



Monitoring and Tuning Azure SQL Database

Module 7



Learning Units covered in this Module

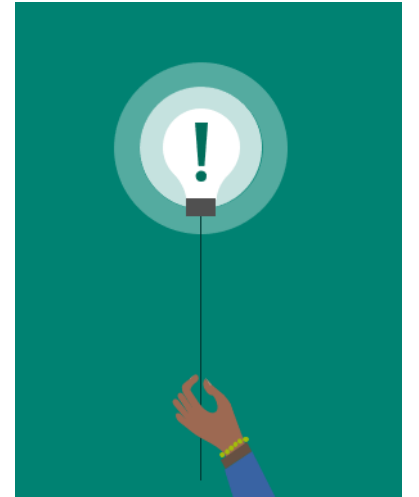
- Lesson 1: Monitoring and Troubleshooting Azure SQL Database
- Lesson 2: Monitoring Query Performance using Query Performance Insight
- Lesson 3: Azure SQL Database Tuning using Automatic Tuning
- Lesson 4: Monitoring Azure SQL Database Performance using Extended Events
- Lesson 5: Configure Alerts through Azure Portal

Lesson 1: Monitoring and Troubleshooting Azure SQL Database

Objectives

After completing this learning, you will be able to:

- Know the various options to monitor and troubleshoot the Azure SQL Database.



Common Issues on Azure SQL Database

Monitoring for Azure SQL Database is scoped at database level.

Here is list of most faced issues:

Database
Connectivity

High DTU
Percentage

Query Timeouts

Deadlocks

Database Storage
consumption

Slow Queries

Tools to Monitor & Troubleshoot Issues

Query Performance
Insight

Automatic Tuning

Intelligent Insights

Extended Events

Dynamic Management
Views (DMVs)

Azure Database Portal
Dashboard

Questions?



Lesson 2: Monitoring Query Performance using Query Performance Insight

Objectives

After completing this learning, you will be able to:

- Know how to troubleshoot the performance of your queries by using Query Performance Insight.



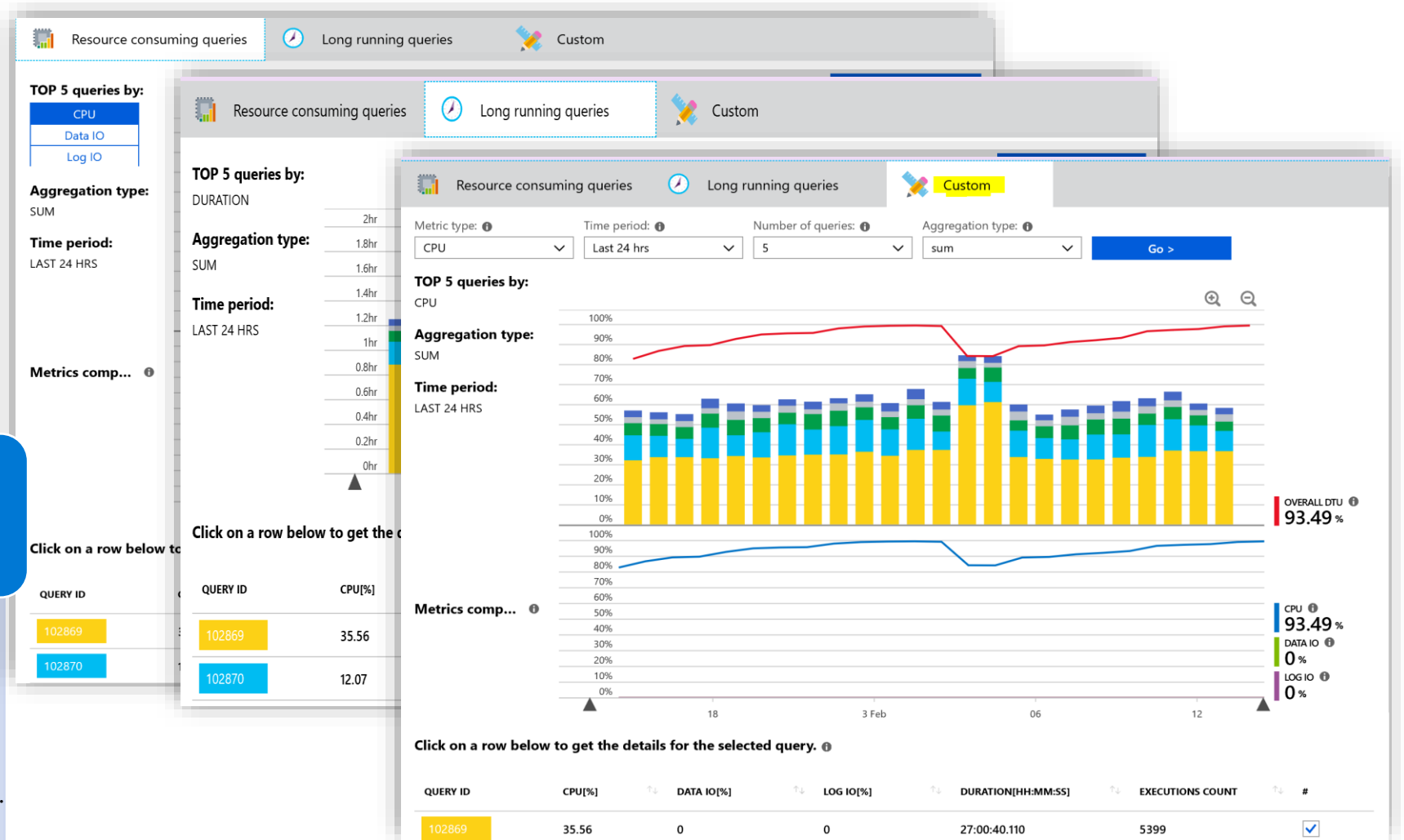
Query Performance Insight

Intelligent Performance

- Performance overview
- Performance recommendati...
- Query Performance Insight
- Automatic tuning

Custom options – Insights based upon custom selection:

- Metric type – resource consuming, Log IO, Queries and Execution queries
- Time period – configuration: 24 hrs, Past Week, Past Month and Custom
- Can drill through the queries to see Query text, CPU, data IO and Log IO utilization %, Duration and Execution count.

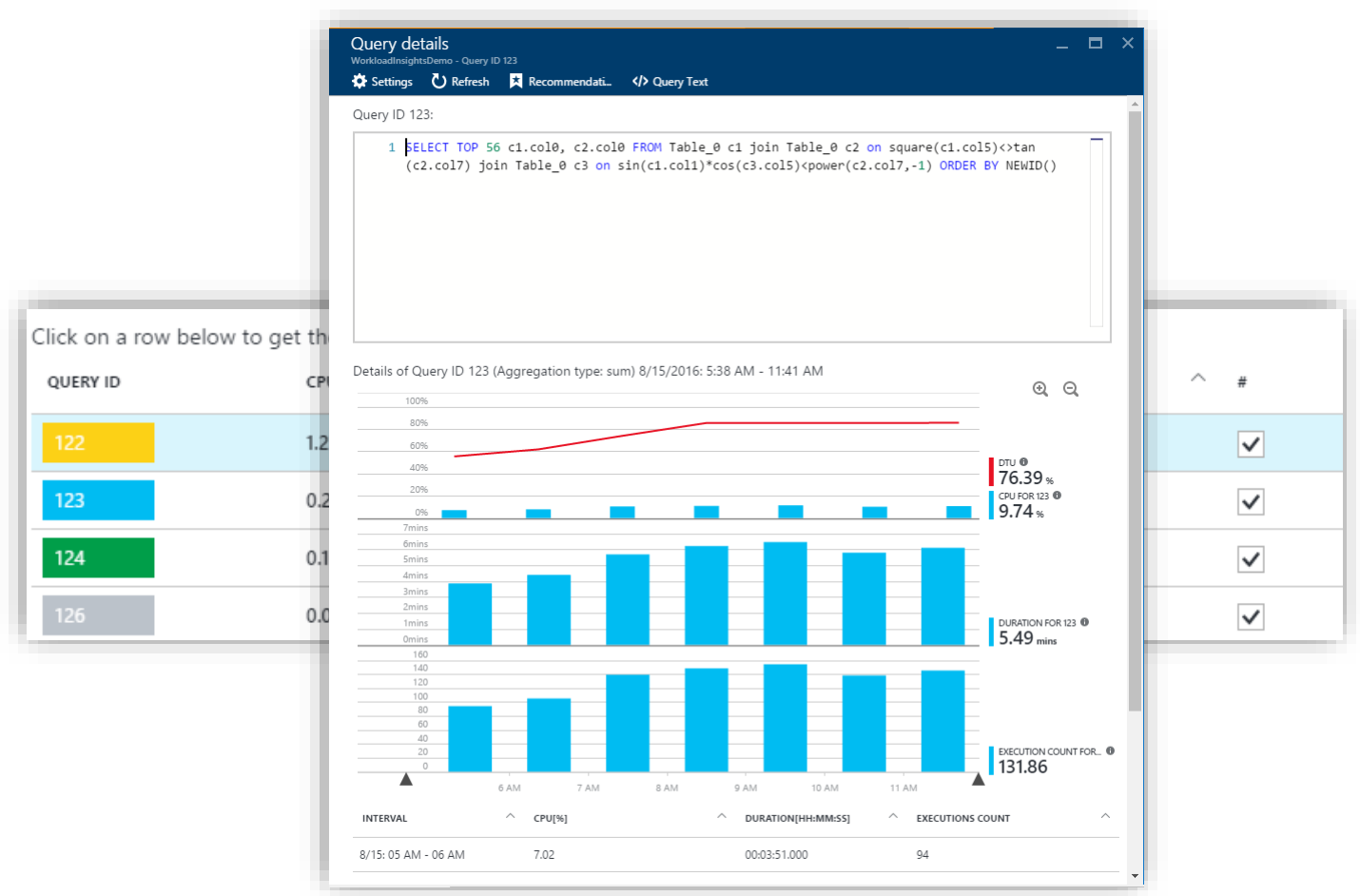


Viewing individual query details

Get details for the individual queries

- CPU Consumption
- Duration
- Execution Count

It does not capture DDL queries

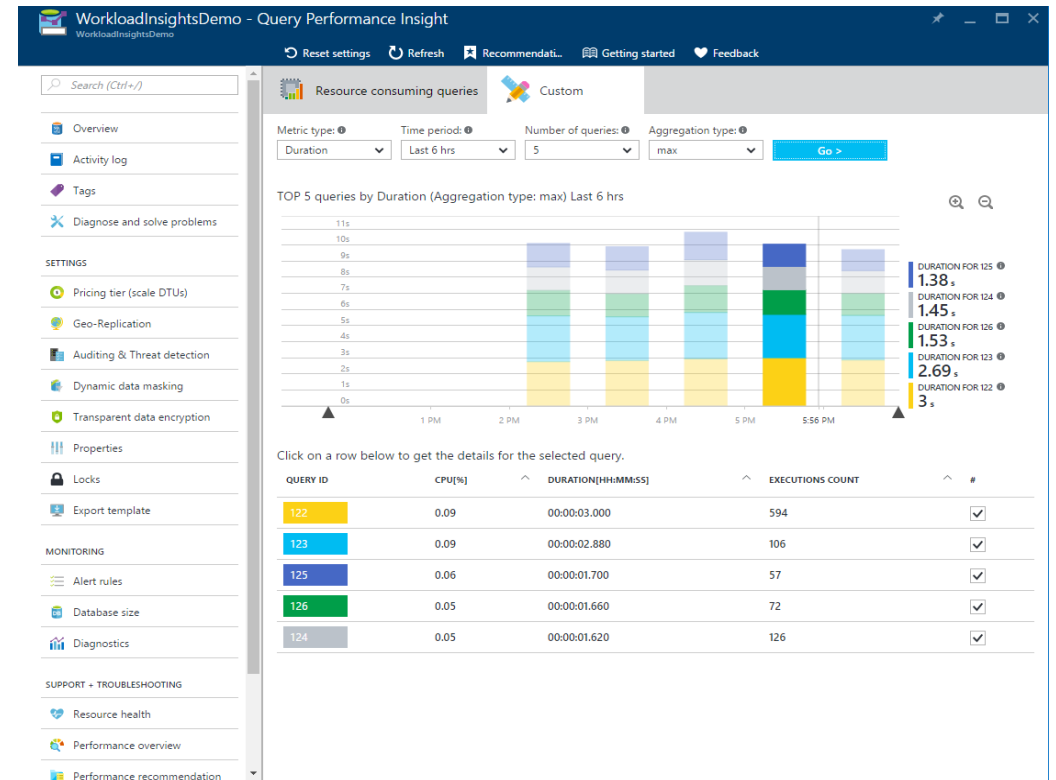


Review top queries per duration

Duration is one of the metrics showing potential bottleneck

Long-running queries has potential for:

- Longer locks
- Blocking other users
- Limiting scalability

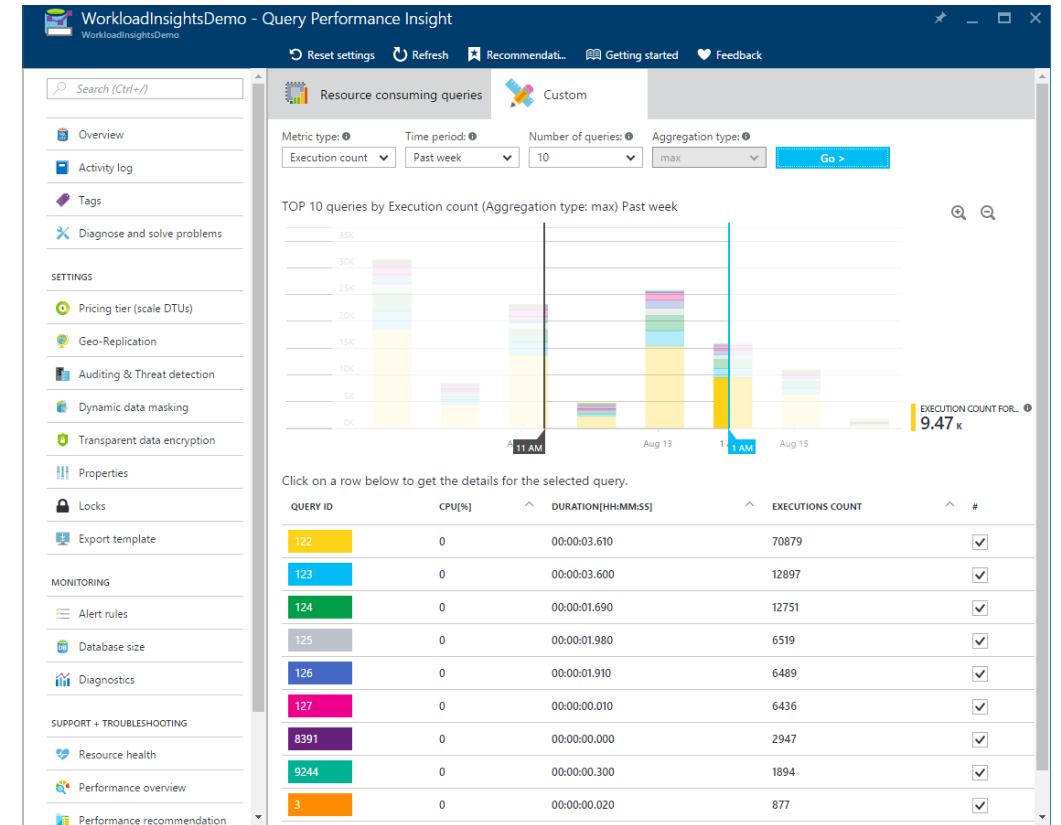


Review top queries per execution count

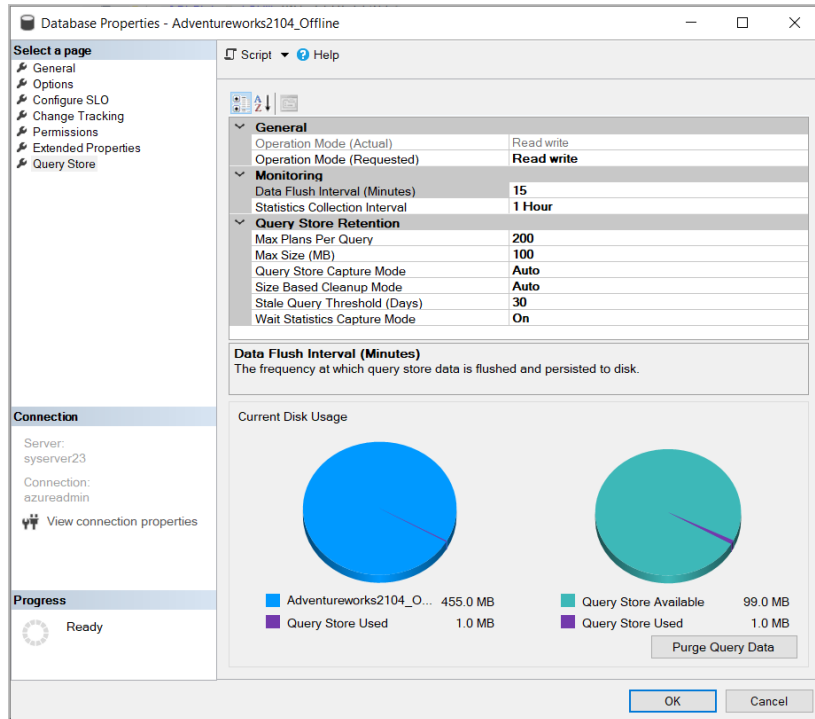
Execution count is one of the metrics showing potential bottleneck

High number of executions has potential for:

- Database performance
- Network latency
- Downstream server latency



Query Store



Retention Policy

- Size based – Auto cleanup when near max size.
- Time based – Default 30 days.
- Max Plans Per Query – Default 200.
- Wait Statistics Capture Mode – Default On.

Capture Policy

- All – Captures all queries.
- Auto – Infrequent queries are ignored.
- None – No queries are captured.
- Custom – Advanced Options

Demonstration

Query Performance Insight

- Analyze the Query Performance Insight output.



Questions?



Knowledge Check

What feature should be enabled on your Azure SQL Database before you can use Query Performance Insight?

How can you view individual query details?

Lesson 3: Azure SQL Database Tuning using Automatic Tuning

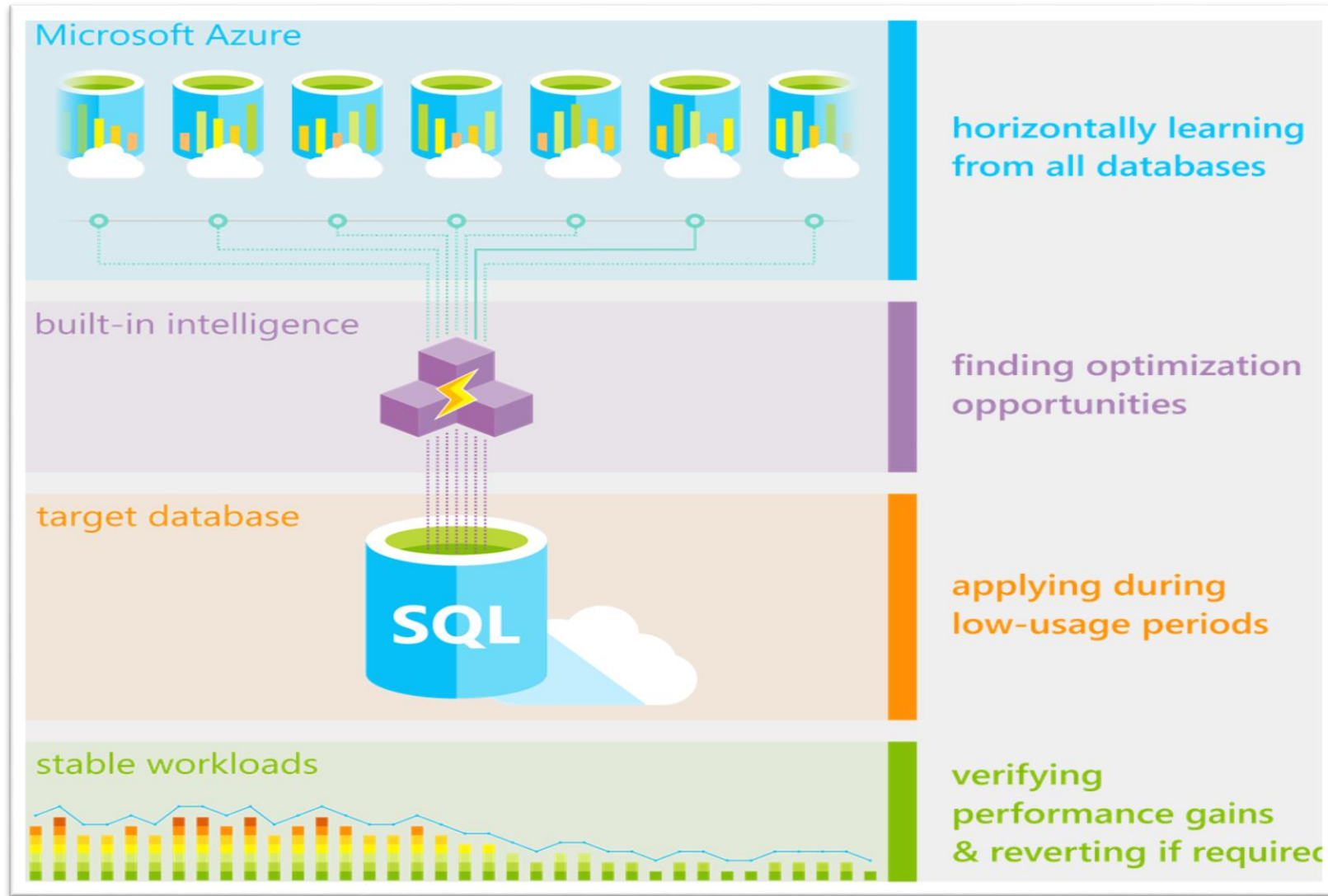
Objectives

After completing this learning, you will be able to:

- Know how Performance Recommendations can help to improve database performance.




Automatic Tuning





[Performance recommendations for SQL Database](#)

Intelligent Performance – Automatic Tuning






Intelligent Performance

 Performance overview

Inherit from:  Server Azure defaults Don't inherit

 The database is inheriting automatic tuning configuration from the server. You can set the configuration to be inherited by going to: [Server tuning settings](#)

Estimated impact Validation report

▼ Validation progress 	Completed
DTU savings (overall) 	31.75% DTU
DTU savings (affected queries) 	90.00% DTU
Queries with improved performance 	12
Queries with regressed performance 	1

Force Last Good Plan:

- Identifies regressed queries due to bad plan and replaces the bad plan with last Good Plan, validates performance improvements and reverts the change if performance does not improve.

Create Index:

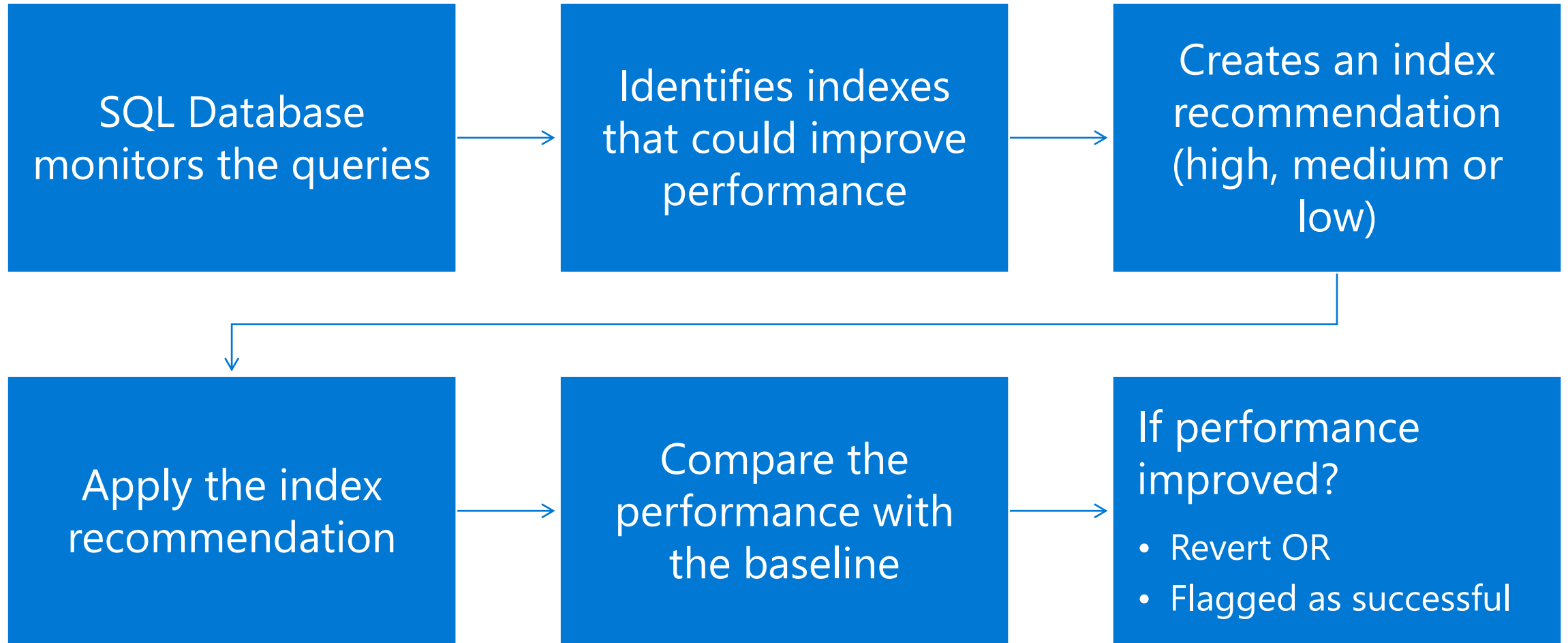
- Identifies and creates Indexes, validates performance improvements and reverts the change if performance degrades.

Drop Index:

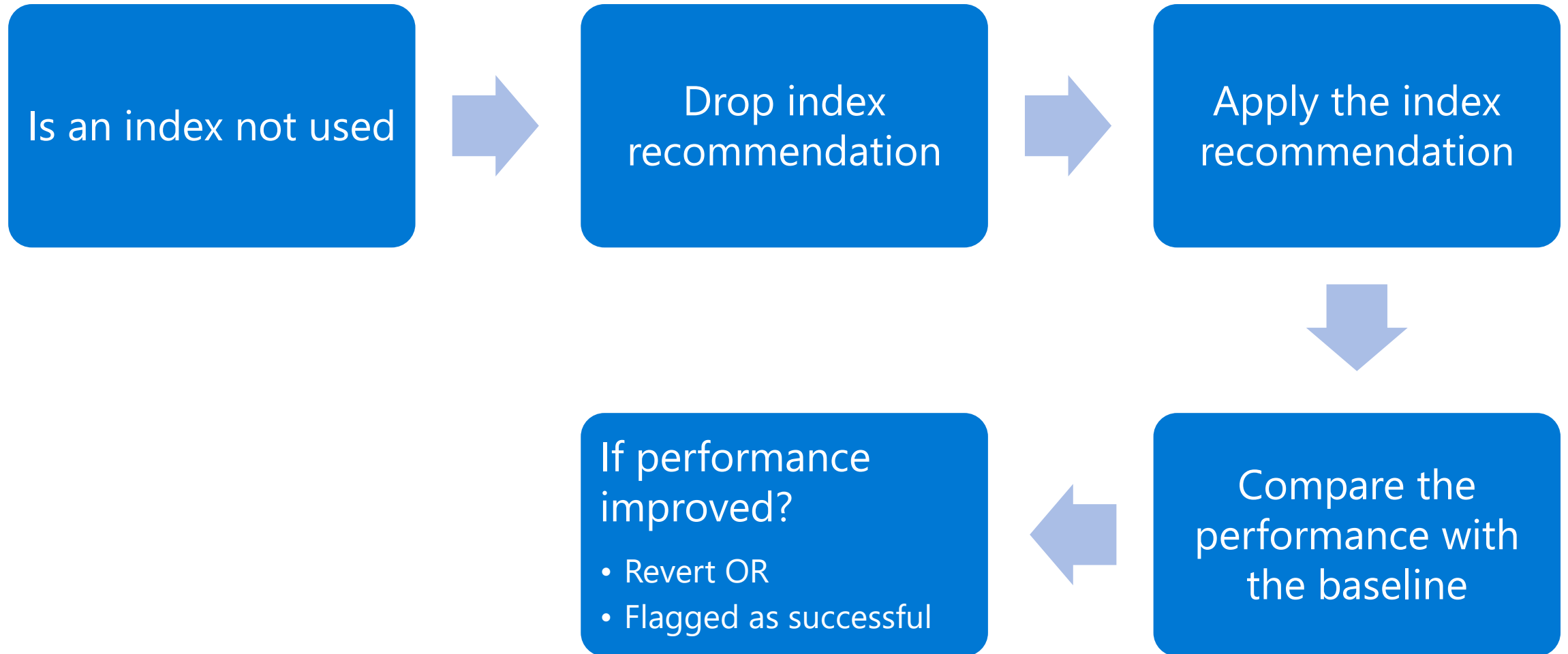
- Identifies and drops unused Indexes, validates performance improvements and reverts the change if performance degrades.

<http://automaticplan correctiondemo.azurewebsites.net/index.html>

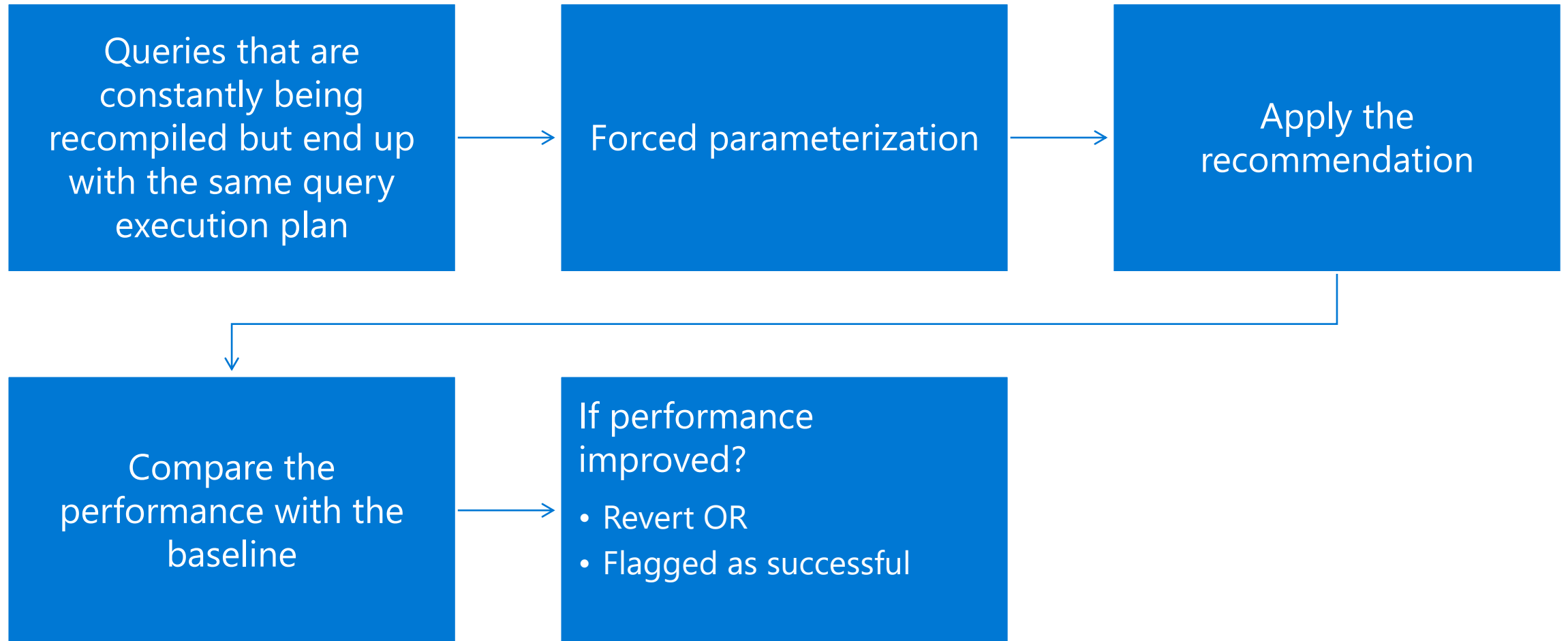
Automatic Tuning – Create Index



Automatic Tuning – Drop Index



Automatic Tuning – Parameterize Queries



Questions?



Knowledge Check

List three types of recommendations from Automatic Tuning.

What could be a reason to disable the automatic tuning option?

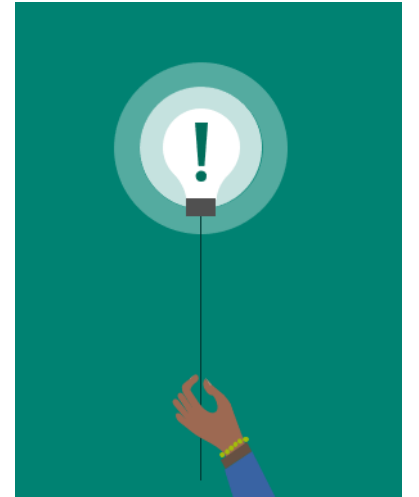
What technology is used for Automatic Tuning?

Lesson 4: Monitoring Azure SQL Database Performance using Extended Events

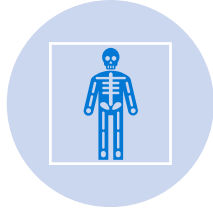
Objectives

After completing this learning, you will be able to:

- Use extended events for troubleshooting performance issues.



Why XEvent?



SQLTrace and
SQLProfiler are
deprecated



Faster and scalable



Designed not to
cause server
problems



More events than
SQLTrace ever had



Targets and actions
make it powerful



SSMS includes the
basic UI tooling

XEvents Objects Explained

Event

- Predefined instrumentation points in the code.

Actions

- Event independent data to add to the collection.
- For example: sql_text, create_dump_all_threads

Predicates

- Independent fields for filtering.
- For example: database_id, session_id

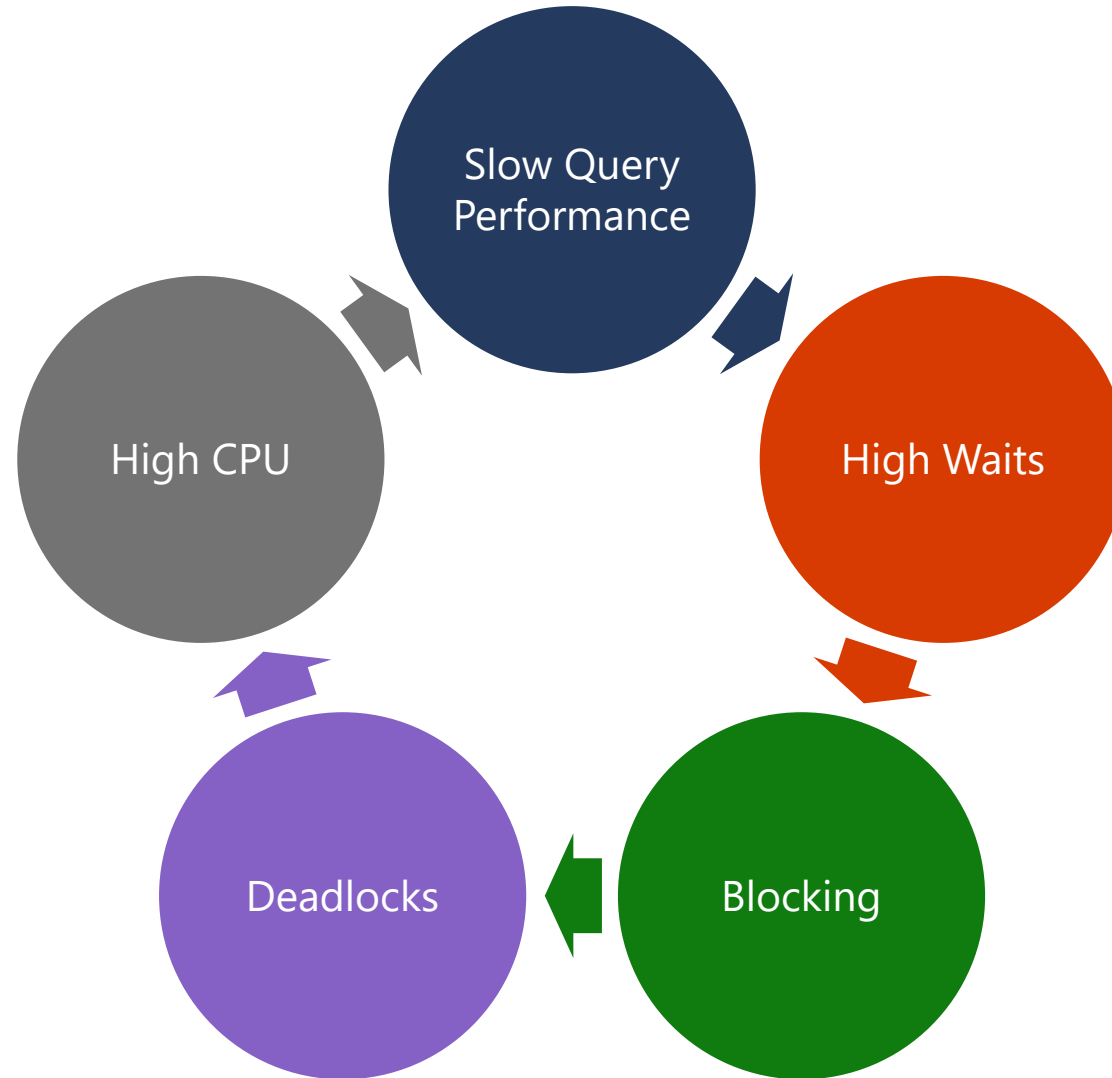
Targets

- Ring Buffer, Event Counter, Event File

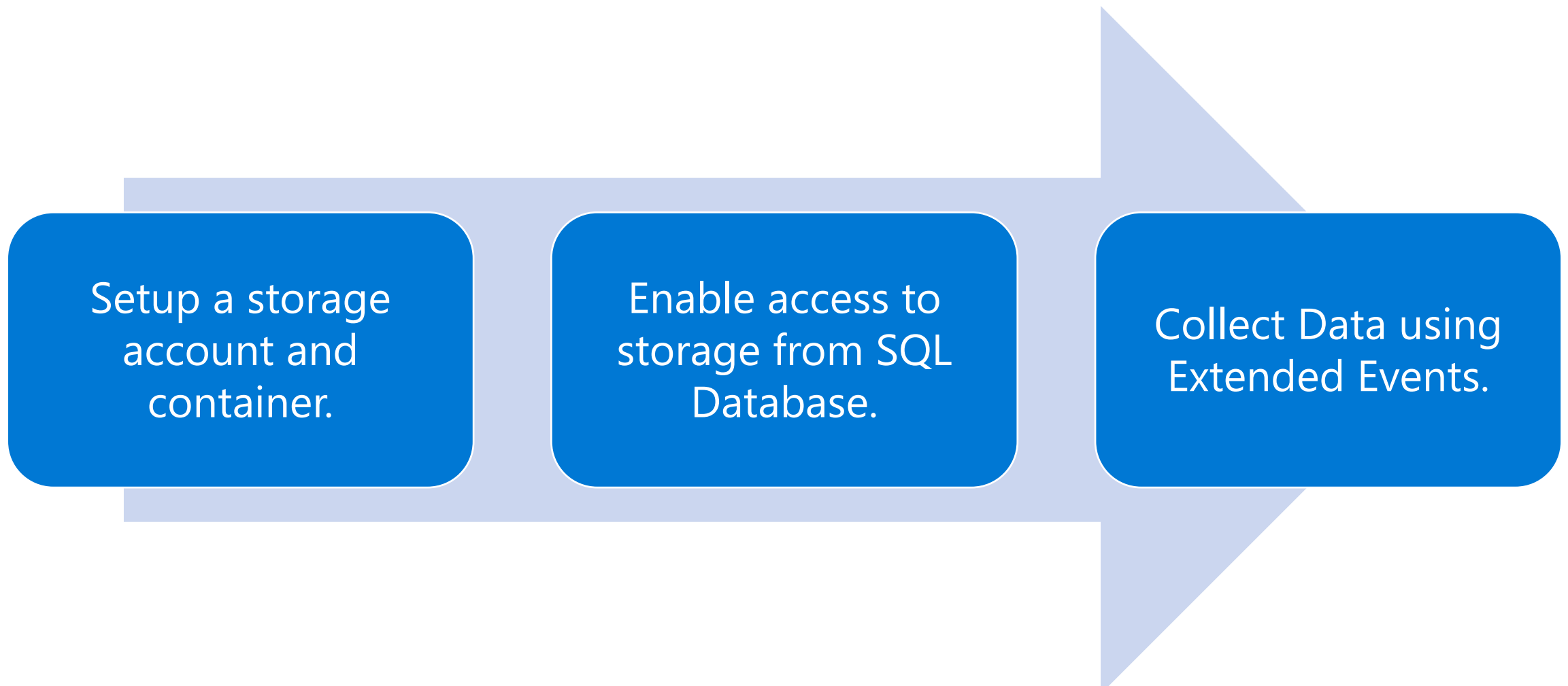
Maps

- Maps "codes" to meaningful names.
- For example: wait_type

XEvents Usage Scenarios



How to enable Extended Events



Setup a storage account and container.

Enable access to storage from SQL Database.

Collect Data using Extended Events.

Storage Container Authorizations



Collect Data Using Extended Events

Create a master key specifying a strong password

- `CREATE MASTER KEY ENCRYPTION BY PASSWORD = 'xxxxxx!';`

Define the blob storage where the XEL will be saved. Use the SAS key that was provided by the definition of the blob storage

- `CREATE DATABASE SCOPED CREDENTIAL [https://xxxx.blob.core.windows.net/xe-container] WITH IDENTITY='SHARED ACCESS SIGNATURE', SECRET = 'sv=2014-02-14&sr=c&sig=Hz2n9vs%3D&st=2016-01-25T23%3A00%3A00Z&se=2016-02-02T23%3A00%3A00Z&sp=rw'`

Define the Extended Event

- Start the event and wait to reproduce the issue.
- Once the issue has been reproduced, stop the event.
- You should see XEL files in the storage container in Azure Storage Explorer.
- You can then download to your laptop/local machine.

Demonstration

Extended Events

- Create Extended Events session using SSMS.
- View Extended Events session.



Questions?



Knowledge Check

List three targets for extended events output.

List three problematic scenarios where extended events can help.

Lesson 5: Configure Alerts through Azure Portal

Objectives

After completing this learning, you will be able to:

- Configure alerts using Azure Management Portal.



Metrics and Alerts

Monitoring

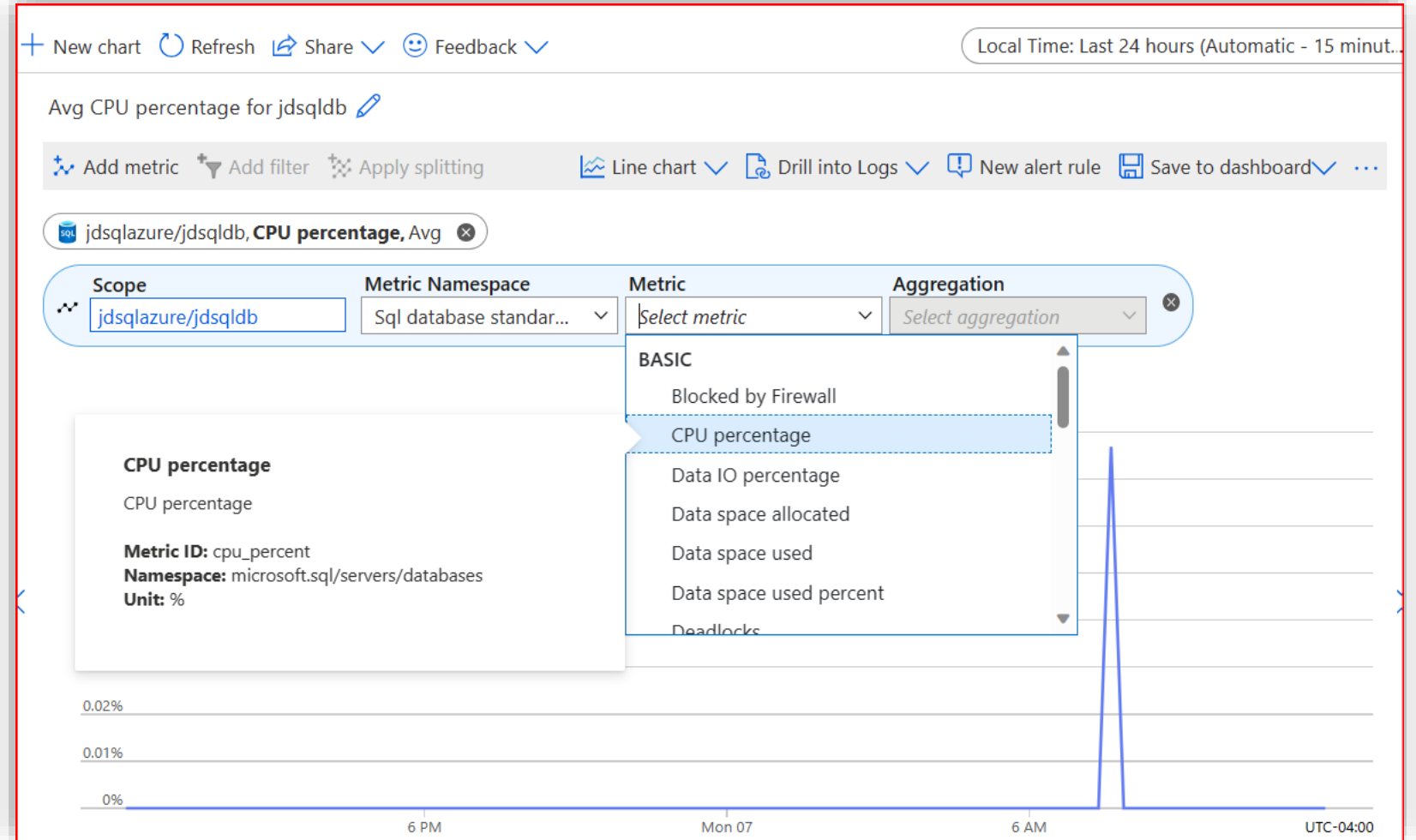
Alerts

Metrics

Diagnostic settings

Logs

- Metrics enable you to see if a database is approaching the limits of CPU, memory, IO, or storage resources.
- High DTU, CPU or IO utilization may indicate that your workload needs more resources.



Purpose of Alerts for Azure SQL Database

Database alerts can help to proactively trigger various events related to database connectivity, high DTU usage or deadlocks, etc.

It helps to proactively resolve underlying issues to avoid application outages and improve user experience.

Receiving an alert based on monitoring metrics or events on

Metric values

- The alert triggers when the value of a specified metric crosses a threshold you assigned in either direction. It triggers when the condition is first met and then when that condition is no longer being met.

Activity log events

- An alert can trigger on every event, or, only when a certain number of events occur.

Purpose of Alerts for Azure SQL Database

You can configure an alert to do the following when it triggers:

- Send email notifications to the service administrator and co-administrators.
- Send email to additional emails that you specify.
- Call a webhook

You can configure and get information about alert rules using

- Azure portal
- PowerShell
- command-line interface (CLI).
- Azure Monitor REST API.

SQL Database alert values

Metric Name	Aggregation Type	Minimum Alert Time Window
CPU percentage	Average	5 minutes
Data IO percentage	Average	5 minutes
Log IO percentage	Average	5 minutes
DTU percentage	Average	5 minutes
Total database size	Maximum	30 minutes
Successful Connections	Total	10 minutes
Failed Connections	Total	10 minutes
Blocked by Firewall	Total	10 minutes
Deadlocks	Total	10 minutes
Database size percentage	Maximum	30 minutes
In-Memory OLTP storage percent(Preview)	Average	5 minutes
Workers percentage	Average	5 minutes
Sessions percent	Average	5 minutes
DTU limit	Average	5 minutes
DTU used	Average	5 minutes

Demonstration

Configure Alerts through Azure Portal

- Configure alerts through Azure Portal.



Questions?



Dankie Faleminderit **Shukran** Chnorakaloutioun Hvala Blagodaria

Děkuji **Tak** Dank u Tānan Kiitos **Merci** Danke Ευχαριστώ A dank

Mahalo מודה. **Dhanyavād** Köszönöm Takk Terima kasih **Grazie** Grazzi

Thank you!

감사합니다 Paldies Choukrane Ačiū **Благодарам** ありがとうございます

谢谢 Баярлалаа **Dziękuję** Obrigado Mulțumesc **Спасибо** Ngiyabonga

Ďakujem Tack Nandri Kop khun **Teşekkür ederim** Дякую Хвала Diolch

