BSF4ooRexx

Creating Portable GUIs with JavaFX

Business Programming 2

Windows GUIs (AWT)	Sockets SSL/TLS	XML SAX/DOM JSON	Scripting AOO/LO (UNO)	Rexx Script Engine	Portable GUIs (JavaFX)	Java Web Server (Tomcat)	Java Classes written in Rexx style

Prof. Rony G. Flatscher

Agenda

- Brief historic overview
  - Java GUI packages for creating portable GUIs
- Overview of JavaFX
  - Concepts
  - ooRexx nutshell examples
- Roundup

Brief Historic Overview, 1

- Java package "java.awt"
  - "awt": "**a**bstract **w**indow **t**oolkit"
    - Java GUI classes for creating a GUI consisting of GUI components
      - Abstracts from concrete operating systems
    - Uses JNI (Java Native Interface) to interact with the platform's GUI
      - "heavy" interaction with peer native GUI controls
    - Insulates the Java programmer from the platform
    - GUI control and event management carried out in a separate "awt"/"GUI"-thread
  - Released with Java 1.0 (1996)

Brief Historic Overview, 2

- Java package "javax.swing"
  - "javax": Java extension
  - Java GUI classes for the most important GUI controls
    - "light-weight"
      - Uses Java2d to draw the controls
        - Text fields can be formatted with HTML style-attributes of that time
      - Contained in awt container
    - Swing class names may start with "J", if an awt class of the same name exists already
      - e.g. javax.swing.JButton vs. java.awt.Button
    - Adds PLAF
      - Pluggable Look and Feel
  - Released with Java 1.2 (1998)

Brief Historic Overview, 3

- Java package "javafx."
  - 2008 a standalone Java package
    - Also included a proper script engine named "JavaFX Script"
      - Reason why the Java scripting framework gets fully supported
      - Removed with JavaFX 2.0 (2011)
  - Replaces java.awt and javax.swing
    - Introduces "Properties"
    - Totally new class hierarchy
    - Many new multiplatform classes for
      - e.g. charts, sound, video
  - Released with Java 1.8/8 (2014) as part of the JRE/JDK as "JavaFX8"
  - Already included in Java 1.7/7 updates as part of the JRE/JDK (7u15)

Concepts of JavaFX, 1

- "Property"
  - Contains a value, has setter and getter methods
  - Can be bound to other properties
    - Auto-update values!
  - GUI classes use properties to display and interact with

Example "property_binding.rex"

```
  -- import the Java class, allow it to be used like an ooRexx class thereafter
sipClz=bsf.import("javafx.beans.property.SimpleIntegerProperty")
num1 = sipClz~new(1)
num2 = sipClz~new(2)
sum=num1~add(num2)
say "'num1=1' (an IntegerProperty) and 'num2=2' (an IntegerProperty), 'sum' (a NumberBinding):" sum~getValue
num1~set(2)
say "after setting 'num1' to '2', sum:" sum~getValue
num2~set(3)
say "after setting 'num2' to '3', sum:" sum~getValue

::requires "BSF.CLS"      -- get Java support
```

Output:

```
'num1=1' (an IntegerProperty) and 'num2=2' (an IntegerProperty), 'sum' (a NumberBinding): 3
after setting 'num1' to '2', sum: 4
after setting 'num2' to '3', sum: 5
```

FX Markup Language (FXML), 1

- Allows to define the GUI as an XML file
  - Tool **SceneBuilder** to create GUIs interactively!
    - Cf. http://gluonhq.com/labs/scene-builder/
- Allows to set up an available javax.script engine
  - Run script code, e.g. for events!
- A Java loader class will read the FXML and create the GUI
  - GUI controls with 'fx:id' attribute directly addressable!

FX Markup Language (FXML), 2

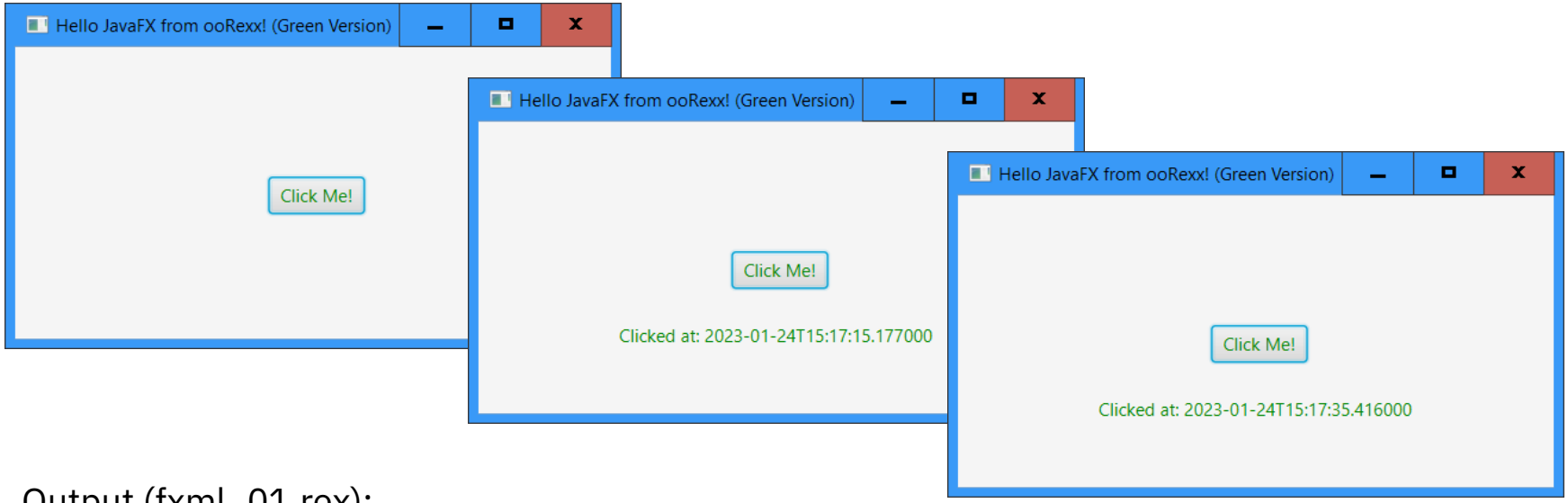
- Invoking script code occurs with the help of javax.script
- Creates a separate **Engine** for each FXML document
- Each invocation gets its own **ScriptContext** with a GLOBAL_SCOPE and ENGINE_SCOPE Binding
- GLOBAL_SCOPE Binding contains
  - The created JavaFX GUI controls that have the attribute 'fx:id' set!
  - A Rexx script can access all of these GUI controls

Prof. Rony G. Flatscher

Model-View-Controller (MVC)

- Introduced with Smalltalk-76
- **M**odel – the data to maintain
  - Our program
- **V**iew – the program to display the data
  - Our program, JavaFX or a combination of both
  - View and model can be bound with Properties!
- **C**ontroller – to control (co-ordinate) interaction with the model and the view
  - Our program serving as the bridge between the model and the view(s)

Example 1



Output (fxml_01.rex):

```
REXXout>2023-01-24T15:17:15.177000: arrived in routine 'buttonClicked' ...
REXXout>... current value of label=[]
REXXout>...     new value of label=[Clicked at: 2023-01-24T15:17:15.177000]
REXXout>
REXXout>2023-01-24T15:17:35.416000: arrived in routine 'buttonClicked' ...
REXXout>... current value of label=[Clicked at: 2023-01-24T15:17:15.177000]
REXXout>...     new value of label=[Clicked at: 2023-01-24T15:17:35.416000]
REXXout>
```

Three Files

1. File: “FXML_01_Document.fxml”

- The **FXML** file defines the GUI
  - Defines "rexx" to be used as the script language
  - Defines an AnchorPane GUI container which contains
    - Button with fx:id="button" (with Rexx code) and a
    - Label with fx:id="label"
    - Text (textFill property) of both controls is GREEN

2. File: “fxml_01_controller.rex”

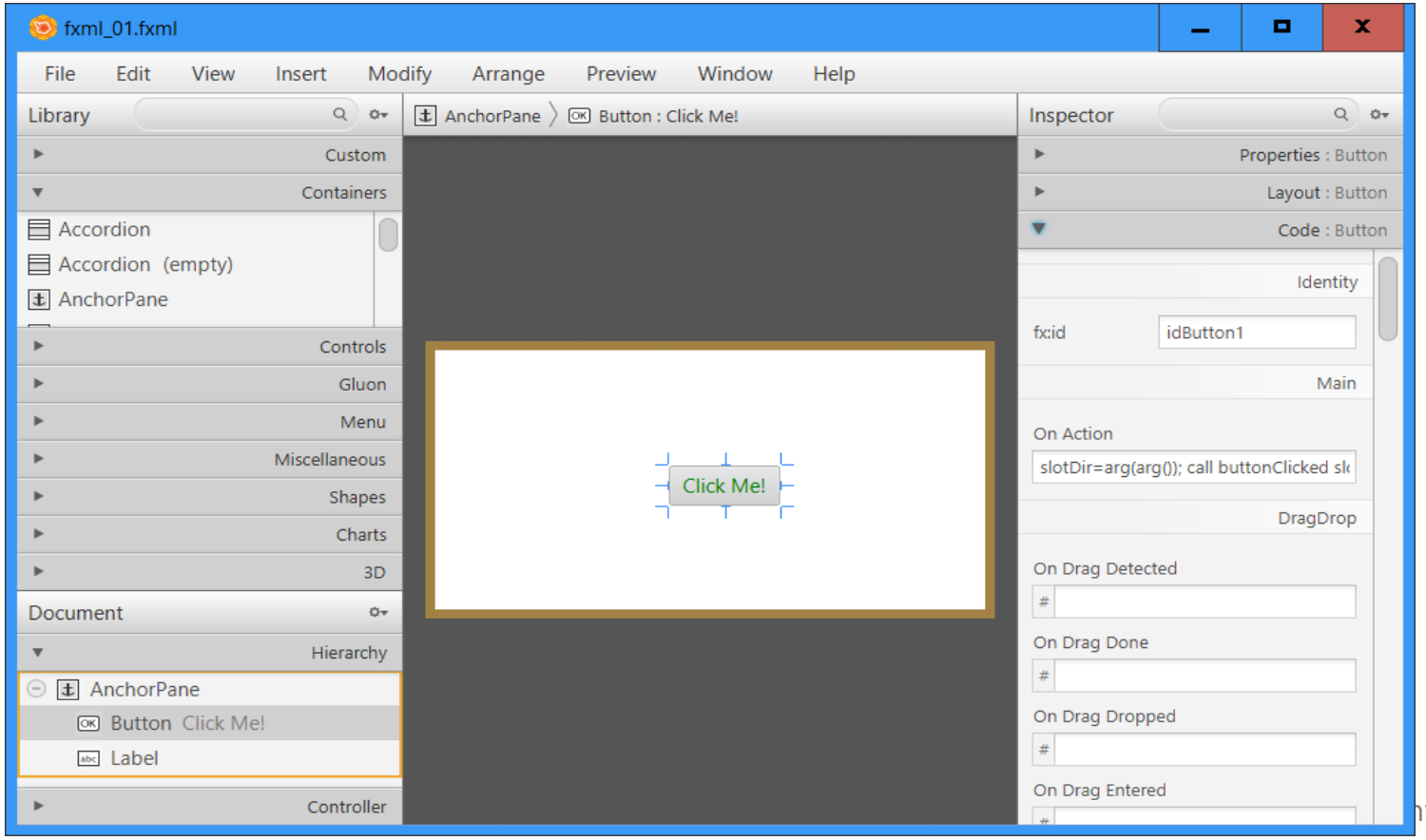
- Defines a public Rexx routine "klickButtonAction"

3. File: “fxml_01.rex”

- Runs the program using the javafx package

Using "SceneBuilder" for the Dialog

- <https://gluonhq.com/products/scene-builder/> (2022-12-11)



2. File: “FXML_01_Document.fxml”

```
<?xml version="1.0" encoding="UTF-8"?>
<?import javafx.scene.control.Button?>
<?import javafx.scene.control.Label?>
<?import javafx.scene.layout.AnchorPane?>
<!-- comment: the following process instruction (PI) defines the Java script engine named 'rexx'
              to run "fxml_01_controller.rex" and the code in the event attribute 'onAction' -->
<?language rexx?>
<AnchorPane id="idAnchorPane" prefHeight="200" prefWidth="400"
            xmlns:fx="http://javafx.com/fxml/1">
    <!-- call Rexx program, its public routine "buttonClicked" is known afterwards -->
    <fx:script source="fxml_01_controller.rex" />
    <children>
        <!-- the Rexx code in the 'onAction' attribute will be invoked by JavaFX;
             note: last argument is the slotDir argument from BSF4ooRexx
        -->
        <Button fx:id="idButton1" layoutX="170.0" layoutY="89.0"
                        onAction="use arg event, slotDir; call buttonClicked slotDir;"
                        text="Click Me!" textFill="GREEN" />
        <Label fx:id="idLabel1" alignment="CENTER" contentDisplay="CENTER"
                                layoutX="76.0"     layoutY="138.0"
                                minHeight="16"     minWidth="49"
                                prefHeight="16.0"  prefWidth="248.0"
                                textFill="GREEN" />
    </children>
</AnchorPane>
```

Concept of "Rexx Script Annotation"

- A "boon" implemented into the ooRexx javax.script ***RexxEngine***
  - A Rexx block comment, which may be one of

    /*@get(idx1 idx2 ...)*/
    - Fetches entries named "idx1", "idx2" from the **ScriptContext's Bindings** and makes them available as Rexx variables by the same name ("idx1", "idx2")

    /*@set(idx1 idx2 ...)*/
    - Sets the entries named "idx1", "idx2" in the **ScriptContext Bindings**, using the values of the Rexx variables "idx1", "idx2"

    /*@showsource*/
    - Displays the Rexx code that gets executed by the *RexxEngine*

2. File: “fxml_01_controller.rex”

- Defines the public Rexx routine "buttonClicked"
  - Usually there is one controller for each FXML file
  - Fetches the supplied slotDir argument
    - Can be used to access the **ScriptContext** and its **Bindings**
    - This example uses "Rexx script annotations"
  - Fetches and updates the Label with fx:id="label"
    - Taking advantage of "Rexx script annotations"

      /*@get(label)*/ instead of coding:

      ```
      label=slotDir~scriptContext~getAttribute("label")
      ```
- Outputs information to stdout

2. File: “fxml_01_controller.rex”

- Responsible for updating the Label object using the (fx:)id value (case-sensitive!) "idLabel1"

```
/* This routine will be called from the Rexx code defined with the "onAction" attribute in Button's definition */
::routine buttonClicked public
use arg slotDir    -- using Rexx script annotation instead
now=.dateTime~new -- time of invocation
say now": arrived in routine 'buttonClicked' …"
/* RexxScript annotation fetches the Label object with the id "idLabel1" from
   the ScriptContext and makes it available as the Rexx variable "IDLABEL1"  */
/* @get(idLabel1) */
say '... current value of label='pp(idLabel1~getText)
idLabel1~text="Clicked at:" now         -- set text property
say '...     new value of label='pp(idLabel1~getText)
say
```

Responsible for the output :

```
REXXout>2023-01-24T15:17:15.177000: arrived in routine 'buttonClicked' ...
REXXout>... current value of label=[]
REXXout>...     new value of label=[Clicked at: 2023-01-24T15:17:15.177000]
REXXout>
REXXout>2023-01-24T15:17:35.416000: arrived in routine 'buttonClicked' ...
REXXout>... current value of label=[Clicked at: 2023-01-24T15:17:15.177000]
REXXout>...     new value of label=[Clicked at: 2023-01-24T15:17:35.416000]
REXXout>
```

Running a JavaFX Application

- A JavaFX application uses
  - Stages to display Scenes
    - A Stage is usually some kind of a window
    - A Scene is a GUI container placed on a Stage for interaction
  - There may be multiple Stages and Scenes
- Abstract class javafx.application.Application
  - Initializes JavaFX, creates a ("primary") Stage and invokes the abstract method start(Stage primaryStage) in its launch method
  - A Rexx program defines a Rexx class that implements the abstract method start
  - Uses BsfCreateRexxProxy() to create a proxied Application, and sends it the launch message (which in turn will invoke the start method implemented in Rexx)

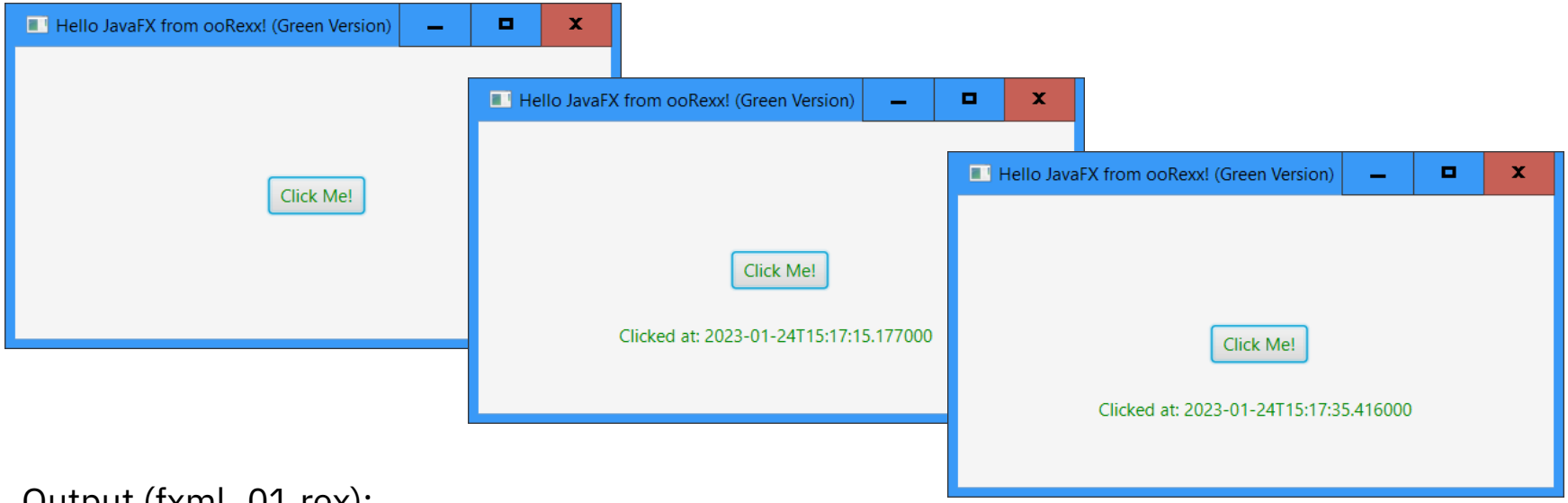
1. File: “fxml_01.rex”

- Defines the Rexx class RexxApplication
  - Implements the abstract method start
  - A Rexx instance will be used in BsfCreateRexxProxy()
    - The resulting Java object (of type javafx.application.Application) gets the launch message sent to it, which eventually will invoke the method start, causing a Rexx message of that name to be sent to the embedded Rexx instance

1. File: “fxml_01.rex”

```
rxApp=.RexxApplication~new -- create Rexx object that will control the FXML set up
jrxApp=BSFCreateRexxProxy(rxApp, ,"javafx.application.Application")
jrxApp~launch(jrxApp~getClass, .nil)    -- launch the application, invokes "start"

::requires "BSF.CLS"    -- get Java support

-- Rexx class defines "javafx.application.Application" abstract method "start"
::class RexxApplication -- implements the abstract class "javafx.application.Application"

::method start          -- Rexx method "start" implements the abstract method
  use arg primaryStage  -- fetch the primary stage (window)
  primaryStage~setTitle("Hello JavaFX from ooRexx! (Green Version)")
   -- create an URL for the FMXLDocument.fxml file (hence the protocol "file:")
  fxmlUrl=.bsf~new("java.net.URL", "file:fxml_01.fxml")
   -- use FXMLLoader to load the FXML and create the GUI graph from its definitions:
  rootNode=bsf.loadClass("javafx.fxml.FXMLLoader")~load(fxmlUrl)

  scene=.bsf~new("javafx.scene.Scene", rootNode)    -- create a scene for our document
  primaryStage~setScene(scene)  -- set the stage to our scene
  primaryStage~show             -- show the stage (and thereby our scene)
```

Roundup Example 1 - Output of Running File: “fxml_01.rex”



Output (fxml_01.rex):

```
REXXout>2023-01-24T15:17:15.177000: arrived in routine 'buttonClicked' ...
REXXout>... current value of label=[]
REXXout>...     new value of label=[Clicked at: 2023-01-24T15:17:15.177000]
REXXout>
REXXout>2023-01-24T15:17:35.416000: arrived in routine 'buttonClicked' ...
REXXout>... current value of label=[Clicked at: 2023-01-24T15:17:15.177000]
REXXout>...     new value of label=[Clicked at: 2023-01-24T15:17:35.416000]
REXXout>
```

JavaFX without Employing FXML

- FXML contains all GUI declarations
  - Which **javafx** controls
  - Position of **javafx** controls
  - Attributes of **javafx** controls, e.g.
    - Color information
    - Position and size information
    - Unique and case-sensitive fx:id values for **javafx** controls
- Without taking advantage of FXML
  - The code needs to do all this setting up
  - Needs to take over event handling

JavaFX Nutshell Example (without FXML), 1 – 1

"javafx_01.rex"

```
rexxHandler=.RexxAppHandler~new
   -- instantiate the abstract JavaFX class, the abstract "start" method will be served by rexxHandler
rxApp=BSFCreateRexxProxy(rexxHandler, ,"javafx.application.Application")
   -- launch the application, invoke "start" and then stay up until the application closes
rxApp~launch(rxApp~getClass, .nil)

::requires "BSF.CLS"    -- get Java support

::class RexxAppHandler  -- the Rexx handler for javafx.application.Application

::method start          -- will be called by JavaFX, allows to setup everything
  use arg primaryStage

  primaryStage~setTitle("Hello JavaFX from ooRexx!")  -- we could use primaryStage~title="..." instead!

  colorClz=bsf.loadClass("javafx.scene.paint.Color")           -- get access to the JavaFX colors
  cdClz=bsf.loadClass("javafx.scene.control.ContentDisplay")   -- get access to ContentDisplay constants
  alClz=bsf.loadClass("javafx.geometry.Pos")                   -- get access to alignment constants (an Enum class)

  root=.bsf~new("javafx.scene.layout.AnchorPane")   -- create the root node
  root~prefHeight=200
  root~prefWidth=400

      -- define the Label
  lbl=.bsf~new("javafx.scene.control.Label")
  lbl~textFill=colorClz~BLUE
  lbl~setLayoutX(76)
  lbl~setLayoutY(138)
  lbl~prefHeight="16.0"
  lbl~prefWidth="248.0"
  lbl~contentDisplay=cdClz~CENTER         -- center ContentDisplay
  lbl~alignment=alClz~valueOf("CENTER")   -- center align

... continued on next slide ...
```

JavaFX Nutshell Example (without FXML), 1 – 2

"javafx_01.rex"

```
... continued on next slide ...

        -- define and add the Button
  btn=.bsf~new("javafx.scene.control.Button")
  btn~textFill=colorClz~BLUE
  btn~layoutX=170       -- assign as if it was a Rexx attribute
  btn~layoutY=89        -- assign as if it was a Rexx attribute
  btn~text="Click Me!"  -- assign as if it was a Rexx attribute
      -- create a RexxButtonHandler, wrap it up as a Java RexxProxy implementing all methods of "javafx.event.EventHandler":
  bh=BSFCreateRexxProxy(.RexxButtonHandler~new(lbl), ,"javafx.event.EventHandler")
  btn~setOnAction(bh)  -- let this instance's Java RexxProxy handle the event

      -- add the button to
  root~getChildren~~add(btn)~~add(lbl)

      -- put the scene on the stage (using AnchorPane's preferred height and width)
  primaryStage~setScene(.bsf~new("javafx.scene.Scene", root))
  primaryStage~show

   -- Rexx class which handles the button presses
::class RexxButtonHandler
::method init
  expose label       -- define an attribute
  use arg label      -- save reference to javafx.scene.control.Label

::method handle      -- will be invoked by the Java side
  expose label
  say .dateTime~new": arrived in code defined for Button's setOnAction method, i.e. the 'handle' method"

  say '... current value of 'pp(label)': label~getText='pp(label~text)  ;
  label~text="Clicked at:" .dateTime~new  -- set the label

  say .dateTime~new': returning from the event handler' ;
  say
```

DOM and CSS

- All **javafx** controls are organized in a **DOM** tree
  - **DOM**: Document Object Model
  - **W3C** standard
- All **javafx** controls can be formatted using **CSS**
  - **CSS**: Cascading Style Sheets
  - Defining styles for all nodes of the DOM tree
- **JavaFX** employs **webkit** for rendering
  - Open source rendering engine
  - e.g. Apple uses it for Safari, Google forked it for Chrome

Six Files

- Image files  
  - bsf4oorexx_032.png (application icon), oorexx_032.png (background)
- Dialog files
  - **1. File:** fxml_02.css
  - **2. File:** FXML_02_Document.fxml
  - **3. File:** fxml_02_controller.rex
  - Automatic substitution of values if the value of the property named *text* starts with % or $
    - %year, %clickMe: substitute string with *ResourceBundle* translation files

      4. File (German), 5. File (English): FXML_02_de.properties, FXML_02_en.properties
    - $name: fetch value for name from **ScriptContext** Bindings at startup
    - ${name}: $-prefix and curly braces, value gets continuously fetched from **ScriptContext**
  - Starting the application (main program)

    6. File: fxml_02.rex

1. File: “fxml_02.css”

```
* define the background of the scene, will be applied to AnchorPane: */
.root {
     -fx-background-image: url("bsf4oorexx_032.png");
     -fx-background-color: LightGoldenRodYellow;
}
/* this is the basic formatting for all Label:s */
.label {
    -fx-font-size: 11px;
    -fx-font-weight: bold;
    -fx-text-fill: #333333;
    -fx-effect: dropshadow( gaussian , rgba(255,255,255,0.5) , 0,0,0,1 );
    -fx-border-color: red;
    -fx-border-radius: 3px;
    -fx-border-style: dashed;
    -fx-border-width: 1px;
}
/* this will change the appearence of Button a little bit: */
.button {
    -fx-text-fill: royalblue;
    -fx-font-weight: 900;
}
/* this will apply alpha (fourth value) to get the background to shine thru the
   label with the class "rexxInfo"; to be able to apply the alpha, one
   needs to turn the hexadecimal values into their decimal representations like:
   hence: oldlace = #fdf5e6 -> fd~x2d f5~x2d e5~x2d -> rgb(253, 245, 230)
*/
.rexxStarted {
     -fx-background-color: rgb(253, 245, 230, 0.75) ;
     -fx-text-fill: royalblue;
}
```

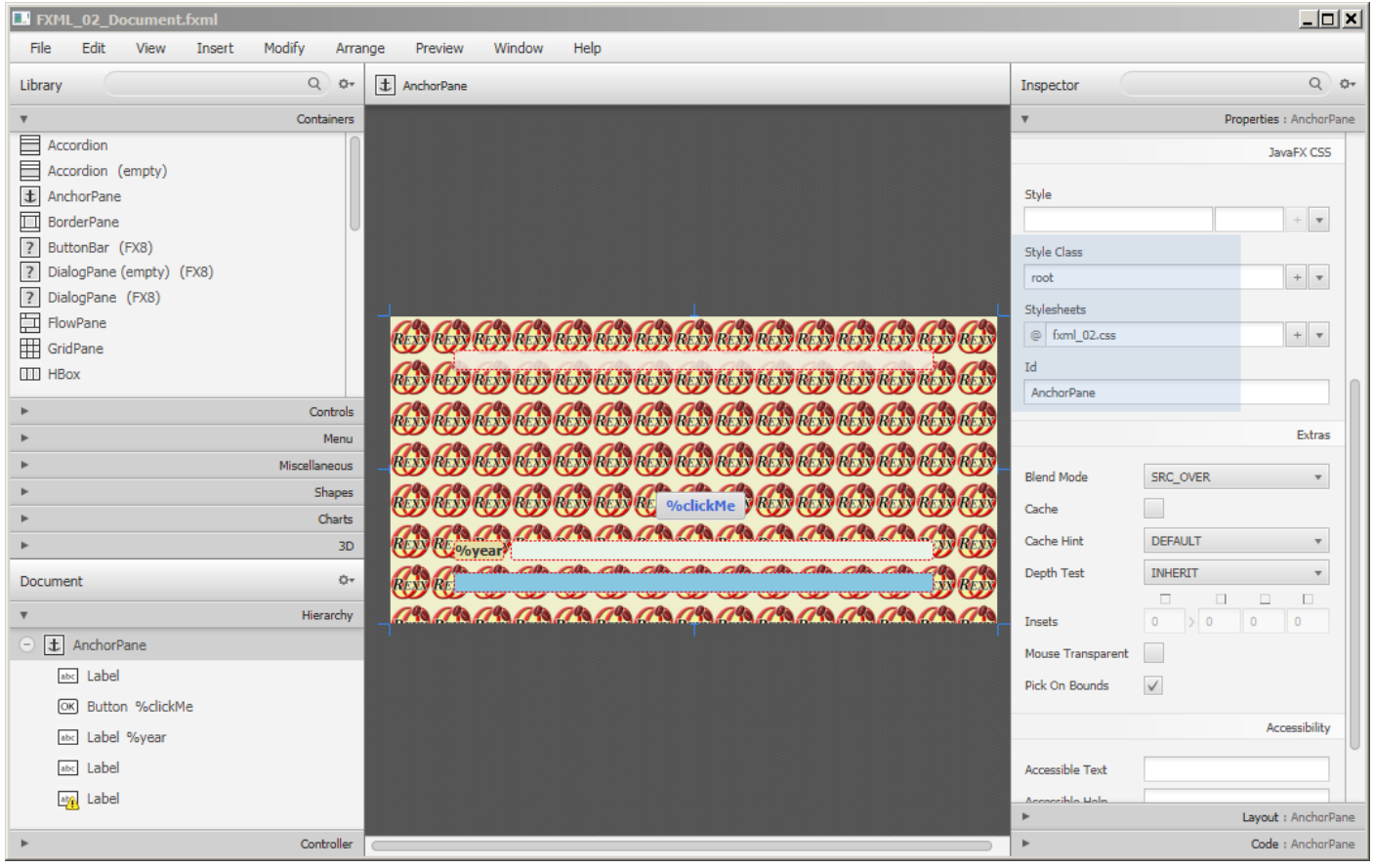
2. File: “FXML_02_Document.fxml”, 1/2

```
<?xml version="1.0" encoding="UTF-8"?>
<?import javafx.scene.control.Button?>
<?import javafx.scene.control.Label?>
<?import javafx.scene.layout.AnchorPane?>
<!-- comment: this file can be displayed and edited with the JavaFX SceneBuilder, e.g. from
              <http://gluonhq.com/labs/scene-builder/>; however note that as of fall 2016
              (SceneBuilder 2.0) there are bugs present that may remove text-field values
              that start with a $ character, so you need to fill them back in with a plain
              text editor! -->
<!-- comment: the following process instruction (PI) defines the Java script engine named 'rexx'
              to be used for the code in event attributes like 'onAction' -->
<?language rexx?>
<AnchorPane fx:id="idAnchorPane" prefHeight="240.0" prefWidth="480.0" styleClass="root"
            stylesheets="@fxml_02.css" xmlns="http://javafx.com/javafx/8.0.65" xmlns:fx="http://javafx.com/fxml/1">
    <!-- comment: defines the attribute in GLOBAL_SCOPE named 'rexxStarted' to be used for labelStart -->
    <fx:script source="fxml_02_controller.rex" />
    <!-- comment: define the JavaFx controls that make up the GUI, all controls that possess a fx:id
                  attribute are stored by their id value in the ScriptContext's GLOBAL_SCOPE -->
    <children>
        <!-- comment: "$rexxStarted" will cause fetching the value of the attribute "rexxStarted"
                      from the ScriptContext's Bindings, when initially setting up the Label;
                      note: SceneBuilder as of 2016-11-22 cannot handle (and deletes) the text attribute's
                      value: "$rexxStarted"                                  -->
        <Label fx:id="labelRexxStarted" alignment="CENTER" layoutX="50.0" layoutY="26.0" minHeight="16" minWidth="69"
               prefHeight="16.0" prefWidth="380.0" styleClass="rexxStarted" stylesheets="@fxml_02.css" text="$rexxStarted" />



... continued on next slide …
```

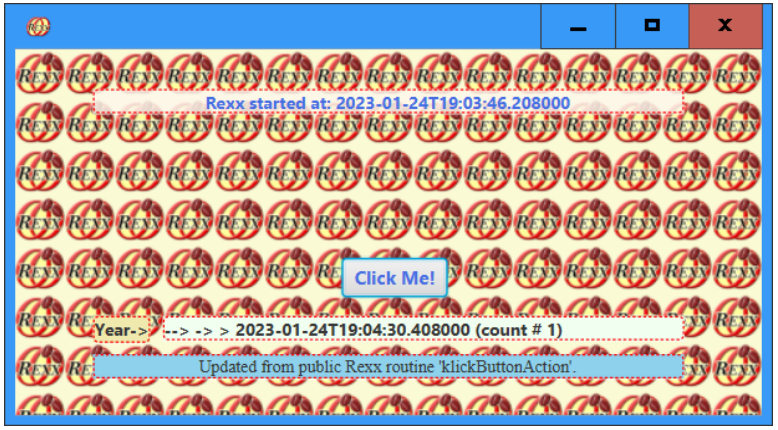
2. File: “FXML_02_Document.fxml”, 2/2

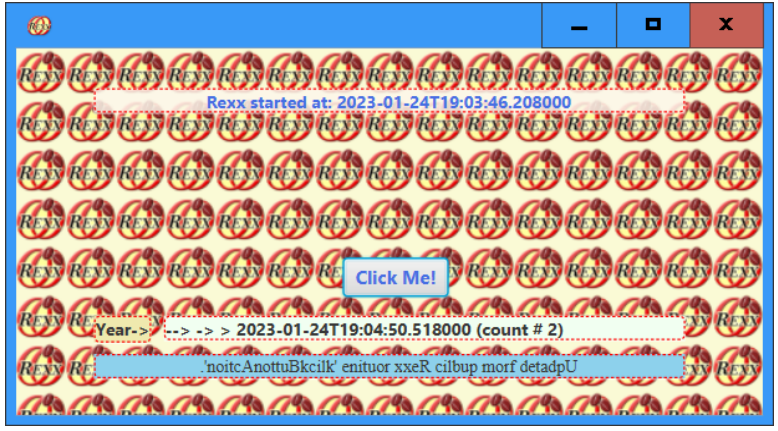
```
... continued from previous slide …
<!-- comment: the Rexx code in the 'onAction' attribute will be invoked by JavaFX via a
                    Rexx call; note that JavaFX will remove any newline characters between the
                    double-quotes ("), hence each Rexx statement is explicitly ended with the
                    semi-colon character; note the text attribute which gets localized -->
        <Button fx:id="idButton" layoutX="210.0" layoutY="137.0" onAction=
           "       say ' ==> ---&gt; arrived in button''s onAction-code ...'  ;
                   /*@showsource*/ /* show this onAction-Rexx code in original and edited state */ ;
                   use arg event, slotDir /* this argument is always sent by BSF4ooRexx */ ;
                   /*@get('label')*/ /* a Rexx script annotation: incorporates the attribute 'label' as a local Rexx variable */ ;
                   say ' ... label~getText='pp(label~getText)  ;
                   say ' ... changing text in label to current date and time ...' ;
                   label~text=.dateTime~new~string             ;
                   say ' ... label~getText='pp(label~getText)  ;
                   say ' ... now invoking the public Rexx routine ''klickButtonAction''' ;
                   call klickButtonAction slotDir /* do additional work */;        "
           text="%clickMe"
        />
        <!-- comment: "%year" will be replaced by the value in the ResourceBundle's properties files -->
        <Label fx:id="year" layoutX="50.0" layoutY="175.0" minHeight="16" minWidth="20"
               style="-fx-background-color: palegoldenrod;" text="%year" />
        <Label fx:id="label" layoutX="95.0" layoutY="175.0" minHeight="16" minWidth="49"
               prefHeight="16.0" prefWidth="335.0" style="-fx-background-color: honeydew;" />
        <!-- comment: "${rexxInfo}" will cause continuous fetching of the value of the attribute
                    "rexxInfo" from the ScriptContext's Bindings;
                    note: SceneBuilder as of 2016-11-22 cannot handle the text attribute's
                    value: "${rexxInfo}", displays a warning icon and does not display this entry! -->
        <Label fx:id="labelRexxInfo" alignment="CENTER" layoutX="50.0" layoutY="200.0" minHeight="16.0" minWidth="49.0"
               prefHeight="16.0" prefWidth="380.0"
               style="-fx-background-color: skyblue; -fx-cursor: wait; -fx-font-family: serif; -fx-font-weight: lighter;"
               text="${rexxInfo}" />
    </children>
</AnchorPane>
```

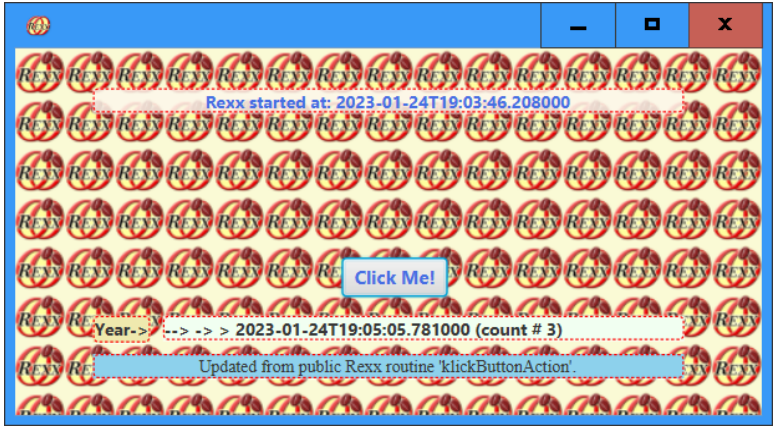
Using "SceneBuilder" for the Dialog



Output of Running "rexx fxml_02.rex" (English GUI)







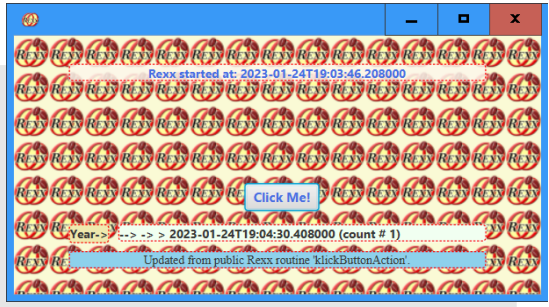
3. File: “fxml_02_controller.rex”, 1/2

```
/*@showsource*/   /* this Rexx script annotation will cause this script's source code to be shown */
started=.dateTime~new   -- take the date and time
slotDir=arg(arg())      -- fetch the slotDir argument (BSF4ooRexx adds this as the last argument at the Java side)
scriptContext=slotDir~scriptContext -- get the ScriptContext from the slotDir (last) argument

parse source s
say "just arrived at" pp(started)": parse source ->" pp(s)
engine_scope=100  -- define numeric value for engine scope Bindings
global_scope=200  -- define numeric value for global scope Bindings
   -- add an attribute to the ScriptContext's GLOBAL_SCOPE Bindings, used for "labelStartTime" in the fxml-document
scriptContext~setAttribute("rexxStarted", "Rexx started at:" started~string, global_scope)
parse version v         -- get Rexx version, display it in the "rexxInfo" label
scriptContext~setAttribute("rexxInfo", "Rexx version:" v, global_scope)
   -- set attribute in ENGINE_SCOPE Bindings (visible for this script engine only):
scriptContext~setAttribute("title", "--> -> >", engine_scope)
   -- set attribute in GLOBAL_SCOPE Bindings (visible for all script engines):
scriptContext~setAttribute("count", 1, global_scope)

/* ********************************************************************************************** */
/* ---------------------------------------------------------------------------------------------- */
/* This routine will be called from the Rexx code defined with the "onAction" event attribute; cf.
   the JavaFX control with the id "label" in the fxml document    */
::routine klickButtonAction public
    slotDir=arg(arg())   -- fetch the slotDir argument (BSF4ooRexx adds this as the last argument at the Java side)
    scriptContext=slotDir~scriptContext   -- get the slotDir (the last) argument, get the entry "SCRIPTCONTEXT"
    say " ==> ---> arrived in public Rexx routine 'klickButtonAction' ..."
       /* the following Rexx script annotation will incorporate the denoted attributes as local
          Rexx variables which can be used immediately thereafter by Rexx  */
    /*@get(rexxInfo label count event title)*/
... continued on next page ...
```

3. File: “fxml_02_controller.rex”, 2/2

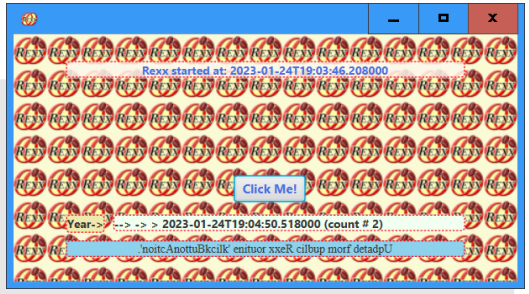
```
... continued from previous page ...
  /* changing the attribute that gets constantly updated (once we return from
     this event handler) thanks to the FXMLLoader: */
rexxInfo="Updated from public Rexx routine 'klickButtonAction'."
if count//2=0 then rexxInfo=rexxInfo~reverse   -- if even, reverse the current text
   /* the following Rexx script annotation will update the value of the attribute
      named 'rexxInfo' setting it to the current value of the Rexx variable named REXXINFO */
/*@set(rexxInfo)*/   -- update the attribute with the Rexx variable's current (new) value
   /* show the currently defined attributes in all ScriptContext's scopes   */
say "getting all attributes from all ScriptContext's scopes..."
st=.stringTable~new     -- contains the scope numbers of the Bindings
st[100]="ENGINE_SCOPE"
st[200]="GLOBAL_SCOPE"
do sc over 100, 200
    say "ScriptContext scope:" pp(sc) "("st~entry(sc)"), available attributes:"
    bin=scriptContext~getBindings(sc)
    if bin=.nil then iterate -- inexistent scope
    keys=bin~keySet          -- get kay values
    it=keys~makearray        -- get the keys as a Rexx array
    do key over it~sortWith(.CaselessComparator~new) -- sort keys (attributes) caselessly
       val=bin~get(key)      -- fetch the key's value
       str=""
       if val~isA(.bsf) then str="~toString:" pp(val~toString)
       say "  " pp(key)~left(35,".") pp(val) str
    end
    say "-"~copies(79)
end
  -- access the "label" JavaFX Label, change its text
label~setText(title .dateTime~new~string "(count #" count")")
  /* now explicitly update the count attribute in global scope bindings; if the
     attribute does not exist, it would be created        */
scriptContext~setAttribute("count", count+1, 200)
say " <== <--- returning from public Rexx routine 'klickButtonAction'."
say
```

3. File: “fxml_02_controller.rex” – Klick # 1 Output



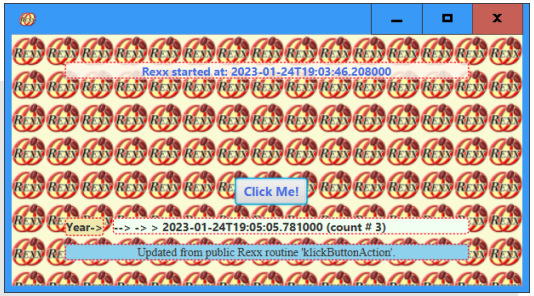

```
... cut (output of /*@showsource*/ Rexx script annotation not shown) ...

REXXout>just arrived at [2023-01-24T19:03:46.208000]: parse source -> [WindowsNT SUBROUTINE fxml_02_controller.rex]
REXXout> ==> ---> arrived in button's onAction-code ...
REXXout> ... label~getText=[]
REXXout> ... changing text in label to current date and time ...
REXXout> ... label~getText=[2023-01-24T19:04:30.388000]
REXXout> ... now invoking the public Rexx routine 'klickButtonAction'
REXXout> ==> ---> arrived in public Rexx routine 'klickButtonAction' ...
REXXout>getting all attributes from all ScriptContext's scopes...
REXXout>ScriptContext scope: [100] (ENGINE_SCOPE), available attributes:
REXXout>   [event]........................... [javafx.event.ActionEvent@52fa7f17] ~toString: [javafx.event.ActionEvent[source=Button[id=idButton, styleClass=button]'Click Me!']]
REXXout>   [javax.script.argv]............... [[Ljava.lang.Object;@6a543dfc] ~toString: [[Ljava.lang.Object;@6a543dfc]
REXXout>   [javax.script.engine]............. [Open Object Rexx (ooRexx)]
REXXout>   [javax.script.engine_version]..... [101.20220806]
REXXout>   [javax.script.filename]........... [FXML_02_Document.fxml-onAction_attribute_in_element_ending_at_line_43]
REXXout>   [javax.script.language]........... [ooRexx]
REXXout>   [javax.script.language_version].... [REXX-ooRexx_5.1.0(MT)_64-bit 6.05 6 Jan 2023]
REXXout>   [javax.script.name]............... [rexx]
REXXout>   [title]........................... [--> -> >]
REXXout>-------------------------------------------------------------------------------
REXXout>ScriptContext scope: [200] (GLOBAL_SCOPE), available attributes:
REXXout>   [count]........................... [1]
REXXout>   [idAnchorPane].................... [javafx.scene.layout.AnchorPane@49153b46] ~toString: [AnchorPane[id=idAnchorPane, styleClass=root root]]
REXXout>   [idButton]........................ [javafx.scene.control.Button@48ce0f4e] ~toString: [Button[id=idButton, styleClass=button]'Click Me!']
REXXout>   [label]........................... [javafx.scene.control.Label@14f9c17c] ~toString: [Label[id=label, styleClass=label]'2023-01-24T19:04:30.388000']
REXXout>   [labelRexxInfo]................... [javafx.scene.control.Label@52979ac4] ~toString: [Label[id=labelRexxInfo, styleClass=label]'Updated from public Rexx routine 'klickButtonAction'.']
REXXout>   [labelRexxStarted]................ [javafx.scene.control.Label@312aef3] ~toString: [Label[id=labelRexxStarted, styleClass=label rexxStarted]'Rexx started at: 2023-01-
24T19:03:46.208000']
REXXout>   [location]........................ [java.net.URL@49a8db74] ~toString: [file:FXML_02_Document.fxml]
REXXout>   [resources]....................... [java.util.PropertyResourceBundle@76469108] ~toString: [java.util.PropertyResourceBundle@76469108]
REXXout>   [rexxInfo]........................ [Updated from public Rexx routine 'klickButtonAction'.]
REXXout>   [rexxStarted]..................... [Rexx started at: 2023-01-24T19:03:46.208000]
REXXout>   [year]............................ [javafx.scene.control.Label@1e2c5f16] ~toString: [Label[id=year, styleClass=label]'Year->']
REXXout>-------------------------------------------------------------------------------
REXXout> <== <--- returning from public Rexx routine 'klickButtonAction'.
REXXout>

... continued on next page ...
```

3. File: “fxml_02_controller.rex” – Klick # 2 Output




```
... continued from previous page ...

REXXout> ==> ---> arrived in button's onAction-code ...
REXXout> ... label~getText=[--> -> > 2023-01-24T19:04:30.408000 (count # 1)]
REXXout> ... changing text in label to current date and time ...
REXXout> ... label~getText=[2023-01-24T19:04:50.505000]
REXXout> ... now invoking the public Rexx routine 'klickButtonAction'
REXXout> ==> ---> arrived in public Rexx routine 'klickButtonAction' ...
REXXout>getting all attributes from all ScriptContext's scopes...
REXXout>ScriptContext scope: [100] (ENGINE_SCOPE), available attributes:
REXXout>   [event]............................ [javafx.event.ActionEvent@667188e4] ~toString: [javafx.event.ActionEvent[source=Button[id=idButton, styleClass=button]'Click Me!']]
REXXout>   [javax.script.argv]................ [[Ljava.lang.Object;@35074c73] ~toString: [[Ljava.lang.Object;@35074c73]
REXXout>   [javax.script.engine].............. [Open Object Rexx (ooRexx)]
REXXout>   [javax.script.engine_version]...... [101.20220806]
REXXout>   [javax.script.filename]............ [FXML_02_Document.fxml-onAction_attribute_in_element_ending_at_line_43]
REXXout>   [javax.script.language]............ [ooRexx]
REXXout>   [javax.script.language_version].... [REXX-ooRexx_5.1.0(MT)_64-bit 6.05 6 Jan 2023]
REXXout>   [javax.script.name]................ [rexx]
REXXout>   [title]............................ [--> -> >]
REXXout>-------------------------------------------------------------------------------
REXXout>ScriptContext scope: [200] (GLOBAL_SCOPE), available attributes:
REXXout>   [count]............................ [2]
REXXout>   [idAnchorPane]..................... [javafx.scene.layout.AnchorPane@49153b46] ~toString: [AnchorPane[id=idAnchorPane, styleClass=root root]]
REXXout>   [idButton]......................... [javafx.scene.control.Button@48ce0f4e] ~toString: [Button[id=idButton, styleClass=button]'Click Me!']
REXXout>   [label]............................ [javafx.scene.control.Label@14f9c17c] ~toString: [Label[id=label, styleClass=label]'2023-01-24T19:04:50.505000']
REXXout>   [labelRexxInfo].................... [javafx.scene.control.Label@52979ac4] ~toString: [Label[id=labelRexxInfo, styleClass=label]'.'noitcAnottuBkcilk' enituor xxeR cilbup morf detadpU']
REXXout>   [labelRexxStarted]................. [javafx.scene.control.Label@312aef3] ~toString: [Label[id=labelRexxStarted, styleClass=label rexxStarted]'Rexx started at: 2023-01-
24T19:03:46.208000']
REXXout>   [location]......................... [java.net.URL@49a8db74] ~toString: [file:FXML_02_Document.fxml]
REXXout>   [resources]........................ [java.util.PropertyResourceBundle@76469108] ~toString: [java.util.PropertyResourceBundle@76469108]
REXXout>   [rexxInfo]......................... [.'noitcAnottuBkcilk' enituor xxeR cilbup morf detadpU]
REXXout>   [rexxStarted]...................... [Rexx started at: 2023-01-24T19:03:46.208000]
REXXout>   [year]............................. [javafx.scene.control.Label@1e2c5f16] ~toString: [Label[id=year, styleClass=label]'Year->']
REXXout>-------------------------------------------------------------------------------
REXXout> <== <--- returning from public Rexx routine 'klickButtonAction'.
REXXout>

... continued on next page ...
```

3. File: “fxml_02_controller.rex” – Klick # 3 Output




```
... continued from previous page ...

REXXout> ==> ---> arrived in button's onAction-code ...
REXXout> ... label~getText=[--> -> > 2023-01-24T19:04:50.518000 (count # 2)]
REXXout> ... changing text in label to current date and time ...
REXXout> ... label~getText=[2023-01-24T19:05:05.769000]
REXXout> ... now invoking the public Rexx routine 'klickButtonAction'
REXXout> ==> ---> arrived in public Rexx routine 'klickButtonAction' ...
REXXout>getting all attributes from all ScriptContext's scopes...
REXXout>ScriptContext scope: [100] (ENGINE_SCOPE), available attributes:
REXXout>   [event]............................ [javafx.event.ActionEvent@78f29099] ~toString: [javafx.event.ActionEvent[source=Button[id=idButton, styleClass=button]'Click Me!']]
REXXout>   [javax.script.argv]................ [[Ljava.lang.Object;@91be3e6] ~toString: [[Ljava.lang.Object;@91be3e6]
REXXout>   [javax.script.engine].............. [Open Object Rexx (ooRexx)]
REXXout>   [javax.script.engine_version]...... [101.20220806]
REXXout>   [javax.script.filename]............ [FXML_02_Document.fxml-onAction_attribute_in_element_ending_at_line_43]
REXXout>   [javax.script.language]............ [ooRexx]
REXXout>   [javax.script.language_version].... [REXX-ooRexx_5.1.0(MT)_64-bit 6.05 6 Jan 2023]
REXXout>   [javax.script.name]................ [rexx]
REXXout>   [title]............................ [--> -> >]
REXXout>-------------------------------------------------------------------------------
REXXout>ScriptContext scope: [200] (GLOBAL_SCOPE), available attributes:
REXXout>   [count]............................ [3]
REXXout>   [idAnchorPane]..................... [javafx.scene.layout.AnchorPane@49153b46] ~toString: [AnchorPane[id=idAnchorPane, styleClass=root root]]
REXXout>   [idButton]......................... [javafx.scene.control.Button@48ce0f4e] ~toString: [Button[id=idButton, styleClass=button]'Click Me!']
REXXout>   [label]............................ [javafx.scene.control.Label@14f9c17c] ~toString: [Label[id=label, styleClass=label]'2023-01-24T19:05:05.769000']
REXXout>   [labelRexxInfo].................... [javafx.scene.control.Label@52979ac4] ~toString: [Label[id=labelRexxInfo, styleClass=label]'Updated from public Rexx routine 'klickButtonAction'.']
REXXout>   [labelRexxStarted]................. [javafx.scene.control.Label@312aef3] ~toString: [Label[id=labelRexxStarted, styleClass=label rexxStarted]'Rexx started at: 2023-01-
24T19:03:46.208000']
REXXout>   [location]......................... [java.net.URL@49a8db74] ~toString: [file:FXML_02_Document.fxml]
REXXout>   [resources]........................ [java.util.PropertyResourceBundle@76469108] ~toString: [java.util.PropertyResourceBundle@76469108]
REXXout>   [rexxInfo]......................... [Updated from public Rexx routine 'klickButtonAction'.]
REXXout>   [rexxStarted]...................... [Rexx started at: 2023-01-24T19:03:46.208000]
REXXout>   [year]............................. [javafx.scene.control.Label@1e2c5f16] ~toString: [Label[id=year, styleClass=label]'Year->']
REXXout>-------------------------------------------------------------------------------
REXXout> <== <--- returning from public Rexx routine 'klickButtonAction'.
REXXout>

... ...
```

6. File: “fxml_02.rex” (Main Program)

```
   /* only "de" has an effect and will use the German translation for the */
parse arg locale .      -- get locale from user ("en", default, or "de" for German)
   -- create Rexx object that will control the FXML set up
if locale<>"" then rexxApp=.RexxApplication~new(locale)
              else rexxApp=.RexxApplication~new
   -- instantiate the abstract JavaFX class, the abstract "start" method will be served by rexxApp
jRexxApp=BsfCreateRexxProxy(rexxApp,,"javafx.application.Application")
   -- launch the application, invoke "start" and then stay up until the application closes
jRexxApp~launch(jRexxApp~getClass, .nil)     -- need to use this version of launch in order to work

::requires "BSF.CLS"    -- get Java support

/* implements the abstract method "start" for the Java class javafx.application.Application
   (BSF4ooRexx also supplies another (trailing) slotDir (a Rexx Directory) argument, as "start" is
   invoked from Java)
*/
::class RexxApplication

::method init  -- constructor to fetch a locale string ("de" for German, file "fxml_01_de.properties"), if any
  expose locale
  use strict arg locale="en"    -- default to English
    /* loads the fxml document defining the GUI elements, sets up a scene for it and shows it */
::method start    -- will be invoked by the "launch" method
  expose locale
  use arg stage   -- we get the stage to use for our UI
    -- create an URL for the FMXLDocument.fxml file (hence the protocol "file:")
  rootDocUrl=.bsf~new("java.net.URL", "file:FXML_02_Document.fxml")
    -- use Java translation services
  jLocale=.bsf~new("java.util.Locale", locale)
  jRB=bsf.loadClass("java.util.ResourceBundle")~getBundle("FXML_02", jLocale)
  root=bsf.loadClass("javafx.fxml.FXMLLoader")~load(rootDocUrl, jRB) -- load the fxml document

  scene=.bsf~new("javafx.scene.Scene", root)    -- create a scene for our document
  stage~setScene(scene)                         -- set the stage to our scene

  img=.bsf~new("javafx.scene.image.Image", "oorexx_032.png")
  stage~getIcons~add(img)                       -- set application icon
  stage~show                                    -- show the stage (and thereby our scene)
```

4./5. File: “FXML_02_{de|en}.properties”

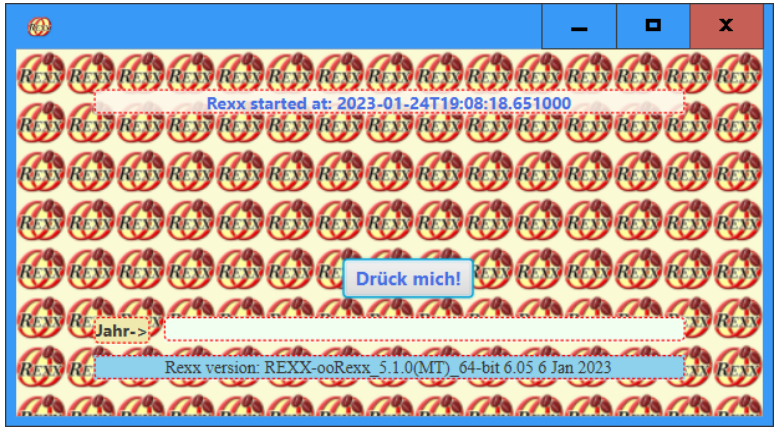
FXML_02**_en**.properties

```
! This is the English (en) translation for two terms.
!
! the following key is used in the Label with the fx:id="text", where
its text attribute states (note the percentage char): text="%year"
year = Year->

! the following key is used in the Button with the fx:id="button", where
its text attribute states (note the percentage char): text="%clickMe"
clickMe = Click Me!
```

FXML_02**_de**.properties

```
! This is the German (de) translation for two terms.
!
! the following key is used in the Label with the fx:id="text", where
its text attribute states (note the percentage char): text="%year"
year = Jahr->

! the following key is used in the Button with the fx:id="button", where
its text attribute states (note the percentage char): text="%clickMe"
clickMe = Drück mich!
```

Output of Running "rexx fxml_02.rex de" (German GUI)



An Address Book Application

- Cf. http://code.makery.ch/library/javafx-8-tutorial/
- Simple address book example
  - Data loaded from JSON file, if available
  - Data stored in JSON file
  - List persons
  - Allow for
    - Adding, deleting, changing persons
    - Create and show statistics about the months of birth
    - Print persons according to the current list order

Files

- Rendering, graphics: address_book_128.png, DarkTheme.css, DarkThemePrint.css
- Rexx-Utilities: json-rgf.cls, put_FXID_objects_into.my.app.rex
- Controlling the application
  - MainApp.rex
    - For each FXML file a Rexx class is defined to control it
- FXML-files defined with SceneBuilder
  - RootLayout.fxml, PersonOverview.fxml, BirthdayStatistics.fxml, PersonEditDialog.fxml, PersonPrinterDialog.fxml

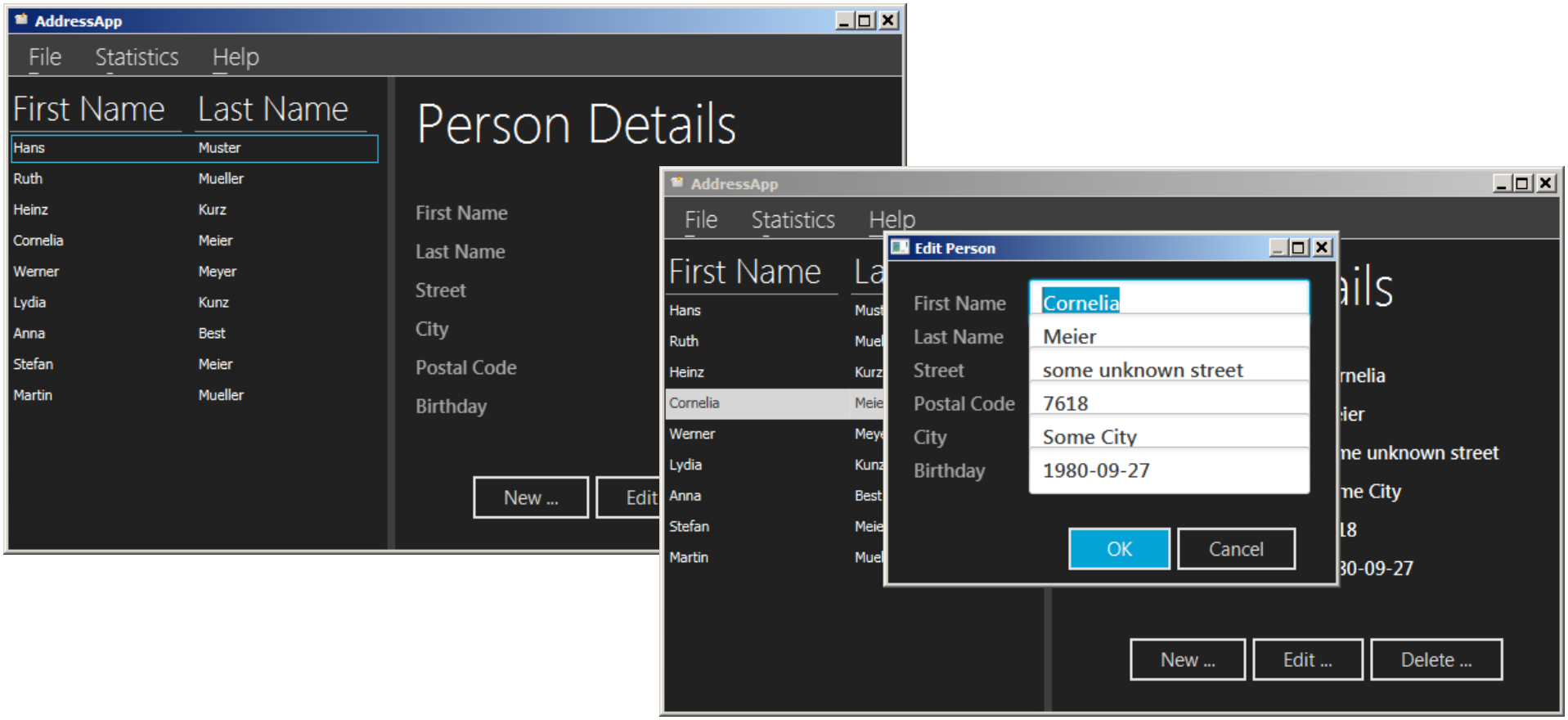
Overview

- Needs ooRexx 5.0.0 or higher
- MainApp.rex
  - In addition creates an entry "MY.APP" in global .environment
  - The controller classes will be able to fetch the **JavaFX** objects to interact with from .MY.APP stored in a directory named after the FXML file
- put_FXID_objects_into.my.app.rex
  - Will be called at the end of each FXML file, after all JavaFX objects got defined
  - If there is no entry named MY.APP in the global Rexx .environment, then one will get created by that name referring to a newly created Rexx directory, such that it can be referred to by its environment symbol .MY.APP
  - Will store all **JavaFX** objects with an fx:id attribute in .MY.APP under the name of the FXML file name (location entry in global **ScriptContext**) for later retrieval

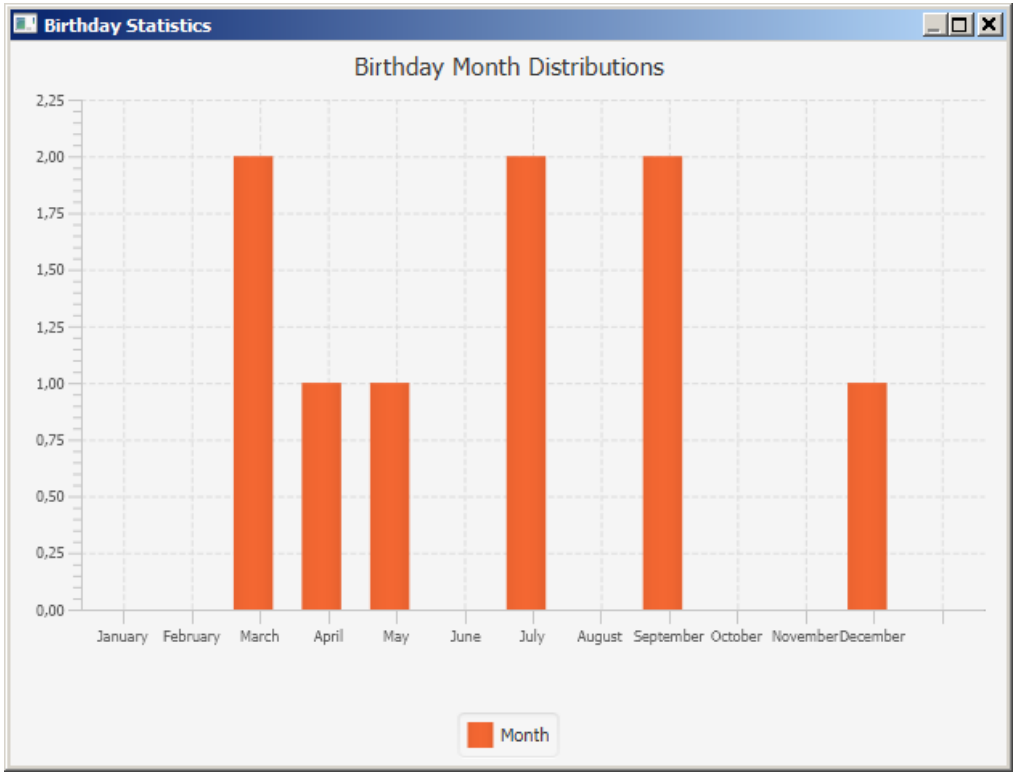
Sample JSON Content

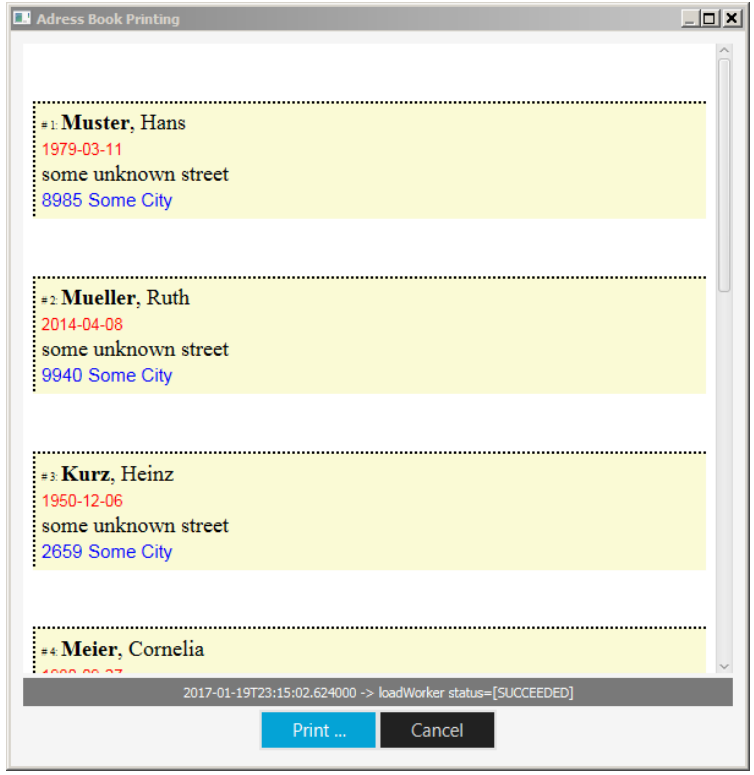
```
[
  {
    "birthday": "1979-03-11",
    "city": "Some City",
    "firstName": "Hans",
    "lastName": "Muster",
    "postalCode": 8985,
    "street": "some unknown street"
  }
,
  {
    "birthday": "2014-04-08",
    "city": "Some City",
    "firstName": "Ruth",
    "lastName": "Mueller",
    "postalCode": 9940,
    "street": "some unknown street"
  }
,
  ... cut ...
,
  {
    "birthday": "1978-05-20",
    "city": "Some City",
    "firstName": "Martin",
    "lastName": "Mueller",
    "postalCode": 4979,
    "street": "some unknown street"
  }
]
```

GUI Output, 1


AddressApp
File
Statistics
Help
First Name
Last Name
Hans
Muster
Ruth
Mueller
Heinz
Kurz
Cornelia
Meier
Werner
Meyer
Lydia
Kunz
Anna
Best
Stefan
Meier
Martin
Mueller
Person Details
First Name
Last Name
Street
City
Postal Code
Birthday
New ...
Edit
Edit Person
First Name
Cornelia
Last Name
Meier
Street
some unknown street
Postal Code
7618
City
Some City
Birthday
1980-09-27
OK
Cancel
New ...
Edit ...
Delete ...

GUI Output, 2


Birthday Statistics
Birthday Month Distributions
2,25
2,00
1,75
1,50
1,25
1,00
0,75
0,50
0,25
0,00
January
February
March
April
May
June
July
August
September
October
November
December
Month


Adress Book Printing
1: Muster, Hans
1979-03-11
some unknown street
8985 Some City
2: Mueller, Ruth
2014-04-08
some unknown street
9940 Some City
3: Kurz, Heinz
1950-12-06
some unknown street
2659 Some City
4: Meier, Cornelia
2017-01-19T23:15:02.624000 -> loadWorker status=[SUCCEEDED]
Print ...
Cancel

Additional Information

- Nutshell examples
  - Cf. BSF4ooRexx850 installation in "bsf4oorexx850/samples/JavaFX"
    - Menu "BSF4ooRexx850 → Samples → JavaFX"
- Information ad JavaFX
  - Menu "BSF4ooRexx850 → Samples → JavaFX → index.html"
    - Link list to many, interesting information around JavaFX
  - Fee open source JavaFX controls
    - http://jfxtras.org/
    - http://fxexperience.com/controlsfx/features/

Roundup

- JavaFX
  - A great and extremely powerful GUI programming infrastructure
  - Allows meeting the most challenging GUI demands
  - **SceneBuilder** makes it easy to take full advantage of **JavaFX**
  - **DOM** and **CSS (webkit)**
- BSF4ooRexx' javax.script support makes it very easy to use JavaFX from ooRexx!
  - Allows for powerful and portable (!) **ooRexx** applications
  - No excuse not to create great GUIs with ooRexx! :)