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Linux Deployment and Management under zVM at Wells Fargo Bank

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Wells Fargo Bank

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SHARE in Boston

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

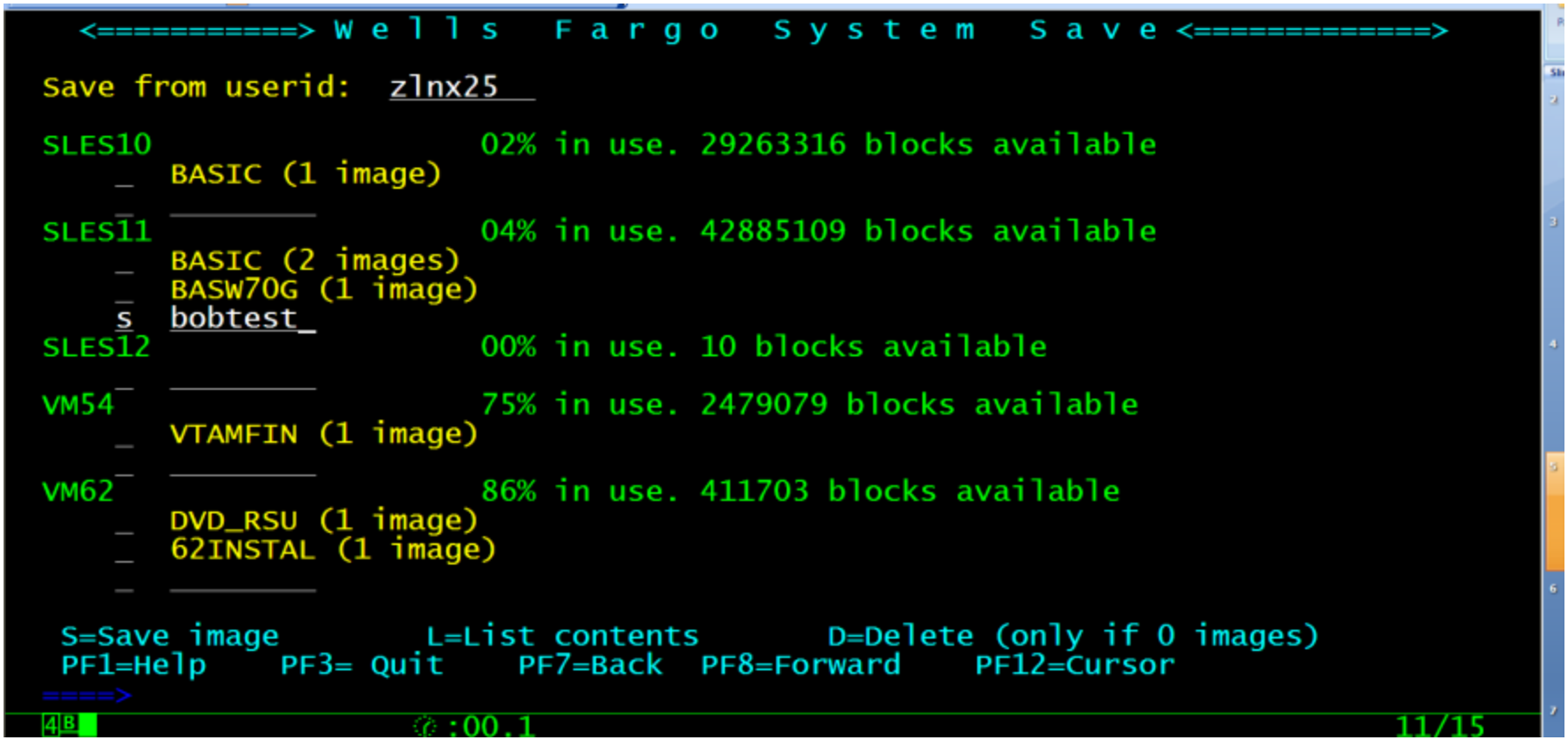
Drawbacks

- 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

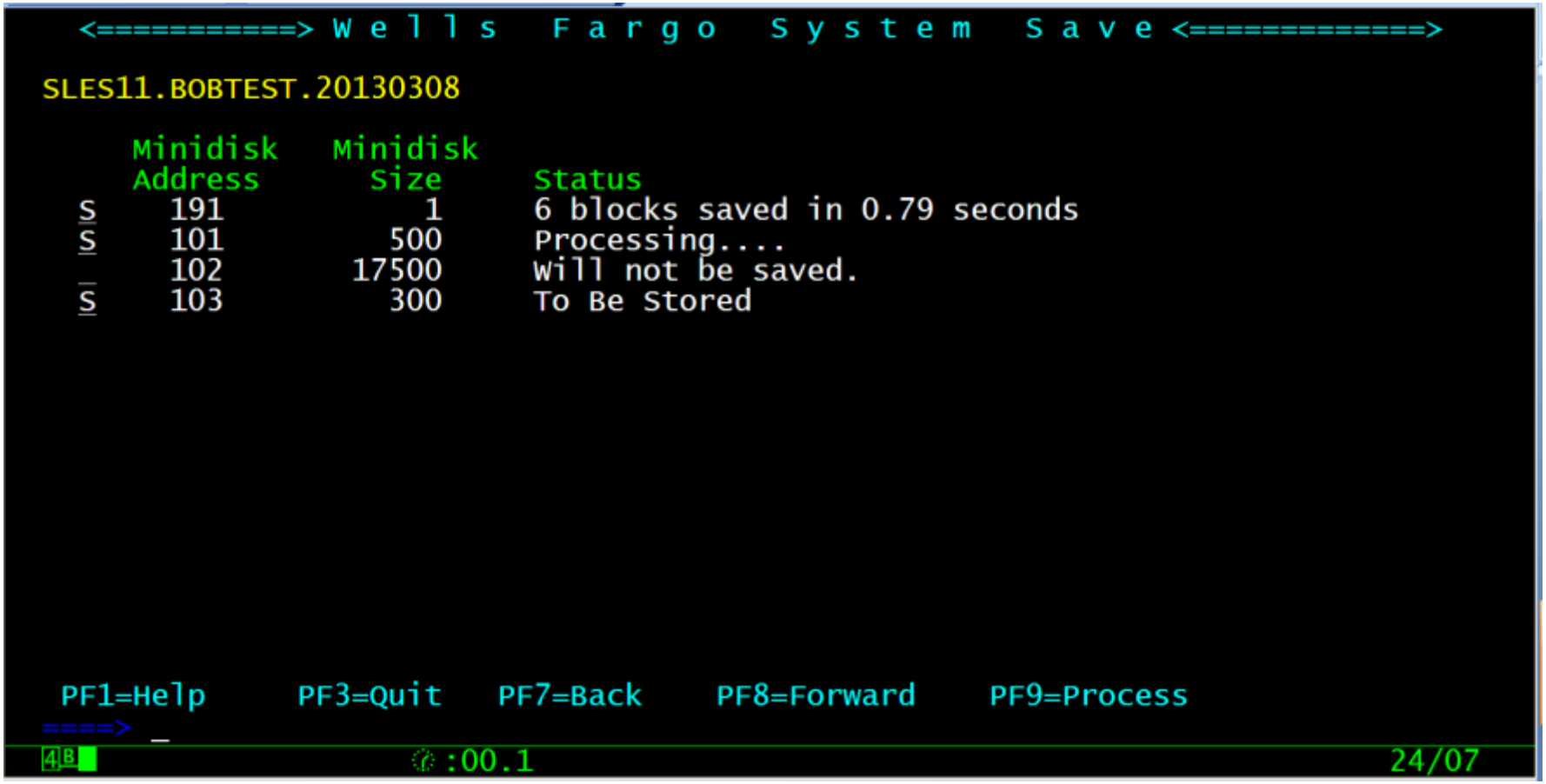
- Created an SFS pool for saving the LINUX image after it was built.
- Accessible to all systems meaning it could be built anywhere.
- Use CMSDDR to copy MDISK to FILE.
  - PIPE CMS EXEC CMSDDR DUMP addr outfn outft outfm
- Slow interface between prod and dev (1K miles apart) required a 2nd SFS pool.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

SAVESYS



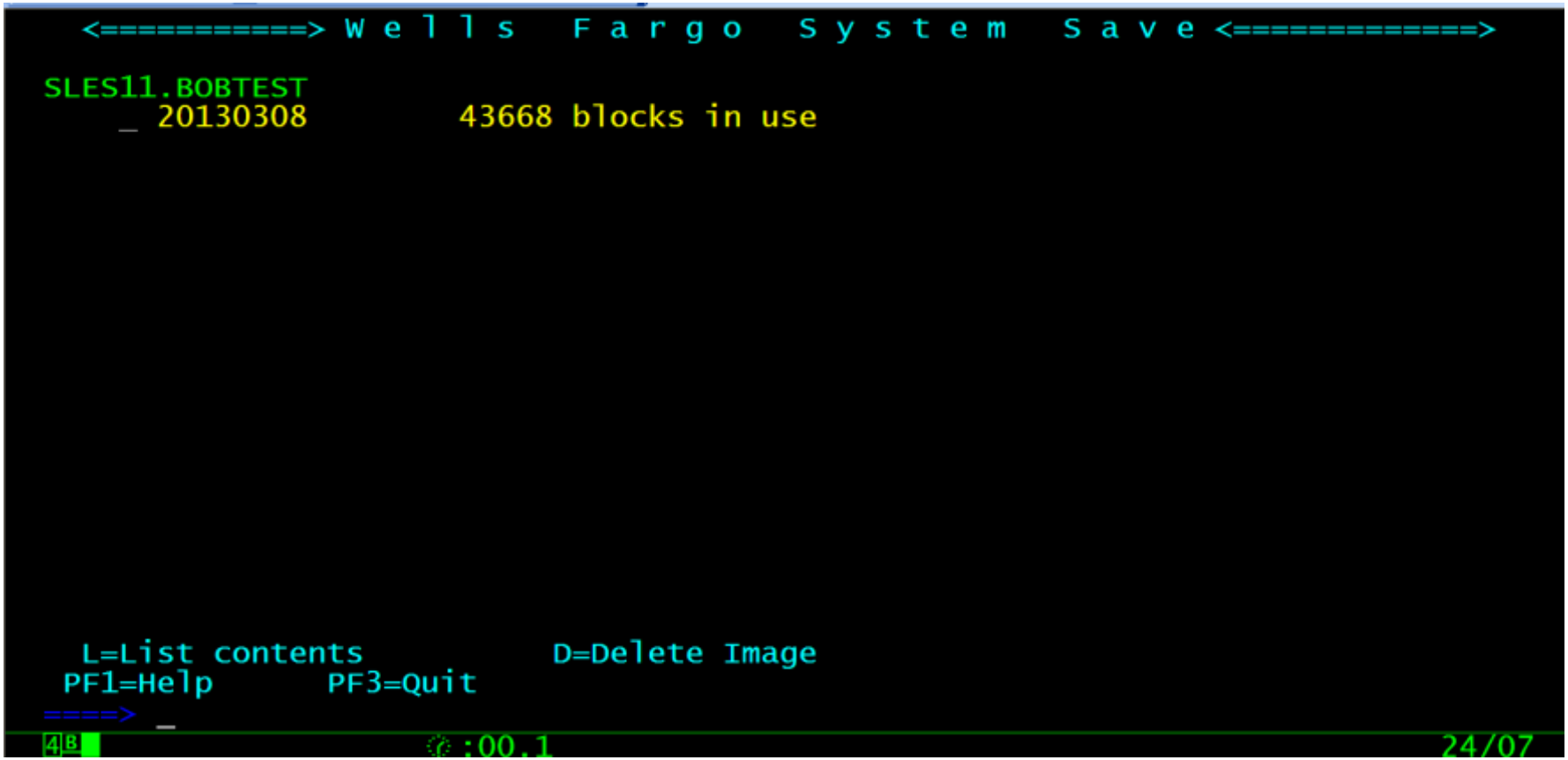
Blank lines allow for new description. User has to be enrolled in SFS to appear in list.

SAVESYS



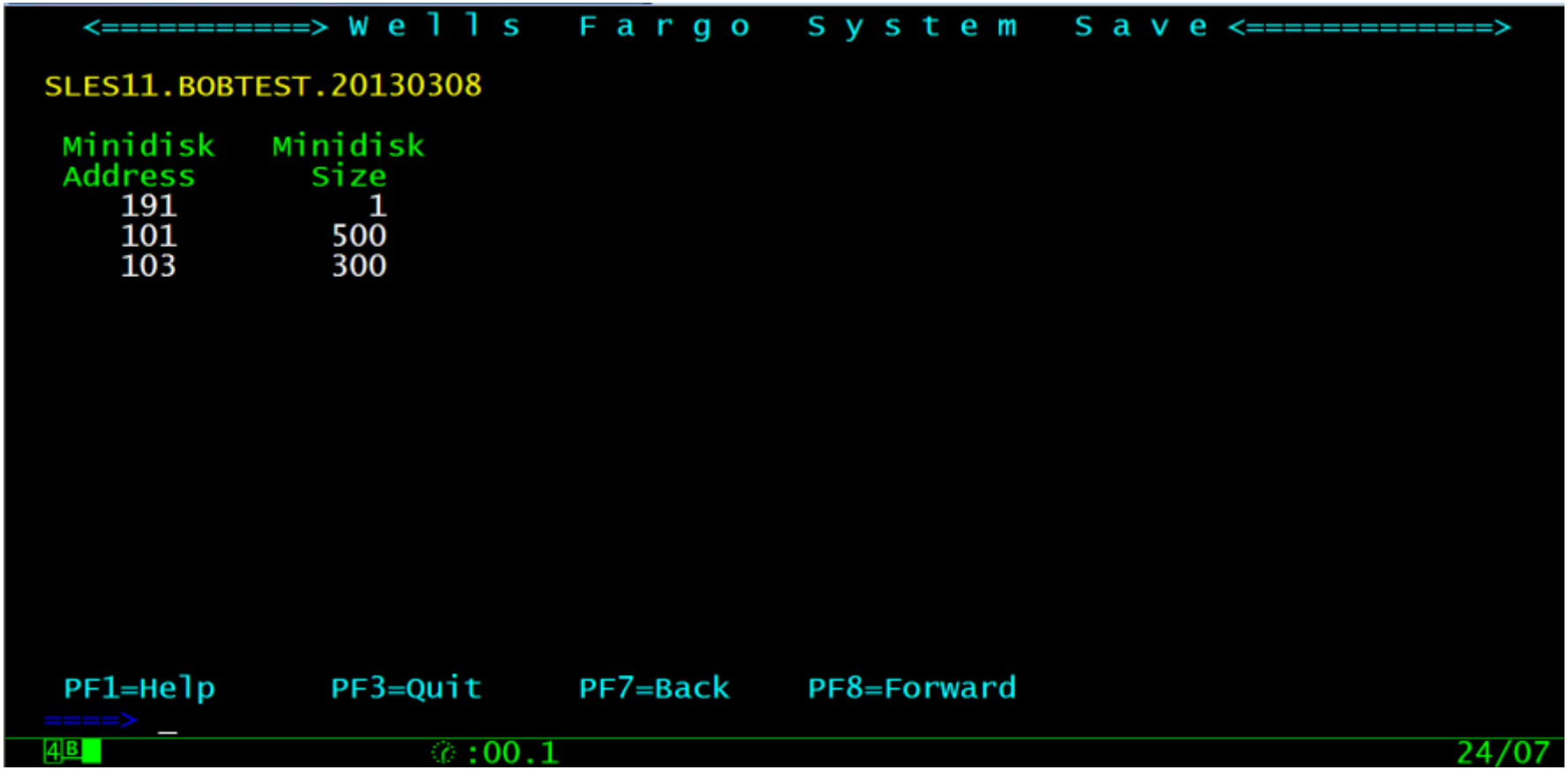
Removing ‘S’ prevents that disk from being saved.

SAVESYS



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

SAVESYS



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

LXSFSWK

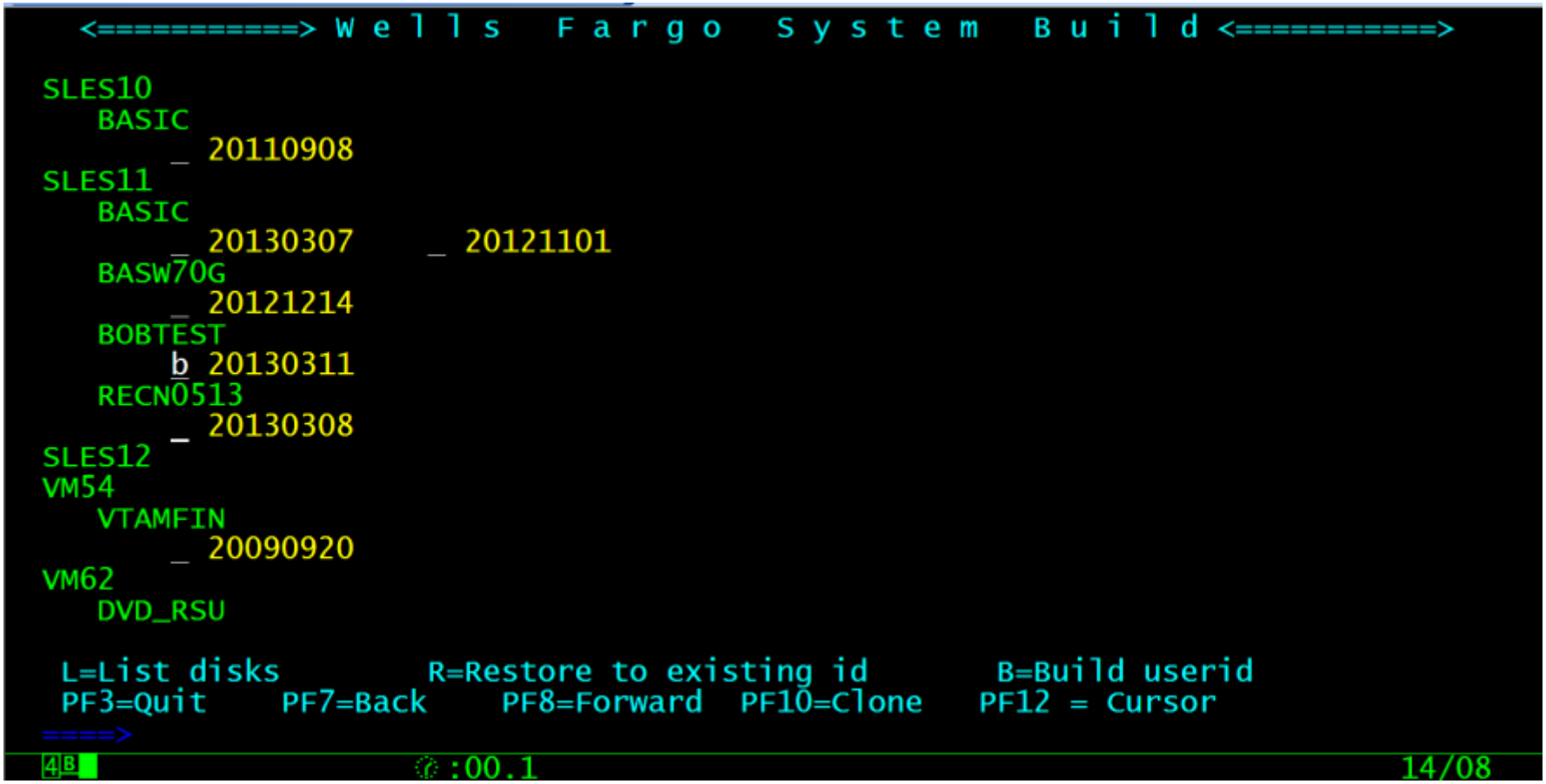
- Nothing to show, works in the dark of night to synchronize the two SFS.
- Compares directory structure, user limits, and files.
- Keeps last status so it knows if something has been deleted.
- Can run for hours, but saves tons of time when creating images.

LXSHARE 192 - Files Involved

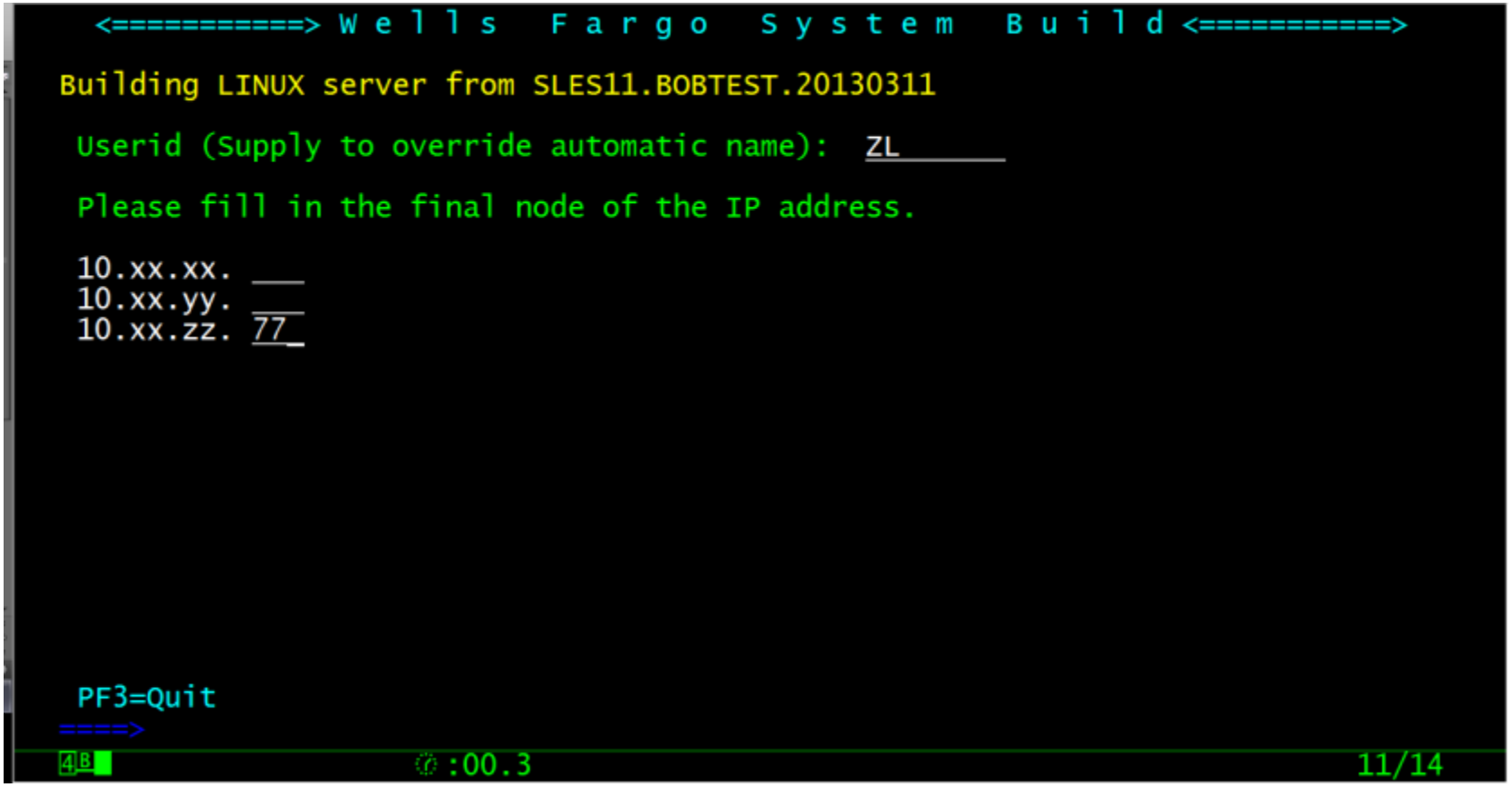
- LXSHARE 192 contains several files for the build and boot processes.
- PROFILE EXEC for server calls LXSTART which prepares for boot
- LXSTART calls LXIDENT which build config file for witsec.
- LINUX_OS NAMES contains default information for each level (SLES10, SLES11, etc)
- SUBNET NAMES contains 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)



BUILDSYS
Creation of new server(s)



Userid is created using network ip address if desired

BUILDSYS

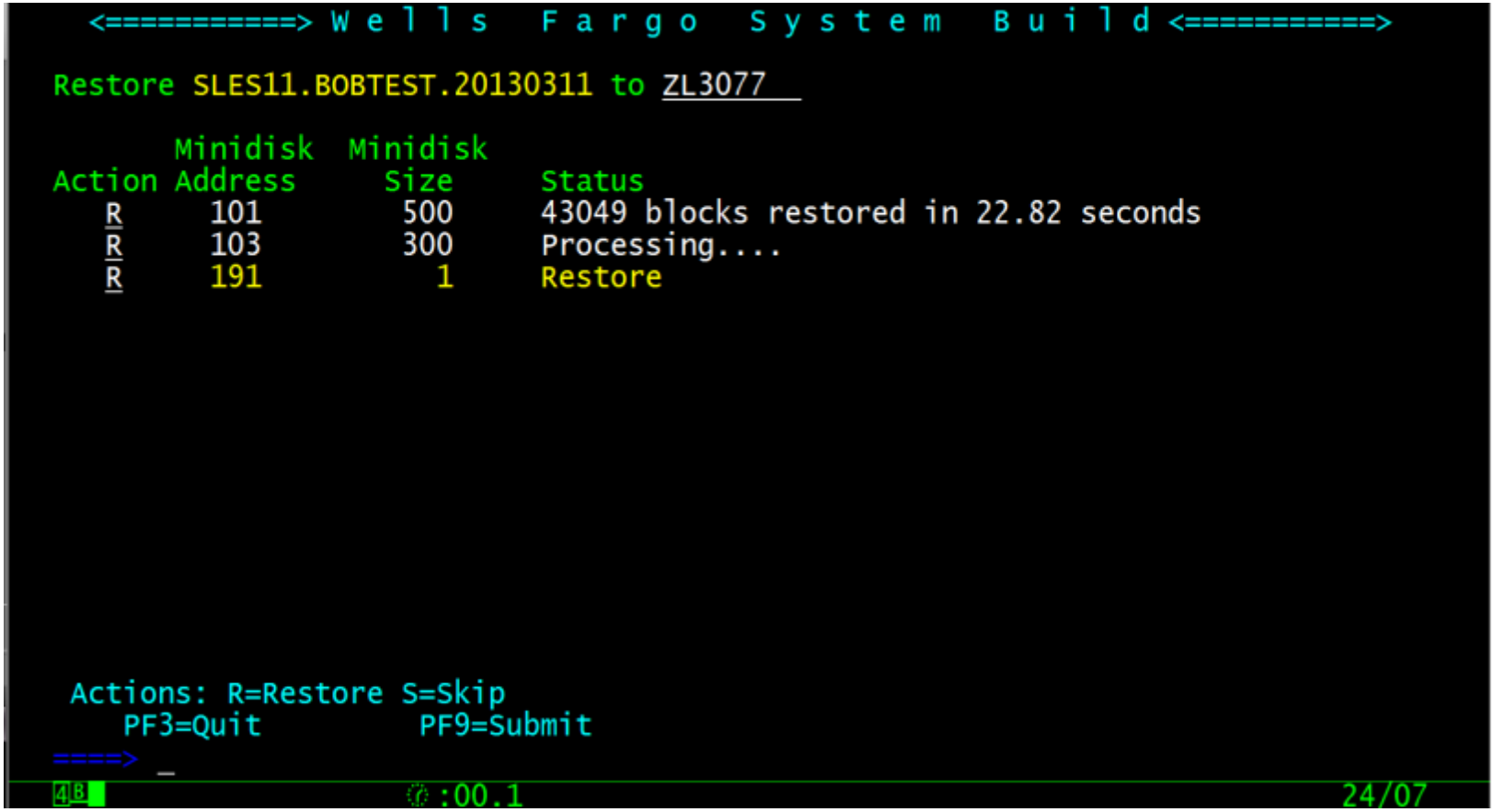
Creation of new server(s)

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

Building LINUX server 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

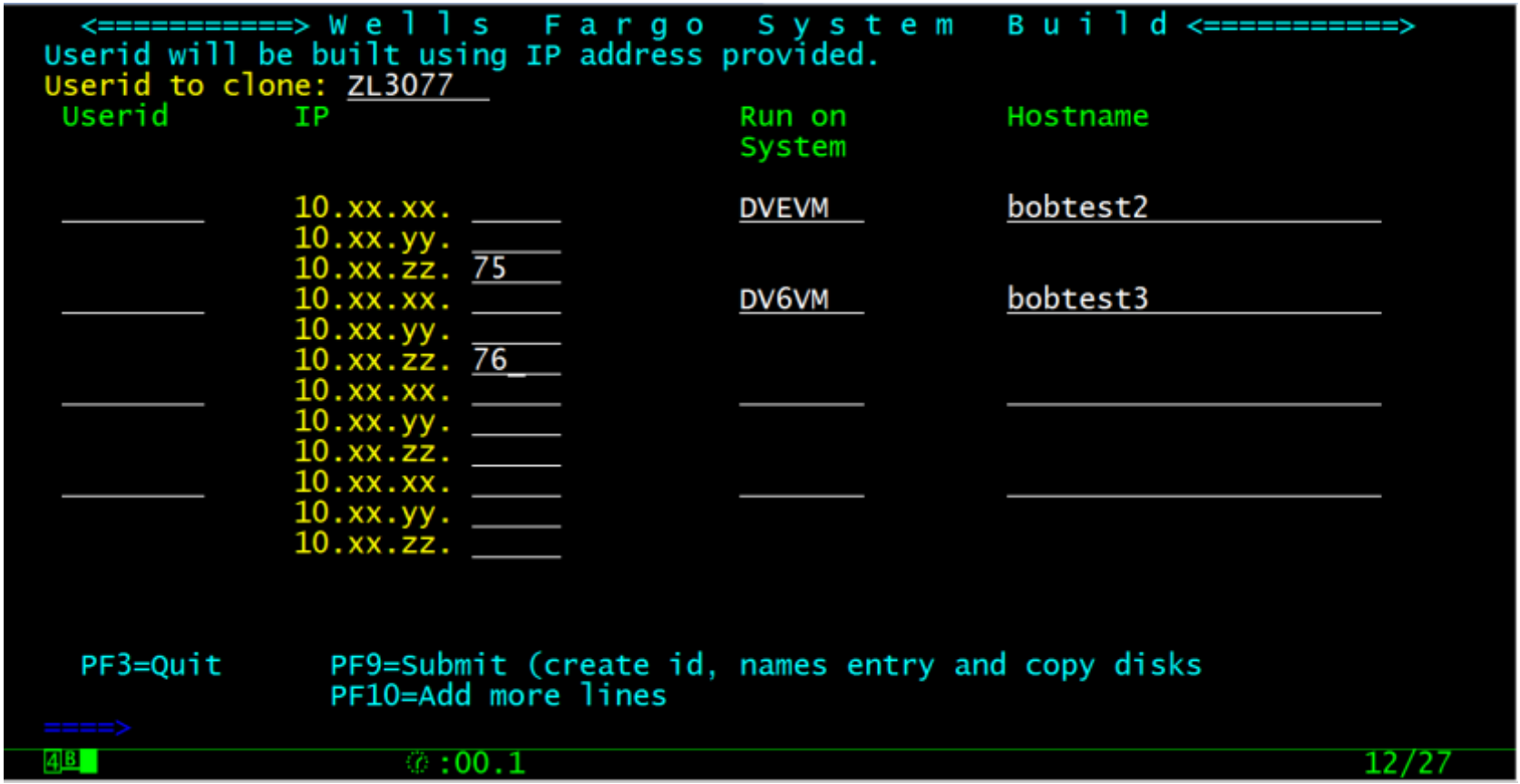
Creation of new server(s)



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

BUILDSYS

Creation of new server(s)



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

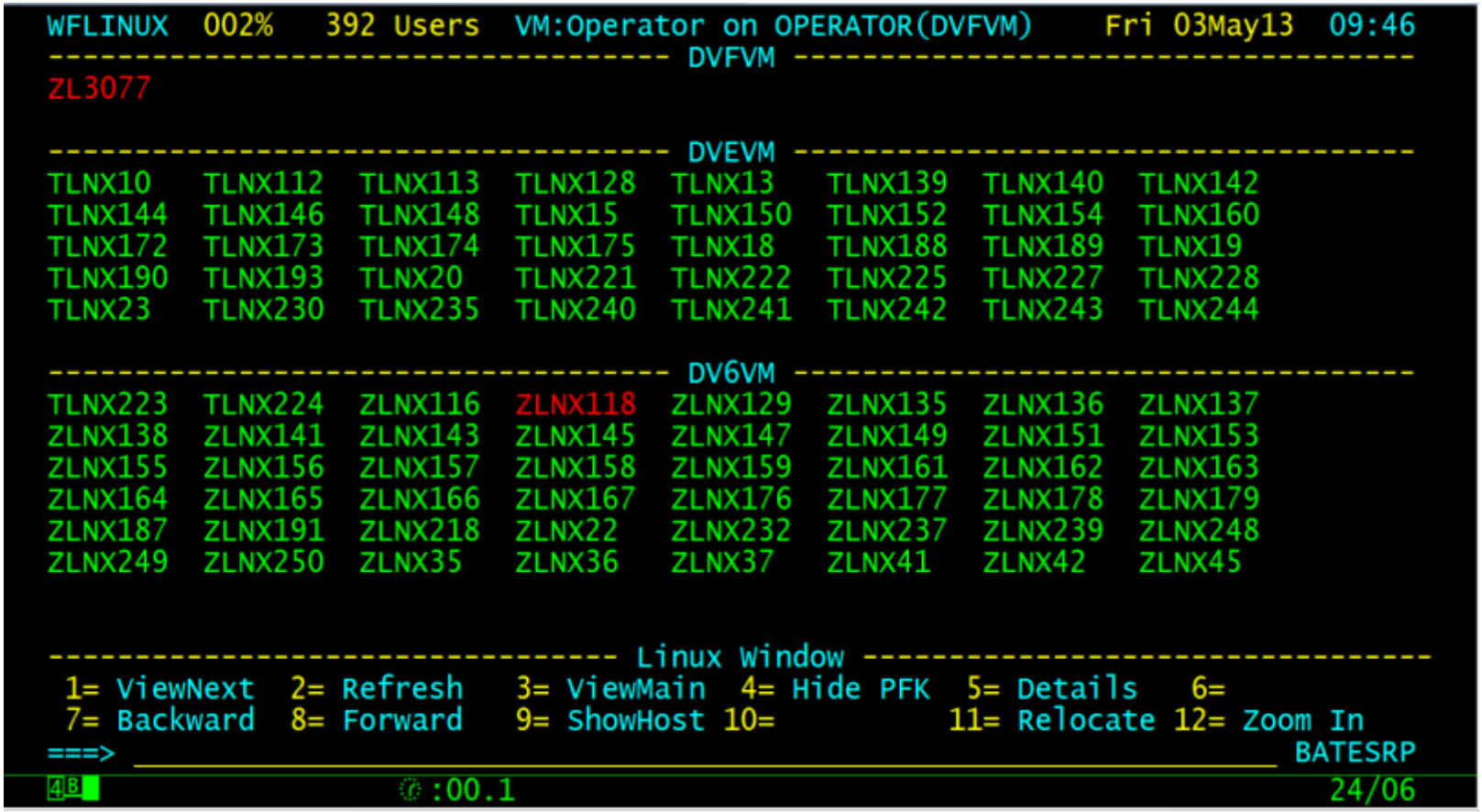
Must be run from PR8VM (checks you are on the right system)

Selects all servers from system with Backup = YES

Issues SIGNAL SHUTDOWN USER server_id

VM:Operator

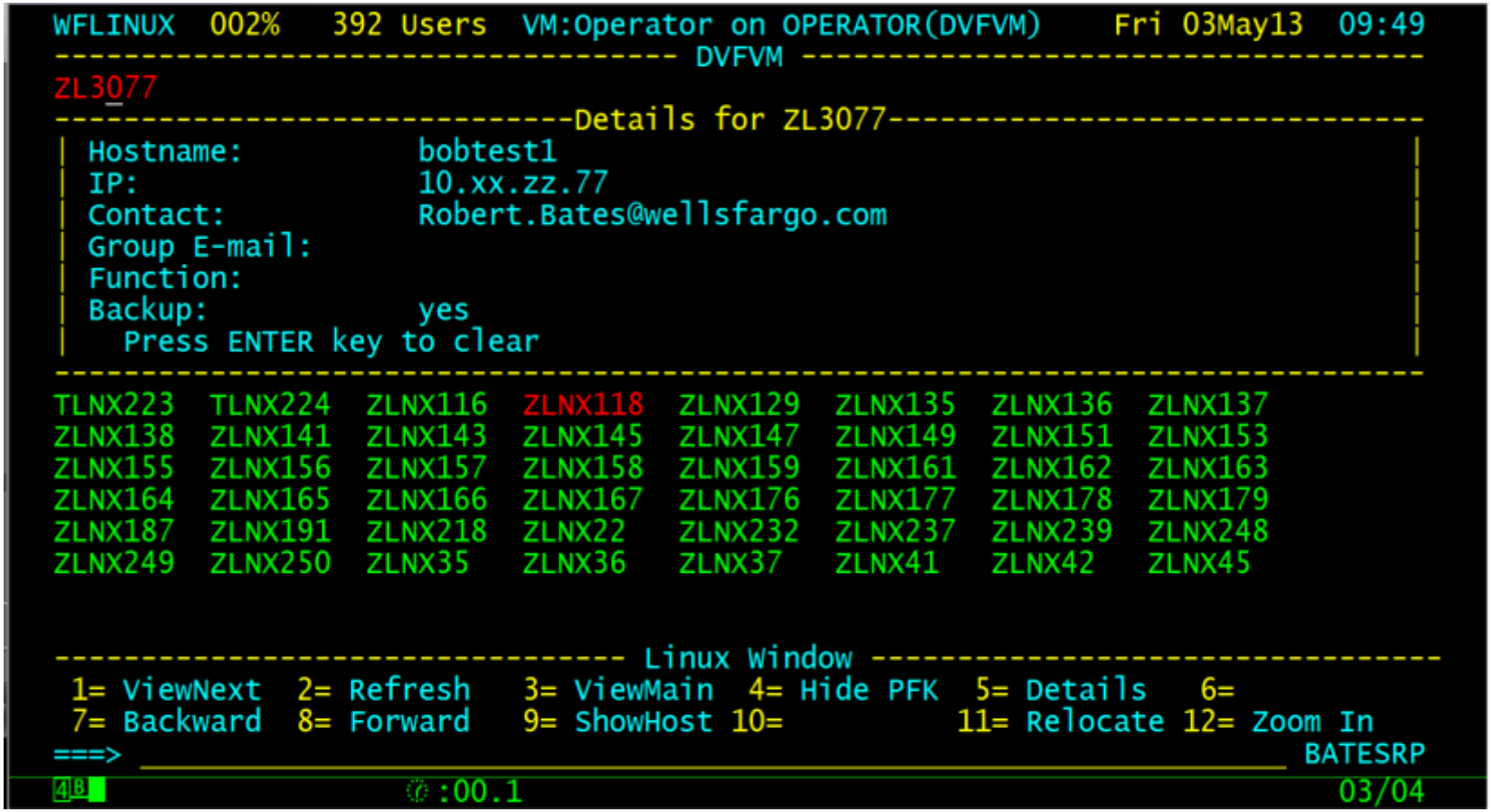
Check servers in the cluster



Green indicates server logged on.
Red not logged on.

VM:Operator

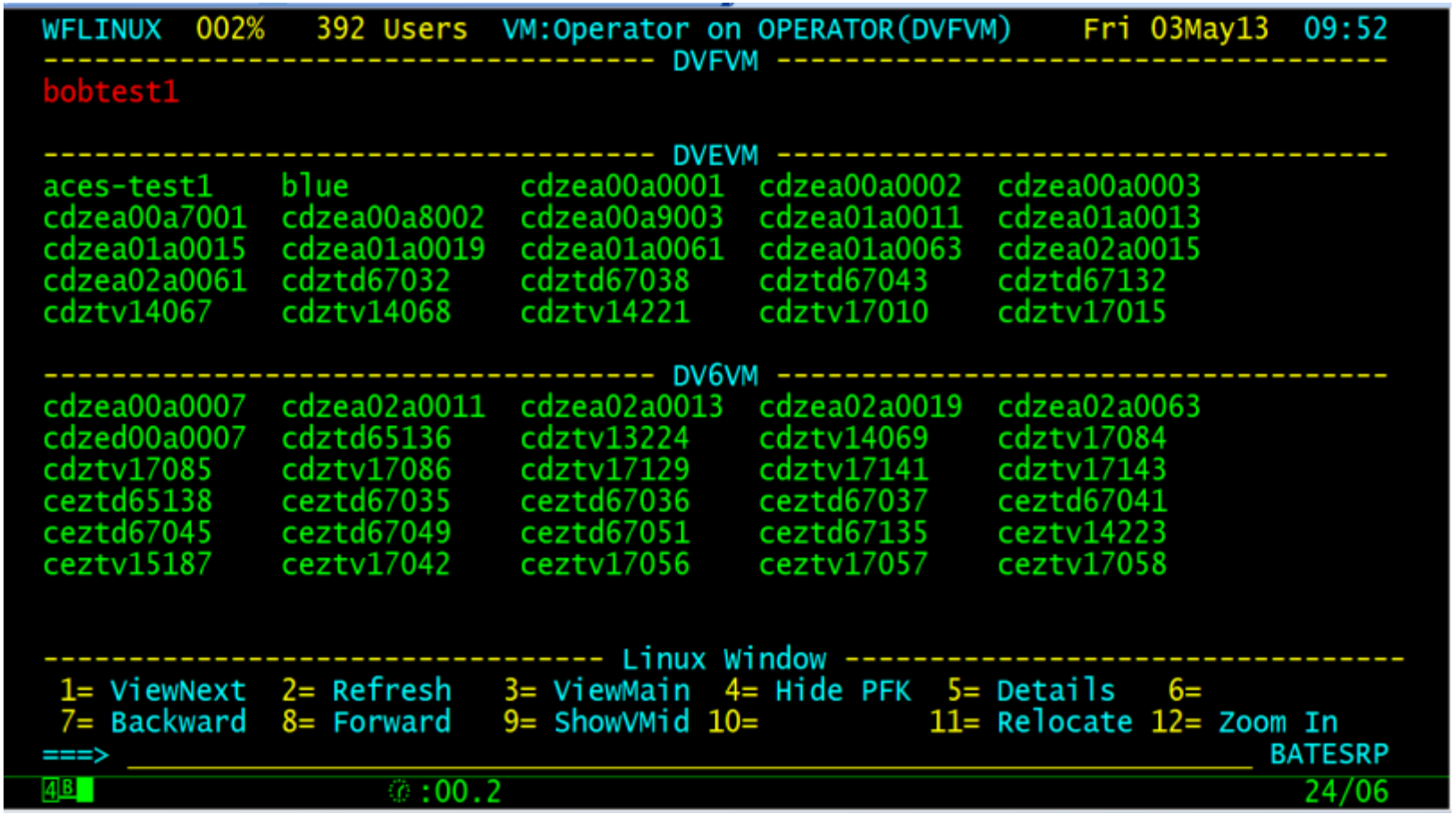
Check servers in the cluster



PF5 gives information on server selected.

VM:Operator

Check servers in the cluster



PF9 toggles between Userid and Hostname.

Bring up a server by request

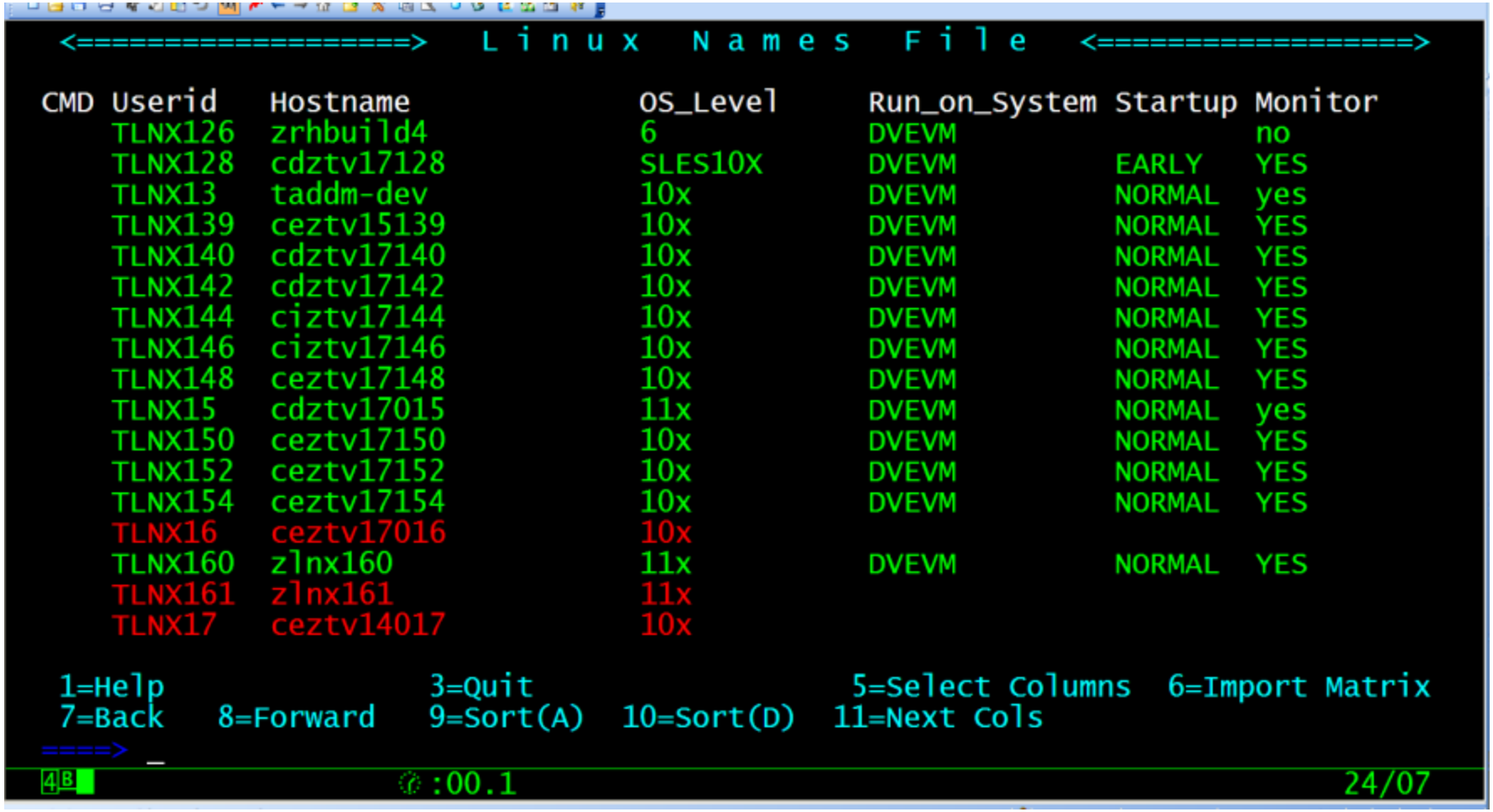
- Servers started by request in BCP
- BRINGUP *server1 server2* …
- Server *server1* started on *runsys*
- Operators often get request from users who don't know the VM userid
- Looks up hostname and gets runsys and nick
- Issues AT runsys CMD XAUTOLOG nick

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



```
<==================>  L i n u x  N a m e s  F i l e  <==================>

CMD Userid   Hostname            OS_Level     Run_on_System Startup Monitor
    TLNX126  zrhbuild4           6            DVEVM                 no
    TLNX128  cdztv17128          SLES10X      DVEVM         EARLY   YES
    TLNX13   taddm-dev           10x          DVEVM         NORMAL  yes
    TLNX139  ceztv15139          10x          DVEVM         NORMAL  YES
    TLNX140  cdztv17140          10x          DVEVM         NORMAL  YES
    TLNX142  cdztv17142          10x          DVEVM         NORMAL  YES
    TLNX144  ciztv17144          10x          DVEVM         NORMAL  YES
    TLNX146  ciztv17146          10x          DVEVM         NORMAL  YES
    TLNX148  ceztv17148          10x          DVEVM         NORMAL  YES
    TLNX15   cdztv17015          11x          DVEVM         NORMAL  yes
    TLNX150  ceztv17150          10x          DVEVM         NORMAL  YES
    TLNX152  ceztv17152          10x          DVEVM         NORMAL  YES
    TLNX154  ceztv17154          10x          DVEVM         NORMAL  YES
    TLNX16   ceztv17016          10x
    TLNX160  zlnx160             11x          DVEVM         NORMAL  YES
    TLNX161  zlnx161             11x
    TLNX17   ceztv14017          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

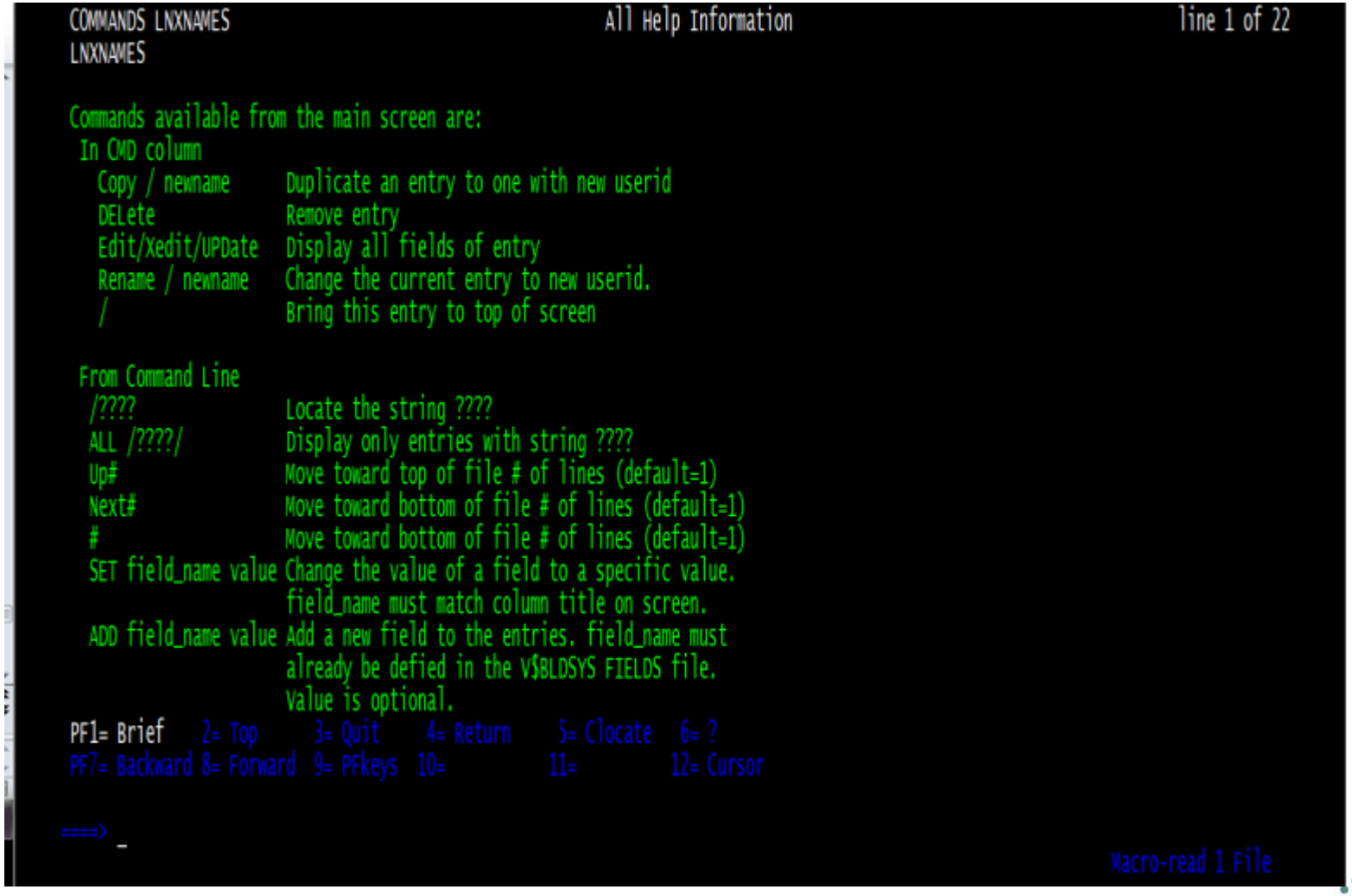
Update/display LINUX NAMES file entries

```
 <==================>  L i n u x   N a m e s   F i l e  <====================>
<======================>  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)            __ Gateway(15)
  __ LAN(8)              __ VLAN(4)                __ Layer2(3)
  __ NIC(4)              __ NICname(4)
  _5 Monitor(3)          _6 Backup(3)              _4 Startup(6)
  _3 Run_on_System(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
====> _
4B                  :00.1                                        24/07
```

Customize the view with selected data

LNXNAMES

Update/display LINUX NAMES file entries



LNXNAMES

Update/display LINUX NAMES file entries

```
<==================>  L i n u x   N a m e s   F i l e  <==================>
<======================>  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 contails 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            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 * * *

====> _
                                                                    XEDIT 1 File
48                  :00.2                          26/007
```

QUESTIONS?