



# Instituto Politécnico Nacional

Escuela Superior de Cómputo

Sistemas Distribuidos

Pineda Guerrero Carlos

Tarea 6

4CV13

Humberto Alejandro Ortega Alcocer (2016630495)

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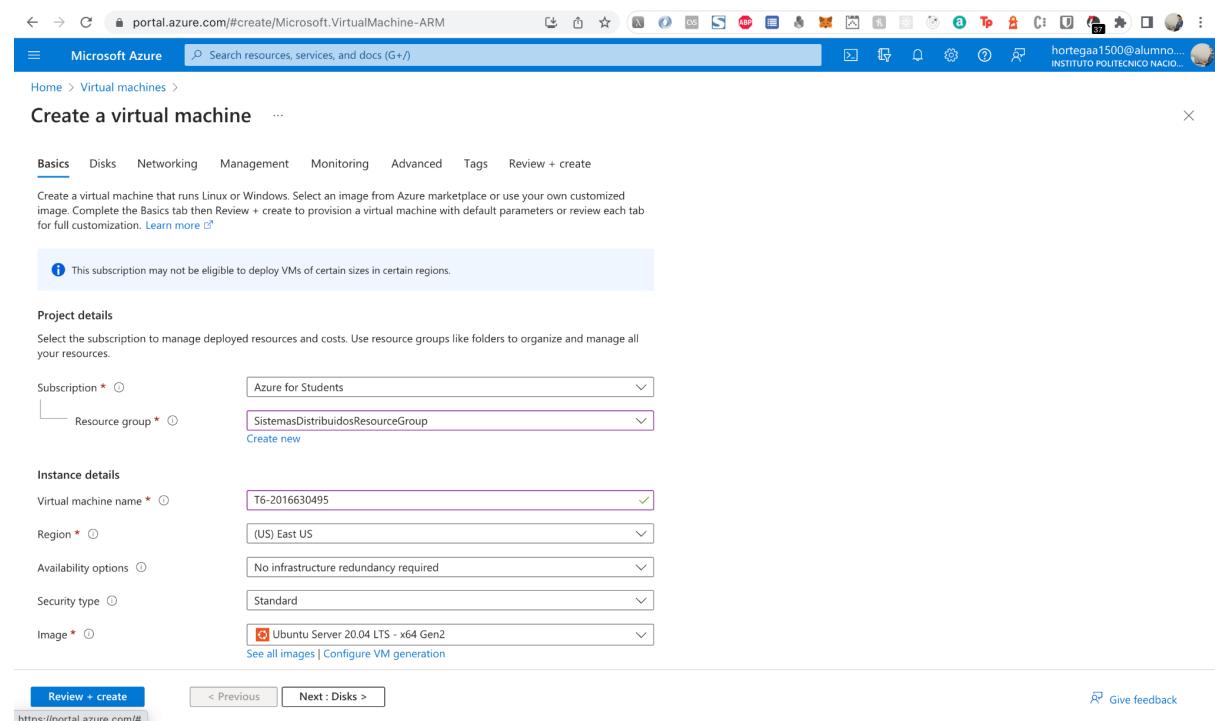
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# Desarrollo

Para desarrollar esta tarea seguiremos el procedimiento en el orden planteado por el profesor en la definición de la tarea. En realidad, no hay mucho que hacer más allá de seguir dichos pasos con cautela y verificar que cada paso nos haya salido correctamente.

## Creación de Máquina Virtual

Lo primero será colocar el nombre de la máquina virtual acorde a las especificaciones del profesor (T6-2016630495, que es T6 y mi número de boleta), usaremos la región de *US-East* y colocaremos la nueva máquina virtual dentro del grupo de recursos que hemos usado durante el semestre para poder retener la configuración de accesos y demás.



The screenshot shows the Microsoft Azure portal interface for creating a new virtual machine. The top navigation bar includes links for portal.azure.com, Microsoft Azure, and a search bar. Below the header, the breadcrumb navigation shows 'Home > Virtual machines > Create a virtual machine'. The main content area is titled 'Create a virtual machine' with a sub-section 'Project details'. It asks to select a subscription and resource group, both set to 'Azure for Students' and 'SistemasDistribuidosResourceGroup'. Under 'Instance details', the 'Virtual machine name' is 'T6-2016630495', 'Region' is '(US) East US', 'Availability options' is 'No infrastructure redundancy required', 'Security type' is 'Standard', and the 'Image' is 'Ubuntu Server 20.04 LTS - x64 Gen2'. At the bottom of the form are buttons for 'Review + create', '< Previous', 'Next : Disks >', and 'Give feedback'.

Lo siguiente será seleccionar la arquitectura (x86 de 64 bits), el tamaño (2vCPU y 4 GiB de RAM), la autenticación (la llave que hemos usado en todas las tareas), y dejaremos el puerto 22 (SSH) abierto.

Lo siguiente será seleccionar el disco de tipo HDD, a manera de que no gastemos nuestros créditos en redundancia o discos de calidad *premium*.

Lo siguiente será que en la pestaña de redes nos aseguremos de que tengamos una IP pública para generar y que tengamos el puerto de SSH abierto (22), posteriormente realizaremos la apertura del puerto 8080.

The screenshot shows the 'Networking' tab of the Azure VM creation wizard. It includes fields for selecting a virtual network (T6-2016630495-vnet), subnet (default), and public IP (T6-2016630495-ip). Under 'NIC network security group', 'Basic' is selected. In the 'Public inbound ports' section, 'Allow selected ports' is chosen, with 'SSH (22)' specified. A warning message states: '⚠️ This will allow all IP addresses to access your virtual machine. This is only recommended for testing. Use the Advanced controls in the Networking tab to create rules to limit inbound traffic to known IP addresses.' Navigation buttons at the bottom include 'Review + create', '< Previous', 'Next : Management >', and 'Give feedback'.

El resumen de nuestra máquina virtual a crear es:

The screenshot shows the final summary page of the Azure VM creation wizard. It displays a green bar indicating 'Validation passed'. The 'Review + create' tab is active. The 'Price' section shows a cost of 0.0416 USD/hr for 1 X Standard B2s by Microsoft. The 'TERMS' section contains legal disclaimers. The 'Name' field is filled with 'HUMBERTO ALEJANDRO ORTEGA ALCOCER'. The 'Preferred e-mail address' field is 'hortegaa1500@alumno.ipn.mx'. The 'Preferred phone number' field is '(+52) 55 57296166'. A warning message at the bottom states: '⚠️ You have set SSH port(s) open to the internet. This is only recommended for testing. If you want to change this setting, go back to Basics tab.' Navigation buttons at the bottom include 'Create', '< Previous', 'Next >', 'Download a template for automation', and 'Give feedback'.

**Basics**

Subscription	Azure for Students
Resource group	SistemasDistribuidosResourceGroup
Virtual machine name	T6-2016630495
Region	East US
Availability options	No infrastructure redundancy required
Security type	Standard
Image	Ubuntu Server 20.04 LTS - Gen2
VM architecture	x64
Size	Standard B2s (2 vcpus, 4 GiB memory)
Authentication type	SSH public key
Username	humbertowood
Key pair name	humbertowood-azure
Public inbound ports	SSH
Azure Spot	No

**Disks**

OS disk type	Standard HDD LRS
Use managed disks	Yes
Delete OS disk with VM	Enabled
Ephemeral OS disk	No

**Networking**

Virtual network	(new) T6-2016630495-vnet
Subnet	(new) default (10.0.0/24)
Public IP	(new) T6-2016630495-ip
Accelerated networking	Off
Place this virtual machine behind an existing load balancing solution?	No
Delete public IP and NIC when VM is deleted	Disabled

**Management**

Microsoft Defender for Cloud	Basic (free)
System assigned managed identity	Off
Login with Azure AD	Off
Auto-shutdown	Off
Backup	Disabled
Enable hotpatch	Off
Patch orchestration options	Image Default

**Monitoring**

Alerts	Off
Boot diagnostics	On
Enable OS guest diagnostics	Off

**Advanced**

Extensions	None
------------	------

Finalmente, crearemos la máquina virtual y esperaremos a que se termine de inicializar

The screenshot shows the Microsoft Azure portal with the URL <https://portal.azure.com/#view/HubsExtension/DeploymentDetailsBlade/>. The page title is "CreateVm-canonical.0001-com-ubuntu-server-focal-2-20230508171207 | Overview". A green checkmark icon indicates "Deployment succeeded". The deployment summary includes the name "CreateVm-canonical.0001-com-ubuntu-server-focal-2-20230508171207", subscription "Azure for Students", resource group "SistemasDistribuidosResourceGroup", start time "5/8/2023, 5:28:26 PM", and correlation ID "63d2f927-2dc0-485b-ad1e-58ea2fe27225". Below this, there are sections for "Deployment details" (Setup auto-shutdown, Monitor VM health, Run a script inside the virtual machine) and "Next steps" (Go to resource, Create another VM). On the right side, there are promotional cards for Cost Management, Microsoft Defender for Cloud, Free Microsoft tutorials, and Work with an expert.

## Apertura del puerto 8080

Lo siguiente será abrir el puerto 8080 que necesitaremos para cuando ejecutemos Tomcat. Para esto nos iremos a nuestro recurso en Azure.

The screenshot shows the Microsoft Azure portal with the URL <https://portal.azure.com/#correo.ipn.mx/resource/subscriptions/a5d9d...>. The page title is "T6-2016630495 | Overview". The main content area displays the VM details: Resource group (moved) "SistemasDistribuidosResourceGroup", Status "Running", Location "East US", Subscription "Azure for Students", and Subscription ID "a5d9d675-3ae1-4e2b-95b5-02150d67b8d2". It also shows the IP address "20.85.228.113" and the virtual network subnet "T6-2016630495-vnet/default". The left sidebar lists various management options like Connect, Start, Stop, Capture, Delete, Refresh, Open in mobile, Feedback, CLI / PS, and several monitoring and configuration tabs (Activity log, Access control (IAM), Tags, Diagnose and solve problems, Networking, Connect, Disks, Size, Microsoft Defender for Cloud, Advisor recommendations, Extensions + applications, Availability + scaling, Configuration, Identity, Properties, Locks, Operations, Bastion, Auto-shutdown, Backup, Disaster recovery).

Iremos a la sección de Networking.

The screenshot shows the Azure portal interface for a virtual machine named T6-2016630495. The 'Networking' section is open, specifically the 'Inbound port rules' tab. There are five rules listed:

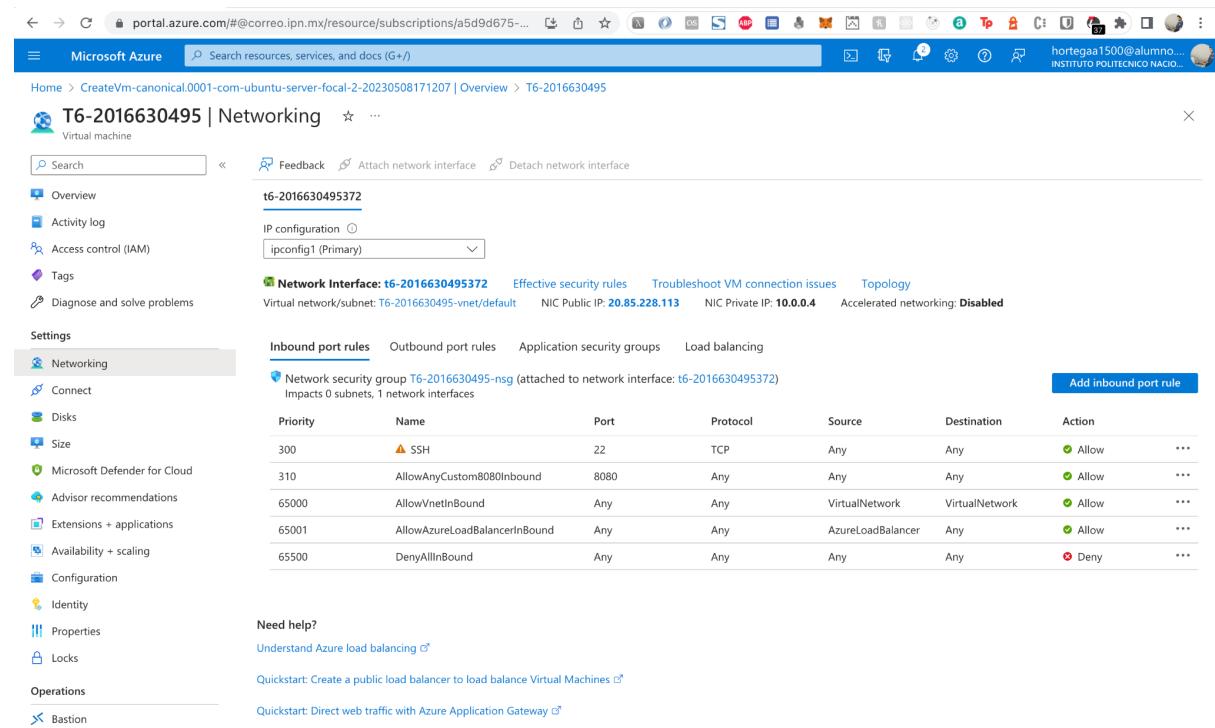
Priority	Name	Port	Protocol	Source	Destination	Action
300	SSH	22	TCP	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

Seleccionaremos la opción de Add inbound port rule y colocaremos los datos correspondientes.

The screenshot shows the 'Add inbound security rule' dialog box. The configuration is as follows:

- Source: Any
- Protocol: Any
- Action: Allow
- Priority: 310
- Name: AllowAnyCustom8080Inbound
- Description: Puerto 8080 para Tomcat

Y verificaremos en la pantalla que el puerto se muestre en el listado de puertos abiertos.



Priority	Name	Port	Protocol	Source	Destination	Action
300	⚠ SSH	22	TCP	Any	Any	Allow
310	AllowAnyCustom8080Inbound	8080	Any	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

*Nota: por seguridad siempre debemos de seleccionar el protocolo a utilizar, PERO he tenido situaciones dónde si por algún motivo llegamos a usar HTTP/2 o Quic y bloqueamos el tráfico ICMP puede no funcionar correctamente. Por eso admite todos los protocolos.*

## Prueba de Conexión

Para probar la conexión trataremos de realizar una sesión de SSH a nuestra máquina virtual.

```
> ssh -i humbertoody-azure.pem 20.85.228.113
The authenticity of host '20.85.228.113 (20.85.228.113)' can't be established.
ED25519 key fingerprint is SHA256:glq+eR/58GhnBxpWajc2I7ZgB8PhtJMsSlSE3K5PQOE.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '20.85.228.113' (ED25519) to the list of known hosts.
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1037-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Mon May  8 23:36:10 UTC 2023

System load:  0.0          Processes:           111
Usage of /:   5.2% of 28.89GB  Users logged in:     0
Memory usage: 6%          IPv4 address for eth0: 10.0.0.4
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

humbertoody@T6-2016630495:~$
```

## Instalación de Tomcat con soporte REST

Lo primero será instalar el OpenJDK en la versión 8 (Java 8) mediante el uso de los comandos proporcionados por el profesor. Primero, actualizando los paquetes del sistema:

```
humbertowoody@T6-2016630495:~$  
humbertowoody@T6-2016630495:~$ sudo apt update && sudo apt install openjdk-8-headless  
Hit:1 http://azure.archive.ubuntu.com/ubuntu focal InRelease  
Get:2 http://azure.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]  
Get:3 http://azure.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]  
Get:4 http://azure.archive.ubuntu.com/ubuntu focal-security InRelease [114 kB]  
Get:5 http://azure.archive.ubuntu.com/ubuntu focal/universe amd64 Packages [8628 kB]  
Get:6 http://azure.archive.ubuntu.com/ubuntu focal/universe Translation-en [5124 kB]  
Get:7 http://azure.archive.ubuntu.com/ubuntu focal/universe amd64 c-n-f Metadata [265 kB]  
Get:8 http://azure.archive.ubuntu.com/ubuntu focal/multiverse amd64 Packages [144 kB]  
Get:9 http://azure.archive.ubuntu.com/ubuntu focal/multiverse Translation-en [104 kB]  
Get:10 http://azure.archive.ubuntu.com/ubuntu focal/multiverse amd64 c-n-f Metadata [9136 B]  
Get:11 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [2536 kB]  
Get:12 http://azure.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [429 kB]  
Get:13 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [16.5 kB]  
Get:14 http://azure.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [1059 kB]  
Get:15 http://azure.archive.ubuntu.com/ubuntu focal-updates/universe Translation-en [250 kB]  
Get:16 http://azure.archive.ubuntu.com/ubuntu focal-updates/universe amd64 c-n-f Metadata [24.2 kB]  
Get:17 http://azure.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [25.2 kB]  
Get:18 http://azure.archive.ubuntu.com/ubuntu focal-updates/multiverse Translation-en [7408 B]  
Get:19 http://azure.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 c-n-f Metadata [612 B]  
Get:20 http://azure.archive.ubuntu.com/ubuntu focal-backports/main amd64 Packages [45.7 kB]  
Get:21 http://azure.archive.ubuntu.com/ubuntu focal-backports/main Translation-en [16.3 kB]  
Get:22 http://azure.archive.ubuntu.com/ubuntu focal-backports/main amd64 c-n-f Metadata [1420 B]  
Get:23 http://azure.archive.ubuntu.com/ubuntu focal-backports/restricted amd64 c-n-f Metadata [116 B]  
Get:24 http://azure.archive.ubuntu.com/ubuntu focal-backports/universe amd64 Packages [24.9 kB]  
Get:25 http://azure.archive.ubuntu.com/ubuntu focal-backports/universe Translation-en [16.3 kB]
```

Y luego instalando el JDK:

```
humbertowoody@T6-2016630495:~$ sudo apt install openjdk-8-jdk-headless  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following additional packages will be installed:  
  ca-certificates-java fontconfig-config fonts-dejavu-core java-common libavahi-client3 libavahi-common-data libavahi-common3 libcurl3  
  libfontconfig1 libjpeg-turbo8 libjpeg8 liblcms2-2 libpcsc-lite1 libxi6 libxrender1 libxtst6 openjdk-8-jre-headless x11-common  
Suggested packages:  
  default-jre cups-common liblcms2-utils pcscd openjdk-8-demo openjdk-8-source libnss-mdns fonts-dejavu-extra fonts-ipafont-gothic  
  fonts-ipafont-mincho fonts-wqy-microhei fonts-wqy-zenhei fonts-indic  
The following NEW packages will be installed:  
  ca-certificates-java fontconfig-config fonts-dejavu-core java-common libavahi-client3 libavahi-common-data libavahi-common3 libcurl3  
  libfontconfig1 libjpeg-turbo8 libjpeg8 liblcms2-2 libpcsc-lite1 libxi6 libxrender1 libxtst6 openjdk-8-jdk-headless openjdk-8-jre-headless  
  x11-common  
0 upgraded, 19 newly installed, 0 to remove and 3 not upgraded.  
Need to get 38.4 MB of archives.  
After this operation, 150 MB of additional disk space will be used.  
Do you want to continue? [Y/n] Y  
Get:1 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 java-common all 0.72 [6816 B]  
Get:2 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 libavahi-common-data amd64 0.7-4ubuntu7.1 [21.4 kB]  
Get:3 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 libavahi-common3 amd64 0.7-4ubuntu7.1 [21.7 kB]  
Get:4 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 libavahi-client3 amd64 0.7-4ubuntu7.1 [25.5 kB]  
Get:5 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 libcurl3 amd64 2.3.1-9ubuntu1.2 [233 kB]  
Get:6 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 liblcms2-2 amd64 2.9-4 [140 kB]  
Get:7 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 libjpeg-turbo8 amd64 2.0.3-0ubuntu1.20.04.3 [118 kB]  
Get:8 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 libjpeg8 amd64 8c-2ubuntu8 [2194 B]  
Get:9 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 fonts-dejavu-core all 2.37-1 [1041 kB]  
Get:10 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 fontconfig-config all 2.13.1-2ubuntu3 [28.8 kB]  
Get:11 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 libfontconfig1 amd64 2.13.1-2ubuntu3 [114 kB]  
Get:12 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 libpcsc-lite1 amd64 1.8.26-3 [22.0 kB]  
Get:13 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 libxi6 amd64 2.1.7.10-0ubuntu1 [29.9 kB]
```

Verificamos que se haya instalado correctamente:

```
humbertowoody@T6-2016630495:~$ java -version  
openjdk version "1.8.0_362"  
OpenJDK Runtime Environment (build 1.8.0_362-8u362-ga-0ubuntu1~20.04.1-b09)  
OpenJDK 64-Bit Server VM (build 25.362-b09, mixed mode)  
humbertowoody@T6-2016630495:~$
```

Ahora descargaremos el archivo de Tomcat indicado por el profesor y lo copiaremos a nuestra máquina virtual:

```
humberto@T6-2016630495:~$ ls
apache-tomcat-8.5.88.zip
humberto@T6-2016630495:~$ > ls
apache-tomcat-8.5.88.zip jaxrs-ri-2.24.zip README.md
gson-2.3.1.jar mysql-connector-j-8.0.33.zip Servicio.zip
> scp -i ../../azure/humberto@T6-2016630495:/home/humberto@T6-2016630495:~/Proyectos/IPN/sistemas-distribuidos-escom/tareas/tarea-6 main*
apache-tomcat-8.5.88.zip          100%   11MB 749.8KB/s  00:14
~/Proyectos/IPN/sistemas-distribuidos-escom/tareas/tarea-6 main*
```

En la máquina virtual, descomprimimos el archivo zip, para esto tendremos que instalar el paquete *unzip*:

```
humberto@T6-2016630495:~$ ls
apache-tomcat-8.5.88.zip
humberto@T6-2016630495:~$ ls
apache-tomcat-8.5.88.zip
humberto@T6-2016630495:~$ unzip apache-tomcat-8.5.88.zip
Command 'unzip' not found, but can be installed with:
sudo apt install unzip

humberto@T6-2016630495:~$ sudo apt install unzip
Reading package lists... Done
Building dependency tree
Reading state information... Done
Suggested packages:
  zip
The following NEW packages will be installed:
  unzip
0 upgraded, 1 newly installed, 0 to remove and 3 not upgraded.
Need to get 168 kB of archives.
After this operation, 593 kB of additional disk space will be used.
Get:1 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 unzip amd64 6.0-25ubuntu1.1 [168 kB]
Fetched 168 kB in 0s (6493 kB/s)
Selecting previously unselected package unzip.
(Reading database ... 59277 files and directories currently installed.)
Preparing to unpack .../unzip_6.0-25ubuntu1.1_amd64.deb ...
Unpacking unzip (6.0-25ubuntu1.1) ...
Setting up unzip (6.0-25ubuntu1.1) ...
Processing triggers for mime-support (3.64ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
humberto@T6-2016630495:~$ unzip apache-tomcat-8.5.88.zip
Archive:  apache-tomcat-8.5.88.zip
  creating: apache-tomcat-8.5.88/
```

Con los archivos finales, ahora borraremos la carpeta `webapps` y la crearemos de nuevo y un directorio `ROOT` dentro de la misma:

```
humberto@T6-2016630495:~$ ls
apache-tomcat-8.5.88 apache-tomcat-8.5.88.zip
humberto@T6-2016630495:~$ cd apache-tomcat-8.5.88/
humberto@T6-2016630495:~/apache-tomcat-8.5.88$ ls
BUILDING.txt CONTRIBUTING.md LICENSE NOTICE README.md RELEASE-NOTES RUNNING.txt bin conf lib logs temp webapps work
humberto@T6-2016630495:~/apache-tomcat-8.5.88$ rm -rf webapps/
humberto@T6-2016630495:~/apache-tomcat-8.5.88$ mkdir webapps
humberto@T6-2016630495:~/apache-tomcat-8.5.88$ mkdir webapps/ROOT
humberto@T6-2016630495:~/apache-tomcat-8.5.88$ tree webapps/
Command 'tree' not found, but can be installed with:

sudo apt install tree

humberto@T6-2016630495:~/apache-tomcat-8.5.88$ sudo apt install tree && tree webapps/
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  tree
0 upgraded, 1 newly installed, 0 to remove and 3 not upgraded.
Need to get 43.0 kB of archives.
After this operation, 115 kB of additional disk space will be used.
Get:1 http://azure.archive.ubuntu.com/ubuntu focal/universe amd64 tree amd64 1.8.0-1 [43.0 kB]
Fetched 43.0 kB in 0s (1503 kB/s)
Selecting previously unselected package tree.
(Reading database ... 59295 files and directories currently installed.)
Preparing to unpack .../tree_1.8.0-1_amd64.deb ...
Unpacking tree (1.8.0-1) ...
Setting up tree (1.8.0-1) ...
Processing triggers for man-db (2.9.1-1) ...
webapps/
└── ROOT

1 directory, 0 files
humberto@T6-2016630495:~/apache-tomcat-8.5.88$
```

Ahora descargaremos la biblioteca de Jersey, la copiaremos al servidor y la descomprimiremos en el mismo:

```
humberto@T6-2016630495:~$ unzip jaxrs-ri-2.24.zip
Archive: jaxrs-ri-2.24.zip
  creating: jaxrs-ri/
  inflating: jaxrs-ri/Jersey-LICENSE.txt
  inflating: jaxrs-ri/third-party-license-readme.txt
  creating: jaxrs-ri/api/
extracting: jaxrs-ri/api/javax.ws.rs-api-2.0.1.jar
  creating: jaxrs-ri/lib/
extracting: jaxrs-ri/lib/jersey-common.jar
extracting: jaxrs-ri/lib/jersey-media-jaxb.jar
extracting: jaxrs-ri/lib/jersey-client.jar
extracting: jaxrs-ri/lib/jersey-server.jar
extracting: jaxrs-ri/lib/jersey-container-servlet-core.jar
extracting: jaxrs-ri/lib/jersey-container-servlet.jar
  creating: jaxrs-ri/ext/
extracting: jaxrs-ri/ext/javax.inject-2.5.0-b05.jar
extracting: jaxrs-ri/ext/osgi-resource-locator-1.0.1.jar
extracting: jaxrs-ri/ext/javax.annotation-api-1.2.jar
extracting: jaxrs-ri/ext/jersey-guava-2.24.jar
extracting: jaxrs-ri/ext/hk2-api-2.5.0-b05.jar
extracting: jaxrs-ri/ext/hk2-utils-2.5.0-b05.jar
extracting: jaxrs-ri/ext/aopalliance-repackaged-2.5.0-b05.jar
extracting: jaxrs-ri/ext/hk2-locator-2.5.0-b05.jar
extracting: jaxrs-ri/ext/javassist-3.20.0-GA.jar
extracting: jaxrs-ri/ext/validation-api-1.1.0.Final.jar
extracting: jaxrs-ri/ext/org.osgi.core-4.2.0.jar
extracting: jaxrs-ri/ext/jaxb-api-2.2.7.jar
extracting: jaxrs-ri/ext/javax.servlet-api-3.0.1.jar
extracting: jaxrs-ri/ext/persistence-api-1.0.jar
> z tarea-6
> scp -i ..../azure/humbertwoody-azure.pem apache-tomcat-8.5.88.zip 20.85.228.113:/home/humbertwoody
> ls
apache-tomcat-8.5.88.zip jaxrs-ri-2.24.zip          README.md
gson-2.3.1.jar      mysql-connector-j-8.0.33.zip  Servicio.zip
> scp -i ..../azure/humbertwoody-azure.pem jaxrs-ri-2.24.zip 20.85.228.113:/home/humbertwoody
jaxrs-ri-2.24.zip           100% 4821KB  3.6MB/s  00:01
~/Proyectos/IPN/sistemas-distribuidos-escom/tareas/tarea-6 main*
```

Ahora moveremos los archivos con extensión .jar a la carpeta correspondiente de Tomcat:

```
humberto@woody:~/T6-2016630495:~/jaxrs-ri$ ls
Jersey-LICENSE.txt api ext lib third-party-license-readme.txt
humberto@woody:~/T6-2016630495:~/jaxrs-ri$ mv api/*.jar .. /apache-tomcat-8.5.88/lib/
humberto@woody:~/T6-2016630495:~/jaxrs-ri$ mv ext/*.jar .. /apache-tomcat-8.5.88/lib/
humberto@woody:~/T6-2016630495:~/jaxrs-ri$ mv lib/*.jar .. /apache-tomcat-8.5.88/lib/
humberto@woody:~/T6-2016630495:~/jaxrs-ri$ cd .. /apache-tomcat-8.5.88/ && ls
BUILDING.txt CONTRIBUTING.md LICENSE NOTICE README.md RELEASE-NOTES RUNNING.txt bin conf lib logs temp webapps work
humberto@woody:~/T6-2016630495:~/apache-tomcat-8.5.88$ cd lib/
humberto@woody:~/T6-2016630495:~/apache-tomcat-8.5.88/lib$ ls
annotations-api.jar jasper.jar jersey-media-jaxb.jar tomcat-i18n-ja.jar
aopaliance-repackaged-2.5.0-b05.jar jaspic-api.jar jersey-server.jar tomcat-i18n-ko.jar
catalina-ant.jar javassist-3.20.0-GA.jar jsp-api.jar tomcat-i18n-ru.jar
catalina-ha.jar javax.annotation-api-1.2.jar org.osgi.core-4.2.0.jar tomcat-i18n-zh-CN.jar
catalina-storeconfig.jar javax.inject-2.5.0-b05.jar osgi-resource-locator-1.0.1.jar tomcat-jdbc.jar
catalina-tribes.jar javax.servlet-api-3.0.1.jar persistence-api-1.0.jar tomcat-jni.jar
catalina.jar javax.ws.rs-api-2.0.1.jar servlet-api.jar tomcat-util-scan.jar
ecj-4.6.3.jar jaxb-api-2.2.7.jar tomcat-api.jar tomcat-util.jar
el-api.jar jersey-client.jar tomcat-coyote.jar tomcat-websocket.jar
hk2-api-2.5.0-b05.jar jersey-common.jar tomcat-dbc.jar validation-api-1.1.0.Final.jar
hk2-locator-2.5.0-b05.jar jersey-container-servlet-core.jar tomcat-i18n-de.jar websocket-api.jar
hk2-utils-2.5.0-b05.jar jersey-container-servlet.jar tomcat-i18n-es.jar
jasper-el.jar jersey-guava-2.24.jar tomcat-i18n-fr.jar
humberto@woody:~/T6-2016630495:~/apache-tomcat-8.5.88/lib$
```

Ahora borraremos un archivo llamado *javax.servlet-api-3.0.1.jar* el cual tiene incompatibilidades entre Jersey y Tomcat:

```
humberto@woody:~/T6-2016630495:~/apache-tomcat-8.5.88/lib$ ls
annotations-api.jar jasper.jar jersey-media-jaxb.jar tomcat-i18n-ja.jar
aopaliance-repackaged-2.5.0-b05.jar jaspic-api.jar jersey-server.jar tomcat-i18n-ko.jar
catalina-ant.jar javassist-3.20.0-GA.jar jsp-api.jar tomcat-i18n-ru.jar
catalina-ha.jar javax.annotation-api-1.2.jar org.osgi.core-4.2.0.jar tomcat-i18n-zh-CN.jar
catalina-storeconfig.jar javax.inject-2.5.0-b05.jar osgi-resource-locator-1.0.1.jar tomcat-jdbc.jar
catalina-tribes.jar javax.servlet-api-3.0.1.jar persistence-api-1.0.jar tomcat-jni.jar
catalina.jar javax.ws.rs-api-2.0.1.jar servlet-api.jar tomcat-util-scan.jar
ecj-4.6.3.jar jaxb-api-2.2.7.jar tomcat-api.jar tomcat-util.jar
el-api.jar jersey-client.jar tomcat-coyote.jar tomcat-websocket.jar
hk2-api-2.5.0-b05.jar jersey-common.jar tomcat-dbc.jar validation-api-1.1.0.Final.jar
hk2-locator-2.5.0-b05.jar jersey-container-servlet-core.jar tomcat-i18n-de.jar websocket-api.jar
hk2-utils-2.5.0-b05.jar jersey-container-servlet.jar tomcat-i18n-es.jar
jasper-el.jar jersey-guava-2.24.jar tomcat-i18n-fr.jar
humberto@woody:~/T6-2016630495:~/apache-tomcat-8.5.88/lib$ rm javax.servlet-api-3.0.1.jar
humberto@woody:~/T6-2016630495:~/apache-tomcat-8.5.88/lib$ ls
annotations-api.jar jasper.jar jersey-server.jar tomcat-i18n-ko.jar
aopaliance-repackaged-2.5.0-b05.jar jaspic-api.jar jsp-api.jar tomcat-i18n-ru.jar
catalina-ant.jar javassist-3.20.0-GA.jar org.osgi.core-4.2.0.jar tomcat-i18n-zh-CN.jar
catalina-ha.jar javax.annotation-api-1.2.jar osgi-resource-locator-1.0.1.jar tomcat-jdbc.jar
catalina-storeconfig.jar javax.inject-2.5.0-b05.jar persistence-api-1.0.jar tomcat-jni.jar
catalina-tribes.jar javax.ws.rs-api-2.0.1.jar servlet-api.jar tomcat-util-scan.jar
catalina.jar jaxb-api-2.2.7.jar tomcat-api.jar tomcat-util.jar
ecj-4.6.3.jar jersey-client.jar tomcat-coyote.jar tomcat-websocket.jar
el-api.jar jersey-common.jar tomcat-dbc.jar validation-api-1.1.0.Final.jar
hk2-api-2.5.0-b05.jar jersey-container-servlet-core.jar tomcat-i18n-de.jar websocket-api.jar
hk2-locator-2.5.0-b05.jar jersey-container-servlet.jar tomcat-i18n-es.jar
hk2-utils-2.5.0-b05.jar jersey-guava-2.24.jar tomcat-i18n-fr.jar
jasper-el.jar jersey-media-jaxb.jar tomcat-i18n-ja.jar
humberto@woody:~/T6-2016630495:~/apache-tomcat-8.5.88/lib$
```

Ahora descargaremos el archivo de GSON a nuestro local, lo copiaremos a la máquina virtual y dentro de la misma lo moveremos al directorio correspondiente para Tomcat:

```
humberto@T6-2016630495:~$ ls
apache-tomcat-8.5.88      gson-2.3.1.jar  jaxrs-ri-2.24.zip
apache-tomcat-8.5.88.zip   jaxrs-ri
humberto@T6-2016630495:~$ mv gson-2.3.1.jar apache-tomcat-8.5.88/lib/
b/
humberto@T6-2016630495:~$ ls apache-tomcat-8.5.88/lib/
annotations-api.jar        jersey-guava-2.24.jar
aopalliance-repackaged-2.5.0-b05.jar jersey-media-jaxb.jar
catalina-ant.jar            jersey-server.jar
catalina-ha.jar              jsp-api.jar
catalina-storeconfig.jar    org.osgi.core-4.2.0.jar
catalina-tribes.jar         osgi-resource-locator-1.0.1.jar
catalina.jar                persistence-api-1.0.jar
ecj-4.6.3.jar               servlet-api.jar
el-api.jar                  tomcat-api.jar
gson-2.3.1.jar              tomcat-coyote.jar
hk2-api-2.5.0-b05.jar       tomcat-dbc.jar
hk2-locator-2.5.0-b05.jar   tomcat-i18n-de.jar
hk2-utils-2.5.0-b05.jar     tomcat-i18n-es.jar
jasper-el.jar               tomcat-i18n-fr.jar
jasper.jar                  tomcat-i18n-ja.jar
jaspic-api.jar              tomcat-i18n-ko.jar
javassist-3.20.0-GA.jar     tomcat-i18n-ru.jar
javax.annotation-api-1.2.jar tomcat-i18n-zh-CN.jar
javax.inject-2.5.0-b05.jar   tomcat-jdbc.jar
javax.ws.rs-api-2.0.1.jar   tomcat-jni.jar
jaxb-api-2.2.7.jar          tomcat-util-scan.jar
jersey-client.jar           tomcat-util.jar
jersey-common.jar           tomcat-websocket.jar
jersey-container-servlet-core.jar validation-api-1.1.0.Final.jar
jersey-container-servlet.jar websocket-api.jar
humberto@T6-2016630495:~$ █
```

```
> z tarea-6 && ls
apache-tomcat-8.5.88.zip  jaxrs-ri-2.24.zip      README.md
gson-2.3.1.jar            mysql-connector-j-8.0.33.zip  Servicio.zip
> scp -i ../../azure/humbertowooday-azure.pem gson-2.3.1.jar 20.85.228.1
13:/home/humbertowood
gson-2.3.1.jar             100% 206KB 692.4KB/s  00:00
~/Proyectos/IPN/sistemas-distribuidos-escom/tareas/tarea-6 main*
```

Ahora descargaremos un archivo zip con el conector de JDBC para MySQL, lo copiaremos a la máquina virtual y lo descomprimiremos:

```
humberto@T6-2016630495:~$ ls
humberto@T6-2016630495:~$ ls
apache-tomcat-8.5.88      jaxrs-ri-2.24.zip      [1590/1824]
apache-tomcat-8.5.88.zip   mysql-connector-j-8.0.33.zip
jaxrs-ri
humberto@T6-2016630495:~$ unzip mysql-connector-j-8.0.33.zip
Archive: mysql-connector-j-8.0.33.zip
  creating: mysql-connector-j-8.0.33/
    creating: mysql-connector-j-8.0.33/src/
      creating: mysql-connector-j-8.0.33/src/build/
        creating: mysql-connector-j-8.0.33/src/build/java/
          creating: mysql-connector-j-8.0.33/src/build/java/documentation/
          creating: mysql-connector-j-8.0.33/src/build/java/instrumentation/
          creating: mysql-connector-j-8.0.33/src/build/misc/
          creating: mysql-connector-j-8.0.33/src/build/misc/debian.in/
          creating: mysql-connector-j-8.0.33/src/build/misc/debian.in/source/
          creating: mysql-connector-j-8.0.33/src/demo/
          creating: mysql-connector-j-8.0.33/src/demo/java/
          creating: mysql-connector-j-8.0.33/src/demo/java/demo/
          creating: mysql-connector-j-8.0.33/src/demo/java/demo/x/
          creating: mysql-connector-j-8.0.33/src/demo/java/demo/x/devapi/
          creating: mysql-connector-j-8.0.33/src/generated/
  creating: mysql-connector-j-8.0.33/src/generated/
```

```
> ls
apache-tomcat-8.5.88.zip  jaxrs-ri-2.24.zip      README.md
gson-2.3.1.jar            mysql-connector-j-8.0.33.zip  Servicio.zip
> scp -i ../../azure/humbertowooday-azure.pem mysql-connector-j-8.0.33.zip
ip 20.85.228.113:/home/humbertowood
mysql-connector-j-8.0.33.zip 100% 4941KB  4.0MB/s  00:01
~/Proyectos/IPN/sistemas-distribuidos-escom/tareas/tarea-6 main*
```

Lo siguiente será colocar los archivos correspondientes en el directorio de Tomcat:

```
humberto@T6-2016630495:~/mysql-connector-j-8.0.33$ ls
CHANGES  INFO_BIN  INFO_SRC  LICENSE  README  build.xml  mysql-connector-j-8.0.33.jar  src
humberto@T6-2016630495:~/mysql-connector-j-8.0.33$ mv mysql-connector-j-8.0.33.jar .. /apache-tomcat-8.5.88/lib/
humberto@T6-2016630495:~/mysql-connector-j-8.0.33$ cd .. /apache-tomcat-8.5.88/lib/ && ls
annotations-api.jar
aopalliance-repackaged-2.5.0-b05.jar
catalina-ant.jar
catalina-ha.jar
catalina-storeconfig.jar
catalina-tribes.jar
catalina.jar
ecj-4.6.3.jar
el-api.jar
gson-2.3.1.jar
hk2-api-2.5.0-b05.jar
hk2-locator-2.5.0-b05.jar
hk2-utils-2.5.0-b05.jar
jasper-el.jar
jasper.jar
jaspic-api.jar
javassist-3.20.0-GA.jar
javax.annotation-api-1.2.jar
javax.inject-2.5.0-b05.jar
javax.ws.rs-api-2.0.1.jar
jaxb-api-2.2.7.jar
jersey-client.jar
jersey-common.jar
jersey-container-servlet-core.jar
jersey-container-servlet.jar
jersey-guava-2.24.jar
humberto@T6-2016630495:~/apache-tomcat-8.5.88/lib$
```

## Iniciar y/o Detener el servidor de Tomcat

Lo primero es definir las variables de entorno con las rutas para Tomcat y nuestra instalación de Java. Para definir las variables de entorno y que los valores no cambien si se pierde la sesión SSH o cualquier cosa, las definiré en el archivo `.bashrc` el cual se carga en cada sesión de Bash:

```
# Variables de entorno para Tomcat
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export CATALINA_HOME=/home/humbertwoody/apache-tomcat-8.5.88
".bashrc" 121L, 3920C written
```

Para verificar que los valores persistan entre múltiples sesiones, imprimiremos los valores después de re-conectarnos a la máquina virtual:

```
> ssh -i humbertoody-azure.pem 20.85.228.113
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1037-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

 System information as of Tue May  9 00:23:56 UTC 2023

 System load:  0.02          Processes:           111
 Usage of /:   6.5% of 28.89GB  Users logged in:     0
 Memory usage: 7%            IPv4 address for eth0: 10.0.0.4
 Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

3 updates can be applied immediately.
2 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

New release '22.04.2 LTS' available.
Run 'do-release-upgrade' to upgrade to it.
```

```
Last login: Mon May  8 23:48:09 2023 from 148.204.56.241
humbertoody@T6-2016630495:~$ echo $JAVA_HOME
/usr/lib/jvm/java-8-openjdk-amd64
humbertoody@T6-2016630495:~$ echo $CATALINA_HOME
/home/humbertoody/apache-tomcat-8.5.88
humbertoody@T6-2016630495:~$
```

Para verificar su funcionamiento, iniciaremos el servidor y luego lo detendremos:

```
humbertoody@T6-2016630495:~$ sh $CATALINA_HOME/bin/catalina.sh start
Using CATALINA_BASE:  /home/humbertoody/apache-tomcat-8.5.88
Using CATALINA_HOME:   /home/humbertoody/apache-tomcat-8.5.88
Using CATALINA_TMPDIR: /home/humbertoody/apache-tomcat-8.5.88/temp
Using JRE_HOME:        /usr/lib/jvm/java-8-openjdk-amd64
Using CLASSPATH:       /home/humbertoody/apache-tomcat-8.5.88/bin/bootstrap.jar:/home/humbertoody/apache-tomcat-8.5.88/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
humbertoody@T6-2016630495:~$ sh $CATALINA_HOME/bin/catalina.sh stop
Using CATALINA_BASE:  /home/humbertoody/apache-tomcat-8.5.88
Using CATALINA_HOME:   /home/humbertoody/apache-tomcat-8.5.88
Using CATALINA_TMPDIR: /home/humbertoody/apache-tomcat-8.5.88/temp
Using JRE_HOME:        /usr/lib/jvm/java-8-openjdk-amd64
Using CLASSPATH:       /home/humbertoody/apache-tomcat-8.5.88/bin/bootstrap.jar:/home/humbertoody/apache-tomcat-8.5.88/bin/tomcat-juli.jar
Using CATALINA_OPTS:
humbertoody@T6-2016630495:~$
```

Es importante que estos comandos funcionen puesto que en cada ocasión que modifiquemos/añadimos archivos a nuestra carpeta lib, requerimos reiniciar Tomcat.

## Iniciar Tomcat cuando inicie la máquina virtual

En esta sección configuraremos la máquina virtual para que, en cuanto arranque, inicie el servicio para el servidor Tomcat. Para esto, editaremos un archivo de la siguiente forma:

```
#!/bin/bash
iptables -t nat -A OUTPUT -o lo -p tcp --dport 80 -j REDIRECT --to-port 8080
runuser -l humbertoody -c 'export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64;export CATALINA_HOME=/home/humbertowoodly/apache-tomcat-8.5.88;sh $CATALINA_HOME/bin/catalina.sh start'
exit 0
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~/etc/rc.local" [New] 4L, 279C written
3,141 All

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

New release '22.04.2 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Tue May  9 00:23:57 2023 from 148.204.56.241
humbertoody@T6-2016630495:~$ tail .bashrc
if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
fi

# Variables de entorno para Tomcat
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export CATALINA_HOME=/home/humbertowoodly/apache-tomcat-8.5.88
humbertoody@T6-2016630495:~$
```

Modifiqué las rutas para JAVA\_HOME y CATALINA\_HOME correspondientemente a mi instalación, así como el usuario ya que uso el mío para poder sacar provecho de mis llaves privadas ya utilizadas previamente.

Luego agregaremos el permiso de ejecución al script que acabamos de modificar:

```
humbertoody@T6-2016630495:~$ ls -lha /etc/rc.local
-rw-r--r-- 1 root root 279 May  9 00:31 /etc/rc.local
humbertoody@T6-2016630495:~$ sudo chmod +x /etc/rc.local
humbertoody@T6-2016630495:~$ ls -lha /etc/rc.local
-rwxr-xr-x 1 root root 279 May  9 00:31 /etc/rc.local
humbertoody@T6-2016630495:~$
```

## Instalación de MySQL

Lo primero será actualizar nuestro listado de repositorios de paquetes en la máquina virtual:

```
humberto@T6-2016630495:~$  
humberto@T6-2016630495:~$ sudo apt update  
Hit:1 http://azure.archive.ubuntu.com/ubuntu focal InRelease  
Get:2 http://azure.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]  
Get:3 http://azure.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]  
Get:4 http://azure.archive.ubuntu.com/ubuntu focal-security InRelease [114 kB]  
Fetched 336 kB in 0s (793 kB/s)  
Reading package lists ... Done  
Building dependency tree  
Reading state information ... Done  
3 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

Ahora instalaremos MySQL Server:

```
emitting double-array: 100% |#####
reading /usr/share/mecab/dic/ipadic/matrix.def ... 1316x1316
emitting matrix      : 100% |#####
done!
update-alternatives: using /var/lib/mecab/dic/ipadic-utf8 to provide /var/lib/mecab/dic/debian (mecab-dictionary) in auto mode
Setting up libhtml-parser-perl (3.72-5) ...
Setting up libhttp-message-perl (6.22-1) ...
Setting up mysql-server-8.0 (8.0.33-0ubuntu0.20.04.1) ...
update-alternatives: using /etc/mysql/mysql.cnf to provide /etc/mysql/my.cnf (my.cnf) in auto mode
Renaming removed key_buffer and myisam-recover options (if present)
mysqld will log errors to /var/log/mysql/error.log
mysqld is running as pid 6591
Created symlink /etc/systemd/system/multi-user.target.wants/mysql.service → /lib/systemd/system/mysql.service.
Setting up libcgi-pm-perl (4.46-1) ...
Setting up libhtml-template-perl (2.97-1) ...
Setting up mysql-server (8.0.33-0ubuntu0.20.04.1) ...
Setting up libcgi-fast-perl (1:2.15-1) ...
Processing triggers for systemd (245.4-4ubuntu3.21) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.9) ...
humberto@T6-2016630495:~$ systemctl status mysqld
Unit mysqld.service could not be found.
humberto@T6-2016630495:~$ systemctl status mysql
● mysql.service - MySQL Community Server
   Loaded: loaded (/lib/systemd/system/mysql.service; enabled; vendor preset: enabled)
   Active: active (running) since Tue 2023-05-09 00:35:26 UTC; 20s ago
     Main PID: 6820 (mysqld)
       Status: "Server is operational"
          Tasks: 38 (limit: 4699)
         Memory: 372.1M
            CPU: 0.000 CPU(s) since start
           CGroup: /system.slice/mysql.service
                     └─6820 /usr/sbin/mysqld

May 09 00:35:25 T6-2016630495 systemd[1]: Starting MySQL Community Server ...
May 09 00:35:26 T6-2016630495 systemd[1]: Started MySQL Community Server.
humberto@T6-2016630495:~$
```

Ahora lo siguiente será configurar MySQL de forma segura, debido a una configuración de las nuevas versiones de MySQL, el usuario root no tiene contraseña, por lo que falla el comando, para arreglar esto, entramos a MySQL y cambiamos el tipo de autenticación del usuario root, de la siguiente forma:

```
Connecting to MySQL using a blank password.

VALIDATE PASSWORD COMPONENT can be used to test passwords
and improve security. It checks the strength of password
and allows the users to set only those passwords which are
secure enough. Would you like to setup VALIDATE PASSWORD component?

Press y|Y for Yes, any other key for No: n
Please set the password for root here.

New password:

Re-enter new password:
... Failed! Error: SET PASSWORD has no significance for user 'root'@'localhost' as the authentication method used doesn't store authentication
data in the MySQL server. Please consider using ALTER USER instead if you want to change authentication parameters.

New password: Killed
humberto@T6-2016630495:~$ sudo mysql
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 12
Server version: 8.0.33-0ubuntu0.20.04.1 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password BY 'SetRootPasswordHere';
Query OK, 0 rows affected (0.06 sec)

mysql> exit
Bye
humberto@T6-2016630495:~$
```

Y ahora si, realizaremos la configuración segura del usuario root:

```
humberto@T6-2016630495:~$ sudo mysql_secure_installation

Securing the MySQL server deployment.

Enter password for user root:

VALIDATE PASSWORD COMPONENT can be used to test passwords
and improve security. It checks the strength of password
and allows the users to set only those passwords which are
secure enough. Would you like to setup VALIDATE PASSWORD component?

Press y|Y for Yes, any other key for No: N
Using existing password for root.
Change the password for root ? ((Press y|Y for Yes, any other key for No) : N

... skipping.
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
a user account created for them. This is intended only for
testing, and to make the installation go a bit smoother.
You should remove them before moving into a production
environment.

Remove anonymous users? (Press y|Y for Yes, any other key for No) : Y
Success.

Normally, root should only be allowed to connect from
'localhost'. This ensures that someone cannot guess at
the root password from the network.

Disallow root login remotely? (Press y|Y for Yes, any other key for No) : Y
Success.

By default, MySQL comes with a database named 'test' that
anyone can access. This is also intended only for testing,
and should be removed before moving into a production
environment.

Remove test database and access to it? (Press y|Y for Yes, any other key for No) : Y
- Dropping test database...
Success.

- Removing privileges on test database ...
Success.

Reloading the privilege tables will ensure that all changes
made so far will take effect immediately.

Reload privilege tables now? (Press y|Y for Yes, any other key for No) : Y
Success.

All done!
humberto@T6-2016630495:~$
```

Luego entraremos al monitor de MySQL y colocaremos la contraseña por defecto así como cargar de nuevo los permisos de los usuarios del servidor.

```
humberto@T6-2016630495:~$ sudo mysql --password=1234567
mysql: [Warning] Using a password on the command line interface can be insecure.
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 20
Server version: 8.0.33-0ubuntu0.20.04.1 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password BY '1234567';
Query OK, 0 rows affected (0.04 sec)

mysql> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.01 sec)

mysql> quit
Bye
humberto@T6-2016630495:~$
```

Ahora crearemos un nuevo usuario en MySQL:

```
humberto@T6-2016630495:~$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 22
Server version: 8.0.33-0ubuntu0.20.04.1 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> create user hugo@localhost identified by '1234567';
Query OK, 0 rows affected (0.04 sec)

mysql> grant all on servicio_web.* to hugo@localhost;
Query OK, 0 rows affected (0.02 sec)

mysql> quit
Bye
humberto@T6-2016630495:~$
```

El usuario se llama *hugo* y tiene la misma contraseña de *root* (mala práctica): 1234567.

## Crear la Base de Datos

Ahora crearemos la base de datos que requiere el proyecto, para esto seguiremos los siguiente pasos:

```
humberto@T6-2016630495:~$ mysql -u hugo -p
Enter password:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 23
Server version: 8.0.33-0ubuntu0.20.04.1 (Ubuntu)

Copyright (c) 2000, 2023, Oracle and/or its affiliates.

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> create database servicio_web;
Query OK, 1 row affected (0.05 sec)
```

Ahora, seleccionaremos la base de datos a utilizar:

```
mysql> use servicio_web;
Database changed
```

Y después crearemos las tablas necesarias para la base de datos:

```
mysql> create table usuarios
    → (
    →     id_usuario integer auto_increment primary key,
    →     email varchar(100) not null,
    →     nombre varchar(100) not null,
    →     apellido_paterno varchar(100) not null,
    →     apellido_materno varchar(100),
    →     fecha_nacimiento datetime not null,
    →     telefono bigint,
    →     genero char(1)
    → );
Query OK, 0 rows affected (0.20 sec)

mysql> create table fotos_usuarios
    → (
    →     id_foto integer auto_increment primary key,
    →     foto longblob,
    →     id_usuario integer not null
    → );
Query OK, 0 rows affected (0.21 sec)

mysql> alter table fotos_usuarios add foreign key (id_usuario) references usuarios(id_usuario);
Query OK, 0 rows affected (0.51 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> create unique index usuarios_1 on usuarios(email);
Query OK, 0 rows affected (0.53 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> quit
Bye
humberto@T6-2016630495:~$
```

## Compilar, empacar y desplegar el servicio web (versión JSON)

Lo primero será descargar en nuestro local el archivo Servicio.zip, lo copiaremos a la máquina virtual y posteriormente lo descomprimiremos en la carpeta de la máquina virtual:

```
humbertoody@T6-2016630495:~$ ls
Servicio.zip          jaxrs-ri-2.24.zip
apache-tomcat-8.5.88  mysql-connector-j-8.0.33
apache-tomcat-8.5.88.zip mysql-connector-j-8.0.33.zip
jaxrs-ri
humbertoody@T6-2016630495:~$ unzip Servicio.zip
Archive: Servicio.zip
  creating: META-INF/
  inflating: META-INF/context.xml
  creating: WEB-INF/
  creating: WEB-INF/classes/
  creating: WEB-INF/classes/servicio_json/
  creating: WEB-INF/classes/servicio_url/
  inflating: WEB-INF/web.xml
  creating: servicio_url/
  inflating: servicio_url/Error.java
  inflating: servicio_url/AdaptadorGsonBase64.java
  inflating: servicio_url/Servicio.java
  inflating: servicio_url/Usuario.java
  creating: servicio_json/
  inflating: servicio_json/Error.java
  inflating: servicio_json/ParamConsultaUsuario.java
  inflating: servicio_json/ParamBorraUsuario.java
  inflating: servicio_json/AdaptadorGsonBase64.java
  inflating: servicio_json/ParamAltaUsuario.java
  inflating: servicio_json/Servicio.java
  inflating: servicio_json/Usuario.java
  inflating: servicio_json/ParamModificaUsuario.java
  inflating: compila_json.sh
  inflating: compila_url.sh
humbertoody@T6-2016630495:~$ > scp -i ../../azure/humbertwoody-azure.pem Servicio.zip 20.85.228.113
:/home/humbertwoody
Servicio.zip          100%   11KB 156.2KB/s  00:00
~/Proyectos/IPN/sistemas-distribuidos-escom/tareas/tarea-6 main*
>
```

Ahora lo que haremos es compilar el archivo Servicio.java usando el comando proporcionado por el profesor:

```
humbertoody@T6-2016630495:~$ ls
META-INF          jaxrs-ri
Servicio.zip      jaxrs-ri-2.24.zip
WEB-INF           mysql-connector-j-8.0.33
apache-tomcat-8.5.88  mysql-connector-j-8.0.33.zip
apache-tomcat-8.5.88.zip servicio_json
compila_json.sh    servicio_url
compila_url.sh
humbertoody@T6-2016630495:~$ javac -cp $CATALINA_HOME/lib/javax.ws.rs-api-2.0.1.jar:$CATALINA_HOME/lib/gson-2.3.1.jar:. servicio_json/Servicio
.java
humbertoody@T6-2016630495:~$
```

Ahora editaremos el archivo context.xml y colocaremos los datos del usuario hugo que creamos anteriormente:

```
humbertoody@T6-2016630495:~$ vim META-INF/context.xml
humbertoody@T6-2016630495:~$ cat META-INF/context.xml
<Context>
  <Resource name="jdbc/datasource_Servicio" auth="Container" type="javax.sql.DataSource"
            maxActive="100" maxIdle="30" maxWait="10000"
            username="hugo" password="1234567"
            driverClassName="com.mysql.cj.jdbc.Driver"
            url="jdbc:mysql://localhost/servicio_web?serverTimezone=UTC" />
</Context>
humbertoody@T6-2016630495:~$
```

Ahora ejecutaremos los comandos proporcionados por el profesor para generar el archivo .war final de nuestro servicio web:

```
humbertoody@T6-2016630495:~$ rm WEB-INF/classes/servicio_json/*
rm: cannot remove 'WEB-INF/classes/servicio_json/*': No such file or directory
humbertoody@T6-2016630495:~$ rm WEB-INF/classes/servicio_url/*
rm: cannot remove 'WEB-INF/classes/servicio_url/*': No such file or directory
humbertoody@T6-2016630495:~$
humbertoody@T6-2016630495:~$ cp servicio_json/*.class WEB-INF/classes/servicio_json/.
humbertoody@T6-2016630495:~$ jar cvf Servicio.war WEB-INF META-INF
added manifest
adding: WEB-INF/(in = 0) (out= 0)(stored 0%)
adding: WEB-INF/web.xml(in = 656) (out= 294)(deflated 55%)
adding: WEB-INF/classes/(in = 0) (out= 0)(stored 0%)
adding: WEB-INF/classes/servicio_url/(in = 0) (out= 0)(stored 0%)
adding: WEB-INF/classes/servicio_json/(in = 0) (out= 0)(stored 0%)
adding: WEB-INF/classes/servicio_json/Usuario.class(in = 435) (out= 295)(deflated 32%)
adding: WEB-INF/classes/servicio_json/AdaptadorGsonBase64.class(in = 1805) (out= 741)(deflated 58%)
adding: WEB-INF/classes/servicio_json/ParamBorraUsuario.class(in = 259) (out= 205)(deflated 20%)
adding: WEB-INF/classes/servicio_json/ParamConsultaUsuario.class(in = 265) (out= 209)(deflated 21%)
adding: WEB-INF/classes/servicio_json/ParamAltaUsuario.class(in = 264) (out= 198)(deflated 25%)
adding: WEB-INF/classes/servicio_json/Servicio.class(in = 8552) (out= 3930)(deflated 54%)
adding: WEB-INF/classes/servicio_json/ParamModificaUsuario.class(in = 272) (out= 204)(deflated 25%)
adding: WEB-INF/classes/servicio_json/Error.class(in = 284) (out= 220)(deflated 22%)
ignoring entry META-INF/
adding: META-INF/context.xml(in = 303) (out= 217)(deflated 28%)
humbertoody@T6-2016630495:~$ cp Servicio.war $CATALINA_HOME/webapps/.
humbertoody@T6-2016630495:~$
```

## Publicar cliente en Tomcat

Para publicar el cliente en Tomcat, primero copiaremos los archivos requeridos a nuestra máquina virtual:

```
humbertoody@T6-2016630495:~$ ls
META-INF           jaxrs-ri
Servicio.war       jaxrs-ri-2.24.zip
Servicio.zip       mysql-connector-j-8.0.33
WEB-INF            mysql-connector-j-8.0.33.zip
WSClient.js        prueba_json.html
apache-tomcat-8.5.88   prueba_url.html
apache-tomcat-8.5.88.zip servicio_json
compila_json.sh    servicio_url
compila_url.sh    usuario_sin_foto.png
humbertoody@T6-2016630495:~$
```

```
> mv ~/Downloads/usuario_sin_foto.png .
> mv ~/Downloads/WSClient.js .
> mv ~/Downloads/prueba_json.html .
> mv ~/Downloads/prueba_url.html .
> ls
apache-tomcat-8.5.88.zip      prueba_json.html  usuario_sin_foto.png
gson-2.3.1.jar                 prueba_url.html  WSClient.js
jaxrs-ri-2.24.zip              README.md
mysql-connector-j-8.0.33.zip   Servicio.zip
> scp -i ../../azure/humbertoody-azure.pem usuario_sin_foto.png 20.85.228.113:/home/humbertoody
usuario_sin_foto.png           100% 1662    26.9KB/s  00:00
> scp -i ../../azure/humbertoody-azure.pem WSClient.js 20.85.228.113:/home/humbertoody
WSClient.js                     100% 3632    53.5KB/s  00:00
> scp -i ../../azure/humbertoody-azure.pem prueba_json.html 20.85.228.113:/home/humbertoody
prueba_json.html               100% 10KB 149.9KB/s  00:00
> scp -i ../../azure/humbertoody-azure.pem prueba_url.html 20.85.228.113:/home/humbertoody
prueba_url.html                100% 10KB 160.9KB/s  00:00
~/Proyectos/IPN/sistemas-distribuidos-escom/tareas/tarea-6 main*
```

Ahora copiaremos los archivos descargados en la ruta de Tomcat necesaria para que se encuentren los archivos:

```
humberto@T6-2016630495:~$ ls
META-INF          jaxrs-ri
Servicio.war      jaxrs-ri-2.24.zip
Servicio.zip      mysql-connector-j-8.0.33
WEB-INF          mysql-connector-j-8.0.33.zip
WSClient.js       prueba_json.html
apache-tomcat-8.5.88  prueba_url.html
apache-tomcat-8.5.88.zip servicio_json
compila_json.sh   servicio_url
compila_url.sh    usuario_sin_foto.png
humberto@T6-2016630495:~$ mv usuario_sin_foto.png apache-tomcat-8.5.88/webapps/ROOT/
humberto@T6-2016630495:~$ mv WSClient.js apache-tomcat-8.5.88/webapps/ROOT/
humberto@T6-2016630495:~$ mv prueba_json.html apache-tomcat-8.5.88/webapps/ROOT/
humberto@T6-2016630495:~$ mv prueba_url.html apache-tomcat-8.5.88/webapps/ROOT/
humberto@T6-2016630495:~$ ls apache-tomcat-8.5.88/webapps/ROOT/
WSClient.js  prueba_json.html  prueba_url.html  usuario_sin_foto.png
humberto@T6-2016630495:~$
```

## Probar el servicio web utilizando el cliente HTML-Javascript

La IP asignada a la máquina virtual es: 20.85.228.113. Con esto, seguiremos los pasos descriptos por el profesor para probar que el servicio está funcionando, para esto primero iniciaremos el servidor de Tomcat:

```
humberto@T6-2016630495:~$ sh $CATALINA_HOME/bin/catalina.sh start
Using CATALINA_BASE:  /home/humberto@T6-2016630495
Using CATALINA_HOME:  /home/humberto@T6-2016630495
Using CATALINA_TMPDIR: /home/humberto@T6-2016630495/temp
Using JRE_HOME:        /usr/lib/jvm/java-8-openjdk-amd64
Using CLASSPATH:       /home/humberto@T6-2016630495
Using CATALINA_OPTS:
Tomcat started.
humberto@T6-2016630495:~$ █
```

La página que se muestra es la siguiente:



Ahora crearemos un usuario haciendo click en: "Alta usuario" y llenaremos los datos requeridos:

Not Secure | 20.85.228.113:8080/prueba\_json.html

Alta de usuario

Email \*  
juan@perez.com

Nombre \*  
Juan

Apellido paterno \*  
Pérez

Apellido materno  
López

Fecha de nacimiento \*  
10/01/1999 00:00

Teléfono  
5519635656

Género  
Masculino

Choose Files MrFantastic.jpeg

Agregar usuario  
Limpiar pantalla  
Regresar

No file chosen

La confirmación del servicio web:

Not Secure | 20.85.228.113:8080/prueba\_json.html

20.85.228.113:8080 says  
OK

Juan

Apellido paterno \*  
Pérez

Apellido materno  
López

Fecha de nacimiento \*  
10/01/1999 00:00

Teléfono  
5519635656

Género  
Masculino

Choose Files MrFantastic.jpeg

Agregar usuario  
Limpiar pantalla  
Regresar

Ahora trataremos de crear un usuario con los mismos datos y mostrará el siguiente error:

Not Secure | 20.85.228.113:8080/prueba\_json.html

20.85.228.113:8080 says  
{"message":"Duplicate entry 'juan@perez.com' for key 'usuarios.usuarios\_1'"}  
OK

Apellido paterno \*  
Pérez

Apellido materno  
López

Fecha de nacimiento \*  
10/01/1999 00:00

Teléfono  
5519635656

Género  
Masculino

Choose Files MrFantastic.jpeg

Agregar usuario  
Limpiar pantalla  
Regresar

Ahora consultaremos si el usuario existe con el correo proporcionado:

Consulta usuario

Email \*

juan@perez.com

Buscar usuario

Regresar

Los datos mostrados:

Modifica usuario

Email \*

juan@perez.com

Nombre \*

Juan

Apellido paterno \*

Pérez

Apellido materno

López

Fecha de nacimiento \*

10/01/1999 00:00

Teléfono

5519635656

Género

Masculino



Choose Files No file chosen

Quitar foto

Guardar cambios

Regresar

Cambiaremos el nombre y guardaremos los cambios:

20.85.228.113:8080 says

OK

Juan de O'Donojú

Apellido paterno \*

Pérez

Apellido materno

López

Fecha de nacimiento \*

10/01/1999 00:00

Teléfono

5519635656

Género

Masculino



Choose Files No file chosen

Quitar foto

Guardar cambios

Regresar

Ahora verificaremos que los datos se actualizaron correctamente:

Not Secure | 20.85.228.113:8080/prueba\_json.html

Modifica usuario

Email \*  
juan@perez.com

Nombre \*  
Juan de O'Donojú

Apellido paterno \*  
Pérez

Apellido materno  
López

Fecha de nacimiento \*  
10/01/1999 00:00

Teléfono  
5519635656

Género  
Masculino

Choose Files No file chosen  
Quitar foto

Guardar cambios

Regresar

Ahora eliminaremos al usuario en cuestión:

Not Secure | 20.85.228.113:8080/prueba\_json.html

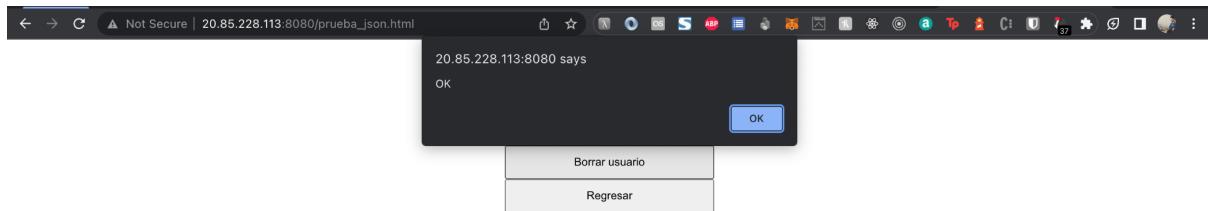
Borra usuario

Email \*  
juan@perez.com

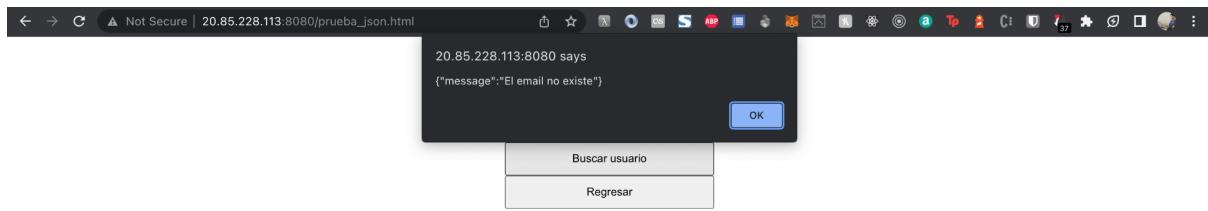
Borrar usuario

Regresar

La confirmación que se muestra:



Ahora trataremos de consultar el usuario y nos mostrará el siguiente error:

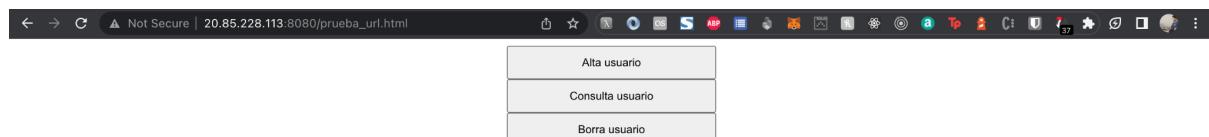


## Compilar, empacar y desplegar el servicio web (versión URL)

Para esta sección, primero realizaremos la compilación del servicio, lo copiaremos al directorio de tomcat correspondiente y reiniciaremos Tomcat para que pueda cargar bien la nueva versión:

```
humberto@T6-2016630495:~$ rm -rf $CATALINA_HOME/webapps/Servicio.war $CATALINA_HOME/webapps/Servicio
humberto@T6-2016630495:~$ javac -cp $CATALINA_HOME/lib/javax.ws.rs-api-2.0.1.jar:$CATALINA_HOME/lib/gson-2.3.1.jar:. servicio_url/Servicio.java
humberto@T6-2016630495:~$ rm WEB-INF/classes/servicio_url/*
humberto@T6-2016630495:~$ rm WEB-INF/classes/servicio_json/*
rm: cannot remove 'WEB-INF/classes/servicio_json/*': No such file or directory
humberto@T6-2016630495:~$ cp servicio_url/*.class WEB-INF/classes/servicio_url/
humberto@T6-2016630495:~$ jar cvf Servicio.war WEB-INF META-INF
added manifest
adding: WEB-INF/(in = 0) (out= 0)(stored 0%)
adding: WEB-INF/web.xml(in = 656) (out= 294)(deflated 55%)
adding: WEB-INF/classes/(in = 0) (out= 0)(stored 0%)
adding: WEB-INF/classes/servicio_url/(in = 0) (out= 0)(stored 0%)
adding: WEB-INF/classes/servicio_url/Usuario.class(in = 1070) (out= 604)(deflated 43%)
adding: WEB-INF/classes/servicio_url/AdaptadorGsonBase64.class(in = 1804) (out= 741)(deflated 58%)
adding: WEB-INF/classes/servicio_url/Servicio.class(in = 8182) (out= 3803)(deflated 53%)
adding: WEB-INF/classes/servicio_url/Error.class(in = 283) (out= 219)(deflated 22%)
adding: WEB-INF/classes/servicio_json/(in = 0) (out= 0)(stored 0%)
ignoring entry META-INF/
adding: META-INF/context.xml(in = 303) (out= 217)(deflated 28%)
humberto@T6-2016630495:~$ cp Servicio.war $CATALINA_HOME/webapps/
humberto@T6-2016630495:~$ sh $CATALINA_HOME/bin/catalina.sh stop
Using CATALINA_BASE: /home/humbertowoodly/apache-tomcat-8.5.88
Using CATALINA_HOME: /home/humbertowoodly/apache-tomcat-8.5.88
Using CATALINA_TMPDIR: /home/humbertowoodly/apache-tomcat-8.5.88/temp
Using JRE_HOME: /usr/lib/jvm/java-8-openjdk-amd64
Using CLASSPATH: /home/humbertowoodly/apache-tomcat-8.5.88/bin/bootstrap.jar:/home/humbertowoodly/apache-tomcat-8.5.88/bin/tomcat-juli.jar
Using CATALINA_OPTS:
humberto@T6-2016630495:~$ sh $CATALINA_HOME/bin/catalina.sh start
Using CATALINA_BASE: /home/humbertowoodly/apache-tomcat-8.5.88
Using CATALINA_HOME: /home/humbertowoodly/apache-tomcat-8.5.88
Using CATALINA_TMPDIR: /home/humbertowoodly/apache-tomcat-8.5.88/temp
Using JRE_HOME: /usr/lib/jvm/java-8-openjdk-amd64
Using CLASSPATH: /home/humbertowoodly/apache-tomcat-8.5.88/bin/bootstrap.jar:/home/humbertowoodly/apache-tomcat-8.5.88/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
humberto@T6-2016630495:~$
```

Ahora, procederemos a realizar las pruebas que realizamos previamente pero ahora con este servicio que codifica los parámetros en la URL (no en formato JSON). La página que se visualiza es



Ahora crearemos un usuario, estos son los datos proporcionados:

Not Secure | 20.85.228.113:8080/prueba\_url.html

Alta de usuario

Email \*  
humberto.woody@gmail.com

Nombre \*  
Humberto

Apellido paterno \*  
Ortega

Apellido materno  
Alcocer

Fecha de nacimiento \*  
12/03/1997 00:00

Teléfono  
5519635641

Genero  
Masculino

  
Choose Files 20181003\_171443.jpg

Agregar usuario

Limpiar pantalla

Regresar

La confirmación:

Not Secure | 20.85.228.113:8080/prueba\_url.html

20.85.228.113:8080 says  
OK

Humberto

Apellido paterno \*  
Ortega

Apellido materno  
Alcocer

Fecha de nacimiento \*  
12/03/1997 00:00

Teléfono  
5519635641

Genero  
Masculino

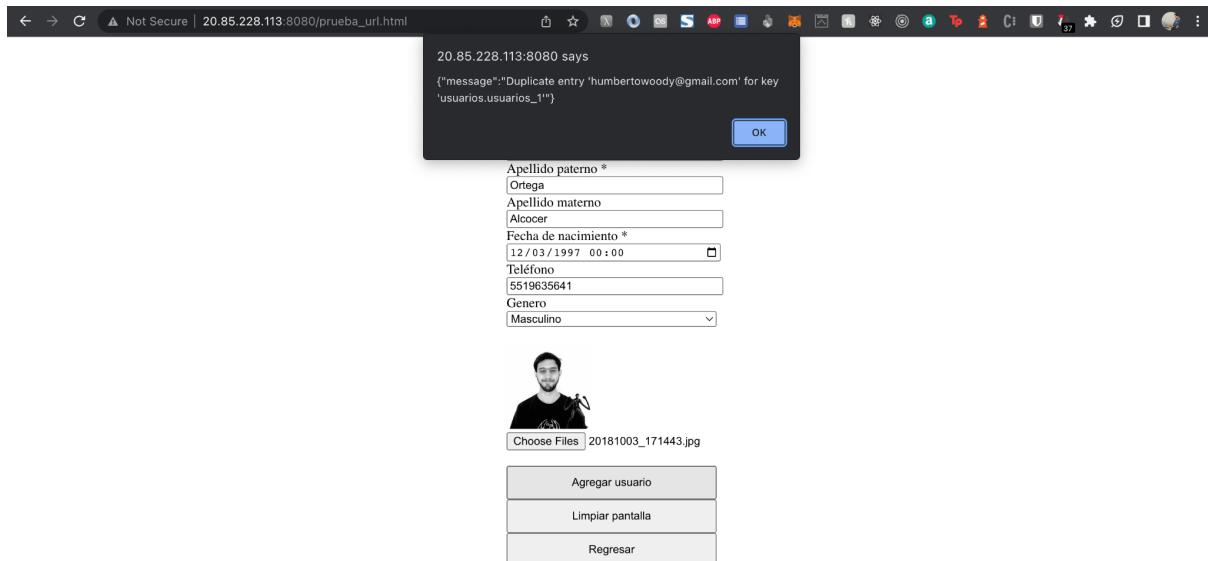
  
Choose Files 20181003\_171443.jpg

Agregar usuario

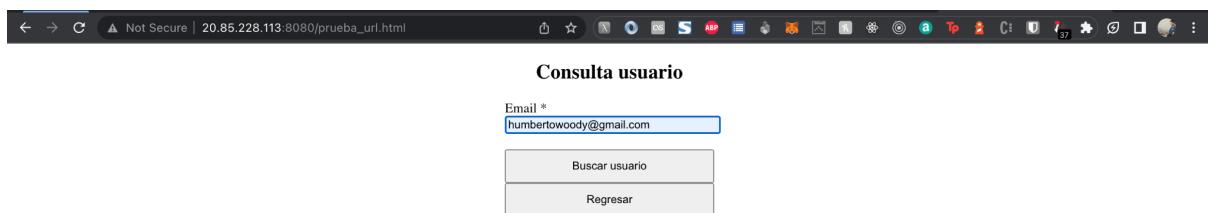
Limpiar pantalla

Regresar

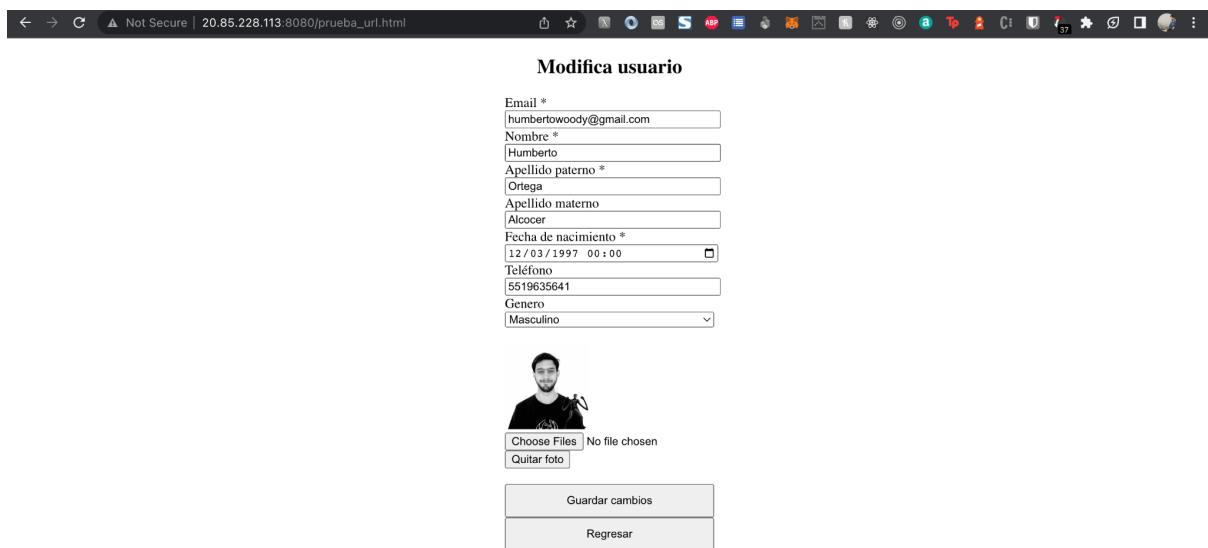
Si intento agregar un usuario con el mismo email:



Ahora consultaremos el usuario recién creado:



La información mostrada:



Modificaremos el nombre del usuario y guardaremos los cambios:

Not Secure | 20.85.228.113:8080/prueba\_url.html

Modifica usuario

Email \*  
humbertowood@gmail.com

Nombre \*  
Humbertortilla

Apellido paterno \*  
Ortega

Apellido materno  
Alcocer

Fecha de nacimiento \*  
12/03/1997 00:00

Teléfono  
5519635641

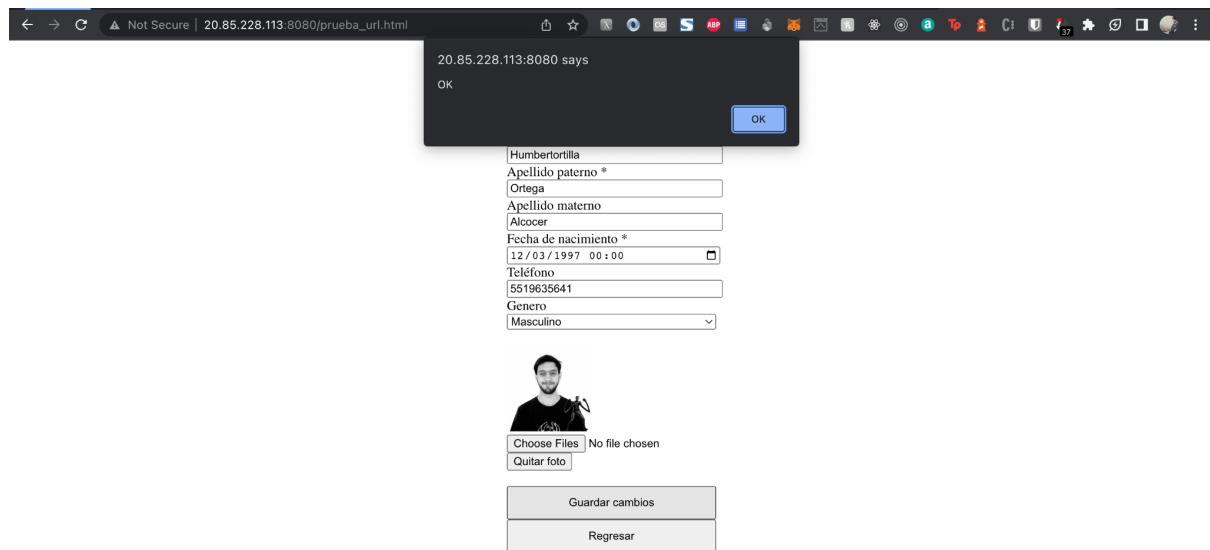
Género  
Masculino

  
Choose Files | No file chosen  
Quitar foto

Guardar cambios

Regresar

El mensaje de confirmación de los cambios será el siguiente:



Ahora consultaremos el usuario para ver si los cambios surtieron efecto:

Not Secure | 20.85.228.113:8080/prueba\_url.html

Modifica usuario

Email \*  
humbertowood@gmail.com

Nombre \*  
Humbertortilla

Apellido paterno \*  
Ortega

Apellido materno  
Alcocer

Fecha de nacimiento \*  
12/03/1997 00:00

Teléfono  
5519635641

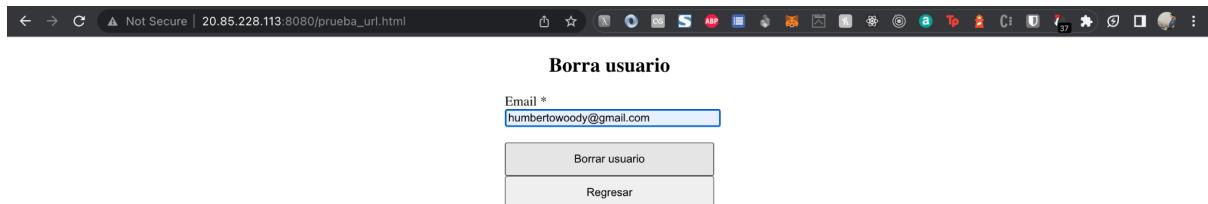
Género  
Masculino

  
Choose Files | No file chosen  
Quitar foto

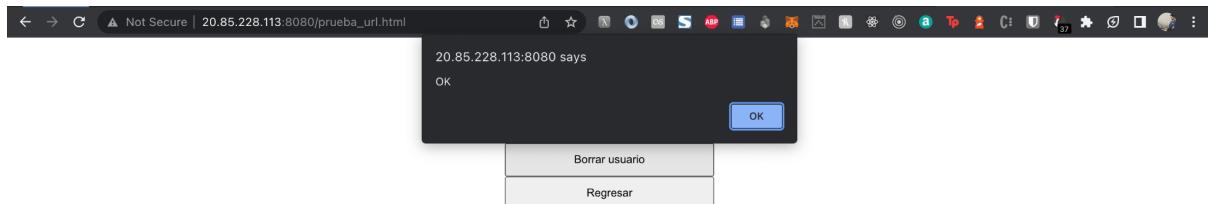
Guardar cambios

Regresar

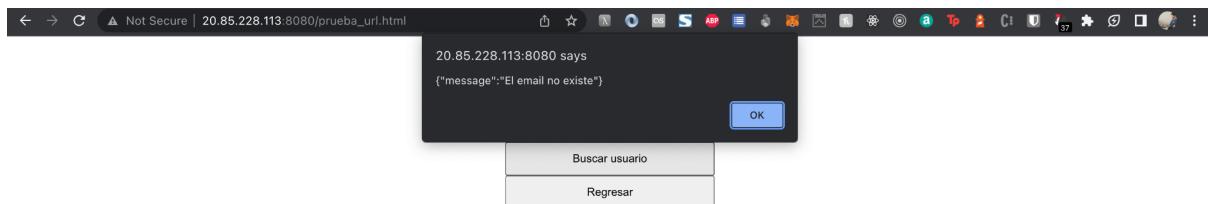
Ahora borraremos el usuario creado:



La confirmación de eliminación:



Finalmente, trataremos de consultar el usuario borrado:



## Crear imagen de la máquina virtual

Para poder crear la imagen de la máquina virtual, primero debemos usar el comando para deprovisionar el usuario de la máquina virtual:

```
Last login: Tue May  9 00:41:21 2023 from 148.204.56.241
humberto@T6-2016630495:~$ sudo waagent -deprovision
/usr/sbin/waagent:27: DeprecationWarning: the imp module is deprecated in favour of importlib; see the module's documentation for alternative us
es
import imp
WARNING! The waagent service will be stopped.
WARNING! Cached DHCP leases will be deleted.
WARNING! root password will be disabled. You will not be able to login as root.
WARNING! /etc/resolv.conf will NOT be removed, this is a behavior change to earlier versions of Ubuntu.
Do you want to proceed (y/n)
humberto@T6-2016630495:~$
```

Ahora usaremos el botón de *Capture* para iniciar la captura de la imagen de la máquina virtual:

The screenshot shows the Microsoft Azure portal interface. The main title bar says "portal.azure.com/#corre...". Below it, the "Microsoft Azure" logo and a search bar with "Search resources, services, and docs (G+)" are visible. On the right, there's a user profile with the email "hortegaa1500@alumno..." and "INSTITUTO POLITÉCNICO NACIONAL". The main content area shows a virtual machine named "T6-2016630495" under the "Virtual machine" category. The "Capture" button is highlighted in blue. The left sidebar has sections like "Overview", "Activity log", "Access control (IAM)", "Tags", "Diagnose and solve problems", "Settings", "Networking", "Connect", "Disks", "Size", "Microsoft Defender for Cloud", "Advisor recommendations", "Extensions + applications", "Availability + scaling", "Configuration", "Identity", "Properties", "Locks", "Operations", and "Bastion". The "Properties" tab is selected. The "Essentials" section displays details such as Resource group (SistemasDistribuidosResourceGroup), Status (Running), Location (East US), Subscription (Azure for Students), Subscription ID (a5d9d675-3ae1-4e2b-95b5-02150d67b8d2), Tags (Click here to add tags), Operating system (Linux (ubuntu 20.04)), Size (Standard B2s (2 vcpus, 4 GiB memory)), Public IP address (20.85.228.113), Virtual network/subnet (T6-2016630495-vnet/default), DNS name (Not configured), and Health state (-). The "Networking" section shows Public IP address (20.85.228.113), Private IP address (10.0.0.4), Virtual network/subnet (T6-2016630495-vnet/default), and DNS name (Configure). The "Size" section shows Size (Standard B2s), vCPUs (2), and RAM (4 GiB).

Ahora seleccionaremos las opciones para que elimine la máquina virtual en cuanto termina el proceso de generación de la imagen:

The screenshot shows the "Create an image" wizard in the Microsoft Azure portal. The title bar says "portal.azure.com/#view/Microsoft\_Azure\_DiskMgmt/Capture...". The main content area is titled "Create an image" with a subtitle "...". It says "Create an image from this virtual machine that can be used to deploy additional virtual machines and virtual machine scale sets. To create a managed image, you must first generalize this virtual machine. [Learn more](#)".  
**Project details**  
Subscription: Azure for Students  
Resource group: SistemasDistribuidosResourceGroup  
**Instance details**  
Region: (US) East US  
Share image to Azure compute gallery:  Yes, share it to a gallery as a VM image version.  
 No, capture only a managed image.  
Automatically delete this virtual machine after creating the image:   
Zone resiliency:   
**Notes**  
Before creating an image, use "waagent -deprovision+user" to prepare the Linux guest OS on the virtual machine. If you create an image from a virtual machine that hasn't been generalized, any virtual machines created from that image won't start. [Learn more](#)  
**Name**: T6-2016630495-image-20230508195913  
**Buttons**: Review + create, < Previous, Next : Tags >, Give feedback.

El resumen de la creación de la imagen es el siguiente:

Validation passed

Basics Tags Review + create

**Basics**

Subscription	Azure for Students
Resource group	SistemasDistribuidosResourceGroup
Region	East US
Share image to Azure compute gallery	No
Automatically delete this virtual machine after creating the image	Yes
Name	T6-2016630495-image-20230508195913
Zone resiliency	Off

Create < Previous Next > Download a template for automation Give feedback

Después de que se termina generar la imagen de la máquina virtual esta es la pantalla con el resumen de las operaciones:

Microsoft.Compute-CaptureVM-20230508195913 | Overview

Your deployment is complete

Deployment name: Microsoft.Compute-CaptureVM-20230508195...  
Subscription: Azure for Students  
Resource group: SistemasDistribuidosResourceGroup

Start time: 5/8/2023, 8:02:40 PM  
Correlation ID: 831db7d8-4b19-4449-be84-bd34ea4426b

Deployment succeeded

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Find an Azure expert >

Go to resource Go to resource group

Finalmente, la imagen disponible en nuestro grupo de recursos se visualiza así:

The screenshot shows the Microsoft Azure portal interface. The URL in the address bar is `portal.azure.com/#@correo.ipn.mx/resource/subscriptions/a5.../resourceGroups/SistemasDistribuidosResourceGroup/providers/Microsoft.Compute/images/T6-2016630495-image-20230508195913`. The title bar says "T6-2016630495-image-20230508195913".

**Overview** (selected)

**Essentials**

Resource group ( <a href="#">move</a> )	: SistemasDistribuidosResourceGroup	Operating system	: Linux
Location ( <a href="#">move</a> )	: East US	Source virtual machine	: T6-2016630495
Subscription ( <a href="#">move</a> )	: Azure for Students	VM generation	: V2
Subscription ID	: a5d9d675-3ae1-4e2b-95b5-02150d67b8d2	Zone resiliency	: Disabled
Provisioning state	: Succeeded		
Tags ( <a href="#">edit</a> )	: Click here to add tags		

**OS disk**

LUN	Source blob URI	Storage type	Caching
Linux	-	Standard HDD LRS	Read/write

**Data disks**

LUN	Source blob URI	Storage type	Caching
No data disk attached			

## Conclusión

Realizar esta tarea fue muy divertido porque se trató de conectarse a la máquina virtual, configurar servicios y programas, establecer procedimientos para compilar y ejecutar. Me gustó mucho porque solo fue cuestión de seguir los pasos tal cual los colocó el profesor y por lo tanto se reducen las posibilidades para que algo salga mal.

Me gustó en particular poder hacer el proceso desde crear la máquina virtual hasta tener un servicio web funcional público en internet. Me parece que será de mucha utilidad para varias cosas a realizar en mi vida profesional.

– Humberto Alejandro Ortega Alcocer.