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Oracle Solaris 11 Implementation and Operations Procedure Guide

December 2016
Edition 1.0
Fujitsu Limited

About This Document

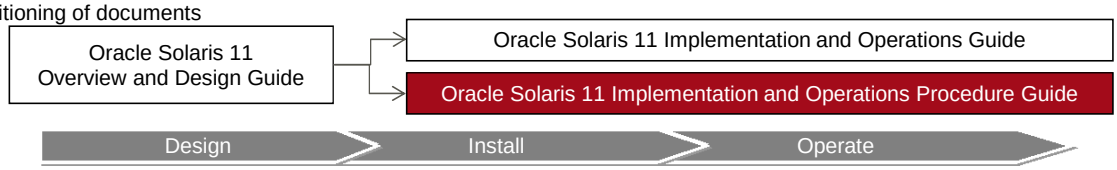
Purpose

- This document presents procedures for building and operating Oracle Solaris 11. To use this procedure guide effectively, read it together with the *Oracle Solaris 11 Implementation and Operations Guide* , a separate volume.
  Oracle Solaris 11 Implementation and Operations Guide .
  http://www.fujitsu.com/global/products/computing/servers/unix/sparc/downloads/documents/

Notes

- This document presents procedures that use Oracle Solaris 11.3.
- There may be differences from the log values written in this procedure guide, depending on the environment.
- "Oracle Solaris" may be abbreviated to "Solaris".
- Fujitsu M10 is sold as SPARC M10 Systems by Fujitsu in Japan. Fujitsu M10 and SPARC M10 Systems are identical products.

Positioning of documents



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Revision History

Date	Edition	Description
December 2016	First	First edition created

Contents

1. Installing Oracle Solaris 11

1-1. Preparing for Installation

(1) Connect to the server for this installation.
Connect to the console of the server for this installation by using terminal software (e.g., TeraTerm).

Points to check: Character code

If the terminal software has a character code specified, confirm that it corresponds to the character code specified at OS installation.

Confirm that the ok prompt is displayed.

```
{0} ok
```

* If it is not displayed, press the [Enter] key.

(2) Start installation.

```
{0} ok boot cdrom
```

```
{0} ok boot cdrom
Boot device:/virtual-devices@100/channel-devices@200/disk@4 File and args:
SunOS Release 5.11 Version 11.3 64-bit
--<Omitted>--
```

* Boot from the OS media, and start installation of Oracle Solaris.
* The error message "WARNING: lgrp_minlat_node:malformed MD, no CPUs found in latency group" may appear. Ignore this message because it does not affect the subsequent steps.
* The title of the OS media is *Oracle(R) Solaris 11.3 Interactive Text Install ISO (SPARC)* .

1-2. Interactive Installation

(1) Initial configuration of the system
1) Select a keyboard layout.

```
1. Arabic                  15. Korean
2. Belgian                 16. Latin-American
3. Brazilian               17. Norwegian
4. Canadian-Bilingual      18. Portuguese
5. Canadian-French         19. Russian
6. Danish                  20. Spanish
7. Dutch                   21. Swedish
8. Dvorak                  22. Swiss-French
9. Finnish                 23. Swiss-German
10. French                 24. Traditional-Chinese
11. German                 25. TurkishQ
12. Italian                26. UK-English
13. Japanese-type6         27. US-English
14. Japanese
To select the keyboard layout, enter a number [default 27]:27
```

Select **27. US-English**.

2) Select a language.

```
1. Chinese - Simplified
2. Chinese - Traditional
3. English
4. French
5. German
6. Italian
7. Japanese
8. Korean
9. Portuguese - Brazil
10. Spanish
To select the language you wish to use, enter a number [default is 3]:3
```

Select **3. English**.

* Select the language to use for interactive installation.

3) Installation menu

```
Welcome to the Oracle Solaris installation menu

      1  Install Oracle Solaris
      2  Install Additional Drivers
      3  Shell
      4  Terminal type (currently xterm)
      5  Reboot

Please enter a number [1]: 1
```

Select **1 Install Oracle Solaris**.

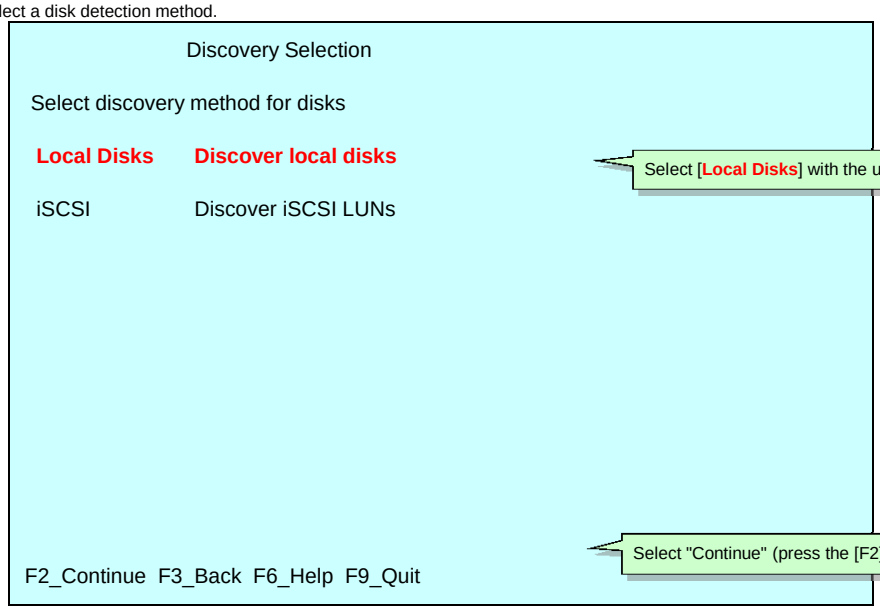
4) [Welcome to Oracle Solaris] screen

```
                Welcome to Oracle Solaris

  Thanks for choosing to install Oracle Solaris! This installer enables you
  to install the Oracle Solaris Operating System (OS) on SPARC or x86
  systems.

  The installation log will be at /system/volatile/install_log.

  How to navigate through this installer:
  - Use the function keys listed at the bottom of each screen to move from
    screen to screen and to perform other operations.
  - Use the up/down arrow keys to change the selection or to move between
    input fields.
  - If your keyboard does not have function keys, or they do not respond,
    press ESC; the legend at the bottom of the screen will change to show
    the ESC keys for navigation and other functions.


  F2_Continue  F6_Help  F9_Quit
```

Select "Continue" (press the [F2] key).

* If the characters are garbled, change the character code of the terminal software to UTF-8. Then, press [Esc] and [3].

5) Select a disk detection method.

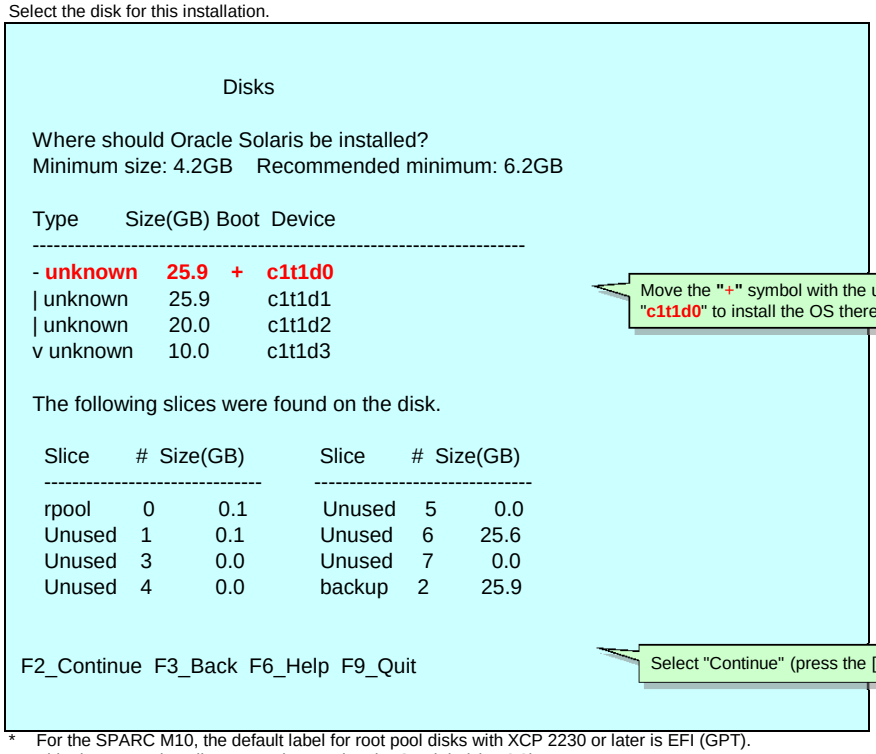


Select [**Local Disks**] with the up and down arrow keys.

Select "Continue" (press the [F2] key).

6) Disks

Select the disk for this installation.



Move the "**+**" symbol with the up and down arrow keys to select the disk "**c1t1d0**" to install the OS there.

Select "Continue" (press the [F2] key).

* For the SPARC M10, the default label for root pool disks with XCP 2230 or later is EFI (GPT).
This document describes procedures using the SMI label (VTOC).

* In cases of the EFI label, "GPT partition" represents a slice.

7) Slices

Specify whether to use the whole disk or only a part of the disk for OS installation. This procedure uses only a part of the disk.

```
                Solaris Slices: 25.9GB scsi Boot

Oracle Solaris can be installed on the whole disk or a slice on the disk.

The following slices were found on the disk.

  Slice      #  Size(GB)          Slice      #  Size(GB)
  ---------------------------     ---------------------------
  rpool      0       0.1          Unused     5       0.0
  Unused     1       0.1          Unused     6      25.6
  Unused     3       0.0          Unused     7       0.0
  Unused     4       0.0          backup     2      25.9


                  Use the whole disk
                  Use a slice on the disk


F2_Continue  F3_Back  F6_Help  F9_Quit
```

Select [**Use a slice on the disk**] with the up and down arrow keys.

Select "Continue" (press the [F2] key).

* In cases of the EFI label, "GPT partition" represents a slice.

8) Set/Select a slice.

If any slice other than slice 0 has an allocated size (GB), cancel the allocations of all slices, and allocate a size to slice 0, which is used as the root pool.

```
                Select Slice: 25.9GB unknown

Oracle Solaris will be installed in the "rpool" slice. Use the F5 key to
change a slice to "rpool."

A slice's size can be increased up to its Avail size. Avail can be
increased by deleting an adjacent slice. Use the F5 key to delete a slice
by changing it to "Unused."

Slices are listed in disk layout order.

  Slice      #  Size(GB)  Avail     Slice      #  Size(GB)  Avail
  ---------------------------------  ---------------------------------
  Unused     0     0.1      0.1     Unused     5     0.0       0.0
  Unused     1     0.1      0.1     Unused     6    25.6      25.6
  Unused     3     0.0      0.0     Unused     7     0.0       0.0
  Unused     4     0.0      0.0     backup     2    25.9      25.9

* indicates the slice's current content will be destroyed


F2_Continue  F3_Back  F5_Change Type  F6_Help  F7_Reset  F9_Quit
```

Select a slice with an allocated size (GB), and press the [**F5**] key.

* In this example, slices 0, 1, and 6 have allocated sizes.

* Do not change the allocation on slice 2 because it represents the whole disk.

Allocate the rpool to slice 0.

```
                Select Slice: 25.9GB unknown

Oracle Solaris will be installed in the "rpool" slice.  Use the F5 key to
change a slice to "rpool."

A slice's size can be increased up to its Avail size. Avail can be increased by deleting an
adjacent slice. Use the F5 key to delete a slice by changing it to "Unused."

Slices are listed in disk layout order.

  Slice      #  Size(GB)  Avail     Slice      #  Size(GB)  Avail
  ---------------------------------  ---------------------------------
  Unused     0      0.0     25.9    Unused     5      0.0     25.9
  Unused     1      0.0     25.9    Unused     6      0.0     25.9
  Unused     3      0.0     25.9    Unused     7      0.0     25.9
  Unused     4      0.0     25.9    backup     2     25.9     25.9

* indicates the slice's current content will be destroyed.


F2_Continue  F3_Back  F5_Change Type  F6_Help  F7_Reset  F9_Quit
```

While no slice has an allocation, select slice 0, and press the [**F5**] key.

* If no slice has an allocation when you press the [F5] key, the rpool is allocated.

Select the slice for this installation.

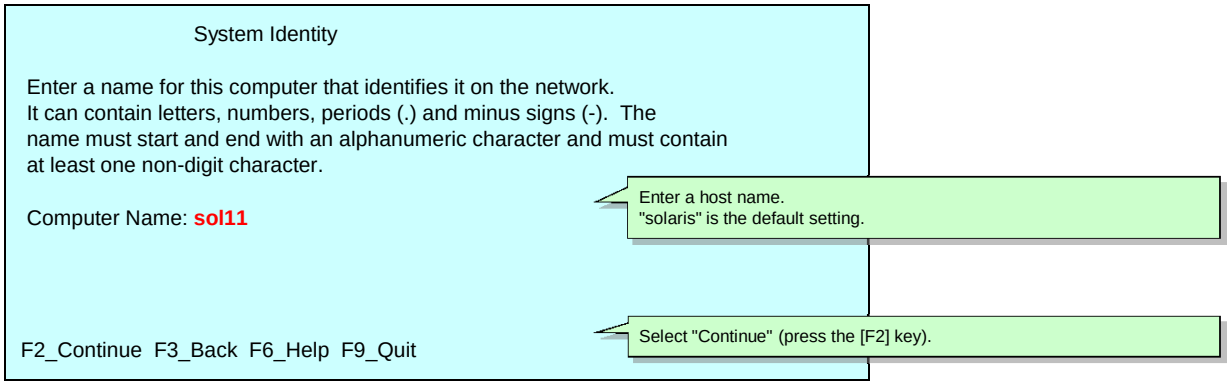
```
                Select Slice: 25.9GB unknown

Oracle Solaris will be installed in the "rpool" slice. Use the F5 key to
change a slice to "rpool."

A slice's size can be increased up to its Avail size. Avail can be
increased by deleting an adjacent slice. Use the F5 key to delete a slice
by changing it to "Unused."

Slices are listed in disk layout order.

  Slice      #  Size(GB)  Avail     Slice      #  Size(GB)  Avail
  ---------------------------------  ---------------------------------
 *rpool      0     25.9     25.9    Unused     5      0.0      0.0
  Unused     1      0.0      0.0    Unused     6      0.0      0.0
  Unused     3      0.0      0.0    Unused     7      0.0      0.0
  Unused     4      0.0      0.0    backup     2     25.9     25.9

* indicates the slice's current content will be destroyed


F2_Continue  F3_Back  F5_Change Type  F6_Help  F7_Reset  F9_Quit
```

Select **slice 0**.

Select "Continue" (press the [F2] key).

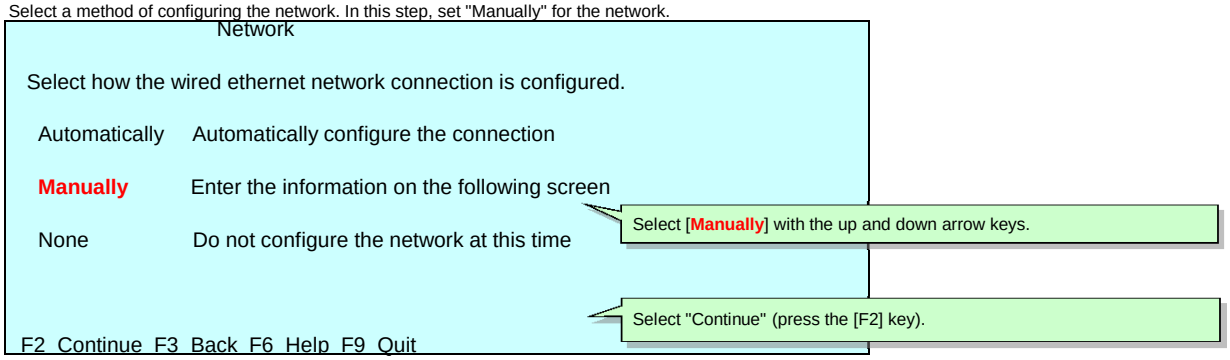
9) System Identity

Set a host name.



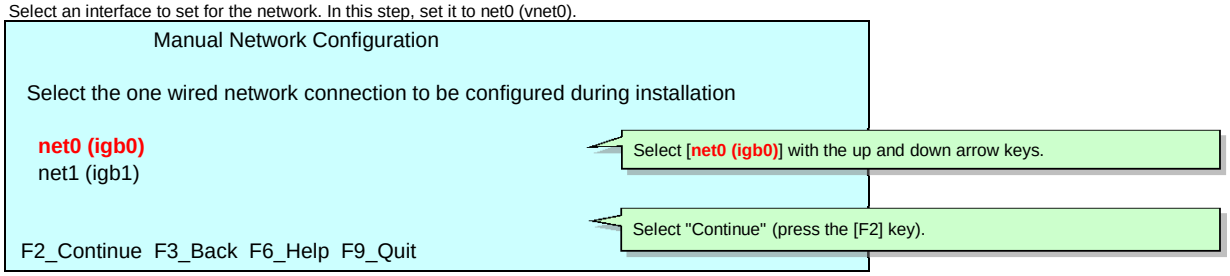
10) Configure the network.

Select a method of configuring the network. In this step, set "Manually" for the network.



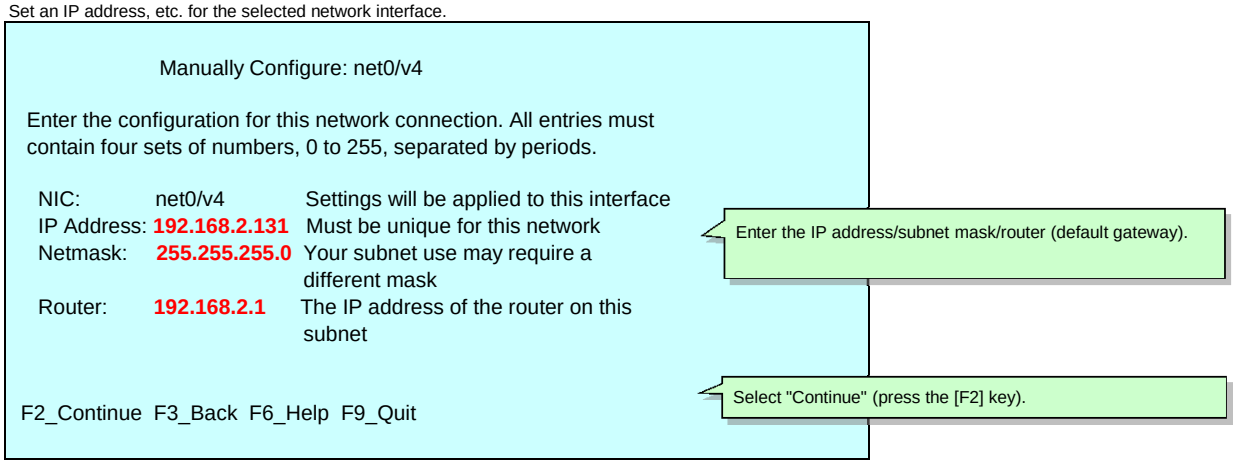
11) Manual Network Configuration

Select an interface to set for the network. In this step, set it to net0 (vnet0).



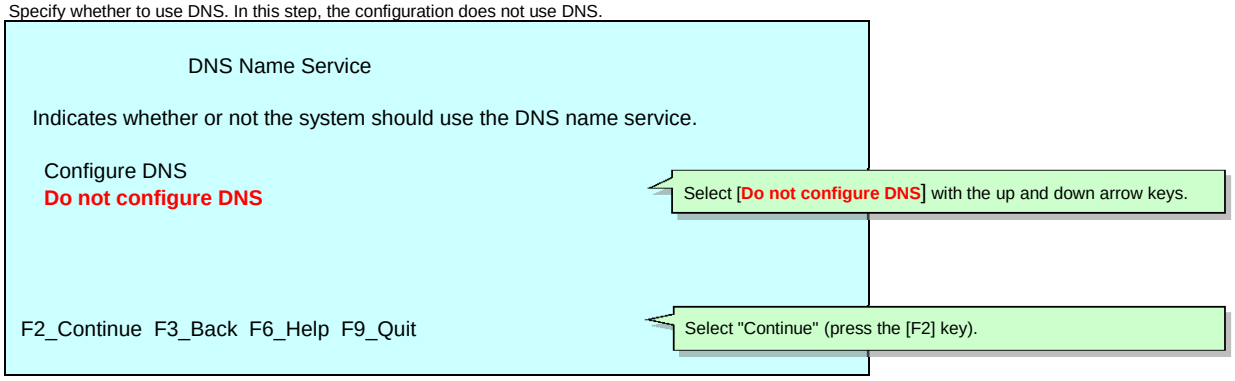
12) Manually Configure: network

Set an IP address, etc. for the selected network interface.



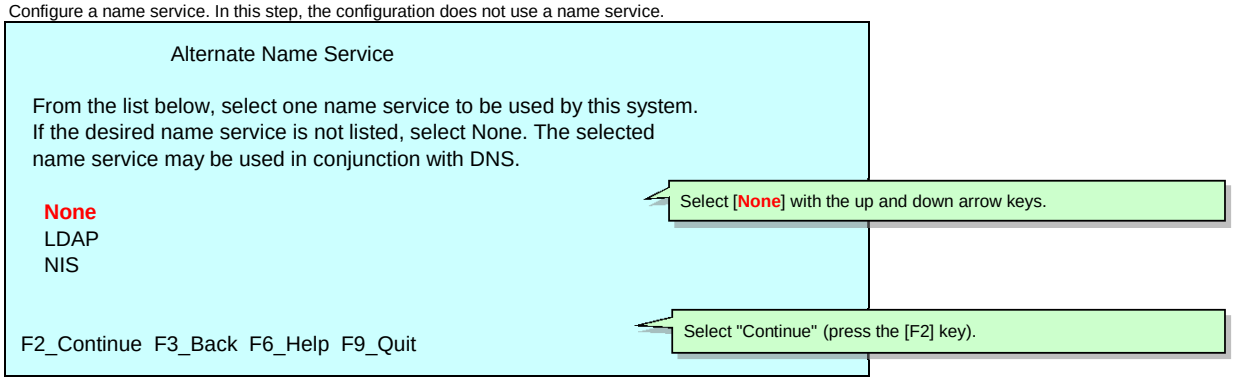
13) Configure the DNS name service.

Specify whether to use DNS. In this step, the configuration does not use DNS.



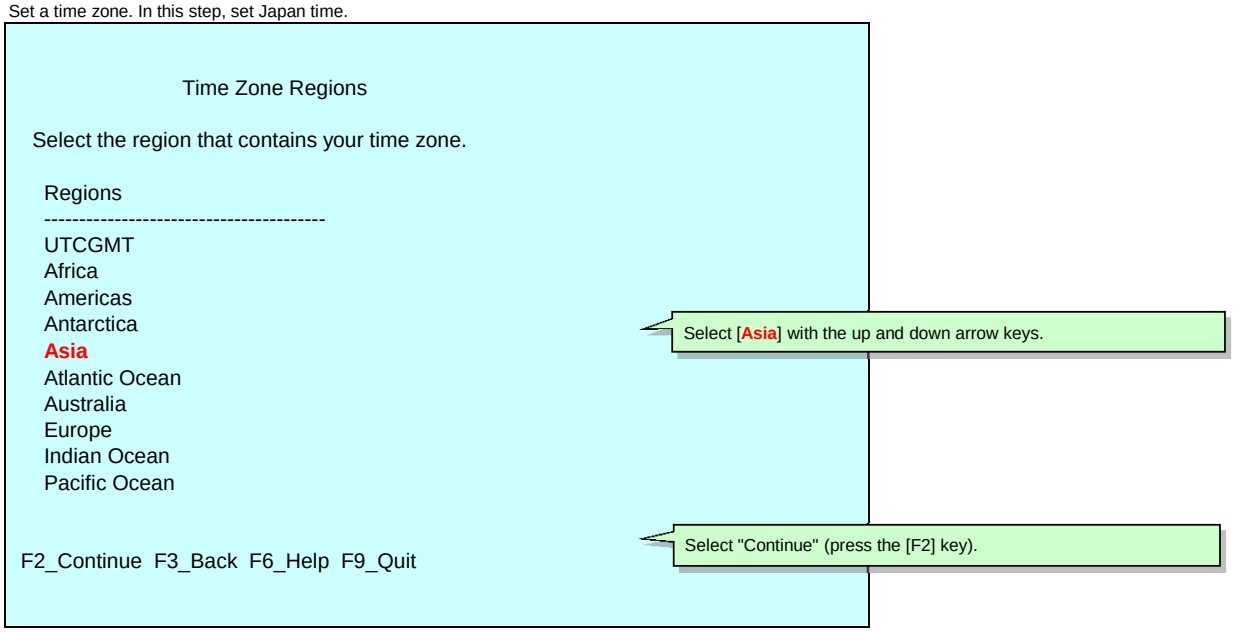
14) Configure an alternate name service.

Configure a name service. In this step, the configuration does not use a name service.

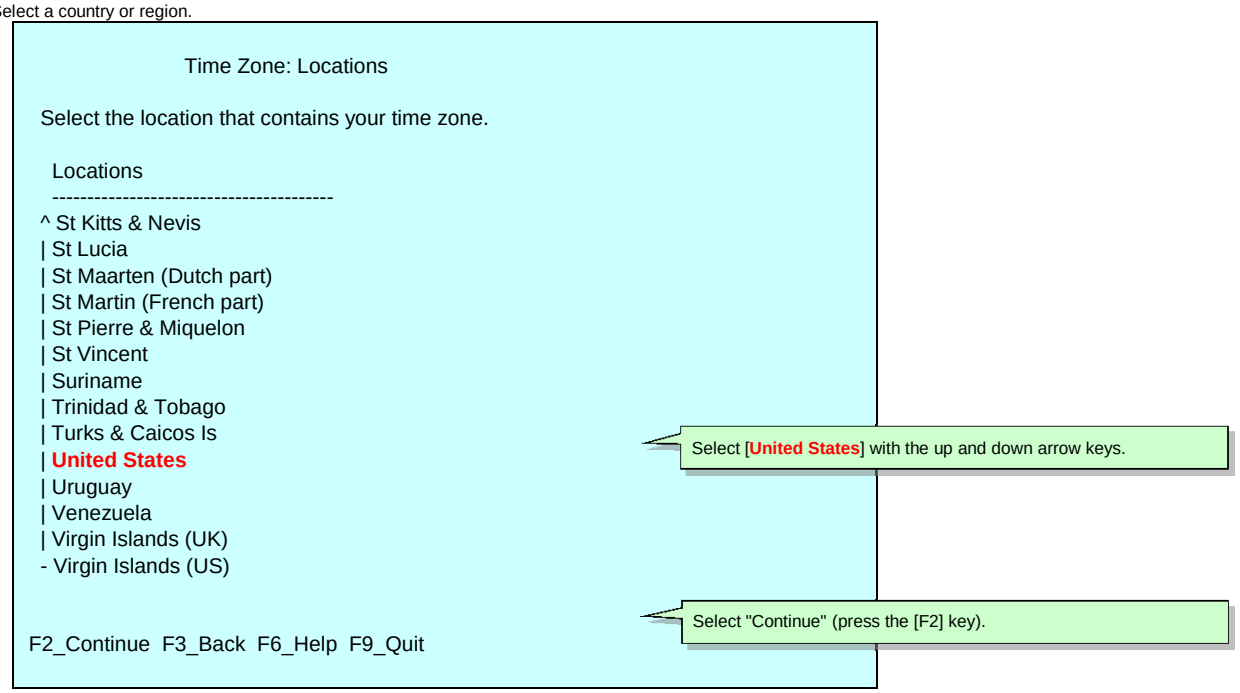


15) Set a time zone.

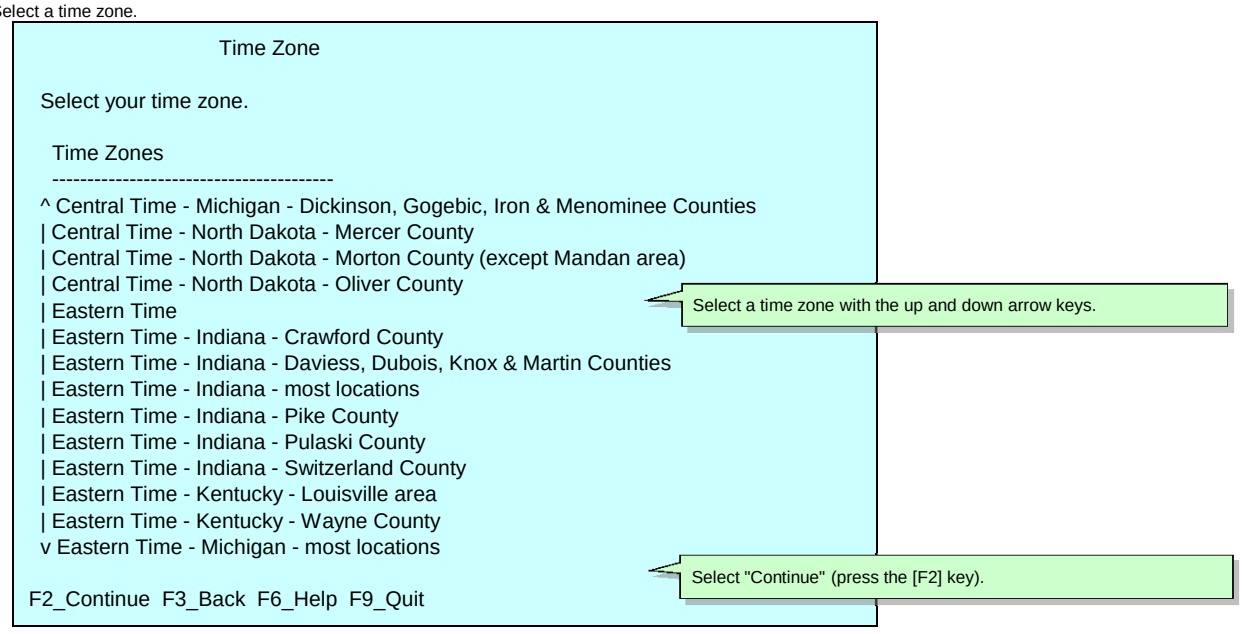
Set a time zone. In this step, set Japan time.



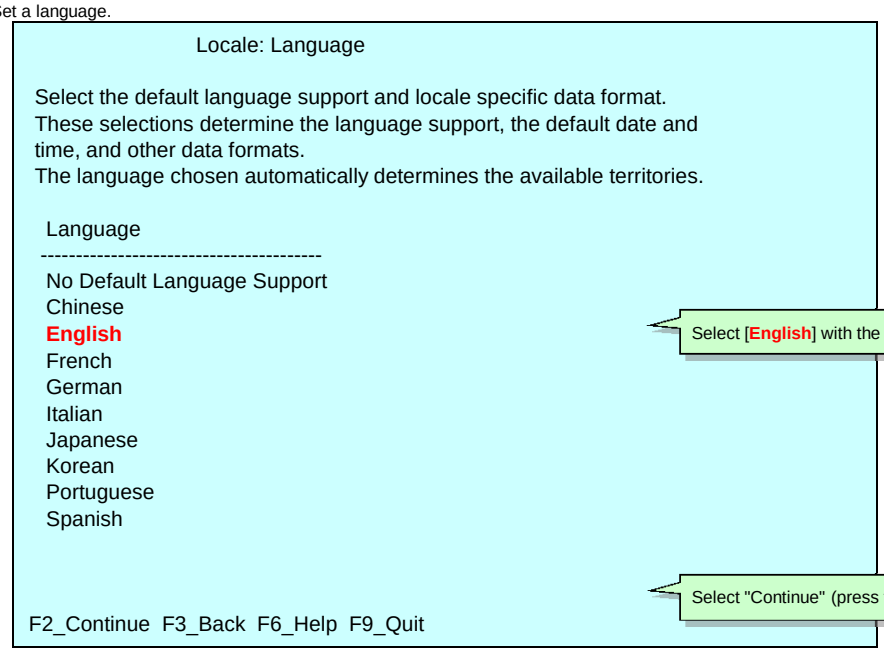
16) Select a country or region.



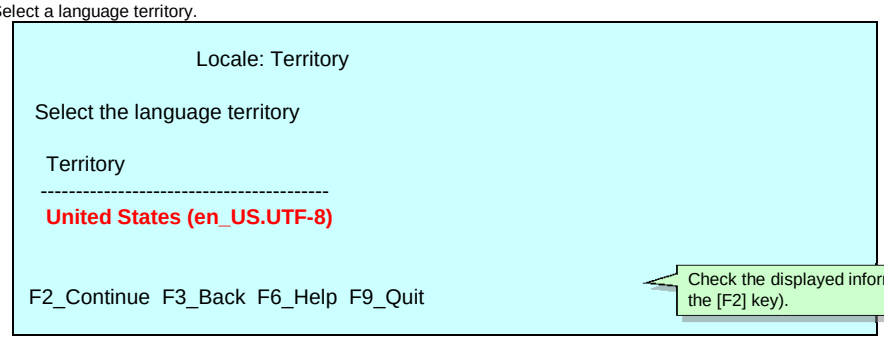
17) Select a time zone.



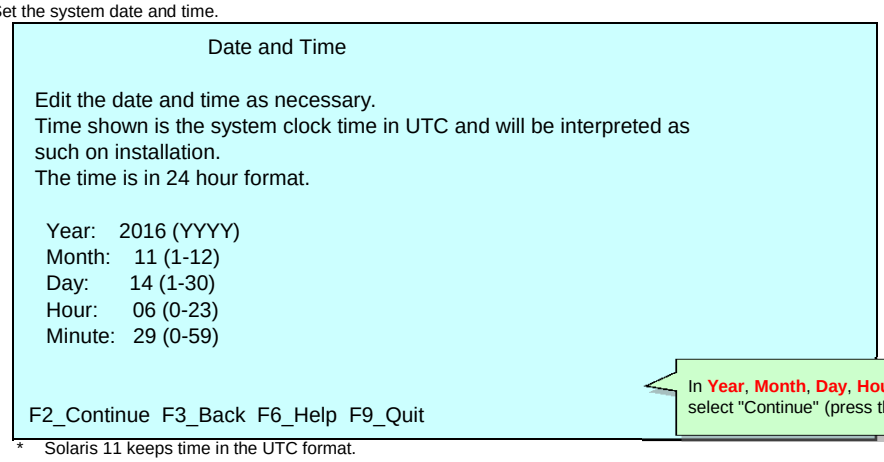
18) Set a language.



19) Select a language territory.



20) Set the system date and time.



* Solaris 11 keeps time in the UTC format.

21) Select a keyboard layout.

```
                        Keyboard

  Select your keyboard.

  ^ German
  | Italian
  | Japanese-type6
  | Japanese
  | Korean
  | Latin-American
  | Norwegian
  | Portuguese
  | Russian
  | Spanish
  | Swedish
  | Swiss-French
  | Swiss-German
  | Traditional-Chinese
  | TurkishQ
  | UK-English
  - US-English

  F2_Continue  F3_Back  F6_Help  F9_Quit
```

Select [**US-English**] with the up and down arrow keys.

Select "Continue" (press the [F2] key).

22) Set the root password and a user account.

Set the root password, and set a user account as required.
If you create a user account at this time, the root becomes a role, not a user. Then, you will not be able to log in directly to the server with the root account.
If you need root privileges, log in with the user account configured here, and then switch to root.

```
                        Users

  Define a root password for the system and user account for yourself.


  System Root Password (required)

  Root password:     ******
  Confirm password: ******

  Create a user account (optional)

  Your real name:   fujitsu
  Username:         user01
  User password:    ******
  Confirm password: ******

  F2_Continue  F3_Back  F6_Help  F9_Quit
```

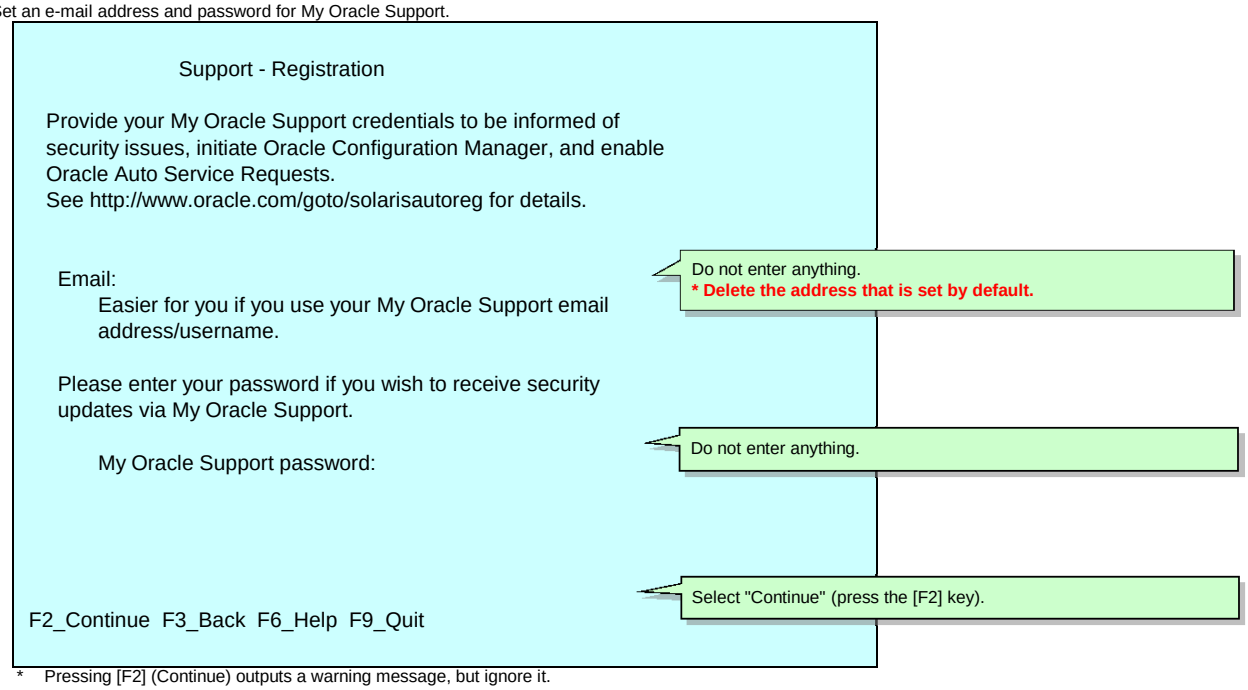
Enter the root password.

Enter the account information for a general user.

Select "Continue" (press the [F2] key).

* The password must have at least six characters that are a mixture of letters and numbers.

23) Set an e-mail address and password for My Oracle Support.



* Pressing [F2] (Continue) outputs a warning message, but ignore it.
* After the warning message is output, press [F2] (Continue) again.
* "anonymous@oracle.com" is the address entered by default. Delete it.

24) Confirm the contents of settings.

```
                    Installation Summary

 Review the settings below before installing. Go back (F3) to make changes.

 - Software: Oracle Solaris 11.3 SPARC
 |
 | Root Pool Disk: 558.9GB scsi
 | Slice 0: 558.9GB rpool
 |
 | Computer name: so11
 |
 | Network:
 | Manual Configuration: net0/v4
 | IP Address: 192.168.2.131/24
 | Netmask: 255.255.255.0
 | Router: 192.168.2.1
 |
 | Time Zone: US/Eastern
 | Locale:
 | Default Language: English
 | Language Support: English (United States)
 | Keyboard: US-English
 | Username: user01
 |
 | Support configuration:
 - No telemetry will be sent automatically

F2_Install  F3_Back  F6_Help  F9_Quit
```

Select "Install" (press the [F2] key).

25) Start installation.

```
                    Installing Oracle Solaris



          Transferring contents

         [                (99%)                ]


F9_Quit
```

26) Installation is complete.

```
                    Installation Complete

The installation of Oracle Solaris has completed successfully.

Reboot to start the newly installed software or Quit if you wish to
perform additional tasks before rebooting.

The installation log is available at /system/volatile/install_log. After
reboot it can be found at /var/log/install/install_log.

F4_View Log  F7_Halt  F8_Reboot  F9_Quit
```

Select "Reboot" (press the [F8] key).

27) Log in.

```
sol11 console login:user01
```

After the restart, log in as a general user that was created.

* If the general user was created at installation, the root was created not as a user but as a role.
So you cannot log in directly with the root account, even with a console connection.
* If the general user was not created at installation, the root was created as a user. So you can log in directly from the console like in Oracle Solaris 10.

28) Switch to root privileges.

```
$ su -
```

The subsequent steps operate with root privileges (undertaking the root role).

[Reference] How to make the root a user or a role

If you have created a general user, execute the following command so that you can log in directly with the root account.

```
# rolemod -K type=normal root
```

* The root::::type=role line is deleted from the /etc/user_attr file.

To revert the root to a role, execute the following command.

```
# usermod -K type=role root
```

* The root::::type=role line is added to the /etc/user_attr file.
* To execute this command, you have to log in as a general user and switch to root privileges.

2. Changing the Root Pool Configuration

The / (root) file system of Solaris 11 is ZFS.
This procedure describes a method of mirroring the root pool using ZFS functions.

2-1. Mirror Configuration of the Root Pool

(1) Check the root pool status.

1) Check the service.

```
# svcs svc:/system/filesystem/local:default
```

* Check the service that manages ZFS mounting.
The default state is online.

```
# svcs svc:/system/filesystem/local:default
STATE          STIME    FMRI
online         14:16:29 svc:/system/filesystem/local:default
```

2) Check the created storage pool.

```
# zpool list
```

* Confirm that the rpool has been configured.

```
# zpool list
NAME    SIZE  ALLOC  FREE   CAP  DEDUP  HEALTH  ALTROOT
rpool  25.5G  9.74G  15.8G  38%  1.00x  ONLINE  -
```

3) Check the root pool configuration.

```
# zpool status
```

* Confirm that no error has occurred.

```
# zpool status
  pool:rpool
 state:ONLINE
  scan:none requested
config:

        NAME        STATE     READ WRITE CKSUM
        rpool       ONLINE       0     0     0
        c1t1d0s0    ONLINE       0     0     0

errors: No known data errors
```

Reference: Checking the root pool configuration at the EFI labeling time

Reference) Check the root pool configuration.

```
# zpool status
```

* In cases of the EFI label, slice numbers are not appended.

```
# zpool status
  pool:rpool
 state:ONLINE
  scan:none requested
config:

        NAME        STATE     READ WRITE CKSUM
        rpool       ONLINE       0     0     0
        c1t1d0      ONLINE       0     0     0

errors: No known data errors
```

(2) Change the root pool configuration.

1) Check the label of the disk to be added to the root pool.

```
# format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c1t1d0 <SUN-SOLARIS-1 cyl 1695 alt 2 hd 255 sec 63>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p0,0
       1. c1t1d1 <SUN-SOLARIS-1 cyl 1695 alt 2 hd 255 sec 63>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p1,0
       2. c1t1d2 <SUN-SOLARIS-1-20.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p2,0
                       .
                       .
                       .
Specify disk (enter its number): 1
```

Enter [1].

```
FORMAT MENU:
        disk        - select a disk
        type        - select (define) a disk type
        partition   - select (define) a partition table
        current     - describe the current disk
        format      - format and analyze the disk
        repair      - repair a defective sector
        label       - write label to the disk
        analyze     - surface analysis
        defect      - defect list management
        backup      - search for backup labels
        verify      - read and display labels
        save        - save new disk/partition definitions
        inquiry     - show disk ID
        volname     - set 8-character volume name
        !<cmd>      - execute <cmd>, then return
        quit
format> partition
```

Enter [partition]. (You can only enter [p].)

```
PARTITION MENU:
        0      - change `0' partition
        1      - change `1' partition
        2      - change `2' partition
        3      - change `3' partition
        4      - change `4' partition
        5      - change `5' partition
        6      - change `6' partition
        7      - change `7' partition
        select - select a predefined table
        modify - modify a predefined partition table
        name   - name the current table
        print  - display the current table
        label  - write partition map and label to the disk
        !<cmd> - execute <cmd>, then return
        quit
partition> print
```

Enter [print]. (You can only enter [p].)

```
Current partition table (original):
Total disk cylinders available:737 + 2 (reserved cylinders)

Part      Tag    Flag     Cylinders    Size            Blocks
  0       root    wm       0 - 736     25.91GB    (737/0/0) 54337536
  1 unassigned    wm       0           0          (0/0/0)           0
  2     backup    wu       0 - 736     25.91GB    (737/0/0) 54337536
  3 unassigned    wm       0           0          (0/0/0)           0
  4 unassigned    wm       0           0          (0/0/0)           0
  5 unassigned    wm       0           0          (0/0/0)           0
  6 unassigned    wm       0           0          (0/0/0)           0
  7 unassigned    wm       0           0          (0/0/0)           0

partition> quit
```

Confirm that it is the SMI label (VTOC).
In cases of the SMI label (VTOC), slices 0 to 7 exist.

Enter [quit]. (You can only enter [q].)

```
FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        show       - translate a disk address
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show disk ID
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        quit
format> quit
```

Enter [quit]. (You can only enter [q].)

2) Copy the label information for the disks in the root pool to the added disk.

```
# prtvtoc /dev/rdsk/c1t1d0s0 | fmthard -s - /dev/rdsk/c1t1d1s0
```

* Copy the label information for c1t1d0s0 to c1t1d1s0.

```
# prtvtoc /dev/rdsk/c1t1d0s0 | fmthard -s - /dev/rdsk/c1t1d1s0
fmthard: New volume table of contents now in place.
```

Reference: Copying label information at the EFI labeling time

Reference) Copy the label information for the disks in the root pool to the added disk.

```
# prtvtoc /dev/rdsk/c1t1d0 | fmthard -s - /dev/rdsk/c1t1d1
```

* In cases of the EFI label, slice numbers are not required.

Reference: How to change the EFI label to the SMI label

Reference) How to revert the EFI label to the SMI label (Example: Device named "c2t1d1")

```
# format -e c2t1d1
```

* Use the -e option.

```
# format -e c2t1d1
selecting c2t1d1

FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        show       - translate a disk address
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        inquiry    - show disk ID
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        quit
format> label
[0] SMI Label
[1] EFI Label
Specify Label type[1]: 0
format> quit
```

Enter [label].

Enter [0].

Enter [quit]. (You can only enter [q].)

Reference) Label display in EFI cases

```
Current partition table (original):
Total disk sectors available:20955069 + 16384 (reserved sectors)

Part      Tag    Flag     First Sector         Size         Last Sector
  0        usr    wm               256       9.99GB           20955102
  1 unassigned    wm                 0            0                  0
  2 unassigned    wm                 0            0                  0
  3 unassigned    wm                 0            0                  0
  4 unassigned    wm                 0            0                  0
  5 unassigned    wm                 0            0                  0
  6 unassigned    wm                 0            0                  0
  8   reserved    wm          20955103      8.00MB           20971486

partition>
```

* In cases of the EFI label, slice 7 does not exist and slice 8 exists.

3) Add a mirror disk.

Add a mirror disk to the root pool. The root pool automatically changes to the mirror configuration when the disk is added.

[Syntax] zpool attach *pool_name mirror_source_disk mirror_disk*

```
# zpool attach rpool c1t1d0s0 c1t1d1s0
```

```
# zpool attach rpool c1t1d0s0 c1t1d1s0
Make sure to wait until resilver is done before rebooting.
```

* The only possible redundant configuration for the root pool is the mirror configuration.
* Add a mirror disk to the root pool. The root pool automatically changes to the mirror configuration when the disk is added.
* In Oracle Solaris 10, after adding the mirror disk, you need to write the boot block to the mirror disk by using the installboot command.
  In Oracle Solaris 11, you do not have to write the boot block.
* The "UNW-MSG-ID: ZFS-8000-QJ" message may appear, but it is not a problem.
* If attempting to add a disk that was used as the root pool in the past, the command fails.
  In this case, you can execute the command using the -f option as follows:
  # zpool attach -f rpool c1t1d0s0 c1t1d1s0

Reference: Adding a mirror disk at the EFI labeling time

Reference) Add a mirror disk.

```
# zpool attach rpool c1t1d0 c1t1d1
```

```
# zpool attach rpool c1t1d0 c1t1d1
Make sure to wait until resilver is done before rebooting.
```

* In cases of the EFI label, slice numbers are not appended.

4) Check the root pool configuration.

```
# zpool status
```

* Confirm the mirror configuration, which has a disk (c1tqd1s0) added to the rpool.
* mirror-0 indicates the mirror configuration on ZFS. The devices under it are mirrored disks.
* Read/Write access to the storage pool is even possible during synchronization.
* The STATE column displays "DEGRADED" during synchronization. It displays "ONLINE" when synchronization completes normally.
* Execute the command periodically until the synchronization is completed.

The command waits until synchronization completes.

```
# zpool status
 pool:rpool
 state:DEGRADED
 status:One or more devices is currently being resilvered.  The pool
 will
        continue to function in a degraded state.
 action:Wait for the resilver to complete.
        Run 'zpool status -v' to see device specific details.
 scan:resilver in progress since Sat Aug 23 05:17:46 2014
    5.79G scanned
    1.28G resilvered at 15.5M/s, 22.05% done, 0h4m to go
config:

        NAME          STATE         READ WRITE CKSUM
        rpool         DEGRADED         0     0     0
          mirror-0    DEGRADED         0     0     0
            c1t1d0s0  ONLINE           0     0     0
            c1t1d1s0  DEGRADED         0     0     0  (resilvering)

errors:No known data errors
```

Synchronization progress is displayed in %.

You can confirm that synchronization is in progress.

To after synchronization completes...

Confirm that there is no error.

```
# zpool status
 pool: rpool
 state: ONLINE
  scan:resilvered 5.79G in 0h14m with 0 errors on Sat Aug 23 05:32:11 2014
config:

      NAME          STATE     READ WRITE CKSUM
      rpool         ONLINE       0     0     0
        mirror-0    ONLINE       0     0     0
          c1t1d0s0  ONLINE       0     0     0
          c1t1d1s0  ONLINE       0     0     0

errors: No known data errors
```

5) Move to OBP.

```
# shutdown -y -g0 -i0
```

* Execute the command after disk mirror synchronization completes.

6) Check the boot-device setting.

```
{0} ok printenv boot-device
```

```
{0} ok printenv boot-device
boot-device =           /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p0,0 disk net
```

* Check the current setting of boot-device.

7) Check the alias names.

```
{0} ok devalias
```

* Check the alias name of the added disk.
* disk0 is the alias name of the system volume.
* disk1 is the alias name of the added mirror disk.

```
{0} ok devalias
--<Omitted>--
net1                    /pci@8000/pci@4/pci@0/pci@1/network@0,1
net0                    /pci@8000/pci@4/pci@0/pci@1/network@0
net                     /pci@8000/pci@4/pci@0/pci@1/network@0
disk7                   /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p7,0
disk6                   /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p6,0
disk5                   /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p5,0
disk4                   /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p4,0
disk3                   /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p3,0
disk2                   /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p2,0
disk1                   /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p1,0
disk0                   /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p0,0
--<Omitted>--
```

8) Set boot-device.

```
{0} ok setenv boot-device disk0 disk1
```

* The command sets all the disks in the mirror configuration to boot-device.

9) Check the boot-device setting.

```
{0} ok printenv
```

* Confirm that all the disks in the mirror configuration are set to boot-devic

```
{0} ok printenv
--<Omitted>--
boot-device             disk0 disk1             disk net
multipath-boot?         false                   false
boot-device-index       0                       0
use-nvramrc?            false                   false
nvramrc
error-reset-recovery    boot                    boot
```

10) Start the OS from the added mirror disk.

```
{0} ok boot disk1
```

* Confirm that the OS can start up from the added mirror disk.
* After starting the OS, log in as a general user, and switch to the root user.

3. Configuring the Network

3-1. Checking the Network

(1) Check the status of the default network.

1) Check the IP address.

```
# ipadm show-addr
```

* Confirm that the IP address is that set at OS installation.

```
# ipadm show-addr
ADDROBJ           TYPE       STATE            ADDR
lo0/v4            static     ok               127.0.0.1/8
net0/v4           static     ok               192.168.10.xx/24
lo0/v6            static     ok               ::1/128
--<Omitted>--
```

2) Check the network interface.

```
# dladm show-link
```

* Confirm that STATE shows "up" for net0.
* Confirm that STATE shows "unknown" for net1.

```
# dladm show-link
LINK              CLASS      MTU      STATE            OVER
net0              phys       1500     up               --
net1              phys       1500     unknown          --
```

3-2. Configuring the Network

(1) Set the IP address.

1) Enable and check the interface.

[Syntax] ipadm create-ip *interface_name*

```
# ipadm create-ip net1
# dladm show-link
```

* Confirm that STATE shows "up" for net1.

```
# dladm show-link
LINK              CLASS      MTU      STATE            OVER
net0              phys       1500     up               --
net1              phys       1500     up               --
```

2) Set the IP address.

[Syntax] ipadm create-addr [*option*] *interface_name*/*arbitrary_string*
[Option] -T: Sets the address object type.
-a: Sets the IP address and the netmask length.

```
# ipadm create-addr -T static -a local=192.168.1.xx/24 net1/v4
```

3) Check the setting.

Check the IP address.

```
# ipadm show-addr
```

* Confirm that the IP address has been set.

```
# ipadm show-addr
ADDROBJ           TYPE       STATE            ADDR
lo0/v4            static     ok               127.0.0.1/8
net0/v4           static     ok               192.168.10.xx/24
net1/v4           static     ok               192.168.1.xx/24
lo0/v6            static     ok               ::1/128
--<Omitted>--
```

Check the configuration file.

```
# cat /etc/ipadm/ipadm-DefaultFixed.conf
```

* The network information configured by the ipadm command is set in the /etc/ipadm/ipadm-DefaultFixed.conf file. (Oracle Solaris 11.1 and later)

```
# cat /etc/ipadm/ipadm-DefaultFixed.conf
_ifname=lo0;_aobjname=lo0/v4;
_ipv4saddr=string,127.0.0.1;prefixlen=string,8;up=string,yes;
_ifname=lo0;    _family=string,2,26;_class=uint64,2;
_ifname=lo0;_aobjname=lo0/v6;
_ipv6saddr=string,::1;prefixlen=string,128;up=string,yes;
_ifname=net0;   _family=string,2,26;_class=uint64,0;
_ifname=net0;_aobjname=net0/v4;
_ipv4saddr=string,192.168.10.xx;prefixlen=string,24;up=string,yes;
_ifname=net0;_aobjname=net0/v6;
_intfid=string,::;prefixlen=string,0;_stateless=string,yes;_stateful=string,yes;
_ifname=net1;   _family=string,2,26;_class=uint64,0;
_ifname=net1;_aobjname=net1/v4;
_ipv4saddr=string,192.168.1.xx;prefixlen=string,24;up=string,yes;
```

(2) Enable network services.
Here, check the states of telnet and FTP, and then enable them.
1) Check the services.

```
# svcs svc:/network/telnet:default
# svcs svc:/network/ftp:default
```

```
# svcs svc:/network/telnet:default
STATE          STIME     FMRI
disabled       9:14:11   svc:/network/telnet:default
# svcs svc:/network/ftp:default
STATE          STIME     FMRI
disabled       9:13:24   svc:/network/ftp:default
```

* In Oracle Solaris 11, all services immediately after installation are disabled.
* Confirm that "disabled" appears under STATE.
* You can specify the abbreviations "telnet" and "ftp" for these service names.

2) Enable the services.

```
# svcadm enable svc:/network/telnet:default
# svcadm enable svc:/network/ftp:default
```

* You can specify the abbreviations "telnet" and "ftp" for these service names.

3) Check the services.

```
# svcs svc:/network/telnet:default
# svcs svc:/network/ftp:default
```

```
# svcs svc:/network/telnet:default
STATE          STIME     FMRI
online         9:14:33   svc:/network/telnet:default
# svcs svc:/network/ftp:default
STATE          STIME     FMRI
online         9:14:50   svc:/network/ftp:default
```

* Confirm that they are enabled (online).
* You can specify the abbreviations "telnet" and "ftp" for these service names.

4. Creating and Registering a Local Repository

4-1. Creating a Local Repository

Since Solaris 11.2, users create a local repository by using a shell script for creating a repository.

- This section shows the procedure for creating a local repository using the DVD drive of a physical server.
- To create a local repository on a virtual environment of Oracle VM Server for SPARC, settings such as allocating the DVD media of the repository as a virtual disk are necessary.

(1) Create a local repository.

1) Create a new storage pool.

[Syntax] zpool create *pool_name disk*

```
# zpool create sol11 c1t1d2
# zpool list
```

```
# zpool list
NAME   SIZE   ALLOC  FREE   CAP  DEDUP  HEALTH  ALTROOT
rpool  25.8G  9.84G  15.9G  38%  1.00x  ONLINE  -
sol11  19.9G  1.12M  19.9G   0%  1.00x  ONLINE  -
```

* Create a new storage pool, and create a local repository there.

2) Create a file system.

[Syntax] zfs create [*option*] *file_system_name*

[Option] -o compression: Sets the compression method property.

```
# zfs create -o compression=on sol11/repo_11_3
# zfs list
```

```
# zfs list
NAME                          USED  AVAIL  REFER  MOUNTPOINT
rpool                        9.93G  15.2G   384K  /rpool
-<Omitted>-
sol11                        1.16M  19.6G   304K  /sol11
sol11/repo_11_3               288K  19.6G   288K  /sol11/repo_11_3
```

* The compression option is not required.

3) Insert and copy the *IPS Repository Installation Guide/IPS Repository (1/2)* (DVD media).

```
* Insert the media into the DVD drive.
# cp -p /media/V78247-01/* /sol11/
# eject cdrom
```

* The title of the media is *Oracle Solaris 11.3 IPS Repository Installation Guide / IPS Repository (1/2) (SPARC, x86)* .

* The path name below /media varies depending on the OS (repository) version.

4) Insert and copy the *IPS Repository (2/2)* (DVD media).

```
* Insert the media into the DVD drive.
# cp -p /media/V78246-01/* /sol11/
# eject cdrom
```

* The title of the media is *Oracle Solaris 11.3 IPS Repository (2/2) (SPARC, x86)* .

* The path name below /media varies depending on the OS (repository) version.

5) Check the copied files.

```
# ls -l /sol11
```

```
# ls -l /sol11
total 16478118
-r-xr-xr-x   1 root sys  1540097274 Oct 27, 2016  10:13 V78246-01_1of5.zip
-r-xr-xr-x   1 root sys  1730669364 Oct 27, 2016  10:15 V78246-01_2of5.zip
-r-xr-xr-x   1 root sys  1717187368 Oct 27, 2016  10:19 V78246-01_3of5.zip
-r-xr-xr-x   1 root sys  1871913207 Oct 27, 2016  10:25 V78246-01_4of5.zip
-r-xr-xr-x   1 root sys  1570373423 Oct 27, 2016  10:10 V78246-01_5of5.zip
-r-xr-xr-x   1 root sys        6470 Oct 27, 2016  08:59 V78247-01.zip
drwxr-xr-x   2 root root          2 Feb 24, 2016  17:40 repo_11_3
```

6) Unpack the files (script for repository file deployment).

```
# cd /sol11
# unzip /sol11/V78247-01.zip
# ls -l
```

```
# ls -l
total 16478153
-rw-r--r--   1 root root       3922 Oct  7, 2016  05:12 README-zipped-repo.txt
-r-xr-xr-x   1 root sys  1540097274 Oct 27, 2016  10:13 V78246-01_1of5.zip
-r-xr-xr-x   1 root sys  1730669364 Oct 27, 2016  10:15 V78246-01_2of5.zip
-r-xr-xr-x   1 root sys  1717187368 Oct 27, 2016  10:19 V78246-01_3of5.zip
-r-xr-xr-x   1 root sys  1871913207 Oct 27, 2016  10:25 V78246-01_4of5.zip
-r-xr-xr-x   1 root sys  1570373423 Oct 27, 2016  10:10 V78246-01_5of5.zip
-r-xr-xr-x   1 root sys        6470 Oct 27, 2016  08:59 V78247-01.zip
-rwxr-xr-x   1 root root      11612 Oct 27, 2016  05:12 install-repo.ksh
drwxr-xr-x   2 root root          2 Feb 24, 2016  17:40 repo_11_3
-rw-r--r--   1 root root        285 Oct  8, 2016  06:52 sol-11_3-repo_md5sums.txt
```

7) Execute the script for repository file deployment.
[Syntax] install-repo.ksh -d *<repository_deployment_destination>* [*option*]
[Option] -v: Diagnoses the repository directory.
-c: Compares the checksums of archive files.

```
# ./install-repo.ksh -d /sol11/repo_11_3 -v -c
```

* The -v and -c options are not required,
but we recommend specifying them.

```
# ./install-repo.ksh -d /sol11/repo_11_3 -v -c
Using V78246-01 files for sol-11_3-repo download.

Comparing checksums of downloaded files...done. Checksums match.

Uncompressing V78246-01_1of5.zip...done.
Uncompressing V78246-01_2of5.zip...done.
Uncompressing V78246-01_3of5.zip...done.
Uncompressing V78246-01_4of5.zip...done.
Uncompressing V78246-01_5of5.zip...done.
Repository can be found in /sol11/repositoryDIR/repo_11_3.
Initiating repository verification.
```

8) Check the repository file deployment.

```
# ls -l /sol11/repo_11_3/
```

```
# ls -l /sol11/repo_11_3/
total 34
-rw-r--r--   1 root  root   3440  Oct 7, 2016  05:12 COPYRIGHT
-rw-r--r--   1 root  root   1626  Oct 7, 2016  05:12 NOTICES
-rwxr-xr-x   1 root  root   5970  Oct 7, 2016  05:12 README-repo-iso.txt
-rw-r--r--   1 root  root    329  Oct 7, 2016  04:19 pkg5.repository
drwxr-xr-x   3 root  root      3 Feb 24, 2016  17:48 publisher
-rw-r--r--   1 root  root    573  Oct 7, 2016  05:12 readme.txt
```

(2) Set the local repository.

1) Set the manifest/content storage directory.

```
# svccfg -s application/pkg/server setprop pkg/inst_root=/sol11/repo_11_3
```

2) Set read-only.

```
# svccfg -s application/pkg/server setprop pkg/readonly=true
```

3) Check the setting of the directory for storing repository images.

```
# svcprop -p pkg/inst_root application/pkg/server
```

* Confirm that the displayed directory is that set in step 1).

```
# svcprop -p pkg/inst_root application/pkg/server
/sol11/repo_11_3
```

4) Start the repository service.

```
# svcadm enable application/pkg/server
```

5) Check the repository service.

```
# svcs application/pkg/server
```

* Confirm that "online" appears under STATE.
* If Apache is already running, you cannot start the service
because of a port number conflict. Stop Apache,
or change the publisher port number to another, free port number.

```
# svcs application/pkg/server
STATE          STIME    FMRI
online         11:33:57 svc:/application/pkg/server:default
```

Reference: How to change the port number of the publisher

(1) Change the port number.

```
# svccfg -s application/pkg/server setprop pkg/port=port_number
```

* The default value for pkg/port is 80.

(2) Reread the setting.

```
# svcadm refresh application/pkg/server
```

(3) Restart the service.

```
# svcadm restart application/pkg/server
```

* Restart the service if the service is already running (enabled). If it is "disabled," specify "enable".

(4) Check the setting.

```
# svcprop -p pkg/port application/pkg/server
```

* The port number that was set is displayed.

4-2. Registering a Local Repository and Installing Packages

(1) Register a publisher.

1) Check the current publisher.

```
# pkg publisher
```

```
# pkg publisher
PUBLISHER                 TYPE     STATUS P LOCATION
solaris                   origin   online F http://pkg.oracle.com/solaris/release/
```

* Confirm that the default publisher is registered.
* "P" next to STATUS indicates whether a proxy is set.
Set => "T" = True Not set => "F" = False

2) Register.

[Syntax] pkg set-publisher [*option*] *publisher_name*
[Option] -G: Deletes the local repository.
-g: Adds the local repository.

```
# pkg set-publisher -G http://pkg.oracle.com/solaris/release/ -g http://localhost/ solaris
```

* Register the repository created in the previous step.

3) Confirm.

```
# pkg publisher
```

```
# pkg publisher
PUBLISHER                 TYPE     STATUS P LOCATION
solaris                   origin   online F http://localhost/
```

* Confirm that the publisher is registered.

Reference: How to delete the local repository

(1) How to delete the local repository

```
# pkg set-publisher -G http://localhost/ solaris
```

* Specify the -G option to delete the local repository.

(2) Install packages.

1) Check the number of packages.

```
# pkg list | wc -l
```

```
# pkg list | wc -l
    583
```

* Check the number of packages already installed.
* In this example in the document, 583 packages are installed.

2) Install a package (system/locale/extra).

```
# pkg install pkg://solaris/system/locale/extra
```

```
# pkg install pkg://solaris/system/locale/extra
           Packages to install:   3
            Services to change:   1
       Create boot environment:  No
Create backup boot environment: Yes

DOWNLOAD                          PKGS  FILES      XFER (MB)  SPEED
Completed                         3/3   2899/2899  84.4/84.4  14.5M/s

PHASE                                          ITEMS
Installing new actions                     3516/3516
Updating package state database                 Done
Updating package cache                           0/0
Updating image state                            Done
Creating fast lookup database                   Done
Updating package cache                           1/1
```

* Install the above package to use an additional locale such as ja_JP.eucJP.
* Confirm that the package can be installed from the local repository.

(3) Install a package (text/locale).

```
# pkg install pkg://solaris/text/locale
```

```
# pkg install pkg://solaris/text/locale
           Packages to install:  1
       Create boot environment: No
Create backup boot environment: No

DOWNLOAD                          PKGS  FILES  XFER (MB)  SPEED
Completed                         1/1   47/47  0.2/0.2    1.9M/s

PHASE                                          ITEMS
Installing new actions                         75/75
Updating package state database                 Done
Updating package cache                           0/0
Updating image state                            Done
Creating fast lookup database                   Done
Updating package cache                           1/1
```

* Install it to use a product (ESF/MW) that uses gettxt (1).
* Confirm that the package can be installed from the local repository.

4) Check the installation of a package (system/locale/extra).

```
# pkg list pkg://solaris/system/locale/extra
```

```
# pkg list pkg://solaris/system/locale/extra
NAME (PUBLISHER)                VERSION                         IFO
system/locale/extra             0.5.11-0.175.3.0.0.26.2         i--
```

* The IFO parameter displays "i" when the installation has succeeded.

(5) Check the installation of a package (text/locale).

```
# pkg list pkg://solaris/text/locale
```

```
# pkg list pkg://solaris/text/locale
NAME (PUBLISHER)                VERSION                         IFO
text/locale                     0.5.11-0.175.3.0.0.30.0         i--
```

* The IFO parameter displays "i" when the installation has succeeded.

6) Check the number of packages.

```
# pkg list | wc -l
```

```
# pkg list | wc -l
     587
```

* Confirm that the number has increased by two installed packages and the number of packages that depend on them.

Reference: Correcting a package

By utilizing a repository, you can restore a package even if a file included in the package is corrupted.
An example of the restore procedure is described below.

1) Delete a file.

```
# ls -l /usr/share/man/man1/exstr.1
# rm /usr/share/man/man1/exstr.1
```

```
# ls -l /usr/share/man/man1/exstr.1
-r--r--r-- 1 root bin 8214 Nov 6 10:04 /usr/share/man/man1/exstr.1
```

* Delete a file (exstr.1) included in the text/locale package.
* This file included in the text/locale package is assumed to be corrupted.

2) Check the file.

```
# ls -l /usr/share/man/man1/exstr.1
```

```
# ls -l /usr/share/man/man1/exstr.1
/usr/share/man/man1/exstr.1:No such file or directory
```

* Confirm that the file does not exist.

3) Detect package errors.

```
# pkg verify text/locale
```

```
# pkg verify text/locale
PACKAGE                                                         STATUS
pkg://solaris/text/locale                                       ERROR
        file: usr/share/man/man1/exstr.1
                ERROR: Missing: regular file does not exist
```

* Check for an error about the exstr.1 file not existing.

4) Correct the package.

```
# pkg fix text/locale
```

```
# pkg fix text/locale
                Packages to fix:   1
      Create boot environment:  No
Create backup boot environment: Yes

Repairing: pkg://solaris/text/locale@0.5.11,5.11-
0.175.3.0.0.30.0:20150821T160101Z
PACKAGE                                                         STATUS
pkg://solaris/text/locale                                       ERROR
        file: usr/share/man/man1/exstr.1
                ERROR: Missing: regular file does not exist
DOWNLOAD                        PKGS  FILES  XFER (MB)  SPEED
Completed                       1/1   1/1    0.0/0.0    255k/s

PHASE                                          ITEMS
Updating modified actions                        1/1
Updating package state database                 Done
Updating package cache                           0/0
Updating image state                            Done
Creating fast lookup database                   Done
Updating package cache                           1/1
```

* Copy the exstr.1 file from the local repository.

5) Check the file.

```
# ls -l /usr/share/man/man1/exstr.1
```

```
# ls -l /usr/share/man/man1/exstr.1
-r--r--r-- 1 root bin 8214 Mar 2 13:14 /usr/share/man/man1/exstr.1
```

* Confirm that the exstr.1 file has been restored.

6) Alter the file.

```
# ls -l /usr/share/man/man1/exstr.1
# echo ABC >> /usr/share/man/man1/exstr.1
```

```
# ls -l /usr/share/man/man1/exstr.1
-r--r--r-- 1 root bin 8214 Nov 6, 2016 10:35 /usr/share/man/man1/exstr.1
```

Check the file size.

* Alter a file (exstr.1) included in the text/locale package.
* This file included in the text/locale package is assumed to be corrupted.

7) Check the file size.

```
# ls -l /usr/share/man/man1/exstr.1
```

* Confirm that the file size changed.

```
# ls -l /usr/share/man/man1/exstr.1
-r--r--r-- 1 root bin 8218 Nov 6, 2016 10:44 /usr/share/man/man1/exstr.1
```

Check the file size.

8) Detect package errors.

```
# pkg verify text/locale
```

* Check for an error about the exstr.1 file hash value being different.

```
# pkg verify text/locale
PACKAGE                                                                 STATUS
pkg://solaris/text/locale                                               ERROR
        file: usr/share/man/man1/exstr.1
                ERROR: Size: 8218 bytes should be 8214
                ERROR: Hash: 224ba87dc2ea797df93d50e513243c5eac700554 should be
5472162df31dc906ce940b811e32882df4f00dc8
```

9) Correct the package.

```
# pkg fix text/locale
```

* Copy the exstr.1 file from the local repository.

```
# pkg fix text/locale
               Packages to fix:   1
       Create boot environment:  No
Create backup boot environment: Yes

Repairing: pkg://solaris/text/locale@0.5.11,5.11-
0.175.3.0.0.30.0:20150821T160101Z
PACKAGE                                                                 STATUS
pkg://solaris/text/locale                                               ERROR
        file: usr/share/man/man1/exstr.1
                ERROR: Size: 8218 bytes should be 8214
                ERROR: Hash: 224ba87dc2ea797df93d50e513243c5eac700554 should be
5472162df31dc906ce940b811e32882df4f00dc8
DOWNLOAD                          PKGS  FILES  XFER (MB)  SPEED
Completed                         1/1   1/1    0.0/0.0    268k/s

PHASE                                          ITEMS
Updating modified actions                        1/1
Updating package state database                 Done
Updating package cache                           0/0
Updating image state                            Done
Creating fast lookup database                   Done
Updating package cache                           1/1
```

10) Check the file.

```
# ls -l /usr/share/man/man1/exstr.1
```

* Confirm that the file size of the exstr.1 file has been restored.

```
# ls -l /usr/share/man/man1/exstr.1
-r--r--r-- 1 root bin 8214 Nov 6 10:53 /usr/share/man/man1/exstr.1
```

Check the file size.

Reference: How to uninstall a package

(1) Check the number of packages.

```
# pkg list | wc -l
```

* Check the number of packages before uninstalling them.

(2) Uninstall.

```
# pkg uninstall pkg://solaris/text/locale
```

```
# pkg uninstall pkg://solaris/text/locale
           Packages to remove:  1
       Create boot environment: No
Create backup boot environment: No

PHASE                                          ITEMS
Removing old actions                           67/67
Updating package state database                 Done
Updating package cache                           1/1
Updating image state                            Done
Creating fast lookup database                   Done
Updating package cache                           1/1
```

(3) Check the number of packages.

```
# pkg list | wc -l
```

* Confirm that the number has decreased by one package and the number of packages that depend on it.

(4) Check the uninstallation.

```
# pkg list pkg://solaris/text/locale
```

* Confirm that the package has been uninstalled.

```
# pkg list pkg://solaris/text/locale
pkg list: No packages matching 'pkg://solaris/text/locale' installed
```

Reference: How to install a package from the release repository

You need access to an external network to install a package from the release repository.
Set a proxy server for external network access to install a package from the release repository.

(1) Set a proxy.

1) Edit the user environment file.

```
# vi /root/.profile
```

* Add "http_proxy" as follows.

```
                --<Omitted>--
case ${SHELL} in
*bash)
   typeset +x PS1="\u@\h:\w\\$ "
   ;;
esac
http_proxy="proxy.example.com:8080" ;export http_proxy
```

<- Add

* ".profile" resides under the /root directory.

2) Check before reading the user environment file.

```
# env
```

```
# env
HZ=100
LC_MONETARY=
SHELL=/usr/bin/bash
TERM=vt100
LC_NUMERIC=
LC_ALL=
--<Omitted>--
```

3) Read the user environment configuration file.

```
# . /root/.profile
```

* The first period (.) must be followed by a blank.

4) Confirm the reflected changes of the user environment file.

```
# env
```

* Confirm that the setting specified in step 1) has been reflected.

Compare to confirm that the setting has been reflected.

```
# env
HZ=100
LC_MONETARY=
SHELL=/usr/bin/bash
TERM=vt100
LC_NUMERIC=
LC_ALL=
http_proxy=proxy.example.com:8080
--<Omitted>--
```

(2) Confirm communication.

1) Confirm network communication.

```
# ping xx.xx.xx.xx
```

* Confirm network communication by executing ping on your terminal.

(3) Configure the svc:/network/dns/client:default service.

1) Check the service settings.

```
# svcprop dns/client | grep config/nameserver
```

```
# svcprop dns/client | grep config/nameserver
#
```

* By default, there are no settings.

2) Configure the service.

```
# svccfg -s dns/client
```

Make settings as follows.

```
svc:/network/dns/client> listprop config/nameserver
svc:/network/dns/client>
svc:/network/dns/client> setprop config/nameserver =xx.xx.xx.xx
svc:/network/dns/client> exit
```

<- Check DNS server settings
<- No settings by default
<- Set DNS server
<- Exit setting

3) Check the /etc/resolv.conf file.

```
# ls -la /etc/resolv.conf
```

```
# ls -la /etc/resolv.conf
/etc/resolv.conf: No such file or directory
```

* Confirm that the /etc/resolv.conf file does not exist.

4) Start the service.

```
# svcadm enable dns/client
```

* If the service is already running, execute "svcadm refresh dns/client" to reconfigure the service.

5) Check the /etc/resolv.conf file.

```
# ls -la /etc/resolv.conf
```

```
# ls -la /etc/resolv.conf
-rw-r--r--   1 root     root      186 Nov 14  17:18 /etc/resolv.conf
```

* After reconfiguring the service, confirm that the /etc/resolv.conf file has been created.

6) Check the service settings.

```
# svcprop dns/client | grep config/nameserver
```

```
# svcprop dns/client | grep config/nameserver
config/nameserver net_address xx.xx.xx.xx
```

* After reconfiguring the service, confirm that the settings have been reflec

7) Confirm that the service has started.

```
# svcs dns/client
```

```
# svcs dns/client
STATE          STIME    FMRI
online         17:18:17 svc:/network/dns/client:default
```

* Confirm that "online" is the status.

8) Check the name resolution.

```
# nslookup example.com
```

```
# nslookup example.com
Server:        xx.xx.xx.xx
Address:       xx.xx.xx.xx#53

Name:    example.com
Address: yy.yy.yy.yy
```

(4) Configure the name-service/switch service.

1) Check the /etc/nsswitch.conf file settings.

```
# cat /etc/nsswitch.conf  | grep host
```

```
# cat /etc/nsswitch.conf  | grep host
hosts:files
```

* If "None" was set for the name service at OS installation, name resolution is performed locally.

2) Check the service settings.

```
# svcprop name-service/switch  | grep config/host
```

```
# svcprop name-service/switch  | grep config/host
#
```

* By default, there are no settings.

3) Configure the service.

```
# svccfg –s name-service/switch
```

Make settings as follows.

```
svc:/system/name-service/switch> listprop config/host
svc:/system/name-service/switch>
svc:/system/name-service/switch> setprop config/host=“files dns“
svc:/system/name-service/switch> exit
```

<- Check name service settings
<- No setting by default
<- Set name service
<- Exit setting

4) Reconfigure the service.

```
# svcadm refresh name-service/switch
```

* The /etc/nsswitch.conf file is updated at the reconfiguration time.

5) Check the /etc/nsswitch.conf file.

```
# ls -la /etc/nsswitch.conf
```

```
# ls -la /etc/nsswitch.conf
-rw-r--r--   1 root     sys        515 Nov 14  17:20 /etc/nsswitch.conf
```

* Check the file update date and time.

6) Check the /etc/nsswitch.conf file settings.

```
# cat /etc/nsswitch.conf  | grep host
```

```
# cat /etc/nsswitch.conf  | grep host
hosts:files dns
```

* Confirm that "dns" is set.

(5) Install and uninstall packages.

1) Check the publisher.

```
# pkg publisher
```

```
# pkg publisher
PUBLISHER                 TYPE     STATUS P LOCATION
solaris                   origin   online F
```

* The publisher is fixed. It is always solaris.

2) Check the packages.

```
# pkg list | head
```

* Check the packages installed.

3) Check the number of packages.

```
# pkg list | wc -l
```

* Confirm the number of packages before installing them.

4) Install gcc.

```
# pkg install gcc-3
```

* The command displays the number of packages to be installed.

```
# pkg install gcc-3
           Packages to install:  2
            Services to change:  1
      Create boot environment: No
Create backup boot environment: No

DOWNLOAD                          PKGS  FILES      XFER (MB)  SPEED
Completed                         2/2   2010/2010  35.0/35.0  9.0M/s

PHASE                                          ITEMS
Installing new actions                     2216/2216
Updating package state database                 Done
Updating package cache                           0/0
Updating image state                            Done
Creating fast lookup database                   Done
Updating package cache                           1/1
```

5) Check the installation.

```
# pkg list gcc-3
```

* The IFO parameter displays "i" when the installation has succeeded.

```
# pkg list gcc-3
NAME (PUBLISHER)              VERSION                    IFO
developer/gcc-3               3.4.3-0.175.2.0.0.42.1     i--
```

6) Check the number of packages.

```
# pkg list | wc -l
```

* Confirm that the number has increased by two installed packages and the number of packages that depend on them.

7) Uninstall.

```
# pkg uninstall gcc-3
```

```
 pkg uninstall gcc-3
           Packages to remove:  1
            Services to change:  1
      Create boot environment: No
Create backup boot environment: No

PHASE                                          ITEMS
Removing old actions                         414/414
Updating package state database                 Done
Updating package cache                           1/1
Updating image state                            Done
Creating fast lookup database                   Done
Updating package cache                           1/1
```

8) Check the number of packages.

```
# pkg list | wc -l
```

* Compare it with the number of existing packages before uninstallation.

9) Check the uninstallation.

```
# pkg list gcc
```

* Confirm that the packages do not exist.

```
# pkg list gcc
pkg list: No packages matching 'gcc' installed
```

Reference: Installing packages using the package manager

(1) Install the necessary packages, and configure the GUI and VNC.

1) Install packages.

```
# pkg install solaris-desktop
```

```
# pkg install solaris-desktop
                  Packages to install:     314
                  Services to change:       13
                  Create boot environment:  No
Create backup boot environment: Yes
DOWNLOAD              PKGS     FILES        XFER (MB)    SPEED
Completed             314/314  47368/47368  490.0/490.0  2.1M/s

PHASE                                        ITEMS
Installing new action                  77708/77708
Updating package state database          Done
Updating package cache                    0/0
Updating image state                     Done
Creating fast lookup database            Done
Creating fast lookup database             1/1
```

* Package installation takes about 30 minutes.
* The command displays the number of packages to be installed.
* **The "MSG-ID: SMF-8000-YX" error appears immediately after installation, and the consolekit service status is maintenance, but you can ignore this message.**
  After a restart, the consolekit service status changes to online, and it works normally.

3) Restart.

```
# shutdown -y -g0 -i6
```

4) Edit the configuration file.

```
# vi /etc/gdm/custom.conf
```

Add the following contents.

```
  --<Omitted>--
[xdmcp]
Enable=true          <- Add
  --<Omitted>--
```

Add the line.

5) Start the service.

```
# svcadm refresh gdm
# svcadm restart gdm
# svcadm enable xvnc-inetd
```

6) Edit the /etc/default/login file.

```
# vi /etc/default/login
```

Edit the file as follows.

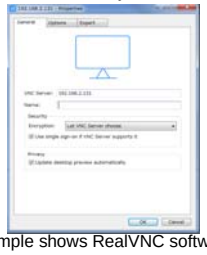
```
# If CONSOLE is set, root can only login on that device.
# If the specified device is /dev/console, then root can also log into
# any of the currently enabled /dev/vt/# virtual terminal devices.
# Comment this line out to allow remote login by root.
#
#CONSOLE=/dev/console
```

Comment it out by adding "#" at the beginning.

* If you logged in as the root user, this step is required.
  If you logged in as a general user, this step is unnecessary.

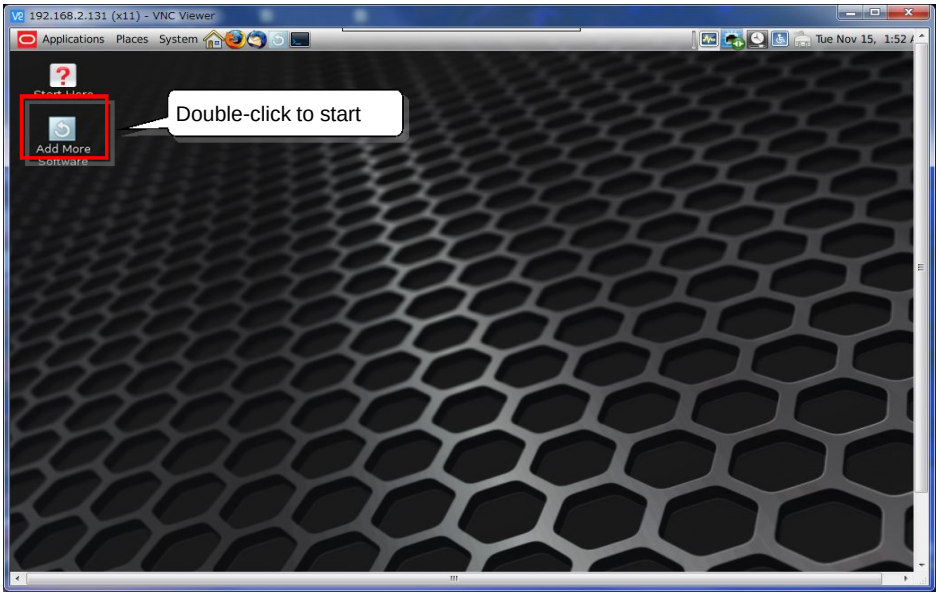
(2) Perform operations on GUI screens.

1) Connect from the VNC client on your terminal.



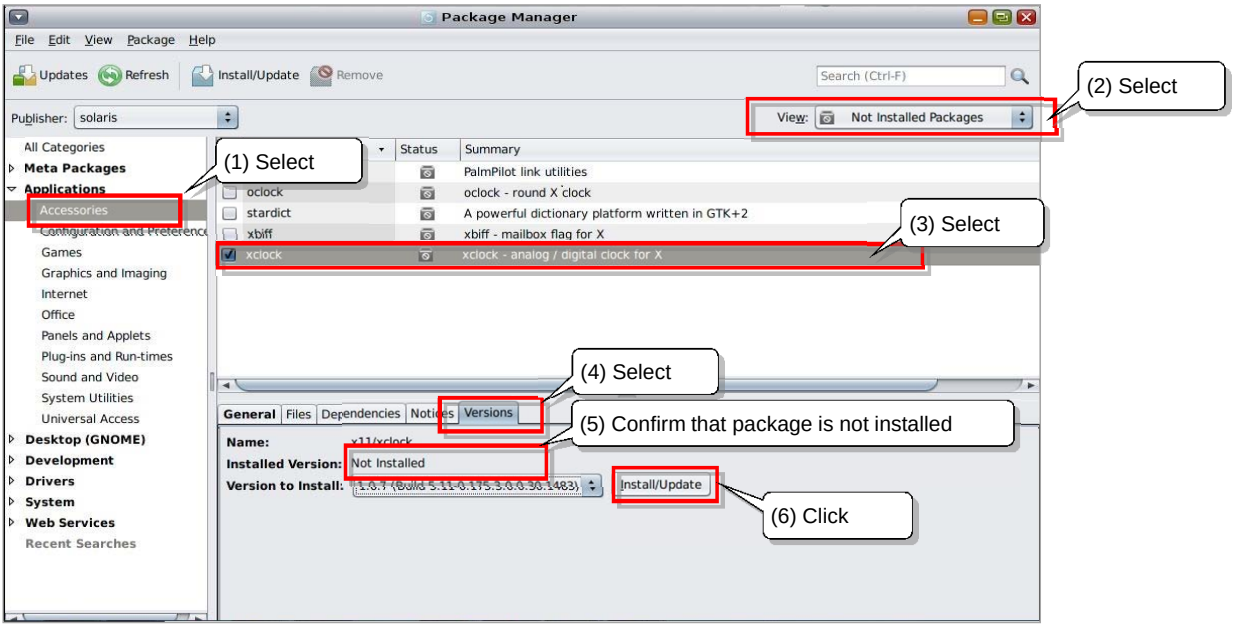
* The example shows RealVNC software.
* You need to download and install the VNC client on the client terminal separately.
* A login screen will appear. Log in by entering the login ID and password of a general user.
* The VNC viewer is free software.

2) Start the package manager.



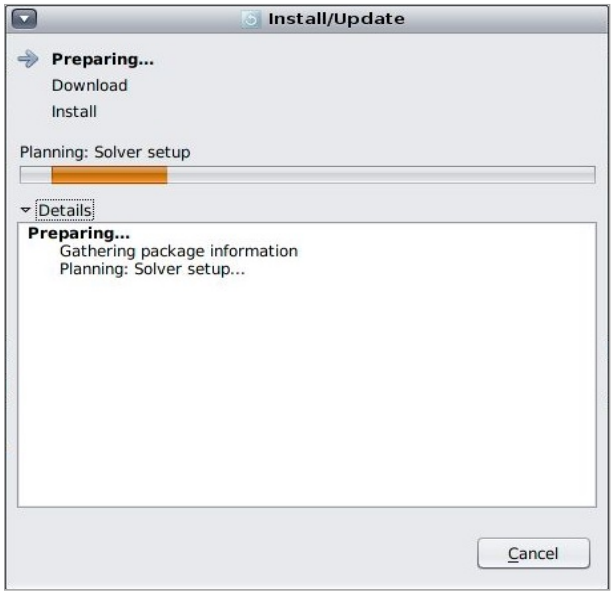
3) Initial screen of the package manager

4) Install a package from the package manager.

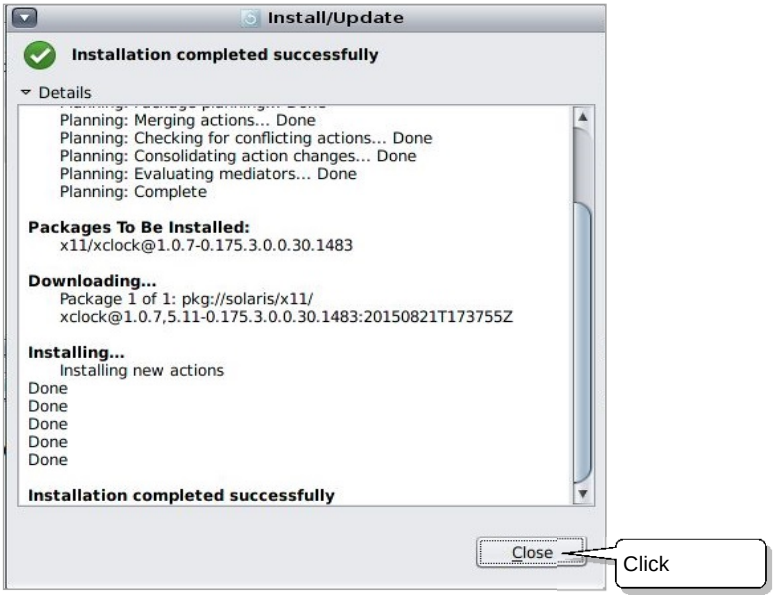


* Here, the xclock package is installed as an example.

5) Install.



6) Installation is completed.



5. Operating and Utilizing a Boot Environment (BE)

5-1. Basic Usage of a BE

This chapter requires a console connection to restart the OS.

(1) Create and check a boot environment.

1) Create a BE.

```
# beadm create be00
```

* be00 is created as a clone of the current boot environment.

2) Check the BE.

```
# beadm list
```

* You can check the current BE status.
* "N" is the displayed Flags value of the currently running BE, and "R" is that of the BE to be started the next time.

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be00    -     -          96.38M static 2016-03-02 14:55
solaris NR    /          3.68G  static 2016-03-01 18:20
```

(2) Select the boot environment to be started the next time.

1) Activate be00.

```
# beadm activate be00
```

2) Check the BE.

```
# beadm list
```

* "R" is the displayed Flags value of be00.
The OS at the next startup will boot in the be00 environment.

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be00    R     -          3.85G  static 2016-03-02 14:55
solaris N     /          727.0K static 2016-03-01 18:20
```

(3) Mount the boot environment.

1) Mount be00.

```
# beadm mount be00 /mnt
```

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be00    R     /mnt       3.85G  static 2016-03-02 14:55
solaris N     /          727.0K static 2016-03-01 18:20
```

2) Check the BE.

```
# beadm list
```

* be00 has been mounted under /mnt.

3) Check the mount destination.

```
# ls /mnt
```

* You can check the be00 environment.

```
# ls /mnt
bin      devices   kernel    net       proc      sol11     var
boot     etc       lib       nfs4      root      system
cdrom    export    media     opt       rpool     tmp
dev      home      mnt       platform  sbin      usr
```

(4) Delete the boot environment.

1) Change the boot environment to be started the next time.

```
# beadm activate solaris
```

* Revert the active environment to solaris because be00 will be deleted.

2) Unmount be00.

```
# beadm unmount be00
```

* Unmount be00 because you will delete it.

3) Check the BE.

```
# beadm list
```

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be00    -     -          96.40M static 2016-03-02 14:55
solaris NR    /          3.67G  static 2016-03-01 18:20
```

4) Delete the BE.

```
# beadm destroy be00
```

```
# beadm destroy be00
Are you sure you want to destroy be00?  This action cannot be undone(y/[n]): y
```

Enter [y].

5) Check the BE.

```
# beadm list
```

* be00 has been deleted.

```
# beadm list
BE      Flags Mountpoint Space Policy Created
--      ----- ---------- ----- ------ -------
solaris NR    /          3.67G static 2016-03-01 18:20
```

5-2. Restoring an Environment Using a BE

(1) Restore a boot environment.

1) Create a BE.

```
# beadm create be01
```

* be01 is created as a clone of the current boot environment.

2) Check the BE.

```
# beadm list
```

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be01    -     -          96.38M static 2016-03-02 16:19
solaris NR    /          3.67G  static 2016-03-01 18:20
```

3) Create a test file.

```
# touch /root/testfile1
# ls –l /root
```

```
# ls -l /root
total 1
-rw-r--r--   1 root     root           0 Mar  2 16:20 testfile1
```

4) Activate be01.

```
# beadm activate be01
# beadm list
```

```
# beadm list
BE      Flags Mountpoint Space Policy Created
--      ----- ---------- ----- ------ -------
be01    R     -          3.85G static 2016-03-02 16:19
solaris N     /          88.0K static 2016-03-01 18:20
```

5) Restart the server.

```
# shutdown -y -g0 -i6
```

* Log in as a general user. Then, switch to root by executing "su -".

```
# beadm list
BE      Flags Mountpoint Space Policy Created
--      ----- ---------- ----- ------ -------
be01    NR    /          3.89G static 2016-03-02 16:19
solaris -     -          6.95M static 2016-03-01 18:20
```

6) Check the BE.

```
# beadm list
```

* The OS booted in be00.

7) Check the test file.

```
# ls -l /root
```

* Confirm that the test file does not exist in be01
since it was created in the solaris boot environment.

```
# ls -l /root
total 0
```

5-3. Package Application Using a BE

(1) Create a BE and install packages.

1) Create a boot environment.

[Syntax] beadm create *BE_name*

```
# beadm create be02
# beadm list
```

* be02 is created as a clone of the current boot environment.

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be01    NR    /          3.89G  static 2016-03-02 16:19
be02    -     -          96.22M static 2016-03-02 17:13
solaris -     -          6.95M  static 2016-03-01 18:20
```

2) Mount the BE.

```
# beadm mount be02 /mnt
# beadm list
```

* Mount the newly created be02 to any directory in
order to apply packages to it.

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be01    NR    /          3.89G  static 2016-03-02 16:19
be02    -     /mnt       96.22M static 2016-03-02 17:13
solaris -     -          6.95M  static 2016-03-01 18:20
```

3) Check the mounting.

```
# ls /mnt
```

* Check the /mnt directory to confirm that be02 is mounted.

```
# ls /mnt
bin       devices   kernel    net       proc      sol11     var
boot      etc       lib       nfs4      root      system
cdrom     export    media     opt       rpool     tmp
dev       home      mnt       platform  sbin      usr
```

4) Check packages.

```
# pkg list gcc-3
```

* Confirm that no packages are installed.

```
root@sol11:~# pkg list gcc-3
pkg list: No packages matching 'gcc-3' installed
```

5) Install packages in the BE.

[Syntax] pkg [*option*] *directory* install *package_name*
[Option] -R: Executes processing for the specified directory.

```
# pkg -R /mnt install gcc-3
```

* Apply the packages to be02, which is not active.

```
# pkg -R /mnt install gcc-3
Packages to install: 1
 Services to change: 1

DOWNLOAD                      PKGS  FILES    XFER (MB)  SPEED
Completed                     1/1   319/319  31.5/31.5  11.8M/s

PHASE                                          ITEMS
Installing new actions                         401/401
Updating package state database                Done
Updating package cache                         0/0
Updating image state                           Done
Creating fast lookup database                  Done
Updating package cache                         1/1
```

6) Check the current boot environment.

```
# pkg list gcc-3
```

* Since the packages are installed in an inactive BE (be02), they are not applied to the current BE (be01).

```
# pkg list gcc-3
pkg list: No packages matching 'gcc-3' installed
```

7) Check the inactive boot environment.

```
# pkg -R /mnt list gcc-3
```

* Confirm that the packages have been installed in be00.
* The IFO parameter displays "i" when the installation has succeeded.

```
# pkg -R /mnt list gcc-3
NAME (PUBLISHER)                  VERSION                    IFO
developer/gcc-3                   3.4.3-0.175.3.0.0.30.0     i--
```

8) Update the boot archive on the new BE.

[Syntax] bootadm update-archive [*option*] *directory*
[Option] -R: Executes processing for the specified directory.

```
# bootadm update-archive -R /mnt
```

9) Unmount the BE.

```
# beadm unmount be02
```

10) Activate the BE.

```
# beadm activate be02
# beadm list
```

* Confirm that be02 has been activated.
* Confirm that "R" is the displayed Flags value of be02.

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be01    N     /          631.0K static 2016-03-02 16:19
be02    R     -          4.28G  static 2016-03-02 17:13
solaris -     -          6.95M  static 2016-03-01 18:20
```

11) Restart.

```
# shutdown -y -g0 -i6
```

* Log in as a general user. Then, switch to root by executing "su -".

12) Check the BE.

```
# beadm list
```

* Confirm that be02 is enabled.

```
# beadm list
BE      Flags Mountpoint Space Policy Created
--      ----- ---------- ----- ------ -------
be01    -     -          6.62M static 2016-03-02 16:19
be02    NR    /          4.36G static 2016-03-02 17:13
solaris -     -          6.95M static 2016-03-01 18:20
```

13) Check the packages.

```
# pkg list gcc-3
```

* The installed packages are displayed since the BEs were switched.

```
# pkg list gcc-3
NAME (PUBLISHER)                  VERSION                    IFO
developer/gcc-3                   3.4.3-0.175.3.0.0.30.0     i--
```

(2) Make changes to the original BE.

1) Activate the BE.

```
# beadm activate be01
# beadm list
```

* Confirm that be01 has been activated.
* Confirm that "R" is the displayed Flags value of be01.

```
# beadm list
BE      Flags Mountpoint Space   Policy Created
--      ----- ---------- -----   ------ -------
be01    R     -          3.90G   static 2016-03-02 16:19
be02    N     /          369.06M static 2016-03-02 17:13
solaris -     -          6.95M   static 2016-03-01 18:20
```

2) Restart.

```
# shutdown -y -g0 -i6
```

* Log in as a user. Then, switch to root by executing "su -".

3) Check the BE.

```
# beadm list
```

* Confirm that be01 is enabled.

```
# beadm list
BE      Flags Mountpoint Space   Policy Created
--      ----- ---------- -----   ------ -------
be01    NR    /          3.94G   static 2016-03-02 16:19
be02    -     -          377.40M static 2016-03-02 17:13
solaris -     -          6.95M   static 2016-03-01 18:20
```

4) Check the packages.

```
# pkg list gcc-3
```

* Since the environment reverted to the original BE, confirm that the packages are not installed.

```
# pkg list gcc-3
pkg list: No packages matching 'gcc-3' installed
```

Reference: Selecting a bootable BE on OBP

1) Move to OBP.

```
# shutdown -y -g0 -i0
```

2) Check available BEs.

```
{0} ok boot -L
```

* Check for available BEs with the -L option.

Select be01.

The output contains the command format for booting from the

```
{0} ok boot -L

Boot device:/pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p0,0  File and args:-L
1 Oracle Solaris 11.3 SPARC
2 be01
3 be02
Select environment to boot:[ 1 - 3 ]: 3

To boot the selected entry, invoke:
boot [<root-device>] -Z rpool/ROOT/be02

Program terminated
```

3) Boot from be01.

```
{0} ok boot -Z rpool/ROOT/be02
```

* Boot from be02 with the -Z option.
* Log in as a general user. Then, switch to root by executing "su -".

```
{0} ok boot -Z rpool/ROOT/be02

SPARC M10-1, No Keyboard
Copyright (c) 1998, 2014, Oracle and/or its affiliates. All rights
reserved.
OpenBoot 4.36.1, 62.2500 GB memory available, Serial #268833945.
[ 2.10.0 ]
Ethernet address b0:99:28:9a:ab:99, Host ID:90061499.
:
:
```

4) Check the BE.

```
# beadm list
```

```
# beadm list
BE      Flags Mountpoint Space   Policy Created
--      ----- ---------- -----   ------ -------
be01    R     -          3.94G   static 2016-03-02 16:19
be02    N     /          391.87M static 2016-03-02 17:13
solaris -     -          6.95M   static 2016-03-01 18:20
```

* Confirm that be02 is enabled.
* The BE started by boot -Z is temporarily the active one.
  To start from the selected BE after a restart, you need to
  activate the selected BE with the beadm activate command.

5) Activate be02.

```
# beadm activate be02
# beadm list
```

```
# beadm list
BE      Flags Mountpoint Space Policy Created
--      ----- ---------- ----- ------ -------
be01    -     -          6.62M static 2016-03-02 16:19
be02    NR    /          4.36G static 2016-03-02 17:13
solaris -     -          6.95M static 2016-03-01 18:20
```

6. Applying an Update Package (SRU)

6-1. Updating the Local Repository Package

This chapter requires a console connection to restart the OS.

(0) Obtain an SRU.

1) Download the SRU archive. Deploy the downloaded archive in an arbitrary directory (/SRU in this example).
Download the SRU from My Oracle Support.

2) Check the downloaded SRU archive.

```
# cd /SRU
# ls -l /SRU
```

```
# ls -l /SRU
total 4757155
-rwxr--r--   1 root   root   1073741824 Feb 16 14:13 SRU15121.zip_a
-rwxr--r--   1 root   root   1073741824 Feb 16 14:13 SRU15121.zip_b
-rwxr--r--   1 root   root    285668346 Feb 16 14:13 SRU15121.zip_c
```

(1) Concatenate the files.

```
# cat SRU15121.zip_a SRU15121.zip_b SRU15121.zip_c > SRU15121.zip
# rm SRU15121.zip_a SRU15121.zip_b SRU15121.zip_c
```

* After the concatenation, delete the original files because they are no longer needed.

(2) Unpack the file.

```
# unzip SRU15121.zip
```

```
# unzip SRU15121.zip
Archive:SRU15121.zip
  inflating:README-zipped-repo.txt
  inflating:install-repo.ksh
 extracting:p22288085_1100_SOLARIS64_1of2.zip
 extracting:p22288085_1100_SOLARIS64_2of2.zip
  inflating:readme-11_3_3_6_0.html
  inflating:readme-11_3_3_6_0.txt
  inflating:sol-11_3_3_6_0-incr-repo_md5sums.txt
```

(3) Check the files.

```
# ls -l
```

```
# ls -l
total 9514536
-rw-r--r--  1 root root        3922 Dec 15 05:21 README-zipped-repo.txt
-rw-r--r--  1 root root   243315199 Feb 16 14:33 SRU15121.zip
-rwxr-xr-x  1 root root       11612 Dec 15 05:21 install-repo.ksh
-rw-r--r--  1 root root  1272657355 Dec 16 09:05 p22288085_1100_SOLARIS64_1of2.zip
-rw-r--r--  1 root root  1160457100 Dec 16 09:14 p22288085_1100_SOLARIS64_2of2.zip
-rw-r--r--  1 root root       55896 Dec 16 06:15 readme-11_3_3_6_0.html
-rw-r--r--  1 root root       39214 Dec 16 06:15 readme-11_3_3_6_0.txt
-rw-r--r--  1 root root         136 Dec 15 05:25 sol-11_3_3_6_0-incr-repo_md5sums.txt
```

(4) Grant the execution right.

```
# chmod +x install-repo.ksh
```

* Perform this step only if the execution right has not been granted.

(5) Execute the installation shell script.

[Syntax] install-repo.ksh -d <*repository_deployment_destination*> [*option*]
[Option] -v: Diagnoses the repository directory.
-c: Compares the checksums of archive files.

```
# env LANG=C ./install-repo.ksh -d /sol11/repo_11_3 -v -c
```

* The -v and -c options are not required, but we recommend specifying them.

```
# env LANG=C ./install-repo.ksh -d /sol11/repo_11_3 -v -c
Using p22288085_1100_SOLARIS64 files for sol-11_3_3_6_0-incr-repo
download.
IPS repository exists at destination /sol11/repo_11_3
Current version:0.175.3.1.0.5.0
Do you want to add to this repository? (y/n)[n]: y

Comparing checksums of downloaded files...done. Checksums match.

Uncompressing p22288085_1100_SOLARIS64_1of2.zip...done.
Uncompressing p22288085_1100_SOLARIS64_2of2.zip...done.
Repository can be found in /sol11/repo_11_3.
Initiating repository rebuild.
Initiating repository verification.
--<Omitted>--
```

Enter [y].

6-2. Applying an Update Package to the OS

(1) Apply package corrections.

1) Check the applicable packages for corrections.

[Syntax] pkg update [*option*]
[Option] -n: Does not apply corrections.
-v: Displays details.

```
# pkg update -nv
```

* The command checks the number and names of the applicable packages for corrections.
* It takes several minutes.

```
# pkg update -nv
            Packages to update:       139
     Estimated space available: 466.29 GB
Estimated space to be consumed:   1.56 GB
       Create boot environment:       Yes
     Activate boot environment:       Yes
Create backup boot environment:        No
          Rebuild boot archive:       Yes

Changed packages:
solaris
  consolidation/X/X-incorporation
    0.5.11,5.11-0.175.3.1.0.2.1489:20150921T191842Z -> 0.5.11,5.11-
0.175.3.2.0.2.1493:20151020T015528Z
  consolidation/ddt/ddt-incorporation
    8.9.15.9.11,5.11:20150916T171410Z ->
8.10.15.11.23,5.11:20151125T000020Z
--<Omitted>--
```

Package versions before and after the corrections were applied are displayed.

If the package version after the correction application is "None", the package is deleted.

2) Apply the corrections.

[Syntax] pkg update [*option*]
[Option] --be-name BE_*name*: Creates a new BE and applies corrections to the BE.

```
# pkg update --be-name be03
```

* The pkg update command, when executed, creates a new BE and applies the update package to the BE.
* Entering the pkg update command may display a confirmation message asking whether you agree to the update package. If so, execute the pkg update command with the --accept option.
  # pkg update --accept --be-name be03

```
# pkg update --be-name be03
            Packages to update: 139
       Create boot environment: Yes
Create backup boot environment:  No

DOWNLOAD                PKGS       FILES      XFER (MB)    SPEED
Completed               39/139     4753/4753  323.2/323.2  27.1M/s

--<Omitted>--

A clone of solaris exists and has been updated and activated.
On the next boot the Boot Environment be03 will be
mounted on '/'.  Reboot when ready to switch to this updated BE.

Updating package cache                           1/1

--<Omitted>--
```

3) Check the BE.

```
# beadm list
```

* Confirm that be03, to which the correction were applied, has been activ
* Confirm that "R" is the displayed Flags value of be03.

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be01    -     -          35.21M static 2016-03-02 16:19
be02    N     /          2.83M  static 2016-03-02 17:13
be03    R     -          11.21G static 2016-03-03 09:52
solaris -     -          6.95M  static 2016-03-01 18:20
```

4) Restart.

```
# shutdown -y -g0 -i6
```

* Restart the OS to switch the BEs (to apply the corrections).
* Log in as a general user. Then, switch to root by executing "su -".

5) Check the BE.

```
# beadm list
```

* Confirm that be03 is enabled.

```
# beadm list
BE      Flags Mountpoint Space  Policy Created
--      ----- ---------- -----  ------ -------
be01    -     -          35.21M static 2016-03-02 16:19
be02    -     -          8.01M  static 2016-03-02 17:13
be03    NR    /          11.33G static 2016-03-03 09:52
solaris -     -          6.95M  static 2016-03-01 18:20
```

6) Check the packages.

```
# pkg update -nv
```

* Since you have installed the update package, confirm that no applicable package for corrections is displayed.
  .

```
# pkg update -nv
No updates available for this image.
```

7) Check the SRU version.

```
# pkg info entire
```

* Check the SRU version applied to be03.

```
# pkg info entire
          Name: entire
       Summary: entire incorporation including Support Repository Update (Oracle
Solaris 11.3.3.6.0).
   Description: This package constrains system package versions to the same
                build.  WARNING: Proper system update and correct package
                selection depend on the presence of this incorporation.
                Removing this package will result in an unsupported system.  For
                more information see:
                https://support.oracle.com/rs?type=doc&id=2045311.1
      Category: Meta Packages/Incorporations
         State: Installed
     Publisher: solaris
       Version: 0.5.11 (Oracle Solaris 11.3.3.6.0)
 Build Release: 5.11
        Branch: 0.175.3.3.0.6.0
Packaging Date: December 13, 2015 08:13:20 PM
          Size: 5.46 kB
          FMRI: pkg://solaris/entire@0.5.11,5.11-0.175.3.3.0.6.0:20151213T201320Z
```

The SRU version is 3.6.

7. Backing Up/Restoring the System Volume

7-1. Backup

This chapter requires a console connection to restart the OS.

7-1-1. Obtaining System Information (Preparation)

(1) Create an area for backup data.

1) Create a new storage pool.

```
# zpool create bkpool c1t1d3
```

* Create a storage pool for storing backup data, etc.

* If attempting to add a disk that was used as the storage pool in the past, the command fails.
In this case, you can execute the command using the -f option as follows:

```
# zpool create -f bkpool c1t1d3
```

2) Check the storage pool.

```
# zpool list
```

* Confirm that the storage pool "bkpool" has been created.

```
# zpool list
NAME    SIZE   ALLOC  FREE   CAP  DEDUP  HEALTH  ALTROOT
bkpool  9.94G  1.01M  9.94G   0%  1.00x  ONLINE  -
rpool   25.8G  17.6G  8.14G  68%  1.00x  ONLINE  -
sol11   19.9G  13.1G  6.75G  66%  1.00x  ONLINE  -
```

3) Create a file system.

```
# zfs create bkpool/log
```

* Create a file system for storing log files.

4) Check the file system.

```
# zfs list
```

* Confirm that the file system "bkpool/log" has been created.

```
# zfs list
NAME                          USED  AVAIL  REFER  MOUNTPOINT
bkpool                       1.16M  9.78G   304K  /bkpool
bkpool/log                    288K  9.78G   288K  /bkpool/log
rpool                        5.79G  6.76G  73.5K  /rpool
rpool/ROOT                   3.72G  6.76G    31K   legacy
--<Omitted>--
```

(2) Collect information before making a backup.

1) Start log collection.

[Syntax] script [*option*] [*file_name*]
[Option] -a: Adds the session record, without overwriting, after the file name

```
# script /bkpool/log/logfile.txt
```

* The subsequently collected information is necessary at the restore time.

```
# script /bkpool/log/logfile.txt
Script started, file is /bkpool/log/logfile.txt
```

The specified file stores the output on the terminal screen after the execution of the script command. When the command ends, you need to enter the exit command to exit.

2) Display system information.

[Syntax] uname [*option*]
[Option] -a: Displays the current system information.

```
# uname -a
```

```
# uname -a
SunOS sol11 5.11 11.3 sun4v sparc sun4v
```

3) Check the OS version.

```
# cat /etc/release
```

* Confirm that "Oracle Solaris 11.3" is displayed as the version.

```
# cat /etc/release
                            Oracle Solaris 11.3 SPARC
  Copyright (c) 1983, 2015, Oracle and/or its affiliates.  All rights reserved.
                             Assembled 06 October 2015
```

4) Check the current date.

```
# date
```

```
# date
Tuesday, November 15, 2016 03:53:34 AM EST
```

5) Check the SRU version.

```
# pkg info entire
```

* Check the currently applied SRU version.

The SRU version is 3.6.

```
# pkg info entire
          Name: entire
       Summary: entire incorporation including Support Repository Update (Oracle
Solaris 11.3.3.6.0).
   Description: This package constrains system package versions to the same
                build.  WARNING: Proper system update and correct package
                selection depend on the presence of this incorporation.
                Removing this package will result in an unsupported system.  For
                more information see:
                https://support.oracle.com/rs?type=doc&id=2045311.1
      Category: Meta Packages/Incorporations
         State: Installed
     Publisher: solaris
       Version: 0.5.11 (Oracle Solaris 11.3.3.6.0)
 Build Release: 5.11
        Branch: 0.175.3.3.0.6.0
Packaging Date: December 13, 2015 08:13:20 PM
          Size: 5.46 kB
          FMRI: pkg://solaris/entire@0.5.11,5.11-0.175.3.3.0.6.0:20151213T201320Z
```

6) Check BEs.

```
# beadm list
```

* Check for the current BE.
* In this example, it is indicated as "NR" for be03.

```
# beadm list
BE            Flags  Mountpoint Space   Policy Created
--            ------ ---------- -----   ------ -------
be01          -      -          7.44M   static 2014-09-26 23:04
be02          -      -          269.11M static 2014-09-26 23:56
be03          NR     /          6.31G   static 2014-09-27 00:56
solaris       -      -          6.58M   static 2014-09-26 01:25
```

7) Check storage pools.

```
# zpool list
```

* Confirm that the displayed storage pools are bkpool, rpool, and sol11. "bkpool" is the storage pool for storing backup data, etc. "rpool" is the root pool. "sol11" is the storage pool created as the repository described in Chapter 4.

```
# zpool list
NAME    SIZE  ALLOC   FREE  CAP  DEDUP  HEALTH  ALTROOT
bkpool 9.94G  1.17M  9.94G   0%  1.00x  ONLINE  -
rpool  25.8G  17.6G  8.14G  68%  1.00x  ONLINE  -
sol11  19.9G  13.1G  6.75G  66%  1.00x  ONLINE  -
```

8) Check the storage pool status.

```
# zpool status
```

* Confirm that no error is displayed.
* Check the storage pool "bkpool" configured from c1t1d3, the root pool "rpool" from the mirror configuration of c1t1d0s0 and c1t1d1s0, and the storage pool "sol11" configured from c1t1d2.

```
# zpool status
  pool: bkpool
 state: ONLINE
  scan: none requested
config:

        NAME        STATE      READ WRITE CKSUM
        bkpool      ONLINE        0     0     0
          c1t1d3    ONLINE        0     0     0

errors: No known data errors

  pool: rpool
 state: ONLINE
  scan: resilvered 5.79G in 0h24m with 0 errors on Fri Sep 26 02:55:12 2014
config:

      NAME          STATE     READ WRITE CKSUM
      rpool         ONLINE       0     0     0
        mirror-0    ONLINE       0     0     0
          c1t1d0s0  ONLINE       0     0     0
          c1t1d1s0  ONLINE       0     0     0

errors: No known data errors

  pool: sol11
 state: ONLINE
  scan: none requested
config:

        NAME        STATE     READ WRITE CKSUM
        sol11       ONLINE       0     0     0
          c1t1d2    ONLINE       0     0     0

errors: No known data errors
```

9) Check the file system.

```
# zfs list
```

* Check the current file system configuration.

```
# zfs list
NAME                        USED  AVAIL  REFER  MOUNTPOINT
bkpool                     1.17M  9.78G   304K  /bkpool
bkpool/log                  296K  9.78G   296K  /bkpool/log
rpool                      17.8G  7.55G   384K  /rpool
rpool/ROOT                 11.6G  7.55G   288K  legacy
rpool/ROOT/be01            13.2M  7.55G  8.26G  /
rpool/ROOT/be01/var        5.69M  7.55G   267M  /var
rpool/ROOT/be02             363M  7.55G  3.85G  /
rpool/ROOT/be02/var        42.1M  7.55G   230M  /var
--<Omitted>--
rpool/dump                 4.13G  7.67G  4.00G  -
rpool/export                920K  7.55G   304K  /export
rpool/export/home           616K  7.55G   304K  /export/home
rpool/export/home/user01    312K  7.55G   312K  /export/home/user01
rpool/swap                 2.06G  7.61G  2.00G  -
sol11                      13.1G  6.44G   304K  /sol11
sol11/repo_11_3            13.1G  6.44G  13.1G  /sol11/repo_11_3
```

10) Check the storage pool version.

[Syntax] zpool upgrade [*option*]

[Option] -v: Displays the current ZFS pool version.

```
# zpool upgrade -v
```

* Confirm that the version number is 37.

```
# zpool upgrade -v
This system is currently running ZFS pool version 37.

The following versions are supported:

VER  DESCRIPTION
---  --------------------------------------------------------
 1   Initial ZFS version
 2   Ditto blocks (replicated metadata)
                  :
 37  lz4 compression
For more information on a particular version, including supported
releases,
see the ZFS Administration Guide.
```

11) Check the ZFS version.

[Syntax] zfs upgrade [*option*] <-a | *file_system*>

[Option] -v ZFS: Displays the ZFS file system version and supported functions.

```
# zfs upgrade -v
```

* Confirm that numbers up to 6 are displayed under VER.

```
# zfs upgrade -v
The following filesystem versions are supported:

VER  DESCRIPTION
---  --------------------------------------------------------
 1   Initial ZFS filesystem version
 2   Enhanced directory entries
 3   Case insensitive and SMB credentials support
 4   userquota, groupquota properties
 5   System attributes
 6   Multilevel file system support

For more information on a particular version, including supported
releases,
see the ZFS Administration Guide.
```

12) Check the current property information.

```
# zpool get all rpool
# zfs get all rpool/ROOT
# zfs get all rpool/ROOT/be01
# zfs get all rpool/ROOT/be01/var
# zfs get all rpool/ROOT/be02
# zfs get all rpool/ROOT/be02/var
# zfs get all rpool/ROOT/be03
# zfs get all rpool/ROOT/be03/var
# zfs get all rpool/ROOT/solaris
# zfs get all rpool/ROOT/solaris-backup-1
# zfs get all rpool/ROOT/solaris-backup-1/var
# zfs get all rpool/ROOT/solaris/var
# zfs get all rpool/VARSHARE
# zfs get all rpool/VARSHARE/pkg
# zfs get all rpool/VARSHARE/pkg/repositories
# zfs get all rpool/VARSHARE/zones
# zfs get all rpool/dump
# zfs get all rpool/export
# zfs get all rpool/export/home
# zfs get all rpool/export/home/user01
# zfs get all rpool/swap
```

```
# zpool get all rpool
NAME   PROPERTY  VALUE  SOURCE
--<Omitted>--
rpool  version   37     default
# zfs get all rpool/ROOT
--<Omitted>--
# zfs get all rpool/dump
NAME         PROPERTY         VALUE                  SOURCE
rpool/dump   available        1.46G                  -
--<Omitted>--
rpool/dump   volblocksize     1M                     -
rpool/dump   volsize          2G                     local
rpool/dump   zoned            off                    default
--<Omitted>--
# zfs get all rpool/swap
NAME         PROPERTY         VALUE                  SOURCE
rpool/swap   available        1.46G                  -
--<Omitted>--
rpool/swap   volblocksize     1M                     -
rpool/swap   volsize          1G                     local
rpool/swap   zoned            off                    default
```

* Check the property information for the storage pools and file systems because it will be needed after restore.
* Confirm that the storage pool versions match (or do not match) the current ZFS pool version checked in step (2) 10) in 7-1-1.
* Be sure to check the property information for the dump device and swap device because they will be re-created after restore.

Reference: How to batch execute the "zfs get all" command

Reference) Check the property values of all file systems.

```
# zfs get all `zfs list -H -o name`
```

13) Check the disk capacity.

```
# df -h
```

* Check the disk usage. "Used" shows the amount of data used.

```
# df -h
Filesystem             Size  Used  Available Capacity  Mounted on
rpool/ROOT/be03        13G   5.5G      3.1G        64%  /
/devices                0K     0K        0K         0%  /devices
/dev                    0K     0K        0K         0%  /dev
--<Omitted>--
/export/home/user01  6.8G    33K      6.8G         1%  /home/user01
```

14) Check the device names of the disks.

```
# format < /dev/null
```

* Check the device name of each disk.

```
# format < /dev/null
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c1t1d0 <Unknown-Unknown-0001-26.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p0,0
       1. c1t1d1 <Unknown-Unknown-0001-26.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p1,0
       2. c1t1d2 <Unknown-Unknown-0001-20.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p2,0
       3. c1t1d3 <Unknown-Unknown-0001-10.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p3,0
Specify disk (enter its number):
```

15) Output the disk format information for the root pool.

```
# prtvtoc /dev/rdsk/c1t1d0s2 > /bkpool/log/map0
# prtvtoc /dev/rdsk/c1t1d1s2 > /bkpool/log/map1
```

* Save the disk format information for the root pool to a file.
* If the root pool has a mirror configuration, output the individual disk format information.
* The disk format information is referenced when the root pool is restored.

Reference: Outputting disk format information at the EFI labeling time

Reference) Output the disk format information for the root pool.

```
# prtvtoc /dev/rdsk/c1t1d0 > /bkpool/log/map0
# prtvtoc /dev/rdsk/c1t1d1 > /bkpool/log/map1
```

* In cases of the EFI label, slice numbers are not required.

16) Check the disk format information.

```
# cat /bkpool/log/map0
# cat /bkpool/log/map1
```

```
# cat /bkpool/log/map0
* /dev/rdsk/c1t1d0s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      63 sectors/track
*     255 tracks/cylinder
*   16065 sectors/cylinder
*    1697 cylinders
*    1695 accessible cylinders
*
* Flags:
*   1:unmountable
*  10:read-only
*
*                         First   Sector    Last
* Partition  Tag  Flags  Sector  Count     Sector    Mount Directory
       0      2     00       0   27230175  27230174
       2      5     01       0   27230175  27230174


# cat /bkpool/log/map1
* /dev/rdsk/c1t1d1s2 partition map
--<Omitted>--
```

17) Log collection is completed.

```
# exit
```

```
# exit
Script done, file is /bkpool/log/logfile.txt
```

* Execution of the script command ends.

7-1-2. Creating a ZFS Snapshot

(1) Create a snapshot.

(1) Create a snapshot of the root pool.

[Syntax] zfs snapshot [*option*] <*file_system*@*snap_name*|*volume*@*snap_name*>

[Option] -r: Creates a snapshot of the ZFS file system with everything under the volume.

```
# zfs snapshot -r rpool@backup
```

2) Display snapshots.

[Syntax] zfs list [*option*] [*file_system*|*volume*|*snapshot*]

[Option] -r: Displays data set information.

-t: Displays the types of the displayed data sets.

```
# zfs list -r -t snapshot
```

```
# zfs list -r -t snapshot
NAME                              USED  AVAIL  REFER  MOUNTPOINT
rpool@backup                         0      -   73.5K  -
rpool/ROOT@backup                    0      -     31K  -
rpool/ROOT/be01@backup               0      -   2.63G  -
rpool/ROOT/be01/var@backup           0      -    133M  -
rpool/ROOT/be02@backup               0      -   2.76G  -
rpool/ROOT/be02/var@backup           0      -    123M  -
rpool/ROOT/be03@install           7.28M     -   2.03G  -

--<Omitted>--
```

3) Delete the snapshots of the dump device and swap device.

```
# zfs destroy rpool/dump@backup
# zfs destroy rpool/swap@backup
```

```
rpool/dump@backup                    0      -   2.00G  -
rpool/swap@backup                    0      -   1.00G  -
```

* The snapshots do not need to be saved because the areas for the dump device and swap device are temporary.

4) Display snapshots.

[Syntax] zfs list [*option*] [*file_system*|*volume*|*snapshot*]

[Option] -r: Displays data set information.

-t: Displays the types of the displayed data sets.

```
# zfs list -r -t snapshot
```

* Confirm that the snapshots of the dump device and swap device have been deleted.

```
# zfs list -r -t snapshot
NAME                              USED  AVAIL  REFER  MOUNTPOINT
rpool@backup                         0      -   73.5K  -
rpool/ROOT@backup                    0      -     31K  -
rpool/ROOT/be01@backup               0      -   2.63G  -
rpool/ROOT/be01/var@backup           0      -    133M  -
rpool/ROOT/be02@backup               0      -   2.76G  -
rpool/ROOT/be02/var@backup           0      -    123M  -
rpool/ROOT/be03@install           7.28M     -   2.03G  -

--<Omitted>--
```

7-1-3. Creating a Root Pool Stream

(1) Execute a backup.

1) Create a file system.

```
# zfs create bkpool/data
```

* Create a file system for storing backup data.

2) Check the file system.

```
# zfs list
```

* Confirm that "bkpool/data" has been created.

```
# zfs list
NAME                        USED  AVAIL  REFER  MOUNTPOINT
bkpool                      124K  4.89G    32K  /bkpool
bkpool/data                  31K  4.89G    31K  /bkpool/data
bkpool/log                   31K  4.89G    31K  /bkpool/log
rpool                      6.15G  6.41G  73.5K  /rpool
rpool/ROOT                 3.56G  6.41G    31K  legacy
--<Omitted>--
```

3) Start the backup.

[Syntax] zfs send [*option*] <*snapshot*>

[Option] -R: Outputs streams of everything under the volume.

-v: Displays detailed information about the generated stream package.

```
# zfs send -Rv rpool@backup |gzip > /bkpool/data/archive.zfs.gz
```

* "WARNING" is displayed because the snapshots of the dump device and swap device have been deleted beforehand. It is not a problem, so ignore it.

* Store the ZFS streams in the archive.zfs.gz file as backup data.
The stream size exceeds the capacity of the backup storage pool, so compress and then save the backup data.
Normally, the capacity of the prepared backup destination is sufficiently larger than the backup data.

```
# zfs send -Rv rpool@backup |gzip >
/bkpool/data/archive.zfs.gz
WARNING:could not send rpool/swap@backup:does not exist
WARNING:could not send rpool/dump@backup:does not exist
sending full stream to rpool@backup
sending full stream to rpool/VARSHARE@backup
sending full stream to rpool/VARSHARE/pkg@backup
sending full stream to
rpool/VARSHARE/pkg/repositories@backup
sending full stream to rpool/VARSHARE/zones@backup
sending full stream to rpool/export@backup
sending full stream to rpool/export/home@backup
sending full stream to rpool/export/home/user01@backup
sending full stream to rpool/ROOT@backup
sending full stream to rpool/ROOT/be03@install
--<Omitted>--
```

4) Check the backup data.

```
# ls -l /bkpool/data
```

* Confirm that the archive.zfs.gz file has been created.

```
# ls -l /bkpool/data
total 3425513
-rw-r--r--   1 root     root     1752463386  Sep 30  00:28 archive.zfs.gz
```

3) Execute export.

```
# zpool export bkpool
```

* After the backup ends, export the backup storage pool.

6) Delete snapshots.

```
# zfs destroy -r rpool@backup
```

* After the backup ends, delete the unnecessary snapshots.

7) Go to OBP.

```
# shutdown -y -g0 -i0
```

* Go to OBP.

8) Confirm the ok prompt.

```
{0} ok
```

7-2. Restore

7-2-1. Starting the System for Restoring the Volume

(1) Start the OS by CD boot.

1) Boot from cdrom.

```
{0} ok boot cdrom
```

* Boot from the OS media used to perform restore.
* Do not disconnect the console until after the restart in step (1) in 7-2-6.

2) Select a keyboard layout.

```
1. Arabic                15. Korean
2. Belgian               16. Latin-American
3. Brazilian             17. Norwegian
4. Canadian-Bilingual    18. Portuguese
5. Canadian-French       19. Russian
6. Danish                20. Spanish
7. Dutch                 21. Swedish
8. Dvorak                22. Swiss-French
9. Finnish               23. Swiss-German
10. French               24. Traditional-Chinese
11. German               25. TurkishQ
12. Italian              26. UK-English
13. Japanese-type6       27. US-English
14. Japanese
To select the keyboard layout, enter a number [default 27]:27
```

Select **27. US-English**.

3) Select a language.

```
1. Chinese - Simplified
2. Chinese - Traditional
3. English
4. French
5. German
6. Italian
7. Japanese
8. Korean
9. Portuguese - Brazil
10. Spanish
To select the language you wish to use, enter a number [default is 3]:3
```

Select **3. English**.

4) Select from the installation menu.

```
Welcome to the Oracle Solaris installation menu

     1  Install Oracle Solaris
     2  Install Additional Drivers
     3  Shell
     4  Terminal type (currently xterm)
     5  Reboot

Please enter a number [1]: 3
```

Select **3 Shell**.

5) Confirm the prompt.

```
#
```

After the shell starts, the prompt appears.

Exit the shell to return to the main menu.

```
#
```

7-2-2. Checking the Backup Data

(1) Check the backup data.

1) Check the storage pools that can be imported.

```
# zpool import
```

* Execute the above command to display a list of storage pools that can be imported.

* It displays the following storage pools:
rpool: For the root pool
bkpool: For storing backup data and log data
sol11: For storing repository data

```
# zpool import
  pool: bkpool
    id: 6551840689761325335
 state: ONLINE
action: The pool can be imported using its name or numeric identifier.
config:

    bkpool       ONLINE
          c1t1d3 ONLINE

  pool: sol11
    id: 17635611426915527343
 state: ONLINE
action: The pool can be imported using its name or numeric identifier.
config:

        sol11    ONLINE
          c1t1d2 ONLINE

  pool: rpool
    id: 12235465592379277880
 state: ONLINE
action: The pool can be imported using its name or numeric identifier.
config:

        rpool        ONLINE
          mirror-0   ONLINE
            c1t1d0s0 ONLINE
            c1t1d1s0 ONLINE
```

2) Import the backup storage pool.

```
# zpool import bkpool
```

3) Check the backup storage pool.

```
# zpool list
```

* The command displays only the imported storage pools.

```
# zpool list
NAME     SIZE  ALLOC   FREE  CAP  DEDUP  HEALTH  ALTROOT
bkpool  9.94G  6.71G  3.23G  67%  1.00x  ONLINE  -
```

4) Check the backup file.

```
# ls -l /bkpool/data/
```

```
# ls -l /bkpool/data/
total 3425513
-rw-r--r-- 1 root root 1752463386 Sep 29 15:28 archive.zfs.gz
```

5) Check the disk format information file.

```
# ls -l /bkpool/log
```

```
# ls -l /bkpool/log/
total 210
-rw-r--r--   1 root     root      104571  Sep 29  14:35   logfile.txt
-rw-r--r--   1 root     root         478  Sep 29  14:34   map0
-rw-r--r--   1 root     root         478  Sep 29  14:34   map1
```

6) Execute disk partitioning.

```
# fmthard -s /bkpool/log/map0 /dev/rdsk/c1t1d0s2
# fmthard -s /bkpool/log/map1 /dev/rdsk/c1t1d1s2
```

* Restore the partition information at the backup time to the disks "c1t1d0" and "c1t1d1" for the root pool.

Reference: Executing disk partitioning at the EFI labeling time

Reference) Execute disk partitioning.

```
# fmthard -s /bkpool/log/map0 /dev/rdsk/c1t1d0
# fmthard -s /bkpool/log/map1 /dev/rdsk/c1t1d1
```

* In cases of the EFI label, slice numbers are not required.

- If an rpool exists, import the rpool in the following procedure. After deleting the existing rpool, create one again.
- If an rpool does not exist, such as when the disk was replaced due to a physical fault, set disk partitioning, and then create an rpool and restore the data.

7-2-3. Creating a Root Pool

(1) Create a root pool.

1) Check the storage pools that can be imported.

```
# zpool import
```

* Check whether the rpool is displayed.
(In this document, it is assumed displayed here and subsequently.)

```
# zpool import
  pool: sol11
    id: 17635611426915527343
 state: ONLINE
action: The pool can be imported using its name or numeric identifier.
config:

        sol11    ONLINE
          c1t1d2 ONLINE

  pool: rpool
    id: 12235465592379277880
 state: ONLINE
action: The pool can be imported using its name or numeric identifier.
config:

     rpool         ONLINE
       mirror-0    ONLINE
         c1t1d0s0  ONLINE
         c1t1d1s0  ONLINE
```

2) Import the root pool.

```
# zpool import rpool
```

* Import the root pool.

3) Check the storage pool.

```
# zpool list
```

```
# zpool list
NAME     SIZE  ALLOC   FREE  CAP  DEDUP  HEALTH  ALTROOT
bkpool  9.94G  6.70G  3.23G  67%  1.00x  ONLINE  -
rpool   25.8G  17.6G  8.13G  68%  1.00x  ONLINE  -
```

4) Delete the imported root pool.

```
# zpool destroy rpool
```

* Delete this root pool because a root pool will be restored from backup data.

5) Create a new root pool.

```
# zpool create rpool mirror c1t1d0s0 c1t1d1s0
```

* The root pool of the restore destination has the same mirror configuration as the root pool of the backup source.
* To not match the version with that checked in step (2) 12) in 7-1-1, create the storage pool of the version specified in the following option.
[Syntax] zpool create [*option*] <*pool*> <*device*>
[Option] -o version=<*pool_version*>

6) Check the new root pool.

```
# zpool list
```

```
# zpool list
NAME     SIZE  ALLOC   FREE  CAP  DEDUP  HEALTH  ALTROOT
bkpool  9.94G  6.70G  3.23G  67%  1.00x  ONLINE  -
rpool   25.8G  1.10M  25.7G   0%  1.00x  ONLINE  -
```

7) Check the status of the new root pool.

```
# zpool status
```

* Confirm that the new root pool has a mirror configuration.

```
# zpool status
  pool: bkpool
 state: ONLINE
  scan: none requested
config:

        NAME      STATE     READ WRITE CKSUM
        bkpool    ONLINE       0     0     0
          c1t1d3  ONLINE       0     0     0

errors: No known data errors

  pool: rpool
 state: ONLINE
  scan: none requested
config:

        NAME          STATE   READ WRITE CKSUM
        rpool         ONLINE     0     0     0
          mirror-0    ONLINE     0     0     0
            c1t1d0s0  ONLINE     0     0     0
            c1t1d1s0  ONLINE     0     0     0

errors: No known data errors
```

7-2-4. Restoring the File System of the Root Pool

(1) Restore.

1) Start the restore.

[Syntax] zfs receive [*option_1*] [*option_2*] <*file_system*>
[Option] -v: Outputs detailed information about the stream and the time taken for the receive operation.
-F: Forcibly rolls back the file system from the latest snapshot.

```
# gzcat /bkpool/data/archive.zfs.gz | zfs receive -vF rpool
```

```
# gzcat /bkpool/data/archive.zfs.gz | zfs receive -vF rpool
receiving full stream of rpool@backup into rpool@backup
received 91.8KB stream in 1 seconds (91.8KB/sec)
receiving full stream of rpool/VARSHARE@backup into rpool/VARSHARE@backup
received 2.47MB stream in 1 seconds (2.47MB/sec)
--<Omitted>--
found clone origin rpool/ROOT/be03@snap01
receiving incremental stream of rpool/ROOT/solaris@backup into
rpool/ROOT/solaris@backup
received 9.38MB stream in 5 seconds (1.88MB/sec)
found clone origin rpool/ROOT/be03/var@snap01
receiving incremental stream of rpool/ROOT/solaris/var@backup into
rpool/ROOT/solaris/var@backup
received 4.36MB stream in 3 seconds (1.45MB/sec)
#
```

2) Create a dump device and swap device.

[Syntax] zfs create [*option*] <*volume*>
[Option] -o volblocksize=<*size*>: Sets volblocksize.
-V <size>: Specifies volsize.

```
# zfs create -o volblocksize=1M -V 2G rpool/dump
# zfs create -o volblocksize=1M -V 1G rpool/swap
```

* You need to create the dump device and swap device separately because they are not backed up.
* Specify volblocksize and volsize with reference to the sizes of the dump device and swap device checked in step (2) 12) in 7-1-1.

3) Check the dump device and swap device.

```
# zfs list
```

```
# zfs list
NAME                          USED  AVAIL  REFER  MOUNTPOINT
--<Omitted>--
rpool/dump                   2.06G  6.60G    16K  -
rpool/export                   98K  4.53G    32K  /export
rpool/export/home              66K  4.53G    32K  /export/home
rpool/export/home/user01       34K  4.53G    34K  /export/home/user01
rpool/swap                   1.03G  5.56G    16K  -
```

4) Export.

```
# zpool export bkpool
```

* After restore, export the storage pool that stores the backup.

5) Confirm that the export has been done.

```
# zpool list
```

* Confirm that bkpool is not displayed.

```
# zpool list
NAME     SIZE  ALLOC  FREE   CAP  DEDUP  HEALTH  ALTROOT
rpool   25.8G  17.7G  8.08G  68%  1.00x  ONLINE  -
```

7-2-5. Setting the Boot Block

(1) Prepare to create a boot block.

1) Check BEs.

```
# beadm list
```

* Check for the BE at the backup time by referencing the information checked in step (2) 6) in 7-1-1.

```
# beadm list
be_find_current_be:failed to find current BE name
BE              Flags  Mountpoint Space   Policy Created
--              ------ ---------- -----   ------ -------
be01            -      -          7.26M   static 2014-09-29 15:58
be02            -      -          268.75M static 2014-09-29 15:57
be03            -      -          6.31G   static 2014-09-29 15:40
solaris         -      -          6.41M   static 2014-09-29 15:58
```

2) Mount the BE.

```
# beadm mount be03 /tmp/mnt
```

3) Check the BE.

```
# beadm list
```

* Confirm that be03 has been mounted to /tmp/mnt.

```
# beadm list
be_find_current_be:failed to find current BE name
BE              Flags  Mountpoint Space   Policy Created
--              ------ ---------- -----   ------ -------
be01            -      -          7.26M   static 2014-09-29 15:58
be02            -      -          268.75M static 2014-09-29 15:57
be03            -      /tmp/mnt   6.31G   static 2014-09-29 15:40
solaris         -      -          6.41M   static 2014-09-29 15:58
```

4) Check the device path names of the disks.

```
# format < /dev/null
```

* Check the device path name of each disk.

```
# format < /dev/null
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c1t1d0 <Unknown-Unknown-0001-26.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p0,0
       1. c1t1d1 <Unknown-Unknown-0001-26.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p1,0
       2. c1t1d2 <Unknown-Unknown-0001-20.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p2,0
       3. c1t1d3 <Unknown-Unknown-0001-10.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p3,0
Specify disk (enter its number):
```

5) Check the storage pool status.

```
# zpool status
```

* Confirm that there is no error.

```
# zpool status
  pool: rpool
 state: ONLINE
  scan: none requested
config:

        NAME          STATE     READ WRITE CKSUM
        rpool         ONLINE       0     0     0
          mirror-0    ONLINE       0     0     0
            c1t1d0s0  ONLINE       0     0     0
            c1t1d1s0  ONLINE       0     0     0

errors: No known data errors
```

(2) Create and check the boot block.

1) Set the boot block.

[Syntax] bootadm install-bootloader [*option*]
[Option] -P <pool_name>: Specifies the pool name.

```
# bootadm install-bootloader -P rpool
```

* Write boot information to the rpool.

2) Delete the device path.

```
# devfsadm -Cn -r /tmp/mnt
```

* Delete the device path of the restored system.

3) Set the reconfiguration of the device path.

```
# touch /tmp/mnt/reconfigure
```

* Set the reconfiguration of the device path at the first startup after restore.

4) Unmount.

```
# beadm unmount be03
```

5) Activate the BE.

```
# beadm activate be03
```

```
# beadm activate be03
be_find_current_be:failed to find current BE name
be_find_current_be:failed to find current BE name
```

* The message on the right may be output, but it is not a problem.

6) Check the BE.

```
# beadm list
```

```
# beadm list
be_find_current_be:failed to find current BE name
BE              Flags  Mountpoint Space   Policy Created
--              ------ ---------- -----   ------ -------
be01            -      -          7.26M   static 2014-09-29 15:58
be02            -      -          268.75M static 2014-09-29 15:57
be03            R      -          6.31G   static 2014-09-29 15:40
solaris         -      -          6.41M   static 2014-09-29 15:58
```

* Confirm that be03 has been activated.
* Confirm that "R" is the displayed Flags value of be03.

7) Export the root pool.

```
# zpool export rpool
```

* Export the root pool.

8) Confirm that the export has been done.

```
# zpool list
```

```
# zpool list
no pools available
```

* Confirm that the repository pool is not displayed.

9) Check OBP parameters (boot-device, auto-boot?).

```
# eeprom boot-device
# eeprom auto-boot?
```

```
# eeprom boot-device
boot-device=disk0 disk1
# eeprom auto-boot?
auto-boot?=false
```

* disk0 and disk1 are the alias names of the system volume.
* Confirm that auto-boot is set to false (OS does not start up automatically).

7-2-6. Starting the OS in the Restored Environment

Import a storage pool (sol11) so that the repository storage pool is recognized after an OS restart.

(1) Import a storage pool.
1) Check the storage pool to be imported.

```
# zpool import
```

```
# zpool import
  pool: bkpool
    id: 6551840689761325335
 state: ONLINE
action: The pool can be imported using its name or numeric identifier.
config:

        bkpool   ONLINE
          c1t1d3 ONLINE

  pool: sol11
    id: 17635611426915527343
 state: ONLINE
action: The pool can be imported using its name or numeric identifier.
config:

        sol11    ONLINE
          c1t1d2 ONLINE

  pool: rpool
    id: 7516732516870017416
 state: ONLINE
action: The pool can be imported using its name or numeric identifier.
config:

        rpool        ONLINE
          mirror-0   ONLINE
            c1t1d0s0 ONLINE
            c1t1d1s0 ONLINE
```

2) Import the repository storage pool.

```
# zpool import sol11
```

* Import the repository storage pool "sol11".

3) Check the storage pool.

```
# zpool list
```

```
# zpool list
NAME    SIZE  ALLOC   FREE  CAP  DEDUP  HEALTH  ALTROOT
sol11  19.9G  13.1G  6.75G  66%  1.00x  ONLINE  -
```

4) Exit the shell.

```
# exit
```

5) Installation menu

```
Welcome to the Oracle Solaris installation menu

      1  Install Oracle Solaris
      2  Install Additional Drivers
      3  Shell
      4  Terminal type (currently xterm)
      5  Reboot

Please enter a number [1]: 5
```

Select **5 Reboot**.

* After the restart, log in as a general user, and then switch to the root user by executing "su -".

7-2-7. Checking the System Information After Restore

(1) Check the system.

1) Display system information.

```
# uname -a
```

```
# uname -a
SunOS sol11 5.11 11.3 sun4v sparc sun4v
```

* Confirm that the displayed information is the same as that checked in step (2) 2) in 7-1-1.

2) Check the version.

```
# cat /etc/release
```

```
# cat /etc/release
                          Oracle Solaris 11.3 SPARC
  Copyright (c) 1983, 2015, Oracle and/or its affiliates.  All rights reserved.
                           Assembled 06 October 2015
```

* Confirm that the displayed information is the same as that checked in step (2) 3) in 7-1-1.

3) Check the date.

```
# date
```

```
# date
Tuesday, November 15, 2016 03:53:34 AM EST
```

4) Check the SRU version.

```
# pkg info entire
```

* Confirm that the displayed information is the same as that checked in step (2) 5) in 7-1-1.

```
# pkg info entire
         Name: entire
      Summary: entire incorporation including Support Repository Update (Oracle
Solaris 11.3.3.6.0).
  Description: This package constrains system package versions to the same
               build.  WARNING: Proper system update and correct package
               selection depend on the presence of this incorporation.
               Removing this package will result in an unsupported system.  For
               more information see:
               https://support.oracle.com/rs?type=doc&id=2045311.1
     Category: Meta Packages/Incorporations
        State: Installed
    Publisher: solaris
      Version: 0.5.11 (Oracle Solaris 11.3.3.6.0)
 Build Release: 5.11
       Branch: 0.175.3.3.0.6.0
Packaging Date: December 13, 2015 08:13:20 PM
         Size: 5.46 kB
         FMRI: pkg://solaris/entire@0.5.11,5.11-0.175.3.3.0.6.0:20151213T201320Z
```

The SRU version is 3.6.

5) Check BEs.

```
# beadm list
```

* Confirm that the displayed information is the same as that checked in step (2) 6) in 7-1-1.

```
# beadm list
BE              Flags  Mountpoint Space   Policy Created
--              ------ ---------- -----   ------ -------
be01            -      -          7.26M   static 2014-09-30 00:58
be02            -      -          268.75M static 2014-09-30 00:57
be03            NR     /          6.37G   static 2014-09-30 00:40
solaris         -      -          6.41M   static 2014-09-30 00:58
```

6) Check storage pools.

```
# zpool list
```

* Confirm that the displayed information is the same as that checked in step (2) 7) in 7-1-1.
* bkpool is not displayed because it has been exported.

```
# zpool list
NAME    SIZE  ALLOC   FREE  CAP  DEDUP  HEALTH  ALTROOT
rpool  25.8G  17.7G  8.08G  68%  1.00x  ONLINE  -
sol11  19.9G  13.1G  6.75G  66%  1.00x  ONLINE  -
```

7) Check the storage pool status.

```
# zpool status
```

* Confirm that the displayed information is the same as that checked in step (2) 8) in 7-1-1.
* bkpool is not displayed because it has been exported.

```
# zpool status
  pool: rpool
 state: ONLINE
  scan: none requested
config:

     NAME          STATE     READ WRITE CKSUM
     rpool         ONLINE       0     0     0
       mirror-0    ONLINE       0     0     0
         c1t1d0s0  ONLINE       0     0     0
         c1t1d1s0  ONLINE       0     0     0

errors: No known data errors

  pool: sol11
 state: ONLINE
  scan: none requested
config:

    NAME      STATE     READ WRITE CKSUM
    sol11     ONLINE       0     0     0
      c1t1d2 ONLINE       0     0     0

errors: No known data errors
```

8) Check the file system.

```
# zfs list
```

* Confirm that the displayed information is the same as that checked in step (2) 9) in 7-1-1.
* bkpool is not displayed because it has been exported.

```
# zfs list
rpool                          17.9G  7.49G   384K  /rpool
rpool/ROOT                     11.7G  7.49G   288K  legacy
rpool/ROOT/be01                13.2M  7.49G  8.26G  /
rpool/ROOT/be01/var            5.69M  7.49G   267M  /var
rpool/ROOT/be02                 363M  7.49G  3.85G  /
rpool/ROOT/be02/var            42.1M  7.49G   230M  /var
rpool/ROOT/be03                11.0G  7.49G  8.45G  /
rpool/ROOT/be03/var            1.05G  7.49G   261M  /var
rpool/ROOT/solaris             9.77M  7.49G  3.67G  /
rpool/ROOT/solaris/var         4.42M  7.49G   228M  /var
rpool/VARSHARE                 4.27M  7.49G  3.07M  /var/share
rpool/VARSHARE/pkg              752K  7.49G   304K  /var/share/pkg
rpool/VARSHARE/pkg/repositories  288K  7.49G   288K  /var/share/pkg/repositories
rpool/VARSHARE/zones            288K  7.49G   288K  /system/zones
rpool/dump                     4.13G  7.61G  4.00G  -
rpool/export                   1.37M  7.49G   304K  /export
rpool/export/home               936K  7.49G   304K  /export/home
rpool/export/home/user01        472K  7.49G   312K  /export/home/user01
rpool/swap                     2.06G  7.55G  2.00G  -
sol11                          13.1G  6.44G   304K  /sol11
sol11/repo_11_3                13.1G  6.44G  13.1G  /sol11/repo_11_3
```

9) Check the storage pool version.

```
# zpool upgrade -v
```

* Confirm that the displayed information is the same as that checked in step (2) 10) in 7-1-1.

```
# zpool upgrade -v
This system is currently running ZFS pool version 37.

The following versions are supported:

VER  DESCRIPTION
---  --------------------------------------------------------
  1   Initial ZFS version
  2   Ditto blocks (replicated metadata)

 37  lz4 compression
For more information on a particular version, including supported releases,
see the ZFS Administration Guide.
```

10) Check the ZFS version.

```
# zfs upgrade -v
```

* Confirm that the displayed information is the same as that checked in step (2) 11) in 7-1-1.

```
# zfs upgrade -v
The following filesystem versions are supported:

VER  DESCRIPTION
---  --------------------------------------------------------
 1   Initial ZFS filesystem version
 2   Enhanced directory entries
 3   Case insensitive and SMB credentials support
 4   userquota, groupquota properties
 5   System attributes
 6   Multilevel file system support

For more information on a particular version, including supported releases,
see the ZFS Administration Guide.
```

11) Display the current property information.

```
# zpool get all rpool
# zfs get all rpool/ROOT
# zfs get all rpool/ROOT/be01
# zfs get all rpool/ROOT/be01/var
# zfs get all rpool/ROOT/be02
# zfs get all rpool/ROOT/be02/var
# zfs get all rpool/ROOT/be03
# zfs get all rpool/ROOT/be03/var
# zfs get all rpool/ROOT/solaris
# zfs get all rpool/ROOT/solaris-backup-1
# zfs get all rpool/ROOT/solaris-backup-1/var
# zfs get all rpool/ROOT/solaris/var
# zfs get all rpool/VARSHARE
# zfs get all rpool/VARSHARE/pkg
# zfs get all rpool/VARSHARE/pkg/repositories
# zfs get all rpool/VARSHARE/zones
# zfs get all rpool/dump
# zfs get all rpool/export
# zfs get all rpool/export/home
# zfs get all rpool/export/home/user01
# zfs get all rpool/swap
```

* Confirm that the displayed information is the same as that checked in step (2) 12) in 7-1-1.

```
# zpool get all rpool
NAME   PROPERTY  VALUE  SOURCE
--<Omitted>--
rpool  version   37     default
# zfs get all rpool/ROOT
--<Omitted>--
# zfs get all rpool/dump
NAME         PROPERTY             VALUE                  SOURCE
rpool/dump   available            1.46G                  -
--<Omitted>--
rpool/dump   volblocksize         1M                     -
rpool/dump   volsize              2G                     local
rpool/dump   zoned                off                    default
--<Omitted>--
# zfs get all rpool/swap
NAME         PROPERTY             VALUE                  SOURCE
rpool/swap   available            1.46G                  -
--<Omitted>--
rpool/swap   volblocksize         1M                     -
rpool/swap   volsize              1G                     local
rpool/swap   zoned                off                    default
```

12) Display the disk capacity.

```
# df -h
```

* Confirm that the displayed information is the same as that checked in step (2) 13) in 7-1-1.

* bkpool is not displayed because it has been exported.

```
# df -h
Filesystem             Size   Used   Available Capacity  Mounted on
rpool/ROOT/be03         25G   8.5G   7.5G      54%       /
/devices                 0K     0K     0K        0%       /devices
/dev                     0K     0K     0K        0%       /dev
--<Omitted>--
/export/home/user01     8.8G    33K   8.8G       1%       /home/user01
```

13) Check the device names of the disks.

```
# format < /dev/null
```

* Confirm that the displayed information is the same as that checked in step (2) 14) in 7-1-1.

```
# format < /dev/null
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c1t1d0 <Unknown-Unknown-0001-26.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p0,0
       1. c1t1d1 <Unknown-Unknown-0001-26.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p1,0
       2. c1t1d2 <Unknown-Unknown-0001-20.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p2,0
       3. c1t1d3 <Unknown-Unknown-0001-10.00GB>
          /pci@8000/pci@4/pci@0/pci@0/scsi@0/disk@p3,0
Specify disk (enter its number):
```

14) Check the disk format information.

```
# prtvtoc /dev/rdsk/c1t1d0s2
# prtvtoc /dev/rdsk/c1t1d1s2
```

* Confirm that the displayed information is the same as that checked in step (2) 16) in 7-1-1.

```
# prtvtoc /dev/rdsk/c1t1d0s2
* /dev/rdsk/c1d0s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      63 sectors/track
*     255 tracks/cylinder
*   16065 sectors/cylinder
*    1697 cylinders
*    1695 accessible cylinders
*
* Flags:
*   1:unmountable
*  10:read-only
*
*                          First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       0      2    00          0  27230175  27230174
       2      5    01          0  27230175  27230174

# prtvtoc /dev/rdsk/c1t1d1s2
* /dev/rdsk/c1t1d1s2 partition map
--<Omitted>--
```

15) Check snapshots.

```
# zfs list -r -t snapshot
```

* Check the snapshots after restore.

```
# zfs list -r -t snapshot
NAME                                USED  AVAIL  REFER  MOUNTPOINT
rpool@backup                       59.5K  -      73.5K  -
rpool/ROOT@backup                      0  -        31K  -
rpool/ROOT/be01@backup                 0  -      2.63G  -
rpool/ROOT/be01/var@backup             0  -       133M  -
rpool/ROOT/be02@backup                 0  -      2.76G  -
rpool/ROOT/be02/var@backup             0  -       122M  -
rpool/ROOT/be03@install             7.10M  -      2.03G  -
--<Omitted>--
```

16) Delete snapshots.

```
# zfs destroy -r rpool@backup
```

* Delete the snapshots that are no longer needed.

17) Check snapshots.

```
# zfs list -r -t snapshot
```

* Confirm that the snapshots that are no longer needed have been deleted.

```
# zfs list -r -t snapshot
NAME                                 USED  AVAIL  REFER  MOUNTPOINT
rpool/ROOT/be03@install             7.99M      -  2.46G  -
rpool/ROOT/be03@2014-09-26-11:23:32  189K      -  2.55G  -
rpool/ROOT/be03@2014-09-26-13:08:05   88K      -  2.81G  -
rpool/ROOT/be03@2014-09-26-13:21:51  97.5K      -  2.81G  -
rpool/ROOT/be03@snap01                95K      -  2.81G  -
rpool/ROOT/be03@2014-09-26-14:56:44  14.2M      -  2.82G  -
rpool/ROOT/be03@2014-09-26-15:56:48  44.9M      -  2.85G  -
rpool/ROOT/be03/var@install           206M      -   305M  -
rpool/ROOT/be03/var@2014-09-26-11:23:32  102M      -   213M  -
rpool/ROOT/be03/var@2014-09-26-13:08:05  31.9M      -   121M  -
rpool/ROOT/be03/var@2014-09-26-13:21:51  31.9M      -   121M  -
rpool/ROOT/be03/var@snap01            115K      -   121M  -
rpool/ROOT/be03/var@2014-09-26-14:56:44  397K      -   121M  -
rpool/ROOT/be03/var@2014-09-26-15:56:48  247M      -   386M  -
```