

# VDCF - Virtual Datacenter Control Framework for the Solaris™ Operating System

## Installation Guide

Version 3.0  
3. September 2010

Copyright © 2005-2010 JomaSoft GmbH  
All rights reserved.

## Table of Contents

1 Introduction.....	3
1.1 Overview.....	4
1.2 Supported Environments.....	5
2 Installation.....	6
2.1 Prerequisites.....	6
2.1.1 Management Server & Solaris.....	6
2.1.2 Network.....	6
2.1.3 Installing the Prerequisites.....	7
2.2 Installing the VDCF Framework.....	8
2.2.1 Overview.....	8
2.2.2 Installation.....	10
2.3 Upgrading the VDCF Framework.....	11
2.3.1 Remove packages.....	11
2.3.2 Replace VDCF prerequisites.....	12
2.3.3 Install new packages.....	13
2.4 Configuring the VDCF Framework.....	14
2.4.1 Web server / Apache.....	14
2.4.2 RBAC and Users.....	15
2.4.3 Admin Environment.....	15
3 Customize the VDCF Framework.....	16
3.1 Configuration files.....	16
3.1.1 Node partitioning.....	16
3.2 System configuration.....	17
3.2.1 Required configuration.....	17
3.2.2 Recommended configuration.....	19
3.3 Next Steps.....	20
4 Appendixes.....	21
4.1 Firewall Rules.....	21
4.2 Installing VDCF in a non-global zone.....	22

## 1 Introduction

This documentation describes the Virtual Datacenter Control Framework (VDCF) for the Solaris Operating System, Version 3.0 and explains how to plan for the product, how to install it and verify that the installation was successful.

See these other documents for further information:

<i>VDCF – Release Notes</i>	for details about the new release
<i>VDCF – Quick Reference</i>	for a short command overview
<i>VDCF Base – Administration Guide</i>	for information about VDCF base usage
<i>VDCF vServer – Administration Guide</i>	for information about VDCF vServer product usage
<i>VDCF LDom – Administration Guide</i>	for information about VDCF LDom product usage
<i>VDCF – Resource Management</i>	for information about VDCF Resource Management
<i>VDCF – Monitoring</i>	for information about VDCF Monitoring

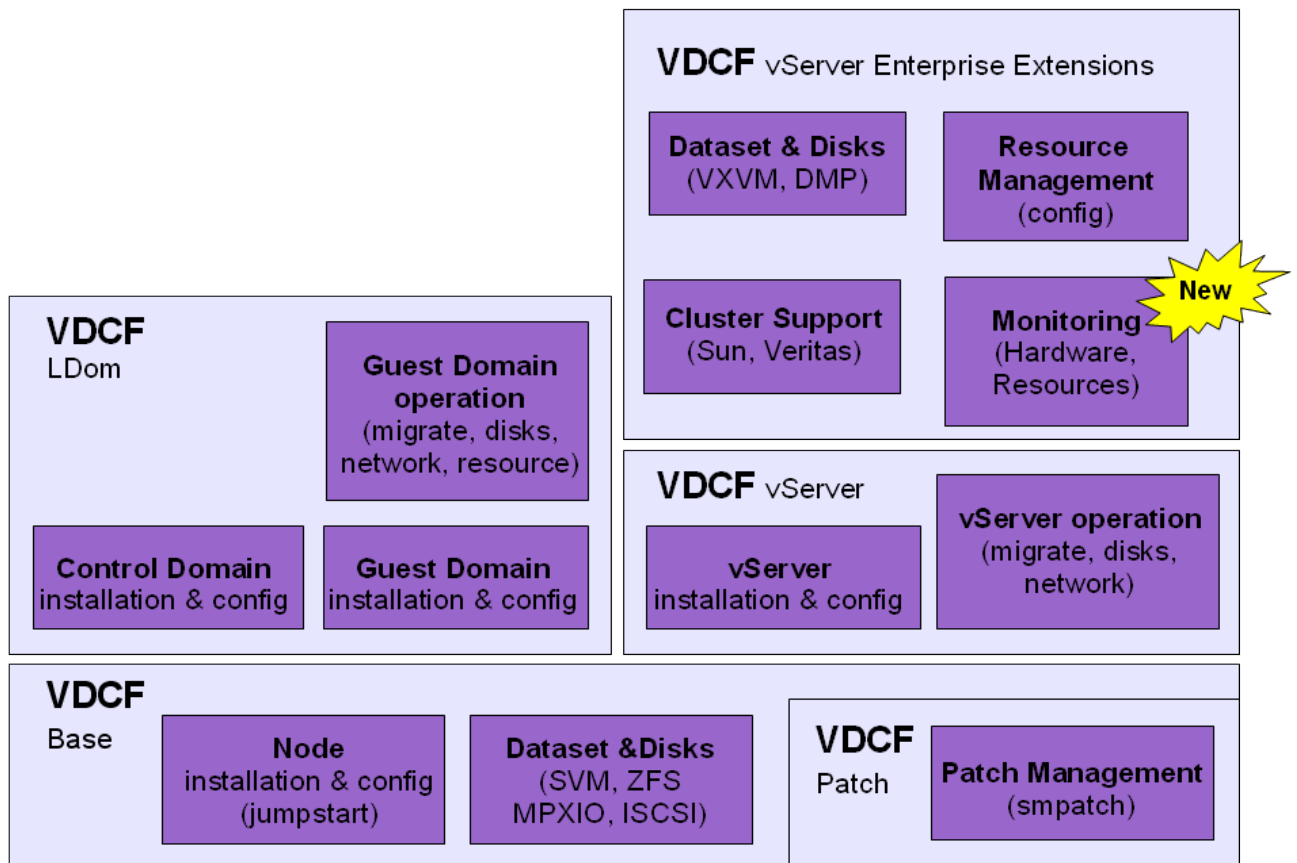
These and all other VDCF documents can be found at:  
<http://www.jomasoft.ch/products/VDCF/docs/>

## 1.1 Overview

VDCF is a platform management framework for the Solaris Operating System. VDCF allows you to run a virtualized data center using Solaris 10 Containers and/or Logical Domains controlled by a centralized management server.

With VDCF, JomaSoft offers a tool to simply and effectively operate your Solaris 10 based virtual data center. On a central management server you create definitions and configuration, which are stored in the Configuration Repository. This information is then used by VDCF to populate physical servers with a Solaris build from which virtual servers or logical domains are created.

VDCF is installed in the Global Zone of a Solaris 10 Server. From this server you install and operate your physical servers (Nodes / Control Domains), Guest Domains and your virtual servers (Containers/Zones).



## 1.2 Supported Environments

Currently the following System Environments are supported:

- Management Server Oracle SPARC Server and x86 Server
- Compute Node/Server Oracle SPARC Server and x86 Server
- Solaris Operating System Solaris 10 Update1 (1/06) or later
- Logical Domains LDomS 1.1/1.2/1.3
- Branded Zones solaris8, solaris9
- Volume Manager Solaris Volume Manager (SVM), ZFS
- Filesystem Solaris UFS, lofs, ZFS
- SAN / iSCSI Storage and HBA's compatible to  
SUN StorEdge SAN 4.4.x / Multipathing using STMS/MPXIO  
iSCSI Targets compatible to Solaris iSCSI Initiator
- Terminal Server Blackbox, Cyclades, IOLAN
- System Controller SC/ALOM, RSC, SSC, 15K, XSCF, ALOMCMT, ILOM, ILOMx86
- Network Link aggregation, IPMP and tagged VLAN for LDomS and vServer

For VDCF vServer Enterprise Customers the following Extensions are available:

- Resource Management Administration of vServer Resource settings
- Monitoring Hardware and Resource Monitoring
- Veritas Dataset Volume Manager: VXVM, Filesystem: vxfs
- Sun Cluster Integration of vServers in Sun Cluster
- Veritas Cluster Integration of vServers in Veritas Cluster

Other environments may only need small enhancements. Send us your request !

## 2 Installation

### 2.1 Prerequisites

#### 2.1.1 Management Server & Solaris

The Management Server must be installed using Solaris 10 Update 1 or later, with at least the “Developer Solaris Software Group” (`SUNWCprog`).

The Locale `en_US.ISO8859-1` (Package `SUNWnamos`) is required to be installed on the Management Server. Use the command `locale -a` to check.

Normally the VDCF framework is installed in the global zone. It is also supported to install VDCF in a non-global zone: See Appendix 4.2 (Installing VDCF in a non-global zone) for details and limitations.

#### Solaris Installation Images & Bootserver

A Bootserver must be setup on the Management Server. A utility for setting up a Bootserver is provided by the VDCF framework. Solaris 10 1/06 or later CD or DVD ready is required. As an alternative you may already have setup the Solaris installation image on the management server.

#### Build / Flash archive

The VDCF framework uses the flash archive technology when installing the compute nodes. Tools to build such flash archives are provided with VDCF. It is highly recommended to use the same flash archive for all compute nodes to create a standardized environment. The flash archive including one Solaris software release is called a build in VDCF terminology. It must contain at a minimum `SUNWCuser` and the packages `SUNWwgetu`, `SUNWwgetr` (`SUNWCwget Cluster`) and SSH.

#### Required Solaris 10 Patches

The flash archive/build must include the following patches

<code>sparc</code>	121118-15 or later (Sun Update Connection Client, <code>smpatch</code> )
<code>i386</code>	121119-15 or later (Sun Update Connection Client, <code>smpatch</code> )

#### Disk space

100 MB free space in <code>/usr/local</code>	to install the prerequisite software
20 MB free space in <code>/opt/</code>	to install the VDCF framework
4 GB free space in <code>/var/opt</code>	where VDCF stores its data
40 GB free space in <code>/export</code>	to store flash archives and installation configuration

#### 2.1.2 Network

A dedicated „Management Network“ is required, which connects the Management Server to the Compute Server and their system controllers.

### 2.1.3 Installing the Prerequisites

The VDCF framework also requires installation of the following freely available software. These must be installed prior to installing the VDCF framework on the management server. You may already use some of the required software.

It is highly recommended to use the installation script `install_vdcf_prereqs`:

```
# cd <download-dir>/vdcf_prereqs

# ./install_vdcf_prereqs
Checking VDCF Prerequisites ...
Installing SMClgcc346 ...
Installing SMCTk ...
Installing SMCTcl ...
Installing SMCexpect ...
Installing SMCncurs ...
Installing SMCreadl ...
Installing SMCsqlite ...
Check /var/tmp/vdcf_prereqs.log for pkgadd details.
Finished
```

The script will install the packages listed here:

a) on the sparc platform:

```
cd <download-dir>/vdcf_prereqs/sparc

pkgadd -G -d ./libgcc-3.4.6-sol10-sparc-local SMClgcc346
pkgadd -G -d ./tk-8.4.9-sol10-sparc-local SMCTk
pkgadd -G -d ./tcl-8.4.9-sol10-sparc-local SMCTcl
pkgadd -G -d ./expect-5.40-sol10-sparc-local SMCexpect
pkgadd -G -d ./ncurses-5.5-sol10-sparc-local SMCncurs
pkgadd -G -d ./readline-5.2-sol10-sparc-local SMCreadl
pkgadd -G -d ./sqlite-3.6.13-sol10-sparc-local SMCsqlite
```

b) on the i386 platform:

```
cd <download-dir>/vdcf_prereqs/x86

pkgadd -G -d ./libgcc-3.4.6-sol10-x86-local SMClgcc346
pkgadd -G -d ./tk-8.4.9-sol10-intel-local SMCTk
pkgadd -G -d ./tcl-8.4.9-sol10-intel-local SMCTcl
pkgadd -G -d ./expect-5.40-sol10-intel-local SMCexpect
pkgadd -G -d ./ncurses-5.5-sol10-x86-local SMCncurs
pkgadd -G -d ./readline-5.2-sol10-x86-local SMCreadl
pkgadd -G -d ./sqlite-3.6.13-sol10-x86-local SMCsqlite
```

## 2.2 Installing the VDCF Framework

### 2.2.1 Overview

The VDCF framework is installed into `/opt/jomasoft/vdcf`.

The framework itself consists of the following software packages:

#### a) Installed on the management server

First you have to install the VDCF foundation. The base product contains the physical node management including installation, configuration and patch management. These packages must be installed manually on the management server:

- VDCF Base Components
  - JSvdcf-base - JomaSoft VDCF Base Framework
  - JSvdcf-patch - JomaSoft VDCF Patch Management

Depending on your needs you may install this additional VDCF products to manage your virtual objects:

- VDCF vServer Product
  - JSvdcf-vserver - JomaSoft VDCF vServer Management
- VDCF LDom Product
  - JSvdcf-ldom - JomaSoft VDCF LDom Management

#### b) Installed on the compute servers

This client package is installed automatically by the framework when installing a new compute node:

- JSvdcf-client - JomaSoft VDCF Client

### c) Directories

When installing the base framework for the first time, the required directories and the configuration repository are initialized. The required ssh key is generated for the root User. The ssh key is used for ssh connections from the management server to the compute server, when initiating "Remote Execution".

<code>/export/install/flash</code>	This is the default directory where the installation configuration and the flash archives (builds) for the compute server are stored. This directory will be visible through a web server. This directory is managed through the VDCF framework commands.
<code>/var/opt/jomasoft/vdcf/db</code>	This directory contains the configuration repository. It's recommended to backup this directory regularly.
<code>/var/opt/jomasoft/vdcf/conf</code>	various configuration files, like <code>customize.cfg</code> , partitioning, build profile, etc
<code>/var/opt/jomasoft/vdcf/config</code>	This directory contains the additional packages, custom scripts and files . used when installing a node or vServer. This directory is managed by the system administrator.
<code>/var/opt/jomasoft/vdcf/log</code>	The framework is logging into this directory

## 2.2.2 Installation

### a) sparc platform

```
cd <download-dir>
```

```
pkgadd -d ./JSvdcf_<version>_sparc.pkg all
```

```
pkgadd -d ./JSvdcf-vserver_<version>_sparc.pkg all
```

```
pkgadd -d ./JSvdcf-ldom_<version>_sparc.pkg all
```

### b) i386 platform

```
cd <download-dir>
```

```
pkgadd -d ./JSvdcf_<version>_i386.pkg all
```

```
pkgadd -d ./JSvdcf-vserver_<version>_i386.pkg all
```

```
pkgadd -d ./JSvdcf-ldom_<version>_i386.pkg all
```

## 2.3 Upgrading the VDCF Framework

Use the following commands to upgrade VDCF to a new version:

First check your currently installed packages and versions:

```
$ vdcfadm -c show_version
```

Package	Version	Arch.	Install-Date	Name
JSvdcf-base	2.3.7	sparc	Feb 27 2010 11:15	VDCF - Base
JSvdcf-ldom	1.1.0	sparc	Feb 26 2010 10:06	VDCF - Logical Domain Management
JSvdcf-patch	2.3.7	sparc	Feb 27 2010 11:16	VDCF - Patch Management
JSvdcf-rm	1.0.7	sparc	Feb 28 2010 16:44	VDCF - Resource Management
JSvdcf-vserver	2.3.7	sparc	Feb 18 2010 22:00	VDCF - Virtual Server Management

### 2.3.1 Remove packages

It's required to remove the packages in the correct order. You only need to remove packages which you install later using a newer version.

#### 1. Remove Enterprise Extensions

```
pkgrm JSvdcf-suncluster (if installed)
pkgrm JSvdcf-veritas (if installed)
pkgrm JSvdcf-vxvm (if installed)
pkgrm JSvdcf-rm (if installed)
pkgrm JSvdcf-monitor (if installed)
```

#### 2. Remove VDCF products

```
pkgrm JSvdcf-vserver
pkgrm JSvdcf-ldom
```

#### 3. Remove the Base framework

```
pkgrm JSvdcf-patch JSvdcf-base
```

### 2.3.2 Replace VDCF prerequisites

If your previous VDCF version is older than version 3.0, you need to replace some of the VDCF prerequisites software using the installation script `install_vdcf_prereqs`.

```
SMClibgcc 3.3      is replaced by  SMClgcc346
SMCsqlite 3.3.6   is replaced by  SMCsqlite 3.6.13
```

A typical upgrade looks like this:

```
# cd <download-dir>/vdcf_prereqs

# ./install_vdcf_prereqs
Checking VDCF Prerequisites ...
Found old prerequisite SMClibgcc (Version: 3.3)
WARN: This package is not required by VDCF anymore.
WARN: You may remove this package, if no other software requires it.
Found old prerequisite SMCsqlite (Version: 3.3.6)
Removing this package now ...

Removal of <SMCsqlite> was successful.
Found SMGtk package
SMGtk  tk
      (sparc) 8.4.9
VDCF skips installation of SMGtk (Version: 8.4.9)
Found SMGtk package
SMGtk  tcl
      (sparc) 8.4.9
VDCF skips installation of SMGtk (Version: 8.4.9)
Found SMCexpect package
SMCexpect  expect
          (sparc) 5.40
VDCF skips installation of SMCexpect (Version: 5.40)
Found SMCncurs package
SMCncurs  ncurses
          (sparc) 5.5
VDCF skips installation of SMCncurs (Version: 5.5)
Found SMCreadl package
SMCreadl  readline
          (sparc) 5.2
VDCF skips installation of SMCreadl (Version: 5.2)
Installing SMClgcc346 ...
Installing SMCsqlite ...
Check /var/tmp/vdcf_prereqs.log for pkgadd details.
Finished
```

### 2.3.3 Install new packages

```
# cd <download-dir>
pkgadd -d ./JSvdcf_<version>_<platform>.pkg all
pkgadd -d ./JSvdcf-vserver_<version>_<platform>.pkg all
pkgadd -d ./JSvdcf-ldom_<version>_<platform>.pkg all
pkgadd -d ./JSvdcf-...
```

Normally it's necessary to upgrade the JSvdcf-client package installed on the Nodes manually:

```
vdcfadm -c update_node all
```

Check the Release Notes for additionally required tasks.

## 2.4 Configuring the VDCF Framework

After installing the VDCF framework, some configuration and integration into your system environment is required.

### 2.4.1 Web server / Apache

When installing a compute node, the configuration and flash archives are delivered through a web server. You may already run a web server, where you add the required configuration.

#### a) Technical User

The web server user must be set to `webservd`. This requirement ensures the permissions are in place that enable execution of the VDCF commands. At VDCF installation RBAC entries are created for the user `webservd`.

#### b) Directories

The document root directory for the web server must be set to `/export/install/flash`. CGI scripts run from `/opt/jomasoft/vdcf/mods/install/cgi`.

#### c) Apache

This is an example of the required additional configuration for the Apache 2.0 web server. A `httpd.conf` file containing the required configuration statements is provided in `/opt/jomasoft/vdcf/conf/sysconf`.

Update your Apache configuration file `/etc/apache2/httpd.conf`.

It is highly recommended to create a VirtualHost configuration for VDCF. It is even possible to create multiple configurations with IP addresses in different networks and to use different ports. Remember to add `Listen` statements for additional ports.

```
<VirtualHost *:80>
    DocumentRoot /export/install/flash

    Alias /scripts/ "/opt/jomasoft/vdcf/mods/install/cgi/"
    Alias /rexec/ "/opt/jomasoft/vdcf/rexec/"
    <Directory /opt/jomasoft/vdcf/mods/install/cgi>
        Options +ExecCGI
    </Directory>
    AddHandler cgi-script .cgi
</VirtualHost>
```

After the modifications restart your Apache web server using the appropriate commands:

```
svcadm restart apache2    (if Apache is already running)
```

```
svcadm enable apache2    (if starting for the first time)
```

## 2.4.2 RBAC and Users

VDCF provides the following RBAC profiles, which must be configured for your administration staff.

VDCF Logger	- required for all users, to be able to log framework messages
VDCF admin Module	- VDCF administration
VDCF install Module	- node installation
VDCF node Module	- node operations
VDCF config Module	- node and vServer customization
VDCF disks Module	- disks management
VDCF dataset Module	- dataset management
VDCF virtual Module	- vServer operations
VDCF ldom Module	- Control (cdom) and Guest domain (gdom) management & operations
VDCF patches Module	- patch management for nodes, vServer, Control and Guest domains
VDCF computepool Manager	- compute pool (cpool) management
VDCF computepool User	- compute pool (cpool) display
VDCF vpool Manager	- virtual pool (vpool) management
VDCF vpool User	- virtual pool (vpool) display

Add the Profile entries to `/etc/user_attr` for your administrators. All users with the above RBAC Profiles are allowed to execute the VDCF commands found in `/opt/jomasoft/vdcf/bin`.

Sample entry from `/opt/jomasoft/vdcf/conf/sysconf/etc_user_attr`

```
marcel:::type=normal;profiles=VDCF Logger,VDCF admin Module,VDCF install \
Module,VDCF node Module,VDCF config Module,VDCF disks Module,VDCF dataset \
Module,VDCF virtual Module,VDCF patches Module,VDCF computepool Manager,VDCF \
ldom Module,VDCF vpool Manager
```

If you would like to create a VDCF administration user, use the following command

```
useradd -d /export/home/vdcf -m -s /bin/bash -P "VDCF Logger,VDCF admin \
Module,VDCF install Module,VDCF node Module,VDCF config Module,VDCF disks \
Module,VDCF dataset Module,VDCF virtual Module,VDCF patches Module,VDCF \
computepool Manager,VDCF ldom Module,VDCF vpool Manager" vdcf
```

## 2.4.3 Admin Environment

Add the following directories to you shell profile

PATH	/opt/jomasoft/vdcf/bin	VDCF commands
MANPATH	/opt/jomasoft/vdcf/man	VDCF manpages

Sample entry:

```
export PATH=/opt/jomasoft/vdcf/bin:$PATH
export MANPATH=/opt/jomasoft/vdcf/man:$MANPATH
```

## 3 Customize the VDCF Framework

### 3.1 Configuration files

There is one main VDCF configuration file: `/var/opt/jomasoft/vdcf/conf/customize.cfg`

You have to modify at least these variables:

```
export FLASHPWD=' '
    Here you store the root password set after a node or vServer is installed.
    Password must be in shadow format.

export FLASH_WEBSERVER_URL="http://10.1.1.1:80"
    Default URL of the configured web server. This URL is used on nodes and vServers
    to get the system configuration and flash archive.

export FLASH_PUBLIC_WEBSERVER_URL="http://192.168.0.1:80"
    Alternate URL of the configured web server. This URL is required if the target node is in
    another network than the management server is. This URL is used on nodes and vServers
    to get the system configuration and flash archive.

export FLASH_BOOTSERVER_IP="10.1.1.1"
    IP address of your management server

export NODE_NET_ALIAS="MNGT:AUTO,PUBL:AUTO,BACK:AUTO,PROBE:AUTO"
    Defines the default speed set when configuring new nodes using the nodecfg command.
    Allowed speed settings are: AUTO,1000fdx,1000hdx,100fdx,100hdx

export CONFIG_DEFAULTS="server.group=node;server.location=RZ"
    Defines default values used when configuring new nodes using the nodecfg -c add
    command. server.group defines the default configuration groups and server.location
    defines the default location of a node.

export CONFIG_NETMASK_DEFAULT="DEFAULT:255.255.255.0,MNGT:255.255.255.0,..."
    Defines default values for the 'netmask' argument used at vserver -c addnet and
    nodecfg -c add

export PATCH_SOURCE_URL="http://10.1.1.1:3816"
    URL of your patch server, usually installed on the VDCF management server
```

#### 3.1.1 Node partitioning

Node partitioning is configured as a Jumpstart profile. You may modify the default values in `/var/opt/jomasoft/vdcf/conf/partitioning.cfg`

For server specific partitioning, for example for older hardware with small disks, you can create a partitioning configuration file per node. The file name has the following format :

```
/var/opt/jomasoft/vdcf/conf/<nodename>_partitioning.cfg
```

## 3.2 System configuration

In VDCF terminology Nodes, Guest domains and vServers are configured using Base and Server configuration. This information is stored in the configuration repository using these two VDCF commands:

- `config` (used for base configuration)
- `serverconfig` (used for server configuration)

Base configuration contain the effective system configuration values, for example DNS server ip addresses. In Server configuration you assign the Base configuration to nodes, vServers or server groups. A base configuration without a server configuration is useless and makes no sense. Only configuration data mapped to a server (or a group of server) is applied at installation time!

This chapter describes the required and recommended Base configuration. Check the VDCF Administration Guide and the manpages of “`config`” and “`serverconfig`” for detailed information about system configuration.

The file `/opt/jomasoft/vdcf/conf/sysconf/vdcf_system_configs` contains the recommended commands and templates for the mentioned commands below.

### 3.2.1 Required configuration

#### a) SCSI\_VHCI

For non-Sun SAN storage, it is required to register the provider SCSI product id. Use the Solaris format command “`inquiry`” to display the provider and productid.

For example for an IBM storage:

```
config -c add type=SCSI_VHCI name=DS8300 provider=IBM productid=2107900
serverconfig -c add type=SCSI_VHCI name=DS8300 group=IBM
```

#### b) SVM Solaris Volume Manager required services

For SVM to work properly the following 3 SMF Services must be enabled on all Nodes.

```
config -c add type=SERVICES name=SVM enable=metainit,mdmonitor,meta
serverconfig -c add group=node type=SERVICES name=SVM
```

### c) Defaultroute per Network

Add the Defaultroute's of your subnets. Replace 'YOURNET' with unique names to identify your networks.

```
config -c add type=DEFAULTROUTE name=YOURNET ipaddr=10.10.1.1  
serverconfig -c add group=<yourgroup> type=DEFAULTROUTE name=YOURNET
```

Use the configuration group <yourgroup> when adding a new node running in this network with  
nodecfg -c add.

### d) DNS

```
config -c add type=DNS name=PROD server=192.168.0.1,192.168.0.2 \  
domain=yourdomain.com search=yourdomain.com
```

```
serverconfig -c add type=DNS name=PROD
```

### 3.2.2 Recommended configuration

The following commands are not required for VDCF, but their use is recommended.

#### a) FSS scheduler

To enable the FSS scheduler run the following commands

```
config -c add type=COMMAND name=FSS command="dispadmin -d FSS"  
serverconfig -c add group=node type=COMMAND name=FSS
```

#### b) Disable insecure SMF services

Here is a sample command for disabling some 'unwanted' SMF services.

```
config -c add type=SERVICES name=HARDENING \  
disable=telnet,sendmail,print/server,rstat  
  
serverconfig -c add type=SERVICES name=HARDENING
```

#### c) NTP time services

If NTP is used in your environment replace ntp1 and ntp2 with your NTP timeservers.

```
config -c add type=NTP name=PROD server=ntp1,ntp2  
serverconfig -c add type=NTP name=PROD
```

#### d) Users

It is recommended to add the administration users after installing a system.

With VDCF you do this using a script which must be stored in  
/var/opt/jomasoft/vdcf/config/script

#### Sample Script:

```
#!/bin/ksh  
  
# Script: add_users  
# Usage: Adds admin users  
  
add_user() {  
  
    typeset username=$1  
  
    # add user, if not already defined  
    if ! grep "^$username:" /etc/passwd >/dev/null; then  
        useradd -d /export/home/$username -s /bin/bash -m $username  
        passwd -df $username  
    fi  
  
}  
  
add_user yourname
```

```
config -c add type=SCRIPT name=USERS script=add_users  
serverconfig -c add type=SCRIPT name=USERS
```

### 3.3 Next Steps

The VDCF framework is now configured and ready to use.

a) Produce a build and install a node

These steps are documented in the VDCF Base - Administration Guide:

- Configure a Build (flash archive) to install using the build command
- Discover and add a node to the VDCF configuration repository (nodecfg command)
- Enable the Build to be installed on the target node (flash command)
- Install the node (node command)

b) Deploy vServers

See the VDCF vServer - Administration Guide for information about:

- Configure Datasets and vServers (dataset and vserver command)
- Install the vServer (vserver command)

c) Build a Control domain and deploy Guest Domains

This is documented in the VDCF LDom - Administration Guide.

- Setup control domain (cdom command)
- Install a guest domain (gdom command)

## 4 Appendixes

### 4.1 Firewall Rules

If your system environment contains firewalls you may have to define firewall rules. These rules are required for a correct execution of VDCF:

a) Firewall rules between Management Server and Target nodes, domains and vServers

VDCF Management Server	Direction	Targets (nodes, domains, vServers)	Comment
	-->	ssh (port 22)	Required for Remote Command Execution
	-->	System Controller	Depending on type of System Controller (telnet or ssh)
WebServer (port 80)	<--		Web server port (see chapter 2.4.1)
Patch Proxy (port 3816)	<--	Only Nodes/Gdom	Port of patch proxy (optional)

The following rules are additionally required if you install X86 Nodes (using PXE)

VDCF Management Server	Direction	Targets	Comment
tftp (udp 69)	<--	Node	PXE Boot / Jumpstart to transfer kernel
NFS (port 2049)	<--	Node	Solaris Jumpstart

b) Firewall Rules and/or Internet Proxy Settings between Management Server and Internet

These rules are required if you are using the VDCF Patch Management. Patch Management has to connect from the Management Server through an Internet Proxy to the Sun Update Connection Servers:

VDCF Management Server	Direction	Internet Server
	-->	getupdates1.sun.com - https (port 443)
	-->	a248.e.akamai.net - https (Port 443)
	-->	cns-services.sun.com - https (Port 443)
	-->	www.sun.com - https (Port 443)

ATTENTION: As Sun does not document the Internet server names they are subject to change.

## 4.2 Installing VDCF in a non-global zone

### Global Zone – Engineering Environment

The VDCF framework must be installed in the global zone. VDCF uses Jumpstart technologies and protocols, which are not supported in a non-global zone. Use the VDCF framework in the global zone as the Engineering environment where you create BootServer environments, install Nodes using a build.profile and produce Flash archives to define Builds.

### Non-Global Zone – Deployment Environment

VDCF is installable in a non-global zone and as a deployment environment for **sparc** systems using the **WANBoot** technology. In such a deployed environment you define Builds based on the BootServer environments and archives created in the Engineering environment.

### Requirements

You must create a whole root zone for VDCF

```
zonecfg -z vdcf1  
create -b
```

Add the following devices to the zone configuration. This is required because VDCF uses lofiadm to maintain the WANBoot images.

```
add device  
set match=/dev/lofictl  
end  
add device  
set match=/dev/lofi/*  
end  
add device  
set match=/dev/rlofi/*  
end
```