

## Tutorial 6 REXX Scripting Language

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PHP, Python (beliebt bei Linux Benutzern), Perl und Tcl/Tk sind weit verbreitete Scripting Languages. REXX ist IBM's bevorzugte Scripting Language und ist deshalb auf allen IBM Betrieb-Systeme seit vielen Jahren verfügbar. Eine ganze Reihe von open source/public domain Versionen sowie auch kommerzielle Versionen existieren für praktisch alle bestehenden Plattformen. Z.B. hat Microsoft seit Jahren einen REXX Interpreter mit ihren SDKs ausgeliefert.

*Aufgabe: Beschäftigen Sie sich mit diesem Tutorial. Schreiben Sie, so wie hier beschrieben, die beiden REXX-Programme; also dieses, das nur "Hallo Welt" ausgibt und jenes, das zwei Zahlen dividiert.*

Unter z/OS und OS/390 ist REXX die mit Abstand am weitesten verbreitete Scripting Language. Das folgende Tutorial beschreibt die Erzeugung und Nutzung eines einfachen REXX Programms unter TSO.

Neben REXX ist CLIST unter TSO als weitere Scriptsprache verfügbar.

The American National Standard (ANSI Standard) for REXX is called "Programming Language - REXX", and its number is X3.274-1996.

The REXX Language Association (RexxLA) is an independent organization dedicated to promoting the use and understanding of the REXX programming language: <http://www.rexxla.org/>

```

Menu  Utilities  Compilers  Options  Status  Help
-----
                          ISPF Primary Option Menu

0  Settings          Terminal and user parameters          User ID . . : PRAKT20
1  View              Display source data or listings      Time. . . : 10:12
2  Edit              Create or change source data         Terminal. : 3278
3  Utilities         Perform utility functions           Screen. . : 1
4  Foreground       Interactive language processing      Language. : ENGLISH
5  Batch            Submit job for language processing   Appl ID . : PDF
6  Command          Enter TSO or Workstation commands   TSO logon : IKJACCNT
7  Dialog Test      Perform dialog testing              TSO prefix: PRAKT20
8  LM Facility      Library administrator functions     System ID : DAVI
9  IBM Products     IBM program development products    MVS acct. : ACCT#
E-----N r          Release . . : ISPF 4.5
e Licensed Materials - Property of IBM e
e 5647-A01 (C) Copyright IBM Corp. 1980, 1997. e
e All rights reserved. e
e US Government Users Restricted Rights - e s
e Use, duplication or disclosure restricted e
e by GSA ADP Schedule Contract with IBM Corp. e
D-----M
Option ==> 3
F1=Help      F3=Exit      F10=Actions  F12=Cancel
    
```

Vom ISPF Primary Option Menue aus einen Partitioned Data Set für die Aufnahme von REXX Scripten anlegen,

Enter!

```

Menu  Help
-----
                          Utility Selection Panel

1  Library          Compress or print data set. Print index listing. Print,
                          rename, delete, browse, edit or view members
2  Data Set         Allocate, rename, delete, catalog, uncatalog, or display
                          information of an entire data set
3  Move/Copy       Move, copy, or promote members or data sets
4  Dslist          Print or display (to process) list of data set names.
                          Print or display VTOC information
5  Reset           Reset statistics for members of ISPF library
6  Hardcopy        Initiate hardcopy output
7  Download        Download ISPF C/S, VA for ISPF, transfer map, or data set.
8  Outlist         Display, delete, or print held job output
9  Commands        Create/change an application command table
*  Reserved        This option reserved for future expansion.
11 Format          Format definition for formatted data Edit/Browse
12 SuperC         Compare data sets (Standard Dialog)
13 SuperCE        Compare data sets Extended (Extended Dialog)
14 Search-For     Search data sets for strings of data (Standard Dialog)
15 Search-ForE   Search data sets for strings of data Extended (Extended Dialog)
Option ==> 2
F1=Help      F3=Exit      F10=Actions  F12=Cancel
    
```

Enter

```

Menu  RefList  Utilities  Help
-----
                                Data Set Utility

      A Allocate new data set          C Catalog data set
      R Rename entire data set        U Uncatalog data set
      D Delete entire data set        S Data set information (short)
blank Data set information           M Allocate new data set
                                      V VSAM Utilities

ISPF Library:
Project . . . PRAKT20
Group . . . REXX
Type . . . EXEC

Other Partitioned, Sequential or VSAM Data Set:
Data Set Name . . .
Volume Serial . . . (If not cataloged, required for option "C")

Data Set Password . . . (If password protected)

Option ==> A
F1=Help      F3=Exit      F10=Actions  F12=Cancel

```

Wir benennen den neuen PDS „PRAKT20.REXX.EXEC“, Allocate, Enter!

```

Menu  RefList  Utilities  Help
-----
                                Allocate New Data Set
                                More:      +

Data Set Name . . . : PRAKT20.REXX.EXEC

Management class . . . DEFAULT      (Blank for default management class)
Storage class . . . PRIM90          (Blank for default storage class)
Volume serial . . . SMS001          (Blank for system default volume) **
Device type . . . . .              (Generic unit or device address) **
Data class . . . . .              (Blank for default data class)
Space units . . . . . MEGABYTE      (BLKS, TRKS, CYLS, KB, MB, BYTES
or RECORDS)
Average record unit                (M, K, or U)
Primary quantity . . 2              (In above units)
Secondary quantity . . 1            (In above units)
Directory blocks . . 5              (Zero for sequential data set) *
Record format . . . FB
Record length . . . 80
Block size . . . . 11440
Data set name type : PDS            (LIBRARY, HFS, PDS, or blank) *
(Y Y/MM/DD, Y YYY/MM/DD)

Command ==>
F1=Help      F3=Exit      F10=Actions  F12=Cancel

```

Die übliche Struktur eines Partitioned Data Sets wählen,  
dreimal F3-Taste drücken!

```

Menu  Utilities  Compilers  Options  Status  Help
-----
                          ISPF Primary Option Menu

0  Settings      Terminal and user parameters      User ID . . : PRAKT20
1  View          Display source data or listings   Time. . . . : 10:21
2  Edit          Create or change source data      Terminal. . : 3278
3  Utilities     Perform utility functions        Screen. . . . : 1
4  Foreground   Interactive language processing  Language. . : ENGLISH
5  Batch        Submit job for language processing Appl ID . . : PDF
6  Command      Enter TSO or Workstation commands TSO logon . : IKJACCNT
7  Dialog Test  Perform dialog testing           TSO prefix: PRAKT20
8  LM Facility  Library administrator functions  System ID . : DAVI
9  IBM Products IBM program development products MVS acct. . : ACCT#
10 SCLM         SW Configuration Library Manager Release . . : ISPF 4.5
11 Workplace   ISPF Object/Action Workplace

Enter X to Terminate using log/list defaults

Option ==> 2
F1=Help      F3=Exit      F10=Actions  F12=Cancel
    
```

In den Editor wechseln, um das REXX Programm zu schreiben, Enter!

```

Menu  RefList  RefMode  Utilities  LMF  Workstation  Help
-----
                          Edit Entry Panel

ISPF Library:
Project . . . . PRAKT20
Group . . . . REXX      . . . .      . . . .      . . . .
Type . . . . EXEC
Member . . . . HALLOAA      (Blank or pattern for member selection list)

Other Partitioned or Sequential Data Set:
Data Set Name . . .
Volume Serial . . .      (If not cataloged)

Workstation File:
File Name . . . . .

Initial Macro . . . .      Options
Profile Name . . . .      / Confirm Cancel/Move/Replace
Format Name . . . .      Mixed Mode
Data Set Password . . . . Edit on Workstation
                          Preserve VB record length

Command ==>
F1=Help      F3=Exit      F10=Actions  F12=Cancel
    
```

Wir schreiben unser REXX-Programm in den Member HALLOAA.



```

Menu  Utilities  Compilers  Options  Status  Help
-----
                    ISPF Primary Option Menu

0  Settings      Terminal and user parameters      User ID . . : PRAKT20
1  View          Display source data or listings    Time. . . . : 10:35
2  Edit          Create or change source data       Terminal. . : 3278
3  Utilities     Perform utility functions          Screen. . . . : 1
4  Foreground   Interactive language processing    Language. . : ENGLISH
5  Batch        Submit job for language processing  Appl ID . . : PDF
6  Command      Enter TSO or Workstation commands  TSO logon : IKJACCNT
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9  IBM Products IBM program development products  MVS acct. : ACCT#
10 SCLM         SW Configuration Library Manager   Release . . : ISPF 4.5
11 Workplace   ISPF Object/Action Workplace

Enter X to Terminate using log/list defaults

Option ==> TSO EXEC REXX.EXEC(HALLOAA) EXEC
F1=Help      F3=Exit      F10=Actions  F12=Cancel

```

Im ISPF Primary Option Menu den Befehl `"TSO EXEC REXX.EXEC(HALLOAA) EXEC"` eingeben, anschließend Enter betätigen!

```

Menu  Utilities  Compilers  Options  Status  Help
-----
                    ISPF Primary Option Menu

0  Settings      Terminal and user parameters      User ID . . : PRAKT20
1  View          Display source data or listings    Time. . . . : 10:35
2  Edit          Create or change source data       Terminal. . : 3278
3  Utilities     Perform utility functions          Screen. . . . : 1
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10 SCLM         SW Configuration Library Manager   Release . . : ISPF 4.5
11 Workplace   ISPF Object/Action Workplace

Enter X to Terminate using log/list defaults

Hallo Welt
***

```

Oben ist das Ergebnis.

Wie unter der weiterführenden Literatur zu finden ist, kann REXX auch für andere Aufgaben nützlich sein. Hier finden Sie ein Beispiel, wie Sie einen Bruch berechnen:

```

File Edit Confirm Menu Utilities Compilers Test Help
-----s
EDIT          PRAKT20.REXX.EXEC(MEXEC) - 01.00          Columns 00001 00072
*****      ***** Top of Data *****
==MSG> -Warning- The UNDO command is not available until you change
==MSG>          your edit profile using the command RECOVERY ON.
000001 /*****REXX*****/
000002 /*      EXEC für Division zweier Zahlen          */
000003 /*****REXX*****/
000004 say 'Zaehler : '
000005 pull z
000006 say 'Nenner : '
000007 pull n
000008 if n=0 then say 'Division durch 0 nicht erlaubt'
000009 else do
000010   say z 'geteilt durch' n 'ist' z/n
000011   say 'oder'
000012   say z 'geteilt durch' n 'ist' z%n 'Rest' z//n
000013 end
*****      ***** Bottom of Data *****

Command ==>
F1=Help      F3=Exit      F5=Rfind      F6=Rchange  F12=Cancel      Scroll ==> PAGE

```

Dafür legt man im Editor einfach einen weiteren Member neben HALLOAA an, zum Beispiel MEXEC. Die restlichen Schritte erfolgen wie bereits beschrieben.

**Aufgabe:** Schreiben Sie ein drittes REXX-Programm. Dieses muß als Bildschirmausgabe "Tutorial " sowie den Namen des Programm-Autors oder – wenn die Aufgaben von mehreren Teilnehmern gemeinsam gelöst werden – die Namen aller Programm-Autoren liefern.

**Aufgabe:** Erstellen Sie mit Hilfe der Tastenkombination "ALT-Druck" zwei Screenshots (einen, der den Programm-Code und einen, der die Bildschirmausgabe Ihres dritten REXX-Programms enthält). Schicken Sie beide Screenshots Ihrem Betreuer per E-Mail zu. Achten Sie darauf, dass ein Screenshot nicht mehr als 250 KByte Speicherplatz belegt. Sehr gut ist das JPEG-Format, das mit weniger als 90 KByte auskommt. Löschen Sie nichts von Ihren Daten! Ihr Tutor möchte sich diese anschauen sowie Ihre REXX-Programme aufrufen.

## Weiterführende Literatur

### Internet

Rexx Language page at IBM Hursley  
<http://www2.hursley.ibm.com/rexx/>

Einfaches REXX Tutorial  
[http://users.comlab.ox.ac.uk/ian.collier/Docs/rexx\\_info/whole.html](http://users.comlab.ox.ac.uk/ian.collier/Docs/rexx_info/whole.html)

Introductory Rexx Tutorial  
[http://www.rexxla.org/About\\_Rexx/rexxtut.html](http://www.rexxla.org/About_Rexx/rexxtut.html)

REXX Tutorial  
<http://users.comlab.ox.ac.uk/ian.collier/Rexx/info.html>

Introductory Rexx Tutorial  
[http://www.rexxla.org/About\\_Rexx/rexxtut.html](http://www.rexxla.org/About_Rexx/rexxtut.html)

### IBM Manuals and Books

- SC28-1882 TSO/E V2R1.1 REXX User's Guide
- SC28-1883 TSO/E Version 2 REXX/MVS Reference
- SC23-3803 Using REXX to Access OpenEdition MVS Services
- | SC31-8231 TME 10 NetView for OS/390 V1R2 Customization: Using REXX
- | SC28-1905 OS/390 Using REXX and OS/390 UNIX System Services
- | SC28-1975 OS/390 V2R10.0 TSO/E REXX Reference
- | SC28-1974 OS/390 V2R9.0-R10.0 TSO/E REXX User's Guide
- ZB35-5100 The REXX Language, 2nd Ed. -- Cowlshaw (see below)
- SC26-4358 SAA CPI: Procedures Language Reference (Level 1)
- SC24-5549 SAA CPI: REXX Level 2 Reference
- G511-1430 IBM REXX Compiler and Library/370: Introducing the Next Step in REXX
- SH19-8160 REXX/370 (Compiler and Library/370): User's Guide and Reference
- SK2T1402 REXX/370 Compiler and Library V1R2.0 Online Product Library
- LY19-6264 IBM REXX Compiler and Library/370: Diagnosis Guide
- SB20-0020 The REXX Handbook -- Ed. Goldberg & Smith (see below)
- | SR23-8926 The NetRexx Language -- M. F. Cowlshaw
- | SG24-2216 Creating Java Applications Using NetRexx -- U. Wahli et al
- SH21-0482 REXX Development System for CICS/ESA and REXX Runtime Facility for CICS/ESA  
Guide and Reference
- GG24-1615 Using REXX in Practice: EXEC2 to REXX Conversion Experiences
- SC23-3803 Using REXX to Access OpenEdition MVS Services
- SC23-3501 OS/390 Internet BonusPak II: Web Programming

### Bücher

- The REXX Language -- M. F. Cowlshaw
  - In English: ISBN 0-13-780735-X Prentice-Hall, 1985
  - ISBN 0-13-780651-5 (Second edition), 1990
  - In German: ISBN 3-446-15195-8 Carl Hanser Verlag, 1988
  - ISBN 0-13-780784-8 P-H International, 1988
  - In Japanese: ISBN 4-7649-0136-6 Kindai-kagaku-sha, 1988

Modern Programming Using REXX -- Robert P. O'Hara and David R. Gomberg  
In English: ISBN 0-13-597311-2 Prentice-Hall, 1985  
ISBN 0-13-579329-5 (Second edition), 1988  
(From REXXPress, REXXPress@wcf.com)

REXX In the TSO Environment -- Gabriel F. Gargiulo



ISBN 0-89435-354-3, QED Information Systems Inc.,  
Order #CC3543; 320pp, 1990

Revised edition:

ISBN 0-89435-418-3, QED Information Systems Inc.,  
471pp, 1993

The REXX Handbook -- Edited by Gabe Goldberg and Phil Smith III  
ISBN 0-07-023682-8, 672pp, McGraw Hill, 1991

Practical Usage of REXX -- Anthony S. Rudd  
ISBN 0-13-682790-X, Ellis Horwood (Simon & Schuster), 1990

Using ARexx on the Amiga -- Chris Zamara and Nick Sullivan  
ISBN 1-55755-114-6, 424pp+diskette, Abacus, 1991

Programming in REXX -- Charles Daney  
ISBN 0-07-015305-1, 300pp, McGraw Hill, 1992

The ARexx Cookbook -- Merrill Callaway  
ISBN 0-9632773-0-8, 221pp, Whitestone, 1992  
(Companion diskette: ISBN 0-9632773-1-6)

Command Language Cookbook -- Hallett German  
ISBN 0-442-00801-5, 352pp, Van Nostrand Reinhold, 1992

REXX--Advanced Techniques for Programmers -- Peter C. Kiesel  
ISBN 0-07-034600-3, 239pp, McGraw Hill, 1993

REXX Tools and Techniques -- Barry K. Nirmal  
ISBN 0-89435-417-5, 264pp, QED, 1993

REXX in der Praxis -- Peter Kees  
ISBN 3-486-22666-5, 279pp, Oldenbourg, 1993

VX-Rexx for OS/2 (Programmer's Guide and Reference) 2.0  
ISBN 1-55094-074-0 Watcom International Corp., 724pp, 1993

REXX Reference Summary Handbook (OS/2) -- Dick Goran  
ISBN 0-9639854-0-X C F S Nevada, Inc, 102pp, 1993.  
ISBN 0-9639854-1-8 (second edition), 148pp, 1994.  
ISBN 0-9639854-2-6 (third edition, for Warp), 208pp, 1995.  
ISBN 0-9639854-3-4 (fourth edition, for Warp 4), 270pp, 1997.

OS/2 2.1 REXX Handbook: Basics, Applications, and Tips -- Hallett German  
ISBN 0442-01734-0, 459pp, Van Nostrand Reinhold, 1993

Proceedings of the REXX Symposium for Developers and Users  
SLAC Report-422, 247pp, May 18-20, 1993

Mastering OS/2 REXX -- Gabriel F. Gargiulo  
ISBN 0-471-51901-4, 417pp, Wiley-QED, 1994

Application Development Using OS/2 REXX -- Anthony S. Rudd  
ISBN 0-471-60691-X, 416pp, Wiley-QED, 1994

Writing VX-Rexx Programs -- Ronny Richardson  
ISBN 0-07911-911-5, 336pp+CD-ROM, McGraw-Hill, 1994

Teach Yourself REXX in 21 Days -- William F. Schindler & Esther Schindler  
ISBN 0-672-30529-1, 527pp, SAMS, 1994

Writing OS/2 REXX Programs -- Ronny Richardson

ISBN 0-07052-372-X, 390pp, McGraw-Hill, 1994

REXX Procedursprak--hur du programmerar din PC med OS/2 -- Bengt Kynning  
ISBN 91-44-48541-7, 300pp, Studentlitteratur (Sweden), 1994

The REXX Cookbook -- Merrill Callaway  
ISBN 0-9632773-4-0, 319pp, Whitestone, 1995  
ISBN 0-9632773-5-9 The REXX files (Companion disk)

Yasashii REXX Nyumon (Introduction to Easy REXX) -- Fumito Yamada  
ISBN 4-88648-434-4, Tokyo: Daiwa Art/Di Art, diskette, 1995

ISPF/REXX Development for Experienced Programmers -- Lou Marco  
ISBN 1-878956-50-7, 201pp, diskette, CBM Books, Ft. Washington, PA, 1995

REXX ni Yoru OS/2 Nyumon (Introduction to OS/2 via REXX) -- Naohiko Yamashita  
ISBN 4-7898-3562-6 Tokyo: CQ Shuppan, 1996

REXX Jiyu Jizai (Handy with REXX) -- Takanori Seki  
ISBN 4-7819-0810-1 Tokyo: Science-sha, 1996

Object REXX by Example -- Gwen L. Veneskey et al.  
ISBN 0-9652329-0-5, 331pp+disk, Aviar Inc. (+1-412-488-9730), 1996

Practical Usage of MVS REXX -- Anthony S. Rudd  
ISBN 3-540-19952-7, 310pp, Springer-Verlag, 1996

Object REXX for OS/2 Warp: REXX Bytes Objects Now -- Trevor Turton et al.  
ISBN 0-13-273467-2, 320pp+disk, Prentice-Hall, 1997

Das REXX Lexikon -- Gerd Leibrock  
ISBN 3-486-23672-5, 598pp, Oldenbourg Verlag, 1997

The NetREXX Language -- M. F. Cowlshaw  
ISBN 0-13-806332-X, 197pp, Prentice-Hall, 1997

Object Oriented Programming with REXX -- Tom Ender  
ISBN 0-471-11844-3, 253 pp, Wiley Computer Publishing, diskette, 1997

Object REXX for Windows NT and Windows 95 -- Ueli Wahli et al  
ISBN 0-13-858028-6, 490pp+disk, Prentice-Hall, 1997

| Down to Earth REXX -- William F. (Bill) Schindler  
| ISBN 0-9677590-0-5, 507pp, Perfect Niche Software, 2000

| Practical Usage of TSO REXX -- Anthony S. Rudd  
| ISBN 1-85233-261-1, 324pp, Springer-Verlag, 2000