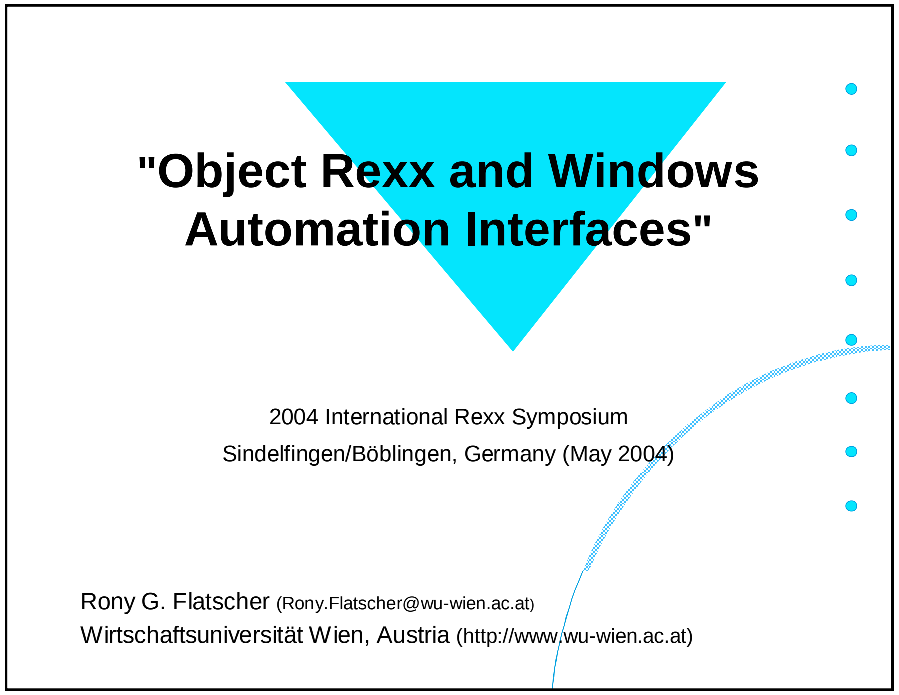

"Object Rexx and Windows Automation Interfaces"

2004 International Rexx Symposium
Sindelfingen/Böblingen, Germany (May 2004)

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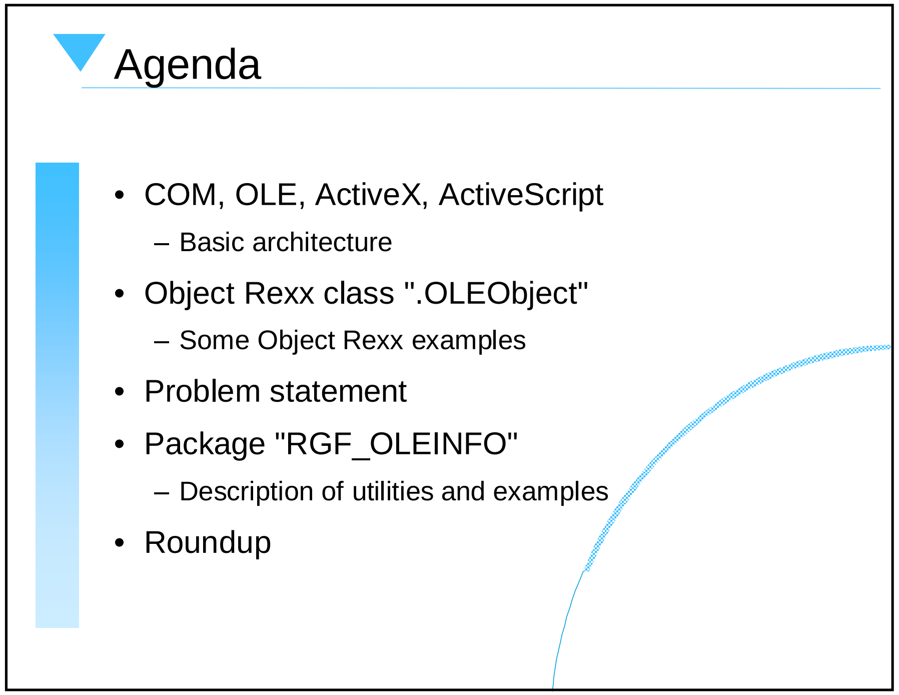


Agenda

- COM, OLE, ActiveX, ActiveScript
  - Basic architecture
- Object Rexx class ".OLEObject"
  - Some Object Rexx examples
- Problem statement
- Package "RGF_OLEINFO"
  - Description of utilities and examples
- Roundup

OLE (ActiveX) Automation, 1

- COM
  - Component Object Model
    - RPC ("remote procedure call")
    - Interfaces (e.g. "IUnknown")
    - Further developments
      - DCOM, COM+
- OLE
  - Object Linking and Embedding
    - COM-based
    - Linking of documents (Dynamic Data Exchange)
      - Cold link
      - Warm link
      - Hot link
    - Embedding of "alien" documents

OLE (ActiveX) Automation, 2

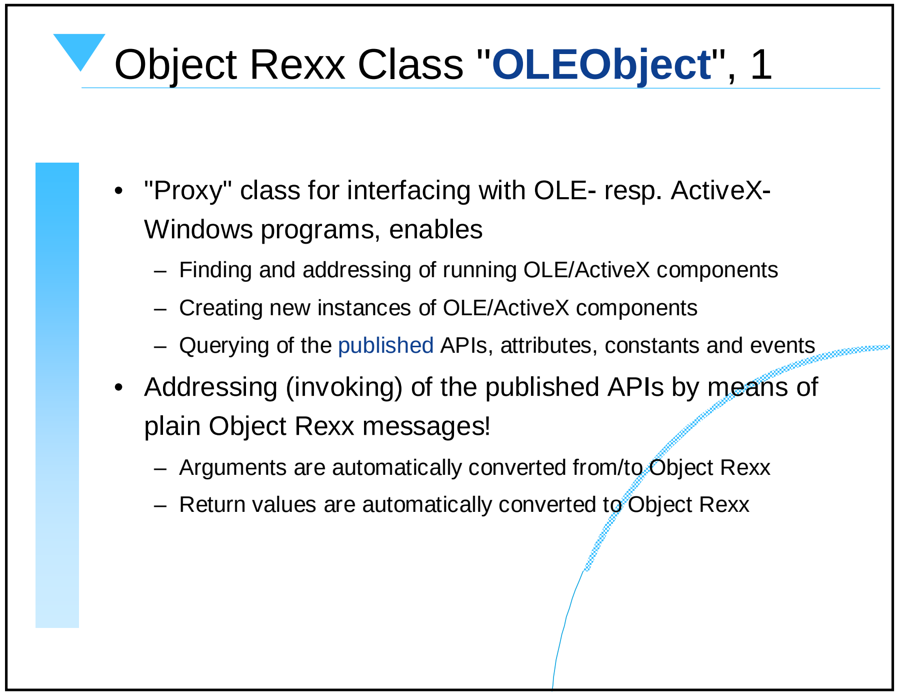
- VBX, OCX, ActiveX
  - Set of COM interfaces defining Windows "Components"
    - Windows programs, which can be combined
    - Pre-defined interface for interfacing with components
  - Acronyms
    - Visual Basic Extension (VBX)
      - Mostly for GUI
    - Object Component Extension (OCX) and ActiveX
      - Independent of Visual Basic, hence deployable by all Windows programs

OLE (ActiveX) Automation, 3

- OLE (ActiveX) Automation
  - Interface for addressing and remote congtrolling Windows applications/components
  - Set of COM based interfaces
    - Standardized definition of APIs for (scripting) languages
      - Invoking functions of Windows programs
      - Querying and setting values of attributes in a Windows component
      - Intercepting of events, which occur in Windows components
    - Recording of user-actions, which later can be reproduced with the help of a scripting language ("macros")

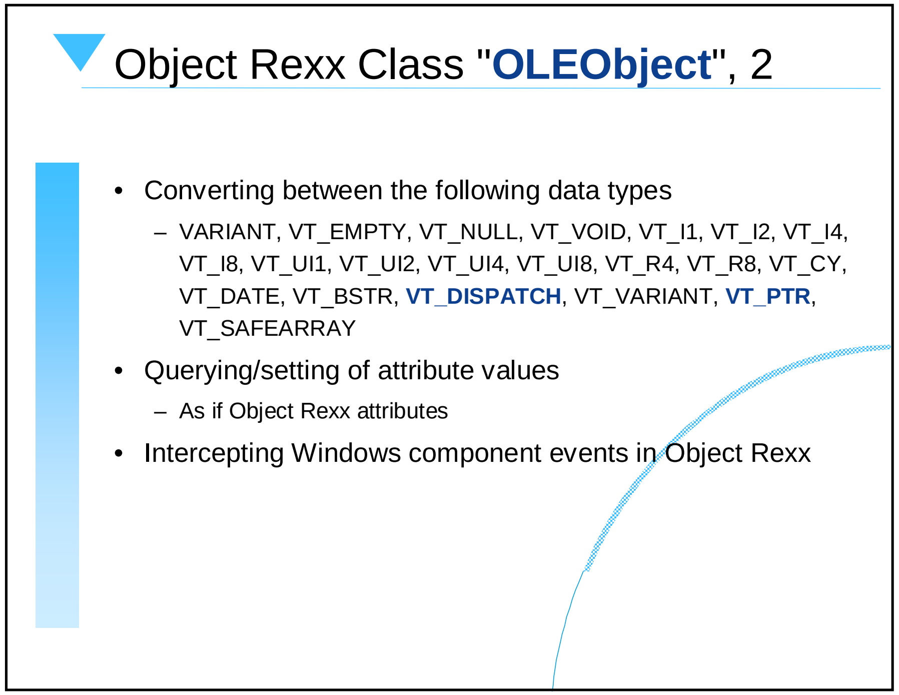
OLE (ActiveX) Automation, 4

- OLE, ActiveX
  - Applications/components are registered with the "Windows registry"
    - HKEY_CLASSES_ROOT
      - **CLSID**
        - » GUID resp. UUID
        - » Global resp. Universal Unique Identifier
      - **ProgID**
        - » Easier to understand/memorize for humans, a unique string
        - » ***VersionindependentProgID***
  - Addressing of such registered components
    - CLSID, PROGID or via a "Moniker" (a string)



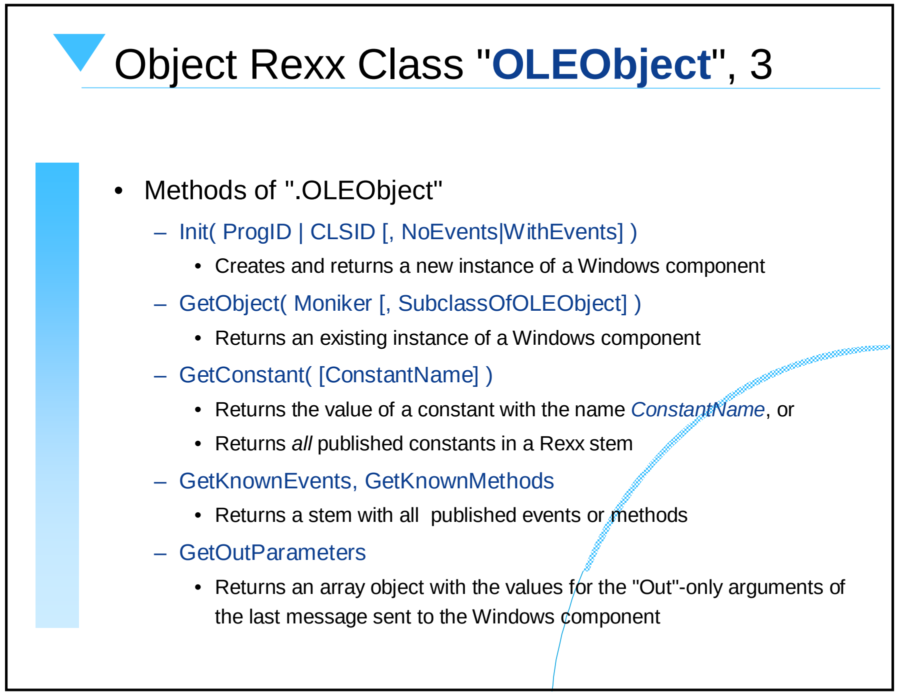
Object Rexx Class "**OLEObject**", 1

- "Proxy" class for interfacing with OLE- resp. ActiveX-Windows programs, enables
  - Finding and addressing of running OLE/ActiveX components
  - Creating new instances of OLE/ActiveX components
  - Querying of the published APIs, attributes, constants and events
- Addressing (invoking) of the published APIs by means of plain Object Rexx messages!
  - Arguments are automatically converted from/to Object Rexx
  - Return values are automatically converted to Object Rexx



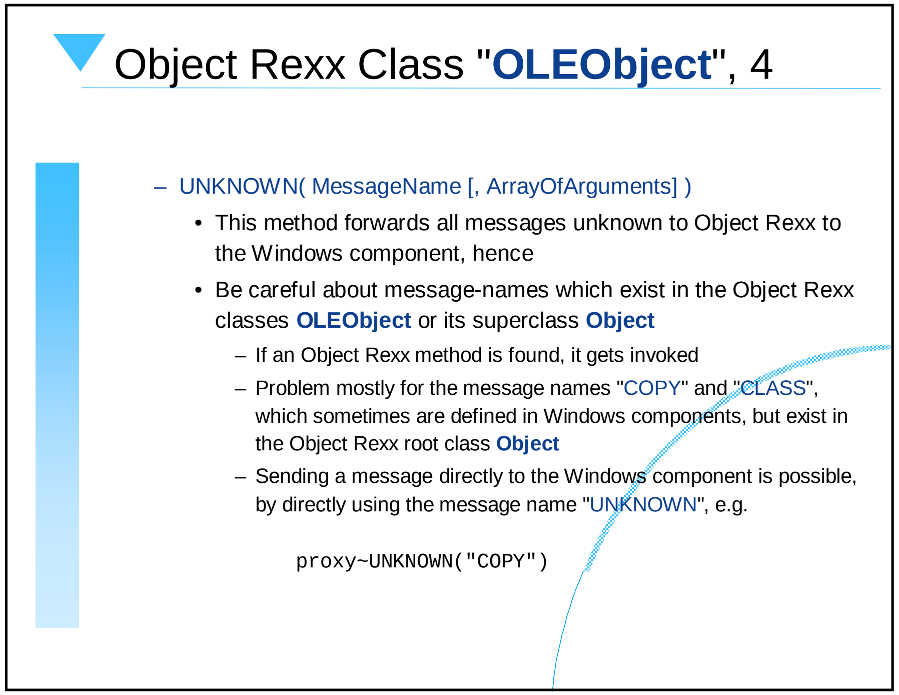
Object Rexx Class "**OLEObject**", 2

- Converting between the following data types
  - VARIANT, VT_EMPTY, VT_NULL, VT_VOID, VT_I1, VT_I2, VT_I4, VT_I8, VT_UI1, VT_UI2, VT_UI4, VT_UI8, VT_R4, VT_R8, VT_CY, VT_DATE, VT_BSTR, **VT_DISPATCH**, VT_VARIANT, **VT_PTR**, VT_SAFEARRAY
- Querying/setting of attribute values
  - As if Object Rexx attributes
- Intercepting Windows component events in Object Rexx



Object Rexx Class "**OLEObject**", 3

- Methods of ".OLEObject"
  - Init(ProgID | CLSID [, NoEvents|WithEvents])
    - Creates and returns a new instance of a Windows component
  - GetObject(Moniker [, SubclassOfOLEObject])
    - Returns an existing instance of a Windows component
  - GetConstant([ConstantName])
    - Returns the value of a constant with the name *ConstantName*, or
    - Returns *all* published constants in a Rexx stem
  - GetKnownEvents, GetKnownMethods
    - Returns a stem with all published events or methods
  - GetOutParameters
    - Returns an array object with the values for the "Out"-only arguments of the last message sent to the Windows component



Object Rexx Class "**OLEObject**", 4

- UNKNOWN(MessageName [, ArrayOfArguments])
  - This method forwards all messages unknown to Object Rexx to the Windows component, hence
  - Be careful about message-names which exist in the Object Rexx classes **OLEObject** or its superclass **Object**
    - If an Object Rexx method is found, it gets invoked
    - Problem mostly for the message names "COPY" and "CLASS", which sometimes are defined in Windows components, but exist in the Object Rexx root class **Object**
    - Sending a message directly to the Windows component is possible, by directly using the message name "UNKNOWN", e.g.

```
proxy~UNKNOWN("COPY")
```

Some Examples, Hints

- The Windows version of Object Rexx is distributed with numerous OLE/ActiveX Examples

```
?\Programs\ObjRexx\SAMPLES\OLE
```

  – Some examples from IBM
    - Remote controlling MS Internet Explorer
    - Remote controlling MS Excel
    - Interfacing with the "advanced directory services" (ADS)

SAMPLES\OLE\APPS\SAMP01.REX

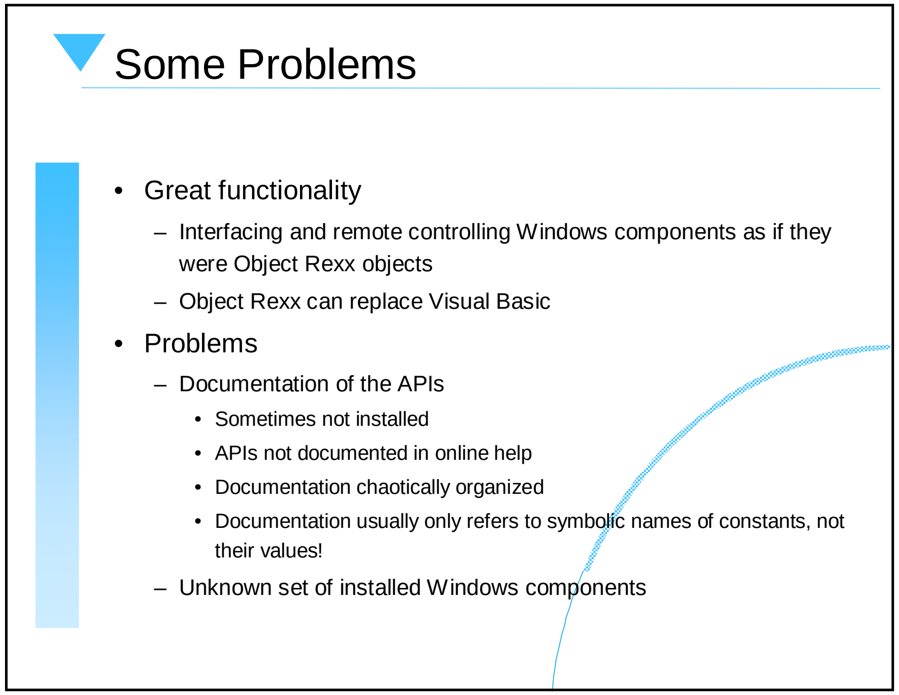
```
/* create an object for IE */
myIE = .OLEObject~New("InternetExplorer.Application")

myIE~Width = 800
myIE~Height = 256

Say "Current dimensions of IE are:" myIE~Width "by" myIE~Height

/* set new dimensions and browse IBM homepage */
myIE~Width = 800
myIE~Height = 600
myIE~Visible = .True
myIE~Navigate("http://www.ibm.com")

/* wait for 10 seconds */
Call SysSleep 10

myIE~Navigate("http://www.ibm.com/news")

/* wait for 10 seconds */
Call SysSleep 10
myIE~quit

::REQUIRES "OREXXOLE.CLS"
```

SAMPLES\OLE\APPS\SAMP09.REX

```
excelObject = .OLEObject~new("Excel.Application")
Worksheet = excelObject~Workbooks~Add~Worksheets[1]
myTitles="ABCDEFGHI"

do j = 1 to 10
  do i = 1 to myTitles~length
    title = myTitles~substr(i,1)
    cell = Worksheet~Range(title||j) -- e.g. ~Range("A1")
    if j = 1 then do
      cell~value = "Type" title  -- header of first row
      cell~font~bold = .true
    end
    else if j = 10 then do -- final row? yes, build sums
      /* set formula, e.g. "=sum(B2:B9)" */
      cell~formula = "=sum(?2:?9)"~translate(title,"?")
      cell~Interior~ColorIndex = 24 -- light blue
    end
    else -- a row between 2 and 9: fill with random value
      cell~value = random()
  end
end

/* save sheet in default TEMP directory */
Worksheet~SaveAs( value("TEMP",,ENVIRONMENT)"\demo.xls")
excelObject~Quit
exit

::requires "orexxole.cls"
```

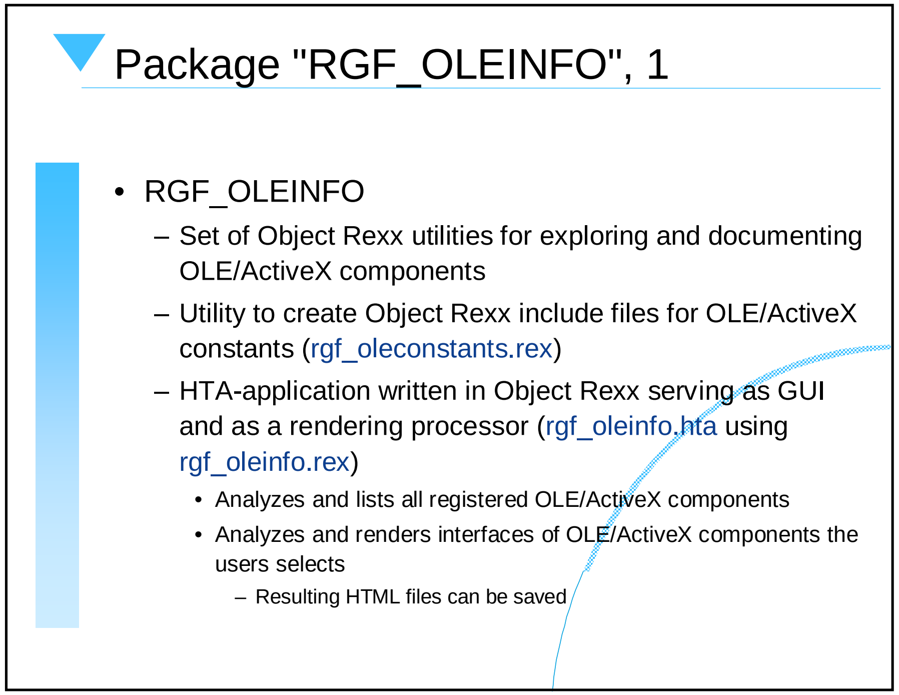
SAMPLES\OLE\ADSI\ADSI1.REX

```
ComputerName = value("COMPUTERNAME",,"ENVIRONMENT")
myComputer = .OLEObject~GetObject("WinNT://"||ComputerName||",computer")

say "Standard properties of this computer:"
say left("Name:",10," ") myComputer~name

/* in this case, using myComputer~class would invoke the standard REXX */
/* method "Class", therefore the OLE objects' "class" method has to be */
/* called explicitly using the "Unknown" method (see documentation for */
/* details on this mechanism).                                         */
say left("Class:",10," ") myComputer~unknown("class",.nil)

say left("GUID:",   10, " ") myComputer~guid
say left("ADsPath:",10, " ") myComputer~adspath
say left("Parent:", 10, " ") myComputer~parent
say left("Schema:", 10, " ") myComputer~schema

exit

::requires "OREXXOLE.CLS"
```



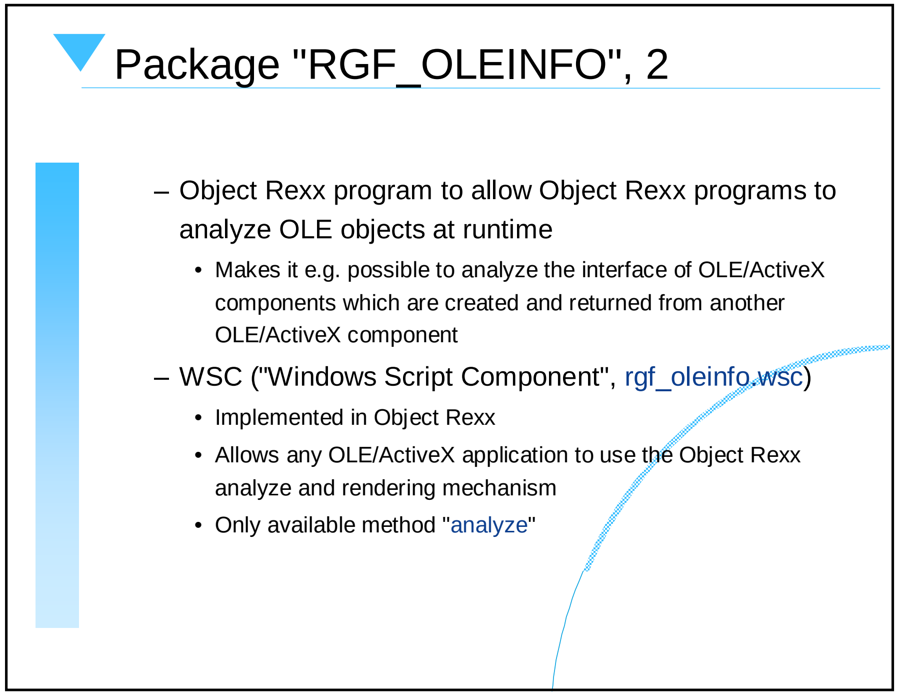
Some Problems

- Great functionality
  - Interfacing and remote controlling Windows components as if they were Object Rexx objects
  - Object Rexx can replace Visual Basic
- Problems
  - Documentation of the APIs
    - Sometimes not installed
    - APIs not documented in online help
    - Documentation chaotically organized
    - Documentation usually only refers to symbolic names of constants, not their values!
  - Unknown set of installed Windows components



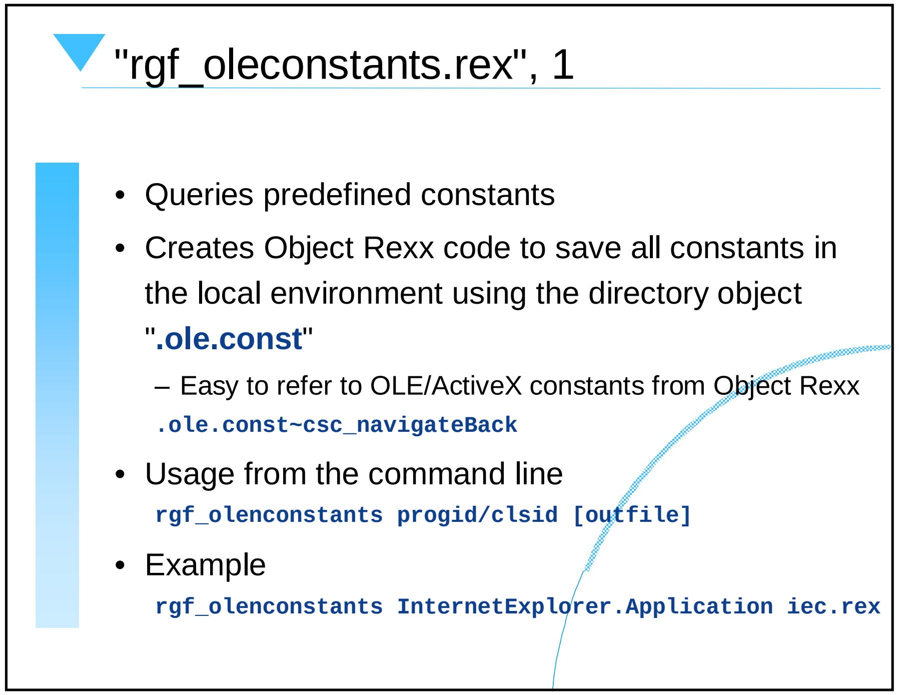
Package "RGF_OLEINFO", 1

- RGF_OLEINFO
  - Set of Object Rexx utilities for exploring and documenting OLE/ActiveX components
  - Utility to create Object Rexx include files for OLE/ActiveX constants (rgf_oleconstants.rex)
  - HTA-application written in Object Rexx serving as GUI and as a rendering processor (rgf_oleinfo.hta using rgf_oleinfo.rex)
    - Analyzes and lists all registered OLE/ActiveX components
    - Analyzes and renders interfaces of OLE/ActiveX components the users selects
      - Resulting HTML files can be saved



Package "RGF_OLEINFO", 2

- Object Rexx program to allow Object Rexx programs to analyze OLE objects at runtime
  - Makes it e.g. possible to analyze the interface of OLE/ActiveX components which are created and returned from another OLE/ActiveX component
- WSC ("Windows Script Component", rgf_oleinfo.wsc)
  - Implemented in Object Rexx
  - Allows any OLE/ActiveX application to use the Object Rexx analyze and rendering mechanism
  - Only available method "analyze"



"rgf_oleconstants.rex", 1

- Queries predefined constants
- Creates Object Rexx code to save all constants in the local environment using the directory object "**.ole.const**"
  - Easy to refer to OLE/ActiveX constants from Object Rexx

    `.ole.const~csc_navigateBack`
- Usage from the command line

  `rgf_olenconstants progid/clsid [outfile]`
- Example

  `rgf_olenconstants InternetExplorer.Application iec.rex`

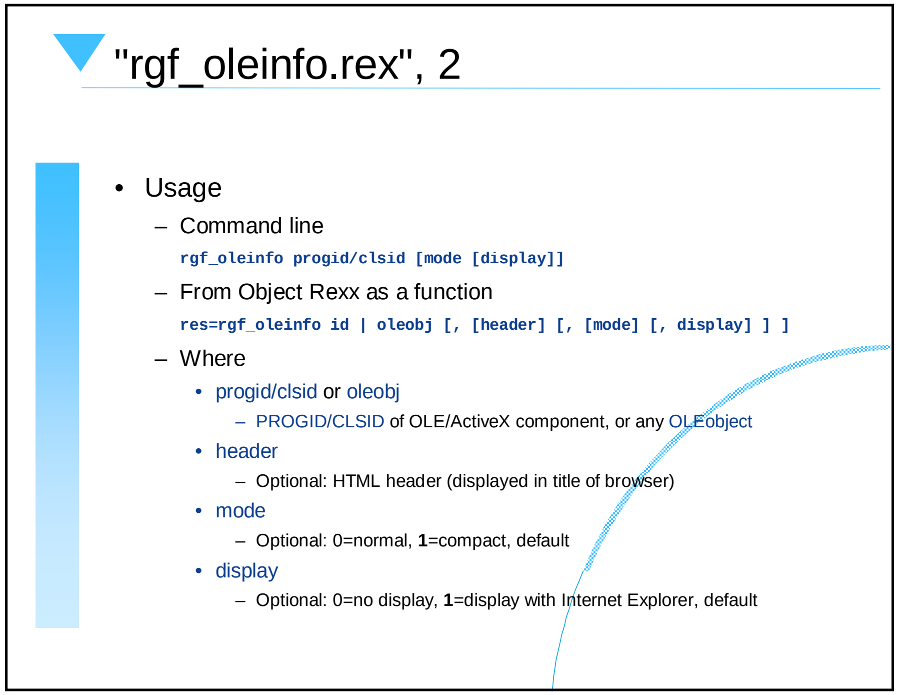
"rgf_oleconstants.rex", 2

- Content of "iec.rex" (excerpt)

```
/* [rgf_oleconstants.rex] run on: [20040430] [21:55:16] */

-- OLE/ActiveX-application/clsid: [InternetExplorer.Application] - there is/are [84] constants

-- create directory 'ole.const', if necessary; maybe shared with OLE constant definitions of other programs
if .local~hasentry('ole.const')=.false then .local~ole.const=.directory~new -- create directory 'ole.const' in .local

.ole.const~CSC_NAVIGATEBACK                 = 2
.ole.const~CSC_NAVIGATEFORWARD              = 1
.ole.const~CSC_UPDATECOMMANDS               = -1
.ole.const~OLECMDEXECOPT_DODEFAULT          = 0
.ole.const~OLECMDEXECOPT_DONTPROMPTUSER     = 2
.ole.const~OLECMDEXECOPT_PROMPTUSER         = 1
.ole.const~OLECMDEXECOPT_SHOWHELP           = 3
.ole.const~OLECMDF_DEFHIDEONCTXTMENU        = 32
.ole.const~OLECMDF_ENABLED                  = 2
.ole.const~OLECMDF_INVISIBLE                = 16
.ole.const~OLECMDF_LATCHED                  = 4
.ole.const~OLECMDF_NINCHED                  = 8
.ole.const~OLECMDF_SUPPORTED                = 1
.ole.const~OLECMDID_ALLOWUILESSSAVEAS       = 46
.ole.const~OLECMDID_CLEARSELECTION          = 18
.ole.const~OLECMDID_CLOSE                   = 45
.ole.const~OLECMDID_COPY                    = 12
... cut ...
```

"rgf_oleinfo.rex", 1

- Queries all available OLE/ActiveX information
  - Information about implementation of OLE/ActiveX components
    - Description, CLSID, ProgID and VersionIndependentProgId (if any)
    - Date when OLE/ActiveX component got registered with Windows
    - DLL/EXE which implements the component, its date and size
  - APIs, attributes, events, constants
- Renders results in HTML
- Rendering may occur in one of two modes
  - Normal mode
    - separate listing of APIs ("methods"), Read-only attributes ("properties"), Write-only attributes ("properties"), Read/Write attributes ("properties"), Events, Constants
  - Compact mode
    - All attributes (properties) are folded together
    - No constants

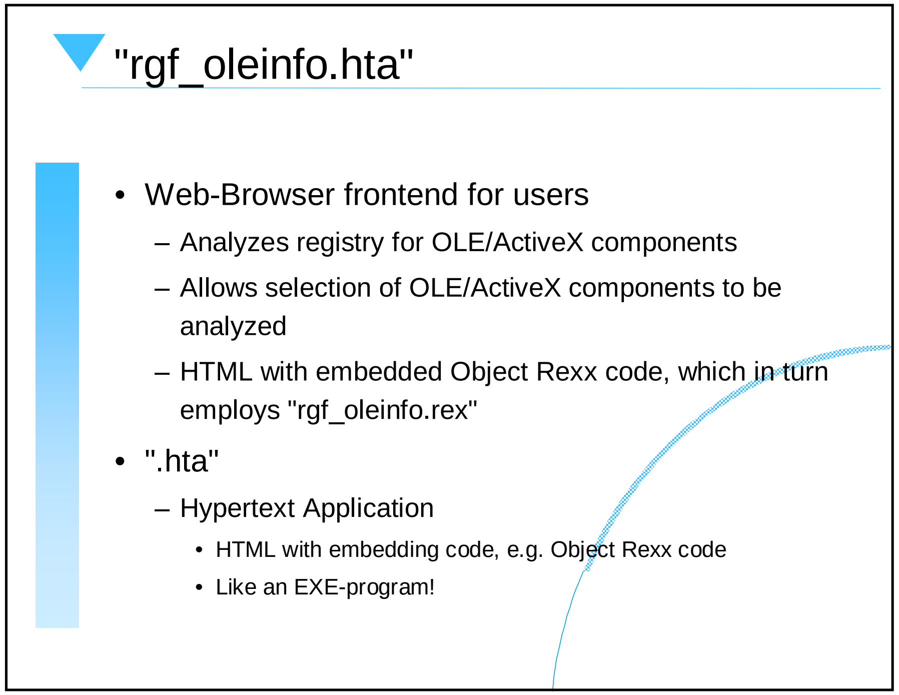


"rgf_oleinfo.rex", 2

- Usage
  - Command line

    `rgf_oleinfo progid/clsid [mode [display]]`
  - From Object Rexx as a function

    `res=rgf_oleinfo id | oleobj [, [header] [, [mode] [, display] ] ]`
  - Where
    - progid/clsid or oleobj
      - PROGID/CLSID of OLE/ActiveX component, or any OLEobject
    - header
      - Optional: HTML header (displayed in title of browser)
    - mode
      - Optional: 0=normal, **1**=compact, default
    - display
      - Optional: 0=no display, **1**=display with Internet Explorer, default



"rgf_oleinfo.hta"

- Web-Browser frontend for users
  - Analyzes registry for OLE/ActiveX components
  - Allows selection of OLE/ActiveX components to be analyzed
  - HTML with embedded Object Rexx code, which in turn employs "rgf_oleinfo.rex"
- ".hta"
  - Hypertext Application
    - HTML with embedding code, e.g. Object Rexx code
    - Like an EXE-program!

"rgf_oleinfo.wsc", 1

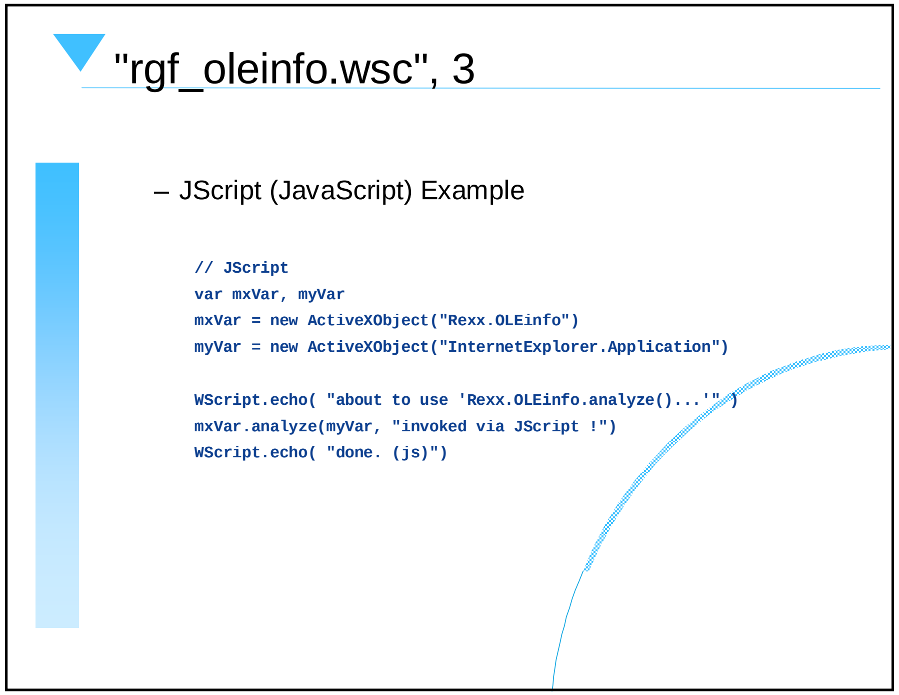
- "rgf_oleinfo.wsc"
  - An OLE/ActiveX component which is ***implemented in Object Rexx (!!)***
  - Allows C++, VisualBasic, VBScript, JScript etc. to use "rgf_oleinfo.rex"
  - Employs the Windows script shell functionality
    - Needs to get registered
      - Right click in Explorer, choose "Register"

"rgf_oleinfo.wsc", 2

- Defines the OLE/ActiveX component named "REXX.OLEinfo", which has one method with the following signature

```
res=analyze( id | oleobj [, [header] [, [mode] [, display] ] ] )
```

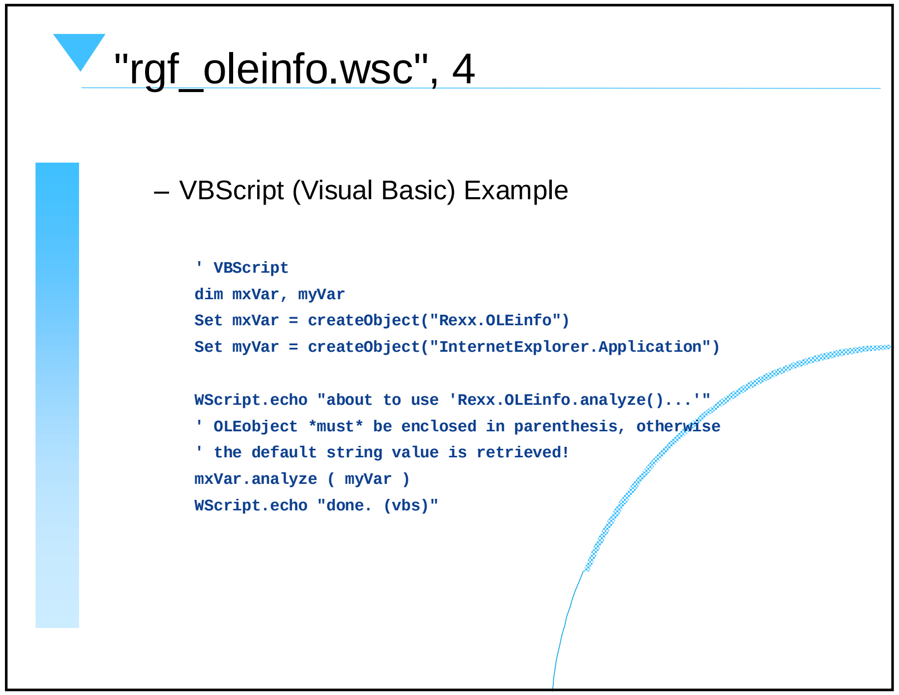
- Invokes "rgf_oleinfo.rex" with the supplied arguments
  - Cf. description of arguments in the appropriate section about tat utility above



"rgf_oleinfo.wsc", 3

– JScript (JavaScript) Example

```
// JScript
var mxVar, myVar
mxVar = new ActiveXObject("Rexx.OLEinfo")
myVar = new ActiveXObject("InternetExplorer.Application")

WScript.echo( "about to use 'Rexx.OLEinfo.analyze()...'" )
mxVar.analyze(myVar, "invoked via JScript !")
WScript.echo( "done. (js)")
```



"rgf_oleinfo.wsc", 4

– VBScript (Visual Basic) Example

```
' VBScript
dim mxVar, myVar
Set mxVar = createObject("Rexx.OLEinfo")
Set myVar = createObject("InternetExplorer.Application")

WScript.echo "about to use 'Rexx.OLEinfo.analyze()...'"
' OLEobject *must* be enclosed in parenthesis, otherwise
' the default string value is retrieved!
mxVar.analyze ( myVar )
WScript.echo "done. (vbs)"
```

Roundup

- Object Rexx for Windows
  - Implemented as a ActiveScript engine
  - Can be used wherever VBScript, JScript etc. are used
- "OLEObject" serves as proxy class
  - Takes over the communication between Object Rexx and the OLE/ActiveX components
- "RGF_OLEINFO"
  - A package for analyzing and documenting OLE/ActiveX interfaces in HTML
  - Allows C++, VBScript, Visual Basic, JScript etc. to take advantage of the Object Rexx solution !