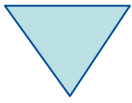




# "Leaping from Classic to Object"

2007 International Rexx Symposium Edition  
Tampa, Florida, U.S.A. (April 2007)

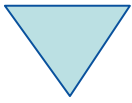
Rony G. Flatscher ([Rony.Flatscher@wu-wien.ac.at](mailto:Rony.Flatscher@wu-wien.ac.at))  
Wirtschaftsuniversität Wien, Austria (<http://www.wu-wien.ac.at>)



# Agenda

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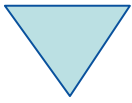
- History
- Getting Object Rexx
- New procedural features
- New object-oriented features
- Roundup



# History, 1

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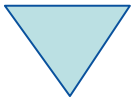
- Begin of the 90'ies
  - OO-version of Rexx presented to the IBM user group "SHARE"
  - Developed since the beginning of the 90'ies
  - 1997 Introduced with OS/2 Warp 4
    - *Support of SOM and WPS*
  - 1998 Free Linux version, trial version for AIX
  - 1998 Windows 95 and Windows/NT



# History, 2

---

- 2004
  - Spring: RexxLA and IBM join in negotiations about opensourcing Object REXX
  - November: RexxLA gets sources from IBM
  - Opensource developers taking responsibility
    - David Ashley, USA, OS2 guru, Linux freak, ooRexx aficionado
    - Rick McGuire, USA, original lead developer
    - Mark Hessling, Australia, Regina maintainer, author of numerous great, opensource, openplatform Rexx function packages
    - Rony G. Flatscher, Austria (Europe!), author of BSF4Rexx, ooRexx tester of many years
- 2005
  - Spring (March/April): RexxLA makes ooRexx freely available as opensource and openplatform
    - **2005-03-25: ooRexx 3.0**



# History, 3

---

- 2006
  - Two new releases
    - **2006-08-15: ooRexx 3.1**
    - **Mark Miesfeld becomes a commiter**
    - **2006-11-19: ooRexx 3.1.1**
      - **First time an official Macintosh version of ooRexx !**
      - **René Jansen**
- 2007
  - **New release targeted for the 18<sup>th</sup> International Rexx Symposium**
    - **2006-11-19: ooRexx 3.1.2**
      - **New platforms like Linux Debian, K/Ubuntu**
  - **Work on ooRexx 3.2.0 and 4.0 going on ...**



# Getting "Open Object Rexx" ("ooRexx") ... for Free!

---

- <http://www.RexxLA.org>
  - Choose the link to "ooRexx"
- <http://www.ooRexx.org>
  - Homepage for ooRexx
  - Links to Sourceforge
    - Source
    - Precompiled versions for AIX, Linux (Debian, K/Ubuntu, Red Hat, Suse, ), MacOSX, Solaris, Windows
    - Consolidated (great!) PDF- and HTML-rendered documentation!



# New Procedural Features, 1

---

- Fully compatible with classic Rexx
  - **New:** execution of a Rexx program
    - *Full syntax check of the Rexx program*
    - *Interpreter carries out all directives (leadin with "::")*
    - *Start of program*
- "rexxc.exe": explicit tokenization of Rexx programs
- **USE ARG** in addition to PARSE ARG
  - among other things allows for retrieving stems by reference (!)



# Example (ex\_stem.rex)

---

## "USE ARG" with a Stem

```
/* ex_stem.rex: demonstrating USE ARG */

info.1 = "Hi, I am a stem which could not get altered in a procedure!"
info.0 = 1 /* indicate one element in stem */
call work info. /* call procedure which adds another element (entry) */
do i=1 to info.0 /* loop over stem */
    say info.i /* show content of stem.i */
end
exit

work: procedure
    use arg great. /* note the usage of "USE ARG" instead of "PARSE ARG" */
    idx = great.0 + 1 /* get number of elements in stem, enlarge it by 1 */
    great.idx = "Object Rexx allows to directly access and manipulate a stem!"
    great.0 = idx /* indicate new number of elements in stem */
    return

/* yields:


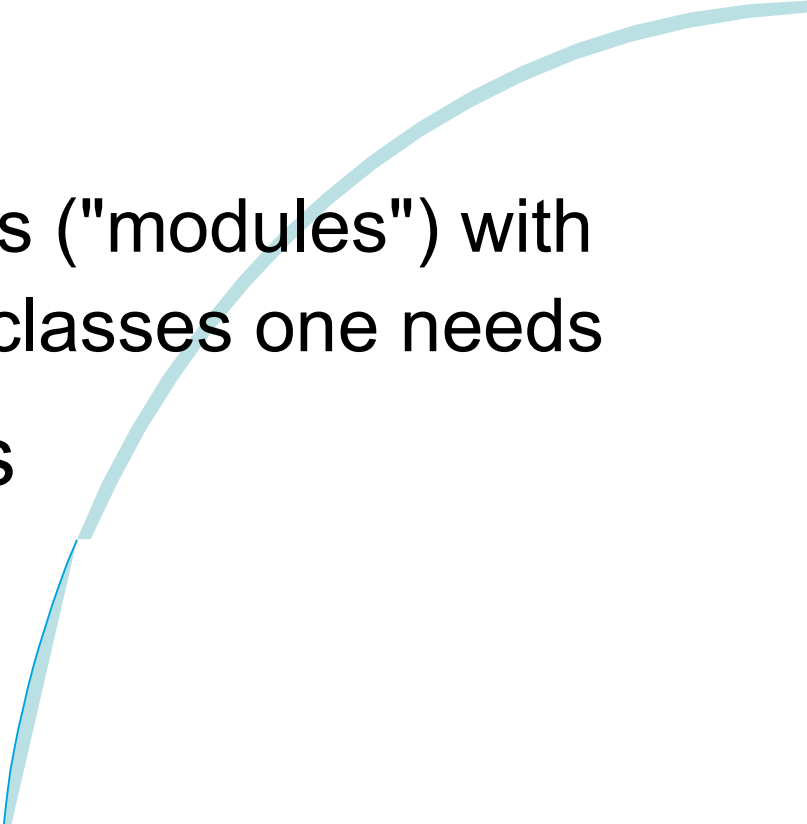
Hi, I am a stem which could not get altered in a procedure!
Object Rexx allows to directly access and manipulate a stem!
*/
```






# New Procedural Features, 2


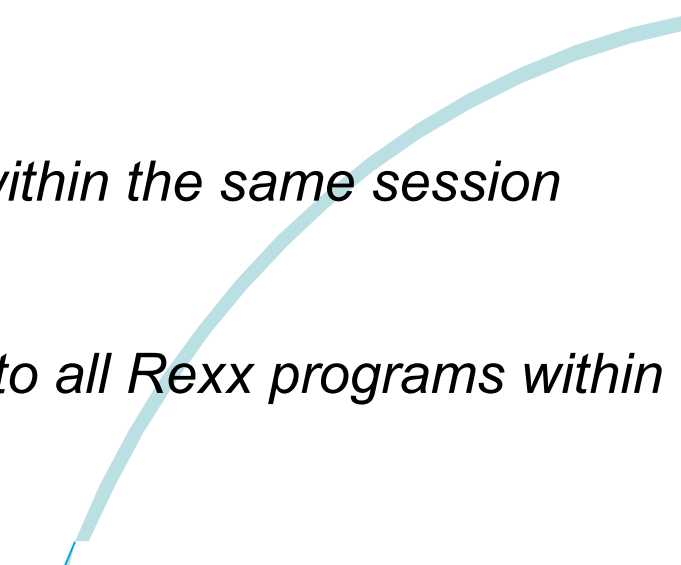
---

- 
- Routine-directive
    - same as a function/procedure
    - if public, then even callable from another (!) program
  - Requires-directive
    - allows for loading programs ("modules") with public routines and public classes one needs
  - User definable exceptions
- 



# OO-Features Simply Usable by Classic Rexx Programs

---

- "Environment"
    - a directory object
      - *allows to store data with a key (a string)*
      - *sharing information (coupling of) among different Rexx programs*
    - **".local"**
      - *available to all Rexx programs within the same session*
    - **".environment"**
      - *on all other platforms: available to all Rexx programs within the same session*
      - *gets searched after .local*
- 
- 

# Example (dec2roman.rex)

## Classic style

```
/* dec2roman.rex: turn decimal number into Roman style */
Do forever
  call charout "STDOUT:", "Enter a number in the range 1-3999: "; PARSE PULL number
  If number = 0 then exit
  say " --->" number "=" dec2rom(number)
End

dec2rom: procedure
  PARSE ARG num, bLowerCase /* mandatory argument: decimal whole number */
  a. = ""
  /* 1-9 */ /* 10-90 */ /* 100-900 */ /* 1000-3000 */
  a.1.1 = "i" ; a.2.1 = "x" ; a.3.1 = "c" ; a.4.1 = "m" ;
  a.1.2 = "ii" ; a.2.2 = "xx" ; a.3.2 = "cc" ; a.4.2 = "mm" ;
  a.1.3 = "iii" ; a.2.3 = "xxx" ; a.3.3 = "ccc" ; a.4.3 = "mmm" ;
  a.1.4 = "iv" ; a.2.4 = "xl" ; a.3.4 = "cd" ;
  a.1.5 = "v" ; a.2.5 = "l" ; a.3.5 = "d" ;
  a.1.6 = "vi" ; a.2.6 = "lx" ; a.3.6 = "dc" ;
  a.1.7 = "vii" ; a.2.7 = "lxx" ; a.3.7 = "dcc" ;
  a.1.8 = "viii" ; a.2.8 = "lxxx" ; a.3.8 = "dccc" ;
  a.1.9 = "ix" ; a.2.9 = "xc" ; a.3.9 = "cm" ;
  IF num < 1 | num > 3999 | \DATATYPE(num, "W") THEN
  DO
    SAY num": not in the range of 1-3999, aborting ..."
    EXIT -1
  END

  num = reverse(strip(num)) /* strip & reverse number to make it easier to loop */
  tmpString = ""
  DO i = 1 TO LENGTH(num)
    idx = SUBSTR(num,i,1)
    tmpString = a.i.idx || tmpString
  END

  bLowerCase = (translate(left(strip(bLowerCase),1)) = "L") /* default to upercase */
  IF bLowerCase THEN RETURN tmpString
  ELSE RETURN TRANSLATE(tmpString) /* x-late to upercase */
```

# Example (routine1\_dec2roman.rex)

```
/* routine1_dec2roman.rex: initialization */
a. = ""
  /* 1-9 */      /* 10-90 */      /* 100-900 */      /* 1000-3000 */
a.1.1 = "i"    ; a.2.1 = "x"    ; a.3.1 = "c"    ; a.4.1 = "m"    ;
a.1.2 = "ii"   ; a.2.2 = "xx"   ; a.3.2 = "cc"   ; a.4.2 = "mm"   ;
a.1.3 = "iii"  ; a.2.3 = "xxx"  ; a.3.3 = "ccc"  ; a.4.3 = "mmm"  ;
a.1.4 = "iv"   ; a.2.4 = "xl"   ; a.3.4 = "cd"   ;
a.1.5 = "v"    ; a.2.5 = "l"    ; a.3.5 = "d"    ;
a.1.6 = "vi"   ; a.2.6 = "lx"   ; a.3.6 = "dc"   ;
a.1.7 = "vii"  ; a.2.7 = "lxx"  ; a.3.7 = "dcc"  ;
a.1.8 = "viii" ; a.2.8 = "lxxx" ; a.3.8 = "dccc" ;
a.1.9 = "ix"   ; a.2.9 = "xc"   ; a.3.9 = "cm"   ;
.local~dec.2.rom = a.          /* save in .local-environment for future use */

::routine dec2roman public
  PARSE ARG num, bLowerCase          /* mandatory argument: decimal whole number */

  a. = .local~dec.2.rom              /* retrieve stem from .local-environment */
  IF num < 1 | num > 3999 | \DATATYPE(num, "W") THEN
  DO
    SAY num": not in the range of 1-3999, aborting ..."
    EXIT -1
  END

  num = reverse(strip(num))          /* strip & reverse number to make it easier to loop */
  tmpString = ""
  DO i = 1 TO LENGTH(num)
    idx = SUBSTR(num,i,1)
    tmpString = a.i.idx || tmpString
  END

  bLowerCase = (translate(left(strip(bLowerCase),1)) = "L") /* default to uppercase */
  IF bLowerCase THEN RETURN tmpString
  ELSE RETURN TRANSLATE(tmpString) /* x-late to uppercase */
```



# Example (use\_routine1\_dec2roman.rex)

---

```
/* use_routine1_dec2roman.rex */  
Do forever  
  call charout "STDOUT:", "Enter a number in the range 1-3999: "  
  PARSE PULL number  
  If number = 0 then exit  
  say "    --->" number "=" dec2roman(number)  
End  
  
::requires "routine1_dec2roman.rex" /* directive to load module with public routine */
```

# Example (routine2\_dec2roman.rex)

```
/* routine2_dec2roman.rex: Initialization code */
d1    = .array~of( "", "i", "ii", "iii", "iv", "v", "vi", "vii", "viii", "ix" )
d10   = .array~of( "", "x", "xx", "xxx", "xl", "l", "lx", "lxx", "lxxx", "xc" )
d100  = .array~of( "", "c", "cc", "ccc", "cd", "d", "dc", "dcc", "dcc", "cm" )
d1000 = .array~of( "", "m", "mm", "mmm" )
.local~roman.arr = .array~of( d1, d10, d100, d1000 ) /* save in local environment */

::ROUTINE dec2roman PUBLIC /* public routine to translate number into Roman*/
  USE ARG num, bLowerCase /* mandatory argument: decimal whole number */

  IF num < 1 | num > 3999 | \DATATYPE(num, "W") THEN
    RAISE USER NOT_A_VALID_NUMBER /* raise user exception */

  num = num~strip~reverse /* strip & reverse number to make it easier to loop */
  tmpString = ""
  DO i = 1 TO LENGTH(num)
    tmpString = .roman.arr[i] ~at(SUBSTR(num,i,1)+1) || tmpString
  END

  bLowerCase = (bLowerCase~strip~left(1)~translate = "L") /* default to uppercase */
  IF bLowerCase THEN RETURN tmpString
  ELSE RETURN TRANSLATE(tmpString) /* x-late to uppercase */
```



# Example (use\_routine2\_dec2roman.rex)

---

```
/* use_routine2_dec2roman.rex */
Do forever
  call charout "STDOUT:", "Enter a number in the range 1-3999: "
  PARSE PULL number
  If number = 0 then exit
  say "    --->" number "=" dec2roman(number)
End

::requires "routine2_dec2roman.rex" /* directive to load module with public routine */
```



# New Object-oriented Features, 1

---

- Allows for implementing abstract data types
  - "Data Type" (DT)
    - *a data type defines the set of valid values*
    - *a data type defines the set of valid operations for it*
    - *examples*
      - *numbers: adding, multiplying, etc*
      - *strings: translating case, concatenating, etc.*
  - "Abstract Data Type" (ADT)
    - *a generic schema defining a data type with*
      - *attributes*
      - *operations on attributes*






# New Object-oriented Features, 2

---

- Object-oriented features of Rexx
  - allow for implementing an ADT
  - a predefined classification tree
  - allow for (multiple) inheritance
  - explicit use of metaclasses
  - tight security manager (!)
    - *allows for implementing any security policy w.r.t. Rexx programs*
      - *untrusted programs from the net*
      - *roaming agents*
      - *company policy w.r.t. executing code in secured environment*



# Example (dog.rex)

---

## Defining Dogs ...

```
/* dog.rex: a program for dogs ... */

myDog = .dog~new          /* create a dog from the class          */
myDog~Name = "Sweety"    /* tell the dog what it is called      */
say "My name is:" myDog~Name /* now ask the dog for its name      */
myDog~Bark                /* come on show them who you are!     */

::class Dog              /* define the class "Dog"              */
::method Name attribute /* let it have an attribute            */
::method Bark           /* let it be able to bark              */
  say "Woof! Woof! Woof!"

/* yields:

  My name is: Sweety
  Woof! Woof! Woof!

*/
```



# Example (bigdog.rex)

---

## Defining **BIG** Dogs ...

```
/* bgdoc.rex: a program for BIG dogs ... */

myDog = .BigDog~new      /* create a BIG dog from the class      */
myDog~Name = "Arnie"    /* tell the dog what it is called      */
say "My name is:" myDog~Name /* now ask the dog for its name      */
myDog~Bark              /* come on show them who you are!     */

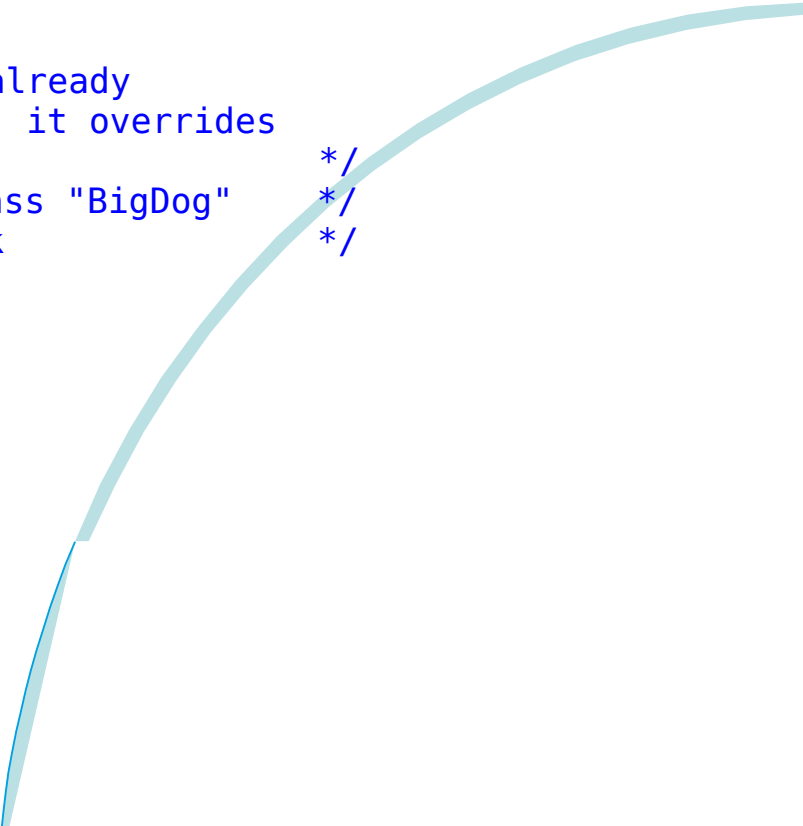

::class Dog            /* define the class "Dog"              */
::method Name attribute /* let it have an attribute            */
::method Bark         /* let it be able to bark              */
  say "Woof! Woof! Woof!"

/* the following class reuses most of what is already
   defined for the class "Dog" via inheritance; it overrides
   the way a big dog barks
*/
::class BigDog subclass Dog /* define the class "BigDog"          */
::method Bark             /* let it be able to bark              */
  say "WOOF! WOOF! WOOF!"

/* yields:

  My name is: Arnie
  WOOF! WOOF! WOOF!


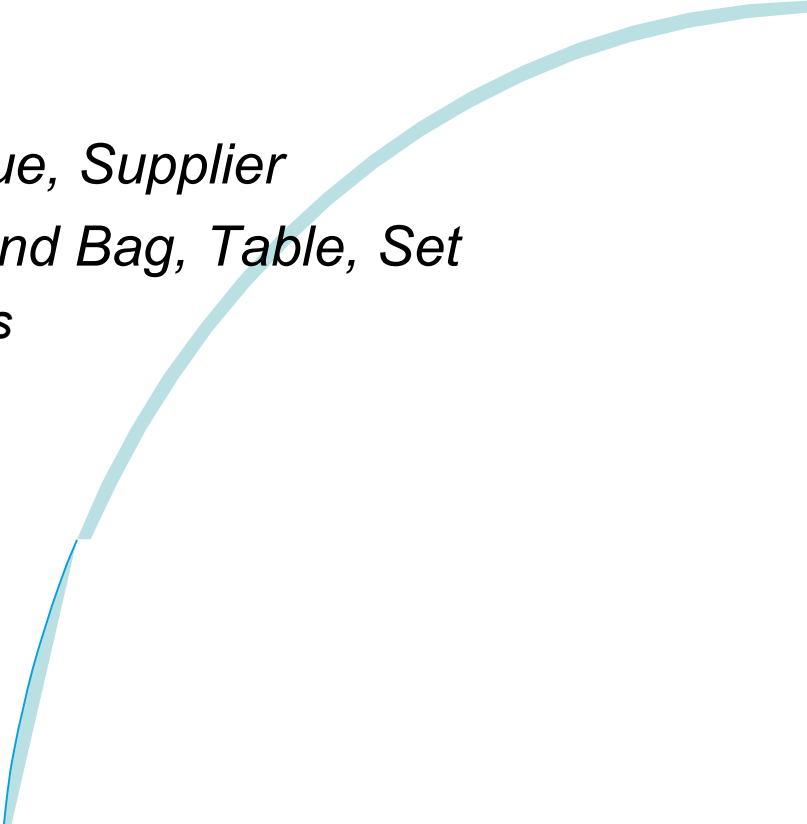
*/
```





# New Object-oriented Features, 3

---

- 
- Object Rexx' classification tree
    - fundamental classes
      - *Object, Class, Method, Message*
    - classic Rexx classes
      - *String, Stem, Stream*
    - collection classes
      - *Array, CircularQueue, List, Queue, Supplier*
      - *Directory, Properties, Relation and Bag, Table, Set*
        - *index is set explicitly by programs*
    - miscellaneous classes
      - *alarm, monitor, ...*
- 



# Example (fruit.rex)

---

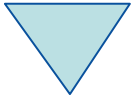
## A Bag Full of Fruits ...

```
/* fruit.rex: a bag, full of fruits ... */

Fruit_Bag = .bag~of( "apple", "apple", "pear", "cherry", "apple", "banana",
                   "plum", "plum", "banana", "apple", "pear", "papaya",
                   "peanut", "peanut", "peanut", "peanut", "peanut", "apple",
                   "peanut", "pineapple", "banana", "plum", "pear", "pear",
                   "plum", "plum", "banana", "apple", "pear", "papaya",
                   "peanut", "peanut", "peanut", "apple", "peanut", "pineapple",
                   "banana", "peanut", "peanut", "peanut", "peanut", "peanut",
                   "apple", "peanut", "pineapple", "banana", "peanut", "papaya",
                   "mango", "peanut", "peanut", "apple", "peanut", "pineapple",
                   "banana", "pear" )

SAY "Total of fruits in bag:" Fruit_Bag~items
SAY

Fruit_Set = .set~new~union(Fruit_Bag)
SAY "consisting of:"
DO fruit OVER Fruit_Set
    SAY right(fruit, 21) || ":" RIGHT( Fruit_Bag~allat(fruit)~items, 3 )
END
```



# Example (fruit.rex)

## Output

Total of fruits in bag: 56

consisting of:

plum:	5
cherry:	1
pear:	6
mango:	1
banana:	7
peanut:	20
pineapple:	4
papaya:	3
apple:	9





# Open Object Rexx ("ooRexx") Roundup

---

- Adds features, long asked for, e.g.
  - Variables by reference (USE ARG)
  - Public routines available to other programs (concept of modules)
  - Very powerful and complete implementation of the OO-paradigm
- Availability
  - Free
  - Opensource
  - Openplatform
    - Precompiled versions for
      - AIX, Linux (rpm, deb), MacOSX, Solaris, Windows 98/NT/2000/XP/Vista
- **Questions?**