Introduction to z/VM Rexx Hands-on Lab

Updated with answers to lab exercises

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Agenda

- Rexx Overview and Related Topics
- Creating and Executing Rexx Programs
- Rexx Language
  - Basic Syntax
  - Strings, Operators, Expressions
  - Tracing, Parsing
  - Control Constructs
  - Subroutines & Functions
  - Issuing Commands and use of Pipelines
- Lab Exercises

Rexx Overview

- **RE**structured e**X**tended e**X**ecutor

- Rexx is a procedural, general purpose language available on many platforms
  - Intuitive
  - Easy to use and read
  - Language concepts are the same on all platforms
    - Minor differences such as file names and structure
    - Operating system-specific tools that support Rexx

Rexx Overview (cont.)

- Few restrictions on program format
  - Indentation
  - 1 or more clauses on a line
  - /* comments can be anywhere and any length */
  - *Implied* semicolon delimiters at end of lines
  - Comma (,) as a continuation character

- Natural data typing
  - Meaning of data depends entirely on their usage

Rexx Overview (cont.)

- Dynamic Scoping
  - ▶ Efficiently interpreted because minimal look-ahead is needed
  - ▶ Meaning of an instruction is only affected by the instructions already executed

- Nothing to Declare !
  - ▶ May document and initialize variables, but…
  - ▶ Implicit declarations take place during execution
  - ▶ **labels:** are the only true declarations

Rexx Overview (cont.)

- The Rexx Evolution…
  - Rexx Sockets API
    - Function package for writing socket applications
  - Object Rexx
    - Object-Oriented Rexx supporting many utilities for a UNIX-type environment, including Linux for System z
  - NetRexx
    - Blend of Rexx and Java; compiles into Java classes
  - Regina Rexx
    - Rexx interpreter ported to most UNIX platforms, including Linux
  - Etc……
- See references page for website information

Creating Rexx Programs

- Create a file with filetype of EXEC using XEDIT, the CMS editor

```
XEDIT  myrexx exec a
```

- Rexx programs begin with a comment line:

```
/*  beginning of program  */          /* Rexx */
```

- Can be run uncompiled and interpreted, or compiled with the Rexx compiler
  - Improved Performance
  - Security

Executing Rexx Programs

- Search order
  - Same for both compiled and interpreted execs
  - Loaded and started through CMS EXEC handler
  - Normal CMS Command search order:

    EXECs, synonyms, MODULEs…

- Invocation
  - Invoke as a CMS command or EXEC:

    myexec -or- **exec myexec**

    - Implied exec (IMPEX) settings control whether exec files are treated as commands
      - SET IMPEX ON|OFF (default is ON)
      - QUERY IMPEX

Helpful Hints for our Exercises

- List Files on A-disk:

  FILELIST * * A or… **LISTFILE * * A**

- XEDIT a file
  - from command line:

    Xedit Filename Filetype Filemode

  - from prefix area on Filelist Screen, PF11 or :

```
x   PROFILE  XEDIT    A1 V      75      74      1  09/17/07 15:48:18
```

- Prefix area commands within the file:

  a add (insert) a single line to the file
  d delete a line (**d5** deletes 5 lines)
  m move a line (**f** following or **p** preceding)
  c copy a line (**f** following or **p** preceding)
  mm…mm block move, **dd…dd** block del, **cc…cc** block copy

Helpful Hints for our Exercises (cont.)

- Screen execution modes
  - **CP Read**
    - CP is waiting for a command
  - **VM Read**
    - CMS is waiting for a command
  - **Running**
    - System is ready for commands or is working on some
  - **More …**
    - More information than can fit on the screen is waiting to be displayed)
      - Clear screen manually or let CP clear after x seconds determined by TERM command setting
  - **Holding**
    - Waiting for you to clear screen manually
  - **Not Accepted**
    - Too many commands in buffer; wait for executing command to complete)

Lab Exercises: What to Expect…

1. Update an existing Rexx program to format a string
2. Write a program to accept an input argument, prompt for data, and display results
3. Trace and Debug existing Rexx programs
4. Write a sort program using stems and various control constructs
5. Write a program using a subroutine to issue CMS commands and Pipes to query accessed disks
6. Write a program to obtain z/VM CP level information

Logging on to the z/VM Lab System

- 3270 Session
- Userids and Passwords

Rexx Language Syntax

- Case **I**nsensitivity

  Denver is the same as **denver**

  - specific support for upper and lower case is provided
  - cases in quoted strings are respected

- *All* Rexx programs must begin with a comment

```
/* This is a comment */
```

- Long lines are common
  - Continuation with commas

```
say 'This text is continued ',
          'on the next line'
```

  - May wrap as a long single line *(but don't do this)*

```
say 'This text is continued
         on the next line'
```

Rexx Strings

- Literal strings: Groups of characters inside single or double quotation marks

```
"Try a game of blackjack",'and beat the odds!'
```

- Two " or ' indicates a " or ' in the string

```
'Guess the dealer''s top card'
"The dealer""s card is an Ace"
```

- Hexadecimal strings: Hex digits (0-9,a-f,A-F) grouped in pairs:

  `'123 45'x` is the same as `'01 23 45'x`

- Binary strings: Binary digits (0 or 1) grouped in quads:

  `'10000 10101010'b` is the same as `'0001 0000 1010 1010'b`

Input and Output

- **say [expression]**
  - writes output to the user's terminal

```
say 'Five Euros equals ' ,
5 * 1.30 'USD'
```

- **pull**
  - prompts for input from the user's terminal

```
pull rate
say 'Five Euros equals' 5 * rate 'USD'
```

- **parse arg**
  - collects arguments passed to a Rexx Program
    - Invoke program: **`EXAMP input1 dataX moreData`**

```
parse arg A1 A2 A3
say A1 A2 A3
```

    - Result:

```
input1 dataX moreData
```

Exercise 1: Syntax and Strings

- Adjust STRING EXEC to provide the following output:

```
"      T'
was a dark and stormy night. Ne'er
before, in all their days, had th
e hackers seen a
program so complex …      "
```

Exercise 1: Syntax and Strings - Answer

```
/* STRING EXEC - Syntax and Strings */

say '"     T'''
say "was a dark and stormy night. Ne'er"
say 'before, in all their days, had th'
say 'e hackers seen a'
say "program so complex ...     """
```

Operators & Expressions

- String Expressions

  (blank) "Mile" "High" --> "Mile High"

  || "Rock"||"ies"   --> "Rockies"

  (abuttal) **abc** = "Rock"

  abc"ies"   --> "Rockies"

- Arithmetic Expressions

  + - * / % (int division) // (remainder)

  ** (power) Prefix - Prefix+

Operators & Expressions

- Comparative Expressions
  - Normal **= \= <> >< > < >= <=**
    - comparison is case sensitive
    - leading/trailing blanks removed before compare
    - shorter strings padded with blanks on right
- Strict **== \== >> << >>= \<< <<= \>>**
    - comparison is case sensitive
    - if 2 strings = except one is shorter, the shorter string is less than the longer string
- Logical Expressions

  & | &&

  \ (preceding expression)

Note: the "not" sign and backslash " \ " are synonymous

Numbers

- A Rexx character string that includes 1 or more decimal digits with an optional decimal point
  - May have leading and trailing blanks
  - Optional sign + or -
  - An "E" specifies exponential notation
    - Be careful with device addresses such as 1E00 (use quotes)

- Precision in calculations may be controlled by the NUMERIC DIGITS instruction
  - Default is 9 digits

- Examples (could also be enclosed in quotes):

12 **-17.9** **+ 7.9E5**

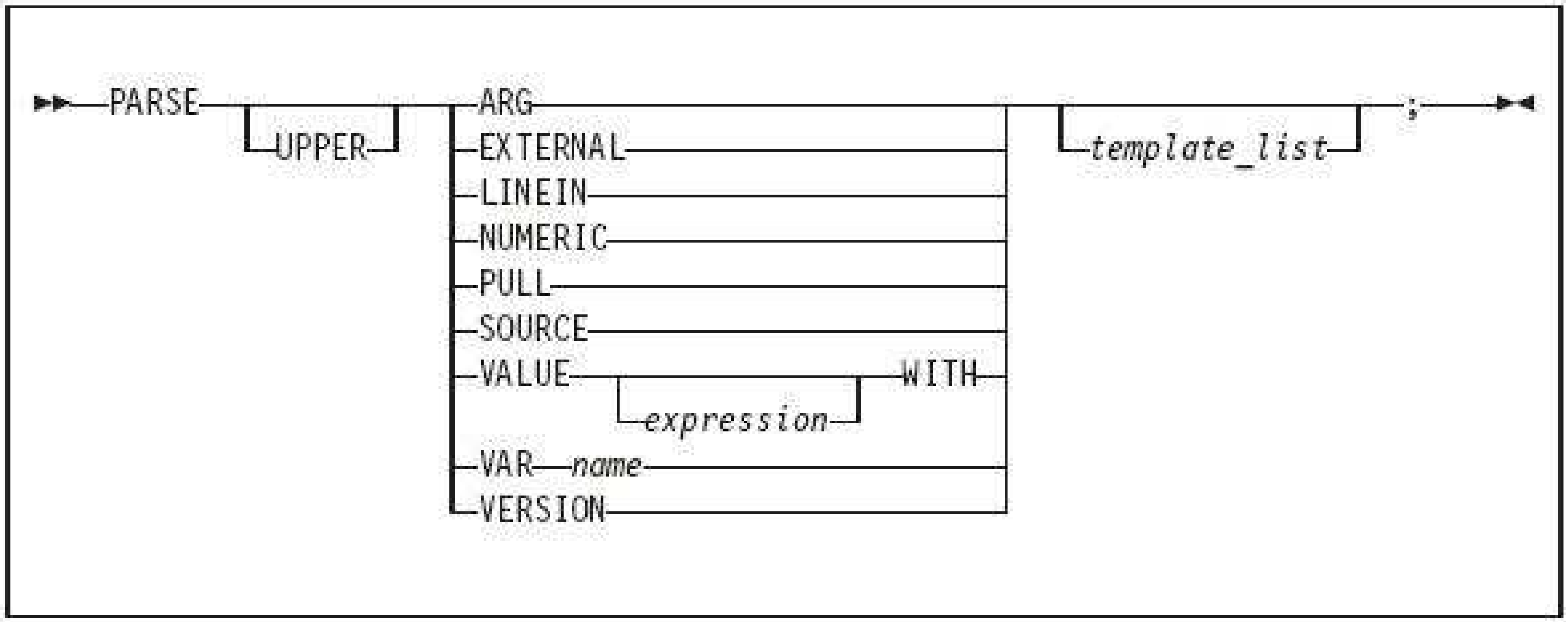
Variables

- Data known by a unique name whose value may change
- Variable names
  - **NOT** case sensitive
  - **Cannot** begin with a digit 0-9
- Defined by assignment (give it a value)

population = 184627

- Variables with no assigned value will have the uppercase variable name as its initial value
- Special variables: **rc, result, sigl**
  - may be set automatically during program execution

Parsing Strings



- Parse Arg – takes data passed into exec or internal routine
  - (see example on “Input and Output” chart)
- Parse Var – parses variable into other variable(s)

Parsing Strings...

- Assigns data to variables using parsing rules

```
str1 = '04-08 May 2009'
parse var str1 w1 w2 w3
```

  - w1 = 04-08
  - w2 = May
  - w3 = 2009

```
parse upper var str1 w1 . w2
```

  - w1 = 04-08
  - w2 = 2009

```
parse var str1 w1 w2
```

  - w1 = 04-08
  - w2 = May 2009

Parsing Strings…

- Default token delimiter is a blank
  - ▶ May be changed on Parse statement

```
str1 = '04-08*May*2009'
parse var str1 w1 '*' w2 '*' w3
```

- w1 = 04-08
- w2 = May
- w3 = 2009

Exercise 2: Say, Pull, & Passing Parameters

- Assume a card deck with suits of Hearts, Diamonds, Clubs, and Spades
- Write a Rexx program to:
  - **pass in** 1 of the 4 suits as an argument
  - **prompt** for a number from 2-10
  - **display** the number and the suit in the format:

```
'Your card is a 10 of Hearts'
```

- **Run** the program with different suits and numbers

Exercise 2: Say, Pull, & Passing Parameters - Answer

```
/*  */
parse arg suit
say 'Enter a number from 2-10:'
pull num
say 'Your card is a 'num' of ' suit
```

Tracing

- trace All
- trace Commands
- trace Error
- trace Failure
- trace Intermediates
- trace Labels
- trace Normal
- trace Off
- trace Results
- trace Scan

- output identifier tags:

`*-*`	source of a single clause
`>>>`	result of expression
`>.>`	value assigned to placehldr
`+++`	error messages

- prefixes if TRACE Intermediates in effect:

`>C>`	data is compound variable
`>F>`	data is result of func call
`>L>`	data is a literal
`>O>`	data is result of operation on 2 terms
`>P>`	data is result of prefix op
`>V>`	data is contents of variable

Tracing (cont.)

- Prefix Options **!** and **?** modify tracing and execution

  ? controls interactive debugging

  TRACE ?Results

  ! inhibits host command execution

  TRACE !C causes command to be traced but not processed

- CMS command **SET EXECTRAC ON** allows you to switch tracing on without modifying the program

- **TS** and **TE** immed commands turn tracing on/off asynchronously

Tracing - Example

- Program

```
/* Trace Sample Program */
Trace Intermediates
number = 1/7
say number
```

- Output

```
    3  *-* number = 1/7
   >L>    "1"
   >L>    "7"
   >O>    "0.142857143"
   4  *-* say number
   >V>    "0.142857143"
0.142857143
```

Exercise 3: Tracing and Debugging

The following Rexx Programs are on your VM A-disk:

- REXXEX3A.EXEC
- REXXEX3B.EXEC

There is something wrong with each program

- Using the TRACE instruction, debug each problem
- Fix the code so that it functions properly

Exercise 3: Tracing and Debugging – Answer A

Trace Intermediate output:

```
 6 *-* string1 = "Rexx" 'Lab'
        >L>    "Rexx"
        >L>    "Lab"
        >O>    "Rexx Lab"
      7 *-* say string11
        >L>    "STRING11"
STRING11
      9 +++ string2 = "Exerc"||"ise'say string2
Error 6 running REXXTR5A EXEC, line 9: Unmatched "/*" or quote
```

Exercise 3: Tracing and Debugging – Answer A

Corrected Rexx Program:

```
Trace I

string1 = "Rexx" 'Lab'
say string1

string2 = "Exerc"||"ise"
say string2
```

Result:

```
 6 *-* string1 = "Rexx" 'Lab'
      >L>   "Rexx"
      >L>   "Lab"
      >O>   "Rexx Lab"
     7 *-* say string1
      >V>   "Rexx Lab"
Rexx Lab
     9 *-* string2 = "Exerc"||"ise"
      >L>   "Exerc"
      >L>   "ise"
      >O>   "Exercise"
    10 *-* say string2
      >V>   "Exercise"
Exercise
```

Exercise 3: Tracing and Debugging – Answer B

Trace Intermediate output:

```
  7 *-* Var1 = "25 35 71"
      >L>   "25 35 71"
    8 *-* /* INPUT: Three positive integers */
    9 *-* /* OUTPUT: The average of these three values */
   12 *-* parse arg w1 . w2 w3
      >>>   ""
      >.>   ""
      >>>   ""
      >>>   ""
   13 *-* w3 = 25
      >L>   "25"
   15 *-* $average = (w1 + w2 + w3) // 3
      >V>   ""
      >V>   ""
   15 +++ $average = (w1 + w2 + w3) // 3
Error 41 running REXXTR5B EXEC, line 15: Bad arithmetic conversion
```

Exercise 3: Tracing and Debugging – Answer B

Corrected Rexx Program:

```
Trace I
Var1 = "25 35 71"

/* INPUT: Three positive integers */
/* OUTPUT: The average of these three values */
parse var var1 w1 w2 w3
/* w3 = 25 */

$average = (w1 + w2 + w3) / 3
say "The average value of these numbers is" $average "."
```

Exercise 3: Tracing and Debugging – Answer B

Result:

```
    7 *-* Var1 = "25 35 71"
      >L>   "25 35 71"
     8 *-* /* INPUT: Three positive integers */
     9 *-* /* OUTPUT: The average of these three values */
    12 *-* parse var var1 w1 w2 w3
      >>>   "25"
      >>>   "35"
      >>>   "71"
    13 *-* /* w3 = 25 */
    15 *-* $average = (w1 + w2 + w3) / 3
      >V>   "25"
      >V>   "35"
      >O>   "60"
      >V>   "71"
      >O>   "131"
      >L>   "3"
      >O>   "43.6666667"
    16 *-* say "The average value of these numbers is" $average "."
      >L>   "The average value of these numbers is"
      >V>   "43.6666667"
      >O>   "The average value of these numbers is 43.6666667"
      >L>   "."
      >O>   "The average value of these numbers is 43.6666667 ."
The average value of these numbers is 43.6666667 .
```

Control Constructs – DO…END

DO … END can be used to create a code block

```
if wins > losses then
   do
     say 'Congratulations!'
     say 'You have won!'
   end
else say 'Sorry, you have lost'
```

Control Constructs - Selection

```
if wins > losses then say 'you have won'
                 else say 'you have lost'

select
  when wins > losses then say 'winner'
  when losses > wins then say 'loser'
  otherwise say ‘even’
end


select
  when wins > losses then say 'winner'
  when losses > wins then say 'loser'
  otherwise NOP
end
```

Control Constructs – DO Loops

```
do forever
  say 'You will get tired of this'
end


do 3
  say "Roll, Roll, Roll the dice"
end


do i=1 to 50 by 1
  say i
end
```

More DO Loops

```
i=30
do until i > 21      /* Evaluate after DO executes */
  i=i+5
end
say i           ──→35


i=30
do while i < 21      /* Evaluate before DO executes */
  i=i+5
end
say i           ──→30
```

Iterate and Leave

- **Iterate** causes a branch to end of control construct

```
 do i=1 to 4
    if i=2 then iterate
   say i
end                    /* displays 1, 3, 4  */
```

- **Leave** exits the control construct

```
 do i=1 to 4
   say i
   if i=3 then leave
end                    /* displays 1, 2, 3  */
```

Symbols and Stems

- Constant symbol starts with a digit (0-9) or period:

  77   .123   12E5

- Simple symbol does not start with a digit nor contains periods:

  ABC   ?3

- Compound symbol contains at least one period, and at least 2 other characters
  - ► **Stem** (up to 1st period), followed by **tail**

  ABC.3   Array.i   Total.name   x.y.z

Built-In Functions

- Parentheses always needed in function calls even if no arguments are required
- Some commonly used functions:

▶ `ABS(-1.674)`	→	`1.674`
▶ `C2D('a')`	→	`129`
▶ `DATE('U')`	→	`'09/19/07'`
▶ `DELSTR('abcde',3,2)`	→	`'abe'`
▶ `D2X(129,2)`	→	`'81'`
▶ `LENGTH('abcdef')`	→	`6`
▶ `POS('day','Wednesday')`	→	`7`
▶ `RIGHT('12',4,'0')`	→	`'0012'`
▶ `SUBSTR('abc',2)`	→	`'bc'`
▶ `WORDS('are we done yet?')`	→	`4`
▶ `WORDPOS('the','now is the time')`	→	`3`

Exercise 4: Sorting Cards - using stems and control constructs

- Write the program CARDSORT EXEC

- Set a variable called rank in your program to represent the possible card values and order:

  rank= '2 3 4 5 6 7 8 9 10 J Q K A'

- Cardsort takes an argument of 2 or more (up to 13) words representing the values of playing cards
  - ►**HINT:** you may want to parse the input args into a stem variable

- Sort the input values in descending order

Exercise 4: Sorting Cards - Answer

```
/* */
rank='2 3 4 5 6 7 8 9 10 J Q K A'
parse upper arg hand             /* get input args      */
num=words(hand)                  /* count how many      */
do i=1 to num
  parse var hand item.i hand     /* place in stem       */
end
do i=1 to num                    /* loop through stems  */
  do j=i+1 to num                /* compare against rank*/
    if wordpos(item.j, rank) > wordpos(item.i,rank)
       then do                   /* sort them           */
             temp=item.j
         item.j=item.i
         item.i=temp      /*after loop item.i has > num*/
       end
    end j
    hand = hand item.i
end
say hand
```

Subroutines & Procedures

- **CALL** instruction is used to invoke a routine
  - ► May be an internal routine, built-in function, or external routine
- May optionally return a result

```
RETURN expression
```

  - ► variable **result** contains the result of the expression
- Parameters may be passed to the called routine

```
CALL My_Routine  parm1
```

…which is functionally equivalent to the clause:

```
NewData = My_Routine(parm1)
```

- Variables are global for subroutines, but not known to procedures unless passed in or EXPOSE option used

Subroutine Example: Returning a Value

```
/* subroutine call example */
x = 5
y = 10
Call Calc x y                   /* call subroutine Calc */
If result > 50 Then
  say "Perimeter is larger than 50"
Else
  say "Perimeter is smaller than 50"
exit

Calc:                          /* begin subroutine     */
Parse Arg len width            /* input args           */
return 2*len + 2*width         /* calculate perimeter  */
                               /* ...and return it     */
```

Issuing Commands from Rexx

- Issuing commands is a way to send a message or request to some unit external to the Rexx program

- Environment is selected by default on entry to a Rexx program
  - ▶ **ADDRESS** instruction can change the active environment
  - ▶ **ADDRESS( )** built-in function used to get name of the currently selected environment

Issuing z/VM Commands from Rexx

- CMS commands issued as a quoted string:
  - ▶ **'STATE PROFILE EXEC'**

- Use DIAG function to issue CP commands with Diagnose x'08‘
  - ▶ **DIAG(8,'QUERY CPLEVEL')**
  - ▶ Can be an expression as part of a longer statement

Issuing Commands – z/VM Example

```
Address CMS             /* send cmds to CMS */
 'STATE PROFILE EXEC'



 If RC=0 Then           /* file found */
    'COPY PROFILE EXEC A TEMP = ='


Parse Value diag(8,'QUERY CPLEVEL') With queryout
```

Issuing Commands – TSO Example

```
"CONSOLE ACTIVATE"
...

ADDRESS CONSOLE  /* change environment to CONSOLE for all commands */
"mvs_cmd"
...
"mvs_cmd"

ADDRESS TSO tso_cmd    /* change environment to TSO for one command */
...
"mvs_cmd"

ADDRESS TSO    /* change environment to TSO for all commands */
"tso_cmd"
...

"CONSOLE DEACTIVATE"
```

Manipulating Files

- Input and output managed as streams
  - Default (terminal input and display)
  - File or dataset
  - Reader
  - Punch
  - Printer
  - Program stack

Manipulating Files – Input (z/VM)

- Input with function call LINEIN
  - LINEIN(name,line,count)
  - answer = LINEIN(name,line,count)
  - CALL LINEIN name,line,count
    - Name
      - name of input stream
    - Line
      - line number to be read
      - Default is current position in stream
    - Count
      - 1 – read 1 line and advance the read position (default)
      - 0 – read no lines, set read position at beginning of specified line

Manipulating Files – Output (z/VM)

- Output with function call LINEOUT
  - LINEOUT(name,string,line)
  - answer = LINEOUT(name,“Sample line”,line)
  - CALL LINEOUT name,string,line
    - String
      - line of data to be written
    - Line
      - line number to write
    - Name
      - name of input stream
  - Output stream opened automatically on first LINEOUT call, closed implicitly at end of program (unless closed explicitly first)

Manipulating Files – TSO

- EXECIO Command
  - Read or write information to a dataset
  - Update an existing dataset
  - EXECIO * DISKR MYINDD (FINIS **STEM MYVAR**
    - *
      - entire dataset (# of lines)
    - DISKR
      - read
    - MYINDD
      - dataset name
    - FINIS
      - close dataset after reading
    - STEM MYVAR
      - place contents of dataset into stem variable MYVAR
  - EXECIO is also a CMS command, usable from z/VM Rexx

Using Pipelines with Rexx

- PIPE is a command that accepts *stage* commands as operands
  - Stages separated by a character called a *stage separator*
    - Default char is vertical bar **|** **(x'4F')**

- Allows you to combine programs so the output of one serves as input to the next
  - Like pipes used for plumbing: data flows through programs like water through pipes!

- User-written stages are Rexx programs
  - Reads in data, works on it, places it back into pipe

Using Pipelines with Rexx - Examples

- Invoking from CMS command line:

```
pipe < profile exec | count lines | console
```

- Invoking from an Exec:

```
/*  Count number of lines in exec */
'PIPE < profile exec | count lines| console'
exit
```

  - /* or…on multiple lines */

```
'PIPE < profile exec',
         '| count lines',
         '| console'
```

Using Pipelines with Rexx - Examples

- Invoking commands and putting output in a stem:

```
'pipe',
'CMS LISTFILE * EXEC A',      /* issue cmd   */
  '| STEM response.'          /* stem output */


do i = 1 to response.0
      say response.i
end
```

Exercise 5: MYDISKS EXEC

- Write a Rexx program to show which disks your userid has accessed

1. **Call a subroutine** that:
   - Uses a PIPE to **issue** CMS command **QUERY DISK** and **save** response
   - **Determine** the number of disks accessed
   - **Return** the value to the main routine
2. **Display** the returned number of disks accessed
3. **Display** each of the disks that are accessed
4. **Issue** the CMS command **QUERY DISK** without using a PIPE
5. **Verify** that output from Steps 3 and 4 match

Exercise 6: WHATCP EXEC

- Write Rexx program WHATCP EXEC to show z/VM CP Level information
  - Issue CP command QUERY CPLEVEL to display CP level
  - Use Rexx Diag function to issue QUERY CPLEVEL command
    - Parse command output to display CP Version, Release, and Service level

Exercise 5: MYDISKS EXEC – Answer #1

```
/* Find Number of disks accessed and list them */
Call GetDisks
Say 'This user has' NumDisks 'disks accessed.'
Say '  '

Do i = 1 to Numdisks
   Say DiskList.i
End

Say '  '
ADDRESS CMS
'QUERY DISK'
Exit

/* Subroutine: Get list of disks and return number of disks accessed*/
GetDisks:
   'PIPE',
     'CMS QUERY DISK',
     '| Drop 1',
     '| STEM DiskList.'
    NumDisks = DiskList.0
Return NumDisks
```

Exercise 5: MYDISKS EXEC – Answer #2

```
/* Find Number of disks accessed and list them */
Call GetDisks
Say 'This user has' NumDisks 'disks accessed.'
Say '  '

Do i = 1 to Numdisks
   Say DiskList.i
End

Say '  '
ADDRESS CMS
'QUERY DISK'
Exit
/*Subroutine: Get list of disks and return number of disks accessed*/
GetDisks:
   'PIPE',
     'CMS QUERY DISK',
     '| Drop 1',
     '| STEM DiskList.',
     '| count lines',
     '| var NumDisks'
Return NumDisks
```

Exercise 6: WHATCP – Answer

```
/* Display CP Level information for the z/VM system */
'CP QUERY CPLEVEL'

Parse value diag(8,'QUERY CPLEVEL') with ,
                 . . version . release . . servicelvl .

say 'z/VM Version = ' version
say 'z/VM Release = ' release
say 'Service Level = ' servicelvl
```

For More Information…

- **Websites:**

http://www.ibm.com/software/awdtools/rexx/	Rexx webpage
http://www.ibm.com/software/awdtools/netrexx/	NetRexx
http://www.ibm.com/software/awdtools/obj-rexx/	Object Rexx
http://regina-rexx.sourceforge.net/	Regina Rexx

- **z/VM publications:**
  - Rexx/VM Reference - SC24-6113
  - Rexx/VM User's Guide - SC24-6114
  - website for library downloads: **http://www.vm.ibm.com/library/**

- **z/OS publications:**
  - TSO/E Rexx User's Guide - SC28-1974
  - TSO/E Rexx Reference - SC28-1975
  - website for library downloads: http://www-304.ibm.com/jct03004c/servers/s390/os390/bkserv/r9pdf/tsoe.html

- **Rexx Compiler**
  - Products ordered separately from z/VM:
    - REXX/370 Compiler, 5695-013
    - REXX/370 Library, 5695-014

- **Other books:**

The Rexx Language	ISBN 0-13-780651-5
The Netrexx Language	ISBN 0-13-806332-X

- **List servers:**
  - http://listserv.uark.edu/scripts/wa.exe?A0=ibmvm

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