
Cloud and
Edge
Computing

Course Overview

Synopsis

An intensive half-day workshop introducing cloud and edge computing for smart factories, focusing on real-time processing, secure hybrid architectures, and seamless system integration to boost operational agility, enable predictive maintenance, and drive data-led decision-making.

Content & Procedure

Course Content:

- Exploring paradigm of Cloud computing
- Core concepts of edge computing and real-time data processing
- Comparative analysis: cloud vs. edge architectures
- Analyse security best practices for hybrid environments (Cloud + on-prem)

Course Procedure / Practical Exercises:

- Hands-on lab: deploying an edge-node gateway with data ingestion

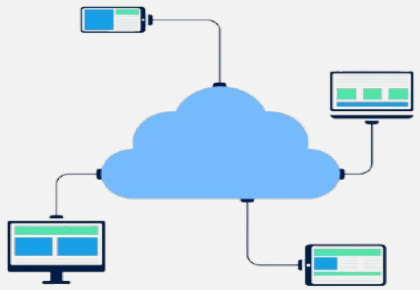
Tools Used: Amazon Web Services (AWS)

Activities Prior to Course: Pre-course

Learning Objectives

After the course, you will…

- Design and deploy basic edge-cloud integrated solutions
- Integrate production-line systems using standard APIs and middleware
- Apply security controls across both cloud and on-premise edge nodes



Operational & Logistical Info

- **Trainer:** [Name or TBD]
- **Duration:** Half Day
- **Cohort Size:** Max 20 Participants
- **Intended Audience**: Engineers, Technicians, and Industry Professionals, Recent Grads
- **Pre-requisites:** Fundamental to Computer System and Network
- **Level:** Basic
- **Location (if applicable):** Physical
- **Resources Needed:** Laptop with installed software, stable internet connection

Agenda

01 Introduction to Cloud Computing

02 Fundamentals of Edge Computing and Real-Time Processing

03 Key Differences Between Cloud and Edge Computing

04 Smart Manufacturing Use Cases for Cloud & Edge Solutions

05 Edge-Cloud Integration Strategies & Reference Architectures

06 Interfacing with ERP, MES and Other Digital Systems

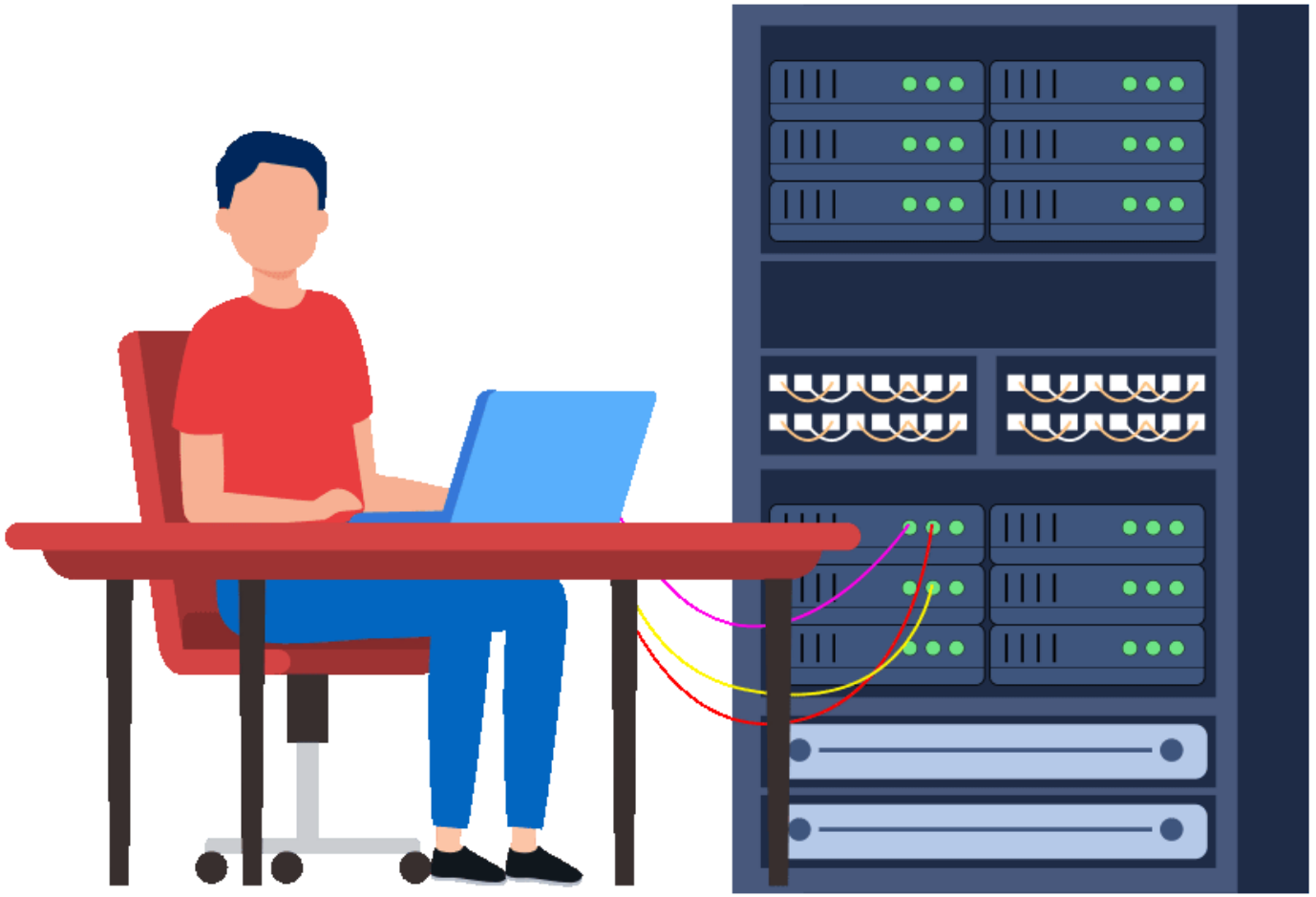
07 Security Considerations for Cloud & Edge Deployments

08 Hands-on Edge-Cloud Deployment & Integration Exercises

Introduction to Cloud Computing

Topics Covered:

1. What is Cloud Computing ?
2. Cloud Deployment Models
3. Cloud Service Models
4. Cloud Computing: Applications in Manufacturing
5. Case Study



What is Cloud Computing?

Jamie's Computer

4 Cores / 8 GB / 500 GB

Requirement for new software

32 Cores / 64 GB / 1 TB

Option 1: Buy a new computer

Challenges: High upfront cost; Need for maintenance & upgrades

Benefits: Full control over infra; Works w/o internet

On-prem

Option 2: Use remote compute

BlueCloud – an over the internet compute provider

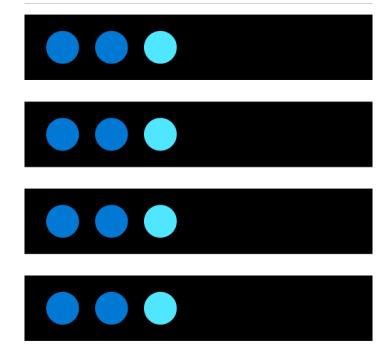
Challenges: Requires stable internet connection

Benefits: pay-as-you-go; Instantly scalable

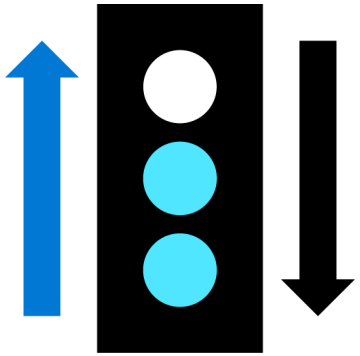
Cloud

What is Cloud Computing?

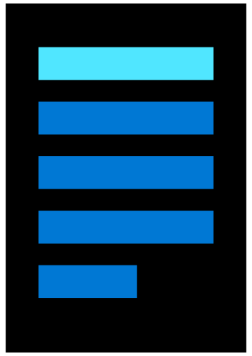
- Cloud computing means delivering IT resources—like servers, storage, and databases—over the internet on demand.
- Instead of buying and maintaining physical servers, organizations rent resources from cloud providers like AWS, Microsoft Azure, or Google Cloud.



Compute



Networking



Storage

Cloud Computing: Core Characteristics

On-demand self-service

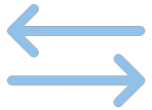
Provision computing resources as needed without human interaction with the provider.

Broad network access

Services available over the network via standard platforms (e.g., mobile, laptop, workstations).

Resource pooling

Provider resources are pooled to serve multiple customers dynamically.



Rapid elasticity

Capabilities can be elastically provisioned and released to scale outward/inward.

Measured service

Usage is monitored, controlled, and reported, ensuring transparency.

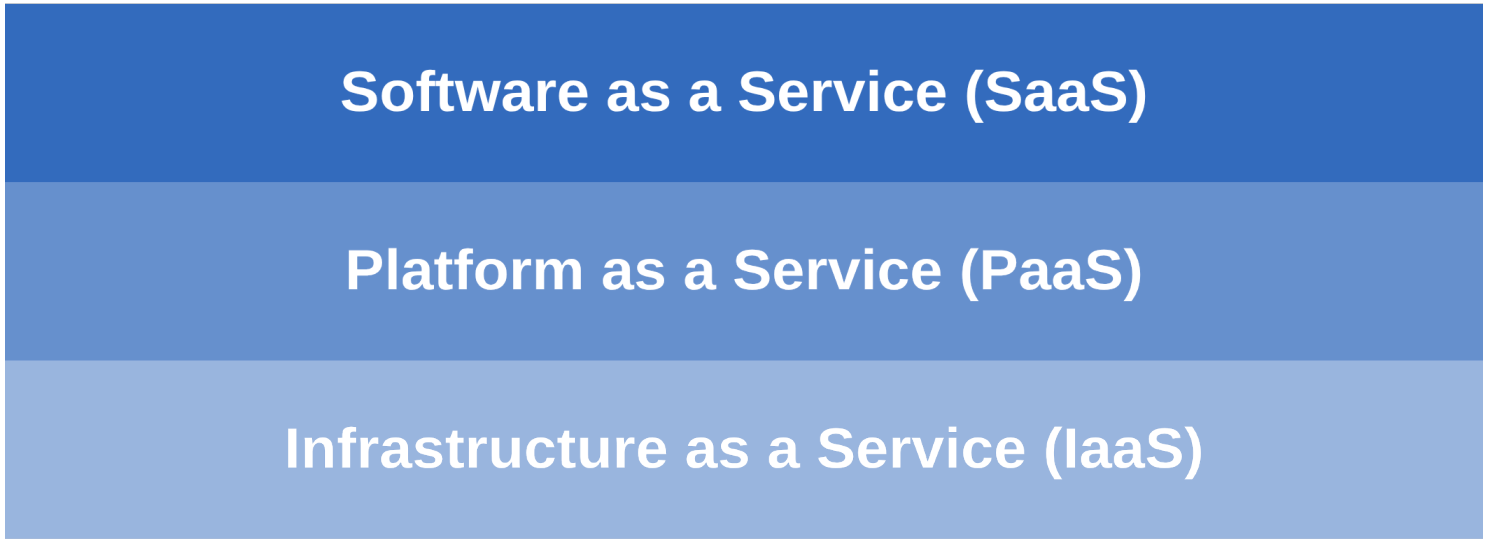
Cloud Computing: Core Services

	Service Category	Description
Core Components	**Compute**	Virtual machines, containers, serverless platforms for running workloads
	Storage	Object, file, and block storage options for persistent data
	Networking	Virtual networks, load balancers, DNS, VPN, and CDNs
	Databases	Managed SQL, NoSQL, and in-memory databases
Security & Ops	**Security & Identity**	IAM, encryption, firewalls, key management, compliance tools
	Monitoring & Logging	Observability tools, metrics collection, and log analysis
	DevOps & CI/CD	Code pipelines, infrastructure as code, monitoring integrations
New Tech	**AI/ML**	Managed ML platforms, pre-trained models, data science tools
	IoT & Edge	Tools for managing and collecting data from IoT devices

Cloud Deployment Models

Model	Description	Example Use Case
Public Cloud	Services offered over the public internet by third-party providers (e.g., AWS, Azure).	Storing machine sensor logs from a factory in Amazon S3.
Private Cloud	Exclusive use by a single organization, managed internally or by a vendor.	Running a confidential design simulation on internal servers.
Hybrid Cloud	Mix of public and private clouds for flexibility and control.	Using private cloud for ERP and public cloud for backup storage.

Cloud Service Models



Cloud Service Models: IaaS

Infrastructure as a Service

- IaaS provides remote computing resources over the internet.
- The provider manages the physical infrastructure (servers, storage, networking) while the customer controls operating systems, applications, and configurations.

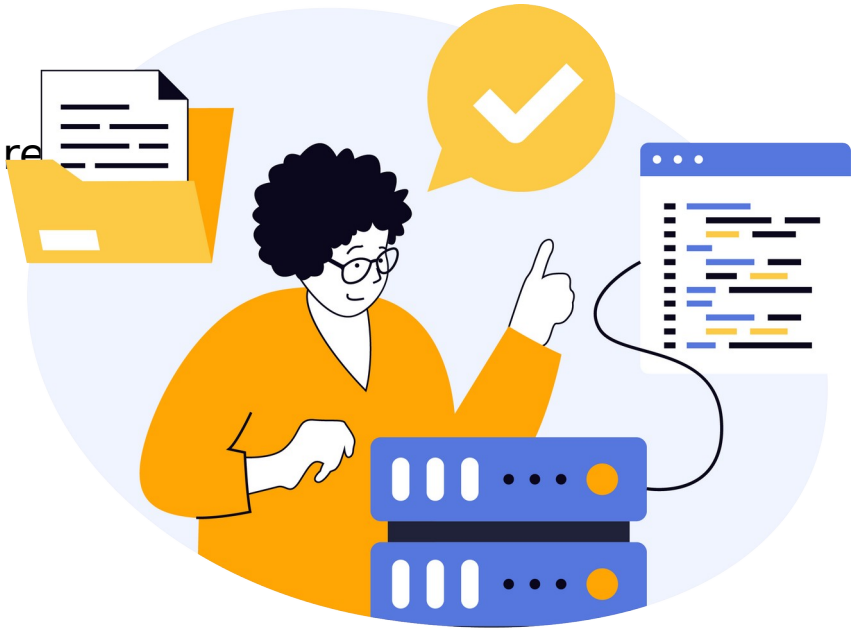
Example Services

- AWS EC2
- Google Cloud Compute Engine
- Azure VMs

Cloud Service Models: PaaS

Platform as a Service

- PaaS offers a complete development platform where customers can create, deploy, and manage applications without focusing on infrastructure complexities.
- The provider takes care of hardware, operating systems, and middleware, letting customers concentrate solely on building their applications.



Example Services

- AWS Beanstalk
- Google Cloud App Engine
- Azure App Service

Cloud Service Models: SaaS

Software as a Service

- SaaS offers remote software/applications services basis on subscription.
- The provider manages everything: infrastructure, platform, and application.
- Users simply access the software via a web browser, without needing to install, maintain, or upgrade anything.

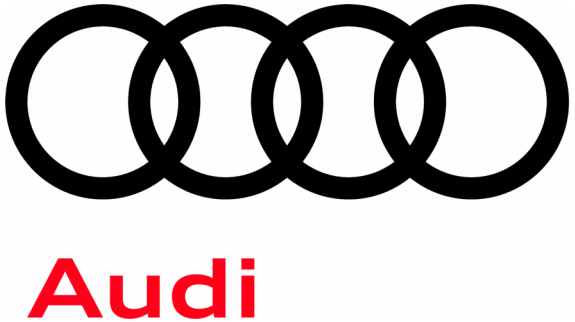
Example Services

- Microsoft 365
- Google Workspace
- AWS Supply Chain

Cloud Service Models: Comparison

Model	What It Offers	Example (Manufacturing)
IaaS (Infrastructure as a Service)	Raw computing resources like virtual machines and storage.	Hosting SCADA system backups.
PaaS (Platform as a Service)	Development platform and environment in the cloud.	Deploying predictive maintenance ML models.
SaaS (Software as a Service)	Fully managed software accessible via web.	Using Salesforce for vendor communication.

Case Study
Audi on AWS



Challenge

- Audi’s online car configurator ran as a monolithic app on-premises, requiring overprovisioned servers to handle traffic spikes.
- Deploying new environments in-house took days to weeks.

Solution

- Migrated to AWS EC2, automated provisioning via Terraform
- Adopted Kubernetes with containers, enabling blue/green and microservices deployments
- Deployed Karpenter to auto-scale multi-architecture EC2 instances, including Graviton-based workloads

Reference: https://aws.amazon.com/solutions/case-studies/audi-efficient-compute-case-study/

Case Study
Audi on AWS

Challenge

- Audi’s online car configurator ran as a monolithic app on-premises, requiring overprovisioned servers to handle traffic spikes.
- Deploying new environments in-house took days to weeks.

Reference: https://aws.amazon.com/solutions/case-studies/audi-efficient-compute-case-study/

Audi

AWS Services Used

- **Amazon EC2** (including Graviton processors)
- **Terraform** & **AWS CloudFormation** (IaC tools)
- **Amazon EKS** + **Karpenter** (container orchestration & node scaling)

Outcomes

- **⬇ 63% compute cost savings** by using Graviton, Spot, Reserved, and On-Demand instances
- **20% faster startup times**, improving responsiveness globally

Thank you

Lorem ipsum dolor sit:

Name
Position

Email: lorem.ipsum@tuvsud.com
Phone: +XX XXX XXXXXX

Follow us on:

tuvsud.com
info@tuvsud.com