Unit Testing for Database Development

Olivier Van Steenlandt



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THANK YOU



Awesome Partner

Microsoft

Platinum

redgate

ACP IT for innovators.

Gold

b.telligent
smart data. smart decisions.

Lucient

Bronze

Tabular Editor

paiqo

Power BI Camp
www.linearis.at



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Feedback





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About me

Olivier Van Steenlandt

Datawarehousing & Reporting Teamlead

Core Member @ dataMinds.be

Speaking / Blogging



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Schedule

What

Why

How

Demo

Summary



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Current Situation

Environments

Development
(Acceptance)
Production

Process

Automatic:
* Change tracking
* Deployments

Tools

Database Project
Azure DevOps

Database Projects



Visual Studio



Visual Studio Code



Azure Data Studio



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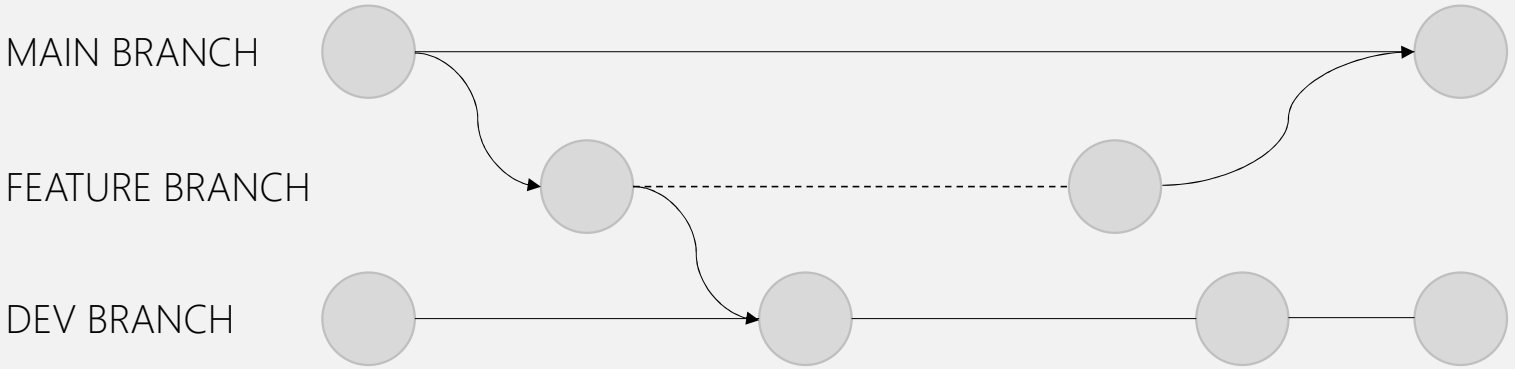
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Branching Strategies

Feature Branching



Future Situation

Process

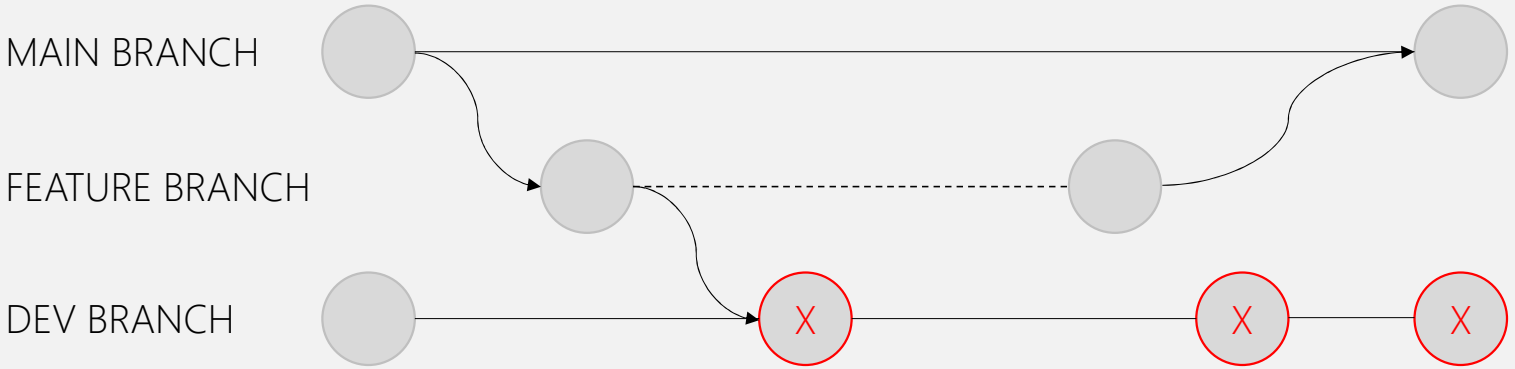
Automatic
Change tracking
Deployments
Unit Testing

Tools

Database Project
Azure DevOps
Unit Testing Framework

Branching Strategies

Feature Branching



Concepts & Basics



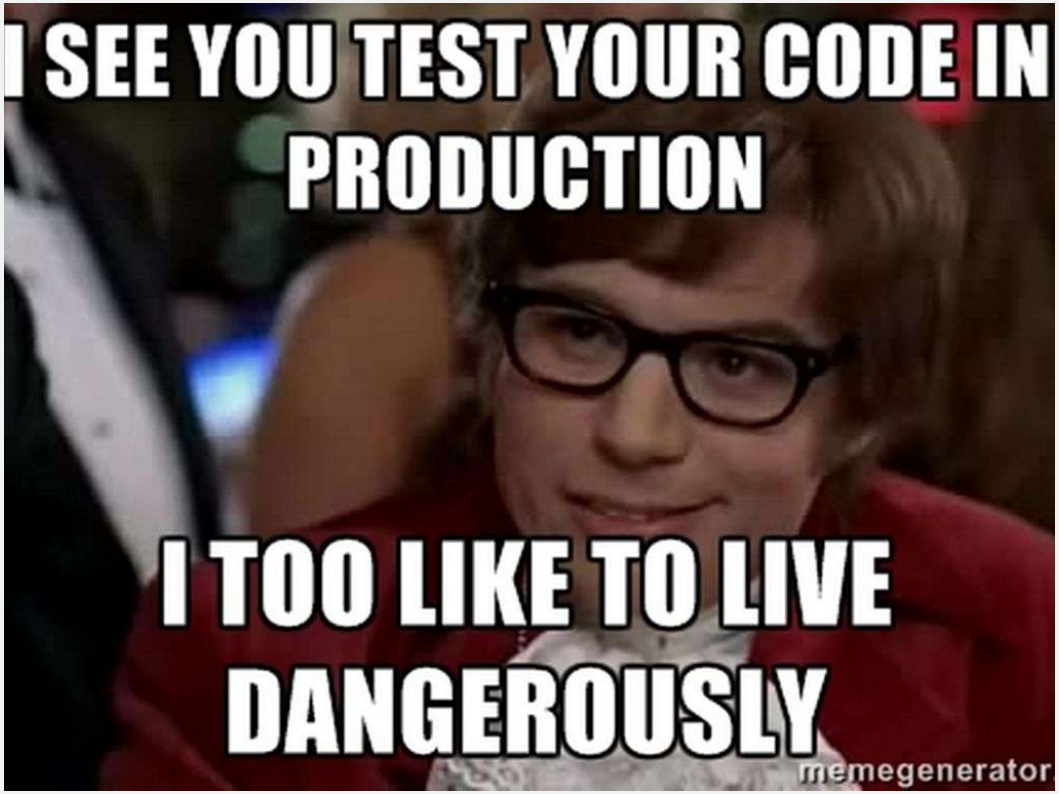
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Why?


I SEE YOU TEST YOUR CODE IN PRODUCTION
I TOO LIKE TO LIVE DANGEROUSLY
memegenerator

Why?

Identify bugs early

Improves Code Quality

Cost Reduction Long term

General

UI Testing

Unit Testing

Integration Testing



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What is Unit Testing

"Unit Testing is a form of software testing by which isolated source code is tested to validate expected behavior" - *Wikipedia*

Typical Design Pattern

1. Create a Test File
2. Write a Test Class
3. Execute Test File
4. Validate the result

Unit Testing Framework

Junit – Java

Jest – JavaScript

PyUnit – Python

Xunit - .Net

Nunit - .Net

Unit Testing for SQL Databases



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Options for Database Unit Testing

Create your own ☺

SQL Server Unit Tests

tSQLt

tSQLt



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tSQLt

https://tsqlt.org/

→Sebastian Meine

→Liz Baron



How to get started?

Download tSQLt

Install tSQLt

Write your first Unit Test



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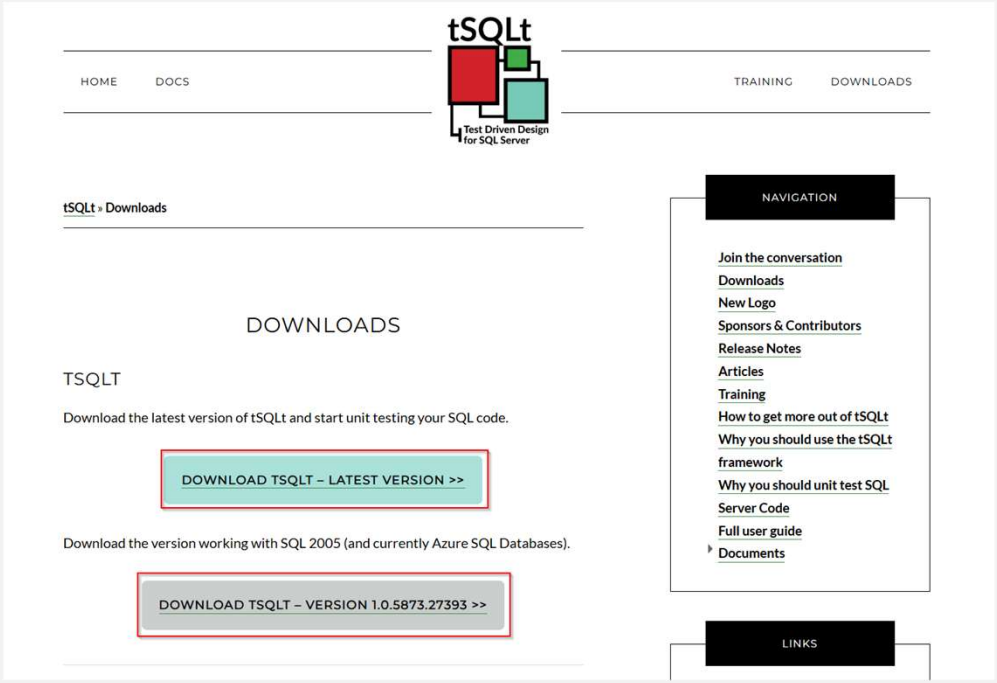
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Download tSQLt

https://tsqlt.org/downloads



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Available versions

tSQLt_V1.0.8083.3529

→SQL Server

tSQLt_V1.0.5873.27393

→ Azure SQL Database



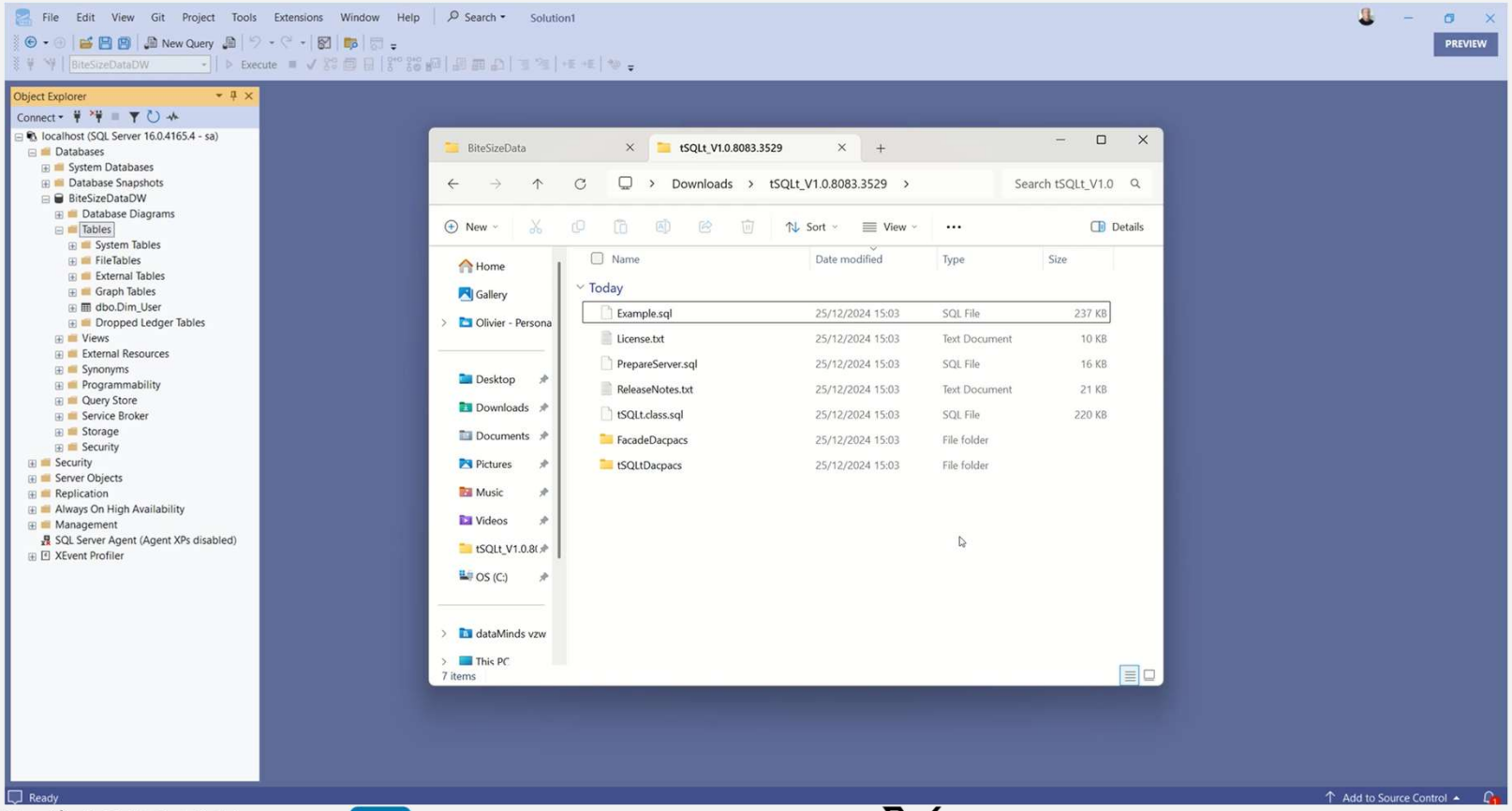
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Installing tSQLt



tSQLt Installed, now what?

1. Create a Test Class

   Grouping of Unit Tests

2. Create a Unit Test

   Testing specific functionality

Create a Test Class

tSQLt.NewTestClass @ClassName

→Stored Procedure

→Example:

```
DECLARE @TestClassName NVARCHAR(MAX) =
'CoreUnitTest';
EXEC tSQLt.NewTestClass @TestClassName
GO
```



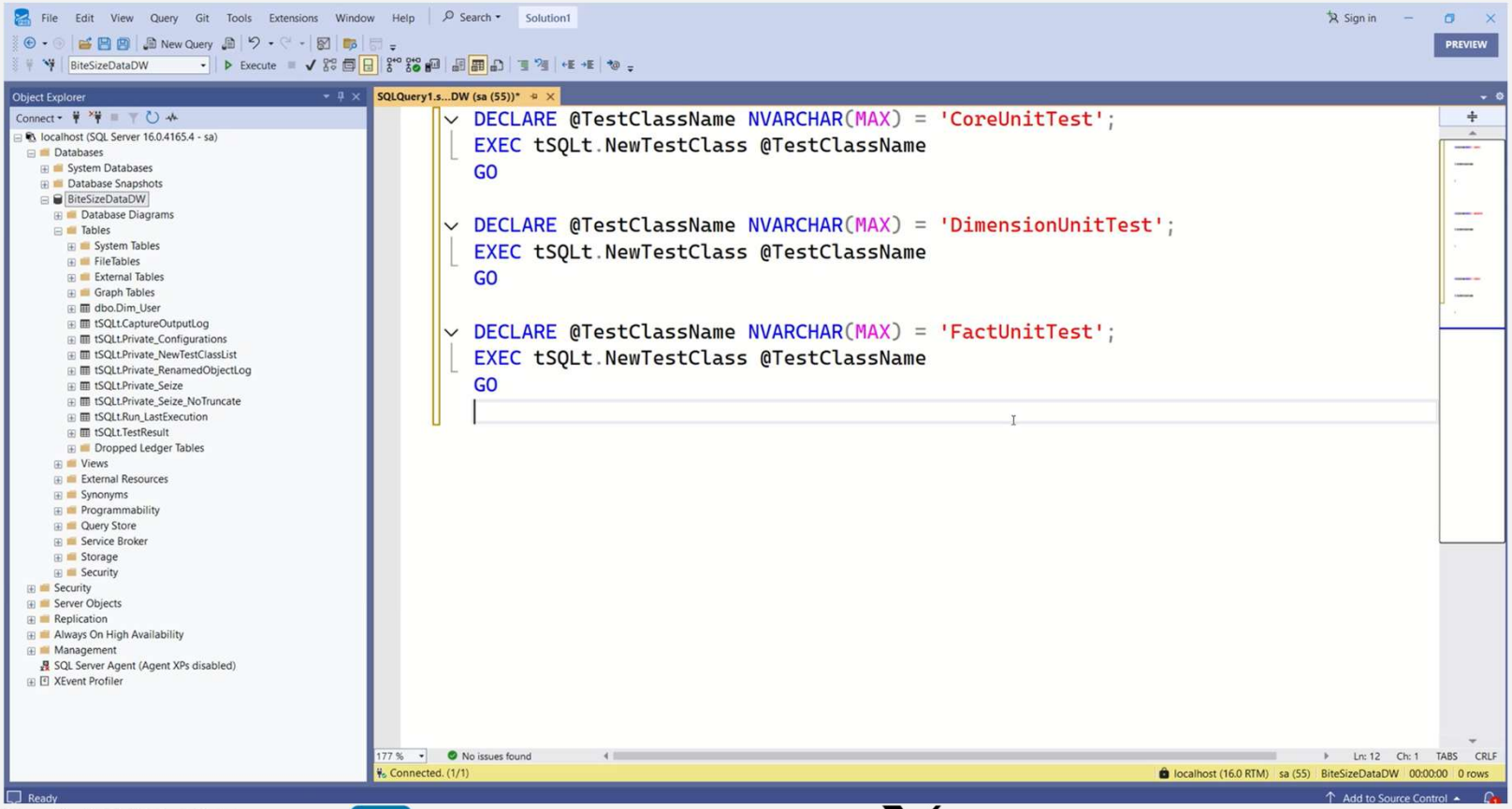
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Create a Test Class





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Testing Different Database Objects

Functions

Stored Procedures

Triggers

Values



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Create a Unit Test

Core Unit Test Class

→Check if Dimension Table Exists

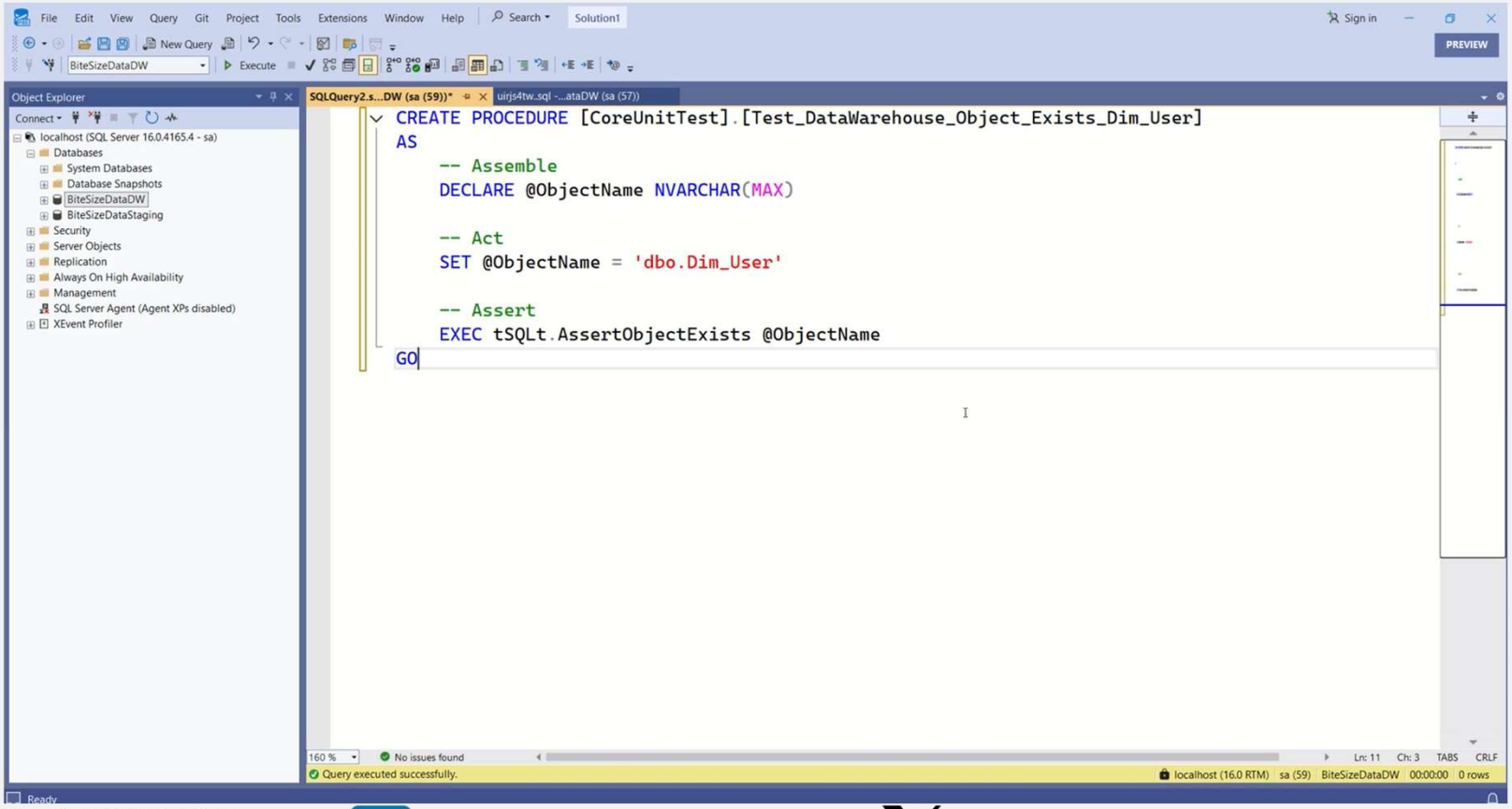
What makes a Unit Test?

Assemble

Act

Assert

Check if Dimension Table Exists





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Which tSQLt did we use?

```
tSQLt.AssertObjectExists
```



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Execute Unit Tests

```
EXEC tSQLt.RunAll
```

```
(1 row affected)

+----------------------+
|Test Execution Summary|
+----------------------+

|No|Test Case Name                                                |Dur(ms)|Result |
+--+--------------------------------------------------------------+-------+-------+
|1 |[CoreUnitTest].[Test_DataWarehouse_Object_Exists_Dim_User]|     26|Success|
-------------------------------------------------------------------------------------
Test Case Summary: 1 test case(s) executed, 1 succeeded, 0 skipped, 0 failed, 0 errored.
-------------------------------------------------------------------------------------
```



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Execute Unit Tests

```
EXEC tSQLt.RunAll
```

```
DECLARE @TestName NVARCHAR(MAX) =
'CoreUnitTest'
EXEC tSQLt.Run @TestName
```



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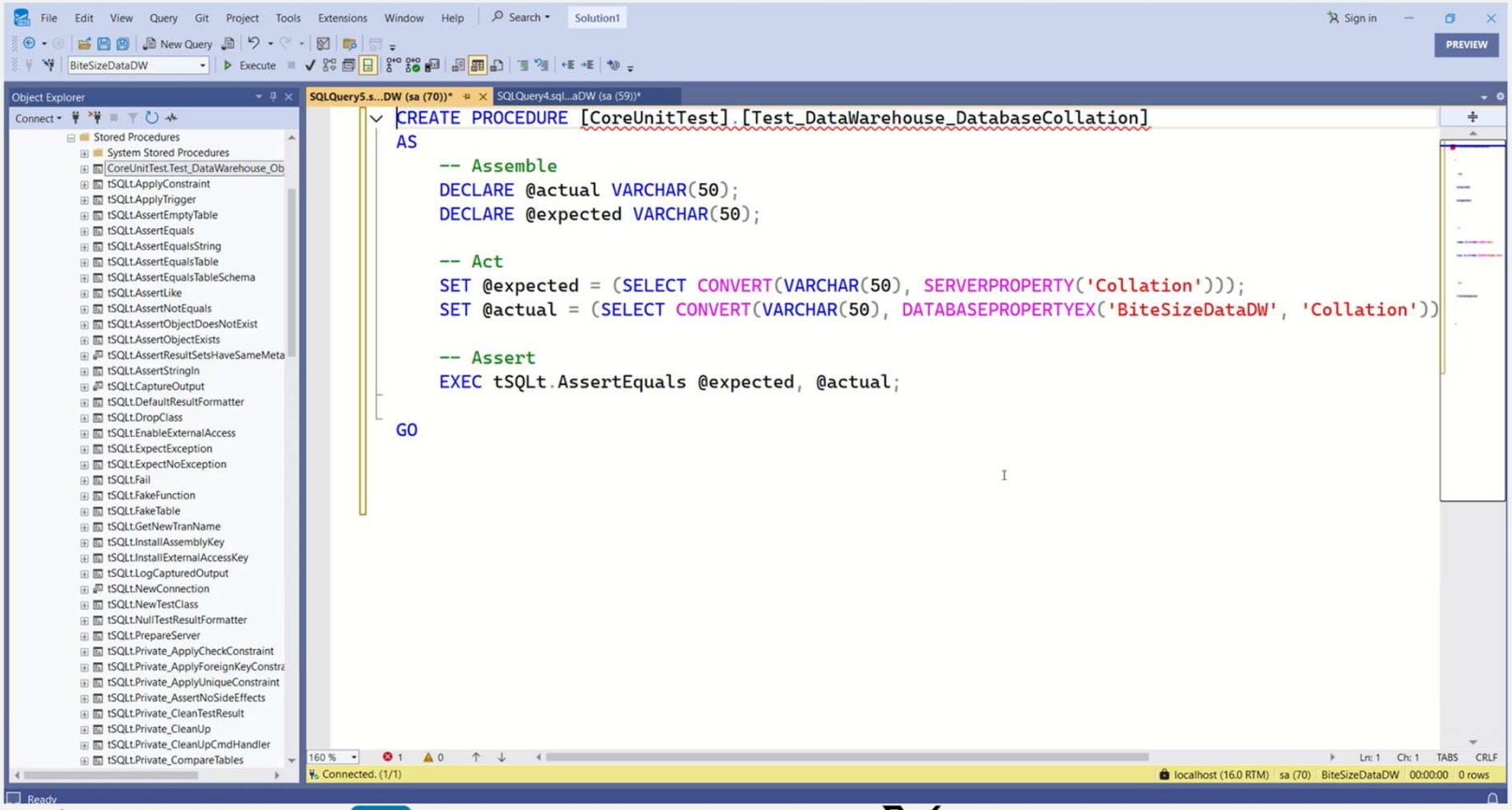
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Create another Unit Test

Core Unit Test Class

→Check Database Collation vs Server Collation

Check Database Collation vs Server Collation





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Testing a Dimension Load

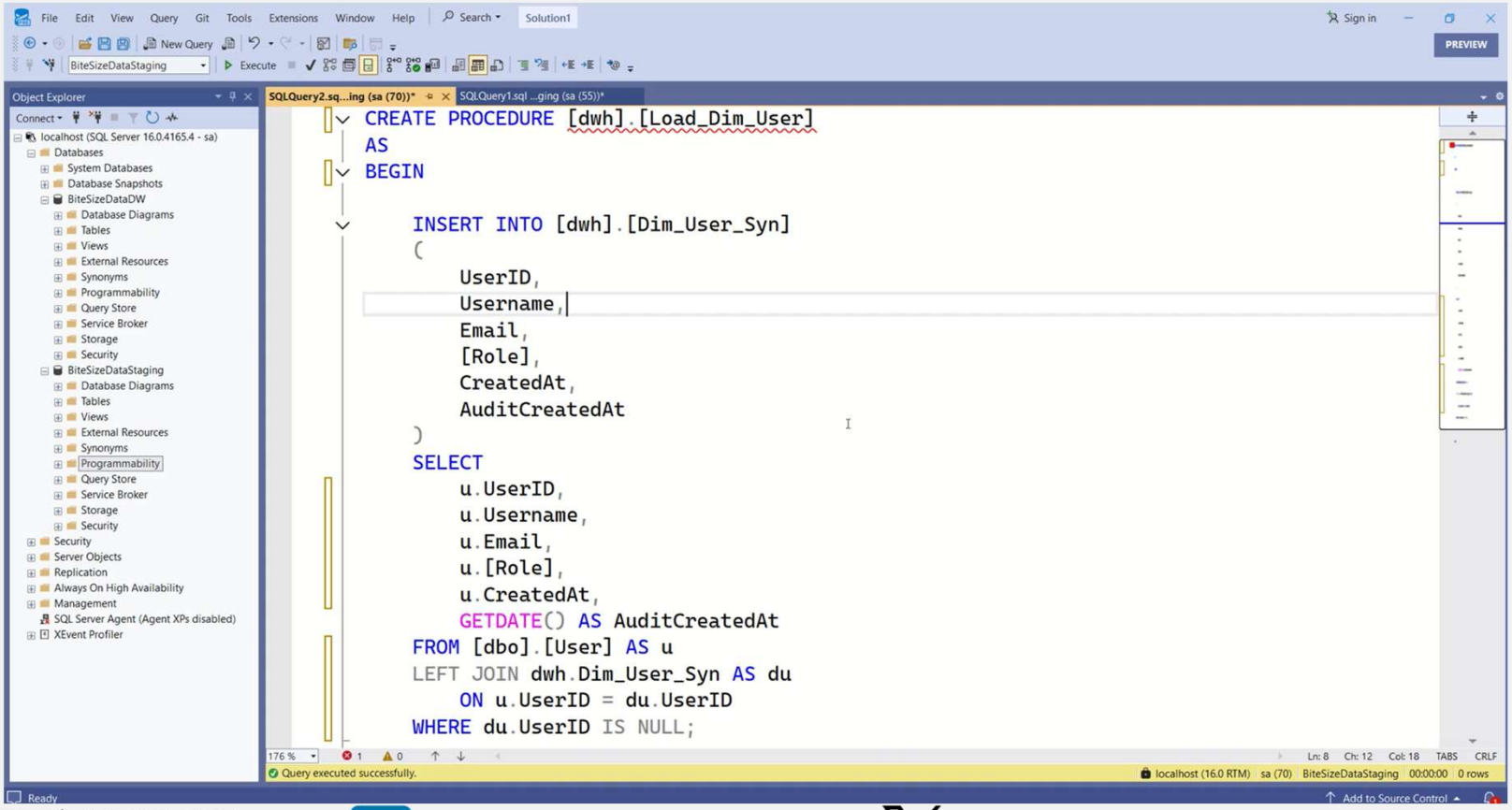
Target Database: BiteSizeDataDW

Source Database: BiteSizeDataStaging

Stored Procedure: dwh.Load_Dim_User

→ Testing cross database functionality!

Testing a Dimension Load





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Which tSQLt did we use?

`tSQLt.FakeTable` → Dependency Isolation

`tSQLt.AssertEqualsTable` → Assertion

Dependency Isolation

ApplyConstraint

ApplyTrigger

FakeTable

FakeFunction

...



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Assertions

AssertObjectExists

AssertObjectDoesNotExist

AssertEquals

AssertNotEquals

AssertEqualsTable

AssertLike

...



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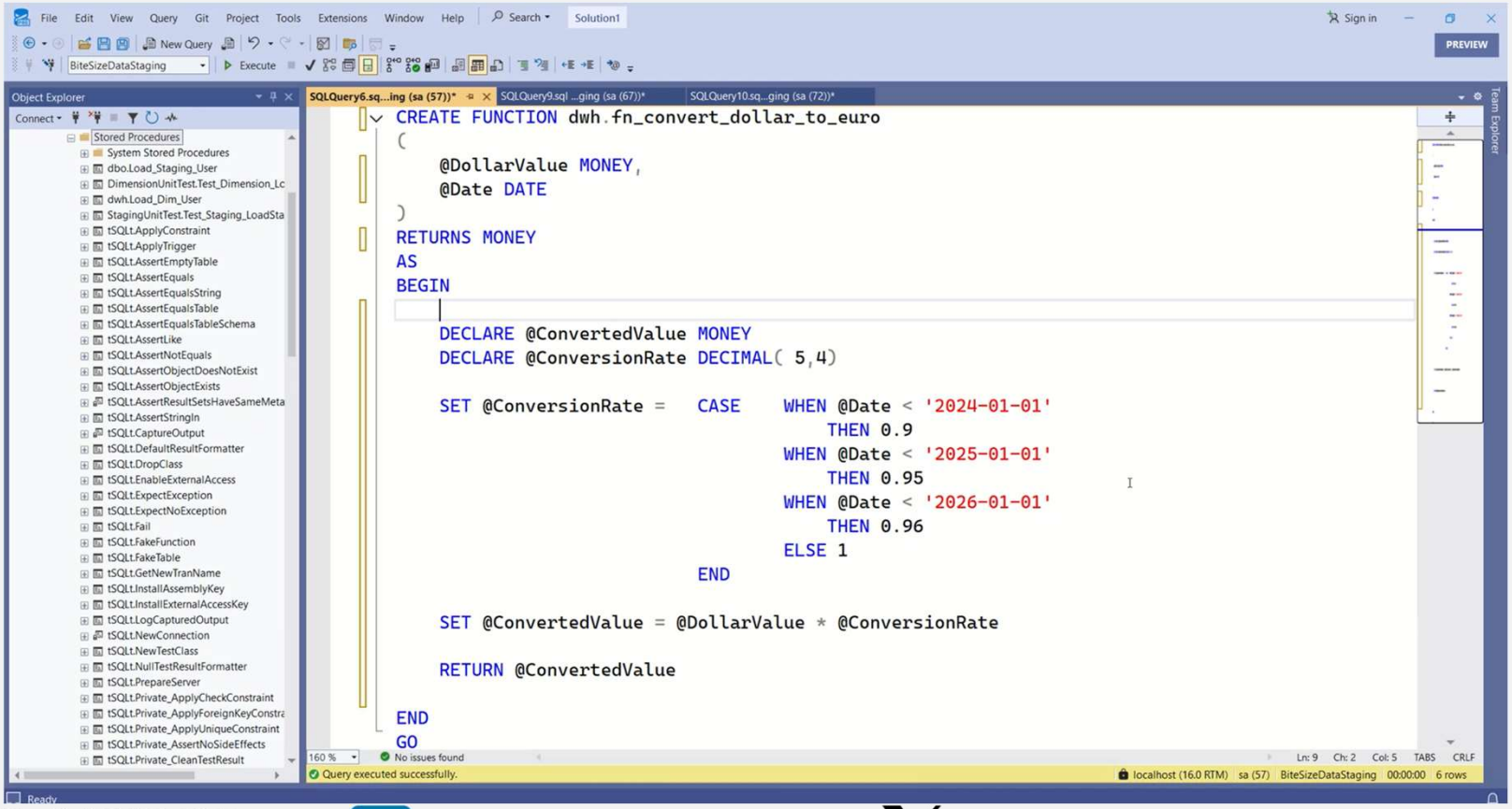
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Testing a Function (1/2)

Converting $ → € based on a date

→Will be used in Dimension load in the end

Testing a Function



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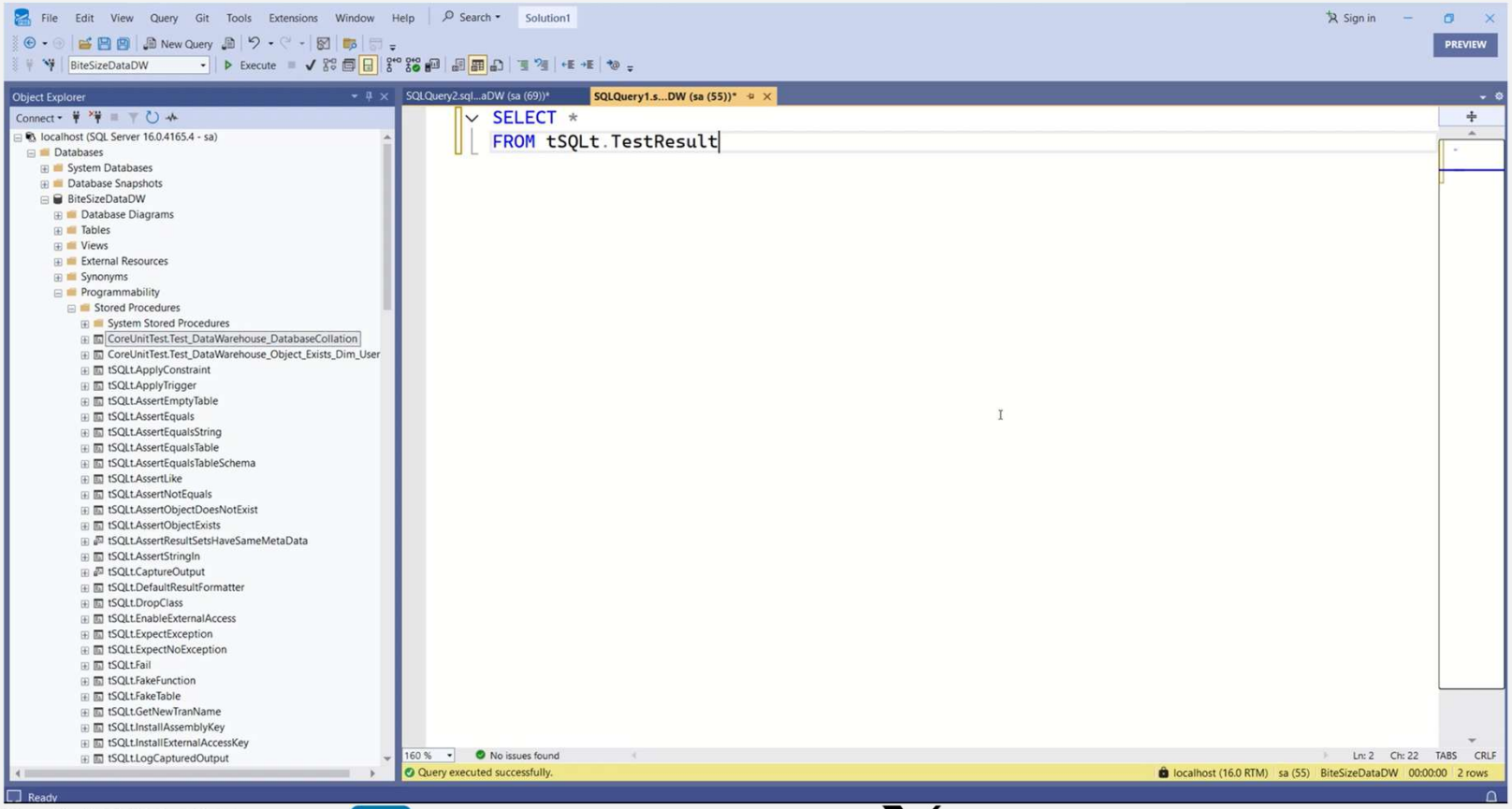
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Getting tSQLt Test Results (1/2)

```
SELECT *
FROM tSQLt.TestResult
```

Getting tSQLt Test Results (1/2)





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Getting tSQLt Test Results (2/2)

```
EXEC [tSQLt].[XmlResultFormatter]
```



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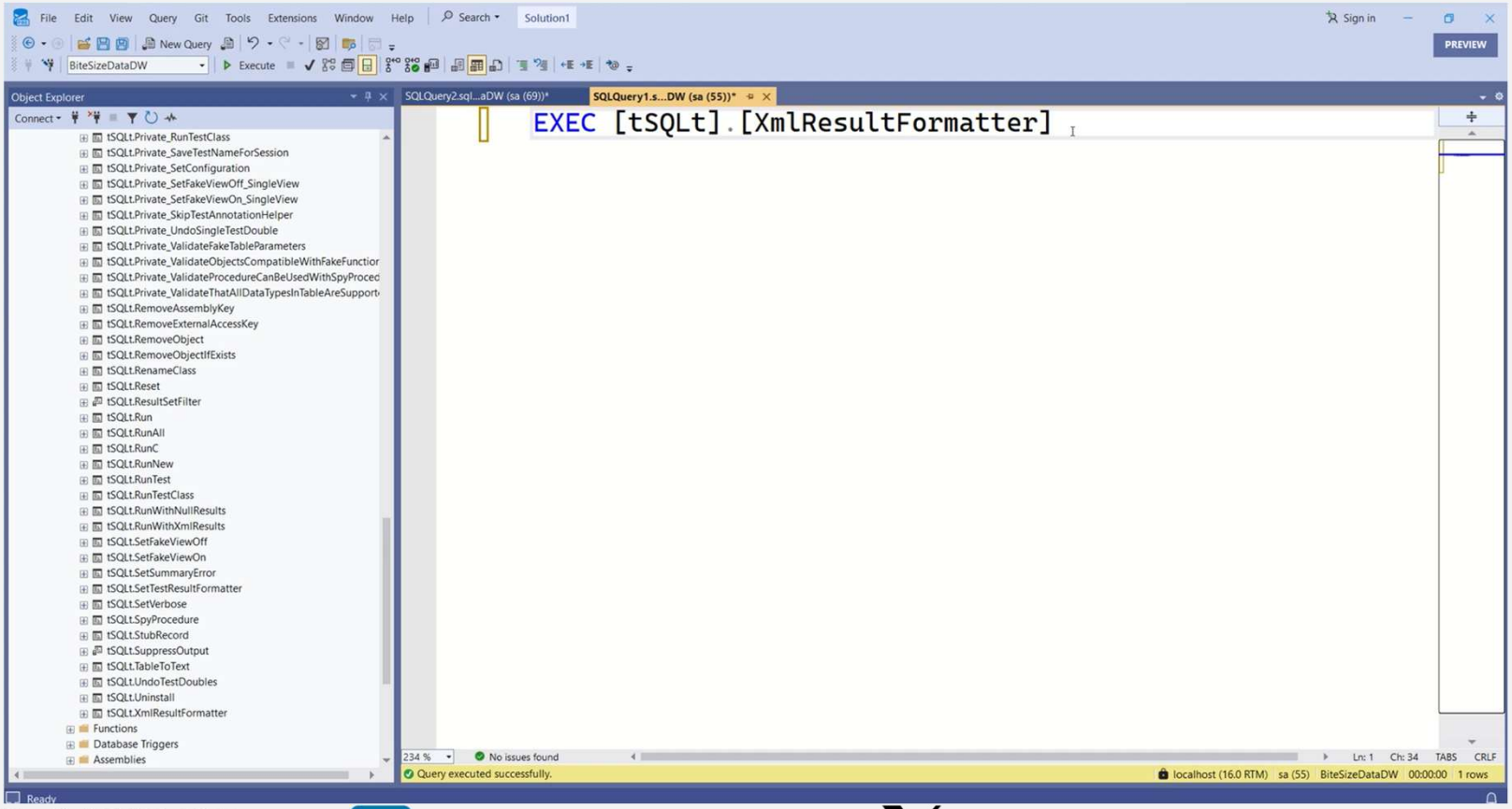
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Getting tSQLt Test Results (2/2)





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Automation



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Automation

Azure DevOps

DbaTools

PowerShell

Database Projects



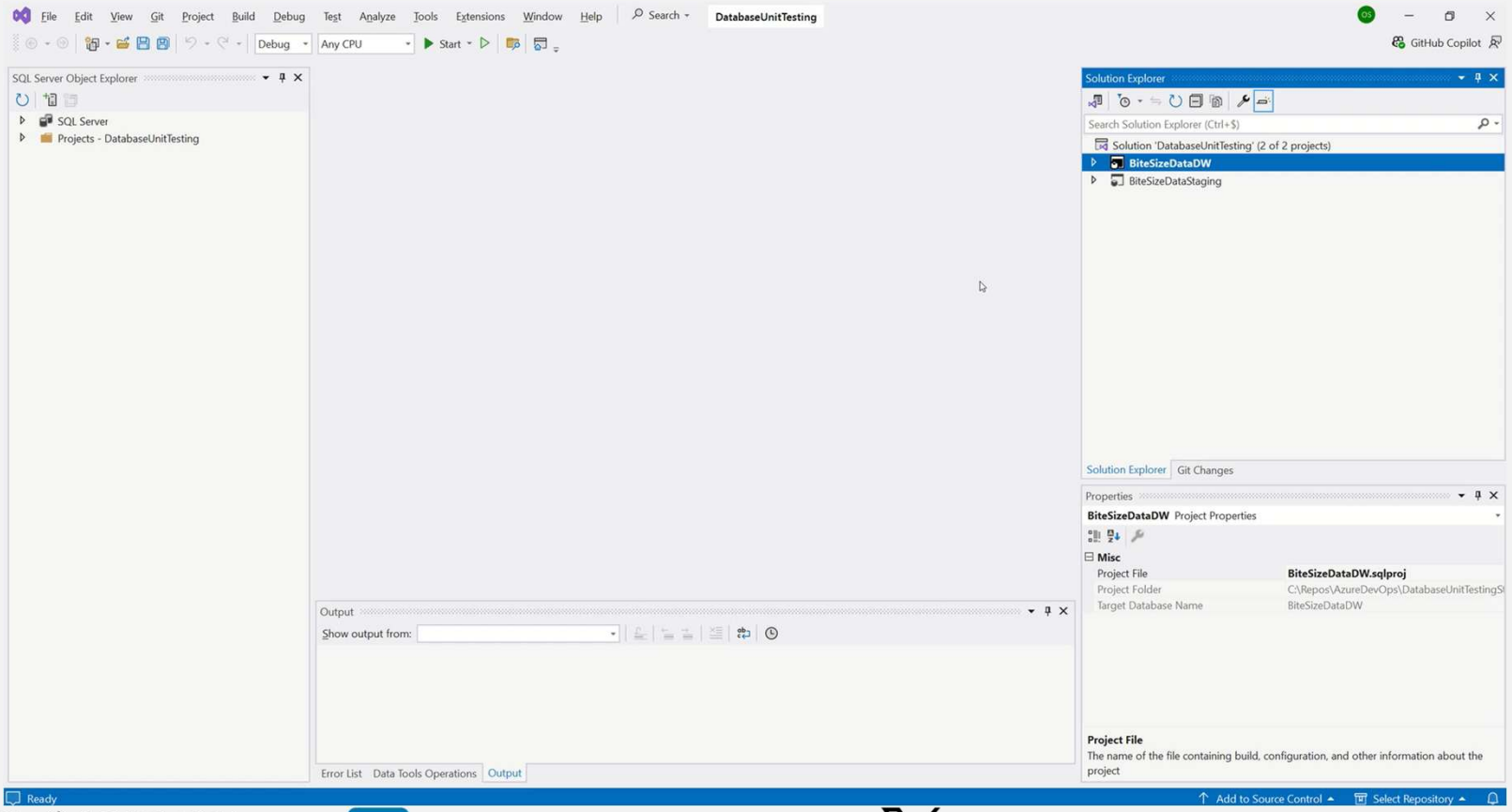
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Setting up the Database Project(s)



Setting up the Database Project(s)

→BiteSizeDataDW_UnitTesting

→BiteSizeDataStaging_UnitTesting

→tSQLt_Framework



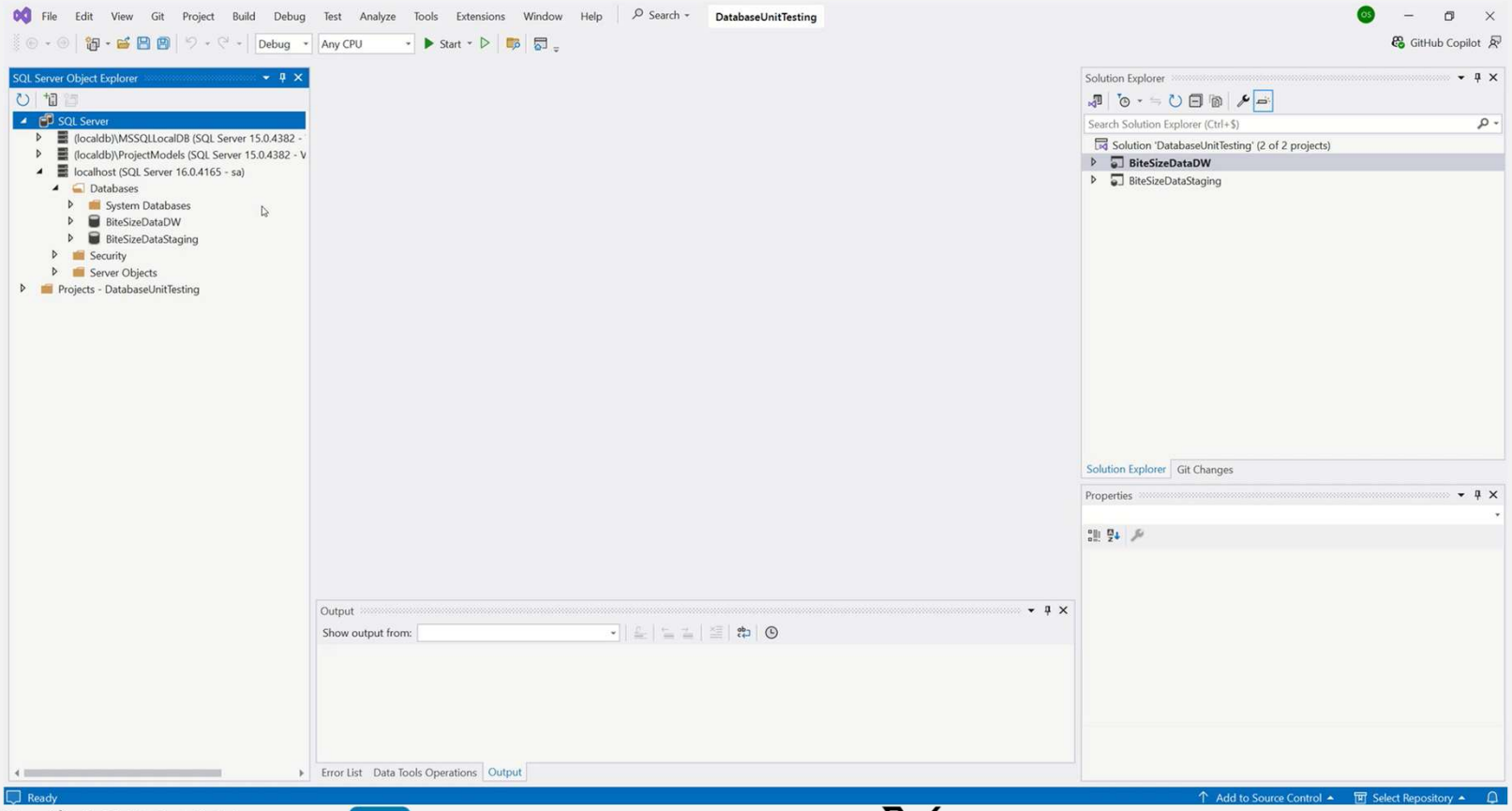
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tSQLt_Framework Database Project





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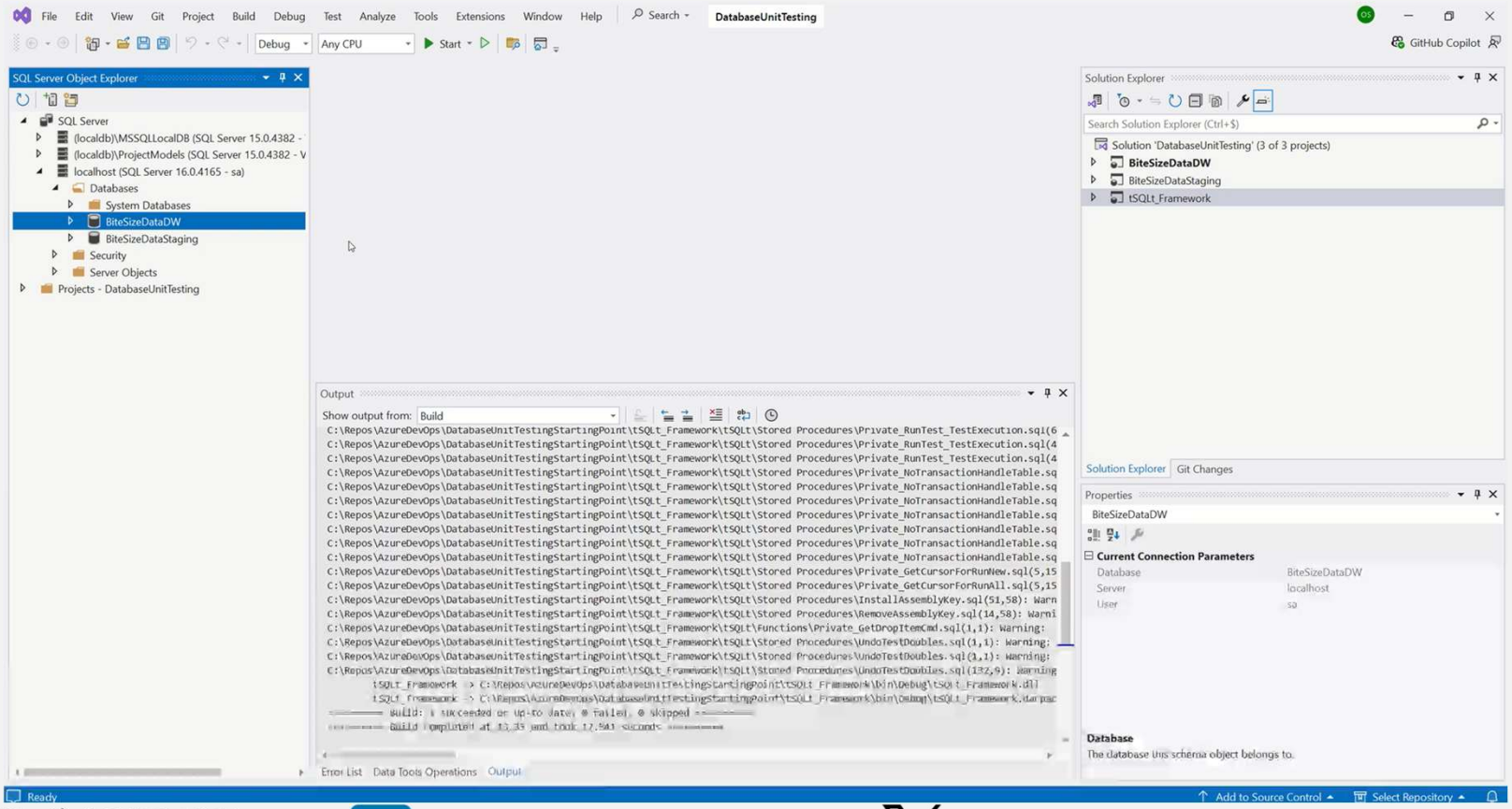
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tSQLt_Framework Database Project

Only for reference

Contains all reference objects

BiteSizeDataDW_UnitTesting Database Project



Current Setup Warnings

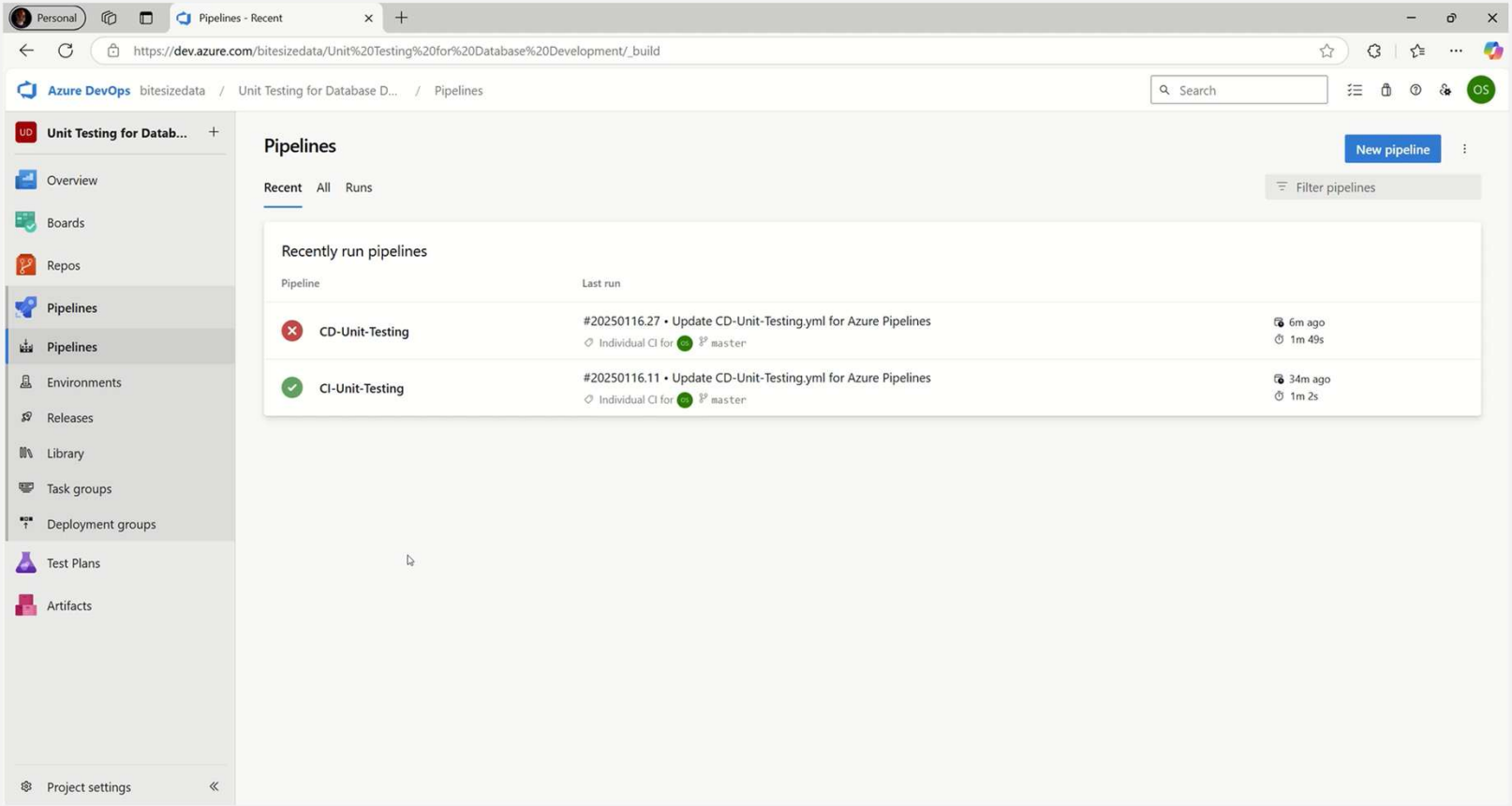
1 way to setup (there are other ways too)

For every new version → changes to make

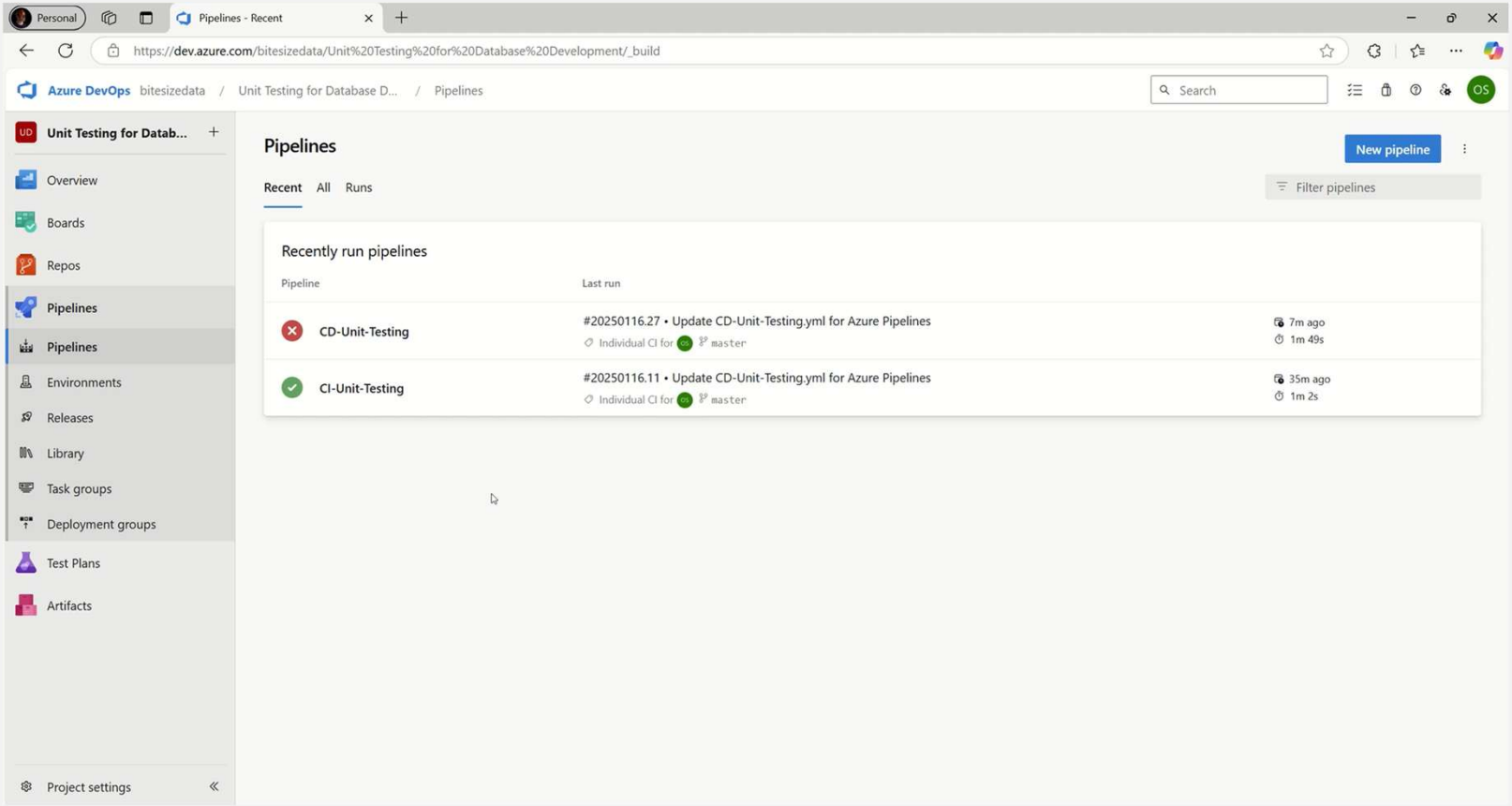
Alternative → Reference the .dacpac

Alternative → Post Deployment or separate scripts

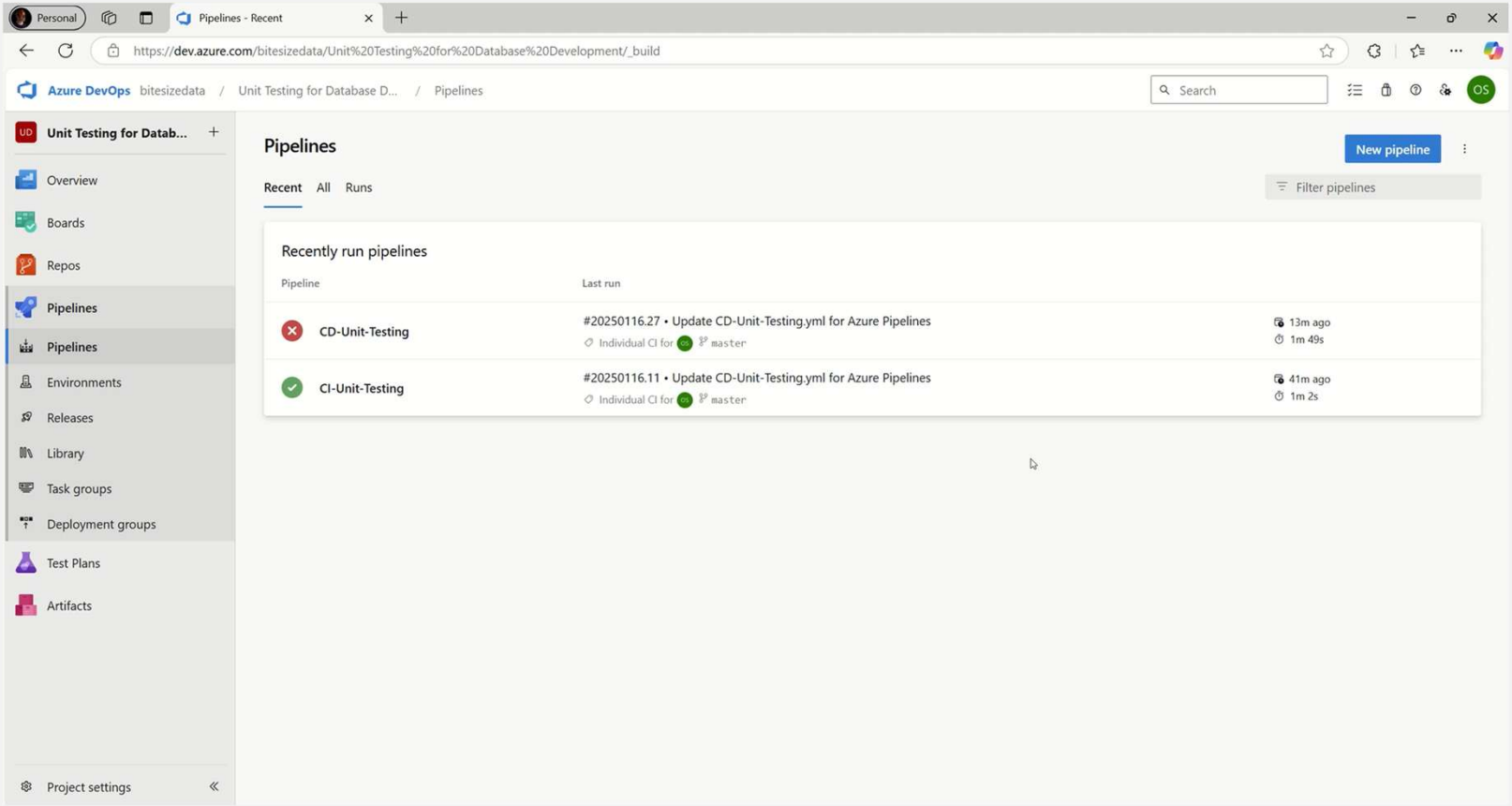
CI-Unit-Testing Pipeline



CD-Unit-Testing Pipeline



CD-Unit-Testing Pipeline



Test Driven Development



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TDD Concepts

Write Unit Tests before starting development

Write the minimal required code to pass

Functionality testing from the start

TDD Benefits & Challenges

+ Requirements More Clear
+ Less debugging in the end
+ Documentation

- Increase Code Volume
- Maintenance overhead
- Time-consuming

Need assistance?

Shoutout to Sander Stad!

Generate your Unit Tests:
https://github.com/sanderstad/PStSQLtTestGenerator

→ Works for: Database Collation, Objects Existence, Function Parameters, Stored Procedure Parameters, Table Columns, View Columns

Summary



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Summary

Write Basic Unit Tests ✓

Structure Unit Tests in a Database Project ✓

Publish Unit Tests ✓

Execute Unit Tests Automatically ✓

Up Next: Code Analysis?



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Feedback



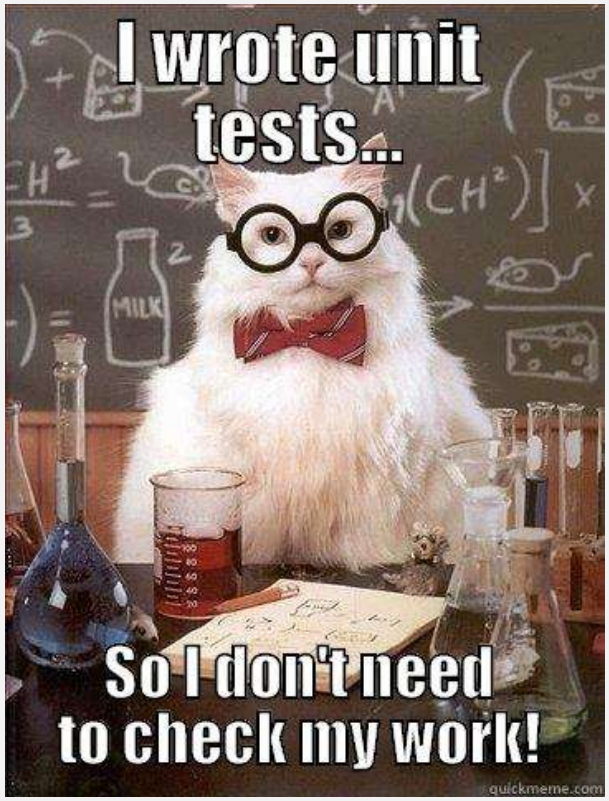


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Thank you!

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Speaking / Blogging



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