IOT and Cloud Computing

SaaS, PaaS, IaaS

Cloud Computing Models

Running your own Server

- Host own Internet facing application
- A thought experiment

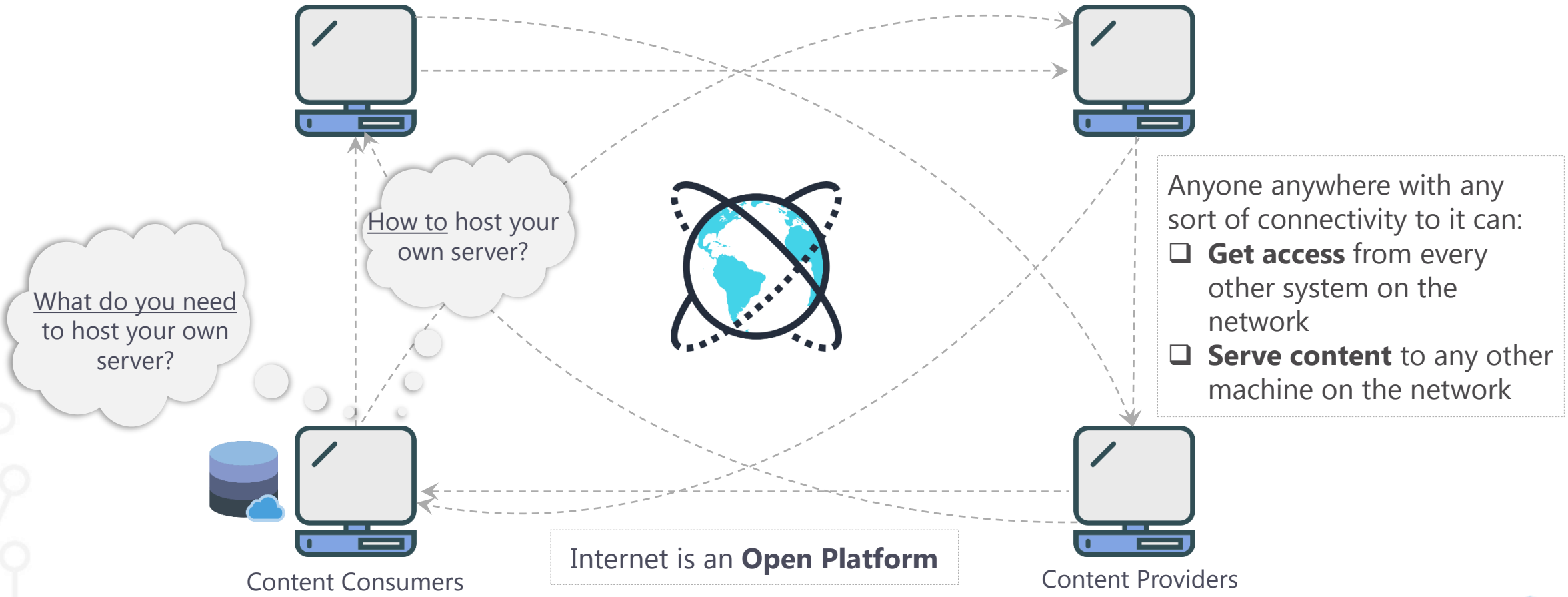
3 broad models

- **IaaS** - Infrastructure as a Service
- **PaaS** - Platform as a Service
- **SaaS** - Software as a Service

New trends in cloud computing

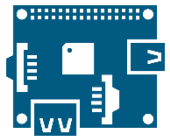
- Models which are blurring the lines between IaaS, PaaS and SaaS

Running Your Own Server

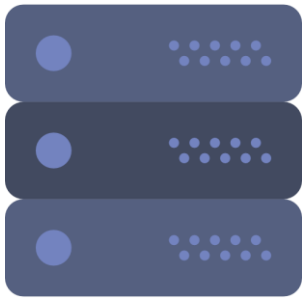


Running Your Own Server - Ingredients

PC

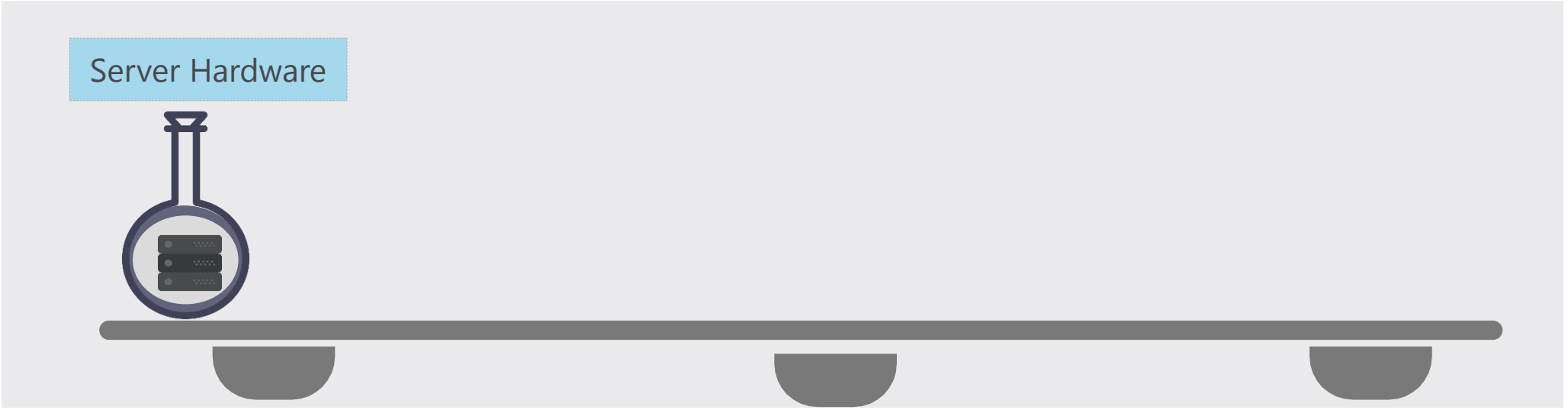


Raspberry Pi



Server Class Machine

- When the service gets more traffic, more servers will be needed
- High end machine needed to service high traffic



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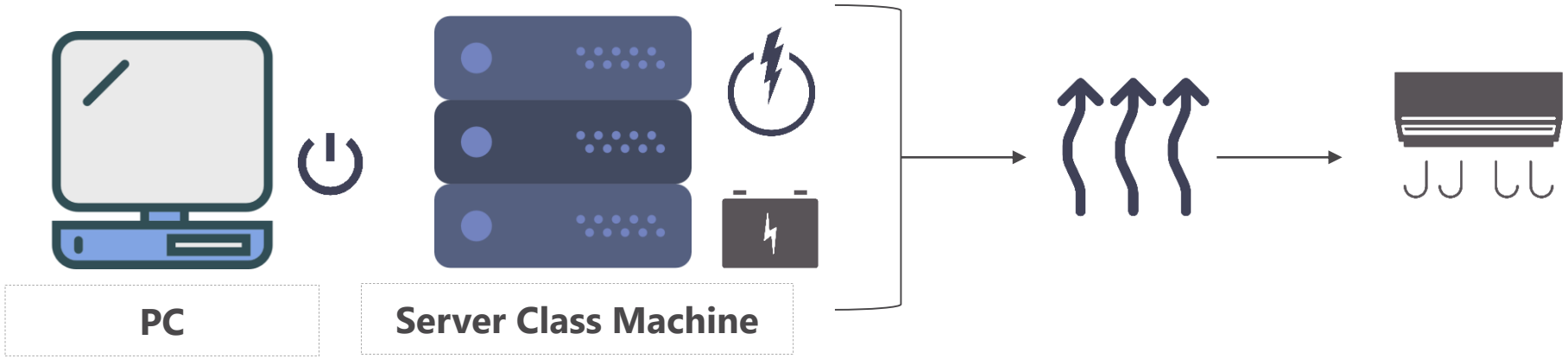
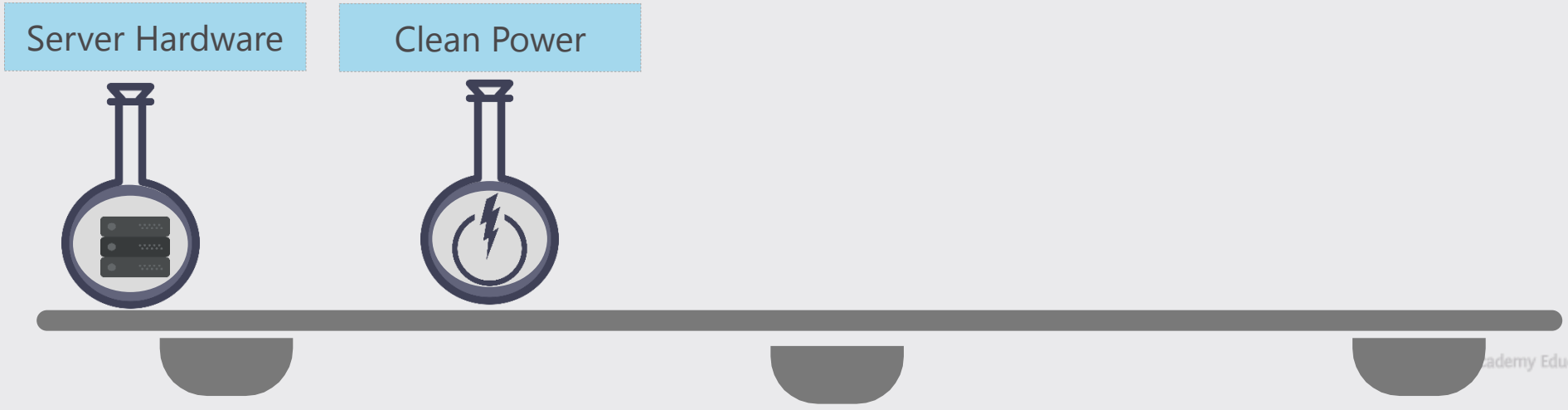
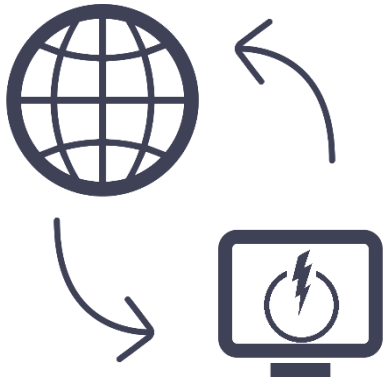


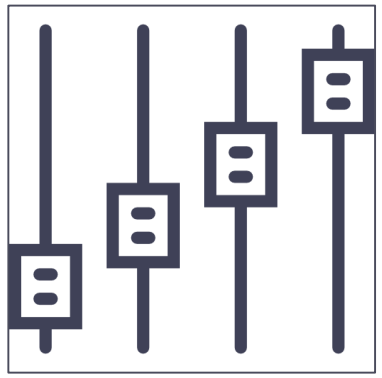
Servers need to be **on and online** at all times



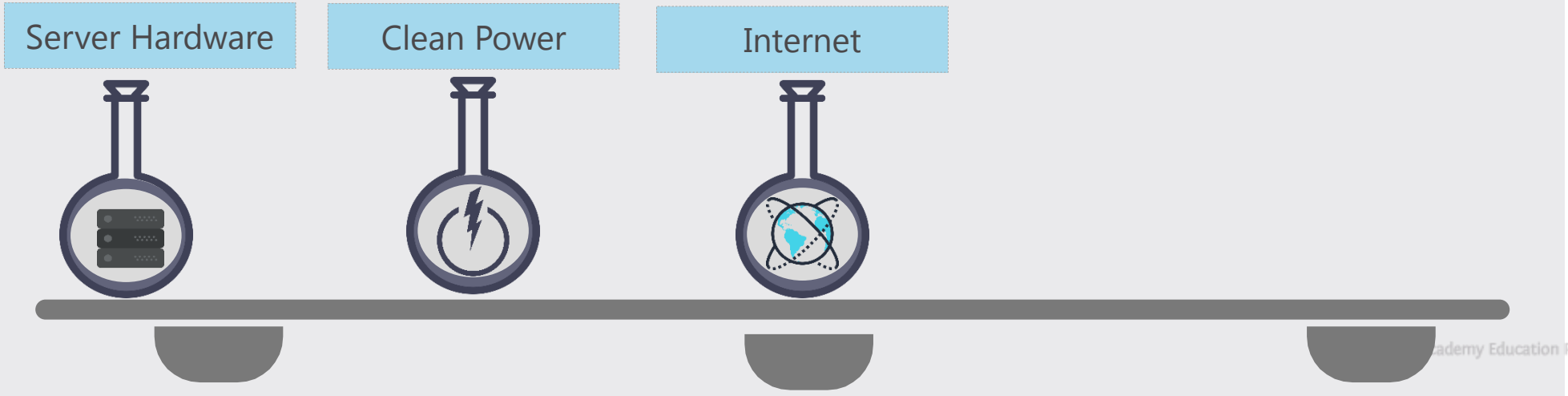
Running Your Own Server - Ingredients



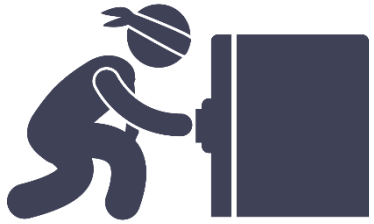
Very fast connection



Multiple levels of redundancy

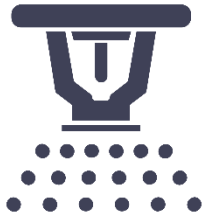


Running Your Own Server - Ingredients

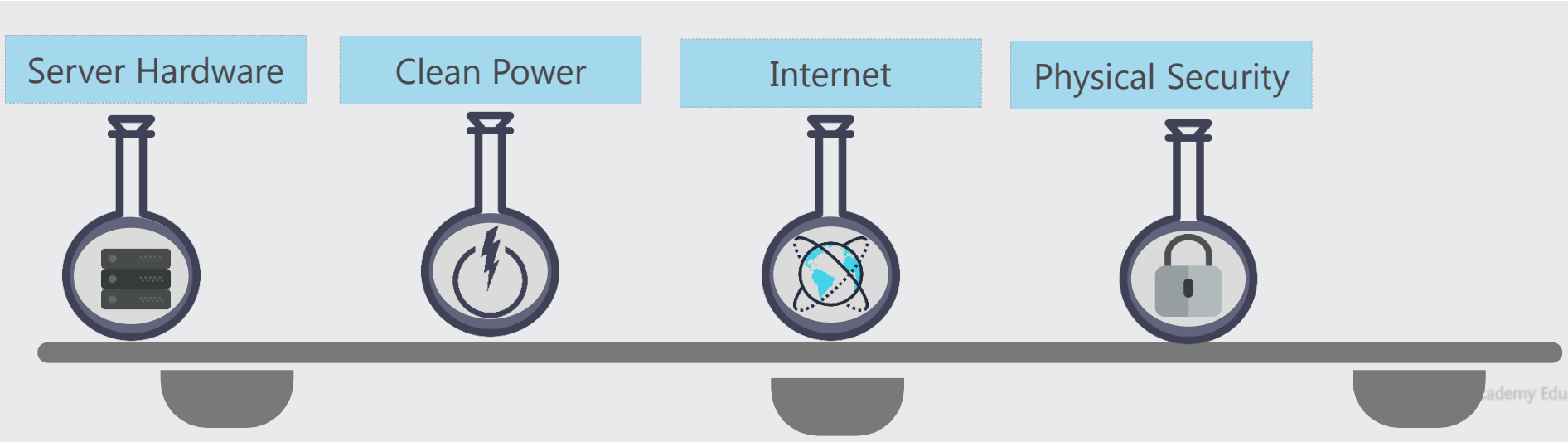


Security of server rooms

Fire safety



Automatics security systems



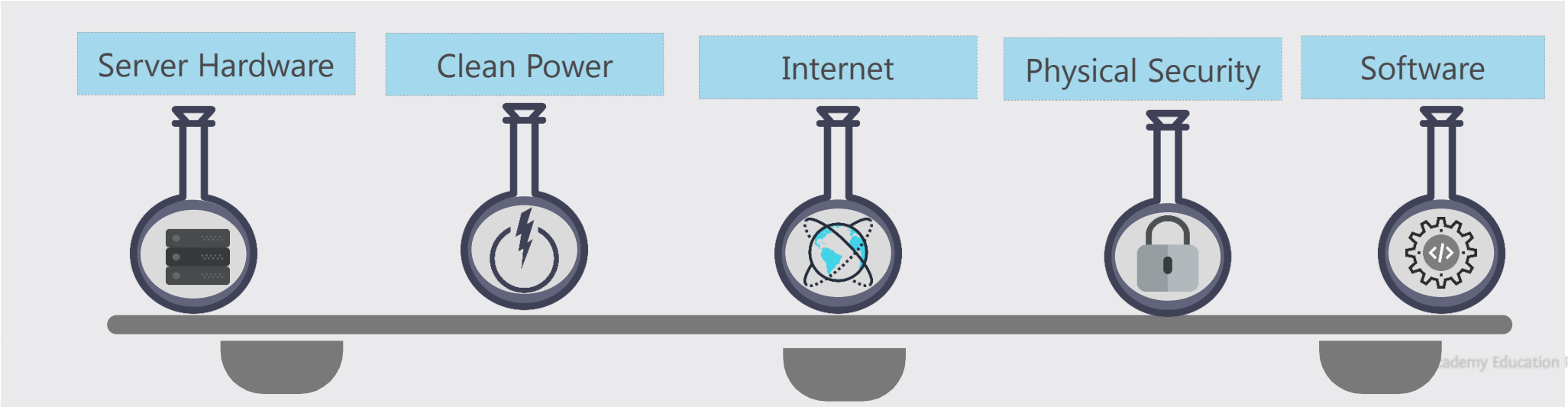
Running Your Own Server - Ingredients

- ❑ Configure all the packages
- ❑ Update it regularly
- ❑ All the patches are applied on a timely basis

Install Operating System

Plug all security gaps

Regular security check ups

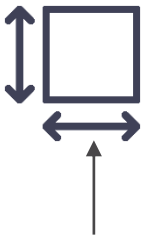


The Data Center

Hardware and physical aspects of managing servers

Data Centers

Sizing the Data center as per your needs



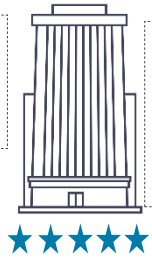
Computing power

Storage

Network capacity

Every big and most medium-sized companies have one or more data centers

Centralized secure location for a company's data assets



Big internet companies have gigantic Data Centers in exotic locations

The Data Center

Hardware and physical aspects of managing servers

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Sizing the Data center as per your needs

Centralized secure location for a company's data assets

Business Continuity and Disaster Management Systems

Natural Disasters

Servers in the Data centers need to be available at all times

High level of built-in Redundancy

Power Outages

The Data Center

Hardware and physical aspects of managing servers

Data Centers

Sizing the Data center as per your needs

Centralized secure location for a company's data assets

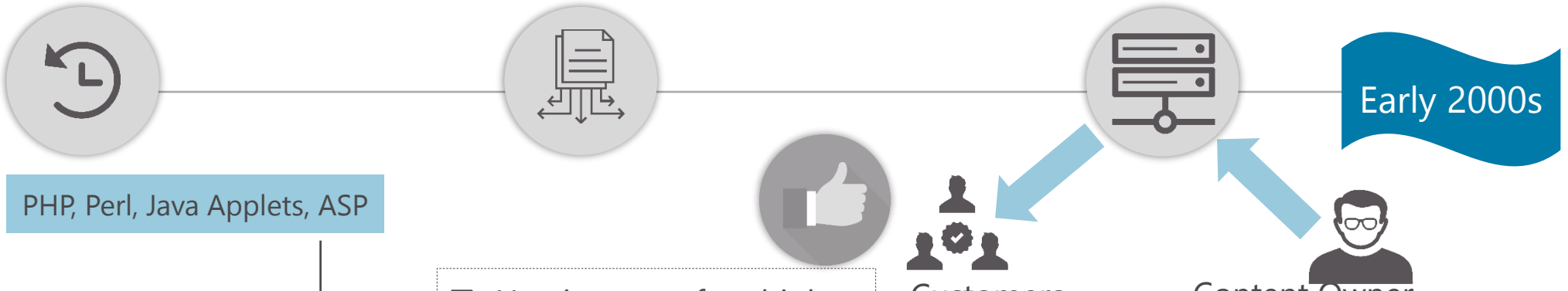
Scaling

- How to handle big and sudden jump in demand?
- How to unite Data centers in different geographies?

Servers in the Data centers need to be available at all times

High level of built-in Redundancy

The Data Center



- Hosting out of multiple locations worldwide
- Hosting at fast speeds
- Caching, content updates

- Incompatible with web applications

Servers managed by the companies

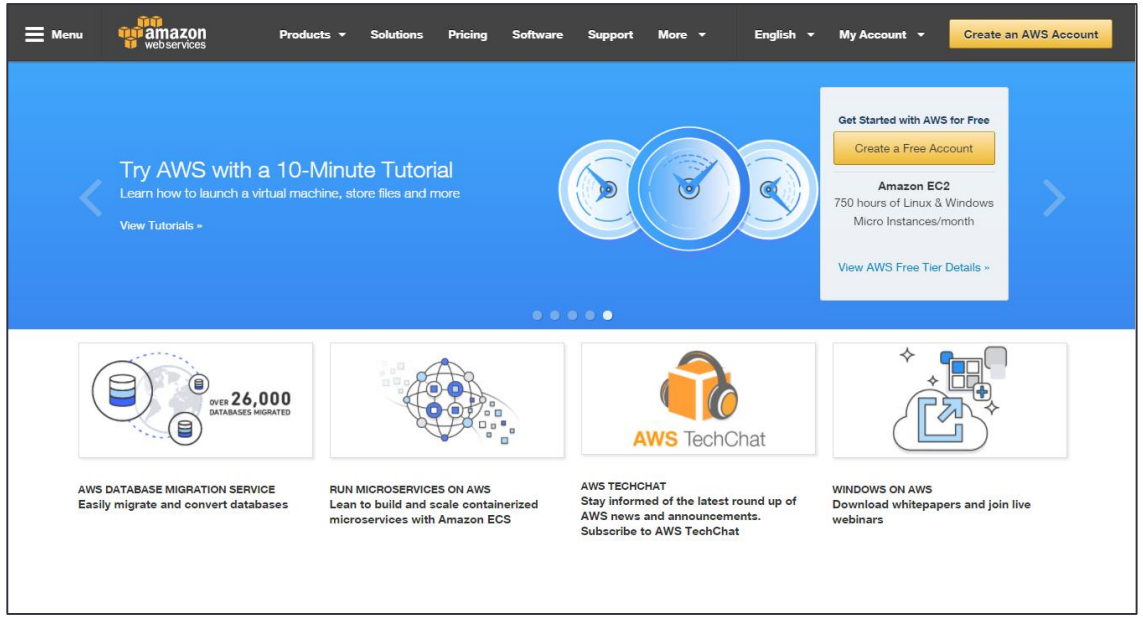
- Rackspace
- Go Daddy

CDN (Content Delivery Networks)

- Akamai
- Cloudflare

It was imperative for a company to host its own Data center, if it really wanted to run a Web App

Virtual Data center



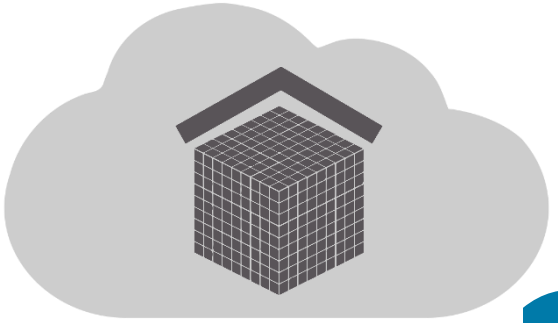
Install OS | Configure custom packages | Run Apps

Having a Data center without the hassle of managing an actual one

Virtual Data center

Amazon Web Services

Full control over what could be run on servers without owning one



Late 2000s

Google Web Services

Image credits: aws.amazon.com

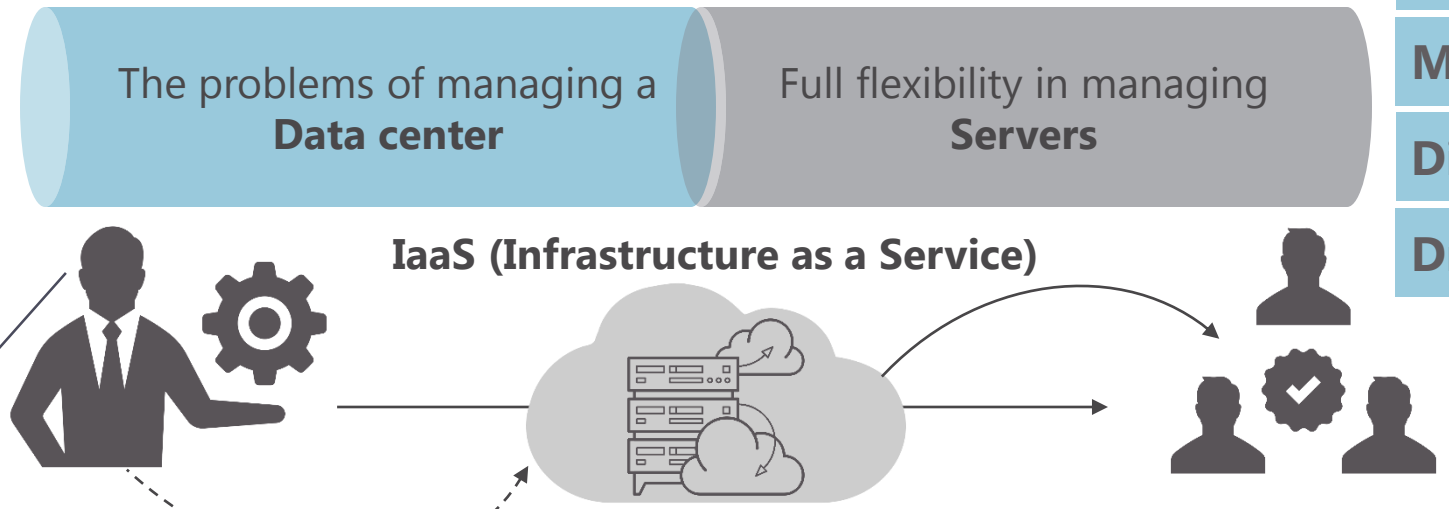
Virtual Data center

Late 2000s

2017

Many billion-dollar startups use cloud services without having a Data center of their own

IaaS



AWS EC2

Microsoft Azure

Digital Ocean

Droplets

IaaS provider allocates a customizable virtual machine and runs it on their physical infrastructure

- Virtual machine which runs on a physical machine
- A machine that can be configured
- Can specify the parameters of this machine

What the Customer gets:

- A virtual machine
- An IP address
- Storage space

What the Customer needs to do:

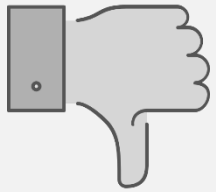
- Install an OS image
- Install, configure software packages
- Run the App
- Maintain: Patch, Upgrade

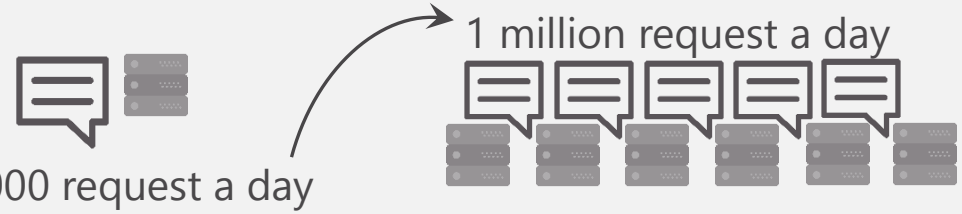
IaaS

IaaS - Infrastructure as a Service | **PaaS** - Platform as a Service | **SaaS** - Software as a Service

- ❑ Most basic of the 3 cloud computing models
- ❑ Very general
- ❑ No real constraints
- ❑ Easy to scale

- ❑ Maintain and manage software issues
- ❑ Software security
- ❑ Scaling – a mechanism needed to split up high traffic amongst multiple virtual machines





IaaS

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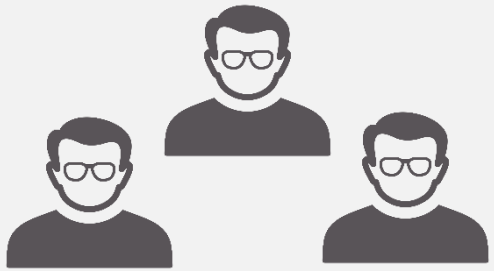
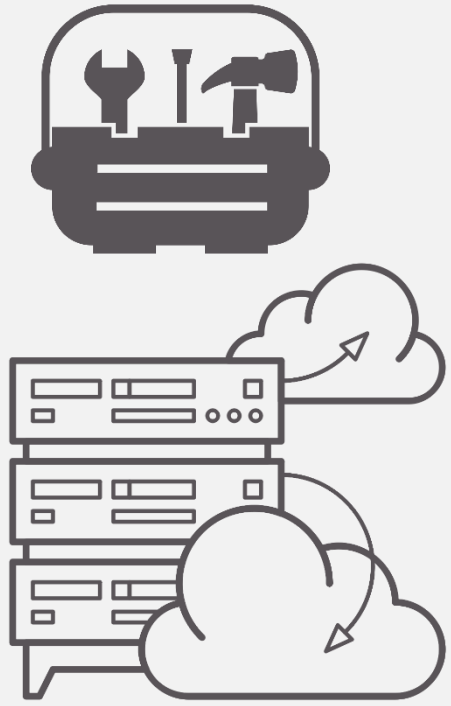
- IaaS providers have a default set of tools or approaches for common problems
- Understand technologies like Load Balancer and DB Replica Sets
- Dedicated experts for IaaS deployment and management
- Evolve a set of best practices

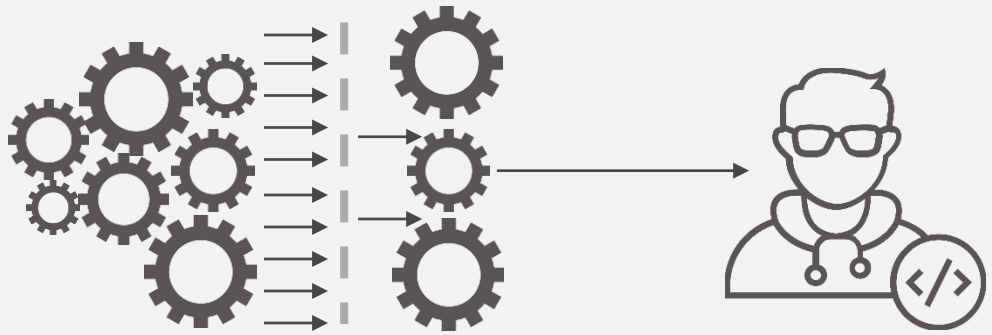




PaaS

IaaS - Infrastructure as a Service | **PaaS** - Platform as a Service | **SaaS** - Software as a Service

- Chooses one or more backend stacks and allows the Apps on that particular stack



Why not use only those technologies which actually run the Apps?

PaaS

IaaS - Infrastructure as a Service | **PaaS** - Platform as a Service | **SaaS** - Software as a Service

- Chooses one or more backend stacks and allows the Apps on that particular stack
- Does not have a configurable virtual machine

What you get:

- A way to run a set of processes in your chosen language or environment
- Access to file system, databases via constrained APIs
- An implicit or explicit way to scale

What you need to do:

- Implement your business logic
- Access control

GAE or Google App Engine

PaaS

IaaS - Infrastructure as a Service | **PaaS** - Platform as a Service | **SaaS** - Software as a Service

- Supports platforms like PHP, python, node js, java, ruby, .net, Go
- For each there is an API for doing various things
- Constraint: Each incoming request needs to be serviced within a particular time limit
- Service provider will take care of OS, maintenance, security and scale

GAE or Google App Engine

PaaS

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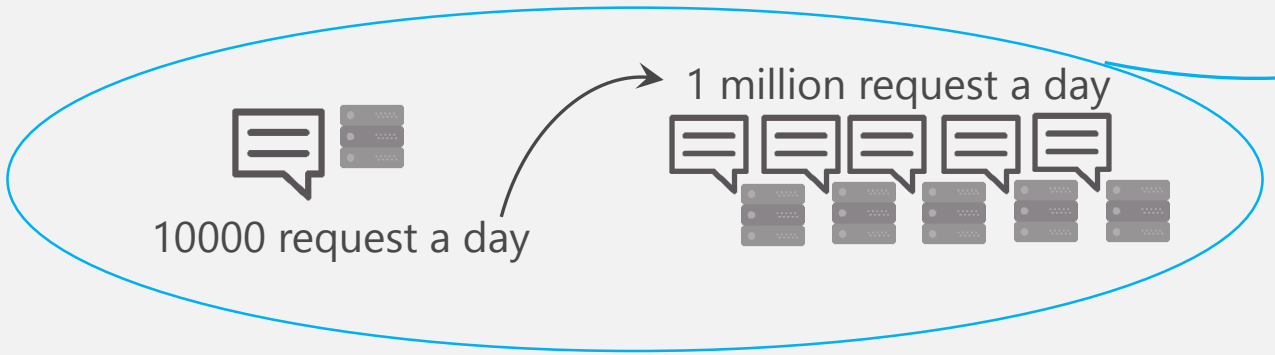
- Constraint: Each incoming request needs to be serviced within a particular time limit
- Service provider will take care of OS, maintenance, security and scale
- Examples: Heroku, force.com



GAE or Google App Engine

SaaS

IaaS - Infrastructure as a Service | **PaaS** - Platform as a Service | **SaaS** - Software as a Service

- Applications that are host to the cloud instead of on your local machine

Google Docs

Gmail

SaaS

IaaS - Infrastructure as a Service | **PaaS** - Platform as a Service | **SaaS** - Software as a Service

- Mostly for IT optimization
  - No need to license, install, maintain multiple S/W packages
  - Sharing, collaboration is easier
  - Policies are easier to implement and monitor

Multiple Cloud Accounts

↑

Multiple Apps

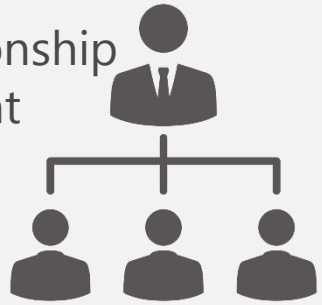
SaaS

IaaS - Infrastructure as a Service | **PaaS** - Platform as a Service | **SaaS** - Software as a Service

- Examples
  - Google Apps: GMail, Google Docs, Sheets
  - Office 360
  - Adobe Cloud
  - Salesforce.com

Cloud Account

Customer Relationship Management



Multiple Cloud Accounts

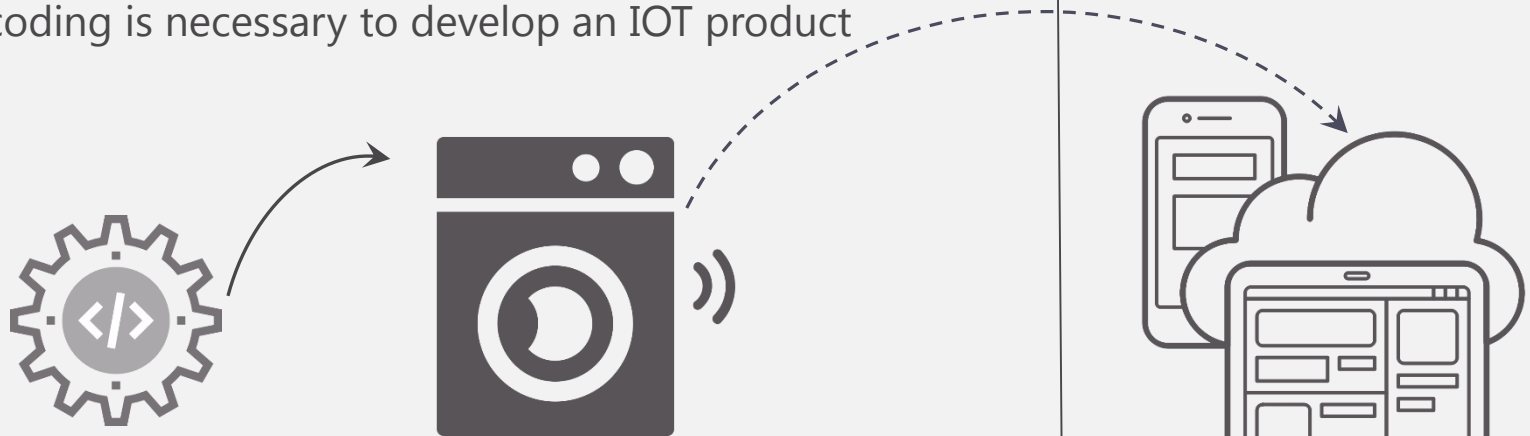
↑

Multiple Apps

SaaS

IaaS - Infrastructure as a Service | **PaaS** - Platform as a Service | **SaaS** - Software as a Service

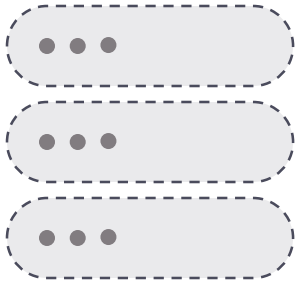
- SaaS has a big impact on the IT Model
- Least important from IOT perspective
  - Custom coding is necessary to develop an IOT product



Newer Trends

"*-as-a-Service"

- Storage as a service
- Messaging as a service
- Database as a service

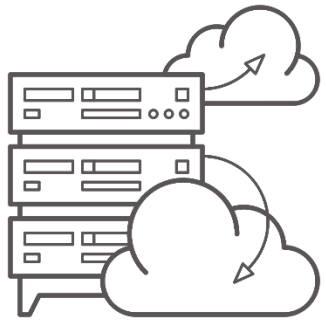


Serverless Backend

- ❑ Ghost servers
- ❑ Developer knows nothing about the server
- ❑ Code a function that services incoming requests only
- ❑ Function-as-a-Service
- ❑ Amazon Lambda (2014)
- ❑ Like PaaS with no persistence

Conclusion

- Any modern IOT application will be served from the cloud
- Days of running your own server are over
- Lots of services are being re-branded as cloud-centric offering
- Important to understand what you get and what you need to do
- Focus on:
  - Features
  - Cost
  - Scalability



Recap

SaaS, PaaS, IaaS

- Cloud Computing Models
- Running your own server
- The Data center
- Virtual Data center
- IaaS
- PaaS
- SaaS
- Newer trends