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Kamil Nowiński & Roman Czarko-Wasiutycz



Maintenance of a DB project and Continuous Delivery using SSDT

Roman Czarko-Wasiutycz



- Od kilkunastu lat zbiera doświadczenia związane z technologiami Microsoftu. Począwszy od developera C++, PHP, C#, administratora SharePoint poprzez administratora Microsoft SQL Server na projektowaniu i rozwijaniu dużych hurtowni danych kończąc. BI DEV/ DBA/ Team Leader.
- Posiadacz tytułów: MCTS, MCSA: SQL Server 2012/2014, MCSE: BI oraz MCSE: Data Management and Analytics.
- Członek Zarządu stowarzyszenia Data Community (dawniej PLSSUG)
- Lider Wrocławskiego oddziału Data Community.
- Współorganizator i prelegent konferencji SQLDay 2013-2019, SQLDay Lite, SQLSaturday i innych.
- Prywatnie fan gier komputerowych, chopperów, samolotów RC i robotyki :)

Kamil Nowiński



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...



Scan me



DevOps approach across your project

- Already adopted across SOME projects
- Already adopted across ALL projects
- Plan to adopt in the next 2 years
- Not adopted and no plans in the next 2 years

Redgate – State of database DevOps

Has your organization already adopted, or do you plan to adopt, a DevOps approach across any of your IT projects?



Yes

43%

already adopted across some projects

15%

already adopted across all projects



No

27%

Plan to adopt across some or all projects in the next two years

15%

Not adopted and no plans to adopt within the next two years

Part ONE

AGENDA – Part One

- 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!

AGENDA – Part Two

- Publish profiles (xml)
- Deploy/Publish database to target server
- PowerShell
- CI/CD
- Azure DevOps!

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?

Workloads

Individual components

Language packs

Installation locations

Web & Cloud (7)



ASP.NET and web development

Build web applications using ASP.NET, ASP.NET Core, HTML, JavaScript, and container development tools.



Python development

Editing, debugging, interactive development and source control for Python.



Data storage and processing

Connect, develop and test data solutions using SQL Server, Azure Data Lake, Hadoop or Azure ML.



Office/SharePoint development

Create Office and SharePoint add-ins, SharePoint solutions, and VSTO add-ins using C#, VB, and JavaScript.



Azure development

Azure SDK, tools, and projects for developing cloud apps and creating resources.



Node.js development

Build scalable network applications using Node.js, an asynchronous event-driven JavaScript runtime.



Data science and analytical applications

Languages and tooling for creating data science applications, including Python, R and F#.



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 download, install?

SQL Server 2017 ▾

Filter by title

- > Distributed Replay
- > SQL Server Configuration Manager
- > SQLCMD
- > SSB Diagnose
- ▼ SQL Server Data Tools (SSDT)
 - Download SSDT**
 - Release notes for SSDT
 - Previous releases of SSDT & SSDT-BI
 - SQL Server Tools
- > Project-Oriented Offline Database Development
- > SQL Server Management Studio (SSMS)
- > SqlPackage.exe
- > SQL Server Profiler
- > Visual Studio native helpers
- > Tutorials
- > SQL Server on Linux
- > SQL on Azure
- > Resources
- > Reference

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.

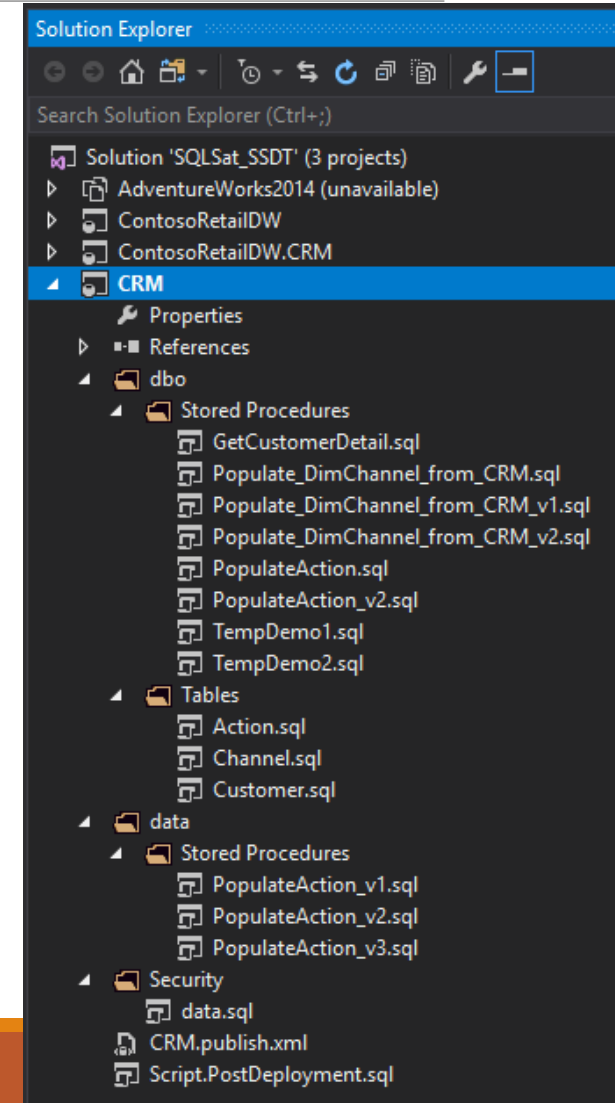
- For Database Projects, install the Data Storage and Processing workload for Visual Studio
- For Analysis Services, Integration Services or Reporting Services projects, download and install [SQL Server Data Tools](#)

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)



(Well) known issues



(Well) known issues

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

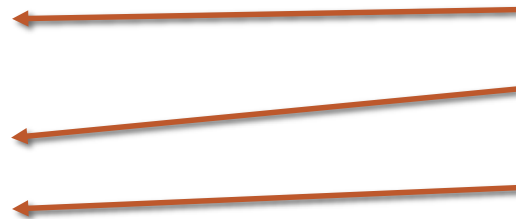
Database dependencies & references

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

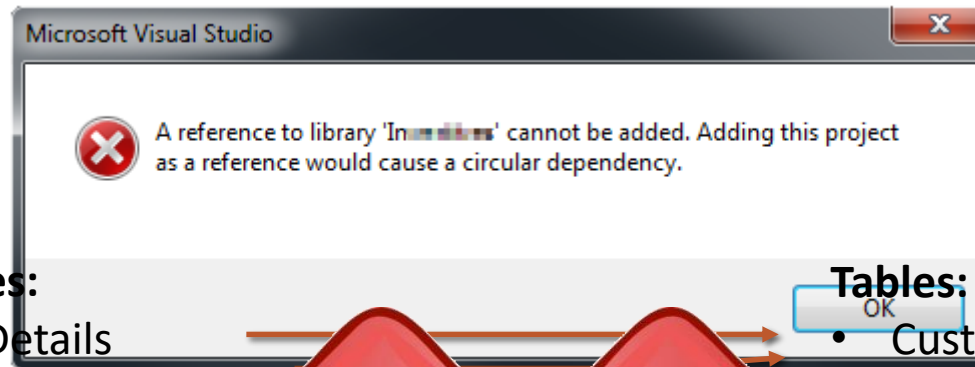
CRM_Interface

Stored Procedures:

- GetCustomerDetails
- MergeCustomers
- AddLogItem
- GetCustomerInvoice

Tables:

- Customer_Audit
- CustomerAddress_Audit
- CustomerEmail_Audit
- TransactionLog



Tables:

- Customer
- InvoiceHeader
- InvoiceLines
- CustomerAddress
- CustomerEmail

Triggers:

- Tr_Customer
- Tr_CustomerEmail

Stored Procedures:

- AddLogItem

CRM

Circular dependencies

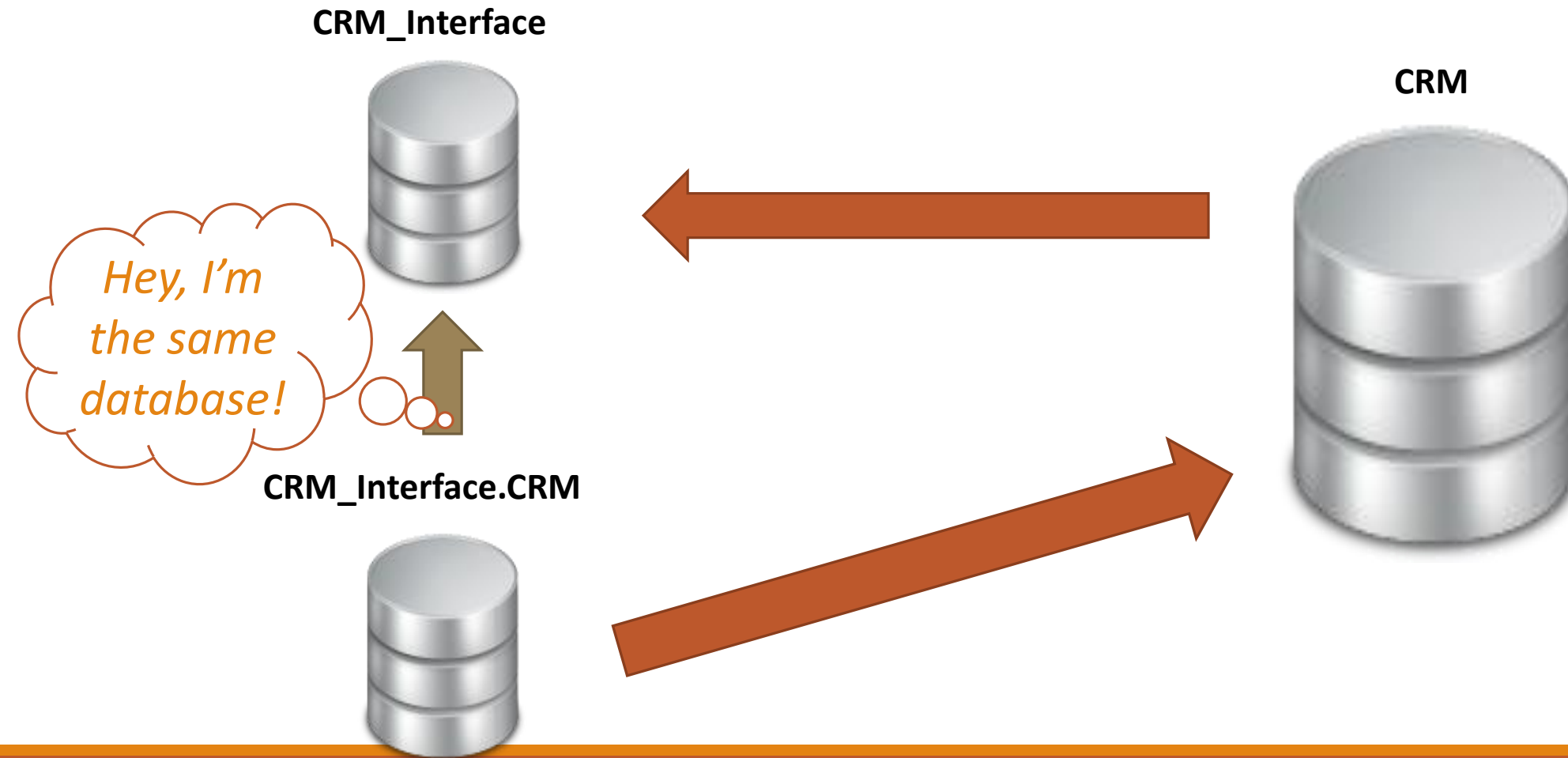
CRM_Interface



CRM



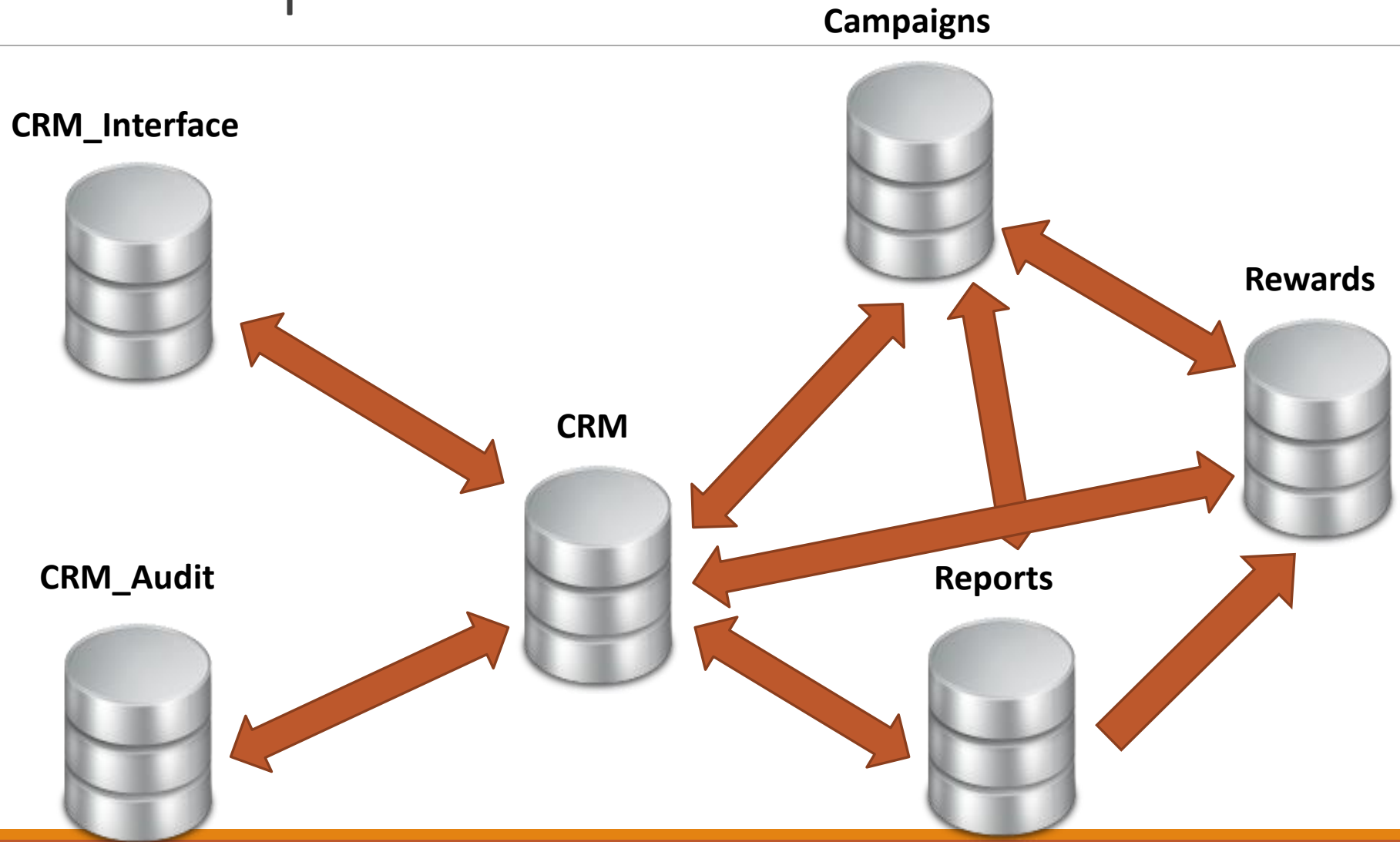
Circular dependencies



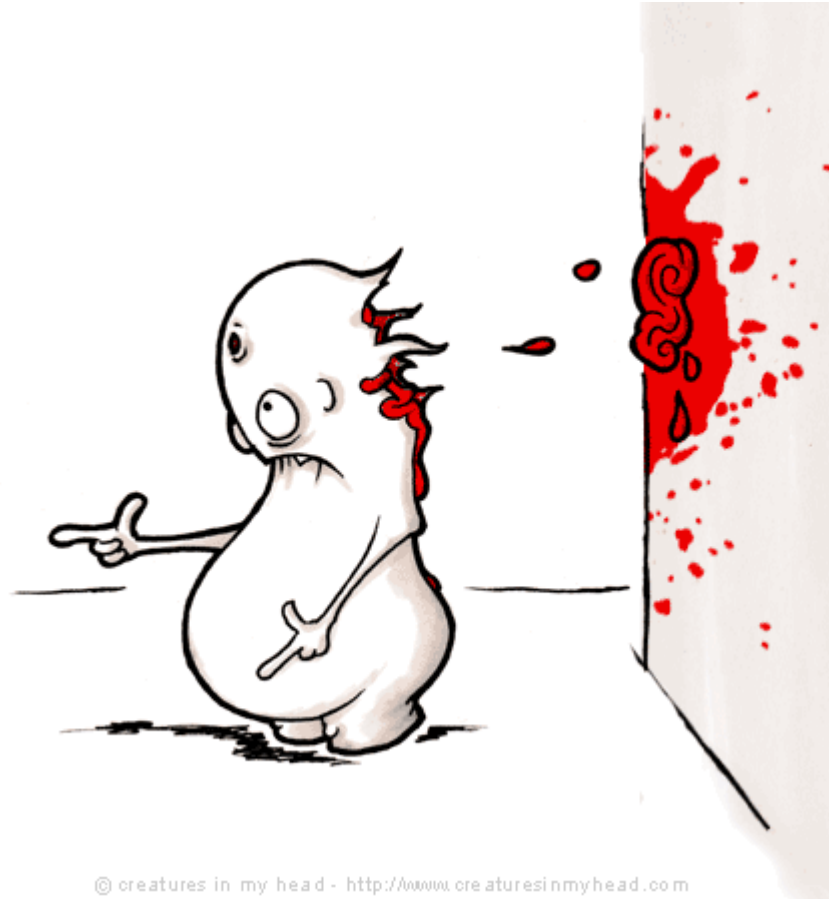
DEMO

- Create database project
- Import database from server
- Create references & variables
- Resolve circular references

Circular dependencies



Circular dependencies



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

Know issue: temp table

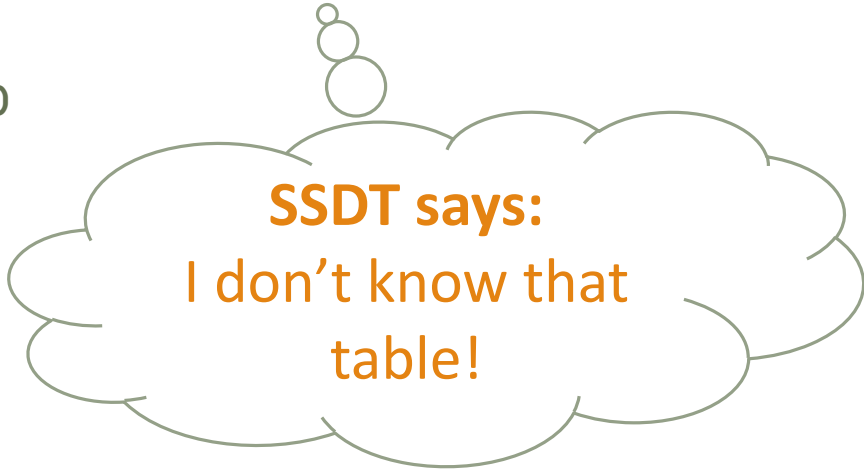
```
CREATE PROCEDURE [dbo].[TempDemo1]
AS
```

```
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

- Create publish profile
- Deploy manually
- 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

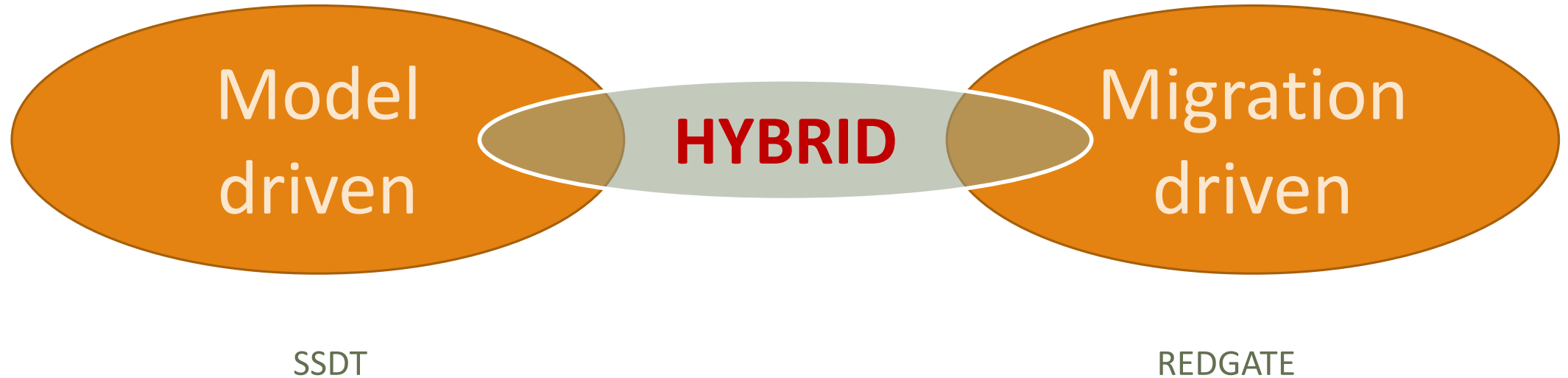
DevOps – definition (Wikipedia)

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).

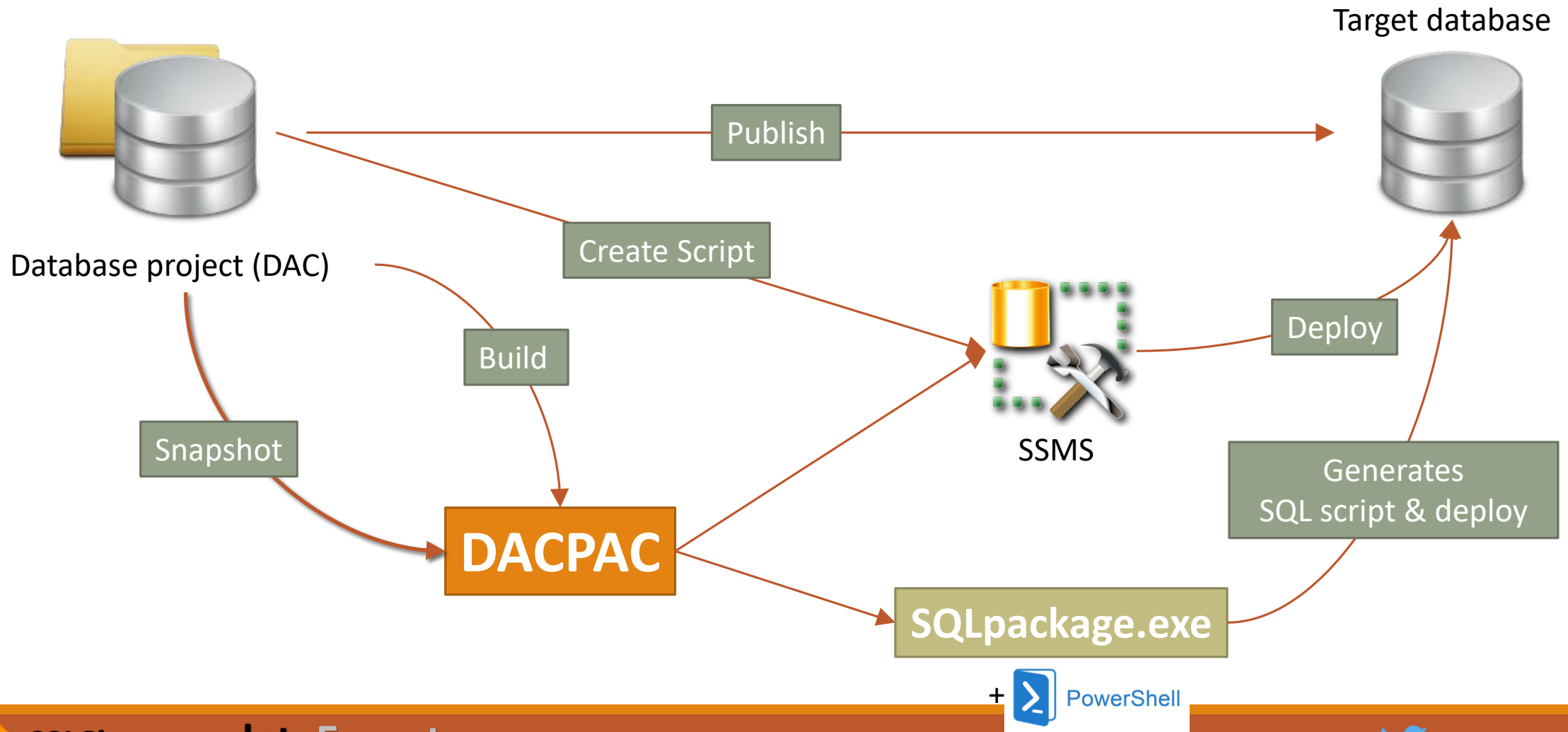
The main characteristic of the DevOps movement is to strongly advocate **automation and monitoring** at **all steps** of software construction, from integration, testing, releasing to deployment and infrastructure management.

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

Database change management approaches



SSDT Deployment Pipeline



sqlpackage.exe

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



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

PowerShell: dbatools



The screenshot shows the dbatools website. The top navigation bar includes the dbatools logo and links for download, command index, team, subscribe, find us, and build reference. The main content area has a dark blue background with the text "PowerShell" and "SQL Server" separated by a yellow heart icon. Below this is a quote: "Instance migrations and best practice implementations have never been safer, faster or freer." and two buttons: "DOWNLOAD" and "GET STARTED". The bottom section, titled "features", lists four features with icons: "free & open source" (dollar sign), "community driven" (group of people), "automation is awesome" (gears), and "lots of upvotes" (trophy).

dbatools

download command index team subscribe find us build reference

PowerShell



SQL Server

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

DOWNLOAD GET STARTED

features

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

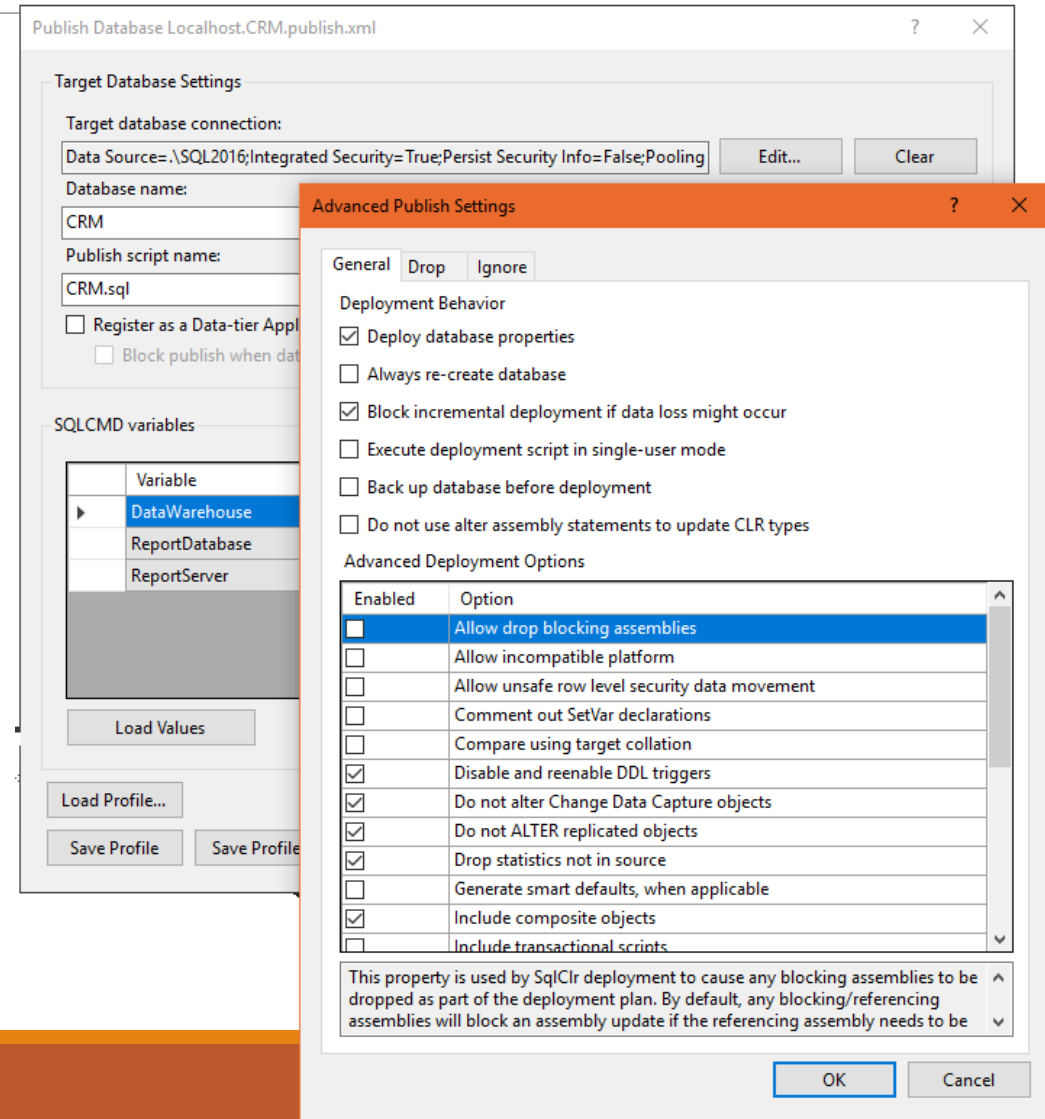
Publish profiles

- 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



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

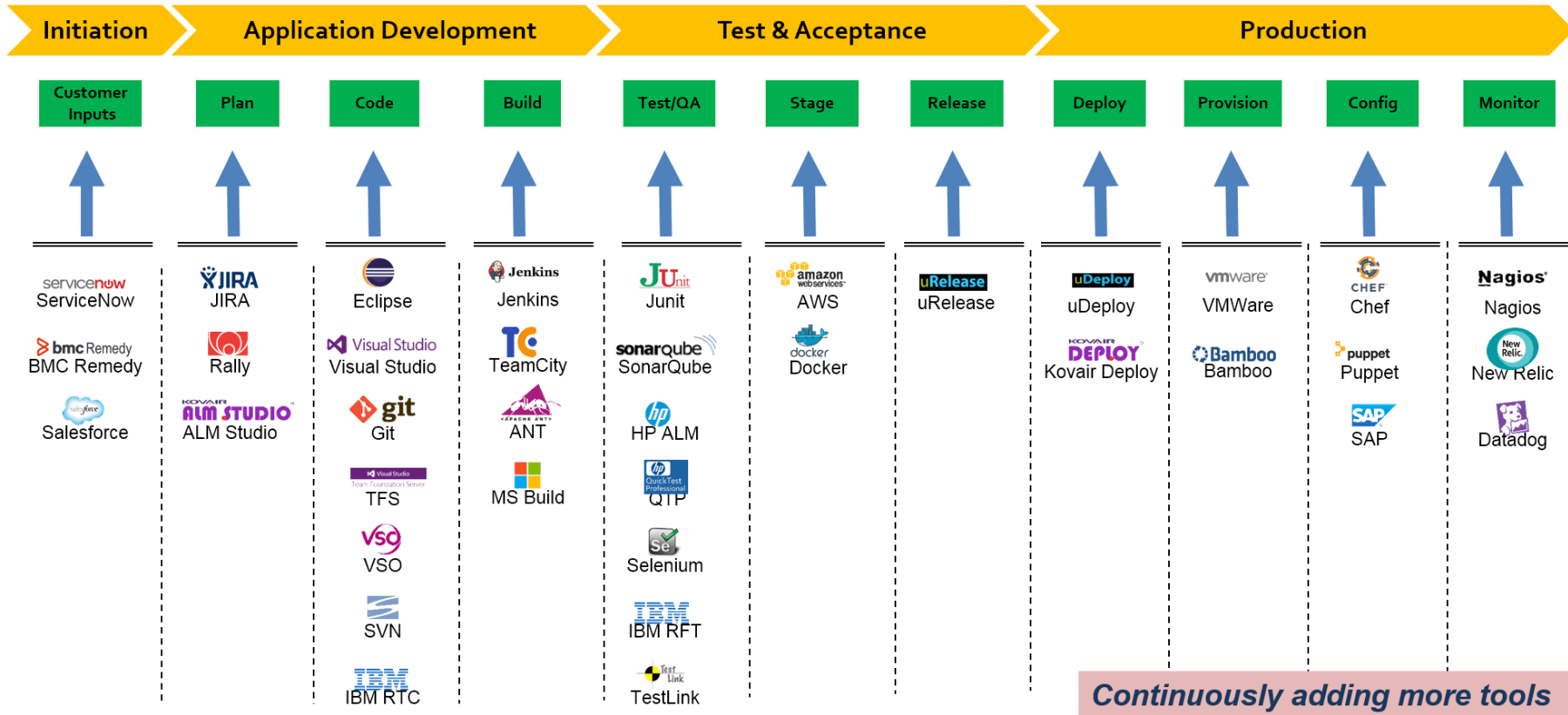
DEMO

- Database changes via **sqlpackage.exe**
- Deployment with PowerShell script
 - Report
 - Script
 - Publish action



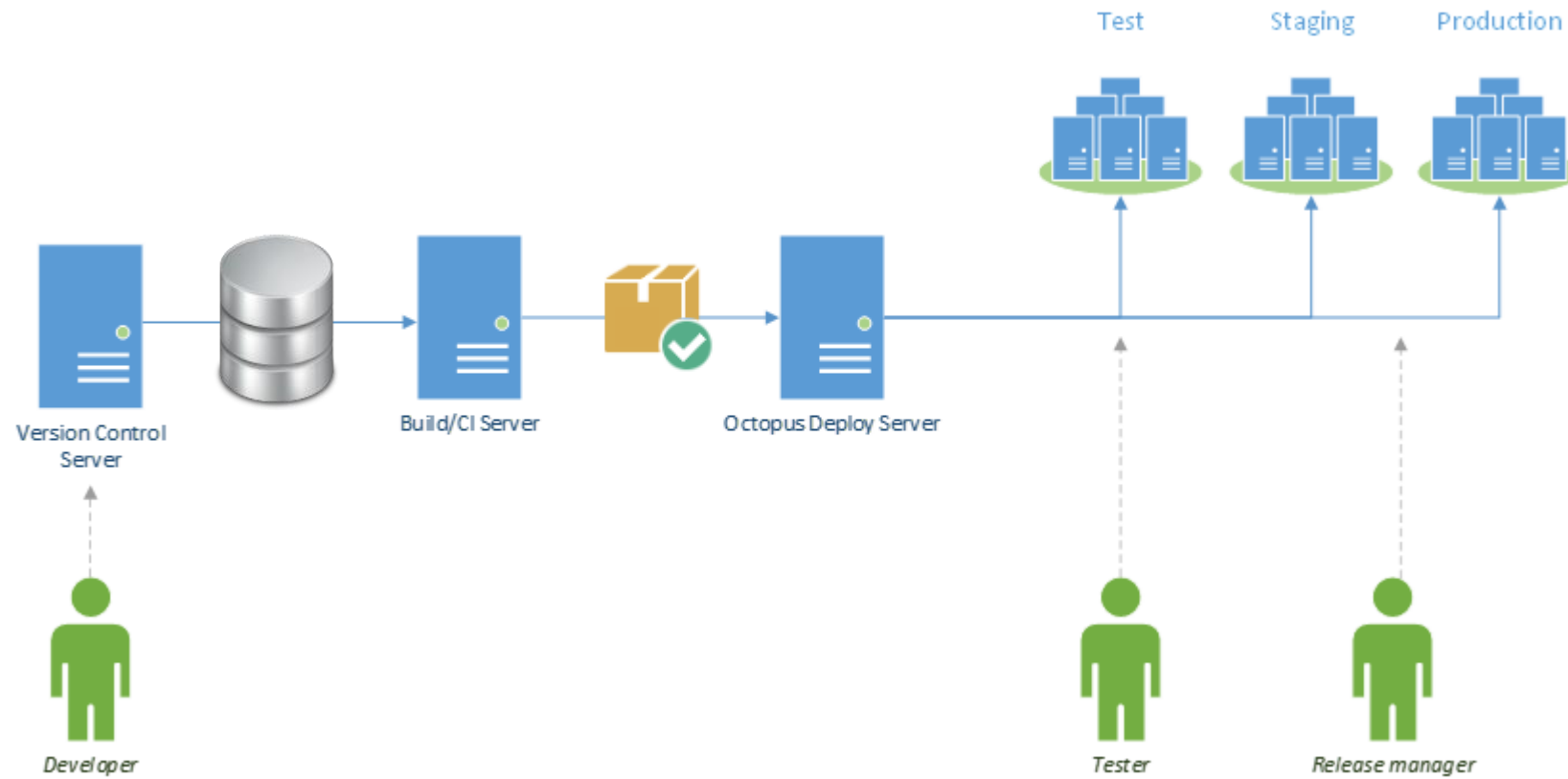
How to automate the Deployment Process?

Deployment process - tools

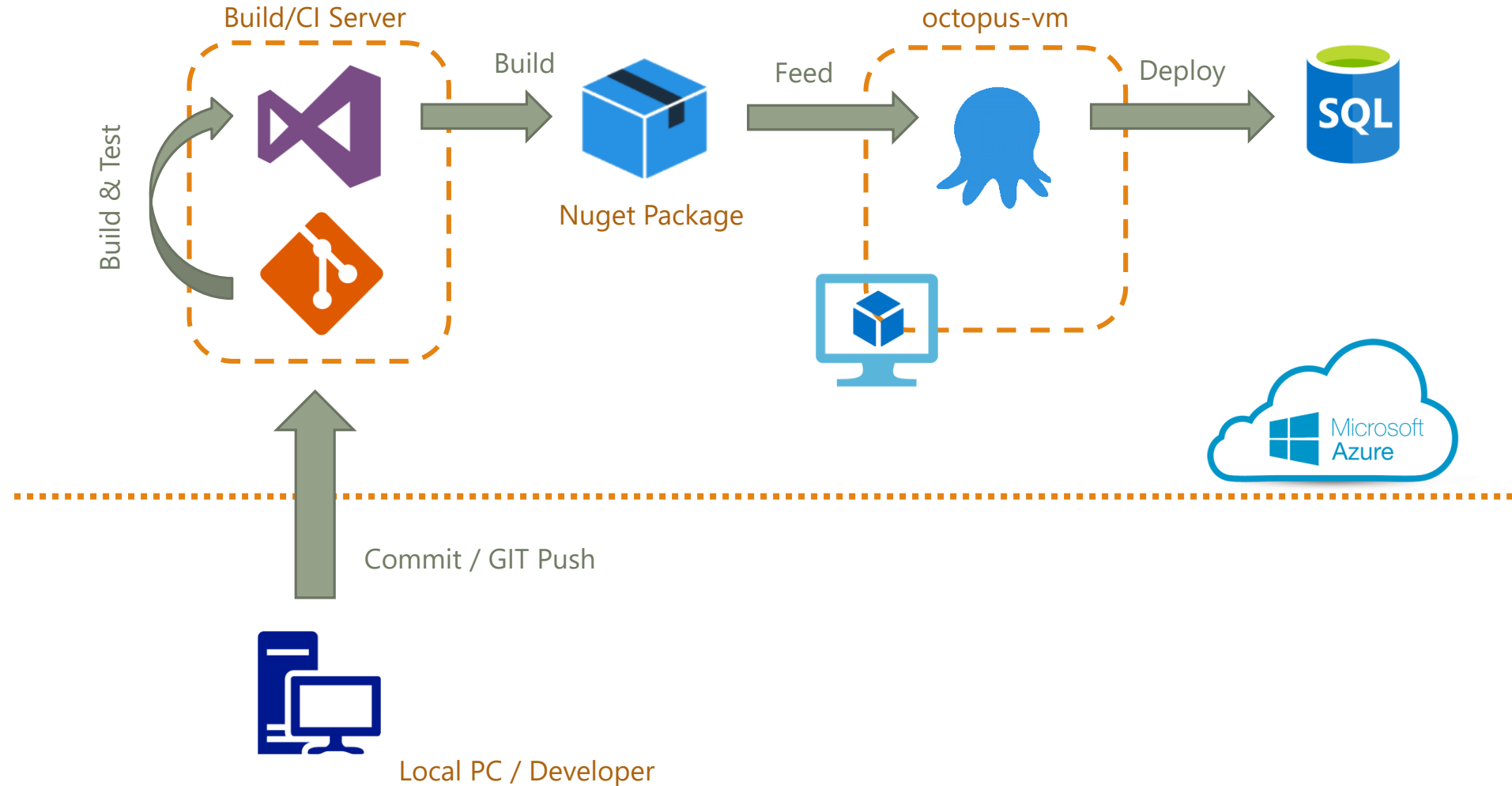


<https://www.kovair.com/intelligent-devops/>

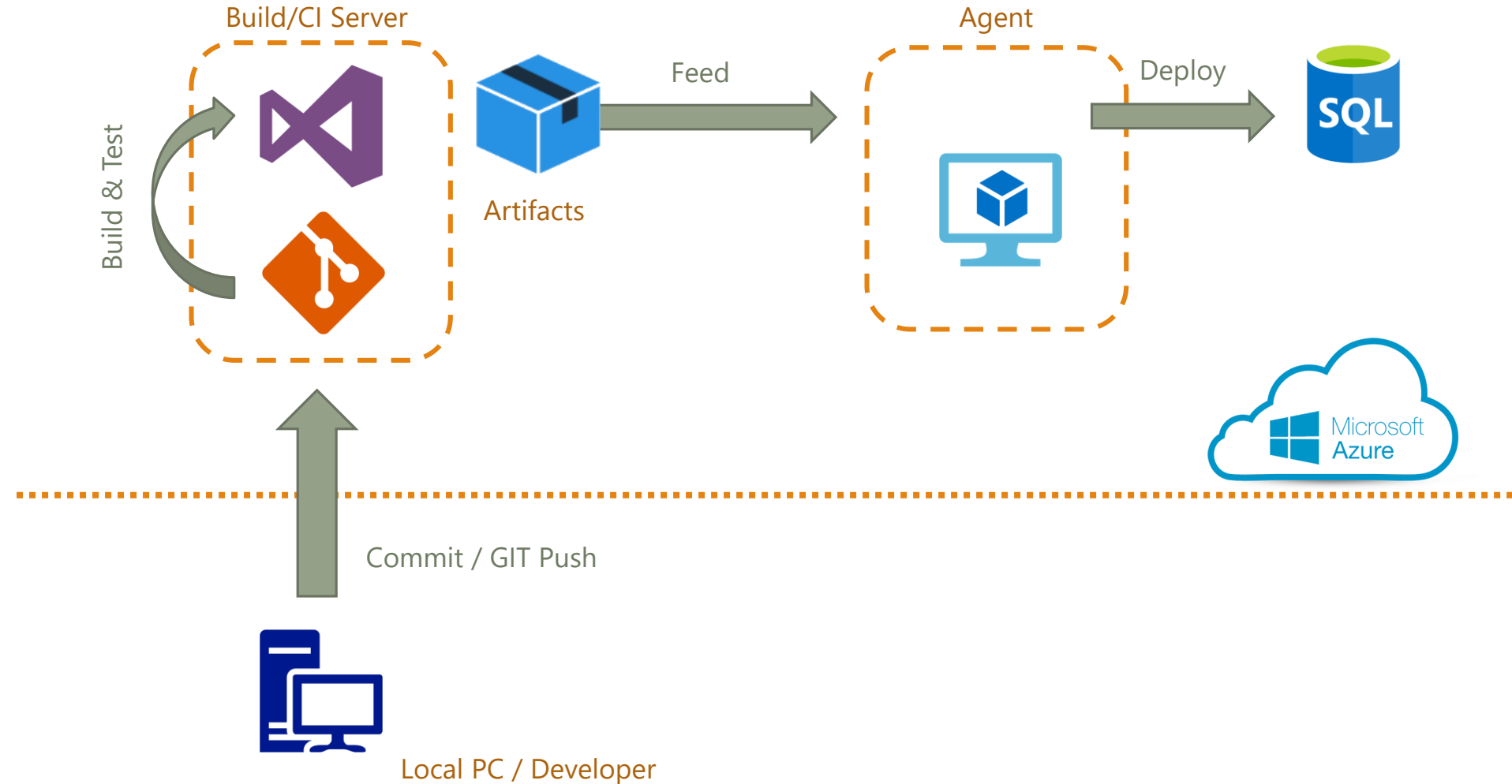
Deployment process



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 Boards

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



Azure Artifacts

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



Azure Repos

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



Azure Test Plans

All in one planned and exploratory testing solution.

DEMO

Automation:

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

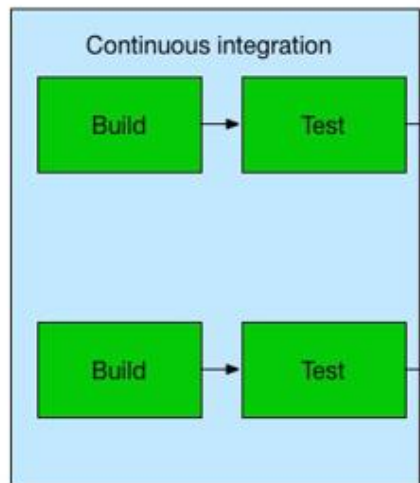


Continuous... x3

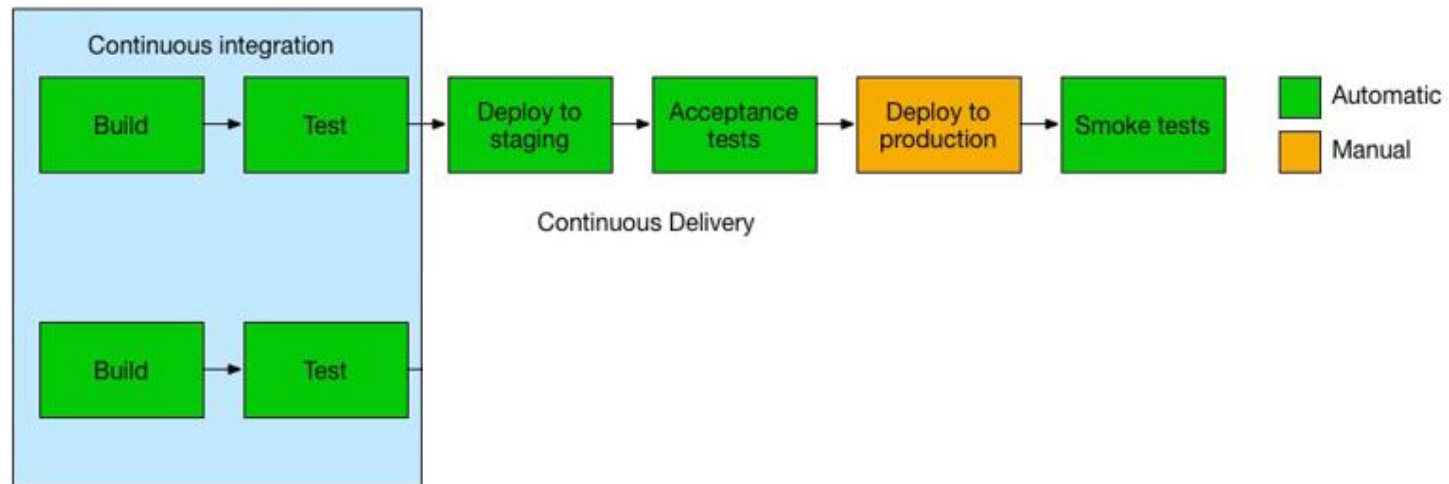
- Continuous Integration
- Continuous Delivery
- Continuous Deployment



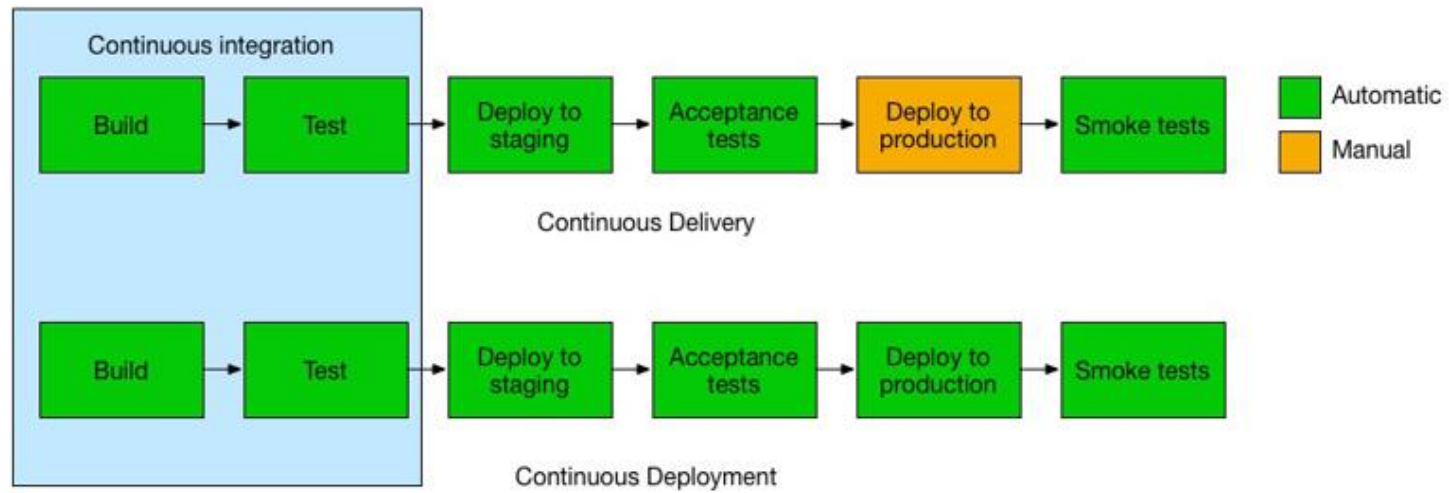
Continuous Integration



Continuous Delivery



Continuous Deployment



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 incomplete 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 are less risky
- Problem can be fixed easier
- Customers see a continuous stream of improvements
- Quality increases every day

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](#)
- [Version Control tools for SQL Server](#)
- [SQLPlayer.net](#) blog

Questions?



Thank you!



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@NowinskiK

@SQLPlayer



SQLPlayer.net



<https://github.com/NowinskiK/CommunityEvents>



Kamil Nowinski

Microsoft Data Platform MVP

MCSE Data Platform & MCSE Data Management and Analytics