NetRexx Scripting for Java Applications

http://www2.hursley.ibm.com/netrexx/

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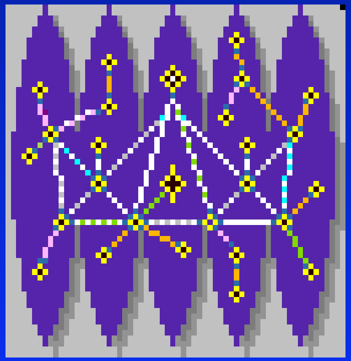


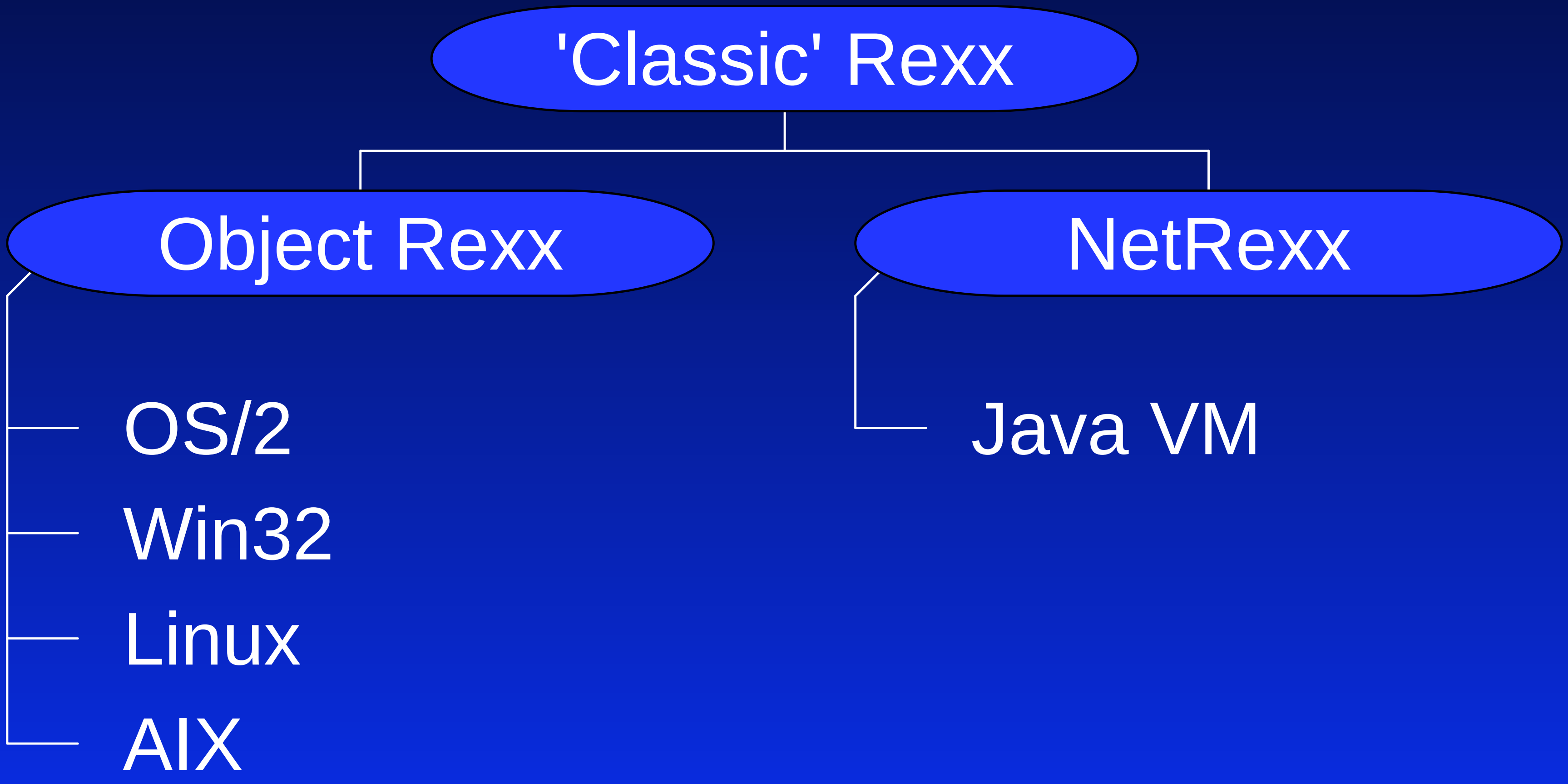
Overview

- Introduction to NetRexx
- Example -- minor classes
- Using the compiler-interpreter
- Example -- scripting
- Questions?

What is NetRexx?

- A complete *alternative* to the Java language, for writing classes for the JVM
- Based on the simple syntax of Rexx, with Rexx decimal arithmetic
- Fully exploits the Java object model, exceptions, and binary arithmetic
- Automates type selection & declaration
- Removes many historical quirks

The Rexx language family



NetRexx Java implementation

- Current implementation first ***translates*** NetRexx to accessible Java source or ***interprets*** directly (or both).
- Runs on any Java platform
- Any class written in Java can be used
  - GUI, TCP/IP, I/O, DataBase, *etc.*
- Anything you could write in Java can be written in NetRexx

NetRexx programs

toast.nrx

```
/* This wishes you good health. */
say 'Cheers!'
```

Control constructs

```
if  answer='yes'  then say 'OK!'
                  else say 'shucks'

loop  i=0  for  mystring.length
   say  i':'  mystring[i]
   end i
```

also `do..end` *for simple grouping*

Control constructs - Select

```
select label choice
  when name='Kewl' then say 'Cool?'
  when back.color=Color.red then say 'Hot'
  otherwise say '<sigh>'
  end choice


select case i+1
  when 1, 2, 3 then say 'some'
  otherwise say 'many'
  end
```

Select and automatic switch{ }

- For example ...

```
select case i+1
  when 1 then say 'one'
  when 2 then say 'two'
  when 3 then say 'three'
  otherwise say 'uh?'
end
```

Select and automatic switch{ }

- Can generate...

```
switch(i+1){
  case 1:  RexxIO.Say("one"); break;
  case 2:  RexxIO.Say("two"); break;
  case 3:  RexxIO.Say("three"); break;
  default: RexxIO.Say("uh?");
}
```

Strings - the base type

- Strings in NetRexx are of type *Rexx*
  - by default, data and numbers are strings
  - standard methods from Object Rexx
  - conversions

- Automatic inter-conversion with Java String class, char and char[ ] arrays, and numeric primitives (optional)

Arithmetic

- Preferred arithmetic is from ANSI X3.274
- Decimal, just one type of number
  - follows human rules (2 * 1.20 is 2.40)
  - gives exact results when expected (***e.g.***, for 0.1, 0.3, 0.9/10)
  - no overflow at binary boundaries
  - arbitrary precision

```
numeric digits 300
say 1/7
```

Numeric digits 300

```
Ø.14285714285714285714285714285714
2857142857142857142857142857142857
1428571428571428571428571428571428
5714285714285714285714285714285714
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5714285714285714285714285714285714
2857142857142857142857142857142857
142857142857142857142857142857
```

Standard Decimal Arithmetic

See:

http://www2.hursley.ibm.com/decimal

Binary classes and methods

- The **binary** keyword instructs the compiler to use native (binary) arithmetic types and operations (boolean, byte, int, long, float, *etc.*)
- Achieves the full speed of the Java Virtual Machine
- No performance penalty for using NetRexx instead of Java

Explicit typing

- Casting/conversions use the ***blank*** (concatenation) ***operator***

```
number=int 7*y    -- number is an int
number2=int       -- variable declaration
```

- Consistently extends to method arguments

```
method size(x=int, y=int, depth=int 3)
```

Other features from Rexx

- Case-insensitivity
- Parse
- Trace (methods, all, results)

```
2 *=*    number=1/7
  >v> number "0.142857143"
3 *=*    parse number before '.' after
  >v> before "0"
  >v> after "142857143"
4 *=*    say after'.'before
  >>> "142857143.0"
```

Exceptions

- Semantics from Java
- Generalized and simplified syntax

```
say 'Please enter a number:'
number=ask      -- read a line
do
  say 'reciprocal is:' 1/number
catch Exception
  say 'Sorry, could not divide'-
      '"'number'" into 1'
end
```

NetRexx JavaBean support

- JavaBean (indirect) properties

```
properties indirect
    filling=Color.red
```

generates (or checks):

```
method getFilling returns java.awt.Color
    return filling
method setFilling($1=java.awt.Color)
    filling=$1
```

NetRexx Inner Class support

- Minor and Dependent classes

```
class Foo
   x=Bar()
   y=Foo.Bar null
   z='Hello'
   x.Counter

class Foo.Bar dependent extends AnOther
   method Counter
      say  parent.z
```

Buttons.nrx

(Softcopy available at the NetRexx web site.)

```
/* Buttons.nrx -- a window with two buttons */
class Buttons adapter extends Frame-
      implements WindowListener, ComponentListener

  properties shared
    shadow=Image                          -- offscreen image
  properties constant
    mywidth=200                           -- our shape
    myheight=300                          -- ..
    glass=Toolkit.getDefaultToolkit.getScreenSize
```

```
/* Main method; called when started */
method main(s=String[]) static
  frame=Buttons("My Buttons" Rexx(s))  -- make a fra
  -- now size and place it mid-screen
  frame.setBounds((glass.width-mywidth)%2,-
        (glass.height-myheight)%2, mywidth, myheight
  frame.show                       -- and make it visib

/* The constructor for Buttons */
method Buttons(s=String)
  super(s)                      -- title to superclass
  setLayout(FlowLayout())       -- set layout scheme
  add(Buttons.Left())           -- add one button ..
  add(Buttons.Right())          -- .. and the other
  addWindowListener(this)       -- listen to Window even
  addComponentListener(this)-- and component events
```

```
/* newimage -- make a new offscreen image */
method newimage
   shadow=createImage(getSize.width, getSize.height)
/* componentResized -- called when graphics resized *
method componentResized(e=ComponentEvent)
   newimage         -- make new sized image

/* update & paint -- called when window is updated *
method update(g=Graphics)         -- avoid flicker
   paint(g)
method paint(g=Graphics)
   if shadow=null then newimage   -- ensure an image
   g.drawImage(shadow, 0, 0, this)-- copy to screen

 /* windowClosing -- called when window is closed */
 -- We need to handle this to end the program
 method windowClosing(e=WindowEvent)
   exit
```

```
/* A dependent class for a button */
class Buttons.Left dependent extends Button-
                   implements ActionListener

  method Left                     -- construct the butto
    super("Green")                -- we choose the label
    addActionListener(this)       -- listen for actions

  method actionPerformed(a=ActionEvent) -- pressed
    g=parent.shadow.getGraphics   -- get the image
    g.setColor(Color.green)       -- choose a colour
    -- now colour the image
    g.fillRect(0, 0, parent.getSize.width,-
                     parent.getSize.height)
    parent.repaint                -- and request redr
```

```
/* A dependent class for a button */
class Buttons.Right dependent extends Button-
                    implements ActionListener

  method Right                   -- construct the butto
    super("Red")                 -- we choose the label
    addActionListener(this)      -- listen for actions

  method actionPerformed(a=ActionEvent) -- pressed
    g=parent.shadow.getGraphics     -- get the image
    g.setColor(Color.red)           -- choose a colour
    -- now colour the image
    g.fillRect(0, 0, parent.getSize.width,-
                     parent.getSize.height)
    parent.repaint                  -- and request redr
```

Using NetRexxC

- Typical wrapper scripts (nrc.rex, nrc.bat) included in package
- Many options (most also specifiable in program)
- Demonstration ...

Scripting applications

- The procedure for interpreting a NetRexx script from Java or NetRexx is extremely simple:
  - make an interpreter (once only)
  - ask the interpreter to parse the script's source file
  - get the resulting Class object (stub)
  - create real instances, invoke method(s), *etc.*, using the usual Java reflection API

The NetRexxA API

- NetRexxA() -- builds an interpreter object
- parse(files=String[], flags=String[])
  returns boolean
- getClassObject(package=String, name=String)
  returns Class

(add dimension for an array class)

Using the API [1]

```
options binary
import COM.ibm.netrexx.process.NetRexx

interpreter=NetRexxA() -- make interpreter

files=['hello.nrx'] -- a file to interpret
flags=['nocrossref', 'verbose0'] -- flags
interpreter.parse(files, flags)  -- parse

helloClass=interpreter.getClassObject(null,-
           'hello') -- find the hello Class
```

Using the API [2]

```
-- find the 'main' method
classes=[interpreter.getClassObject('java.lang',-
         'String', 1)]
mainMethod=helloClass.getMethod('main', classes)

-- now invoke it, with a null instance (it's
-- static) and an empty String array (values)

values=[Object String[0]]
loop for 10    -- let's call it ten times...
  mainMethod.invoke(null, values)
  end
```

Summary

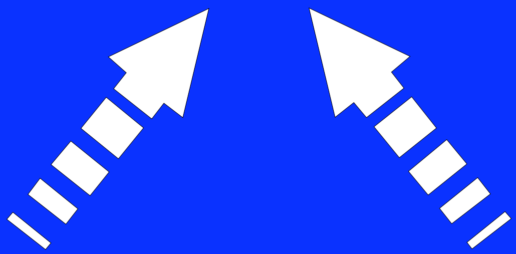
- A blend of Rexx and Java
  - scripting ***and*** application development
  - a truly general-purpose language
- Both decimal and binary arithmetic
- High productivity and simplicity
  - Java source for a typical class has 35% more tokens than NetRexx
- Designed for ***users***, not compilers.

Questions?

... Please fill in your evaluation form!

http://www2.hursley.ibm.com/netrexx/

NetRexx



Rexx + Java

Strong typing doesn’t need extra typin