

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

Installation Guide

Version 2.3
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1 Introduction

This documentation describes the Virtual Datacenter Control Framework (VDCF) for the Solaris Operating System, Version 2.3 and explains how to plan for the product, how to install it and verify that the installation was successful.

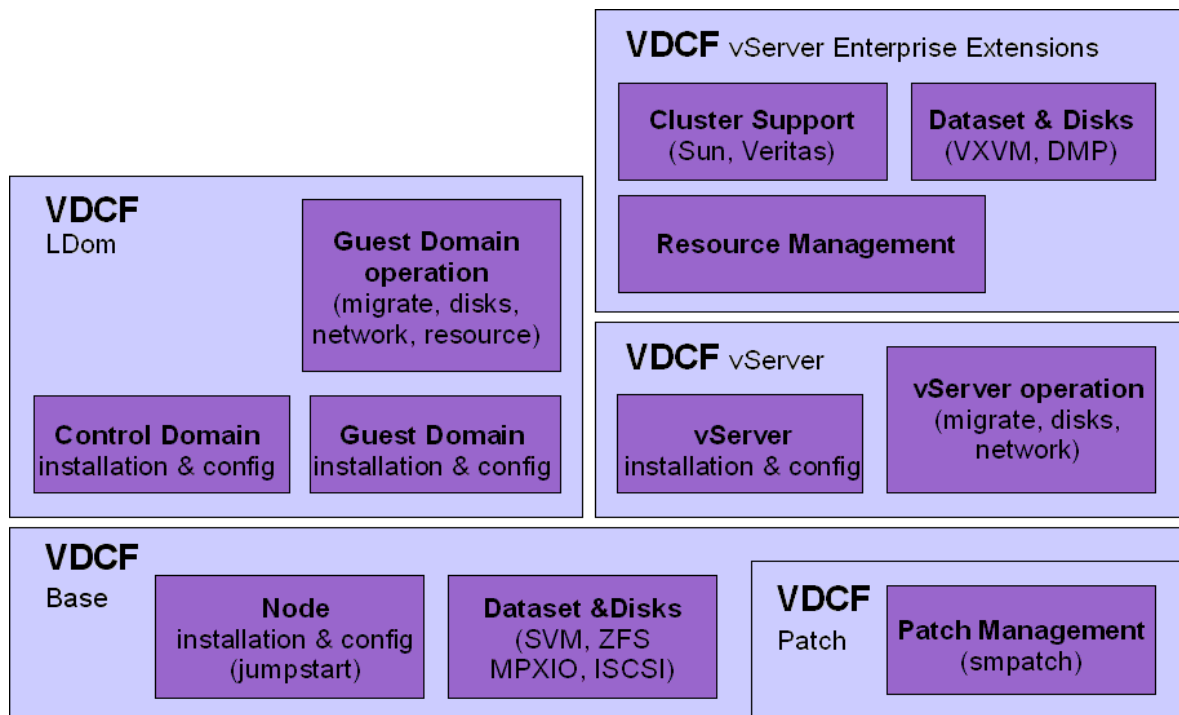
See these other documents for further information:

<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

1.1 Overview

The Virtual Datacenter Control Framework (VDCF) is a systems management tool for the Solaris Operating System. With the features of VDCF you are able to run your virtualized Datacenter using Solaris 10 Zones and/or Logical Domains from a centralized management server.

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 (Zones).



1.2 Supported Environments

Currently the following System Environments are supported:

- Management Server Sun SPARC Server and x86 Server
- Compute Node/Server Sun SPARC Server and x86 Server
- Solaris Operating System Solaris 10 Update1 (1/06) or later
- 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, ILOM
- Network Link aggregation, IPMP and tagged VLAN for vServer

For VDCF vServer Enterprise Customers the following Extensions are available:

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

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

sparc 121118-15 or later (Sun Update Connection Client, smpatch)

i386 121119-15 or later (Sun Update Connection Client, smpatch)

Disk space

100 MB free space in /usr/local

20 MB free space in /opt/

4 GB free space in /var/opt

40 GB free space in /export

to install the prerequisite software

to install the VDCF framework

where VDCF stores its data

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.

2.2 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 SMClibgcc ...
Installing SMCTk ...
Installing SMCTcl ...
Installing SMCexpect ...
Installing SMCncurs ...
Installing SMCreadl ...
Installing SMCsqlite ...
Finished
Check /var/tmp/vdcf_prereqs.log for details.
```

The script will install the packages listed here:

a) on the sparc platform:

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

pkgadd -G -d ./libgcc-3.3-sol10-sparc-local SMClibgcc
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-3.3.6-sol10-sparc-local SMCsqlite
```

b) on the i386 platform:

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

pkgadd -G -d ./libgcc-3.3-sol10-intel-local SMClibgcc
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-3.3.6-sol10-x86-local SMCsqlite
```

2.3 Installing the VDCF Framework

2.3.1 Overview

The VDCF framework is installed into `/opt/jomasoft/vdcf`. It is recommended to create a separate `/opt` filesystem.

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 compute server. This directory is managed by the system administrator.
<code>/var/opt/jomasoft/vdcf/log</code>	The framework is logging into this directory

2.3.2 Installation

a) sparc platform

```
cd </cdrom/cdrom0>/vdcf/sparc  
  
pkgadd -d ./JSvdcf_<version>_sparc.pkg JSvdcf-base JSvdcf-patch  
  
pkgadd -d ./JSvdcf-vserver_<version>_sparc.pkg JSvdcf-vserver  
pkgadd -d ./JSvdcf-ldom_<version>_sparc.pkg JSvdcf-ldom
```

b) i386 platform

```
cd </cdrom/cdrom0>/vdcf/i386  
  
pkgadd -d ./JSvdcf_<version>_i386.pkg JSvdcf-base JSvdcf-patch  
  
pkgadd -d ./JSvdcf-vserver_<version>_i386.pkg JSvdcf-vserver  
pkgadd -d ./JSvdcf-ldom_<version>_i386.pkg JSvdcf-ldom
```

2.4 Upgrading the VDCF Framework

Use following commands to upgrade VDCF to a new version:

Use this command to display your installed VDCF products:

```
/opt/jomasoft/vdcf/bin/vdcfadm -c show_version
```

Package	Version	Arch.	Install-Date	Name
JSvdcf-base	2.0.0	sparc	Feb 27 2009 11:15	VDCF - Base
JSvdcf-ldom	1.0.0	sparc	Feb 26 2009 10:06	VDCF - Logical Domain Management
JSvdcf-patch	2.0.0	sparc	Feb 27 2009 11:16	VDCF - Patch Management
JSvdcf-rm	1.0.0	sparc	Feb 28 2009 16:44	VDCF - Resource Management
JSvdcf-vserver	2.0.0	sparc	Feb 18 2009 22:00	VDCF - Virtual Server Management

Depending on your VDCF installation you have to remove some VDCF packages first. All VDCF packages depend on the VDCF base package. So remove it at last:

```
pkgrm JSvdcf-vserver JSvdcf-ldom  
pkgrm JSvdcf-patch JSvdcf-base
```

```
cd </cdrom/cdrom0>/vdcf/<platform>
```

```
pkgadd -d ./JSvdcf_<version>_<platform>.pkg JSvdcf-base JSvdcf-patch  
pkgadd -d ./JSvdcf-vserver_<version>_<platform>.pkg JSvdcf-vserver  
pkgadd -d ./JSvdcf-ldom_<version>_<platform>.pkg JSvdcf-ldom
```

Sometimes it may be 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.

2.5 Configuring the VDCF Framework

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

2.5.1 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 1.3 and 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/apache/httpd.conf` for the Apache 1.3 or `/etc/apache2/httpd.conf` for the Apache2.

The default user for apache is usually `nobody`. The user must be updated to `webservd`.

```
User webservd
Group webservd
```

It is highly recommended to create a `VirtualHost` configuration for VDCF. It is even possible to create multiple configuration 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:

a) Apache 1.3

```
/etc/init.d/apache restart
```

b) Apache 2.0

```
svcadm restart apache2    (if apache is already running)
svcadm enable apache2     (if starting for the first time)
```

2.5.2 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
```

2.5.3 Admin Environment

Add the following directories to you shell profile

PATH	<code>/opt/jomasoft/vdcf/bin</code>	VDCF commands
MANPATH	<code>/opt/jomasoft/vdcf/man</code>	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
```

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 filename have 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
```

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)
- 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 2.5.1)
Patch Proxy (port 3816)	<--		Port of patch proxy (optional)
NFS (port 2049)	<--		Required for Flash Archive Transfer (Solaris 10 Update 3 Issue)

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
```