
SPARC Enterprise

Logical Domains 1.2 Guide

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Description of Solaris™ Operating Environment

The Solaris™ Operating Environment brand notation has been changed to Solaris™ Operating System. Replace the Solaris™ Operating Environment (Solaris OE) notation with Solaris™ Operating System (Solaris OS).

Revision History

Edition	Date	Revised Location (Type) (*1)	Description
01	2008-6-12	-	-
02	2008-12-19	All (Modification)	Modified manual number to C120-E534-02EN.
		Cover, Preface, 2.1,3.2, READER'S COMMENT FORM (Addition)	Added "T5140/T5240"
		Related manuals (Addition)	Added "Logical Domains (LDoms) 1.0.3 Release Notes" "Logical Domains (LDoms) 1.0.3 Administration Guide"
		Related manuals (Removal)	Removed "Logical Domains (LDoms) MIB 1.0.1 Release Notes" "Logical Domains (LDoms) MIB 1.0.1 Administration Guide"
		Chapter 4 (Modification)	Added "(Example 1)" as the chapter title
		Chapter 5 (Addition)	Added "Chapter 5 Building Procedure (Example 2)"
		Chapter 6 (Addition)	Added "Chapter 6 Installing LDoms Manager"
		Appendix (Addition)	Added "Appendix A Backing Up/Restoring the File System" "Appendix B Supplement"
		1.3,1.5 (Addition)	Added "/T2 Plus"
		1.6 (Addition)	Recommended operational environment
		3.4 (Modification)	Modified some descriptions based on addition of "T5140/T5240"
		3.5 (Addition)	Added "3.5 Points to Consider Regarding Network Building"
		Description on 4.9.4 "System firmware 7.0.9 or later" (Removal)	Removed the description
READER'S COMMENT FORM (Modification)	Modified contact phone number of Fujitsu Learning Media Limited		
03	2009-3-19	All (Modification)	Modified manual number to C120-E534-03EN.

03	2009-3-19	Cover, Preface, 1.2, 1.6, 2.1, 3.2, 3.4, 3.5, 4.1.2, 4.2.2, 4.2.3, 5.2.1, 5.2.4, 5.3.3, 6.2.1, 8.2, B (Addition)	Added "T5440"
		Description on 3.1 2) "PRIMECLUSTER GLS" (Removal)	Removed the description
		4.2.3 (Modification)	Modified "ldm add-config"command
		7.7.5 (Addition)	Added "Modification of OBP variables"
		7.12.3 (Modification)	Modified "pkgrm SUNWldm" command
		8.2 (Modification)	Modified "Figure 8.1"
		8.3 (Modification)	Modified "Figure 8.2"
		Table 9.1 (Addition)	Added "No.13"
		Appendix B Supplement (Addition)	Added "SPARC Enterprise T5440"
04	2009-6-1	All (Modification)	Modified manual number to C120-E534-04EN.
		1.5 (Modification)	Modified "Virtual Disks"
		Table 1.3 (Addition)	Added Table 1.3
		3.1 (Modification)	Modified "Configurations"
		3.4 (Modification)	Modified "Allocation of disk device"
		3.4 (Modification)	Modified " Notes on the use of RAID software"
		3.4 (Addition)	Added " Configuration Example 7"
		3.4 (Addition)	Added " Configuration Example 8"
		4.2.3, 5.3.4 (Modification)	Modified "ldm ls -e"
		4.6.2 (Modification)	Modified "Rebooting the Control Domain"
		4.1.3, 4.6.2, 5.2.3, 5.8.6, 5.10.2.1, 6.1.3, 7.7.5, 7.10 (Modification)	Added " ILOM"
		7.1.1 (Modification)	Modified "FLAGS"

		7.7.5 (Modification)	Modified "Modification of OBP variables , Device-alias etc."
		Table 9.1 (Addition)	Added "No.14"
		Table 9.2 (Addition)	Added Table 9.2
		Appendix C (Addition)	Added " Appendix C "
05	2009-9-25	All (Modification)	Modified manual number to C120-E534-05EN.
		All (Modification)	Modified manual title to "SPARC Enterprise Logical Domains 1.2 Guide".
		Table 1.2, 1.3 (Removal)	Removed Table 1.2, Table 1.3
		3.1.1 Configurations (Modification)	Modified supported functions
		Table 3.2, 3.3, 3.4 (Removal)	Removed Table 3.2, Table 3.3, Table 3.4
		3.4.1 Allocation of disk device (Addition)	Added Physical devices
		3.6.2 Multi-path and NIC redundant configuration (Addition)	Added notes on Link Aggregation
		Figure 3.10, 11, 12 (Modification)	Modified Figure 3.10, Figure 3.11, Figure 3.12
		Figure 3.13 (Removal)	Removed Figure Figure 3.13
		4.2.10 (Addition)	Added "4.2.10 Configuration of domain dependency relationships"
		Figure 5.1, 5.2 (Removal)	Removed Figure 5.1, Figure 5.2
		Figure 5.3 (Modification)	Modified Figure 5.3
		5.3.5 (Modification)	Modified "5.3.5 Defining the Guest Domain Administrative Users"
		6.3.2 (Modification)	Modified "6.3.2 Starting installer"
		7.1.1 (Modification)	Modified " Confirming the state of the domain"
		Table 9.3. 9.4 (Addition)	Added Table 9.3, Table 9.4
		Chapter 10 (Addition)	Added Chapter 10

		Appendix B (Removal)	Removed " Appendix B Supplement"
		Appendix C (Removal)	Removed " Appendix C Instructions for Backup/Restoration of ZFS file system"
		Appendix B (Addition)	Added new " Appendix B Instructions for Backup/Restoration of ZFS file system"
06	2009-11-16	3.1.1 Configurations (Modification)	Modified supported functions
		Table 9.5 (Addition)	Added Table 9.5

*1 Items in the "Revised location" column refer to the latest edition unless the item is marked with an asterisk. An asterisk indicates an item in an older edition.

Preface

This document provides an overview of the Logical Domains (LDoms) provided by SPARC Enterprise T5120/T5220/T5140/T5240/T5440, its application examples, and other information. The environment created using LDoms functions is referred to as the "domain" or "LDoms" in this document.

Organization of this manual

This document describes the LDoms environment in the following framework.

Chapter 1 Logical Domains

This chapter explains an overview of the LDoms functions, comparison with other partitioning methods provided by Fujitsu and operations that are appropriate for the LDoms environment, for consideration when installing LDoms.

Chapter 2 LDoms Application

This chapter explains purpose and operation appropriate for the LDoms and notes on applying the LDoms.

Chapter 3 LDoms Configuration Design

This chapter explains notes on the design or building of LDoms environment configuration.

Chapter 4 Building Procedure (Example 1)

This chapter explains the building procedure for building the LDoms environment.

Chapter 5 Building Procedure (Example 2)

This chapter explains the building procedure for building the LDoms environment including a guest domain (also used as an I/O domain).

Chapter 6 Installing LDoms Manager

This chapter explains the procedure for installing LDoms Manager.

Chapter 7 Operating LDoms

This chapter explains the operation method of the LDoms environment and notes on operation.

Chapter 8 Tasks Required to Replace Parts

This chapter explains the tasks to perform for replacing parts.

Chapter 9 Bug Information and Notes

The information and notes on bugs in this chapter are for reference when using LDoms.

Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440

This chapter explains Logical Domains 1.2 Operating Environment and configurations in SPARC Enterprise.

Appendix A Backup and Restore Procedure

This appendix explains the backup and restore procedures for the LDoms.

Appendix B Instructions for Backup/Restoration for ZFS file system

This appendix explains backup/restoration of ZFS file system.

Reference Manuals

The documents listed below are documents relating to this manual.

Fujitsu has created this document with focus on providing the LDoms function, while referring to the **Logical Domains (LDoms) Documentation** provided by Sun Microsystems. Be sure to read the following documents when building the LDoms environment.

Logical Domains (LDoms) 1.2 Documentation

<http://docs.sun.com/app/docs/coll/2502.1?l=en>

- Logical Domains 1.2 Release Notes
- Logical Domains 1.2 Administration Guide
- Logical Domains 1.2 Reference Manual

Logical Domains (LDoms) 1.1 Documentation

<http://docs.sun.com/app/docs/coll/ldom1.1>

- Logical Domains 1.1 Release Notes
- Logical Domains 1.1 Administration Guide

Logical Domains (LDoms) 1.0 Documentation

<http://docs.sun.com/app/docs/coll/ldom1.0>

- Logical Domains (LDoms) 1.0.3 Release Notes
- Logical Domains (LDoms) 1.0.3 Administration Guide
- Logical Domains (LDoms) 1.0.2 Release Notes
- Logical Domains (LDoms) 1.0.2 Administration Guide

Refer to the following document:

Beginners Guide to LDoms: Understanding and Deploying Logical Domains

<http://www.sun.com/blueprints/0207/820-0832.html>

Logical Domains (LDoms) MIB Documentation

- Logical Domains (LDoms) MIB 1.0.1 Release Notes
- Logical Domains (LDoms) MIB 1.0.1 Administration Guide

Text Conventions

This manual uses the following fonts and symbols to express specific types of information.

Fonts/symbols	Meaning	Example
AaBbCc	Indicates commands that users enter.	# ls -l <Enter>
<i>Italic</i>	Indicates names of manuals.	See the <i>System Console Software User's Guide</i> .
[]	Indicates names of chapters, sections, items, buttons, menus.	See Chapter 4, "Building Procedure."

Syntax of the Command Line Interface (CLI)

The command syntax is described below.

Command Syntax

- A variable that requires input of a value must be enclosed in < >.
- An optional element must be enclosed in [].
- A group of options for an optional keyword must be enclosed in [] and delimited by |.
- A group of options for a mandatory keyword must be enclosed in { } and delimited by |.

The command syntax is shown in a frame such as this one.

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Notice

The contents of this manual may be revised without prior notice.

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Chapter 1 Logical Domains

1.1 The Basics of Logical Domains

Logical Domains (LDoms) is a virtualized hardware environment operating on the SPARC platform. It can divide one platform into several virtualized server environments, and each virtualized server can run its own independent instance of the operating system.

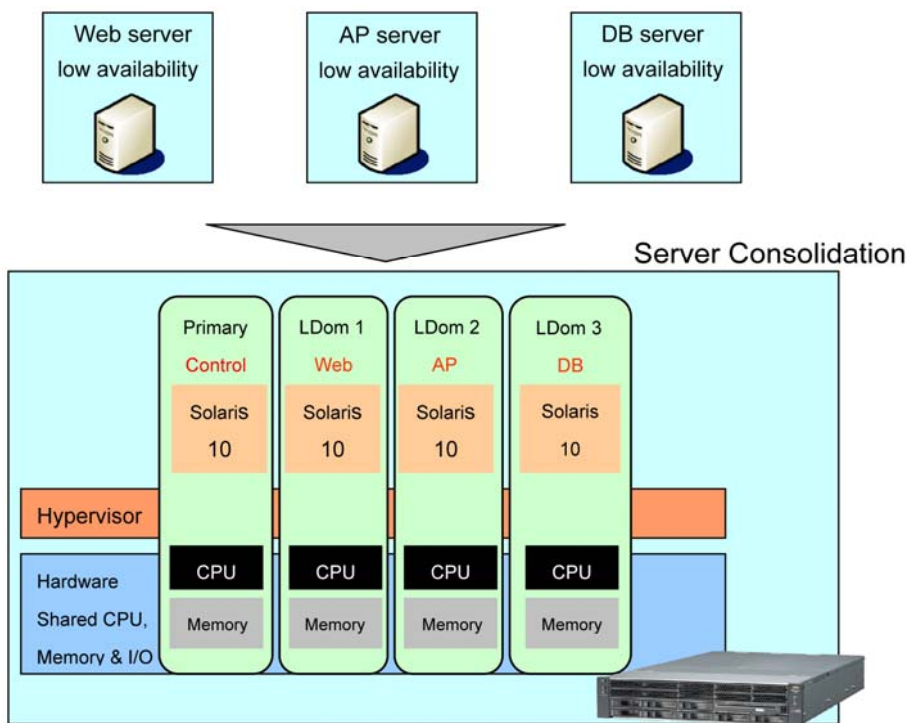


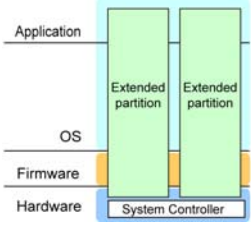
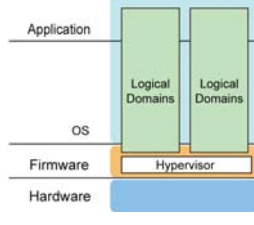
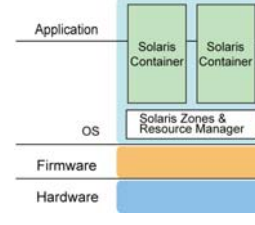
Figure 1.1 Logical Domains (LDoms)

1.2 Differences Between Partitioning Methods

With the hardware partition, the models of the SPARC Enterprise M4000 series or later can be partitioned on the hardware layer. Also, with the Solaris OS function, the Solaris Container environment can be configured on all SPARC Enterprise models.

Each partitioning method has the following features.

Table 1.1 Comparison of partitioning methods

		Hardware Partition	Logical Domains (LDoms)	Solaris Container
Partitioning method		Partitioning on the hardware layer	Partitioning on the firmware layer	Partitioning on the OS layer
				
Target model	Mxxxx	A (M4000 series or later)	NA	A
	T5xxx	NA	A	A
Reliability	Fault isolation	Very high Insulated at the hardware layer	High Maintaining OS isolation (only I/O is used in common within the domain)	Not high Maintaining independence of the application layer. (OS kernels are in common)
	Security	Very high Unable to access files and processes between partitions	Very high Unable to access files and processes between guest domains	High Unable to access files and processes between zones (however, able to access files and processes of each zone from Global Zone)
Flexibility	Maximum divisibility	Low 24 divisions (M9000)	Good 128 divisions (T5440) For more information, see "Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440"	Very good 8,191 divisions (all models)
	Distribution unit of CPU resources	Not good per XSB	Good Per CPU thread	Very good per percent
Cost	Design Cost	Low Required for the initial setting of hardware resources, several OSs installations	Low Required for developing the resource allocation policy, several OSs installations	Very low Not required for hardware configuration

		Hardware Partition	Logical Domains (LDoms)	Solaris Container
	Management Cost	<p>Low</p> <p>Required for managing several systems</p>	<p>Low</p> <p>Required for managing several systems (OSs)</p>	<p>Very low</p> <p>Only single OS system is managed. (application of OS patch)</p> <p>Setting/management of zones per task is required.</p>
Operation continuity from the previous Solaris servers to SPARC Enterprise (Server aggregation)		<p>Very good</p> <p>The transition is available without any changes to the configuration/operation. (Only Solaris 10)</p>	<p>Very good</p> <p>Transition is available without any changes to the configuration/operation (Only Solaris 10)</p>	<p>Not good</p> <p>A review of the system configuration and its operation method for OS consolidation are required.</p>

1.3 The Basics of Hypervisor

Ultra SPARC T2/T2 Plus processors have the following three operation modes.

- Nonprivileged mode (User mode)
- Privileged mode (Supervisor mode)
- Hyperprivileged mode (Hypervisor mode)

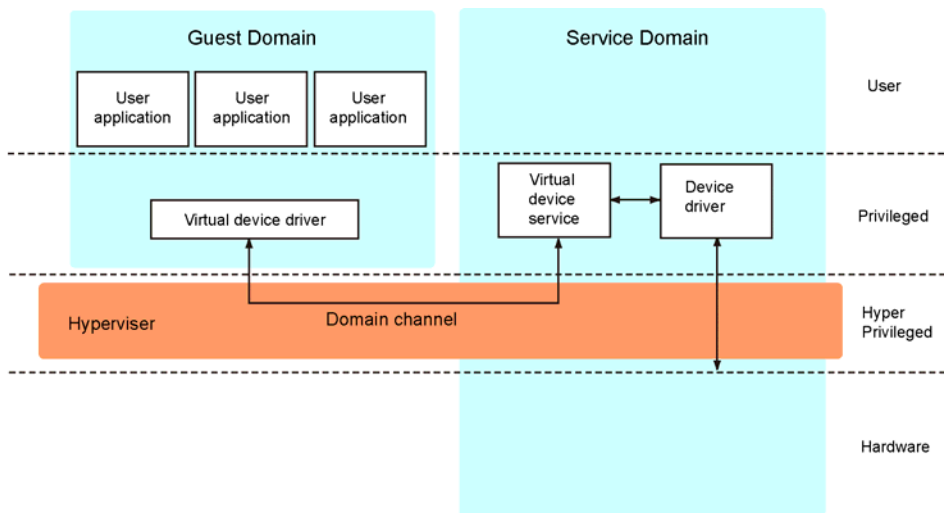


Figure 1.2 Operation modes of Ultra SPARC T2/T2 Plus processors

The hypervisor acquires control authority from the kernel (Supervisor mode) if required. It makes several kernels operate under the control of the hypervisor simultaneously.

The hypervisor is provided as a part of the firmware that is stored in EEPROM.

1.4 Role of the Domain in Logical Domains

In LDoms environment, Logical Domains are classified into four domains according to the role.

- Control Domain

This is the domain in which the Logical Domains Manager is installed. This domain can create and manage other domains, and allocate a virtual resource. Only one control domain exists in a platform.

- I/O Domain

This is the domain that has an ownership of physical I/O devices such as PCI cards and has a direct access to them. The number of I/O domains differs according to platforms you are using.

- Service Domain

This is the domain that provides virtual device services for other domains in cooperation with the I/O domain. The virtual device services contain disk, network, and console.

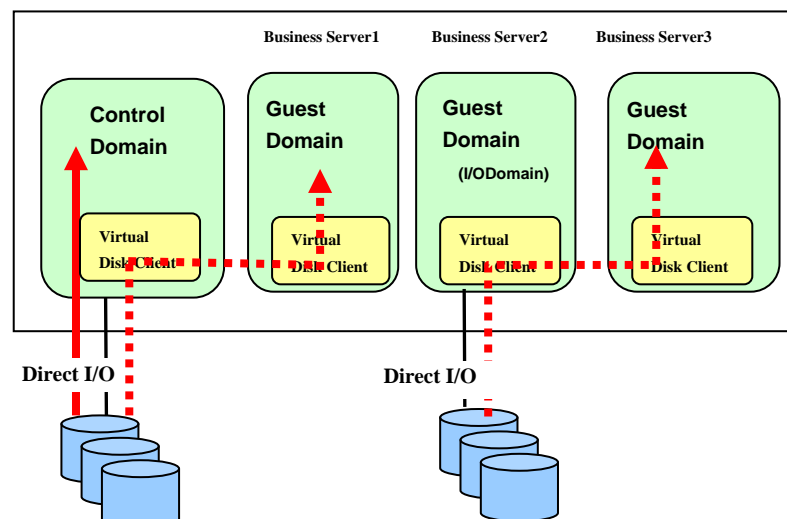
- Guest Domain

This is the domain that is managed by the control domain and uses the virtual device services provided by the I/O domain and service domain.

Independent OSs run in each logical domain.

One logical domain can have several roles. In general, the control domain is also used as the I/O domain and service domain. In this document, this is called as the control domain.

In addition, the guest domain is used as the I/O domain and service domain but another guest domain is not. In this document, the former is called as the guest domain (also used as the I/O domain), the latter is called as the guest domain.



1.5 Virtualized Hardware Components

- Virtualized CPU

Up to 128 virtualized CPUs that consider a thread as a minimum unit, can be allocated to each domain. The thread is one of the features for Ultra SPARC T2/T2 Plus CPU. At this moment, a virtualized CPU can be added to/removed from a domain without stopping the domain. The operations for addition/deletion start from the control domain.

- Memory

Memory can be allocated to each domain in units of 8 kilobytes, which is the minimum physical memory segment managed by Solaris OS.

- Virtual Disks

The virtual disk service (vds) controls physical disks to provide each domain with the virtual disks.

You can use the following as entities of the virtual disks. However, there are some restrictions depending on the type of entities.

- Physical disks
- Disk slices (Boot disk is not available for any releases older than Solaris10 10/08.)
- UFS files
- Loopback file system (Boot disks are not available.)
- ZFS volumes/ZFS files (supported by LDomS 1.1 or later)

- Virtual Console

You can access the virtual consoles of each domain when connecting using the console service of the control domain and the telnet command.

- Virtual Network

A virtual network device (vnet) can be defined for each domain. The virtual network device communicates with other domains or physical networks via the virtual switch (vsw) of the service domains.

- Virtual Cipher Unit

You can virtualize the cipher unit that Ultra SPARC T2/T2 Plus processor has per 1 core, and allocate it to any domain. (This is not supported yet.)



Some functions are not supported by Fujitsu. Refer to Chapter 2 and subsequent chapters for more information.

1.6 Operating Environment of Logical Domains

LDoms working environment differs according to the version of hardware or LDoms software. For more information, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”.

Chapter 2 LDom Application

2.1 Policy on Selecting Partitions

Fujitsu supports three partitioning methods: LDom, hardware partitioning and Solaris Container. Select the appropriate method according to the operation features.

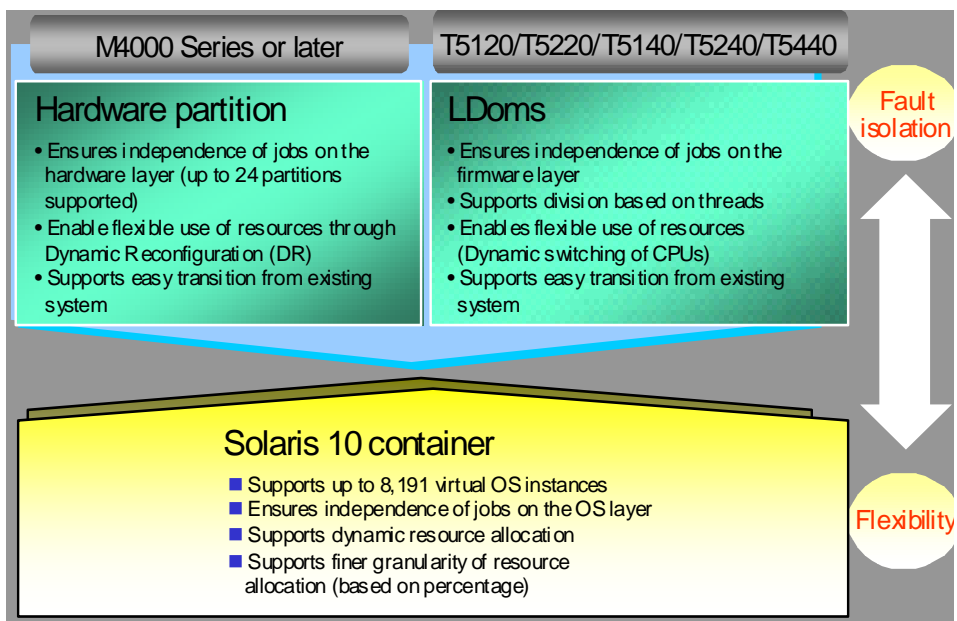


Figure 2.1 Partitioning methods

2.2 Application Purposes of LDoms

LDoms can be implemented for the following purposes:

2.2.1 Transition from the previous Solaris server

- In the case of SPARC Enterprise T5120 (4 cores), the consolidation of a maximum of three previous Solaris server (800MHz, 2CPUs) units can be achieved.
- In the case of SPARC Enterprise T5120 (8 cores), the consolidation of a maximum of three previous Solaris server (800MHz, 4CPUs) units is enabled.

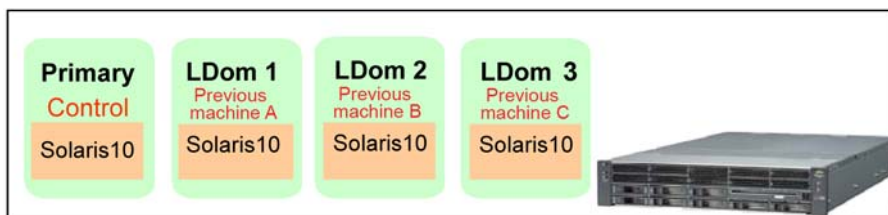


Figure 2.2 LDoms application example (transition from the previous Solaris server)

2.2.2 Proper Use of LDoms in the Development/debug machines

Development / debugging systems generally require more processing power and RAM. Moreover, domains for these purposes are to be kept separate from production domains. Using the LDoms technology, one can create separate domains with different processing power and memory.

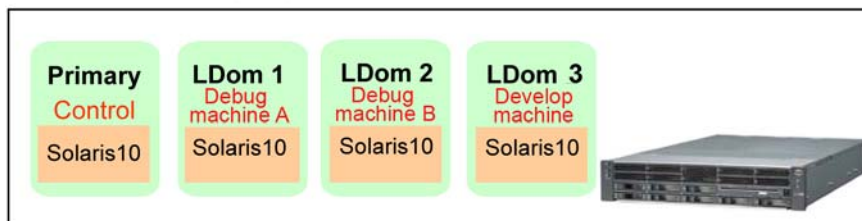


Figure 2.3 LDoms application example (proper use of LDoms in the development/debug machines)

2.3 Operations for which LDomS can be used

LDoms operation depends on the control domain. There is little overhead, such as CPU/memory resource overhead. There is some virtual I/O overhead.

- Applicable operations are as follows: Web/AP servers
Software has a redundancy function provided by load balancing or middleware
- Middleware Agent and other applications
Software which can be restarted properly if stopped for any reason.
- Development machines
Operation continuity or high I/O performance comparable to that of real machines is not required.

1) Example of configuration for migration from previous servers

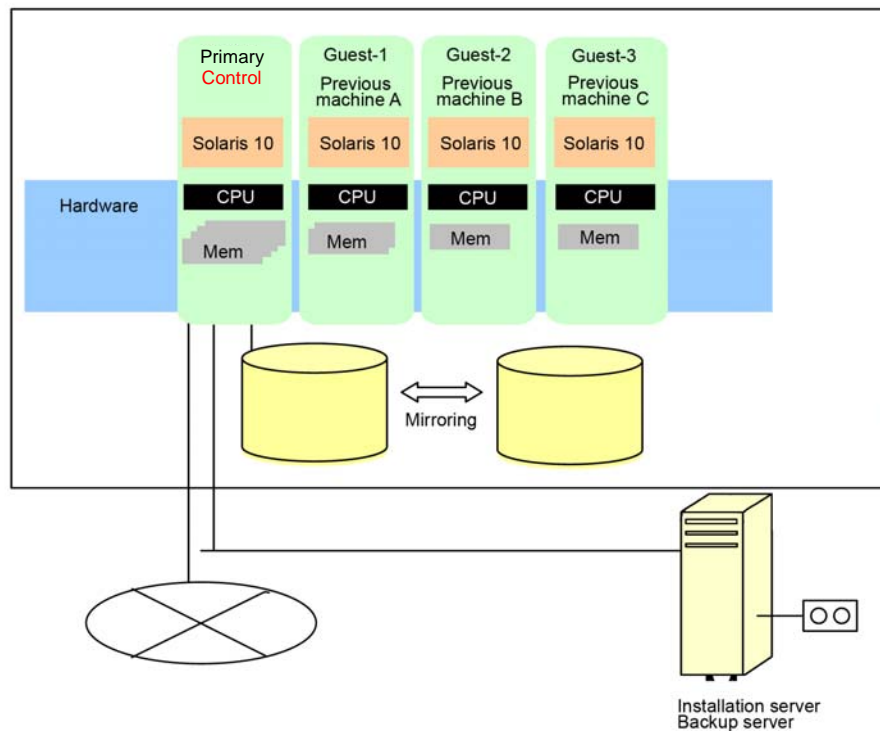


Figure 2.4 Example of configuration for migration from previous Solaris servers

- 2) Example of configuration for migration from DB servers of previous Solaris servers.

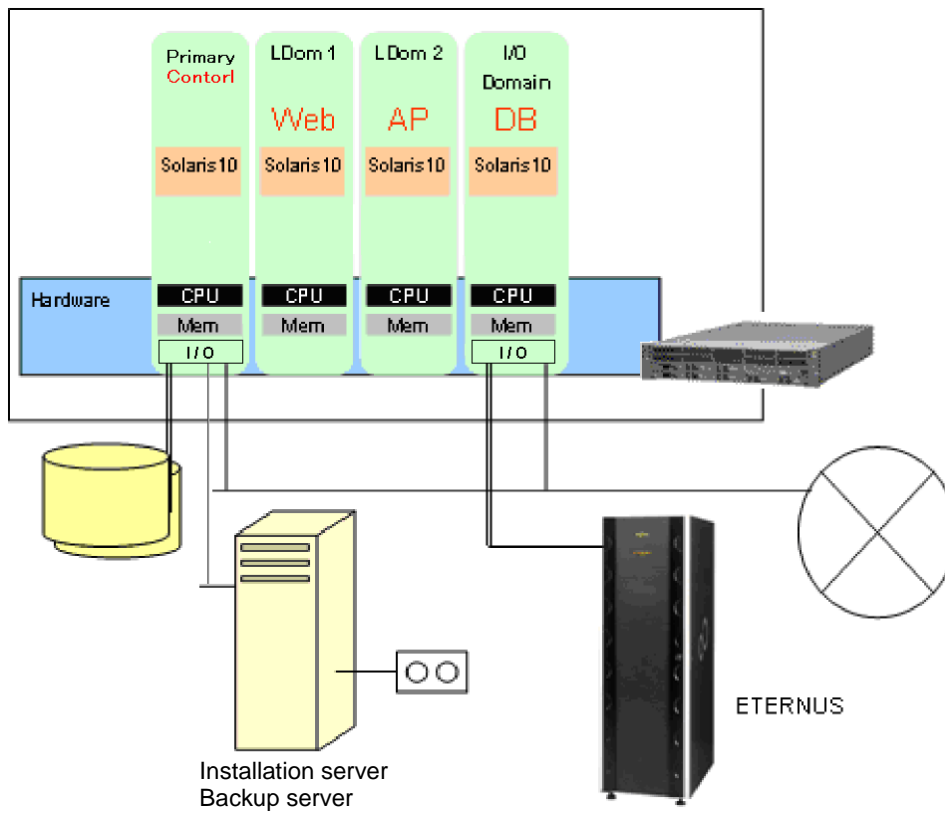


Figure 2.5 Example of configuration for migration from DB servers of previous Solaris servers

3) Example of configuration when using development machine/debug machine

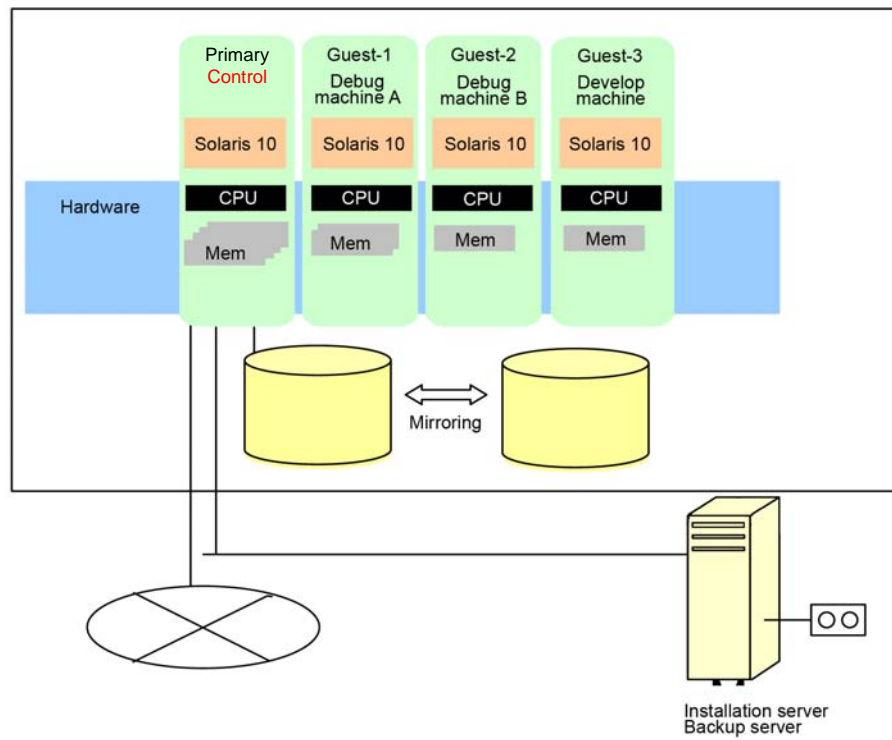


Figure 2.6 Example of configuration when using development machine/debug machine

2.4 LDoms Performance

- There are few overheads of CPU/memory resource overhead.
- Allocate to the control domain/guest domain per core to avoid affecting the CPU load.
- SPARC Enterprise T5120/T5220 has only virtual I/O. Consider all operations, including those performed in the guest domain.
- The performance of the virtual I/O may be degraded compared to the performance of direct I/O, which handles I/O directly, because of the data transfers via the control domain. In case I/O performance is important, Fujitsu recommends advanced verification. Please contact the Platform Solution Center if a device for advanced verification is required.
- The CPU load of the control domain and/or I/O domain increases when the virtual network device (vnet) is used in the guest domain.
- Because the processing of each network card is allocated to a single CPU thread, please use the same number of network cards as that of the number of vnets and allocate the same number of CPU threads to the control domain.

Chapter 3 LDom Configuration Design

3.1 Points to Consider Regarding the LDom Application

3.1.1 Configurations

- For Logical Domains Manager Software, an installation server is required to install to the guest domain.
- Before installing LDom, create a mirror of the internal disks (with PRIMECLUSTER GDS or Solaris Volume Manager or ZFS).
- Install the Enhanced Support Facility (ESF) to the control domain and guest domain.
- Allocate the CPU in units of core to the control domain and guest domains.
- Refer to [How to set up REMCS in Logical Domains (LDom)], which is the ESF user's guide (REMCS version) when using REMCS (Remote Customer Support system).
- The following functions are supported by Fujitsu for this release of LDom 1.2.
 - Solaris containers on domains *
 - Jumbo Frame
 - Link Aggregation
 - Export a Virtual Disk Backend Multiple Times
 - Configuring domain dependencies
 - CPU Power Management
 - Device number assignment for virtual I/O device
- * The following functions cannot be used by the domain where Solaris containers exists.
 - Dynamic Reconfiguration of Virtual CPUs
 - Migrating an Active Domain
- The following functions are not supported.
 - Multi path configuration of a virtual disk
 - NIU(Network Interface Unit) Hybrid I/O
 - Physical-to-Virtual Migration Tool - ldmp2v(1M) command
 - Logical Domains Configuration Assistant
 - Autorecovery of configurations
 - SAN Boot

3.1.2 Middleware support

- DO NOT install the business application software to the control domain for security reasons.
- DO NOT install the middleware to the control domain in principle. However, the following middleware should be installed to the control domain.

- Enhanced Support Facility
Installation required. It should be installed to each domain. Refer to the Enhanced Support Facility document for details.
- PRIMECLUSTER GDS
GDS can use the disk connected by the Direct I/O.
- PRIMECLUSTER GLS
It enables redundant configuration of the network, only NIC switching mode is supported. GLS can be used in guest domain, too.
- Solaris Volume Manager
Solaris Volume Manager can use the disk connected by the Direct I/O.
- Server System Manager (SSM) Agent
It is unable to install and use SSM agent on Guest domain.(SSM does NOT support monitoring Guest domain)
Power-off operation from SSM is disabled in the LDoms environment.
- As for the guest domain, the middleware works normally on Solaris 10. However, place the manager function of the middleware outside the guest domain and deploy only the agent in the guest domain because the manager function is required for high reliability.
- The operations of the following products are verified in the guest domain because of hardware is controlled/monitored directly.

Table 3.1 Supported Middleware Applications

Product Name	Operations on guest domain	Remarks
Enhanced Support Facility	Available	Installation to all domains is required.
Systemwalker CMGR	Available	The domain configuration is available only in the business server.
Systemwalker OMGR	Available	
Systemwalker SQC	Available	

- Contact the vendors in charge of each product about ISVs (Independent Software Vendors)/IHVs (Independent Hardware Vendors).

3.1.3 I/O Support

- The Direct I/O of the guest domain is not available in SPARC Enterprise T5120/T5220.
 - The following I/Os are not available from the guest domain.
 - Graphic card
 - Serial port
 - USB
 - DVD equipment (*1)
- *1: Available from the guest domain (also used as I/O domain).
- Use the tape equipment of the external server via a network when using the tape equipment from the guest domain.

3.1.4 Network

The NIC driver, which is allocated to the virtual switch (vsw), is a driver that is compliant only with the GLDv3 (Generic LAN Driver version3). The driver that is currently compliant with the network is the FUJITSU PCI GigabitEthernet(fjgi, version 4 or later)or e1000g, nxge.

3.1.5 Maintenance

- The reconfiguration of LDom is required to replace the hardware such as the motherboard. You should control the information for the LDom configuration setting, including backups.

3.2 LDom Configuration Overview

In SPARC Enterprise T5120/5220/T5140/T5240/T5440, LDom configuration differs according to machine model.

For more information, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”.

3.3 Points to Consider Regarding LDom Configuration units

The hardware resources of CPU and memory are allocated as follows.

- The CPU should be allocated per core unit to the control domain/guest domain. The I/O connection is utilized for only the control domain in SPARC Enterprise T5120/T5220, so pay attention to all operations including those in the guest domain.
- The minimum memory requirement for control domain is 1GB, while the recommended amount is 4GB. Install more memory if necessary.
- Memory of the guest domain (also used as I/O domain), or of the control domain providing the virtual disk services to the guest domain needs to be added according to the disk I/O load of the guest domain.
- When three or more application programs causing high disk I/O load run at one time, please allocate memory to the control domain or guest domain (also used as I/O domain) by referring to the following standard.

The number of high disk I/O load programs running simultaneously	0 to 2	3	4	5	6	7
Memory of the control domain or I/O domain(GB)	4	5	6	7	8	9

- If the sar -g command continues to output non 0 as the value of 'pgscan/s' on the control domain providing the virtual disk services or guest domain (also used as I/O domain), memory insufficiency may occur. For more information, please refer to "System Administration Guide: Advanced Administration Chapter 13 Monitoring System Performance (Tasks)".

3.4 Points to Consider Regarding I/O Building

Points to note regarding I/O building in the LDoms environment are explained in this section.

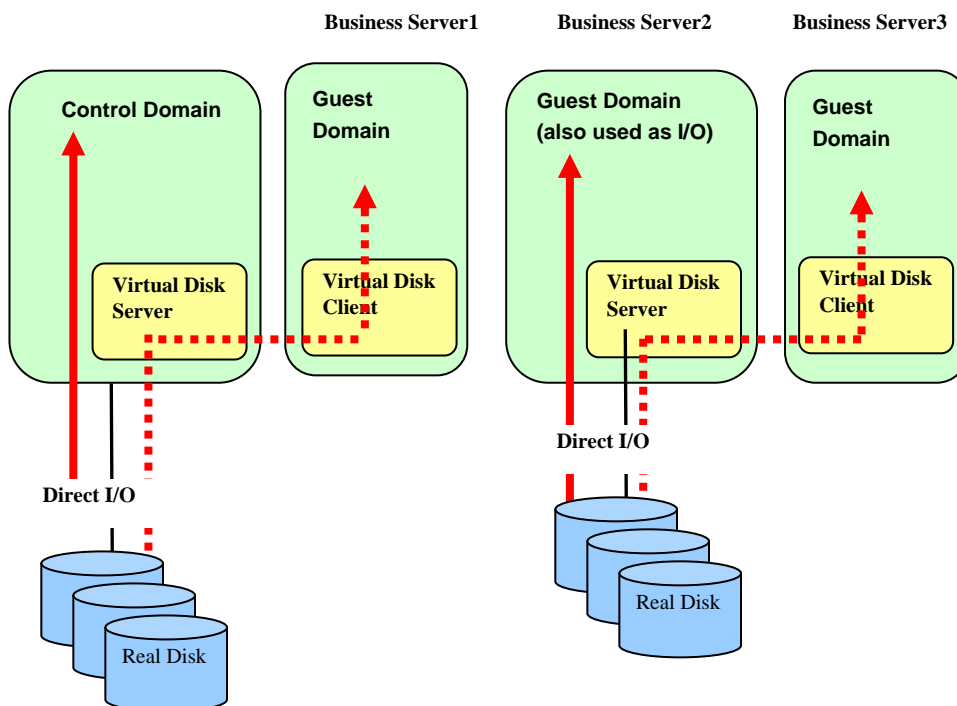
The following domain can be configured in SPARC Enterprise T5120/T5220/T5140/T5240/T5440.

- Control Domain
- Guest Domain (also used as I/O domain)*
* except SPARC Enterprise T5120/T5220
- Guest Domain

If your computer operation requires a large amount of disk access in the guest domain (such as database access operation), please construct a guest domain (also used as I/O domain) that has direct access to disk devices.

Applications or middlewares accessing disks frequently should be run in the guest domain (also used as I/O domain).

When a large amount of network access occurs in the guest domain (like when file transfer is performed), configure the guest domain (also used as I/O domain) having direct access to a network card (such as Gigabit Ethernet card). If your application or middleware uses a large amount of network access, please try to run it on the guest domain (also used as I/O domain).



- Create one control domain. You cannot perform any business application on it.
- In this example, the control domain and Business Server2 (guest domain) are also used as the I/O domain and service domain. They can be configured not to have the role of the service domain.
- In this example, I/Os of Business Server1 and 3 (guest domains) are configured as virtualized I/Os.

- In SPARC Enterprise T5120/T5220/T5140/T5240/T5440, the number of guest domains (also used as I/O domains) you can create differs according to machine model. In addition, the guest domains (also used as I/O domains) cannot be created on some machine models. For more information, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”.

3.4.1 Allocation of disk device

- Connect internal disks to the control domain using direct I/O.
- Connect external disks (file unit devices, disk array devices) to the control domain or guest domain (also used as I/O domain) using direct I/O.
- Use the internal disk as the system disk of the control domain.
- We recommend that a disk (including the system disk) used in the guest domain (also used as I/O domain) should be the disk connected using direct I/O.
- Please use direct I/O to allocate NIC to the control domain.
- Please allocate a virtual disk and virtual network to the guest domain without direct I/O. Allocate them from the Control domain or the Guest domain (also used as I/O domain).
- Allocate any of the following to the virtual disk.
 - Files created on UFS
 - Files or volumes created on ZFS
 - SVM volumes
 - Physical devices

Internal disks
File Unit(PW0G7FL1F) connected with SCSI card(SE0X7SC2F)
File Unit(SE0X9FL1F) connected with SAS card(SE0X7SA1F)
ETERNUS 2000/3000/4000/6000/8000 series connected with 8GFC card(SE0X7F22F,SE0X7F21F)
- Use PRIMECLUSTER GDS or Solaris Volume Manager or ZFS to mirror an internal disk and external file unit device.
- Please make every effort to use different disks for being used in the control domain or the guest domain (also used as I/O domain) and for being allocated to the virtual disk. If you use the same disk, please separate partitions.
- We recommend that different disks should be allocated for each domain.
- Do not delete a virtual I/O device.

3.4.2 Notes on the use of RAID software

- RAID software can be installed on the control domain or guest domain (also used as I/O domain) to which direct I/O is connected. However, RAID functionality is not available for guest domains.
Remarks: Solaris volume manager (hereinafter referred as to Solaris VM) is also available in the control domain where direct I/O is connected or guest domain (also used as I/O domain).
- The disk that implements mirroring in the control domain or guest domain (also used as I/O domain) can be allocated to another domain as the virtual disk.
- For using the GDS operation management view of PRIMECLUSTER GDS, change the security settings of Solaris Security Toolkit (SST) in order to access the system from the web browser of the client PC.

3.4.3 Notes on the connection of the disk array device (ETERNUS, Sun STK)

- Devices with a multi-path configuration can be used the ETERNUS multi-path driver (ETMPD), and Sun STK Traffic Manager (MPxIO) in the control domain or guest domain (also used as I/O domain). Moreover, these disks can be allocated to the virtual disk.

3.5 Configuration Examples of LDoms

3.5.1 Configuration Example 1

This section indicates how to build the LDoms in the internal disk. Refer to this example when the dedicated device can be allocated to the control domain or to each guest domain. The disks allocated to each domain are available as system disks or data disks.

Points to consider regarding building

- 1) All of the internal disks connect to the control domain by Direct I/O.
- 2) The control domain uses internal disks.
- 3) The mirroring of all internal disks is executed in the control domain.
Remarks: PRIMECLUSTER GDS (GDS) and Solaris Volume Manager (Solaris VM) and ZFS are available.
- 4) Allocate dedicated disk to each Guest domain, and initialize by using UFS file system. Then mount them on the Control domain.
- 5) Create a file to be allocated as the virtual disk on each UFS file system.
Remarks: In the following example, one file is created on each of three UFS file systems.
- 6) The created file is used to allocate a virtual disk to each guest domain.

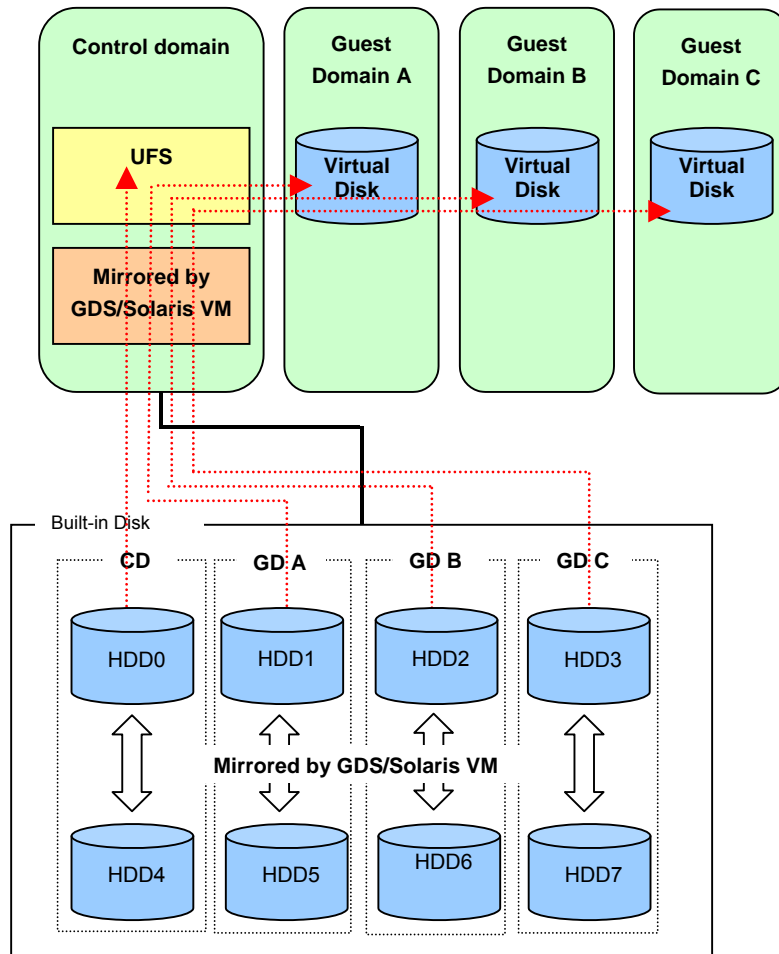


Figure 3.1 Example 1 Configuration when building the LDomS in the internal disk

3.5.2 Configuration Example 2

Refer to this example when the number of available disks are less than the sum of the number of control and guest domains, so that the disks are to be shared between the control and guest domains.

The disks allocated to each domain are available as the system disk or data disk.

Points to consider regarding building

- 1) The internal disks connect to the control domain through Direct I/O.
- 2) The internal disks are divided into slices for allocation to the control and guest domains.

Remarks: You do not have to divide the partition for each guest domain if there are several guest domains.

- 3) The control domain uses partitions for itself.
- 4) All internal disks of the control domain are mirrored.(PRIMECLUSTER GDS (GDS) and Solaris Volume Manager (SVM) and ZFS are available as mirroring software.)
- 5) Allocate dedicated disks to each guest domain, initialize UFS on them and mount them on the control domain.
- 6) Create a file to be allocated as the virtual disk on each UFS file system.

Remarks: In the following example, one file is created on each of three UFS file systems.

- 7) The created file is used to allocate a virtual disk to each guest domain.

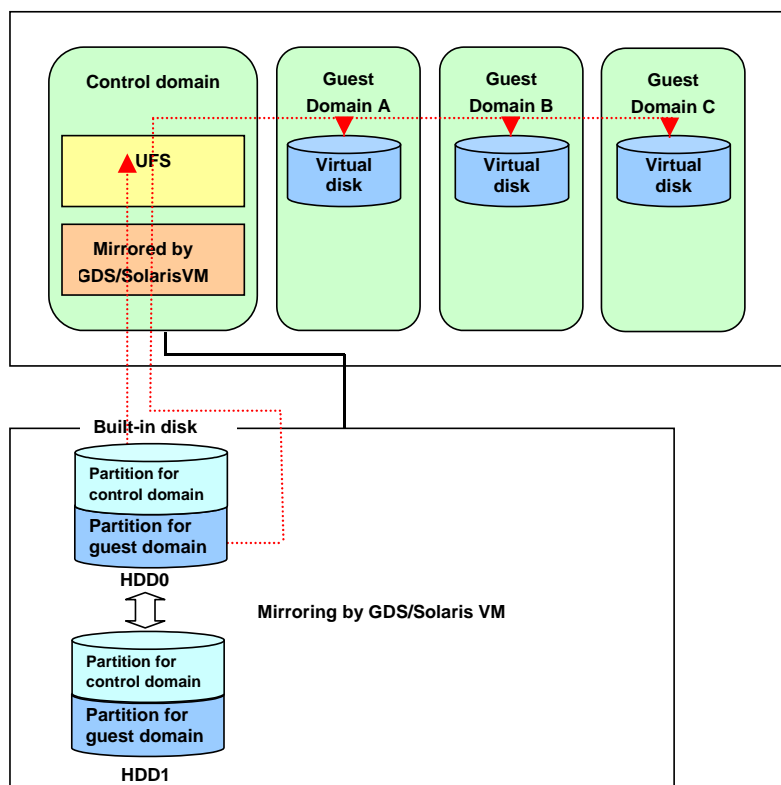


Figure 3.2 Example 2 Configuration when building the LDomS in the internal disk

3.5.3 Configuration Example 3

This section describes how to create logical domains on internal disks and external file unit devices.

The disks allocated to each domain are available as the system disk or data disk.

Points to consider regarding building

- 1) To mirror the control domain, use internal disks connected by using direct I/O.
Remarks: You can use GDS, Solaris VM, ZFS.
- 2) Connect external file unit to the control domain using direct I/O.
- 3) Mirror disks of external file unit in the control domain.
Remarks: You can use GDS, Solaris VM, ZFS.
- 4) Allocate dedicated disks to each guest domain and initialize UFS on them and mount them on the control domain.
- 5) Create a file to be allocated as the virtual disk on each UFS file system.
Remarks: In the following example, one file is created on each of three UFS file systems.
- 6) The created file is used to allocate a virtual disk to each guest domain.

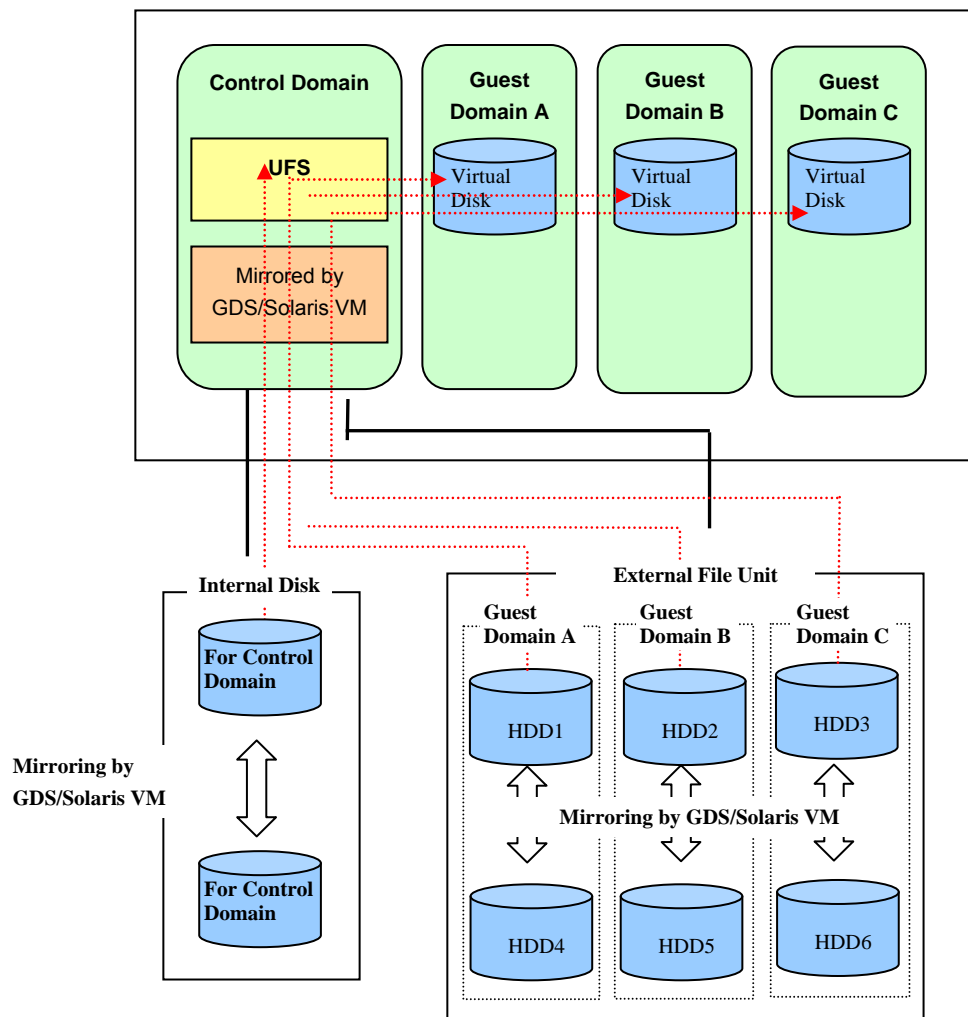


Figure 3.3 Example 1 Configuration when building the LDomS using direct I/O

3.5.4 Configuration Example 4

This section describes another procedure of creating logical domains on internal disks and external file unit devices.

The disks allocated to each domain are available as the system disk or data disk.

Points to consider regarding building

- 1) All of the internal disks connect to the control domain by Direct I/O.
- 2) The control domain uses internal disks.
- 3) The mirroring of all internal disks is executed in the control domain.
Remarks: PRIMECLUSTER GDS (GDS) and Solaris Volume Manager (Solaris VM) and ZFS are available.
- 4) Allocate a disk for Guest Domain A and initialize UFS file system on Guest Domain A and mount it on the control domain.
- 5) Create a file to be allocated as the virtual disk on each UFS file system.
- 6) The created file is used to allocate a virtual disk to Guest Domain A.
- 7) Connect external file unit to Guest Domain B using direct I/O.

- 8) Guest Domain B uses disks connected by using direct I/O.
- 9) The mirroring of external file unit is executed in Guest Domain B.
Remarks: PRIMECLUSTER GDS (GDS) and Solaris Volume Manager (Solaris VM) and ZFS are available.
- 10) Allocate dedicated disks for Guest Domain C and initialize UFS on it and mount it on the control domain.
- 11) Create a file to be allocated as the virtual disk on each UFS file system.
- 12) The created file is used to allocate a virtual disk to Guest Domain C.

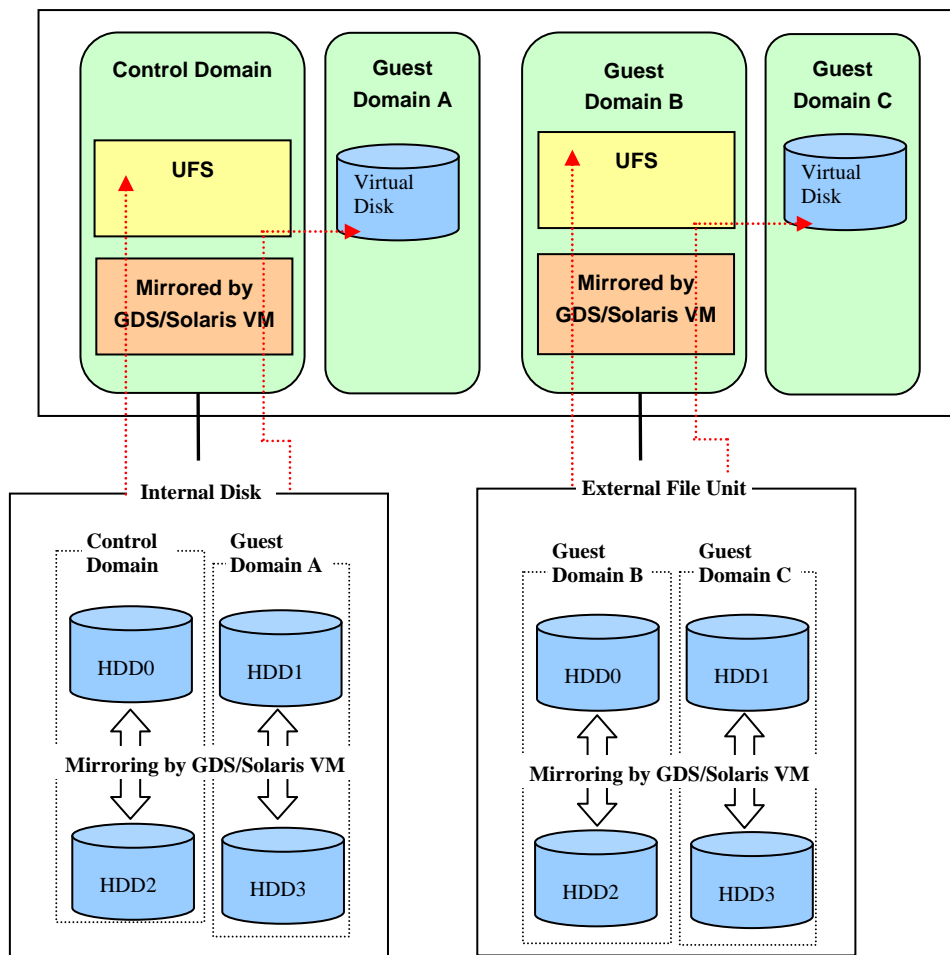


Figure 3.4 Example 2 Configuration when building the LDoms using direct I/O

3.5.5 Configuration Example 5

This section describes how to connect disk array devices to the control domain in order to configure LDoms by using UFS file system.

The disks allocated to each domain are available as the system disk or data disk.

Points to consider regarding building

- 1) To mirror the control domain, use internal disks connected by using direct I/O.
Remarks: You can use GDS, Solaris VM, ZFS.
- 2) Configure dedicated LU (on the disk array) on each guest domain.
- 3) Use direct I/O to connect all LUs to the control domain.
- 4) The multi-path control is used in the control domain if necessary.

- Remarks: When the disk array ETERNUS is used, ETMPD is available.
When the Sun STK disk array is used, MPxIO is available.
- 5) Each LU is initialized by the UFS file system to be mounted to the control domain.
 - 6) Create a file to be allocated as the virtual disk on each UFS file system.
Remarks: In the following example, one file is created on each of three UFS file systems.
 - 7) The created file is used to allocate a virtual disk to each guest domain.

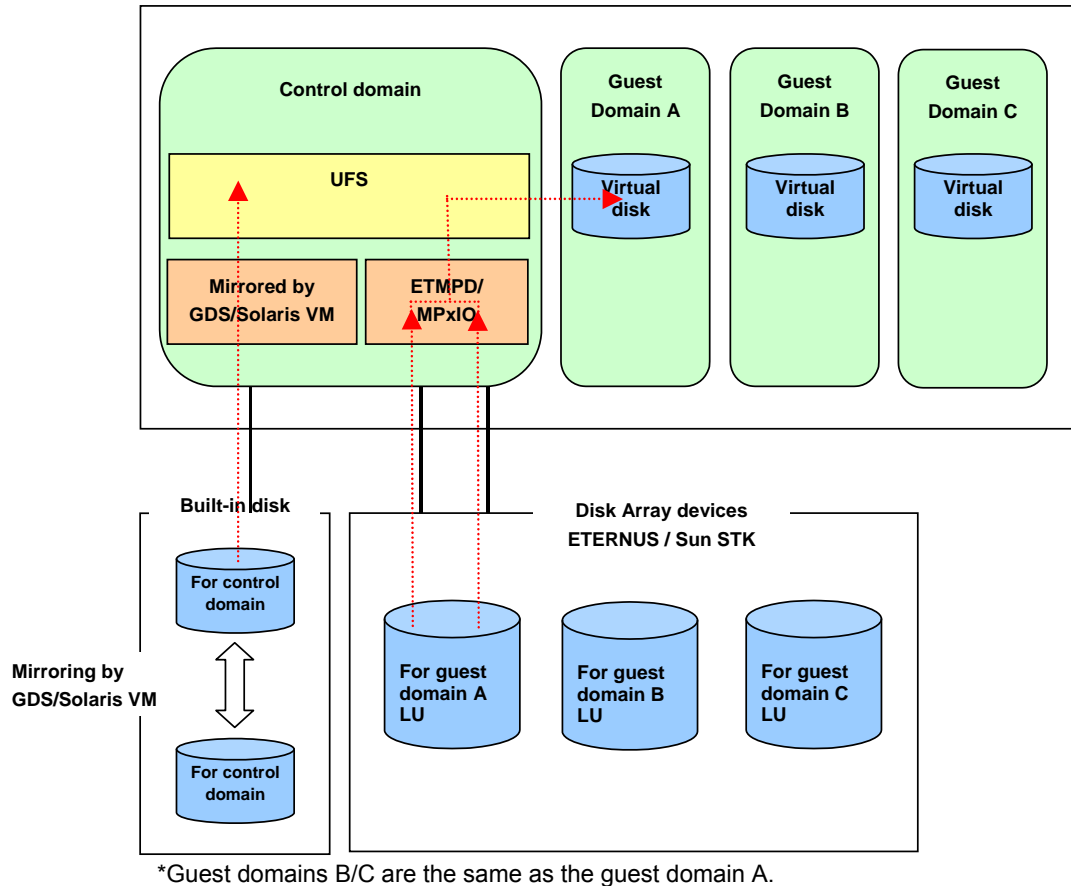


Figure 3.5 Example 3 Configuration when building the LDomS using direct I/O

3.5.6 Configuration Example 6

This section describes how to configure LDomS by using internal disks.

The disks allocated to each domain are available as the system disk or data disk.

Points to consider regarding building

- 1) The internal disks connect to the control domain through Direct I/O.
- 2) The control domain uses internal disks.
- 3) All internal disks of the control domain are mirrored.(PRIMECLUSTER GDS (GDS) and Solaris Volume Manager (SVM) and ZFS are available as mirroring software.)
- 4) Allocate dedicated disks to Guest Domain A,B, initialize UFS on them and mount them on the control domain.
- 5) Create a file to be allocated as the virtual disk on each UFS file system.

Remarks: In the following example, one file is created on each of two UFS file systems.

- 6) The created file is used to allocate a virtual disk to each guest domain.
- 7) Configure dedicated LU (on the disk array) on Guest Domain C.
- 8) Use direct I/O to connect all LUs to Guest Domain C.
- 9) Guest Domain C uses disks connected by using direct I/O.
- 10) The multi-path control is used in the control domain if necessary.

Remarks: When the disk array ETERNUS is used, ETMPD is available.
When the Sun STK disk array is used, MPxIO is available.

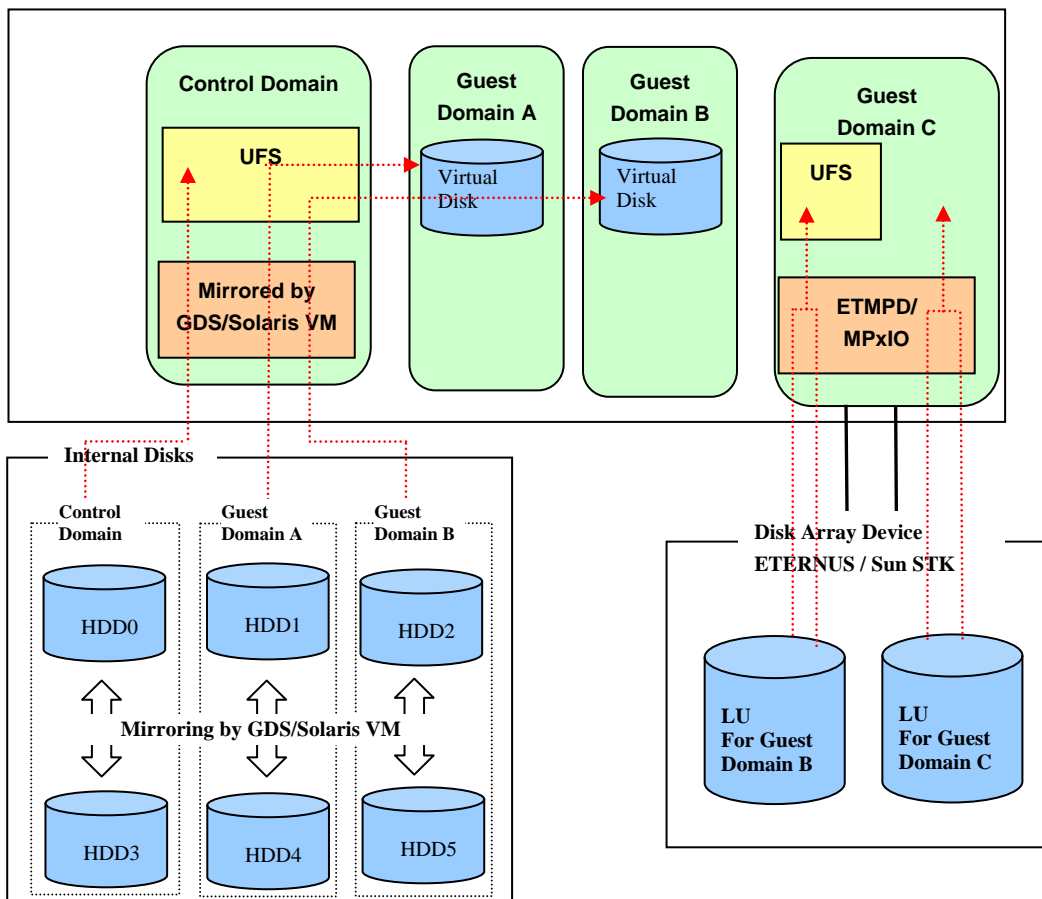


Figure 3.6 Example 4 Configuration when building the LDomS using direct I/O

3.5.7 Configuration Example 7

Here, the method of configuring LDomS on Solaris VM using an internal disk and external file unit device is explained.

A disk allocated to each domain can be used as a system disk, or data disk.

Points to consider regarding building

- 1) Connect the internal disk to the control domain using direct I/O.
- 2) Use the internal disk for the control domain.
- 3) Perform the mirroring of the internal disk in the control domain with Solaris VM.
- 4) Allocate Solaris VM volume created in a disk used for guest domain A to guest domain A as a virtual disk.
- 5) Connect the external file unit to guest domain B using direct I/O.

- 6) Guest domain B will use a disk connected using direct I/O.
- 7) Perform the mirroring of the disk of the external file unit in guest domain B with Solaris VM.
- 8) Allocate Solaris VM volume created in a disk used for guest domain C to guest domain C as a virtual disk.

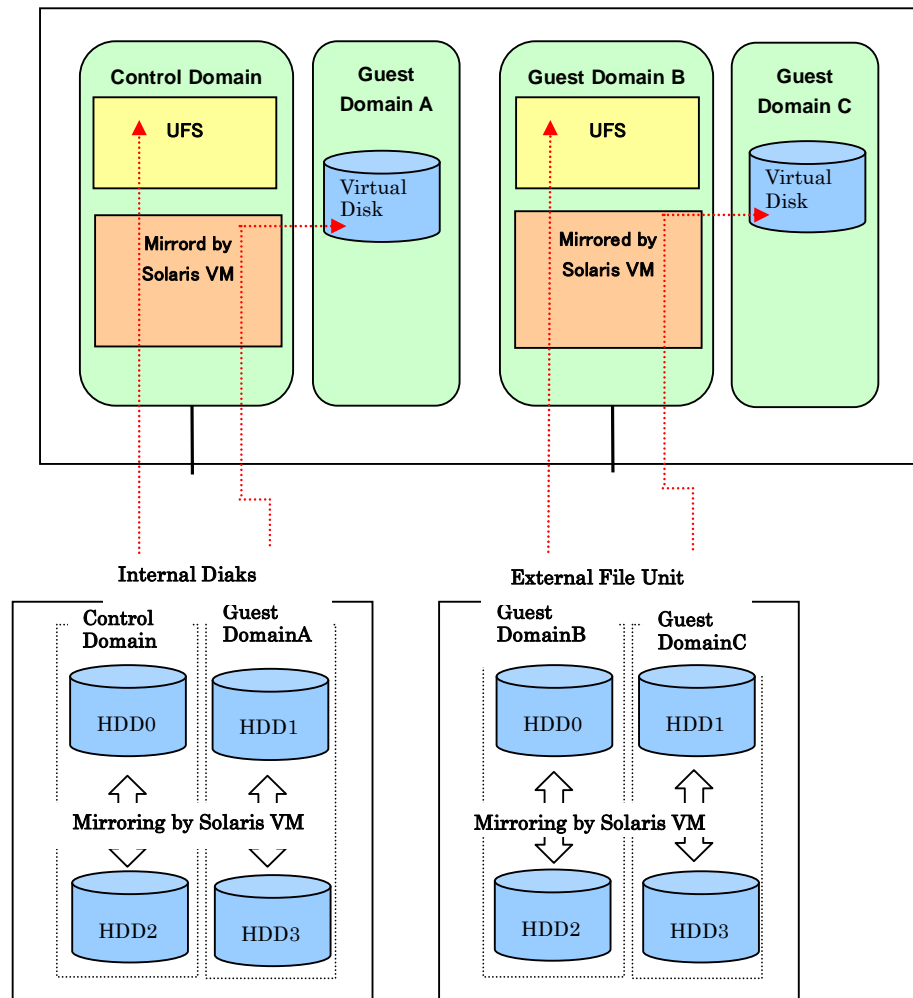


Figure 3.7 Example 5 Configuration when building the LDomS using direct I/O

3.5.8 Configuration Example 8

Here the method of configuring LDomS in an internal disk when ZFS file is allocated as a virtual disk is explained.

Points to consider regarding building

- 1) Connect the internal disk to the control domain using direct I/O.
- 2) Use the internal disk for the control domain.
- 3) Allocate an exclusive disk to each guest domain, and initialize it with ZFS to mount the control domain.
- 4) Create a file to be allocated as a virtual disk on the mounted ZFS.
- 5) Allocate the created file to each guest domain as a virtual disk.

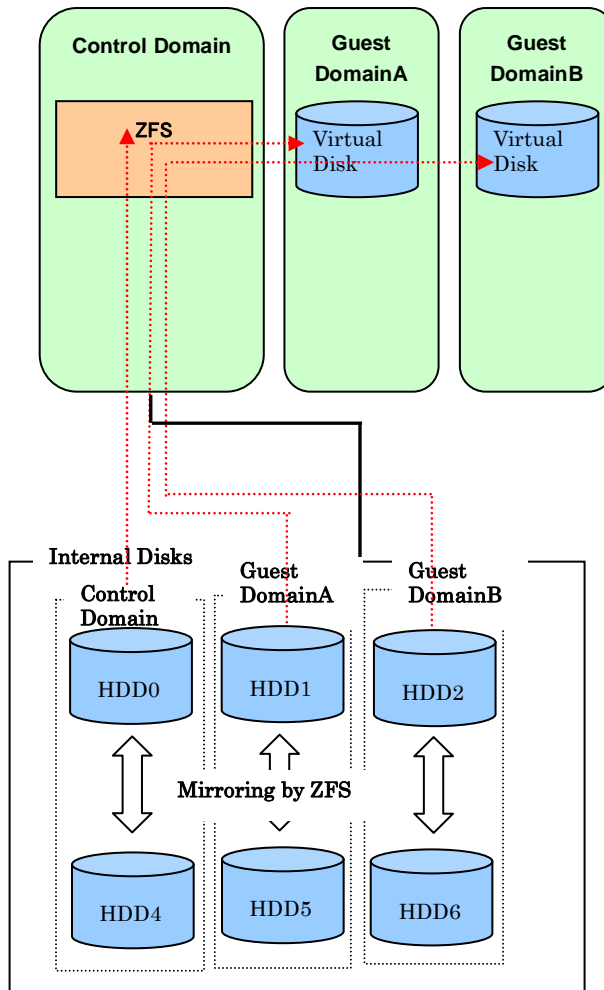


Figure 3.8 Example 3 Configuration when building the LDoms in the internal disk

3.6 Points to Consider Regarding Network building

Points on and notes on the network building in the LDom environments are explained in this section.

3.6.1 Allocation of the virtual switch (vsw) or virtual network device (vnet)

- Fujitsu recommends allocating the vsw service for each different NIC and allocating the vnet according to the following configuration example.

When consolidating the vnet of several guest domains to the vsw that is allocated to one NIC, the upper limit of the throughput sum for each vnet is limited to one NIC throughput.

[Configuration example]

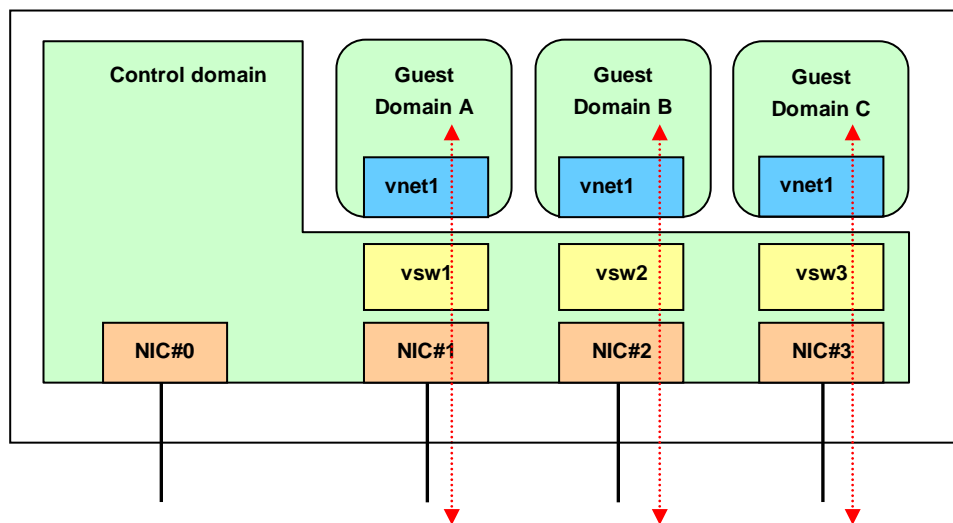


Figure 3.9 Allocation of the virtual switch (vsw) or virtual network device (vnet)

- DO NOT allocate more than 32 vnet for one vsw service. The load for the control domain may become very high, leading to a suspension of system operations.
- The VLAN of vnet is supported.
- The Jumbo frame of vnet and vsw is supported from LDom1.2.

3.6.2 Multi-path and NIC redundant configuration

- In the following conditions, the NIC redundant configuration will be available when the Link Aggregation function in the standard Solaris 10 OS is combined with LDom.
 - The NIC driver that supports Link Aggregation of the Solaris 10 OS standard should correspond to GLDv3.
 - You should apply Kernel Patch 127127-11 to the control domain.
 - You can use only the composition in which device (aggr) that brought the NIC device together is allocated in vsw in the control domain. In the guest domain, vnet cannot be brought together in aggr.

[Configuration example]

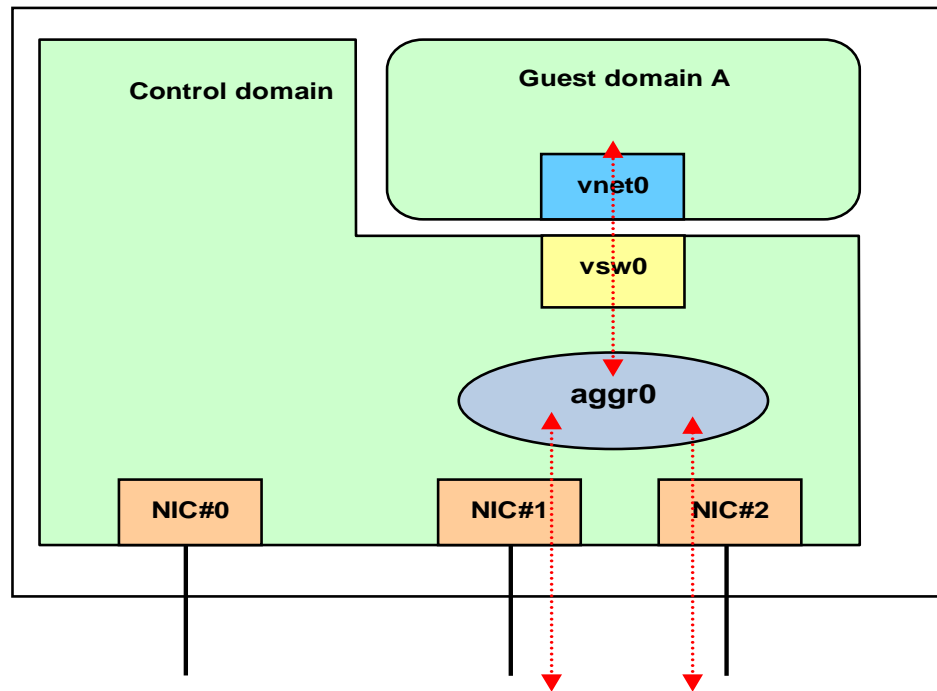


Figure 3.10 Link Aggregation configuration with Control Domain

- The NIC redundant configuration will be available when the IP network multi-path (IPMP) function in the standard Solaris 10 OS is combined with LDoms.
 - Notes on the IPMP configuration in the guest domain
 - This configuration can be used only for fault detection with the test signal.
 - Fault detection by monitoring the link state is not supported.

[Configuration example]

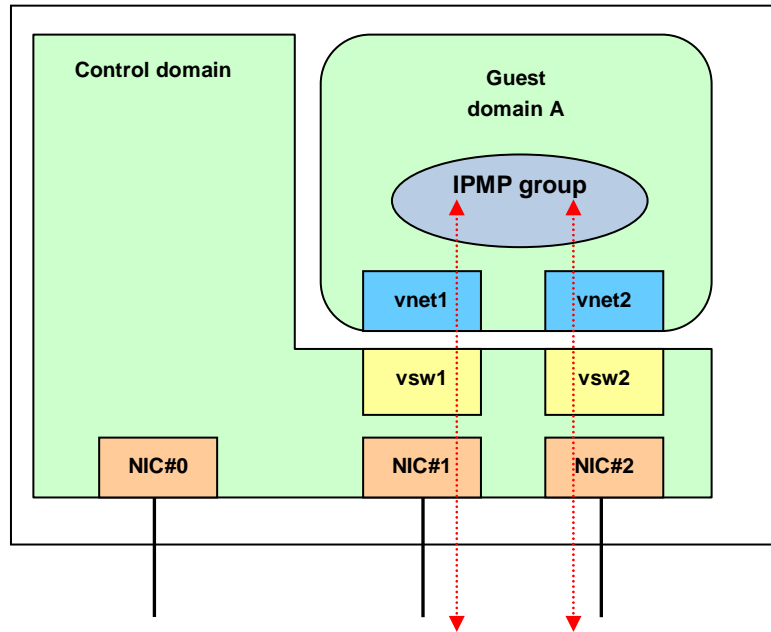


Figure 3.11 Multi-path configuration with Guest Domain

- Notes on setting multi-path configuration with the control domain
The method of the fault detection that you can use is a fault detection by the test signal and a fault detection by the link state monitoring.

[Configuration example]

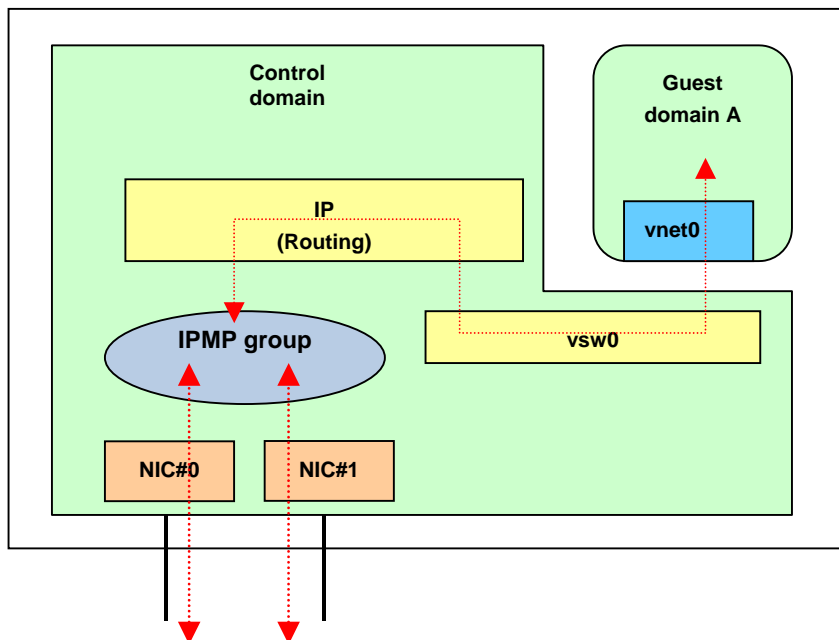


Figure 3.12 Multi-path configuration with Control Domain

3.6.3 Notes on LAN in SPARC Enterprise T5140/T5240/T5440

- When 10GbitEthernet XAUI card is installed, ports cannot be used because of exclusive use. For more information, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”.

Chapter 4 Building Procedure (Example 1)

This chapter describes how to configure the control domain and guest domain.

4.1 Precautions to Take Before Starting to Build

4.1.1 LDoms environment

Regarding environment supported by Fujitsu, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”

4.1.2 Firmware

There are two kinds of system monitoring mechanism - ALOM and ILOM, and the way of checking firmware differs between ALOM and ILOM. The following example describes how to check firmware by each system monitoring function.

【ALOM】

- Your firmware can be confirmed from system controller (SC).

```
sc> showhost
Sun System Firmware 7.2.2.e 2009/06/19 10:22

Host flash versions:
  Hypervisor 1.7.2.a 2009/05/05 19:32
  OBP 4.30.2.b 2009/06/16 07:02
  POST 4.30.2 2009/04/21 09:53
```

Remarks: The screenshots in Section 4.1 show examples of CLI operations of the system controller in the ALOM CMT shell as well as the execution results. Refer to [Integrated Lights Out Manager Additional Manual] on ALOM CMT shell.

[ILOM]

```

-> show /HOST

/HOST
  Targets:
    bootmode
    diag
    domain

  Properties:
    autorestart = reset
    autorunonerror = false
    bootfailrecovery = poweroff
    bootrestart = none
    boottimeout = 0
    hypervisor_version = Hypervisor 1.7.2.a 2009/05/05 19:32
    macaddress = 00:14:4f:97:b5:58
    maxbootfail = 3
    obp_version = OBP 4.30.2.b 2009/06/16 07:02
    post_version = POST 4.30.2 2009/04/21 09:53
    send_break_action = (none)
    status = Solaris running
    sysfw version = Sun System Firmware 7.2.2.e 2009/06/19
10:22

  Commands:
    cd
    set
    show

```

4.1.3 Logical domains manager software (LDoms manager)

The installed LDoms Manager can be checked using the following method.

```

# pkginfo -l SUNWldm | grep VERSION
VERSION: 1.2,REV=2009.06.25.09.48

```

When an unsupported package is installed, remove it by using the following procedure.

```

# pkginfo -l SUNWldm | grep VERSION
VERSION: 1.2,REV=2009.06.25.09.48
# svcadm disable ldmd
# svcadm disable vntsd
# pkgrm SUNWldm SUNWjass

The following package is installed:
SUNWldm Logical Domains Manager
(sparc.sun4v) 1.2,REV=2009.06.25.09.48

Do you delete this package? [y,n,?,q] y
...

```

After removing the package, download the LDoms manager from the following official Fujitsu site:

<http://www.fujitsu.com/global/services/computing/server/sparcenterprise/products/software/ldoms/>

4.1.4 Operating system (OS) for the Control Domain

- Solaris 10 OS 8/07 or later
- Required patch
- Cluster specified and installed with Core System Support (SUNWCreq) or higher

The Solaris release, patch, and install cluster can be checked using the following method.

```
# cat /etc/release
Solaris 10 10/08 s10s_u6wos_07b SPARC
Copyright 2008 Sun Microsystems, Inc. All Rights
Reserved.
Use is subject to license terms.
Assembled 27 October 2008

# patchadd -p | grep 127111
Patch: 127127-11 Obsoletes: 118557-09 118560-02 118562-14 118843-
01 120046-01 120068-03 120737-01 121132-03 121233-01 121239-02
121290-03 121721-01 121944-03 122363-02 122537-02 123360-01
123398-02 123564-01 123712-01 123836-01 123915-01 124235-03
124252-03 124256-06 125016-02 125037-06 125043-01 125081-16
125122-01 125131-01 125169-01 125196-05 125202-01 125251-02
125253-01 125367-03 125380-02 125382-01 125418-01 125482-03
125484-04 125490-02 125501-01 125553-03 125890-03 125899-01
125917-03 126135-01 126143-01 126144-02 126322-01 126423-03
126432-01 126434-06 126448-05 126450-01 126647-02 126664-01
126665-01 126666-01 126668-01 126670-01 126672-02 126916-01
127111-11 127716-01 127718-05 127728-06 127730-04 127732-01
127741-01 127745-01 127747-01 127749-03 127750-01 127753-02
127757-01 127761-01 127855-02 127858-01 127862-01 127874-01
127880-02 127918-02 127966-01 127982-01 127984-02 127990-02
127992-01 128002-01 128028-03 128030-03 128314-01 128404-01
128500-01 136718-01 136887-01 137044-01 137082-01 137113-01
Requires: 118731-01 118833-36 118918-24 119042-09 119254-51
119578-30 120011-14 120900-04 121133-02 121901-01 125891-01
126540-02 126897-02 127755-01 Incompatibles: Packages: SUNWcsu
SUNWcsr SUNWcsl SUNWkvmt200 SUNWcart200 SUNWcar SUNWcakrnt2000
SUNWcakr FJSVhea SUNWkvm SUNWckr SUNWcsd SUNWcpcu FJSVcpcu
SUNWcryr SUNWib SUNWfmd FJSVfmd SUNWperl584core SUNWesu SUNWmdb
FJSVmdb SUNWmdbr FJSVmdbr SUNWpiclu FJSVpiclu SUNWzfskr SUNWsmapi
SUNWzfsr SUNWzfsu SUNWzoneu SUNWcslr SUNWtsg SUNWtsu SUNWkrbr
SUNWkrbu SUNWgss SUNWssad SUNWl394 SUNWmdr SUNWmdu SUNWintgige
SUNWopenssl-libraries SUNWwbsup SUNWpapi SUNWippcore SUNWipplr
SUNWipplu SUNWtnetc SUNWtnetd SUNWtoo SUNWaudit SUNWtsr SUNWusb
SUNWtavor SUNWudapltu SUNWudapltr SUNWrcmdc SUNWrcmds SUNWnfscr
SUNWgssk SUNWnfscr SUNWnfscu SUNWvolu SUNWnfssu SUNWp15u
SUNWbtool SUNWarc SUNWarcr SUNWxcu4 SUNWnisu SUNWypr SUNWypu
SUNWatfsu SUNWcpc SUNWfruid SUNWiopc SUNWdtrc SUNWldomr SUNWldomu
SUNWn2cp SUNWniumx SUNWnxge SUNWust1 SUNWust2 SUNWcry SUNWkdcu
SUNWcstl SUNWpcr SUNWpcu SUNWppm SUNWpsr SUNWpsu SUNWdcar
SUNWluxl SUNWdtrp SUNWscplp SUNWhea SUNWnfsskr SUNWfss SUNWftdur
SUNWftduu SUNWpamsc SUNWpd SUNWpdu SUNWpiclr SUNWpsm-lpd SUNWrds
SUNWsndmu SUNWspnego SUNWgssdh
# cat /var/sadm/system/admin/CLUSTER
CLUSTER=SUNWCXall
```

Remarks: Fujitsu recommends adding the Secure Shell (SUNWCssh) installation when applying the Core System Support to the control domain.

4.1.5 Enhanced Support Facility (ESF)

To check the version of your ESF, use the following procedure.

```
# /opt/FJSVbse/bin/esfver
```

```
esfver: INFO: Integrated Version of already installed Enhanced Support Facility.  
VERSION=3.0 REVISION=2006.12.1200,  
  
ESF_PATCH_VERSION = 3.0A20 20070807
```

4.1.6 Sun Explorer Data Collector

- Use the latest version of Sun Explorer Data Collector 5.10 or later.
- The following describes how to check the version of Sun Explorer Data Collector.

```
# /opt/SUNWexplo/bin/explorer -V  
Explorer version: 5.13  
:  
:  
#
```

Note: Install Sun Explorer Data Collector into both control and guest domain.

4.2 Building Flow

The following describes the steps of building LDom system.

- 1) Determining the LDom configuration
- 2) Preparing the LDom configuration scripts
- 3) Installation of LDom Manager
- 4) Defining the Guest Domain Administrative Users
- 5) Preparing the Files for the Virtual Disks
- 6) Building the Control Domain
- 7) Building the Guest Domain
- 8) Retaining the LDom Configuration Information
- 9) Installing the Guest Domain
- 10) Configuration of domain dependency relationships

This section explains 1) Determining the LDom Configuration and 2) Preparing the LDom configuration scripts.

4.2.1 Determining the LDom configuration

The domains to be constructed, the virtual services and the hardware resources allocated to each domain are configured.

4.2.1.1 LDom configuration name

The system controller can save up to eight LDom configuration (config).

The saved configurations can be switched by power cycling or resetting the system after designating the configuration to be used next.

The configuration is specified as 'initial' in this document.

4.2.1.2 Domain names

Fujitsu recommends that the number of the domain operated in LDom be less than the number of CPU cores.

In this document, we take the case of SPARC Enterprise T5120/5220 and the domain structure is configured with the primary domain, ldom1, ldom2, and ldom3.

4.2.1.3 The virtual disk service

The virtual disk service is configured using the following resources.

The virtual disk server (vdiskserver)

The virtual server device (vdiskserverdevice)

The virtual disk (vdisk)

In this document, the virtual disk server (primary-vds0) can operate on the control domain, and the three virtual disk devices, vol1, vol2 and vol3, are allocated to ldom1, ldom2, and ldom3, as virtual disks (vdisk0).

The virtual disk server (primary-vds0)	—	The virtual disk server device for ldom1 (vol1) →
		The virtual disk for ldom1 (vdisk0)
	—	The virtual disk server device for ldom2 (vol2) →
		The virtual disk for ldom2 (vdisk0)
	—	The virtual disk server device for ldom3 (vol3) →
		The virtual disk for ldom3 (vdisk0)

You can specify a general file in the UFS file system as a virtual disk device. In this section, allocate the file on the following directory structure as the virtual disk server device.

/LDoms domain	—	Vol1 — vdisk0.img → vol1 Virtual disk server device entities
	—	Vol2 — vdisk0.img → vol2 Virtual disk server device entities
	—	Vol3 — vdisk0.img → vol3 Virtual disk server device entities
	—	Scripts → Storage directory of the construction script
	—	Domains → Storage directory of the configuration information for the guest

4.2.1.4 The virtual switch service

The virtual switch service is configured using the following resources.

The virtual switch (vswitch)

The virtual network device (vnet)

The network adapter (net-dev)

The virtual switch service (primary-vsw0, primary-vsw1, primary-vsw2, and primary-vsw3) can operate on the control domain, and the network adapter (e1000g0) is used by all domains. The virtual switch is allocated for each of ldom1, ldom2, and ldom3 to use e1000g1, e1000g2 and e1000g3 as the dedicated network adapter of the virtual network device (vnet1)

In the following example, the name of the driver (e1000g) is the standard LAN port of SPARC Enterprise T5120/T5220.

For the driver name of a standard LAN port of each machine model, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”.

Network adapter (e1000g0) - Virtual switch (primary-vsw0) - Used for the communication among all of domains (vnet0)
Network adapter (e1000g1) - Virtual switch (primary-vsw1) - Used in ldom1 (vnet1)
Network adapter (e1000g2) - Virtual switch (primary-vsw2) - Used in ldom2 (vnet1)
Network adapter (e1000g3) - Virtual switch (primary-vsw3) - Used in ldom3 (vnet1)

4.2.1.5 Distributing device service of the virtual console terminal

The guest domain console is connected with the virtual console (vcons), which is provided by the distributing device service of the virtual console terminal (vconscn), and the virtual network terminal server (vntsd).

The distributing device service of the virtual console terminal allocates dedicated port numbers that do not overlap with those of the other network services for the virtual console of the guest domain. Automatic assignment of port numbers is available. However, in this case, the port numbers of the virtual console are changed by the binding/unbinding of the guest domain resources.

The virtual network terminal server provides a function for connecting via the telnet command, to the virtual console of the guest domain to which a port number is allocated by the distributing device service of the virtual console.

In this document, the dedicated port numbers for 5001 to 5003 are allocated for each virtual console of ldom1, ldom2 and ldom3.

4.2.1.6 Creating the allocation sheet for hardware resources

The following allocation sheet for the hardware resources is created.

Table 4.1 Hardware resource allocation

Configuration name (CONFIG)	Initial				Remarks
	primary	ldom1	ldom2	ldom3	
Domain name (DOMAIN)	primary	ldom1	ldom2	ldom3	This is the name used for control by LDoms Manager. It is not linked to the host name or node name.
Virtual CPU numbers (VCPU)	8	16	16	24	Specify a multiple of the number of threads per CPU core.
Memory (MEM)	4096M	1920M	1024M	1024M	Memory allocated to firmware cannot be used. Exclude the memory size allocated to firmware. Eliminate 128MB from the allocation for the firmware. When 1024MB is allocated, enter [1024M], and when allocating 4GB, enter [4G].
Cryptographic device *(MAU)	0	0	0	0	Specify the MAU unit number. Specify "0" when using the active reconfiguration of CPU. You cannot allocate the MAU beyond the CPU core numbers.
Virtual network device 0(VNET0)		vsw0	vsw0	vsw0	Specify the virtual switch service to connect to virtual network device 0.
Virtual network device 1(VNET1)		vsw1	vsw2	vsw3	Specify the virtual switch service to connect to virtual network device 1.
Virtual disk 0(VDISK0)		vol1	vol2	vol3	Specify the virtual disk server device to allocate to virtual disk 0.
Virtual console (VCONS)		5001	5002	5003	Specify the port number to allocate to the virtual console.

*1: Sizes used by firmware may differ depending on machine model or firmware version. Please check available sizes by seeing the result of output of the command below.

Primary# ldm list-device -a

4.2.2 Preparing the LDoms configuration script

The control domain configuration script and the guest domain configuration script are created with the allocation sheet of the hardware resources that are created in the LDoms configuration. Save the created script in the directory for the LDoms configuration script (/LDoms/Scripts/) to make the script operable as required.

4.2.2.1 Creation of the Control Domain configuration scripts

The following is an example of the control domain configuration script.

Set the values of the allocation sheet of the hardware resources to the shell variables (CONFIG, VCPU, MAU, MEM).

```
#!/bin/sh
# Control domain configuration script (for 4 domains)
CONFIG=initial # Configuration name to store in the system controller
VCPU=8 # Virtual CPU numbers to allocate to the control domain
MAU=0 # MAU numbers to allocate to the control domain
MEM=4096M # Memory to allocate to the control domain (K:KB,M:MB,G:GB)

ldm set-mau $MAU primary
ldm set-vcpu $VCPU primary
ldm set-memory $MEM primary

# Define the virtual disk server.
ldm add-vdiskserver primary-vds0 primary
# Define the virtual disk server device and specify the entity.
ldm add-vdiskserverdevice /LDoms/Vol1/vdisk0.img vol1@primary-vds0
ldm add-vdiskserverdevice /LDoms/Vol2/vdisk0.img vol2@primary-vds0
ldm add-vdiskserverdevice /LDoms/Vol3/vdisk0.img vol3@primary-vds0

# Define the virtual switch service and specify the network adapter. (*1)
ldm add-vswitch net-dev=e1000g0 primary-vsw0 primary
ldm add-vswitch net-dev=e1000g1 primary-vsw1 primary
ldm add-vswitch net-dev=e1000g2 primary-vsw2 primary
ldm add-vswitch net-dev=e1000g3 primary-vsw3 primary

# Specify the distributing device service of the virtual console terminal and the port
range to allocate.
ldm add-vconscon port-range=5000-5100 primary-vcc0 primary

eeprom auto-boot\?=false
# Save the configuration in the system controller.
ldm add-config $CONFIG
# After executing this script, the power-off, reclosing or reset is required.
```

*1: Standard network drivers differs according to hardware platform. For more information, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”.network drivers are listed bel

This script is stored in the /LDoms/Scripts/ directory of the control domain under the name primary.sh.

4.2.2.2 Creating the Guest Domain configuration script

The following is an example of the guest domain configuration script. Set the values on the 'Hardware resource allocation' sheet to the shell variables (DOMAIN,VCPU,MAU,MEM,VNET0,VNET1,VDISK0,VCONS).

```
#!/bin/sh
# Guest domain configuration script (for ldomain)
DOMAIN=ldom1      # Domain name
VCPU=16           # CPU numbers to allocate to the domain
MAU=0             # MAU numbers to allocate the domains
MEM=1920M         # Memory to allocate the domain (K:KB,M:MB,G:GB)
VNET0=primary-vsw0
VNET1=primary-vsw1
VDISK0=vol1@primary-vds0
VCONS="port=5001"

ldm add-domain $DOMAIN
ldm set-mau $MAU $DOMAIN
ldm add-vcpu $VCPU $DOMAIN
ldm add-memory $MEM $DOMAIN
ldm add-vnet vnet0 $VNET0 $DOMAIN
ldm add-vnet vnet1 $VNET1 $DOMAIN
ldm add-vdisk vdisk0 $VDISK0 $DOMAIN
ldm set-vcons $VCONS $DOMAIN

# Specify the domain to prevent the automatic disk boot when starting the domains
because of the network installation.
ldm set-variable auto-boot\?=false $DOMAIN

# When executing the following, the domain will be active.
ldm bind-domain $DOMAIN
ldm start-domain $DOMAIN

# When executing the following, save the configuration information of the domain.
# The stored configuration information is available as the input of the following
command.
# ldm add-domain -i
ldm list-constraints -x $DOMAIN >/LDoms/Domains/$DOMAIN.xml
cp /LDoms/Domains/$DOMAIN.xml /LDoms/$DOMAIN.`date +%y%m%d%H%M%S`

# When executing the following, the Ethernet address of the virtual network of the
domain is indicated.
# The Ethernet address which is displayed in the ok prompt is not the virtual network
device address.
ldm ls -e $DOMAIN|grep vnet|cut -d@ -f3|nawk '{ print $1,$2 }' | xargs -L 1 echo vnet
```

This script is stored in the /LDoms/Scripts/ directory of the control domain under the name ldom?.sh (? means the number used to express the configuration domain:1,2 or 3).

4.2.3 Installation of LDoms Manager

Please see chapter 6 “Installation LDoms Manager” for the installation instructions.

4.2.4 Defining the Guest Domain Administrative Users

Only the root users of the control domain can use the ldm command by default. System operation by only the root user or sharing of the root user's password with several users is not recommended on security grounds. If the users who control the only guest domain are allowed to use the ldm command, system control by root users or the password sharing of root users is not required.

The following are permitted by installing LDoms Manager.

- solaris.ldoms.read: the sub commands beginning with ldm list or ldm list- are available.
- solaris.ldoms.write: all of the ldm sub commands are available.

The following procedure indicates the steps from creating a role that has LDoms control authority through permissions added by LDoms Manager, up to the phase where the administrative user of the guest domain that granted the role is enabled to use the ldm command.

- 1) Define the ldomlopr that controls the guest domain ldom1.

```
primary# groupadd ldomadm
primary# mkdir -p /LDoms/ldomlopr
primary# useradd -g ldomadm -d /LDoms/ldomlopr ldomlopr
primary# passwd ldomlopr
New password:<Initial password of ldomlopr>
Re-entry a new password: <the initial password of ldomlopr>
passwd: The password of ldomlopr is changed.
```

- 2) Create the .profile that sets the environment variables of the path and prompt to the ldm command and online manual.

```
primary# vi /LDoms/ldomlopr/.profile

(add the following:)
PATH=$PATH:/opt/SUNWldm/bin ; export PATH
MANPATH=$MANPATH:/opt/SUNWldm/man ; export MANPATH
PS1="primary$" ; export PS1
```

Remarks:

- For security considerations, Fujitsu recommends not including the current directory (especially, consecutive colons) in the PATH variables.
- If the domain names are set in each shell prompt of the control domain and guest domain, it facilitates understanding the connecting domains.

- 3) Change the owner of the home directory and .profile file.

```
primary# chown ldomlopr:ldomadm /LDoms/ldomlopr
primary# chown ldomlopr:ldomadm /LDoms/ldomlopr/.profile
```

- 4) Define the role of the guest domain administration, ldomadm.

```
primary# roleadd -A solaris.ldoms.write ldomadm
primary# passwd ldomadm
A new password: <the password of ldomadm>
Re-entry a new password
passwd: The password of ldomadm is changed.
```

- 5) Allocate the role of ldomadm to the ldomlopr users.

```
primary# usermod -R ldomadm ldomlopr
```

- 6) Check whether the role is available.

```
primary# su - ldomlopr
primary$ ldm list
Authorization failed
primary$ su ldomadm
Password: <the password of ldomadm>
$ ldm list
...
NAME           STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary        active  -n-cv  SP    64    8064M   0.1%  43m
$ exit
```

Remarks: Allocate the ldomadm role to all of the users to administer the other domains.

- 7) If you execute the following, 'ldm1 opr' can use only 'ldm list' and subcommands beginning with 'ldm list-'.

```
primary# usermod -A
"solaris.device.cdrw,solaris.profmgr.read,solaris.jobs.users,solaris.mail.mailq,solaris
.ldoms.read" ldomlopr
```

Remarks: Specifying "solaris.jobs.users" may cause an error. If an error occurs, delete "solaris.jobs.users" and execute.

- 8) The following table indicates the relationship between the user's names/roles names on the definition or control domain and executable functions.

Usable functions	root user (Permission : Solaris.*)	ldomadm role (solaris.ldoms.write)	ldom?opr (Permission: when Solaris or ldoms.read is provided)
ldm list , ldm list-***	A	A	A
ldm bind-domain	A	A	N/A
ldm add-***	A	A	N/A
ldm remove-***	A	A	N/A
ldm set-***	A	A	N/A
ldm start-domain	A	A	N/A
ldm stop-domain	A	A	N/A
ldm unbind-domain	A	A	N/A
ldm panic-domain	A	A	N/A
Shutdown of the control domain, etc	A	N/A	N/A

4.2.5 Preparing the Files for the Virtual Disks

Create the file to be specified as the virtual disk server device that will be used to install the OS to the guest domain.

```
primary# cd /LDoms
primary# mkfile 8G Vol1/vdisk0.img
primary# mkfile 20G Vol2/vdisk0.img
primary# mkfile 100G Vol3/vdisk0.img
```

Creation of directories Vol1, Vol2 and Vol3 is required, in order to execute command described above.

4.2.6 Building the Control Domain

4.2.6.1 Executing the Control Domain building script

Build the control domain by executing the control domain building script which was created in advance.

Check the configuration, which is stored in the system controller after executing the control domain building script.

```
primary# ./LDoms/Scripts/primary.sh
...
primary# ldm list-config
factory-default
initial[next poweron]
```

Remarks: The above indicates that the LDoms configuration is the factory set configuration, which is set to be changed after reboot .

Start the server daemon of the virtual network terminal.

```
primary# svcs -a |grep ldom
disabled 17:01:10 svc:/ldoms/vntsd:default
online 16:10:48 svc:/ldoms/ldmd:default
primary# svcadm enable svc:/ldoms/vntsd:default
primary# svcs svc:/ldoms/vntsd:default
STATE STIME FMRI
online 17:03:10 svc:/ldoms/vntsd:default
```

4.2.6.2 Rebooting the Control Domain

The system configuration is changed after the system is powered off and then powered on again.

```
primary# shutdown -i0 -g0 -y
:
syncing file systems... done
{0} ok power-off
:
Chassis | critical: Host has been powered off
[Input #(sharp) + .(dot)]
```

The following operation differs depending on the system monitoring mechanisms (ALOM, ILOM).

Follow the procedure for your system monitoring mechanism.

【ALOM】

```
sc> poweron -c
Enter #. to return to ALOM.
Chassis | major: Host has been powered on
```


[ILOM]

```

-> start /SYS
Are you sure you want to start SyS (y/n)? y
Starting /SYS

P2LE52 console login: Apr 17 13:13:17 P2LE52 unix: WARNING: Power-off
requested, system will now shutdown.
:
:
:
P2LE52 console login:

```

4.2.6.3 Checking the Control Domain configuration

Check the control domain configuration after the reboot.

```

primary# ldm list-config
factory-default
initial [current]
primary# ldm list-bindings primary
NAME          STATE    FLAGS    CONS    VCPU    MEMORY    UTIL    UPTIME
primary       active   -ndcv-   SP      8       1G        0.0%   6h 32m

MAC
00:14:4f:97:b5:58

HOSTID
0x8497b558

CONTROL
failure-policy=ignore

DEPENDENCY
master=

VCPU
VID  PID  UTIL  STRAND
0    0    1.8%  100%
1    1    2.4%  100%
2    2    0.1%  100%
3    3    0.0%  100%
4    4    0.6%  100%
5    5    0.0%  100%
6    6    0.4%  100%
7    7    0.0%  100%

MEMORY
RA          PA          SIZE
0x8000000  0x8000000  1G

VARIABLES
boot-device=/pci@0/pci@0/pci@2/scsi@0/disk@0,0:a disk net
keyboard-layout=Japanese

IO
DEVICE      PSEUDONYM  OPTIONS
pci@0       pci
niu@80      niu

VCC
NAME        PORT-RANGE
primary-vcc0 5000-5100

VSW
NAME        MAC          NET-DEV  DEVICE      DEFAULT-VLAN-ID  PVID  VID  MTU  MODE
primary-vsw0 00:14:4f:fa:80:2e e1000g0 switch@0 1        1        1500

VDS
NAME        VOLUME      OPTIONS      MPGROUP      DEVICE
primary-vds0 vol0                /Ldom1/vdisk0.img

VCONS
NAME        SERVICE      PORT
SP

primary# ldm list-services

```

Building Procedure (Example 1)

VCC									
NAME	LDOM	PORT-RANGE							
primary-vcc0	primary	5000-5100							
VSW									
NAME	LDOM	MAC	NET-DEV	DEVICE	DEFAULT-VLAN-ID	PVID	VID	MTU	MODE
primary-vsw0	primary	00:14:4f:f8:ff:c8	e1000g0	switch@0	1	1		1500	
VDS									
NAME	LDOM	VOLUME	OPTIONS	MPGROUP	DEVICE				
primary-vds0	primary	vol1			/Ldom1/vdisk0.img				

4.2.7 Building the Guest Domain

4.2.7.1 Executing the Guest Domain building script

Execute the guest domain building script, which was created in advance and then build the guest domain.

Check the state of the guest domain after executing the guest domain building script.

```

primary$ . /LDoms/Scripts/ldom1.sh
...
root@gazellu# ldm list-bindings ldom1
NAME          STATE      FLAGS    CONS   VCPU  MEMORY  UTIL  UPTIME
ldom1         active    -t----  5010   16    1920M   12%   43m

MAC
  00:14:4f:f9:58:b2

HOSTID
  0x84f958b2

CONTROL
  failure-policy=ignore

DEPENDENCY
  master=

VCPU
  VID   PID   UTIL  STRAND
  0     8     100%  100%
  1     9     0.0%  100%
  2     10    0.0%  100%
  3     11    0.0%  100%
  4     12    0.0%  100%
  5     13    0.0%  100%
  6     14    0.0%  100%
  7     15    0.0%  100%
  8     16    0.0%  100%
  9     17    0.0%  100%
  10    18    0.0%  100%
  11    19    0.0%  100%
  12    20    0.0%  100%
  13    21    0.0%  100%
  14    22    0.0%  100%
  15    23    0.0%  100%

MEMORY
  RA          PA          SIZE
  0x8000000   0x10800000  1G

VARIABLES
  auto-boot?=false
  boot-device=vdisk1
  keyboard-layout=Japanese

NETWORK
  NAME      SERVICE          DEVICE    MAC          MODE  PVID VID  MTU
  vnet0     primary-vsw0@primary  network@0  00:14:4f:fa:7e:b0  1          1500
  PEER      primary-vsw0@primary  00:14:4f:f8:ff:c8  1          1500
  NAME      SERVICE          DEVICE    MAC          MODE  PVID VID  MTU
  vnet1     primary-vsw1@primary  network@1  00:14:4f:f8:24:7f  1          1500
  PEER      primary-vsw1@primary  00:14:4f:f8:9e:c6  1          1500

DISK
  NAME      VOLUME          TOUT  DEVICE  SERVER  MPGROUP
  vdisk1    voll@primary-vds0  disk@0  primary

```

```
VCONS
NAME          SERVICE          PORT
group1        primary-vcc0@primary 5001
primary$ . /LDoms/Scripts/ldom2.sh
:
primary$ . /LDoms/Scripts/ldom3.sh
```

Remarks:

- The above FLAGS indicates that the domain is the transition state (mainly, ok prompt mode).
- Rebooting the control domain is not required to make additions to, changes to, and deletions from the guest domain without making any changes to the control domain configuration.
- You need to create a directory to be used to save the domain configuration information before executing the guest domain configuration script.

4.2.7.2 Checking the Guest Domain console

Check whether you can access the guest domain console by using the virtual console.

After the connection, you can check the virtual environment by using the OBP command.

```
primary# svcadm enable svc:/ldoms/vntsd:default
primary# telnet localhost 5001
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

Connecting to console "ldom1" in group "ldom1" ....
Press ~? for control options ..

{0} ok banner

SPARC Enterprise T5220, No Keyboard
Copyright 2009 Sun Microsystems, Inc. All rights reserved.
OpenBoot 4.30.2.b, 1024 MB memory available, Serial #83562114.
Ethernet address 0:14:4f:fb:e:82, Host ID: 84fb0e82.

{0} ok devalias
vdisk0                /virtual-devices@100/channel-devices@200/disk@0
vnet1                 /virtual-devices@100/channel-devices@200/network@1
vnet0                 /virtual-devices@100/channel-devices@200/network@0
net                   /virtual-devices@100/channel-devices@200/network@0
disk                  /virtual-devices@100/channel-devices@200/disk@0
virtual-console       /virtual-devices/console@1
name                  aliases

{0} ok show-devs
/cpu@7
/cpu@6
/cpu@5
/cpu@4
/cpu@3
/cpu@2
/cpu@1
/cpu@0
/virtual-devices@100
/virtual-memory
/memory@m0,8000000
/aliases
/options
/openprom
/chosen
/packages
/virtual-devices@100/channel-devices@200
/virtual-devices@100/console@1
```

```

/virtual-devices@100/random-number-generator@e
/virtual-devices@100/ncp@6
/virtual-devices@100/n2cp@7
/virtual-devices@100/flashprom@0
More [,<cr>,q,n,p,c] ?

```

Remarks:

- When returning to the control domain, enter [~(tilde)] and [. (dot)] sequentially. In the case of connecting to the control domain with ssh, the connection to the control domain is disconnected using this operation. If you do not want to disconnect from the control domain, enter the [.] after entering the [~ (tilde)] + [~ (tilde)] + [. (dot)] and a number of [~] equivalent to the layer that uses ssh + 1.
- When sending the break signal, enter [~(tilde)] and [#(sharp)] sequentially.
- The MAC address that is indicated by the above banner command, has no relationship to the virtual network device (vnet0, vnet1). Check the MAC address of the virtual network device by outputting the ldm list-bindings command.

4.2.8 Retaining the LDoms Configuration Information

The hypervisor reads the LDoms configuration stored in EEPROM at the time of power activation. The LDoms configuration may be lost as a result of a failure of hardware, which includes EEPROM, such as a motherboard.

The LDoms Manager starts the guest domain by referring to the LDoms configuration which has been stored on the disk (/var/opt/SUNWldm/). If this disk cannot be accessed, the guest domain will not start the guest domain.

The following corrective actions are recommended for these conditions.

- Save of the building script

Save the building script in a certain location (/LDoms/Scripts/ in this document) so that the latest control domain building script (primary.sh in this document) or guest domain building script (ldom?.sh in this document) can be executed as required, and so that the LDoms environment can be rebuilt.
- Collection/Save of the guest domain configuration information

The outputs of ldm list-constraints -x [domain-name] when used for the input of ldm add-domain -i [file-name], can rebuild the collected guest domain. Collect the configuration information of the guest domain whenever the configuration is changed and save it in a certain location (/LDoms/Domains/ in this document).
- Save of the information to external media

Copy the information in the CD-R, DVD-R, tapes or file servers to be prepared in case they are lost from the disk.

4.2.9 Installing the Guest Domain

The OS installation of the guest domain is executed using the network installation method as well as the standard OS. Fujitsu recommends preparing another chassis for the installation server. The cancellation of the SST security configuration and the setting for virtual network communication between the control domain and guest domain are required although it is possible to use the control domain as the installation server.

4.2.9.1 Making the settings to the installed server

- 1) Check the MAC address (Ethernet) of the guest domain (ldom1 in the following example). (Operation of control domain)

```
primary$ ldm ls -l ldom1 <Enter>
:
NETWORK
  NAME      SERVICE          DEVICE          MAC                                     MODE PVID VID MTU
  vnet0    primary-vsw0@primary network@0    < MAC address of the guest domain>    1     1500
```

Remarks: DO NOT USE the result displayed by the banner command of the guest domain OBP.

- 2) Register the MAC address, IP address and host name of the guest domain with the installation server. (Operation of installed server)

```
# vi /etc/ethers <Enter>
```

(Add the following)

```
<MAC address of the guest domain> ldom1
```

...

```
# vi /etc/hosts <Enter>
```

(Add the following)

```
192.168.1.101 ldom1
```

...

- 3) Set the installation client. (Operation of installed server)

Remarks: Create the Solaris install image of the installation server in advance.

```
# cd <path to the Solaris image>/Solaris_10/Tools <Enter>
```

```
# ./add_install_client ldom1 sun4v <Enter>
```

- 4) Confirm the setting. (Operation of installed server)

```
# cat /etc/bootparams <Enter>
```

```
ldom1 root=192.168.1.100:/export/image/solaris10_8_07/Solaris_10/Tools/
Bootinstall=192.168.1.100:/export/image/solaris10_8_07/ boottype=:in
rootopts=:rsize=8192
```

- 5) Share the install image. (Operation of installed server.)

Remarks: It is not necessary to execute the command when sharing has already been done.

```
# share -o ro,anon=0 /export/image <Enter>
```

4.2.9.2 Network installation

- 1) Connect to the console of the guest domain. (Operation of control domain)

```
primary$ telnet localhost 5001 <Enter>
```

- 2) Check the virtual network device. (Operation of guest domain)

```
{0} ok devalias <Enter>
vdisk0                /virtual-devices@100/channel-devices@200/disk@0
vnet1                 /virtual-devices@100/channel-devices@200/network@1
vnet0                 /virtual-devices@100/channel-devices@200/network@0
net                   /virtual-devices@100/channel-devices@200/network@0
disk                  /virtual-devices@100/channel-devices@200/disk@0
virtual-console       /virtual-devices/console@1
name                  aliases
{0} ok
```

Remarks: The devices indicated with other net or disk names are not available in a guest domain other than the I/O domain.

- 3) Execute network installation. (Operation of guest domain)

```
{0} ok boot vnet0 <Enter>
Boot device: /virtual-devices@100/channel-devices@200/network@0 File and args:
:
SunOS Release 5.10 Version Generic_120011-14 64-bit
Copyright 1983-2007 Sun Microsystems, Inc. All rights reserved. Use is subject to
license terms.
:
whoami: no domain name
Configuring devices.
Using RPC Bootparams for network configuration information.
Attempting to configure interface vnet0...
Configured interface vnet0
Beginning system identification...
Searching for configuration file(s)...
Search complete.
Discovering additional network configuration...
```

Remarks:

- After this, execute the standard OS installation.
- The virtual disk names (c0d0s0, etc) are displayed as the disk name in the guest domain.
- The virtual network device names (vnet0, etc) are displayed as the network device name in the guest domain.
- If the virtual console is disconnected during the installation, the screen cannot be displayed normally even if reconnecting. Avoid disconnecting the virtual console during the installation.

4.2.9.3 Installing from DVD

The guest domain can be booted by using exported CD, DVD or the ISO image.

4.2.9.4 Installing Enhanced Support Facility (ESF)

Install ESF by referring to the following document.

- [Enhanced Support Facility Online Manual] and [Enhanced Support Facility 3.1 installation guide]
<http://software.fujitsu.com/jp/manual/manualindex/P08001214e.html>

4.2.10 Configuration of domain dependency relationships

Dependency relationships between domains can be configured.

For more information, please see “Logical Domains 1.2 Administration Guide”.

<http://docs.sun.com/app/docs/coll/2502.1?l=en>

4.2.10.1 Configuration of domain dependency relationships

Domain dependencies can be configured when or after domains are created. Fujitsu recommends that domain dependencies should be configured after domains are created.

- 1) Specify the master domain (ldom1) for the slave domain (ldom2). *

```
primary$ ldm set-domain master=ldom1 ldom2<Enter>
```

- 2) Define failure policies (such as panic) for the master domain (ldom1).

```
primary$ ldm set-domain failure-policy=panic ldom1<Enter>
```

- 3) Create configuration script to configure dependency relationships.

```
ldm set-domain master=ldom1 ldom2
ldm set-domain failure-policy=panic ldom1
```

- *) Each slave domain can specify up to four master domains.

However dependency cycles (mutual dependency relationship between two domains) cannot be configured.

When a master domain stops, a slave domain that has dependency relationships behaves according to the master domain's failure policy.

The failure policy takes an action against the slave domain when the master domain stops.

The status of master domain's stop means halts/reboots/reset/panic of the domain. Preparing a configuration script to define dependency relationships makes the recovery after maintenance easy.

4.2.10.2 Cancellation of domains dependency relationships

You need to cancel dependency relationships when maintaining domains.

If a domain is stopped or rebooted without cancellation of the dependency relationships, its slave domains are affected.

The following describes how to cancel domain dependencies.

- 1) Cancel the master domain of the slave domain (ldom2).

By specifying nothing for the master parameter, domain dependency relationships can be cancelled.

```
primary$ ldm set-domain master= ldom2<Enter>
```

- 2) Create the configuration script to cancel the dependency relationships.


```
ldm set-domain master= ldom2
```

Note) Preparing the configuration script to cancel the dependency relationships makes your works required before stopping domains easy.

Chapter 5 Building Procedure (Example 2)

This chapter describes how to configure the LDoms environment of the guest domain (also used as I/O domain).

5.1 I/O Domains

On SPARC Enterprise T5120/T5220/T5140/T5240/T5440, by dividing PCI Express leaf, you can configure domains (I/O domains) that are allowed to access I/O directly besides the control domain.

You can occupy and use resources of I/O by using these domains as guest domains. In this section, the guest domain that is also used as I/O domain is sometimes referred to as I/O domain.

5.2 Notes before building I/O Domains

5.2.1 Hardware

For hardware requirements of I/O domains, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”.

5.2.2 Software

For software requirements of I/O domains, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”.

5.2.3 Firmware

There are two kinds of system monitoring mechanism - ALOM and ILOM, and the way of checking firmware differs between ALOM and ILOM. The following example describes how to check firmware by each system monitoring function.

【ALOM】

- Your firmware can be confirmed from system controller (SC).

```
sc> showhost
Sun System Firmware 7.2.2.e 2009/06/19 10:22

Host flash versions:
Hypervisor 1.7.2.a 2009/05/05 19:32
OBP 4.30.2.b 2009/06/16 07:02
POST 4.30.2 2009/04/21 09:53
```

Remarks: The screenshots in Section 5.2.3 show examples of CLI operations of the system controller in the ALOM CMT shell as well as the execution results.

Refer to [Integrated Lights Out Manager Additional Manual] about ALOM CMT shell.

【ILOM の場合】

```
-> show /HOST

/HOST
  Targets:
    bootmode
    diag
    domain

  Properties:
    autorestart = reset
    autorunonerror = false
    bootfailrecovery = poweroff
    bootrestart = none
    boottimeout = 0
    hypervisor_version = Hypervisor 1.7.2.a 2009/05/05 19:32
    macaddress = 00:14:4f:97:b5:58
    maxbootfail = 3
    obp_version = OBP 4.30.2.b 2009/06/16 07:02
    post_version = POST 4.30.2 2009/04/21 09:53
    send_break_action = (none)
    status = Solaris running
    sysfw_version = Sun System Firmware 7.2.2.e 2009/06/19 10:22

  Commands:
    cd
    set
    show
```

5.2.4 Loading additional cards

For more information, please see “Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440”.

5.3 Building Procedure

This section describes the procedure of building LDoms, and determination of LDoms configuration that you can make before starting the configuration, and preparation of LDoms system configuration script.

If you create the control domain, or to the guest domain also used as I/O domain on disks connected by using Fujitsu option, you must have an installation server.

The following describes the steps of building LDoms system.

- 1) Determining the LDoms configuration
- 2) Preparing the LDoms configuration scripts
- 3) Building an Installation Server
- 4) Installation of LDoms Manager
- 5) Defining the Guest Domain Administrative Users

- 6) Preparing the Files for the Virtual Disks
- 7) Dividing PCI devices
- 8) Building the Control Domain
- 9) Building the I/O domain
- 10) Building the Guest Domain
- 11) Retaining the LDom Configuration Information
- 12) Installing the Guest Domain
- 13) Saving the LDom setting

5.3.1 Determining the LDom configuration

The domains to be constructed, the virtual services and the hardware resources allocated to each domain are configured.

5.3.1.1 LDom configuration name

The configuration is specified as 'split-io', 'initial', 'initial-io', or 'operation' in this document.

5.3.1.2 Domain names

Fujitsu recommends that the number of the domain operated in LDom be less than the number of CPU cores.

In this document, four domains are configured as shown below.

Control Domain : primary

Guest Domain(also used as I/O Domain) : iodom

Guest Domain : ldom1, ldom2

5.3.1.3 The virtual disk service

In this document, the virtual disk server (primary-vds0) can operate on the control domain only, and the two virtual disk devices, vol1 and vol2, are allocated to ldom1 and ldom2, respectively as virtual disks (vdisk0).

The virtual disk server (primary-vds0)	┌	The virtual disk server device for ldom1 (vol1) →
		The virtual disk for ldom1 (vdisk0)
	└	The virtual disk server device for ldom2 (vol2) →
		The virtual disk for ldom2 (vdisk0)

You can specify a general file in the UFS file system as a virtual disk device. You can allocate the file on the following directory structure as the virtual disk server device.

/LDoms domain	┌	Vol1 — vdisk0.img → vol1 Virtual disk server device entities
		Vol2 — vdisk0.img → vol2 Virtual disk server device entities
		Scripts → Storage directory of the construction script
		Domains → Storage directory of the configuration information for the guest

5.3.1.4 The virtual switch service

The virtual switch service (primary-vsw0, primary-vsw1) can operate on the control domain, and the network adapter (fjgi0) is used by all domains. The virtual switch is

allocated for each of ldom1, and ldom2 to function as the dedicated network adapter of the virtual network device (vnet1). I/O domain will be connected with the control domain , and guest domain via network switch.

Network adapter (fjgi0) - Virtual switch (primary-vsw0) - Used for the communication among all of domains (vnet0)
Network adapter (fjgi1) - Virtual switch (primary-vsw1) - Used in ldom1 and ldom2 (vnet1)
Network adapter (nxge0) - same network as Control Domain(fjgi0 vsw0) each Guest Domain(vnet0)
Network adapter (nxge1) - same network for WAN as Control Domain(fjgi1 vsw1) each Guest Domain(vnet1)

5.3.1.5 Distributing device service of the virtual console terminal

In this document, the dedicated port numbers from 5000 to 5002 are allocated for each virtual console of iodom, ldom1, and ldom2.

5.3.1.6 Creating the allocation sheet for hardware resources

The following allocation sheet for the hardware resources is created.

Table 5.1 Hardware resource allocation

Configuration name (CONFIG)	Initial				Remarks
	primary	iodom	ldom1	ldom2	
Domain name (DOMAIN)	primary	iodom	ldom1	ldom2	
Main Use	Administration	DB	Web	Application	
Virtual CPU numbers (VCPU)	16	32	24	24	
Memory (MEM)	4G	8G	8G	8G	Memory allocated to firmware cannot be used. Exclude the memory size allocated to firmware.
Cryptographic device (MAU)	0	0	0	0	
I/O device	pci@400	pci@500			
Virtual network device 0(VNET0)			vsw0	vsw0	Network for internal use
Virtual network device 1(VNET1)			vsw1	vsw1	Network for WAN
Virtual disk 0(VDISK0)			vol1	vol2	
Virtual console (VCONS)		5000	5001	5002	

Sizes used by firmware may differ according to the machine model or firmware version.

Confirm available sizes by checking the output result of the following command.

```
primary# ldm list-devices -a
```

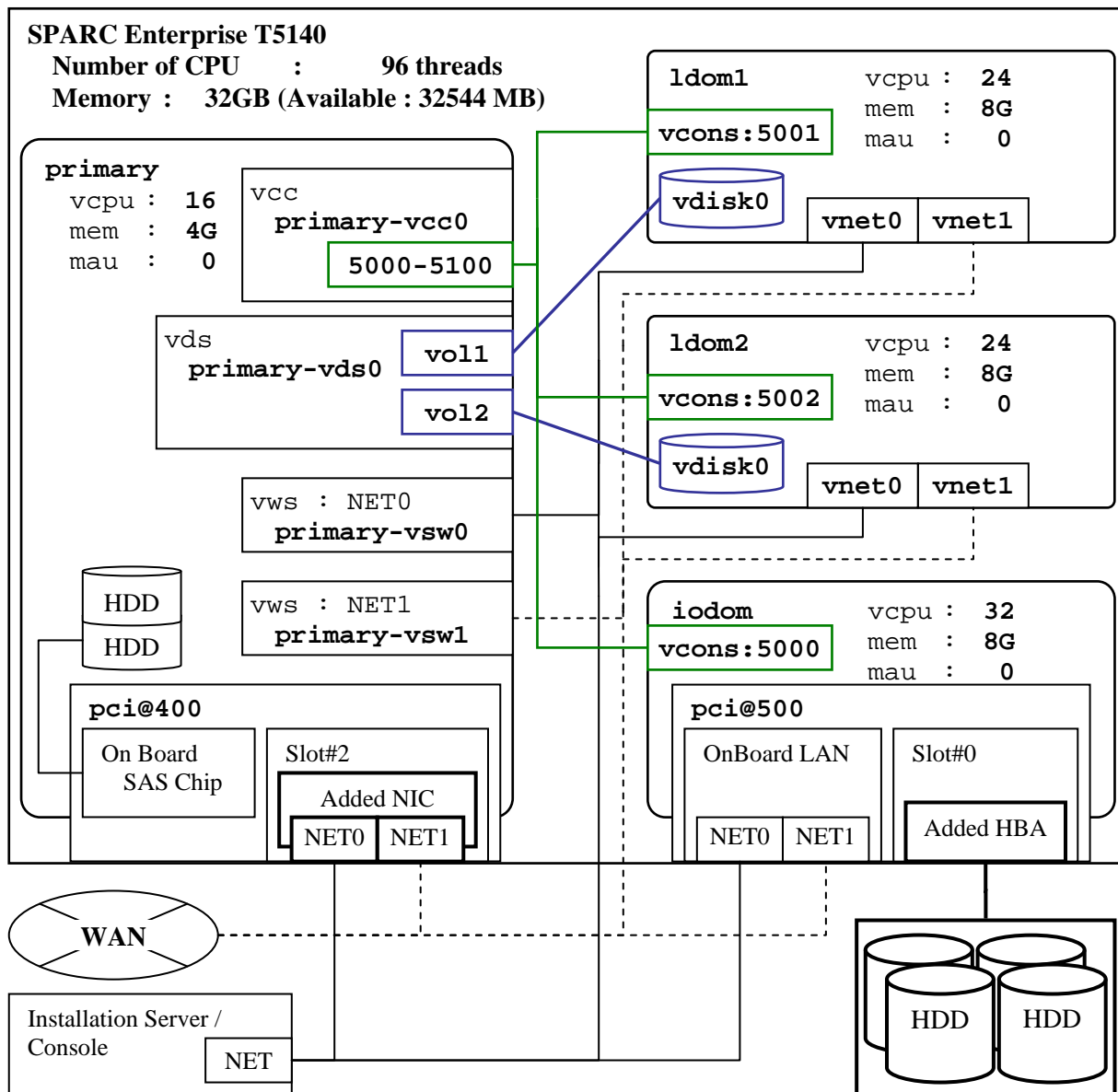


Figure 5.1 Example of configuration on SPARC Enterprise T5140

5.3.2 Preparing the LDom configuration script

The control domain configuration script and the guest domain configuration script are created with the allocation sheet of the hardware resources that are created in the LDom configuration. Save the created script in the directory for the LDom configuration script (/LDoms/Scripts/) to make the script operable as required.

5.3.2.1 Creation of the Control Domain configuration scripts

The following is an example of the control domain configuration script.

Set the values of the allocation sheet of the hardware resources to the shell variables (CONFIG, VCPU, MAU, MEM).

```
#!/bin/sh
# Control domain configuration script (for 4 domains)
CONFIG=initial # Configuration name to store in the system controller
VCPU=16 # Virtual CPU numbers to allocate to the control domain
MAU=0 # MAU numbers to allocate to the control domain
MEM=4G # Memory to allocate to the control domain (K:KB,M:MB,G:GB)

ldm set-mau $MAU primary
ldm set-vcpu $VCPU primary
ldm set-memory $MEM primary

# Define the virtual disk server.
ldm add-vdiskserver primary-vds0 primary
# Define the virtual disk server device and specify the entity.
ldm add-vdiskserverdevice /LDoms/Vol1/vdisk0.img vol1@primary-vds0
ldm add-vdiskserverdevice /LDoms/Vol2/vdisk0.img vol2@primary-vds0

# Define the virtual switch service and specify the network adapter. (*)
ldm add-vswitch net-dev=fjgi0 primary-vsw0 primary
ldm add-vswitch net-dev=fjgi1 primary-vsw1 primary

# Specify the distributing device service of the virtual console terminal and the port
range to allocate.
ldm add-vconscon port-range=5000-5100 primary-vcc0 primary

eeprom auto-boot\?=false
# Save the configuration in the system controller.
ldm add-config $CONFIG
# After executing this script, the power-off, reclosing or reset is required.
```

* If you configure the I/O domain, please specify the driver name of LAN card added to
PCIe Slot1 or Slot2 (or Slot3 if your machine is T5140).

This script is stored in the /LDoms/Scripts/ directory of the control domain under the name of primary.sh.

5.3.2.2 Creating the I/O domain configuration script

The following is an example of the I/O domain configuration script. Set the values on the 'Hardware resource allocation' sheet to the shell variables (DOMAIN,VCPU,MAU,MEM,VCONS, IO).

```
#!/bin/sh
# IO domain configuration script
DOMAIN=iodom          # Domain name
VCPU=32              # CPU numbers to allocate to the domain
MAU=0                # MAU numbers to allocate the domains
MEM=8G              # Memory to allocate the domain (K:KB,M:MB,G:GB)

VCONS="port=5000"
IO="pci@500"         # PCI device to be allocated to the domain

ldm add-domain $DOMAIN
ldm set-mau $MAU $DOMAIN
ldm add-vcpu $VCPU $DOMAIN
ldm add-memory $MEM $DOMAIN

# Do not allocate vnet, vdisk in order to use resources on the PCI device
ldm add-io $IO $DOMAIN
ldm set-vcons $VCONS $DOMAIN

# Specify the domain to prevent the automatic disk boot when starting the domains
because of the network installation.
ldm set-variable auto-boot\?=false $DOMAIN

# When executing the following, the configuration information of the domain is saved.
# The stored configuration information is available as the input of the following
command.
# ldm add-domain -i
ldm list-constraints -x $DOMAIN >/LDoms/Domains/$DOMAIN.xml
cp /LDoms/Domains/$DOMAIN.xml /LDoms/$DOMAIN.`date +%y%m%d%H%M%S`

# When executing the following, the Ethernet address of the virtual network of the
domain is indicated.
# The Ethernet address which is displayed in the ok prompt is not the virtual network
device address.
ldm ls -e $DOMAIN|grep vnet|cut -d@ -f3|nawk '{ print $1,$2 }' | xargs -L 1 echo vnet
```

If you want to use a hostid of I/O domain permanently, please change the setting as described below.

Example) Set hosted to "83fc0000"

```
MAC="00:14:4F:FC:00:00"          #Addition
ldm add-domain mac-addr=$MAC $DOMAIN #Change
```

This script is stored in the /LDoms/Scripts/ directory of the control domain under the name of iodom.sh .

5.3.2.3 Creating the Guest Domain configuration script

The following is an example of the guest domain configuration script. Set the values on the 'Hardware resource allocation' sheet to the shell variables (DOMAIN,VCPU,MAU,MEM,VNET0,VNET1,VDISK0,VCONS).

```
#!/bin/sh
# Guest domain configuration script (for 1 domain)
DOMAIN=ldom1        # Domain name
VCPU=24            # CPU numbers to allocate to the domain
MAU=0             # MAU numbers to allocate the domains
MEM=8G           # Memory to allocate the domain (K:KB,M:MB,G:GB)
```

```

VNET0=primary-vsw0
VNET1=primary-vsw1
VDISK0=voll@primary-vds0
VCONS="port=5001"

ldm add-domain $DOMAIN
ldm set-mau $MAU $DOMAIN
ldm add-vcpu $VCPU $DOMAIN
ldm add-memory $MEM $DOMAIN
ldm add-vnet vnet0 $VNET0 $DOMAIN
ldm add-vnet vnet1 $VNET1 $DOMAIN
ldm add-vdisk vdisk0 $VDISK0 $DOMAIN
ldm set-vcons $VCONS $DOMAIN

# Specify the domain to prevent the automatic disk boot when starting the domains
because of the network installation.
ldm set-variable auto-boot\?=false $DOMAIN

# When executing the following, the domain will be active.
ldm bind-domain $DOMAIN
ldm start-domain $DOMAIN

# When executing the following, save the configuration information of the domain.
# The stored configuration information is available as the input of the following
command.
# ldm add-domain -i
ldm list-constraints -x $DOMAIN >/LDoms/Domains/$DOMAIN.xml
cp /LDoms/Domains/$DOMAIN.xml /LDoms/$DOMAIN.`date +%y%m%d%H%M%S`

# When executing the following, the Ethernet address of the virtual network of the
domain is indicated.
# The Ethernet address which is displayed in the ok prompt is not the virtual network
device address.
ldm ls -e $DOMAIN|grep vnet|cut -d@ -f3|nawk '{ print $1,$2 }' | xargs -L 1 echo vnet

```

This script is stored in the `/LDoms/Scripts/` directory of the control domain under the name of `ldom?.sh` (? means the number used to express the configuration domain:1 or 2).

5.3.3 Building an Installation Server

Please see product manuals for each driver to build an installation server.

Latest Drivers

<https://updatesite.jp.fujitsu.com/unix/en/download/driver/index.html>

FUJITSU PCI GigabitEthernet 3.0

<https://updatesite.jp.fujitsu.com/unix/en/download/driver/giga-3/index.html>

Installation Server Configuration Guide For I/O Device Drivers

FUJITSU ULTRA LVD SCSI Host Bus Adapter Driver

<https://updatesite.jp.fujitsu.com/unix/en/download/driver/ultra320-scsi-2/index.html>

Installation Server Configuration Guide For I/O Device Drivers

FUJITSU PCI Fibre Channel 4.0

<https://updatesite.jp.fujitsu.com/unix/en/download/driver/pfca-4/index.html>

FUJITSU PCI Fibre Channel 4.0 Update1 Instructions

5.3.4 Installation of LDoms Manager

Please see chapter 6 “Installation of LDoms Manager” for the installation instructions.

5.3.5 Defining the Guest Domain Administrative Users

Only the root users of the control domain can use the ldm command by default. System operation by only the root user or sharing of the root user's password with several users is not recommended on security grounds. If the users who control the only guest domain are allowed to use the ldm command, system control by root users or the password sharing of root users is not required.

The following are permitted by installing LDoms Manager.

- solaris.ldoms.read: the sub commands beginning with ldm list or ldm list- are available.
- solaris.ldoms.write: all of the ldm sub commands are available.

The following procedure indicates the steps from creating a role that has LDoms control authority through permissions added by LDoms Manager, up to the phase where the administrative user of the guest domain that granted the role is enabled to use the ldm command.

- 1) Define the ldomlopr that controls the guest domain ldom1.

```
primary# groupadd ldomadm
primary# mkdir -p /LDoms/ldomlopr
primary# useradd -g ldomadm -d /LDoms/ldomlopr ldomlopr
primary# passwd ldomlopr
New password:<Initial password of ldomlopr>
Re-entry a new password: <the initial password of ldomlopr>
passwd: The password of ldomlopr is changed.
```

- 2) Create the .profile that sets the environment variables of the path and prompt to the ldm command and online manual.

```
primary# vi /LDoms/ldomlopr/.profile

(add the following:)
PATH=$PATH:/opt/SUNWldm/bin ; export PATH
MANPATH=$MANPATH:/opt/SUNWldm/man ; export MANPATH
PS1="primary$" ; export PS1
```

- 3) For security considerations, Fujitsu recommends not including the current directory (especially, consecutive colons) in the PATH variables.
- 4) If the domain names are set in each shell prompt of the control domain and guest domain, it facilitates understanding the connecting domains.
- 5) Allocate the ldomadm role to all users who manage other domains.
- 6) An error may occur if "solaris.jobs.users" is specified. When the error occurs, remove "solaris.jobs.users" before the execution.
- 7) For the rest, do the same procedure as normal OS installation.
- 8) If the virtual console is cut off during the installation, the screen is not displayed normally even if you re-connect it. Do not cut off the virtual console during the installation.
- 9) Enter [~(tilde)] and [. (dot)] successively when you return to the control domain. However, if you enter [~(tilde)] and [. (dot)] successively while you are connecting to the

control domain with ssh, the connection to the control domain is cut off. If you want to avoid the connection to the control domain from being cut off, enter [.] after entering as many [~] as the number of classes +1 that use [~(tilde)] and [~(tilde)] and [. (dot)] and ssh.

- 10) Enter [~(tilde)] and [# (sharp)] successively when you transmit Break signal.
- 11) MAC address shown by the above-mentioned banner command has no relation to the virtual network devices (vnet0,vnet1). Check the MAC address of the virtual network address by the output of the ldm list-bindings command.
- 12) Do not use the result of the banner command at the OBP prompt of the guest domain.
- 13) Create the Solaris installation image of the installation server beforehand.
- 14) You do not need to execute this if it has already been shared.
- 15) Devices shown by aliases of net, disk cannot be used in guest domains which are not used as I/O domains.
- 16) For the rest, do the same procedure as normal OS installation.
- 17) In guest domains, virtual disk names (such as c0d0s0) are displayed as disk names.
- 18) In guest domains, virtual network device names (such as vnet0) are displayed as network device names.
- 19) Change the owner of the home directory and .profile file.

```
primary# chown ldomlopr:ldomadm /LDoms/ldomlopr
primary# chown ldomlopr:ldomadm /LDoms/ldomlopr/.profile
```

20) Define the role of the guest domain administration, ldomadm.

```
primary# roleadd -A solaris.ldoms.write ldomadm
primary# passwd ldomadm
A new password: <the password of ldomadm>
Re-entry a new password
passwd: The password of ldomadm is changed.
```

21) Allocate the role of ldomadm to the ldomlopr users.

```
primary# usermod -R ldomadm ldomlopr
```

22) Check whether the role is available.

```
primary# su - ldomlopr
primary$ ldm list
Authorization failed
primary$ su ldomadm
Password: <the password of ldomadm>
$ ldm list
...
NAME                STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary             active  -n-cv  SP    64    8064M   0.1%  43m
$ exit
```

23) When the following is executed, only the subcommands beginning with ldm list or ldm list-, will be available

```
primary# usermod -A
"solaris.device.cdrw,solaris.profmgr.read,solaris.jobs.users,solaris.mail.mailq,solaris
.ldoms.read" ldomlopr
```

The following table indicates the relationship between the user's names/roles names on the definition or control domain and executable functions.

Usable functions	root user (Permission : Solaris.*)	ldomadm role (solaris.ldoms.write)	ldom?opr (Permission: when Solaris or ldoms.read is provided)
ldm list , ldm list-***	A	A	A
ldm bind-domain	A	A	N/A
ldm unbind-domain	A	A	N/A
ldm add-***	A	A	N/A
ldm remove-***	A	A	N/A
ldm set-***	A	A	N/A
ldm start-domain	A	A	N/A
ldm stop-domain	A	A	N/A
ldm panic-domain	A	A	N/A
ldm migrate-domain	A	A	N/A
ldm cancel-operation	A	A	N/A
Shutdown of the control domain, etc	A	N/A	N/A

5.3.6 Preparing the Files for the Virtual Disks

Create the file to be specified as the virtual disk server device that will be used to install the OS to the guest domain.

```
primary# cd /LDoms
primary# mkfile 20G Vol1/vdisk0.img
primary# mkfile 20G Vol2/vdisk0.img
```

Remarks: You need to create directories Vol1, and Vol2 before creating the file using the above command.

5.3.7 Dividing PCI devices

Allocate pci@400 to the control domain (primary) and pci@500 to I/O domain (iodom).

5.3.7.1 Checking PCI devices which can be divided

```
primary# ldm ls-devices -a io
IO
  DEVICE          PSEUDONYM      BOUND  OPTIONS
  pci@400         pci_0          yes
  pci@500         pci_1          yes
```

5.3.7.2 Checking a boot storage path

```
primary# df -h /
/dev/dsk/clt0d0s0      14G   6.9G   7.3G   49%   /
primary# ls -l /dev/dsk/clt0d0s0
lrwxrwxrwx   1 root   root           49 Oct 21 18:22 /dev/dsk/clt0d0s0 -
> ../../devices/pci@400/pci@0/pci@8/scsi@0/sd@0,0:a
```

5.3.7.3 Dividing PCI devices

Since pci@400 is used as boot disk of the control domain, divide pci@500 for I/O domain.

```
primary# dm rm-io pci@500 primary
Initiating delayed reconfigure operation on LDom primary. All
configuration
changes for other LDoms are disabled until the LDom reboots, at which
time
the new configuration for LDom primary will also take effect.
```

5.3.7.4 Checking divided PCI devices

```
primary# ldm ls-devices io
IO
  DEVICE          PSEUDONYM
  pci@500         pci 1
```

5.3.7.5 Saving divided PCI configuration

```
primary# ldm add-config split-io
primary# ldm ls-config
factory-default
split-io [current]
```

5.3.7.6 Reboot the system to make the divided PCI configuration effective

The system configuration is changed after the system is powered off and then powered on again.

Power off the system in the ok prompt due to delayed reconfiguration.

```
primary# touch /reconfigure
primary# shutdown -i0 -g0 -y
:
r)boot, o)k prompt, h)alt? o
:
{0} ok power-off
Chassis | critical: Host has been powered off
[Enter "# + ."]
```

The following operation differs depending on the system monitoring mechanisms (ALOM, ILOM).

Follow the procedure for your system monitoring mechanism.

[ALOM]

```
sc> poweron -c
Enter #. to return to ALOM.
Chassis | major: Host has been powered on
```

[ILOM]


```
-> start /SYS
Are you sure you want to start /SYS (y/n)? y
Starting /SYS
```

5.3.8 Building the Control Domain

5.3.8.1 Executing the Control Domain building script

Build the control domain by executing the control domain building script which was created in advance.

Check the configuration, which is stored in the system controller after executing the control domain building script.

```
primary# . /LDoms/Scripts/primary.sh
...
primary# ldm list-config
factory-default
initial
split-io [current]
```

5.3.8.2 Rebooting the Control Domain

The system configuration is changed after the system is powered off and then powered on again.

Power off the system in the ok prompt due to delayed reconfiguration.

```
primary# touch /reconfigure
primary# shutdown -i0 -g0 -y
:
syncing file systems... done
Program terminated
r)boot, o)k prompt, h)alt? o ....[Enter o ]
:
{0} ok power-off
Chassis | critical: Host has been powered off
[Enter # (sharp) + . (dot)]
```

The following operation differs depending on the system monitoring mechanisms (ALOM, ILOM).

Follow the procedure for your system monitoring mechanism.

【ALOM】

```
sc> poweron -c
Enter #. to return to ALOM.
Chassis | major: Host has been powered on
```

【ILOM】

```
-> start /SYS
Are you sure you want to start /SYS (y/n)? y
Starting /SYS
```

After booting OS, start the virtual network terminal server daemon.

```
primary# svcs "*ldom*"
STATE          STIME          FMRI
```

```

disabled      10:05:33 svc:/ldoms/vntsd:default
online       10:05:43 svc:/ldoms/ldmd:default
primary# svcadm enable vntsd
primary# svcs vntsd
STATE          STIME          FMRI
online        10:13:34 svc:/ldoms/vntsd:default

```

5.3.8.3 Checking the Control Domain configuration

Check the control domain configuration.

```

primary# ldm ls-config
factory-default
initial
split-io [current]
primary# ldm ls-bindings primary
NAME          STATE    FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary       active   -n-cv  SP    16    4G      0.0%  2h 2m

MAC
    00:14:4f:46:39:1c

VCPU
  VID  PID  UTIL  STRAND
  0    0    0.6%  100%
  1    1    0.0%  100%
  2    2    0.0%  100%
  3    3    0.0%  100%
  4    4    0.0%  100%
  5    5    0.0%  100%
  6    6    0.0%  100%
  7    7    0.0%  100%
  8    8    0.1%  100%
  9    9    0.0%  100%
 10   10    0.0%  100%
 11   11    0.0%  100%
 12   12    0.0%  100%
 13   13    0.0%  100%
 14   14    0.0%  100%
 15   15    0.0%  100%
 24   24    0.5%  100%
 25   25    0.0%  100%
 26   26    0.0%  100%
 27   27    0.0%  100%
 28   28    0.2%  100%
 29   29    0.0%  100%
 30   30    0.0%  100%
 31   31    0.0%  100%
 32   32   100%  100%
 33   33   100%  100%
 34   34   100%  100%
 35   35   100%  100%
 36   36   100%  100%
 37   37   100%  100%
 38   38   100%  100%
 39   39   100%  100%

MEMORY
  RA          PA          SIZE
  0xe000000  0xe000000  4G

VARIABLES
boot-device=disk net
keyboard-layout=US-English

```

```

IO
  DEVICE          PSEUDONYM      OPTIONS
  pci@400         pci_0

VCC
  NAME            PORT-RANGE
  primary-vcc     5000-5100

VDS
  NAME            VOLUME        OPTIONS      DEVICE
  primary-vds0

VCONS
  NAME            SERVICE        PORT
  SP

primary#
    
```

5.3.9 Building the I/O domain

5.3.9.1 Executing the I/O domain building script

Execute the I/O domain building script, which was created in advance and then build the I/O domain.

Check the configuration of the I/O domain saved in the system controller after executing the I/O domain building script.

```

primary# /LDoms/Scripts/iodom.sh
...
primary# ldm ls
NAME            STATE    FLAGS    CONS    VCPU    MEMORY    UTIL    UPTIME
primary         active   -n-c-    SP      16      4G        0.1%    8m
iodom           inactive -----    32      8G
primary# ldm ls -l iodom
NAME            STATE    FLAGS    CONS    VCPU    MEMORY    UTIL    UPTIME
iodom           inactive -----    32      8G

IO
  DEVICE          OPTIONS
  pci@500
    
```

5.3.9.2 Installing the I/O domain

(1) Making the settings to the installed server

- 1) Check the MAC address (Ethernet). Check from SC to use NETO of on-board network. The following operation differs depending on the system monitoring mechanisms (ALOM, ILOM). Follow the procedure for your system monitoring mechanism.

【ALOM】

```

sc> showsc
:
sys_enetaddr      00:14:4f:46:39:1c
    
```

“sys_enetaddr” gives MAC address of the I/O domain.

【ILOM】

```

-> show /HOST

/HOST
Targets:
    bootmode
    diag
    domain

Properties:
    autorestart = reset
    autorunonerror = false
    bootfailrecovery = poweroff
    bootrestart = none
    boottimeout = 0
    hypervisor_version = Hypervisor 1.7.2.a 2009/05/05 19:32
    macaddress = 00:14:4f:97:b5:58
    maxbootfail = 3
    obp_version = OBP 4.30.2.b 2009/06/16 07:02
    post_version = POST 4.30.2 2009/04/21 09:53
    send_break_action = (none)
    status = OpenBoot Running
    sysfw_version = Sun System Firmware 7.2.2.e 2009/06/19 10:22

Commands:
    cd
    set
    show

```

“macaddress” gives MAC address of the I/O domain.

- 2) Register the MAC address, IP address and host name of the guest domain with the installation server. (Operation of installed server)

```

# vi /etc/ethers <Enter>

(Add the following or change it)
00:14:4f:46:39:1c iodom
...
# vi /etc/hosts <Enter>

(Add the following)
192.168.1.110 iodom
...

```

- 3) Set the installation client. (Operation of installed server)

```

# cd <Path to Solaris image>/Solaris_10/Tools
# ./add_install_client iodom sun4v

```

When you specify the custom JumpStart directory:

```

# cd <Path to Solaris image>/Solaris_10/Tools
# ./add_install_client -c <Hostname of Installation server>:/jumpstart
iodom sun4v

```

(2) Installing the network

- 1) Start the I/O domain. (Operation of control domain)

```

primary# ldm bind iodom
primary# ldm start iodom

```

- 2) Connect to the console of the I/O domain. (Operation of control domain)

```
primary# ldm ls iodom
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
iodom         active -t---  5000  32    8G      3.1%  1m
primary# telnet localhost 5000
```

- 3) Check the network device and execute network installation. (Operation of I/O domain)

Note: The setting of devalias is not done automatically on the I/O domain.

```
{0} ok show-nets
a) /pci@500/pci@0/pci@8/network@0,3
b) /pci@500/pci@0/pci@8/network@0,2
c) /pci@500/pci@0/pci@8/network@0,1
d) /pci@500/pci@0/pci@8/network@0
q) NO SELECTION
Enter Selection, q to quit: d
/pci@500/pci@0/pci@8/network@0 has been selected.
Type ^Y ( Control-Y ) to insert it in the command line.
e.g. ok nvalias mydev ^Y
      for creating devalias mydev for /pci@500/pci@0/pci@8/network@0
{0} ok nvalias net /pci@500/pci@0/pci@8/network@0
{0} ok boot net
Boot device: /pci@500/pci@0/pci@8/network@0 File and args:
/pci@500/pci@0/pci@8/network@0: 1000 Mbps link up
Requesting Internet Address for 0:14:4f:46:39:1c
Requesting Internet Address for 0:14:4f:46:39:1c

SunOS Release 5.10 Version Generic_127127-11 64-bit
Copyright 1983-2008 Sun Microsystems, Inc. All rights reserved.
Use is subject to license terms.
```

Remark 1: After this, execute the standard OS installation.

Remark 2: If the virtual console is disconnected during the installation, the screen cannot be displayed normally even if reconnecting it. Avoid disconnecting the virtual console during the installation.

(3) Installing Enhanced Support Facility (ESF)

Please see “5.3.12.3 Installation of Enhanced Support Facility (ESF).

5.3.9.3 Rebooting the system

Reboot the system in order to make the setting of the I/O domain effective after installing the I/O domain.

```
primary# ldm stop iodom
LDom iodom stopped
primary# ldm unbind iodom
primary# ldm ls
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary       active -n-c-  SP    16    4G      0.1%  4h 3m
iodom         inactive -----  32    8G
primary# ldm add-config initial-io
primary# ldm ls-config
factory-default
initial [current]
initial-io [next poweron]
split-io
```

```
primary# shutdown -i0 -g0 -y
:
r)boot, o)k prompt, h)alt? o
:
{0} ok power-off
Chassis | critical: Host has been powered off
[Enter # (sharp) +. (dot)]
```

The following operation differs depending on the system monitoring mechanisms (ALOM, ILOM).

Follow the procedure for your system monitoring mechanism.

[ALOM]

```
sc> poweron -c
Enter #. to return to ALOM.
Chassis | major: Host has been powered on
```

[ILOM]

```
-> start /SYS
Are you sure you want to start /SYS (y/n)? y
Starting /SYS
```

5.3.10 Building the Guest Domain

5.3.10.1 Executing the Guest Domain building script

Execute the guest domain building script, which was created in advance and then build the guest domain.

Execute the guest domain building script.

```
primary# /LDoms/Scripts/ldom1.sh
...
primary# /LDoms/Scripts/ldom2.sh
...
```

Remark: Rebooting the control domain is not required to add, change, and remove the guest domain without making any changes to the control domain configuration.

5.3.10.2 Checking the Guest Domain console

Check whether you can access the guest domain console by using the virtual console.

After the connection, you can check the virtual environment by using the OBP command.

```

primary# telnet localhost 5001
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

Connecting to console "ldom1" in group "ldom1" ....
Press ? for control options ..

{0} ok banner

T5240, No Keyboard
Copyright 2008 Sun Microsystems, Inc. All rights reserved.
OpenBoot 4.29.0.a, 8192 MB memory available, Serial #66666434.
Ethernet address 0:14:4f:f9:3f:c2, Host ID: 83f93fc2.

{0} ok devalias
vdisk0                /virtual-devices@100/channel-devices@200/disk@0
vnet1                 /virtual-devices@100/channel-devices@200/network@1
vnet0                 /virtual-devices@100/channel-devices@200/network@0
net                   /virtual-devices@100/channel-devices@200/network@0
disk                  /virtual-devices@100/channel-devices@200/disk@0
virtual-console       /virtual-devices/console@1
name                  aliases
{0} ok show-devs
/cpu@f
/cpu@e
/cpu@d
/cpu@c
/cpu@b
/cpu@a
/cpu@9
/cpu@8
/cpu@7
/cpu@6
/cpu@5
/cpu@4
/cpu@3
/cpu@2
/cpu@1
/cpu@0
/virtual-devices@100
/virtual-memory
/memory@m0,8000000
/aliases
/options
/openprom
More [<space>,<cr>,q,n,p,c] ?

```

Remarks:

- When returning to the control domain, enter [~(tilde)] and [. (dot)] sequentially. In the case of connecting to the control domain with ssh, the connection to the control domain is disconnected using this operation. If you do not want to disconnect from the control domain, enter the [.] after entering the [~ (tilde)] + [~ (tilde)] + [. (dot)] and a number of [~] equivalent to the layer that uses ssh + 1.
- When sending the break signal, enter [~(tilde)] and [#(sharp)] sequentially.
- The MAC address that is indicated by the above banner command, has no relationship to the virtual network device (vnet0, vnet1). Check the MAC address of the virtual network device by outputting the ldm list-bindings command.

5.3.11 Retaining the LDom Configuration Information

The hypervisor reads the LDom configuration stored in EEPROM at the time of power activation. The LDom configuration may be lost as a result of a failure of hardware, which includes EEPROM, such as a motherboard.

The LDom Manager starts the guest domain by referring to the LDom configuration which has been stored on the disk (`/var/opt/SUNWldm/`). If this disk cannot be accessed, the guest domain will not start the guest domain.

The following corrective actions are recommended for these conditions.

- **Save of the building script**
Save the building script in a certain location (`/LDoms/Scripts/` in this document) so that the latest control domain building script (`primary.sh` in this document) or guest domain building script (`ldom?.sh` in this document) can be executed as required, and so that the LDom environment can be rebuilt.
- **Collection/Save of the guest domain configuration information**
The outputs of `ldm list-constraints -x [domain-name]` when used for the input of `ldm add-domain -i [file-name]`, can rebuild the collected guest domain. Collect the configuration information of the guest domain whenever the configuration is changed and save it in a certain location (`/LDoms/Domains/` in this document).
- **Save of the information to external media**
Copy the information in the CD-R, DVD-R, tapes or file servers to be prepared in case they are lost from the disk.

5.3.12 Installing the Guest Domain

The OS installation of the guest domain is executed using the network installation method as well as the standard OS. Fujitsu recommends preparing another chassis for the installation server. The cancellation of the SST security configuration and the setting for virtual network communication between the control domain and guest domain are required although it is possible to use the control domain as the installation server.

5.3.12.1 Making the settings to the installed server

- 1) Check the MAC address (Ethernet) of the guest domain (ldom1 in the following example). (Operation of control domain)

```
primary$ ldm ls -l ldom1 <Enter>
:
NETWORK
  NAME      SERVICE                DEVICE      MAC
  vnet0     primary-vsw0@primary   network@0   <MAC address of the guest domain>
```

Remarks: DO NOT USE the result displayed by the banner command of the guest domain OBP.

- 2) Register the MAC address, IP address and host name of the guest domain with the installation server. (Operation of installed server)

```
# vi /etc/ethers <Enter>

(Add the following)
<MAC address of the guest domain> ldom1
...
# vi /etc/hosts <Enter>

(Add the following)
192.168.1.101 ldom1
...

```

- 3) Set the installation client. (Operation of installed server)

Remarks: Create the Solaris install image of the installation server in advance.

```
# cd <path to the Solaris image>/Solaris_10/Tools <Enter>
# ./add_install_client ldom1 sun4v <Enter>
```

- 4) Confirm the setting. (Operation of installed server)

```
# cat /etc/bootparams <Enter>
ldom1 root=192.168.1.100:/export/image/solaris10_8_07/Solaris_10/Tools/
Bootinstall=192.168.1.100:/export/image/solaris10_8_07/ boottype=:in
rootopts=:rsize=8192
```

5) Share the install image. (Operation of installed server.)

Remarks: It is not necessary to execute the command when sharing has already been done.

```
# share -o ro,anon=0 /export/image <Enter>
```

5.3.12.2 Network installation

1) Connect to the console of the guest domain. (Operation of control domain)

```
primary$ telnet localhost 5001 <Enter>
```

2) Check the virtual network device. (Operation of guest domain)

```
{0} ok devalias <Enter>
vdisk0          /virtual-devices@100/channel-devices@200/disk@0
vnet1           /virtual-devices@100/channel-devices@200/network@1
vnet0           /virtual-devices@100/channel-devices@200/network@0
net             /virtual-devices@100/channel-devices@200/network@0
disk            /virtual-devices@100/channel-devices@200/disk@0
virtual-console /virtual-devices/console@1
name           aliases
{0} ok
```

Remarks: The devices indicated with other net or disk names are not available in a guest domain other than the I/O domain.

3) Execute network installation. (Operation of guest domain)

```
{0} ok boot vnet0
Boot device: /virtual-devices@100/channel-devices@200/network@0 File and args:
:
SunOS Release 5.10 Version Generic_127127-11 64-bit
Copyright 1983-2008 Sun Microsystems, Inc. All rights reserved.
Use is subject to license terms.
:
whoami: no domain name
Configuring devices.
Using RPC Bootparams for network configuration information.
Attempting to configure interface vnet0...
Configured interface vnet0
Beginning system identification...
Searching for configuration file(s)...
Search complete.
Discovering additional network configuration...
```

Remarks:

- After this, execute the standard OS installation.
- The virtual disk names (c0d0s0, etc) are displayed as the disk name in the guest domain.
- The virtual network device names (vnet0, etc) are displayed as the network device name in the guest domain.
- If the virtual console is disconnected during the installation, the screen cannot be displayed normally even if reconnecting. Avoid disconnecting the virtual console during the installation.

5.3.12.3 Installing Enhanced Support Facility (ESF)

Install ESF by referring to the following documents.

- [Enhanced Support Facility 3.1 Online Manual] and [Enhanced Support Facility 3.1 installation guide]

<http://software.fujitsu.com/jp/manual/manualindex/P08001214e.html>

5.3.13 Saving the LDom's setting

After determining the configuration of your operation, please save the configuration and make a backup of the LDom's setting again.

```
# ldm add-config operation
```

Regarding the backup of the LDom's configuration, please refer to "Appendix A Procedures of Backing up/Restoring".

Chapter 6 Installing LDom Manager

6.1 Upgrading Firmware

The firmware must be upgraded when the firmware version is not supported. Also, in order to use the new functions, the firmware may need to be upgraded. You can download the firmware for upgrading from the official Fujitsu site.

6.1.1 Downloading the latest firmware

You can download the latest firmware from the following official Fujitsu site:

<http://www.fujitsu.com/global/services/computing/server/sparcenterprise/downloads/firmware/>

6.1.2 Upgrading the firmware of a system with a configured LDom environment

When upgrading the firmware of the system with a configured LDom environment, stop all of the guest domains, release the resource binding, after preserving the logical domain composition referring to "7.7.5 Modification of OBP variables, device-alias etc." ,shut down the power, and then start upgrading the firmware.

```
# ldm list
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary       active -n-cv  SP    8     1G     0.6%  52m
ldom1         active -n---  5001  16    1920M  0.8%  36m
ldom2         active -n---  5002  16    1G     6.2%  36m
ldom3         active -n---  5003  24    4G     1.0%  36m
# ldm stop-domain -a
LDom ldom1 stopped
LDom ldom2 stopped
LDom ldom3 stopped
# ldm unbind-domain ldom1
# ldm unbind-domain ldom2
# ldm unbind-domain ldom3
# shutdown -y -g0 -i5
...
```

6.1.3 Firmware upgrading procedure

- 1) Shut down the power to the system to be upgraded.
- 2) Unzip the downloaded firmware (139439-04.zip in the following example) on the system on which a web browser is available.

```
# unzip 139439-04.zip
Archive:  139439-04.zip
  creating: 139439-04/
  inflating: 139439-04/Install.info
  inflating: 139439-04/Sun_System_Firmware-7_2_2_e-SPARC_Enterprise_T5120+T5220.pkg
  inflating: 139439-04/sysfw720_README_docs.css
  inflating: 139439-04/copyright
  inflating: 139439-04/sysfw720_README_docs.html
  inflating: 139439-04/sysfwdownload
  inflating: 139439-04/sysfwdownload.README
   creating: 139439-04/Legal/
  inflating: 139439-04/Legal/FIRMWARE_SLA+Entitlement.txt
  inflating: 139439-04/Legal/SLA_10_languages_text.tar
  inflating: 139439-04/Legal/ThirdpartylicenseREADME_ILOM3.0.txt
  inflating: 139439-04/README.139439-04
  inflating: 139439-04/LEGAL_LICENSE.TXT
#
```

Remarks: In this example, the firmware update file is [Sun_System_Firmware-7_2_2_e-Sparc_Enterprise_T5120+5220.pkg].

- 3) Log into the system controller through the WEB browser.
Remarks: The login user needs the administrator authority for the system controller.

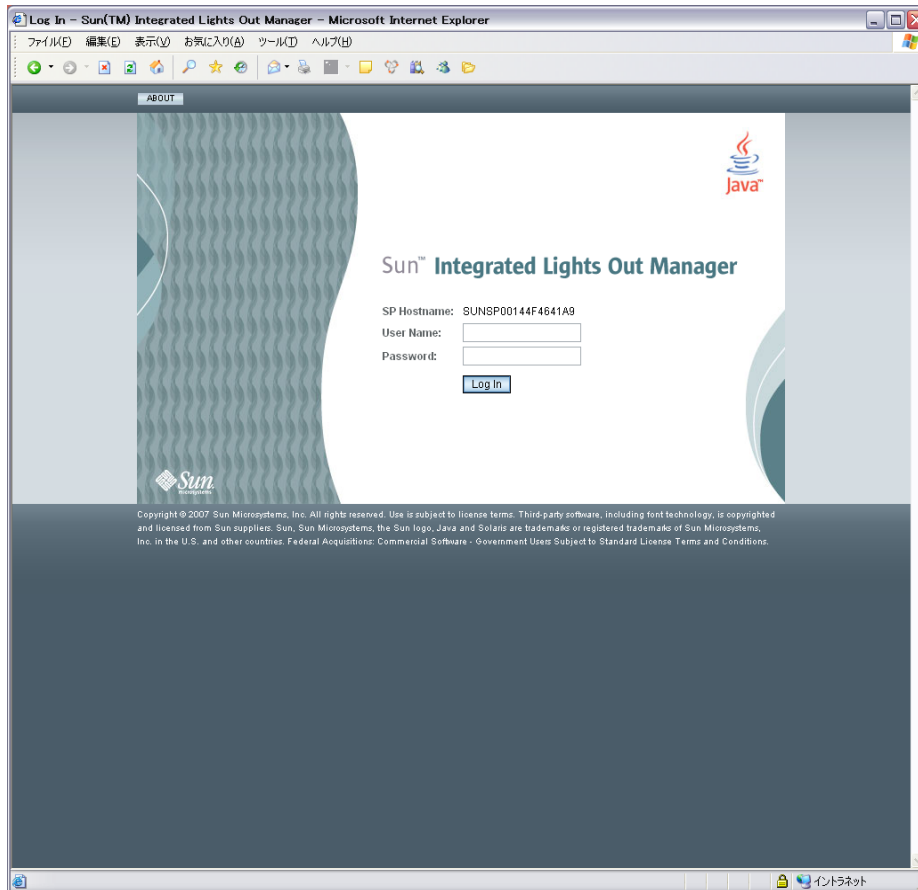


Figure 6.1 [Login] window

- 4) Select [Maintenance] → [Firmware Upgrade].
The [Firmware Upgrade] page is displayed.
Click [Enter Upgrade Mode].

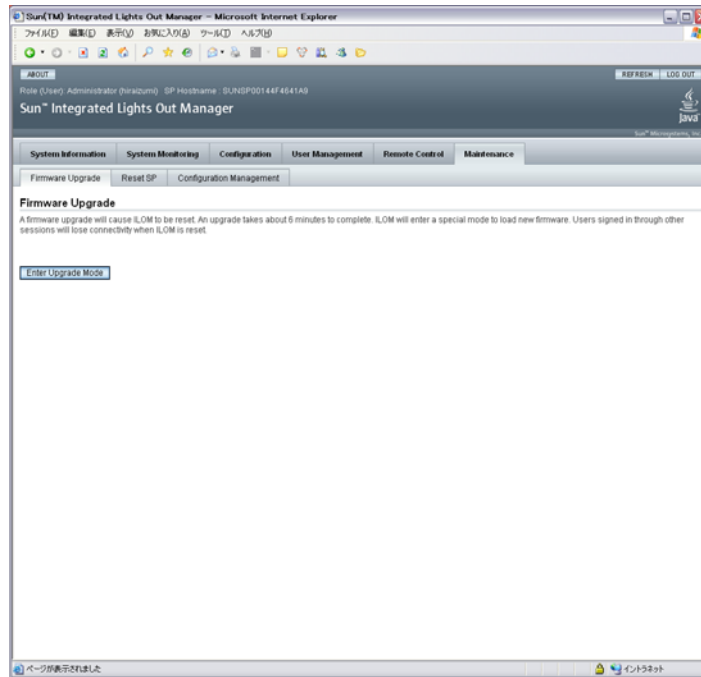


Figure 6.2 [Firmware Upgrade] window

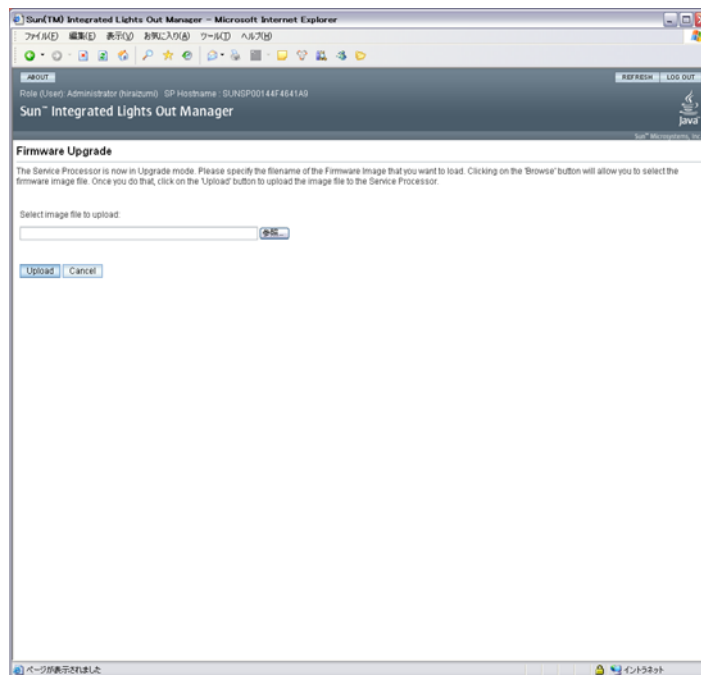


Figure 6.3 [Firmware Upgrade] window

Remarks: When the dialog box is displayed, click [OK].

- 5) Enter the path name in the [Select Image File to Upload] field, or click and specify the firmware update file with .pkg extension.

Click [Upload].

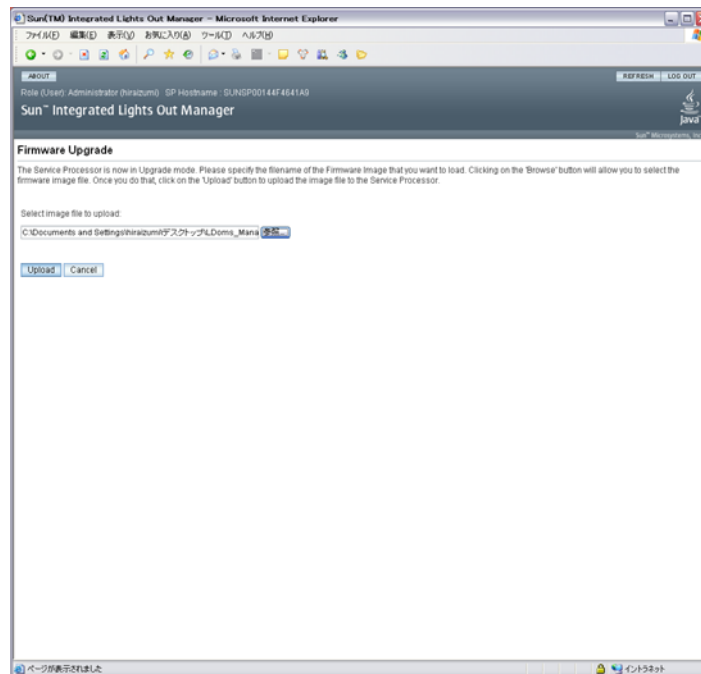


Figure 6.4 [Firmware Upgrade] window

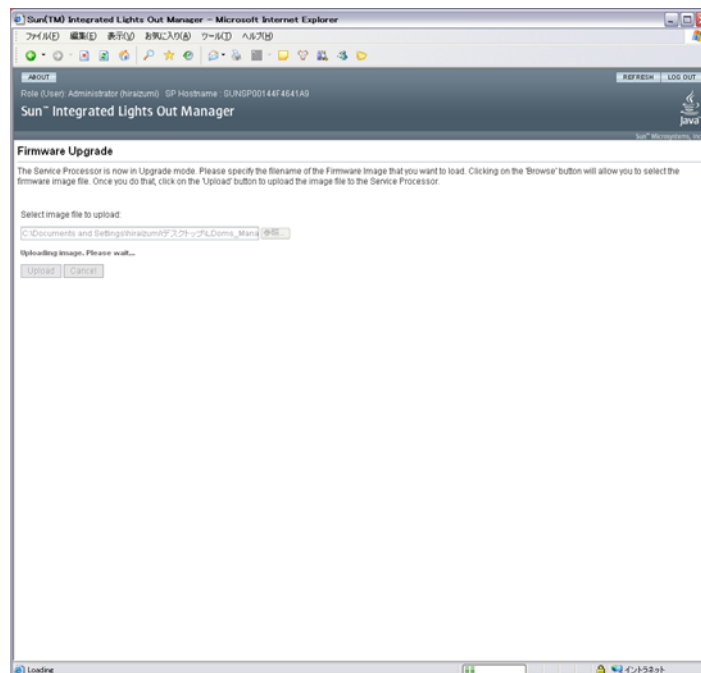


Figure 6.5 [Firmware Upgrade] window

- 6) When the [Verify Firmware Image] page is displayed, click [OK].
- 7) Select [Preserve Configuration] and then click [Start Upgrade].

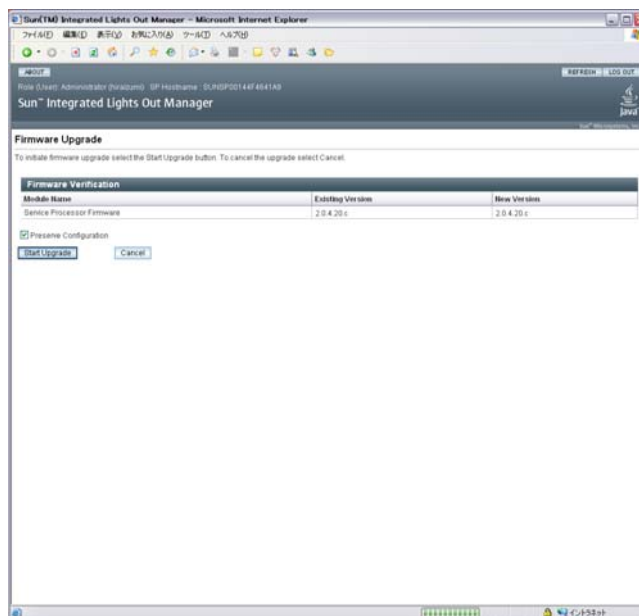


Figure 6.6 [Firmware Upgrade] window

Remarks: When the dialog box is displayed, click the [OK].

- 8) The progress screen is indicated in upgrading the firmware.
When the upgrade is completed, the system controller reboots automatically.

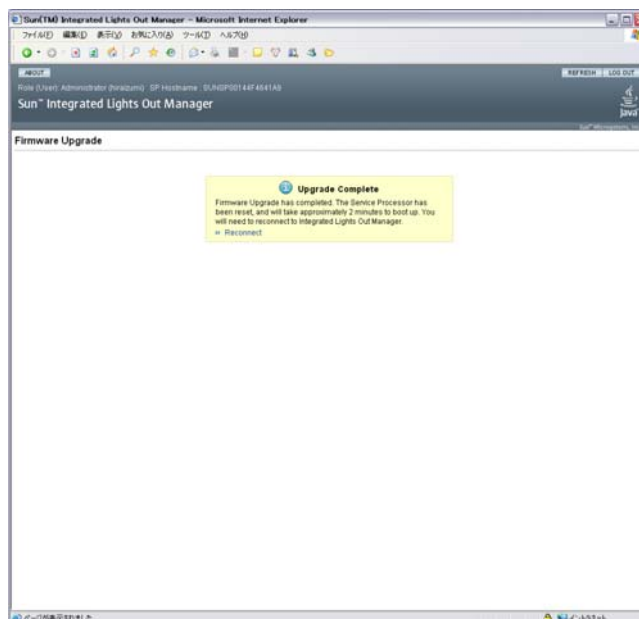


Figure 6.7 [Firmware Upgrade] window

- 9) Confirm the version of the firmware.

The following operation differs depending on the system monitoring mechanisms (ALOM, ILOM).

Follow the procedure for your system monitoring mechanism.

【ALOM】

After rebooting the system controller (SC), connect the firmware to confirm the version.

```
$ ssh T5120-SC
Password:
Waiting for daemons to initialize...

Daemons ready

Sun(TM) Integrated Lights Out Manager

Version 2.0.4.16

Copyright 2007 Sun Microsystems, Inc. All rights reserved.
Use is subject to license terms.

sc> showhost
Sun System Firmware 7.2.2.e 2009/06/19 10:22

Host flash versions:
  Hypervisor 1.7.2.a 2009/05/05 19:32
  OBP 4.30.2.b 2009/06/16 07:02
  POST 4.30.2 2009/04/21 09:53

sc> poweron -c
```

Remarks: In the above case, the firmware version is 7.2.2.e.

【ILOM】

```
$ ssh T5120-SC
Password:
Waiting for daemons to initialize...

Daemons ready

Sun(TM) Integrated Lights Out Manager

Version 2.0.4.16

Copyright 2007 Sun Microsystems, Inc. All rights reserved.
Use is subject to license terms.

-> show /HOST

/HOST
  Targets:
    bootmode
    diag
    domain

  Properties:
    autorestart = reset
    autorunonerror = false
    bootfailrecovery = poweroff
    bootrestart = none
    boottimeout = 0
    hypervisor_version = Hypervisor 1.7.2.a 2009/05/05 19:32
    macaddress = 00:14:4f:97:b5:58
    maxbootfail = 3
    obp_version = OBP 4.30.2.b 2009/06/16 07:02
    post_version = POST 4.30.2 2009/04/21 09:53
    send_break_action = (none)
    status = Solaris running
    sysfw_version = Sun System Firmware 7.2.2.e 2009/06/19 10:22

  Commands:
    cd
    set
    show

-> start /SYS
Are you sure you want to start /SYS (y/n)? y
Starting /SYS
```

Remarks: In the above case, the firmware version is 7.2.2.e.

6.2 Installing the OS for the Control Domain

6.2.1 Installing the Solaris OS

For OS of the control domain, specify Core System Support (SUNWCreq) or more as install cluster and install Solaris 10 OS 8/07 or later.

Fujitsu recommends installing Secure Shell (SUNWCssh) additionally when applying the Core System Support.

The procedure for installing to the control domain is the same as that for a system without LDomS.

6.2.2 Applying required patches

Apply the required patches for the installed Solaris OS and the recommended security patches.

You can download the patches from the following site:

- Recommended & Security Patches

<http://www.fujitsu.com/global/support/software/security/products-s/patch-info/>

6.2.3 Installing Enhanced Support Facility (ESF)

Refer to the following document for information on installing ESF.

- [Enhanced Support Facility 3.1 Online Manual] and [Enhanced Support Facility 3.1 installation guide]

<http://software.fujitsu.com/jp/manual/manualindex/P08001214e.html>

6.2.4 Sun Explorer Data Collector

- Use the latest version of Sun Explorer Data Collector 5.10 or later.
- The following describes how to check the version of Sun Explorer Data Collector.

```
# /opt/SUNWexplo/bin/explorer -V
Explorer version: 5.13
:
:
#
```

Note: Install Sun Explorer Data Collector into both control and guest domain.

6.3 Installing LDoms Manager

6.3.1 Unzipping the installation archive

Unzip the installation archive of the downloaded LDoms Manager.

```
# cd /var/tmp
# unzip /net/nfs-server/archives/LDoms_Manager-1_2.zip
Archive:  LDoms_Manager-1_2.zip
  creating: LDoms_Manager-1_2/
  creating: LDoms_Manager-1_2/Install/
  inflating: LDoms_Manager-1_2/Install/install-ldm
...
  inflating: LDoms_Manager-1_2/README
```

6.3.2 Starting installer

Start the LDoms Manager installer.

The security configuration menu by Solaris Security Toolkit (SST) is displayed.

- Select [a] to display the security configuration by using Solaris Security Toolkit (SST).
- Select [b] to bypass the security configuration.
- Select [c] to execute the setting by the user-specified security driver.

Install the LDoms Manager according to the security policy for the control domain.

However, the security configuration of SST affects the installation processing for Enhanced Support Facility (ESF). If the ESF is not installed, select [b]. After installation of LDoms Manager is completed, install the ESF as soon as possible.

```
# cd /var/tmp/LDoms_Manager-1_2/Install
# Install/install-ldm
Welcome to the LDoms installer.

You are about to install the domain manager package that will enable
you to create, destroy and control other domains on your system. Given
the capabilities of the domain manager, you can now change the security
configuration of this Solaris instance using the Solaris Security
Toolkit.

Select a security profile from this list:

a) Hardened Solaris configuration for LDoms (recommended)
b) Standard Solaris configuration
c) Your custom-defined Solaris security configuration profile

Enter a, b, or c [a]: a
```

```
Select an option for configuration:
y) Yes, launch the LDoms Configuration Assistant after install
n) No thanks, I will configure LDoms myself later

Enter y or n [y]: n
```

Remarks:

In LDom Manager 1.2 or newer, a confirmation menu that asks you whether or not you want to configure Logical Domains by Logical Domains Configuration Assistant will appear after the LDom Manager installer starts.

When [y] is selected

Logical Domains Configuration Assistant is used to perform the configuration processing of Logical Domains.

When [n] is selected

Logical Domains Configuration Assistant is not used.

To configure Logical Domains, scripts or commands are used after LDom Manager 1.2 is installed.

Note) Select [n]. Fujitsu is not supporting [y].

You must configure the logical domain by selecting [n], and using the script after LDom Manager 1.2 is installed.

- After installing LDom Manager, the Logical Domain Manager daemon (ldmd) is started automatically.

6.3.3 Confirming installation

The following command is executed to confirm the installation.

```
# /opt/SUNWldm/bin/ldm list
-----
Notice: the LDom Manager is running in configuration mode. Configuration and
resource information is displayed for the configuration under construction;
not the current active configuration. The configuration being built
will only take effect after it is downloaded to the system controller and
the host is reset.
-----
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary      active -n-cv  SP    64    8064M   0.1%  16m
```

Remarks:

- The above Notice message is always displayed until the initial setting of the control domain is completed.
- The control domain name is primary.

6.3.4 Setting the environment variables

Set the ldm command, path to the online manual, and environment variables of the prompt.

```
# vi .profile
...
(Add the following.)
PATH=$PATH:/opt/SUNWldm/bin ; export PATH
MANPATH=$MANPATH:/opt/SUNWldm/man ; export MANPATH
PS1="primary#" ; export PS1
```

Remarks:

- For security considerations, Fujitsu recommends not including the current directory (especially, consecutive colons) in the PATH variables.
- If the domain names are set in each shell prompt of the control domain and guest domain, you can find the connecting domains easily.

6.3.5 Changing the security configuration with the Solaris Security Toolkit (SST)

When selecting [a] of the security configuration menu by SST, the security configuration by SST is executed.

By introducing SST, the following objectives can be achieved:

- stop of major network services except ssh
- restrictions on accessible hosts by tcpwrapper, etc
- restrictions on cron and at users
- changes to password setting policy
- collecting access logs

and comparable operations, you can automatically set these items for higher security.

You can change the security configurations by SST according to the application requirements or operations after introducing them.

This is the method of accessing using Telnet in cases where there is no device that can use ssh.

```
primary# svcadm enable svc:/system/filesystem/autofs:default
primary# svcadm enable svc:/network/telnet:default
primary# echo "in.telnetd: ALL" >> /etc/hosts.allow
primary# vi /etc/default/login
```

The row of "CONSOLE" is commented out.

The users who are allowed to execute at command can use it if they are activated from /etc/cron.d/at.deny.

When implementing the security configuration by SST again, the temporary changes are canceled.

The security configuration by SST can be always implemented from the console without LDomS Manager installer.

```
primary# /opt/SUNWjass/bin/jass-execute -q -d ldm_control-secure.driver
primary# /usr/sbin/shutdown -i6 -g0 -y
```

If the following messages are displayed during the execution, enter "yes" to continue the processing.

```
primary# /opt/SUNWjass/bin/jass-execute -q -d ldm_control-secure.driver
[NOTE] The following prompt can be disabled by setting JASS_NOVICE_USER to 0.
[WARN] Depending on how the Solaris Security Toolkit is configured, it
is both possible and likely that by default all remote shell and file transfer
access to this system will be disabled upon reboot effectively locking out any
user without console access to the system.
```

```
Are you sure that you want to continue? (yes/no): [no]
```

```
Yes
Executing driver, ldm_control-secure.driver
primary# /usr/sbin/shutdown -i6 -g0 -y
```

After system reboot, the following messages will be displayed at the time of the change of users or the display of login prompt.

```
This system is for the use of authorized users only.
Individuals using this computer system without authority, or in
excess of their authority, are subject to having all of their
activities on this system monitored and recorded by system
personnel.

In the course of monitoring individuals improperly using this
system, or in the course of system maintenance, the activities
of authorized users may also be monitored.

Anyone using this system expressly consents to such monitoring
and is advised that if such monitoring reveals possible
evidence of criminal activity, system personnel may provide the
evidence of such monitoring to law enforcement officials.
```

Implement the following from the console when you want to cancel the security configuration by SST.

```
primary# /opt/SUNWjass/bin/jass-execute -u
primary# /usr/sbin/shutdown -i6 -g0 -y
```

Refer to the following site for details of Solaris Security Toolkit 4.2.

- [Solaris Security Toolkit 4.2 Documentation]
<http://docs.sun.com/app/docs/coll/sstoolkit4.2>

6.3.6 Checking/resetting the hardware monitoring function

Because of the security setting by SST, the setting for the hardware monitoring may be canceled by ESF machine control. After setting the security by using SST, check the setting for hardware monitoring by using the following procedure, and modify the setting when the setting is canceled.

- 1) Check/Editing of syslog.conf

Check whether the following is written in the /etc/syslog.conf file. If not, add it.

```
*.err;kern.debug;daemon.notice<tab>/var/opt/FJSVmadm/evh/evh_pipe
```

Remarks: <tab> means pressing the tab key and creating a space before and after the command.

- 2) Reboot the syslog service to enable the syslog.conf setting.

```
primary# svcadm restart svc:/system/system-log:default
```


Chapter 7 Operating LDomS

7.1 Confirming the State of/Starting/Stopping the Guest Domain

7.1.1 Confirming the state of the domain

1) Confirm the states of all domains.

```
primary$ ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv-	SP	8	4G	0.6%	52m
ldom1	active	-n----	5001	16	1920M	0.0%	36m
ldom2	bound	-t----	5002	16	1G	6.2%	4m
ldom3	inactive	-n----	5003	24	4G	100%	52m

- STATE:
 - active: active state
 - bound: resource bounding state
 - inactive: resource non-bounding information
- FLAGS:
 - : place holder
 - c: control domain
 - d: delayed reconstruction state
 - e: error
 - n: normal (OS-active) state
 - s: Column 1 - starting or stopping
 - Column 6 - source domain
 - t: Column 2 - transition
 - Column 6 - target domain
 - v: virtual I/O service domain
- CONS:
 - SP: System Processor (System controller)
 - Values: the port number connected to the domain
- VCPU: number of virtual CPUs
- MEMORY: memory amount
- UTIL: CPU utilization
- UPTIME: uptime

- 2) Specify the domain you would like to confirm as follows when checking every domain.

```
primary$ ldm list ldom1 <Enter>
```

Remarks: ldm list <domain name>

- 3) Add and specify -l when checking the detail information.

7.1 Confirming the State of/Starting/Stopping the Guest Domain

```

primary# ldm list -l
NAME          STATE      FLAGS    CONS    VCPU    MEMORY    UTIL    UPTIME
primary      active    -n-cv-   SP      8       4G        0.1%   5d 20h 41m

SOFTSTATE
Solaris running

MAC
00:14:4f:97:b5:58

HOSTID
0x8497b558

CONTROL
failure-policy=ignore } Information on failure-policy

DEPENDENCY
master= } Information on master domain
When a master domain is set, the name of the master domain is displayed.

VCPU
VID  PID  UTIL  STRAND
0    0    0.3%  100%
1    1    0.1%  100%
2    2    0.0%  100%
3    3    0.0%  100%
4    4    0.2%  100%
5    5    0.0%  100%
6    6    0.0%  100%
7    7    0.0%  100%
} Allocated virtual CPU information
VID: CPU-ID, which the domains recognize:
PID: actual CPU-ID

MEMORY
RA          PA          SIZE
0x80000000 0x80000000 4G
} Allocated memory information

VARIABLES
auto-boot?=false
boot-device=/pci@0/pci@0/pci@2/scsi@0/disk@0,0:a disk net
keyboard-layout=US-English
multipath-boot?=true
nvramrc=none
security-mode=none
security-password=
} Setting condition of OBP variables

IO
DEVICE      PSEUDONYM  OPTIONS
pci@0       pci
niu@80      niu
} Allocated I/O information

VCC
NAME          PORT-RANGE
primary-vcc0  5000-5100
} Virtual console distributing device service information

VSW
NAME          MAC          NET-DEV  DEVICE  DEFAULT-VLAN-ID  PVID  VID  MTU  MODE
primary-vsw0  00:14:4f:f8:ff:c8  e1000g0  switch@0  1              1    1500
primary-vsw1  00:14:4f:f8:9e:c6  e1000g1  switch@1  1              1    1500
primary-vsw2  00:14:4f:fa:65:c4  e1000g2  switch@2  1              1    1500
primary-vsw3  00:14:4f:f9:ad:3b  e1000g3  switch@3  1              1    1500
} Virtual switch service information

VDS
NAME          VOLUME  OPTIONS  MPGROUP  DEVICE
primary-vds0  vol1    /LDoms/Vol1/vdisk0.img
              vol2    /LDoms/Vol2/vdisk0.img
              vol3    /LDoms/Vol3/vdisk0.img
} Virtual disk service information

VCONS
NAME          SERVICE  PORT
SP

-----
NAME          STATE      FLAGS    CONS    VCPU    MEMORY    UTIL    UPTIME
ldom1        bound     - - - -  5001    16       1920M

MAC
00:14:4f:f9:58:b2

HOSTID
0x84f958b2

```

```

CONTROL
  failure-policy=ignore
} Information on failure-policy

DEPENDENCY
  master=
} Information on master domain
  When a master domain is set, the name of the master domain is displayed.

VCPU
  VID   PID   UTIL  STRAND
  0     8     100%
  1     9     100%
  2     10    100%
  3     11    100%
  4     12    100%
  5     13    100%
  6     14    100%
  7     15    100%

MEMORY
  RA           PA           SIZE
  0x80000000  0x48000000  1920M

VARIABLES
  auto-boot?=false
  boot-device=vdisk1
  keyboard-layout=Japanese
} Setting condition of OBP variables

NETWORK
  NAME      SERVICE          DEVICE    MAC              MODE   PVID  MTU   VID
  vnet0     primary-vsw0@primary  network@0 00:14:4f:fa:7e:b0 1     1500
  vnet1     primary-vsw1@primary  network@1 00:14:4f:f8:24:7f 1     1500
} Virtual network device information

DISK
  NAME      VOLUME          TOUT DEVICE  SERVER  MPGROUP
  vdisk1    voll@primary-vds0  disk@0  primary
} Virtual disk information

VCONS
  NAME      SERVICE          PORT
  group1    primary-vcc0@primary  5001
} Virtual console information

-----
NAME      STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
ldom2    inactive  -----  :      8     1G
-----
:
-----
NAME      STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
ldom3    inactive  -----  :      8     4G
-----

```

7.1.2 Starting the domain

- 1) Confirm the domain state.

```
primary$ ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.6%	52m
ldom1	inactive	-----		16	1920M		
ldom2	inactive	-----		16	1G		
ldom3	inactive	-----		24	4G		

Remarks: You can get the same result from [# ldm ls].

- 2) Bind the resource to the domain.

Remarks:

- DO NOT execute this command when STATE is bound.
- You can get the same result from [# ldm bind domain name].

```
primary$ ldm bind-domain ldom1 <Enter>
```

- 3) Start the domain.

Remarks:

- You can get the same result from [# ldm start domain name].
- You can start in batch all of the domains that are bound when the start-up sequence does not need to be considered.

```
primary$ ldm start-domain ldom1 <Enter>
primary$ ldm start-domain -a <Enter>
```

- 4) Check whether the domain becomes the active state.

```
primary$ ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.6%	52m
ldom1	active	-n---	5001	16	1920M	17%	1s
ldom2	inactive	-----		16	1G		
ldom3	inactive	-----		24	4G		

7.1.3 Stopping the domain from the Guest Domain

1) Check the domain state.

```
primary$ ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.6%	55m
ldom1	active	-n---	5001	16	1920M	21%	3m
ldom2	active	-n---	5002	16	1G	21%	8s
ldom3	active	-n---	5003	24	4G	13%	8s

2) Connect to and log into the domain console .

```
primary$ telnet localhost 5001 <Enter>
ldom1 console login: root
Password:
...
```

3) Shut down the OS by using the shutdown command.

```
ldom1# shutdown -y -g0 -i5 <Enter>
```

Remarks: Disconnect the console by [~(tilde)+. (dot)].

4) Check the domain state.

```
primary$ ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.6%	56m
ldom1	bound	-----	5001	16	1920M		
ldom2	active	-n---	5002	16	1G	20%	2m
ldom3	active	-n---	5003	24	4G	12%	2m

7.1.4 Stopping the domain from the Control Domain

1) Check the domain state.

```
primary$ ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.6%	58m
ldom1	active	-n---	5001	16	1920M	21%	8s
ldom2	active	-n---	5002	16	1G	21%	4m
ldom3	active	-n---	5003	24	4G	13%	4m

2) Stop the domain.

```
primary$ ldm stop-domain ldom1 <Enter>
```

Remarks:

- Shut down the domain by using the same sequence as that for the case where the [halt] command is used on the guest domain.
- When forcibly shutting down the domain, add the [-f] option. It is used when the prompt is displayed after shutdown.

```
primary$ ldm stop-domain -f ldom1 <Enter>
```

Remarks: Use the [panic-domain] sub command when the panic is forcibly created.

```
primary$ ldm panic-domain ldom1 <Enter>
```

Remarks: You can start in batch all of domains that are bound when the stop sequence does not need to be considered.

```
primary$ ldm stop-domain -a <Enter>
```

3) Check the domain state.

```
primary$ ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.8%	59m
ldom1	bound	-----		16	1920M		
ldom2	active	-n---	5002	16	1G	21%	5m
ldom3	active	-n---	5003	24	4G	13%	5m

Remarks: The STATUS is changed to the resource binding state (bound) when the domain enters the power-off state.

7.1.5 How to acquire the crash dump of the Guest Domain

This is the process for creating the crash dump for the fault investigation of the guest domain.

- 1) Log into the guest domain to confirm the crash dump information.

```
ldom1# dumpadm <Enter>
Dump content: kernel page
Dump device: /dev/dsk/c0d0s1 (swap)
Savecore directory: /var/crash/ldom2
Valid savecore: yes
```

Remarks: Refer to the dumpadm (1M) manual when changing it.

- 2) Generate a panic from the control domain to the guest domain.

```
primary$ ldm panic-domain <domain name> <Enter>
```

- 3) Check the created dump file after rebooting the guest domain.

```
ldom1# ls -l /var/crash/ldom2 <Enter>
-rw-r--r--  1 root    root          2      Jan.  9  11:58  bounds
-rw-r--r--  1 root    root    1232962  Jan.  9  11:58  unix.0
-rw-r--r--  1 root    root   126697472  Jan.  9  11:58  vmcore.0
```

Remarks: Save the output file by using arbitrary methods.

7.2 Console of the Guest Domain

7.2.1 Connecting/disconnecting the Guest Domain to/from the console

- 1) Check the port numbers of the virtual console.

```
primary$ ldm list ldom1 <Enter>
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
ldom1         active -n---  5001  16    1920M   6.2%  23m
```

- 2) Connect to the console of the guest domain.

```
primary$ telnet localhost 5001 <Enter>
```

The following message is displayed, and enter the root user's ID and password.

```
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

Connecting to console "ldom1" in group "ldom1" ....
Press ? for control options ..

ldom1 console login: root <Enter>
Password:***** <Enter>

Dec 18 16:40:35 ldom1 login: ROOT LOGIN /dev/console
Last login: Tue Dec 18 09:16:30 from 10.77.134.148
Sun Microsystems Inc. SunOS 5.10 Generic January 2005
ldom1#
```

- 3) Disconnection of the guest domain console

Enter [~ (tilde)] + [. (dot)] in succession and disconnect the virtual console session of the guest domain.

```
ldom1# (Nothing is displayed.)
Connection to localhost closed by foreign host.
primary$
```

Remarks: In this example, the logout process may not be executed but the connection to the guest domain console and virtual console is disconnected. This is similar to a situation where a user leaves a console unattended without logging out. For security management purposes, Fujitsu recommends logging out from the console and then disconnecting it.

7.2.2 Grouping the virtual console

When one administrator controls several domains, he or she can replace the domain without stopping the telnet session by using the virtual console group.

- 1) Stop the domain you want to group and then release the resource binding.

```
primary$ ldm list
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary      active -n-cv  SP    8     4G     0.6%  52m
ldom1       active -n---  5001  16    1920M  0.0%  36m
ldom2       active -t---  5002  16     1G     6.2%  4m
ldom3       active -t---  5003  24     4G    100%  52m
primary$ ldm stop-domain ldom2
primary$ ldm stop-domain ldom3
primary$ ldm unbind-domain ldom2
primary$ ldm unbind-domain ldom3
```

- 2) Reconfigure the virtual console of the domain that cancels the resource binding.

```
primary$ ldm set-vcons port=5001 group=ldom1 ldom2
primary$ ldm set-vcons port=5001 group=ldom1 ldom3
primary$ ldm bind ldom2
primary$ ldm bind ldom3
primary$ ldm list
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary      active -n-cv  SP    8     4G     0.2%  56m
ldom1       active -n---  5001  16    1920M  0.0%  41m
ldom2       bound  -----  5001  16     1G     0.0%  0s
ldom3       bound  -----  5001  24     4G     0.0%  0s
primary$ ldm start ldom2
LDom ldom2 started
primary$ ldm start ldom3
LDom ldom3 started
primary$ ldm list
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary      active -n-cv  SP    8     4G     0.3%  57m
ldom1       active -n---  5001  16    1920M  0.0%  41m
ldom2       active -t---  5001  16     1G     9.1%  3s
ldom3       active -t---  5001  24     4G    32%   0s
```

3) Connect to the grouped virtual console group.

```

primary$ ldm list
NAME          STATE  FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary      active -n-cv  SP    8     4G     0.3%  57m
ldom1        active -n---  5001  16    1920M  0.0%  41m
ldom2        active -t---  5001  16     1G     9.1%   3s
ldom3        active -t---  5001  24     4G    32%    0s
primary$ telnet localhost 5001 <Enter>
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^'.

T5120-vnts-ldom1: h, l, c{id}, n{name}, q: 1 <Enter> ← (The list of connected domains is displayed.)
DOMAIN ID      DOMAIN NAME      DOMAIN STATE
0              ldom1            online
1              ldom3            online
2              ldom2            online

T5120-vnts-ldom1: h, l, c{id}, n{name}, q: c 0 <Enter> ← (Specified by c + domain ID)
Connecting to console "ldom1 in group "ldom1" ....
Press ? for control options ..

ldom1 console login:

```

4) Replace the console with the other domain console.

```

ldom1 console login: Enter [~ (tilde)] + [. (dot)] in succession.
T5120-vnts-ldom1: h, l, c{id}, n{name}, q:c1
Connecting to console "ldom2" in group "ldom1" ....
Press ? for control options ..

{0} ok

```

Remarks: In case of connecting to the control domain with ssh, the connection to the control domain is disconnected using the above operation. If you do not want to disconnect from the control domain, enter the [.] after entering the [~ (tilde)] + [~ (tilde)] + [. (dot)], and a number of [~] equivalent to the layer that uses ssh + 1.

5) Disconnection of the grouped virtual console

Specify the [q] after entering [~ (tilde)] + [. (dot)] in succession.

```

{0} ok Enter [~ (tilde)] + [. (dot)] in succession.
T5120-vnts-ldom1: h, l, c{id}, n{name}, q:c
Connection to localhost closed by foreign host.
primary$

```

Remarks: In the case of connecting to the control domain with ssh, the connection to the control domain is disconnected using the above operation. If you do not want to disconnect from the control domain, enter the [.] after entering the [~ (tilde)] + [~ (tilde)] + [. (dot)] and a number of [~] equivalent to the layer that uses ssh + 1.

7.3 Establishing a Network Connection to the Guest Domain

7.3.1 Connection from non-Control Domain

Log into the guest domain through the network.

```
remotehost$ telnet <IP address of the guest domain> <Enter>
```

Remarks:

- Login by SSH is enabled.
- When the default setting is in effect, the control domain cannot connect to the guest domain through a network.
- The security configuration of the control domain is not applied to the guest domain. It is necessary to set security for every domain.

7.3.2 Connection from the Control Domain

When implementing network communication between the control domain and the guest domain, you should configure the virtual network device of the control domain.

1) Check the current network configuration.

```
primary# ifconfig -a
lo0: flags=2001000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4,VIRTUAL> mtu 8232 index 1
    inet 127.0.0.1 netmask ff000000
e1000g0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 2
    inet 192.168.1.100 netmask fffffff0 broadcast 192.168.1.255
    ether 0:14:4f:46:41:a0
```

Remarks: Be sure to log in to the guest domain as the root user from the control domain.

2) Disable the current network interface.

```
primary# ifconfig e1000g0 down <Enter>
primary# ifconfig e1000g0 unplumb <Enter>
```

3) Check the virtual network device.

```
primary# dladm show-link | grep vsw <Enter>
vsw0          Type: non vlan mtu: 1500      Device: vsw0
```

- 4) Enable the virtual network device (vsw0).

```
primary# ifconfig vsw0 plumb <Enter>
```

Remarks: The virtual network device of the control domain is named "vsw?".

- 5) Configure the virtual network device (vsw0).

```
primary# ifconfig vsw0 192.168.1.100 netmask 255.255.255.0 broadcast + up <Enter>
```

Remarks: Set the IP address and net mask that were used in the control domain.

- 6) Check the network configuration.

```
primary# ifconfig -a <Enter>
lo0: flags=2001000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4,VIRTUAL> mtu 8232 index 1
    inet 127.0.0.1 netmask ff000000
vsw0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
    inet 192.168.1.100 netmask ffffffff broadcast 10.77.134.255
    ether 0:14:4f:2a:85:70
```

- 7) Replace the network definition file.

```
primary# mv /etc/hostname.e1000g0 /etc/hostname.vsw0 <Enter>
```

Remarks: Check the security setting for the control domain before connecting to the server for the control domain.

7.4 Backing Up/Restoring the File System

Back up/restore the file system of the guest domain on each guest domain only for the virtual disks that were bound to the domain. Refer to the following documents for information on saving/restoring the file system.

- "System Administration Guide (Devices and File Systems)"

<http://docs.sun.com/app/docs/doc/817-5093>

The tape device cannot be allocated to the guest domain. Use the remote tape drive when backing up/restoring the virtual disks on the guest domain.

Use the following procedure to use the remote tape drive.

- 1) Add the guest domain entry on the `/etc/inet/hosts` file or the name service of the remote host (remotehost) to which the tape device is connected.
- 2) Add the remote host entry on the `/etc/inet/hosts` file or the name service of the guest domain.
- 3) Make the `rlogin` service of the remote host operational.
- 4) Create the `rhosts` file (`$HOME/.rhosts`) in the home directory of the root user in the remote host and then add the host name of the guest domain.

The following is an example of the configuration of the `rhosts` file of the root user.

```
remotehost# cat >> $HOME/.rhosts
ldom1
ldom2
ldom3
<Ctrl+d>
remotehost# chmod 0400 $HOME/.rhosts
```

The following is an example of using the remote tape drive.

```
ldom1# ufsdump 0ucf remotehost:/dev/rmt/0n /dev/rdisk/c0d0s0
ldom1# rsh remotehost mt rewind /dev/rmt/0
ldom1# ufsrestore tf remotehost:/dev/rmt/0
```

Remarks:

- Access to virtual disk entities, which is canceled for the consolidation to the guest domain from the control domain, is available. However, when the consolidated virtual disk entities are read or written from the control domain, disk errors or system hang-up sometimes occur. Therefore, **DO NOT ACCESS** the virtual disk entities that connect to the guest domain from the control domain.
- When conducting an operation that must access a virtual disk connected to the guest domain in the control domain, stop the guest domain and unbind it.
- When restoring the virtual disk entity connected to the guest domain by using tasks such as restoration of the control domain, a part of or all of the contents of the virtual disks of the guest domain may be lost. When the virtual disk entity, which is connected to the guest domain, is restored by the control domain, restore the counterpart virtual disk on the guest domain by using the save data from the guest domain.

7.5 Powering off the Server, Stopping/Rebooting the Control Domain

When turning off the server, or stopping/rebooting the control domain or changing to the single-user mode the control domain, you should stop all guest domains and cancel all connections.

Also, when changing the LDom configuration for the control domain, be sure to turn off the server itself (RUN level5) and then turn it on again, instead of rebooting (RUN level6) and powering up the server.

- 1) Stop all of the guest domains.

```
primary# ldm stop -a <Enter>
```

- 2) Release the binding to all of the guest domain resources.

Make sure that all of the domains except the control domain are set to "inactive".

```
primary# ldm unbind-domain ldom1 <Enter>
primary# ldm unbind-domain ldom2 <Enter>
primary# ldm unbind-domain ldom3 <Enter>
primary# ldm list<Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.1%	3h 19m
ldom1	inactive	----		16	1920M		
ldom2	inactive	----		16	1G		
ldom3	inactive	----		24	4G		

- 3) The logical domain composition is preserved.

To make changed information effective since the next power on after preserving the logical domain composition referring to "7.7.5 Modification of OBP variables, device-alias etc."

- 4) Stop (Reboot) the control domain.

```
primary# shutdown -y -g0 -i5 (or 6 or 0) <Enter>
```

Remarks: When turning off the power, stopping and rebooting the control domain without stopping the guest domain and canceling the resource connection, some failures may occur. For example, the guest domain cannot be started or operation errors occur. In this case, release the resource binding of the guest domain, set the guest domain to "inactive" and reboot the guest domain.

When the guest domain cannot be started

```
primary# ldm stop-domain <domain name><Enter>
primary# ldm unbind-domain <domain name> <Enter>
primary# ldm bind-domain <domain name><Enter>
primary# ldm start-domain <domain name> <Enter>
```

If the following message is displayed when the guest domain is stopped, forcibly terminate the domain with the [-f] option.

```
ldom1 stop timed out, use -f to force it to stop  
primary# ldm stop-domain -f <domain name> <Enter>
```

When a panic is indicated for the guest domain, execute the following command.

```
ldom1 stop timed out, use -f to force it to stop  
primary# ldm panic-domain<domain name> <Enter>
```


7.6 Starting/Stopping the LDom-related Services

The following daemons should be activated in order to use LDom.

- Logical Domain Manager daemon (ldmd)
- Virtual network terminal server daemon (vntsd)

Operate the LDom-related services in the manner explained below.

7.6.1 Logical Domain Manager daemon

When the guest domain is active or the `ldm` command is executed, Logical Domain Manager daemon should be in the online state.

- 1) Check the Logical Domain Manager daemon state.

```
primary# svcs ldmd <Enter>
```

- 2) Start the Logical Domain Manager daemon.

```
primary# svcadm enable ldmd <Enter>
```

Remarks: When maintaining the hardware, stop the Logical Domain Manager daemon by using the following operation and then turn off the power to the server.

```
primary# svcadm disable ldmd <Enter>
```

7.6.2 Virtual network terminal server daemon

When operating the guest domain by using the virtual console, the virtual network terminal server daemon should be in the online state.

- 1) Check the state of the virtual network terminal server daemon.

```
primary# svcs vntsd <Enter>
```

- 2) Start the virtual network terminal server daemon.

```
primary# svcadm enable vntsd <Enter>
```

Remarks: When maintaining the hardware or restoring the LDom configuration to the factory-default configuration, stop the virtual network terminal server daemon by using the following operations after stopping all of the guest domains.

```
primary# svcadm disable vntsd <Enter>
```

7.7 Making Temporary Configuration Changes to Domains

This chapter explains how to temporarily the allocation of the hardware resources.

When making changes to the LDOMs configuration assuming the configuration will be continue to be used, Fujitsu recommends removing the guest domain once and then executing the building script reflecting the configuration changes.

7.7.1 Adding/removing virtual CPUs

1) Check the virtual CPU numbers of each domain.

```
primary# ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	3.1%	1d 36m
ldom1	active	-n---	5001	16	1920M	34%	1m
ldom2	active	-n---	5002	16	1G	34%	17h 48m
ldom3	active	-n---	5003	24	4G	17%	17h 48m

2) Remove CPUs. (Remove the eight VCPUs of ldom3.)

```
primary# ldm remove-vcpu 8 ldom3 <Enter>
```

3) Add the CPUs. (Add the eight VCPUs to ldom1)

```
primary# ldm add-vcpu 8 ldom1 <Enter>
```

4) Check the virtual CPU numbers of each domain.

```
primary# ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.2%	1d 1h 50m
ldom1	active	-n---	5001	24	1920M	33%	1h 15m
ldom2	active	-n---	5002	16	1G	0.1%	19h 3m
ldom3	active	-n---	5003	16	4G	0.1%	19h 3m

Remarks:

- The CPU as well as the control domain can be added/removed dynamically.
- The stop of the domain and the cancel of the consolidation are required for adding and removing the virtual CPU for the domain to which the encryption unit numbers (MAU) are allocated.
- When adding/removing the virtual CPU for the domain for which the drd daemon does not operate, it will not become enabled until the domain is rebooted.

7.7.2 Adding/removing memory

Rebooting the domain is required to change the memory.

7.7.2.1 Guest Domain

1) Check the amount of memory allocated to the domain

```
primary# ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.7%	1d 5h 59m
ldom1	active	-n---	5001	24	1920M	22%	1m
ldom2	active	-n---	5002	16	1G	0.1%	23h 12m
ldom3	active	-n---	5003	16	4G	36%	23h 12m

2) Stop the domain.

```
primary# ldm stop-domain ldom2 <Enter>
primary# ldm stop-domain ldom3 <Enter>
```

3) Remove the domain memory. (Remove the 1GB memory of ldom3.)

```
primary# ldm remove-memory 1G ldom3 <Enter>
```

Remarks: Addressable units are G (GB), M (MB) and K (KB).

4) Add the domain memory. (Add the 1GB memory to ldom2.)

```
primary# ldm add-memory 1G ldom2 <Enter>
```

Remarks: Addressable units are G (GB), M (MB) and K (KB).

5) Start the domain.

```
primary# ldm start-domain ldom3 <Enter>
primary# ldm start-domain ldom2 <Enter>
```

6) Check the memory amount of the domain.

```
primary# ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.7%	1d 5h 59m
ldom1	active	-n---	5000	8	1920M	22%	1m
ldom2	active	-n---	5001	8	2G	0.1%	23h 12m
ldom3	active	-n---	5002	8	3G	36%	23h 12m

7.7.2.2 Control Domain

- 1) Stop all of the domains.

```
primary# ldm stop-domain -a <Enter>
primary# ldm unbind-domain <domain name><Enter>
```

Remarks: Be sure to stop all of guest domains and release the resource bindings because the changes to the control domain memory require the rebooting of the control domain.

- 2) Check the memory amount of the control domain.

```
primary# ldm list primary <Enter>
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary       active -n-cv  SP    8     4G      0.2%  1d 5h 54m
```

- 3) Add the memory to the control domain.

```
primary# ldm add-memory 1G primary <Enter>
Initiating delayed reconfigure operation on LDom primary. All configuration
changes for other LDOMs are disabled until the LDom reboots, at which time
the new configuration for LDom primary will also take effect.
```

- 4) Reboot the control domain.

```
primary# shutdown -y -g0 -i6 <Enter>
```

- 5) Check the memory amount of the domain.

```
primary# ldm list primary <Enter>
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary       active -n-cv  SP    8     5G      0.2%  6m
```

7.7.3 Adding/removing virtual disks

7.7.3.1 Adding the virtual disks

1) Add the virtual disk devices.

```
primary# mkfile 20G /LDoms/Vol1/vdisk1.img <Enter>
primary# ldm add-vdsdev /LDoms/Vol1/vdisk1.img voll1@primary-vds0 <Enter>
```

2) Check the virtual disk devices.

```
primary# ldm ls -l <Enter>
:
VDS
  NAME          VOLUME      OPTIONS      DEVICE
  primary-vds0  voll1       /LDoms/Vol1/vdisk0.img
                voll2       /LDoms/Vol2/vdisk0.img
                voll3       /LDoms/Vol3/vdisk0.img
                voll1       /LDoms/Vol1/vdisk1.img
```

Remarks: The VOLUME name should be unique in the virtual disk server (primary-vds0).

3) Stop the target domain and release the resource binding.

```
primary# ldm stop-domain ldom1 <Enter>
primary# ldm unbind-domain ldom1 <Enter>
```

4) Add the virtual disks to the guest domain.

```
primary# ldm add-vdisk vdisk1 voll1@primary-vds0 ldom1 <Enter>
```

5) Check the virtual disks of the guest domain.

Note: The NAME should be unique in the guest domain.

```
primary# ldm list -l ldom1 <Enter>
:
DISK
  NAME          VOLUME          TOUT DEVICE  SERVER
  vdisk0        voll1@primary-vds0  disk@0
  vdisk1        voll1@primary-vds0  disk@1
```

6) Start the guest domain.

Note: Please do not execute the following operation in process of addition of a virtual disk (ldm add-vdisk).

```
primary# ldm bind-domain ldom1 <Enter>
primary# ldm start-domain ldom1 <Enter>
```

7) Reconfigure the device after logging into the domain.

```
ldom1# devfsadm <Enter>
```

Remarks: Starting the domain by boot -r (the device reconfiguration) from the OBP prompt is available.

8) Check the disks.

```
ldom1# format <Enter>
Searching for disks...done

AVAILABLE DISK SELECTIONS:
    0. c0d0 <SUN-DiskImage-10GB cyl 34950 alt 2 hd 1 sec 600>
       /virtual-devices@100/channel-devices@200/disk@0
    1. c0d1 <SUN-DiskImage-20GB cyl 67960 alt 2 hd 1 sec 600>
       /virtual-devices@100/channel-devices@200/disk@1
Specify disk (enter its number):
```

7.7.3.2 Removing the virtual disks

1) Check the virtual disk devices.

```
primary# ldm list -l ldom1 <Enter>
:
DISK
  NAME          VOLUME          TOUT DEVICE  SERVER
  vdisk0        vol1@primary-vds0      disk@0
  vdisk1        vol11@primary-vds0    disk@1
```

2) Stop the target domain and release the resource binding.

```
primary# ldm stop-domain ldom1 <Enter>
primary# ldm unbind-domain ldom1 <Enter>
```

3) Remove the virtual disk from the guest domain.

```
primary# ldm remove-vdisk vdisk1 ldom1 <Enter>
```

When removing the virtual disk device

```
primary# ldm remove-vdsdev vol11@primary-vds0 <Enter>
```

4) Start the guest domain.

```
primary# ldm bind-domain ldom1 <Enter>
primary# ldm start-domain ldom1 <Enter>
```

7.7.4 Adding/removing the virtual network devices

7.7.4.1 Adding the virtual network device

- 1) Check the virtual switch service.

```
primary# ldm ls-services<Enter>
:
VSW
  NAME                MAC                NET-DEV  DEVICE    MODE
  primary-vsw0        00:14:4f:f8:97:91  e1000g0  switch@0  prog,promisc
  primary-vsw1        00:14:4f:f9:90:05  e1000g1  switch@1  prog,promisc
  primary-vsw2        00:14:4f:fa:65:18  e1000g2  switch@2  prog,promisc
  primary-vsw3        00:14:4f:f9:ad:3b  e1000g3  switch@3  prog,promisc
```

Remarks: The following is operation adding the virtual switch service.

```
primary# ldm add-vsw primary-vswx primary
Initiating delayed reconfigure operation on LDom primary. All configuration
changes for other LDomS are disabled until the LDom reboots, at which time
the new configuration for LDom primary will also take effect.
```

- 2) Stop the target domain and release the resource binding.

```
primary# ldm stop-domain ldom1 <Enter>
primary# ldm unbind-domain ldom1 <Enter>
```

- 3) Add the virtual network device to the guest domain.

```
primary# ldm add-vnet vnet2 primary-vswx ldom1 <Enter>
```

- 4) Check the virtual network device of the guest domain.

```
primary# ldm list -l ldom1 <Enter>
:
NETWORK
  NAME                SERVICE            DEVICE    MAC
  vnet0                primary-vsw0        network@0  00:14:4f:f8:b4:8c
  vnet1                primary-vsw1        network@1  00:14:4f:f8:dd:13
  vnet2                primary-vswx        network@2  00:14:4f:fa:63:a3
```

5) Start the guest domain.

```
primary# ldm bind-domain ldom1 <Enter>
primary# ldm start-domain ldom1 <Enter>
```

6) Configure the network interface on the guest domain.

```
ldom1# ifconfig vnet2 plumb
ldom1# ifconfig vnet2
vnet2: flags=1000842<BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
    inet 0.0.0.0 netmask 0
    ether 0:14:4f:fa:63:a3
```

7.7.4.2 Removing the virtual switch service and virtual network device

1) Stop the target domain and release the resource binding.

```
primary# ldm stop-domain ldom1 <Enter>
primary# ldm unbind-domain ldom1 <Enter>
```

2) Remove the virtual network device from the guest domain.

```
primary# ldm remove-vnet vnet2 ldom1 <Enter>
```

Remarks: The following is operation removing the virtual switch service.

```
primary# ldm remove-vsw primary-vsw <Enter>
Initiating delayed reconfigure operation on LDom primary. All configuration changes
for other LDom are disabled until the LDom reboots, at which time the new
configuration for LDom primary will also take effect.
```

3) Start the guest domain.

```
primary# ldm list -l ldom1 <Enter>
...
NETWORK
  NAME          SERVICE          DEVICE          MAC
  vnet0         primary-vsw0@primary  network@0      00:14:4f:f8:b4:8c
  vnet1         primary-vsw1@primary  network@1      00:14:4f:f8:dd:13
DISK
  NAME          VOLUME          TOUT DEVICE  SERVER
  vdisk0        voll@primary-vds0      disk@0        primary
VCONS
  NAME          SERVICE          PORT
  ldom1         primary-vcc0@primary  5001
primary# ldm bind-domain ldom1 <Enter>
primary# ldm start-domain ldom1 <Enter>
```


7.7.5 Modification of OBP variables, device-alias etc.

If you modified OBP variables, device-alias etc. of the control domain, the modification does not become effective at the next power on. Before powering off the machine, the modification needs to be reflected to the configuration information. Also it is recommended that you should reflect it in configuration script of the control domain. When the states of guest domain is changed, it is necessary to reflect it in configuration information.

Example) When you change the boot disk to "disk3"

```
primary# eeprom boot-device=disk3
primary# ldm remove-config initial
primary# ldm add-config initial
primary# ldm list-config
factory-default
initial [current]
primary# shutdown -i0 -g0 -y
ok> power-off
```

The following operation differs depending on the system monitoring mechanisms (ALOM, ILOM).

Follow the procedure for your system monitoring mechanism.

【ALOM】

```
sc> poweron -c
```

【ILOM】

```
-> start /SYS
Are you sure you want to start /SYS (y/n)? y
Starting /SYS
```

7.8 Collecting/Restoring the Configuration Information of the Guest Domain

This chapter explains how to collect the configuration information of the guest domain and restore the guest domain that uses the information.

7.8.1 Collecting the configuration information of the Guest Domain

- 1) The following indicates how to collect the configuration information of the guest domain. (In this example, the configuration information of ldom1 is stored in /LDoms/Domains/.)

```
primary$ ldm list-constraints -x ldom1 > /LDoms/Domains/ldom1.xml <Enter>
```

Remarks:

- The configuration file is created in xml format
- Perform the above for all of the domains whenever the configuration is changed.
- Copy the information in the DVD-R, tapes or file servers to be prepared in case they are lost from the disk

7.8.2 Restoring the Guest Domain

The guest domain, whose configuration is changed temporarily, can be restored to the configuration in effect at the point where such configuration information was collected.

7.8.2.1 Removing the Guest Domain

Stop the guest domain that you want to reconfigure, release the binding and then remove it.

```
primary$ ldm list <Enter>
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary       active  -n-cv  SP    8     4G      0.3%  21h 34m
ldom1         inactive -----  4     1G
primary$ ldm remove-domain ldom1 <Enter>
primary$ ldm list <Enter>
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary       active  -n-cv  SP    8     4G      0.3%  21h 34m
```

Remarks: Even if you remove the virtual disk content, it's contents remains available because it has been saved, and can therefore be reused.

7.8.2.2 Rebuilding the Guest Domain

- 1) Rebuild the guest domain by using the saved xml file.

```
primary$ ldm add-domain -i /LDoms/Domains/ldom1.xml <Enter>
```

2) Check the guest domain.

```
primary$ ldm ls <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.1%	21h 38m
ldom1	inactive	-----		16	1920M		

3) Start the domain.

```
primary$ ldm bind-domain ldom1 <Enter>
primary$ ldm start-domain ldom1 <Enter>
primary$ ldm list <Enter>
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	UPTIME
primary	active	-n-cv	SP	8	4G	0.1%	21h 38m
ldom1	active	-n---	5001	16	1920M	41%	1m

7.9 Replacing the LDoms Configuration from the Control Domain

The LDoms configuration is stored in the system controller (SC), and is read after power activation or reset. Several LDoms configurations are available for replacement purposes.

In order to operate the degraded hardware temporarily in a different LDoms configuration, this function is used when the LDoms environment is rebuilt in a degraded environment and operated again using the original configuration after hardware restoration.

- 1) Check the in-use configuration.

The following is an example of the output from LDoms Manager 1.0.3.

```
primary# ldm list-sponfig <Enter>
factory-default
initial
reduced [current]
```

Remarks: In this example, [reduced] is the in-use LDoms environment.

- 2) Stop the guest domain and release the binding.

```
primary# ldm stop -a <Enter>
primary# ldm unbind <domain name> <Enter>
```

- 3) Specify the configuration you want to replace.

```
primary# ldm set-sponfig initial <Enter>
```

- 4) Check the configuration again.

```
primary# ldm list-sponfig <Enter>
factory-default
initial [next poweron]
reduced [current]
```

Remarks: The configuration with [next] is executed after the reboot.

- 5) Activate the power again.

```
primary# shutdown -y -g0 -i5 <Enter>
...
sc> poweron -c
```

7.10 Replacing LDOMs Configuration from the System Controller

You can select the saved LDOMs configuration from the system controller.

The following operation differs depending on the system monitoring mechanisms (ALOM, ILOM).

Follow the procedure for your system monitoring mechanism.

【ALOM】

- 1) Specify the config option with the bootmode command, by logging into the system controller (SC).

```
sc> bootmode config="factory-default"
```

Remarks: The saved configuration is specified with the ldm add-config command for other than [factory-default].

- 2) Implement the reset command.

```
sc> reset
```

Remarks: The LDOMs configuration is replaced after the next start.

【ILOM】

```
-> set /HOST/bootmode config=factory-default
Set 'config' to 'factory-default'
-> reset /SYS
Are you sure you want to reset /SYS (y/n)? Y
Performing reset on /SYS
```

Remarks: The LDOMs configuration is replaced after the next start.

7.11 How to Remove the LDOMs Environment

The following indicates the procedure for creating the environment in which the OS and system controller do not use the LDOMs.

7.11.1 Removing the Guest Domain

- 1) Stop all of the guest domains.

```
ldom1# shutdown -i0 -g0 -y <Enter>
ldom2# shutdown -i0 -g0 -y <Enter>
ldom3# shutdown -i0 -g0 -y <Enter>
primary# ldm stop-domain -a <Enter>
```

- 2) Remove the connections of all of the guest domains.

```
primary# ldm unbind <domain name> <Enter>
```

- 3) Remove all of the guest domains.

```
primary# ldm remove-domain <domain name> <Enter>
```

7.11.2 Removing the LDOMs configuration

- 1) Set the LDOMs configuration to the factory-default.

```
primary# ldm set-config factory-default <Enter>
```

- 2) Remove all of the saved LDOMs configurations.

```
primary# ldm list-config <Enter>
primary# ldm remove-config <config name > <Enter>
...
```

- 3) Reconfirm the configurations.

```
primary# ldm list-config <Enter>
factory-default [next poweron]
```

Remarks: You cannot remove [factory-default] (the factory default configuration).

- 4) Restore the network definition file if the file was changed in [7.3.2 Connection to the control domain].

```
primary# mv /etc/hostname.vsw0 /etc/hostname.e1000g0 <Enter>
```

- 5) Stop the vntsd service.

```
primary# svcadm -v disable vntsd <Enter>
svc:/ldoms/vntsd:default is disabled.
primary# svcs -a |grep ldom
disabled      8:36:20 svc:/ldoms/vntsd:default
online        8:32:59 svc:/ldoms/ldmd:default
```

- 6) Turn off the power to the server and then reboot it.

```
primary# shutdown -y -g0 -i5 <Enter>
...
sc> poweron -c
```

Remarks: You can get the same result even if you implement the reset command on the system controller (SC).

7.12 How to Remove and Re-install the LDOMs

The following describes how to remove and reinstall LDOMs. You can use the same procedure when upgrading LDOMs.

7.12.1 Removing the Guest Domain

Please see “7.11.1 Removing the guest domain”.

7.12.2 Removing the LDoms configuration

Please see “7.11.2 Removing the LDoms configuration”.

7.12.3 Removing the LDoms Manager

- 1) Remove LDoms Manager.

To check installed LDoms Manager, please take the steps below.

```
# pkginfo -l SUNWldm|grep VERSION
VERSION: 1.2,REV=2009.06.25.09.48
```

If a package has already been removed, take the steps below to remove LDoms Manager.

```
# pkginfo -l SUNWldm|grep VERSION
VERSION: 1.2,REV=2009.06.25.09.48
# svcadm disable ldmd
# svcadm disable vntsd
# pkgrm SUNWldm
The following package has been installed. :
SUNWldm Logical Domains Manager
(sparc.sun4v) 1.2,REV=2009.06.25.09.48

Do you delete this package [y,n,?,q] y
...
```

After removing the package, download from Fujitsu official website.

<http://www.fujitsu.com/global/services/computing/server/sparcenterprise/products/software/ldoms/>

- 2) Remove Solaris Security Toolkit.

After return the security setting by using Solaris Security Toolkit to the original security setting, remove the package.

```
primary# /opt/SUNWjass/bin/jass-execute -u <Enter>
:
primary# pkgrm SUNWjass <Enter>

primary# /usr/sbin/shutdown -i6 -g0 -y <Enter>
```

7.12.4 Installing the LDoms Manager

Make sure that OS, patch level, and firm level meet the requirement of LDoms Manager that you are going to install.

Apply the latest recommended & security patches, and regular PTF.

Refer to “6.3 Installing LDoms Manager” to install the new package.

7.12.5 Building the domains

Refer to “4.2.6/5.3.8 Building the Control Domain”, and “4.2.7/5.3.10 Building the Guest Domain” to build each domain.

- 1) Confirm the state of all domains after creating them.

```
primary$ ldm list <Enter>
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary      active -n-cv  SP    8     4G     0.6%  52m
ldom1        active -n---  5001  16    1920M  0.0%  36m
ldom2        bound  -t---  5002  16     1G     6.2%  4m
ldom3        inactive -n--  5003  24     4G    100%  52m
```

For more information, please refer to “7.1.1 Confirming the state of the domain”.

Chapter 8 Tasks Required to Replace Parts

This chapter explains the tasks to perform for replacing parts.

After replacing the motherboard and SCC module, the factory-default settings of the LDom environment become effective. Observe the following procedures in the order given: [8.2 Stopping the System Before Replacing Parts] and [8.3 Building LDom after Replacing Parts].

8.1 Parts Replacement Performed by the Service Engineer

Your service engineer must replace the parts in the device-deactivated state and check their operations which include the POST completion of the control domain.

8.2 Stopping the System Before Replacing Parts

If the hardware failure occurs, and you execute the following parts replacement procedure, the LDom environment must be deleted before starting the procedure. Stop the system first, and then perform the procedure by referring to [8.1 Parts replacement performed by the Service Engineer].

- Replacing the motherboard (SPARC Enterprise T5120, T5220, T5140, T5240)
- Replacing the BSP board (SPARC Enterprise T5440)
- Replacing SCC module
- Replacing parts in the factory default state
CMP module (SPARC Enterprise T5440)

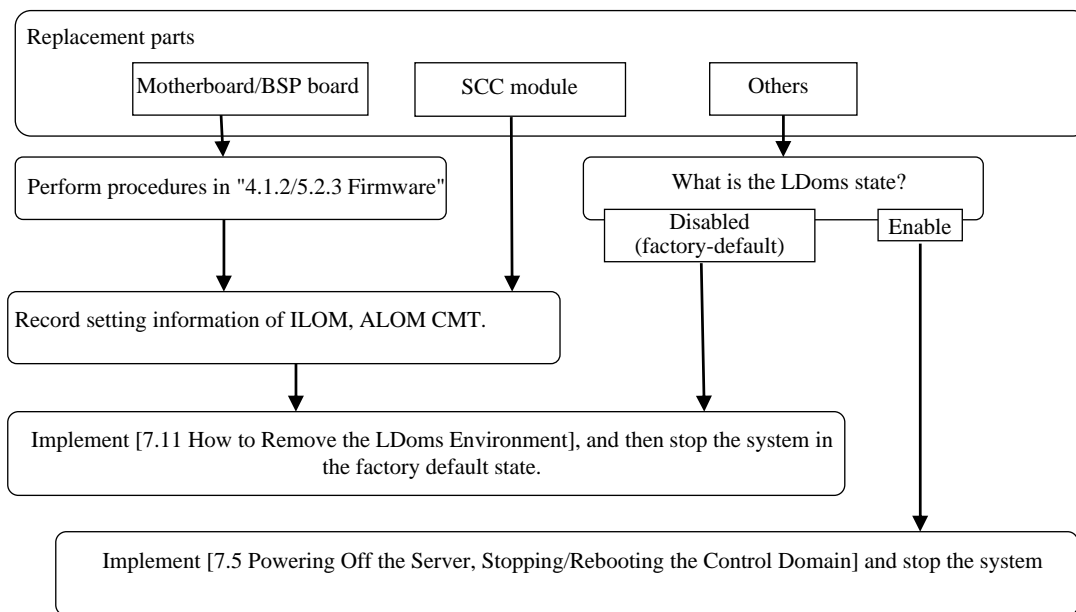


Figure 8.1 Task flow for stopping the system before replacing parts

8.3 Building LDom's after Replacing Parts

LDom's must be rebuilt when the LDom's environment enters the factory-default state. Refer to [Figure 8.2 Tasks flow for Building LDom's after Replacing Parts] for information on building the LDom's environment.

- Notes
 - 1) The MAC addresses of the guest domain (HostID), virtual switch (vsw) or virtual network (vnet), which are automatically allocated, may be changed.
 - 2) The X part of the virtual switch (vswX), the virtual network (vnetX), and the virtual disk (c0dXs0) may also be changed.

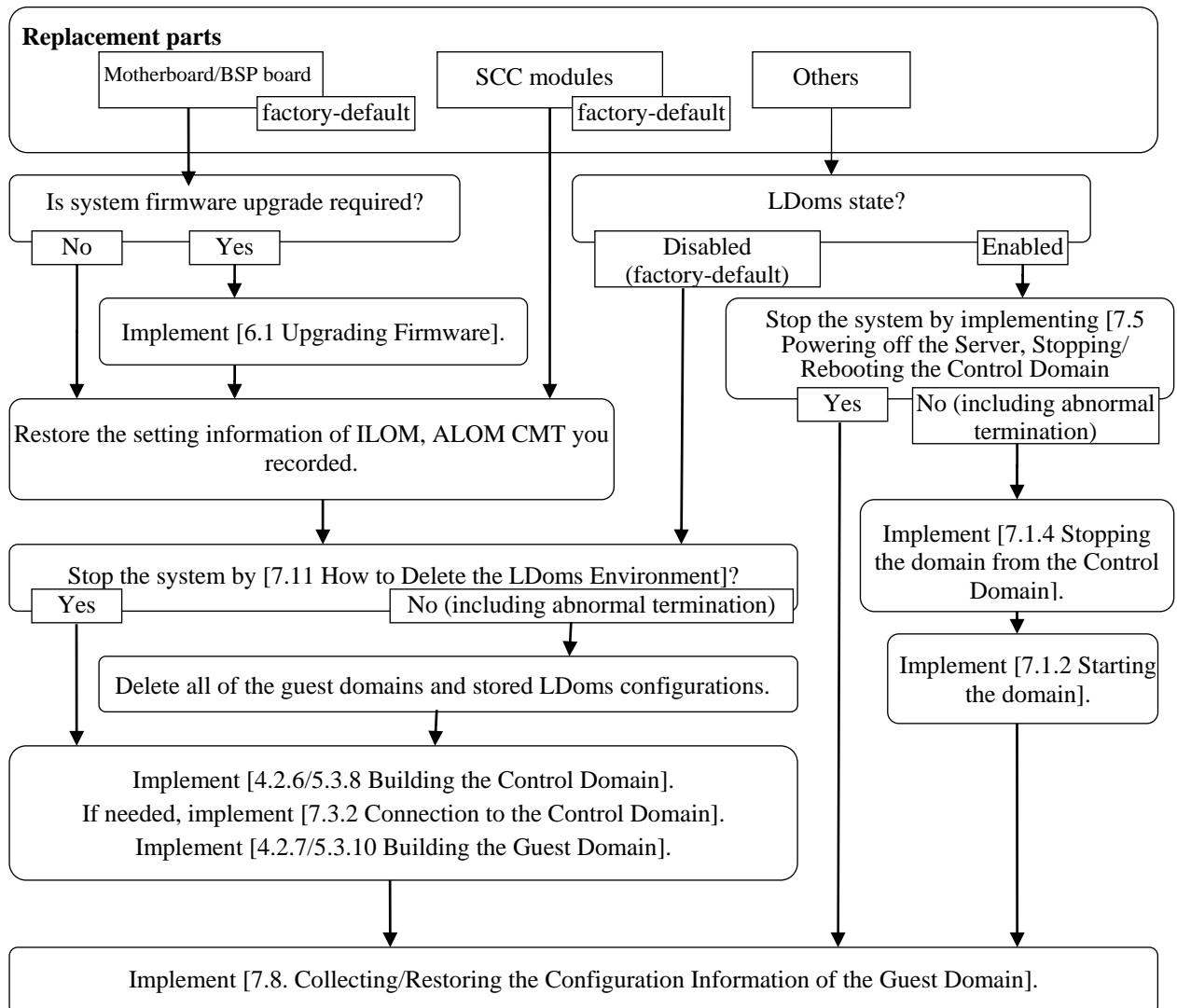


Figure 8.2 Tasks flow for Building LDOMs after Replacing Parts

Chapter 9 Bug Information and Notes

9.1 Bug Information and Notes

The information and notes on bugs in this chapter are for reference when using LDoms.

Table 9.1 Bug information and notes on LDoms 1.0.2 or later

1	Symptom	When booting the Solaris OS in the guest domain, a panic sometimes occurs in [recursive mutex_enter]. This bug occurs when more than four guest domains are built (Low frequency of occurrence) This corresponds to Sun Bug ID: 6639934.
	Recommended Action	Reboot the Solaris OS of the corresponding guest domain when the error occurs. This does not affect the control domain or the other guest domains.
2	Symptom	The boot of the Solaris OS sometimes hangs in the guest domain. This bug occurs when more than four guest domains are built. (Low frequency of occurrence)
	Recommended Action	Forcibly stop the corresponding guest domain and then reboot the Solaris OS when the error occurs. This does not affect the control domain or the other guest domains.
3	Symptom	The "db error: disk I/O error" occurs and single user mode becomes effective when booting the Solaris OS in the guest domain. This bug occurs when more than four guest domains are built. (Low frequency of occurrence)
	Recommended Action	Reboot the Solaris OS of the corresponding guest domain when the error occurs. This does not affect the control domain or the other guest domains.
4	Symptom	The "svc.configd: Fatal error: "boot" backup failed:" occurs and single user mode becomes effective when booting the Solaris OS in the guest domain. This bug occurs when more than four guest domains are built. (Low occurrence)
	Recommended Action	Reboot the Solaris OS of the corresponding guest domain when the error occurs. This does not affect the control domain or the other guest domains.
5	Symptom	If multiple guest domains are installed at one time, "boot net" may fail.
	Recommended Action	We recommend that you install four or less guest domains at one time. Please reduce the number of guest domains you try to install at one time. Domains where this problem occurred can be restored by executing start-domain following stop-domain.

6	Symptom	<p>The following WARNING message may be displayed when collecting necessary information in Sun Explorer.</p> <pre># /opt/SUNWexplo/bin/explorer : : October 17 14:45:22 t5240-fj-05 [16428] disks: RUNNING Oct 17 14:45:22 t5240-fj-05 scsi: WARNING: /pci@400/pci@0/pci@1/pci@0/usb@0,2/storage@2/disk@0,0 (sd2): Oct 17 14:45:22 t5240-fj-05 Error for Command: inquiry Error Level: Informational Oct 17 14:45:22 t5240-fj-05 scsi: Requested Block: 0 Error Block: 0 Oct 17 14:45:22 t5240-fj-05 scsi: Vendor: TSSTcorp Serial Number: Oct 17 14:45:22 t5240-fj-05 scsi: Sense Key: Illegal Request Oct 17 14:45:22 t5240-fj-05 scsi: ASC: 0x24 (invalid field in cdb), ASCQ: 0x0, FRU: 0x0 October 17 14:46:05 t5240-fj-05 [16428] emc: RUNNING</pre>
	Recommended Action	<p>This symptom corresponds to Sun Microsystems BugID#6450938, 6561095.</p> <p>This WARNING message does not affect the system therefore please ignore this message.</p>
7	Symptom	<p>The following error message is displayed when deleting virtual CPUs fails.</p> <pre>primary# ldm remove-vcpu 4 mydom2 LDom mydom2 does not support adding VCPUs ^^^^^^ Resource removal failed</pre>
	Recommended Action	<p>This symptom corresponds to Sun Microsystems BugID#6769835.</p> <p>“adding” is displayed even if the “remove” processing is in process.</p> <p>This symptom does not affect your business.</p>
8	Symptom	<p>When the logical domains are running in "factory-default" configuration, total number of vcpus and total amount of memory appears to be exceeding the actual number of vcpus and memory size available.</p> <pre>primary# ldm list-domain NAME STATE FLAGS CONS VCPU MEMORY UTIL UPTIME primary active -n-c- SP 127 16160M 0.0% 3m mydom2 inactive ----- 120 12G</pre>
	Recommended Action	<p>This is not a problem because they are displayed as specified. If “STATE” is “inactive”, the ldm command outputs a domain definition, not values used by the domain.</p>
9	Symptom	<p>You can export the same virtual disk backend with the exclusive option (excl) many times. (From LDom1.0.3 Administration Guide, you are allowed to export it only one time.)</p>
	Recommended Action	<p>If you export one virtual disk backend many times, please delete all virtual disk server devices exported with the exclusive option (excl) first, then re-export them without the exclusive option (excl).</p>

10	Symptom	In the Solaris 10 10/08 environment, even if you exported with the slice option that creates one slice disk, slices between s0 and s7 are created after allocating to a guest domain.
	Recommended Action	Slices between s0 and s7 are created, but since only s0 is available actually, please ignore the slices between s1 and s7.
11	Symptom	If you execute the eject (1) from the control domain, a media may be ejected even though a CD/DVD is in use on a guest domain.
	Recommended Action	Please specify the exclusive option (excl) when exporting the CD/DVD. By specifying the exclusive option, the eject (1) from the control domain becomes invalid. Please use the eject button of the CD/DVD drive to eject a media.
12	Symptom	If you use an exported CD/DVD in a guest domain, you may fail to eject a media even though you press the eject button of the CD/DVD drive.
	Recommended Action	You need to cancel the allocation of the exported CD/DVD to the guest domain. To cancel the allocation, you need to stop the guest domain after deleting the virtual disk from the guest domain.
13	Symptom	If you install Solaris OS into the guest domain via network, the system may hang during the guest domain OS boot.
	Recommended Action	This corresponds to Sun Microsystems BugID #6705823. 6705823 guest ldom hangs during boot net of s10u4 Please apply 127111-05 or later to mini root of the install image.
14	Symptom	When the two or more virtual consoles are added, the telnet connection cannot be established to the newly added virtual console ports.
	Recommended Action	Only a single virtual console service should exist. Please do not create more than one virtual console service.

15	Symptom	<p>When a virtual I/O device is removed, the device names of the remaining virtual I/O devices are reassigned and may be changed at the binding of the guest domain.</p> <p>The virtual I/O device may be a Virtual Disk(vdisk), a Virtual Network device(vnet), or a Virtual Switch(vsw).</p> <p>There are two cases. One is that the device name assigned to the Virtual Disk is changed when one of three Virtual Disks is removed. The other is that the device name is not changed.</p> <p>In this example, three Virtual Disk vdisk0, vdisk1, vdisk2 exist.</p> <p>1) Check device names.</p> <pre>#ldm ls -l ldom1 DISK NAME VOLUME TOUT DEVICE SERVER MPGROUP vdisk0 Vol1@primary-vds0 disk@0 primary vdisk1 Vol2@primary-vds0 disk@1 primary vdisk2 Vol3@primary-vds0 disk@2 primary</pre> <p>< Case where the device name does not change ></p> <p>2-1) When we remove vdisk2 , the device name assigned to any Virtual Disk is not changed after binding a guest domain.</p> <pre>#ldm ls -l ldom1 DISK NAME VOLUME TOUT DEVICE SERVER MPGROUP vdisk0 Vol1@primary-vds0 disk@0 primary vdisk1 Vol2@primary-vds0 disk@1 primary</pre> <p>< Case where the device name changes ></p> <p>2-2) When we remove vdisk1, the device name assigned to vdisk2 is changed after binding a guest domain.</p> <pre>#ldm ls -l ldom1 DISK NAME VOLUME TOUT DEVICE SERVER MPGROUP vdisk0 Vol1@primary-vds0 disk@0 primary vdisk2 Vol3@primary-vds0 <u>disk@1</u> primary changed!!</pre> <p>Note) The guest domain which is assigned with vdisk2 as a boot disk cannot boot.</p>
	Recommended Action	<p>In LDomS 1.2, the resolution for this symptom is given by 142840-02 or later. Please apply the patch.</p> <p>In LDomS 1.1 or before, please execute follwing method to avoid / restore this symptom.</p> <p>Workaround: Do not remove any virtual I/O devices.</p> <p>Recovery operations: Execute the LDomS configuration script for the guest domain to reconfigure the guest domain. After that, re-install Solaris OS to the guest domain or restore the system to the guest domain from the latest backup. Do not remove any virtual I/O devices after recovery.</p>

16	Symptom	If virtual CPUs are repeatedly added/removed by using dynamic reconfiguration to/from a domain, the domain may panic. This symptom corresponds to Sun Microsystems Bug ID: 6883476.
	Recommended Action	Do not add/remove virtual CPUs by using dynamic reconfiguration (such as by using a shell script) repeatedly to/from a domain. If this symptom occurs, reboot Solaris OS of the domain.

Table 9.2 Bug information and notes on LDomS 1.1

1	Symptom	After the migration of an active domain, the “UPTIME” for the migrated domain is displayed as an abnormal value (e.g. “183205d 10h”), when “ldm list”, “ldm list-domain” or “ldm list-bindings” commands are executed.
	Recommended Action	This appears to be Sun Microsystems BugID#6774641. This does not affect the guest domain and could be ignored.
2	Symptom	When a virtual disk with a backend file size of less than 512 bytes is added or removed using dynamic reconfiguration (DR), the guest domain’s Solaris OS may hang-up. Example 1) primary# ldm add-vdisk Vol50B Vol50B@primary-vds0 ldom3 VIO configure request sent, but no valid response received Ldom ldom3 did not respond to request to configure VIO device VIO device is considered to be allocated to Ldom, but might not be available to the guest OS Example 2) primary# ldm rm-vdisk Vol50B ldom3 VIO unconfigure request sent, but no valid response received Ldom ldom3 did not respond to request to configure VIO device VIO device is considered to be allocated to Ldom, but might not be available to the guest OS Failed to remove vdisk instance
	Recommended Action	The minimum size of LDomS virtual disk is 512 bytes. Please delete the virtual disk smaller than 512 bytes in inactive state.
3	Symptom	When “ldm migrate” command fails, an improper domain may be created in the target host. Please see a few examples below. Example 1) When the target host falls in a delayed reconfiguration during the rehearsal of domain migration. Example 2) When a network connection between source/target is broken during the active domain migration. Example 3) When the inactive domain migration occurs while a network connection between source/target is not established.

	Recommended Action	<p>Regarding Example 1:</p> <p>This phenomenon on the delayed reconfiguration corresponds to Sun Microsystems Bug ID#6787570.</p> <p>During the rehearsal of migration, please do not execute the operation that activates the reconfiguration. If the migration fails, get rid of the cause of the failure in the first place. Then, please remove domains created in the target host manually.</p> <p>Regarding Example 2, 3:</p> <p>If the migration fails, please get rid of the cause of the failure such as network trouble. After that, please take the steps below.</p> <p>2) Remove the source domain manually if the target domain is resumed.</p> <ul style="list-style-type: none"> • In other cases, remove both source and target domains manually, and rebuild the source domain in the source host.
4	Symptom	<p>The following passage is from “Logical Domains (LDDoms) 1.1 Administration Guide” of Sun Microsystems.</p> <p>“You cannot migrate a logical domain that has bound cryptographic units. Attempts to migrate such a domain fail.”</p> <p>However, when number of VCPU is 1, this migration does not fail.</p>
	Recommended Action	<p>This is a mistake of “Logical Domains (LDDoms) 1.1 Administration Guide”.</p> <p>Correctly, you can not migrate an active domain binding cryptographic units if it has more than one VCPU. This phenomenon corresponds to Sun Microsystems BugID#6843096.</p> <p>“6843096 LDDoms document info is not accurate in customer environment”</p>
5	Symptom	<p>After performing an active domain migration, the system time of the migrated domain will have a delay.</p>
	Recommended Action	<p>Please fix the time error using the “date” command if necessary.</p> <pre># date mmddHHMM[[cc] yy] [.SS]</pre> <p>Please refer to the man pages for the details of “date”.</p>
6	Symptom	<p>If the network connection between source and target host is disconnected during an active domain migration, the migration fails and the number of the vcpu of the source domain is reduced to 1.</p>
	Recommended Action	<p>After rebooting the source domain, execute the following command to modify the number of vcpu.</p> <pre># ldm add-vcpu <vcpu number> <ldom name></pre>
7	Symptom	<p>When you export SVM volume as back-end by using the slice option, a label of the virtual disk allocated to the guest domain is displayed as “<drive type unknown>” by executing the format(1M) from the guest domain.</p>
	Recommended Action	<p>The displayed information is wrong. But this has no effect on the system behavior.</p>
8	Symptom	<p>When you export zfs volume as back-end by using the slice option, a label of the virtual disk allocated to the guest domain is displayed as “<Unknown-Unknown-XX>” by executing the format(1M) from the guest domain.</p>
	Recommended Action	<p>The displayed information is wrong. But this has no effect on the system behavior. This corresponds to Sun Microsystems BugID#6840912.</p>

9	Symptom	If you execute 'ldm start' or 'ldm stop' or commands which perform DR of the virtual disk during the execution of DR of a virtual disk, the ldmd may dump core and terminate abnormally.
	Recommended Action	This corresponds to Sun Microsystems BugID#6825741. When you execute any of commands (add-vds, add-vdsdev, add-vdisk, rm-vds, rm-vdsdev, rm-vdisk) which perform DR of the virtual disk, please do not execute 'ldm start' or 'ldm stop' or commands (add-vds, add-vdsdev, add-vdisk, rm-vds, rm-vdsdev, rm-vdisk) which perform DR of the virtual disk.
10	Symptom	When you execute the add-vdisk subcommand with Dynamic Reconfiguration(DR), the following message may be output. Moreover a virtual disk may be added to the guest domain actually even if this message is output. Primary# ldm add-vdisk vol3 vol3@vds1 ldom2 VIO configure request sent, but no valid response received Ldom ldom2 did not respond to request to configure VIO device VIO device is considered to be allocated to Ldom, but might not be available to the guest OS
	Recommended Action	If the virtual disk that you were trying to add had already been added to the guest domain when this message was output, use the rm-vdisk subcommand to remove the added virtual disk. Also when you execute the rm-vdisk subcommand against the virtual disk where this message is output due to the execution of the add-vdisk command, the rm-vdisk subcommand may fail. In this case, please re-execute the rm-vdisk subcommand after a while (15 mins – more than 30 mins later).

Table 9.3 Bug information and notes on LDoms 1.2

1	Symptom	<p>When you try to set the virtual console option for the control domain with “ldm set-vcons”, the ldmd daemon outputs a core dump. The ldmd daemon is rebooted automatically.</p> <p>Example: # ldm set-vcons port=5004 primary Sep 2 11:50:26 XXXXXX genunix: NOTICE: core_log: ldmd[526] core dumped: /var/core/core_XXXXXX_ldmd_0_0_1251859823_526 Invalid response</p>
	Recommended Action	<p>The “ldm set-vcons” can be used only for unbound guest domains. Please do not use this command for the control domain.</p>
2	Symptom	<p>When the control domain is in delayed reconfiguration mode and its virtual CPU’s are reconfigured several times with any of the following commands, the ldmd daemon may output a core dump.</p> <p>“ldm add-vcpu” command (Addition of the virtual CPU) “ldm remove-vcpu” command (Deletion of the virtual CPU) “ldm set-vcpu” command (Setting of the virtual CPU) The ldmd daemon is rebooted automatically.</p> <p>Example: # ldm set-memory 2G primary Initiating delayed reconfigure operation on Ldom primary. All configuration changes for other LDoms are disabled until the Ldom reboots, at which time the new configuration for Ldom primary will also take effect. # ldm list-domain NAME STATE FLAGS CONS VCPU MEMORY UTIL UPTIME primary active -ndcv- SP 8 1G 0.0% 1h 1m ldom1 inactive ----- 4 2G ldom2 inactive ----- 8 1G # ldm set-vcpu 1 primary</p> <hr/> <p>Notice: Ldom primary is in the process of a delayed reconfiguration. Any changes made to primary will only take effect after it reboots.</p> <hr/> <p># ldm set-vcpu 2 primary Aug 13 16:12:16 XXXXXX genunix: NOTICE: core_log: ldmd[2053] core dumped: /var/core/core_XXXXXX_ldmd_0_0_1250147534_2053 Invalid response</p> <p>Moreover, when this symptom occurs, the following message is output into the /var/svc/log/ldoms-ldmd:default.log file. Fatal error: (4) Reconfiguring the HV (FIXME: do warmstart)</p>
	Recommended Action	<p>This issue corresponds to Sun Microsystems BugID#6697096. Please reboot the control domain before trying to reconfigure the virtual CPU’s on the control domain in the delayed reconfiguration mode.</p>

3	Symptom	<p>You may enter the delayed reconfiguration mode in the following cases.</p> <p>2) If operation to virtual I/O devices is performed while the logical domain is active and OS is running, the domain may enter a delayed reconfiguration state instead of being dynamically reconfigured (DR). Currently, the following operations are known to cause the delayed reconfiguration instead of dynamic reconfiguration (DR).</p> <ul style="list-style-type: none"> - Any of mac-addr, net-dev, mode, or mtu is specified with the set-vsw subcommand. - Either mode or mtu is specified with the set-vnet subcommand. - Timeout is specified with the set-vdisk subcommand. <p>2) If operation to virtual I/O devices is performed while OS is not running in the active guest domain or LogicalDomains dynamic reconfiguration daemon (drd) of the target guest domain has stopped, the domain may enter the delayed reconfiguration mode instead of resulting in error. Currently, the following operations are known to cause the delayed reconfiguration instead of resulting in error.</p> <ul style="list-style-type: none"> - Any of mac-addr, net-dev, mode, or mtu is specified with the set-vsw subcommand. - Either mode or mtu is specified with the set-vnet subcommand. - Timeout is specified with the set-vdisk subcommand. <p>The following messages mean the delayed reconfiguration. Initiating delayed reconfigure operation on <domain_name>. All configuration changes for other LDomS are disabled until the Ldom reboots, at which time the new configuration for Ldom <domain_name> will also take effect.</p>
	Recommended Action	<p>Use the following command to check which domain is in the delayed reconfiguration.</p> <pre># ldm list-domain NAME STATE FLAGS CONS VCPU MEMORY UTIL UPTIME primary active -n-cv- S P 8 4G 0.6% 52m ldom1 active -nd--- 5001 16 1920M 0.0% 36m</pre> <ul style="list-style-type: none"> • * If “d” is displayed in the third row of FLAGS of a target domain, it means the delayed reconfiguration mode. • If the domain is in the reconfiguration mode, please reboot the domain or cancel the operation with ldm cancel-operation reconf command. <p>If you want immediate effect, please reboot the domain. If you are going to do the procedure later, please take the steps below.</p> <p>1)Cancel the pending delayed reconfiguration with the ldm cancel-operation reconf command.</p> <pre># ldm cancel-operation reconf <domain_name></pre> <p>2)After stopping the domain to be changed, perform operation to virtual I/O devices again and boot the domain.</p>
4	Symptom	<p>The following message may be output when Solaris OS of the control domain is booted.</p> <pre>WARNING: ds_ucap_init: ds_loopback_set_svc err (16)</pre> <p>This symptom corresponds to Sun Microsystems Bug ID: 6813225.</p>
	Recommended Action	<p>The resolution for this symptom is given by 139983-04 or newer, therefore please apply the patch.</p>

5	Symptom	<p>"ldm add-{vdisk vnet vsw}" command executes with illegal id value causes unexpected phenomenon occurs like below:</p> <p>Example 1) Wrong message is displayed.</p> <pre># ldm add-vdisk id=<u>abcd</u> vdisk3 Vol1@primary-vds0 ldoma3</pre> <p><u>Id already exists</u></p> <p>Example 2) Wrong id is set.</p> <pre># ldm add-vdisk id=<u>12abc12</u> vdisk3 Vol1@primary-vds0 ldoma3</pre> <pre># ldm ls -o disk ldoma3</pre> <pre>NAME ldoma3</pre> <pre>DISK NAME VOLUME TOUT ID DEVICE SERVER MPGROUP <...> vdisk3 Vol1@primary-vds0 <u>12</u> disk@12 primary</pre>
	Recommended Action	<p>This corresponds to Sun Microsystems BugID #6858840.</p> <p>6858840 Incorrect error message reported for illegal id values in add-{vnet vsw vdisk} command</p> <p>Please do not set illegal id value.</p>

Table 9.4 Notes for “Domain Dependencies”

1	Symptom	When you try to configure a master domain, the following error message may be displayed. LDom "<slave_name>" is bound and requires LDom "<master_name>" be bound
	Recommended Action	The message is displayed when the master domain is not binding resources (inactive). After binding resources of the master domain, configure the master domain.
2	Symptom	When you try to unbind resources against a guest domain, the following error message may be displayed. LDom "<slave_name>" is bound with a dependency on LDom "<master_name>"
	Recommended Action	The message is displayed when a domain that is configured as the master domain(master_name) exists. Execute the following command or execute the configuration script for cancellation of dependency relationships to cancel the domain dependencies. # ldm set-domain master= <slave_name>
3	Symptom	If a slave domain is reset due to a master domain's stop, the ok prompt may be displayed twice in the slave domain.
	Recommended Action	This is a problem with the display. It does not affect the guest domain and Solaris OS of the guest domain, therefore please ignore this symptom.
4	Symptom	If a master domain stops (failure-policy=panic) while OK prompt is displayed on a slave domain, the following error message is output on the slave domain's screen and the boot fails. FATAL: /virtual-devices@100/console@1: Last Trap: Non-Resumable Error In addition, even if you boot of the slave domain again, the boot fails with the following error message. FATAL: system is not bootable, boot command is disabled
	Recommended Action	Please execute the boot of OS of the guest domain after rebooting the guest domain having this symptom from the control domain.

Table 9.5 Notes for “CPU Power Management Software on LDOMs 1.2”

- To use CPU Power Management Software, you need to apply 142840-02 or newer that is a LDOMs 1.2 patch.

1	Symptom	If CPU Power Management switches off the power of a virtual CPU of a domain, the virtual CPU becomes invisible from that domain even by using <code>psrinfo(1M)</code> or other commands.
	Recommended Action	This is normal operation based on the specification.
2	Symptom	If a processor set or resource pool is set on a domain when CPU Power Management is enabled, the following message may be output into <code>/var/adm/messages</code> of the domain. Sep 4 18:31:20 ldoma1 rcm_daemon[2777]: POOL: processor set (-1) would go below its minimum value of 1
	Recommended Action	The message is output when CPU Power Management tries to switch off the power of the virtual CPU of the processor set more than the value of <code>pset.min</code> of the processor set set on the domain. This is normal operation based on the specification and there is no influence other than the message output, therefore please ignore the message.
3	Symptom	While a break is in process of execution on the console of a guest domain when CPU Power Management is enabled, the <code>ldm(1M)</code> command may give no response on the control domain. (Guest domain's console) Break with <code>~#</code> <code># Debugging requested; hardware watchdog suspended.</code> <code>c)ontinue, s)ync, r)eset?</code> (Control domain) <code>primary# ldm list-domain</code> No response condition
	Recommended Action	This issue corresponds to Sun Microsystems BugID#6875401. Until a relevant patch is released, please take the steps below for workaround. 1) Select any of 'continue', 'sync', or 'reset' to cancel the break condition on the console of the guest domain. 2) Recover the <code>ldm(1M)</code> command from the no response condition by using <code>Ctrl+C</code> .

Chapter 10 Notes on SPARC Enterprise T5120/T5220/T5140/T5240/T5440

This chapter explains Logical Domains 1.2 Operating Environment and configurations in SPARC Enterprise.

10.1 Logical Domains 1.2 Operating Environment

Logical Domains 1.2 operates under the following environment.

Table 10.1 Operation environment

Hardware	SPARC Enterprise T5120/T5220/T5140/T5240/T5440
Firmware	7.2.2.e or later
Operating System	Solaris 10 8/07 or later (Solaris 10 5/09 or later is recommended.)
Maximum divisibility	- SPARC Enterprise T5120/T5220 64 divisions (*1) - SPARC Enterprise T5140/T5240/T5440 128 divisions (*2)
Required Patches (Control Domain)	Solaris 10 5/09 requires the following patches. 141778-02 or later 139983-04 or later Solaris 10 8/07, 5/08, 10/08 require the following patch. 139555-08
Required Patches (Service Domains, I/O Domains)	Solaris 10 8/07, 5/08, 10/08 require the following patch. 139555-08
Required Patches (Guest Domains)	Solaris 10 8/07, 5/08, 10/08 require the following patch. 139555-08
Enhanced Support Facility	- SPARC Enterprise T5120/T5220 3.0 or newer The following patches are required for Enhanced Support Facility Manuals & Patches 3.0A20 or 3.0A30. 914603-05 or newer 914604-05 or newer 914595-05 or newer - SPARC Enterprise T5140/T5240

	3.0.1 or newer (The following patches are required for 3.0.1) 914603-05 or newer 914604-05 or newer 914595-05 or newer - SPARC Enterprise T5440 3.1 or newer (The following patches are required for 3.1) 914603-05 or newer 914604-05 or newer 914595-05 or newer
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*1: control domain and 63 guest domains are configurable.

*2: control domain and 127 guest domains are configurable.

10.2 Notes on SPARC Enterprise T5120/T5220

10.2.1 Working environment and recommended configuration of LDoms

Fujitsu recommends the following configurations in SPARC Enterprise T5120/T5220.

However you need to test your configuration in the environment where you use the system in actual business. Our recommendation may differ depending on the result of the test.

Table 10.2 Recommended configurations in SPARC Enterprise T5120/T5220

Number of domains	Control Domains: 1 Guest Domains: 2 to 3 (*)
Number of CPUs	More than 1 CPU core per domain
Memory	Control Domain: 4GB (At least 1GB) Guest Domain: more than 1GB
Internal disks	It is used in the control domain, and the mirroring of the disk is executed in the RAID software. (The internal disk is available in the guest domain.)

* The guest domain (also used as I/O domain) cannot be created on SPARC Enterprise T5120/T5220.

10.2.2 Notes on LAN in SPARC Enterprise T5120/T5220

The following describes network driver names of standard LAN ports.

SPARC Enterprise T5120/T5220 : e1000g

10.3 Notes on SPARC Enterprise T5140/T5240

10.3.1 Working environment and recommended configuration of LDomS

Fujitsu recommends the following configurations in SPARC Enterprise T5140/T5240.

However you need to test your configuration in the environment where you use the system in actual business. Our recommendation may differ depending on the result of the test.

Table 10.3 Recommended configurations in SPARC Enterprise T5140/T5240

Number of domains	Control Domains: 1 Guest Domains: 3 to 7 (*1, *2)
Number of CPUs	More than 1 CPU core per domain
Memory	Control Domain: 4GB (At least 1GB) Guest Domain (also used as I/O domain) : more than 4GB Guest Domain: more than 1GB
Internal disks	It is used in the control domain, and the mirroring of the disk is executed in the RAID software. (The internal disk is available in the guest domain.)

*1: You can create one guest domain (also used as an I/O domain). This configuration is effective in a domain that needs I/O performance.

*2: If you create a guest domain (also used as I/O domain). You need to add a LAN card to a slot on the control domain because standard ports are all allocated to the guest domain (also used as I/O domain)

10.3.2 Notes on LAN in SPARC Enterprise T5140/T5240

- The following ports are unavailable due to incompatibility on the system loading 10GbitEthernet XAUI card.
- (In case of SPARC Enterprise T5140/T5240)

XAUI card installation location	Unavailable Standard LAN Ports
Slot 0	NET1
Slot 1	NET0

- When you configure the guest domain (also used as I/O domain) on SPARC Enterprise T5140/T5240, standard LAN ports are allocated to the guest domain (also used as I/O domain). Therefore you need to add a LAN card to the control domain.

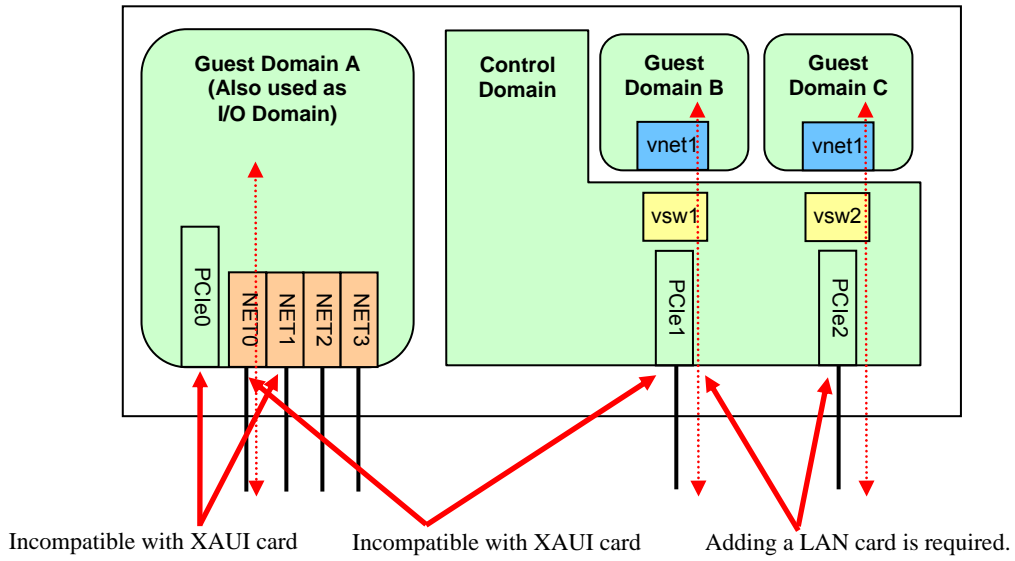


Figure 10.1 In case of SPARC Enterprise T5140

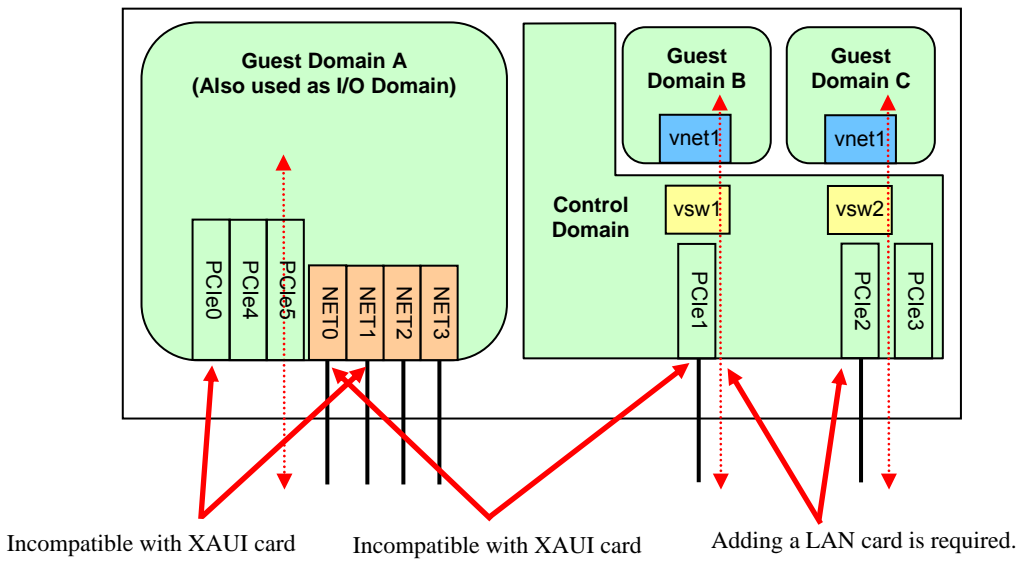


Figure 10.2 In case of SPARC Enterprise T5240

The following describes network driver names of standard LAN ports.

SPARC Enterprise T5140/T5240 : nxge

10.3.3 Loading additional cards

Regarding slots implementing Ethernet cards, XAUI cards, storage connection cards, and other cards on SPARC Enterprise T5140/T5240, please see "Figure 10.3".

Control Domain : pci@400

I/O Domain : pci@500

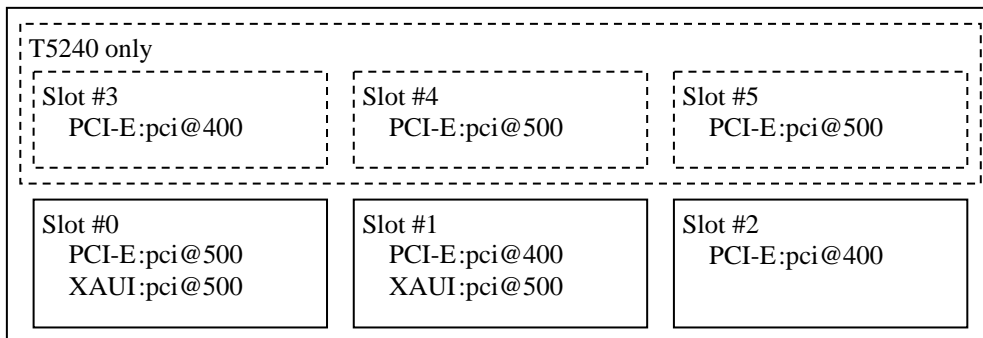


Figure 10.3 Slot location and I/O devices on SPARC Enterprise T5140/T5240

10.4 Notes on SPARC Enterprise T5440

10.4.1 Working environment and recommended configuration of LDomS

Fujitsu recommends the following configurations in SPARC Enterprise T5440.

However you need to test your configuration in the environment where you use the system in actual business. Our recommendation may differ depending on the result of the test.

Table 10.4 Recommended configurations in SPARC Enterprise T5440

Number of domains	Control Domains: 1 Guest Domains: 3 to 7 (*1) Guest Domains: 3 to 11 (*2)
Number of CPUs	More than 1 CPU core per domain
Memory	Control Domain: 4GB (At least 1GB) Guest Domain (also used as I/O domain) : more than 4GB Guest Domain: more than 1GB
Internal disks	It is used in the control domain, and the mirroring of the disk is executed in the RAID software. (The internal disk is available in the guest domain.)

*1: In case of SPARC Enterprise T5440 2 CPU model, you can create one guest domain (also used as I/O domain).

This configuration is effective in domains that need I/O performance.

When you create the guest domain (also used as I/O domain), a LAN card needs to be added to a slot of the control domain because all of standard LAN cards are allocated to guest domains(also used as I/O domains).

*2: In case of SPARC Enterprise T5440 4 CPU model, you can create three guest domains (also used as I/O domains). This configuration is effective in domains that need I/O performance.

10.4.2 Notes on LAN in SPARC Enterprise T5440

The following ports are unavailable due to incompatibility on the system loading 10GbitEthernet XAUI card.

□ (In case of SPARC Enterprise T5440)

XAUI card installation location	Unavailable Standard LAN Ports
Slot 4	NET1
Slot 5	NET0

The following describes network driver names of standard LAN ports.

SPARC Enterprise T5440 : nxge

10.4.3 Loading additional cards

Regarding slots for an Ethernet card, XAUI card, Storage connection card, and other cards on SPARC Enterprise T5440, please refer to Figure 10.4.

In addition, I/O device and the number of I/O domains that you can create are different between 2 CPU model and 4 CPU model..

(In case of 2 CPU model)

- Number of I/O Domains : 2
- Control Domain : pci@400
- I/O Domain : pci@500

(In case of 4 CPU model)

- Number of I/O Domains : 4
- Control Domain : pci@400(*), pci@500, pci@600, pci@700
- I/O Domain : pci@500, pci@600, pci@700

(*) Be sure to allocate pci@400 to the control domain.

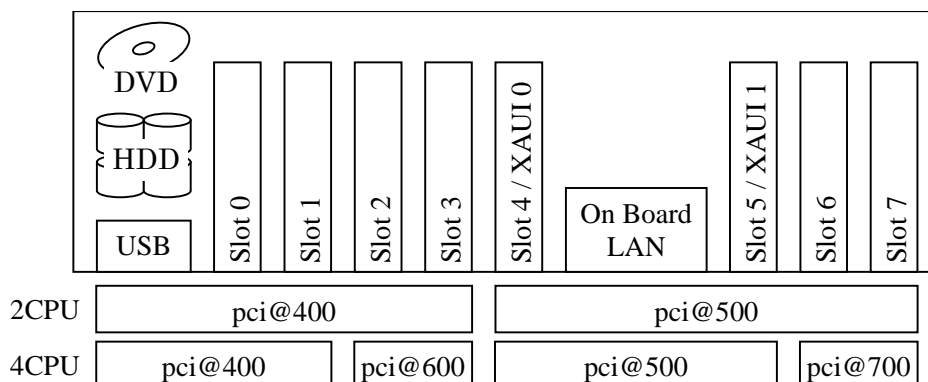


Figure 10.4 Slot location and I/O devices on SPARC Enterprise T5440

10.5 Hardware requirement of I/O Domains

- SPARC Enterprise T5140/SPARC Enterprise T5240/SPARC Enterprise T5440
- Ethernet card for the control domain
- External storage connection card for the I/O domain and external storage

10.6 Supplement

This supplement explains the relations between an internal disk, an I/O slot, on-board LAN and a logical domain, when using LDomS.

- The following shows configurations when all I/Os are connected to the control domain and when I/Os are divided into the control domain and the guest domain (also used as I/O domain).

10.6.1 SPARC Enterprise T5140

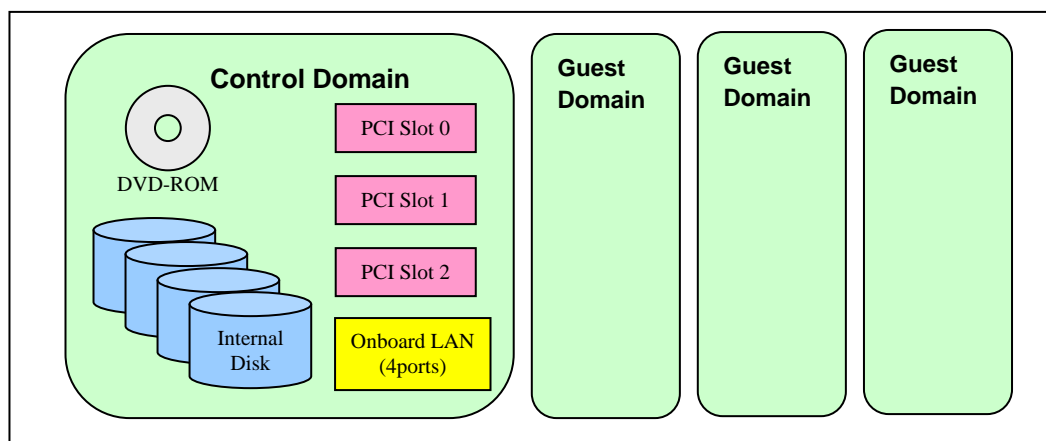
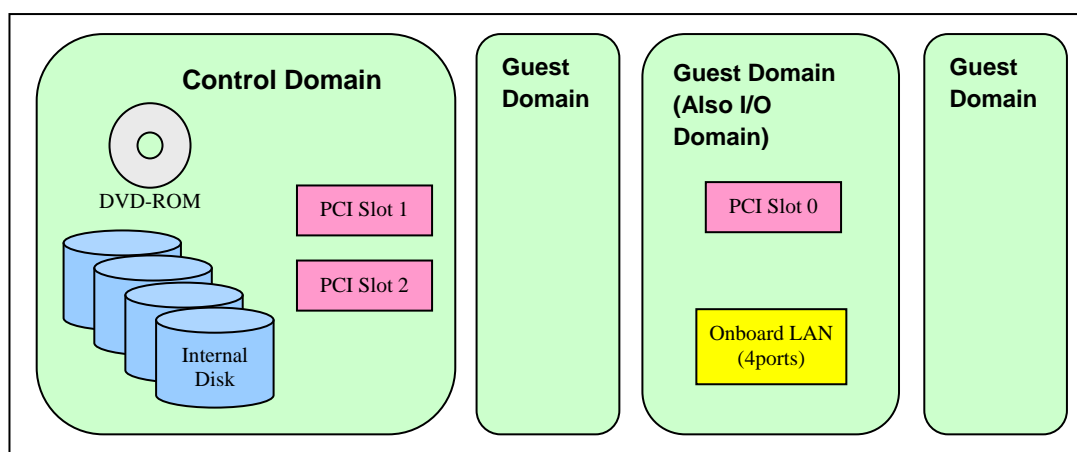


Figure 10.5 Configuration pattern 1



Note: In the second configuration example, XAUI card is not implemented. A LAN card needs to be added to the control domain.

Figure 10.6 Configuration pattern 2

10.6.2 SPARC Enterprise T5240

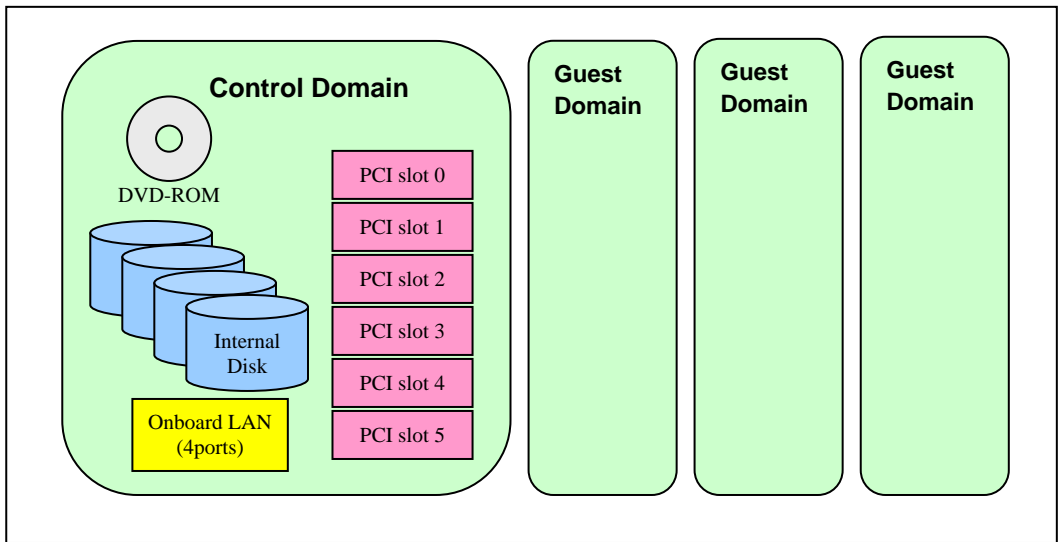
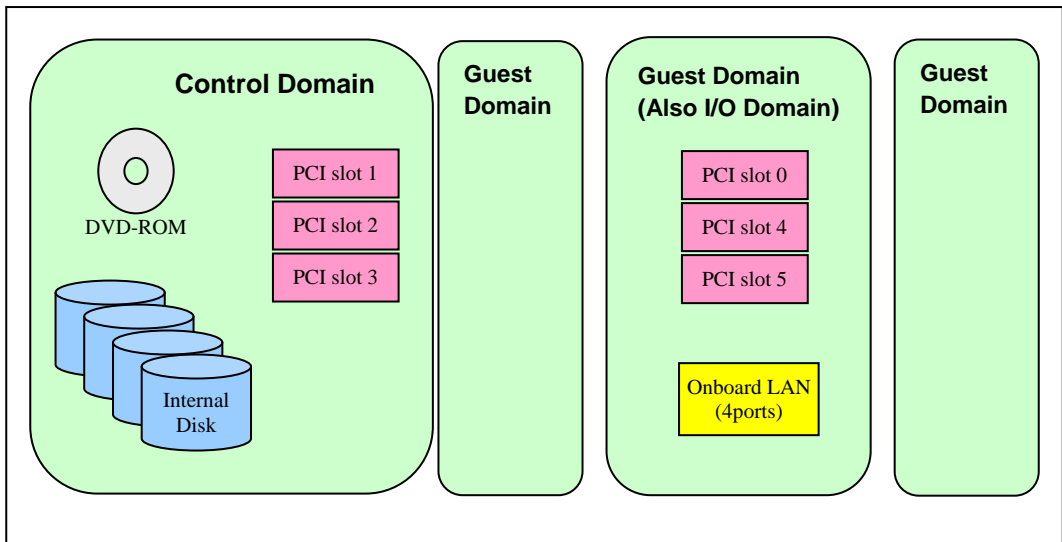


Figure 10.7 Configuration pattern 1



Note: In the second configuration example, XAUI card is not implemented. A LAN card needs to be added to the control domain.

Figure 10.8 Configuration pattern 2

10.6.3 SPARC Enterprise T5440

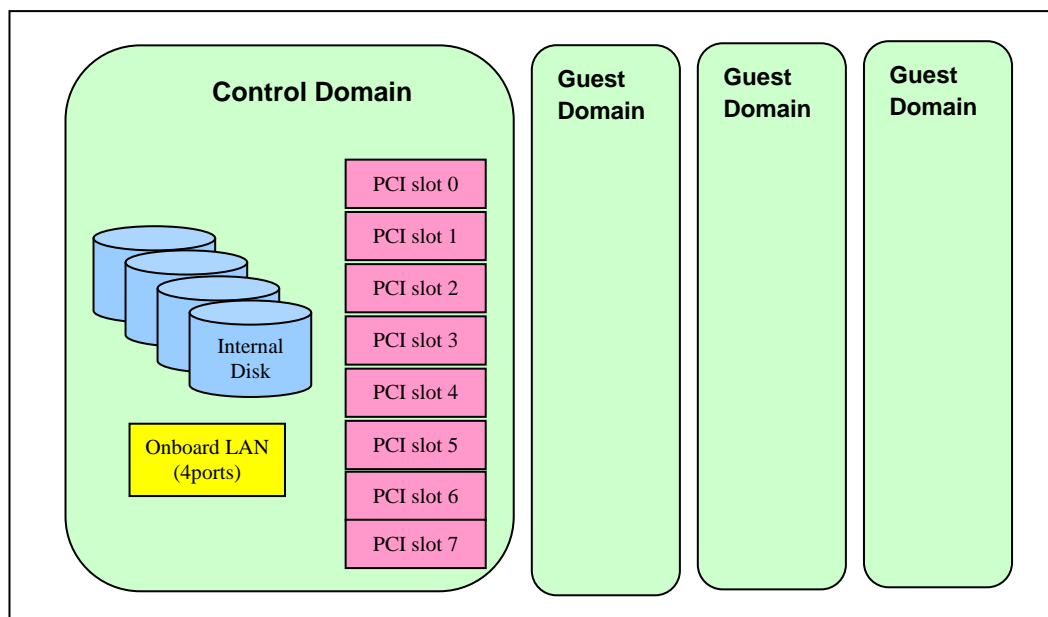
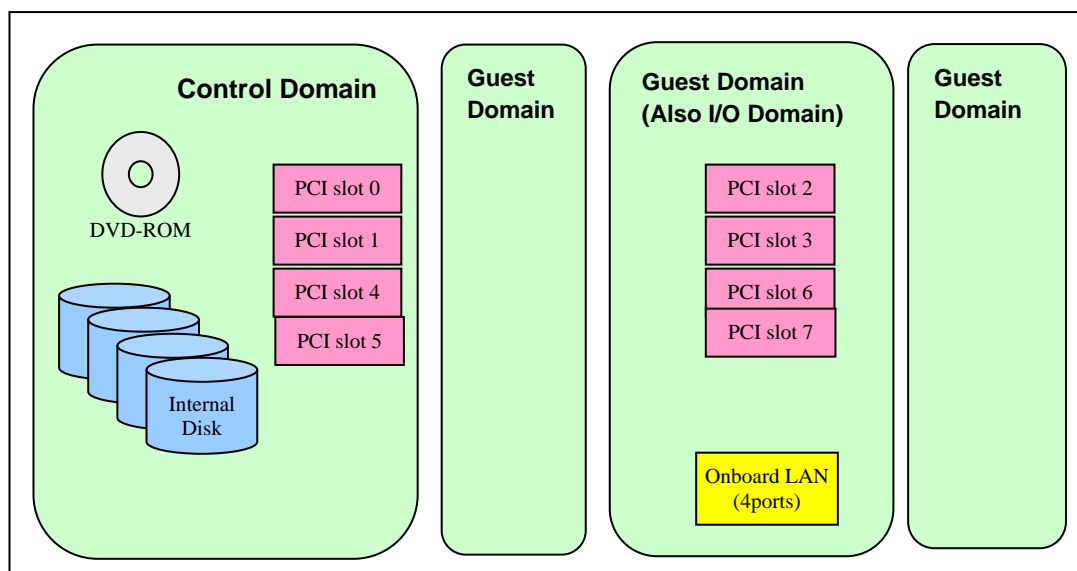
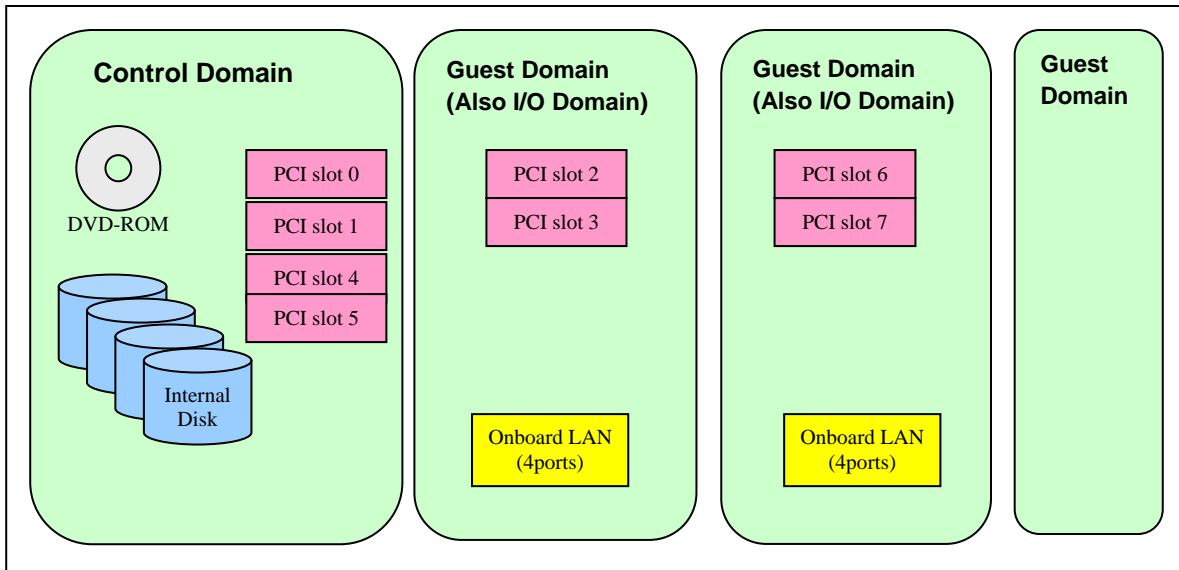


Figure 10.9 Configuration pattern 1



Note: In the second configuration example, XAUI card is not implemented.
A LAN card needs to be added to the control domain.

Figure 10.10 Configuration pattern 2



Note: In the second configuration example, XAUI card is not implemented.
A LAN card needs to be added to the control domain.

Figure 10.11 Configuration pattern 3

Appendix A Backup and Restore Procedure

A.1 Backing Up/Restoring the File System

Back up/restore the file system of the guest domain on each guest domain only for the virtual disks that were bound to the domain. Refer to the following documents for information on saving/restoring the file system.

“Solaris System Administration Guide (Devices and File Systems)”

<http://docs.sun.com/app/docs/doc/817-5093>

The tape device cannot be allocated to the guest domain. Use the remote tape drive when backing up/restoring the virtual disks on the guest domain. After you complete backing up/restoring, return the setting to its original setting in case any security issues occur.

- 1) Add the guest domain entry on the /etc/inet/hosts file or the name service of the remote host (remotehost) to which the tape device is connected.

```
remotehost# echo "xxx.xxx.xxx.xxx ldom1" >> /etc/inet/hosts
```

- 2) Add the remote host entry on the /etc/inet/hosts file or the name service of the guest domain.

```
ldom1# echo "xxx.xxx.xxx.yyy remotehost" >> /etc/inet/hosts
```

- 3) Make the rlogin service of the remote host operational.

```
remotehost# cat >> $HOME/.rhosts
ldom1
ldom2
ldom3
<Ctrl+d>
remotehost# chmod 0400 $HOME/.rhosts
```

- 4) The following is an example of the configuration of the rhosts file of the root user.

```
ldom1# ufsdump 0ucf remotehost:/dev/rmt/0n /dev/rdsk/c0d0s0
ldom1# rsh remotehost mt rewind /dev/rmt/0
ldom1# ufsrestore tf remotehost:/dev/rmt/0
```

Access to virtual disk entities, which is canceled for the consolidation to the guest domain from the control domain, is available. However, when the consolidated virtual disk entities are read or written from the control domain, disk errors or system hang-up sometimes occur. Therefore, DO NOT ACCESS the virtual disk entities that connect to the guest domain from the control domain.

When conducting an operation that must access a virtual disk connected to the guest domain in the control domain, stop the guest domain and unbind it.

When restoring the virtual disk entity connected to the guest domain by using tasks such as restoration of the control domain, a part of or all of the contents of the virtual disks of the guest domain may be lost. When the virtual disk entity, which is connected to the

guest domain, is restored by the control domain, restore the counterpart virtual disk on the guest domain by using the save data from the guest domain.

Instructions on how to collect VTOC information

```
ldom1# prtvtoc /dev/rdisk/c#t#d#s2 > file
```

Note: file: the name of a file saving VTOC information

If you cannot allocate an emergency boot disk, you can boot the system from a network server to continue your work.

A.2 Procedures of Backup/Restoration of the Guest Domain

After allocating an emergency boot disk, back up the guest domain by using an emergency bootOS. When you try to restore the guest domain, use the emergency bootOS.

A.2.1 Allocating an Emergency Boot Disk to the Guest Domain

The following describes how to add disks for each virtual disk.

1) Add virtual disk devices.

```
primary# mkfile 10G /LDoms/Vol1/vdisk1.img  
primary# ldm add-vdsdev /LDoms/Vol1/vdisk1.img Vol11@primary-vds0
```

2) Check the virtual disk devices.

```
primary# ldm ls -l
```

3) Stop the target domain, and loosen the combination of resources.

```
primary# ldm stop-domain ldom1  
primary# ldm unbind-domain ldom1
```

4) Add the emergency boot disk to the guest domain.

```
primary# ldm add-vdisk vdisk1 Vol11@primary-vds0 ldom1
```

5) Check virtual disks of the guest domain.

```
primary# ldm list -l ldom1
```

6) Start the guest domain.

```
primary# ldm bind-domain ldom1  
primary# ldm start-domain ldom1
```

7) After logging in to the guest domain, reconfigure the devices.

```
ldom1# devfsadm
```

- 8) Check disks of the guest domain.

```
ldom1# format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
  0. c0d0 <SUN-DiskImage-10GB cyl 34950 alt 2 hd 1 sec 600>
     /virtual-devices@100/channel-devices@200/disk@0
  1. c0d1 <SUN-DiskImage-10GB cyl 34950 alt 2 hd 1 sec 600>
     /virtual-devices@100/channel-devices@200/disk@1
Specify disk (enter its number):
```

A.2.2 Installing the emergency bootOS for the Guest Domain

Install the emergency bootOS for the guest domain and then perform the installation of the latest patches and the configuration of the environment.

The tape device cannot be allocated to the guest domain.

If you back up/restore virtual disks on the guest domain, please use a remote tape drive.

- 1) Install the emergency boot disk for the guest domain, and then install the latest patches and configure the environment. If you have already finished the installation of the emergency boot disk and the necessary configuration, please skip these steps.

```
ldom1# /usr/sbin/shutdown -i0 -g0 -y
ok > boot vnet0
```

- 2) Add the guest domain entry on the /etc/inet/hosts file or the name service of the remote host (remotehost) to which the tape device is connected. After you complete backing up/restoring, return the setting to its original setting in case any security issues occur.

```
remotehost# echo "xxx.xxx.xxx.xxx ldom1" >> /etc/inet/hosts
```

- 3) Add the remote host entry on the /etc/inet/hosts file or the name service of the guest domain.

```
ldom1# echo "xxx.xxx.xxx.yyy remotehost" >> /etc/inet/hosts
```

- 4) Make the rlogin service of the remote host operational.

```
remotehost# cat >> $HOME/.rhosts
ldom1
ldom2
ldom3
<Ctrl+d>
remotehost# chmod 0400 $HOME/.rhosts
```

- 5) Check the state of the remote tape drive.

```
ldom1# rsh remotehost mt status
HP DAT-72 tape drive:
  sense key(0x0)= No Additional Sense   residual= 0   retries= 0
  file no= 0   block no= 0
```

A.2.3 Backing up the Guest Domain

Boot the system from the emergency bootOS for the guest domain to back up the guest domain.

- 1) Start from the emergency boot disk.

```
primary# telnet localhost 5001
:
{0} ok boot vdisk1
```

- 2) Collect vtoc information for a disk to be copied.

```
ldom1# prtvtoc /dev/rdisk/c0d0s2 > ldom1-disk0.vtoc
```

- 3) Back up the system of the guest domain.

```
ldom1# rsh remotehost mt rewind /dev/rmt/0
ldom1# ufsdump 0ucf remotehost:/dev/rmt/0cn /dev/rdisk/c0d0s0
ldom1# ufsdump 0ucf remotehost:/dev/rmt/0cn /dev/rdisk/c0d0s3
ldom1# ufsdump 0ucf remotehost:/dev/rmt/0cn /dev/rdisk/c0d0s4
ldom1# ufsdump 0ucf remotehost:/dev/rmt/0cn /dev/rdisk/c0d0s5
```

- 4) Check what you backed up.

```
ldom1# rsh remotehost mt rewind /dev/rmt/0
ldom1# ufsrestore tf remotehost:/dev/rmt/0cn > ufsrest-tf-c0d0s0.log
ldom1# ufsrestore tf remotehost:/dev/rmt/0cn > ufsrest-tf-c0d0s3.log
ldom1# ufsrestore tf remotehost:/dev/rmt/0cn > ufsrest-tf-c0d0s4.log
ldom1# ufsrestore tf remotehost:/dev/rmt/0cn > ufsrest-tf-c0d0s5.log
```

A.2.4 Restoring the Guest Domain

Start from the emergency bootOS for the guest domain to restore the guest domain.

If you change the size of the destination disk of the restoration, start from the installation server and format the disks beforehand.

- 1) Start from the emergency boot disk for the guest domain.

```
primary# telnet localhost 5001
:
{0} ok boot vdisk1
```

- 2) Format the destination disk of the restoration.

```
ldom1# fmthard -s ldom1-disk0.vtoc /dev/rdisk/c0d0s2
```

- 3) Restore the system of the guest domain from the tape device.

```
ldom1# rsh remotehost mt rewind /dev/rmt/0
```

Also create bootblk for the root partition.

```
ldom1# newfs /dev/rdisk/c0d0s0
ldom1# mount -F ufs /dev/dsk/c0d0s0 /mnt
ldom1# cd /mnt
ldom1# ufsrestore rvf remotehost:/dev/rmt/0cn
ldom1# rm restoresymtable
ldom1# cd /usr/sbin
ldom1# umount /mnt
ldom1# ./installboot /usr/platform/`uname -i`/lib/fs/ufs/bootblk /dev/rdisk/c0t0s0
```

Restore each slice except the swap and backup partitions.

```
ldom1# newfs /dev/rdisk/c0d0s3
ldom1# mount -F ufs /dev/dsk/c0d0s3 /mnt
ldom1# cd /mnt
ldom1# ufsrestore rvf remotehost:/dev/rmt/0cn
ldom1# rm restoresymtable
ldom1# cd /
ldom1# umount /mnt

ldom1# newfs /dev/rdisk/c0d0s4
ldom1# mount -F ufs /dev/dsk/c0d0s4 /mnt
ldom1# cd /mnt
ldom1# ufsrestore rvf remotehost:/dev/rmt/0cn
ldom1# rm restoresymtable
ldom1# cd /
ldom1# umount /mnt

ldom1# newfs /dev/rdisk/c0d0s5
ldom1# mount -F ufs /dev/dsk/c0d0s5 /mnt
ldom1# cd /mnt
ldom1# ufsrestore rvf remotehost:/dev/rmt/0cn
ldom1# rm restoresymtable
ldom1# cd /
ldom1# umount /mnt
```

- 4) Verify the restored file system.

```
ldom1# fsck /dev/rdisk/c0d0s0
ldom1# fsck /dev/rdisk/c0d0s3
ldom1# fsck /dev/rdisk/c0d0s4
ldom1# fsck /dev/rdisk/c0d0s5
```

A.3 Procedure of Backing up/Restoring the File System of the Control Domain

After stopping the guest domain, back up the control domain.
After you finish restoring the control domain, restore the latest guest domain.

A.3.1 Stopping the Guest Domain

Before stopping the control domain, stop the guest domain.

- 1) Set to prevent each guest domain from being booted automatically.

```
ldom1# eeprom auto-boot?=false
ldom1# eeprom auto-boot?
auto-boot?=false
```

2) Confirm that each guest domain is not running.

```
primary# ldm list
NAME          STATE    FLAGS   CONS   VCPU  MEMORY  UTIL  UPTIME
primary       active  -n-cv   SP     12    6G      0.2%  1d 16h 29m
ldom1         active  -n---   5001   24    2G      0.0%  16s
ldom2         active  -n---   5002   24    3G      0.0%  1d 20h 33m
ldom3         active  -n---   5003   36    4G      0.0%  1d 20h 33m
primary# telnet localhost 5001
ldom1# /usr/bin/shutdown -i0 -g0 -y
primary# telnet localhost 5002
ldom2# /usr/bin/shutdown -i0 -g0 -y
primary# telnet localhost 5003
ldom3# /usr/bin/shutdown -i0 -g0 -y
primary# ldm stop-domain -a
primary# ldm list
NAME          STATE    FLAGS   CONS   VCPU  MEMORY  UTIL  UPTIME
primary       active  -n-cv   SP     12    6G      0.2%  1d 16h 43m
ldom1         bound   ----- 5001   24    2G
ldom2         bound   ----- 5002   24    3G
ldom3         bound   ----- 5003   36    4G
```

A.3.2 Stopping the Control Domain

Since disks of the control domain are mirrored, follow the instructions of your software to stop the control domain without failing to establish the synchronization of the disks.

1) After setting to prevent the control domain from being booted automatically, stop the control domain.

```
primary# eeprom auto-boot?=false
primary# /usr/sbin/shutdown -i0 -g0 -y
```

A.3.3 Installing the emergency bootOS for the Control Domain

Install the emergency bootOS for the control domain and then install the latest patches, and configure the environment.

1) Install OS into the emergency bootOS for the control domain. If you have already prepared you can skip this step.

```
ok > boot net
```

2) Check the state of the tape drive.

```
sept5# mt status
HP DAT-72 tape drive:
sense key(0x0)= No Additional Sense   residual= 0   retries= 0
file no= 0   block no= 0
```


A.3.4 Backing up the Control Domain

Start from the emergency bootOS for the control domain to back up the control domain.

- 1) Start from the emergency boot disk for the control domain.

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

- 2) Collect vtoc information of the disk to be backed up.

```
sept5# prtvtoc /dev/rdisk/c1t0d0s2 > c1t0d0s2.vtoc
```

- 3) Back up the system of the control domain.

```
sept5# mt rewind /dev/rmt/0
sept5# ufsdump 0ucf /dev/rmt/0cn /dev/rdisk/c1t0d0s0
sept5# ufsdump 0ucf /dev/rmt/0cn /dev/rdisk/c1t0d0s3
```

- 4) Confirm what you backed up.

```
sept5# mt rewind /dev/rmt/0
sept5# ufsrestore tf /dev/rmt/0cn > ufsrest-tf-c1t0d0s0.log
sept5# ufsrestore tf /dev/rmt/0cn > ufsrest-tf-c1t0d0s3.log
```

A.3.5 Restoring the Control Domain

Boot from the emergency bootOS for the control domain to restore the control domain.

- 1) Format the destination disk of the restoration.

```
sept5# fmthard -s c1t0d0s2.vtoc /dev/rdisk/c1t0d0s2
```

- 2) Restore the system of the control domain from the tape device.

```
sept5# mt rewind /dev/rmt/0
```

Create bootblk for the root partition.

```
sept5# newfs /dev/rdisk/c1t0d0s0
sept5# mount -F ufs /dev/dsk/c1t0d0s0 /mnt
sept5# cd /mnt
sept5# ufsrestore rvf /dev/rmt/0cn
sept5# rm restoresymtable
sept5# cd /usr/sbin
sept5# umount /mnt
sept5# ./installboot /usr/platform/`uname -i`/lib/fs/ufs/bootblk /dev/rdisk/c1t0d0s0
```

Restore each slice except the swap and backup partitions.

```
sept5# newfs /dev/rdisk/c1t0d0s3
sept5# mount -F ufs /dev/dsk/c1t0d0s3 /mnt
sept5# cd /mnt
sept5# ufsrestore rvf /dev/rmt/0cn
sept5# rm restoresymtable
sept5# cd /
sept5# umount /mnt
```

- 3) Verify the restored file system.

```
sept5# fsck /dev/rdisk/c1t0d0s0
sept5# fsck /dev/rdisk/c1t0d0s3
```

A.3.6 Restoring the Guest Domain

Boot from the control domain to restore the guest domain.

- 1) Boot the control domain to start each guest domain.

```
sept5# eeprom boot-device=disk
sept5# /usr/sbin/shutdown -i0 -g0 -y
{0} ok boot
:
:
primary# ldm list
NAME          STATE    FLAGS    CONS    VCPU    MEMORY    UTIL    UPTIME
primary       active   -n-cv    SP      12      6G        0.0%    5m
ldom1         bound   -----  5001    24      2G
ldom2         bound   -----  5002    24      3G
ldom3         bound   -----  5003    36      4G
primary# ldm start-domain -a
LDom ldom1 started
LDom ldom2 started
LDom ldom3 started
primary# ldm list
NAME          STATE    FLAGS    CONS    VCPU    MEMORY    UTIL    UPTIME
primary       active   -n-cv    SP      12      6G        0.2%    8m
ldom1         active   -t---    5001    24      2G        0.0%    1m
ldom2         active   -t---    5002    24      3G        0.0%    1m
ldom3         active   -t---    5003    36      4G        0.0%    1m
```

- 2) Restore the latest guest domain.
Boot from the emergency bootOS for the guest domain and restore the guest domain from the latest backup, if necessary.

```
primary# telnet localhost 5001
:
{0} ok boot vdisk1
```

For more information, please refer to the procedure of the restoration of the guest domain.

A.4 Procedure of Backing Up/Restoring the File System of I/O Domain

After stopping the guest domain using services provided by the I/O domain, back up the I/O domain.

A.4.1 Stopping the Guest Domain

Stop the guest domain before stopping the I/O domain.

- 1) Set to prevent each guest domain from being booted automatically.

```
ldom1# eeprom auto-boot?=false
ldom1# eeprom auto-boot?
auto-boot?=false
```

- 2) Confirm that each guest domain is not running.

```
primary# ldm list
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary       active -n-cv  SP    12    6G      0.2%  1d 16h 29m
ldom1         active -n---  5001  24    2G      0.0%  16s
ldom2         active -n---  5002  24    3G      0.0%  1d 20h 33m
ldom3         active -n---  5003  36    4G      0.0%  1d 20h 33m
primary# telnet localhost 5001
ldom1# /usr/bin/shutdown -i0 -g0 -y
primary# telnet localhost 5002
ldom2# /usr/bin/shutdown -i0 -g0 -y
primary# telnet localhost 5003
ldom3# /usr/bin/shutdown -i0 -g0 -y
primary# ldm stop-domain -a
primary# ldm list
NAME          STATE   FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
primary       active -n-cv  SP    12    6G      0.2%  1d 16h 43m
ldom1         bound  -----  5001  24    2G
ldom2         bound  -----  5002  24    3G
ldom3         bound  -----  5003  36    4G
```

A.4.2 Stopping the I/O Domain

Since disks of the I/O domain have been mirrored, follow the instructions of your software to stop the I/O domain without failing to establish the synchronization of the disks.

- 1) After setting to prevent the I/O domain from being booted automatically, stop the I/O domain.

```
iodomain1# eeprom auto-boot?=false
iodomain1# /usr/sbin/shutdown -i0 -g0 -y
```

A.4.3 Allocating the emergency boot disk for the I/O Domain

The following describes how to add the emergency boot disk for the I/O domain. If you have already prepared, you can skip this procedure.

- 1) Add virtual disk devices.

```
primary# mkfile 10G /LDoms/Vol9/vdisk1.img
primary# ldm add-vdsdev /LDoms/Vol9/vdisk1.img Vol91@primary-vds0
```

- 2) Check virtual disk devices.

```
primary# ldm ls -l
```

- 3) Stop the target domain, and loosen the combination of resources.

```
primary# ldm stop-domain iodom1
primary# ldm unbind-domain iodom1
```

- 4) Add the emergency boot disk to the guest domain.

```
primary# ldm add-vdisk vdisk1 Vol91@primary-vds0 iodom1
```

- 5) Check the virtual disks of the guest domain.

```
primary# ldm list -l iodom1
```

- 6) Start the guest domain.

```
primary# ldm bind-domain iodom1
primary# ldm start-domain iodom1
```

- 7) After logging in to the guest domain, reconfigure devices.

```
iodom1# devfsadm
```

- 8) Check the disks of the guest domain.

```
iodom1# format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
 0. c0d0 <SUN-DiskImage-10GB cyl 34950 alt 2 hd 1 sec 600>
    /virtual-devices@100/channel-devices@200/disk@0
 1. c0d1 <SUN-DiskImage-10GB cyl 34950 alt 2 hd 1 sec 600>
    /virtual-devices@100/channel-devices@200/disk@1
Specify disk (enter its number):
```

A.4.4 Installing the emergency boot disk for the I/O Domain

- 1) Install the emergency bootOS for the I/O domain, and then apply the latest patches and configure the environment. If you have already prepared, you can skip this procedure.

```
iodom1# /usr/sbin/shutdown -i0 -g0 -y
ok > boot vnet0
```

- 2) Add the I/O domain entry on the /etc/inet/hosts file or the name service of the remote host (remotehost) to which the tape device is connected. After you finish, return the setting to its original setting in case any security issues occur.

```
remotehost# echo "xxx.xxx.xxx.xxx iodom1" >> /etc/inet/hosts
```

- 3) Add the remote host entry on the /etc/inet/hosts file or the name service of the guest domain.

```
iodom1# echo "xxx.xxx.xxx.yyy remotehost" >> /etc/inet/hosts
```

- 4) Make the rlogin service of the remote host operational.

```
remotehost# cat "iodom1" >> $HOME/.rhosts
remotehost# chmod 0400 $HOME/.rhosts
```

- 5) Check the state of the remote tape drive.

```
iodom1# rsh remotehost mt status
HP DAT-72 tape drive:
sense key(0x0)= No Additional Sense    residual= 0    retries= 0
file no= 0    block no= 0
```

A.4.5 Backing Up the Guest Domain

Boot from the emergency bootOS of domains to back up the guest domain.

- 1) Boot from the emergency boot disk for the I/O domain.

```
primary# telnet localhost 5009
:
{0} ok boot vdisk1
```

- 2) Collect vtoc information of disks to be backed up.

```
iodom1# prtvtoc /dev/rdisk/c0d0s2 > iodom1-disk0.vtoc
```

- 3) Back up the system of the I/O domain.

```
iodom1# rsh remotehost mt rewind /dev/rmt/0
iodom1# ufsdump 0ucf remotehost:/dev/rmt/0cn /dev/rdisk/c0d0s0
iodom1# ufsdump 0ucf remotehost:/dev/rmt/0cn /dev/rdisk/c0d0s3
iodom1# ufsdump 0ucf remotehost:/dev/rmt/0cn /dev/rdisk/c0d0s4
iodom1# ufsdump 0ucf remotehost:/dev/rmt/0cn /dev/rdisk/c0d0s5
```

- 4) Check what you backed up.

```
iodom1# rsh remotehost mt rewind /dev/rmt/0
iodom1# ufsrestore tf remotehost:/dev/rmt/0cn > ufsrest-tf-c0d0s0.log
iodom1# ufsrestore tf remotehost:/dev/rmt/0cn > ufsrest-tf-c0d0s3.log
iodom1# ufsrestore tf remotehost:/dev/rmt/0cn > ufsrest-tf-c0d0s4.log
iodom1# ufsrestore tf remotehost:/dev/rmt/0cn > ufsrest-tf-c0d0s5.log
```

A.4.6 Restoring the I/O Domain

Boot from bootOS for domains and restore the I/O domain.

- 1) Boot from the emergency boot disk for the I/O domain.

```
primary# telnet localhost 5009
:
{0} ok boot vdisk1
```

- 2) Format the destination disk of the restoration.

```
iodom1# fmthard -s iodom1-disk0.vtoc /dev/rdisk/c0d0s2
```

- 3) Restore the system of the guest domain from the tape device.

```
iodom1# rsh remotehost mt rewind /dev/rmt/0
```

Create bootblk for the root partition.

```
iodom1# newfs /dev/rdisk/c0d0s0
iodom1# mount -F ufs /dev/dsk/c0d0s0 /mnt
iodom1# cd /mnt
iodom1# ufsrestore rvf remotehost:/dev/rmt/0cn
iodom1# rm restoresymtable
iodom1# cd /usr/sbin
iodom1# umount /mnt
iodom1# ./installboot /usr/platform/^uname -i`/lib/fs/ufs/bootblk /dev/rdisk/c0t0s0
```

Restore each slice except the swap and backup partitions.

```
iodom1# newfs /dev/rdisk/c0d0s3
iodom1# mount -F ufs /dev/dsk/c0d0s3 /mnt
iodom1# cd /mnt
iodom1# ufsrestore rvf remotehost:/dev/rmt/0cn
iodom1# rm restoresymtable
iodom1# cd /
iodom1# umount /mnt

iodom1# newfs /dev/rdisk/c0d0s4
iodom1# mount -F ufs /dev/dsk/c0d0s4 /mnt
iodom1# cd /mnt
iodom1# ufsrestore rvf remotehost:/dev/rmt/0cn
iodom1# rm restoresymtable
iodom1# cd /
iodom1# umount /mnt

iodom1# newfs /dev/rdisk/c0d0s5
iodom1# mount -F ufs /dev/dsk/c0d0s5 /mnt
iodom1# cd /mnt
iodom1# ufsrestore rvf remotehost:/dev/rmt/0cn
iodom1# rm restoresymtable
iodom1# cd /
iodom1# umount /mnt
```

- 4) Verify the restored file system.

```
iodom1# fsck /dev/rdisk/c0d0s0
iodom1# fsck /dev/rdisk/c0d0s3
iodom1# fsck /dev/rdisk/c0d0s4
iodom1# fsck /dev/rdisk/c0d0s5
```

Appendix B Instructions for Backup/ Restoration of ZFS file system

Here backup/restoration of ZFS file system is described.

Regarding general information on management of ZFS filesystem, please see the following manual.

Solaris ZFS Administration Guide

<http://docs.sun.com/app/docs/doc/817-2271>

You can install system volume on ZFS file system on Solaris OS 10/08 or later. The following describes examples of backup/restoration procedure of ZFS file system.

B.1 Notes on the descriptions of this instruction

- This instruction gives you useful information on how to backup/restore ZFS filesystem of the control domain and guest domain.
- According to the environment, a local or remote tape drive, or disk is available for the backup destination of ZFS filesystem. This document gives an example in which a local tape drive is used for the backup destination.
- In the following example of the setting, a remote tape drive is used. Return the setting to its original setting after performing backup or restoration to avoid security issues.

- 1) Add the entry of the target domain of backup or restoration to the `/etc/inet/hosts` file or name services of the remote host (remotehost) where the tape drive is connected.

```
remotehost# echo "xxx.xxx.xxx.xxx XXXXX" >> /etc/inet/hosts
```

- 2) Add the entry of the remote host to the `/etc/inet/hosts` file or name services of the target domain.

```
# echo "xxx.xxx.xxx.yyy remotehost" >> /etc/inet/hosts
```

- 3) Enable the `rlogin` service of the remote host.

```
remotehost# cat >> $HOME/.rhosts XXXXX <Ctrl+d> remotehost# chmod 0400 $HOME/.rhosts
```

- 4) The following example shows how to use the remote tape drive.

```
# ufsdump 0ucf remotehost:/dev/rmt/0n /dev/rdisk/c0d0s0  
# rsh remotehost mt rewind /dev/rmt/0  
# ufsrestore tf remotehost:/dev/rmt/0
```

- In this document, an example of procedure for the system having the following ZFS filesystem is given.

```
primary# zpool list
NAME          SIZE  USED  AVAIL    CAP  HEALTH  ALTROOT
ldomspool     68G  10.0G  58.0G   14%  ONLINE  -
rpool        48.8G  16.9G  31.8G   34%  ONLINE  -
primary# zfs list
NAME          USED  AVAIL  REFER  MOUNTPOINT
ldomspool     10.0G  56.9G   19K    /ldomspool
ldomspool/ldom2  10.0G  56.9G  10.0G  /ldomspool/ldom2
rpool        18.9G  29.1G   93K    /rpool
rpool/ROOT    15.9G  29.1G   18K    legacy
rpool/ROOT/s10s_u6wos_07b  15.9G  29.1G  15.9G  /
rpool/dump    1.00G  29.1G  1.00G  -
rpool/export  60K    29.1G   20K    /export
rpool/export/home  40K    29.1G   40K    /export/home
rpool/swap    2G     31.1G  34.9M  -
```

- Disk, and device used in the example
 - c0t2d0s0 : Slice storing the control domain
 - c0t1d0s0 : Slice storing the guest domain
 - rmt/0 : Local tape device that is the backup destination

B.2 Backup of ZFS file system

Notes

- If you use this procedure to backup/restore ZFS filesystem, you need to boot the system in single user mode from the boot image where 139555-08 or newer is applied. If your OS is Solaris 10 OS 5/09 or newer, 139555-08 is included.
- Please note the following when your backup destination is a tape drive.
 - A tape to backup data of the control domain should be different from one to backup data of each guest domain .
 - Be sure to record which date is backed up and in what order.
 - The "zfs send" command does not support multi-volume. If one tape is not enough for backed up data, backup the data to the tape with the tar command after backing up it to the disk or other storages.

1) Preparation

When you backup a filesystem of the control domain, stop all domains except the control domain and cancel the bind of resources.

In the following example, guest domains - ldom1, ldom2, and ldom3 exist.

```
primary# ldm stop-domain ldom1
primary# ldm stop-domain ldom2
primary# ldm stop-domain ldom3
primary# ldm unbind-domain ldom1
primary# ldm unbind-domain ldom2
primary# ldm unbind-domain ldom3
```


Collect information by zpool, disk, and filesystems beforehand, and backup them into another disk. A record of information collected with 'get all' should be kept because the record is useful for check after you restore the file system.

In the following example, a log is written in logfile_get_all_org.txt with script(1).

```
# script logfile_get_all_org.txt
# zpool list
NAME          SIZE   USED  AVAIL    CAP  HEALTH  ALTROOT
ldomspool     68G  10.0G  58.0G   14%  ONLINE  -
rpool        48.8G  16.9G  31.8G   34%  ONLINE  -
# zfs list
NAME                                USED  AVAIL  REFER  MOUNTPOINT
ldomspool                            10.0G  56.9G   19K    /ldomspool
ldomspool/ldom2                       10.0G  56.9G  10.0G
/ldomspool/ldom2
rpool                                18.9G  29.1G   93K    /rpool
rpool/ROOT                            15.9G  29.1G   18K    legacy
rpool/ROOT/s10s_u6wos_07b           15.9G  29.1G  15.9G   /
rpool/dump                            1.00G  29.1G  1.00G   -
rpool/export                          60K    29.1G   20K    /export
rpool/export/home                     40K    29.1G   40K    /export/home
rpool/swap                             2G    31.1G  34.9M   -
# zpool get all rpool
# zfs get all rpool
# zfs get all rpool/ROOT
# zfs get all rpool/ROOT/s10s_u6wos_07b
# zfs get all rpool/dump
# zfs get all rpool/export
# zfs get all rpool/export/home
# zfs get all rpool/swap
# zpool get all ldomspool
# zfs get all ldomspool
# zfs get all ldomspool/ldom2
# df -k
# format < /dev/null
# prtvtoc /dev/rdisk/c0t2d0s2 > primary-c0t2d0s2.map
# prtvtoc /dev/rdisk/c0t1d0s2 > primary-c0t1d0s2.map
# exit
```

2) Saving System Information

Use the snapshot function to save system information. However, you do not have to save the dump and swap areas because they are work areas. Please remove unnecessary snapshots.

```
# zfs snapshot -r rpool@backup
# zfs destroy rpool/dump@backup
# zfs destroy rpool/swap@backup
# zfs snapshot -r ldomspool@backup
```

3) Backup of System Information

Backup snapshots of each ZFS file system you saved in the step of 2).
Specify a tape drive or another disk as backup destination.

When you use a tape as backup destination, the tape for ZFS snapshot of the control domain should be different from the tape for ZFS snapshots of each guest domains.

```
# mt -f /dev/rmt/0 rewind
# zfs send -v rpool@backup > /dev/rmt/0cn
# zfs send -v rpool/ROOT@backup > /dev/rmt/0cn
# zfs send -vR rpool/ROOT/s10s_u6wos_07b@backup >
/dev/rmt/0cn
# zfs send -v rpool/export@backup > /dev/rmt/0cn
# zfs send -v rpool/export/home@backup > /dev/rmt/0c
(Tape exchange)
# mt -f /dev/rmt/0 rewind
# zfs send -v ldomspool@backup > /dev/rmt/0cn
# zfs send -v ldomspool/ldom2@backup > /dev/rmt/0c
```

B.3 Restoration of ZFS File System

Notes

- If you use this procedure to backup/restore ZFS filesystem, you need to boot the system in single user mode from the boot image where 139555-08 or newer is applied. If your OS is Solaris 10 OS 5/09 or newer, 139555-08 is included.
- Backup data used in this procedure must be data backed up in “B.2 Backup of ZFS filesystem”.
- ZFS storage pool before the backup must have the same name as after the restoration.

1) Preparation of Restoration Destination System

(1) Boot the system in single use mode from a network installation environment.

※You need to configure the network installation environment beforehand.

```
{0} ok boot net -s
```

(2) Create disk slice and disk label by using the format(1M) or fmthard(1M) command according to disk partition information you recorded beforehand.

```
# format
```

or

```
# fmthard -s primary-c0t2d0s2.map /dev/rdisk/c0t2d0s2
```

2) Restoration of System File

Restore system information backed up from a disk or external media such as a tape drive.

- (1) Create a new storage pool to mount the disk where backed files are stored.

```
# zpool create -fo altroot=/var/tmp/rpool -o
cacheFile=/etc/zfs/zpool.cache -o failmode=continue -m legacy
rpool c0t2d0s0
```

- (2) Restore disks composing 'rpool'.

```
# mt -f /dev/rmt/0 rewind
# zfs receive -Fd rpool < /dev/rmt/0n
# zfs receive -Fd rpool < /dev/rmt/0n
# zfs receive -Fd rpool < /dev/rmt/0n
# zfs receive -Fd rpool < /dev/rmt/0n
# zfs receive -Fd rpool < /dev/rmt/0
```

- (3) Create 'dump' and 'swap'.

You need to create 'dump' and 'swap' individually because they are not backed up.

Information of dump and swap collected in the preparation described in "3. Notes on backup of ZFS filesystem"

```
primary# zfs get all rpool/dump
NAME          PROPERTY          VALUE                SOURCE
rpool/dump    type              volume               -
rpool/dump    creation          Tue Apr  7 18:13 2009 -
rpool/dump    used              1.00G                -
rpool/dump    available         29.1G                -
rpool/dump    referenced        1.00G                -
rpool/dump    compressratio     1.00x                -
rpool/dump    reservation       none                  default
rpool/dump    volsize           1G                    -
rpool/dump    volblocksize      128K                  -
rpool/dump    checksum          off                   local
rpool/dump    compression       off                   local
rpool/dump    readonly          off                   default
rpool/dump    shareiscsi        off                   default
rpool/dump    copies            1                     default
rpool/dump    refreservation    none                  default
primary# zfs get all rpool/swap
NAME          PROPERTY          VALUE                SOURCE
rpool/swap    type              volume               -
rpool/swap    creation          Tue Apr  7 18:13 2009 -
rpool/swap    used              2G                    -
rpool/swap    available         31.1G                -
rpool/swap    referenced        34.9M                -
rpool/swap    compressratio     1.00x                -
rpool/swap    reservation       none                  default
rpool/swap    volsize           2G                    -
rpool/swap    volblocksize      8K                    -
rpool/swap    checksum          on                    default
rpool/swap    compression       off                   default
rpool/swap    readonly          off                   default
```

```
rpool/swap shareiscsi      off          default
rpool/swap copies          1           default
rpool/swap refreservation  2G         local
primary#
```

Specify 'volsize' for the -V option of the 'create'.

```
# zfs create -o volblocksize=128k -V 1g rpool/dump
# zfs create -o volblocksize=8k -V 2g rpool/swap
```

3) Create 'bootblock'.

```
# installboot -F zfs /usr/platform/`uname -
i`/lib/fs/zfs/bootblk /dev/rdisk/c0t2d0s0
# zpool set bootfs=rpool/ROOT/s10s_u6wos_07b rpool
# zfs set canmount=noauto rpool/ROOT/s10s_u6wos_07b
# zfs set canmount=noauto rpool
# zfs set mountpoint=/rpool rpool
# zfs set mountpoint=/export rpool/export
# zfs set mountpoint=legacy rpool/ROOT
# zfs set canmount=on rpool
# zpool export rpool
```

4) Boot the system from rpool.

```
# shutdown -g0 -i0 -y
{1} ok boot
```

5) When you restore ZFS filesystem of the control domain and also ZFS filesystems where the guest domains are stored, take the steps of (1) and (2) after rebooting the system.

- (1) Create disk slice and disk label by using the format(1M) or fmthard(1M) command according to disk partition information you recorded beforehand.

```
# format
```

or

```
# fmthard -s primary-c0t1d0s2.map /dev/rdisk/c0t1d0s2
```

- (2) Create a ZFS storage pool where the guest domains are stored.

```
primary# zpool create -f ldomspool c0t1d0s0
```

- (3) Restore ZFS filesystem within the ZFS storage pool where the guest domains are stored.

```
(Exchange tapes)
primary# mt -f /dev/rmt/0 rewind
primary# zfs receive -Fd ldomspool < /dev/rmt/0n
primary# zfs receive -Fd ldomspool < /dev/rmt/0
```

6) Check after Restoration

Collect the same information as you collected in preparation for system backup ('logfile_get_all_org.txt' in the example) and check whether or not the content is restored correctly.

In the following example, logs are stored in 'logfile_get_all_new.txt' with script(1).

```
# script logfile_get_all_new.txt
# zpool list
# zfs list
# zpool get all rpool
# zfs get all rpool
# zfs get all rpool/ROOT
# zfs get all rpool/ROOT/s10s_u6wos_07b
# zfs get all rpool/dump
# zfs get all rpool/export
# zfs get all rpool/export/home
# zfs get all rpool/swap
# zpool get all ldomspool
# zfs get all ldomspool
# zfs get all ldomspool/ldom2
# df -k
# format < /dev/null
# prtvtoc /dev/rdisk/c0t2d0s2
# prtvtoc /dev/rdisk/c0t1d0s2
# exit
```

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