PA200
Overview of contemporary public cloud providers

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Outline

1. Introduction to Public Cloud
2. Compute Services
3. Storage Services
4. Monitoring of applications
5. Other Services

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Cloud definition

„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.“

- National Institute of Standards and Technology

Key features of the cloud

- On-demand self service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

Service Models

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)

Deployment Models

- Public cloud
- Private cloud
- Hybrid cloud

Contemporary Cloud Providers

Amazon Web Services

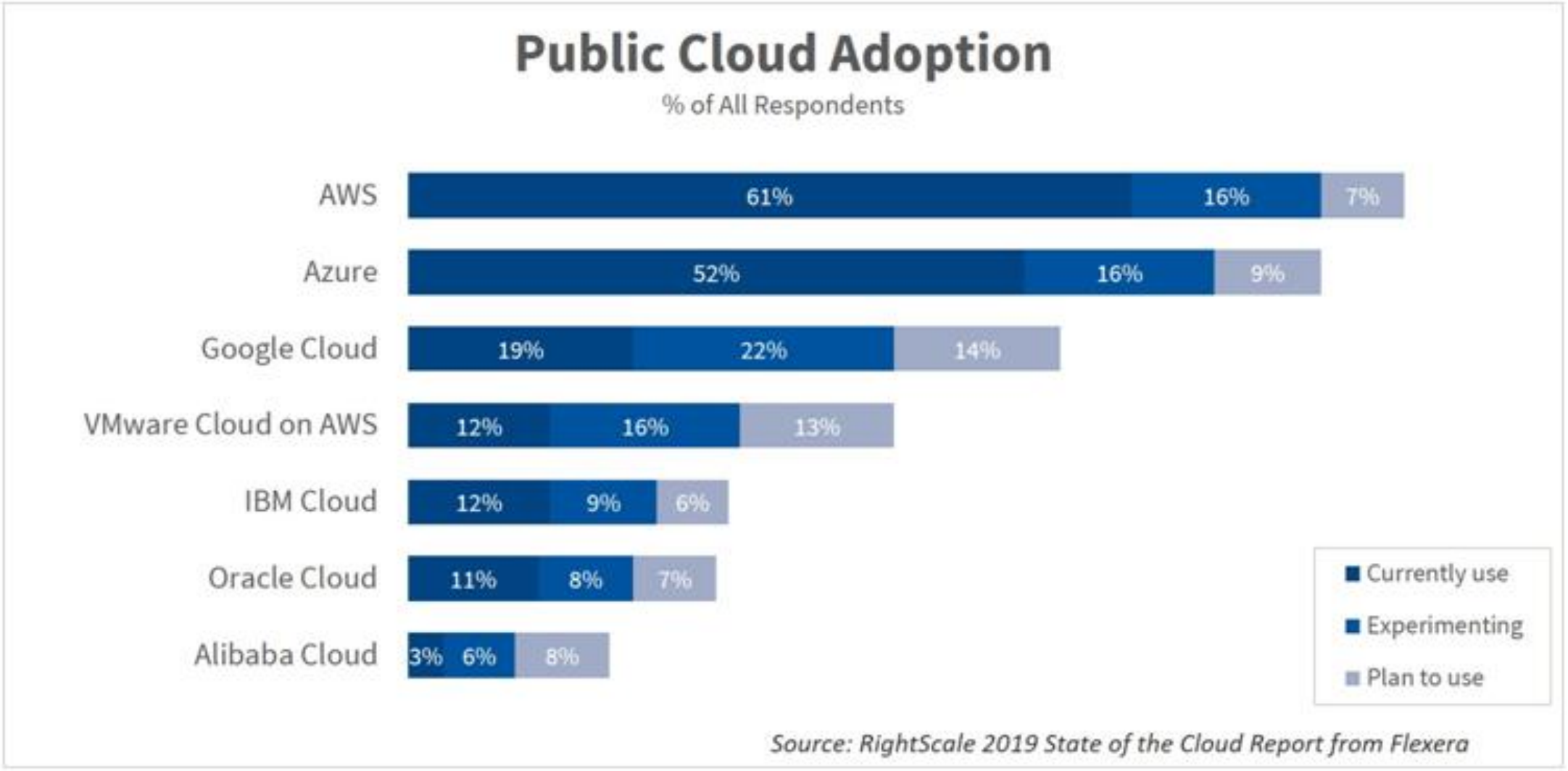
Microsoft Azure

Google Cloud

Oracle Cloud

IBM Cloud

Public Cloud Adoption



Amazon Web Services (AWS)

- Launched in July 2002 (major redesign in 2006)
- Initially Amazon was providing access to spare compute capacity in their datacenters hosting their e-commerce systems
  - Their goal was to have a fully automated management of all resources
  - Their E-commerce solution was later redesigned to be hosted in AWS

- **Offers over 100 services** (IaaS, PaaS and SaaS)
- 22 geographic regions

- You can start using **AWS Free Tier**

Microsoft Azure

- Launched in February 2010
- Public cloud provided by Microsoft
- Flagship of Microsoft products and services
  - Very intensive development of provided services with a goal to become leader in cloud industry
  - Offers 58 regions worldwide (https://azure.microsoft.com/en-us/regions/)
- **Offers over 100 services** (IaaS, PaaS and SaaS)
  - Great tooling support for developers (not only Microsoft/.NET developers)

- You can start using **Azure for Students**
  - https://azure.microsoft.com/students

Google Cloud

- Launched in April 2008
- Google Cloud unites all Google Cloud Services
  - Google Cloud Platform is a public cloud provided by Google
- 22 geographic regions
- **Offers over 100 services** (IaaS, PaaS and SaaS)

- You can start using **Google Cloud Platform Free Tier**
  - https://cloud.google.com/free

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Virtual Machines (IaaS)

- IaaS service which allocates a virtual machine in cloud provider's datacenter
- Provides a full access to a virtual machine with Windows or Linux OS preinstalled
- **It is important to select type of VM based in application's requirements**
  - Different ratio CPU/RAM, performance of storage, GPU availability
  - General Purpose / Compute / Memory / Storage Optimized
- Services:
  - Azure Virtual Machine + Azure Storage Managed Disk
  - Amazon Elastic Compute Cloud (Amazon EC2) + Amazon Elastic Block Store (EBS)
  - Google Compute Engine + Google Persistent Disk

Managed application hosting (PaaS)

- Web/application servers managed by the cloud provider (PaaS)
- Developer selects required runtime (.NET, PHP, Java, NodeJS, etc.) and then deploys its application using supported deployment method
  - Common support for Continuous Integration and Deployment
- Support for vertical and horizontal scalability (autoscale)
- Services:
  - Azure App Service
  - AWS Elastic Beanstalk
  - Google App Engine

Managed Containers (PaaS)

- Cloud provier provisions and manages compute infrastructure for deployment and operations of applications in containers
- Developer creates a Docker container with application and stores it in a container registry
- The service downloads the application container and runs it
- Services:
  - Azure Container Instances, Azure Kubernetes Service
  - Amazon Elastic Container Service, Amazon Elastic Kubernetes Service
  - Google Cloud Run

Serverless Computing (PaaS/FaaS)

- **Function as a Service (FaaS)** is a new trend, when developers deploy not applications but functions (methods with code) that are triggered based in selected trigger
- The function is automatically hosted and also scaled
- Commonly billed based on consumed CPU time and memory
- Supported triggers: HTTP call, time, message in queue, new file
- Services:
  - Azure Functions
  - AWS Lambda
  - Google Cloud Functions

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Object / Blob storage (PaaS)

- Highly scalable object/blob storage service
- Commonly used as a primary storage service for data
- Supported types of data
  - Files (blobs) with block or random access, Data Lakes
  - Messages in a queue
  - Records in a table (key-value storage, no SQL access)
- Services:
  - Azure Storage
  - Amazon Simple Storage Service (Amazon S3), Amazon Simple Queue Service
  - Google Cloud Storage

Relational database (PaaS)

- Relational database engine hosted as a service (fully managed by the cloud provider offering high availability, managed backups, etc.)
- Commonly used database engines are offered as a service by cloud providers
- New database services are built by the cloud providers to achieve high scalability
- Services:
  - Azure SQL Database (Microsoft SQL Server, PostgreSQL, MySQL, MariaDB)
  - Amazon RDS, Amazon Aurora
  - Google Cloud SQL

NoSQL database

- Various NoSQL databases provided as a managed service (PaaS):
  - Document Database (Mongo DB)
  - Column-family (Apache Cassandra)
  - Key-value (Redis)
  - Graph (Gremlin)

- Services:
  - Azure CosmosDB, Azure Storage, Azure Cache for Redis
  - Amazon DynamoDB, Amazon DocumentDB, Amazon Neptune, Amazon Timestream, Amazon Managed Apache Cassandra Service
  - Google Cloud Bigtable, Google Cloud Firestore, Google Memorystore

Big Data analytics

- Data are stored in Data Lakes (eg. CSV files, NoSQL databases)
- Analytical Services can connect to these data lakes and run analytical queries, computations and machine learning
  - Apache Hadoop, Apache Spark

- Services:
  - Azure Storage, Azure Synapse Analytics, Azure Databricks
  - Amazon S3, Amazon Athena, Amazon EMR
  - Google Cloud Storage, Google Cloud Bigtable, Google BigQuery, Google Cloud Dataproc

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Monitoring of applications

- Cloud applications should be actively monitored not just by basic tools that are part of the hosting service
- Additional services can be used for collection of exceptions, outages and their intelligent analytics
- Services:
  - Azure Application Insights
  - Amazon CloudWatch
  - Google Cloud Logging / Monitoring / Trace / Profiler…

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Artificial Intelligence

- Services providing a simple API to access advanced AI models and services to:
  - Analyze images
  - Analyze texts
  - Analyze anomalies

- Services:
  - Azure Cognitive Services
  - Amazon ML Services, Amazon AI Services
  - Google AI Hub, Vision AI, Video AI, Natural Language, Translation, AutoML

Questions

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