

## AIX NIM Primer

Common  
Session 560536  
Oct 5, 2010 – 2.15pm  
Director's Room 1

Jaqui Lynch  
Solutions Architect  
Forsythe Technology Inc.  
lynchj@forsythe.com



1

## Agenda

- Introduction
- NIM Resources
- Setup
- Client installs
- Hints and tips



2

## Introduction

- Central point of management for installation and maintenance
- Used for LPARs and standalone servers
- Create golden image and clone LPARs
- Can install from software, golden image or mksysb
- Can use to apply maintenance or add bundles of products
- Can install multiple servers at a time
- Push or pull installs
- Fast – DVD takes about 8 hours, NIM 15 minutes

3



## NIM environment

- Master
  - NIM server itself
  - Owns and provides the resources necessary to service clients
  - Stores information about clients and resources
  - Stores information about NIM in its database
  - Need to backup NIM database regularly
- Client
  - Machines defined as clients
  - Standalone, diskless, dataless
  - System WPAR machines
- Network
  - Must support NFS
  - If using TCP wrappers will need to unwrap tftp and bootpd on the NIM master
  - At AIX v5.3 NIM no longer requires the r commands (rsh)
  - Use nimsh instead of rsh, etc

4



## NIM Server Setup

- Must be at highest level of AIX that you plan to support
- Should use dedicated resources for Disk and Network
  - Affects ability to restore images if depends on VIO
  - Same applies to TSM server
- Plan for memory (2-4GB is plenty) and core (.5 of a core with 2 VPs)
- Create scalable VG - nimvg on disk to hold NIM resources
- Create /nim filesystem in nimvg (JFS2)
- I also create a separate filesystem called /backups for mksysb images
- Install filesets and any updates from TLs for them
  - bos.sysmgt.nim.master
  - bos.sysmgt.nim.spot
  - bos.sysmgt.nim.client
- Also ensure the following filesets are installed
  - bos.net.tcp.server
  - bos.net.nfs.server
- Use lspp to check they are there

5



## More Setup

- Note – NIM does not like dot in resource names so use \_
- Put AIX DVD in the DVD drive or replace /dev/cd0 below with the directory you have the BFFs from the DVD loaded up to
- Setup NIM
  - nim\_master\_setup -B -a device=/dev/cd0 -a file\_system=/nim -a volume\_group=nimvg
  - Creates /ftpboot
  - Will not take a mksysb of the NIM server
  - Creates SPOT and lpp\_source resources in /nim

Directory Structure:

```
/nim
/nim/lpp_source
/nim/images
/nim/spot
/nim/bosinst_data
/nim/resolv_conf
```

6



## NIM Command output after setup

```
# lspp -l | grep nim
bos.sysmgmt.nim.client 6.1.5.2 COMMITTED Network Install Manager -
bos.sysmgmt.nim.master 6.1.5.2 COMMITTED Network Install Manager -
bos.sysmgmt.nim.spot 6.1.5.1 COMMITTED Network Install Manager - SPOT
bos.sysmgmt.nim.client 6.1.5.2 COMMITTED Network Install Manager -

# df -g /nim
Filesystem GB blocks Free %Used lused %lused Mounted on
/dev/lvnm 125.00 56.33 55% 76032 1% /nim

# ls -al /nim
total 16
drwxr-xr-x 8 root system 256 Jan 06 2010 .
drwxr-xr-x 26 root system 4096 Sep 07 11:02 ..
drwxr-xr-x 2 root system 256 Jan 06 2010 bosinst_data
drwxr-xr-x 3 root system 4096 May 05 14:32 images
drwxr-xr-x 2 root system 256 Jan 05 2010 lost+found
drwxr-xr-x 6 root system 256 Apr 29 08:42 lpp_source
drwxr-xr-x 2 root system 256 Jan 06 2010 resolv_conf
drwxr-xr-x 6 root system 256 Apr 29 09:07 spot
```

7



## Check network setup

```
# cat /etc/hosts | grep gandalf
10.152.10.124 gandalf

# cat /etc/inetd.conf
##
## service socket protocol wait/ user server server program
## name type nowait program arguments
##
bootps dgram udp wait root /usr/sbin/bootpd bootpd /etc/bootptab
tftp dgram udp6 SRC nobody /usr/sbin/tftpd tftpd -n

Do not TCP wrap these
```

8



## NIM Resources

- Machines
  - These are the clients
- lpp\_source
  - The lpp\_source (Licensed Program Product source) directory contains the images that AIX uses to load software. These are typically the BFF (backup file format) images that exist on the AIX installation CDs or DVD. Each OS version should have its own lpp\_source. Additionally these should be separated into 32-bit and 64-bit lpp\_source sets.
- SPOT
  - The SPOT (Shared Product Object Tree) is a directory that is created from the lpp\_source. The SPOT is used in a similar fashion to the boot images and installation scripts on the Base installation CD volume 1 for AIX. It may be necessary to create multiple SPOTs depending on the maintenance levels and versions that need to be supported.
- mksysb
  - The NIM master can use lpp\_source to install an instance or it can install the instance from a mksysb of either that instance or another one. Once the mksysb is restored a script can be run automatically to customize the instance .

9



## NIM Resources

```
# ls -al lpp_source
```

```
total 0
```

```
drwxr-xr-x 6 root system 256 Apr 29 08:42 .
drwxr-xr-x 8 root system 256 Jan 06 2010 ..
drwxr-xr-x 5 root system 256 Mar 16 2010 614lpp_res
drwxr-xr-x 5 root system 256 Apr 29 12:42 61t105_lpp
drwxr-xr-x 5 root system 256 Mar 16 2010 61t14sp3_lpp
drwxr-xr-x 5 root system 256 Mar 16 2010 aix53_lpp
```

```
# ls -al spot
```

```
total 0
```

```
drwxr-xr-x 6 root system 256 Apr 29 09:07 .
drwxr-xr-x 8 root system 256 Jan 06 2010 ..
drwxr-xr-x 3 bin bin 256 Jan 06 2010 614spot_res
drwxr-xr-x 3 root system 256 Jan 06 2010 aix53_spot
drwxr-xr-x 3 root system 256 Apr 29 09:07 spot_61t105
drwxr-xr-x 3 root system 256 Mar 16 2010 spot_aix61t104sp3
```

10



## NIM Resources

- **Scripts**
  - Scripts can be set to run during a BOS install to ensure that the resulting instance of the operating system is correctly tailored with any post installation items. These can include security requirements, third-party software installation and other customizations related to additional paging or dump space.
- **bosinst\_data**
  - This is a file, not a directory, and it contains the necessary information to allow the installation to take place without manual intervention. It is used to define defaults such as default disk drive, type of installation and so on.
- **image\_data**
  - This is also a file and contains operating system image information related to file systems, mirroring, etc.
- **installp\_bundles**
  - These are files that list additional software to be loaded after AIX is installed. This can be useful when setting up groups of servers. As an example one bundle maybe for DB2 servers while another may be for web servers. Once the Operating System is installed you simply select the post install bundle and apply it.

11



## Client Machine Information

- Hardware Platform Type – default is chrp, older rs6k or rspc not supported
- Kernel to use for Network Boot - set to mp (AIX 5.3 discontinued shipment of up kernel – 5.3 ships only MP 32bit or MP 64bit, v6 and higher are MP 64bit only)
- Cable Type - most likely tp, not bnc or dix – N/A for virtual Ethernet
- Network Adapter Hardware Address - optional field
- More flexible to specify IP parameters on SMS menus during nim client boot.
- You must specify IP parameters if nim client and nim master are on different IP subnets
- Network Adapter Logical Device name - optional field - note this is an adapter name (entx) not an interface name (not enx or etx)
- Machines can register themselves. A running AIX instance (machine or LPAR) can become a client, can define itself to this server, by doing a smitty nimit.

12



## List resources

### •# lsnim

•master	machines	master
•boot	resources	boot
•nim_script	resources	nim_script
•master_net	networks	ent
•master_net_conf	resources	resolv_conf
•6100-04bid_ow	resources	bosinst_data
•basic_res_grp	groups	res_group
•Gandalf	machines	standalone
•61t105_lpp	resources	lpp_source
•spot_61t105	resources	spot
•mksysb_61t105	resources	mksysb
•ent-Network1	networks	ent

13



## Update resources

- Put update CD in or change into fixes directory
- Update SPOT and lpp\_source
  - smitty nim
  - Perform nim administration tasks
  - Manage resources
  - Perform operations on resources
  - Select the SPOT
  - Select update\_all
  - Point it to the update CD or directory

14



## Setup a client to restore from a mksysb

- Create the client (gandalf) machine to nim as a machine object
- Make sure gandalf is in /etc/hosts or in DNS and that the name can be resolved
- The first step is to define gandalf as a client machine
  - smitty nim, perform admin tasks, manage machines
  - Define gandalf as a machine
  - Select 64 as kernel, nimsh as shell, N/A as network i/face

15



## Image\_data

- Template is /usr/lpp/bosinst/image.template
- Copy and modify
- Specify things like
  - logical volume policy
  - SHRINK=no
  - EXACT\_FIT=no
  - lv\_data: (an lv\_data stanza for each logical volume in rootvg)
    - COPIES= 1 ( or 2, 3 to mirror. make sure you have enough target disk stanzas in the bosinst\_data resource)
    - LPs= nn (the number of logical partitions)
    - PP= nn (if mirroring, this is an exact 2x or 3x of LPs)
- IF you don't specify an image\_data resource, NIM will use the file embedded in the mksysb image.
- Typical use of a "side" image.data file is when mksysb is mirrored, but the new install is to be nonmirrored, or vice-versa.

16





## Setup mksysb as a resource

```
smitty nim
Perform nim administrative tasks
Manage resources
Define a resource
  Select mksysb resource and then fill in the following fields
  name = aix61tl2sp2_mksysb
  server = master
  location = /nim/images/aix61tl2sp2-golden.mksysb
```

17



## Tell NIM to use the mksysb for this machine

```
smitty nim_bosinst
  Select gandalf
  install source = aixtl2sp2_mksysb
  select mksysb and spot as resources (also select the lpp)
  Select yes to accept licenses
  Select no to initiate now
```

Initiate now = no means this is a pull resource and must be initiated at the client

18



## Tell NIM to use the mksysb for this machine

```

Install the Base Operating System on Standalone Client

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

[TOP]
* Installation Target                [Entry Fields]
* Installation TYPE                  p6d853a
* SPOT                               mksysb
LPP_SOURCE                           spot_61t105
Mksysb                               61t105
                                     mksysb_61t105


BOSINST_DATA to use during installation 6100-04b10-01
IMAGE_DATA to use during installation   []
RESOLV_CONF to use for network configuration []
CUSTOMIZATION_SCRIPT to run after installation []
CUSTOMIZATION_FS_SCRIPT to run at first reboot []
ACCEPT new license agreements?         [yes]
Remain NIM client after install?       [yes]
PRESERVE NIM definitions for resources on this target? [yes]

FORCE PUSH the installation?            [no]
Initiate reboot and installation now?   [no]
-OR-
Set bootlist for installation at the next reboot? [no]

Additional BUNDLES to install           []
-OR-
Additional FILESETS to install          []
(bundle will be ignored)

[MORE...??]

F1=Help          F2=Refresh          F3=Cancel          F4=List
Esc+5=Reset     Esc+6=Command     Esc+7=Edit       Esc+8=Image
Esc+9=Shell     Esc+0=Exit       Enter=Do
  
```

19 

## List resources

```
# lsnim -l gandalf
```

```

gandalf:
class          = machines
type          = standalone
connect       = nimsh
platform      = chrp
netboot_kernel = mp
if1           = master_net gandalf 0
cable_type1   = N/A
Cstate       = ready for a NIM operation
prev_state   = not running
Mstate      = not running
lpp_source   = 61t105_lpp
mksysb      = mksysb_61t105
spot        = spot_61t105
cpuid       = 00C20AE54C00
control     = master
Cstate_result = failure
  
```

## Checks

showmount -e

```
/nim/lpp_source/61tl05_lpp          gandalf
/nim/spot/spot_61tl05/spot_61tl05/usr  gandalf
/nim/images/aix61-tl05sp1-golden.mkysb  gandalf
```

# cat /etc/bootptab

```
gandalf:bf=/tftpboot/gandalf:ip=10.152.10.124:ht=ethernet:sa=10.152.10.203:sm
=255.255.255.0:
```

21



## Checks

# ls -al /tftpboot

```
lrwxrwxrwx 1 root system 18 May 14 16:14 10.152.10.124 -> /tftpboot/gandalf
lrwxrwxrwx 1 root system 18 May 14 16:14 10.152.10.124.boot ->
/tftpboot/gandalf
lrwxrwxrwx 1 root system 23 May 14 16:14 10.152.10.124.info ->
/tftpboot/gandalf.info
lrwxrwxrwx 1 root system 28 May 14 16:14 10.152.10.124.iprecord ->
/tftpboot/gandalf.iprecord
lrwxrwxrwx 1 root system 33 May 14 16:14 gandalf ->
/tftpboot/spot_61tl05.chrp.64.ent
-rw-r--r-- 1 root system 1156 May 14 16:14 gandalf.info
lrwxrwxrwx 1 root system 35 May 14 16:14 gandalf.iprecord ->
/tftpboot/spot_61tl05.iprecord.ent
-rw-r--r-- 1 root system 16958976 Apr 29 12:52 spot_61tl05.chrp.64.ent
-rw-r--r-- 1 root system 512 Apr 29 12:52 spot_61tl05.iprecord.ent
-rw-r--r-- 1 root system 16752640 Mar 16 2010 spot_aix61tl04sp3.chrp.64.ent
-rw-r--r-- 1 root system 512 Mar 16 2010
```

22



## Backout

- If you have a machine enabled for install, and need to back out...
  - `nim -o reset -aforce=yes <nimclienthostname>`
  - `nim -Fo deallocate -asubclass=all <nimclienthostname>`
  - `nim -o change -a cpuid="" <nimclienthostname>`

23



## Start the install from the client

- Boot client into SMS mode either from the HMC or the server

Select 2 for setup remote IPL

Select 1 for first ethernet

Select 1 for IPV4

Select 1 for bootp

Select 1 for IP parameters

1 - client - 10.0.1.5

Use the client IP here

2 - server - 10.0.1.9

Use the NIM server IP here

3 - Gateway - 10.0.1.1

You may need to leave this as 0.0.0.0

4 - Subnet - 255.255.255.0

Esc

Select 2 for adapter config

2 spanning tree - ensure it is disabled (this can speed things up)

ESC

3 - protocol - set it to standard

ESC and ESC

3 Ping test then 1 to execute ping test

If the ping test is successful return to main menu

Select 5 - boot options

1 select boot device

6 select network

1 bootp

1 select first ethernet

2 normal mode boot

1 yes I want to exit

24



## Next steps

- LPAR/Server should boot and you should see tftp start up
- After around 30,000 packets the console prompt should appear

F1 and enter for console

1 for english during install

An error message that "all LVs are being created exactly as they were but the disks are not the same" may appear. Unless there is a reason not to, go ahead and:

Choose 1 to continue with install

2 Check install settings

Make sure that only 1 disk is chosen here and that it is the correct one for rootvg:

Choose hdisk0

Use maps for installation – I tend to choose no

Check that importvgs defaults to n

0 to continue with choices

Note make sure the mksysb you are using is not of a mirrored system

After the system reboots you can import volume groups, remirror rootvg and perform further tailoring

25



## Continuing on

- After reboot install should start
- Monitor using lsnim -l lparname
- This will show you how far it has gone

26



## Useful commands

- lsnim
- lsnim -l lparname
- nim -o reset -a force=yes clientnode
- nim -Fo deallocate -a subclass=all clientnode
- nim -o change -a cpuid="" clientnode
- bootlist -m normal -o (check bootlist)
- arp and ping
- oslevel -s
- Instfix
- showmount -e
- ls -al /ftpboot

27



## Useful commands on master

```
# lsnim -l mksysb_61tl05

mksysb_61tl05:
class      = resources
type       = mksysb
Rstate     = ready for use
prev_state = unavailable for use
location   = /nim/images/aix61-tl05sp1-golden.mksysb
version    = 6
release    = 1
mod        = 5
oslevel_r  = 6100-05
alloc_count = 2
server     = master
creation_date = Thu Apr 29 09:35:47 2010
```

28



## Useful commands on master

```
# lsrim -l 61tl05_lpp

61tl05_lpp:
class      = resources
type       = lpp_source
comments   = AIX 61 tl05 sp1 lpp
arch       = power
Rstate     = ready for use
prev_state = unavailable for use
location   = /nim/lpp_source/61tl05_lpp
simages    = yes
alloc_count = 2
server     = master
```

29



## Useful commands on master

```
# lsrim -l spot_61tl05

spot_61tl05:
class      = resources
type       = spot
plat_defined = chrp
arch       = power
bos_license = yes
Rstate     = ready for use
prev_state = verification is being performed
location   = /nim/spot/spot_61tl05/spot_61tl05/usr
version    = 6
release    = 1
mod        = 5
oslevel_r  = 6100-05
alloc_count = 2
server     = master
if_supported = chrp.64 ent
Rstate_result = success
```

30



## Useful commands on master

```
# ls -al /etc/niminfo
-rw-r--r-- 1 root system 164 Jan 06 2010 /etc/niminfo
# cat /etc/niminfo
# nimconfig
export NIM_NAME=master
export NIM_CONFIGURATION=master
export NIM_MASTER_PORT=1058
export NIM_REGISTRATION_PORT=1059
export NIM_MASTER_HOSTNAME=pnimmstr
```

31



## Useful commands on master

```
# ls -al /etc/objrepos/nim*
-rw-rw-r-- 1 root system 24576 Sep 28 10:20 /etc/objrepos/nim_attr
-rw-rw-r-- 1 root system 36864 Sep 28 10:20 /etc/objrepos/nim_attr.vc
-rw-rw-r-- 1 root system 4096 Sep 28 10:20 /etc/objrepos/nim_object
-rw-rw-r-- 1 root system 8192 Sep 28 10:20 /etc/objrepos/nim_object.vc
-r-xr-x--- 1 root system 28672 Sep 06 09:48 /etc/objrepos/nim_pdatr
-r-xr-x--- 1 root system 36864 Sep 06 09:48 /etc/objrepos/nim_pdatr.vc
```

32





## Backing up and restoring NIM

Save the following NIM files on the master

```
/etc/niminfo  
/etc/objrepos/nim_attr  
/etc/objrepos/nim_attr.vc  
/etc/objrepos/nim_object  
/etc/objrepos/nim_object.vc
```

You can restore the NIM database and activate the NIM master using the Web-based System Manager, SMIT, or the command line.

Restore the files saved in Backing up the NIM database.

33



## Recovering /etc/niminfo

/etc/niminfo is required on master and running NIM clients to run NIM operations and commands

You can rebuild it on the master:

```
nimconfig -rTo
```

You can rebuild it from a running NIM client:

```
nimit -a master_port= PortNumber -a master= MasterHostName  
-a name= ClientMachineObjectName
```

34



## **/etc/niminfo on the client**

```
export NIM_NAME=gandalf
export NIM_HOSTNAME=gandalf
export NIM_CONFIGURATION=standalone
export NIM_MASTER_HOSTNAME=pnimmstr
export NIM_MASTER_PORT=1058
export NIM_REGISTRATION_PORT=1059
export NIM_SHELL="nimsh"
export NIM_MASTERID=00C20AE54C00
export RC_CONFIG=rc.bos_inst
export
NIM_BOSINST_RECOVER=" ../SPOT/usr/lpp/bos.sysmgmt/nim/methods/c_bosinst_env -a
hostname=gandalf"
export SPOT=pnimmstr:/nim/spot/spot_61tl05/spot_61tl05/usr
export NIM_CUSTOM=" ../SPOT/usr/lpp/bos.sysmgmt/nim/methods/c_script -a
location=pnimmstr:/export/nim/scripts/gandalf.script"
export NIM_BOS_IMAGE=/NIM_BOS_IMAGE
export NIM_BOS_FORMAT=mksysb
export NIM_HOSTS=" 127.0.0.1:loopback:localhost 10.152.10.124:gandalf
10.152.10.203:pnimmstr "
export NIM_MOUNTS="
pnimmstr:/nim/lpp_source/61tl05_lpp:/SPOT/usr/sys/inst.images:dir
pnimmstr:/nim/images/aix61-tl05sp1-golden.mksysb:/NIM_BOS_IMAGE:file "
export ROUTES=" default:0:10.152.10.1 "
```

35



## **References for NIM**

- How to install AIX 5L (look for EZNIM)  
<http://www.ibm.com/developerworks/aix/library/au-install-aix.html>
- SG24-7296 – NIM from A-Z in AIX 5L Redbook – 30 May 2007  
<http://www.redbooks.ibm.com/redbooks/pdfs/sg247296.pdf>
- The Power of Network Install Manager  
[http://www.ibm.com/developerworks/aix/library/au-nim/index.html?S\\_TACT=105AGX20](http://www.ibm.com/developerworks/aix/library/au-nim/index.html?S_TACT=105AGX20)
- Simplifying with NIM – article from IBM Systems Magazine 2006  
<http://www.circle4.com/jaqui/eserver/aixtra-FebMar06-SimplifyingwithNIM.pdf>
- NIM Concepts  
[http://publib.boulder.ibm.com/infocenter/aix/v6r1/topic/com.ibm.aix.install/doc/insgdr/f/nim\\_concepts.htm](http://publib.boulder.ibm.com/infocenter/aix/v6r1/topic/com.ibm.aix.install/doc/insgdr/f/nim_concepts.htm)
- Backing up the NIM Database  
[http://publib.boulder.ibm.com/infocenter/aix/v6r1/topic/com.ibm.aix.install/doc/insgdr/f/adv\\_config\\_backup\\_db\\_cmd\\_line.htm](http://publib.boulder.ibm.com/infocenter/aix/v6r1/topic/com.ibm.aix.install/doc/insgdr/f/adv_config_backup_db_cmd_line.htm)
- AIX v6.1 NIM Pages  
[http://publib.boulder.ibm.com/infocenter/aix/v6r1/topic/com.ibm.aix.install/doc/insgdr/f/basic\\_config.htm](http://publib.boulder.ibm.com/infocenter/aix/v6r1/topic/com.ibm.aix.install/doc/insgdr/f/basic_config.htm)

36



Questions???

