



Power VUG

HMC/VIOS tasks made easy with Scripting and Commands

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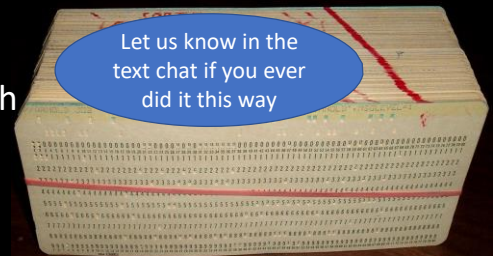
Abstract



- ❖ Some useful tips and best practices for using the Command Line Interface (CLI) and Scripting on the HMC and VIOS.
- ❖ We will cover methods to make your life easier, and show how to work around some "features" which may seem to be restrictive.
- ❖ We assume that you are generally familiar with
 - Scripting
 - HMC
 - VIOS

An older way to code

Let us know in the text chat if you ever did it this way



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Restricted shells



❖ But, gaz, don't the HMC and VIOS command lines have restricted shells?

➤ Doesn't that tie your hands behind your back?



❖ Yes, the shells *are* restricted

➤ We can use some clever tricks to get things done

❖ PLEASE NOTE – this is not Shell Scripting 101

➤ We assume that you already have some scripting skills



Hacker (Wikipedia)



❖ A computer **hacker** is any skilled computer expert who uses their technical knowledge to overcome a problem

❖ This is us



❖ While "hacker" *can* refer to any skilled computer programmer, **the term has become associated in popular culture with a "security hacker"**, someone who, with their technical knowledge, uses bugs or exploits to break into computer systems



❖ This is not us

What does “restricted” mean? (general)



❖ A restricted shell is like the normal shell but some actions are not allowed:

❖ The main restrictions are:



- changing directories with `cd`
- setting or unsetting the values of `SHELL`, `PATH`, `ENV`, (or `BASH_ENV`)
- specifying command names containing `/`
- specifying a file name containing a `/` as an argument to the `source` (`.`) builtin command
- redirecting output using the `>`, `>|`, `<>`, `>&`, `&>`, and `>>` redirection operators

What does “restricted” mean? (HMC details from `man rbash`)



❖ A restricted shell behaves identically to `bash` with the exception that the following are disallowed or not performed

- changing directories with `cd`
- setting or unsetting the values of `SHELL`, `PATH`, `ENV`, or `BASH_ENV`
- specifying command names containing `/`
- specifying a file name containing a `/` as an argument to the `.` builtin command
- specifying a filename containing a slash as an argument to the `-p` option to the `hash` builtin command
- importing function definitions from the shell environment at startup
- parsing the value of `SHELLOPTS` from the shell environment at startup
- redirecting output using the `>`, `>|`, `<>`, `>&`, `&>`, and `>>` redirection operators
- using the `exec` builtin command to replace the shell with another command
- adding or deleting builtin commands with the `-f` and `-d` options to the `enable` builtin command
- using the `enable` builtin command to enable disabled shell builtins
- specifying the `-p` option to the `command` builtin command
- turning off restricted mode with `set +r` or `set +o restricted`.



What does “restricted” mean? (VIOS details from `man ksh`)



❖ The `rksh` command invokes a restricted version of the Korn shell. It allows administrators to provide a controlled shell environment to the users. There is also a restricted version of `rksh` available for the enhanced Korn shell, called `rksh93`.

❖ With a restricted shell a user cannot:

- Change the current working directory.
- Set the value of the `SHELL`, `ENV`, or `PATH` variable.
- Specify the pathname of a command that contains a `/` (slash).
- Redirect output of a command with
 - > (right caret), >| (right caret, pipe symbol), <> (left caret, right caret), or >> (two right carets).



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In VIOS you can just use `oem_setup_env`



❖ Yes, in the VIOS if you run `oem_setup_env` you get a root `ksh`

- not restricted

❖ The clue is in the command name:

- It is there to provide an environment to allow you to setup OEM specifics

❖ You should not be doing day to day work in this shell

- Of course, people do, but they shouldn't
- VIOS specific things can break
- If you break a VIOS, it can badly affect all of the client VMs/LPARs

Your system is
our concern
but *your*
responsibility!

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In VIOS you can just use `oem_setup_env`



❖ Yes, in the VIOS if you run `oem_setup_env` you get a root ksh

Access to the unrestricted AIX shell

The VIOS's underlying operating system is AIX. You can get to the full (unrestricted) AIX shell by logging in to the restricted shell as `padmin` and then entering the `oem_setup_env` command. This gives you full root access to the AIX operating system, which runs the VIOS.

However, use this with caution. The VIOS is critical to your environment and damage done here can have repercussions on all LPARs. You can't log in directly to the VIOS as root.

The `exit` command returns you to the restricted shell as `padmin`.

Doug Gwyn said:



Unix was not designed to stop you from doing stupid things,

because,

that would stop you from doing clever things.

Your system is *our* concern
but *your* responsibility!

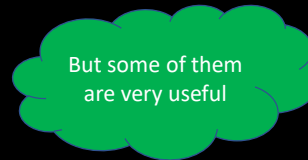


\$PATH on HMC



```
hscroot@hmc:~> echo $PATH
/hmcrbin/:/usr/hmcrbin
```

```
hscroot@hmc:~> ls /hmcrbin/
basename  cut      egrep   grep   more   netstat ping6   sleep  umount
cat        date    fgrep   ls     mount  ping    sed     sort   uname
```



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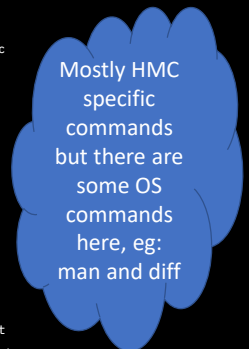
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/usr/hmcrbin



```
hscroot@hmc11:-> ls /usr/hmcrbin
OS_install  chlparstate  cpdump      getgardrec  lscuod      lsmediadev  lssvc      mkisofs     zmhmcsur    scp
asmmenu     chlparutil   cpfile      getopt       lsdatarep   lsmemdev    lssvcevents  mkmigrkeys  zmllock     sendfile
bkconsdata  chnportlogin  cpsysplan   getpcietopology  lsdump      lsmemopt    lssvcinfo   mkprofddata  zmlparutil  setkeyoncec
bkprofddata  chperfmon    createse    getriotopology  lsfru       lsmigrdbg   lssyscfg    mkpwpolicy   zmprofddata  setlparcap
chaccfg      chprmhmc     csmlicutil  getupgfiles  lshmc       lsnodeid    lssysconn   mkrsrc-api   zmpwpolicy   sha1sum
chbmccert   chproxy      defsysplanres  head         lshmcauth   lsnpportlogin  lssysplan   mksvcevent   zmrsrc-api   ssh
chcod        chpsm        deploysysplan  hmcshutdown  lshmc-cert  lspartition  lssysplanres  mksyscfg     zmsyscfg     ssh-keygen
chcodpool   chpwpolicy   diag-cloudconn  hmcwin       lshmcncr    lsperrfmon  lstskey      mksysconn    zmsysconn    startdump
chcomgmt    chpwmgmt     diagcloudconn  host          lshmcfs     lsprihmhc   lsusrta      mksysplan    zmsysplan    sum
chcuod      chsacfg      diagrmc      hwdbg        lshmcldap   lsprofspace  lsvet        mkvterm      zmsysplanres  tail
chdatarep   chspnmp      diff          installios   lshmcusr    lsproxy     man           monhmc       zmvterm      texmtask
chhmc       chstat       dircolors    ldapsearch    lshsc       lspsm       mccodop      n1smg        invi          updhmc
chhmcauth   chsvc        dlslic       less          lshwinfo    lspwdpolicy  migrcfg       optmem       rrlpar       updlic
chhmccert   chsvcevent   drstartlpar  locale       lshwres     lspwrgmt    migrdbg       osinstall    rrstartlpar  updpnh
chhmccncr   chsvcinfo    du            logssh       lsilmtdscan  lsrefcode   migrpar       pedbg        rrstartremote  utilcollect
chhmcf      chsyscfg     dump         lpar_netboot  lsiotopo    lsrepairfru  migrremote    pesh         rsMMRIOserver  utilhmcvent
chhmcldap   chsyspwd     expr         lpcfop       lsipsec     lsrrstartlpar  mkaccfg       refdev       rsthwres     utilpurge
chhmcsur    chsysstate   formatmedia  lsaccfg      lsled       lsrsdevsize  mkauthkeys    repairfru    rstprofddata  utilsnapmoni
chhwres     chtskey      gen_backup_db  lsavailres   lslic       lsrsic      mkkodpool     rm           rstupgdata    viosvrcmd
chipsec      chusrta      genisoimage  lsbmccert    lslock      lsrsrc-api  mkdir         zmaccfg      runilmtscan  vtmenu
chkmedia     chvet        getcimstatus2  lscod        lslogon     lssacfg     mkhmccert     rmdir        runlpcmd     which
chled        cclear       getdump      lscodpool    lsparmigr   lsspsnmp    mkhmcsur      zmdump       rnsig        who
chlickey    cp            getfile      lscmgmt      lsparutil   lsstat      mkmhmcsur_ldap  rmfile       saveupgdata  whoami
```



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\$PATH on VIOS



```
/usr/ios/cli:/usr/ios/Utils:/usr/ios/lpm/bin:/usr/ios/oem:/usr/ios/ldw/bin:/home/padmin
```

```
$ ls /usr/ios/cli
FPLEVEL.txt      SPLEVEL.txt      ios_level        itm              man.ksh
README.txt       cron_mail_check.sh ios_level.prev   langlist
README.vios      environment       ioscli          lsvirt.snap

$ ls /usr/ios/Utils
auditpr      chvlog      cpiscsi      head           maintcluster  oem_setup_env  rmiscsi      stty          tr
awk          chvlrepo    crontab      ls            man           openssl        rmvlog       su            vi
bootinfo    cleandisk   cut          lscluster     mkdir         part           roletlist    swrole       vnicstat
cache_mgt   clear       date         lsiscsi       mkiscsi       precheck       rules        tail          wall
cat         cliffdc     df           lsmpio        mksvm         ps             rulescfgset  tar           wc
chiscsi     clo        find         lssrc         mkvlog        pvi           scp          tee           who
chmod       clstartstop ftp          lsvlog        more          rm             sed          termdef      whoami
chrepos     cp          grep         lsvlrepo     mv            rmcluster     ssh          tnconconsole zcat

$ ls /usr/ios/lpm/bin
mkauthkeys

$ ls /usr/ios/oem

$ ls /usr/ios/ldw/bin
cpsysplan      deploysysplan  lssysplanres  rmsysplan      update_install_setup
defsysplanres  lssysplan      mksysplan     rmsysplanres

$ ls /home/padmin
cfgbackups  config      install.log  ioscli.log  rules
```

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Aliases



❖ But there are a load of aliases too

```
$ alias | grep mon
nmon='ioscli nmon'
svmon='ioscli svmon'
topas_nmon='ioscli topas_nmon'
```

```
$ alias | grep user
chuser='ioscli chuser'
lsuser='ioscli lsuser'
mkceuser='ioscli mkceuser'
mkuser='ioscli mkuser'
rmuser='ioscli rmuser'
```

Power VM

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Shell builtins



- ❖ Of course, you also get the shell builtins

- alias, case, declare, echo, fc, for, print, read, set, test, typeset etc

- ❖ (except cd)

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Exchange authentication keys



- ❖ Exchange authentication keys

- To avoid having to enter passwords and make “remote” scripting possible

- ❖ A variety of keys can be used



- ❖ We cover one example for HMC and VIOS

- ❖ There may already be keys on the target, so do not overwrite them

- ❖ Copy the file to unix - add your public key - copy it back

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User IDs



- ❖ Of course, the classic ones are
 - hscroot on the HMC
 - padmin on VIOS
- ❖ Some advantages to creating specific users
 - Audit trail
 - Individual histories
 - Restricted access to resources
 - Easy to lock
- ❖ There may be disadvantages
 - `-rw-r----- 1 root root 2654634 Apr 28 16:30 /var/log/messages`
 - `root:x:0:hscroot,ccfw,sfp,invscout`



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HMC password policy



- ❖ All as hscroot, no need for root.
- ❖ Make a new password policy


```
mkpwdpolicy -i \
"name=gaz12, \
description=, \
min_pwage=1, \
pwage=180, \
min_length=12, \
hist_size=10, \
warn_pwage=7, \
min_digits=0, \
min_uppercase_chars=0, \
min_lowercase_chars=0, \
min_special_chars=0"
```
- ❖ Activate it
 - `chpwdpolicy -o a -n gaz12`
- ❖ change the password
 - `chhmcusr -u gaz -t passwd`
- ❖ disable the policy
 - `chpwdpolicy -o d`
- ❖ remove the policy
 - `rmpwdpolicy -n gaz12`

Please Login

Username

Password

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Make a new HMC user



The screenshot shows the 'Add User' dialog in the HMC 'Users and Roles' section. The 'User ID' is 'scripter' and the 'Description' is 'hmcsuperadminscripter'. Under 'Authentication', 'Local Authentication' is selected. The 'Details' section shows a password field, a confirm password field, and a checked box for 'Password expires in (days)' set to 20. In the 'Managed Resource Roles' section, 'AllSystemResources' is checked. In the 'Task Roles' section, 'hmcsuperadmin' is selected. The 'OK' button is highlighted with a red box, and the 'Help' button is highlighted with a green box. A red arrow points from the 'Add...' button in the 'User Profiles' list to the 'Add User' dialog.

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HMC Roles



The screenshot shows the 'Users and Roles' interface with the 'Roles' section expanded. The 'Manage Task and Resource Roles' link is highlighted with a red box. The description for this link is 'Add, copy, remove, and change managed resources, and task roles.'

The screenshot shows the 'Customize User Controls' dialog. The 'Managed Resource Roles' radio button is selected. Below it, 'AllSystemResources' is selected in the 'Select Managed Resource Roles' list.

The screenshot shows the 'Customize User Controls' dialog. The 'Task Roles' radio button is selected. Below it, 'hmcserviceep' is selected in the 'Select Task Roles' list.

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Doing it on the CLI



❖ mkhmcusr, lshmcusr, chhmcusr, rmhmcusr

```
➤ mkhmcusr -i "name=scripter2,description=\"a scripter\",\  
taskrole=hmcsuperadmin,resourcerole=AllSystemResources"
```

❖ mkaccfg, lsaccfg, chaccfg, rmaccfg

```
lsaccfg -t resourcerole --filter resourceroles=POWER8role  
name=POWER8role,"resources=cec:root/ibmhscS1_0|8284-  
22A*215296V|IBMHSC_ComputerSystem,lpar:root/ibmhscS1_0|ALL_PARTITIONS*8284-  
22A*215296V|IBMHSC_Partition,cec:root/ibmhscS1_0|8408-  
E8E*21D494V|IBMHSC_ComputerSystem,lpar:root/ibmhscS1_0|ALL_PARTITIONS*8408-  
E8E*21D494V|IBMHSC_Partition,cec:root/ibmhscS1_0|8286-  
42A*100EC7V|IBMHSC_ComputerSystem,lpar:root/ibmhscS1_0|ALL_PARTITIONS*8286-  
42A*100EC7V|IBMHSC_Partition,cec:root/ibmhscS1_0|8247-  
22L*211986A|IBMHSC_ComputerSystem,lpar:root/ibmhscS1_0|ALL_PARTITIONS*8247-  
22L*211986A|IBMHSC_Partition"
```



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Make a new VIOS user



❖ mkuser, lsuser, chuser, rmuser

```
$ mkuser scripter
```

```
Changing password for "scripter"
```

```
scripter's New password:
```

```
Enter the new password again:
```



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Password prompt on HMC



```
$ ssh scripiter@hmc16 pwd
The authenticity of host 'hmc16 (9.137.62.13)' can't be
established.
ECDSA key fingerprint is
SHA256:DY13b/XVQa8RgKeiS4ifmee1XH7193LL87I44j5lh3Y.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'hmc16,9.137.62.13' (ECDSA) to
the list of known hosts.
Password:
/home/scripiter

$ ssh scripiter@hmc16 pwd
Password:
/home/scripiter
```



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Password prompt on VIOS



```
$ ssh scripiter@ambervios3
The authenticity of host 'ambervios3 (9.137.62.106)' can't be established.
ECDSA key fingerprint is SHA256:WwGEZVIDuYzv1R+hJnxxVdlpMtpDQcMVHJRfaiDvQ7A.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ambervios3,9.137.62.106' (ECDSA) to the list of known hosts.
scripiter@ambervios3's password:
[compat]: 3004-610 You are required to change your password.
Please choose a new one.
Last login: Mon Apr 27 06:02:42 CDT 2020 on ssh from 9.137.62.229
WARNING: Your password has expired.
You must change your password now and login again!
Changing password for "scripiter"
scripiter's Old password:
scripiter's New password:
Enter the new password again:
Connection to ambervios3 closed.
$
$ ssh scripiter@ambervios3
scripiter@ambervios3's password:
Last login: Mon Apr 27 06:03:38 CDT 2020 on ssh from 9.137.62.229

The following file has been updated: .profile
Changes will take affect at next login.
```



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Exchange ssh keys



- ❖ So, we exchange ssh keys
- ❖ Firstly, make our key
- ❖ DON'T overwrite any existing keys on the target
 - Remember that we cannot redirect in an ssh, so:
 - Copy the existing keys to a local system
 - Add our key
 - Copy the file back



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Generate a key on AIX or on Linux



```
$ ls -l .ssh
total 8
-rw-r--r--  1 gaz      staff      457 27 Apr 12:03 known_hosts

$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/gaz/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/gaz/.ssh/id_rsa.
Your public key has been saved in /home/gaz/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:oYX112J3N0IewSX5ENX1HD9+c6iuGMIfD8uodSF0PvY  gaz@gaznim.aixncc.uk.ibm.com

The key's randomart image is:
+---[RSA 2048]-----+
|
| .==oo
| + o+= o=
| o = + =o..+
| . = + + oo..
| o S . .oo
| . o + . +
| + = E .
| . * B .
| . = o .
+---[SHA256]-----+

$ ls -l .ssh
total 24
-rw-----  1 gaz      staff      1675 27 Apr 12:23 id_rsa
-rw-r--r--  1 gaz      staff      410 27 Apr 12:23 id_rsa.pub
-rw-r--r--  1 gaz      staff      457 27 Apr 12:03 known_hosts
```



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HMC Authentication keys



```
$ scp scripiter@hmc16:~/.ssh/authorized_keys2 authorized_keys2_hmc16
Password:
authorized_keys2          100%    0    0.0KB/s   00:00

$ cat ~/.ssh/id_rsa.pub >> authorized_keys2_hmc16

$ scp authorized_keys2_hmc16 scripiter@hmc16:~/.ssh/authorized_keys2
Password:
authorized_keys2_hmc16    100%  410    1.1MB/s   00:00

$ ssh scripiter@hmc16 pwd
/home/scripiter

$ rm authorized_keys2_hmc16
```



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VIOS Authentication keys



```
$ scp scripiter@ambervios3:~/.ssh/authorized_keys2 authorized_keys2_ambervios3
scripiter@ambervios3's password:
authorized_keys2          100%    0    0.0KB/s   00:00
$
$ cat ~/.ssh/id_rsa.pub >> authorized_keys2_ambervios3
$
$ scp authorized_keys2_ambervios3 scripiter@ambervios3:~/.ssh/authorized_keys2
scripiter@ambervios3's password:
authorized_keys2_ambervios3 100%  410    836.4KB/s 00:00
$
$ ssh scripiter@ambervios3 pwd
scripiter@ambervios3's password:
```

HUH?



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VIOS Authentication keys (workaround a gotcha)



```
$ scp scripiter@ambervios3:~/.ssh/authorized_keys2 authorized_keys2_ambervios3
scripiter@ambervios3's password:
authorized_keys2          100%   0      0.0KB/s   00:00
$
$ cat ~/.ssh/id_rsa.pub >> authorized_keys2_ambervios3
$
$ scp authorized_keys2_ambervios3 scripiter@ambervios3:~/.ssh/authorized_keys2
scripiter@ambervios3's password:
authorized_keys2_ambervios3 100% 410   836.4KB/s   00:00
$
$ ssh scripiter@ambervios3 pwd
scripiter@ambervios3's password:
$ ssh scripiter@ambervios3 pwd
/home/scripiter
$
$ rm authorized_keys2_ambervios3
$
```

HUH?

`/etc/ssh/sshd config`

```
# The default is to check both ~/.ssh/authorized_keys and ~/.ssh/authorized_keys2
# but this is overridden so installations will only check ~/.ssh/authorized_keys
AuthorizedKeysFile      .ssh/authorized_keys
```

```
So, you could oem_setup_env and run:
# ln ~scripiter/.ssh/authorized_keys2 ~scripiter/.ssh/authorized_keys
```



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Do you use PuTTY – use PuTTYgen?



The first screenshot shows the PuTTY Key Generator window with the 'Generate' button highlighted. The second screenshot shows the mouse cursor moving over the blank area to generate randomness. The third screenshot shows the generated key pair, with the 'Save private key' button highlighted.

Public key for pasting into OpenSSH authorized_keys file:

```
ssh-rsa
AAAAB3NzaC1yc2EAAAABIQAAQEAmp71kXVwpyr47LMPwf0Z7td77uNe3QIW9Hs
043aqC/2WjAD9QIF50zcfpF
+uvvQZGvRgon4KloHbcrcce6RVNkMkePWjxYBo60nWoTncKkQZ5HudrfR6ibrSA6b
UHG8arkBj1jXGxoeXoNkNH42/Ac60dxUtvREvLwvCC6DCCvstLT/S903hNlUrfvOyQ/f
```

Key fingerprint: ssh-rsa 2048 85:1e:33:e2:ea:77:4d:2d:9c:a0:b7:94:4b:76:fc:fb

Key comment: rsa-key-20200427

Key passphrase:

Cyrfim passphrase:

Actions

Generate a public/private key pair

Load an existing private key file

Save the generated key

Parameters

Type of key to generate: RSA DSA ECDSA Ed25519 SSH-1 (RSA)

Number of bits in a generated key: 2048

Save the private key on your laptop

Concatenate the public key onto the authorized_keys file on the target

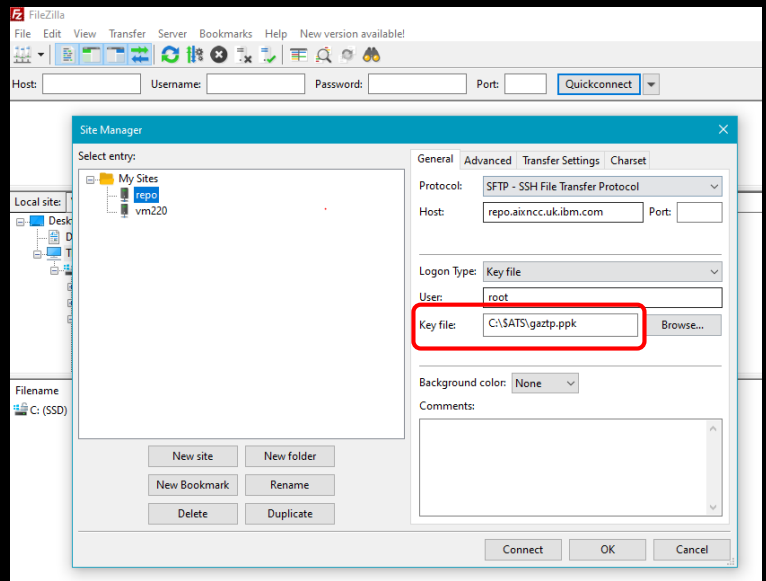
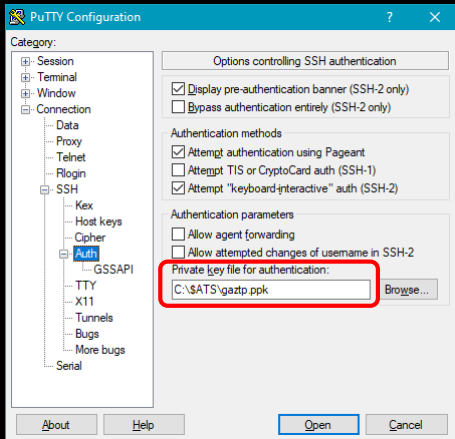
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USING it on PuTTY ... and other things, like FileZilla



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Now we can ssh a whole script – HMC



```

$ ssh scripter@hmc16 '
> echo
> echo -e ^[[7m I am \\c
> whoami
> echo -e ^[[27m
> lshmc -V
> '
I am scripter

"version= Version: 9
Release: 1
Service Pack: 940
HMC Build level 2002070500
MH01760 - HMC V9R1 M920 [ppc64le]
MH01788 - Required fix for HMC V9R1 M920 [ppc64le]
MH01790 - HMC V9R1 Service Pack 1 Release (M921) [ppc64le]
MH01801 - iFix for HMC V9R1 M921
MH01811 - HMC V9R1 M930
MH01821 - iFix for HMC V9R1 M910+
MH01826 - iFix for HMC V9R1 M930
MH01832 - HMC V9R1 M931
MH01837 - HMC V9R1 M940
MH01843 - iFix for HMC V9R1 M940
", "base_version=V9R1
"
$

```

Enclose the whole script in quotes:

```
script
```

<ESC>[7m is the code for smso
 <ESC>[27m is the code for rmso
 <ESC>[4m is the code for smul
 <ESC>[24m is the code for rmul

Others in "man terminfo"

In ksh and bash

use <CTRL>-V to insert a control character

Linux needs "echo -e"

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Now we can ssh a whole script – VIOS

```
$ ssh scripiter@ambervios3 '
> echo
> echo ^[[7m I am
>
$ ssh scripiter@ambervios3 '
> echo
> echo ^[[7m I am \\c
> whoami
> echo ^[[27m
> ioscli ioslevel
> '
I am scripiter

3.1.1.10
$
```

Enclose the whole script in single quotes

script

<ESC>[7m is the code for smso
 <ESC>[27m is the code for rmso
 <ESC>[4m is the code for smul
 <ESC>[24m is the code for rmul

Others in “man terminfo”

In ksh and bash

use <CTRL>-V to insert a control character

AIX does NOT need “echo -e”

Most commands on VIOS

need to be run via ioscli

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This means ...



- ❖ In this way, we can write complex scripts
 - using our favourite editor on a familiar system
 - pulling output back to the “home” system
 - where we can:
 - parse/manipulate it
 - use it as intermediate data for other scripts
 - log it
 - send it by email
 - Etcetera, etcetera, etcetera

vi

ed

vim

emacs

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A useful set of links

```
ls -li hmc*
127011 -rwxr-xr-x  7 root    system    42 07 Aug 2013  hmc10
127011 -rwxr-xr-x  7 root    system    42 07 Aug 2013  hmc11
127011 -rwxr-xr-x  7 root    system    42 07 Aug 2013  hmc12
127011 -rwxr-xr-x  7 root    system    42 07 Aug 2013  hmc13
127011 -rwxr-xr-x  7 root    system    42 07 Aug 2013  hmc14
127011 -rwxr-xr-x  7 root    system    42 07 Aug 2013  hmc15
127011 -rwxr-xr-x  7 root    system    42 07 Aug 2013  hmc16
```

```
cat hmc10
```

```
HMC=$(basename $0)
```

```
ssh hscroot@${HMC} $@
```

```
hmc16 'whoami;date'
hscroot
Mon Apr 27 20:03:50 UTC 2020
hmc15
Last login: Sun Apr 19 01:32:45 2020 from vm220.aixncc.uk.ibm.com
hscroot@hmc15:~>
```

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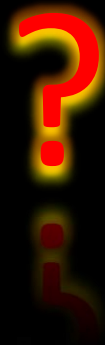
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Can we create a script on the HMC or VIOS



- ❖ The HMC is an appliance and you cannot (legitimately) save a script locally
- ❖ You do not have access to vi but can use `rnvi -f <text file name>`
- ❖ As mentioned, on VIOS you *can* `oem_setup_env`
 - So, you can create a script locally, and save it in `$PATH`
 - But this is not a great idea.
 - Apart from anything else, an upgrade might wipe it out
 - My advice is “Just Don’t Do It”
- ❖ General users do have access to vi
 - And you can do this:



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Having a local file on a VIOS

- ❖ padmin has a restricted shell
 - so cannot redirect output to create a script,
- ❖ but can “vi g” and write it to \$HOME
 - and can chmod 755
 - home dir is on PATH

```
$ vi g
$ chmod 777 g
$ g
hello world
$
```



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A great tip for helping with day to day CLI work on the HMC



- ❖ Create a file with useful variables
- ❖ After you log in to the HMC you can source the file

```
rnvi -f set_variables
smul=^[[4m
rmul=^[[24m
smso=^[[7m
rmso=^[[27m
EMERALD=P8-S824-emerald
GREEN=P7-p730b-green
INDIGO=P7-p710c-indigo
CYAN=P7-p710b-cyan
LEMON=P8-S822-lemon
RUBY=P8-E850-ruby
LIME=P8-S822-lime
PURPLE=P7-p770-purple
AMBER=P9-S922-amber
RED=P9-S924-red
VM220=vm220-a74b3c63-0000002e
```

```
. set_variables

lssyscfg -r sys -m $AMBER -F name,type_model,state
P9-S922-amber,9009-22A,Operating

lssyscfg -r lpar -m $AMBER --filter lpar_names=$VM220 -F os_version
AIX 7.2 7200-03-01-1838

viosvcmd -m $AMBER -p ambervios2 -c ioslevel
3.1.1.10
```



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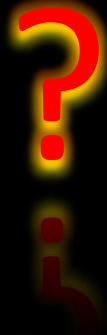
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Getting the HMC output on separate lines



- ❖ Many HMC commands produce one, very long line of CSV output
- ❖ You can use sed to convert the output to multiple lines
 - `sed -e s/,/\n/g`

But why would you want to do that?



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Getting the HMC output on separate lines



```
lshmcusr --filter names=hscroot
name=hscroot,taskrole=hmcsuperadmin,description=
HMC Super
User,pwage=99999,resource=ALL:,authentication
_type=local,remote_webui_access=1,remote_ssh_ac
cess=1,min_pwage=0,session_timeout=0,verify_time
out=15,idle_timeout=0,inactivity_expiration=0,re
sources=<ResourceID = ALL:><UserDefinedName =
AllSystemResources>,password_encryption=sha512,d
isabled=0,passwd_authentication=1
```

Unfortunately, no
awk on the HMC ...

... but there is awk
on my "home"
system 😊

```
lshmcusr --filter names=hscroot | sed -e s/,/\n/g
name=hscroot
taskrole=hmcsuperadmin
description=HMC Super User
pwage=99999
resource=ALL:
authentication_type=local
remote_webui_access=1
remote_ssh_access=1
min_pwage=0
session_timeout=0
verify_timeout=15
idle_timeout=0
inactivity_expiration=0
resources=<ResourceID = ALL:><UserDefinedName =
AllSystemResources>
password_encryption=sha512
disabled=0
passwd_authentication=1
```

This makes the
output much
more useful with
grep

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Compare these



```
hscroot@hmc14:~> lshmc -n | grep ipv4addr
```

```
hostname=hmc14,domain=aixncc.uk.ibm.com,"ipaddr=10.0.255.1,9.137.62.30,0.0.0.0,0.0.0.0","networkmask=255.255.255.0,255.255.255.0,255.255.255.0,255.255.255.0",gateway=9.137.62.1,"nameserver=9.64.162.21,9.137.62.2,9.137.62.37","domainsu
fix=aixncc.uk.ibm.com,uk.ibm.com,software.ibm.com,securep.ibm.com",slipipaddr=10.255.0.1,slipnetmask=255.255.0.0,"ip
addr_lpar=9.137.62.30,10.0.255.1","networkmask_lpar=255.255.255.0,255.255.255.0","clients=10.0.255.4,10.0.255.14,10.0.255.10,10.0.255.5,10.0.255.6,10.0.255.2,10.0.255.13,10.0.255.7,10.0.255.3,10.0.255.15,10.0.255.12,10.0.255.9,10.0.25
5.8,10.0.255.11","ipv6addr_lpar=fe80:0:0:0:42f2:e9ff:fe0d:d7ad,fe80:0:0:0:42f2:e9ff:fe0d:d7ac","slipipaddrs=10.0.255.1
9,137.62.30,fe80::42f2:e9ff:fe0d:d7ac/64,fe80::42f2:e9ff:fe0d:d7ad/64,fe80::40f2:e9ff:fe0d:d7ab/64",ipv4addr_eth0=1
0.0.255.1,ipv4netmask_eth0=255.255.255.0,ipv4dhcp_eth0=off,ipv6addr_eth0=fe80:0:0:0:42f2:e9ff:fe0d:d7ac/64,ipv6auto
eth0=off,ipv6privacy_eth0=off,ipv6dhcp_eth0=off,lparcomm_eth0=off,jumboframe_eth0=off,speed_eth0=auto,duplex_eth0=au
to,tso_eth0=,ipv4addr_eth1=9.137.62.30,ipv4netmask_eth1=255.255.255.0,ipv4dhcp_eth1=off,ipv6addr_eth1=fe80:0:0:0:42f2
:e9ff:fe0d:d7ad/64,ipv6auto_eth1=off,ipv6privacy_eth1=off,ipv6dhcp_eth1=off,lparcomm_eth1=off,jumboframe_eth1=off,s
peed_eth1=auto,duplex_eth1=auto,tso_eth1=,ipv4addr_eth2=0.0.0.0,ipv4netmask_eth2=255.255.255.0,ipv4dhcp_eth2=off,ip
v6addr_eth2=,ipv6auto_eth2=off,ipv6privacy_eth2=off,ipv6dhcp_eth2=off,lparcomm_eth2=off,jumboframe_eth2=off,speed_eth
2=auto,duplex_eth2=auto,tso_eth2=,ipv4addr_eth3=0.0.0.0,ipv4netmask_eth3=255.255.255.0,ipv4dhcp_eth3=off,ipv6addr_et
h3=,ipv6auto_eth3=off,ipv6privacy_eth3=off,ipv6dhcp_eth3=off,lparcomm_eth3=off,jumboframe_eth3=off,speed_eth3=auto,d
uplex_eth3=auto,tso_eth3=
```

```
hscroot@hmc14:~> lshmc -n | sed -e s/,/\n/g | grep ipv4addr
```

```
ipv4addr_eth0=10.0.255.1
ipv4addr_eth1=9.137.62.30
ipv4addr_eth2=0.0.0.0
ipv4addr_eth3=0.0.0.0
```



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HMC commands often come in groups



chsyscfg	chhwres	chpwdpolicy	chsvc	cpsysplan
lssyscfg	lshwres	chsyspwd	lssvc	deploysysplan
mksyscfg	rsthwres	lspwdpolicy		lssysplan
rmsyscfg		mkpwdpolicy	chsvcevent	mksysplan
	lslparmig	rmpwdpolicy	lssvcevents	rmsysplan
chhmcusr	lsmigrdbg		mksvcevent	
lshmcusr	migrctfg	chpwrmgmt		defsysplanres
mkhmcusr	migrdbg	lspwrmgmt	chsvcinfo	lssysplanres
mkhmcusr_ldap	migr_lpar		lssvcinfo	rmsysplanres
rmhmcusr	migrremote	chsacfg		
	mkmigrkeys	lsacfg	lssysconn	chvet
chled		lssacfg	mksysconn	lsvet
lslcd			rmsysconn	

Worth checking all the man pages,
especially for things like filters

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Developing a script



- ❖ Usual practices for scripting
 - Define the objective
 - Maybe produce a flowchart
 - Write the script
 - Debug
 - Tweak
- ❖ Usually work out the individual syntax on the command line
- ❖ Then work out loops etc
- ❖ Error checking
- ❖ Things are pretty safe, (for the HMC or VIOS)
 - after all it's a restricted shell
 - But you can break LPARs if you are not careful

BUT
Remember what
Doug Gwyn said

Find the OS level of all LPARs



- ❖ To find and display the OS level of all LPARs
- ❖ Connect to the HMC
- ❖ Get a list of all Systems
- ❖ For each system, list the LPAR and the OS level
- ❖ Display the output
- ❖ All of this can be done using commands available on the HMC



Get a list of all Systems



```
lssyscfg -r sys -F name
P8-S824-emerald
P7-p730b-green
P8-E850-ruby
P7-p710b-cyan
P7-p710c-indigo
P7-p770-purple
P9-S924-red
P8-S822-lemon
BMC-9006-22P_130A6WA
BMC-9183-22X_13002EA
P9-S922-amber
P8-S822-lime
```

Hmm, the BMC
based servers
won't have LPARs

Hmm, we may
want to use
"sort" here

List the LPAR and the OS level LPARs on a particular server



```
lssyscfg -r lpar -m $AMBER -F name,os_version
vm224,Unknown
ambervios3,VIOS 3.1.1.10
ambervios2,VIOS 3.1.1.10
vm220-a74b3c63-0000002e,AIX 7.2 7200-03-01-1838
ambervios1 FUBAR,VIOS
vm50 SLES12,Linux/SuSE 4.4.21-69-default 12
```

Hmm, we'll want to use "sort" here
and put the system name at the
start of each line

The commands on the HMC CLI



```
lssyscfg -r sys -F name | grep -vi ^BMC | sort | while read server
do
lssyscfg -m ${server} -r lpar -F name,os_version| \
    sed -e s/^{server},/ |sort
echo
done
```



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The script on a home server



```
hmcuser=scripter@hmc16

ssh $hmcuser '
lssyscfg -r sys -F name | grep -vi ^BMC | sort | while read server
do
lssyscfg -m ${server} -r lpar -F name,os_version| \
    sed -e s/^{server},/ |sort
echo
done
'
```



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cat get_ats_wwpns



```
ssh scripiter@hmc16 '
lssyscfg -r sys -F name | while read sys
do lssyscfg -r sys -m ${sys} -F name,state | grep -v "Power Off" && {
    lshwres -r io --rsubtype slotchildren -m ${sys} \
        -F phys_loc,description,mac_address,wwpn,microcode_version |grep Fibre
    echo
}
done
'
```



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get_ats_wwpns output



```
P7-p710c-indigo,Operating
U78AB.001.WZSH31E-P1-C4-T1,8 Gigabit PCI-E Dual Port Fibre Channel Adapter,null,1000000c992c32e,null
U78AB.001.WZSH31E-P1-C4-T2,8 Gigabit PCI-E Dual Port Fibre Channel Adapter,null,1000000c992c32f,null

P9-S924-red,Operating

BMC-9006-22P_130A6WA,Operating

BMC-9183-22X_13002EA,Operating

P9-S922-amber,Operating
U78D3.001.WZS00HD-P1-C8-T1,PCIe2 16Gb 2-Port Fibre Channel Adapter,null,100000109b335f0d,100300
U78D3.001.WZS00HD-P1-C8-T2,PCIe2 16Gb 2-Port Fibre Channel Adapter,null,100000109b335f0e,100300
U78D3.001.WZS00HD-P1-C2-T1,PCIe2 16Gb 2-Port Fibre Channel Adapter,null,100000109b331ba0,100300
U78D3.001.WZS00HD-P1-C2-T2,PCIe2 16Gb 2-Port Fibre Channel Adapter,null,100000109b331ba1,100300
```



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cat getlmbs



```
ssh scripiter@hmc16 '
    lssyscfg -r sys -F name | grep -v ^BMC | while read sys
    do echo -e "${sys}\\t\\c
        lshwres -m ${sys} -r mem --level sys -F mem_region_size
    done | sort
'
```

LPM is impossible if the LMB is not the same on the source and the target



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getlmbs output



```
P7-p710b-cyan      256
P7-p710c-indigo   256
P7-p730b-green    256
P7-p770-purple    256
P8-E850-ruby      256
P8-S822-lemon     256
P8-S822-lime      256
P8-S824-emerald   256
P9-S922-amber     256
P9-S924-red       256
```



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cat whereispar



```
#####
#                                                                 #
# A simple script - attempts to find an LPAR by name - far from foolproof but helpful #
#                                                                 #
#   Written by Gareth Coates gaz@uk.ibm.com in 2020.      Copyright (c) IBM 2020   #
#                                                                 #
#####
export needle=$1
ssh hscroot@hmc16 "
#set -xv
    lssyscfg -r sys -F name | while read sys
    do lssyscfg -r lpar -m \${sys} -F name | while read lpar
        do echo \${lpar} | grep -qi $needle && echo -e \${sys}\\\t\${lpar}
        done
    done
"

```



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whereispar - output



```
whereispar blue
P9-S924-red      w3-blue

whereispar silver
P9-S924-red      silver4 AIX6.1
P9-S924-red      silver1 Ubuntu18.04
P9-S924-red      silver6 SLES15
P9-S924-red      silver7 RHEL8
P9-S924-red      silver3 AIX7.1 TL4
P9-S924-red      silver5 AIX 7.2.TL3
P9-S924-red      silver2 RHEL75

```



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Let's look at the quoting

```
export needle=$1
ssh hscroot@hmc16 "
#set -xv
lssyscfg -r sys -F name | while read sys
do lssyscfg -r lpar -m \${sys} -F name | while read lpar
do echo \${lpar} | grep -qi $needle && echo -e \${sys} \\t \${lpar}
done
done
"
```

And this is a very
simple script

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ping-pong – an LPM script - the main loop



```
echo $LPAR is on $SOURCE and goes to $TARGET
echo Starting migration ... at $(date +%H:%M:%S) ... \\c

time ssh hscroot@$SOURCEHMC "migrlpar -o m \
    -t $TARGET -m $SOURCE \
    -u hscroot -p $LPAR --ip $TARGETHMC"

RESULT=$?
echo \\007
[ $RESULT -ne 0 ] && {
    ssh padmin@$VIOS "clffdc -c VIOS -p 1"
    # The snap is created under
    # /home/ios/logs/sfp_ffdc
    exit
}
```

We completed
32874 migrations
Between POWER8
and POWER9

In this script,
commands are
ssh'd onto the
HMC & the VIOS

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DLPAR



```
lshwres -m $SYSTEM --level lpar -r proc --filter lpar_ids=$ID -F curr_min_proc_units,curr_proc_units,curr_max_proc_units
```

```
0.5,3.0,4.0
```

```
lshwres -m $SYSTEM --level lpar -r proc --filter lpar_ids=$ID -F curr_min_procs,curr_procs,curr_max_procs,curr_uncap_weight
```

```
1,4,4,128
```

```
lshwres -m $SYSTEM --level lpar -r mem --filter lpar_ids=$ID -F curr_min_mem,curr_mem,curr_max_mem
```

```
4096,4096,32768
```

Use `chhwres` to modify:

```
chhwres -m $SYSTEM -r proc -o r -p $LPAR --procs 1
```

```
chhwres -m $SYSTEM -r proc -o s -p $LPAR --procunits 0.6
```

```
chhwres -m $SYSTEM -r mem -o a -p $LPAR -q 1024
```



r = remove s = set a = add

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DPO – Dynamic Platform Optimiser



```
lsmemopt -o calcscore -r lpar -m $AMBER -F lpar_name,curr_lpar_score,predicted_lpar_score
```

```
ambervios1,100,90
```

```
ambervios2,100,100
```

```
ambervios3,80,100
```

```
vm50 SLES12,100,100
```

```
vm224,100,100
```

```
vm220-a74b3c63-0000002e,100,100
```



```
optmem -m $AMBER -t affinity -p ambervios3 -o start
```

```
ambervios1,90,90
```

```
ambervios2,100,100
```

```
ambervios3,100,100
```

```
vm50 SLES12,100,100
```

```
vm224,100,100
```

```
vm220-a74b3c63-0000002e,100,100
```



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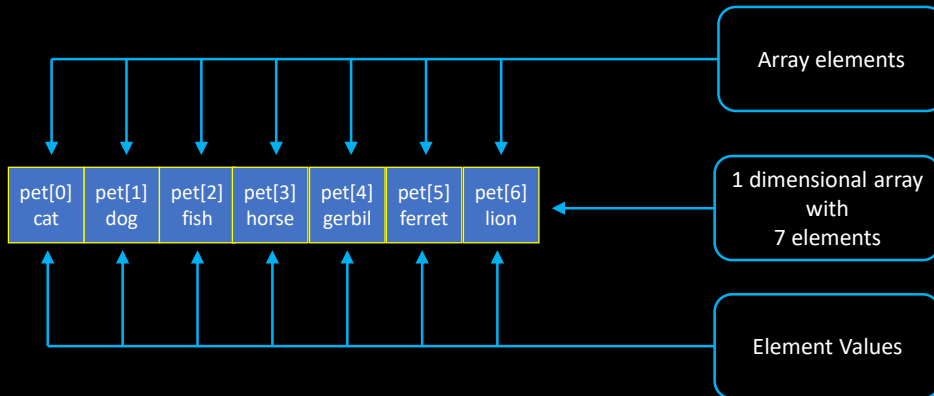
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Arrays



- ❖ Do you use arrays in your scripts?
- ❖ They are internal features of ksh and bash
- ❖ Easy to use and allow for powerful programming



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ksh arrays in AIX



- ❖ Create an array called MACHINES
 - Elements are the names of machines managed by an HMC

```
set -A MACHINES $(ssh hscroot@${HMC} ' lssyscfg -r sys -F name ' )
```

It really is that easy



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bash arrays



```
MACHINES=( $(ssh hscroot@hmc16 ' lssyscfg -r sys -F name ' ) )
```

That is even easier

ABC
VBC

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Using arrays



```
ELEMENT=0
while [ ${ELEMENT} -lt ${#MACHINES[*]} ]
do
    echo ${ELEMENT} \t ${MACHINES[${ELEMENT}]}
    ELEMENT=$(( ELEMENT + 1 ))
done
```

Done

```
0      P7-p730b-green
1      P7-p750-peach
2      P7-p750-diamond
3      P6-p520-red
4      P7-p770-purple
5      P8-S822-lime
6      P6-p520-gold
7      P7-p710c-indigo
8      P6-p520-silver
9      P8-E850-ruby
10     P6-p520-bronze
11     P6-p520-orange
12     P8-S824-emerald
```



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So what? Well, psalm



<https://ibm.biz/PowerTricks>

POWER Server And LPAR Menu

```
0          9.137.62.13      hmc16.aixncc.uk.ibm.com
1          9.137.62.27      hmc15.aixncc.uk.ibm.com
```

Please select an HMC by number:



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PSALM = Power Systems and LPAR Manager



```
0          Select a Managed Server
1          Get information about the HMC
```

Please make a selection: 0

```
0          P8-S824-emerald
1          P7-p730b-green
2          P8-E850-ruby
3          P7-p710b-cyan
4          P7-p710c-indigo
5          P7-p770-purple
6          P9-S924-red
7          P8-S822-lemon
8          BMC-9006-22P_130A6WA
9          BMC-9183-22X_13002EA
10         P9-S922-amber
11         P8-S822-lime
```

Please select a machine by number:



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PSALM – selecting a machine and LPAR



```
9      BMC-9183-22X_13002EA
10     P9-S922-amber
11     P8-S822-lime
```

Please select a machine by number: 10

```
0      Select an LPAR on this Managed Server
1      Get information about this Managed Server
```

Please make a selection: 0

0	vm224	17	aixlinux	Open_Firmware
1	ambervios3	3	vioserver	Running
2	ambervios2	2	vioserver	Running
3	vm220-a74b3c63-0000002e	23	aixlinux	Running
4	ambervios1	1	vioserver	Not_Activated
5	vm50_SLES12	11	aixlinux	Running

Please select an LPAR by number:



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PSALM – selecting what to do



Please select an LPAR by number: 3

vm220-a74b3c63-0000002e,23,aixlinux,Running

- 1) List resources
- 2) Activate Normal
- 3) Activate SMS
- 4) Open vterm
- 5) Close vterm
- 6) Shutdown immediate
- 7) Shutdown OS

Please make a selection:



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There is only one configuration file



```
vm220:/# cat /usr/local/lib/psalm
9.137.62.13      hmc16          # for POWER9
9.137.62.27      hmc15          # for POWER9
```

- ❖ All the HMCs, servers and LPARs are worked out in the script, using arrays
- ❖ No maintenance when adding a server or an LPAR



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Create an LPAR



- ❖ A suite of scripts and files called “malt “
 - Make An LPAR Tool
 - <https://ibm.biz/PowerTricks>

config	The configuration file
malt	The script which runs it all
bkprofiles	Create a backup of the profiles
dmpar_vios	DLPAR the virtual adapters into the VIOSes
chprof_vios	Add the virtual adapters to the VIOS profiles
mkmpar_client_2vio	Create the LPAR (dual VIOS version)



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mk1par_client_2vio



```
# a script to create an LPAR
# written by Gareth Coates = gaz@uk.ibm.com
#
# part of the "malt" suite and requires the config file

ssh hscroot@${HMC} "
    mksyscfg -r lpar -m ${MACH} -i \
    \\\"virtual_scsi_adapters=${S0SLOT}/client/${SERVERID_0}/${SERVERSLOT}/${S0REQ}, \
        ${S1SLOT}/client/${SERVERID_1}/${SERVERSLOT}/${S1REQ}\\\", \
    \\\"virtual_eth_adapters=${E0SLOT}/0/${E0PVID}/${E0TRUNK}/${E0REQ}, \
        ${E1SLOT}/0/${E1PVID}/${E1TRUNK}/${E1REQ}, \
        ${E2SLOT}/0/${E2PVID}/${E2TRUNK}/${E2REQ}, \
        ${E3SLOT}/0/${E3PVID}/${E3TRUNK}/${E3REQ}\\\", \
    name=${LPARNAME}, \
    lpar_id=${CLIENTID}, \
    lpar_env=aixlinux, \
    work_group_id=none, \
    shared_proc_pool_util_auth=0, \
    power_ctrl_lpar_ids=none, \
    boot_mode=norm, \
    auto_start=0, \
    profile_name=${CLIENTPROF}, \
    min_mem=${MINMEM}, \
    desired_mem=${DESMEM}, \
    max_mem=${MAXMEM}, \
    proc_mode=shared, \
    min_proc_units=${MINPROCUNITS}, \
    desired_proc_units=${DESPROCUNITS}, \
    max_proc_units=${MAXPROCUNITS}, \
    min_procs=${MINPROCS}, \
    desired_procs=${DESPROCS}, \
    max_procs=${MAXPROCS}, \
    sharing_mode=uncap, \
    uncap_weight=${WEIGHT}, \
    io_slots=none, \
    lpar_io_pool_ids=none, \
    max_virtual_slots=${MAXVSLOTS}, \
    boot_mode=norm, \
    conn_monitoring=0, \
    auto_start=0, \
    power_ctrl_lpar_ids=none
\"
"
```

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Running malt



```
VM220
Make An LPAR Tool Version: 0.7

Running "doit" using "./config" as the config file?

Do you want to continue [yYnN] ? y
YES
Backing up the profile definitions - exit if it fails
Adding virtual scsi adapters to the profiles of the VIO servers
starting 1st server
starting 2nd server
Adding virtual scsi adapters to VIO servers using DLPAR
starting 1st VIO server
starting 2nd VIO server
Making the client LPAR

real    0m14.03s
user    0m0.10s
sys     0m0.00s
vm220:/usr/local/local/malt/VUG#
```

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Did it work?



```
hscroot@hmc16:~> lssyscfg -r lpar -m $AMBER --filter lpar_ids=107
name=vm107-malt,lpar id=107,lpar env=aixlinux,state=Not
Activated,resource config=0,os version=Unknown,logical serial num=78049406B,default profile=normal,cur
r profile=work group id=none,shared proc pool util auth=0,allow perf collection=0,power ctrl lpar ids
=none,boot mode=norm,lpar keylock=no,m auto start=0,redundant err path reporting=0,imc state=inactive,
imc ipaddr=,time_ref=0,lpar avail priority=127,desired lpar proc compat mode=default,curr lpar proc co
mpat mode=POWER9_base,simplified_remote_restart capable=0,sync_curr_profile=0,affinity_group_id=none,v
tpm enabled=0,migr storage_vios_data_status=No data
collected,migr_storage_vios_data_timestamp=unavailable,powervm_mgmt_capable=0,pend_secure_boot=0,curr
_secure_boot=0
```

```
hscroot@hmc16:~> lssyscfg -r prof -m $AMBER --filter lpar_ids=107
name=normal,lpar name=vm107-
malt,lpar id=107,lpar env=aixlinux,all resources=0,min mem=512,desired mem=768,max mem=1024,min num hu
ge pages=null,desired num huge pages=null,max num huge pages=null,mem mode=ded,mem expansion=0.0,hpt_r
atio=1:128,ppt ratio=1:4096,proc mode=shared,min proc units=0.2,desired proc units=0.5,max proc units=
1.8,min procs=1,desired procs=1,max procs=2,sharing mode=uncap,uncap_weight=100,shared_proc_pool_id=0,
shared_proc_pool_name=DefaultPool,affinity_group_id=none,io_slots=none,lpar_io_pool_id=none,max_virtu
al_slots=200,virtual_serial_adapters=0/server/1/any//any/1,1/server/1/any//any/1,virtual_scsi_adapt
ers=11/client/2/ambervios2/107/1,12/client/3/ambervios3/107/1,virtual_eth_adapters=2/0/627/0/17/ETHER
NET0/all/none,4/0/104/0/1/ETHERNET0/all/none,5/0/105/0/1/ETHERNET0/all/none,6/0/106/0/1/ETHERNET
0/all/none,virtual_eth_vsi_profiles=none,virtual_fc_adapters=none,vnic_adapters=none,vtpm_adapters=n
one,boot mode=norm,conn_monitoring=0,auto start=0,power ctrl lpar ids=none,work group id=none,redundan
t_err_path_reporting=0,lpar_proc_compat_mode=default,electronic_err_reporting=null,sriov_eth_logical_p
orts=none,sriov_roce_logical_ports=none
```



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EZH – a utility from <http://ezh.sourceforge.net/>



- ❖ EZH - Easy HMC Command Line Interface
- ❖ Written by Brian Smith

EZH version 1.2.
 Copyright 2012 Brian Smith.
 Released under GPLv3 license
<http://ezh.sourceforge.net>



1. LPAR Related Commands
2. DLPAR Related Commands
3. Frame Related Commands
4. Misc. Commands
- q. Exit

Enter option [1-4, q to quit] :

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General tip



- ❖ Think outside the box
- ❖ There's more than one way to cook a potato
- ❖ For example uptime on an HMC

```
scripter@hmc16:~> uptime
bash: uptime: command not found
```



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HMC uptime



```
1 scripter@hmc16:~> ls -l /var/log/boot.log
-rw-r--r-- 1 root root 13734 Apr 26 09:03 /var/log/boot.log

2 scripter@hmc16:~> who -b
    system boot  Apr 26 08:57

3 scripter@hmc16:~> cat /proc/uptime
140535.85 6712752.46
+---+---+ +---+---+
|           |
|           +-----> Idle seconds
|
|           +-----> Seconds of uptime
```

- ❖ But $6,712,752.46 > 140,535.85$
- ❖ how can the “idle time” exceed the “uptime”?



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A way to redirect in VIOS



```

$ ls -l
total 8
-rw-r--r--  1 root      system          63 Apr 27 09:45 ioscli.log

$ ioslevel > ioslevel.out
rksh: ioslevel.out: 0403-019 The operation is not allowed in a restricted shell.

$ ioslevel | tee ioslevel.out
3.1.1.10

$ ls -l
total 16
-rw-r--r--  1 root      system          81 Apr 27 18:19 ioscli.log
-rw-r--r--  1 scripiter system          9 Apr 27 18:19 ioslevel.out

$ cat ioslevel.out
3.1.1.10

```

As expected?

OH!

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What AIX command did that VIO command actually run?



```

$ export CLI_DEBUG=33
$ lsmap -vadapter vhost8
AIX: "lsdev -c adapter -t IBM,v-scsi-host -s vdevice -F "name" | wc -l -c"
AIX: "lsdev -c adapter -t IBM,v-scsi-host -s vdevice -F "name""
AIX: "lsdev -C -l vhost8 -F "physloc""
AIX: "lsdev -p vhost8 -F "name" | wc -l -c"
AIX: "lsdev -p vhost8 -F "name""
SVSA                Physloc                Client Partition ID
-----
vhost8              U9009.22A.7804940-V3-C8 0x00000011

VTD                vtscsi10
Status              Available
LUN                 0x8100000000000000
Backing device      SSPVolume_1.f4583ef95b5c90fe6f7d4dfc31db213a
Physloc
Mirrored            N/A

$

```



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VIOS – what commands have you run

```
$ fc -l
597  ls -l /usr/bin/ | grep -i ksh
598  echo $PATH
599  ls /usr/ios/cli
600  ls /usr/ios/utils
601  ls /usr/ios/lpm/bin
602  ls /usr/ios/oem
603  ls /usr/ios/ldw/bin
604  ls /home/padmin
605  smitty
606  ls -l *smit*
607  lsrep
608  oem_setup_env
609  diag
610  lsrep
611  lsgcl
612  fc -l
```



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VIOS – what commands have you run

```
$ lsgcl
Apr 26 2020, 10:33:53 root    ioslevel
Apr 26 2020, 10:33:55 root    license
Apr 26 2020, 10:34:01 root    lsdev -dev ent5 -attr netaddr
Apr 26 2020, 10:43:53 root    ioslevel
Apr 26 2020, 10:44:01 root    lsdev -dev ent5 -attr netaddr
Apr 26 2020, 10:44:04 root    ioslevel
Apr 26 2020, 10:47:59 root    lsmap -all -net -field svea physloc sea backing
                                   bdphysloc -fmt :
Apr 26 2020, 10:47:59 root    lsdev -dev ent5 -attr ctl_chan
Apr 26 2020, 10:47:59 root    lsdev -dev ent5 -attr ctl_chan
Apr 26 2020, 10:47:59 root    lsmap -all -field svsa physloc clientid vtd lun
                                   backing bdphysloc status -fmt :
Apr 26 2020, 10:47:59 root    lssp -field pname name vtd -fmt , -all
Apr 26 2020, 10:48:00 root    lsvg old_rootvg -field ppsize -fmt :
Apr 26 2020, 10:48:00 root    lsvg rootvg -field ppsize -fmt :
```



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Which VIOS provides your vSCSI

❖ Run this as root in a client LPAR

```
# print "cvai" | kdb | grep vscsi | grep -v read
vscsi0      0x000007 0x000000000000 0x0      ambervios2->vhost1
vscsi2      0x000007 0x000000000000 0x0      ambervios3->vhost2
```

❖ shows the VIOS and vhost for a client vscsi adapter.

BUT
Remember what
Doug Gwyn said



Which VIOS provides your NPIV

❖ Run this as root in a client LPAR

```
echo vfcs | kdb | grep vfchost
fcs0      0xF1000A00001EC000 0x0008 peachvio1 vfchost0 0x01 0x0000
fcs1      0xF1000A00001EA000 0x0008 peachvio2 vfchost0 0x01 0x0000
```

❖ shows the VIOS and vhost for a client vscsi adapter.

BUT
Remember what
Doug Gwyn said

ssp scripts from mr_nmon



❖ <https://www.ibm.com/support/pages/shared-storage-pools-hands-fun-virtual-disks-lu-example>

Shared Storage Pools - Hands-On Fun with Virtual Disks (LU) by Example

How To

Summary

Strictly at your own risk but if you are a UNIX guru some very useful techniques.

Objective

Nigel Griffiths
IBM Technical Staff Member
Advanced Technology Support, EMEA



Steps

Warning: If you get the `nslim` or `dd` commands wrong then you will **destroy** your LU virtual disks & virtual machine content. Please tell me, if you do - I enjoy a good laugh :-)
Please, test the commands & your understanding on a test SSP!

Shared Storage Pool four Ksh script commands and a program that I hope you will find useful:

1. `ncluster` - status of all VIOS
2. `nlu` - improved lu replacement
3. `npool` - storage pool use
4. `nmap` - finds if a lu is online (mapped) on any VIOS
5. `nslim` - copy a fat LU backup to a now THIN LU - see below for details. Version 3 with C source code.
 - Download includes a README and hints:
 - `ntool_for_ssp_v4.tar` (40 KB) 22nd May 2017

From the README:

ntools for SSP

- These scripts and code are offers "as-is" no warrentee what-so-ever.
 - As they are so small they a not cotyrighted.
 - The scripts are simple but I find them very useful.
 - The `nslim` program can destroy your SSP data so be careful.
 - I hope you find them useful too.
- Chears, Twitter user @mr_nmon, Nigel Griffiths.

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ncluster



❖ A simple, but very useful two liner:

```
/usr/ios/cli/ioscli cluster -status -verbose -fmt : -
field "Node State" "Node Repos State" "Pool State"
"Node Roles" "Node Upgrade Status" "Node Name" | \
awk -F: 'BEGIN { printf "No State Repos Pool Role ---
Upgrade-Status--- Node-Name\n" ; } { printf "%2d %5s
%5s %4s %4s %20s %s\n", NR, $1, $2, $3, $4, $5, $6; }'
```

❖ It takes a while to run, so be patient

➤ The `cluster` command takes time, it is not a slow script!



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ncluster - output



No	State	Repos	Pool	Role	---Upgrade-Status---	Node-Name
1	DOWN	UNKNOWN			3.1.1.10 ON_LEVEL	greenvios1.aixncc.uk.ibm.com
2	DOWN	UNKNOWN			3.1.1.10 ON_LEVEL	greenvios2.aixncc.uk.ibm.com
3	OK	OK	OK		3.1.1.10 ON_LEVEL	indigovios1.aixncc.uk.ibm.com
4	DOWN	UNKNOWN			3.1.1.10 ON_LEVEL	rubyvios1.aixncc.uk.ibm.com
5	DOWN	UNKNOWN			3.1.1.10 ON_LEVEL	rubyvios2.aixncc.uk.ibm.com
6	DOWN	UNKNOWN			3.1.1.10 ON_LEVEL	emeraldvios1.aixncc.uk.ibm.com
7	DOWN	UNKNOWN			3.1.1.10 ON_LEVEL	emeraldvios2.aixncc.uk.ibm.com
8	DOWN	UNKNOWN			3.1.1.10 ON_LEVEL	limevios1.aixncc.uk.ibm.com
9	DOWN	UNKNOWN			3.1.1.10 ON_LEVEL	limevios2.aixncc.uk.ibm.com
10	OK	OK	OK		3.1.1.10 ON_LEVEL	redvios1.aixncc.uk.ibm.com
11	OK	OK	OK		3.1.1.10 ON_LEVEL	redvios2.aixncc.uk.ibm.com
12	OK	OK	OK		3.1.1.10 ON_LEVEL	ambervios2.aixncc.uk.ibm.com
13	OK	OK	OK	DBN	3.1.1.10 ON_LEVEL	ambervios3.aixncc.uk.ibm.com

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npool - storage pool use

name = globular

Pool Pacific

Pool-Size= 4192256 MB

Pool-Used= 2722584 MB =64.94%

Pool-Free= 1469672 MB =35.06%

Allocated to client VMs = 4924417 MB

Allocated compared to Pool=117.46%

Used to Allocate Ratio =55.29%

Overcommit=3495928 MB



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nlu



nlu -h

/home/padmin/nlu Nigel's lu command with improved layout and column ordering
 /home/padmin/nlu [-sizemb | -usedmb | -used | -type | -tier | -name (default)]

nlu -sizemb | head

SizeMB	UsedMB	Used%	Type	Tier	Name
8192	3760	45%	THIN	SYSTEM	microVM
32768	0	0%	THIN	SYSTEM	SSPVolume_3
32768	0	0%	THIN	SYSTEM	SSPVolume_4
32768	0	0%	THIN	SYSTEM	SSPVolume_5
32768	0	0%	THIN	SYSTEM	image-AIX-7211-Gold
32768	0	0%	THIN	SYSTEM	volume-AIX7233_CloudReady-12b18a7d-9833
32768	0	0%	THIN	SYSTEM	volume-temp_vol_45c536f3-48fe-4c1c-8249-31e9-07f7d001-5ba6
32768	0	0%	THIN	SYSTEM	volume-temp_vol_45c536f3-48fe-4c1c-8249-31e9-1f256e45-b2da
32768	0	0%	THIN	SYSTEM	volume-temp_vol_45c536f3-48fe-4c1c-8249-31e9-dbaaf347-be4e



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nmap



nmap -h

nmap Nigel's nmap command to find if a LU (virtual disk) is mapped anywhere on the SSP to a LPAR/VM

nmap -h

nmap lu-name

nmap ALL

nmap SSPVolume_2

Search the SSP for SSPVolume_2

NODE ambervios3.aixncc.uk.ibm.com

NODE ambervios2.aixncc.uk.ibm.com

NODE redvios2.aixncc.uk.ibm.com

NODE redvios1.aixncc.uk.ibm.com

vhost31:U9009.42A.7804930-V1-C25:SSPVolume_2.52d0ff4846f94cc77b32b7a1d11020e

NODE limevios2.aixncc.uk.ibm.com

NODE limevios1.aixncc.uk.ibm.com

NODE emeraldvios2.aixncc.uk.ibm.com

NODE emeraldvios1.aixncc.uk.ibm.com

NODE rubyvios2.aixncc.uk.ibm.com

NODE rubyvios1.aixncc.uk.ibm.com

NODE indigovios1.aixncc.uk.ibm.com

NODE greenvios2.aixncc.uk.ibm.com

NODE greenvios1.aixncc.uk.ibm.com



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Resources



- ❖ <https://developer.ibm.com/technologies/systems/articles/au-vioscli/>
- ❖ https://www.ibm.com/support/knowledgecenter/POWER9/p9hb1/p9hb1_vios_concepts_cli.htm
- ❖ <http://www.redbooks.ibm.com/>



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