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Introduction to dbConnect for Facilities Management

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FM34-1L This hands-on lab will give you a jump-start into the world of database connectivity. Learn how to set up a database connection, create links, and turn your drawing into a powerful interface to your database. Explore the dbConnect Manager and the Data View window and create intelligent annotation using Labels. Create simple and even complex queries with the Query Editor.

About the Speaker:

Scott is president of SHM Development, Inc., a software development consulting company specializing in custom database applications that use Autodesk software in the AEC and GIS industries. He has more than 20 years of programming experience, and has been integrating databases with AutoCAD software ever since it was possible. He is the author of AutoCAD Database Connectivity from Autodesk Press, as well as several articles on databases and AutoCAD. Scott has served two two-year terms on the AUGI Board of Directors.

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Introduction

Welcome to FM23-1L *Introduction to dbConnect for Facilities Management*. This lab is designed to give you an overview of the dbConnect features of AutoCAD within the context of a real-world, facilities management application. You will be working with an AutoCAD drawing of an office floor plan and an Access database. Using only the out-of-the box dbConnect tools, you will build a simple space management system.

The Drawing

The AutoCAD drawing included with this lab is an architectural plan of one floor of an office building. The drawing was created with the intent of eventually linking it to a database. Some very simple rules were followed, which will simplify the transition to a database-linked drawing.

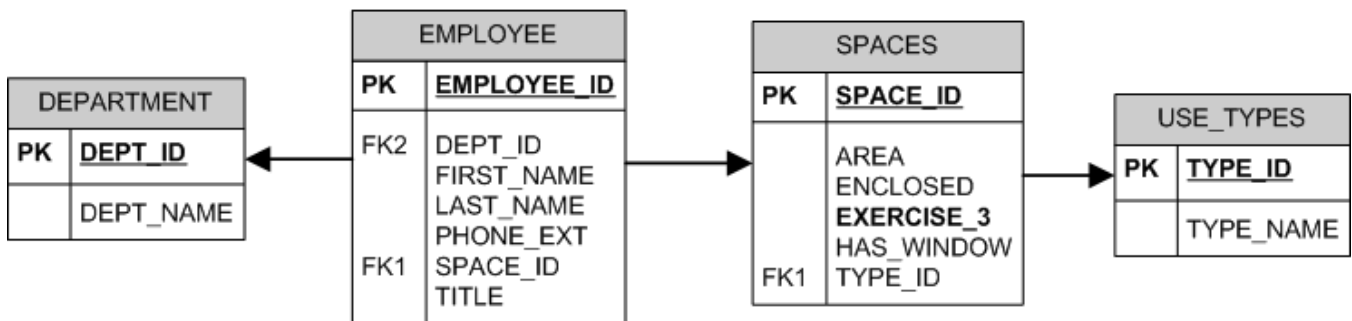
- There are closed polylines on the A-SPACE layer that define the perimeter of each space.
- The polylines for offices are color coded by department.
- For non-office space, the polyline color is set to "bylayer."
- Each space is labeled with a text object, which is on the A-EMPNAM layer.
- For offices and cubicles, the label is the name of the employee and the color is set to "bylayer."
- For vacant offices, the label reads "Vacant" and the text color is set to red.
- For vacant offices, the polyline color is set to "bylayer."
- For non-office space, the label describes the use of the space, and the color is set to yellow.

The Database

This lab also includes an Access database (office.mdb) containing the following four tables:

- EMPLOYEE – Contains one row per employee.
- DEPARTMENT – Contains one row per department. The EMPLOYEE table has a foreign key column that indicates which department each employee belongs to.
- SPACES – Contains one row per space. A space can be a cubicle, enclosed office, conference room, etc. This table contains a foreign key column that links it to the employee that currently occupies the space.
- USE_TYPES – Contains one row for each distinct type of space. Examples of space types are Office, Conference Room, Storage, Library, etc.

Below is a relationship diagram for the database.



The database also includes a *view* (also called a “Query” in MS Access) called **SPACES_QUERY** that returns one row per space, and joins the other three tables to create a dynamic view of all the data in the database from the perspective of each space. For linking purposes, dbConnect makes no distinction between *tables* and *views* in a database. This lab uses this view as the primary linking table for dbConnect. Linking to a view rather than a table has significant advantages:

- It gives you access to columns in related tables for labeling purposes.
- It makes querying multiple tables much easier.
- The view can be based on other dynamic data in your database, allowing you to create more dynamic labels.
- The view itself is easily redefined to include additional tables or columns as your database grows.

Below is a diagram showing the resulting structure of the SPACES_QUERY view.

SPACES_QUERY
AREA
DEPT_NAME
ENCLOSED
EXERCISE_3
FIRST_NAME
HAS_WINDOW
LAST_NAME
PHONE_EXT
SPACE_ID
SPACE_LABEL
TITLE
TYPE_NAME

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Lab Exercises

Exercise 1. Configuring a Data Source

This exercise walks you through the configuration and connection to the office database.

1. Start AutoCAD.
2. From the **Tools** menu, choose **dbConnect**. This displays the **dbConnect Manager**. A **dbConnect** pull-down menu is also added to the AutoCAD menu bar.
Tip: You can also toggle the display of the dbConnect Manager by typing CTRL+6.
3. Right-click the **Data Sources** branch in the **dbConnect Manager** and choose **Configure Data Source...** from the shortcut menu. The **Configure a Data Source** dialog box is displayed.
4. Type "**office**" as the data source name, and click **OK** or press **ENTER**. This launches the **Data Link Properties** dialog box.
5. On the **Provider** tab, select **Microsoft Jet 4.0 OLE DB Provider** in the list of OLE DB Providers, and click **Next >>** to switch to the **Connection** tab.
6. Click the ellipsis icon located just to the right of the file box and browse for the **office.mdb** file.
7. Click **Test Connection** to verify that a connection can be made.
8. Click **OK**.
9. Double-click the **office** data source in the **dbConnect Manager** window to establish a connection.

Exercise 2. Using the Data View Window

This exercise introduces you to the Data View window

1. Double-click the **EMPLOYEE** table in the **dbConnect Manager** window to display the **Data View** window for this table.
2. Click in the first field under the **TITLE** column and type "**Project Manager.**" As you are typing, notice that there is a small "pencil" icon in the row selector (on the far left side of the table grid).
3. Press the **down arrow** key to advance to the next row. Notice that the row selector now shows a Greek "delta" symbol, indicating that changes have been made to that row. There is also a "delta" symbol in the table selector (in the top left corner of the table grid) indicating that changes have been made to the table, but have not yet been committed to the database.
4. Continue changing the **TITLE** value in the next three rows to "**Engineer,**" "**Architect,**" and "**CAD Specialist**" respectively.
5. Right-click in the table selector (in the top left corner of the table grid) to display the table selector shortcut menu. Using this menu gives you the option to commit changes or restore the table to its original state. Either option will close the **Data View** window.
6. Choose **Commit** to save the changes and close the Data View window.

Exercise 3. Creating Links to Graphical Objects

In this exercise, you will start linking the space polygons to rows in the SPACES_QUERY view.

1. Open office.dwg. This drawing contains a floor plan of an office. Each space is represented by a closed polygon.
2. Right-click the **SPACES_QUERY** table and choose **New Link Template**. The **New Link Template** dialog box is displayed.
3. Accept the default link template name of **SPACES_QUERYLink1** by clicking **Continue**. This takes you to the **Link Template** dialog box, where you indicate which columns in the table you are using as your link columns.
4. Click the check box next to **SPACE_ID** to indicate the key column you are using, and then click **OK**. You should now see a **SPACES_QUERYLink1** node in the **dbConnect Manager** just below **parcels.dwg**.
5. Before you start creating links on entities, you must bring up the **Data View** window. Right-click the **SPACES_QUERYLink1** node and choose **View Table**.

Tip: You may find it easier to "dock" the Data View window so that it does not obscure your drawing area. To ensure that docking is enabled for the Data View window, right-click the Data View window toolbar and choose Allow Docking. Then drag the window by its title bar to one edge of the AutoCAD window.

6. From the **View** menu, choose **Named Views**.
7. On the **Named Views** tab of the **View** dialog box, select **Exercise 3** and click **Set Current**. Click **OK**.
8. In the **Data View** window, right-click any of the column headers and choose **Sort** from the shortcut menu.
9. Choose **EXERCISE_3** in the first pick list in the **Sort** dialog box and then click **OK**. This will bring the spaces that correspond to the current view to the top of the grid in the **Data View** window.
10. In the **Data View** window, click the row selector (just to the left of the row) for the row with the name **Darryl Mckendrick**.
11. Locate the space on the floor plan that is labeled, **Darryl Mckendrick**. Click the **Link** toolbar button and select the polygon that encloses that space.
12. Press **ENTER**.

Note: Notice that the row in the Data View window is highlighted in yellow and that the next row in the table has been selected. If your objects on the screen are in an order similar to the way they appear in the table, this feature makes it convenient for you to continue linking rows without having to select the next row in the Data View window each time.

13. Repeat steps 11 and 12 and link the next row in the table to its corresponding space. Continue until all nine spaces (visible on the screen) have been linked.

Tip: If you prefer to use the keyboard, you can use the DVLINK command to create the first link, and then you can simply press SPACEBAR or ENTER to repeat the command as you continue linking objects.

14. Save the drawing.

Exercise 4. Creating Freestanding Labels

In this exercise, you will create labels – dynamic text objects that are linked to data in your database.

1. Right-click the **SPACES_QUERY** table and choose **New Label Template**. The **New Label Template** dialog box is displayed.
2. Accept the default label template name of **SPACES_QUERYLabel1** by clicking **Continue**. This takes you to the **Label Template** dialog box.
3. Right-click the text area and choose **Select All**.
4. Select the **Character** tab and change the font height to **6"**.
5. Select the **Properties** tab and change the justification to **Middle Center**.
6. Return to the **Label Fields** tab, select **SPACE_LABEL** from the field drop-down list and click **Add**.
7. Click **OK**.
8. In the **Data View** window, click the row selector (just to the left of the row) for the row with the name **Darryl Mckendrick**.
9. Next to the **Link** toolbar button there is a small down arrow. Click this arrow and choose **Create Freestanding Labels**. Notice that the **Link** button icon changes to a label icon.
10. Locate the space on the floor plan that is labeled, **Darryl Mckendrick**. Click the **Label** toolbar icon. At the command line, you are prompted to select an insertion point for the label. Select a point inside that space.
Tip: As with links, you can type "DVLINK" at the command line to create the first label, and then you can simply press SPACEBAR or ENTER to repeat the command as you continue adding labels.
11. Repeat step 11 until you have placed labels in each of the nine spaces that are visible on the screen.
12. Erase the text objects that previously labeled each space.
13. Save and close the drawing.

Exercise 5. Creating a Simple Query

In this exercise, you will use the Query Editor to highlight all the space polygons belonging to the Planning department.

1. Open **office2.dwg**. This drawing is the same as **office.dwg**, except that all of the space polygons are linked to the database.
2. Right-click the **SPACES_QUERY** table and choose **New Query** from the shortcut menu. This displays the **New Query** dialog box.
3. Type "**Planning Department**" as the query name and click **Continue**. This takes you to the **Query Editor**.
4. Make sure the **Quick Query** tab is selected.
5. In the Field list select **DEPT_NAME** and make sure **= Equal** is selected in the **Operator** pick list.
6. Click the **Look up values** button. This displays all the distinct values for the **DEPT_NAME** column.

7. Select **Planning** from the list and click **OK**. The text "Planning" now appears in the **Value** field.
8. At the bottom of the dialog box, deselect the **Indicate records in data view** check box, and make sure the **Indicate objects in drawing** check box is selected.
9. Click **Store** to save the query in the current drawing. The "Planning Department" query now appears as a node in the **dbConnect Manager** under the **office2.dwg** node.
10. Click **Execute**. The dialog box is closed, and the spaces that belong to the Planning Department are highlighted (selected) in the drawing.

Note: The objects are selected the same way they would be if you had picked them manually. To deselect them, simply press ESC a couple of times. You may also notice that when the dbConnect Manager window is open, you may need to click in the command prompt area or the graphics area to shift input focus so that ESC will work properly.

Exercise 6. Creating a Range Query

The Query Editor also provides an easy way to create a query based on a range of values. In this exercise, you will highlight the spaces whose area is between 70 and 80 square feet.

1. Right-click the **SPACES_QUERY** table and choose **New Query** from the shortcut menu to display the **New Query** dialog box.
2. Type "**Space Area**" as the query name and click **Continue**.
3. Select the **Range Query** tab in the **Query Editor**.
4. In the **Field** list, select **AREA**.
5. Type "**70**" in the **From** field.
6. Type "**80**" in the **Through** field.

Tip: At any time during the query building process, you can see what your query looks like as an SQL statement by selecting the SQL Query tab. If you do this, however, make sure you don't make any changes to the SQL statement. If you do, the Query Editor will reset itself if you try to go back to any other tab.

7. Make sure the **Indicate records in data view** check box is deselected, and the **Indicate objects in drawing** check box is selected.
8. Click **Store** to save the query in the current drawing.
9. Click **Execute** to dismiss the dialog box and highlight (select) the space polygons that satisfy the query.

Exercise 7. Viewing Linked Records and Linked Objects

In this exercise, you will learn how to synchronize the drawing with the Data View window.

1. Double-click the **SPACES_QUERY** table in the **dbConnect Manager** window to display the **Data View** window for this table.
2. Dock the **Data View** window at the bottom or top of the AutoCAD window.
3. From the **Data View** menu, choose **Options**.
4. Under **AutoPan and Zoom**, make sure that **Automatically Pan Drawing** and **Automatically Zoom Drawing** are both selected.
5. Set the **Zoom factor** to **60** percent.

6. Under **Record Indication Settings**, choose **Show only indicated records**.
7. Choose **OK**.
8. In the **Data View** window, double-click a row selector, and notice that AutoCAD zooms in on the linked polygon.
9. Select multiple rows by holding down **SHIFT**.
10. Right-click the row selector, and choose **View linked objects** from the shortcut menu. AutoCAD zooms so that the selected objects are visible.
11. From the **View** menu, choose **Zoom** and then **Extents**.
12. From the **Data View** menu, choose **AutoView Linked Records**.
13. Select one or more space polygons in the AutoCAD window. Note that only the linked records are displayed in the **Data View** window.
14. To reset the **Data View** window to show all records, simply double-click the **SPACES_QUERY** table in the **dbConnect Manager** window.

Exercise 8. Using the Query Builder

In this exercise, you will use the Query Editor to find conference rooms that have an area greater than 200 square feet

1. Right-click the **SPACES_QUERY** table, and select **New Query...** from the shortcut menu.
2. In the **New Query** dialog box, type "**Large Conference Rooms**" as the query name.
3. In the **Query Editor** dialog box, select the **Query Builder** tab. When this tab is activated, the **Query Editor** shows a grid area with the headings **Field**, **Operator**, **Value** and **Logical**.
4. In the first row of the grid, click in the first cell under the **Field** column. A pick list will appear with a list of available fields.
5. Choose **TYPE_NAME** from the list of fields.
6. In the **Operator** column, choose **= Equal**.
7. Click in the **Value** column, and an edit box will appear with an ellipsis ("...") button.
8. Click the ellipsis button and a dialog box will appear with the list of available values for the **TYPE_NAME** field.
9. Choose **Conference Room** from the list and click **OK**.
10. Click in the **Logical** column until you see the word "**And.**"
11. In the second row in the grid, choose **AREA** under the **Field** column.
12. In the **Operator** column, select **> Greater Than**.
13. In the **Value** column, type **200**.
14. Click **Store** to save the query in the current drawing. The "Large Conference Rooms" query now appears as a node in the **dbConnect Manager** under the **office2.dwg** node.
15. At the bottom of the dialog box, make sure that both the **Indicate records in data view** and **Indicate objects in drawing** check boxes are selected.
16. Click **Execute**.

Exercise 9. Using the SQL Query Tab

In this exercise, you will copy an existing query and modify the SQL code in the Query Editor.

1. Right-click the **Large Conference Rooms** query in the **dbConnect Manager**, and choose **Duplicate** from the shortcut menu. This will make a duplicate copy of the query, and put you in edit mode in the tree view to rename the new query.
2. Type "**Small Conference Rooms**" as the new query name.
3. Right-click the **Small Conference Rooms** query and choose **Edit** from the shortcut menu.
4. Choose the **SQL Query** tab. The query that you built in the previous exercise is shown using SQL. The SQL query should read as follows:

```
SELECT SPACE_ID, SPACE_LABEL, FIRST_NAME, LAST_NAME, TITLE, PHONE_EXT,
DEPT_NAME, HAS_WINDOW, ENCLOSED, AREA, TYPE_NAME, EXERCISE_3
FROM SPACES_QUERY
WHERE ( TYPE_NAME = 'Conference Room' ) And ( AREA > 200 )
```

5. Change the AREA > 200 to AREA <= 200.

Tip: You may need to scroll the query window horizontally to see this part of the query. You can also resize the Query Editor dialog box.
6. Choose the **Query Builder** tab. A warning message is displayed to inform you that choosing a "previous" tab (meaning any tab to the left of the current tab) will reset the **Query Editor** dialog box to its default state.
7. Choose **No** on the **Warning Message** dialog box to return to the **Query Builder** tab.
8. Choose **Check**. This will check the syntax of the current SQL statement, without actually executing it.
9. Choose **OK** to clear the **SQL syntax** message.
10. Click **Store** to save the changes you made to the query.
11. Choose **Execute**.

Exercise 10. Using Link Select

Link Select allows you to perform queries using a combination of SQL and graphical selection. In this exercise, you will find all the spaces that are designated as "File Area" in the top half of the floor plan.

1. Zoom to the extents of the drawing.
2. Right-click the **SPACES_QUERYLink1** link template, and choose **Link Select...** from the link template shortcut menu. The **Link Select** dialog box is displayed.
3. Choose **Select in Drawing <** and click the **Select** button. This will hide the **Link Select** dialog box and prompt you to select objects in the drawing.
4. Imagine a horizontal line that divides the floor plan into two equal halves, and use a window to select all the objects in the top half of the floor plan.

Note: Objects that are not linked with the current link template will automatically be filtered out of the selection.
5. Press **ENTER** to complete the selection and return to the Link Select dialog box. This should select approximately 58 objects. The exact number of objects selected and the number of matching records found are displayed at the bottom of the dialog box.

6. Choose **Intersect** from the **Do** pick list at the top of the dialog box.
7. Choose **Use Query**, and make sure the **Quick Query** tab is active.
8. In the **Field** list, select TYPE_NAME.
9. In the Operator pick list, choose **= Equal**.
10. Click **Look up values** and choose **File Area**, then click **OK**.
11. Click **Execute**. Notice the change in the number of objects and number of records displayed at the bottom of the dialog box.
12. Make sure that the Indicate records in data view and Indicate objects in drawing check boxes are both selected.
13. Click **Finish**. The objects that met the criteria are highlighted, and the **Data View** window appears with the corresponding rows displayed.

Exercise 11. Exporting Links

In this exercise, you will use the Export Links feature to populate the HAS_WINDOW field in the SPACES table with the correct value.

1. Zoom to the extents of the drawing.
2. Press **ESC** a few times to be sure that no objects are selected. Also, close the **Data View** window if it is visible.
3. From the **dbConnect** menu, choose **Links** and then **Export Links**.
4. Using the "Fence" selection method, draw a fence line through all the spaces that are adjacent to an exterior wall.
5. Press **ENTER** to complete the selection. This will display the **Export Links** dialog box.
6. In the **Save as type** pick list, choose **native database format**.
7. Type "**WINDOW_OFFICES**" in the **File name** field.
Note: The Included Fields list can be used to choose specific fields from the linked table to export. For this exercise, you only need to export the SPACE_ID field.
8. Click **Save**. After a short delay, the dialog box closes, and the **WINDOW_OFFICES** table appears under the **office** data source node in the **dbConnect Manager** window.
9. Right-click the **SPACES** table and choose **New Query**.
10. Leave **SPACESQuery1** as the default name and choose **Continue**.
11. Choose the **SQL Query** tab.
12. Delete any existing text, and type the following SQL statement in the text area:

```
UPDATE SPACES SET HAS_WINDOW='Y'
WHERE SPACE_ID IN (SELECT SPACE_ID FROM WINDOW_OFFICES)
```
13. Choose **Execute**. A dialog box will display that shows the number of SQL statements that were executed, and the number of rows affected.

