Pacemaker 1.1

Clusters from Scratch

Crearea de Clustere Active/Pasive și Active/Active pe Fedora

Andrew Beekhof

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Ediție 5

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Scopul acestui document este de a furniza un ghid de la început-la-sfârșit despre cum să construiți un exemplu de cluster activ/pasiv cu Pacemaker și de a arăta cum poate fi convertit la unul de tip activ/activ.

Clusterul din exemplu va folosi:

1. Fedora 13 ca sistem de operare gazdă

2. Corosync pentru a furniza servicii de mesagerie și apartenență,

3. Pacemaker pentru a efectua gestiunea resurselor,

4. DRBD ca o alternativă eficientă ca și cost pentru spațiu de stocare partajat,

5. GFS2 ca și sistem de fișiere de cluster (în mod activ/activ)

6. Shell-ul crm pentru vizualizarea configurației și pentru realizarea de modificări

Dată fiind natura grafică a procesului de instalare al Fedora, un număr de capturi de ecran sunt incluse. Însă ghidul este compus în mod primar din comenzi, motivele pentru care sunt executate și rezultatele de ieșire așteptate ale acestora.

[1] An explanation of CC-BY-SA is available at *http://creativecommons.org/licenses/by-sa/3.0/*

Cuprins

Listă de figuri

Prefață

Cuprins

1. Document Conventions

This manual uses several conventions to highlight certain words and phrases and draw attention to specific pieces of information.

In PDF and paper editions, this manual uses typefaces drawn from the *Liberation Fonts*[1] set. The Liberation Fonts set is also used in HTML editions if the set is installed on your system. If not, alternative but equivalent typefaces are displayed. Note: Red Hat Enterprise Linux 5 and later include the Liberation Fonts set by default.

1.1. Typographic Conventions

Four typographic conventions are used to call attention to specific words and phrases. These conventions, and the circumstances they apply to, are as follows.

`Mono-spaced Bold`

Used to highlight system input, including shell commands, file names and paths. Also used to highlight keys and key combinations. For example:

> To see the contents of the file **`my_next_bestselling_novel`** in your current working directory, enter the **`cat my_next_bestselling_novel`** command at the shell prompt and press **`Enter`** to execute the command.

The above includes a file name, a shell command and a key, all presented in mono-spaced bold and all distinguishable thanks to context.

Key combinations can be distinguished from an individual key by the plus sign that connects each part of a key combination. For example:

> Press **`Enter`** to execute the command.
>
> Press **`Ctrl`**+**`Alt`**+**`F2`** to switch to a virtual terminal.

The first example highlights a particular key to press. The second example highlights a key combination: a set of three keys pressed simultaneously.

If source code is discussed, class names, methods, functions, variable names and returned values mentioned within a paragraph will be presented as above, in **`mono-spaced bold`**. For example:

[1] https://fedorahosted.org/liberation-fonts/

File-related classes include **filesystem** for file systems, **file** for files, and **dir** for directories. Each class has its own associated set of permissions.

Proportional Bold

This denotes words or phrases encountered on a system, including application names; dialog box text; labeled buttons; check-box and radio button labels; menu titles and sub-menu titles. For example:

Choose **System** → **Preferences** → **Mouse** from the main menu bar to launch **Mouse Preferences**. In the **Buttons** tab, select the **Left-handed mouse** check box and click **Close** to switch the primary mouse button from the left to the right (making the mouse suitable for use in the left hand).

To insert a special character into a **gedit** file, choose **Applications** → **Accessories** → **Character Map** from the main menu bar. Next, choose **Search** → **Find…** from the **Character Map** menu bar, type the name of the character in the **Search** field and click **Next**. The character you sought will be highlighted in the **Character Table**. Double-click this highlighted character to place it in the **Text to copy** field and then click the **Copy** button. Now switch back to your document and choose **Edit** → **Paste** from the **gedit** menu bar.

The above text includes application names; system-wide menu names and items; application-specific menu names; and buttons and text found within a GUI interface, all presented in proportional bold and all distinguishable by context.

Mono-spaced Bold Italic or ***Proportional Bold Italic***

Whether mono-spaced bold or proportional bold, the addition of italics indicates replaceable or variable text. Italics denotes text you do not input literally or displayed text that changes depending on circumstance. For example:

To connect to a remote machine using ssh, type **ssh *username*@*domain.name*** at a shell prompt. If the remote machine is **example.com** and your username on that machine is john, type **ssh john@example.com**.

The **mount -o remount *file-system*** command remounts the named file system. For example, to remount the **/home** file system, the command is **mount -o remount /home**.

To see the version of a currently installed package, use the **rpm -q *package*** command. It will return a result as follows: ***package-version-release***.

Note the words in bold italics above — username, domain.name, file-system, package, version and release. Each word is a placeholder, either for text you enter when issuing a command or for text displayed by the system.

Aside from standard usage for presenting the title of a work, italics denotes the first use of a new and important term. For example:

Publican is a *DocBook* publishing system.

1.2. Pull-quote Conventions

Terminal output and source code listings are set off visually from the surrounding text.

Output sent to a terminal is set in **mono-spaced roman** and presented thus:

```
books        Desktop   documentation  drafts  mss    photos   stuff  svn
books_tests  Desktop1  downloads      images  notes  scripts  svgs
```

Source-code listings are also set in **mono-spaced roman** but add syntax highlighting as follows:

```
package org.jboss.book.jca.ex1;

import javax.naming.InitialContext;

public class ExClient
{
   public static void main(String args[])
       throws Exception
   {
      InitialContext iniCtx = new InitialContext();
      Object         ref    = iniCtx.lookup("EchoBean");
      EchoHome       home   = (EchoHome) ref;
      Echo           echo   = home.create();

      System.out.println("Created Echo");

      System.out.println("Echo.echo('Hello') = " + echo.echo("Hello"));
   }
}
```

1.3. Notes and Warnings

Finally, we use three visual styles to draw attention to information that might otherwise be overlooked.

Notă

Notes are tips, shortcuts or alternative approaches to the task at hand. Ignoring a note should have no negative consequences, but you might miss out on a trick that makes your life easier.

Important

Important boxes detail things that are easily missed: configuration changes that only apply to the current session, or services that need restarting before an update will apply. Ignoring a box labeled 'Important' will not cause data loss but may cause irritation and frustration.

Avertisment

Warnings should not be ignored. Ignoring warnings will most likely cause data loss.

2. We Need Feedback!

If you find a typographical error in this manual, or if you have thought of a way to make this manual better, we would love to hear from you! Please submit a report in Bugzilla[2] against the product **Pacemaker.**

When submitting a bug report, be sure to mention the manual's identifier: *Clusters_from_Scratch*

If you have a suggestion for improving the documentation, try to be as specific as possible when describing it. If you have found an error, please include the section number and some of the surrounding text so we can find it easily.

[2] *http://bugs.clusterlabs.org*

Citeşte-mă-Întâi-pe-Mine

Cuprins

1.1. Domeniul de Aplicare al acestui Document

Clusterele de calculatoare pot fi folosite pentru a furniza servicii sau resurse cu disponibilitate crescută. Redundanța mai multor mașini este folosită pentru a proteja împotriva eșecurilor de multe feluri.

This document will walk through the installation and setup of simple clusters using the Fedora distribution, version 14.

The clusters described here will use Pacemaker and Corosync to provide resource management and messaging. Required packages and modifications to their configuration files are described along with the use of the Pacemaker command line tool for generating the XML used for cluster control.

Pacemaker este o componentă centrală şi furnizează gestiunea resurselor necesară în aceste sisteme. Această gestiune include detectarea și recuperarea de la eșecul diverselor noduri, resurselor și serviciilor care sunt sub controlul acestuia.

Când sunt necesare informații mai aprofundate și pentru utilizarea în lumea reală, vă rugăm să faceți referință la manualul *Pacemaker Explained*[1].

1.2. Ce Este Pacemaker?

Pacemaker is a cluster resource manager. It achieves maximum availability for your cluster services (aka. resources) by detecting and recovering from node and resource-level failures by making use of the messaging and membership capabilities provided by your preferred cluster infrastructure (either Corosync or Heartbeat).

Pacemaker's key features include:

- Detectarea şi recuperarea eşecurilor la nivel de nod şi serviciu
- Agnostic d.p.d.v. al stocării, nu sunt cerinţe pentru spaţiu de stocare partajat
- Agnostic d.p.d.v. al resurselor, orice poate fi scriptat poate fi folosit într-un cluster
- Supports STONITH for ensuring data integrity
- Suportă clustere mici şi mari

[1] http://www.clusterlabs.org/doc/

- Supports both quorate and resource driven clusters
- Supports practically any redundancy configuration
- Configuraţie replicată în mod automat care poate fi actualizată de pe orice nod
- Abilitatea de a specifica ordonare, colocare şi anti-colocare la nivelul întregului cluster
- Suport pentru tipuri de servicii avansate
  - Clone: pentru servicii care trebuie să fie active pe mai multe noduri
  - Stări-multiple: pentru servicii cu mai multe moduri de operare (ex. master/slave, primar/secundar)
- Shell de cluster unificat, scriptabil

1.3. Arhitectura Pacemaker

La cel mai înalt nivel, clusterul este compus din trei părţi:

- Non-cluster aware components (illustrated in green). These pieces include the resources themselves, scripts that start, stop and monitor them, and also a local daemon that masks the differences between the different standards these scripts implement.
- Resource management Pacemaker provides the brain (illustrated in blue) that processes and reacts to events regarding the cluster. These events include nodes joining or leaving the cluster; resource events caused by failures, maintenance, scheduled activities; and other administrative actions. Pacemaker will compute the ideal state of the cluster and plot a path to achieve it after any of these events. This may include moving resources, stopping nodes and even forcing them offline with remote power switches.
- Low level infrastructure Corosync provides reliable messaging, membership and quorum information about the cluster (illustrated in red).

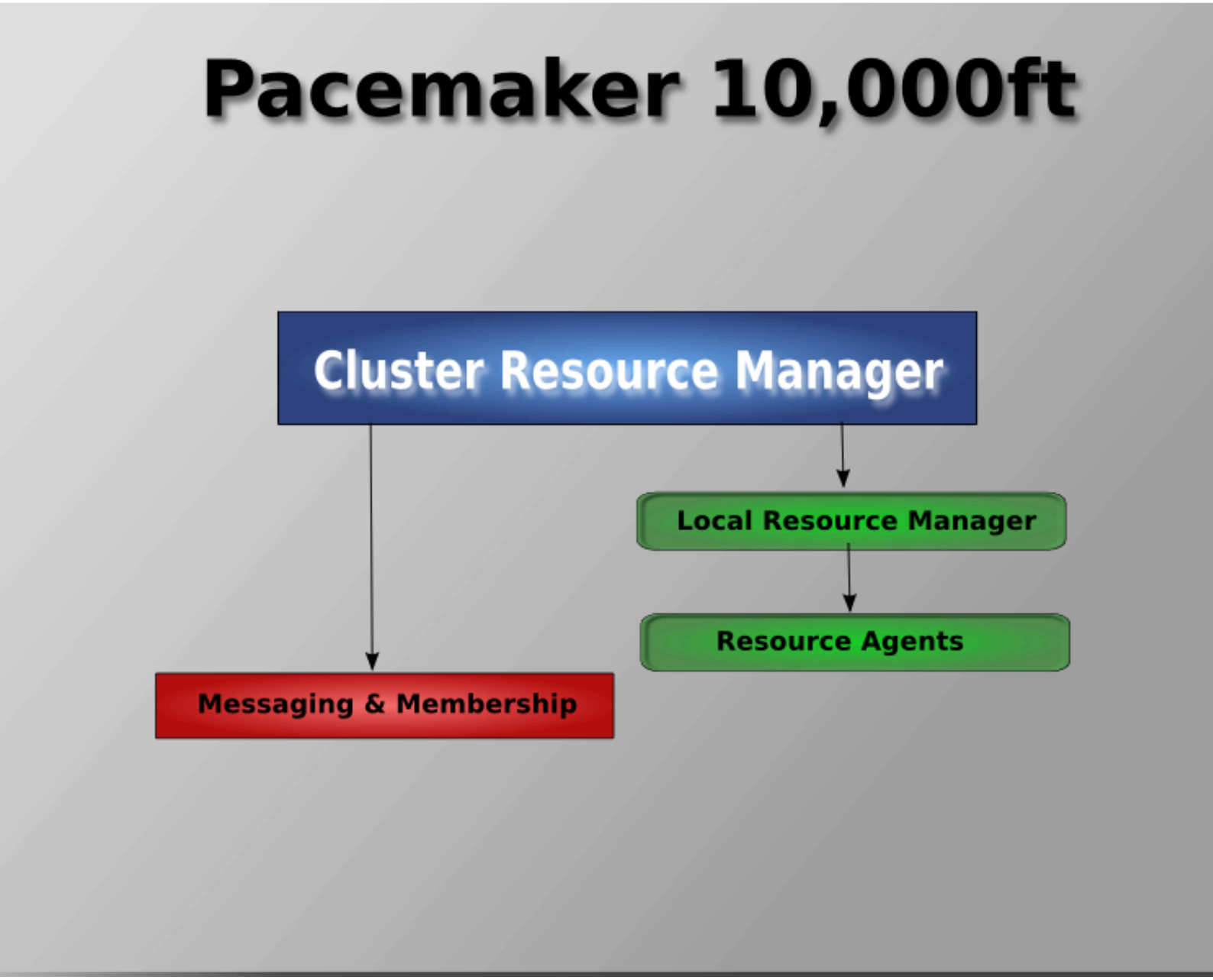


Fig. 1.1. Vederea Conceptuală a Stivei

When combined with Corosync, Pacemaker also supports popular open source cluster filesystems. [2]

Due to recent standardization within the cluster filesystem community, they make use of a common distributed lock manager which makes use of Corosync for its messaging capabilities and Pacemaker for its membership (which nodes are up/down) and fencing services.

[2] Even though Pacemaker also supports Heartbeat, the filesystems need to use the stack for messaging and membership and Corosync seems to be what they're standardizing on. Technically it would be possible for them to support Heartbeat as well, however there seems little interest in this.

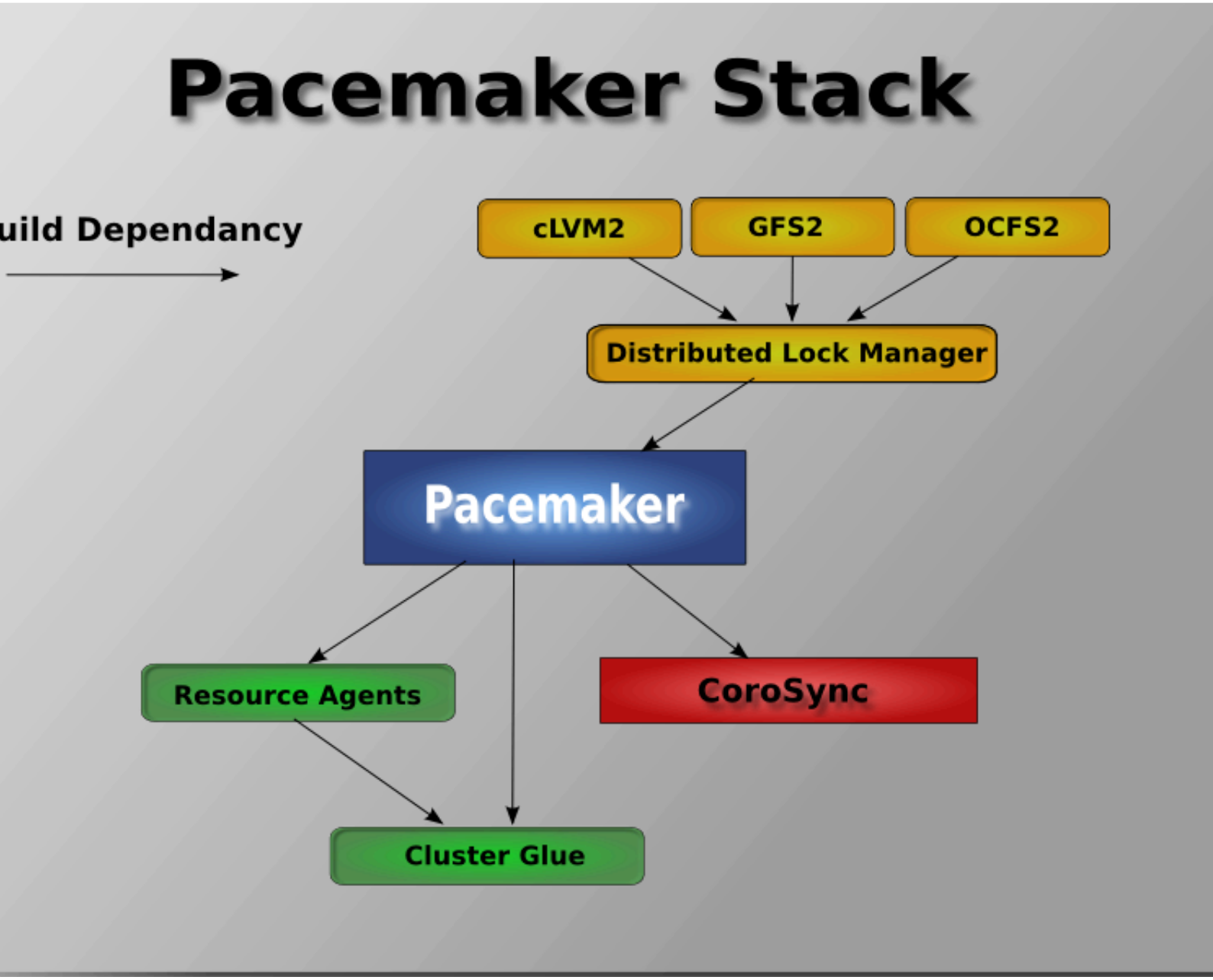


Fig. 1.2. Stiva Pacemaker

1.3.1. Componente Interne

Pacemaker însuşi este compus din patru componente cheie (ilustrate mai jos cu aceeaşi schemă de culori ca şi în diagrama anterioară):

- CIB (aka. Cluster Information Base)
- CRMd (aka. Cluster Resource Management daemon)
- PEngine (aka. PE sau Policy Engine)
- STONITHd

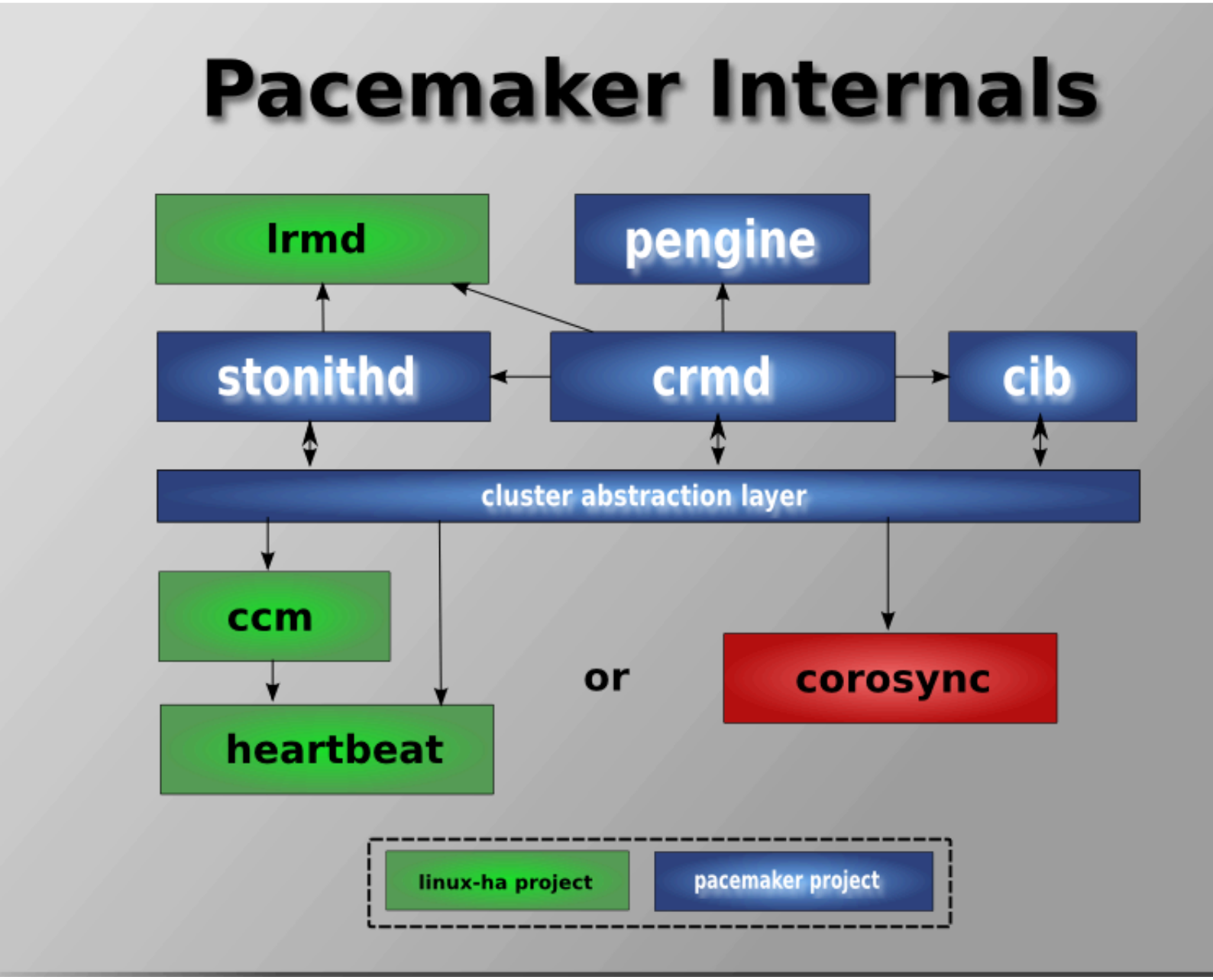


Fig. 1.3. Componente Interne

The CIB uses XML to represent both the cluster's configuration and current state of all resources in the cluster. The contents of the CIB are automatically kept in sync across the entire cluster and are used by the PEngine to compute the ideal state of the cluster and how it should be achieved.

This list of instructions is then fed to the DC (Designated Co-ordinator). Pacemaker centralizes all cluster decision making by electing one of the CRMd instances to act as a master. Should the elected CRMd process, or the node it is on, fail… a new one is quickly established.

The DC carries out the PEngine's instructions in the required order by passing them to either the LRMd (Local Resource Management daemon) or CRMd peers on other nodes via the cluster messaging infrastructure (which in turn passes them on to their LRMd process).

Nodurile vecine raportează toate rezultatele operaţiunilor înapoi către DC şi pe baza rezultatelor aşteptate şi a rezultatelor actuale, fie va executa orice acţiuni care necesitau să aştepte ca şi cele anterioare să termine sau va anula procesarea şi va ruga PEngine-ul să recalculeze starea ideală a clusterului pe baza rezultatelor neaşteptate.

În anumite cazuri, ar putea fi necesar să oprească alimentarea nodurilor pentru a proteja datele partajate sau pentru a termina recuperarea resurselor. Pentru acest lucru Pacemaker vine cu STONITHd. STONITH este un acronim pentru Shoot-The-Other-Node-In-The-Head (împuşcă celălalt nod în cap) şi este implementat de obicei cu un switch de alimentare cu curent controlat de la distanţă. În Pacemaker, dispozitivele STONITH sunt modelate precum resursele (şi configurate în CIB) pentru a permite monitorizarea facilă a acestora în caz de eşec, totuşi STONITHd se ocupă de înţelegerea topologiei STONITH astfel încât clienţii acestuia să solicite pur şi simplu ca un nod să fie evacuat forţat şi acesta se va ocupa de rest.

1.4. Tipuri de Clustere Pacemaker

Pacemaker nu face nici un fel de presupuneri despre mediul vostru, acest aspect îi permite să suporte practic orice *configuraţie redundantă*[3] incluzând Activ/Activ, Activ/Pasiv, N+1, N+M, N-la-1 şi N-la-N.

În acest document ne vom concentra pe setarea unui server web Apache cu disponibilitate crescută cu un cluster Activ/Pasiv folosind DRBD și Ext4 pentru a stoca datele. Apoi, vom actualiza clusterul la Activ/Activ folosind GFS2.

[3] http://en.wikipedia.org/wiki/High-availability_cluster#Node_configurations

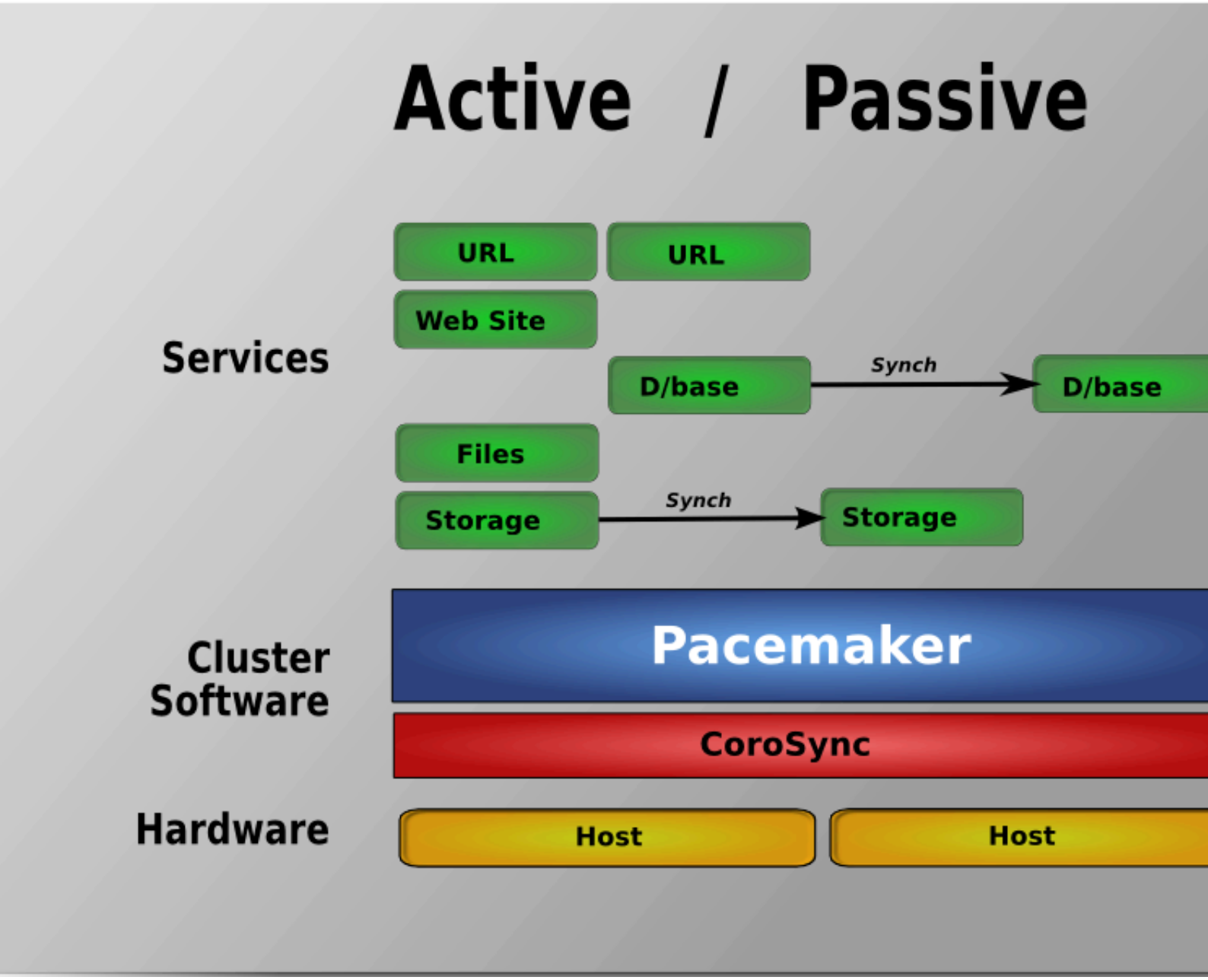


Fig. 1.4. Redundanţă Activă/Pasivă

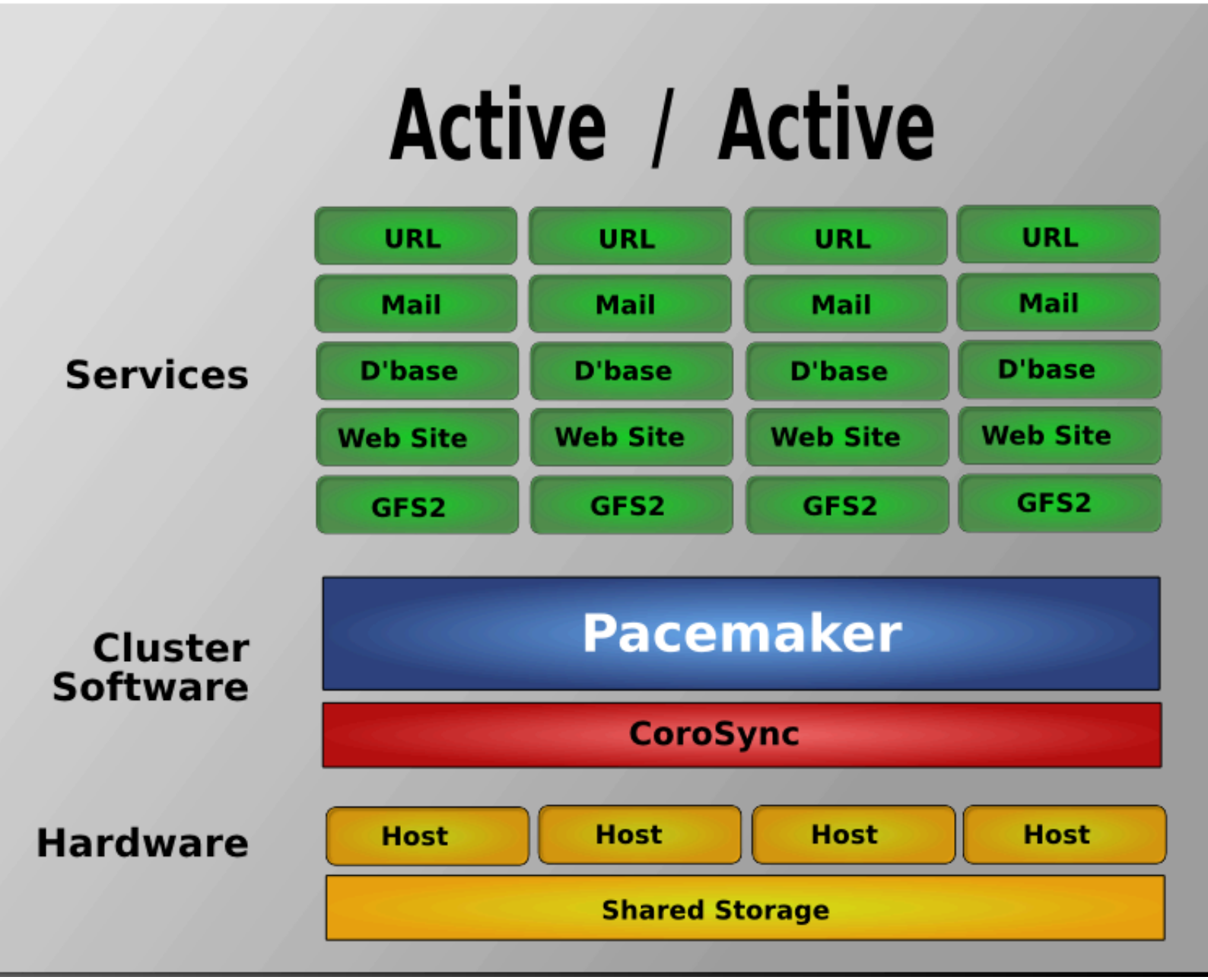


Fig. 1.5. Redundanţă N la N

Instalare

Cuprins

2.1. Instalarea Sistemului de Operare

Detailed instructions for installing Fedora are available at *http://docs.fedoraproject.org/install-guide/f13/* in a number of languages. The abbreviated version is as follows…

Point your browser to *http://fedoraproject.org/en/get-fedora-all*, locate the Install Media section and download the install DVD that matches your hardware.

Burn the disk image to a DVD [1] and boot from it. Or use the image to boot a virtual machine as I have done here. After clicking through the welcome screen, select your language and keyboard layout [2]

[1] *http://docs.fedoraproject.org/readme-burning-isos/en-US.html*
[2] *http://docs.fedoraproject.org/install-guide/f13/en-US/html/s1-langselection-x86.html*

Fig. 2.1. Installation: Good choice

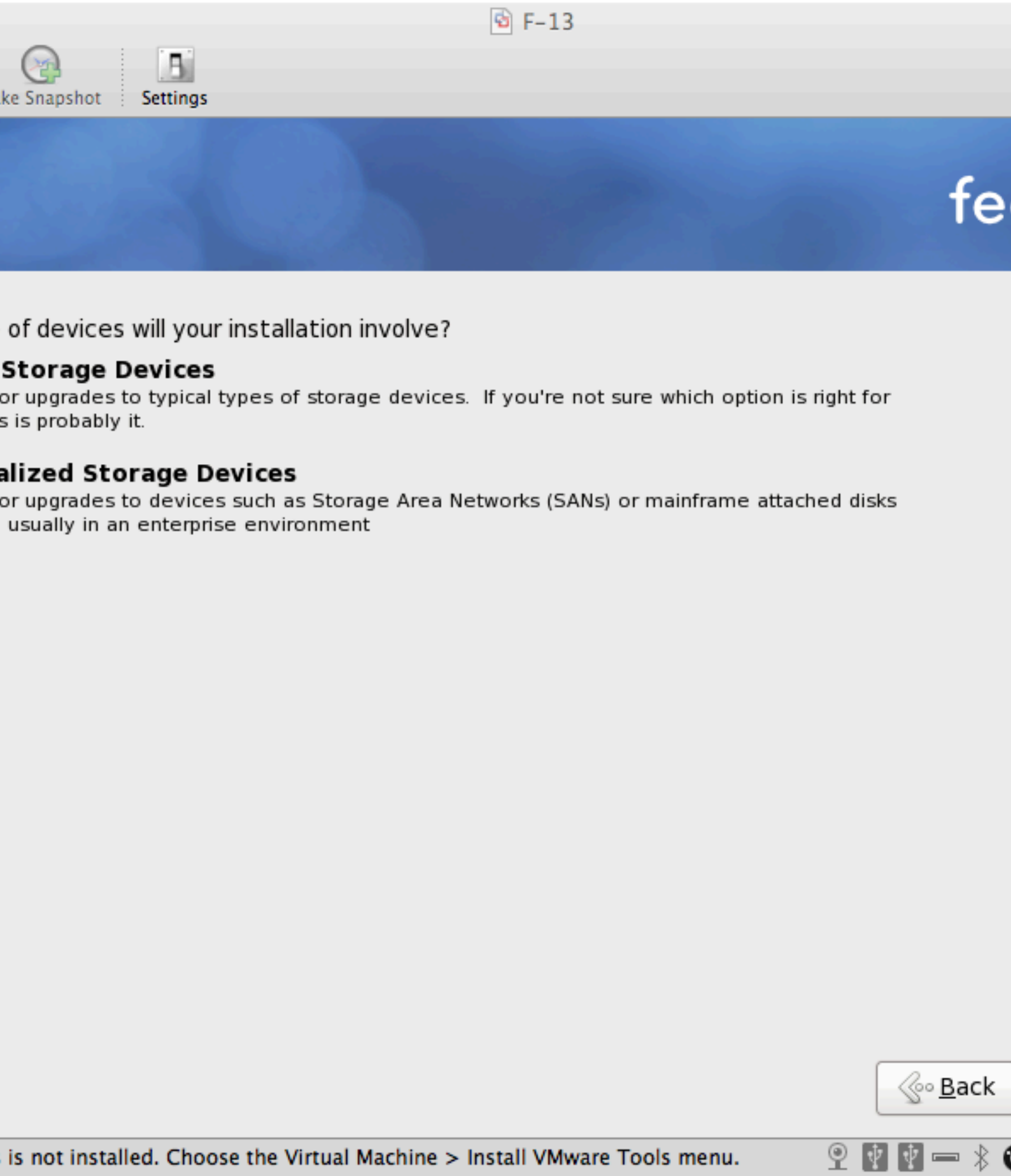


Fig. 2.2. Instalarea Fedora - Dispozitive de Stocare

Assign your machine a host name. [3] I happen to control the clusterlabs.org domain name, so I will use that here.

[3] *http://docs.fedoraproject.org/install-guide/f13/en-US/html/sn-networkconfig-fedora.html*

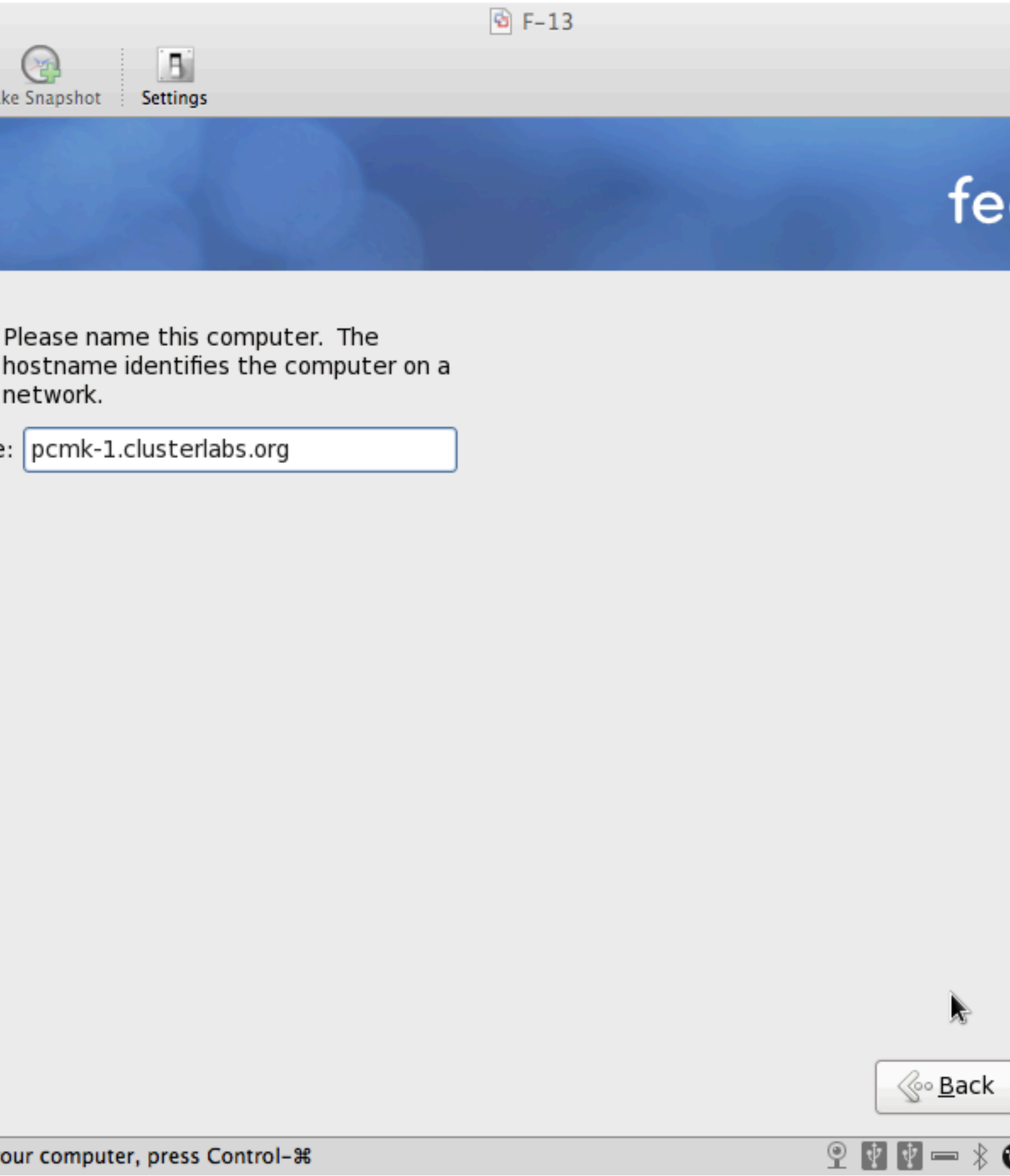


Fig. 2.3. Instalarea Fedora - Nume de gazdă

You will then be prompted to indicate the machine's physical location and to supply a root password. [4]

Now select where you want Fedora installed. [5]

As I don't care about any existing data, I will accept the default and allow Fedora to use the complete drive. However I want to reserve some space for DRBD, so I'll check the Review and modify partitioning layout box.

[4] *http://docs.fedoraproject.org/install-guide/f13/en-US/html/sn-account_configuration.html*
[5] *http://docs.fedoraproject.org/install-guide/f13/en-US/html/s1-diskpartsetup-x86.html*

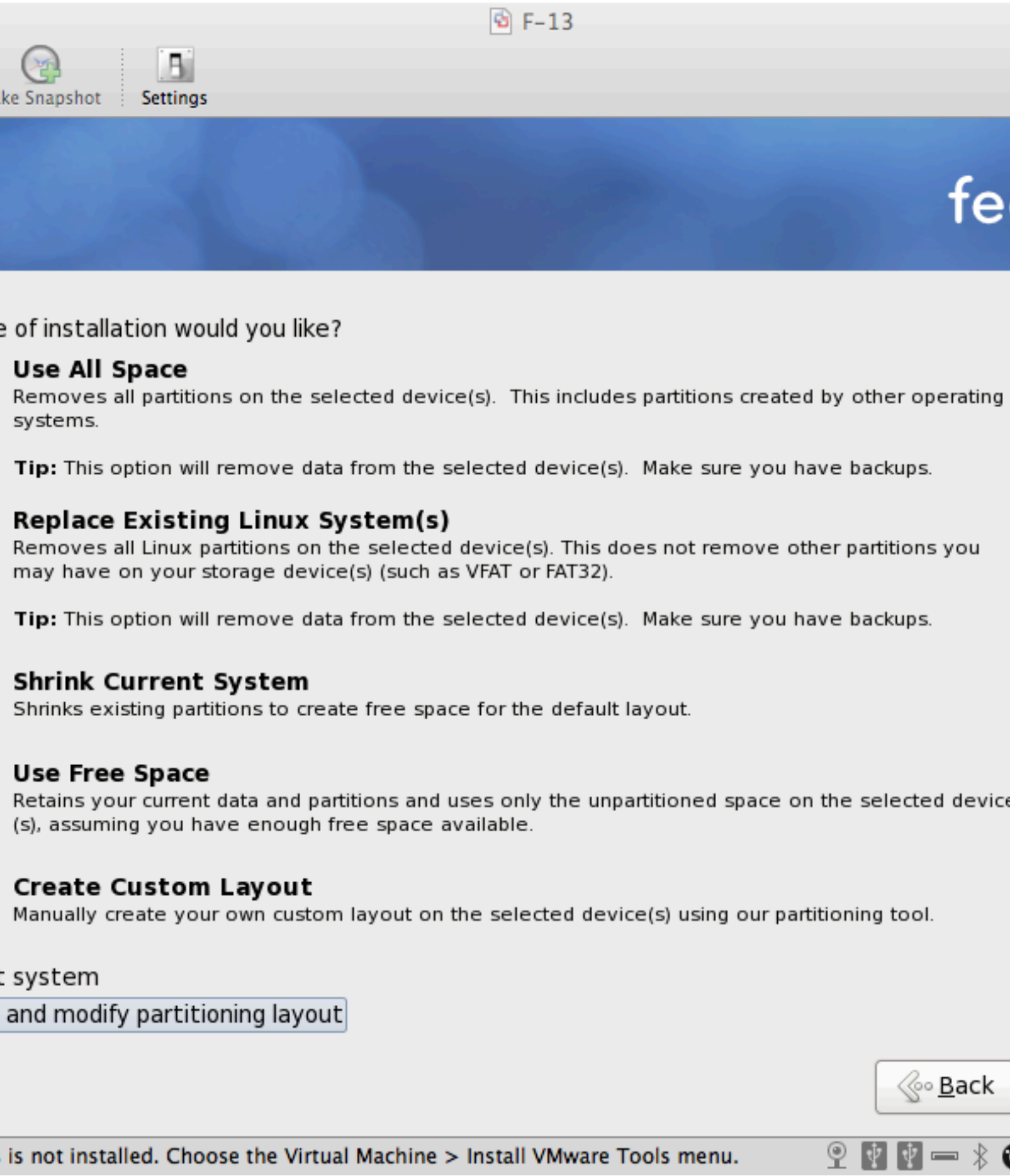


Fig. 2.4. Instalarea Fedora - Tipul de Instalare

By default, Fedora will give all the space to the / (aka. root) partition. Wel'll take some back so we can use DRBD.

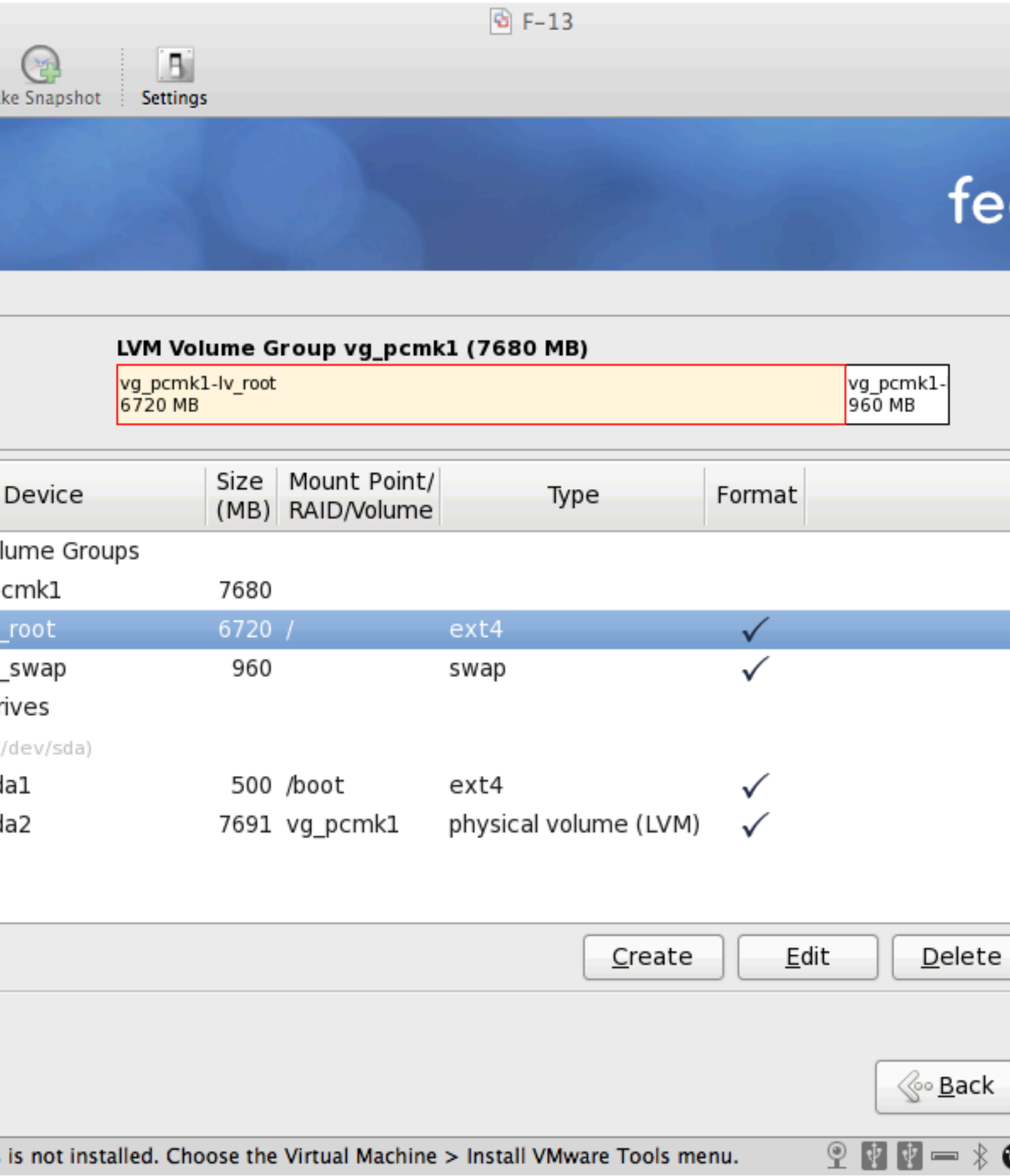


Fig. 2.5. Instalarea Fedora - Partiționarea Implicită

Așezarea finalizată a partițiilor ar trebui să arate asemănător cu diagrama de mai jos.

Important

If you plan on following the DRBD or GFS2 portions of this guide, you should reserve at least 1Gb of space on each machine from which to create a shared volume. Fedora Installation - Customize PartitioningFedora Installation: Create a partition to use (later) for website data

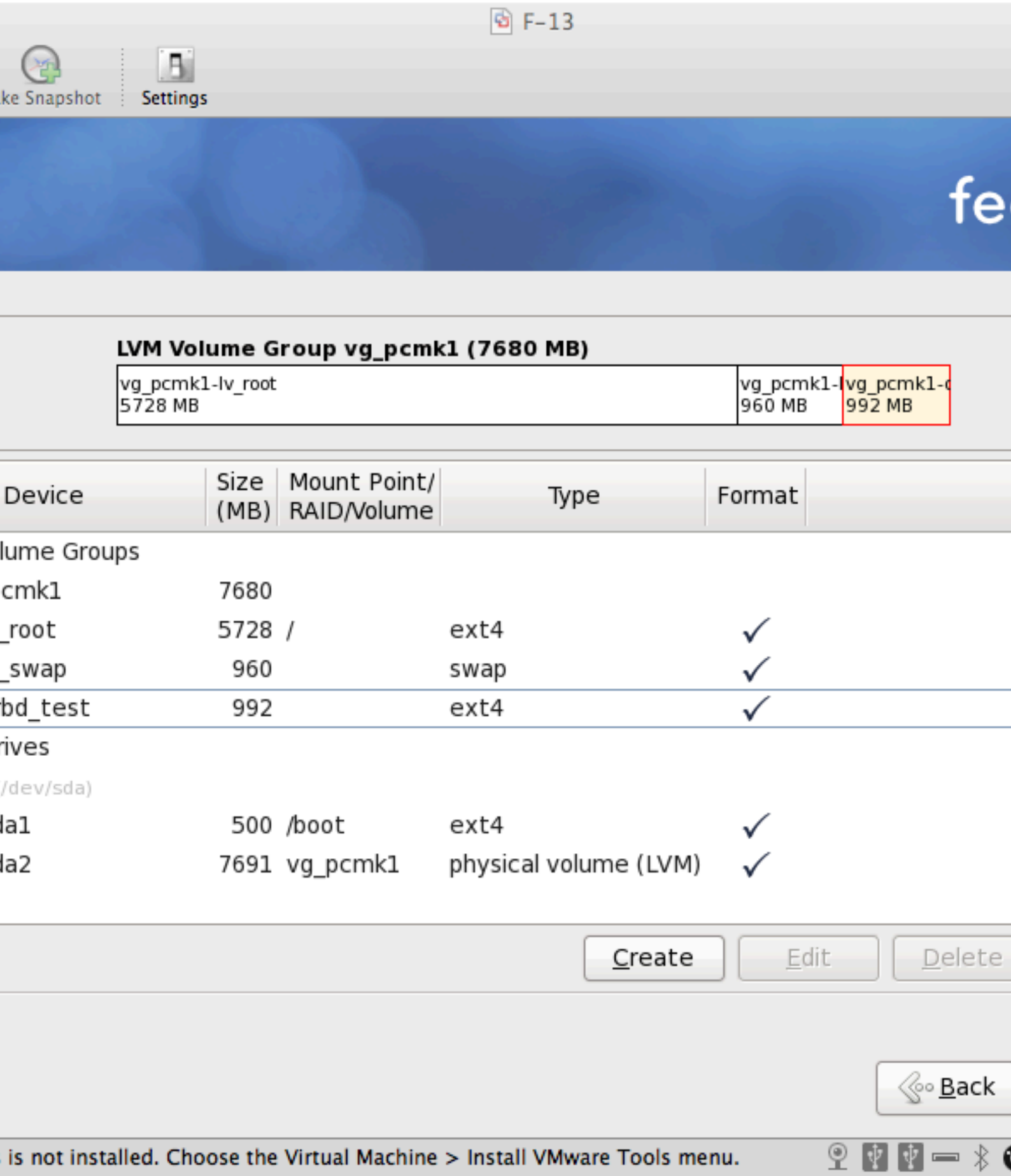


Fig. 2.6. Instalarea Fedora - Customizarea Partiționării

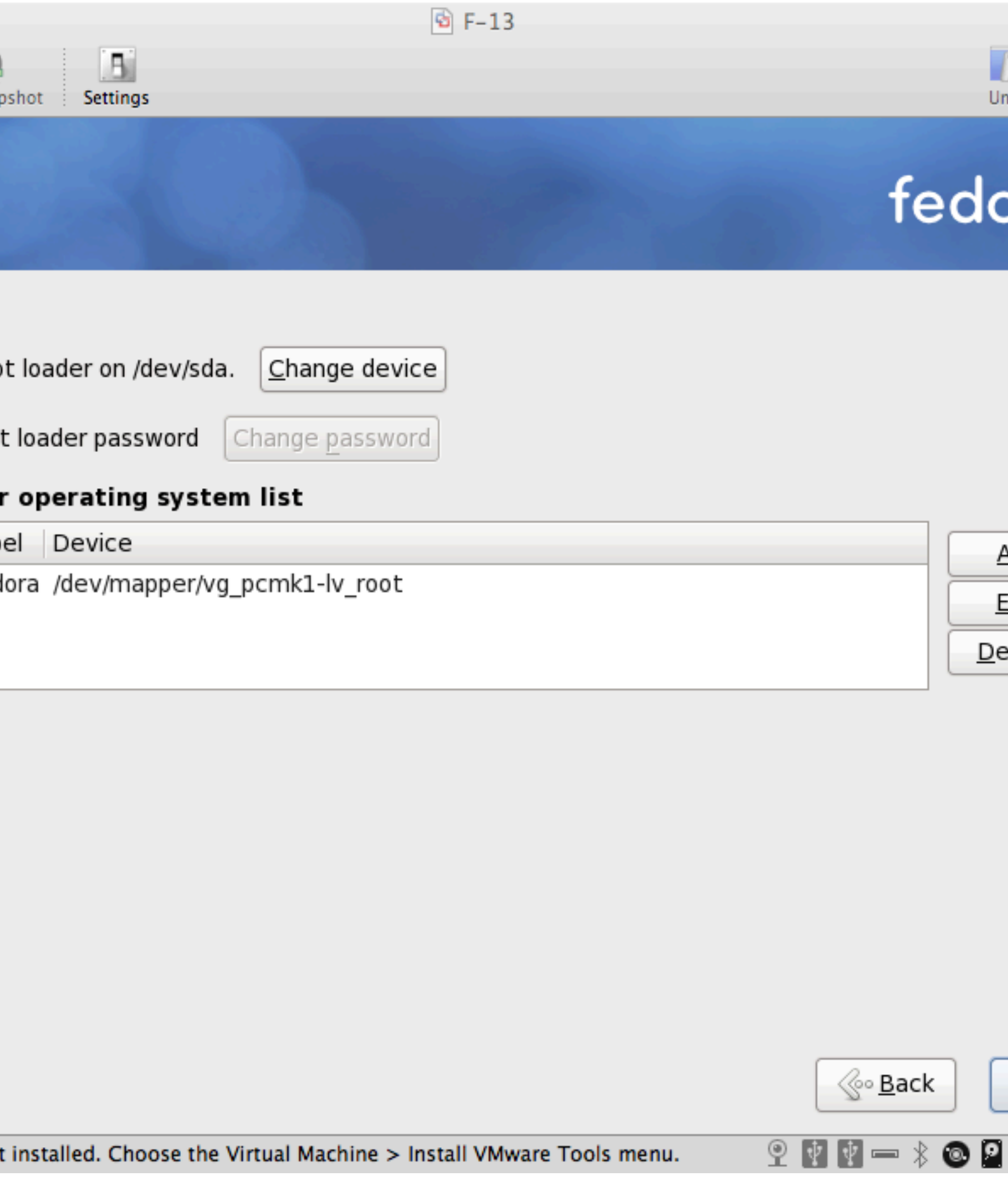


Fig. 2.7. Instalarea Fedora - Bootloader

Next choose which software should be installed. Change the selection to Web Server since we plan on using Apache. Don’t enable updates yet, we’ll do that (and install any extra software we need) later. After you click next, Fedora will begin installing.

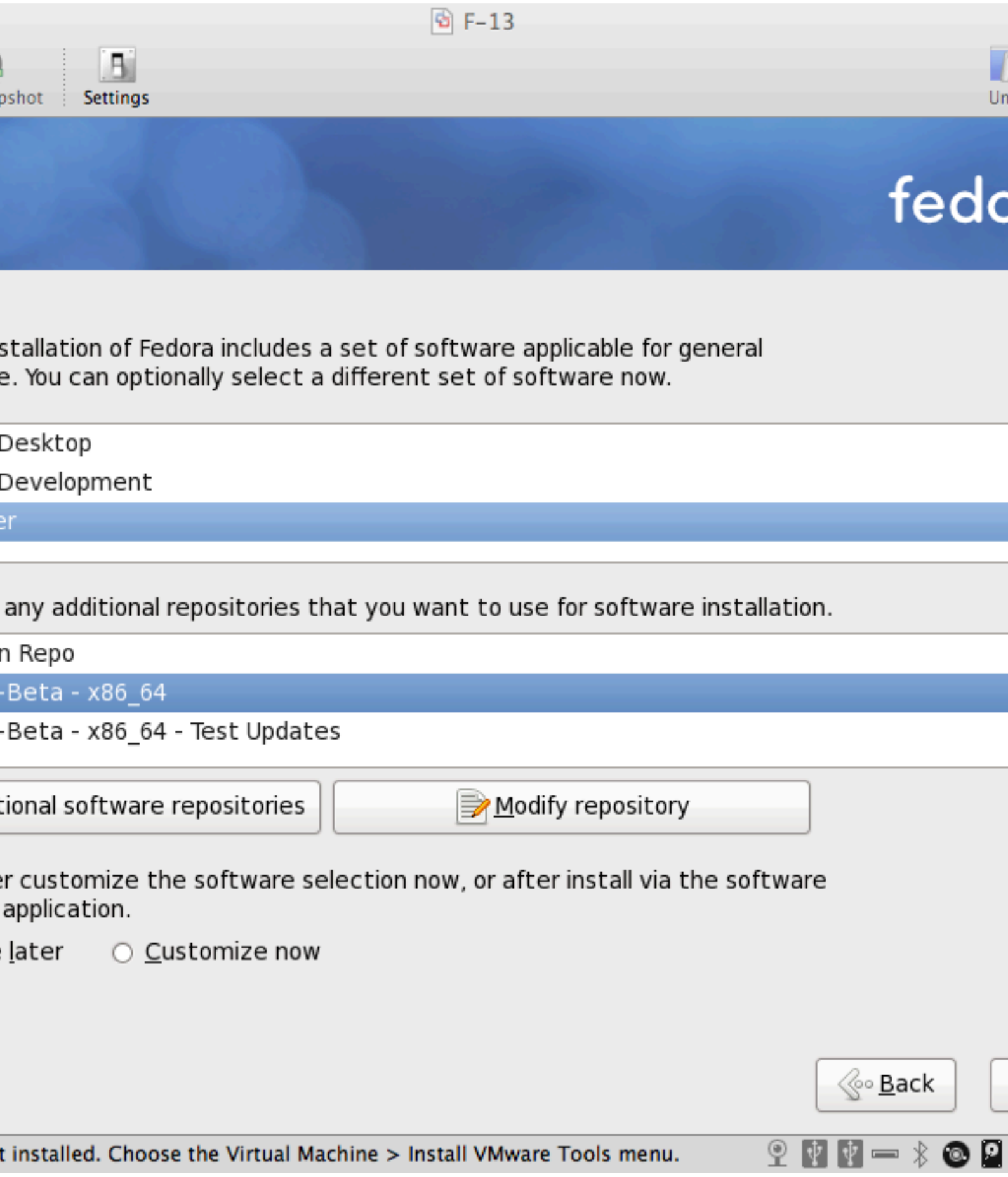


Fig. 2.8. Instalarea Fedora - Software

Go grab something to drink, this may take a while

Fig. 2.9. Instalarea Fedora - Instalează

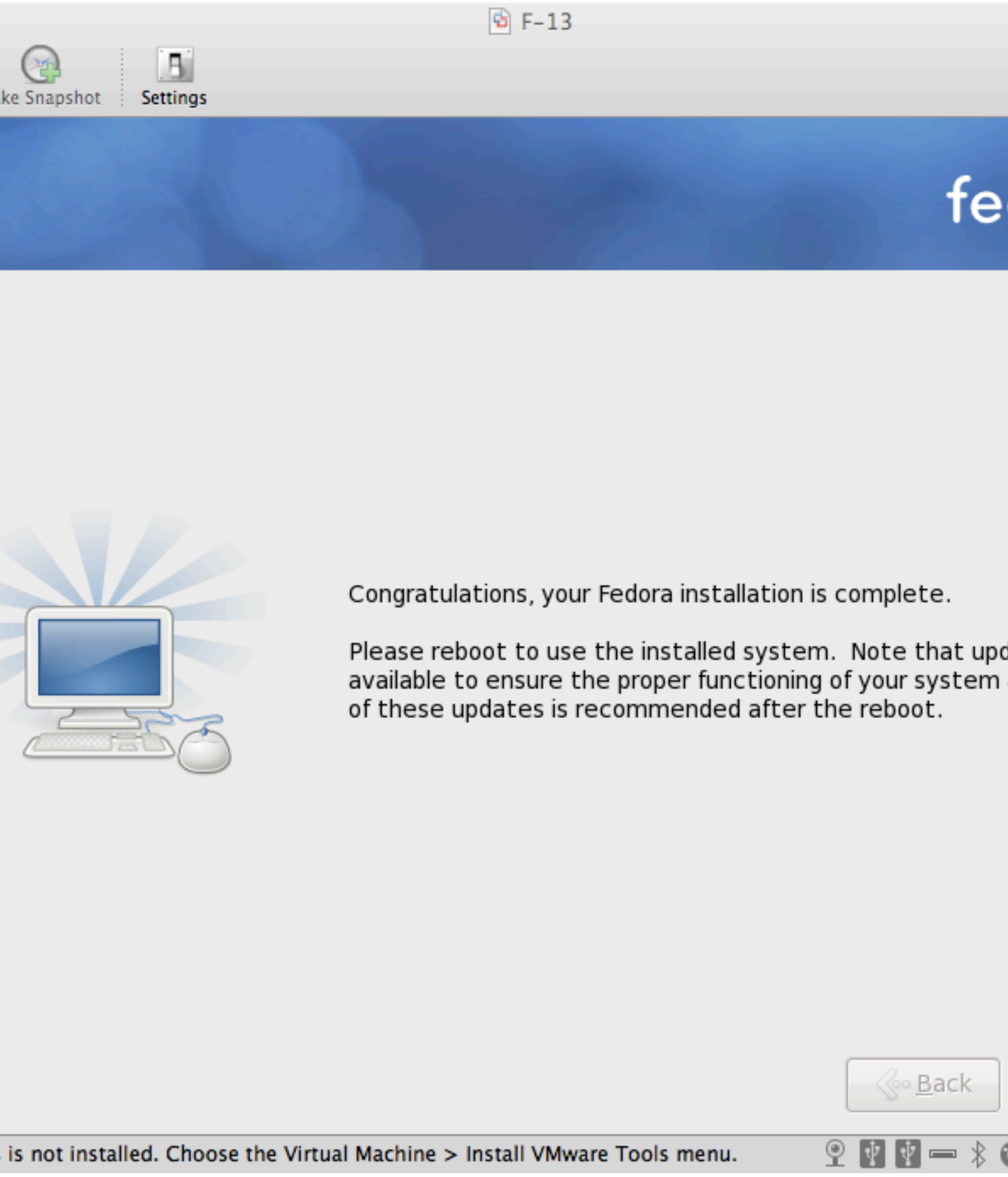


Fig. 2.10. Instalarea Fedora - Instalarea a Terminat

Once the node reboots, follow the on screen instructions [6] to create a system user and configure the time.

[6] *http://docs.fedoraproject.org/install-guide/f13/en-US/html/ch-firstboot.html*

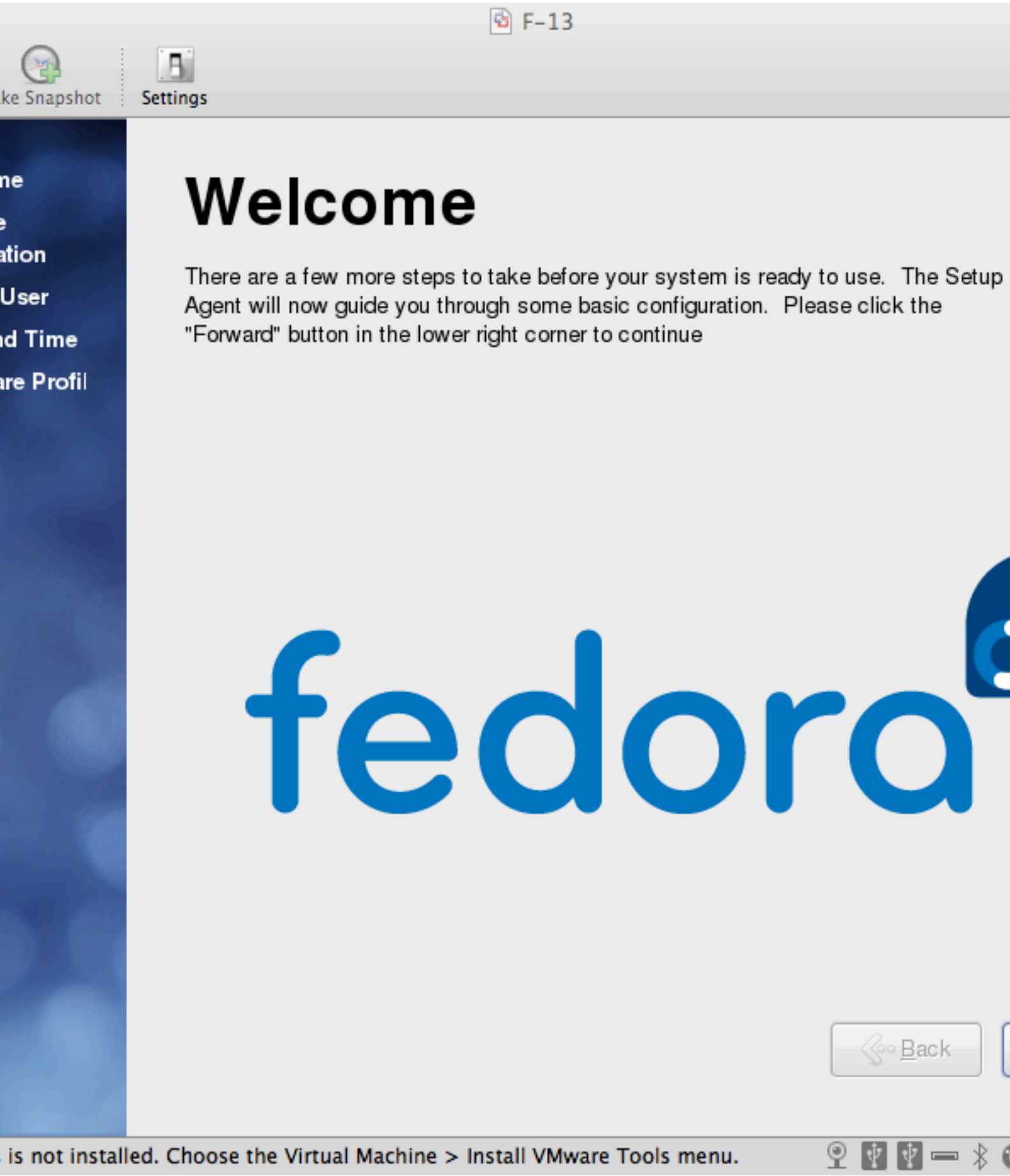


Fig. 2.11. Instalarea Fedora - Primul Boot

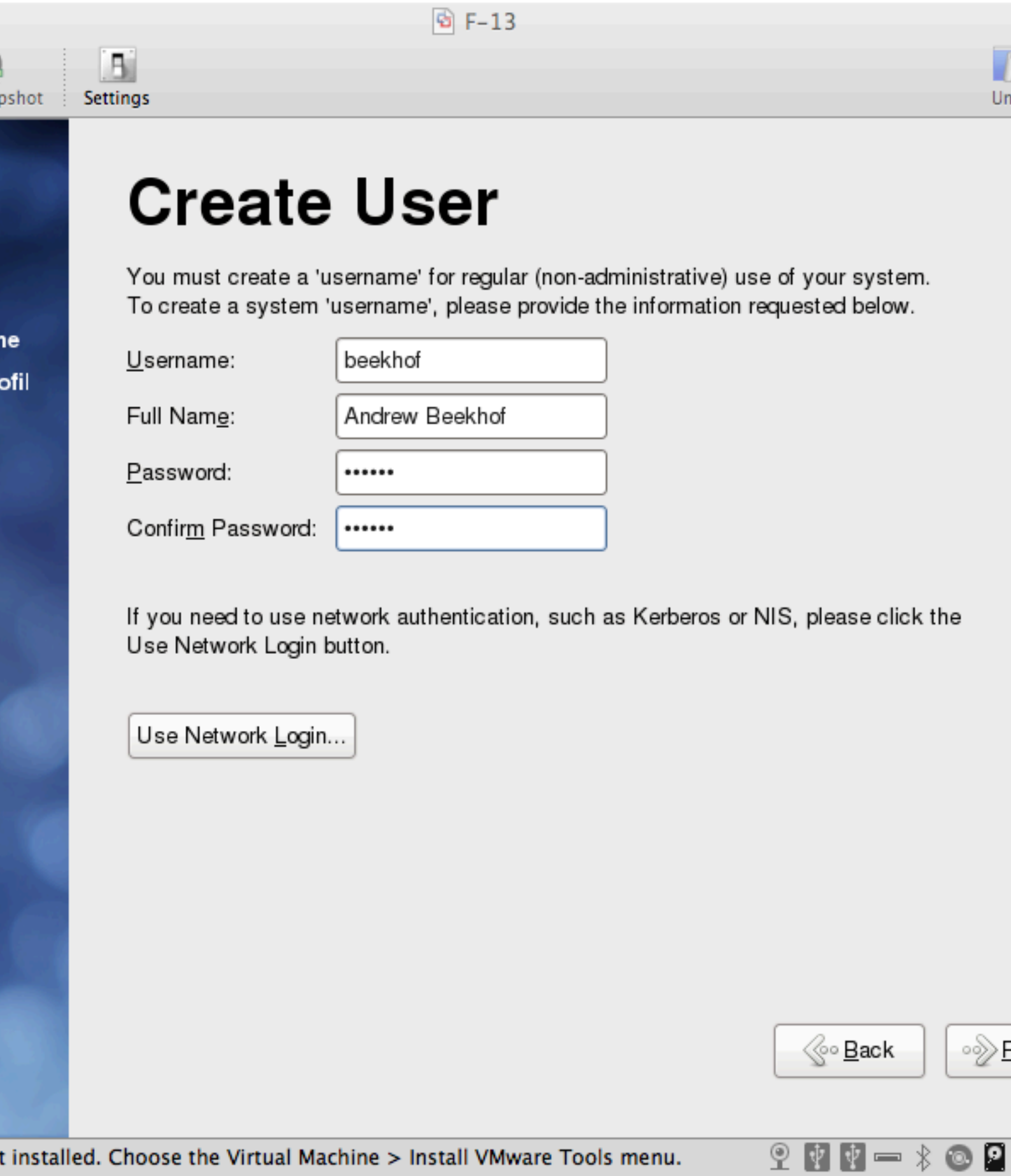


Fig. 2.12. Instalarea Fedora - Creați un Utilizator Neprivilegiat

Notă

It is highly recommended to enable NTP on your cluster nodes. Doing so ensures all nodes agree on the current time and makes reading log files significantly easier. Fedora Installation - Date and TimeFedora Installation: Enable NTP to keep the times on all your nodes consistent

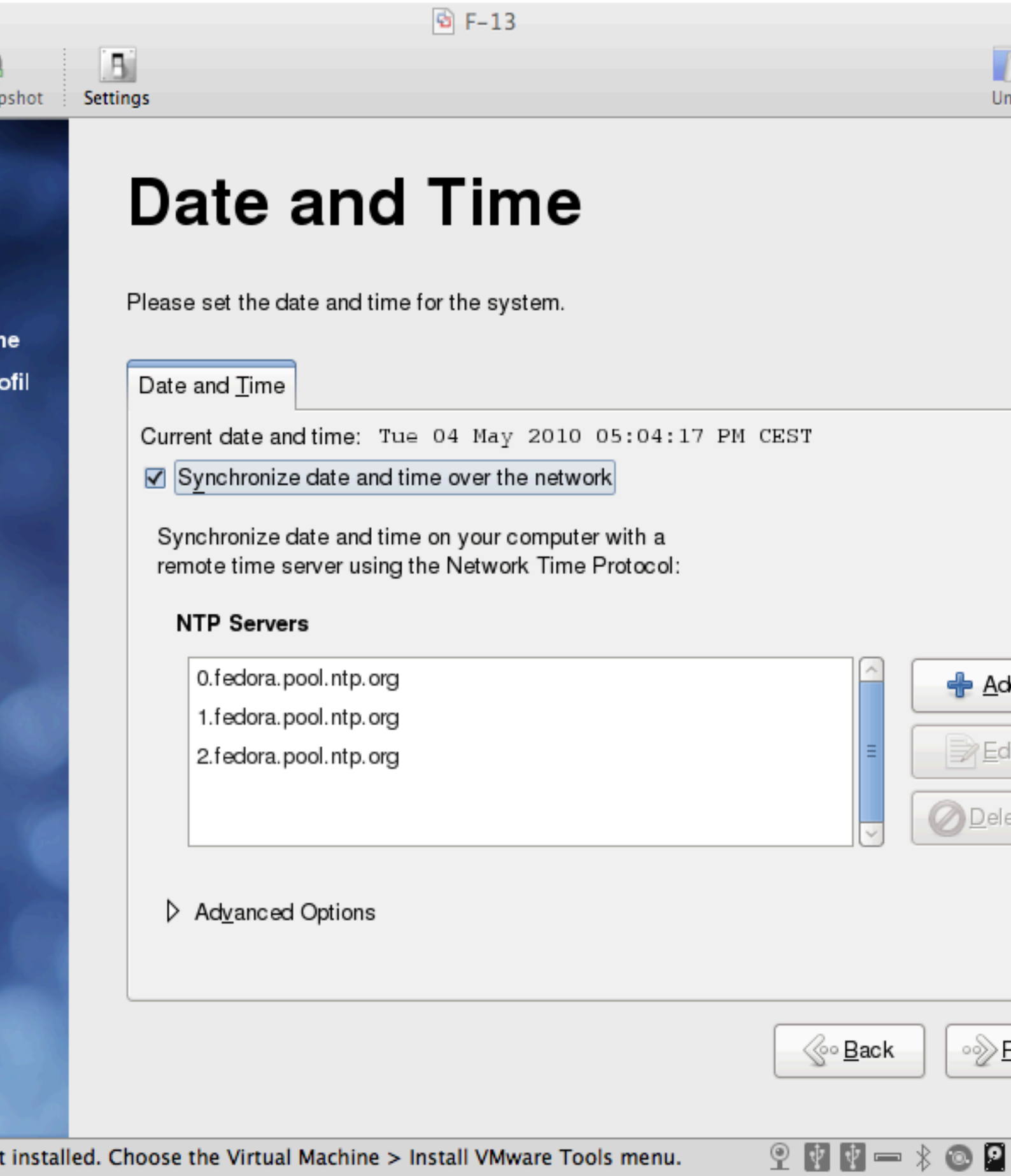


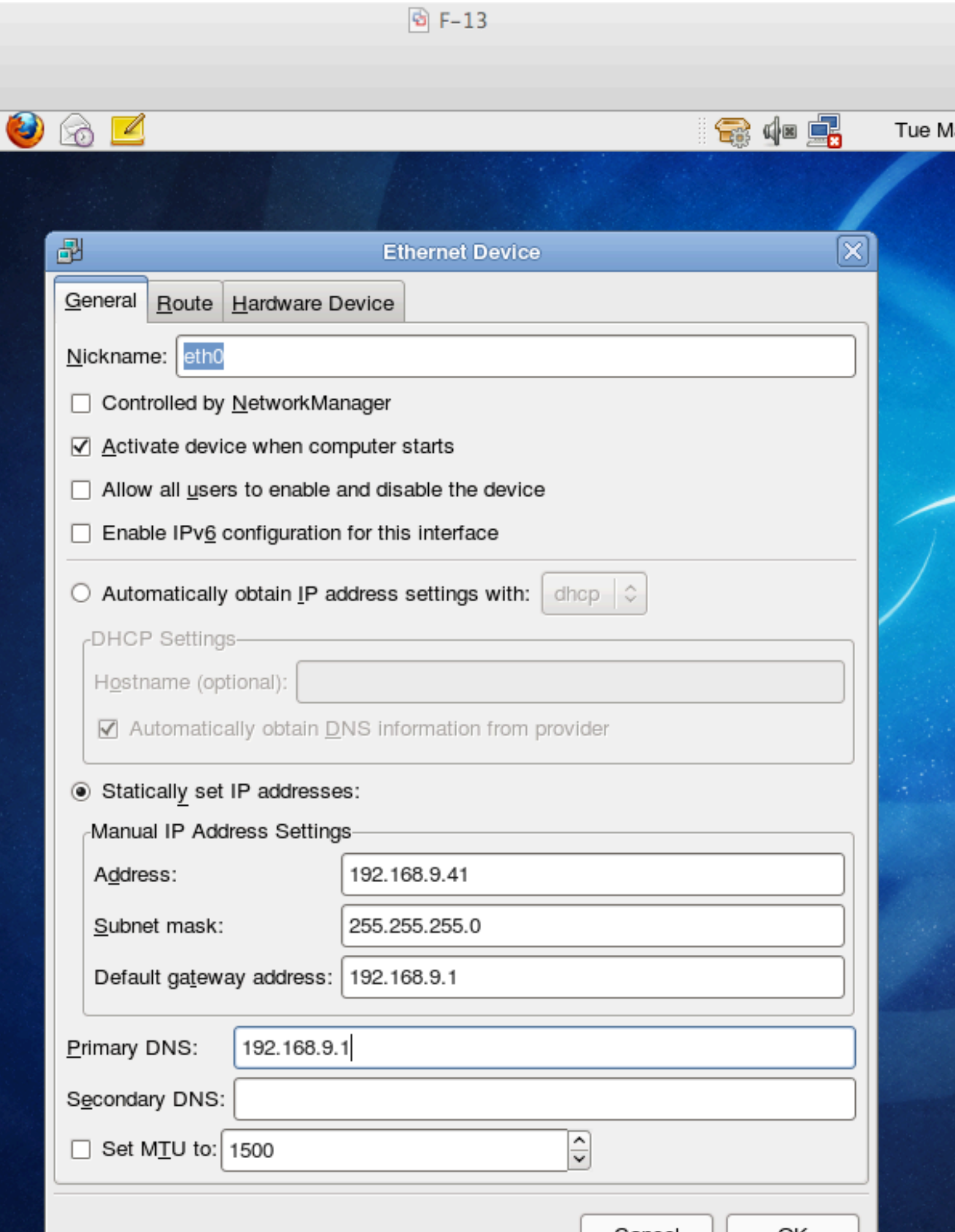
Fig. 2.13. Instalarea Fedora - Data și Ora

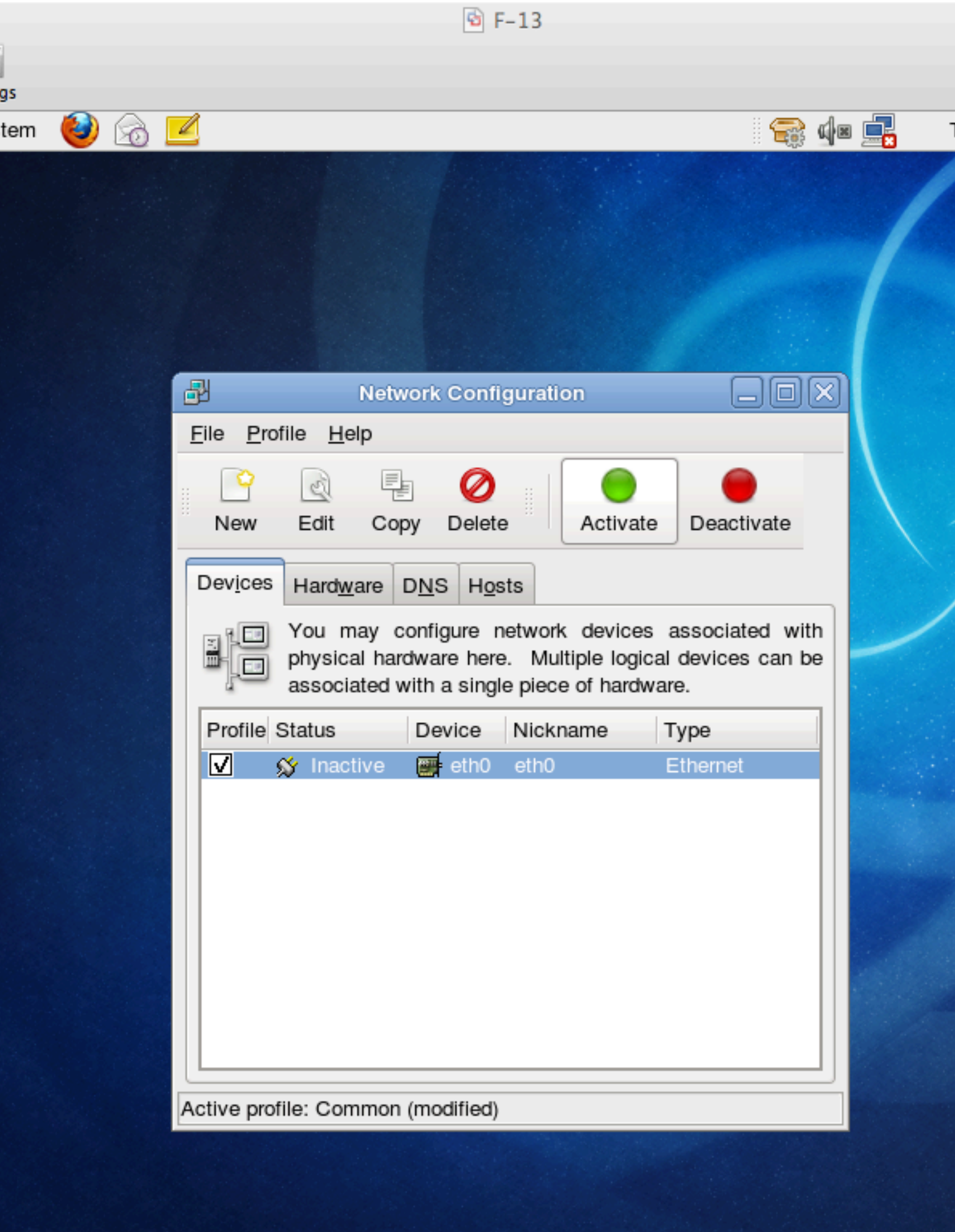
Selectați cu mouse-ul prin următorul ecran până ajungeți la fereastra de login. Selectați utilizatorul pe care l-ați creat și furnizați parola pe care ați ales-o mai devreme.

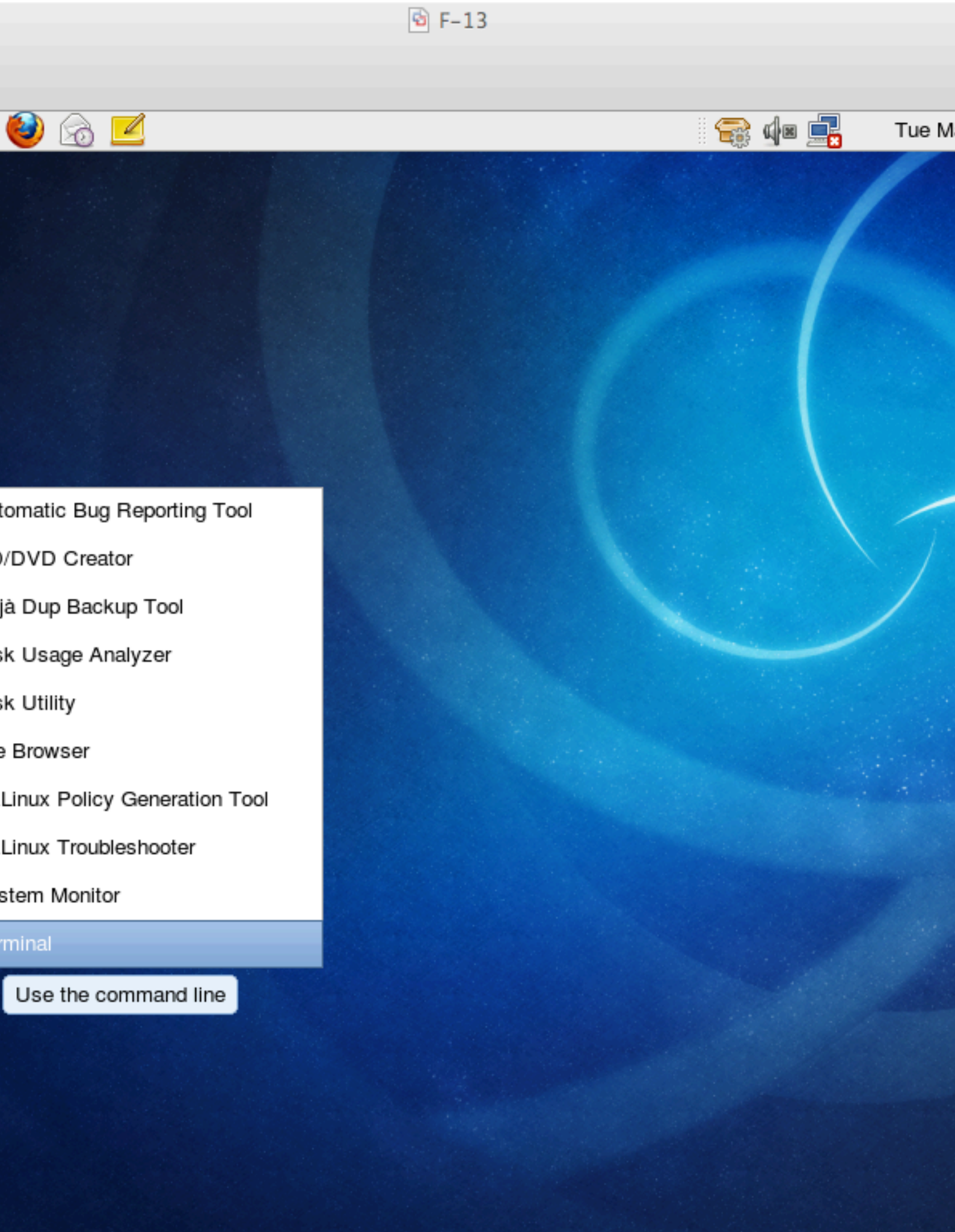

F-13
Tue M
ences
stration
entation
this Computer
creen
t beekhof...
own...
Add/Remove Software
Authentication
Bootloader
Date & Time
Firewall
Language
Network
Configure network devices and connections
Printing
SELinux Management
Services
Software Update
Users and Groups

Important

Do not accept the default network settings. Cluster machines should never obtain an ip address via DHCP. Here I will use the internal addresses for the clusterlab.org network.


F-13
Tue M
Ethernet Device
General
Route
Hardware Device
Nickname:
eth0
Controlled by NetworkManager
Activate device when computer starts
Allow all users to enable and disable the device
Enable IPv6 configuration for this interface
Automatically obtain IP address settings with:
dhcp
DHCP Settings
Hostname (optional):
Automatically obtain DNS information from provider
Statically set IP addresses:
Manual IP Address Settings
Address:
192.168.9.41
Subnet mask:
255.255.255.0
Default gateway address:
192.168.9.1
Primary DNS:
192.168.9.1
Secondary DNS:
Set MTU to:
1500


F-13
Network Configuration
File
Profile
Help
New
Edit
Copy
Delete
Activate
Deactivate
Devices
Hardware
DNS
Hosts
You may configure network devices associated with physical hardware here. Multiple logical devices can be associated with a single piece of hardware.
Profile
Status
Device
Nickname
Type
Inactive
eth0
eth0
Ethernet
Active profile: Common (modified)


F-13
Tue M
tomatic Bug Reporting Tool
/DVD Creator
jà Dup Backup Tool
sk Usage Analyzer
sk Utility
e Browser
Linux Policy Generation Tool
Linux Troubleshooter
stem Monitor
rminal
Use the command line

Notă

Aceea a fost ultima captură de ecran, de aici înainte vom lucra de la terminal.

2.2. Instalarea Software-ului de Cluster

Go to the terminal window you just opened and switch to the super user (aka. "root") account with the su command. You will need to supply the password you entered earlier during the installation process.

```
[beekhof@pcmk-1 ~]$ su -
Password:
[root@pcmk-1 ~]#
```

Notă

Luați aminte că numele de utilizator (textul dinaintea simbolului @) acum indică faptul că rulăm ca super utilizatorul "root".

```
# ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UNKNOWN qlen 1000
    link/ether 00:0c:29:6f:e1:58 brd ff:ff:ff:ff:ff:ff
    inet 192.168.9.41/24 brd 192.168.9.255 scope global eth0
    inet6 ::20c:29ff:fe6f:e158/64 scope global dynamic
       valid_lft 2591667sec preferred_lft 604467sec
    inet6 2002:57ae:43fc:0:20c:29ff:fe6f:e158/64 scope global dynamic
       valid_lft 2591990sec preferred_lft 604790sec
    inet6 fe80::20c:29ff:fe6f:e158/64 scope link
       valid_lft forever preferred_lft forever
# ping -c 1 www.google.com
PING www.l.google.com (74.125.39.99) 56(84) bytes of data.
64 bytes from fx-in-f99.1e100.net (74.125.39.99): icmp_seq=1 ttl=56 time=16.7 ms

--- www.l.google.com ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 20ms
rtt min/avg/max/mdev = 16.713/16.713/16.713/0.000 ms
# /sbin/chkconfig network on
#
```

2.2.1. Scurtături de Securitate

Pentru a simplifica acest ghid și pentru a ne concentra pe aspecte care sunt legate în mod direct de clustering, o să dezactivăm acum firewall-ul mașinii și instalarea de SELinux. Ambele aceste acțiuni creează probleme semnificative de securitate și nu ar trebui să fie efectuate pe mașini care vor fi expuse în mod direct către lumea exterioara.

Important

TODO: Crearea unui Apendix care să se ocupe cu (cel puțin) reactivarea firewall-ului.

```
# sed -i.bak "s/SELINUX=enforcing/SELINUX=permissive/g" /etc/selinux/config
# /sbin/chkconfig --del iptables
# service iptables stop
iptables: Flushing firewall rules:                         [  OK  ]
iptables: Setting chains to policy ACCEPT: filter          [  OK  ]
iptables: Unloading modules:                               [  OK  ]
```

Notă

Va trebui să reporniți pentru ca modificările de SELinux să ia effect. Altfel ați vedea ceva similar cu acesta când veți porni corosync:

```
May  4 19:30:54 pcmk-1 setroubleshoot: SELinux is preventing /usr/sbin/
corosync "getattr" access on /. For complete SELinux messages. run sealert -l
 6e0d4384-638e-4d55-9aaf-7dac011f29c1
May  4 19:30:54 pcmk-1 setroubleshoot: SELinux is preventing /usr/sbin/
corosync "getattr" access on /. For complete SELinux messages. run sealert -l
 6e0d4384-638e-4d55-9aaf-7dac011f29c1
```

2.2.2. Instalați Software-ul de Cluster

Începând cu versiunea 12, Fedora vine cu versiuni recente ale tuturor lucrurilor de care aveți nevoie, așa că pur și simplu porniți shell-ul și rulați:

```
# sed -i.bak "s/enabled=0/enabled=1/g"
/etc/yum.repos.d/fedora.repo
# sed -i.bak "s/enabled=0/enabled=1/g"
/etc/yum.repos.d/fedora-updates.repo
# yum install -y pacemaker corosync
Loaded plugins: presto, refresh-packagekit
fedora/metalink                                          |  22 kB     00:00
fedora-debuginfo/metalink                                |  16 kB     00:00
fedora-debuginfo                                         | 3.2 kB     00:00
fedora-debuginfo/primary_db                              | 1.4 MB     00:04
fedora-source/metalink                                   |  22 kB     00:00
fedora-source                                            | 3.2 kB     00:00
fedora-source/primary_db                                 | 3.0 MB     00:05
updates/metalink                                         |  26 kB     00:00
updates                                                  | 2.6 kB     00:00
updates/primary_db                                       | 1.1 kB     00:00
updates-debuginfo/metalink                               |  18 kB     00:00
updates-debuginfo                                        | 2.6 kB     00:00
updates-debuginfo/primary_db                             | 1.1 kB     00:00
updates-source/metalink                                  |  25 kB     00:00
updates-source                                           | 2.6 kB     00:00
updates-source/primary_db                                | 1.1 kB     00:00
Setting up Install Process
```

```
Resolving Dependencies
--> Running transaction check
---> Package corosync.x86_64 0:1.2.1-1.fc13 set to be updated
--> Processing Dependency: corosynclib = 1.2.1-1.fc13 for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libquorum.so.4(COROSYNC_QUORUM_1.0)(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libvotequorum.so.4(COROSYNC_VOTEQUORUM_1.0)(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libcpg.so.4(COROSYNC_CPG_1.0)(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libconfdb.so.4(COROSYNC_CONFDB_1.0)(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libcfg.so.4(COROSYNC_CFG_0.82)(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libpload.so.4(COROSYNC_PLOAD_1.0)(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: liblogsys.so.4()(64bit) for package: corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libconfdb.so.4()(64bit) for package: corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libcoroipcc.so.4()(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libcpg.so.4()(64bit) for package: corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libquorum.so.4()(64bit) for package: corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libcoroipcs.so.4()(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libvotequorum.so.4()(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libcfg.so.4()(64bit) for package: corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libtotem_pg.so.4()(64bit) for package:
 corosync-1.2.1-1.fc13.x86_64
--> Processing Dependency: libpload.so.4()(64bit) for package: corosync-1.2.1-1.fc13.x86_64
---> Package pacemaker.x86_64 0:1.1.5-1.fc13 set to be updated
--> Processing Dependency: heartbeat >= 3.0.0 for package: pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: net-snmp >= 5.4 for package: pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: resource-agents for package: pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: cluster-glue for package: pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libnetsnmp.so.20()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libcrmcluster.so.1()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libpengine.so.3()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libnetsnmpagent.so.20()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libesmtp.so.5()(64bit) for package: pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libstonithd.so.1()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libhbclient.so.1()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libpils.so.2()(64bit) for package: pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libpe_status.so.2()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libnetsnmpmibs.so.20()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libnetsnmphelpers.so.20()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libcib.so.1()(64bit) for package: pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libccmclient.so.1()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libstonith.so.1()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: liblrm.so.2()(64bit) for package: pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libtransitioner.so.1()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libpe_rules.so.2()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
```

```
--> Processing Dependency: libcrmcommon.so.2()(64bit) for package:
 pacemaker-1.1.5-1.fc13.x86_64
--> Processing Dependency: libplumb.so.2()(64bit) for package: pacemaker-1.1.5-1.fc13.x86_64
--> Running transaction check
---> Package cluster-glue.x86_64 0:1.0.2-1.fc13 set to be updated
--> Processing Dependency: perl-TimeDate for package: cluster-glue-1.0.2-1.fc13.x86_64
--> Processing Dependency: libOpenIPMIutils.so.0()(64bit) for package: cluster-
glue-1.0.2-1.fc13.x86_64
--> Processing Dependency: libOpenIPMIposix.so.0()(64bit) for package: cluster-
glue-1.0.2-1.fc13.x86_64
--> Processing Dependency: libopenhpi.so.2()(64bit) for package: cluster-
glue-1.0.2-1.fc13.x86_64
--> Processing Dependency: libOpenIPMI.so.0()(64bit) for package: cluster-
glue-1.0.2-1.fc13.x86_64
---> Package cluster-glue-libs.x86_64 0:1.0.2-1.fc13 set to be updated
---> Package corosynclib.x86_64 0:1.2.1-1.fc13 set to be updated
--> Processing Dependency: librdmacm.so.1(RDMACM_1.0)(64bit) for package:
 corosynclib-1.2.1-1.fc13.x86_64
--> Processing Dependency: libibverbs.so.1(IBVERBS_1.0)(64bit) for package:
 corosynclib-1.2.1-1.fc13.x86_64
--> Processing Dependency: libibverbs.so.1(IBVERBS_1.1)(64bit) for package:
 corosynclib-1.2.1-1.fc13.x86_64
--> Processing Dependency: libibverbs.so.1()(64bit) for package:
 corosynclib-1.2.1-1.fc13.x86_64
--> Processing Dependency: librdmacm.so.1()(64bit) for package:
 corosynclib-1.2.1-1.fc13.x86_64
---> Package heartbeat.x86_64 0:3.0.0-0.7.0daab7da36a8.hg.fc13 set to be updated
--> Processing Dependency: PyXML for package: heartbeat-3.0.0-0.7.0daab7da36a8.hg.fc13.x86_64
---> Package heartbeat-libs.x86_64 0:3.0.0-0.7.0daab7da36a8.hg.fc13 set to be updated
---> Package libesmtp.x86_64 0:1.0.4-12.fc12 set to be updated
---> Package net-snmp.x86_64 1:5.5-12.fc13 set to be updated
--> Processing Dependency: libsensors.so.4()(64bit) for package: 1:net-
snmp-5.5-12.fc13.x86_64
---> Package net-snmp-libs.x86_64 1:5.5-12.fc13 set to be updated
---> Package pacemaker-libs.x86_64 0:1.1.5-1.fc13 set to be updated
---> Package resource-agents.x86_64 0:3.0.10-1.fc13 set to be updated
--> Processing Dependency: libnet.so.1()(64bit) for package: resource-
agents-3.0.10-1.fc13.x86_64
--> Running transaction check
---> Package OpenIPMI-libs.x86_64 0:2.0.16-8.fc13 set to be updated
---> Package PyXML.x86_64 0:0.8.4-17.fc13 set to be updated
---> Package libibverbs.x86_64 0:1.1.3-4.fc13 set to be updated
--> Processing Dependency: libibverbs-driver for package: libibverbs-1.1.3-4.fc13.x86_64
---> Package libnet.x86_64 0:1.1.4-3.fc12 set to be updated
---> Package librdmacm.x86_64 0:1.0.10-2.fc13 set to be updated
---> Package lm_sensors-libs.x86_64 0:3.1.2-2.fc13 set to be updated
---> Package openhpi-libs.x86_64 0:2.14.1-3.fc13 set to be updated
---> Package perl-TimeDate.noarch 1:1.20-1.fc13 set to be updated
--> Running transaction check
---> Package libmlx4.x86_64 0:1.0.1-5.fc13 set to be updated
--> Finished Dependency Resolution

Dependencies Resolved


================================================================================
 Package                Arch     Version                          Repository      Size
================================================================================
Installing:
 corosync               x86_64   1.2.1-1.fc13                     fedora         136 k
 pacemaker              x86_64   1.1.5-1.fc13                     fedora         543 k
Installing for dependencies:
 OpenIPMI-libs          x86_64   2.0.16-8.fc13                    fedora         474 k
 PyXML                  x86_64   0.8.4-17.fc13                    fedora         906 k
 cluster-glue           x86_64   1.0.2-1.fc13                     fedora         230 k
 cluster-glue-libs      x86_64   1.0.2-1.fc13                     fedora         116 k
 corosynclib            x86_64   1.2.1-1.fc13                     fedora         145 k
```

```
 heartbeat              x86_64   3.0.0-0.7.0daab7da36a8.hg.fc13      updates        172 k
 heartbeat-libs         x86_64   3.0.0-0.7.0daab7da36a8.hg.fc13      updates        265 k
 libesmtp               x86_64   1.0.4-12.fc12                       fedora          54 k
 libibverbs             x86_64   1.1.3-4.fc13                        fedora          42 k
 libmlx4                x86_64   1.0.1-5.fc13                        fedora          27 k
 libnet                 x86_64   1.1.4-3.fc12                        fedora          49 k
 librdmacm              x86_64   1.0.10-2.fc13                       fedora          22 k
 lm_sensors-libs        x86_64   3.1.2-2.fc13                        fedora          37 k
 net-snmp               x86_64   1:5.5-12.fc13                       fedora         295 k
 net-snmp-libs          x86_64   1:5.5-12.fc13                       fedora         1.5 M
 openhpi-libs           x86_64   2.14.1-3.fc13                       fedora         135 k
 pacemaker-libs         x86_64   1.1.5-1.fc13                        fedora         264 k
 perl-TimeDate          noarch   1:1.20-1.fc13                       fedora          42 k
 resource-agents        x86_64   3.0.10-1.fc13                       fedora         357 k

Transaction Summary
================================================================================
Install      21 Package(s)
Upgrade       0 Package(s)

Total download size: 5.7 M
Installed size: 20 M
Downloading Packages:
Setting up and reading Presto delta metadata
updates-testing/prestodelta                              | 164 kB     00:00
fedora/prestodelta                                       |  150 B     00:00
Processing delta metadata
Package(s) data still to download: 5.7 M
(1/21): OpenIPMI-libs-2.0.16-8.fc13.x86_64.rpm           | 474 kB     00:00
(2/21): PyXML-0.8.4-17.fc13.x86_64.rpm                   | 906 kB     00:01
(3/21): cluster-glue-1.0.2-1.fc13.x86_64.rpm             | 230 kB     00:00
(4/21): cluster-glue-libs-1.0.2-1.fc13.x86_64.rpm        | 116 kB     00:00
(5/21): corosync-1.2.1-1.fc13.x86_64.rpm                 | 136 kB     00:00
(6/21): corosynclib-1.2.1-1.fc13.x86_64.rpm              | 145 kB     00:00
(7/21): heartbeat-3.0.0-0.7.0daab7da36a8.hg.fc13.x86_64.rpm | 172 kB     00:00
(8/21): heartbeat-libs-3.0.0-0.7.0daab7da36a8.hg.fc13.x86_64.rpm | 265 kB     00:00
(9/21): libesmtp-1.0.4-12.fc12.x86_64.rpm                |  54 kB     00:00
(10/21): libibverbs-1.1.3-4.fc13.x86_64.rpm              |  42 kB     00:00
(11/21): libmlx4-1.0.1-5.fc13.x86_64.rpm                 |  27 kB     00:00
(12/21): libnet-1.1.4-3.fc12.x86_64.rpm                  |  49 kB     00:00
(13/21): librdmacm-1.0.10-2.fc13.x86_64.rpm              |  22 kB     00:00
(14/21): lm_sensors-libs-3.1.2-2.fc13.x86_64.rpm         |  37 kB     00:00
(15/21): net-snmp-5.5-12.fc13.x86_64.rpm                 | 295 kB     00:00
(16/21): net-snmp-libs-5.5-12.fc13.x86_64.rpm            | 1.5 MB     00:01
(17/21): openhpi-libs-2.14.1-3.fc13.x86_64.rpm           | 135 kB     00:00
(18/21): pacemaker-1.1.5-1.fc13.x86_64.rpm               | 543 kB     00:00
(19/21): pacemaker-libs-1.1.5-1.fc13.x86_64.rpm          | 264 kB     00:00
(20/21): perl-TimeDate-1.20-1.fc13.noarch.rpm            |  42 kB     00:00
(21/21): resource-agents-3.0.10-1.fc13.x86_64.rpm        | 357 kB     00:00

Total                                            539 kB/s | 5.7 MB     00:10
warning: rpmts_HdrFromFdno: Header V3 RSA/SHA256 Signature, key ID e8e40fde: NOKEY
fedora/gpgkey                                            | 3.2 kB     00:00 ...
Importing GPG key 0xE8E40FDE "Fedora (13) <fedora@fedoraproject.org%gt;" from /etc/pki/rpm-
gpg/RPM-GPG-KEY-fedora-x86_64

Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing     : lm_sensors-libs-3.1.2-2.fc13.x86_64                     1/21
  Installing     : 1:net-snmp-libs-5.5-12.fc13.x86_64                      2/21
  Installing     : 1:net-snmp-5.5-12.fc13.x86_64                           3/21
  Installing     : openhpi-libs-2.14.1-3.fc13.x86_64                       4/21
  Installing     : libibverbs-1.1.3-4.fc13.x86_64                          5/21
  Installing     : libmlx4-1.0.1-5.fc13.x86_64                             6/21
  Installing     : librdmacm-1.0.10-2.fc13.x86_64                          7/21
```

```
  Installing     : corosync-1.2.1-1.fc13.x86_64                                  8/21
  Installing     : corosynclib-1.2.1-1.fc13.x86_64                               9/21
  Installing     : libesmtp-1.0.4-12.fc12.x86_64                                10/21
  Installing     : OpenIPMI-libs-2.0.16-8.fc13.x86_64                           11/21
  Installing     : PyXML-0.8.4-17.fc13.x86_64                                   12/21
  Installing     : libnet-1.1.4-3.fc12.x86_64                                   13/21
  Installing     : 1:perl-TimeDate-1.20-1.fc13.noarch                           14/21
  Installing     : cluster-glue-1.0.2-1.fc13.x86_64                             15/21
  Installing     : cluster-glue-libs-1.0.2-1.fc13.x86_64                        16/21
  Installing     : resource-agents-3.0.10-1.fc13.x86_64                         17/21
  Installing     : heartbeat-libs-3.0.0-0.7.0daab7da36a8.hg.fc13.x86_64         18/21
  Installing     : heartbeat-3.0.0-0.7.0daab7da36a8.hg.fc13.x86_64              19/21
  Installing     : pacemaker-1.1.5-1.fc13.x86_64                                20/21
  Installing     : pacemaker-libs-1.1.5-1.fc13.x86_64                           21/21

Installed:
  corosync.x86_64 0:1.2.1-1.fc13                    pacemaker.x86_64 0:1.1.5-1.fc13

Dependency Installed:
  OpenIPMI-libs.x86_64 0:2.0.16-8.fc13
  PyXML.x86_64 0:0.8.4-17.fc13
  cluster-glue.x86_64 0:1.0.2-1.fc13
  cluster-glue-libs.x86_64 0:1.0.2-1.fc13
  corosynclib.x86_64 0:1.2.1-1.fc13
  heartbeat.x86_64 0:3.0.0-0.7.0daab7da36a8.hg.fc13
  heartbeat-libs.x86_64 0:3.0.0-0.7.0daab7da36a8.hg.fc13
  libesmtp.x86_64 0:1.0.4-12.fc12
  libibverbs.x86_64 0:1.1.3-4.fc13
  libmlx4.x86_64 0:1.0.1-5.fc13
  libnet.x86_64 0:1.1.4-3.fc12
  librdmacm.x86_64 0:1.0.10-2.fc13
  lm_sensors-libs.x86_64 0:3.1.2-2.fc13
  net-snmp.x86_64 1:5.5-12.fc13
  net-snmp-libs.x86_64 1:5.5-12.fc13
  openhpi-libs.x86_64 0:2.14.1-3.fc13
  pacemaker-libs.x86_64 0:1.1.5-1.fc13
  perl-TimeDate.noarch 1:1.20-1.fc13
  resource-agents.x86_64 0:3.0.10-1.fc13

Complete!
#
```

2.3. Înainte de a Continua

Repetați pașii de Instalare astfel încât să aveți 2 noduri cu Fedora cu software-ul de cluster instalat.

For the purposes of this document, the additional node is called pcmk-2 with address 192.168.122.102.

2.4. Setup

2.4.1. Finalizați Rețelistica

Confirmați că puteți comunica cu cele două noi noduri:

```
# ping -c 3 192.168.122.102
PING 192.168.122.102 (192.168.122.102) 56(84) bytes of data.
64 bytes from 192.168.122.102: icmp_seq=1 ttl=64 time=0.343 ms
64 bytes from 192.168.122.102: icmp_seq=2 ttl=64 time=0.402 ms
64 bytes from 192.168.122.102: icmp_seq=3 ttl=64 time=0.558 ms
```

```
--- 192.168.122.102 ping statistics ---3 packets transmitted, 3 received, 0% packet loss,
 time 2000ms
rtt min/avg/max/mdev = 0.343/0.434/0.558/0.092 ms
```

Figure 2.18. Verify Connectivity by IP address

Acum trebuie să ne asigurăm că putem comunica cu mașinile după numele acestora. Dacă aveți un server DNS, adăugați intrări adiționale pentru cele două mașini. În caz contrar, va trebui să adăugați mașinile în /etc/hosts. Mai jos sunt intrările pentru nodurile mele de cluster:

```
# grep pcmk /etc/hosts
192.168.122.101 pcmk-1.clusterlabs.org pcmk-1
192.168.122.102 pcmk-2.clusterlabs.org pcmk-2
```

Figure 2.19. Set up /etc/hosts entries

Putem verifica setup-ul folosind ping din nou:

```
# ping -c 3 pcmk-2
PING pcmk-2.clusterlabs.org (192.168.122.101) 56(84) bytes of data.
64 bytes from pcmk-1.clusterlabs.org (192.168.122.101): icmp_seq=1 ttl=64 time=0.164 ms
64 bytes from pcmk-1.clusterlabs.org (192.168.122.101): icmp_seq=2 ttl=64 time=0.475 ms
64 bytes from pcmk-1.clusterlabs.org (192.168.122.101): icmp_seq=3 ttl=64 time=0.186 ms

--- pcmk-2.clusterlabs.org ping statistics ---3 packets transmitted, 3 received, 0% packet
 loss, time 2001ms
rtt min/avg/max/mdev = 0.164/0.275/0.475/0.141 ms
```

Figure 2.20. Verify Connectivity by Hostname

2.4.2. Configurați SSH

SSH este un mod convenabil și sigur de a copia fișierele și de a efectua comenzi pe sisteme la distanță. Pentru scopurile acestui ghid, vom crea o cheie fără parolă (folosind opțiunea -N "") astfel încât să putem efectua acțiuni la distanță fără a mai fi întrebați.

Avertisment

Chei neprotejate de SSH, precum cele fără parolă, nu sunt recomandate pentru servere expuse la lumea externă.

Creați o cheie nouă și permiteți oricui cu acea cheie să se logheze:

Crearea și Activarea unei Chei noi SSH

```
# ssh-keygen -t dsa -f ~/.ssh/id_dsa -N ""
Generating public/private dsa key pair.
Your identification has been saved in /root/.ssh/id_dsa.
Your public key has been saved in /root/.ssh/id_dsa.pub.
The key fingerprint is:
91:09:5c:82:5a:6a:50:08:4e:b2:0c:62:de:cc:74:44 root@pcmk-1.clusterlabs.org
```

```
The key's randomart image is:
+--[ DSA 1024]----+
|==.ooEo..        |
|X O + .o o       |
| * A    +        |
|  +      .       |
| .      S        |
|                 |
|                 |
|                 |
|                 |
+-----------------+

# cp .ssh/id_dsa.pub .ssh/authorized_keys
```

Instalați cheia pe celelalte noduri și testați că acum puteți rula comenzi de la distanță, fără să mai fiți întrebați

```
# scp -r .ssh pcmk-2:
The authenticity of host 'pcmk-2 (192.168.122.102)' can't be established.
RSA key fingerprint is b1:2b:55:93:f1:d9:52:2b:0f:f2:8a:4e:ae:c6:7c:9a.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'pcmk-2,192.168.122.102' (RSA) to the list of known
 hosts.root@pcmk-2's password:
id_dsa.pub                                100%  616     0.6KB/s   00:00
id_dsa                                    100%  672     0.7KB/s   00:00
known_hosts                               100%  400     0.4KB/s   00:00
authorized_keys                           100%  616     0.6KB/s   00:00
# ssh pcmk-2 -- uname -npcmk-2
#
```

Figure 2.22. Installing the SSH Key on Another Host

2.4.3. Numele Scurte ale Nodurilor

During installation, we filled in the machine's fully qualifier domain name (FQDN) which can be rather long when it appears in cluster logs and status output. See for yourself how the machine identifies itself:

```
# uname -n
pcmk-1.clusterlabs.org
# dnsdomainname clusterlabs.org
```

Rezultatul de ieșire de la a doua comandă este în regulă, dar nu avem nevoie cu adevărat ca numele de domeniu să fie inclus în detaliile de bază ale gazdei. Pentru a adresa acest lucru, trebuie să actualizăm /etc/sysconfig/network. Așa ar trebui să arate înainte să începem.

```
# cat /etc/sysconfig/network
NETWORKING=yes
HOSTNAME=pcmk-1.clusterlabs.org
GATEWAY=192.168.122.1
```

Tot ceea ce trebuie să facem acum este să scoatem porțiunea de nume de domeniu, care este stocată oricum în altă parte.

```
# sed -i.bak 's/\.[a-z].*//g' /etc/sysconfig/network
```

Acum confirmați că modificarea a fost realizată cu succes. Conținutul fișierului revizuit ar trebui să arate ceva de genul acesta.

```
# cat /etc/sysconfig/network
NETWORKING=yes
HOSTNAME=pcmk-1
GATEWAY=192.168.122.1
```

However we're not finished. The machine wont normally see the shortened host name until about it reboots, but we can force it to update.

```
# source /etc/sysconfig/network
# hostname $HOSTNAME
```

Acum verificați că mașina folosește numele corecte

```
# uname -npcmk-1
# dnsdomainname clusterlabs.org
```

Acum repetați pe pcmk-2.

2.4.4. Configurarea Corosync

Choose a port number and multi-cast [7] address. [8] Be sure that the values you chose do not conflict with any existing clusters you might have. For advice on choosing a multi-cast address, see *http://www.29west.com/docs/THPM/multicast-address-assignment.html* For this document, I have chosen port 4000 and used 226.94.1.1 as the multi-cast address.

Important

Instrucțiunile de mai jos se aplică numai pentru o mașină cu o singură placă de rețea. Dacă aveți un setup mai complicat, ar trebui să editați configurația manual.

```
# export ais_port=4000
# export ais_mcast=226.94.1.1
```

În continuare determinăm în mod automat adresa gazdelor. Nefolosind adresa completă, facem configurația fezabilă pentru a fi copiată pe alte noduri.

```
# export ais_addr=`ip addr | grep "inet " | tail -n 1 | awk '{print $4}' | sed s/255/0/`
```

Listați și verificați opțiunile de configurare

[7] *http://en.wikipedia.org/wiki/Multicast*
[8] *http://en.wikipedia.org/wiki/Multicast_address*

```
# env | grep ais_ais_mcast=226.94.1.1
ais_port=4000
ais_addr=192.168.122.0
```

Once you're happy with the chosen values, update the Corosync configuration

```
# cp /etc/corosync/corosync.conf.example /etc/corosync/corosync.conf
# sed -i.bak "s/.*mcastaddr:.*/mcastaddr:\ $ais_mcast/g" /etc/corosync/corosync.conf
# sed -i.bak "s/.*mcastport:.*/mcastport:\ $ais_port/g" /etc/corosync/corosync.conf
# sed -i.bak "s/.*bindnetaddr:.*/bindnetaddr:\ $ais_addr/g" /etc/corosync/corosync.conf
```

În sfârșit, spuneți Corosync-ului să încarce plugin-ul de Pacemaker.

```
# cat <<-END >>/etc/corosync/service.d/pcmk
service {
        # Load the Pacemaker Cluster Resource Manager
        name: pacemaker
        ver:  1
}
END
```

The final configuration should look something like the sample in Appendix B, Sample Corosync Configuration.

Important

When run in version 1 mode, the plugin does not start the Pacemaker daemons. Instead it just sets up the quorum and messaging interfaces needed by the rest of the stack. Starting the dameons occurs when the Pacemaker init script is invoked. This resolves two long standing issues:

a. Forking-ul înăuntrul unui proces multi-threaded precum Corosync cauzează tot felul de probleme. Acest lucru a fost problematic pentru Pacemaker din moment ce acesta are nevoie de un număr de daemoni să fie lansați în execuție.

b. Corosync nu a fost niciodată conceput pentru închiderea în pași - un aspect necesar anterior pentru a preveni clusterul din a ieși înainte ca Pacemaker să poată opri toate resursele active.

2.4.5. Propagarea Configurației

Acum trebuie să copiem modificările făcute până acum pe celălalt nod:

```
# for f in /etc/corosync/corosync.conf /etc/corosync/service.d/pcmk /etc/hosts; do scp $f
 pcmk-2:$f ; done
corosync.conf                                 100% 1528     1.5KB/s   00:00
hosts                                         100%  281     0.3KB/s   00:00
#
```

Verificați Instalarea Clusterului

Cuprins

3.1. Verificați Instalarea Corosync

Porniți Corosync pe primul nod

```
# /etc/init.d/corosync start
Starting Corosync Cluster Engine (corosync): [ OK ]
```

Verificați dacă a pornit corect clusterul și că o apartenență inițială s-a putut forma

```
# grep -e "corosync.*network interface" -e "Corosync Cluster Engine" -e "Successfully read
 main configuration file" /var/log/messages
Aug 27 09:05:34 pcmk-1 corosync[1540]: [MAIN ] Corosync Cluster Engine ('1.1.0'): started and
 ready to provide service.
Aug 27 09:05:34 pcmk-1 corosync[1540]: [MAIN ] Successfully read main configuration file '/
etc/corosync/corosync.conf'.
# grep TOTEM /var/log/messages
Aug 27 09:05:34 pcmk-1 corosync[1540]: [TOTEM ] Initializing transport (UDP/IP).
Aug 27 09:05:34 pcmk-1 corosync[1540]: [TOTEM ] Initializing transmit/receive security:
 libtomcrypt SOBER128/SHA1HMAC (mode 0).
Aug 27 09:05:35 pcmk-1 corosync[1540]: [TOTEM ] The network interface [192.168.122.101] is
 now up.
Aug 27 09:05:35 pcmk-1 corosync[1540]: [TOTEM ] A processor joined or left the membership and
 a new membership was formed.
```

With one node functional, it's now safe to start Corosync on the second node as well.

```
# ssh pcmk-2 -- /etc/init.d/corosync start
Starting Corosync Cluster Engine (corosync): [ OK ]
#
```

Verificați dacă s-a format corect clusterul

```
# grep TOTEM /var/log/messages
Aug 27 09:05:34 pcmk-1 corosync[1540]: [TOTEM ] Initializing transport (UDP/IP).
Aug 27 09:05:34 pcmk-1 corosync[1540]: [TOTEM ] Initializing transmit/receive security:
 libtomcrypt SOBER128/SHA1HMAC (mode 0).
Aug 27 09:05:35 pcmk-1 corosync[1540]: [TOTEM ] The network interface [192.168.122.101] is
 now up.
Aug 27 09:05:35 pcmk-1 corosync[1540]: [TOTEM ] A processor joined or left the membership and
 a new membership was formed.
Aug 27 09:12:11 pcmk-1 corosync[1540]: [TOTEM ] A processor joined or left the membership and
 a new membership was formed.
```

3.2. Verificați Instalarea Pacemaker

Acum că am confirmat că este funcțional Corosync putem verifica și restul stivei.

```
# grep pcmk_startup /var/log/messages
```

```
Aug 27 09:05:35 pcmk-1 corosync[1540]:  [pcmk ] info: pcmk_startup: CRM: InitializedAug 27
 09:05:35 pcmk-1 corosync[1540]:  [pcmk ] Logging: Initialized pcmk_startup
Aug 27 09:05:35 pcmk-1 corosync[1540]:  [pcmk ] info: pcmk_startup: Maximum core file size
 is: 18446744073709551615
Aug 27 09:05:35 pcmk-1 corosync[1540]:  [pcmk ] info: pcmk_startup: Service: 9Aug 27 09:05:35
 pcmk-1 corosync[1540]:  [pcmk ] info: pcmk_startup: Local hostname: pcmk-1
```

Acum încercați să porniți Pacemaker și verificați că procesele necesare au fost pornite

```
# /etc/init.d/pacemaker start
Starting Pacemaker Cluster Manager: [ OK ]

# grep -e pacemakerd.*get_config_opt -e pacemakerd.*start_child -e "Starting Pacemaker" /var/
log/messages
Feb  8 13:31:24 pcmk-1 pacemakerd: [13155]: info: get_config_opt: Found 'pacemaker' for
 option: name
Feb  8 13:31:24 pcmk-1 pacemakerd: [13155]: info: get_config_opt: Found '1' for option: ver
Feb  8 13:31:24 pcmk-1 pacemakerd: [13155]: info: get_config_opt: Defaulting to 'no' for
 option: use_logd
Feb  8 13:31:24 pcmk-1 pacemakerd: [13155]: info: get_config_opt: Defaulting to 'no' for
 option: use_mgmtd
Feb  8 13:31:24 pcmk-1 pacemakerd: [13155]: info: get_config_opt: Found 'on' for option:
 debug
Feb  8 13:31:24 pcmk-1 pacemakerd: [13155]: info: get_config_opt: Found 'yes' for option:
 to_logfile
Feb  8 13:31:24 pcmk-1 pacemakerd: [13155]: info: get_config_opt: Found '/var/log/
corosync.log' for option: logfile
Feb  8 13:31:24 pcmk-1 pacemakerd: [13155]: info: get_config_opt: Found 'yes' for option:
 to_syslog
Feb  8 13:31:24 pcmk-1 pacemakerd: [13155]: info: get_config_opt: Found 'daemon' for option:
 syslog_facility
Feb  8 16:50:38 pcmk-1 pacemakerd: [13990]: info: main: Starting Pacemaker 1.1.5 (Build:
 31f088949239+):  docbook-manpages publican ncurses trace-logging cman cs-quorum heartbeat
 corosync snmp libesmtp
Feb  8 16:50:38 pcmk-1 pacemakerd: [13990]: info: start_child: Forked child 14022 for process
 stonith-ng
Feb  8 16:50:38 pcmk-1 pacemakerd: [13990]: info: start_child: Forked child 14023 for process
 cib
Feb  8 16:50:38 pcmk-1 pacemakerd: [13990]: info: start_child: Forked child 14024 for process
 lrmd
Feb  8 16:50:38 pcmk-1 pacemakerd: [13990]: info: start_child: Forked child 14025 for process
 attrd
Feb  8 16:50:38 pcmk-1 pacemakerd: [13990]: info: start_child: Forked child 14026 for process
 pengine
Feb  8 16:50:38 pcmk-1 pacemakerd: [13990]: info: start_child: Forked child 14027 for process
 crmd

# ps axf PID TTY   STAT  TIME COMMAND
  2 ?    S<   0:00 [kthreadd]
  3 ?    S<   0:00 \_ [migration/0]
... lots of processes ...
13990 ?  S    0:01 pacemakerd
14022 ?  Sa   0:00 \_ /usr/lib64/heartbeat/stonithd
14023 ?  Sa   0:00 \_ /usr/lib64/heartbeat/cib
14024 ?  Sa   0:00 \_ /usr/lib64/heartbeat/lrmd
14025 ?  Sa   0:00 \_ /usr/lib64/heartbeat/attrd
14026 ?  Sa   0:00 \_ /usr/lib64/heartbeat/pengine
14027 ?  Sa   0:00 \_ /usr/lib64/heartbeat/crmd
```

În continuare, verificați pentru orice mesaje de tip ERROR din timpul pornirii - nu ar trebui să existe nici unul.

```
# grep ERROR: /var/log/messages | grep -v unpack_resources
#
```

Repeat on the other node and display the cluster's status.

```
# ssh pcmk-2 -- /etc/init.d/pacemaker start
Starting Pacemaker Cluster Manager: [ OK ]
# crm_mon
============
Last updated: Thu Aug 27 16:54:55 2009Stack: openais
Current DC: pcmk-1 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
0 Resources configured.
============
Online: [ pcmk-1 pcmk-2 ]
```

Pacemaker Tools

Cuprins

4.1. Folosirea Utilitarelor Pacemaker

În trecutul întunecat, configurarea Pacemaker necesita ca administratorul să citească și să scrie XML. În stilul adevărat UNIX, existau și un număr de comenzi diferite care se specializau în diferitele aspecte ale interogării și actualizării clusterului.

Începând cu Pacemaker 1.0, acest lucru s-a schimbat și avem un shell de cluster integrat, scriptabil, care ascunde toată schela neordonată de XML. Chiar vă permite să adăugați într-o coadă de așteptare mai multe schimbări și să le aplicați în mod atomic.

Luați-vă ceva timp pentru a vă familiariza cu ceea ce poate să facă.

crm --help

```
usage:
    crm [-D display_type]
    crm [-D display_type] args
    crm [-D display_type] [-f file]

    Use crm without arguments for an interactive session.
    Supply one or more arguments for a "single-shot" use.
    Specify with -f a file which contains a script. Use '-' for
    standard input or use pipe/redirection.

    crm displays cli format configurations using a color scheme
    and/or in uppercase. Pick one of "color" or "uppercase", or
    use "-D color,uppercase" if you want colorful uppercase.
    Get plain output by "-D plain". The default may be set in
    user preferences (options).

Examples:

    # crm -f stopapp2.cli
    # crm < stopapp2.cli
    # crm resource stop global_www
    # crm status
```

The primary tool for monitoring the status of the cluster is crm_mon (also available as crm status). It can be run in a variety of modes and has a number of output options. To find out about any of the tools that come with Pacemaker, simply invoke them with the --help option or consult the included man pages. Both sets of output are created from the tool, and so will always be in sync with each other and the tool itself.

Additionally, the Pacemaker version and supported cluster stack(s) are available via the --feature option to pacemakerd.

pacemakerd --features

```
Pacemaker 1.1.9-3.fc20.2 (Build: 781a388)
```

```
 Supporting v3.0.7:  generated-manpages agent-manpages ncurses libqb-logging libqb-ipc
 upstart systemd nagios  corosync-native
```

pacemakerd --help

```
pacemakerd - Start/Stop Pacemaker

Usage: pacemakerd mode [options]
Options:
 -?, --help   This text
 -$, --version   Version information
 -V, --verbose   Increase debug output
 -S, --shutdown   Instruct Pacemaker to shutdown on this machine
 -F, --features   Display the full version and list of features Pacemaker was built with

Additional Options:
 -f, --foreground   (Ignored) Pacemaker always runs in the foreground
 -p, --pid-file=value  (Ignored) Daemon pid file location

Report bugs to pacemaker@oss.clusterlabs.org
```

crm_mon --help

```
crm_mon - Provides a summary of cluster's current state.

Outputs varying levels of detail in a number of different formats.

Usage: crm_mon mode [options]
Options:
 -?, --help   This text
 -$, --version   Version information
 -V, --verbose   Increase debug output
 -Q, --quiet   Display only essential output

Modes:
 -h, --as-html=value Write cluster status to the named html file
 -X, --as-xml   Write cluster status as xml to stdout. This will enable one-shot mode.
 -w, --web-cgi   Web mode with output suitable for cgi
 -s, --simple-status  Display the cluster status once as a simple one line output (suitable
 for nagios)

Display Options:
 -n, --group-by-node   Group resources by node
 -r, --inactive   Display inactive resources
 -f, --failcounts   Display resource fail counts
 -o, --operations   Display resource operation history
 -t, --timing-details   Display resource operation history with timing details
 -c, --tickets    Display cluster tickets
 -W, --watch-fencing    Listen for fencing events. For use with --external-agent, --mail-to
 and/or --snmp-traps where supported
 -A, --show-node-attributes  Display node attributes

Additional Options:
 -i, --interval=value  Update frequency in seconds
 -1, --one-shot   Display the cluster status once on the console and exit
 -N, --disable-ncurses   Disable the use of ncurses
 -d, --daemonize   Run in the background as a daemon
 -p, --pid-file=value  (Advanced) Daemon pid file location
 -E, --external-agent=value A program to run when resource operations take place.
 -e, --external-recipient=value A recipient for your program (assuming you want the program
 to send something to someone).

Examples:

Display the cluster status on the console with updates as they occur:
```

```
 # crm_mon

Display the cluster status on the console just once then exit:

 # crm_mon -1

Display your cluster status, group resources by node, and include inactive resources in the
 list:

 # crm_mon --group-by-node --inactive

Start crm_mon as a background daemon and have it write the cluster status to an HTML file:

 # crm_mon --daemonize --as-html /path/to/docroot/filename.html

Start crm_mon and export the current cluster status as xml to stdout, then exit.:

 # crm_mon --as-xml


Report bugs to pacemaker@oss.clusterlabs.org
```

Notă

Dacă opțiunile de SNMP și/sau email nu sunt listate, atunci Pacemaker nu a fost construit pentru a le suporta. Acest lucru s-ar putea întâmpla din alegerea făcută de distribuția folosită sau librăriile necesare ar putea să nu fie disponibile. Vă rugăm să contactați pe oricine v-a furnizat pachetele pentru mai multe detalii.

Crearea unui Cluster Activ/Pasiv

Cuprins

5.1. Explorarea Configurației Existente

Când Pacemaker pornește, înregistrează în mod automat numărul și detaliile nodurilor din cluster la fel ca și care stivă este folosită și care versiune de Pacemaker este folosită.

Așa ar trebui să arate configurația de bază.

```
# crm configure show
node pcmk-1
node pcmk-2
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2"
```

Pentru cei care nu se tem de XML, puteți vedea configurația în stare brută adăugând "xml" la comanda anterioară.

Ultimul XML pe care îl veți vedea în acest document.

```
# crm configure show xml
<?xml version="1.0" ?>
<cib admin_epoch="0" crm_feature_set="3.0.1" dc-uuid="pcmk-1" epoch="13" have-
quorum="1" num_updates="7" validate-with="pacemaker-1.0">
 <configuration>
  <crm_config>
   <cluster_property_set id="cib-bootstrap-options">
    <nvpair id="cib-bootstrap-options-dc-version" name="dc-version" value="1.1.5-
bdd89e69ba545404d02445be1f3d72e6a203ba2f"/>
    <nvpair id="cib-bootstrap-options-cluster-infrastructure" name="cluster-
infrastructure" value="openais"/>
    <nvpair id="cib-bootstrap-options-expected-quorum-votes" name="expected-quorum-
votes" value="2"/>
   </cluster_property_set>
  </crm_config>
  <rsc_defaults/>
  <op_defaults/>
  <nodes>
   <node id="pcmk-1" type="normal" uname="pcmk-1"/>
   <node id="pcmk-2" type="normal" uname="pcmk-2"/>
  </nodes>
  <resources/>
  <constraints/>
 </configuration>
</cib>
```

Before we make any changes, its a good idea to check the validity of the configuration.

```
# crm_verify -L
crm_verify[2195]: 2009/08/27_16:57:12 ERROR: unpack_resources: Resource start-up disabled
 since no STONITH resources have been defined
crm_verify[2195]: 2009/08/27_16:57:12 ERROR: unpack_resources: Either configure some or
 disable STONITH with the stonith-enabled option
crm_verify[2195]: 2009/08/27_16:57:12 ERROR: unpack_resources: NOTE: Clusters with shared
 data need STONITH to ensure data integrity
Errors found during check: config not valid -V may provide more details
#
```

După cum puteți vedea, utilitarul a găsit câteva erori.

In order to guarantee the safety of your data [1] , Pacemaker ships with STONITH [2] enabled. However it also knows when no STONITH configuration has been supplied and reports this as a problem (since the cluster would not be able to make progress if a situation requiring node fencing arose).

Momentan, vom dezactiva această funcționalitate și o vom configura mai târziu în secțiunea Configurarea STONITH. Este important de reținut că utilizarea STONITH este puternic încurajată, oprirea acestuia îi spune clusterului să se prefacă pur și simplu că nodurile care au eșuat sunt oprite în siguranță. Unii comercianți vor refuza chiar să ofere suport pentru clustere care îl au dezactivat.

Pentru a dezactiva STONITH, setăm opțiunea clusterului stonith-enabled pe false.

```
# crm configure property stonith-enabled=false
# crm_verify -L
```

Cu noua opțiune a clusterului setată, configurația este acum validă.

Avertisment

The use of stonith-enabled=false is completely inappropriate for a production cluster. We use it here to defer the discussion of its configuration which can differ widely from one installation to the next. See *Secțiune 9.1, „What Is STONITH”* for information on why STONITH is important and details on how to configure it.

5.2. Adăugarea unei Resurse

The first thing we should do is configure an IP address. Regardless of where the cluster service(s) are running, we need a consistent address to contact them on. Here I will choose and add 192.168.122.101 as the floating address, give it the imaginative name ClusterIP and tell the cluster to check that its running every 30 seconds.

Important

Adresa aleasă nu trebuie să fie una deja asociată cu un nod fizic

[1] If the data is corrupt, there is little point in continuing to make it available
[2] A common node fencing mechanism. Used to ensure data integrity by powering off "bad" nodes

```
# crm configure primitive ClusterIP ocf:heartbeat:IPaddr2 \
     params ip=192.168.122.101 cidr_netmask=32 \
     op monitor interval=30s
```

The other important piece of information here is ocf:heartbeat:IPaddr2.

This tells Pacemaker three things about the resource you want to add. The first field, ocf, is the standard to which the resource script conforms to and where to find it. The second field is specific to OCF resources and tells the cluster which namespace to find the resource script in, in this case heartbeat. The last field indicates the name of the resource script.

Pentru a obține o listă a claselor de resurse disponibile, rulați

```
# crm ra classesheartbeat
lsb ocf / heartbeat pacemakerstonith
```

Pentru a găsi mai apoi toți agenții de resursă OCF furnizați de Pacemaker și Heartbeat, rulați

```
# crm ra list ocf pacemaker
ClusterMon   Dummy     Stateful    SysInfo    SystemHealth  controld
ping      pingd
# crm ra list ocf heartbeat
AoEtarget       AudibleAlarm      ClusterMon       Delay
Dummy         EvmsSCC        Evmsd         Filesystem
ICP          IPaddr         IPaddr2        IPsrcaddr
LVM          LinuxSCSI       MailTo         ManageRAID
ManageVE        Pure-FTPd       Raid1         Route
SAPDatabase      SAPInstance      SendArp        ServeRAID
SphinxSearchDaemon   Squid         Stateful        SysInfo
VIPArip         VirtualDomain     WAS          WAS6
WinPopup        Xen          Xinetd         anything
apache          db2          drbd          eDir88
iSCSILogicalUnit    iSCSITarget      ids          iscsi
ldirectord       mysql         mysql-proxy      nfsserver
oracle          oralsnr        pgsql         pingd
portblock       rsyncd         scsi2reservation    sfex
tomcat          vmware
#
```

Acum verificați că resursa IP a fost adăugată și listați status-ul clusterului pentru a vedea că acum este activă.

```
# crm configure shownode pcmk-1
node pcmk-2primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
# crm_mon
============
Last updated: Fri Aug 28 15:23:48 2009
Stack: openais
Current DC: pcmk-1 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
1 Resources configured.
============
```

```
Online: [ pcmk-1 pcmk-2 ]
ClusterIP (ocf::heartbeat:IPaddr): Started pcmk-1
```

5.3. Efectuați un Failover

Fiind un cluster de tip high-availability, ar trebui să testăm failover-ul noii noastre resurse înainte de a merge mai departe.

Întâi, găsiți nodul pe care rulează adresa IP.

```
# crm resource status ClusterIP
resource ClusterIP is running on: pcmk-1
#
```

Opriți Pacemaker și Corosync pe acea mașină.

```
# ssh pcmk-1 -- /etc/init.d/pacemaker stop
Signaling Pacemaker Cluster Manager to terminate: [ OK ]
Waiting for cluster services to unload:. [ OK ]
# ssh pcmk-1 -- /etc/init.d/corosync stop
Stopping Corosync Cluster Engine (corosync): [ OK ]
Waiting for services to unload: [ OK ]
#
```

Odată ce Corosync nu mai rulează, mergeți pe celălalt nod și verificați status-ul clusterului cu crm_mon.

```
# crm_mon
============
Last updated: Fri Aug 28 15:27:35 2009
Stack: openais
Current DC: pcmk-2 - partition WITHOUT quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
1 Resources configured.
============

Online: [ pcmk-2 ]OFFLINE: [ pcmk-1 ]
```

Sunt trei aspecte de ținut cont în legătură cu starea curentă a clusterului. Primul este acela că, așa cum ne așteptam, pcmk-1 este acum offline. Totodată putem vedea că, ClusterIP nu rulează nicăieri!

5.3.1. Quorum și Clusterele Formate din Două Noduri

Acest lucru este datorită faptului că, clusterul nu mai are quorum, după cum poate fi observat din textul "partition WITHOUT quorum" (ieșind în evidență în verde) în rezultatul de ieșire de mai sus. Pentru a reduce posibilitatea coruperii datelor, comportamentul implicit al Pacemaker-ului este să oprească toate resursele dacă clusterul nu are quorum.

Un cluster este considerat că are quorum când mai mult de jumătate din nodurile cunoscute sau așteptate sunt online, sau pentru cei cu înclinație către matematică, în orice moment în care ecuația următoare este adevărată:

```
numărul_total_de_noduri < 2 * numărul_de_noduri_active
```

Therefore a two-node cluster only has quorum when both nodes are running, which is no longer the case for our cluster. This would normally make the creation of a two-node cluster pointless [3] , however it is possible to control how Pacemaker behaves when quorum is lost. In particular, we can tell the cluster to simply ignore quorum altogether.

```
# crm configure property no-quorum-policy=ignore
# crm configure show
node pcmk-1
node pcmk-2
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
```

După câteva momente, clusterul va porni adresa IP pe nodul rămas. Luați aminte, clusterul încă nu are quorum.

```
# crm_mon
============
Last updated: Fri Aug 28 15:30:18 2009
Stack: openais
Current DC: pcmk-2 - partition WITHOUT quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
1 Resources configured.
============
Online: [ pcmk-2 ]
OFFLINE: [ pcmk-1 ]
ClusterIP (ocf::heartbeat:IPaddr): Started pcmk-2
```

Acum simulați recuperarea nodului restartând stiva de cluster pe pcmk-1 și verificați status-ul clusterului.

```
# /etc/init.d/corosync start
Starting Corosync Cluster Engine (corosync): [ OK ]
# /etc/init.d/pacemaker start
Starting Pacemaker Cluster Manager: [ OK ]# crm_mon
============
Last updated: Fri Aug 28 15:32:13 2009
Stack: openais
Current DC: pcmk-2 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
1 Resources configured.
============
Online: [ pcmk-1 pcmk-2 ]

ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-1
```

Aici putem vedea ceva ce unii ar putea considera surprinzător, IP-ul rulează înapoi pe locația sa originală!

[3] Actually some would argue that two-node clusters are always pointless, but that is an argument for another time

5.3.2. Prevenirea Mutării Resurselor după Recuperare

În anumite circumstanțe, este foarte de dorit să se prevină ca resursele sănătoase din a fi mutate prin cluster. Mutarea resurselor necesită aproape întotdeauna o perioadă de nefuncționare. Pentru servicii complexe precum bazele de date Oracle, această perioadă poate fi destul de lungă.

To address this, Pacemaker has the concept of resource stickiness which controls how much a service prefers to stay running where it is. You may like to think of it as the "cost" of any downtime. By default, Pacemaker assumes there is zero cost associated with moving resources and will do so to achieve "optimal" [4] resource placement. We can specify a different stickiness for every resource, but it is often sufficient to change the default.

```
# crm configure rsc_defaults resource-stickiness=100
# crm configure show
node pcmk-1
node pcmk-2
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

Dacă încercăm din nou acum testul de failover, vedem că așa cum este de așteptat ClusterIP se mută în continuare pe pcmk-2 când pcmk-1 este trecut offline.

```
# ssh pcmk-1 -- /etc/init.d/pacemaker stop
Signaling Pacemaker Cluster Manager to terminate:          [  OK  ]
Waiting for cluster services to unload:.                   [  OK  ]
# ssh pcmk-1 -- /etc/init.d/corosync stop
Stopping Corosync Cluster Engine (corosync):        [ OK ]
Waiting for services to unload:              [ OK ]
# ssh pcmk-2 -- crm_mon -1
============
Last updated: Fri Aug 28 15:39:38 2009
Stack: openais
Current DC: pcmk-2 - partition WITHOUT quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
1 Resources configured.
============

Online: [ pcmk-2 ]
OFFLINE: [ pcmk-1 ]
ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-2
```

Însă când aducem pcmk-1 înapoi online, ClusterIP acum rămâne în funcționare pe pcmk-2.

```
# /etc/init.d/corosync start
Starting Corosync Cluster Engine (corosync): [ OK ]
# /etc/init.d/pacemaker start
Starting Pacemaker Cluster Manager: [ OK ]
```

[4] It should be noted that Pacemaker's definition of optimal may not always agree with that of a human's. The order in which Pacemaker processes lists of resources and nodes creates implicit preferences in situations where the administrator has not explicitly specified them

```
# crm_mon
============
Last updated: Fri Aug 28 15:41:23 2009
Stack: openais
Current DC: pcmk-2 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
1 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-2
```

Apache - Adăugarea mai Multor Servicii

Cuprins

6.1. Forward

Now that we have a basic but functional active/passive two-node cluster, we're ready to add some real services. We're going to start with Apache because its a feature of many clusters and relatively simple to configure.

6.2. Instalare

Before continuing, we need to make sure Apache is installed on both hosts.

```
# yum install -y httpdSetting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package httpd.x86_64 0:2.2.13-2.fc12 set to be updated
--> Processing Dependency: httpd-tools = 2.2.13-2.fc12 for package:
 httpd-2.2.13-2.fc12.x86_64
--> Processing Dependency: apr-util-ldap for package: httpd-2.2.13-2.fc12.x86_64
--> Processing Dependency: /etc/mime.types for package: httpd-2.2.13-2.fc12.x86_64
--> Processing Dependency: libaprutil-1.so.0()(64bit) for package: httpd-2.2.13-2.fc12.x86_64
--> Processing Dependency: libapr-1.so.0()(64bit) for package: httpd-2.2.13-2.fc12.x86_64
--> Running transaction check
---> Package apr.x86_64 0:1.3.9-2.fc12 set to be updated
---> Package apr-util.x86_64 0:1.3.9-2.fc12 set to be updated
---> Package apr-util-ldap.x86_64 0:1.3.9-2.fc12 set to be updated
---> Package httpd-tools.x86_64 0:2.2.13-2.fc12 set to be updated
---> Package mailcap.noarch 0:2.1.30-1.fc12 set to be updated
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
Package        Arch       Version        Repository     Size
================================================================================
Installing:
httpd        x86_64      2.2.13-2.fc12      rawhide      735 k
Installing for dependencies:
apr          x86_64      1.3.9-2.fc12       rawhide      117 k
apr-util       x86_64      1.3.9-2.fc12       rawhide       84 k
apr-util-ldap    x86_64      1.3.9-2.fc12       rawhide       15 k
httpd-tools      x86_64      2.2.13-2.fc12      rawhide       63 k
mailcap        noarch      2.1.30-1.fc12      rawhide       25 k
```

```
Transaction Summary
================================================================================
Install    6 Package(s)
Upgrade    0 Package(s)

Total download size: 1.0 M
Downloading Packages:
(1/6): apr-1.3.9-2.fc12.x86_64.rpm                 | 117 kB   00:00
(2/6): apr-util-1.3.9-2.fc12.x86_64.rpm               | 84 kB   00:00
(3/6): apr-util-ldap-1.3.9-2.fc12.x86_64.rpm           | 15 kB   00:00
(4/6): httpd-2.2.13-2.fc12.x86_64.rpm                | 735 kB   00:00
(5/6): httpd-tools-2.2.13-2.fc12.x86_64.rpm             | 63 kB   00:00
(6/6): mailcap-2.1.30-1.fc12.noarch.rpm               | 25 kB   00:00
 --------------------------------------------------------------------------------
Total                           875 kB/s | 1.0 MB   00:01
Running rpm_check_debug
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
Running Transaction
 Installing   : apr-1.3.9-2.fc12.x86_64                      1/6
 Installing   : apr-util-1.3.9-2.fc12.x86_64                  2/6
 Installing   : apr-util-ldap-1.3.9-2.fc12.x86_64                3/6
 Installing   : httpd-tools-2.2.13-2.fc12.x86_64               4/6
 Installing   : mailcap-2.1.30-1.fc12.noarch                  5/6
 Installing   : httpd-2.2.13-2.fc12.x86_64                    6/6

Installed:
 httpd.x86_64 0:2.2.13-2.fc12

Dependency Installed:
 apr.x86_64 0:1.3.9-2.fc12      apr-util.x86_64 0:1.3.9-2.fc12
 apr-util-ldap.x86_64 0:1.3.9-2.fc12 httpd-tools.x86_64 0:2.2.13-2.fc12
 mailcap.noarch 0:2.1.30-1.fc12

Complete!
```

De asemenea, avem nevoie de utilitarul wget pentru ca și clusterul să fie capabil să verifice status-ul serverului Apache.

```
# yum install -y wgetSetting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package wget.x86_64 0:1.11.4-5.fc12 set to be updated
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
Package    Arch       Version           Repository        Size
================================================================================
Installing:
wget       x86_64     1.11.4-5.fc12         rawhide        393 k

Transaction Summary
================================================================================
Install    1 Package(s)
Upgrade    0 Package(s)

Total download size: 393 k
Downloading Packages:
wget-1.11.4-5.fc12.x86_64.rpm                      | 393 kB   00:00
Running rpm_check_debug
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
```

```
Running Transaction
 Installing   : wget-1.11.4-5.fc12.x86_64                       1/1

Installed:
 wget.x86_64 0:1.11.4-5.fc12

Complete!
```

6.3. Pregătire

Mai întâi trebuie să creem o pagină pe care Apache să o servească. Pe Fedora docroot-ul implicit al Apache-ului este în /var/www/html, așa că vom crea un fișier index acolo.

```
[root@pcmk-1 ~]# cat <<-END >/var/www/html/index.html <html>
 <body>My Test Site - pcmk-1</body>
 </html>
 END
```

Pentru moment, vom simplifica lucrurile servind doar un site static și vom sincroniza manual datele între cele două noduri. Așa că rulați comanda din nou pe pcmk-2.

```
[root@pcmk-2 ~]# cat <<-END >/var/www/html/index.html <html>
 <body>My Test Site - pcmk-2</body>
 </html>
 END
```

6.4. Activați status URL-ul Apache-ului

Pentru a monitoriza sănătatea instanței voastre de Apache și pentru a o recupera dacă eșuează, agentul de resursă folosit de Pacemaker presupune că URL-ul server-status este disponibil. Uitați-vă după următoarele în /etc/httpd/conf/httpd.conf și asigurați-vă că nu este dezactivat sau comentat.

```
<Location /server-status>
   SetHandler server-status
   Order deny,allow
   Deny from all
   Allow from 127.0.0.1
</Location>
```

6.5. Actualizarea Configurației

At this point, Apache is ready to go, all that needs to be done is to add it to the cluster. Lets call the resource WebSite. We need to use an OCF script called apache in the heartbeat namespace [1] , the only required parameter is the path to the main Apache configuration file and we'll tell the cluster to check once a minute that apache is still running.

```
# crm configure primitive WebSite ocf:heartbeat:apache params configfile=/etc/httpd/conf/
httpd.conf op monitor interval=1min
# crm configure show
node pcmk-1
node pcmk-2primitive WebSite ocf:heartbeat:apache \ params configfile="/etc/httpd/conf/
httpd.conf" \ op monitor interval="1min"primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
```

[1] Compare the key used here ocf:heartbeat:apache with the one we used earlier for the IP address: ocf:heartbeat:IPaddr2

```
    op monitor interval="30s"
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

După o scurtă întârziere, ar trebui să vedem clusterul pornind apache-ul

```
# crm_mon
============
Last updated: Fri Aug 28 16:12:49 2009
Stack: openais
Current DC: pcmk-2 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
2 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-2
WebSite    (ocf::heartbeat:apache):    Started pcmk-1
```

Așteptați un moment, resursa WebSite nu rulează pe aceeași gazdă ca și adresa noastră IP!

6.6. Asigurarea că Resursele Rulează pe Aceeași Gazdă

Pentru a reduce nivelul de încărcare pe oricare din mașini, Pacemaker va încerca în mod general să împrăștie resursele configurate de-a lungul nodurilor din cluster. Totuși putem spune clusterului că două resurse au legătura una cu cealaltă și trebuie să ruleze pe aceeași gazdă (sau să nu ruleze deloc). Aici instruim clusterul că WebSite poate rula numar pe o gazdă pe care este activ ClusterIP.

For the constraint, we need a name (choose something descriptive like website-with-ip), indicate that its mandatory (so that if ClusterIP is not active anywhere, WebSite will not be permitted to run anywhere either) by specifying a score of INFINITY and finally list the two resources.

Notă

Dacă ClusterIP nu este activ nicăieri, lui WebSite nu i se va permite să ruleze nicăieri.

Important

Colocation constraints are "directional", in that they imply certain things about the order in which the two resources will have a location chosen. In this case we're saying **`WebSite`** needs to be placed on the same machine as **`ClusterIP`**, this implies that we must know the location of **`ClusterIP`** before choosing a location for **`WebSite`**.

```
# crm configure colocation website-with-ip INFINITY: WebSite ClusterIP
# crm configure show
node pcmk-1
node pcmk-2
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"colocation website-with-ip inf: WebSite
 ClusterIPproperty $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
# crm_mon
============
Last updated: Fri Aug 28 16:14:34 2009
Stack: openais
Current DC: pcmk-2 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
2 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-2
WebSite    (ocf::heartbeat:apache):    Started pcmk-2
```

6.7. Controlarea Ordinii de Pornire/Oprire a Resursei

When Apache starts, it binds to the available IP addresses. It doesn't know about any addresses we add afterwards, so not only do they need to run on the same node, but we need to make sure ClusterIP is already active before we start WebSite. We do this by adding an ordering constraint. We need to give it a name (choose something descriptive like apache-after-ip), indicate that its mandatory (so that any recovery for ClusterIP will also trigger recovery of WebSite) and list the two resources in the order we need them to start.

```
# crm configure order apache-after-ip mandatory: ClusterIP WebSite
# crm configure show
node pcmk-1
node pcmk-2
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"
colocation website-with-ip inf: WebSite ClusterIPorder apache-after-ip inf: ClusterIP
 WebSiteproperty $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

6.8. Specificarea unei Locații Preferate

Pacemaker nu se bazează pe nici un fel de simetrie hardware între noduri, așa că ar putea foarte bine ca o mașină să fie mai puternică decât cealaltă. În astfel de cazuri are logică să găzduim resursele acolo dacă este disponibilă. Pentru a face acest lucru creăm o restricție de locație. Din nou îi dăm un nume descriptiv (prefer-pcmk-1), specificăm resursa pe care vrem să o rulăm acolo (WebSite), cât de mult am dori ca aceasta să ruleze acolo (vom folosi 50 momentan, dar într-o situație cu două noduri aproape orice valoare mai mare ca 0 este suficientă) și numele gazdei.

```
# crm configure location prefer-pcmk-1 WebSite 50: pcmk-1
# crm configure show
node pcmk-1
node pcmk-2
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"location prefer-pcmk-1 WebSite 50: pcmk-1colocation website-
with-ip inf: WebSite ClusterIP
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
# crm_mon
============
Last updated: Fri Aug 28 16:17:35 2009
Stack: openais
Current DC: pcmk-2 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
2 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-2WebSite    (ocf::heartbeat:apache):
  Started pcmk-2
```

Așteptați o clipă, resursele sunt încă pe pcmk-2!

Chiar dacă acum preferăm pcmk-1 în favoarea pcmk-2, această preferință este (în mod intenționat) mai mică decât adezivitatea resursei (cât de mult am preferat să nu avem nefuncționare inutilă).

Pentru a vedea scorurile curente de plasament, puteți folosi un utilitar numit ptest

```
ptest -sL
```

Notă

Include output There is a way to force them to move though…

6.9. Mutarea Manuală a Resurselor Prin Jurul Clusterului

Sunt întotdeauna momente când un administrator are nevoie să preia controlul clusterului și să forțeze resursele să se mute într-o locație specifică. Dedesupt folosim restricții de locație precum cea pe care am creat-o mai sus, dar în mod fericit nu trebuie să vă pese. Doar furnizați numele resursei și locația dorită, iar noi vom face restul.

```
# crm resource move WebSite pcmk-1
# crm_mon
============
Last updated: Fri Aug 28 16:19:24 2009
Stack: openais
Current DC: pcmk-2 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
2 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-1
WebSite    (ocf::heartbeat:apache):    Started pcmk-1
```

Notice how the colocation rule we created has ensured that ClusterIP was also moved to pcmk-1. For the curious, we can see the effect of this command by examining the configuration

```
# crm configure show
node pcmk-1
node pcmk-2
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"
location cli-prefer-WebSite WebSite \
    rule $id="cli-prefer-rule-WebSite" inf: #uname eq pcmk-1
location prefer-pcmk-1 WebSite 50: pcmk-1
colocation website-with-ip inf: WebSite ClusterIP
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

Subliniată este restricția automată folosită pentru a muta resursele pe pcmk-1

6.9.1. Returnarea Controlului Înapoi Clusterului

Odată ce am terminat oricare activitate ce ne-a cerut să mutăm resursele pe pcmk-1, în cazul nostru nimic, putem mai apoi să permitem clusterului să reia operațiunile normale prin comanda unmove. Din moment ce am configurat anterior o adezivitate implicită, resursele vor rămâne pe pcmk-1.

```
# crm resource unmove WebSite
# crm configure show
node pcmk-1
node pcmk-2
primitive WebSite ocf:heartbeat:apache \
```

```
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"
location prefer-pcmk-1 WebSite 50: pcmk-1
colocation website-with-ip inf: WebSite ClusterIP
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

Observați că restricția automată acum nu mai există. Dacă verificăm status-ul clusterului, putem vedea că așa cum ne așteptam resursele sunt în continuare active pe pcmk-1.

```
# crm_mon
============
Last updated: Fri Aug 28 16:20:53 2009
Stack: openais
Current DC: pcmk-2 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
2 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

 ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-1
 WebSite    (ocf::heartbeat:apache):    Started pcmk-1
```

Stocare Replicată cu DRBD

Cuprins

7.1. Background

Even if you're serving up static websites, having to manually synchronize the contents of that website to all the machines in the cluster is not ideal. For dynamic websites, such as a wiki, it's not even an option. Not everyone care afford network-attached storage but somehow the data needs to be kept in sync. Enter DRBD which can be thought of as network based RAID-1. See *http://www.drbd.org/* for more details.

7.2. Instalarea Pachetelor DRBD

Since its inclusion in the upstream 2.6.33 kernel, everything needed to use DRBD ships with Fedora 13. All you need to do is install it:

```
# yum install -y drbd-pacemaker drbd-udev
Loaded plugins: presto, refresh-packagekit
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package drbd-pacemaker.x86_64 0:8.3.7-2.fc13 set to be updated
--> Processing Dependency: drbd-utils = 8.3.7-2.fc13 for package: drbd-
pacemaker-8.3.7-2.fc13.x86_64
--> Running transaction check
---> Package drbd-utils.x86_64 0:8.3.7-2.fc13 set to be updated
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
 Package                Arch           Version              Repository      Size
================================================================================
Installing:
 drbd-pacemaker         x86_64         8.3.7-2.fc13         fedora          19 k
Installing for dependencies:
 drbd-utils             x86_64         8.3.7-2.fc13         fedora         165 k

Transaction Summary
================================================================================
Install       2 Package(s)
Upgrade       0 Package(s)

Total download size: 184 k
Installed size: 427 k
```

```
Downloading Packages:
Setting up and reading Presto delta metadata
fedora/prestodelta                                       | 1.7 kB     00:00
Processing delta metadata
Package(s) data still to download: 184 k
(1/2): drbd-pacemaker-8.3.7-2.fc13.x86_64.rpm            |  19 kB     00:01
(2/2): drbd-utils-8.3.7-2.fc13.x86_64.rpm                | 165 kB     00:02
 ---------------------------------------------------------------------------
Total                                            45 kB/s | 184 kB     00:04
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing     : drbd-utils-8.3.7-2.fc13.x86_64                          1/2
  Installing     : drbd-pacemaker-8.3.7-2.fc13.x86_64                      2/2

Installed:
  drbd-pacemaker.x86_64 0:8.3.7-2.fc13

Dependency Installed:
  drbd-utils.x86_64 0:8.3.7-2.fc13

Complete!
```

7.3. Configurarea DRBD

Înainte să configurăm DRBD-ul, trebuie să punem deoparte spațiu pe disc pentru ca acesta să îl folosească.

7.3.1. Crearea Unei Partiții Pentru DRBD

Dacă aveți mai mult de 1Gb liber, simțiți-vă liberi să-l folosiți. Pentru acest ghid însă, 1Gb este suficient spațiu pentru un singur fișier html și suficient pentru a stoca ulterior metadata din GFS2.

```
# lvcreate -n drbd-demo -L 1G VolGroup
Logical volume "drbd-demo" created
# lvs
LV    VG    Attr  LSize  Origin Snap% Move Log Copy% Convert
drbd-demo VolGroup -wi-a- 1.00G
lv_root  VolGroup -wi-ao  7.30G
lv_swap  VolGroup -wi-ao 500.00M
```

Repetați acest lucru pe al doilea nod, asigurați-vă că folosiți o partiție de aceeași dimensiune.

```
# ssh pcmk-2 -- lvs
LV   VG    Attr  LSize  Origin Snap% Move Log Copy% Convert
lv_root VolGroup -wi-ao  7.30G
lv_swap VolGroup -wi-ao 500.00M
# ssh pcmk-2 -- lvcreate -n drbd-demo -L 1G VolGroup
Logical volume "drbd-demo" created
# ssh pcmk-2 -- lvs
LV    VG    Attr  LSize  Origin Snap% Move Log Copy% Convert
drbd-demo VolGroup -wi-a- 1.00G
lv_root  VolGroup -wi-ao  7.30G
lv_swap  VolGroup -wi-ao 500.00M
```

7.3.2. Scrierea Config-ului DRBD

Nu există nici o serie de comenzi pentru a construi configurația DRBD, așa că pur și simplu copiați configurația de mai jos în /etc/drbd.conf.

Informații detaliate despre directivele folosite în această configurație (precum și alte alternative) sunt disponibile de pe *http://www.drbd.org/users-guide/ch-configure.html*

Avertisment

Be sure to use the names and addresses of your nodes if they differ from the ones used in this guide.

```
global {
 usage-count yes;
}
common {
 protocol C;
}
resource wwwdata {
 meta-disk internal;
 device  /dev/drbd1;
 syncer {
  verify-alg sha1;
 }
 net {
  allow-two-primaries;
 }
 on pcmk-1 {
  disk   /dev/mapper/VolGroup-drbd--demo;
  address  192.168.122.101:7789;
 }
 on pcmk-2 {
  disk   /dev/mapper/VolGroup-drbd--demo;
  address  192.168.122.102:7789;
 }
}
```

Notă

TODO: De explicat motivul pentru opțiunea allow-two primaries

7.3.3. Inițializarea și Încărcarea DRBD-ului

Cu configurația pusă la locul ei, acum putem executa inițializarea DRBD-ului.

```
# drbdadm create-md wwwdata
md_offset 12578816
al_offset 12546048
bm_offset 12541952

Found some data
==> This might destroy existing data! <==

Do you want to proceed?
[need to type 'yes' to confirm] yes
Writing meta data...
initializing activity log
NOT initialized bitmap
```

```
New drbd meta data block successfully created.
success
```

Acum încărcați modulul de kernel al DRBD și confirmați că totul este în regulă

```
# modprobe drbd# drbdadm up wwwdata# cat /proc/drbdversion: 8.3.6 (api:88/proto:86-90)
GIT-hash: f3606c47cc6fcf6b3f086e425cb34af8b7a81bbf build by root@pcmk-1, 2009-12-08 11:22:57
 1: cs:WFConnection ro:Secondary/Unknown ds:Inconsistent/DUnknown C r----
  ns:0 nr:0 dw:0 dr:0 al:0 bm:0 lo:0 pe:0 ua:0 ap:0 ep:1 wo:b oos:12248
```

Repeat on the second node

```
# ssh pcmk-2 -- drbdadm --force create-md wwwdata
Writing meta data...
initializing activity log
NOT initialized bitmap
New drbd meta data block successfully created.
success
# ssh pcmk-2 -- modprobe drbd
WARNING: Deprecated config file /etc/modprobe.conf, all config files belong into /etc/
modprobe.d/.
# ssh pcmk-2 -- drbdadm up wwwdata
# ssh pcmk-2 -- cat /proc/drbd
version: 8.3.6 (api:88/proto:86-90)
GIT-hash: f3606c47cc6fcf6b3f086e425cb34af8b7a81bbf build by root@pcmk-1, 2009-12-08 11:22:57
 1: cs:Connected ro:Secondary/Secondary ds:Inconsistent/Inconsistent C r----
    ns:0 nr:0 dw:0 dr:0 al:0 bm:0 lo:0 pe:0 ua:0 ap:0 ep:1 wo:b oos:12248
```

Acum trebuie să spunem DRBD-ului care set de date să îl folosească. Din moment ce ambele părți conțin date nefolositoare, putem rula următoarea comandă pe pcmk-1:

```
# drbdadm -- --overwrite-data-of-peer primary wwwdata
# cat /proc/drbd
version: 8.3.6 (api:88/proto:86-90)
GIT-hash: f3606c47cc6fcf6b3f086e425cb34af8b7a81bbf build by root@pcmk-1, 2009-12-08 11:22:57
1: cs:SyncSource ro:Primary/Secondary ds:UpToDate/Inconsistent C r----
   ns:2184 nr:0 dw:0 dr:2472 al:0 bm:0 lo:0 pe:0 ua:0 ap:0 ep:1 wo:b oos:10064
    [=====>.............] sync'ed: 33.4% (10064/12248)K
    finish: 0:00:37 speed: 240 (240) K/sec
# cat /proc/drbd
version: 8.3.6 (api:88/proto:86-90)
GIT-hash: f3606c47cc6fcf6b3f086e425cb34af8b7a81bbf build by root@pcmk-1, 2009-12-08 11:22:57
1: cs:Connected ro:Primary/Secondary ds:UpToDate/UpToDate C r----
   ns:12248 nr:0 dw:0 dr:12536 al:0 bm:1 lo:0 pe:0 ua:0 ap:0 ep:1 wo:b oos:0
```

pcmk-1 is now in the Primary state which allows it to be written to. Which means it's a good point at which to create a filesystem and populate it with some data to serve up via our WebSite resource.

7.3.4. Popularea DRBD-ului cu Date

```
# mkfs.ext4 /dev/drbd1
mke2fs 1.41.4 (27-Jan-2009)
Filesystem label=
OS type: Linux
Block size=1024 (log=0)
Fragment size=1024 (log=0)
3072 inodes, 12248 blocks
612 blocks (5.00%) reserved for the super user
First data block=1
Maximum filesystem blocks=12582912
2 block groups
```

```
8192 blocks per group, 8192 fragments per group
1536 inodes per group
Superblock backups stored on blocks:
    8193

Writing inode tables: done
Creating journal (1024 blocks): done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 26 mounts or
180 days, whichever comes first. Use tune2fs -c or -i to override.
```

Now mount the newly created filesystem so we can create our index file

```
# mount /dev/drbd1 /mnt/
# cat <<-END >/mnt/index.html
 <html>
  <body>My Test Site - drbd</body>
 </html>
 END
# umount /dev/drbd1
```

7.4. Configurarea Clusterului pentru DRBD

O funcționalitate utilă a shell-ului crm este aceea că îl puteți folosi în mod interactiv pentru a realiza mai multe modificări în mod atomic.

Întâi lansăm shell-ul. Promptul se va schimba pentru a indica faptul că sunteți în mod interactiv.

```
# crm cib
crm(live) #
```

Next we must create a working copy of the current configuration. This is where all our changes will go. The cluster will not see any of them until we say it's ok. Notice again how the prompt changes, this time to indicate that we're no longer looking at the live cluster.

```
cib crm(live) # cib new drbd
INFO: drbd shadow CIB created
crm(drbd) #
```

Acum putem crea clona noastră de DRBD și să listăm configurația revizuită.

```
crm(drbd) # configure primitive WebData ocf:linbit:drbd params drbd_resource=wwwdata \
    op monitor interval=60s
crm(drbd) # configure ms WebDataClone WebData meta master-max=1 master-node-max=1 \
    clone-max=2 clone-node-max=1 notify=truecrm(drbd) # configure shownode pcmk-1
node pcmk-2primitive WebData ocf:linbit:drbd \
 params drbd_resource="wwwdata" \
 op monitor interval="60s"primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"ms WebDataClone WebData \
 meta master-max="1" master-node-max="1" clone-max="2" clone-node-max="1" notify="true"
location prefer-pcmk-1 WebSite 50: pcmk-1
colocation website-with-ip inf: WebSite ClusterIP
order apache-after-ip inf: ClusterIP WebSite
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
```

```
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

Odată ce suntem multumiți cu modificările realizate, putem spune clusterului să înceapă să le folosească și vom folosi crm_mon pentru a verifica faptul că totul funcționează.

```
crm(drbd) # cib commit drbdINFO: commited 'drbd' shadow CIB to the cluster
crm(drbd) # quitbye
# crm_mon
============
Last updated: Tue Sep 1 09:37:13 2009
Stack: openais
Current DC: pcmk-1 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
3 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-1
WebSite (ocf::heartbeat:apache):    Started pcmk-1Master/Slave Set: WebDataClone Masters: [
 pcmk-2 ] Slaves: [ pcmk-1 ]
```

Notă

Include detalii despre adăugarea unei resurse secundare DRBD

Acum că DRBD funcționează putem configura o resursă Filesystem pentru a îl folosi. Suplimentar față de definiția sistemului de fișiere, trebuie să spunem clusterului de asemenea unde poate fi plasată (doar pe DRBD-ul Primar) și când îi este permis să pornească (după ce nodul a fost promovat la acest rol - Primar).

Încă o dată vom folosi modul interactiv al shell-ului

```
# crm
crm(live) # cib new fs
INFO: fs shadow CIB created
crm(fs) # configure primitive WebFS ocf:heartbeat:Filesystem \
    params device="/dev/drbd/by-res/wwwdata" directory="/var/www/html" fstype="ext4"
crm(fs) # configure colocation fs_on_drbd inf: WebFS WebDataClone:Master
crm(fs) # configure order WebFS-after-WebData inf: WebDataClone:promote WebFS:start

We also need to tell the cluster that Apache needs to run on the same
machine as the filesystem and that it must be active before Apache can
start.

crm(fs) # configure colocation WebSite-with-WebFS inf: WebSite WebFS
crm(fs) # configure order WebSite-after-WebFS inf: WebFS WebSite
```

E timpul să revizuim configurația actualizată:

```
crm(fs) # crm configure show
```

```
node pcmk-1
node pcmk-2
primitive WebData ocf:linbit:drbd \
    params drbd_resource="wwwdata" \
    op monitor interval="60s"
primitive WebFS ocf:heartbeat:Filesystem \
    params device="/dev/drbd/by-res/wwwdata" directory="/var/www/html" fstype="ext4"
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"
ms WebDataClone WebData \
    meta master-max="1" master-node-max="1" clone-max="2" clone-node-max="1" notify="true"
location prefer-pcmk-1 WebSite 50: pcmk-1
colocation WebSite-with-WebFS inf: WebSite WebFS
colocation fs_on_drbd inf: WebFS WebDataClone:Master
colocation website-with-ip inf: WebSite ClusterIP
order WebFS-after-WebData inf: WebDataClone:promote WebFS:start
order WebSite-after-WebFS inf: WebFS WebSite
order apache-after-ip inf: ClusterIP WebSite
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

După ce am revizuit configurația nouă, o încărcăm din nou și urmărim clusterul cum o pune în folosință.

```
crm(fs) # cib commit fs
INFO: commited 'fs' shadow CIB to the cluster
crm(fs) # quit
bye
# crm_mon
============
Last updated: Tue Sep 1 10:08:44 2009
Stack: openais
Current DC: pcmk-1 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
4 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-1
WebSite (ocf::heartbeat:apache): Started pcmk-1
Master/Slave Set: WebDataClone
    Masters: [ pcmk-1 ]
    Slaves: [ pcmk-2 ]
WebFS (ocf::heartbeat:Filesystem): Started pcmk-1
```

7.4.1. Testarea Migrării

We could shut down the active node again, but another way to safely simulate recovery is to put the node into what is called "standby mode". Nodes in this state tell the cluster that they are not allowed to run resources. Any resources found active there will be moved elsewhere. This feature can be particularly useful when updating the resources' packages.

Puneți nodul local în mod standby și observați cum clusterul mută toate resursele pe nodul celălalt. Observați de asemenea că status-ul nodului se va schimba pentru a indica faptul că nu mai poate găzdui resurse.

```
# crm node standby
# crm_mon
============
Last updated: Tue Sep 1 10:09:57 2009
Stack: openais
Current DC: pcmk-1 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
4 Resources configured.
============
Node pcmk-1: standbyOnline: [ pcmk-2 ]

ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-2
WebSite (ocf::heartbeat:apache):    Started pcmk-2
Master/Slave Set: WebDataClone
    Masters: [ pcmk-2 ]    Stopped: [ WebData:1 ]
WebFS  (ocf::heartbeat:Filesystem):  Started pcmk-2
```

Odată ce am făcut tot ceea ce era nevoie să facem pe pcmk-1 (în acest caz nimic, vroiam doar să vedem resursele mutându-se), putem permite nodului să fie din nou un membru întreg al clusterului.

```
# crm node online
# crm_mon
============
Last updated: Tue Sep 1 10:13:25 2009
Stack: openais
Current DC: pcmk-1 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
4 Resources configured.
============
Online: [ pcmk-1 pcmk-2 ]
ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-2
WebSite (ocf::heartbeat:apache):    Started pcmk-2
Master/Slave Set: WebDataClone
    Masters: [ pcmk-2 ]
    Slaves: [ pcmk-1 ]
WebFS  (ocf::heartbeat:Filesystem):  Started pcmk-2
```

Observați că setările noastre de adezivitate a resurselor previn serviciile din a migra înapoi pe pcmk-1.

Conversia la Activ/Activ

Cuprins

8.1. Cerințe

Cerința primară pentru un cluster Activ/Activ este ca datele necesare pentru serviciile voastre să fie disponibile, în mod simultan, pe ambele mașini. Pacemaker nu face nici o cerință asupra modului în care este atins acest scop, ați putea folosi un SAN dacă ați fi avut unul disponibil, însă din moment ce DRBD suportă noduri multiple Primare, putem să le folosim pe acestea de asemenea.

The only hitch is that we need to use a cluster-aware filesystem. The one we used earlier with DRBD, ext4, is not one of those. Both OCFS2 and GFS2 are supported, however here we will use GFS2 which comes with Fedora.

We'll also need to use CMAN for Cluster Membership and Quorum instead of our Corosync plugin.

8.2. Adăugarea de Suport pentru CMAN

CMAN v3[1] este un plugin al Corosync care monitorizează numele și numărul de noduri active din cluster pentru a livra informații de apartenență și quorum clienților (cum ar fi daemonii Pacemaker).

In a traditional Corosync-Pacemaker cluster, a Pacemaker plugin is loaded to provide membership and quorum information. The motivation for wanting to use CMAN for this instead, is to ensure all elements of the cluster stack are making decisions based on the same membership and quorum data.[2]

In the case of GFS2, the key pieces are the dlm_controld and gfs_controld helpers which act as the glue between the filesystem and the cluster software. Supporting CMAN enables us to use the versions already being shipped by most distributions (since CMAN has been around longer than Pacemaker and is part of the Red Hat cluster stack).

[1] http://docs.redhat.com/docs/en-US/Red_Hat_Enterprise_Linux/6/html-single/Cluster_Suite_Overview/index.html#s2-clumembership-overview-CSO

[2] A failure to do this can lead to what is called *internal split-brain* - a situation where different parts of the stack disagree about whether some nodes are alive or dead - which quickly leads to unnecessary down-time and/or data corruption.

Avertisment

Ensure Corosync and Pacemaker are stopped on all nodes before continuing

Avertisment

Be sure to disable the Pacemaker plugin before continuing with this section. In most cases, this can be achieved by removing /etc/corosync/service.d/pcmk and stopping Corosync.

8.2.1. Instalarea Soft-ului necesar

```
# yum install -y cman gfs2-utils gfs2-cluster
Loaded plugins: auto-update-debuginfo
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package cman.x86_64 0:3.1.7-1.fc15 will be installed
--> Processing Dependency: modcluster >= 0.18.1-1 for package: cman-3.1.7-1.fc15.x86_64
--> Processing Dependency: fence-agents >= 3.1.5-1 for package: cman-3.1.7-1.fc15.x86_64
--> Processing Dependency: openais >= 1.1.4-1 for package: cman-3.1.7-1.fc15.x86_64
--> Processing Dependency: ricci >= 0.18.1-1 for package: cman-3.1.7-1.fc15.x86_64
--> Processing Dependency: libSaCkpt.so.3(OPENAIS_CKPT_B.01.01)(64bit) for package:
 cman-3.1.7-1.fc15.x86_64
--> Processing Dependency: libSaCkpt.so.3()(64bit) for package: cman-3.1.7-1.fc15.x86_64
---> Package gfs2-cluster.x86_64 0:3.1.1-2.fc15 will be installed
---> Package gfs2-utils.x86_64 0:3.1.1-2.fc15 will be installed
--> Running transaction check
---> Package fence-agents.x86_64 0:3.1.5-1.fc15 will be installed
--> Processing Dependency: /usr/bin/virsh for package: fence-agents-3.1.5-1.fc15.x86_64
--> Processing Dependency: net-snmp-utils for package: fence-agents-3.1.5-1.fc15.x86_64
--> Processing Dependency: sg3_utils for package: fence-agents-3.1.5-1.fc15.x86_64
--> Processing Dependency: perl(Net::Telnet) for package: fence-agents-3.1.5-1.fc15.x86_64
--> Processing Dependency: /usr/bin/ipmitool for package: fence-agents-3.1.5-1.fc15.x86_64
--> Processing Dependency: perl-Net-Telnet for package: fence-agents-3.1.5-1.fc15.x86_64
--> Processing Dependency: pexpect for package: fence-agents-3.1.5-1.fc15.x86_64
--> Processing Dependency: pyOpenSSL for package: fence-agents-3.1.5-1.fc15.x86_64
--> Processing Dependency: python-suds for package: fence-agents-3.1.5-1.fc15.x86_64
---> Package modcluster.x86_64 0:0.18.7-1.fc15 will be installed
--> Processing Dependency: oddjob for package: modcluster-0.18.7-1.fc15.x86_64
---> Package openais.x86_64 0:1.1.4-2.fc15 will be installed
---> Package openaislib.x86_64 0:1.1.4-2.fc15 will be installed
---> Package ricci.x86_64 0:0.18.7-1.fc15 will be installed
--> Processing Dependency: parted for package: ricci-0.18.7-1.fc15.x86_64
--> Processing Dependency: nss-tools for package: ricci-0.18.7-1.fc15.x86_64
--> Running transaction check
---> Package ipmitool.x86_64 0:1.8.11-6.fc15 will be installed
---> Package libvirt-client.x86_64 0:0.8.8-7.fc15 will be installed
--> Processing Dependency: libnetcf.so.1(NETCF_1.3.0)(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
--> Processing Dependency: cyrus-sasl-md5 for package: libvirt-client-0.8.8-7.fc15.x86_64
--> Processing Dependency: gettext for package: libvirt-client-0.8.8-7.fc15.x86_64
--> Processing Dependency: nc for package: libvirt-client-0.8.8-7.fc15.x86_64
--> Processing Dependency: libnuma.so.1(libnuma_1.1)(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
```

```
--> Processing Dependency: libnuma.so.1(libnuma_1.2)(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
--> Processing Dependency: libnetcf.so.1(NETCF_1.2.0)(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
--> Processing Dependency: gnutls-utils for package: libvirt-client-0.8.8-7.fc15.x86_64
--> Processing Dependency: libnetcf.so.1(NETCF_1.0.0)(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
--> Processing Dependency: libxenstore.so.3.0()(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
--> Processing Dependency: libyajl.so.1()(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
--> Processing Dependency: libnl.so.1()(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
--> Processing Dependency: libnuma.so.1()(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
--> Processing Dependency: libaugeas.so.0()(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
--> Processing Dependency: libnetcf.so.1()(64bit) for package: libvirt-
client-0.8.8-7.fc15.x86_64
---> Package net-snmp-utils.x86_64 1:5.6.1-7.fc15 will be installed
---> Package nss-tools.x86_64 0:3.12.10-6.fc15 will be installed
---> Package oddjob.x86_64 0:0.31-2.fc15 will be installed
---> Package parted.x86_64 0:2.3-10.fc15 will be installed
---> Package perl-Net-Telnet.noarch 0:3.03-12.fc15 will be installed
---> Package pexpect.noarch 0:2.3-6.fc15 will be installed
---> Package pyOpenSSL.x86_64 0:0.10-3.fc15 will be installed
---> Package python-suds.noarch 0:0.3.9-3.fc15 will be installed
---> Package sg3_utils.x86_64 0:1.29-3.fc15 will be installed
--> Processing Dependency: sg3_utils-libs = 1.29-3.fc15 for package:
 sg3_utils-1.29-3.fc15.x86_64
--> Processing Dependency: libsgutils2.so.2()(64bit) for package:
 sg3_utils-1.29-3.fc15.x86_64
--> Running transaction check
---> Package augeas-libs.x86_64 0:0.9.0-1.fc15 will be installed
---> Package cyrus-sasl-md5.x86_64 0:2.1.23-18.fc15 will be installed
---> Package gettext.x86_64 0:0.18.1.1-7.fc15 will be installed
--> Processing Dependency: libgomp.so.1(GOMP_1.0)(64bit) for
 package: gettext-0.18.1.1-7.fc15.x86_64
--> Processing Dependency: libgettextlib-0.18.1.so()(64bit) for
 package: gettext-0.18.1.1-7.fc15.x86_64
--> Processing Dependency: libgettextsrc-0.18.1.so()(64bit) for
 package: gettext-0.18.1.1-7.fc15.x86_64
--> Processing Dependency: libgomp.so.1()(64bit) for package: gettext-0.18.1.1-7.fc15.x86_64
---> Package gnutls-utils.x86_64 0:2.10.5-1.fc15 will be installed
---> Package libnl.x86_64 0:1.1-14.fc15 will be installed
---> Package nc.x86_64 0:1.100-3.fc15 will be installed
--> Processing Dependency: libbsd.so.0(LIBBSD_0.0)(64bit) for package: nc-1.100-3.fc15.x86_64
--> Processing Dependency: libbsd.so.0(LIBBSD_0.2)(64bit) for package: nc-1.100-3.fc15.x86_64
--> Processing Dependency: libbsd.so.0()(64bit) for package: nc-1.100-3.fc15.x86_64
---> Package netcf-libs.x86_64 0:0.1.9-1.fc15 will be installed
---> Package numactl.x86_64 0:2.0.7-1.fc15 will be installed
---> Package sg3_utils-libs.x86_64 0:1.29-3.fc15 will be installed
---> Package xen-libs.x86_64 0:4.1.1-3.fc15 will be installed
--> Processing Dependency: xen-licenses for package: xen-libs-4.1.1-3.fc15.x86_64
---> Package yajl.x86_64 0:1.0.11-1.fc15 will be installed
--> Running transaction check
---> Package gettext-libs.x86_64 0:0.18.1.1-7.fc15 will be installed
---> Package libbsd.x86_64 0:0.2.0-4.fc15 will be installed
---> Package libgomp.x86_64 0:4.6.1-9.fc15 will be installed
---> Package xen-licenses.x86_64 0:4.1.1-3.fc15 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
 Package              Arch        Version                 Repository    Size
================================================================================
```

```
Installing:
 cman                 x86_64      3.1.7-1.fc15            updates      366 k
 gfs2-cluster         x86_64      3.1.1-2.fc15            fedora        69 k
 gfs2-utils           x86_64      3.1.1-2.fc15            fedora       222 k
Installing for dependencies:
 augeas-libs          x86_64      0.9.0-1.fc15            updates      311 k
 cyrus-sasl-md5       x86_64      2.1.23-18.fc15          updates       46 k
 fence-agents         x86_64      3.1.5-1.fc15            updates      186 k
 gettext              x86_64      0.18.1.1-7.fc15         fedora       1.0 M
 gettext-libs         x86_64      0.18.1.1-7.fc15         fedora       610 k
 gnutls-utils         x86_64      2.10.5-1.fc15           fedora       101 k
 ipmitool             x86_64      1.8.11-6.fc15           fedora       273 k
 libbsd               x86_64      0.2.0-4.fc15            fedora        37 k
 libgomp              x86_64      4.6.1-9.fc15            updates       95 k
 libnl                x86_64      1.1-14.fc15             fedora       118 k
 libvirt-client       x86_64      0.8.8-7.fc15            updates      2.4 M
 modcluster           x86_64      0.18.7-1.fc15           fedora       187 k
 nc                   x86_64      1.100-3.fc15            updates       24 k
 net-snmp-utils       x86_64      1:5.6.1-7.fc15          fedora       180 k
 netcf-libs           x86_64      0.1.9-1.fc15            updates       50 k
 nss-tools            x86_64      3.12.10-6.fc15          updates      723 k
 numactl              x86_64      2.0.7-1.fc15            updates       54 k
 oddjob               x86_64      0.31-2.fc15             fedora        61 k
 openais              x86_64      1.1.4-2.fc15            fedora       190 k
 openaislib           x86_64      1.1.4-2.fc15            fedora        88 k
 parted               x86_64      2.3-10.fc15             updates      618 k
 perl-Net-Telnet      noarch      3.03-12.fc15            fedora        55 k
 pexpect              noarch      2.3-6.fc15              fedora       141 k
 pyOpenSSL            x86_64      0.10-3.fc15             fedora       198 k
 python-suds          noarch      0.3.9-3.fc15            fedora       195 k
 ricci                x86_64      0.18.7-1.fc15           fedora       584 k
 sg3_utils            x86_64      1.29-3.fc15             fedora       465 k
 sg3_utils-libs       x86_64      1.29-3.fc15             fedora        54 k
 xen-libs             x86_64      4.1.1-3.fc15            updates      310 k
 xen-licenses         x86_64      4.1.1-3.fc15            updates       64 k
 yajl                 x86_64      1.0.11-1.fc15           fedora        27 k

Transaction Summary
================================================================================
Install      34 Package(s)

Total download size: 10 M
Installed size: 38 M
Downloading Packages:
(1/34): augeas-libs-0.9.0-1.fc15.x86_64.rpm           | 311 kB     00:00
(2/34): cman-3.1.7-1.fc15.x86_64.rpm                  | 366 kB     00:00
(3/34): cyrus-sasl-md5-2.1.23-18.fc15.x86_64.rpm      |  46 kB     00:00
(4/34): fence-agents-3.1.5-1.fc15.x86_64.rpm          | 186 kB     00:00
(5/34): gettext-0.18.1.1-7.fc15.x86_64.rpm            | 1.0 MB     00:01
(6/34): gettext-libs-0.18.1.1-7.fc15.x86_64.rpm       | 610 kB     00:00
(7/34): gfs2-cluster-3.1.1-2.fc15.x86_64.rpm          |  69 kB     00:00
(8/34): gfs2-utils-3.1.1-2.fc15.x86_64.rpm            | 222 kB     00:00
(9/34): gnutls-utils-2.10.5-1.fc15.x86_64.rpm         | 101 kB     00:00
(10/34): ipmitool-1.8.11-6.fc15.x86_64.rpm            | 273 kB     00:00
(11/34): libbsd-0.2.0-4.fc15.x86_64.rpm               |  37 kB     00:00
(12/34): libgomp-4.6.1-9.fc15.x86_64.rpm              |  95 kB     00:00
(13/34): libnl-1.1-14.fc15.x86_64.rpm                 | 118 kB     00:00
(14/34): libvirt-client-0.8.8-7.fc15.x86_64.rpm       | 2.4 MB     00:01
(15/34): modcluster-0.18.7-1.fc15.x86_64.rpm          | 187 kB     00:00
(16/34): nc-1.100-3.fc15.x86_64.rpm                   |  24 kB     00:00
(17/34): net-snmp-utils-5.6.1-7.fc15.x86_64.rpm       | 180 kB     00:00
(18/34): netcf-libs-0.1.9-1.fc15.x86_64.rpm           |  50 kB     00:00
(19/34): nss-tools-3.12.10-6.fc15.x86_64.rpm          | 723 kB     00:00
(20/34): numactl-2.0.7-1.fc15.x86_64.rpm              |  54 kB     00:00
(21/34): oddjob-0.31-2.fc15.x86_64.rpm                |  61 kB     00:00
(22/34): openais-1.1.4-2.fc15.x86_64.rpm              | 190 kB     00:00
(23/34): openaislib-1.1.4-2.fc15.x86_64.rpm           |  88 kB     00:00
```

```
(24/34): parted-2.3-10.fc15.x86_64.rpm                | 618 kB     00:00
(25/34): perl-Net-Telnet-3.03-12.fc15.noarch.rpm      |  55 kB     00:00
(26/34): pexpect-2.3-6.fc15.noarch.rpm                | 141 kB     00:00
(27/34): pyOpenSSL-0.10-3.fc15.x86_64.rpm             | 198 kB     00:00
(28/34): python-suds-0.3.9-3.fc15.noarch.rpm          | 195 kB     00:00
(29/34): ricci-0.18.7-1.fc15.x86_64.rpm               | 584 kB     00:00
(30/34): sg3_utils-1.29-3.fc15.x86_64.rpm             | 465 kB     00:00
(31/34): sg3_utils-libs-1.29-3.fc15.x86_64.rpm        |  54 kB     00:00
(32/34): xen-libs-4.1.1-3.fc15.x86_64.rpm             | 310 kB     00:00
(33/34): xen-licenses-4.1.1-3.fc15.x86_64.rpm         |  64 kB     00:00
(34/34): yajl-1.0.11-1.fc15.x86_64.rpm                |  27 kB     00:00
 ---------------------------------------------------------------------------
Total                                        803 kB/s |  10 MB     00:12
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : openais-1.1.4-2.fc15.x86_64                               1/34
  Installing : openaislib-1.1.4-2.fc15.x86_64                            2/34
  Installing : libnl-1.1-14.fc15.x86_64                                  3/34
  Installing : augeas-libs-0.9.0-1.fc15.x86_64                           4/34
  Installing : oddjob-0.31-2.fc15.x86_64                                 5/34
  Installing : modcluster-0.18.7-1.fc15.x86_64                           6/34
  Installing : netcf-libs-0.1.9-1.fc15.x86_64                            7/34
  Installing : 1:net-snmp-utils-5.6.1-7.fc15.x86_64                      8/34
  Installing : sg3_utils-libs-1.29-3.fc15.x86_64                         9/34
  Installing : sg3_utils-1.29-3.fc15.x86_64                             10/34
  Installing : libgomp-4.6.1-9.fc15.x86_64                              11/34
  Installing : gnutls-utils-2.10.5-1.fc15.x86_64                        12/34
  Installing : pyOpenSSL-0.10-3.fc15.x86_64                             13/34
  Installing : parted-2.3-10.fc15.x86_64                                14/34
  Installing : cyrus-sasl-md5-2.1.23-18.fc15.x86_64                     15/34
  Installing : python-suds-0.3.9-3.fc15.noarch                          16/34
  Installing : ipmitool-1.8.11-6.fc15.x86_64                            17/34
  Installing : perl-Net-Telnet-3.03-12.fc15.noarch                      18/34
  Installing : numactl-2.0.7-1.fc15.x86_64                              19/34
  Installing : yajl-1.0.11-1.fc15.x86_64                                20/34
  Installing : gettext-libs-0.18.1.1-7.fc15.x86_64                      21/34
  Installing : gettext-0.18.1.1-7.fc15.x86_64                           22/34
  Installing : libbsd-0.2.0-4.fc15.x86_64                               23/34
  Installing : nc-1.100-3.fc15.x86_64                                   24/34
  Installing : xen-licenses-4.1.1-3.fc15.x86_64                         25/34
  Installing : xen-libs-4.1.1-3.fc15.x86_64                             26/34
  Installing : libvirt-client-0.8.8-7.fc15.x86_64                       27/34

Note: This output shows SysV services only and does not include native
      systemd services. SysV configuration data might be overridden by native
      systemd configuration.

  Installing : nss-tools-3.12.10-6.fc15.x86_64                          28/34
  Installing : ricci-0.18.7-1.fc15.x86_64                               29/34
  Installing : pexpect-2.3-6.fc15.noarch                                30/34
  Installing : fence-agents-3.1.5-1.fc15.x86_64                         31/34
  Installing : cman-3.1.7-1.fc15.x86_64                                 32/34
  Installing : gfs2-cluster-3.1.1-2.fc15.x86_64                         33/34
  Installing : gfs2-utils-3.1.1-2.fc15.x86_64                           34/34

Installed:
  cman.x86_64 0:3.1.7-1.fc15           gfs2-cluster.x86_64 0:3.1.1-2.fc15
  gfs2-utils.x86_64 0:3.1.1-2.fc15

Dependency Installed:
  augeas-libs.x86_64 0:0.9.0-1.fc15
  cyrus-sasl-md5.x86_64 0:2.1.23-18.fc15
  fence-agents.x86_64 0:3.1.5-1.fc15
  gettext.x86_64 0:0.18.1.1-7.fc15
  gettext-libs.x86_64 0:0.18.1.1-7.fc15
```

```
  gnutls-utils.x86_64 0:2.10.5-1.fc15
  ipmitool.x86_64 0:1.8.11-6.fc15
  libbsd.x86_64 0:0.2.0-4.fc15
  libgomp.x86_64 0:4.6.1-9.fc15
  libnl.x86_64 0:1.1-14.fc15
  libvirt-client.x86_64 0:0.8.8-7.fc15
  modcluster.x86_64 0:0.18.7-1.fc15
  nc.x86_64 0:1.100-3.fc15
  net-snmp-utils.x86_64 1:5.6.1-7.fc15
  netcf-libs.x86_64 0:0.1.9-1.fc15
  nss-tools.x86_64 0:3.12.10-6.fc15
  numactl.x86_64 0:2.0.7-1.fc15
  oddjob.x86_64 0:0.31-2.fc15
  openais.x86_64 0:1.1.4-2.fc15
  openaislib.x86_64 0:1.1.4-2.fc15
  parted.x86_64 0:2.3-10.fc15
  perl-Net-Telnet.noarch 0:3.03-12.fc15
  pexpect.noarch 0:2.3-6.fc15
  pyOpenSSL.x86_64 0:0.10-3.fc15
  python-suds.noarch 0:0.3.9-3.fc15
  ricci.x86_64 0:0.18.7-1.fc15
  sg3_utils.x86_64 0:1.29-3.fc15
  sg3_utils-libs.x86_64 0:1.29-3.fc15
  xen-libs.x86_64 0:4.1.1-3.fc15
  xen-licenses.x86_64 0:4.1.1-3.fc15
  yajl.x86_64 0:1.0.11-1.fc15

Complete!
```

8.2.2. Configurarea CMAN

Notă

The standard Pacemaker config file will continue to be used for resource management even after we start using CMAN. There is no need to recreate all your resources and constraints to the *cluster.conf* syntax, we simply create a minimal version that lists the nodes.

Primul lucru pe care trebuie să îl facem este să îi spunem lui CMAN să încheie cu succes procedura de pornire chiar și fără quorum. Putem realiza acest lucru prin schimbarea setării de expirare a temporizatorului pentru quorum:

```
# sed -i.sed "s/.*CMAN_QUORUM_TIMEOUT=.*/CMAN_QUORUM_TIMEOUT=0/g" /etc/sysconfig/cman
```

Next we create a basic configuration file and place it in /etc/cluster/cluster.conf. The name used for each clusternode should correspond to that node's uname -n, just as Pacemaker expects. The nodeid can be any positive mumber but must be unique.

Un cluster.conf de bază pentru un cluster format din două noduri

```
<?xml version="1.0"?>
<cluster config_version="1" name="my_cluster_name">
  <logging debug="off"/>
  <clusternodes>
    <clusternode name="pcmk-1" nodeid="1"/>
    <clusternode name="pcmk-2" nodeid="2"/>
```

```
  </clusternodes>
</cluster>
```

8.2.3. Redundant Rings

For those wishing to use Corosync's multiple rings feature, simply define an alternate name for each node. For example:

```
    <clusternode name="pcmk-1" nodeid="1"/>
        <altname name="pcmk-1-internal"/>
    </clusternode>
```

8.2.4. Configurarea Evacuării Forțate în CMAN

We configure the fence_pcmk agent (supplied with Pacemaker) to redirect any fencing requests from CMAN components (such as dlm_controld) to Pacemaker. Pacemaker's fencing subsystem lets other parts of the stack know that a node has been successfully fenced, thus avoiding the need for it to be fenced again when other subsystems notice the node is gone.

Avertisment

Configurarea de dispozitive reale de evacuare forțată în CMAN va rezulta în evacuarea forțată de mai multe ori a nodurilor pe măsură ce părți diferite ale stivei detectează că un nod lipsește sau a eșuat.

The definition should be placed in the fencedevices section and contain:

```
<fencedevice name="pcmk" agent="fence_pcmk"/>
```

Each clusternode must be configured to use this device by adding a fence method block that lists the node's name as the port.

```
<fence>
  <method name="pcmk-redirect">
    <device name="pcmk" port="node_name_here"/>
  </method>
</fence>
```

Punând totul la un loc, avem:

cluster.conf pentru un cluster format din două noduri cu evacuare forțată

```
<?xml version="1.0"?>
<cluster config_version="1" name="mycluster">
  <logging debug="off"/>
  <clusternodes>
    <clusternode name="pcmk-1" nodeid="1">
      <fence>
        <method name="pcmk-redirect">
          <device name="pcmk" port="pcmk-1"/>
        </method>
```

```
      </fence>
    </clusternode>
    <clusternode name="pcmk-2" nodeid="2">
      <fence>
        <method name="pcmk-redirect">
          <device name="pcmk" port="pcmk-2"/>
        </method>
      </fence>
    </clusternode>
  </clusternodes>
  <fencedevices>
    <fencedevice name="pcmk" agent="fence_pcmk"/>
  </fencedevices>
</cluster>
```

8.2.5. Aducerea Clusterului Online cu CMAN

Primul lucru care trebuie făcut este de a verifica dacă este validă configurația

```
# ccs_config_validate
Configuration validates
```

Acum porniți CMAN

```
# service cman start
Starting cluster:
   Checking Network Manager...                             [  OK  ]
   Global setup...                                         [  OK  ]
   Loading kernel modules...                               [  OK  ]
   Mounting configfs...                                    [  OK  ]
   Starting cman...                                        [  OK  ]
   Waiting for quorum...                                   [  OK  ]
   Starting fenced...                                      [  OK  ]
   Starting dlm_controld...                                [  OK  ]
   Starting gfs_controld...                                [  OK  ]
   Unfencing self...                                       [  OK  ]
   Joining fence domain...                                 [  OK  ]
```

Odată ce ați confirmat că primul nod este fericit online, porniți al doilea nod.

```
[root@pcmk-2 ~]# service cman start
Starting cluster:
   Checking Network Manager...                             [  OK  ]
   Global setup...                                         [  OK  ]
   Loading kernel modules...                               [  OK  ]
   Mounting configfs...                                    [  OK  ]
   Starting cman...                                        [  OK  ]
   Waiting for quorum...                                   [  OK  ]
   Starting fenced...                                      [  OK  ]
   Starting dlm_controld...                                [  OK  ]
   Starting gfs_controld...                                [  OK  ]
   Unfencing self...                                       [  OK  ]
   Joining fence domain...                                 [  OK  ]
# cman_tool nodes
Node  Sts   Inc   Joined               Name
   1   M    548   2011-09-28 10:52:21  pcmk-1
   2   M    548   2011-09-28 10:52:21  pcmk-2
```

You should now see both nodes online. To begin managing resources, simply start Pacemaker.

```
# service pacemaker start
```

```
 Starting Pacemaker Cluster Manager: [  OK  ]
```

and again on the second node, after which point you can use crm_mon as you normally would.

```
[root@pcmk-2 ~]# service pacemaker start
 Starting Pacemaker Cluster Manager: [  OK  ]
# crm_mon -1
```

8.3. Creați un Sistem de Fișiere GFS2

8.3.1. Pregătire

Înainte de a face orice partiției existente, trebuie să ne asigurăm că este nemontată. Realizăm acest lucru spunând clusterului să oprească resursa WebFS. Acest lucru va asigura că alte resurse (în cazul nostru, Apache) care folosesc WebFS nu sunt doar oprite, ci sunt oprite în ordinea corectă.

```
# crm_resource --resource WebFS --set-parameter target-role --meta --parameter-value Stopped
# crm_mon
============
Last updated: Thu Sep 3 15:18:06 2009
Stack: openais
Current DC: pcmk-1 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
6 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

Master/Slave Set: WebDataClone
    Masters: [ pcmk-1 ]
    Slaves: [ pcmk-2 ]
ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-1
```

Notă

Luați aminte că atât Apache cât și WebFS au fost oprite.

8.3.2. Crearea și Popularea unei Partiții GFS2

Acum că stiva de cluster și componentele de integrare rulează fără piedici, putem crea o partiție GFS2.

Avertisment

Această acțiune va șterge tot conținutul stocat anterior pe dispozitivul DRBD. Asigurați-vă că aveți o copie a oricăror date importante.

Trebuie să specificăm un număr de parametri adiționali când creem o partiție GFS2.

Întâi trebuie să folosim opțiunea -p pentru a specifica faptul că vrem să folosim DLM-ul Kernel-ului. În continuare folosim -j pentru a indica faptul că trebuie să rezerve destul spațiu pentru două jurnale (unul pentru fiecare nod care accesează sistemul de fișiere).

În cele din urmă, folosim -t pentru a specifica numele tabelei de blocare. Formatul acestui câmp este clustername:fsname. Pentru fsname, nu trebuie decât să alegem ceva unic și descriptiv și din moment ce nu am specificat un clustername încă, vom folosi valoarea implicită (pcmk).

To specify an alternate name for the cluster, locate the service section containing **`name: pacemaker`** in corosync.conf and insert the following line anywhere inside the block:

```
clustername: myname
```

Realizați acest lucru pe fiecare nod din cluster și asigurați-vă că le-ați repornit înainte de a continua.

```
# mkfs.gfs2 -p lock_dlm -j 2 -t pcmk:web /dev/drbd1
This will destroy any data on /dev/drbd1.
It appears to contain: data

Are you sure you want to proceed? [y/n] y

Device:          /dev/drbd1
Blocksize:         4096
Device Size        1.00 GB (131072 blocks)
Filesystem Size:      1.00 GB (131070 blocks)
Journals:         2
Resource Groups:      2
Locking Protocol:     "lock_dlm"
Lock Table:        "pcmk:web"
UUID:           6B776F46-177B-BAF8-2C2B-292C0E078613
```

Apoi (re)populați noul sistem de fișiere cu date (pagini web). Momentan vom crea o nouă variație pe pagina noastră principală.

```
# mount /dev/drbd1 /mnt/# cat <<-END >/mnt/index.html
<html>
<body>My Test Site - GFS2</body>
</html>
END
# umount /dev/drbd1
# drbdadm verify wwwdata#
```

8.4. Reconfigurarea Clusterului pentru GFS2

```
# crm
crm(live) # cib new GFS2
INFO: GFS2 shadow CIB created
crm(GFS2) # configure delete WebFS
crm(GFS2) # configure primitive WebFS ocf:heartbeat:Filesystem params device="/dev/drbd/by-
res/wwwdata" directory="/var/www/html" fstype="gfs2"
```

Acum că am creat resursa, trebuie să recreem și toate restricțiile care o foloseau. Acest lucru este datorită faptului că shell-ul va înlătura în mod automat orice restricție care referențiază WebFS..

```
crm(GFS2) # configure colocation WebSite-with-WebFS inf: WebSite WebFS
crm(GFS2) # configure colocation fs_on_drbd inf: WebFS WebDataClone:Master
crm(GFS2) # configure order WebFS-after-WebData inf: WebDataClone:promote WebFS:start
crm(GFS2) # configure order WebSite-after-WebFS inf: WebFS WebSite
crm(GFS2) # configure show
```

```
node pcmk-1
node pcmk-2
primitive WebData ocf:linbit:drbd \
    params drbd_resource="wwwdata" \
    op monitor interval="60s"
primitive WebFS ocf:heartbeat:Filesystem \
    params device="/dev/drbd/by-res/wwwdata" directory="/var/www/html" fstype="gfs2"
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" \
    op monitor interval="30s"
ms WebDataClone WebData \
    meta master-max="1" master-node-max="1" clone-max="2" clone-node-max="1" notify="true"
colocation WebSite-with-WebFS inf: WebSite WebFS
colocation fs_on_drbd inf: WebFS WebDataClone:Master
colocation website-with-ip inf: WebSite ClusterIP
order WebFS-after-WebData inf: WebDataClone:promote WebFS:start
order WebSite-after-WebFS inf: WebFS WebSite
order apache-after-ip inf: ClusterIP WebSite
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

Revizuiți configurația înainte de a o încărca pe cluster, părăsind shell-ul și urmărind răspunsul clusterului

```
crm(GFS2) # cib commit GFS2
INFO: commited 'GFS2' shadow CIB to the cluster
crm(GFS2) # quit
bye
# crm_mon
============
Last updated: Thu Sep 3 20:49:54 2009
Stack: openais
Current DC: pcmk-2 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
6 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

WebSite (ocf::heartbeat:apache):    Started pcmk-2
Master/Slave Set: WebDataClone
    Masters: [ pcmk-1 ]
    Slaves: [ pcmk-2 ]
ClusterIP    (ocf::heartbeat:IPaddr):    Started pcmk-2WebFS (ocf::heartbeat:Filesystem):
 Started pcmk-1
```

8.5. Reconfigurarea Pacemaker pentru Activ/Activ

Aproape totul este la locul său. Versiunile recente de DRBD sunt capabile să opereze în mod Primar/Primar și sistemul de fișiere pe care îl folosim este conștient de cluster. Tot ce trebuie să facem aum este să reconfigurăm clusterul pentru a profita de acest lucru.

Acest lucru va implica un număr de modificări, așa că vom folosi din nou modul interactiv.

crm # cib new active

Nu are nici un sens să facem serviciile active în ambele locații dacă nu putem ajunge la acestea, așa că hai să clonăm adresa IP. Resursele clonate IPaddr2 folosesc o regulă de iptables pentru a se asigura că fiecare cerere nu este procesată decât de una din cele două instanțe ale clonei. Meta opțiunile adiționale spun clusterului câte instanțe ale clonei dorim (câte o "găleată de cereri" pentru fiecare nod) și că dacă toate celelalte noduri eșuează, atunci nodul care rămâne ar trebui să le țină pe toate. Altfel cererile ar fi pur și simplu aruncate.

```
# configure clone WebIP ClusterIP \
    meta globally-unique="true" clone-max="2" clone-node-max="2"
```

Acum trebuie să spunem ClusterIP-ului cum să decidă care cereri sunt procesate de care gazde. Pentru a realiza acest lucru trebuie să specificăm parametrul clusterip_hash.

Deschideți resursa ClusterIP

```
# configure edit ClusterIP
```

Adăugați următoarele pe linia params

```
clusterip_hash="sourceip"
```

Astfel încât definiția completă să arate precum:

```
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" clusterip_hash="sourceip" \
    op monitor interval="30s"
```

Aici este transcrierea completă

```
# crm crm(live)
# cib new active
INFO: active shadow CIB created
crm(active) # configure clone WebIP ClusterIP \
    meta globally-unique="true" clone-max="2" clone-node-max="2"
crm(active) # configure shownode pcmk-1
node pcmk-2
primitive WebData ocf:linbit:drbd \
    params drbd_resource="wwwdata" \
    op monitor interval="60s"
primitive WebFS ocf:heartbeat:Filesystem \
    params device="/dev/drbd/by-res/wwwdata" directory="/var/www/html" fstype="gfs2"
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" clusterip_hash="sourceip" \
    op monitor interval="30s"
ms WebDataClone WebData \
    meta master-max="1" master-node-max="1" clone-max="2" clone-node-max="1" notify="true"
clone WebIP ClusterIP \
    meta globally-unique="true" clone-max="2" clone-node-max="2"
colocation WebSite-with-WebFS inf: WebSite WebFS
colocation fs_on_drbd inf: WebFS WebDataClone:Master
colocation website-with-ip inf: WebSite WebIPorder WebFS-after-WebData inf:
 WebDataClone:promote WebFS:start
order WebSite-after-WebFS inf: WebFS WebSiteorder apache-after-ip inf: WebIP WebSite
property $id="cib-bootstrap-options" \
```

```
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

Vedeți câte restricții care referențiau ClusterIP au fost actualizate pentru a folosi WebIP în schimb. Acesta este un beneficiu adițional al folosirii shell-ului crm.

În continuare trebuie să convertim resursele de sistem de fișiere și Apache în clone. Din nou, shell-ul va actualiza în mod automat orice restricții relevante.

```
crm(active) # configure clone WebFSClone WebFS
crm(active) # configure clone WebSiteClone WebSite
```

Ultimul pas este acela de a spune clusterului că acum îi este permis să promoveze ambele instanțe să fie Primare (Master).

```
crm(active) # configure edit WebDataClone
```

Schimbați master-max la 2

```
crm(active) # configure show
node pcmk-1
node pcmk-2
primitive WebData ocf:linbit:drbd \
    params drbd_resource="wwwdata" \
    op monitor interval="60s"
primitive WebFS ocf:heartbeat:Filesystem \
    params device="/dev/drbd/by-res/wwwdata" directory="/var/www/html" fstype="gfs2"
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" clusterip_hash="sourceip" \
    op monitor interval="30s"
ms WebDataClone WebData \
    meta master-max="2" master-node-max="1" clone-max="2" clone-node-max="1" notify="true"
clone WebFSClone WebFSclone WebIP ClusterIP \
    meta globally-unique="true" clone-max="2" clone-node-max="2"
clone WebSiteClone WebSitecolocation WebSite-with-WebFS inf: WebSiteClone WebFSClone
colocation fs_on_drbd inf: WebFSClone WebDataClone:Master
colocation website-with-ip inf: WebSiteClone WebIP
order WebFS-after-WebData inf: WebDataClone:promote WebFSClone:start
order WebSite-after-WebFS inf: WebFSClone WebSiteClone
order apache-after-ip inf: WebIP WebSiteClone
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="false" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

Revizuiți configurația înainte de a o încărca pe cluster, părăsind shell-ul și urmărind răspunsul clusterului

```
crm(active) # cib commit active
```

```
INFO: commited 'active' shadow CIB to the cluster
crm(active) # quit
bye
# crm_mon
============
Last updated: Thu Sep 3 21:37:27 2009
Stack: openais
Current DC: pcmk-2 - partition with quorum
Version: 1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f
2 Nodes configured, 2 expected votes
6 Resources configured.
============

Online: [ pcmk-1 pcmk-2 ]

Master/Slave Set: WebDataClone
    Masters: [ pcmk-1 pcmk-2 ]
Clone Set: WebIP Started: [ pcmk-1 pcmk-2 ]
Clone Set: WebFSClone Started: [ pcmk-1 pcmk-2 ]
Clone Set: WebSiteClone Started: [ pcmk-1 pcmk-2 ]
```

8.5.1. Testarea Recuperării

Notă

TODO: Plasarea unui nod în standby pentru a demonstra failover-ul

Configurarea STONITH

Cuprins

9.1. What Is STONITH

STONITH is an acronym for Shoot-The-Other-Node-In-The-Head and it protects your data from being corrupted by rogue nodes or concurrent access.

Just because a node is unresponsive, this doesn't mean it isn't accessing your data. The only way to be 100% sure that your data is safe, is to use STONITH so we can be certain that the node is truly offline, before allowing the data to be accessed from another node.

STONITH mai are un rol pe care îl joacă în cazul în care un serviciu clusterizat nu poate fi oprit. În acest caz, clusterul foloseşte STONITH pentru a forţa întregul nod offline, astfel făcând să fie sigură pornirea serviciului în altă parte.

9.2. Ce Dispozitiv STONITH Ar Trebui Să Folosiţi

Este imperativ ca dispozitivul STONITH să permită clusterului să facă diferenţa între o defecţiune a nodului şi una a reţelei.

Cea mai mare greşeală pe care o fac oamenii în alegerea unui dispozitiv STONITH este să folosească un switch de curent cu acces la distanţă (cum ar fi multe controlere IPMI integrate) care partajează curentul cu nodul pe care îl controlează. În astfel de cazuri, clusterul nu poate fi sigur dacă nodul este cu adevărat offline sau inactiv şi suferă din cauza unei probleme de reţea.

În mod similar, orice dispozitiv care se bazează pe maşină să fie activă (cum ar fi "dispozitivele" bazate pe SSH folosite în timpul testării) sunt nepotrivite.

9.3. Configurarea STONITH

1. Find the correct driver: **`stonith_admin --list-installed`**

2. Since every device is different, the parameters needed to configure it will vary. To find out the parameters associated with the device, run: **`stonith_admin --metadata --agent type`**

   ```
   The output should be XML formatted text containing additional
   parameter descriptions. We will endevor to make the output more
   friendly in a later version.
   ```

3. Enter the shell crm Create an editable copy of the existing configuration cib new stonith Create a fencing resource containing a primitive resource with a class of stonith, a type of type and a parameter for each of the values returned in step 2: **`configure primitive …`**

4. If the device does not know how to fence nodes based on their uname, you may also need to set the special **`pcmk_host_map`** parameter. See **`man stonithd`** for details.

5. If the device does not support the list command, you may also need to set the special **pcmk_host_list** and/or **pcmk_host_check** parameters. See **man stonithd** for details.

6. If the device does not expect the victim to be specified with the port parameter, you may also need to set the special **pcmk_host_argument** parameter. See **man stonithd** for details.

7. Upload it into the CIB from the shell: **cib commit stonith**

8. Once the stonith resource is running, you can test it by executing: **stonith_admin --reboot nodename**. Although you might want to stop the cluster on that machine first.

9.4. Exemplu

Assuming we have an chassis containing four nodes and an IPMI device active on 10.0.0.1, then we would chose the fence_ipmilan driver in step 2 and obtain the following list of parameters

Obţinerea unei liste de Parametri STONITH

```
# stonith_admin --metadata -a fence_ipmilan
```

```
<?xml version="1.0" ?>
<resource-agent name="fence_ipmilan" shortdesc="Fence agent for IPMI over LAN">
<longdesc>
fence_ipmilan is an I/O Fencing agent which can be used with machines controlled by IPMI.
 This agent calls support software using ipmitool (http://ipmitool.sf.net/).

To use fence_ipmilan with HP iLO 3 you have to enable lanplus option (lanplus / -P) and
 increase wait after operation to 4 seconds (power_wait=4 / -T 4)</longdesc>
<parameters>
        <parameter name="auth" unique="1">
                <getopt mixed="-A" />
                <content type="string" />
                <shortdesc>IPMI Lan Auth type (md5, password, or none)</shortdesc>
        </parameter>
        <parameter name="ipaddr" unique="1">
                <getopt mixed="-a" />
                <content type="string" />
                <shortdesc>IPMI Lan IP to talk to</shortdesc>
        </parameter>
        <parameter name="passwd" unique="1">
                <getopt mixed="-p" />
                <content type="string" />
                <shortdesc>Password (if required) to control power on IPMI device</shortdesc>
        </parameter>
        <parameter name="passwd_script" unique="1">
                <getopt mixed="-S" />
                <content type="string" />
                <shortdesc>Script to retrieve password (if required)</shortdesc>
        </parameter>
        <parameter name="lanplus" unique="1">
                <getopt mixed="-P" />
                <content type="boolean" />
                <shortdesc>Use Lanplus</shortdesc>
        </parameter>
        <parameter name="login" unique="1">
                <getopt mixed="-l" />
                <content type="string" />
                <shortdesc>Username/Login (if required) to control power on IPMI device</
shortdesc>
        </parameter>
        <parameter name="action" unique="1">
```

```
                <getopt mixed="-o" />
                <content type="string" default="reboot"/>
                <shortdesc>Operation to perform. Valid operations: on, off, reboot, status,
 list, diag, monitor or metadata</shortdesc>
        </parameter>
        <parameter name="timeout" unique="1">
                <getopt mixed="-t" />
                <content type="string" />
                <shortdesc>Timeout (sec) for IPMI operation</shortdesc>
        </parameter>
        <parameter name="cipher" unique="1">
                <getopt mixed="-C" />
                <content type="string" />
                <shortdesc>Ciphersuite to use (same as ipmitool -C parameter)</shortdesc>
        </parameter>
        <parameter name="method" unique="1">
                <getopt mixed="-M" />
                <content type="string" default="onoff"/>
                <shortdesc>Method to fence (onoff or cycle)</shortdesc>
        </parameter>
        <parameter name="power_wait" unique="1">
                <getopt mixed="-T" />
                <content type="string" default="2"/>
                <shortdesc>Wait X seconds after on/off operation</shortdesc>
        </parameter>
        <parameter name="delay" unique="1">
                <getopt mixed="-f" />
                <content type="string" />
                <shortdesc>Wait X seconds before fencing is started</shortdesc>
        </parameter>
        <parameter name="verbose" unique="1">
                <getopt mixed="-v" />
                <content type="boolean" />
                <shortdesc>Verbose mode</shortdesc>
        </parameter>
</parameters>
<actions>
        <action name="on" />
        <action name="off" />
        <action name="reboot" />
        <action name="status" />
        <action name="diag" />
        <action name="list" />
        <action name="monitor" />
        <action name="metadata" />
</actions>
</resource-agent>
```

din care am crea un fragment de resursă STONITH care ar putea arăta aşa

Exemplu de Resursă STONITH

```
# crm crm(live)# cib new stonith
INFO: stonith shadow CIB created
crm(stonith)# configure primitive impi-fencing stonith::fence_ipmilan \
 params pcmk_host_list="pcmk-1 pcmk-2" ipaddr=10.0.0.1 login=testuser passwd=abc123 \
 op monitor interval="60s"
```

Şi în sfârşit, din moment ce l-am dezactivat mai devreme, trebuie să reactivăm STONITH. În acest punct ar trebui să avem următoarea configuraţie.

```
crm(stonith)# configure property stonith-enabled="true"crm(stonith)# configure shownode
 pcmk-1
```

```
node pcmk-2
primitive WebData ocf:linbit:drbd \
    params drbd_resource="wwwdata" \
    op monitor interval="60s"
primitive WebFS ocf:heartbeat:Filesystem \
    params device="/dev/drbd/by-res/wwwdata" directory="/var/www/html" fstype="gfs2"
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" clusterip_hash="sourceip" \
    op monitor interval="30s"primitive ipmi-fencing
 stonith::fence_ipmilan \ params pcmk_host_list="pcmk-1
 pcmk-2" ipaddr=10.0.0.1 login=testuser passwd=abc123 \ op monitor interval="60s"ms
 WebDataClone WebData \
    meta master-max="2" master-node-max="1" clone-max="2" clone-node-max="1" notify="true"
clone WebFSClone WebFS
clone WebIP ClusterIP \
    meta globally-unique="true" clone-max="2" clone-node-max="2"
clone WebSiteClone WebSite
colocation WebSite-with-WebFS inf: WebSiteClone WebFSClone
colocation fs_on_drbd inf: WebFSClone WebDataClone:Master
colocation website-with-ip inf: WebSiteClone WebIP
order WebFS-after-WebData inf: WebDataClone:promote WebFSClone:start
order WebSite-after-WebFS inf: WebFSClone WebSiteClone
order apache-after-ip inf: WebIP WebSiteClone
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="true" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
crm(stonith)# cib commit stonithINFO: commited 'stonith' shadow CIB to the cluster
crm(stonith)# quit
bye
```

Anexa A. Recapitularea Configurației

Cuprins

A.1. Configurația Finală a Clusterului

```
# crm configure show
node pcmk-1
node pcmk-2
primitive WebData ocf:linbit:drbd \
    params drbd_resource="wwwdata" \
    op monitor interval="60s"
primitive WebFS ocf:heartbeat:Filesystem \
    params device="/dev/drbd/by-res/wwwdata" directory="/var/www/html" fstype="gfs2"
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" clusterip_hash="sourceip" \
    op monitor interval="30s"
primitive ipmi-fencing stonith::fence_ipmilan \
    params pcmk_host_list="pcmk-1 pcmk-2" ipaddr=10.0.0.1 login=testuser passwd=abc123 \
    op monitor interval="60s"
ms WebDataClone WebData \
    meta master-max="2" master-node-max="1" clone-max="2" clone-node-max="1" notify="true"
clone WebFSClone WebFS
clone WebIP ClusterIP \
    meta globally-unique="true" clone-max="2" clone-node-max="2"
clone WebSiteClone WebSite
colocation WebSite-with-WebFS inf: WebSiteClone WebFSClone
colocation fs_on_drbd inf: WebFSClone WebDataClone:Master
colocation website-with-ip inf: WebSiteClone WebIP
order WebFS-after-WebData inf: WebDataClone:promote WebFSClone:start
order WebSite-after-WebFS inf: WebFSClone WebSiteClone
order apache-after-ip inf: WebIP WebSiteClone
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="true" \
    no-quorum-policy="ignore"
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

A.2. Lista Nodurilor

Lista nodurilor din cluster este populată în mod automat de către cluster.

```
node pcmk-1
node pcmk-2
```

A.3. Opțiunile Clusterului

Aici este locul unde clusterul stochează automat anumite informații despre cluster

- dc-version - versiunea (incluzând hash-ul codului sursă din upstream) Pacemaker-ului folosit pe DC
- cluster-infrastructure - infrastructura de cluster folosită (heartbeat sau openais)
- expected-quorum-votes - numărul maxim de noduri care se așteaptă să facă parte din cluster

și locul unde administratorul poate seta opțiuni care controlează modul în care operează clusterul

- stonith-enabled=true - Pune STONITH în folosință
- no-quorum-policy=ignore - Ignoră pierderea quorumului și continuă să găzduiască resurse.

```
property $id="cib-bootstrap-options" \
    dc-version="1.1.5-bdd89e69ba545404d02445be1f3d72e6a203ba2f" \
    cluster-infrastructure="openais" \
    expected-quorum-votes="2" \
    stonith-enabled="true" \
    no-quorum-policy="ignore"
```

A.4. Resurse

A.4.1. Opțiuni Implicite

Aici configurăm opțiuni ale clusterului care se aplică fiecărei resurse.

- resource-stickiness - Specifică aversiunea față de mutarea resurselor către alte mașini

```
rsc_defaults $id="rsc-options" \
    resource-stickiness="100"
```

A.4.2. Evacuarea Forțată

Notă

TODO: Adaugă text aici

```
primitive ipmi-fencing stonith::fence_ipmilan \
    params pcmk_host_list="pcmk-1 pcmk-2" ipaddr=10.0.0.1 login=testuser passwd=abc123 \
    op monitor interval="60s"
clone Fencing rsa-fencing
```

A.4.3. Adresa Serviciului

Utilizatorii serviciilor furnizate de către cluster necesită o adresă neschimbabilă prin care să le acceseze. În mod adițional, am clonat adresa astfel încât va fi activă pe ambele noduri. O regulă de iptables (creată ca parte din agentul de resursă) este folosită pentru a asigura faptul că fiecare cerere va fi procesată doar de către una din cele două instanțe ale clonei. Meta opțiunile adiționale spun clusterului că dorim două instanțe ale clonei (câte o "găleată de cereri" pentru fiecare nod) și că dacă un nod eșuează, atunci nodul care rămâne ar trebui să le țină pe amândouă.

```
primitive ClusterIP ocf:heartbeat:IPaddr2 \
    params ip="192.168.122.101" cidr_netmask="32" clusterip_hash="sourceip" \
    op monitor interval="30s"
clone WebIP ClusterIP
    meta globally-unique="true" clone-max="2" clone-node-max="2"
```

Notă

TODO: RA-ul ar trebui să verifice globally-unique=true când este clonat

A.4.4. DRBD - Stocare Partajată

Aici definim serviciul DRBD și specificăm care resursă DRBD (din drbd.conf) ar trebui să gestioneze. O creem ca resursă master/slave și pentru a avea un setup activ/activ, permitem ambelor instanțe să fie promovate specificând master-max=2. De asemenea setăm opțiunea notify astfel încât clusterul va spune agentului DRBD când vecinul acestuia își schimbă starea.

```
primitive WebData ocf:linbit:drbd \
    params drbd_resource="wwwdata" \
    op monitor interval="60s"
ms WebDataClone WebData \
    meta master-max="2" master-node-max="1" clone-max="2" clone-node-max="1" notify="true"
```

A.4.5. Sistem de Fișiere de Cluster

Sistemul de fișiere de cluster se asigură că fișierele sunt citite și scrise corect. Trebuie să specificăm dispozitivul de tip bloc (furnizat de DRBD), unde îl vrem montat și că folosim GFS2. Din nou este o clonă deoarece este intenționat să fie activă pe ambele noduri. Restricțiile adiționale asigură faptul că poate fi pornită numai pe noduri cu gfs-control activ și instanțe DRBD.

```
primitive WebFS ocf:heartbeat:Filesystem \
    params device="/dev/drbd/by-res/wwwdata" directory="/var/www/html" fstype="gfs2"
clone WebFSClone WebFS
colocation WebFS-with-gfs-control inf: WebFSClone gfs-clone
colocation fs_on_drbd inf: WebFSClone WebDataClone:Master
order WebFS-after-WebData inf: WebDataClone:promote WebFSClone:start
order start-WebFS-after-gfs-control inf: gfs-clone WebFSClone
```

A.4.6. Apache

Lastly we have the actual service, Apache. We need only tell the cluster where to find it's main configuration file and restrict it to running on nodes that have the required filesystem mounted and the IP address active.

```
primitive WebSite ocf:heartbeat:apache \
    params configfile="/etc/httpd/conf/httpd.conf" \
    op monitor interval="1min"
clone WebSiteClone WebSite
colocation WebSite-with-WebFS inf: WebSiteClone WebFSClone
colocation website-with-ip inf: WebSiteClone WebIP
order apache-after-ip inf: WebIP WebSiteClone
order WebSite-after-WebFS inf: WebFSClone WebSiteClone
```

Anexa B. Exemplu de Configurație al Corosync

Exemplu de corosync.conf pentru un cluster cu două noduri

```
# Please read the Corosync.conf.5 manual page
compatibility: whitetank

totem {
    version: 2

    # How long before declaring a token lost (ms)
    token:     5000

    # How many token retransmits before forming a new configuration
    token_retransmits_before_loss_const: 10

    # How long to wait for join messages in the membership protocol (ms)
    join:      1000

    # How long to wait for consensus to be achieved before starting a new
    # round of membership configuration (ms)
    consensus:   6000

    # Turn off the virtual synchrony filter
    vsftype:    none

    # Number of messages that may be sent by one processor on receipt of the token
    max_messages:  20

    # Stagger sending the node join messages by 1..send_join ms
    send_join: 45

    # Limit generated nodeids to 31-bits (positive signed integers)
    clear_node_high_bit: yes

    # Disable encryption
    secauth:    off

    # How many threads to use for encryption/decryption
    threads:      0

    # Optionally assign a fixed node id (integer)
    # nodeid:     1234

    interface {
        ringnumber: 0

        # The following values need to be set based on your environment
        bindnetaddr: 192.168.122.0
        mcastaddr: 226.94.1.1
        mcastport: 4000
    }
}

logging {
    debug: off
    fileline: off
    to_syslog: yes
    to_stderr: off
    syslog_facility: daemon
    timestamp: on
```

```
}

amf {
    mode: disabled
}
```

Anexa C. Documentație Suplimentară

- Project Website *http://www.clusterlabs.org*
- Cluster Commands A comprehensive guide to cluster commands has been written by Novell and can be found at: *http://www.novell.com/documentation/sles11/book_sleha/index.html?page=/documentation/sles11/book_sleha/data/book_sleha.html*
- Corosync *http://www.corosync.org*

Anexa D. Istoricul Reviziilor

Versiune 1-1 **Mon May 17 2010** **Andrew Beekhof** *andrew@beekhof.net*

Import din Pages.app

Versiune 2-1 **Wed Sep 22 2010** **Raoul Scarazzini** *rasca@miamammausalinux.org*

Italian translation

Versiune 3-1 **Wed Feb 9 2011** **Andrew Beekhof** *andrew@beekhof.net*

Updated for Fedora 13

Versiune 4-1 **Wed Oct 5 2011** **Andrew Beekhof** *andrew@beekhof.net*

Update the GFS2 section to use CMAN

Versiune 5-1 **Fri Feb 10 2012** **Andrew Beekhof** *andrew@beekhof.net*

Generate docbook content from asciidoc sources

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