Linux for IBM System z Installation Hands-on-Lab

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Agenda

Introduction *(this presentation)*

- Linux on System z
- Hardware Requirements
- Intro to Lab and Installation Overview

Basic Lab Exercises *(work at your own pace using workshop notes)*

- Installation of Linux for System z
  - SuSE SLES 11 (installed on ECKD devices)
- Define and configure additional device

Elective Lab Exercies *(work at your own pace using workshop notes)*

- Basic Linux System Administration
- Using Linux as a Firewall
- Using Linux as a DNS with BIND
- File service with Samba
- Apache Web Server Installation and Customization

What is Linux on IBM System z?

A native IBM System z operating environment

- Pure Linux, and ASCII environment
- Exploits IBM System z hardware, including IEEE floating point
- 32-bit & 64-bit

Not a unique version of Linux or other operating system

Not a replacement for other IBM System z operating systems

Linux for System z Design

Multiple supported environments

- Single Image (non-zArchitecture processors)
- Logical Partition (LPAR)
- z/VM guest

Exploits IBM System z Hardware

- Hardware Management Console (HMC)
- 3380/3390 ECKD DASD
- FBA (9336 or VDISK)
- FICON, FCP, ESCON/Parallel Channels
- OSA/2 or OSA Express Adapters
- IEEE Floating Point
- Expanded Storage
- Magnetic Tape
- HiperSockets
- Crypto

Hardware Requirements

Processors

- IBM zEnterprise System
- z9 EC, z9 BC, z10 EC, z10 BC
- Z800, z900, z990
- 9672 G2 – G6 (IBM only supports G5+)
- Multiprise 2000 (not supported by IBM)
- Multiprise 3000
- P/390, R/390, Integrated Server (not supported by IBM)

Central Storage

- 1GB required for installation

DASD

- At least two 3390-3 or single 5G SCSI LUN

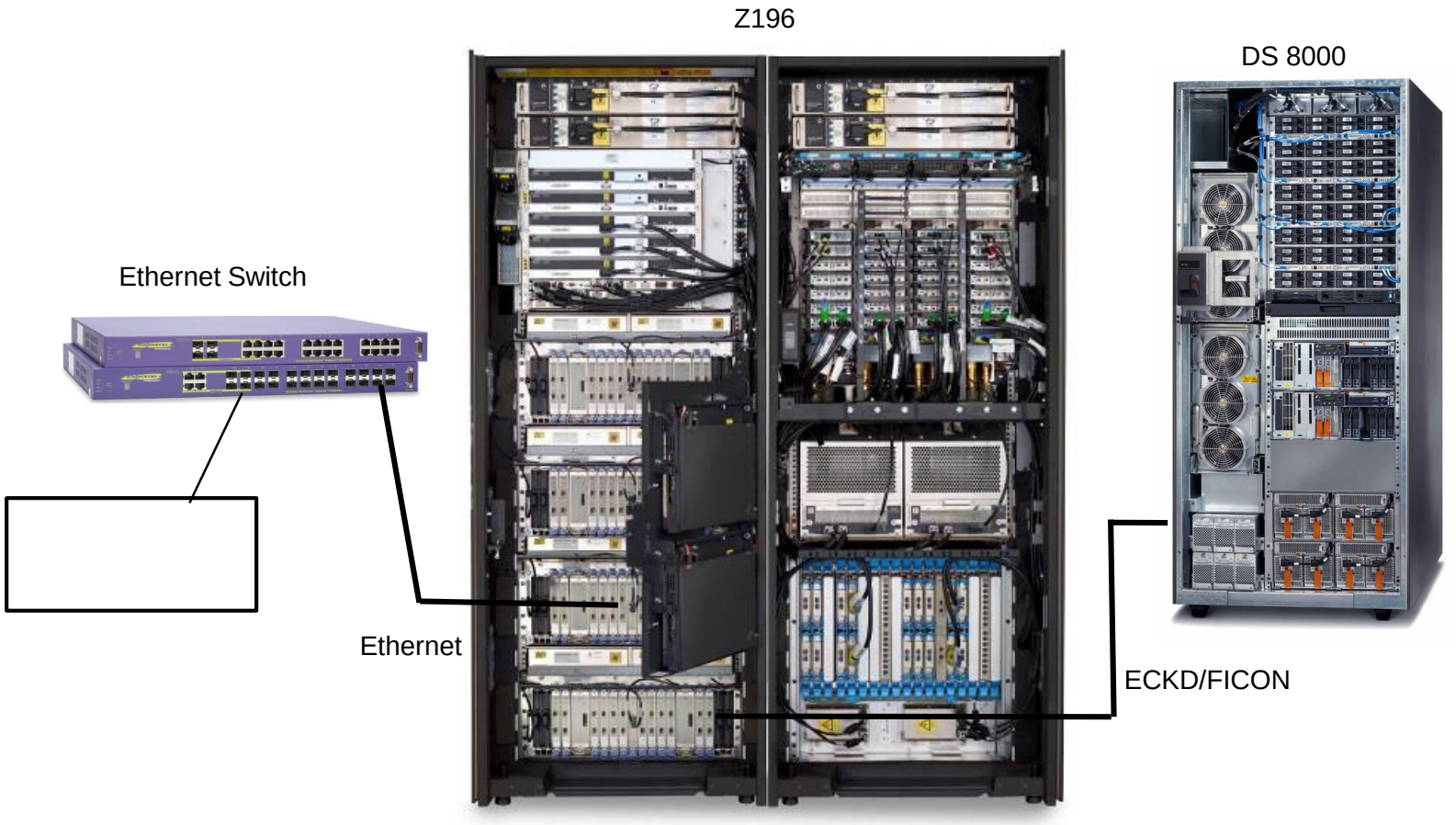
System console

- Hardware Management Console (LPAR or basic mode)
- Virtual 3215 console (VM)

Workstation with CD-ROM for installation

Network connectivity is required to acquire installation materials

Our Hardware Environment



IOCP – Allocate HW Devices

```
ID    MSG1='IODF34',MSG2='SYS5.IODF34 - 2008-02-21 11:11',    *
      SYSTEM=(2097,1),LSYSTEM=Z10EC,                          *
      TOK=('Z10EC',000000011ED020661111080201080 52F00000000,00*
      000000,'08-02-21','11:11:08','SYS5','IODF34')
RESOURCE PARTITION=((CSS(0),(CF01,1),(S01,2),(S03,4),(VECLASS,*
      B),(VMCLASS,A),(VMRESCUE,9),(VMTPC,5),(ZNALS02,3),(ZVM,6*
      ),(ZVM2,7),(ZVM3,8),(*,C),(*,D),(*,E),(*,F)),(CSS(1),(*,*
      1),(*,2),(*,3),(*,4),(*,5),(*,6),(*,7),(*,8),(*,9),(*,A)*
      ,(*,B),(*,C),(*,D),(*,E),(*,F)),(CSS(2),(*,1),(*,2),(*,3*
      ),(*,4),(*,5),(*,6),(*,7),(*,8),(*,9),(*,A),(*,B),(*,C),*
      (*,D),(*,E),(*,F)),(CSS(3),(*,1),(*,2),(*,3),(*,4),(*,5)*
      ,(*,6),(*,7),(*,8),(*,9),(*,A),(*,B),(*,C),(*,D),(*,E),(*
      *,F)))
CHPID PATH=(CSS(0),1B),SHARED,                                *
      PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
      02,ZVM,ZVM2,ZVM3),(=)),PCHID=171,TYPE=OSD
CHPID PATH=(CSS(0),47),SHARED,                                *
      PARTITION=((VECLASS,VMCLASS,VMRESCUE,VMTPC,ZVM,ZVM2,ZVM3*
      ),(=)),PCHID=1D3,TYPE=FCP
CHPID PATH=(CSS(0),48),SHARED,                                *
      PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
      02,ZVM,ZVM2,ZVM3),(=)),PCHID=1E0,TYPE=FC
```

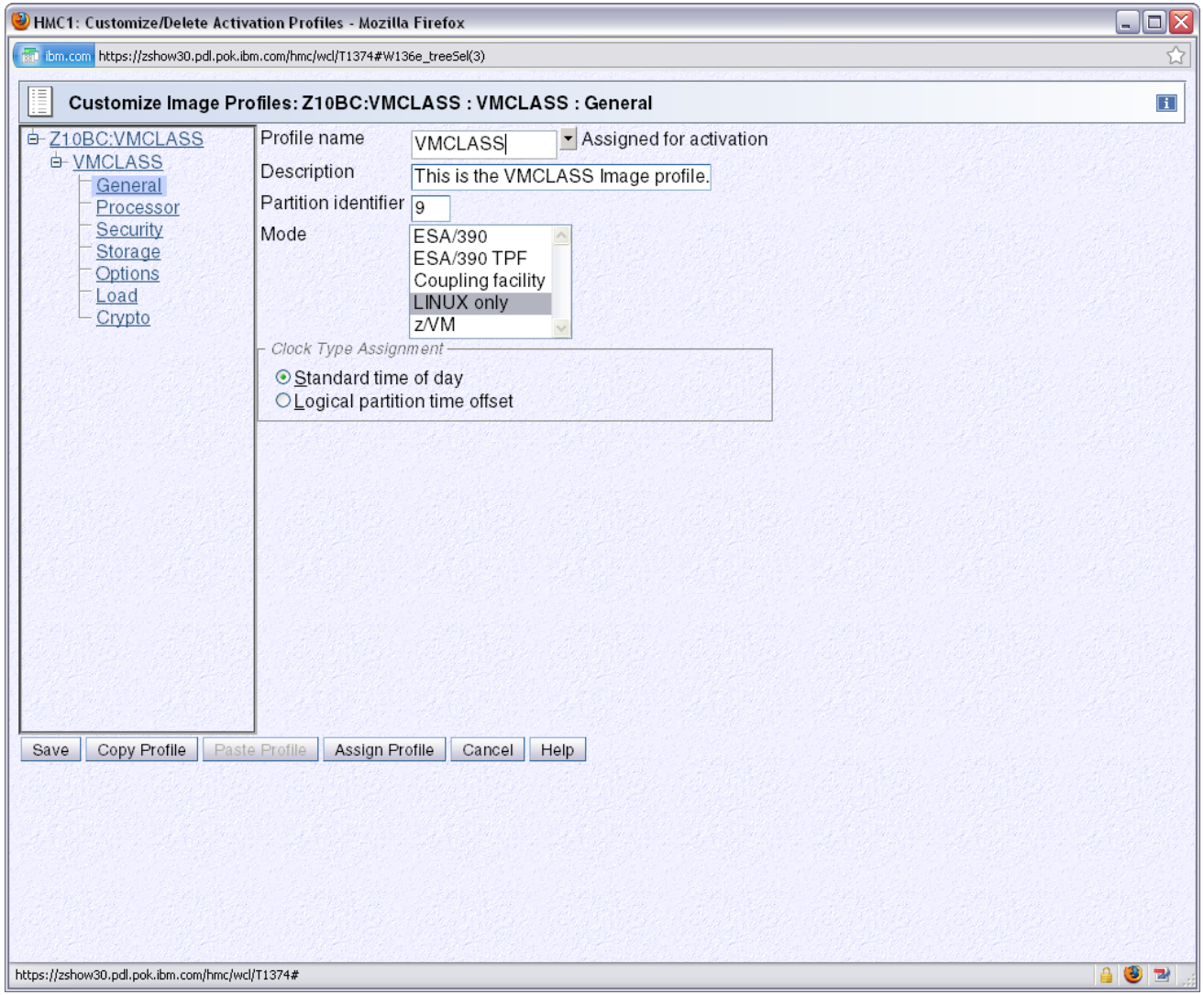
IOCP – (cont)

```
CHPID PATH=(CSS(0),50),SHARED,                    *
    PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
    02,ZVM,ZVM2,ZVM3),(=)),PCHID=150,TYPE=FC
CHPID PATH=(CSS(0),51),SHARED,                    *
    PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
    02,ZVM,ZVM2,ZVM3),(=)),PCHID=151,TYPE=FC
CHPID PATH=(CSS(0),52),SHARED,                    *
    PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
    02,ZVM,ZVM2,ZVM3),(=)),PCHID=152,TYPE=FC
CHPID PATH=(CSS(0),54),SHARED,                    *
    PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
    02,ZVM,ZVM2,ZVM3),(=)),PCHID=1B0,TYPE=FC
CHPID PATH=(CSS(0),55),SHARED,                    *
    PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
    02,ZVM,ZVM2,ZVM3),(=)),PCHID=1B1,TYPE=FC
CHPID PATH=(CSS(0),56),SHARED,                    *
    PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
    02,ZVM,ZVM2,ZVM3),(=)),PCHID=1B2,TYPE=FC
CHPID PATH=(CSS(0),58),SHARED,                    *
    PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
    02,ZVM,ZVM2,ZVM3),(=)),PCHID=1C0,TYPE=FC
CHPID PATH=(CSS(0),59),SHARED,                    *
    PARTITION=((S01,S03,VECLASS,VMCLASS,VMRESCUE,VMTPC,ZNALS*
    02,ZVM,ZVM2,ZVM3),(=)),PCHID=1C1,TYPE=FC
```

IOCP – (cont)

```
CNTLUNIT CUNUMBR=0A00,PATH=((CSS(0),47)),UNIT=FCP
IODEVICE ADDRESS=(A00,064),CUNUMBR=(0A00),UNIT=FCP
CNTLUNIT CUNUMBR=0B00,PATH=((CSS(0),4B)),UNIT=FCP
IODEVICE ADDRESS=(B00,064),CUNUMBR=(0B00),UNIT=FCP
CNTLUNIT CUNUMBR=20E0,PATH=((CSS(0),1B)),UNIT=OSA
IODEVICE ADDRESS=(20E0,014),UNITADD=00,CUNUMBR=(20E0),UNIT=OSA
IODEVICE ADDRESS=20EE,UNITADD=FE,CUNUMBR=(20E0),UNIT=OSAD
IODEVICE ADDRESS=20EF,UNITADD=0F,CUNUMBR=(20E0),UNIT=OSA
CNTLUNIT CUNUMBR=6200,PATH=((CSS(0),50,51,52,54,55,56,58,59)),*
     UNITADD=((00,128)),CUADD=2,UNIT=1750
IODEVICE ADDRESS=(6200,100),CUNUMBR=(6200),STADET=Y,         *
     PARTITION=((CSS(0),VMRESCUE,VMCLASS)),UNIT=3390
CNTLUNIT CUNUMBR=6700,PATH=((CSS(0),50,51,52,54,55,56,58,59)),*
     UNITADD=((00,128)),CUADD=7,UNIT=1750
IODEVICE ADDRESS=(6700,128),CUNUMBR=(6700),STADET=Y,         *
     PARTITION=((CSS(0),ZVM2,VMRESCUE,VMCLASS)),UNIT=3390
```

LPAR Activate Profile



z/VM Directory Entry

```
USER     DIRECT   A1  F 80  Trunc=80 Size=7554 Line=4927 Col=1 Alt=4

04927 USER VMTM001 XXXXXXXX 1G 16G G
04928    IPL CMS
04929    IUCV ANY PRIORITY MSGLIMIT 2000
04930    IUCV ALLOW
04931    MACHINE ESA 2
04932    OPTION QUICKDSP
04933    CONSOLE 0020 3215
04934    NICDEF 0AC0 TYPE QDIO LAN SYSTEM EDUCATN
04935    NICDEF 0BC0 TYPE QDIO LAN SYSTEM EDUCATN
04936    SPOOL 000C 2540 READER *
04937    SPOOL 000D 2540 PUNCH A
04938    SPOOL 000E 1403 A
04939    LINK MAINT 0190 0190 RR
04940    LINK MAINT 019D 019D RR
04941    LINK MAINT 019E 019E RR
04942    LINK TCPMAINT 0592 0592 RR
04943    LINK VMPLACE 6208 6202 RR
04944    LINK VMLABLIN BBBE F6FF RR
04945    MDISK 0300 3390 1 3339 CBB00D MW ALL ALL ALL
04946    MDISK 0301 3390 1 3339 CBB00E MW ALL ALL ALL
04947    MDISK 0302 3390 5007 3339 CBB005 MW ALL ALL ALL
```

Getting Started

Obtain hardware resources

- IOCDS updates LPAR profile to define new LPAR with;
  - •CPU(s), memory (at least 1GB), dasd (at least 2 3390-3), network interface, tape drive
- z/VM virtual machine with:
  - •CPU (1 defined by default)
  - •Memory (1GB minimum)
  - •DASD (at least 2 3390-3, or equivalent with multiple minidisks)
  - •Network attachment (virtual NIC)
  - •Virtual punch and card reader (vintage 2540 devices)
- Obtain installation materials
  - •Kernel (either tape IPL version, or virtual rdr IPL version)
  - •Parm file
  - •Ram disk (installation file system to load into memory)

Obtain Installation Materials

Distributors include materials on DVD

- SUSE – located in /boot on DVD
  - •Tape kernel – tapeipl.ikr
  - •VM rdr kernel – vmrdr.ikr
  - •Parm file – parmfile
  - •Ram disk – initrd

Transfer installation materials to host system

- z/VM
  - •Kernel and Ram disk must be sent binary with a fixed record format and lrecl of 80
  - •From work station enter ***quote site fixrecfm 80***
  - •Parm file should be transferred in ascii to facilitate easy changes

Using Installation Materials

z/VM

- Punch components to virtual reader in following order
  - •Kernel (vmrdr.ikr)
  - •Parm file
  - •Ram disk

Load installation materials into memory

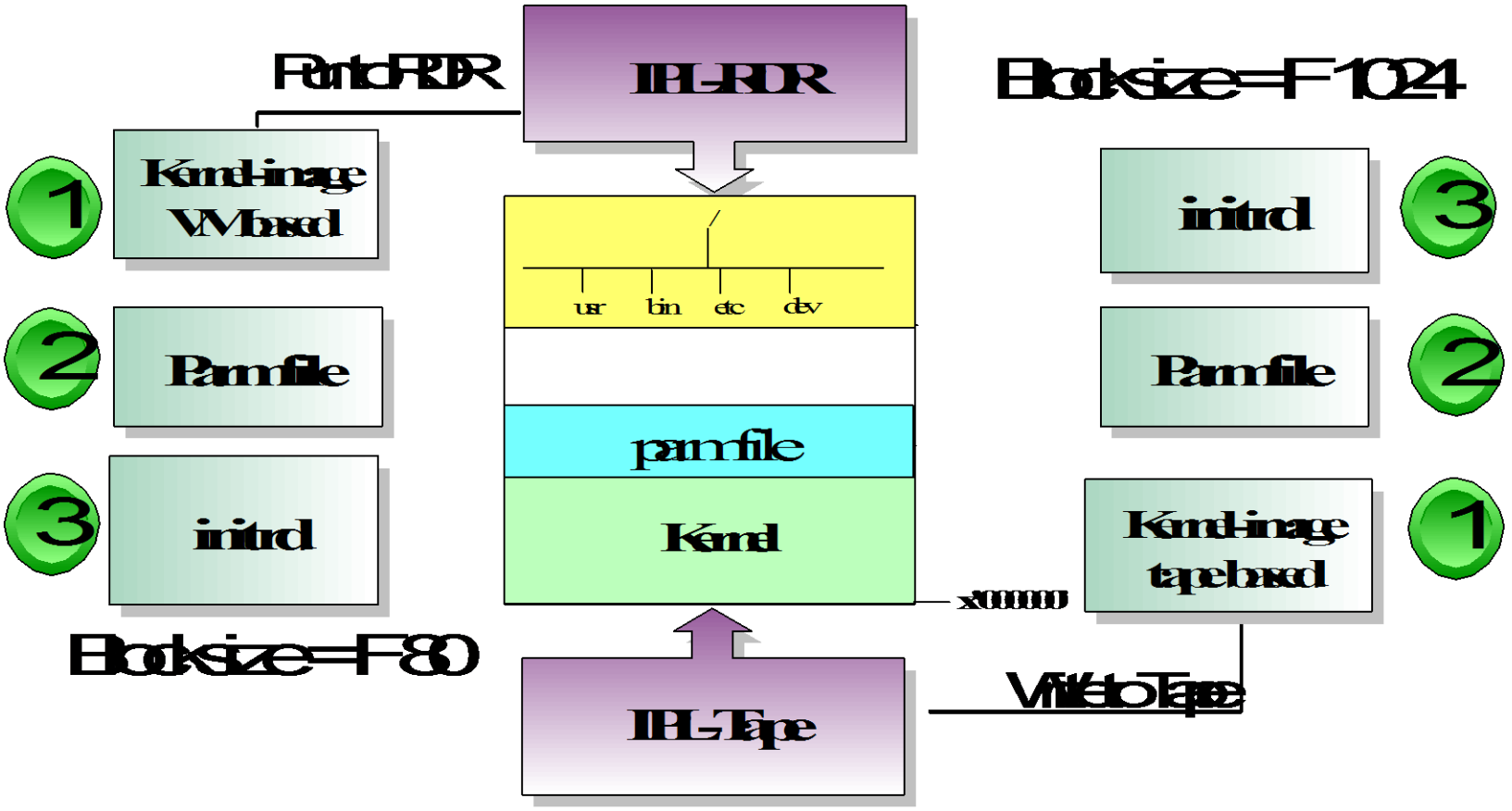
- z/VM
  - •IPL the virtual rdr (usually address 00c)

Kernel will get control from IPL process and begin executing

Ram disk image will be uncompressed and mounted as root file system

Network customization script will prompt you for network configuration information

Initial System Build



Configure Network Interface

Network setup script will prompt for information used to configure interface

- Information required varies by type of interface
  - All interfaces require
  - IP address – typically assigned to you by your network administrator
  - Hostname – fully qualified name that exists in a dns somewhere
    - Associated with your IP address
  - Netmask – given to you by your network administrator (e.g. 255.255.255.0)
  - Gateway address – IP address of your next hop router
  - IP address of dns service
  - MTU size – given to you by your network administrator
- Additional information for point-to-point interfaces (ctc, iucv)
  - Peer IP address – the IP address of the host on the other end of the link
  - Device address for read/write ctc pair, or vm userid of iucv connection partner
- Additional information for multi-access interfaces (eth, his…)
  - Broadcast address – typically your network address with a host of 255
  - Device addresses for interface (even/odd pair, triplet of addresses for OSA Express, or Hipersockets)

Completing Install

From ramdisk system, install tools build new linux system on target dasd

- Build complete linux file system with all necessary utilities installed to run and maintain the system
- Install desired packages such as Samba, Apache, BIND etc.

Installation tool builds linux system using rpm utility

- Maintain rpm database listing everything installed and level
- Provides for easier service later
- Allows for automatic tailoring during install process

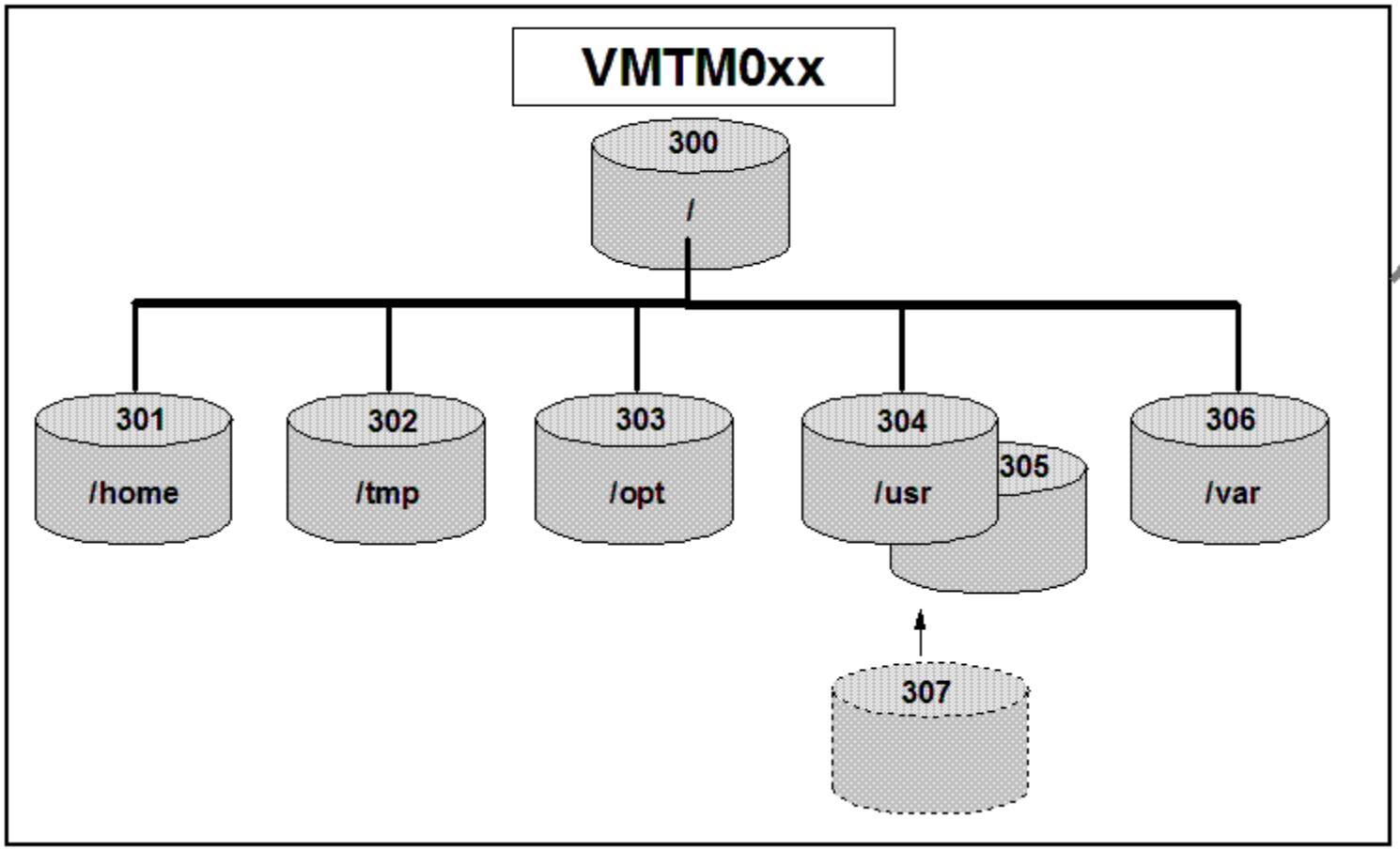
Need to create a “bootable” device for new Linux system

- Same concept as updating Master Boot Record (MBR) on a pc
- Typically boot device is same as device containing root file system
  - Device must at least have contents of /boot directory

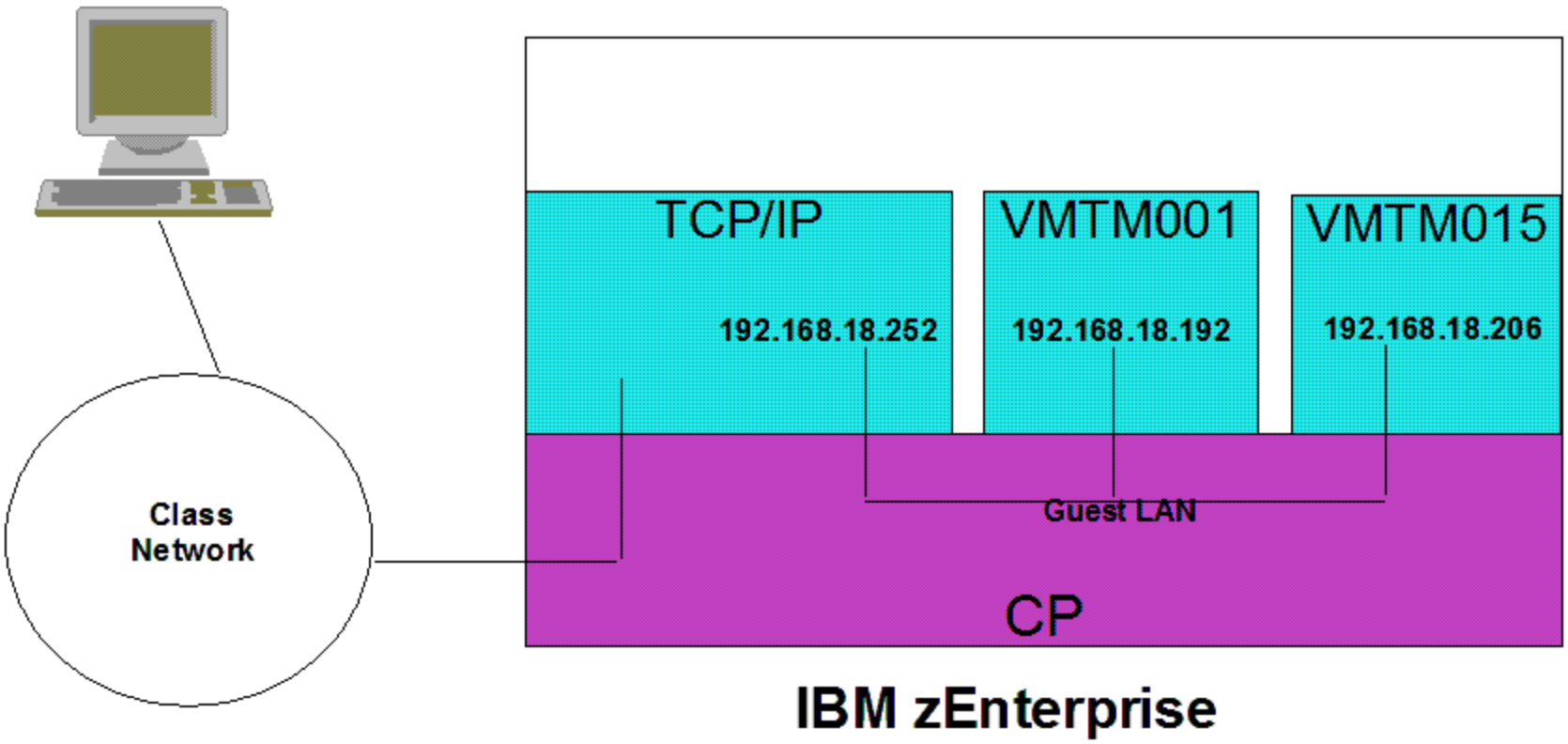
System z DASD requires IPL text to be written to cylinder 0 record 1

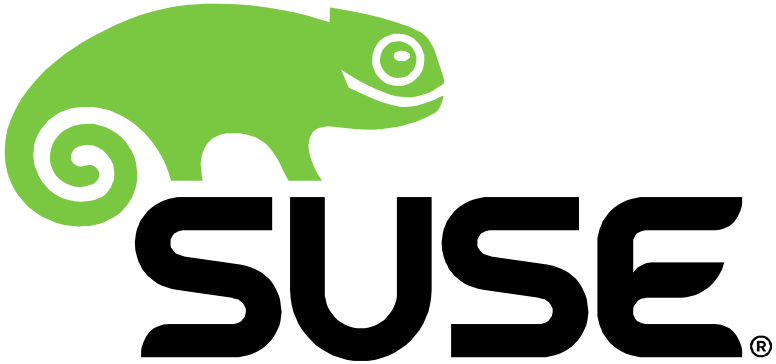
- Linux System z utility named zipl performs this task
- IPL text contains pointers in file system to absolute location of:
  - Kernel
  - Parm file
  - Initial ram disk

Installed System



Lab Network Configuration

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