Cloud Computing Trends

Foreword

- Cloud computing has become the foundation of a range of important applications. At the same time, other technologies are also driving the further advancement of cloud computing. This chapter focuses on the relationship between cloud computing and related fields, and introduces you to some of the new technologies related to cloud computing.

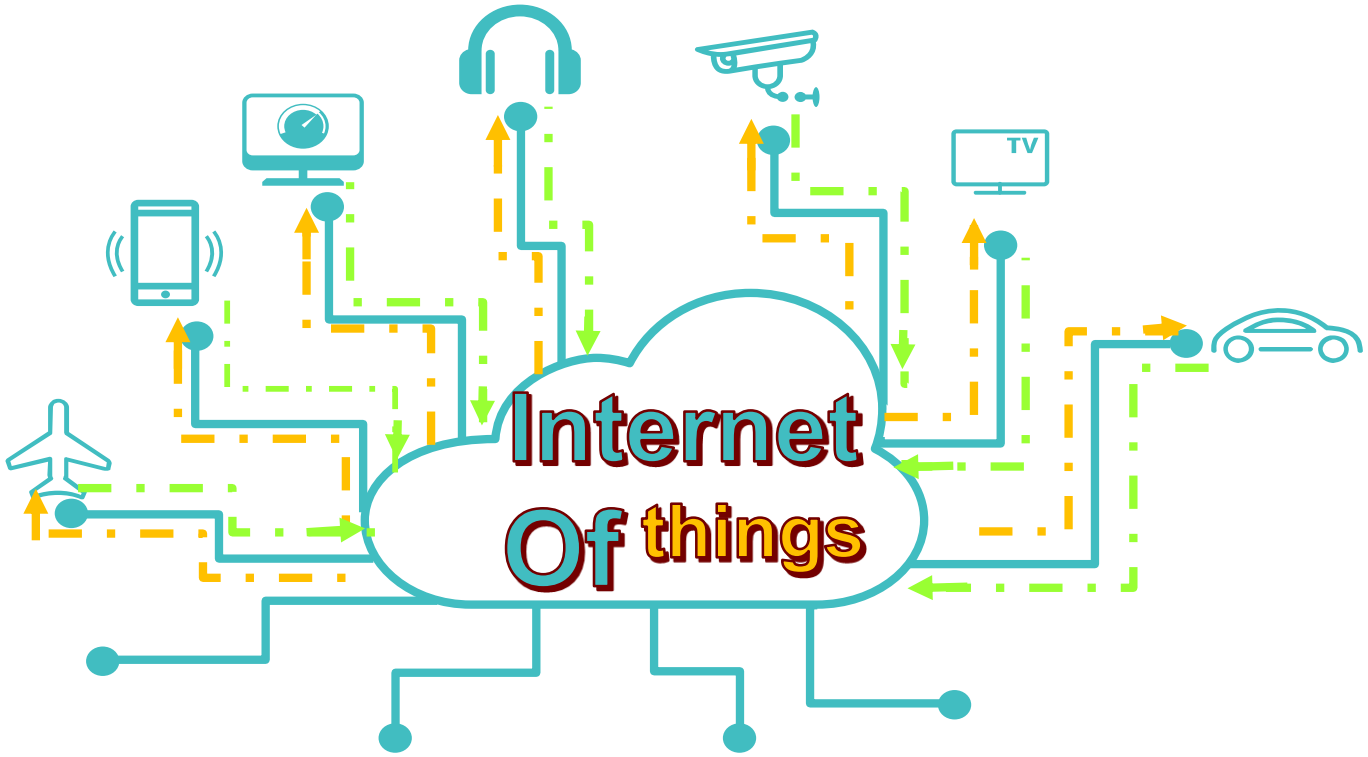
Objectives

- Upon completion of this course, you will:
  - Be able to describe key technologies that underpin cloud computing.
  - Understand the relationship between cloud computing and other fields.
  - Understand some of the most prominent cloud computing trends.

Contents

IoT

- The Internet of Things (IoT) is the concept of connecting everything through the Internet, including all sorts of communication and interaction: people-people, people-things, and things-things.



Main IoT Technologies

RFID

Sensors

Embedded Systems

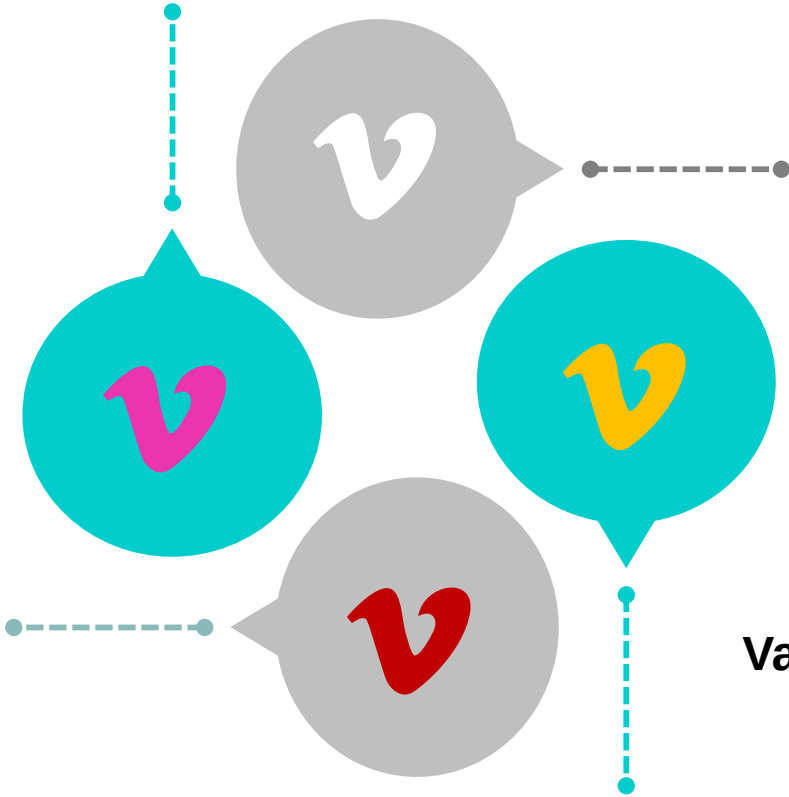
Big Data

- Big data refers to data sets that are too large or complex to be handled by traditional data-processing application software.
- Such data sets are generated by the IoT. Due to a radical increase in total IoT connections, ever more massive data sets will be generated.

Characteristics of Big Data

Volume: the amount of data

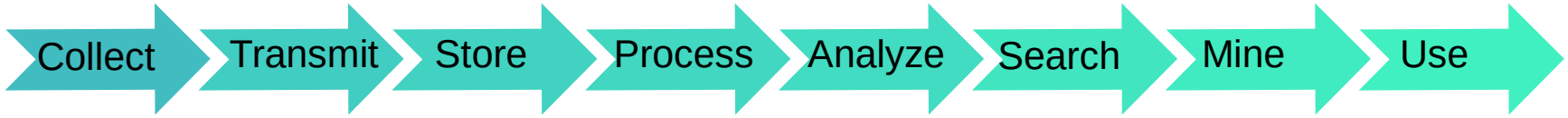
Variety: the different types of data

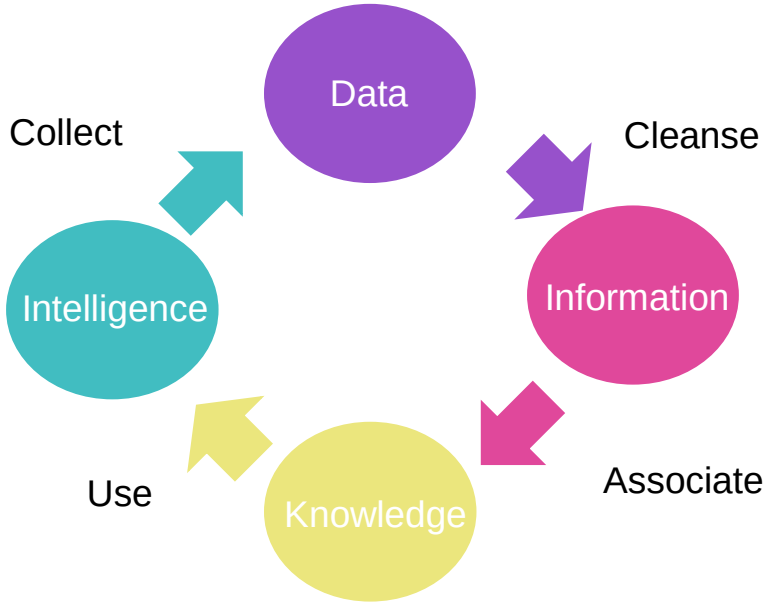


Velocity: the speed at which data is generated

Value: the value that can be extracted from data

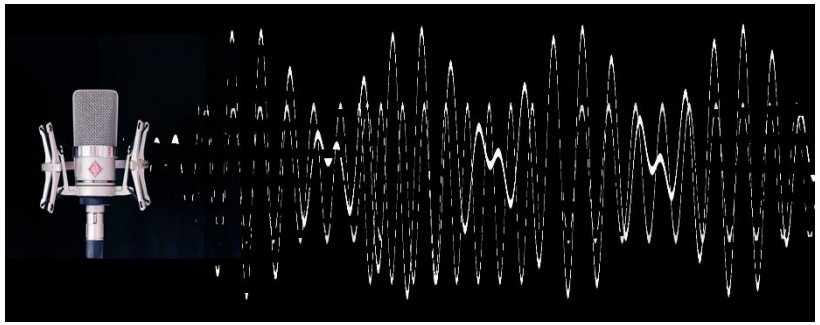
Big Data Processing





Artificial Intelligence

- Artificial intelligence (AI) is an area of computer science that focuses on the research into and development of theories, methodology, technology, and application systems for simulating and extending human intelligence with machines.
- Applications of AI include robotics, speech recognition, image recognition, natural language processing.



Elements of AI

- Big Data

Artificial intelligence is intelligence acquired and summarized by big data analytics.

- Computing Power

Computing power is a prerequisite for applying AI algorithms to extract value from massive data sets.

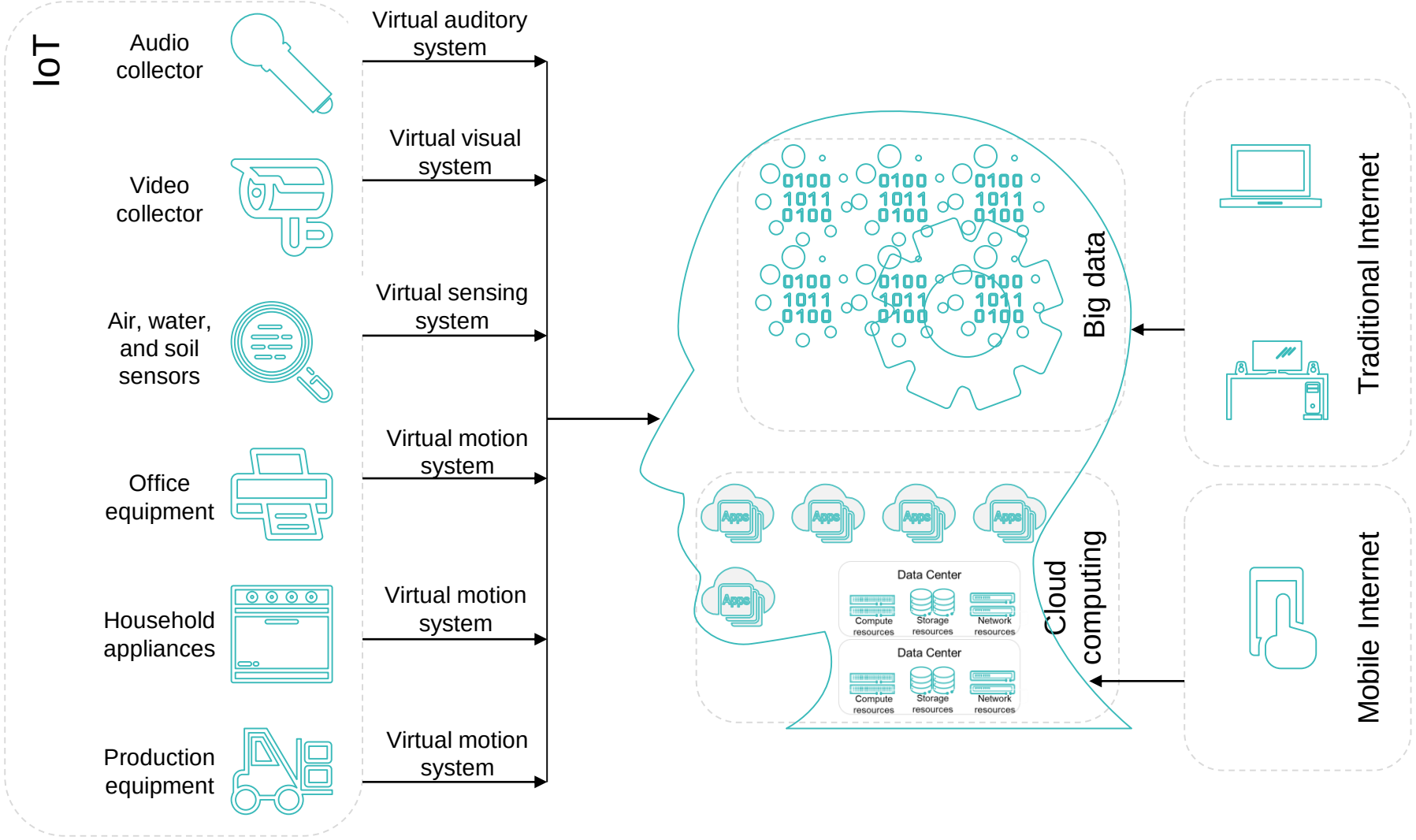
- Algorithms

Algorithms are the fundamental way by which AI is realized, and an effective method to extract data intelligence.

- Scenario

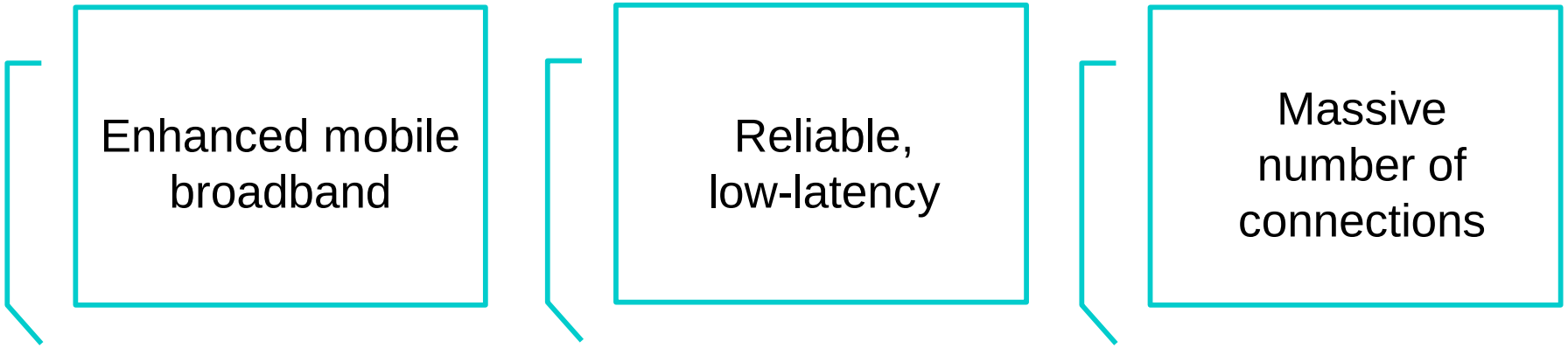
Big data, computing power, and algorithms are input that will create meaningful output only if applied to practical business scenarios.

Cloud Computing, IoT, & Big Data

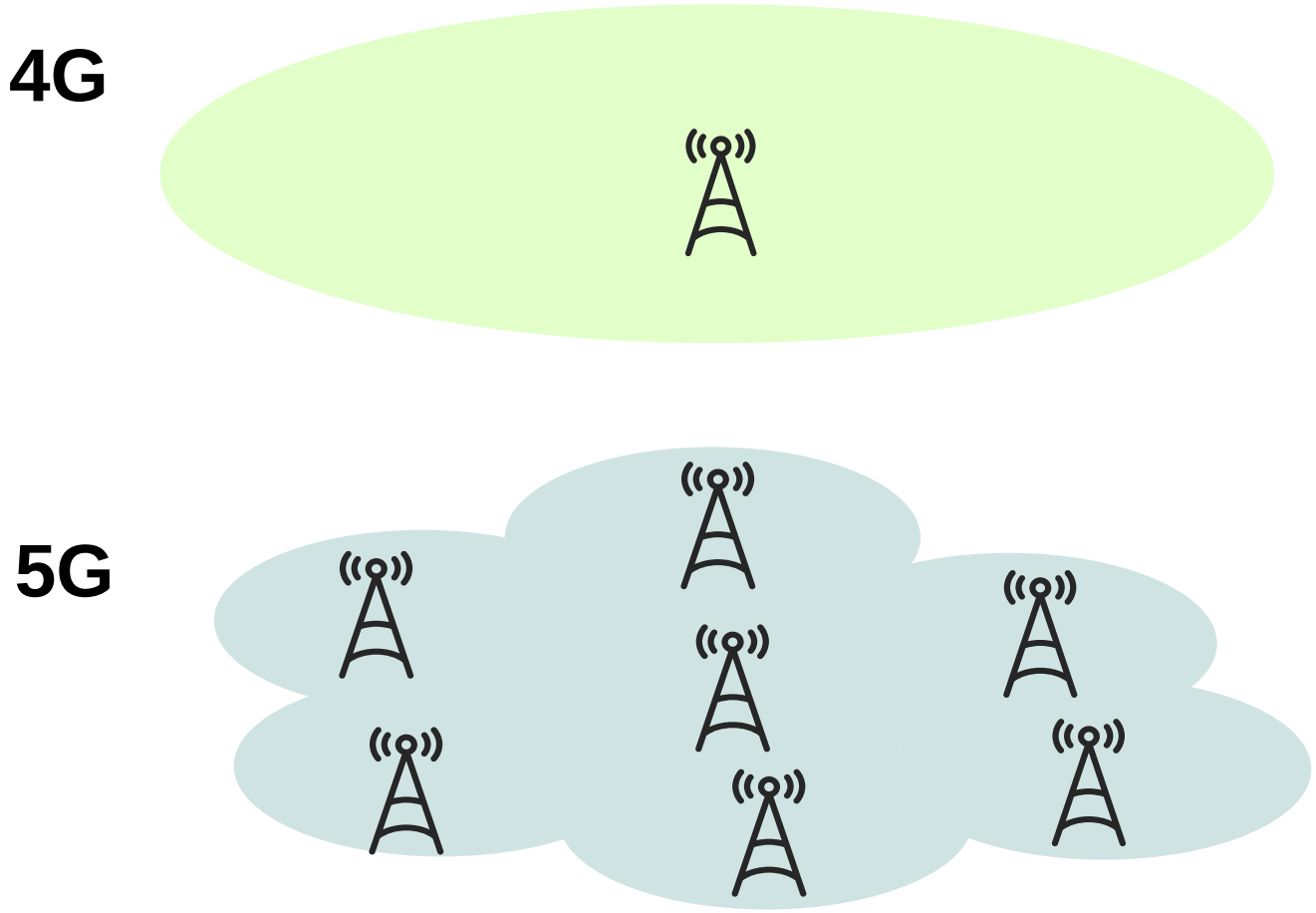


The 5G Era

- 5G refers to the 5th generation of mobile communications technologies and standards.



How 5G Works: Network Densification



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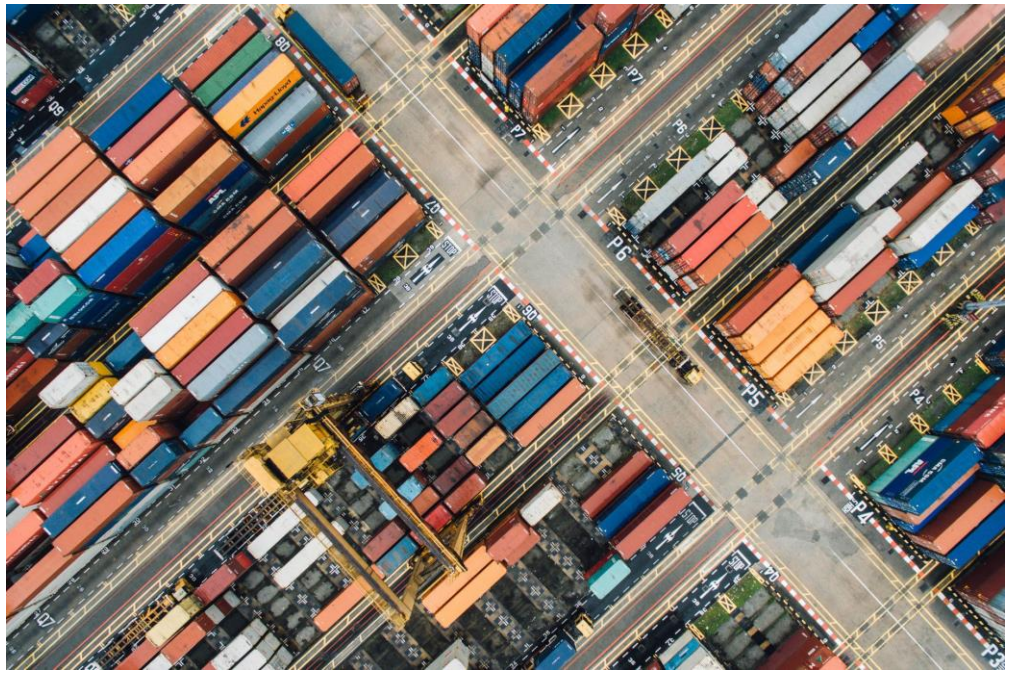
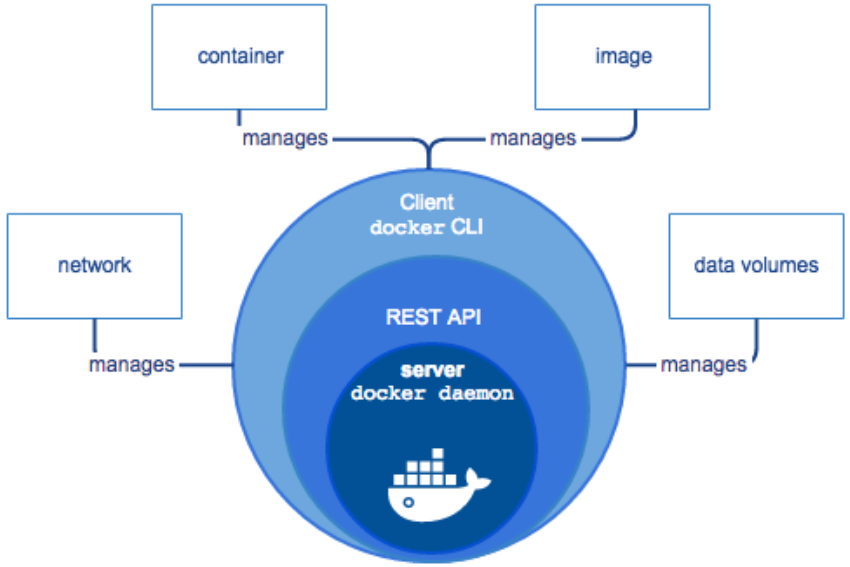
Containers

- Containerization is a lightweight virtualization technology that uses OS-level virtualization. Several containers (isolated user-space instances) can be created on each operating system, each of which is allocated only a subset of the computer's resources.

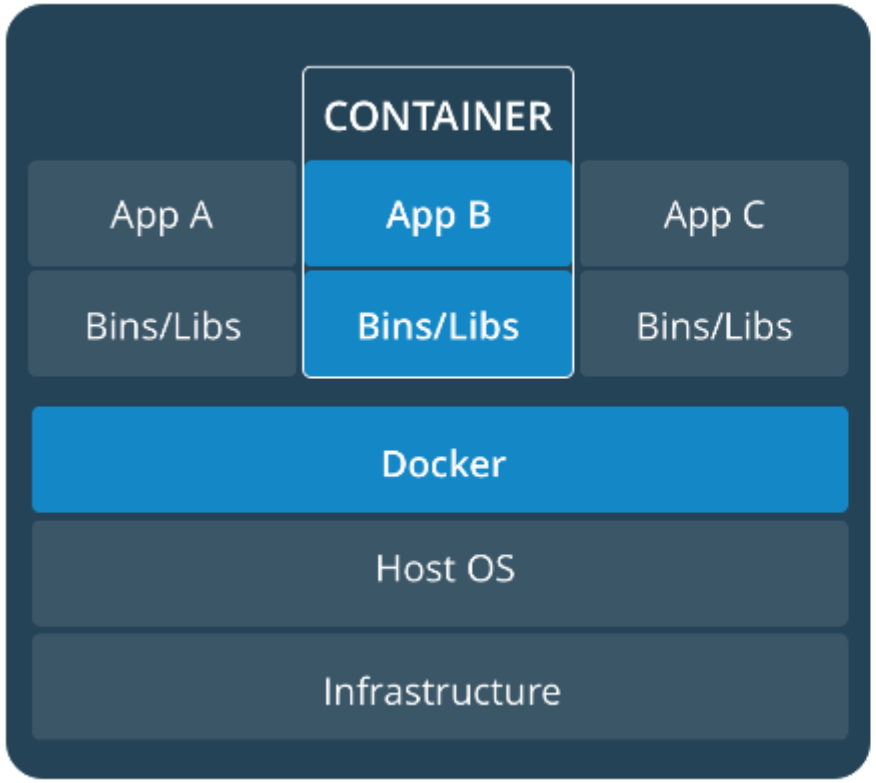


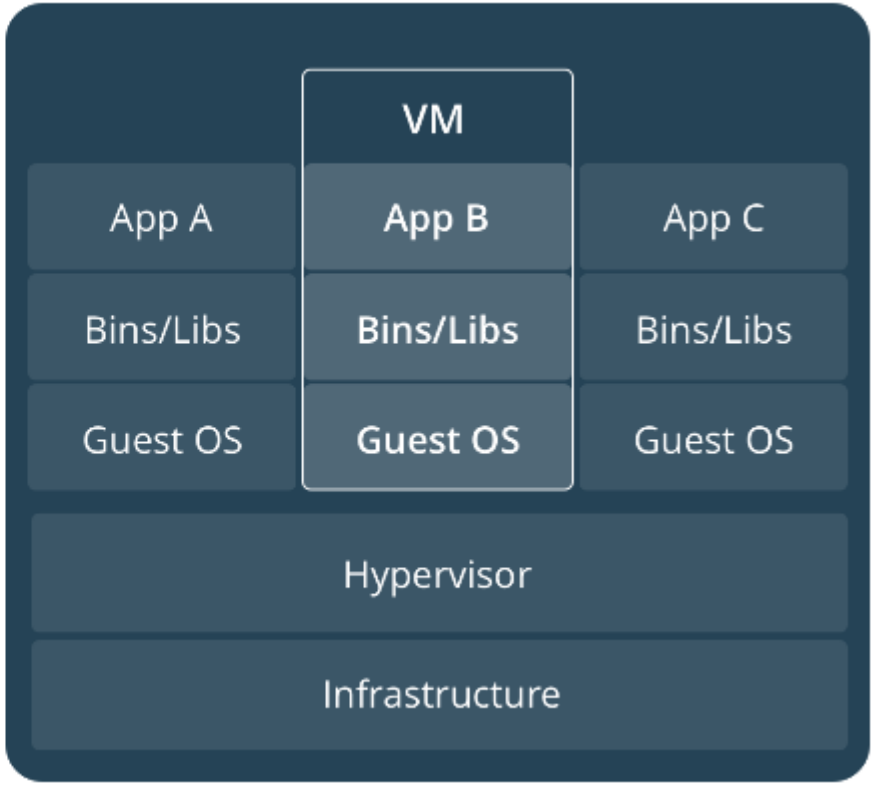
Docker

- Docker is an open source application container engine. It allows developers to pack their applications and dependency packages into a portable container, and later run them on any other Linux machine. The sandbox mechanism is used for containers, eliminating any interface between containers.

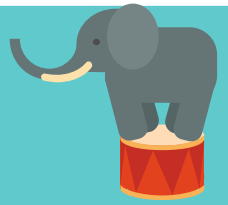
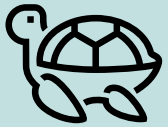


Docker Technology - Differences Between Containers and VMs (1)





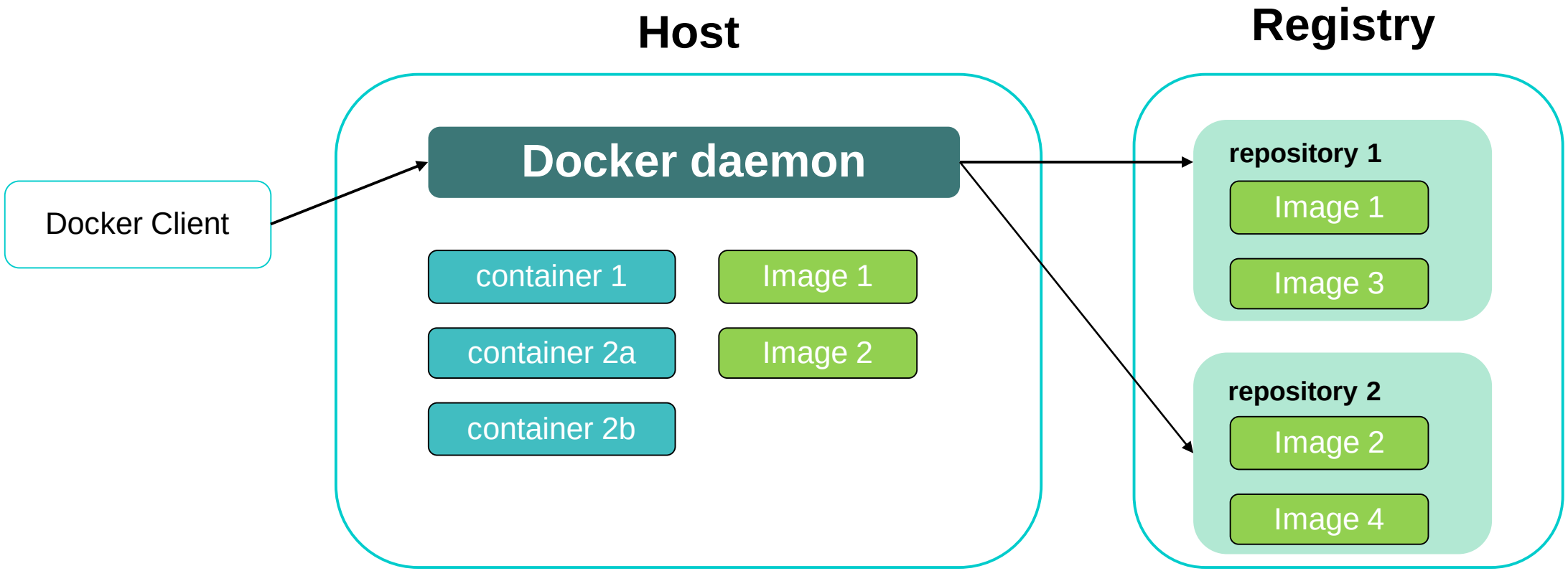
Docker Technology - Differences Between Containers and VMs (2)

Difference	VM	Docker
Size		
Boot speed		
Integration		

Docker Elements

- **Image**
  - A Docker image is a read-only template used to create Docker containers. Docker provides a simple mechanism to allow users to create images or update existing ones. Users can also download images created by others and use them without making any changes.
- **Container**
  - Docker uses containers to run applications. A container is a runtime instance of a docker image. A container can be started, started, stopped, and deleted. Each container is an isolated and secure platform.
- **Repository**
  - A repository is a set of Docker images. A Registry is a hosted service containing repositories of images. Each image has a unique tag.

Docker Architecture



OpenStack

- Began in 2010 as a joint project of Rackspace Hosting and NASA, OpenStack is a free open-source software platform for cloud computing. OpenStack requires contributions to be released under the Apache 2.0 license.

OpenStack is a free open-source software platform for cloud computing.

OpenStack Components

Nova **Compute**	**Swift** **Object Storage**	**Cinder** **Block Storage**
Neutron **Network**	**Keystone** **Authentication**	**Ceilometer** **Metering**
Glance **Image**	**Heat** **Orchestration**	**Horizon** **Dashboard (UI Console)**

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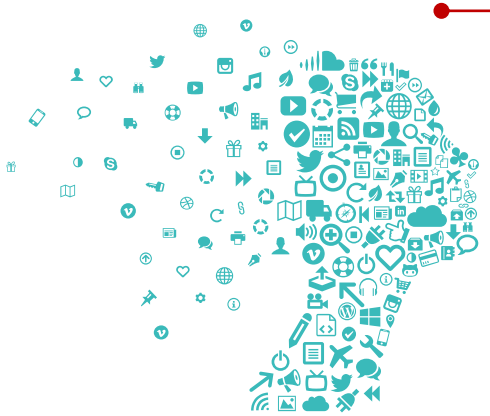
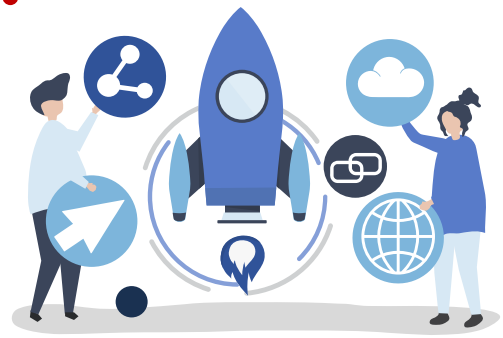
Cloud Computing Trends

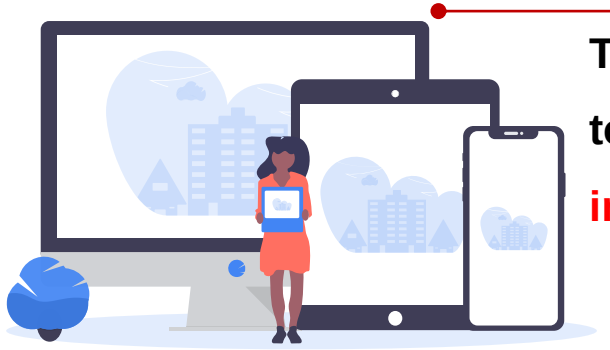
Cloud giants are **strengthening cooperation**, leading to a **more concentrated** market.



Cloud providers are using **more AI**.

Hybrid cloud and industry cloud are gaining momentum.





There is an emerging trend toward **cloud-device integration**.

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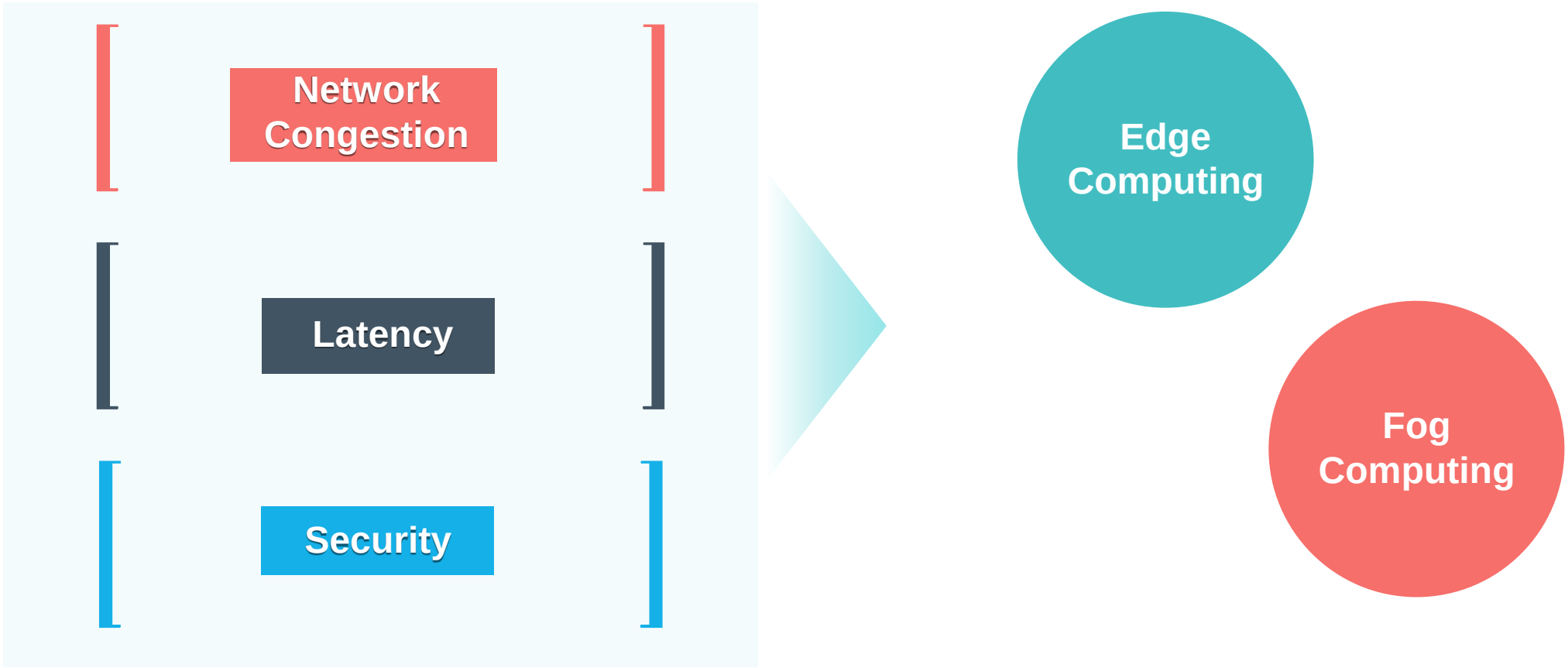
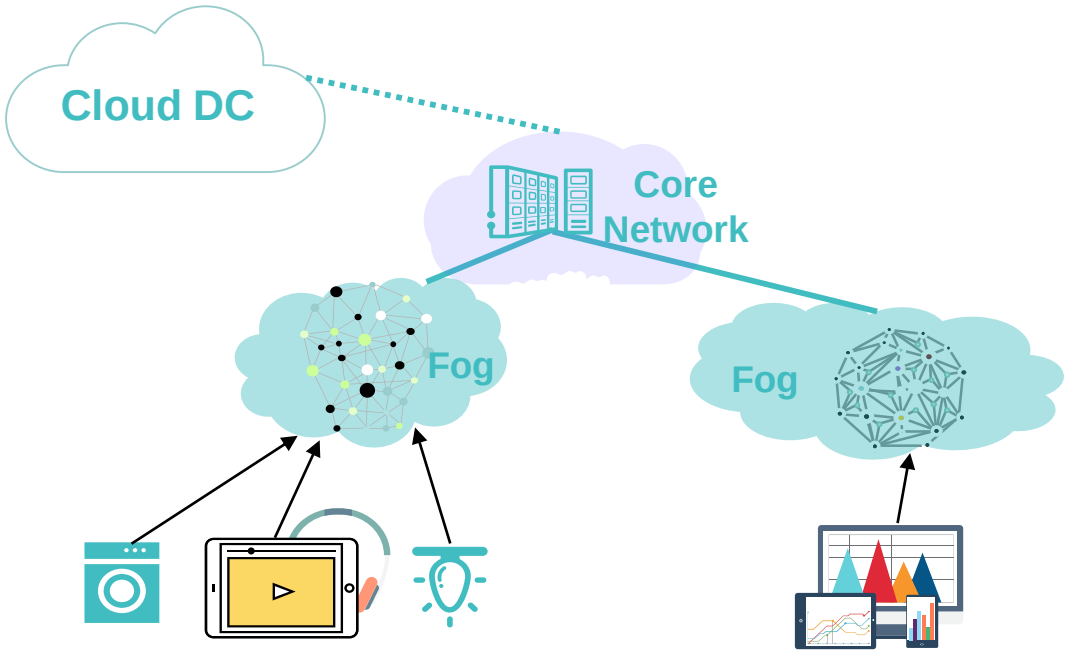
Cloud Computing Extensions



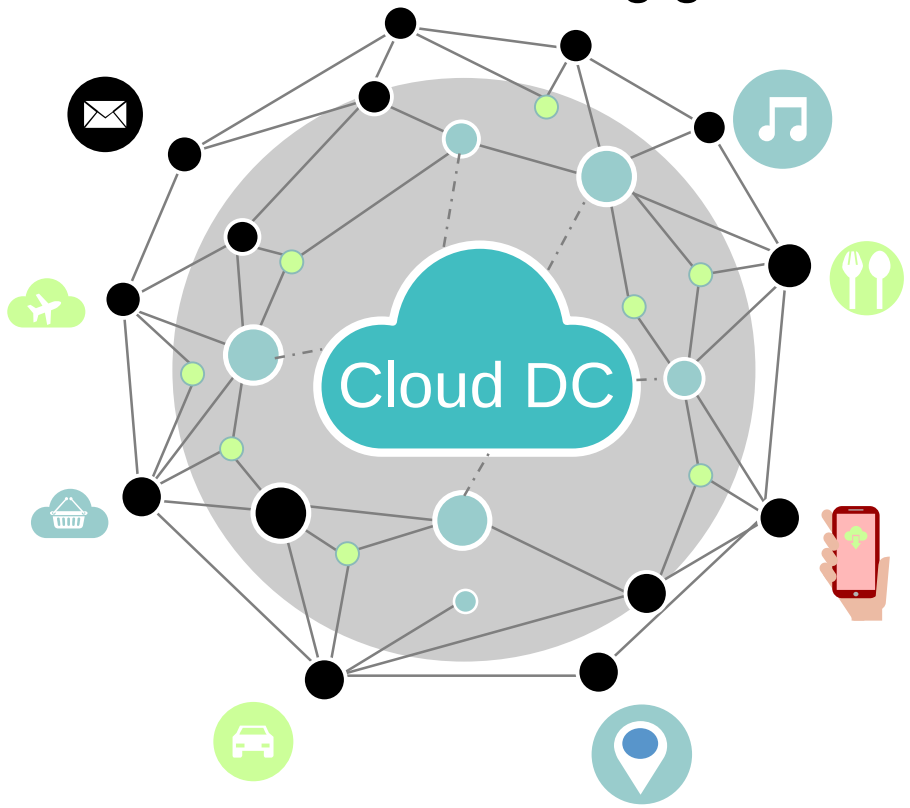
Fog Computing

- Fog computing is an extension of cloud computing services to the edge of the network to decrease latency and network congestion. Fog computing uses edge devices to carry out a substantial amount of computation, storage, and communication locally, instead of storing all data in cloud data centers.

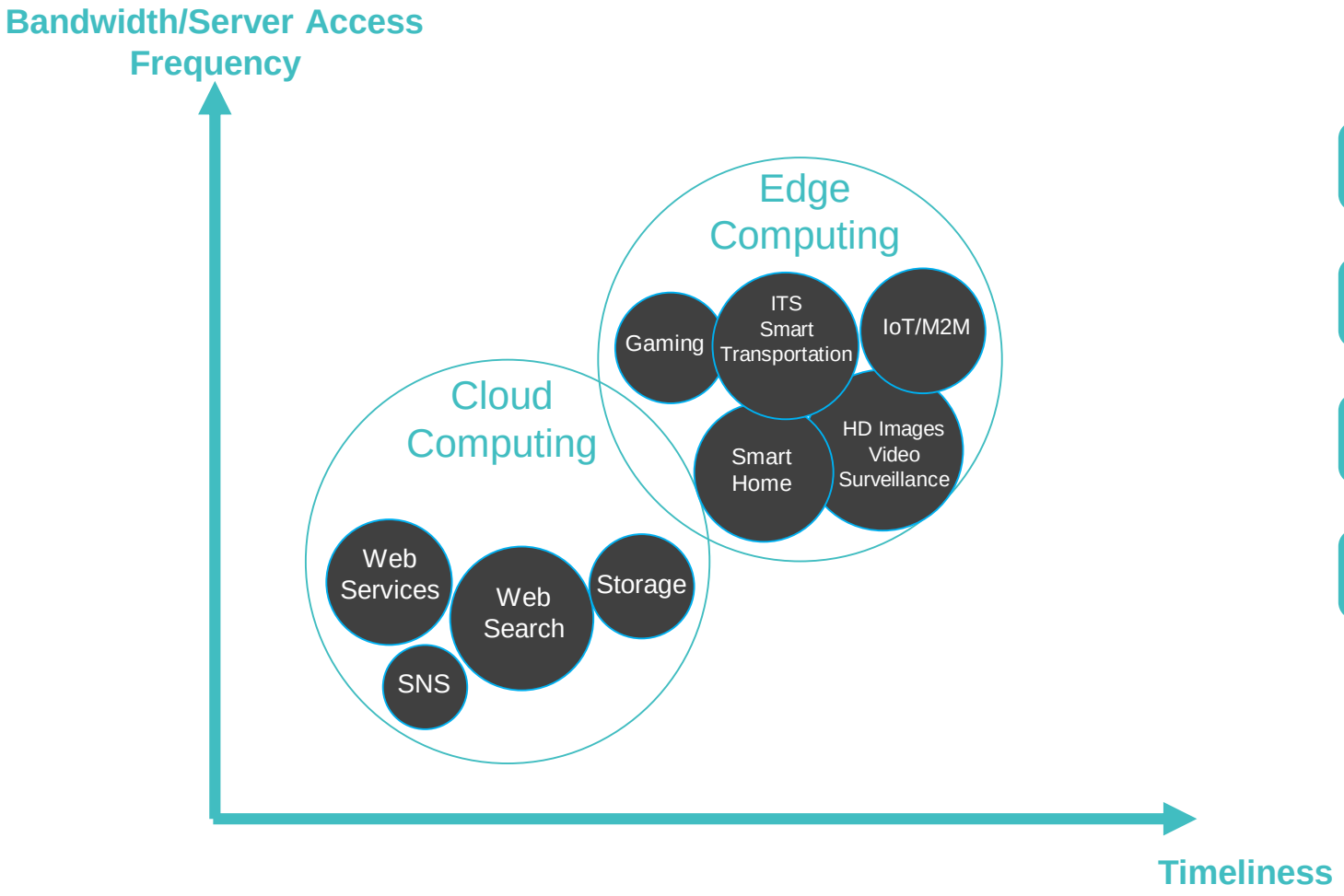


Edge Computing (1)

- Edge computing creates an open platform that integrates core capabilities including network, compute, storage, and applications at the edge of your network, to process data where it is being generated.



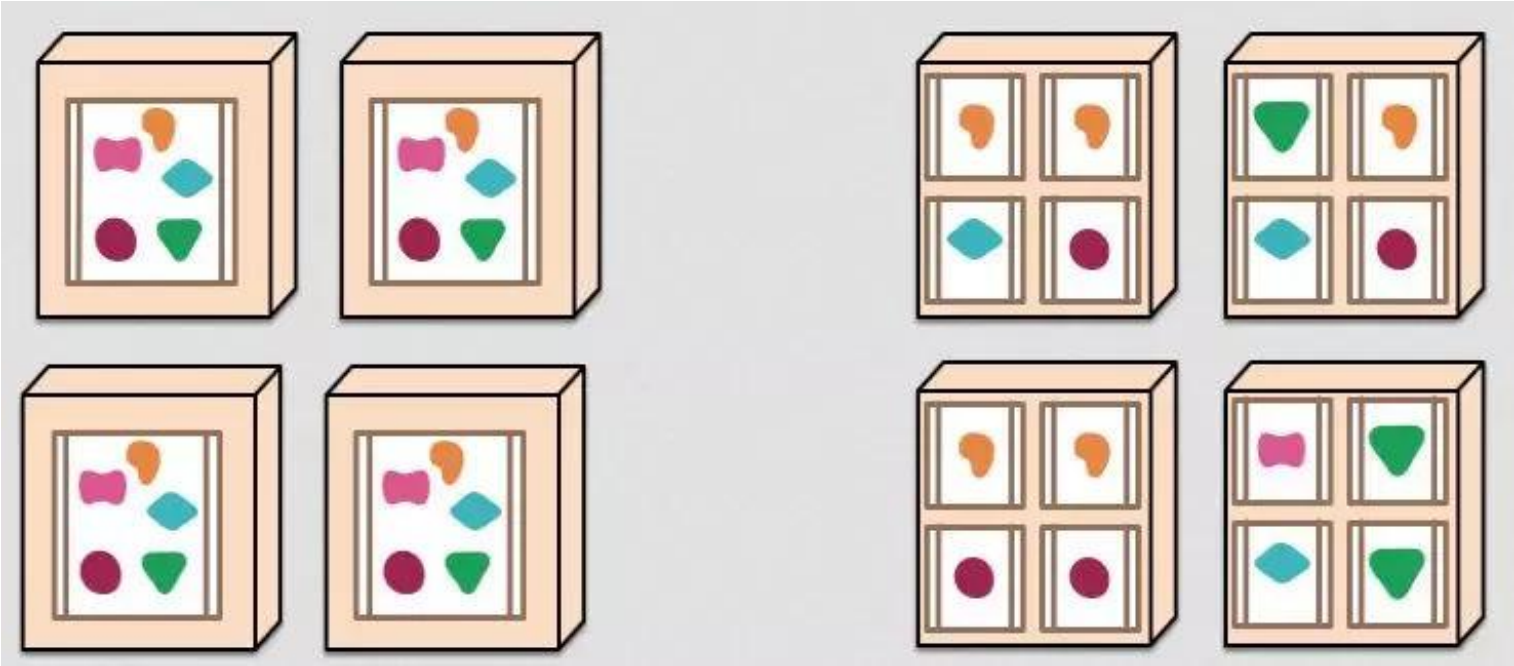
Edge Computing (2)



- **Low latency**
- **HD video, bandwidth-intensive**
- **Transmission network efficiency**
- **High-quality user experience**

Microservices

- Microservices are a software development technique that structures an application as a collection of loosely coupled, fine-grained services. In a microservices architecture, lightweight communication protocols are used, often HTTP resource APIs. The services are built around functionalities and deployed independently and in a fully automated manner. The need for centralized management is minimized. The services can be written in different languages and use different storage types.



Pros and Cons of Microservices

Pros

- Independent deployment, flexible scalability
- Effective resource isolation
- Optimized development teams

Cons

- **Complex development and testing process due to project splitting**
- **Difficulty of ensuring data consistency between services**

Serverless (1)

- Serverless computing is a model for building and managing microservices-based architectures. It allows you to manage your application deployment on a per-service level, rather than a per-server level.
  - **Function as a Service (FaaS)**: The service provider provides a platform where the developer develops, runs, and manages their applications without the need to build and maintain an infrastructure.
  - **Backend as a Service (BaaS)**: The service provider provides a serverless backend, also known as backend as a service for the mobile application developer. BaaS shifts backend functions including data/file storage, account management, data collection, operation analysis, message push, and social media integration to the cloud, allowing the developer to focus on their apps' frontend.

Serverless (2)

Previously

Build a framework that runs on a server to respond to multiple events.

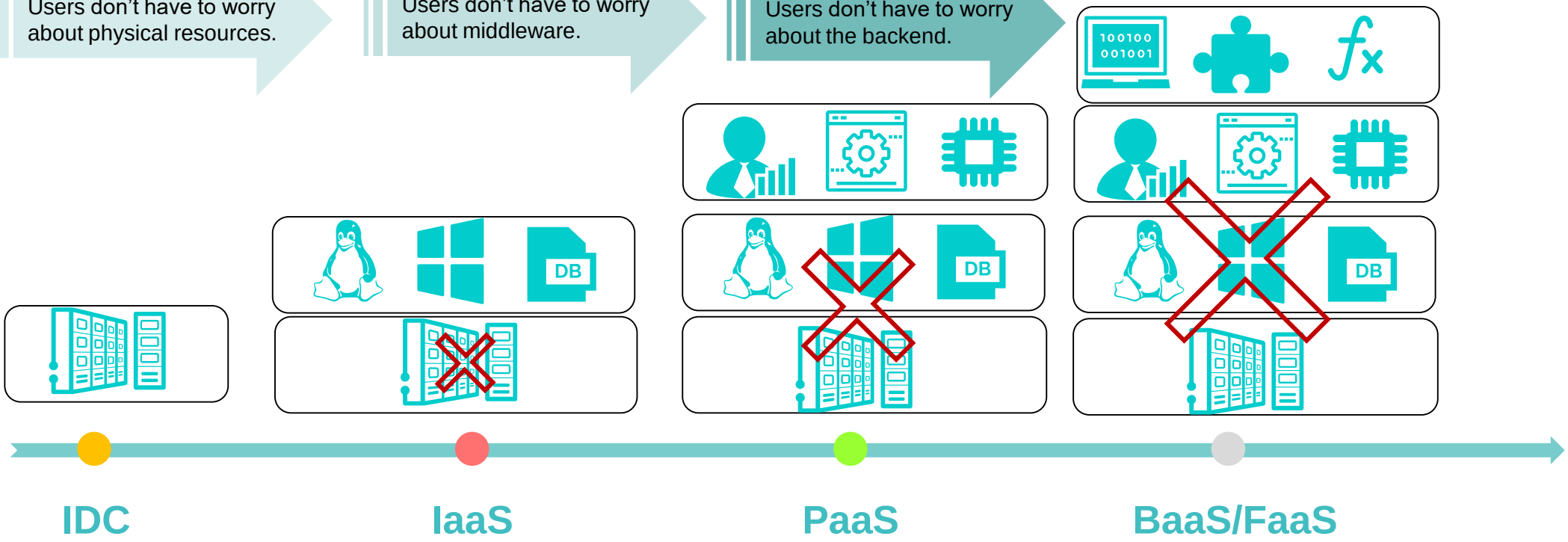
Now

Build or use a separate microservice or function to respond to each event.

Users don't have to worry about physical resources.

Users don't have to worry about middleware.

Users don't have to worry about the backend.



FaaS Characteristics

- No need for O&M
- Able to focus on the code
- Quick boot, short life cycle
- Infinite elasticity
- Automated

BaaS Benefits

Higher Efficiency

Reduces costs associated with mobile application development environments and improves efficiency.

Faster TTM

Allows developers to focus on their apps rather than backend functions, and reduces operational costs of apps after launching.

Reduce Resources Needed to Launch Apps

Fewer developers and IT resources are required.

Optimized for Mobile Phones and Tablets

BaaS providers have spent a considerable amount of time and resources on optimizing mobile application data and networks.

Secure and Elastic Infrastructure

BaaS provides bundled infrastructure services, relieving developers of the burden of ensuring elasticity, security, and performance.

A Full Collection of Common APIs

BaaS offers a full collection of commonly used third-party APIs, sparing developers the hassle of collecting these resources.

Quiz

1. Which of the following is not an element of artificial intelligence? ( )

   A. Big data

   B. Cognitive analysis capability

   C. Computing power

   D. Scenario

2. The only function of the Internet of Things is to collect the data generated by connected objects.

   A. True

   B. False

Summary

- Fields Related to Cloud Computing
- Cloud Computing Technologies
- Cloud Computing Trends
- Other Emerging Technologies

Recommendations

- Huawei e-Learning website
  - http://support.huawei.com/learning/Index!toTrainIndex
- Huawei Support case library
  - http://support.huawei.com/enterprise/servicecenter?lang=en
- HCIA-Cloud Computing v4.0 online forum
  - https://forum.huawei.com/enterprise/en/Huawei-Official-Communication-Channel-HCNA-Cloud-Certification-Course/thread/456287-911


Thank You
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