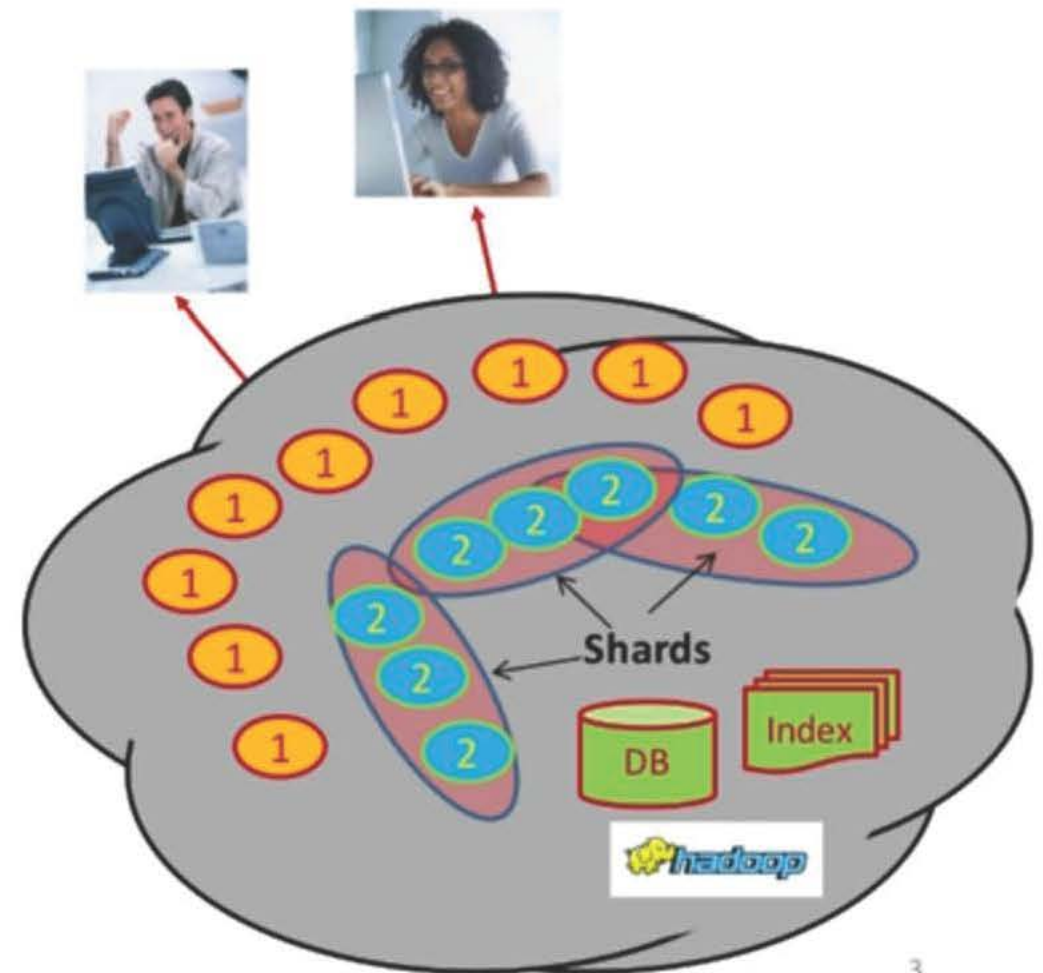# IoT: Cloud Services

Cloud Edge Services

IoT Apps talking to Cloud

- The modern cloud is comprised by a number of services called micro-services

  - many times in a multi-tiered architecture

- Client devices (IoT sensors, smartphones, etc) talk to the Edge of the Cloud

  - The **edge services** are simple, lightweight, and nimble

Shards

Index

DB

hadoop

3

IoT Cloud Edge

- Cloud services for IoT must provide per-device authentication and access control.

- Cloud Edge must route messages to a microservice endpoint based on message properties.

    - We will talk later about micro services and IoT messages.

    - Routing rules give the flexibility to send messages where they need to go without the need to stand up additional services to process messages or to write additional code.

Edge services

- Near the edge of the cloud focus is on serving a vast number of clients in the fastest possible way
  - Caching content at different layers helps
  - Stateless

- Inside we find high volume services that operate in a pipelined manner, asynchronously

- Deep inside the cloud we see a world of virtual computer clusters that are scheduled to share resources and on which applications like MapReduce/Hadoop/Spark are very popular
  - Applications: A/B testing

- In the bottom of the Cloud is where the data are being stored

IoT Systems and Edge Services

- An IoT ecosystem is a complex array of intertwined systems that work together to seamlessly provide to the customers a great experience.

- The Cloud APIs is the front door to that system

  - Needs to support thousands of different devices

  - Handle multiple thousands of requests per second during peak hours.

Cloud Edge evolution

- The Cloud API is the way the IoT services interact with the cloud. Hence background upgrades/updates should not affect the communication.

- This can be achieved with a common well-defined and extensible Cloud API

- A robust edge service must enable

  - rapid development

  - great flexibility

  - expansive insights

  - resiliency

Cloud Edge Features to support IoT

- Authentication

- Insights

- Stress Testing

- Canary Testing

- Dynamic Routing

- Load Shedding

- Security

- Static Response handling

- Multi-Region Resiliency

Cloud Edge Insights

- A service that allows us to shed and prioritize traffic when issues occur.

- Detailed information into network performance and errors, as well as handles software load balancing for even load distribution.

- Fine-grained metrics in real-time so that we can quickly observe and react to problems.

- Dynamically change properties

IoT: Cloud Services

IoT pushing the limits of SOA to microservices

IoT and Microservices

- IoT is gaining a lot of attention and the Cloud platform has more requirements.

- Big Data became commonplace and the world started moving towards the API economy.
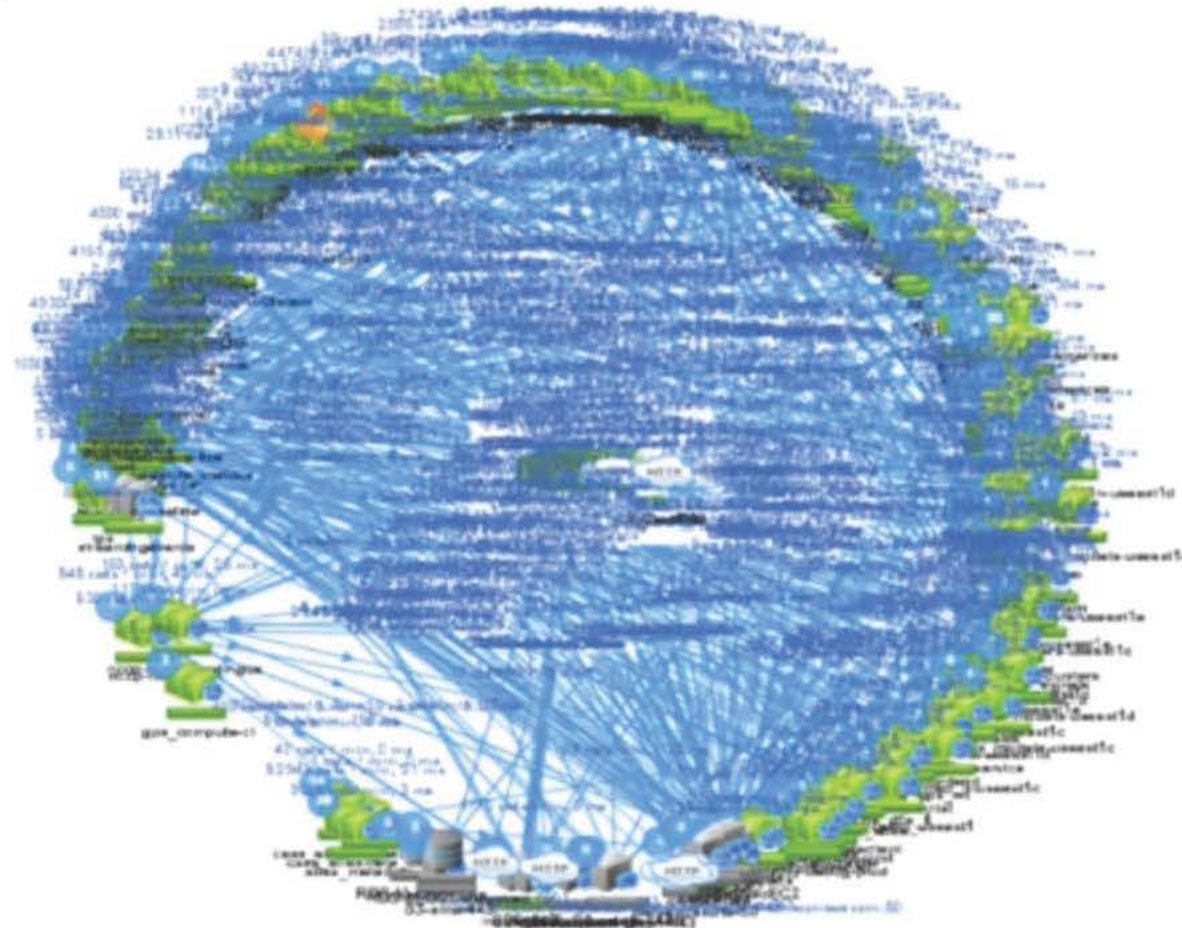
Classic SOA

- This is where the Classic SOA started showing problems.

  - too complicated, with hundreds of interfaces and impossible to define granularity.

- The Microservices architecture adds agility to SOA and brings the much needed speed and efficiency when it comes to deployment and modification of systems.

- Microservices can define the size of a service and the manner in which they talk to other services.

- Microservice architecture brings in smaller services and lightweight protocols.

- The principle of the Microservices architecture is akin to the Unix principle "Do one thing and do it well".

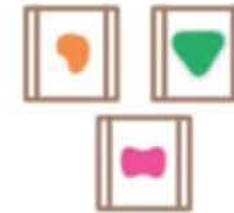# Microservice style vs Monolyth

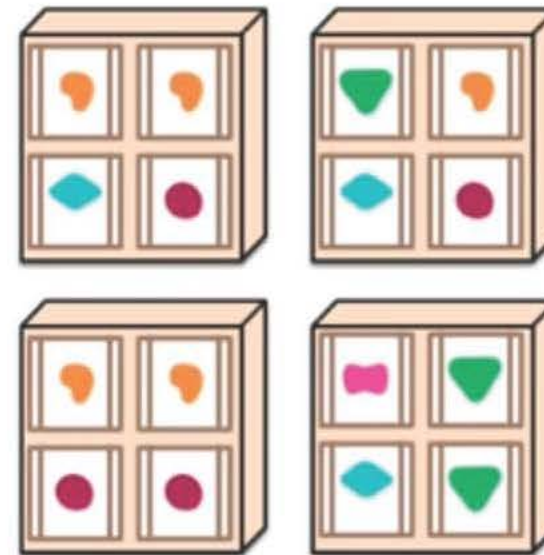A monolithic application puts all its functionality into a single process...

... and scales by replicating the monolith on multiple servers
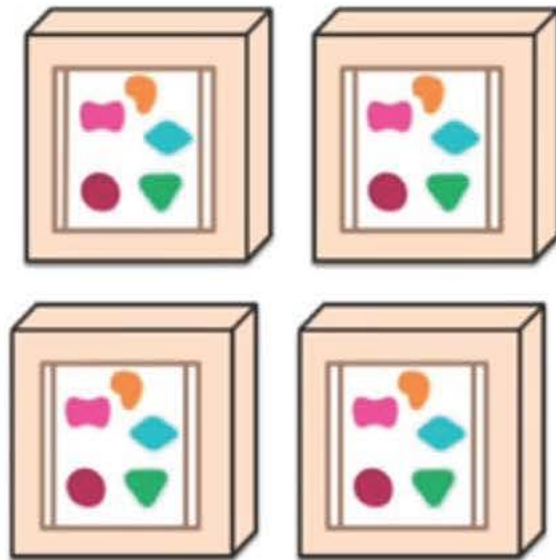
A microservices architecture puts each element of functionality into a separate service...

... and scales by distributing these services across servers, replicating as needed.
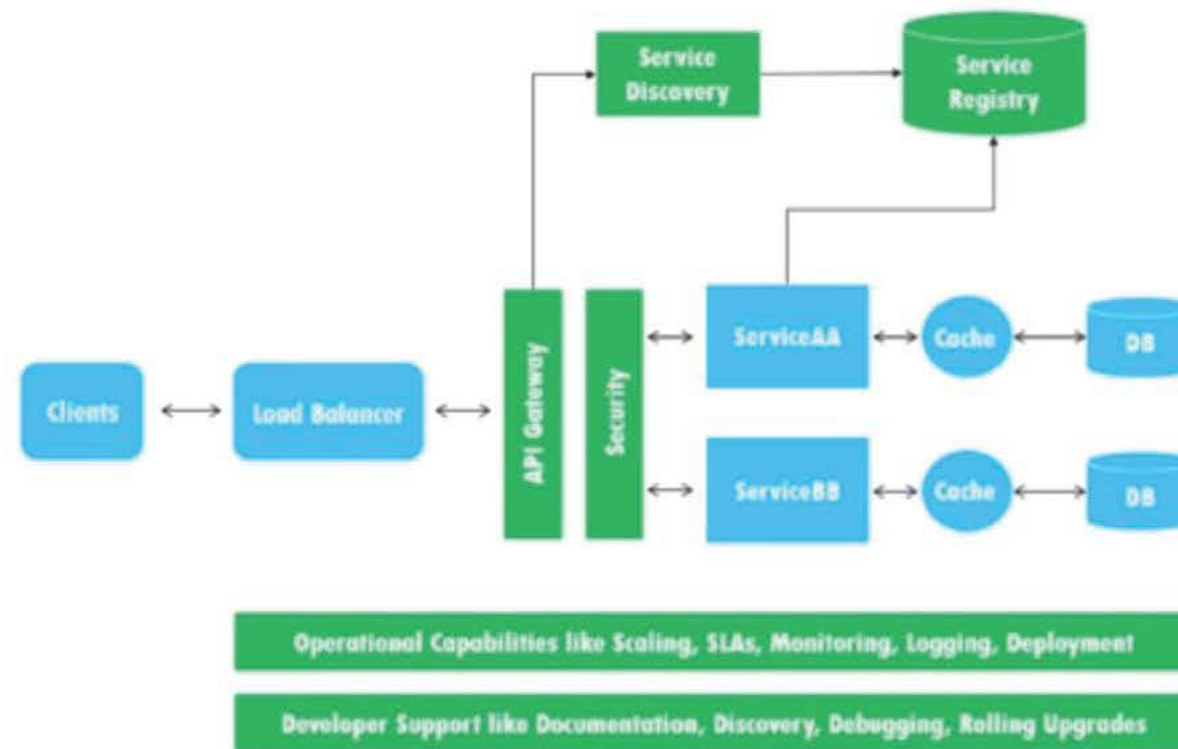
IoT & Microservices

- **Microservice architectural style**: developing a single application as a suite of small services, each running in its own process and communicating with lightweight mechanisms, e.g. REST API.

- Microservices also offer a way of scaling the infrastructure both horizontally and vertically giving long term benefits to the IoT deployments. Each of the services can scale based on the needs.

- Given the dynamism of deployment and scalability expectations which comes with IoT, Microservices need to become an important part of the overall IoT Strategy.
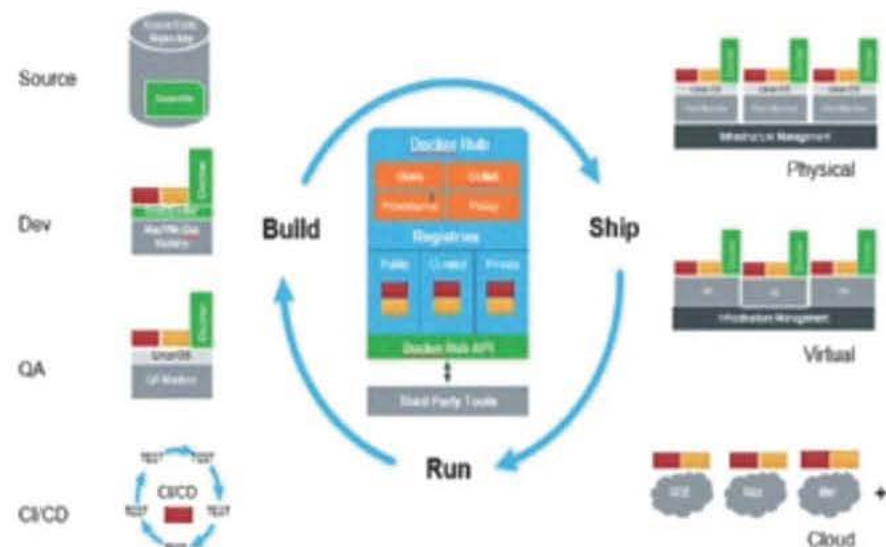
Microservices Challenges

- **Distributed application logic:** with microservices the logic is spread across the services and, more importantly, embedded in the control and data flow between those services.
- **Diverse technology stack**: the system may be comprised of in house developed services, open source software, and external libraries.
- **Hard to test and debug**: there might be thousands of interactions between the constituent services
  - Equivalent to the "butterfly effect" (a minor change of service, could potentially be catastrophic)