Infrastructure As Code

KTH DevOps Course - Week 4

2021-04-20 - Alex Nodet

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Cloud Architect

Hej!

At King since 2016

- Machine Learning
- Cloud Computing
- Data Engineering

Previous:

- Freelance Software Engineer
- Master in Computer Science & Networks at Esisar/KTH

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Your future

You built YourAwesomeApp™

What's great about it?

1. <your dream>
2. It's awesome!
3. X millions users!

Software code

Where do you run the software?

Infrastructure

(Servers, databases, storage, …)

Different infrastructure strategies

SaaS

Bring your software

Easy to use
Little control

PaaS

Bring your software
and dependencies

IaaS

Bring your software
and specific
dependencies

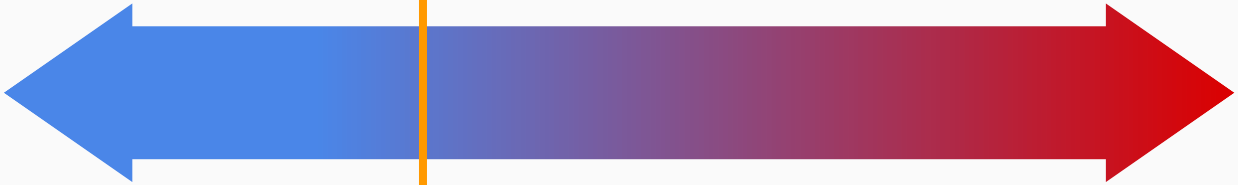
More complex
Flexible control

On-premises
hardware

High maintenance
Full control

Image: imgflip.com

Different infrastructure strategies



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Common use-case for IaC

On-premises
hardware

High maintenance
Full control

Image: imgflip.com

Infrastructure example - Offline playtesting for game balancing

“Playtest your game content with human-like bots!”

Check out the article on King Tech blog
https://medium.com/techking/human-like-playtesting-with-deep-learning-92adafffe921

Infrastructure example - Smart Farming Corp.

“Replace your equipment before it breaks!”

4G/5G chip

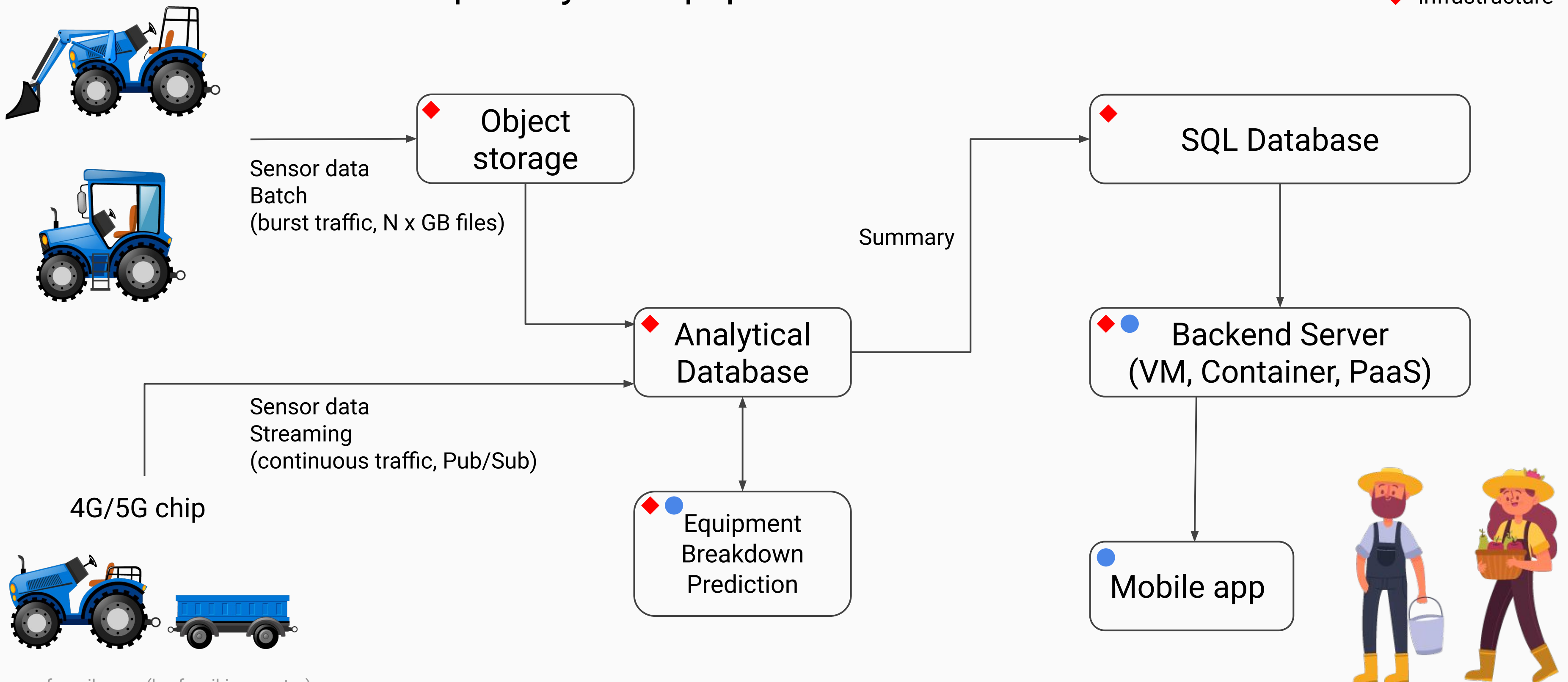
Mobile app

Images: freepik.com (brgfx, pikisuperstar)

Infrastructure example - Smart Farming Corp.

“Replace your equipment before it breaks!”

● Software
◆ Infrastructure



◆ Object storage

Sensor data
Batch
(burst traffic, N x GB files)

◆ Analytical Database

Sensor data
Streaming
(continuous traffic, Pub/Sub)

4G/5G chip

◆ ● Equipment Breakdown Prediction

Summary

◆ SQL Database

◆ ● Backend Server
(VM, Container, PaaS)

● Mobile app

Images: freepik.com (brgfx, pikisuperstar)

Infrastructure Administration - the naive way

The naive way

1. SSH to the server
2. Change configuration files

1. Go to the Web UI
2. Change settings

Challenges

- Automation
- Documentation
- “Oops” moments

Image: https://www.deviantart.com/origmding/art/PEBKAC-162278715

IaC example with Terraform

Declaration file

```
// easy to reuse between customers
variable "farm_name" {
  default = "carrot-corp"
}

variable "backend_machine_type" {
  default = "n1-standard-1"
}

resource "google_storage_bucket" "sensor_data" {
  name     = "storage-${var.farm_name}"
  location = "EU"

  labels {  // easier billing and management
    farm   = var.farm_name
  }
}
```

```
resource "google_compute_instance" "backend_server" {
  // add relationship between resources
  depends_on = [google_storage_bucket.sensor_data]

  name         = "backend-${var.farm_name}"
  machine_type = var.backend_machine_type

  boot_disk {
    initialize_params {
      image = "debian-cloud/debian-9"
    }
  }

  labels {  // easier billing and management
    farm     = var.farm_name
  }
}
```

In CLI, CI/CD, ...

```
$> terraform apply   [-var 'farm_name=tomato-and-co']
```

Source: https://learn.hashicorp.com/tutorials/terraform/infrastructure-as-code?in=terraform/gcp-get-started

Benefits and challenges of IaC

Pros

- Automation
- Version control
- Repeatable
- Reusable
- Documentation
- Audit, peer reviews

Cons

- More complex
- May lag behind latest features
- Not everything can be code
- It becomes code
  - Technical debt
  - Mindset, culture

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DevOps!

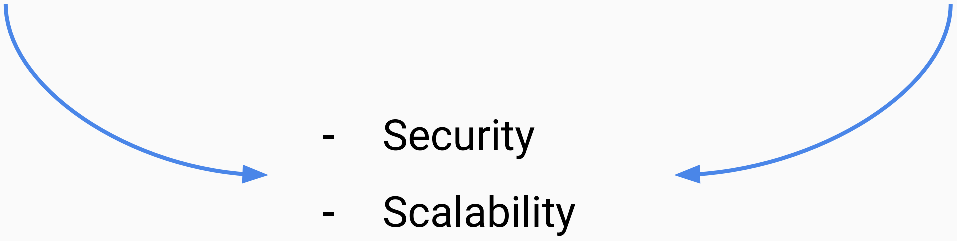
Cultural challenges of IaC and DevOps

For Dev teams

- New concepts
  - Disaster recovery
  - Networking
- Understand the infrastructure
- “It works on my machine”

For Ops teams

- Software Engineering
  - Best practices
  - Development tools
- Understand the application
- “Who deployed on a Friday?”



- Security
- Scalability

Keywords to check out in 2021

Docker

Kubernetes

Cloud Native Computing Foundation

GitOps

Terraform / Atlantis

Drone CI

“Hidden Technical Debt in Machine Learning Systems” - NIPS 2015

OpenAPI

Protocol Buffers

Reminder: it’s a fast-paced field

Thank you!

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