Surname: Name: ID:

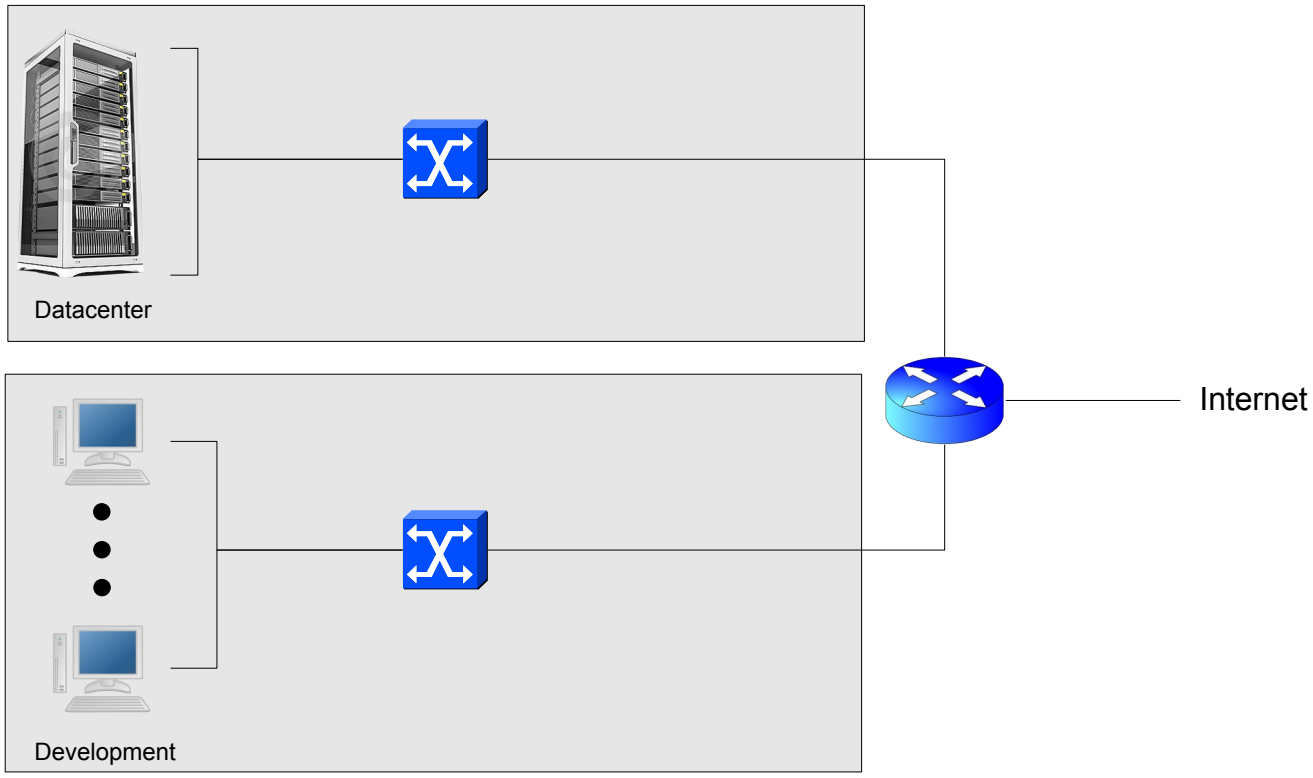
ADMINISTRACIÓ DE SISTEMES OPERATIUS

Final Exam, January 9th 2015

Exam needs to be done without external assistance
Answer into the reserved space
Clearly state SURNAME and NAME
It is mandatory to clearly explain the taken decisions when answering
Duration: 2 hours (It is not possible to leave before 30 minutes)

Question 1 – Network (4 Points)

A company has a network as shown in the figure:



The company has two main divisions:

- Development department, consisting of 15 PC.
- A Datacenter, having 80 Servers.

We also know that the company developns molecule simulators, for which it uses the company's datacenter (40 servers).

We also know that through a web server, the company allows to external agents, connected from the outside, perform simulations. These simulations are performed using 38 of the available servers. The remaining 2 are used to host the rest of the services:

- DNS
- Web
- NFS (centralized for all the users)
- GIT
- VPN
- SSH
- Intranet

Finally, we have the following reserved IP range 147.45.23.0/24.

1. Dels anteriors serveis indica quins posaries públics i quins no. **Justifica la resposta** **(0.5 Points)**

2. Assign which IP addresses need to be assigned to all machines in this network. Elaborate your answer. **(0.75 Points)**

3. Detail to which servers would you install each service, you must be coherent with the previous answers. **(0.75 Points)**

4. How would you offer a secure network from the outside in this situation?. **(0.75 Points)**

5. Given that the company is growing, the company hires the datacenter service from an external enterprise. How can you manage to offer secure connectivity between the two datacenters?

(0.5 Points)

6. Some users belonging to a project request a shared disk space for them. For them it is important that no other user is able to access these files. The shared directory is `/projects` in the host 25 in the datacenter. Detail which actions would you take to allow secure local access along with secure remote access from their computers. **(0.75 Points)**

Question 2 – Monitoring (3 Points)

We have a server in charge of the management in a car build chain. This server has a total amount of 10 sensors validating that the different components are corrects. They also control that no problem is found in

the build chain. If a problem is detected the system must react very quickly stopping the component building, raise an alarm and sending a message to the operator.

In order to operate, the server has a service named `i_sensor` in charge of obtaining the information from the sensors in real time. The `i_watcher` is the process raising the alarm, while the stopping of the build chain is done through `i_controller`.

In a particular moment there is an alarm, the administrator checks the status of the system and observes the following top:

```
top - 17:54:50 up 4 days, 19:01,  2 users,  load average: 7.44, 4.46, 3.18
Threads: 311 total,  10 running, 301 sleeping,   0 stopped,   0 zombie
%Cpu0  : 61.0 us,  4.5 sy,  0.0 ni, 34.1 id,  0.0 wa,  0.0 hi,  0.3 si,  0.0 st
%Cpu1  : 72.6 us,  3.9 sy,  0.0 ni,  0.0 id, 23.5 wa,  0.0 hi,  0.0 si,  0.0 st
%Cpu2  : 69.5 us,  5.2 sy,  0.0 ni,  9.4 id, 15.9 wa,  0.0 hi,  0.0 si,  0.0 st
%Cpu3  : 53.9 us,  4.9 sy,  0.0 ni, 41.2 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
KiB Mem:   2071636 total,  1951220 used,   120416 free,   174900 buffers
KiB Swap:        0 total,        0 used,        0 free.  1231204 cached Mem

  PID USER      PR  NI    VIRT    RES    SHR S %CPU %MEM     TIME+ COMMAND
 6736 sens-user 20   0   27352  18468   6752 R 51.1  0.9   0:01.93 i_sensor
 6664 sens-user 20   0   21329  15678   6752 R 43.3  0.0   0:03.60 i_sensor
 6753 sens-user 20   0   23868  14608   6732 R 26.1  0.7   0:00.87 i_sensor
 2711 root      20 -20   83024  17264   3208 R 21.5  0.8   0:09.38 i_controller
 6766 sens-user 20   0   23636  13504   6652 R 18.2  0.7   0:00.56 i_sensor
 6775 sens-user 20   0   23504  13188   6524 R 15.3  0.6   0:00.47 i_sensor
 6782 sens-user 20   0   20864   7404   4012 R  2.6  0.4   0:00.08 i_sensor
 6785 watcher   20   0    8868   5272   1216 R  1.0  0.3   0:00.03 i_watcher
    9 root      20   0       0      0      0 S  0.3  0.0   1:06.49 rcu_preempt
   37 root      20   0       0      0      0 S  0.3  0.0   0:14.17 kswapd0
   60 root      20   0       0      0      0 S  0.3  0.0   2:04.96 mmcqd/0
 1456 mysql     20   0  325380 158648   5256 S  0.3  7.7   0:12.03 mysqld
18048 mysql     20   0  325380 158648   5256 S  0.3  7.7   1:14.83 mysqld
```

1. Do you think that the stopping has been justified, or rather it is an error in the system: **(0.75 Point)**

2. Define each of the fields concerning the system memory indicating in which status is the machine at this moment. **(1 Point)**

3. State the implications of the above `top` regarding the fact that two CPU have a relatively high wait time. **(0.75 Points)**

4. Which characteristic have the processes using 0% of memory? **(0.5 Points)**

Question 3 – Other (3 Points)

We have the following state of `/shared` in our system:

```
drwxr-xr-x  4 rserral rserral 4096 Jun  2 11:29 .
drwxr-xr-x 13 rserral rserral 4096 Jun  2 16:51 ..
drwxr-xr-x  2 aso     rserral 4096 Jun  2 22:39 dir1
drwxr-xr--  2 rserral aso     4096 Jun  2 15:03 dir2
./dir1:
drwxr-xr-- 2 rserral aso     4096 Jun  2 15:03 .
drwxr-xr-x 4 rserral rserral 4096 Jun  2 11:29 ..
-rw------- 1 aso     aso       13 Jun  2 15:03 fitxer11
-rw-r----- 1 root    rserral  213 Jun  2 15:03 fitxer14
./dir2:
drwxr-xr-x 2 aso     rserral 4096 Jun  2 22:39 .
drwxr-xr-x 4 rserral rserral 4096 Jun  2 11:29 ..
lrwxrwxrwx 1 rserral rserral   16 Jun  2 22:39 fitxer21 -> ../dir1/fitxer11
-rw-r----- 1 root    root   32413 Jun  2 15:03 fitxer22
```

We know that a user, unless differently stated, only belongs to th grup with his own name. We also know that `aso` is the only user with privileges to run `sudo`.

Answer the following questions independently (action happening in a question do not affect the rest).

1. What happens when we run:

   `aso:``/shared$ mv dir2/fitxer22 dir1/` **(0.25 Points)**

2. Now we try to:

   `rserral:``/shared$ rm dir2/fitxer21` **(0.25 Points)**

3. Given the output of:

   `rserral:``/shared$ cat dir1/fitxer14`

   `dir1/fitxer11`

   What happens if we run:

aso:`/shared$ cat dir1/fitxer14 | sudo xargs rm` **(0.75 Points)**

4. And:

   rserral:`/shared$ cat dir1/fitxer14 > dir1/fitxer11` **(0.25 Points)**

5. Now we run:

   rserral:`/shared$ sudo mkdir dir3` **(0.25 Points)**

6. The user `rserral` wants to create a file called `/home/rserral/free.txt` every day. This file has to contain the size of the directory `/home/rserral`. Indicate which command needs to be executed and which changes to the system are required to do so. **(0.75 Points)**

7. The administrator realizes that the user `rserral` made the changes detailed in the previous question and decides that this user should not be able to run this kind of tasks. How can you forbid these changes using a single command? **(0.5 Points)**