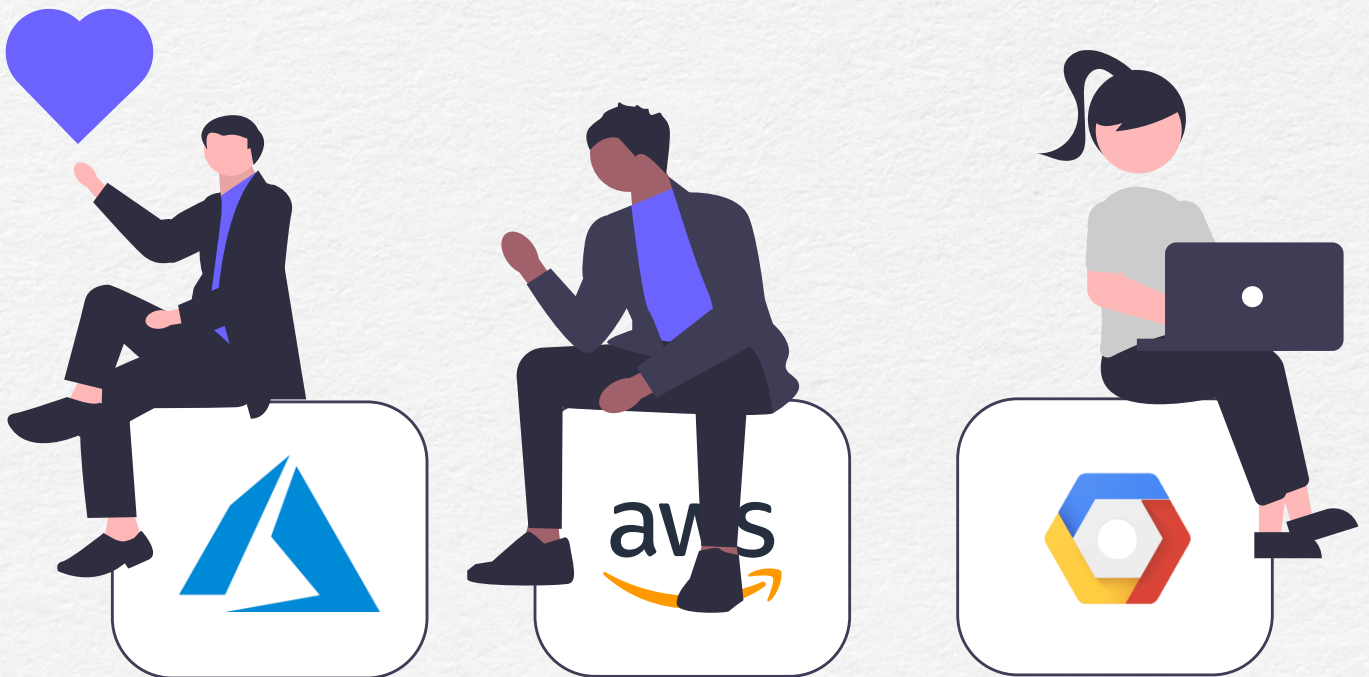


Cloud Foundations: Core Services Across Azure, AWS, and GCP

by Marian Veteanu



Compute

Virtual machines, containers
and serverless computing

Storage

Object, block, and file storage

Networking

Virtual networks, load
balancers, and DNS

Database

SQL, NoSQL, and managed
databases

Security

Identity, encryption, and
compliance

Developer Tools

CI/CD pipelines, code
repositories

AI/ML

Machine learning services,
AI tools

Other

Monitoring, analytics, and
DevOps tools

Azure Core Services



Compute

- Azure Virtual Machines
- Azure App Service
- Azure Container Instances (ACI)
- Azure Kubernetes Service (AKS)
- Azure Functions
- Azure Batch

Networking

- Azure Virtual Network (VNet)
- Azure Load Balancer
- Azure Application Gateway
- Azure VPN Gateway
- Azure DNS
- Azure Front Door

Security

- Azure Entra ID
- Azure Security Center
- Azure Key Vault
- Azure Firewall
- Azure Sentinel
- Azure DDoS Protection

Developer Tools

- Azure DevOps
- Azure Repos
- Azure Pipelines
- Azure Artifacts
- Azure Test Plans

Storage

- Azure Blob Storage
- Azure Disk Storage
- Azure Files
- Azure Archive Storage
- Azure Data Lake Storage

Database

- Azure SQL Database
- Azure SQL Managed Instance
- Azure Cosmos DB
- Azure Database for MySQL
- Azure Database for PostgreSQL

AI/ML

- Azure Machine Learning
- Azure Cognitive Services
- Azure Bot Service
- Azure Databricks
- Azure Cognitive Search

Other

- Azure Monitor
- Azure Backup
- Azure Logic Apps
- Azure Service Bus
- Azure Synapse Analytics

AWS Core Services



Compute

- EC2 (Elastic Compute Cloud)
- AWS Lambda
- Amazon ECS
- Amazon EKS
- AWS Fargate
- AWS Batch

Storage

- Amazon S3 (Simple Storage Service)
- Amazon EBS (Elastic Block Store)
- Amazon EFS (Elastic File System)
- Amazon S3 Glacier
- AWS Storage Gateway

Networking

- Amazon VPC
- Elastic Load Balancing (ELB)
- Amazon Route 53
- AWS Direct Connect
- AWS Transit Gateway
- AWS Global Accelerator

Database

- Amazon RDS (Relational Database Service)
- Amazon DynamoDB
- Amazon Aurora
- Amazon Redshift
- Amazon ElastiCache

Security

- AWS IAM
- AWS Shield
- AWS WAF (Web Application Firewall)
- AWS KMS (Key Management Service)
- Amazon GuardDuty
- AWS Security Hub

AI/ML

- Amazon SageMaker
- AWS DeepLens
- Amazon Polly
- Amazon Rekognition
- Amazon Lex
- Amazon Comprehend

Developer Tools

- AWS CodeCommit
- AWS CodePipeline
- AWS CodeBuild
- AWS CodeDeploy
- AWS Cloud9

Other

- Amazon CloudWatch
- AWS CloudTrail
- AWS Config
- Amazon SNS
- Amazon SQS

GCP Core Services



Compute

- Compute Engine
- Google Kubernetes Engine (GKE)
- Cloud Functions
- Cloud Run
- App Engine
- Google Batch

Storage

- Cloud Storage
- Persistent Disks
- Filestore
- Cloud Storage Archive
- Cloud Bigtable

Networking

- Virtual Private Cloud (VPC)
- Cloud Load Balancing
- Cloud DNS
- Cloud CDN
- Cloud Interconnect
- Traffic Director

Database

- Cloud SQL
- Cloud Spanner
- Firestore
- BigTable
- BigQuery

Security

- Identity and Access Management (IAM)
- Google Cloud Armor
- Cloud Identity
- Cloud Key Management Service (KMS)
- Security Command Center
- VPC Service Controls

AI/ML

- AI Platform
- AutoML
- Vertex AI
- Dialogflow
- Cloud Natural Language
- Cloud Vision

Developer Tools

- Cloud Source Repositories
- Cloud Build
- Cloud Code
- Cloud Tasks
- Artifact Registry

Other

- Cloud Logging
- Cloud Monitoring
- Cloud Trace
- Cloud Pub/Sub
- Cloud Scheduler

Compute

Service Type	Azure	AWS	GCP
Virtual Machines	Azure Virtual Machines	EC2 (Elastic Compute Cloud)	Compute Engine
App Hosting (PaaS)	Azure App Service	Elastic Beanstalk	Google App Engine
Containers	Azure Kubernetes Service (AKS) Azure Container Instances (ACI)	Amazon EKS (Elastic Kubernetes Service) Amazon ECS (Elastic Container Service)	Google Kubernetes Engine (GKE) Google Cloud Run
Serverless	Azure Functions	AWS Lambda	Google Cloud Functions
Batch Processing	Azure Batch	AWS Batch	Google Batch

Storage

Service Type	Azure	AWS	GCP
Object Storage	Azure Blob Storage	Amazon S3	Google Cloud Storage
Block Storage	Azure Disk Storage	Amazon EBS (Elastic Block Store)	Persistent Disks
File Storage	Azure Files	Amazon EFS (Elastic File System)	Filestore
Archive Storage	Azure Archive Storage	Amazon S3 Glacier	Cloud Storage Archive
Big Data Storage	Azure Data Lake Storage	Amazon S3 (also used for data lakes)	Cloud Bigtable

Networking

Service Type	Azure	AWS	GCP
Virtual Private Network	Azure Virtual Network (VNet)	Amazon VPC (Virtual Private Cloud)	Virtual Private Cloud (VPC)
Load Balancing	Azure Load Balancer	Elastic Load Balancing (ELB)	Cloud Load Balancing
DNS	Azure DNS	Amazon Route 53	Cloud DNS
Content Delivery Network	Azure CDN	Amazon CloudFront	Cloud CDN
Dedicated Connectivity	Azure ExpressRoute	AWS Direct Connect	Cloud Interconnect
Firewall	Azure Firewall	AWS Network Firewall	Google Cloud Firewall
VPN Gateway	Azure VPN Gateway	AWS Site-to-Site VPN	Cloud VPN
Application Gateway	Azure Application Gateway	AWS Application Load Balancer (ALB)	N/A (Managed through Cloud LB)
DDoS Protection	Azure DDoS Protection	AWS Shield	Cloud Armor

Databases

Service Type	Azure	AWS	GCP
Relational Database (SQL)	Azure SQL Database Azure SQL Managed Instance	Amazon RDS (Relational Database Service) Amazon Aurora	Cloud SQL
NoSQL Database	Azure Cosmos DB	Amazon DynamoDB Amazon DocumentDB (with MongoDB compatibility)	Firestore
Data Warehousing	Azure Synapse Analytics (formerly SQL Data Warehouse)	Amazon Redshift	BigQuery
In-memory Database	Azure Cache for Redis	Amazon ElastiCache (Redis, Memcached)	Cloud Memorystore (Redis)
Managed Open Source Databases	Azure Database for MySQL Azure Database for PostgreSQL Azure Database for MariaDB	Amazon RDS for MySQL Amazon RDS for PostgreSQL Amazon RDS for MariaDB	Cloud SQL for MySQL Cloud SQL for PostgreSQL
Big Data Storage/Analytics	Azure Data Lake	Amazon S3 (with Athena, EMR, etc.)	BigQuery, Cloud Bigtable

Security

Service Type	Azure	AWS	GCP
Identity and Access Management	Azure Active Directory (Azure AD)	AWS IAM (Identity and Access Management)	Identity and Access Management (IAM)
Single Sign-On (SSO)	Azure AD Single Sign-On	AWS Single Sign-On	Cloud Identity
Key Management	Azure Key Vault	AWS KMS (Key Management Service)	Cloud Key Management Service (KMS)
Security Information and Event Management (SIEM)	Azure Sentinel	AWS Security Hub	Google Security Operations
Threat Detection	Azure Security Center	Amazon GuardDuty	Security Command Center
Web Application Firewall (WAF)	Azure WAF	AWS WAF	Cloud Armor (WAF capabilities)
Certificate Management	Azure Key Vault (for SSL certs)	AWS Certificate Manager	Google Cloud Certificate Manager
Encryption	Azure Disk Encryption	AWS Encryption SDK, EBS Encryption	Google Cloud Encryption at Rest
Compliance and Security Management	Azure Policy	AWS Config	Organization Policy Service

AI/ML, GenAI and AI Studios

Service Type	Azure	AWS	GCP
Machine Learning Platform	Azure Machine Learning	Amazon SageMaker	Vertex AI
Pre-built AI Models	Azure Cognitive Services	AWS AI Services (e.g., Rekognition, Polly, Comprehend)	Cloud AI APIs (e.g., Vision, Speech, Translation)
Computer Vision	Azure Cognitive Services - Vision	Amazon Rekognition	Cloud Vision
Natural Language Processing	Azure Cognitive Services - Language	Amazon Comprehend	Cloud Natural Language
Speech Recognition & Synthesis	Azure Cognitive Services - Speech	Amazon Polly, Amazon Transcribe	Cloud Speech-to-Text, Cloud Text-to-Speech
Generative AI Services	Azure OpenAI Service	Amazon Bedrock	Generative AI Studio
Conversational AI	Azure Bot Service, Language Understanding (LUIS)	Amazon Lex	Dialogflow
Data Labeling	Azure Machine Learning Data Labeling	SageMaker Ground Truth	Vertex AI Data Labeling
AutoML	Azure Machine Learning - AutoML	Amazon SageMaker Autopilot	Vertex AI AutoML
AI Studio / Model Deployment	Azure AI Studio	Amazon SageMaker Studio	Vertex AI Workbench
Vector Database	Azure Cognitive Search with Vector Capabilities	Amazon Kendra (with vector support)	Vertex Matching Engine

Developer Services

Service Type	Azure	AWS	GCP
Source Control	Azure Repos	AWS CodeCommit	Cloud Source Repositories
CI/CD Pipelines	Azure Pipelines	AWS CodePipeline	Cloud Build
Build and Testing	Azure DevTest Labs	AWS CodeBuild	Cloud Build, Cloud Testing
Artifact Repository	Azure Artifacts	AWS CodeArtifact	Artifact Registry
Integrated Development Environment (IDE)	Visual Studio Online/CodeSpaces	AWS Cloud9	Cloud Shell (limited IDE capabilities)
Infrastructure as Code (IaC)	Azure Resource Manager (ARM), Bicep	AWS CloudFormation	Google Cloud Deployment Manager
APIs and Integration	Azure API Management	Amazon API Gateway	API Gateway
Secrets Management	Azure Key Vault	AWS Secrets Manager	Secret Manager
Mobile App Development	Visual Studio App Center	AWS Amplify	Firebase
Task Automation	Azure Logic Apps	AWS Step Functions	Cloud Tasks
Serverless Workflow Orchestration	Azure Durable Functions	AWS Step Functions	Workflows
Code Review and Collaboration	GitHub (owned by Microsoft)	AWS CodeCommit (Git-based collaboration)	Cloud Source Repositories (basic features)
Package Management	Azure Artifacts (for Maven, NPM, NuGet)	AWS CodeArtifact	Artifact Registry

Other

Service Type	Azure	AWS	GCP
Monitoring & Observability	Azure Monitor, Application Insights	Amazon CloudWatch	Cloud Monitoring (Operations Suite)
Logging	Azure Log Analytics	AWS CloudTrail	Cloud Logging
Resource Management	Azure Resource Manager (ARM)	AWS Resource Groups	Resource Manager
Cost Management	Azure Cost Management and Billing	AWS Cost Explorer	Cloud Billing
Backup and Recovery	Azure Backup	AWS Backup	Cloud Backup
Email and Notification	Azure Communication Services, Azure Notification Hubs	Amazon SES (Simple Email Service), Amazon SNS	Firestore Cloud Messaging, Pub/Sub
Analytics and Big Data Processing	Azure Synapse Analytics, HDInsight	Amazon EMR (Elastic MapReduce)	Dataproc, BigQuery
Internet of Things (IoT)	Azure IoT Hub	AWS IoT Core	Cloud IoT Core
File Transfer	Azure Data Box	AWS Snowball, AWS DataSync	Transfer Appliance

Strategic Framework for Cloud Platform Selection

Business Goals Alignment

- Identify if the cloud provider offers solutions aligned with the organization's core goals (e.g., scalability for rapid growth, cost control for efficiency).
- Assess the long-term roadmap of each provider for innovative features.

Compliance and Regulatory Requirements

- Confirm certifications (e.g., HIPAA, GDPR, SOC 2) relevant to industry needs.
- Ensure data residency options align with geographic regulations and business requirements.

Cost Management and Optimization

- Review pricing models and support for multi-tier storage to control costs.
- Compare cost management tools (e.g., Azure Cost Management, AWS Cost Explorer, GCP Billing) for visibility and predictive budgeting.

Ecosystem and Vendor Compatibility

- Check compatibility with existing tools, workflows, and on-premises systems.
- Consider ecosystem strengths for future initiatives, such as AI/ML, IoT, or analytics.

Support for Innovation (AI/ML, Serverless, IoT)

- Evaluate each provider's offerings in areas critical for innovation, such as AI, serverless computing, and IoT.
- Look for managed services that simplify adoption of complex technologies.

Reliability and Performance

- Review SLAs for uptime, data durability, and disaster recovery.
- Assess network latency and performance options for mission-critical applications.

Security and Risk Management

- Compare built-in security features and additional security services (e.g., DDoS protection, firewalls, identity management).
- Consider security policies and support for comprehensive risk management.

Vendor Lock-In and Flexibility

- Examine portability options for future migration or multi-cloud strategy.
- Evaluate ease of integrating with other cloud providers for a multi-cloud approach.

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