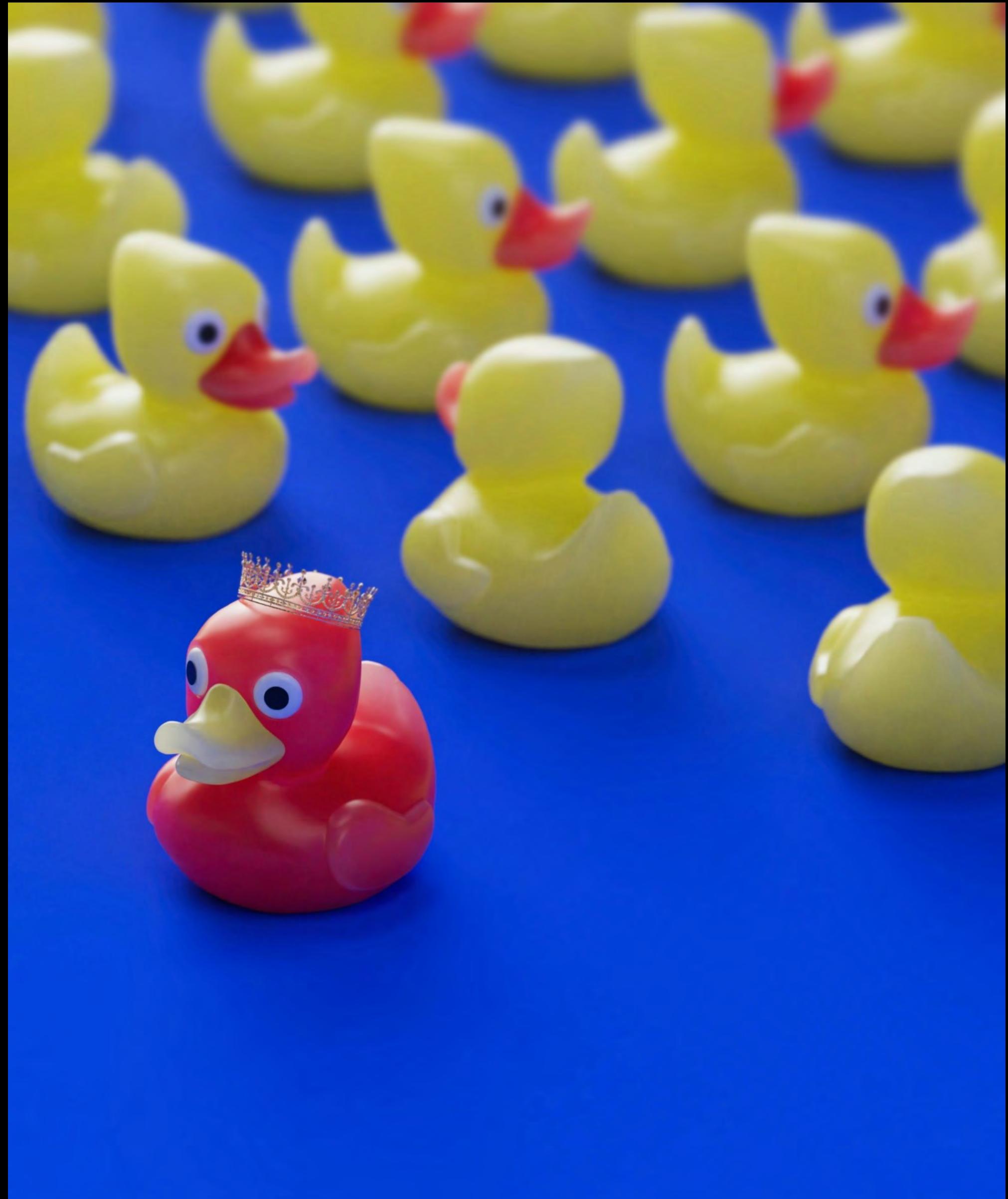
Platform

level 2



Clusters

- preventing outage
- load distribution
- network replication



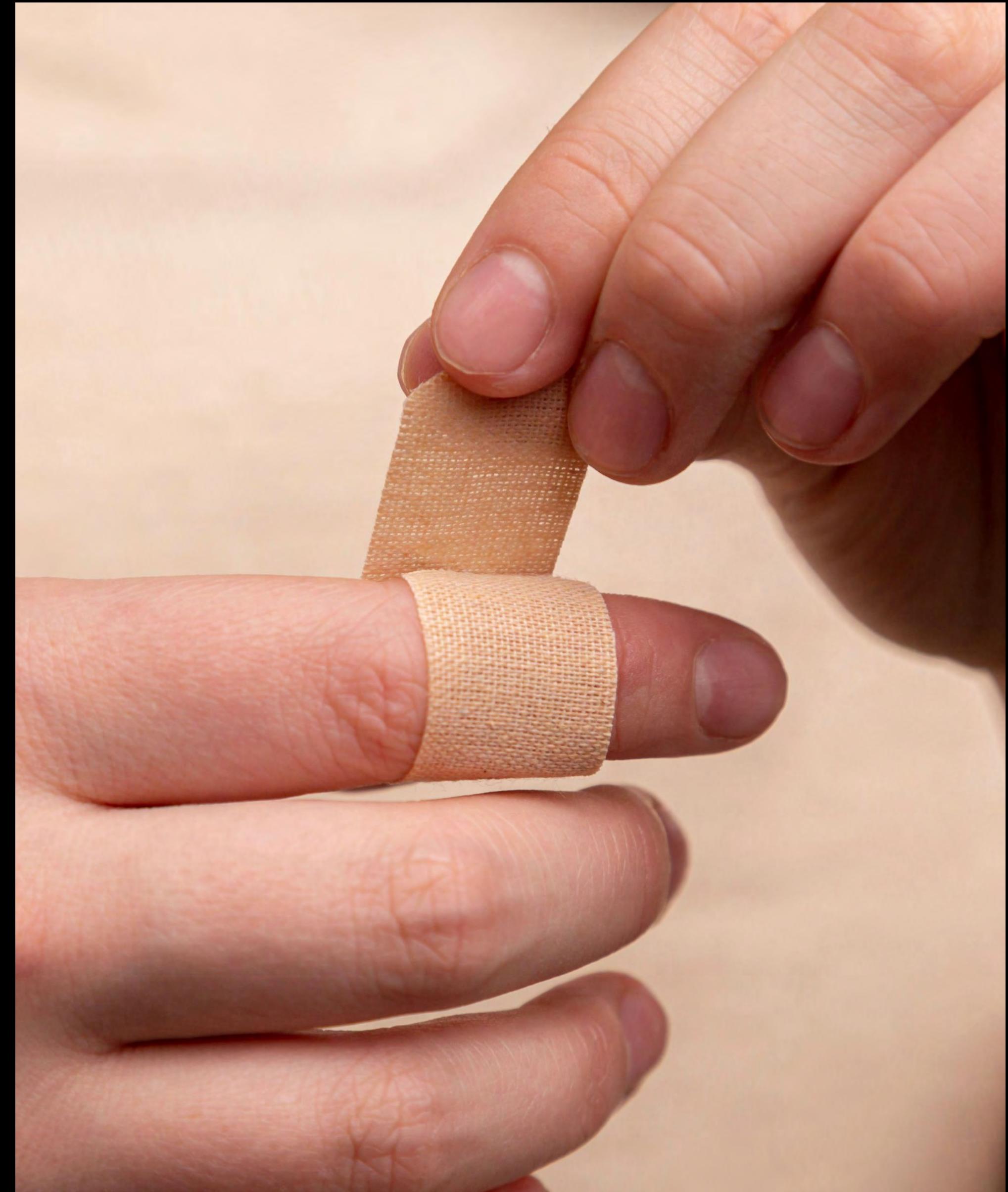
Orchestration

- lifecycle control
- autoscaling
- anti-affinity



Self-Healing

- machine replacement
- health checks (ext)
- health monitoring (int)



application

platform

Data



level 3

Redundancy

- database replicas
- msg broker replicas
- backups



Caching

- application caching
- database caching
- standalone caching
- content delivery network



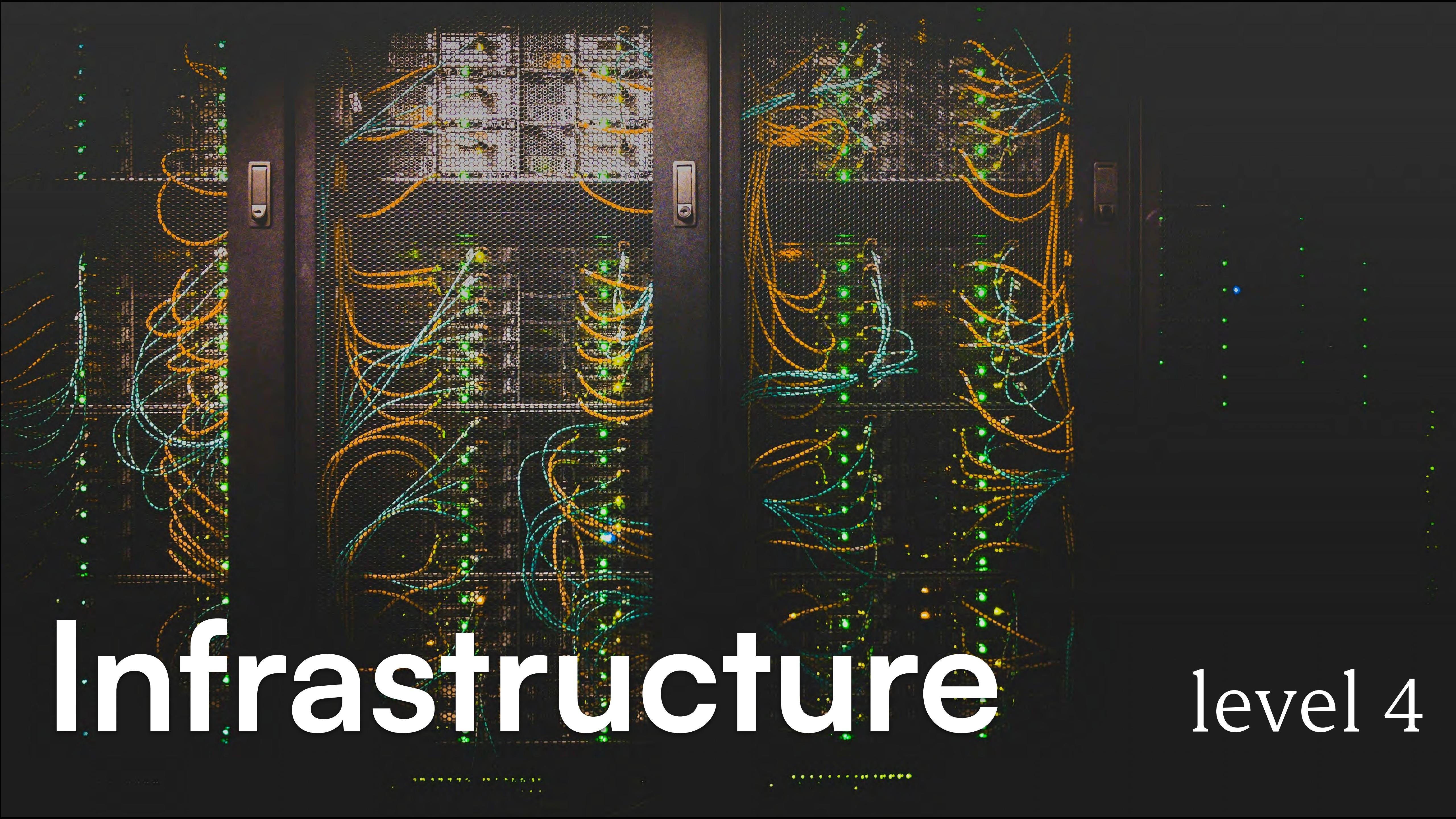
application

platform

data

Infrastructure

level 4



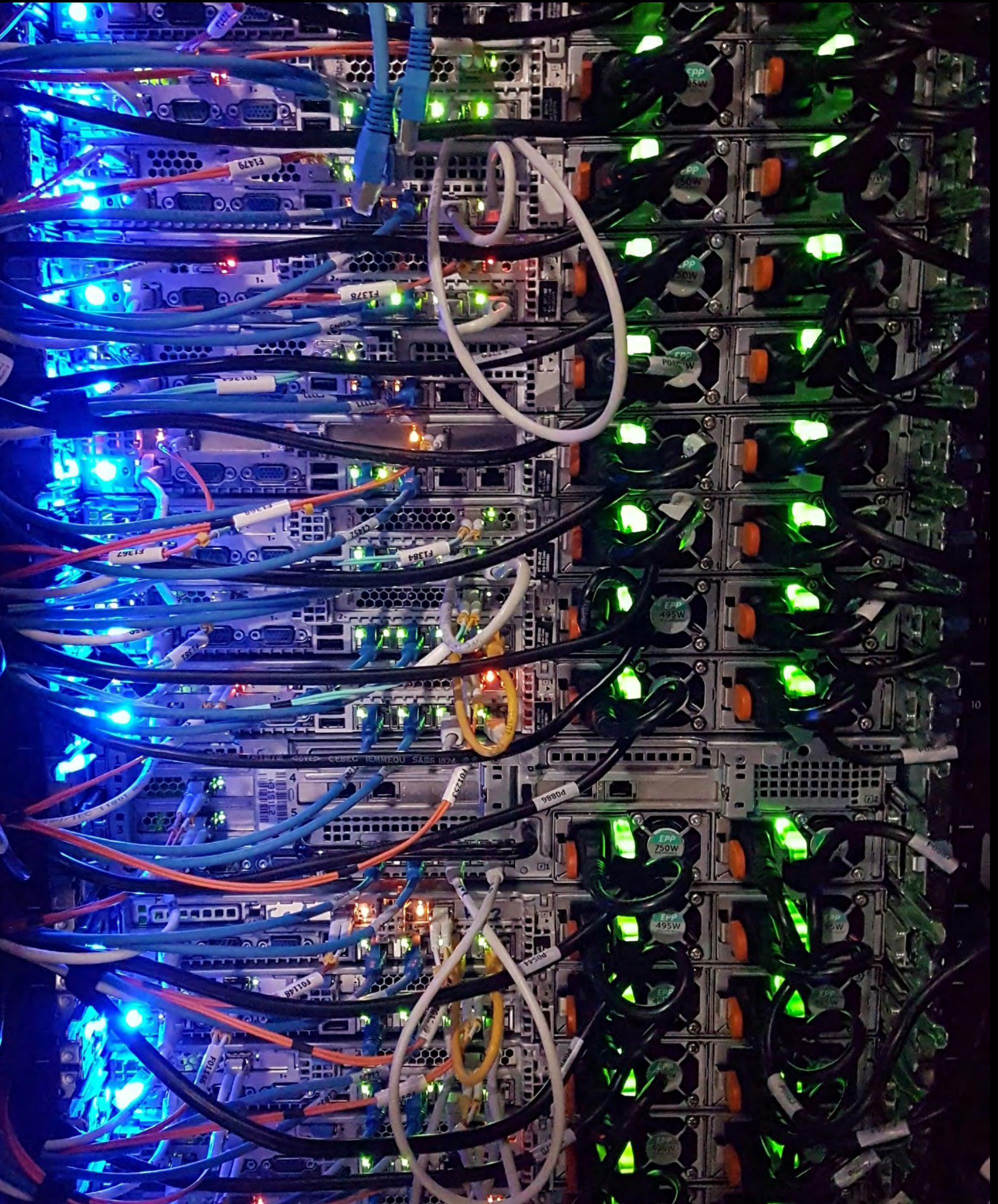
Compute

- hot migration
- instance groups



Networking

- software defined network
- load balancing



Disk

- replicated storage
- network file system



application

platform

data

infrastructure

Hardware

level 5



Hardware

- RAID
- rack distribution
- internet channel backup



application

platform

data

infrastructure

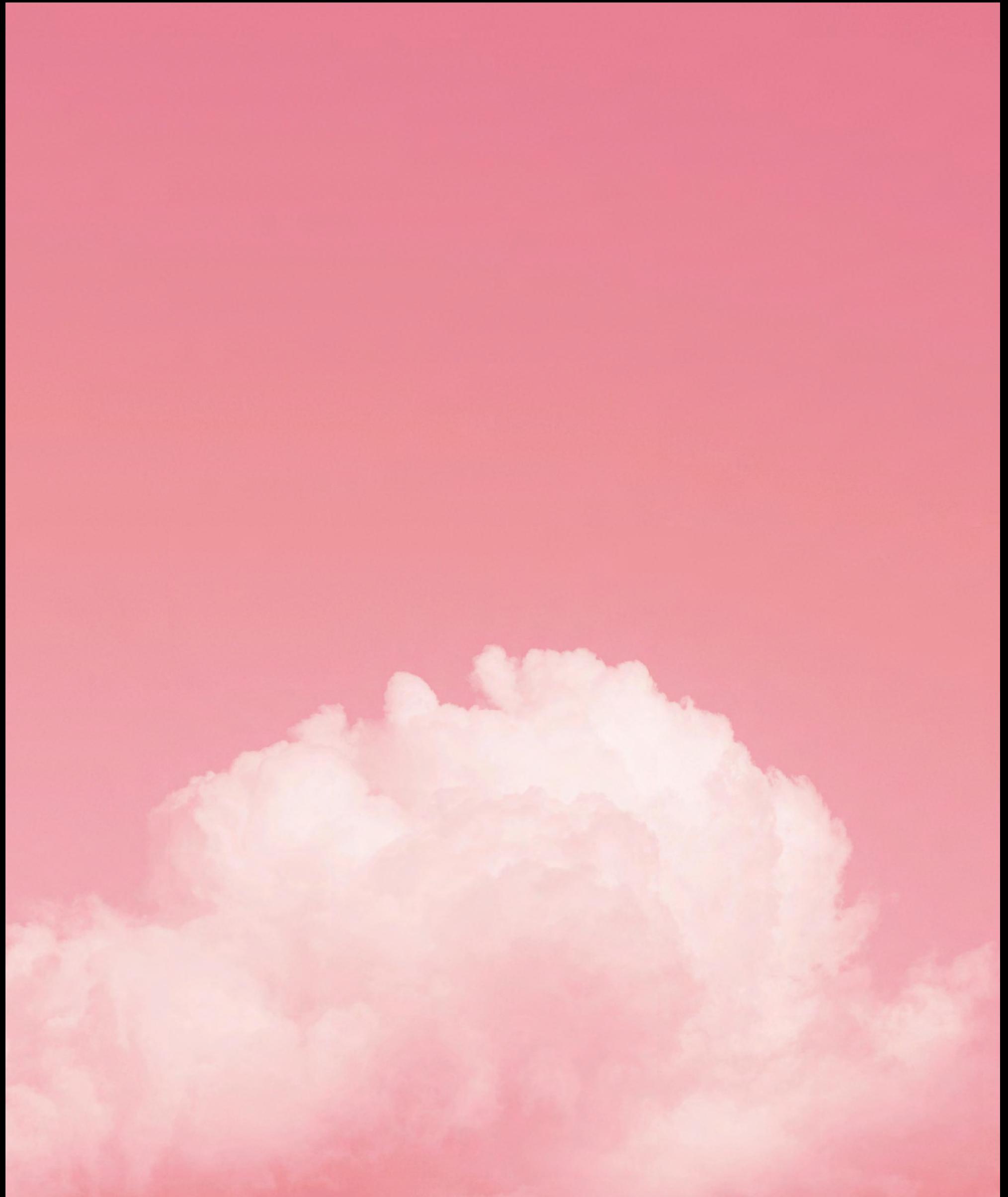
hardware

Global Availability

level 0

Cloud and DC

- multi DC disaster recovery
- cloud multizone regions



Global Server Load Balancing

- BGP Anycast
- multiregion load balancing



global availability

application

platform

data

infrastructure

hardware

Summing Up

- availability is made up of many levels
- each level must cooperate with other levels
- need to consider all levels
when developing HA systems







Thank You!