X++ Advanced

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X++ Advanced

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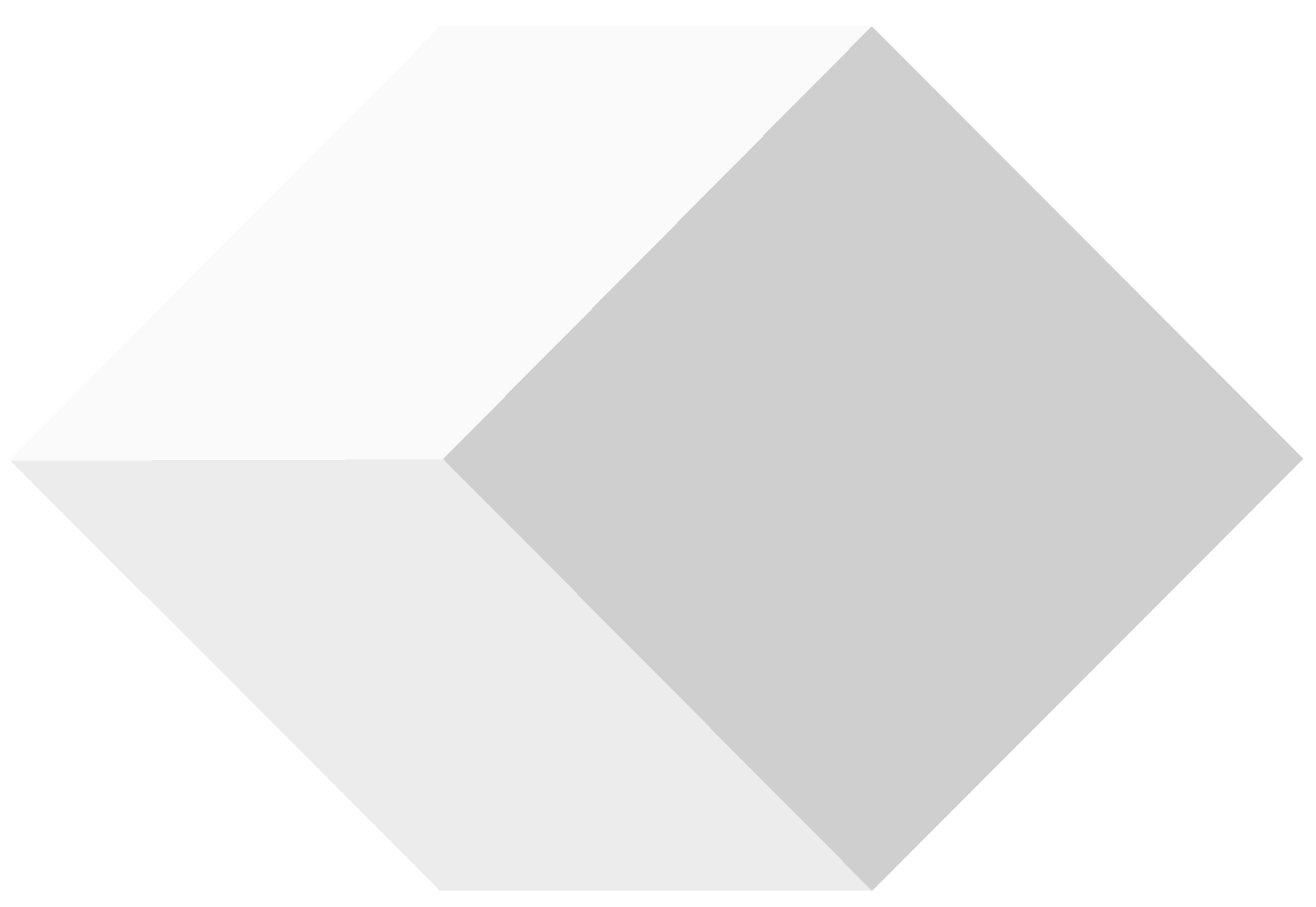
Lesson 1.

Introduction to X++ Advanced



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1.1 INTRODUCTION

This is the third course in Microsoft® Business Solutions–Axapta® development suite. The course covers advanced programming in X++.

Purpose

This course expands on the knowledge introduced in the online courses: MorphX Essentials and X++ Basics. The course provides you with an in-depth knowledge relating to X++ Programming. You will go deeper into the world of objects and classes and will be introduced to the concepts of polymorphism, overloading and inheritance. This course will go through different advanced programming features, you will learn about form controls, validation techniques, static and dynamic methods, report templates, how to use macros within MorphX, how to make your own wizards and much more.

Prerequisites

Successful completion of the MorphX Essentials and the X++Basic online courses.
It is highly recommended that you have worked with the X++ language and MorphX for 3-6 month before this class.

General

This course is comprised of a series of lessons, each explaining a range of specific subjects and functionalities which belong together in Axapta. All lessons are developed in relation to common business logic, and the subjects and functionalities are presented within the perspective of the usual business procedures familiar to most users.

This material is a supplement to the instructor's explanations during the course and not tailored for individual studies without tutoring.

In the beginning of each lesson you will find a brief overview of the lesson and a list of objectives, informing you what subjects and functionalities you will get to know in the specific lesson. In each lesson there will be examples; the examples make it easier for you to refer the theoretical aspects of the course to how Axapta works outside classroom training. At the end of each lesson you will find exercises. The exercises are designed to give you a hands-on experience with the functionality described.

Lesson 2.

Development Tools

At the end of this lesson, you are expected to be able to:

Know the development environment

Know about the different development tools in Axapta

Use the tools described

2.1 INTRODUCTION TO DEVELOPMENT TOOLS

The following lesson describes the development tools available in Microsoft Axapta. The lesson starts with a short recap of the MorphX development environment and then moves on to the different tools you can use to make your repeated tasks easier to complete. We will see where the tools are located and how they work.

The following are the tools described in this lesson:

The MorphXplorer

The debugger

The trace

The cross-reference

The table browser

The Find functionality

The Compare tool

The table definition tool

Tutorials

2.2 RECAP OF THE DEVELOPMENT ENVIRONMENT

The Axapta development environment is an integrated toolbox combining different functions, such as designing, editing, data storing, compiling, and debugging within one common environment. The development environment within Axapta can be divided into 3 main areas, IntelliMorph (user interfaces/presentation), MorphX Development Suite (business logic and data dictionary) and data storing (databases).

IntelliMorph

IntelliMorph is the technology that controls the user interface in Axapta. The user interface is how the functionality of the application is presented or displayed to the user. The same functionality can be displayed on multiple platforms or devices using the same application code, for example, via the Web or via Mobile devices.

IntelliMorph controls the layout of the user interface and makes it hassle-free to modify forms, reports and menus.

MorphX Development Suite

MorphX Development Suite is designed as a multipurpose toolbox for developing ERP applications. MorphX Development Suite enables system administrators and programmers to add new, and modify existing Axapta functionality. MorphX Development Suite is the environment that handles the business logic and the design of the data model.

Business Logic

When complex requirements call for new business logic, Axapta's own object-oriented language, X++, can be used. X++ uses object-oriented programming principles such as encapsulation, inheritance, classes, objects and methods. The language has Java-like syntax. The X++ language serves many purposes. It's a database language, a scripting language to create the interface to the database, a language for building

reports, a language for building forms for the user-interface (for both traditional Windows clients and web applications), etc. X++ even includes a help-system language.

Few, if any, ERP systems provide such a versatile tool. Axapta X++ radically reduces the amount of code necessary to deliver rich and versatile functionality. Less code means less risk of error and better performance, and the object orientation increases the ease and speed of any development task.

Data Dictionary

The Data dictionary describes the data model within Axapta. The data model contains information about how and where tables, fields, indexes, and data types are used.

Database

The databases supported by Axapta store all data generated through the business logic. Axapta is not tied to a specific database platform, but is designed for use on top of existing standard relational databases. Databases supported by Axapta v3.0 are Microsoft SQL Server (2000) and Oracle (9.0.x).

2.3 AVAILABLE TOOLS

The Integrated development environment

Axapta has its own integrated Development Environment (IDE) which is a programming environment consisting of a code editor, a debugger, a compiler, and a graphical user interface (GUI) builder. The commands in the IDE are very similar to the development environment in the Microsoft Visual Studio.

The Visual MorphXplorer

Through the development of a system, you will often need to display the relation between your tables and classes. Axapta has a tool that makes this possible, the Visual MorphXplorer. To activate the Visual MorphXplorer go to the Tools menu on the menu bar, select the development section, and choose Visual MorphXplorer. To add new tables or classes, right-click the client area of the window. To see the tables or classes related to an element, right-click the element and choose the appropriate option.

You can depict the relations between tables with this information:

- The current table's 1:n relations.
- The current table's n:1 relations.
- The classes that use the current table.
- The maps that the current table is a part of.

In a class visualization diagram you can depict:

- What classes the current class uses.
- What classes the current class is being used by.
- The current class' super class.
- The current class' sub classes.

UML Notation used in Visual MorphXplorer

We use UML notation to show how tables are related to each other. The table below describes the symbols used:

Symbol	Meaning
——<	Zero, one, or many records
++——	Precisely one record
——	One or zero records
——▶	Table used in a map
*	Table appearing more than once in a diagram

The debugger

Axapta is equipped with a powerful software development tool known as the Debugger. A debugger can be defined as a special program used to control the execution of another program for diagnostic purposes. For example to find errors (bugs) in X++ programs.

The debugger in Axapta 3.0 allows interactive debugging from within the IDE (Integrated Development Environment) through the editor window. With the help of the debugger you can:

- Step through the program one statement at a time, either "over" or "into" functions
- Run the program up to a certain point (either to the cursor or to a "breakpoint") and then stop
- Show the name, type, scope and value of the variables at each point during the execution of the program in a variable window
- View the call stack
- View system status

- Display line numbers in your code

To activate the debugger go to the Tools menu, select Options and then select the Development tab. Set the debug mode:

No: The debugger is never activated.

Always: The debugger is activated when X++ code is executed.

On Breakpoint: The debugger is activated only when a breakpoint in the X++ code is encountered.

Breakpoint
Breakpoints can be set to interrupt the execution of the X++ program at specific points. To set a breakpoint, position the cursor at the point you wish to break the execution and then click the breakpoint toggle button ( ) or press F9. The line color changes to red, indicating breakpoint at this position. Next in order is to execute the program to the breakpoint you just added by clicking the go button ( ) or pressing F5. This makes the program run until it reaches the next breakpoint.

A conditional breakpoint feature has not yet been introduced in the 3.0 debugger but is expected to appear in next release.

The Debugger window is divided into four windows:

Variables
Displays the value of the variables that are within the scope of the current call stack level. When a variable has changed between stops, it is drawn in a different color to make it easy to spot modified variables.
It is also possible to edit the value of a variable.
Call Stack
Displays the stack of function / method calls, allowing the user to see which function / method called the one that is currently being debugged.
A function / method on the call stack can be selected to change the call stack level. This means that the source code for the selected function / method is displayed in the source code window.
Watch
Displays a user-defined range of variables. It is possible to choose the

name of the variables that should appear in this window by entering their names, or by dragging a variable from the Variables window or the source code window into the Watch window.
When a variable has changed between stops, it is drawn in a different color to make it easy to spot modified variables.
It is also possible to edit the value of a variable.

Output

Displays text that is written to this window from X++ code for debugging purposes. When the call stack level is changed by selecting a function / method in the Call Stack window, the Variables and Watch window are automatically refreshed to display the variables that are within the scope of the selected call stack level.

Trace

If you want to trace program execution you need to activate the trace. To do this go to the Tools menu, select Options, and then select the Development tab. On the tab you see the Trace group in which 4 options are available:

- Database trace
- Methods trace
- Client-Server trace
- ActiveX trace

When you select one of the trace methods a window will appear as soon as you activate one of the controls you were tracing.

Note: Be aware that if you select Methods trace you will get a lot of information at once because Axapta shows you all the methods that will be called, like OnMouseMove or OnMouseLeave.

Cross-reference

The Axapta cross-reference system was designed to improve your overview of application objects. The cross-reference system answers questions such as:

- Where is a field accessed (read/written)?
- Where is a method activated?

- What is the type name used in the system?
- What are the variable names used in the system?

Cross-references are based on what happens in the X++ code, on labels, and on information in the property sheets. The last mentioned includes information about the use of tables, fields, indexes, Extended Data Types, and Base Enums.

Before you can use the cross-references you need to create them. To create a cross-reference system for your application, click Update Periodic on the Cross-reference submenu. The Cross-reference submenu is located on the Development submenu on the Tools menu.

Note: Be aware that updating all the cross-references is very time consuming. Depending on the hardware you have it can take from four hours and up. It is recommended that you update a selected part of the database.

Application objects

Use this view to see which elements are referring to the actual element. Furthermore, use the Scan Source to search for a specific text string.

To compare applications object on different layers, right-click the element. Choose Add-ins and then select Compare. The system shows the differences in the two objects by marking the new elements in blue, deleted elements in red, and unchanged elements in black.

The Table browser

The table browser facility allows you to view, edit, and enter data in any table used as a data source for a form, a query or a report.

The table browser is available from the Add-ins menu on the Application Object Tree shortcut menu.

Find

Sometimes while developing you might need to find a certain method or a certain line of code. To do so Axapta implements a find function. This find works in the same way as the Windows find. Use it to find elements in the AOT based on one or more of the following parameters:

- Name
- A certain text
- A specific date
- Elements created by a certain person
- If you want to search all notes or just on methods
- The type of element
- The layer in which the element is placed
- The size
- Where the element is run (server/client)

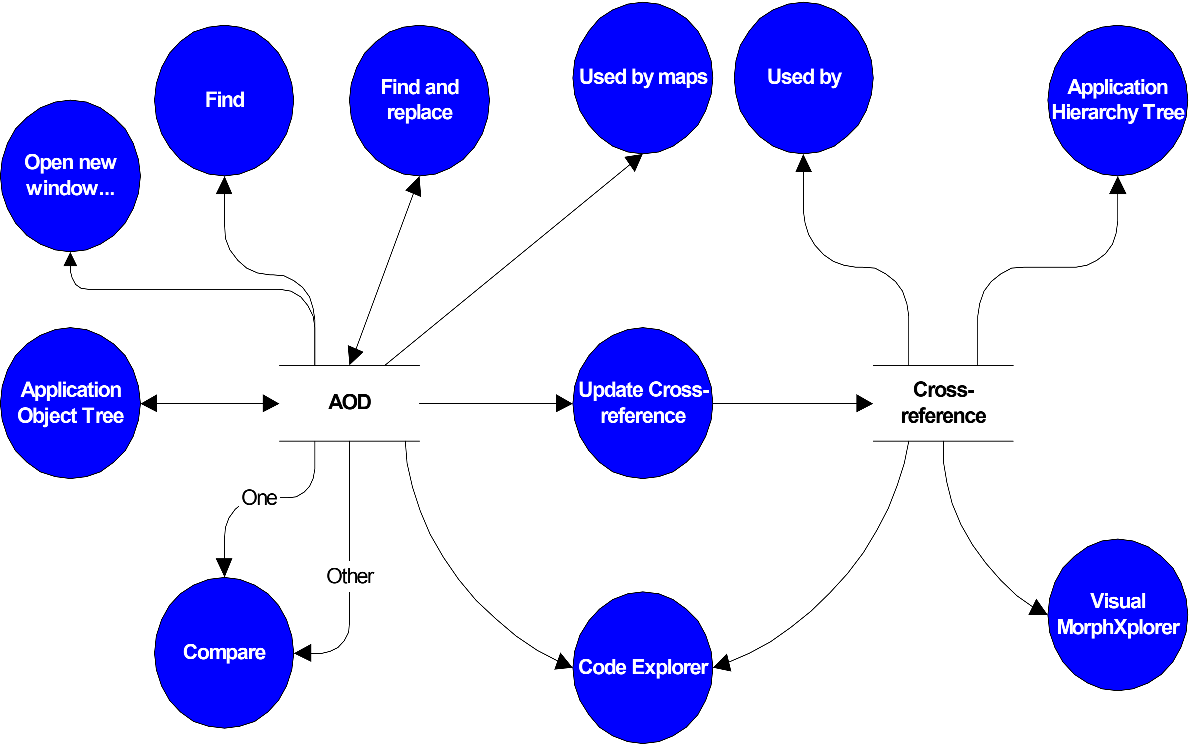
The Filter tab is used for advanced filtering of the search result. Write X++ code in the Source field. The code is evaluated for each node that is found and should return a Boolean that is true if the node is to be included in the search result and false if it should not be included.

Compare

Under Add-ins there is yet another powerful tool, the compare tool. The Compare layers function can be used as an alternative to the Create upgrade project. The Compare layers function compares any two layers and creates a project with the objects that are different from one layer to another. As opposed to the Create upgrade project, duplicates are not deleted. Consequently, the Compare layers function may also be useful as a general tool, for example to give an overview of modifications made in a certain layer. Properties as well as X++ source code are compared.

Table definition

Use the Table definitions tool to get information about a table. To do this select the table, right-click and choose Add-ins -> Table definition. After this you have the opportunity to set sorting and ranges.



Tutorials

Axapta includes a number of tutorials to show you the solution to some common tasks and to demonstrate the use of common controls. The tutorials are implemented as forms and classes. They are prefixed *"tutorial_"* and can be found below the Forms and Classes node in the Application Object Tree.

2.4 EXERCISES

Exercise 1 **MorphXplorer**

Show the relations between the tables and maps:

- Address
- Country
- County
- State
- ZipCode
- Currency
- AddressFormatHeading
- AddressMap

Be sure that all relations are shown

Exercise 2 **Debugger**

Try to debug the code created in the Create Dialog example from the X++ Basic course, Communicating with user, Communication tools.

```
static void AXPDialogWField(Args _args)

{
```

```
    Dialog      d1;

    DialogGroup dg1;

    DialogField df1, df2;

    ;

    // To bring the window to the top

    Window 36, 12 at 10,10;


    d1  = new Dialog("Criteria");

    dg1 = d1.addGroup("Customer");

    df1 = d1.addField(TypeId(Custaccount), "Account Number");

    dg1.columns(2);

    // df2 = d1.addField(TypeId(AccountName), "Name");


    if (d1.run())

       print df1.value();

    pause;


}
```

Exercise 3 **Debugger**

Place a breakpoint at the init method of the Form VendTable

```
void init()
{
    super();
```

```
  → TaxVATNumTable::enableLookupVatNum(SalesTax_VatNum);
}
```

Open the Vendor Table Dialog and follow the code step by step.

Exercise 4 **Table browser**

Use the Table browser to examine the tables from Zipcode. Try to enter some fields or delete some.

Exercise 5 **Find compare**

1. Try to change a line of code, add a line of code and delete a line of code in the ABCBase class methods then compare the new class with the original from the sys layer.

2. Which layers are affected if you delete the ABCBase class?

Exercise 6 **Table definition**

Use the Table definitions to get a view of the table Zipcode

Lesson 3.

Classes

At the end of this lesson, you are expected to be able to:

Understand the concept of a class.

Design, create and manage classes and methods.

3.1 WHAT IS A CLASS?

In the preceding lesson you tried creating an object with an associated object handle of the type Dialog. Dialog is the name of the class you want to use.

A class can be seen as a baking form or a blueprint drawing. You use it each time you create an object or an object handle. Using a single class, we can create an unlimited number of objects and object handles.

Class Content

As mentioned, a class is used to design objects and object handles. Thus the class contains all the properties an object is to have in form of methods and variables.

Class Declaration

After creation this method appears as follows:

```
public class Class_name

{
       //This is where you declare all variables

       //that each object is to contain

       //for instance:

       str text;
}
```

In the Class Declaration the name of the class is specified and variables that are used in the entire object are declared. Moreover, you can use it to specify inheritance, this is described in the lesson “inheritance”. It is not possible to assign values to the variables in Class Declaration. It is best practice to use uppercase for the first letter in a class name.

3.2 STANDARD METHODS

When a new class is created it automatically contains the following 3 standard methods

New

After creation the “New” method appears as follows:

```
void New()

{
}
```

You use it each time you create/instantiate an object. Using this method, you may assign values to an object's variables, as in the Dialog class. If you declared a text variable named "text" in the **ClassDeclaration**, you can now use **new** to enter a value in this variable. You can do this as follows:

```
void New(str _text)

{
       text = _text;
}
```

_text is a local text variable that belongs to the individual method.

void indicates that the method returns no value. This topic will be explored further later on.

Finalize

When an object is terminated, that is, no longer connected to an object handle, the object ’dies’ and gets garbage collected.

If you want to terminate the object yourself, the method you use is called **finalize**.

It is possible to terminate other objects by stating this in the **finalize** method .

You can also terminate an object by setting the object handle to = Null

Example

```
StopWatch sw;  //You create an object handle of the stopwatch type

sw = new stopWatch(); //You create an object of the stopwatch type
and link it to the object handle

sw = Null; // The object is terminated if there are no other
object handles pointing to the object

Or

sw.finalize(); // The object is terminated, even though there are
other object handles pointing to the object. If the finalize
command contains code, the code will also be executed
```

3.3 OBJECT METHODS

You can create your own methods that execute your own code.

```
void testMethod()

{
	print ”This is a test method”;
	pause;
}
```

The new method is embedded in each object that is created from this class.

It can be called as follows:

```
objectHandleName.testMethod();
```

If an object method calls another object method on the same object, the objectHandleName is replaced with **this** (a pointer pointing at the object itself). Object methods are also referred to as dynamic methods.

3.4 CLASS METHODS

In the same way an object has a set of methods, it is also possible to create methods belonging to the class. You can do this using the keyword **static**.

If you were to write the method above as a class method, it would look like this:

```
static void test_method()

{
        print ”this is a test method”;
        pause;
}
```

and could be opened as follows：

```
Classname::test_method();
```

Class methods are also referred to as static methods, and unlike dynamic methods, you do not need to instantiate an object before using a static method. Notice that it is not possible to use member variables in a static method.

Static methods are widely used in Axapta, since we often just want to work with data stored in tables and therefore do not need to instantiate member attributes.

3.5 MAIN

As in jobs, which is what you have been using most of the time, you have the option of executing a certain class method directly from a menu option. The method is called **Main()** and may be written as follows:

```
Static void Main(Args _args)

{
}
```

The Method should do nothing else than create an instance of the object itself and then call the necessary member methods.

Using **Args**, you are able to transfer data to the method, if needed. **Args** will be covered in greater detail later.

You can also execute this method by highlighting the class in the AOT and selecting Open from the right-click menu or the tool bar.

3.6 TABLES

A table can also be considered as an independent class when seen from a programming point of view.

You can address fields and methods on tables. Methods can be called from other objects or from the same table.

To be able to enter, update and delete records in tables you must create a table buffer.

Tables differ from classes in the following manner:

Room for a table buffer is automatically assigned (for classes, you use new).

A table cannot be inherited from other tables.

Table fields are public; they may be referred to from everywhere.

Table fields can be referred to directly, for example in a report.

(Variables in methods can only be referred to by return of values).

```
static void AXPSelectFromTable(Args _args)

{

    // create buffer

    Custtable ct;

    ;

    // fill data

    select ct;


    print ct.Name;

    pause;

}
```

Inheritance from other tables is not possible, but all tables are compatible with the Common table and its fields.

3.7 OVERVIEW

A class is not an object. Think of a class as a blueprint that defines how an object will behave when it is created from the specification declared by the class. Concrete objects are obtained by instantiating a previously defined class. You can instantiate many objects from one class definition, just as you can construct many houses all the same from an architect's drawing.

Classes are fundamental when working with object oriented programming, because they can be reused when an object needs to have similar behavior as a formerly instantiated object.

3.8 Exercises

Exercise 7 **Creating a class**

Create a new class and call it **TestClass1**.

Exercise 8 **Creating an object**

- Edit **TestClass1** to have a text variable embedded in all objects created from this class. Declare the variable in the **ClassDeclaration()** method.
- **New()** serves to enter a value in the variable each time an object is created. If no value is specified, **New()** must set the variable content to '**Empty'.**
- Create an object method called **Outvar()** to output the variable content to the screen.
- Create a job, and output a text from **TextClass1**.

Exercise 9 **Modifying Outvar()**

- Edit **Outvar()** so that it allows you to enter a new value in the text by giving arguments to the method Outvar().
- Use the job from the previous exercise to test whether **Outvar()** work as intended.

Exercise 10 **Creating the class method Main()**

- Create the class method **Main(),** and enter code in it to have it output a line to the screen, for example 'just testing'.

- Test it by activating **Open** on the tool bar or in the menu.

Exercise 11 **Create a job that execute Main()**

Now create a job that execute **Main()** in **TestClass1**

Exercise 12 **Calculators (Optional)**

- Create a class that functions as a primitive calculator.

- The class is to contain a **new** method that may receive the two numbers the calculator will be using for its calculations.

- Each mathematical operation (+,-,* and /) must have an object method that calculates a value based on the two numbers received in the new method.

- Output the result of the calculation from your "calculator."

- Create a job that can test the calculator, too.

Lesson 4.

Data Return

At the end of this lesson, you are expected to be able to:

Use methods that returns data.

Write methods that returns data.

Doc ID: AX-300-ILT-068-v01.00-ENUS

4.1 USING DATA RETURN

So far, you have been working with methods that receive data when you open them. But you have yet to use methods that return data.

Up to now, all methods you have written have specified void. Void indicates that there is no return value. As an example of a method that returns data, you could use the class method GetTickCount() from the WinAPI class. GetTickCount() returns an integer that is the number of thousands of seconds that the system has been running.

If you want to create a method yourself that can return data, you must remember two things. Instead of using void, you must specify which data type you want returned. Here the possibilities are endless. All forms of data types may be returned, as well as database buffers and objects. You also have the option of specifying any type. This means that the method can return several different data types.

In addition to this specification, you must also enter a command called return and specify what you want returned. Return must always be placed at the end, as this command concludes the method.

Example:

You can create a method that receives integers and returns the value multiplied by two.

```
int Double(int number)
{
        return number*2;   //No lines
following return are executed.
}
```

4.2 EXERCISES

Exercise 13 **Calculator**

Create a class that functions as a primitive calculator.

The class is to contain a new method that may receive the two numbers the calculator will be using for its calculations.

Each mathematical operation (+,-,* and /) is to have an object method that calculates a value based on the two numbers received in the new method.

Get the results of the calculation returned as data without having them printed out by the 'calculator'.

Then create a job that can test the calculator and output the mathematical results.

Exercise 14 **Using WinAPI::GetTickCount**

Create a new job that uses and prints out the number of thousands of seconds the system has been running.

Exercise 15 **Return a database buffer**

Create a new class or use the class from your last lesson. Create a new class method. This method must be able to receive a customer account number and return the entire record for the relevant customer in a database buffer.

Then create a job that opens the method with a given account number and finally prints out the customer's name. If you experience problems, you may want to review the lesson covering select.

Exercise 16 **Create a stopwatch**

The purpose of this exercise is to demonstrate some of the advantages of object-oriented programming. Let's say you want to develop a stopwatch. To make it work, you need an interface, a form containing buttons and displays, and the actual clockworks, a class. The point is that you may develop these two elements separately without having to know exactly how the elements are constructed internally. Knowing the information to be transferred between the elements is sufficient.

Your Part of the Exercise:

Your part of the exercise is to develop the actual "clockworks." The “outlook” of the stopwatch will be a form with buttons and displays. The form is to use a class, the clockworks, from which it may create an object. The class should have four object methods corresponding to the ’start’, ’stop’, ’reset’ and ’display time’ buttons on the form. In order to make this work, however, it is important that we agree on the following:

- The name of the class
- The name of the methods
- What parameters the methods are to receive and return.

This data can be completed in the template below (this template can actually be used every time you create a class) :

Class Name:		
Method Name	Parameters	Return Value

The remaining aspects of coding the class and methods are up to you, as long as they meet the functional requirements below:

Stopwatch: Functional Requirement
· *It must be possible to retrieve the time elapsed since the stopwatch was started.*
· *It must be possible to stop the stopwatch without resetting it, so that it may resume counting as soon as 'start' is pressed again.*
· *It must be possible to reset the intervals when you press a button called: 'reset'.* · *It should be possible to resume counting when 'reset' is pressed while the stopwatch is running.*
· *The stopwatch is to measure time in thousandths of seconds.*

Exercise 17 **Modifying the stopwatch start method (optional)**

Modify the start method so that, if activated when the stopwatch is running, the stop method is automatically activated.

Lesson 5.

Inheritance

At the end of this lesson, you are expected to be able to:

Understand the principles of inheritance.

Use inheritance between classes.

Understand and manage overriding and overloading of methods.

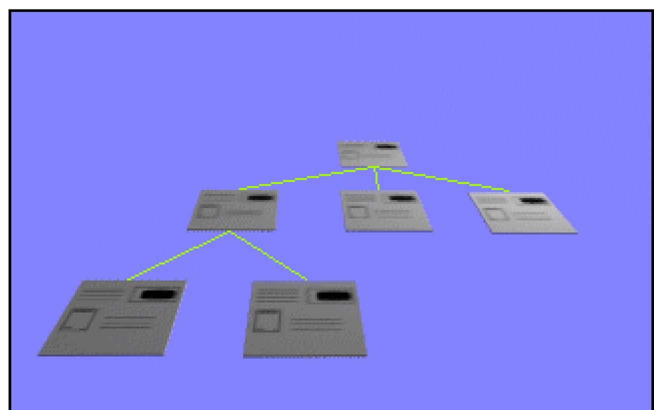
5.1 WHAT IS INHERITANCE?

In an earlier course (MorphX Essentials online course), you were introduced to extended data types. You saw how one or more extended data types could inherit properties from an overlying extended data type.

The same principle applies to classes.

Let's use the same TV set example. You may have a black and white TV or a color TV. Both types are TV set varieties and therefore have many common characteristics. If you want to compare with the class example, you could say that you are dealing with a super class called TV. There are two underlying classes named black and white TV and color TV. Both these classes inherit all their properties from the class called TV.

You can therefore set up an entire inheritance hierarchy for a system of classes.



5.2 How Does Inheritance Work?

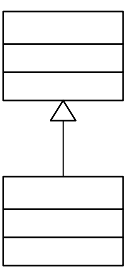
Let's use an example. We have two classes. **Class1** and **Class2**. **Class2** inherits **Class1**.

This means that the class declaration method contains the **extends** command and appears as follows:

Example

```
public class Class2 extends Class1

{}
```

This is visualized in UML as:



The following now applies:

Objects created from **Class2** have the same methods and variables as **Class1**.

Objects created from **Class2** may have variables and methods that do not exist in **Class1**.

Objects created from **Class2** may have methods from **Class1** that are overridden, that is, overwritten or altered, in **Class2**.

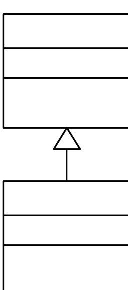
If you compare an object to a TV set once more, you could say that a TV stemming from an inherited class will have the same methods -- buttons on the remote control -- as a TV stemming from the class from which the properties are being inherited.

The TV from the inherited class may even have more methods. Finally, some of the inherited methods may have been altered.

Example

Please note that a class may only inherit from one other class. In other words, there is no multiple inheritance in X++.

For example, **Class1** contains two methods as illustratet in the figure.



Class2 overrides the method method1 from **Class1**. If the system refers to the method method2 in **Class2**, the method is automatically "retrieved" from the overlying class **Class1**.

Class2 may contain methods not present in **Class1**. In this case, method3.

.

5.3 Overriding, Overloading and Inheritance

As mentioned earlier it is possible to inherit from one object to another. This is done in the same way as in Java, by using the keyword `extends`. The inheritance is stated in the classDeclaration, similar to the following:

```
Class Class2 extends Class1
```

Where class1 and class2 are the two classes, in this case class2 inherits from class1, and class is the keyword denoting that this is a class. In Axapta it is only possible to do a single inheritance.

Private, Public and Protected

The following keywords are used to define the degree of visibility:

public: Methods declared as `public` are accessible anywhere the class is accessible, and they are inherited by subclasses.

protected: Methods declared as `protected` are accessible to and inherited by subclasses.

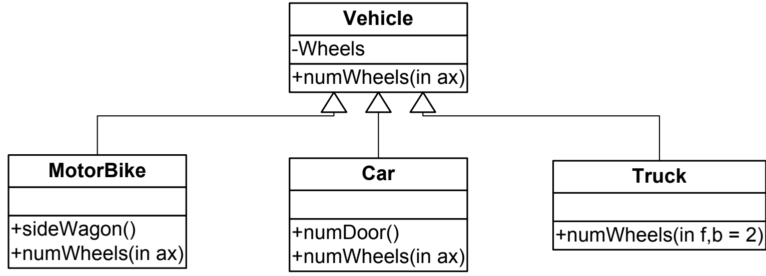
private: Methods declared as `private` are accessible only in the class itself and cannot be overridden by subclasses

You can also specify a method as abstract, which means that the code for the method is only defined in the child class, and you cannot use it in a parent object. These keywords are defined and implemented in Axapta.

Overriding and overloading

If you inherit from a class, there are many cases where you might want to override or overload a certain method.

Example



The model describes how three classes inherit from one class. The Vehicle class has the public method numWheels (defining the number of wheels on the vehicle), which is inherited by

1. The MotorBike class
2. The Car class
3. The Truck class.

These three classes also have other methods, defining what they can do.

The method they inherit from the Vehicle class can be either overridden or overloaded. In the first and second case the method is overridden, which means that only the functionality is changed. In the third case the method is overloaded, which means that both functionality and parameters are changed. The rear axles of a truck usually have four wheels, two on each side, which is different from the front axles of the truck that have 2 wheels per axe. Both a motorbike and a car have the same number of wheels in the back as in on the front. Because the front and back axles of a truck are different the method inherited from the vehicle class must be overloaded. This is not necessary when the motorbike and the car inherit, as it is only the number of wheels pr. axle that differs.

It is only possible to add new parameters to existing ones. It is not possible to change existing parameters. Always remember to set a default value on the new parameters.

5.4 CONSTRUCTOR CONTROLLED INHERITANCE

Inheritance is a very powerful tool in object-oriented programming since it allows you to use already existing and tested classes and prevents you from writing redundant code. Child classes can inherit methods from the parent and use them as they are, override them or even overload them. To use a child class, you create a handle for it and instantiate the object. But this is not always sufficient. Sometimes you do not know exactly which child class to work with.

Example

A vehicle company has just built a very advanced vehicle creation factory. They can produce motorbikes, cars, and trucks. Now they need a program, which can be used to control which type of vehicle is being produced.

The solution to this problem lies in the vehicle class structure created earlier. In order to use this class structure the following code must be placed in a construct method on the parent class:

```
static Vehicle construct(VehicleType _type)

{
        switch (_type)

        {

                case vehicleType::Truck      : return new Truck();


                case vehicleType::Car        : return new Car();


                case vehicleType::MotorBike :return new MotorBike()


                default                      : error('Wrong type');

        }
return 0;
}
```

If the factory should create a truck, simply use the following code:

```
Vehicle newVehicle;
...
...
newVehicle = Vehicle::construct(VehicleType::Truck);
…Do something with the truck …
```

In order to determine which type of vehicle is created the method `toString` is used. This method returns the type as a string. For example does the number of axles which has to be placed on the vehicle depend on the type; two axles for motorbike, and car, and three axles for a truck:

```
If (newVehicle.toString() == "Truck")

        Create 3 axles;

Else Create 2 axles.
```

Please note that instead of hard coding the number 3, you should instead write and use a method, getNrOfAxles(), in the Truck class that returns the number of axles. This is the correct object oriented way of coding.

Constructor controlled inheritance is widely used in Axapta, all the modules is based on this technology. The number sequence class structure is a good example of this. The parent class NumberSeqReference contains a construct method, which is called every time Axapta needs to create a new number sequence.

5.5 JOB AID

Function	Procedure	Keystroke
Create a class that inherits from another	Create a new class and let it inherit from the class ABCBase	
Work routine New Class	Create a new class ***(Class1***) in the AOT, Classes node	CTRL+N
Work routine Edit the code for class1 so it inherits from the ABCBase class	Edit the new class insert the code: *public class Class1 extends ABCBase;* *{* *}* save and compile it.	Right-click the Class F8

5.6 EXERCISES

Exercise 18 **Create two classes and let one inherit from the other.**

The class airplane should inherit from the vehicle class. First create the classes. All interaction with the Airplane class will be at Vehicle class level.

Class Vehicle should contain:

an abstract method "aditionalInformation".

a toString method, so we can check the name of the class.

Class airplane:

- Use the construct method from the Vehicle class

Use this job to test your classes

```
static void inheritance(Args _args)
{
    Vehicle    airplane;
    Vehicle    bike;
    Vehicle    car;
    ;
    airplane   = Vehicle::constructor(VehicleType::Airplane);
    bike       = Vehicle::constructor(VehicleType::Bike);
    car        = Vehicle::constructor(VehicleType::Car);

    print airplane.toString();
    print bike.toString();
    print car.toString();

    print airplane.aditionalInformation();
    print bike.aditionalInformation();
    print car.aditionalInformation();
    pause;
}.
```

Exercise 19 Inherit from the Stopwatch

Use the stopwatch example from the Data Return lesson and create a new class that inherits from your “StopWatch” class. Override the method that returns the time elapsed, so it returns the time elapsed divided by 1000 (the time in seconds).

Lesson 6.

Polymorphism

At the end of this lesson, you are expected to be able to:

Understand the principles of polymorphism.

Apply polymorphism.

6.1 POLYMORPHISM

When a method has several forms

The work polymorphism is derived from Greek and means “many forms”.

When you work with inherited classes and a method exists in several versions, you have the option of using polymorphic.

Example:

Like in the previous lesson, you have two classes: **Class1** and **Class2,** where **Class2** inherits from **Class1.**

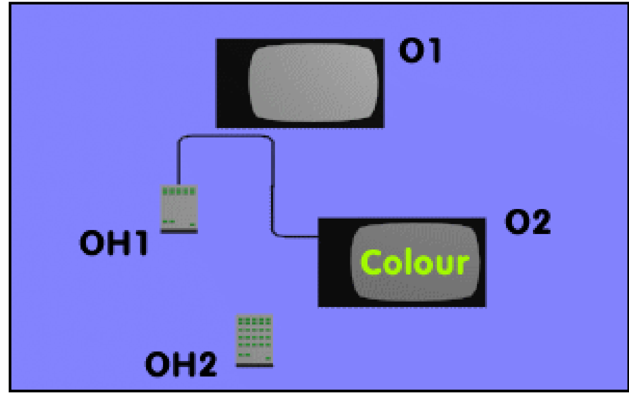
Now you will create an object from **Class2**, but using an object handle from **Class1**.

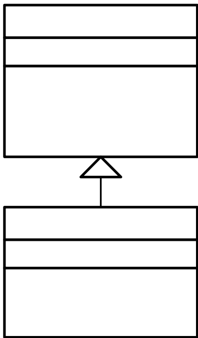
Class1 K = new Class2();

What are the results of this?

Once more, we'll use a TV set with a remote control as an example.

In this situation, you have two types of TVs. An O1 type that is inherited in O2. This type has the same methods as in O1, but some of them have been altered. Moreover, O2 has some additional methods. The current situation is that you have a TV of the O2 type and a remote control of the O1 type. You can therefore only activate the methods that exist in O1, the buttons on the remote control. But since the TV set to which the remote control is linked, is of the O2 type, these are the methods that will be executed.





For example, **Class1** contains four methods.

Class2 overrides two methods from **Class1**. If the system refers to one of the methods that are not overridden in **Class2**, the method is automatically "retrieved" from the overlying class.

Class2 may contain methods not present in **Class1**, in this case, method5.

```
Class1 C1;              // Defines handle of Class 1 type

C1 = new Class2();      //The handle points to an object of the
                        inherited class

C1.method1();           // the method is opened from class 2,
                        exists in class 1

C1.method2();           // the method is opened from class 1,
                        exists in class 1

C1.method3();           // the method is opened from class 2,
                        exists in class 1

C1.method4();           // the method is opened from class 1,
                        exists in class 1

C1.method5();           // the method cannot be opened, since it
                        does not exist in Class 1
                        // in other words, your handle only "knows"
                        methods declared in class 1
```

6.2 EXERCISES

Exercise 20 **Using polymorphism**

· Edit the form that executed your stopwatch (lesson *Data return*) so that it creates an object of your 'second stopwatch' but uses an object handle from your original stopwatch.

Exercise 21 **Using polymorphism (Optional)**

1 Create a new class using a class method that can test stopwatch objects. It should work in the following way:

The method receives an object handle created from your original stopwatch class. This object handle is linked to an object created from your original class or the class that inherited this class (The class that displays the time in seconds).

The method will then do the following:

· Activate the stopwatch object start method.

· Pause until the user prompts the system to continue.

· Activate the stopwatch object stop method.

· Activate the stopwatch object printout time method.

2 Once the class with the new method is written, a new job is created where the object and an object handle is created and entered in the method, which is then executed.

This exercise serves to illustrate the concept of polymorphism, as your test method works well whether it receives a stopwatch object handle linked to an object of both of the stopwatch types.

Lesson 7.

Maps

At the end of this lesson, you are expected to be able to:

Understand the purpose of the maps feature.

Create and use maps.

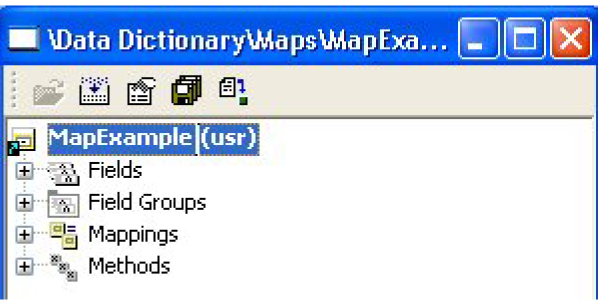
7.1 THE PURPOSE OF MAPS

As previously seen, a table **cannot** inherit properties from another table (with the exception of Common). So the question is: If two tables are almost identical, is it necessary to create methods that are virtually the same for each of these tables?

No, and this is where maps enter the picture. You could say that maps compensate for the fact that tables cannot inherit properties from one another. Maps is located in the AOT under Data Dictionary. Even though a map resembles a table at first glance, the critical difference is that, it does not contain data but functions rather as a library of methods intended to be shared by several tables.

7.2 STRUCTURE

The following is an illustration of a map.



A map contains fields to which the methods created later in the relevant map, refer to. The idea is that each field is linked to fields in regular tables. This linkage is created through Mappings. First you create one mapping per table, which will later use methods from the relevant map. Then, on each individual mapping, you make sure each map field is linked with each table field.

7.3 CALLING METHODS

If you want to activate a method located on a map, you might think you should be able to do this by simply specifying the table name followed by the name of the desired method. However, it is not as simple as that. A table may be linked to several different maps, which is also why it is necessary to specify the name of the map where the method is located.

You call the method as follows:

Table.Map::Method();

Please note that even though this example uses '**::**'before the name of the method, it is actually dynamic.

7.4 JOB AID

Function	Procedure	Keystroke
New map	From AOT, Data dictionary, Maps	CTRL+N
Naming the map	Name the map accordingly to the tables and functionality you want to relate to (look at the existing map names for inspiration)	
Create fields	Create the fields you need for this map.	
Create mappings	Create the mappings. One for each table	
Create methods	Write the methods which you will need for all tables.	
Create this pointers in the table method	Make a reference in the table method to the map method.	

7.5 EXERCISES

Exercise 22 **Creating a map**

- Create two new tables with two text fields each, both with different names.
- Then create a Map, also with two text fields.
- Finally, in Mappings, make sure the two text fields are linked to fields in each of the two tables.

Exercise 23 **Using a map**

- Create a method on the map you created in the previous exercise, where you can copy the contents of the first field to the second field.
- Create a form that shows data for one of the two tables and which has a button activating the previous method in the current record.

Lesson 8.

Information Exchange

At the end of this lesson, you are expected to be able to:

Understand how application elements can activate each other

Understand how information can be exchanged between application elements

Be familiar with methods from the Args class.

8.1 USING INFORMATION EXCHANGE

So far you have seen how data is synchronized when one form is activated from another form. This happens automatically, but the point is naturally that the opened form must know which record was active in the form it was opened from.

Let's start nice and slow by finding out how to activate a form without using a menu item.

You can do this as follows:

```
Args  args = new Args(formStr(FormName));

FormRun       formRun= new FormRun(Args);

;

formRun.init();

formRun.run();

formRun.wait();
```

If there is a form named as specified above under **FormName**, it will now be executed. However, no data will be transferred to the form, since you have not instructed the system to do so.

If you wanted to transfer data, the example above would have looked like this:

```
Args  args = new Args();

Form  form = new Form(formStr(FormName));

FormRun formRun;

;

args.object(form);

args.caller(this);

args.name(formStr(FormName));

formRun = ClassFactory.formRunClass(args);

formRun.init();

formRun.run();

formRun.wait();
```

8.2 THE ARGS CLASS

The secret behind information exchange lies hidden in objects created from the Args class. Through Menu Items, you can add parameters in the form of text or an Enum of a given value.

This data is entered in an object created from the Args class and may be "fished out" using methods for the Args object, **parm()**, **parmEnumType()**, and **parmEnum()**. In the code example above, the methods could also have been used to enter data in the Args object.

All methods in the Args class can be viewed in **System Documentation, Classes**, **Args** but some of them, such as **dataSet()** and **record()**, should be mentioned here. This is because if you open an application element from a form using a menu item, you can then use these methods on the opened element to find out which record was active in the form from which the element was opened, as well as which table the relevant record stems from. You can also use the **record()** method to enter a record in the **Args** object.

Finally, you have the **caller()** method. It is used to specify the object from which elements were opened.

8.3 ARGS OBJECTS

The methods specified in the above section are accessible on objects created from the Args class. The question is therefore how to get hold of the Args objects. You already know that the form or report receives an object of this type.

```
element.args()
```

The code above indicates how to retrieve the Args object. You can therefore, as an extension of the line above, specify a method you want executed on the Args object, or you can link it to an object handle and apply the methods from there.

8.4 EXERCISES

Exercise 24 **Opening a form**

- Create a new form displaying CustTable data.
- Then create a menu item used to activate the form. On the properties of the created menu item, you can now specify a parameter and an Enum.
- Then open the form's init or run method and add code that allows you to retrieve parameter and Enum.

Exercise 25 **Opening a form from another form**

- Now create another form also displaying CustTable data (make a copy of the first form, and delete the init/run method).
- Enter the menu item you created in the previous exercise in this form.
- Then get the form from the previous exercise, and edit its init- or run method so that return values are printed from the **dataset()** and **record()** methods on the form's Args object.

Exercise 26 **Opening a form from a job**

- Create a job that activates the form from the first exercise.
- Write the code so that the content of the Args object corresponds to that of the second exercise.

Exercise 27 **Closing Form1 from Form2 (Optional Exercise)**

In the second exercise you activated a form from another form.

- Create a button on the activated form that can be used to close the form it was called from.

Lesson 9.

Data in Forms

At the end of this lesson, you are expected to be able to:

Understand how you select and enter data in forms.

Understand how queries function on forms

Call a method on a form automatically

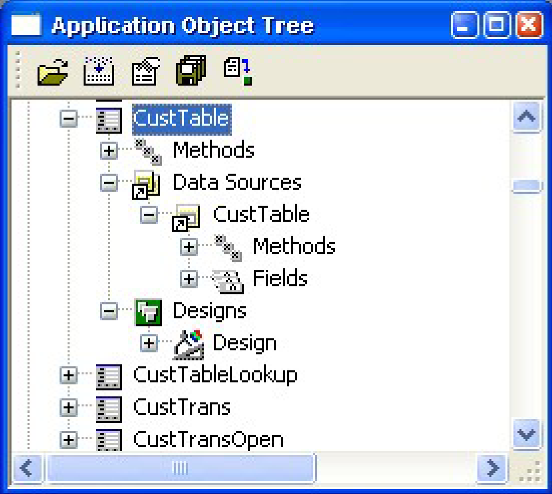
9.1 DATA IN FORMS

At this point, you have probably developed a large number of forms for displaying data from various tables. Some of these forms displayed all records in a table, while other forms only included an extract of the table content (synchronized forms). You probably did not worry much about how the data was selected as the system took care of this automatically. In this lesson we explore how to manipulate the handling and display of data in forms.

Queries on forms

The data contents of a table can be influenced using a query linked to the relevant form. Forms that are linked to one or more tables also contain queries. The queries may not be as visible as in a report when you are looking at the tree structure of a form, but that it is actually the same.

If you expand the tree structure of a form in the AOT, you will notice that you can't see the query but only data source.



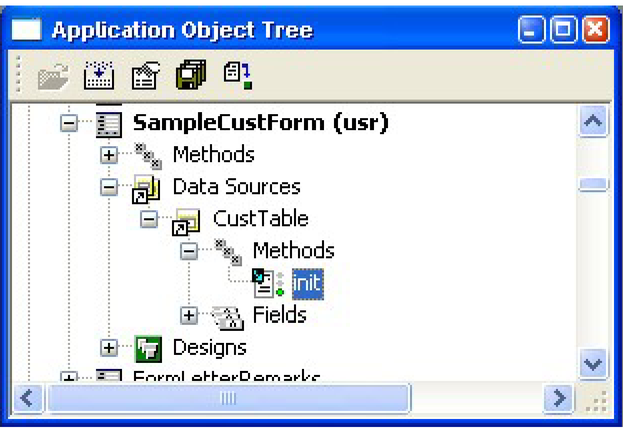
Using a query on a form

Manipulating queries in a form is neither more nor less advanced than manipulating reports. For example, if you only want to load records where a given field has a certain value, you can generally accomplish this in the same way as in a report.

In the form's data source init method, you could create an object of the **QueryBuildRange** type and then, using the **value()** method, specify the

field value for which you want ranges.

For example, if you build a simple form based on the **CustTable** you can override the **Init** method on the data source as follows.



The code in the Init method would be as follows.

```
public void init()
{
    QueryBuildRange     queryBuildRange;
    ;
    super();
    queryBuildRange =
this.query().dataSourceNo(1).addRange(fieldnum(CustTabl
e,AccountNum));
    queryBuildRange.value("4000");
}
```

Here you use the **addRange()** method on the data source for the form to add a new range on the **AccountNum** field. A value is assigned to this range with the **value()** method of the queryBuildRange. Remember to make a call to super() to make sure the query is initialized correctly.

When the form is run the result is a filtered view of the CustTable for the specific record.

Data loading

The **executeQuery()** method on a forms data source is used to execute the query generated from the **Init()** method on the data source. This can be

used at times to refresh the data on a form. For example if you want to refresh the data in a form when editing data, you can accomplish this by running the form's query again.

If you add a button to a form, you can add some code to change the display of data. The code below is executed when the button is clicked.

```
void clicked()
{
    Query               currentQuery;
    QueryBuildRange     queryBuildRange;
    ;

    super();

    currentQuery = CustTable_ds.query();
    queryBuildRange =
currentQuery.dataSourceNo(1).range(1);
    queryBuildRange.value("4000..4004");
    CustTable_ds.executeQuery();
}
```

In this example you use a method located on the form's data source. To access the form’s data source you can use the name of the data source extended with _ds. Like this :

Datasourcename_ds.executeQuery();

You could also use the _q suffix on the data source name to get to the query of the data source. For example adding another button to the sample form you can change the code to look like this :

```
void clicked()
{
    super();

    CustTable_q.dataSourceNo(1).range(1).value("4000");
    CustTable_ds.executeQuery();
}
```

If you wanted to move the positioning of the active record in the displayed set of data you can use the **First()**, **Last()**, **Next()** and **Prev()** methods. For example to move to the last record:

Datasourcename_ds.last();

You can look at additional methods like **filter()** and **findRecord()** to use by overriding or calling from the data source to alter the display of data on a form.

Manipulating data in a form

Once you have opened a form or move around the record set in a form you may want to manipulate the data in a form. This can also be achieved with overriding or calling the methods on a form's data sources.

For example you could create a new record in the underlying table with the **create()** method. Calling this method has the same effect as the user pressing the CTRL+N keys on the keyboard.

Datasourcename_ds.create();

This method takes a boolean parameter to determine if the record is inserted before, false, or after, true.

After a new record is created you can initialize default values by calling the **initValue()** method. Calling this method actives the table **initValue()** method. If this method is overridden on the data source calling **super()** will activate the method on the table. MorphX calls the **initValue()** method on a table automatically so there is no need to call this explicitly.

You may want to delete a record from a table via the form. A user can do this with the ALT+F9 keys. It can also be achieved by calling the delete() method on the data source.

Datasourcename_ds.delete();

If this method is overridden the use of **super()** activates the **validateDelete()** method on the data source which activates the same method on the table. The **validateDelete()** method on the table and the data source should return true if the delete can go ahead and false if it shouldn't.

Assigning values to fields in a record is a simple matter of using the data source. For example assigning a value to the CustGroup field for a form that uses the CustTable would be achieved by

```
CustTable.CustGroup = "10";
```

Method description

In the Developer's Guide you will find descriptions of all methods on the form's data source, as well as indication of the sequence in which they are executed. For clarity of this material they are reproduced here:

Method Name	Is Executed	Comments
Active	the user scrolls to make a new record the current one.	The super() call makes a new record the current one.
Create	the user creates a new record in the data source, for example by using the default shortcut key for insertion (CTRL+N).	The super() call creates a new record before the current one on the screen. To have the new record created after the current record, set the methods after parameter to true.
defaultMark	the user clicks mark area (top left corner) in a grid control.	When records are loaded and presented in a grid, they are marked with a default mark value of one (1). The fact that they are marked is used for delete and for copy.
Delete	the user deletes a record in the data source.	The super()activates **validateDelete** and (if it returns true) manages the database delete action.
deleteMarked	the user deletes (ALT+F9) one or more marked (selected) records in the data source.	If no records have been marked (selected), **delete** is executed.

dislayOption	before a record is displayed.	**displayOption** is executed once for each record, before the record is displayed and after it has been loaded. The method is used to set text color and background color for individual records.
exeuteQuery	the form is opened for data display.	The super() call executes the query generated by the **init** method and displays records.
Filter	the user activates the **Filter** command on the form shortcut menu.	Write code lines on the **filter** method if you want to add information to the standard filer functionality.
findValue	the user clicks the **Find Value** command in the shortcut menu on a form control.	The super() call finds the specified value, and makes the record with that value the current one using findRecord.
First	focus moves to the first record in the data source.	The super() call moves to the first record in the data source.
Init	The form is opened.	On the basis of the properties on the data source, the super() call creates the query to load data to be displayed in the form.
initValue	a new record is created. The purpose is to fill in initial values in the record.	The super() call activates the table's **initValue** method and the values initial values are filled in. In this method you would typically assign values to a new record. The system does not consider the record to be modified until the user has entered values in one or more fields.

Last	focus moves to the last record in the data source.	The super() call moves to the last record in the data source.
Leave	focus moves to a new record, or to a new data source.	**leave** is executed regardless of changes to the record. The super() call does not do anything and the method is merely used as a notification.
leaveRecord	focus moves to a new record.	
linkActive	the user scrolls to a new record in a form with its data source linked to another data source.	The super() call activates **executeQuery** on the data source that the form is linked to. This method is only used when a link between two data sources has been established (by setting the **LinkType** property to **Yes** on the data source).
Next	focus moves to the next record in the data source.	The super() call moves to the next record in the data source.
Prev	focus moves to the previous record in the data source.	The super() call moves to the previous record in the data source.
Print	the user activates the **Print** command in the **File** menu.	The super() call prints the current record using the system's auto report facilities (the SysTableReport report, located in the **Reports** node).
Prompt	the user activates the **Filter Records** command (from the **Command** menu or by activating the CTRL+F3).	The super() call activates the standard form used to limit the query range (the **sysQueryForm** form).

Refresh		The super() call updates the screen (all fields in the data source). **refresh** calls **refreshEx**. The contents of the active record are re-drawn without load from disk. You can for example use **refresh** if you need to update in the course of a major operation.
refreshEx	a form is activated where records have been selected.	**refreshEx** is an extended version of the **refresh** method. It has one parameter and refreshes a single line.
removeFilter	the user clicks the **Cancel Filter** command in the shortcut menu on a form control.	The super() call resets the query, that is, removes all modifications to the original query generated by the form data source **init** method.
reRead	Not activated by the system	The super() call re-reads the current record from the database.
Research	Not activated by the system.	The super() call refreshes the database search defined by the query automatically generated in the **init** method. Corresponds to re-activating **executeQuery** with the exception that research preserves the query's filter, sorting and so on. **research vs. executeQuery** If you want to refresh the form with records that were inserted in a method or job that was called, then you should use **research**. If you want to change the query to show other records, perhaps

		based on a modified filter, then you should use **executeQuery**.
validateDelete	A record is to be deleted.	The super() call invokes the **validateDelete** method on the table. Use this method to add your own data validation checks whenever necessary.
validateWrite	A new or updated record is to be written	The super() call invokes the **validateWrite** method on the table. Use this method to add your own data validation checks whenever necessary.
Write	the user inserts a new record or updates an existing one.	The super() activates **validateWrite** and (if it returns true) manages the database write action.

Validation sequence of data

The validation of data entered on a form happens in a defined sequence once the user has modified data in a form control. (Refer to Validation Techniques Lesson).

Automatic features

At times, you may want a form to be automatically updated at a certain time interval, for example if the data displayed in the form frequently changes or you would like to execute a task from a form at certain time intervals.

All forms inherit properties from the **Object** kernel class. The **SetTimeOut()** method is located in this class. This method is used with three parameters, the first two of which are mandatory. The first one indicates the ID of the method to be activated. The second indicates the number of thousandths of seconds for the method, specified in the first parameter that is executed.

The last parameter is a boolean that is used to indicate how the time is measured. If the parameter is set to **true** then the idle time is measured from when the keyboard or mouse was used. Use false to indicate that the time should be measure since the last time **SetTimeOut()** was executed.

You can execute this method from a form as follows:

```
element.SetTimeOut(identifierstr(Methodname),3000,false);
```

For further description of **SetTimeOut()** and other methods in the **Object** class, see **System Documentation/Classes**.

9.2 EXERCISES

Exercise 28 **Finding a good example**

Use the Find tool to find a form using an object of the QueryBuildRange type.

Exercise 29 **Ranges on CustGroup**

Create a form displaying data from **CustTable** in a grid a range set on the **CustGroup** field so that only customers in group 40 are displayed.

Exercise 30 **Ranges on CustGroup (Continued)**

- Create a text field in the form from the previous exercise. You will be using the field to specify a certain customer group so that only records containing the same customer group are displayed in the form.
- To that end, create a button that updates the content of the form when activated.

Exercise 31 **Automatic updating**

- Finally, readjust the form so that updating takes place automatically every second.
- To check whether the updating actually occurs as often as expected, you must also insert a data field that displays the number of updates performed since the form was opened.

Lesson 10.

Windows in Forms

At the end of this lesson, you are expected to be able to:

Use the Window form controls

Use methods on the Window Form Controls

10.1 WINDOWS IN FORMS

In the preceding section we looked at form controls. Window is one of them. An object of this type derives from the **FormWindowControl** kernel class. It has several purposes, but in this lesson you will focus on using it to display images.

Properties

If the image you want to display is saved in a file, the easiest way to load the image would be to use the property called **ImageName**. Here you can specify the path and name of the file you want to load.

Alternatively, you can use **DataSource** and **DataField** in properties. If so, you enter data source name and field name containing path and file name there.

Finally, in properties, you also have the option of specifying a method name in **DataMethod**, which returns the path and file name. A new method can be created on a table, data source or from the form objects to display. An example or a method would look like this on a table if the table has a field called **FileName**.

```
display Filename displayImage()
{
    return this.Filename;
}
```

Methods

Another way to load an image would be to use the **ImageName()** and **UpdateWindow()** methods, both of which are located on the object.

Example

If you create a new form with a window control and set the **name** property to ImageWindow and also set the **AutoDeclaration** property to Yes then you can load an image on the form with the following code, for example, from the clicked method of a button.

```
void clicked()

{
```

```
    super();

    ImageWindow.imageName("C:\\temp\\Images\\img10-
paraglider.jpg");

    ImageWindow.updateWindow();

}
```

If you haven’t set the AutoDeclaration property then your code will have to access the control via the full path via the form design.

```
void clicked()
{
    FormWindowControl imageDisplay;
    ;
    super();

    imageDisplay =
element.design().control(control::imageWindow);
    imageDisplay.imageName("C:\\temp\\Images\\img10-
paraglider.jpg");
    imageDisplay.updateWindow();
}
```

If you want these methods to be executed each time you change records, the methods can be placed in the **active()** method on the form's data source.

Database stored images

Up to this point we have been relying on the image being stored in the file system. If this is to work for all users of the system then the static image files will have to be stored in a common shared network location. What if you want to make use of an image stored in the database?

You can do this easily with the use of a container field on a table. To display the image you can then make use of the MorphX **Image** class to

load data from a field or any container and use the **Image()** method on the window control to use this data. For example this code segment makes use of a window control called imageWindow.

```
void displayImage()
{
    Image   logoImage;
    ;
    //This relies on the imageWindow control being set
to AutoDeclaration.
    //windowsControlImage is the table of the data
source.
    //displayimage is the field on the table.

element.lock();
logoImage = new Image();
logoImage.setData(windowsControlImage.displayimage);
imageWindow.image(logoImage);
imageWindow.widthValue(logoimage.width());
imageWindow.heightValue(logoimage.height());
element.resetSize();
element.unLock();
}
```

10.2 EXERCISES

Exercise 32 **Using properties**

- Create a new table with two text fields. One of the fields is intended for image ID, while the other must be long enough to accommodate both a path and a file name.
- Then create a form using the table above as data source and containing the two fields and a window whose properties are set such that the image specified in field no. 2 is displayed there.

Exercise 33 **Using methods**

Now alter the form so that the loading of the image is no longer managed by the properties above, but rather by methods placed under the form's data source.

Exercise 34 **Selecting a file**

Add code to the form so that it is no longer necessary to enter a path and file name in field no. 2. Instead, the form may have a button that activates a file selection function where path and file name are automatically entered in the field. (You may want to refer to the **SysImportDialog** form.)

Exercise 35 **Using a stored image**

Reference to Appendix

Lesson 11.

Lookup Forms

At the end of this lesson, you are expected to be able to:

Know about Lookups for Forms.

Program customized Lookup forms.

11.1 USING LOOKUP

When a table field refers to a field in another table, you have the option of performing lookups while in the field.

Typically, several other fields are displayed on the list of possible values from the field that is being referred to. We know that two of the fields stem from the table properties **TitleField1** and **TitleField2**.

In addition to this option, an extra field is added to the list each time an index is created in the reference table. This field is the first component of the index.

Naturally, it would be very time-consuming to create indexes in tables just because the fields represented in their first components will be used in a list during a lookup. We can only conclude, therefore, that there must be a better way.

11.2 LOOKUP FORMS

What we need is a form that is specially designed with the desired fields that are to function in the same way as the lists described above.

You shouldn't have any trouble with the design, but two questions remain:

- How can you open the form from a certain field?
- And how do you get the form to return data from a given record field that you select?

Building on the form you are opening from

The most complicated part of creating the lookup form takes place on the form from which you open another element. First, create a field here containing a button that activates the field's Lookup method. You create this button by setting the field property named **LookupButton** to **Always**.

Lookup() on the field is activated when the system performs a lookup. According to Best Practices, the most correct way is to create a new method on the table you perform the lookup on. Thus, the only code to be placed in **lookup()** is a call of the new method on the table.

As mentioned above, the new method on the form must activate the form from which data are collected. This code will look like the one you saw in the lesson **Information Exchange**, except for the fact that the run() and wait() methods on the FormRun object are not used. Instead, they are replaced by a method from the FormStringControl object called **PerformFormLookup()**. This method is to receive the FormRun object.

For an example of the code, see the **Accountnum** field in the **LedgerJournalTransDaily** form.

This code example gives you an idea of what you can do.

```
FormRun     newlookup;

Args argForm = new Args()

;

argForm.name(formstr(myLookupForm));

argForm.caller(this);

newlookup = ClassFactory.formRunClass(argForm);
```

```
newlookup.init();

this.performFormLookup(newlookup);
```

Building on the form that is opened

On the form you are calling, the **selectMode()** method is used together with a parameter that is the object handle linked to the field form that is to be returned. This can be placed in either the form's init or run methods after the call to **super().**

element.SelectMode(field name);

11.3 EXERCISES

Exercise 36 **New table with lookup form**

- Create a table containing ID, first and last names for technicians performing tasks in customers' locations.
- You must therefore also create a field in CustTable for technician IDs. You cannot setup any reference here.
- Then create the lookup form from the Technician table. You want to sort the technicians according to their first names.
- Finally, make sure you enter the necessary code.

Exercise 37 **Filtration**

The preceding exercise now gets a bit more advanced.

- In the technician table you are to insert an extra field that specifies the customer group. The result should be that during lookups only technicians in the same group as the relevant customer will be displayed.

Lesson 12.

List Views

At the end of this lesson, you are expected to be able to:

List views in forms

Create menus in forms.

12.1 USING LIST VIEWS

List View is a control type that can contain various types of data that do not necessarily originate from a table. For the same reason, List View requires code to populate the data in control.

Data can be entered using the **add()** method, but this method only serves to insert text.

You also have the option of entering objects of the **FormListItem** type using the **addItem()** method.

The way the data are presented in list view depends on the settings for the property by the name of **View Type**.

Drag and Drop

The ability of a user to drag and drop data is an important concept to windows environment. ListView controls have the ability to utilize drag and drop but this requires some code to handle the manipulation of the lists.

To utilize drag and drop on the ListView set the **DragDrop** property on the list to Manual. You can then add code to override methods like **Drop()**.

Menus

You can create menus that are activated by right-clicking in the form.

For the form's design and underlying controls, you will find the **context()** method. By entering code strings on this method, where you create an object of the **Popup Menu** class, and finally use the **draw()** method to activate the menu.

See the **SysDateLookup** form for a complete example.

12.2 Exercises

Exercise 38 **Creating a List View**

Create a form with a list view containing account numbers for all clients in CustTable.

Exercise 39 **Dragging and dropping between List Views**

Create an additional list view in the form from the first exercise, and add code that allows you to drag account numbers from the first list view and drop them into the new list view, so that they are moved there.

Exercise 40 **Menu**

Extend the functionality of the second list view so that you can open a menu containing two items by right-clicking. The first item allows you to delete the last transaction, while the second item lets you delete all transactions at once.

Lesson 13.

Tree Structure

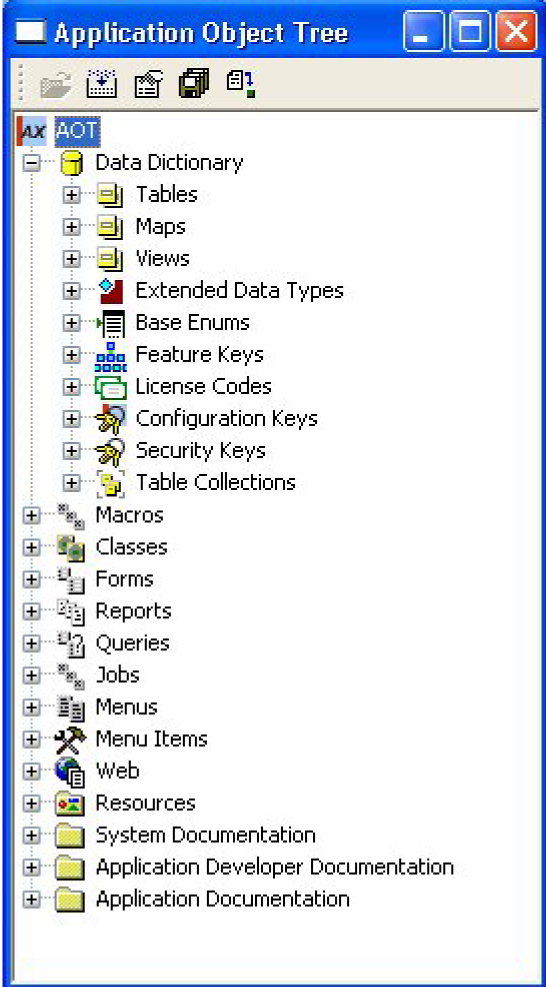
At the end of this lesson, you are expected to be able to:

Create forms containing tree structures.

Understand the programming required by tree structures.

13.1 USING TREE STRUCTURES

In the prior Axapta development courses, you have spent most of your time working on projects and the AOT. You may not have thought about it, but you are actually dealing with data represented in a tree structure in both cases. In this lesson, we will look at how you can present data like that in a form.



13.2 KERNEL CLASSES

To create tree structures in forms, you must use methods located in two of the system's kernel classes.

FormTreeControl and **FormTreeItem**.

FormTreeControl is the class whose object is the form control containing the tree. While objects are created from the **FormTreeItem** class, the nodes are in the tree.

13.3 METHODS

In this lesson you will be introduced only to the most important kernel class methods mentioned on the preceding page. For a complete description of the two classes, go to **System Documentation, Classes**.

The **add()** method, which is used to create the tree, is located in the **FormTreeControl** kernel class. It must have at least three parameters:

```
root = controlname.add(0,0,'text');
```

The script above shows how to create the root of the tree. The method returns an integer that is saved in a variable here labeled **root**. You will need the root variable when building branches on the tree.

You can add a branch to the tree in the following manner:

```
item   = new FormTreeItem('Text');

l1     = controlname.AddItem(root,0,item);
```

The **l1** variable has the same function as **root**. This is what you use when you want to add another level of branches.

13.4 DATA

On each tree node you may also place data of any type. You can do this either using **new()** on **FormTreeItem** on the method's fourth parameter or the **data()** method once the object has been created. You also use **data()** to return data on the node.

You may want to load data each time you change tree node. If so, you must enter code for this purpose in the **selectionChanged()** method on the form's **FormTreeControl** object.

13.5 EXERCISES

Exercise 41 **Creating a form with a tree structure**

Create a form with a tree structure using the company name (can be retrieved from the **CompanyInfo** table) as its root and all customer groups of the business as branches. The form is not going to have a data source. Instead, create a method on the form that handles data loading. You must be able to activate this method using a button on the form.

Exercise 42 **Expanding the tree structure**

Now adapt the above form so that the tree also contains customers associated with each of the customer groups and transactions for each customer.

Exercise 43 **Fields**

Enter fields in the form displaying data on the customer transactions, including account number, vouchers, data, and amount, so that the fields are completed when a transaction is selected in the tree. When no transaction is selected, the fields are to be hidden.

Lesson 14.

Temporary Tables

At the end of this lesson, you are expected to be able to:

Determine when it is beneficial to use temporary tables.

Use temporary tables in connection with forms.

14.1 TEMPORARY TABLE FUNCTION

Temporary tables may be used in many contexts. The distinguishing feature of a temporary table is that the **Temporary** property is set to **Yes**. This entails that data placed in such a table, as opposed to data placed in a regular table, is only saved temporarily.

In a 3-tier environment, temporary tables are instantiated where data is first accessed. Meaning the first insert determines whether a table lives on the client or on the server.

14.2 PURPOSE OF TEMPORARY TABLES

The purpose of temporary tables is to save a collection of data, for instance for display in a form or a report. Since the quantity of data is not going to be used in other contexts and is saved in various other tables, there is no reason to save it.

The system already contains several tables of this type. They are not hard to find, as their names all start with **tmp**. Later, when completing exercises using temporary tables, you can either use one of the existing tables or create a new one containing the fields you need.

14.3 USE

In general, you use temporary tables in much the same way as you use regular tables. The crucial difference is that the data is deleted when there is no longer a table buffer attached.

If you want to use a temporary table in a form, you will have to insert the table in the form's data source.

Then you enter data into the table (buffer) using the form's **init** method. At the end of the form's init method you must transfer the table buffer to the form's data source, in order to avoid erasing data.

```
DatasourceName.SetTmpData(TableBufferName);
```

The same applies if you want to use a temporary table in a report. However, in addition to the init method, you must also enter code in the report's fetch method. Here, you use the **send()** method (a method on the report). This method transfers data to the report's design. For a more detailed description of these and other methods on reports, see the Developer's Guide.

Best practice

- A temporary table should live on the tier where it is used.
- If a temporary table is used on several tiers, the table should live on the tier where the largest number of inserts and updates is performed.

14.4 Exercises

Exercise 44 **Temporary table in a job**

- The purpose of this exercise is to demonstrate when you need a temporary table. Create a job that allows you to output customer data on screen using **print** and **pause.** The output must contain the account number, name, and number of customer transactions and should be set up so that the customers are output in a sequence analogous with the transaction number.

Exercise 45 **Temporary table in a class**

- Create a class with two methods, each one holding half the code from the job above. One method enters data in the temporary table, while the other retrieves it.
- Did everything go as expected?

Exercise 46 **Temporary table in a form**

- Present the data from the first exercise in the same order in a grid on a form.

Exercise 47 **Temporary table in a report**

- Output the above data in a report. (Tip: You may want to look at the **Cheque** report code.)

Exercise 48 **Temporary table for spool file administration - Optional**

- You are going to display all files with the extension ’spl’ on c: in a form.
- Create the form so that it updates itself automatically every 30 seconds.
- Finally, allow the user the option of selecting the files he or she wants to delete, and create a button for activating the delete function.

Lesson 15.

Validation Techniques

At the end of this lesson, you are expected to be able to:

Understand the purpose of validation techniques.

Recognize where validation techniques are used in Axapta.

Use the validation techniques in Axapta.

15.1 VALIDATION METHODS

Overview

When you enter, alter or delete data, it may be necessary to check or validate whether the change is OK. You may already have looked at Delete Actions, which perform a validation whenever somebody tries to delete an entire record from a table.

To ensure that the user does not enter the wrong type of data in a specific field, you should validate – which means check the content of the entered data. You can also use validation to give the user the message that you cannot honor his request. For example if a user wants to book a meeting room, which is already booked.

Because of the rather complex architecture of Axapta, you will have to consider which validation method you want to use, where to run it (Client/server) and on which element to place it on.

.

15.2 Delete Actions (Review)

One situation where you will need validation, is when you try to delete a complete record in a table. Let us look at one example:

You attempt to delete a record in CustTable. But the CustTrans table contains transactions for the relevant customer. Therefore, you cannot allow the customer to be deleted. You can prevent this by setting up a "delete action".

In CustTable under the Delete Actions node, a Delete Action has been created for the CustTrans table. In the properties for this Delete Action, you can see that CustTrans is selected as table and that the delete action type is set to Restricted. This means that a customer cannot be deleted as long as related transactions exist in the CustTrans table. You have the following options:

Delete Actions	Consequence
None	The customer is deleted, transactions remain
Cascade	Transactions are automatically deleted, together with the customer
Restricted	If there are transactions, the customer cannot be deleted
Cascade + Restricted	Not implemented

15.3 TABLE VALIDATION METHODS

All tables automatically inherit three methods that are specially designed for validation. These methods are:

METHOD NAME	ACTIVATED WHEN
ValidateDelete	When attempting to delete an entire record. Checks delete actions.
ValidateWrite	When saving a record if changes have been made to one of the record fields.
ValidateField	Each time you change and exit a field. May therefore be used to evaluate a single field. You may encode rules for "legal" values in fields.

These methods are meant to be overridden fully or partially, as needed.

Example

Let us anticipate that you want to make sure that the users get a warning whenever a the value of CreditMax for a customer exceeds 1000000.

This can be done in the method Validatefield() on custtable. Please not that some code have already been placed there, so we only have to add a few lines:

```
boolean validateField(fieldId p1)

{

    boolean ret;
    ret = super(p1);
    switch (p1)

    {

        case fieldNum(CustTable, VATNum) :
         ret = TaxVATNumTable::checkVATNum(this.VATNum,
this, p1);

            break;

        case fieldNum(CustTable, CreditMax) :
```

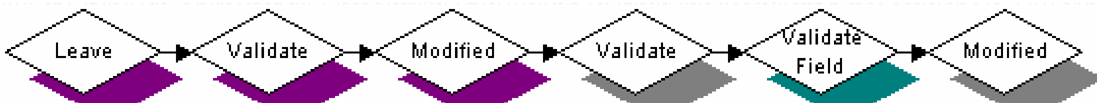
```
            if (this.creditMax < 0)
            {
                ret = checkFailed("@SYS69970");
            }

            //New code for this Example

            else
            {
                if (this.creditMax >= 100)

                {

                    if (box::yesNo("CreditMax exceeds
100 do you accept this",DialogButton::No) ==
DialogButton::No)

         ret = checkFailed("The CreditMax have not been
changed");

                }

            }

            //End of New code for this Example

            break;
    }

    return ret;

}
```

Other validation methods

Data sources on forms	validateWrite, validateDelete
On form controls (StringEdit, IntEdit etc.)	validate

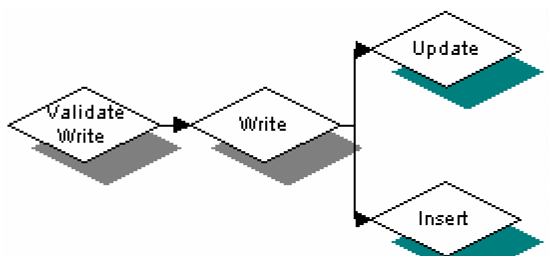
15.4 VALIDATION SEQUENCES

Validation of data is used to validate the contents of the data entered by the user. Axapta has two different methods to validate data. Validation can be put directly on the field or the table. A validation method always returns either `true` or `false`. Axapta has two different approaches to validation. The first validation happens when you leave a control. The order is as follows:



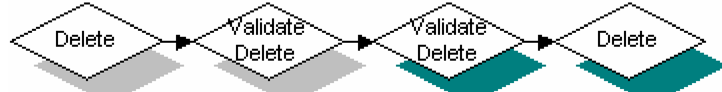
The methods `Leave`, the first `Validate` and the first `Modified` are placed on the control itself. The methods `Validate` and the second `Modified` are placed on the data source. The `Validate Field` is placed on the table itself.

Secondly when you leave a record the system goes through the following process



First of all the method `ValidateWrite` is called, then the method `Write`, these are placed on the data source. Depending on the record being worked on, if new, or its content are just being updated the `Insert` or `Update` method is called, which is then placed on the table.

Finally, when a record is deleted, the system runs through the following steps:



The first `Delete` and first `ValidateDelete` are placed on the data

source. The second `ValidateDelete` and `Delete` are placed on the table.

When working with the validation methods, the ‘`this`’ pointer does not refer to the data source, table or field, but to the current row being edited. To access the table we have to create a table buffer or we can access the original value of the field by using the `orig` method of the ‘`this`’ pointer, followed by the attribute in the table you wanted.

Example

```
print this.orig().AXATeacherId;

print this.AXASTTeacherId;
```

Prints the old value of the `AXATeacherId` followed by the new value of the `AXATeacherId`. This code is actually called twice since it is both called from the data source and the table.

15.5 EXERCISES

Exercise 49 **Validate on the table BankGroup.**

Create a validate method for the BankGroup table. The following additional validation requirement must be made:

The first letter of a BankGroupId may only be used once. So if a bankgroupId "MyBankgroup" is used, "MySometingElse" may not be used, Because the "M" is already used.

Lesson 16.

Queries

At the end of this lesson, you are expected to be able to:

Understand the query element

Understand where queries can be used

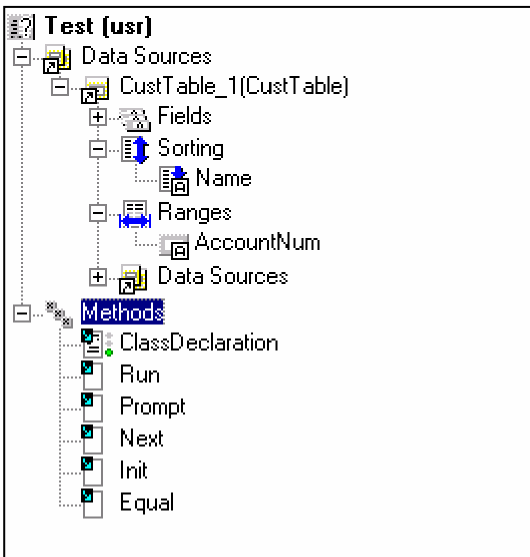
Create queries

16.1 WHAT IS A QUERY?

A query is an application element found in the AOT, just like reports and forms. It can be viewed as a definition of a data search.

You might already have tried to perform a data search using **select** combined with **while.** Queries are a better option, as they grant the user who will employ them at a later stage, much greater freedom with regard to specification of ranges and sorting order.

A Query Example:



In principle, a query consists of one or more data sources (tables to be searched) and a set of methods that are executed when the query is run. In this example, CustTable serves as data source, data is to be sorted after the Name field and restricted on the AccountNum field.

As previously mentioned, the advantage is that the user may modify this setup when running the job.

16.2 EXECUTION

A query is not particularly interesting in itself, in that it cannot do anything but search through selected data in a given order. It does not get exciting until you write a string of code that uses and executes our query.

To do this, we must create an object based on a kernel class called QueryRun. This object is attached to an object of the Query type created from the query above called **Test**. This code may be written as follows:

Example

```
CustTable    ct;

Query        q =new Query('Test');
//This is where you create your query (test) for an
object

QueryRun     qr=new QueryRun(q);
//This is where you create an object of the QueryRun
type.


if (qr.prompt()) //this is where you start and have
                                      "true"
                                      //returned-

                                     //if you click OK.

{

      while (qr.next())        //next() changes record
                               and returns //'true'-

      {            //provided that a record exists.

      ct= qr.get(TableNum(CustTable));

      print ct.Name;
//get() returns the content of a record -

      }                  //in the specified table.

}

pause;
```

If two tables had been placed under data sources in the query above, it would have been necessary to use **get()** twice inside the loop if data were to be retrieved from another table.

16.3 KERNEL CLASS QUERY, ONE TABLE

As seen above, an existing query from the AOT can be run using the kernel classes QueryRun and Query.

There are some kernel classes that may be used in connection with queries. In fact, it was not necessary to create the query above in the AOT in advance; you could also have created it in the code by simply using some of the kernel classes.

This structure would appear as follows:

Example

```
Query                    q;
QueryRun                 qr;
QueryBuildDataSource     qbd;
QueryBuildRange          qbr;
q;     =new Query();
qbd    =q.AddDataSource(TableNum(CustTable));
       // Add data source here
qbr    =qbd.AddRange(FieldNum(CustTable,AccountNum));
       //Add range here

qbd.AddSortField(FieldNum(CustTable,Name));
       // Add sorting field here

qr     = new queryRun(q);
       // execution of query;
etc.
```

The example above uses the **QueryBuildDataSource** and **QueryBuildRange** kernel classes. We simply create two new objects out of these classes and end up with a query object ready to be executed. Moreover, these classes have several useful methods. The **Value()** method located in the **QueryBuildRange** class serves as an example. This method can be used to enter data in the range fields, as well as retrieving values from the fields.

16.4 JOIN

Use **join** to link tables to each other in a search. The command is used almost as **select**, as almost the same subcommands are available to both commands.

The following example shows how you can search for transactions attached to the individual customer:

Example

```
CustTable CT;
CustTrans CTR;

While select AccountNum,Name

From CT
Order by AccountNum
Join* from CTR

Where(CTR.AccountNum==CT.AccountNum)

{

//For example code for printing data

}
```

It is important to specify the **where** statement correctly after **join**, because it is responsible for how the data is linked.

Join works differently according to the command preceding it.

The following table describes the options.

Command	Description
Inner	Customer is only selected if any attached transactions exist. All his transactions are selected. If nothing else is specified before **join** in the code, **inner** is automatically used.

Outer	Customer is selected no matter whether any transactions are attached to him or not. All his transactions are selected.
Exists	Customer is only selected if transactions are attached to him, but only one attached transaction is selected.
Notexists	Customer is only selected if no transactions are attached to him. No transactions are selected.

16.5 KERNEL CLASS QUERY, SEVERAL TABLES

Using more than one table is very similar to using one table. You just need to create one more instance of the data source. You might need to link the two data sources together.

Example

```
Query                   q;
QueryRun                qr;
QueryBuildDataSource    qbd1,qbd2;
QueryBuildRange         qbr;
QueryBuildLink          qbl;
q;     =new Query();
qbd1   =q.AddDataSource(TableNum(CustTable));
       // datasource 1

       // range and sort field for data source 1
qbr    = qbd1.AddRange(FieldNum(CustTable,AccountNum));
qbd1.AddSortField(FieldNum(CustTable,AccountNum));

       // datasource 2
qbd2   = qbd1.AddDataSource(TableNum(CustTrans));
       // datasource 2
qbd2.JoinMode(JoinMode::Innerjoin);
                        // join mode
qbl    = qdb2.Addlink(fieldnum(Custtable,AccountNum),
fieldnum(Custtrans,AccountNum));
                              // relation between data
sources));

qr     = new queryRun(q);
       // execution of query;

if (qr.prompt())
       etc.

Note: Format "normal" begin:
```

However there may be an easier way to link two tables together in a query. If relations have been specified in the data model (data dictionary) as it is the case in this example, you could have set the property relations the second data source to the value "true" like this:

```
Qbd2.relations(True);
```

In that case you will not need to use the class "QueryBuildLink".

Note: Format "normal" End:

16.6 General

It is not very common to build up a **query** from scratch, as shown above. The only reason it was done here is to show how easy it really is. The advantage of partially designing **queries** and other application elements in this way is that the design may be modified when the job is executed, which makes the system much more flexible

16.7 JOB AID

Function	Procedure
Query using several tables	• First, create the needed handles/objects for the first data source in the query. • Then create the second data source, • Then create the relation between the two data sources. Now you have a buffer for the two tables. Note: the second data source is added to the first data source and not the query itself.

16.8 EXERCISES

Exercise 50 **Running a query**

- Build a query in the AOT for the purpose of searching through the Customer table and the Customer Transaction table. Sort the query on Customer name or ID.
- Then create a job that uses this query to print the amount of sales orders to the related customer.

```
static void Exercise1(Args _args)
{
  QueryRun     queryExercise = new
QueryRun(queryStr(QueryExercise));
  CustTable    custTable;
  CustTrans    custTrans;
  AmountMST    amountMST=0;
  Name         name="";
  ;
  if (queryExercise. ????????)
  {
      //the query is sorted by Customer.
      while (queryExercise. ????????)
      {
            custTable = ????????
            custTrans = ????????
            if  (name != custTable.Name)
            {
                print  custTable.Name+" "+
num2str(amountMST,10,2,2,1);
                //start calculating for the next
customer.
                name       = custTable.Name;
                amountMST  = 0;
            }
            //increase the total amout of sales orders
            amountMST += custTrans.AmountMST;
        }
    }
    pause;
}
```

Exercise 51 **Building a query**

- Create a job that prints all customer names by generating a query on the custtable. . (Do not use a query from the AOT, but rather a query generated automatically by the job)

Exercise 52 **Build a complex query**

- Redo the previous exercise, but create the query in X++ as well (Do not use a query from the AOT).

Lesson 17.

Using System, X and Dict. Classes

At the end of this lesson, you are expected to be able to:

Understand how to use System Classes

Understand what X-Classes is

Understand when to use X-Classes

Understand the purpose of Dict. Classes

Manage the use of methods on Dict. Classes

17.1 Using System Classes

A system class is an interface to functionality defined in MorphX, for example to create, or run a form.

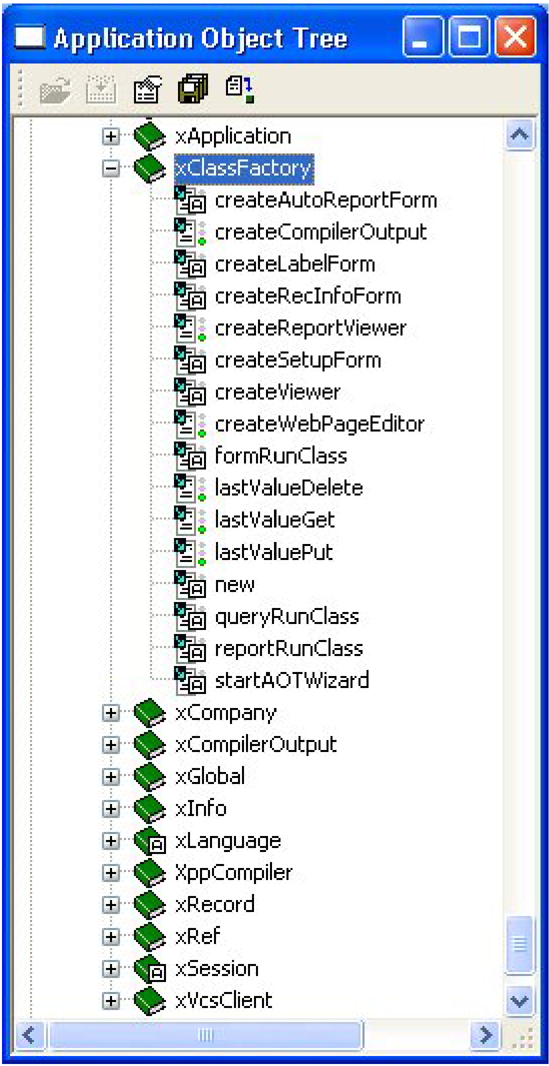
17.2 X-CLASSES

In the node Classes under the node **System Documentation** you will find the X-Classes. The X-Classes provide you with a variety of methods to execute forms, reports, queries, create tables and so on. When you try to open the X-Classes you will not open the code, but instead a file displaying information about the specific method or class.

X-CLASS	SYSTEM CLASS	DESCRIPTION
xApplication	Application	Returning information concerning Company, System date, etc. **Methods can be overridden**.
XclassFactory	ClassFactory	Used when you want to run Forms, Reports, and Queries. **Methods can be overridden.**
Xcompany	Company	Returning Company information. **Methods can be overridden**.
Xinfo	Info	Used to display information, warning and error-messages to the user. **Methods can be overridden**.
Xrecord		When you are creating a new table, the table inherits its methods from this class. **Methods cannot be overridden.**
Xref		Used to update x-references, when compiling an object.
Xsession	Session	Returns information concerning logindate, logintime, userID, etc. **Methods can be overridden.**

XClassFactory

An example of an X Class is the **xClassFactory** class which contains methods for running forms, queries, and reports. Use this class to overwrite the functionality of the execution of forms, reports and queries. For example you can show an info box with the name of the form, every time a form is run.



XInfoClass and Infolog

If you as a user execute a job, for example posting a journal, this will lead to the generation of several dialog boxes where you will have to click OK every time you want to continue. This can be avoided by using the infolog functionality.

Infolog is the name of an object handle generated by the system, and attached to an object instantiated from the XInfo class.

To use the infolog

The method **error()** uses infolog. Other methods using the infolog are for example **checkfailed()** from the Global class, and the **checkAllowPosting()** method.

But infolog can also be used directly. Infolog has the method **add(),** which is used to insert lines that the user will see as messages. The following text describes the syntax of the **add()** method:

```
Infolog.add(Exception::<Value>,<Text>);
```

The value of the exception specifies how the message is presented (Info, Error, Warning, and so on). The text specifies the text line that is included in the message.

Note: Infolog.add() is only used in situations where **Info(), Warning(), Error(), Checkfailed()** are inadequate. For example when using the exception **Break().**

If the above described code line was executed in a job, a message would appear in a window. If **add()** was used more than once, a corresponding number of messages would appear in the same window.

If you want to delete the content of the window, use the method **clear()**:

```
Infolog.clear();
```

You can also cut or copy lines from the window using the methods **cut()** and **copy().** These methods return a container, that includes the cut or copied lines.

Infolog

Example of use

You want to copy 2., 3., and 4. line to a container variable called c.

```
C = infolog.copy(2,4)
```

If you want to insert the variable in a window, use the method **view()**.

```
Infolog.view(c);
```

The **view()** method can be used as an alternative to the **add()** method, that only inserts one line at a time.

Prefix

If a job generates more than one message, these will be grouped in the window with a common heading. To specify what the text in the heading, use the function **SetPrefix()**.

If you want to print two lines with a common heading: ‘Result’, during a job, the code will look as follows:

```
SetPrefix(‘Result’);

Infolog.add(Exception::info,’Testline1’);

Infolog.add(Exception::info,’Testline2’);
```

17.3 THE GLOBAL CLASS

The global class is the class that holds the standard functions used in the X++ development environment. If you want to add or change methods to the global scope of Axapta you can do this in the global class.

Note

Changes to fundamental classes should be made with caution since they will be reflected throughout the entire application.

17.4 USING DICT CLASSES

Under kernel classes, you will find a number of classes whose names start with Dict, which is short for Dictionary. These classes function as information registers for some of the system's application elements.

There are a total of 10 of these classes, each of which can be used to retrieve information regarding tables, fields, or classes.

Example

You need to determine how many values a certain Base Enum may take on. One way to solve this problem would be to go into the AOT and look it up. But what if this happened to a user who don't have access to the AOT?

There is a class called DictEnum. When you create an object of this class with new() as a parameter, it is possible to receive the ID of the Base Enum you want to examine. You may then use the values() method that returns the number of elements on the relevant Base Enum.

17.5 EXERCISES

Exercise 53 **Viewing Dict classes**

Open System Documentation/Classes to locate the 10 Dict classes.

Based on their names and methods, you should have no problems determining their purpose.

Exercise 54 **Testing DictClass**

Create a tool that allows the user to select a certain class and then receive information on its number of static and dynamic methods and their names.

Exercise 55 **Testing DictTable**

Create a clean-up tool that allows the user to delete all records in all tables carrying the recId selected by the user.

Exercise 56 **Modify formRunClass**

Modify the formRunClass method in the ClassFactory class so that when we open the Students form a message will be displayed.

Exercise 57 **X Classes**

Create a job that can display the name of the current user

Lesson 18.

Macros

At the end of this lesson, you are expected to be able to:

Understand the purpose of using macros.

Know the types of macro that are available.

Understand the syntax of macros.

18.1 MACROS

A macro typically contains lines of X++ code that can be useful in several places. The advantage of defining such lines as a macro is that the maintenance is done in one place only.

It is a preprocessor capability of the X++ compiler. Everywhere the macro is used in the code it will be replaced with the definition of the macro. You will not see this happen in the code but it is the way the X++ compiler deals with macros.

A simple macro contains a string. The behavior is similar to the normal string only it is a static piece of code, so it can't be changed dynamically.

The macro begins with #

Example:

```
#define.text("hello world');
;
print #text;
```

When a macro is used in a lot of different places, it can be handy to place the macro in a macro library (see macro node in AOT tree)

A macro can also contain some code. The value 'a' is incremented with the value text. This is of course impossible. But the X++ compiler will not compile the line a+="Text"; When the define is included in the code (remove "//"). A compile error will occur.

Example

```
int a;
//#define.debug("1");
;
a  = 9;
#if.debug
        a +="text";
#endif
```

Macros are handy for debugging the code. Encapsulate your print statement with macros and you can remove all print statements just by removing the define.

See the Developer’s Guide for all macro commands.

It is also possible to make macro functions.

```
int a;
str b;
//#define.debug("1")

#LOCALMACRO.test
#if.empty(%1)
        print "empty value";
#endif
#if.debug
   %1 +="test";
#endif
#ENDMACRO
 ;
a  = 9;
b = "hello world';
#test(a)
#test(b)
#test
```

The above example uses a %1. This is the notation for parameters in a macro function. The second parameter contains %2, etc. It is possible to do checks on the parameters.

Note

If the macro function contains compile error, the compiler shows only error on the lines of code that use the macro function

18.2 MACROS VS. METHODS

Based on the description above, it may be hard to see what the real difference is between macros and methods. But they have quite a few different properties that are important to know about:

- A macro is nothing but a string of text.
- As opposed to methods, a macro cannot be translated independently.
- If the code of a macro is altered, all application elements using it must be recompiled before the changes take effect.
- Variables declared in a macro, are not embedded.
- When using a macro, you must place a **#** before its name.

18.3 MACRO TYPES

Whether you are dealing with a macro that operates as a constant or an entire string of code, there are three types of macros:

- **Global macros**. Macros of this type are created separately in the AOT under the **Macros** node. System users will then have free access to macros of this type, irrespective of the method in which it is used.

- **Local macros on methods.** As opposed to a global macro, there may be times when you want to use a macro in connection with a single method. If that is the case, you create the macro on the relevant method. Thus, you won't be able to access this macro from other system locations.

- **Local macros in libraries**. Rather than placing the macros locally, as in a single method, you can also choose to group them in a library. The advantage of doing so is that macros that are related to one another can be gathered in one place. Macro libraries are created in the same place as local macros. To distinguish between macro libraries and local macros, the names of macro libraries are spelled out only in upper case.

Examples

For examples of how to encode macros, please see the Developer's Guide.

18.4 JOB AID

Function	Procedure	Keystroke
Create a macro Create a new macro	Create a new macro from the **Macro node** in the **AOT**	Ctrl+N or right-click and select **new macro**
Work routine Open the macro	Open the new macro so you can edit it	Right-click and select **edit**
Work routine Write your code	Define the system path For an example open some of the existing macros. Save	CTRL+F3 Ctrl+S

18.5 Exercises

Exercise 58 **Local macro in a job**

- Create a new job. The job must contain a macro constant and a local macro that is able to output first and last name on the screen — print and pause.
- The job is to output the macro constant and use the other local macro.

Exercise 59 **Global macros**

- Now create a global macro that can receive and output a text string.
- Then test the macro in a job.
- What happens if you alter the macro after it has been entered in the job?

Exercise 60 **Macro library**

- Create a macro library with one local macro that is able to receive three numbers and output the sum of these.
- Test it in a job.
- Now edit the macro so that it still works when opened with only two parameters.

Exercise 61 **Calculation macro**

- Copy the macro from the previous exercise, but adapt it so that it receives two numbers and a third parameter +, -, x or ÷. Depending on the third parameter, the macro will output the sum of the two numbers, subtracted, multiplied, or divided by one another.

Lesson 19.

Reports

At the end of this lesson, you are expected to be able to:

Be familiar with the Element operator.

Develop more advanced reports.

Use a display method in a report.

Use the Args object and the Element operator to synchronize a report with a form.

19.1 Reports, Args, and Element

In a previous course you looked at how to develop a report. However, you have yet to experiment with coding in reports. That's what you'll be doing in this lesson. Coding in reports is also a good opportunity to use Args and Element.

19.2 Display Methods

Display methods can be used successfully in reports in connection with direct lookups in the database and/or calculations. It is important to look at where to locate these.

You have the following options:

- Under the report's design methods, a logo, for example, may appear.
- Under the table methods used by the data source of the report.

If you are using the table methods, the table label must be specified under properties in the field using the display method (in the same way as for forms).

Example

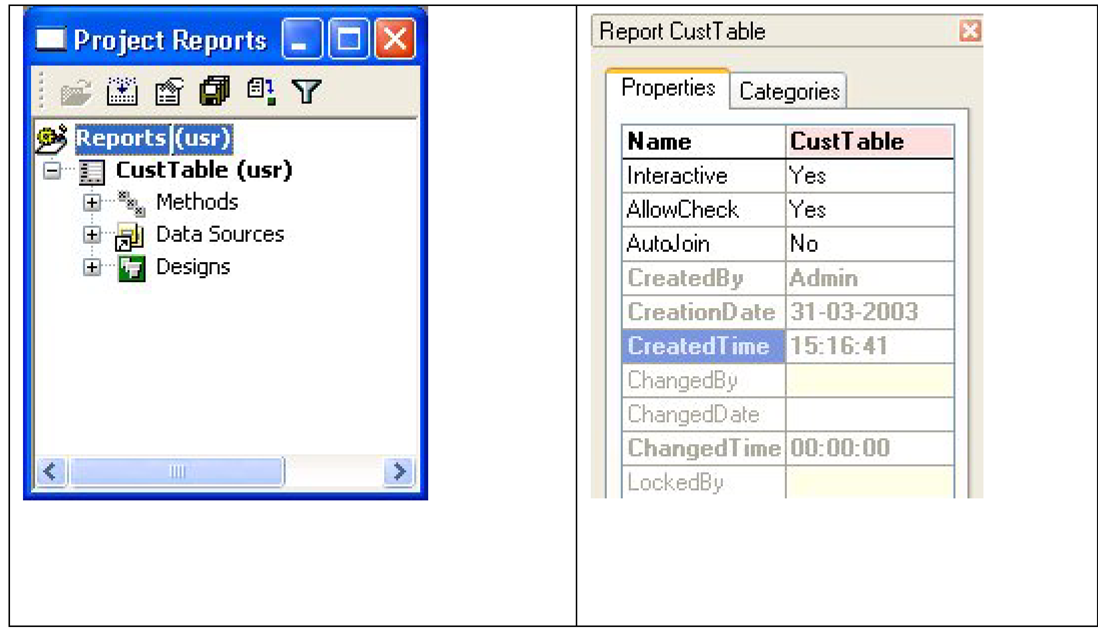
Check the Developer’s guide for an *Example showing how to use a display method.*

19.3 SYNCHRONIZATION

In connection with forms, you have seen that two forms may be synchronized with one another without requiring any code. From Axapta, you may also synchronize a report with a form.

Example

Let's look at an arbitrary report searching through CustTable. It must be synchronizable with a form displaying customers, so that if the report is activated from a form containing data from CustTable, only the customer of the relevant record will be included in the report. This can be done in several ways: If you alter the report properties so that Autojoin is set to Yes as shown below, the report will be synchronized.



Example of synchronization using coding

In the section on queries you looked at the kernel class called QueryBuildRange. It is used for the generation of objects that are employed in queries. Moreover, it contains the value() method, which you can use to enter range values. But in order to get this to work, you must look at the two tools called Args and Element.

Args

Args is a kernel class. The name stands for Arguments. You may remember seeing the class in connection with job parameters and the lesson about information exchange. Each job receives a parameter of this type. In fact, the kernel uses the `Args class` to generate objects used for data transfer, for example from a form to a report.

Element

Element resembles the **this** operator. A report consists of several objects. The **this** operator can be used to open an object's methods inside that same object. Likewise, the Element operator is used to call methods within an entire report, even if the report consists of a collection of objects. You can use the Element operator in reports and forms.

Example

So you can use Elements and Args across several objects. A good example of this is using code to synchronize.

In order for the synchronization to be successful, you must enter code onto the report's run method. You may write it as follows:

```
CustTable          ct;

QueryBuildRange    qbr;

if (element.args().dataset()==TableNum(CustTable))


{

//code is executed if args contains a table buffer from
CustTable

     ct =element.args().record();

//Set ct = the relevant record saved in args

     qbr=element.query().dataSourceNo(1)

.findRange(FieldNum(CustTable,AccountNum));

//Set qbr = the query's ranges on AccountNum (if any)

 if (!qbr)

//If it does not exist, create it below
```

```
              {
                   qbr=element.query().dataSourceNo(1)
addRange(FieldNum(CustTable,AccountNum));
              }
qbr.Value(ct.AccountNum);
//The ct value is used as range
               element.Query().interactive(false);
//The range box is closed
              }
super();
```

Using the Element designation, you gain access to the report methods. In this case, you could have achieved the same result using **this**.

19.4 EXERCISES

Exercise 62 **Display methods**

- Create a display method on the EmpTable. which returns the local phone number when no phone number exists.
- Create a report which prints usernames and their related phone number. If no phone number exists, their related local phone number is printed.

Exercise 63 **Synchronization**

- Create a print button on the Employee Form. This report only prints the report of exercise 1 from the selected employee. When no employee is selected a message should appear when the print button is pressed.

Lesson 20.

Report Design

At the end of this lesson, you are expected to be able to:

Present and use reports with several designs.

20.1 USING REPORT DESIGN

In this lesson you will look at how to work with reports, with a special emphasis on your options with regard to design.

Previously you have worked with reports having only a single, very traditional design. But reports can actually be developed with several different designs.

The question is therefore which design to use when executing the report?

If you haven't done anything in terms of code, the system will always use the first design.

If you prefer to use one of the other designs, you must use code to make sure the system uses the one you want. You can do this by means of the **design()** method. As a parameter, the method receives the name of the report design. A suitable place to use this method might be on the report's **run** method.

Programmable sections

As a part of a report's design, you may create one or more programmable sections. This part of the design may contain data and/or text. The crucial difference is that designs of this type must be activated by code.

Execute() is the method used for activation. As a parameter of this method, you specify a number (the number of the relevant programmable section). In the exercises for this lesson, the method may be placed in the **fetch** method.

By making the Super() call in the ExecuteSection method of the ProgrammableSection conditional, you can make the printing of these sections conditional.

20.2 EXERCISES

Exercise 64 **Report with two designs**

Create a report with two designs.

The report is to contain data from the employee table. The idea is that the report may be activated either from the employee form or from the main menu.

If the report is activated from the main menu:

The design must be constructed as a list where the selected employees are listed with ID, name, and phone number in descending order.

If the report is activated by clicking a button on the employee form:

Only data for the relevant employee will be output, but in a design where the data fill the entire page.

Exercise 65 **Report without data source**

Create a report without data source, but with a programmable section containing a control of the **Integer** type.

Create an integer variable in the report's **classDeclation** method.

Finally, create a loop in the report's **fetch** method where the variable declared above is counted from 1 to 10. For each round, the report's programmable section should be activated and the variable output. In this way, the report will fill 10 lines.

This exercise may not appear to be particularly meaningful, however if you implement the next exercise it will show you how this function may be put to constructive use.

Exercise 66 **Absence report – Optional**

You now want to record the employees' absences. This requires a new table with the following fields: **Employee ID**, **Start Date**, and **End Date**.

Then create a form using the new table as data source.

The hardest part of this exercise is the absence report, where employee absence is to be output for a selected month.

The report has a matrix-like design that looks like this:

January 1999	1	2	3	4	5	6	7
etc.							
ARN	XX	XX					
FJO				XX	XX	XX	
IGS		XX	XX				
KBU			XX				

Lesson 21.

Wizard Wizard

At the end of this lesson, you are expected to be able to:

Understand the purpose of the Wizard Wizard.

Understand how to use the Wizard Wizard.

21.1 WHAT IS THE WIZARD WIZARD?

A Wizard is a tool that may be used to create various things, such as a new report or a new item in the Inventory Management module. The purpose of wizards is to guide the developer/user through various procedures, thereby making them less complicated.

The system contains a number of wizards, one of which is called the Wizard Wizard. The purpose of this wizard is to simplify the task for programmers developing new wizards.

The two wizard types

Wizard Wizard creates a class, a form, a new project and a menu item all with the same name selected by the programmer. This name will automatically end with **Wizard**.

Once the name is selected, you must specify which purpose the new wizard is supposed to serve.

You have the following options:

- **Standard Wizard** is a wizard type intended for regular tasks. The Report wizard is an example of a standard wizard

- **Default data Wizard** is used to help the user create necessary default data like address information and number sequences. All default data wizards are automatically included in the system’s Default data Wizard and its status, whether it has been executed or not, is indicated. The Default data Wizard can be started from the Axapta Setup Wizard that is automatically activated when you first start Axapta, and from the Company accounts menu.

Once you have selected the type, you specify the number of steps. The Wizard Wizard has then fulfilled its purpose. You have now created a class and a form grouped in a project. The two application elements will function as a new wizard, but not until you have created new methods and expanded the form's layout with texts, etc.

Guidelines and tips for developing wizards

You can find general development guidelines and tips for developing Wizards in the Developer’s Guide.

The wizard form and wizard class

The wizard form has one tab and the number of tabs you specify as steps in the wizard. The form has two methods which you can read about in the developers guide.

The wizard class you create will either extend the SysWizard class or the SysDefaultDataWizard depending on the kind of wizard you chose to create.

Below you can see some of the methods in this class:

Useful methods on the SysWizard class	
boolean validate()	This method is called before the wizard is closed. Return false if the user input is invalid. This will prevent the run() method from being called when the user clicks the Finish button. The method is used to validate user input.
FormRun formRun()	Returns a FormRun which is an instance of the form of the same name as the class. This method is always overridden and should not be changed.
static void main(args args)	Creates a new instance of the wizard and calls wizard.run on the SysWizard class. This method is always overridden and should not be changed.
void run()	This method is called when the user clicks the Finish button – if validate() returned true.
void setupNavigation()	Use this method to set up whether the Next and Back buttons should

	be enabled from the start. Default is that all is enabled, except back in the first step and next in the last. The buttons can then be enabled runtime when a certain condition is fulfilled.

Useful methods on the SysDefaultDataWizard class	
boolean Enabled()	Determines whether the wizard should be displayed in the list of basic setup wizards
boolean MustRun()	Determines whether the base data is already there or whether the wizard should create it.
str Description()	Returns a short description of what the wizard does. The description is used in the wizard's caption if the Caption property has not been set.

21.2 JOB AID

Function	Procedure
Create a wizard	A step-by-step guide can be found in the Developer’s guide: *Create a wizard*.

21.3 EXERCISES

Exercise 67 **New wizard**

- You will be creating a new wizard to be used for developing list images. You must therefore be familiar with the following kernel classes: **Form**, **FormBuildDataSource**, **FormBuildDesign**, **FormBuildGridControl**, and **FormBuildStringControl**.
- To test some of these methods in practice, you must create a job able to create a form that contains data from **custtable** and which includes a grid with the **AccountNum** and **Name** fields.

Exercise 68 **Create a wizard**

- Now use the Wizard Wizard to create the basic part of the new wizard.
- Then make the necessary adjustments to the class and the form, to ensure that the new wizard will function as intended.
- There should be four steps where the user may specify names on the form, as well as which table and fields he or she wants to use.

Appendix A.

Introduction to X++ Advanced

This appendix contains:

Guidelines for instructors prior to and starting the course

Information about the requirements for the course, for example, equipment, prerequisites

Notes to instructors for Lesson 1 (Introduction)

GENERAL INFORMATION

Prerequisites

- Successful completion of the General Axapta Application Test and X++Basic online course.
  It is highly recommended that you have worked with the X++ language and MorphX Development environment for at least 3-6 month before this class.

- Access to an Axapta installation with a clean (that is, without additional transactions or any other alterations) demo data file imported into it.

- Basic programming skills are a MUST. Try not to get side tracked by such topics, or you will not complete the course in the designated time. Perhaps even refer participants to other courses covering such topics – as well as additional areas of training in the Axapta curriculum. Have several copies of your curriculum handy for participants who want to know more…

Note

It cannot be emphasized strongly enough to enforce these prerequisites!

Course prerequisites are important for gaining the most from this course (or any course). Learners need to experience some success – it gets very de-motivating to continuously run into problems and rely on the instructor (or other participants). Participants lacking the necessary prerequisites for a particular course may be dismissed from the classroom at their own expense, at the discretion of the instructor. Please communicate this message clearly with NSC participants.

Every country must strive to make the learning experience as productive and efficient as possible. Screening students to insure a common starting basis for this class (and other classes) is an effective way to optimize the time spent in the classroom. The centrally determined prerequisites are set with this in mind.

This course requires a successfully passed test in order to register and you can monitor that every potential participant meets this criteria via the e-Academy client. The Training responsible person in each NTR has received access to this client, along with instructions on how to use it.

Please contact this person in your NTR or Michael Aksglæde (Project Manager for e-Academy), if you experience problems with this client.

In addition to these prerequisites, it is also recommended that participants have completed the “Essentials” online courses and the General Microsoft Axapta Application Workshop. However they are not compulsory, and hence not a prerequisite for this course.

Although not prerequisites, the training development team strongly recommends these courses as this course was developed with these courses in mind as recommended preparation. Hence, you could say that knowledge *equivalent to* these courses is a prerequisite (successful completion of the General Microsoft Axapta Application Test is satisfactory evidence of this).

BEFORE YOU START THE CLASS:

Pre course

Before the course, you need to:

- Thoroughly familiarize yourself with the training material. Read the material and appendices, paying particular attention to the guidelines to instructors.
- Inform participants what to bring (see Equipment below for more information).

Equipment required

- One flipchart with white board markers
- Whiteboard and whiteboard markers
- It is also a good idea to bring some small rewards (for example, small items from Navision Web Shop, marketing posters, pens etc) as incentives for participants
- A projector for the instructor to utilize and provide demos in Axapta, when necessary.

Note

For information regarding course schedule, target audience, related certification, and so on, please consult the Axapta Training Guide V3.0 - available on the e-Academy site on Base Camp.

BEGINNING THE COURSE

Use the Xpo file: **AX30Adv** supplied with the training materials for this course. Some solutions to smaller exercises are inserted directly in the appendix.

The Xpo file contains exercise solutions. Each grouped under the name of the lesson, the uniq number within the doc ID(refer to the first page of each lesson), the version number and in some cases also the exercise number. Example ax30_47_ReportDesign (where ax30 means Axapta version 3.0 Adv stands for X++ **Adv**anced, 47 is the unique number from the doc ID and Report Design is the name of the lesson).

The solutions in this xpo file are *suggested* ways of approaching the exercises.

The training development team at the Vedbæk campus is always interested in hearing your comments and feedback. Also, if you make changes or additions to the xpo file, or any of the material, we would like you to share it with us and your colleagues in NTRs. Please send your feedback or input for this course to: Pernille Halberg at phalberg@microsoft.com.

Appendix B.

Development Tools

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

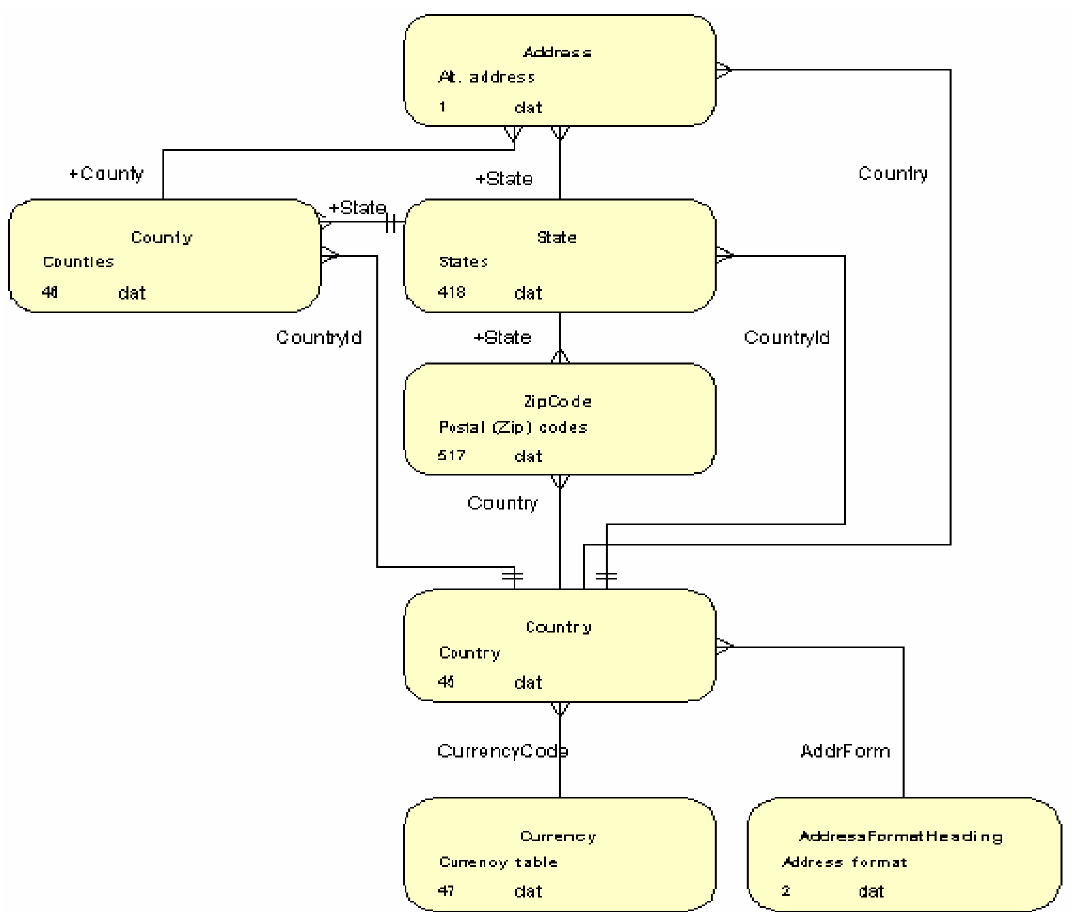
DEVELOPMENT TOOLS

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Tutorials	Show a tutorial, get a class dialog What is the purpose of these tutorials? name an example where they would come in handy	Axapta dialog
	Review	Any problems encountered?	dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix

Exercise 1 **MorphXplorer**



Exercise 2 **Debugger**

No solution needed

Exercise 3 **System Trace**

No solution needed (remember to Select `Method trace` under tools, options, development, trace.)

Exercise 4 **Find compare**

No solution needed

Exercise 5 **Table browser**

The changed method

```
void new()
{
;
//rem changed line
}
```

Exercise 6 **Table definition**

No solution needed.

Appendix C.

Classes

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization	**Question to start with** Have you ever heard the expressions…	
	Exercise 1	Create a new class (5 min) the participants can try out the new class wizard either here or in a later exercise	
	Review	Any problems encountered?	dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 7 Creating a class

```
classDeclaration body003A

public class TestClass1
{
}
```

NOTE: A class name can't be changed by changing the properties

Exercise 8 Creating an object

NOTE: the serves New() should be created by overwriting the default New() behavior.

```
public class TestClass1
{
    str myText;
}

void Outvar()
{
    ;
     print myText;
}

void new(str _text= 'Empty')
{
    ;
    myText = _text;
}
```

```
static void Exercise2(Args _args)
{
    TestClass1 testClass1 = new TestClass1('Hello
World');
    TestClass1 testClass2 = new TestClass1();
    ;
    testClass1.Outvar();
    testClass2.Outvar();
    pause;
}
```

Exercise 9 **Modifying Outvar()**

```
static void Exercise_ModOutvar(Args _args)
{
    TestClass1 testClass1 = new TestClass1();
    ;
    testClass1.Outvar();
    testClass1.Outvar('Hello World');
    testClass1.Outvar();
    pause;
}

void Outvar(str _text = myText)
{
    ;
    myText= _text;
    print myText;
}
```

Exercise 10 **Creating the class method Main()**

Exercise 11 **Create a job that execute Main()**

Exercise 12 **Calculators (Optional)**

```
static void Exercise4(Args _args)
{
    Calculator calculator = new Calculator(9,3);
    ;
    print calculator.plus();
    print calculator.minus();
    print calculator.multiply();
    print calculator.divide();
    pause;
}

public class Calculator
{
    real a,b;
}

void new(real _a = 0, real _b = 0)
{
    ;
    a =_a;
    b =_b;
}

real plus()
{
    ;
    return a + b;
}

real multiply()
{
    ;
    return a * b;
}
```

```
real divide()
{
    ;
    return a / b;
}

real minus()
{
    ;
    return a - b;
}
```

Appendix D.

Data Return

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

DocID: AX-300-APP-065-v01.00-ENUS

INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Exercises	Note that there have been created two sets of solutions for the stopwatch exercises, if you find one of them better than the other please notify HQ and we will correct it so that only one solution exist in the xpo file.	
	Review	Any problems encountered?	dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 13 **Calculator**

Exercise 14 **Using WinAPI::GetTickCount**

Exercise 15 **Return a database buffer**

Exercise 16 **Create a stopwatch**

Exercise 17 **Modifying the stopwatch start method (optional)**

Appendix E.

Inheritance

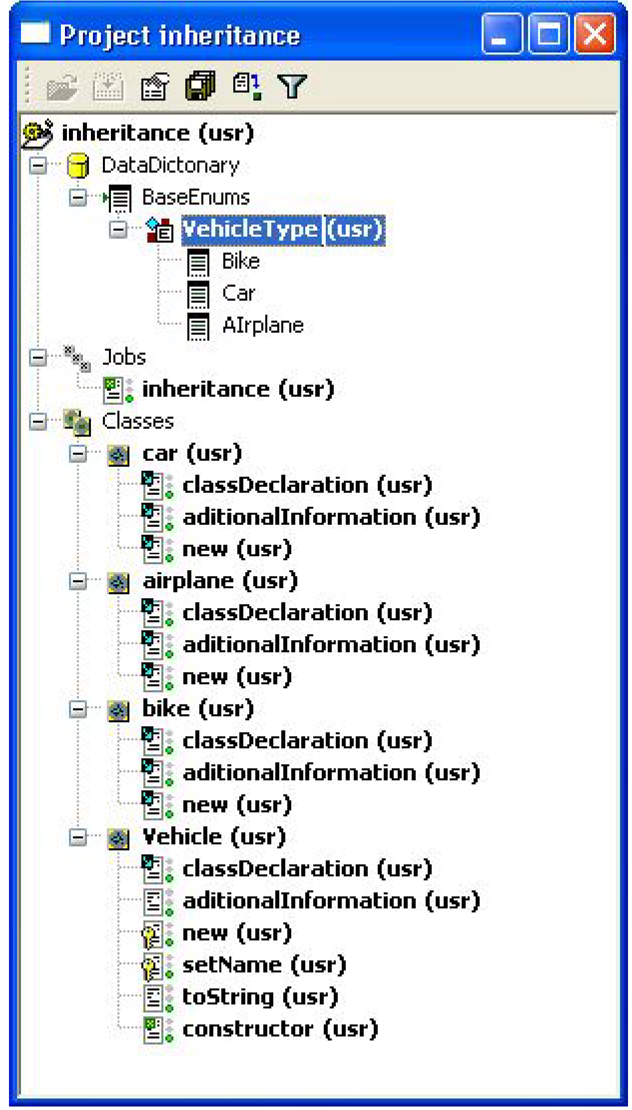
This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 18 **Create two classes and let one inherit from the other.**



The Code

Vehicle

```
abstract  class Vehicle
{
    str VehicleName;
}
```

```
abstract void aditionalInformation()
{ }
```

```
protected void new()
{ }
```

```
Public str toString()
{
   return VehicleName;
}
```

```
Static Vehicle construct(VehicleType _type)
{
    switch (_type)
    {
        case VehicleType::Car       : return new
Car();
        case VehicleType::Bike      : return new
Bike();
        case VehicleType::AIrplane  : return new
Airplane();
        default                     :
debug::assert(true); return null;
       }
}
```

```
protected void setName(str _name)
{
    VehicleName =  _name;
}
```

airplane

```
public class Airplane extends Vehicle
{ }
```

	`void aditionalInformation()`
	`{`
	`   print "An airplane can fly";`
	`}`

	`void new()`
	`{`
	`    super();`
	`    this.setName("Airplane");}`

Car & Bike	`Are similar to the Airplane class`

Exercise 19 **Inherit from the Stopwatch class**

Use the stopwatch example from the Data Return lesson and create a new class that inherits from your “StopWatch” class. Override the method that returns the time elapsed, so it returns the time elapsed in seconds.

Appendix F.

Polymorphism

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 20 **Using Polymorphism**

Exercise 21 **Using Polymorphism (Optional)**

Appendix G.

Maps

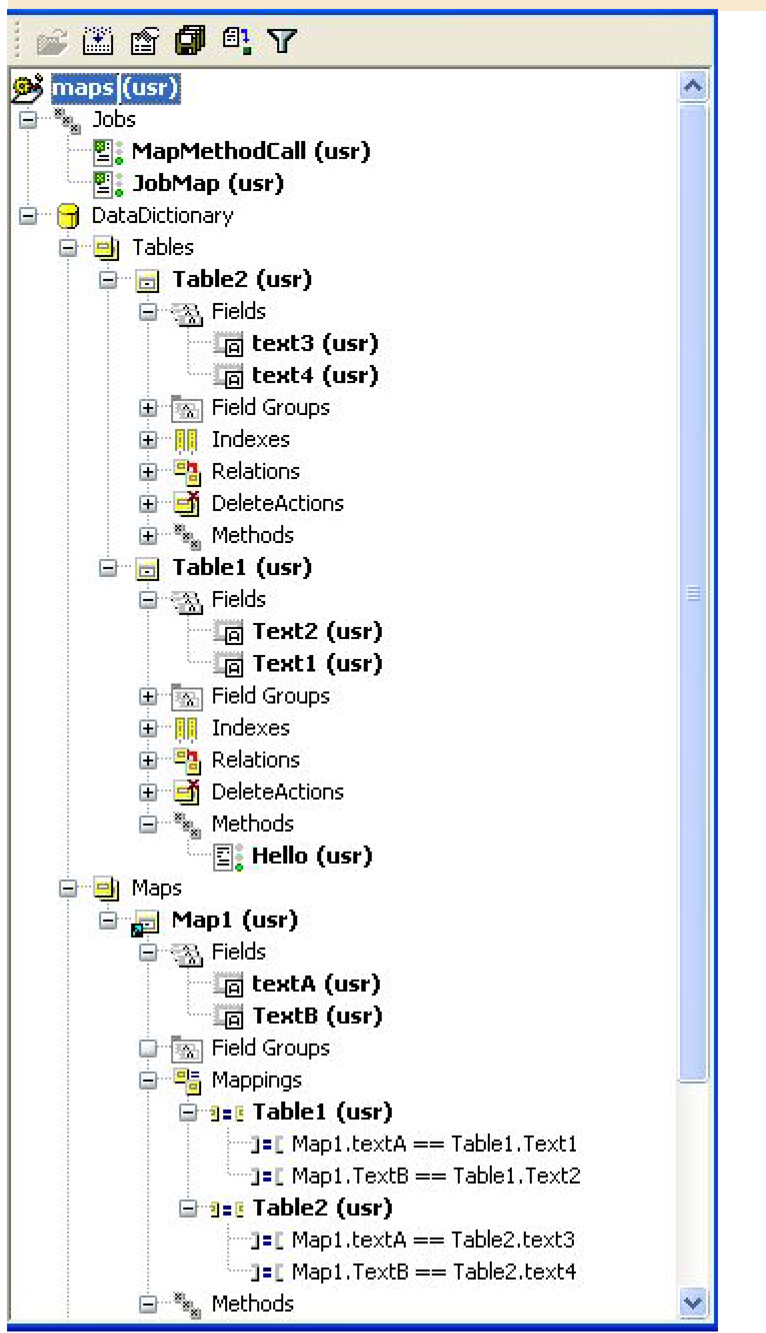
This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 22 **Creating a map**



Exercise 23 **Using a map**

```
void clicked()
{
    Table1 _table1;
   ;
    _table1.Map1::maptest();
    element.dataSource().reread();
    element.dataSource().refresh();
}



void maptest()
{
   Map1 _map= this.orig();
   ;
   ttsbegin;
   while select forupdate _map
   where _map.Text1 != _map.Text2
   {
     _map.Text1 =  _map.Text2;
     _map.update();
   }
   ttscommit;
}
```

Appendix H.

Information Exchange

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization	**Question to start with** Have you ever heard the expressions…	
	Exercise 1		
	Exercise 2…		
	Review	Any problems encountered?	dialog

Exercise Solutions

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 24 **Opening a form**

Exercise 25 **Opening a form from another form**

Exercise 26 **Opening a form from a job**

Exercise 27 **Closing Form1 from Form2 (Optional Exercise)**

Appendix I.

Data in Forms

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTE

The xpo file for this lesson includes the built objects for the examples. This is a brief summary of the example form used in this lesson.

Using a query on a form

You can view the **Init()** method on **SampleCustForm** supplied for this lesson.

Data loading

The example for using the **ExecuteQuery()** method can be see on the button titled Example2 on the **SampleCustForm**.

Examples of the use of the **First()**, **Last()**, **Next()** and **Prev()** and be see from the overridden clicked methods of the menu buttons added to the sample form. An example of using the **Filter()** and **FindRecord()** methods can also be found on the list of menu buttons on this form.

Data manipulation

A button has been added to the Data Manipulation menu button to show and example of calling the **create()** method.

The **InitValue()** method on the SampleCustForm has been extended to show an example of using this method.

An example of calling the **delete()** method has been made on the menu button titled “Delete Record”. Also to highlight the use of the validateDelete() method this method has been overridden on the data source.

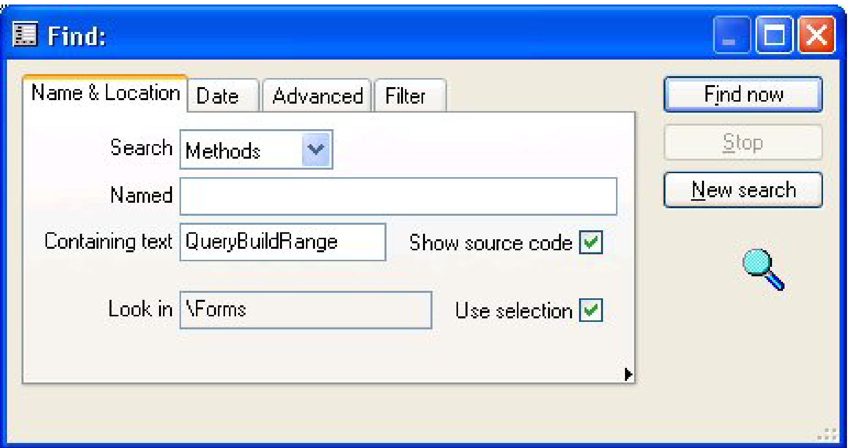
EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 28 Finding a good example

Most good programmers know to learn from what is already written. In Axapta 3.0 there are approx. 1800 forms from which you can learn. This exercise was about looking at some code that is already written to suit a purpose and learn from that.

1. Right-click on the Forms node of the AOT and select Find from the shortcut menu.



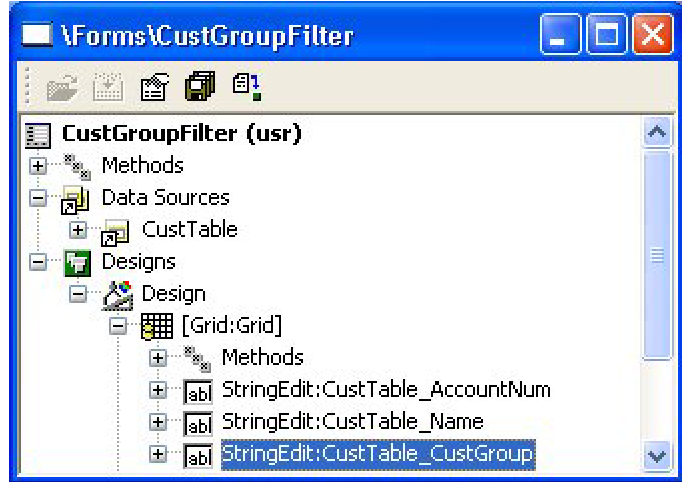
2. When the Find dialog box opens enter the text *QueryBuildRange*” in the **Containing Text** field.

3. Click the FIND NOW button to start the search.

4. This will return a big list of forms where the string *QueryBuildRange* has been used. A good example is the **CustTrans** form. It uses the **QueryBuildRange** as a variable called **CriteriaOpen** in the Init method on the data source.

Exercise 29 Ranges on CustGroup

- Locate the Forms node in the AOT.
- Right-click on the Forms Node and select New Form.
- The new form will be created, for example, Form1. You will have to rename this. Press F2 or right-click on the form and select rename. Call the form **CustGroupFilter**
- The next step is to create the data source for the form. The easiest way to do this is to open another copy of the AOT. Locate the tables node under Data Dictionary. Find CustTable. When you have found this drag this table to the data sources node of the form.
- The next step is to create a simple design for the form to display the data.
- Expand the Designs node of the form. On the Design node right-click and select New Control. From the menu of controls that are displayed select Grid
- Once you have a Grid control it is just a matter of adding the fields to the Grid. To do this you will have to drop controls from the CustTable data source.
- Right-click on the Data sources node on the Form. Select Open New Window. This will allow you to drag the fields the second windows to your Grid. Expand the nodes of this new windows to find the fields.
- Drag and drop these fields **AccountNum**, **Name**, **CustGroup**.
- The design node should look like this.



- The form is now built. We have to add some code to use the QueryBuildRange to filter the data.
- Expand the Data Sources node of the form. Expand the CustTable data source until you find the Methods node.
- Right-click on the Method node and select Override Method. Then select the Init method
- Enter the following code in the Init method.

```
public void init()
{
    QueryBuildRange     queryBuildRange;
    ;

    super();

    queryBuildRange =
this.query().dataSourceNo(1).addRange(fieldnum(CustTabl
e,CustGroup));
    queryBuildRange.value("40");
}
```

- Close and save your form and make sure the form has compiled OK.

- Run the form.

Exercise 30 **Ranges on CustGroup (Continued)**

This solution is based on the prior exercise having been completed.

- Locate the Design node of the form. Right-click and select New Control. Select the **StringEdit** control. There are neater ways to design a form but this will do for this example.
- While you are there create a button that you can use to refresh the data. Right-click on the Design and select new Control. Select the button control.
- The string edit control will be called StringEdit. It is best to change this. Right-click on this control and select properties.
- Change the name property. Change the name property to **GroupFilter**. Also change the AutoDeclaration property to Yes to make it easier to reference this control.
- Expand the Button control to locate methods. Right-click on the methods node and select Override Method. Select the Clicked method.
- By overriding this method the X++ editor will be displayed. Enter the following code in the editor.

```
void clicked()
{
    Query               currentQuery;
    QueryBuildRange     queryBuildRange;
    ;

    super();

    currentQuery = CustTable_ds.query();
    queryBuildRange =
currentQuery.dataSourceNo(1).range(1);
    queryBuildRange.value(GroupFilter.text());
    CustTable_ds.executeQuery(); }
```

- You see the use of GroupFilter.text() this is using the text() method on the new control we created to return the value to the code. Because we have used the **AutoDeclaration** property we can call this control directly in our form.

- Compile and Save the form. Run it and try the code out. You see in this example that 10 has been entered in the control and when the button is clicked the code filters the form.

Exercise 31 Automatic updating

You can use the SetTimeOut() on a method on the form. For example Created a new method call it **setRunUpdate** from the methods node of the form. You can use the same code as you created in the last exercise from the clicked method on the button. Then you can use this line of code, for example, from the **OnRun** method on the form.

element.setTimeOut("**setRunUpdate**",1000,False;

This will run the update code 10 seconds after the form starts.

Appendix J.

Windows in Forms

This appendix contains:

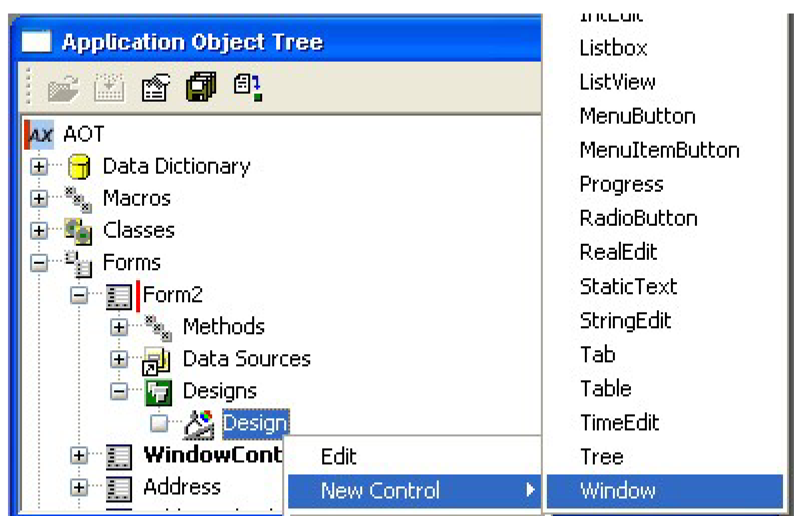
- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

The XPO file for this lesson includes the built objects for the examples. This is a brief summary of the example form used in this lesson.

Properties

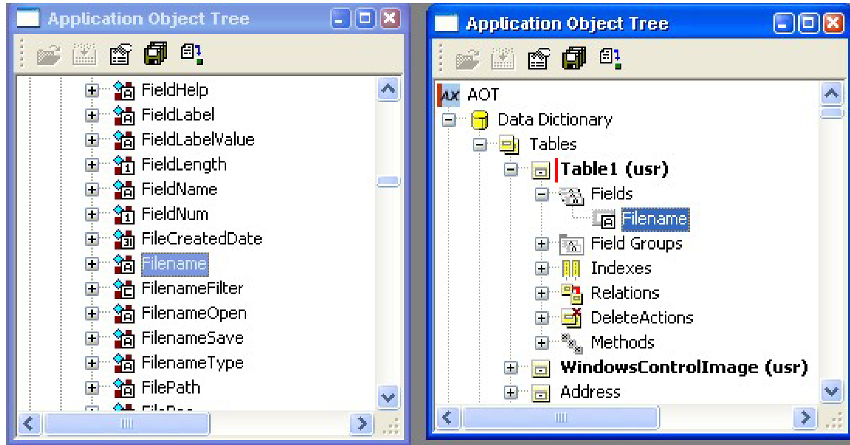
An image has been provided with the material but you can select your own. In the XPO for this exercise the project has a form called **WindowControlForm** which you can use to display the image or simply build a new form from the AOT as and example to the class as follows :

- Right-click on the Forms node in the AOT.
- Select New Form
- When the form is created expand the form to the Design.
- 

- Right-click and select New Control
- The select Window.
- Once the control is created you can right-click on it to view the properties. Then you can alter the **ImageName** property.
- Save and run the form.

To use the **DataSource** and **DataField** properties you will need a table. One is provided in the XPO for this manual or create one yourself. You can use the extended data type of **filename**. To create a table to use the properties :

- Right-click on the table node of the AOT.
- Select New Table.
- Position two AOT windows side by side so that you can locate the FileName extended data type

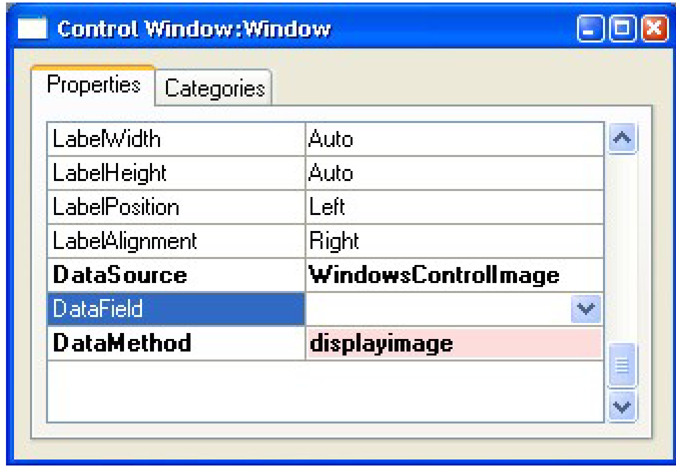


Once this is done you can either use the Table Browser by right-clicking the new table. Select Add-ins then Table Browser. Press CTRL+N to create a new record and type in the path to the image you want to display. Alternatively build a form and enter the data from a new form.

To show the use of the DataMethod property a display method has been created on the WindowsControlImage sample table. The code looks as follows.

```
display Filename displayImage()

{

    return this.Filename;

}
```

If you use this property make sure you also set the **DataSource** property.



Methods

To make use of methods on the window to example buttons have been add to the WindowControlForm sample form. Two examples are provided on to highlight the different ways to access the methods on the control depending on the use of the **AutoDeclaration** property on the control.

With AutoDeclaration = Yes.

```
void clicked()
{
    super();
    ImageWindow.imageName("C:\\temp\\Images\\img10-
paraglider.jpg");
    ImageWindow.updateWindow();
}
```

With AutoDeclaration = No (default).

```
void clicked()
{
    FormWindowControl imageDisplay;
    ;
    super();

    imageDisplay =
element.design().control(control::imageWindow);
    imageDisplay.imageName("C:\\temp\\Images\\img10-
paraglider.jpg");
    imageDisplay.updateWindow();
}
```

Database stored images

On the sample form WindowControlFrom three buttons have been added along with a method on the form. This relies on a container field existing in the underlying table. A good example of using this is the standard CompanyLogo form.

The first button titled “Store Image” uses this code on the overridden clicked method.

```
void clicked()
{
    str filename;
    FileNameFilter filter = ['All files','*.*'];
    Bindata binData = new BinData();
    super();


    filename =
Winapi::getOpenFileName(element.hWnd(),filter,'',
"Select Image to Display", '','');

    if (filename)
    {
        if (binData.loadFile(filename))
        {
            WindowsControlImage.displayImage =
binData.getData();
        }
        element.displayImage();
    }
}
```

The second button “Load Image from Table” calls a new method on the form to display the image from the table field.

```
void clicked()
{
    super();
    //Make a call to the method to display the image.
This is on the form.
    element.displayImage();
}
```

The third button “Remove Image” clears the data from the field.

```
void clicked()
{
    super();
```

```
    windowscontrolimage.displayImage = ConNull();
    windowscontrolimage.update();
    element.displayImage();
}
```

The code from the method to retrieve the image from the field and display it makes use if the **Image** system class.

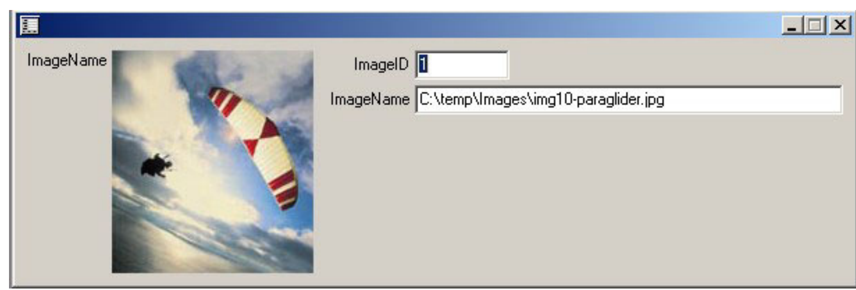
```
void displayImage()
{
    Image   logoImage;
    ;

    //This relies on the imageWindow control being set
to AutoDeclaration.
    //windowsControlImage is the table of the
datasource.
    //displayimage is the field on the table.

    try
    {
        element.lock();
        if (windowsControlImage.displayimage)
        {
            logoImage = new Image();

logoImage.setData(windowsControlImage.displayimage);
            imageWindow.image(logoImage);
            imageWindow.widthValue(logoimage.width());

imageWindow.heightValue(logoimage.height());
        }
        else
        {
            imageWindow.imageResource(0);
            imageWindow.widthValue(32);
            imageWindow.heightValue(32);
        }

        element.resetSize();
        element.unLock();

    }
    catch (EXCEPTION::Warning)
    {
        error(StrFmt("@SYS19312",
windowsControlImage.displayimage));
    }
}
```

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 32 Using properties

- Create a new table from the AOT node.
- Rename the table by pressing F2 or right-click and select rename. Call the table **WindowsImages**
- Locate the field node. Right-click the field node and create a new string. Call this field **ImageID**
- Create a new string field. Call this field **ImageName**.
- Change the **StringSize** property of the **ImageName** field to a length that will accept a path name and long file name.
- Now Create a new form from the forms node of the AOT. Call the form **WindowsImages**
- Add the new table as the data source for this form.
- The next step is to add a new control to the design of the form. Expand the Designs node and right-click on the Design node. Select New Control and select the Window control.
- Drag the **ImageID** and the **ImageName** fields from the Data source onto the design.
- Right-click on the Window control and change the **DataSource** property to the data source WindowsImages. Also change the **DataField** property to ImageName.
- Save the form and run it by right-clicking on the form name and selecting open.
- Enter some data in the fields with a path and name to a valid image.



Exercise 33 Using methods

NOTE : This solution relies on exercise the exercise Using Properties being completed.

- Create a new method on the data source of the form. To do this find the Data sources node. Expand the WindowsImages node.
- From the methods node right-click and select New Method.
- Call the method returnFileName and add the following code

```
display FileName returnFileName()
{
    return WindowsImages.ImageName;
}
```

- Note the method has to be a **display** method and return the **FileName** data type.
- Find the Window control on the design.
- Right-click on this and find the properties. Change the **DataSource** property to the data source WindowsImages and the **DataMethod** to the new method returnFileName.
- Save and run the form.

Exercise 34 **Selecting a file**

NOTE : This solution relies on exercise Using Properties being completed.

- Locate the Design node on the form WindowsImages.
- Add a new button to the form.
- Expand the nodes of the button.
- Right-click on the Method node and select Override Method. Select the Clicked method. Here we can write some code on the method to use the Windows API calls in Axapta WinAPI.
- Add the following code to the method when the editor is displayed or double-click on the method to edit it.

```
void clicked()
{
    str filename;
    FileNameFilter filter = ['All files','*.*'];
    ;
    super();


    filename =
Winapi::getOpenFileName(element.hWnd(),filter,'',
"Select Image to Display", '','');

    if (filename)
    {
        WindowsImages.ImageName = filename;
    }

}
```

- Save and compile the form then run it. Click the new button and select a file.

Exercise 35 **Using a stored image**

NOTE : This solution relies on the prior exercise being completed.

- Add a new field to the table of type container.
- Call the field ImageData.
- There is a small issue with changing the underlying table that a form is based on as the new field won't be picked up in the data sources assigned to the form. To get around this issue, save the form. Then right-click and select the restore option. The new file will be available in the data source.
- You will have to change some properties of the Window control to make it easier to code again. Right-click on the Window control and change the properties. Name to WindowImage and Auto Declaration to es.
- So that you have two examples of the code right-click on the button created in exercise 3. Select the duplicate option. You will now have two buttons on the form and the code on the **clicked** method will have been copied as well.
- Change the code on the new button to retrieve the binary data from the selected image and use the Image class to load it into the control.

```
void clicked()
{
    str filename;
    FileNameFilter filter = ['All files','*.*'];
    Bindata binData = new BinData();
    Image   logoImage;
    ;
    super();


    filename =
Winapi::getOpenFileName(element.hWnd(),filter,'',
"Select Image to Display", '','');

     if (filename)
    {
        if (binData.loadFile(filename))
        {
            WindowsImages.ImageData =
binData.getData();
        }
```

```
            element.lock();
            logoImage = new Image();
            logoImage.setData(WindowsImages.ImageData);
            windowImage.image(logoImage);
            windowImage.widthValue(logoimage.width());
            windowImage.heightValue(logoimage.height());
            element.resetSize();
            element.unLock();
        }

}
```

- The additional code needed to display the image would be best on a separate form method as that it could be called from different places on the form but it is all place together for ease of the exercise.

Appendix K.

Lookup Forms

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix. This is a brief summary of the example form used in this lesson.

Exercise 36 **New table with lookup form**

- Create a new table called Technicians.
- Expand the table to add new fields. Add an integer called ID, and two strings called FirstName and LastName. Save the table.
- Locate the **CustTable**. Expand the fields node and right-click and create a new field. Call this field TechnicianID. Save the table.
- Create a new form from the Forms node of the AOT.
- Call the form Technicians.
- Create a Design for the form of a simple Grid. Add the three field from the Table ID, FirstName and LastName.
- Locate the **CustTable** form in the AOT. Modify the design to add the new field TechnicianID to the Overview tab grid.
- Expand this new control to find the methods nodes. Right-click and select Override Method. Select the Lookup method.
- Add some code to the method to perform the look up. This code uses the FormRun class which is needed to be passed to a method called **performFormLookup**.

```
public void lookup()
{
    FormRun     newPopup;
    Args argForm = new Args()
    ;

    argForm.name(formstr(Technicians));
```

```
    argForm.caller(this);
    newPopup = ClassFactory.formRunClass(argForm);
    newPopup.init();
    this.performFormLookup(newPopup);
}
```

- Now this will pop up the new lookup by using the performFormLookup method on the control. The next step is to modify the called form to be able to return a value.
- Override the run method on the **Technicians** form. Add the following line of code to return the value. You still need to call super() as you still want the form to run.

```
public void run()
{
    super();

element.selectMode(element.control(control::Technicians_ID));
}
```

- Save you objects then try them out. You will have to enter some data in the Technicians table but you can do this from the form.

Exercise 37 Filtering data

NOTE : This exercise builds on the prior exercise.

- Add the new field to the Technicians table. Base it on the **CustGroupId** extended data type.
- Extend the code added for the lookup form in the prior exercise. This passes the Customer Group from the CustTable You will just need to add one line, for example:

```
…..
argForm.caller(this);
argForm.parm(CustTable.CustGroup);
newPopup = ClassFactory.formRunClass(argForm);
…..
```

- Locate the Technicians form. Expand the Data source node to find the methods node. Right-click and select Override Method, select the Init method. Add the following code to method. This makes use of the **args** class pass to the form from the calling form to filter the popup form for the **CustGroupId**.

```
public void init()
{
    QueryBuildRange     queryBuildRange;
    ;

    super();

    queryBuildRange =
this.query().dataSourceNo(1).addRange(fieldnum(Technici
ans,CustGroupId));
    queryBuildRange.value(element.args().parm());

}
```

- The trick here is the use of the Args class calling the parm method to retrieve the data sent from the calling form.
- Add you own error check to the code.

Appendix L.

List Views

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

A good example of the usage of list controls are the tutorial forms **Tutorial_Form_ListControl** and **Tutorial_Form_ListControl_CheckBox**. To see and example of creating a menu you can view the form **Tutorial_PopupMenu**.

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization	**Question to start with** Have you ever heard the expressions…	
	Exercise 1		
	Exercise 2		
	Exercise 3		
	Review	Any problems encountered?	dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix. This is a brief summary of the example form used in this lesson.

Exercise 38 Creating a List View

- Create a new form from the AOT. Call the form ListExample.
- Locate the Designs node of the form. Expand the Design.
- Right-click on the Design node and select New Control. Select ListView.
- Axapta will set the AutoDeclaration property of this control to yes so that you can code against it.
- The next step is to create some code to load up the data.
- Locate the Form methods. Right-click and select override method. Select the Run method.
- Add the following code to Run method.

```
public void run()
{
    CustTable   _custTable;
    ;
    super();

    while select * from _custtable
    {
     ListView.add(_custtable.Name);
    }

    ListView.viewType(1);
```

```
}
```

- This is very simple code to loop through the CustTable to select the data and add to the ListView control.
- The call to the viewType() method displays the format of the list.

Exercise 39 Dragging and dropping between List Views

NOTE : This solution assumes that you have completed the prior exercise.

- Create a new form from the AOT. Call the form ListExample.
- Locate the Designs node of the form. Expand the Design.
- Right-click on the Design node and select New Control. Select ListView.
- Axapta will set the AutoDeclaration property of this control to yes so that you can code against it.
- Add a second new Control. Select ListView. This new list will be called ListView1
- There are some variables that will be used latter in the form which should be added to the form classDeclaration.

```
public class FormRun extends ObjectRun
{
    FormListControl _list;
    FormListControl _list2;
}
```

- The next step is to create some code to load up the data.
- Locate the Form methods. Right-click and select override method.

Select the Run method.

- Add the following code to Run method.

```
public void run()
{
    _list = element.control(control::listview);
    _list2 = element.control(control::listview1);

    this.fillList();
    _list.viewType(1);
    _list2.viewType(1);
}
```

- This code relies on some new methods being created on the form fillList(), insertListItem_1(), insertListItem_2().

- The code for fillList() should look like this. This method is used to load up the data to the first list.

```
void fillList()
{
    CustTable   _custTable;
    int i = 0;
    ;

    while select * from _custtable
    order by accountNum
    {
        element.insertListItem_1(_custtable.Name,i);
        i++;
    }

}
```

- The code for insertListItem_1() should look list this. This method is used add items to the first list control.

```
int insertListItem_1(Str s, int i)
{
    int idx;
    FormListItem item;

    item = new FormListItem(s,i);
    item.idx(i);
    idx = _list.addItem(item);

    return idx;
}
```

- The code for insertListItem_2() should look list this. This method is used add items to the first list control.

```
int insertListItem_2(Str s, int i)
{
    int idx;
    FormListItem item;

    item = new FormListItem(s,i);
    item.idx(i);
    idx = _list2.addItem(item);

    return idx;
}
```

- The code to handle the drag-and-drop will be place in the overridded method drop() of each list control. To do this locate the methods node under the ListView control.

- Right-click on methods node and select Override Method. Select the Drop() method.

· Edit the code to enter this code. This code is using the input parameters of the dragSource control and finding the selected item. It then inserts the item to the list and deletes the item from the source list.

```
void drop(FormControl dragSource, FormDrag dragMode,
int x, int y)
{
    FormListControl _sourcelist;
    int idx;
    ;

    _sourcelist = dragSource;
    idx =
_sourcelist.getNextItem(FormListNEXT::SELECTED);
element.insertListItem_1(_sourcelist.getItem(idx).text(
),idx);
    _sourcelist.delete(idx);
}
```

· There is a property on a ListView called SingleSelection which determines if the user is allowed to select more that one item from the list. The code above will only add the first item. You can add a loop to handle list.

Exercise 40 Menu

NOTE : This solution assumes that you have completed the prior exercise.

· On the second ListView control override the method context. Add the following code to add the menu.

```
public void context()
{
    int i, selectedMenu;
    FormStaticTextControl text;
    PopupMenu   _listmenu     = new
PopupMenu(element.hWnd());
    int         _listdelete =
_listmenu.insertItem('Delete Item');
    int         _listdeleteAll =
_listmenu.insertItem('Delete All');
    ;

    selectedMenu = _listmenu.draw();

    switch (selectedMenu)
    {
        case -1:
            break;

        case _listdelete:

_list2.delete(_list2.getNextItem(FormListNEXT::SELECTED
));
            break;

        case _listdeleteAll:
            _list2.deleteAll();
            break;
    }

}
```

.

Appendix M.

Tree Structure

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization	**Question to start with** Have you ever heard the expressions…	
	Exercise 1		
	Exercise 2		
	Exercise 3		
	Review	Any problems encountered?	Dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 41 **Creating a form with a tree structure**

Exercise 42 **Expanding the tree structure**

Exercise 43 **Fields**

Appendix N.

Temporary Tables

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

TEMPORARY TABLES

Time	Topic	What to do/say	Medium
5	Introduction	Introduce lesson objectives	PPT
10	Comprehension/ Visualization	Temp tables Purpose Use Temp. tables and Views, do the view still exist when the temp tables is closed?	Dialog Axapta
5	**Questions**	Q: Where are temporary tables created? A: Temporary tables are created as files in the local file system. Q: Does it have any impact where you declare your table? (server& client) A: it does not matter where, on the server or on the client, a temporary table is declared. Even when you write code like server static `<tmptable>::createTable()` that instantiates a table, the table still becomes a client temporary table if the first record is inserted from client code. If a temporary table has a new dataset (setTmpData), the temporary table will afterwards be with the temporary table that provided its data. (ref. Dev Guide)	dialog
20-40	**Exercises**	4 + 1 optional	Axapta
	Review	Any problems encountered?	dialog

Exercise Solutions

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 44 **Temporary table in a job**

Exercise 45 **Temporary table in a class**

Exercise 46 **Temporary table in a form**

Exercise 47 **Temporary table in a report**

Exercise 48 **Temporary table for spool file administration - Optional**

Appendix O.

Validation Techniques

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization	**Question to start with** Have you ever heard the expressions…	
	Exercise 1		
	Review	Any problems encountered?	dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 49 **Validate on the table BankGroup**

```
public boolean validateField(fieldId _fieldIdToCheck)
{
    boolean ret;
    BankGroup _bankgroup;
    BankGroupId _bankgroupId =
substr(this.BankGroupId,1,1)+"*";

    //First use the standard validation
    ret = super(_fieldIdToCheck);

    //Second make your additional validation
    if (ret==true)
    {
        switch (_fieldIdToCheck)
        {
            //performance issue: only query when the
BankGroupId is changed
            case fieldnum(BankGroup,BankGroupId):
                select firstonly _bankgroup
                where _bankgroup.BankGroupId like
_bankgroupId
                &&    _bankgroup.RecId != this.RecId;
                if (_bankgroup)
                {
                    info("First letter already used");
                    ret = false;
                }
        }
    }
    return ret;
}
```

Appendix P.

Queries

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

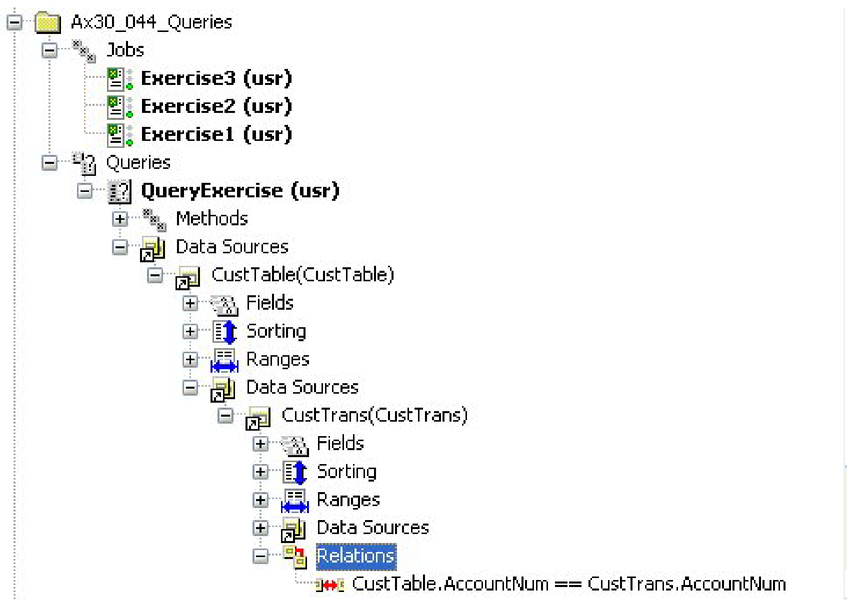
INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization		
	Demo	Show the new Query dialog	Axapta Dialog
	Exercise 1		
	Exercise 2		
	Exercise 3		
	Review	Any problems encountered?	dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 50 Running an AOT query



The code

```
static void Exercise1(Args _args)
{
 QueryRun      _queryExercise = new
QueryRun(queryStr(QueryExercise));
 CustTable     _custTable;
   CustTrans     _custTrans;
   AmountMST     _amountMST=0;
   Name          _name="";
    ;
    if (_queryExercise.prompt())
    {
        //the query is sorted by Customer.
```

```
        while (_queryExercise.next())
        {
            _custTable =
_queryExercise.get(tablenum(CustTable));
            _custTrans = _queryExercise.
get(tablenum(CustTrans));
            if  (_name != _custTable.Name)
            {
                print _custTable.Name+" "+
num2str(_amountMST,10,2,2,1);
                //start calculating for the next
customer.
                _name       = _custTable.Name;
                _amountMST  = 0;
            }
            //increase the total amount of sales orders
            _amountMST += _custTrans.AmountMST;
        }
    }
    pause;
}
```

Exercise 51 **Building a query**

```
static void Exercise2(Args _args)
{
 CustTable             _custTable;
  Query                 q = new Query();
  QueryBuildDataSource  qbd;
  QueryRun              _queryExercise;
  ;
  qbd = q.addDataSource(TableNum(CustTable));
  qbd.addSortField(FieldNum(CustTable,Name));
  //no additional ranges are added
  _queryExercise  = new QueryRun(q);
  if (_queryExercise.prompt())
  {
    while (_queryExercise.next())
    {
        _custTable = _queryExercise.getNo(1);
```

```
            print _custTable.Name;
        }
    }
    pause;
}
```

Exercise 52 **Build a complex query**

```
static void Exercise3(Args _args)
{
    CustTable             _custTable;
    CustTrans             _custTrans;
    Query                    q = new Query();
    QueryBuildDataSource  qbdCustTable;
    QueryBuildDataSource  qbdCustTrans;
    QueryRun              _queryExercise;
    Name                     _name;
    AmountMST           _amountMST;
    ;

    //add the first data source.
    qbdCustTable = q.addDataSource(TableNum(CustTable));
    qbdCustTable.addSortField(FieldNum(CustTable,Name));

    //add the second data source.
    qbdCustTrans =
qbdCustTable.addDataSource(TableNum(CustTrans));

    //declare the relation between the two data sources.
    qbdCustTrans.joinMode(JoinMode::InnerJoin);
    qbdCustTrans.addLink(fieldnum(CustTable,AccountNum),

fieldnum(CustTrans,AccountNum));


    _queryExercise  = new QueryRun(q);
    if (_queryExercise.prompt())
      {
          //the query is sorted by Customer.
```

```
        while (_queryExercise.next())
        {
            _custTable = _queryExercise.getNo(1);
            _custTrans = _queryExercise.getNo(2);
            if  (_name != _custTable.Name)
            {
                print _custTable.Name+" "+
num2str(_amountMST,10,2,2,1);
                //start calculating for the next
customer.
                _name       = _custTable.Name;
                _amountMST  = 0;
            }
            //increase the total amount of sales orders
            _amountMST += _custTrans.AmountMST;
        }
    }
    pause;
}
```

Appendix Q.

Using System, X and Dict. Classes

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization	**Question to start with** Have you ever heard the expressions…	
	Exercise 1		
	Exercise 2….		
	Review	Any problems encountered?	dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 53 **Viewing Dict classes**

Exercise 54 **Testing DictClass**

Exercise 55 **Testing DictTable**

Exercise 56 **Modify FormRunClass**

Exercise 57 **X Classes**

Appendix R.

Macros

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization	**Question to start with** Have you ever heard the expressions…	
	Exercise 1		
	Exercise 2….		
	Review	Any problems encountered?	dialog

Exercise Solutions

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 58 **Local macro in a job**

Exercise 59 **Global macros**

Exercise 60 **Macro library**

Exercise 61 **Calculation macro**

Appendix S.

Reports

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization	**Question to start with** Have you ever heard the expressions…	
	Exercise 1		
	Exercise 2		
	Review	Any problems encountered?	dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 62 **Display methods**

The display method on the table

```
display str showPhone()
{
    if (this.Phone)
    {
        return this.Phone;
    }
    else
    {
        return this.PhoneLocal;
    }
}
```

FieldString : Control properties (the text field in the report):

Table: EMPTable
DataMethod: Showphone

Exercise 63 **Synchronization**

Overwrite the run method of the report generated in exercise 1.

```
public void run()
{
    EmplTable       _emplTable;
```

```
    QueryBuildRange _qbr;
   //activate this code only when it is called from the
Employee Form
    if (element.args().dataset()==TableNum(EmplTable))
    {
        _emplTable  = element.args().record();
        _qbr        = element.query().dataSourceNo(1).
                findRange(FieldNum(EmplTable,EmplId));
        if (!_qbr)
        {
            info("ERROR");
        }
        else
        {
            _qbr.value(_emplTable.EmplId);
        }
    }
    super();
}
```

Appendix T.

Report Design

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

Time	Topic	What to do/say	Medium
	Introduction	Introduce lesson objectives	
	Comprehension/ Visualization	**Question to start with** Have you ever heard the expressions…	
	Exercise 1		
	Exercise 2		
	Review	Any problems encountered?	dialog

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 64 **Report with two designs**

Exercise 65 **Report without data source**

Exercise 66 **Absence report - Optional**

Appendix U.

Wizard Wizard

This appendix contains:

- Notes and guidelines to instructors
- Solutions to exercises

INSTRUCTOR NOTES

EXERCISE SOLUTIONS

Use the Xpo file: **AX30Adv** supplied with the training materials for this appendix. Some solutions to smaller exercises are inserted directly in the appendix.

Exercise 67 **New wizard**

Exercise 68 **Create a wizard**