Summary: This technical article describes how SAP customers in this new era of abundant data can benefit from the capabilities delivered by the Microsoft Business Intelligence (BI) platform. The document outlines key scenarios and interoperability solutions that are delivered in the platform and by third-parties that can drive new business insights for an organization using Microsoft BI and SAP.

Authors: Christoph Schuler, Justin Martinson, Sanjay Soni

Reviewers: AJ Mee, Arun Justus, Barry MacMahon, Chris Finlan, Herain Oberoi, Juergen Thomas, Martin Vach

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Executive Summary

The world of data is changing. We are seeing the convergence of a number of significant trends that are fundamentally transforming the industry. The first trend is data growing at exponential rates, in more types, shapes and sizes than ever before. The drivers for this data growth range from increased transactional processing in businesses to billions of users interacting on social media using connected devices to billions of signals generated by machine-to-machine interactions every day. The second trend is a change in the way users are consuming and collaborating on data. Users have new expectations on how to collaborate effectively around information and ideas. The third trend is driven by cloud economics that enable companies to do things they could not do before. The cost of storage, compute and networking continues to decline, enabling new scenarios where the perceived value of ambient data is greater than the cost of storing it, processing it and analyzing it for insights.

In this changing world, organizations are struggling to keep up with increasing amounts of data, both structured and unstructured, and the inability and cost of IT to keep up with user demands. Businesses are faced with new questions like ‘How effective is my online campaign?’, ‘How do I optimize my truck fleet based on weather patterns?’, or ‘How do I predict future results?’. Data stored in SAP systems plays a critical role in answering these types of business questions. However, these new types of questions cannot be answered without tapping into the vast amounts of data that is available. Organizations that are able to take advantage of new technologies to ask and answer these new types of questions will be able to more effectively differentiate and derive new value for the business whether it is in the form of revenue growth, cost savings or creating entirely new business models.

Microsoft envisions a world where every organization is moving towards a data-centric culture. A “data culture” develops when, with the right tools, insights can come from anyone, anywhere, at any time. In a data culture, the entire effectiveness of an organization can elevate. This is especially true when every employee can harness the power of data once only reserved for data experts or IT and take advantage of the power of self-service business insights, visualization capabilities and natural language that work inside familiar tools. Microsoft’s data platform, built across Office 365, SQL Server and Azure, is aimed at enabling this data culture.
Microsoft BI and SAP
Enabling a data culture where everyone in an organization is empowered to derive new business insights is at the core of Microsoft BI solutions.

Any data, any size, anywhere
Microsoft BI solutions provide data management and access to all data types, across structured and unstructured data sources. Structured data includes business information from SAP systems about customers, products, assets, manufacturing processes, or employees that is critical in gaining valuable business insights. When combined with other data sources, for example external data from a marketplace, or unstructured data from Hadoop, the power to derive new business insights is amplified and can uncover new opportunities for the business.

For IT organizations, this presents several challenges. Data in SAP systems is not easily or directly accessible and contained in various formats, transactional or aggregated, spread across different locations and database systems. Transactional data volumes are steadily increasing and the user demand for up-to-date business insights is growing.

Connecting with the world’s data
Microsoft BI solutions enable data enrichment by connecting to the world’s data through a global marketplace for curated data and services authored by Microsoft and 3rd parties. Using familiar tools in Excel, you can discover and combine data, enriching your organization’s data with information such as social analytics or with 3rd party data sets. Imagine a retail business that is competing on price for the products they offer. By utilizing pricing information from social channels or marketplaces about neighboring stores and competing markets, and comparing this information with profit margins and sales data from their SAP system, the retailer is able to lower prices when and where necessary and for the right products.

Immersive data experiences
With Power BI for Office 365, Microsoft is offering a complete self-service BI solution delivered through Excel and Office 365 that provides data discovery, analysis, and visualization capabilities to identify deeper business insights from data. The Power BI for Office 365 service is a cloud-based solution that enables collaboration and reduces the barriers to deploying a BI environment for sharing reports and accessing information. Customers can also realize these benefits in their on-premise environment using SQL Server, SharePoint and Excel. Included in Power BI are:

- **Power Query** - For data search and discovery. A data search engine allows customers to query data from within their business and from external data sources on the Web, all within Excel. Power Query also cleans and merges data sets from multiple sources, enabling IT and BI users to focus on data insights rather than data management.

- **Power Pivot** - For analyzing and modeling data. Power Pivot enables customers to create flexible models within Excel that can process large data sets very quickly using SQL Server’s in-memory database technology. Users can customize the model as needed all within Excel – no extra development needed.
**Power View and Power Map** - For visualizing and exploring. Using Power View, customers can manipulate data and turn it into charts, graphs, and other visual means which work great for presentations and reports. Power Map is a 3D data visualization tool for mapping, exploring and interacting with geographic and temporal data.

Data and insights exposed using these capabilities in Excel are also available in the cloud through Power BI for Office 365. Customers can share and access their BI models and reports across the desktop, Web and devices, within a trusted, managed environment.

Within their organization’s trusted environment, BI users can quickly create BI Sites in Office 365 to share worksheets with colleagues, collaborate over insights and results, and quickly find data and reports. Data in reports published to Office 365 can be refreshed from on-premised data sources through the Data Management Gateway. This ensures that the data in your workbooks is current.

With Q&A, Power BI sites provide an innovative new natural language query capability that allows users to type a question into a dialog box. The system understands the semantics of the question being asked and instantly generates an answer using charts and graphs of the correct data for the user.

To enable users to stay connected to their data wherever they are, Power BI provides a connected experience. BI users can access and receive live updates on their reports through their browser with HTML5 or through a mobile application designed for their device.
Microsoft BI Scenarios for SAP

The following pages will provide you with an overview of different scenarios that are available for customers today to bring SAP data into their Microsoft BI solutions and by doing so, create new business insights for anyone in their organization.

**Discover**

End users can directly connect to SAP to discover business data using Power Query for Excel. SAP data and metadata is made available through the semantic layer (Universe) in SAP BusinessObjects BI. SAP data can be loaded directly into a worksheet or a Power Pivot model. From there, the end user can combine, analyze, visualize and share business data using Power BI.

**Analyze**

End users can directly connect to SAP to analyze data, using Power Pivot or PivotTables in Excel. SAP data and metadata is made available through connectors from third-parties and SAP. With Power Pivot, SAP data can be loaded directly into a data model and users can combine, analyze, visualize and share business data and insights using Power BI. Further, a user can analyze SAP data using PivotTables or PivotCharts.

**Integrate**

In a data warehouse scenario corporate IT can use SQL Server Integration Services (SSIS) to extract, transform and load data into a SQL Server database. SAP data and metadata is accessible through Microsoft and third-party connectors. With SAP data stored in a data warehouse, the full stack of Microsoft BI tools for IT and end users becomes available to further enrich, combine, analyze, visualize and share the data.

**Report**

In the more traditional scenario of operational reporting, corporate IT can use SQL Server Reporting Services (SSRS) to directly connect to data in SAP. SAP data and metadata is accessible through Microsoft and third-party connectors. Reports can be refreshed and shared with other users through the built-in SharePoint integration.

Each of the scenarios and connectivity solutions that are described will map to the Discover, Analyze, Integrate, and Report categories from above. As you evaluate the different solutions, consider important factors such as the location and type of your SAP data. Is your SAP data only available in the transactional ERP system? Or is it available in the form of BW cubes or BusinessObjects BI Universes? Also consider the required release and support level for each of the scenarios listed, both for the Microsoft BI tools as well as your SAP environment.
Power Query Connectivity to SAP BusinessObjects BI Universes

Using Power Query, the Excel user can discover and analyze SAP data by connecting directly to SAP BusinessObjects BI Universes. This connectivity provides metadata and data from dimensional, sometimes called common, semantic layer Universes which have a UNX file extension. This solution was jointly developed by Microsoft and SAP.

Key advantages:

- Excel users have seamless and direct access to SAP data exposed via SAP BusinessObjects BI Universes
- Excel is a familiar front-end tool, no need to learn complex new tool set or skills
- Semantic layer of SAP BusinessObjects BI Universes hides the complexity of the underlying SAP data source
- Customers can leverage existing investments in Microsoft and SAP BI technologies
- SAP data can be loaded into Excel table or Power Pivot data model

SAP BusinessObjects BI Universe in Power Query Navigator
Requirements:
- Excel 2010 Professional Plus with Software Assurance or Excel 2013 Professional Plus, Office 365 ProPlus, or Excel 2013 Standalone
- Power Query for Excel
- SAP BusinessObjects BI 4.1 SP2 or higher

Further details and download:
- Power BI Connectivity to SAP BusinessObjects BI Tutorial: [http://go.microsoft.com/fwlink/?LinkId=399114](http://go.microsoft.com/fwlink/?LinkId=399114)
SAP NetWeaver Gateway

SAP NetWeaver Gateway is a newer technology from SAP, originally designed to facilitate access to SAP data for people-centric mobile and web applications. SAP NetWeaver Gateway is based on open standards and uses the OData protocol to enable access to business data. OData can be easily consumed by various client applications, including Excel with Power Query and Power Pivot in BI scenarios.

SAP NetWeaver Gateway provides access to these SAP data sources:

- SAP ERP: BAPIs/remote function modules, ABAP objects, WebDynpro
- SAP BW: BW query

**Key advantages:**
- Enables standard OData access to SAP business data
- Supports other use cases, e.g. R/W integration with SharePoint, Office, mobile apps
- Works with SAP ERP, SAP CRM, ... SAP BW, SAP HANA

**Requirements:**
- SAP NetWeaver Gateway
- Excel 2010 or Excel 2013

**Further details and download:**
- SAP NetWeaver Gateway Demo System: [http://scn.sap.com/docs/D0C-31221](http://scn.sap.com/docs/D0C-31221)
Theobald Software - Xtract PPV
In this solution, Power Pivot uses Xtract PPV as a data source which can extract data from an SAP system. Xtract PPV has a server component, which extracts data from SAP ERP or SAP BW and provides it as an OData feed to Power Pivot. Xtract PPV has a designer tool which is used to define the data extracts.

![Diagram of data flow from SAP to Power Pivot via Xtract PPV]

Theobald products are licensed separately. Xtract PPV provides access to these SAP data sources:
- SAP ERP: tables, queries, BAPIs/remote function modules, ABAP reports, DeltaQ
- SAP BW: cubes and queries, hierarchies, Open Hub Service, DeltaQ

Key advantages:
- Direct access to virtually any SAP data object. Not limited to SAP BW.
- SSO enabled via SNC (Secure Network Communication)
- SAP data exposed as ATOM data feed, making it suitable for other applications

Requirements:
- SAP ERP: release 4.0B and above, 4.6A and above for DeltaQ extraction
- SAP BW: release 3.1 and above, 3.5 and above for Open Hub Services extraction

![Xtract PPV Designer with supported SAP sources]

Further details and download:
SAP ODBO Connector for SAP BW (on HANA or non-HANA platform)

In this solution, you can connect an Excel PivotTable directly to an SAP BW system via the SAP ODBO Provider. The Excel user can select from available cubes and queries in SAP BW and work with SAP data in PivotTable reports or PivotCharts. The OLE DB provider requires username/password authentication.

For SAP HANA based systems, an ODBC driver is available which can be used to connect Excel to the SAP HANA database, and using SQL statements query the data. The recommended approach by SAP is to use the ODBO (MDX) connector, because it takes advantage of the metadata in the HANA repository. In comparison, the ODBC driver will connect directly at the database level and surface database objects.

The ODBO Provider enables access to these SAP data sources:
- SAP BW: cubes and queries

Key advantages:
- Enables direct consumption of SAP BW cubes and queries in Excel

Requirements:
- Excel 2007, Excel 2010 or Excel 2013
- OLEDB for OLAP Provider, available from SAP Marketplace

Further details and download:
- SAP OLE DB for OLAP:
  http://help.sap.com/saphelp_nw73/helpdata/en/47/a8762109272a1de10000000a42189b/content.htm
- Connecting SAP HANA with Excel:
Microsoft Connector for SAP BI

The Microsoft Connector for SAP BI enables you to extract data from, or load data into, an SAP BW system. The connector is intended for use with SSIS and includes three main components: SAP BI Data Source, SAP BI Destination and SAP BI Connection Manager. Data extraction via Open Hub Services (OHS) requires a separate SAP license. OHS provides three options to unload data: (1) directly to an external system (SSIS), (2) into tables in SAP BW and (3) into flat files. Some customers prefer to use option (2) with a subsequent table extract to optimize for performance. The Data Provider requires username/password authentication.

The Microsoft Connector for SAP BI provides access to these SAP data sources:
- SAP BW: cubes (info providers)

Key advantages:
- SAP certified integration scenario
- Supports delta extraction and packaging; well suited for large amounts of data
- Supports parallel extraction

Requirements:
- SAP BW: release 7.0 SPS 17 or above; Open Hub Services license and configuration
- Works with SQL Server Integration Services

Further details and download:
- The Connector is available as part of the SQL Server Feature Pack
Data Provider for SAP (part of Microsoft BizTalk Adapter Pack)
With the Data Provider for SAP you can read data from an SAP table/view or a remote-enabled function module/BAPI. Supported SAP table types include transparent, pool and cluster tables.

The Data Provider requires a custom function module to be installed on the SAP system. With the function module, SAP data is extracted from tables or views, type converted and returned to the SSIS package. The function module has built-in functionality to optimize for large data extractions and return the data in multiple packages. The Data Provider requires username/password authentication.

The Data Provider for SAP enables access to these SAP data sources:
- SAP ERP: tables, BAPIs/remote function modules
- SAP BW: tables, BAPIs/remote function modules

Key advantages:
- Well-suited for table extraction
- Good performance for larger data sets
- Supports parallel extraction
- Standardized ADO.NET interface for use with other client apps

Requirements:
- Custom function module (shipped with Data Provider) installed on SAP system
- Microsoft Adapter Framework
- Works with SQL Server Integration Services

Further details and download:
Theobald Software - Xtract IS

The Theobald Xtract IS product suite enables SQL Server Integration Services to extract data from virtually any SAP data object in an SAP business system (ERP, CRM, SCM, etc...) or SAP BW system.

Theobald products are licensed separately. The Xtract IS suite offers nine components for these SAP data sources:
- SAP ERP: table, query, BAPI/remote function module, ABAP report, DeltaQ
- SAP BW: cube/query, hierarchy, Open Hub Services, BW loader, DeltaQ

**Key advantages:**
- Access to virtually any SAP data object
- SSO enabled via SNC (Secure Network Communication)
- Easy to install and use. Search/browse for data objects in SAP by description

Theobald XtractIS in SQL Server Integration Services

**Requirements:**
- SAP ERP: release 4.0B and above, 4.6A and above for DeltaQ extraction
- SAP BW: release 3.1 and above, 3.5 and above for Open Hub Services extraction
- Works with SQL Server Integration Services

**Further details and download:**
ODBC Provider for SAP HANA
SAP HANA has a supported ODBC interface which provides database access for third-party tools. Using SQL Server Integration Services, data can be extracted from an SAP HANA database, transformed and loaded into a SQL Server Data Warehouse.

The ODBC Provider for SAP HANA provides access to these SAP data sources:
- SAP ERP on SAP HANA: tables
- SAP BW on SAP HANA: tables

Key advantages:
- Works with any SAP system on top of SAP HANA (ERP, BW, CRM...)

Requirements:
- SAP HANA ODBC driver
- Works with SQL Server Integration Services

Further details and download:
Simplement Data Liberator™
As an alternative to the ETL methods described previously, the Simplement Data Liberator™ builds upon the same replication technology used for hot standby purposes. Using this technology, data can be replicated continuously from the underlying database of the SAP system into a SQL Server database.

Simplement products are licensed separately. Simplement Data Liberator provides access to these SAP data sources:
- SAP ERP: database tables

Key advantages:
- Once initialized, data streams continuously in real-time
- Well suited for large volumes of reporting data
- Security context and hierarchies are replicated with data

Requirements:
- Configuration of database replication

Further details and download:
- Simplement Data Liberator: [http://www.simplement.us/dataliberator.shtml](http://www.simplement.us/dataliberator.shtml)
.NET Data Provider and Query Designer for SAP NetWeaver BI
For operational reporting scenarios, SQL Server Reporting Services provides built-in connectivity to an SAP BW system. Report design and execution is supported with a .NET data provider and query designer that connects directly to the XML/A interface of an SAP BW system. SSO is supported via SAP logon tickets.

The .NET Data Provider for SAP NetWeaver BI provides access to these SAP data sources:
- SAP BW: cubes and queries

**Key advantages:**
- Enables direct reporting against SAP BW
- Delivered with SQL Server Reporting Services (no separate install)
- SSO is supported via SAP logon tickets (requires ticket issuing system)

**Requirements:**
- Works with SQL Server Reporting Services
- SAP BW 3.5 SP20, or SAP BW 7.0 SP10. For SAP BW releases 7.3 and 7.4 there is a known connection issue that is under review.

Further details and download:
Theobald Software - Xtract RS

Theobald Xtract RS enables SQL Server Reporting Services (SSRS) to access data from virtually any SAP data object in an SAP business system or SAP BW system.

Theobald products are licensed separately. Xtract RS provides read access to these SAP data sources:
- SAP ERP: table, query, BAPI/remote function module, ABAP report
- SAP BW: cube/query

Key advantages:
- Direct reporting access to virtually any SAP data object. Not limited to SAP BW.
- SSO enabled via SNC (Secure Network Communication)
- Easy to install and use. Tight integration into SSRS design tools. User can search/browse for data objects in SAP by description

Requirements:
- SAP ERP: release 4.0B and above
- SAP BW: release 3.1 and above
- Works with SQL Server Reporting Services

Further details and download:
Conclusion
In this new era of abundant data, Microsoft is uniquely positioned to offer organizations the tools and platform they need to harness the power of data and make it easy for all users to achieve new business insights. Through the tools outlined in this paper, individuals and organizations are able to tap into the value of business data in an SAP system, and use familiar tools to combine, enrich and share insights that was previously not possible.

For more information
- Microsoft BI: http://www.microsoft.com/bi
- Microsoft Power BI: http://powerbi.com
- SQL Server: http://www.microsoft.com/sqlserver

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