IBM z/VM *Express System Install*

What is it
What's new
What's next

2026 VMWorkshop
www.vmworkshop.org

IBM®
z/VM ESI
Express System Install

The world's finest pocket-sized mainframe hybrid cloud

z/VM ONLINE | z/VM Express System Install

EXPRESS
SYSTEM
INSTALL

built on IBM Virtualization Technology by

Fred Bader . . . . . : Worldwide System Center
Vic Cross . . . . . : Worldwide Z Acceleration
Justice Heughan . . . . . : Worldwide System Center
Ernest Horn . . . . . : LinuxONE Technical Sales
Paul Novak . . . . . : Worldwide System Center
Clayton Slaughter . . . . : Z Ecosystem ISV Center
Bruce Hayden (Retired) . . : Worldwide System Center

RUNNING IBMZVM

The z/VM ESI team

IBM z/VM ESI

Topics Covered

Agenda

z/VM in a nutshell
The z/VM ESI concept
Standard z/VM installation
– History and current method
A new z/VM system
– What is there
– What would be better?
z/VM installation system
– Modifying it
– Creating disk images
– Restoring the images
Customization
– System
– Network
– Input panel

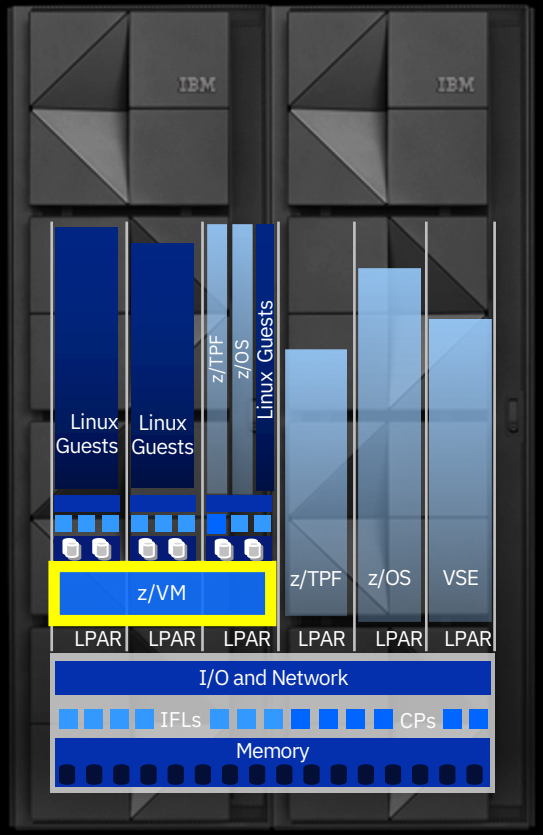
z/VM ESI: Our install process
– Booting LPAR
– Network
– Input fields
– System restore
– Automated customization

IPL new system

Other items
– ...like SSI
– Demonstration

IBM z/VM in a nutshell: what is it?

- IBM’s premier, enterprise-class, flagship virtualization hipervisor
- Capable of supporting more virtual servers than any other platform
- Known situations where Linux performance under z/VM exceeds native LPAR



Arguably the most capable and functionally rich hipervisor

- Legendary stability and qualities of service
- The only supported hypervisor for production Oracle databases on z/Architecture
- Was the first choice of the Red Hat OpenShift development team for s390x
- The only hypervisor with high-performance memory overcommitment
- The only hypervisor with memory-speed virtual disks available for paging
- Highly granular resource sharing, simulation, and restrictability

Arguably the most capable and functionally rich hipervisor

The concept:
What is z/VM ESI?

E. pluribus Unum

out of many, one

Standardize z/VM software bundle based on IBM expertise and good practices

RACF/VM — *Identity, access, and security management*

z/VM LDAP — *OpenShift and Linux security management*

Performance Toolkit — *Performance management*

DirMaint — *Directory configuration management*

Operations Manager — *Monitoring, automation, and log management*

Speedy,

secure...

Ready;

Red Hat Installation Support System

Express Linux Automation and Networking – ELAN

Ansible playbooks to create supporting infrastructure

Ansible playbooks to install

- OpenShift Container Platform
- IBM Cloud Infrastructure Center

Unified System based on z/VM

The z/VM ESI stack

Simplified deployment and setup of Red Hat OpenShift Container Platform or IBM Cloud Infrastructure Centre

Red Hat OpenShift — Hybrid cloud platform

Rapid deployment and time to value

z/VM ESI value-added packaging

Enterprise grade virtualization

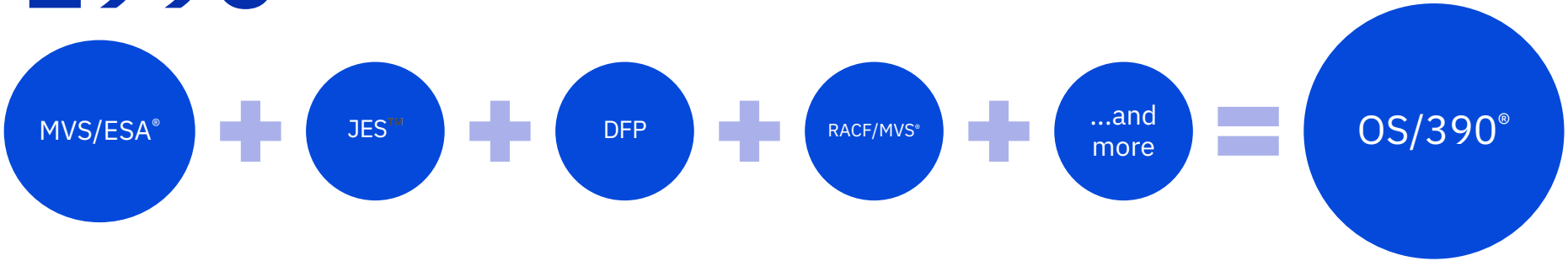
IBM z/VM

Legendary hardware

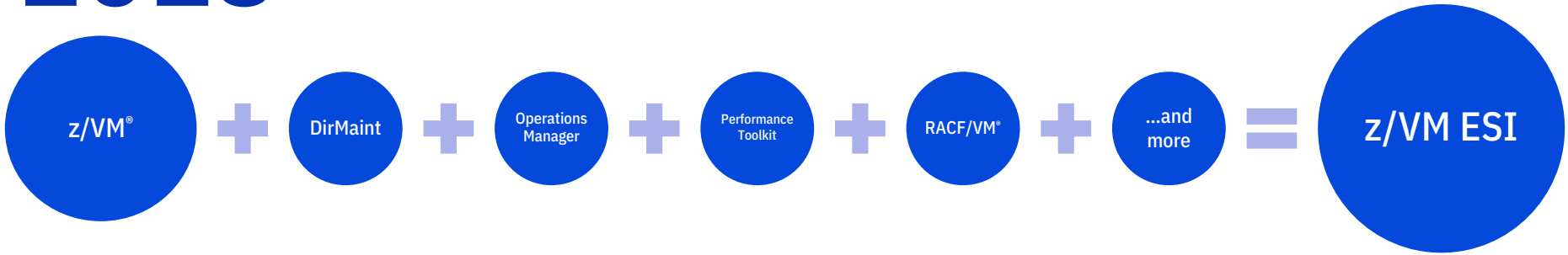
IBM Z or LinuxONE hardware

IBM z/VM ESI

1995

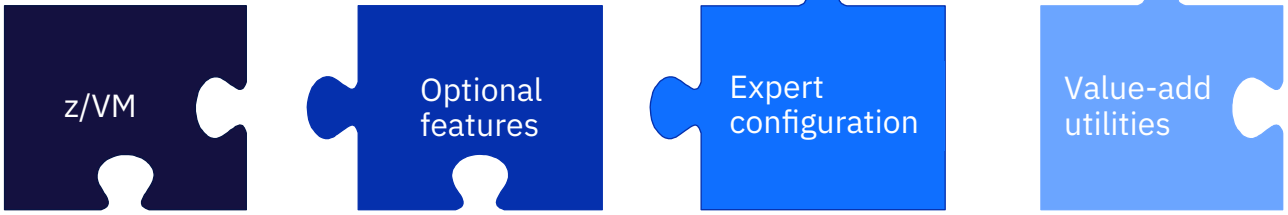


2018



Not a new concept for an IBM z/Architecture Operating System!

Similar to how MVS/ESA plus common features were bundled to create OS/390.



- Obtained from ShopZ

Not a special build

- RACF/VM

Identity, access, and security management

- z/VM LDAP

OpenShift and Linux security management

- Performance Toolkit

Performance management

- DirMaint

User & disk configuration management

- Operations manager

Monitoring, automation, and log management

- Functional as shipped
- Secure
- Reasonable defaults
- Good practices from IBM experts baked in

- Automation
- Rapid setup of features

What is z/VM ESI

What is z/VM ESI

z/VM Installation

- Overview
- Historically
- Presently

Load VM nucleus and Ramdisk; Start LPAR

Use HMC 3270 to fill in fields

Start installation

- Format, label, and allocate disks
- Load minidisk image files
- Pipeline stages created to do this
  (Not documented, for installation only)
- Restores initial part of RES disk, initial spool
- Restores minidisk by minidisk

IPLs restored system (2nd level)

- Initialize spool
- Initialize SFS filepools
- Apply service (RSU)

Install complete!

z/VM Installation: overview

z/VM Installation: history

- Originally tape based
- Restore a starter system using DDR
  - The system must match your DASD! (3330, 3350, 3380, 3390, FB-512)
- IPL that system
- Restore minidisks from tape (VMFPLC2 format)
- Problems with tape formats and compatibility

- Now based on capabilities of the HMC
- Read files from DVD, USB, or server
  - Read the ISO right from the HMC if DPM-enabled
- Load images into memory
- ”Restart” the LPAR
- Documented in the Hardware library
  ”Installing software by using Load from Removable Media or FTP server support”

z/VM Installation: presently

How did we get from a standard z/VM system to z/VM ESI?

What do we have? A “starter” z/VM system

- One spool volume and one page volume
- No volumes defined to add workload
- Minimal security (no RACF or TLS/SSL)
- No system automation, little monitoring
- Minimal performance monitoring
- Minimal network setup with no virtual switch
- No API capability
- No framework for Linux

In short, you want more than just this.

Installation Has Finished

- Maybe you've done this before?
  - Did you take notes?
  - Maybe you followed an IBM Redbooks publication (cookbook)
  - Maybe you used instructions from a class or workshop?
  - Maybe you attended a hands-on lab and snarfed the workbook?
  - If you have not attended the hands-on lab that Richard Lewis is offering here at the workshop, you should!
- Fortunately, we upgrade systems more often than performing fresh installs.
- But, what if this is your first z/VM system?

So, how do you proceed?

Let’s Do Something Different!

Create a system ready to be used – a.k.a. a “Usable System”

First, we must create that system
Install the basic system
Configure networking, configure a vswitch
Activate RACF, Dirmaint, Perfkit & configure
Install z/VM Operations Manager & configure
Install Linux
Configure TLS/SSL, LDAP
Configure and enable SMAPI
Add some users
Enable monitor data collection
Lots of other miscellaneous customization

If you were going to deploy multiple systems, how would you build the “golden” system?

OK, once you’ve built the “golden” system…

- Dump it to tape?
- Send it in the mail?
- Run standalone DDR

Or…
Use the IBM installation z/VM system as the basis for a new installation process!

- Apply customisations to your “golden” system after it’s been restored
- Include extra products and packages

Customizing the Cloned System

The system must be tailored to the environment

What may need to be changed after the restore?

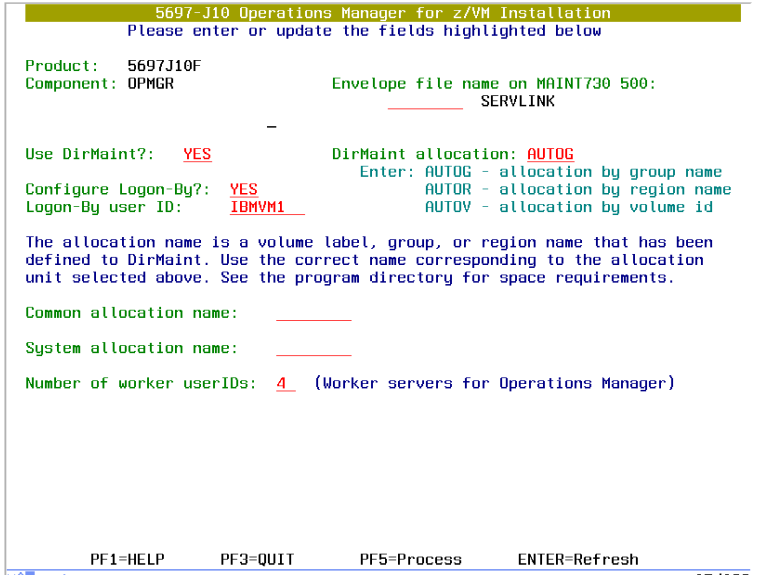
- Real addresses (DASD and OSA)
- Disk labels
- System name
- IPL parameters
- IP info (IP address, VLAN, etc.)

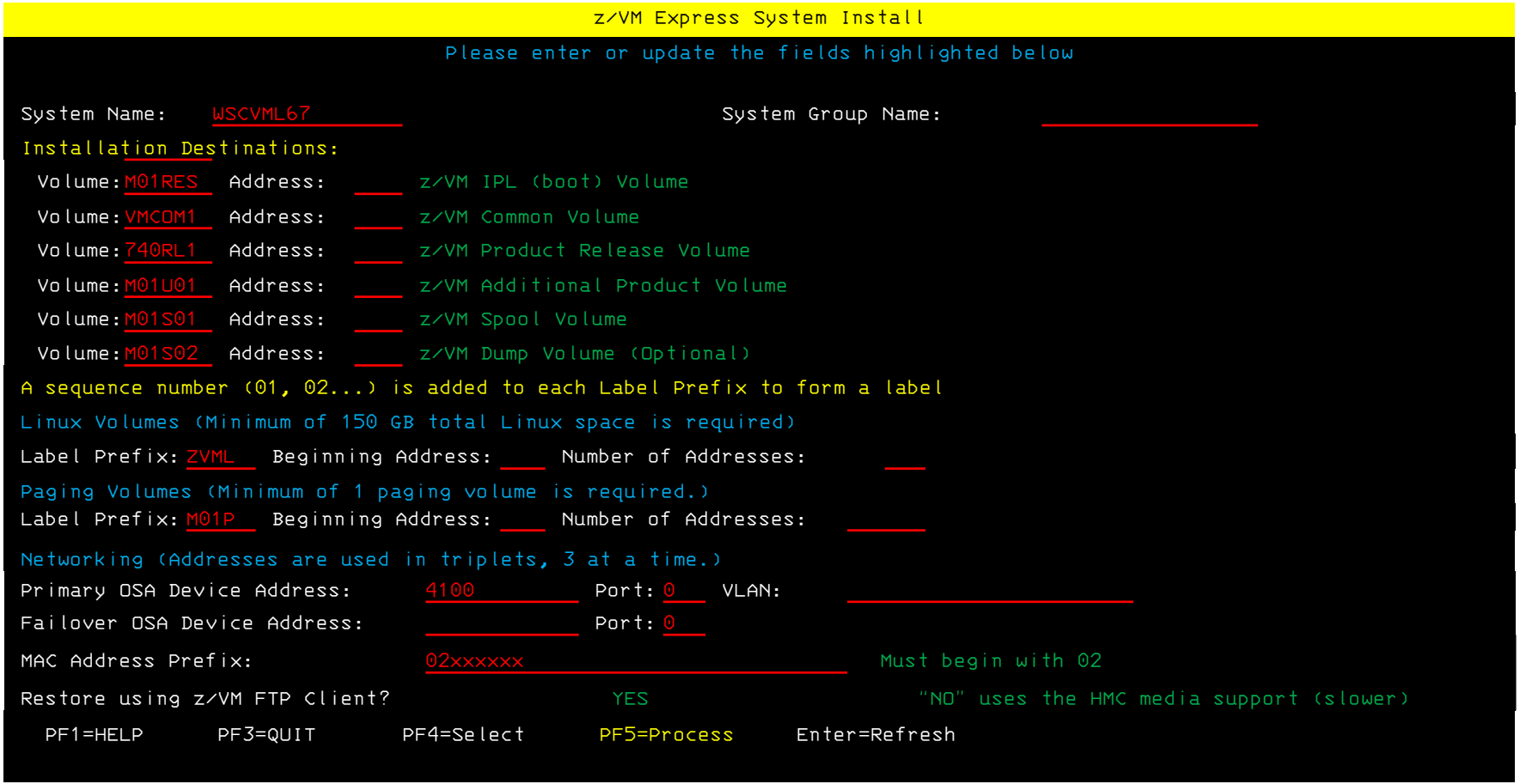
Other changes we can make

- Add paging and spooling disks
- Add disks ready for Linux workloads
- Adjust to different size DASD or LUNs

Bruce developed an XEDIT based panel for INSTPROD EXEC; and used that idea

- Ask for the values to be customized
- Verify values as valid, issue errors, etc.





RESTORESYS panel

The information needed to restore and customize the system

Alternate Restore Option

We can restore using the Pipelines ftp stage

Did you notice?

```
Restore using z/VM FTP client?:  YES  "NO" uses the HMC media support
```

- Because we created a network connection
  - we can use the ftp stage directly to a server
- This is MUCH faster than loading via HMC!
  - Restore in less than 10 minutes vs. an hour or so
- Some additional fields if this is enabled:

```
                    z/VM Express System Installation
                Please enter or update the fields highlighted below

Installation FTP Server:        This is the same server used to boot this
                                partition with the installation image files.

  Host name or IP Address:  _____________________________
  FTP User ID:              _____________________________
  FTP Password:
  Path or directory:        _____________________________________________
```

IPWIZARD, the sequel

- IPWIZARD works, but it is several screens
- We had a few more requirements:
  - Ask for a Linux IP address
  - Force layer 3
  - Ask if Telnet server should be disabled

- Bruce created a single panel to ask all in one place
  - Called SETUPNET EXEC
- It still calls the z/VM TCP/IP utility for the setup
  - Same thing that IBM-supplied code does
    - It still creates log and trace files (like `IPWIZARD $FILE$ C`)

What is Customized?

- User Directory
- DirMaint
- VMSES/E
- TCPIP
- Disks
- SYSTEM CONFIG

What is Customized?

Directory:
– DASD labels
– VLAN (if used)
Update the source as USER INPUT
(erase Dirmaint's USER DIRECT file)
Write the object directory
Dirmaint:
- Create EXTENT CONTROL

VMSES/E:
- Change the system name

TCPIP:
- IP address, MTU, netmask, default route
- TCPIP DATA: Host name and domain
- Name server addresses

Disks:
- Format page and spool
- Label volumes and set owner
- Erase or release residual data at end (ECKD)
- Update IPL parms on RES disk

System config:
- Update DASD labels
- Add spool or page as specified
- Add EDevice definitions (SCSI)
- Update VSwitch (OSA addresses, VLAN)
- MAC prefix
- System name
- Threads (1 or 2), STP enabled (if available)
- CP variables with our z/VM ESI level

The installation process

Assumptions:

1. You have an LPAR defined and ready, or a partition created (DPM mode)
2. You have the ESI installation bundle (.iso or files) on one of these:
   - On a server accessible through your network by the HMC (and both SEs for older systems)
   - Loaded as an ISO file (*Boot from: ISO Image* only available in DPM)
   - On a USB inserted into the HMC

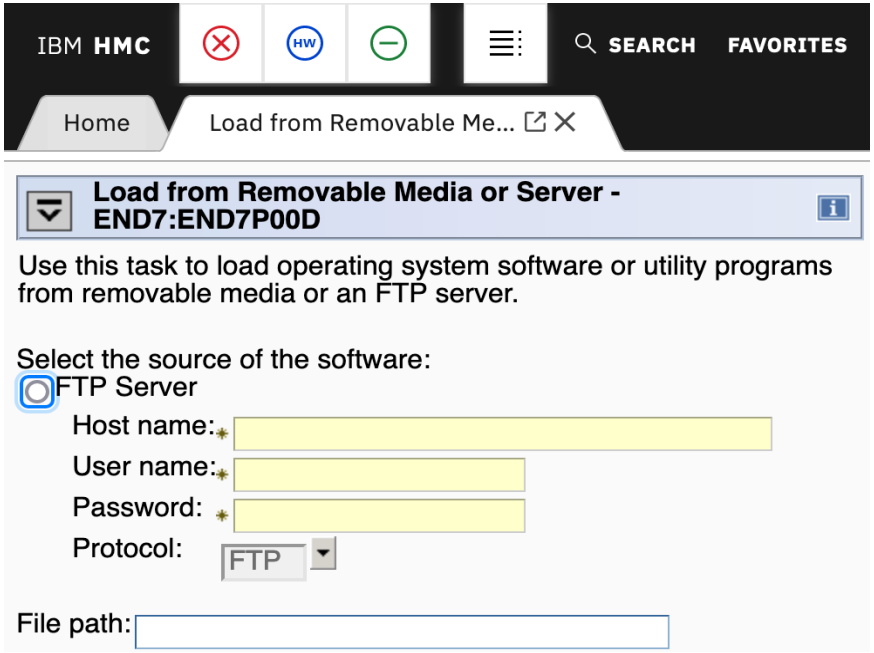
To start:

– “Load from Removable Media or Server”

Protocols FTP, SFTP, and FTPS supported

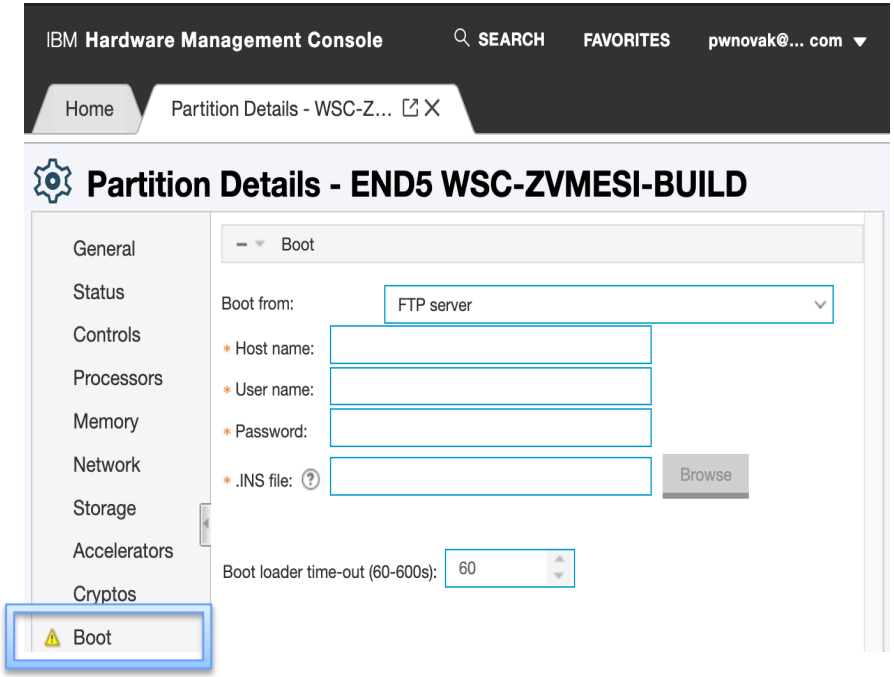
PR/SM

Load from Removable Media or Server



Dynamic Partition Manager (DPM)

Boot heading of your partition configuration panel



The Install Process: where it starts

The Integrated 3270 Console is required

– It displays the fields required to gather system parameters and allows input

– This is just like a normal z/VM install… with one exception

  • We implemented a mechanism to handle the situation where the Integrated 3270 task isn't started prior to invoking the load operation.

  • Under a standard installation, if you've forgotten to start the Integrated 3270 task, you need to start your Load operation over again.

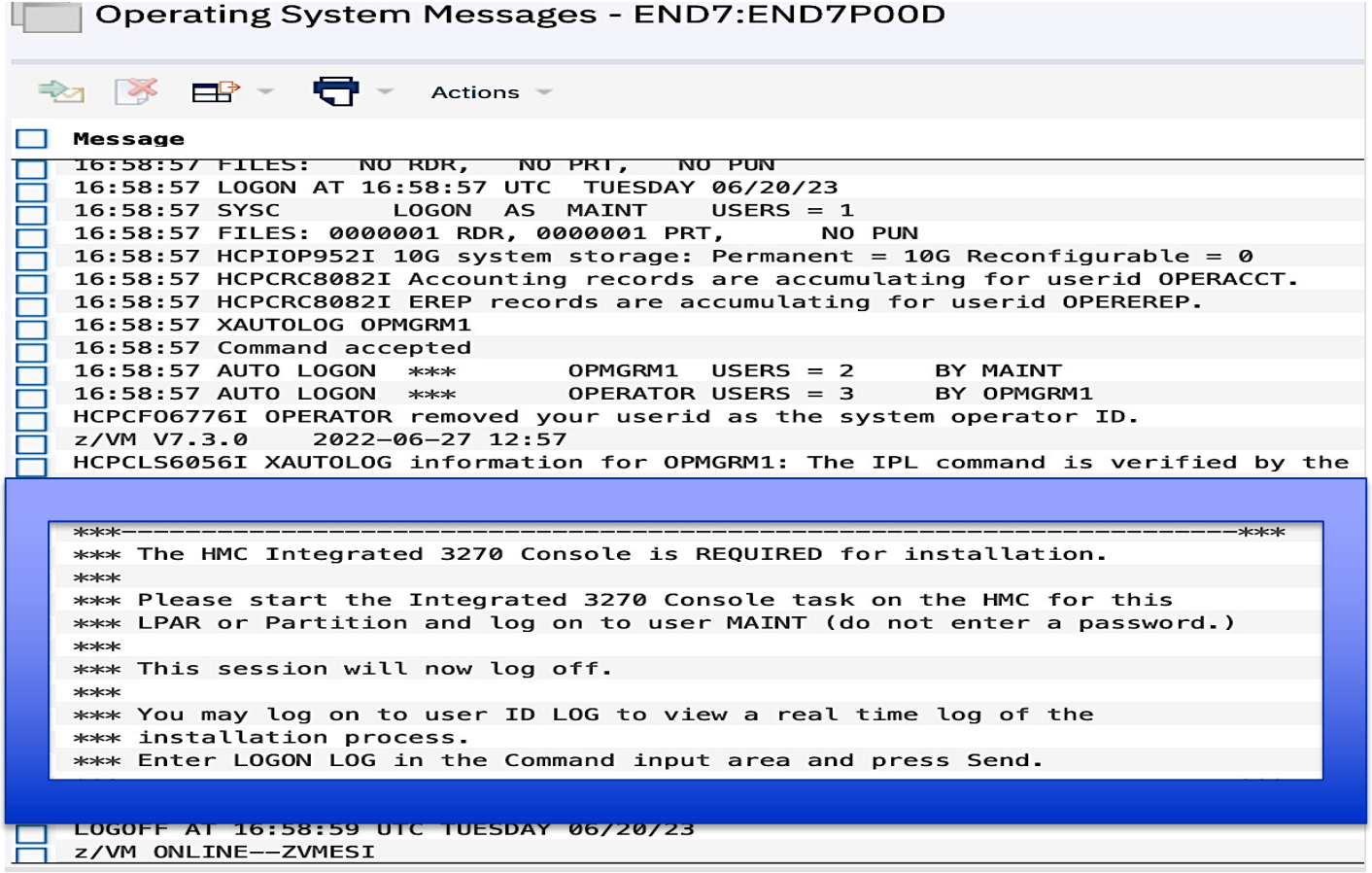
    – If you are using the DPM load from ISO, this is especially frustrating!

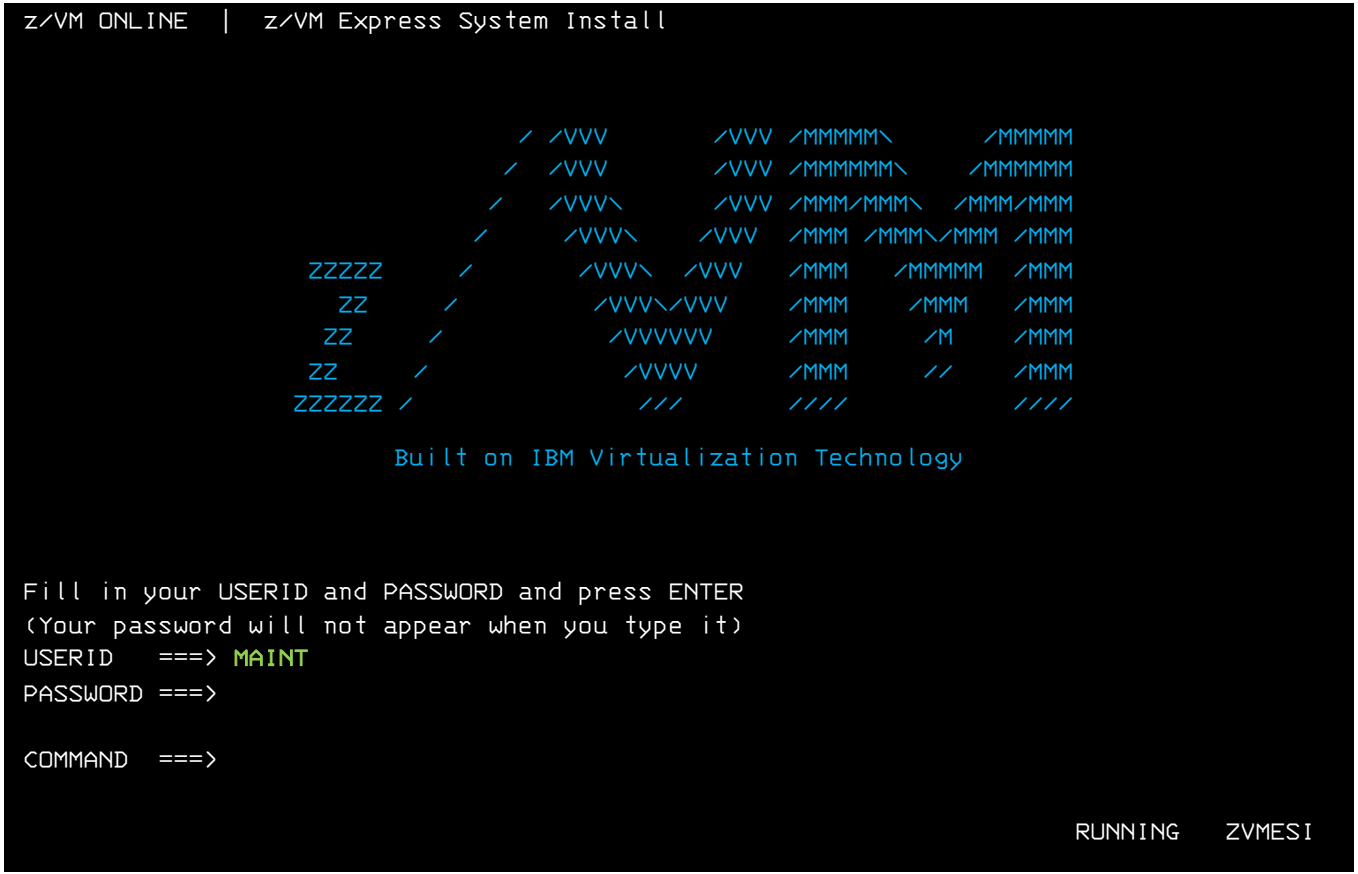
  • Unlike a standard installation, you are not required to start Integrated 3270 first. Under z/VM ESI, if you've forgotten to start it, messages are shown under the *Operating System Messages* task. (next slide)

– To proceed, launch the Integrated 3720 task and log on to the userid MAINT.

Elimination of the Integrated 3270 before Load pitfall

- Notice that you can optionally log on to user id *LOG* here in the *Operating System Messages* task
  - This is truly a line mode interface
    - Remember the typewriter consoles?
  - The install process will send messages to this console to track progress
  - This is helpful if there is a login timeout on your HMC





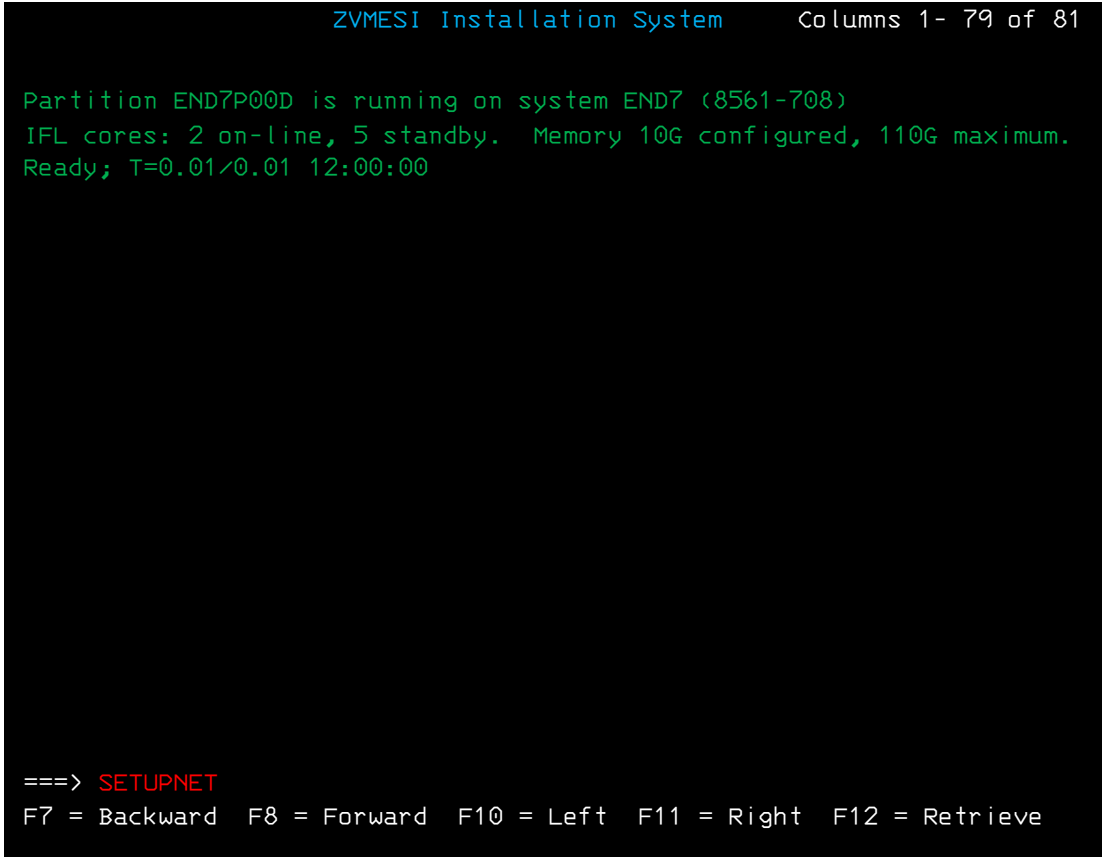
Login via Integrated 3270 Console if not started before LOAD

First interaction with z/VM ESI under CMS

- Notice that we have chosen to use full-screen CMS.
  - This provides an improved user experience that includes the ability to scroll backward and forward so that you can review console output.

- Installation under z/VM ESI is a two-phase process:
  - Phase 1: Networking
  - Phase 2: System restoration (installation)

Next step is to issue the command SETUPNET, which will walk you through Phase 1.



Network Setup

Setting up the network – Run SETUPNET

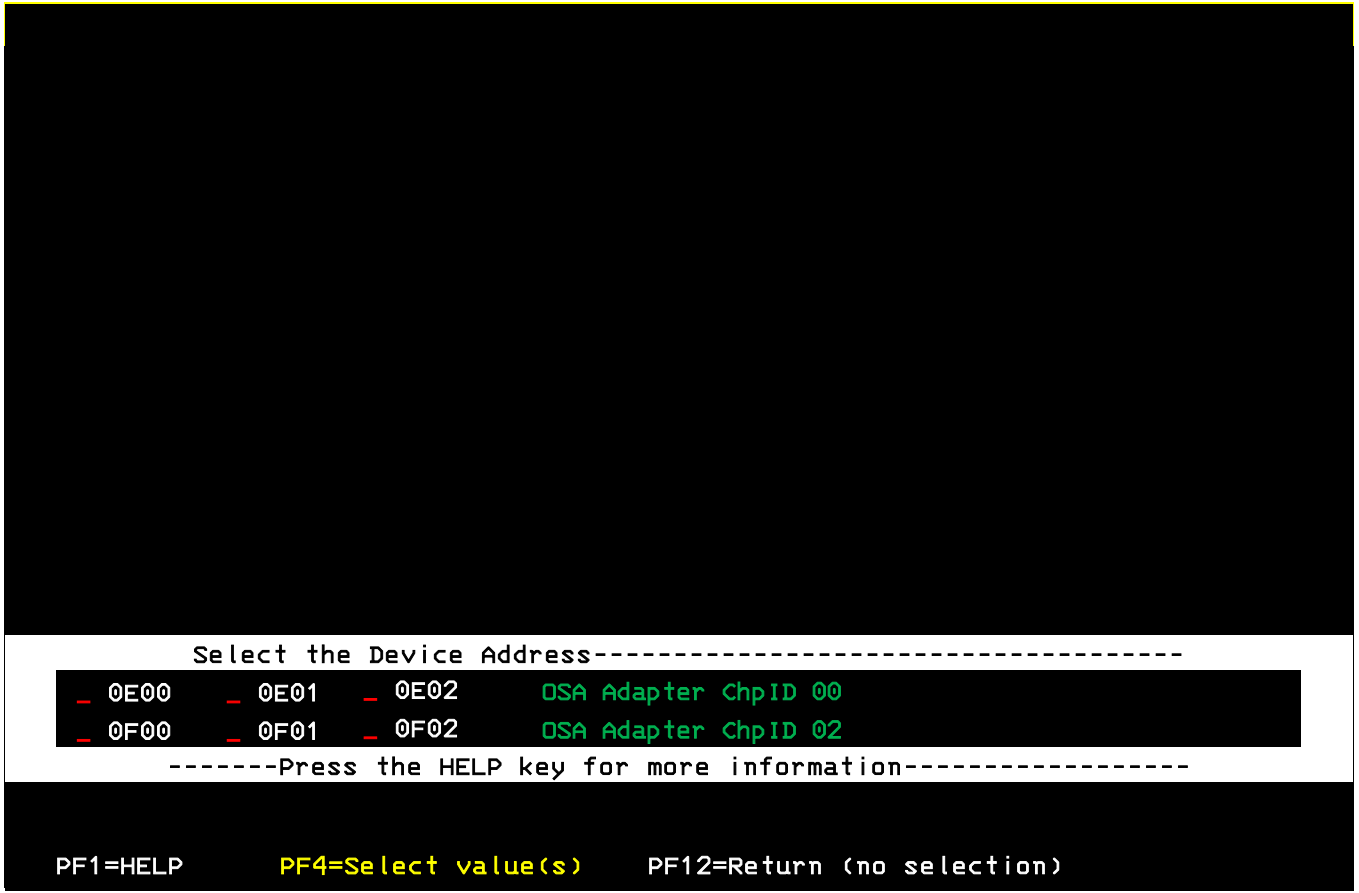
- All the values are on 1 screen
- The native z/VM IPWIZARD can also be used

```
                    z/VM Express System Installation
          Please enter your network information in the fields below

z/VM Host Name:          WSCVML67
Domain Name:             Wsclab.Endicott.ibm.com
z/VM IP Address:         9.60.86.200
Subnet Mask:             /24                  /nn CIDR mask or x.x.x.x
Gateway IP Address:      9.60.86.1            Router address
Linux Host Name:         lxocpb01             (Default shown)
Linux IP Address:        9.60.86.201          (Default is next IP)
DNS Addresses:           9.60.86.6            One DNS server reqd
                         9.60.86.7            Additional optional

VLAN Id:                 1701                 VLAN number optional
MTU Size:                8992                 1492 or 8992
Device Address:                               Press PF4 for list
OSA Port Number:         0                    (0 or 1)
Install Connection Type: IP                   (Installation only)
Enable the TELNET server? NO

  PF1=HELP      PF3=QUIT      PF4=Select      PF5=Process      Enter=Refresh
```


Network Setup

Setting up the network – Run SETUPNET

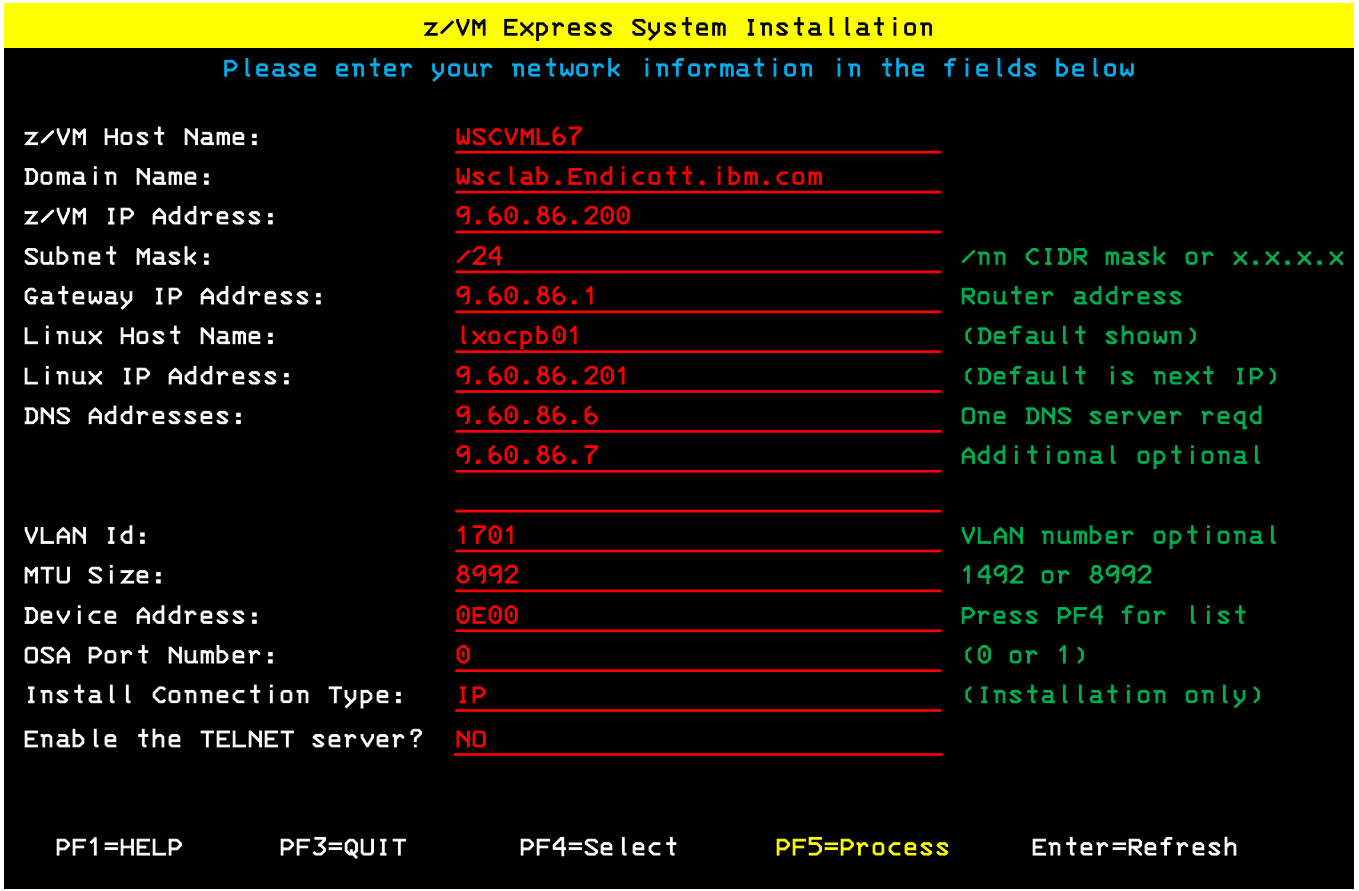
- All the values are on 1 screen
- The native z/VM IPWIZARD can also be used
- Ability to use PF4 for a listing of discovered options.



Network Setup

Setting up the network – Run SETUPNET

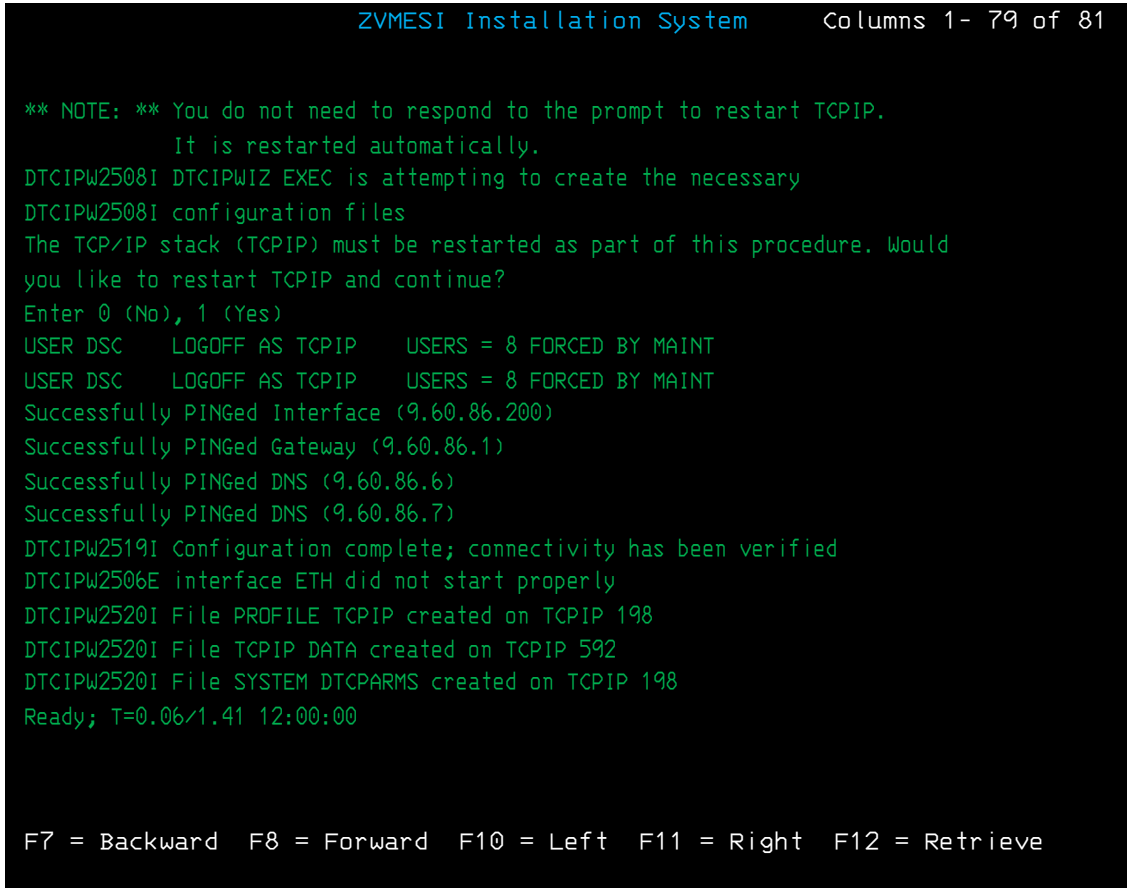
- All the values are on 1 screen
- IPWIZARD can also be used
- After all values are entered, press PF5 to validate input and process.
- DTCIPWIZ is invoked and sets up TCPIP.



Network setup validation and processing

Configuration complete; connectivity has been verified

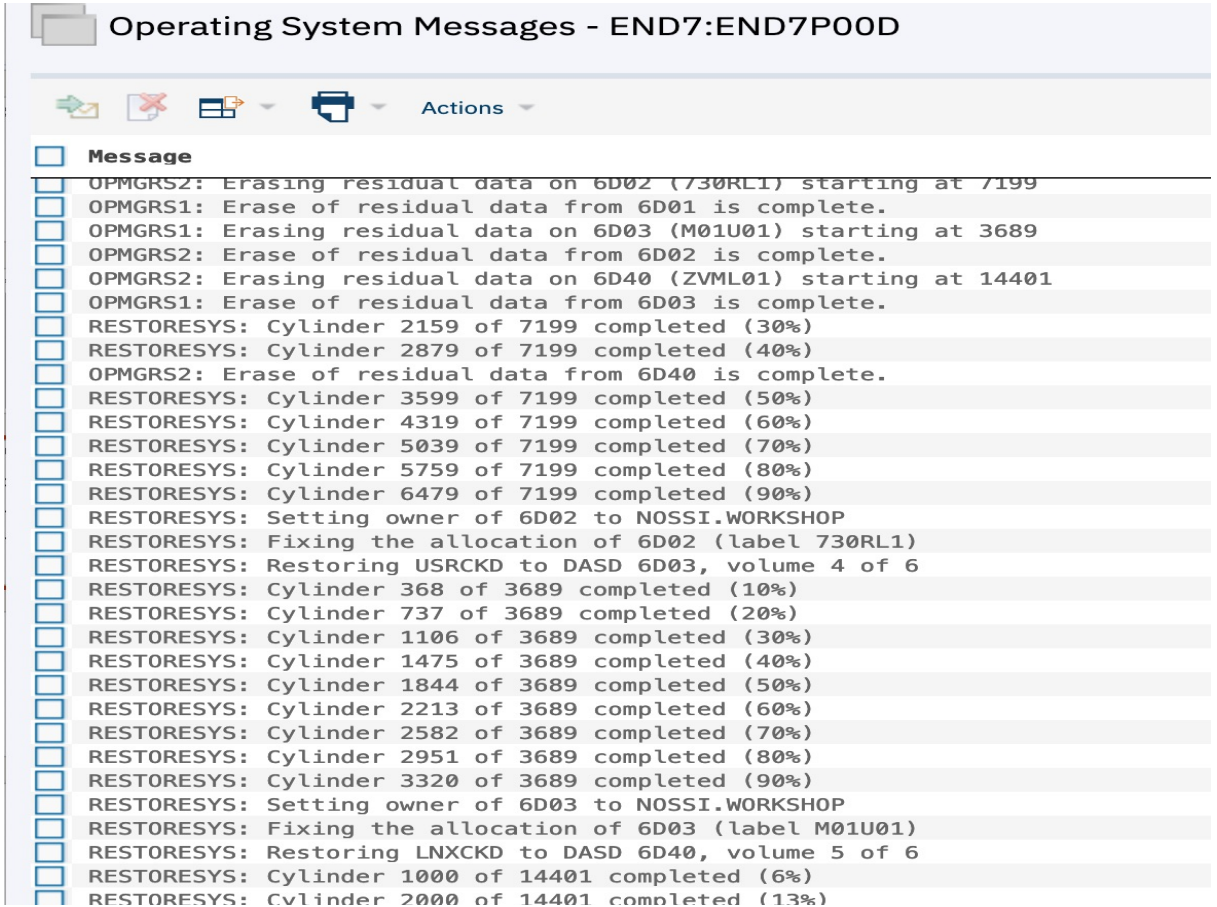
- From this point forward, it is no longer necessary to be constrained by continued use of the Integrated 3270. 😄
- Connect via TCPIP using your full-function 3270 emulator.
- Especially nice if your HMC has mandatory re-authorization timeouts.



Operating System Messages shows a log

We logged on to a user id named LOG to see this

These are the same messages seen on the 3270 display



Customizing the Restored System

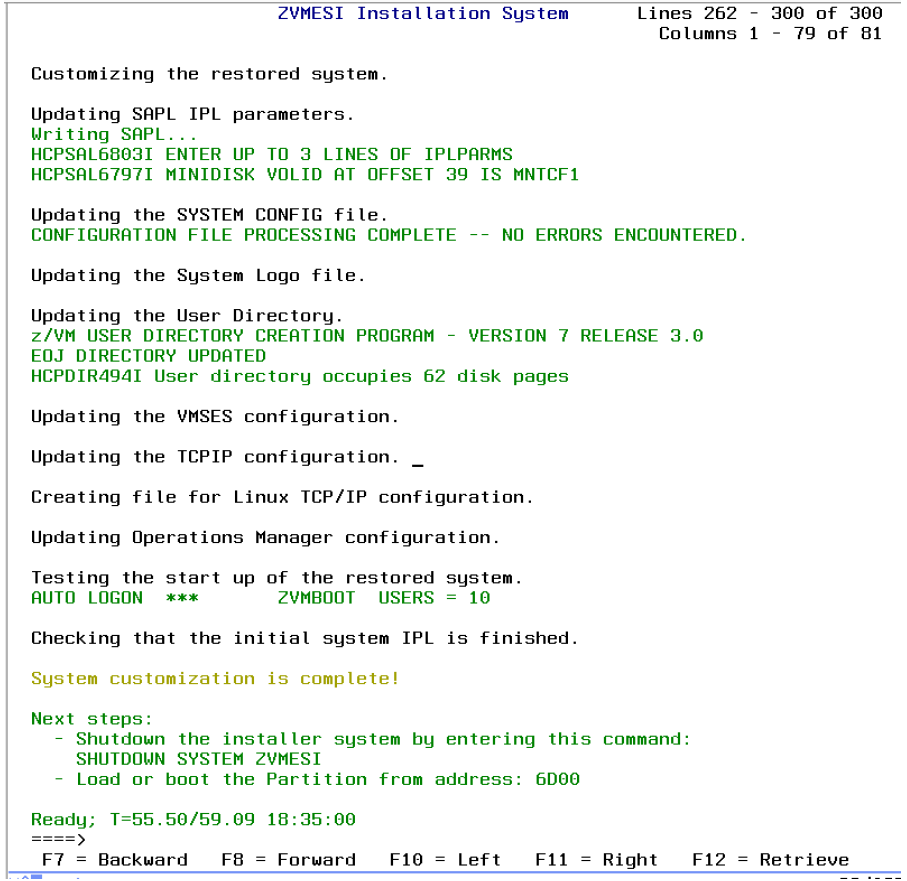
This is done automatically once the restore is complete

The list of customization tasks was shown earlier

The installed system is booted 2nd level
The spool disks have changed
– The size and maybe the label
It is necessary to perform a FORCE start
– It starts then shuts down

The final messages help with the next steps

- Shutdown the installer system
- How to IPL the new system



Now IPL Your New System!

Some of us know what that looks like

Some details about the restored system:

RACF/VM is active
- IDs have Password Phrases
- All are expired
- List of IDs and initial phrases in document

Operations Manager for z/VM is installed
- Monitoring consoles of running VMs
- Cleaning up spool and log files

Passwords are removed from several IDs
- Some are revoked – no need to log on
- LOGON BY enabled for some others

CP Monitor data collection is active
- Collects 5 to 6 days of data
- Automatically erases old files

TLS/SSL is configured and active
- We created our own small CA to issue cert
  - CA is Certificate Authority
  - Certificates can be downloaded from the included Linux system
- Secure Telnet is enabled
  - Unsecure is allowed for initial logon
- LDAP is configured

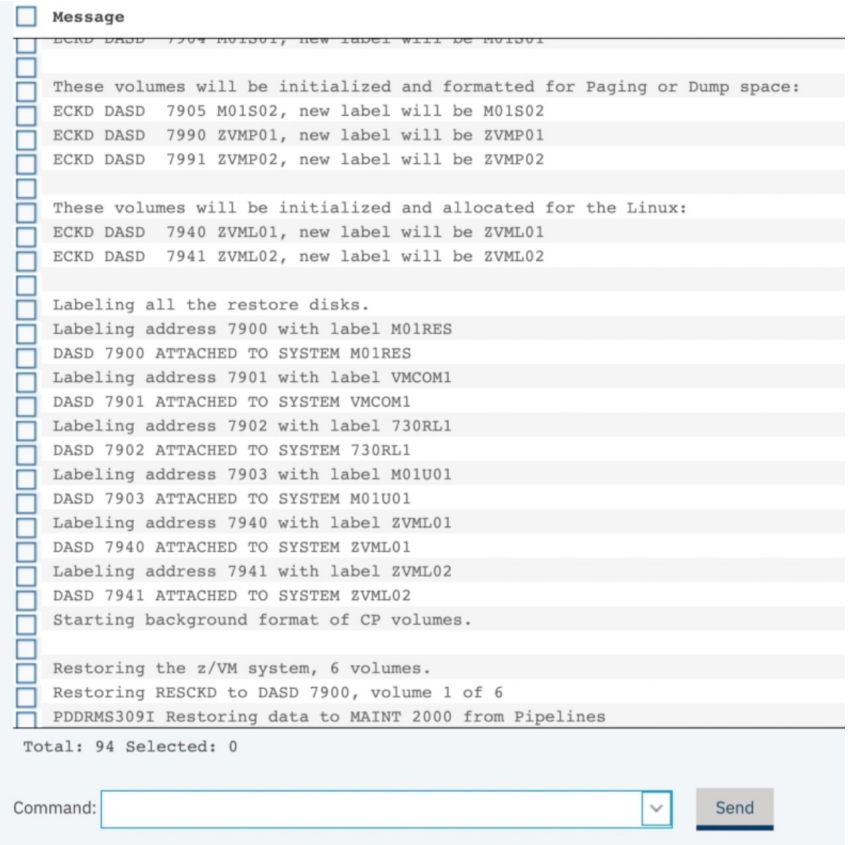
We have a document that describes the differences.

Some Additional Features

We've added some options for special situations

Configuration using a Spreadsheet
For planning in advance or multiple installs
– Fill out a spreadsheet we provide
– Values are the same as you see on the 3270
– Save it in CSV format
– Put it in the same directory as install files
Fills in the fields on the 3270 panels
– Otherwise, the process is the same

Then we took that one step further
Fully automatic installation
No need to log on to a 3270
– (assuming all input data is correct)
See progress on Operating System Messages




```
                    z/VM Express System Installation
              Please enter or update the fields highlighted below

 System Name:  WORKSHOP             System Group Name:  WRKGROUP
 Enable SSI?:  YES                  SSI Cluster Name:   SHOPSSI

Installation destinations:

 Volume:  M01RES  Address:  ____   IPL volume for z/VM
 Volume:  VMCOM1  Address:  ____   z/VM Common volume
 Volume:  730RL1  Address:  ____   z/VM Release 7.3 product volume
 Volume:  M01U01  Address:  ____   z/VM Additional Products
 Volume:  M01S01  Address:  ____   Spool volume
 Volume:  RACFDB  Address:  ____   RACF Primary database volume
 Volume:  RACFBK  Address:  ____   RACF Backup database volume
 Volume:  M01S02  Address:  ____   Dedicated dump space (optional)

A sequence number (01, 02) is added to each Label Prefix to form a Label

Linux volumes:  (Minimum of 1 volumes required, minimum 30051 cylinders)

 Label prefix:  ZVML   Beginning address:  ____   Number of addresses:  1

Paging volumes:  (You must specify at least 1 paging device)

 Label prefix:  M01P   Beginning address:  ____   Number of addresses:  __

Networking:  (Addresses are used in triples, 3 at a time)

 Primary  OSA device address:  4100  Port:  0  VLAN:  ____  (optional)
 Failover OSA device address:  ____  Port:  0  Failover OSA is optional

 MAC Address Prefix:  02____          Must begin with 02
```

SSI is great, but setting up the CTCs is harder

The CTC connections are required!

We hope DPM will offer configuration help

Converting an “SSI-ready” z/VM system to a single “SSI-enabled” one is documented

Could it be done automatically?

Maybe after restoring our system?

Sure!

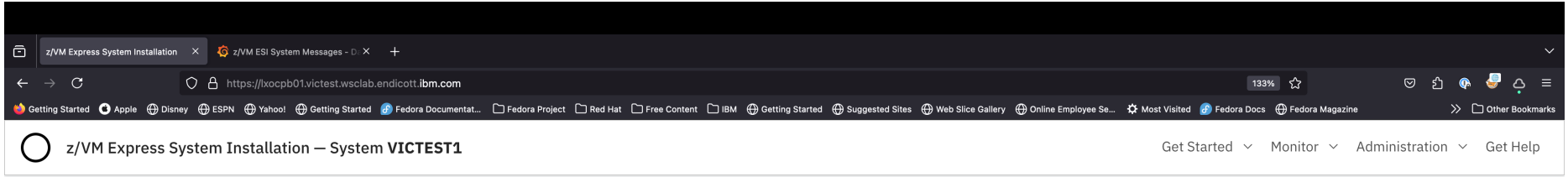
- It needs more disks for RACF
- SSI cluster name is needed
- SYSTEM CONFIG and directory changes
- Create the PDR
- SFS config, VMSES/E

Use the cloning process for more members

- Documented in the z/VM Library

What About z/VM SSI?
Our target customers usually install a single system

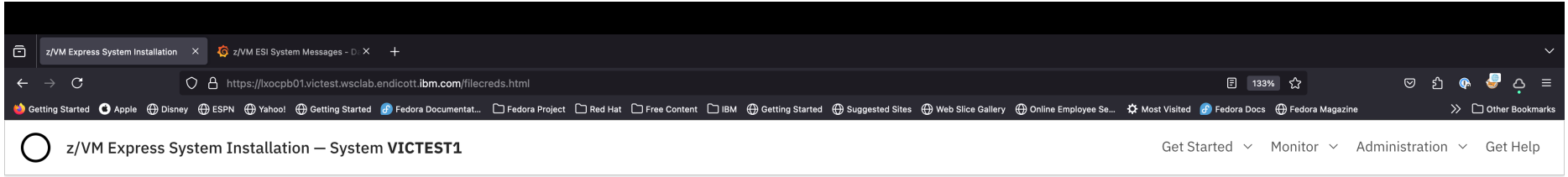
How about a demonstration?



Get Started with Hybrid Cloud on LinuxONE

You are using z/VM Express System Installation (*ESI*), the world's finest pocket-sized private cloud solution for IBM Z and LinuxONE! Click on the tabs for more details on what you can build using z/VM ESI.

Openshift Container Platform	IBM Cloud Infrastructure Center	Management Utilities



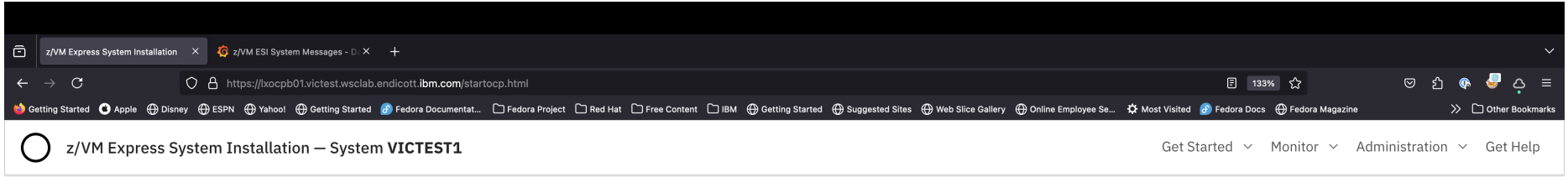
Get Started with extra modules for z/VM ***ESI***

We just can't fit all of the great functions available to you with z/VM ESI in the one download! Some capabilities come as additional download files.

ESI Modules already accessible

Module name	Description	Date Uploaded	Size
icic-1.2.1.0-fba	ICIC 1.2.1.0 module (FBA)	05/08/2024, 2:48:08 pm	1.97G
rhocp-install-4.14.9	RHOCP Installation for 4.14.9	05/08/2024, 2:48:18 pm	1.39G

\+ Upload content to the ELAN



IBM
z/VM ESI

Get Started with OpenShift Container Platform on LinuxONE

Manage OCP clusters from this page — click the tabs below for details.

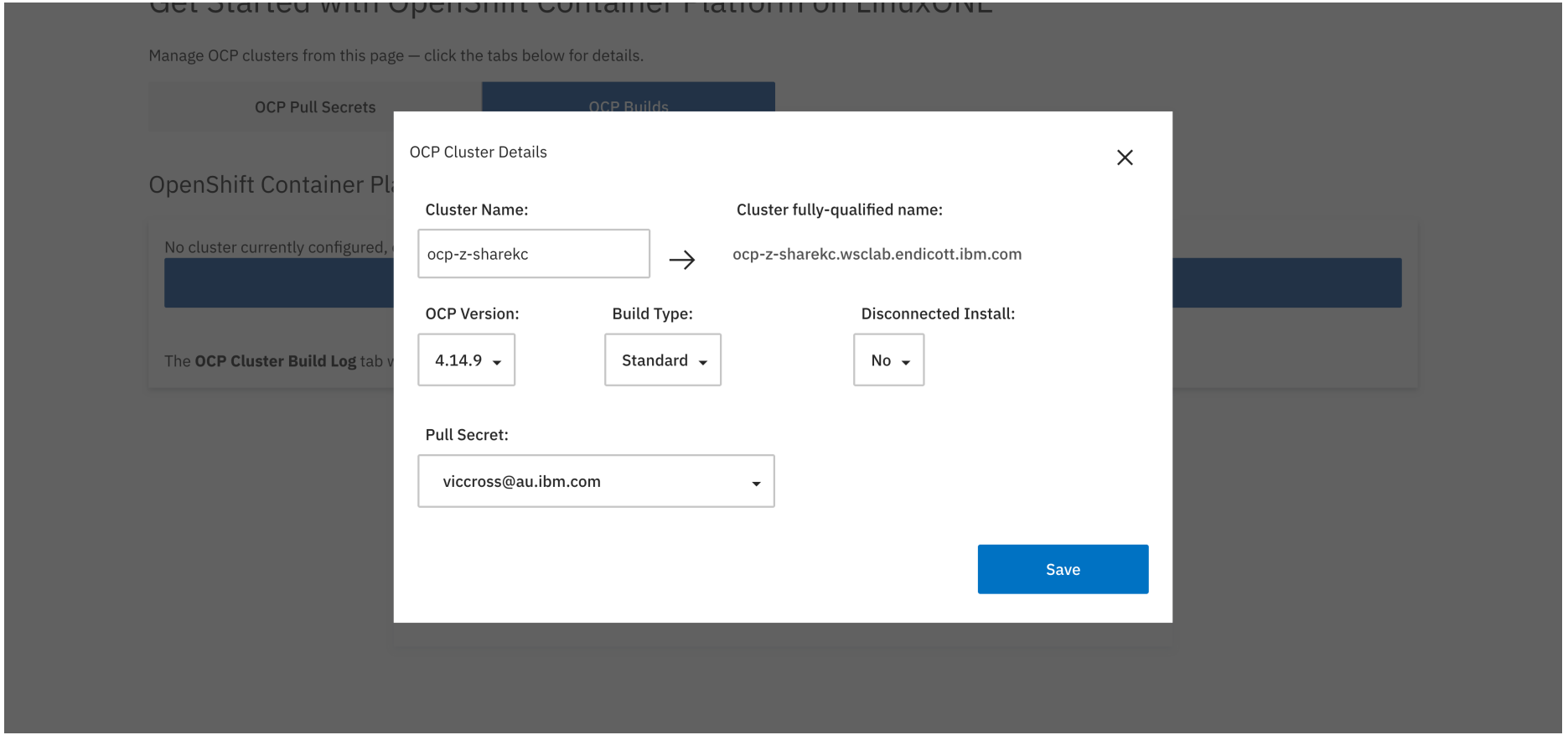
OCP Pull Secrets | OCP Builds

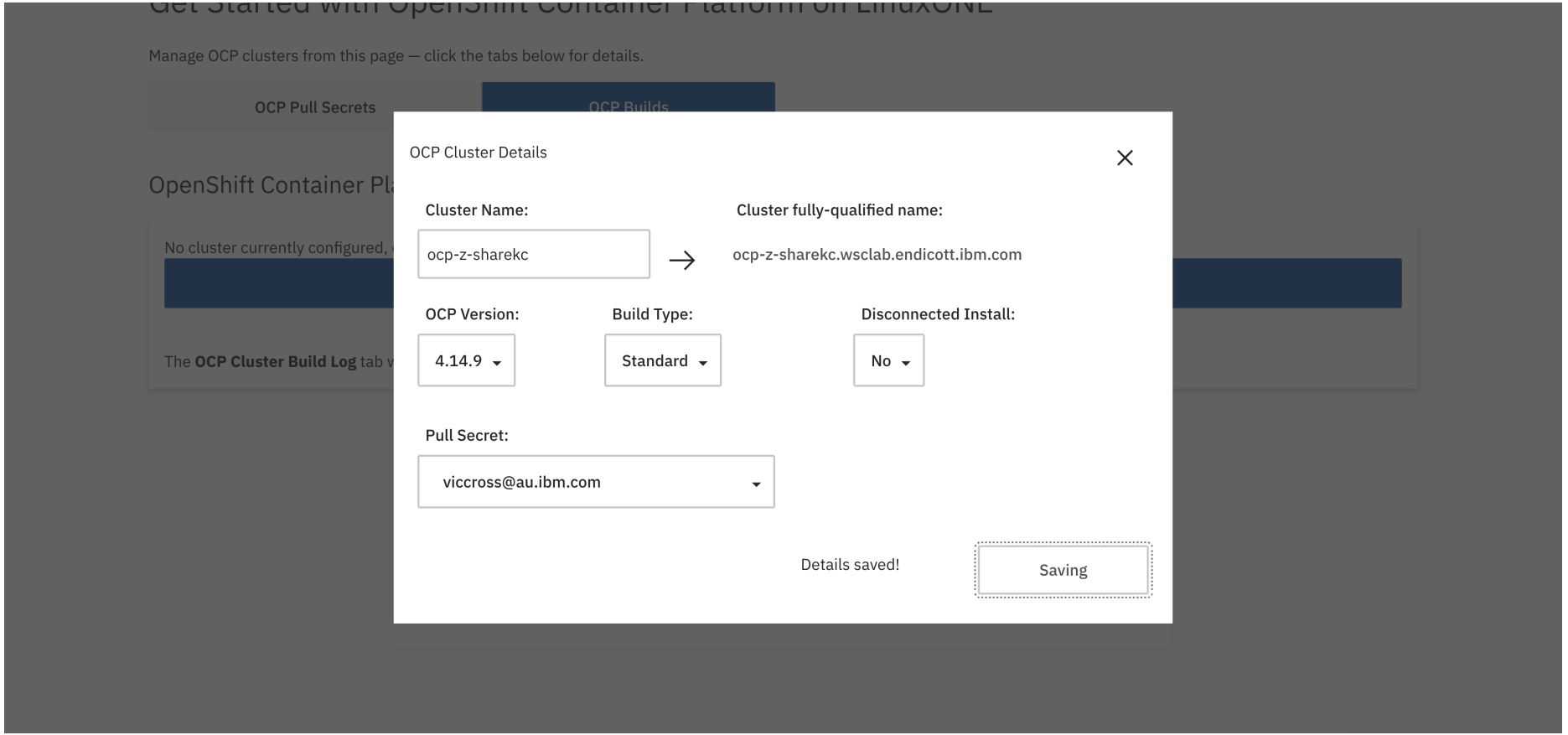
OpenShift Container Platform Clusters

No cluster currently configured, click the button to start:

Configure

The **OCP Cluster Build Log** tab will show the log of the build, and the **Metrics** pages will show information on system activity.





Get Started with OpenShift Container Platform on LinuxONE

Manage OCP clusters from this page — click the tabs below for details.

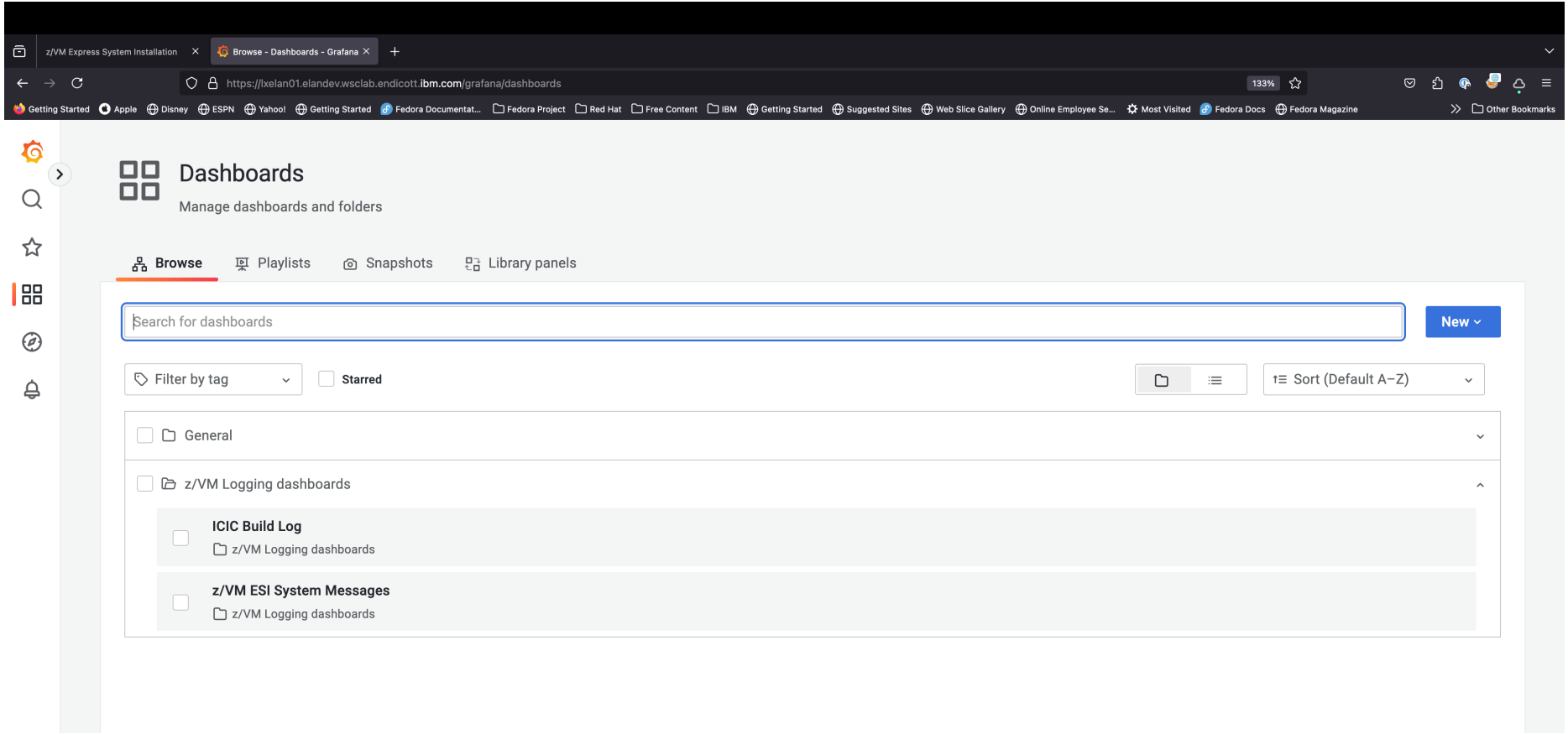
OCP Pull Secrets | OCP Builds

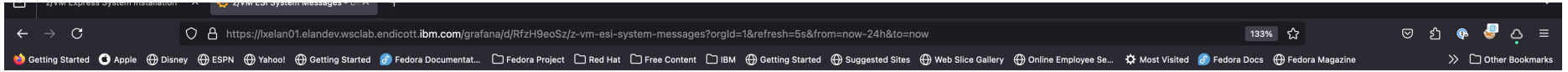
OpenShift Container Platform Clusters

Cluster name	Build Type	OCP Version	Status		
ocp-z-sharekc	Standard	4.14.9	Defining	Details	Build Log

Add a cluster

The **OCP Cluster Build Log** tab will show the log of the build, and the **Metrics** pages will show information on system activity.





z/VM Logging dashboards / z/VM ESI System Messages

Last 24 hours | 5s

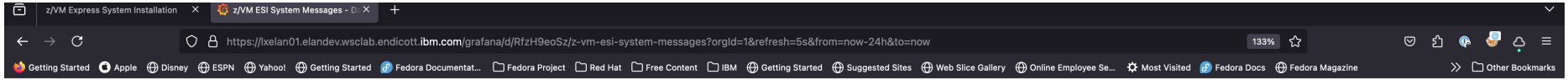
z/VM guest name: All

Log messages

Console Messages

```
2024-08-07 09:38:01 LXELAN03 [2534594.547431] alloc_contig_range: [7fc01, 7fd01) PFNs busy
2024-08-07 09:38:01 LXELAN03 [2534594.547412] alloc_contig_range: [7fc00, 7fd00) PFNs busy
2024-08-07 09:38:01 LXELAN03 [2534594.547441] alloc_contig_range: [7fc02, 7fd02) PFNs busy
2024-08-07 09:38:01 LXELAN03 [2534594.547407] alloc_contig_range: 58870 callbacks suppressed
2024-08-07 09:38:01 LXELAN03 [2534594.547452] alloc_contig_range: [7fc03, 7fd03) PFNs busy
2024-08-07 09:38:01 LXELAN03 [2534594.547462] alloc_contig_range: [7fc04, 7fd04) PFNs busy
2024-08-07 09:38:01 LXELAN03 [2534594.547483] alloc_contig_range: [7fc06, 7fd06) PFNs busy
2024-08-07 09:38:01 LXELAN03 [2534594.547472] alloc_contig_range: [7fc05, 7fd05) PFNs busy
2024-08-07 09:38:01 LXELAN03 [2534594.547495] alloc_contig_range: [7fc07, 7fd07) PFNs busy
2024-08-07 09:38:01 LXELAN03 [2534594.547515] alloc_contig_range: [7fc09, 7fd09) PFNs busy
2024-08-07 09:38:01 LXELAN03 [2534594.547505] alloc_contig_range: [7fc08, 7fd08) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185337] alloc_contig_range: [7fc02, 7fd02) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185329] alloc_contig_range: [7fc01, 7fd01) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185304] alloc_contig_range: [7fc00, 7fd00) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185300] alloc_contig_range: 58870 callbacks suppressed
2024-08-07 09:39:02 LXELAN03 [2534655.185344] alloc_contig_range: [7fc03, 7fd03) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185362] alloc_contig_range: [7fc05, 7fd05) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185354] alloc_contig_range: [7fc04, 7fd04) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185374] alloc_contig_range: [7fc06, 7fd06) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185391] alloc_contig_range: [7fc08, 7fd08) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185383] alloc_contig_range: [7fc07, 7fd07) PFNs busy
2024-08-07 09:39:02 LXELAN03 [2534655.185404] alloc_contig_range: [7fc09, 7fd09) PFNs busy
```

VMEVENT entries



z/VM Logging dashboards / z/VM ESI System Messages

Last 24 hours | 5s

z/VM guest name: Enter variable value

- Selected (1)
- All
- ICICCMP1
- ICICMGT0
- LXELAN01
- LXELAN02
- LXELAN03
- LXOCPB01
- OPERATOR
- RACFSMF

Log messages

Console Messages

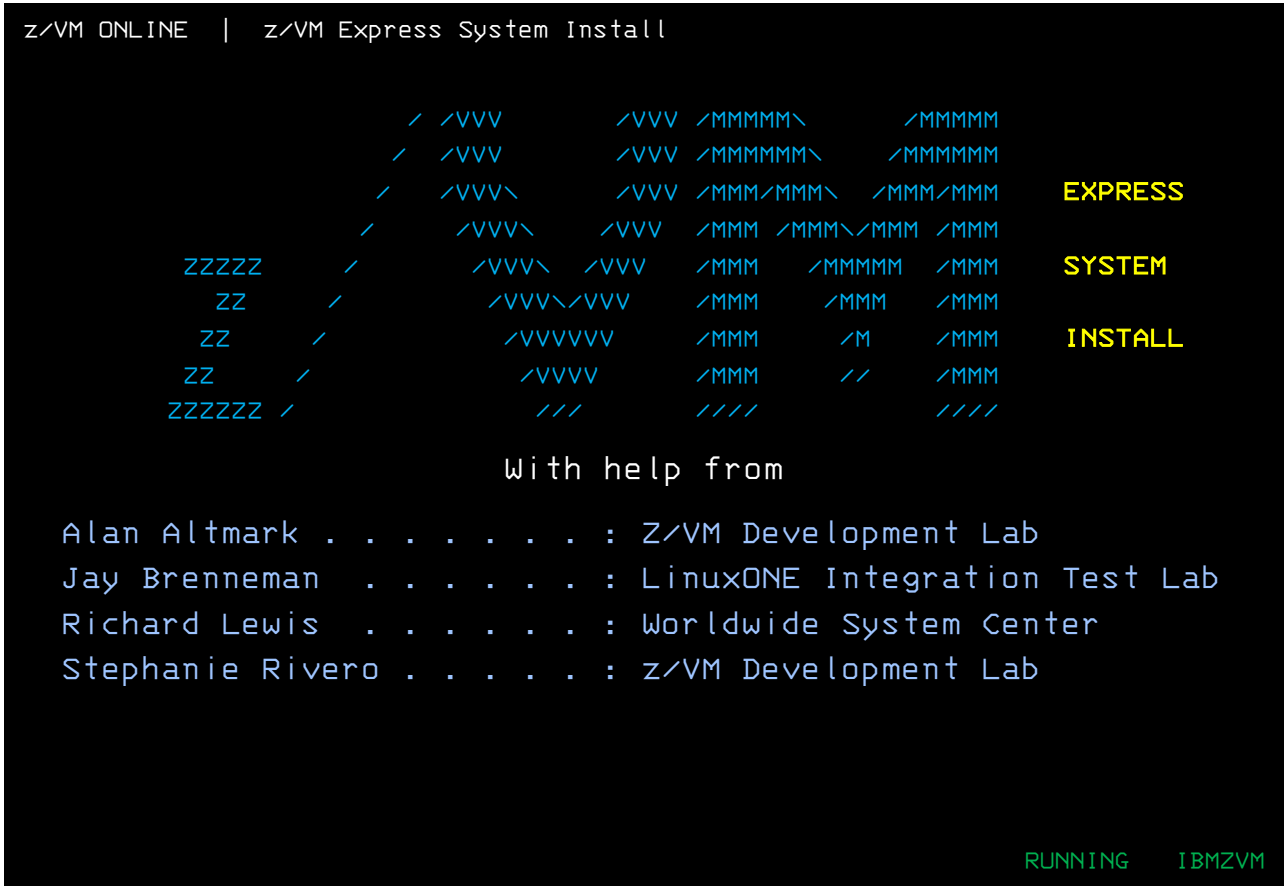
```
> 2024-08-07 0                34594.547431] alloc_contig_range: [7fc01, 7fd01) PFNs busy
> 2024-08-07 0                34594.547412] alloc_contig_range: [7fc00, 7fd00) PFNs busy
> 2024-08-07 0                34594.547441] alloc_contig_range: [7fc02, 7fd02) PFNs busy
> 2024-08-07 0                34594.547407] alloc_contig_range: 58870 callbacks suppressed
> 2024-08-07 0                34594.547452] alloc_contig_range: [7fc03, 7fd03) PFNs busy
> 2024-08-07 0                34594.547462] alloc_contig_range: [7fc04, 7fd04) PFNs busy
> 2024-08-07 0                34594.547483] alloc_contig_range: [7fc06, 7fd06) PFNs busy
> 2024-08-07 0                34594.547472] alloc_contig_range: [7fc05, 7fd05) PFNs busy
> 2024-08-07 0                34594.547495] alloc_contig_range: [7fc07, 7fd07) PFNs busy
> 2024-08-07 0                34594.547515] alloc_contig_range: [7fc09, 7fd09) PFNs busy
> 2024-08-07 09:38:01 LXELAN03 [2534594.547505] alloc_contig_range: [7fc08, 7fd08) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185337] alloc_contig_range: [7fc02, 7fd02) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185329] alloc_contig_range: [7fc01, 7fd01) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185304] alloc_contig_range: [7fc00, 7fd00) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185300] alloc_contig_range: 58870 callbacks suppressed
> 2024-08-07 09:39:02 LXELAN03 [2534655.185344] alloc_contig_range: [7fc03, 7fd03) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185362] alloc_contig_range: [7fc05, 7fd05) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185354] alloc_contig_range: [7fc04, 7fd04) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185374] alloc_contig_range: [7fc06, 7fd06) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185391] alloc_contig_range: [7fc08, 7fd08) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185383] alloc_contig_range: [7fc07, 7fd07) PFNs busy
> 2024-08-07 09:39:02 LXELAN03 [2534655.185404] alloc_contig_range: [7fc09, 7fd09) PFNs busy
> 2024-08-07 09:40:01 LXELAN03 [2534714.816011] alloc_contig_range: [7fc02, 7fd02) PFNs busy
```

VMEVENT entries

IBM z/VM ESI

- Attend the Express Linux Automation and Network (ELAN) session here at the VMWorkshop
- Thursday, June 11 2026 at 15:30
- Room 2201

For more information about the ELAN



Thanks for Listening!

IBM z/VM ESI

Thanks for listening!

Contact your IBM Z representative for more information or email ehorn@us.ibm.com

