MicroStrategy Academic Program

Creating a center of excellence for enterprise analytics and mobility.

ENTERPRISE APPLICATIONS

APPROXIMATE TIME NEEDED: 6 HOURS
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This course helps you develop an understanding of the MicroStrategy Analytics Enterprise platform and its architectural components. You will also learn about the tools used for reporting and project designing in MicroStrategy.

You will gain knowledge about MicroStrategy user interfaces such as MicroStrategy Web and Developer, and how you can use them to conduct business data analysis. Learn about dataset objects, such as attributes and metrics, that are needed to create data visualizations and reports in Web. Learn how and where these dataset objects are stored and how you can interact with them. Take a step deeper to understand how those objects are created within a project, and how your raw data can be turned into dataset objects that you can report on.

You will work primarily in MicroStrategy Web and Developer in this course.

At the end of this lesson, you will:

• Have a deeper understanding of the MicroStrategy Analytics Platform architecture
• Understand how to add objects to reports and documents
• Learn how MicroStrategy works with your data sources
• Gain insight into how the objects you report on are created and stored in a project
• Learn the basics of a project life cycle and how it relates to reporting in MicroStrategy

MicroStrategy Analytics Enterprise platform

The MicroStrategy Analytics Enterprise platform empowers organizations to analyze vast amounts of data, offer tangible solutions to business queries, build data visualizations, and enable users to share their insights anywhere and anytime.

The MicroStrategy Analytics Enterprise platform architecture includes all the required components to support an organization’s analytics needs, from self-service reporting through creating enterprise applications for a complete analytical workflow. These components include metadata repositories, and servers required to assemble metadata objects and provide core analytical processing power for any type of analytics application. The components also include the clients through which users request and receive reports and dashboards provided as output, from business analysts to developers and administrators. Finally, there are tools to define and manage the analytics infrastructure.

The MicroStrategy Analytics Enterprise platform can be broken down into four sections:
• Clients
Interact with your business data: User interfaces

MicroStrategy provides a variety of dynamic tools that allow you to analyze your data in effective ways. Below is a brief description of each product.

Desktop

With Desktop, users can import data themselves, clean the data, and create visually appealing dashboards to meet their business needs. All of this can be done in a matter of minutes, without any support from your IT department. See your decisions in real time as the dashboard changes instantly as you move, add, or delete data. Insert trend lines or reference lines to make identifying trends easier. Desktop can be used as a standalone product, and is the only MicroStrategy software that does not require the full enterprise platform.
Web

Create reports, documents, interactive documents, and Visual Insight dashboards in MicroStrategy Web. Visual Insight dashboards have much of the same capabilities as Desktop dashboards, but have the advantage of starting out connected to the enterprise platform, making sharing and distributing dashboards quick and easy.

Reports

A report is a MicroStrategy object that represents a request for a specific set of formatted data from your data source. In its most basic form a report is displayed as a grid. A report consists of two parts:

- A report template, which is the underlying structure of the report
- The report-related objects placed on the template such as attributes and metrics.

A report is the simplest method to view your business data. Add attributes and metrics to the report to return meaningful data. Add other objects such as prompts and filters to narrow the focus of your data exploration.

- Attributes provide business context to the report, in this example Customer is an attribute.

- Metrics are your business measurements, often these are key performance indicators. In this example Gross Revenue, Revenue, Profit, Cost, and Units Sold are all metrics.

- Prompts are questions the user must answer before the report is run. The answer to the prompt determines that data that is visible in the report.

- Filters narrow the data in the report. Filters are created by the dataset objects on the report.

<table>
<thead>
<tr>
<th>Customer</th>
<th>Gross Revenue</th>
<th>Revenue</th>
<th>Profit</th>
<th>Cost</th>
<th>Units Sold</th>
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<td>$2,002</td>
<td>$234</td>
<td>$1,049</td>
<td>97</td>
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<tr>
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<tr>
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<td>$1,015</td>
<td>$1,015</td>
<td>$185</td>
<td>$930</td>
<td>31</td>
</tr>
</tbody>
</table>
Documents

A document is used to format data from multiple reports (used as datasets) in a presentation quality display. Grid and graph reports can be viewed at the same time, along with images and text. Documents can be used to gain an understanding of key performance indicators and business measurements, and with their pixel-perfect formatting options, are an excellent choice for executive presentations. Using document sections and groupings, you can easily organize your data and view subtotals. A document may be multiple pages long, but can be printed and saved as a PDF.

Interactive documents

Sometimes referred to as dashboard-style documents, interactive documents are commonly a single page and are intended to be viewed online. Interactive features allow users to change how they view the data. Each user can interact with the document in a different way to reach many business conclusions from
the same data. Buttons, drop-down menus, and selectors can be added to interactive documents to provide a variety of ways for users to interact with and manipulate the data. A variety of visualizations can be added to interactive documents to create an aesthetically pleasing analysis.

![Transportation Data](image)

**Mobile**

Deploy your documents, reports, and dashboards to your mobile device with MicroStrategy Mobile. Mobile apps are made up of documents created in Web, which are combined into an app and then deployed to mobile devices via MicroStrategy Mobile. Interact with your business data on the go, both on and offline. Design your documents and dashboards with mobile usage in mind by adding interactive visualizations called widgets. These widgets enhance the usability of the app, and allow users to interact with their data even further.

Create mobile apps by linking documents and dashboards together. Add navigation buttons to seamlessly move through different sections of the app. Create custom configurations and deploy the app to as many or as few users as
you choose. Access your apps on your mobile device from the MicroStrategy Mobile app.

**Developer**

Use Developer to manager your business data and reporting environments. Often used by Architects and Administrators, Developer contains all of the information you need for your business. Reporting environments are organized into projects, that contain all of the objects and data needed for data analysis. Developer is used to create database connections, user groups, managing projects and deploying applications to your organization. Many Administrator tools are located in Developer, providing a technically robust, key piece of the MicroStrategy Enterprise platform.
SDK

A Software Development Kit or SDK is a collection of programming tools, utilities, documentation, and libraries of functions that allow users to customize, extend, and integrate MicroStrategy products within other applications. There are a variety of available MicroStrategy SDKs such as: Web SDK, Mobile SDK, Visualization SDK, Web Services SDK, Intelligence Server SDK, and Office SDK.
Below is an image of a visualization that has been customized using SDK. Code is used to create the custom visualizations.

Usher

Usher is a digital identity platform designed to provide security for business processes and system access across an enterprise. Usher uses mobile security badges that cannot be lost, stolen, or counterfeited. Mobile security badges can unlock workstations, provide physical access in buildings, and use peer-to-peer ID validation.
Grid reports: Basic data analysis

We’ve learned a little about what the MicroStrategy Enterprise covers, now we’ll learn how this relates to data analysis. It’s clear that MicroStrategy encompasses a wide range of services and enterprise assets, but how does that apply to you? What can you create with MicroStrategy software? Where does the data come from? How can you turn raw data into something that you can present in a boardroom? We are going to cover all of this throughout this course.

To start, we are going to learn about the most basic method for analyzing data by creating a grid report. To create a report, we must have data. We will go into much more detail about how to get your data onto a report later on, but for right now, we’re going to use data that comes out-of-the-box with MicroStrategy Web. We will be logging into the sample MicroStrategy Tutorial project to learn the basics of MicroStrategy capabilities.

The building blocks of a report are attributes and metrics.

**Attributes:** These objects provide context for your calculations. Region, Country, Year, and Month, are all examples of attributes.

**Metrics:** Metrics are business calculations such as Revenue, Profit, or Cost.

You can combine an attribute (Year) with a metric (Revenue) and you place them both on a grid report. The data value displayed will be the total revenue for that year. So Year, the attribute, provides context for the Revenue values. Without the attribute the Revenue value is meaningless. A little confused, don't worry! Up next is an exercise to help all of this make sense. Follow along with the instructor to create a basic grid report in MicroStrategy Web, using the built in data from MicroStrategy Tutorial.

**Exercise 1.1: Create a grid report in MicroStrategy Web**

1. **Access the MicroStrategy Cloud environment**

2. **Log in to MicroStrategy Cloud**

In the Welcome to MicroStrategy Cloud email, click **Access MicroStrategy Platform**.
2 In the Login MicroStrategy web page, scroll down, and click **Credentials**.

The system displays the option to log in using Standard authentication.

3 In the User name and Password boxes, type (or copy and paste) the login credentials provided in the Welcome to MicroStrategy Cloud email.

Alternatively, you can access MicroStrategy with this information:

<table>
<thead>
<tr>
<th>USER NAME</th>
<th>PASSWORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>mstr</td>
<td>KEd47PRxaeMz</td>
</tr>
</tbody>
</table>
4 Click **Login**. The MicroStrategy Cloud landing page displays in the Chrome browser window of your cloud environment.

**Open MicroStrategy Web**

5 On the landing page, click **MicroStrategy Web**.
You will arrive at the MicroStrategy Tutorial Home page.

6 Click **Go to MicroStrategy Web** to open the Shared Reports folder of the MicroStrategy Tutorial project.

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**Create a report**

1 On the Tutorial home page, click **Create** then select **New Report**.
2 On the next window, select **Blank Report**. You are now viewing the Report Editor.

The All Objects panel shows all of the objects that are available in the MicroStrategy Tutorial project. The objects in this panel are determined when the project is created. We will learn about project objects throughout this lesson.

3 We are going to locate our attributes and metrics from the All Objects panel. Click **Attributes**. You will now see a series of folders that contain all the different attributes.

4 Click the **Geography** folder. Double-click the **Region** attribute to add it to the grid. Notice that attributes have a green diamond icon.

5 To go back one level, click the up arrow next to Geography in the menu at the top of the All Objects panel.

6 Open the **Products** folder. Double-click **Category** to add it to the report. We now have two attributes on our report.
7  From the drop-down menu at the top of the All Objects panel, change Products to Metrics.

![All Objects Panel](image1)

8  Click Sales metrics.

9  Add Revenue, Profit, and Cost to the grid. Double-click each metric to add it to the grid.

10 On the toolbar above the All Objects panel, click Run Report.

11 At the bottom of the All Objects panel, click Report Objects. This way we are only viewing the objects (in this case attributes and metrics) that we have placed on the report.

Your report should now match the following image:

![Report Details](image2)
12 Click **Save**.

13 Save the report in the **My Reports** folder and rename the report: **Regional Sales**. Click **OK**.

14 Click **Run newly saved report**.

15 Remove the attributes **Category** and **Region** from the report. As you remove each attribute, you will see the meaning of the metrics change. When all attributes are removed, the metrics display a total report value.

Now that we have created a grid report, we can continue to build on this data and explore other ways to analyze it in addition to viewing it as a grid. Reports can be used as datasets in other MicroStrategy applications.

### Create an interactive document: Visualize and interact with your data

In addition to creating reports, you can also create documents and dashboards in Web. Basic reporting grids offer simple and concise information. However, most organizations have more sophisticated reporting and analysis needs that can be handled by creating documents and dashboards. There are two types of documents: basic documents and interactive, or dashboard-style, documents.

#### Basic documents

Documents are a container for a variety of data coming from one or more reports or datasets. You can position, group, and format data in a basic document.

### Activity: Explore a document

Follow these steps to view a document in MicroStrategy Web.

1. On the MicroStrategy Tutorial home page, click the **Enterprise Reporting Documents** folder. Click **Go to MicroStrategy Web on the welcome page to access the Tutorial home page**.
2 Click **Category Sales and Profit Performance** to open the document.

3 Click through the grouping fields at the top of the document. See how the data changes when you make different selections. The buttons you are clicking are called selectors.

Documents are organized into sections. They can also be grouped by any of the attributes available in the dataset. Grouping acts as a filter, and impacts the visible data in the document.

**Interactive documents**

The next type of document you can create is an interactive or dashboard-style document. While the terms are interchangeable, dashboard-style documents can be easily confused with dashboards which are a separate way of visualizing your data. So we will refer to dashboard-style documents as interactive documents for the remainder of this lesson.

Interactive documents have more of a visual appeal than basic documents. A basic document may be many pages long, but an interactive document is designed to be a highly visual and interactive display that fits on a single page. Most documents focus on providing summary-level data and highlighting key measures.

Often times, panels are placed onto interactive documents to layer data. This way you can clearly and concisely group related data in a way that is logical to users. Users can navigate through the panels, or layers of data, by clicking selectors. In the next activity, explore an interactive document in Web. Keep in mind that interactive documents can also be turned into mobile apps.
Activity: Explore an interactive document

1. On the Tutorial home page, open MicroStrategy Platform Capabilities then click MicroStrategy Mobile then click iPad.

2. Select Regional Sales Overview.

3. In the drop-down menu near Central Region Performance, select Jan 2016.

4. Click the Profit Growth, Revenue Growth, and Profit Margin selectors above the line graph at the bottom of the document.

Users can interact with the document in different ways to find the data and analysis that is most relevant to them. The graphs that you see on the dashboard are called visualizations.

Dashboards

Dashboards can be created in Desktop or using Visual Insight in MicroStrategy Web. Dashboards allow you to quickly explore data and see your data instantly transform. Dashboards focus on delivering rich graphical representations of your data. In addition to visualizations, dashboards can also display text and images. As with documents, a dashboard must have a dataset from which to build the
visualizations. In the following exercise you will create a visualization in a Visual Insight (VI) dashboard in Web.

**Exercise 1.2: Create a visualization in a VI dashboard**

In this exercise we will add the Regional Sales report we previously created, to a dashboard and create a visualization.

1. On the Tutorial home page, click **Create** then **New Dashboard**.

2. On the toolbar, next to the Save icon, click **Add Data** then select **Existing Dataset**.

3. Select **My Reports** from the drop-down menu in the Select Existing Dataset window.

4. Select **Regional Sales** and click **OK**. *If you cannot locate the Regional Sales report, check the Shared Reports folder.*

   The objects from the Regional Sales report have now been added to the dashboard. The same attributes and metrics can be used to create visualizations.

5. Drag the **Category** attribute from the All Objects panel, to the **Rows** drop zone on the Editor panel.

   A grid is the default dashboard visualization. You will now see a grid displaying Category information. In the following step, select another visualization from the gallery.

6. Drag the **Cost** metric from the All Objects panel and add it to the **Vertical** drop zone in the Editor Panel.

7. On the right-hand side of the dashboard window, in the visualization gallery, click **Bar Chart**.

   You have now created a simple visualization.

8. To see additional business measures, we can add more metrics to the visualization. Drag the **Profit** and **Revenue** metrics to the **Vertical** drop zone.
You will see three stacked bar graphs. Separately, these graphs do not allow you to analyze your data very effectively.

9 To group all of the metrics on the same graph, click and drag the **Metric Names** object in the **Vertical** drop zone to the **Horizontal** drop zone.

10 We can take our analysis one step further. With all the bars on the graph being the same color, it is challenging to tell which metric is represented by which bar. To make this more apparent, add the **Metric Names** object to the **Color By** drop zone on the Editor Panel.
A legend now appears on the visualization and users can quickly and easily identify trends. As a designer, creating dashboards allows you to quickly make decisions about how to best display data to users.

11 Click Save. Name the dashboard: Regional Performance Dashboard and save it in the My Reports folder. Select Run newly saved dashboard. More information on creating and designing VI dashboards can be found in course 10.113 Visual Data Discovery: Visual Insight.
Data is the foundation of business intelligence. By exploring and analyzing your data, you can gain insight to help drive your business. There are essentially two methods for bringing your data into MicroStrategy. The first is to import data from a variety of sources directly into Web. This creates a cube that stores the data. You can build reports, documents, dashboards, and apps using the data in the cube. The second method is to access a data warehouse. Create and connect your project, the container for all your reporting objects, directly to the data warehouse. We will learn more about projects and data warehouses later in this course.

**Cube:** When you import external data directly into a report or document, or directly into Web, the data is added as an Intelligent Cube. The cube essentially sits between Web and the data warehouse. So when the report runs, rather than
going all the way to the data warehouse to retrieve results, it simply pings the cube. This improves performance by reducing report run times.

**Project:** A project resides in Developer, and is a culmination of all the data, objects, and documents in your reporting environment.

**Data warehouse:** A database that houses and organizes large amounts of data. It allows for updates and loads, and is used for making business intelligence decisions.

Creating a data warehouse typically requires your IT department and requires time and planning. Importing data directly into MicroStrategy allows analysts the flexibility to add data from a variety of sources and begin data analysis right away.

**Import data into MicroStrategy**

Data can be imported from a variety of sources such as:

- File sources
- Database sources
- Hadoop
- Salesforce reports
- Google Analytics, Big Query, and Drive
- Dropbox
- Facebook
- Twitter
- Reports and queries in BI tools
You can import data directly into an application object such as a report, document, or dashboard, or add the external data on its own. To import your data directly into an application object, select **Add External Dataset** and select your data. MicroStrategy will automatically turn your data into dataset objects called attributes and metrics.

MicroStrategy determines which objects are attributes and metrics based on their location (columns and rows) on your data source. Sometimes during the import process, you may need to clean, or wrangle, your data so that you can properly perform your data analysis.

You can also click the **Add External Data** icon on the MicroStrategy Web homepage. This turns the data into a cube that can be imported into a document, report, or dashboard, in Web.

**Verify and clean your data**

There are two steps in the data cleaning process. The first is to preview the data. The preview window gives you an overview of the attributes and metrics. You can easily drag and drop these objects to move them to the appropriate locations. You can also see an overview of the data itself and identify if there are any obvious errors in the data.
In the preview window, you can check your attributes and metrics, to ensure that the data is labeled properly. You can also preview the data values to identify any gaps or erroneous data.

The second data preparation step is to wrangle the data.

Data wrangling allows you to manage and edit your data. You can cleanse your data before you start building your visualizations. You can perform a variety of actions on the data such as removing blank cells, renaming columns, finding and replacing cell values, transposing to pivot data, and concatenating columns.

Once you have prepared your data, it is stored as a cube. If you imported the data directly into a report or document, the data will be instantly available. If you imported the data into Web, you can add the cube as a dataset to your document, report, or dashboard.

**Dataset objects: Attributes and metrics**

Data is defined as attributes and metrics. Attributes and metrics are the objects that are placed on a report or dashboard to create visualizations and perform data analysis. Attributes and metrics can also be created from data in your data warehouse, which we will explore later on in this lesson. Attributes provide context for business data. Region, Year, Country, and Customer, are examples of attributes. Metrics are calculations performed on the business data. Numeric in nature, Cost, Revenue, and Profit are all examples of metrics.

*If you are familiar with SQL, MicroStrategy will define the type of data into something that the SQL engine will understand. Attributes are understood to be the columns that describe the data. These would be located in the Select clause as seen in this example:*
Select YEAR_ID from LU_YEAR. A fact column would locate the metric in order to be defined such as: Select Sum(Revenue) from ORDER_Detail.

In a report or document, attributes are depicted by a green diamond. Metrics are depicted by an orange ruler icon. While MicroStrategy can turn your data into attributes and metrics automatically when you import data, you can also build your own attributes and metrics from your data warehouse in MicroStrategy Developer.

**Exercise 2.1: Import a dataset into the Regional Performance Dashboard**

In this exercise, you will open the Regional Performance Dashboard we previously created and add the Regional Store Performance.xlsx file as a dataset. You will then create additional visualizations with the new data.

**Import a file into an existing dashboard**

1. In Tutorial, navigate to the My Reports folder and open the Regional Performance Dashboard.
2. On the toolbar, click Add Data and select External Data.
3. In the Connect to Your Data window, click File From Disk to upload data from an Excel file.
4. Select Choose Files.
5. Locate and add the Regional Store Performance.xlsx file sent to you by the Instructor of this course.
6. When the file appears in the Upload your files window, click Prepare Data.

If you remember, MicroStrategy identifies attributes and metrics based on their location in the file. It is always a good idea to verify the quality of the data before you import it into the dashboard. The next steps will show you some examples of ways you can clean your data before you import it into the dashboard.

View the attributes and metrics in the Preview screen to see if anything looks misplaced. In this case, the attributes and metrics are defined appropriately. But if you look at the Country column in the lower half of the Preview window, you will see that some country cells are blank. Additionally, notice
that the capitalization of New York is not consistent. To fix the data, you will need to wrangle it. The data wrangle feature allows you to edit your data directly in MicroStrategy without having to return to your original data source.

7 Click **Wrangle** in the Preview window.

8 In this exercise, all of the data refers to regions within the United States. To fix the missing country information, click the **Country** column heading. A series of options will appear in the pane above the column. Select **Fill Down** to apply United States as the country for every row.

9 Since new york and New York have two different spellings, they will appear as different values, when in fact they represent the same data. So, we need to make all spellings of the state consistent. To do this, select the **State** column heading.

10 From the **Select Function** drop-down menu, click **Text Selector**. Any text values from the State column will appear in the window at the bottom of the screen.

11 To make all the New York entries the same, hover over **new york** and click **Edit**.

12 In the menu, select **New York**, then click the double check marks to Apply to All.

13 Click **OK**.
The data is now ready to be imported into the dashboard.

14 In the Preview window, click **Finish**.

The Regional Store Performance data now appears in the dashboard. The dashboard now has multiple datasets. When designing documents and dashboards in MicroStrategy, you can add multiple datasets.

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### Add a bubble chart visualization

1 To add a new visualization, you have to add a new visualization pane. To do this, click **Insert Visualization** on the toolbar. A new visualization pane will appear next to the bar chart.

2 With the empty visualization pane selected, click **Bubble Chart** on the visualization gallery.

3 From the Regional Store Performance dataset, drag the objects below into the following drop zones:
   
   - Drag the **Order Count** metric to the **Vertical** drop zone
   - Drag the **Item Count** metric to the **Horizontal** drop zone
   - Drag the **Calendar Date** attribute to the **Break By** drop zone
   - Drag the **Location Description** attribute to the **Color By** drop zone

4 Click **Save**.
Using a data warehouse: MicroStrategy metadata

MicroStrategy is flexible in that you have multiple options for adding data. If you want to create a dashboard or report quickly, you can simply import your data directly into a MicroStrategy application. You can also connect to your data through traditional project architecture. When connecting to your data with the traditional architecture, the data is clean and prepared and ready for output. When you connect to the data directly, by importing it into a MicroStrategy application, the user must clean and prepare the data (if necessary).
Referring back to the MicroStrategy Enterprise platform, the metadata repository is what feeds the entire platform. The metadata sits at the core of the Enterprise platform.

**Fundamentals of business intelligence: Metadata**

Metadata is data about your data. Metadata refers to everything in your reporting environment. All of your data, projects, reports, attributes, and metrics are part of the metadata repository. The objects in the metadata are created from what is contained in your data warehouse. The metadata stores the objects that you will actually use in your reports and documents.

Metadata stores all project information. It is grouped into applications, documents, components, and data models. Metadata associates the tables and columns of a data warehouse (raw data) with user-defined attributes and facts stored in the metadata. Attributes and facts are used to create metrics. Metrics and attributes are placed on MicroStrategy reports, documents, and dashboards to analyze business intelligence.

**Table:** Primary physical component of a data warehouse, consisting of columns of data.

**Column:** The set of fields of a given name and datatype in all rows of a given table.
**Attribute:** Provides context for reporting on facts and defines the level of detail at which users want to analyze facts.

**Fact:** Usually numeric, facts relate aggregatable data stored in the data warehouse to the reporting environment.

**Metric:** A business calculation, or measure, built with attributes, facts, or other metrics.

A metadata repository stores object definitions and information about your data warehouse. The information is stored within a relational database. The metadata maps the objects used to build reports and analyze your data, to data warehouse structures and data. The metadata also stores the definitions of all objects created in Developer and Web.

Objects are used to represent your data. You can build and manipulate several different kinds of objects in MicroStrategy to be used in data analysis. Below is an explanation of the different types of MicroStrategy objects, all of which are stored in the metadata.

**Configuration objects**

These objects provide important information in regards to the connectivity, user privileges, and project administration. Database instances, users, and groups are all examples of configuration objects. These objects are not used for reporting, but are created by the project architect or administrator to manage the platform. Configuration objects are contained within the Administrator section of Developer.

**Schema objects**

Schema objects are created to correspond to objects in the database. Facts, attributes, and hierarchies are all examples of schema objects. Facts are the building blocks of business data; these relate numeric data values from the data warehouse to the MicroStrategy reporting environment. Attributes represent the business context in which fact data is relevant. Attributes are used to define the level at which you want to view numeric data on a report. Hierarchies are groupings of attributes that are displayed to reflect their relationships to other attributes. The groupings make logical connections between attributes when reporting or analyzing data. For example, a time hierarchy may include Year, Quarter, Month, and Day attributes.
Application objects

These objects are used to provide insight into relevant data. Application objects include reports, documents, filters, templates, custom groups, metrics, and prompts. Application objects are created using schema objects as building blocks. Application objects can be created in Web and some in Developer.

- **Filters** allow you to narrow the data that is visible on the report or document. Say for instance that you have an attribute called US States and you have placed this attribute on a report or visualization on a document. When you analyze your data at this level, you will see data for all US states on each report. If you want to only view data for an individual state, or specific states, you can create a filter using any of the individual states included in the attribute.

- **Templates** can be used to save time when you are creating similar reports and documents on a regular basis.

- **Custom groups** are groups of filters that bring back data in a specifically defined set of attribute elements. Use a custom group to group attribute elements in a way that is not defined in the data warehouse. By adding conditions to each element of the custom group, you can specify the data that is filtered. For example, you can create a custom group for seasons of the year. The group elements would be the actual seasons, Winter, Spring, Summer, and Fall. Within each group element are the months of the year that pertain to that season.

- **Prompts** are questions the system presents to the user before the report is executed. How the user answers the question determines what data is displayed on the report.

Business data building blocks: Facts

To better understand metadata and its connection to the data warehouse, we need to have a better understanding of the objects we are working with. Facts are essential elements of the business data model. Facts generally represent the answers to the business question on which you want to report.
Facts are stored in the metadata in fact tables. These fact tables are composed of different columns. Each cell in the columns represents a specific piece of numeric information from your data warehouse. When fact information is requested for a report, that column is accessed to retrieve the necessary data. This data is used to create a metric which is the business measure that is displayed on a report. Facts are based on physical columns within tables in the data warehouse. Facts do not describe data, they are the actual data values stored at a specific fact level. Below is an illustration of where facts are located in a data warehouse.

**Business data context: Attributes**

Business data represented by facts offers little insight without the presence of a business context, in the form of an attribute. Attributes provide you a context with which to report on and analyze data.

For example, if you have a report that displays a Revenue metric (based on a Revenue fact) and you combine it with a Category attribute, you will see revenue values for each product category. If you remove the Category attribute, you will only see a single total Revenue value for all categories. Without the attributes, the metric (created from the fact) is relatively meaningless.
Attributes are made up of these components:

**Attribute form:** Contains the description of the attribute. Attributes can have multiple forms.

For example, the Customer attribute could have the following forms: Customer Email, Customer First Name, and Customer Last Name. Attribute forms are determined by the tables in the data warehouse, which we will explore later on in this lesson. Expand the attribute name in the Dataset Objects panel to view the attribute forms. You can choose which attribute forms to display in the report.

**Attribute element:** These are the actual values of the attribute. If the attribute is Customer, each individual customer represents an attribute element. Elements are displayed on a report.
When you create filters or prompts on reports and documents, you can select to filter by a specific attribute element. Attributes are created after the facts are added to the data warehouse. In the image below, you will see the forms and elements of the Customer attribute.

Business data relationships: Hierarchies

A hierarchy is a group of conceptually related attributes. Within a hierarchy, attributes are arranged in a specific way based on their relationship to each other. A common hierarchy is Time. If your business data has quarterly and annual sales figures, this data is stored based on the concepts of day, month, quarter, and year. It is likely that you would have the attributes Day, Month, Quarter, and Year, so you can report your sales data at a variety of levels.

There are two types of hierarchies in MicroStrategy, system hierarchies and user hierarchies.

System hierarchies are automatically created in Developer when you create a project. A project is created in Developer. This houses the metadata repository, user groups, reports, filters, metrics and functions. Your business data can be organized into one or many separate projects. MicroStrategy creates a system hierarchy by identifying attributes that are related based on their placement in the project.

User hierarchies group attributes together and define their relationships in a way that makes sense to the business organization. User hierarchies are created to define a meaningful path for element browsing or drilling. Drilling allows you to view data at other levels.

Below is an example of a system hierarchy in Developer. Notice the different symbols on the connecting lines. These represent the relationships (one-to-one,
one-to-many) between the attributes. System hierarchies can be very complex. This hierarchy shows how all of the attributes in the project are related.

Below is an example of a user hierarchy. Notice how the lines appear differently. The arrows define the browsing path between the elements. A user hierarchy does not need to involve every attribute in the project. You can select the attributes that you want to create drill paths between.

The following activity will demonstrate drilling within the Time hierarchy.
Activity: Drilling on a report

In this activity open a report and view drilling options using a Time hierarchy.

1. Navigate to the MicroStrategy Tutorial home page.
2. Open the **Shared Reports** folder.
3. Click **Subject Areas**, then **Sales and Profitability Analysis**.
4. Open the **Category Sales Report**.

<table>
<thead>
<tr>
<th>Month</th>
<th>Subcategory</th>
<th>Metrics</th>
<th>Profit</th>
<th>Profit Forecast</th>
<th>Revenue</th>
<th>Revenue Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 2012</td>
<td>Art &amp; Architecture</td>
<td></td>
<td>$1,763</td>
<td>$1,419</td>
<td>$6,916</td>
<td>$6,570</td>
</tr>
<tr>
<td></td>
<td>Business</td>
<td></td>
<td>$1,410</td>
<td>$1,280</td>
<td>$5,738</td>
<td>$5,451</td>
</tr>
<tr>
<td></td>
<td>Literature</td>
<td></td>
<td>$937</td>
<td>$650</td>
<td>$4,273</td>
<td>$3,333</td>
</tr>
<tr>
<td></td>
<td>Books - Miscellaneous</td>
<td></td>
<td>$911</td>
<td>$702</td>
<td>$4,718</td>
<td>$4,765</td>
</tr>
<tr>
<td></td>
<td>Science &amp; Technology</td>
<td></td>
<td>$2,705</td>
<td>$2,379</td>
<td>$10,767</td>
<td>$8,829</td>
</tr>
<tr>
<td></td>
<td>Sports &amp; Health</td>
<td></td>
<td>$1,164</td>
<td>$1,161</td>
<td>$4,749</td>
<td>$5,386</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>$8,890</td>
<td>$7,890</td>
<td>$37,161</td>
<td>$34,319</td>
</tr>
</tbody>
</table>

| Feb 2012| Art & Architecture         |         | $1,953 | $2,149          | $7,771  | $7,382           |
|         | Business                   |         | $1,695 | $1,549          | $6,883  | $6,883           |
|         | Literature                 |         | $1,192 | $964            | $5,448  | $4,413           |
|         | Books - Miscellaneous      |         | $1,019 | $843            | $5,308  | $4,671           |
|         | Science & Technology       |         | $3,295 | $3,403          | $13,175 | $11,402          |
|         | Sports & Health            |         | $1,522 | $1,482          | $6,225  | $5,167           |
|         | Total                      |         | $10,677| $10,391         | $44,510 | $39,978          |

Notice that the only Time attribute on the report is Month.

5. To drill, and see the data at another level, right-click the **Month** column heading.

6. Hover your cursor over **Drill** to see the drilling options. The available levels are displayed with arrows next to them. The up arrow indicates that you are drilling up levels, the down arrow indicates you are drilling down levels.
Drilling up within the levels of the hierarchy is more inclusive, drilling down is less inclusive.

7 Hover over Geography, Products, and Customers. These are the other user hierarchies available in the project. Since none of these attributes are on the report, drilling is not enabled.

8 Select Quarter.

Quarter has now been added to the report. All of the metrics are now displayed by Quarter rather than Month.

9 Right-click the Subcategory column heading on the report. Select Drill.

Notice that the only drill option is Item.

10 Close the report without saving.
MicroStrategy architecture

Enterprise platform architecture refers to how the platform is structured. At the core of business intelligence is data. So when we talk about architecture, we are essentially discussing how we can connect to our data. How the architecture is assembled depends on the available components such as: metadata, the data warehouse, servers, and user interfaces.

Intelligence Server

The Intelligence Server is an analytical server designed for enterprise querying, reporting and OLAP analysis. The important functionality of the Intelligence Server include:

- Sharing objects
- Sharing data
- Managing the sharing of data and objects in a controlled and secure environment
- Protecting the information in the metadata

Data will pass through the Intelligence Server and then continue on to other servers and user interfaces that are part of the architecture. While the Intelligence Server is not required to use MicroStrategy, it allows for a complete enterprise platform. The following is an explanation of architecture types.

Two-tier architecture: No Intelligence Server

In a two-tier BI environment (often called a direct connection), MicroStrategy Developer clients connect to the metadata and data warehouse through Open Database Connectivity (ODBC). ODBC enables a single program (in this case
Developer) to access different database management systems using the same source code.

**Three-tier architecture: Intelligence Server**

A three-tier BI environment (often called a server connection) consists of the data warehouse and metadata, Intelligence Server, and MicroStrategy Developer. Each Developer client connects to the Intelligence Server through Transmission Control Protocol/Internet Protocol (TCP/IP). TCP/IP is a communication protocol...
used to connect to and communicate with other computers on the Internet or the network.

Four-tier architecture: Intelligence Server and additional servers

A four-tier business BI environment consists of MicroStrategy Web and/or Mobile along with all the components of the three-tier architecture. In this four-tier environment, Web and Mobile servers are added. These servers communicate with the Intelligence Server through TCP/IP. The clients (mobile clients and web browsers) communicate through their respective servers using Hypertext Transfer
Protocol (HTTP). Below is an example of a four-tier architecture that uses both Web and Mobile.

**Sharing objects with the Intelligence Server**

Metadata enables the sharing of objects across MicroStrategy applications, meaning that what is contained in the metadata is available for all MicroStrategy applications. The Intelligence Server, if connected, takes this data and finds the most efficient data retrieval scenario. When data is retrieved from the data warehouse, it is done using SQL. SQL stands for Standard Query Language and is the common language for communication with relational databases. Whenever you execute a report or run a document, MicroStrategy executes a SQL query to retrieve the appropriate data. The metadata takes the SQL query and translates the results back as MicroStrategy objects that are easily analyzed on reports and documents.
Introduction to MicroStrategy projects

A project is where you build and store all schema objects (attributes, facts, hierarchies) and information you need to create application objects (reports, filters, metrics, etc.). Essentially, a project is your reporting environment. A project represents the intersection of a data source, metadata, and users. Projects are created within a project source in Developer.

A project:
• Defines the set of data warehouse tables to be used, and therefore the data available for analysis.
• Contains all schema objects used to interpret the data in those tables. Schema objects include attributes, facts, hierarchies and other objects such as partitions, tables, and transformations.
• Contains all reporting, or application, objects used to create reports and analyze the data. These objects include metrics, filters, reports, documents, and so on.
• Defines the user groups that have access to the project and its objects.
Projects are often used to organize data. Projects can separate data from the data warehouse into smaller sections of related data. For example, your business may have a project source separated into numerous projects such as Human Resources, Sales, Inventory, Distribution, and Customer Satisfaction to reflect the data that is important to each of your organizations departments. Creating projects allows users to only have access to necessary and relevant data.

Project life cycle

The life cycle of a project can be organized into five categories:

1. Gather business requirements
2. Design the logical data model
3. Design the physical data warehouse schema
4. Create the project
5. Manage the project schema

In this lesson we will learn about the various stages of the project life cycle, but our primary focus will be on project creation.

Gather business requirements

The first step in the project life cycle is understanding your business requirements. You need to have an understanding of what type of information users need to access and analyze. All of the steps of creating the project and adding data should be focused on ensuring that the end users have access to the information they need.

Design the logical data model

The logical data model is a logical arrangement of the data seen by the users. It is built as a part of the project creation process from the available source data, and should be designed with reporting requirements in mind. The logical data model
graphically depicts the flow and structure of the data. The model is similar to a map in that it shows all of the available data and how it connects.

Below is a sample logical data model.

The logical data model allows you to conceptualize your business model and the data on which to report. It helps you to identify how the parts of the data will interact. When creating a logical data model, keep in mind your business requirements, so you are aware of what you intend to learn from the data.

The logical data model includes attributes, facts (measures we need), and hierarchies. In this example, the smaller blue boxes are the attributes, the large orange box contains the facts, and flow of the arrows depicts the hierarchies.

In order to create a logical data model, you must have an understanding of all of the attributes in the project. You also need to know how the attributes relate to each other. The way attributes are connected, or their relationships, are essential to the logical data model. Relationships give meaning to the data by providing logical associations of attributes.

The attribute relationships are indicated by the lines on the logical data model above. Every direct relationship between attributes has two parts, a parent and a
A child must always have one parent, and a parent can have one or many children. Parent attributes are at a higher logical level than child attributes.

There are four types of direct relationships that can exist between attributes:

- **One-to-one**: Each element in the parent attribute only corresponds to one element in the child attribute. In the example above, Social Security Number (SSN) and Customer share a one-to-one relationship. This is because only one SSN exists for any given customer.

- **One-to-many**: Each element in the parent attribute corresponds to one or more elements in the child attribute. Each child attribute corresponds to only one parent attribute. In the logical data model sample above, Region and Store have a one-to-many relationship. Each region has several stores, but each store is only associated with one region.

- **Many-to-many**: Each element in the parent attribute can have multiple children, and each child element can have multiple parents. In the sample logical data model, Item and Color share a many-to-many relationship. A variety of items come in multiple colors, and those colors are available in a variety of items.

**Design the physical data warehouse schema**

Based on the logical data model, the physical data warehouse schema is a detailed graphic representation of your business data as it is stored in the data warehouse. The physical warehouse schema organizes the logical data model from a database perspective.
Several physical schema models can be derived from the same logical data model. The logical model illustrates the facts and attributes that you will create. The physical warehouse schema tells you where the underlying data for those objects is stored. From the physical warehouse schema, you know how your data is stored and how you can retrieve it for analysis.

The main components of a physical warehouse schema are tables and columns. Columns and tables represent facts and attributes from the logical data model. The rows in a table represent attribute elements and fact data. The tables represent what physically resides in the data warehouse. In the image below, you will see physical warehouse schema tables on the left, and what those tables look like in the actual data warehouse on the right.

Columns

Columns contain attribute and fact data. Every attribute must contain an ID column; this is a unique numeric identification code. Attributes may also have a description column. Description columns can be text or numeric, and contain descriptions of the attribute elements. Generally, an attribute will have an ID and
at least one descriptive column. Another column type, fact columns, contain the fact data. Descriptive columns are the attribute forms.

Tables

Tables are the physical groupings of related data. There are two types of tables, lookup tables and fact tables.

Lookup tables

Lookup tables are the physical representation of attributes. Lookup tables store the information for an attribute in ID and descriptive columns.

Fact tables

Fact tables store fact columns and attribute ID columns. This is because attributes provide context for facts. The attribute ID columns in a fact table represent the level at which those facts are stored. The image below shows the Customer_SLS fact table. The attribute ID, Customer_ID, is stored in the fact table along with the fact data. You can rename the fact columns in the fact table so that they are more user-friendly.
Create metrics from facts

Metrics are your business calculations. Metrics are actually created later on in the project life cycle, after the schema objects are created. It's important to understand how metrics are created from the facts before we create the project. Facts are just data values, so we need to add calculations to give them more meaning. When you create a metric, you are essentially applying a function or calculation to a fact. The default metric function is Sum.

Metrics are created inside the project in Developer, they can also be created in Web. In the following example, the sum function is applied to the Revenue fact, which comes from the TOT_DOLLAR_SALES column as seen in the example above. This calculation creates the Revenue metric. When the metric is displayed...
with an attribute, the value shown will be a sum of all Revenue values for that attribute.

![Image of Revenue Metric Editor]

**Key structures: Identify data in tables**

Each table has a primary key that creates a unique value to identify a record within the table. In the lookup table below, Region_ID is the primary key. Because each region has a unique ID value, and identifying that ID value does not depend on another column, this is considered a simple key.

![Image of LU_Region]

In addition to a primary key, a table may also have a foreign key. A foreign key helps define the relationships between attributes across the attribute’s lookup tables. In our logical data model, Division and Category were directly related. Division was the parent attribute to Category. Primary and foreign keys do not
have to be in a specific order, but generally primary keys are the first column in a table.

Because this is a one-to-many relationship, meaning that each division has many categories, but each category has only one division, a foreign key would be included in the Category lookup table. If we add the parent ID, in this case Division_ID, to the child table, LU_Category, we can define the relationship between the attributes. This allows the table to lookup and relate the attributes as seen below. The foreign key is the Division_ID column in the LU_Category lookup table. Primary and foreign keys exist in the database and are defined by the Database Administrator. In MicroStrategy we use the primary and foreign keys to understand how attributes are related, but do not change or define those keys in the database.

Exercise 3.1: Create a physical data warehouse schema

In this exercise, you will create a physical warehouse schema based off a logical data model and a variety of requirements. To help you in this process, a sample outline of a physical warehouse schema (provided by the Instructor) is available to guide you. Remember that numerous physical warehouse schema designs can be created from the same logical data model. The outline in this exercise is just one of the many options.
Below is the image of the logical data model you will be working from. For this exercise, we will only focus on the Geography and Account hierarchies.

Based off the logical data model above, and the parameters listed below, build a physical warehouse schema for MSTR Bank. The bank is looking to analyze their transactions. The information gathered from the business requirements:

- The physical warehouse schema model must include all attributes from the Geography and Account hierarchies
- The bank has 10 regions, 50 districts, and 1500 branches.
- The bank has 7 divisions with over 6 million accounts.
- Each attribute in the Geography and Account hierarchies has an ID and a DESC column for each element.
- The source data also stores a column for each employee’s first name, last name, and Social Security Number. This data should be visible in the schema model.
Instructions

Create a lookup table for each attribute, and indicate the relationship between the attributes within the tables by looking at the relationships in the logical data model. Notice that the highlighted attributes have a one-to-many relationship. Use the physical schema guide provided by the instructor to fill in the missing values, or use the following image.

Create the project

After you have created your logical data model based of your business requirements, and then arranged your physical schema, you are ready to create a
A project includes all of the objects required in your reporting environment. There are numerous components of a project which are detailed below. Before we can understand how to connect a project to your data, we must become familiar with the project components.

**Metadata**

A repository of every schema and application object, as well as project settings.

**Metadata shell**

Before you can add any data into the metadata repository, you must have tables to hold that data. The metadata shell is a set of blank tables created when you implement a business intelligence environment.

**Project source**

A project source is a configuration object which represents a connection to a metadata repository. Every object included in the metadata will be available in the project source. Projects are created within the project source to group and organize the objects in a way that makes sense to your business.

Below is an image of a project source called My Tutorial Project Source containing one project called My Demo Project. All of the metadata objects are contained within the folders of the project. Notice that the schema objects folder is expanded.
A project source connects to a single metadata repository. However, multiple project sources can access the same repository. In a production environment, your project source will typically connect to the Intelligence Server, which in turn connects to the metadata.

Quiz: What type of architecture structure, represented in the following diagram, is a common way to connect a project source to the metadata?

Database instance

A database instance is a configuration object that represents a connection to a data source. When you define a project, you specify the data source location by creating and selecting a database instance.

Project creation and connectivity

Projects are created and connected in MicroStrategy Developer. In a production environment, project creation occurs using a variety of tools such as Architect, and Connectivity and Configuration wizards. These tools give project designers the ability to build the project in the most effective way. You can learn how to create projects using the full spectrum of Developer tools in the course 10.412 Project Architecting. In the remainder of this lesson, we will create a project using the Project Creation Assistant. This wizard simplifies the project creation process, and is an alternative method for creating simple projects appropriate for demo projects, proof-of-concepts, and other similar BI goals.

In addition to understanding some of the key components of a project, it is also important to understand the main steps in creating a project, to see how the
components interact with each other. Below is an illustration and an overview of project creation steps.

There are 5 main steps to creating a project:

1. **Create the metadata repository**
   
The metadata is the link between your raw business data and your reporting environment. MicroStrategy creates a default table configuration when you create a repository, that populates the tables with basic data such as project folder structure and connection information.

2. **Connect to the metadata repository and data source**

   **Connect to the metadata: Create a project source**

   Once the metadata is created, you must establish connections to the metadata and the data source. You connect to the metadata through a project source. The project source is the pointer to the metadata.

   In a two-tier environment the project source connects through a DSN. DSN stands for data source name. The DSN connects the project source directly to the data without the use of the Intelligence Server. This is generally not
recommended in a production environment. In a three or four-tier environment, the project source connects to the metadata through the Intelligence Server.

**Connect to the data source: Create a database instance**

Remember that metadata essentially describes your data, it is not the data itself. Your actual data is part of your data source or data warehouse. Once you connect to your metadata, you next have to connect to your data source. You connect to your data source by creating a database instance.

3  Create a production project

Once the metadata is created and you are connected to the metadata and data source, you can create a project. Building a project involves creating a basic project definition and creating the attributes, facts, and hierarchies that will help you build meaningful reports and documents.

4  Create facts and attributes

Schema objects are the foundations of business reporting. These must be created in the project before you can begin any data analysis.

5  Deploy your project and create reports

Once you have created all of the schema objects for your project, you can deploy it using MicroStrategy Web. Facts are used to create metrics, and attributes and metrics are essential components of reports and visualizations.

**Exercise 3.2: Create a project using the Project Creation Assistant**

In this exercise we will connect to an existing project source in Developer that already has a metadata repository. We will use the Project Creation Assistant to add a new project. We will use the Warehouse Catalog and Architect tools to explore schema objects and understand how these become objects that we can use when creating reports and documents.

---

**Open Developer**

1  Open you MicroStrategy Cloud email and copy the password onto a notepad or word document.
2 Go to MicroStrategy Cloud homepage that we bookmarked in the first exercise. You can also access the home page from your MicroStrategy Cloud email.

3 Copy the Intelligence Server IP address and paste it on the same word document as the MicroStrategy Cloud password.

MicroStrategy Developer & Tools Suite
Access the comprehensive administrative tools suite.

Developer Machine name: test-env-2799-rdp.customer.cloud.microstrategy.com
Intelligence Server IP Address: 10.249.114.81


5 Enter your username (mstr) and password (from your MicroStrategy Cloud email) in the Remote Desktop Connection window.

REMOTE DESKTOP CONNECTION
Username
Password
Login

6 On the next screen under ALL CONNECTIONS click Developer Instance RDP.
7 The Remote Desktop will open.

8 On the Windows desktop, open the **hosts** file.

9 Click **Yes**.

10 Place your cursor at the bottom of the text in the hosts file. Type the IP address followed by “i-server” at the end of the file. See the example below.

11 Save and close the hosts file.

12 Click on the Developer icon on the Windows desktop, to open Developer.

---

**Add the Analytics Module Project source**

1 In the Project Source Manager window, click **Add**.

2 In the Project Source Manager window, in the Project source box, type **MicroStrategy Analytics Modules**.

3 In the Connection mode drop-down list, leave **Server** selected.

4 In the Server name, type **i-server** as the host name of Intelligence Server.
5  Accept all other defaults.

6  Click OK twice to close the Project Source Manager.

7  To log into the project source, select Click here to connect to MicroStrategy Analytics Modules.

8  In the Login window, in the Login id and Password boxes, type the login and the password provided in the Welcome to MicroStrategy Cloud email and click OK.

You can now access the MicroStrategy Analytics Modules project source in Developer.

Create the project

Since we are creating a project within a project source, the metadata repository has already been created. The MicroStrategy Analytics Module project source connects to that metadata.

1  In Developer, right-click the MicroStrategy Analytics Module project source.
2  Click **Create New Project**.

3  On the Project Creation Assistant window click the arrow next to **Create project**.

4  Name the project: Regional Sales Project. Click **OK**. It may take some time for the project to be created.

---

### Select a database instance to connect to the data source

1  On the Project Creation Wizard window click the arrow next to **Select tables from the Warehouse Catalog**.

2  From the drop-down menu select **Tutorial MySQL** as the primary database instance for the project. Click **OK**.

3  A message will appear, click **Yes**.

4  The Warehouse Catalog Options window opens.

5  On the Catalog-Warehouse Connection screen, under Customer Database Login, click **Select**.

6  Now that we have selected an existing database instance, we have to choose the proper login to access that instance. To do this, select **Data** and click **OK**.

---

**Select the data warehouse tables to connect to**

So far we have named the project, identified the database instance we want to use and selected the appropriate login credentials. To complete the database instance, we have to select which tables we want to access in the database.
7 In the Warehouse Catalog Options window click **Read Settings** on the left pane. Then click the **Settings** button.

Remember that MicroStrategy uses SQL to execute requests for data. We have to verify, and potentially update, the SQL statements so that they point to the correct data warehouse tables.

8 In the top pane, scroll all the way to the right. At the very end of the SQL statement remove: `#?Schema_Name?#`. In its place, and in between the apostrophes, type: `tutorial_wh`. This selection is highlighted in the image below.

9 Click **OK**.

10 Click **OK** again. The Warehouse Catalog window will open with two columns.

11 Click the **Lightning Bolt** next to the Save icon to read the current warehouse catalog. The warehouse catalog contains all the tables for that warehouse. Remember that the tables are where the facts and attributes are stored.

**Select the warehouse tables to use in the Regional Sales Project**

All of the tables in the tutorial_wh are located in the column on the left of the Warehouse Catalog window. If we move tables into the column on the right, we can add them to our project.

12 Select the following tables and move them to the right column using the arrows in the middle of the window:

<table>
<thead>
<tr>
<th>Lookup Tables</th>
<th>Fact Tables</th>
</tr>
</thead>
<tbody>
<tr>
<td>lu_category</td>
<td>mnth_category_sls</td>
</tr>
</tbody>
</table>
13 Select **Save and Close**. In the Change Comments window click **OK**.

### Create facts and attributes

1. Click the arrow next to **Create Facts** in the Project Creation Assistant.

2. Click **Define Rules**. This is a helpful feature of the Project Creation Assistant. While you can manually rename facts so they are more meaningful, MicroStrategy can also create a more user friendly fact name from the table column if selected. Click **OK**.

3. Click **Next**. The Fact Creation Wizard window will appear.

   The available columns are all of the columns listed in the tables we selected in the previous step. Since we are creating facts and attributes separately, we only want to select the columns that represent facts. Remember that facts are the actual data values and are used to create metrics.

4. Select the following column names and move them to the Facts pane.
   - GROSS_DOLLAR_SALES
   - TOT_COST
   - TOT_DOLLAR_SALES
   - TOT_UNIT_SALES

5. Click **Finish**.

6. Select **Create attributes** in the Project Creation Assistant. The Attribute Creation Wizard opens, click **Next**.

7. Notice that some of the column names are highlighted in gray. The Attribute Creation Wizard highlights the columns it expects to be attributes. We are not going to add every attribute, however. Using the middle arrows, move the...
attributes seen in the image below to the attribute column. You are Attribute Creation Wizard window should match the image below:

8 Click **Next**.

9 The Description column names will appear for the attributes. Click **Next**.

10 The Lookup table names appear next to the attributes. This indicates which table that attribute is contained in. Click **Next**.

11 Now you will define the relationships between the attributes. Select the **Category** attribute, click **Add** and select **Subcat**. Click **OK**. These relationships create the hierarchies in the project.

12 Select **Country**, click **Add**, and select **Region**, click **OK**.

13 Select **Region**, and add **Cust State** as the child, click **OK**.

14 Select **Year**, and add **Quarter** and **Month**, click **OK**.

15 Click **Next** then **Finish**.
View and edit the tables and hierarchies you created in Architect

Add another table

1. On the Project Creation Assistant window select **Architect**.

2. If not already selected, click the **Project Tables View** tab. You will see the tables that you have created for this project.

3. If you expand **Tutorial MySQL** in the left pane, you will see a list of all the tables in the warehouse. Scroll down and click and drag the **ytd_day** table to the **Project Tables View** tab.

4. In the Result Preview window click **OK**.

Create a new relationship

5. Click the **Hierarchy View** tab. When we created the attributes, remember that we defined the relationships, these are represented in this system hierarchy. The Hierarchy should match the following image:

```
Category
  +--- Country
  +--- Year
     |   +--- Subcat
     |   +--- Region
     |   +--- Month
     |   +--- Quarter
     +--- Cust State
```

Notice that year has two children, Month and Quarter. In a report created from these objects, you could drill from Year to Month or Year to Quarter, but not between Quarter and Month.
6  Click **Save and Close**, then click **OK**.

7  Click **Update** in the Schema Update window.

8  Click **OK** in the Project Creation Assistant window.

---

**Create metrics based on the facts you created**

Metrics are business calculations created from facts. Metrics, not facts, are used on reports and documents. So before we are ready to create a report using this project, we need to create metrics.

1  Expand, or double click, the Regional Sales Project folder list. Expand the **Public Objects** folder.

2  Select **Metrics**. In the empty space adjacent to the folder list, right-click and point to **New** then **Metric**.

3  Click **OK** on the new metric window. The Metric Editor will open.

4  Facts are listed on the left. Double-click **Tot Dollar Sales**. Sum is the default metric function, therefore \( \text{Sum}([\text{TotDollar Sales}]) \) is the definition of this metric.

5  Click **Validate**. This step ensures that the metric definition is valid before adding it to the project.
6 Click **Save and New**. The **Save and New option is the on the toolbar next to Save and Close. The icon is a disk with a gold star**.

7 Name the metric: Revenue. Click **Save**.

8 The New Metric window appears, click **OK**.

9 Double-click **Tot Cost**, then click **Validate**.

10 Click **Save and New**. Rename the metric: Cost.

11 Create the metric for **Tot Unit Sales**, click **Save and Close** and name the metric: Unit Sales.

   You can also create metrics by performing calculations between multiple facts, or between multiple metrics (called derived metrics). In the next steps, we will create a metric using multiple facts.

12 Right-click and select **Metrics**, then click **OK**, to open the Metric Editor.

13 Double-click the **Tot Dollar Sales** fact, add a minus sign, and then double-click **Tot Cost**.

14 Click **Validate**.

15 Click **Save and Close**. Name the metric: Profit.

16 Close out of Developer and the Remote Desktop.
Exercise 3.3: Create application objects in the Regional Sales Project

Create a report in the Regional Sales Project

1. Open MicroStrategy Web. You should have bookmarked this link earlier in the course, or you can access it from your MicroStrategy Cloud email.

2. Click Go to MicroStrategy Web.

   By default MicroStrategy Web opens with the MicroStrategy Tutorial project. We need to switch to the Regional Sales Project to access all the objects we just created.

3. On the Tutorial home page, above the red Create button, click the down arrow next to the M.

4. Hover over Projects and Select Regional Sales Project from the list.

5. Click Create Report, then select Blank Report.

6. In the All Objects panel select Attributes.

7. Add Region, Category and Subcat to the grid.

   In addition to double-clicking the objects, you can also drag and drop them onto the grid.

8. Select Metrics in the drop-down menu of the All Objects panel.
9 Drag **Cost, Profit, Revenue, and Unit Sales** to the grid.

10 Run the report. *Click the first icon on the toolbar, with the lightning bolt, to run the report.*

<table>
<thead>
<tr>
<th>Region</th>
<th>Category</th>
<th>Subcat</th>
<th>Cost</th>
<th>Profit</th>
<th>Revenue</th>
<th>Unit Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>Books</td>
<td>Art &amp; Architecture</td>
<td>90,381</td>
<td>30,552</td>
<td>120,933</td>
<td>7,182</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Business</td>
<td>76,046</td>
<td>24,683</td>
<td>100,929</td>
<td>7,192</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Literature</td>
<td>58,065</td>
<td>16,334</td>
<td>74,399</td>
<td>9,643</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Books - Miscellaneous</td>
<td>63,289</td>
<td>15,042</td>
<td>78,331</td>
<td>9,667</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science &amp; Technology</td>
<td>155,087</td>
<td>51,656</td>
<td>206,743</td>
<td>6,279</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sports &amp; Health</td>
<td>63,622</td>
<td>20,727</td>
<td>84,349</td>
<td>6,774</td>
</tr>
<tr>
<td>Electronics</td>
<td>Audio Equipment</td>
<td>763,192</td>
<td>181,340</td>
<td>944,530</td>
<td>3,666</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cameras</td>
<td>1,021,946</td>
<td>260,374</td>
<td>1,282,320</td>
<td>2,803</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computers</td>
<td>394,836</td>
<td>96,409</td>
<td>403,245</td>
<td>4,170</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electronics - Miscellaneous</td>
<td>960,296</td>
<td>237,902</td>
<td>1,196,203</td>
<td>3,235</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TV’s</td>
<td>759,995</td>
<td>192,619</td>
<td>952,613</td>
<td>3,690</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Video Equipment</td>
<td>1,009,135</td>
<td>260,814</td>
<td>1,269,980</td>
<td>2,777</td>
<td></td>
</tr>
</tbody>
</table>

11 Save the report in the My Reports folder as Sales Report. Select **Run newly saved report**.

---

**Add the report as a dataset to a VI dashboard**

1 Return to the Regional Sales Project home page. *Above the toolbar you will see Regional Sales Project>My Reports>Sales Report. Click Regional Sales Project to return to the project home page.*

2 Click **Create Dashboard**. Close out of any pop-ups that appear when you first launch the dashboard.

3 On the All Objects panel click **Add Existing Dataset**.

4 Navigate to the **My Reports** folder and select **Sales Report**.

5 Click **Select**. The report will now become the dataset for the dashboard.

**Create a pie chart**

6 Click the **Pie Chart** icon in the Visualization gallery.

7 Drag the **Category** attribute to the **Slice** drop zone.

8 Add the **Revenue** metric to the **Angle** and **Color by** drop zones.
9 To change the coloring of the pie chart, click the Format tab on the Editor Panel.

10 Change the **Title and Container** drop-down to **Shapes and Data Labels**.

11 Click **Select color ranges**.

12 Change the color to **Red-Orange-Green**.

13 Click **OK**.

14 On the Format panel under Data Labels click **Text**.

Create a heat map

Heat maps make it easy to analyze data by using colors and shapes to show trends. The metrics added to the heat map change the size and color of the squares. Heat maps allow you to quickly identify data trends.

15 Insert a second visualization. *Click Insert Visualization on the toolbar.*

16 Click **Heat Map** on the Visualization gallery.

17 Add **Region** and **Category** to the **Grouping** drop zone.

18 Add **Unit Sales** to the **Size by** drop zone. The Unit Sales metric will also be added to the Color By drop zone.
19 Add **Revenue** to the **Color by** drop zone. This will replace the **Unit Sales** metric.

20 Save the dashboard as **Sales Dashboard** in the **Shared Reports** folder.

21 Click **Run newly saved dashboard**

    **Insert a bar chart**

22 Insert a third visualization, and change it to a **Bar Chart**.

23 Add **Region** to the **Horizontal** drop zone.

24 Add **Unit Sales** to the **Vertical** drop zone.

**Move the visualizations around**

25 Select **Visualization 2**, the **Heat Map**. Click the pane and drag it to the bottom of the window. A blue line will appear, make sure the line appears under the both visualizations. The dashboard should now match the following image.

26 Click **Save**.
Add a reference line

27 Right-click the bar chart. Hover over **Add Reference Line** and select **Median**.

Reference lines make identifying trends quick and easy. The value of the median Unit Sales appears along with the line.

Add titles to the visualizations

28 Double click the text **Visualization 1**. Rename the graph: Category Revenue.

29 Rename Visualization 2: Revenue and Unit Sales by Region.

30 Name Visualization 3: Median Unit Sales.
31 Click **Format**, on the toolbar, and select **Dark Theme**. The dashboard should look like this:

32 Click **Save** and close the dashboard.
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