A Gentle Introduction to z/VM System Installation for the Inexperienced

Daniel P. Martin
Rocket Software, Inc.

Tuesday, August 11th, 2015
Session Number 17481
Agenda

• Introductions
  – Who is this person, and why is he here?

• Getting Started
  – Materials, Methods, and The Bootstrapping Problem.

• Planning
  – Motive, means…

• Choices
  – …and opportunity.

• Process
  – “…take the red pill: find out how deep the rabbit hole goes.”

• Results
  – What did I just do, and where do I go from here?

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Agenda

• Additional Resources
  – IBM resources
  – User Community Resources

• Questions, Comments, and Feedback
Introduction
About Rocket Software

We Build Software That Matters.

One day in 1990, one of our founders started writing assembler code in a spare bedroom in his house near Boston. The very first product he built helped large enterprises solve an important problem—how to process more database queries more efficiently. That was how Rocket Software started.

More than two decades later, our software engineers have built well over 100 products that solve problems across a broad spectrum of enterprise technology. Our engineers talk with you, our customers and partners, every day to discover new pain points and learn about the (hopefully really hard) problems and challenges you face.

We help you prevent outages, protect your data, store your data, share your data, virtualize your data, manage your networks, improve your service levels, discover insights, modernize your applications, access and connect users and applications, minimize risk and increase compliance, and so much more. We build and deliver products that matter to you so that you can deliver your best products, solutions, and services to your customers and grow your business.

We Put You First.

Rocket was founded on the premise that we would build products that matter for people—and we have never wavered from that. In fact, it’s the cornerstone of our core values that we live every day—we put you, our customers and partners, first.

We treat all of our customers and partners as individuals rather than transactions. That’s been our history. And that’s why our customers and partners see us as a trusted partner.

We don’t just sell software. We care about our customers’ and partners’ success—a win for you is a win for us. We spend our time solving the problems that keep you awake. We build software that matters—to you.

Treating You With Humanity.

This is the piece that almost every business today gets wrong. This is the piece that we talk about getting right at Rocket. We put you first and are committed to never letting you fail. We are committed to each other. Rocketeers don’t let each other fail. We are people building software for people. We are people solving problems for people. We have worked really hard over the past 25 years to earn your trust. And for the past 25 years we have always tried to treat you with humanity.

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About your speaker

• As a customer:
  • 22 years at University of Arkansas
    • …lots of VM, starting with VM/370 R6 PLC 3 (CDC Omega 480-III, anyone?)
    • …lots of Unix / Linux (Solaris, HP-UX, AIX, NCR/Teradata, Various distros)
    • …IT Security Weasel*
      *Telling people things they didn’t want to hear before it was cool.
  • “A Certain Major Retailer”
    • Early 1980’s - “Distributed Systems”
  • Since 2003: Senior Software Developer for Rocket Software, Inc.
    • Lead design / development
      • IBM Backup and Restore Manager for z/VM
      • IBM Archive Manager for z/VM
    • Co-conspirator
      • IBM Tape Manager for z/VM
      • IBM Operations Manager for z/VM
• Away From the Keyboard:
  • Certified Law Enforcement Officer, Search and Rescue Worker, Emergency Medical First Responder, and misplaced farm boy with a peculiar fondness for shiny things…
Target Audience

• Some familiarity with IBM z Systems Concepts, Facilities, and Terminology

• Some familiarity with IBM z/VM Concepts and Terminology

• Foundation-level, Introductory Overview

• Shameless Plug:
  
  − Tuesday, 13:45-17:30: Sessions 17468, 17469, & 17470, “z/VM Installation / Migration / Upgrade Hands-On Lab” (three parts, in room Asia 5)
Starting out...

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Materials, methods, and What we’re about to do…

- Goal: Provide basic instruction on how to perform the initial system installation for z/VM

- Objectives:
  - Define the basic requirements
  - Identify available options for z/VM installation packaging and distribution
  - Identify necessary system resources
  - Review the planning process
  - Navigate the installation process
  - Discuss post-installation configuration
Materials and Methods: What you’re going to need

• Our example scenario:

• You are using a currently supported processor.

• You are using a currently supported z/VM release.
  • This presentation uses z/VM 6.3 for all examples.
  • You have already ordered and received installation materials.
Materials and Methods: Basic requirements

• Our example scenario:

• Goal is to produce a monolithic / non-SSI system:
  – SSI installation procedure is functionally similar.
    • More decisions.
    • More hardware resources.

• Plan is to install a “Traditionally Managed” system:
  – Not managed by OpenStack / xCAT / IBM Director.

• Why?
  – Simplicity.
Materials and Methods: What’s in the box?

• Make sure you received what you ordered.
  – Physical or Electronic Delivery

• Review the Packing List.
  – Otherwise, how do you know you actually received what you asked for?
  – If you didn’t, where is it?
  – If the materials you received are inconsistent with the packing list, stop now – and don’t resume until the situation is corrected.
    » It’s quite uncommon, but mistakes happen. Fix It Now.
Materials and Methods: The Bootstrapping Problem

- It all starts with hardware.
- Hardware is only useful once you add software. *
  - *Otherwise, you have a wheel with no hamster.
- “OK, the power is on… Now what?”
Materials and Methods: The Bootstrapping Problem

• “The old days” (phrase of old; noun): Stuff that we don’t have to do any more.
Materials and Methods: The Bootstrapping Problem

- The modern installation process relies on the presence of a starter system.
- If you do not have a starter system, one will be provided for you.
Materials and Methods: The Bootstrapping Problem

• Source media
  • Tape
    • ECKD DASD required
    • TCP/IP Network is not required
    • Starter system preloaded on tape.
  • DVD+RW or Digital Download
    • ECKD or FBA/SCSI DASD
    • TCP/IP infrastructure is required
    • Starter system preloaded on DVD+RW media
    • Digital download: You already have a starter system.

• Installation destination
  • 1st Level (“Bare LPAR”)
    • No pre-existing z/VM system
    • …or “clean sweep” desired
    • …or migration coming later
    • …starter system required.
  • 2nd Level (as z/VM guest)
    • 1st-level system IS your starter system
    • z/VM supports z/VM as a guest operating system
    • Migration, testing, education.
Materials and Methods: The Bootstrapping Problem

- **Source media**
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Materials and Methods: The Bootstrapping Problem

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Materials and Methods: The Bootstrapping Problem

• Two stages:

  • (1) Deploy an initial installation (“starter”) system if you do not already have one.

  • (2) Perform the actual system installation.

• Exact steps are determined by:
  • Type of installation media (Tape, optical media, download)
  • Initial system state (Bare LPAR, “Second-level” VM)
Materials and Methods
The Bootstrapping Problem:

- Road map:
  - Steps are defined in one book: *z/VM Installation Guide*

- Assumptions for this exercise:
  - Not installing an SSI cluster (“Monolithic” z/VM system)
  - Not configuring for external management (xCAT / OpenStack)
Materials and Methods: Getting past fear of commitment

• Decision time:
  • Second-level VM; install materials downloaded from DVD.
  • Assumptions:
    • FTP transfer from DVD to CMS minidisk has been done.
    • Second-level guest virtual machine has been created.
      • …more in a moment…
    • We’re just installing, not plumbing a network today.

• Following this path:
  • z/VM 6.3 Installation Guide – Chapter 6
  • …jumping in at “Step 3: Complete the installation worksheets”
**Action**

**Foundation: Installation Worksheets**

- For this path:
  - Worksheet 1 (Table 7)
  - Worksheet 2 (Table 8)
  - Worksheet 3 (Table 9)
  - Worksheet 8 (Table 14)
Action
Foundation: Installation Worksheets

- For this path:
  - Worksheet 1 (Table 7)
    - Second level install
    - Install to MDISK
    - Default language is AMENG
    - Destination media is ECKD 3390-3
    - Common service file pool name is VMPSFS
    - Non-SSI
  - System name: SHARE125
Table 7. DVD Installation Worksheet 1

<table>
<thead>
<tr>
<th>Install To</th>
<th>Product</th>
<th>Install To</th>
<th>Product</th>
<th>Install To</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>VM</td>
<td>M</td>
<td>DIRM</td>
<td>M</td>
<td>ICKDSF</td>
</tr>
<tr>
<td>M</td>
<td>OSA</td>
<td>M</td>
<td>PERF TK</td>
<td>M</td>
<td>RACF</td>
</tr>
<tr>
<td>M</td>
<td>RSCS</td>
<td>M</td>
<td>TCP IP</td>
<td>M</td>
<td>VMHCD</td>
</tr>
</tbody>
</table>

Default system language: AMENG
DASD type and model: 3390-3
SCSI volume size: VMPSFS
Common service filepool name: VMPSFS

Installation Type: X Non-SSI
SSI Cluster Name: 

*The system name you select should be considered a permanent name. Changing the system name after installation is a complicated process.
Foundation: Installation Worksheets

• For this path:
  • Worksheet 2 (Table 8)
    • Using xCAT or IBM Director? Not today.
### Action Foundation: Installation Worksheets

**Table 8. DVD Installation Worksheet 2**

Would you like to have your system automatically configured to be managed by a SMAPI client for system management, such as xCAT or IBM Director? (Y/N)

Keep the following in mind:

- If you say YES, you should not attempt to manage your system in any other way.
- If you'd like to manage your own system, or use a purchased external security manager or a purchased directory manager, say NO.

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Action

Foundation: Installation Worksheets

- For this path:
  - Worksheet 3 (Table 9)
    - DASD Assets – VOLSERs and VDEVs
      - There’s some recycling going on here…
  - Worksheet 8 (Table 14)
### Action Foundation: Installation Worksheets

Table 9. DVD Installation Worksheet 3 (3380 Non-SSI Only)

<table>
<thead>
<tr>
<th>Volume Type</th>
<th>Default Label</th>
<th>New Label</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMON</td>
<td>VMCOM1</td>
<td>62DCM1</td>
<td>6301</td>
</tr>
<tr>
<td>COMMON2</td>
<td>VMCOM2</td>
<td>62DCM2</td>
<td>6302</td>
</tr>
<tr>
<td>RELVOL</td>
<td>630RL1</td>
<td>62DRL1</td>
<td>6303</td>
</tr>
<tr>
<td>RELVOL2</td>
<td>630RL2</td>
<td>62DRL2</td>
<td>6304</td>
</tr>
<tr>
<td>RES</td>
<td>M01RES</td>
<td>62DRES</td>
<td>6305</td>
</tr>
<tr>
<td>SPOOL</td>
<td>M01S01</td>
<td>62DS01</td>
<td>6306</td>
</tr>
<tr>
<td>PAGE</td>
<td>M01P01</td>
<td>62DP01</td>
<td>6307</td>
</tr>
<tr>
<td>WORK</td>
<td>M01W01</td>
<td>62DW01</td>
<td>6308</td>
</tr>
<tr>
<td>WORK</td>
<td>M01W02</td>
<td>62DW02</td>
<td>6309</td>
</tr>
<tr>
<td>WORK</td>
<td>M01W03</td>
<td>62DW03</td>
<td>630A</td>
</tr>
</tbody>
</table>

Note: You must not use any of IBM’s default volume labels for a volume other than the volume for which it is originally defined.

Complete your session evaluations online at www.SHARE.org/Orlando-Eval
Action

Foundation: Installation Worksheets

- For this path:
  - Worksheet 8 (Table 14)
    - Where’s all this stuff coming from?

**Table 14. DVD Installation Worksheet 8**

- IP address or host name: ______________
- FTP server user ID and password: ______________
- DVD/FTP directory path name: ______________
- VM user ID and address of VM minidisk to upload DVD: DMARTIN 5400
Action

“Make me a virtual machine like this”

 Virtual machine identity. No special privileges needed.

 Virtual processors – number and mode
(Spot the two-engine virtual MP?)

 “Can set virtual TOD clock”

 Virtual CPUs defined

 Virtual console – recorded by OPMGRM1

 Virtual unit record devices

 LINK to DMARTIN 5400 – source of install images

Complete your session evaluations online at www.SHARE.org/Orlando-Eval
Action

“Make me a virtual machine like this”

...continued...

A handful of virtual 3270 terminals, just because we can.

(See the CP DIAL command...)

...continued...
Action

“Make me a virtual machine like this”

...continued...

| MDISK 0191 3390 101 | VM540A WR XXXXXXXX X | X
| MDISK 2222 3390 111 | VM540A WR XXXXXXXX X | X
| MDISK 24CC 3390 9497 | VM540B MR XXXXX X | XXXXXX XXXXXX
| MDISK 2CF0 3390 9507 | VM540B MR XXXXX X | XXXXXX XXXXXX

...continued...

**Required** MDISK definitions for this installation path:

191 – CMS “A” disk
2222, 24CC, 2CF0 – Required by bootstrapping tactics.
Action

“Make me a virtual machine like this”

...continued...

And, finally...

Nine 3390-3 DASD volumes for the second-level system install (MDISKs 6301-630A)

...plus...

The stock set of first-level CMS MDISKs (MAINT 190, 19D and 19E)

Complete your session evaluations online at www.SHARE.org/Orlando-Eval
### Action:

**Inspect the virtualized install setup**

<table>
<thead>
<tr>
<th>Device</th>
<th>Type</th>
<th>Volume</th>
<th>Mount Point</th>
<th>Access</th>
<th>Subchannel</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASD 2222</td>
<td>VM540A</td>
<td>R/W</td>
<td></td>
<td>10 CYL</td>
<td>AFB2</td>
</tr>
<tr>
<td>DASD 24CC</td>
<td>VM540B</td>
<td>R/W</td>
<td></td>
<td>10 CYL</td>
<td>AD35</td>
</tr>
<tr>
<td>DASD 2CF0</td>
<td>VM540B</td>
<td>R/W</td>
<td></td>
<td>120 CYL</td>
<td>AD35</td>
</tr>
<tr>
<td>DASD 5400</td>
<td>V54X00</td>
<td>R/O</td>
<td></td>
<td>32767 CYL</td>
<td>AF00</td>
</tr>
<tr>
<td>DASD 6301</td>
<td>62DCM1</td>
<td>R/W</td>
<td></td>
<td>3339 CYL</td>
<td>AE38</td>
</tr>
<tr>
<td>DASD 6302</td>
<td>62DCM2</td>
<td>R/W</td>
<td></td>
<td>3339 CYL</td>
<td>AE39</td>
</tr>
<tr>
<td>DASD 6303</td>
<td>62DRL1</td>
<td>R/W</td>
<td></td>
<td>3339 CYL</td>
<td>AE3A</td>
</tr>
<tr>
<td>DASD 6304</td>
<td>62DRL2</td>
<td>R/W</td>
<td></td>
<td>3339 CYL</td>
<td>AE3B</td>
</tr>
<tr>
<td>DASD 6305</td>
<td>62DRES</td>
<td>R/W</td>
<td></td>
<td>3339 CYL</td>
<td>AE37</td>
</tr>
<tr>
<td>DASD 6306</td>
<td>62DS01</td>
<td>R/W</td>
<td></td>
<td>3339 CYL</td>
<td>AE3D</td>
</tr>
<tr>
<td>DASD 6307</td>
<td>62DP01</td>
<td>R/W</td>
<td></td>
<td>3339 CYL</td>
<td>AE3E</td>
</tr>
<tr>
<td>DASD 6308</td>
<td>62DW01</td>
<td>R/W</td>
<td></td>
<td>3339 CYL</td>
<td>AE3F</td>
</tr>
<tr>
<td>DASD 6309</td>
<td>VM5406</td>
<td>R/W</td>
<td></td>
<td>3339 CYL</td>
<td>AD39</td>
</tr>
</tbody>
</table>

**CP READ**

**VMLEVEL1**

---

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Action:
Log in, let CMS start, and invoke INSTPLAN:

Most of the actual thought is taken out of the process at this point, IF you completed the worksheets first.
Action:
Log in, let CMS start, and invoke INSTPLAN:

INSTPLAN fields are all filled in; we’ve pressed <ENTER> to validate the contents.
Action:
Log in, let CMS start, and invoke INSTPLAN:

INSTPLAN panel 2 filled in;
We’ve declined the privilege of external systems management by responding N.
Action:
Log in, let CMS start, and invoke INSTPLAN:

INSTPLAN: We pressed PF5 after saying “N” to external management.

We get to review some of our choices now.

Note that the “generic” DASD volume names are still shown.

We’ll fix that in a moment.
Action:

Log in, let CMS start, and invoke INSTPLAN:

INSTPLAN: We’ve now supplied our own DASD volume names and (virtual – it’s a second-level install…) device addresses.
Action:
Log in, let CMS start, and invoke INSTPLAN:

INSTPLAN: We pressed “PF5” to process DASD choices. The result is one last opportunity to check for correctness, and a CMS “Ready;” prompt.
Action:
Time to invoke INSTALL

INSTPLAN has finished.
You have double-checked your work.
It’s all correct, so…
…it’s time to execute INSTALL

Complete your session evaluations online at www.SHARE.org/Orlando-Eval
Action:
Time to invoke INSTALL

INSTALL takes off. Once the 3390-3 volumes are initialized, things move along at a fairly brisk pace.
Action:
Time to invoke INSTALL

And by “brisk” I mean “a few minutes, and 317 steps later…”
Action:

After INSTALL, the first IPL of 2\textsuperscript{nd}-level system:

...INSTALL finishes loading MDISK images, and the initial boot of the installed system takes place.

Some housekeeping will ensue.
Action:

After INSTALL, the first IPL of 2\textsuperscript{nd}-level system:

Housekeeping: The POSTLOAD process restores some additional DASD, and SFS File Pool Servers are initialized…
**Action:**

After INSTALL, the first IPL of 2\textsuperscript{nd}-level system:

More housekeeping: SFS file pool server initialization completes.

Shareable components of CMS on the newly-installed system are initialized.
Action:

After INSTALL, the first IPL of 2\textsuperscript{nd}-level system:

More housekeeping:

Next, any pending service updates embedded with the installed system image are processed.
Action:

After INSTALL, the first IPL of 2nd-level system:

Yet more housekeeping:

Services have been initialized, and pending service updates are tidied up. The initial installation process automatically shuts down the fresh system with the REIPL option specified.
Action:

After INSTALL, the first IPL of 2nd-level system:

The newly-installed system image has successfully shut down, and is about to re-IPL itself...
Action:
After INSTALL, the first IPL of 2nd-level system:

Automatic SHUTDOWN has completed; automatic re-IPL has completed.

Note that OPERATOR has automatically disconnected from the system console.

This is normal for a WARM start where OPERATOR wasn't logged on to the console at the time of system shutdown.
Some observations about the install process:

- It takes more time to narrate the installation process than it does to actually execute it.
  - On our lab system, the actual “heads down” time was about 30 minutes.
  - Pay attention to details when completing the worksheets…
  - …and when transcribing them to the install dialogs.
    - … or don’t, and enjoy the process of Coming to the Attention of Important People …
What did we just accomplish?

- End result: A “second-level” z/VM 6.3 system
  - Not a cluster member (non-SSI)
    - ...although with multiple virtual machines, you could make a virtual SSI cluster.
  - “Traditionally” managed (i.e. not enabled for xCAT)

- What’s the point?
  - Test / development environment established
    - First-level hypervisor protects other guests from “collateral damage” if something horrible happens to this new system.
  - Other uses: “Your mileage may vary” depending on need
    - Training; initial deployment of new service updates or OEM products; “safe playground” for systems programmer.
Next Steps
Where to from here?

• A: “It depends.”
• Typical next steps:
  – Deploy in LPAR instead of as a 2\textsuperscript{nd}-level guest:
    – Do \textbf{NOT} try to run same system volumes from two locations concurrently. At best, “results may be unpredictable.”
  – Enable, configure and implement networking:
    – TCP/IP
    – RSCS (NJE)
  – Provision resources for other guest virtual machines:
    – Linux, z/OS, z/VSE, z/TPF, CMS
  – Provision systems management / security tools:
    – RACF, DIRMAINT, Automation, Tape Management, Backup…
    – Non-IBM OEM tools
Next steps
It’s all about choices

• Except, perhaps, for the parts that are all about policy.

• “Next steps” are dictated by installation needs.

• Needs of the enterprise dictate the level of complexity
  – Mix of features and products
  – Cluster or monolithic system configuration?
    • Two-way? Four-way?
      » Remote? How remote?
  – Traditional or xCAT-style system management?

• Goal: Keep it as simple as necessary – but no more so.
Additional Resources
a/k/a “Things I wish I had known…”

• This week:
  – Tuesday afternoon: z/VM 6.3 Hands-On Lab
  – This week: Spot a ribbon wearer, ask questions!

• Online
  – http://www2.marist.edu/htbin/wlvindex?LINUX-VM – Linux-390 Listserv
A Gentle Introduction to z/VM System Install: Questions, comments, and feedback?

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Sometimes, it’s better to light a flamethrower than curse the darkness.
– Sir Terry Pratchett, “Men at Arms”
THANK YOU! – Session 17481
Intro to z/VM System Installation

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That's not rocket science. That's Rocket Software.