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Introduction

History of the International Rexx Language Symposium

In 1990, Cathie Dager of SLAC[1] convened the organizing committee for the first independent Rexx[2] Symposium for Developers and Users. SLAC continued to organize this annual event until the middle of the 1990's when the RexxLA took over that responsibility. Symposia have been held annually since 1990.

About RexxLA

During the 1993 Symposium in La Jolla, California, plans for a Rexx User Group materialized. The Rexx Language Association (RexxLA), as it was called, is an independent, non-profit organization dedicated to promoting the use and understanding of the Rexx programming language. RexxLA manages several open source implementations of Rexx.

The selection procedure

Presentation proposals are solicited yearly using a CFP[3] procedure, after which the RexxLA symposium comittee reviews them and votes which presentations are selected for the symposium. The presentations are peer reviewed before being presented. Presenters are not compensated for their presentations.

Location

The 2021 symposium was held Online from 7 Nov 2021 to 11 Nov 2021.

[1] Stanford Linear Accelerator Center, since 2008 SLAC National Accelerator Laboratory
[2] Cowlishaw, M. F., **The REXX Language** (second edition), ISBN 0-13-780651-5, Prentice-Hall, 1990.
[3] Call For Papers.

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Tutorial: From Rexx to ooRexx – Rony G. Flatscher

Date and Time

7 Nov 2021, 16:00:00 CET

Presenter

Rony G. Flatscher

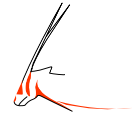
Presenter Details

Rony works as a professor for Business informatics (”Wirtschaftsinformatik”) at the Vienna University of Economics and Business Administration (Wirtschaftsuniversität Wien) and uses Open Object Rexx for teaching Business Administration and MIS students the object-oriented paradigm, as well as remote-controlling (automating) Windows and Windows end-user applications (e.g. MS Office, Open Office) as well as Java and Java applications (he is the author of BSF4ooRexx, the ooRexx-Java bridge, which uses Apache BSF and had Rony invited to become an ASF member). He consults and trains in all of his research fields.

Session Abstract

Aimed at classic Rexx programmers, introducing some of the new, useful features that ooRexx makes available, like: ”USE ARG” to fetch arguments like stems by reference, the ability to define public routines and explicitly require Rexx programs (”packages”) that contain collections of public routines. The tutorial uses short nutshell examples to demonstrate these new features.

"From Rexx to ooRexx"



The 2021 International Rexx Symposium

Online ("Covid-19")

November 7th – November 11th 2021

© 2021 Rony G. Flatscher (Rony.Flatscher@wu.ac.at)
Wirtschaftsuniversität Wien, Austria (http://www.wu.ac.at)

Agenda

- Brief History
- Getting Object Rexx
- Some new features like
  - USE ARG
- New: Directives
  - ::ROUTINE, ::REQUIRES
  - ::CLASS, ::ATTRIBUTE, ::METHOD, ::CONSTANT
- Roundup

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Brief History, 1

- Begin of the 90s
  - OO-version of Rexx (Object REXX) presented to the IBM user group "SHARE"
  - Developed since the beginning of the 90s
    - Originally conceived by a team led by Simon Nash
    - Rewritten product under the lead of Rick McGuire
  - 1997 Introduced with OS/2 Warp 4
    - *Support of SOM and WPS*
  - 1998 Free Linux version, trial version for AIX
  - 1998 Windows 95 and Windows/NT

Brief History, 2

- RexxLA and IBM negotiate
  - 2004 IBM handed over source code
  - "Open Object Rexx (ooRexx) 3.0"
    - Open source version of IBM's Object REXX
    - Released by RexxLA: 2005-03-25
  - ooRexx 4.0 (2009)
    - New kernel, 32- and 64-bit became possible
  - ooRexx 4.2 (2014)
  - ooRexx 5.0 currently in beta, *but better than 4.2!*

Some New Features

- Compatible with classic Rexx, TRL 2
  - New sequence of execution of Rexx programs:

    Phase 1: Full syntax check of the Rexx program upfront

    Phase 2: Interpreter carries out all directives (lead in with "::")

    Phase 3: Start of program execution with line # 1
- rexxc[.exe]: compiles Rexx programs
  - If same bitness and same endianness, on all platforms
- USE ARG in addition to PARSE ARG
  - among other things allows for retrieving stems *by reference (!)*
- Line comments, led in by two dashes ("--")

  -- comment until the line ends

Stem, Classic REXX Example "stemclassic.rex"

```
s.1="Entry # 1"
s.2="Entry # 2"
s.0=2           /* total number of entries in stem          */

call add2stem   /* add to stem using an (internal) routine  */

do i=1 to s.0   /* iterate over all stem array entries      */
   say "#" i":" s.i
end
exit

add2stem: procedure expose s. -- allow access to stem
  n=s.0+1       /* add after last current entry             */
  s.n="Entry #" n "added in add2stem()"
  s.0=n         /* update total number of entries in stem   */
  return

/* yields:

   # 1: Entry # 1
   # 2: Entry # 2
   # 3: Entry # 3 added in add2stem()

*/
```

Stem, REXX with USE ARG Example "stemusearg.rex"

```
s.1="Entry # 1"
s.2="Entry # 2"
s.0=2              /* total number of entries in stem           */

call add2stem s.   /* supply stem as an argument!               */

do i=1 to s.0      /* iterate over all stem array entries       */
   say "#" i":" s.i
end
exit

add2stem: procedure  /* no "expose s." needed anymore !         */
  use arg s.      /* USE ARG allows to directly refer to the stem */
  n=s.0+1         /* add after last current entry               */
  s.n="Entry #" n "added in add2stem()"
  s.0=n           /* update total number of entries in stem     */
  return

/* yields:

   # 1: Entry # 1
   # 2: Entry # 2
   # 3: Entry # 3 added in add2stem()

*/
```

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Stem, ooRexx USE ARG Example "stemroutine1.rex"

```
s.1="Entry # 1"
s.2="Entry # 2"
s.0=2              /* total number of entries in stem           */

call add2stem s.   /* supply stem as an argument!               */

do i=1 to s.0      /* iterate over all stem array entries       */
   say "#" i":" s.i
end

::routine add2stem
  use arg s.      /* USE ARG allows to directly refer to the stem */
  n=s.0+1         /* add after last current entry               */
  s.n="Entry #" n "added in add2stem()"
  s.0=n           /* update total number of entries in stem     */
  return

/* yields:

   # 1: Entry # 1
   # 2: Entry # 2
   # 3: Entry # 3 added in add2stem()

*/
```


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Stem, ooRexx USE ARG Example "stemroutine2.rex"

```
s.1="Entry # 1"
s.2="Entry # 2"
s.0=2              /* total number of entries in stem          */

call add2stem s.   /* supply stem as an argument!               */

do i=1 to s.0      /* iterate over all stem array entries       */
   say "#" i":" s.i
end

::routine add2stem   /* we can even use a different stem name  */
  use arg abc.  /* USE ARG allows to directly refer to the stem */
  n=abc.0+1     /* add after last current entry                */
  abc.n="Entry #" n "added in add2stem()"
  abc.0=n       /* update total number of entries in stem      */
  return

/* yields:

   # 1: Entry # 1
   # 2: Entry # 2
   # 3: Entry # 3 added in add2stem()

*/
```


About Directives in ooRexx

- Always placed at the end of a Rexx program
  - led in by "::" followed by the name of the directive
    - "routine", "class", "attribute", "method", ...
- Instructions to the ooRexx interpreter before program starts
  - Interpreter sequentially processes and carries out directives in *phase 2* of startup (*phase 1* is the syntax checking phase)
  - After all directives got carried out, *phase 3* starts, *the execution of the Rexx program* with line # 1
- An ooRexx program with directives
  - Defines a "package" of routines and classes
  - Rexx code before the first directive is named "prolog"

::Routine Directive

- Syntax

  ::routine name [public]

  – Interpreter maintains routines (and classes) per Rexx program ("package")

  – If optional keyword public is present, the routine can be also *directly invoked by another (!) Rexx program*

::ROUTINE Directive, Example "routine.rex"

```
r=" 1 "
s=2
say "r="pp(r)
say "s="pp(s)
say
say "The result of 'r || 3 ' is:" pp(r || 3 )
say "The result of 's || 3 ' is:" pp(s || 3 )
say "The result of 'r + 3'   is:" pp(r +  3)
say "The result of 's + 3'   is:" pp(s +  3)
say
say "The result of 'r s'     is:" pp(r s)
say "The result of 'r || s'  is:" pp(r || s)
say "The result of 'r+s'     is:" pp(r+s)

::routine pp               -- enclose argument in square brackets
  parse arg value
  return "["value"]"

/* yields:

   r=[ 1 ]
   s=[2]

   The result of 'r || 3 ' is: [ 1 3]
   The result of 's || 3 ' is: [23]
   The result of 'r + 3'   is: [4]
   The result of 's + 3'   is: [5]

   The result of 'r s'     is: [ 1  2]
   The result of 'r || s'  is: [ 1 2]
   The result of 'r+s'     is: [3]
*/
```

::ROUTINE Directive, Example "toolpackage.rex"

```
-- collection of useful little Rexx routines

::routine pp    public -- enclose argument in square brackets
  parse arg value
  return "["value"]"

::routine quote public -- enclose argument in double-quotes
  parse arg value
  return '"' || value || '"'
```

::ROUTINE Directive, Example "call_package.rex"

```
call toolpackage.rex    -- get access to public routines in "toolpackage.rex"
say quote('hello, my beloved world')

r=" 1 "
s=2
say "r="pp(r)
say "s="pp(s)
say
say "r="quote(r)
say "s="quote(s)
say
say "The result of 'r || 3 ' is:" pp(r || 3 )
say "The result of 's || 3 ' is:" quote(s || 3 )
say "The result of 'r + 3'   is:" pp(r +  3)
say "The result of 's + 3'   is:" quote(s +  3)

/* yields:

   "hello, my beloved world"
   r=[ 1 ]
   s=[2]

   r=" 1 "
   s="2"

   The result of 'r || 3 ' is: [ 1 3]
   The result of 's || 3 ' is: "23"
   The result of 'r + 3'   is: [4]
   The result of 's + 3'   is: "5"
*/
```

::REQUIRES Directive

- Syntax

  ::requires package

  – Interpreter in phase 2 will either
    - Call (execute) the Rexx program named "package" on behalf of the current Rexx program and make all its public routines and classes upon return directly available to us
    - Or if the interpreter already required that "package" will *immediately* make all its public routines and classes available to us
      – In this case "package" will ***not** be called/executed anymore!*

::REQUIRES-Directive, Example "requires_package.rex"

```
say quote('hello, my beloved world')

r=" 1 "
s=2
say "r="pp(r)
say "s="pp(s)
say
say "r="quote(r)
say "s="quote(s)
say
say "The result of 'r || 3 ' is:" pp(r || 3 )
say "The result of 's || 3 ' is:" quote(s || 3 )
say "The result of 'r + 3'   is:" pp(r +  3)
say "The result of 's + 3'   is:" quote(s +  3)

::requires toolpackage.rex -- get access to public routines in "toolpackage.rex"

/* yields:

   "hello, my beloved world"
   r=[ 1 ]
   s=[2]

   r=" 1 "
   s="2"

   The result of 'r || 3 ' is: [ 1 3]
   The result of 's || 3 ' is: "23"
   The result of 'r + 3'   is: [4]
   The result of 's + 3'   is: "5"
*/
```

The Message Paradigm, 1

- A programmer sends messages to objects
  - The *object* looks for a method routine with the same name as the received message
  - If arguments were sent the *object* forwards them
  - The *object* returns any value the method routine returns
- *C.f. <https://en.wikipedia.org/wiki/Alan_Kay>*
  - One of the fathers of "object-orientation"
- Programming languages with this paradigm, e.g.
  - Smalltalk, Objective C, ...

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The Message Paradigm, 2 ooRexx

- Proper message operator "~" (tilde, "twiddle")
- In ooRexx everything is an *"object"*
  - Hence one can send messages to everything!
- Example

```
say "hi, Rexx!"~reverse
-- same as in classic REXX:
say reverse("hi, Rexx!")
-- both yield (actually run the same code):
!xxeR ,ih
```

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The Message Paradigm, 3
ooRexx

- Creating "*values*" a.k.a. "*objects*", "*instances*"

  Classic Rexx-style (strings only)

  ```
  str="this is a string"
  ```

  ooRexx-style (*any* class/type including .string class)

  ```
  str=.string~new("this is a string")
  ```


About Classic REXX Structures, 1
Important Usage of Stems

- Whenever structures ("records") are needed, *stems* get used in classic REXX
- Example
  - A person may have a name and a salary, e.g.

    ```
    p.name = "Doe, John"
    p.salary= "10500"
    ```

  - E.g. a collection of data with a person structure

    ```
    p.1.name = "Doe, John"; p.1.salary=10500
    p.2.name = "Doe, Mary"; p.2.salary=8500
    p.0 = 2
    ```

About Classic REXX Structures, 2

Important Usage of Stems

- Whenever *structures* ("*records*") need to be processed, *every* Rexx programmer *must* know the *exact stem encoding!*
- *Everyone* must implement routines like increasing the salary *exactly* like everyone else!
- If *structures* are simple and not used in many places, this is o.k., but the more complex the more places the *structure* needs to be accessed, the more error prone this becomes!

About ooREXX *Structures*, 1

Classes (Types, Structures)

- Any object-oriented language makes it easy to define and implement *structures*!
  - That is what they were designed for!
- The *structure* ("*class*") usually consists of
  - *Attributes* (data elements like "name", "salary"), a.k.a. "*object variables*", "*fields*", ...
  - Routines (like "increaseSalary"), a.k.a. "*methods*", "*method routines*", ...

About ooREXX *Structures*, 2

Classes (Types, Structures)

- **::CLASS** Directive
  - Denotes the name of the *structure*
  - Can optionally be public
- **::ATTRIBUTE** Directive
  - Denotes the name of a *data element, field*
- **::METHOD** Directive
  - Denotes the name of a routine of the *structure*
  - Defines the *Rexx code* to be run, when invoked

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About ooREXX *Structures*, 3

Classes (Types, Structures)

- Once
  - A *structure* ("*class*", "*type*" both of which are synonyms of each other) got defined
  - One can create an *unlimited (!) number* of persons ("*instances*", "*objects*", "*values*", all of which are synonyms)
    - *Each* person will have its *own copy of attributes (data elements, fields)*
    - *All* persons will share/use the *same method routines* that got defined for the structure (class, type)

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ooRexx Structure "Person" "personstructure.rex"

```
p=.person~new("Doe, John", 10500)
say "name:   " p~name
say "salary:" p~salary

::class person              -- define the name

::attribute name            -- define a data element, field, object variable
::attribute salary          -- define a data element, field, object variable

::method    init            -- constructor method routine (to set the attribute values)
  expose name salary        -- establish direct access to attributes
  use arg name, salary      -- fetch and assign attribute values

/* yields:

   name:    Doe, John
   salary: 10500

*/
```

Defining the ooRexx Class (Type) "person.cls"

```
::class person PUBLIC       -- define the name, this time PUBLIC

::attribute name            -- define a data element, field, object variable
::attribute salary          -- define a data element, field, object variable

::method    init            -- constructor method routine (to set the attribute values)
  expose name salary        -- establish direct access to attributes
  use arg name, salary      -- fetch and assign attribute values
```

Defining the ooRexx Class (Type) "requires_person.rex"

```
p.1 = .person~new("Doe, John", 10500)
p.2 = .person~new("Doe, Mary",  8500)
p.0 = 2

sum=0
do i=1 to p.0
   say p.i~name "earns:" p.i~salary
   sum=sum+p.i~salary
end
say
say "Sum of salaries:" sum

::requires person.cls    -- get access to the public class "person" in "person.cls"

/* yields:

   Doe, John earns: 10500
   Doe, Mary earns: 8500

   Sum of salaries: 19000
*/
```

ooRexx *Classes* and Beyond ...

- ooRexx comes with a wealth of *classes*
  - A lot of tested functionality for "free" ;-)
  - E.g., the collection classes augment what stems are capable of doing!
    - Explore the collection classes and you will immediately be much more productive!
    - If seeking arrays, you have them: .Array class
  - Consult the pdf-books coming with ooRexx, e.g.,
    - "ooRexx Programming Guide" (rexxpg.pdf)
    - "ooRexx Reference Guide" (rexxref.pdf)

Roundup

- ooRexx is great and compatible to classic REXX
  - You can continue to program in classic REXX, yet use ooRexx on Linux, MacOS, Windows, s390x...
- ooRexx adds a lot of flexibility and power to the REXX language and to your fingertips
  - One can take advantage of all of it immediately
  - Simple to use because of the *message paradigm*
    - Send ooRexx *messages* to Windows and MS Office ...
    - Send ooRexx *messages* to Java ...
    - Send ooRexx *messages* to ...
- ***Get it and have fun! :-)***

Links

- RexxLA-Homepage (non-profit SIG, owner of ooRexx, BSF4ooRexx)
  <http://www.rexxla.org/>
- ooRexx 5.0 beta on Sourceforge
  <https://sourceforge.net/projects/oorexx/files/oorexx/5.0.0beta/>
  - Introduction to ooRexx on Windows, Slides ("Business Programming 1")
    - <http://wi.wu.ac.at/rgf/wu/lehre/autowin/material/foils/>
- BSF4ooRexx on Sourceforge (ooRexx-Java bridge)
  <https://sourceforge.net/projects/bsf4oorexx/>
  - Introduction to BSF4ooRexx (Windows, Mac, Unix), Slides ("Business Programming 2")
    - <http://wi.wu.ac.at/rgf/wu/lehre/autojava/material/foils/>
- Student's work, including ooRexx, BSF4ooRexx
  <http://wi.wu.ac.at/rgf/diplomarbeiten/>
- JetBrains "IntelliJ IDEA", powerful IDE for all operating systems
  - <https://www.jetbrains.com/idea/download>, free "Community-Edition"
    - Students and lecturers can use the professional edition for free
  - Alexander Seik's ooRexx-Plugin with readme (as of: 2021-11-07)
    - <https://sourceforge.net/projects/bsf4oorexx/files/Sandbox/aseik/ooRexxIDEA/GA/2.0.4/>
- Introduction to ooRexx (254 pages, covers ooRexx 4.2)
  <https://www.facultas.at/Flatscher>

2

Stems a Different Way - Introducing 'oo' in ooRexx – Rony G. Flatscher

Date and Time

7 Nov 2021, 17:00:00 CET

Presenter

Rony G. Flatscher

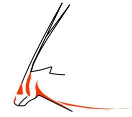
Presenter Details

Rony works as a professor for Business informatics ("Wirtschaftsinformatik") at the Vienna University of Economics and Business Administration (Wirtschafts-universität Wien) and uses Open Object Rexx for teaching Business Administration and MIS students the object-oriented paradigm, as well as remote-controlling (automating) Windows and Windows end-user applications (e.g. MS Office, Open Office) as well as Java and Java applications (he is the author of BSF4ooRexx, the ooRexx-Java bridge, which uses Apache BSF and had Rony invited to become an ASF member). He consults and trains in all of his research fields.

Session Abstract

Aimed at classic Rexx programmers, who employ stem variables in their programs to encode data structures and/or collect values ("stem arrays"). ooRexx brings an easy to employ infrastructure to define data structures in a more easy and safer way, and also introduces an explicit array collection which can even be sorted by rules the Rexx programmers set forward.

Stems a Different Way - Introducing 'oo' in 'ooRexx



Tutorial: 2021-11-07, International RexxLA Symposium (Online, "Covid-19")

First presented: 2019 – International Rexx Symposium, Hursley, September 2019

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Overview

- Data type, abstract data type
  - REXX: strings, stem variables ("stems")
  - ooRexx in addition: Classes, Attributes, Methods
- Collecting values
  - REXX (and ooRexx): "Stem arrays"
  - ooRexx: *real* arrays
- Roundup