"UNO.CLS: An (Open) Object Rexx Module for Universal Network Objects"

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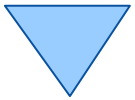


Agenda

- Sources, links
- Outlook given in 2005
- UNO
- UNO.CLS
- Nutshell Examples
- Roundup and Outlook

Sources of figures, examples and hints

- From the excellent OOo "Developer's Guide", cf. http://api.openoffice.org/SDK/
- OpenOffice.org papers at
  http://wi.wu-wien.ac.at/rgf/diplomarbeiten
  look for the works of *Mr. Ahammer* (fall 2005) and *Mr. Burger* (spring 2006) who document OOo with ooRexx, more to come
- From the excellent book, "OpenOffice.org Macros Explained" by Mr. Pitonyak, cf. http://www.HetzenWerke.com

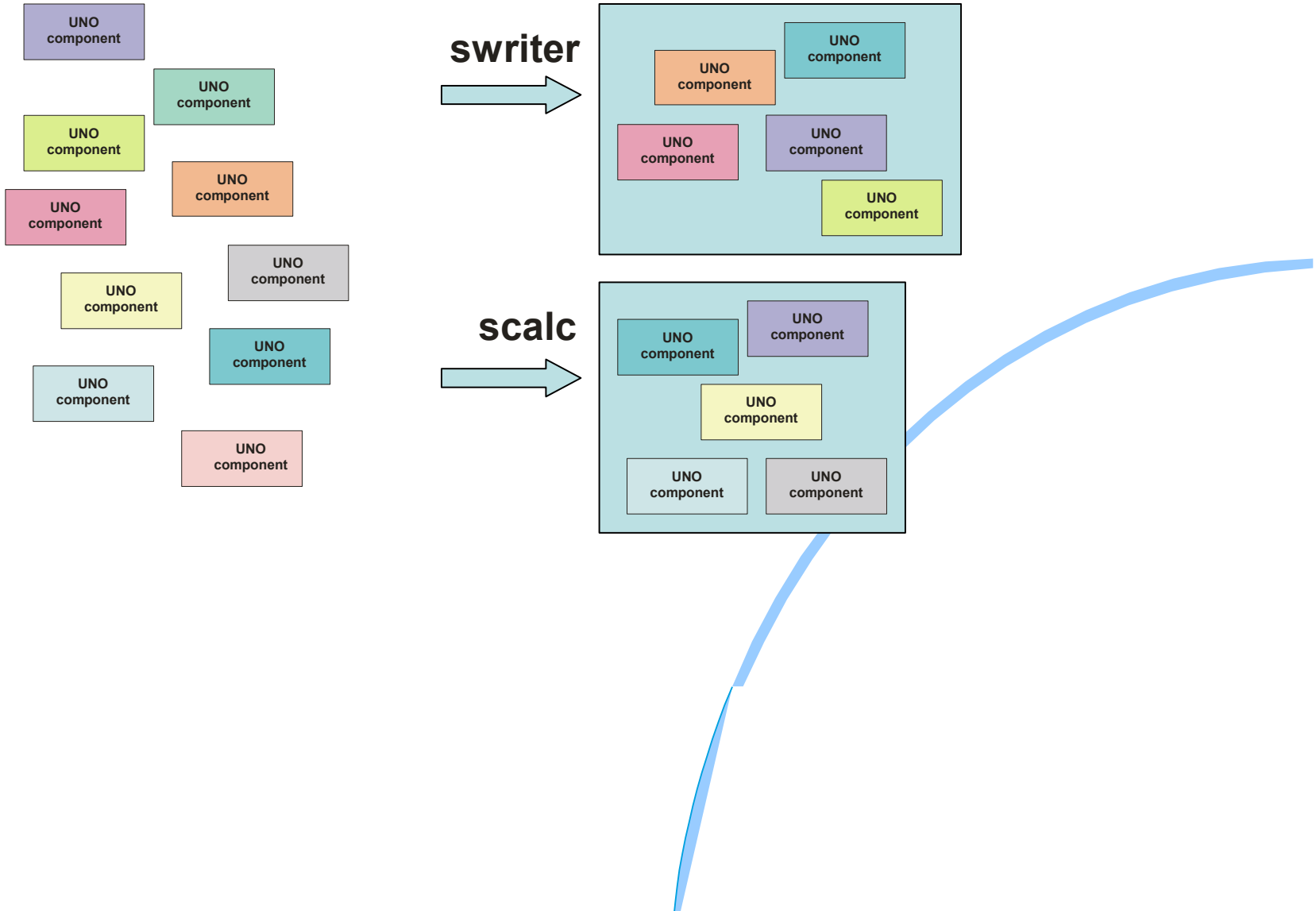
Outlook given in 2005 "Roundup and Outlook, 2"

- Creating an ooRexx package
  - Simplifying recurring tasks, like establishing a connection with a server
  - Simplifying access to components, e.g. making it easier to manipulate cells of the spreadsheet
- With the advent of OOo 2.0
  - Devise a plug-in for BSF4Rexx, allowing ooRexx to be dispatched from within OOo
  - Will make it possible to use ooRexx wherever StarBasic is used!

Universal Network Objects (UNO), 1

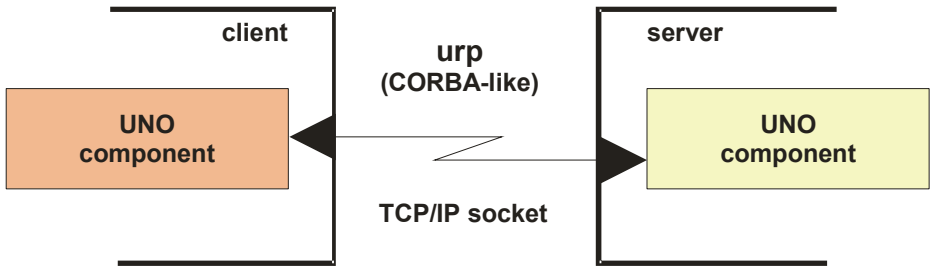
- Component technology used to create the building stones of the OpenOffice.org/StarOffice modules
- CORBA-like
  - IDL: Interface Description Language to define components and types, queryable at runtime
- Defines a communication protocol: urp
- Client/server architecture
- URE: "UNO runtime environment" (fall 2005)

Universal Network Objects (UNO), 2



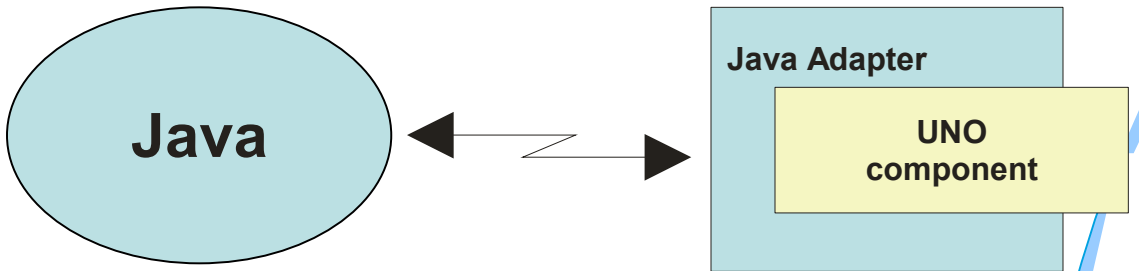
Universal Network Objects (UNO), 3

- urp – UNO remote protocol
- TCP/IP sockets
  - Server can be on another machine (even running another operating system)



Universal Network Objects (UNO), 4 Java Adapter

- Sun bought StarOffice
  - Java interfaces to UNO components
  - Java can be used to implement UNO components
  - ...



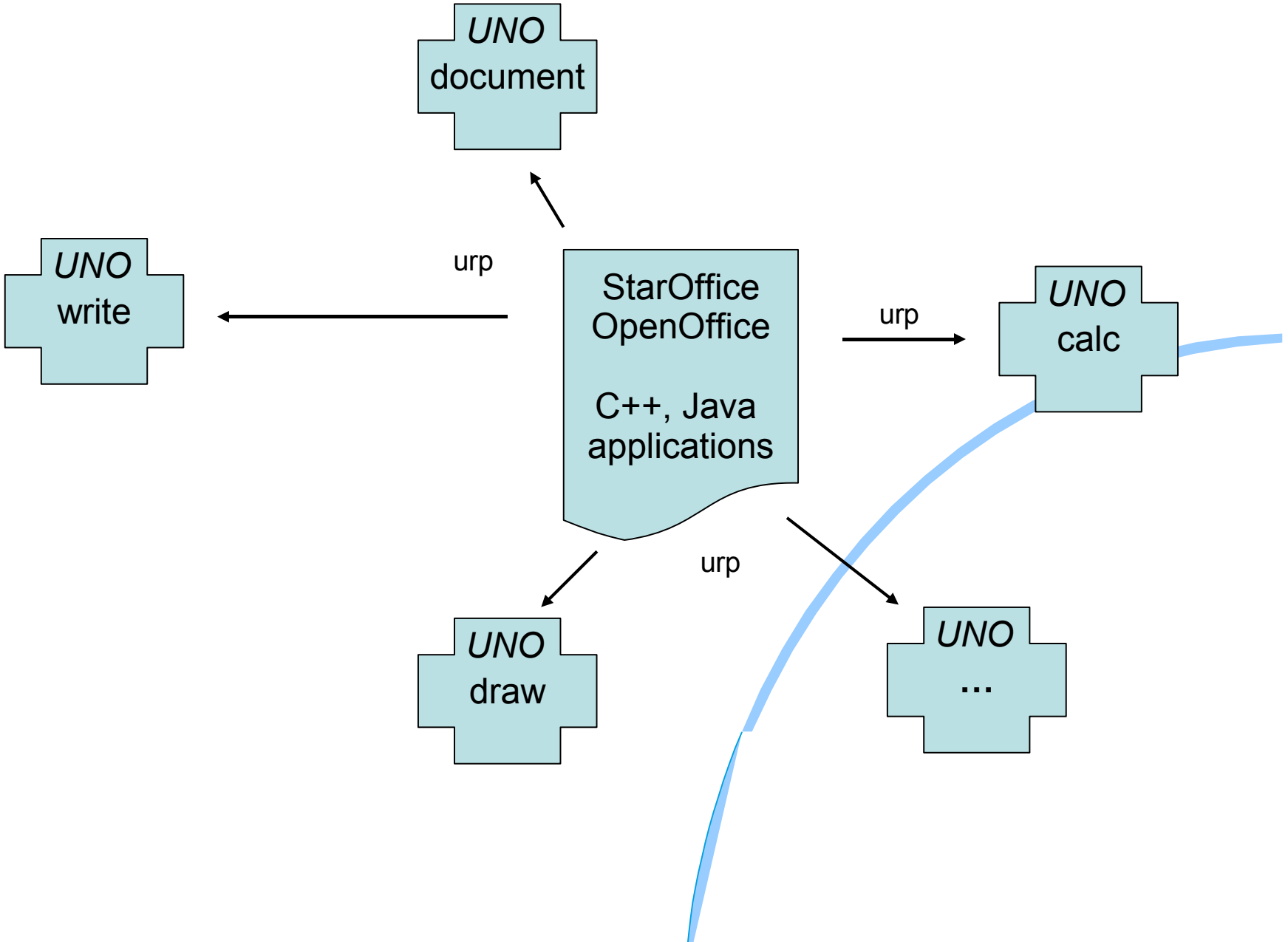
OpenOffice.org/StarOffice Developer's Bird Eye's View, 1

- Set of services to create and maintain documents
- All common functionality of all types of documents is extracted and organized as a set of interfaces
  - E.g. Loading, saving, printing documents
- For each type of document the specific functionality is extracted and organized as a specialized set of interfaces
    - E.g. TextCursors ("write"), Cell-Manipulation ("calc")

OpenOffice.org/StarOffice Developer's Bird Eye's View, 2

- Client/Server Architecture
  - Employing distributable components ("UNO")
    - Server can run on any computer in the world!
    - Operating system and/or of server as well as that of the client is irrelevant!
  - Communication: urp
    - TCP/IP sockets
    - Named pipes, if available
  - Client can run on the same machine as the server

OpenOffice.org/StarOffice Building Blocks, 1



OpenOffice.org/StarOffice Building Blocks, 2

- "Service Managers"
  - Supplied by servers
  - Can be used to request services from the server
  - Returned service allows access to a part of the "office" functionality, E.g.
    - *com.sun.star.frame.Desktop*
    - *com.sun.star.configuration.ConfigurationProvider*
    - *com.sun.star.sdb.DatabaseContext*

OpenOffice.org/StarOffice Building Blocks, 3

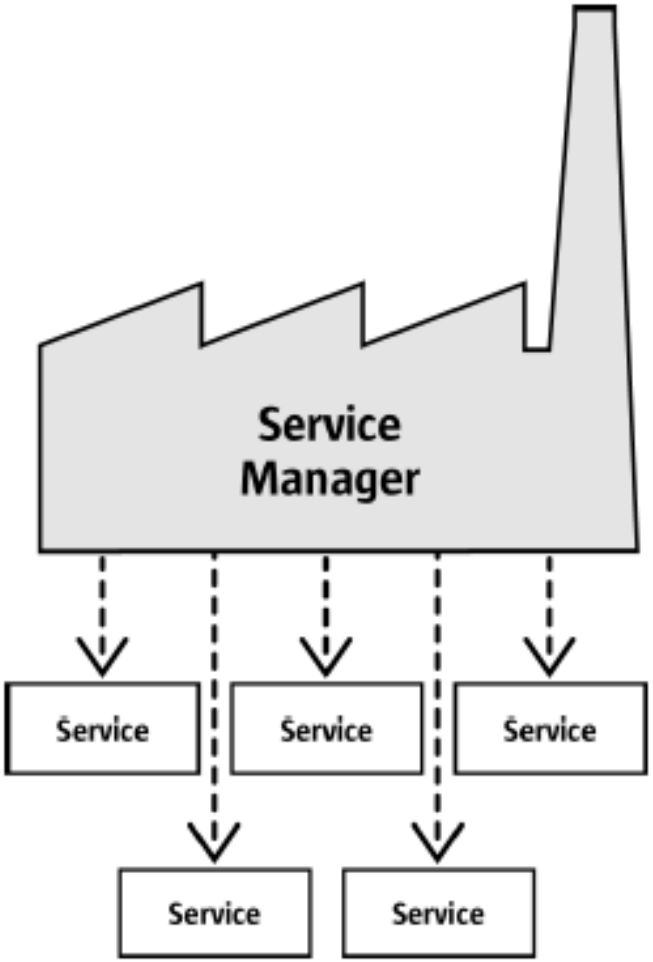


Illustration 2.1: Service manager

OpenOffice.org/StarOffice Building Blocks, 4

- "Services"
  - Can be comprehensive
  - Are organized in partitions named
    - "Interfaces" (group of functions/methods) and
    - "structs" (group of related properties only)
  - Depending on the desired task you need to request the appropriate interface, e.g.
    - com.sun.star.view.**X**Printable
    - com.sun.star.frame.**X**Storable
    - com.sun.star.text.**X**TextDocument

OpenOffice.org/StarOffice Building Blocks, 5

- An example
  - Two services with seven interfaces exposed
    - There are more available
  - "OfficeDocument"
    - Four interfaces
  - "TextDocument"
    - Three interfaces

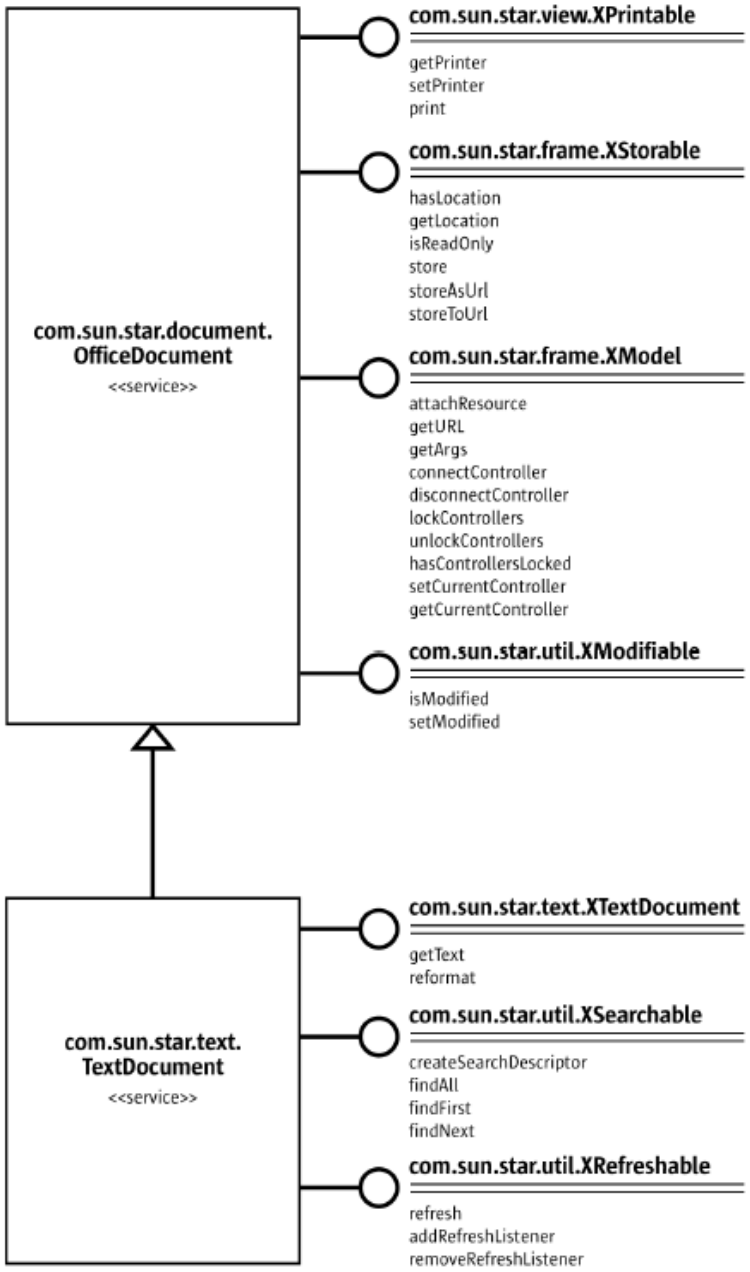


Illustration 2.3: Text Document

Creating a Text Document Java, 1

```
class Test {
   public static void main (String args[]) {
     com.sun.star.frame.XDesktop xDesktop = null;
     com.sun.star.lang.XMultiComponentFactory xMCF = null;
     try {
       com.sun.star.uno.XComponentContext xContext = null;
       xContext = com.sun.star.comp.helper.Bootstrap.bootstrap();

       xMCF = xContext.getServiceManager();
       if( xMCF != null ) {
         System.out.println("Connected to a running office ...");
         Object oDesktop = xMCF.createInstanceWithContext(
             "com.sun.star.frame.Desktop", xContext);

         xDesktop = (com.sun.star.frame.XDesktop)
             com.sun.star.uno.UnoRuntime.queryInterface(
                 com.sun.star.frame.XDesktop.class, oDesktop);

         com.sun.star.frame.XComponentLoader xComponentLoader =
             (com.sun.star.frame.XComponentLoader)
                 com.sun.star.uno.UnoRuntime.queryInterface(
                     com.sun.star.frame.XComponentLoader.class, xDesktop);

         com.sun.star.beans.PropertyValue xEmptyArgs[] = // empty property array
             new com.sun.star.beans.PropertyValue[0];

         com.sun.star.lang.XComponent xComponent =       // text document
                xComponentLoader.loadComponentFromURL( "private:factory/swriter",
                    "_blank", 0, xEmptyArgs);
       }
       else
           System.out.println("Not able to create desktop object.");
     }
     catch( Exception e) {
         e.printStackTrace(System.err);
         System.exit(1);
     }
     System.err.println("Successful run.");
     System.exit(0);
   }
```

Creating a Text Document Java, 2

```
... cut ...

com.sun.star.frame.XDesktop xDesktop =
     (com.sun.star.frame.XDesktop)
     com.sun.star.uno.UnoRuntime.queryInterface(
            com.sun.star.frame.XDesktop.class, oDesktop);

com.sun.star.frame.XComponentLoader xComponentLoader =
     (com.sun.star.frame.XComponentLoader)
     com.sun.star.uno.UnoRuntime.queryInterface(
             com.sun.star.frame.XComponentLoader.class, xDesktop);

com.sun.star.beans.PropertyValue xEmptyArgs[] = // empty property array
             new com.sun.star.beans.PropertyValue[0];

com.sun.star.lang.XComponent xComponent =       // text document
      xComponentLoader.loadComponentFromURL("private:factory/swriter",
                    "_blank", 0, xEmptyArgs);

... cut ...
```

OpenOffice.org 2.x/StarOffice 8 Programming Languages

- OOo version 2.x
  - C++
  - StarBasic
    - Scripting language
  - **Java**
  - Python
  - New Java-based Scripting Framework
    - BeanShell (interpretable Java)
    - JavaScript (Rhino)

OpenOffice.org/StarOffice and ooRexx ?

- No direct support for ooRexx in OOo
- No external Rexx functions available for OOo
- BUT
  - **If** there was a way to bridge ooRexx with Java and then use Java to bridge to UNO, **then** it would be **possible** to team up OOo with ooRexx!
  - … and there **is** a means available for that:

    BSF4Rexx !

Creating a Text Document ooRexx with BSF4Rexx

```
xContext   = .bsf~bsf.import("com.sun.star.comp.helper.Bootstrap")~bootstrap
unoRuntime = .bsf~bsf.import("com.sun.star.uno.UnoRuntime")

xMCF = xContext~getServiceManager();
if xMCF<>.nil then
do
   say "Connecting to office ..."
   oDesktop = xMCF~createInstanceWithContext("com.sun.star.frame.Desktop", xContext)

   xDesktop = unoRuntime~queryInterface( -
      .bsf~bsf.import("com.sun.star.frame.XDesktop"), oDesktop)

   xComponentLoader = unoRuntime~queryInterface( -
            .bsf~bsf.import("com.sun.star.frame.XComponentLoader"), xDesktop)

    PropertyValueClass=.bsf~bsf.import("com.sun.star.beans.PropertyValue")
    xEmptyArgs=bsf.createArray( PropertyValueClass, 0 )  -- empty property array

    xComponent = xComponentLoader~loadComponentFromURL( "private:factory/swriter", -
               "_blank", 0, xEmptyArgs);
end
else
    say "Not able to create desktop object."

::requires BSF.CLS   -- get Java support (BSF4Rexx)
```

BSF4Rexx, Version 2006-04-10 (17th International Rexx Symposium)

- Install BSF4Rexx
  - Follow the instructions coming with BSF4Rexx
  - Follow the instructions in "readmeBSF4Rexx.txt"
- Configure OOo's Java
  - Make sure OOo is enabled for Java
    - Check "Tools → Options… → Security → OpenOffice.org → Java → Enable"
  - Make sure OOo uses the Java version for which BSF4Rexx was installed !

UNO.CLS, 1

- "OOO.CLS"
  - Created for and introduced at the 16th International Rexx Symposium
  - Eased creation of ooRexx programs that drive OOo
- "UNO.CLS"
  - Generalized support to UNO
  - Drastically enhanced support for UNO and OOo
  - Allows introspection/reflection of UNO objects!

UNO.CLS, 2

- Environment symbol **.UNO**
  - Version of UNO.CLS: .uno~version
  - Empty Property array: .uno~noProps
  - Stores UNO classes loaded via the public routine UNO.LoadClass(...)
    - Preloaded UNO classes:
      - .uno~**Any**: com.sun.star.uno.Any
      - .uno~**AnyConverter**: com.sun.star.uno.AnyConverter
      - .uno~**Bootstrap**: com.sun.star.comp.helper.Bootstrap
      - .uno~**PropertyValue**: com.sun.star.beans.PropertyValue
      - .uno~**RgfReflectUno**: org.oorexx.uno.RgfReflectUNO
      - .uno~**UnoRuntime**: com.sun.star.uno.UnoRuntime

UNO.CLS, 3
Public Routines

- UNO.connect([UNO_URL])
  - Bootstraps UNO and returns the remote object, if UNO_URL is given, or local context object else
- UNO.loadClass(className [, idx])
  - Creates a proxy class object from the given UNO class name and stores it with idx in .UNO; if idx is omitted the unqualified class name is used
- UNO.wrap(BSFProxyObject)
  - Creates and returns a UNO proxy object from a BSF proxy object, adding special UNO behaviour

UNO.CLS, 4
Public Routines

- UNO.areSame(o1, o2)
  - Returns .true if both the UNO object references o1 and o2 refer to the same object, .false else
- UNO.createDesktop([context])
  - Creates and returns the XDesktop interface object
- UNO.setCell(XSheet, x, y, value)
  - Sets cell with x/y co-ordinates (0-based) in Xsheet to value using setFormula()

UNO.CLS, 5
Public Routines for Macro Usage

- If ooRexx script is invoked via the OOo scripting framework the following two routines can be used
  - UNO.getScriptContext()
    - Returns the ScriptContext, a UNO proxy object
  - UNO.getScriptContextVersion()
    - Returns the ScriptContext version for the Ooo-ooRexx-macro-scripting support

UNO.CLS, 6
Conversion of Fully Qualified Filenames

- UNO uses URL encoding for filenames, independent of platforms
  - Fully qualified platform dependent file names need therefore be converted
  - ConvertFromURL(URL)
    - Returns operating system dependent format of fully qualified file name as encoded in URL
  - ConvertToURL(fileName)
    - Returns operating system neutral URL encoding of operating system dependent fully qualified fileName

UNO.CLS, 7
URL En-/Decoding

- URLs need to be encoded (and decoded) such that they do not contain illegal characters escaping such characters in the %nn notation
  - encodeURL(url)
    - Escapes illegal characters
  - decodeURL(url)
    - Translates escaped characters

UNO.CLS, 8
Reflection/Introspection Support, 1

- Learning the structure of UNO objects can be tedious and time-consuming
- The following routines return all available information in a blank delimited string that can be huge
  - For simple debugging purposes the public routine ppd(blankDelimitedString) can be used which will insert CR-LF-TABs for making a SAY output better ledgible
- org.oorexx.uno.RgfReflectUNO methods are used

UNO.CLS, 9 Reflection/Introspection Support, 2

- UNO.findInterfaceWithMember(o, name, [bReturnString], [howMany])
  - Looks for a member name (case-independently) in the UNO object o; if bReturnString is .true, then the interface UNOIDL definition is returned, else the queried interface object. If a string is to be returned then up to howMany matching interface definitions are encoded, separated by a LF ("0A"x) is returned; a value of -1 will return all interface definitions where a named member can be found.
- UNO.getDefinition(o)
  - The UNOIDL definition of the UNO object o is returned as a blank delimited string.
- UNO.getInterfaceNamesViaReflection(o)
  - Returns a blank delimited string of the interface names that the UNO service object o implements (reflection, ie. according to UNOIDL)

UNO.CLS, 10
Reflection/Introspection Support, 3

- UNO.getProperties(o)
  - Returns a blank delimited string of the property definitions that are defined for the UNO service object o
- UNO.getServiceNamesViaReflection(o)
  - Returns a blank delimited string of the interface names that the UNO service object o implements
- UNO.getTypeName(o)
  - Returns the type name of the UNO object o
- UNO.getXTypeProviderTypeNames(o)
  - Returns a blank delimited string of the interface names that the UNO service object o implements (introspection).

UNO.CLS, 11
Reflection/Introspection Support, 4

- UNO.queryInterfaceName(o, name)
  - Returns a fully qualified interface name matching the unqualified, case-insensitive name for the UNO object o
- UNO.queryInterfaceObjectByName(o, name)
  - Returns the queried interface object for the interface name matching the unqualified, case-insensitive name for the UNO object o
- UNO.queryServiceName(o, name)
  - Returns a fully qualified service name matching the unqualified, case-insensitive name for the UNO object o

Creating a Text Document ooRexx with UNO.CLS

```
xComponentLoader = UNO.createDesktop() ~XDesktop ~XComponentLoader
xWriterComponent = xComponentLoader~loadComponentFromURL(                -
                   "private:factory/swriter", "_blank", 0, .UNO~noProps)
say ppd(uno.getDefinition(xWriterComponent))

::requires UNO.CLS    -- get UNO support
```

(Multilingual) UNO Spellchecker

```
ctxt = UNO.connect()          /* connect to server and retrieve the ctxt object  */
sm   = ctxt~getServiceManager /* retrieve XMultiComponentFactory                 */

say "**********************"
say "*** Spell Checker ***"
say "**********************"
say "Please enter a word: "
parse pull aWord              /* get word to spell check from user   */
say
   /* create the LinguServiceManager and the SpellChecker */
lsm = sm~createInstanceWithContext("com.sun.star.linguistic2.LinguServiceManager", ctxt)
sc  = lsm~XLinguServiceManager~getSpellChecker

   /* load the required class "com.sun.star.lang.Locale" and set the language to US-english */
call uno.loadClass "com.sun.star.lang.Locale"
aLocale = .uno~Locale~new("en", "US", "")

isCorrect = sc~isValid(aWord, aLocale, .UNO~noProps)  /* test the word  */
say "The word" pp(aWord) "is" iif(isCorrect, "", "NOT") "correct!"

   /* if the word is not correct submit all alternatives */
sa = sc~spell(aWord, aLocale, .uno~noProps)

if .nil <> sa then
do
   say; say "Alternatives: "
   do alternative over sa~alternatives
      say "   " alternative
   end
end

::requires UNO.CLS   -- get UNO support
```

Output:

```
**********************
*** Spell Checker ***
**********************
Please enter a word:
misterious

The word [misterious] is NOT correct!

Alternatives:
   mysterious
```

Roundup and Outlook

- UNO
  - CORBA-like component technology
  - URE and OOo build on it
- Java UNO adapters
  - Allow using BSF4Rexx
  - ooRexx can be used to automate/script OOo
- With OOo v2.0
  - Java scripting engine framework
  - Using BSF4Rexx and an Ooo-ooRexx-engine, ooRexx can be employed as a macro language!