Kamil Nowinski

SQL Player

Play with data & have fun!

Maintenance of a DB project and Continuous Delivery using SSDT

ABOUT ME

Kamil Nowinski

FRIEND OF redgate 2019

Microsoft CERTIFIED Solutions Associate SQL Server 2012

MCSE Data Platform

MVP Microsoft® Most Valuable Professional

Microsoft Data Platform **MVP**
Speaker, blogger, data enthusiast

Senior Data Engineer at ASOS (www.asos.com)
15+ yrs experience as DEV/BI/(DBA)

Member of the Data Community PL

Project member of „SCD Merge Wizard"

Founder of blog SQLPlayer (www.SQLplayer.net)

SQL Server Certificates:
MCITP, MCP, MCTS, MCSA, MCSE Data Platform,

MCSE Data Management & Analytics

Moreover: Bicycle, Running, Digital photography
@NowinskiK, @SQLPlayer

Blog & interviews

www.SQLPlayer.net

PODCAST – interviews with…

… be perfect is to change often."
The Right Honourable Winston Churchill
Microsoft
PASS
See all the films you want, as often as you like'
Join now at ODEON Limitless
Data Community
#sqlfamily
SUMMIT2017
Microsoft
Microsoft Azure

Scan me

Part ONE

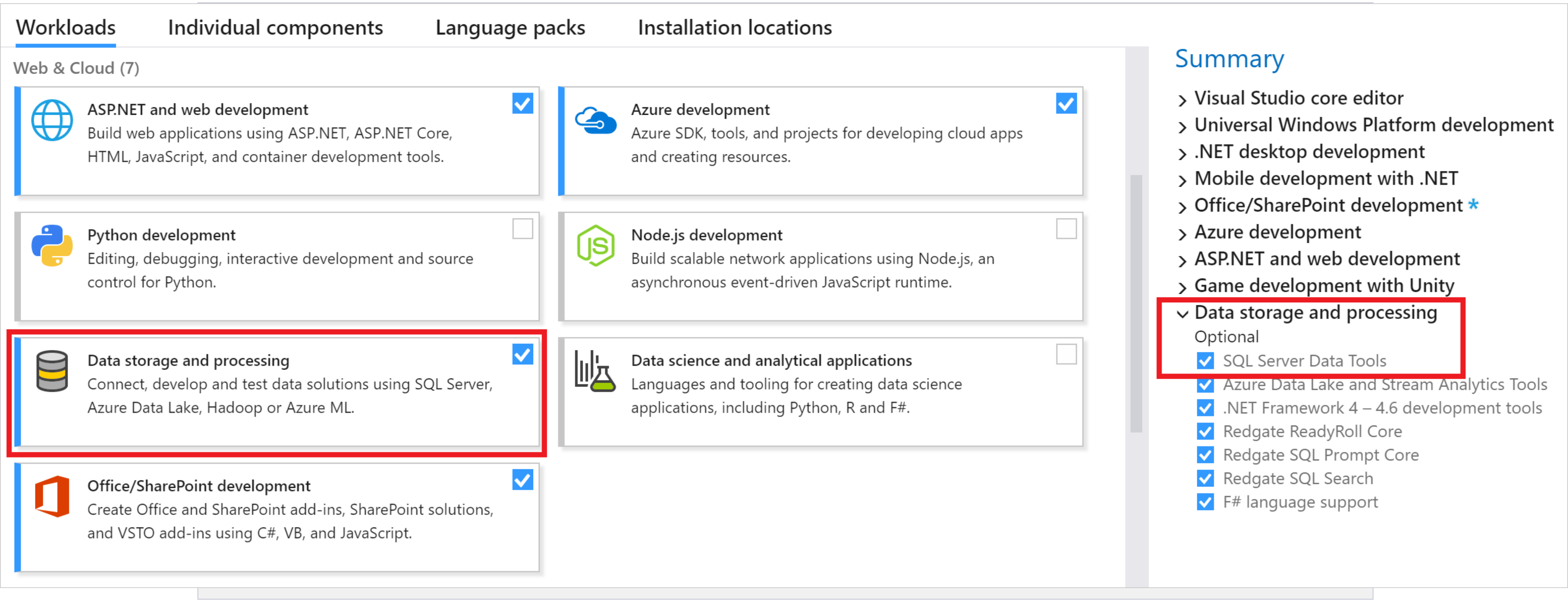
AGENDA

- What is the SSDT?
- Do I need it?
- How to start with DACPAC's?
- (Well) known issues
- Deploy/Publish database to target server
- Circular dependencies!

What is the SSDT?

- SQL Server Data Tools
- Now, it’s a part of Visual Studio
- Free!
- Database project, including:
  - Schema, Stored Procedures, Functions,
  - Tables, Views, Security, CLR
  - ... and much more!

SSDT: How to install?



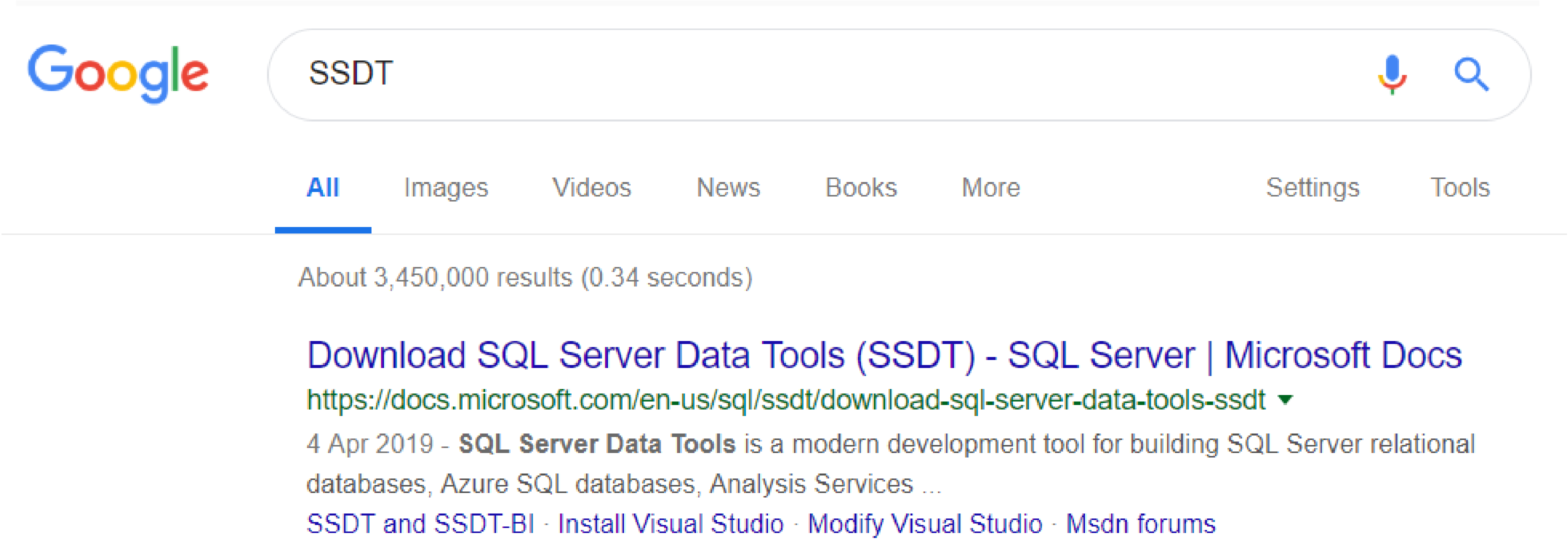
Web & Cloud (7)

- ☑ **ASP.NET and web development**
  Build web applications using ASP.NET, ASP.NET Core, HTML, JavaScript, and container development tools.
- ☑ **Azure development**
  Azure SDK, tools, and projects for developing cloud apps and creating resources.
- □ **Python development**
  Editing, debugging, interactive development and source control for Python.
- □ **Node.js development**
  Build scalable network applications using Node.js, an asynchronous event-driven JavaScript runtime.
- ☑ **Data storage and processing**
  Connect, develop and test data solutions using SQL Server, Azure Data Lake, Hadoop or Azure ML.
- □ **Data science and analytical applications**
  Languages and tooling for creating data science applications, including Python, R and F#.
- ☑ **Office/SharePoint development**
  Create Office and SharePoint add-ins, SharePoint solutions, and VSTO add-ins using C#, VB, and JavaScript.

Summary

- › Visual Studio core editor
- › Universal Windows Platform development
- › .NET desktop development
- › Mobile development with .NET
- › Office/SharePoint development *
- › Azure development
- › ASP.NET and web development
- › Game development with Unity
- ⌄ Data storage and processing
  - Optional
  - ☑ SQL Server Data Tools
  - ☑ Azure Data Lake and Stream Analytics Tools
  - ☑ .NET Framework 4 – 4.6 development tools
  - ☑ Redgate ReadyRoll Core
  - ☑ Redgate SQL Prompt Core
  - ☑ Redgate SQL Search
  - ☑ F# language support

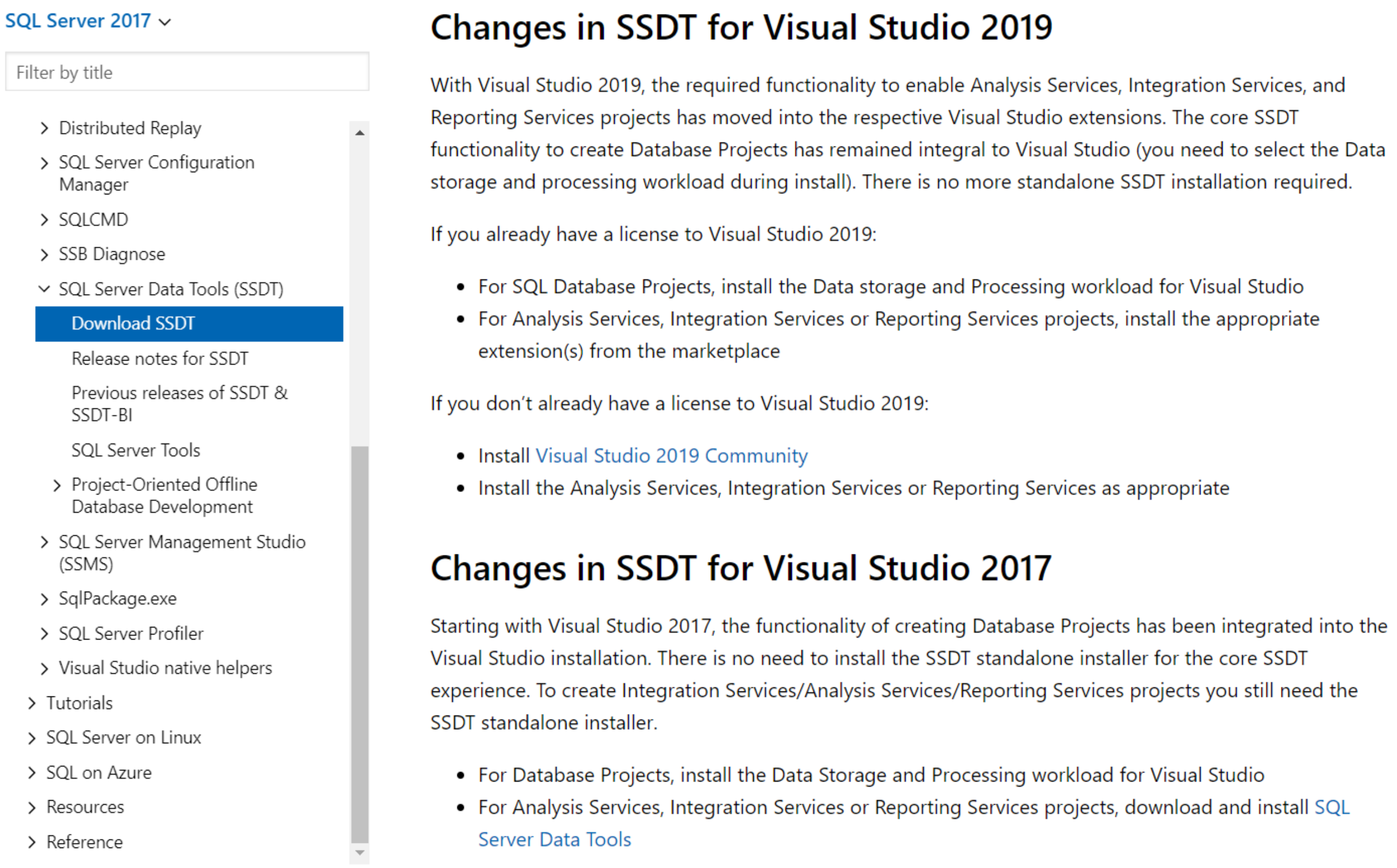
SSDT: How to install?



About 3,450,000 results (0.34 seconds)

Download SQL Server Data Tools (SSDT) - SQL Server | Microsoft Docs
https://docs.microsoft.com/en-us/sql/ssdt/download-sql-server-data-tools-ssdt ▾
4 Apr 2019 - **SQL Server Data Tools** is a modern development tool for building SQL Server relational databases, Azure SQL databases, Analysis Services ...
SSDT and SSDT-BI · Install Visual Studio · Modify Visual Studio · Msdn forums

SSDT: How to download, install?



Changes in SSDT for Visual Studio 2019

With Visual Studio 2019, the required functionality to enable Analysis Services, Integration Services, and Reporting Services projects has moved into the respective Visual Studio extensions. The core SSDT functionality to create Database Projects has remained integral to Visual Studio (you need to select the Data storage and processing workload during install). There is no more standalone SSDT installation required.

If you already have a license to Visual Studio 2019:

- For SQL Database Projects, install the Data storage and Processing workload for Visual Studio
- For Analysis Services, Integration Services or Reporting Services projects, install the appropriate extension(s) from the marketplace

If you don't already have a license to Visual Studio 2019:

- Install Visual Studio 2019 Community
- Install the Analysis Services, Integration Services or Reporting Services as appropriate

Changes in SSDT for Visual Studio 2017

Starting with Visual Studio 2017, the functionality of creating Database Projects has been integrated into the Visual Studio installation. There is no need to install the SSDT standalone installer for the core SSDT experience. To create Integration Services/Analysis Services/Reporting Services projects you still need the SSDT standalone installer.

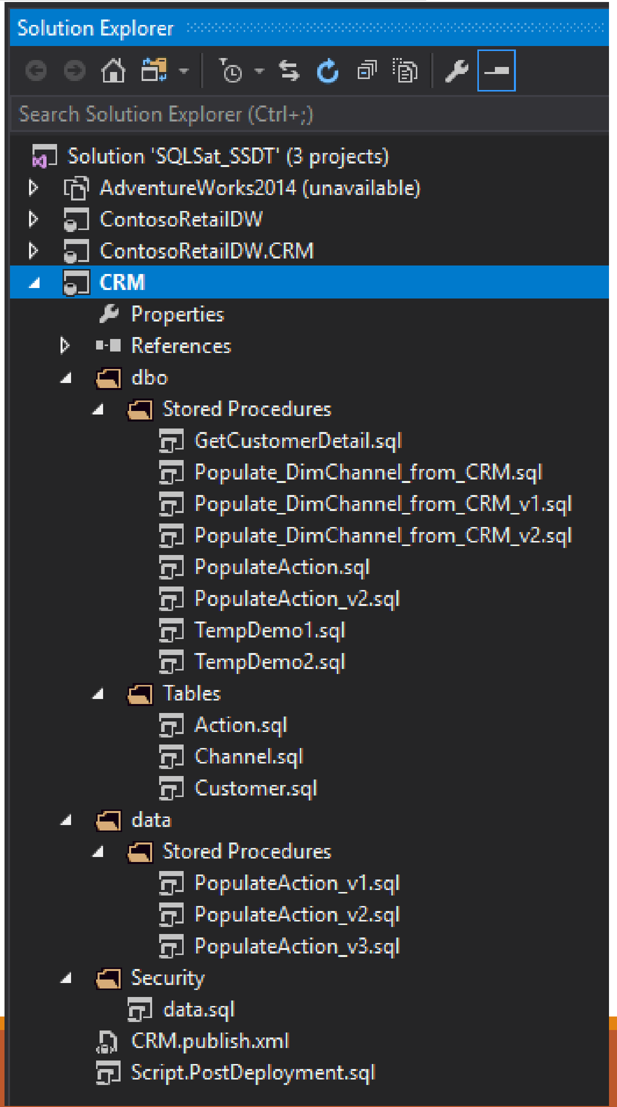
- For Database Projects, install the Data Storage and Processing workload for Visual Studio
- For Analysis Services, Integration Services or Reporting Services projects, download and install SQL Server Data Tools

DACPAC, BACPAC

- DACPAC = Data Tier AppliCation PACkage
  - Doesn’t contain DATA
  - Contains SCHEMA Only
- BACPAC = BACkup PACage
  - Contains SCHEMA
  - Contains DATA (BCP native format)
- ZIP format

How to start with database project?

- Install SSDT
- Create new db project and import:
  - From script
  - Directly from SQL server
  - Data-Tier Application (DACPAC)



Solution Explorer

Search Solution Explorer (Ctrl+;)

```
Solution 'SQLSat_SSDT' (3 projects)
▷ AdventureWorks2014 (unavailable)
▷ ContosoRetailDW
▷ ContosoRetailDW.CRM
◢ CRM
    Properties
  ▷ References
  ◢ dbo
    ◢ Stored Procedures
        GetCustomerDetail.sql
        Populate_DimChannel_from_CRM.sql
        Populate_DimChannel_from_CRM_v1.sql
        Populate_DimChannel_from_CRM_v2.sql
        PopulateAction.sql
        PopulateAction_v2.sql
        TempDemo1.sql
        TempDemo2.sql
    ◢ Tables
        Action.sql
        Channel.sql
        Customer.sql
  ◢ data
    ◢ Stored Procedures
        PopulateAction_v1.sql
        PopulateAction_v2.sql
        PopulateAction_v3.sql
  ◢ Security
      data.sql
    CRM.publish.xml
    Script.PostDeployment.sql
```

DEMO #1

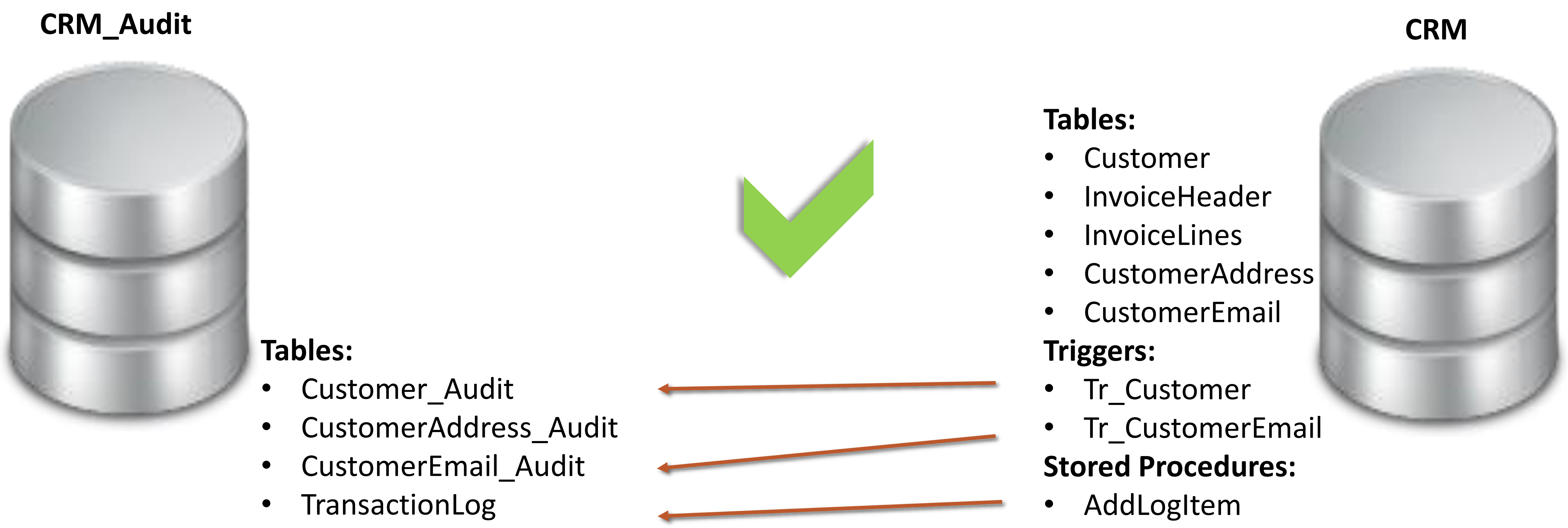
- Create first database project (CRM)
- Import database from server

(Well) known issues

(Well) known issues

- Circular references/dependencies
- Unvisible temp tables
- Disable/Enable trigger across databases
- How to manage of data?
- Can I deploy SQL Jobs?

Database dependencies & references



CRM_Audit

Tables:

- Customer_Audit
- CustomerAddress_Audit
- CustomerEmail_Audit
- TransactionLog

CRM

Tables:

- Customer
- InvoiceHeader
- InvoiceLines
- CustomerAddress
- CustomerEmail

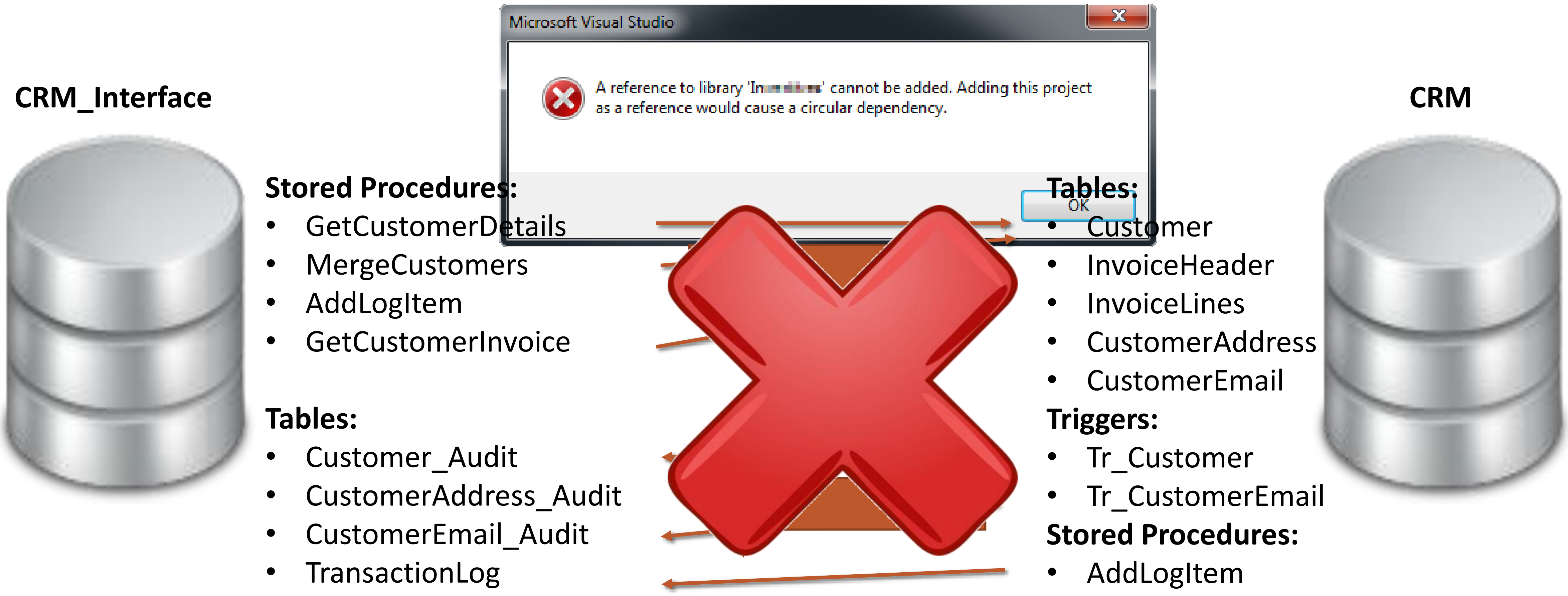
Triggers:

- Tr_Customer
- Tr_CustomerEmail

Stored Procedures:

- AddLogItem

Circular dependencies



Microsoft Visual Studio

A reference to library 'In[redacted]' cannot be added. Adding this project as a reference would cause a circular dependency.

CRM_Interface

Stored Procedures:

- GetCustomerDetails
- MergeCustomers
- AddLogItem
- GetCustomerInvoice

Tables:

- Customer_Audit
- CustomerAddress_Audit
- CustomerEmail_Audit
- TransactionLog

CRM

Tables:

- Customer
- InvoiceHeader
- InvoiceLines
- CustomerAddress
- CustomerEmail

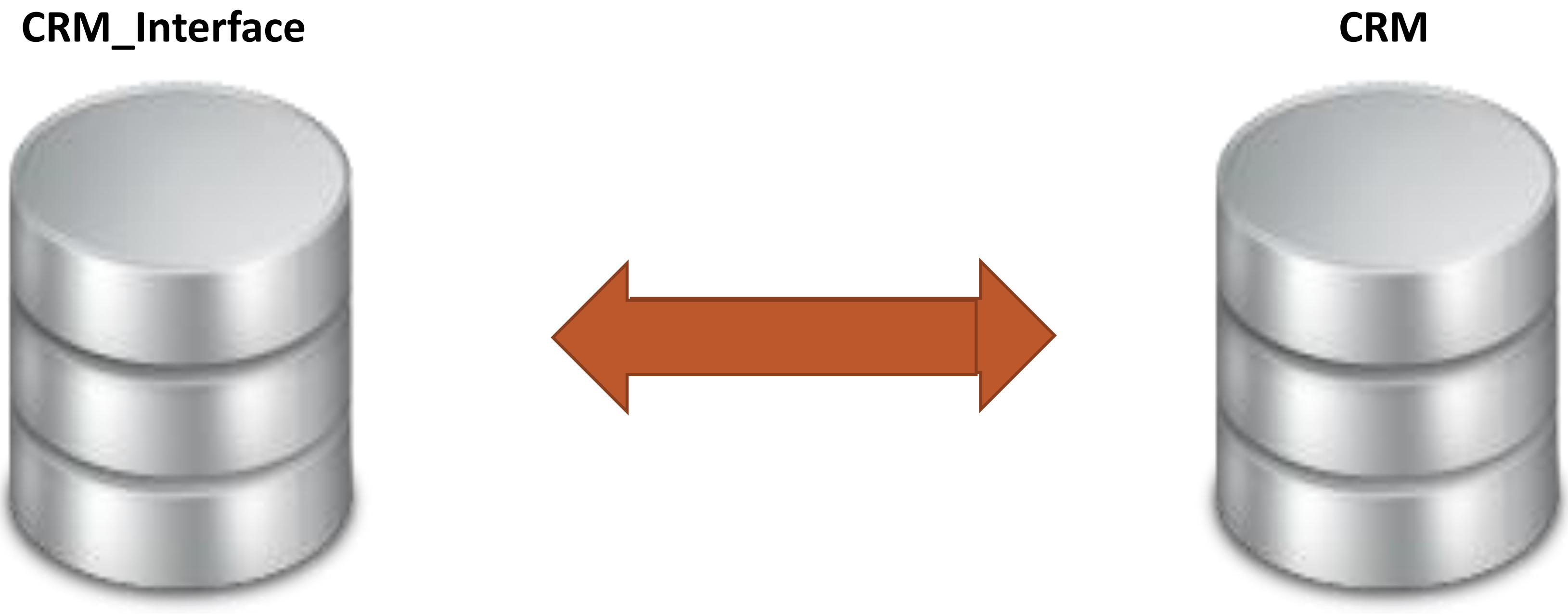
Triggers:

- Tr_Customer
- Tr_CustomerEmail

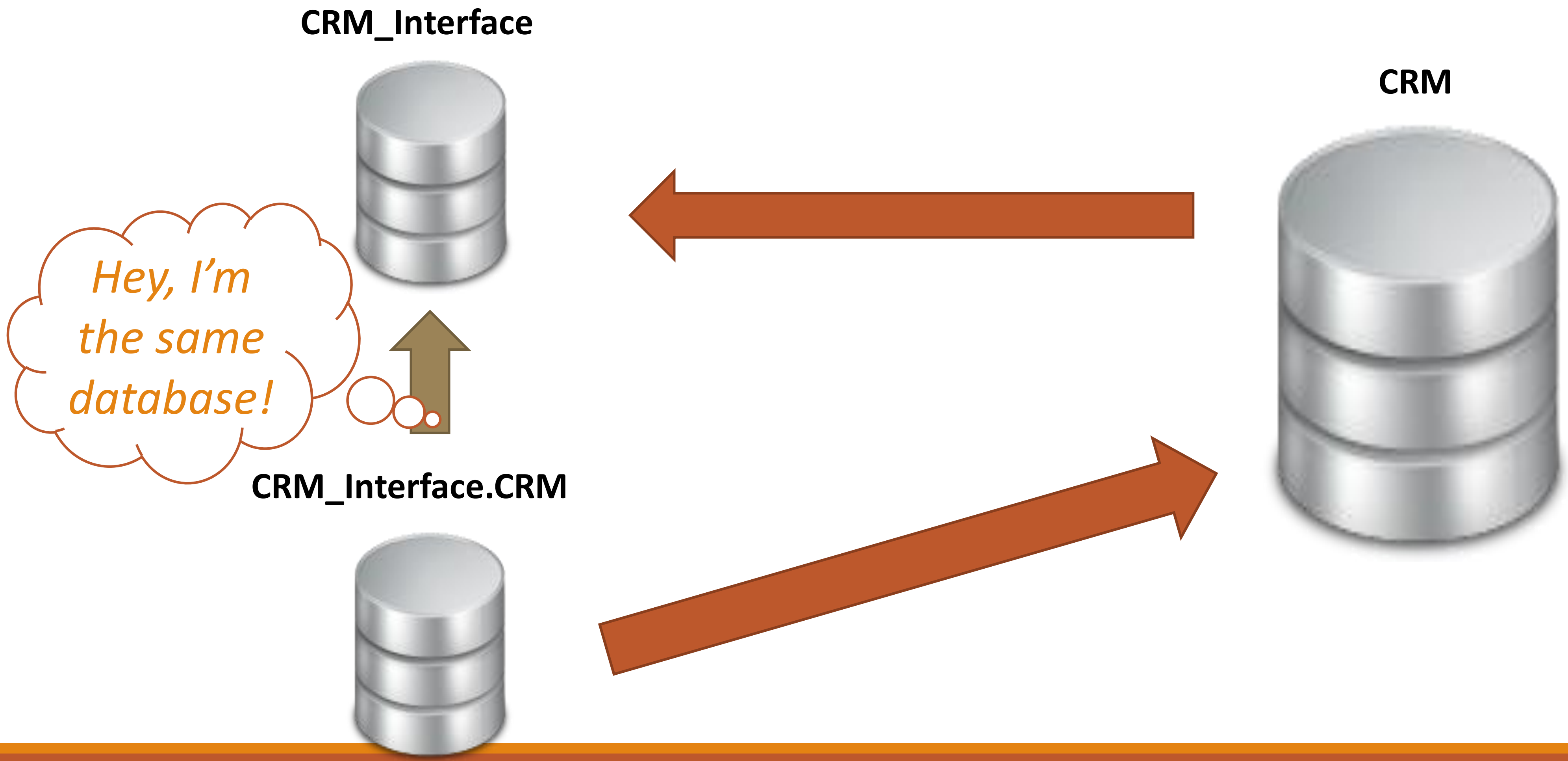
Stored Procedures:

- AddLogItem

Circular dependencies



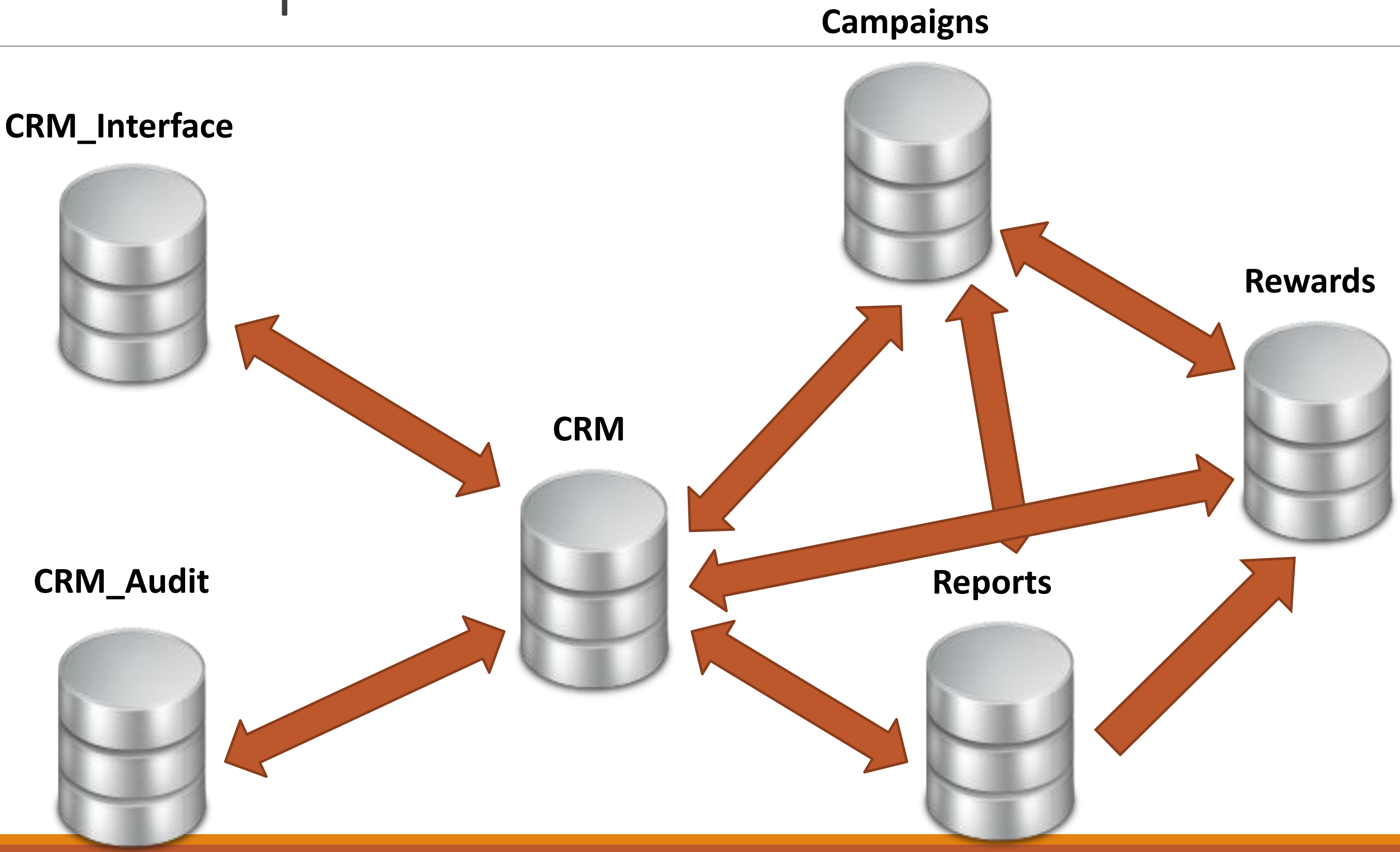
Circular dependencies



DEMO #2

- Create second database project
- Import database from server
- Create references & variables
- Resolve circular references
- Create publish profile
- Deploy manually

Circular dependencies



Circular dependencies

© creatures in my head - http://www.creaturesinmyhead.com

Know issue: temp table

```
CREATE PROCEDURE [dbo].[TempDemo1]
AS


CREATE TABLE #TempTable (Id INT);
EXEC TempDemo2;
```

```
CREATE PROCEDURE [dbo].[TempDemo2]
AS

SELECT * FROM #TempTable;

RETURN 0
```

SSDT says:

I don’t know that table!

Know issue: temp table

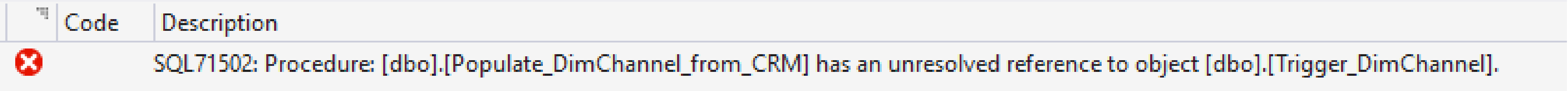
```
CREATE PROCEDURE [dbo].[TempDemo1]
AS



CREATE TABLE #TempTable (Id INT);
EXEC TempDemo2;
```

```
CREATE PROCEDURE [dbo].[TempDemo2]
AS

IF 0=1
   CREATE TABLE #TempTable (ID int);

SELECT * FROM #TempTable;

RETURN 0
```

Know issue: Disable/Enable trigger #1

- Disable/Enable trigger from other database

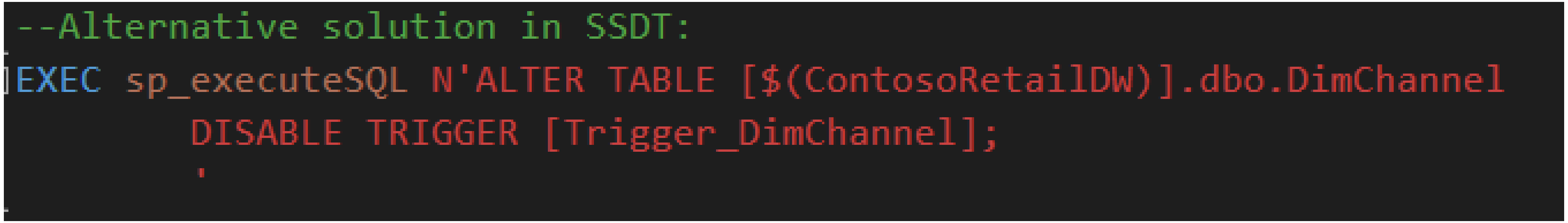
```
ALTER TABLE [$(ContosoRetailDW)].dbo.DimChannel
    DISABLE TRIGGER [Trigger_DimChannel];
```



	Code	Description
☒		SQL71502: Procedure: [dbo].[Populate_DimChannel_from_CRM] has an unresolved reference to object [dbo].[Trigger_DimChannel].

Know issue: Disable/Enable trigger #2

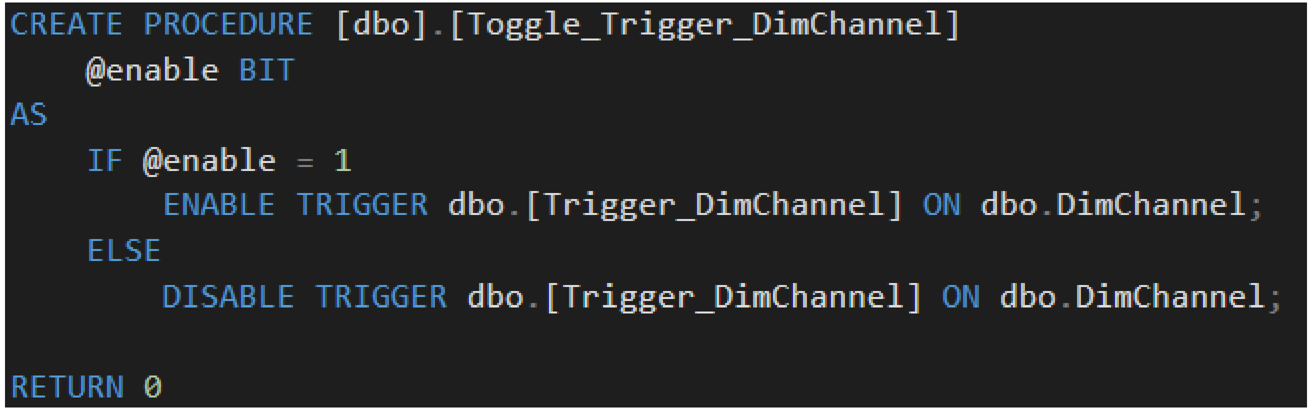
- Alternative #1:
  - Use dynamic SQL (not recommended)



```
--Alternative solution in SSDT:
EXEC sp_executeSQL N'ALTER TABLE [$(ContosoRetailDW)].dbo.DimChannel
        DISABLE TRIGGER [Trigger_DimChannel];
        '
```

Know issue: Disable/Enable trigger #3

- Alternative #2:
  - Create SP in the second database (locally for the trigger)
  - Call that SP from ’Remote’ database



```
CREATE PROCEDURE [dbo].[Toggle_Trigger_DimChannel]
    @enable BIT
AS
    IF @enable = 1
        ENABLE TRIGGER dbo.[Trigger_DimChannel] ON dbo.DimChannel;
    ELSE
        DISABLE TRIGGER dbo.[Trigger_DimChannel] ON dbo.DimChannel;

RETURN 0
```

How to include **data** in a database project?

- SSDT has no built-in solution for including data
- Use Post-Deployment script to populate table
- Wrap the scripts into stored procedures
- Make sure the order of referenced tables

How to include **data** in a database project?

- Scenario #1: initial values only
  - For the very first time (run) only
  - Target table is empty
  - INSERT
  - Example script

How to include **data** in a database project?

- Scenario #2: User has NO access to data
  - Full MERGE statement
  - Include DELETE clause
  - Example script

How to include **data** in a database project?

- Scenario #3: users CAN add values from app
  - MERGE statement
  - Exclude DELETE clause
  - Example script

DEMO #4

- Data script in Stored Procedure
- Post-Deployment script
- How to change data & deploy it

SQL Jobs in database project

- Facts:
  - DACPAC is a database level project
  - SQLJobs are on server-level
- How to cope with:
  - Add separate database project
  - Only T-SQL scripts
  - Pre/Post deployment script to include above
  - Use PowerShell and SALT module from Sabin.io

Part TWO

AGENDA

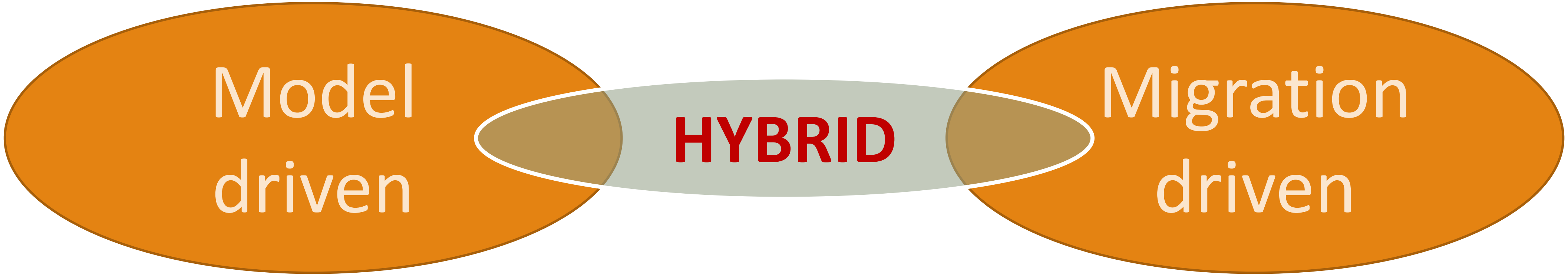
- Deploy/Publish database to target server
- PowerShell
- CI/CD
- Azure DevOps

DevOps – definition (Wikipedia)

DevOps (a clipped compound of "**development**" and "**operations**") is a software engineering **culture and practice** that aims at unifying software development (Dev) and software operation (Ops).
The main characteristic of the DevOps movement is to strongly advocate **automation and monitoring** at **all steps** of software construction, from integration, testing, releasing to deployment and infrastructure management.

DevOps aims at shorter development cycles, increased deployment frequency, and more dependable releases, in close alignment with business objectives.

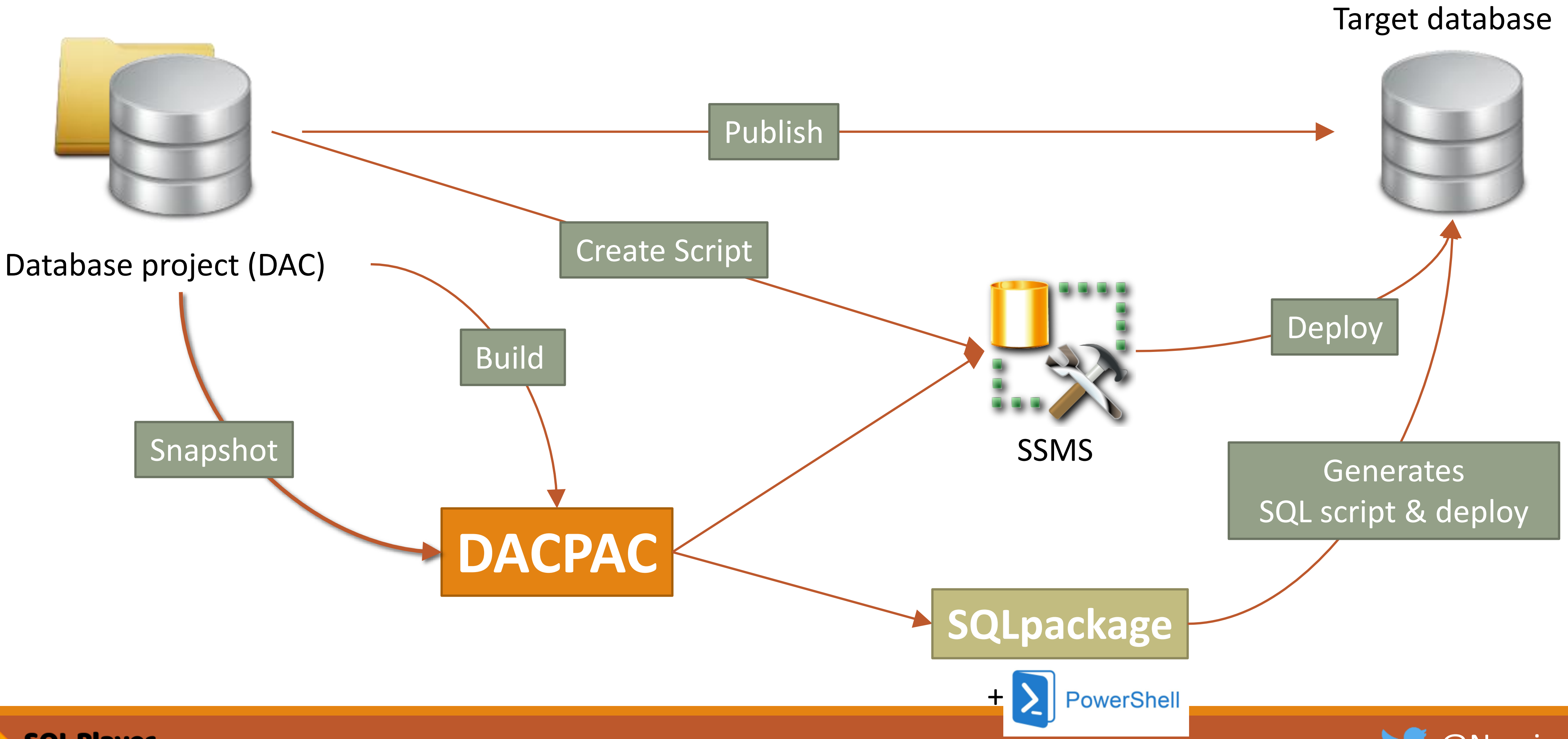
Database change management approaches



SSDT

REDGATE

SSDT Deployment Pipeline



sqlpackage.exe

- The **sqlpackage** application can:
  - create script
  - create report
  - create script + report & deploy at the same time

SQLPlayer Retweeted

SQLServer Data Tools @sqldatatools · Apr 16

A new release of sqlpackage is now available on all platforms! This includes graph table support for edge constraints and fixes a number of reported issues. Download here #SQLServer

Download and install sqlpackage - SQL Server

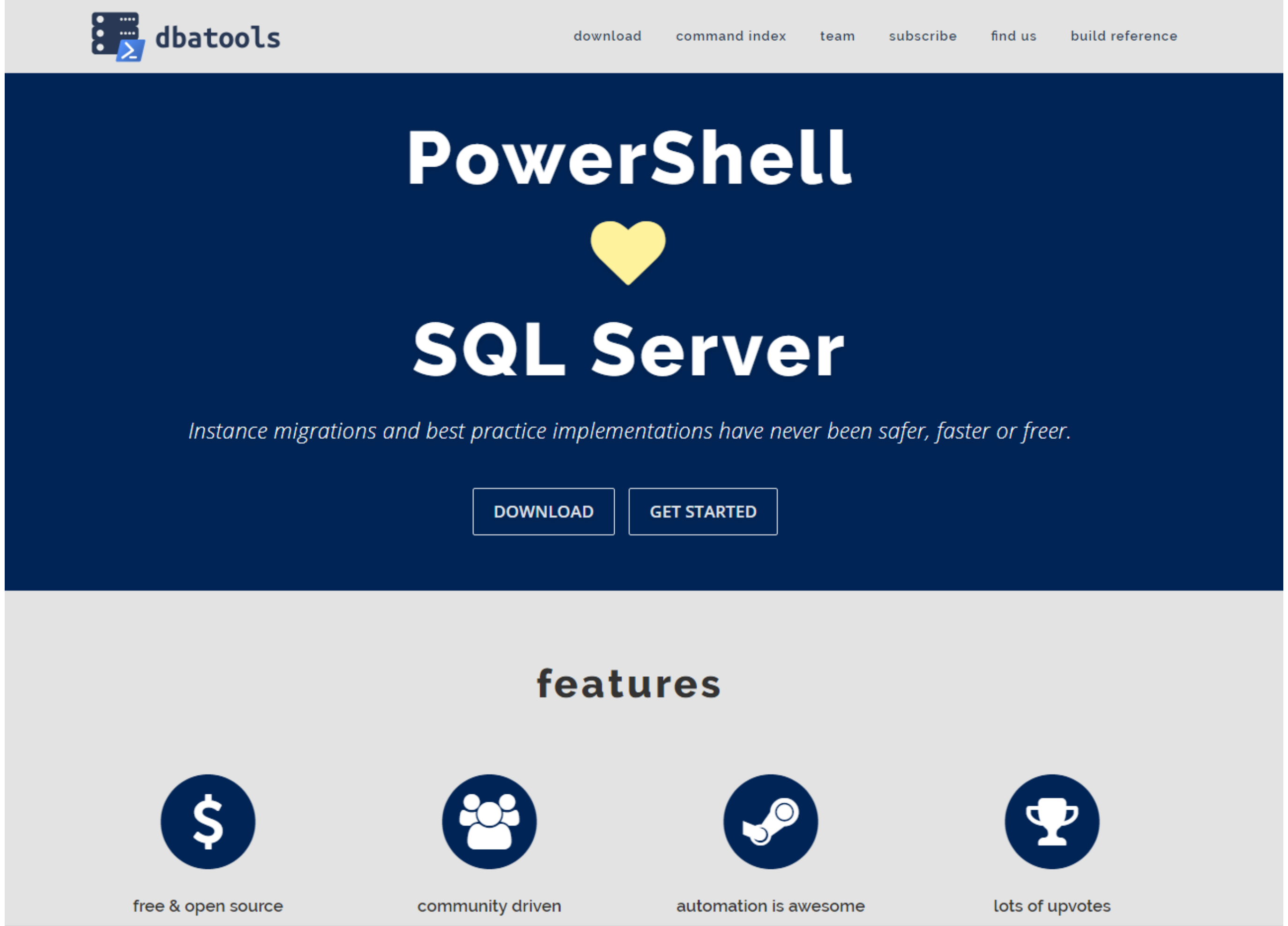
Download and Install sqlpackage for Windows, macOS, or Linux

docs.microsoft.com

35 47

https://docs.microsoft.com/en-gb/sql/tools/sqlpackage-download?view=sql-server-2017

PowerShell: dbatools



PowerShell ❤ SQL Server

Instance migrations and best practice implementations have never been safer, faster or freer.

features

- free & open source
- community driven
- automation is awesome
- lots of upvotes

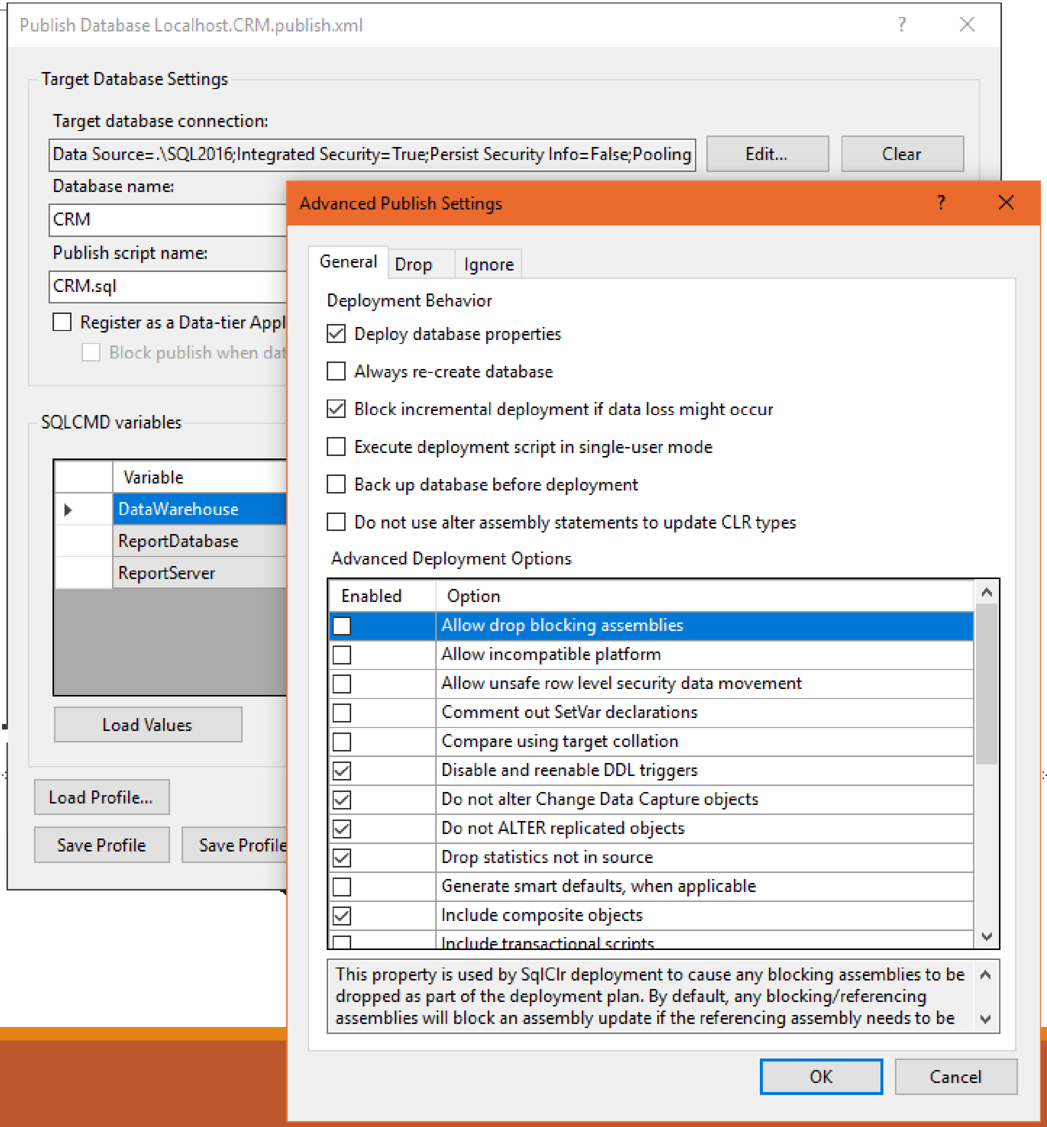
Publish profiles

- Save deployment’s parameters
- Create on database project’s context
- Visual Studio UI Support
- XML format
- Visible as an item of the project
- Multiple profiles per project available
- Keep tons of parameters and variable values
- Perfect candidate to configure a publish to environments

Publish profiles

The files contain:

- Target server connection
- Target database name
- Output file name of publish script
- Multiple publish options:
  - Generate smart defaults
  - Management of triggers
  - Dropping target objects or not
  - Ignoring types of objects
- Variable values



Publish Database Localhost.CRM.publish.xml

Target Database Settings

Target database connection:

Data Source=.\SQL2016;Integrated Security=True;Persist Security Info=False;Pooling

Database name:

CRM

Publish script name:

CRM.sql

□ Register as a Data-tier Appl

□ Block publish when dat

SQLCMD variables

Variable
DataWarehouse
ReportDatabase
ReportServer

Advanced Publish Settings

Deployment Behavior

☑ Deploy database properties

□ Always re-create database

☑ Block incremental deployment if data loss might occur

□ Execute deployment script in single-user mode

□ Back up database before deployment

□ Do not use alter assembly statements to update CLR types

Advanced Deployment Options

Enabled	Option
□	Allow drop blocking assemblies
□	Allow incompatible platform
□	Allow unsafe row level security data movement
□	Comment out SetVar declarations
□	Compare using target collation
☑	Disable and reenable DDL triggers
☑	Do not alter Change Data Capture objects
☑	Do not ALTER replicated objects
☑	Drop statistics not in source
□	Generate smart defaults, when applicable
☑	Include composite objects
□	Include transactional scripts

This property is used by SqlClr deployment to cause any blocking assemblies to be dropped as part of the deployment plan. By default, any blocking/referencing assemblies will block an assembly update if the referencing assembly needs to be

Deployment methods

- The **sqlpackage** application can:
  - create script
  - create report
  - create script + report & deploy at the same time
- The libraries (DAC) do exactly the same
  - Microsoft.SqlServer.Dac.DacServices.dll
  - Microsoft.SqlServer.TransactSql.ScriptDom.dll

DEMO #1

- How to deploy via **sqlpackage.exe**
- - create deployment script
- - create deployment report
- - script & report & publish at the same tim

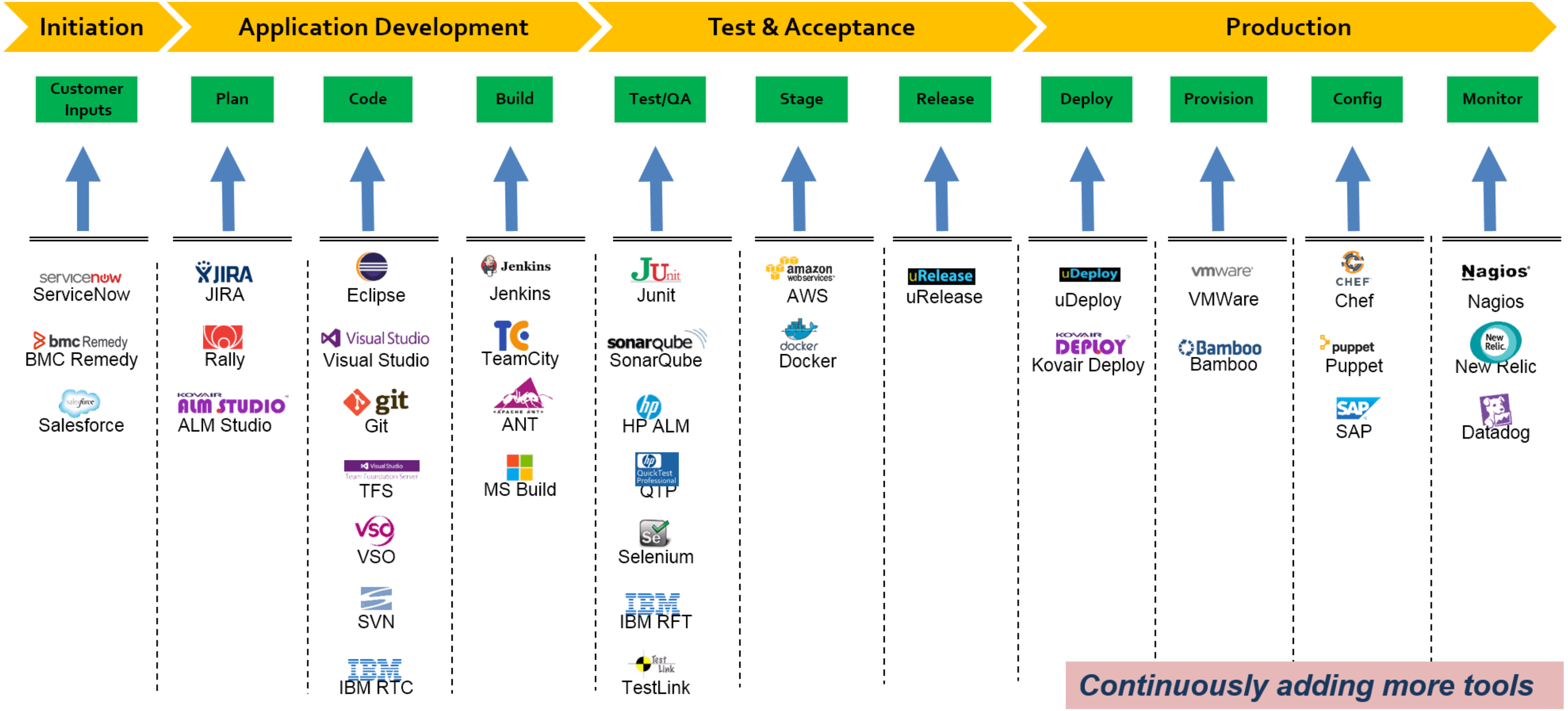
DEMO #2

- Database changes
- Deployment with PowerShell scrip
  - Report
  - Script
  - Publish action

dbatools

How to automate the Deployment Process?

Deployment process - tools



Initiation

- Customer Inputs: ServiceNow, BMC Remedy, Salesforce

Application Development

- Plan: JIRA, Rally, ALM Studio
- Code: Eclipse, Visual Studio, Git, TFS, VSO, SVN, IBM RTC
- Build: Jenkins, TeamCity, ANT, MS Build

Test & Acceptance

- Test/QA: Junit, SonarQube, HP ALM, QTP, Selenium, IBM RFT, TestLink
- Stage: AWS, Docker
- Release: uRelease

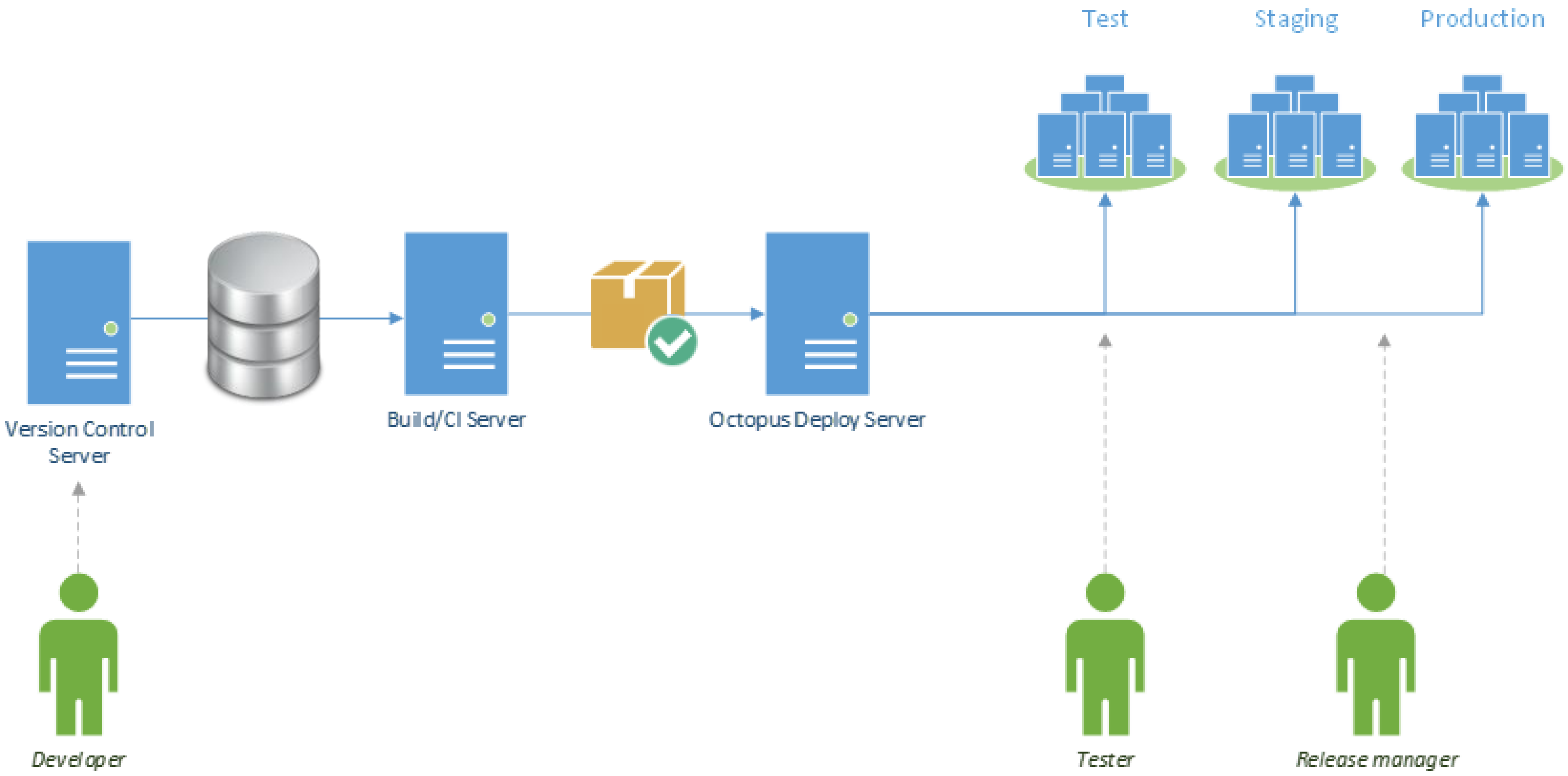
Production

- Deploy: uDeploy, Kovair Deploy
- Provision: VMWare, Bamboo
- Config: Chef, Puppet, SAP
- Monitor: Nagios, New Relic, Datadog

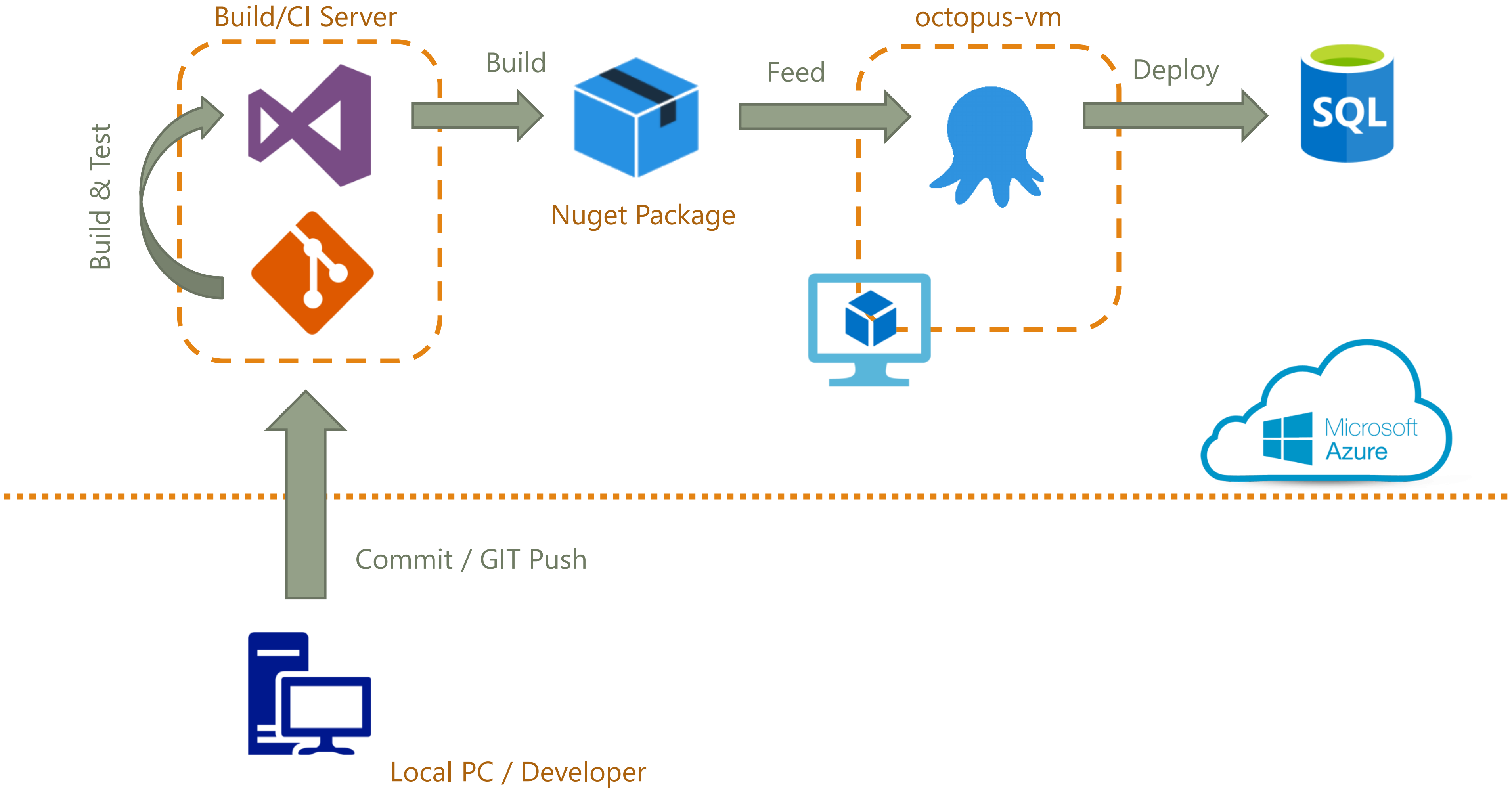
Continuously adding more tools

https://www.kovair.com/intelligent-devops/

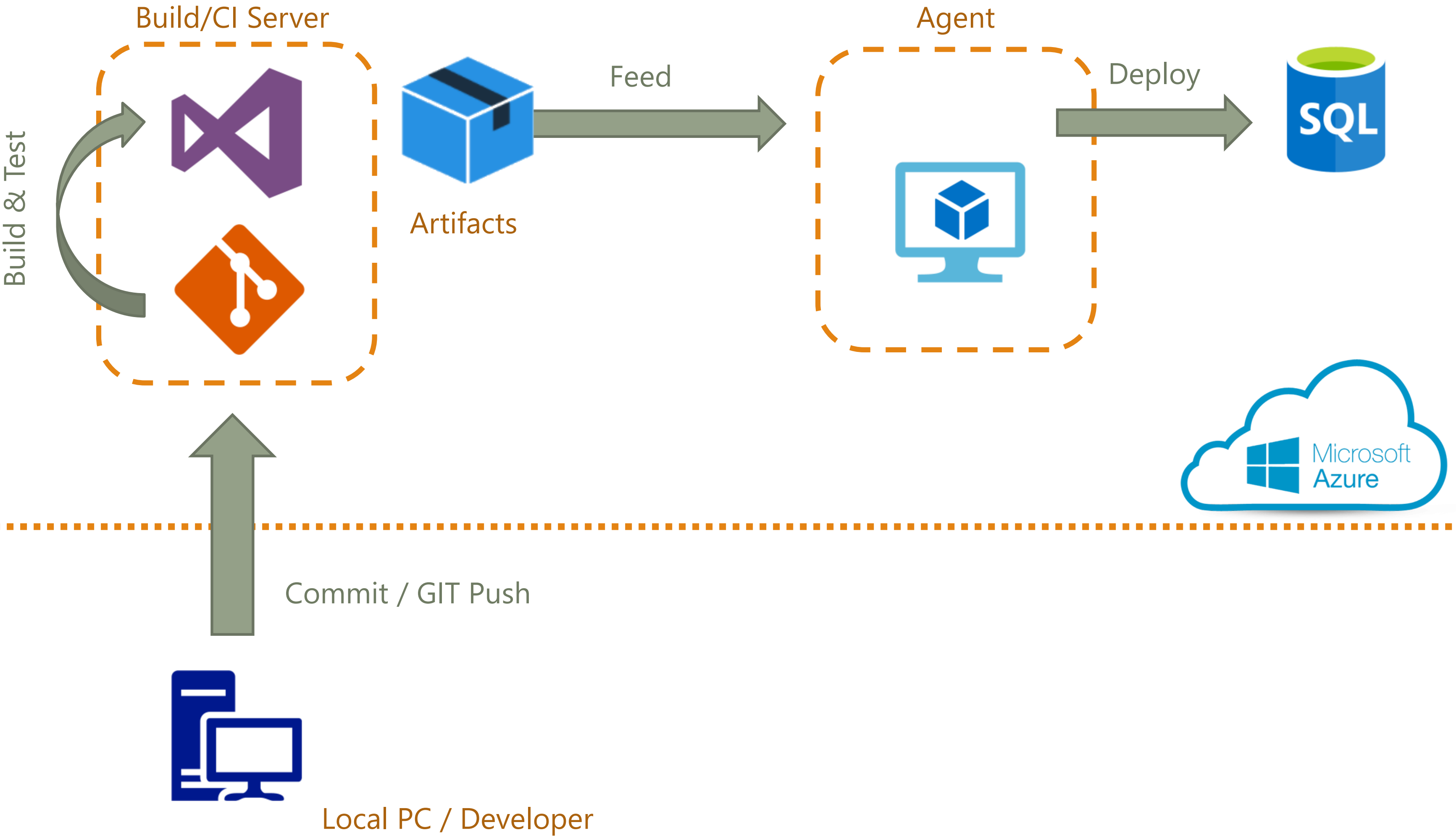
Deployment process with Octopus



VSTS, TeamCity, Octopus



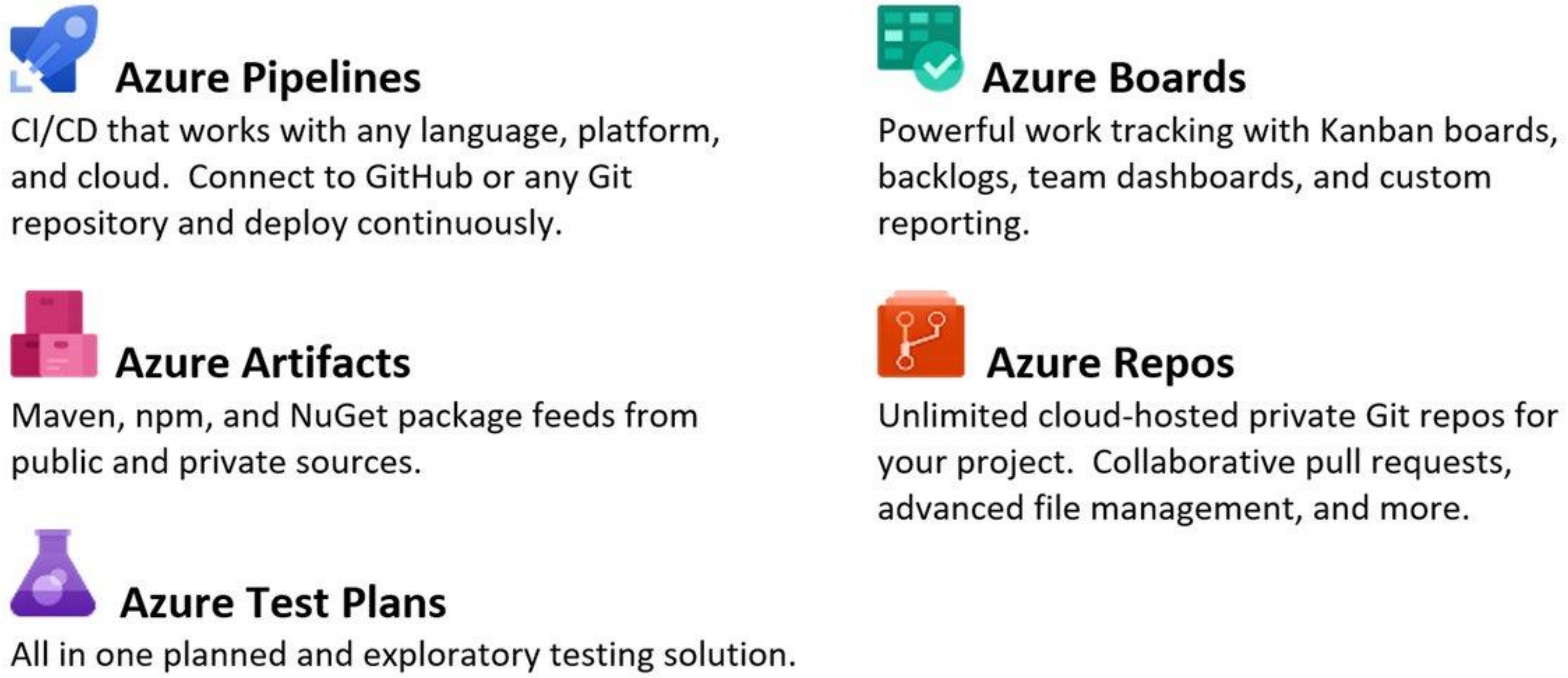
Let’s simplify that… Azure DevOps



Azure DevOps – former VSTS

Azure DevOps
Azure Boards
Azure Repos
Azure Pipelines
Azure Test Plans
Azure Artifacts

Introducing Azure DevOps



Azure Pipelines

CI/CD that works with any language, platform, and cloud. Connect to GitHub or any Git repository and deploy continuously.

Azure Artifacts

Maven, npm, and NuGet package feeds from public and private sources.

Azure Test Plans

All in one planned and exploratory testing solution.

Azure Boards

Powerful work tracking with Kanban boards, backlogs, team dashboards, and custom reporting.

Azure Repos

Unlimited cloud-hosted private Git repos for your project. Collaborative pull requests, advanced file management, and more.

DEMO #3

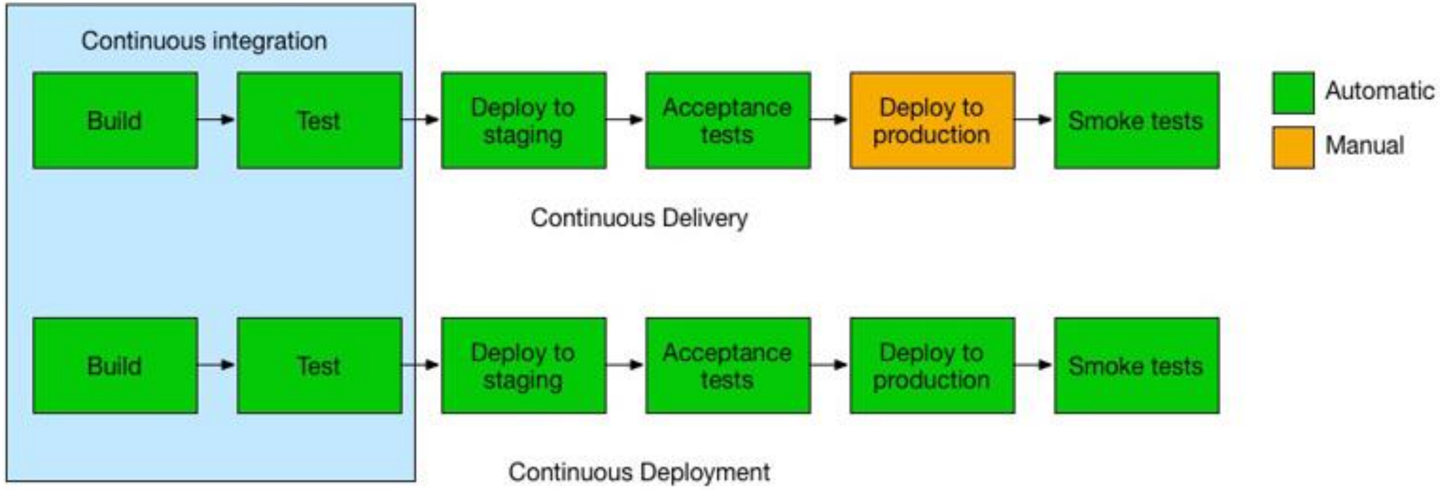
Automation:

- Code repository
- Why GIT?
- Azure DevOps and its pipelines
- Configuration
- Extensions, Marketplace
- Let’s click the RED button

Continous... x3

- Continous Integration
- Continous Delivery
- Continous Deployment

Continous… x3



Business Awareness

Continuous Integration

COSTS:

- Write automated tests
- CI server (builds, tests)
- Often MERGE of changes by developers

BENEFITS:

- Less bugs on production (captured by early tests)
- Easy way of building Releases
- Less context switching – devs are alerted as soon as they break the build
- Testing costs are reduced drastically
- QA team spend less time testing

Continuous Delivery

COSTS:

- Strong foundation in CI
- Deployments need to be automated
- Feature flags for imcomplete features

BENEFITS :

- Removing complexity of deployment process
- More often releases
- Faster feedback from customer
- Less pressure for small changes

Continuous Deployment

COSTS:

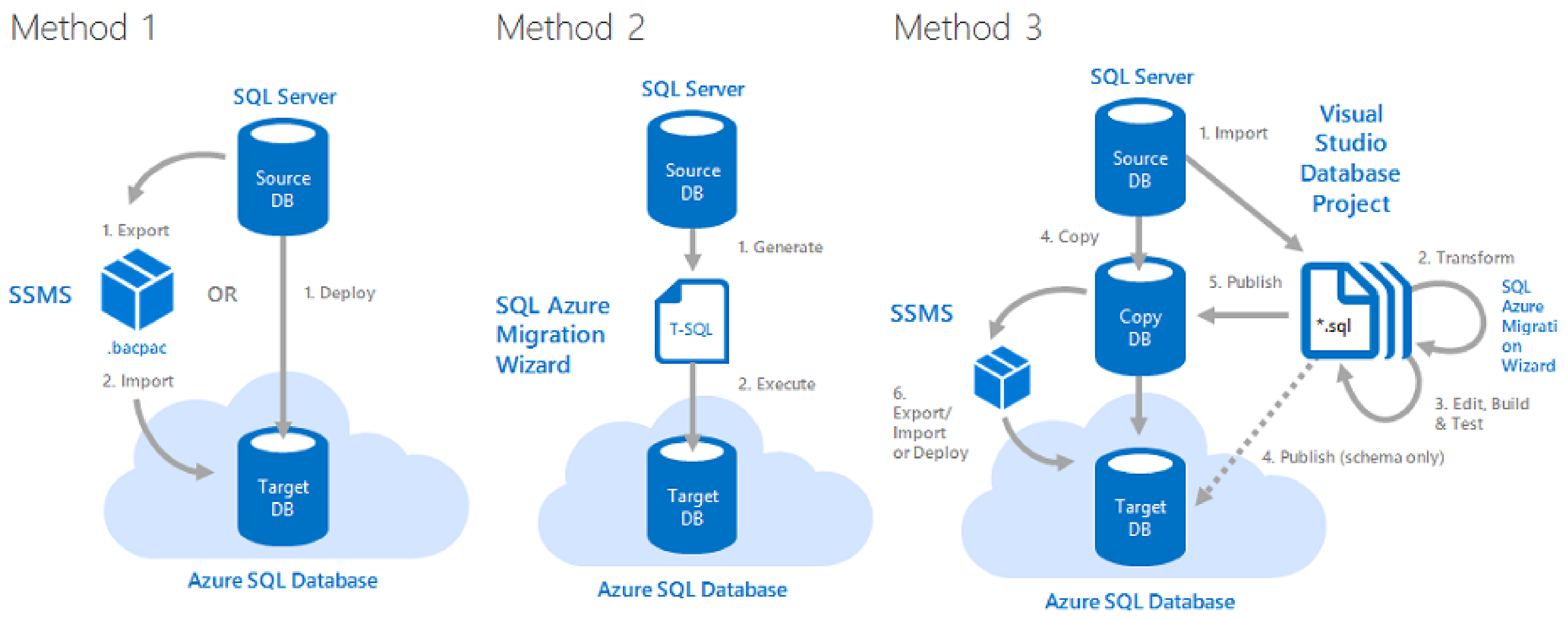
- The best level of testing culture
- Keep up your documentation with the pace of deployments
- Feature flags as a part of the process of releasing significant changes

BENEFITS :

- Faster developing
- Deployments triggered automatically for every change
- Releases ase less risky
- Problem can be fix easier
- Customers see a continuous stream of improvements
- Quality increases every day

Migration to the Cloud

Migration to the cloud



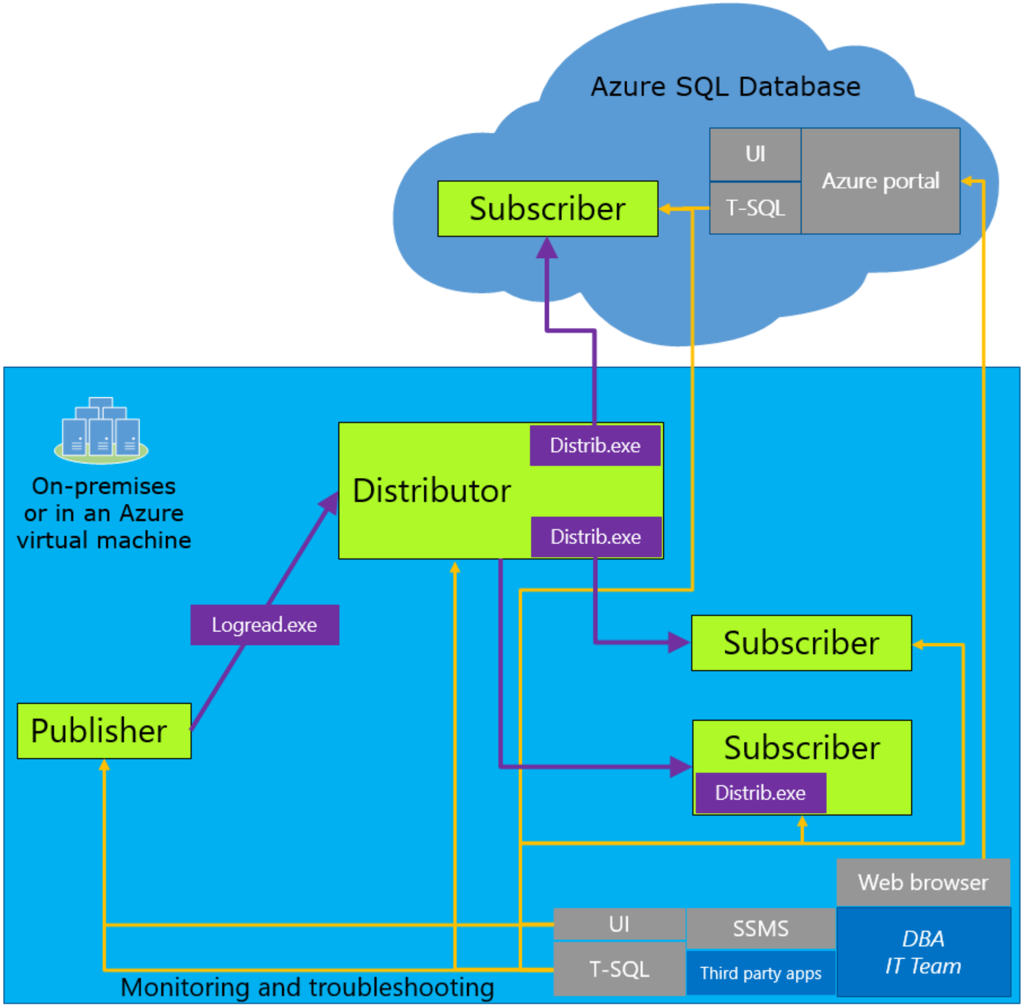
Method 1

Method 2

Method 3

Migration with replication

- Transactional replication
- Migration without stopping production (*downtime*)
- PUSH subscriptions are supported only



Summary

- Migrate to GIT or start using repo for databases if you haven’t yet
- Create many publish profiles (i.e. per environment)
- Automate your deployment with PowerShell
- Set up CI/CD in Azure DevOps
- DevOps = Teams Cooperation

Resources

- SQL Server Data Tools (MSDN)
- SQLPackage.exe (MSDN)
- Data-tier Application Framework (DACFx)
- Microsoft SQL Server Data Tools Team Blog
- GIT – branch organization
- Continuous Delivery and the Database (Redgate)
- Alex Yates - model vs mig
- SQLPlayer.net blog

Questions?

Thank you!

kamil@nowinski.net

@NowinskiK @SQLPlayer

SQLPlayer.net

https://github.com/NowinskiK/CommunityEvents

Kamil Nowinski
Microsoft Data Platform MVP
MCSE Data Platform & MCSE Data Management and Analytics