

DR_DRCT: A Journey with the USER DIRECTory

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Abstract

When systems grow, the size and complexity of the user directory grows along with it. A new release means new virtual machines in the directory. When setting up a new system it may be convenient to clone a directory, but then changes are required. You can write tools to make directory modification tasks easier. The DR_DRCT package on the z/VM Download page includes some such tools; it also represents an education on capabilities of the directory. We take a tour of those tools, the motivation behind them, and some of that education.

Agenda

- What is in the Directory?
- Install – Where is the Directory?
- Directory Problems
 - What happens when there is no directory?
 - What if the directory doesn't fit in DRCT?
 - Moving/Expanding DRCT area: MOVEDRCT
 - Finding lost minidisks: MAPADASD
 - Re-building your Source Directory after a new install
 - DIRSUB, RDIRSUB
- Interesting capabilities within the Directory
- Fun tools
 - VM2EAV
 - VDIRCMD

Background – How did I get into this?

- Expansion of Crypto capabilities added size to the object directory
- Compatibility testing meant we were trying multiple versions
- The object directory became too big to fit in DRCT
- Rather than increase DRCT space, tester used a work-around
- Small mistake, and work-around bites tester
- Experience. Something you get just after you need it.

What is in the Directory?

“The z/VM user directory specifies the configuration and operating characteristics of virtual machines.”

- Source Directory = That human-readable and editable file
 - Default name USER DIRECT
- Object Directory = CP-readable version that DIRECTXA puts in the DRCT-allocated area
- In an SSI, one Source Directory, but an Object Directory for every SSI Member System

INSTALL: Where does INSTALL put the Directory?

- DRCT allocated area on the “RES” pack
 - Cyl 1-20 (ECKD) or Blocks 01200-25199 (FBA)
- CP takes first DRCT area it finds, starting on the RES (IPL) pack

What happens when there is no Directory?

System Operator: “AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAah!!!!.”

- The system will come up, but OPERATOR is the only user that exists
- And even OPERATOR is hobbled, e.g. no minidisks
- Likewise consider what happens if you drastically alter the directory while the system is up
 - Logged on users continue to exist
 - But if they have been removed from the directory and logoff... poof!

What if the Directory does not fit in DRCT area?

HCPDIR760E NOT ENOUGH SPACE ALLOCATED FOR DIRECTORY
EOJ DIRECTORY NOT UPDATED

- Your options are
 - Make the USER DIRECTory smaller
 - Make the DRCT area bigger
- MOVEDRCT EXEC is for the second option

USING MOVEDRCT

- Step 1: Update \$DIRECT\$’s MDISK lines
 - USER \$DIRECT\$ NOLOG
 - MDISK A01 3390 0001 020 PTB69A R

- Step 2: Run MOVEDRCT
 - MOVEDRCT 123 USER DIRECT C

- MOVEDRCT will do some sanity checks, then move the object directory to the new “minidisk” location
 - Sanity checks don’t cover everything, e.g. access to CPFMTXA assumed (but you won’t get far)

- In an SSI, there will be minidisks A02, A03, etc. and you will need to run MOVEDRCT on each member

Finding lost minidisk: MAPADASD

- Creates a map of CMS-formatted areas on DASD
 - Kind of like DISKMAP, but no info on ownership

- Works backward from the end of the pack, using DEF MDISK to identify CMS-formatted regions

- Currently assumes ECKD
 - Adding FBA is straightforward

Re-building your Source Directory after a new INSTALL

Your mission: Create a new source directory, like the old directory but using newly INSTALLED users.

- Some approaches
 - Upgrade in Place
 - Drawbacks: Old system UserIDs retained, old DASD retained
 - Copy manually
 - Drawbacks: Lots of work, error prone
 - DIRSUB EXEC
 - RDIRSUB EXEC

DIRSUB, RDIRSUB

- DIRSUB extracts specified directory entries, plus PROFILEs they INCLUDE
 - Users are specified right in the EXEC
- RDIRSUB does (almost) the same thing as DIRSUB
 - RDIRSUB re-writes DIRSUB, specifying all users **except** those specified in RDIRSUB
 - So, RDIRSUB is the complement of DIRSUB
- The intention of both EXECs is to create a file to be appended to the USER DIRECT created by INSTALL

Interesting capabilities within the Directory

- APPCPASS
 - APPCPASS N2P1AAVS N2P2AAVS SFSOWNER PASSWORD
- NICDEF
 - NICDEF FFF0 TYPE QDIO LAN SYSTEM SLOW
- POOLs of users
 - POOL LOW 1 HIGH 200 PROFILE 2DVPROF
- ADJUNCT
 - ADJUNCT MRADJUNE
- COMMAND
 - COMMAND SET PF12 RETRIEVE BACKWARD
 - COMMAND SET PF11 RETRIEVE FORWARD

Quiz! Is this an allowable set of entries?

```
*  
IDENTITY 2DV00099 FAKE      2G 16T G  
  INCLUDE 2DVPROFI
```

```
*  
USER 2DV FAKE      2G 16T G  
  POOL LOW 1 HIGH  98 PROFILE 2DVPROF  
* Each 2DVnnnnnn hosts a 2nd-level VM system built on VDisk
```

```
*  
USER 2DV FAKE      2G 16T G  
  POOL LOW 100 HIGH 898 PROFILE 2DVPROF  
* Each 2DVnnnnnn hosts a 2nd-level VM system built on VDisk
```

Superman!

- CLASS ABCDEFGHJKLMNOPQRSTUVWXYZ123456
- OPTION LNKNOPAS
 - Other OPTION statements
- IUCV
 - ANY
 - *xxx
 - IUCV *IDENT RESANY GLOBAL REVOKE

Fun Tools

- VM2EAV
 - Copy newly-installed system (5 volumes) to one big Extended Address Volume
- VDIRCMD
 - Put conditional COMMAND statements in the directory

VDIRCMD

- Uses CP exit VDIR
 - VDIR is mostly just a command that issues a command
 - Conditional is supplied by SET/QUERY PRODUCT

- Example directory entries
 - CMD VDIR CELLOMAN E FORCE BANJO
 - CMD VDIR PIANO001 E LOGOFF

VDIRCMD – Preventing VIOLIN competing with BANJO

USER BANJO LOUD 256M 5G G

...

CMD SET PRODUCT BANJO111 STATE ENABLED

...

USER VIOLIN SWEET 256M 5G G

...

CMD VDIR BANJO111 E LOGOFF

...

Coming Soon

- 8DIR EXEC
 - Convert 4-member SSI source directory to 8-member SSI source directory
- USSISOU EXEC and USSITARG EXEC
 - Issue DIRECTXA on every joined SSI member
 - ...and optionally, other commands
 - Not needed if using DIRMAINT or similar product

Tools Are Available

- VM Download Packages

<https://www.vm.ibm.com/download/packages/>

- DR_DRCT specifically

https://www.vm.ibm.com/download/packages/descript.cgi?DR_DRCT

- My developer page

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Questions?

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This presentation starts with the basics of what is the directory, what is in it, and where you find it. Then we get into some directory problems and describe some tools to deal with certain problems. Next we take a break to admire a few capabilities that have been added to the directory over the years. The presentation finishes with an introduction to a couple of tools that are peripherally related to the directory.

What we won't be covering:

- DIRMAINT or other directory manager
- RACF or other external security manager

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- Compatibility testing meant we were trying multiple versions
- The object directory became too big to fit in DRCT
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- Small mistake, and work-around bites tester
- Experience. Something you get just after you need it.

This all happened around 2014, z/VM 6.3.0.

When replacing a file, or an object directory, you don't want to delete the old version until the new one is safely written. So if the object directory half fills DRCT, it can't be added to. But you can save a tiny directory and then save one that more than fills half the space.

That's the work-around. But if, while the tiny directory is live, you log off the user which has the minidisk where the source directories are, and that user is not in the tiny directory, you have no path back. That is what happened.

Two solutions: MAPADASD to find the minidisk where the directory is, MOVEDRCT to make increasing DRCT easier.

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The experience of IPLing with no directory was like being in a white out. I knew the world was still out there somewhere, but I couldn't see it.

Another goodie: In an SSI, in the source directory I changed a USER to an IDENT. Then I issued DIRECTXA on one member and logged on the now Multiconfigurationvirtualmachine user. On a second SSI member, where I had not issued a new DIRECTXA, I attempted to log on the same user, and got "Logoff/Force Pending for user...".

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 - Sanity checks don’t cover everything, e.g. access to CPFMTXA assumed (but you won’t get far)
- In an SSI, there will be minidisks A02, A03, etc. and you will need to run MOVEDRCT on each member

MOVEDRCT includes comments for how to create a larger DRCT region when installing z/VM.

Finding lost minidisk: MAPADASD

- Creates a map of CMS-formatted areas on DASD
 - Kind of like DISKMAP, but no info on ownership
- Works backward from the end of the pack, using DEF MDISK to identify CMS-formatted regions
- Currently assumes ECKD
 - Adding FBA is straightforward

MAPADASD uses some super powers, including ATTaching DASD both to oneself and then to SYSTEM, and DEF MDISK. So it must be run from a privileged user.

Re-building your Source Directory after a new INSTALL

Your mission: Create a new source directory, like the old directory but using newly INSTALLED users.

- Some approaches
 - Upgrade in Place
 - Drawbacks: Old system UserIDs retained, old DASD retained
 - Copy manually
 - Drawbacks: Lots of work, error prone
 - DIRSUB EXEC
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DIRSUB, RDIRSUB

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 - So, RDIRSUB is the complement of DIRSUB
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To prime RDIRSUB, I used a USER DIRECT from a fresh install of the z/VM level I was upgrading *from*, and issued

```
PIPE < USER DIRECT A | find USER | specs w2 |>  
USER LIST A
```

```
PIPE < USER DIRECT A | find IDENT| specs w2|>>  
USER LIST A
```

Interesting capabilities within the Directory

- APPCPASS
 - APPCPASS N2P1AAVS N2P2AAVS SFSOWNER PASSWORD
- NICDEF
 - NICDEF FFF0 TYPE QDIO LAN SYSTEM SLOW
- POOLs of users
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- COMMAND
 - COMMAND SET PF12 RETRIEVE BACKWARD
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For APPCPASS connecting to a private resource,
parameters are: system targuser refID refPW, e.g.
APPCPASS GDLTST9A YAKSSI MAINT MPASS

For NICDEF one can add other parameters as well.
The key point, quoting CP Planning & Admin, is
“The network administrator can manage each user
connection entirely within the user directory.”

Quiz! Is this an allowable set of entries?

```
*  
IDENTITY 2DV00099 FAKE    2G 16T G  
  INCLUDE 2DVPROFI  
*  
USER 2DV FAKE    2G 16T G  
  POOL LOW 1 HIGH  98 PROFILE 2DVPROF  
* Each 2DVnnnnnn hosts a 2nd-level VM system built on VDisk  
*  
USER 2DV FAKE    2G 16T G  
  POOL LOW 100 HIGH 898 PROFILE 2DVPROF  
* Each 2DVnnnnnn hosts a 2nd-level VM system built on VDisk
```

Yes! The two pools do not overlap each other,
nor do they overlap the IDENTITY.

Superman!

- CLASS ABCDEFGHJKLMNOPQSTVWXYZ123456
- OPTION LNKNOPAS
 - Other OPTION statements
- IUCV
 - ANY
 - *xxx
 - IUCV *IDENT RESANY GLOBAL REVOKE

These are just some examples of special powers that may be granted within a directory entry. The privilege classes can alternatively be specified on the USER/IDENTITY line.

Fun Tools

- VM2EAV
 - Copy newly-installed system (5 volumes) to one big Extended Address Volume
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 - Put conditional COMMAND statements in the directory

VDIRCMD

- Uses CP exit VDIR
 - VDIR is mostly just a command that issues a command
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- Example directory entries
 - CMD VDIR CELLOMAN E FORCE BANJO
 - CMD VDIR PIANO001 E LOGOFF

I used SET/QUERY PRODUCT because I found in it exactly the functionality I needed. I would have preferred to check environmental variables for the condition, but that would require more advanced programming.

Notice that PRODUCT names must be exactly 8 characters.

VDIRCMD – Preventing VIOLIN competing with BANJO

```
USER BANJO LOUD 256M 5G G
...
CMD SET PRODUCT BANJO111 STATE ENABLED
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USER VIOLIN SWEET 256M 5G G
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CMD VDIR BANJO111 E LOGOFF
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```

VIOLIN will not stay logged on if BANJO111 is enabled, and it will be enabled if BANJO has logged on. A good companion exit would be to disable the PRODUCT BANJO111 when BANJO logs off. Then VIOLIN could not log on iff BANJO was on. Adding a corresponding PRODUCT VIOLIN11, we could then ensure BANJO and VIOLIN were never logged on at the same time.

Coming Soon

- 8DIR EXEC
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- USSISOU EXEC and USSITARG EXEC
 - Issue DIRECTXA on every joined SSI member
 - ...and optionally, other commands
 - Not needed if using DIRMAINT or similar product

These are tools developed for working with the directory of an 8-member SSI.

Tools Are Available

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Thank you for your time.
Drive safely.