Module 7

Planning and implementing Azure SQL Database

Module Overview

- Planning and deploying Azure SQL Database
- Implementing and managing Azure SQL Database
- Managing Azure SQL Database security
- Monitoring Azure SQL Database
- Managing Azure SQL Database business continuity

Lesson 1: Planning and deploying Azure SQL Database

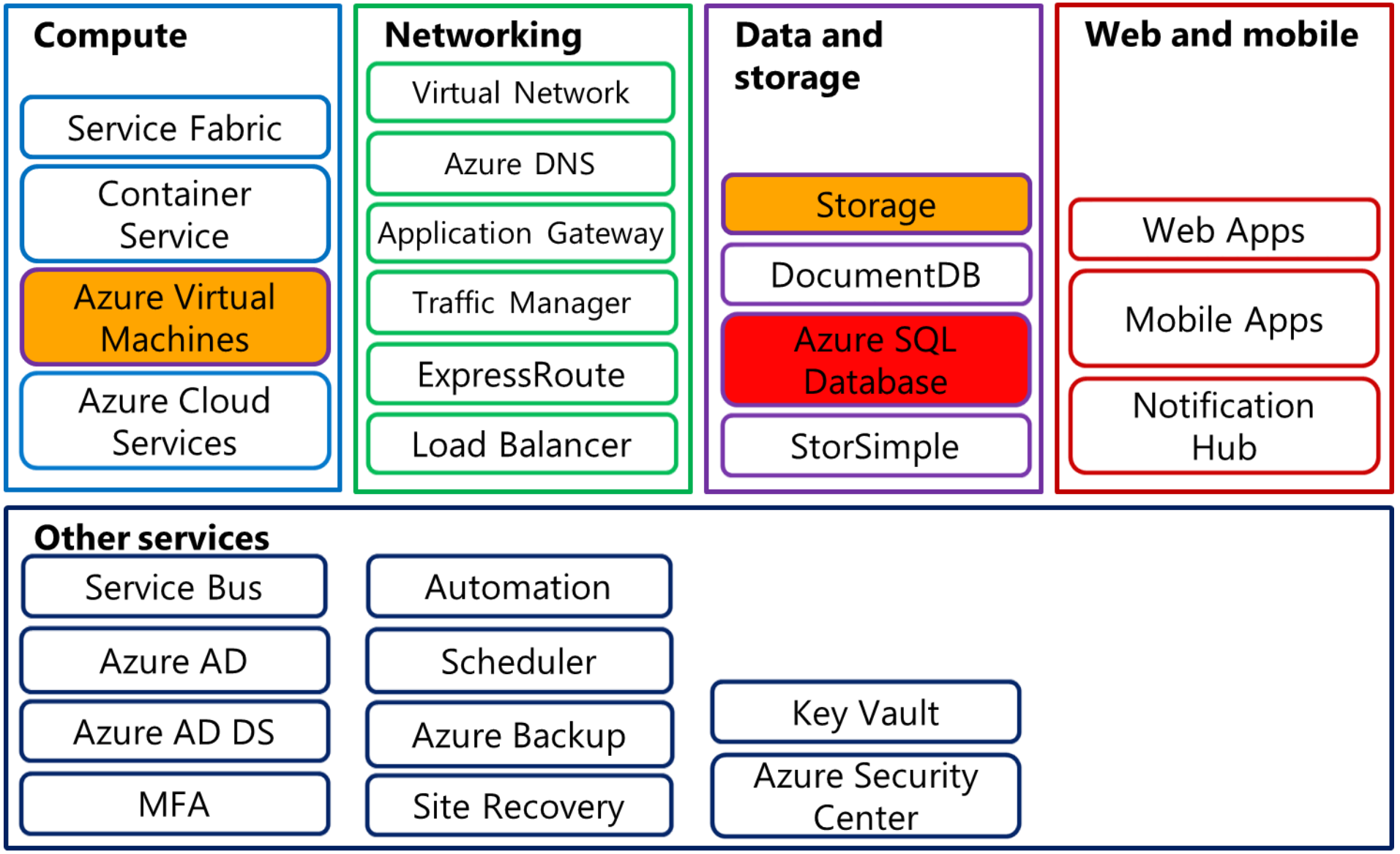
- Demonstration: Preparing the environment for the lab and demos in this module
- Relational database services as a component of Azure
- Azure SQL Database vs. SQL Server in an IaaS virtual machine
- Azure SQL Database architecture
- Planning the deployment of an Azure SQL Database

Demonstration: Preparing the environment for the lab and demos in this module

To prepare the demonstration and lab environment for this module, you must:

1. Launch Windows PowerShell as an administrator
2. Run the **Setup-Azure** command
3. Specify the module number, and confirm your selection

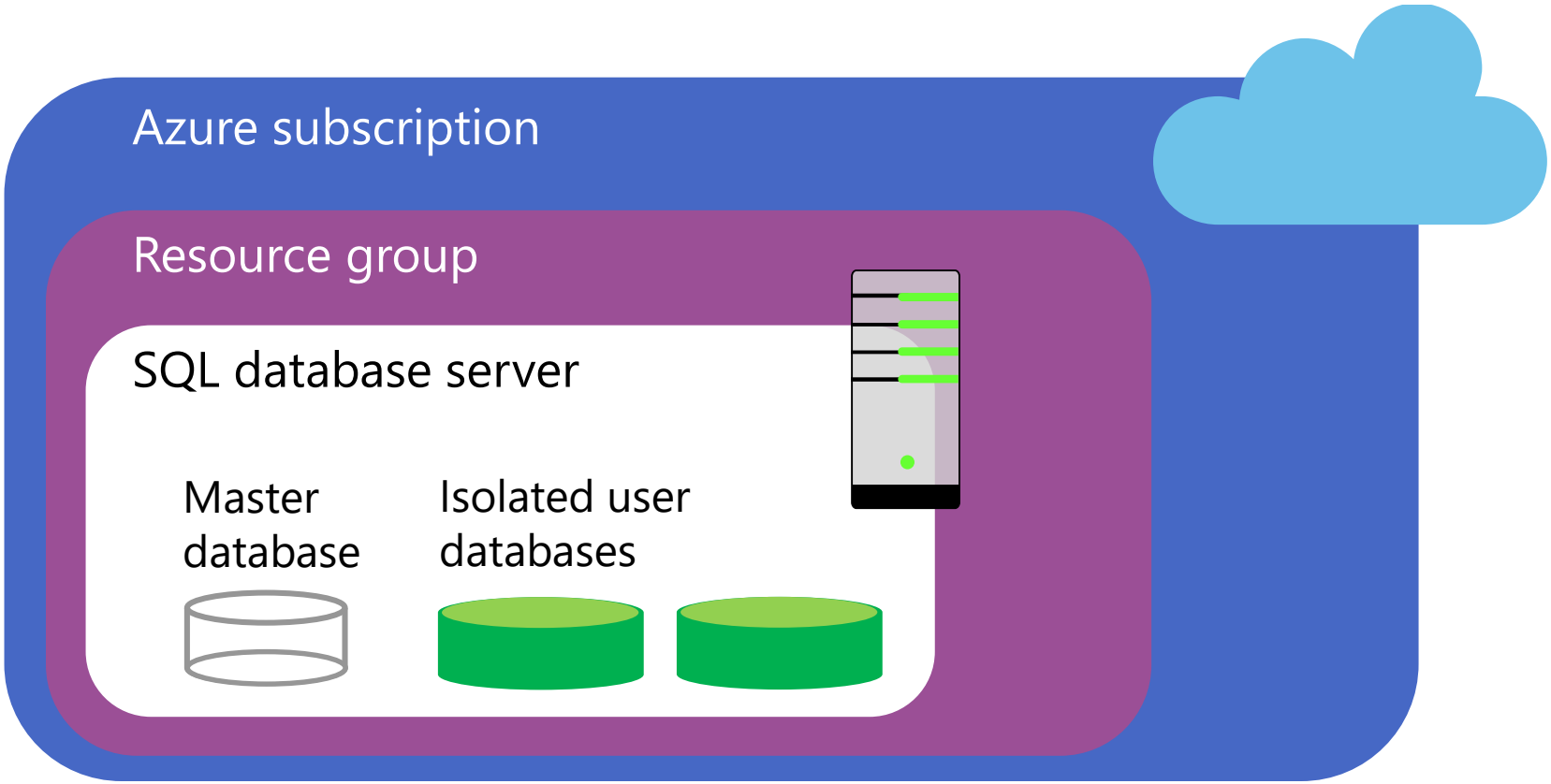
Relational database services as a component of Azure



Azure SQL Database vs. SQL Server in an IaaS virtual machine

Characteristic	Azure SQL Database (PaaS)	SQL Server in a virtual machine (IaaS)
Overhead (compared with an on-premises virtual machine)	Minimized	Lower (no need for infrastructure support)
Cost (compared with an on-premises virtual machine)	Minimized	Lower (no need for infrastructure support)
Provisioning time (compared with an on-premises virtual machine)	Minimized	Lower (no infrastructure dependencies)
Feature parity (compared with an on-premises virtual machine)	No	Yes
Virtual network support	No	Yes
High availability and scalability	Yes	Yes

Azure SQL Database architecture



- Azure SQL Database is:
  - A PaaS relational data store
  - Built on SQL Server technologies

Planning the deployment of an Azure SQL Database

Feature	Basic	Standard (S1–S3)	Premium (P1–P11)
Maximum database size	2 GB	250 GB	1 TB
DTUs	5	10-100	125-4000
Point-in-time restore	Any point in the last 7 days	Any point in the last 14 days	Any point in the last 35 days
Disaster recovery	Geo-restore, active geo-replication, up to 4 readable secondary copies	Geo-restore, active geo-replication, up to 4 readable secondary copies	Geo-restore, active geo-replication, up to 4 readable secondary copies
Maximum in-memory OLTP storage	NA	NA	1 GB-32 GB
Maximum concurrent workers	30	60-200	200-6400
Maximum concurrent logins	30	60-200	200-6400
Maximum sessions	300	600-2400	2400-32000

Lesson 2: Implementing and managing Azure SQL Database

- Tools for implementing and managing Azure SQL Database
- Provisioning Azure SQL Database
- Migrating a SQL Server Database to Azure SQL Database
- Demonstration: Implementing Azure SQL Database

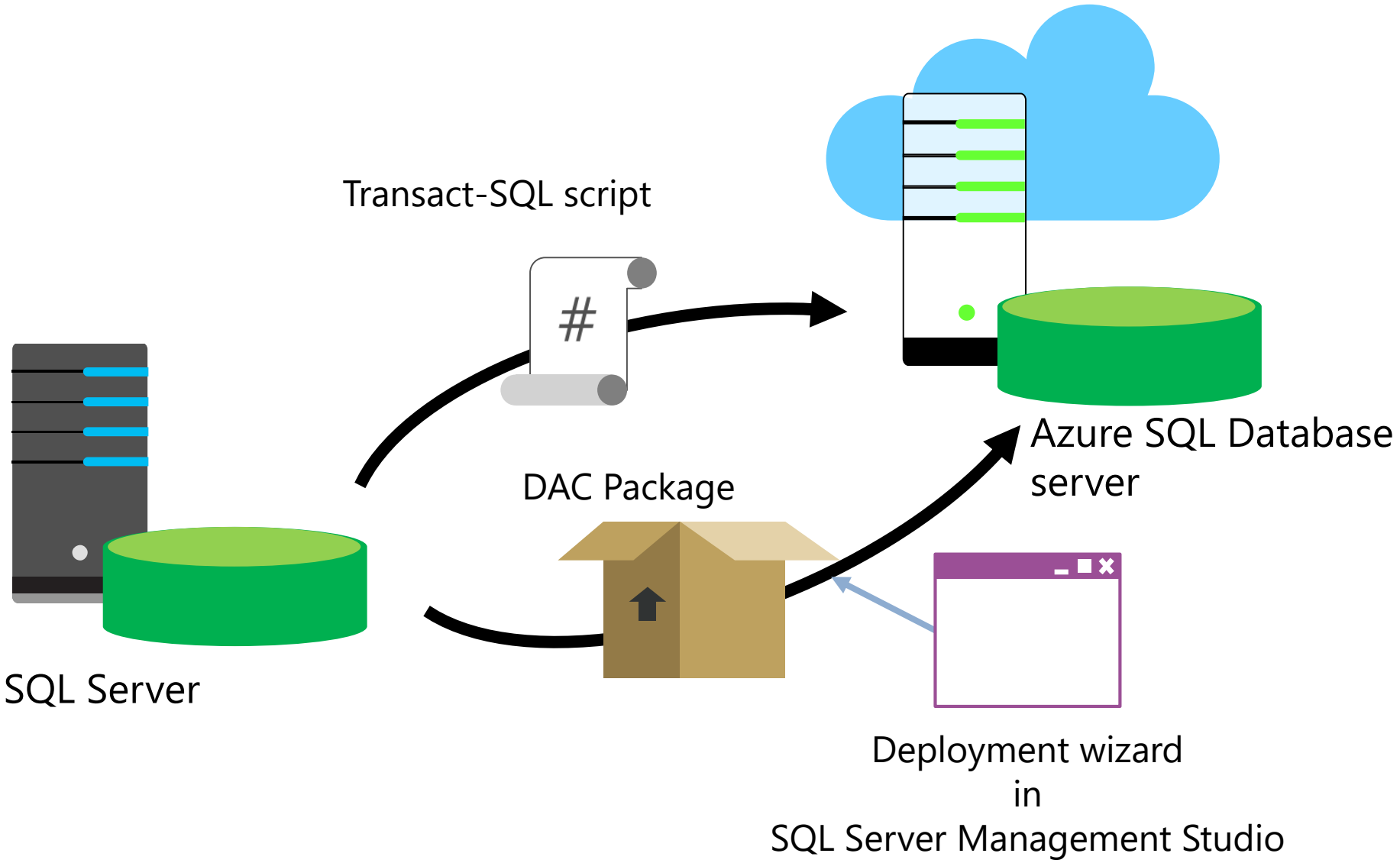
Tools for implementing and managing Azure SQL Database

- Azure portal
- Azure PowerShell module
- Azure CLI
- Azure Resource Manager templates
- SQL Server Management Studio
- SQLCMD
- Visual Studio

Provisioning Azure SQL Database

Creating a database	• Database name • Server name • Service tier • Performance level • Maximum size • Collation • Resource group
Creating a server	• Server name • Admin login credentials • Location (Azure region) • Whether to allow Azure services to access server • Whether to create V12 server

Migrating a SQL Server Database to Azure SQL Database



Demonstration: Implementing Azure SQL Database

In this demonstration, you will see how to:

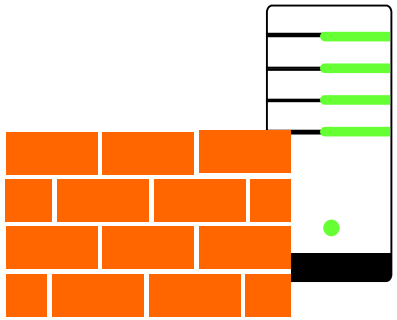
- Create an Azure SQL Database
- Configure server firewall settings
- Connect to Azure SQL Database by using SQL Server Management Studio
- Configure a client connection string to Azure SQL Database

Lesson 3: Managing Azure SQL Database security

- Overview of Azure SQL Database security
- Managing firewall rules
- Managing logins and users
- Managing role membership and permissions
- Demonstration: Configuring security

Overview of Azure SQL Database security

Server level

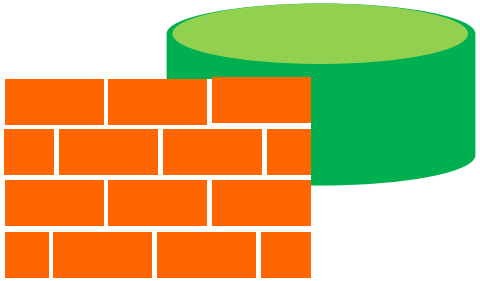


Firewall rules

Logins

Master database roles

Database level



Firewall rules

Users

Database roles

Schema and object level

Permissions

Managing firewall rules

- Server firewall rules:
  - View server firewall settings in **sys.firewall_rules**
  - Manage using **sp_set_firewall_rule** and **sp_delete_firewall_rule**
- Database firewall rules:
  - Allow IP ranges to access individual databases
  - View database firewall rules in **sys.database_firewall_rules**
  - Manage using **sp_set_database_firewall_rule** and **sp_delete_database_firewall_rule**

Managing logins and users

- Logins:
  - To manage a login, establish a session that is connected to the master database
  - To create a login, specify login name and password
  - Fully-qualified name is *login_name@server_name*

```
CREATE LOGIN MyLogin
WITH PASSWORD = 'Pa$$w0rd';
```

- Users:
  - Permits a login to access a database

```
CREATE USER MyUser
FROM LOGIN MyLogin;
```

Managing role membership and permissions

- Managing role membership:
  - Database roles are defined in each database
  - Roles with server-level permissions are defined in the master database

```
EXEC sp_addrolemember 'dbmanager', 'MyUser';
EXEC sp_addrolemember 'db_datareader', 'MyUser';
```

- Managing permissions:
  - Use the same GRANT, REVOKE, and DENY statements as SQL Server
  - Use roles to control access, and only use explicit permissions to override where necessary

```
DENY SELECT ON dbo.MyTable TO MyUser;
```

Demonstration: Configuring security

In this demonstration, you will see how to manage logins, users, roles, and permissions

Lesson 4: Monitoring Azure SQL Database

- Metrics and alerts
- Dynamic management views
- Database auditing
- Demonstration: Monitoring Azure SQL Database

Metrics and alerts

- Database metric charts:
  - Successful and failed connections
  - Storage utilization
  - CPU utilization
  - DTU utilization
- Alerts:
  - Send an automated email notification when a metric exceeds the threshold value
  - Submit an HTTP request to a webhook

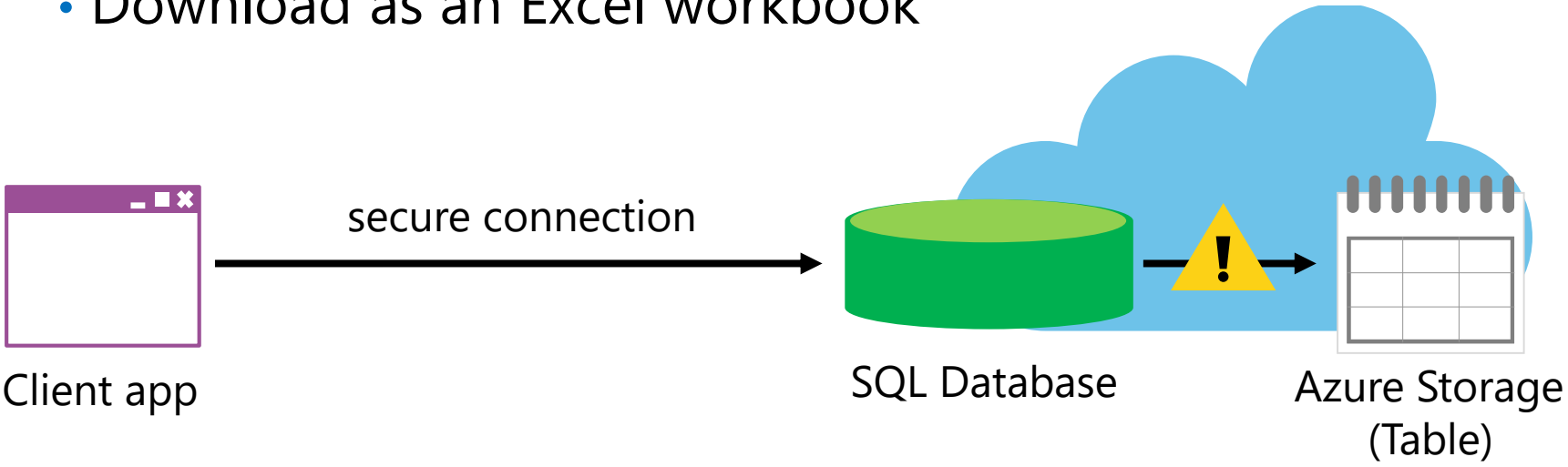
Dynamic management views

- System metadata views:
  - Current activity
  - Historic activity
- Commonly used to troubleshoot concurrency and performance issues
- To retrieve details about current transactions and the session in which they are being executed:

```
SELECT s.program_name, s.status, t.transaction_begin_time,
   t.state
FROM sys.dm_tran_sessions s
JOIN sys.dm_tran_session_transaction st
ON s.session_id = st.session_id
JOIN sys.dm_tran_active_transactions t
ON st.transaction_id = t.transaction_id
```

Database auditing

- Enable auditing for a database:
  - Audit records are stored in an Azure Storage account
- Use secure connection strings:
  - *server_name*.database.**secure**.windows.net
- View audited events:
  - Summary view in Azure portal
  - Download as an Excel workbook



Demonstration: Monitoring Azure SQL Database

In this demonstration, you will see how to:

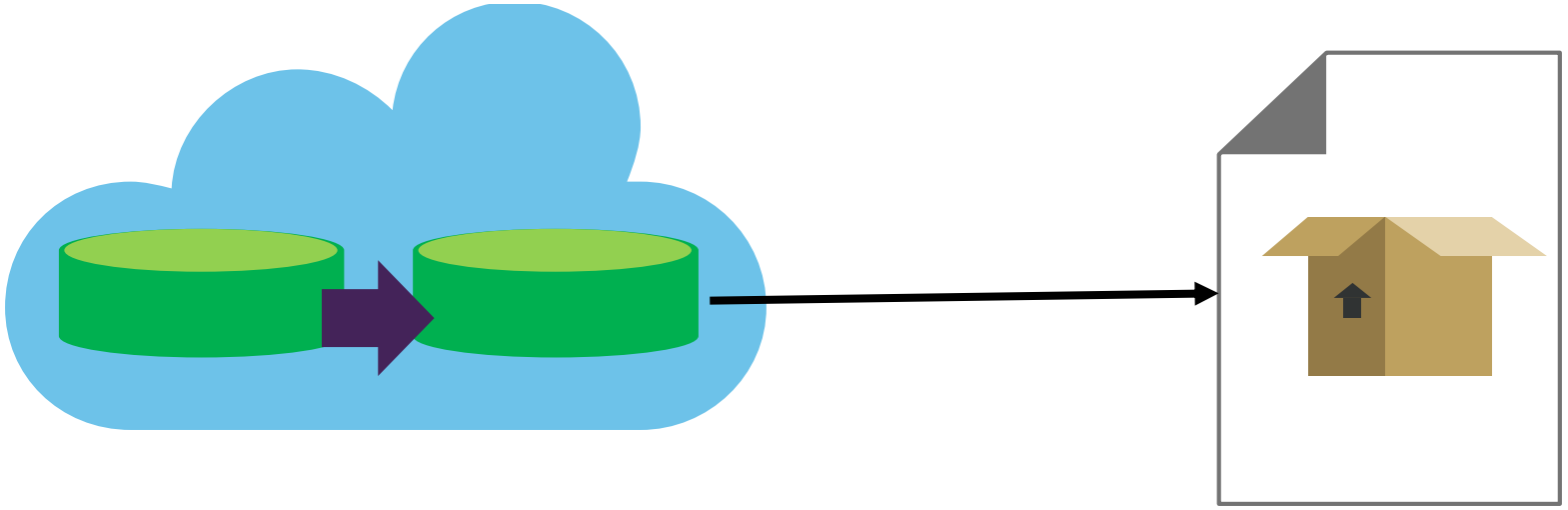
- View SQL Database metrics
- Configure SQL Database auditing

Lesson 5: Managing Azure SQL Database business continuity

- Database copy and export
- Point in time restore
- Geo-replication
- Demonstration: Managing data recovery and high availability

Database copy and export

1. Export a copy of the database at periodic intervals
2. Store the exported .bacpac file in a storage account
3. Import the copied database in the event of a database, server, or datacenter failure



Point in time restore

- Azure automatically creates periodic backups that replicate to a remote datacenter
- You can restore databases to a previous point in time:
  - Basic. Daily restore point retained for 7 days
  - Standard. You can restore to a specific point in time within 35 days
  - Premium. You can restore to a specific point in time within 35 days
- You can restore a deleted database to the most recent recovery point

Geo-replication

- Stores a continuous copy of a primary database to one or more secondary databases in remote datacenters:
  - Up to four readable secondaries
  - Supported by all pricing tiers
  - Any Azure region
- Failover procedure:
  1. Bring the secondary database online
  2. Modify application connection strings

Demonstration: Managing data recovery and high availability

In this demonstration, you will see how to:

- Restore a database
- Configure geo-replication

Lab: Planning and implementing Azure SQL Database

- Exercise 1: Creating, securing, and monitoring an Azure SQL Database
- Exercise 2: Migrating a Microsoft SQL Server Database to Azure SQL Database
- Exercise 3: Restoring a database

Estimated Time: 60 minutes

Lab Scenario

Managers at A. Datum are planning to migrate some of the company's application databases to the cloud.

To achieve this goal, you plan to use Microsoft Azure SQL Database. You have been asked to test SQL Database by creating a new database of A. Datum servers and by migrating sample data from the A. Datum customer relationship management system. Managers have asked you to investigate how SQL Database will support an existing custom application used with A. Datum, as well as disaster recovery features.

Lab Review

- If the SalesApp web application was deployed to a server with a fixed public IP address, how could you enable it to access the sales Azure SQL Database without allowing it to access any other Azure SQL Database on the same server running SQL?

Module Review and Takeaways

- Common Issues and Troubleshooting Tips
- Review Question