# Creating Custom Reports with Report Design Tools

This learning module describes how to create custom reports against K2 SmartObjects with tools like K2 Workspace Report Designer, SQL Server Reporting Services (SSRS) and Excel PowerPivot. It also describes how to expose and consume SSRS reports as K2 SmartObjects.

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## Conventions

The following table documents the conventions used throughout this module:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bold Text With Border</strong></td>
<td>Represents commands, controls, items, menus, options, parameters, and file and folder paths. For example, in an instruction to click on the <strong>OK</strong> button; look for a control on the page with OK as its name. When you see text represented like this, you should see a control, window or field on the user interface with the same name.</td>
</tr>
<tr>
<td><strong>Fixed-pitch font</strong></td>
<td>Represents text (or code) that must be entered exactly as shown. When you see text represented in this style, you should be typing this text into a textbox, control, window or other UI component.</td>
</tr>
</tbody>
</table>

**Italic text in Square Brackets** | Represents variables or values to be selected from the K2 Context browser |

| **Fixed-pitch italic font** | Represents additional instructions, explanations or a description of expected behavior in Demonstrations and Lab Exercises |
| <ALL CAPITALS> | Represents a key to be pressed on the keyboard. For example, <CTRL> represents the Control key on the keyboard. |

![Icon] | Represents a best practice. Best practices are the recommended approach or guidance for specific scenarios. When you see the Best Practice icon, consider how this practice impacts your requirements or how you can implement this practice in your environment. |

![Icon] | Represents important information. Important information is highlighted in order to draw attention to a key piece of information, and typically serves as a warning or point you should bear in mind when using the K2 platform in your K2 solutions. |

![Icon] | Represents a note. Notes explain a topic or provide additional information, and can provide a summary or explanatory point about a topic. |

![Icon] | Explains a concept, or provides an explanation for a step in an exercise |

![Icon] | Represents a hint, tip or available tools and resources that can help you during the design and development cycles of a K2 solution. |

![Code] | Denotes technical information. This information is not vital in terms of meeting the goals of the learning module, but may be of interest to technical users. |

![Code] | Represents trivia. The text included next to this icon is for interest only – think of it as a quick break from learning about K2. |

![Code] | Estimated time to complete a task, step or exercise |
Module Overview

This learning module describes how custom reports can be created and consumed in K2 blackpearl. We will describe how power users can use the K2 Workspace Report Designer and Microsoft Excel PowerPivot to build reusable reports against K2 SmartObjects, and how report developers can create custom reports using report design and hosting tools like Business Intelligence Studio and SQL server reporting services (SSRS). We will also describe how to expose existing SSRS reports as K2 SmartObjects and how to consume these SmartObjects in a workflow.

Target Audience

This module is intended for power-users who have experience building reports. It is also suitable for technical roles like .NET developers, programmers. This module is not suitable for non-technical roles or participants that do not have any report design experience.

Note that this module has several optional topics and lab exercises which may be skipped if the technologies being discussed do not apply to the course participants.

Outcomes

At the end of this module, participants will have a good understanding of the available tools and technologies that are used to design custom reports in K2 and how K2 SmartObjects are used as a data source when creating custom reports with various report design tools. Participants should also understand how to expose SSRS reports as SmartObjects and then use these SmartObjects in a K2 workflow.

Complexity

<table>
<thead>
<tr>
<th>This Module</th>
<th>Level</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td></td>
<td>Introduction to the topic or overview and assumes little or no expertise with the topic being covered. Typically level 100 modules cover concepts, functions, features and benefits.</td>
</tr>
<tr>
<td>200</td>
<td></td>
<td>Covers intermediate learning materials, assumes 100-level knowledge, and provides specific details about the topic and a complete understanding of the features. 200-level training may discuss case studies that cover a breadth of common scenarios or explain how to use more advanced features.</td>
</tr>
<tr>
<td>300</td>
<td></td>
<td>Covers advanced learning materials and assumes 200-level knowledge, and an in-depth understanding of product features in a real-world environment. 300-level training provides a detailed technical subset of product technologies that illustrate specific aspects of the product that are key to improving performance or interoperability and include architecture, performance, migration, development and deployment.</td>
</tr>
<tr>
<td>400</td>
<td></td>
<td>Expert learning materials and assumes a deep level of technical knowledge and experience, as well as a detailed, thorough understanding of the topic. 400-level courses are essentially expert-to-expert sessions and the 400-level training content provides the means for customers to push products to maximum performance, achieve the broadest possible interoperability and create applications using the most advanced features.</td>
</tr>
</tbody>
</table>

Prerequisites and Required Knowledge

This module requires that the participant has completed the following learning modules (or already has equivalent functional knowledge of K2)

- 100.SYD K2 SmartObjects - Fundamentals

Although not required, we recommend completing the 100.BRU K2 Workspace Reporting learning module before starting this learning module.

This learning module also refers to (or uses) other technologies for optional topics. Because the purpose of this module is not to instruct you on these other technologies, you should be familiar with the technologies, systems or approaches listed below (to the required level of proficiency) to successfully complete this learning module.

<table>
<thead>
<tr>
<th>Skill or Technology</th>
<th>Proficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQL Server Reporting Services and Business Intelligence Studio</td>
<td>(Optional topic of this learning module)</td>
</tr>
<tr>
<td></td>
<td>• Designing SSRS reports with Business Intelligence Studio</td>
</tr>
<tr>
<td></td>
<td>• Publishing and running reports in SSRS</td>
</tr>
<tr>
<td>Microsoft Excel PowerPivot</td>
<td>(Optional topic of this learning module)</td>
</tr>
<tr>
<td></td>
<td>• Consuming REST services in Microsoft PowerPivot</td>
</tr>
</tbody>
</table>
Compatibility
This learning module is compatible with the following K2 products and versions

<table>
<thead>
<tr>
<th>Product</th>
<th>Version</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2 blackpearl</td>
<td>4.6.x or later</td>
<td></td>
</tr>
</tbody>
</table>

Virtual Environment Prerequisites
This learning module has prerequisites which need to be configured to support the lab exercises. Follow the instructions below to set up the prerequisites for this learning module.

⚠️ This script should be executed in the Virtual Server environment which accompanies this learning module.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instructions</th>
</tr>
</thead>
</table>
| Step 1: Install the prerequisites for this training module in the Virtual Server environment | **Tasks:**
  1. Log on to the virtual environment with the following credentials:
     Username: Denallix\Administrator
     Password: K2pass!
  2. Copy the file **K2 Learning-300.UKY.exe** provided with this learning module to any location in the Virtual Server environment. You may download the .exe file from the **K2 Learning Module Installers (Download)** shortcut on the VPC desktop, or directly from the following URL:
     ftp://K2LearningInstallers:$k2learning!@ftp.k2.com/K2 Learning-300.UKY.exe
     Ask your instructor for help, if needed.
  3. Double-click the file **K2 Learning-300.UKY.exe** to start the extract process. You should extract the files to C:\K2 Learning (this value should be set correctly by default)
  4. After the extract process has completed, double-click the file **C:\K2 Learning\300.UKY\Setup\SetupPreRequisites.bat** to install and deploy the prerequisites for this training module. The installation process may take up to 5 minutes to complete
  5. Once you see the success message **Completed setting up prerequisites for learning module...** close the command window.
SmartObjects: Review

By now you should have a good understanding of K2 SmartObjects, including how SmartObjects are used to expose various back-end systems as logical business entities and how to use SmartObjects in K2 workflows and user interfaces. Custom reporting in K2 is largely dependent on SmartObjects, so take a moment to review the diagram in the slide for this topic.

Note that Reports and Workflows can act both as providers and consumers of SmartObjects. You can expose SSRS reports or workflow reporting data as SmartObjects and then use those SmartObjects in workflows, User Interfaces or other reports. A typical use case is to create a form-letter SSRS report, expose that report as a SmartObject and then use this SmartObject in a workflow to add the report output as a .pdf attachment to an email. You will learn how to do this in the third exercise of this learning module.

You can create custom reports that use SmartObjects from any provider, including business data and workflow reporting data. This approach is commonly used to combine business data and workflow data into a custom report. You will learn how to create such reports with various design tools in the lab exercises 1 and 2 for this module.

You can also consume SmartObjects on third-party reporting tools, for example Microsoft Excel PowerPivot and Visio Services. In the final exercise for this module, you will create a PowerPivot report in Microsoft Excel that uses reporting data exposed as a SmartObject.
K2 comes with a selection of pre-built reports that expose workflow reporting data. (These reports are described in detail in the K2 Learning modules 100.BRU K2 Workspace – Reporting and 200.CPH Process Portals and Web Parts). There are 5 standard reports that can present various aspects of workflow data graphically or as an overview report, and are typically used for Business Intelligence or Business Activity Monitoring of K2 workflows.

K2 automatically captures workflow metrics and audit data when workflows execute, so this data is also available to you if you want to create custom reports.

The limitations of the standard workflow reports is that they do not include business data, modifying the report layout is limited to a predefined configuration options, and users cannot export the raw data that was used to generate the report directly. To address these limitations, K2 provides a built-in custom report design tool in K2 Workspace, as well the capability to design custom reports with certain third-party report design tools. Before we start looking into these, let's review the available workflow reporting SmartObjects, since they are very relevant when you want to use workflow reporting data in a custom report.
**Generic Workflow Reporting SmartObjects**

- **Workflow General**
  - Exposes same data used for the standard K2 workflow reports
  - Use these to create customized and generic reports for workflow(s)
  - Workflow reporting permissions are still applied

- **Workflow Solutions**
  - Workflow-specific SmartObjects
  - Enable Workflow Reporting SmartObjects and select the activities/events to expose
  - When workflow is published new SmartObjects are published as well
  - Use these to create workflow-specific reports
  - **Note:** can impact deployment time, so not recommended unless required

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**Generic Reporting SmartObjects**

All the data that is used to generate the standard K2 workflow reports is also available through SmartObjects that are installed with K2 by default. You can find these SmartObjects in the Category [Workflow Reports] > [Workflow General] as shown on the screenshot below.

The data available through these SmartObjects is used by K2's standard reports, which means that report designers can create custom reports against the same data by querying the appropriate SmartObject. Note that the standard workflow Reporting SmartObjects are generic: they can be applied to any process definition (some will require a process or activity name as an input parameter). In addition, the SmartObjects will respect any workflow-level
security and users will not be able to use these SmartObjects to report on workflows that they do not have at least "View" or "View Participate" permissions to.

Specific Reporting SmartObjects
In addition to the standard workflow reporting SmartObjects, you can also generate specific workflow reporting SmartObjects for a particular workflow definition by setting the **Create Workflow Reporting SmartObjects** option in the process properties window. You will then select the workflow items that K2 should generate SmartObjects for. Generally, these SmartObjects are used if you want to expose a specific workflow as a SmartObject rather than using the generic reporting SmartObjects.

The screenshot below shows where to configure the option to generate the reporting SmartObjects:

![Generating Reporting SmartObjects for a specific workflow](image-url)
Once the Workflow Reporting SmartObjects have been published to a K2 server, you can create custom reports that consume the appropriate SmartObject methods, but remember that the SmartObjects will only return data for the specific workflow definition.
Custom Reports in K2

- SmartObjects are the data source
- Can combine data from different systems in one report
  - e.g. combine workflow reporting data with business data
  - e.g. combine data from disparate systems in one report
- Custom Reporting Technologies
  - K2 Workspace Report Designer
  - Third-party designers
    - e.g. Visual Studio 2010 Report Projects, Report Designer 3.0
  - ADO.NET/REST/WCF consumers
    - e.g. Excel PowerPivot, Visio Services, SharePoint BCS
  - UI tools
    - e.g. SmartForms, InfoPath, ASP.NET

When you want to create custom reports in K2, remember that SmartObjects is the primary data source for consuming both Workflow Reporting and Business Data in a report design tool. Because SmartObjects are consistent, it doesn’t matter where the underlying data comes from: as far as the report is concerned, all the data appears to come from the same provider. This makes it possible to combine data from many different systems into a single report. As long as there is some common identifier that allows you to join the different SmartObjects, you can create a custom report for that data.

Three approaches are commonly used to design custom reports in K2. (In this learning module we will look at the first three approaches)

1) The K2 Workspace Report designer
2) Third-party report design tools like Visual Studio 2010 Business Intelligence projects and Microsoft Report Designer 3.0
3) Applications that can consume ADO.NET, REST or WCF services, for example Excel's PowerPivot add-on, Visio services and SharePoint's Business Connectivity Services
4) Any User Interface technology capable of consuming SmartObjects, for example InfoPath, ASP.NET or K2 smartforms

Once created, these custom reports are usually accessed in one of the following ways:

1) You can re-run saved custom report definitions in K2 workspace
2) Administrators can import existing SSRS reports into K2 workspace (this option requires install-time configuration on the K2 server)
3) Reports designed in a SSRS design tool can be exported to a SSRS-enabled SharePoint server or a SSRS server and then run just like any other report
4) You can publish some applications such as Excel PowerPivot reports to a SharePoint environment
5) You can expose published SSRS reports as K2 SmartObjects and then use them anywhere (for example, exporting a SSRS report to a pdf file and attaching it to an email as part of an automated workflow step)
The K2 Workspace Report Designer

The K2 Workspace Report Designer allows users with appropriate permissions to design custom Tabular, Matrix or Summary reports using a web-based design environment. (It is not possible to create graphical reports in this design tool).

The screenshot below shows the Report Designer environment with some annotations describing some functions of the design environment.
Administrators can restrict who may design and run reports in this environment by setting up security in K2 workspace, as shown below:

**Setting security for the Report Designer**

When creating a new report, designers can select data from any SmartObjects published on the K2 environment. If SmartObject Associations have been defined, K2 will automatically allow the user to combine data from additional SmartObjects based on the associated property. As part of the report design you can optionally summarize, group and filter data, and apply styling to the report. When the report is saved, it will be saved in a specified folder in the Category System, and other users will then be able to re-run the report at any time in the future.
The K2 workspace report designer is also sometimes used to create a simple table of reporting data, which can then be exported to a third-party program like Microsoft Excel for further processing. When running the report, users may export the report results to another format like an Excel spreadsheet or pdf file.

An additional feature is the ability to import a report that was previously deployed to a SSRS server. (This option is only available if the K2 installation was associated with a SSRS server when K2 was installed.) This makes it possible for end users to run SSRS reports from the same reporting environment as they would use for running reports designed with the K2 report design tool. You can also export existing report definitions from K2 into an .rdl file for further design and development in a SSRS design tool like Visual Studio.
Configuring SSRS integration at installation time

SQL Reporting Services Configuration

Enable Reporting Services Integration

Web Service URL: http://DLX-80/ReportServer - Test
LAB 1: Creating a custom report in the K2 Workspace Report Designer

In this lab exercise you will use the custom report design tool in K2 Workspace to create a custom report that lists the current tasks for each user in the organization.

Objective
The objective of this lab exercise is to learn how to use the custom Report Designer tool provided in K2 Workspace to create custom reports.

Duration
This lab exercise should take around 20 minutes to complete.

Context
In this lab exercise you will create a simple custom report which lists the current tasks for users in the organization. Think of this as a "detailed current task list" report for each user in the organization so that we can see who has what tasks that they need to complete. The report should look something like this:

<table>
<thead>
<tr>
<th>Process Name</th>
<th>Follower</th>
<th>Activity Name</th>
<th>Task Start Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denallix leave request approval</td>
<td></td>
<td>Update Employee leave balance tracker</td>
<td>9/11/2012 11:45 PM</td>
</tr>
<tr>
<td>K2: DENALLIXBRANDON</td>
<td>Brandon</td>
<td>Leave request for Rob Joy - 9/12/2012 12:00 PM</td>
<td>9/12/2012 12:00 PM</td>
</tr>
<tr>
<td>Denallix leave request approval</td>
<td></td>
<td>Update Employee leave balance tracker</td>
<td>9/12/2012 12:00 PM</td>
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<td>Denallix leave request approval</td>
<td></td>
<td>Update Employee leave balance tracker</td>
<td>9/11/2012 11:45 PM</td>
</tr>
</tbody>
</table>
Business Intelligence Studio/Report Designer (SSRS)

- Use the SOURCECODE ADO.NET provider as a data source
- Visual Studio 2008/2010: register the SOURCECODE provider in VS configuration files
- Report Designer 3.0: reference an existing SOURCECODE data source from SSRS environment
- Publish SSRS Reports to SSRS/SharePoint
- Render SSRS reports in custom UIs using Report Viewer controls

- Hint: Use SmartObject Tester to write and test ADO Queries
- Note: Report design tools and report servers may require additional configuration and may not be supported by K2

Note: This is an optional topic and is only required if participants will be using SSRS to create custom reports

One of the available APIs that developers may use to interact with SmartObjects at runtime is the SmartObject ADO.NET provider. Because this provider conforms to ADO.NET standards, it is possible to use it as a data source for other design tools, such as Business Intelligence Studio in Visual Studio 2010 or Microsoft Report Designer 3.0. With these advanced report design tools you can create very powerful and rich reports.

Using the SOURCECODE ADO.NET provider to design a custom report in Visual Studio

Typically, reports designed in these design tools are exported to a SSRS server or SSRS-enabled SharePoint environment, allowing end users to run the reports any time they wish. You may also render SSRS in custom user interfaces using standard Microsoft references like the report viewer control.
Note: Before you can use the ADO.NET provider in the report design tool of your choice, it may need to be registered. For Report Designer 3.0, for example, you will need to publish the ADO.NET provider as a data source to a SSRS server and then retrieve the data source from the SSRS server in Report Designer 3.0. For a Business Intelligence project in Microsoft Visual Studio, you will need to register the ADO.NET provider in Visual Studio first and potentially also on the report execution server.

Registering the ADO.NET provider in the various report design tools is beyond the scope of this learning module. Please refer to the Additional Resources section of this module for more on installing the ADO.NET provider.

Note that K2 does not support all possible report design tools, so check with K2 support services to determine if your report design tool is supported.

The easiest way to write and test ADO queries against SmartObjects is to use the SmartObject Service Tester utility (located by default in C:\Program Files (x86)\K2 blackpearl\Bin\SmartObject Service Tester.exe) and use the ADO Query tool to write and test your query. The ADO syntax has familiar, SQL-like syntax and you can even join and filter data directly in the query like you would in a typical SQL statement. Check the K2 Developer Reference documentation at Developer Reference > ADO.NET Provider > ADO.NET Overview for more information about the ADO query syntax.

Using the SmartObject Service Tester utility to write and test ADO queries against SmartObjects
LAB 2: Creating a custom BI report in Visual Studio

Objective
The objective of this exercise is to learn how to use the Business Intelligence project type in Visual Studio to create a custom SSRS report that uses SmartObjects as the data source.

Note: This is an optional lab and is only recommended if participants will be using SSRS to create custom reports and are already familiar with creating Visual Studio BI reports.

This lab exercise assumes that you are familiar with Visual Studio and creating Business Intelligence Projects with Visual Studio. If you are not, please team up with a participant who is, or alternatively the instructor should complete the lab as a demonstration.

Duration
This lab exercise should take around 20 minutes to complete.

Context
In this lab exercise we will create a custom K2 report to display the current K2 tasks workload for each user as a graphical report. We will use one of the standard workflow reporting SmartObject (Activity Instance Destination) and summarize the task counts for each task, per user. (As part of the prerequisites installation for this module, we started several instances of sample workflows to create "dummy" tasks for users, just to have some data for this report). At the end of the lab exercise we will publish the report to SSRS so that it can be used in the next lab exercise.

Ultimately, we want a report which uses pie charts so that we can get an overall understanding of the number of tasks for each task type assigned to each user. The report layout should look something like this:
Due to time constraints we will not spend too much time styling the report or improving the report layout. The purpose here is just to illustrate how to create a custom report. You will be able to recreate this same report in your own K2 environment and change the style and layout as you wish.
Exposing SSRS reports as K2 SmartObjects

Note: This is an optional topic and is only required if participants will be using SSRS in their organizations

One of the standard SmartObject service brokers provided with K2 blackpearl is a broker that can expose reports published to an SSRS server as SmartObjects. This broker allows you to consume the output of SSRS reports just like any other SmartObject File property in your K2 solutions. The most obvious example would be to create a form letter or predefined document, populate the report with data and then attach the report as a .pdf file to an email sent as part of a K2 workflow.

The first step to achieve this is to register a service broker for the SSRS server where the report is published. The broker will discover all the available reports and create Service Objects for them. See the screenshot below for an example:

Once the new service instance is registered, you can create SmartObjects for any of the reports in the SSRS server using the SmartObject design tool of your choice. (In the screenshot below, we have used K2 Studio). Note that the SmartObject will have one property (Report File) which represents the output of the SmartObject’s methods. The methods will output the report format in a specific file format. As you can see in the example below, various Export methods are available, each returning a different type of file. Note that any input parameters for the report are...
mapped to input parameters for the service object method: you can hard-code the input parameters or you may accept the report parameter when the report is generated at runtime.

Creating a new SmartObject for one of the reports on the SSRS server

Once the SmartObject is published to the K2 server you can use the SmartObject tester utility to test the SmartObject just like any other SmartObject. In the example below, we are testing the new SmartObject by executing the Export to Image method. The report’s parameter is a required input property, and the report’s output is returned to us as a TIFF file:
Once you have verified that your SmartObject is working, you can consume the SmartObject just like any other SmartObject. In the example below, we are using the email event wizard and attaching the result of the Export to PDF method to the email. Note that you need to drag and drop the Report File property into the Attachments property, as shown in the screenshot:

Using the output of a SSRS SmartObject as an attachment in the email event wizard

![SmartObject Tester Utility Screenshot]

![Email Event Wizard Screenshot]
LAB 3: Exposing and consuming a SSRS report as a SmartObject

Objective
The objective of this lab exercise is to learn how to expose a SSRS report as a SmartObject and then consume that SmartObject in a workflow.

Note: This is an optional lab and is only required if participants will be using SSRS in their organization

Duration
This lab exercise should take around 20 minutes to complete.

Context
For the purposes of this exercise we will create a SmartObject for the SSRS report that we published in the previous exercise. We will then extend an existing skeleton K2 workflow to attach the output of this report to an e-mail event.

Note: if you did not deploy the SSRS report in the previous exercise, you may open the solution for the lab 2 exercise from the following location and then deploy the report project:

C:\K2 Learning\300.UKY\LAB 2\_Solution\K2Learning_300UKY\K2Learning_300UKY.sln

Eventually, we want to implement a scenario where a K2 workflow will use a SmartObjects which exposes a SSRS report to attach a pdf file to an email event.
LAB 3: Exposing and consuming a SSRS report as a SmartObject

Email sent to originator with attached PDF file

SSRS report exposed as a SmartObject
Consuming K2 SmartObjects in other third-party reporting applications

- **Excel PowerPivot/PowerView**
  - SmartObject REST services can be a data source in Excel PowerPivot
  - Can join data from multiple SmartObjects and "slice/dice" as required
  - Save workbook locally or publish it to SharePoint

- **Visio Services**
  - Consume SmartObjects exposed as SharePoint lists or through a custom data source
  - Publish Visio diagram to SharePoint

- **SharePoint**
  - Use Business Connectivity Services in SharePoint 2010 to expose SmartObjects as SharePoint lists

- **Other technologies**
  - SSIS, ADO.NET consumers, REST consumers

Note: This is an optional topic and is only required if participants will be using other third-party tools to create custom reports.

There are many ways to create custom reports, and it is possible to use K2 SmartObjects as the data source in some of these custom report design technologies. We will briefly discuss a selection of custom reporting approaches, but this is by no means a definitive list.

K2 also exposes SmartObjects as WCF and REST services, and the data can be provided in common formats like XML, JSON or ATOM feeds. So, even if your report design tool does not support ADO.NET, you can still access reporting data through one of these alternative interfaces.

**Excel PowerPivot**

PowerPivot is an add-on component for Microsoft Excel. With this add-on, you can import data from various data sources and create rich, graphical reports with slice-and-dice capabilities. You can save and share the Excel workbook just like any normal Excel file, or publish the file to SharePoint so that other users can access it in a browser.

To consume SmartObjects from power pivot, you need only point the PowerPivot data source to one of the SmartObject REST endpoints. You will learn how to do this in the next lab exercise.

Configuring and using the SmartObject REST services is discussed in more detail in the learning module 300.YOK K2 SmartObject APIs and Services (Runtime) and in the K2 product documentation at [Developer Reference > Services Reference > K2 SmartObject Services > K2 SmartObject Services Introduction](#).
An example of an Excel PowerPivot report that uses SmartObject data

Visio Services
Microsoft Visio 2010 has new data visualization features, and you can consume K2 SmartObjects in these visualization tools. A custom data provider for Visio is available from K2 underground (http://www.k2underground.com/groups/k2_process_visualizer/default.aspx). With this provider you can consume both workflow and non-workflow SmartObjects in a Microsoft Visio diagram. As with Excel, you can publish these Visio diagrams to SharePoint where users will be able to access them using nothing more than a web browser.
Examples of Visio Services diagrams that use SmartObjects as the data source

SharePoint BCS
Business Connectivity Services (BCS) in SharePoint 2010 allows you to expose external data as a standard SharePoint list. (Business Data Catalog is a roughly equivalent feature in SharePoint 2007). Using SharePoint designer, you can use any of the available SmartObject WCF service endpoints as data sources for BCS, and then create SharePoint Lists based on these SmartObjects. You can even allow users to edit and capture data in the external system using SharePoint's native form-generation capability.

Due to time constraints we will not do a lab exercise for this approach, but you may refer to the Additional Resources section of this learning module for a video example and links to the K2 product documentation that describe this approach in more detail.

Other Technologies
In theory, any technology capable of consuming ADO.NET, WCF services or REST services should be able to use K2 SmartObjects as a data source. K2 does not necessarily support all possible consumers or provide tooling to consume SmartObjects in these technologies, but the gregarious nature of these interfaces means that it should be possible to consume K2 SmartObjects in many other technologies.
LAB 4: Using Excel PowerPivot to create custom reports

Objective
The objective of this lab exercise is to learn how to use the SmartObject REST services and Microsoft Excel PowerPivot to create custom reports against K2 SmartObject data. This is an optional lab and is only required if participants will be using Excel and PowerPivot to create custom reports.

Duration
This lab exercise should take around 20 minutes to complete.

Context
In this exercise you will use the **Activity Instance Destination** SmartObject to create an interactive report that lists employees' current K2 workload. It's very similar to the report you may have created in LAB 2, except that we will use Microsoft Excel and PowerPivot instead of a SSRS report.

There are two parts to this exercise: in Part 1 you will import data into a PowerPivot table. Part 2 is optional, and here you will create a graphical report based on the data that you imported in Part 1. Ultimately, we want to be able to use a PowerPivot report to view workloads for users based on dynamic selections made by the user.
LAB 4: Using Excel PowerPivot to create custom reports

PowerPivot report with interactive filtering

Filter data based on selections
Let’s review the main topics covered in this learning module:

- Workflow Reporting SmartObjects
  - Generic reporting SmartObjects
  - Workflow-specific reporting SmartObjects
- K2 Custom Reporting options
  - K2 Workspace Report Designer
  - Third-party designers like Visual Studio 2010 and Report Designer
  - Third-party reporting tools like Excel PowerPivot and Visio Services
  - UI design tools (e.g. smartforms, InfoPath, ASP.NET)
- Custom reporting interfaces
  - SmartObjects
  - ADO.NET
  - REST/WCF Services
- Exposing and consuming SSRS reports as K2 SmartObjects

Can you identify any reporting requirements in your organization where the K2 Workspace Report Designer would be useful? Can you envision combining K2 workflow data with business data in a custom report? If your organization uses SSRS, do you understand how to use K2 SmartObjects as the data source for an SSRS report? Can you identify use cases to expose a SSRS report as a SmartObject and then use that SmartObject in a K2 solution? If you will be using technologies like Excel and PowerPivot, do you understand how to reference SmartObjects from these tools?

This is your opportunity for asking questions to clarify any of the topics covered during this module. If you are unclear about a topic, please ask the instructor to explain or elaborate.
## Additional Resources

There are many custom reporting approaches and the technologies used by your organization may prescribe or restrict which can be used. As such we can’t cover every approach, but the following table lists additional resources that supplement the information provided in this module and may be useful to you:

<table>
<thead>
<tr>
<th>Resource</th>
<th>Location and Notes</th>
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*Describes how to register the SOURCECODE ADO.NET provider in Visual Studio 2008 so that it can be used in Business Intelligence Projects*


*More information on the Microsoft PowerPivot product*


*More information on Visio Services in Microsoft SharePoint*

| K2 SmartObjects Services and BCS                                      | http://www.youtube.com/watch?v=IP5F2kv-P0

*This video demonstrates how to expose K2 SmartObjects as a SharePoint list*

  **Product Documentation:**

  - Concepts > Integration > SharePoint > K2 for SharePoint 2010 > BCS > External List and Column Data in K2
  - Concepts > Integration > SharePoint > K2 for SharePoint 2010 > BCS > SmartObject Data in External Lists

*The product documentation contains additional information on exposing SmartObjects through BCS*


*This plug-in for Visio 2010 allows you to create rich visual reports against K2 workflow reporting data and other SmartObject data.*


*Document that describes the SmartObject WCF and REST services in detail*


*download the PowerPivot add-in for Microsoft Excel*

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**Sumitomo Corp**, a Conglomerate originally started in Kyoto, Japan is one of the oldest continuously operating companies in the world, being founded in 1630 CE. Masatomo Sumitomo opened a medicine and book shop in Kyoto in the early 17th Century, and as time went on various members of the family added to the conglomerate.

Current research suggests that the oldest continuously operating company in the world is **Kongo Gumi**, a 40th generation construction firm in Japan which was founded in 578 CE. Prince Shotoku brought Kongo family members to Japan from Korea more than 1,400 years ago to build the Buddhist Shitennoji Temple, which still stands today.