Linkedin Learning - Cloud Architecture: Core Concepts

Course Intro:

- Manner of planning
  - determines the success of your architecture
- Work from big to little

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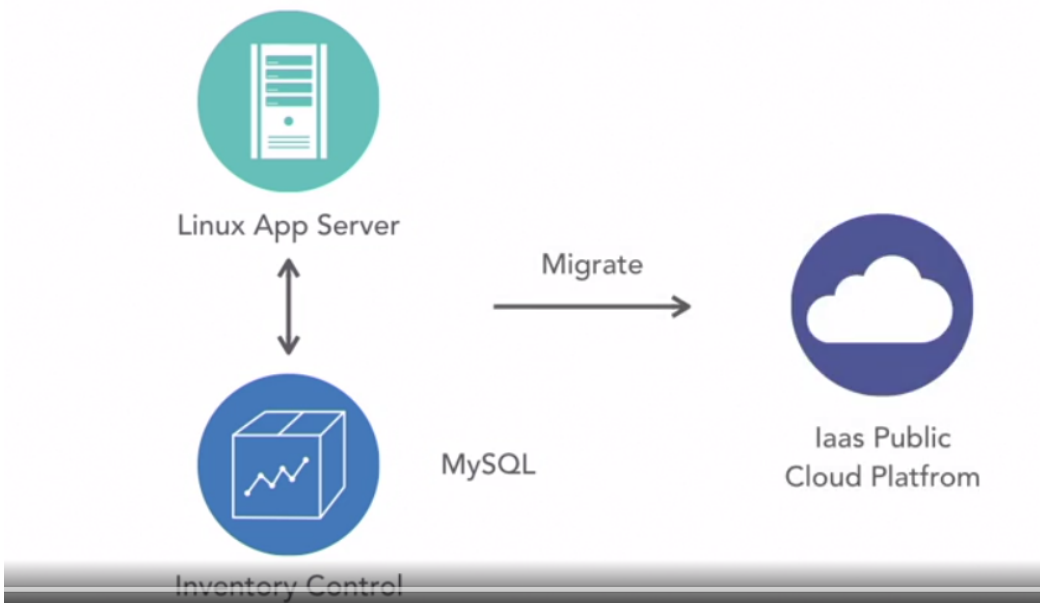
- Core concepts -> Design decisions -> Advanced Concepts

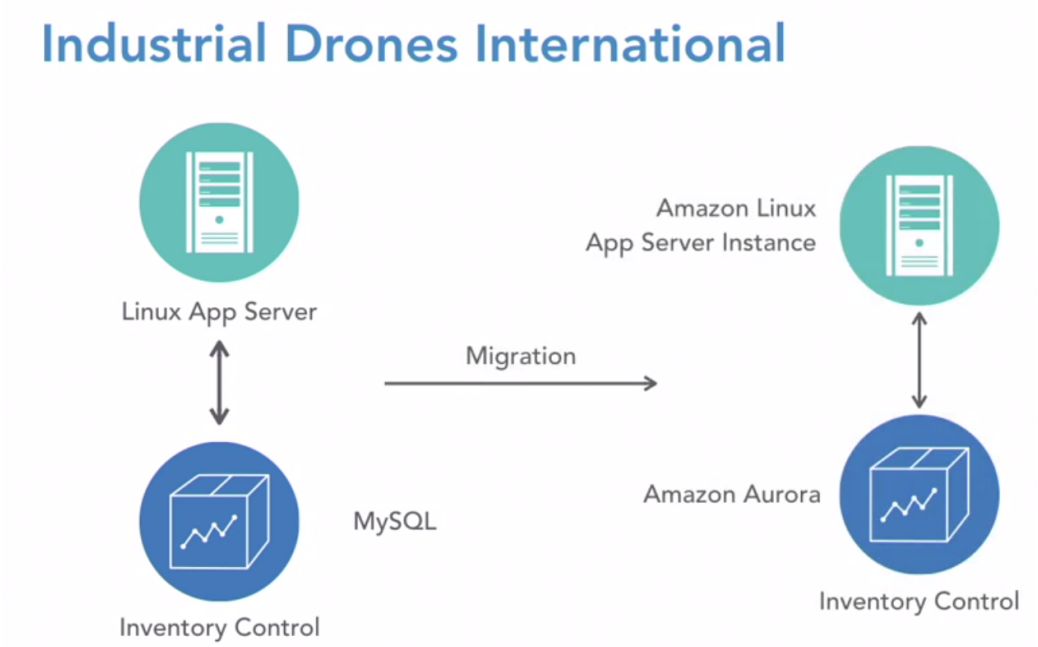
Cloud architecture:

Example 1: Industrial Drones international



Requirements:

- Performance
- Security
- Governance
- Cloud service (IaaS/PaaS/SaaS)
    - Look at providers(Amazon Web Services/Google)
    - Most of the times, there will be multi clouds
- Data
- DevOps
- Storage



Skills, tools and processes

- Look things hollistically

edX Course - Chapter 1 Virtualization

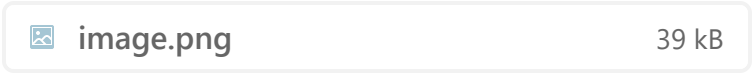
Intro

- Cloud computing
  - the remote allocation of resources on the cloud(internet)
  - "*Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction*"(NIST)
- Cloud computing providers
  - offer various services
    - provisioning and releasing resources
    - Infrastructure as a Service (IaaS)
      - Cloud service model
      - provides on demand physical and virtual computing resources, storage, network, firewall
      - Uses hypervisors
      - Backbone of all cloud services
    - Platform as a Service (PaaS)
      - cloud service model
      - allow users to develop, run, and manage applications while concealing the tasks involved in the management of the underlying infrastructure.
      - With PaaS, users are able to concentrate their efforts on building their applications, which is a great benefit to developers.

        - Users have a choice between managed and self-managed PaaS solutions. Users can either use managed PaaS solutions hosted by cloud computing providers like Amazon AWS, Microsoft Azure, Google Cloud Platform (GCP), IBM Cloud, and Oracle Cloud or deploy an on-premise PaaS as a self-managed solution, using a platform such as Red Hat OpenShift.
    - Software as a Service (SaaS)
        - **SaaS**, ou **Software as a Service**, é uma forma de disponibilizar softwares e soluções de tecnologia por meio da internet, como um serviço. Com esse **modelo**, sua empresa não precisa instalar, manter e atualizar hardwares ou softwares.
  - Offer web interfaces in the form of consoles and dashboards, aimed to improve user experience
  - pay-as-you-go
    - allowing users to pay only for the cloud resources they are using at the time

- Key Features of Cloud Computing
  - Speed and agility
    - provisioned with a few clicks
    - easy scaling (up and down) - by increasing or decreasing the number of running instances of a particular resource as a response for the demand
  - Cost
    - reduces the up-front cost to set up infrastructure
    - cost estimator based on demand
  - Easy to access resources
    - users can access resources at any time, any machine, anywhere, as long as it is connected to the cloud service provider

    - Maintenance
        - No longer the user's concern to maintain an up-front infrastructure
    - Multi-tenancy
        - multiple users share the same resource pool
    - Reliability
        - resources can be hosted in different data center locations

- Cloud Deployment Models
    - **Private**
        - designed and operated solely for one organization(e.g. bank, hospital)
        - can be hosted internally or externally, managed internally or third party
        - ca be built using a software stack like OpenStack
    - **Public**
        - open to the public for anyone to access, after paying
        - e.g. Google Cloud Platform, Amazon Web Services
    - **Hybrid**
        - Public + Private
        - sensitive information on the private cloud, while offering public resources
        - meeting temporary resources during high demand
    - 

    - Community cloud
        - formed by multiple organizations sharing a common cloud infrastructure
    - Distributed Cloud
        - formed by distributed systems connected to a single network

    - Multicloud
        - one organization using multiple public cloud providers to run its workload
    - Poly cloud
        - one organization using multiple public cloud providers to leverage specific services from each provider

- Virtualization
    - "*In computing, virtualization refers to the act of creating a virtual (rather than actual) version of something, including virtual computer hardware platforms, operating systems, storage devices, and computer resources*".
    - Can be achieved at different hardware and software layers
        - e.g. CPU, disk, RAM, filesystems, etc
        - behaves like an actual physical system
    - Created with the help of a hypervisor
- Hypervisors
    - runs on a host machine
    - piece of software capable of creating multiple isolated virtual operating environments
    - 2 types
        - Type 1 - Native
            - runs directly on top of a physical host machine's hardware
            - no need for a host OS
        - Type 2 - Hosted
            - runs on top of host's OS
            - used for end-users

KVM

- Kernel-based Virtual Machine

    - Kernel = core component of a operational system; data processing
    - image.png 57 kB
- Loadable virtualization module for Linux
    - converts the kernel into a hypervisor capable of managing guest VMs
- image.png 56 kB
- Benefits
    - Open source software
    - Efficient and low cost
    - hardware-assisted virtualization for an array of OS
    - highly scalable
    - Advanced security features

VirtualBox

- type-2 hypersensor
- x86 and AMD64/Intel64 virtualization product
- Benefits
    - Open source
    - Free
    - Runs Windows, Linux, Mac Os X
    - easy to use

Vagrant

- Using Virtual Machines in a development environment has numerous benefits:
    - Reproducible environment

    - Management of multiple projects, each in its isolated and restricted environment
    - Sharing the environment with other teammates
    - Keeping the development and deployment environments in sync
    - Running consistently the same VM on different OSes leveraging hypervisors such as VirtualBox or KVM.
- Automate VMs management by providing an end-to-end lifecycle management utility
- Benefits
    - It automates the setup of one or more VMs, which results in saved time, increased productivity, and lower operational costs.
    - It introduces consistency in infrastructure provisioning through Vagrantfile.
    - It is a flexible cross-platform tool.
    - It provides support for Docker, thus helping manage Docker containers in addition to VMs.
    - It is easy to install and to configure.
    - It is very useful in multi-developer teams.

edX Course - Chapter 3 Platform as a Service (PaaS)

PaaS - cloud service model representing a class of cloud computing services that allow users to develop, run, and manage applications while concealing the tasks involved in the management of the underlying infrastructure. With PaaS, users are able to concentrate their efforts on building their applications, which is a great benefit to developers.

Users have a choice between managed and self-managed PaaS solutions. Users can either use managed PaaS solutions hosted by cloud computing

providers like Amazon AWS, Microsoft Azure, Google Cloud Platform (GCP), IBM Cloud, and Oracle Cloud or deploy an on-premise PaaS as a self-managed solution, using a platform such as Red Hat OpenShift.

edX Course - OpenStack Components

What is OpenStack?

- Cloud operating system
- Control large pools of compute,storage, and network resources through datacenter
- Managed and provisioned through APIs
- Composed of several components to control a cloud service
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-

Nova

- Compute -> VMs
-

Ironic

-

Swift

-

Cinder

-

Manila

Neutron

Octavia

Keystone

Glance

Searchlight

Heat

Senlin

Magnum

Freezer

Horizon

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Ceilometer

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Monasca

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CloudKitty

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Tricircle

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edX Course - Chapter 2 Infrastructure as a Service (IaaS)

Intro

- Cloud service model
- provides on demand physical and virtual computing resources, storage, network, firewall
- Uses hypervisors
- Backbone of all cloud services

Amazon EC2

- Amazon Web Service (AWS) - leading service provider

    - Easy to use console
- Amazon services rely heavily on its infrastructure
- Amazon Elastic Compute Cloud (Amazon EC2) is its IaaS
    - Amazon EC2 **instances are VMs**
- **Pros:**
    - easy-to-use IaaS
    - flexible
    - enables **automation**
    - cost effective: only pay for time and resources used
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