Azure Security

Key Vault, Defense in Depth, Azure Firewall, DDoS Protection, Network Security Group

Contents

Introduction to Azure Security

One of the best reasons to use Azure for your applications and services is to take advantage of its wide array of security tools and capabilities. These tools and capabilities help make it possible to create secure solutions on the secure Azure platform.

Microsoft Azure provides confidentiality, integrity, and availability of customer data, while also enabling transparent accountability.


Identity and access management
Threat protection
Cloud security
Information protection
Security
Information governance
Insider risk management
Compliance management
Discover and respond

Azure Key Vault

A cloud service for securely storing and accessing secrets (API keys, passwords), cryptographic keys, and certificates.

- **Centralized Key Management:** Manage keys, secrets, and certificates from a single location.
- **Secrets Management:** Securely store and manage sensitive information.
- **Certificate Management:** Simplify the process of provisioning and managing SSL/TLS certificates.
- **Key Rotation and Versioning:** Automate key rotation and maintain version control for enhanced security.

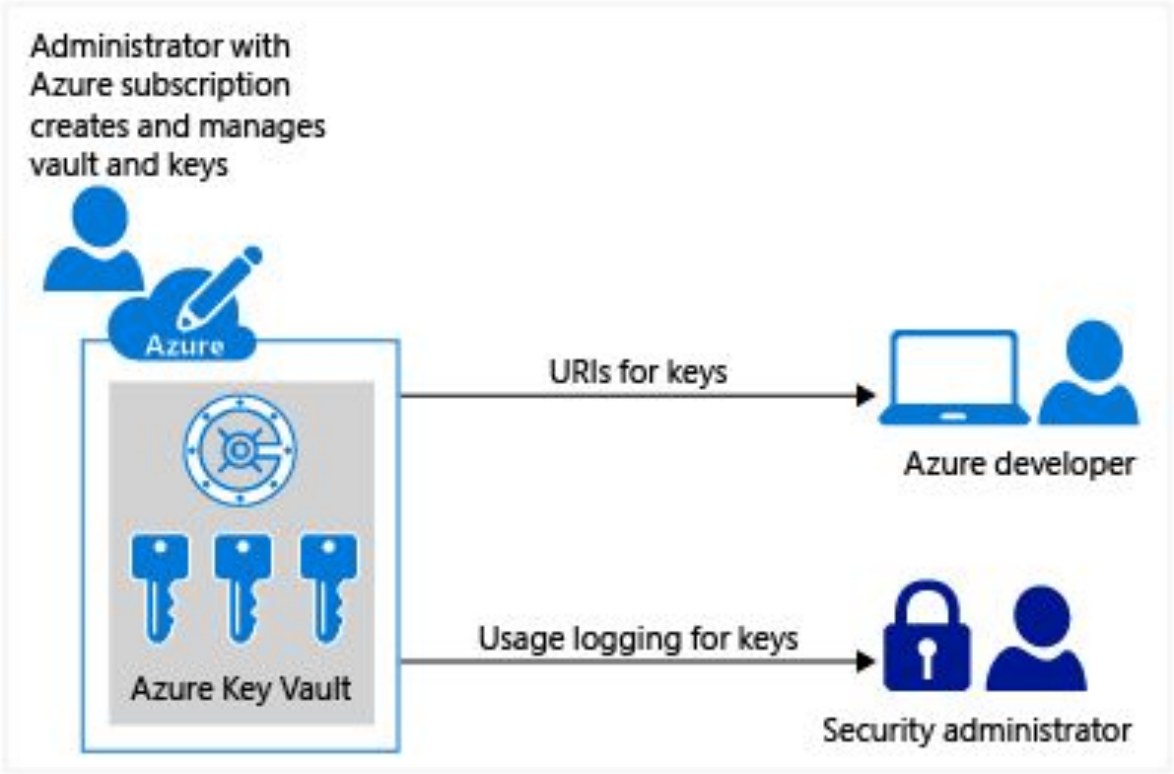
Azure Key Vault Architecture

Components:

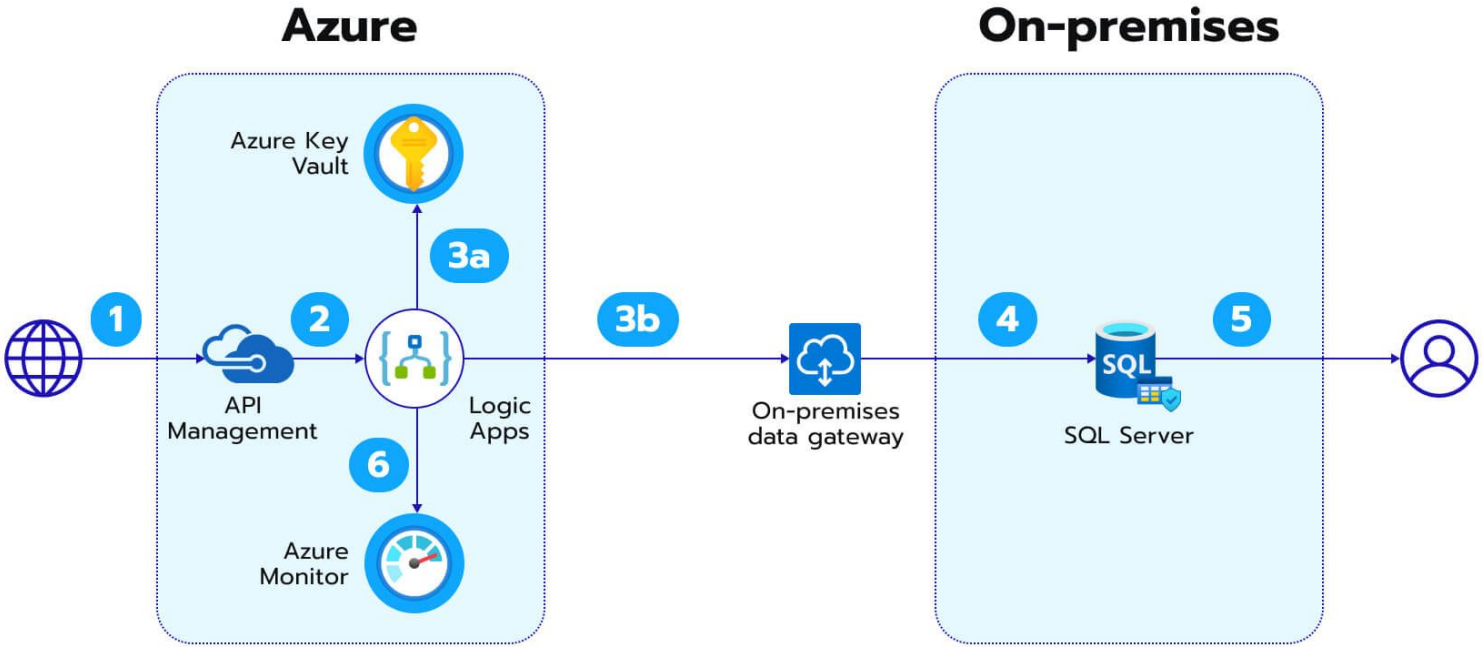
- **Vaults:** Secure containers for storing keys, secrets, and certificates.
- **Managed HSM:** Hardware Security Modules for high-assurance key management.
- **Keys, Secrets, Certificates:** Core elements managed within Key Vault.

Integration:

- **Applications:** Use Key Vault to manage secrets and keys for applications.
- **Azure Services:** Integrate with other Azure services like Azure Functions, Logic Apps, and more.



This administrator gives developers URIs to call from their applications.
This administrator also gives key usage logging information to the security administrator.
https://learn.microsoft.com/en-us/azure/key-vault/general/basic-concepts

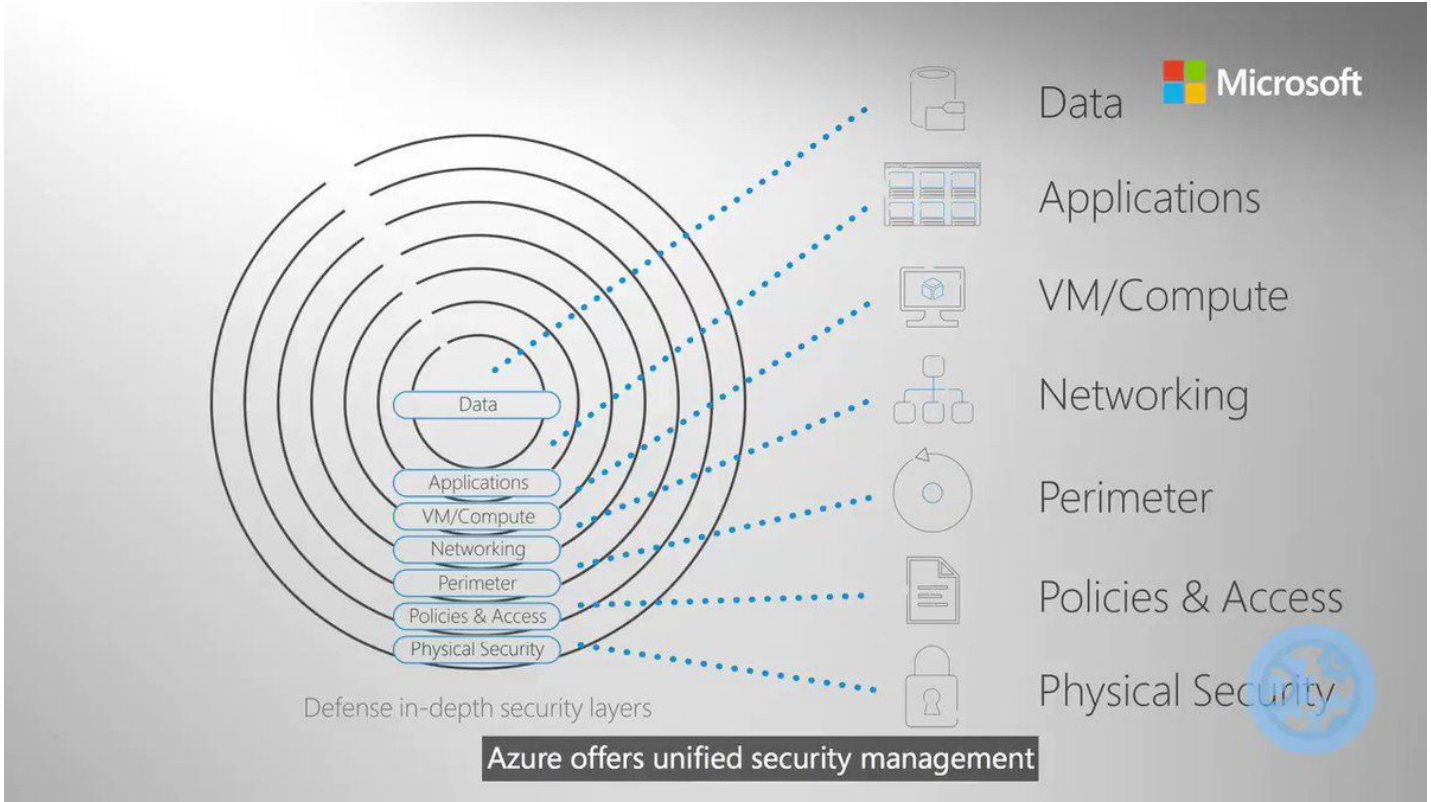


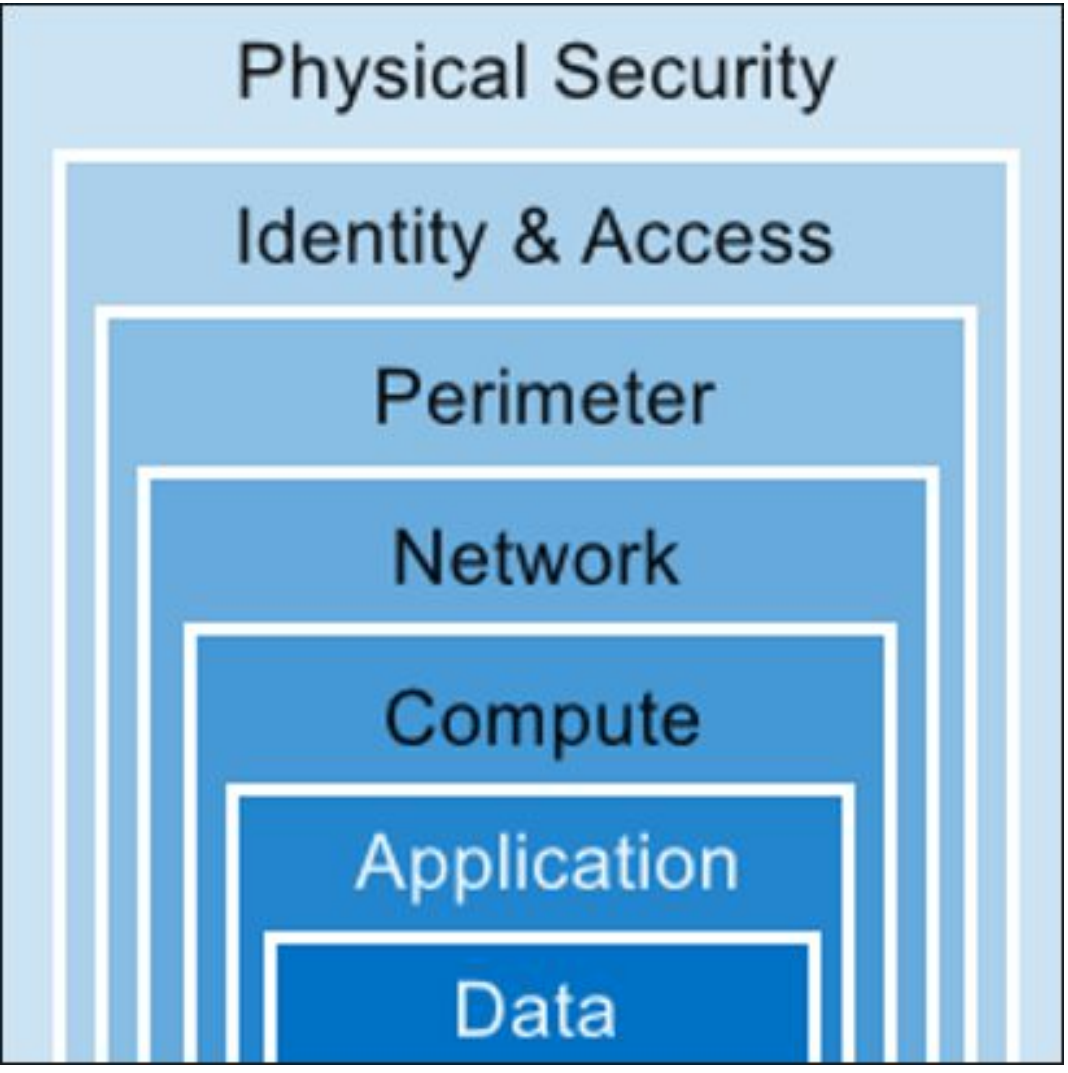
Microsoft Azure

Incorporation of cloud-based data into on-premises data storage with Logic Apps and SQL Server

Defense in Depth

A layered security approach that provides multiple levels of protection.

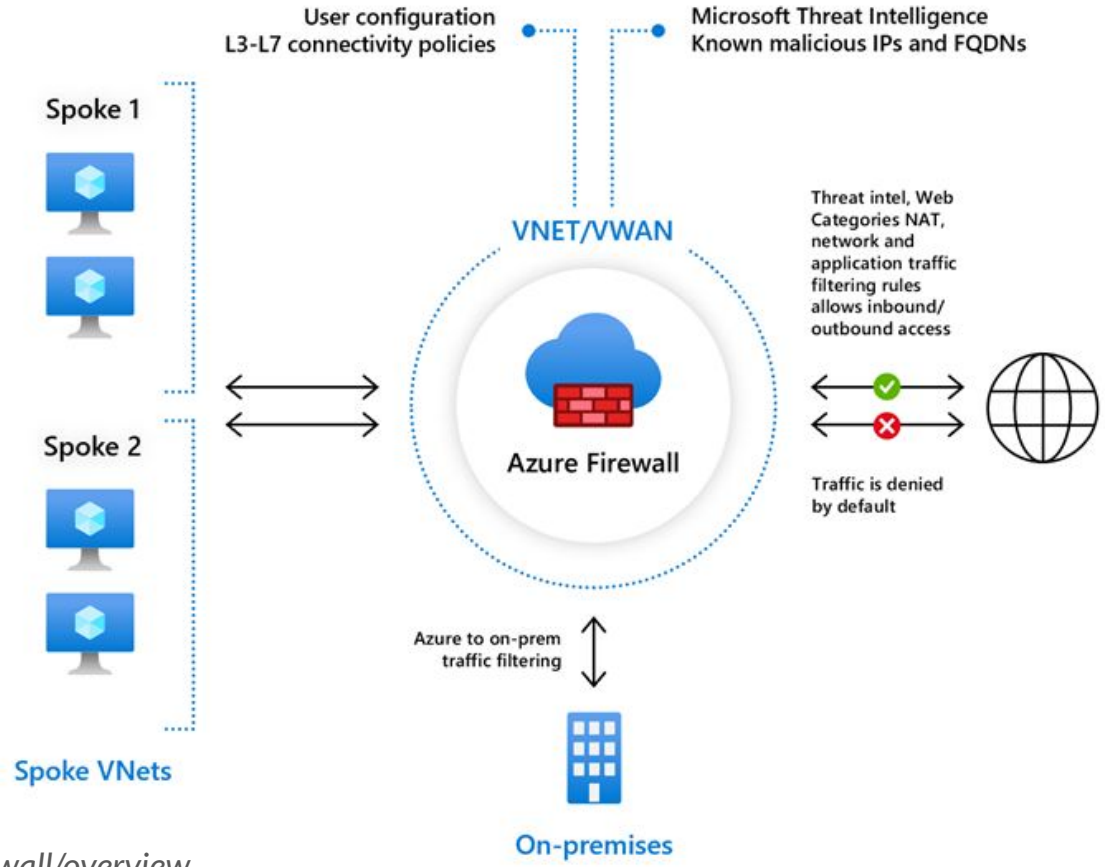




- **Physical Security:** Secure data centers with access controls and surveillance.
- **Identity & Access Management:** Implement strong authentication and authorization mechanisms.
- **Perimeter Security:** Use firewalls and DDoS protection to safeguard network boundaries.
- **Network Security:** Segment networks and control traffic flow with Network Security Groups (NSGs).
- **Compute Security:** Protect virtual machines and workloads with endpoint protection.
- **Application Security:** Secure application code and dependencies.
- **Data Security:** Encrypt data at rest and in transit.

Azure Firewall

A managed, cloud-based network security service that protects your cloud workloads running on Azure.



https://learn.microsoft.com/en-us/azure/firewall/overview

Azure Firewall

Features:

- **Stateful Firewall as a Service:** Monitors and inspects network traffic based on state and context.
- **High Availability:** Ensures continuous protection with built-in redundancy.
- **Unrestricted Cloud Scalability:** Automatically scales to meet changing network traffic demands.
- **Threat Intelligence:** Leverages Microsoft’s threat intelligence to detect and prevent attacks.

Azure Firewall

Policies and Rules:

- **Network Rules:** Control inbound and outbound traffic based on IP addresses and ports.
- **Application Rules:** Filter traffic based on URLs and domain names.
- **NAT Rules:** Translate network addresses for inbound and outbound connections.

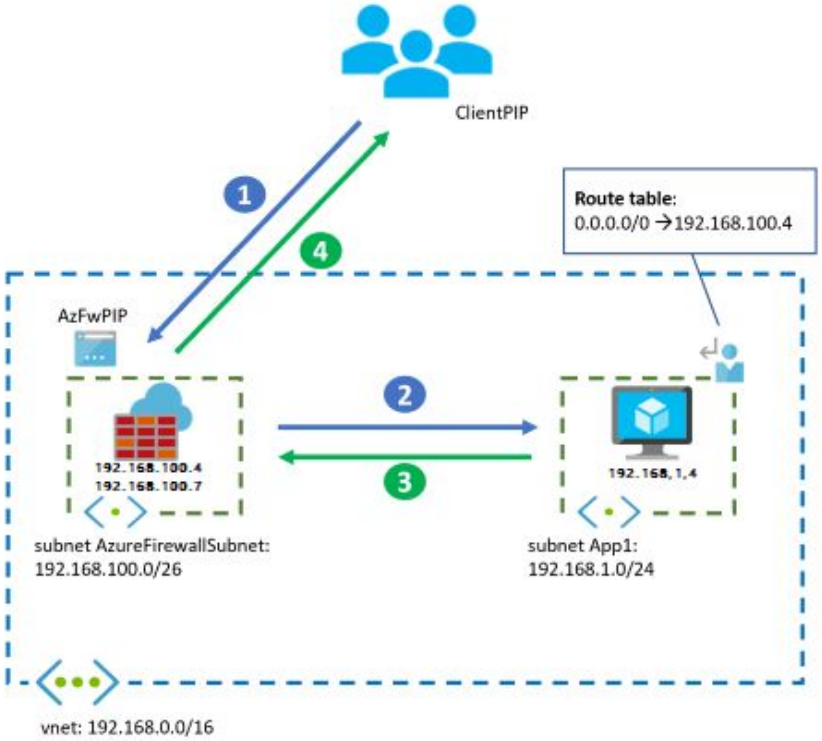
Integration:

- **Azure Monitor:** Collect and analyze firewall logs.
- **Log Analytics:** Gain insights into traffic patterns and security events.

Azure Firewall Architecture

Components:

- **Virtual Networks:** Securely connect Azure resources.
- **Firewall Subnet:** Dedicated subnet for the firewall.
- **Route Tables:** Define routing rules for network traffic.
- **Public IP Addresses:** Assign public IPs for external access.



DDoS Protection

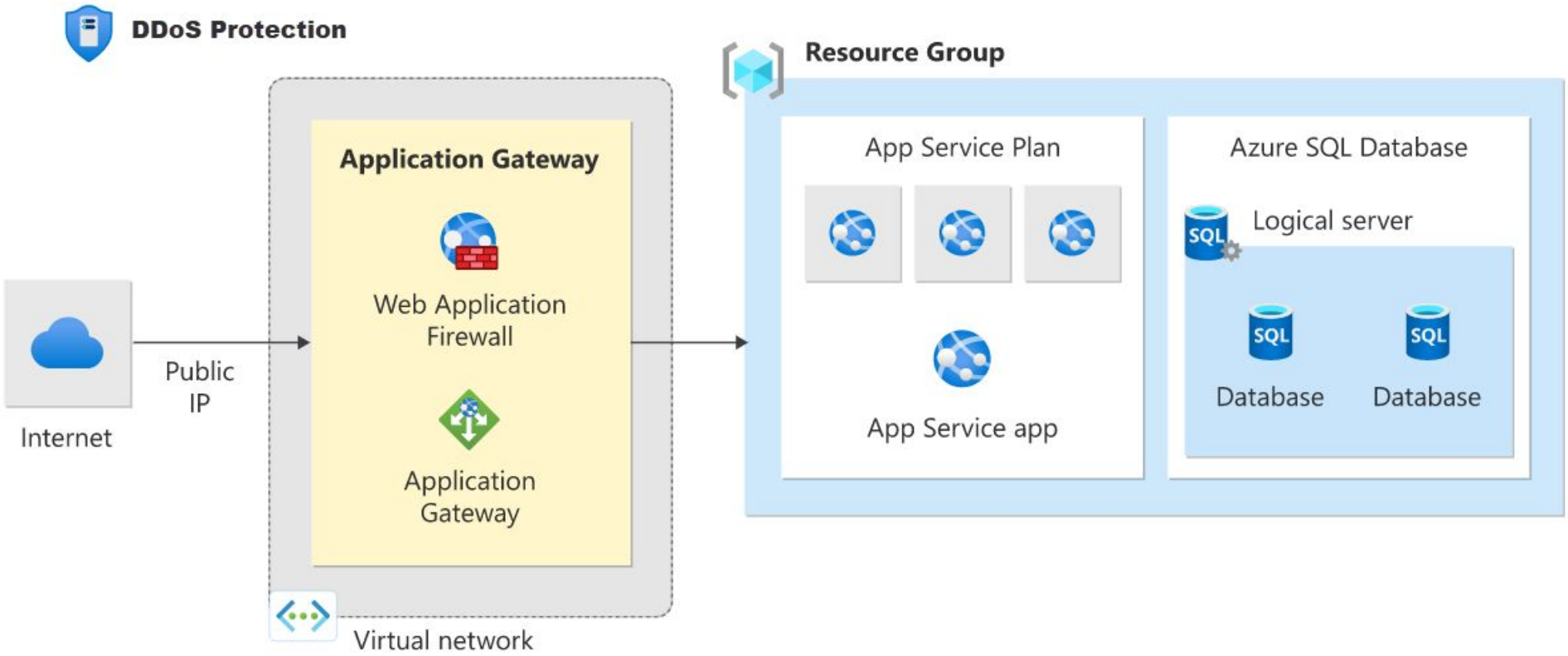
Services designed to protect Azure resources from Distributed Denial of Service (DDoS) attacks.

Always-on Monitoring: Continuously monitors network traffic for signs of DDoS attacks.

Adaptive Tuning: Adjusts protection mechanisms based on traffic patterns.

Application Layer Protection: Protects against HTTP/S-based attacks.

Attack Analytics: Provides detailed insights and reports on attack metrics.



https://learn.microsoft.com/en-us/azure/ddos-protection/ddos-protection-overview

Network Security Group (NSG)

A security feature that controls network traffic to and from Azure resources.

- **Inbound and Outbound Rules:** Define rules for traffic entering and leaving a network interface, VM, or subnet.
- **Security Rules (Allow/Deny):** Specify whether to allow or deny traffic based on various parameters.
- **Priority:** Determines the order in which rules are applied.
- **Source and Destination:** Specify the source and destination IP addresses or ranges.
- **Protocol:** Define the protocol type (TCP, UDP, ICMP).

Azure Solutions

Internet of things

Internet of Things (IoT) with Azure

The Internet of Things (IoT) is a network of physical devices that connect to and exchange data with other devices and services over the Internet or other network. There are currently over ten billion connected devices in the world and more are added every year. Anything that can be embedded with the necessary sensors and software can be connected over the internet.

Azure IoT Hub is a managed service hosted in the cloud that acts as a central message hub for communication between an IoT application and its attached devices. You can connect millions of devices and their backend solutions reliably and securely. Almost any device can be connected to an IoT hub.

https://learn.microsoft.com/en-us/azure/iot-hub/iot-concepts-and-iot-hub?WT.mc_id=Portal-HubsExtension

Internet of Things (IoT) with Azure

The Internet of Things (IoT) refers to the network of physical objects—“things”—embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the internet.

- **Examples:** Smart homes (smart thermostats, lights), industrial automation (predictive maintenance, asset tracking), healthcare (wearable health monitors).
- **Importance:** Enhances efficiency, enables real-time monitoring, supports data-driven decision making, and creates new business opportunities.

Azure IoT Services

Azure IoT Hub: Manages and secures billions of IoT devices and messages.

Azure IoT Central: Simplifies IoT application development with a fully managed solution.

Azure IoT Edge: Brings cloud analytics and intelligence to edge devices.

Azure Digital Twins: Models and simulates physical environments.

Azure Time Series Insights: Analyzes and visualizes time-series data.

https://azure.microsoft.com/en-us/solutions/iot

Importance of IoT

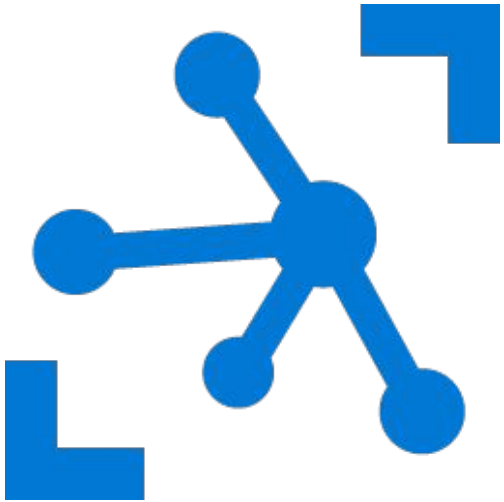
- To generate new business models and revenue streams
- To improve business decisions through data-driven insights from IoT data
- To increase productivity and efficiency of business operations
- To enhance customer experience
- IoT enhances safety and security in various sectors, from home automation to industrial applications.

Azure IoT Hub

A managed service that acts as a central message hub for bi-directional communication between IoT applications and the devices it manages.

Key Features: Device management, secure communication, scalable message routing, and cloud integration.

Benefits: Scalable infrastructure, robust security, seamless integration with other Azure services, accelerated development time.



Bi-directional Communication

Telemetry Data: Devices send telemetry data to the cloud.

Cloud-to-Device Messaging: Send commands and notifications to devices from the cloud.

Direct Methods: Invoke methods directly on the device from the cloud.

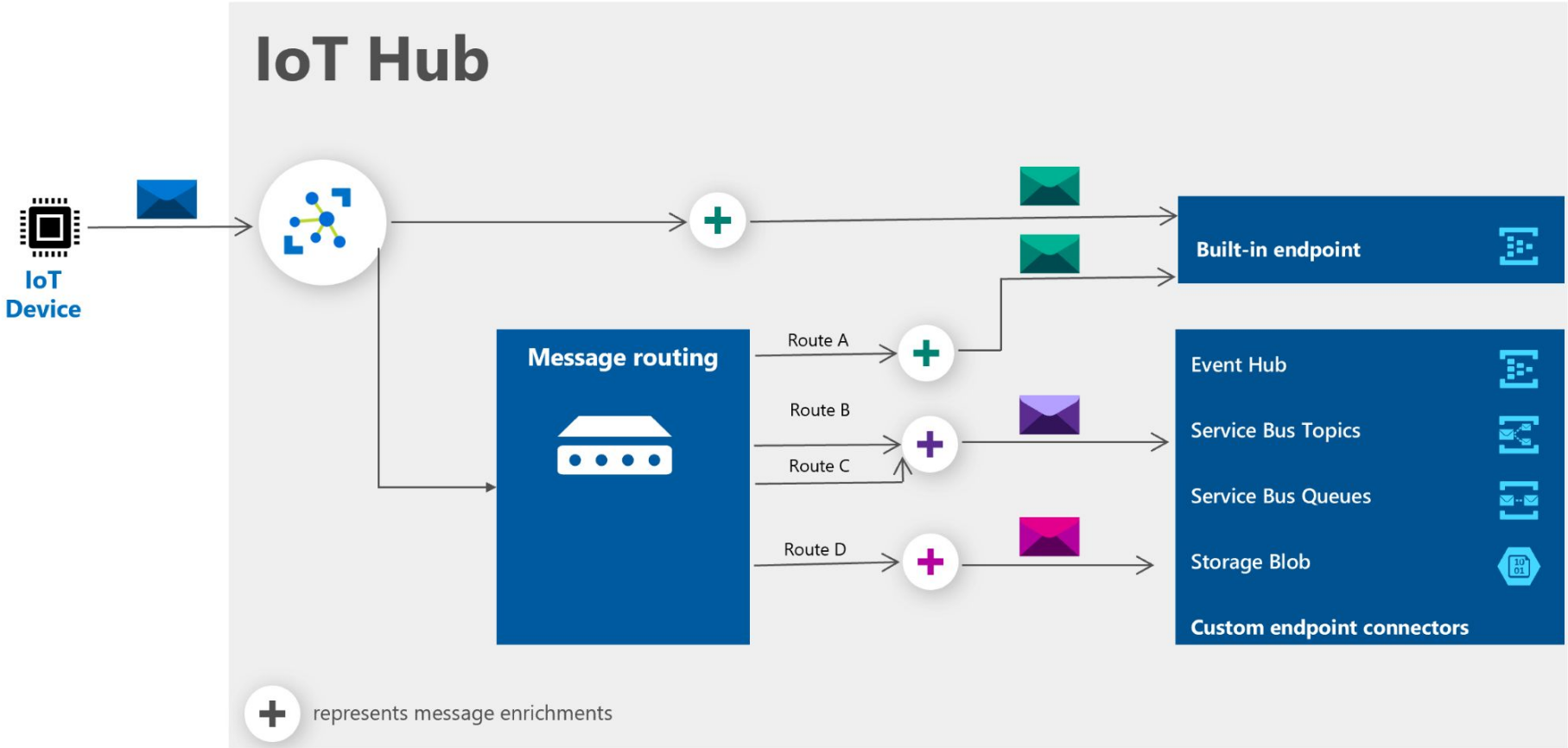
Twin Properties: Synchronize state information between the cloud and the device.

Message Routing

Routing Rules: Define rules to route messages based on their properties.

Endpoints: Route messages to different endpoints (Event Hubs, Service Bus, Storage, etc.).

Query Language: Use SQL-like queries to filter and route messages.


IoT Hub
IoT Device
Message routing
Route A
Route B
Route C
Route D
Built-in endpoint
Event Hub
Service Bus Topics
Service Bus Queues
Storage Blob
Custom endpoint connectors
represents message enrichments

Integration with Other Azure Services

Data Processing: Stream Analytics, Azure Functions, and Logic Apps for real-time data processing.

Storage: Store data in Azure Blob, Azure SQL Database, Azure Cosmos DB, or Azure Data Lake.

Analytics: Use Azure Machine Learning and Azure Time Series Insights for data analysis.

Visualization: Create dashboards and reports with Power BI.

Future of IoT and Azure

Emerging Trends:

- **5G:** Enhanced connectivity and low latency.
- **AI Integration:** More intelligent and autonomous IoT solutions.

Azure IoT Evolution:

- **Enhanced Security:** Continuous improvements in IoT security features.
- **Integration:** Deeper integration with other Azure services like AI, ML, and blockchain.
- **Simplified Development:** More tools and services to reduce development complexity.

Predictions:

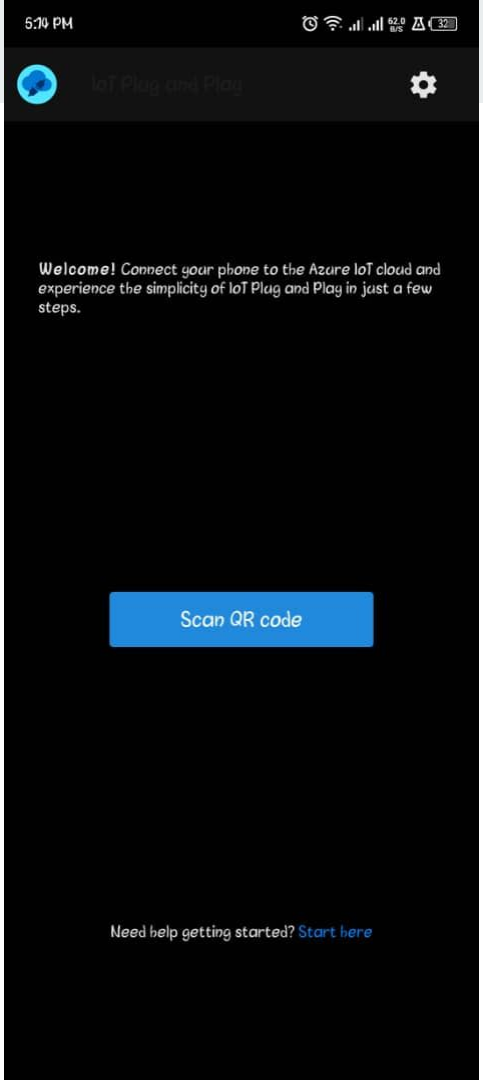
- **IoT Market Growth:** Rapid growth in the IoT market across various industries.
- **Smart Everything:** Proliferation of smart devices and environments.
- **Data-Driven Insights:** Increased reliance on IoT data for decision-making.

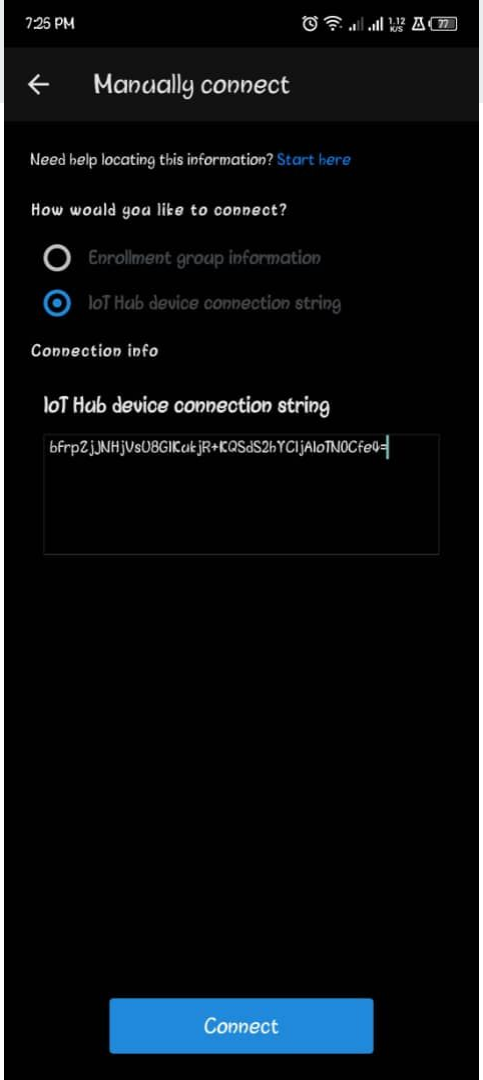
Lab

- Show how to create and configure an IoT Hub, connect a device, and send data.

IoT Plug and Play

Download on Android or IOS





IoT Plug and Play

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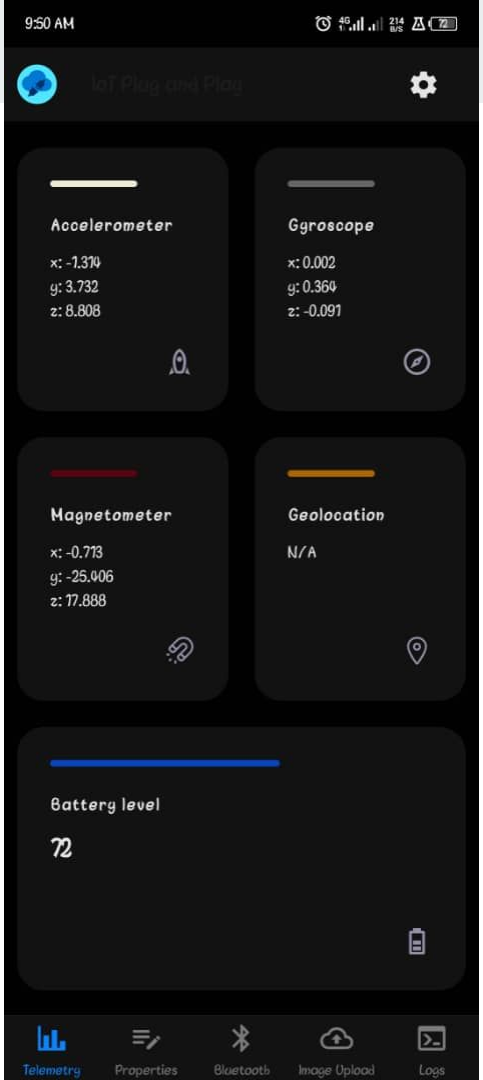

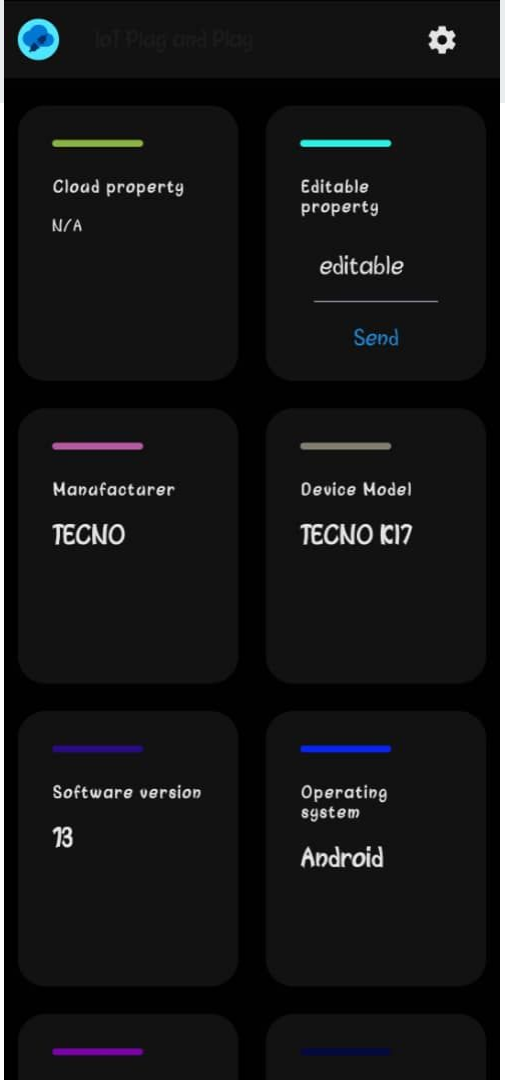

Assignment

- Create a practical IoT solution using Azure IoT Hub. Your solution should involve setting up an IoT Hub, registering a device, and simulating the device to send telemetry data or files to Azure Blob Storage.
- Submission Link - https://forms.gle/YXyc1eaRZjCNn6eX8

Quiz Time!!!

- https://quizizz.com/admin/quiz/668ebb8eaca7e9381d8055c4