



Rocket z/VM Training VM Workshop 2025

Not "IF" but "WHEN"

A Practical Approach to z/VM System Disaster Recovery using IBM Tools

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Speaker's background: "Embrace the Weird!"

- I wrote my first mainframe programs in 1979 (OS/MVT 21.8F using CALL-OS, FORTRAN, BASIC, and York APL); first IBM 370 assembler code in 1980.
 - "I think I'm making progress."
- A one-line career summary: "Deep on IBM Z System virtualization, Unix & Linux; broad on... other weird stuff."
 - VM since 1979; Various incarnations of Unix since 1983
 - Linux since the beginning of Linux (Slackware, 5.25" floppies, 1993)
 - Enough MVT /VS/1 / MVS / OS/390 / z/OS to be dangerous
 - z/VM Product Engineer at Rocket Software, Inc. since 2003
 - Role expanded beyond z/VM to "Geek of Virtualization and Container Technology on IBM Z" in 2022.
 - More recently: Custodian of Rocket TMON for VSE
- It continues to be a long, strange trip:
 - IBM 8100, IBM 3650, CADAM, Amoeba, Plan 9, MUSIC, OS/2, UTS, SCO Unix, TeraData, NetWare, HP-UX, AIX, Ultrix, Solaris, Cluster / High-Performance Computing (Linux+Beowulf, Myrinet, InfiniBand), Image Processing, Embedded Systems, First IT Security Officer for U. of Arkansas
 - Outside of IT: Gentleman Farmer, Certified Emergency Medical Responder, State of AR Law Enforcement Officer
 - More generally: "I'm having a great career based on working with the weird stuff."

Outline

Presentation roadmap

- Foundations: Things you should already know or have
- Architecture review: z/VM system organization
- Boundaries: Scope and scale
- Tool set: z/VM components, Licensed Program Products, and Hardware
- Strategy and Objectives: System recovery
- Tactics: Backup
- Definitions: What's a disaster?
- Tactics: Recovery
- Wrap-up: Q&A, Feedback, Discussion

Things you should already...

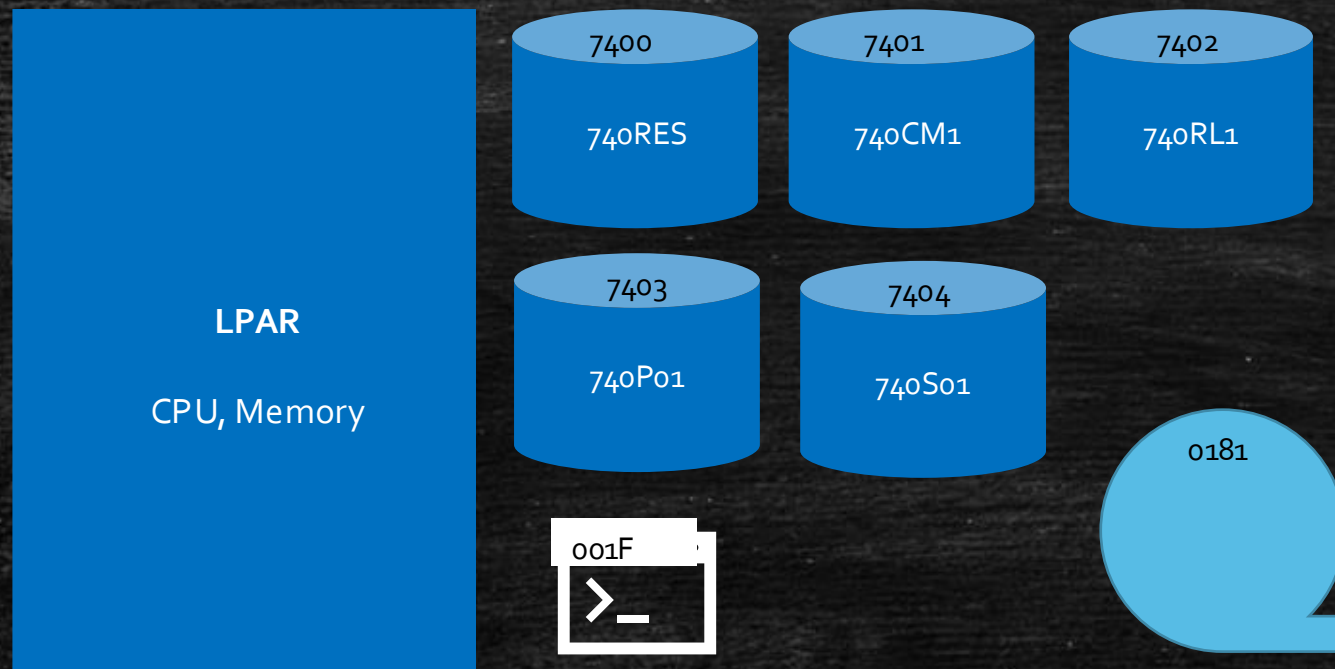
- ...know: z/VM Systems Programmer / Systems Administrator skills
- ...know: How to find your way around in the z/VM Library
- ...have: Understanding of your hardware & software environment[s]
- ...have: Management support: Policy, Retention, and Resources
- ...have: Time, Essential Knowledge, Plans

Architecture Review: z/VM system organization

Essential parts of the z/VM operating system

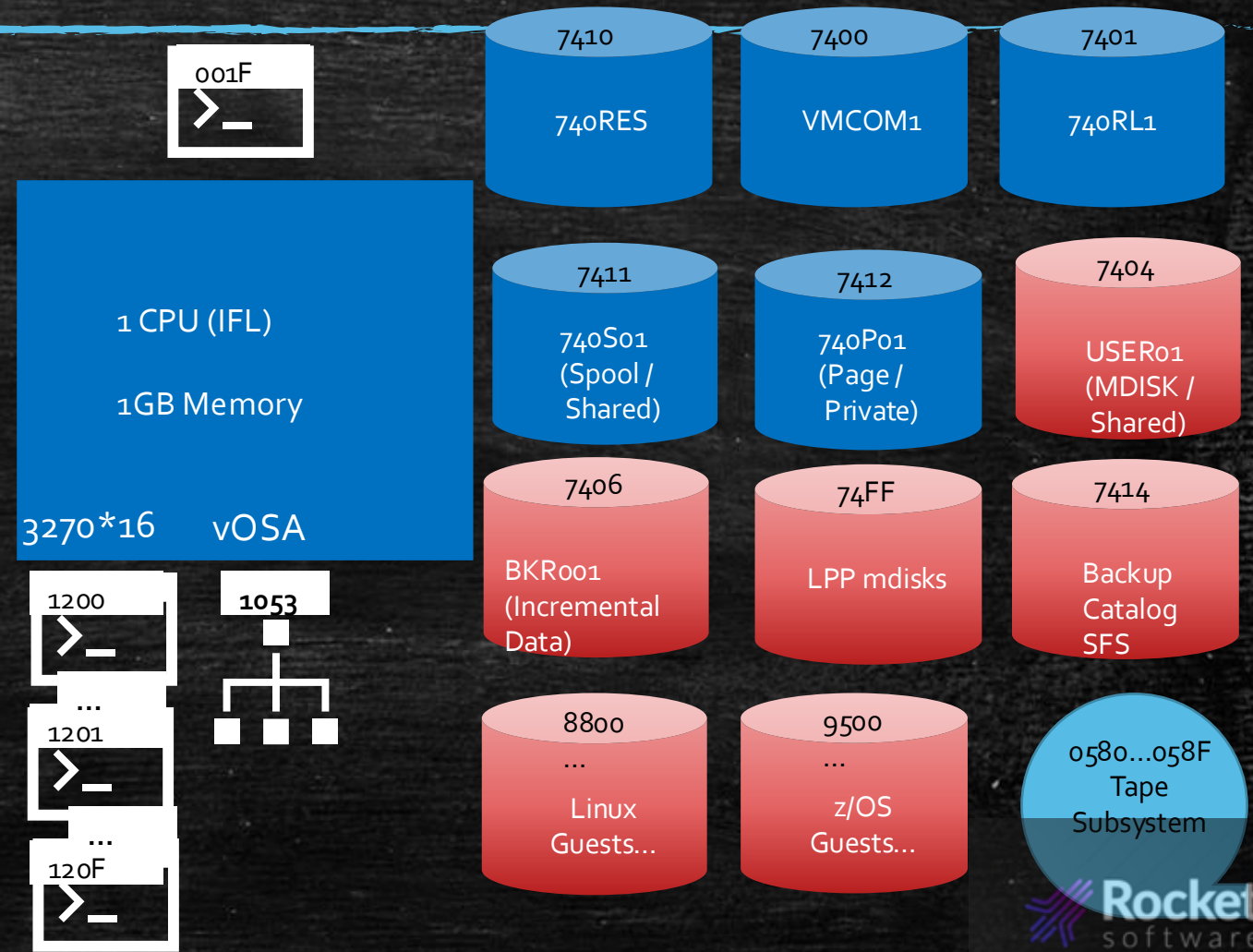
- For our purposes, mostly DASD assets:
 - CP-owned: RES, Common, Release, Spool, Page
 - SSI: PDR volume
 - CP system: "Online and ATTACHed to SYSTEM"
 - CP system minidisks (CPLOAD MODULE, SYSTEM CONFIG)
 - CMS run-time: MAINT 190, 19D, 19E
- Non-DASD:
 - At least one system console
 - Tape subsystem (we assume TS7700, where we assume at all...)
 - Login credentials: OPERATOR, MAINTvrm

Architecture Review: Minimalist z/VM system organization



Architecture Review: Somewhat more realistic z/VM system organization

- Expands on the minimum:
 - CPU, Memory, Console, OSA, Tape
 - ...DASD
 - The z/VM minimum set, **plus**...
 - System infrastructure volumes
 - *Program products, non-IBM SFS, installation materials, additional page / spool capacity, RACF database...*
 - User / Guest volumes
 - *i.e. production workload data*



Boundaries: Scope and scale

- My one size may not fit your all.
 - Scope of discussion
 - (Mostly) focused on non-SSI z/VM configurations
 - *We'll take a brief look at SSI considerations toward the end*
 - Scale: Discussion assumes a small- to medium-sized z/VM system configuration
 - Tape is medium of choice for backup
 - *Lab environment is based on TS7700, though process is largely subsystem-agnostic*
 - No assumptions made regarding availability or use off-site DASD replication
 - Focus: **SYSTEM** recovery, *not* **APPLICATION** recovery

Tool set: z/VM components

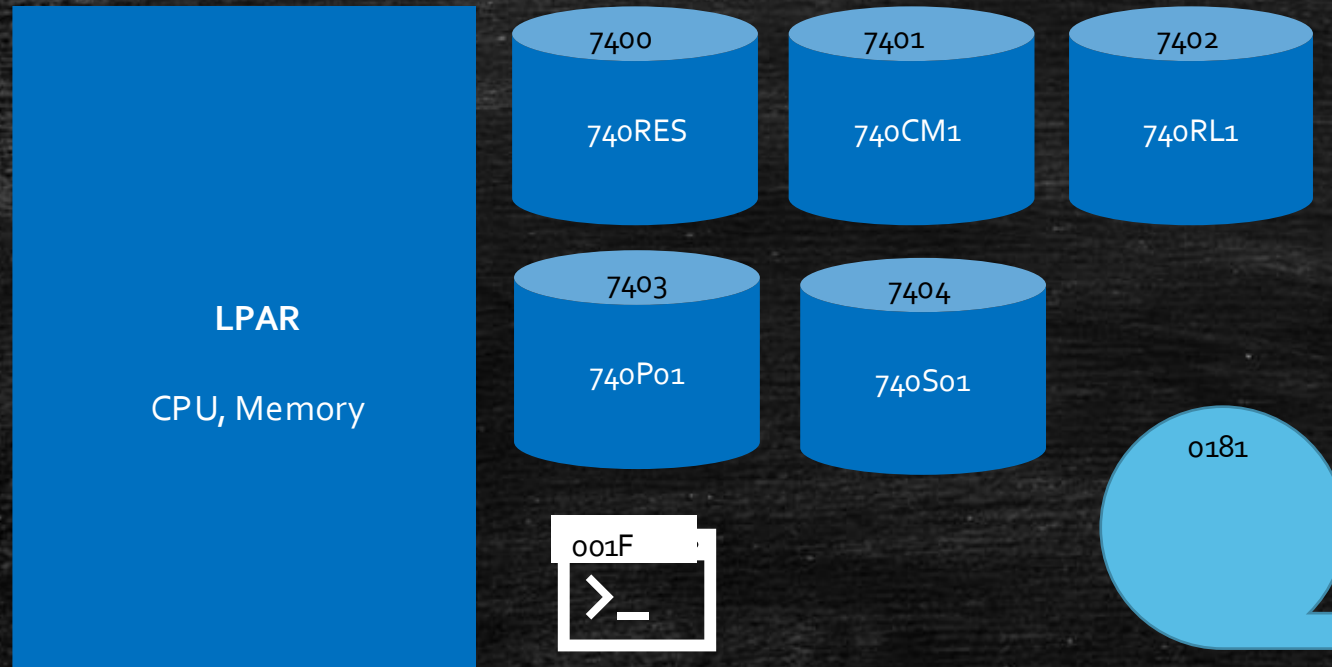
- Provided as part of the z/VM operating system
- Q: What tools can I rely on having available in a recovery scenario?
 - CP (hypervisor) and CMS (“command shell”)
 - Utility functions:
 - DDR (DASD Dump / Restore)
 - ICKDSF
 - DFSMS/VM RMS (Removable Media Services)
 - *Supporting software for IBM Virtual Tape Subsystem*

Tool set: Licensed Program Products

“What additional tools does this example rely on?”

- IBM Operations Manager for z/VM
 - Automated operations
- IBM Tape Manager for z/VM
 - Tape media management services
- IBM Backup and Restore Manager for z/VM
 - z/VM data backup and restore services
- IBM Library for REXX on zSeries (fee-based licensed product)
–OR–
IBM Alternate Library for REXX on zSeries (zero-fee alternate)
 - Prerequisite for Tape Manager, Backup and Restore Manager

Tool set: Hardware



Processor, DASD, and tape resources sufficient to support backup, recovery, and operation of your z/VM system.

Strategy and Objectives: System Recovery

- Focus: SYSTEM recovery, *not* APPLICATION recovery
- Our goal is to facilitate recovery of a functioning z/VM system, *without* repeating the process of installing, servicing, and customizing an equivalent newly-installed system.
 - *i.e. to expedite recreation of the original z/VM environment*
- Application recovery is a separate process.
 - It's possible for me to know (or discover) the system resources essential to z/VM system operation. That's a technology problem.
 - It's not possible for me to know what application workload components are essential to **your** business operations. That's a policy problem.

System recovery: Essential resources

- “Things that belong to CP”
 - Sysres, Common, Release
 - Page and Spool
- Essential z/VM components
 - Maintenance environment – e.g. MAINTvm (and friends)
 - CLOAD MODULE, SYSTEM CONFIG, etc
 - RACF database
 - TCPIP configuration (note dependencies on recovery network environment)
 - All located on sysres / common / release volumes
 - Enables recreation of spool-resident resources (NSS / DCSS) if not preserved due to “hot backup” problem

System recovery: Essential resources

- “It’s not enough to back it up; you have to know where you put it.”
- Tape volser[s]
 - This scenario assumes use of high-capacity VTS volumes; one (virtual) tape holds all DASD volumes being backed up.
- Order of operations
 - Order of operations during backup defines order of operations during recovery
 - In this scenario, information is preserved in the Backup & Restore Manager backup job log.
 - Some external note taking is required.
 - *What did I back up? In what order? Which tape volume[s]?*

Tactics: Backup

- What do we really need to back up, and where do we put the results?
 - Note the prior discussion of “essential ingredients”
- A technical detour: The resource discovery problem
 - Or “what’s in a live z/VM system?”
 - Turns out most of this is computable.

Tactics: Asset identification

- Algorithm
 - Identify CP-owned DASD assets
 - `QUERY CPOWNERD, QUERY ALLOC`
 - Locate CP configuration data
 - `QUERY CPDISKS, QUERY CPLOAD`
 - Locate essential CMS minidisks
 - Assumes "stock" configuration: `QUERY MDISK USERID * <vdev> DRCT LOC`
 - ...for 190, 19D, 19E
 - Enumerate (running) local SFS file pool servers
 - `CP QUERY USERID` to extract current system name
 - `CP QUERY RESOURCE NODEID <name>` to enumerate active file pools
 - Shaky ground here: All file pools are RESOURCES, but not all RESOURCES are file pools...

Example: CP QUERY CPOWNERD (filtered)

```
x3270-4 rs54.rocketsoftware.com
File Options
pipe cp query cpowered | nlocate /Reserved/ | console
Slot Vol-ID Rdev Type Status SSIOwner SysOwner
  1 740RES 7400 Own Online and attached -----
  5 740CM1 7401 Own Online and attached -----
 10 740S01 7403 Own Online and attached -----
255 740P01 7404 Own Online and attached -----
Ready; T=0.01/0.01 09:15:41
```



These are my CP owned volumes. I definitely care about these, as I can't start my system if these resources aren't available in a recovery setting.

Example: CP QUERY ALLOC (filtered)

```
x3270-4 rs54.rocketsoftware.com
File Options
pipe cp query alloc | nlocate /TOTAL=000000000000/ | console
DASD 7400 740RES 3390 CKD-ECKD (UNITS IN CYLINDERS)
      DRCT  TOTAL=000000000020 INUSE=000000000001 AVAIL=000000000019, ACTIVE
DASD 7401 740CM1 3390 CKD-ECKD (UNITS IN CYLINDERS)
DASD 7403 740S01 3390 CKD-ECKD (UNITS IN CYLINDERS)
      SPDOL TOTAL=000000003337 INUSE=000000000160 AVAIL=000000003177
DASD 7404 740P01 3390 CKD-ECKD (UNITS IN CYLINDERS)
      PAGE  TOTAL=000000003337 INUSE=000000000000 AVAIL=000000003337
IPL NUCLEUS ACTIVE ON VOLUME 740RES
Ready; T=0.01/0.01 09:19:32
```

QUERY ALLOC shows some useful details about how those CP owned volumes are used. For instance, if the *only* thing on a volume is PAGE space, it's not essential to back up the content. It *is* essential to have that volume presence at IPL time in a recovery scenario, so I'll need to either back up page volumes or pre-initialize them via ICKDSF in a recovery setting.

Example: CP QUERY CPDISKS *and* CP QUERY CPLOAD

```
x3270-4 rs54.rocketsoftware.com
File Options
cp query cpdisks
Label  Userid  Vdev Mode Stat Vol-ID Rdev Type StartLoc EndLoc
MNTCF1 MAINT 0CF1 A R/O 740RES 7400 CKD 39 158
MNTCF3 MAINT 0CF3 C R/O 740RES 7400 CKD 160 279
Ready; T=0.01/0.01 09:21:11
cp query cpload
Module CPLDAD was loaded from minidisk on volume 740RES at cylinder 39.
Parm disk number 1 is on volume 740CM1, cylinders 1 through 120.
Last start was a system restart from SHUTDOWN REIPL.
Ready; T=0.01/0.01 09:21:19
```

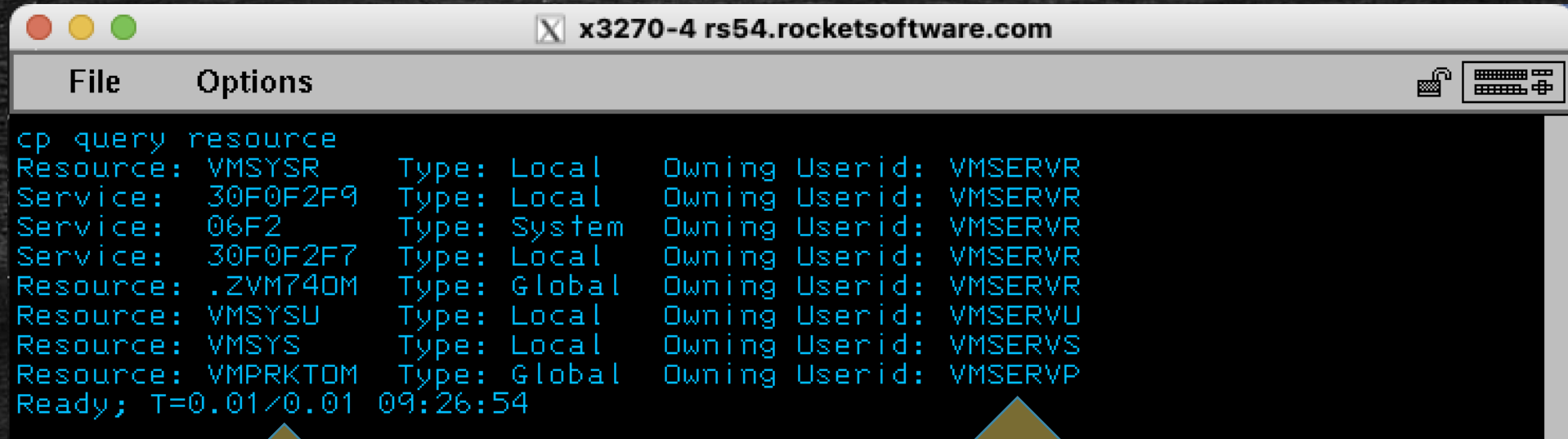
QUERY CPDISKS and QUERY CPLOAD tell me more important details about how my system is configured. Specifically, I can tell that I absolutely need to be able to recover the contents of 740RES since my essential CP disks and my CP nucleus are on that real DASD volume.

Example: CP QUERY MDISK

```
x3270-4 rs54.rocketsoftware.com
File Options
cp query mdisk userid * 190 drct loc
TargetID Tdev OwnerID Odev Dtype Vol-ID Rdev StartLoc Size
MAINT740 0190 MAINT 0190 3390 740RES 7400 280 214
Ready; T=0.01/0.01 09:51:19
cp query mdisk userid * 19d drct loc
TargetID Tdev OwnerID Odev Dtype Vol-ID Rdev StartLoc Size
MAINT740 019D MAINT 019D 3390 740RES 7400 1969 292
Ready; T=0.01/0.01 09:51:26
cp query mdisk userid * 19e drct loc
TargetID Tdev OwnerID Odev Dtype Vol-ID Rdev StartLoc Size
MAINT740 019E MAINT 019E 3390 740RES 7400 2261 500
Ready; T=0.01/0.01 09:51:30
```

Here, QUERY MDISK tells me – again – that 740RES is essential because that's where my CMS system minidisks live.

Example: CP QUERY RESOURCE



```
File Options
cp query resource
Resource: VMSYSR      Type: Local   Owning Userid: VMSERVR
Service: 30F0F2F9    Type: Local   Owning Userid: VMSERVR
Service: 06F2        Type: System  Owning Userid: VMSERVR
Service: 30F0F2F7    Type: Local   Owning Userid: VMSERVR
Resource: .ZVM740M   Type: Global  Owning Userid: VMSERVR
Resource: VMSYSU     Type: Local   Owning Userid: VMSERVU
Resource: VMSYS      Type: Local   Owning Userid: VMSERVS
Resource: VMPRKTOM   Type: Global  Owning Userid: VMSERVP
Ready; T=0.01/0.01 09:26:54
```

SFS is a bit more difficult to handle via stock z/VM interfaces, but not that difficult. QUERY RESOURCE can be used to identify active SFS file pool servers. Note that I have to know a few things about my system, as QUERY RESOURCE shows me “stuff” that’s not actually an SFS file pool. I keep finding myself saying “you can automate a lot, but sooner or later you have to know something” and this is a good example of that case.

CP QUERY RESOURCE makes it possible to identify the SFS file pool server SVMs associated with an individual file pool. When thinking about system disaster recovery for z/VM, we need to know – at minimum – which SFS resources are needed to accomplish the SYSTEM recovery work. VMSYS:, VMSYSU:, and VMPSFS: (in this case, renamed to VMPRKTOM:) contain data important to the recovery problem. VMSYSR is the as-supplied-by-IBM CRR (Coordinated Resource Recovery) server – a part of the z/VM APPC architecture. The remaining “Service:” or “Resource:” artifacts are APPC resources that aren’t essential to the “systemrecovery” problem.

Tactics: Asset identification

- More considerations for CP QUERY RESOURCE and SFS
 - For the examples at hand, essential SFS file pools are handled by backup of **sysres, common, and release** volumes.
 - *This reaches the standard of "good enough."*
 - Proposition: Beyond the essential system resources provided with the as-shipped-by-IBM z/VM system, SFS is an application workload component, **not** a system resource component.
 - "You can automate a lot, but sooner or later you actually have to know something."

Tactics: Asset identification

- A footnote: System resource discovery via manual CP commands is tedious and at risk for errors.
 - So, that whole conversation about QUERY CPOWNED, QUERY CPDISKS, etc...?
 - *"It is unworthy of excellent men to lose hours like slaves in the labor of calculation which could be relegated to anyone else if machines were used."*
-- Gottfried Wilhelm Leibniz

Caveat: The “hot backup” problem

- Backup creates a (theoretically) static image of data at rest on DASD.
- The problem with moving targets is that... they move.
- What do we want? Point-in-time consistency.
 - *When do we want it? At just the right time.*

When looking at the “backup” side of SYSTEM disaster recovery, you have to consider the “hot backup” problem – that is, if you’re backing up a live z/VM system while that z/VM system is running, you need to carefully consider which parts of the system are changing beneath your feet as you create a backup.

The goal is point-in-time consistency.

The only way to achieve rock-solid point in time consistency is to shut down the system you need to back up, and then back it up from another system which has full access to all the DASD resources.

If this isn’t feasible – if you must back up the live z/VM system – you can achieve a “reasonable approximation of point-in-time consistency” with respect to the SYSTEM recovery problem.

Tactics: Backup

- An inconvenient detail: Handling the backup catalog
 - The RESTORE capabilities of *IBM Backup and Restore Manager for z/VM* depend on data stored in the backup catalog SFS file space.
 - What's been backed up?
 - Where does the resulting data reside?
 - The backup catalog SFS file space is a run-time artifact of the backup process.
 - A good example of the "hot backup" problem:
 - You cannot reliably back up the backup catalog as part of a system recovery backup
 - Worse, it's difficult to restore the backup catalog from a backup created under these conditions

Backup and Restore Manager presents a special version of the "hot backup" problem. Normal RESTORE capability depends on data that is maintained in the backup catalog, which is a data structure housed in an SFS file space.

The problem here is that backup catalog content is created "in flight" as a side-effect of the backup process. You can't back up the backup catalog as part of a regular DR backup because the DR backup of the backup catalog won't be finished until that job completes.

Lots of moving parts here. It's OK to take a moment to think about this.

Tactics: Backup

- Solution: Handling the backup catalog
- Two steps to creation of a system recovery backup
 - **First**, back up the essential DASD assets which represent your z/VM system
 - Sysres, Common, Release, Spool, (maybe) Page volumes
 - Use the **DDRTAPE** output handler to write data in a format that can be restored using the z/VM DDR utility
 - **Second**, back up the backup catalog SFS file space in a format that can be restored using only tools that are part of the base z/VM operating system
 - **CATBACKUP EXPORT** to generate a recovery image of the backup catalog
 - Export created via FILEPOOL UNLOAD FILESPACE
 - Use the **DDRTAPE** output handler to generate a recovery image of the catalog export minidisk

Tactics: Backup

Provision the Catalog Export minidisk

- Solution: Handling the backup catalog
 - **Second**, back up the backup catalog SFS file space in a format that can be restored using only tools that are part of the base z/VM operating system
 - **CATBACKUP EXPORT** to generate a recovery image of the backup catalog
 - Use the **DDRTAPE** output handler to generate a recovery image of the catalog export minidisk
 - Provisioning tasks
 - BKRBACKUP-owned "export minidisk" (formatted as CMS EDF)
 - *Default: BKRBACKUP CBAC*
 - Update BKRSYSTEM CONFIG
 - *BKR_Catalog_Export_Minidisk = <vdev>*

Tactics: Backup

Provision the Catalog Export minidisk

- Solution: Handling the backup catalog
 - Provisioning tasks
 - BKRBKUP-owned "export minidisk" (formatted as CMS EDF)
 - *Default: BKRBKUP CBAC*
 - Update BKRSYSTEM CONFIG
 - *BKR_Catalog_Export_Minidisk = <vdev>*
 - Sizing guidelines in the Admin Guide
 - Output of **QUERY LIMITS FOR BKRCATLG BKRSFS**
(4K data blocks in use) * 1.4 is a good start

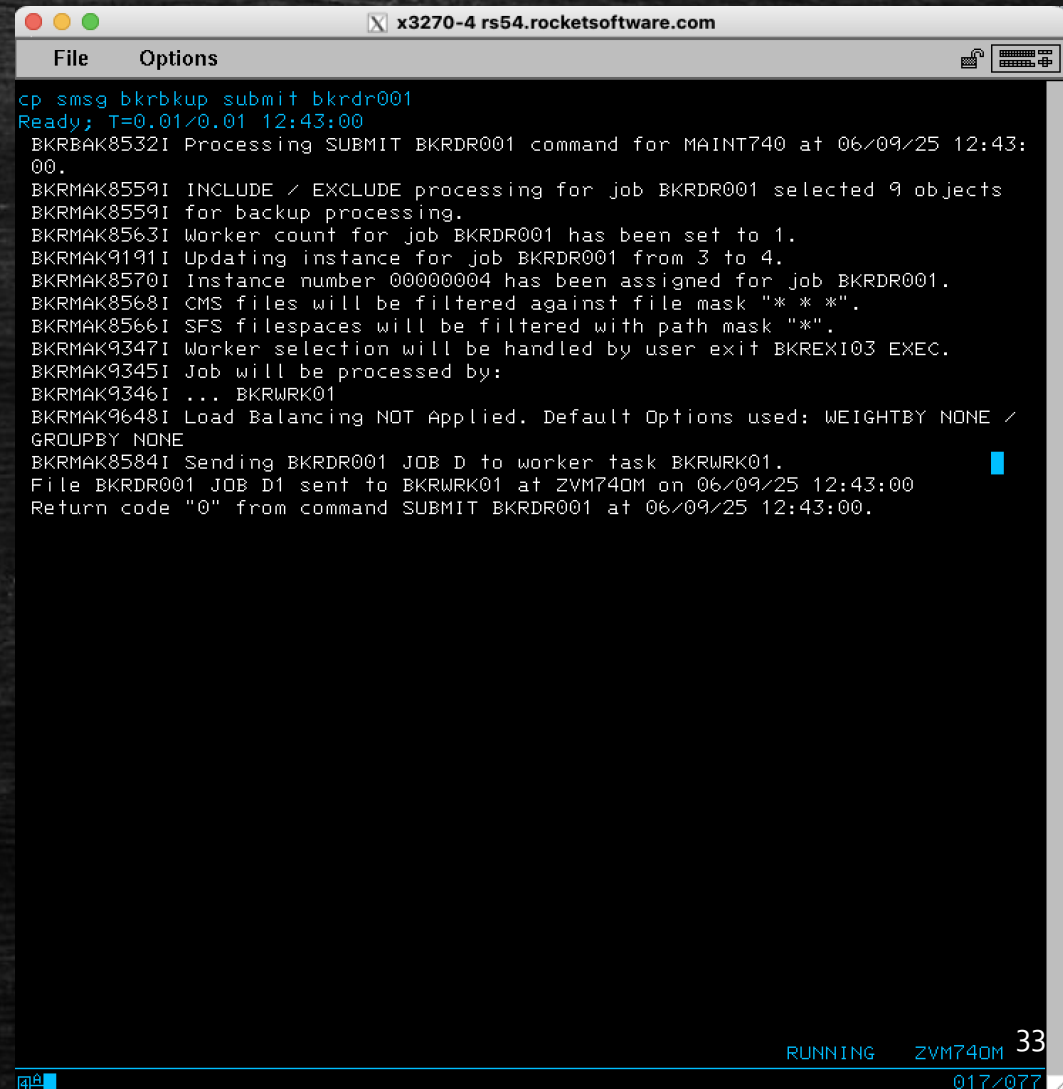
Tactics: Backup

- System Disaster Recovery Backup Workflow:
- Perform resource discovery to identify essential DASD assets and incorporate them into a system disaster recovery backup template (BKRDR001)
- Weekly (or at policy-determined interval), run the BKRDR001 backup
 - Generates DDR-format backup of essential DASD assets
- After BKRDR001 completes...
 - Execute CATBACKUP EXPORT to capture a recovery snapshot of the catalog
 - Run the BKRDR002 backup
 - Generate DDR-format backup of the backup catalog recovery snapshot

After resource discovery & selection...

Primary DR DASD image (DDR) backup

- Workflow:
 - DASD image DR backup (tape in DDR format)
 - Export catalog filespace
 - DASD image backup of catalog export minidisk (tape in DDR format)



```
x3270-4 rs54.rocketsoftware.com
File Options
cp smsg bkrbkup submit bkrdr001
Ready; T=0.01/0.01 12:43:00
BKRBK8532I Processing SUBMIT BKRDR001 command for MAINT740 at 06/09/25 12:43:00.
BKRMK8559I INCLUDE / EXCLUDE processing for job BKRDR001 selected 9 objects
BKRMK8559I for backup processing.
BKRMK8563I Worker count for job BKRDR001 has been set to 1.
BKRMK9191I Updating instance for job BKRDR001 from 3 to 4.
BKRMK8570I Instance number 00000004 has been assigned for job BKRDR001.
BKRMK8568I CMS files will be filtered against file mask "* * *".
BKRMK8566I SFS filespace will be filtered with path mask "*".
BKRMK9347I Worker selection will be handled by user exit BKREX103 EXEC.
BKRMK9345I Job will be processed by:
BKRMK9346I ... BKRWRK01
BKRMK9648I Load Balancing NOT Applied. Default Options used: WEIGHTBY NONE /
GROUPBY NONE
BKRMK8584I Sending BKRDR001 JOB D to worker task BKRWRK01.
File BKRDR001 JOB D1 sent to BKRWRK01 at ZVM740M on 06/09/25 12:43:00
Return code "0" from command SUBMIT BKRDR001 at 06/09/25 12:43:00.

RUNNING ZVM740M 33
017/077
```

After resource discovery & selection...

Primary DR DASD image (DDR) backup

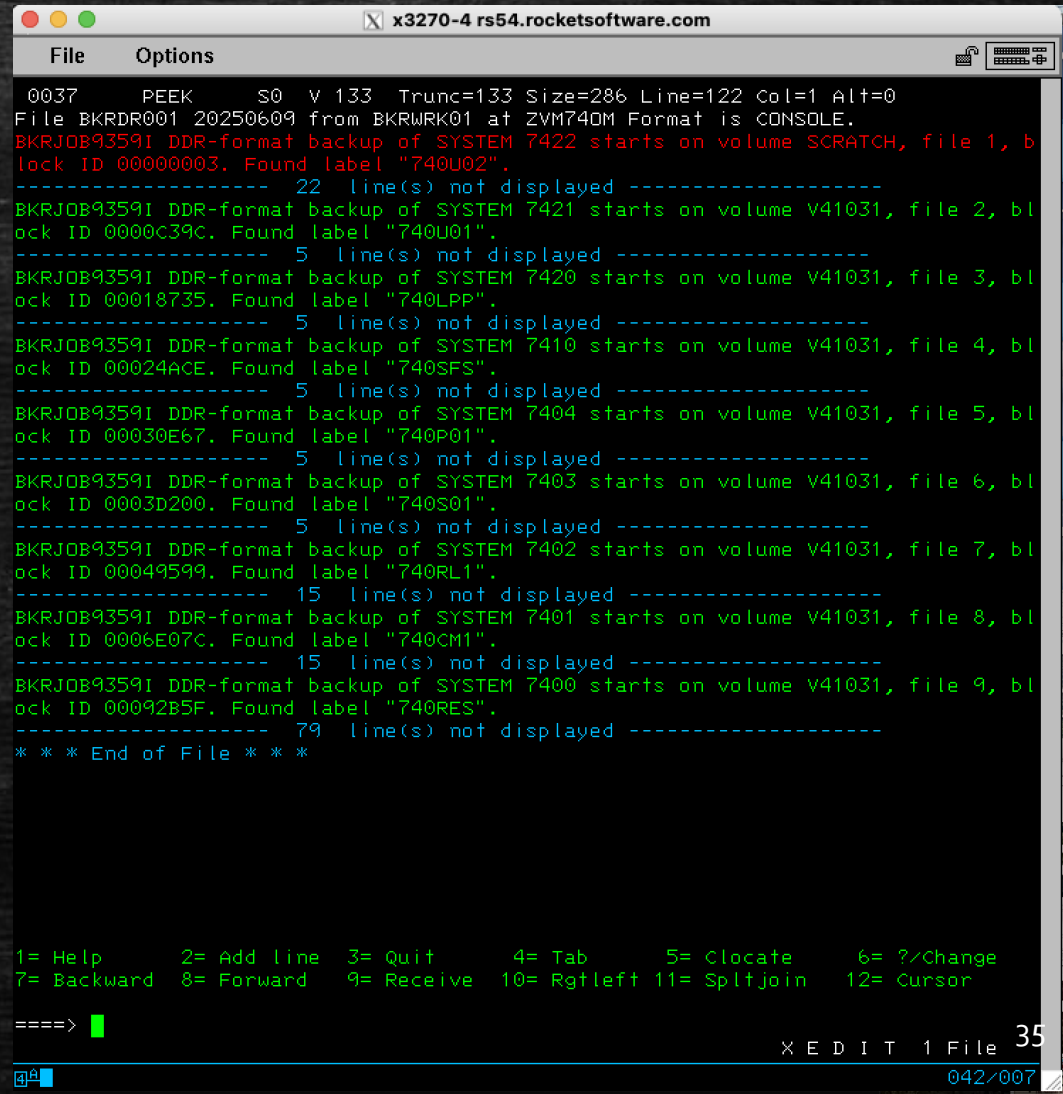
- Workflow:
 - DASD image DR backup (tape in DDR format)
 - Export catalog filespace
 - DASD image backup of catalog export minidisk (tape in DDR format)
 - **NOTE:** Tape volser, real DASD device address, and start-of-data offset documented in backup job log via message **9359I**

```
x3270-4 rs54.rocketsoftware.com
File Options
BKRWPU9632I SYSTEM 7422 12:43:49 06/09/25 CKD track 20999 of maximum 50069
BKRWPU9632I SYSTEM 7422 12:43:54 06/09/25 CKD track 31499 of maximum 50069
BKRWPU9632I SYSTEM 7422 12:43:58 06/09/25 CKD track 41999 of maximum 50069
SYSTEM 7422 PL CKD 3390 3990 00003338 0015 00058786 00050069 00050070
BKRJOB9359I DDR-format backup of SYSTEM 7421 starts on volume V41049, file 2, b
BKRWPU9632I SYSTEM 7421 12:44:05 06/09/25 CKD track 10499 of maximum 50069
BKRWPU9632I SYSTEM 7421 12:44:09 06/09/25 CKD track 20999 of maximum 50069
BKRWPU9632I SYSTEM 7421 12:44:13 06/09/25 CKD track 31499 of maximum 50069
BKRWPU9632I SYSTEM 7421 12:44:18 06/09/25 CKD track 41999 of maximum 50069
SYSTEM 7421 PL CKD 3390 3990 00003338 0015 00058786 00050069 00050070
BKRJOB9359I DDR-format backup of SYSTEM 7420 starts on volume V41049, file 3, b
BKRWPU9632I SYSTEM 7420 12:44:25 06/09/25 CKD track 10499 of maximum 50069
BKRWPU9632I SYSTEM 7420 12:44:29 06/09/25 CKD track 20999 of maximum 50069
BKRWPU9632I SYSTEM 7420 12:44:34 06/09/25 CKD track 31499 of maximum 50069
BKRWPU9632I SYSTEM 7420 12:44:38 06/09/25 CKD track 41999 of maximum 50069
SYSTEM 7420 PL CKD 3390 3990 00003338 0015 00058786 00050069 00050070
BKRJOB9359I DDR-format backup of SYSTEM 7410 starts on volume V41049, file 4, b
BKRWPU9632I SYSTEM 7410 12:44:46 06/09/25 CKD track 10499 of maximum 50069
BKRWPU9632I SYSTEM 7410 12:44:50 06/09/25 CKD track 20999 of maximum 50069
BKRWPU9632I SYSTEM 7410 12:44:54 06/09/25 CKD track 31499 of maximum 50069
BKRWPU9632I SYSTEM 7410 12:44:58 06/09/25 CKD track 41999 of maximum 50069
SYSTEM 7410 PL CKD 3390 3990 00003338 0015 00058786 00050069 00050070
BKRJOB9359I DDR-format backup of SYSTEM 7404 starts on volume V41049, file 5, b
BKRWPU9632I SYSTEM 7404 12:45:06 06/09/25 CKD track 10499 of maximum 50069
BKRWPU9632I SYSTEM 7404 12:45:10 06/09/25 CKD track 20999 of maximum 50069
BKRWPU9632I SYSTEM 7404 12:45:14 06/09/25 CKD track 31499 of maximum 50069
BKRWPU9632I SYSTEM 7404 12:45:18 06/09/25 CKD track 41999 of maximum 50069
SYSTEM 7404 PL CKD 3390 3990 00003338 0015 00058786 00050069 00050070
BKRJOB9359I DDR-format backup of SYSTEM 7403 starts on volume V41049, file 6, b
BKRWPU9632I SYSTEM 7403 12:45:26 06/09/25 CKD track 10499 of maximum 50069
BKRWPU9632I SYSTEM 7403 12:45:30 06/09/25 CKD track 20999 of maximum 50069
BKRWPU9632I SYSTEM 7403 12:45:35 06/09/25 CKD track 31499 of maximum 50069
BKRWPU9632I SYSTEM 7403 12:45:39 06/09/25 CKD track 41999 of maximum 50069
SYSTEM 7403 PL CKD 3390 3990 00003338 0015 00058786 00050069 00050070
BKRJOB9359I DDR-format backup of SYSTEM 7402 starts on volume V41049, file 7, b
BKRWPU9632I SYSTEM 7402 12:45:46 06/09/25 CKD track 10499 of maximum 150239
BKRWPU9632I SYSTEM 7402 12:45:51 06/09/25 CKD track 20999 of maximum 150239
BKRWPU9632I SYSTEM 7402 12:45:55 06/09/25 CKD track 31499 of maximum 150239
BKRWPU9632I SYSTEM 7402 12:45:59 06/09/25 CKD track 41999 of maximum 150239
BKRWPU9632I SYSTEM 7402 12:46:03 06/09/25 CKD track 52499 of maximum 150239
BKRWPU9632I SYSTEM 7402 12:46:08 06/09/25 CKD track 62999 of maximum 150239
BKRWRK01-ZVM740M (Scroll) 34
042/001
```

After resource discovery & selection...

Primary DR DASD image (DDR) backup

- Workflow:
 - DASD image DR backup (tape in DDR format)
 - Export catalog filespace
 - DASD image backup of catalog export minidisk (tape in DDR format)
 - **NOTE:** Tape volser, real DASD device address, and start-of-data offset documented in backup job log via message **9359I**



```
0037      PEEK      S0  V 133  Trunc=133  Size=286  Line=122  Col=1  Alt=0
File BKRDR001 20250609 from BKRWRK01 at ZVM740M Format is CONSOLE.
BKRJOB9359I DDR-format backup of SYSTEM 7422 starts on volume SCRATCH, file 1, b
lock ID 00000003. Found label "740U02".
----- 22 line(s) not displayed -----
BKRJOB9359I DDR-format backup of SYSTEM 7421 starts on volume V41031, file 2, bl
ock ID 0000C39C. Found label "740U01".
----- 5 line(s) not displayed -----
BKRJOB9359I DDR-format backup of SYSTEM 7420 starts on volume V41031, file 3, bl
ock ID 00018735. Found label "740LPP".
----- 5 line(s) not displayed -----
BKRJOB9359I DDR-format backup of SYSTEM 7410 starts on volume V41031, file 4, bl
ock ID 00024ACE. Found label "740SFS".
----- 5 line(s) not displayed -----
BKRJOB9359I DDR-format backup of SYSTEM 7404 starts on volume V41031, file 5, bl
ock ID 00030E67. Found label "740P01".
----- 5 line(s) not displayed -----
BKRJOB9359I DDR-format backup of SYSTEM 7403 starts on volume V41031, file 6, bl
ock ID 0003D200. Found label "740S01".
----- 5 line(s) not displayed -----
BKRJOB9359I DDR-format backup of SYSTEM 7402 starts on volume V41031, file 7, bl
ock ID 00049599. Found label "740RL1".
----- 15 line(s) not displayed -----
BKRJOB9359I DDR-format backup of SYSTEM 7401 starts on volume V41031, file 8, bl
ock ID 0006E07C. Found label "740CM1".
----- 15 line(s) not displayed -----
BKRJOB9359I DDR-format backup of SYSTEM 7400 starts on volume V41031, file 9, bl
ock ID 00092B5F. Found label "740RES".
----- 79 line(s) not displayed -----
*** End of File ***

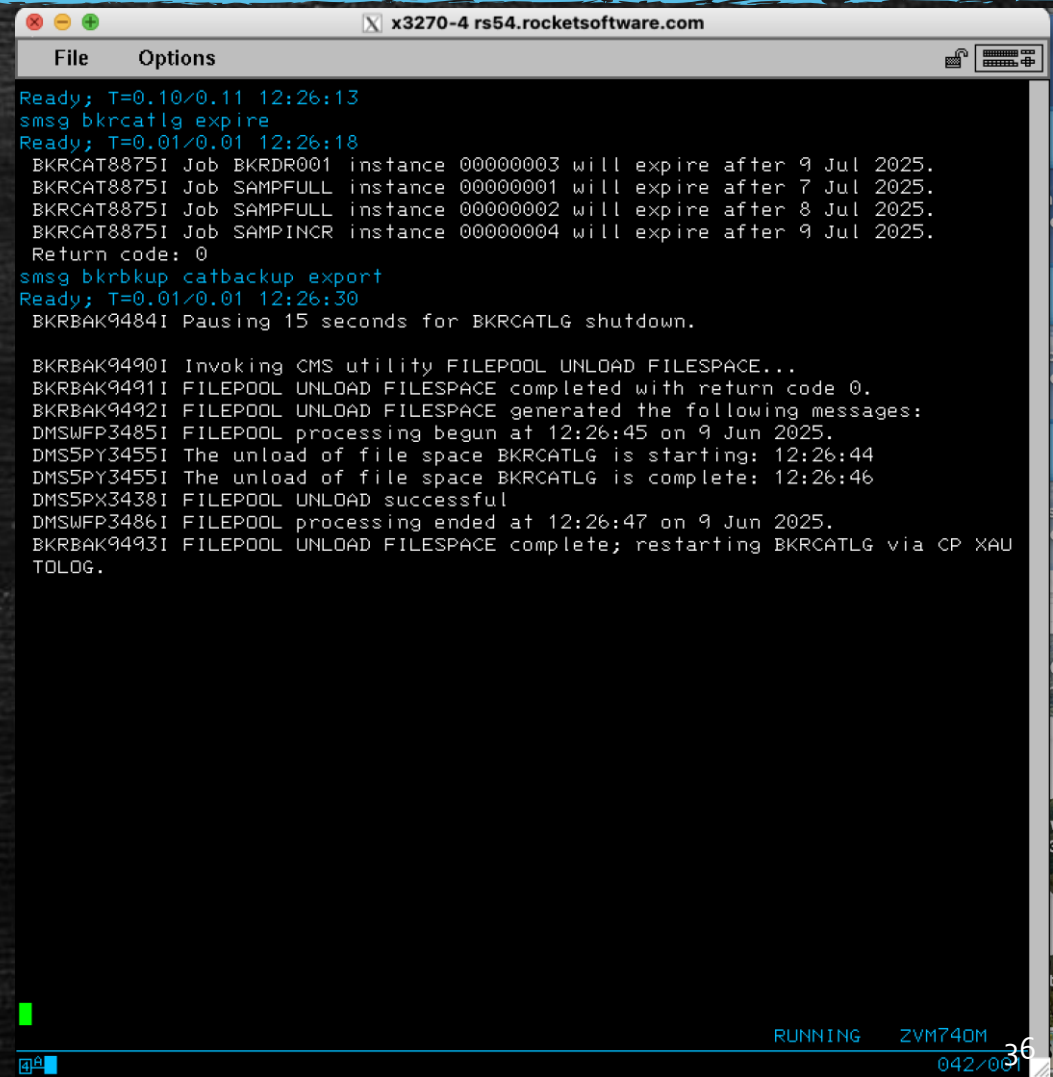
1= Help      2= Add line  3= Quit      4= Tab      5= Clocate  6= ?/Change
7= Backward  8= Forward   9= Receive   10= Rgleft  11= Spljoin 12= Cursor

====> █

X E D I T 1 File 35
042/007
```

After primary DR DASD image backup... CATBACKUP EXPORT

- Workflow:
 - ~~DASD image DR backup (tape in DDR format)~~
 - Export catalog filespace
 - DASD image backup of catalog export minidisk (tape in DDR format)



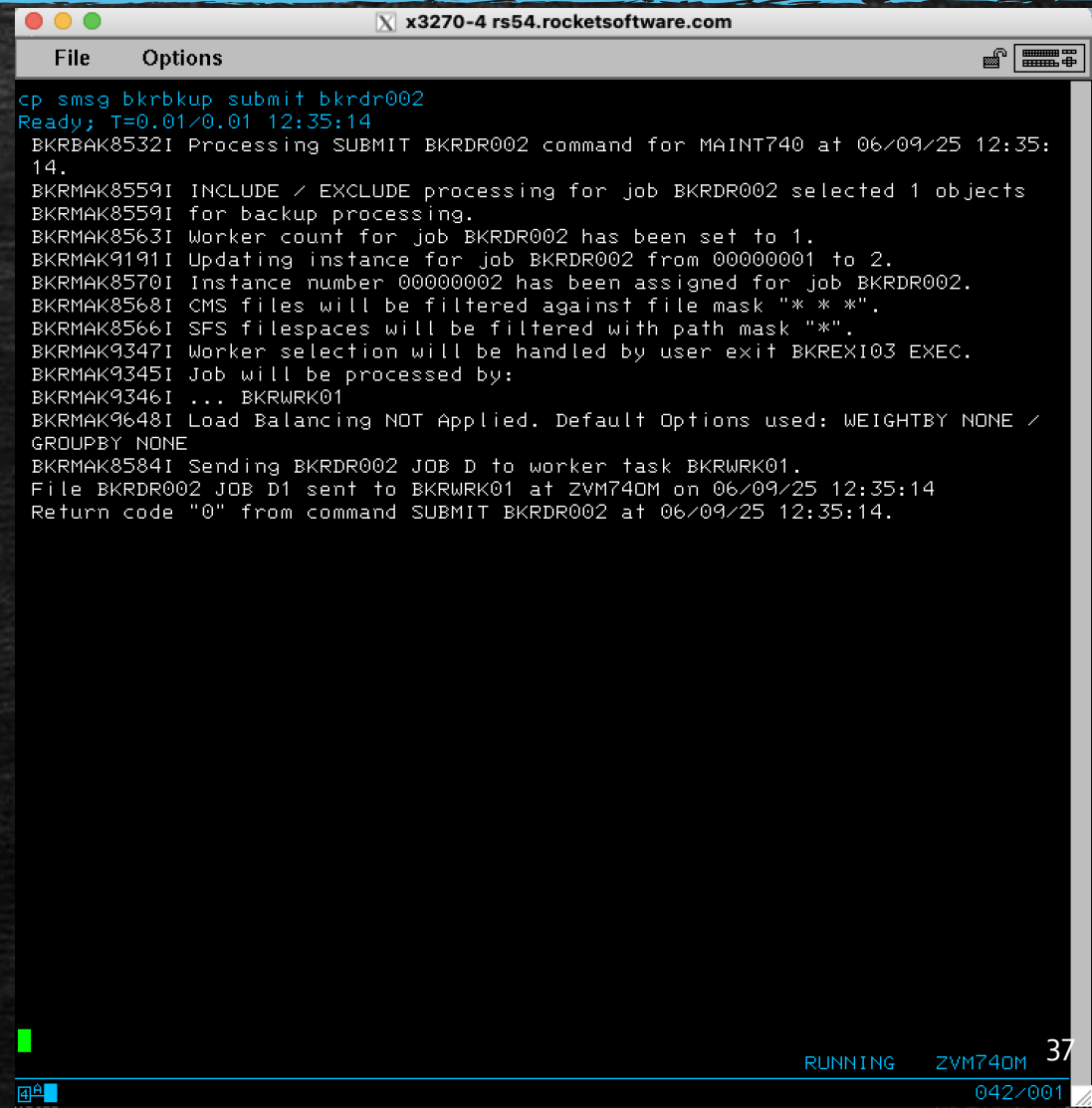
```
x3270-4 rs54.rocketsoftware.com
File Options
Ready; T=0.10/0.11 12:26:13
msg bkrcatlg expire
Ready; T=0.01/0.01 12:26:18
BKRCAT8875I Job BKRDR001 instance 00000003 will expire after 9 Jul 2025.
BKRCAT8875I Job SAMPFULL instance 00000001 will expire after 7 Jul 2025.
BKRCAT8875I Job SAMPFULL instance 00000002 will expire after 8 Jul 2025.
BKRCAT8875I Job SAMPINCR instance 00000004 will expire after 9 Jul 2025.
Return code: 0
msg bkrbkup catbackup export
Ready; T=0.01/0.01 12:26:30
BKRBK9484I Pausing 15 seconds for BKRCATLG shutdown.

BKRBK9490I Invoking CMS utility FILEPOOL UNLOAD FILESPACE...
BKRBK9491I FILEPOOL UNLOAD FILESPACE completed with return code 0.
BKRBK9492I FILEPOOL UNLOAD FILESPACE generated the following messages:
DMSWFP3485I FILEPOOL processing begun at 12:26:45 on 9 Jun 2025.
DMS5PY3455I The unload of file space BKRCATLG is starting: 12:26:44
DMS5PY3455I The unload of file space BKRCATLG is complete: 12:26:46
DMS5PX3438I FILEPOOL UNLOAD successful
DMSWFP3486I FILEPOOL processing ended at 12:26:47 on 9 Jun 2025.
BKRBK9493I FILEPOOL UNLOAD FILESPACE complete; restarting BKRCATLG via CP XAU
TOLG.

RUNNING ZVM740M 36
042/001
```

After CATBACKUP EXPORT... DDR-format backup of EXPORT minidisk

- Workflow:
 - DASD image DR backup (tape in DDR format)
 - Export catalog filespace
 - DASD image backup of catalog export minidisk (tape in DDR format)



A terminal window titled "x3270-4 rs54.rocketsoftware.com" with a menu bar containing "File" and "Options". The terminal displays the following text:

```
cp smsg bkrbkup submit bkrdr002
Ready; T=0.01/0.01 12:35:14
BKRBK8532I Processing SUBMIT BKRDR002 command for MAINT740 at 06/09/25 12:35:
14.
BKRMK8559I INCLUDE / EXCLUDE processing for job BKRDR002 selected 1 objects
BKRMK8559I for backup processing.
BKRMK8563I Worker count for job BKRDR002 has been set to 1.
BKRMK9191I Updating instance for job BKRDR002 from 00000001 to 2.
BKRMK8570I Instance number 00000002 has been assigned for job BKRDR002.
BKRMK8568I CMS files will be filtered against file mask "* * *".
BKRMK8566I SFS filespace will be filtered with path mask "*".
BKRMK9347I Worker selection will be handled by user exit BKREX103 EXEC.
BKRMK9345I Job will be processed by:
BKRMK9346I ... BKRWRK01
BKRMK9648I Load Balancing NOT Applied. Default Options used: WEIGHTBY NONE /
GROUPBY NONE
BKRMK8584I Sending BKRDR002 JOB D to worker task BKRWRK01.
File BKRDR002 JOB D1 sent to BKRWRK01 at ZVM740M on 06/09/25 12:35:14
Return code "0" from command SUBMIT BKRDR002 at 06/09/25 12:35:14.
```

At the bottom of the terminal window, there is a status bar with the text "RUNNING ZVM740M 37" and a small icon on the left.

Definitions: What's a disaster?

Everything was not, in fact, fine...



...business operations are halted due to disruption or disaster.

-
- “oops!”

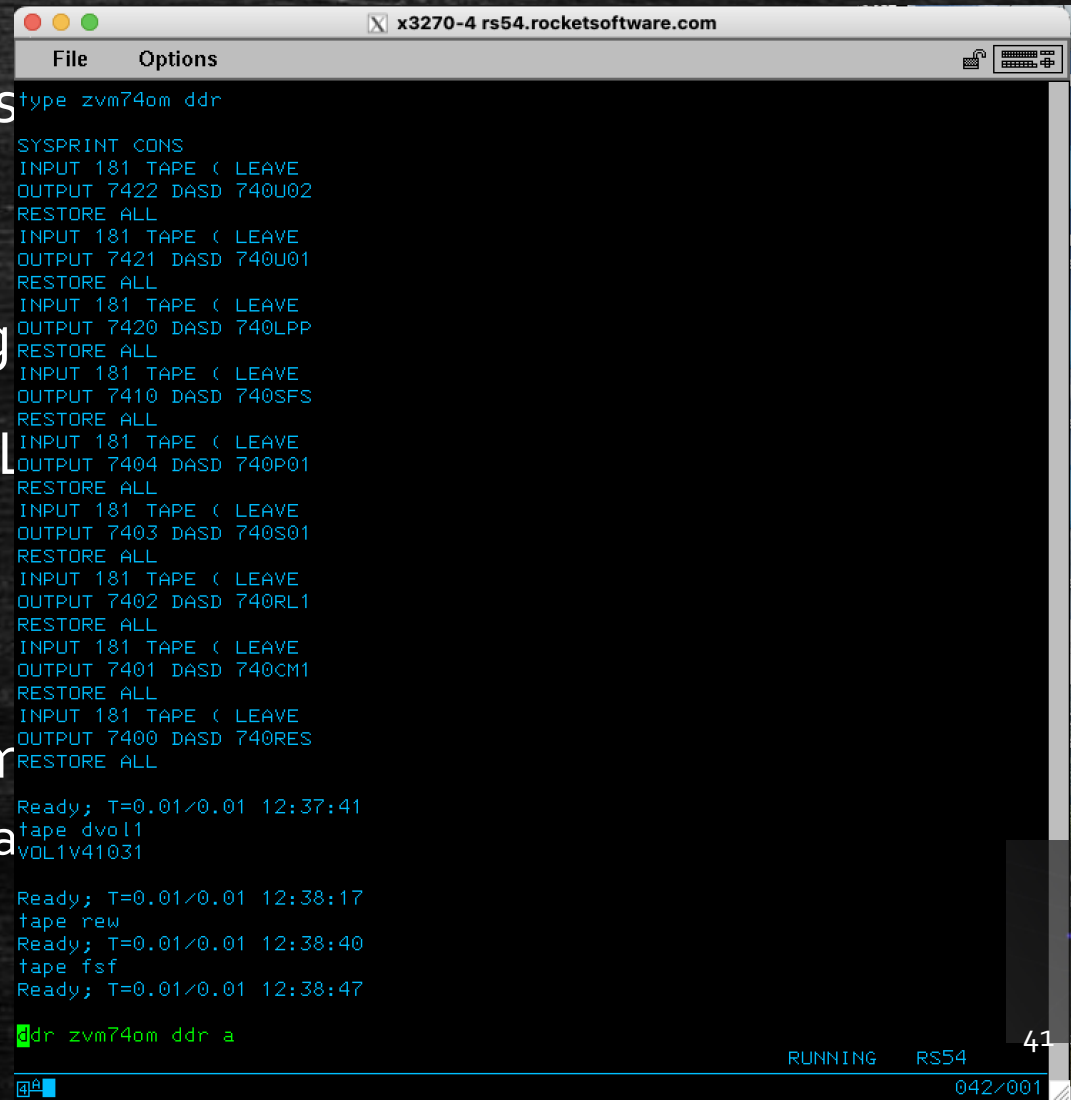
Tactics: Recovery

- ...or “what comes after the disaster?”
- Identify and mount the tape generated by BKRDR001
- “TAPE FSF” to skip past the SL label
- Set up DDR input statements (based on BKRDR001 log / message 9359I)
- Restore DDR-format DASD image backup data using DDR
 - Remember: This is provided as part of your as-delivered-by-IBM z/VM system

Tactics: Recovery

Part 1 – Restore DR DASD image backup

- ...or “what comes after the disaster”
- Identify and mount the tape groups
- “TAPE FSF” to skip past the SL
- Set up DDR input statements (e.g. 9359I)
- Restore DDR-format DASD images
 - Remember: This is provided as part of the



```
x3270-4 rs54.rocketsoftware.com
File Options
type zvm74om ddr
SYSPRINT CONS
INPUT 181 TAPE ( LEAVE
OUTPUT 7422 DASD 740U02
RESTORE ALL
INPUT 181 TAPE ( LEAVE
OUTPUT 7421 DASD 740U01
RESTORE ALL
INPUT 181 TAPE ( LEAVE
OUTPUT 7420 DASD 740LPP
RESTORE ALL
INPUT 181 TAPE ( LEAVE
OUTPUT 7410 DASD 740SFS
RESTORE ALL
INPUT 181 TAPE ( LEAVE
OUTPUT 7404 DASD 740P01
RESTORE ALL
INPUT 181 TAPE ( LEAVE
OUTPUT 7403 DASD 740S01
RESTORE ALL
INPUT 181 TAPE ( LEAVE
OUTPUT 7402 DASD 740RL1
RESTORE ALL
INPUT 181 TAPE ( LEAVE
OUTPUT 7401 DASD 740CM1
RESTORE ALL
INPUT 181 TAPE ( LEAVE
OUTPUT 7400 DASD 740RES
RESTORE ALL

Ready; T=0.01/0.01 12:37:41
tape dvol1
VOL1V41031

Ready; T=0.01/0.01 12:38:17
tape rew
Ready; T=0.01/0.01 12:38:40
tape fsf
Ready; T=0.01/0.01 12:38:47

dr zvm74om ddr a
RUNNING RS54 41
042/001
```

Tactics: Recovery

Part 1 – Restore DR DASD image backup

- ...or “what comes after the disaster”
- Identify and mount the tape generator
- “TAPE FSF” to skip past the SFS
- Set up DDR input statements (9359I)
- Restore DDR-format DASD images
 - Remember: This is provided as part of the

```
File Options
RESTORING 740U02
DATA DUMPED 06/09/25 AT 14.04.39 GMT FROM 740U02 RESTORED TO 740U02
INPUT CYLINDER EXTENTS OUTPUT CYLINDER EXTENTS
START STOP START STOP
0 3337 0 3337
END OF RESTORE
RESTORING 740U01
DATA DUMPED 06/09/25 AT 14.04.59 GMT FROM 740U01 RESTORED TO 740U01
INPUT CYLINDER EXTENTS OUTPUT CYLINDER EXTENTS
START STOP START STOP
0 3337 0 3337
END OF RESTORE
RESTORING 740LPP
DATA DUMPED 06/09/25 AT 14.05.19 GMT FROM 740LPP RESTORED TO 740LPP
INPUT CYLINDER EXTENTS OUTPUT CYLINDER EXTENTS
START STOP START STOP
0 3337 0 3337
END OF RESTORE
RESTORING 740SFS
DATA DUMPED 06/09/25 AT 14.05.40 GMT FROM 740SFS RESTORED TO 740SFS
INPUT CYLINDER EXTENTS OUTPUT CYLINDER EXTENTS
START STOP START STOP
0 3337 0 3337
END OF RESTORE
RESTORING 740P01
DATA DUMPED 06/09/25 AT 14.06.00 GMT FROM 740P01 RESTORED TO 740P01
INPUT CYLINDER EXTENTS OUTPUT CYLINDER EXTENTS
START STOP START STOP
0 3337 0 3337
END OF RESTORE
RESTORING 740S01
DATA DUMPED 06/09/25 AT 14.06.20 GMT FROM 740S01 RESTORED TO 740S01
INPUT CYLINDER EXTENTS OUTPUT CYLINDER EXTENTS
START STOP START STOP
0 3337 0 3337
END OF RESTORE

RUNNING RS54 42
042/001
```

Tactics: Recovery

Part 1 – Restore DR DASD image backup

- ...or “what comes after the disaster”
- Identify and mount the tape generator
- “TAPE FSF” to skip past the SL
- Set up DDR input statements (9359I)
- Restore DDR-format DASD image
 - Remember: This is provided as part of the recovery

```
x3270-4 rs54.rocketsoftware.com
File Options
END OF RESTORE
RESTORING 740CM1
DATA DUMPED 06/09/25 AT 14.07.40 GMT FROM 740CM1 RESTORED TO 740CM1
INPUT CYLINDER EXTENTS      OUTPUT CYLINDER EXTENTS
  START      STOP      START      STOP
    0        10015      0        10015
END OF RESTORE
RESTORING 740RES
DATA DUMPED 06/09/25 AT 14.08.41 GMT FROM 740RES RESTORED TO 740RES
INPUT CYLINDER EXTENTS      OUTPUT CYLINDER EXTENTS
  START      STOP      START      STOP
    0        10015      0        10015
END OF RESTORE
END OF JOB
Ready; T=0.78/13.50 12:56:35

cp ipl 7400 clear loadparm 001f
RUNNING RS54 43
042/032
```

Tactics: Recovery

Part 2 – IPL the just-restored system

- Bring up the just-restored z/VM system
- Points to consider
 - If you backed up SPOOL volumes, expect to need a FORCE start
 - If your hosted applications are started via AUTOLOG₁ / AUTOLOG₂, you may need to use the NOAUTOLOG startup parameter
 - ...and manually start essential components of z/VM after this IPL...
 - If BKRBKUP and BKRCATLG start via AUTOLOG, CP FORCE those services as preparation for restoring the backup catalog file space.
 - **DO** allow BKRSVSFS (the SFS file pool server housing the backup catalog file space) to start.
 - **The file pool server must be “on air” in order to restore the SFS file space**

Tactics: Recovery

Part 2 – IPL the just-restored system

- Bring up the just-restored z/VM
- Points to consider
 - If you backed up SPOOL volumes,
 - If your hosted applications are started, you may need to use the NOAUTOC
 - ...and manually start essential com
 - If BKRBKUP, BKRCATLG, and the CP FORCE those services as prep space.

```
File Options
14:03:56 z/VM V7 R4.0 SERVICE LEVEL 0001 (64-BIT)
14:03:57 SYSTEM NUCLEUS CREATED ON 2025-05-09 AT 10:08:08, LOADED FROM 740RES
14:03:57
14:03:57 *****
14:03:57 * LICENSED MATERIALS - PROPERTY OF IBM* *
14:03:57 * *
14:03:57 * 5741-A09 (C) COPYRIGHT IBM CORP. 1983, 2024. ALL RIGHTS *
14:03:57 * RESERVED. US GOVERNMENT USERS RESTRICTED RIGHTS - USE, *
14:03:57 * DUPLICATION OR DISCLOSURE RESTRICTED BY GSA ADP SCHEDULE *
14:03:57 * CONTRACT WITH IBM CORP. *
14:03:57 * *
14:03:57 * * TRADEMARK OF INTERNATIONAL BUSINESS MACHINES. *
14:03:57 *****
14:03:57
14:03:57 HCPZC06718I Using parm disk 1 on volume 740CM1 (device 7401).
14:03:57 HCPZC06718I Parm disk resides on cylinders 1 through 120.
14:03:57 Start ((Warm|Force|COLD|CLEAN) (Drain) (Disable) (NODirect)
14:03:57 (NOAUTOlog)) or (SHUTDOWN)
14:04:01 HCPPCC2582I Storage reconfiguration by SYSTEM is complete. Permanent =
16 Reconfigurable = 0
14:04:02
14:04:02 NOW 14:04:02 EDT MONDAY 2025-06-09
14:04:02 Change TOD clock (Yes|No)
14:04:03
14:04:03 The directory on volume 740RES at address 7400 has been brought online.
14:04:03 HCPWRM904E System recovery failure; incorrect warm start data.
14:04:03 HCPASK9205A
14:04:03 HCPASK9205A Invalid warm start data encountered.
14:04:03 HCPASK9205A No files have been deleted yet.
14:04:03 HCPASK9205A To change to a FORCE start, enter FORCE.
14:04:03 HCPASK9205A To stop processing, enter STOP.
```

CP READ ZVM740M 45
042/001

Tactics: Recovery

Part 2 – IPL the just-restored system

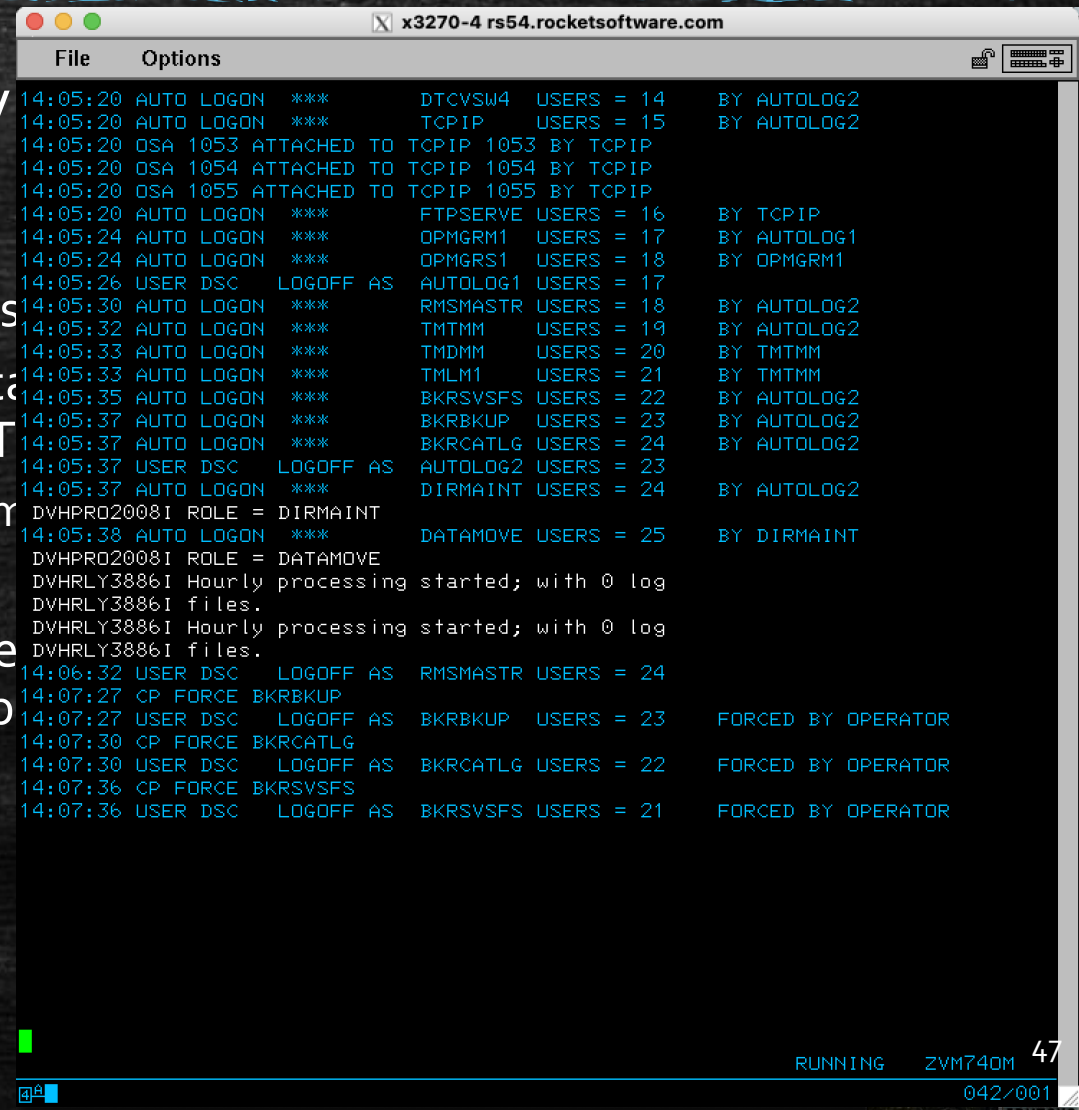
- Bring up the just-restored z/VM
- Points to consider
 - If you backed up SPOOL volumes,
 - If your hosted applications are stalled you may need to use the NOAUTC
 - ...and manually start essential comp
 - If BKRBKUP, BKRCATLG, and the ICP FORCE those services as prepa space.

```
x3270-4 rs54.rocketsoftware.com
File Options
14:03:56 z/VM V7 R4.0 SERVICE LEVEL 0001 (64-BIT)
14:03:57 SYSTEM NUCLEUS CREATED ON 2025-05-09 AT 10:08:08, LOADED FROM 740RES
14:03:57
14:03:57 *****
14:03:57 * LICENSED MATERIALS - PROPERTY OF IBM* *
14:03:57 * *
14:03:57 * 5741-A09 (C) COPYRIGHT IBM CORP. 1983, 2024. ALL RIGHTS *
14:03:57 * RESERVED. US GOVERNMENT USERS RESTRICTED RIGHTS - USE, *
14:03:57 * DUPLICATION OR DISCLOSURE RESTRICTED BY GSA ADP SCHEDULE *
14:03:57 * CONTRACT WITH IBM CORP. *
14:03:57 * *
14:03:57 * * TRADEMARK OF INTERNATIONAL BUSINESS MACHINES. *
14:03:57 *****
14:03:57
14:03:57 HCPZC06718I Using parm disk 1 on volume 740CM1 (device 7401).
14:03:57 HCPZC06718I Parm disk resides on cylinders 1 through 120.
14:03:57 Start ((Warm|Force|COLD|CLEAN) (DRain) (Disable) (NODIRect)
14:03:57 (NOAUTDlog)) or (SHUTDOWN)
14:04:01 HCPPCC2582I Storage reconfiguration by SYSTEM is complete. Permanent =
1G Reconfigurable = 0
14:04:02
14:04:02 NOW 14:04:02 EDT MONDAY 2025-06-09
14:04:02 Change TOD clock (Yes|No)
14:04:03
14:04:03 The directory on volume 740RES at address 7400 has been brought online.
14:04:03 HCPWRM904E System recovery failure; incorrect warm start data.
14:04:03 HCPASK9205A
14:04:03 HCPASK9205A Invalid warm start data encountered.
14:04:03 HCPASK9205A No files have been deleted yet.
14:04:03 HCPASK9205A To change to a FORCE start, enter FORCE.
14:04:03 HCPASK9205A To stop processing, enter STOP.
14:05:17 FORCE
14:05:17 HCPWRS2513I
14:05:17 HCPWRS2513I Spool files available 327
14:05:17 HCPWRS2512I Spooling initialization is complete.
14:05:17 DASD 7403 dump unit CP IPL pages 15359 PGMBKS DEFAULT FRMTBL DEFAULT
14:05:17 HCPAAU2700I System gateway ZVM740M identified.
14:05:17 z/VM Version 7 Release 4.0, Service Level 0001 (64-bit),
14:05:17 built on IBM Virtualization Technology
14:05:17 There is no logmsg data
14:05:17 FILES: NO RDR, 0012 PRT, NO PUN
HOLDING ZVM740M 46
042/001
```

Tactics: Recovery

Part 2 – IPL the just-restored system

- Bring up the just-restored z/V
- Points to consider
 - If you backed up SPOOL volumes
 - If your hosted applications are started you may need to use the NOAUT
 - ...and manually start essential com
 - If BKRBKUP, BKRCATLG, and the CP FORCE those services as prep space.



The screenshot shows a z/OS console window titled 'x3270-4 rs54.rocketsoftware.com'. The window displays a list of system events and user actions. The events include automatic logons for various users (DTCVSW4, TCP/IP, OSA 1053, OSA 1054, OSA 1055, FTPSERVE, DPMGRM1, DPMGRS1, RMSMASTR, TMTMM, TMDMM, TMLM1, BKRSVSFS, BKRBKUP, BKRCATLG, DIRMAINT, DATAMOVE) and manual logoffs for users DSC and CP FORCE. The console also shows the start of hourly processing for DVHRLY3886I files. The status bar at the bottom indicates 'RUNNING' and 'ZVM740M 47', with a timestamp of '042/001'.

```
File Options
14:05:20 AUTO LOGON *** DTCVSW4 USERS = 14 BY AUTOLOG2
14:05:20 AUTO LOGON *** TCP/IP USERS = 15 BY AUTOLOG2
14:05:20 OSA 1053 ATTACHED TO TCP/IP 1053 BY TCP/IP
14:05:20 OSA 1054 ATTACHED TO TCP/IP 1054 BY TCP/IP
14:05:20 OSA 1055 ATTACHED TO TCP/IP 1055 BY TCP/IP
14:05:20 AUTO LOGON *** FTPSERVE USERS = 16 BY TCP/IP
14:05:24 AUTO LOGON *** DPMGRM1 USERS = 17 BY AUTOLOG1
14:05:24 AUTO LOGON *** DPMGRS1 USERS = 18 BY DPMGRM1
14:05:26 USER DSC LOGOFF AS AUTOLOG1 USERS = 17
14:05:30 AUTO LOGON *** RMSMASTR USERS = 18 BY AUTOLOG2
14:05:32 AUTO LOGON *** TMTMM USERS = 19 BY AUTOLOG2
14:05:33 AUTO LOGON *** TMDMM USERS = 20 BY TMTMM
14:05:33 AUTO LOGON *** TMLM1 USERS = 21 BY TMTMM
14:05:35 AUTO LOGON *** BKRSVSFS USERS = 22 BY AUTOLOG2
14:05:37 AUTO LOGON *** BKRBKUP USERS = 23 BY AUTOLOG2
14:05:37 AUTO LOGON *** BKRCATLG USERS = 24 BY AUTOLOG2
14:05:37 USER DSC LOGOFF AS AUTOLOG2 USERS = 23
14:05:37 AUTO LOGON *** DIRMAINT USERS = 24 BY AUTOLOG2
DVHPRD2008I ROLE = DIRMAINT
14:05:38 AUTO LOGON *** DATAMOVE USERS = 25 BY DIRMAINT
DVHPRD2008I ROLE = DATAMOVE
DVHRLY3886I Hourly processing started; with 0 log
DVHRLY3886I files.
DVHRLY3886I Hourly processing started; with 0 log
DVHRLY3886I files.
14:06:32 USER DSC LOGOFF AS RMSMASTR USERS = 24
14:07:27 CP FORCE BKRBKUP
14:07:27 USER DSC LOGOFF AS BKRBKUP USERS = 23 FORCED BY OPERATOR
14:07:30 CP FORCE BKRCATLG
14:07:30 USER DSC LOGOFF AS BKRCATLG USERS = 22 FORCED BY OPERATOR
14:07:36 CP FORCE BKRSVSFS
14:07:36 USER DSC LOGOFF AS BKRSVSFS USERS = 21 FORCED BY OPERATOR
```

RUNNING ZVM740M 47
042/001

Tactics: Recovery

Part 3 – Restore the backup catalog

- Restore the DASD image backup of BKRBKUP CBAC
 - Via MAINT740 or similarly privileged user...
 - LINK BKRBKUP CBAC CBAC MR
 - Mount tape created by BKRDR002 (DFSMSRM MOUNT VOL ... (READONLY)
 - DDR RESTORE the catalog image...

Tactics: Recovery

Part 3 – Restore the backup catalog

- Restore the DASD image back
 - Via MAINT740 or similarly privileged user
 - LINK BKRBKUP CBAC CBAC MR
 - Mount tape created by BKRDRoo
 - DDR RESTORE the catalog image

```
x3270-4 rs54.rocketsoftware.com
File Options
dfsmsrm mount vol v41032 (vdev 181 readonly
DGTUIR2026I DFSMS request 9 accepted for processing
Ready; T=0.01/0.01 14:16:31
Tape 181 attached
14:16:31 * MSG FROM RMSMASTR: FSMBCR2120I Request 9 complete; volume V41032,
category VOLSPECIFIC, mounted on device 04BF in library IBMVTL1
14:16:31 * MSG FROM RMSMASTR: FSMBEC2125I Request 9: device 04BF attached to
MAINT740 as 0181; access mode = READONLY
tape new
Ready; T=0.01/0.01 14:16:36
tape dvol1
VOL1V41032
Ready; T=0.01/0.01 14:16:39
cp q v cbac
DASD CBAC 3390 740U02 R/W 1000 CYL ON DASD 7422 SUBCHANNEL = 0020
Ready; T=0.01/0.01 14:16:46
tape fsf
Ready; T=0.01/0.01 14:16:53
ddr
z/VM DASD DUMP/RESTORE PROGRAM
ENTER:
sysprint cons
ENTER:
in 181 tape (leave
ENTER:
out cbac dasd
ENTER:
restore all
HCPDDR717D DATA DUMPED FROM CATBAK TO BE RESTORED
DO YOU WISH TO CONTINUE? RESPOND YES, NO OR REREAD:
yes
HCPDDR711D VOLID READ IS CATBAK
DO YOU WISH TO CONTINUE? RESPOND YES, NO OR REREAD:
yes
RESTORING CATBAK
DATA DUMPED 06/09/25 AT 16.35.55 GMT FROM CATBAK RESTORED TO CATBAK
INPUT CYLINDER EXTENTS OUTPUT CYLINDER EXTENTS
START STOP START STOP
0 999 0 999
END OF RESTORE
HOLDING ZVM740M 49
042/001
```

Tactics: Recovery

Part 3 – Restore the backup catalog

- Restore the DASD image back
 - Via MAINT740 or similarly privileged user
 - LINK BKRBKUP CBAC CBAC MR
 - Mount tape created by BKRRDRoot
 - DDR RESTORE the catalog image

```
ENTER:
END OF JOB
Ready; T=0.02/0.22 14:20:23
access cbac z
DMSACC724I CBAC replaces Z (1B5)
Ready; T=0.01/0.01 14:20:28
q disk z
LABEL VDEV M STAT CYL TYPE BLKSZ FILES BLKS USED-(%) BLKS LEFT BLK TOTAL
CATBAK CBAC Z R/W 1000 3390 4096 1 14231-08 165769 180000
Ready; T=0.01/0.01 14:20:31
listfile * * z (label
FILENAME FILETYPE FM FORMAT LRECL RECS BLOCKS DATE TIME LABEL
BKRCATLG SNAPSHOT Z1 V 29001 2032 14169 6/09/25 12:26:47 CATBAK
Ready; T=0.01/0.01 14:20:37
```

RUNNING ZVM740M 50
042/001

Tactics: Recovery

Part 3 – Restore the backup catalog

- Restore the DASD image backup of BKRBKUP CBAC
 - Via MAINT740 or similarly privileged user...
 - LINK BKRBKUP CBAC CBAC MR
 - Mount tape created by BKRDR002 (DFSMSRM MOUNT VOL ... (READONLY
 - DDR RESTORE the catalog image...
 - Restore the backup catalog SFS filesystem using FILEPOOL RELOAD
 - Again, part of as-shipped-by-IBM z/VM...

Tactics: Recovery

Part 3 – Restore the backup catalog

- Restore the DASD image backup
 - Via MAINT740 or similarly privileged user
 - LINK BKRBKUP CBAC CBAC MOUNT
 - Mount tape created by BKRDR
 - DDR RESTORE the catalog image
 - Restore the backup catalog SFC
 - Again, part of as-shipped-by-IBM

```
x3270-4 rs54.rocketsoftware.com
File Options
access cbac z
Ready; T=0.01/0.01 14:25:27
listfile * * z (label)
FILENAME FILETYPE FM FORMAT LRECL RECS BLOCKS DATE TIME LABEL
BKRCATLG SNAPSHOT Z1 V 29001 2032 14169 6/09/25 12:26:47 CATBAK
Ready; T=0.01/0.01 14:25:31
filepool reload filespace bkrcatlg bkrsfs:
DMSWFP3485I FILEPOOL processing begun at 14:25:41 on 9 Jun 2025.
DMS5PY3594R File space BKRCATLG in file pool BKRSFS will be replaced from
DMS5PY3594R file space BKRCATLG in file pool BKRSFS from reload file
DMS5PY3594R created at 06/09/25 on 12:26:44
DMS5PY3594R Enter '1' to continue or '0' to cancel.
1
DMS5PY3455I The reload of file space BKRCATLG is starting: 14:25:45
DMS5PY3455I The reload of file space BKRCATLG is complete: 14:26:08
DMS5PY3438I FILEPOOL RELOAD successful
DMSWFP3486I FILEPOOL processing ended at 14:26:09 on 9 Jun 2025.
Ready; T=0.16/0.24 14:26:09
query limits for bkrcatlg bkrsfs
Userid Storage Group 4K Block Limit 4K Blocks Committed Threshold
BKRCATLG 2 750000 12794-01% 90%
Ready; T=0.01/0.01 14:26:31
```

RUNNING ZVM740M 042/001

Tactics: Recovery

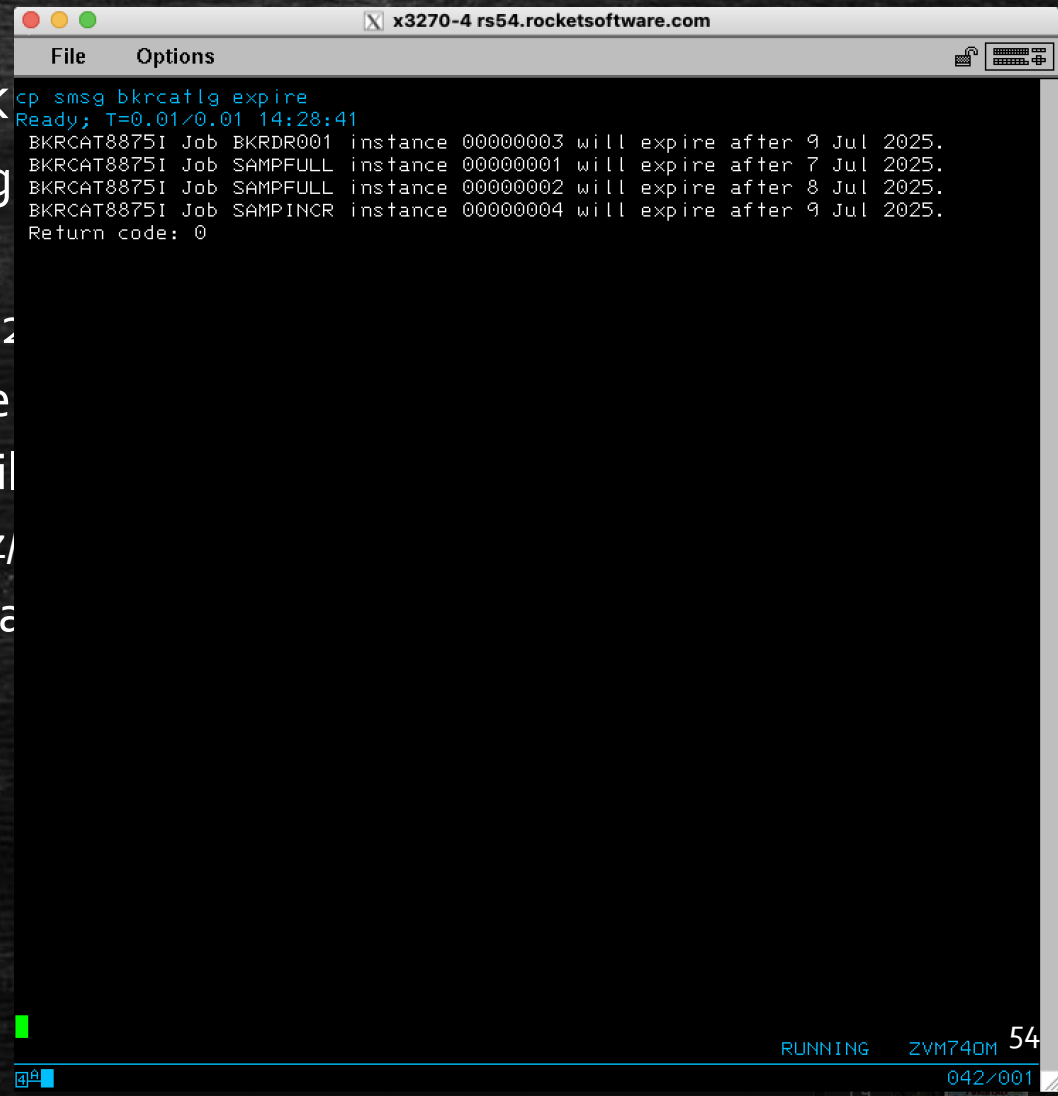
Part 3 – Restore the backup catalog

- Restore the DASD image backup of BKRBKUP CBAC
 - Via MAINT740 or similarly privileged user...
 - LINK BKRBKUP CBAC CBAC MR
 - Mount tape created by BKRDR002 (DFSMSRM MOUNT VOL ... (READONLY
 - DDR RESTORE the catalog image...
 - Restore the backup catalog SFS filespace using FILEPOOL RELOAD
 - Again, part of as-shipped-by-IBM z/VM...
 - Finally, start Backup & Restore Manager service virtual machines
 - CP XAUTOLOG BKRBKUP
 - CP XAUTOLOG BKRCATLG

Tactics: Recovery

Part 3 – Restore the backup catalog

- Restore the DASD image back
 - Via MAINT740 or similarly privileged user
 - LINK BKRBKUP CBAC CBAC MR
 - Mount tape created by BKRDR002
 - DDR RESTORE the catalog image
 - Restore the backup catalog SFS file
 - Again, part of as-shipped-by-IBM z/OS
 - Finally, start Backup & Restore Manager
 - CP XAUTOLOG BKRBKUP
 - CP XAUTOLOG BKRCATLG



```
x3270-4 rs54.rocketsoftware.com
File Options
cp smsg bkrcatlg expire
Ready; T=0.01/0.01 14:28:41
BKRCAT8875I Job BKRDR001 instance 00000003 will expire after 9 Jul 2025.
BKRCAT8875I Job SAMPFULL instance 00000001 will expire after 7 Jul 2025.
BKRCAT8875I Job SAMPFULL instance 00000002 will expire after 8 Jul 2025.
BKRCAT8875I Job SAMPINCR instance 00000004 will expire after 9 Jul 2025.
Return code: 0
```

RUNNING ZVM740M 54
042/001

Wait. What!?

- Note that the instance of BKRDRO02 is **not** in the restored copy of the backup catalog filespace.
- “As an exercise for the reader...”
 - Think back to the order of operations during DR backup creation
 - Do the first DR backup
 - Export the backup catalog filespace
 - Do the second DR backup
 - Results: As expected, based on sequence of events during the DR backup process

Tactics: Recovery

What's after part 3?

- "It depends."
- Your z/VM operating system is restored.
- Your Backup & Restore Manager backup catalog filespace is restored.
- At this point, additional application data recovery can be performed.
 - ...based on data maintained by BKRCATLG
 - ...using "normal" RESTORE command processing
 - ...via "usual" BKRBACKUP interfaces

Tactics: Recovery

What's after part 3?

- "It depends."
- Your z/VM operating system is restored.
- Your Backup & Restore Manager backup catalog filespace is restored.
- At this point, additional application data recovery can be performed.
 - ...based on data maintained by BKRCATLG
 - ...using "normal" RESTORE command processing
 - ...via "usual" BKRBACKUP interfaces
- You have policies and procedures for this. Right?

A Footnote: SSI considerations

- From the system recovery perspective, the steps are more or less the same.
- You can't solve this problem for SSI without a thorough understand of "what is shared" versus "what is not shared."
 - Avoid duplication of effort: Don't back up the same thing multiple times.
 - Know what **isn't** shared: This is a painful lesson to learn during recovery.
 - Once you back it up, keep track of where you put it.
 - This problem is hard enough for a single non-SSI system.
 - Don't put off testing until a conveniently timed real disaster occurs.
 - Backups are cheap. Recovery is priceless... and still employed the next day.

Questions, Comments, Feedback...?

- **“I WOULD RATHER HAVE QUESTIONS THAT CANNOT BE ANSWERED THAN ANSWERS THAT CANNOT BE QUESTIONED.”**

Richard Feynman (1918 – 1988), Theoretical Physicist

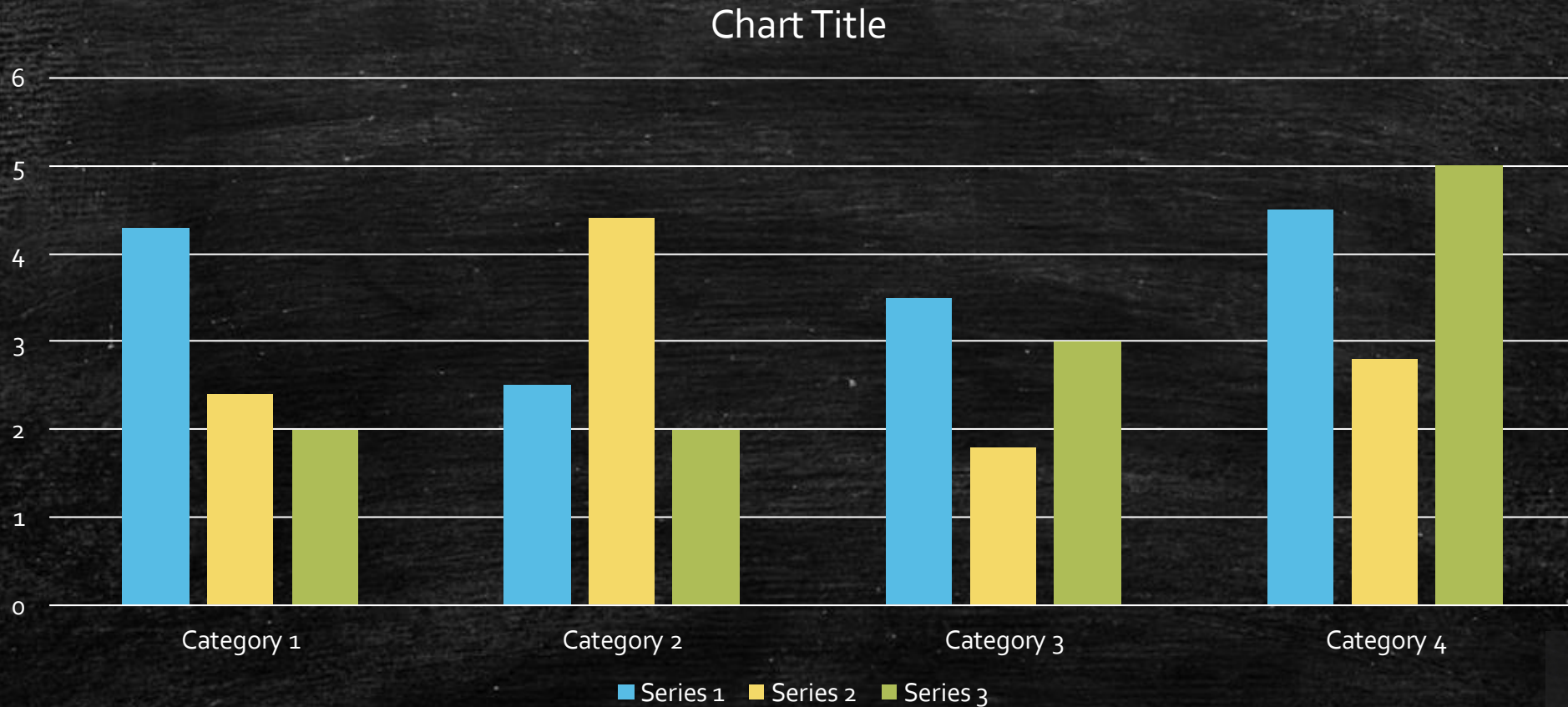




Title and Content Layout with List

- Add your first bullet point here
- Add your second bullet point here
- Add your third bullet point here

Title and Content Layout with Chart



Two Content Layout with Table

- First bullet point here
- Second bullet point here
- Third bullet point here

| Class | Group A | Group B |
|---------|---------|---------|
| Class 1 | 82 | 95 |
| Class 2 | 76 | 88 |
| Class 3 | 84 | 90 |

Two Content Layout with SmartArt

Group A

- Task 1
- Task 2

Group B

- Task 1
- Task 2

Group C

- Task 1

- First bullet point here
- Second bullet point here
- Third bullet point here

Add a Slide Title - 1

Add a Slide Title - 2

Add a Slide Title - 3

Add a Slide Title - 4



Add a Slide Title - 5

