Kerberos LDAP NFSv4

Configuration Guide
2014

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1. Overview

This document explains how to configure NFSv4 Server with Kerberos and LDAP authentication.
Using Kerberos and/or LDAP with NFSv4 enables use of NFSv4 while maintaining each user's and user group's security rights for files and folders..

The goal of this document is to describe how to setup a network to enable the following:

#	User authentication is performed using a central Kerberos server (typically Active Directory)

#	User information (UID/GID/home directories) is stored in a LDAP directory

#	NFS automount information is stored in LDAP

#	NFSv4 authentication using Kerberos is possible with support for legacy NFSv3 mounts.

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1.1. Server Components

NFS server V4

The NFS server stands for Network File Server which is a client/server application designed by Sun Microsystems that allows all network users to access shared files stored on computers of different types. NFS provides access to shared files through an interface called the Virtual File System (VFS) that runs on top of TCP/IP. Users can manipulate shared files as if they were stored locally on the user's own hard disk.

Kerberos Authentication

Kerberos is a secure method for authenticating a request for a service in a computer network. Kerberos lets a user request an encrypted "ticket" from an authentication process that can then be used to request a particular service from a server. The user's password does not have to pass through the network.

LDAP Server

The Lightweight Directory Access Protocol (LDAP) is an application protocol for accessing and maintaining distributed directory information services over an Internet Protocol (IP) network.

Note: SoftNAS does not support installation of Open LDAP servers on the SoftNAS server itself. To use LDAP, you would typically already have an LDAP server running separately in your environment and configure SoftNAS to reference that LDAP server. Refer to the vendor's LDAP server documentation or Open LDAP configuration and setup information (not included with SoftNAS).

2. Kerberos Authentication

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2.1. Prerequisites

The following prerequisites are required for a successful Kerberos install

#	Server packages

#	Time synchronization

#	Host Names

Server Packages

To begin using Kerberos the following packages should be installed in the SoftNAS server.

```
krb5-appl-servers
krb5-appl-clients
krb5-server
krb5-workstation
krb5-auth-dialog
krb5-devel-1.10.3
krb5-pkinit-openssl
krb5-server-ldap

 yum install krb###
### yum -y install krb5-pkinit-openssl krb5-server-ldap
```

Time Synchronization

All machines that will participate in kerberos authentication must have a reliable, synchronized time source. If the difference in time between systems varies by more than a small amount (usually five minutes), systems will not be able to authenticate.
The following error will be displayed in this case, in a Red Hat Enterprise Linux 5 environment

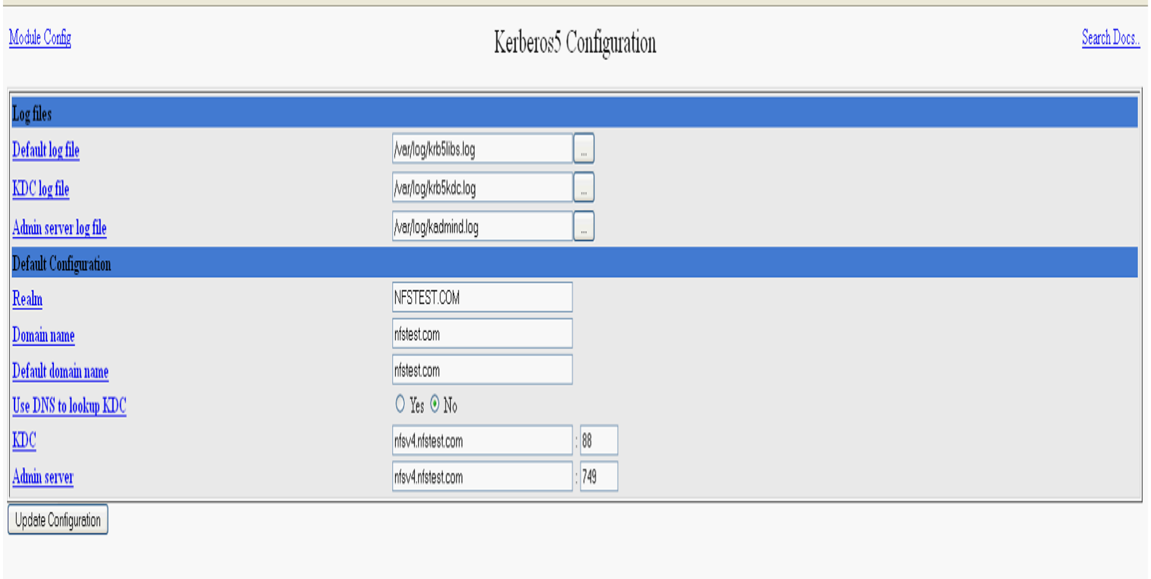
```
kadmin: GSS-API (or Kerberos) error while initializing kadmin interface
```

Resolution:
To resolve this error, it is necessary to ensure that the time between the client and the KDC is synchronized.

### Host Names

All hosts must have their hostname set to the fully qualified hostname as reported by DNS. Both forward and reverse mapping must work properly. If the host name does not match the reverse DNS lookup, Kerberos authentication will fail.
To avoid this in the testing environment we have added the server name inside /etc/hosts file also in the clients hosts file

```
10.185.147.225      nfsv4.nfstest.com   nfsv4 nfstest.com
```



Kerberos5 Configuration

Log files

Default log file /var/log/krb5libs.log

KDC log file /var/log/krb5kdc.log

Admin server log file /var/log/kadmind.log

Default Configuration

Realm NFSTEST.COM

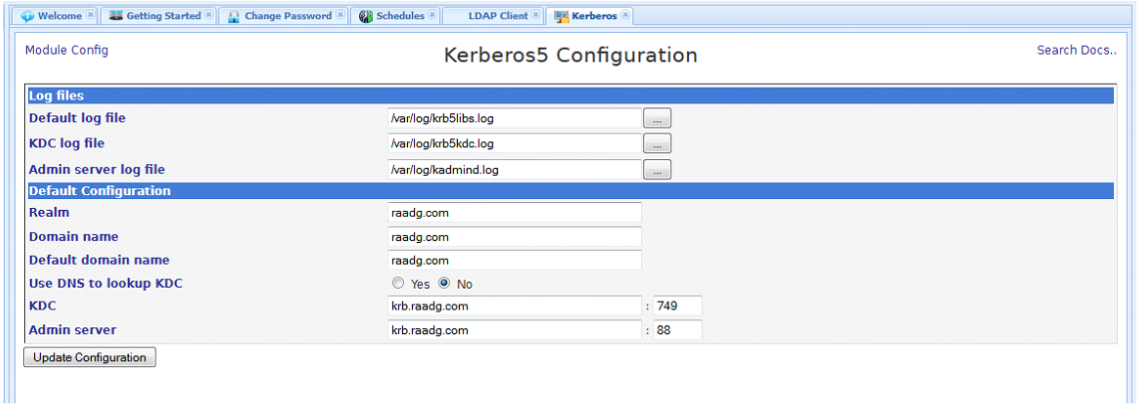
Domain name nfstest.com

Default domain name nfstest.com

Use DNS to lookup KDC ○ Yes ● No

KDC nfsv4.nfstest.com : 88

Admin server nfsv4.nfstest.com : 749



Kerberos5 Configuration

Log files

Default log file /var/log/krb5libs.log

KDC log file /var/log/krb5kdc.log

Admin server log file /var/log/kadmind.log

Default Configuration

Realm raadg.com

Domain name raadg.com

Default domain name raadg.com

Use DNS to lookup KDC ○ Yes ● No

KDC krb.raadg.com : 749

Admin server krb.raadg.com : 88

The Above snapshot is the Kerberos Configuration where are the configuration files

`/etc/krb5.conf && /var/kerberos/krb5kdc/kdc.conf && /var/kerberos/krb5kdc/kadm5.acl`

```
1./etc/krb5.conf
==============
[logging]
default = FILE:/var/log/krb5libs.log
kdc = FILE:/var/log/krb5kdc.log
admin_server = FILE:/var/log/kadmind.log

[libdefaults]
 default_realm = NFSTEST.COM
 dns_lookup_realm = false
 dns_lookup_kdc = false
 clockskew = 120
 ticket_lifetime = 24h
 renew_lifetime = 7d
 forwardable = true

[realms]
```

```
 NFSTEST.COM = {
  kdc = nfsv4.nfstest.com:88
  admin_server = nfsv4.nfstest.com:749
  default_domain = nfstest.com
 }

[domain_realm]
 .nfstest.com = NFSTEST.COM
 nfstest.com = NFSTEST.COM

[appdefaults]
 pam = {
   debug = false
   ticket_lifetime = 36000
   renew_lifetime = 36000
   forwardable = true
   krb4_convert = false
 }
 kinit = {
   ticket_lifetime = 36000
   renew_lifetime = 36000
   forwardable = true
 }

2./var/kerberos/krb5kdc/kdc.conf
==========================
 [kdcdefaults]
 kdc_ports = 88
 kdc_tcp_ports = 88

[realms]
 NFSTEST.COM = {
  acl_file = /var/kerberos/krb5kdc/kadm5.acl
  dict_file = /usr/share/dict/words
  admin_keytab = /var/kerberos/krb5kdc/kadm5.keytab
  supported_enctypes = aes256-cts:normal aes128-cts:normal des3-hmac-sha1:normal des-cbc-
md5:normal des-cbc-crc:normal
 }


3./var/kerberos/krb5kdc/kadm5.acl
========================
 */admin@NFSTEST.COM */
```

2.2. Configuration Steps

After the prerequisites have been met, the following steps are required for a successful configuration

#	Create the Kerberos database

#	Add administrative user

#	Create host principal for the KDC (nfsv4)

#	Setup the default policy

#	Add normal users

#	Perform firewall configuration

Create Kerberos Database

Create the database with the following command.

```
[root@nfsv4] kdb5_util create -s
```

This will prompt you for a password. You will only have to enter this password which is here `nf$Server`

Add the first Administrative User

I do administration as root, so the first user I add is root/admin. The default realm is appended automatically, so the command to use is as follows.

```
[root@nfsv4] kadmin.local -q "addprinc root/admin"
```

Enter a password when prompted which is also `"nf$Server"`

Create a Host Principal for the KDC (nfsv4)

```
[root@nfsv4]# kadmin
  Authenticating as principal root/admin@nfsv4.nfstest.com with password.
  Password for root/admin@nfsv4.nfstest.com:
  kadmin: addprinc -randkey host/nfsv4.nfstest.com
  NOTICE: no policy specified for host/nfsv4.nfstest.com@nfstest.com; assigning "default"
  Principal "host/nfsv4.nfstest.com@nfstest.com " created.
  kadmin: ktadd host/nfsv4.nfstest.com
```

Setup Default Policy

You will want to create the default password policy at this point. All new accounts will have this policy enforced.

```
  [root@nfsv4] kadmin
  Authenticating as principal root/admin@nfstest.com with password.
  Password for root/admin@ nfstest.com:
  kadmin: add_policy -maxlife 180days -minlife 2days -minlength 8 -minclasses 3 -history
10 default
```

Add a normal user

```
[root@ec2-54-204-34-218 config]# kadmin.local -q "addprinc ahmed/users"
Authenticating as principal root/admin@NFSTEST.COM with password.
NOTICE: no policy specified for ahmed/users@NFSTEST.COM; assigning "default"
Enter password for principal "ahmed/users@NFSTEST.COM":
Re-enter password for principal "ahmed/users@NFSTEST.COM":
Principal "ahmed/users@NFSTEST.COM" created.
```

Firewall Configuration

It is highly recommended that a firewall (for example iptables) be used to restrict access. For kerberos to work, the following ports must be opened.

- Clients must be able to reach all KDCs on UDP port 88 (for authentication).
- Clients must be able to reach the primary KDC on TCP port 749 (for password management).
- The primary KDC must be able to reach the secondary KDCs on TCP port 754 (for replication).

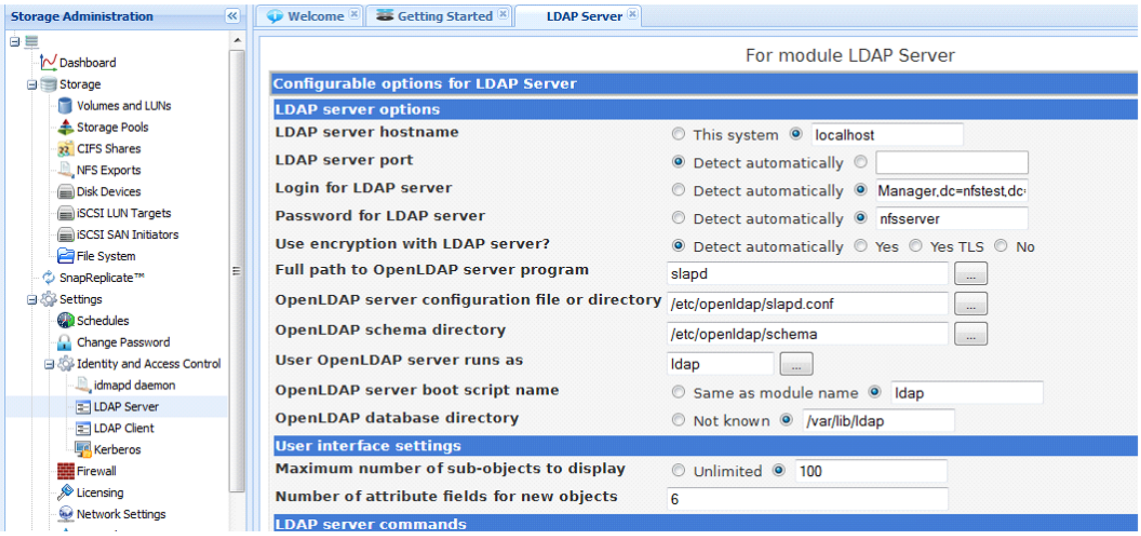
3. Open LDAP Server Configuration

First we have to initialize LDAP server but setting the configuration in the webmin-LDAP-server Module

1. To build root DN for LDAP we have to clear

```
*rm -rf /var/lib/ldap/*
    *rm -rf /etc/openldap/slapd.d/*
    * cp /usr/share/openldap-servers/DB_CONFIG.example  /var/lib/ldap/
    * chown -R ldap.ldap /var/lib/ldap/
```

2. Configure Webmin LDAP module as screenshot



For module LDAP Server

Configurable options for LDAP Server

LDAP server options

LDAP server hostname: ○ This system ● localhost

LDAP server port: ● Detect automatically ○

Login for LDAP server: ○ Detect automatically ● Manager,dc=nfstest,dc

Password for LDAP server: ○ Detect automatically ● nfsserver

Use encryption with LDAP server?: ● Detect automatically ○ Yes ○ Yes TLS ○ No

Full path to OpenLDAP server program: slapd

OpenLDAP server configuration file or directory: /etc/openldap/slapd.conf

OpenLDAP schema directory: /etc/openldap/schema

User OpenLDAP server runs as: ldap

OpenLDAP server boot script name: ○ Same as module name ● ldap

OpenLDAP database directory: ○ Not known ● /var/lib/ldap

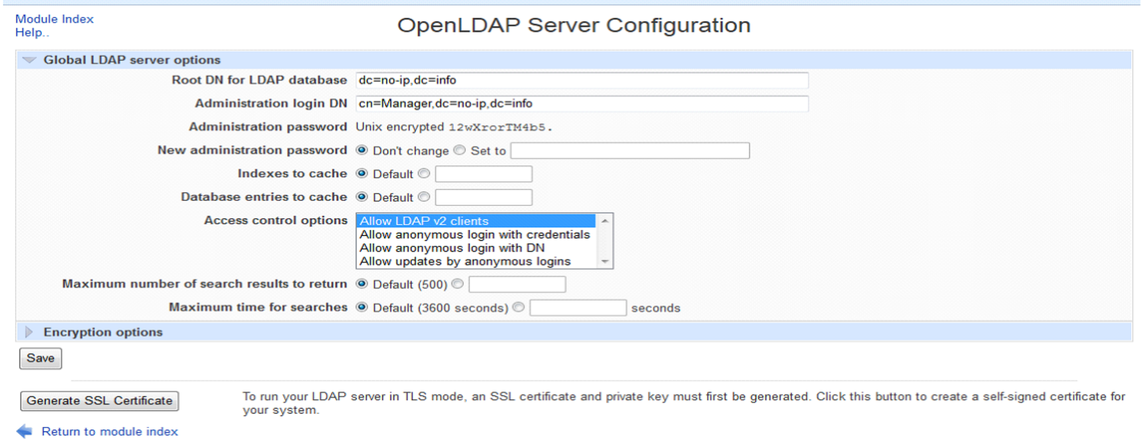
User interface settings

Maximum number of sub-objects to display: ○ Unlimited ● 100

Number of attribute fields for new objects: 6

LDAP server commands

3. Click Save. The openldap server configuration page is displayed.



OpenLDAP Server Configuration

Global LDAP server options

Root DN for LDAP database: dc=no-ip,dc=info

Administration login DN: cn=Manager,dc=no-ip,dc=info

Administration password: Unix encrypted 12wXrorTM4b5.

New administration password: ● Don't change ○ Set to

Indexes to cache: ● Default ○

Database entries to cache: ● Default ○

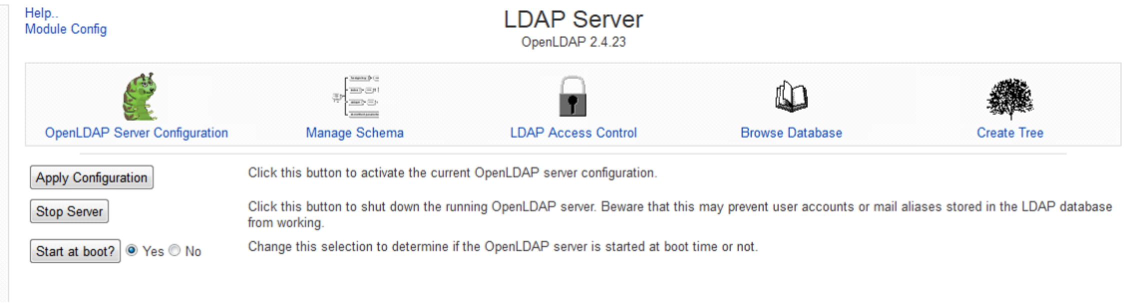
Access control options: Allow LDAP v2 clients
Allow anonymous login with credentials
Allow anonymous login with DN
Allow updates by anonymous logins

Maximum number of search results to return: ● Default (500) ○

Maximum time for searches: ● Default (3600 seconds) ○ seconds

Encryption options

To run your LDAP server in TLS mode, an SSL certificate and private key must first be generated. Click this button to create a self-signed certificate for your system.



LDAP Server

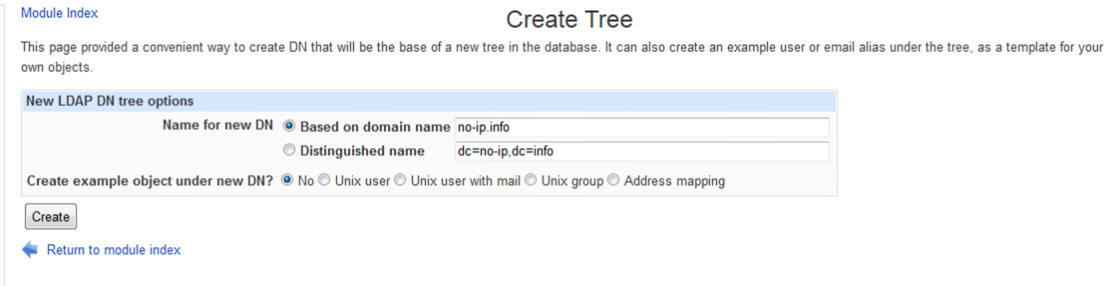
OpenLDAP 2.4.23

Apply Configuration: Click this button to activate the current OpenLDAP server configuration.

Stop Server: Click this button to shut down the running OpenLDAP server. Beware that this may prevent user accounts or mail aliases stored in the LDAP database from working.

Start at boot? ● Yes ○ No: Change this selection to determine if the OpenLDAP server is started at boot time or not.

By clicking on Create Tree



Module Index

Create Tree

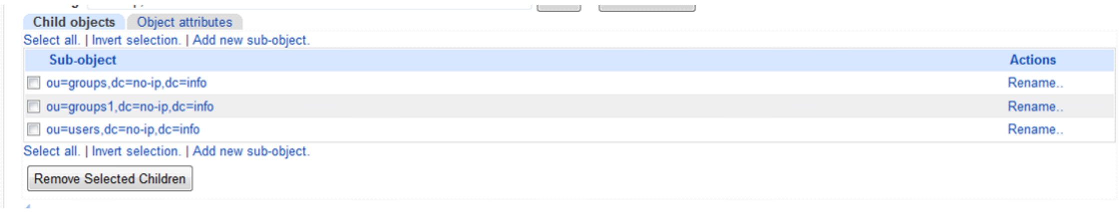
This page provided a convenient way to create DN that will be the base of a new tree in the database. It can also create an example user or email alias under the tree, as a template for your own objects.

New LDAP DN tree options		
Name for new DN	● Based on domain name	no-ip.info
	○ Distinguished name	dc=no-ip,dc=info
Create example object under new DN?	● No ○ Unix user ○ Unix user with mail ○ Unix group ○ Address mapping	

Create

Return to module index

by this check LDAP server for cn=Manger,dc=no-ip,dc=info is created
Next we have to create Organization unit to hold Groups and Users
By clicking "Browse Database"



Child objects | Object attributes

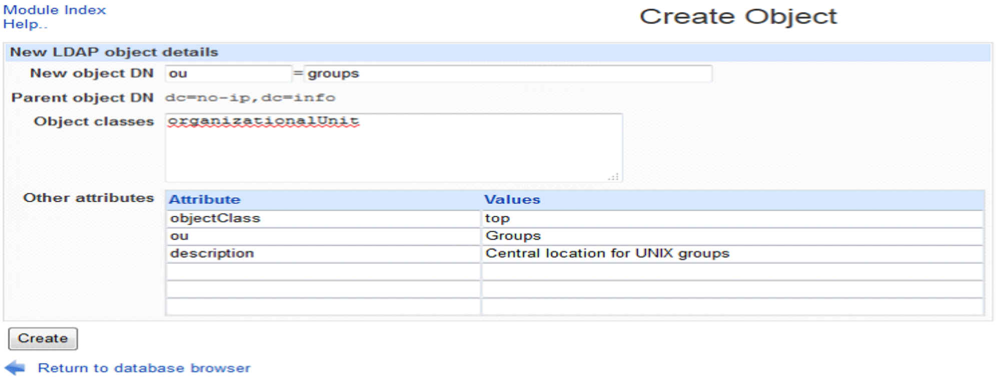
Select all. | Invert selection. | Add new sub-object.

Sub-object	Actions
□ ou=groups,dc=no-ip,dc=info	Rename..
□ ou=groups1,dc=no-ip,dc=info	Rename..
□ ou=users,dc=no-ip,dc=info	Rename..

Select all. | Invert selection. | Add new sub-object.

Remove Selected Children

Click on "Add new sub-object" To have "Groups" "Users" objects for LDAP users and Groups



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Help..

Create Object

New LDAP object details	
New object DN	ou = groups
Parent object DN	dc=no-ip,dc=info
Object classes	organizationalUnit

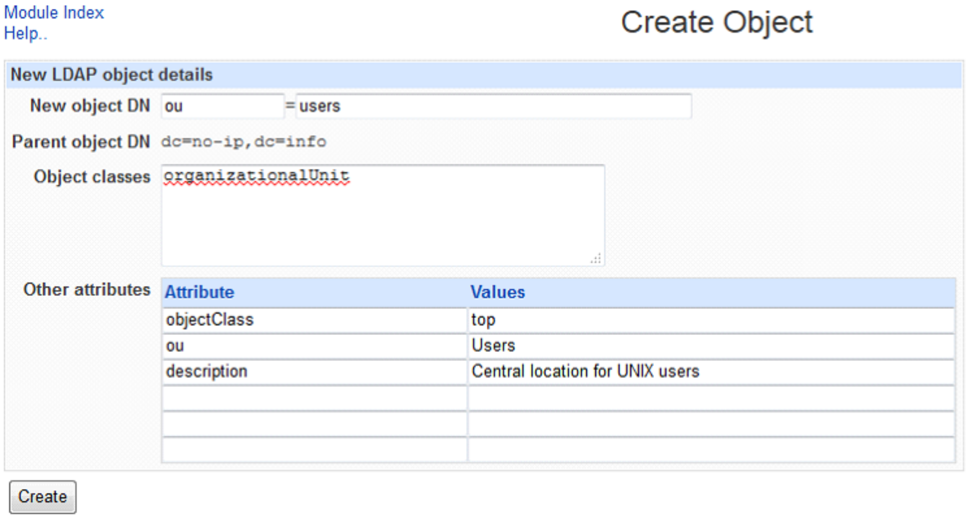
Other attributes

Attribute	Values
objectClass	top
ou	Groups
description	Central location for UNIX groups

Create

Return to database browser

For Users



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Create Object

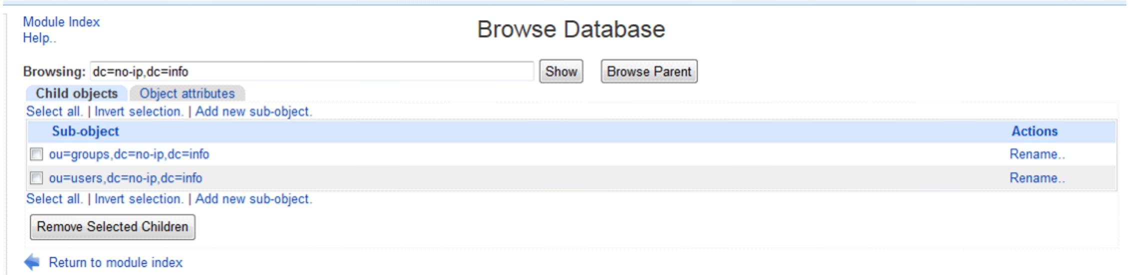
New LDAP object details	
New object DN	ou = users
Parent object DN	dc=no-ip,dc=info
Object classes	organizationalUnit

Other attributes

Attribute	Values
objectClass	top
ou	Users
description	Central location for UNIX users

Create

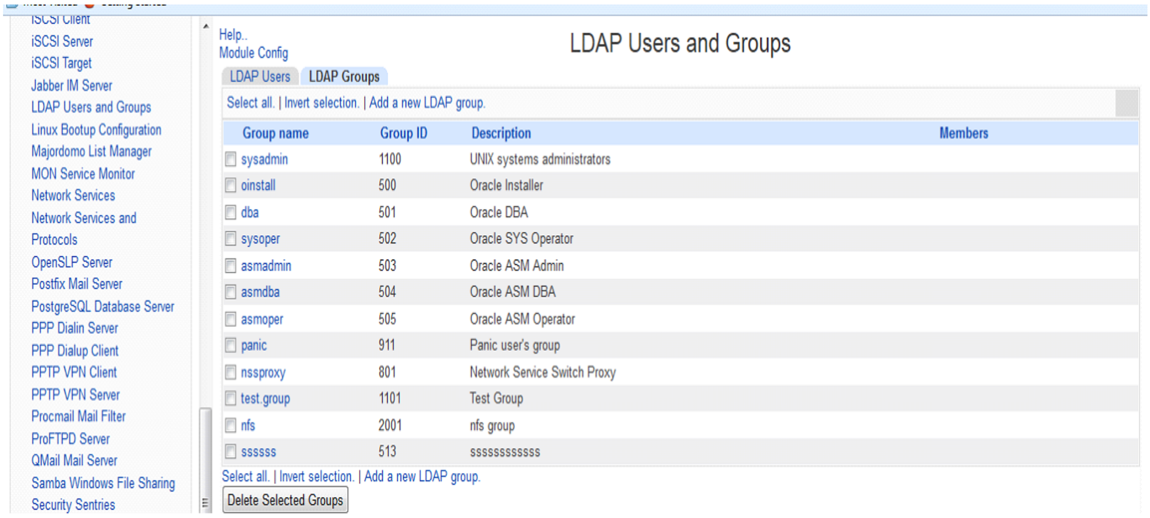
After the above steps we should have something like this



Browsing: dc=no-ip,dc=info

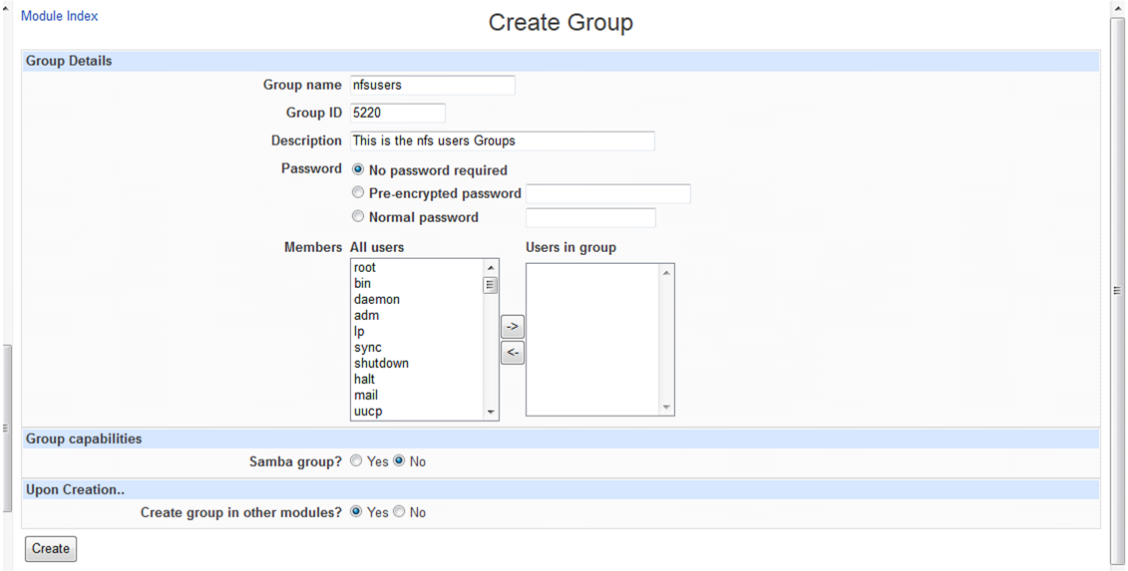
Sub-object	Actions
□ ou=groups,dc=no-ip,dc=info	Rename..
□ ou=users,dc=no-ip,dc=info	Rename..

After this step we can create Groups and Users elements by clicking on " LDAP Users and Groups" At the left Panel



Group name	Group ID	Description	Members
□ sysadmin	1100	UNIX systems administrators	
□ oinstall	500	Oracle Installer	
□ dba	501	Oracle DBA	
□ sysoper	502	Oracle SYS Operator	
□ asmadmin	503	Oracle ASM Admin	
□ asmdba	504	Oracle ASM DBA	
□ asmoper	505	Oracle ASM Operator	
□ panic	911	Panic user's group	
□ nssproxy	801	Network Service Switch Proxy	
□ test.group	1101	Test Group	
□ nfs	2001	nfs group	
□ ssssss	513	ssssssssssss	

Add New LDAP Group



Group name: nfsusers

Group ID: 5220

Description: This is the nfs users Groups

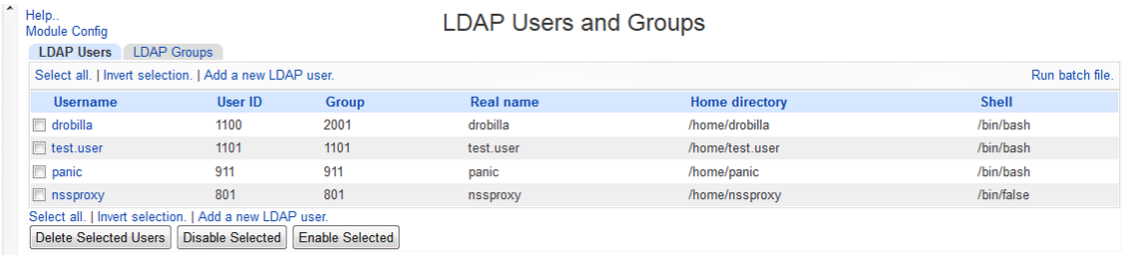
Password: ● No password required ○ Pre-encrypted password ○ Normal password

Members: All users: root, bin, daemon, adm, lp, sync, shutdown, halt, mail, uucp — Users in group:

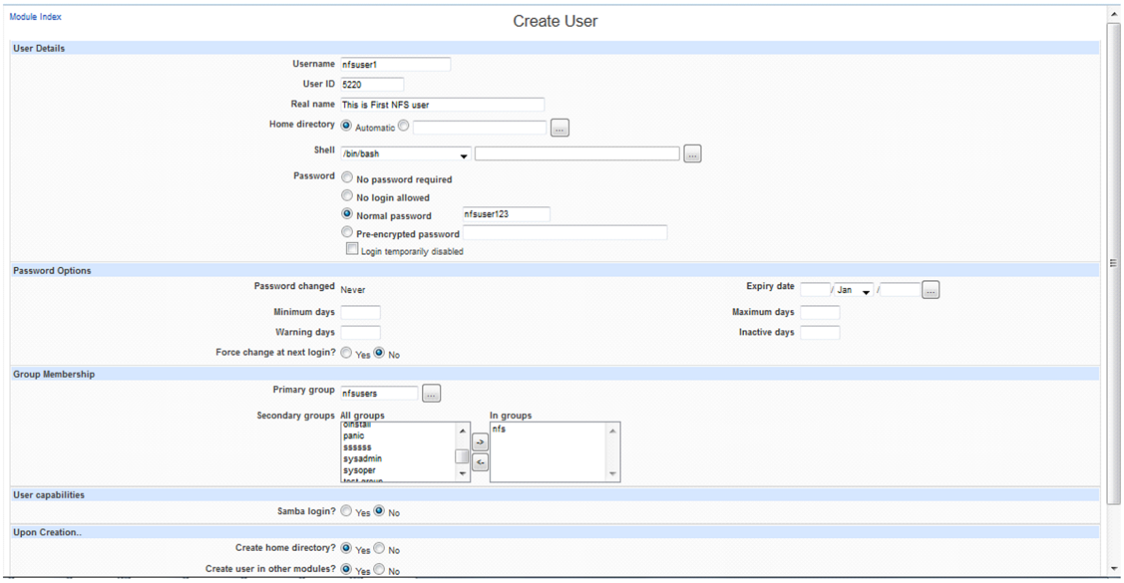
Samba group? ○ Yes ● No

Create group in other modules? ● Yes ○ No

Add new user to nfsusers



Username	User ID	Group	Real name	Home directory	Shell
□ drobilla	1100	2001	drobilla	/home/drobilla	/bin/bash
□ test.user	1101	1101	test.user	/home/test.user	/bin/bash
□ panic	911	911	panic	/home/panic	/bin/bash
□ nssproxy	801	801	nssproxy	/home/nssproxy	/bin/false



Create User

User Details

Username: nfsuser1

User ID: 5220

Real name: This is First NFS user

Home directory: ● Automatic ○

Shell: /bin/bash

Password:
○ No password required
○ No login allowed
● Normal password nfsuser123
○ Pre-encrypted password
□ Login temporarily disabled

Password Options

Password changed: Never

Expiry date: / Jan /

Minimum days:

Maximum days:

Warning days:

Inactive days:

Force change at next login? ○ Yes ● No

Group Membership

Primary group: nfsusers

Secondary groups: All groups: oinstall, panic, ssssss, sysadmin, sysoper, test group — In groups: nfs

User capabilities

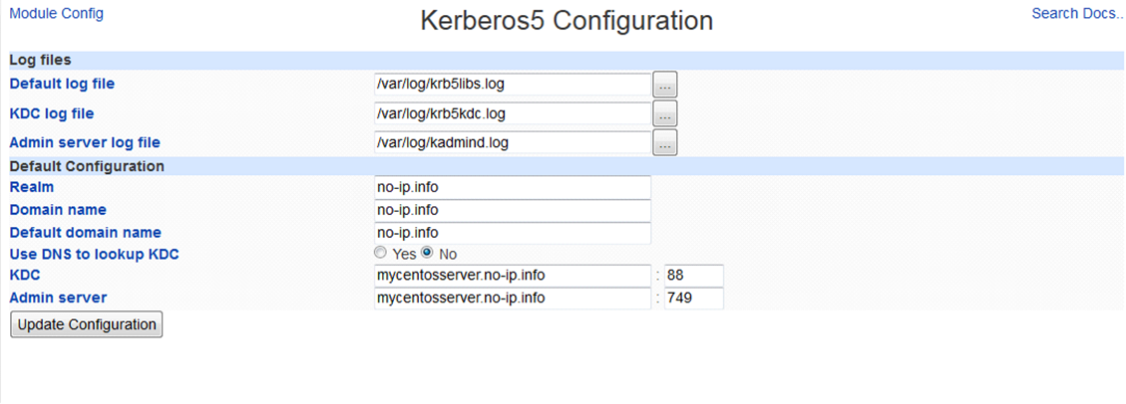
Samba login? ○ Yes ● No

Upon Creation..

Create home directory? ● Yes ○ No

Create user in other modules? ● Yes ○ No

As we talked above how to configure Kerberos5



Kerberos5 Configuration

Log files

Default log file: /var/log/krb5libs.log

KDC log file: /var/log/krb5kdc.log

Admin server log file: /var/log/kadmind.log

Default Configuration

Realm: no-ip.info

Domain name: no-ip.info

Default domain name: no-ip.info

Use DNS to lookup KDC: ○ Yes ● No

KDC: mycentosserver.no-ip.info : 88

Admin server: mycentosserver.no-ip.info : 749

As your LDAP server must be configured to use kerberos. If you are running your LDAP server on the same machine as your kerberos KDC, then everything is setup; otherwise, the following must be configured:

```
/etc/openlad/slapd.conf

access to attr=loginShell
        by dn.regex="uid=.*/admin,cn=GSSAPI,cn=auth" write
        by self write
        by * read
# Only the user can see their employeeNumber
access to attr=employeeNumber
        by dn.regex="uid=.*/admin,cn=GSSAPI,cn=auth" write
        by self read
        by * none
# Default read access for everything else
access to *
        by dn.regex="uid=.*/admin,cn=GSSAPI,cn=auth" write
        by * read
```

3.1. ldap.conf

This file needs to be propagated to each host, including the ldap servers. Only the following three lines need to be present.

```
BASE    dc=no-ip,dc=info
URI     ldaps://mycentosserver.no-ip.info
```

This where all clients are going to point and look for LDAP server.

3.2. Client Setup

Copy Files

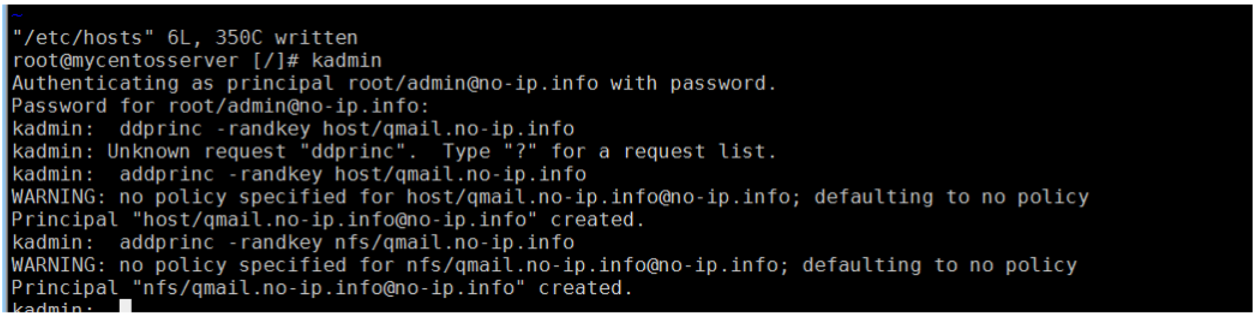
Copy the following files from the KDC or LDAP server.

```
#   /etc/krb5.conf
#   /etc/openldap/ldap.conf
#   /etc/openldap/cacerts/cacert.pem
```

Create Kerberos Principals

Run kadmin on the server and create the following principals. Replace qmail.no-ip.info with the fully qualified name of the client machine. If you don't plan to use NFS, then don't add the second principal. You can always add it now, even if you aren't planning on using NFSv4 at the moment; it won't hurt anything.

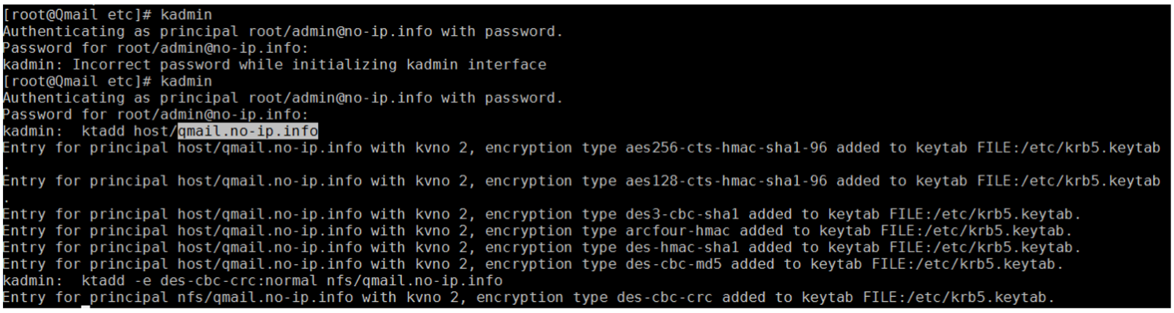
```
[root@mycentosserver]# kadmin
Authenticating as principal root/admin@no-ip.info with password.
Password for root/admin@no-ip.info:
kadmin: addprinc -randkey host/qmail.no-ip.info
kadmin: addprinc -randkey nfs/qmail.no-ip.info
```



```
~
"/etc/hosts" 6L, 350C written
root@mycentosserver [/]# kadmin
Authenticating as principal root/admin@no-ip.info with password.
Password for root/admin@no-ip.info:
kadmin:  ddprinc -randkey host/qmail.no-ip.info
kadmin: Unknown request "ddprinc".  Type "?" for a request list.
kadmin:  addprinc -randkey host/qmail.no-ip.info
WARNING: no policy specified for host/qmail.no-ip.info@no-ip.info; defaulting to no policy
Principal "host/qmail.no-ip.info@no-ip.info" created.
kadmin:  addprinc -randkey nfs/qmail.no-ip.info
WARNING: no policy specified for nfs/qmail.no-ip.info@no-ip.info; defaulting to no policy
Principal "nfs/qmail.no-ip.info@no-ip.info" created.
kadmin:
```

Now run kadmin on the client. Add the above two principals to the keytab file as follows. Note the special way in which the NFS principal is added. This is important or again things will fail in mysterious ways.

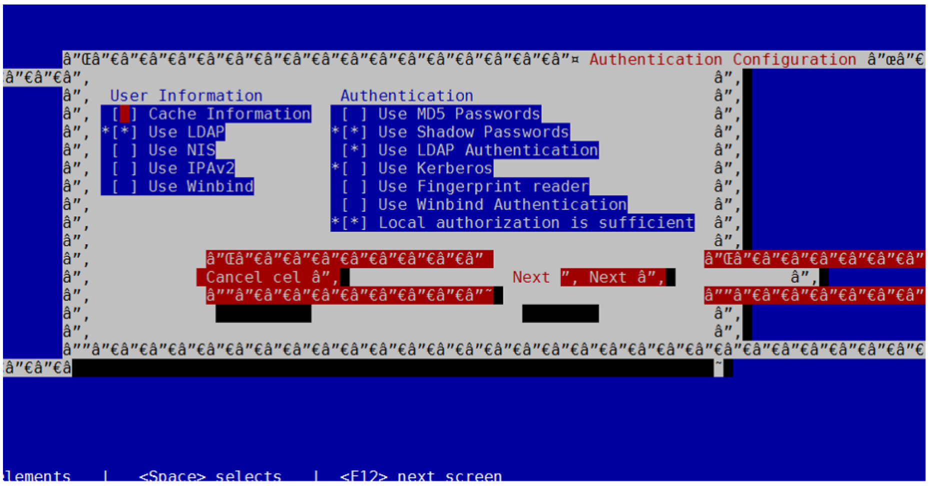
```
[root@qmail ~]# kadmin
Authenticating as principal root/admin@no-ip.info with password.
Password for root/admin@no-ip.info:
kadmin: ktadd host/qmial.no-ip.info
kadmin: ktadd -e des-cbc-crc:normal nfs/qmail.no-ip.info
```



```
[root@Qmail etc]# kadmin
Authenticating as principal root/admin@no-ip.info with password.
Password for root/admin@no-ip.info:
kadmin: Incorrect password while initializing kadmin interface
[root@Qmail etc]# kadmin
Authenticating as principal root/admin@no-ip.info with password.
Password for root/admin@no-ip.info:
kadmin:  ktadd host/qmail.no-ip.info
Entry for principal host/qmail.no-ip.info with kvno 2, encryption type aes256-cts-hmac-sha1-96 added to keytab FILE:/etc/krb5.keytab
.
Entry for principal host/qmail.no-ip.info with kvno 2, encryption type aes128-cts-hmac-sha1-96 added to keytab FILE:/etc/krb5.keytab
.
Entry for principal host/qmail.no-ip.info with kvno 2, encryption type des3-cbc-sha1 added to keytab FILE:/etc/krb5.keytab.
Entry for principal host/qmail.no-ip.info with kvno 2, encryption type arcfour-hmac added to keytab FILE:/etc/krb5.keytab.
Entry for principal host/qmail.no-ip.info with kvno 2, encryption type des-hmac-sha1 added to keytab FILE:/etc/krb5.keytab.
Entry for principal host/qmail.no-ip.info with kvno 2, encryption type des-cbc-md5 added to keytab FILE:/etc/krb5.keytab.
kadmin:  ktadd -e des-cbc-crc:normal nfs/qmail.no-ip.info
Entry for principal nfs/qmail.no-ip.info with kvno 2, encryption type des-cbc-crc added to keytab FILE:/etc/krb5.keytab.
```

Enable Authentication

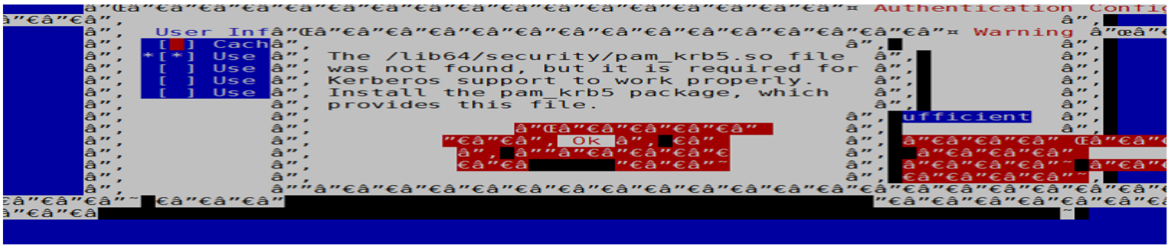
Run the configuration tool by typing authconfig at the shell prompt. You will need to check 'Use LDAP' under 'User Information' and 'Use Kerberos' under 'Authentication'.



```
Authentication Configuration

 User Information            Authentication
 [ ] Cache Information       [ ] Use MD5 Passwords
 [*] Use LDAP                [*] Use Shadow Passwords
 [ ] Use NIS                 [*] Use LDAP Authentication
 [ ] Use IPAv2               [ ] Use Kerberos
 [ ] Use Winbind             [ ] Use Fingerprint reader
                             [ ] Use Winbind Authentication
                             [*] Local authorization is sufficient
```

After Hit Next you may face this error

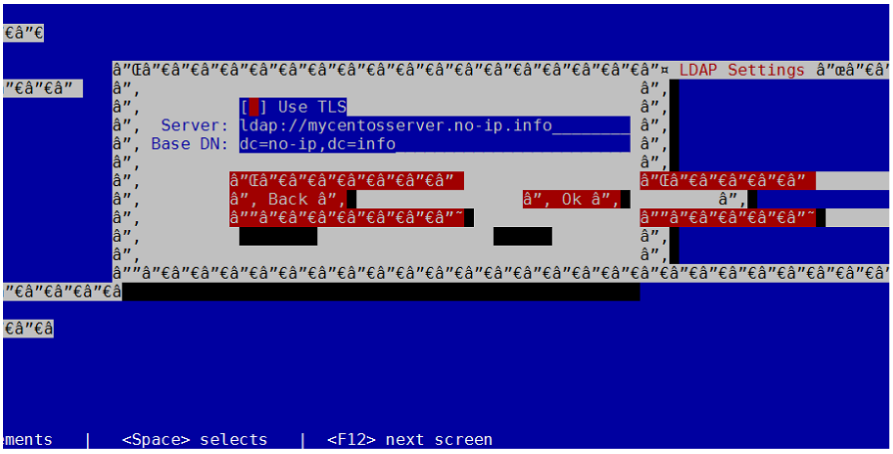


```
Warning

The /lib64/security/pam_krb5.so file
was not found, but it is required for
Kerberos support to work properly.
Install the pam_krb5 package, which
provides this file.
```

yum install pam_krb5

Hit Next



```
LDAP Settings

          [ ] Use TLS
  Server: ldap://mycentosserver.no-ip.info_______
 Base DN: dc=no-ip,dc=info
```

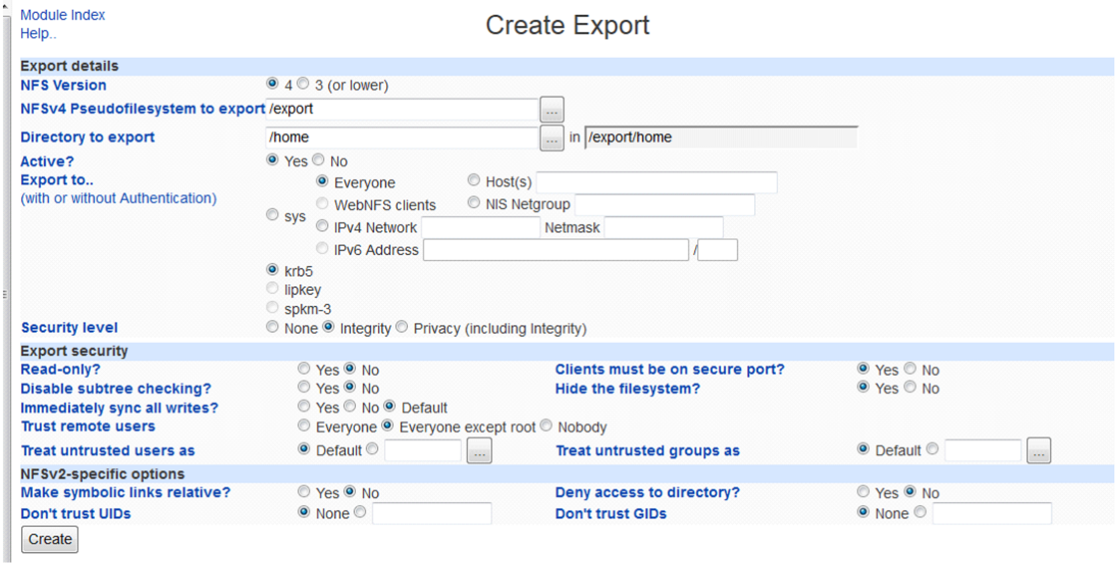
Due to we copy /etc/openldap/ldap So you should see the contents

At this point the LDAP && Kerberos are configured to get informations from ldap and auth from Kerbros.

4. NFSv4 Configuration

We need know to share /home using /export/home to share all LDAP_USER_HOMEDIR.

The following screens show how to configure the export:



Module Index
Help..

Create Export

Export details

NFS Version ● 4 ○ 3 (or lower)

NFSv4 Pseudofilesystem to export /export [...]

Directory to export /home [...] in /export/home

Active? ● Yes ○ No

Export to..
(with or without Authentication)

○ sys
- ● Everyone ○ Host(s)
- ○ WebNFS clients ○ NIS Netgroup
- ○ IPv4 Network Netmask
- ○ IPv6 Address /

● krb5
○ lipkey
○ spkm-3

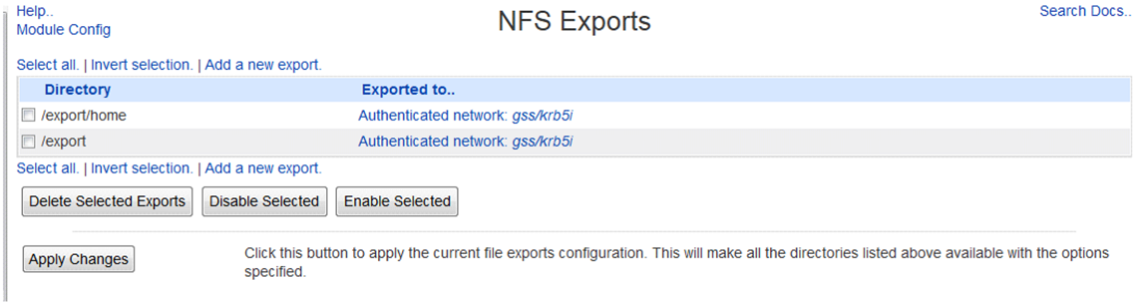
Security level ○ None ● Integrity ○ Privacy (including Integrity)

Export security

Read-only? ○ Yes ● No
Clients must be on secure port? ● Yes ○ No
Disable subtree checking? ○ Yes ● No
Hide the filesystem? ● Yes ○ No
Immediately sync all writes? ○ Yes ○ No ● Default
Trust remote users ○ Everyone ● Everyone except root ○ Nobody
Treat untrusted users as ● Default ○ [...]
Treat untrusted groups as ● Default ○ [...]

NFSv2-specific options

Make symbolic links relative? ○ Yes ● No
Deny access to directory? ○ Yes ● No
Don't trust UIDs ● None ○
Don't trust GIDs ● None ○



Help..
Module Config

NFS Exports

Search Docs..

Select all. | Invert selection. | Add a new export.

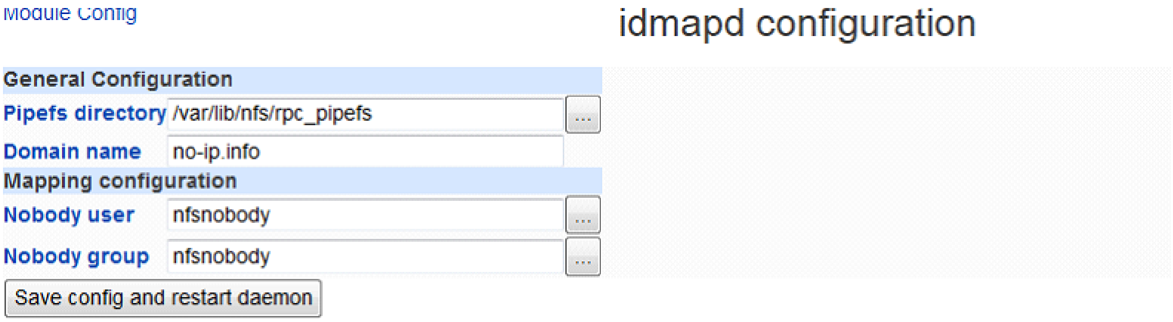
	Directory	Exported to..
□	/export/home	Authenticated network: *gss/krb5i*
□	/export	Authenticated network: *gss/krb5i*

Select all. | Invert selection. | Add a new export.

Click this button to apply the current file exports configuration. This will make all the directories listed above available with the options specified.

4.1. Modify /etc/idmapd.conf

You must change the domain to your current domain. Also, The user mapping for nobody should be updated.



idmapd configuration

General Configuration

Pipefs directory	/var/lib/nfs/rpc_pipefs
Domain name	no-ip.info

Mapping configuration

Nobody user	nfsnobody
Nobody group	nfsnobody

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4.2. Modify /etc/sysconfig/nfs

To enable secure NFS, you must add the following line to /etc/sysconfig/nfs

```
SECURE_NFS=yes
```

If you are still using NFSv3 and a firewall, you may want to add the following definitions as well. Choose ports that are appropriate to your environment, although the listed values work well for us.

```
STATD_PORT=4000
LOCKD_TCPPORT=4001
LOCKD_UDPPORT=4001
MOUNTD_PORT=4002
RQUOTAD_PORT=4003
```

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