Serverless Computing – Part1

Service Management in Networks – WS 2021

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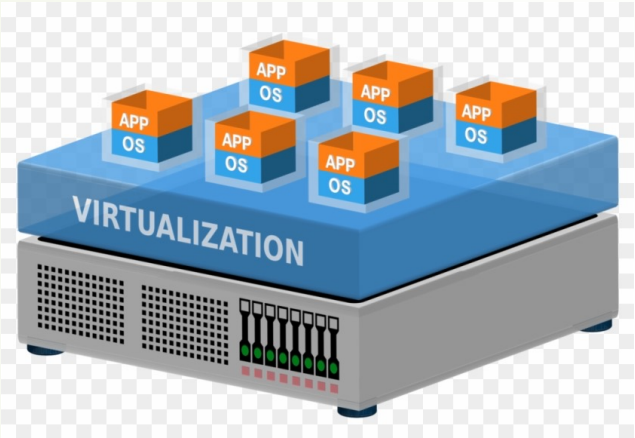
Evolution of Cloud Computing



Traditional
Data centers

Virtualization

Cloud
Computing

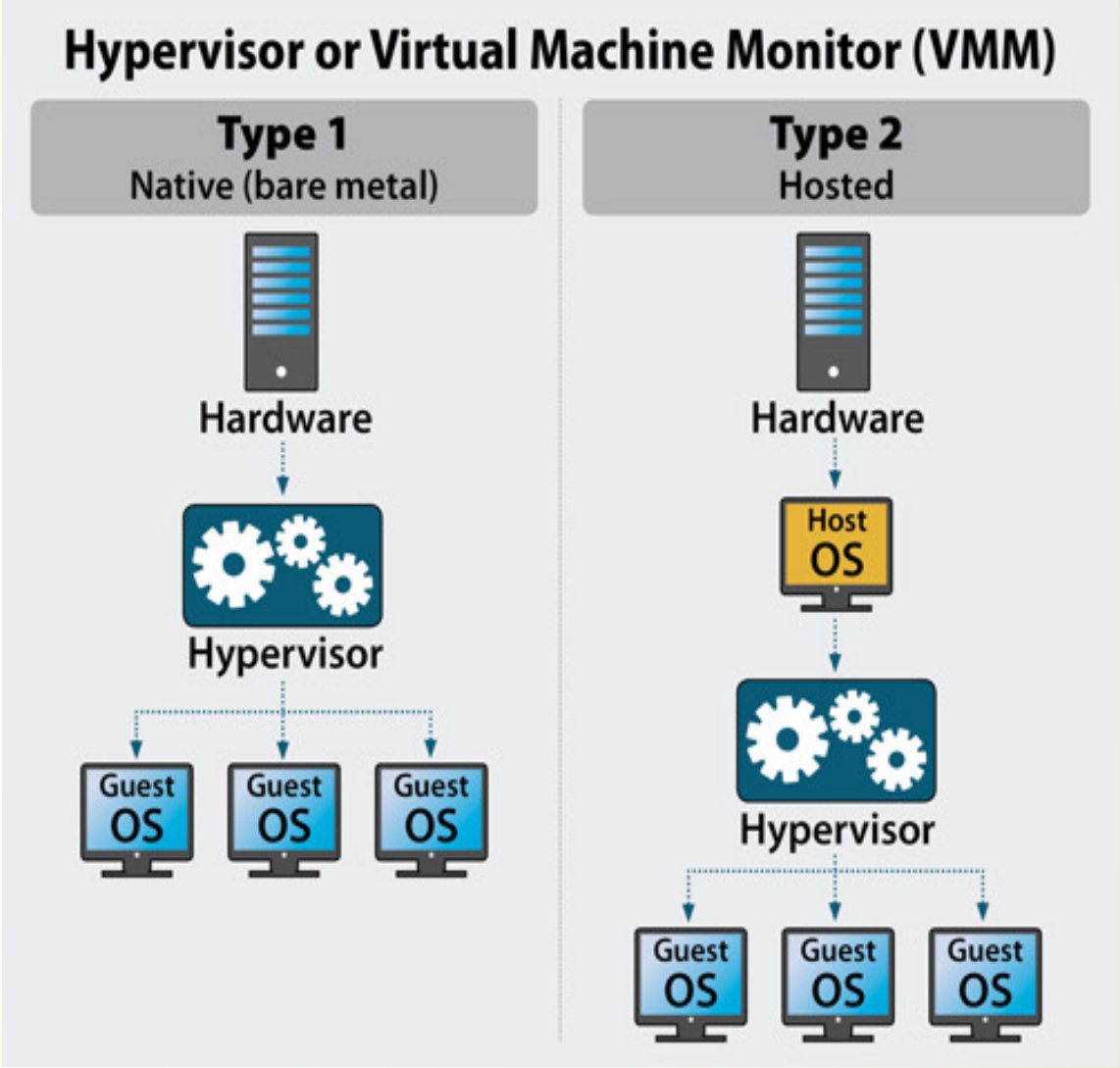
Virtualization

1. Hypervisor-based Virtualization
   - ❖ Type 1 / Bare-metal Hypervisor

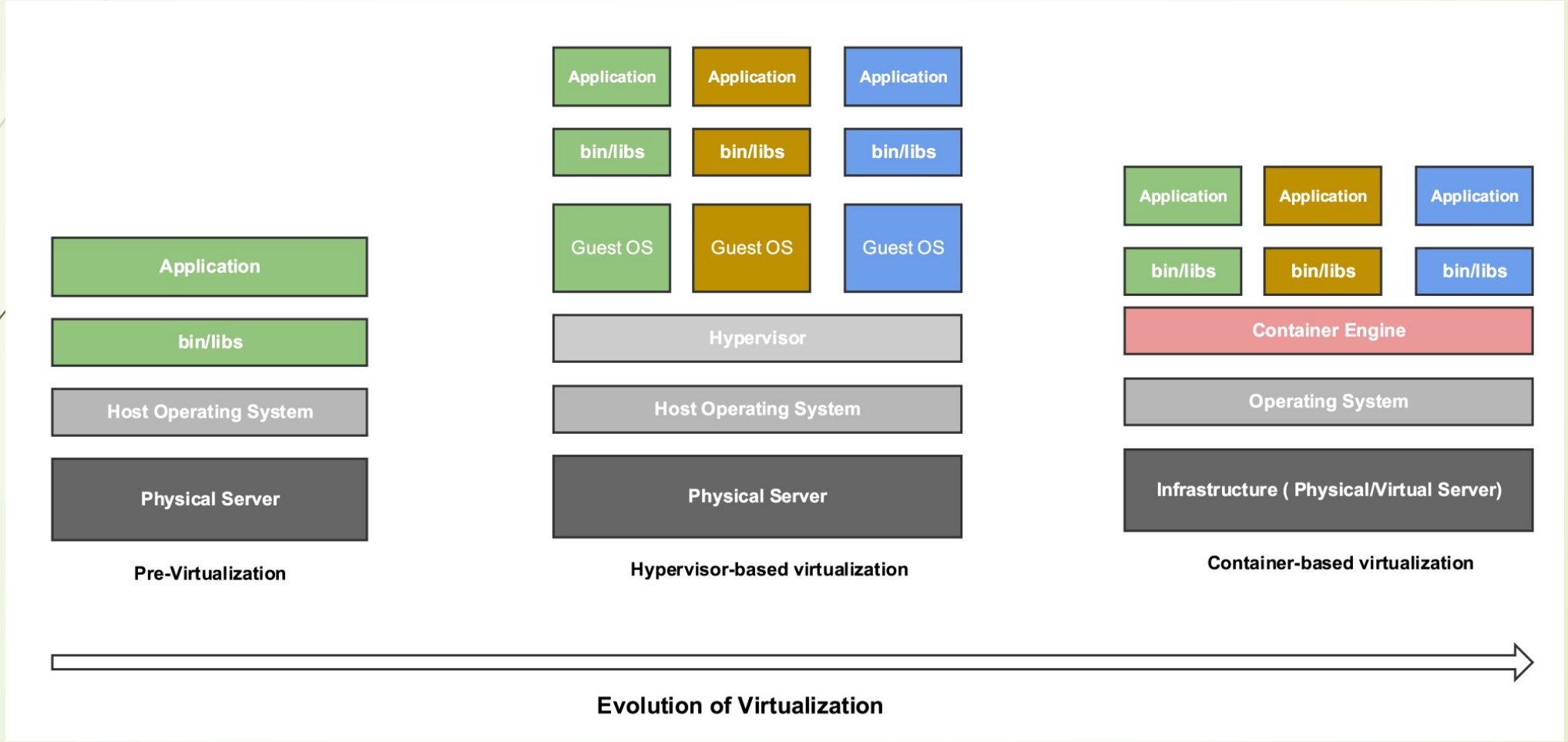
     Ex: Xen, Hyper-V
   - ❖ Type 2 / Hosted Hypervisor

     Ex: VMWare, VirutalBox
2. Container-based Virtualization

   Ex: Docker, OpenVZ, LXC, FreeBSD Zones, Solaris jails etc.



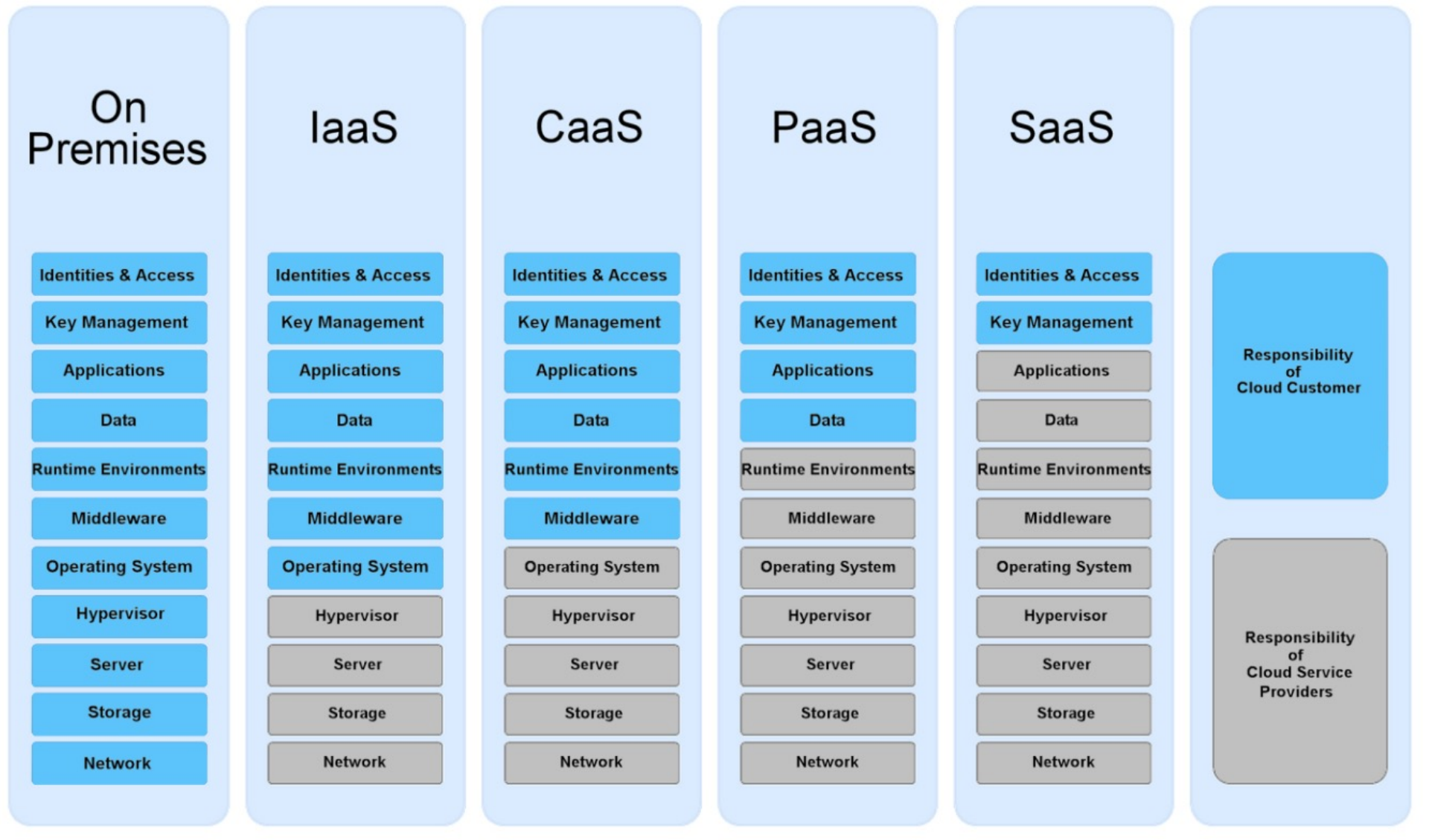
Virtualization (contd.)



Cloud Computing

- Coined by NIST (U.S National Institute of Standards and Technology)
- Share of responsibilities between providers and consumers by choice
- Cloud Computing Models
  - Infrastucture as a Service (IaaS)
  - Container as a Service (CaaS)
  - Platform as a Service (PaaS)
  - Software as a Service (SaaS)

Cloud Computing Models



Cloud Computing Models – Example Services

- IaaS

  Azure IaaS, AWS EC2, Google cloud infrastructure, IBM IaaS cloud servers etc.

- CaaS

  Google Kubernetes Engine (GKE), Amazon Elastic Container Service (ECS), Azure Container Instances

- PaaS (build web apps on cloud platforms)

  SAP cloud, Google App Engine, IBM Cloud Foundry

- SaaS

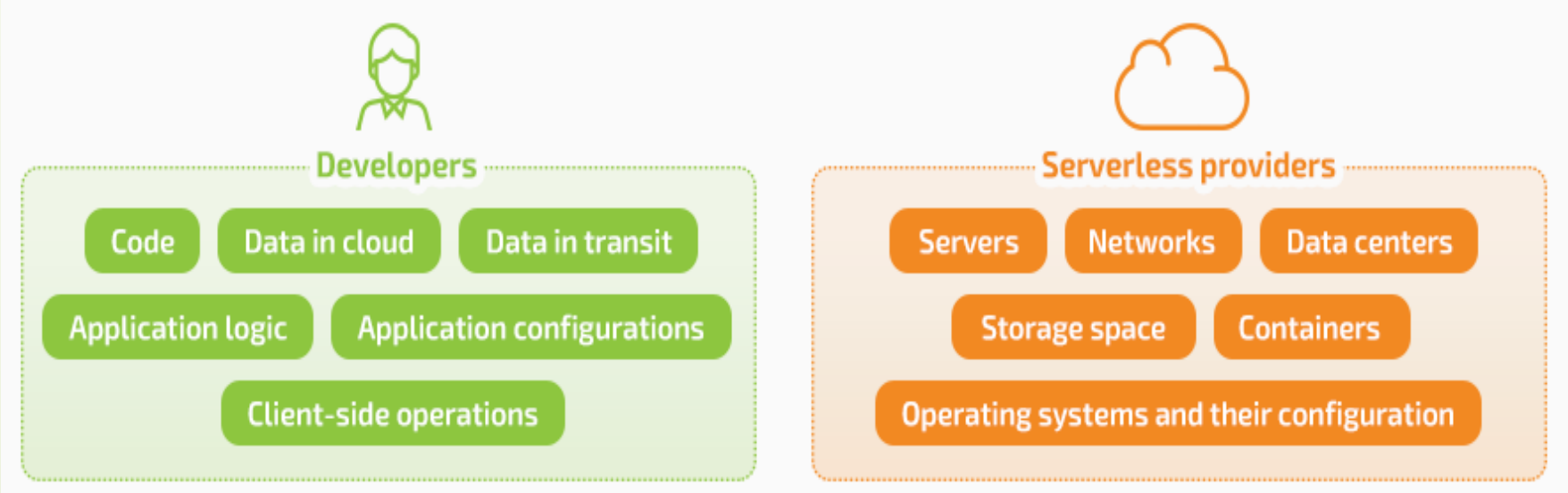
  Dropbox, Cloud based Microsoft Office 365, G Suite, Slack, Cisco WebEx, Box etc.

Serverless Computing

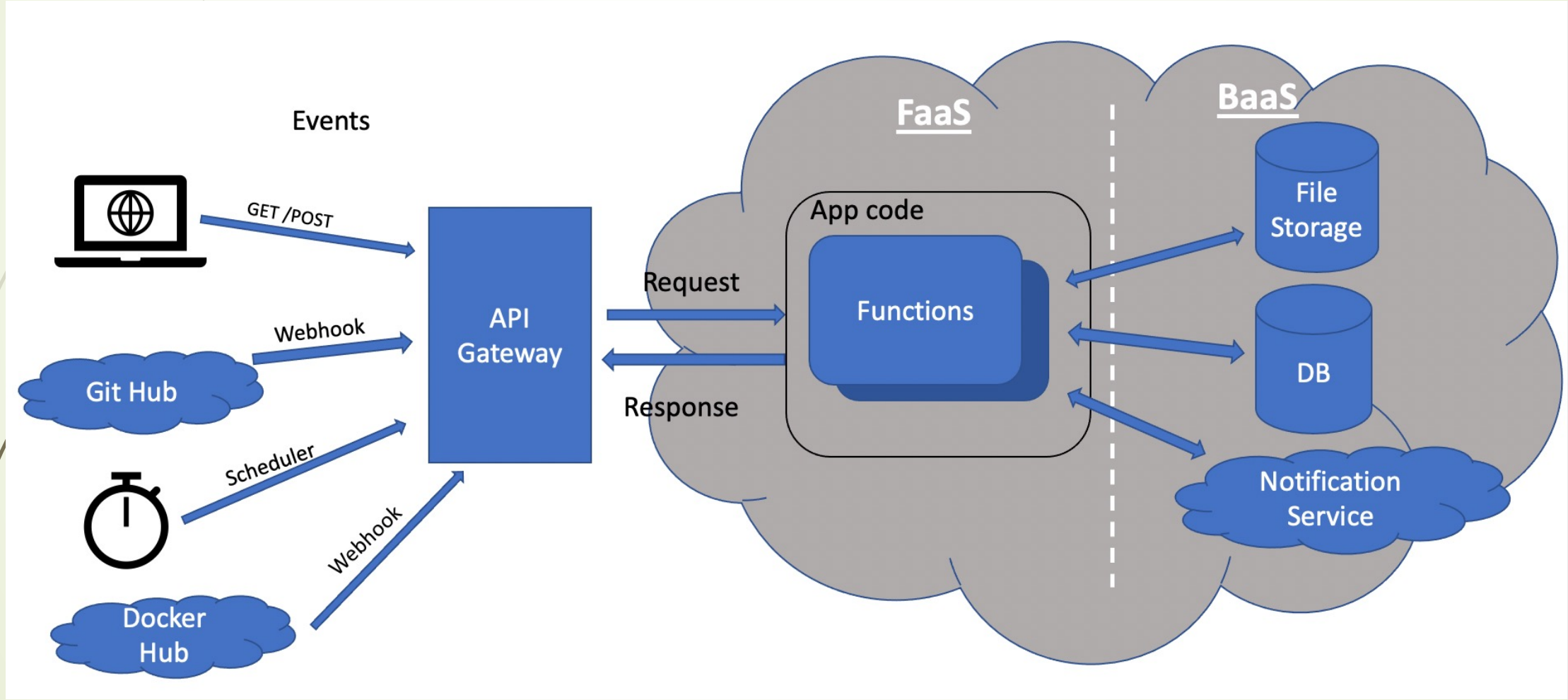
- Buzz word – introduced in 2012 by iron.io for their IronWorker product
- Serverless concept does not convey the literal meaning.
- Serverless represents the perspective of developer.
- Develop a program and launch it in cloud without worrying about infrastructure.
- ‘Pay-as-you-go’ billing model.
- Google App engine in 2008 and Amazon Lambda in 2014.
- ‘Serverless’ is a type of service architectures
  - Monolithic Architecture
  - Microservice Architecture
  - Serverless Architecture

Serverless Computing (contd.)

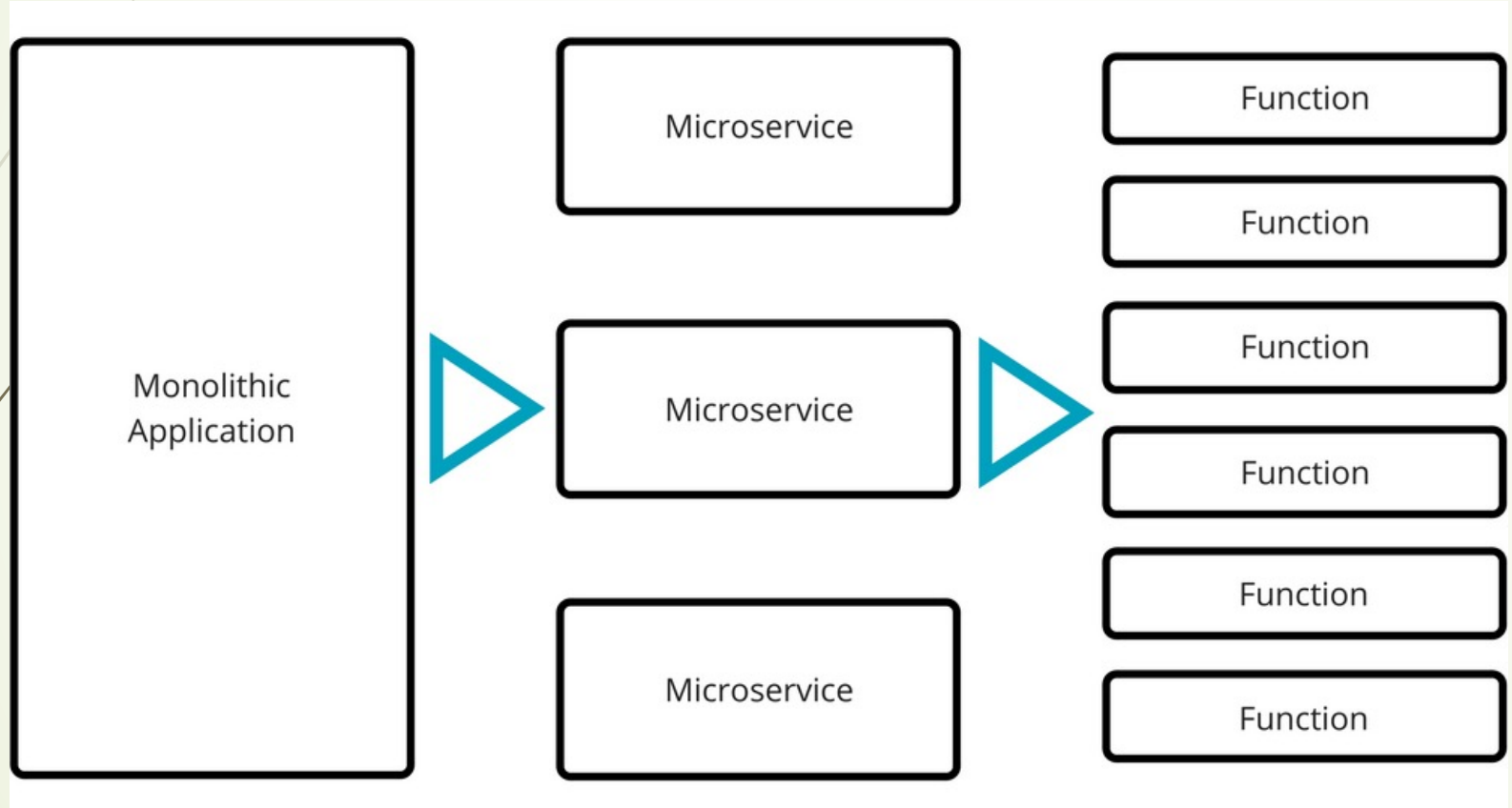
- Serverless resembles Platform as a Service (PaaS) model.
- CNCF (Cloud Native Computing Foundation) divides Serverless into two computing models.
  - Backend as a Service (BaaS)
  - Function as a Service (FaaS)
- Serverless model fits between PaaS and SaaS in the cloud computing chart.



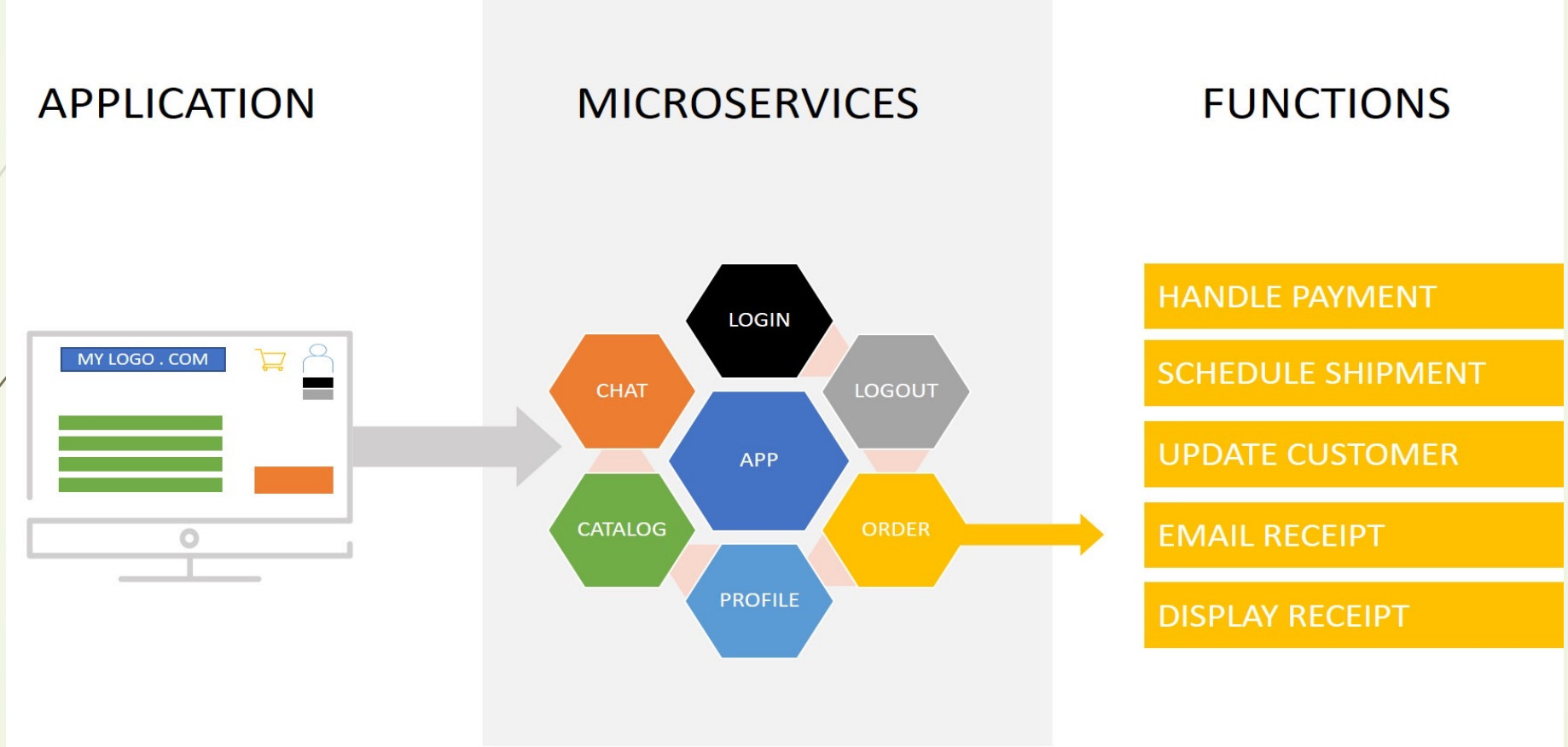
Serverless Computing – Event driven architecture



Comparing service architectures



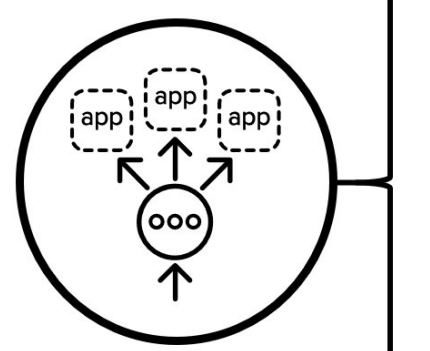
Comparing service architecturs (contd.)



The decomposition of application to microservices to individual functions.

Benefits of Serverless models

- Pay-as-you-go model saves cost.
- No operations and infrastructure cost.
- Supports autoscaling
- Developers get more time to code
- Fast and independent deployment



BENEFITS of SERVERLESS

35% OPEX
Reduce costs related to server provisioning

28% PRODUCTIVITY
Spend more time working on apps

23% TIME TO VALUE
Deploy faster

14% SIMPLIFICATION
Decrease software complexity

Challenges with serverless models

- Testing and debugging
- Not suitable for long-running processes
- Startup latency or Cold start
- Vendor lock-in
- Security concerns with multi-tenant servers

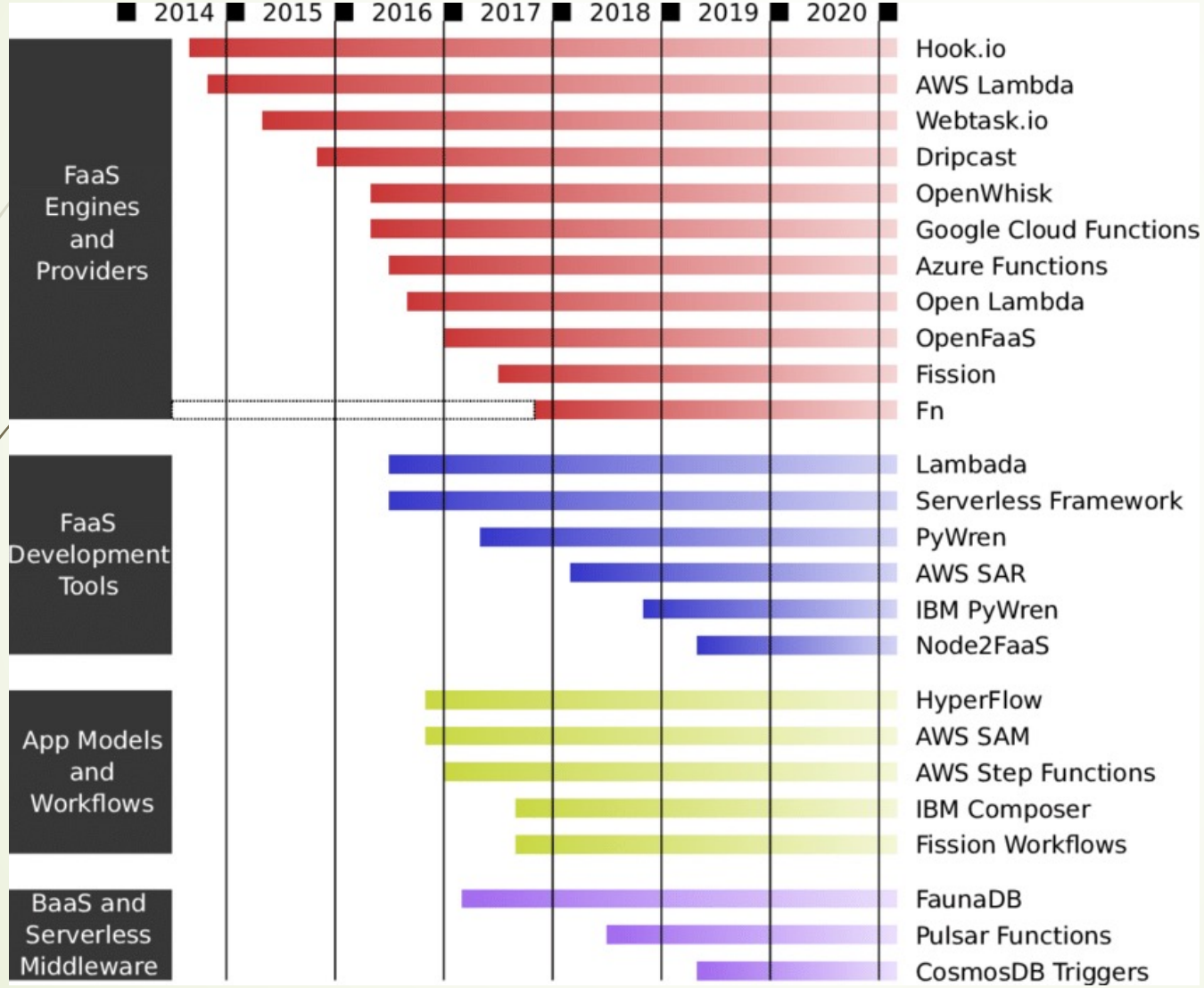
Use cases

- Multimedia Processing
- Database changes
- IoT sensor input messages
- Large-scale data stream processing
- Chat bots
- Batch jobs & scheduled tasks
- HTTP REST APIs and web apps
- Mobile back-ends
- Business logic
- Continuous integration pipeline

Serverless providers

- Commercial providers
  - AWS Lambda
  - Azure Functions
  - Google cloud functions
  - IBM Cloud Functions
- Open-source providers
  - OpenFaaS
  - OpenWhisk
  - Fission
  - Kubeless
  - Knative

Growth of serverless ecosystem



Conclusion

- What we have learnt
  - Evolution of Cloud computing
  - Fundamentals of Serverless computing
  - Serverless providers
- What to expect next week
  - Open-source serverless platforms
  - Serverless web application on OpenFaaS demo
  - Create and deploy a sample function using OpenFaaS platform

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