Object Oriented ABAP

From SAP Technical

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Understanding the concepts of Object Oriented Programming

What is Object Orientation?
In the past, information systems used to be defined primarily by their functionality: Data and functions were kept separate and linked together by means of input and output relations.

The object-oriented approach, however, focuses on objects that represent abstract or concrete things of the real world. These objects are first defined by their character and their properties, which are represented by their internal structure and their attributes (data). The behavior of these objects is described by methods (functionality).

Comparison between Procedural and Object Oriented Programming

Features	Procedure Oriented approach	Object Oriented approach
Emphasis	Emphasis on tasks	Emphasis on things that does those tasks.
Modularization	Programs are divided into smaller programs known as functions	Programs are organized into classes and objects and the functionalities are embedded into methods of a class.
Data security	Most of the functions share global data	Data can be hidden and cannot be accessed by external sources.
Extensibility	Relatively more time consuming to modify for extending existing functionality.	New data and functions can be easily added whenever necessary

Object Oriented Approach - key features

1. Better Programming Structure.
2. Real world entity can be modeled very well.
3. Stress on data security and access.
4. Reduction in code redundancy.
5. Data encapsulation and abstraction.

What are Objects and Classes?

Objects: An object is a section of source code that contains data and provides services. The data forms the attributes of the object. The services are known as methods (also known as operations or functions). They form a capsule which

combines the character to the respective behavior. Objects should enable programmers to map a real problem and its proposed software solution on a one-to-one basis.

Classes: Classes describe objects. From a technical point of view, objects are runtime instances of a class. In theory, you can create any number of objects based on a single class. Each instance (object) of a class has a unique identity and its own set of values for its attributes.

Local and Global Classes

As mentioned earlier a class is an abstract description of an object. Classes in ABAP Objects can be declared either globally or locally.

Global Class: Global classes and interfaces are defined in the Class Builder (Transaction SE24) in the ABAP Workbench. They are stored centrally in class pools in the class library in the R/3 Repository. All of the ABAP programs in an R/3 System can access the global classes

Local Class: Local classes are define in an ABAP program (Transaction SE38) and can only be used in the program in which they are defined.

	Global Class	Local Class
Accessed By	Any program	Only the program where it is defined.
Stored In	In the Class Repository	Only in the program where it is defined.
Created By	Created using transaction SE24	Created using SE38
Namespace	Must begin with Y or Z	Can begin with any character

Local Classes

Every class will have two sections.

(1) Definition. (2) Implementation

Definition: This section is used to declare the components of the classes such as attributes, methods, events .They are enclosed in the ABAP statements CLASS ... ENDCLASS.

```
CLASS <class> DEFINITION.
...
ENDCLASS.
```

Implementation: This section of a class contains the implementation of all **methods** of the class. The implementation part of a local class is a processing block.

```
CLASS <class> IMPLEMENTATION.
...
ENDCLASS.
```

Structure of a Class

The following statements define the structure of a class:

1. A class contains components
2. Each component is assigned to a visibility section
3. Classes implement methods

1. Components of a Class are as follow:

- ☐ Attributes:- Any data,constants,types declared within a class form the attribute of the class.

- ☐ Methods:- Block of code, providing some functionality offered by the class. Can be compared to function modules. They can access all of the attributes of a class.

  Methods are defined in the definition part of a class and implement it in the implementation part using the following processing block:

  METHOD <meth>.

  ...

  ENDMETHOD.

  Methods are called using the CALL METHOD statement.

- ☐ Events:- A mechanism set within a class which can help a class to trigger methods of other class.

- ☐ Interfaces:- Interfaces are independent structures that you can implement in a class to extend the scope of that class**.**

  Instance and Static Components:

- ☐ Instance components exist separately in each instance (object) of the class and are referred using instance component selector using '☐'.

- ☐ Static components only exist once per class and are valid for all instances of the class. They are declared with the **CLASS-** keywords

- ☐ Static components can be used without even creating an instance of the class and are referred to using static component selector '**=>**'.

2. Visibility of Components

Each class component has a visibility. In ABAP Objects the whole class definition is separated into three visibility sections: **PUBLIC, PROTECTED, and PRIVATE**.

- Data declared in public section can be accessed by the class itself, by its subclasses as well as by other users outside the class.

- Data declared in the protected section can be accessed by the class itself, and also by its subclasses but not by external users outside the class.

- Data declared in the private section can be accessed by the class only, but not by its subclasses and by external users outside the class.

```
CLASS <class> DEFINITION.
 PUBLIC SECTION.
  ...
PROTECTED SECTION.
  ...
PRIVATE SECTION.
  ...
ENDCLASS.
```

We shall see an example on **Visibility of Components** once we become familiar with attributes of ABAP Objects.

```
REPORT  YDEMO_CLASS.
*---------------------------------------------------------------------*
*       CLASS class1 DEFINITION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
CLASS CLASS1 DEFINITION.

  PUBLIC SECTION.
    DATA:
    W_TEXT(40) VALUE 'ABAP Objects'.
    METHODS : DISPLAY.
ENDCLASS.                    "Parentcl DEFINITION
*&---------------------------------------------------------------------*
*&       Class (Implementation)  CLASS1
*&---------------------------------------------------------------------*
*        Text
*---------------------------------------------------------------------*
CLASS CLASS1 IMPLEMENTATION.
  METHOD DISPLAY.
    WRITE:/ 'This is method "DISPLAY"'.
  ENDMETHOD.                    "display
ENDCLASS.                                          "CLASS1
*************************************************************************
START-OF-SELECTION.
  DATA:
   CLASS1 TYPE REF TO CLASS1.

  CREATE OBJECT: CLASS1.

  WRITE :/ CLASS1->W_TEXT.
  CALL METHOD:
       CLASS1->DISPLAY.
```

Step1

Step2

The yellow block of code is CLASS Definition

The Green block of code is CLASS Implementation

The Grey block of code is for object creation. This object creation includes two steps:

Step1 is Create a reference variable with reference to the class.

Syntax: **DATA :** <object name> **TYPE REF TO** <class name>.

Step 2 : Create an object from the reference variable:-

Syntax: CREATE OBJECT <object name>.

Output for the above code is

```
Demo for local class creation
---------------------------------
ABAP Objects
This is method "DISPLAY"
```

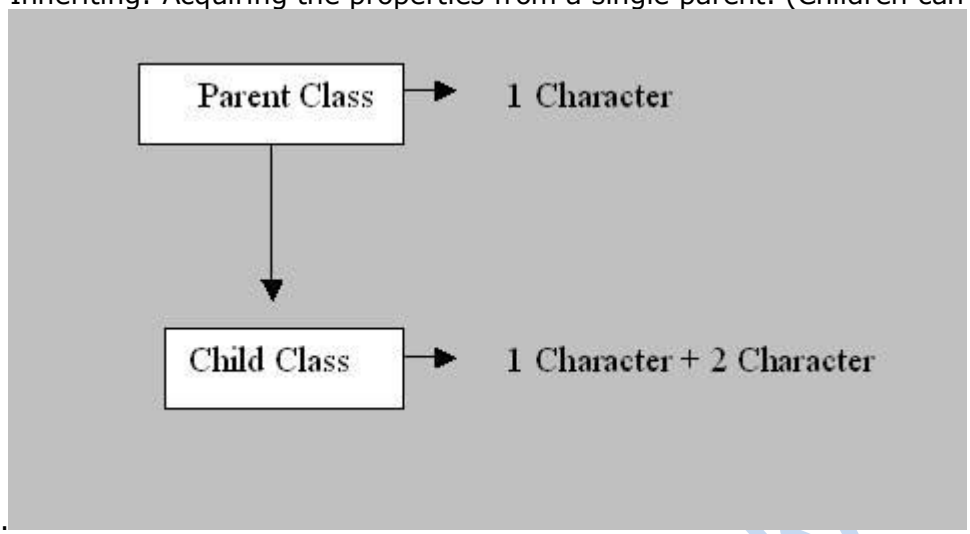

Attributes of Object Oriented Programming:

- Inheritance.
- Abstraction.
- Encapsulation.
- Polymorphism

Inheritance is the concept of adopting the features from the parent and reusing them . It involves passing the behavior of a class to another class. You can use an existing class to derive a new class. Derived classes inherit the data and methods of the super class. However, they can overwrite existing methods, and also add new ones.

Inheritance is of two types: Single Inheritance and Multiple Inheritance

Single Inheriting: Acquiring the properties from a single parent. (Children can be more).



Example for Single Inheritance

Multiple inheritance: Acquiring the properties from more than one parent.

Example

Tomato4 (Best Color, Size, Taste)

Tomato1

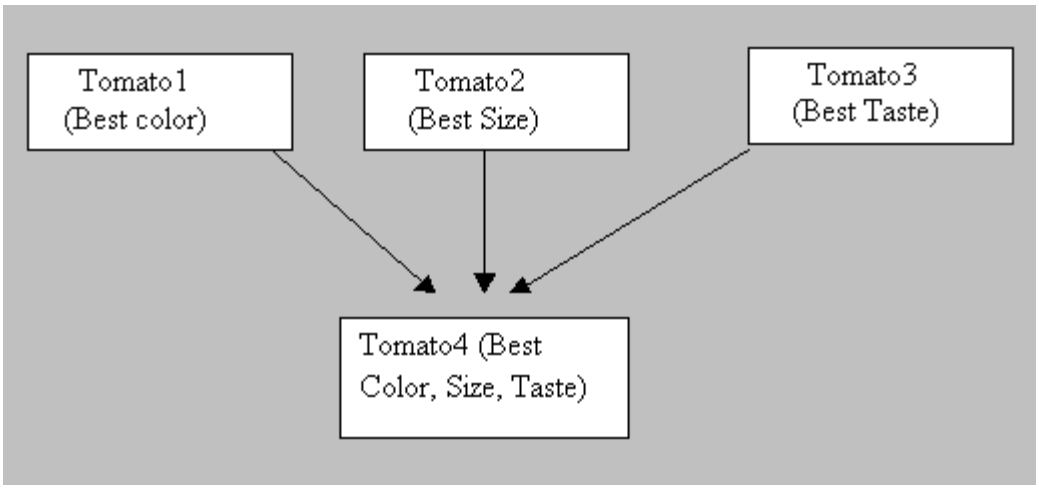
(Best color)

Tomato2

(Best Size)

Tomato3

(Best Taste)



Syntax : CLASS <subclass> DEFINITION INHERITING FROM <superclass>.

Let us see a very simple example for creating subclass(child) from a superclass(parent)

```
*&---------------------------------------------------------------------*

REPORT  YDEMO_INHERITANCE.
*---------------------------------------------------------------------*
*       CLASS PARENT DEFINITION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
CLASS PARENT DEFINITION.
  PUBLIC SECTION.
    DATA:
    W_PUBLIC(30) VALUE 'This is public data'.
    METHODS:   PARENTMET.

ENDCLASS.                    "Parentcl DEFINITION

*Child class defination
CLASS CHILD DEFINITION INHERITING FROM PARENT.
  PUBLIC SECTION.
    METHODS : CHILDMET.
ENDCLASS.                    "child  DEFINATION INH
*&---------------------------------------------------------------------*
*&       Class (Implementation)  PARENT
*&---------------------------------------------------------------------*
*        Text
*---------------------------------------------------------------------*
CLASS PARENT IMPLEMENTATION.
  METHOD PARENTMET.
    WRITE /: W_PUBLIC.
  ENDMETHOD.                     "Display
ENDCLASS.               "PARENT
*&---------------------------------------------------------------------*
*&       Class (Implementation)  CHILD
*&---------------------------------------------------------------------*
*        Text
*---------------------------------------------------------------------*
CLASS CHILD IMPLEMENTATION.
  METHOD CHILDMET.
    SKIP.
    WRITE /:    'Method in child class',
                W_PUBLIC.
  endmethod.
  ENDCLASS.               "CHILD

START-OF-SELECTION.
  DATA:
     PARENT TYPE REF TO PARENT,
     CHILD  TYPE REF TO CHILD.

  CREATE OBJECT : PARENT, CHILD.
  CALL METHOD:
    PARENT->parentmet,
    CHILD->childmet.
```

Multiple Inheritance is **not supported** by **ABAP**.

Output is as follows :

```
Test program for Inheritance
This is public data
Method in child class
This is public data
```

Abstraction: Everything is visualized in terms of classes and objects.

Encapsulation The wrapping up of data and methods into a single unit (called class) is known as Encapsulation. The data is not accessible to the outside world only those methods, which are wrapped in the class, can access it.

Polymorphism: Methods of same name behave differently in different classes**.** Identical (identically-named) methods behave differently in different classes. Object-oriented programming contains constructions called interfaces. They enable you to address methods with the same name in different objects. Although the form of address is always the same, the implementation of the method is specific to a particular class.

Object oriented programming (OOP) explained with an example

Create a class that keeps track of a bank account balance. Then write a program to use this class.

Steps involved:

- Run the class builder utility (**SE24**).
- Create a class called ZACCOUNTxx, where xx is the last two digits of your logon ID.
- Declare a PRIVATE attribute BALANCE of type DMBTR to store the account balance.
- Create the following PUBLIC methods:
  - SET_BALANCE (Sets the balance to a new value)
    - IMPORTING NEW_BALANCE TYPE DMBTR
  - DEPOSIT (Adds a deposit amount to the balance and returns the new balance)
    - IMPORTING AMOUNT TYPE DMBTR
    - RETURNING NEW_BALANCE TYPE DMBTR
  - WITHDRAW (Subtracts a deposit amount from the balance and returns the new balance.)
    - IMPORTING AMOUNT TYPE DMBTR
    - RETURNING NEW_BALANCE TYPE DMBTR
    - EXCEPTIONS INSUFFICIENT_FUNDS
- Activate all elements of your class.
- Write a program called Z_USE_ACCOUNT_xx, where xx is the last two digits of your logon ID. This program should do the following:
  - Instantiate an instance of the Account class.
  - Set the account balance to some initial value.
  - Make several deposits and withdrawals, printing the new balance each time. Do not allow the balance to become less than zero. (Use the exception to detect this.)
- Test and debug your program.

"Extra Credit": If you have extra time, try any of the following:

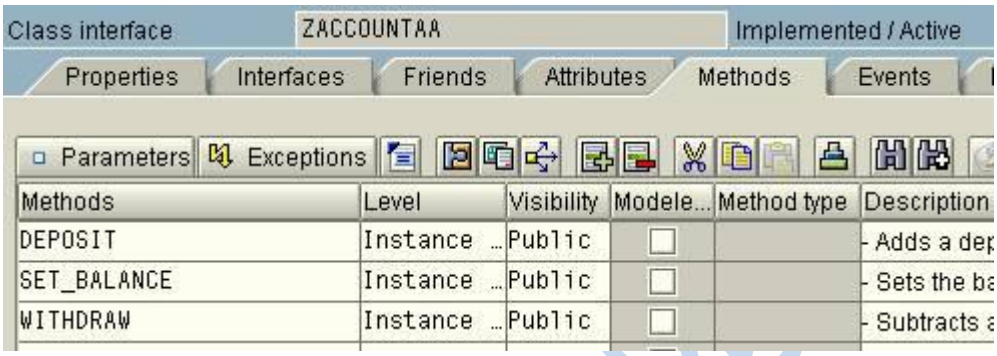
- Replace the SET_BALANCE method with a constructor. Pass the opening balance when you instantiate the account object.
- Create a static attribute and methods to set and get the name of the bank that holds the accounts.

Step-by-step approach with screen-shots

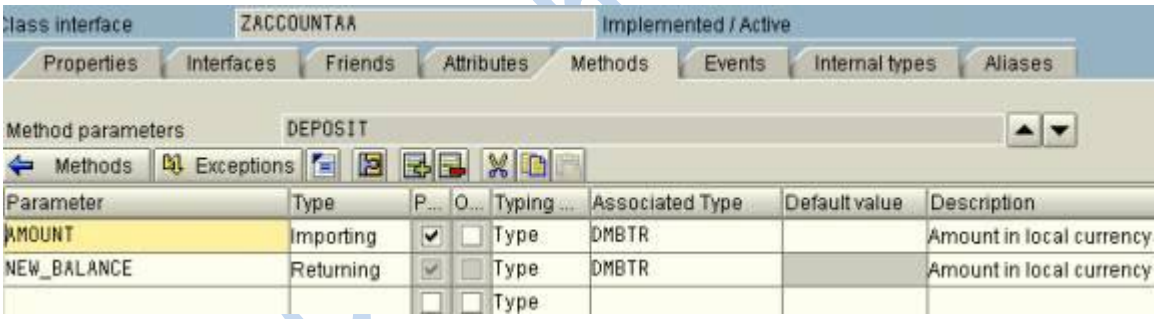
Go to SE24 (Class builder)

Type in ZACCOUNTAA as the name of the class and press Create.

Define 3 methods DEPOSIT, SET_BALANCE and WITHDRAW.

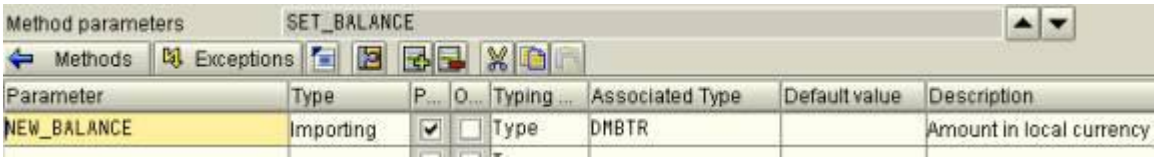


Place the mouse cursor in DEPOSIT and hit the Parameters button.



Write the parameters imported / exported for DEPOSIT method.

Similarly for SET_BALANCE



And WITHDRAW

Method parameters WITHDRAW

Methods | Exceptions

Parameter	Type	P...	O...	Typing ...	Associated Type	Default value	Description
AMOUNT	Importing	☑	☐	Type	DMBTR		Amount in local currency
NEW_BALANCE	Returning	☑	☐	Type	DMBTR		Amount in local currency

For withdraw we define an exception.

Method exceptions WITHDRAW

Methods | Parameters | Exception

Exception	Description
INSUFFICIENT_FUNDS	Insufficient balance. cannot withdraw.

We can see the attributes and methods by pressing "Display object list" button on top.

Class / Interface

ZACCOUNTAA

Object Name	D.
ZACCOUNTAA	My
Attribute	
BALANCE	An
Methods	
DEPOSIT	- A
SET_BALANCE	- S
WITHDRAW	- S

Now we IMPLEMENT the 3 methods. Double click the method DEPOSIT.

Ty.	Parameter	Type spec.	Description
	VALUE(AMOUNT)	TYPE DMBTR	Amount in local currency
	VALUE(NEW_BALANCE)	TYPE DMBTR	Amount in local currency

Method DEPOSIT Activ

```
method DEPOSIT .
BALANCE = BALANCE + AMOUNT.
NEW_BALANCE = BALANCE.
endmethod.
```

Write the required code. Similarly for SET_BALANCE

Ty.	Parameter	Type spec.	De
	VALUE(NEW_BALANCE)	TYPE DMBTR	Am

Method SET_BALANCE

```
method SET_BALANCE .
BALANCE = NEW_BALANCE.
endmethod.
```

Similarly for WITHDRAW.

Ty.	Parameter	Type spec.	Descriptic
	VALUE(AMOUNT)	TYPE DMBTR	Amount in
	VALUE(NEW_BALANCE)	TYPE DMBTR	Amount in
	INSUFFICIENT_FUNDS		Insufficier

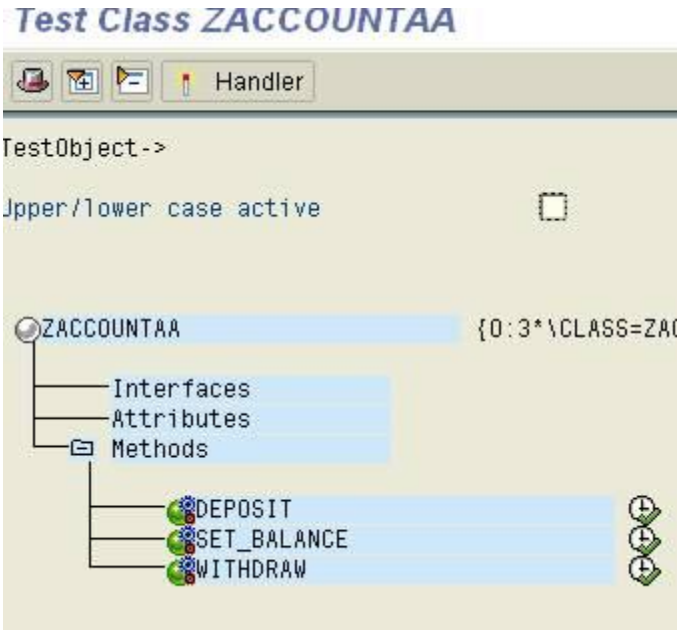
Method WITHDRAW Activ

```
method WITHDRAW .
IF BALANCE >= AMOUNT.
BALANCE = BALANCE - AMOUNT.
NEW_BALANCE = BALANCE.
ELSE.
RAISE INSUFFICIENT_FUNDS.
ENDIF.
endmethod.
```

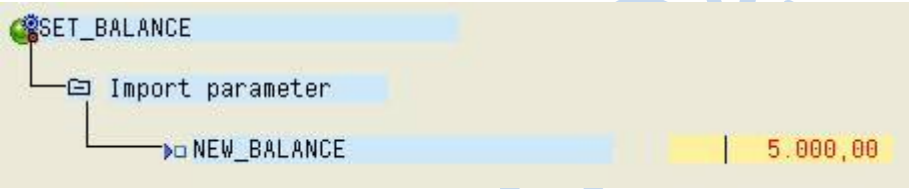
Now we are almost done creating the object. Press CTRL + F3 to activate or hit the Matchstick.

We will see this in the status Active object generated

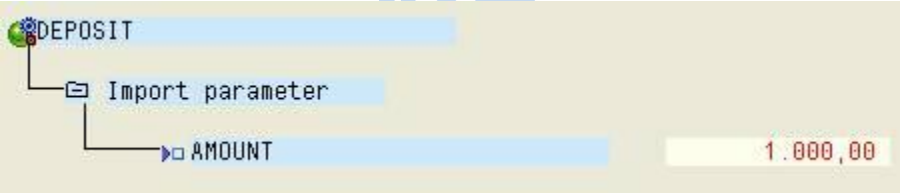
Now we are done building the global class we can test it. Press F8.



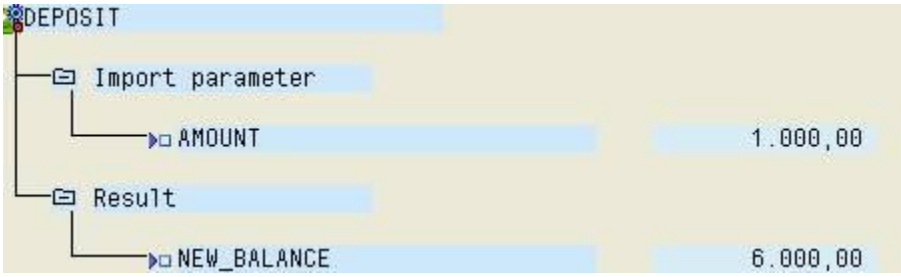
Click SET_BALANCE. Write the NEW_BALANCE and press ENTER.



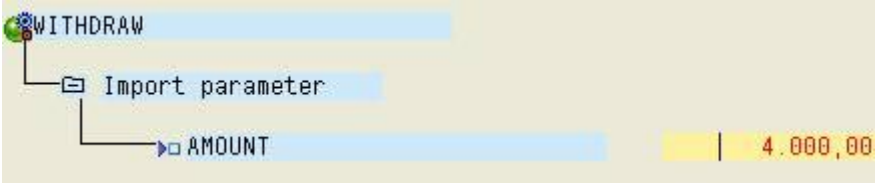
We come back to Initial Screen. Now click DEPOSIT.

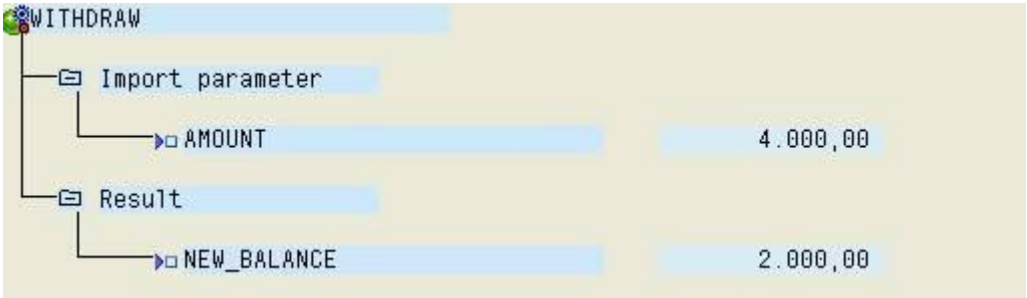


We see the return Values now.



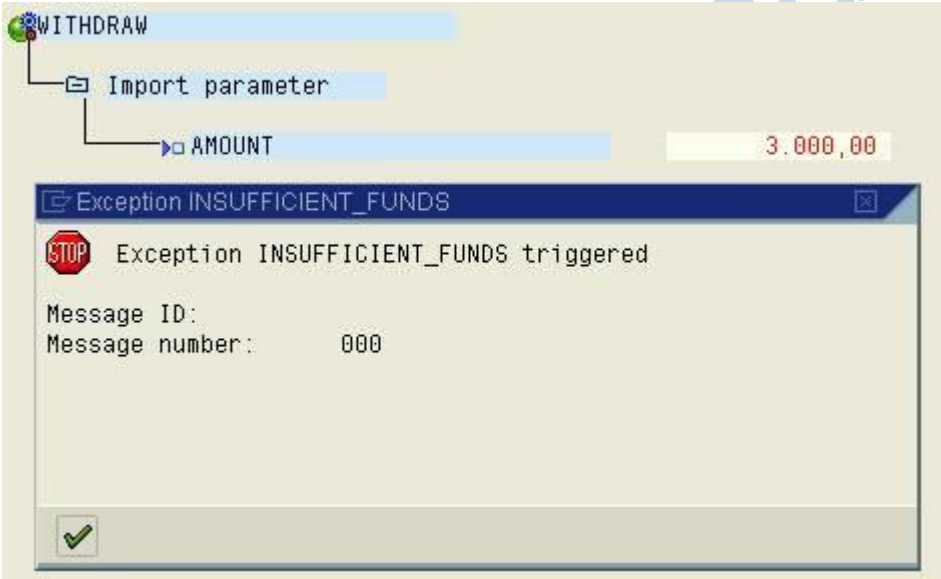
Now let's WITHDRAW 4000





Now the BALANCE is 2000

Let's try withdrawing 3000 now.



We get an exception.

Given below is an example code for using the global class we defined.

```
REPORT  ZGB_OOPS_BANK                                    .

DATA: acct1 type ref to zaccountaa.

DATA: bal type i.

create object: acct1.
```

```
selection-screen begin of block a.
parameters: p_amnt type dmbtr,
            p_dpst type dmbtr,
            p_wdrw type dmbtr.
selection-screen end of block a.

start-of-selection.

call method acct1->set_balance( p_amnt ).
write:/ 'Set balance to ', p_amnt.

bal = acct1->deposit( p_dpst ).
write:/ 'Deposited ', p_dpst ,' bucks making balance to ', bal.

bal = acct1->withdraw( p_wdrw ).
write:/ 'Withdrew ', p_wdrw ,' bucks making balance to ', bal.
```

This is the output.

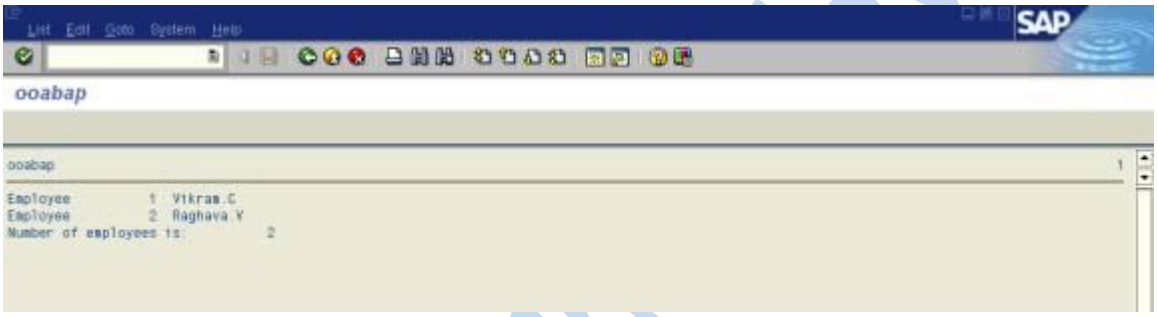
Program ZGB_OOPS_BANK

```
Program ZGB_OOPS_BANK

Set balance to          4.000,00
Deposited           3.000,00   bucks making balance to       7.000
Withdrew              200,00   bucks making balance to       6.800
```

Demo program illustrating Simple class and Super class

```
*&---------------------------------------------------------------------*
*& Report  Z_OOABAP18                                                  *
*&                                                                     *
*&---------------------------------------------------------------------*
*&                                                                     *
*&                                                                     *
*&---------------------------------------------------------------------*
REPORT  Z_OOABAP18                          .
CLASS lcl_employee DEFINITION.
  PUBLIC SECTION.
*---------------------------------------------------------------------
* The public section is accesible from outside
*---------------------------------------------------------------------
    TYPES:
      BEGIN OF t_employee,
        no  TYPE i,
        name TYPE string,
     END OF t_employee.
    METHODS:
      constructor
        IMPORTING im_employee_no TYPE i
                  im_employee_name TYPE string,
      display_employee.
*   Class methods are global for all instances
    CLASS-METHODS: display_no_of_employees.
  PROTECTED SECTION.
*---------------------------------------------------------------------
* The protected section is accessible from the class and its subclasses
*---------------------------------------------------------------------
*   Class data are global for all instances
    CLASS-DATA: g_no_of_employees TYPE i.
  PRIVATE SECTION.
*---------------------------------------------------------------------
* The private section is only accessible from within the classs
*---------------------------------------------------------------------
DATA: g_employee TYPE t_employee.
ENDCLASS.
*--- LCL Employee - Implementation
CLASS lcl_employee IMPLEMENTATION.
  METHOD constructor.
    g_employee-no = im_employee_no.
    g_employee-name = im_employee_name.
    g_no_of_employees = g_no_of_employees + 1.
  ENDMETHOD.
  METHOD display_employee.
    WRITE:/ 'Employee', g_employee-no, g_employee-name.
  ENDMETHOD.
  METHOD display_no_of_employees.
```

```
    WRITE: / 'Number of employees is:', g_no_of_employees.
  ENDMETHOD.
ENDCLASS.
*********************************************************************
* R E P O R T
*********************************************************************
DATA: g_employee1 TYPE REF TO lcl_employee,
      g_employee2 TYPE REF TO lcl_employee.
START-OF-SELECTION.
  CREATE OBJECT g_employee1
    EXPORTING im_employee_no = 1
              im_employee_name = 'Vikram.C'.
  CREATE OBJECT g_employee2
    EXPORTING im_employee_no = 2
              im_employee_name = 'Raghava.V'.
  CALL METHOD g_employee1->display_employee.
  CALL METHOD g_employee2->display_employee.
```



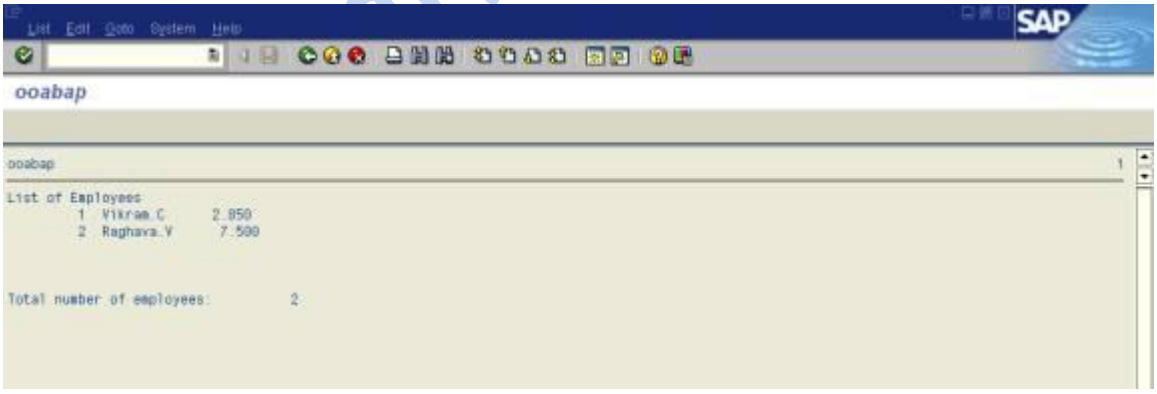
Demo program illustrating Inheritance

```
*&---------------------------------------------------------------------*
*& Report  Z_OOABAP19                                                  *
*&                                                                     *
*&---------------------------------------------------------------------*
*&                                                                     *
*&                                                                     *
*&---------------------------------------------------------------------*

REPORT  Z_OOABAP19                          .
CLASS lcl_company_employees DEFINITION.
  PUBLIC SECTION.
    TYPES:
      BEGIN OF t_employee,
        no  TYPE i,
        name TYPE string,
        wage TYPE i,
     END OF t_employee.
    METHODS:
      constructor,
      add_employee
        IMPORTING im_no   TYPE i
                  im_name TYPE string
                  im_wage TYPE i,
      display_employee_list,
      display_no_of_employees.

  PRIVATE SECTION.
    CLASS-DATA: i_employee_list TYPE TABLE OF t_employee,
                no_of_employees TYPE i.
ENDCLASS.
*-- CLASS LCL_CompanyEmployees IMPLEMENTATION
CLASS lcl_company_employees IMPLEMENTATION.
  METHOD constructor.
    no_of_employees = no_of_employees + 1.
  ENDMETHOD.
  METHOD add_employee.
*   Adds a new employee to the list of employees
    DATA: l_employee TYPE t_employee.
    l_employee-no = im_no.
    l_employee-name = im_name.
    l_employee-wage = im_wage.
    APPEND l_employee TO i_employee_list.
  ENDMETHOD.
  METHOD display_employee_list.
*   Displays all employees and there wage
    DATA: l_employee TYPE t_employee.
    WRITE: / 'List of Employees'.
    LOOP AT i_employee_list INTO l_employee.
      WRITE: / l_employee-no, l_employee-name, l_employee-wage.
    ENDLOOP.
```

```
  ENDMETHOD.
  METHOD display_no_of_employees.
*   Displays total number of employees
    SKIP 3.
    WRITE: / 'Total number of employees:', no_of_employees.
  ENDMETHOD.
ENDCLASS.

*******************************************************
* Sub class LCL_BlueCollar_Employee
*******************************************************
CLASS lcl_bluecollar_employee DEFINITION
         INHERITING FROM lcl_company_employees.
  PUBLIC SECTION.
    METHODS:
       constructor
         IMPORTING im_no            TYPE i
                   im_name          TYPE string
                   im_hours         TYPE i
                   im_hourly_payment TYPE i,
        add_employee REDEFINITION.
  PRIVATE SECTION.
    DATA:no            TYPE i,
         name          TYPE string,
         hours         TYPE i,
         hourly_payment TYPE i.

ENDCLASS.


*---- CLASS LCL_BlueCollar_Employee IMPLEMENTATION
CLASS lcl_bluecollar_employee IMPLEMENTATION.
  METHOD constructor.
*   The superclass constructor method must be called from the subclass

*   constructor method
    CALL METHOD super->constructor.
    no = im_no.
    name = im_name.
    hours = im_hours.
    hourly_payment = im_hourly_payment.
  ENDMETHOD.
  METHOD add_employee.
*   Calculate wage an call the superclass method add_employee to add

*   the employee to the employee list
    DATA: l_wage TYPE i.
    l_wage = hours * hourly_payment.
    CALL METHOD super->add_employee
      EXPORTING im_no = no
                im_name = name
                im_wage = l_wage.
```

```
  ENDMETHOD.
ENDCLASS.
*******************************************************
* Sub class LCL_WhiteCollar_Employee
*******************************************************
CLASS lcl_whitecollar_employee DEFINITION

    INHERITING FROM lcl_company_employees.
  PUBLIC SECTION.
    METHODS:
        constructor
          IMPORTING im_no                TYPE i
                    im_name              TYPE string
                    im_monthly_salary    TYPE i
                    im_monthly_deducations TYPE i,
        add_employee REDEFINITION.
  PRIVATE SECTION.
    DATA:
      no                  TYPE i,
      name                TYPE string,
      monthly_salary      TYPE i,
      monthly_deducations TYPE i.
ENDCLASS.
*---- CLASS LCL_WhiteCollar_Employee IMPLEMENTATION
CLASS lcl_whitecollar_employee IMPLEMENTATION.
  METHOD constructor.
*   The superclass constructor method must be called from the subclass
*   constructor method
    CALL METHOD super->constructor.
    no = im_no.
    name = im_name.
    monthly_salary = im_monthly_salary.
    monthly_deducations = im_monthly_deducations.
  ENDMETHOD.
  METHOD add_employee.
*   Calculate wage an call the superclass method add_employee to add

*   the employee to the employee list
    DATA: l_wage TYPE i.
    l_wage = monthly_salary - monthly_deducations.
    CALL METHOD super->add_employee
      EXPORTING im_no = no
                im_name = name
                im_wage = l_wage.
  ENDMETHOD.
ENDCLASS.


*******************************************************
* R E P O R T
*******************************************************
DATA:
```

```
* Object references
  o_bluecollar_employee1  TYPE REF TO lcl_bluecollar_employee,
  o_whitecollar_employee1 TYPE REF TO lcl_whitecollar_employee.
START-OF-SELECTION.
* Create bluecollar employee obeject
  CREATE OBJECT o_bluecollar_employee1
      EXPORTING im_no  = 1
                im_name  = 'Vikram.C'
                im_hours = 38
                im_hourly_payment = 75.
* Add bluecollar employee to employee list
  CALL METHOD o_bluecollar_employee1->add_employee
      EXPORTING im_no  = 1
                im_name  = 'Vikram.C'
                im_wage = 0.
* Create whitecollar employee obeject
  CREATE OBJECT o_whitecollar_employee1
      EXPORTING im_no  = 2
                im_name  = 'Raghava.V'
                im_monthly_salary = 10000
                im_monthly_deducations = 2500.
* Add bluecollar employee to employee list
  CALL METHOD o_whitecollar_employee1->add_employee
      EXPORTING im_no  = 1
                im_name  = 'Vikram.C'
                im_wage = 0.
* Display employee list and number of employees. Note that the result
* will be the same when called from o_whitecollar_employee1 or
* o_bluecolarcollar_employee1, because the methods are defined
* as static (CLASS-METHODS)
  CALL METHOD o_whitecollar_employee1->display_employee_list.
  CALL METHOD o_whitecollar_employee1->display_no_of_employees.
```



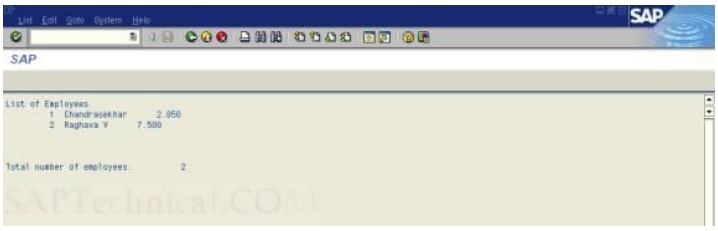
Demo program illustrating Interface

```
*&---------------------------------------------------------------------*
*& Report  Z_OOABAP20                                                  *
*&                                                                     *
*&---------------------------------------------------------------------*
*&                                                                    *
*&                                                                     *
*&---------------------------------------------------------------------*

REPORT  Z_OOABAP20
                    .
INTERFACE lif_employee.
  METHODS:
    add_employee
      IMPORTING im_no   TYPE i
                im_name TYPE string
                im_wage TYPE i.
ENDINTERFACE.

*******************************************************
* Super class LCL_CompanyEmployees
*******************************************************

CLASS lcl_company_employees DEFINITION.
  PUBLIC SECTION.
    INTERFACES lif_employee.
    TYPES:
      BEGIN OF t_employee,
        no  TYPE i,
        name TYPE string,
        wage TYPE i,
     END OF t_employee.
    METHODS:
      constructor,

      display_employee_list,
      display_no_of_employees.

  PRIVATE SECTION.
    CLASS-DATA: i_employee_list TYPE TABLE OF t_employee,
                no_of_employees TYPE i.
ENDCLASS.

*-- CLASS LCL_CompanyEmployees IMPLEMENTATION

CLASS lcl_company_employees IMPLEMENTATION.
  METHOD constructor.
    no_of_employees = no_of_employees + 1.
  ENDMETHOD.
  METHOD lif_employee~add_employee.
```

```
*   Adds a new employee to the list of employees
    DATA: l_employee TYPE t_employee.
    l_employee-no = im_no.
    l_employee-name = im_name.
    l_employee-wage = im_wage.
    APPEND l_employee TO i_employee_list.
  ENDMETHOD.
  METHOD display_employee_list.
*   Displays all employees and there wage
    DATA: l_employee TYPE t_employee.
    WRITE: / 'List of Employees'.
    LOOP AT i_employee_list INTO l_employee.
      WRITE: / l_employee-no, l_employee-name, l_employee-wage.
    ENDLOOP.
  ENDMETHOD.
  METHOD display_no_of_employees.
*   Displays total number of employees
    SKIP 3.
    WRITE: / 'Total number of employees:', no_of_employees.
  ENDMETHOD.
ENDCLASS.

*********************************************************
* Sub class LCL_BlueCollar_Employee
*********************************************************

CLASS lcl_bluecollar_employee DEFINITION
         INHERITING FROM lcl_company_employees.
  PUBLIC SECTION.
    METHODS:
       constructor
         IMPORTING im_no          TYPE i
                   im_name        TYPE string
                   im_hours       TYPE i
                   im_hourly_payment TYPE i,
        lif_employee~add_employee REDEFINITION..
  PRIVATE SECTION.
    DATA:no            TYPE i,
        name          TYPE string,
        hours         TYPE i,
        hourly_payment TYPE i.

ENDCLASS.

*---- CLASS LCL_BlueCollar_Employee IMPLEMENTATION
CLASS lcl_bluecollar_employee IMPLEMENTATION.
  METHOD constructor.
*   The superclass constructor method must be called from the subclass
*   constructor method
    CALL METHOD super->constructor.
    no = im_no.
    name = im_name.
```

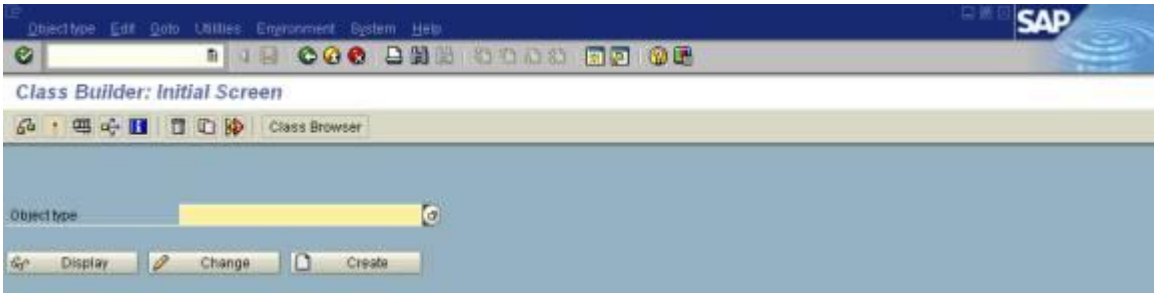
```
    hours = im_hours.
    hourly_payment = im_hourly_payment.
  ENDMETHOD.
  METHOD lif_employee~add_employee.
*   Calculate wage an call the superclass method add_employee to add
*   the employee to the employee list
    DATA: l_wage TYPE i.
    l_wage = hours * hourly_payment.
    CALL METHOD super->lif_employee~add_employee
      EXPORTING im_no = no
                im_name = name
                im_wage = l_wage.
  ENDMETHOD.
ENDCLASS.

*******************************************************
* Sub class LCL_WhiteCollar_Employee
*******************************************************
CLASS lcl_whitecollar_employee DEFINITION

    INHERITING FROM lcl_company_employees.
  PUBLIC SECTION.
    METHODS:
        constructor
          IMPORTING im_no                TYPE i
                    im_name              TYPE string
                    im_monthly_salary     TYPE i
                    im_monthly_deducations TYPE i,
        lif_employee~add_employee REDEFINITION.
  PRIVATE SECTION.
    DATA:
      no                  TYPE i,
      name                 TYPE string,
      monthly_salary        TYPE i,
      monthly_deducations   TYPE i.
ENDCLASS.
*---- CLASS LCL_WhiteCollar_Employee IMPLEMENTATION
CLASS lcl_whitecollar_employee IMPLEMENTATION.
  METHOD constructor.
*   The superclass constructor method must be called from the subclass
*   constructor method

    CALL METHOD super->constructor.
    no = im_no.
    name = im_name.
    monthly_salary = im_monthly_salary.
    monthly_deducations = im_monthly_deducations.
  ENDMETHOD.
  METHOD lif_employee~add_employee.
*   Calculate wage an call the superclass method add_employee to add
*   the employee to the employee list
    DATA: l_wage TYPE i.
```

```
    l_wage = monthly_salary - monthly_deducations.
    CALL METHOD super->lif_employee~add_employee
      EXPORTING im_no = no
                im_name = name
                im_wage = l_wage.
  ENDMETHOD.
ENDCLASS.

*****************************************************
* R E P O R T
*****************************************************
DATA:
* Object references
  o_bluecollar_employee1  TYPE REF TO lcl_bluecollar_employee,
  o_whitecollar_employee1 TYPE REF TO lcl_whitecollar_employee.
START-OF-SELECTION.
* Create bluecollar employee obeject
  CREATE OBJECT o_bluecollar_employee1
      EXPORTING im_no  = 1
                im_name  = 'Chandrasekhar'
                im_hours = 38
                im_hourly_payment = 75.
* Add bluecollar employee to employee list
  CALL METHOD o_bluecollar_employee1->lif_employee~add_employee
      EXPORTING im_no  = 1
                im_name  = 'Vikram C'
                im_wage = 0.
* Create whitecollar employee obeject
  CREATE OBJECT o_whitecollar_employee1
      EXPORTING im_no  = 2
                im_name  = 'Raghava V'
                im_monthly_salary = 10000
                im_monthly_deducations = 2500.
* Add bluecollar employee to employee list
  CALL METHOD o_whitecollar_employee1->lif_employee~add_employee
      EXPORTING im_no  = 1
                im_name  = 'Gylle Karen'
                im_wage = 0.
* Display employee list and number of employees. Note that the result
* will be the same when called from o_whitecollar_employee1 or
* o_bluecolarcollar_employee1, because the methods are defined
* as static (CLASS-METHODS)
  CALL METHOD o_whitecollar_employee1->display_employee_list.
  CALL METHOD o_whitecollar_employee1->display_no_of_employees.
```

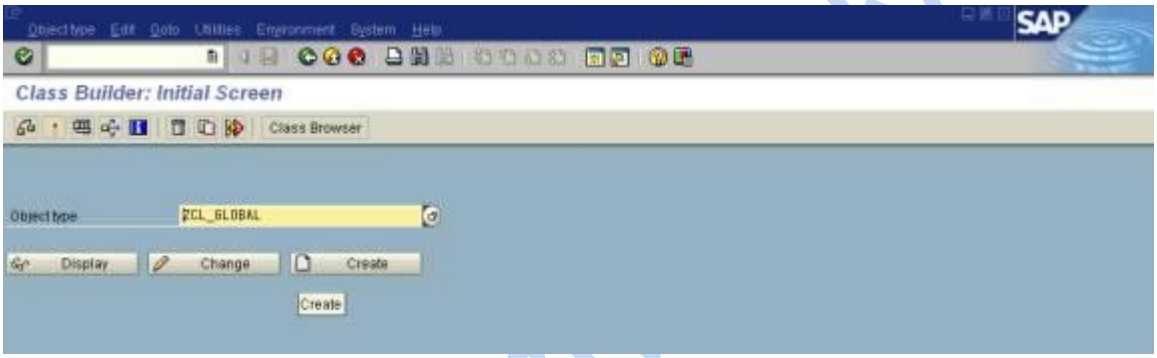


Global Class Functionality (Step-by-step approach)

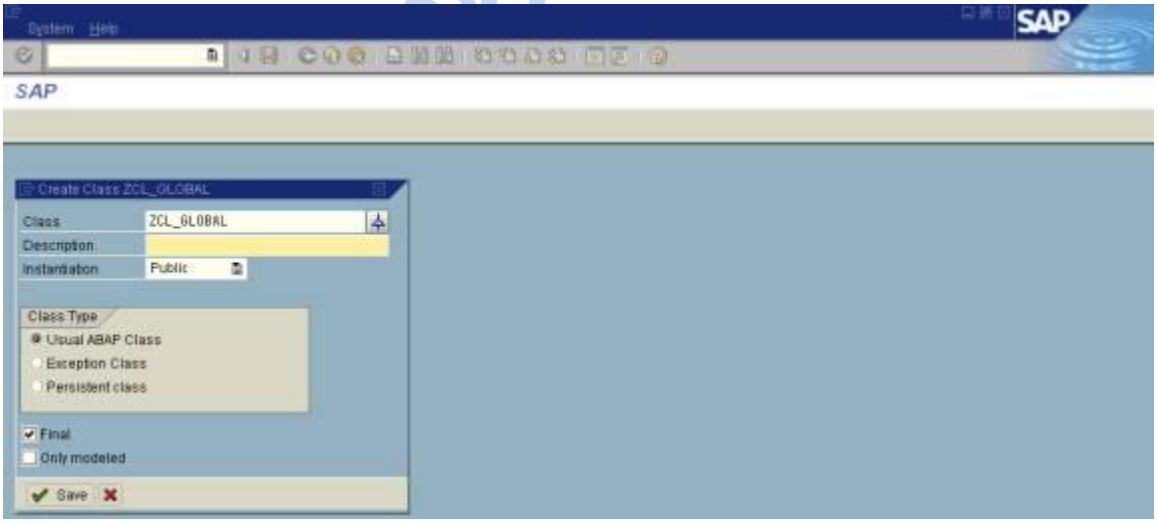
Go to SE24 T-Code.



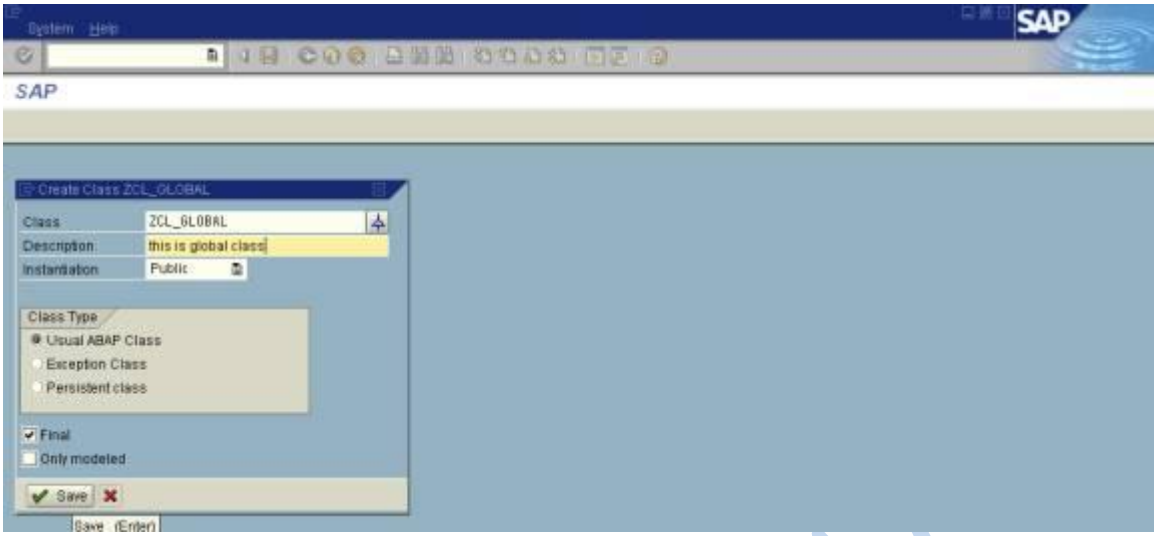
Provide the name.



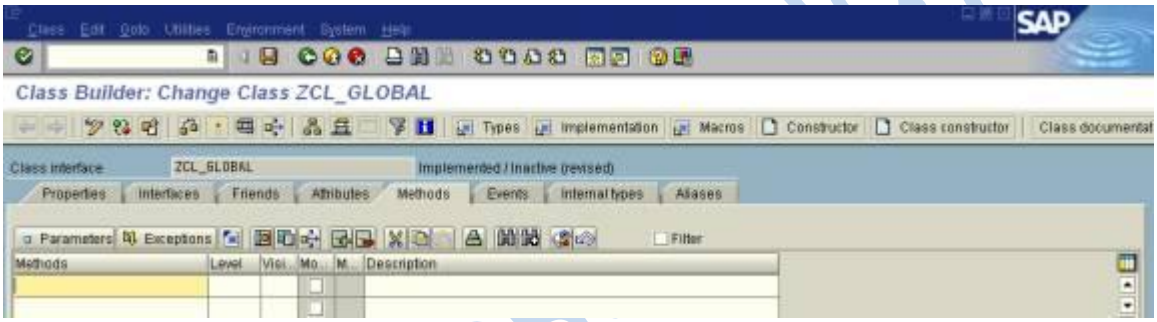
Click on the Create button.



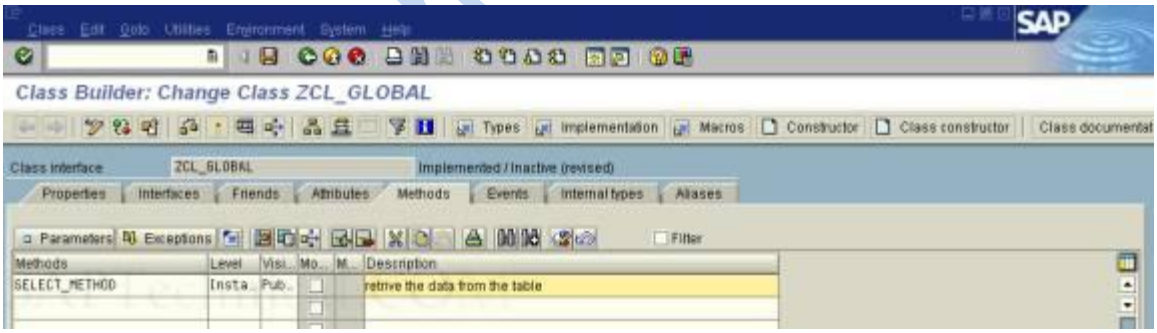
Provide the Description.



Press Save button. Then we can view the screen like this.

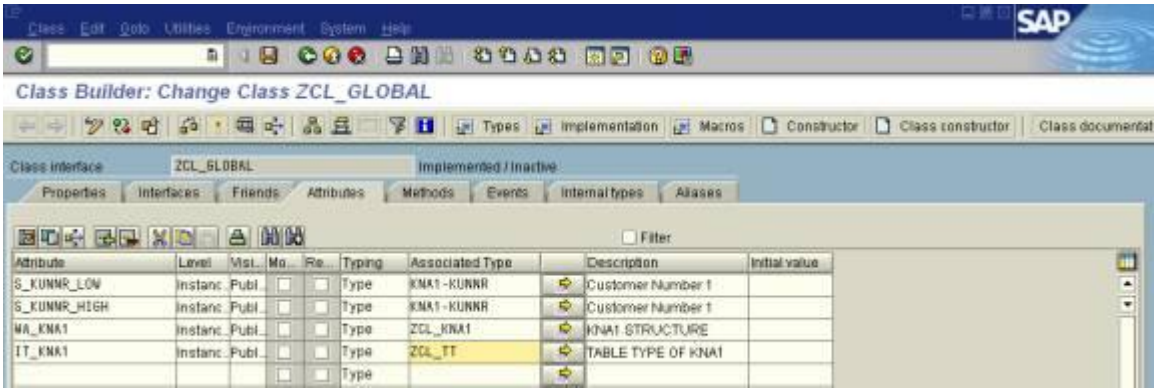


Provide method.

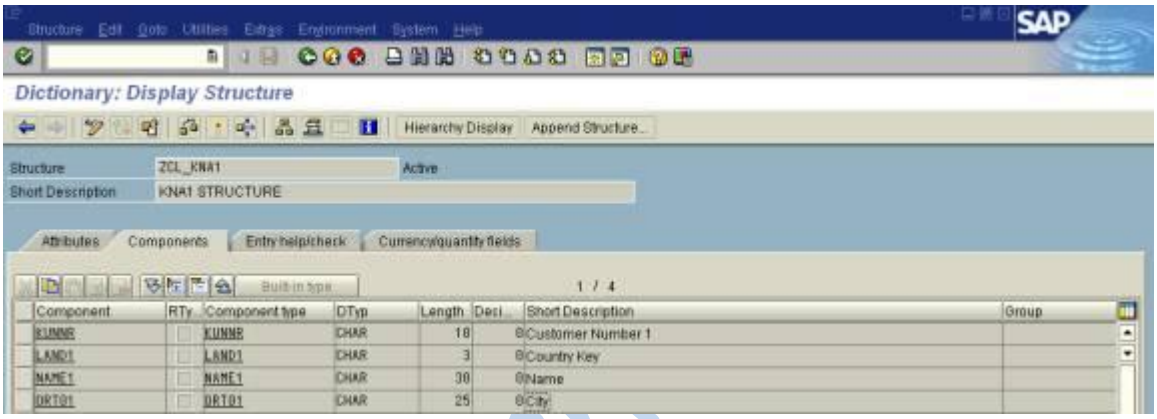


Goto Attributes

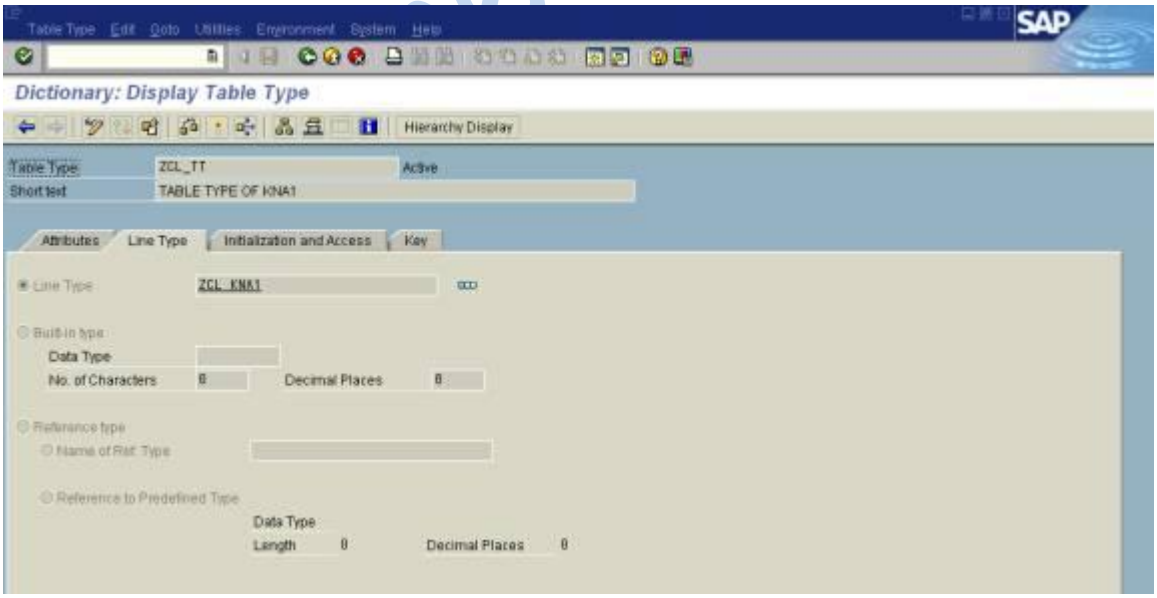
Provide the values.



In ZCL_KNA1 is the structure.



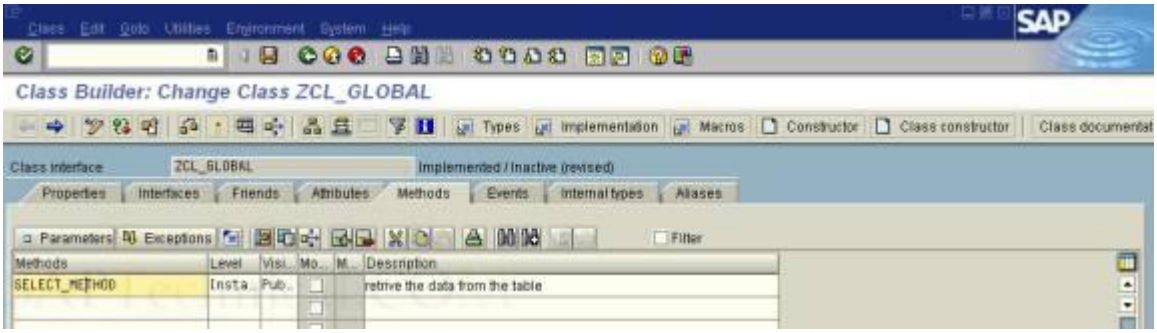
And ZCL_TT is table type.



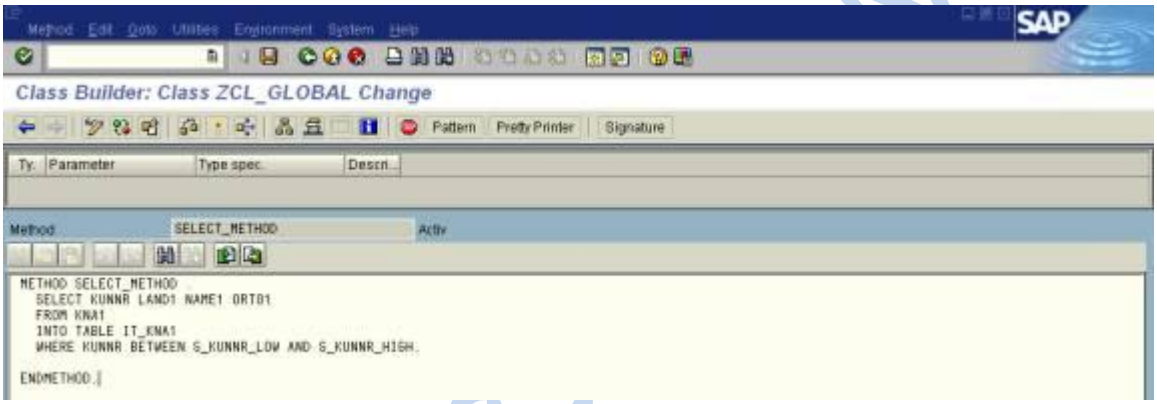
Go to methods tab.

And double click on the method select method.

And write the logic.



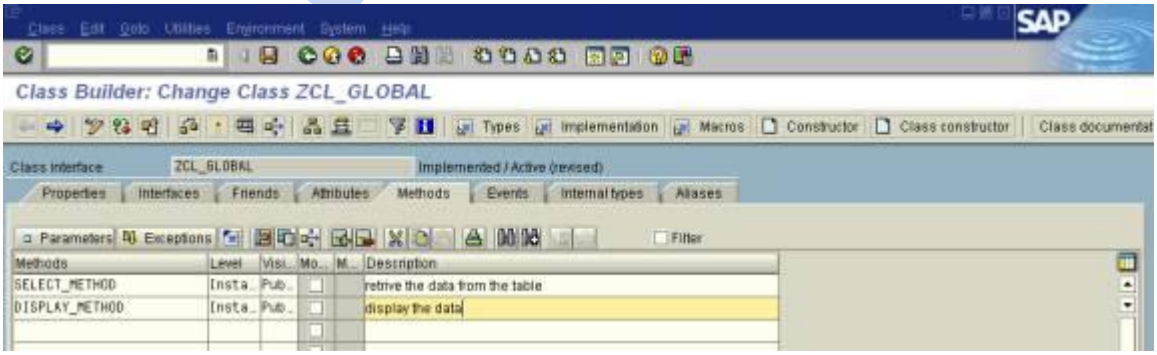
The code is like this.



Go back

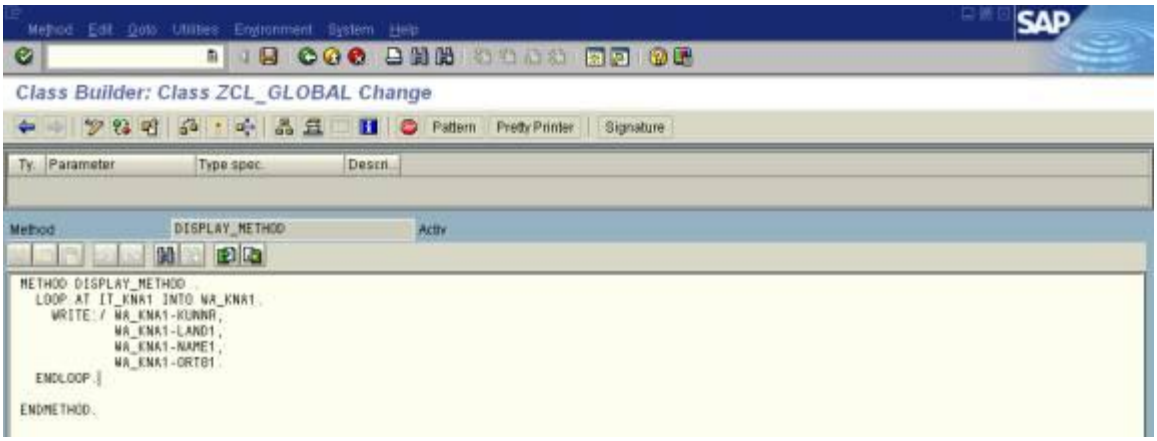
Save check and activate it.

And provide another method Display method.



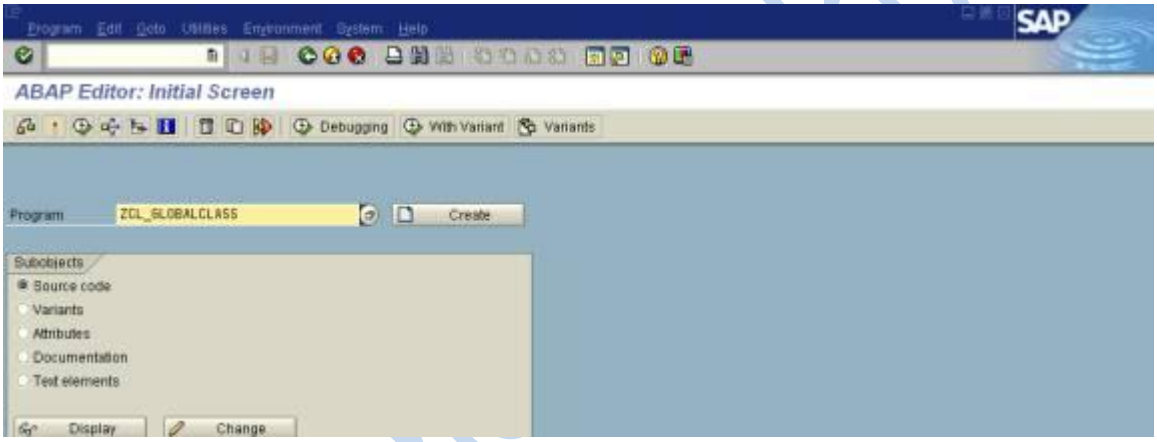
Double click on the display method.

Then write the logic.

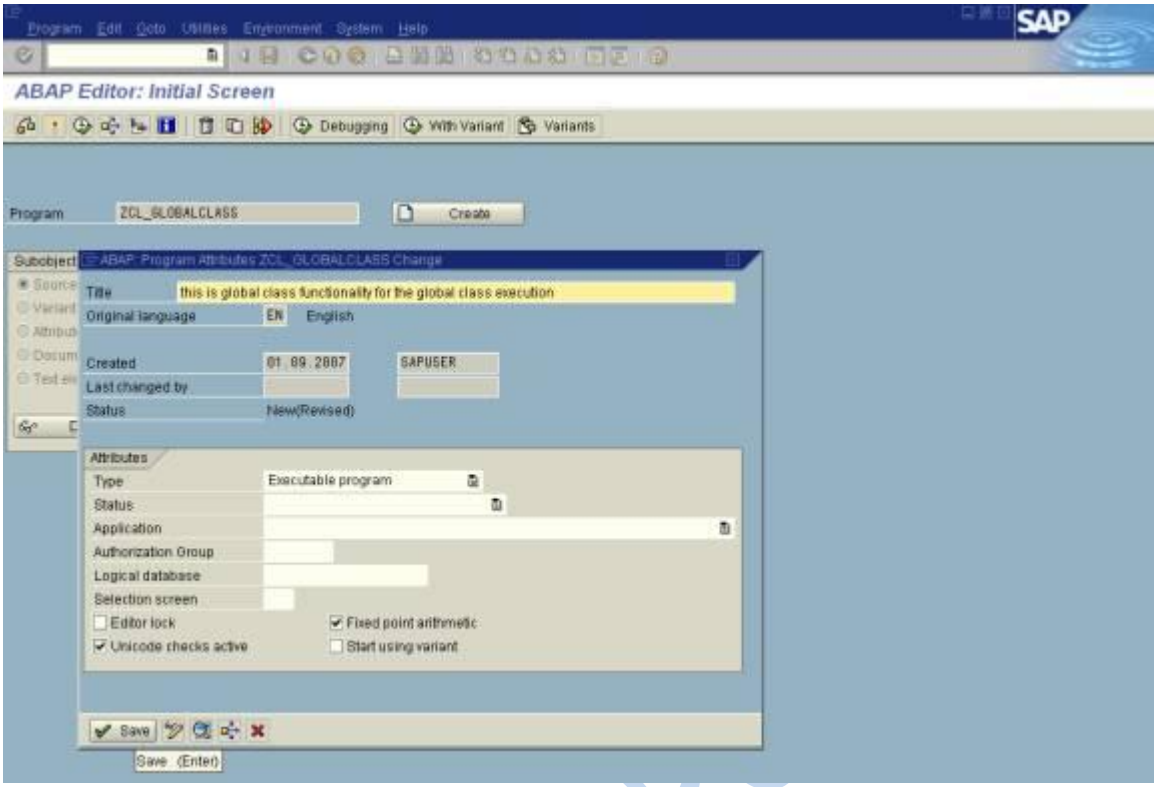


Save it, check it, activate it.

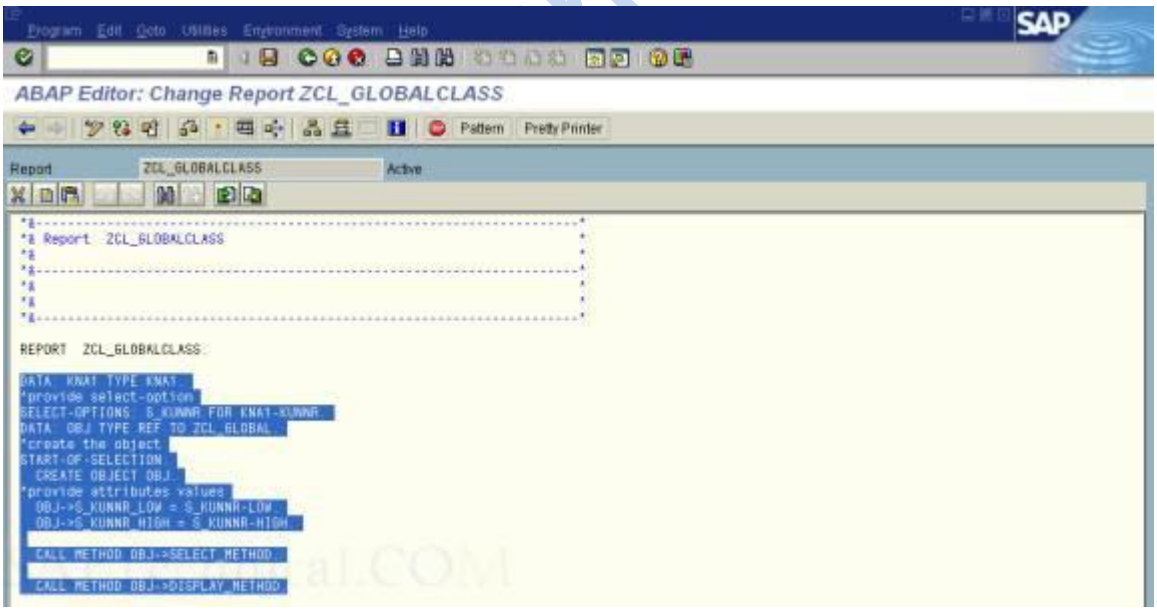
Provide the logic in se38.



Create the program.



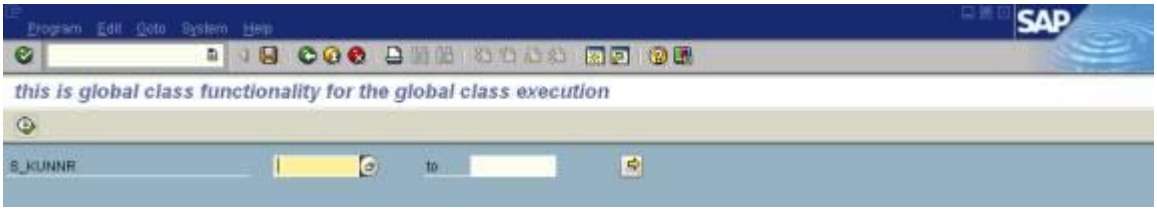
Provide the logic.



Then save it, check it, activate it.

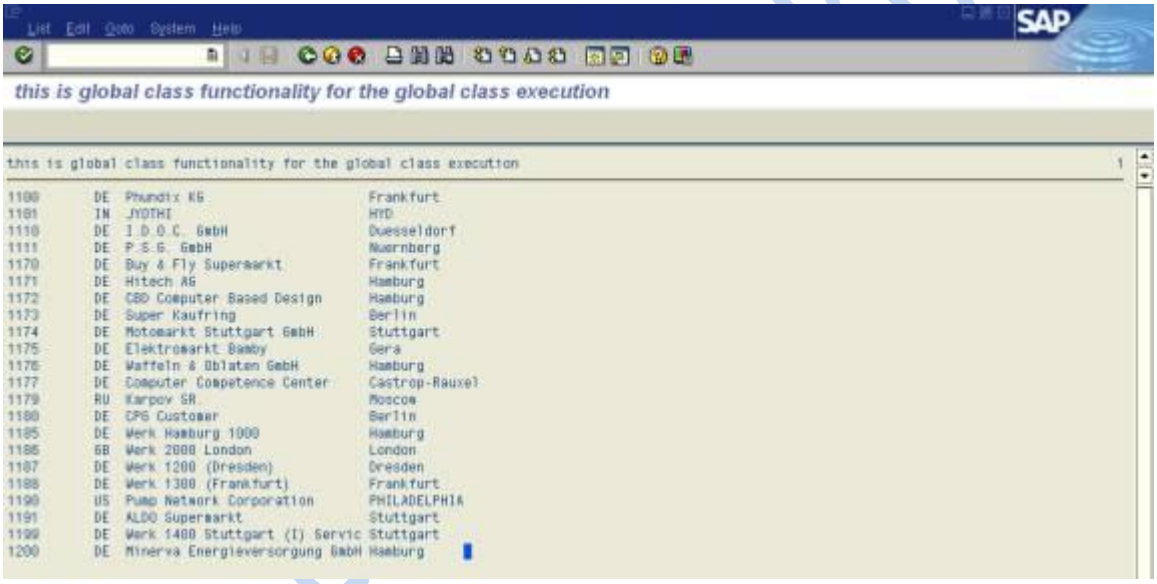
And execute it.

The output is like this.



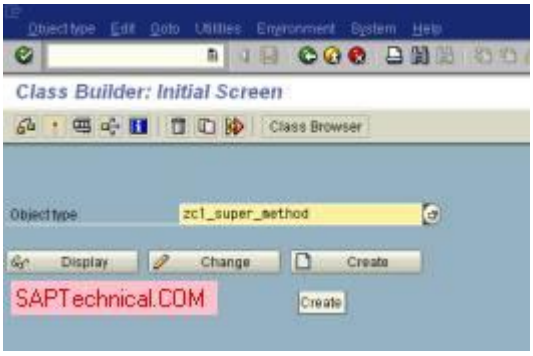
Provide the values.

Execute it.

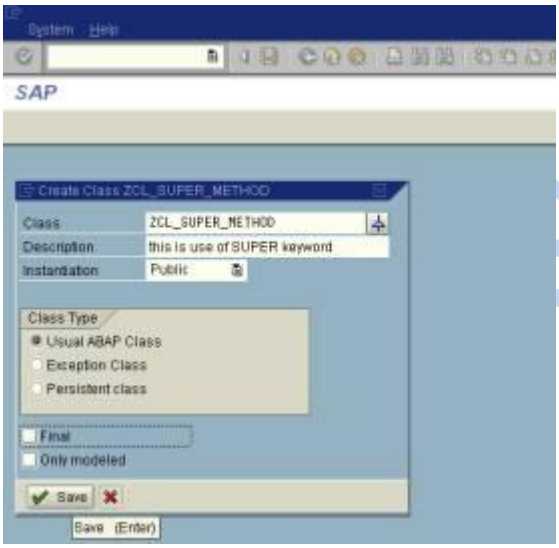


Working with the Keyword SUPER in object Oriented Programming

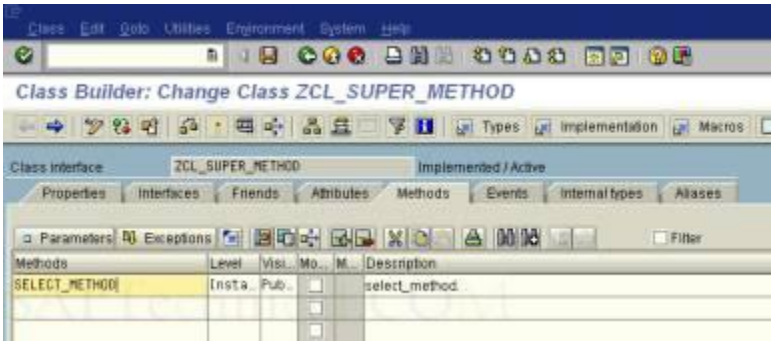
SUPER is the key word used to represent the super class of a class in oops you can access the methods and attributes of the super class using this word SUPER.



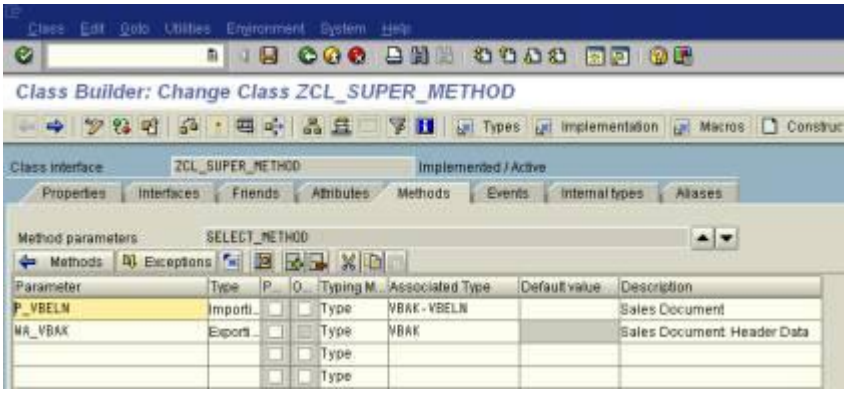
Press CREATE.



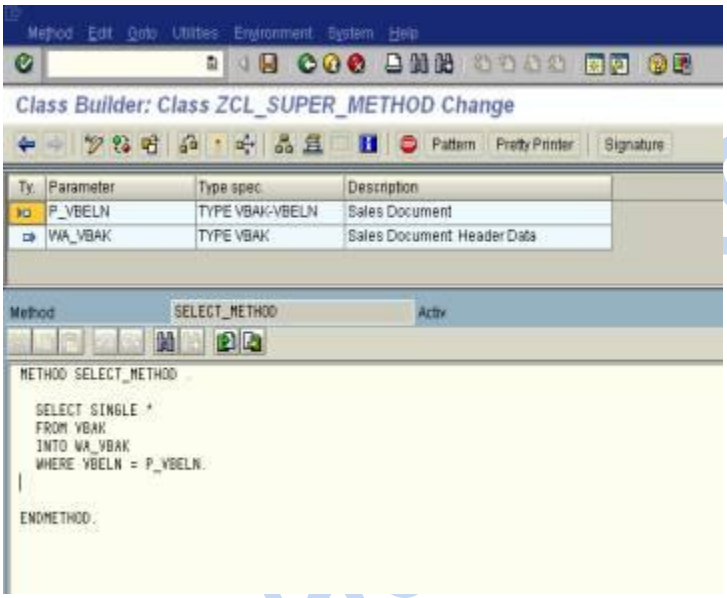
Save it.



Provide parameter for this method.



Double click on the method then provide the logic.

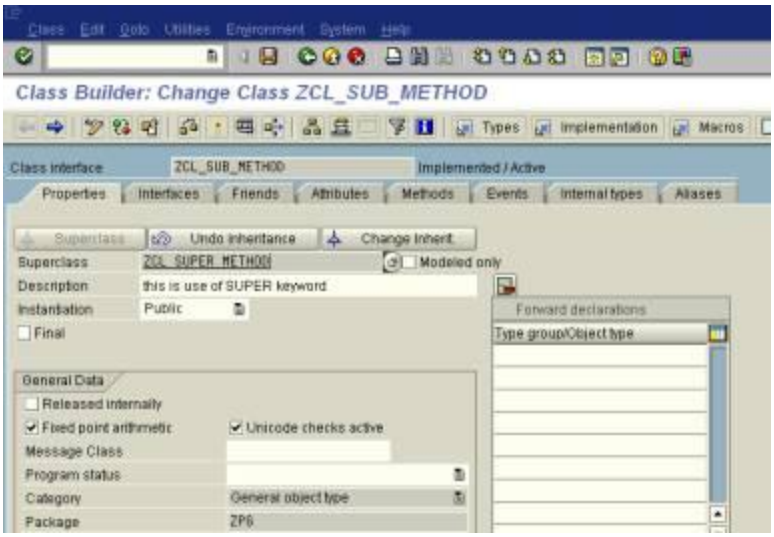


Save it, check it. And Activate it.

Go to SE24.

Provide another sub class.

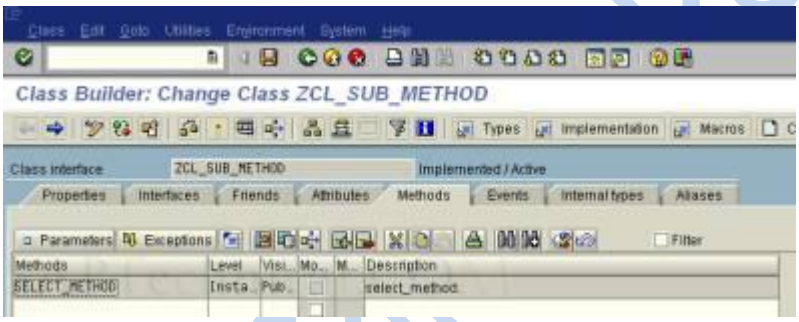
In this we can provide super class name in the sub class attributes.



Save it.

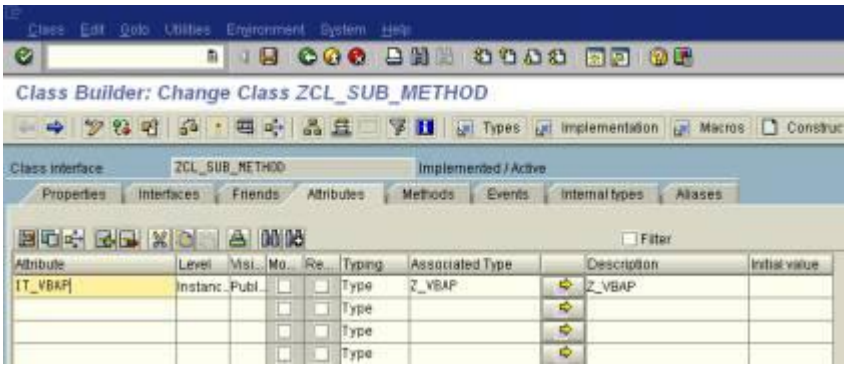
Then we can see the methods tab.

In this we can get automatically the super class method



Go to attributes tab.

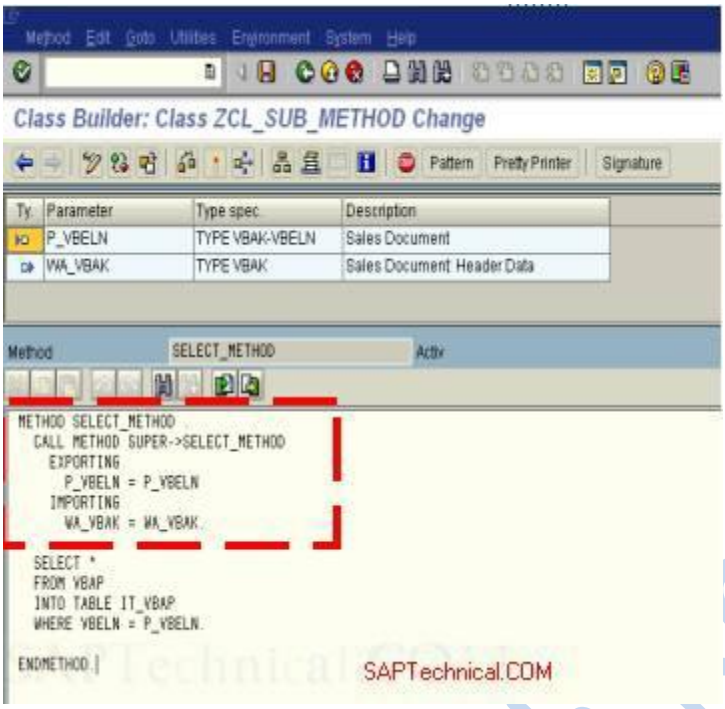
Then provide the variables.



Save it.

Go to the methods.

Provide the logic in the method double click.



Save it, check it and activate it.

Here we can user SUPER keyword.

Then go to SE38.

Provide the logic in this program.

```
*&---------------------------------------------------------------------*
*& Report  ZCL_SUB_METHOD                                             *
*&                                                                     *
*&---------------------------------------------------------------------*
*&   How to work with SUPER keyword
*
*&                                                                     *
*&---------------------------------------------------------------------*
REPORT  ZCL_SUB_METHOD .
*Provide object for sub class
DATA: OBJ TYPE REF TO ZCL_SUB_METHOD.
*provide parameters
PARAMETERS: P_VBELN TYPE VBAK-VBELN.
*Provide data object
DATA: WA_VBAK TYPE VBAK,
      WA_VBAP TYPE VBAP,
      IT_VBAP TYPE Z_VBAP.
```

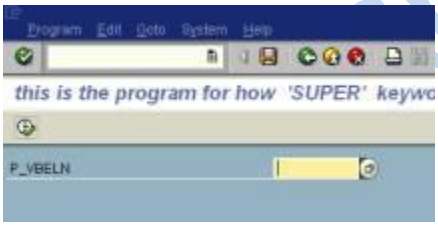
```
*Create the object
CREATE OBJECT OBJ.
*Call select method
CALL METHOD OBJ->SELECT_METHOD
  EXPORTING
    P_VBELN = P_VBELN
  IMPORTING
    WA_VBAK = WA_VBAK.
*Display header data
WRITE:/ WA_VBAK-VBELN,
        WA_VBAK-ERDAT,
        WA_VBAK-ERZET,
        WA_VBAK-ERNAM.
SKIP 2.
*Provide item data
IT_VBAP = OBJ->IT_VBAP."For Your Reference this IT_VBAP is declared in attribute
*Display item data
LOOP AT IT_VBAP INTO WA_VBAP.
WRITE:/ WA_VBAP-VBELN,
        WA_VBAP-POSNR,
        WA_VBAP-MATKL.
        ENDLOOP.
```

Then save it, check it, and activate it.

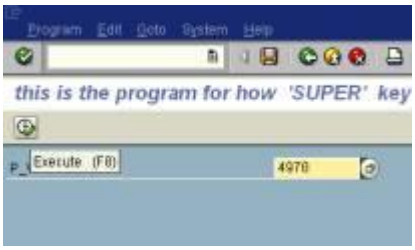
Here one important point is by using one object in the sub class.

Then we can implement the super class method automatically.

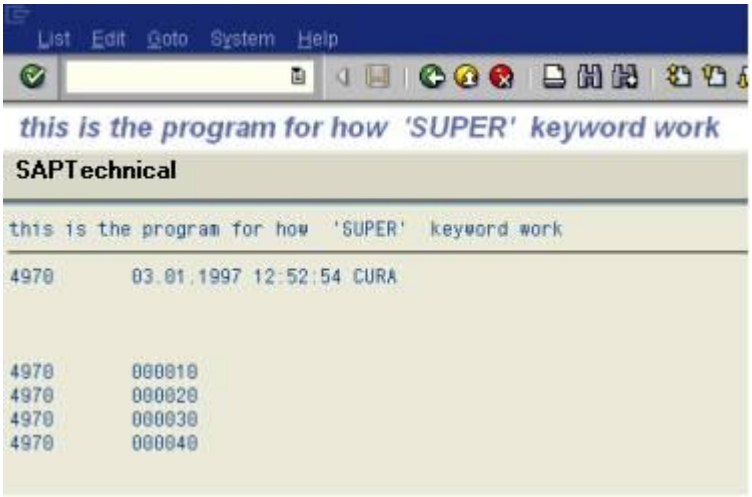
The output for this program is as follows.



Provide the values.



Execute it.



Working with Inheritance

Inheritance is the concept of passing the behavior of a class to another class.

- You can use an existing class to derive a new class.
- Derived class inherits the data and methods of a super class.
- However they can overwrite the methods existing methods and also add new once.
- Inheritance is to inherit the attributes and methods from a parent class.

Inheritance:

- Inheritance is the process by which object of one class acquire the properties of another class.
- Advantage of this property is reusability.
- This means we can add additional features to an existing class with out modifying it.

Go to SE38.

Provide the program name.

Provide the properties.

Save it.

Provide the logic for inheritance.

```
*&---------------------------------------------------------------*
*& Report  ZLOCALCLASS_VARIABLES                                *
*&                                                               *
*&---------------------------------------------------------------*
*&                                                               *
*&                                                               *
*&---------------------------------------------------------------*
REPORT  ZLOCALCLASS_VARIABLES.
*OOPS INHERITANCE
*SUPER CLASS FUNCTIONALITY
*DEFINE THE CLASS.
CLASS CL_LC DEFINITION.
PUBLIC SECTION.
DATA: A TYPE I,
      B TYPE I,
      C TYPE I.
METHODS: DISPLAY,
         MM1.
CLASS-METHODS: MM2.
ENDCLASS.
*CLASS IMPLEMENTATION
CLASS CL_LC IMPLEMENTATION.
METHOD DISPLAY.
WRITE:/ 'THIS IS SUPER CLASS' COLOR 7.
ENDMETHOD.
METHOD MM1.
```

```
WRITE:/ 'THIS IS MM1 METHOD IN SUPER CLASS'.
ENDMETHOD.
METHOD MM2.
WRITE:/ 'THIS IS THE STATIC METHOD' COLOR 2.
WRITE:/ 'THIS IS MM2 METHOD IN SUPER CLASS' COLOR 2.
ENDMETHOD.
ENDCLASS.
*SUB CLASS FUNCTIONALITY
*CREATE THE CLASS.
*INHERITING THE SUPER CLASS.
CLASS CL_SUB DEFINITION INHERITING FROM CL_LC. "HOW WE CAN INHERIT
PUBLIC SECTION.
DATA: A1 TYPE I,
      B1 TYPE I,
      C1 TYPE I.
METHODS: DISPLAY REDEFINITION,     "REDEFINE THE SUPER CLASS METHOD
         SUB.
ENDCLASS.
*CLASS IMPLEMENTATION.
CLASS CL_SUB IMPLEMENTATION.
METHOD DISPLAY.
WRITE:/ 'THIS IS THE SUB CLASS OVERWRITE METHOD' COLOR 3.
ENDMETHOD.
METHOD SUB.
WRITE:/ 'THIS IS THE SUB CLASS METHOD' COLOR 3.
ENDMETHOD.
ENDCLASS.
*CREATE THE OBJECT FOR SUB CLASS.
DATA: OBJ TYPE REF TO CL_SUB.
START-OF-SELECTION.
CREATE OBJECT OBJ.
CALL METHOD OBJ->DISPLAY. "THIS IS SUB CLASS METHOD
CALL METHOD OBJ->SUB.
WRITE:/'THIS IS THE SUPER CLASS METHODS CALLED BY THE SUB CLASS OBJECT'COLOR
5.
SKIP 1.
CALL METHOD OBJ->MM1.     "THIS IS SUPER CLASS METHOD
CALL METHOD OBJ->MM2.
*CREATE THE OBJECT FOR SUPER CLASS.
DATA: OBJ1 TYPE REF TO CL_LC.
START-OF-SELECTION.
CREATE OBJECT OBJ1.
SKIP 3.
WRITE:/ 'WE CAN CALL ONLY SUPER CLASS METHODS BY USING SUPER CLASS OBJECT'
COLOR 5.
CALL METHOD OBJ1->DISPLAY. "THIS IS SUPER CLASS METHOD
CALL METHOD OBJ1->MM1.
CALL METHOD OBJ1->MM2.
```

Save it, check it, activate it and execute it.

Then the output is like this.

List Edit Goto System Help

simple local class program using variables

```
simple local class program using variables                                  1

THIS IS THE SUB CLASS OVERWRITE METHOD
THIS IS THE SUB CLASS METHOD
THIS IS THE SUPER CLASS METHODS CALLED BY THE SUB CLASS OBJECT

THIS IS MM1 METHOD IN SUPER CLASS
THIS IS THE STATIC METHOD
THIS IS MM2 METHOD IN SUPER CLASS



WE CAN CALL ONLY SUPER CLASS METHODS BY USING SUPER CLASS OBJECT
THIS IS SUPER CLASS
THIS IS MM1 METHOD IN SUPER CLASS
THIS IS THE STATIC METHOD
THIS IS MM2 METHOD IN SUPER CLASS
```

Working with constructor

Description of Constructor:

- Constructor is automatically called when an object created.
- Constructor is the same name of the class.
- No return value.
- With in static method we can only access class attributes.
- Class-constructor does not have any parameters.
- Constructor has only import parameters.

Go to SE38 provide program name and property.

Save it.

Provide the logic.

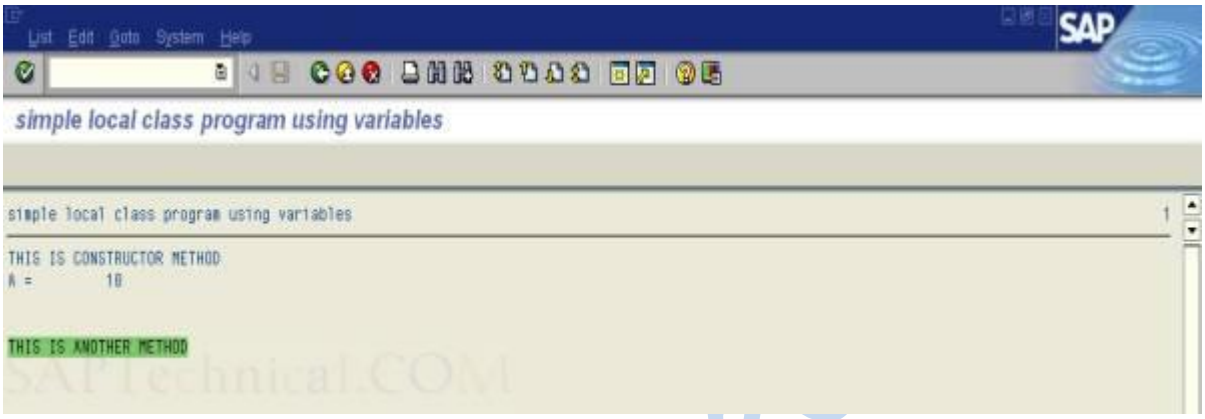
```
*&---------------------------------------------------------------------*
*& Report  ZLOCALCLASS_VARIABLES                                      *
*&                                                                     *
*&---------------------------------------------------------------------*
*&   How to work Constructor                                           *
*&                          VikramChellappa                            *
*&---------------------------------------------------------------------*
REPORT  ZLOCALCLASS_VARIABLES.
*OOPS CONSTRUCTOR.
**PROVIDE DATA TYPES   "CONSTRUCTOR DOES NOT HAVE ANY EXPORT PARAMETERS.
*DATA: C TYPE I.
*DEFINE THE CLASS.
CLASS CL_LC DEFINITION.
PUBLIC SECTION.
METHODS: CONSTRUCTOR IMPORTING A TYPE I,
*                EXPORTING B TYPE I,  "IT TAKES ONLY IMPORT PARAMETERS
       ANOTHER.
ENDCLASS.
*class implementation.
CLASS CL_LC IMPLEMENTATION.
METHOD CONSTRUCTOR.
WRITE:/ 'THIS IS CONSTRUCTOR METHOD'.
WRITE:/ 'A =', A.
ENDMETHOD.
METHOD ANOTHER.
WRITE:/ 'THIS IS ANOTHER METHOD' COLOR 5.
ENDMETHOD.
ENDCLASS.
*create the object.
DATA OBJ TYPE REF TO CL_LC.
START-OF-SELECTION.
CREATE OBJECT OBJ EXPORTING A = 10.
*               IMPORTING B = C.
*call the method.
```

SKIP 2.
CALL METHOD OBJ->ANOTHER.

Save it, check it, activate it.

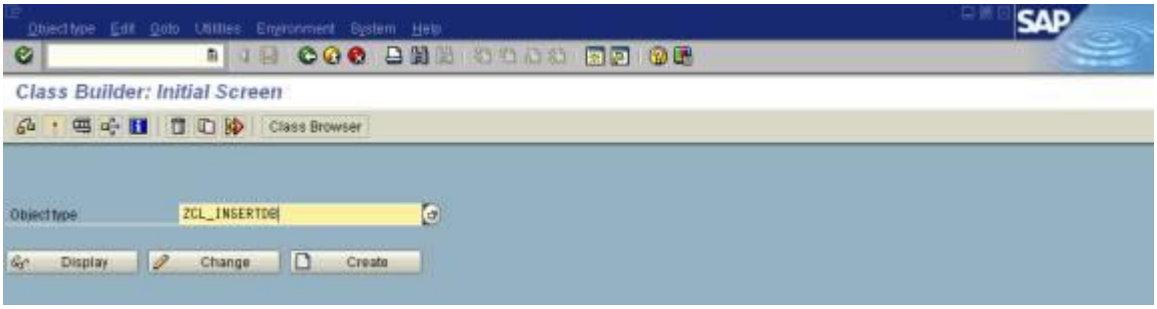
Execute it.

Then the output is like this.

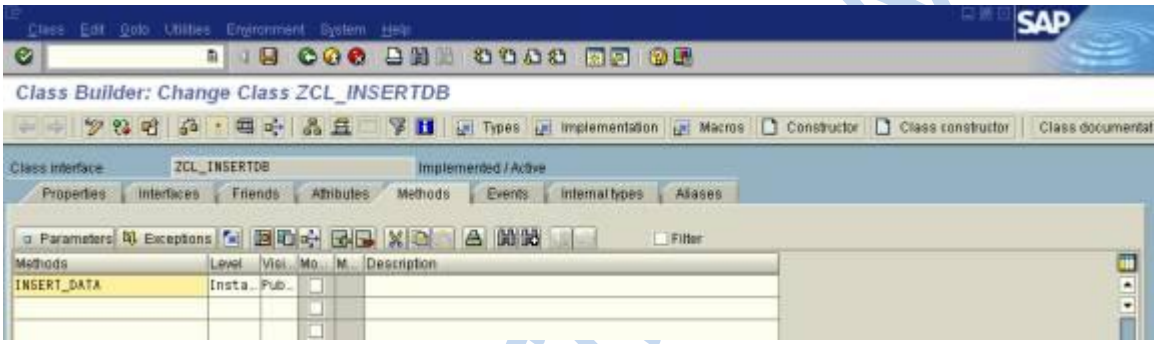


Insert data into the database table using Classes

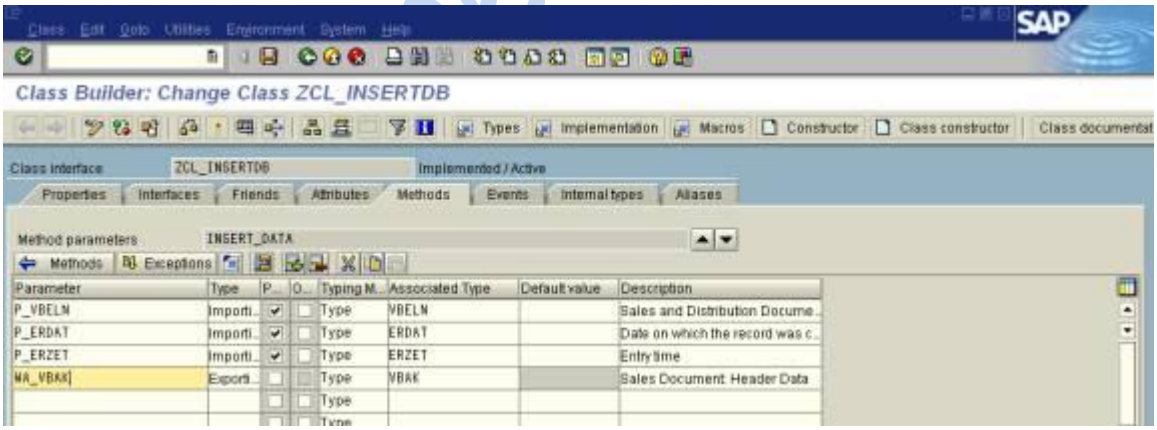
Go to Class Builder and create a new class



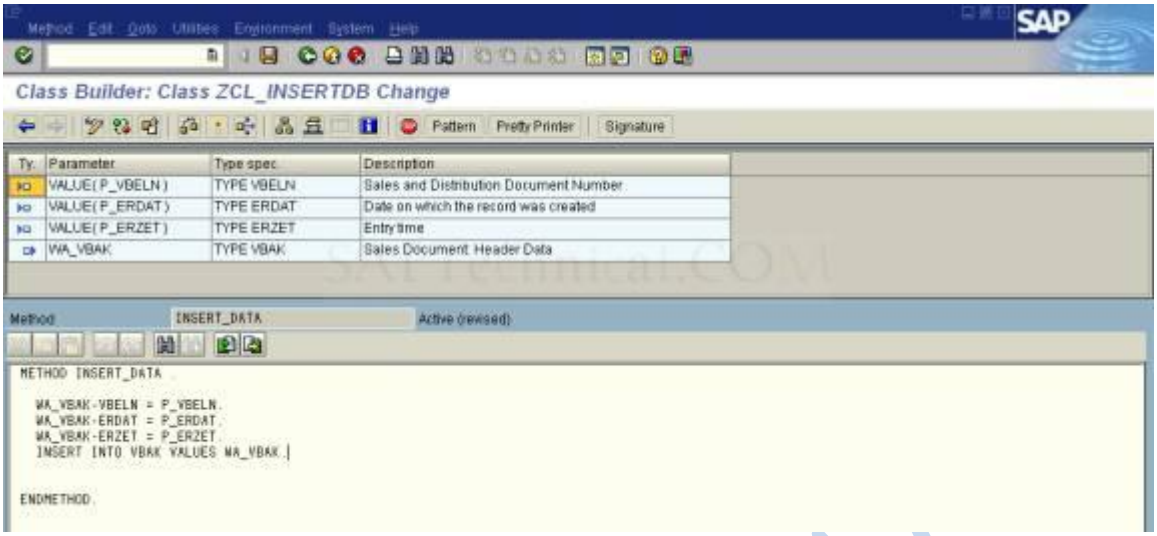
Provide the method name.



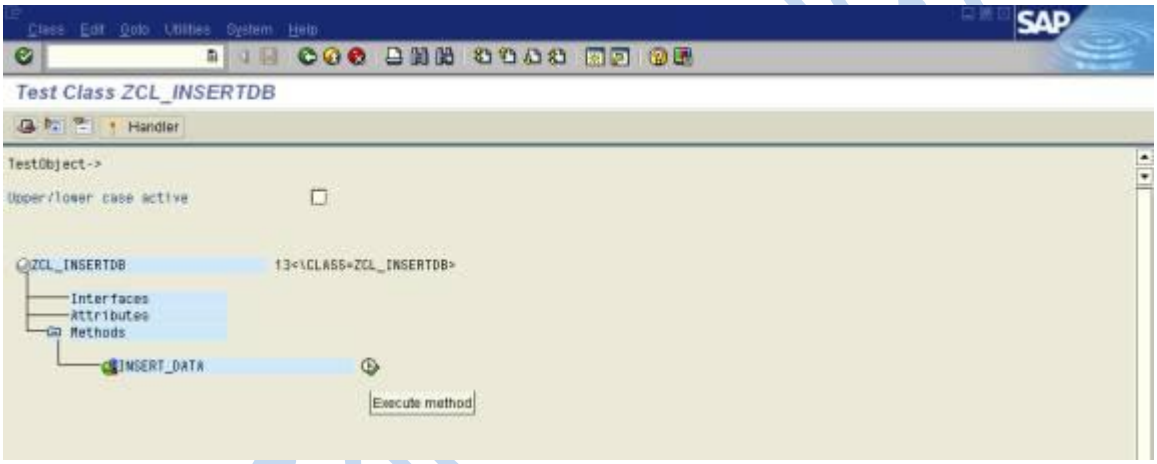
Go to parameters and provide the attributes.



Go back to methods. And provide the logic by double click on the method name.



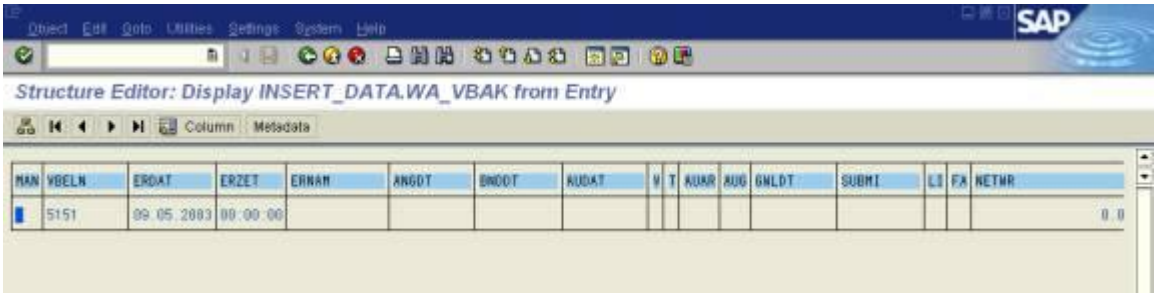
Then save it, check it, activate it and execute it.



Press F8.

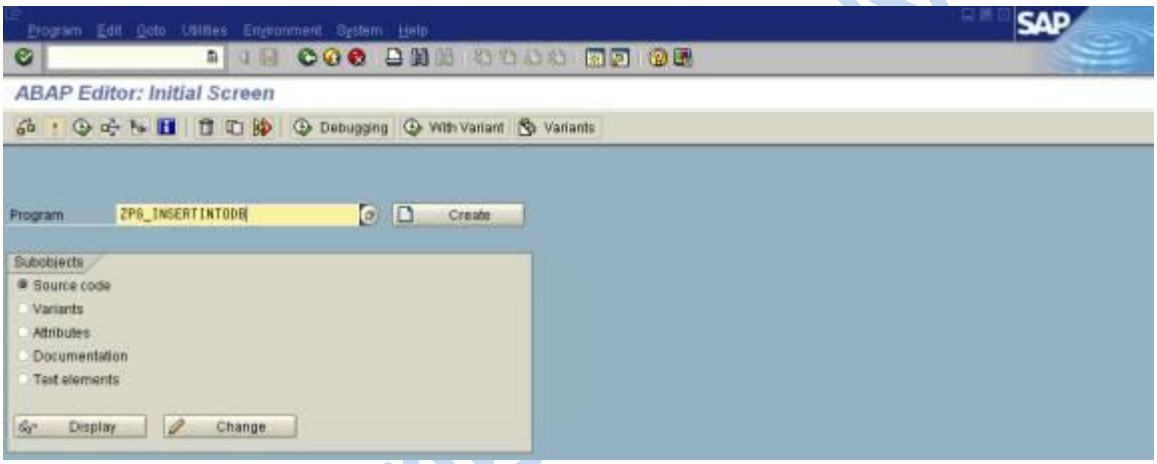
The data is stored in database.

To verify, go to VBAK table (SE16) and check whether the data is stored or not.



Now we will create a program using the above class for inserting the data into the database table.

Go to SE38 and create a program.



Select create button.

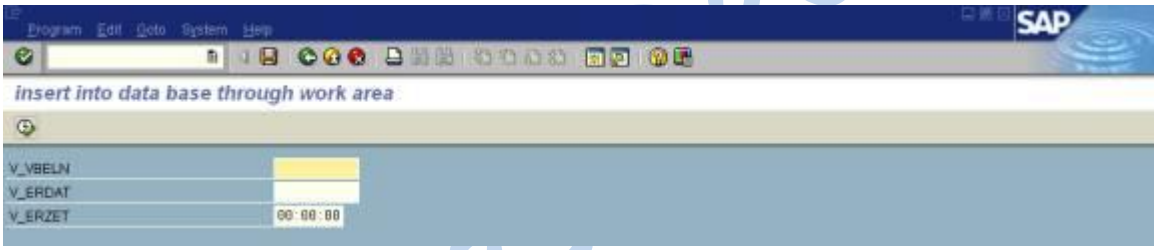
After that provide the following logic.

```
*&---------------------------------------------------------------------*
*& Report  ZPG_INSERTINTODB                                           *
*&                                                                     *
*&---------------------------------------------------------------------*
*&                                                                     *
*&                                                                      *
*&---------------------------------------------------------------------*
REPORT  ZPG_INSERTINTODB.
*provide the object for the class
DATA: OBJ_INSERT TYPE REF TO ZCL_INSERTDB.
*provide parameters
PARAMETERS: V_VBELN TYPE VBELN,
            V_ERDAT TYPE ERDAT,
            V_ERZET TYPE ERZET.
*provide work area
DATA: WA TYPE VBAK.
```

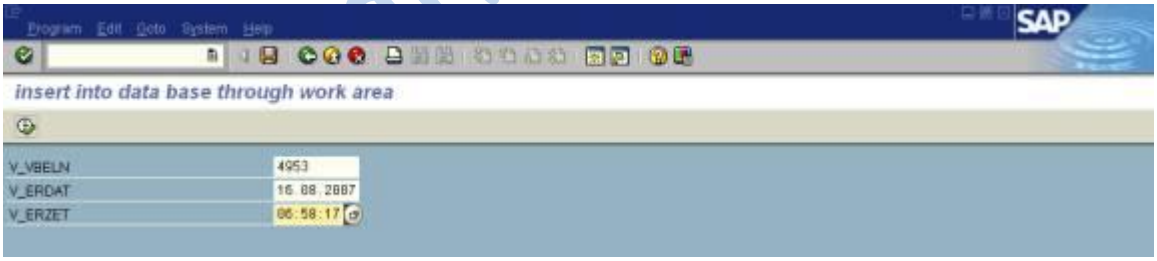
```
*create the object
START-OF-SELECTION.
  CREATE OBJECT OBJ_INSERT.
*provide insert method
  CALL METHOD OBJ_INSERT->INSERT_DATA
*provide exporting parameters
    EXPORTING
      P_VBELN = V_VBELN
      P_ERDAT = V_ERDAT
      P_ERZET = V_ERZET
*provide import parameters
    IMPORTING
      WA_VBAK = WA.
*display the data.
  WRITE:/ WA-VBELN,
          WA-ERDAT,
          WA-ERZET.
```

Save it , activate it, execute it .

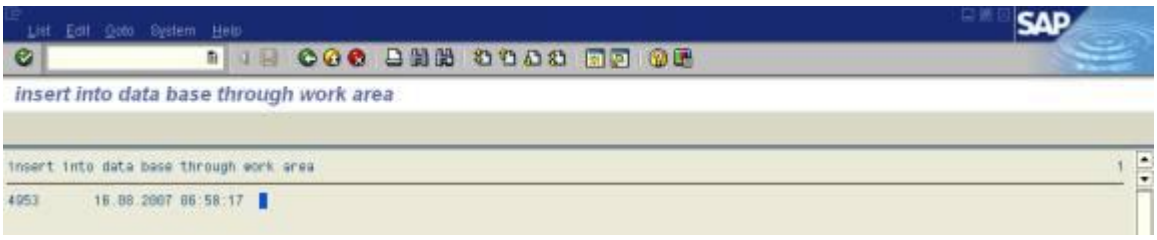
The screen is like this.



Provide values.



Execute it.



Following is the sample output of the same:

MANDT	VBELN	ERDAT	ERZET	ERNAM	ANGDT	BNDDT	AUDAT	VBTYP	TRVOG	AUART	AUGRU	GWLDT	SUBMI	LIFSK
800	4950	02.01.1997	10:30:12		00.00.0000	00.00.0000	00.00.0000					00.00.0000		
800	4951	27.07.2007	13:10:33		00.00.0000	00.00.0000	00.00.0000					00.00.0000		
800	4952	10.08.2007	08:13:50		00.00.0000	00.00.0000	00.00.0000					00.00.0000		
800	4953	15.08.2007	06:58:17		00.00.0000	00.00.0000	00.00.0000					00.00.0000		
800	4960	00.00.0000	00:00:00		00.00.0000	00.00.0000	00.00.0000			OR		00.00.0000		
800	4969	02.01.1997	10:30:12	CURA	00.00.0000	00.00.0000	02.01.1997	C	0	OR		00.00.0000		
800	4970	03.01.1997	12:52:54	CURA	00.00.0000	00.00.0000	03.01.1997	C	0	OR		00.00.0000		

Working with import, export and change parameters of a class

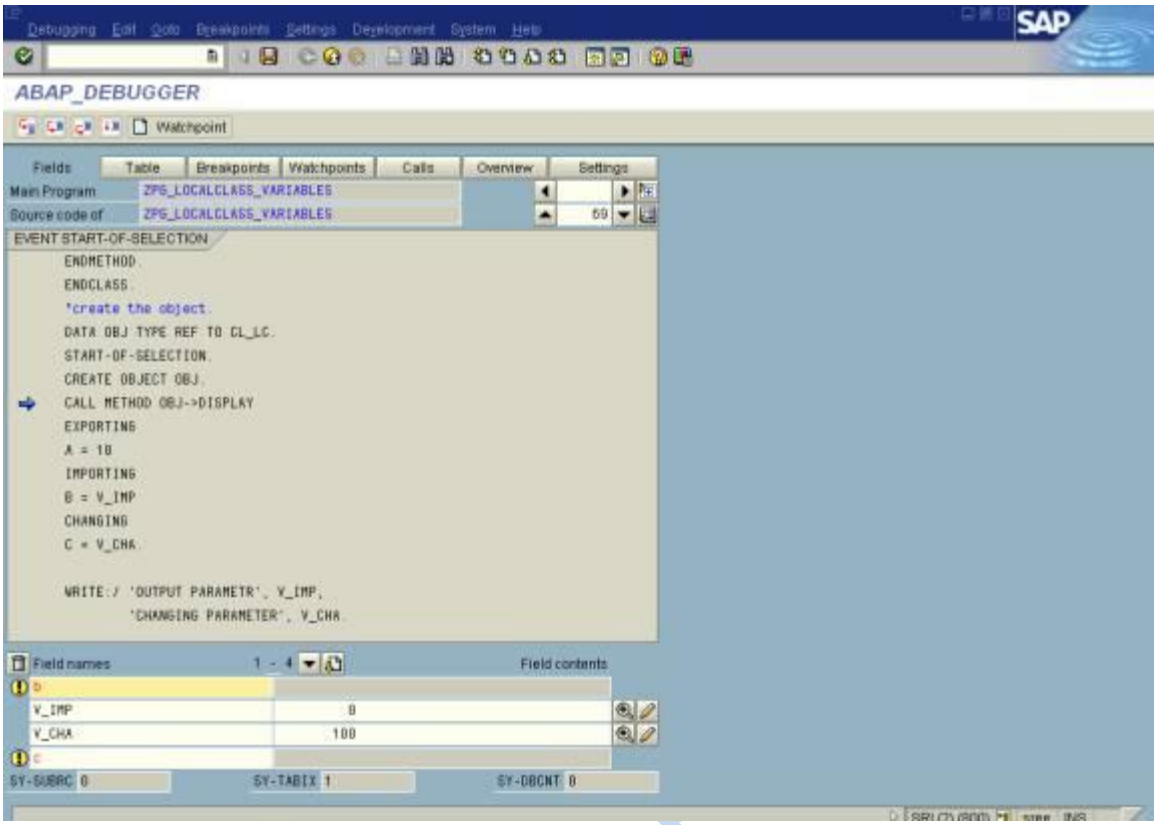
Go to SE38 and create a program.

Then provide the following code.

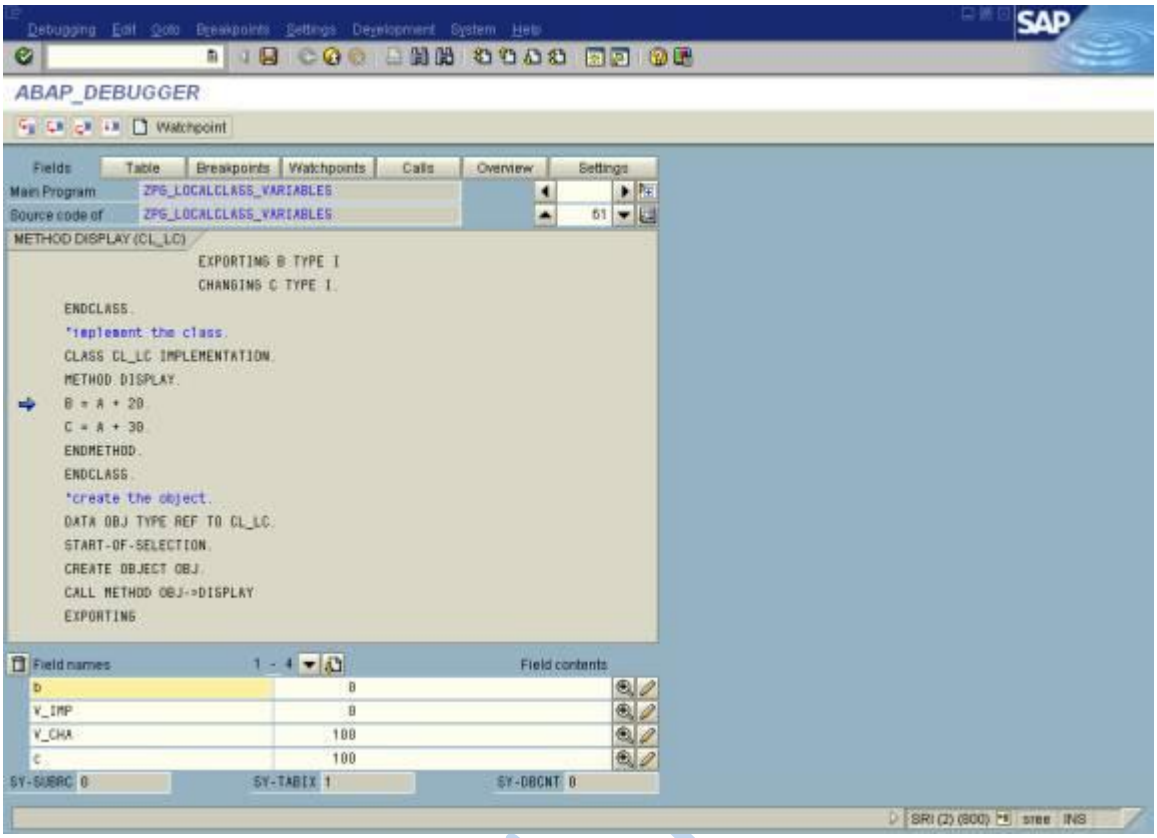
```
REPORT  ZLOCALCLASS_VARIABLES.
*How we can use import and export and changing parameters in the class.
*Provide the variables
DATA: V_IMP TYPE I,
      V_CHA TYPE I VALUE 100.
*Define the class.
CLASS CL_LC DEFINITION.
PUBLIC SECTION.
METHODS: DISPLAY IMPORTING A TYPE I
               EXPORTING B TYPE I
               CHANGING C TYPE I.
ENDCLASS.
*Implement the class.
CLASS CL_LC IMPLEMENTATION.
METHOD DISPLAY.
B = A + 20.
C = A + 30.
ENDMETHOD.
ENDCLASS.
*Create the object.
DATA OBJ TYPE REF TO CL_LC.
START-OF-SELECTION.
CREATE OBJECT OBJ.
CALL METHOD OBJ->DISPLAY
EXPORTING
A = 10
IMPORTING
B = V_IMP
CHANGING
C = V_CHA.
WRITE:/ 'OUTPUT PARAMETR',    V_IMP,
        'CHANGING PARAMETER', V_CHA.
```

Save and activate the program.

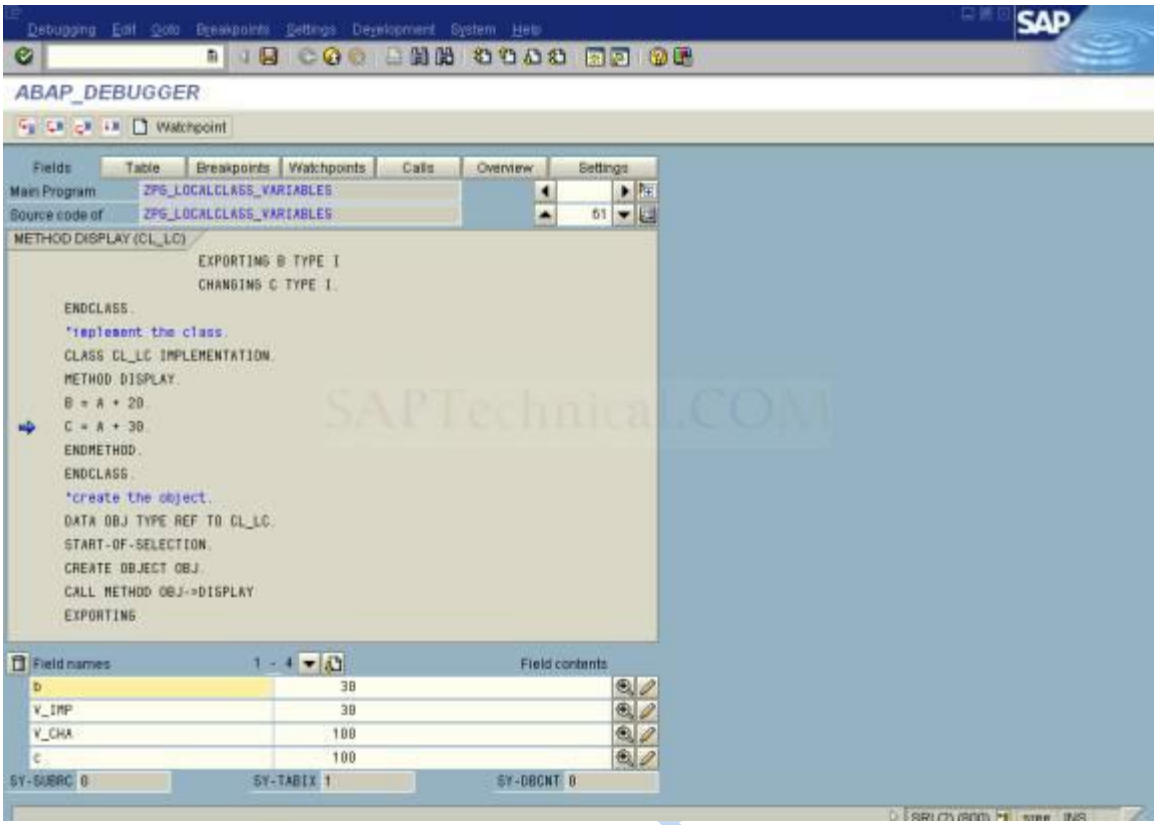
Now execute the program by inserting a breakpoint.



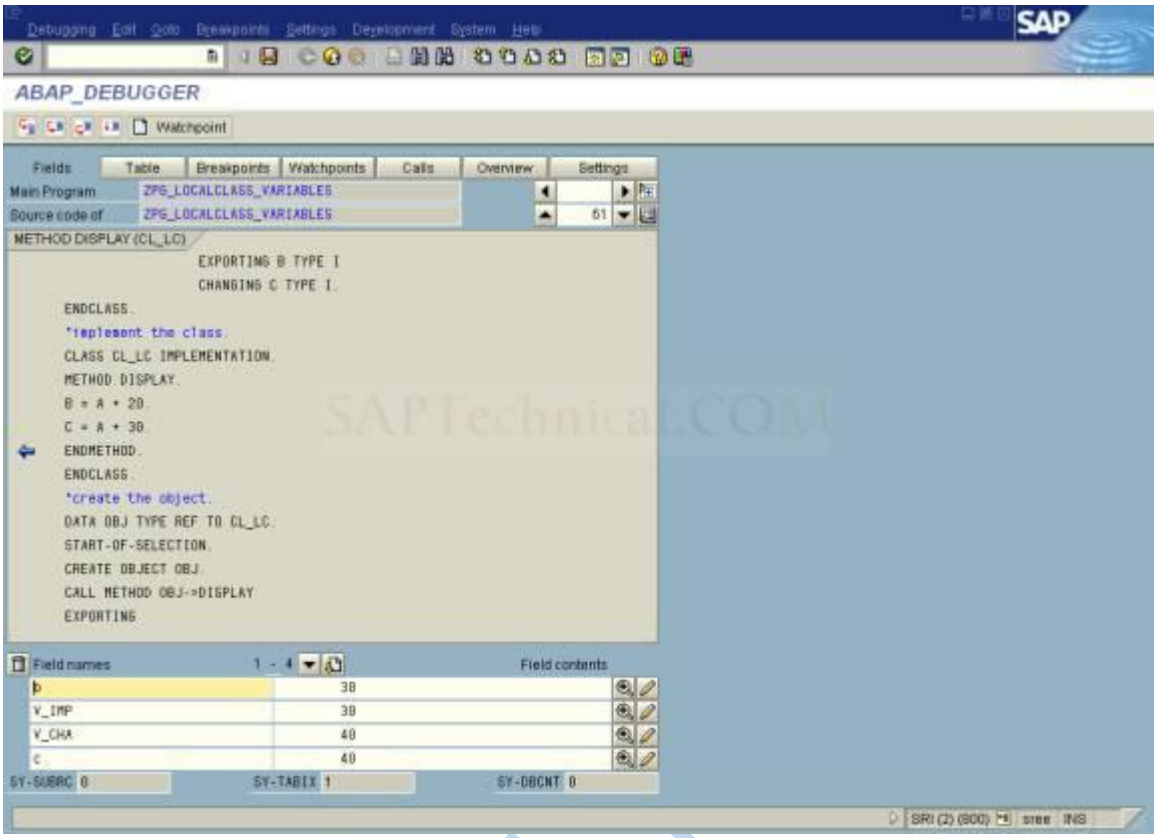
Press F5.



Press F5



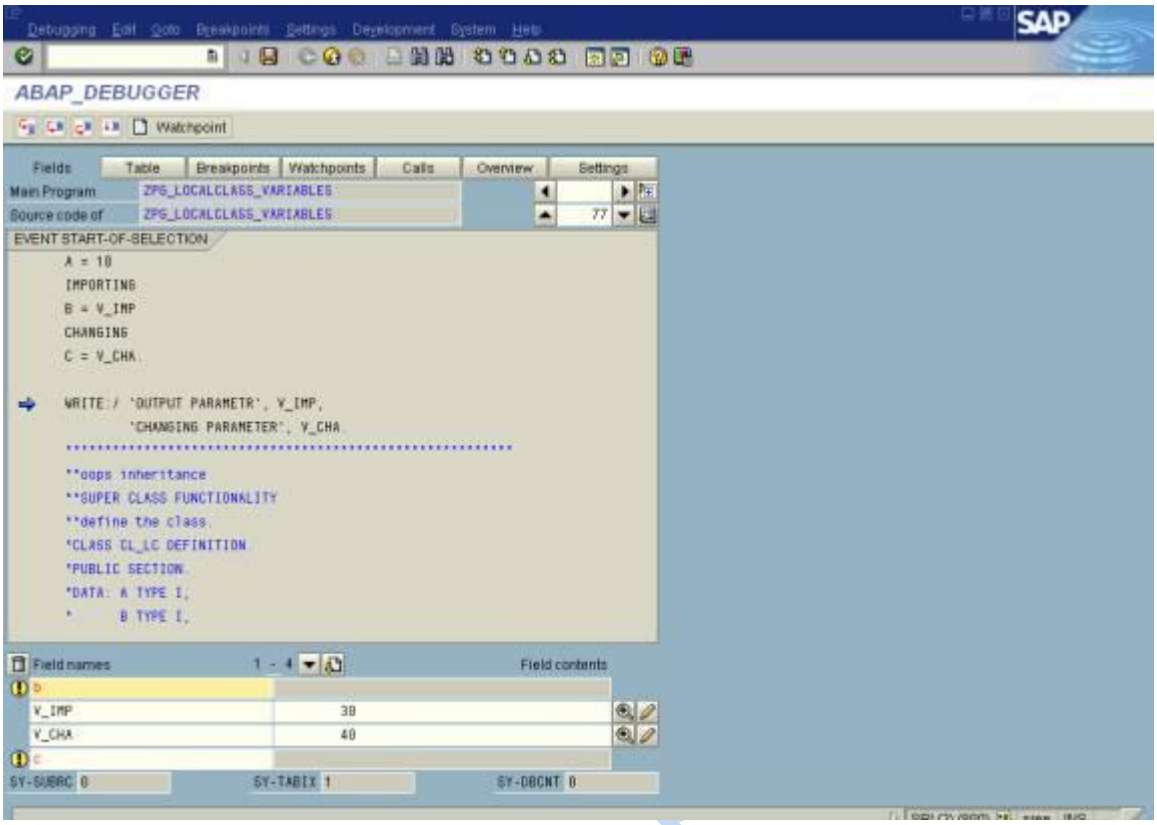
Press F5.



The values are changed.

Press F5.

Then



Final output.

Working on Polymorphism

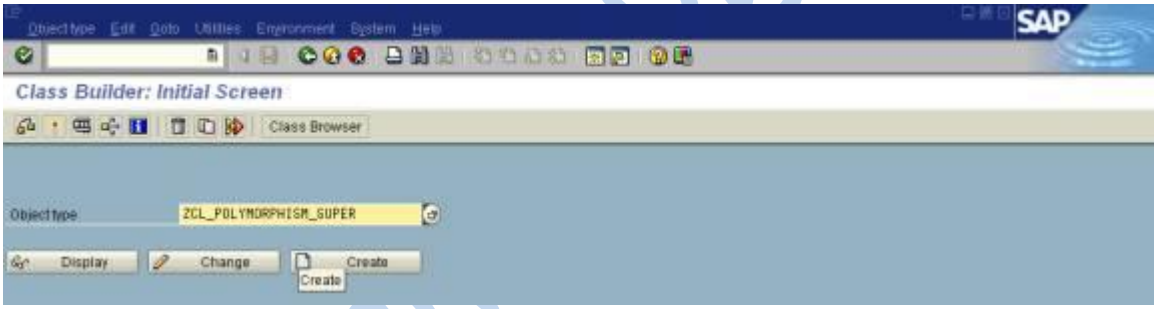
POLYMORPHISM:-

Polymorphism is a characteristic of being able to assign a different behavior or value in a subclass, to something that was declared in a parent class. For example, a method can be declared in a parent class, but each subclass can have a different implementation of that method. This allows each subclass to differ, without the parent class being explicitly aware that a difference exists.

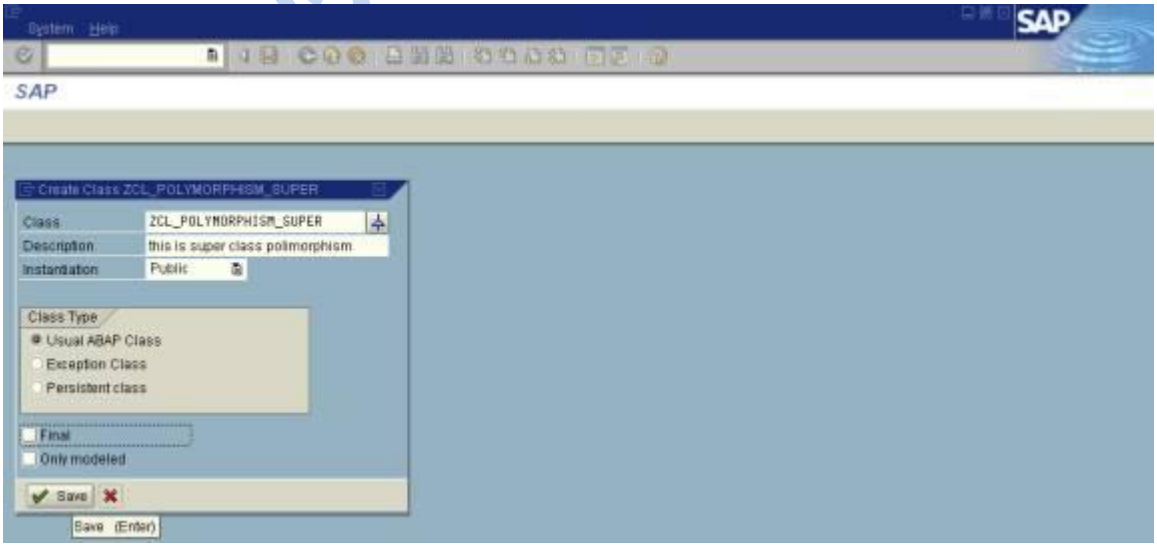
CLAUSES REGARDING POLYMORPHISM:-

1.Allows one interface to be used for a general class of actions.
2.When objects from different classes react differently to the same procedural call.
3.User can work with different classes in a similar way, regardless of their implementation.
4.Allows improved code organization and readability as well as creation of "extensible" programs.
5.Although the form of address is always the same, the implementation of the method is specific to a particular class.

Go to SE24 T-code.

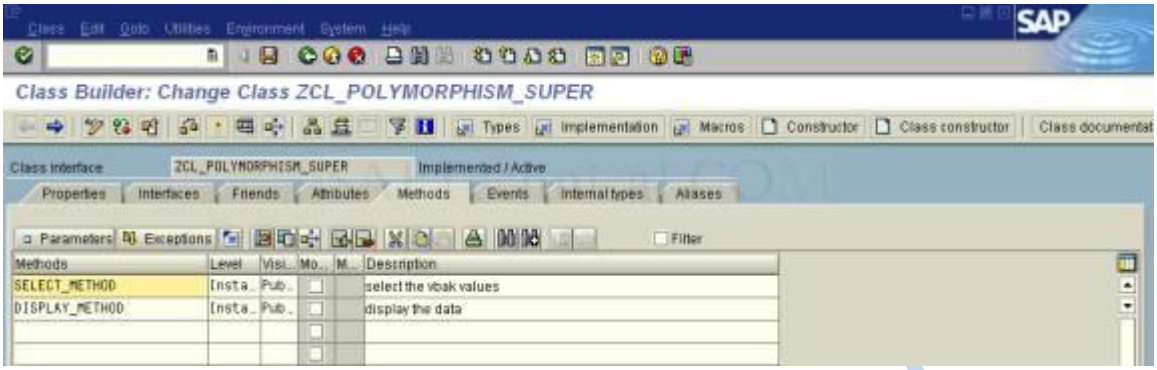


Press create button.

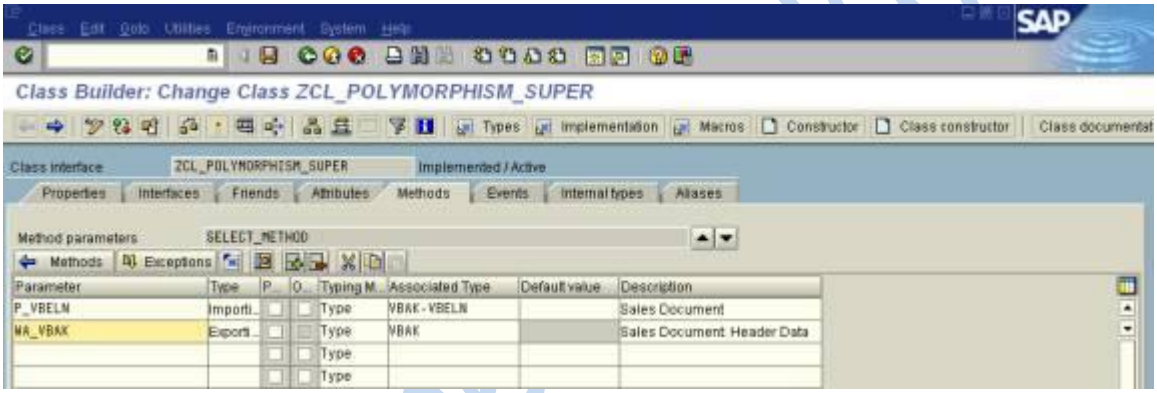


Press Save button.

Provide methods.

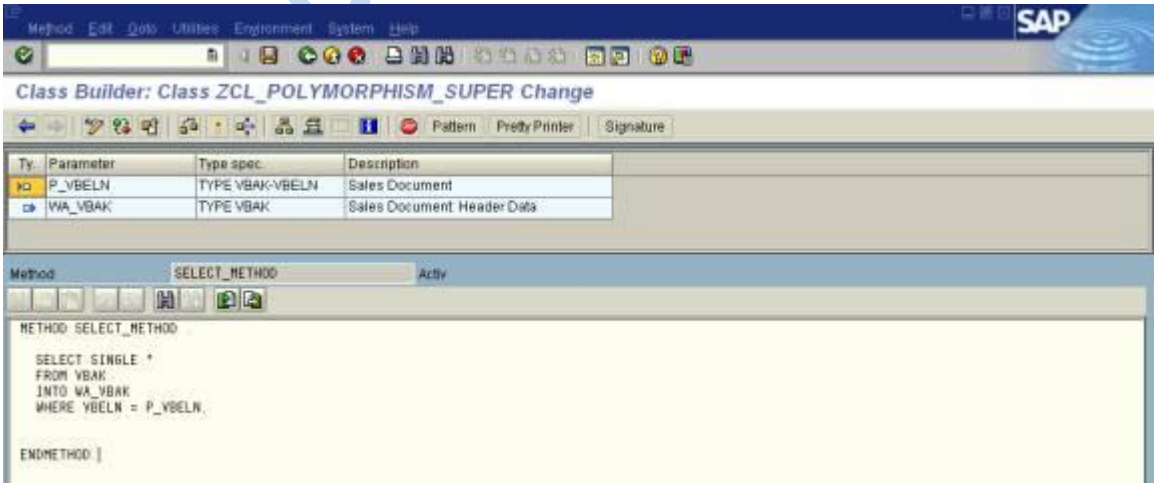


Select the first method then provide the parameters for this method.

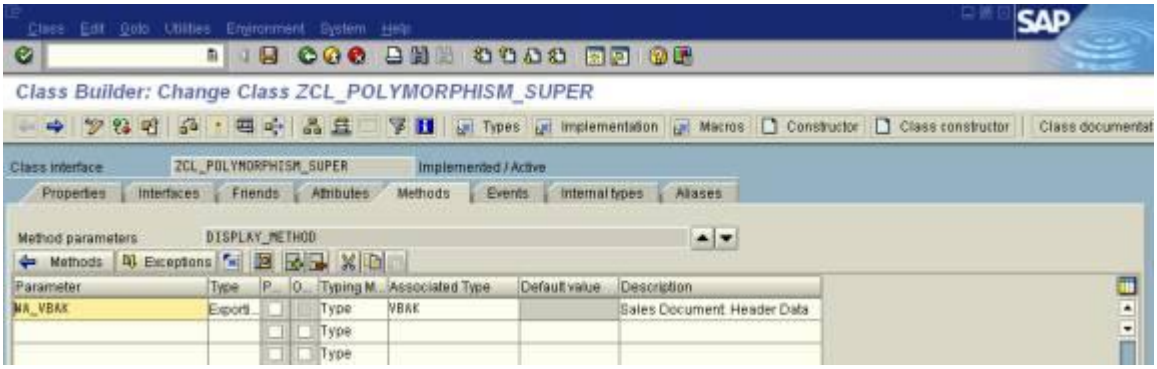


Go back to the methods then double click on the method name.

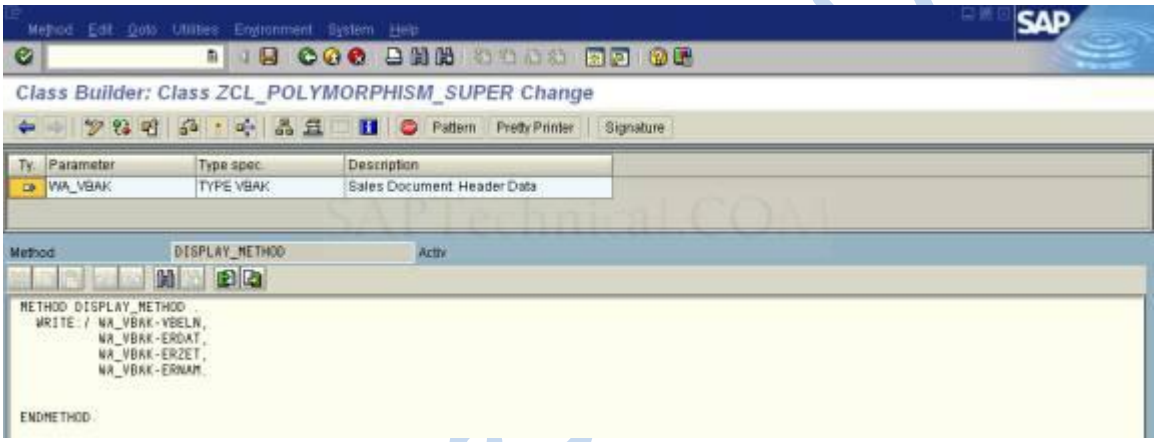
Then provide the logic.



Select display method then provide the parameters for this method.

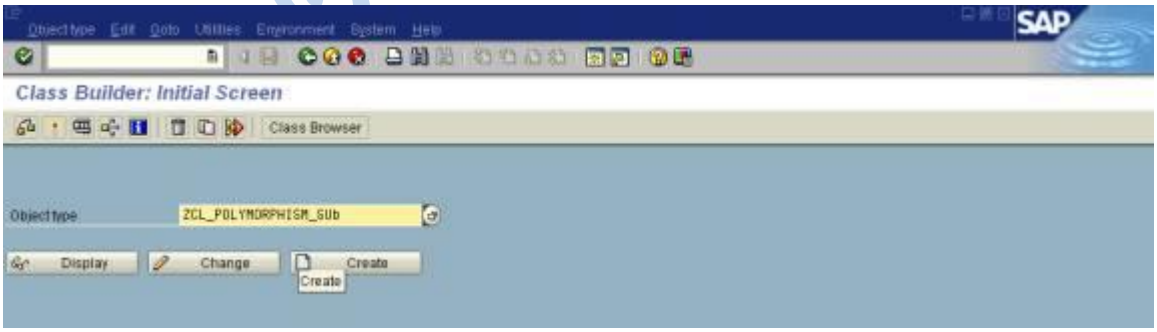


Go back to method then provide the logic.

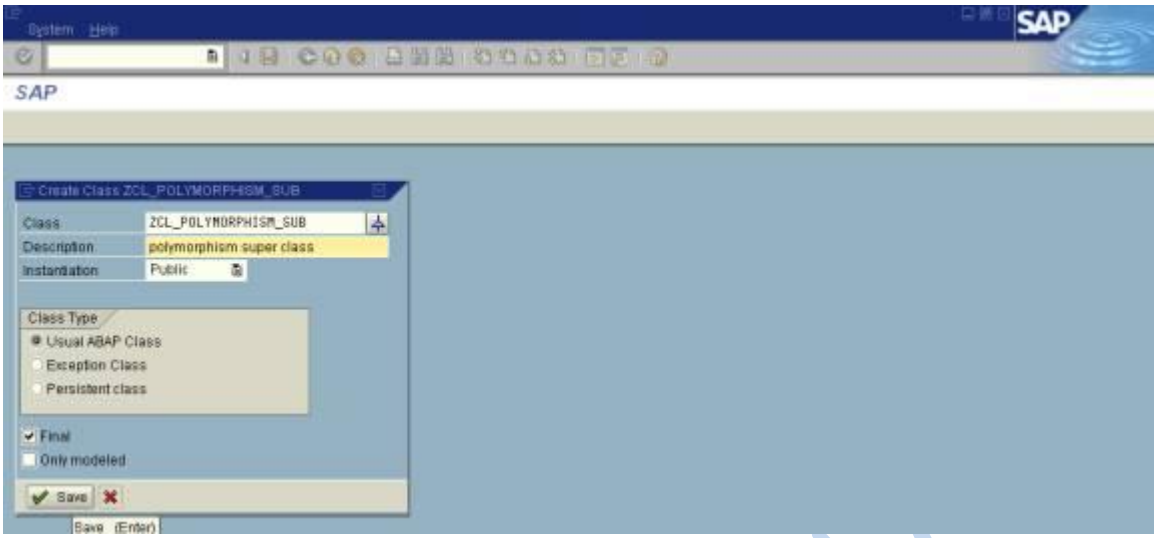


Save it , check it , and activate it .

Provide SUBCLASS:

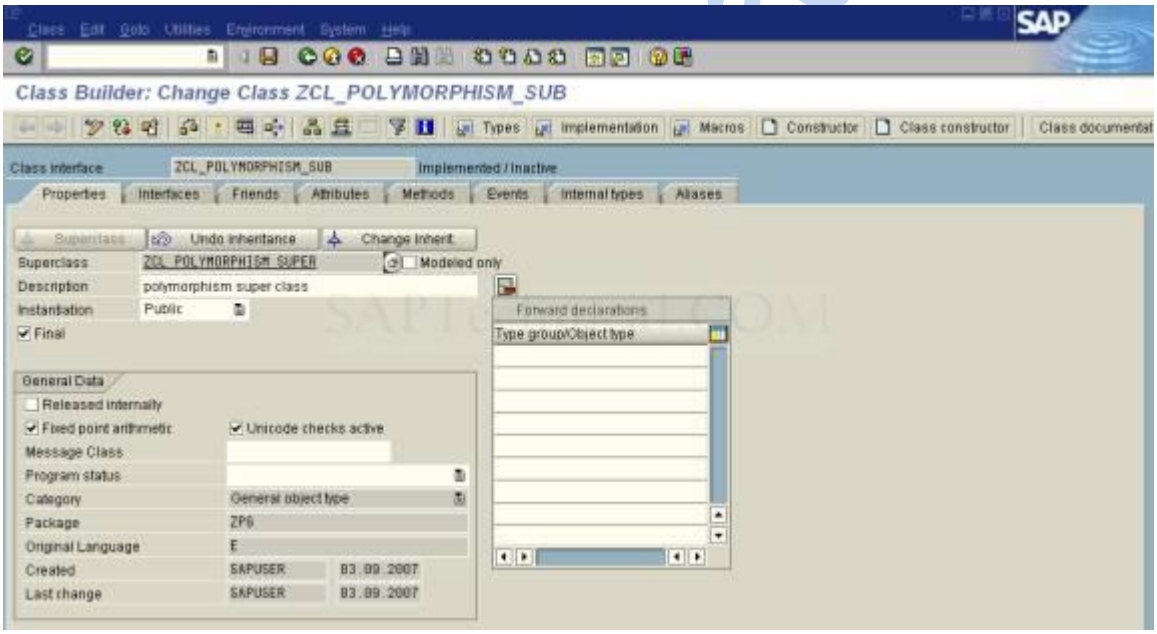


Press CREATE button.

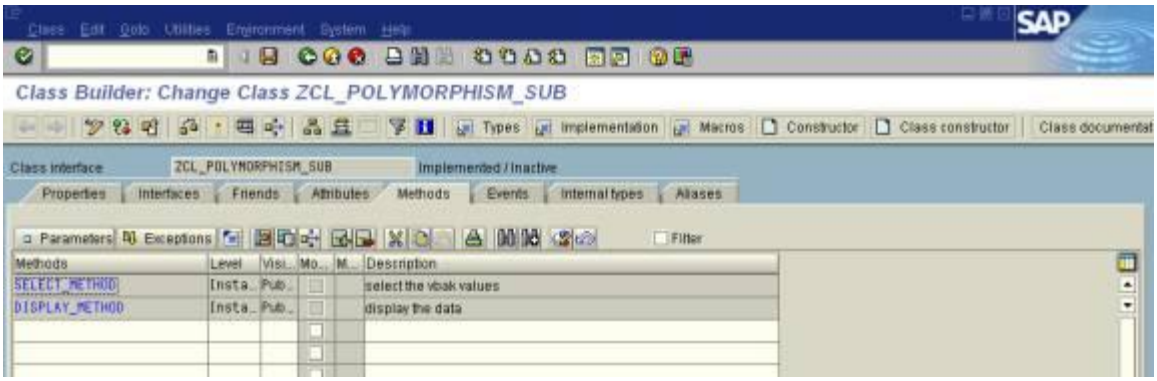


Click on  **SAVE** .

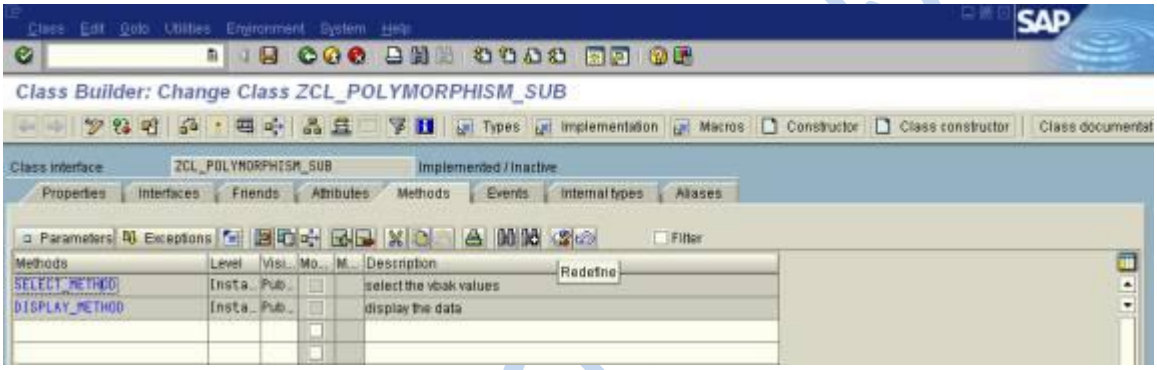
Go to attribute provide the values that means provide super class name.



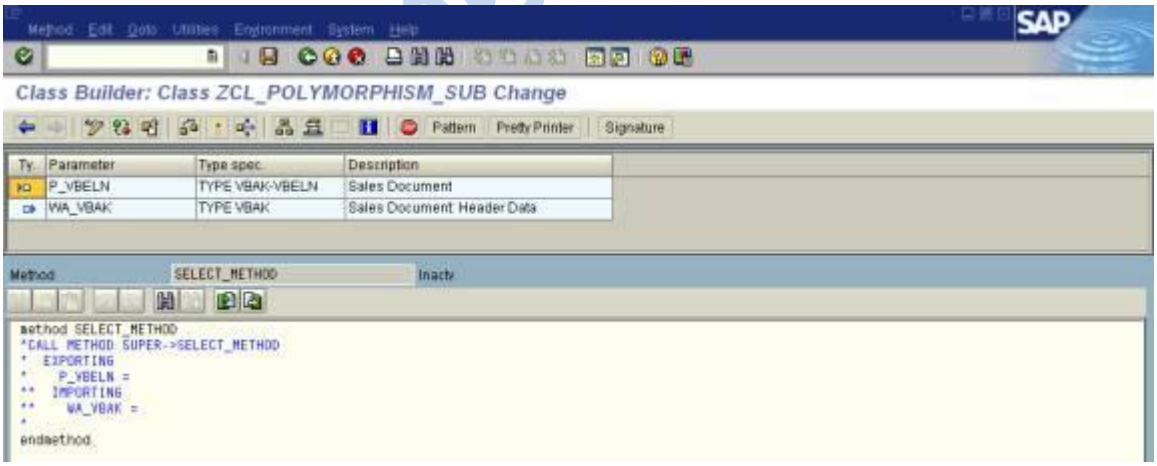
Go to methods we can see like this.



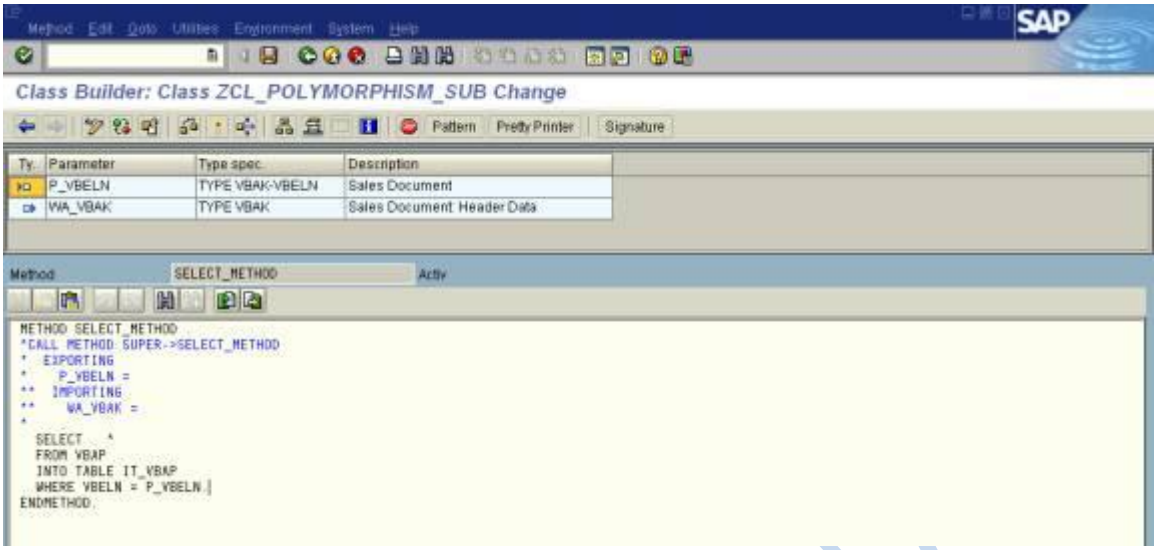
Select select _ method then press the REDEFINE button.



Then screen would like this.



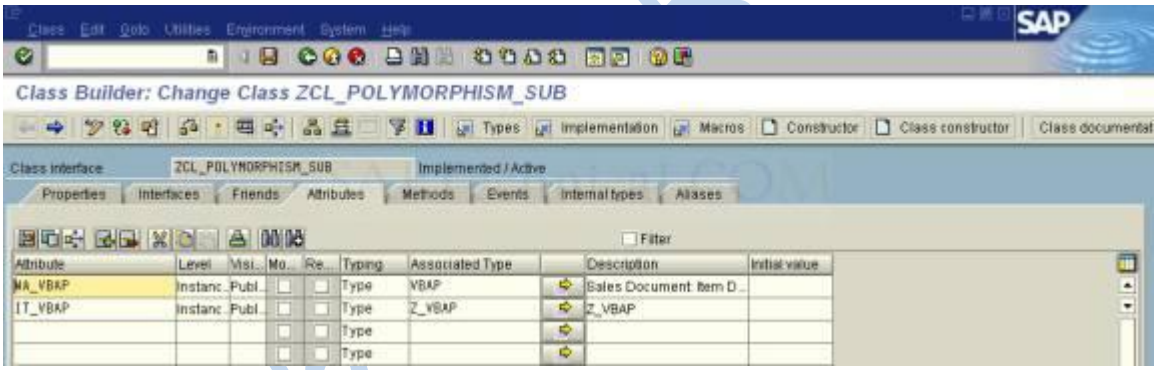
Provide the logic.



Then save it  **.**

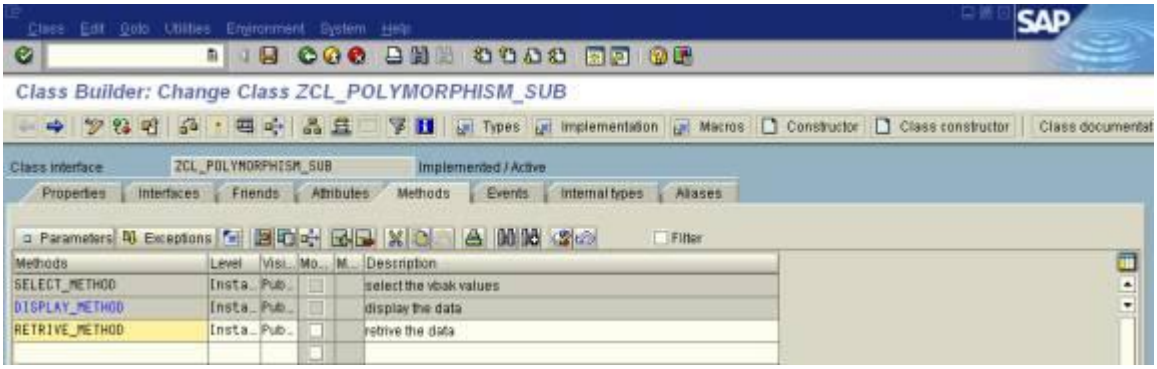
Go to Attributes.

Then provide the Variables.

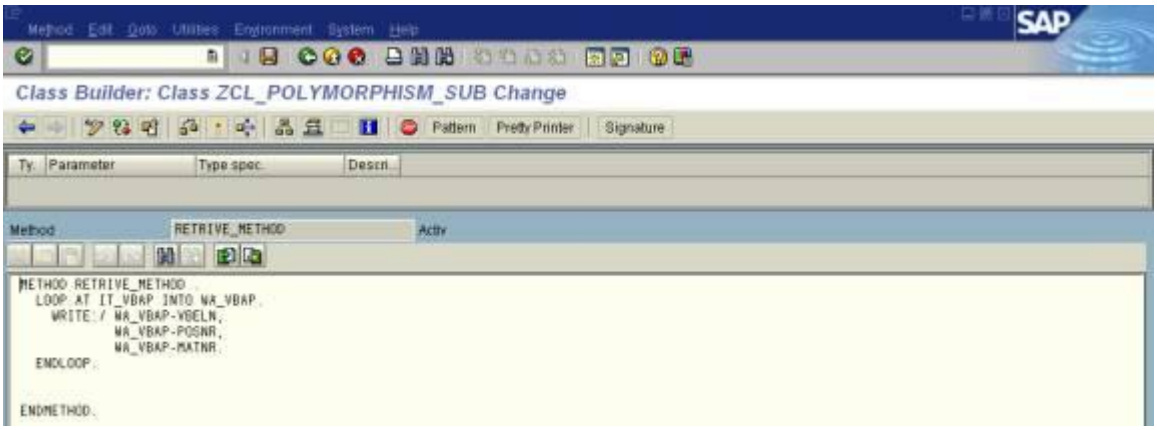


Go back to the methods.

Then provide another method.

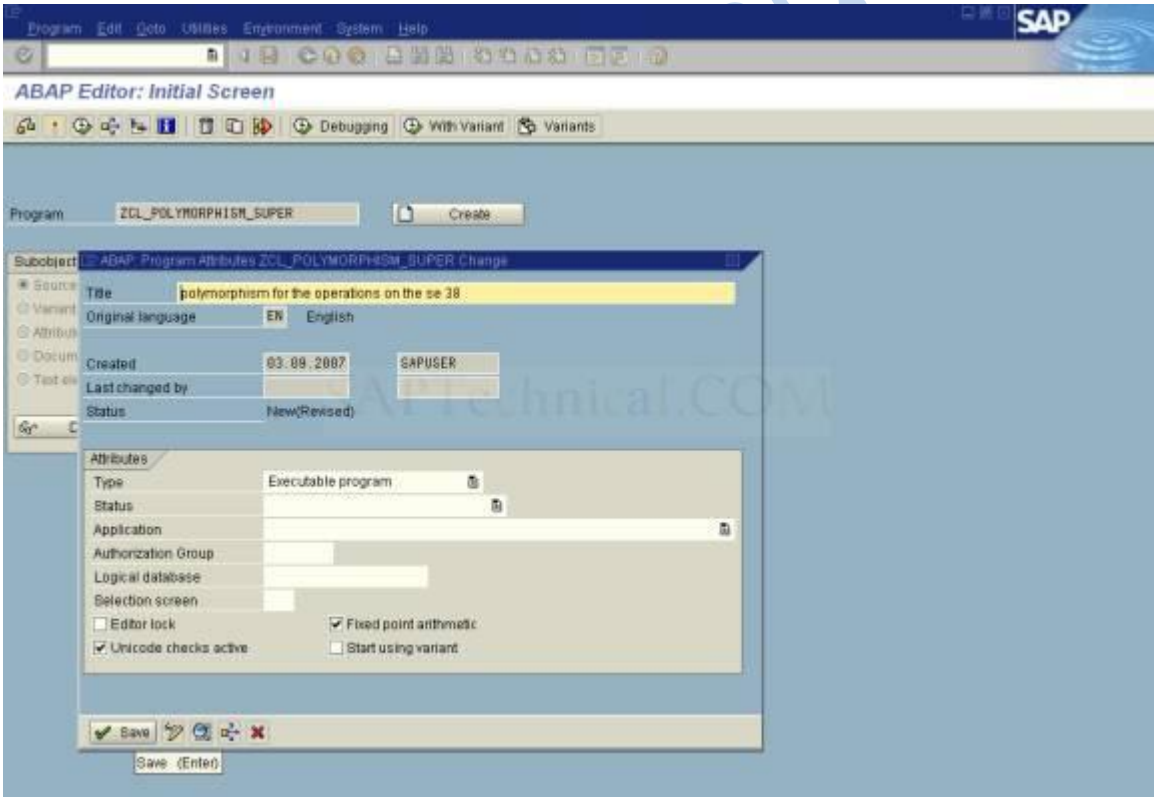


Double click on the method then provide the logic



Click on SAVE , CHECK , and ACTIVATE .

Then provide the code in the T-Code SE38.



Provide the logic.

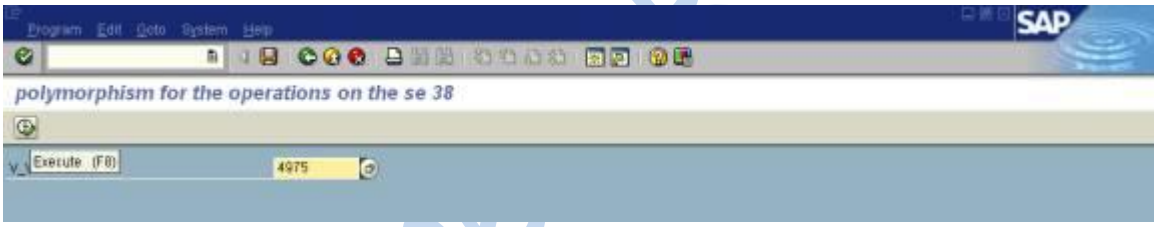
*Provide Object for Sub Class

DATA: OBJ1 TYPE REF TO ZCL_POLYMORPHISM_SUB.
*Provide Parameters

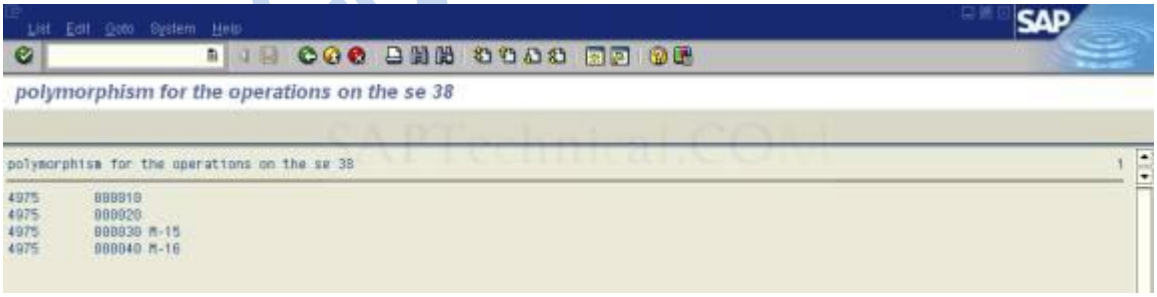
```
PARAMETERS: V_VBELN TYPE VBAP-VBELN.
*Provide Data Objects
DATA: WA_VBAP TYPE VBAP,
      IT_VBAP TYPE Z_VBAP.
*Create the Object
CREATE OBJECT OBJ1.
*Call the Redefine Select Method
CALL METHOD OBJ1->SELECT_METHOD
  EXPORTING
    P_VBELN = V_VBELN
*  IMPORTING
*    WA_VBAK =.
*Provide the IT_VBAP Values
IT_VBAP = OBJ1->IT_VBAP.
LOOP AT IT_VBAP INTO WA_VBAP.
  WRITE:/ WA_VBAP-VBELN,
          WA_VBAP-POSNR,
          WA_VBAP-MATNR.
ENDLOOP.
```

Click On SAVE , CHECK , ACTIVATE and EXECUTE it.

Output :-



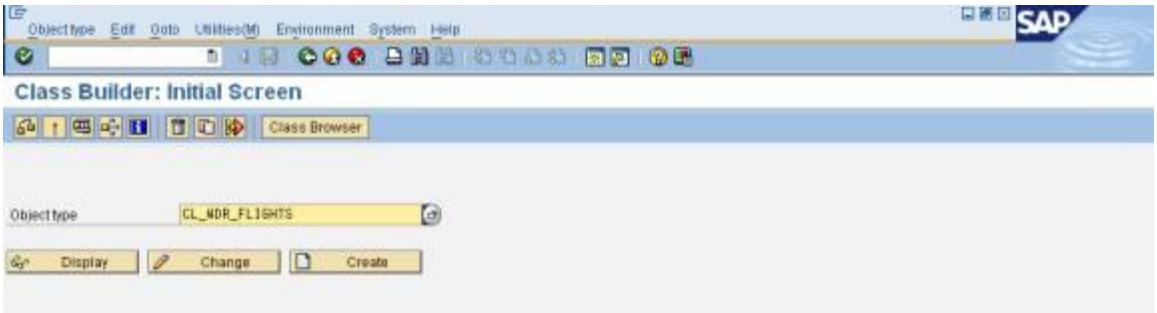
The output data display in the list.



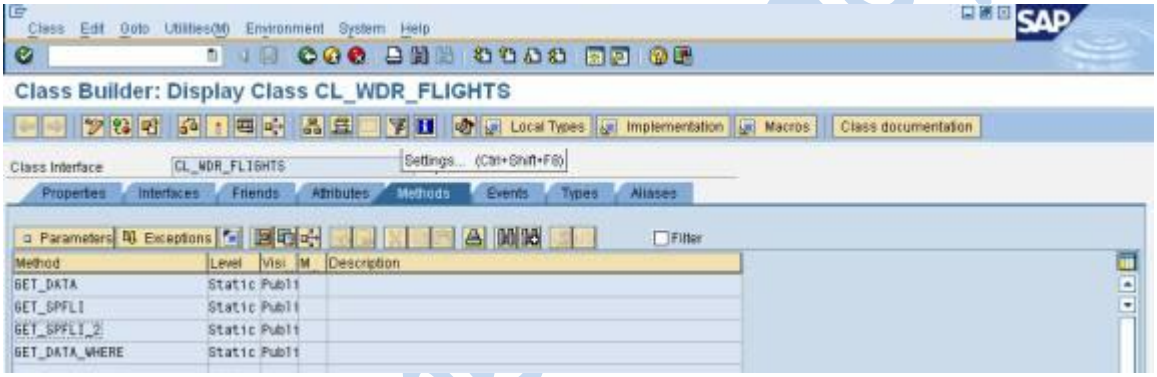
Enhancement of a Standard Class

Go to TCode SE24.

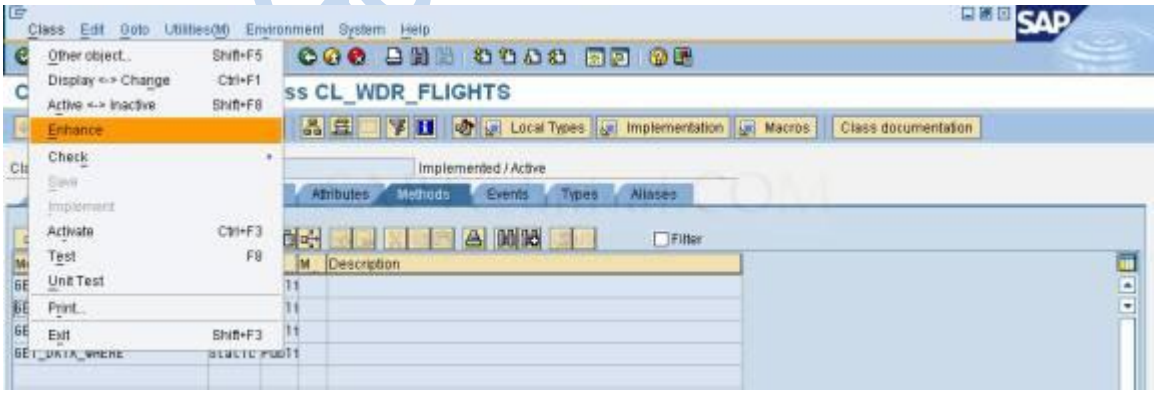
Enter the name of the Class to be enhanced.



The Following Screen would be displayed.

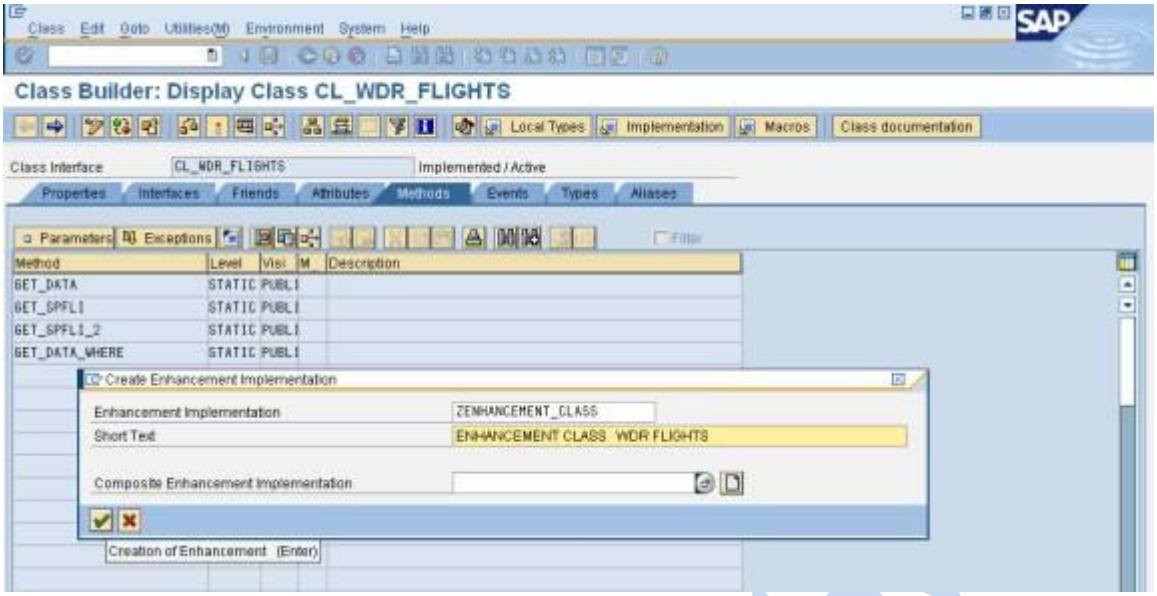


Click on Class > Enhance.

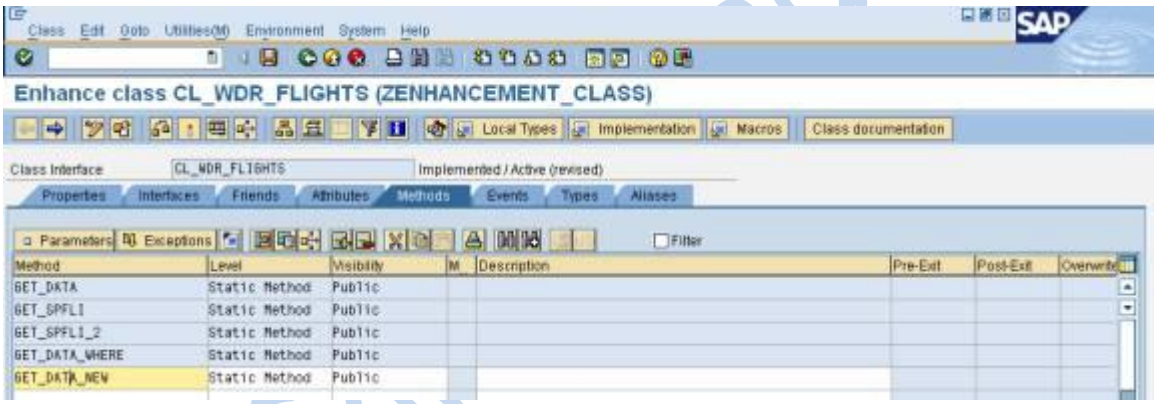


Give the name of the enhancement implementation and short text

Click on continue.



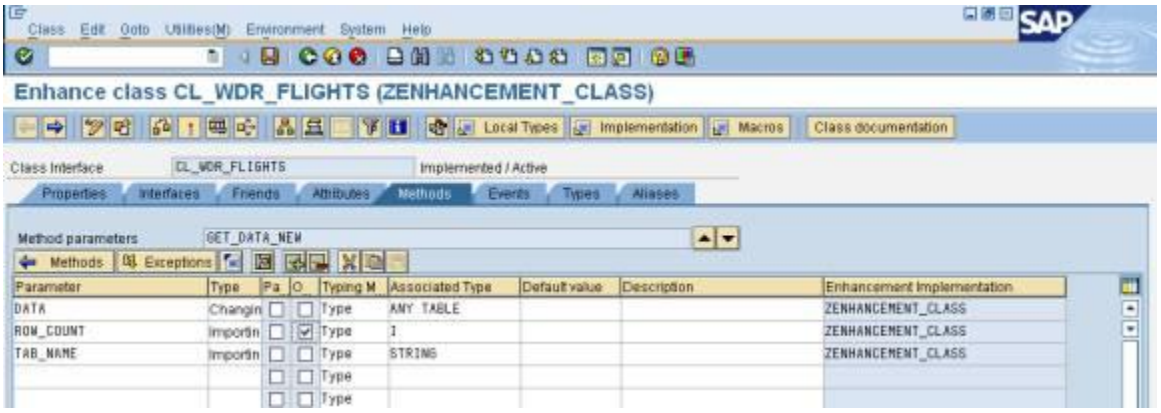
Enter the New method "GET_DATA_NEW"



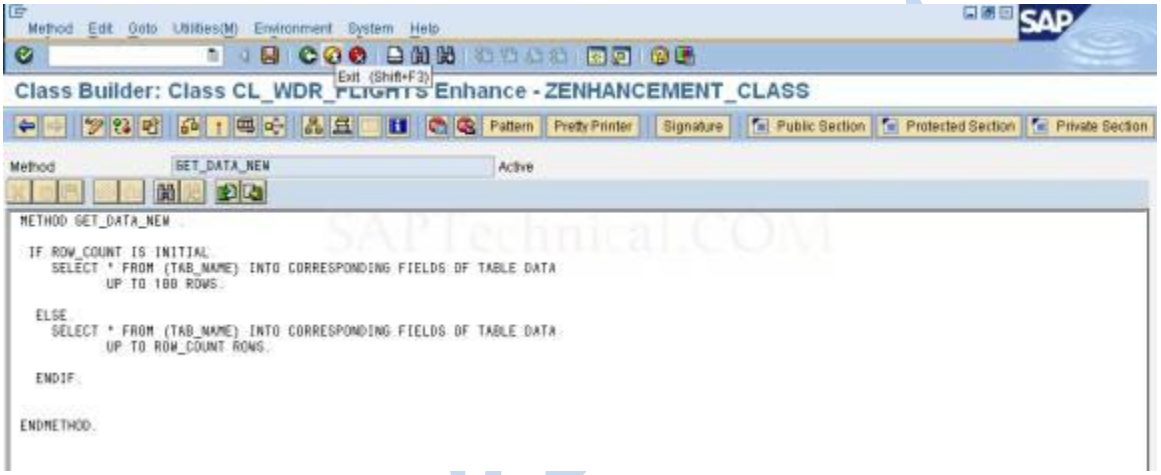
Click on Parameters.

Enter the Required parameters, Type, Associated Type.

Click on Back and get back to method screen.



Enter the Source code.

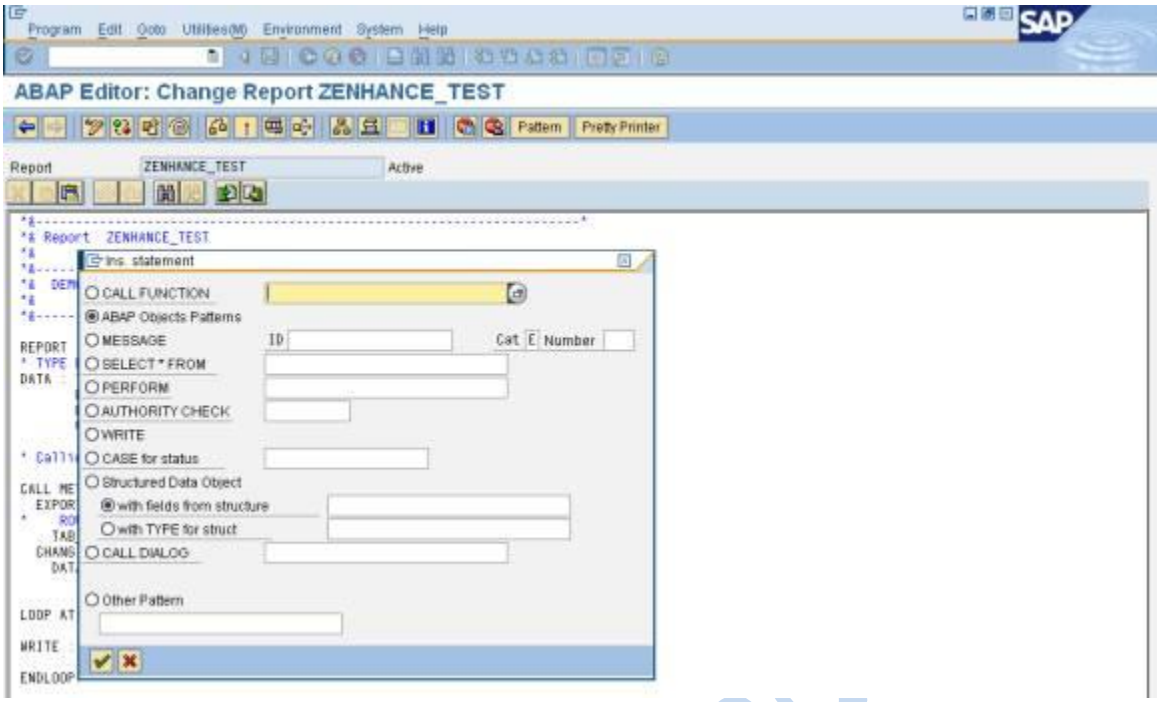


Click on Save Check and activate.

Create a Report program on SE38 T- Code.

Click on Pattern.

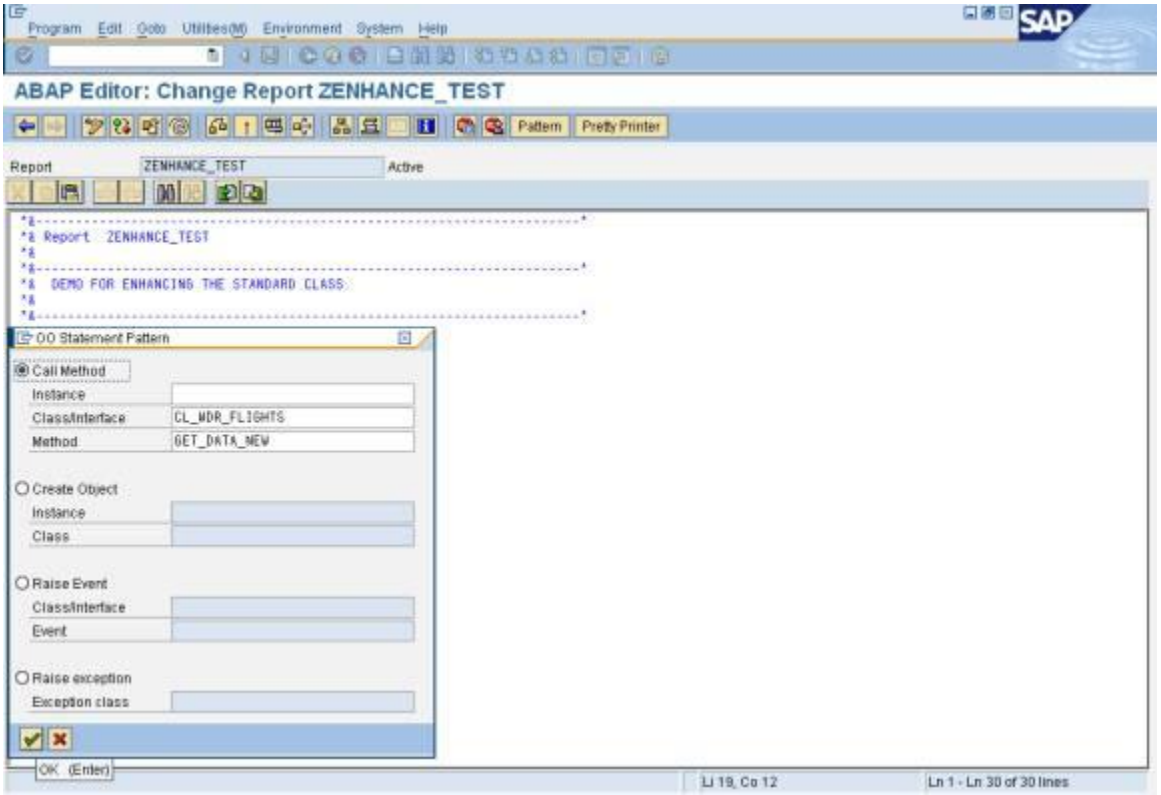
Select ABAP Object Patterns.



Click on continue.

Enter the Enhance Class name and method name.

Click on continue.

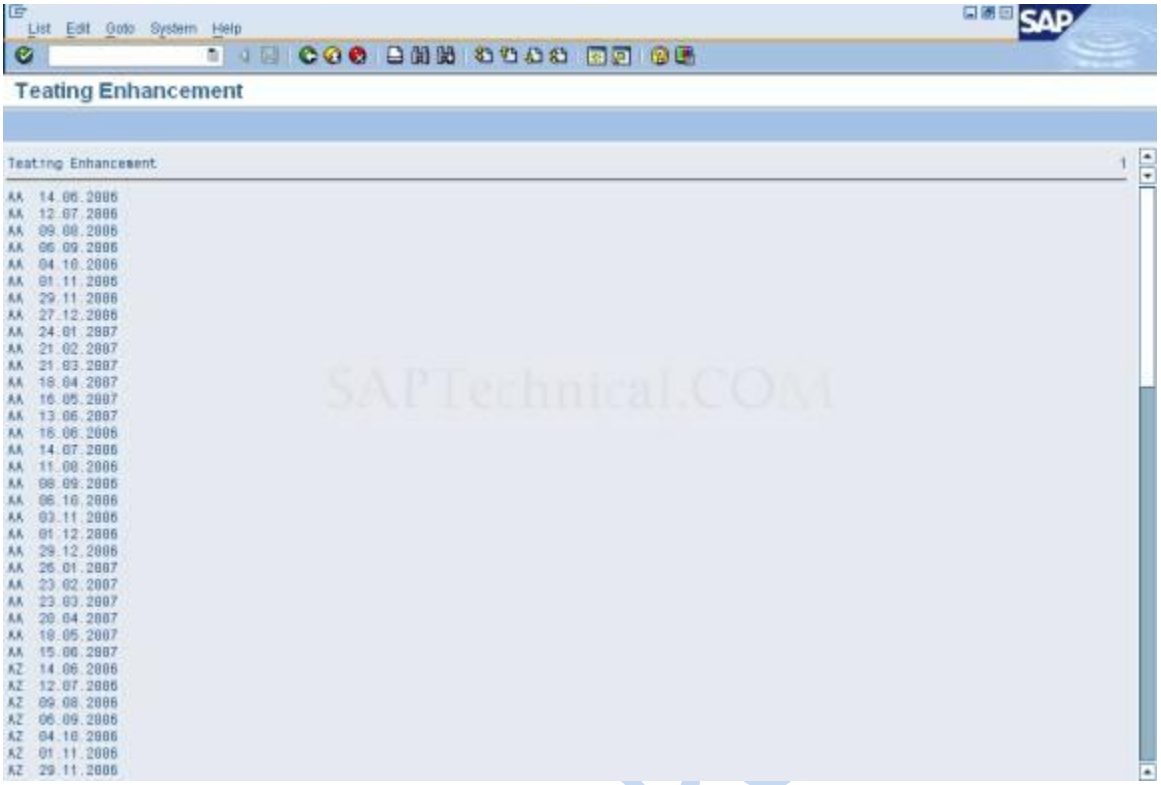


Paste the Below Code.

```
*&---------------------------------------------------------------------*
*& Report  ZENHANCE_TEST
*&  DEMO FOR ENHANCING THE STANDARD CLASS.
REPORT  ZENHANCE_TEST.
* TYPE DECLARATIONS
DATA : TABLE TYPE STRING,
       ROW_COUNT TYPE I,
       DATA_OUT TYPE TABLE OF SFLIGHT,
       W_OUT LIKE LINE OF DATA_OUT.
* Calling the Enhanced class and Enhanced methods.
CALL METHOD CL_WDR_FLIGHTS=>GET_DATA_NEW
  EXPORTING
*    ROW_COUNT =
    TAB_NAME  = 'SFLIGHT'
  CHANGING
    DATA      = DATA_OUT.
LOOP AT DATA_OUT INTO W_OUT.
WRITE :/ W_OUT-CARRID, W_OUT-FLDATE.
ENDLOOP.
```

Click on Save Check and Activate.

Execute the program:


List Edit Goto System Help
Teating Enhancement
Teating Enhancement 1
AA 14.06.2006
AA 12.07.2006
AA 09.08.2006
AA 06.09.2006
AA 04.10.2006
AA 01.11.2006
AA 29.11.2006
AA 27.12.2006
AA 24.01.2007
AA 21.02.2007
AA 21.03.2007
AA 18.04.2007
AA 16.05.2007
AA 13.06.2007
AA 16.06.2006
AA 14.07.2006
AA 11.08.2006
AA 08.09.2006
AA 06.10.2006
AA 03.11.2006
AA 01.12.2006
AA 29.12.2006
AA 26.01.2007
AA 23.02.2007
AA 23.03.2007
AA 20.04.2007
AA 18.05.2007
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AZ 12.07.2006
AZ 09.08.2006
AZ 06.09.2006
AZ 04.10.2006
AZ 01.11.2006
AZ 29.11.2006

ABAP Classes in Workflow

1. ABAP Classes and Business Workflow:

We can use **ABAP classes** in the definition and runtime components of **SAP Web Flow Engine** in the same way as object types defined in the Business object Repository (BOR).

Before proceeding further we need to know where to create and maintain **ABAP Classes** and **ABAP Interfaces**.

2. What is Class Builder and its purpose?

The **Class Builder** allows us to create and maintain global ABAP classes and interfaces. Both of these object types, like global data types, are defined in the **ABAP Repository**, thus composing a central class library. Together, they form a central class library and are visible throughout the system. We can display existing classes and interfaces in the class library using the Class Browser.

We can define local classes as well as global classes. They are defined locally in programs, function groups or as auxiliary classes of global classes of the class pools. Local classes are only visible within the defining module.

ABAP classes are processed using the Class Builder.

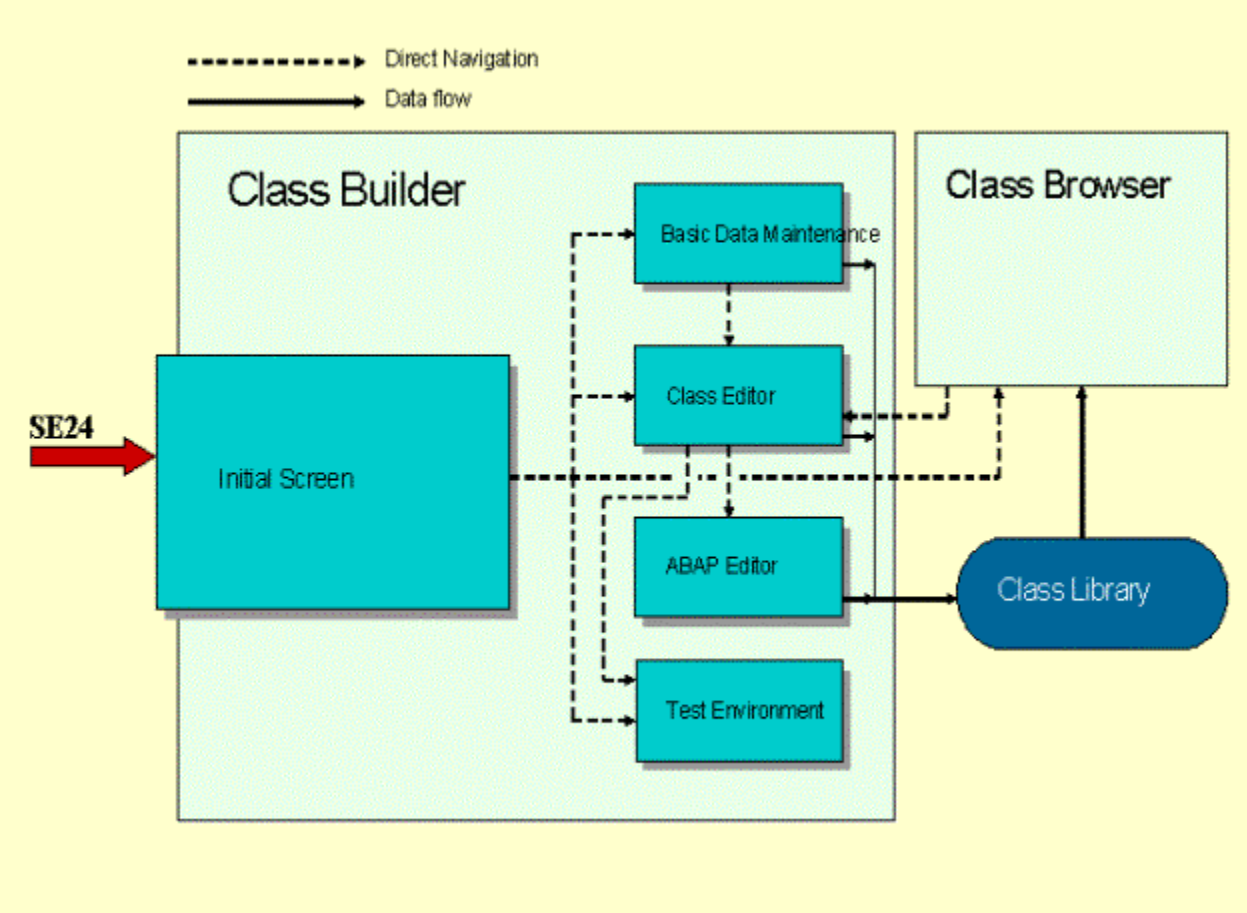
3. How to reach Class Builder?

To reach the initial screen of the Class Builder, choose Development ☐ Class Builder from the initial screen of the ABAP Workbench or enter transaction code **SE24**.

4. How does it integrate?

The Class Builder allows us to create Web development objects within the ABAP Workbench. We can use the Class Browser to display and maintain existing global object types from the class library.

The diagram below illustrates the architecture of the Class Builder and the relationships between its components (including the Class Browser)



From here, we can either display the contents of the class library or edit a class using the Class Editor. Once we have defined an object type, we can implement its methods. From the initial screen or the Class Editor, we can also access the Class Builder's test environment. We can define the object types immediately after implementing the method in the ABAP Editor. It is also possible to access the test environment from the initial screen or Class Editor.

5. How to use the Class Builder?

Use the Class Builder to:

- Display an overview (in the Class Browser) of global object types and their relationships.

- Maintain existing global classes or interfaces.
- Create new global classes and interfaces.
- Implement inheritance between global classes.
- Create compound interfaces.
- Create and specify the attributes, methods, and events of global classes and interfaces.
- Define internal types in classes.
- Implement methods.
- Redefine methods.
- Maintain local auxiliary classes.
- Test classes or interfaces in a simulated runtime environment.

6. What are the constraints?

We cannot define object types on the basis of graphical object modeling.

7. Note before creating global classes and interfaces:

Global classes and interfaces that we create in the Class Builder are stored in the class library and administered by the R/3 Repository: they therefore have the same namespace as all other Repository objects. It is therefore necessary to have naming conventions for object types and their components and to use them uniformly within program development.

8. Naming Conventions in ABAP Objects:

The following naming convention has been conceived for use within the **SAP namespace**. If we do not observe the naming conventions for object types (classes and interfaces), conflicts will occur when the system creates persistent classes, since it will be unable to generate the necessary co-classes.

9. Conventions for Object Types:

Class in the class library	**CL_<class name>**
Interfaces in the class library	**IF_<interface name>**
Local classes in programs (recommendation)	**LCL_<class name>**
Local interfaces in programs (recommendation)	**LIF_<interface name>**

10. Conventions for Components:

Method name	**<method name>**
Events	**<event name>**
Local type definitions within a class (recommendation)	**TY_<type name>**
Data definitions (variables)	**<variable name>**
Data definitions (constants) (recommendation)	**CO_<constant name>**

11. Local Conventions within Methods:

For parameters:

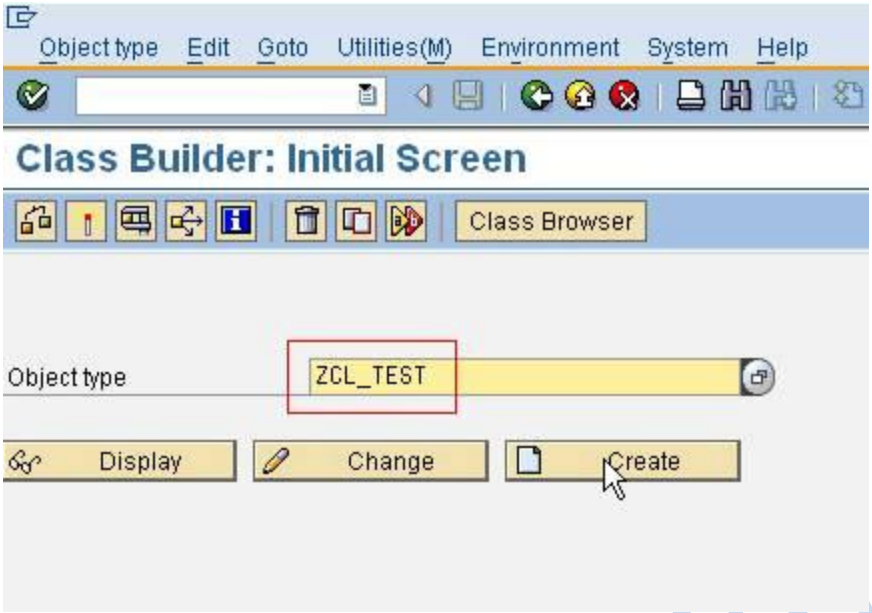
IMPORTING parameters	IM_<parameter name>
EXPORTING parameters	EX_<parameter name>
CHANGING parameters	CH_<parameter name>
RESULT	RE_<result>

12. Using ABAP Classes in Workflow:

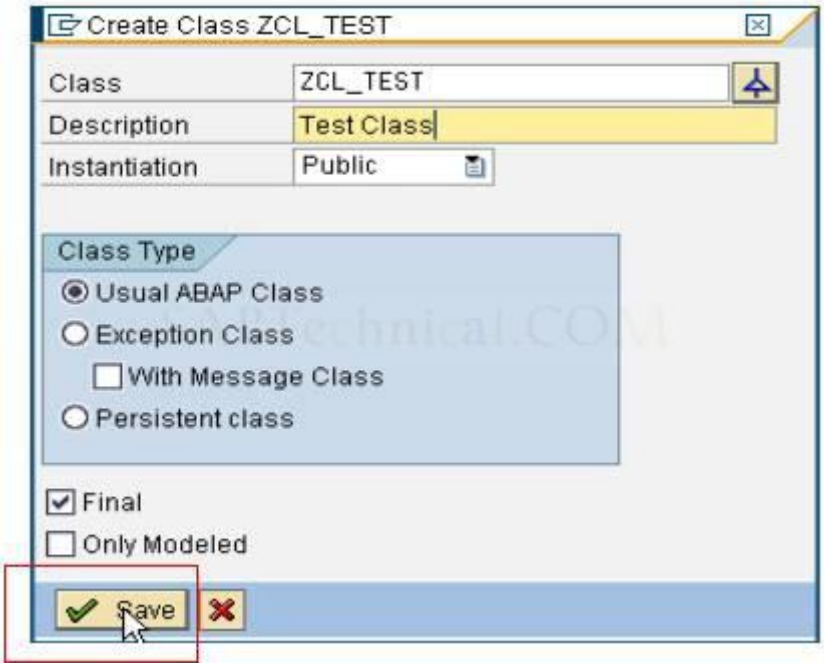
Within the SAP WebFlow Engine we can use ABAP classes that support the **IF_WORKFLOW** interface. Classes that have implemented the IF_WORKFLOW interface are recognized as workflow-enabled in the Class Builder.

13. How to create ABAP Classes that support IF_WORKFLOW interface?

- Go to transaction **SE24** and create a customized class.

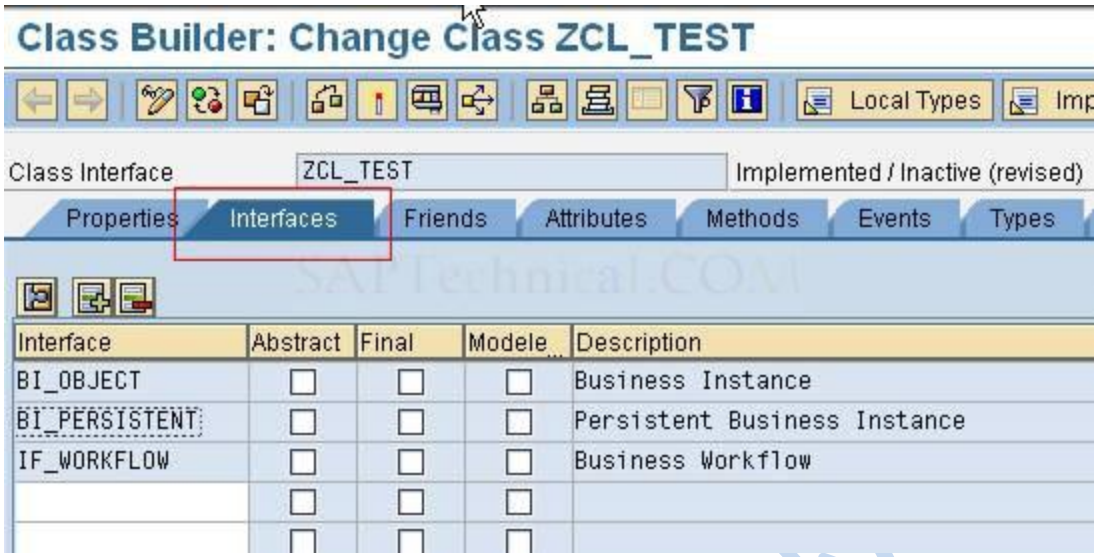


- Next the pop up appears where we need to mention the detail as follows:

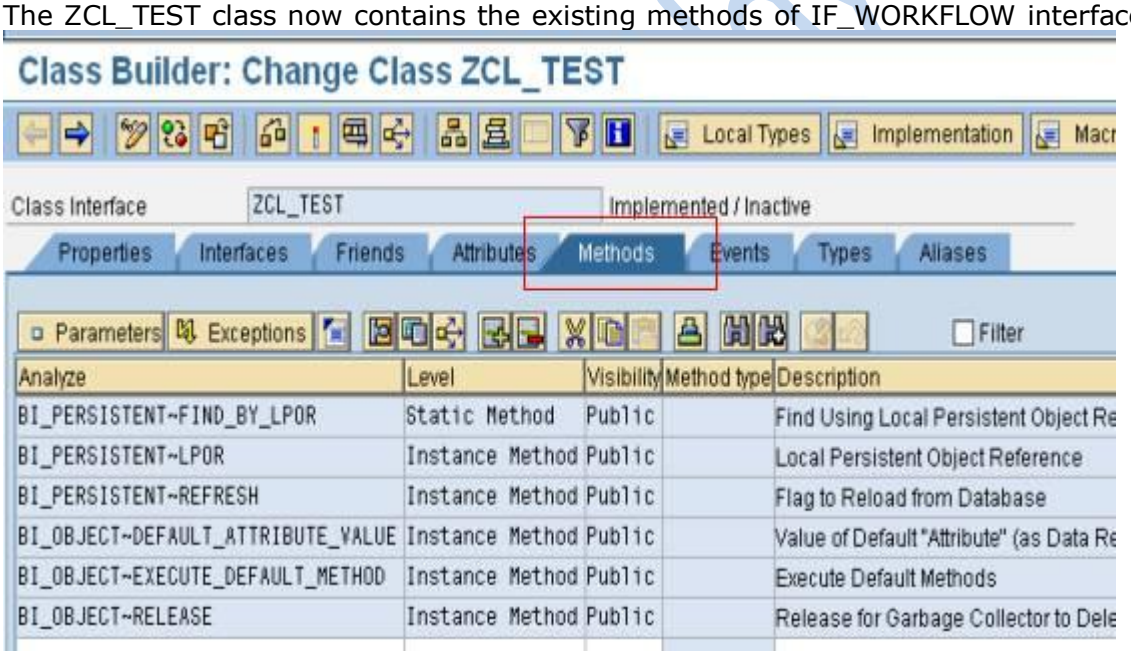


- Save it and the class is created.

- Now the class is to implement IF_WORKFLOW interface. For this go to the Interfaces tab and declare the IF_WORKFLOW as the interface there and press Enter; two sub-interfaces appear: BI_OBJECT and BI_PERSISTENT. Save the Class.



- The ZCL_TEST class now contains the existing methods of IF_WORKFLOW interface.



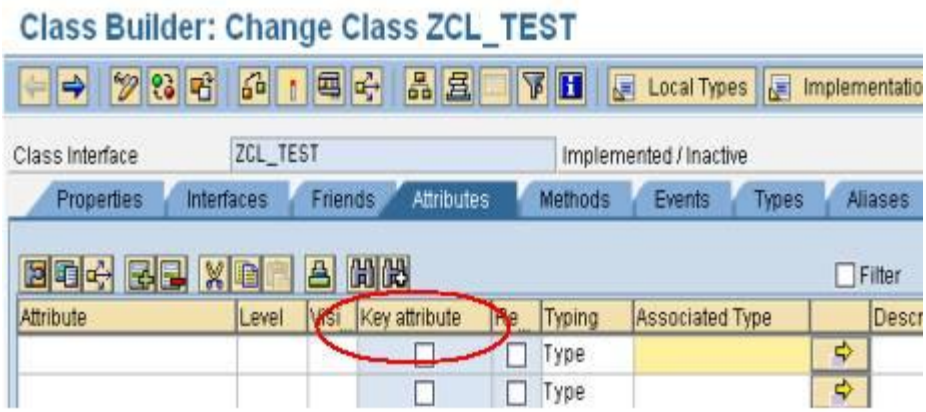
14. Lights on Key Attributes and Attributes:

The key attributes are used to define the object key. There can also be other defined attributes other than key attributes. The SAP Web Flow Engine can access all public attributes of a class.

Key Attributes:

In the Class Builder there is an additional column **Key Attributes** on the 

tab page as shown below:



We need to **check** this box when we are defining any attribute as the Key Attribute.

All key fields must be character-type fields (elementary types: CHAR, NUMC) and have a defined length. The maximum length allowed for all key fields is 32 characters. The length of the key field for the persistent display is 32 characters.

In the case of persistent ABAP objects we can use the GUID, which is generated automatically by the object manager when an instance is created.

Attributes:

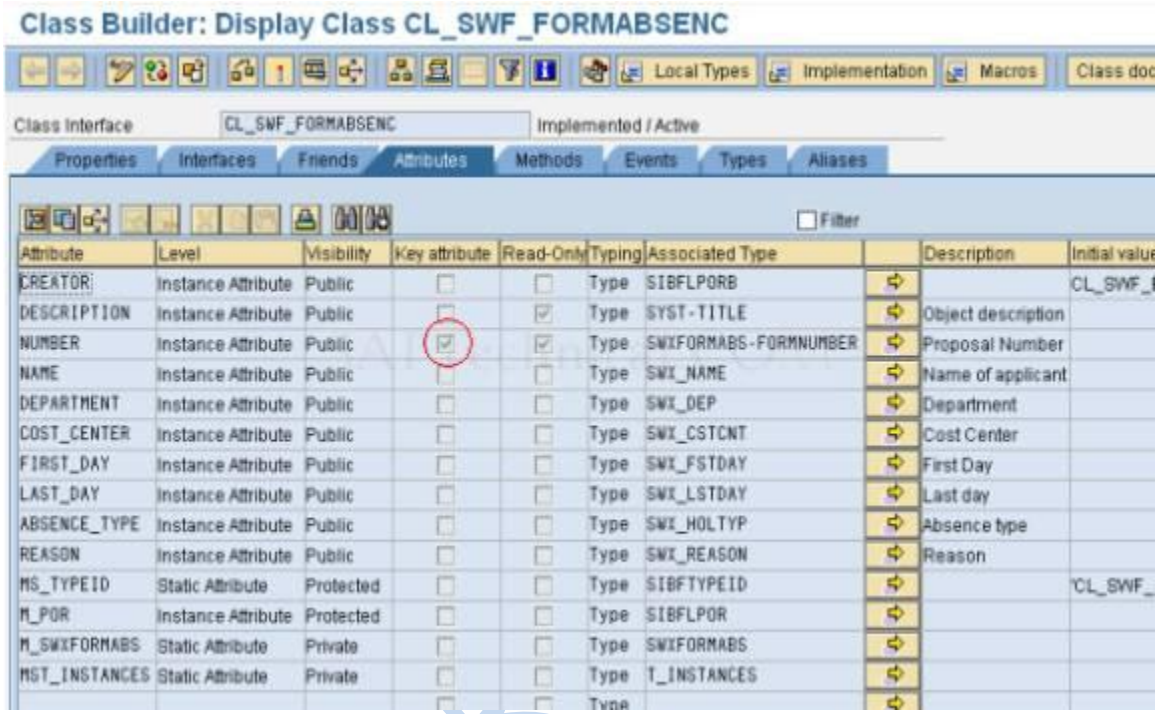
In addition to all the other data types that the Class Builder supports, we can also define attributes with reference to an object from the Business Object Repository (BOR). To do this, we have to use the structure SWOTOBJID as the data type. The BOR object is determined using the corresponding value.

To assign a BOR object instance to an attribute we need to use the corresponding BOR macros. Normally, this is implemented within the CONSTRUCTOR of a class.

To use the BOR macros in a class, two INCLUDES must be included.

- ☐ Include <CNTN03>……contains the local types
- ☐ Include <CNTN02>……contains the BOR macros

- **An example to show how to define Attributes and Key Attributes:**



Attribute	Level	Visibility	Key attribute	Read-Only	Typing	Associated Type		Description	Initial value
CREATOR	Instance Attribute	Public			Type	SIBFLPORB			CL_SWF_
DESCRIPTION	Instance Attribute	Public		✓	Type	SYST-TITLE		Object description	
NUMBER	Instance Attribute	Public	✓	✓	Type	SWIFORMABS-FORMNUMBER		Proposal Number	
NAME	Instance Attribute	Public			Type	SWI_NAME		Name of applicant	
DEPARTMENT	Instance Attribute	Public			Type	SWI_DEP		Department	
COST_CENTER	Instance Attribute	Public			Type	SWI_CSTCNT		Cost Center	
FIRST_DAY	Instance Attribute	Public			Type	SWI_FSTDAY		First Day	
LAST_DAY	Instance Attribute	Public			Type	SWI_LSTDAY		Last day	
ABSENCE_TYPE	Instance Attribute	Public			Type	SWI_HOLTYP		Absence type	
REASON	Instance Attribute	Public			Type	SWI_REASON		Reason	
MS_TYPEID	Static Attribute	Protected			Type	SIBFTYPEID			CL_SWF_
M_POR	Instance Attribute	Protected			Type	SIBFLPOR			
M_SWIFORMABS	Static Attribute	Private			Type	SWIFORMABS			
MST_INSTANCES	Static Attribute	Private			Type	T_INSTANCES			
					Type				

15. Why IF_WORKFLOW Interface?

The IF_WORKFLOW interface is necessary when using an ABAP class within the SAP Web Flow Engine. The interface contains methods that allow the object to be used within the SAP Web Flow Engine.

The SAP Web Flow Engine handles all objects generically. Objects have to be saved in the event of a context change. Therefore, it is necessary to convert object references in such a way that they can be saved persistently. Conversely, we have to be able to generate the corresponding instance of an ABAP class from the persistently saved key.

There are also a number of SAP Web Flow Engine components, for example, the Workflow Log that can display objects. In this case the object has to provide corresponding functions.

The IF_WORKFLOW interface puts a logical parenthesis round the BI_PERSISTENT (instance management) and BI_OBJECT (object behavior) interfaces. The IF_WORKFLOW interface contains the following methods:

- ☐ BI_PERSISTENT~FIND_BY_LPOR
- ☐ BI_PERSISTENT~LPOR
- ☐ BI_PERSISTENT~REFRESH
- ☐ BI_OBJECT~DEFAULT_ATTRIBUTE_VALUE

- BI_OBJECT~EXECUTE_DEFAULT_METHOD
- BI_OBJECT~RELEASE

A class that implements the IF_WORKFLOW interface can be used in any workflow. The class is automatically released for use in workflows when the interface is implemented. Therefore, we can only make compatible changes to a class after implementation (we cannot delete attributes, change types or delete methods). There is no where-used list to show which workflows the class is used in.

Internal classes of an application should not implement the IF_WORKFLOW interface, since this could mean that each method of the class is used in the workflow. Therefore, we should encapsulate the workflow functions in another class that calls the selected methods of the internal class.

Each method of the IF_WORKFLOW Interface as mentioned earlier has its distinct functionality, which is discussed below.

16. BI_PERSISTENT~FIND_BY_LPOR Method:

If we want to convert a persistent saved display of an object into an instance of the corresponding ABAP class, SAP Web flow Engine calls the BI_PERSISTENT~FIND_BY_LPOR method.

Features:

The method parameter LPOR is the persistent object reference and is of SIBFLPOR structure type. A reference of BI_PERSISTENT type is returned.

The following table shows the components of the **SIBFLPOR** structure:

Field	Description
CATID	Describes the object type (CL for ABAP classes)
TYPEID	ABAP class name
INSTID	Object key. The key is limited to 32 characters.

We can implement this method in several ways. In the case of persistent classes we can create the ABAP object instance using the generated classes. In the case of individual persistence management we have to implement the individual actions (such as creating an instance, performing an existence check, entering public attributes, and so on) manually within the class.

Instance management takes place automatically in the case of persistent classes. In the case of individual persistence management we also have to carry out instance management by class. The SAP Web Flow Engine does not provide any instance management. We must therefore implement our own instance management in the case of individual persistence management.

The FIND_BY_LPOR method should always return the same instance if the following problems are to be avoided:

- Inconsistency in the data display
- Instance data being overwritten by another instance
- Locking conflicts

There is an implementation example in the CL_SWF_FORMABSENC demo class.

Class Builder: Class CL_SWF_FORMABSENC Display

Method BI_PERSISTENT~FIND_BY_LPOR Activ

```
METHOD bi_persistent~find_by_lpor .
*- begin of local data
  DATA: l_formabsenc   TYPE REF TO cl_swf_formabsenc.
  DATA: l_number       TYPE swxformabs-formnumber.
  DATA: l_instance     TYPE t_instance.
*- end   of local data

  CHECK lpor-instid IS NOT INITIAL.

*- instid is the key of the object
  l_number = lpor-instid.

  READ TABLE mst_instances WITH KEY number = l_number
       INTO l_instance.
  IF sy-subrc <> 0.

    TRY.
        CREATE OBJECT l_formabsenc
          EXPORTING
            im_number   = l_number

      CATCH cx_bo_error .
*------ object not found
        EXIT.
    ENDTRY.

    l_instance-number   = l_number.
    l_instance-instance = l_formabsenc.
    APPEND l_instance TO mst_instances.

  ENDIF.

  result = l_instance-instance.

ENDMETHOD.                    "
```

17. BI_PERSISTENT~LPOR Method:

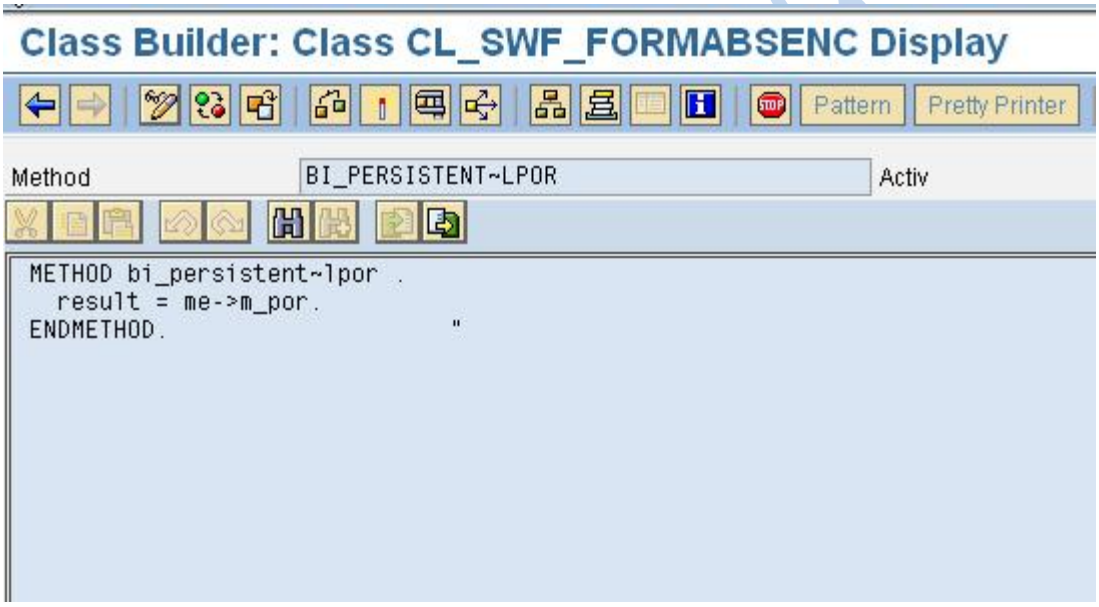
The BI_PERSISTENT~LPOR method is the counterpart to the BI_PERSISTENT~FIND_BY_LPOR method. It provides the persistent display for an existing instance of an ABAP object.

Features:

The method returns the persistent display of an object reference as a SIBFLPOR type structure as described earlier.

There is a close relationship between the BI_PERSISTENT~FIND_BY_LPOR method and the BI_PERSISTENT~LPOR method. If we call the BI_PERSISTENT~FIND_BY_LPOR method first and then the BI_PERSISTENT~LPOR method, the BI_PERSISTENT~LPOR method must return the same value as was previously used to call the BI_PERSISTENT~FIND_BY_LPOR method.

There are also several ways of implementing this method in this case. There is an implementation example in the CL_SWF_FORMABSENC demo class.



18. BI_PERSISTENT~REFRESH Method:

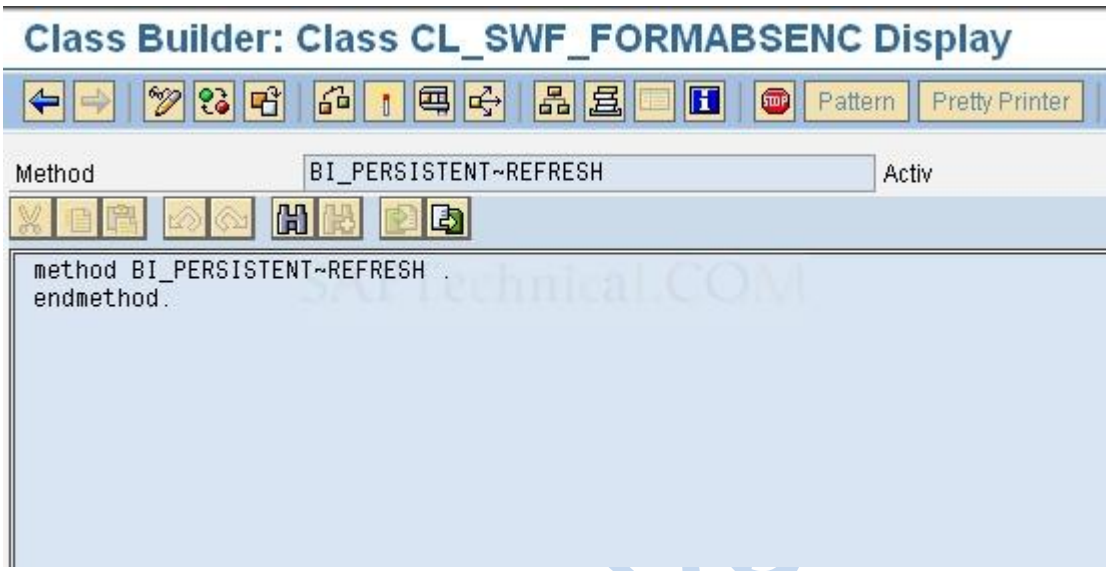
SAP Web Flow Engine calls the BI_PERSISTENT~REFRESH method when the system has to ensure that all values of an object are valid or that they agree exactly with the persistent display of the object.

Features:

The method implementation depends on the internal organization of the class. We can check the object instance data in the database, if necessary.

If we do not need the method in our class, then we need only to carry out a "dummy" implementation (without further coding) to avoid program errors when the system calls the method.

There is an implementation example in the CL_SWF_FORMABSENC demo class.



19. BI_OBJECT~DEFAULT_ATTRIBUTE_VALUE Method:

The BI_OBJECT~DEFAULT_ATTRIBUTE_VALUE method returns the display name of the object.

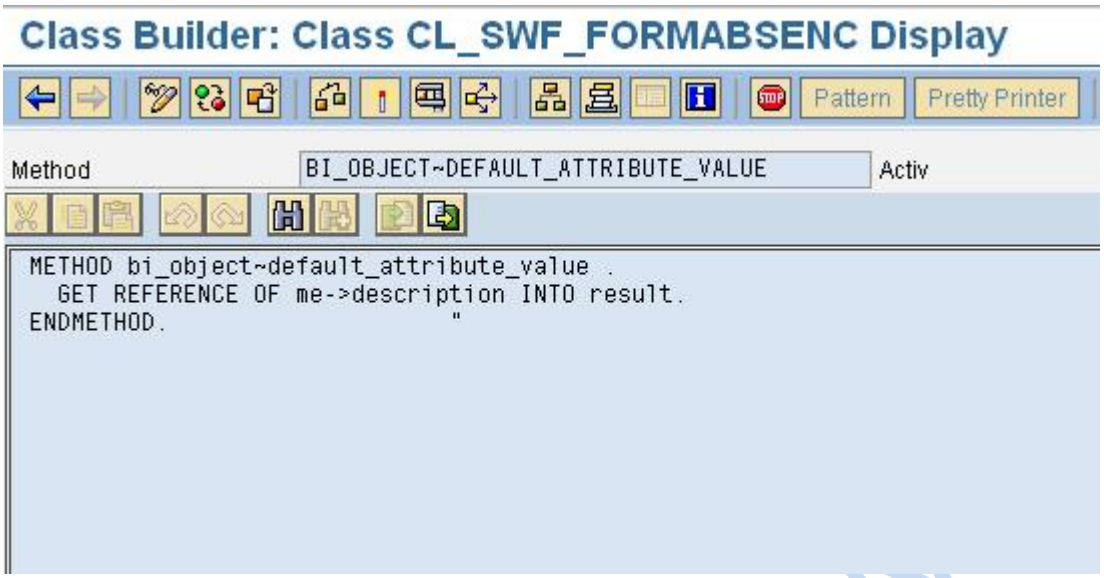
Features:

We can display references to process objects or process step objects at different positions within the SAP Web Flow Engine (for example, in Business Workplace and in Workflow Log). The object key is normally displayed here. If, for example, we want to display a descriptive text instead, the BI_OBJECT~DEFAULT_ATTRIBUTE_VALUE method has to return the corresponding value.

If the method does not contain implementation or does not return a value, the object key is displayed.

If we do not need the method in our class, then we need only to carry out a "dummy" implementation (without further coding) to avoid program errors when the system calls the method.

There is an implementation example in the CL_SWF_FORMABSENC demo class.



20. BI_OBJECT~EXECUTE_DEFAULT_METHOD Method:

The BI_OBJECT~EXECUTE_DEFAULT_METHOD method is the standard method for the object. This method is executed when, for example, we call the object in Business Workplace.

Features:

We can display process objects or process step objects at different positions within the SAP Web Flow Engine (for example, in Business Workplace and in Workflow Log). The SAP Web Flow Engine calls the BI_OBJECT~EXECUTE_DEFAULT_METHOD method.

If we do not need the method in our class, then we need only to carry out a "dummy" implementation (without further coding) to avoid program errors when the system calls the method.

There is an implementation example in the CL_SWF_FORMABSENC demo class.

Class Builder: Class CL_SWF_FORMABSENC Display

Pattern | Pretty Printer

Method BI_OBJECT~EXECUTE_DEFAULT_METHOD Activ

```
METHOD bi_object~execute_default_method .
  TRY.
      me->display( ).
    CATCH cx_root.
  ENDTRY.
ENDMETHOD.                                  "
```

21. BI_OBJECT~RELEASE Method:

The system indicates that the reference to the instance is no longer needed by using the BI_OBJECT~RELEASE method. This means we can delete the reference from instance management. Once the last reference has been deleted from instance management, the GARBAGE COLLECTOR can release the corresponding memory area.

Features:

If we do not need the method in our class, then we need only to carry out a "dummy" implementation (without further coding) to avoid program errors when the system calls the method.

There is an implementation example in the CL_SWF_FORMABSENC demo class.

Class Builder: Class CL_SWF_FORMABSENC Display

Pattern | Pretty Printer

Method BI_OBJECT~RELEASE Activ

```
method BI_OBJECT~RELEASE .
endmethod.
```

22. How to use ABAP Classes in Process Steps of Business Workflow?

In process steps we can use methods and attributes of ABAP classes in the same way as methods and attributes of Business Object Repository (BOR) objects. We can call these methods in the process context.

Features:

While using the ABAP Classes in the Process Steps the methods may contain dialogs, they can be synchronous or asynchronous; they may appear in the workflow log, and so on.

In general, we can use any method that is implemented as a public method. The method can be implemented in the class itself, in one of the super classes of the class, or by way of an interface.

The maximum permitted length for methods that are implemented by way of an interface, for example IF_WORKFLOW~FIND_BY_LPOR, is 30 characters. If the method name is too long, we can choose a shorter name for the method by defining an alias. If the method is implemented in the class or in a super class, the name of the method cannot be longer than 30 characters, so this limitation does not apply.

Parameters:

We can assign values from the workflow container to the method parameters. Conversely, export parameters can be entered as workflow container values. The following overview shows how the individual types can be used as parameters:

- ☐ Simple types (string, integer, and so on)
- ☐ Data Dictionary types (structures, tables, complex types)
- ☐ References to objects from the Business Object Repository
- ☐ References to ABAP classes (supporting the IF_WORKFLOW interface)

We can transfer method parameters that represent a persistent object (IF_WORKFLOW or BOR Object) in the following ways:

- ☐ ABAP classes (with IF_WORKFLOW interface)
  - ☐ TYPE SIBFLPORB

    Object is transferred using the persistent display
  - ☐ TYPE REF TO <Class name>

Object is transferred as object reference

- BOR objects
  - TYPE SIBFLPORB

    Object is transferred using the persistent display

  - TYPE SWOTOBJID

    Object is transferred using the persistent display; this display is only valid for BOR objects

  - TYPE SWC_OBJECT

    Object is transferred as object reference

Exceptions:

The SAP Web Flow Engine can deal with exceptions that are triggered by the methods. It differentiates between application exceptions and temporary exceptions. The two exception categories are differentiated by the exception in the class hierarchy or by naming conventions. In the case of a temporary exception, the SAP Web Flow Engine attempts to execute the method again. In the case of a permanent error the status for the workflow is set to error.

Class-Based Exceptions:

To create a temporary exception, we can use, for example, the CX_BO_TEMPORARY class or a corresponding subclass. It can be helpful to trigger an exception for dialog methods when the user cancels the dialog. Here, for example, we could trigger the CX_BO_ACTION_CANCELED exception (subclass of the CX_BO_TEMPORARY class).

Exceptions Not Based on Class:

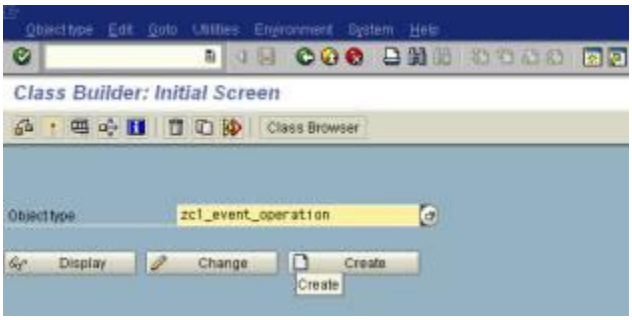
We can also trigger exceptions not based on class. The SAP Web Flow Engine can differentiate between the two exception categories (temporary and permanent) by the name. If the exception begins with TMP or TEMP, it is a temporary exception; otherwise it is a permanent exception.

Working with events in a Global Class

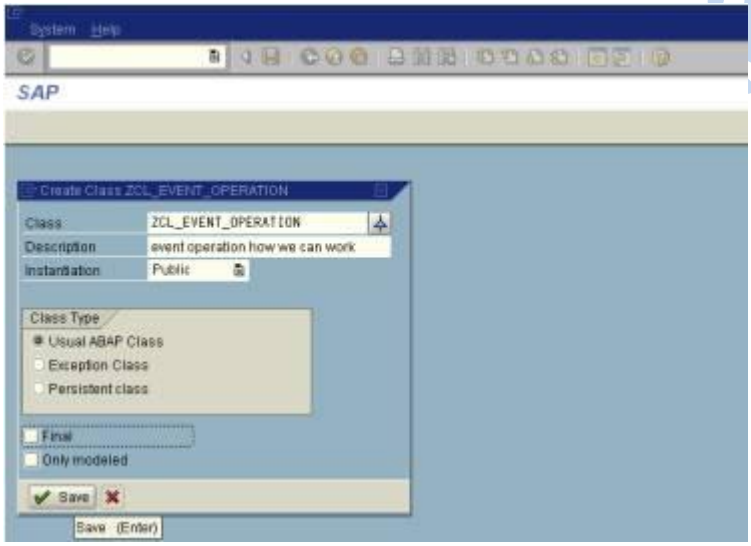
"I would like to explain about Working with Events in Global Class" .

Go to Class Builder "SE24".

Provide class name.



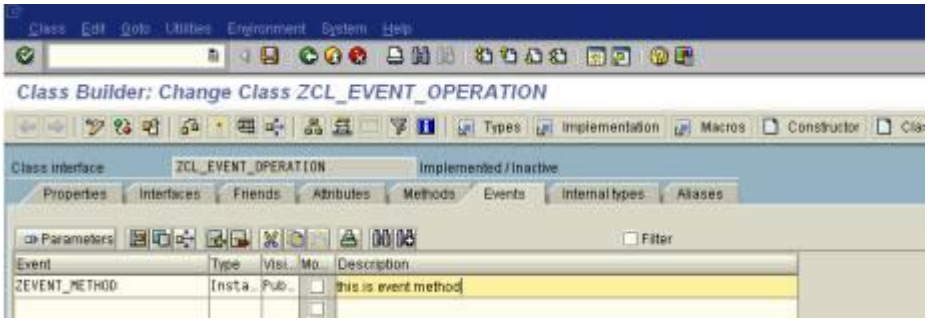
Press create button.



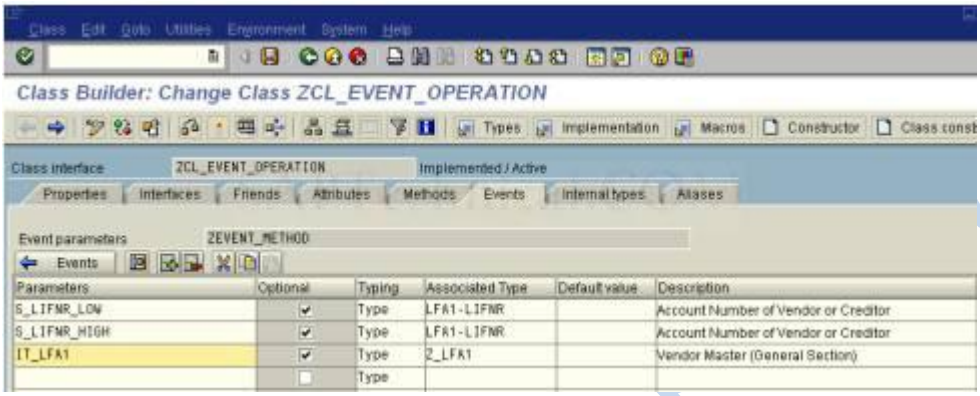
Save it.

Go to event tab.

Then provide event method.



Provide parameters also for this method.

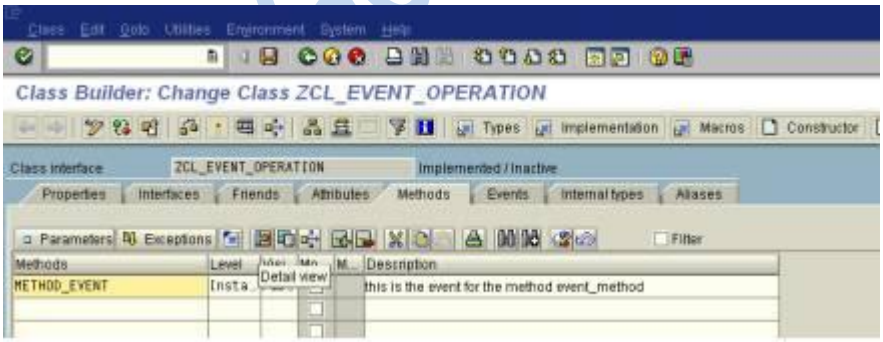


Save it.

Then go to methods option.

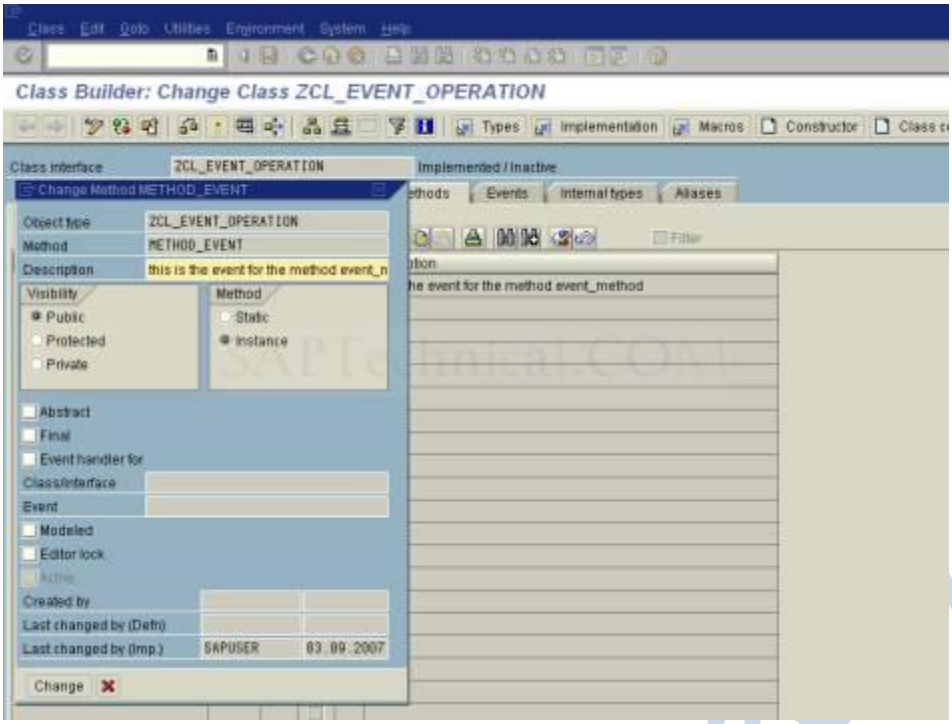
We wouldn't be able to write any code in the events directly.

For this we can create another method in the method tab.

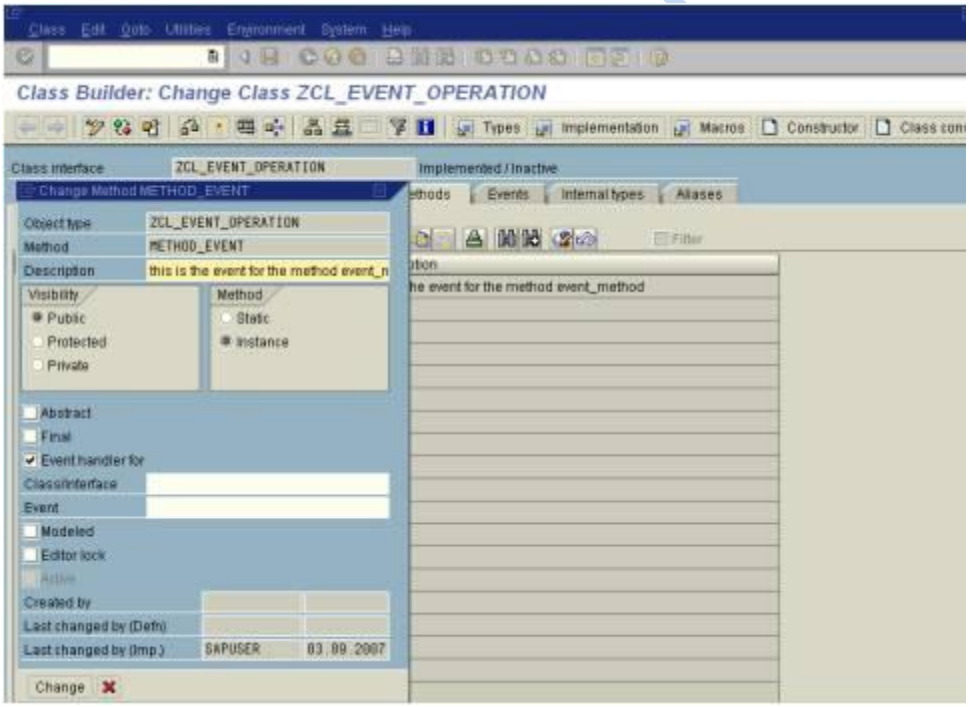


Then provide link between method and also the event method.

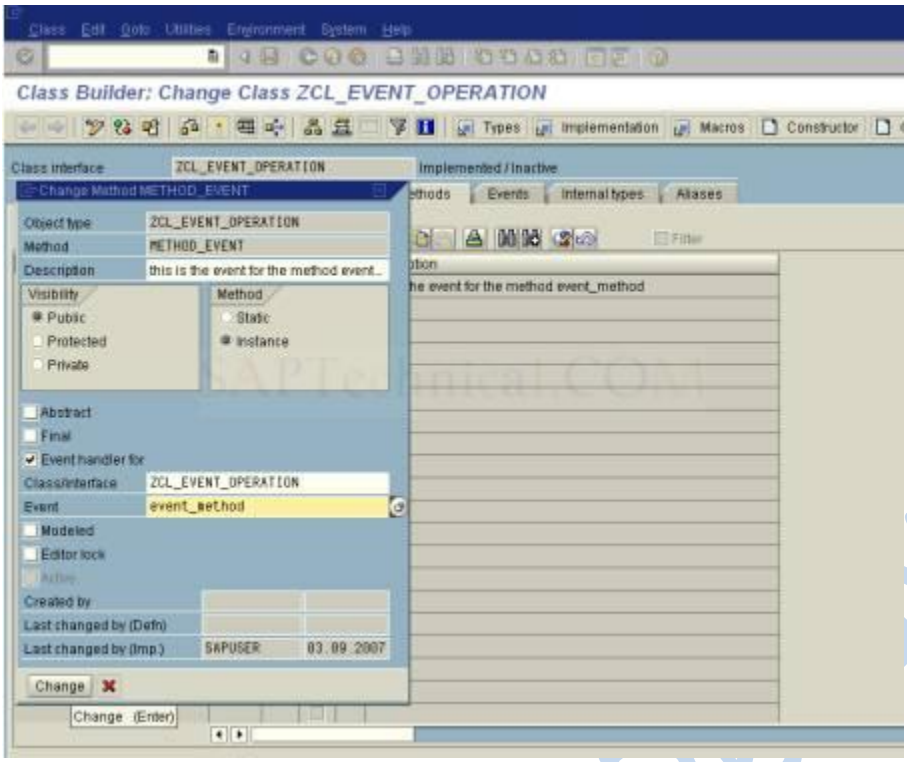
Then we can click on this detail view button.



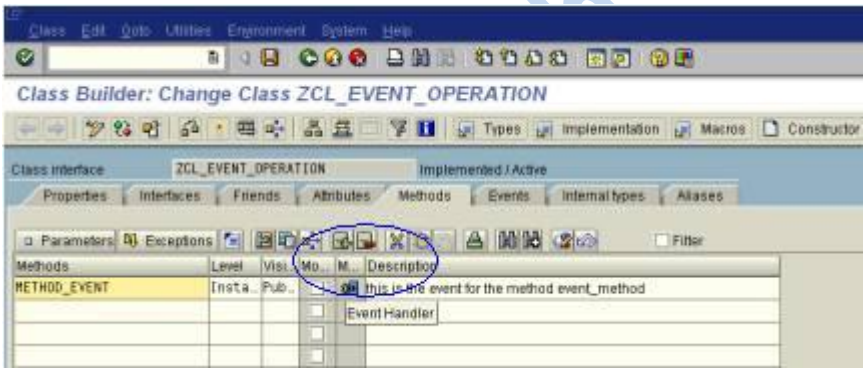
Then enable the event handler for check box.



Provide the class name and also the event name.

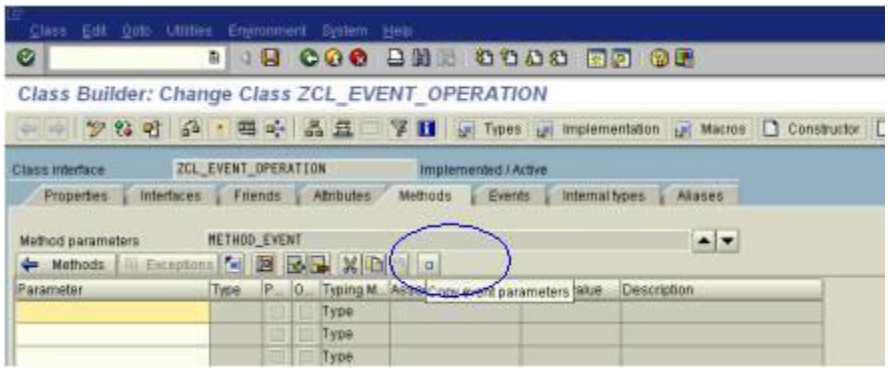


Save & activate. Following screen appears:

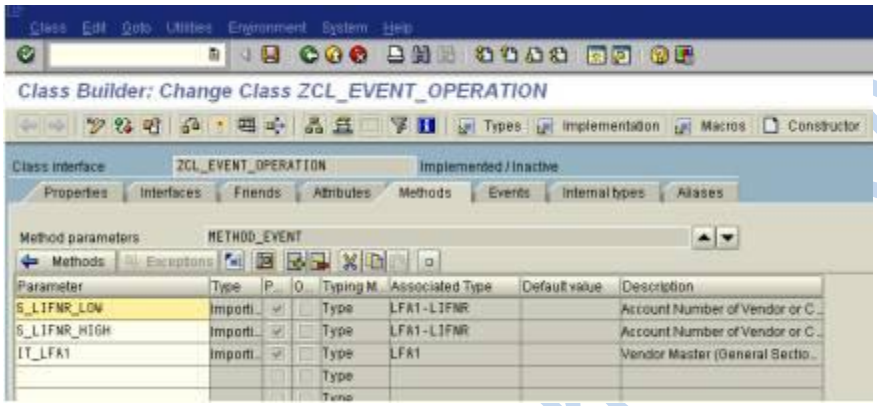


Now select the method.

And also copy the parameters of the event method.



By pressing this copy event parameter we can get the parameters.



Save and go back to the earlier screen..

Then double click on the method name.

Then provide the following logic for triggering the event.

```
METHOD METHOD_EVENT .

*check the condition

IF S_LIFNR_LOW < 1000 AND S_LIFNR_HIGH > 2000.

   MESSAGE I000(0) WITH 'enter the values between 1000 and 2000'.

   RAISE EVENT ZEVENT_METHOD.

ENDIF.

*provide select statement

SELECT *

FROM LFA1
```

```
INTO TABLE IT_LFA1

WHERE LIFNR BETWEEN S_LIFNR_LOW AND S_LIFNR_HIGH.

*transfer the values to another internal table

IT_LFA11 = IT_LFA1.

ENDMETHOD.
```

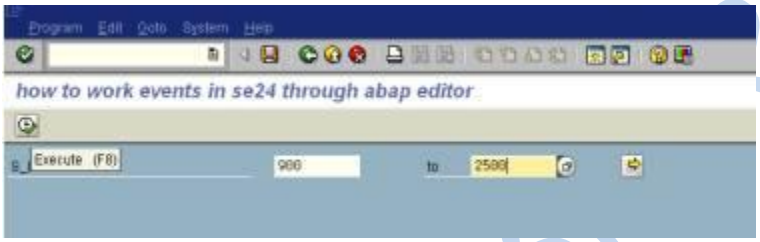
After that provide the logic in se38.

```
REPORT  ZCL_EVENT_OPERATION .

*provide data objects

DATA: LFA1 TYPE LFA1,

      OBJ TYPE REF TO ZCL_EVENT_OPERATION,

      IT_LFA1 TYPE Z_LFA1,

      IT_LFA11 TYPE Z_LFA1,

      WA_LFA1 TYPE LFA1.

*provide select statement

SELECT-OPTIONS: S_LIFNR FOR LFA1-LIFNR.

*provide create object

START-OF-SELECTION.

  CREATE OBJECT OBJ.

*call the method

  CALL METHOD OBJ->METHOD_EVENT

    EXPORTING

      S_LIFNR_LOW  = S_LIFNR-LOW

      S_LIFNR_HIGH = S_LIFNR-HIGH

      IT_LFA1      = IT_LFA1.

*provide attribute value
```

```
  IT_LFA11 = OBJ->IT_LFA11.
*display the data
  LOOP AT IT_LFA11 INTO WA_LFA1.
    WRITE:/ WA_LFA1-LIFNR,
            WA_LFA1-LAND1,
            WA_LFA1-NAME1,
            WA_LFA1-ORT01.
  ENDLOOP.
```

Save it, check it, activate it and execute it.

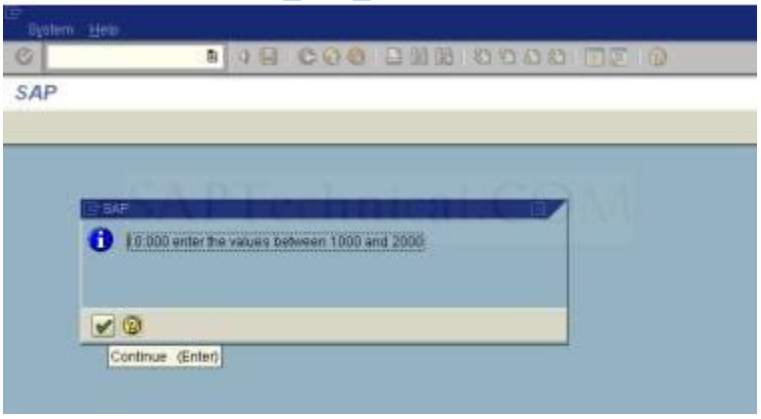
Then the output is like this.



If lifnr value is <1000 and >2000.

Then press execute it.

The output is like this.



Then press enter.

The output is like this.

List Edit Goto System Help

how to work events in se24 through abap editor

how to work events in se24 through abap editor

999	IN	CHANDRASEKHAR	
1000	DE	girl	Berlin
1001	DE	SKF Kugelmeier KGaA	Schweinfurt
1002	DE	Müller KG	Rosenheim
1003	US	Gusswerk US	HARBOR CITY
1004	GB	Jones Ltd.	W1 Londond
1005	DE	PAQ Deutschland GmbH	Manheim
1006	DE	Blacks AG	Frankfurt/Main
1007	DE	Bike Retail & Co.	Hannover
1008	GB	Motor constructions Ltd.	Leeds
1009	DE	Parts & Pipes	Zuffenhausen
1010	DE	Sunny Electronics GmbH	Stuttgart
1011	US	SKF Americas	NEWARK
1012	DE	Reihl & Müller	Braunschweig
1013	DE	Real Estate Agency Hamburg	Hamburg
1014	DE	Herrmann & Riemer	Holzminden
1015	DE	Wollner AG	Aachen
1020	DE	Grosshandel-Baden USA	Manheim
1021	DE	Moe'Tech Company AG	Freiburg
1022	DE	Mac'Grosshandel	Hamburg
1023	DE	Molkereigenossenschaft Brandenburg	Postdam
1025	FR	SEC System SA	Boulogne
1030	US	Jotachi Deutschland AG	ATLANTA
1032	GB	Wesson Ltd.	Manchester
1033	DE	Walldorf Grosshandel	Walldorf
1035	DE	Sommer GmbH	Dessau
1040	DE	Hamberger u. CO.	Duiburg
1045	DE	Kreutzschmid KgaA	Leipzig
1050	DE	Humpert u. Töchter GmbH	Rosenheim
1055	NL	Inter-Speed BV	Rotterdam
1058	DE	Nordspeed GmbH	Hamburg

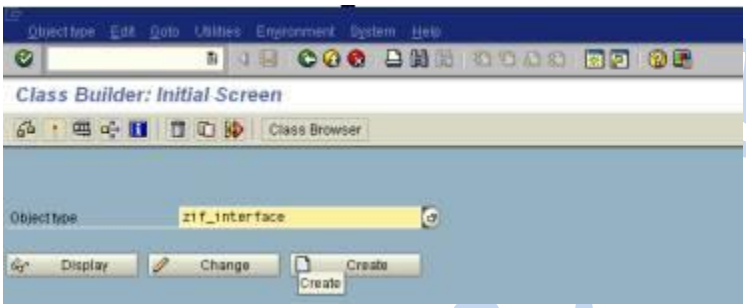
Working with Interfaces

In ABAP interfaces are implemented in addition to, and independently of classes. An interface only has a declaration part, and do not have visibility sections. Components (Attributes, methods, constants, types) can be defined the same way as in classes.

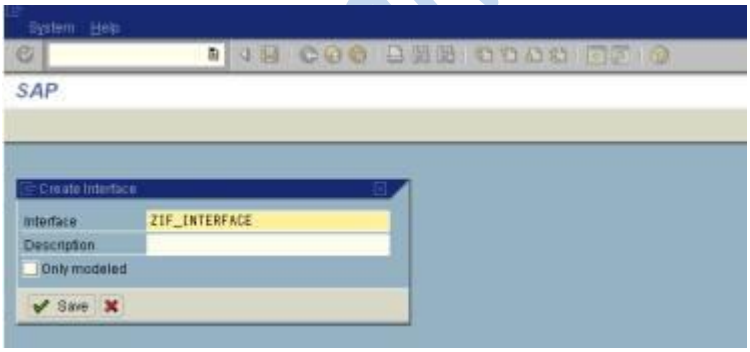
- Interfaces are listed in the definition part of the class, and must always be in the PUBLIC SECTION.
- Operations defined in the interface are implemented as methods of the class. All methods of the interface must be present in the implementation part of the class.
- Attributes, events, constants and types defined in the interface are automatically available to the class carrying out the implementation.
- Interface components are addressed in the class by <interface name>~<component name>

Go to SE24 provide interface name.

Interface name start with ZIF_

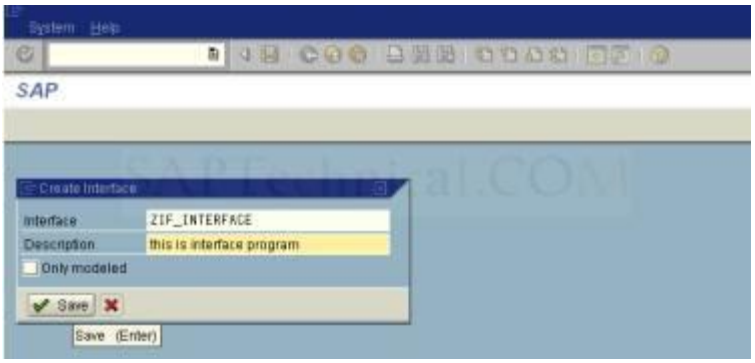


Press create button.

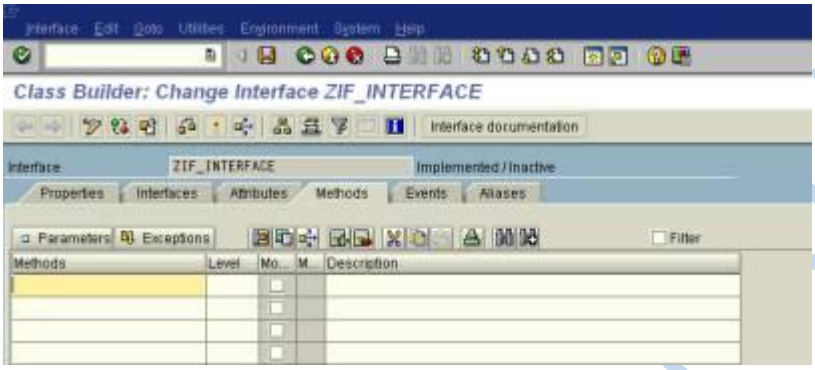


Provide description.

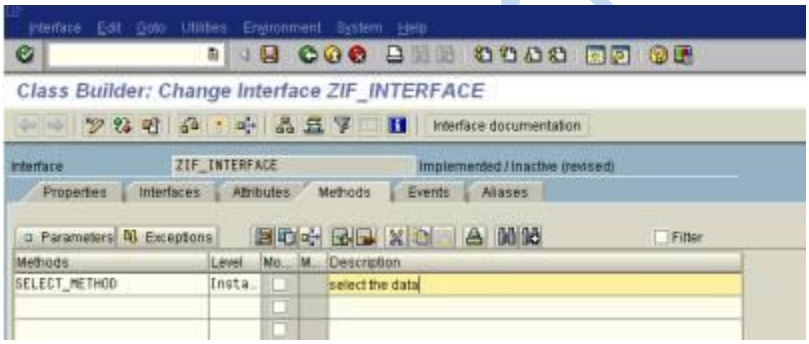
Save it.



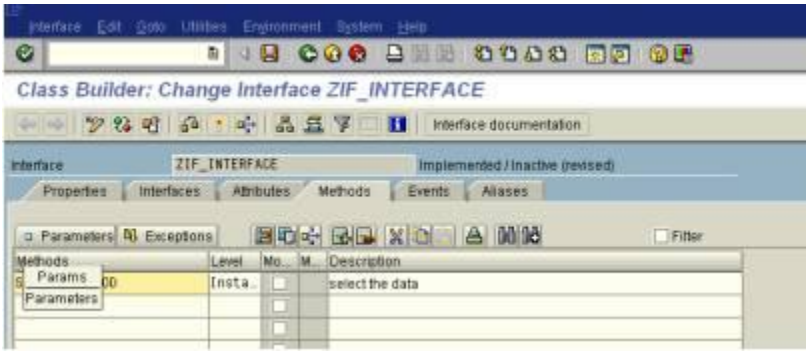
Save it.



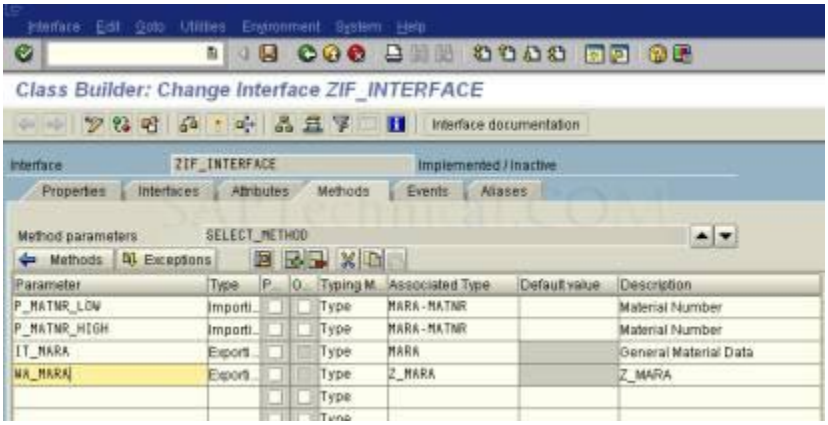
Provide the method name.



Provide the parameters for this method.



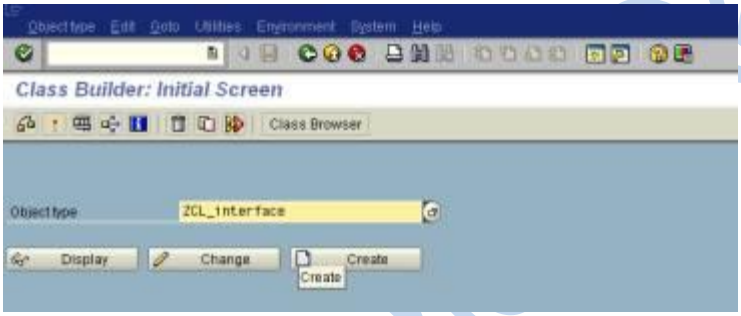
The screen is like this.



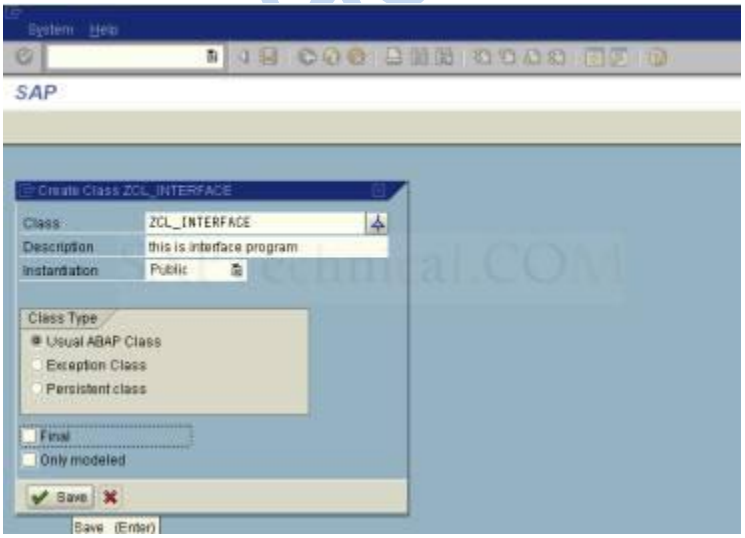
Then save it, check it, activate it.

We cannot implement the method of this interface.

Provide the name in the class.



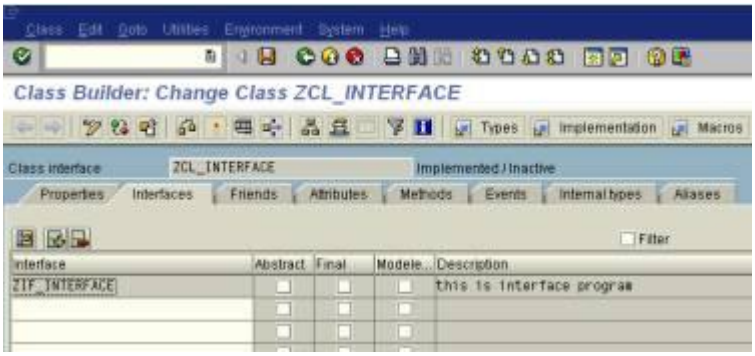
Create it.



Save it.

Go to interface tab.

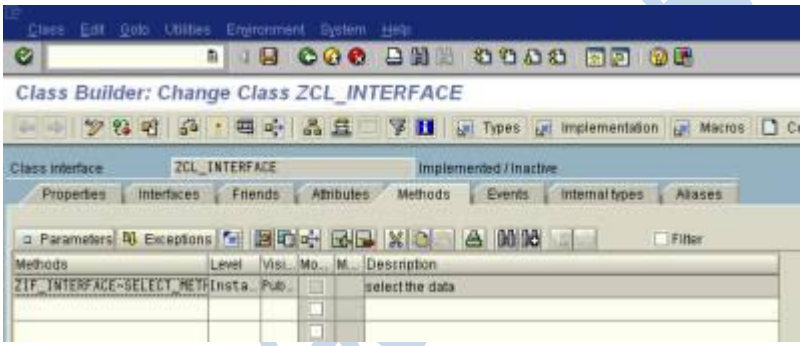
Provide the interface name.



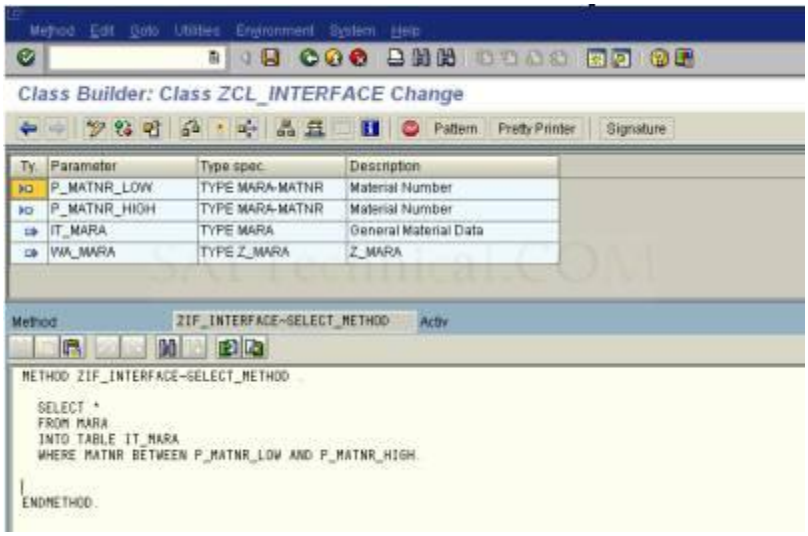
Save it.

Then go to the methods tab.

Then we can see the interface method name in the class method.

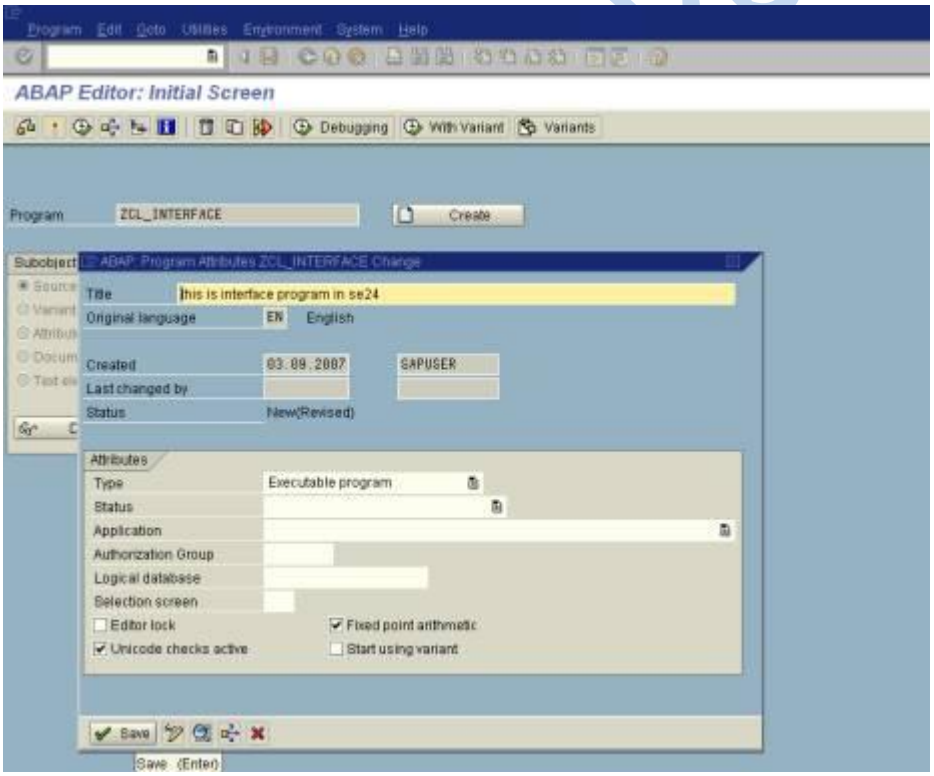


Then double click on the method then write the logic here.



Then save it, check it, activate it.

Create a program in SE38.

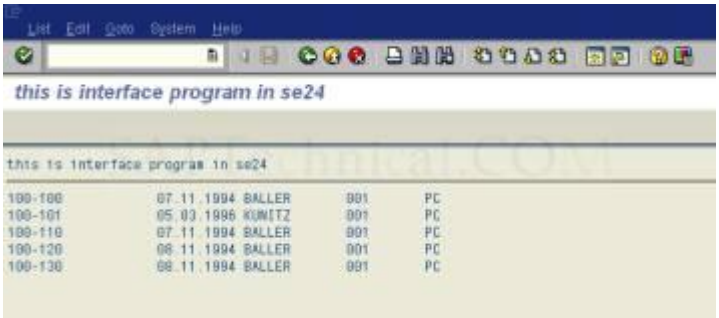


Provide the code.

```
*&---------------------------------------------------------------------*
*& Report  ZCL_INTERFACE                                              *
*&---------------------------------------------------------------------*
REPORT  ZCL_INTERFACE .
*provide mara table
DATA: MARA TYPE MARA.
*provide data objects
DATA: OBJ TYPE REF TO ZCL_INTERFACE,
      IT_MARA TYPE Z_MARA,
      WA_MARA TYPE MARA.
*provide selection screen
SELECT-OPTIONS: S_MATNR FOR MARA-MATNR.
*provide object
START-OF-SELECTION.
  CREATE OBJECT OBJ.
*call the method.
  CALL METHOD OBJ->ZIF_INTERFACE~SELECT_METHOD
    EXPORTING
      P_MATNR_LOW  = S_MATNR-LOW
      P_MATNR_HIGH = S_MATNR-HIGH
    IMPORTING
      IT_MARA      = IT_MARA
      WA_MARA      = WA_MARA.
*display the data
  LOOP AT IT_MARA INTO WA_MARA.
    WRITE:/ WA_MARA-MATNR,
            WA_MARA-ERSDA,
            WA_MARA-ERNAM,
            WA_MARA-MATKL,
            WA_MARA-MEINS.
  ENDLOOP.
```

Then save it, check it ,activate it then execute it the output is like this.

The output is see in the list.



What is the use of aliases?

ALIASES:

This is the aliases name. it is only for interfaces.

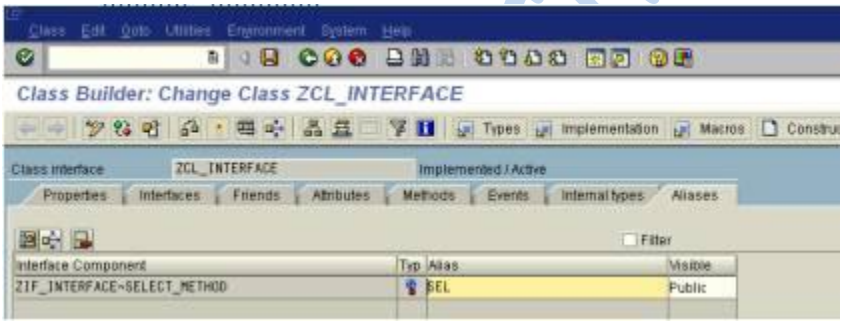
Go to se24.

Then go to aliases tab.

Then provide another name for the interface method.

Then provide public.

Save it, check it, activate it.



Then go to SE38.

Change the method name also.

```
*&---------------------------------------------------------------------*
*& Report  ZCL_INTERFACE                                              *
*&                                                                     *
*&---------------------------------------------------------------------*
REPORT  ZCL_INTERFACE .
*provide mara table
DATA: MARA TYPE MARA.
*provide data objects
DATA: OBJ TYPE REF TO ZCL_INTERFACE,
```

```
      IT_MARA TYPE Z_MARA,
      WA_MARA TYPE MARA.
*provide selection screen
SELECT-OPTIONS: S_MATNR FOR MARA-MATNR.
*provide object
START-OF-SELECTION.
  CREATE OBJECT OBJ.
*call the method.
*  CALL METHOD OBJ->ZIF_INTERFACE~SELECT_METHOD
  CALL METHOD OBJ->SEL
    EXPORTING
      P_MATNR_LOW  = S_MATNR-LOW
      P_MATNR_HIGH = S_MATNR-HIGH
    IMPORTING
      IT_MARA      = IT_MARA
      WA_MARA      = WA_MARA.
*display the data
  LOOP AT IT_MARA INTO WA_MARA.
    WRITE:/ WA_MARA-MATNR,
            WA_MARA-ERSDA,
            WA_MARA-ERNAM,
            WA_MARA-MATKL,
            WA_MARA-MEINS.
  ENDLOOP.
```

The output would be as shown below:.

Creating a global class from a local class

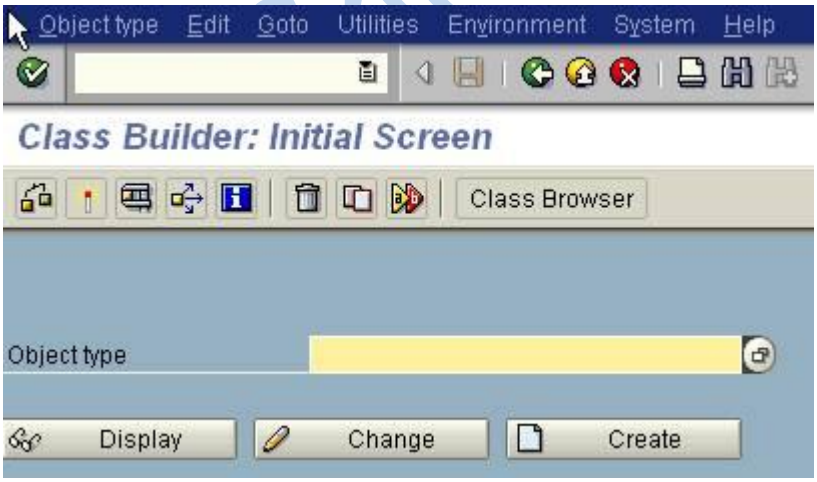
In this tutorial, we would look into the procedure of creating a global class using a local class defined in a program.

Consider the following Z program, which contains a local class:

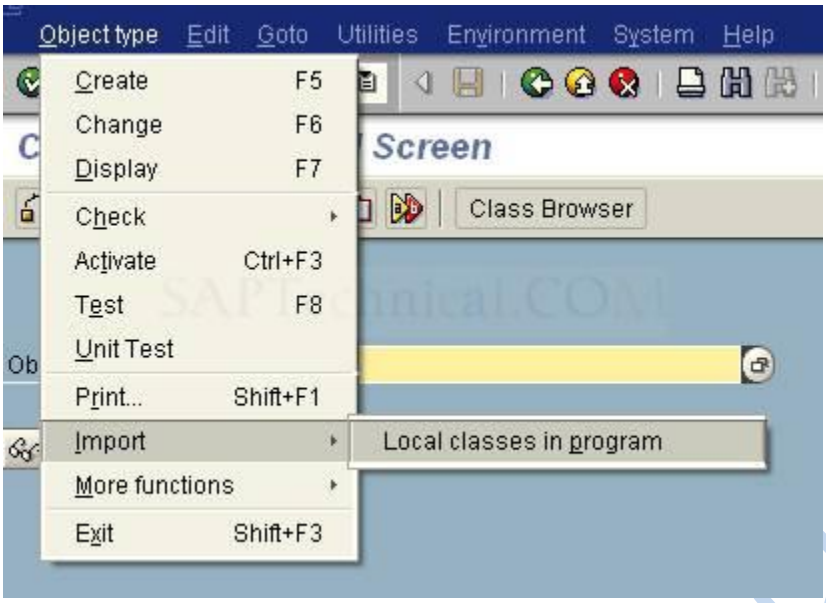
```
REPORT  zclass_test.
*---------------------------------------------------------*
*       CLASS zcl_test DEFINITION
*---------------------------------------------------------*
*
*---------------------------------------------------------*
CLASS zcl_test DEFINITION.
  PUBLIC SECTION.
    METHODS: display.
ENDCLASS.                    "zcl_test DEFINITION
*---------------------------------------------------------*
*       CLASS zcl_test IMPLEMENTATION
*---------------------------------------------------------*
*
*---------------------------------------------------------*
CLASS zcl_test IMPLEMENTATION.
  METHOD display.
    WRITE: 'SAPTechnical.com'.
  ENDMETHOD.                    "display
ENDCLASS.                    "zcl_test IMPLEMENTATION
```

Now let us create a global class SE24 using the above local class:

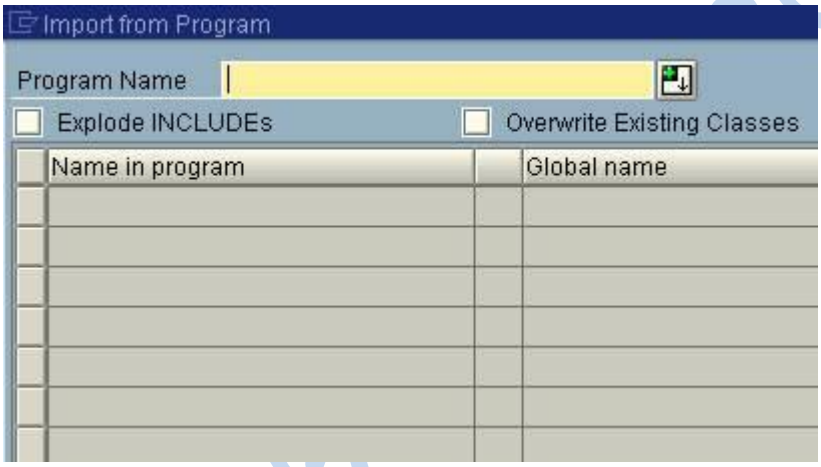
Go to transaction SE24.



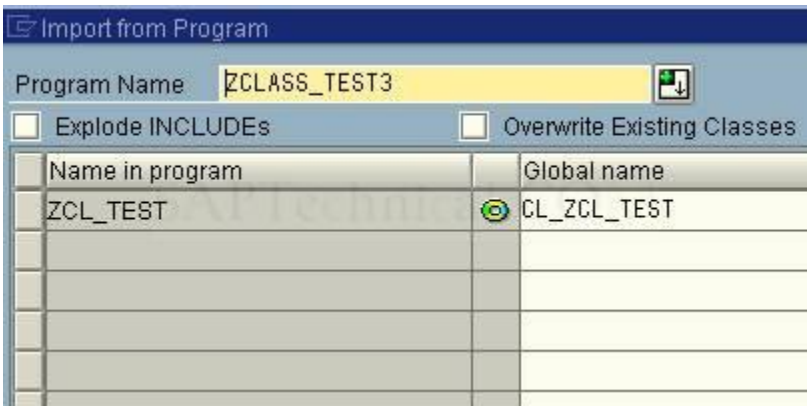
Now select Object type ☐ import ☐ Local classes in program (As shown below):



Following pop-up appears:

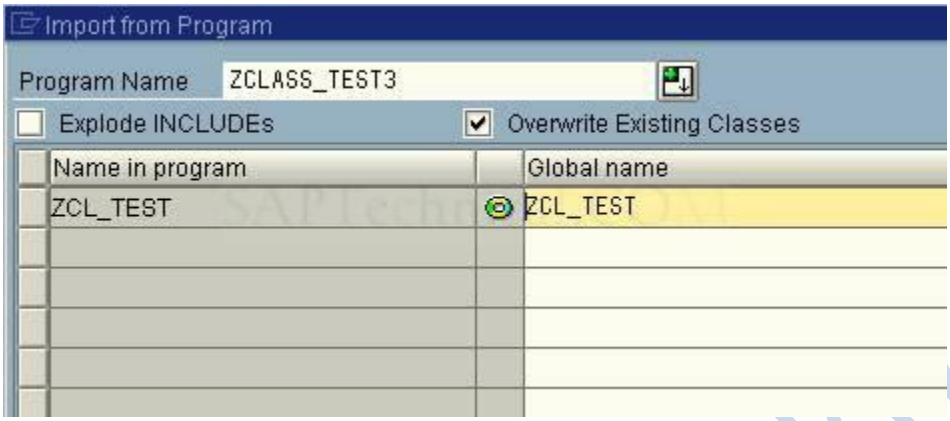


Enter your Z program in which the local class is defined and press ENTER.



The class name defined in our program is ZCL_TEST and the proposed global class name is CL_ZCL_TEST. Now you can rename the global class name as per your requirement.

If the local class is defined inside an include, we need to check the checkbox "Explode INCLUDEs'.



Now click on import. Following message would appear:

Now check the global class ZCL_TEST.

Create Transaction for local class method

In this demo I am going to show how to create transaction on a local class method.

Step1: First create a local class in a report from transaction SE38.

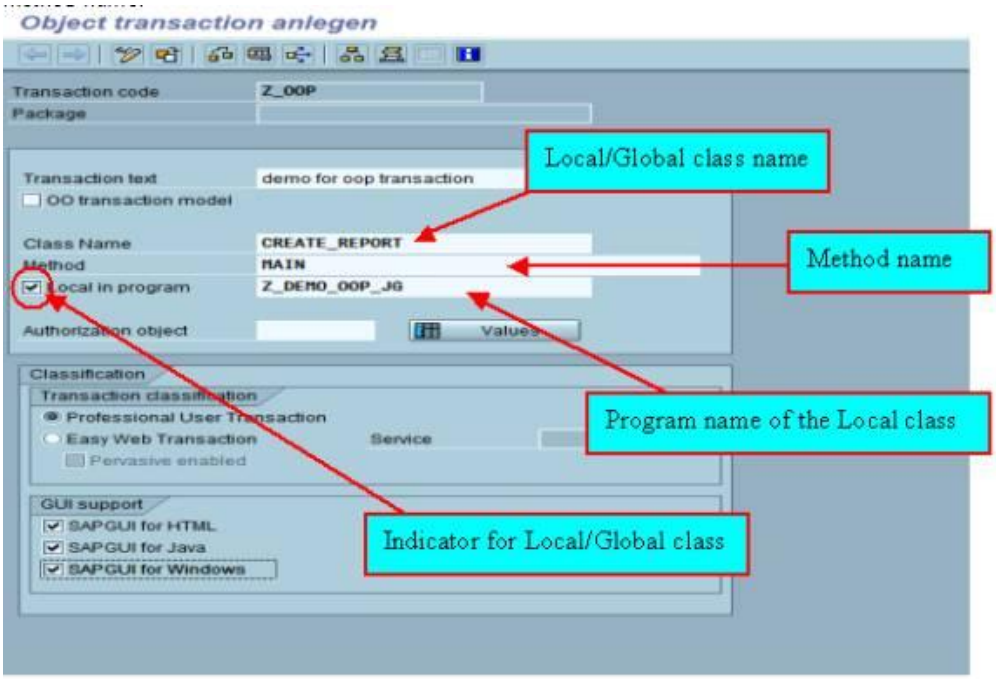
```
REPORT  z_demo_oop_jg .
*---------------------------------------------------------------------*
*       CLASS create_report DEFINITION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
CLASS create_report DEFINITION.
  PUBLIC SECTION.
    METHODS: main.
  PRIVATE SECTION.
    DATA: i_data TYPE STANDARD TABLE OF sbook INITIAL SIZE 0.
    METHODS: fetch_data,
             display_data.
ENDCLASS.                    "create_report DEFINITION
*---------------------------------------------------------------------*
*       CLASS create_report IMPLEMENTATION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
CLASS create_report IMPLEMENTATION.
  METHOD fetch_data.
* Select 100 records from SBOOK table
    SELECT * FROM sbook
    INTO TABLE i_data
    UP TO 100 ROWS.
  ENDMETHOD.                    "fetch_data
  METHOD display_data.
    CALL FUNCTION 'REUSE_ALV_GRID_DISPLAY'
      EXPORTING
        i_structure_name = 'SBOOK'
      TABLES
        t_outtab         = i_data
      EXCEPTIONS
        program_error    = 1
        OTHERS           = 2.
    IF sy-subrc <> 0.
      MESSAGE ID sy-msgid TYPE sy-msgty NUMBER sy-msgno
              WITH sy-msgv1 sy-msgv2 sy-msgv3 sy-msgv4.
    ENDIF.
  ENDMETHOD.                    "display_data
  METHOD main.
    fetch_data( ).
    display_data( ).
  ENDMETHOD.                    "main
ENDCLASS.                    "create_report IMPLEMENTATION
```

Step2. Now from transaction SE93 create a transaction for the method MAIN as shown in the screen shots given below:

Give a transaction name and press create button.

In the next screen give a description and choose the proper radio button

In the next screen provide report name (where the local class is defined), local class name and method name.



Now save the transaction and execute it.
In this case it will display the report.

ID	No.	Flight Date	Book. no.	Cust. No.			Lug.weight	Unit			Amount (for.currency)	Curr.	Amount (loc.currency)	Curr.	Booking date	Sales Off.	Agenc
A	17	07.03.2007	1	2780	P		17,4000	KG		B	875,90	EUR	803,58	USD	06.12.2006		1
AA	17	07.03.2007	2	1946	P		13,4000	KG		B	761,30	USD	761,30	USD	29.01.2007		2
AA	17	07.03.2007	3	4387	P		9,8000	KG		B	761,30	USD	761,30	USD	07.11.2006	29	
AA	17	07.03.2007	4	4157	P		23,9000	KG		B	875,90	EUR	803,58	USD	11.11.2006		1
AA	17	07.03.2007	5	3315	P		25	KG	X	B	829,82	EUR	761,30	USD	13.01.2007		
AA	17	07.03.2007	6	2059	P		19,8000	KG		B	514,78	GBP	761,30	USD	28.01.2007		1
AA	17	07.03.2007	7	744	P		18,9000	KG		B	845,88	USD	845,88	USD	07.12.2006		1
AA	17	07.03.2007	8	941	P		10,9000	KG		B	922,01	EUR	845,88	USD	12.01.2007		1
AA	17	07.03.2007	9	4051	P		15,3000	KG	X	B	486,17	GBP	719,00	USD	02.11.2006		1
AA	17	07.03.2007	10	1656	P		0	KG	X	B	803,58	USD	803,58	USD	28.11.2006		1
AA	17	07.03.2007	11	4151	P	X	21,8000	KG		B	783,71	EUR	719,00	USD	19.11.2006		2
AA	17	07.03.2007	12	1817	P		27,1000	KG		B	657,88	AUD	803,58	USD	17.02.2007		1
AA	17	07.03.2007	13	1392	P		27,5000	KG	X	B	829,82	EUR	761,30	USD	14.01.2007		1
AA	17	07.03.2007	14	1546	P		12,2000	KG	X	B	719,00	USD	719,00	USD	24.11.2006		1
AA	17	07.03.2007	15	4468	P		10,4000	KG	X	B	783,71	EUR	719,00	USD	18.12.2006		
AA	17	07.03.2007	16	913	P		0	KG	X	B	7.853,57	ZAR	845,88	USD	17.02.2007		2
AA	17	07.03.2007	17	2073	P		14,4000	KG		B	922,01	EUR	845,88	USD	10.01.2007		2
AA	17	07.03.2007	18	1119	P		13,5000	KG		B	829,82	EUR	761,30	USD	23.10.2006		1
AA	17	07.03.2007	19	1601	P		0	KG	X	B	761,30	USD	761,30	USD	04.02.2007		3
AA	17	07.03.2007	20	329	P		0	KG	X	B	866,68	EUR	795,12	USD	21.10.2006		1
AA	17	07.03.2007	21	4271	P	X	0	KG	X	B	1.373,19	SGD	761,30	USD	10.11.2006		1
AA	17	07.03.2007	22	4271	P		0	KG	X	B	829,82	EUR	761,30	USD	22.10.2006		
AA	17	07.03.2007	23	2610	P		21,6000	KG		B	719,00	USD	719,00	USD	15.02.2007		3
AA	17	07.03.2007	24	4535	P		0	KG		B	514,78	GBP	761,30	USD	13.02.2007		2
AA	17	07.03.2007	25	2558	P	X	10,7000	KG		B	845,88	USD	845,88	USD	02.12.2006		3
AA	17	07.03.2007	26	3940	P		0	KG		B	875,90	EUR	803,58	USD	31.10.2006		1
AA	17	07.03.2007	27	534	P		0	KG		B	783,71	EUR	719,00	USD	17.11.2006		

This technique can be used to call a method (local class) from another program using statement: call transaction.

EX: call transaction 'Z_OOP'.

Note: In the same way you can create a transaction on method of a global class.

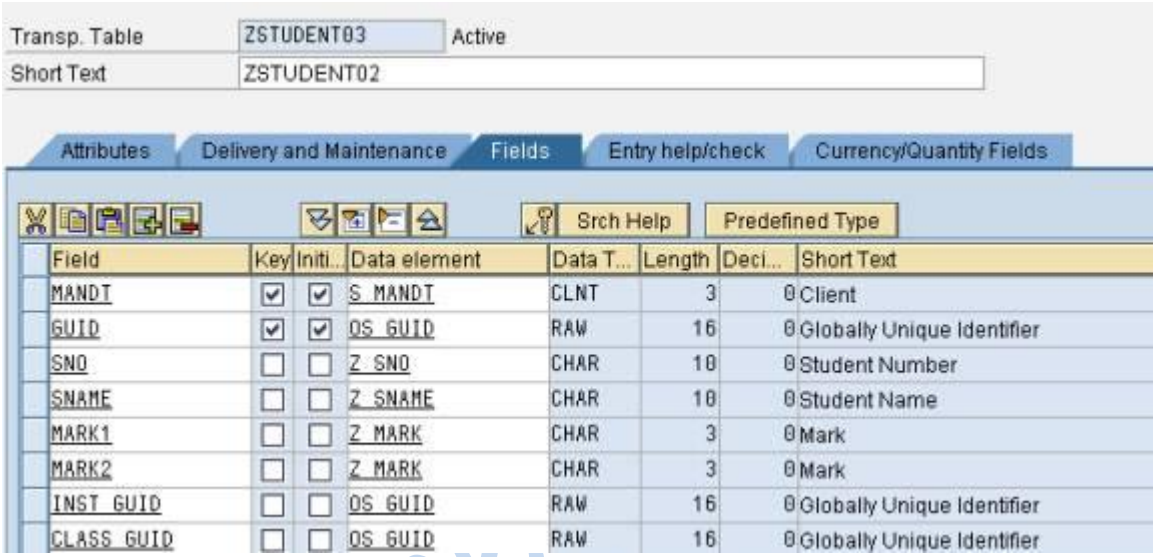
Persistent Objects: A Quick Reference

Objective

To store references to the persistent object persistently in the database.

Step: 1 -> Create a database table

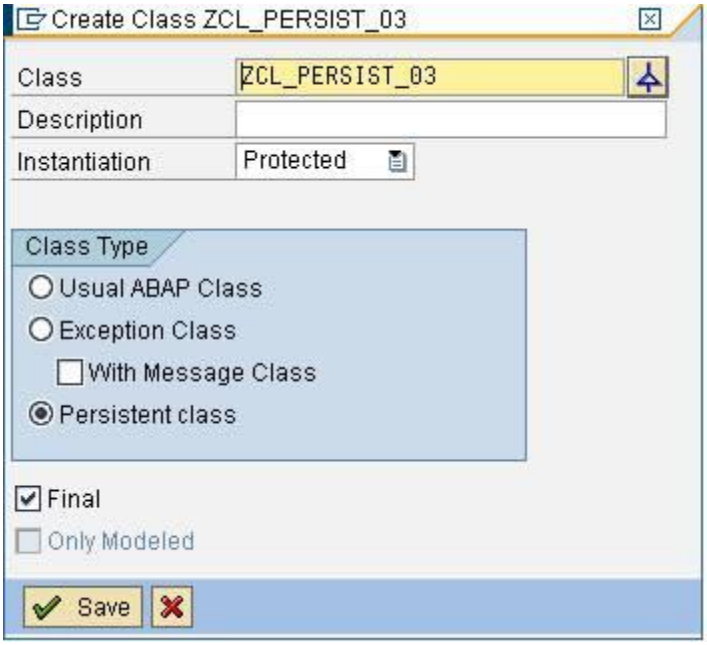
This table should contain 2 fields of type OS_GUID in addition to the GUID object attribute. The first field is used to store the instance GUID while the other is used to store the class GUID.



Field	Key	Initi...	Data element	Data T...	Length	Deci...	Short Text
MANDT	☑	☑	S_MANDT	CLNT	3	0	Client
GUID	☑	☑	OS_GUID	RAW	16	0	Globally Unique Identifier
SNO	☐	☐	Z_SNO	CHAR	10	0	Student Number
SNAME	☐	☐	Z_SNAME	CHAR	10	0	Student Name
MARK1	☐	☐	Z_MARK	CHAR	3	0	Mark
MARK2	☐	☐	Z_MARK	CHAR	3	0	Mark
INST_GUID	☐	☐	OS_GUID	RAW	16	0	Globally Unique Identifier
CLASS_GUID	☐	☐	OS_GUID	RAW	16	0	Globally Unique Identifier

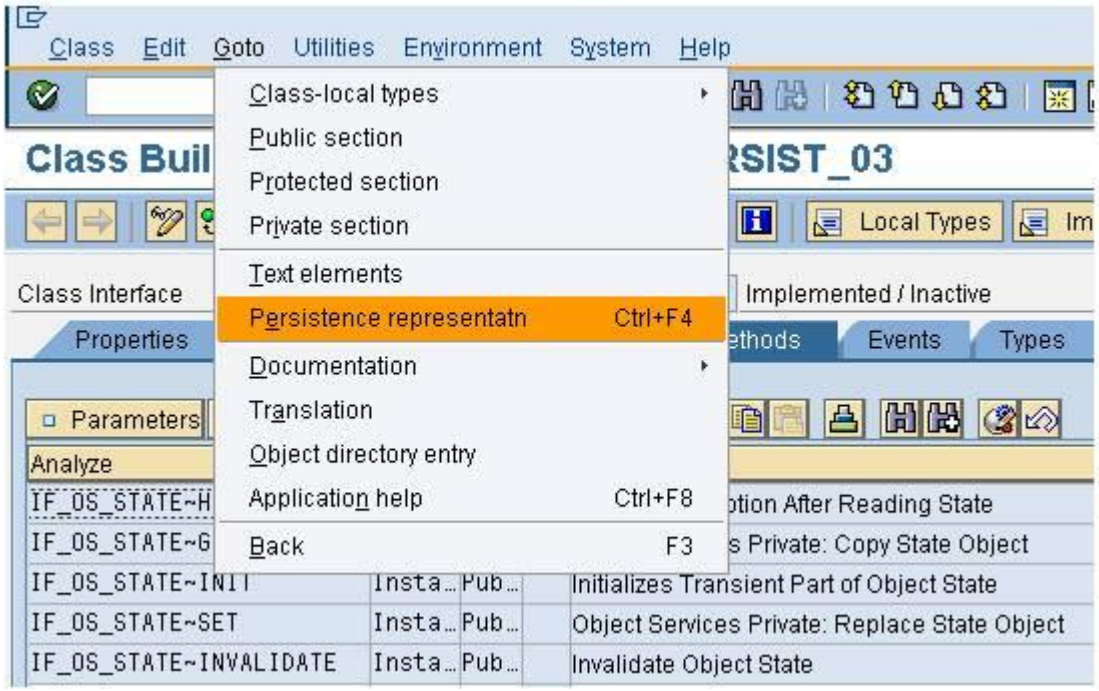
Step: 2 ->Create a Persistent Class

In the next screen select the class type as Persistent Class and then hit Save Button.



Step: 3 -> Persistent Mapping or Mapping

Goto->Persistence Representation



Give the table name. For e.g. ZSTUDENT03 and hit the enter button

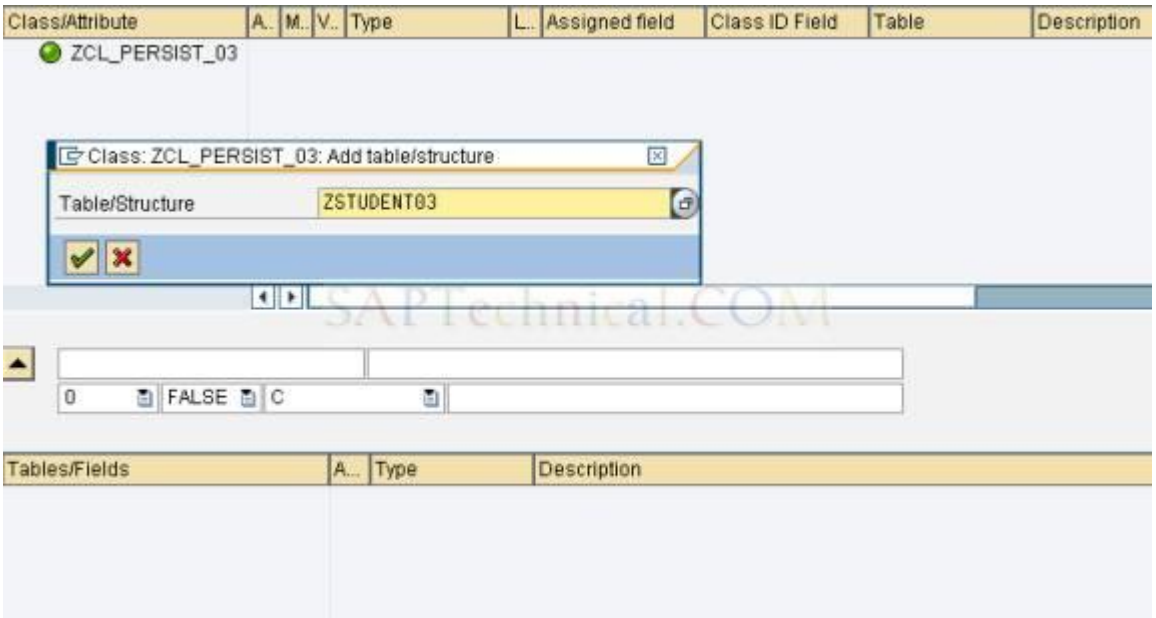
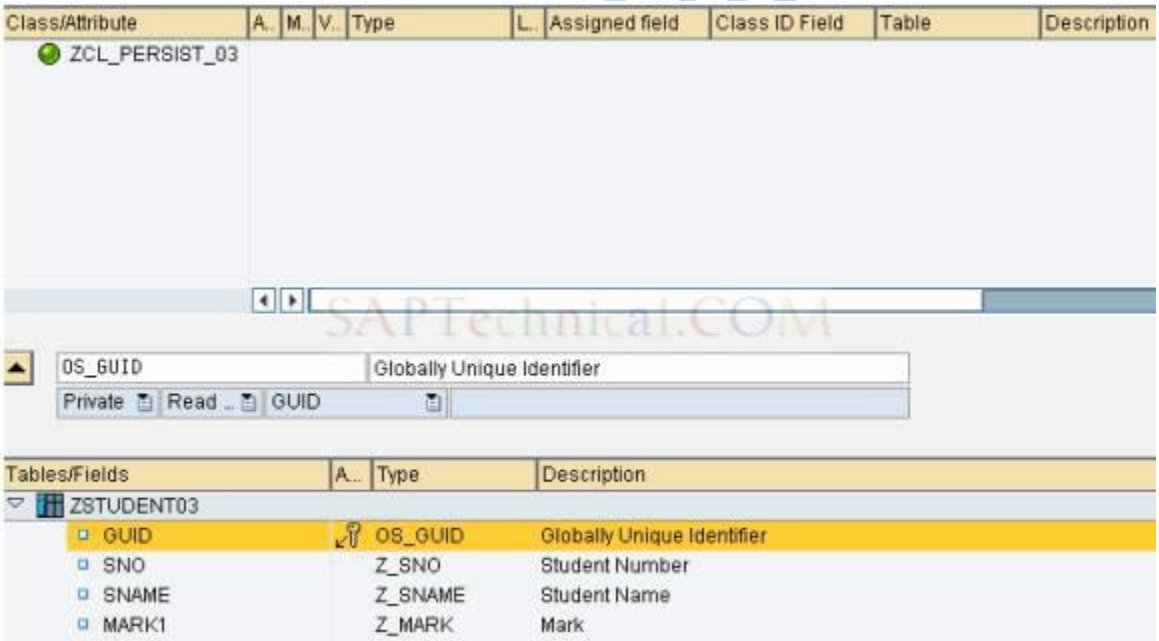
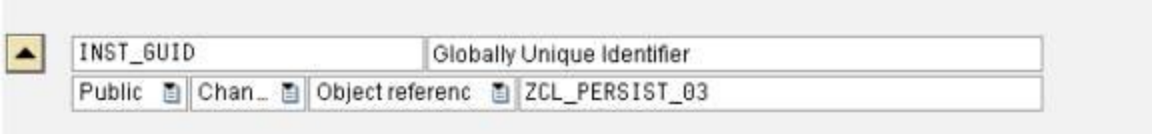


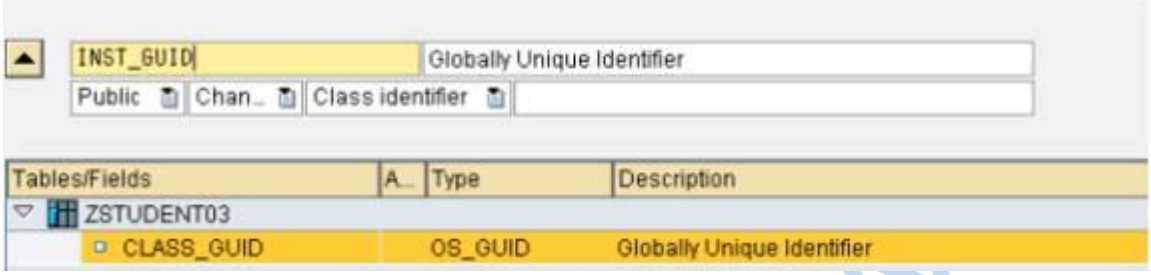
Table fields appear in the lower half of the tool screen. Double Click the table field and press the button. Add the remaining fields.



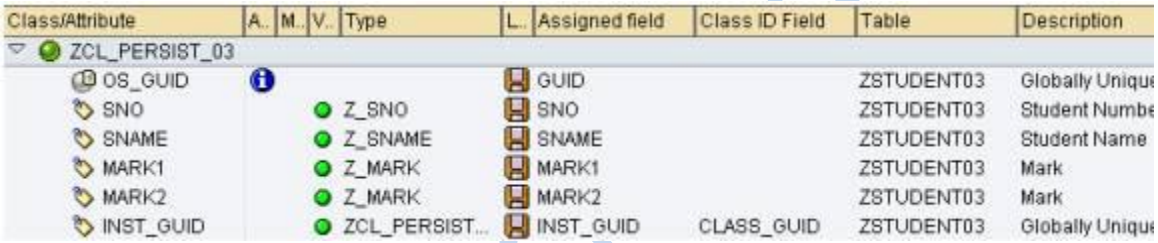
While adding the field INST_GUID choose the assignment type as Object reference and for the attribute type specify the class name for e.g. ZCL_PERSIST_03



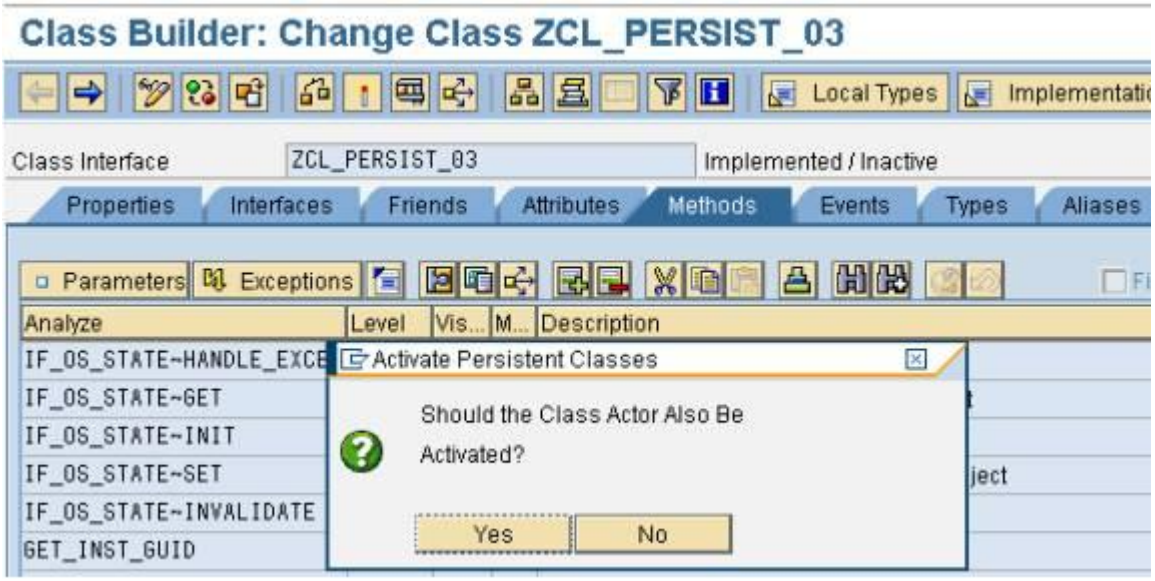
To assign a class indicator, select the corresponding table field of type **OS_GUID** by double-clicking. Enter the name of the reference attribute for the attribute name.



Screen looks like below. Press Save.



Activate the Class. Press the Yes Button to activate the class actor as well.



Write a Program to create the persistent object.

Source Code excerpt:

```
DATA: AGENT TYPE REF TO ZCA_PERSIST_03,
      STUDENT TYPE REF TO ZCL_PERSIST_03,
      REF1 TYPE REF TO OBJECT.
DATA: SNO LIKE ZSTUDENT04-SNO VALUE '1000',
      SNAME LIKE ZSTUDENT04-SNAME VALUE 'HAKIM',
      MARK1 LIKE ZSTUDENT04-MARK1 VALUE '100',
      MARK2 LIKE ZSTUDENT04-MARK2 VALUE '100'.
AGENT = ZCA_PERSIST_03=>AGENT.
TRY.
CALL METHOD AGENT->CREATE_PERSISTENT
  EXPORTING
*    I_INST_GUID =
    I_MARK1     = MARK1
    I_MARK2     = MARK2
    I_SNAME     = SNAME
    I_SNO       = SNO
*  RECEIVING
*    RESULT      =
    .
 COMMIT WORK.
 CATCH CX_OS_OBJECT_EXISTING .
ENDTRY.
```

Go to SE16 and check the entries.

Table ZSTUDENT03 Display

Client		800
GUID	(GUID)	30EA9E25999F0843BE6F7B86063F2916
Student Number		1000
Student Name		HAKIM
Mark	(MARK1)	100
Mark	(MARK2)	100
GUID	(INST GUID)	00000000000000000000000000000000
GUID	(CLASS GUID)	00000000000000000000000000000000

Store the Persistent Object Reference in the database.

Source Code excerpt.

```
TRY.
CALL METHOD AGENT->IF_OS_CA_PERSISTENCY~GET_PERSISTENT_BY_OID
  EXPORTING
```

```
    I_OID  = '30EA9E25999F0843BE6F7B86063F2916'
  RECEIVING
    RESULT = REF1
    .
 CATCH CX_OS_OBJECT_NOT_FOUND .
 CATCH CX_OS_CLASS_NOT_FOUND .
ENDTRY.
STUDENT ?= REF1.
STUDENT->SET_INST_GUID( STUDENT ).
COMMIT WORK.
```

Go to SE16 and check the entries.

Table ZSTUDENT03 Display

Client		800
GUID	(GUID)	30EA9E25999F0843BE6F7B86063F2916
Student Number		1000
Student Name		HAKIM
Mark	(MARK1)	100
Mark	(MARK2)	100
GUID	(INST GUID)	30EA9E25999F0843BE6F7B86063F2916
GUID	(CLASS GUID)	FDAC954CFF36DA479FF4BD78D02C29E7

Persistent Objects: Using Business Key Identity

Objective

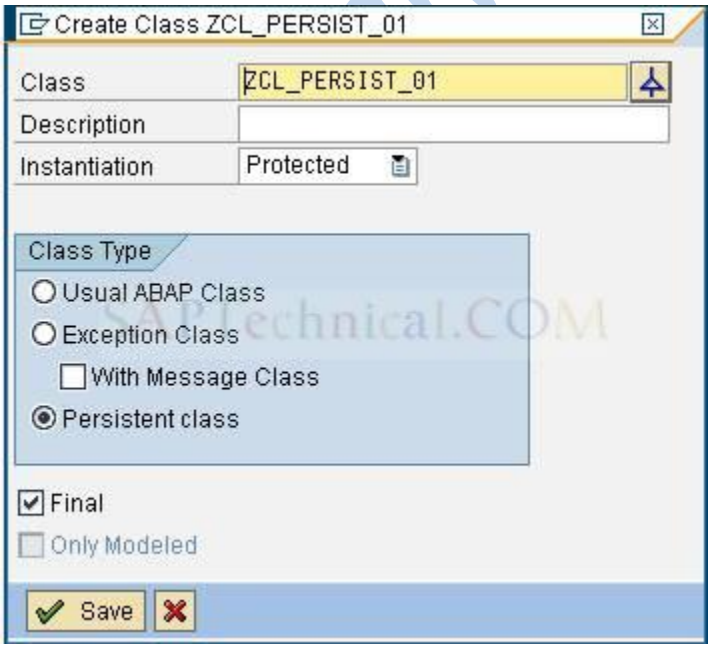
To Store the attributes of the Objects persistently in the database.

Step: 1 ->Create a Persistent Class

Go to Class Builder (TCode SE24)

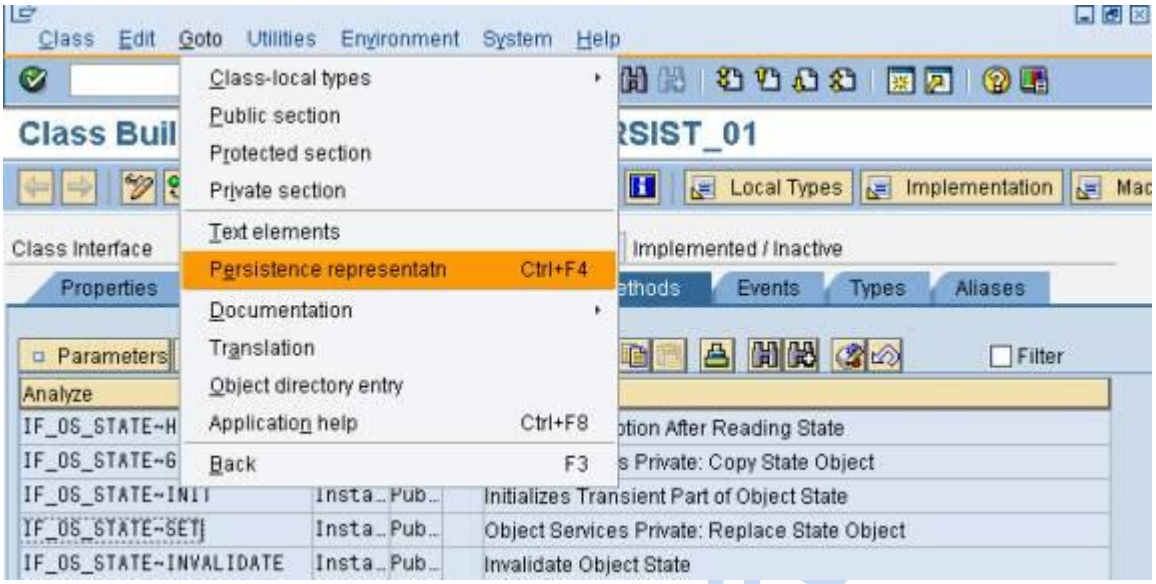
Give persistent class name for e.g. ZCL_PERSIST_01 and hit the create button

In the next screen select the class type as Persistent Class and then hit Save Button.



Step: 2 -> Persistent Mapping or Mapping

Utilities->Persistence Representation



Give the table name. For e.g. ZSTUDENT01 and hit the enter button

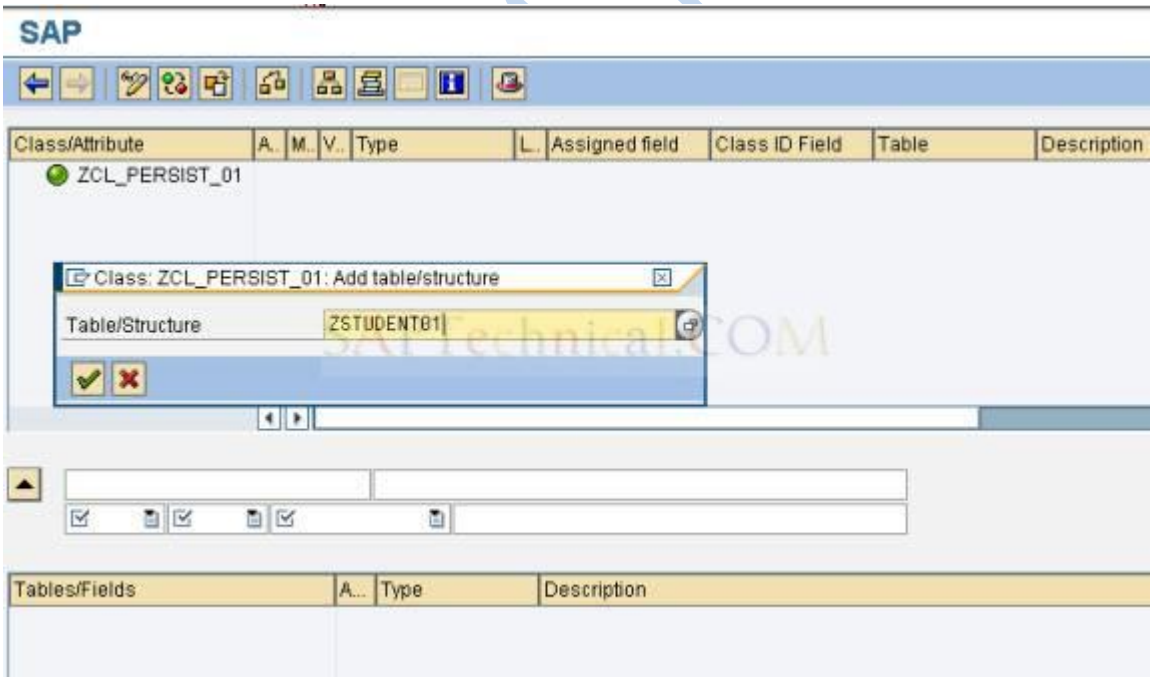


Table fields appear below the mapping screen.

Tables/Fields	A...	Type	Description
ZSTUDENT01			
SNO		Z_SNO	Student Number
SNAME		Z_SNAME	Student Name
MARK1		Z_MARK	Mark
MARK2		Z_MARK	Mark

Double Click the table field and then press the upward arrow button

SNO	Student Number		
Public	Read ..	Business key	Z_SNO

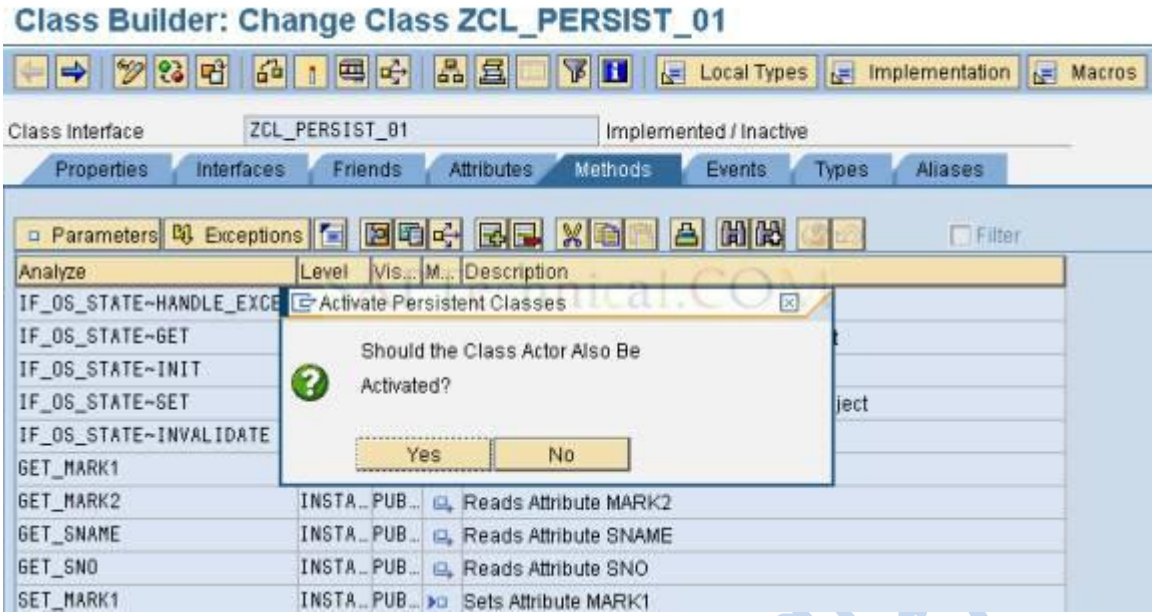
Tables/Fields	A...	Type	Description
ZSTUDENT01			
SNO		Z_SNO	Student Number
SNAME		Z_SNAME	Student Name
MARK1		Z_MARK	Mark
MARK2		Z_MARK	Mark

Add the remaining fields as well. Screen looks like this now.

Change Persistence Representation: ZCL_PERSIST_01

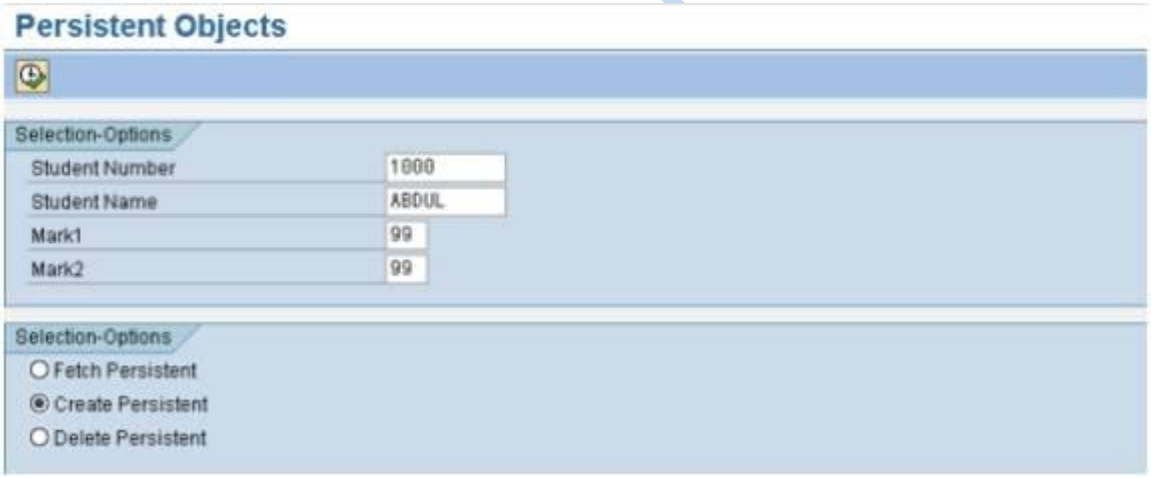
Class/Attribute	A..	M..	V..	Type	L..	Assigned field	Class ID Field	Table	Description
ZCL_PERSIST_01									
SNAME				Z_SNAME		SNAME		ZSTUDENT01	Student Name
SNO				Z_SNO		SNO		ZSTUDENT01	Student Number
MARK1				Z_MARK		MARK1		ZSTUDENT01	Mark
MARK2				Z_MARK		MARK2		ZSTUDENT01	Mark

Activate the Class. Press the Yes Button to activate the class actor as well.



Step: 3 -> Write a Program to create / fetch / delete the Persistent Object

Our Program Selection-Screen looks like below



Here I am creating a new student. Specify the value and hit the execute button.

Output:

Go to SE16 and check the entries

Source Code

```
*&---------------------------------------------------------------------*
*& Report  Z_GET_PERSISTENT
*& Published @ SAPTechnical.com
*&---------------------------------------------------------------------*
*&Author : Abdul Hakim
*&Development Language: ABAP
*&System Release: SAP Netweaver 2004
*&Title: Persistent Object using Business Key Object Identity!!
*&---------------------------------------------------------------------*
REPORT  Z_GET_PERSISTENT.
selection-screen begin of block blk1 with frame title tit1.
parameters: sno   like zstudent01-sno obligatory,
          sname like zstudent01-sname obligatory,
          mark1 like zstudent01-mark1 obligatory,
          mark2 like zstudent01-mark2 obligatory.
selection-screen end of block blk1.
selection-screen begin of block blk2 with frame title tit2.
parameters: r1 type c radiobutton group rad1,
          r2 type c radiobutton group rad1,
          r3 type c radiobutton group rad1.
selection-screen end of block blk2.
*---------------------------------------------------------------------*
*       CLASS lcl_class1 DEFINITION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
class lcl_class1 definition.
  public section.
    data: agent     type ref to zca_persist_01,
          students  type ref to zcl_persist_01.
    data result1 type ref to zcl_persist_01.
    methods: fetch_persistent importing im_sno like sno
                                        im_sname like sname,
             create_persistent importing im_sno like sno
                                         im_sname like sname
                                         im_mark1 like mark1
                                         im_mark2 like mark2,
```

```
          delete_persistent importing im_sno like sno
                                      im_sname like sname,
          output.
  private section.
    data: sno type zstudent01-sno,
          sname type zstudent01-sname,
          mark1 type zstudent01-mark1,
          mark2 type zstudent01-mark2.
endclass.                    "lcl_class1 DEFINITION
*---------------------------------------------------------------------*
*       CLASS lcl_class1 IMPLEMENTATION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
class lcl_class1 implementation.
  method fetch_persistent.
    agent = zca_persist_01=>agent.
    try.
       agent->get_persistent( exporting i_sno     = im_sno
                                        i_sname   = im_sname
                              receiving result  = students ).
       .
       sname = students->get_sname( ).
       sno   = students->get_sno( ).
       mark1 = students->get_mark1( ).
       mark2 = students->get_mark2( ).
       if r1 eq 'X'.
         output( ).
       endif.
     CATCH CX_OS_OBJECT_NOT_FOUND .
     MESSAGE 'Object doesn''t exists' TYPE 'I' DISPLAY LIKE 'E'.
    endtry.
  endmethod.                   "fetch_persistent
  method output.
    write:/ sno,
            sname,
            mark1,
            mark2.
  endmethod.                   "output
  method create_persistent.
    fetch_persistent( exporting im_sname = im_sname
                                im_sno = im_sno ).
    try.
       agent->create_persistent( exporting i_mark1 = im_mark1
                                           i_mark2 = im_mark2
                                           i_sname = im_sname
                                           i_sno   = im_sno
                                 receiving result = students ).
       commit work.
       write 'Object Created'.
     CATCH CX_OS_OBJECT_EXISTING .
     MESSAGE 'Object already exists' TYPE 'I' DISPLAY LIKE 'E'.
    endtry.
```

```
  endmethod.                    "create_persistent
  method delete_persistent.
    fetch_persistent( exporting im_sname = im_sname
                              im_sno = im_sno ).
    try.
        agent->delete_persistent( exporting i_sname = im_sname
                                            i_sno   = im_sno ).
        commit work.
        write 'Object Deleted'.
      CATCH CX_OS_OBJECT_NOT_EXISTING .
      MESSAGE 'Object doesn''t exists' TYPE 'I' DISPLAY LIKE 'E'.
    endtry.
  endmethod.                    "delete_persistent
endclass.                   "lcl_class1 IMPLEMENTATION
data ref_class1 type ref to lcl_class1.
*---------------------------------------------------------------------*
*       Load-of-Program
*---------------------------------------------------------------------*
load-of-program.
  tit1 = text-001.
  tit2 = text-001.
*---------------------------------------------------------------------*
*       Start-of-Selection
*---------------------------------------------------------------------*
start-of-selection.
  create object ref_class1.
  if r1 eq 'X'.
    ref_class1->fetch_persistent( exporting im_sno = sno
                                            im_sname = sname ).
  elseif r2 eq 'X'.
    ref_class1->create_persistent( exporting im_sno = sno
                                             im_sname = sname
                                             im_mark1 = mark1
                                             im_mark2 = mark2 ).
  else.
    ref_class1->delete_persistent( exporting im_sno = sno
                                             im_sname = sname ).
  endif.
```

Persistent Objects: Using GUID Object Identity

Objective

To Store the attributes of the Objects persistently in the database.

Persistent Object's Identity

Every Persistent Object has a unique identity with which it can be accessed. There are 2 types of Object identity

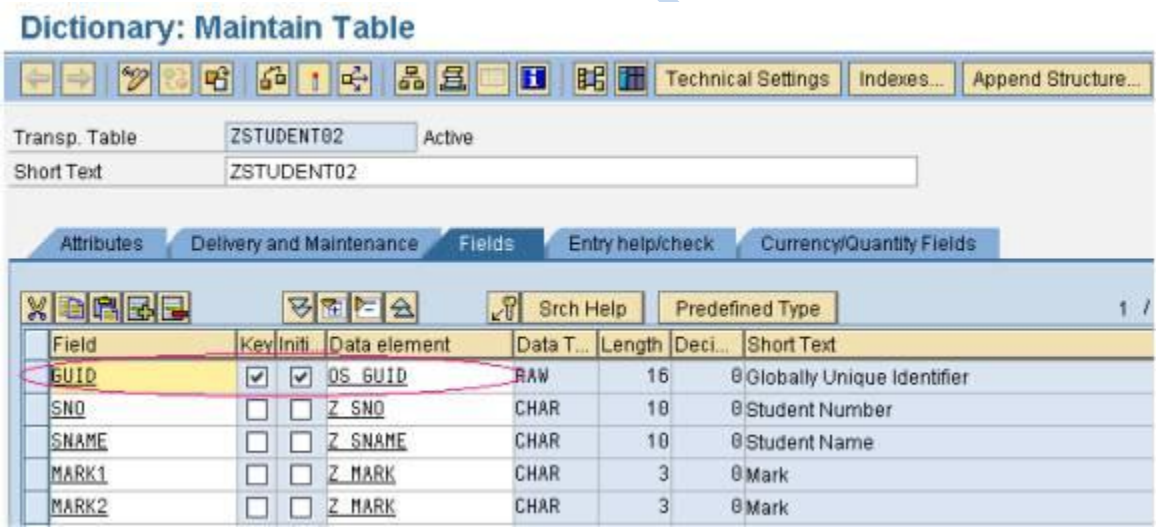
1. Business Key
2. GUID(Global Unique Identifier)

For Persistent Objects using Business key Identity please check my previous article, "Persistent Objects: Using Business Key identity"

This article will focus only on Persistent Object using GUID.

Step: 1 -> Create a database table

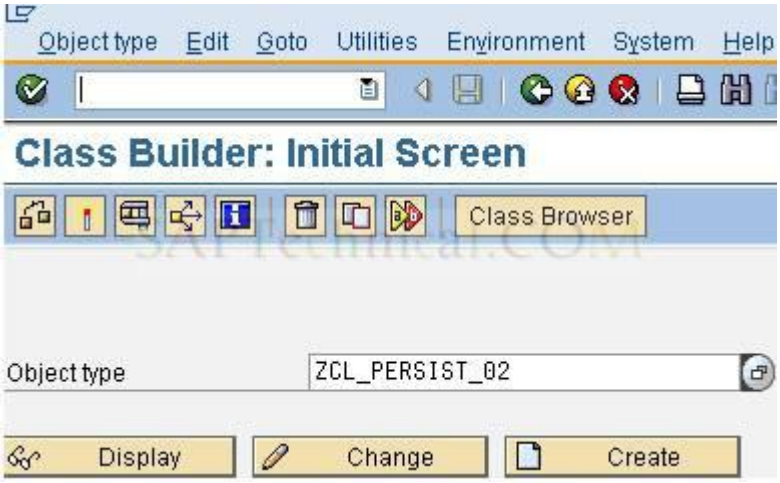
This table should contain a key field of type OS_GUID.



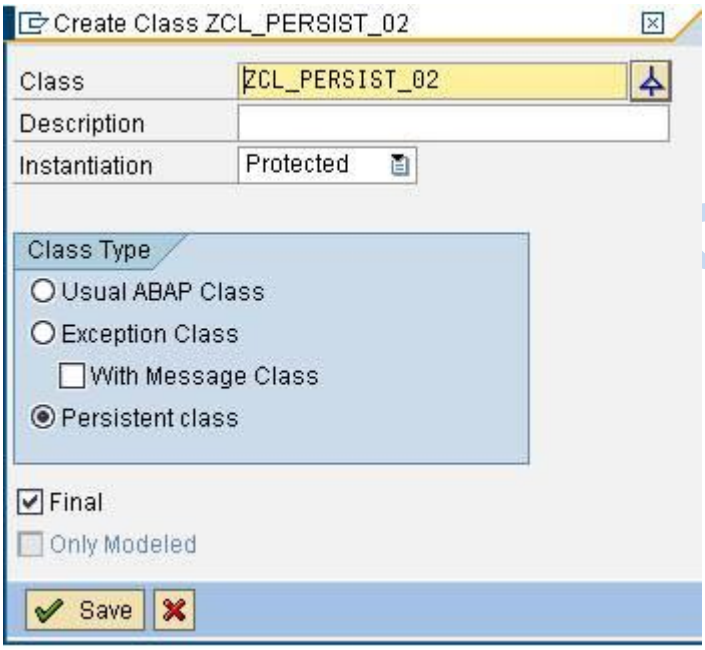
Step: 2 ->Create a Persistent Class

Go to Class Builder (tcode SE24)

Give persistent class name for eg ZCL_PERSIST_02 and hit the create button



In the next screen select the class type as Persistent Class and then hit Save Button.



Step: 3 -> Persistent Mapping or Mapping

Goto->Persistence Representation

Give the table name. For eg ZSTUDENT02 and hit the enter button

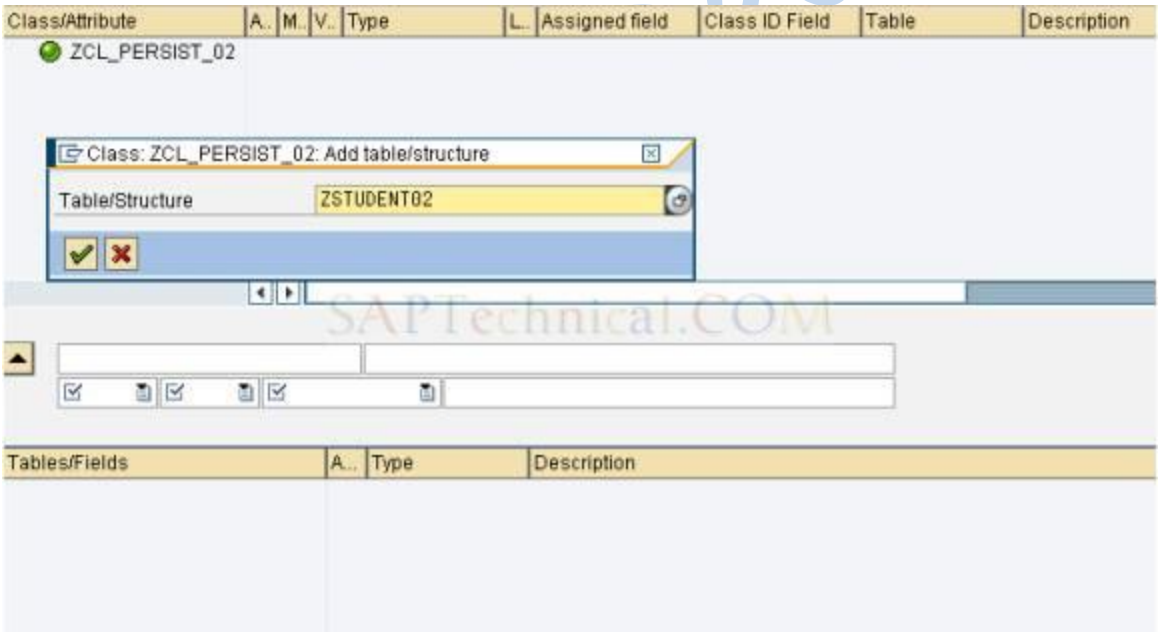
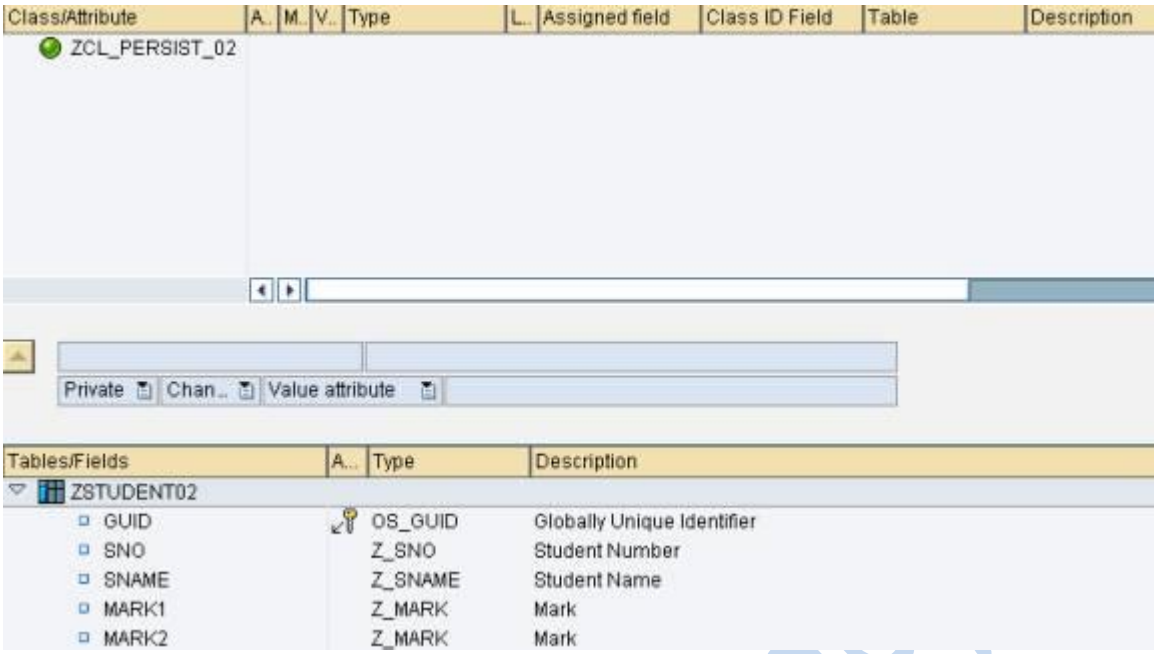
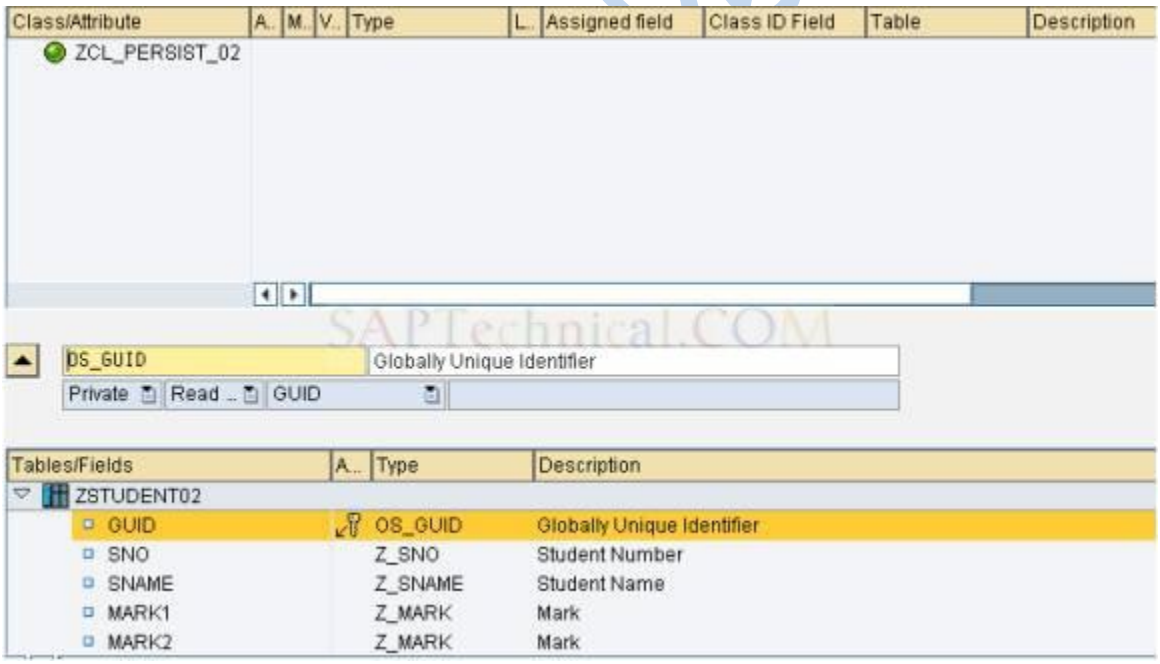


Table fields appear in the lower half of the tool screen.



Double Click the table field



Press the upward arrow button 

Class/Attribute	A..	M..	V..	Type	L..	Assigned field	Class ID Field	Table	Description
ZCL_PERSIST_02									
OS_GUID						GUID		ZSTUDENT02	Globally Unique

SN0 | Student Number

Public | Chan.. | Value attribute | Z_SN0

Tables/Fields	A...	Type	Description
ZSTUDENT02			
SNO		Z_SNO	Student Number
SNAME		Z_SNAME	Student Name
MARK1		Z_MARK	Mark
MARK2		Z_MARK	Mark

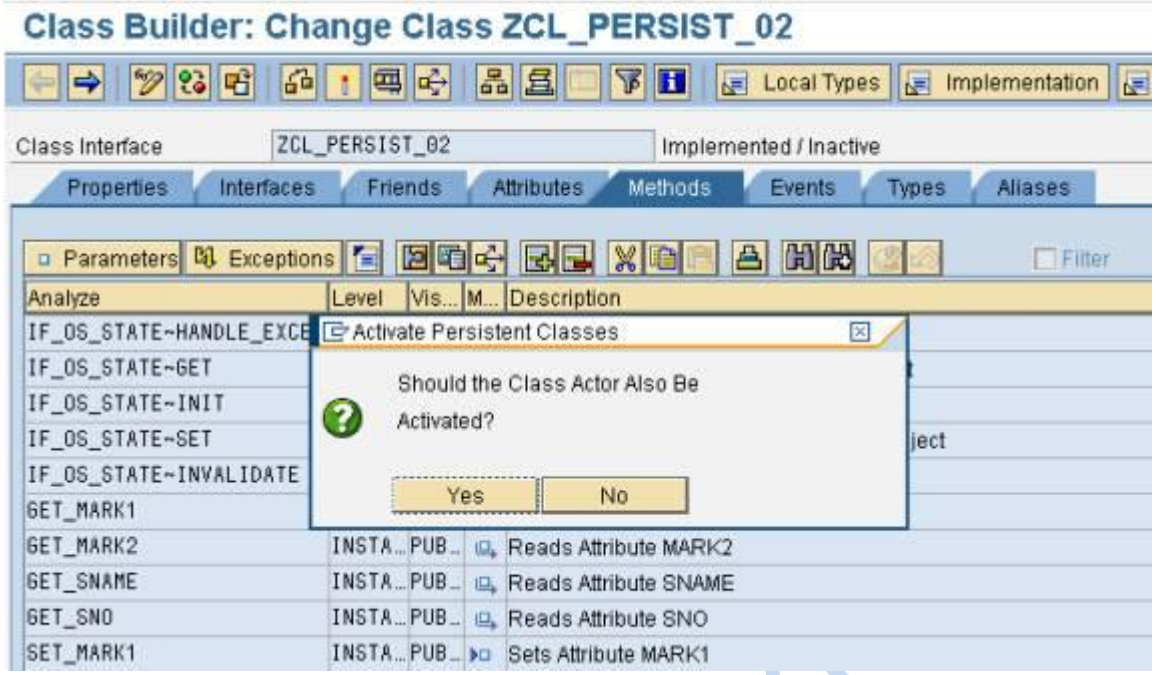
Add the remaining fields as well. Screen looks like this now. Press Save Button

Class/Attribute	A..	M..	V..	Type	L..	Assigned field	Class ID Field	Table	Description
ZCL_PERSIST_02									
OS_GUID						GUID		ZSTUDENT02	Globally Unique
SNO				Z_SNO		SNO		ZSTUDENT02	Student Numbe
SNAME				Z_SNAME		SNAME		ZSTUDENT02	Student Name
MARK1				Z_MARK		MARK1		ZSTUDENT02	Mark
MARK2				Z_MARK		MARK2		ZSTUDENT02	Mark

Private | Chan.. | Value attribute

Tables/Fields	A...	Type	Description
ZSTUDENT02			

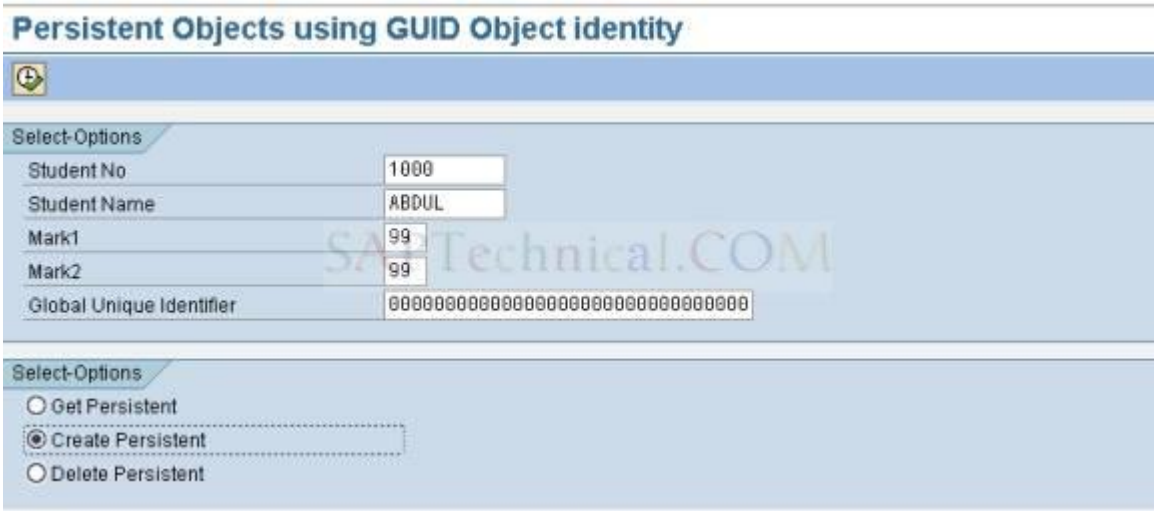
Activate the Class. Press the Yes Button to activate the class actor as well.



Unlike Business Key, GUID is not an attribute of the Persistent Class.

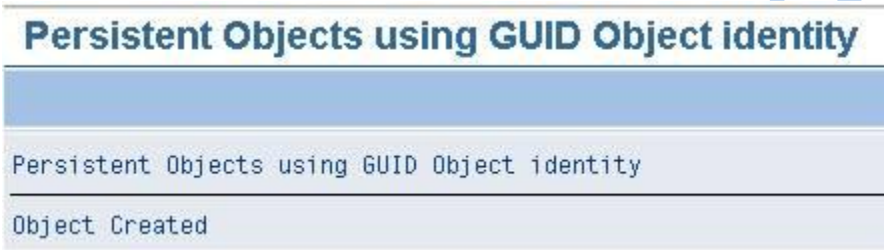
Step: 4 -> Write a Program to create / fetch / delete the Persistent Object

Our Program Selection-Screen looks like below

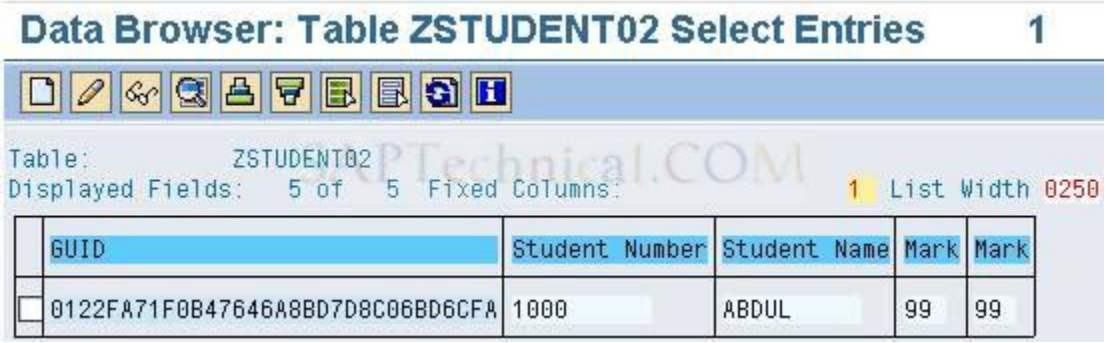


Here I am creating a new student. Specify the value and hit the execute button.

Output:



Go to SE16 and check the entries



Source Code

```
*&---------------------------------------------------------------------*
*& Report  Z_PERSISTENT_GUID
*&
*&---------------------------------------------------------------------*
*&Author : Abdul Hakim
*&Development Language: ABAP
*&System Release: SAP Netweaver 2004
*&Title: Persistent Object using GUID Object Identity!!
```

```
*&---------------------------------------------------------------------*
REPORT  Z_PERSISTENT_GUID.
selection-screen begin of block b1 with frame title tit1.
parameters: sno   like zstudent02-sno,
            sname like zstudent02-sname,
            mark1 like zstudent02-mark1,
            mark2 like zstudent02-mark2,
            guid  like zstudent02-guid.
selection-screen end of block b1.
selection-screen begin of block b2 with frame title tit2.
parameters: r1 radiobutton group rad1,
            r2 radiobutton group rad1,
            r3 radiobutton group rad1.
selection-screen end of block b2.
data: agent type ref to zca_persist_02,
      students type ref to zcl_persist_02.
data: result1 type ref to object,
      result2 type ref to zcl_persist_02.
*---------------------------------------------------------------------*
*       Load-of-Program
*---------------------------------------------------------------------*
load-of-program.
  tit1 = text-001.
  tit2 = tit1.
*---------------------------------------------------------------------*
*       At Selection Screen
*---------------------------------------------------------------------*
at selection-screen.
  if ( r2 eq 'X' ).
    if sno is initial or sname is initial.
      MESSAGE 'Enter the values in Sno/Sname fields'
      TYPE 'E' DISPLAY LIKE 'E'.
    endif.
  endif.
*---------------------------------------------------------------------*
*       Start-of-Selection
*---------------------------------------------------------------------*
start-of-selection.
  agent = zca_persist_02=>agent.
  if r1 eq 'X'.
    TRY.
        CALL METHOD AGENT->IF_OS_CA_PERSISTENCY~GET_PERSISTENT_BY_OID
          EXPORTING
            I_OID  = guid
          RECEIVING
            RESULT = result1.
        result2 ?= result1.
        sno = result2->get_sno( ).
        sname = result2->get_sname( ).
        mark1 = result2->get_mark1( ).
        mark2 = result2->get_mark2( ).

write:/ sno,
```

```
            sname,
            mark1,
            mark2.
    CATCH CX_OS_OBJECT_NOT_FOUND .
*     CATCH CX_OS_CLASS_NOT_FOUND .
      MESSAGE 'Object doesn''t exists' TYPE 'I' DISPLAY LIKE 'E'.
  ENDTRY.
 elseif r2 eq 'X'.
  TRY.
      CALL METHOD AGENT->CREATE_PERSISTENT
        EXPORTING
          I_MARK1 = mark1
          I_MARK2 = mark2
          I_SNAME = sname
          I_SNO   = sno
        RECEIVING
          RESULT  = students.
      commit work.
      write 'Object Created'.
    CATCH CX_OS_OBJECT_EXISTING .
      MESSAGE 'Object already exists' TYPE 'I' DISPLAY LIKE 'E'.
  ENDTRY.
 else.
  TRY.
      CALL METHOD AGENT->IF_OS_CA_PERSISTENCY~GET_PERSISTENT_BY_OID
        EXPORTING
          I_OID  = guid
        RECEIVING
          RESULT = result1.
    CATCH CX_OS_OBJECT_NOT_FOUND .
*     CATCH CX_OS_CLASS_NOT_FOUND .
      MESSAGE 'Object doesn''t exists' TYPE 'I' DISPLAY LIKE 'E'.
  ENDTRY.
  result2 ?= result1.
  TRY.
      CALL METHOD AGENT->IF_OS_FACTORY~DELETE_PERSISTENT
        EXPORTING
          I_OBJECT = result2.
      commit work.
      write 'Object Deleted'.
    CATCH CX_OS_OBJECT_NOT_EXISTING .
      MESSAGE 'Object doesn''t exists' TYPE 'I' DISPLAY LIKE 'E'.
  ENDTRY.
 endif.
```

Implementing Persistent Service using Transaction Service

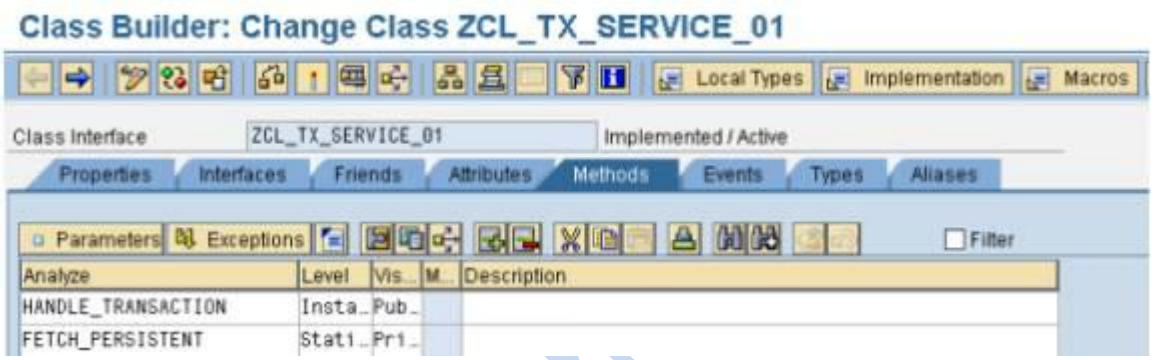
Transaction Service is an object-oriented wrapper of SAP LUW.

In this article we will discuss how we can implement Persistent Service using Transaction Service

Step: 1

Go to Class Builder and create a class.

Define methods.



Step: 2

Implement the methods

```
method HANDLE_TRANSACTION.
  data: tx type ref to if_os_transaction,
        tx_manager type ref to if_os_transaction_manager.

  tx_manager = cl_os_system=>get_transaction_manager( ).
  tx = tx_manager->create_transaction( ).

  try.
    tx->start( ).
    fetch_persistent( ).
    tx->end( ).
    catch cx_os_error.
    tx->undo( ).
  endtry.

endmethod.
```

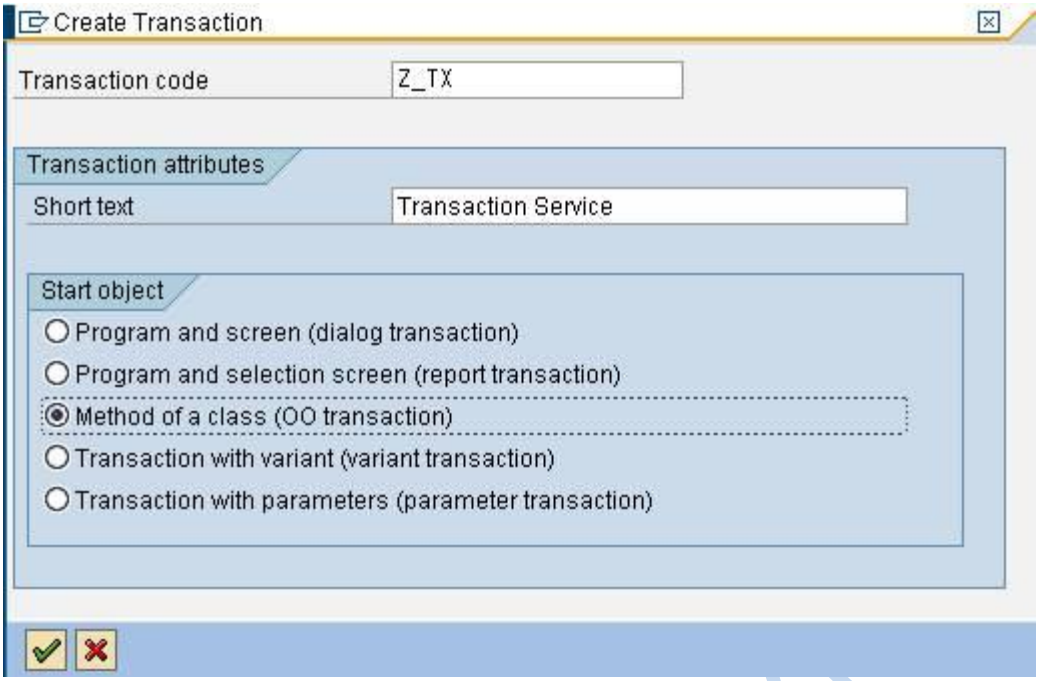
```
method FETCH_PERSISTENT .
    data: sno type zstudent01-sno value '1000',
          sname type zstudent01-sname value 'ABDUL',
          mark1 type zstudent01-mark1 value '01',
          mark2 type zstudent01-mark2 value '02'.
    data: agent     type ref to zca_persist_01,
          students  type ref to zcl_persist_01.
    agent = zca_persist_01=>agent.
    try.
     agent->get_persistent( exporting i_sno     = sno
                                      i_sname   = sname
                            receiving result  = students ).
      sname = students->get_sname( ).sno = students->get_sno( ).
      students->set_mark1( mark1 ).students->set_mark2( mark2 ).
      CATCH CX_OS_OBJECT_NOT_FOUND .
      MESSAGE 'Object doesn''t exists' TYPE 'I' DISPLAY LIKE 'E'.
    endtry.
endmethod.
```

Step: 3

Create OO transaction.

Go to Tcode SE93. Give Tcode name for eg Z_TX and hit the create button

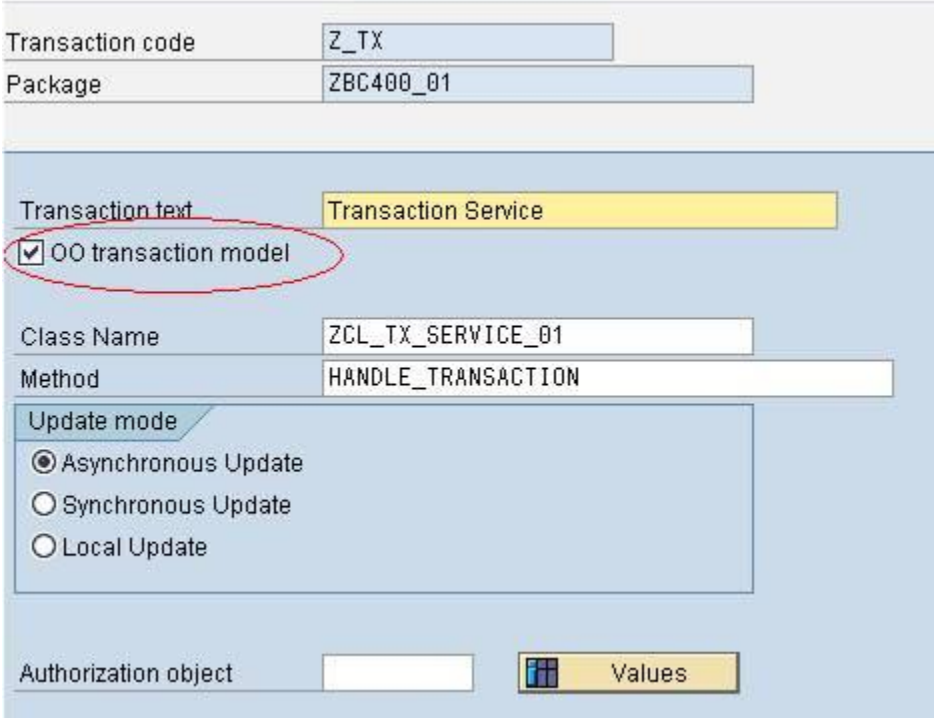
Step: 4 Select OO transaction



Step: 5

Specify the Class Name and the Method Name.

Also select the OO transaction Model check box. Finally Save.

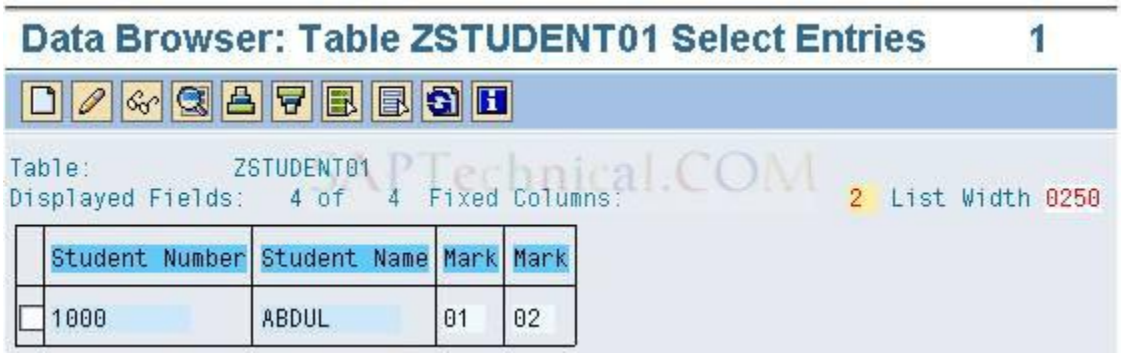


Step: 6

Execute the transaction Z_TX

Step: 7

Go to SE16 and check the table entries



Binding in ABAP Object Oriented Programming

Some basic terminologies

1.1 ABAP Objects

ABAP objects is the term given to object oriented programming done in ABAP. This programming model unites data and functions. OO ABAP is built on existing ABAP language. ABAP objects are run in same environment as the normal ABAP programs. OO ABAP is part of ABAP since R/3 release 4.0

1.2 Class

Class is a prototype that defines data and the behaviour common to all the objects of certain kind. Here methods provide the behaviour. We can say classes describe objects.

Classes can be declared either globally or locally. Global classes can be declared using transaction SE24. Local classes are declared in an ABAP program (reports etc).

1.3 Objects

It signifies the real world. Technically we can say objects are instances of a class. We can create any number of objects from a class template. All the objects created have unique identity and each contain different set of attributes. Objects we create in a program exist only till the program exists.

1.4 Encapsulation

Through encapsulation we restrict the visibility of attributes and methods in the object.

There are three levels of visibility in OO ABAP.

- Public
- Protected
- Private

1.5 Polymorphism

The name of method is same but they behave differently in different classes. It means implementation of method (i.e. body of the method) is different in different classes. It can be achieved in two different ways in OO ABAP.

- Interfaces
- Overriding methods or redefining methods in each class after inheritance

1.6 Inheritance

In OO ABAP we use an existing class to derive a new class (child class). The new class contains the attributes of the parent class (derives according to the visibility of attributes and methods) in addition to new attributes and methods added to it. The child class derives all the attributes and methods declared in parent class as public visibility. The child class cannot inherit private members. The protected members in parent class are derived in child class but their visibility changes to private.

1.7 Interfaces

Interfaces are similarly defined as classes. They also contain attributes and methods. But interfaces do not have implementation part. Their methods are implemented in the class that implements the interface.

So we provide different implementation to the methods defined in the interface in different class that implements that interface. This way polymorphism is achieved.

1.8 Binding in Object Oriented languages

It is the concept which determines the object's method to be invoked based on the signature or parameters provided. It is important in case of invoking a method, which is redefined in subsequent sub classes. As the level of hierarchy increases and the same method is redefined in subclasses we need to know which method is called. When this decision is made at run time it is called as Dynamic binding. When this decision is made at compile time it is known as Static binding. In Java this concept is implemented using concept of method overriding and in C++ there is concept of virtual functions. They help in achieving dynamic binding. Similarly in OO ABAP we can redefine methods and use concept of binding to invoke methods as per required.

Binding in OO ABAP

Suppose we need to redefine or override a method of a class in all sub classes inheriting from it. We can take a pointer or reference variable to the base or parent class. This parent class reference variable can take or refer to objects of the sub classes. Now to decide that which method will be called upon while we are using this parent class reference variable, we need to know about the concept of binding.

- We define a reference variable as

  Data : obj_a type ref to <class name>.

  Here obj_a is a reference variable of type class <class name>

- Creating the object

  create object : obj_a.

  Now obj_a refers to an object of class <class name>

- Clear obj_a.

  Now the reference variable obj_a no more refers to the object of <class name>.

  In this case garbage collector will come and remove the object from memory.

2.1 Example

Let us create a report and some local classes and look into concept of binding

Create a report zpmm_class_dynamic.

```
*&---------------------------------------------------------------------*
*& Report  ZPMM_CLASS_DYNAMIC                                          *
*&                                                                     *
*&---------------------------------------------------------------------*
REPORT  ZPMM_CLASS_DYNAMIC                                             .
*---------------------------------------------------------------------*
*       CLASS a DEFINITION
*---------------------------------------------------------------------*
CLASS a DEFINITION.
  PUBLIC SECTION.
   methods : rise,
             fall.
ENDCLASS.                    "a DEFINITION
*---------------------------------------------------------------------*
*       CLASS a IMPLEMENTATION
*---------------------------------------------------------------------*
CLASS a IMPLEMENTATION.
  METHOD rise.
   write : / 'Super class a --------- rise()'.
  ENDMETHOD.                    "rise
  METHOD fall.
write : / 'Super class a --------- fall()'.
  ENDMETHOD.                    "fall
ENDCLASS.                    "a IMPLEMENTATION
*---------------------------------------------------------------------*
*       CLASS b DEFINITION
*---------------------------------------------------------------------*
CLASS b DEFINITION inheriting from a.
  PUBLIC SECTION.
methods : rise redefinition,
          xyz.
ENDCLASS.                    "b DEFINITION
*---------------------------------------------------------------------*
*       CLASS b IMPLEMENTATION
*---------------------------------------------------------------------*
CLASS b IMPLEMENTATION.
  METHOD rise.
   write : / 'Child class b redefined --------- rise()'.
  ENDMETHOD.                    "rise
```

```
  METHOD xyz.
    write : / 'Child class b new method --------- xyz()'.
  ENDMETHOD.                    "xyz
ENDCLASS.                    "b IMPLEMENTATION
********End of Class Definition and implementations***************
***Global declaration
***Creating reference variables for the classes defined above
data :
*Reference variable of type class a
      obj_a type ref to a,
*Reference variable of type class b
      obj_b1 type ref to b,
*Reference variable of type class b
      obj_b2 type ref to b.
***********************************
*********************************************************************
*                    START-OF-SELECTION
*********************************************************************
START-OF-SELECTION.
create object : obj_a,
            obj_b1,
            obj_b2.
*********************************************************************
*                    END-OF-SELECTION
*********************************************************************
END-OF-SELECTION.
 call method : obj_a->fall,
           obj_a->rise,
           obj_b1->fall.
```

Now output of above code is :

Super class a-----------fall()

Super class a-----------rise()

Super class a-----------fall()

We will just discuss how we got this output and what will happen when we assign subclass objects to reference variables of parent class.

2.2 Binding

We have reference variables

obj_a , obj_b1 ,obj_b2

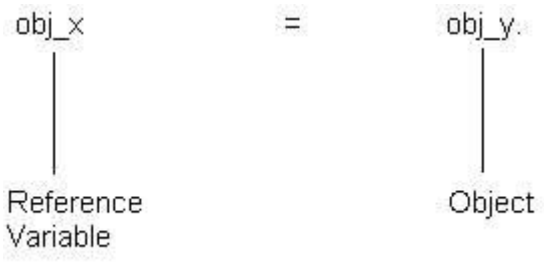
Further we created object obj_a (refers to object of class a) and obj_b1(refers to object of class b) using create object statement.

When we assign

obj_a = obj_b1.

Then both obj_a and obj_b now refer to same object of class b.

But obj_a is reference variable of type parent class of class b.



Now when

obj_a = obj_b .

Reference variable is of type Base Class

Object passed is of type Sub Class.

When we will use the reference variable obj_a to invoke method rise() which is overridden in sub class b, the sub class b method rise() (redefined method) is invoked.

So if we change the code below START-OF-SELECTION event and END-OF-SELECTION event in **section 2.1** to check the above theory.

```
*****************************************************************
*                    START-OF-SELECTION
*****************************************************************
START-OF-SELECTION.
create object : obj_a,
            obj_b1,
            obj_b2.
 obj_a = obj_b1.
*****************************************************************
*                    END-OF-SELECTION
*****************************************************************
END-OF-SELECTION.
 call method : obj_a->fall,
            obj_a->rise,
            obj_b1->fall.
```

Now output of above code is :
Super class a----------fall()
Child class b redefined----------rise()
Super class a----------fall()

2.3 Binding Check Table

I have prepared a table to check the method invoked in case of inheritance. This table is used to check the method invoked when the method is redefined in sub classes.

Reference Variable	Object	Method Invoked
Base Class	Base Class	Base Class
Base Class	Sub Class	Sub Class
Sub Class	Sub Class	Sub Class

Note: We can not take a reference variable of Sub Class to refer a Base class object.

obj_b1 = obj_a. is not possible

We can now verify the output of code given in section **section 2.1**.

2.4 Important in Binding

Till now we have seen which method is called when we use reference variable of base class and pass the object of sub class. But there are some restrictions on calling methods.

When obj_a = obj_b.

When reference variable is of base class i.e obj_a

And object referred by obj_a is of type subclass i.e. obj_b.

In this case base class reference variable can only call the methods which are defined there in the base class.

We can not invoke the new method defined in the class b xyz() using base class obj_a reference variable.

obj_a = obj_b.

call method : obj_a->xyz. Is not possible. It will throw an error.

In this case we can only call

call method : obj_a->fall,

obj_a->rise.

When we call **obj_a->fall** , it will call the method of base class since it is not redefined in sub class b.

When we call **obj_a->rise**, it will call the method of sub class since it is redefined in sub class b. For this we can use the table of **section 2.3**.

2.5 Output of section 2.1

We can now verify the output of code given in **section 2.1** from the table described **in section 2.3**

We will just see the START-OF-SELECTION and END-OF-SELECTION events below from **section 2.1**

```
*****************************************************************
*                START-OF-SELECTION
*****************************************************************
START-OF-SELECTION.
create object : obj_a,
            obj_b1,
            obj_b2.
*****************************************************************
*                END-OF-SELECTION
*****************************************************************
END-OF-SELECTION.
 call method : obj_a->fall,
           obj_a->rise,
           obj_b1->fall.
Now output of above code is :
Super class a-----------fall()
Super class a-----------rise()
Super class a-----------fall()
```

Here **obj_a** refers to base class object so it only calls base class methods rise() and fall().

Since method **fall()** is not redefined in class b and is just inherited from class a , so when we call **obj_b1->fall**, the base class method is invoked.

Understanding "ABAP Unit"

Introduction:

It is a best practice to modularize our programs as much as we can for better programming. If we want to check one particular module like subroutines, function modules or classes for bugs then we can do it using ABAP Unit. ABAP Unit is a tool for unit testing of ABAP programs.

How to write these tests:

ABAP unit is based on ABAP objects. The global class CL_AUNIT_ASSERT contains methods which can be used for testing .Tests are implemented in local classes. Inside the local class the necessary method from the global class can be called for testing. These test classes can be written inside the program for which the test is to be done. It will not affect our production code in anyways.

Difference between Ordinary class and Test class:

Both the test class and test method should have FOR TESTING addition.

Ex:

```
CLASS mytest DEFINITION FOR TESTING.

  PRIVATE SECTION.

  METHODS mytest FOR TESTING.

ENDCLASS.
```

Methods in CL_AUNIT_ASSERT for Testing:

- ASSERT_EQUALS
- ASSERT_DIFFERS
- ASSERT_BOUND
- ASSERT_NOT_BOUND
- ASSERT_INITIAL
- ASSERT_NOT_INITIAL
- ASSERT_CHAR_CP
- ASSERT_CHAR_NP
- ASSERT_EQUALS_F
- FAIL
- ABORT

ASSERT_EQUALS - Checks the equality of two data objects.

ASSERT_DIFFERS - Checks for the difference of two data objects.

ASSERT_BOUND - checks for the validity of the reference of a reference variable.

ASSERT_INITIAL - checks whether the reference of a reference variable is invalid.

ASSERT_NOT_INITIAL - checks whether the data object is not having its initial value.

ASSERT_SUBRC - checks for the specific value of SY-SUBRC.

ASSERT_EQUALS:

ASSERT_EQUALS is one of the methods in the class CL_AUNIT_ASSERT. This method can be used for checking equality of two data objects.

The parameters of the method:

ACT - Actual result

EXP - Expected Result

MSG - Message to be displayed in the result

LEVEL - Error level (Tolerable/Critical/fatal)

QUIT - If the test fails, flow level is controlled using this

(NO/METHOD/CLASS/PROGRAM)

TOL - Tolerance level for F

Levels:

- 0 - Tolerable
- 1 - Critical
- 2 - Fatal

Quit:

- No (0) – It will continue the current test Method.
- Method (1) – It will interrupt the current test method
- Class (2) – It will interrupt the current test class.
- Program (3) – abandon execution of all test classes for the tested program.

Tolerance:

If the tolerance limit specified is exceeded then error is shown.

Ex:

Actual result – 24.

Expected Result – 25.

Tolerance – 0.9999.
Difference = Expected Result - Actual result.
= 1 > tolerance.
Therefore displays an error.

Example Program:

Let us consider an example for ABAP unit test using the method ASSERT_EQUALS to check the equality of two data objects. In this program, we have two methods divide and factorial in a local class MATH. We want to test the factorial method. So we have created one class and one method MYTEST for testing. In the test method implementation we have called the factorial method and so the data object RESULT is populated. Now we are going to compare the actual data object (RESULT) with the expected result. For that we are calling the ASSERT_EQUALS from the global class passing the expected result.

```
*---------------------------------------------------------------------*
*       CLASS math DEFINITION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
CLASS math DEFINITION.
  PUBLIC SECTION.
    METHODS divide
          IMPORTING opr1    TYPE i
                    opr2    TYPE i
          EXPORTING result  TYPE f
          RAISING   cx_sy_arithmetic_error.
    METHODS factorial
      IMPORTING n TYPE i
      RETURNING value(fact) TYPE i.
ENDCLASS.                    "math DEFINITION
*---------------------------------------------------------------------*
*       CLASS math IMPLEMENTATION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
CLASS math IMPLEMENTATION.
  METHOD divide.
    result = opr2 / opr1.
  ENDMETHOD.                    "divide
  METHOD factorial.
    fact = 1.
    IF n = 0.
      RETURN.
    ELSE.
      DO n TIMES.
        fact = fact * sy-index.
      ENDDO.
```

```
    ENDIF.
  ENDMETHOD.                          "factorial
ENDCLASS.                            "math IMPLEMENTATION
START-OF-SELECTION.
  DATA w_obj TYPE REF TO math.
  DATA exc  TYPE REF TO cx_sy_arithmetic_error.
  DATA res  TYPE f.
  DATA result TYPE i.
  DATA text TYPE string.
  CREATE OBJECT w_obj.
  TRY.
      w_obj->divide( EXPORTING opr1 = 32 opr2 = 4
                     IMPORTING result = res ).
      WRITE : res.
      text = res.
    CATCH cx_sy_arithmetic_error INTO exc.
      text = exc->get_text( ).
      MESSAGE text TYPE 'I'.
  ENDTRY.
  CREATE OBJECT w_obj.
  COMPUTE result = w_obj->factorial( 4 ).
  WRITE :/ 'The result for factorial is:',result.
*---------------------------------------------------------------------*
*       CLASS mytest DEFINITION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
CLASS mytest DEFINITION  "#AU Risk_Level Harmless
           FOR TESTING. "#AU Duration Short
  PRIVATE SECTION.
    METHODS mytest FOR TESTING.
ENDCLASS.                    "mytest DEFINITION
*---------------------------------------------------------------------*
*       CLASS mytest IMPLEMENTATION
*---------------------------------------------------------------------*
*
*---------------------------------------------------------------------*
CLASS mytest IMPLEMENTATION.
  METHOD mytest.
    CREATE OBJECT w_obj.
    result = w_obj->factorial( 4 ).
    cl_aunit_assert=>assert_equals( act    = result
                                    exp    = '24'
                                    msg    = 'Factorial Not calculated Correctly'
                                    level  = '0'
                                    quit   = '2'
                                    tol    = '0.999'
                                     ).
  ENDMETHOD.                          "mytest
ENDCLASS.                    "mytest IMPLEMENTATION
```

Executing Unit Tests:

For program,

Program -> Test -> Unit Test.

For class,

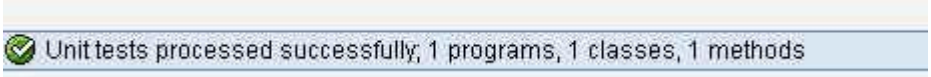
Class -> Unit Test.

For Function Module,

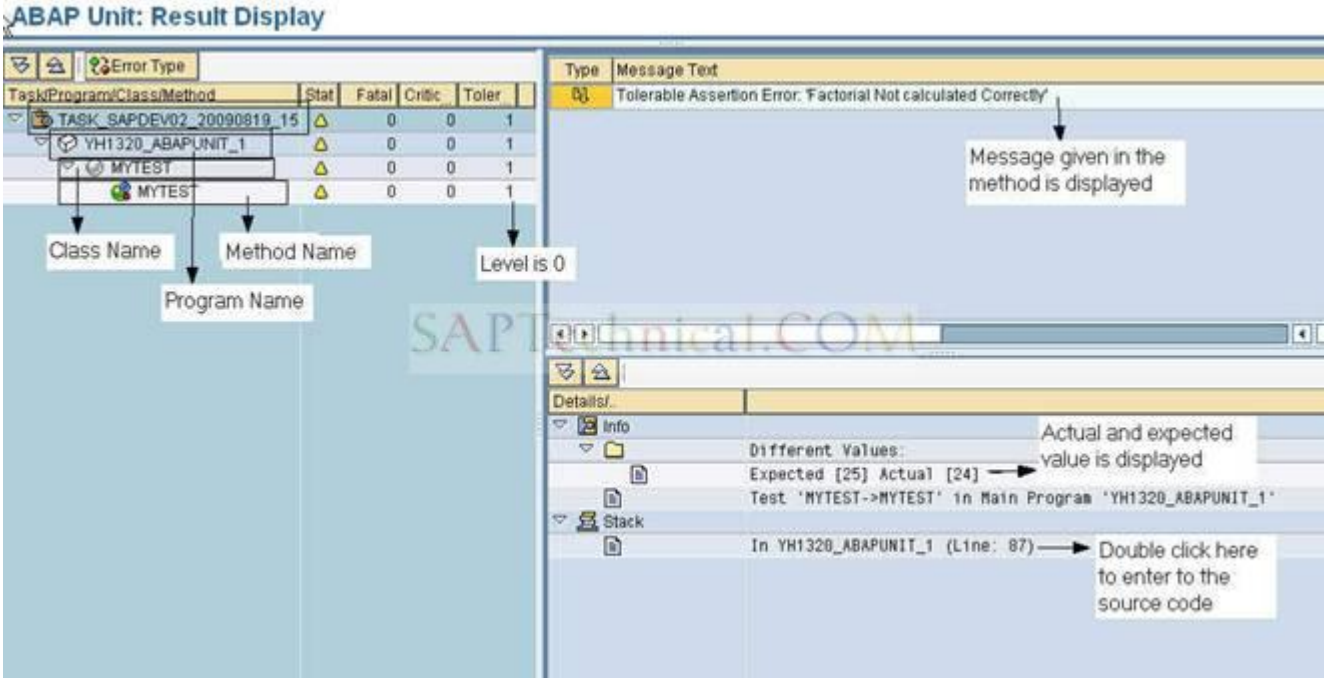
Function Module -> Test -> Unit Test.

Result of Unit Test:

If both the actual and the expected result is same, then Unit test does not find any errors. In that case one message will be displayed on status bar like,



If it finds errors then a result will be displayed as follows:

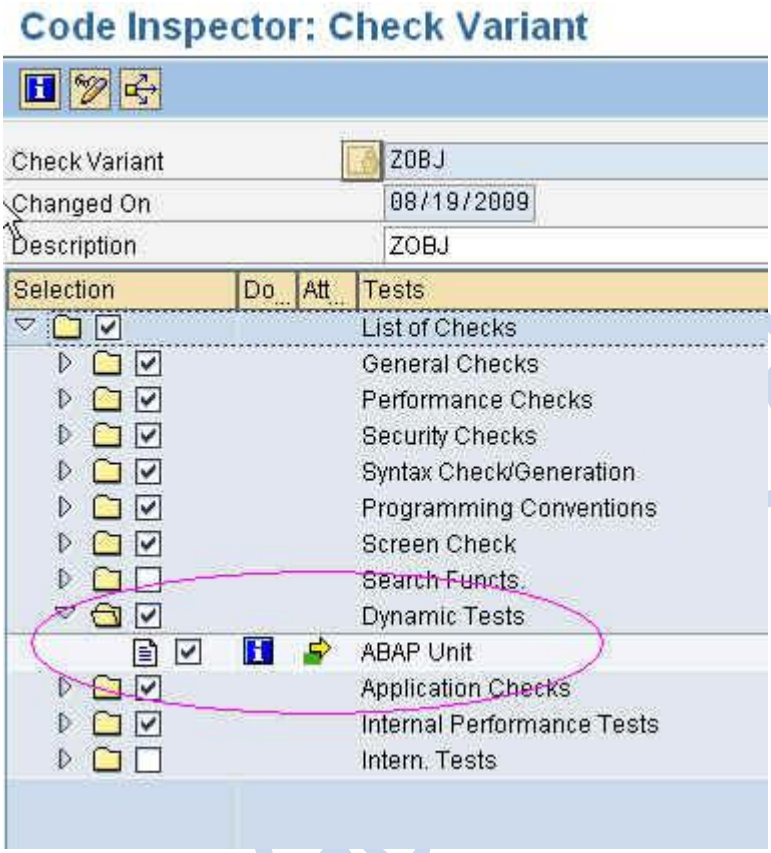


The task is displayed in a tree structure with a Program name, Class name and method name. Both the expected and the actual results can be seen in the Unit test results. Also in

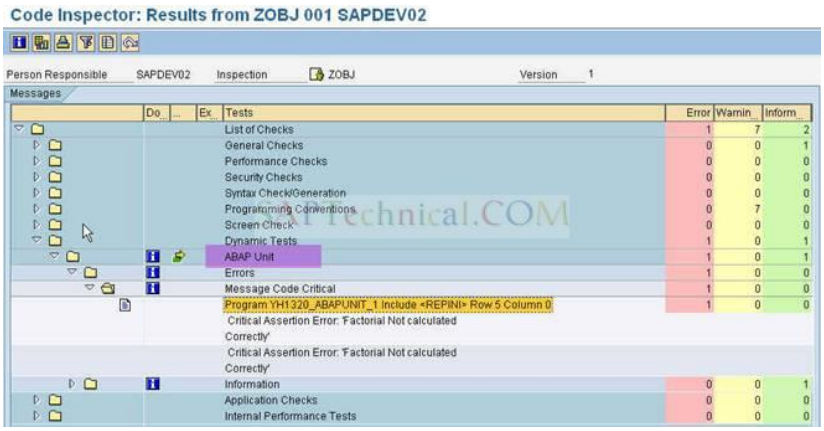
the stack it will be displaying the line number where the error occurred. By double clicking the line number we can enter into the source code.

ABAP Unit results in Code Inspector:

We can see the ABAP unit results in code inspector. While creating the variant, check for the ABAP unit in Dynamic check.



In the Code inspector results we can check for the ABAP unit errors, warnings and informations.



Demo on "Narrow Casting"

Definition: The assignment of a subclass instance to a reference variable of the type "reference to super class" is described as a narrowing cast, because you are switching from a more detailed view to a one with less detail. It is also called as up-casting.

Use of narrowing casting:

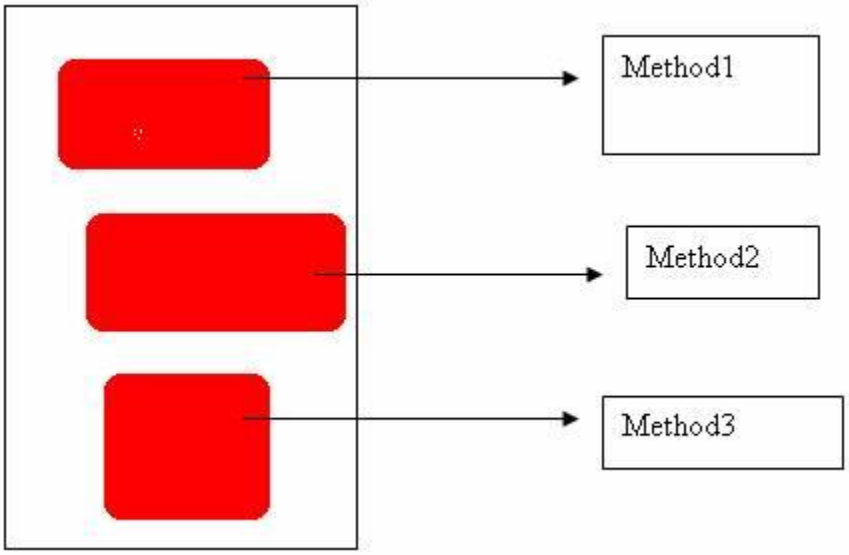
A user who is not interested in the finer points of cars, trucks, and busses (but only, for example, in the fuel consumption and tank gauge) does not need to know about them. This user only wants and needs to work with (references to) the lcl_vehicle(super class) class. However, in order to allow the user to work with cars, busses, or trucks, you generally need a narrowing cast.

Principle of narrowing casting:

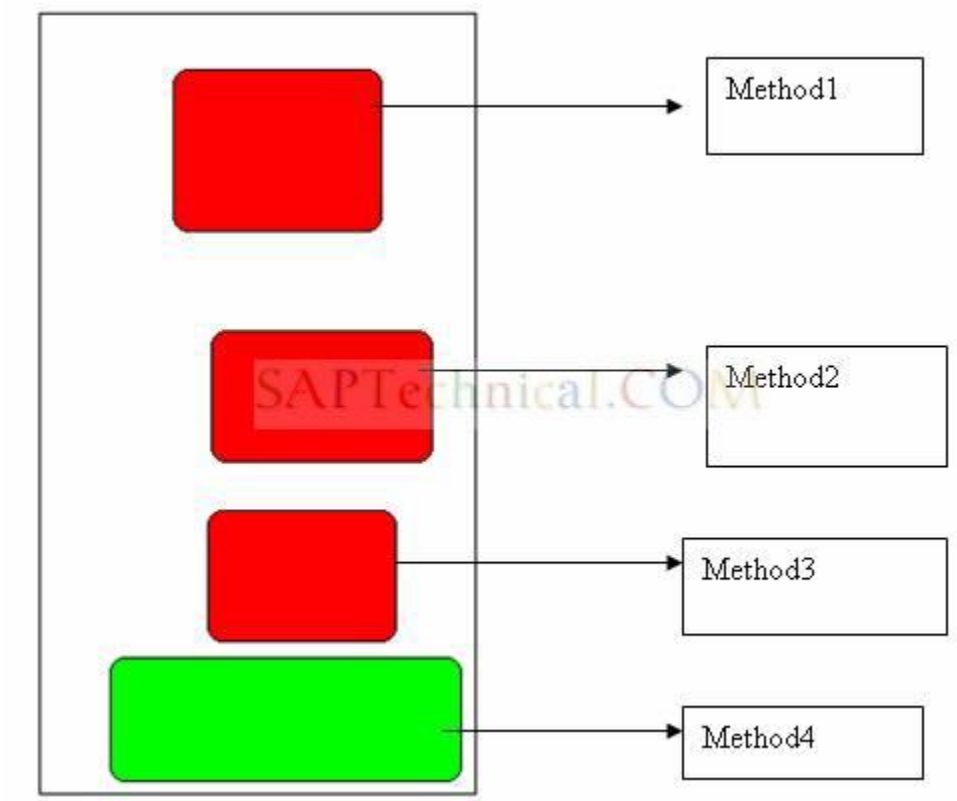
1. In narrowing casting the object which is created with reference to the sub class is assigned to the reference of type super class.
2. Using the super class reference it is possible to access the methods from the object which are only defined at the super class.
3. This access is also called as generic access as super class is normally called as general class.

Example:

Super class: vehicle (contains general methods)



Sub class: truck (contains more specific methods)



Here method4 is the specific for the sub class and remaining methods are inherited from the super class.

Now create the object with reference to the subclass.

1. Declare a variable with reference to the subclass.

DATA: REF_TRUCK TYPE REF TO TRUCK.

2. Create object with this reference.

CREATE OBJECT REF_TRUCK.

Narrowing cast:

1. Declare a variable with reference to the super class.

DATA: REF_VEHICLE TYPE REF TO VEHICLE.

2. Assign the object reference (REF_TRUCK) to REF_VEHICLE.

REF_VEHICLE = REF_TRUCK.

Accessing methods using super class reference.

1. By the super class reference (REF_VEHICLE) it is possible to access all the methods which are defined at the super class but the implementations are taken from the sub class.

2. If any method is redefined at the sub class then that method's implementation which exist at the sub class is taken in to consideration.

E.g. assume that 'method2' is redefined at the sub class.

When this method is accessed using the super class reference

Like:

Call method REF_VEHICLE->method2.

Here we can access the implementation which exists at the sub class but not from the super class.

3. It is not possible to access the methods which only defined in the sub class using the super class reference.

E.g. Method4 is not accessed using reference REF_VEHICLE.

Call method REF_VEHICLE-> Method4.

This is wrong convention.

Demo for narrowing casting:

Go to transaction SE38.

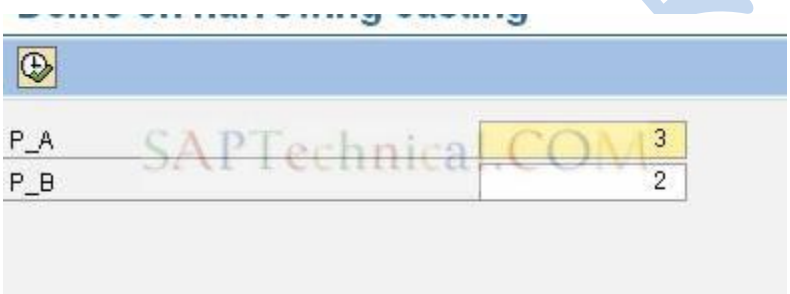
Report ZNARROWING_CAST1 Inactive

```
1  *&---------------------------------------------------------------------*
2  *& Report  ZNARROWING_CAST1
3  *&
4  *&---------------------------------------------------------------------*
5  *&
6  *&
7  *&---------------------------------------------------------------------*
8
9  REPORT  znarrowing_cast1.
10 *---------------------------------------------------------------------*
11 *       CLASS CL_SUPER DEFINITION
12 *---------------------------------------------------------------------*
13 *
14 *---------------------------------------------------------------------*
15 CLASS cl_super DEFINITION.
16
17   PUBLIC SECTION.
18     METHODS: add IMPORTING f_a TYPE i
19                            f_b TYPE i
20                  EXPORTING f_c TYPE i.
21
22 ENDCLASS.                    "CL_SUPER DEFINITION
23
24 *---------------------------------------------------------------------*
25 *       CLASS CL_SUPER IMPLEMENTATION
26 *---------------------------------------------------------------------*
27 *
28 *---------------------------------------------------------------------*
29 CLASS cl_super IMPLEMENTATION.
30
31   METHOD add.
32
33     f_c = f_a + f_b.
34
35   ENDMETHOD.                    "ADD
36
37 ENDCLASS.                    "CL_SUPER IMPLEMENTATION
```

```
40  *       CLASS CL_SUB DEFINITION
41  *---------------------------------------------------------------------*
42  *
43  *---------------------------------------------------------------------*
44  CLASS cl_sub DEFINITION INHERITING FROM cl_super.
45
46    PUBLIC SECTION.
47
48     METHODS: ADD REDEFINITION.
49
50      METHODS: sub IMPORTING f_a TYPE i
51                             f_b TYPE i
52                   EXPORTING f_c TYPE i.
53
54  ENDCLASS.                    "CL_SUB DEFINITION
55
56  *---------------------------------------------------------------------*
57  *       CLASS CL_SUB IMPLEMENTATION
58  *---------------------------------------------------------------------*
59  *
60  *---------------------------------------------------------------------*
61  CLASS cl_sub IMPLEMENTATION.
62
63    METHOD ADD.
64
65    F_C = F_A + F_B + 1.
66
67    ENDMETHOD.
68
69    METHOD sub.
70
71      f_c = f_a  - f_b.
72
73    ENDMETHOD.                   "SUB
74
75  ENDCLASS.                    "CL_SUB IMPLEMENTATION
```

```
START-OF-SELECTION.

  PARAMETERS: p_a TYPE i,
              p_b TYPE i.

  DATA: gv_add TYPE i.
  DATA: gv_sub TYPE i.

  DATA: ref1 TYPE REF TO cl_sub.
  DATA: REF2 TYPE REF  TO CL_SUPER.

  CREATE OBJECT ref1.

*  NARROWING CAST WE CAN REFER THE METHODS WHICH ARE ONLY IN SUPER CLASS INCLUDING REDEFINED CLASS.

  REF2 = REF1.

  CALL METHOD ref2->add
    EXPORTING
      f_a = p_a
      f_b = p_b
    IMPORTING
      f_c = gv_add.
  WRITE:/ gv_add.

* IN NARROWING CAST WE CANNOT ACCESS THE METHODS WHICH ARE NOT DEFINED AT THE SUPER CLASS.

*  CALL METHOD ref2->sub
*    EXPORTING
*      f_a = p_a
*      f_b = p_b
*    IMPORTING
*      f_c = gv_sub.
*
*  WRITE:/ gv_sub.
```

Now execute (F8):



Result:

```
Demo on narrowing casting
-------------------------
          6
```

Abstract Classes and Methods in Object Oriented Programming

Abstract Class: Classes which contain one or more abstract methods or abstract properties, such methods or properties do not provide implementation. These abstract methods or properties are implemented in the derived classes (Sub-classes).

Abstract classes does not create any instances to that class objects

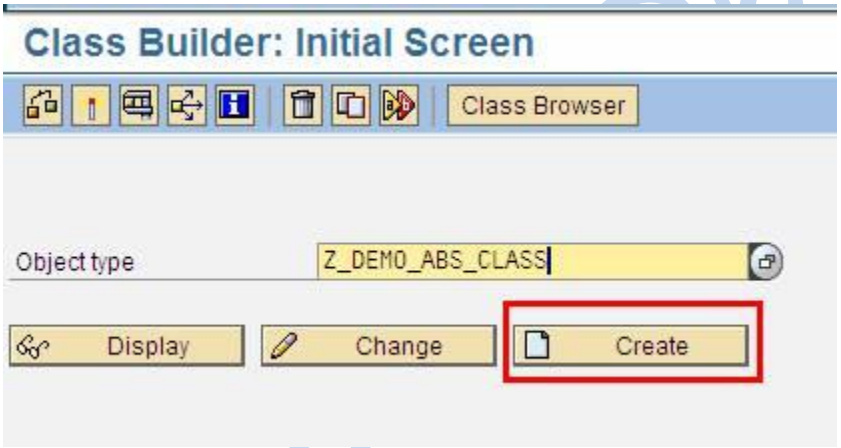
Use of Abstract class:

We can define some common functionalities in Abstract class (Super-class) and those can be used in derived classes (Sub classes).

Step-by-Step Approach to create Abstract classes and Methods

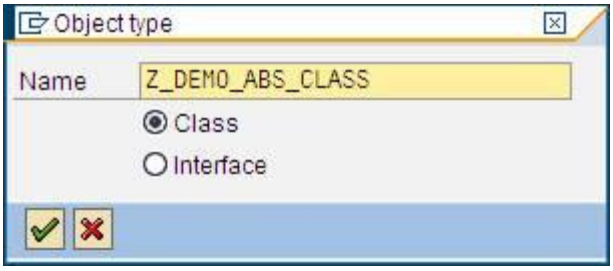
TCode: SE24

Enter the name of class as 'Z_DEMO_ABS_CLASS' and press Create Button



A pop-up window is displayed, then select "Class" radio button and

Press enter 

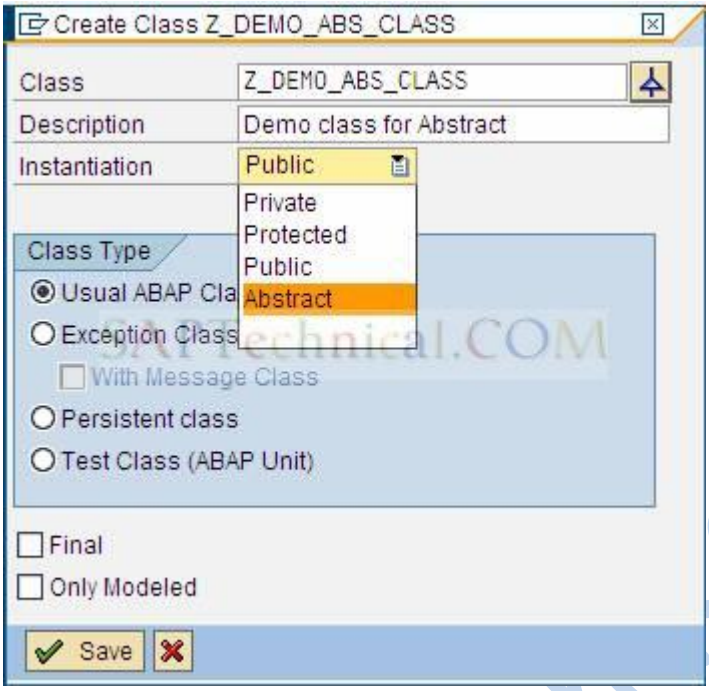


It will go to the next screen.

Here you enter the Description of the class and then select "Abstract" from Instantiation Drop down list to define the class an abstract class,

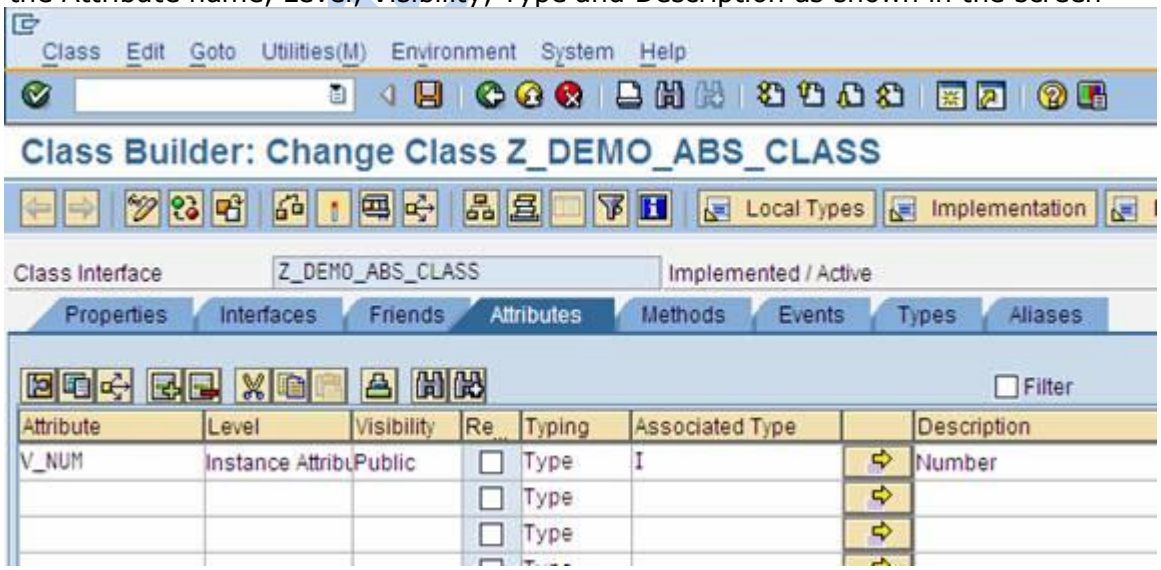
Then click on save 

button



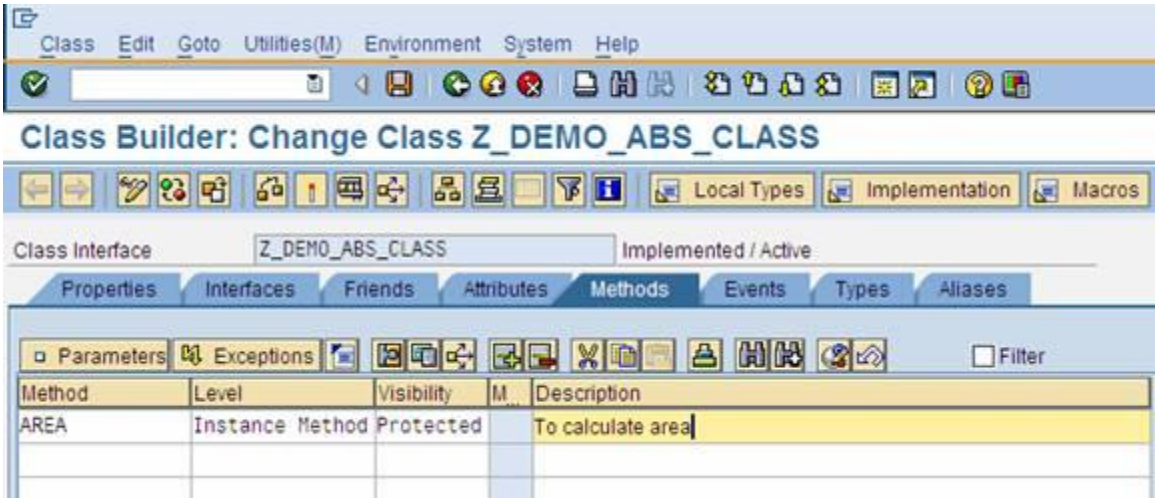
Go to the "Attributes" tab,

Enter the Attribute name, Level, Visibility, Type and Description as shown in the screen shot.

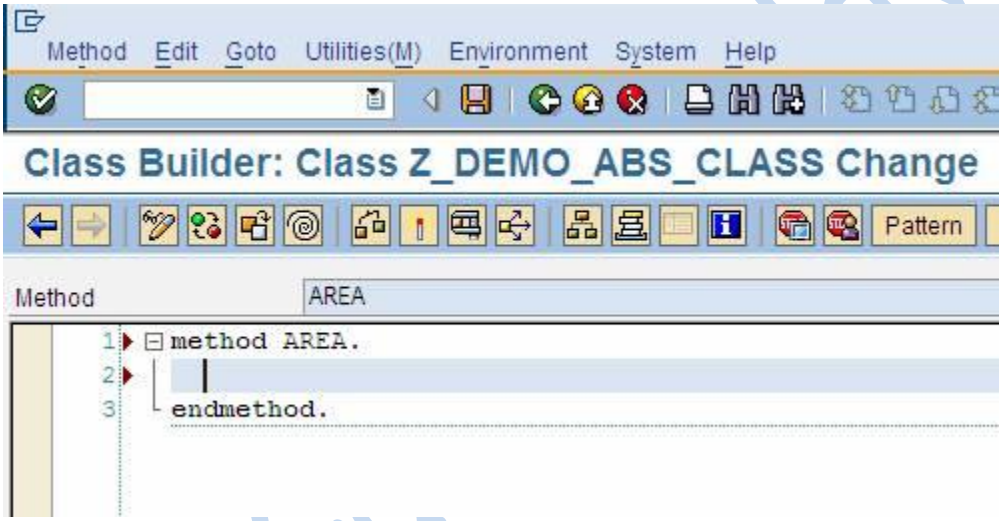


Go to Methods tab,

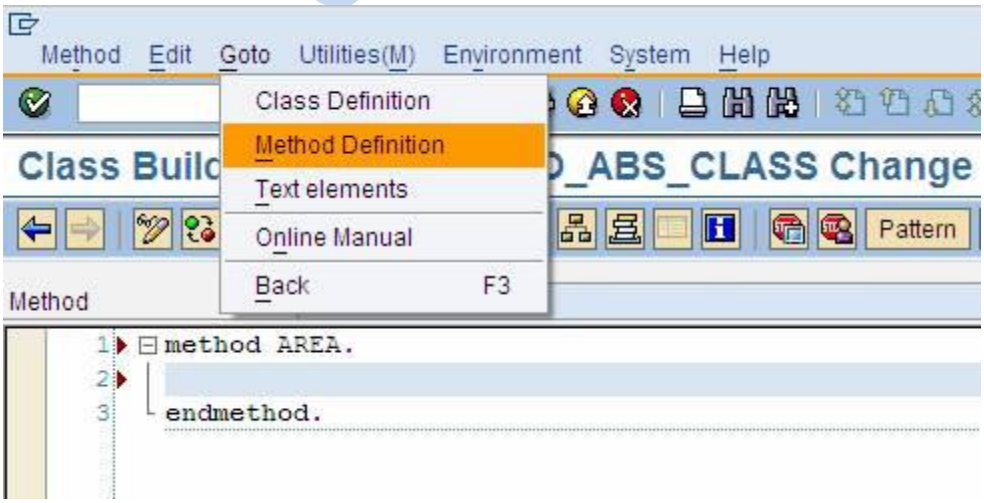
Enter Method name, Level, Visibility and Description as shown in the below screen shot



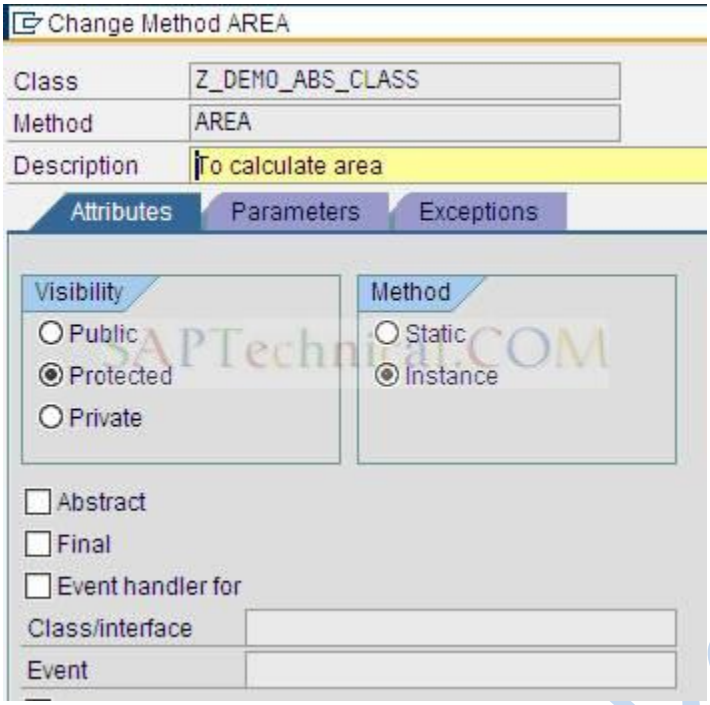
Double click on the Method name "AREA"; it goes to method Implementation screen.



Go to Menu path, then Goto -> Method definition



Pop-up window is displayed. It gives complete information of the method



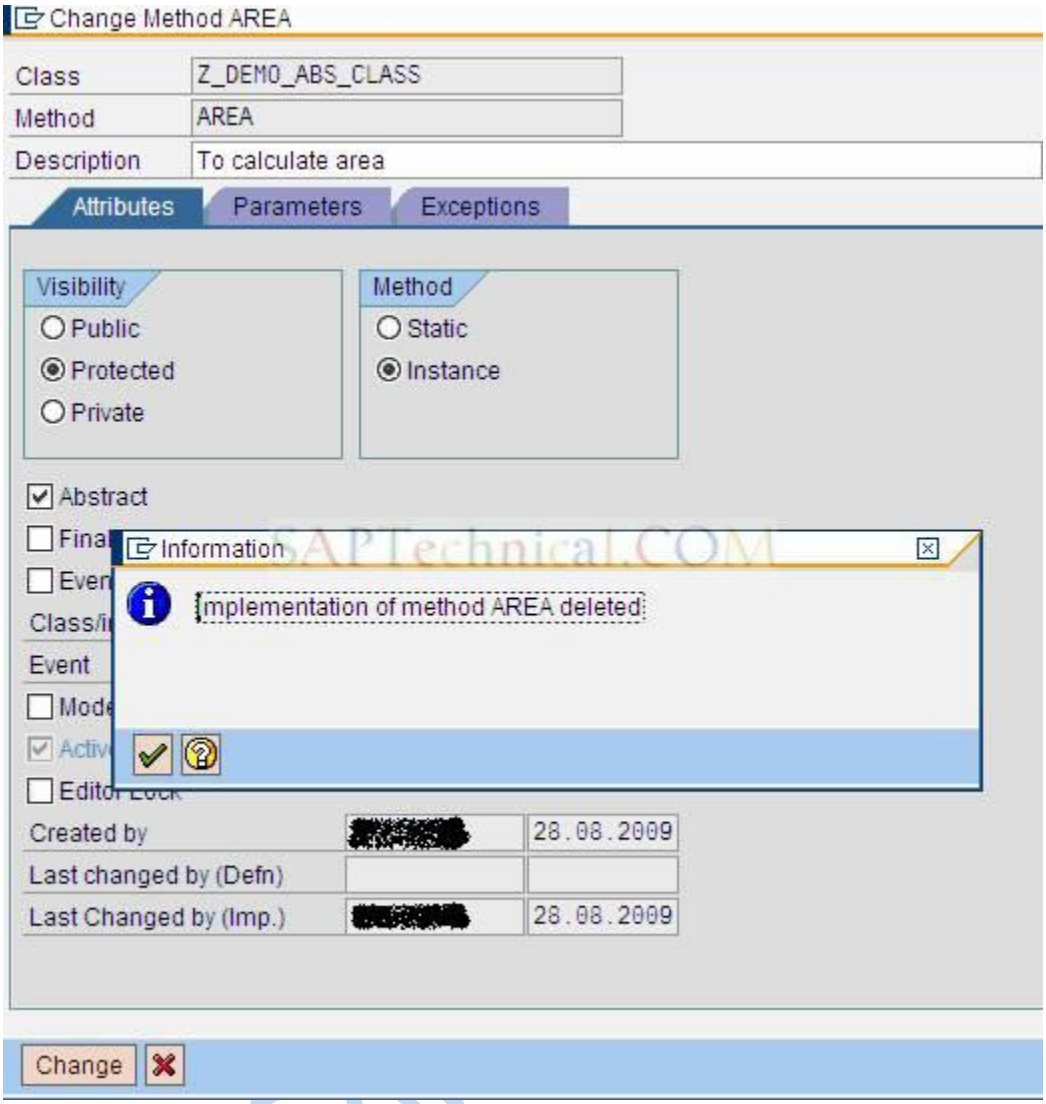
To define method "AREA" as an abstract method,

Go to "Attributes" tab, check the check box "Abstract"

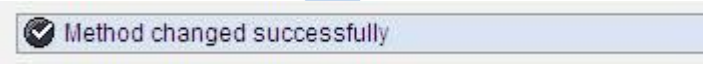
When you click on the "Abstract" check box, pop-up window is displayed,

then press button.

Then press "Change" button.



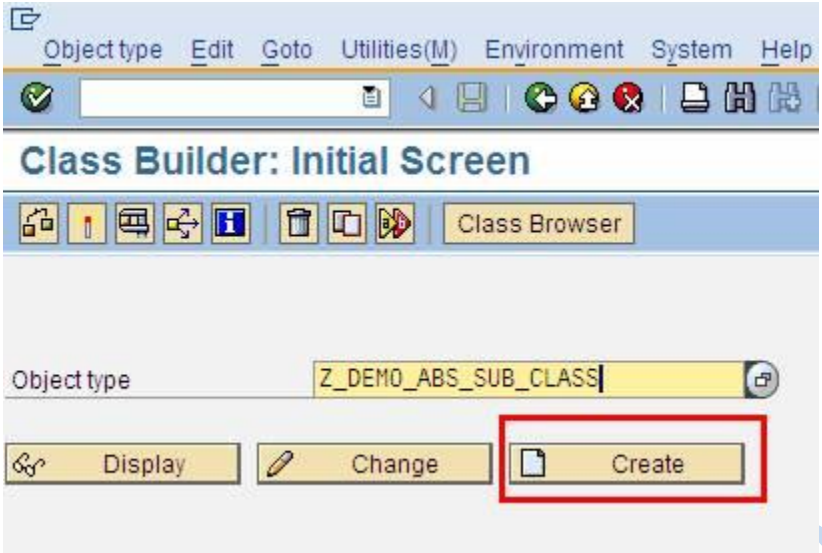
A successful message is displayed like "Method changed successfully"



Creating Sub Class:

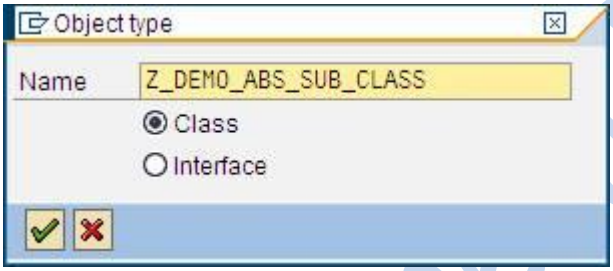
TCode: SE24

Enter the name of class as 'Z_DEMO_ABS_SUB_CLASS' and press Create Button to create sub class



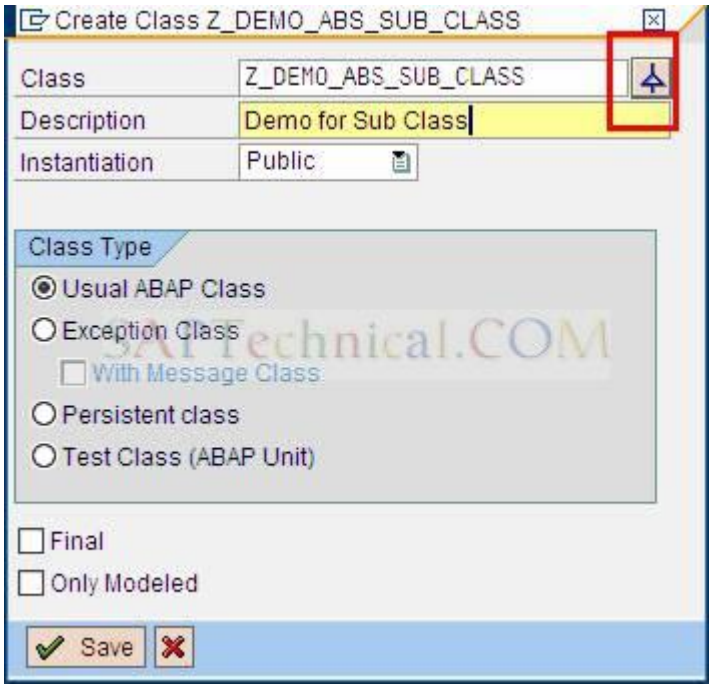
A pop-up window is displayed, then select "Class" radio button and

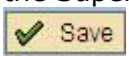
Press enter

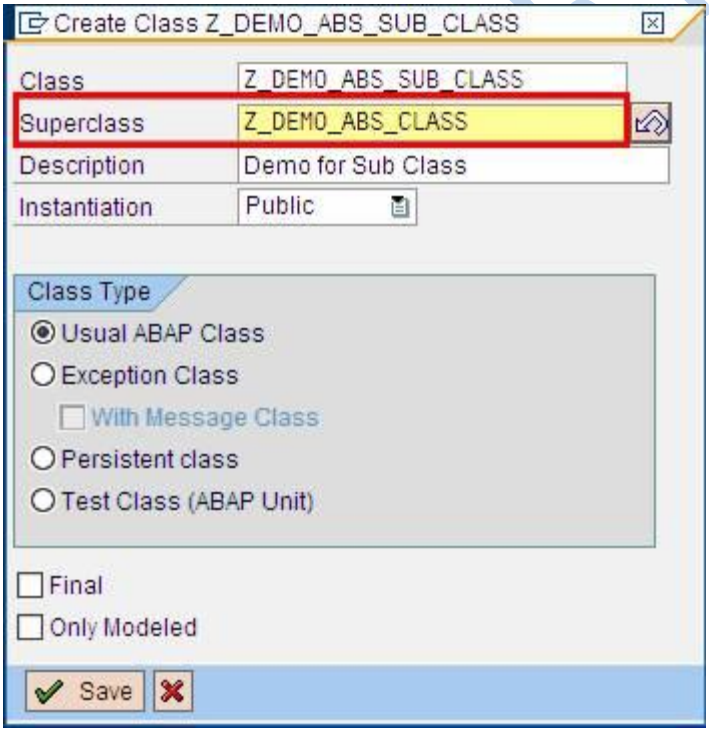


It goes to next screen, here you enter the Description of the class and then

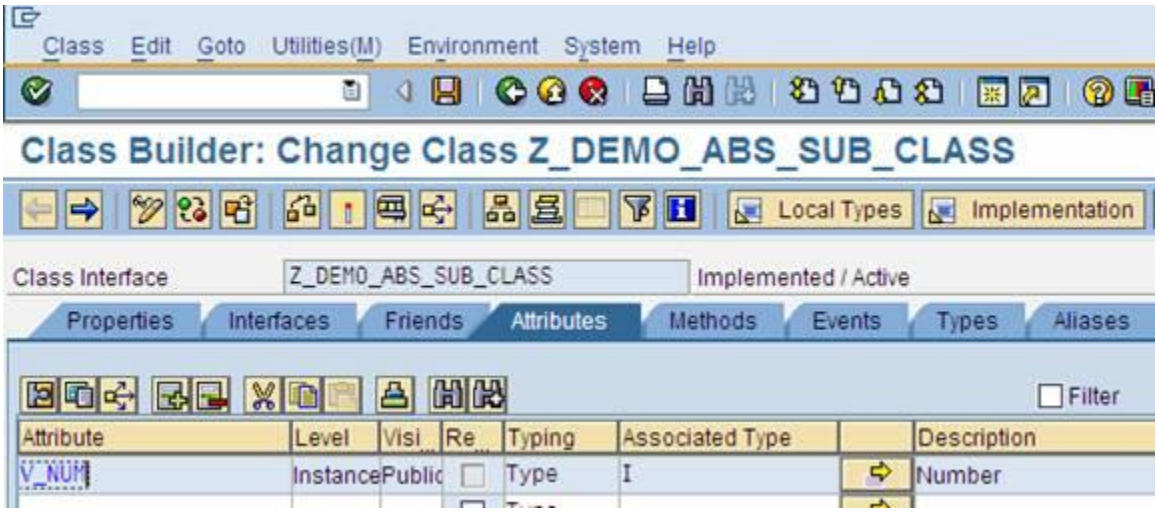
Select the inheritance button , to inherit the super class then press Save button



Enter the Super class name as "Z_DEMO_ABS_CLASS", which is being created earlier and press  button.



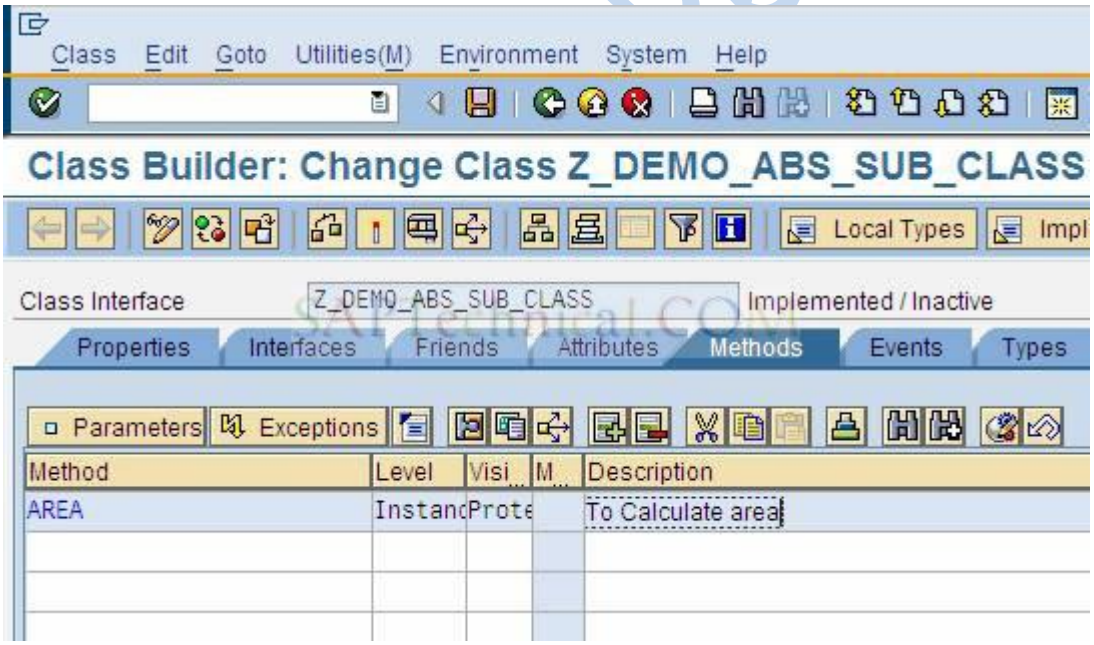
The Attributes and methods defined in the super class will automatically come into the sub class. See the below screen shots.



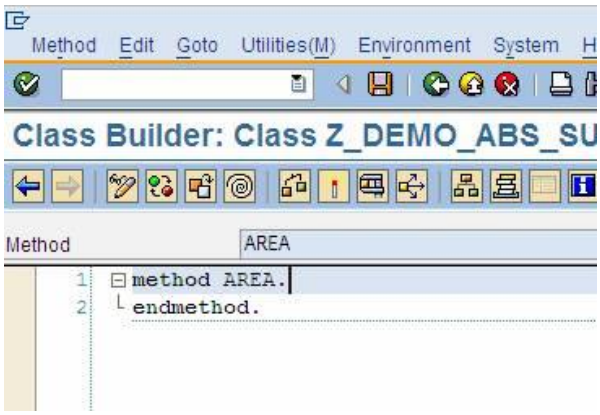
Go to the Methods tab, select the "AREA" method and click on

"Redefine" button 

If you are not Redefine the method and trying to activate the class, it gives syntax error.



Here you can write the code



Write the code In between Method and End Method

Method AREA
....
Endmethod

Write the below code

method AREA

```
*  Local Data Declarations
  DATA: lv_count TYPE i,
        lv_res TYPE i.

* initialize Count value to '1'
  lv_count = '1'.

  DO 10 TIMES.
    IF lv_count <= '10'.
      lv_res = v_num * lv_count.
*     Displa the multiplication table for a Given Number
      WRITE: / v_num,
               '*',
               lv_count,
               '=',
               lv_res.
*     Increment Count value
      lv_count = lv_count + 1.
    ELSE.
      EXIT.
    ENDIF.
  ENDDO.
* Clear variable
  CLEAR: v_num.
```

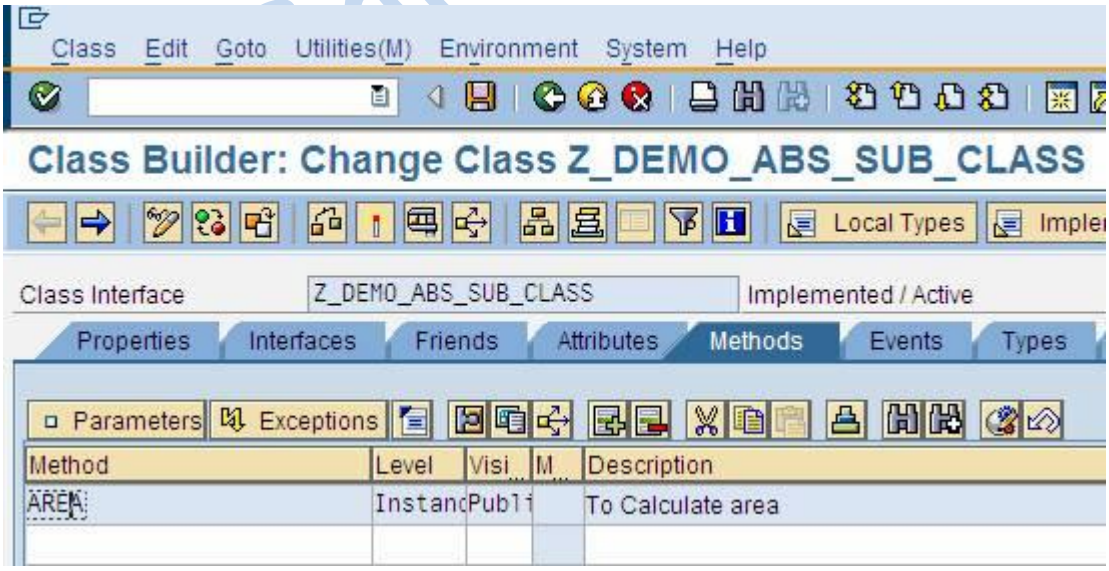
endmethod

Method AREA Active

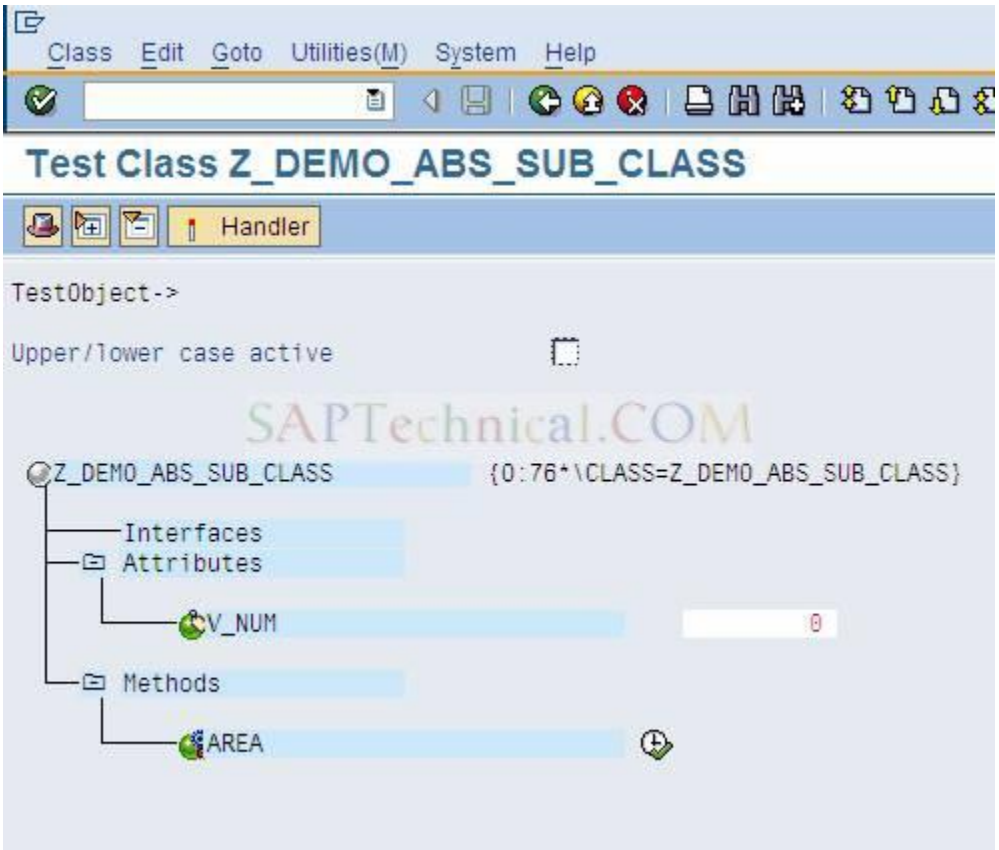
```
METHOD area.
* Local Data Declarations
  DATA: lv_count TYPE i,
        lv_res TYPE i.

* initialize Count value to '1'
  lv_count = '1'.

  DO 10 TIMES.
    IF lv_count <= '10'.
      lv_res = v_num * lv_count.
*     Displa the multiplication table for a Given Number
      WRITE: / v_num,
               '*',
               lv_count,
               '=',
               lv_res.
*     Increment Count value
      lv_count = lv_count + 1.
    ELSE.
      EXIT.
    ENDIF.
  ENDDO.
* Clear variable
  CLEAR: v_num.

ENDMETHOD.
```


Then save and activate the class and method.

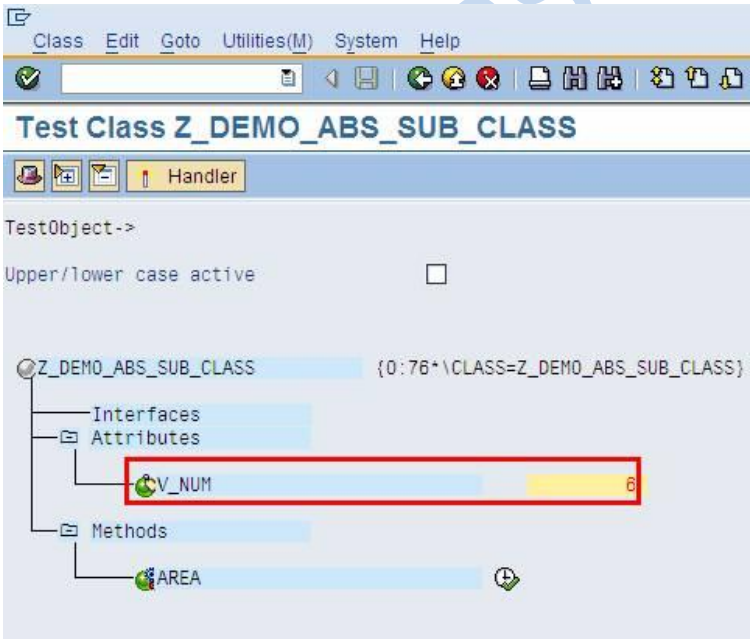
Finally execute the class  (F8)



It goes to below screen



Enter the number under V_NUM as "6" and press execute button .



The out will be displayed like below.

Class Edit Goto Utilities(M) System Help

Test Class Z_DEMO_ABS_SUB_CLASS

Handler

TestObject->AREA()

Upper/lower case active

```
6 *  1 =  6
6 *  2 =  12
6 *  3 =  18
6 *  4 =  24
6 *  5 =  30
6 *  6 =  36
6 *  7 =  42
6 *  8 =  48
6 *  9 =  54
6 *  10 =  60
```


TestObject->

Upper/lower case active

Z_DEMO_ABS_SUB_CLASS {0:76*\CLASS=Z_DEMO_ABS_SUB_CLASS}

- Interfaces
- Attributes
  - V_NUM 0
- Methods
  - AREA

Final Classes and Methods in Object Oriented Programming

Final Class: A class that is defined as final class can not be inherited further. All Methods of a final class are inherently final and must not be declared as final in the class definition. Also, a final method can not be redefined further.
If only a method of a class is final then that class can be inherited but that method cannot be redefined.

Use of final class:

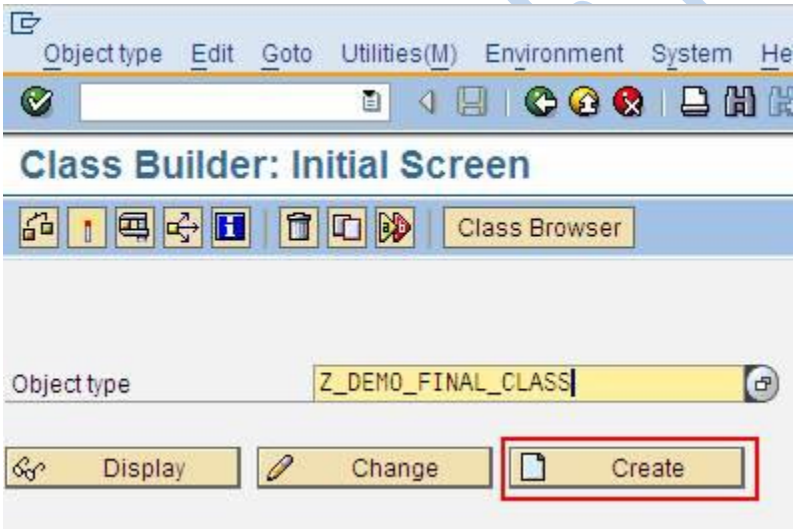
If you don't want anyone else to change or override the functionality of your class then you can define it as final. Thus no one can inherit and modify the features of this class.

Step-by-Step Approach to create Final classes and Methods

Final Class:

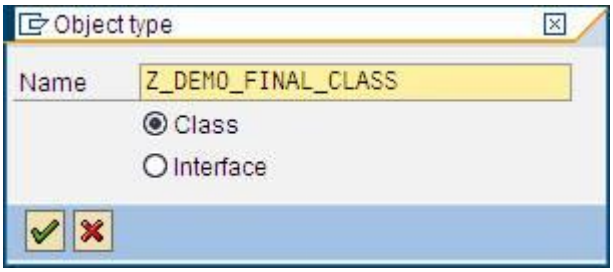
TCode: SE24

Enter the name of class as 'Z_DEMO_FINAL_CLASS' and press Create Button

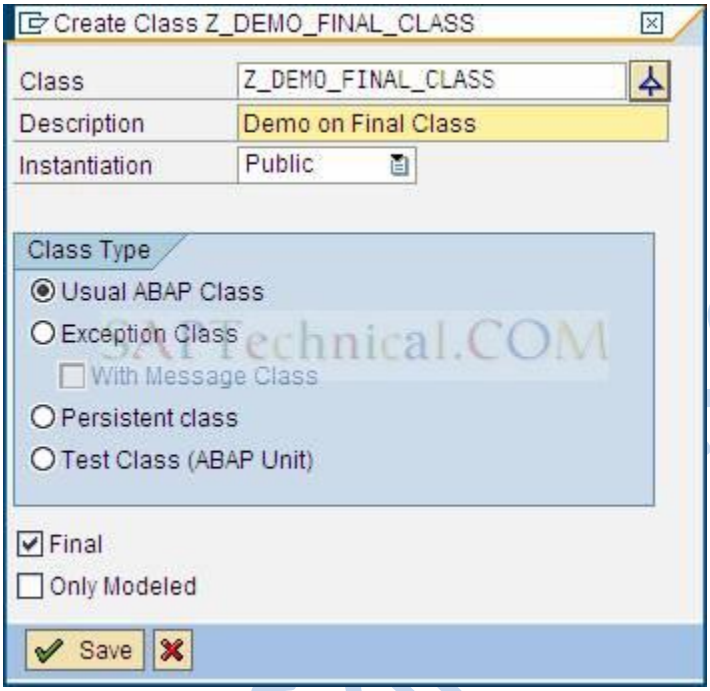


A pop-up window is displayed, then select "Class" radio button and

Press enter

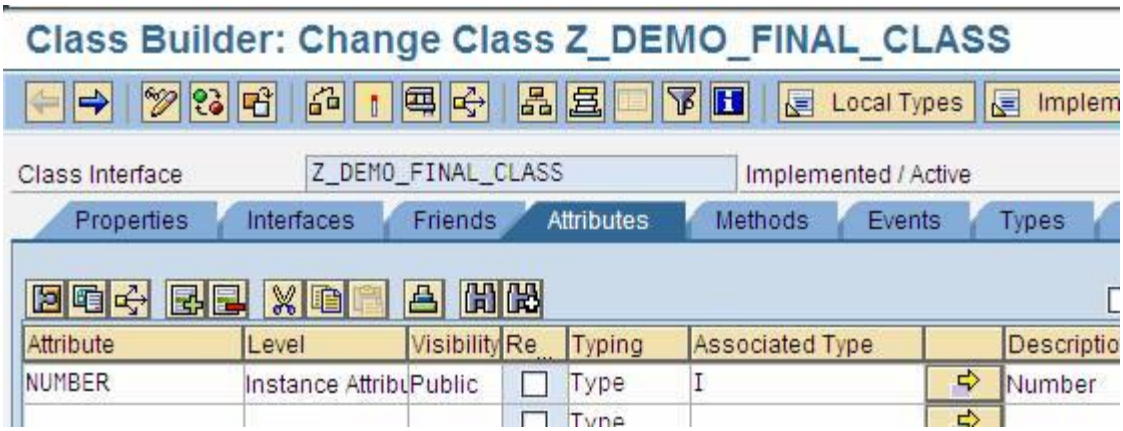


Enter the Description of the class and select the check box "Final" to define the class as Final class, and then press enter



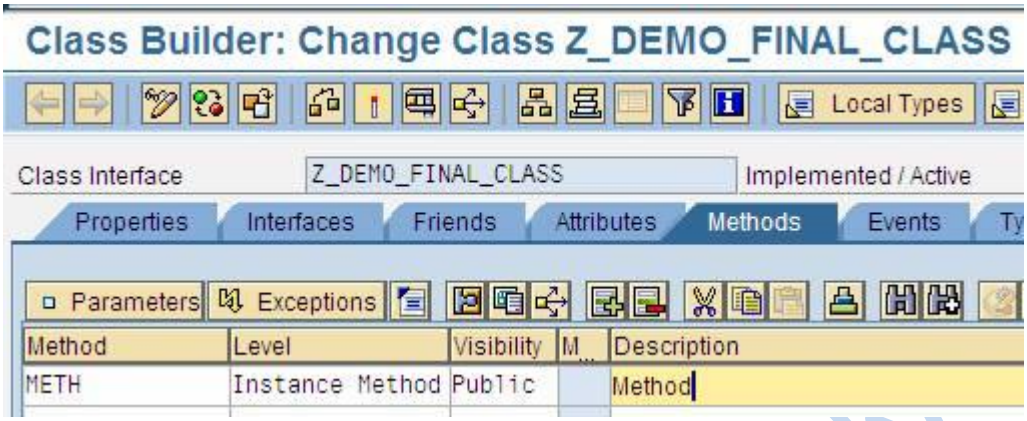
Go to the "Attributes" tab,

Enter the Attribute name, Level, Visibility, Type and Description as shown in the screen shot.



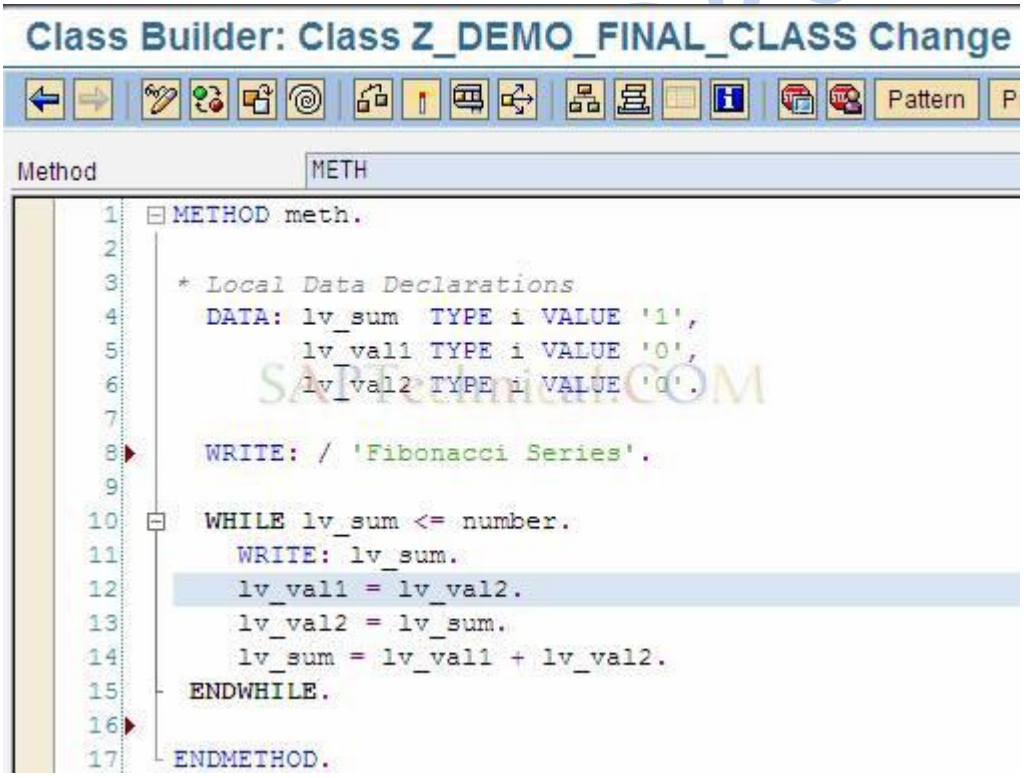
Go to Methods tab,

Enter Method name, Level, Visibility and Description as shown in the below screen shot



Double click on the Method name "METH"; it goes to method Implementation screen.

Here write the code.



Write the following code in method meth

Method meth

```
* Local Data Declarations
  DATA: lv_sum  TYPE i VALUE '1',
        lv_val1 TYPE i VALUE '0',
        lv_val2 TYPE i VALUE '0'.

  WRITE: / 'Fibonacci Series'.

  WHILE lv_sum <= number.
    WRITE: lv_sum.
    lv_val1 = lv_val2.
    lv_val2 = lv_sum.
    lv_sum = lv_val1 + lv_val2.
 ENDWHILE.
```

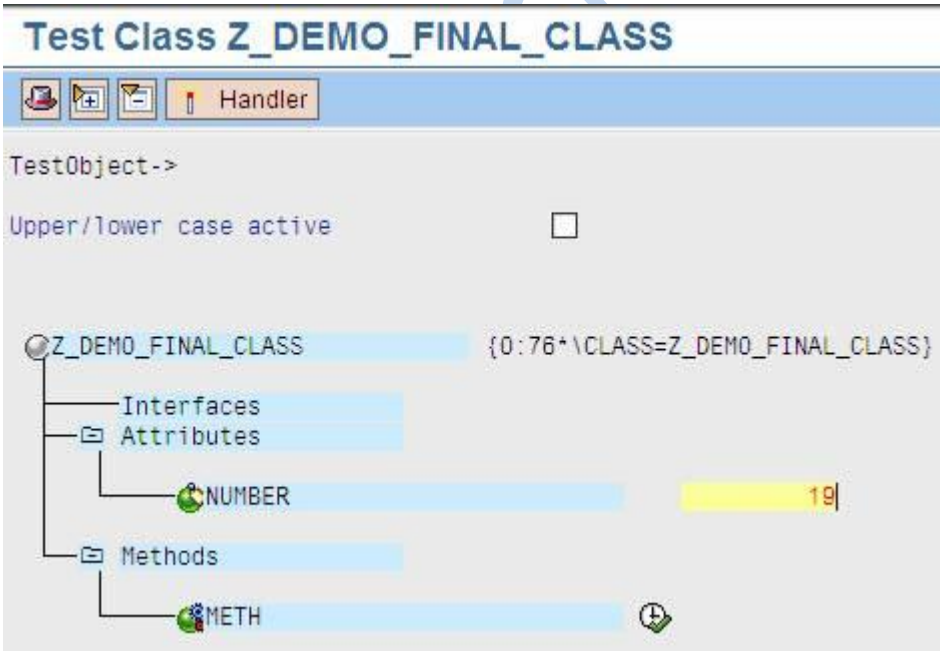
Endmethod.

Then save and activate the class and method.

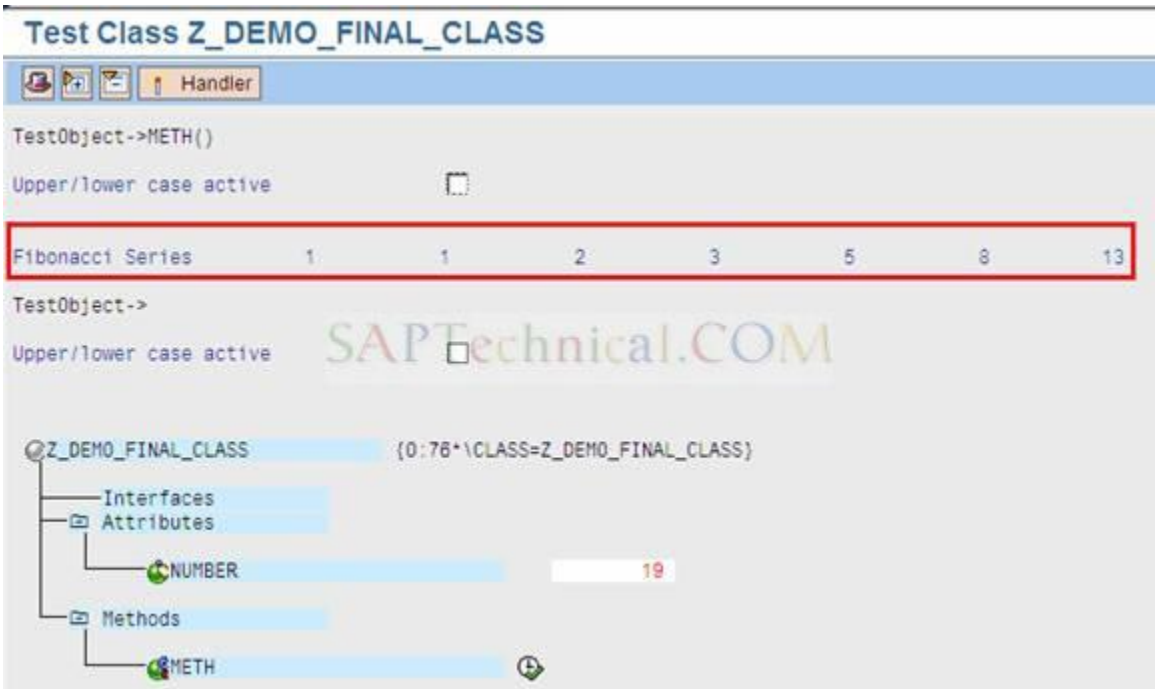
Finally execute the class by pressing (F8) button

It goes to below screen, then enter value under "NUMBER" as "19" and

Press execute button .



The output will be displayed like below.

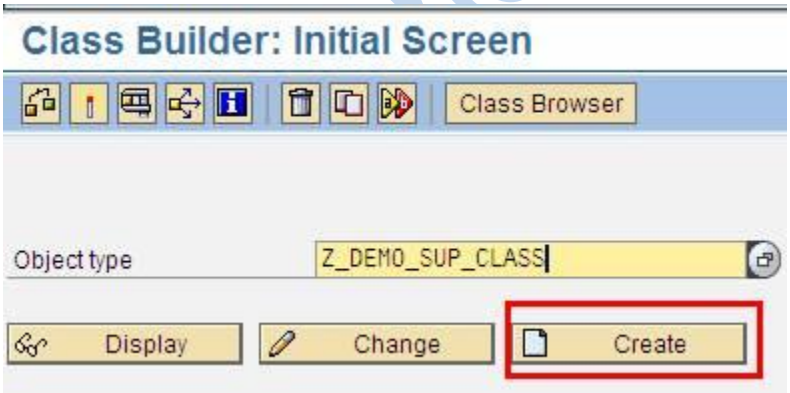


Final Method:

a) Creating Super Class:

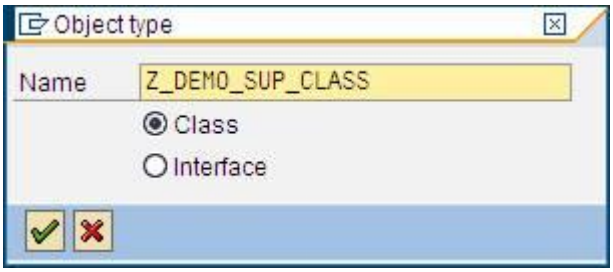
TCode: SE24

Enter the name of class as 'Z_DEMO_SUP_CLASS' to create super class and then press "Create" Button

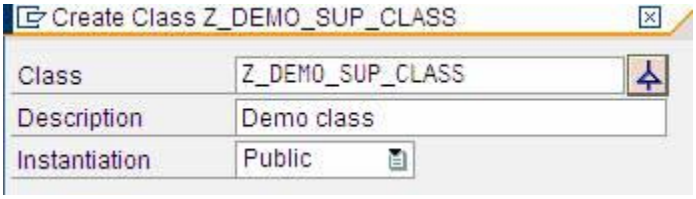


A pop-up window is displayed, then select "Class" radio button and

Press enter

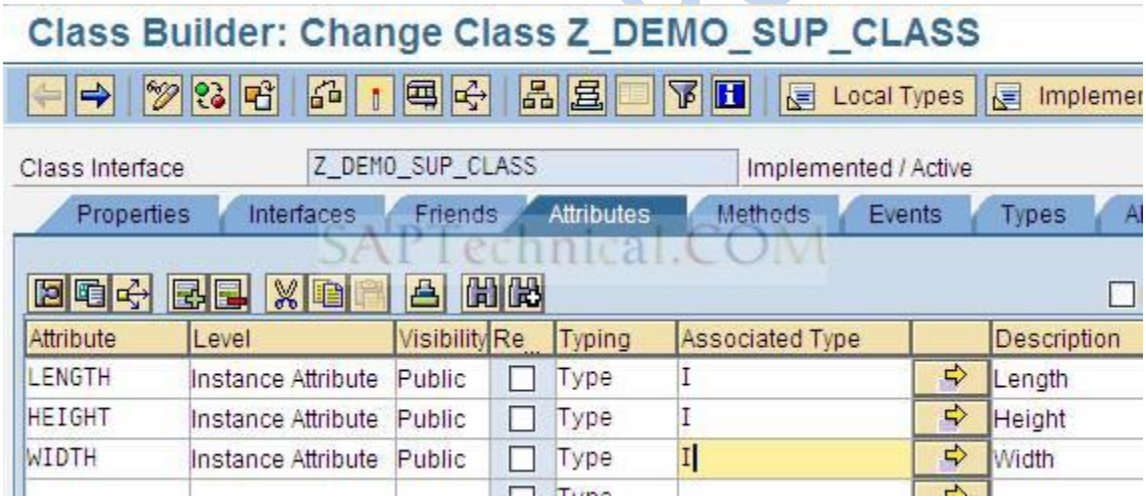


Enter the Description of the class and then press enter



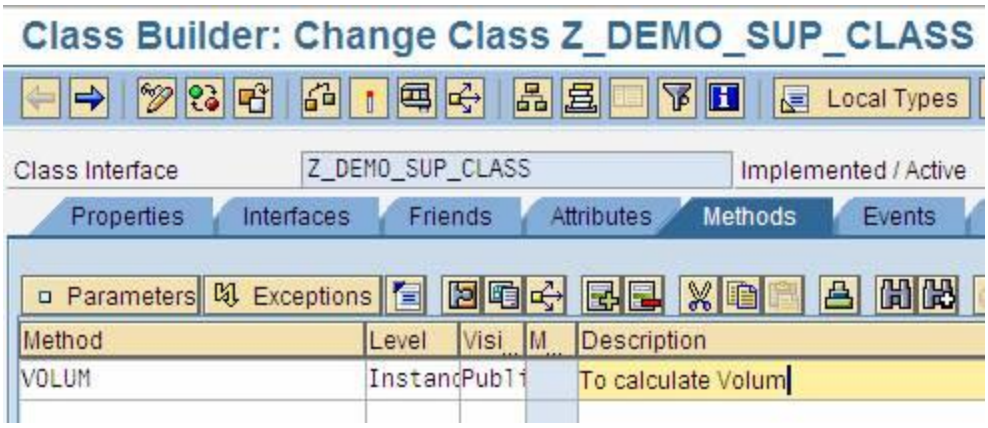
Go to the "Attributes" tab,

Enter the Attribute name, Level, Visibility, Type and Description as shown in the screen shot.

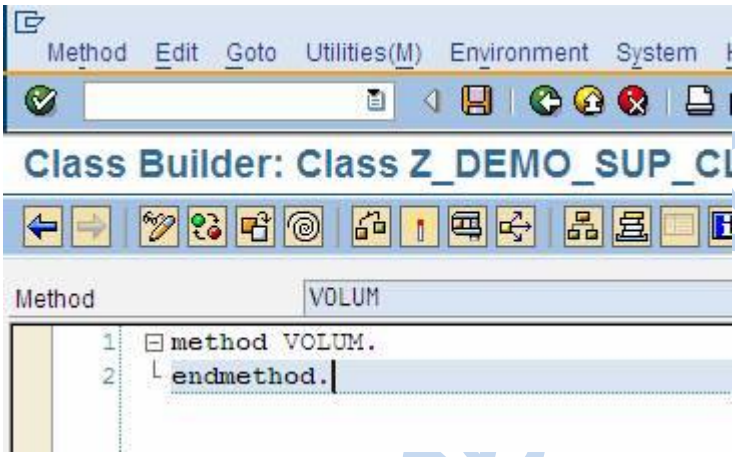


Go to Methods tab,

Enter Method name, Level, Visibility and Description as shown in the below screen shot

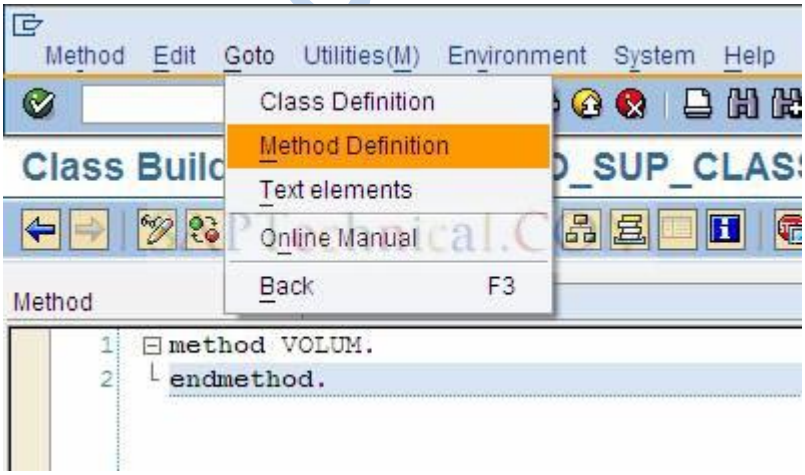


Double click on the Method name "VOLUM"; it goes to method Implementation screen. As shown below



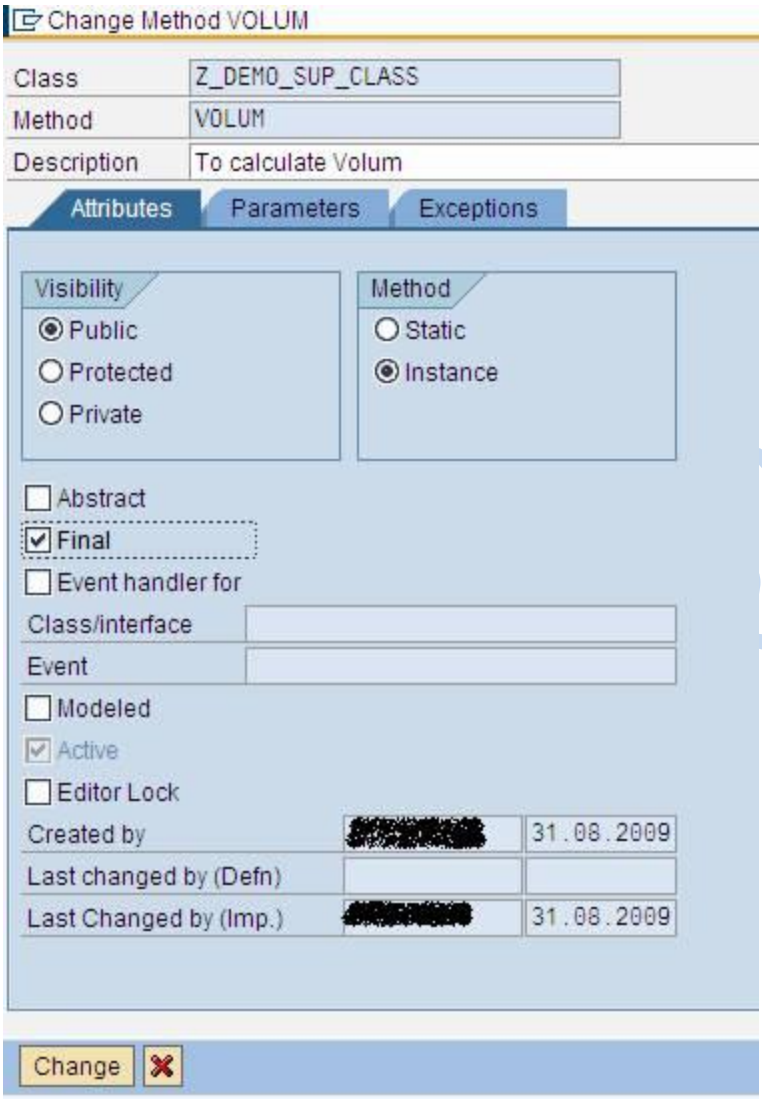
To define method "VOLUM" as a Final method,

Go to Menu path, then Goto -> Method definition

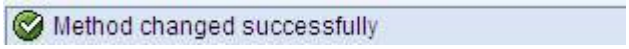


Pop-up window is displayed

Go to "Attributes" tab, check the check box "Final" and then press "Change" button.

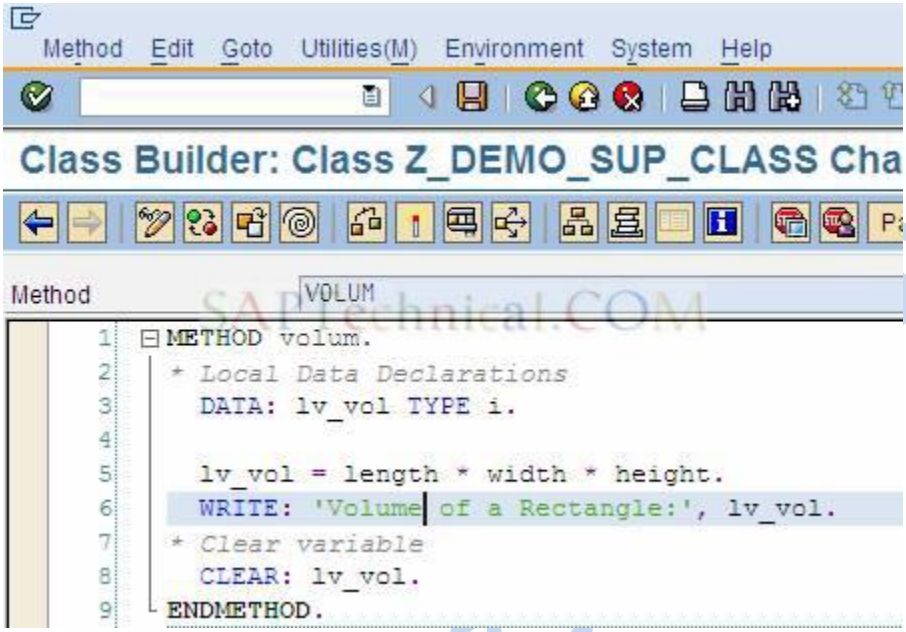


A successful message is displayed like "Method changed successfully"



Write the below code in Method volume

```
METHOD volum.
* Local Data Declarations
  DATA: lv_vol TYPE i.

  lv_vol = length * width * height.
  WRITE: 'Volume of a Rectangle:', lv_vol.
* Clear variable
  CLEAR: lv_vol.
ENDMETHOD.
```

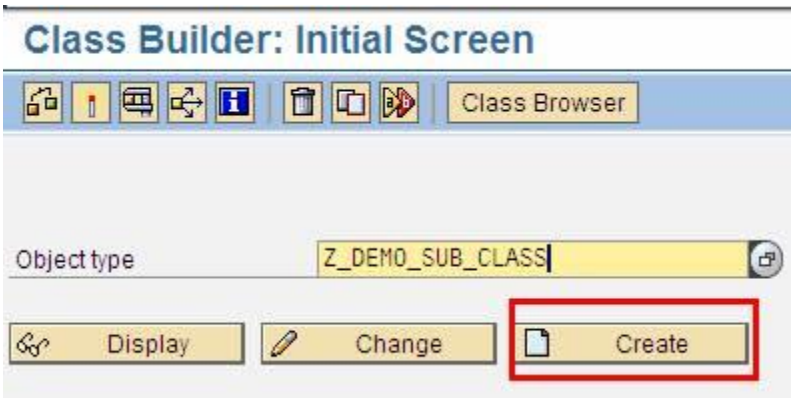


Then save and activate the class and method.

b) Creating Sub Class:

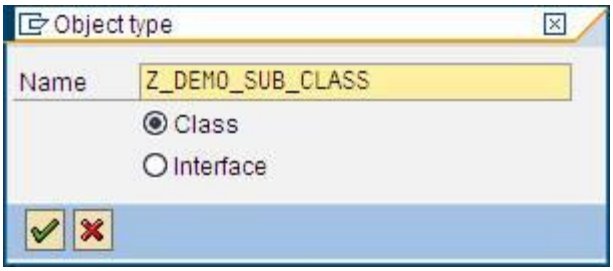
TCode: SE24

Enter the name of class as 'Z_DEMO_SUB_CLASS' and press Create Button to create sub class

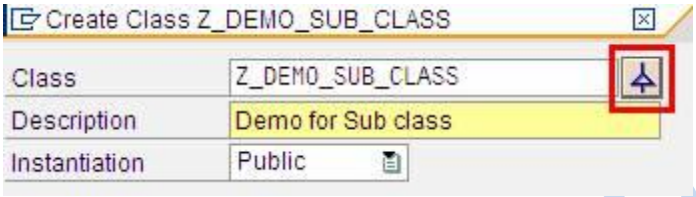


A pop-up window is displayed, then select "Class" radio button and

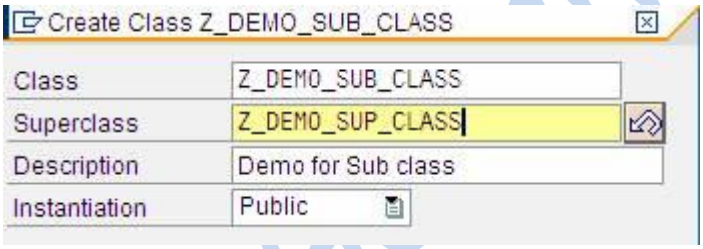
Press enter



Enter the Description of the class and then select the inheritance button , to inherit the super class.



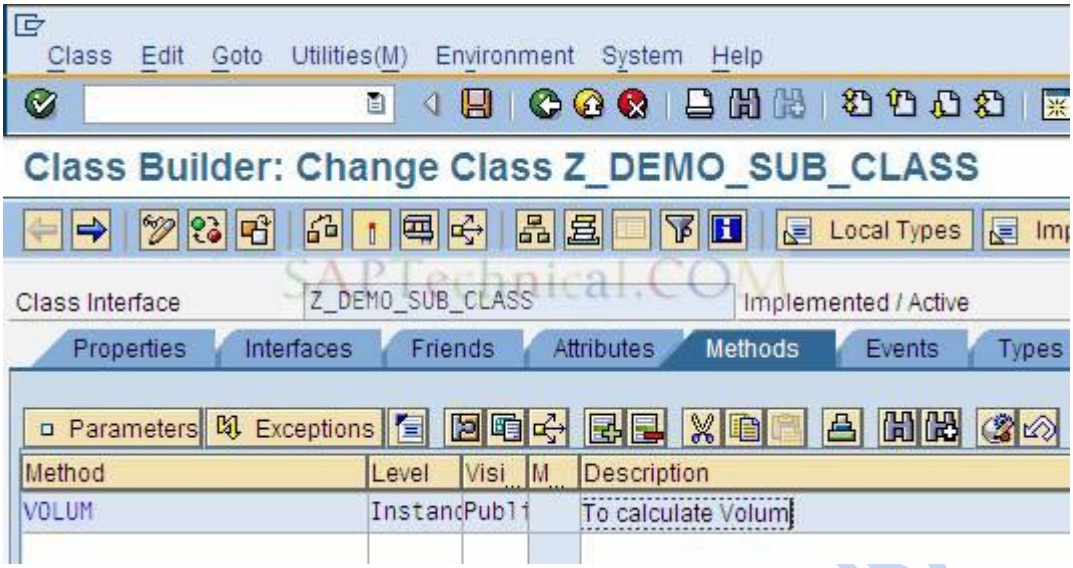
Enter the Super class name as "Z_DEMO_SUP_CLASS", which is being created earlier and press "Save" button.



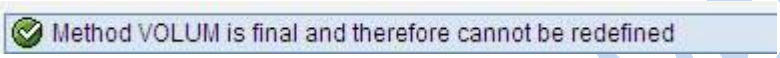
The Attributes and methods defined in the super class will automatically come into the sub class.

If you try to redefine or modify the super class method "VOLUM", go to the Methods tab, select the "VOLUM" method and click on

"Redefine" button ,



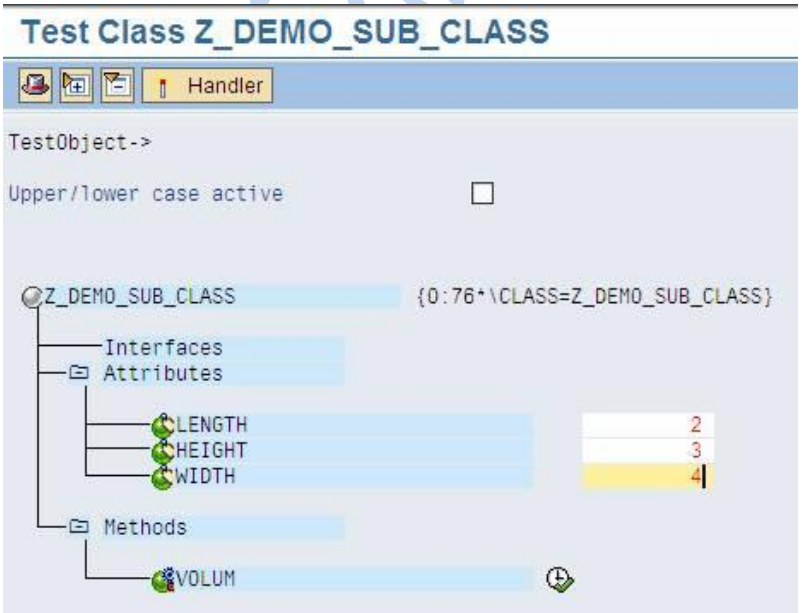
It gives a message like below and not allowed to redefine or modify the method in sub class.



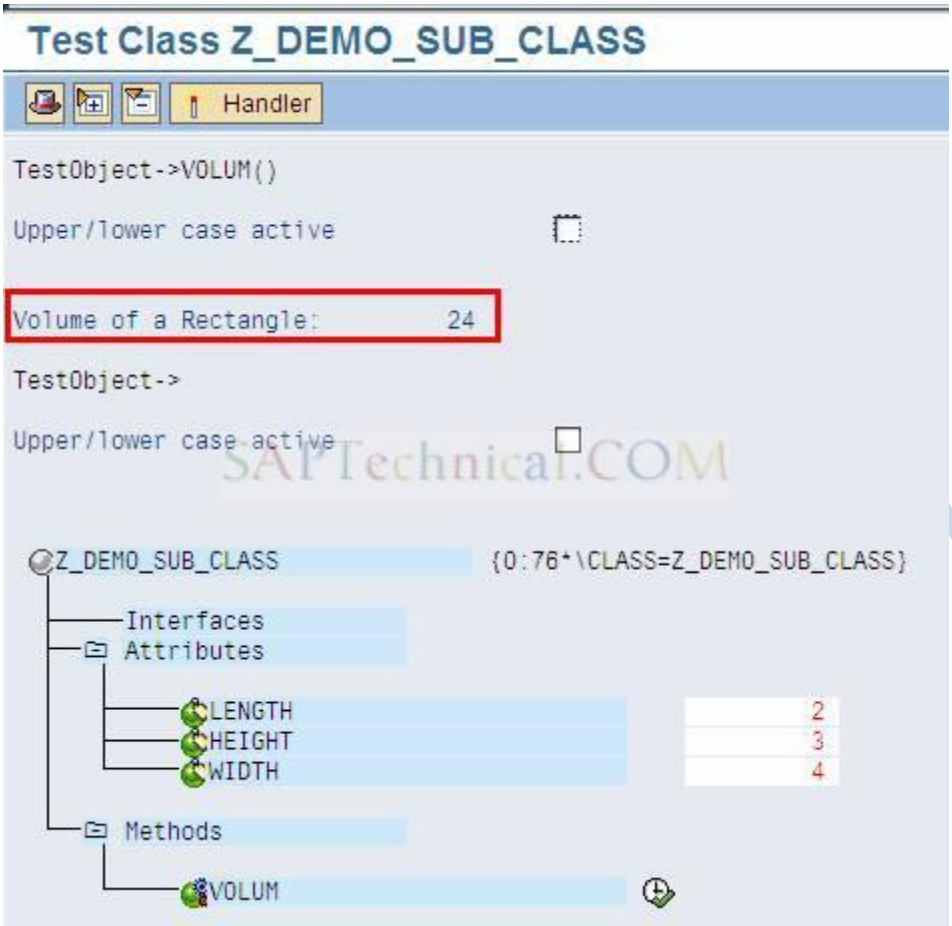
The method implementation "VOLUM" can be used in both super class "Z_DEMO_SUP_CLASS" and sub class "Z_DEMO_SUB_CLASS".

Execute the sub class "Z_DEMO_SUB_CLASS" by pressing (F8) button

It goes to below screen, then enter values under "LENGTH, HEIGHT and WIDTH" as "2, 3 and 4" and Press execute button .



The output will be displayed like below.



Same as sub class, you can also execute the super class "Z_DEMO_SUP_CLASS", the same output will be displayed.

Redefining methods in subclass

Definition: The methods of the super class can be re-implemented at the sub class.

Purpose to redefine methods: if the method implementation at the super class is not satisfies the requirement of the object which is created with reference to the sub class.

Principles of redefining methods:

1. The REDEFINITION statement for the inherited method must be in the same SECTION as the definition of the original method.
2. If you redefine a method, you do not need to enter its interface again in the subclass, but only the name of the method.
3. In the case of redefined methods, changing the interface (**overloading**) is not permitted; exception: Overloading is possible with the constructor
4. Within the redefined method, you can access components of the direct super class using the SUPER reference.
5. The pseudo-reference super can only be used in redefined methods.

Demo program for redefining method:

Go to transaction SE38:

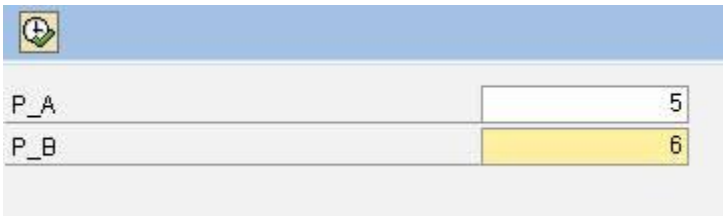
Give any name for the program.

Report ZINHERITANCE_REDEFINITION1 Active

```
1  *&---------------------------------------------------------------------*
2  *& Report  ZINHERITANCE_REDEFINITION1
3  *&
4  *&---------------------------------------------------------------------*
5  *&
6  *&
7  *&---------------------------------------------------------------------*
8
9  REPORT  zinheritance_redefinition1.
10
11 *---------------------------------------------------------------------*
12 *       CLASS CL_SUPER DEFINITION
13 *---------------------------------------------------------------------*
14 *
15 *---------------------------------------------------------------------*
16 CLASS cl_super DEFINITION.
17
18   PUBLIC SECTION.
19     METHODS: add IMPORTING f_a TYPE i
20                            f_b TYPE i
21                  EXPORTING f_c TYPE i.
22
23 ENDCLASS.                    "CL_SUPER DEFINITION
24
25 *---------------------------------------------------------------------*
26 *       CLASS CL_SUPER IMPLEMENTATION
27 *---------------------------------------------------------------------*
28 *
29 *---------------------------------------------------------------------*
30 CLASS cl_super IMPLEMENTATION.
31
32   METHOD add.
33
34     f_c = f_a + f_b.
35
36   ENDMETHOD.                    "ADD
37
38 ENDCLASS.                    "CL_SUPER IMPLEMENTATION
```

```
29
30  CLASS CL_SUB DEFINITION INHERITING FROM CL_SUPER.
31
32    PUBLIC SECTION.
33    *no interfaces used.the same interface exist as defined in super class.
34    METHODS: ADD REDEFINITION.
35
36
37    ENDCLASS.
38
39  CLASS CL_SUB IMPLEMENTATION.
40
41  METHOD ADD.
42
43    F_C = F_A  + F_B + 10.
44
45  ENDMETHOD.
46
47    ENDCLASS.
48
49
50    START-OF-SELECTION.
51
52    PARAMETERS: P_A TYPE I,
53                P_B TYPE I.
54
55    DATA: GV_ADD TYPE I.
56    DATA: GV_SUB TYPE I.
57
58    DATA: REF1 TYPE REF TO CL_SUB.
59
60    CREATE OBJECT REF1.
61
62    CALL METHOD REF1->ADD EXPORTING F_A = P_A
63                                    F_B = P_B
64                          IMPORTING  F_C = GV_ADD.
65    WRITE:/ GV_ADD.
```


After execution (F8):



Result:

```
Demo for Redefinition of method
---------------------------------
        21
```

Demo for use of super keyword in redefinition:

Go to transaction SE38.

Report ZINHERITANCE_REDEFINITION_SUP Active

```
1  *&---------------------------------------------------------------------*
2  *& Report  ZINHERITANCE_REDEFINITION_SUP
3  *&
4  *&---------------------------------------------------------------------*
5  *&
6  *&
7  *&---------------------------------------------------------------------*
8
9  REPORT  zinheritance_redefinition_sup.
10
11 *---------------------------------------------------------------------*
12 *       CLASS CL_SUPER DEFINITION
13 *---------------------------------------------------------------------*
14 *
15 *---------------------------------------------------------------------*
16 CLASS cl_super DEFINITION.
17
18   PUBLIC SECTION.
19     METHODS: add IMPORTING f_a TYPE i
20                            f_b TYPE i
21                  EXPORTING f_c TYPE i.
22
23 ENDCLASS.                    "CL_SUPER DEFINITION
24
25 *---------------------------------------------------------------------*
26 *       CLASS CL_SUPER IMPLEMENTATION
27 *---------------------------------------------------------------------*
28 *
29 *---------------------------------------------------------------------*
30 CLASS cl_super IMPLEMENTATION.
31
32   METHOD add.
33
34     f_c = f_a + f_b.
35
36   ENDMETHOD.                    "ADD
37
38 ENDCLASS.                    "CL_SUPER IMPLEMENTATION
39
```

```
40  *---------------------------------------------------------------------*
41  *       CLASS CL_SUB DEFINITION
42  *---------------------------------------------------------------------*
43  *
44  *---------------------------------------------------------------------*
45  CLASS cl_sub DEFINITION INHERITING FROM cl_super.
46
47    PUBLIC SECTION.
48
49      METHODS: add REDEFINITION.
50
51
52
53  ENDCLASS.                    "CL_SUB DEFINITION
54
55  *---------------------------------------------------------------------*
56  *       CLASS CL_SUB IMPLEMENTATION
57  *---------------------------------------------------------------------*
58  *
59  *---------------------------------------------------------------------*
60  CLASS cl_sub IMPLEMENTATION.
61
62    METHOD add.
63
64  *Use of  SUPER KEY.
65      DATA: gv_var1 TYPE i.
66      DATA: gv_var2 TYPE i.
67      DATA: gv_var3 TYPE i.
68      gv_var1 = 10.
69      gv_var2 = 20.
70
71      CALL METHOD super->add
72        EXPORTING
73          f_a = gv_var1
74          f_b = gv_var2
75        IMPORTING
76          f_c = gv_var3.
77      f_c = gv_var3 + f_a + f_b.
78
79    ENDMETHOD.                    "ADD
80
81
82
83
84  ENDCLASS.                    "CL_SUB IMPLEMENTATION
```

```
START-OF-SELECTION.

  PARAMETERS: p_a TYPE i,
              p_b TYPE i.

  DATA: gv_add TYPE i.
  DATA: gv_sub TYPE i.

  DATA: ref1 TYPE REF TO cl_sub.

  CREATE OBJECT ref1.

  CALL METHOD ref1->add
    EXPORTING
      f_a = p_a
      f_b = p_b
    IMPORTING
      f_c = gv_add.
  WRITE:/ gv_add.
```

After execution (F8):

Result:

```
Use of super keyword
--------------------
        39
```

Handling Data in Excel In-place Display Using BDS

The article demonstrates data handling in excel in-place display using BDS with the help of a program. The demo program maintains the entries in a database table through an excel in-place display.

OVERVIEW

MS Excel is the conventional way of storing and maintaining data. Sometimes, user prefers to display report output in specific MS Excel templates; which contain logos, user specific table formats, engineering drawings, diagrams and macros. The data modified manually in these excel templates may be again transferred to SAP for processing.

Excel integration is required due to various reasons like avoiding user training on newly developed custom programs and screens, use existing data templates, data integration with legacy system.

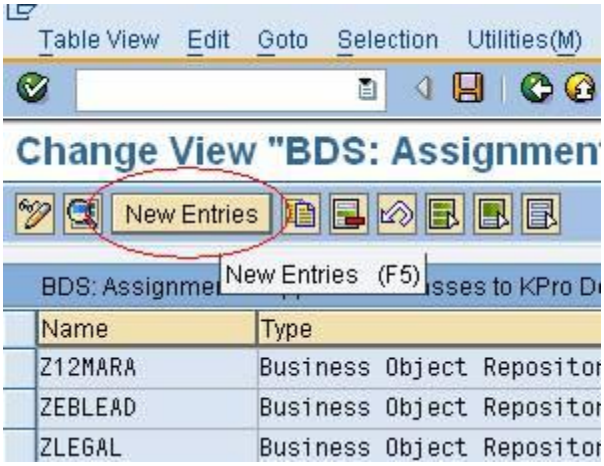
BDS (Business Document Services) is a convenient option for excel integration as user specific MS Excel templates can be stored in it. These templates can be called in an ABAP program at runtime to display data. Also, the data modified by the user in MS Excel can be read into ABAP program for processing.

The functionality will be demonstrated through a demo program. The program will display the content of a custom table in excel in-place display. The user can change the non key fields displayed and the modified contents will be updated to the table after validation.

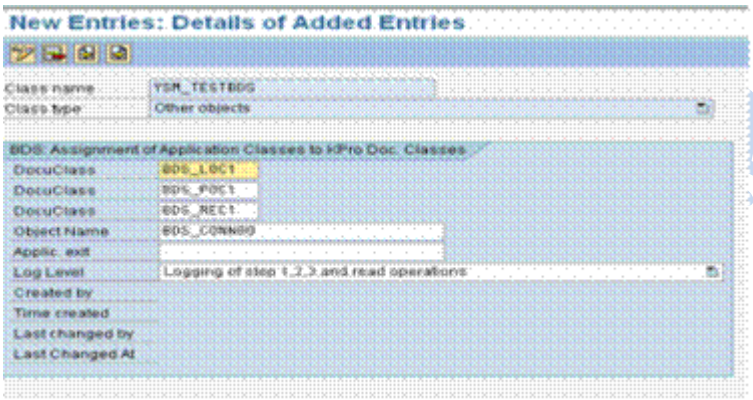
1. Defining a B DS Class

A custom BDS class can be defined through transaction SBDSV1 as described below. An existing BDS class can be used, unless the user wants a separate class for a specific application.

In SBDSV1, Go to 'NEW ENTRIES'.



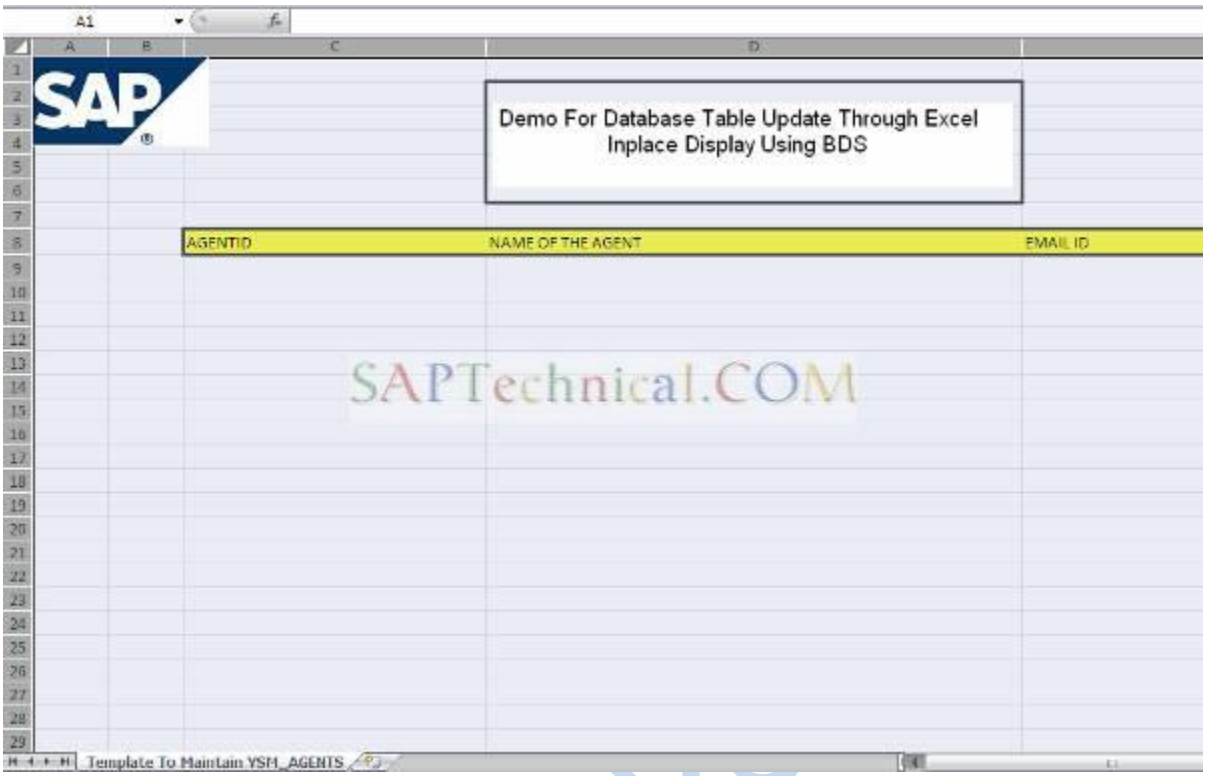
Enter the 'Class name', 'Class type' as 'Other objects(OT)', 'Log Level' as required and rest of the parameters should filled as shown below.



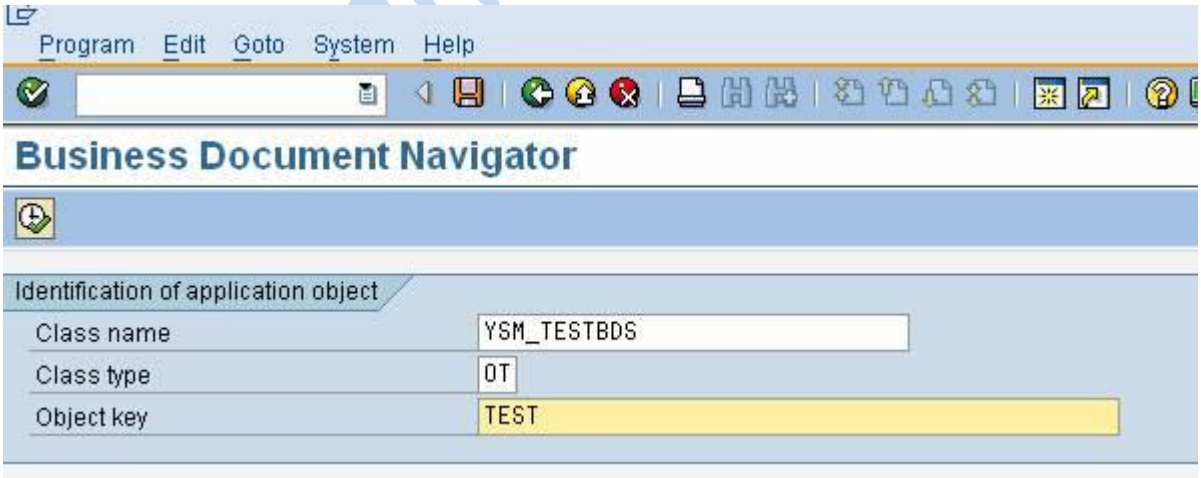
2. Uploading MS Excel Template

Design a template as per user requirement in MS Excel. You can embed all static objects/data to be displayed such as logos, drawings, headers etc in the template, except the area, where the data will be filled at runtime.

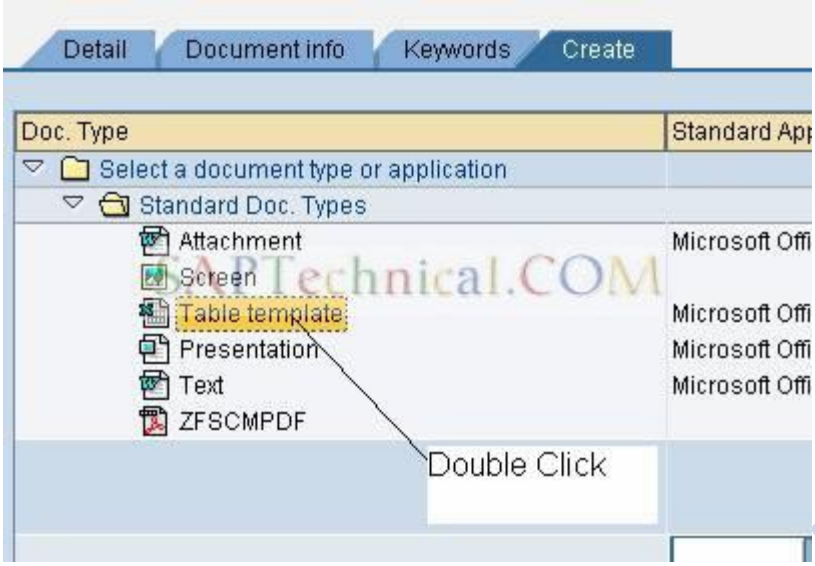
A sample template has been created as shown below.



Now, the MS Excel template needs to be uploaded to BDS using transaction OAOR under a class. Enter any existing Class Name, Class Type as 'OT' and Object Key in the selection screen of OAOR. Object key is like a sub folder, which is used to distinguish different sets of documents stored under a class. Any value can be entered to define an object key in OAOR. But to access a document, the same object key must be keyed in, in which it was stored initially.

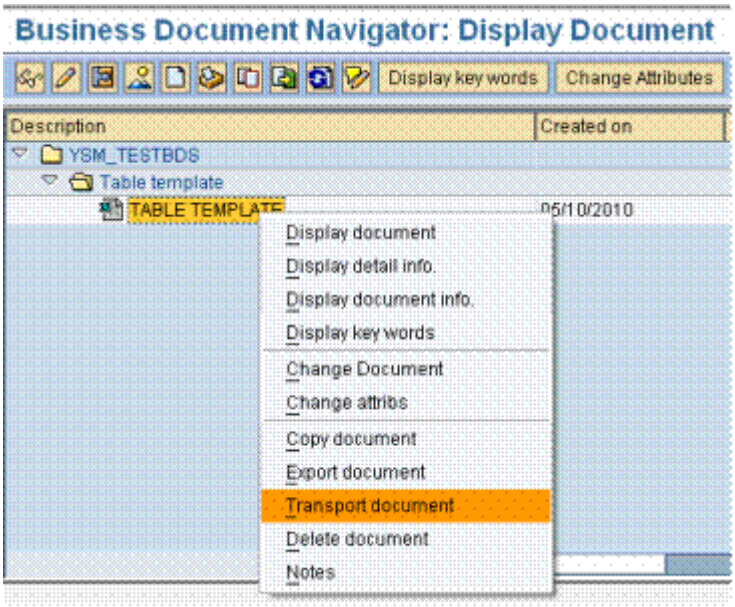


Now, go to 'Create' tab and double click on table template. It will show a pop up to upload the MS Excel template.



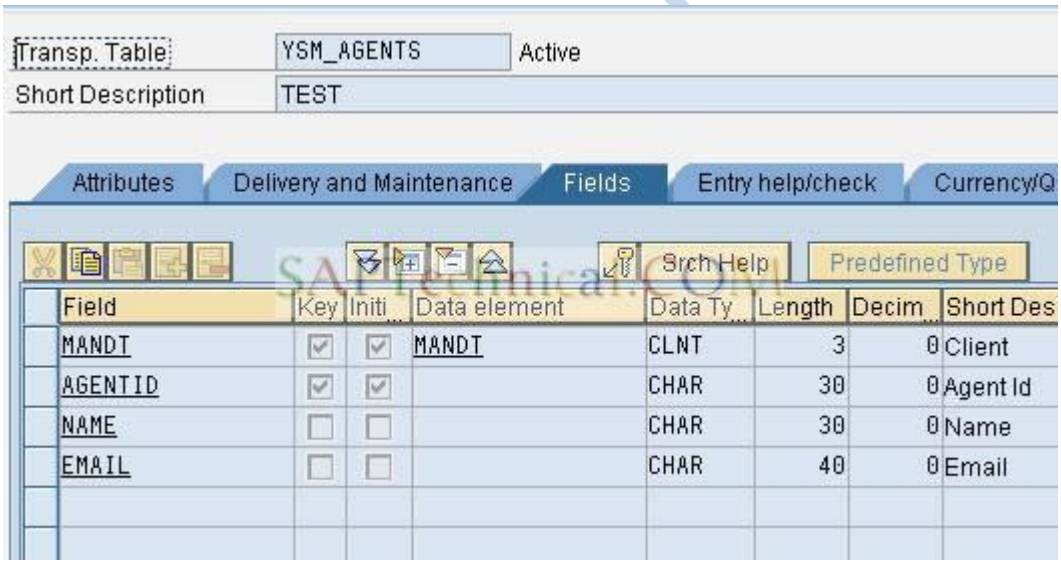
Enter the 'Description' for the table template after uploading.

The uploaded table template can be attached to a transport request as well.



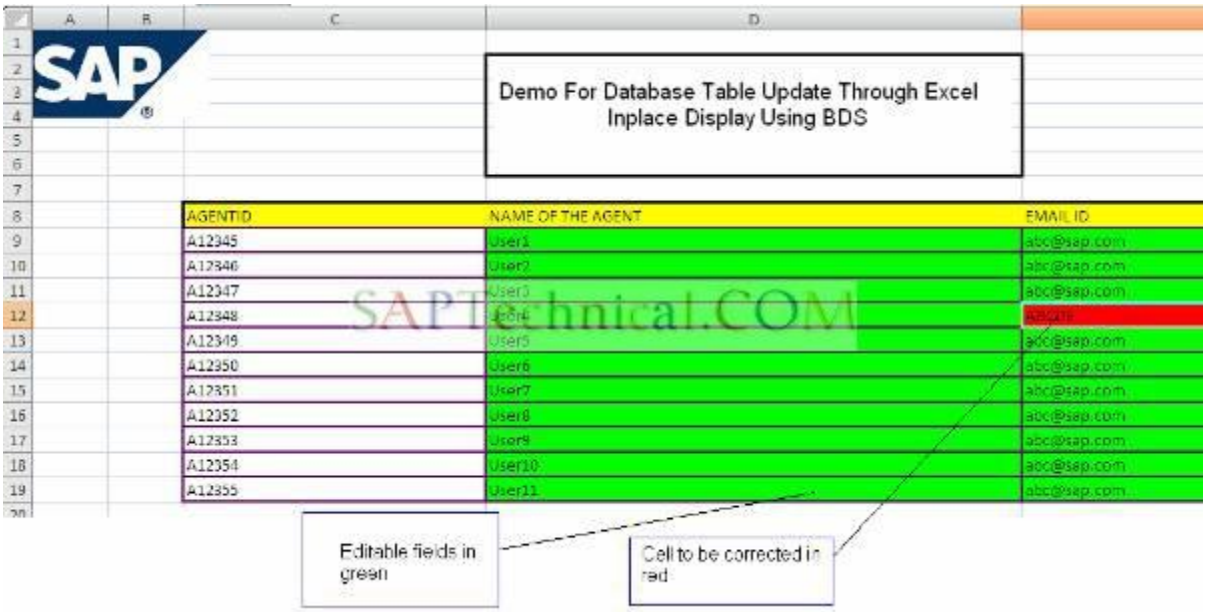
3. Code to Handle Data in Excel In-place Display

The program will maintain a custom table YSM_AGENTS, which has the following fields.



Initially, the program will display the table contents of YSM_AGENTS in the excel template uploaded in BDS. The user should be able to modify only the non key fields of the table filled with color green. So, we need to protect the whole worksheet except a range or window, which will contain editable fields NAME & EMAIL. The user will not be able to modify anything else except these fields.

Also, the email entered will be validated. If an invalid email id is entered, error message will be displayed with the cell to be corrected filled with color red.



Create a screen '0100' and a custom control 'EXCEL' in it to display the excel document in-place. Also, activate the BACK, EXIT, CANCEL, SAVE options in GUI status.

```
*&---------------------------------------------------------------------*
*& Report  YSM_TEST5
*&---------------------------------------------------------------------*
*& Demo program for displaying table data in a specific excel template
*& using BDS. Also, reads the contents modified by user again into ABAP
*& program after validations and updates the table.
*&---------------------------------------------------------------------*
  REPORT  ysm_test5.

**********************************************************************
* Data Declaration
**********************************************************************
* Custom Table With 3 fields
*->AGENTID  (KEY)
*->NAME
*->EMAIL
TABLES: ysm_agents.

TYPES: BEGIN OF t_agents,
        agentid  TYPE ysm_agents-agentid,
        name     TYPE ysm_agents-name,
        email    TYPE ysm_agents-email,
       END OF t_agents.

DATA: int_agents     TYPE TABLE OF t_agents,
      wf_entries     TYPE i.

TYPE-POOLS: soi,
            sbdst.

DATA: r_document  TYPE REF TO cl_bds_document_set,
      r_excel     TYPE REF TO i_oi_spreadsheet,
      r_container TYPE REF TO cl_gui_custom_container,
```

```
      r_control   TYPE REF TO i_oi_container_control,
      r_proxy     TYPE REF TO i_oi_document_proxy,
      r_error     TYPE REF TO i_oi_error,
      wf_retcode  TYPE soi_ret_string.


*************************************************************************
* Selection Screen
*************************************************************************
SELECTION-SCREEN BEGIN OF BLOCK b1 WITH FRAME.
* User will enter the agent ids to be modified
SELECT-OPTIONS: s_agent FOR ysm_agents-agentid OBLIGATORY.

* Details of table template in BDS to be entered
PARAMETERS: p_clsnam  TYPE sbdst_classname  DEFAULT 'YSM_TESTBDS'    OBLIGATORY,
            p_clstyp  TYPE sbdst_classtype  DEFAULT 'OT'             OBLIGATORY,
            p_objkey  TYPE sbdst_object_key DEFAULT 'TEST'           OBLIGATORY,
            p_desc    TYPE char255          DEFAULT 'TABLE TEMPLATE' OBLIGATORY.
SELECTION-SCREEN END OF BLOCK b1.


*************************************************************************
* START OF SELECTION
*************************************************************************
START-OF-SELECTION.
* Call Excel Inplace Display
  CALL SCREEN 100. "Create a screen 100 with custom container 'EXCEL'

*************************************************************************
* SCREEN LOGIC
*************************************************************************
*&---------------------------------------------------------------------*
*&      Module  STATUS_0100  OUTPUT
*&---------------------------------------------------------------------*
MODULE status_0100 OUTPUT.

  SET PF-STATUS 'STAT100'.   "Enable SAVE, BACK, EXIT, CANCEL
  SET TITLEBAR  'TITLE100'.  "Set title

* Get table data
  PERFORM f_get_table_data.

* Open the excel template in BDS in-place
  PERFORM f_open_document USING p_clsnam
                                p_clstyp
                                p_objkey
                                p_desc.

* Display table data in the excel template
  PERFORM f_dis_table_data.

* Protect the whole sheet except the editable fields
  PERFORM f_protect_sheet.

ENDMODULE.                 " STATUS_0100  OUTPUT

*&---------------------------------------------------------------------*
*&      Module  USER_COMMAND_0100  INPUT
*&---------------------------------------------------------------------*
```

```
MODULE user_command_0100 INPUT.

  CASE sy-ucomm.
    WHEN 'BACK' OR 'EXIT' OR 'CANCEL'.
* Close document
      PERFORM f_close_document.
      LEAVE TO SCREEN 0.
    WHEN 'SAVE'.
* Save the modified entries into database
      PERFORM f_save_document.
  ENDCASE.

ENDMODULE.                " USER_COMMAND_0100  INPUT

*****************************************************************************
* SUBROUTINES
*****************************************************************************
*&---------------------------------------------------------------------*
*&      Form  f_get_table_data
*&---------------------------------------------------------------------*
*       Get fresh data from YSM_AGENTS
*----------------------------------------------------------------------*
FORM f_get_table_data .

* Get all the agents from table
  SELECT   agentid
           name
           email
      FROM ysm_agents
       INTO TABLE int_agents
        WHERE agentid IN s_agent.

  IF sy-subrc NE 0.
    MESSAGE 'No Agent Details Found' TYPE 'E'.
  ENDIF.

* Get the no of rows to be displayed
  DESCRIBE TABLE int_agents LINES wf_entries.

ENDFORM.                  " f_get_table_data

*&---------------------------------------------------------------------*
*&      Form  f_open_document
*&---------------------------------------------------------------------*
*       Open the table template from BDS
*----------------------------------------------------------------------*
*  -->  l_clsnam         Class Name in OAOR
*  -->  l_clstyp         Class Type in OAOR
*  -->  l_objkey         Object key in OAOR
*  -->  l_desc           Description of the excel template in OAOR
*----------------------------------------------------------------------*
FORM f_open_document USING l_clsnam TYPE sbdst_classname
                           l_clstyp TYPE sbdst_classtype
                           l_objkey TYPE sbdst_object_key
                           l_desc   TYPE char255.

  DATA: locint_signature   TYPE sbdst_signature,
        locint_uris        TYPE sbdst_uri,
```

```
      locwa_signature    LIKE LINE OF locint_signature,
      locwa_uris         LIKE LINE OF locint_uris.

  IF NOT r_document IS INITIAL.
    RETURN.
  ENDIF.

* Create container control
  CALL METHOD c_oi_container_control_creator=>get_container_control
    IMPORTING
      control = r_control
      retcode = wf_retcode.

  IF wf_retcode NE c_oi_errors=>ret_ok.
    CALL METHOD c_oi_errors=>raise_message
      EXPORTING
        type = 'E'.
  ENDIF.

* Initialize Custom Control
  CREATE OBJECT r_container
    EXPORTING
      container_name = 'EXCEL'. "Custom Control Name

  CALL METHOD r_control->init_control
    EXPORTING
      r3_application_name      = 'EXCEL INPLACE BDS'
      inplace_enabled          = abap_true
      inplace_scroll_documents = abap_true
      parent                   = r_container
    IMPORTING
      retcode                  = wf_retcode.

  IF wf_retcode NE c_oi_errors=>ret_ok.
    CALL METHOD c_oi_errors=>raise_message
      EXPORTING
        type = 'E'.
  ENDIF.

* Create object for cl_bds_document_set
  CREATE OBJECT r_document.

* Get Document with URL
  locwa_signature-prop_name  = 'DESCRIPTION'.
* Description of the table template in OAOR
  locwa_signature-prop_value = l_desc.
  APPEND locwa_signature TO locint_signature.

  CALL METHOD r_document->get_with_url
    EXPORTING
      classname       = l_clsnam
      classtype       = l_clstyp
      object_key      = l_objkey
    CHANGING
      uris            = locint_uris
      signature       = locint_signature
    EXCEPTIONS
      nothing_found   = 1
      error_kpro      = 2
```

```
      internal_error  = 3
      parameter_error = 4
      not_authorized  = 5
      not_allowed     = 6.

  IF sy-subrc NE 0.
    MESSAGE 'Error Retrieving Document' TYPE 'E'.
  ENDIF.

  READ TABLE locint_uris INTO locwa_uris INDEX 1.

  CALL METHOD r_control->get_document_proxy
    EXPORTING
      document_type  = 'Excel.Sheet'
    IMPORTING
      document_proxy = r_proxy
      retcode        = wf_retcode.

  IF wf_retcode NE c_oi_errors=>ret_ok.
    CALL METHOD c_oi_errors=>show_message
      EXPORTING
        type = 'E'.
  ENDIF.

* Open Document
  CALL METHOD r_proxy->open_document
    EXPORTING
      document_url     = locwa_uris-uri
      open_inplace     = abap_true
      protect_document = abap_true "Protect Document initially
    IMPORTING
      retcode          = wf_retcode.

  IF wf_retcode NE c_oi_errors=>ret_ok.
    CALL METHOD c_oi_errors=>show_message
      EXPORTING
        type = 'E'.
  ENDIF.

* Get Excel Interface
  CALL METHOD r_proxy->get_spreadsheet_interface
    IMPORTING
      sheet_interface = r_excel
      retcode         = wf_retcode.

  IF wf_retcode NE c_oi_errors=>ret_ok.
    CALL METHOD c_oi_errors=>show_message
      EXPORTING
        type = 'E'.
  ENDIF.

ENDFORM.                    " f_open_document

*&---------------------------------------------------------------------*
*&      Form  f_dis_table_data
*&---------------------------------------------------------------------*
*       Display data in table template
*----------------------------------------------------------------------*
FORM f_dis_table_data .
```

```
  DATA: locint_fields TYPE TABLE OF rfc_fields.


* Create a range to insert data
  PERFORM f_create_range USING 9            "Begin on 9th row
                               3            "Begin on 3rd col
                               wf_entries   "No of rows reqd
                               3            "No of cols reqd
                               'AGENTS'.    "Range name
*-> Set Frame to the range
*# Calculation of TYP parameter
* The parameter has 8 bits
*0 Sets the left margin
*1 Sets the top margin
*2 Sets the bottom margin
*3 Sets the right margin
*4 Horizontal line
*5 Sets the left margin
*6 Thickness
*7 Thickness
* My figure will be 7 6 5 4 3 2 1 0
*                  1 0 1 1 1 1 1 1
* Binary 1011 1111 stands for 191 in decimal
* Check SAP help for more info.....
* http://help.sap.com/saphelp_NW04s/helpdata/en/
  " 21/b531bfe1ba11d2bdbe080009b4534c/frameset.htm

  CALL METHOD r_excel->set_frame
    EXPORTING
      rangename = 'AGENTS'
      typ       = 191
      color     = 21
    IMPORTING
      error     = r_error
      retcode   = wf_retcode.

  IF r_error->has_failed = abap_true.
    CALL METHOD r_error->raise_message
      EXPORTING
        type = 'E'.
  ENDIF.

* Get field attributes of the table to be displayed
  CALL FUNCTION 'DP_GET_FIELDS_FROM_TABLE'
    TABLES
      data            = int_agents
      fields          = locint_fields
    EXCEPTIONS
      dp_invalid_table = 1
      OTHERS           = 2.

  IF sy-subrc <> 0.
    MESSAGE ID sy-msgid TYPE sy-msgty NUMBER sy-msgno
           WITH sy-msgv1 sy-msgv2 sy-msgv3 sy-msgv4.
  ENDIF.

* Insert the table entries into Excel
  CALL METHOD r_excel->insert_one_table
```

```
    EXPORTING
      fields_table = locint_fields[]  "Defn of fields
      data_table   = int_agents[]     "Data
      rangename    = 'AGENTS'         "Range Name
    IMPORTING
      error        = r_error
      retcode      = wf_retcode.

  IF r_error->has_failed = abap_true.
    CALL METHOD r_error->raise_message
      EXPORTING
        type = 'E'.
  ENDIF.

ENDFORM.                    " f_dis_table_data

*&---------------------------------------------------------------------*
*&      Form  f_protect_sheet
*&---------------------------------------------------------------------*
*       Protect the whole sheet except the fields to edited
*----------------------------------------------------------------------*
FORM f_protect_sheet .

  DATA: loc_protect      TYPE c,
        loc_sheetname    TYPE char31.

* Check whether the sheet is protected
*  in case it's unprotected manually
  CALL METHOD r_excel->get_active_sheet
    IMPORTING
      sheetname = loc_sheetname
      error     = r_error
      retcode   = wf_retcode.

  IF r_error->has_failed = abap_true.
    CALL METHOD r_error->raise_message
      EXPORTING
        type = 'E'.
  ENDIF.

  CALL METHOD r_excel->get_protection
    EXPORTING
      sheetname = loc_sheetname   "Active sheet name
    IMPORTING
      error     = r_error
      retcode   = wf_retcode
      protect   = loc_protect.

  IF r_error->has_failed = abap_true.
    CALL METHOD r_error->raise_message
      EXPORTING
        type = 'E'.
  ELSE.
* If not protected, protect the sheet
    IF loc_protect NE abap_true.
      CALL METHOD r_excel->protect
        EXPORTING
          protect = abap_true
        IMPORTING
```

```
        error   = r_error
        retcode = wf_retcode.

      IF r_error->has_failed = abap_true.
        CALL METHOD r_error->raise_message
          EXPORTING
            type = 'E'.
      ENDIF.
    ENDIF.
  ENDIF.

* The user should not be allowed to change the primary fields.
* The sheet is protected against change and a particular range will
* be unprotected for editing

* Create a range to enable editing for non key fields
  PERFORM f_create_range USING 9          "Begin on 9th row
                               4          "Begin on 4th col
                               wf_entries  "No of rows reqd
                               2          "Only 2 columns are editable
                               'EDIT'.     "Range name

* Unprotect the range for editing
  CALL METHOD r_excel->protect_range
    EXPORTING
      name    = 'EDIT'
      protect = space
    IMPORTING
      error   = r_error
      retcode = wf_retcode.

  IF r_error->has_failed = abap_true.
    CALL METHOD r_error->raise_message
      EXPORTING
        type = 'E'.
  ENDIF.

*->Set colour to editable range
*# Check SAP help link for colour codes
* http://help.sap.com/saphelp_NW04s/helpdata/en
  "/21/b531bfe1ba11d2bdbe080009b4534c/frameset.htm
  CALL METHOD r_excel->set_color
    EXPORTING
      rangename = 'EDIT'
      front     = 1
      back      = 4
    IMPORTING
      error     = r_error
      retcode   = wf_retcode.

  IF r_error->has_failed = abap_true.
    CALL METHOD r_error->raise_message
      EXPORTING
        type = 'E'.
  ENDIF.

ENDFORM.                    " f_protect_sheet
*&---------------------------------------------------------------------*
*&      Form  f_close_document
```

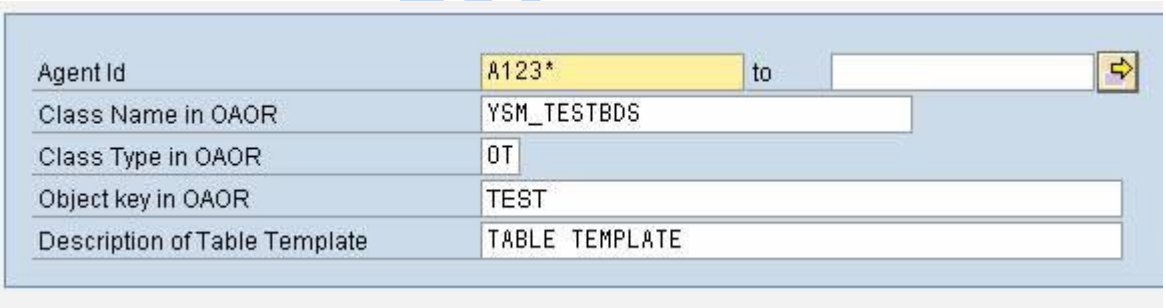
```
*&---------------------------------------------------------------------*
*       Close the document when user leaves the program
*---------------------------------------------------------------------*
FORM f_close_document .

* Close document
  IF NOT r_proxy IS INITIAL.
    CALL METHOD r_proxy->close_document
      IMPORTING
        error   = r_error
        retcode = wf_retcode.

    IF r_error->has_failed = abap_true.
      CALL METHOD r_error->raise_message
        EXPORTING
          type = 'E'.
    ENDIF.
  ENDIF.

ENDFORM.                    " f_close_document

*&---------------------------------------------------------------------*
*&      Form  f_save_document
*&---------------------------------------------------------------------*
*       Save the modified entries into database table
*---------------------------------------------------------------------*
FORM f_save_document .

  DATA: locint_ranges      TYPE soi_range_list,
        locwa_ranges       TYPE soi_range_item,
        locint_moddata     TYPE soi_generic_table,
        locwa_moddata      TYPE soi_generic_item,
        locint_agents_mod  TYPE TABLE OF ysm_agents,
        locwa_agents_mod   TYPE ysm_agents,
        loc_error_row      TYPE i.

* Initialize the colour of the editable range
  CALL METHOD r_excel->set_color
    EXPORTING
      rangename = 'EDIT'
      front     = 1
      back      = 4
    IMPORTING
      error     = r_error
      retcode   = wf_retcode.

  IF r_error->has_failed = abap_true.
    CALL METHOD r_error->raise_message
      EXPORTING
        type = 'E'.
  ENDIF.

* Define the range from which data needs to be read
  locwa_ranges-name    = 'AGENTS'.
  locwa_ranges-rows    = wf_entries.
  locwa_ranges-columns = 3.
  APPEND locwa_ranges TO locint_ranges.

* Get modified data
```

```
  CALL METHOD r_excel->get_ranges_data
    IMPORTING
      contents = locint_moddata
      error    = r_error
    CHANGING
      ranges   = locint_ranges.

  IF r_error->has_failed = abap_true.
    CALL METHOD r_error->raise_message
      EXPORTING
        type = 'E'.
  ENDIF.

  LOOP AT locint_moddata INTO locwa_moddata.
    CASE locwa_moddata-column.
      WHEN 1.
        locwa_agents_mod-agentid = locwa_moddata-value.
      WHEN 2.
        locwa_agents_mod-name    = locwa_moddata-value.
      WHEN 3.
        locwa_agents_mod-email   = locwa_moddata-value.

*-> Validate the email id entered

* Get the current row no taking account the rows
*  in the sheet above the range
        loc_error_row = locwa_moddata-row + 8.
        PERFORM f_validate_email USING locwa_agents_mod-email
                                       loc_error_row.
    ENDCASE.

    AT END OF row.
      locwa_agents_mod-mandt = sy-mandt.
      APPEND locwa_agents_mod TO locint_agents_mod.
      CLEAR  locwa_agents_mod.
    ENDAT.

  ENDLOOP.

* Update Table
  MODIFY ysm_agents FROM TABLE locint_agents_mod.
  COMMIT WORK.

  IF sy-subrc EQ 0.
    MESSAGE 'DATA UPDATED' TYPE 'S'.
  ELSE.
    MESSAGE 'DATA NOT UPDATED' TYPE 'E'.
  ENDIF.

ENDFORM.                    " f_save_document

*&---------------------------------------------------------------------*
*&      Form  f_validate_email
*&---------------------------------------------------------------------*
*       Validate the email id entered
*----------------------------------------------------------------------*
*      -->l_email  Email Id
*----------------------------------------------------------------------*
FORM f_validate_email  USING    l_email   TYPE c
```

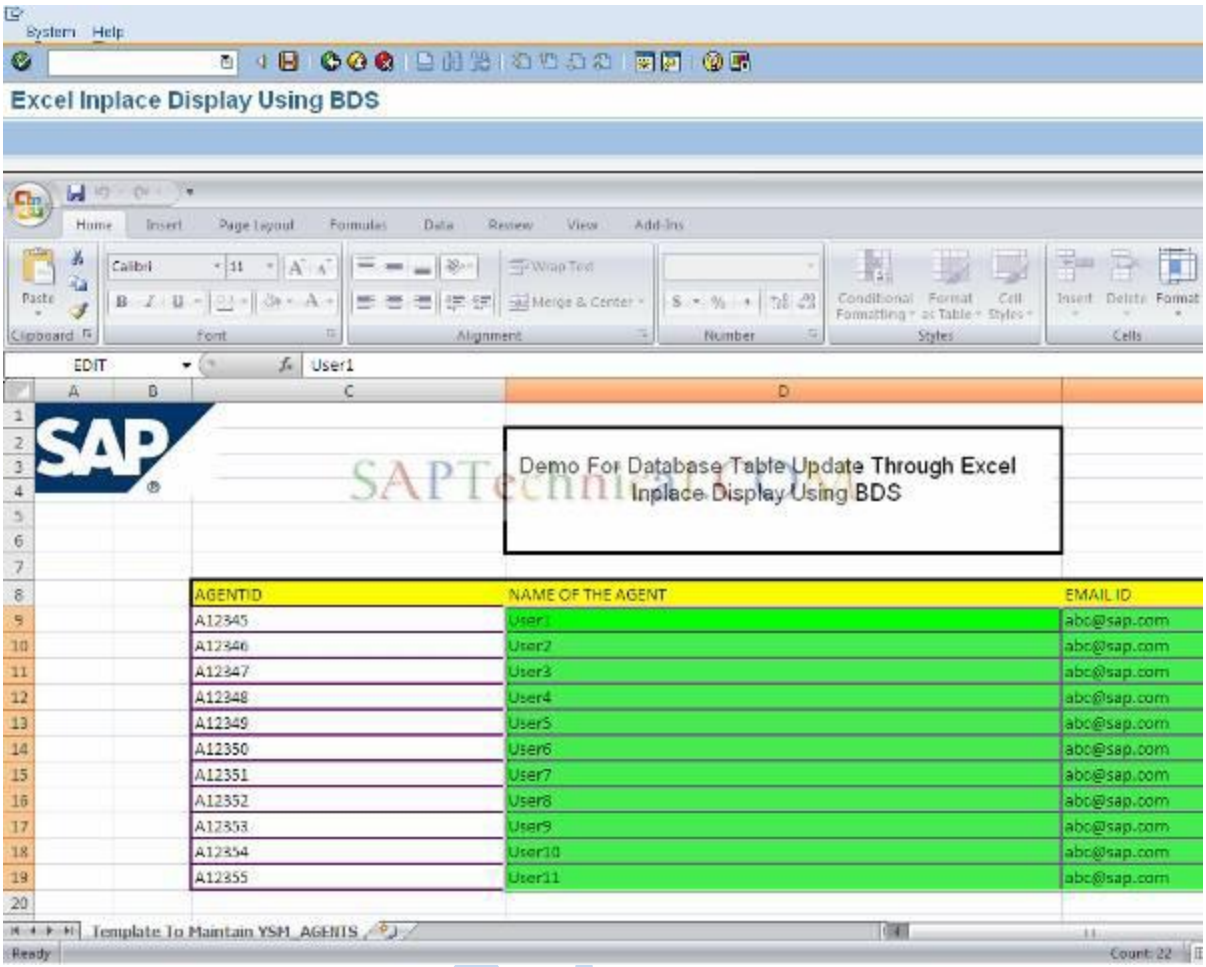
```
                              l_err_row TYPE i.

  TYPE-POOLS:sx.
  DATA: locwa_address TYPE sx_address.

* Check Email Id
  locwa_address-type = 'INT'.
  locwa_address-address = l_email.

  CALL FUNCTION 'SX_INTERNET_ADDRESS_TO_NORMAL'
    EXPORTING
      address_unstruct    = locwa_address
    EXCEPTIONS
      error_address_type  = 1
      error_address       = 2
      error_group_address = 3
      OTHERS              = 4.

  IF sy-subrc <> 0.

* Create a range to highlight the error cell
    PERFORM f_create_range USING l_err_row
                              5   "Column no for email id
                              1
                              1
                              'ERROR'.

* Display the error cell in red
    CALL METHOD r_excel->set_color
      EXPORTING
        rangename = 'ERROR'
        front     = 1
        back      = 3
      IMPORTING
        error     = r_error
        retcode   = wf_retcode.

    IF r_error->has_failed = abap_true.
      CALL METHOD r_error->raise_message
        EXPORTING
          type = 'E'.
    ENDIF.

    MESSAGE 'Invalid Email Address' TYPE 'E'.
  ENDIF.

ENDFORM.                    " f_validate_email
*&---------------------------------------------------------------------*
*&      Form  f_create_range
*&---------------------------------------------------------------------*
*       Create a range dynamically in excel sheet
*----------------------------------------------------------------------*
*      -->l_top       Begin on row
*      -->l_left      Begin on column
*      -->l_row       No of rows
*      -->l_column    No of columns
*      -->l_range     Range Name
*----------------------------------------------------------------------*
FORM f_create_range  USING  l_top    TYPE i
```

```
                    l_left   TYPE i
                    l_row    TYPE i
                    l_column TYPE i
                    l_range  TYPE char255.


* Select area for entries to be displayed
  CALL METHOD r_excel->set_selection
    EXPORTING
      top     = l_top
      left    = l_left
      rows    = l_row
      columns = l_column.

* Define Range
  CALL METHOD r_excel->insert_range
    EXPORTING
      name    = l_range
      rows    = l_row
      columns = l_column
    IMPORTING
      error   = r_error.

  IF r_error->has_failed = abap_true.
    CALL METHOD r_error->raise_message
      EXPORTING
        type = 'E'.
  ENDIF.


ENDFORM.                    " f_create_range
```

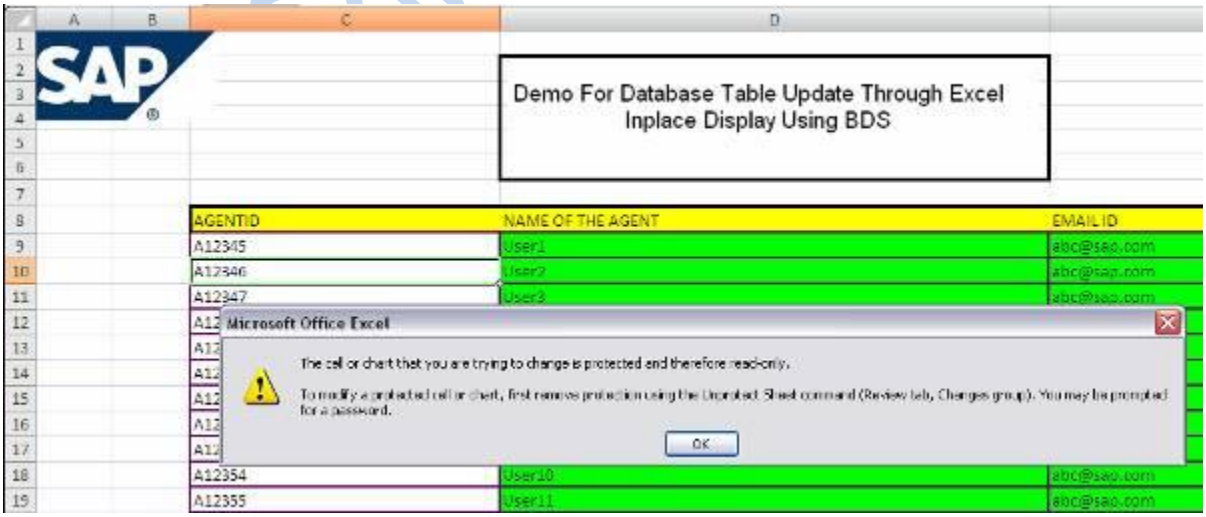
Selection Screen:



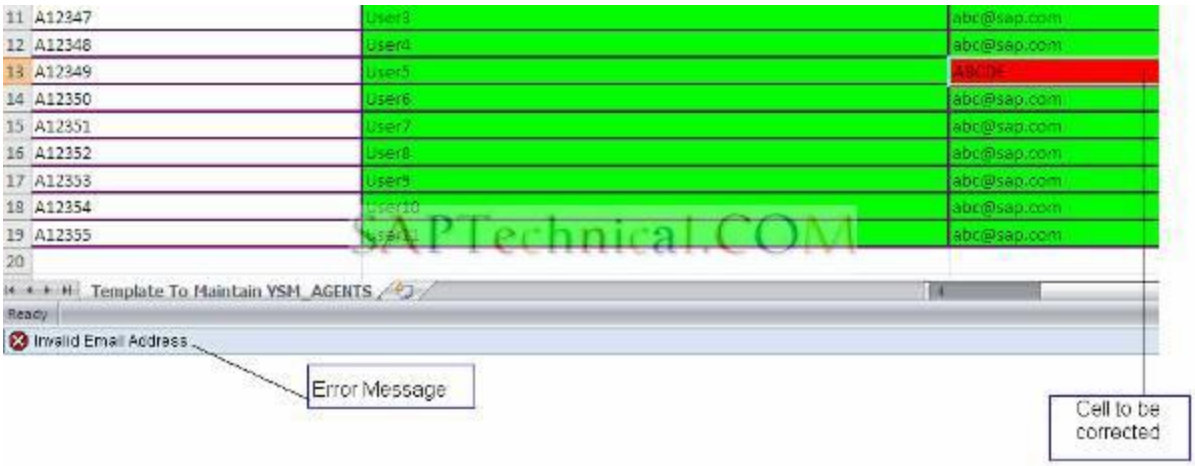
Initial Screen Displaying the Table Entries:



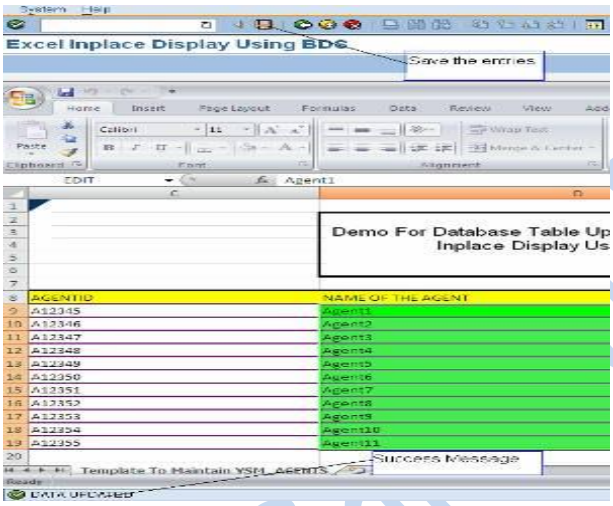
Doesn't allow the user to modify the primary field AGENTID or rest of the cells, except the fields NAME & EMAILID:



Shows error message and highlights the cell to be corrected in red, if an invalid email id is entered:



Data Changed and Successfully Saved:



Cl.	Agent Id	Name	Email
800	A12345	Agent1	xyz@sap.com
800	A12346	Agent2	xyz@sap.com
800	A12347	Agent3	xyz@sap.com
800	A12348	Agent4	xyz@sap.com
800	A12349	Agent5	xyz@sap.com
800	A12350	Agent6	xyz@sap.com
800	A12351	Agent7	xyz@sap.com
800	A12352	Agent8	xyz@sap.com
800	A12353	Agent9	xyz@sap.com
800	A12354	Agent10	xyz@sap.com
800	A12355	Agent11	xyz@sap.com

Event Handler Technique in Object oriented ABAP

Event is a mechanism by which method of one class can raise method of another class, without the hazard of instantiating that class. It provides to raise the method (event handler method) of one class with help of another method in the same or different class (triggering method).

The below steps is required to have the event handler in the class:-

- Create an event in a class.
- Create a triggering method in the same class which will raise the event.
- Create an event handler method for the event in same/other class.
- Register the event handler method in the program.

Now, the above settings are complete for event handler in class. Create an object from the class containing the event and call the triggering method to raise the event.

By taking the above steps, the following sample examples will demonstrate the event handler technique in Class.

1. Events with Handler Method in the same class.

This example tells that how to raise method, if the triggering method and event handler method presents in the same class.

Sample code and Output.

ABAP Editor: Change Report ZCLASS_EVENT001

Pattern | Pretty Printer

Report ZCLASS_EVENT001 Active

```
1  *&---------------------------------------------------------------------*
2  *& Report  ZCLASS_EVENT001
3  *&---------------------------------------------------------------------*
4  *&Events with Handler Method in the same class.
5  *&Created by Satya Mahanandia
6  *&---------------------------------------------------------------------*
7  REPORT  ZCLASS_EVENT001.
8  *---------------------------------------------------------------------*
9  *       CLASS class1 DEFINITION
10 *---------------------------------------------------------------------*
11 CLASS CLASS1 DEFINITION.
12   PUBLIC SECTION.
13 *Creating event : Event1
14     EVENTS: EVENT1.
15 *Creating an event handling method. This method can belong to
16 * same or different class
17     METHODS: METHOD1 FOR EVENT EVENT1 OF  CLASS1.
18 * Method to raise the event
19     METHODS : TRIGGER1.
20 ENDCLASS.                    "class1 DEFINITION
21 *---------------------------------------------------------------------*
22 *       CLASS class1 IMPLEMENTATION
23 *---------------------------------------------------------------------*
24 CLASS CLASS1 IMPLEMENTATION.
25 * Method : Method1 will be called when the event is raised
26   METHOD : METHOD1.
27     WRITE:/5 ' I am the event handler method'.
28   ENDMETHOD.                    ":
29 * Method : Tgger1 will raise the event
30   METHOD : TRIGGER1.
31     WRITE:/5 'I am Trigger1, going to raise event Event1'.
```


Next->

Program Edit Goto Utilities(M) Environment System Help

ABAP Editor: Change Report ZCLASS_EVENT001

Pattern Pretty Printer

Report ZCLASS_EVENT001 Active

```
30    METHOD : TRIGGER1.
31      WRITE:/5 'I am Trigger1, going to raise event Event1'.
32      RAISE EVENT EVENT1.
33    ENDMETHOD.                          ";
34  ENDCLASS.                       "class1 IMPLEMENTATION
35
36  START-OF-SELECTION.
37    DATA: OBJ TYPE REF TO CLASS1.
38    CREATE OBJECT: OBJ .
39  * Registering the event handler method
40    SET HANDLER OBJ->METHOD1 FOR OBJ  .
41  * Calling the event which will raise the event.
42    CALL METHOD OBJ->TRIGGER1.
```

Output.

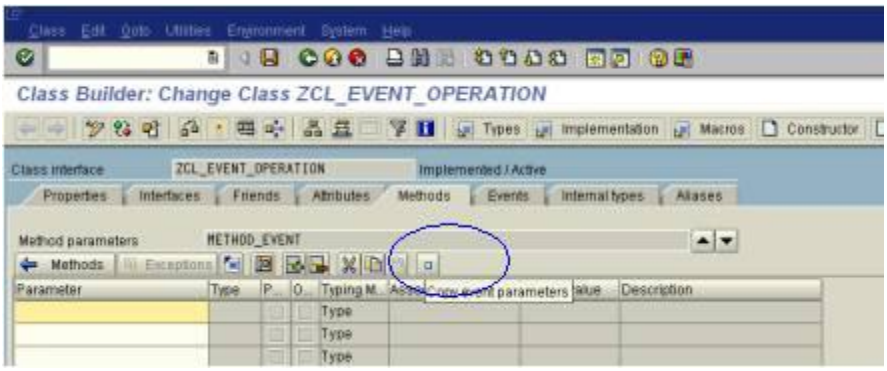
List Edit Goto System Help

Events with Handler Method in the same class

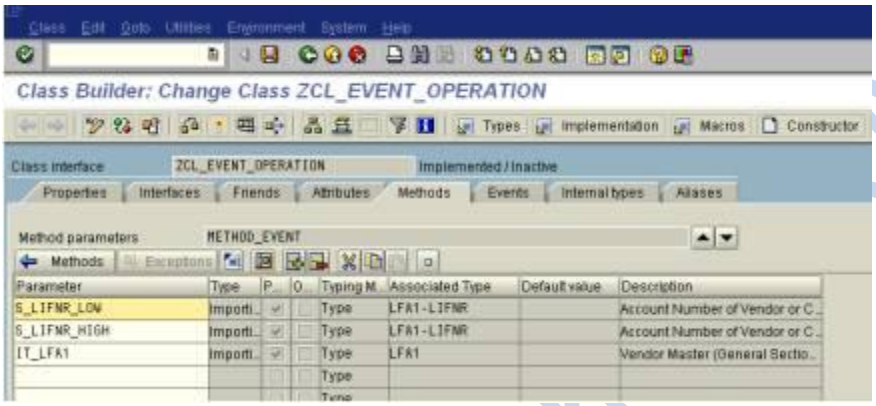

```
Events with Handler Method in the same class

I am Trigger1, going to raise event Event1
 I am the event handler method
```

Now select the method.

And also copy the parameters of the event method.



By pressing this copy event parameter we can get the parameters.



Save and go back to the earlier screen..

Then double click on the method name.

Then provide the following logic for triggering the event.

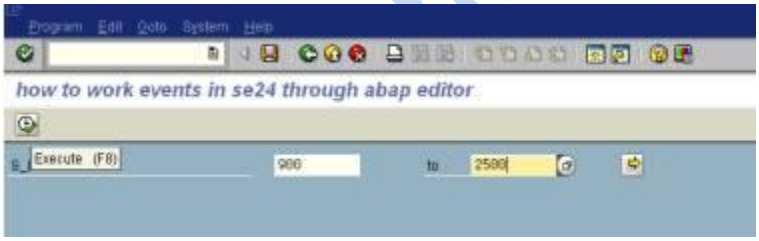
```
METHOD METHOD_EVENT .

*check the condition

IF S_LIFNR_LOW < 1000 AND S_LIFNR_HIGH > 2000.
   MESSAGE I000(0) WITH 'enter the values between 1000 and 2000'.
   RAISE EVENT ZEVENT_METHOD.
ENDIF.

*provide select statement

SELECT *
FROM LFA1
INTO TABLE IT_LFA1
WHERE LIFNR BETWEEN S_LIFNR_LOW AND S_LIFNR_HIGH.
*transfer the values to another internal table
IT_LFA11 = IT_LFA1.
ENDMETHOD.
```

After that provide the logic in se38.

```
REPORT  ZCL_EVENT_OPERATION .
*provide data objects
DATA: LFA1 TYPE LFA1,
      OBJ TYPE REF TO ZCL_EVENT_OPERATION,
      IT_LFA1 TYPE Z_LFA1,
      IT_LFA11 TYPE Z_LFA1,
      WA_LFA1 TYPE LFA1.
*provide select statement
SELECT-OPTIONS: S_LIFNR FOR LFA1-LIFNR.
*provide create object
START-OF-SELECTION.
  CREATE OBJECT OBJ.
*call the method
  CALL METHOD OBJ->METHOD_EVENT
    EXPORTING
      S_LIFNR_LOW  = S_LIFNR-LOW
      S_LIFNR_HIGH = S_LIFNR-HIGH
      IT_LFA1      = IT_LFA1.
*provide attribute value
  IT_LFA11 = OBJ->IT_LFA11.
*display the data
  LOOP AT IT_LFA11 INTO WA_LFA1.
    WRITE:/ WA_LFA1-LIFNR,
            WA_LFA1-LAND1,
            WA_LFA1-NAME1,
            WA_LFA1-ORT01.
  ENDLOOP.
```

Save it, check it, activate it and execute it.

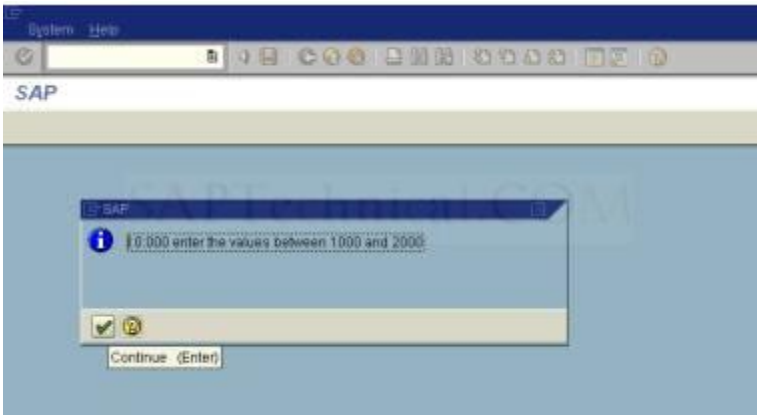
Then the output is like this.



If lifnr value is <1000 and >2000.

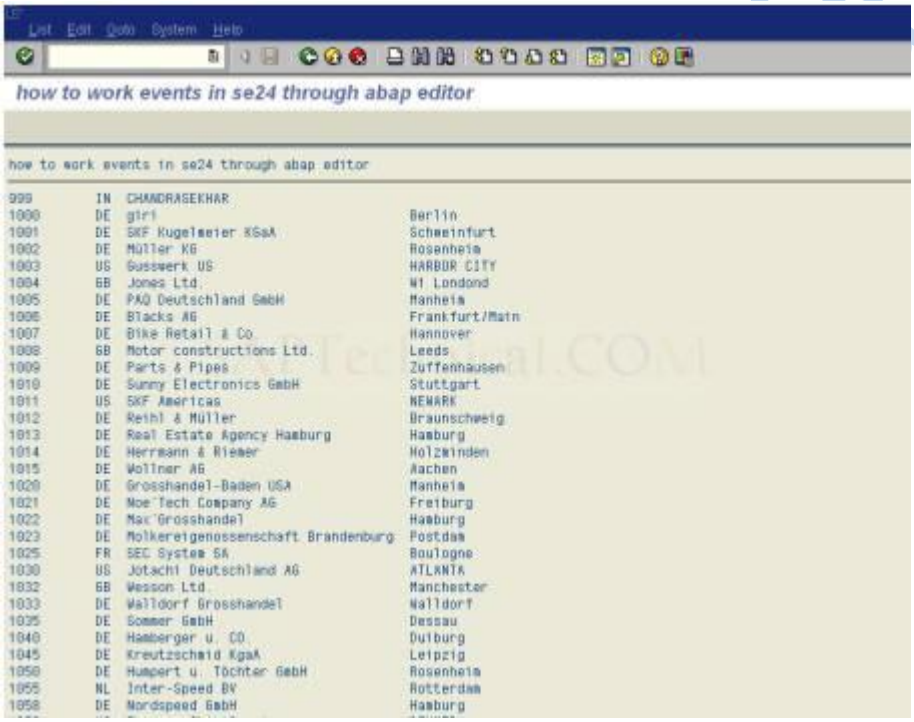
Then press execute it.

The output is like this.



Then press enter.

The output is like this.



Dialog processing after COMMIT WORK statement

How to perform dialog processing after **commit work** execution?

In general, we may come across the scenario where, some dialog processing needs to be done after transaction "commit work". It's explained here by considering a scenario.

After filling all necessary details in the delivery document, user clicks on "save" button to create a delivery document. If any dialog processing (like pop-up to fill some details) required upon successful execution of COMMIT WORK statement. In this case, we can approach below method.

Let me explain this by creating a custom class.

Create an event handler method in the custom class ZTEST_HANDLER for the event TRANSACTION_FINISHED of the standard class CL_SYSTEM_TRANSACTION_STATE.

Standard class: CL_SYSTEM_TRANSACTION_STATE

Event name : TRANSACTION_FINISHED

Note: This event gets triggered as soon as the COMMIT WORK gets executed.

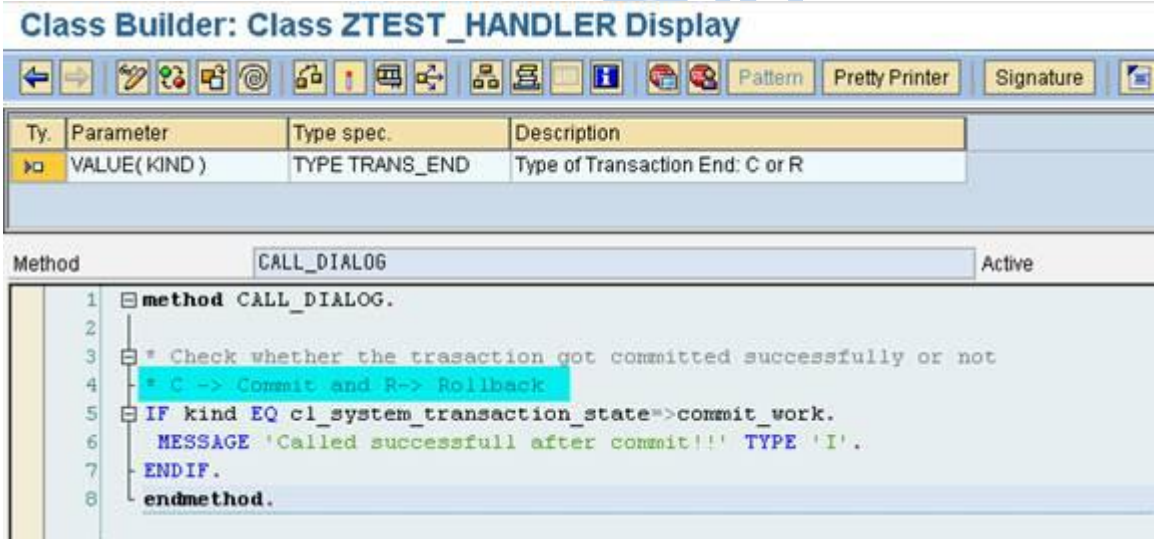
My custom class name : ZTEST_HANDLER

My event handler method: CALL_DIALOG (Event TRANSACTION_FINISHED of standard class CL_SYSTEM_TRANSACTION_STATE attached to this custom method)

1) Event handler method CALL_DIALOG

2) Event handler method: CALL_DIALOG detailed view

Once the COMMIT WORK for the transaction is executed, control comes to custom method CALL_DIALOG method. Here we can check whether transaction got committed successfully or rolled back by using interface parameter *KIND* as shown in below screen shot.



To get the control to the CALL_DIALOG method, we need to do SET HANDLER to register the event in any user exit before transaction COMMIT WORK execution.

Here in this case, I registered event in a BADI, which gets triggered after pressing SAVE button in the outbound delivery (VL01N/VL02N) and before COMMIT WORK execution.

Please find below screen shot of BADI method.

Class Builder: Class ZCL_IM_TEST_DELIVERY_DIAL Display

Pattern | Pretty Printer | Signature

Ty.	Parameter	Type spec.	Description
	IT_XVBUK	TYPE SHP_VL10_VBUK_T OPTIONAL	Current Status of Header Status
	IT_YVBUK	TYPE SHP_VL10_VBUK_T OPTIONAL	Database Status: Header Status
	IT_XVBUP	TYPE SHP_VL10_VBUP_T OPTIONAL	Current Status of Item Status
	IT_YVBUP	TYPE SHP_VL10_VBUP_T OPTIONAL	Database Status: Item Status
	IS_V50AGL	TYPE V50AGL OPTIONAL	Global Delivery Control Flags
	IF_TRTYP	TYPE TRTYP OPTIONAL	Transaction Type
	IF_TCODE	TYPE LE_SHP_TCODE OPTIONAL	Functional Transaction Code in Deliv
	CS_LIKP	TYPE LIKP OPTIONAL	Current Header Line in Delivery
	CS_LIKPD	TYPE LIKPD OPTIONAL	Dynamic Part of Delivery Header
	CT_YLIKP	TYPE SHP_YLIKP_T OPTIONAL	Database Status: Delivery Header
	CT_XLIPS	TYPE SHP_LIPS_T OPTIONAL	Current Status of Delivery Items

Method IF_EX_LE_SHP_DELIVERY_PROC~READ_DELIVERY Active

```
method IF_EX_LE_SHP_DELIVERY_PROC~READ_DELIVERY.

  break RV64208.
  SET HANDLER ZTEST_HANDLER=>CALL_DIALOG.
endmethod.
```

The Event TRANANSACTION_FINISHED of standard Class CL_SYSTEM_TRANSACTION_STATE and its parameters are shown in below screen shots:

Class Builder: Display Class CL_SYSTEM_TRANSACTION_STATE

Local Types | Implementation | Macros | Class

Class Interface CL_SYSTEM_TRANSACTION_STATE Implemented / Active

Properties | Interfaces | Friends | Attributes | Methods | Events | Types | Aliases

Parameters | Filter

Event	Type	Visi...	Description
TRANSACTION_FINISHED	Stat1_	Pub...	System Event at End of Transaction

Class Builder: Display Class CL_SYSTEM_TRANSACTION_STATE

Local Types | Implementation | Macros | Class documer

Class Interface CL_SYSTEM_TRANSACTION_STATE Implemented / Active

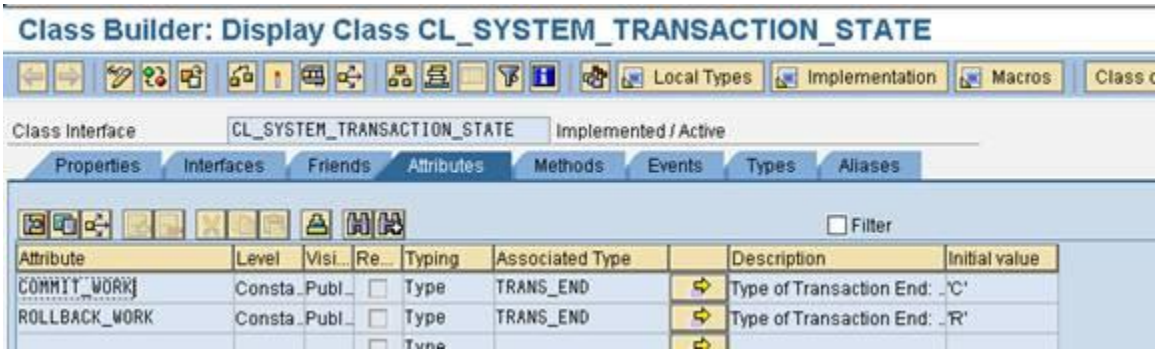
Properties | Interfaces | Friends | Attributes | Methods | Events | Types | Aliases

Event parameters TRANSACTION_FINISHED

Events

Parameters	O...	Typing	Associated Type	Default value	Description
KIND		Type	TRANS_END		Type of Transaction End: C or R
		Type			

Attributes of Class CL_SYSTEM_TRANSACTION_STATE:



Note: We can use IMPORT and EXPORT statements to transfer data from BADI to the method CALL_DIALOG.