

SHARE

Technology - Connections - Results

A Basic Cloning Methodology for z/VM Systems

Jim Moling
US Treasury, Financial Management Service

Thursday, August 27, 2009
Session 9169



maximize
improve agility save time
engages colleagues



Disclaimers

- **The opinions & ideas expressed herein are those of the author alone and do not necessarily reflect those of Financial Management Service, furthermore, Financial Management Service is hereby absolved of any and all responsibility or liability for the information contained herein.**
- **Copyrights & Trademarks:**
 - Any and all copyrights & trademarks are hereby acknowledged to be owned by their respective parties
 - All other brands, logos and products are trademarks or registered trademarks of their respective companies
 - All rights reserved
- **Disclaimer of Endorsement:**

Reference herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government, and shall not be used for advertising or product endorsement purposes.
- **Disclaimer of Liability:**

With respect to this presentation, neither the United States Government nor any of their employees, makes any warranty, express or implied, including the warranties of merchantability and fitness for a particular purpose, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.



Overview

- Why, What & How of Cloning
 - Why cloning?
 - What are we cloning?
 - How are we cloning?
- Demo: Cloning An Active z/VM System
- Summary: What's Next...



The Why, What & How of Cloning

- Why Cloning?

- Standardized configurations



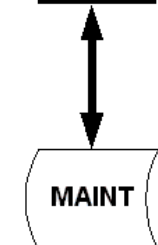
- Facilitates maintenance testing & rollout



- Time savings



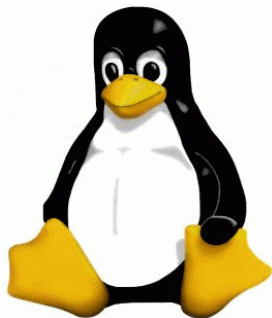
- Cost savings



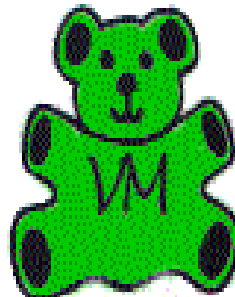
The Why, What & How of Cloning

- **What Are We Cloning?**
 - Operating Systems That Run On System z
 - z/OS: Large enterprise class systems
 - z/Linux: Linux based server systems
 - z/VM: A Hypervisor for operating systems

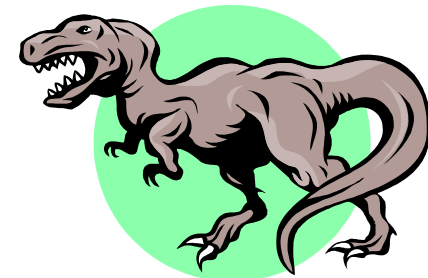
z/Linux



z/VM

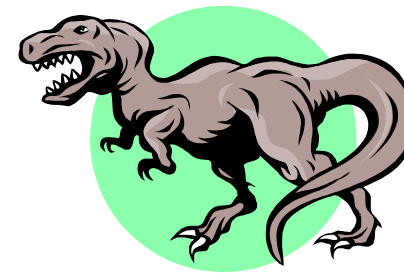
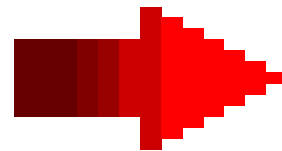
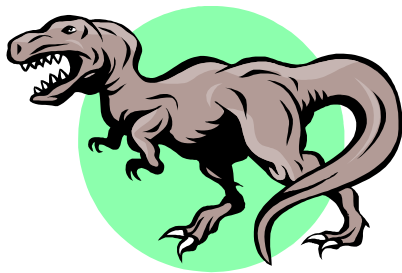


z/OS



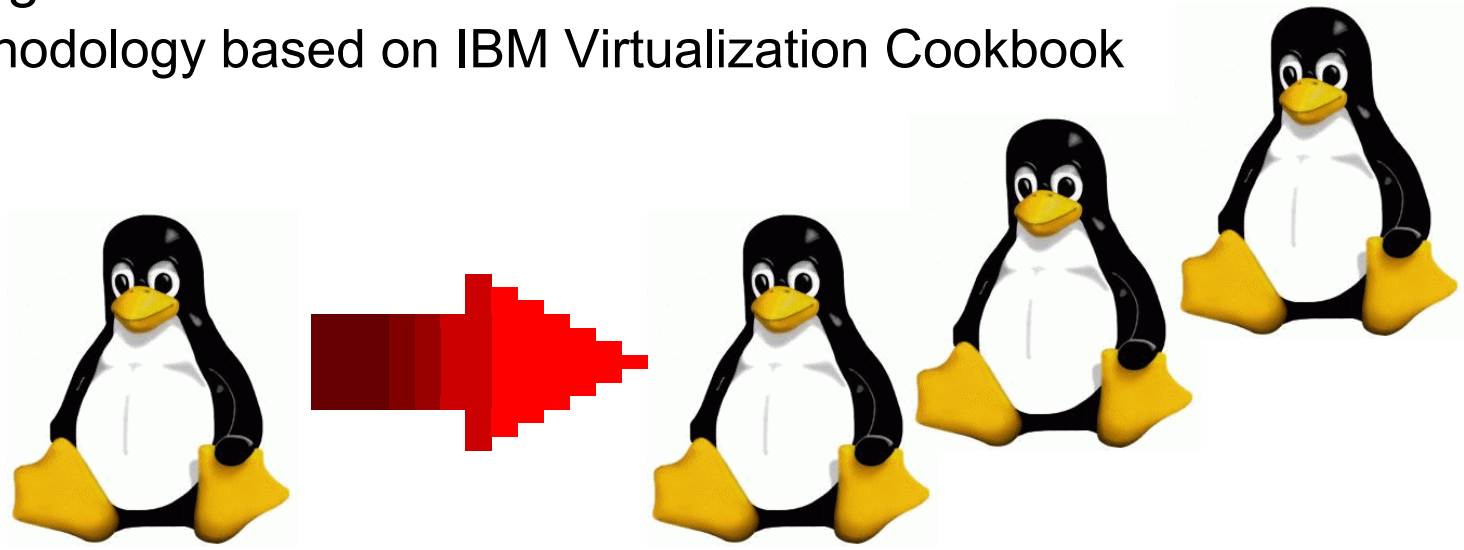
The Why, What & How of Cloning

- Cloning z/OS
 - z/OS was the first operating system that we cloned
 - We now have 18 z/OS systems across 2 data centers (and growing)
 - Takes the longest to clone: ~ 2.0-2.5 Hours
 - Cloned by running ~50 batch jobs in z/OS environment



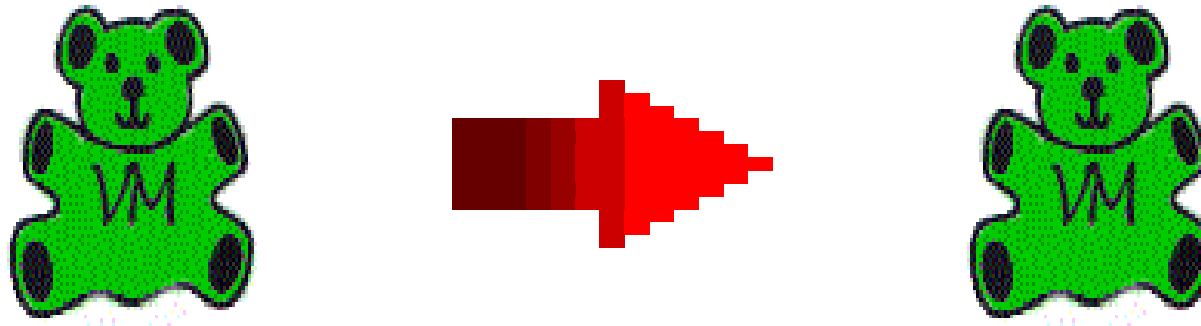
The Why, What & How of Cloning

- Cloning Virtual Linux Servers Was Next
 - We have 20+ Virtual Servers (and growing)
 - Virtual Servers are cloned in minutes (< 5 minutes)
 - 15-20 minutes if Flash Copy DASD feature not available
 - Cloning is via a “Controller” Linux Server
 - Methodology based on IBM Virtualization Cookbook



The Why, What & How of Cloning

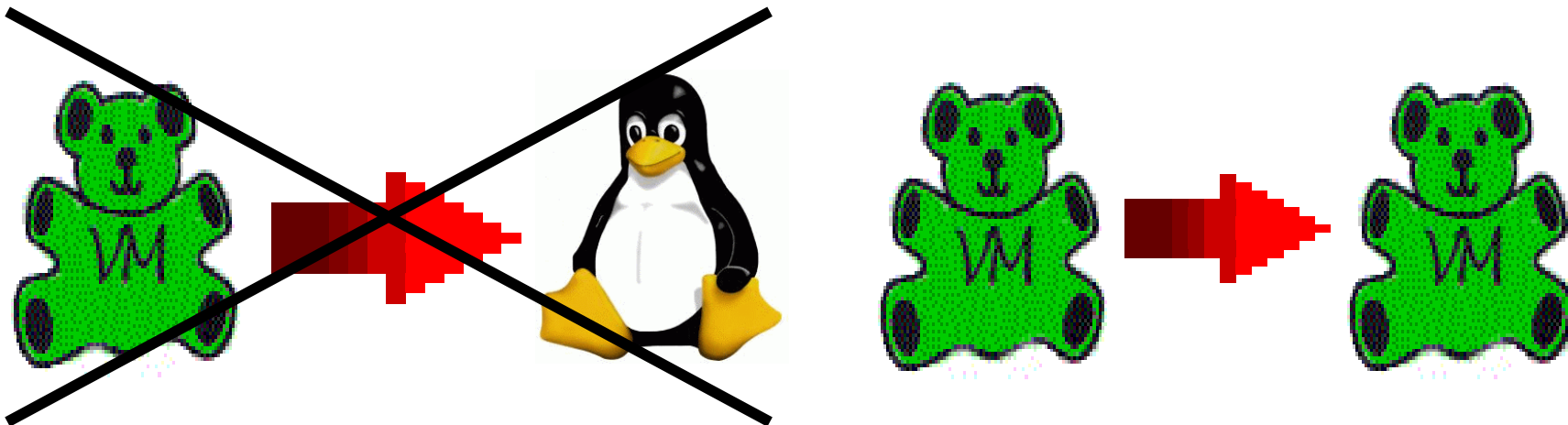
- Finally, We're Cloning z/VM Systems
 - Looked for a VM cloning process, didn't find it, so created it
 - We now have 8 z/VM systems across 2 data centers (and growing)
 - Takes about 2-3 minutes to clone z/VM
 - But takes 20-30 minutes if Flash Copy is not available
 - Cloning is performed via a "Cloning" Virtual Machine
 - If all goes well, you'll see a demo of this process ...



The Why, What & How of Cloning

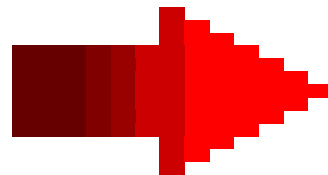
- **How Is Cloning Accomplished?**

- Establish standards that support duplication
- Establish a “Base” system as the prototype
- Develop an automated cloning procedure
- Procedure based on available utilities, i.e. Rexx, DDF, etc
- Clone a system from a like system (my rule)



How We Are Cloning z/VM

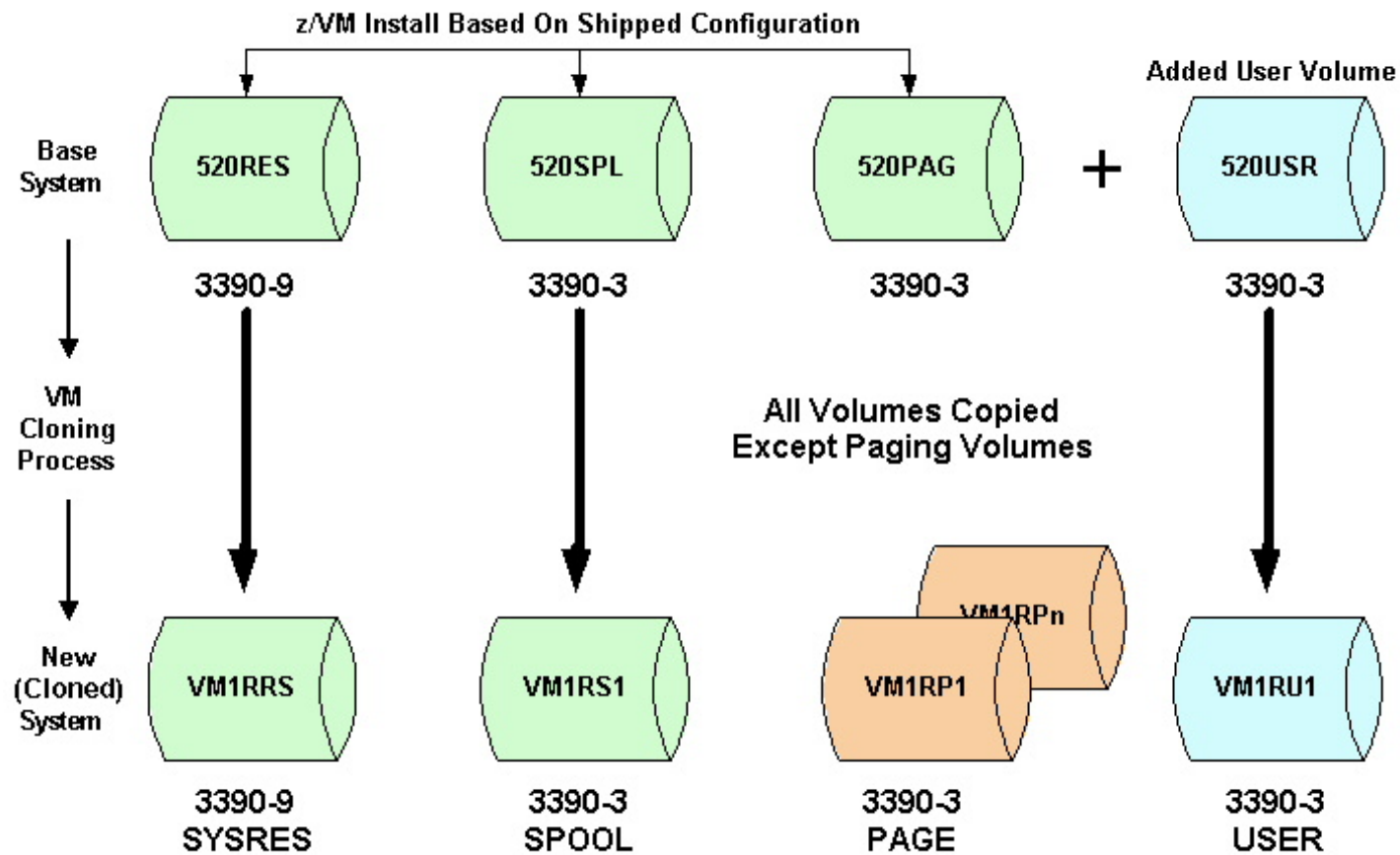
- Our z/VM Cloning Criteria
 - Cloning process developed using z/VM 5.2.0
 - Running in a shared DASD environment
 - So each z/VM system must have unique volsers
 - Based On Shipped Configuration From IBM
 - Using a single, 3390-9 volume for SYSRES
 - Not Using Dirmaint, Shared File System, External Security, ...





How We Are Cloning z/VM

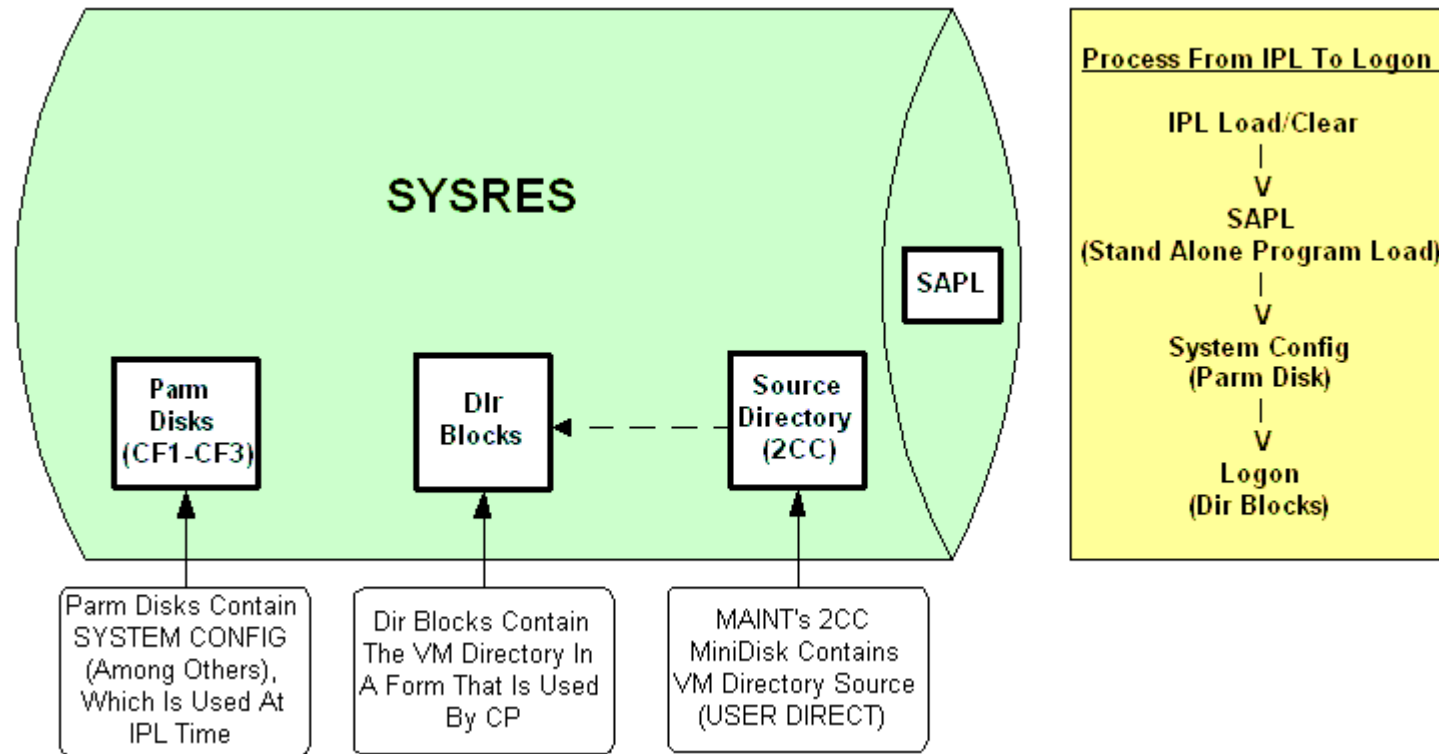
- Cloning process is based on shipped configuration + User volume





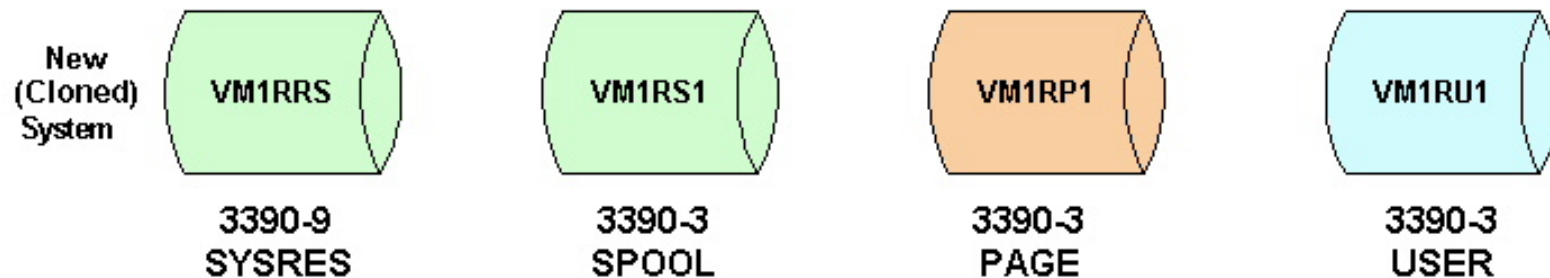
How We Are Cloning z/VM

- Two Files Must Be Modified In A Cloned System
 - SYSTEM CONFIG (Located on Parm Disk, i.e. CF1)
 - USER DIRECT (Shipped on MAINT's 2CC minidisk)



How We Are Cloning z/VM

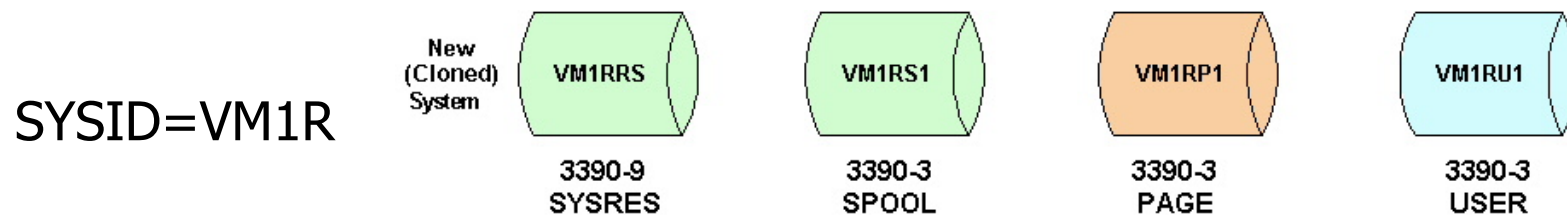
- Conventions/Standards For Cloning
 - Established a naming standard for System ID (SYSID)
 - Established a naming standard for system volumes
 - Added a User volume to the configuration
 - Created a minimal System Config “model file” for cloning
 - Created a minimal VM Directory “model file” for cloning





How We Are Cloning z/VM

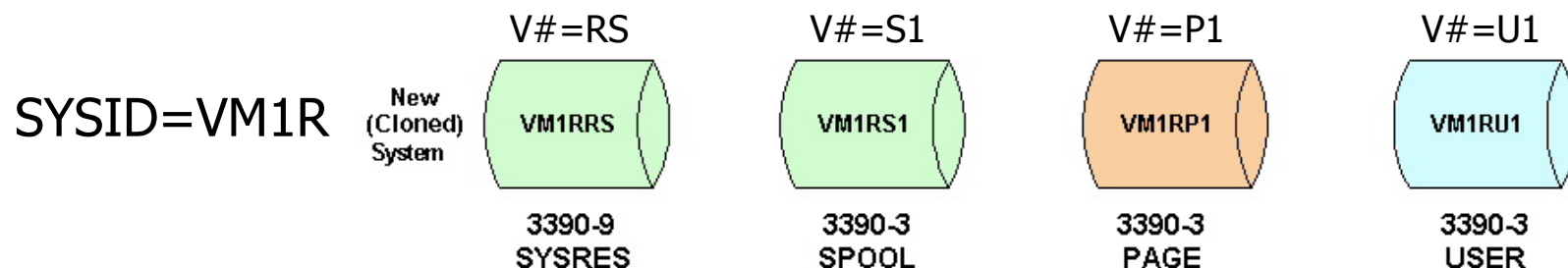
- Naming Standard – SYSID
 - Using a 4-char SYSID to drive the cloning process
 - All system files can co-exist since names are unique (based on SYSID), i.e. System Configs, VM Directories, TCP/IP files, etc.
 - Volsers are also based on SYSID to make them unique
 - SYSID format: **VMnx**, where:
 - **VM** = Common prefix so VM systems & volumes are unique (from z/OS & z/Linux in our case)
 - **n** = a number that represents the data center
 - **x** = a letter to designate the VM system





How We Are Cloning z/VM

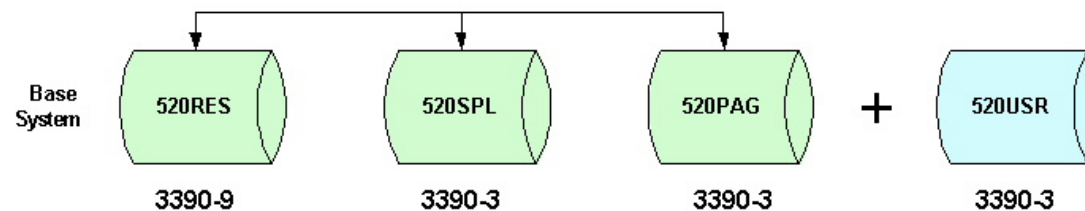
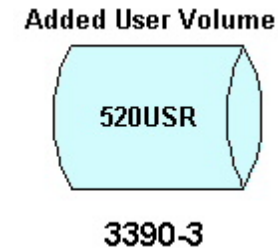
- Naming Standard – System Volsers
 - Volser format: VMnx + V# = **VMnxV#**
 - First 4 characters are the SYSID, i.e. **VMnx** (such as VM1R)
 - 5th character indicates volume type: **V** = R, P, S, U
 - 6th character is a number to keep same volume types unique: **#** = 1-9 (except SYSRES is always **S**, i.e. **RS**)
 - *Note that current cloning process does not include TDISK volumes – we just haven't needed them*
 - TDISK volume type would be **T**, i.e. VM1RT1
 - Cloning can be modified to include TDISK's (if you modify execs)





How We Are Cloning z/VM

- Why Add A User Volume?
 - Simplifies moving to a new version of z/VM
 - Simplifies maintenance via full SYSRES replacement
 - Easy to clone – just 1 more DASD volume to copy
 - Conventions:
 - Always allocate new minidisks on the User volume
 - *This means no more allocations on the SYSRES volume!*
 - Using low-end cylinders for VM users (we only have a few)
 - Using high-end cylinders for VM tools, utilities & ISV software





How We Are Cloning z/VM

- Cloning Models Give Consistent Results
 - Cloning will only change volsers for a new system
 - Cloning models should have basic definitions – you decide what they should be
 - System Config Model: fn=<Source Sysid> ft=\$CONFIG\$
 - User Directory Model: fn=<Source Sysid> ft=\$DIRECT\$
 - You can then modify the new files after cloning
 - New System Config: fn=<New Sysid> ft=CONFIG
 - New User Directory: fn=<New Sysid> ft=DIRECT



Note: fn means 'file name' & ft means 'file type'



How We Are Cloning z/VM

- Preparation For Cloning
 - Setup a cloning virtual machine called: VMCLONER
 - Make sure it has the same authorities as MAINT, i.e.
 - *Dir Option: DEVMAINT (Allows SET MDISK to work)*
 - *Dir Option: LNKNOPAS (Allows LINK w/o password)*
 - *Other Dir Options: MAINTCCW LNKE LNKS*
 - Wrote Rexx execs to perform the cloning & IPL processes
 - Rexx execs only use utilities shipped with z/VM
 - *DDR, CPFMTXA*
 - 3 Rexx execs accomplish Cloning & IPL
 - *CLONEVM – Performs the cloning process*
 - *IPLVM – Performs an IPL of the cloned system*
 - *TESTIPL – IPLVM front-end with instructions for 1st IPL*



How We Are Cloning z/VM

- Two Cloning Modes To Choose From
 - Active Mode – The original cloning method
 - Cloning source (volumes) based on VM system you logged onto
 - The original cloning process was based on active mode only
 - Use this method after installing the z/VM starter system
 - Warning: *This mode does not support cloning an active system that you are not logged onto!*
 - Static Mode – Cloning enhancement
 - Cloning source is from static, non-active VM system volumes
 - This method allows you to establish a “golden image” for cloning:
 - Install the starter system and clone it using Active Mode
 - IPL & customize the cloned system, i.e. add SFS, External Security, DirMaint, etc.
 - After customizing, shut it down, then use it as a golden image via static cloning from another VM system, i.e. the starter system



How We Are Cloning z/VM

- Choice Of Naming Standards
 - Using our Naming Standards is optional
 - Depends on specified parameters whether or not our SYSID and Volser naming standards are enforced
 - If you do use your own standards, make sure they're correct!
 - See the comments in the default parameter file for details
 - Default parameter file: CLONEVM \$PARMS\$ A1



How We Are Cloning z/VM

- Overview Of The Cloning Process
 - Execute the CLONEVM exec: `CLONEVM sysid`
 - The cloning process consists of 11 steps
 - There are many prompts during it's execution, so that it can be easily aborted if something doesn't look right
 - Execution results are written to a log file: `sysid LOG A1`
 - Execute the TESTIPL exec: `TESTIPL sysid`
 - Front-end to the IPLVM exec
 - Calls the IPLVM exec after displaying 1st IPL instructions
 - IPLVM execution results are written to: `sysid IPL A1`
 - Hopefully you'll see how this works during the demo ...



How We Are Cloning z/VM

- Cloning Process ...
 - Determine the SYSID for a new VM system, i.e. VM1R
 - Logon to the VMCLONER virtual machine
 - Execute the CLONEVM exec: **CLONEVM** vm1r
 - It looks for a parameter file, i.e. VM1R \$PARMS\$ A1
 - If exists, asks if you want to make changes (via XEDIT)
 - If it doesn't exist, it will create a new one and enter XEDIT
 - Edit the parameter file to specify (or change if not 1st time):
 - The SYSID of the new system: VM1R
 - The DASD addresses for the new system
 - The Source SYSID that you're cloning from
 - The Source Volser Prefix you're cloning from
 - The Source Model files for the System Config & User Directory
 - Finally, save the parameter file with these changes, i.e. FILE command



How We Are Cloning z/VM

- Editing the parameter file:

```

VM1R      $PARMS$  A1  F 80  Trunc=80 Size=161 Line=0 Col=1 Alt=0
=====>
00000 * * * Top of File * * *
00001 * =====
00002 * =====> Parameter File For Cloning A New VM System <=====
00003 * =====
00004
00005 * < Specify Source & Target Information For Cloning A New System >
00006
00007 * -----
00008 * New (Target) System Information
00009 * -----
00010 * Specify The New (Target) System & DASD Volumes That Will Be Cloned To:
00011
00012 NewID    = VM1R
00013
00014 NewResA  = BA65
00015 NewResV  = VM1RRS
          :
          :
    
```



How We Are Cloning z/VM

- Cloning Process ...
 - 11 steps are executed by the CLONEVM exec:
 1. GetParms – Reads/Edits cloning parameters from a file
 2. DefVols – Defines volsers & verifies addresses
 3. ClipVols – Clips the volsers of all target DASD
 4. LinkVols – Links to all source & target volumes
 5. CloneDir – Clones the VM Directory source file
 6. CloneCfg – Clones the System Config file
 7. CloneVol – Clones the new system volumes
 8. WriteDir – Writes VM Directory to new SYSRES
 9. PageVols – Formats the new PAGE volume(s)
 10. Transfer – Transfers files if cloning a static system
 11. FirstIPL – First IPL of cloned system to clear spool



How We Are Cloning z/VM

- Cloning Process ...
 - Once CLONEVM has completed, then run TESTIPL
 - The TESTIPL Rexx exec provides instructions on performing the first IPL of a newly cloned system, then calls the IPLVM Rexx exec
 - *Specify the new SYSID as a parameter to TESTIPL*
 - *For example: **TESTIPL vm1r***
 - The IPLVM Rexx exec allows you to easily run another VM system “2nd level”
 - *The IPLVM exec defines terminals so you can dial into VMCLONER locally to check out the new system*
 - *TCP/IP access is also possible, but you’ll have to set it up to work in your environment! (see IPLVM exec comments)*



How We Are Cloning z/VM

- Instructions displayed by the TESTIPL exec

```
TESTIPL: About To Perform An IPL Of VM System: VM1R ...
```

```
-----  
> If This Is The First IPL Of VM1R, Then Follow These Guidelines:
```

```
1) When The SAPL Screen Is Displayed, Specify: PROMPT FN=VM1R
```

```
2) Press PF10 To Proceed With The IPL Using These Options
```

```
3) When Prompted For Start Options, Specify: COLD DRAIN
```

```
4) When The TOD Prompt Is Given, Specify: NO
```

```
5) There Will Be Several Prompts For Spool Files, Reply: GO
```

```
-----  
==> About To Begin The IPL, Continue (Y/N) ? (Enter=Y):
```



Where Do We Go From Here...

- Lots of room for improvement in this cloning process, but it's a start!
- Some of the improvements that are in the works:
 - Working on panel displays for entering cloning parameters
 - Working on a Read-Only SYSRES configuration
 - Working on further developments based on a read-only SYSRES that will assist in applying maintenance to z/VM
 - Adapt to work with Shared File System (SFS)
 - Adapt to work with directory maintenance software, i.e Dirmaint, etc
 - Adapt to work with external security software, i.e. RACF, etc
- If you're interested in a copy of the current execs (and this presentation) shoot me an email at: james.moling@fms.treas.gov