Welcome to DataFlex 18.0 for Web

Data Access Worldwide is the creator of DataFlex. Since 1976, Data Access has been delivering tools for building database applications. DataFlex is also available in a Personal Edition, which is a free, fully functional edition that can be used for non-commercial, private use.

Download a copy of DataFlex 18.0 from www.download.com or www.dataaccess.com if you did not yet install the DataFlex Studio and install the product. To verify if your system is properly configured for creating web applications a tool named CheckDataFlexWeb is provided.

The goal of this introduction is to show you the steps involved in building database applications with DataFlex. We will do so by using an example scenario. We will make a browser based application which can be made accessible via the Internet. In a second step we will add reporting. Most of the functionality will be limited to what can be obtained by drag & drop features in DataFlex, but we included some small code fragments. Don't let it stop you from getting further into the underlying programming language and framework!

Let us start by introducing some concepts to you.

Object oriented

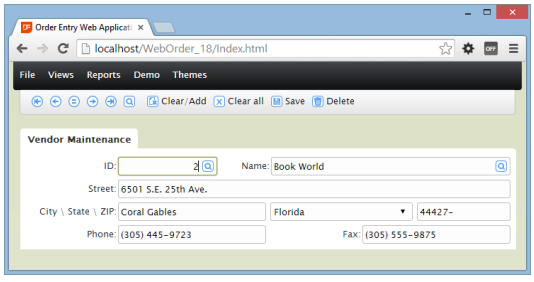
DataFlex is an object oriented programming language. This means that for all common components, a class is already defined. This class is the definition of how such a component looks and functions and what it exactly does once it is instantiated as an object in a written program. The advantage is that a lot of technical details are taken care of for you and you can concentrate on the real functionality of the application you want to develop.

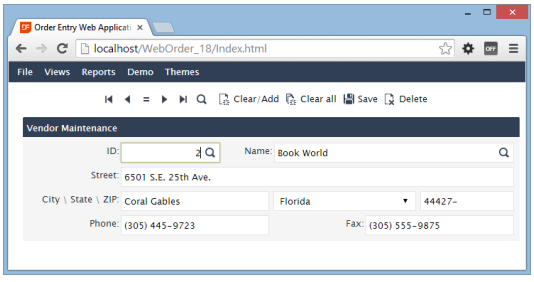
Workspace

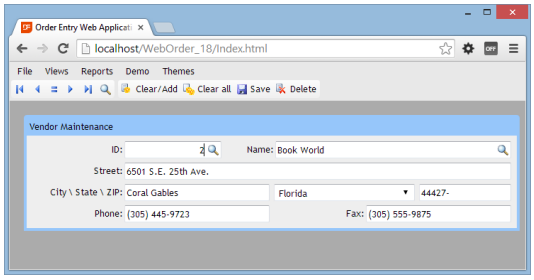
Before you start a web project, a new environment must be made on your PC, and this is a "workspace". A workspace is a set of folders in which the database, source-code and such are stored. A workspace can only have one web project. This project will be compiled into a program or 'executable'. The workspace and project information is viewed from within the DataFlex Studio through the Workspace Explorer. You can also see a workspace's directory structure in the Configure Workspace Properties dialog.

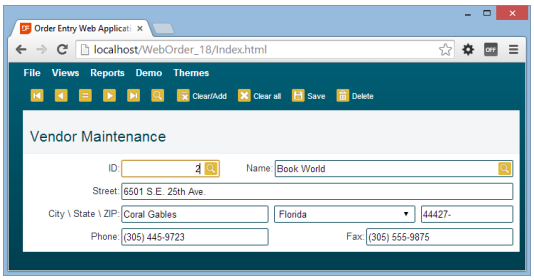
Themes

The Framework is highly CSS (Cascading Style Sheet) based for the layout. Switching – even live – to a different theme changes the visual look and feel of the application but requires no code changes. The framework installs four different themes with the Df_Web_Creme as the default theme for web application development. Take a look at one of the four themes in the WebOrder example. There is even a Windows alike theme available. In this introduction guide we won't go in CSS itself, that is more an expert level feature.









Database

DataFlex can work with any popular database management system. For instance, the combination of DataFlex Personal and Microsoft SQL Express is very powerful. DataFlex comes with the necessary database drivers, but for our introduction we will limit ourselves to the embedded DataFlex database. Databases are maintained in the DataFlex Studio. The Studio allows for the creation of tables, the definition of business rules and custom coding.

At a later date, you can easily convert the tables in the native database to any other supported database backend. You may use the available DataFlex tools to automatically perform the conversion of existing data as well as table structures.

Data Dictionary

When entering data, you want to have the most accurate and consistent information stored in your database. Before saving records, the entered data needs to be validated. Examples of such validations are that a State should be uppercase, or a customer may not order more than his credit-limit's amount. Those validations are referred to as 'Business Rules'. It makes sense to store these rules in one central place and this is what we call 'Data Dictionaries'. The advantage is that the rules will be applied to all applications that use data dictionaries and when a change in rules has to be programmed; the change only has to be made in one place. It also means that if you were to migrate the application to another database platform, the same business rules are automatically applied no matter what database backend is used. Data dictionaries are created and maintained via the Data Dictionary Modeler in the Studio.

Our Example Scenario: Media

We will build a small database application that we will call Media. We will create a table Media in which we store all our CD's, DVD's, Books etc. Next, we will make a table named People to store the names of friends and relatives. These two tables will be linked to each other in such a way that you can keep track of each media's location: Do you still have it yourself, or have you lent it to a friend? In short, we will take you through the following steps:

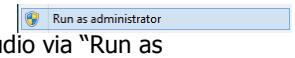
- Create a project named Media.
  All components in a workspace must be created while this project is active.
- Create a table named People.
  The table needs a unique key and columns to store address, phone-number, date of birth, etc. of a Person.
- Create the Person Data Entry Web View using the Data Entry Wizard to enter data into the People table.
  A web view is a web page to enter data.
- Compile the program and test our first results.
- Create a table named 'Media'. This will have a unique key and a few columns to store Author (/Artist/Writer), the media type and maybe the price and purchase date. In the table we also store the PeopleID, to be able to relate to the Person table.
- Manually, by using drag & drop, create a view to enter data into Media.

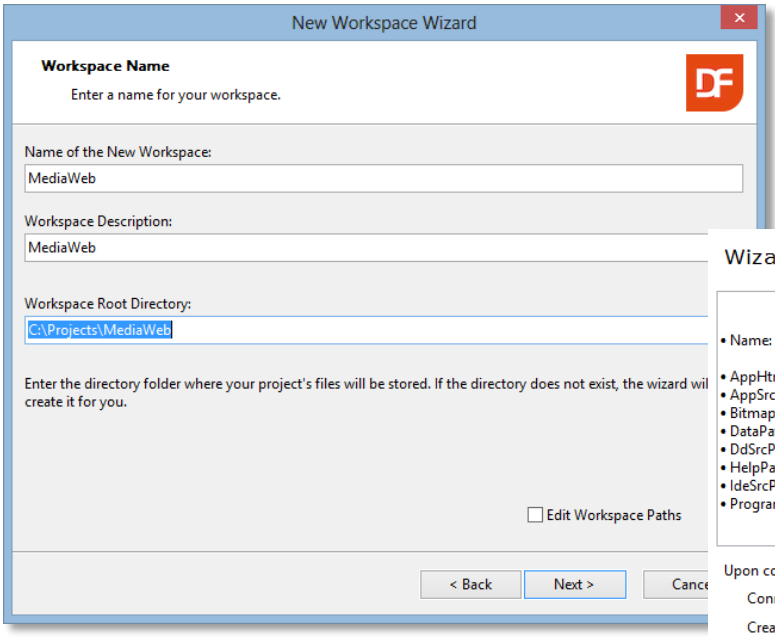
- After that, we will build in some more advanced features:
  - Make sure that the Media- and People ID's are automatically generated sequential numbers.

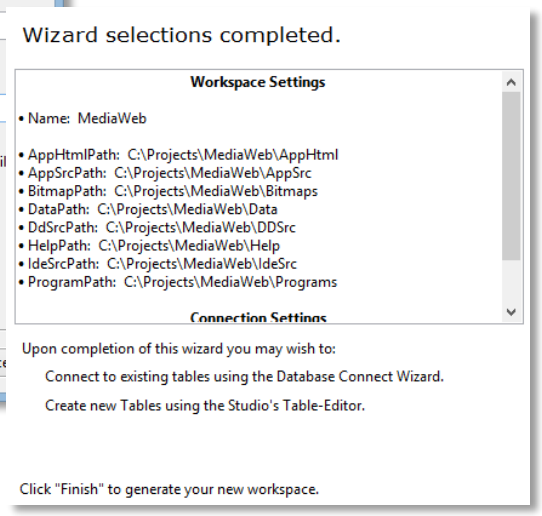
- Put user-friendly pop-up lists (selection lists) in the application to easily and quickly find records in Media and People.
- Ensure consistent format of the way the column Media.Type is entered. We will create a combo box for it and make sure the user always enters the types in a consistent manner.
- Enable the user to store a picture with Media.
- Create a picture browser
- Create a module to view which People own/borrowed what Media.
- Create a module to search with wild cards.
- Create a Visual Report Writer report and integrate the report in the project.

Getting Started!

Start the DataFlex Studio. If you use Windows Vista, Windows 7 or Windows 8 please start the Studio via "Run as administrator". This is available via a right mouse click on the menu option. Once the first steps are taken a normal start is enough. We will start by creating a new workspace. From the File menu, choose New Workspace… Give the workspace a name - in our example, we will name it MediaWeb and store it under C:\Projects\MediaWeb. The folder should allow web shares and Windows has strict rules about the location.







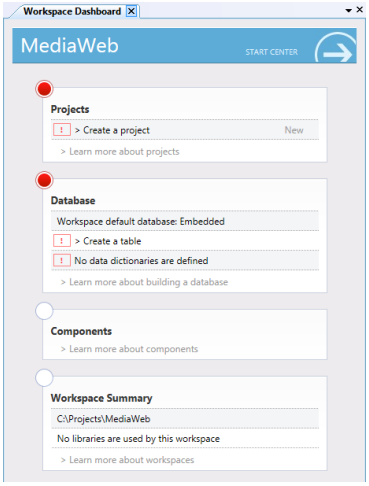
After clicking the Next button accept all defaults in the Database Type wizard page as we use the embedded database.

Prior to closing the wizard you will see a summary of the gathered information and what to do next.

The wizard creates the folders for the Media workspace and returns to the Studio so that you take the next steps.

Note: Workspace information can be altered later via the DataFlex Studio and – if folder renaming is desired – the Windows Explorer.

The Dashboard



After the workspace has been created the DataFlex Studio will open the workspace dashboard. The dashboard is feature that guides you through the application development. The dashboard gathers information from the workspace and shows where you might want to pay attention to. A red colored marker indicates a required action, a yellow colored marker indicates that you need to pay attention to this group of items.

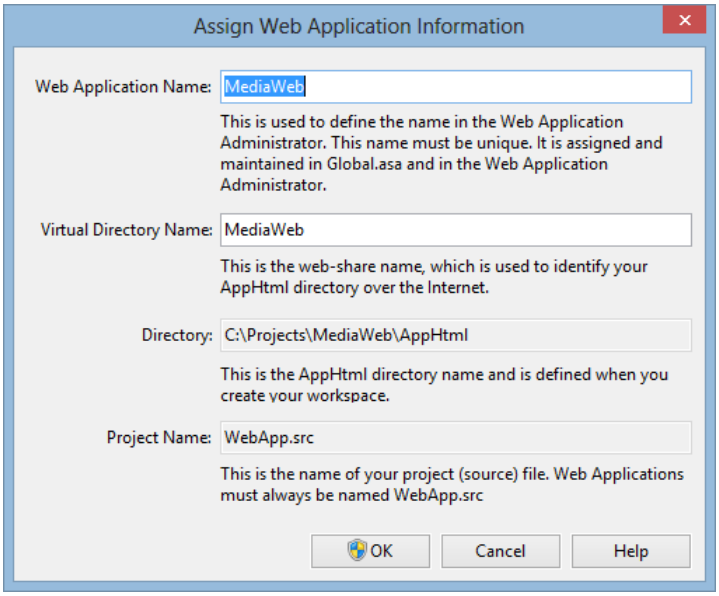
The dashboard as shown here says that the next step is either the table or project creation. We will first create the project.

Tip: *Keep the dashboard open and notice that it will automatically update during the whole process of application development.*

Tip: *At any time in the project development you can add TODO markers which are picked up by the dashboard, this means you can use the dashboard as a project management tool.*

Create the Web Project

The next step is to create a project. For almost everything we create in the Studio we need an active project. There are several ways in the Studio from which you can create a project. For now click the option in the dashboard. Alternatively you can also create a new project via the File pull-down menu, option New, and Project.



This will open a dialog in which we select "Web Project", usually the third option in the set of icons. This choice displays a dialog where you then enter the name of the application and virtual directory. The default names values are identical to the workspace name. These names must be unique on the same machine. The virtual directory name is an attribute from Microsoft IIS and is used for the URL. Later you will see a URL http://localhost/MediaWeb and IIS uses the MediaWeb part of the name to find the web application.

The directory name cannot be changed here. If you would like a different folder name you should have indicated this in the new workspace wizard. The default will be good enough to work.

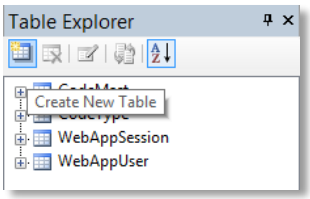
A workspace can only have one web application and to make it easy the Studio uses the name webapp.src which cannot be changed here.

Click OK now, you will see a progress panel showing files being copied. Finally the file WebApp.Src is created on disk and MediaWeb is made the current project. The project file contains two main objects one being a cWebApp containing a menu structure. We can already press the F5 key to run the application but we better first focus on the creation of a table in which we will store the data.

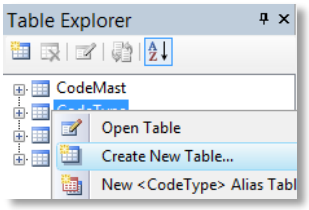
Note: *It is the creation of the web application that requires you to start the Studio as Administrator. From here on, now that the application is created, it is no longer required.*

Create the People Table

The next step in the process is to create one or more tables. Tables can be created via the Table Explorer. As usual there are several ways to come to the point to start the table creation. Make sure you have the Table Explorer window open. If Table Explorer is not opened – by default you will find this window on the left hand side of the screen, grouped together with Code Explorer – you can activate it via the View pull-down menu, Table Explorer option or the button positioned in the views toolbar.



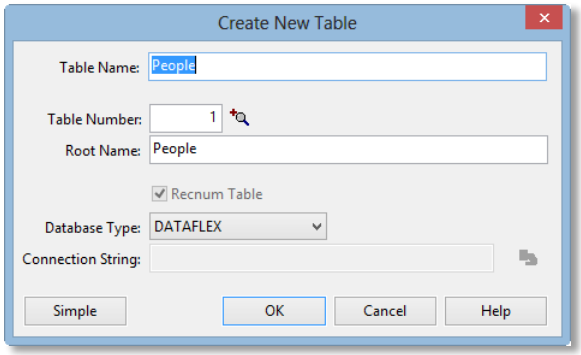
The Table Explorer panel consists of a tool-bar and a list (tree-view) which shows the tables already present in your workspace. The names of the tables present are read from a file called filelist. This file will be automatically maintained for you.



The buttons above the list can be used to create, drop or open a table for modification. The same functionality can also be found in the floating menu that can be opened with a right mouse click in the Table Explorer window.

In the floating menu you will notice a couple of data dictionary options. We will discuss the use of the data dictionaries later.

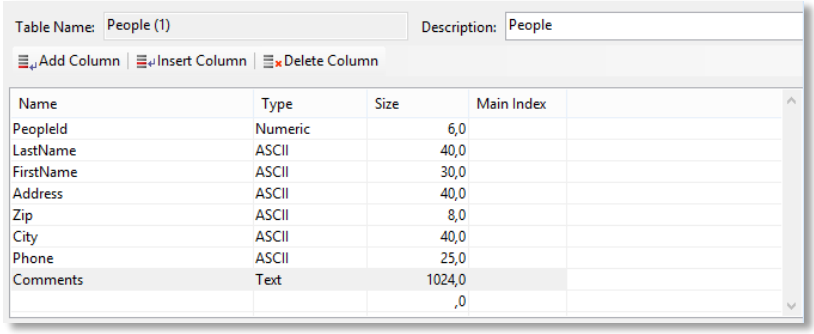
So click the "Create New Table" button (first button) or choose the "Create New Table" option from the floating menu.



In the dialog you should enter the name of the table – People – in two of the input fields (labeled Table Name and Root Name). The other parts of the dialog – including the button labeled "Simple" – are not important at this moment, they are for more advanced use.

Pressing the OK button will instruct the DataFlex Studio to open a Table Editor for the new table we are creating. The information on the Table Editor pane is divided in a Columns, Indexes and Relationships area.

The column information is editable via a grid in which you can specify the names of the columns and their type, length and main index. Create the table to match the following screenshot.



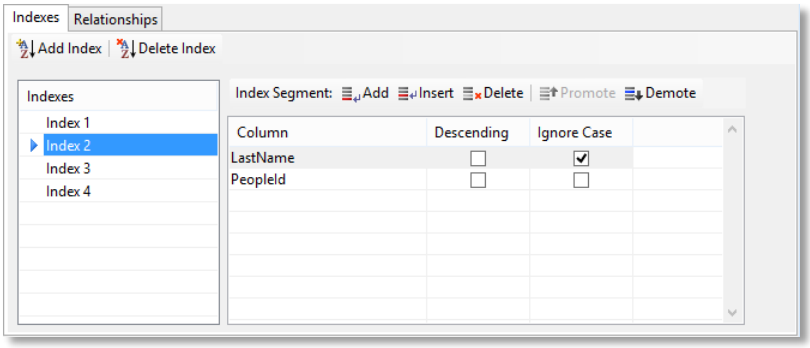
Name	Type	Size	Main Index
PeopleId	Numeric	6,0	
LastName	ASCII	40,0	
FirstName	ASCII	30,0	
Address	ASCII	40,0	
Zip	ASCII	8,0	
City	ASCII	40,0	
Phone	ASCII	25,0	
Comments	Text	1024,0	
		,0	

If you would like to, enter more columns; you might want to store the size of their shoes, their hobbies or an e-mail address. Feel free to do so. The quick introduction assumes you have created the shown columns of the given type and size. The column PeopleId is a key-field and each People record can be identified by this.

In order to look up records, we will create a couple of indexes. Let's suppose we want to allow to search by LastName, FirstName and Zip. We need to create an index for each one of them and each index need to be unique in itself.

The picture shows that the second index consists of two segments: LastName and PeopleID, the latter making the index unique. Also notice that the checkbox Ignore Case is checked. This means that when a user searches on "Johnson" the order in which it is found is not dependent on whether it is typed as "JOHNSON", "johnson" or "Johnson".

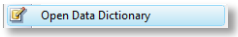
The tab has two toolbars. One - with the buttons "Add Index" and "Delete Index" – and this works on the list of indexes making it possible for you to add or remove a complete index while the other toolbar works on the grid with index segments. With "promote" and "demote" the order of the index segments can be changed.



Save the table structure for the table People by pressing the Ctrl+S key-combination or click the save tool-bar button.

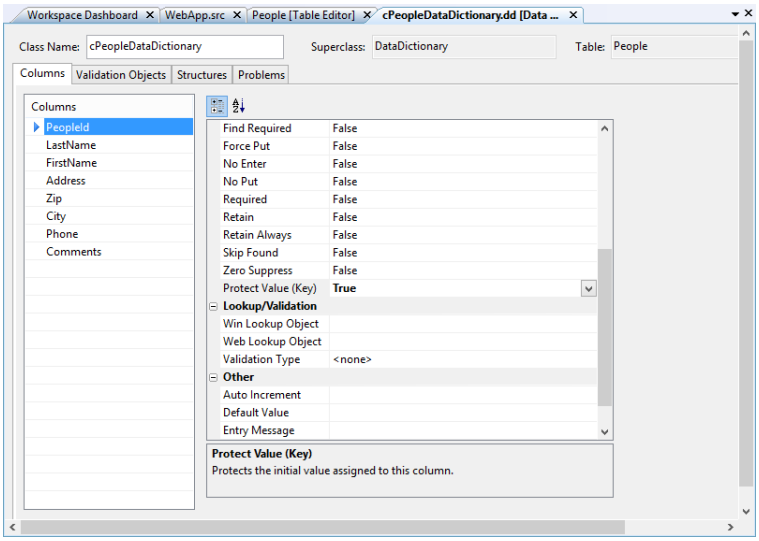
The Business Rules

When a column is marked as a key-field (Protect value attribute) the value cannot be changed after the record has been created. PeopleID is used to link the rows between the later to be created Media table and People table and for this reason we do not want to allow this value to be changed. To indicate that the PeopleId column is a key-field, we need to modify a setting in the data dictionary for the table People. While the data dictionary class is automatically created when we created the table, it is not opened for editing yet. To open the data dictionary, right click the table in the table editor and select "Open Data Dictionary" from the menu.



One new tab-page in the code editor part of the DataFlex Studio will open and the focus will be on the DD modeling tab.

Click the PeopleId column in the list of columns and find the option "Protect Value (Key)" in the list of properties as shown to the right. Change the value of this setting from **False** to **True** and we've finished setting the key field.



While we are on this screen we can also add a couple more Business Rules:

- Make sure that the column LastName is always entered – select LastName from the columns list and set its Required attribute to True.
- Make sure that the Zip and City are always stored in uppercase – the same for Zip and City, changing the Capslock attribute to True.

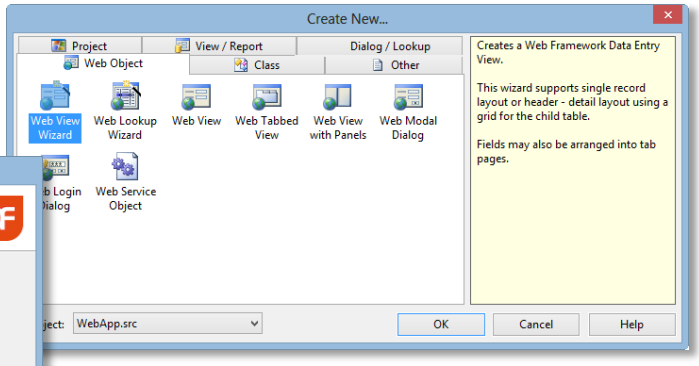
We need to save the table and data dictionary to disk. Either save each one independently, or use the Save all option. If you select the Save all option you also save changed source code which might be a good idea anyway. You may still undo the change after saving as it has no influence on the undo stack. On the other hand, closing a file would affect the stack and you may not undo all the changes.

DataFlex

Data Entry View

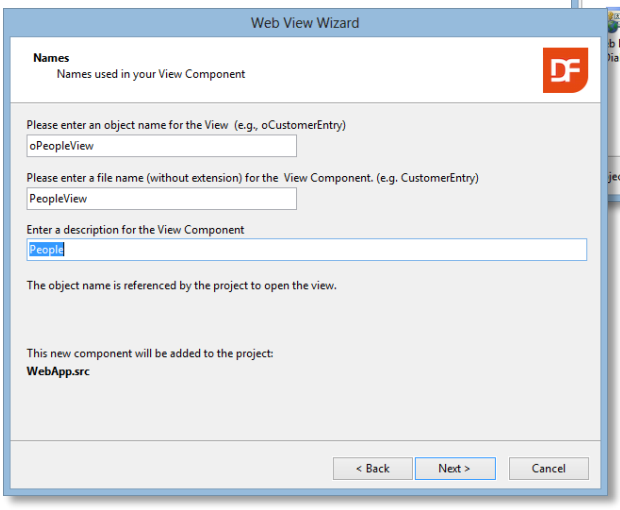
We can now create a data entry view and we will do so with the Web View Wizard. Again click on File, New and now Web Object and the panel shown to the right appears.

As you can see, there are a number of wizards and templates available. Choose the 'Web View Wizard' icon.

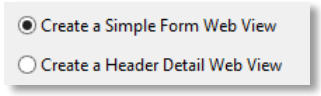


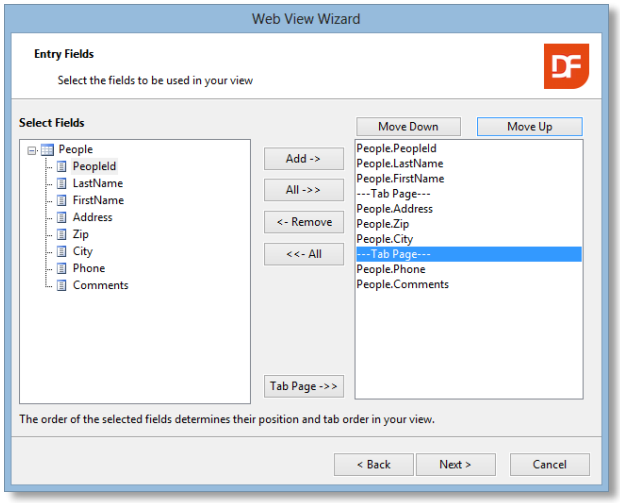
Enter the following information while processing the wizard:

- The object gets the name oPeopleView, the filename is PeopleView and the description People.



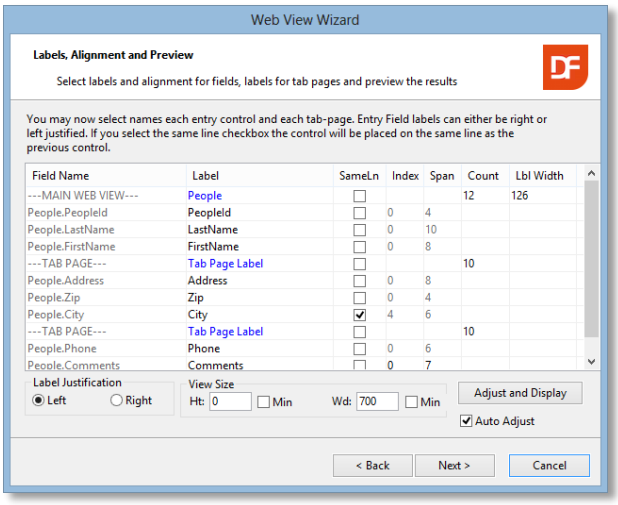
- Create a simple data entry web view. Choose Simple Form Web View.
- Choose the People table.





As shown, place all the columns on the View. By adding two Tab-pages, the wizard creates a web view with a better overview. The wizard page should look like as shown to the right.

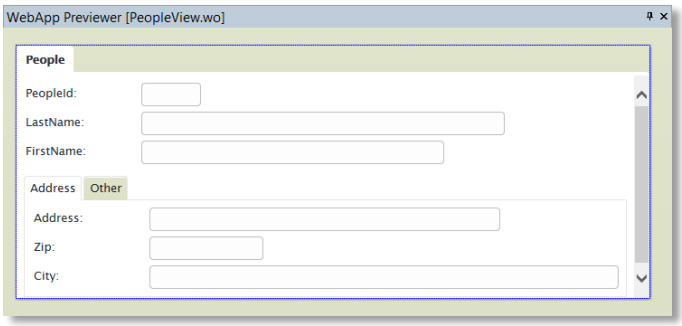
On the next wizard page you can indicate whether you want to see the labels aligned left (always placed on the left hand side of the controls) or right and change the text of each label. The labels for the tab-pages should be changed.



You can click the button labeled "Adjust and Display" to see what your web data entry view would look like. Web controls are laid out in a column based structure. The number of columns (automatic or self calculated) determine the width of an input control and the amount of controls that can be placed on a horizontal line. All the settings can be changed later after the wizard finished the web component. We recommend using the default values at this moment.

Click Next and Finish the wizard which will bring you back to the Studio. In the Studio, the result of the wizard will be loaded automatically. You will see the source code.

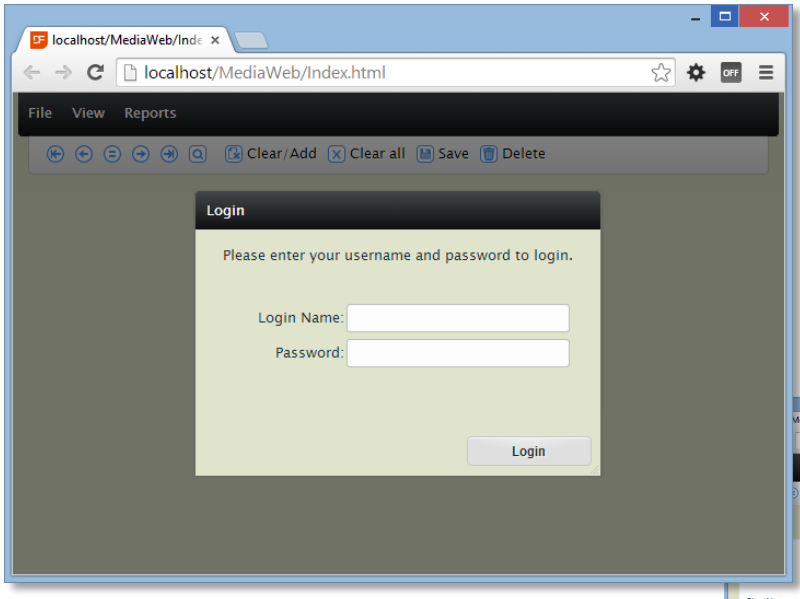
Press F7 to view the layout in a preview panel. By changing object properties you can change the layout, change labels and more. The object properties are displayed in a panel that can be activated by pressing the Ctrl+2 key-combination (or via the menu-item View, Properties). If you did not change the labels of the tab-pages, now is a good moment to change it. To do this:



- Expand the object structure in the code explorer panel .
- Locate the oPage1 object.
- Switch to the properties panel.
- Locate the psCaption property.
- Change the text of the first tab-page to "Address".
- Do the same – different label value – for the second tab-page.

You are now ready to test your first DataFlex Web application. To do so, the project needs to be compiled. Based on the generated source-code, the compiler will make an executable (webapp.exe). After compilation the application can be started. The testing can be started in different ways:

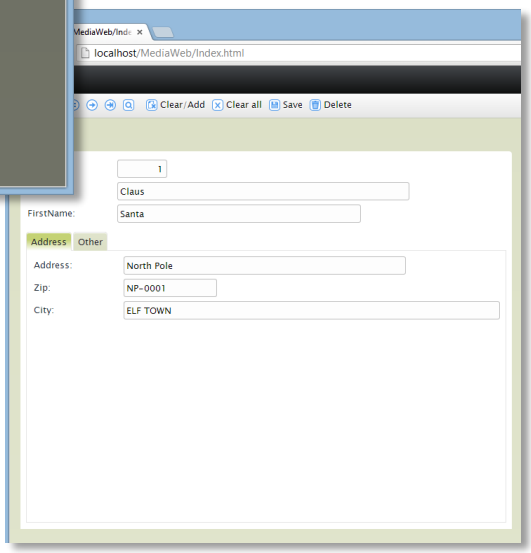
1. Press F8 to only compile.
2. Press F5 to run. When compilation is needed, the compiler will be automatically launched.
3. Choose the Project pull-down and select Compile.
4. Click on the little blue triangle icon in the "debug" tool-bar.



If you selected option 2 or 4 and the compilation is finished, the application starts by opening or attaching to your preferred web browser.

The application starts with a login box in which you can enter "guest" for the login name and the password. We tell you more about the login soon.

Now bring up the People view (from the view pull-down) and enter some records. Notice the following:



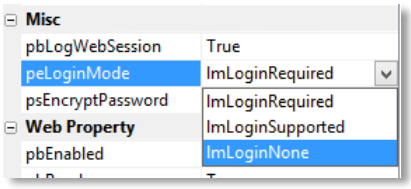
- Begin with the first record by using PeopleId '1'. The next is '2' and so on (more about this later).
- Save records by pressing the F2 key, or clicking the save icon on the tool-bar.
- Clearing the screen can be done by F5 (the record will not be deleted).

- Once you have entered multiple records, you can browse through them by using F7 (Previous) and F8 (Next). F7 and F8 work only if the cursor is placed in the columns PeopleID, LastName, FirstName or City. And that is makes sense: These were the columns that we defined indexes on.
- Key in a partial name in LastName and hit F9. This will find (equal) based on the given (partial) string. Try this!

Close the browser application to return to the Studio.

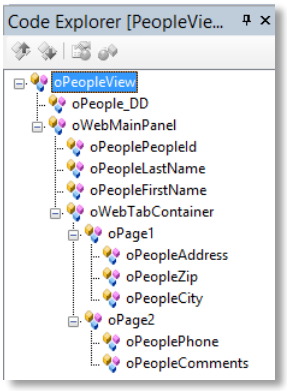
Note that sometimes closing the debugger does not close the run mode of the Studio. You can stop the running mode by clicking the stop button.

Login system

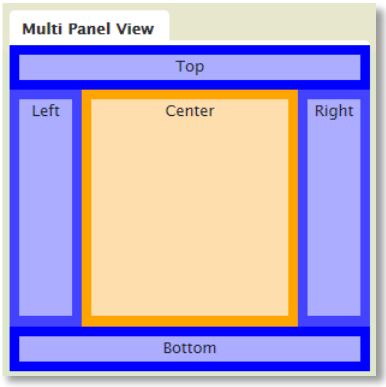


As you have seen in the preview chapter the application opens by showing a login screen. Each DataFlex web application contains a session management system consisting of a user and a session table. The session table is a requirement but the login is not. You might want to allow everyone to use the application, or offer special features after login under a different user account. During the development phase of the web application login can be turned off, to make testing easier. To do so make webapp.src the current tab-page in the DataFlex Studio and click on the oWebApp object in the code explorer. In the properties panel locate the peLoginMode property and change this from lmLoginRequired to lmLoginNone. The option lmLoginSupported is meant for applications that offer additional functionality after logging in.

Layout and positioning

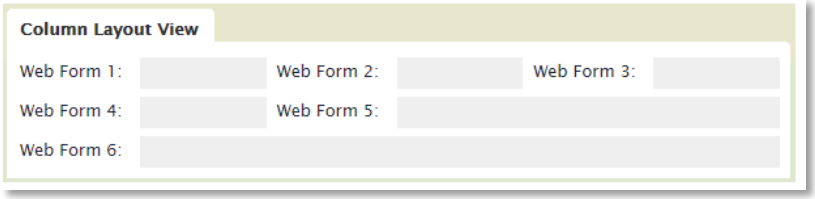


The DataFlex Web framework uses a column and panel layout system to divide the available space in the browser for positioning and sizing of the HTML objects. Let's take a look at the just created oPeopleView object in the code explorer window. Notice the view contains one panel (oWebMainPanel) which is divided into three input controls and a tab-container with two tab-pages. Each tab-page has a couple input controls.
Let's first focus on the panel. Each view – but also each panel – can be divided into a maximum of five panels. There can be one top, one bottom, one left, one right and one center panel. A property named peRegion determines if the panel is a center panel, a left, right, top or bottom panel. In the oPeopleView there is only one panel and it is a center panel.

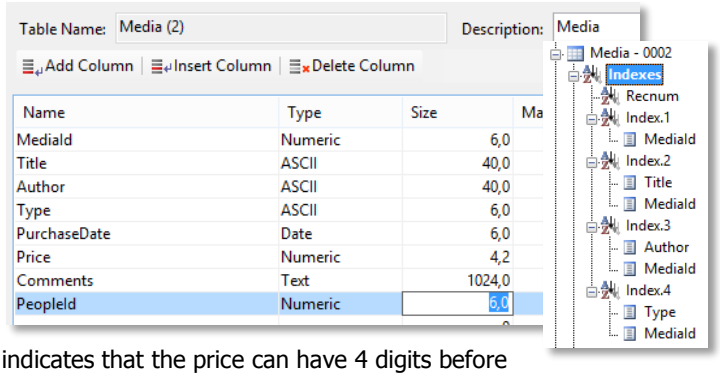


The creation order of the objects and their column index / span determine where the objects are positioned.

Each panel can be divided into columns often set to 12, making positioning reasonable easy. Each HTML object can start in one of the columns (piColumnIndex) and can span a number of columns (piColumnSpan). If piColumnSpan is set to 0 is tells the system to take all the columns defined in the panel. The first column is column 0. If you want to combine two objects at the same "line" they must divide the available number of columns of the panel amongst eachother. This does not need to be done evenly.



Media table

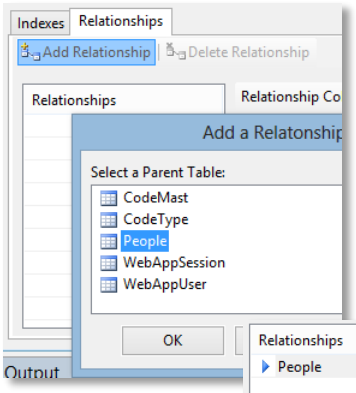


The creation of the table for the Media is the next step in our process. So click again the New Table button in Table Explorer. Enter the value "Media" for the table and the root names. Then create the columns as shown in the picture.
Note:

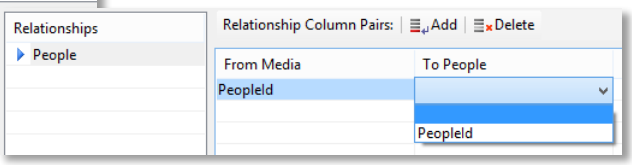
- In the column Type we want to keep track of if it's a CD, DVD, BOOK etc.
- The PurchaseDate is of the type Date.
- The Price is numeric with the 4.2 format. This indicates that the price can have 4 digits before and two after the decimal point.
- The column PeopleID will be used in the relation with the People table. We will, therefore, ensure that it is of the same type (numeric) and same size (6 digits) as the column in the other table.

MediaID will be the key field. Besides that, create indexes on Title, Author and Type. To make them unique, we add MediaID as last segment of each index. We also choose to switch on the Case Insensitive option.

Tip: *Until now we have explained that an index is there to quickly and easily find a record. Indexes have another important function, which is fast sorting in reports. It is not difficult to create more indexes at a later time if you need this for certain reports.*



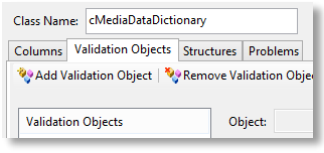
The Media table will contain records of our media in the possession of a certain person. In technical terms this means there is a relationship between the tables Media and People. Therefore, let us create the relationship between the two tables. Choose the tab-page named Relationships and choose the first tool-bar button (Add relationship). A dialog with tables pops up and you should select the table People from this list. Relationships are almost always defined from many to one, so in this case, from Media to People.



The selection of the parent table opens the option to specify from which child column(s) to which parent column(s) the relationship is made. The type and length of the related columns must match and the parent column (usually the key-field) must be uniquely indexed. The current table layout meets these criteria.

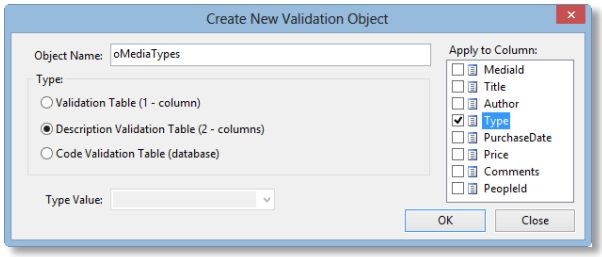
The Business Rules for the Media table

Finally, we will add some more Business Rules in the Data Dictionary. For this, the table needs to be saved first. The MediaID column will be a Key Field and the Title column is required. You should be able to do this with the guidelines given with the People data dictionary.

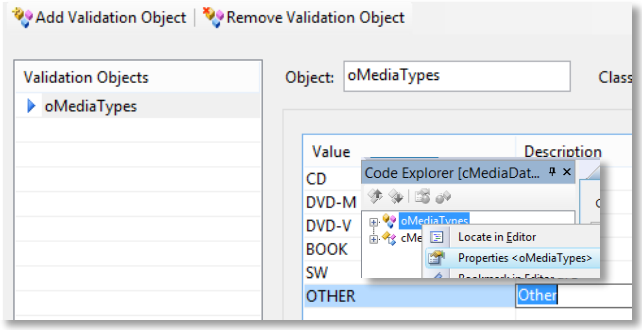


The values for Type should always be entered in uppercase (the Capslock attribute needs to be selected), but let's add something extra. We want the user to use consistent naming when entering Media Types. If it is a CD-Rom, its Type should be entered as 'CD'. If it's a book, it should always be entered as 'BOOK'. If such details were not entered consistently, think about how difficult it would be to make a selection ('Show me all books') when making a report. Therefore we will make a simple validation table on the column Type. You do this via the Validation Objects tab-page. Click the "Add Validation Object" button select the

'Type' column under 'Apply to Column' and 'Description Validation Table' for the type. Enter 'oMediaTypes' for the object name. Object names at this level need to have a unique name.



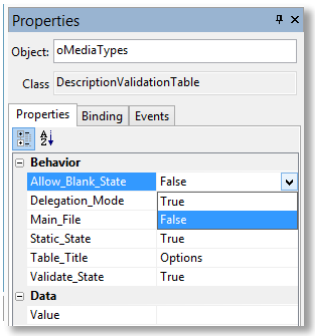
After you clicked the OK button you can start entering values

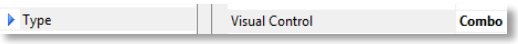


for the table. We suggest you enter the values as shown.

Feel free to add more optional Types.

Via the Allow_Blank_State property of the oMediaTypes validation table you can indicate whether the value may be left blank or not. If the value is not set to True the user must select a value from the list when creating or editing a record. Make your own choice.



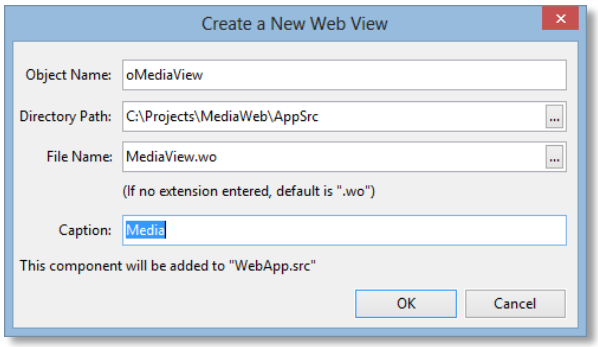


To get a list of the media types in any web view to be constructed you have to change the visual control of the Type column in the Media data dictionary class.

Tip: *It is of no importance at this time, but open the tab-page called Structures where you can see that the People table obviously is added to the structure with Media. This is a hint that validations do not only apply to single tables; related tables are also validated.*

Creating the Media Data Entry View

The second view will be the Media Data Entry View. This time the wizard will not be used to create a data entry View. This means you will learn how to make a data entry view in a more manual way. From the menu under File, choose New, Web Object, but now click on the third icon: Web View.



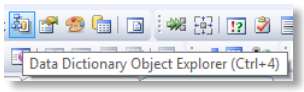
After that, enter "oMediaView" for the object name and the file on disk will be named MediaView.wo.

Tip: The dialog shows that the component will be added to the project WebApp.Src. it will also be placed in the menu of the application automatically.

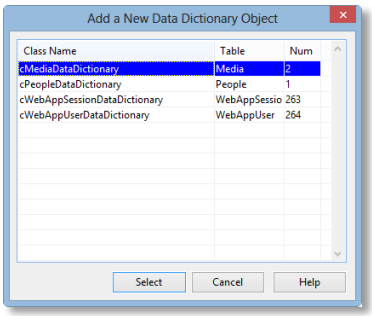
A new concept: Data Awareness

Before we continue, let's explain a new concept: **Data Awareness**. DataFlex is a tool to build database applications. After the first sample we saw that it takes a View (interface) to enter data into the database. The several components in the interface are apparently coupled to the underlying columns in the tables. That's right, that's exactly what happened. But in fact there is an extra layer in between; the Data Dictionaries. DataFlex knows different types of components. An important difference is whether components are 'data aware', or not. If they are, you only have to assign Data Dictionary objects (DDO's) to it in order to have the desired data (tables) at your disposal. Data aware web controls make use of data binding usually via an Entry_Item statement.

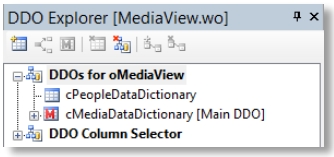
To continue. You are now looking at a very basic cWebView in the Studio that contains a container and a dummy input control and some comment. The first thing we need to do is to decide which tables we want to maintain in this View. In the menu, under View, open DDO Explorer (or Ctrl+4). In DDO Explorer no tables are selected yet. Adding a DDO is done via clicking the "Add DDO" button. You can do the same from the floating menu (right click on "DDOs for..").



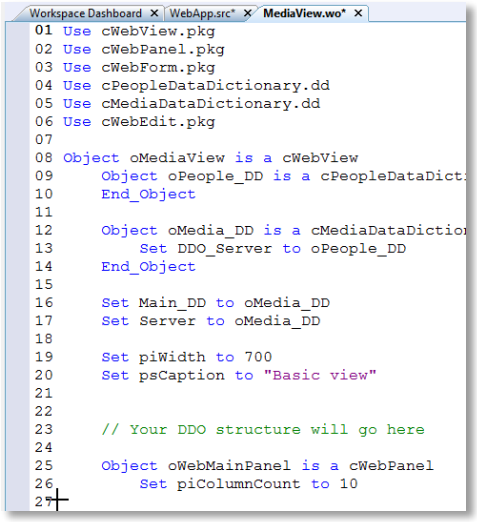
In the dialog that opens you have to select the right data dictionary for this new view. Since we want to edit (create, modify, delete) the table Media, select the cMediaDataDictionary class (highlighted in the picture).

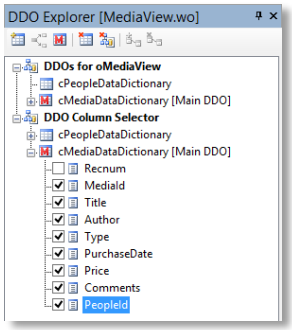


The Studio automatically makes the DDO for the Media table the main DDO and because Media has a relationship to a parent table (People), the DDO for that table will also be automatically added. When the choices are not correct, you can change these via the floating menu on each of the DDOs and apply the change. In our example this is now correct, so no action needed.



In the DDO Column Selector select all columns of Media (fill in all but the Recnum checkboxes) and drag them onto the view source code.

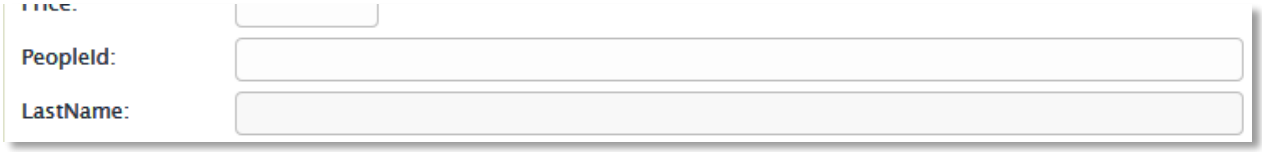




Insert them – as shown – inside the panel object just under "Set piColumnCount".

Similarly, drag & drop the column LastName from cPeopleDataDictionary onto the source just after the "PeopleId" cWebForm object just created during the first drag & drop.

Press the F7 key and take a look at the preview window opened.



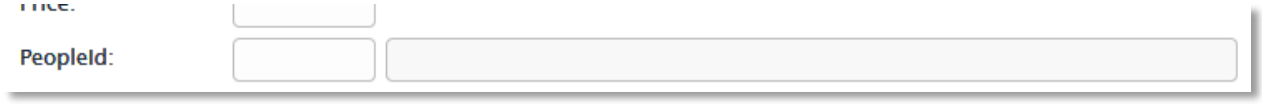
Wouldn't it be better if the People LastName input field could be positioned after the PeopleId input field, instead of underneath it? Yes, of course. You can do this if you understand the layout system a bit. Each container is divided into columns (also indicated in the data entry wizard). The default number of columns for a container is 12. An input like the PeopleId does not need 12 columns or the full width of the cWebView and that "line" can be shared with other controls, such as our "LastName" control.

To change this:

- Click in the code explorer, locate the oMedia_PeopleId object and switch to the properties panel
  - Change the piColumnSpan property to 3.
- Now click in the code explorer again on the oPeople_LastName object and switch again to the properties panel

- change the piColumnSpan to 8.
- Change the piColumnIndex to 3 (yes, right, the same value as the piColumnSpan of the oMedia_PeopleId object).

- To make it more attracting remove label of the oPeople_LastName object by setting the pbShowLabel to false. The distance between the two controls on the same "line" will be adjusted and it looks more "nice".

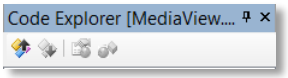


To see what the application looks like after it's compiled and started you click the run button or press F5.

The new data entry view is labeled as specified in the create webview dialog (e.g. "Media") in the menu system. Enter a couple of media records. Let the Media ID start at '1' and choose the Person related to it by browsing through the Person records with F7 and F8. Do this while the cursor sits in the PeopleId input field. Once you have created a few Media records, use F7 and F8 to browse through the data.

You might want to reduce the width of the MediaId, PurchaseDate and Price input controls (as shown above). To do this; change the piColumnSpan from 0 of these objects (which means use all there is) to 3 or 4. Use the code explorer to focus the object, use the properties panel to change the properties.

More space for the Comments



It would make sense to give the comments input control more vertical space and therefor switch the location of the oMedia_PeopleId / oPeople_LastName controls in the object order with the oMedia_Comments object. This can be done directly in the source code but you can also do this via the code explorer. Locate the object oMedia_Comments and press Alt+DownArrow) twice. The first time it will move between oMedia_PeopleId and oPeople_LastName and the second time it will move the end. The object order change can also be done via the buttons in the tool-bar of the code explorer or via a menu choice in the floating menu of the code explorer panel. It is quite typical for Windows programs to offer the same functionality multiple times.

Finally, to give more space to the Comments, locate the property pbFillHeight of the oMedia_Comments object and set this to true. This means that this object takes up the vertical space left between the previous object and the bottom of its container. Each container can have multiple objects with the pbFillHeight set to true but it is better to limit this.

Displaying LastName and FirstName combined

```
Object oPeople_LastName is a cWebForm
    Set piColumnSpan to 8
    Set piColumnIndex to 3
    Set pbEnabled to False
    Set psLabel to "LastName:"
    Set pbShowLabel to False

    Procedure OnSetCalculatedValue String ByRef sValue
        Forward Send OnSetCalculatedValue (&sValue)
        Move (People.LastName - ',' * People.FirstName) to sValue
    End_Procedure
End_Object
```

The cWebForm created when adding the LastName control in the view can be easily modified to show both the LastName and FirstName values. For this select the oPeople_LastName object in the code explorer and then activate the properties panel (Ctrl+2). On the tab-page named "Events" double click the OnSetCalculatedValue event and see it is being inserted in the source code. Now add "Move (People.LastName - ',' * People.FirstName) to sValue" in the procedure (it does not matter where as long as it is between "Procedure" and "End_Procedure" and that it is a full line of source code.

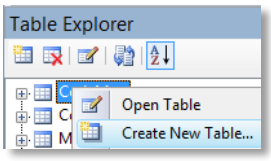
Because it makes no sense that a user can enter a value in a display control the pbEnabled property needs to be set to false.

```
Set piWidth to 1000
Set piMinWidth to 1000
Set psCaption to "Media"

Set phoDefaultView to Self

Object oWebMainPanel is a cWebPanel
```

Make the Media view the default view

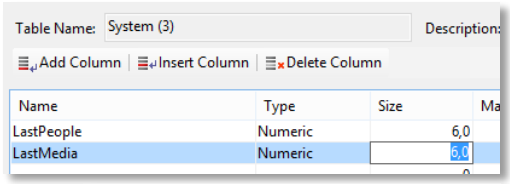
If you feel the Media view is your main view which should be opened automatically after starting the application you can do this by adding "Set phoDefaultView to Self" to the code of the oMediaView object. Place it between the psCaption and the first cWebPanel object.

Automatically Generate Key Fields

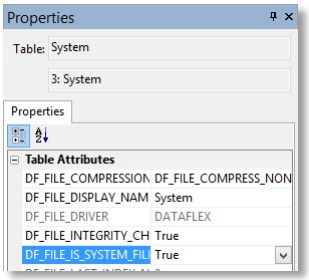


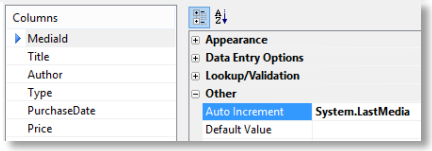
For People as well as Media we defined unique, numeric keys. This number stored in those key fields is in fact not relevant to the user. In addition, it would be troublesome for users to remember what the last given number was when they try to create a new Media or Person record. This can easily be taken care of; it only takes two steps:

1. Create an extra table. In this table we will always store only one (1) record. This is called a system table. In this table we define two columns only: LastPeople and LastMedia. These columns are numeric, 6 digits.
2. The Data Dictionaries of Media and People will take care of generating these ID's automatically, using the system-file.

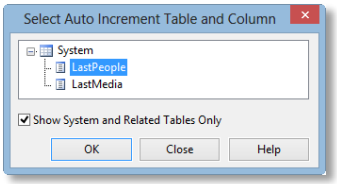


To make sure it actually becomes a system-file, select True for the table attribute DF_FILE_IS_SYSTEM_FILE.



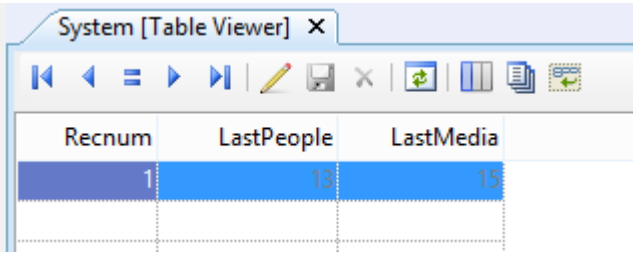


We want the Data Dictionaries to automatically increment the ID each time a new record is saved. Open the data dictionaries for the tables People and Media in the Studio. Look for the attribute Auto Increment (grouped under Other) in the list of properties for the columns PeopleID (in People) and MediaID (in Media) and click the prompt button. From the list of tables, select System and from the columns the correct source data column – those are LastPeople for PeopleID and LastMedia for MediaID.



Note: The value can be taken from a system table or a parent table. That is why you see the checkbox labeled "Show System and Related Tables Only".

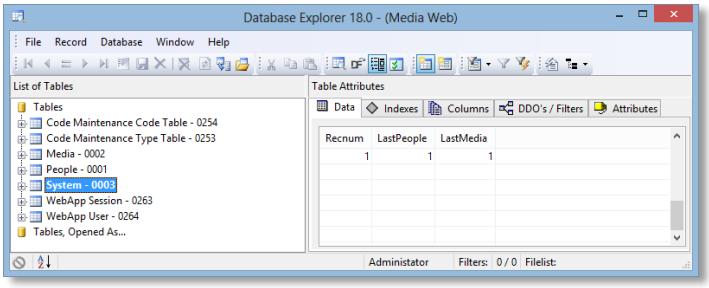
Ok. This should work, if not it is because you have already created some records, with ID's 1, 2, 3 etc. The first time we will use our automated increment function it will try save a record with ID of '1' and that won't work because that value already exists. ID's should always be unique – it is a key field! Our new application can't save any new records. We could delete our existing records, but there's another way to solve this. Right click the "System" table in the table explorer and choose "View Table". The contents of the table is opened in a tab-page in the design area of the Studio.



Let's assume that the last ID you have entered was 10. Then enter the value 10 for both the LastPeople and LastMedia. Next time a record is created, the IDs will be automatically set to 11.

As an alternative you can do the same – and more – via another useful tool from the Studio Tools menu: Database Explorer.

Database Explorer (often called DBExplorer) provides a quick means to directly edit data in tables. It is a typical tool for developers, but be careful if you use it as it bypasses any safety or validations you have built into your applications.



The first thing we have to do is to make it possible to change data. By default, Database Explorer is configured in its most secure mode which is set to

only allow us to read data. Therefore, click on the little icon at the very bottom-left. Change it from a red colored icon to a gray colored one. This is a one-time change; if you want to allow the read-write operation each time you open a table; open the configuration dialog and Flags, Table change the checkbox setting for "Open/Set Tables Readonly".

Data Dictionary changes

Before we compile and test our application, let's make a couple more improvements. Therefor open the Media and People data dictionaries if they are not already open.

Set the Auto Find EQ attribute In the Media data dictionary for the column MediaId to true. Do the same for PeopleId in the People data dictionary.

Locate the Status Help attribute and enter some status help text for some columns. You will see this appearing as tool-tip in the web pages. Use your own imagination.

Select the PhoneNumber in the People data dictionary and change the Capslock attribute to true. If you enter a phone number like 0800-CALLSANTA the characters will display uppercased.

Summary

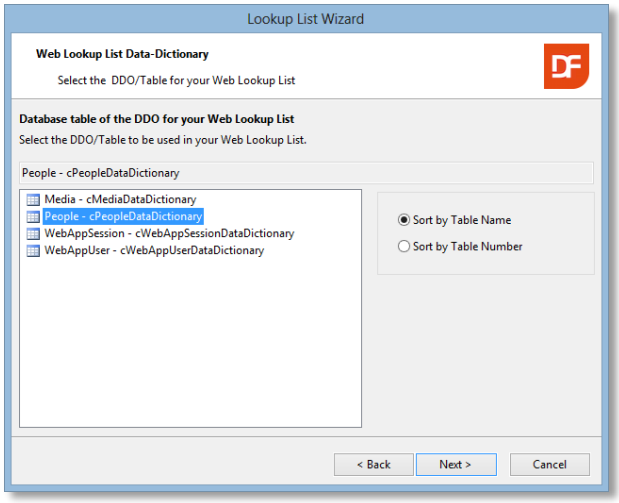
We have made the following improvements:

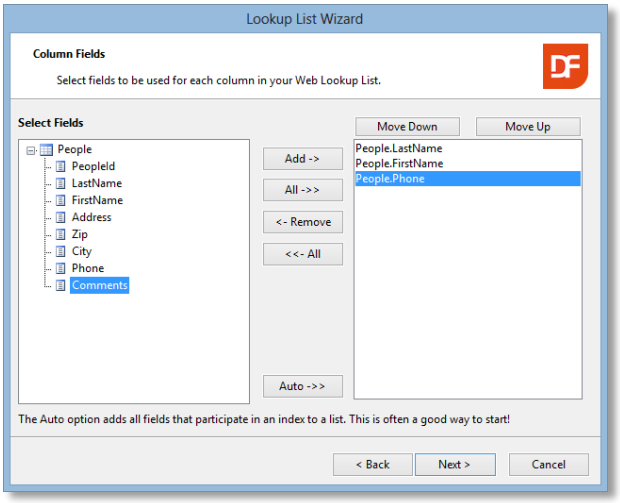
- The ID's for People and Media are automatically serialized/incremented.
- Filling in an existing ID at Media, followed by pressing the Tab will automatically find the Media that goes with that ID, this is what Autofind EQ does. It makes sense to make the same change on ID for People.
- Entering data for Media Types now makes much more sense. Always uppercase, in a combo-box, which is the appropriate visual control for this type of data-entry.
- Setting the Appearance of Media.Type in the data dictionary to Combo-box, this column will always be displayed as a combo box by default.
- Help will be displayed for some items in the form of a tool-tip.

Selection Lists

We can make more improvements: If there are only a few records in the tables, it is not a problem to find the right data using F7 and F8, but when the tables grow, we must offer a better way for finding the right records, so we will add look-up lists, also known as Selection Lists.

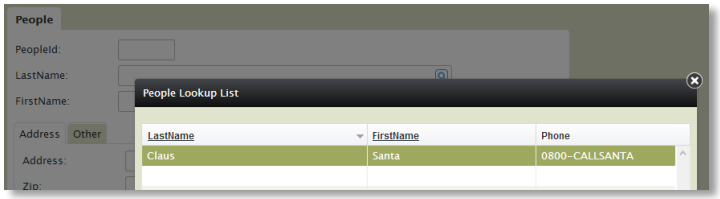
From the File menu in Studio, choose New, Web Object and start-up the Web Lookup Wizard (usually the 2nd icon).





Let's first make a selection list for People, in which we place LastName, FirstName and Phone (number). Accept the defaults for the other wizard pages. Finish the wizard and compile/run the program again (F5).

You can see that buttons (Prompt Buttons) are automatically added to LastName and Firstname.



Clicking on the prompt button (or pressing F4) brings the just created selection list to the screen, offering the following standard functionality:

- Depending on the column in which the cursor is, the sort order of the list changes accordingly.
- Simply start typing the desired LastName and a pop-up screen appears. Pressing Enter will take you to the closest record. Because we use indexes, finding records in a set of just a few records will be as fast as when searching a record in a set of a few million!

Now it should be easy to create a selection list for the Media table. Maybe you want to try another way instead of using the wizard; by drag & drop. In that case, here are some tips: Choose File, New, Web Object: Web Modal Dialog. Enter "oMediaLookup" as the object name. The dialog contains two panel objects. In the top panel we will create our prompt list object. Find the cWebPromptList entry in the class palette (WebApp Controls Group) and drag in source code inside the oMainPanel object. Remove the first automatic inserted cWebColumn object. Change the caption title to "Select Media" (psCaption).

Use the DDO Selector to select the Media Data dictionary for the component. Drag the Title and Author from Media and LastName from People from the DDO Column Selector to the oWebPromptList object.

Now it becomes a bit trickier; you need to do some coding or copy, paste and change. The OK and CANCEL buttons from the template need to send their message to the oWebPromptList object. Therefore lookup the OnClick methods in the buttons and extend the "Send Ok" / "Send Cancel" lines with "of oWebPromptList". If you like to have a "Search" button you can copy the button from the People lookup component, adjust positioning of the three buttons and object reference.

```
Object oOkButton is a cWebButton
    Set psCaption to "OK"
    Set piColumnSpan to 1
    Set piColumnIndex to 3

    Procedure OnClick
        Send Ok of oWebPromptList
    End_Procedure

End_Object
```

In the bottom of the oMediaLookup object (cWebModalDialog class) you will find three methods and a lot of comments that need to be replaced with the following code:

```
Set pbServerOnShow to True
Procedure OnShow
    Send InitializePromptList of oWebPromptList
End_Procedure

Set pbServerOnSubmit to True
Procedure OnSubmit
    Send Ok of oWebPromptList
End_Procedure
```

One of the tasks automatically performed when using the Web Look up wizard is the connection of the lookup list with one or more columns from the table via the data dictionary. Since we did not use the wizard this time, we need to make these connections ourselves.

Open the Media data dictionary (if no longer opened), click the column(s) for which you want the oMediaLookup to appear and select the MediaLookup.wo file for the column property Web Lookup Object.

Once we've done this we can compile and run the application to see if we are happy with the results.

People lookup in Media View

If you look at the Media view it feels something is missing. There is a selection list for the Media but there is no selection list for the People record. To get that working, open the People data dictionary and select the PeopleId column. Now select the Web Lookup Object attribute and press the drop-down arrow. From the list select "oPeopleWebLookup" and save the data dictionary.

Compile and run the application and you can select a record from the People table via the selection list. One thing that is not working is the search button. To get this working the following code needs to be inserted in the oMedia_PeopleId object:

```
Procedure Prompt_Callback Integer hPrompt
    WebSet piInitialColumn of hPrompt to 0
End_Procedure
```

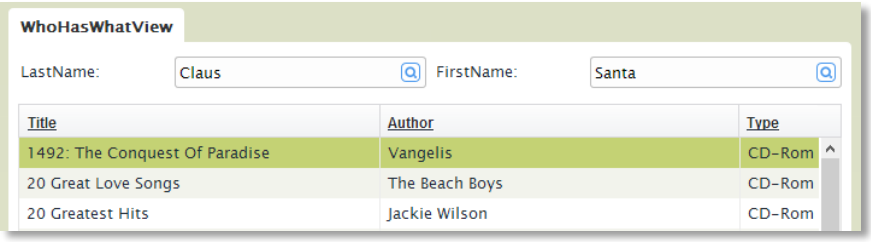
This event is fired when the selectionlist opens and you can use this to make run-time changes to settings that are normally design-time settings.

Show All Media Borrowed

Let's do something a bit more advanced. It is not so difficult to create a View where a user can browse through People and display in a grid all the Media that each person has borrowed. To browse through People and show only the appropriate Media, we need to create a view with a constraint, a filter.

Here is how you can do this:

- First we create a new index in the Media table containing the columns PeopleId, Title and MediaId. The new index is index number 5.
- Create a new web view using the Web View Wizard.
- Name the object oWhoHasWhatView.
- Use the "Header Detail Web View" option.
- Select the Media data dictionary in the child DDO page.
- Select the People data dictionary (there is only one class) in the header DDO page.
- Select LastName and FirstName as the header entry fields.
- Select Title, Author and Type for the detail entry fields.
- On the labels and alignment wizard page:
    - Deselect "Auto Adjust".
    - Change the "Span" value for LastName from 8 to 5 and for FirstName from 2 to 5.
    - Tick the "SameLn" checkbox for the FirstName.
    - Change "Index" to 5 for the FirstName.
- Finish the wizard and the source code loads.
- Find the oDetailGrid object in the source code and change the class from cWebGrid to cWebList. This will make the grid read-only.



Pictures

The very last enhancement we make to the application is to add pictures for the Media we catalog. Let's say that we want to store a picture with each Media record. First, we need to change the table:

- Open the Media table if not open, and add a column named Picture.

- Specify the type ASCII, and a length of 255. The actual picture will not be stored here. Each record will hold a reference to the picture file name.
- Open the Media view again in Studio.
- Insert a cWebPanel (drag from the Class palette) as sibling of the oWebMainPanel object. Name this object oWebPicturePanel (via properties panel or directly in the source code).
- If you currently have the WebApp Previewer panel opened you will see an error. It tells you that you can only have one "main" panel. To correct this change the peRegion property of the object to prRight. This will also divide the web view into two containers side-by-side.
- Set the width of this new container to 250. Normally you don't set the width of containers but in this case we want to make space for the picture.
- Change the width of the cWebView from 700 to 1000.
- Set piMinWidth to 1000.
- Drag the new picture field from the DDO Column Explorer to the oWebPicturePanel object.
- Change the name to oMedia_Picture_Hidden. Set the pbRender property of one of this object to false to really hide the object. This hidden object is needed to be able to store the filename of the picture in the record.
- Drag a cWebImage object from the class palette to the cWebPicturePanel object. Name this object oMedia_Picture. Hide the label of this object (pbShowLabel to false).

The cWebImage class is not data-aware and we need to do some coding to display and save a picture. Before we do that we need to decide where the pictures stored. The easiest way is to store them in the web-shared folder (or one of the sub-folders) but this means that the files can be accessed outside the application. That is not a big issue for the pictures of this Media application but if the data is more sensitive (employee photos, documents, reports etc.) it is important to store them at an alternative location. You don't want someone to just get the files via a browser. The cWebImage class supports displaying an image from a secure and a shared location.

Displaying the image needs to be done based on an event. When the user browses to a different Media record the application sends two messages that could be used to respond to. We could respond on OnPostFind in the DDO or Refresh in the cWebImage object. The advantage of the Refresh method is that the code is directly related to the image control.

```
Procedure Refresh Integer eMode
    Boolean bSynching
    String sPath

    Forward Send Refresh eMode

    Get AppSynching to bSynching
    If (not (bSynching)) Begin
        Move (ExtractFilePath (Media.Picture)) to sPath
        If (sPath <> "") Begin
            Send UpdateLocalImage Media.Picture
        End
        Else Begin
            WebSet psUrl to ("Images/" - Media.Picture)
        End
    End
End_Procedure
```

The above code checks if the stored image file name includes a path or not. If a path is stored the control creates a secure URL to avoid the file can be accessed outside the application environment and if no path is present the image is supposed to be in a sub-folder of the web-share folder named Images.

The AppSynching check avoid that the code is executed when the application synchronizes itself when the browser connects to the application server.

Selecting an image from disk is not as easy as the rest of the application development we did so far. Should an image be selected from available images or should a new image upload be supported. Selecting from existing files requires that we need to determine to what folders on the server we would like the application user get access. To make an image selector – it is good to practice this – you have to do the following:

- Create a new modal dialog (File, New, Web Object, Web Modal Dialog). Name the object oPictureSelector. The dialog is the same kind of dialog you had to create for a selection list.
- In the dialog you will find two cWebPanel objects; create a third cWebPanel object and set its peRegion to prRight. Set the width of this panel to 250 (same as in the oMediaView).
- Drop a cWebImage object in this panel and set its height (piHeight) to 250.
- Drop a cWebList object in the main panel and name it oFilesList. Rename the column object to oFileNameColumn and change the caption to "FileName".
- Change the height of the list by setting the pbFillHeight to true. It will now take all the height of the container (cWebPanel).
- Make the cWebList not data aware by setting the property pbDataAware to false.
- The data needs to be passed to the list via an event called OnManualLoadData; add this event to the list via the events tab-page in the object properties.
- The first parameter of the OnManualLoadData is the most important one; it is an array that needs to be filled with files from the disk. To read the files from a folder on disk you can make use of the Direct_Input command. Use the code below to fill the list.

```
Procedure ScanFolder tWebRow[] ByRef aFiles String sFolder Integer iChannel
    Integer iRow
    String sFileName

    Move (SizeOfArray (aFiles)) to iRow

    Direct_Input channel iChannel ("DIR:" - sFolder - "\*.*")
    While (not (SeqEof))
        Readln channel iChannel sFileName
        If (not (SeqEof) and (Left (sFileName, 1) <> '[')) Begin
            Get EncryptKey Of ghoWebResourceManager (sFolder - '\' - Trim (sFileName)) ;
                to aFiles[iRow].aCells[0].sValue
            Move (Trim (sFileName)) to aFiles[iRow].aCells[1].sValue
            Increment iRow
        End
    Loop
    Close_Input channel iChannel
End_Procedure

Procedure OnManualLoadData tWebRow[] ByRef aFiles String ByRef sCurrentRowID
    String sFolder
    Integer iChannel
    Handle hoWorkspace

    Move (Seq_New_Channel ()) to iChannel
    If (iChannel >= 0) Begin
        Get phoWorkspace of ghoApplication to hoWorkspace
        Get psHome of hoWorkspace to sFolder
        If (Right (sFolder, 1) <> "\") Begin
            Move (sFolder - "\") to sFolder
        End
        Move (sFolder - "Images") to sFolder
```

```
        Send ScanFolder (&aFiles) sFolder iChannel

        // Now images in apphtml path
        Get psAppHtmlPath of hoWorkspace to sFolder
        If (Right (sFolder, 1) <> "\") Begin
            Move (sFolder - "\") to sFolder
        End
        Move (sFolder - "Images") to sFolder
        Send ScanFolder (&aFiles) sFolder iChannel

        Send Seq_Release_Channel iChannel
    End
End_Procedure
```

- If the user navigates thru the list of files it would be nice to show the image in the cWebImage object you've already created. To do this add:

```
Procedure OnChangeCurrentRow String sFromRowID String sToRowID
    String sFileName

    Forward Send OnChangeCurrentRow sFromRowID sToRowID

    WebSet psCurrentRowID to sToRowID
    Get DecryptKey of ghoWebResourceManager sToRowID to sFileName
    Send UpdateLocalImage of oWebImage sFileName
End_Procedure
```

- We are almost there...
- Find the OnSubmit event and add the oFileList object as destination object for the Ok message. Add the same object reference to the Ok message send by the Ok button.
- Uncomment (Ctrl+K) the following line and change the code to:

```
Set pbServerOnShow to True

Procedure OnShow
    Send GridRefresh of oFilesList
End_Procedure
```

- One final addition; the dialog needs to have a function to return the name of the selected picture. For that add:

```
Function SelectedImage Returns String
    String sCurrentRowID sFileName

    WebGet psCurrentRowID of oFilesList to sCurrentRowID
    Get DecryptKey of ghoWebResourceManager sCurrentRowID to sFileName

    Function_Return sFileName
End_Function
```

Now we call (open) this dialog from the cWebImage object in the oMediaView object. Open the dialog in the OnClick event of the cWebImage object. Add the following code;

```
Set pbServerOnClick to True

Procedure OnClick
    Send Popup of oPictureSelector Self
```

```
End_Procedure
```

To use the selected picture add the following code, again to the cWebImage object in the oMediaView object;

```
Procedure OnCloseModalDialog Handle hoModalDialog
    String sFileName

    Get SelectedImage of hoModalDialog to sFileName
    Send UpdateLocalImage sFileName
    Set Field_Changed_Value of oMedia_DD Field Media.Picture to sFileName
End_Procedure
```

Finally, go to WebApp.Src, find the line "Use PictureSelector.wo" and move the line before the "Use MediaView.wo" line. Alternatively you can add the "Use PictureSelector.wo" to the top of the code inside MediaView.wo.

Wildcard Search View

Wouldn't it be nice to have a web view where you can enter a text value which is used to filter the Media records? Of course you would like to have this! Here is how to do this. Create a new web view, use a Web Tabbed View this time. Drop a cWebForm, a cWebButton and a cWebList object to the code inside the first tab-page. Change the name of the cWebList object to oMediaList. Align the button with the form on the same line giving the form more columns than the button. For example; Set the piColumnSpan of the form to 8. Take the rest of the default number of columns (= 10) for the button. Label the form "Filter on:" and the button "Search!". Drag some data columns (Title, Author, Price…) from the DDO Column Selector (in the DDO Explorer) to the cWebList object. Label the first tab-page "List" and the second tab-page "Details". Open the oMediaView – if not still opened – and copy the contents of the oWebMainPanel object into the second tab-page. This makes it possible to click on a row in the list, switch to the details tab-page and see/edit the Media details.

To get the list fill itself automatically when the view opens add:

```
Procedure OnLoad
    Send Find of oMedia_DD FIRST_RECORD Index.1
End_Procedure
```

To the cWebList object. The cWebList object sends this event when it loads.

To filter the data in the list we need to make use of the OnConstrain event in a DDO, in the oMedia_DD object to be precise. In this event we need to code the condition for the filter. We will make use of a "constrain as" condition which is fine as long as the number of rows in the table is not too large as the filter cannot be optimized. Add the following code:

```
Procedure OnConstrain
    If (psFilterValue (Self) <> "") Begin
        Constrain Media as (Media.Title * Media.Author * Media.Type * String (Media.Price) ;
            * String (Media.PurchaseDate) * Media.Comments * Media.Picture contains
psFilterValue (Self))
    End
End_Procedure
```

This filter concatenates all columns we want to search and looks if the filter string is present in that value. You can increase or decrease the number of columns to compare with. The filter also makes use of a self-defined property psFilterValue. Create this in the cWebView object by adding:

```
Property String psFilterValue
```

The property will get it value by clicking the search button. Change the contents of the psFilterValue property by adding the following code to the button object.

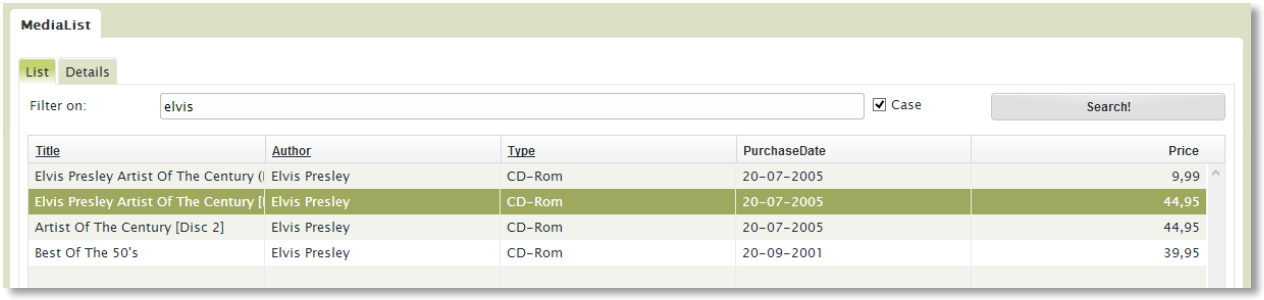
```
Procedure OnClick
```

```
    String sFilterValue

    WebGet psValue of oSearchForm to sFilterValue

    Send FilterMedia of oMedia_DD sFilterValue
    Send FindDDRecordInBuffer of oMediaList
End_Procedure
```

Add a self-defined method named FilterMedia to the oMedia_DD object. The code for this method is:

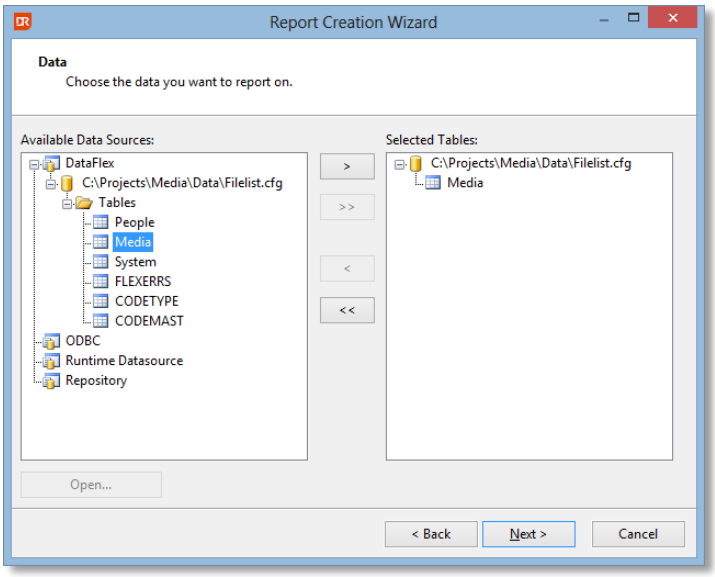
```
Procedure FilterMedia String sFilterValue
    Set psFilterValue to sFilterValue

    Send Rebuild_Constraints
    Send Refind_Records of oMedia_DD
End_Procedure
```

Compile and test your new search view. If you like you can add a checkbox to make case insensitive filtering possible (as shown in the screenshot).



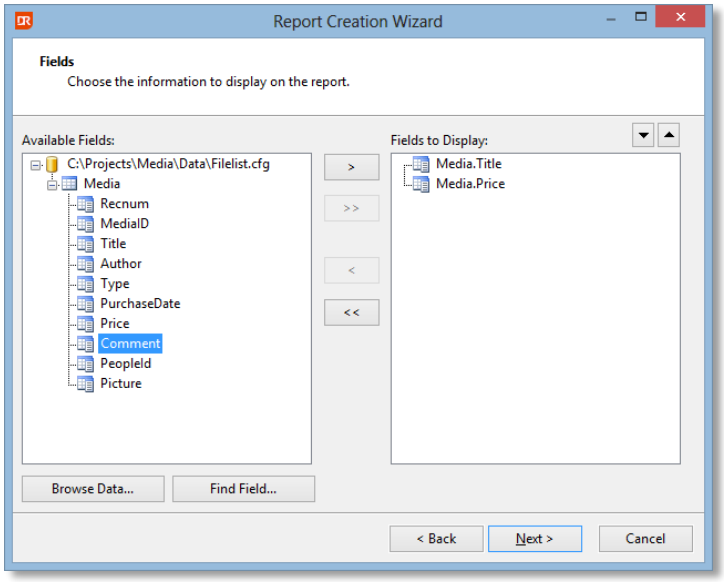
Reports and Lists

One of the most powerful ways to create reports and integrate them in DataFlex is by using DataFlex Reports and the DataFlex Reports Integration Library. This is a wizard that automatically integrates a report in your Web application. The end-user will be able to start the report from the menu and still be able to influence the sort order, output device, and even selection criteria. It's simple: First create a report with DataFlex Reports, and then start the wizard – the rest is self-explanatory.



Note: If you do not have a license for DataFlex Reports, please contact the Data Access sales representative in your region to receive an evaluation license, or to purchase a license.

Start DataFlex Reports and select File, New. Then choose Standard Report. You can also press the Ctrl+N key combination. In the wizard select DataFlex as your data source and point to the SWS file of your workspace (in the root folder). This will load the paths of the workspace and shows the contents of a file called the filelist. Select the Media table from the list of tables.

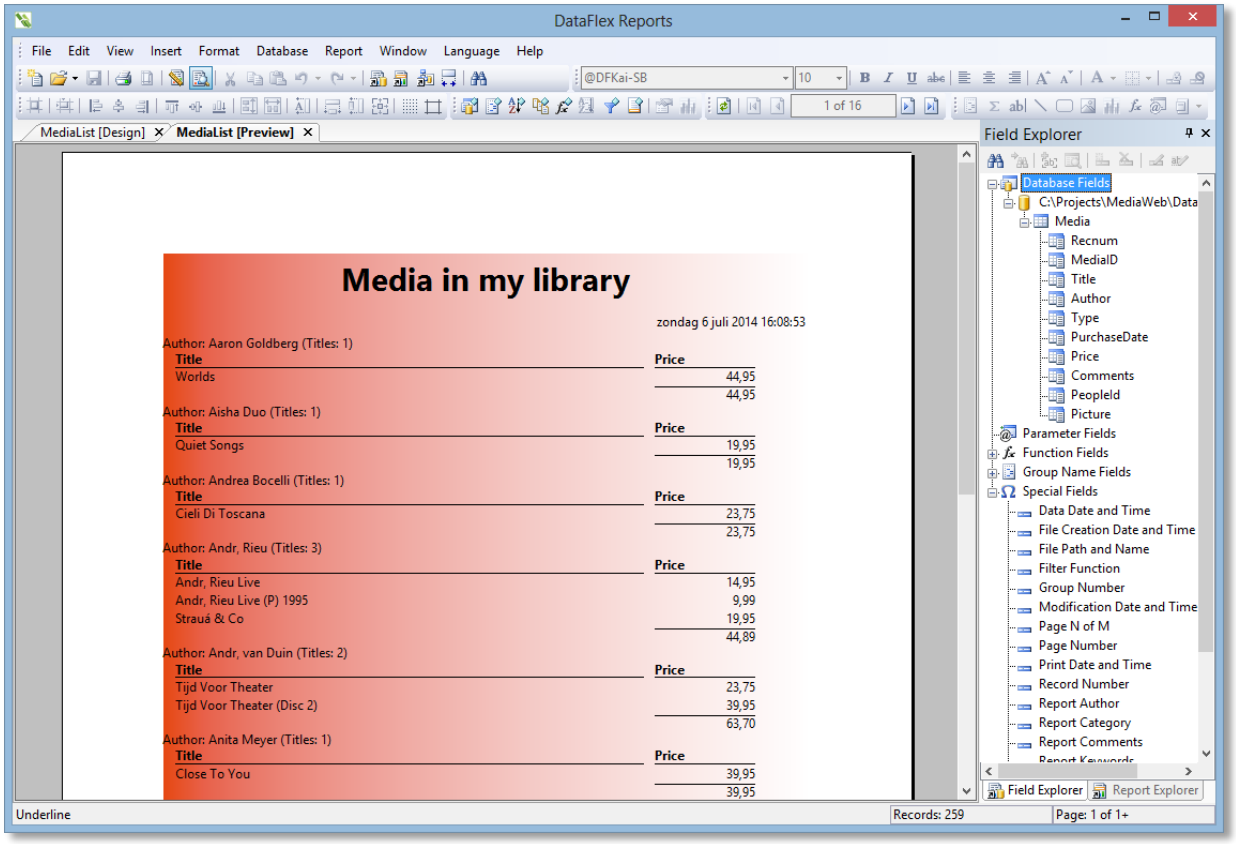


After clicking the 'Next' button you have to select which columns from the Media table should appear in the body section of the report. The body section of a report is repeated for each record that matches selection criteria. In the 'Fields' page select the columns Title and Price.

The next wizard page let you select the column(s) to group data on. Here we select the column Author. This means that titles can be printed per author.

The pages summary, data filters and repository can be skipped for this report.

After finishing you can preview the report in the designer and start making the first layout modifications. Take a look at the screenshot and see that we used colors to 'beautify' the report. We also added a function to combine the Author name with the number of Media records we have for this author. The prices are summarized and finally the



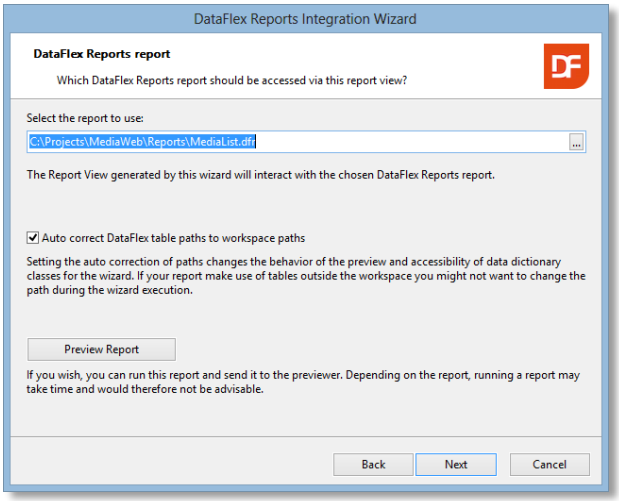
page footer contains a 'Page N of M' text.

Not shown but interesting; we can sort the details of each group on Title or any other column.

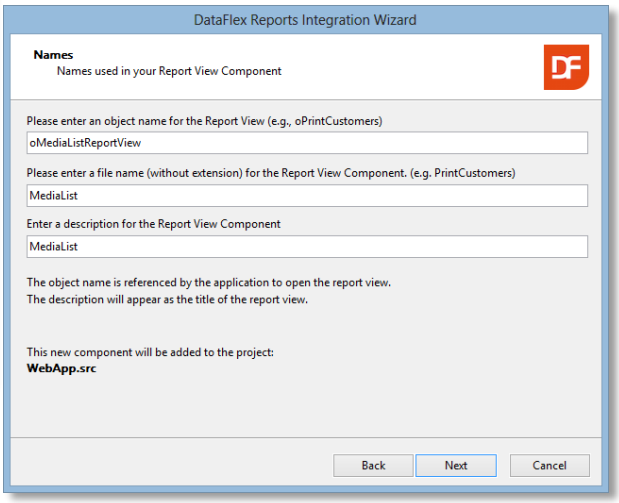
DataFlex Reports Developer edition optionally (turned on) installs an integration library. Attach to the library by selecting Tools, Maintain Libraries. In the dialog that pops up you will see the already connected libraries. Press the "Add Library" button to select the SWS file of the DataFlex Reports library. The library is most likely installed inside the DataFlex environment in a folder libraries. After clicking OK a wizard starts that guides you through the process of attaching. You should accept all the defaults. The wizard copies files and makes modifications to a css and the main index.html file. Check if you can still compile and run your web application. It should still work!

To integrate the report we start the integration wizard. Select File, New, Web Object and pick the DataFlex Reports Integration Wizard. Note that there is also a wizard for Windows programs but you need to one in the Web Object page.

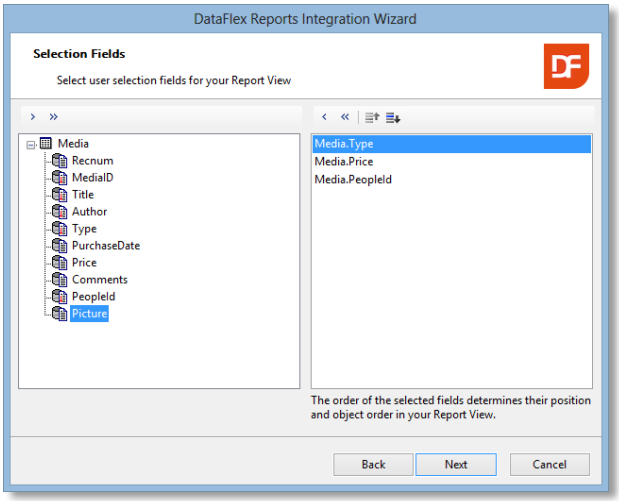
In the wizard select the report that you want to integrate. You can preview the report but keep in mind that a preview might take some time when you have more data than present in this Quick introduction workspace.



After clicking the 'Next' button you can enter the object and filename. Names based on the report name are suggested to you. You can use the defaults in this introduction training.

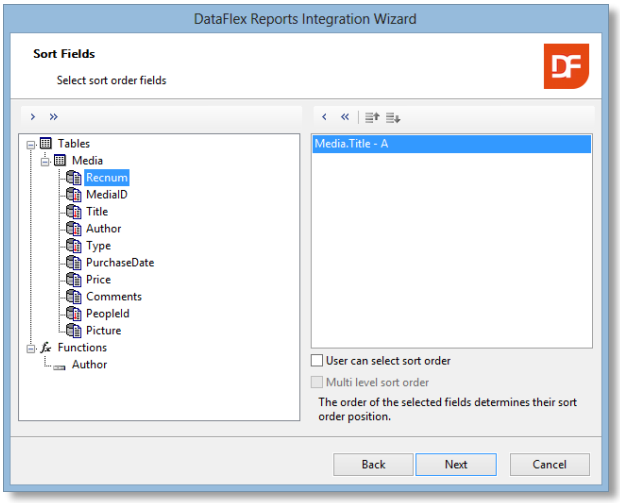


In the next wizard page you can choose to create user defined selection criteria controls. Based on the user input report data will be filtered. Select the columns Type, Price and PeopleId.



The next wizard page let you specify the labels for the selection controls and whether the labels should be left, right aligned or centered. Accept the defaults or make a label text modification to see how this works.

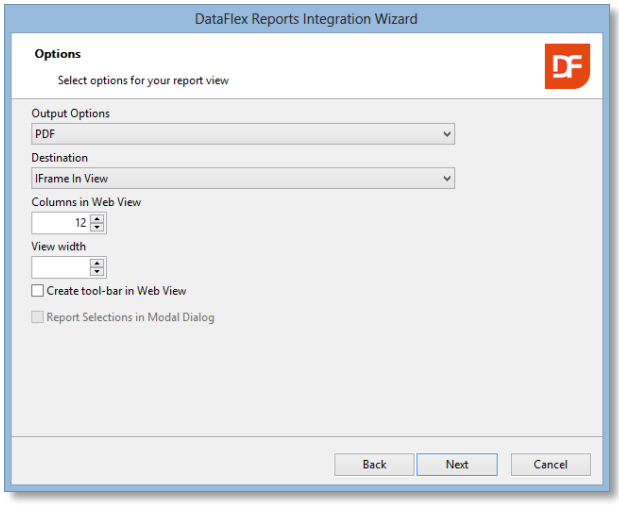
The next page shows the sort order defined in the report. This is the Media Title column. Add a couple of more sort fields like PurchaseDate and Price. Turn on the option that the user can change the sort order; if not turned on



the data will be first sorted on Title, then on PurchaseDate and then on Price. With user selection the user can determine what sorting should be used.

The next important wizard page is the output selection. Here you can choose between PDF, three Image formats or HTML. Base on the first choice the destination drop-down will change and offer more or less destination options.

A PDF can be displayed in a new browser window, a new browser tab-page, an iFrame (on a tab-page) or in a modal dialog. Two of the image formats or a HTML document can be shown in a previewer component delivered to you via the library. One of the image formats can only be downloaded. HTML reports support interaction with the web application framework, for example to look up a record in the system.



Select 'PDF' and the default 'iFrame in a View' option and re-run the wizard again to inspect the result of the other options and decide what you like the most in your own environment.

Finish the wizard and compile / run the web application. Read one or more of the blogs about DataFlex Reports integration at the Data Access web-site (http://support.dataaccess.com/Forums).

Get Started!

This concludes this Quick Introduction Guide for DataFlex. If you have not done so yet, take a look at DataFlex Content Management written in and delivered with DataFlex. You can find a Quick Introduction document like this one at www.electos.com under "Get Started!", or at www.dataaccess.eu , under "Get Started!".

To learn more about DataFlex, visit the following sites to learn more about the product and its creator:

- www.visualdataflex.com
- www.dataaccess.com
- www.electos.com
- www.visualreportwriter.com
- www.visualdatapump.com

We Look Forward to Helping You to Get Started With Visual DataFlex!

Other related sites:

- support.dataaccess.com/forums
- www.dynamicai.eu (Business Intelligence tool)

If the documentation, help-files or the forums don't provide you with answers, feel free to ask for assistance via e-mail. Visit the Data Access website for the support options in your region.

Another very good resource is an extensive training guide called "Discovering Visual DataFlex" that contains more than 600 pages. This book has been made available for each revision of DataFlex since the beginning of 2008. Please contact your Data Access sales representative if you would like to purchase a copy of this book. The picture shows the Visual DataFlex 15.1 version of the book. An addendum that lets you discover the new and changed behavior added in version 16.x is available. There will be an update of the book to version Visual DataFlex 2014 available later in 2014.