5. Connect to and consume Azure services and third-party services
└ 5.2 Develop event-based solutions
└ 5.2.2 Implement solutions that use Azure Event Hub

1. What is Azure Event Hubs and what is it used for?
2. How does Event Hubs differ from Event Grid and Service Bus?
3. What are the key components of Event Hubs (namespace, event hub, partition, consumer group)?
4. How is data transmitted and consumed in Event Hubs (push/pull)?
5. What are partitions and why are they important in Event Hubs?
6. What is a consumer group and how is it used?
7. What are the differences between Standard, Basic, and Dedicated tiers?
8. How do you send events to Event Hubs using Azure SDK or Azure CLI?
9. How do you consume events from Event Hubs using EventProcessorClient?
10. What is checkpointing and why is it needed?
11. How do you implement checkpointing with Azure Blob Storage?
12. How do you authenticate and authorize access to Event Hubs (Shared Access Policies vs Azure AD)?
13. What are throughput units and how do they impact performance?
14. What are the retention and capture capabilities of Event Hubs?
15. How do Event Hubs integrate with Azure Stream Analytics and Azure Functions?

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1. What is Azure Event Hubs and what is it used for?
Event Hubs is a data streaming platform and event ingestion service for high-throughput data pipelines.
Use cases: telemetry ingestion, app/event logging, IoT data streams.

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2. How does Event Hubs differ from Event Grid and Service Bus?

- Event Hubs: Streaming, pull-based, low-latency, high-volume.
- Event Grid: Push-based, lightweight eventing.
- Service Bus: Reliable messaging with ordering and sessions.

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3. What are the key components of Event Hubs?

- Namespace: Container for event hubs.
- Event Hub: Stream that holds data.
- Partition: Log stream shard for parallelism.
- Consumer Group: Independent view for multiple consumers.

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4. How is data transmitted and consumed in Event Hubs?
Data is pushed by producers and pulled by consumers. Consumers use SDKs to poll events per partition.

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5. What are partitions and why are they important?
Partitions enable horizontal scaling and parallel processing.
Events with the same partition key always go to the same partition to preserve order.

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6. What is a consumer group and how is it used?
A consumer group is a view of an event hub.
Each consumer group has its own state, allowing multiple apps to read independently.

7. What are the differences between Standard, Basic, and Dedicated tiers?

- Basic: Single consumer group, limited features.
- Standard: Multiple consumer groups, capture, 1–20 throughput units.
- Dedicated: Reserved capacity, higher scale, 90+ MB/s ingress.

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8. How do you send events to Event Hubs using Azure SDK or CLI?

CLI:

```
az eventhubs eventhub send --name <hub> --namespace-name <ns> --resource-group <rg> --message "event data"
```

.NET SDK:

```
await producer.SendAsync(new EventData(Encoding.UTF8.GetBytes("event data")));
```

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9. How do you consume events from Event Hubs using EventProcessorClient?

Use Azure.Messaging.EventHubs.Processor:

```
var processor = new EventProcessorClient(blobContainerClient, "$Default", connStr, hubName);
processor.ProcessEventAsync += async args => { /* handle event */ };
await processor.StartProcessingAsync();
```

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10. What is checkpointing and why is it needed?

Checkpointing stores the last successfully processed event offset.
It ensures events aren't reprocessed after restarts and supports fault tolerance.

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11. How do you implement checkpointing with Azure Blob Storage?

Use EventProcessorClient with a Blob container as storage:

```
new EventProcessorClient(blobContainerClient, "$Default", eventHubConnectionString, eventHubName)
```

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12. How do you authenticate and authorize access to Event Hubs?

- Shared Access Policies: Use connection string with Send, Listen, or Manage claims.
- Azure AD: Use Azure Identity SDK + RBAC on Event Hub namespace or resource.

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13. What are throughput units and how do they impact performance?

Each Throughput Unit (TU) allows:

- 1 MB/s ingress or 1000 events/s
- 2 MB/s egress
  You can purchase 1–20 TUs in Standard tier to scale performance.

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14. What are the retention and capture capabilities of Event Hubs?

- Retention: Configurable up to 7 days (Standard) or 90 days (Dedicated).
- Capture: Automatically stores data to Blob Storage or Data Lake in AVRO format.

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15. How do Event Hubs integrate with Azure Stream Analytics and Azure Functions?

- Stream Analytics: Direct input via Event Hub; use for real-time queries and dashboards.
- Azure Functions: Use Event Hub trigger to react to events:

```
[EventHubTrigger("hubname", Connection = "EventHubConnection")] EventData[] events
```