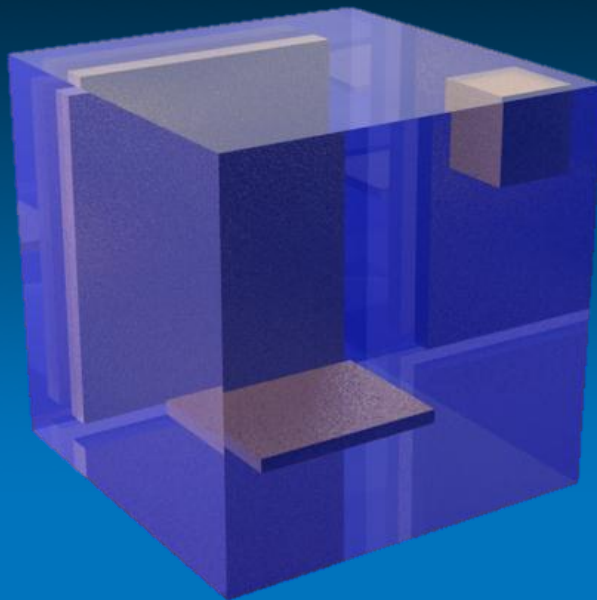


The Developer Side of the MS Business Intelligence Stack



by
Sascha Lorenz (PSG)

MDM
Patterns
Methodology
Coaching
BI Architecture
BI Strategy
Reporting Services
Skill Improvement
Data Profiling
BI Lifecycle
Coaching
Data Quality
Analysis Services
Data Warehouse
ETL
OLAP
Dimensional Modeling
Consulting

About me...

- Sascha Lorenz
- Senior Consultant, Coach & Trainer
- PSG Projekt Service GmbH, Hamburg
- Our Customers are German Federal Agencies, Shipping Companies and Banks (Fonds Administration & NPL)
- Engaged in German PASS Chapter (Hamburg)

Follow me on **Facebook** and
<http://saschalorenz.blogspot.com>

A word cloud of business intelligence and data management terms. The words are arranged in a horizontal, slightly curved layout. The most prominent words are 'BI Architecture' and 'Coaching', which are larger than the others. Other visible words include 'MDM', 'Patterns', 'Methodology', 'Data Quality', 'Reporting Services', 'BI Strategy', 'Skill Improvement', 'Data Profiling', 'BI Lifecycle', 'Dimensional Modeling', 'OLAP', 'Data Warehouse', 'ETL', 'Analysis Services', 'Consulting', and 'Coaching' (repeated). The words are in various shades of blue and white, set against a dark blue background.

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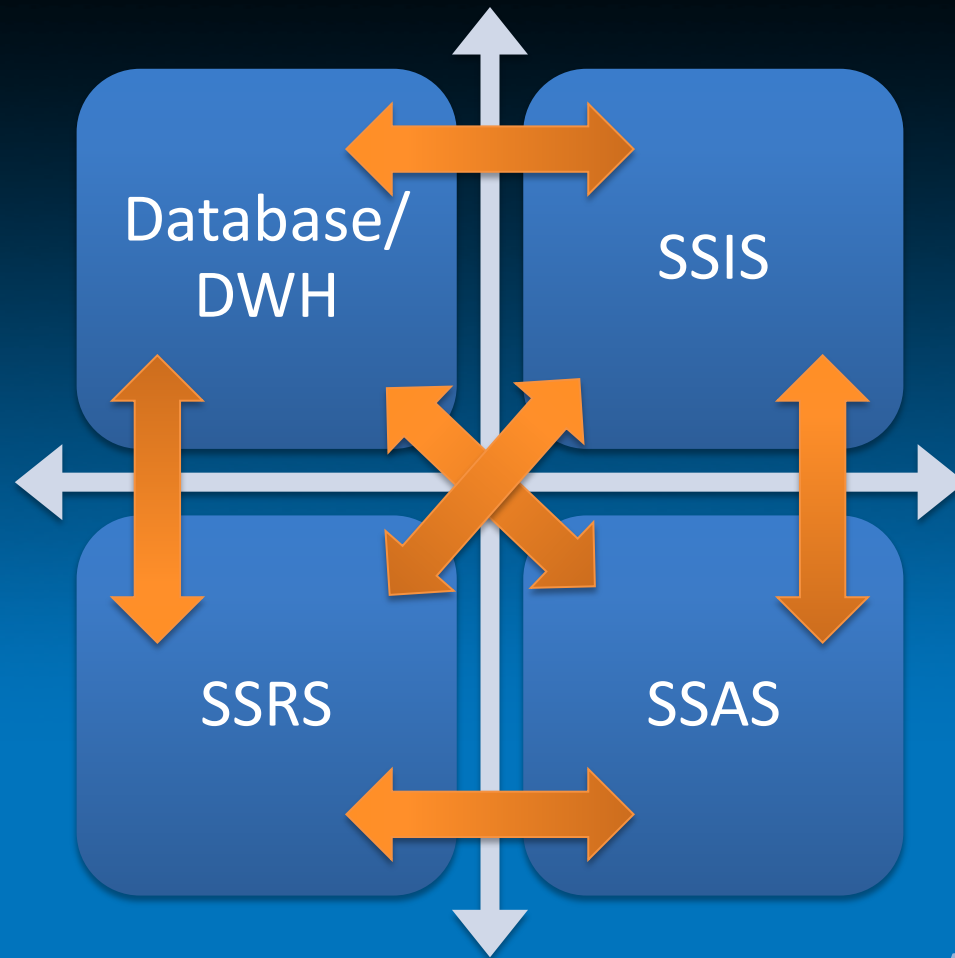
Why talking about a developer side of Microsoft Business Intelligence?

- We have powerful services in SQL Server!
- We have powerful tools in SQL Server!
- But we have no framework(s) to tied all these services and tools together!

A word cloud of Microsoft Business Intelligence concepts. The words are arranged in a horizontal, slightly curved layout. The most prominent words are 'BI Architecture' and 'ETL'. Other visible words include 'Data Warehouse', 'OLAP', 'Reporting Services', 'Data Quality', 'Analysis Services', 'Consulting', 'BI Strategy', 'Skill Improvement', 'Dimensional Modeling', 'BI Lifecycle', 'Data Profiling', 'Coaching', 'Methodology', 'Patterns', and 'MDM'.

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SQL Server Services



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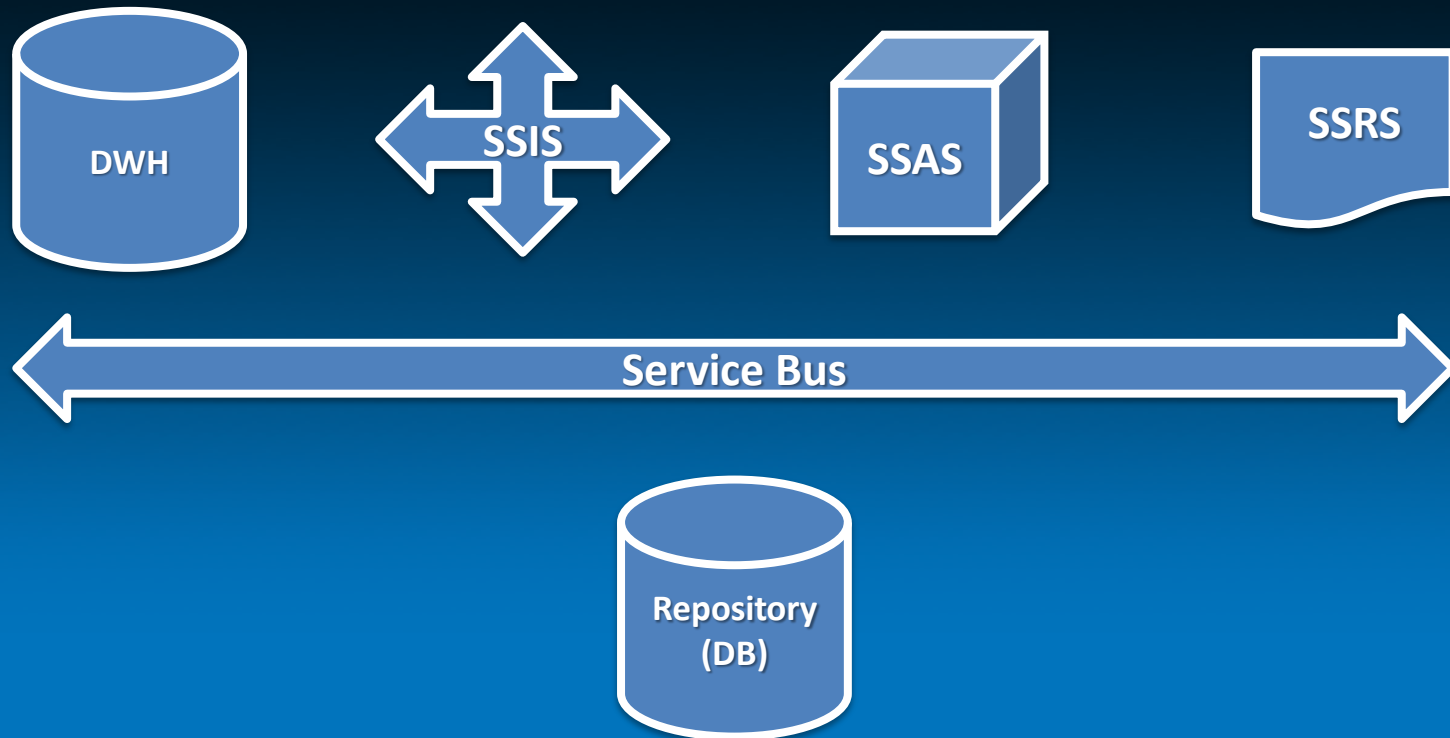
Framework?

We need a MS BI Middleware!

- Aims to achieve with our Middleware:
 - Central Repository for all services
 - DWH, SSIS, SSAS & SSRS
 - Control of processing SSIS & Cubes
 - Transport & Storage System
 - Central Logging

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MS BI Middleware



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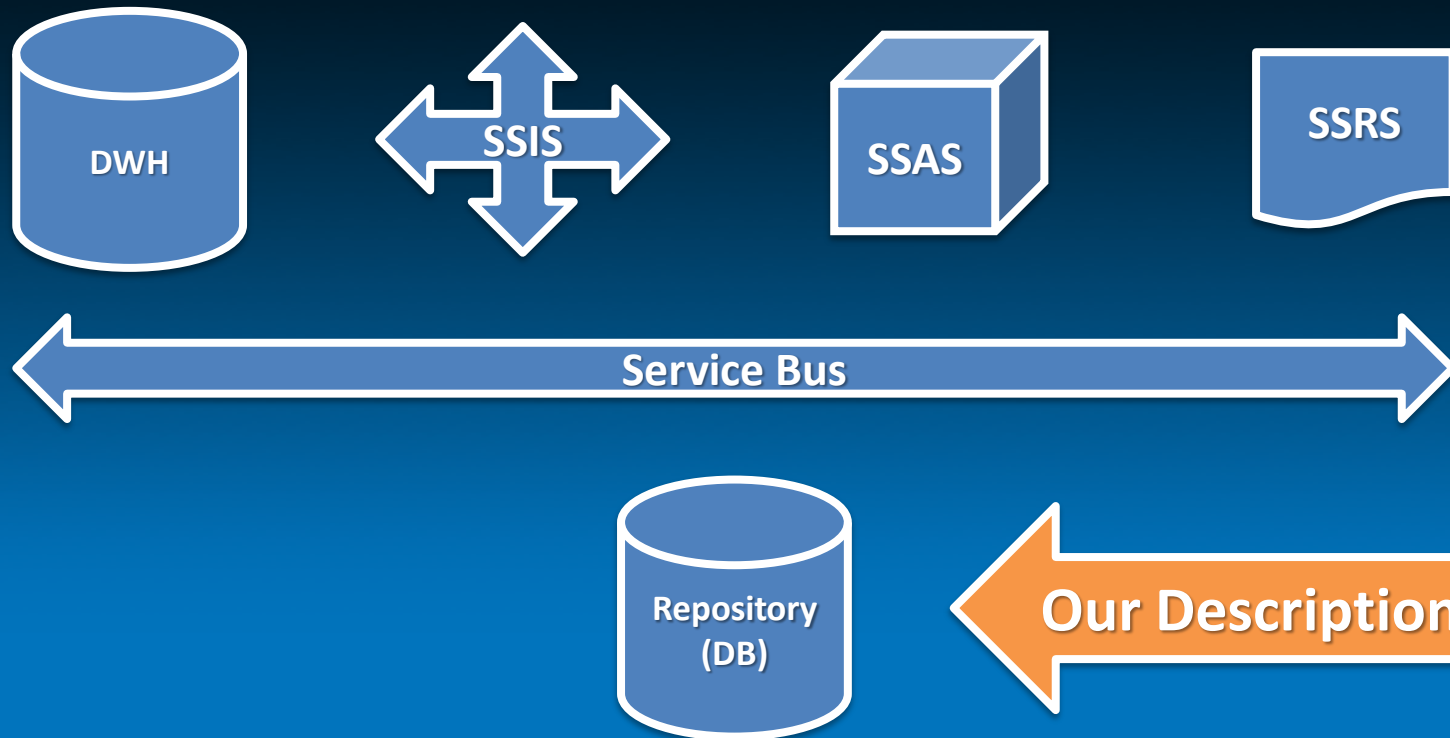
Yes, we are talking about coding in .net!

No kidding!

- There are no limitations, because SQL Server provides „only“ services!
- There are no cool-all-in-one-tools! This is a big advantage of the platform!
- „BIDS“ only creates descriptions (Meta Data). The services makes the real job!

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MS BI Middleware



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A closer look at the services

- Database Engine
- Integration Services
- Analysis Services
- Reporting Services
- (Master Data Services)



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What are we looking for?

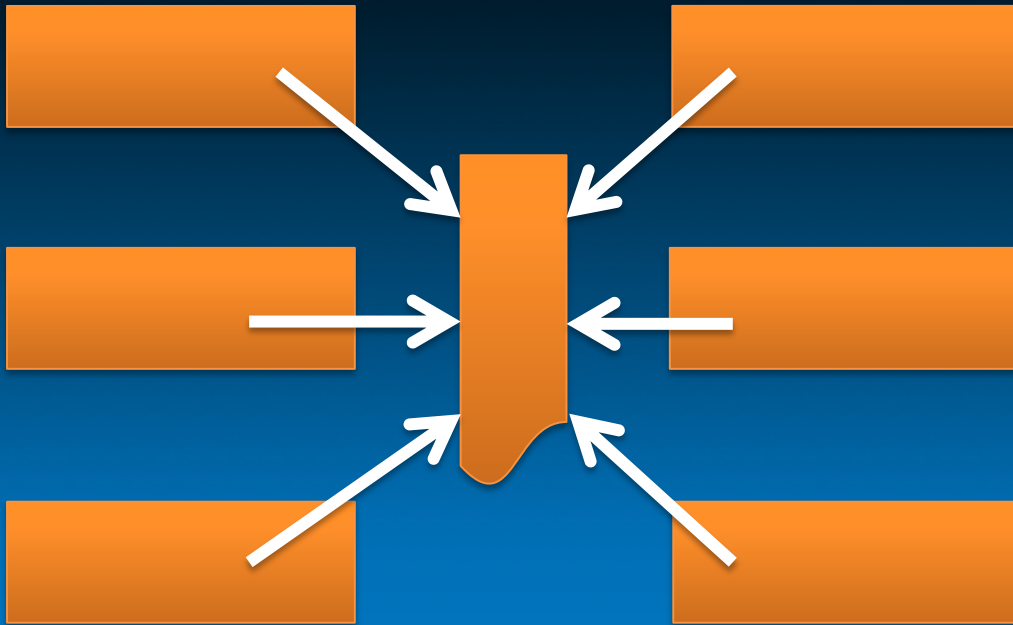
- Data about the Data & Structure ... Meta Data!!
- A documented way to read these!
- A documented way to *create and edit objects!*



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Database Engine

Data Warehouse



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Database Engine

- Easy Job...!
- Meta Data... yepp...
- Read create and edit objects... yepp...



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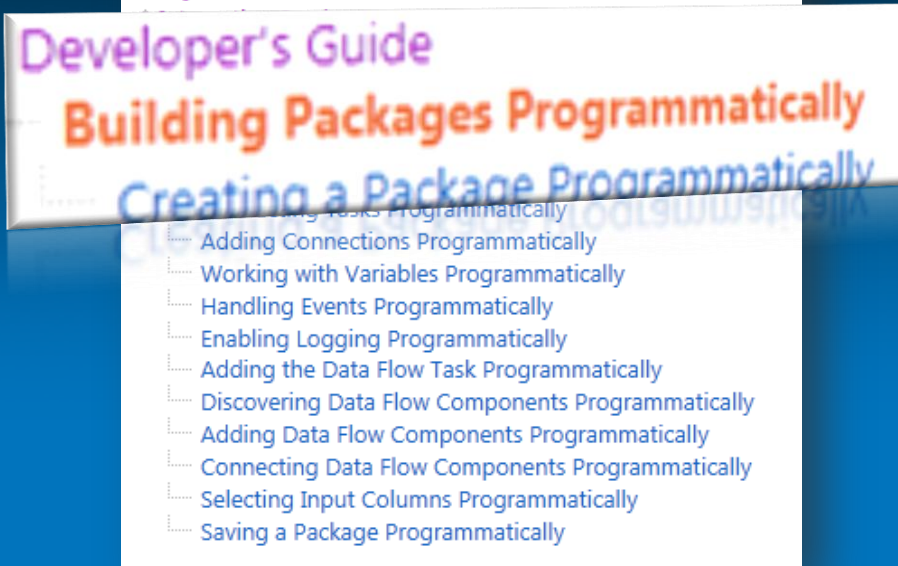
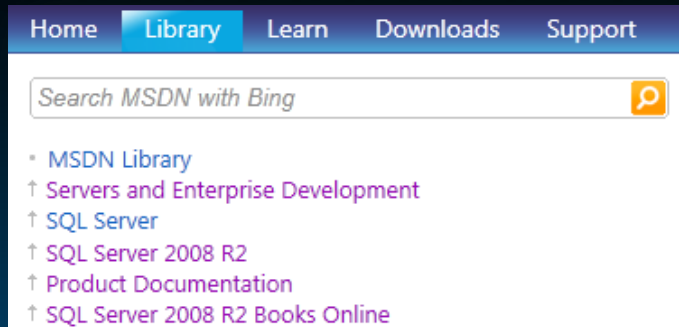
Integration Services

- Hmmm, Meta Data?
- How to get these?
- And, how to create objects and edit objects??
- But wait, there is a *documented way* to achieve this!



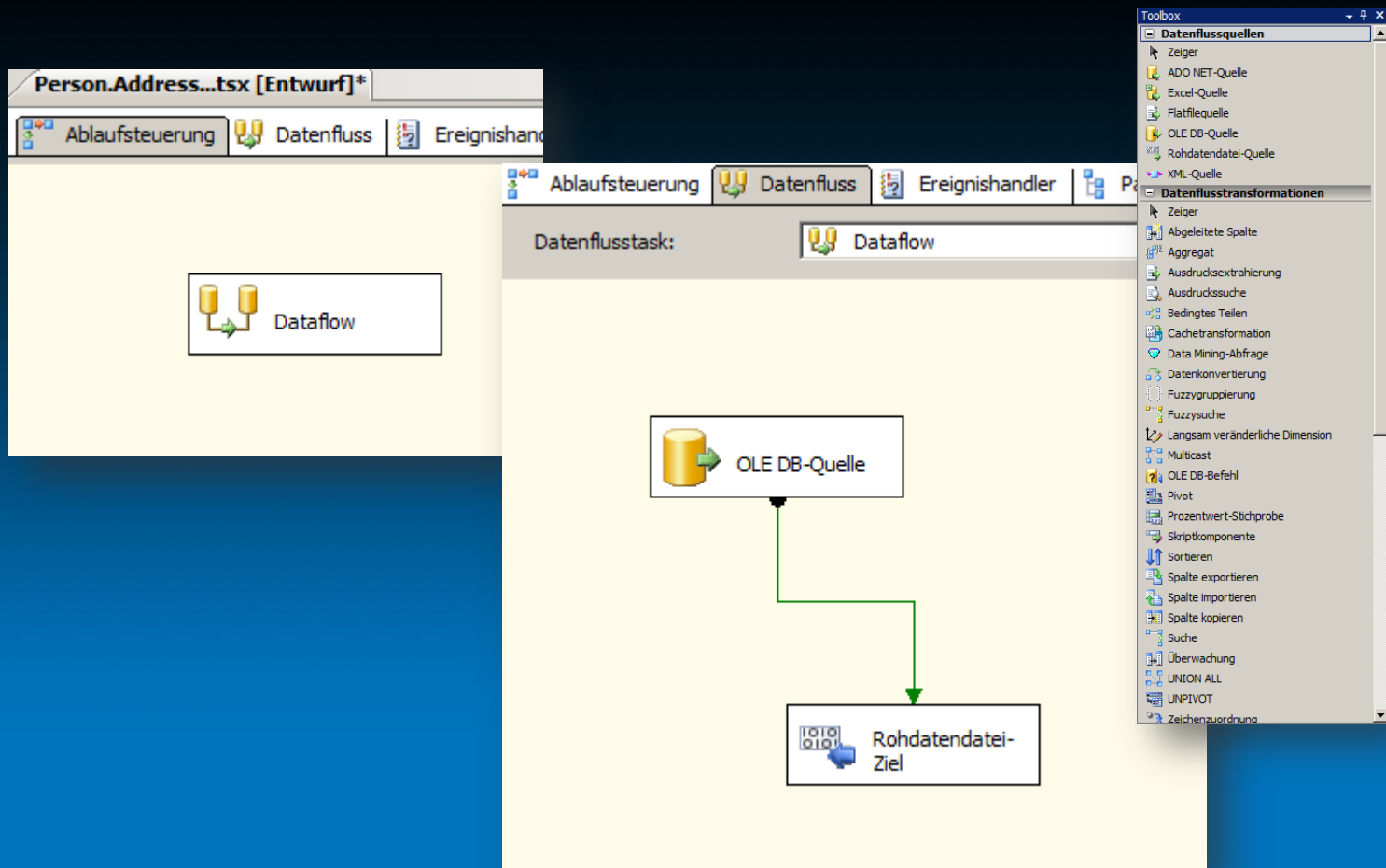
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Integration Services



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A SSIS Package...



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A new SSIS Package...

```
using Microsoft.SqlServer.Dts.Runtime;  
using Microsoft.SqlServer.Dts.Pipeline Wrapper;  
using wrap = Microsoft.SqlServer.Dts.Runtime.Wrapper;
```

...

```
Package p = new Package();  
<here add magic...>
```

```
Microsoft.SqlServer.Dts.Runtime.Application a = new  
    Microsoft.SqlServer.Dts.Runtime.Application();
```

```
a.SaveToXml(@"c:\SSISDEMOS\demo001.dtsx", p, null);
```

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A new SSIS Package... II

```
ConnectionManager adventureWorks = p.Connections.Add("OLEDB");  
adventureWorks.Name = "OLEDBPASS";  
adventureWorks.ConnectionString = @"Provider=SQLNCLI;Integrated  
Security=SSPI;Persist Security Info=False;Initial  
Catalog=AdventureWorks;Data Source=(local);Auto  
Translate=False;";
```

```
TaskHost th = p.Executables.Add("STOCK:SQLTask") as TaskHost;  
th.Name = "mySQLTask 1";  
th.Description = "Execute a SQL Query";  
th.Properties["SqlStatementSource"].SetValue(th,  
    "Select * from Person.Address");  
th.Properties["Connection"].SetValue(th, "OLEDBPASS");
```

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A new SSIS Package... III

```
TaskHost th = p.Executables.Add("STOCK:SQLTask") as TaskHost;  
th.Name = "mySQLTask 1";  
th.Description = "Execute a SQL Query";  
<add more properties>  
TaskHost th1 = p.Executables.Add("STOCK:SQLTask") as TaskHost;  
th1.Name = "mySQLTask 2";  
th1.Description = "Execute a SQL Query";  
<add more properties>
```

```
PrecedenceConstraint pcTasks =  
    p.PrecedenceConstraints.Add((Executable)th,  
                                (Executable)th1);  
pcTasks.Value = DTSExecResult.Success; // .Completion / .Failure
```

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A new SSIS Package... IV

```
private void CreateExtractZMW(string Source)
{
    Package p = new Package();

    ConnectionManager adventureworks = p.Connections.Add("OLEDB");
    adventureworks.Name = "OLEDBPASS";
    adventureworks.ConnectionString = @"Provider=SQLNCLI1;Integrated Security=SSPI;Persist Security Info=False;Initial Catalog=Adventureworks2008;Data Source=(local);Auto Translate=False;";

    TaskHost dft = p.Executables.Add("STOCK:PipelineTask") as TaskHost;
    dft.Name = "EUMOPASS DataFlow";

    MainPipe dft = (MainPipe)dft.InnerObject;

    zdtComponentMetadata100 source = dft.ComponentMetadataCollection.New();
    source.Name = "OLEDBSource";
    source.ComponentClassid = "OLEDBAdapter.OleDbSource";

    ManagedComponentWrapper instanceSource = source.Instantiate();
    instanceSource.ProvideComponentProperties();

    source.RuntimeConnectionCollection[0].ConnectionManagerid = adventureworks.ID;
    source.RuntimeConnectionCollection[0].ConnectionManager = OLEDBAdapter.GetExtendedInterface(adventureworks);

    instanceSource.SetComponentProperty("AccessMode", 2);
    instanceSource.SetComponentProperty("SqlCommand", "Select * From "+ Source+";");

    instanceSource.AcquireConnections(null);
    if (instanceSource.Validate() == dtValidationStatus.VS_INVALID)
    {
        instanceSource.ReinitializeMetadata();
    }
    else
    {
        listbox1.Items.Add(instanceSource.Validate().ToString());
        instanceSource.ReleaseConnections();
    }

    zdtComponentMetadata100 destination = dft.ComponentMetadataCollection.New();
    destination.Name = "RawFile";
    destination.ComponentClassid = "OLEDBAdapter.RawDestination";

    ManagedComponentWrapper instanceDestination = destination.Instantiate();
    instanceDestination.ProvideComponentProperties();

    instanceDestination.SetComponentProperty("AccessMode", 0);
    instanceDestination.SetComponentProperty("FileName", @"C:\SSIS\Source\Source.raw");
    instanceDestination.SetComponentProperty("WriteOption", 0);

    zdtPath100 path = dft.PathCollection.New();
    path.AttachPathAndPropagateNotifications(source.OutputCollection[0], destination.InputCollection[0]);

    zdtInput100 destInput = destination.InputCollection[0];
    zdtVirtualInput100 destVirtualInput = destInput.GetVirtualInput();
    zdtVirtualInputColumnCollection100 destVirtualInputColumns = destVirtualInput.VirtualInputColumnCollection;
    listbox1.Items.Clear();
    foreach(zdtVirtualInputColumn100 virtInputColumn in destVirtualInputColumns)
    {
        if (virtInputColumn.DataType != Microsoft.SqlServer.DTS.Runtime.Wrapper.DataType.DT_INTTEXT && virtInputColumn.DataType != Microsoft.SqlServer.DTS.Runtime.Wrapper.DataType.DT_IMAGE)
        {
            zdtInputColumn100 inputColumn = instanceDestination.SetUsageType(destInput.ID, destVirtualInput, virtInputColumn.LineageId, dtUsageType.UT_READONLY);
            listbox1.Items.Add(virtInputColumn.Name + " (" + virtInputColumn.DataType + ")");
        }
    }

    Microsoft.SqlServer.DTS.Runtime.Application a = new Microsoft.SqlServer.DTS.Runtime.Application();
    a.SaveToXML(@"C:\SSIS\Source\Source.dtsx", p, null);
}
```

MDM

Patterns

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Data Profiling

Coaching

Architecture

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Demo SSIS



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SSIS...

But wait, there is much more...

**Of course, you can read SSIS Packages
and modify them!**

A word cloud of business intelligence (BI) and data management terms. The words are arranged in a horizontal, slightly curved layout. The most prominent words are 'ETL', 'Data Warehouse', 'OLAP', 'BI Architecture', and 'Coaching'. Other visible terms include 'Consulting', 'Analysis Services', 'Data Quality', 'Reporting Services', 'BI Strategy', 'Skill Improvement', 'Data Profiling', 'BI Lifecycle', 'Dimensional Modeling', 'Methodology', 'Patterns', and 'MDM'.

Consulting ETL Data Warehouse OLAP Analysis Services Data Quality Reporting Services BI Strategy Skill Improvement Data Profiling BI Lifecycle Dimensional Modeling Methodology Patterns MDM BI Architecture Coaching

An used SSIS Package...

```
Application app = new Application();  
  
Package p = app.LoadPackage(@"c:\...\p1.dtsx", null);  
  
int n = p.Configurations.Count;  
DtsProperty p2 = p.Properties["VersionGUID"];  
DTSProtectionLevel p1 = p.ProtectionLevel;  
Console.WriteLine("Number of configurations = " + n);  
Console.WriteLine("VersionGUID = " + p2);  
Console.WriteLine("ProtectionLevel = " + p1);
```

<And so on...>

A word cloud of various terms related to Business Intelligence (BI) and data management. The terms are arranged in a horizontal, slightly overlapping manner. The most prominent terms include 'BI Architecture', 'ETL', 'Data Warehouse', 'OLAP', 'Reporting Services', 'Data Quality', 'Analysis Services', 'Consulting', 'MDM', 'Patterns', 'Methodology', 'Coaching', 'Data Profiling', 'Skill Improvement', 'BI Lifecycle', 'Dimensional Modeling', and 'BI Strategy'.

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Analysis Services

- Hmm, Meta Data?
- How to get these?
- And, how to create and edit objects??
- But wait, there is a *documented way* to achieve this, *too!*



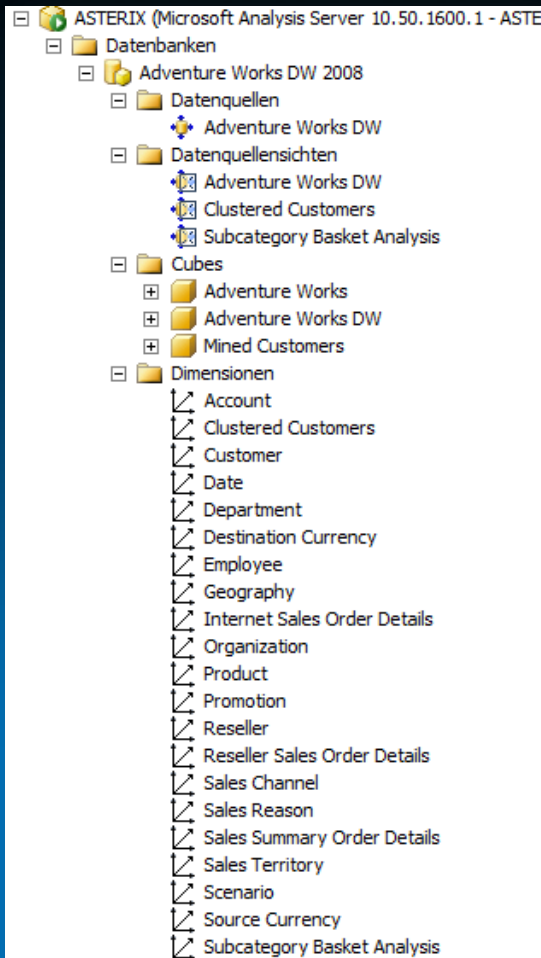
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A quick glance at a “cube” project



- SSAS is not centered on cubes!
- There is always a SSAS database around the cube(s) and the dimensions!
- **So we first need a database!**

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Analysis Services...

```
using Microsoft.AnalysisServices;
```

```
...
```

```
using (Server svr = new Server())
```

```
{
```

```
    svr.Connect(„myServer");
```

```
    Database db = svr.Databases.Add(pDatabaseName);
```

```
    db.DataSourceImpersonationInfo = new  
    ImpersonationInfo(ImpersonationMode.ImpersonateServiceAccount);  
    db.Update();
```

```
    DataSource ds = db.DataSources.Add(pDSName);
```

```
    ds.ConnectionString = pDSConnString;
```

```
    ds.Update();
```

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Analysis Services...

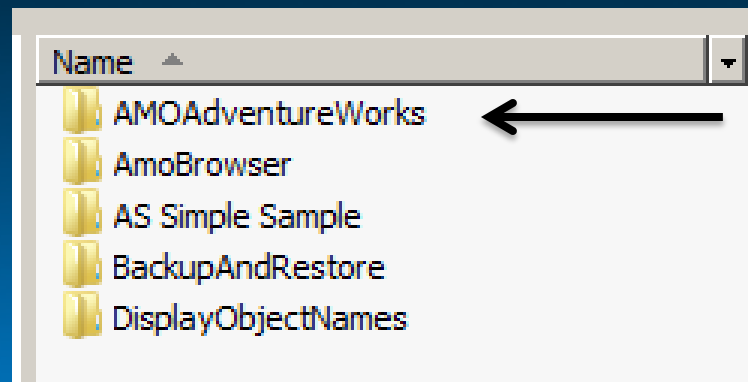
```
DataSourceView dsv = db.DataSourceViews.Add(pDSVName);  
dsv.DataSourceID = pDSName;  
dsv.Schema = new DataSet();  
  
OleDbConnection connection = new  
    OleDbConnection(dsv.DataSource.ConnectionString);  
connection.Open();  
  
rows = tbl.Select("keypath = 'Database/DSV/Table'");  
foreach (DataRow row in rows)  
    AddTable(dsv, connection, row["keyvalue"].ToString());
```



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Analysis Services...

▼ Microsoft SQL Server ▼ 100 ▼ Samples ▼ Analysis Services ▼ Programmability ▼ AMO ▼



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Analysis Services...

```
rows = tbl.Select("keypath = 'Database/DSV/Relation'");  
foreach (DataRow row in rows)  
{  
    string[] pRelation = row["keyvalue"].ToString().Split(';');  
    AddRelation(dsv,  
        pRelation[0],pRelation[1],pRelation[2],pRelation[3]);  
}  
  
dsv.Update();
```

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Analysis Services...

```
dim = db.Dimensions.Add(pDimensionName);  
dim.Source = new DataSourceViewBinding(pDSVName);  
...  
attr = dim.Attributes.Add(pAttributeName);  
...  
attr.KeyColumns.Add(CreateDataItem(db.DataSourceViews[0],  
pKeyColumn[1], pKeyColumn[2]));  
  
attr.NameColumn = CreateDataItem(db.DataSourceViews[0], pNameColumn[0],  
pNameColumn[1]);
```

A word cloud of various terms related to Business Intelligence and data management. The terms are arranged in a horizontal, slightly overlapping manner. The most prominent terms include 'BI Architecture', 'ETL', 'Data Warehouse', 'OLAP', 'Reporting Services', 'Data Quality', 'Analysis Services', 'Consulting', 'MDM', 'Patterns', 'Methodology', 'Coaching', 'Data Profiling', 'Skill Improvement', 'BI Lifecycle', 'Dimensional Modeling', and 'BI Strategy'.

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Demo SSAS



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Analysis Services Repository (express edition)...

	id	project	keypath	keyvalue
▶	3	amodemo	Database/Name	SQLBits 7 DemoSSAS
	4	amodemo	Database/DS/Name	amo ds
	5	amodemo	Database/DS/ConnString	Provider=SQLNCLI10.1;Data Source=Localhos...
	6	amodemo	Database/DSV/Name	amo dsv
	7	amodemo	Database/DSV/Table	Zeit
	8	amodemo	Database/DSV/Table	Dim 1
	9	amodemo	Database/DSV/Table	fakt 1
	10	amodemo	Database/DSV/Relation	fakt1;Dim 1;Dim 1;id
	11	amodemo	Database/DSV/Relation	fakt1;date;Zeit;ps_datum
	12	amodemo	Database/Dimension	Dim 1
	15	amodemo	Database/Dimension/Dim 1/Attribute/Idx/KeyColumns	1;Dim 1;id
	14	amodemo	Database/Dimension/Dim 1/Attribute	Idx
	16	amodemo	Database/Dimension/Dim 1/Attribute/Idx/NameColumn	Dim 1;DimString
	17	amodemo	Database/Dimension/Dim 1/Attribute	Level4id
	18	amodemo	Database/Dimension/Dim 1/Attribute/Level4Id/KeyColumns	1;Dim 1;Level4id
	19	amodemo	Database/Dimension/Dim 1/Attribute/Level4Id/NameColumn	Dim 1;Level4
	20	amodemo	Database/Dimension/Dim 1/Attribute/Idx/Usage	Key
	21	amodemo	Database/Dimension/Dim 1/Attribute/Level4Id/Usage	Regular
	22	amodemo	Database/Dimension/Dim 1/Attribute	Level3id
	23	amodemo	Database/Dimension/Dim 1/Attribute/Level3Id/Usage	Regular
	24	amodemo	Database/Dimension/Dim 1/Attribute/Level3Id/KeyColumns	1;Dim 1;Level4id
	25	amodemo	Database/Dimension/Dim 1/Attribute/Level3Id/KeyColumns	2;Dim 1;Level3id
	26	amodemo	Database/Dimension/Dim 1/Attribute/Level3Id/NameColumn	Dim 1;Level3

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BI Architecture

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Analysis Services...

- Recap:
We can modify the structure of a cube
(Database, Dimensions, Attributes, Measures
and so on...) by using simple ...

SQL DML Statements!



A word cloud of various business intelligence and data management terms. The words are arranged in a horizontal, slightly curved layout. The most prominent words are 'ETL', 'Data Warehouse', 'OLAP', 'BI Architecture', and 'Reporting Services'. Other visible terms include 'Consulting', 'Data Quality', 'Analysis Services', 'BI Strategy', 'Skill Improvement', 'Data Profiling', 'BI Lifecycle', 'Coaching', 'Methodology', 'Patterns', and 'MDM'.

Consulting ETL Data Warehouse OLAP Reporting Services BI Strategy Skill Improvement Data Profiling BI Lifecycle Coaching Methodology Patterns MDM

Analysis Services...

- But, how to take a look into a SSAS Database without a solution/project?

Import it in BIDS!



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Consulting ETL Data Warehouse OLAP Dimensional Modeling Reporting Services BI Strategy Skill Improvement Data Profiling BI Lifecycle Coaching Coaching BI Architecture Methodology Patterns MDM

Demo SSAS Import



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Analysis Services...

- One last point about SSAS... 😊

There is ADOMD.NET!



A word cloud of various business intelligence and data management terms. The words are arranged in a horizontal, slightly overlapping manner, with varying font sizes and weights. The terms include:

- MDM
- Patterns
- Methodology
- Coaching
- BI Architecture
- BI Strategy
- Reporting Services
- Data Quality
- Analysis Services
- ETL
- Data Warehouse
- OLAP
- Dimensional Modeling
- Skill Improvement
- BI Lifecycle
- Data Profiling
- Coaching
- Consulting

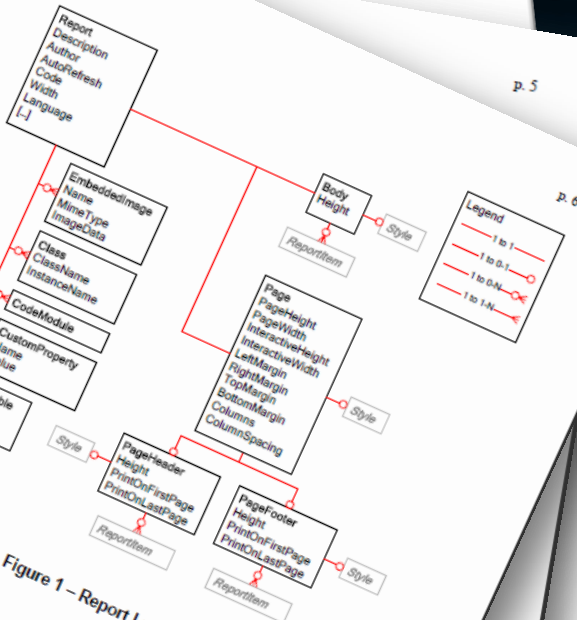
Reporting Services

- Hmm, Meta Data?
- How to get these?
- And, how to create and edit objects??
- But wait, there is a *documented way* to achieve this, of course!



MDM
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ETL
Consulting
OLAP
Dimensional Modeling

Reporting Services



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Demo SSRS

View & Create RDL Files



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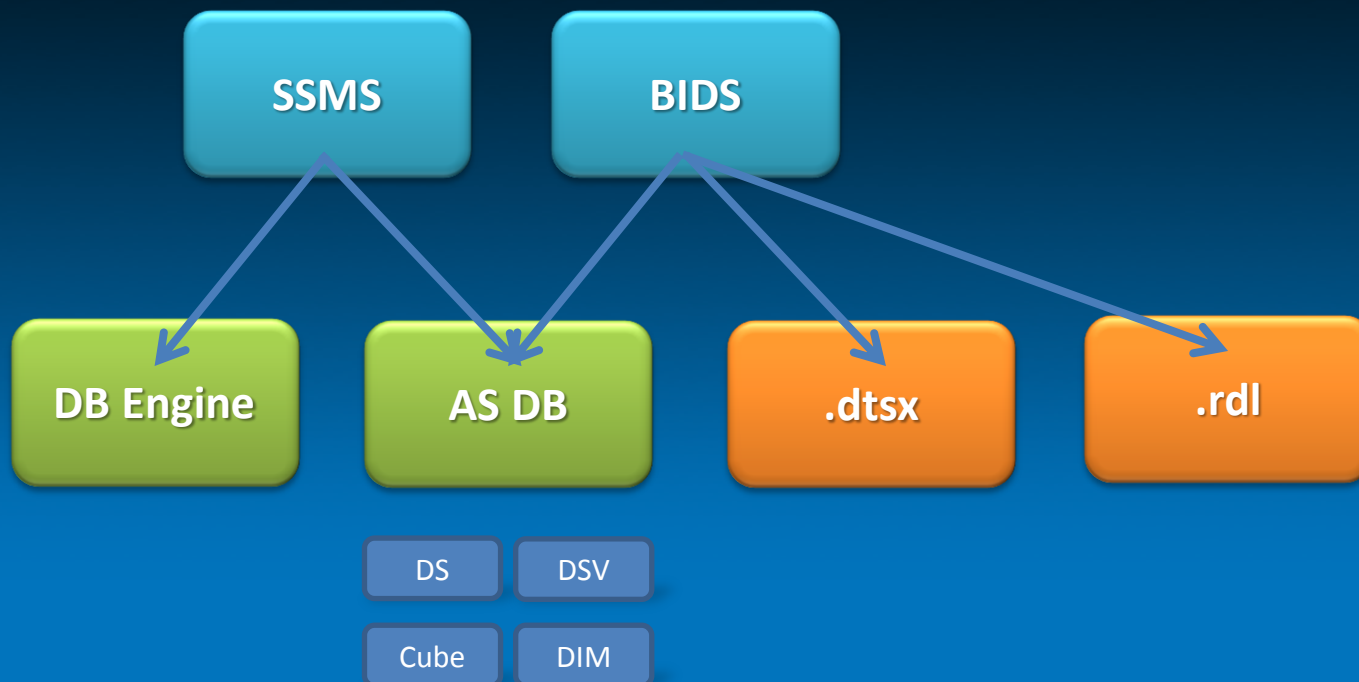
Reporting Services

- Recap:
We can view, edit and create RDL Files with simple XmlDocument commands in C#.

A word cloud of business intelligence (BI) related terms. The words are arranged in a horizontal, slightly curved layout. The most prominent words are 'ETL', 'Data Warehouse', 'OLAP', 'Reporting Services', 'BI Architecture', and 'Coaching'. Other visible words include 'Consulting', 'Analysis Services', 'Data Quality', 'BI Strategy', 'Skill Improvement', 'Data Profiling', 'BI Lifecycle', 'Dimensional Modeling', 'Methodology', 'Patterns', and 'MDM'.

Consulting ETL Data Warehouse OLAP Reporting Services BI Architecture Coaching
Analysis Services Data Quality BI Strategy Skill Improvement Data Profiling BI Lifecycle Dimensional Modeling Methodology Patterns MDM

Tools & Services Summary



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Your benefits..

- You are faster...
- You are smarter...
- Avoiding manual work...



A word cloud of various business intelligence and data management terms. The words are arranged in a horizontal, slightly curved layout, with some terms appearing larger than others. The terms include: Consulting, ETL, Data Warehouse, OLAP, Analysis Services, Data Quality, Reporting Services, Dimensional Modeling, BI Strategy, Skill Improvement, BI Lifecycle, BI Architecture, Methodology, Data Profiling, Coaching, Patterns, and MDM.

Consulting ETL Data Warehouse OLAP Analysis Services Data Quality Reporting Services Dimensional Modeling BI Strategy Skill Improvement BI Lifecycle BI Architecture Methodology Data Profiling Coaching Patterns MDM

But, there is a gap...

- There are two szenarios:
 - Starting from greenfield 😊
 - You are thrown in at the deep end! ☹



A word cloud of various terms related to Business Intelligence (BI) and data management. The terms are arranged in a horizontal, slightly curved layout. The most prominent terms are 'BI Architecture' and 'Coaching', which are the largest. Other significant terms include 'Data Warehouse', 'OLAP', 'Reporting Services', 'Data Quality', 'Analysis Services', 'ETL', 'Consulting', 'MDM', 'Patterns', 'Methodology', 'Coaching', 'Data Profiling', 'BI Lifecycle', 'Skill Improvement', 'Dimensional Modeling', 'BI Strategy', and 'Data Quality'.

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Starting with MS BI is very easy

- MS Business Intelligence Studio (BIDS)
- Third Party Tools for the MS BI Stack
 - „Wizards“
 - „Assistants“
 - „Accelerators“

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Back in real live

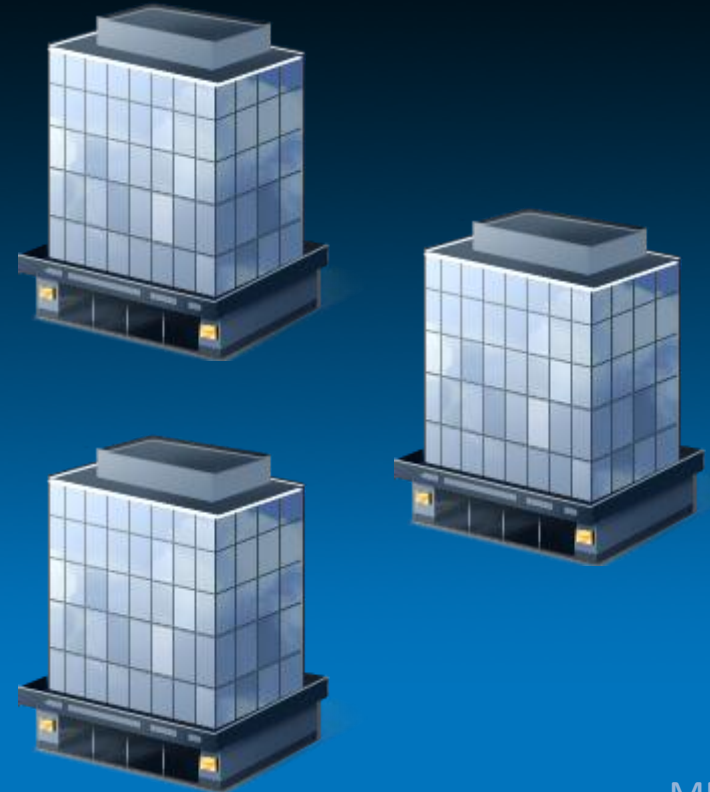
- Month or years later, our MS BI environment is still growing!
- The starting point is nevertheless our PoC or Pilot
- Perhaps we are building an Enterprise BI Environment 😊
- Now we need a way to maintaining the whole environment!



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Challenges in Enterprise Business Intelligence Environments

- many reports
- many cubes
- complex Enterprise DWH
- damn many SSIS packages & SQL Agent Jobs on different servers



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BI Lifecycle Management

- Version 1.0



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BI Lifecycle Management

- Version 1.5



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BI Lifecycle Management

- Version 2.0



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BI Lifecycle Management

- Version 2.5



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BI Lifecycle Management

- Version 2.5



Reporting for...

- Audits
- Compliance
- Security
- Impact Analysis



A word cloud of various business intelligence and data-related terms. The words are arranged in a horizontal, slightly curved layout. The most prominent words are 'BI Architecture' and 'Coaching', which are larger than the others. Other visible words include 'Reporting Services', 'Data Warehouse', 'ETL', 'OLAP', 'Data Quality', 'Analysis Services', 'Consulting', 'BI Strategy', 'Skill Improvement', 'Data Profiling', 'BI Lifecycle', 'Dimensional Modeling', 'Methodology', 'Patterns', and 'MDM'.

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Every time we works with SQL Sources (Queries)

- DWH
- Reporting Tools (third Party)
- SSIS
- SSAS
- SSRS



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Revisiting Database Engine

- Data Sources...
- SSIS
- SSAS
 - Named Tables
 - Computed Columns
- SSRS
 - Query Statements



A word cloud of various terms related to Business Intelligence (BI) and data management. The terms are arranged in a horizontal, slightly curved layout. The most prominent words are 'BI Architecture' and 'Coaching', which are larger than the others. Other visible terms include 'ETL', 'Data Warehouse', 'OLAP', 'Reporting Services', 'Data Quality', 'Analysis Services', 'Consulting', 'BI Strategy', 'Skill Improvement', 'Data Profiling', 'BI Lifecycle', 'Methodology', 'Patterns', 'MDM', 'Dimensional Modeling', and 'Data Quality'.

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Solve Data Sources SQL Queries



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Get estimated Queryplan

```
SqlConnection con = new SqlConnection(tbConStr.Text);
con.Open();
SqlCommand showplan_on = new SqlCommand("set showplan_xml on", con);
showplan_on.ExecuteNonQuery();

SqlCommand query = new SqlCommand(tbQuery.Text, con);
SqlDataReader showplan_results = query.ExecuteReader();
if (showplan_results.Read())
    tbOutput.Text = showplan_results[0].ToString();

showplan_results.Close();

SqlCommand showplan_off = new SqlCommand("set showplan_xml off", con);
showplan_off.ExecuteNonQuery();
con.Close();
```

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Get Query Plan...

Attention!

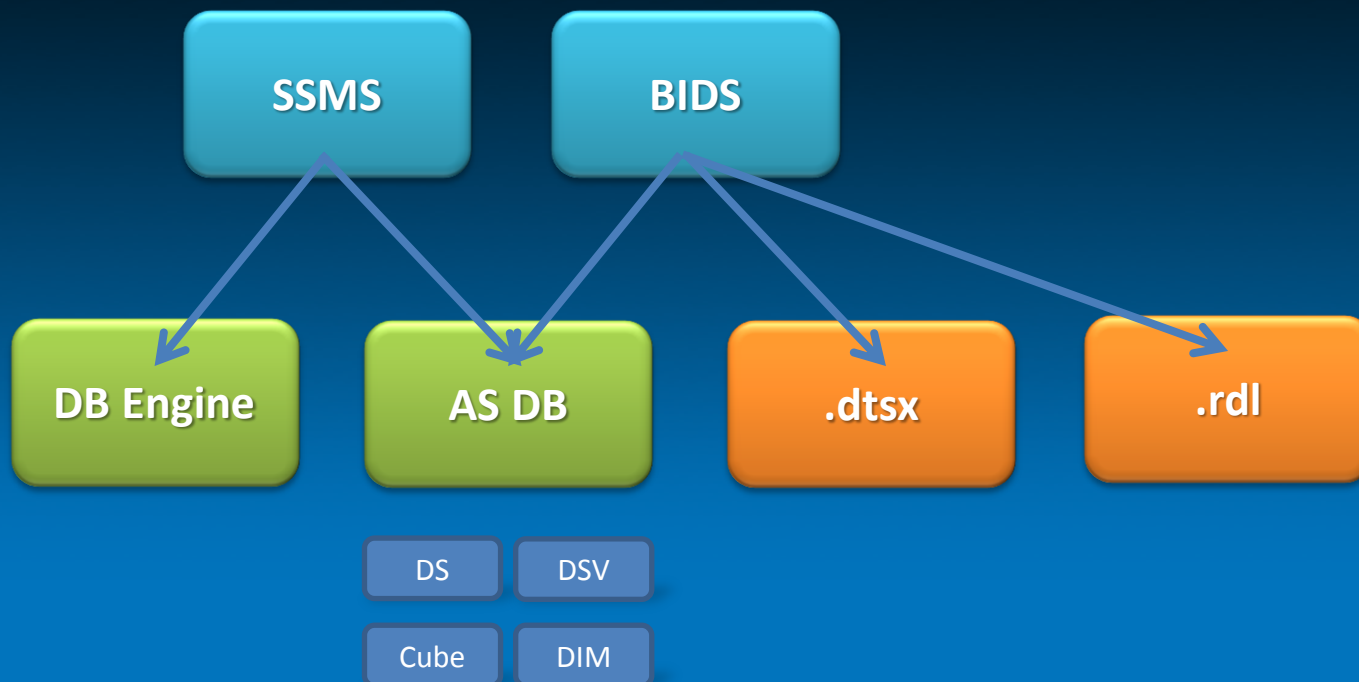
- It works not for all situations, but it is an easy and cheap way to achieve our aim!



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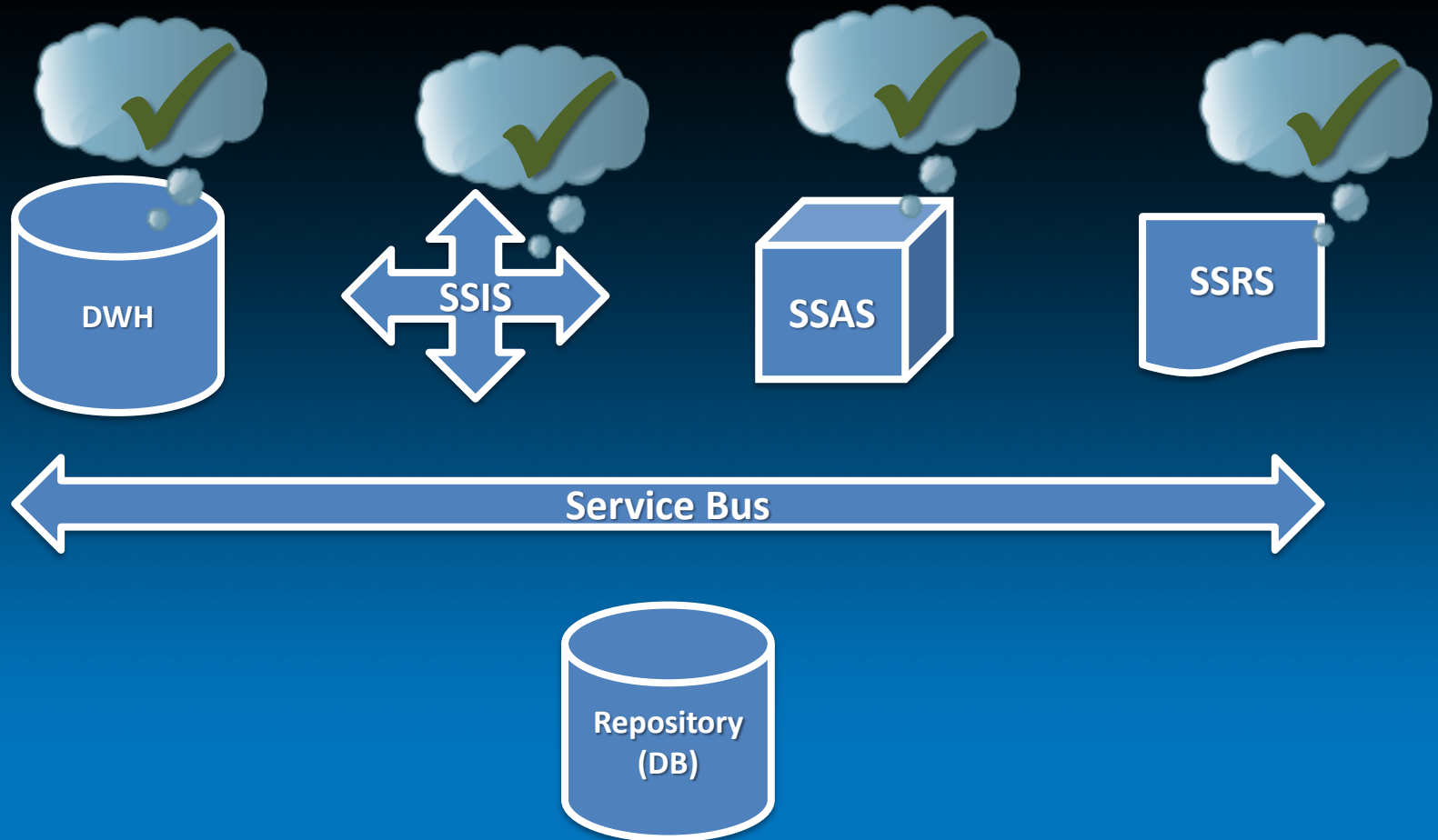
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Tools & Services Summary



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MS BI Middleware



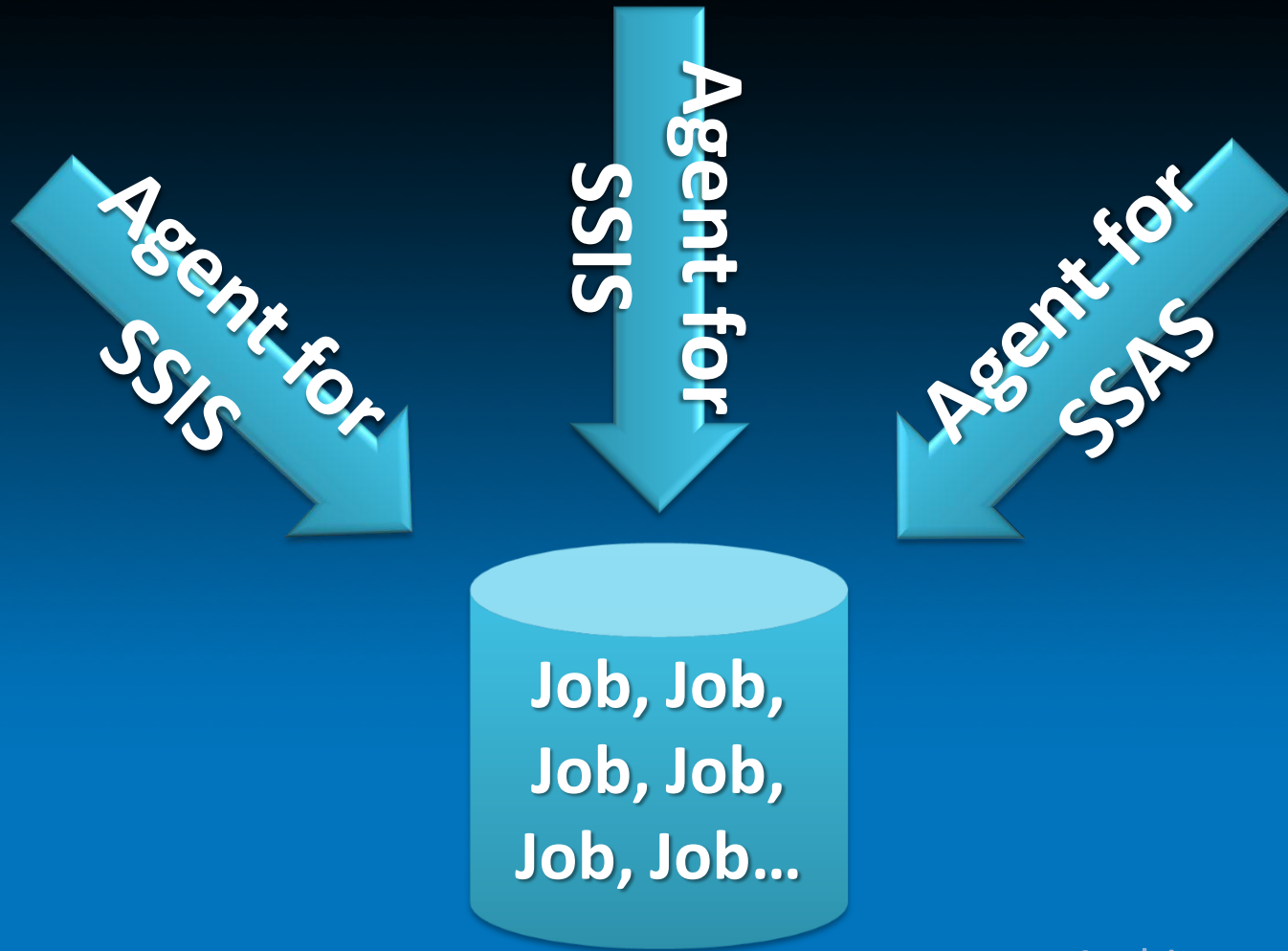
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Service Bus...



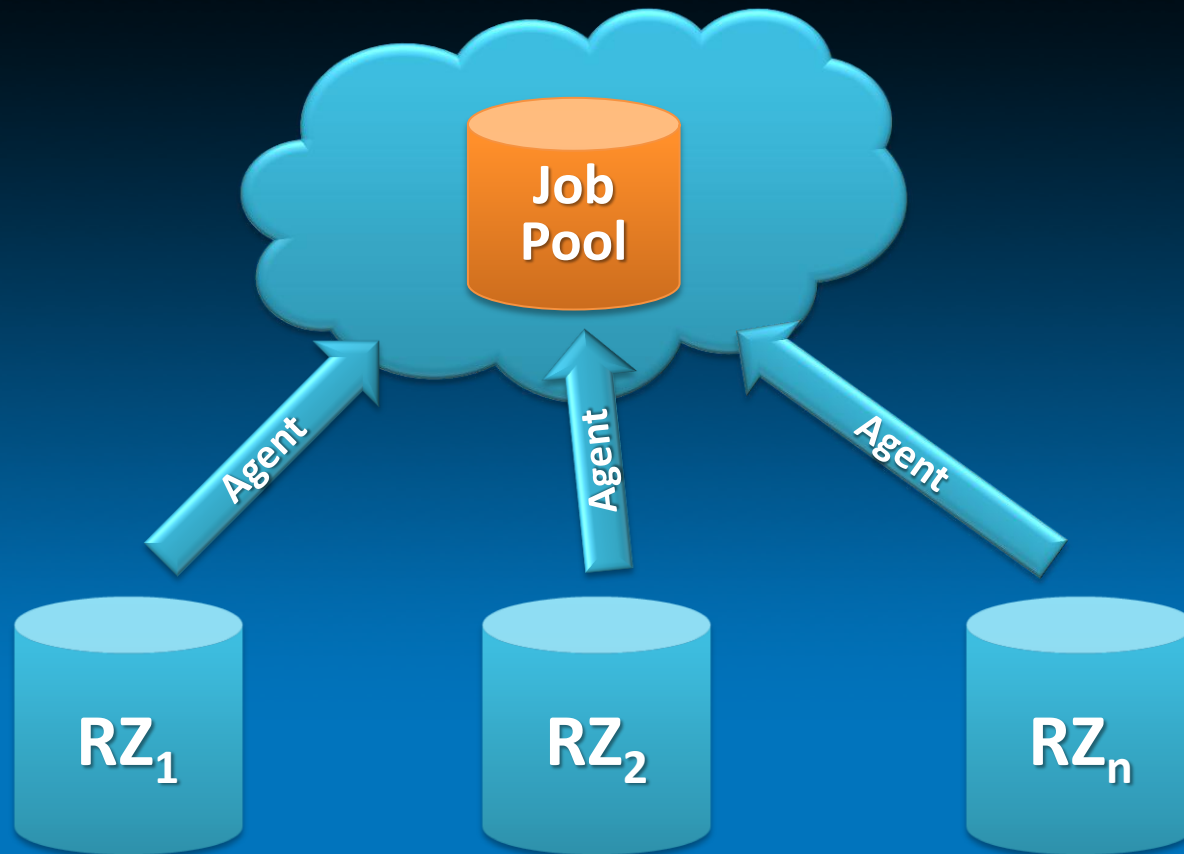
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Service Bus...



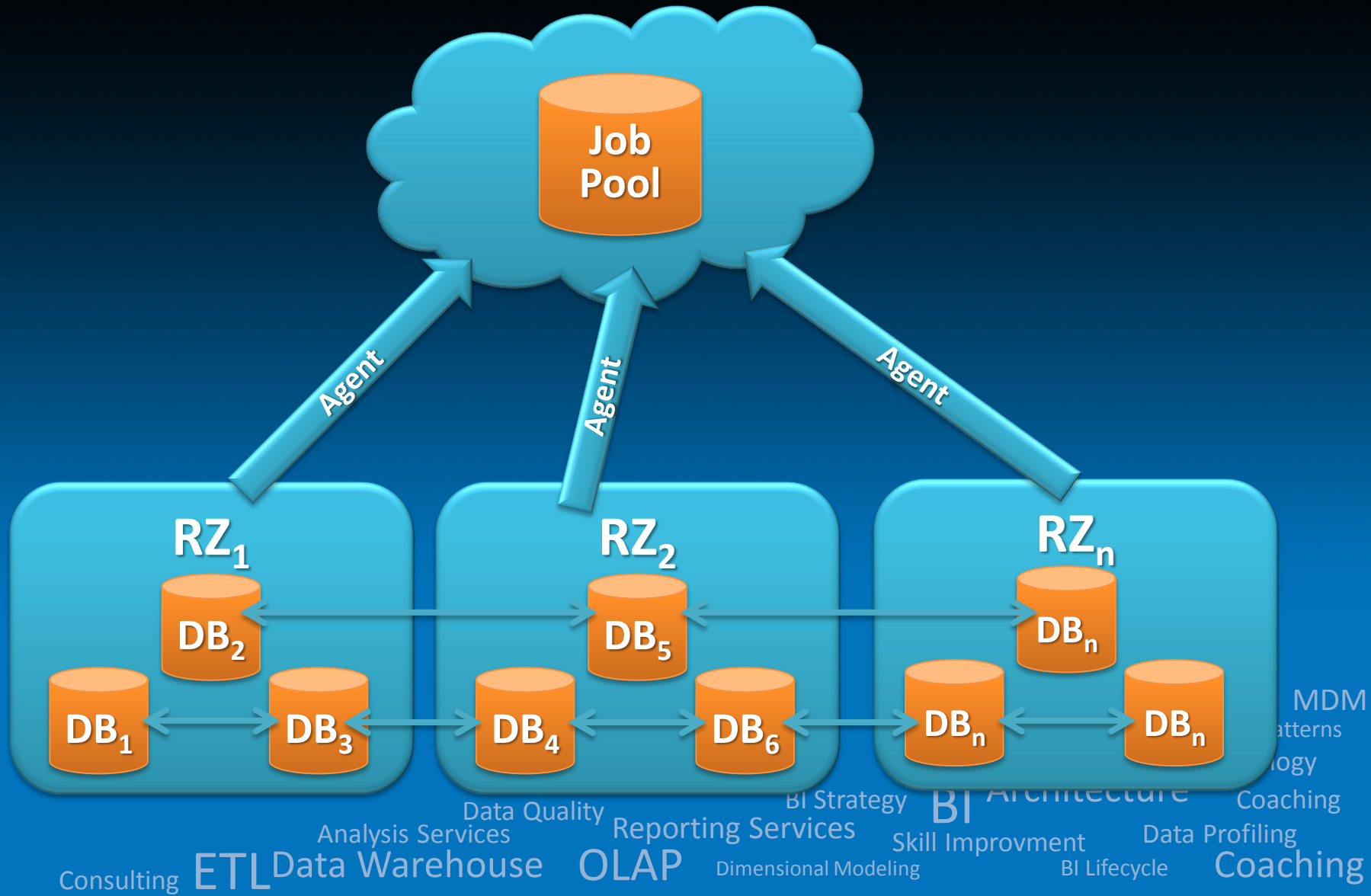
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Service Bus...

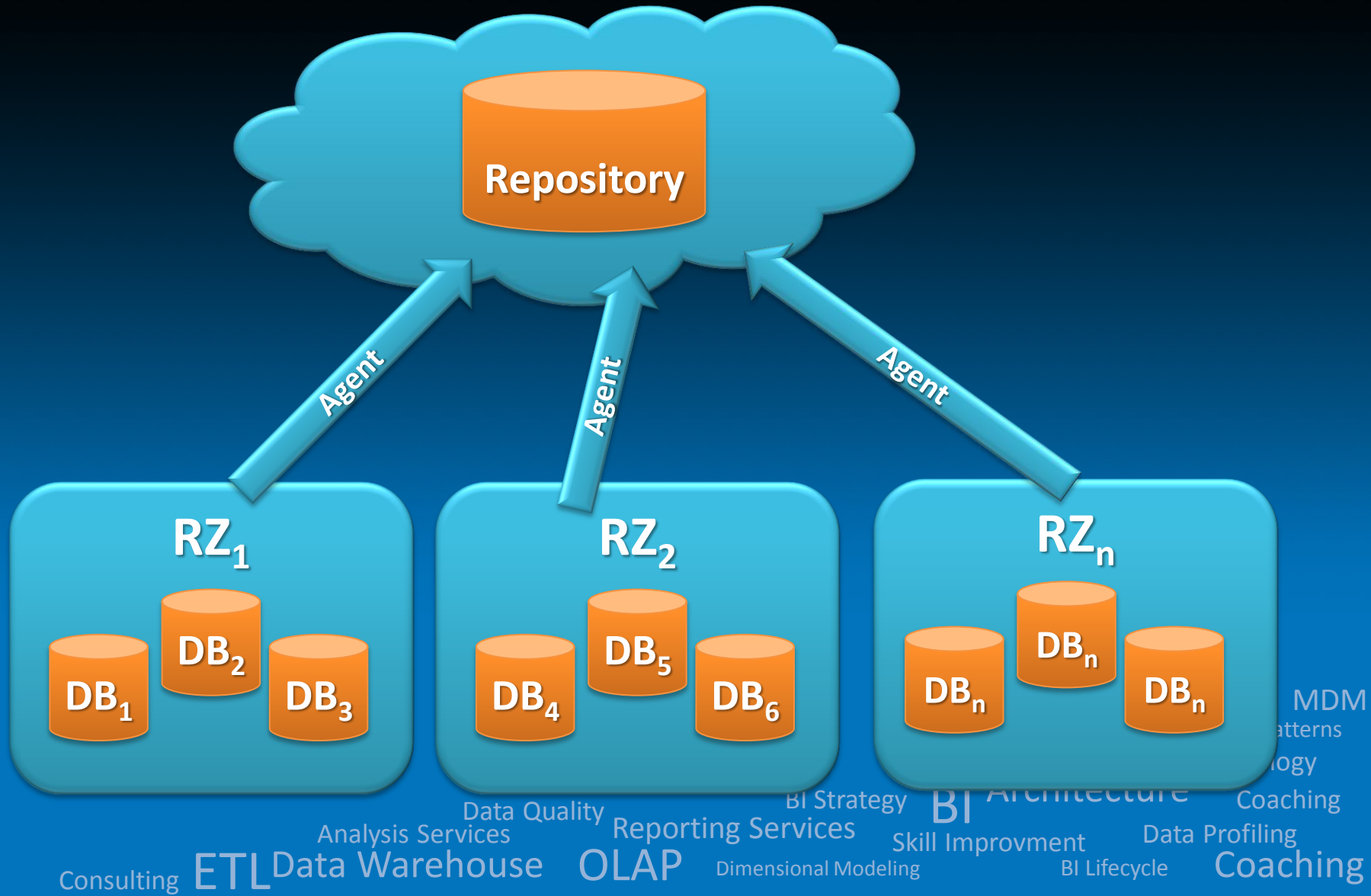


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Service Bus...

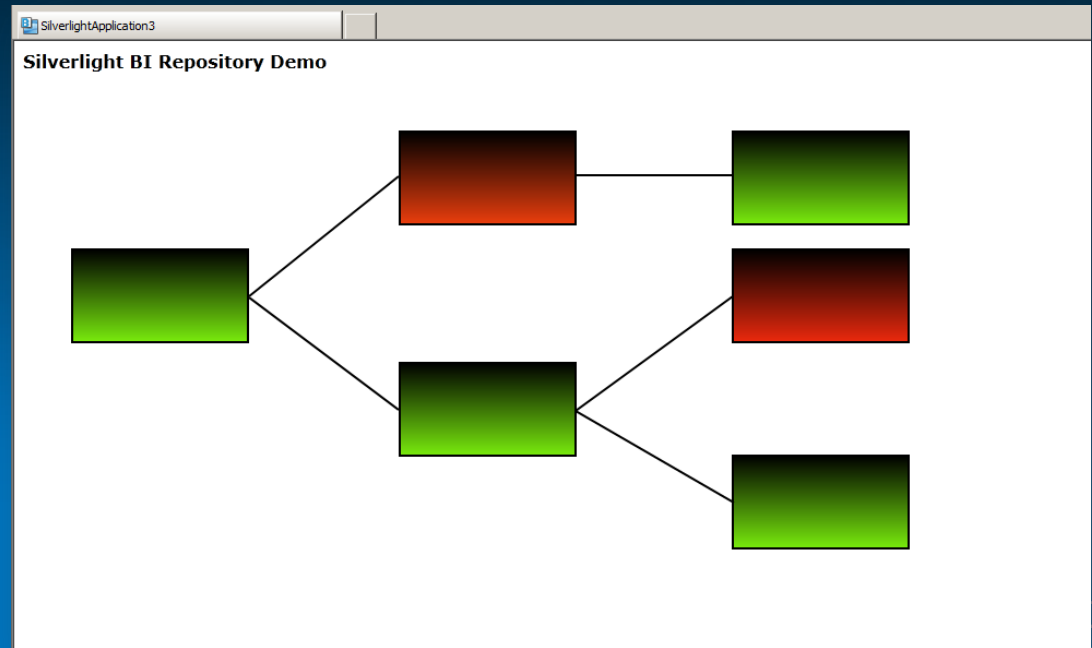


Service Bus...



User Interfaces

- WinForms...
 - Buttons, Listbox, Tree -> good for RAD!
- Command line...
- Powershell...
- Excel... ?!
- Visio !
- Silverlight...
 - **Services / WCF**



Consulting ETL Data Warehouse OLAP Analysis Services Data Quality Reporting Services BI Strategy BI Architecture Methodology Coaching Data Profiling Skill Improvement BI Lifecycle Dimensional Modeling

Recap...

- dynSSIS...
- Analysis Management Objects...
- ADOMD.NET
- Reporting Services -> RDL Files...
- SQL Query Solver
- Transport & Store Engine
- (Cloud) Job pool / Repository
- User Interface

A word cloud of BI-related terms in white text on a blue background. The terms are arranged in a horizontal, slightly curved layout. The most prominent words are 'BI Architecture' and 'Coaching', which are larger than the others. Other visible terms include 'MDM Patterns', 'Methodology', 'BI Strategy', 'Reporting Services', 'Data Quality', 'Analysis Services', 'Data Warehouse', 'ETL', 'Consulting', 'OLAP', 'Dimensional Modeling', 'Skill Improvement', 'Data Profiling', 'BI Lifecycle', and 'Coaching' (repeated).

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So long...

Any Questions?



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Consulting ETL Data Warehouse OLAP Analysis Services Data Quality Reporting Services Dimensional Modeling BI Strategy Skill Improvement BI Lifecycle BI Architecture Methodology Data Profiling Coaching Patterns MDM

The End

Thank you!

Follow me on Facebook and <http://saschalorenz.blogspot.com>

Send me a mail -> lorenz@psg.de

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Consulting ETL Data Warehouse OLAP Dimensional Modeling BI Strategy Reporting Services Skill Improvement Data Profiling BI Lifecycle Coaching Coaching Methodology Patterns MDM

Coming up...

In the exhibition area:

17:30 Prize draws

till 19:30 Group by - After event part

Games

Beer

Food

more Beer

X Boxes

Networking

more Beer

