Linux Shell Scripting for the z/VM Rexx User

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Scope

• VM User new to running Linux? “I know how to write REXX execs. How do I write Shell scripts?”

• Unix user new to VM? “I know how to write Shell Scripts. How do I write REXX execs?”

• This is not a tutorial on basic CM/CMS commands or Linux shell commands. I will presume you know those already.

• This will be very simplistic. Lots more finer details. Buy a book.

• No guarantees I haven't fat-fingered some examples.
Rexx vs. Shell

- **Rexx**
  - There is only one rexx for VM. Similar REXX’s on other platforms.
  - EXEC is early (pre VM/SP 4) version, not easily programmable
  - EXEC2 like MVS PLIST

- **Shell**
  - Many shells for *nix:
    - sh, bsh, bash, ksh,csh,tcsh, zsh
  - Linux usually uses bash
  - All similar, but different
  - REXX available for linux in Regina if you're lazy and don't want to learn shell scripts.
Start it Up!

• **REXX**
  - First Line must be a comment: /*.....*/
  - Recommend use of ‘address command’ - forces CP commands and called execs to be prefaced by ‘CP’ and ‘EXEC’
  - Help command

• **Shell**
  - First line must be `#!/bin/bash`
  - Tells what environment to run shell in
  - man command
Naming Conventions

- REXX filetype must be ‘EXEC’
- Execute by entering filename or “EXEC” filename
- Must exist on accessed disk in search order. Will take first one it finds. MYJOB EXEC A will run instead of MYJOB EXEC S. Be careful!
- Shell: Any filename
- Must be executable rwx rwx rwx
- Must exist in PATH
  - echo $PATH
- Or explicitly declare path “/usr/bin/command” or ./command on current directory
Capturing Output

- **Rexx:**
  - CP SPOOL CONSOLE START TO *
  - EXEC MYREXX
  - CP SPOOL CONSOLE STOP CLOSE
  - Results in virtual reader

- **Script:**
  - script
  - ./myshell
  - exit
  - Results in file “typescript”
Tracing

- Second line or later:
  - trace r
  - trace i for intermediate detail
  - trace o to turn off

- First line:
  - #! /bin/bash -x
Variables

- Any non-rexx command
- Use a, artifice, glob
  - Not if, do, end
  - Upper, lower case
- Declare by
  - Glob = ‘thing’
  - Glob = 2
- Generally not usable outside of exec (See GLOBALV)

- Preceded by $
- Convention: Uppercase
- Declare without $
  - GLOP=‘thing’
  - Echo $GLOP
- To use outside of script
  - Export $GLOP
Passing Arguments

- EXEC GLOP a b c
- parse arg a b c.
- ./glop a b c
- $1 contains a
- $2 contains b
- $3 contains c
Read in and Display User Data

- say ‘What is your name?’
- parse pull name
- say name
- echo -n “What is your name?”
- read NAME
- echo $NAME
Variable Substitution

- \texttt{glop = 'some text'}
- \texttt{glop = 4+3}
- \texttt{glop = oldglop||'more text'}
- \texttt{glop = oldglop*7}
- Integer or FP arithmetic
- \texttt{GLOP=Peach}
- \texttt{GLOP="Peach"}
- \texttt{GLOP=$((5+3*2))}
- Integer arithmetic only. Results truncated to lower integer.
Standard In/Standard Out

- **Rexx assumes**
  - input from terminal (or stack)
  - Output to terminal
  - errors to terminal
- **Can be redirected with**
  - Pipes
  - EXECIO
  - FILEDEFs
  - CP SPOOL

- **Stdin is terminal (0)**
- **Stdout is terminal (1)**
- **Stderr is terminal (2)**
- **Can be redirected!**
  - Command 1>file1 2>file2
Getting Command Output into a Variable

• Several ways:
  – Use the Stack
    • ID (FIFO
      • parse pull user . node .
  – EXECIO (also stack)
  – PIPELINES
    • (More later)

• Use backquotes:
  – DATE=`date`
  – echo $DATE
If-Then

- if x='large' then
  - do
    - say 'x is big'
  - end
- if test "$X" = "large" ; then
  - echo "X is big"
- fi
- Or test string1=string2
- Or [string1 = string2]
If-Then-Else

- if x='large' then
  - do
    - say 'x is big'
  - end
- else do
  - say 'x not so big'
  - R = 8
- end

if test "$X" = "large" ; then
  - echo "X is big"
else
  - echo "X not so big"
fi
Types of Equality

- **Strings**
  - if \( x = 'large' \)
  - if \( x <> 'large' \)
  - if \( x = '' \) (zero length)

- **Numbers**
  - if \( x = y \)
  - if \( x > y \)
  - if \( x >= y \)
  - if \( x <> y \)

- **Strings**
  - test \( str1 = str2 \)
  - test \( str1 != str2 \)
  - test -z \( str \)

- **Numbers**
  - \( int1 -eq int2 \)
  - \( int2 -gt int2 \)
  - \( int1 -ge int2 \)
  - \( int1 -ne int2 \)
Compound Equalities

- If $x=y$ & $w=z$ then ...
- If $x=y$ | $w=z$ then ...
- If [ "$X" = "$Y" && "$W" = "$Z" ] ; then
- If [ "$X" = "$Y" || "$W" = "$Z" ] ; then
Select from List

- select
  - when x=1 then …
  - when x=2 then
  - otherwise …
- end

- case "$X" in
  - 1) do … ;;
  - 2) do … ;;
- esac
- If no matches found, does nothing.
Loops

- do x=1 to 20
  - ...
- end
  - -or-
- x=1
- do until x=20
  - ...
  - x = x+1
- end

- X=1
- while [$x -lt 20]
- do
  - ...
  - X=`expr $X + 1`
- Done
Reading a file one line at a time

- do forever
  - 'MAKEBUF'
  - buf1 = rc
  - 'EXECIO 1 DISKR' fn ft fm
  - if rc <> 0 then leave
  - parse pull line
  - <manipulate line>
  - 'DROPBUF' buf1
- End
- 'DROPBUF' buf1
- 'FINIS' fn ft fm

- while read LINE
  - do
  - <manipulate LINE>
  - done < filename
Arrays

- var.1 = 1
- var.2 = 2
- var.3 = 5
- var.apple='peach'
- var.0 contains the number of items in the array
- say fruit.2 gives orange

- Name[index]=value
- Index must be integer => 0
- Arrays start index=0
- Index of * means all members
- Array variable accessed as:
  - ${name[index]}
  - Echo ${fruit[2]} gives orange
  - Echo ${fruit[*]} gives apple banana orange
Pipelines

• VERY complex and powerful
• Uses "stage" commands written just for pipes
• Can have multipath pipelines and pipes that call other pipes.
  
  PIPE stage | stage | stage
  
  PIPE literal 'hello' | console
  
  – Gives 'hello'
• Place all but rexx variables inside single quotes
• Useful:
  
  – 'PIPE CP QUERY NAMES | split at , | strip | locate /LNX/ | console
• Uses standard linux commands
• Directs stdout of one command to stdin of next command
• ps -ax | grep dsm
  
  – shows all running processes containing string "dsm"
• Useful:
  
  – tar -cf . | tar -xpf -C /mnt
  
  – Copies all files and subdirectories recursively from local directory to /mnt, preserving ownerships, dates and permissions. Quite fast.
Output Redirection to or from a file

- Use EXECIO, stack
- PIPEs is better:
  - 'PIPE CP QUERY NAMES | split at , | strip | >LINUX SERVERS A'
- Use >> to append to existing file
- 'PIPE < LINUX SERVERS A | console'
- 'PIPE < LINUX SERVERS A | CP SIGNAL SHUTDOWN'
- ps -ax | grep dsm > dsm.processes
- Use >> to append to existing file
- Redundant, but illustrates the point: use a file as input to a command:
  - cat 0< .profile
  - mail friend@berkeley.edu < exam.answers
Quoting

- Rexx assumes variable if not quoted, literal if quoted.
- If variable not set, variable = name of variable
- say glop
  - glop
- glop = 'pudding'
- say glop
  - pudding
- Use single or double quote, but be consistent. Close with same type you open with.
- Quotes are special characters modifying what follows, like `\ " '`
- This is a very complex topic. Look it up.
- "meta-caracters" need to be quoted if not to be used as meta. Sometimes called "escaping" the character.
  - * ? [] ' " $ ; & ( ) | !
- Double quotes disable meta characters
  - Echo '$USER owes <-$1250,**>; [as of (`DATE %m %d`)]'
  - Rewrite as (use \ to escape $)
  - Echo '$USER owes <-\$1250,**>; [as of (`DATE %m %d`)]'
  - Gives
  - Fred owes <1250.**>; as of (1221)
Return Codes - A way of checking success

- Special variable rc
  - rc = 0 if ok
  - rc <> 0 if not ok

- Special variable $?
  - $? = 0 if ok
  - $? != 0 if not ok
Subroutines

- 'ERASE PROFILE ANY A'
- call sub1 rc
- say result
- ...
- sub1: procedure /*variables not visible outside subroutine*/
- parse arg v1
- if v1 = 0 then return 'OK'
- else return 'bad juju'

- insmod -f "/lib/modules/misc/cmsfs.o" > /dev/null
- failed $? 1
- ...
- failed() {
  - if [$1 -ne 0]; then
    - echo "failed to insmod cmsfs"
    - exit 0
  - fi
  - }

Does a File Exist?

- 'ESTATE' fn ft fm
  - or
- 'ESTATEW' fn ft fm if you want to know if it's writeable
- rc = 0 if exists, writable
- rc = 28 otherwise
- fm must be in accessed disk list or else rc = 36

- if [-f /home/mystuff]; then
  - echo "exists"
- Will search for file whether in $PATH or not.
- Other options:
  - -e file or directory exists
  - -s exists and size > 0
  - -w exists and writable
  - -x exists and executable
There's More...

- Both languages have MANY other options. This is just to get you started.

- Didn't cover:
  - Print formatting
  - Setting defaults for variables and arguments
  - CSL or Script libraries
  - Manipulation of strings
  - Interfaces to DB2, Oracle, other databases
  - Sleep, signals, wakeup
Further Reading:

- **Shell**:
  - man shell
  - Srirang Veeraraghaven "Sams Teach yourself Shell Programming in 24 Hours" SAMS publications (2002)
  - http://www.injunea.demon.co.uk/pages/page201.htm

- **REXX**
  - SC24-5465-02 REXX/VM User's Guide (IBM)
  - SC24-5770-01 REXX/VM Reference (IBM)
  - SC24-5970-00 CMS Pipelines User's Guide (IBM)