

Linux Deployment and Management under zVM at Wells Fargo Bank

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About Wells Fargo Bank

- Headquartered in San Francisco
- Acquired Wachovia Bank December 2008 (doubled) – completed migration end of 2011
- 70 Million customers, 1/3 of US Households have relationship
- 9000 Stores (branches)
- #1 Mortgage lender (commercial and residential)
- #3 ATMs (12,355)
- #4 in US in full service brokerage & wealth management
- #5 Insurance brokerage
- #4 in assets
- #1 in market cap
- 1st to do internet banking
- 270,000 employees

About Me

- VM user since 1977 (VM/370 R3) and Systems programmer since 1980 (VM/SP R1).
- Systems programmer for z/VM and Linux on z Series at WF
- AVP, Operating Systems Engineer
- Enterprise Hosting Services
- At WF since 2007
- 8 team members
- Install/support/engineer Linux on z and z/VM builds
- Level 2-3 for all Linux on z servers
- Sir Bob, Master Darter of Beantown

What We Have

- Production
 - 4 LPARs on 2 sites with failover between
 - z196 with 52 IFLs total
 - zVM 6.2
- Development/Test
 - 3 LPARs on 2 boxes
 - z10 2 LPARs 6 IFLs zVM 6.2 and 2 IFLs zVM 6.3
 - z196 1 LPAR 6 IFLs zVM 6.3

How It Was

Adding a server meant several tasks:

- Define the server
- Copy the disks using Hidro or DDR
- Update the LINUXUP EXEC on AUTOLOG2
- Add a GRANT VSWITCH on AUTOLOG2
- Update the LINUX NODES file on ZTCP
- Update a list in LNXDOWN EXEC
- Update files on server's 191

Drawbacks

- One change could effect several files.
- Missing a step could result in problems later
- Any change to the base version needs to be tested out before creating new servers.
- Base version was only locally available (pre-SSI) and had to be duplicated on each system for deployment.

First step – Save the Image

- Created an SFS pool for saving the LINUX image after it was built.
- Accessible to all systems meaning it could be built anywhere.
- Use CMSDDR to copy MDISK to FILE.
 - PIPE CMS EXEC CMSDDR DUMP addr outfn outft outfm
- Slow interface between prod and dev (1K miles apart) required a 2nd SFS pool. One in dev, one in prod.

SAVESYS

```

<=====> W e l l s   F a r g o   S y s t e m   S a v e <=====>
Save from userid:  zlnx25

SLES10          02% in use. 29263316 blocks available
  _ BASIC (1 image)
  _
SLES11          04% in use. 42885109 blocks available
  _ BASIC (2 images)
  _ BASW70G (1 image)
  _ s bobtest_
SLES12          00% in use. 10 blocks available
  _
VM54           75% in use. 2479079 blocks available
  _ VTAMFIN (1 image)
  _
VM62           86% in use. 411703 blocks available
  _ DVD_RSU (1 image)
  _ 62INSTAL (1 image)
  _

S=Save image      L=List contents      D=Delete (only if 0 images)
PF1=Help         PF3= Quit      PF7=Back  PF8=Forward  PF12=Cursor
====>
4|B|  ;00.1  11/15

```

Blank lines allow for new description. User has to be enrolled in SFS to appear in list.

SAVESYS

```

<=====> W e l l s   F a r g o   S y s t e m   S a v e <=====>

SLES11.BOBTEST.20130308

  Minidisk  Minidisk
  Address   Size      Status
  S    191      1      6 blocks saved in 0.79 seconds
  S    101     500     Processing...
  S    102    17500   will not be saved.
  S    103     300     To Be Stored

PF1=Help   PF3=Quit   PF7=Back   PF8=Forward PF9=Process

====>
4B █          :00.1          24/07
  
```

Removing 'S' prevents that disk from being saved.

SAVESYS

```
<=====> W e l l s   F a r g o   S y s t e m   S a v e <=====>
SLES11.BOBTEST
_ 20130308          43668 blocks in use

L=List contents      D=Delete Image
PF1=Help             PF3=Quit
====>
4B  :00.1 24/07
```

Directory structure has user (os level), description, date saved.

SAVESYS

```
<=====> w e l l s   F a r g o   S y s t e m   S a v e <=====>
SLES11.BOBTEST.20130308

Minidisk  Minidisk
Address   Size
  191      1
  101     500
  103     300

PF1=Help    PF3=Quit    PF7=Back    PF8=Forward
=====>
4B █                @ :00.1                                24/07
```

Files are actually named to identify address and size:
IMAG0103 CYL00300

LXSFSWK

- Nothing to show, works in the dark of night to synchronize the two SFS.
- Compares directory structure, user limits, and files.
- Keeps last status so it knows if something has been deleted.
- Can run for hours, but saves tons of time when creating images.

LXSHARE 192 - Files Involved

- LXSHARE 192 contains several files for the build and boot processes.
- PROFILE EXEC for server calls LXSTART which prepares for boot
- LXSTART calls LXIDENT which build config file for witsec.
- LINUX_OS NAMES contains default information for each level (SLES10, SLES11, etc)
- SUBNET NAMES contains default information for each network
- LINUX NAMES contains all the information for each server.
- Fields in LINUX_OS and SUBNET determine which fields are displayed on BUILDSYS screens.

BUILDSYS

Creation of new server(s)

```
<=====> W e l l s   F a r g o   S y s t e m   B u i l d <=====>

SLES10
  BASIC
    _ 20110908
SLES11
  BASIC
    _ 20130307      _ 20121101
  BASW70G
    _ 20121214
  BOBTST
    b 20130311
  RECN0513
    _ 20130308
SLES12
VM54
  VTAMFIN
    _ 20090920
VM62
  DVD_RSU

L=List disks      R=Restore to existing id      B=Build userid
PF3=Quit         PF7=Back      PF8=Forward  PF10=Clone  PF12 = Cursor
====>

4B █                               :00.1                               14/08
```

BUILDSYS

Creation of new server(s)

```
<=====> W e l l s   F a r g o   S y s t e m   B u i l d <=====>
Building LINUX server from SLES11.BOBTEST.20130311
Userid (Supply to override automatic name):  ZL_____
Please fill in the final node of the IP address.
10.xx.xx.  ___
10.xx.yy.  ___
10.xx.zz.  77_

PF3=Quit
====>
4B █          :00.3          11/14
```

Userid is created using network ip address if desired

BUILDSYS

Creation of new server(s)

```

<=====> Wells Fargo System Build <=====>
Building LINUX server ZL3077 from SLES11.BOBTEST.20130311

Please fill in all blanks (information for LINUX NAMES)

Hostname: bobtest1 OS_Level: SLES11
Full_Domain_Name: .wellsfargo.com
IP: 10.xx.zz.77 Netmask: 255.255.255.0 Gateway: 10.xx.zz.31
LAN: VSW1 VLAN: 770 Layer2: yes
NIC: 3000 NICname: QETH
Monitor: yes Backup: yes Startup: NORMAL
Run_on_System: DVFVM
Contact: Robert.Bates@wellsfargo.com
Group_Email:
Function:

Default stor: 1G Max Stor 2G CPUs: 2
PF3=Quit PF9=Submit (add to Linux names/Create user)
====>
4B :00.1 15/15

```

Yellow is protected and built from other values.

Process causes the id creation and population of LINUX NAMES

BUILDSYS

Creation of new server(s)

```

<=====> Wells Fargo System Build <=====>

Restore SLES11.BOBTEST.20130311 to ZL3077

  Minidisk  Minidisk
Action Address  Size  Status
  R      101     500  43049 blocks restored in 22.82 seconds
  R      103     300  Processing...
  R      191      1    Restore

Actions: R=Restore S=Skip
         PF3=Quit   PF9=Submit

====>

```

[4]B :00.1 24/07

Once restores complete another pfkey is revealed.
 PF10=Create Duplicates

BUILDSYS

Creation of new server(s)

```

<=====> W e l l s   F a r g o   S y s t e m   B u i l d <=====>
Userid will be built using IP address provided.
Userid to clone: ZL3077
  Userid          IP                      Run on          Hostname
  _____     _____          _____     _____
  10.xx.xx.      _____          DVEVM          bobtest2
  10.xx.yy.      _____
  10.xx.zz.      75_____
  10.xx.xx.      _____          DV6VM          bobtest3
  10.xx.yy.      _____
  10.xx.zz.      76_____
  10.xx.xx.      _____
  10.xx.yy.      _____
  10.xx.zz.      _____
  10.xx.xx.      _____
  10.xx.yy.      _____
  10.xx.zz.      _____

PF3=Quit          PF9=Submit (create id, names entry and copy disks
                  PF10=Add more lines

====>
4B █              :00.1                                12/27
  
```

Userids created, LINUX NAMES updated, disks created with HiDro duplicating from original userid (ZL3077)

LINUX NAMES entry for BOBTEST1

```
:nick.ZL3077
:hostname.bobtest1
:fqdn.bobtest1.wellsfargo.com
:runsys.DVFVM
:startup.NORMAL
:ip.10.xx.zz.77
:vlan.770
:netmask.255.255.255.0
:gateway.10.xx.zz.31
:lan.SYSTEM/VSW1
:nic.3000
:nicname.QETH
:layer2.yes
:monitor.yes
:backup.yes
:os_level.SLES11
:contact.Robert.Bates@wellsfargo.com
:function.
:grp_email.
```

AUTOLOG2 - LINUXUP

- Servers are grouped a couple ways
 - Startup: Early, Normal, Late
 - Start maximum of 10 at a time
 - Runsys: Name of system to start it on
 - PIPE CMS NAMEFIND :runsys DVEVM :Startup Normal :nick (FILE LINUX TYPE * | stem serv_list.

Note: If a server has no runsys or startup it will not be selected to be autologged.

WITSEC

File created when server is autologged

Read at boot

WITSEC decides if anything has changed

Makes adjustments if needed.

```
NEW_ENV=DEV
NEW_HOSTNAME=taddm-dev
NEW_IP=10.xx.yy.13
NEW_GATEWAY=10.xx.yy.31
NEW_NICADDR=3000
NEW_NETMASK=255.255.255.0
NEW_QETH_LAYER2_SUPPORT=1
NEW_NICNAME=QETH
NEW_FQDN=taddm-dev.wellsfargo.com
NEW_DNS1=10.0.23.37
NEW_DNS2=10.12.71.20
NEW_shared_pool_capacity=6
NEW_system_active_processors=20
```

ZTCP – BLDLXNOD

- Rebuild the LINUX NODE file each time ZTCP is started
- Grab the servers for the system, the IP address, and monitor tag = YES.
- Create the lines for each server.

```
node = 'ZL3077' network_address = '10.xx.zz.77' vmid = 'ZL3077'
```
- Does a copy to keep the last version just in case as well.

LNXdOWN

Many servers in prod are still shutdown once a week and backed up from zOS (full pack).

LNXdOWN SYSTEM PR8VM BACKUP

Must be run from PR8VM (checks you are on the right system)

Selects all servers from system with Backup = YES

Issues SIGNAL SHUTDOWN USER server_id

VM:Operator

Check servers in the cluster

```

WFLINUX 002% 392 Users VM:Operator on OPERATOR(DVFVM) Fri 03May13 09:46
----- DVFVM -----
ZL3077

----- DVEVM -----
TLNX10 TLNX112 TLNX113 TLNX128 TLNX13 TLNX139 TLNX140 TLNX142
TLNX144 TLNX146 TLNX148 TLNX15 TLNX150 TLNX152 TLNX154 TLNX160
TLNX172 TLNX173 TLNX174 TLNX175 TLNX18 TLNX188 TLNX189 TLNX19
TLNX190 TLNX193 TLNX20 TLNX221 TLNX222 TLNX225 TLNX227 TLNX228
TLNX23 TLNX230 TLNX235 TLNX240 TLNX241 TLNX242 TLNX243 TLNX244

----- DV6VM -----
TLNX223 TLNX224 ZLNX116 ZLNX118 ZLNX129 ZLNX135 ZLNX136 ZLNX137
ZLNX138 ZLNX141 ZLNX143 ZLNX145 ZLNX147 ZLNX149 ZLNX151 ZLNX153
ZLNX155 ZLNX156 ZLNX157 ZLNX158 ZLNX159 ZLNX161 ZLNX162 ZLNX163
ZLNX164 ZLNX165 ZLNX166 ZLNX167 ZLNX176 ZLNX177 ZLNX178 ZLNX179
ZLNX187 ZLNX191 ZLNX218 ZLNX22 ZLNX232 ZLNX237 ZLNX239 ZLNX248
ZLNX249 ZLNX250 ZLNX35 ZLNX36 ZLNX37 ZLNX41 ZLNX42 ZLNX45

----- Linux window -----
1= ViewNext 2= Refresh 3= ViewMain 4= Hide PFK 5= Details 6=
7= Backward 8= Forward 9= ShowHost 10= 11= Relocate 12= Zoom In
===>
4B :00.1 BATESRP
24/06
  
```

Green indicates server logged on.
Red not logged on.

VM:Operator

Check servers in the cluster

```

WFLINUX 002% 392 Users VM:Operator on OPERATOR(DVFVM) Fri 03May13 09:49
----- DVFVM -----
ZL3077
-----Details for ZL3077-----
| Hostname:          bobtest1
| IP:               10.xx.zz.77
| Contact:          Robert.Bates@wellsfargo.com
| Group E-mail:
| Function:
| Backup:           yes
| Press ENTER key to clear
-----
TLNX223 TLNX224 ZLNX116 ZLNX118 ZLNX129 ZLNX135 ZLNX136 ZLNX137
ZLNX138 ZLNX141 ZLNX143 ZLNX145 ZLNX147 ZLNX149 ZLNX151 ZLNX153
ZLNX155 ZLNX156 ZLNX157 ZLNX158 ZLNX159 ZLNX161 ZLNX162 ZLNX163
ZLNX164 ZLNX165 ZLNX166 ZLNX167 ZLNX176 ZLNX177 ZLNX178 ZLNX179
ZLNX187 ZLNX191 ZLNX218 ZLNX22  ZLNX232 ZLNX237 ZLNX239 ZLNX248
ZLNX249 ZLNX250 ZLNX35  ZLNX36  ZLNX37  ZLNX41  ZLNX42  ZLNX45

----- Linux Window -----
1= ViewNext 2= Refresh 3= ViewMain 4= Hide PFK 5= Details 6=
7= Backward 8= Forward 9= ShowHost 10=
11= Relocate 12= Zoom In
====> _____ BATESRP
| 4B | _____ :00.1 _____ 03/04

```

PF5 gives information on server selected.

VM:Operator

Check servers in the cluster

```

WFLINUX 002% 392 Users VM:Operator on OPERATOR(DVFVM) Fri 03May13 09:52
----- DVFVM -----
bobtest1

----- DVEVM -----
aces-test1 blue cdzea00a0001 cdzea00a0002 cdzea00a0003
cdzea00a7001 cdzea00a8002 cdzea00a9003 cdzea01a0011 cdzea01a0013
cdzea01a0015 cdzea01a0019 cdzea01a0061 cdzea01a0063 cdzea02a0015
cdzea02a0061 cdztd67032 cdztd67038 cdztd67043 cdztd67132
cdztdv14067 cdztdv14068 cdztdv14221 cdztdv17010 cdztdv17015

----- DV6VM -----
cdzea00a0007 cdzea02a0011 cdzea02a0013 cdzea02a0019 cdzea02a0063
cdzed00a0007 cdztd65136 cdztdv13224 cdztdv14069 cdztdv17084
cdztdv17085 cdztdv17086 cdztdv17129 cdztdv17141 cdztdv17143
ceztd65138 ceztd67035 ceztd67036 ceztd67037 ceztd67041
ceztd67045 ceztd67049 ceztd67051 ceztd67135 ceztdv14223
ceztdv15187 ceztdv17042 ceztdv17056 ceztdv17057 ceztdv17058

----- Linux Window -----
1= ViewNext 2= Refresh 3= ViewMain 4= Hide PFK 5= Details 6=
7= Backward 8= Forward 9= ShowVMid 10= 11= Relocate 12= Zoom In
===> BATESRP
[AB] :00.2 24/06
  
```

PF9 toggles between Userid and Hostname.

Bring up a server by request

- Servers started by request in BCP
- BRINGUP *server1 server2 ...*
- Server *server1* started on *runsys*
- Operators often get request from users who don't know the VM userid
- Looks up hostname and gets *runsys* and *nick*
- Issues AT *runsys* CMD XAUTOLOG *nick*

LINUX NAMES

- File can get very large in a hurry.
- Adding a new field becomes tiresome.
- Manual maintenance can be dangerous.

LNXNAMES

Update/display LINUX NAMES file entries

```

<=====> Linux Names File <=====>

CMD Userid      Hostname      OS_Level      Run_on_System Startup Monitor
TLNX126 zrhbuil4     6             DVEVM         no
TLNX128 cdztlv17128  SLES10X      DVEVM         EARLY  YES
TLNX13  taddm-dev    10x          DVEVM         NORMAL yes
TLNX139 ceztlv15139  10x          DVEVM         NORMAL YES
TLNX140 cdztlv17140  10x          DVEVM         NORMAL YES
TLNX142 cdztlv17142  10x          DVEVM         NORMAL YES
TLNX144 ciztlv17144  10x          DVEVM         NORMAL YES
TLNX146 ciztlv17146  10x          DVEVM         NORMAL YES
TLNX148 ceztlv17148 10x          DVEVM         NORMAL YES
TLNX15  cdztlv17015  11x          DVEVM         NORMAL yes
TLNX150 ceztlv17150  10x          DVEVM         NORMAL YES
TLNX152 ceztlv17152  10x          DVEVM         NORMAL YES
TLNX154 ceztlv17154  10x          DVEVM         NORMAL YES
TLNX16  ceztlv17016  10x
TLNX160 zlnx160      11x          DVEVM         NORMAL YES
TLNX161 zlnx161      11x
TLNX17  ceztlv14017  10x

1=Help      3=Quit      5=Select columns  6=Import Matrix
7=Back      8=Forward   9=Sort(A)  10=Sort(D)  11=Next cols

====> _
[4B] :00.1 24/07
  
```

LNXNAMES

Update/display LINUX NAMES file entries

```

<=====> Linux Names File <=====>
<=====> Display Column Preferences <=====>
Customize screen by selecting fields to display. Userid is always present.
Use numbers starting with 1 to select order of other fields.
Current column settings:
CMD Userid  Hostname          OS_Level  Run_on_System Startup Monitor
  1 Hostname(20)                2 OS_Level(12)
  Full_Domain_Name(35)
  IP(15)                Netmask(15)
  LAN(8)                 VLAN(4)
  NIC(4)                 NICname(4)
  5 Monitor(3)           6 Backup(3)
  3 Run_on_System(6)      4 startup(6)
  7 Contact(40)
  Group_Email(25)
  Function(64)

  BCP_Hostname(20)
  BCP_Full_Domain_Name(35)
  BCP_IP(15)             BCP_Gateway(15)

3=Quit          4=Clear Header  7=Back      8=Forward
9=Save as Default 11=Next Cols

====> _
[4]B █          :00.1          24/07

```

Customize the view with selected data

LNXXAMES

Update/display LINUX NAMES file entries

```

COMMANDS LNXXAMES                               All Help Information                               line 1 of 22
LNXXAMES

Commands available from the main screen are:
In CMD column
Copy / newname      Duplicate an entry to one with new userid
DELEte              Remove entry
Edit/Xedit/UPDate  Display all fields of entry
Rename / newname    Change the current entry to new userid.
/                   Bring this entry to top of screen

From Command Line
/????              Locate the string ????
ALL /????/         Display only entries with string ????
Up#                 Move toward top of file # of lines (default=1)
Next#               Move toward bottom of file # of lines (default=1)
#                  Move toward bottom of file # of lines (default=1)
SET field_name value Change the value of a field to a specific value.
                    field_name must match column title on screen.
ADD field_name value Add a new field to the entries. field_name must
                    already be defied in the V$BLDSYS FIELDS file.
                    Value is optional.

PF1= Brief   2= Top     3= Quit   4= Return   5= Clocate   6= ?
PF7= Backward 8= Forward 9= PFkeys 10=         11=          12= Cursor

====> _
Macro-read 1 File

```

LNxNAMES

Update/display LINUX NAMES file entries

```

<=====> Linux Names File <=====
<=====> Linux User Detail Update <=====

Userid being updated: ZL3077

Hostname: bobtest1                OS_Level: SLES11
Full_Domain_Name: bobtest1.wellsfargo.com
IP: 10.xx.zz.77                   Netmask: 255.255.255.0   Gateway: 10.xx.zz.31
LAN: VSW1                          VLAN: 770                Layer2: yes
NIC: 3000                          NICname: QETH
Monitor: yes                       Backup: yes              Startup: NORMAL
Run_on_System: DVFVM
Contact: Robert.Bates@wellsfargo.com
Group_Email: _____
Function: _____

BCP_Hostname: _____
BCP_Full_Domain_Name: _____
BCP_IP: _____              BCP_Gateway: _____

3=Quit                6=Save

====> _
4B  :00.1 24/07
  
```


V\$BLDSYS FIELDS

```

V$BLDSYS FIELDS  E1  V 221  Trunc=221 Size=20 Line=7 Col=1 Alt=0

==== * * * Top of File * * *
==== * This file contains the variable details for BUILDSYS and LNXNAMES
==== * mtrx=Titles in the Linux Matrix spreadsheet on Sharepoint
==== * ttls=Titles on the screen
==== * flds=tags in the LINUX NAMES File
==== * pos=Row,column on the screen
==== * len=field length
==== * prot=Protected field, N means data can be entered or changed.
==== * form=Format of the field, U=upper case, M=Mixed case, I=Ip address, N=Number
==== * dup=Fields to use when creating duplicates of the current build
==== * startup_list are valid values for start_up
==== udscreen_mtrx 'Hostname Other_DNS_names IP_Address . Gateway VLAN LAN NIC NICname Layer2 BCP_Hostname BCP_Full_Domain_Nam
==== udscreen_ttls 'Hostname Full_Domain_Name IP Netmask Gateway VLAN LAN NIC NICname Layer2 BCP_Hostname BCP_Full_Domain_Nam
==== udscreen_flds 'hostname fqdn ip netmask gateway vlan lan nic nicname layer2 bcp_hostname bcp_fqdn
==== udscreen_pos '7.2 8.2 9.2 9.25 9.54 10.25 10.2 11.2 11.25 10.54 18.2 19.2
==== udscreen_len '20 35 15 15 15 4 8 4 4 3 20 35
==== udscreen_prot 'N Y Y Y Y N N Y Y Y N Y
==== udscreen_req 'Y Y Y Y Y Y Y Y Y Y Y
==== udscreen_form 'M M I I I N U N U YN M M
==== udscreen_dup '1.55 N *.15 N N N N N N N 2.55 N
==== startup_list 'EARLY NORMAL LATE NO'
==== * * * End of File * * *

====> _

X E D I T 1 File

```

QUESTIONS?