Take Home Messages
IO Systems

- difference & relation of **bandwidth** and **IOPS** (IO Operations Per Second)

  - they are computed with **realtime measurements**

- **dd, strace & time** are simple tools helping to investigate IO bottlenecks

- understanding **IO bound** & **CPU bound** applications

  - impact of latency on CPU bound applications (they become IO bound)

Take Home Messages
Redundancy Algorithms

- Definition of Parity = XOR operation

- **Parity** allows to identify **data corruption**

  - parity alone does not locate corrupted data - you need checksumming

- Evolution **RAID** (scale-up) to **RAIN** (scale-out) system (disk redundancy => disk+node redundancy) => similar evolution as monolithic application towards micro service architecture

  - **RAIN** technology is built on top of your network!

Take Home Messages
Cloud Storage

- Cloud storage **locates objects** using a distributed hash table **DHT**

- Cloud storage uses the concept of a **bucket** to provide a fast/scalable listing (index)

- Cloud storage uses replication or erasure encoding to provide data high-availability

- Cloud storage uses **DHTs** based on the **consistent hashing principle** to minimise data movements when servers are added or removed