Smart IoT Cloud Storage System (Azure)

PROJECT OWNER: Unnati Pandya

Storage Locker:

Part 1: Cloud Services for pre-defined scenario:

Client's current situation:

This company has invested in environmental control systems that have smart sensors for some of its storage lockers. They have to monitor the temperatures and moisture level. These sensors keep an eye on humidity and temperature to keep premium storage at its best.

The client needs a high scalability ensuring solution to connect devices and process telemetry data.

The Requirements of the Clients:

- The data storage needs to be accessible around-the-clock (730 hours a month).
- To keep historical data for analysis and to facilitate frequent reads and writes of the telemetry data from the sensors, data storage will be needed.
- Up to 5 TB of storage must be supported by the solution.
- Secure file transfers with low latency are required for the transfer of data.
- A monthly data transfer volume of roughly 500 GB is anticipated.
- Updates to the sensor devices must be pushed by the solution.

The Goals of the Clients:

- Enhance the automation of environmental control and keep storage lockers at ideal conditions.
- Utilize sensor data to uncover patterns and anticipate problems before they arise.
- Maintaining dependable and regular storage conditions will increase client satisfaction.

Cloud Service Model:

A hybrid cloud model will suit clients best as well implementation A hybrid cloud approach would be best for the customer in order to provide high availability, scalability, and secure data storage.

The advantages of public and private clouds are combined in a hybrid cloud, which gives the client access to public cloud services' scalability and affordability while retaining control over sensitive data and apps in an on-premises or private cloud setting.

The flexibility and security of this paradigm allow the client to suit their own needs for processing and storing data.

Cloud Service Type

It will use a combination of IaaS (Infrastructure as a Service) and PaaS (Platform as a service) to provide scalability, flexibility and better control over the virtual machines and we need IoT Hub for sensors and temperature maintenance.

- IaaS: Virtual machines (VMs) or containers can be provisioned by the client for the purpose of storing and analyzing telemetry data. By doing this, management responsibilities are transferred to the cloud provider and the underlying infrastructure is given flexibility and control.

- PaaS: Managed database services and analytics platforms are two examples of PaaS options that can simplify data storage, processing, and visualization duties. As a result, the customer can concentrate on creating and implementing their applications rather than worrying about infrastructure administration.

Specific Azure Services and Solutions:

Azure services Solutions for this will be following features that we need:

- **Azure IoT Hub:** This will serve as the central point of communication between sensor devices and the cloud. It offers safe, dependable messaging with reduced latency for telemetry data (temperature and humidity measurements).

- **Azure Blob Storage:** This will keep historical sensor data for long-term study. Blob storage is extremely scalable, cost-effective, and has 99.999999999999999% durability.

- **Azure Time Series Insights (TSI):** This service is designed to capture and analyze time-series data such as sensor readings. It enables real-time viewing and querying of historical data on temperature and humidity patterns.

- **Azure Functions:** This serverless compute service can be activated by receiving sensor data via IoT Hub. You can create functions to analyze the data, send alarms if service levels are exceeded, and maybe send commands back to the devices to modify temperature/humidity.

- **Azure Active Directory (AAD):** This service handles secure authentication and authorization for Azure resources and sensor devices.

- **Azure Monitor:** Monitors the health, performance, and availability of all Azure resources (IoT Hub, Functions, and TSI). Obtains metrics on resource use, data processing times, and error rates. Provides alerts for potential faults and contributes to system reliability

Expected Cost Estimation:

Service type	Region	Description	Estimated monthly cost
Azure Functions	Canada Central	Premium tier, Pay as you go, EP3: 4 Cores(s), 14 GB RAM, 250 GB Storage, 1 Pre-warmed instances, 1 Additional scaled out units	$1,277.50
Azure IoT Hub	East US	Standard Tier, S2: Unlimited devices, 6,000,000 msgs/day, $250.00/mo, 1 IoT Hub Units; IoT Hub Device Provisioning: 0 Operations;	$250.00
Azure Time Series Insights	West US	S2 tier: 1 unit(s)	$1,350.00

Storage Accounts	East US	Block Blob Storage, Blob Storage, Hierarchical Namespace, GRS Redundancy, Hot Access Tier, 5 TB Capacity - Pay as you go, 10 x 10,000 Write operations, 10 x 10,000 Read operations, 9 x 10,000 Iterative Read operations, 10 x 100 Iterative Write operations, 498 GB Data Retrieval, 1,000 GB Data Write, SFTP disabled, 1,000 GB Index, 0 x 10,000 Other operations, 1000 GB Georeplication data transfer	$324.22
Azure Monitor	East US	Managed Prometheus: 0 AKS nodes in cluster, 10000 Prometheus metrics per node, 30 seconds of Metric collection interval, 0	$2,124.70

Azure Active Directory External Identities	West US	Premium P2 tier: 50,000 monthly active user(s), 34 SMS/Phone Events	$1.02
	Support		$0.00
	Licensing Program	Microsoft Customer Agreement (MCA)	
	Billing Account		
	Billing Profile		
	Total		$5,327.44

Cost Estimation:

https://azure.com/e/35223a5883ac4ca596ce45c8cd248735

Benefits to Clients:

- **Scalability:** Azure's cloud services can simply scaled up or down to meet changing data storage and processing needs.
- **Reliability:** Azure provides high availability and durability for data storage, ensuring that telemetry data is always available.
- **Security:** Azure offers strong security features such as encryption, access control, and threat detection to protect sensitive data from unauthorized access.
- **Cost-effectiveness**: Azure's pay-as-you-go pricing and customizable pricing models enable clients to optimize expenses based on actual usage and needs.

- **Innovation:** Azure's IoT and analytics services allow the client to take use of modern technologies for real-time data processing, analysis, and insight generation.

Part 2: Cloud Infrastructure diagram