

TAREA 2

Implementación de una
arquitectura de tres capas en
la nube

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Introducción

La implementación de una arquitectura de tres capas en la nube es un enfoque que permite desarrollar aplicaciones robustas y escalables, dividiendo las responsabilidades en capas independientes que interactúan entre sí. En esta tarea, se construirá una aplicación SPA (Single Page Application) como la capa de presentación, la cual interactúa con un servicio web REST alojado en un servidor Tomcat, constituyendo la capa de lógica de negocios. Finalmente, se emplea MySQL como el sistema de gestión de bases de datos (DBMS) para la capa de almacenamiento de datos. Esta separación de responsabilidades facilita el mantenimiento, escalabilidad y seguridad del sistema, al tiempo que permite una mejor distribución de cargas de trabajo y la integración de tecnologías específicas en cada capa. La instalación de Tomcat será la primera fase del proceso, proporcionando el entorno adecuado para ejecutar servicios web REST. Para ello, se utilizará JAX-RS, una biblioteca que permite exponer servicios web de estilo REST sobre el servidor Tomcat, junto con la integración de Jersey, que es una implementación popular de esta especificación. Además, se asegurará la compatibilidad de las bibliotecas necesarias y se integrará el soporte para JSON mediante la biblioteca Gson, permitiendo la comunicación eficiente entre el cliente SPA y el servicio REST. Una vez configurado el entorno de servidor y los servicios web, MySQL servirá como el motor de base de datos que gestionará la información de la aplicación, asegurando una capa de persistencia eficiente y estructurada. Los usuarios y permisos serán configurados de manera que solo los usuarios autorizados puedan acceder y modificar los datos. Además, se construirán y probarán tablas relacionales, como la de usuarios y sus fotos, lo que refuerza la integridad de los datos y la estructura de la base de datos. Finalmente, la configuración automática de Tomcat garantizará que el servidor web esté siempre en línea al iniciar la máquina virtual, asegurando la disponibilidad constante de los servicios. Este enfoque modular y distribuido es esencial para aprovechar las ventajas de la nube y las tecnologías web modernas, optimizando tanto el rendimiento como la seguridad en la aplicación.

Desarrollo

En esta tarea se va a implementar una arquitectura de tres capas en la nube, consistente en una aplicación SPA (Single Page Application), un servicio web REST para Tomcat y el DBMS MySQL.

Primeramente se instalará Tomcat y la biblioteca para el soporte de servicios web REST (JAX-RS).

Instalación de Tomcat con soporte REST

1. Crear una máquina virtual con Ubuntu con al menos 1GB de memoria RAM. Abrir los puertos 80 y 8080 para el protocolo TCP.

El nombre de la máquina virtual deberá iniciar con "T2-" y el número de boleta del alumno o alumna, si el número de boleta es 12345678, entonces la máquina virtual deberá llamarse: T2-12345678.

The screenshot shows the 'Create a VM' wizard in the Microsoft Azure portal. The 'Basic' step is completed with the following settings:

Setting	Value
Suscripción	Azure for Students
Grupo de recursos	(nuevo) T2-2022630463_group
Nombre de máquina virtual	T2-2022630463
Región	West US
Opciones de disponibilidad	No se requiere redundancia de la infraestructura
Opciones de zona	Zona autoseleccionada
Tipo de seguridad	Estándar
Imagen	Ubuntu Minimal 22.04 LTS - Gen2
Arquitectura de VM	x64
Tamaño	Standard B1s (1 vcpu, 1 GiB de memoria)
Habilitar hibernación	No
Tipo de autenticación	Contraseña
Nombre de usuario	T2-2022630463
Puertos de entrada públicos	SSH, HTTP, HTTPS
Azure de acceso puntual	No

Below the configuration, there are sections for 'Disks' and 'Networking'. At the bottom, there are 'Previous' and 'Next' buttons, and links for 'Download a template for automation' and 'Send feedback'.

Entrada inicial

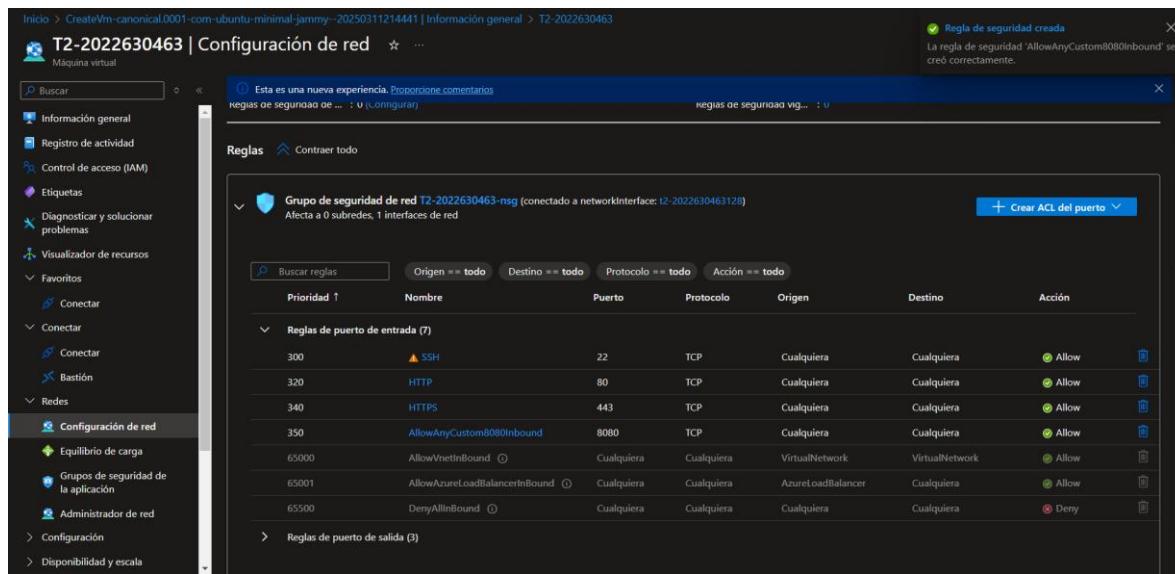
The screenshot shows the 'Information general' page for the VM 'T2-2022630463'. The left sidebar has a tree view with 'Información general' selected. The main area displays the VM's properties:

Propiedad	Valor
Grupo de recursos	T2-2022630463_group
Estado	En ejecución
Ubicación	West US
Suscripción	Azure for Students
Id. de suscripción	269a505c-76da-4067-8681-4f716970514b
Sistema operativo	Linux (ubuntu 22.04)
Tamaño	Standard B1s (1 vcpu, 1 GiB de memoria)
Dirección IP pública	13.91.86.51
Red virtual/subred	T2-2022630463-vnet/default
Nombre DNS	Sin configurar
Estado de mantenimiento	-
Hora de creación	12/3/2025, 3:49 UTC

Below the properties, there are tabs for 'Máquina virtual', 'Redes', and 'Redes' (repeated). The 'Redes' tab shows network interface details:

Red	Dirección IP pública	Dirección IP privada
T2-2022630463	13.91.86.51 (Interfaz de red T2-2022630463128)	-
T2-2022630463	-	10.0.0.4
T2-2022630463	-	-
T2-2022630463	T2-2022630463-vnet/default	-
Configurar	-	-

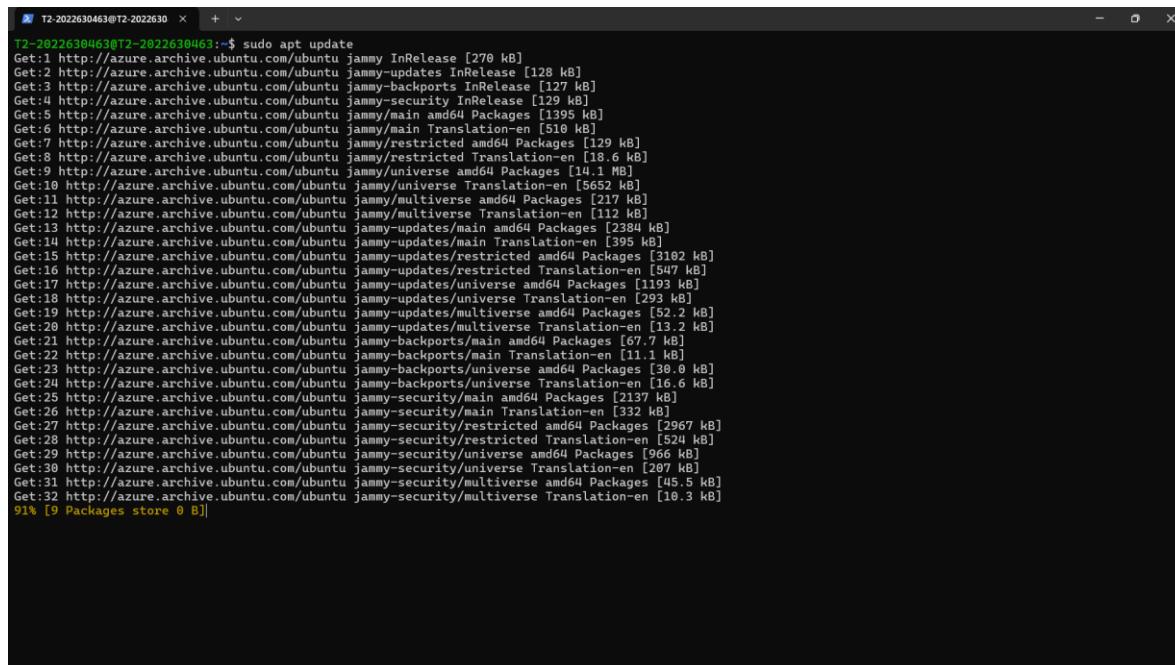
Abrir los puertos 80 y 8080



2. Instalar JDK8 ejecutando los siguientes comandos en la máquina virtual:

sudo apt update

sudo apt install openjdk-8-jdk-headless



```
T2-2022630463@T2-2022630463:~$ sudo apt update
Get:1 http://azure.archive.ubuntu.com/ubuntu jammy InRelease [270 kB]
Get:2 http://azure.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Get:5 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 Packages [1395 kB]
Get:6 http://azure.archive.ubuntu.com/ubuntu jammy/main Translation-en [510 kB]
Get:7 http://azure.archive.ubuntu.com/ubuntu jammy/restricted amd64 Packages [129 kB]
Get:8 http://azure.archive.ubuntu.com/ubuntu jammy/restricted Translation-en [18.6 kB]
Get:9 http://azure.archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [14.1 MB]
Get:10 http://azure.archive.ubuntu.com/ubuntu jammy/universe Translation-en [5652 kB]
Get:11 http://azure.archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [217 kB]
Get:12 http://azure.archive.ubuntu.com/ubuntu jammy/multiverse Translation-en [112 kB]
Get:13 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [2384 kB]
Get:14 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [395 kB]
Get:15 http://azure.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [3102 kB]
Get:16 http://azure.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [547 kB]
Get:17 http://azure.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1193 kB]
Get:18 http://azure.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [293 kB]
Get:19 http://azure.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [52.2 kB]
Get:20 http://azure.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [13.2 kB]
Get:21 http://azure.archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [67.7 kB]
Get:22 http://azure.archive.ubuntu.com/ubuntu jammy-backports/main Translation-en [11.1 kB]
Get:23 http://azure.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [38.6 kB]
Get:24 http://azure.archive.ubuntu.com/ubuntu jammy-backports/universe Translation-en [16.6 kB]
Get:25 http://azure.archive.ubuntu.com/ubuntu jammy-security/main amd64 Packages [2137 kB]
Get:26 http://azure.archive.ubuntu.com/ubuntu jammy-security/main Translation-en [332 kB]
Get:27 http://azure.archive.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [2967 kB]
Get:28 http://azure.archive.ubuntu.com/ubuntu jammy-security/restricted Translation-en [524 kB]
Get:29 http://azure.archive.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [966 kB]
Get:30 http://azure.archive.ubuntu.com/ubuntu jammy-security/universe Translation-en [207 kB]
Get:31 http://azure.archive.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [45.5 kB]
Get:32 http://azure.archive.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [10.3 kB]
91% [9 Packages store 0 B]
```

```
T2-2022630463@T2-2022630463:~$ sudo apt install openjdk-8-jdk-headless
Reading package lists... Done
Building dependency tree... Done
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 libnspr4 libnss3 libpcsc-lite1 libx11-data libxau6 libxcb1 libxdmcp6 libxext6 libxi6 libxrender1 libxtst6
  openjdk-8-jre-headless x11-common
Suggested packages:
  default-jre cups-common liblcms2-pcsd openjdk-8-demo openjdk-8-source libnss-mdns fonts-dejavu-extra fonts-nanum 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 libnspr4 libnss3 libpcsc-lite1 libx11-data libxau6 libxcb1 libxdmcp6 libxext6 libxi6 libxrender1 libxtst6
  openjdk-8-jdk-headless openjdk-8-jre-headless x11-common
0 upgraded, 27 newly installed, 0 to remove and 11 not upgraded.
Need to get 44.0 MB of archives.
After this operation, 158 MB of additional disk space will be used.
Do you want to continue? [Y/n] |
```

```
T2-2022630463@T2-2022630463:~ + ~
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jcmd to provide /usr/bin/jcmd (jcmd) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jdb to provide /usr/bin/jdb (jdb) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jdeps to provide /usr/bin/jdeps (jdeps) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jfr to provide /usr/bin/jfr (jfr) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jhat to provide /usr/bin/jhat (jhat) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jinfo to provide /usr/bin/jinfo (jinfo) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jmap to provide /usr/bin/jmap (jmap) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jps to provide /usr/bin/jps (jps) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jrungscript to provide /usr/bin/jrungscript (jrungscript) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jadepbugd to provide /usr/bin/jadepbugd (jadepbugd) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jstack to provide /usr/bin/jstack (jstack) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jstat to provide /usr/bin/jstat (jstat) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/jstated to provide /usr/bin/jstated (jstated) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/native2ascii to provide /usr/bin/native2ascii (native2ascii) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/rmic to provide /usr/bin/rmic (rmic) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/schemagen to provide /usr/bin/schemagen (schemagen) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/serialver to provide /usr/bin/serialver (serialver) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/wsimport to provide /usr/bin/wsimport (wsimport) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/bin/xjc to provide /usr/bin/xjc (xjc) in auto mode
Processing triggers for libc-bin (2.35-0ubuntu3.9) ...
Processing triggers for ca-certificates (20240203-22.04.1) ...
Updating certificates in /etc/ssl/certs...
0 added, 0 removed; done.
Running hooks in /etc/ca-certificates/update.d...
done.
done.
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line 78.)
debconf: falling back to frontend: Readline
Scanning processes...
Scanning linux images...
Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.
No VM guests are running outdated hypervisor (qemu) binaries on this host.
T2-2022630463@T2-2022630463:~ |
```

3. Descargar la distribución binaria de Tomcat 8 (p.e. apache-tomcat-8.5.99.zip en el directorio v8.5.99/bin) de la siguiente URL:

<https://archive.apache.org/dist/tomcat/tomcat-8/>

Name	Last modified	Size	Description
Parent Directory	-	-	-
v8.0.0-RC1/	2013-08-05 17:51	-	-
v8.0.0-RC10/	2013-12-26 23:48	-	-
v8.0.0-RC3/	2013-09-23 20:46	-	-
v8.0.0-RC5/	2013-10-20 14:12	-	-
v8.0.1/	2014-02-02 14:56	-	-
v8.0.11/	2014-08-22 09:15	-	-
v8.0.12/	2014-09-03 09:37	-	-
v8.0.14/	2014-09-29 11:24	-	-
v8.0.15/	2014-11-07 07:27	-	-
v8.0.17/	2015-01-15 13:39	-	-
v8.0.18/	2015-01-26 13:41	-	-
v8.0.20/	2015-02-20 08:52	-	-
v8.0.21/	2015-03-26 21:24	-	-
v8.0.22/	2015-05-05 07:53	-	-
v8.0.23/	2015-08-19 00:09	-	-
v8.0.24/	2015-08-19 00:09	-	-
v8.0.26/	2015-08-21 18:14	-	-
v8.0.27/	2015-10-01 10:17	-	-
v8.0.28/	2015-10-14 16:25	-	-
v8.0.30/	2015-11-24 11:13	-	-

Al ingresar a la carpeta v8.5.99 encontramos estas carpetas:

The screenshot shows a web browser window with the URL archive.apache.org/dist/tomcat/tomcat-8/v8.5.99/. The title bar says "Apache Archive Distribution Directory". The page content is as follows:

Apache Archive Distribution Directory

The directories and files linked below are a historical archive of software released by Apache Software Foundation projects.

THEY MAY BE UNSUPPORTED AND UNSAFE TO USE
Current releases can be found on our [download server](#).

Name	Last modified	Size	Description
Parent_Directory	-	-	
bin/	2024-02-19 16:15	-	
src/	2024-02-19 16:15	-	
KEYS	2024-02-14 23:00	44K	
RELEASE-NOTES	2024-02-14 23:00	7.0K	

Accedemos a la carpeta bin:

The screenshot shows a web browser window with the URL archive.apache.org/dist/tomcat/tomcat-8/v8.5.99/bin/. The title bar says "Apache Archive Distribution Directory". The page content is as follows:

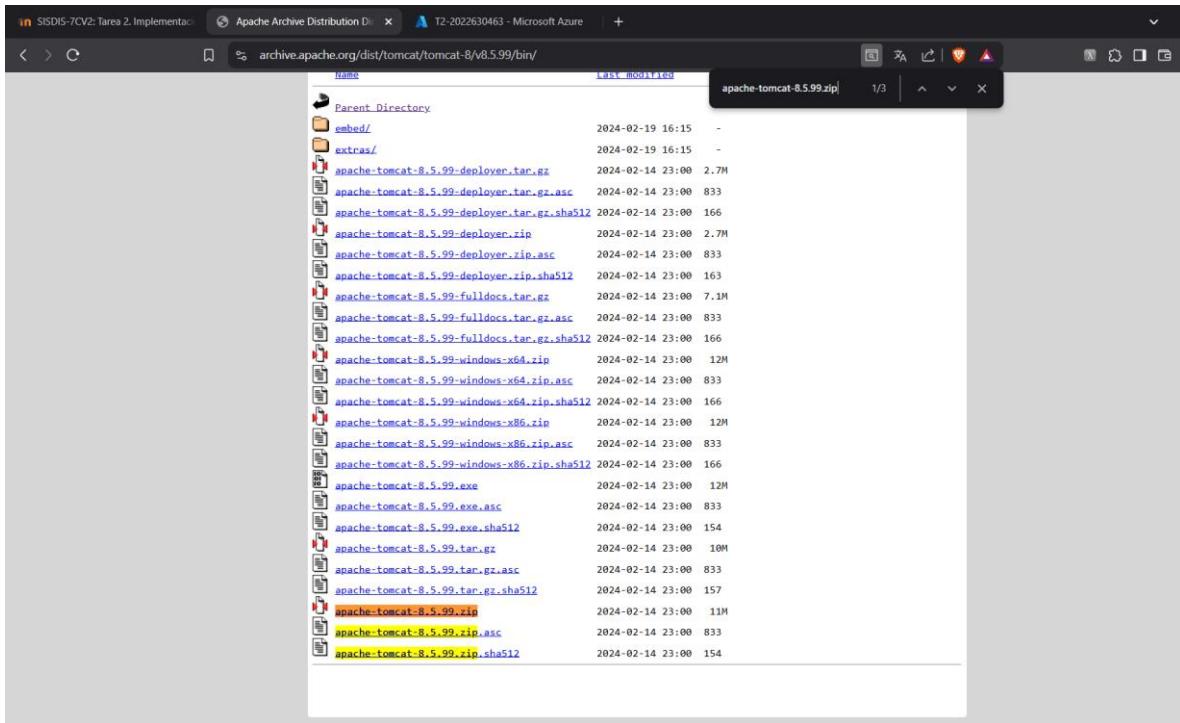
Apache Archive Distribution Directory

The directories and files linked below are a historical archive of software released by Apache Software Foundation projects.

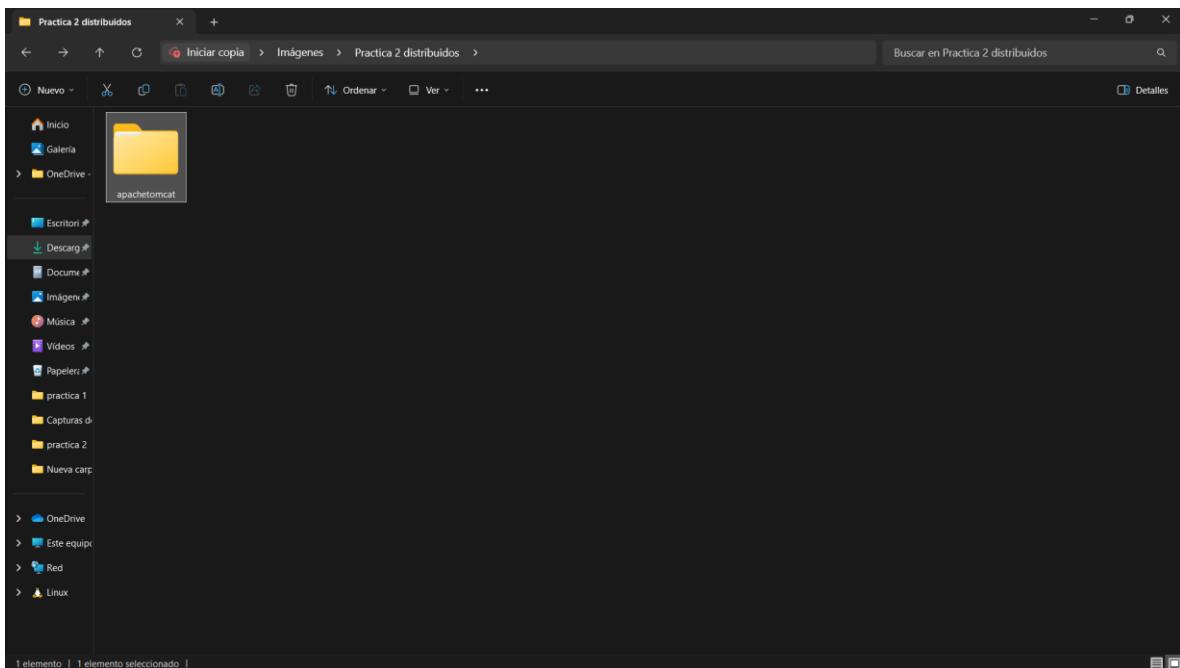
THEY MAY BE UNSUPPORTED AND UNSAFE TO USE
Current releases can be found on our [download server](#).

Name	Last_modified	Size	Description
Parent_Directory	-	-	
embedd/	2024-02-19 16:15	-	
extra/	2024-02-19 16:15	-	
apache-tomcat-8.5.99-deployer.tar.gz	2024-02-14 23:00	2.7M	
apache-tomcat-8.5.99-deployer.tar.gz.asc	2024-02-14 23:00	833	
apache-tomcat-8.5.99-deployer.tar.gz.sha512	2024-02-14 23:00	166	
apache-tomcat-8.5.99-deployer.zip	2024-02-14 23:00	2.7M	
apache-tomcat-8.5.99-deployer.zip.asc	2024-02-14 23:00	833	
apache-tomcat-8.5.99-deployer.zip.sha512	2024-02-14 23:00	163	
apache-tomcat-8.5.99-fulldocs.tar.gz	2024-02-14 23:00	7.1M	
apache-tomcat-8.5.99-fulldocs.tar.gz.asc	2024-02-14 23:00	833	
apache-tomcat-8.5.99-fulldocs.tar.gz.sha512	2024-02-14 23:00	166	
apache-tomcat-8.5.99-windows-x64.zip	2024-02-14 23:00	12M	
apache-tomcat-8.5.99-windows-x64.zip.asc	2024-02-14 23:00	833	
apache-tomcat-8.5.99-windows-x64.zip.sha512	2024-02-14 23:00	166	
apache-tomcat-8.5.99-windows-x86.zip	2024-02-14 23:00	12M	
apache-tomcat-8.5.99-windows-x86.zip.asc	2024-02-14 23:00	833	
apache-tomcat-8.5.99-windows-x86.zip.sha512	2024-02-14 23:00	166	
apache-tomcat-8.5.99.exe	2024-02-14 23:00	12M	
apache-tomcat-8.5.99.exe.asc	2024-02-14 23:00	833	
apache-tomcat-8.5.99.exe.sha512	2024-02-14 23:00	164	

Ya ingresando a la carpeta bin buscaremos un zip de nombre: apache-tomcat-8.5.99.zip y lo descargamos

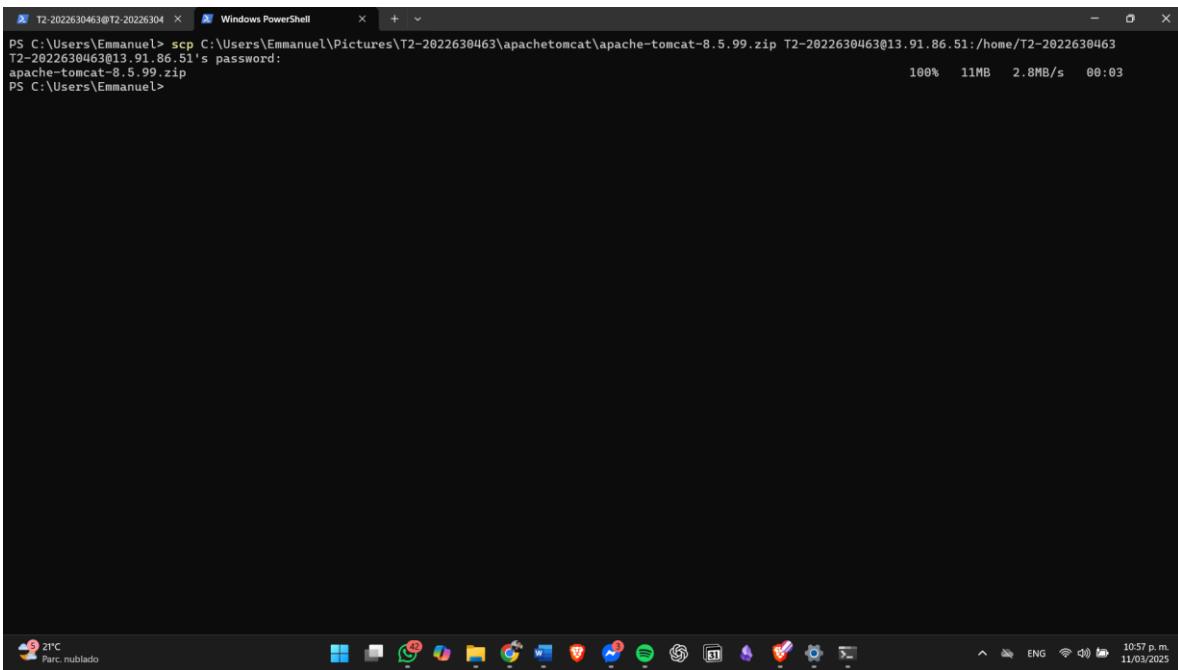


Lo ubicaré en una carpeta específica en mi máquina host (Windows)



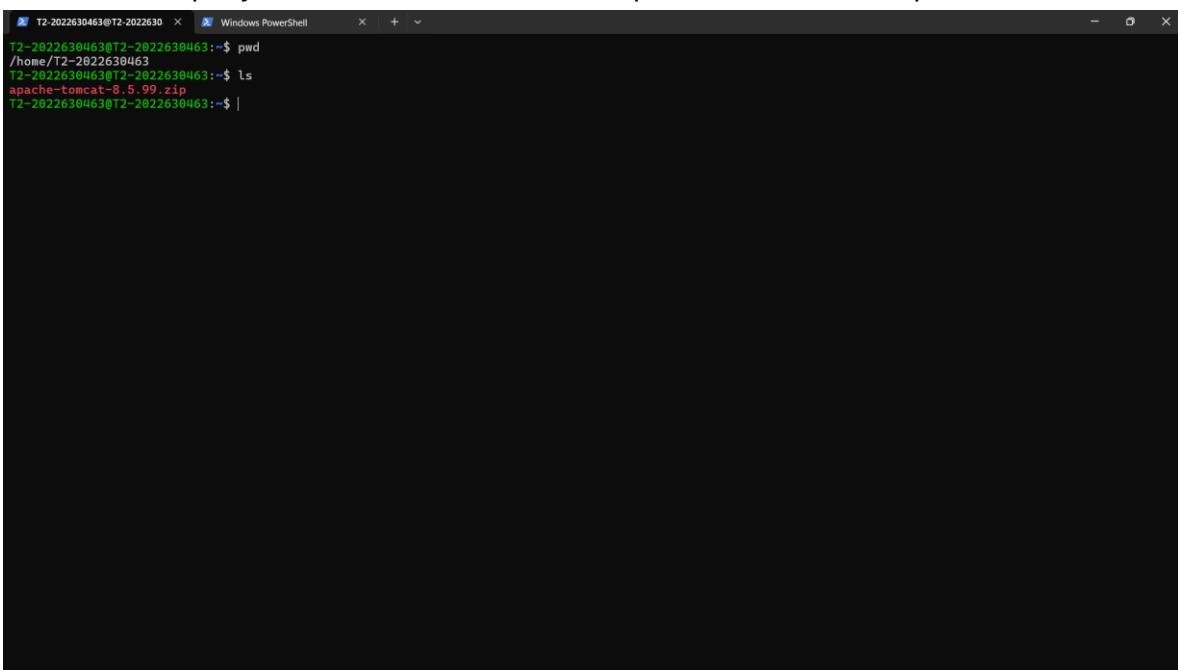
Ahora, copiaré el archivo zip ubicado en mi máquina host a la máquina virtual, esto se hará utilizando el comando SCP (secure copy) el cual utiliza ssh, la sintaxis del comando es:

scp C:\ruta\al\archivo usuario@IP-ubuntu:/ruta/destino



```
PS C:\Users\Emmanuel> scp C:\Users\Emmanuel\Pictures\T2-2022630463\apachetomcat\apache-tomcat-8.5.99.zip T2-2022630463@13.91.86.51:/home/T2-2022630463  
T2-2022630463@13.91.86.51's password:  
apache-tomcat-8.5.99.zip  
PS C:\Users\Emmanuel>
```

Ahora utilizamos **ls** para listar los archivos localizados en mi ruta actual. Y observamos que ya se encuentra el archivo .zip ubicado en mi máquina virtual.



```
T2-2022630463@T2-2022630463:~$ pwd  
/home/T2-2022630463  
T2-2022630463@T2-2022630463:~$ ls  
apache-tomcat-8.5.99.zip  
T2-2022630463@T2-2022630463:~$ |
```

Ahora utilizamos el comando **unzip** para descomprimir el archivo.

Primero instalamos los paquetes de unzip.

```
T2-2022630463@T2-2022630:~$ pwd
/home/T2-2022630463
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99.zip
T2-2022630463@T2-2022630463:~$ unzip archivo.zip
-bash: unzip: command not found
T2-2022630463@T2-2022630463:~$ sudo apt install unzip
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Suggested packages:
  zip
The following NEW packages will be installed:
  unzip
0 upgraded, 1 newly installed, 0 to remove and 11 not upgraded.
Need to get 175 kB of archives.
After this operation, 386 kB of additional disk space will be used.
Get:1 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 unzip amd64 6.0-26ubuntu3.2 [175 kB]
Fetched 175 kB in 0s (6484 kB/s)
debconf: delaying package configuration, since apt-utils is not installed
Selecting previously unselected package unzip.
(Reading database ... 49881 files and directories currently installed.)
Preparing to unpack .../unzip_6.0-26ubuntu3.2_amd64.deb ...
Unpacking unzip (6.0-26ubuntu3.2) ...
Setting up unzip (6.0-26ubuntu3.2) ...
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line 78.)
debconf: falling back to frontend: Readline
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

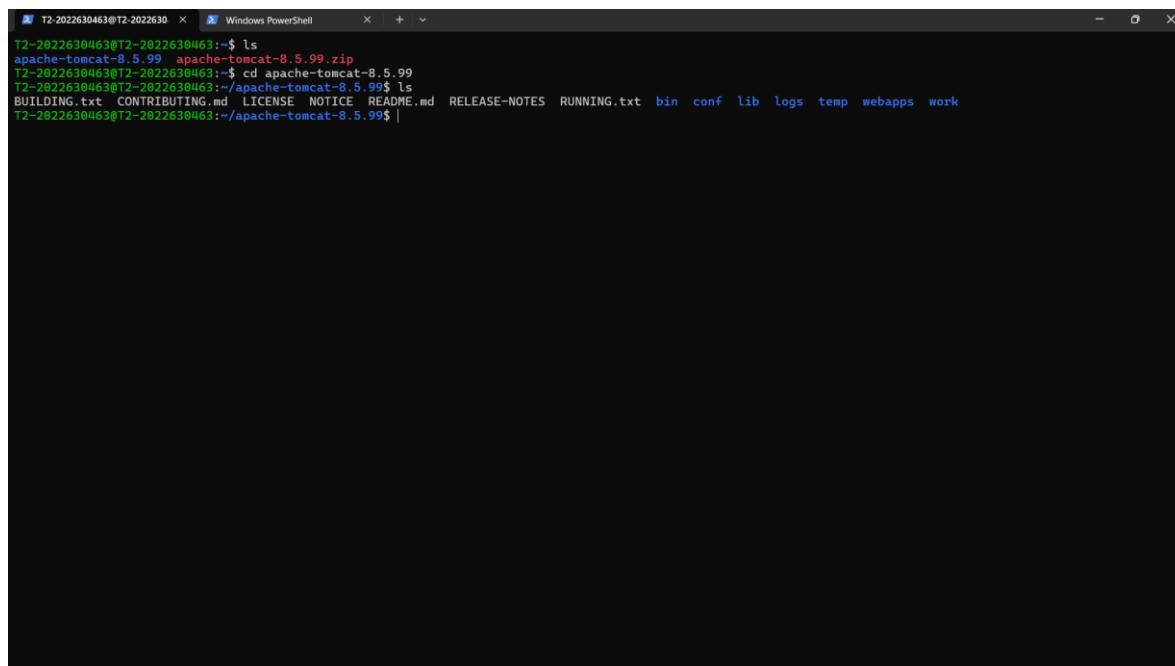
No VM guests are running outdated hypervisor (qemu) binaries on this host.
T2-2022630463@T2-2022630463:~$
```

```
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99.zip
T2-2022630463@T2-2022630463:~$ unzip apache-tomcat-8.5.99.zip
Archive: apache-tomcat-8.5.99.zip
  creating: apache-tomcat-8.5.99/
  creating: apache-tomcat-8.5.99/bin/
  creating: apache-tomcat-8.5.99/conf/
  creating: apache-tomcat-8.5.99/lib/
  creating: apache-tomcat-8.5.99/logs/
  creating: apache-tomcat-8.5.99/temp/
  creating: apache-tomcat-8.5.99/webapps/
  creating: apache-tomcat-8.5.99/webapps/ROOT/
  creating: apache-tomcat-8.5.99/webapps/ROOT/WEB-INF/
  creating: apache-tomcat-8.5.99/webapps/docs/
  creating: apache-tomcat-8.5.99/webapps/docs/META-INF/
  creating: apache-tomcat-8.5.99/webapps/docs/WEB-INF/
  creating: apache-tomcat-8.5.99/webapps/docs/WEB-INF/jsp/
  creating: apache-tomcat-8.5.99/webapps/docs/annotationapi/
  creating: apache-tomcat-8.5.99/webapps/docs/api/
  creating: apache-tomcat-8.5.99/webapps/docs/appdev/
  creating: apache-tomcat-8.5.99/webapps/docs/appdev/sample/
  creating: apache-tomcat-8.5.99/webapps/docs/appdev/sample/docs/
  creating: apache-tomcat-8.5.99/webapps/docs/appdev/sample/src/
  creating: apache-tomcat-8.5.99/webapps/docs/appdev/sample/src/mypackage/
  creating: apache-tomcat-8.5.99/webapps/docs/appdev/sample/web/
  creating: apache-tomcat-8.5.99/webapps/docs/appdev/sample/web/WEB-INF/
  creating: apache-tomcat-8.5.99/webapps/docs/appdev/sample/web/images/
  creating: apache-tomcat-8.5.99/webapps/docs/architecture/
  creating: apache-tomcat-8.5.99/webapps/docs/architecture/requestProcess/
  creating: apache-tomcat-8.5.99/webapps/docs/architecture/startup/
  creating: apache-tomcat-8.5.99/webapps/docs/config/
  creating: apache-tomcat-8.5.99/webapps/docs/elapi/
  creating: apache-tomcat-8.5.99/webapps/docs/images/
  creating: apache-tomcat-8.5.99/webapps/docs/images/fonts/
  creating: apache-tomcat-8.5.99/webapps/docs/jaspicapi/
  creating: apache-tomcat-8.5.99/webapps/docs/jspapi/
  creating: apache-tomcat-8.5.99/webapps/docs/servletapi/
  creating: apache-tomcat-8.5.99/webapps/docs/tribes/
  creating: apache-tomcat-8.5.99/webapps/docs/websocketapi/
  creating: apache-tomcat-8.5.99/webapps/examples/
  creating: apache-tomcat-8.5.99/webapps/examples/META-INF/
  creating: apache-tomcat-8.5.99/webapps/examples/WEB-INF/
  creating: apache-tomcat-8.5.99/webapps/examples/WEB-INF/classes/
  creating: apache-tomcat-8.5.99/webapps/examples/WEB-INF/classes/async/
```

5. Eliminar el directorio webapps el cual se encuentra dentro del directorio de Tomcat. Crear un nuevo directorio webapps y dentro de éste crear el directorio ROOT.

NOTA DE SEGURIDAD: Lo anterior se recomienda debido a que se han detectado vulnerabilidades en algunas aplicaciones que vienen con Tomcat, estas aplicaciones se encuentran originalmente instaladas en los directorios webapps y webapps/ROOT.

Buscamos el directorio webapp dentro de la carpeta Tomcat que se generó al momento de descomprimirlo

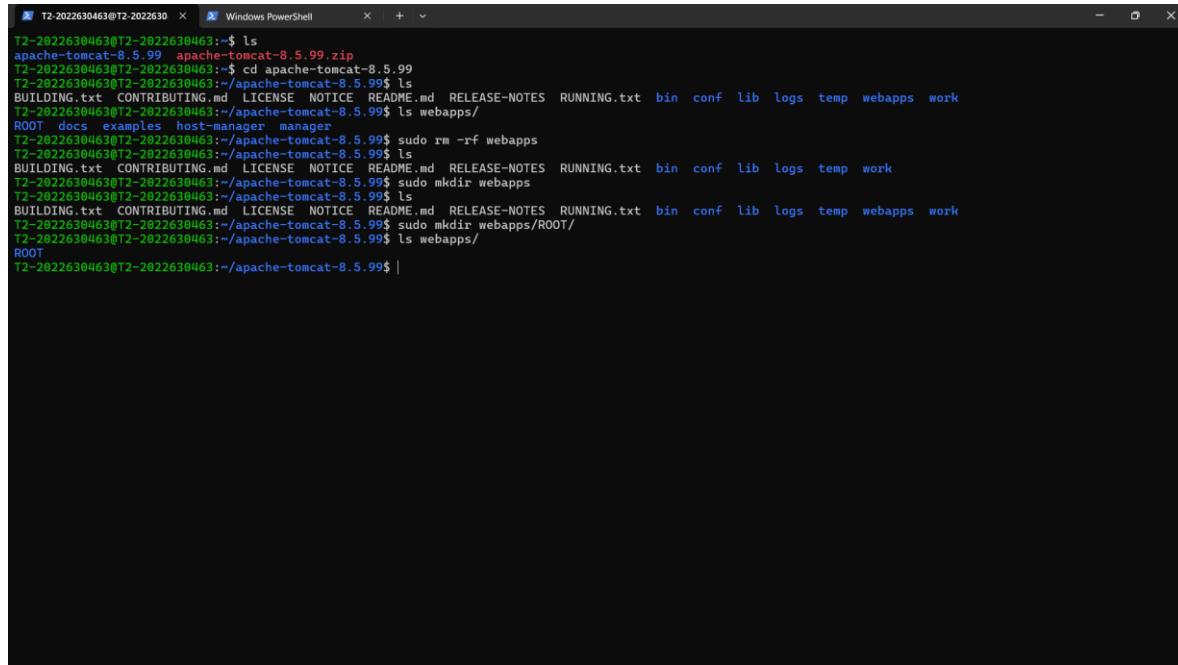


```
T2-2022630463@T2-2022630 X Windows PowerShell X + - 
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip
T2-2022630463@T2-2022630463:~$ cd apache-tomcat-8.5.99
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ ls
BUILDING.txt CONTRIBUTING.md LICENSE NOTICE README.md RELEASE-NOTES RUNNING.txt bin conf lib logs temp webapps work
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ |
```

Accedemos al directorio webapps para comprobar si se encuentra el directorio de ROOT. Por lo que procederemos a borrar el directorio webapps, para luego crear el directorio Webapps y en su interior el directorio ROOT.

Utilizaremos el comando **sudo rm -rf webapps** el cual eliminará el directorio webapps con todo lo que esté en su interior.

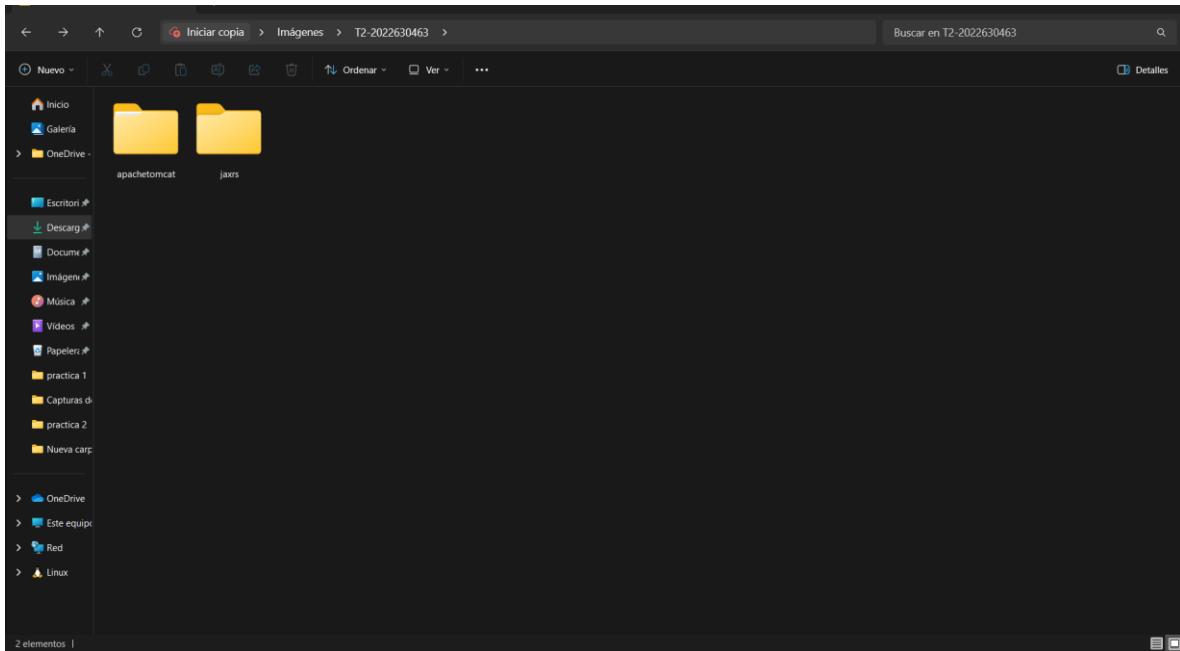
Con el comando **sudo mkdir** creamos los nuevos directorios.



```
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip
T2-2022630463@T2-2022630463:~$ cd apache-tomcat-8.5.99
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ ls
BUILDING.txt CONTRIBUTING.md LICENSE NOTICE README.md RELEASE-NOTES RUNNING.txt bin conf lib logs temp webapps work
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ ls webapps/
ROOT docs examples host-manager manager
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ sudo rm -rf webapps
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ ls
BUILDING.txt CONTRIBUTING.md LICENSE NOTICE README.md RELEASE-NOTES RUNNING.txt bin conf lib logs temp work
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ sudo mkdir webapps
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ ls
BUILDING.txt CONTRIBUTING.md LICENSE NOTICE README.md RELEASE-NOTES RUNNING.txt bin conf lib logs temp webapps work
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ sudo mkdir webapps/ROOT
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ ls webapps/
ROOT
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ |
```

6. Descargar la biblioteca "Jersey" de la siguiente URL. Jersey es una implementación de JAX-RS la cual permite ejecutar servicios web estilo REST sobre Tomcat:

<https://repo1.maven.org/maven2/org/glassfish/jersey/bundles/jaxrs-ri/2.24/jaxrs-ri-2.24.zip>

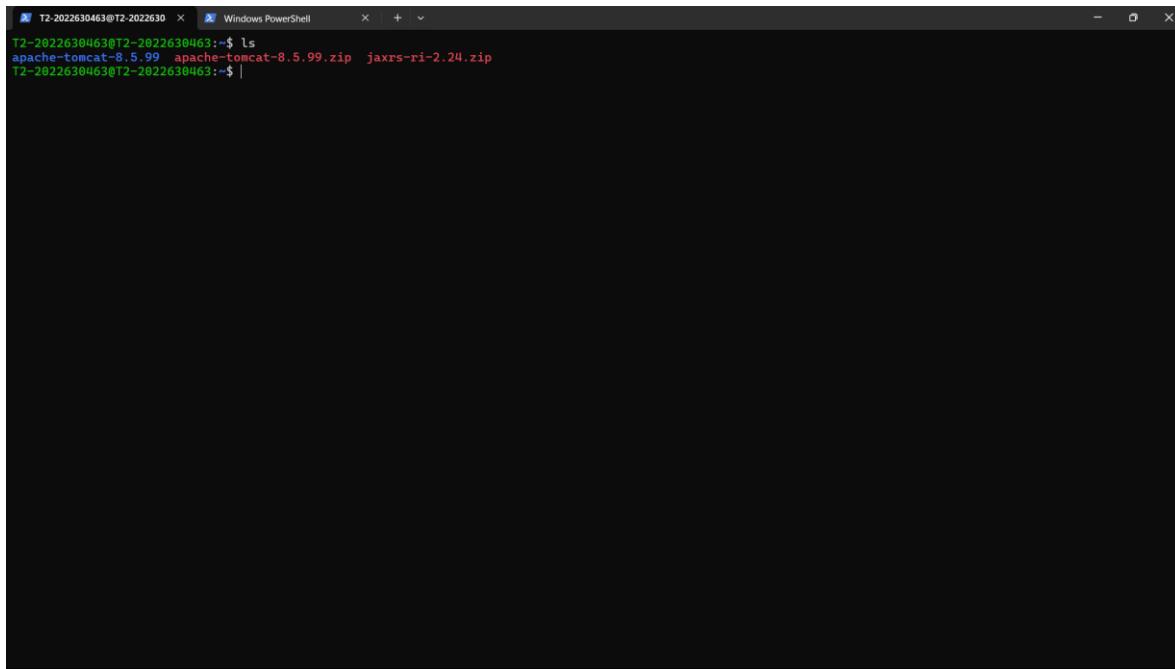


Lo almacenamos nuevamente en una ruta específica, en este caso yo lo almacené en la misma carpeta donde almacené tomcat.

Aplicaremos el mismo procedimiento para copiar el zip de jersey a la máquina virtual.

```
PS C:\Users\Emmanuel> scp C:\Users\Emmanuel\Pictures\T2-2022630463\jaxrs\jaxrs-ri-2.24.zip T2-2022630463@13.91.86.51:/home/T2-2022630463
T2-2022630463@13.91.86.51's password:
Permission denied, please try again.
T2-2022630463@13.91.86.51's password:
jaxrs-ri-2.24.zip                                         100% 4821KB   3.4MB/s   00:01
PS C:\Users\Emmanuel> |
```

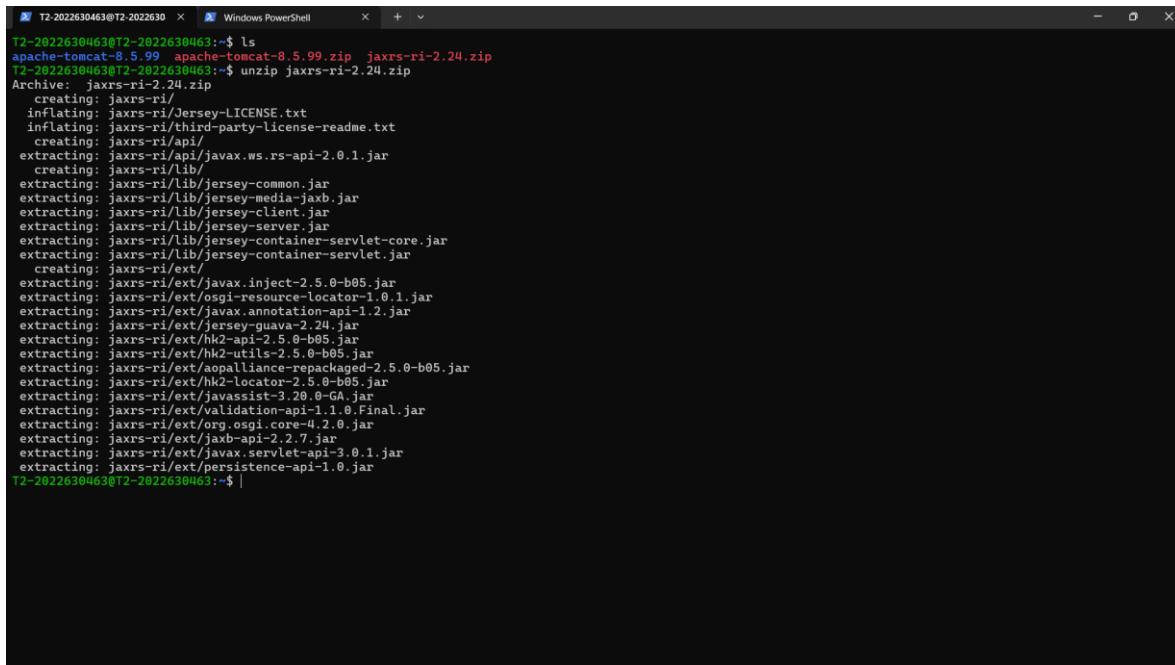
Comprobamos que el archive fue recibido correctamente.



```
T2-2022630463@T2-2022630: ~$ ls  
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip jaxrs-ri-2.24.zip  
T2-2022630463@T2-2022630463: ~$
```

7. Copiar a la máquina virtual el archivo descargado anteriormente, desempacarlo y **copiar todos los archivos** con extensión “.jar” los cuales se encuentran en los directorios desempacados, al directorio "lib" de Tomcat.

Desempaque del archivo .zip



```
T2-2022630463@T2-2022630463: ~$ ls  
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip jaxrs-ri-2.24.zip  
T2-2022630463@T2-2022630463: ~$ 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  
T2-2022630463@T2-2022630463: ~$
```

Accedemos al directorio donde se extrajo el contenido del archivo zip. Y comprobamos que dentro de cada directorio existan archivos .jar para ser copiados al directorio lib de tomcat

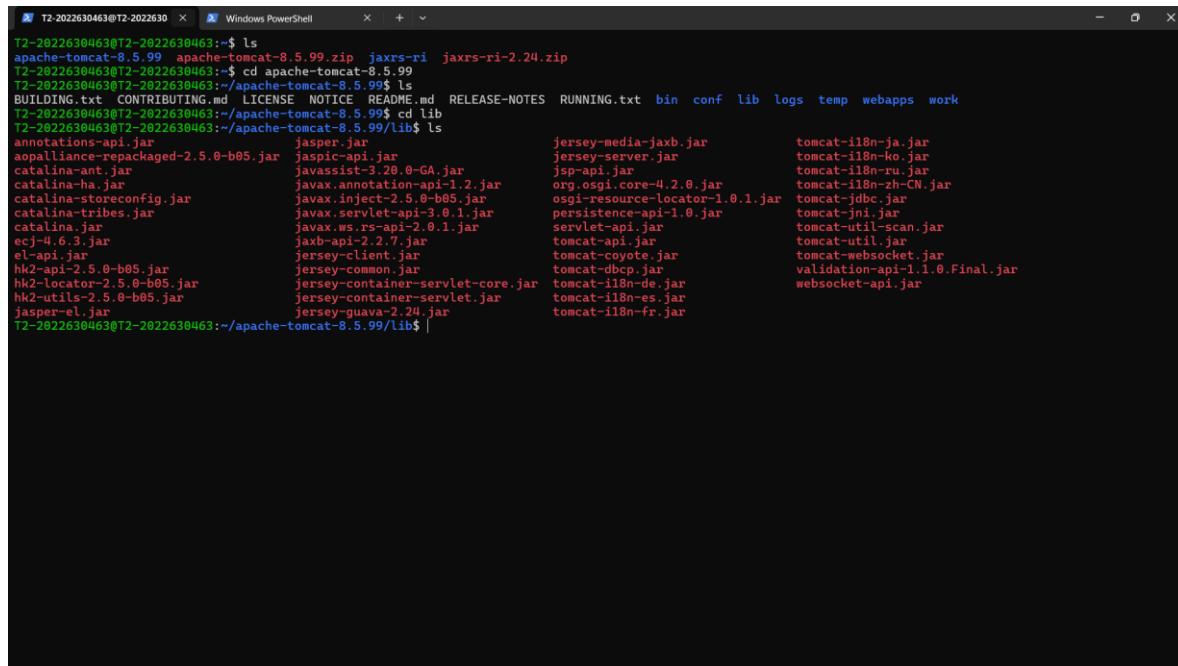
```
T2-2022630463@T2-2022630 X Windows PowerShell x + v
T2-2022630463@T2-2022630463:~$ unzip jaxrs-ri-2.24.zip
Archive: jaxrs-ri-2.24.zip
  creating: jaxrs-ri/
  inflating: jaxrs-ri/Jersey-LICENSE.txt
  inflating: jaxrs-ri/third-party-license-readme.txt
  creating: jaxrs-ri/api/
  extracting: jaxrs-ri/api/javax.ws.rs-api-2.0.1.jar
  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/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
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip jaxrs-ri jaxrs-ri-2.24.zip
T2-2022630463@T2-2022630463:~$ cd jaxrs-ri
T2-2022630463@T2-2022630463:~/jaxrs-ri$ ls
Jersey-LICENSE.txt api ext lib third-party-license-readme.txt
T2-2022630463@T2-2022630463:~/jaxrs-ri$ ls lib/
jersey-client.jar jersey-common.jar jersey-container-servlet-core.jar jersey-container-servlet.jar jersey-media-jaxb.jar jersey-server.jar
T2-2022630463@T2-2022630463:~/jaxrs-ri$ ls api/
javax.ws.rs-api-2.0.1.jar
T2-2022630463@T2-2022630463:~/jaxrs-ri$ ls ext/
aopalliance-repackaged-2.5.0-b05.jar javax.inject-2.5.0-b05.jar jaxb-api-2.2.7.jar jersey-guava-2.24.jar javax.persistence-api-1.0.jar
hk2-api-2.5.0-b05.jar javax.annotation-api-1.2.jar jersey-client.jar org.osgi.core-4.2.0.jar validation-api-1.1.0.Final.jar
hk2-locator-2.5.0-b05.jar javax.ws.rs-api-2.0.1.jar jersey-server.jar osgi-resource-locator-1.0.1.jar
hk2-utils-2.5.0-b05.jar javax.ws.rs-api-3.0.1.jar
T2-2022630463@T2-2022630463:~/jaxrs-ri$
```

Para copiar los archivos .jar ubicados en cada carpeta utilizamos el comando **cp**
cp /ruta/origen/*.jar /ruta/destino/

```
T2-2022630463@T2-2022630463:~/jaxrs-ri$ ls
Jersey-LICENSE.txt api ext lib third-party-license-readme.txt
T2-2022630463@T2-2022630463:~/jaxrs-ri$ pwd
/home/T2-2022630463/jaxrs-ri
T2-2022630463@T2-2022630463:~/jaxrs-ri$ cd ..
T2-2022630463@T2-2022630463:~/jaxrs-ri$ ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip jaxrs-ri jaxrs-ri-2.24.zip
T2-2022630463@T2-2022630463:~$ cp /home/T2-2022630463/jaxrs-ri/api/*.jar /home/T2-2022630463/apache-tomcat-8.5.99/lib
T2-2022630463@T2-2022630463:~$ ls apache-tomcat-8.5.99/lib
annotations-api.jar catalina.jar jaspic-api.jar tomcat-coyote.jar tomcat-118n-ja.jar tomcat-jni.jar
catalina-ant.jar ejc-4.6.3.jar javax.ws.rs-api-2.0.1.jar tomcat-dbcp.jar tomcat-118n-ko.jar tomcat-util-scan.jar
catalina-ha.jar el-api.jar jsp-api.jar tomcat-118n-de.jar tomcat-118n-ru.jar tomcat-util.jar
catalina-storeconfig.jar jasper-el.jar servlet-api.jar tomcat-118n-es.jar tomcat-118n-zh-CN.jar tomcat-websocket.jar
catalina-tribes.jar jasper.jar tomcat-api.jar tomcat-118n-fr.jar tomcat-jdbc.jar websocket-api.jar
T2-2022630463@T2-2022630463:~$ cp /home/T2-2022630463/jaxrs-ri/ext/*.jar /home/T2-2022630463/apache-tomcat-8.5.99/lib
T2-2022630463@T2-2022630463:~$ ls apache-tomcat-8.5.99/lib
annotations-api.jar hk2-api-2.5.0-b05.jar javax.servlet-api-3.0.1.jar tomcat-api.jar tomcat-118n-zh-CN.jar
aopalliance-repackaged-2.5.0-b05.jar hk2-locator-2.5.0-b05.jar javax.ws.rs-api-2.0.1.jar tomcat-coyote.jar tomcat-jdbc.jar
catalina-ant.jar hk2-utils-2.5.0-b05.jar jaxb-api-2.2.7.jar tomcat-jni.jar
catalina-ha.jar jasper-el.jar jersey-guava-2.24.jar tomcat-118n-de.jar tomcat-util-scan.jar
catalina-storeconfig.jar jasper.jar jsp-api.jar tomcat-118n-es.jar tomcat-util.jar
catalina-tribes.jar jaspic-api.jar org.osgi.core-4.2.0.jar tomcat-118n-fr.jar tomcat-websocket.jar
catalina.jar javassist-3.20.0-GA.jar osgi-resource-locator-1.0.1.jar tomcat-118n-ja.jar validation-api-1.1.0.Final.jar
ejc-4.6.3.jar javax.annotation-api-1.2.jar persistence-api-1.0.jar tomcat-118n-ko.jar websocket-api.jar
el-api.jar javax.inject-2.5.0-b05.jar servlet-api.jar tomcat-118n-ru.jar
T2-2022630463@T2-2022630463:~$ cp /home/T2-2022630463/jaxrs-ri/lib/*.jar /home/T2-2022630463/apache-tomcat-8.5.99/lib
T2-2022630463@T2-2022630463:~$ ls apache-tomcat-8.5.99/lib
annotations-api.jar jasper.jar jersey-media-jaxb.jar tomcat-118n-ja.jar
aopalliance-repackaged-2.5.0-b05.jar jaspic-api.jar jersey-server.jar tomcat-118n-ko.jar
catalina-ant.jar javassist-3.20.0-GA.jar jsp-api.jar tomcat-118n-ru.jar
catalina-ha.jar javax.annotation-api-1.2.jar org.osgi.core-4.2.0.jar tomcat-118n-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
ejc-4.6.3.jar jaxb-api-2.2.7.jar tomcat-api.jar tomcat-util.jar
hk2-api-2.5.0-b05.jar jersey-client.jar tomcat-coyote.jar tomcat-websocket.jar
hk2-locator-2.5.0-b05.jar jersey-container-servlet-core.jar tomcat-118n-de.jar validation-api-1.1.0.Final.jar
hk2-utils-2.5.0-b05.jar jersey-container-servlet.jar tomcat-118n-es.jar websocket-api.jar
jasper-el.jar jersey-guava-2.24.jar tomcat-118n-fr.jar
```

8. Borrar el archivo javax.servlet-api-3.0.1.jar del directorio "lib" de Tomcat (esto debe hacerse ya que existe una incompatibilidad entre Tomcat y Jersey).

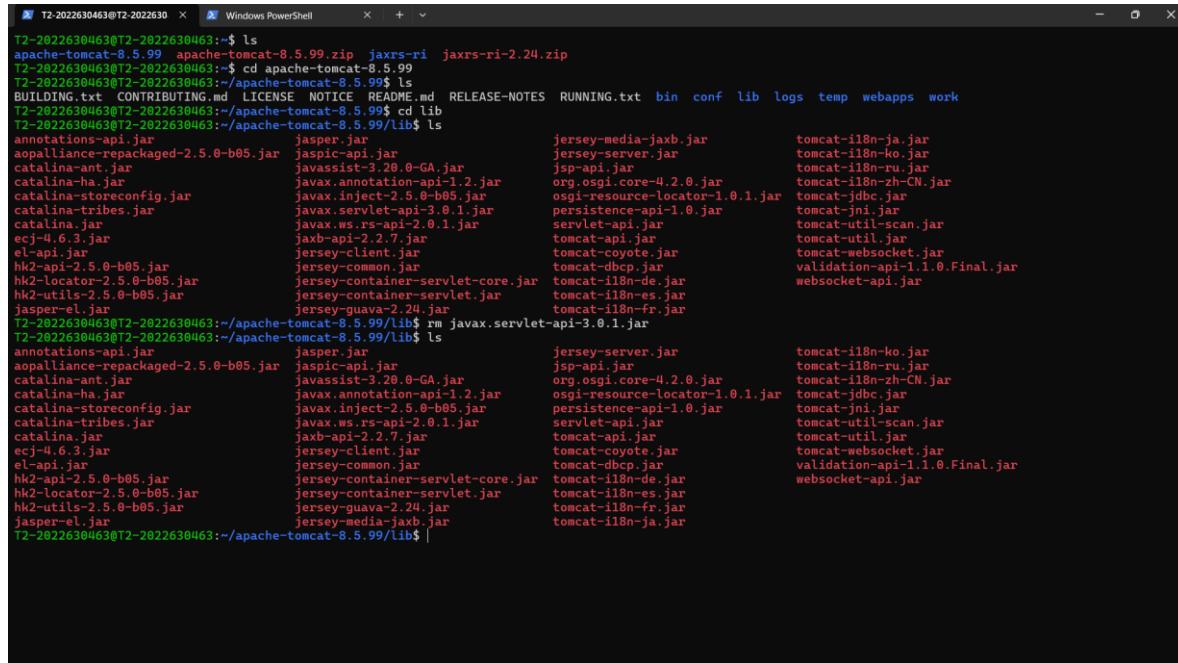
Actualmente se muestra así el listado de archivos almacenados en el directorio lib de tomcat



```
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip jaxrs-ri jaxrs-ri-2.24.zip
T2-2022630463@T2-2022630463:~$ cd apache-tomcat-8.5.99
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ ls
BUILDING.txt CONTRIBUTING.md LICENSE NOTICE README.md RELEASE-NOTES RUNNING.txt bin conf lib logs temp webapps work
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ cd lib
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99/lib$ ls
annotations-api.jar jasper.jar jersey-media-jaxb.jar tomcat-i18n-ja.jar
apolliance-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-dbcp.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
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99/lib$ |
```

Para eliminar el archivo javax.servlet-api-3.0.1.jar usamos el comando

rm nombre_archivo



```
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip jaxrs-ri jaxrs-ri-2.24.zip
T2-2022630463@T2-2022630463:~$ cd apache-tomcat-8.5.99
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ ls
BUILDING.txt CONTRIBUTING.md LICENSE NOTICE README.md RELEASE-NOTES RUNNING.txt bin conf lib logs temp webapps work
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ cd lib
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99/lib$ ls
annotations-api.jar jasper.jar jersey-media-jaxb.jar tomcat-i18n-ja.jar
apolliance-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-dbcp.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
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99/lib$ rm javax.servlet-api-3.0.1.jar
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99/lib$ ls
annotations-api.jar jasper.jar jersey-server.jar tomcat-i18n-ko.jar
apolliance-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-dbcp.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
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99/lib$ |
```

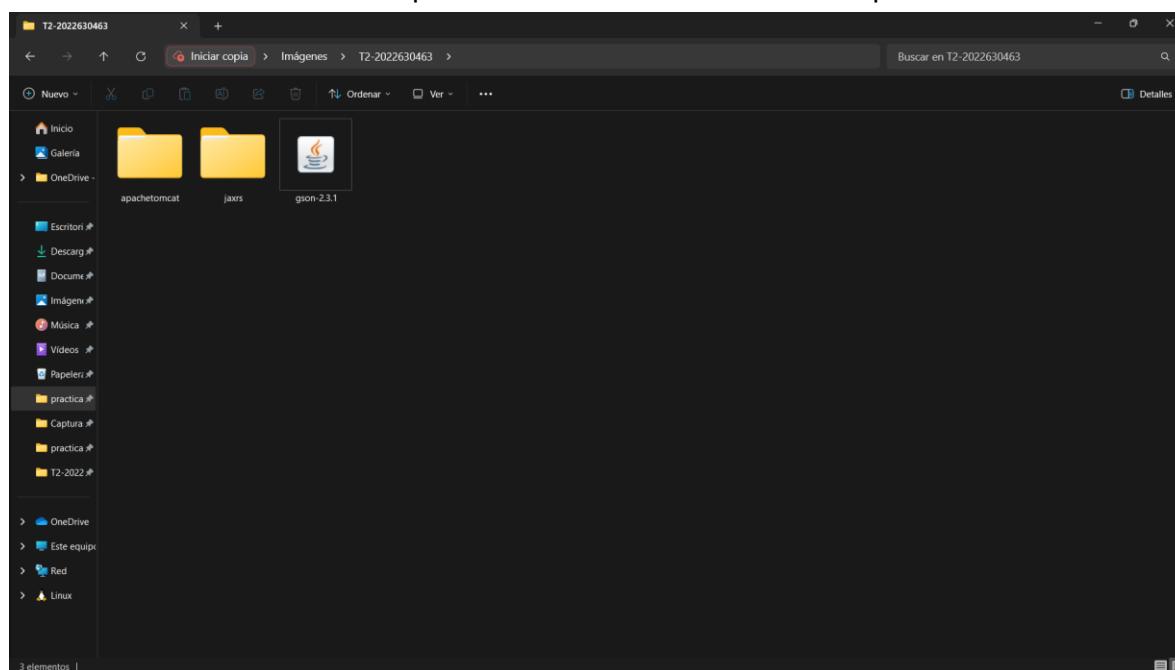
9. Descargar el archivo gson-2.3.1.jar de la URL:

<https://repo1.maven.org/maven2/com/google/code/gson/gson/2.3.1/gson-2.3.1.jar>

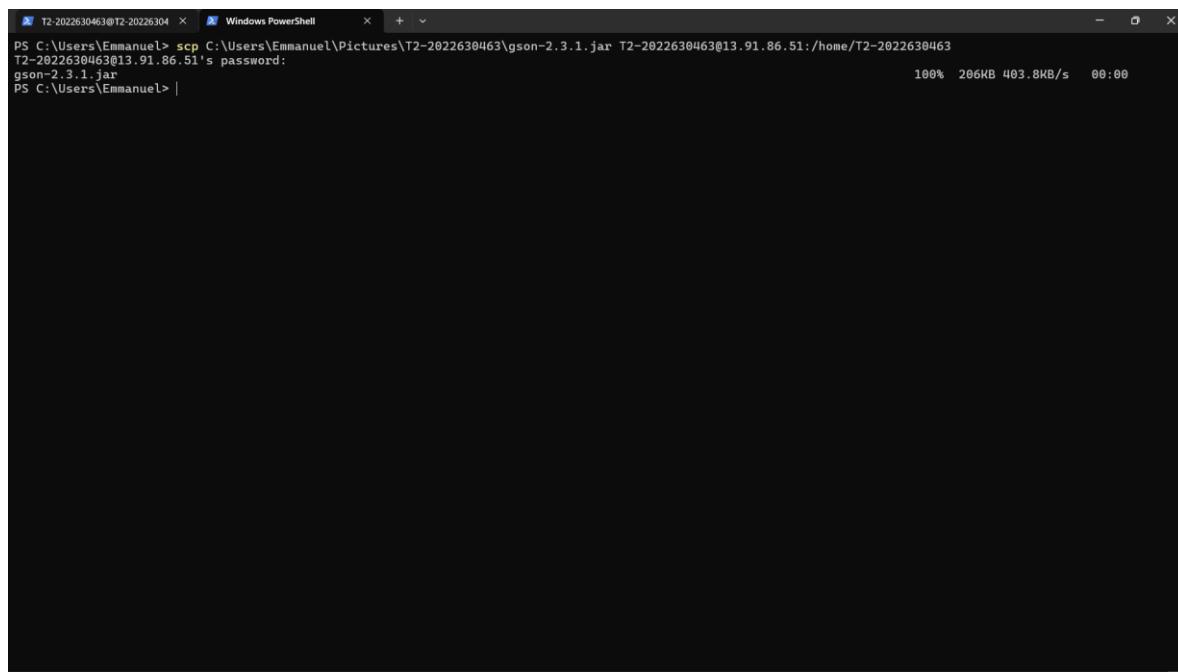
The screenshot shows a Microsoft Edge browser window. The main content area displays a Moodle assignment page with instructions for a task. The right side of the screen shows a 'Historial de descargas recientes' (Recent Downloads History) window. The history list includes the following items:

- gson-2.3.1.jar (206 KB • Hecho)
- jaxrs-ri-2.24.zip (4.7 MB • Hace 34 minutos)
- apache-tomcat-8.5.99.zip (10.9 MB • Hace 59 minutos)
- apache-tomca-8.5.99.zip (10.9 MB • Hace 1 hora)
- WSClient.js (3.5 KB • Hace 3 horas)
- usuario_sin_foto.png (1.662 B • Hace 3 horas)
- Servicio.zip (24.9 KB • Hace 3 horas)
- prueba.url.html (10.5 KB • Hace 3 horas)
- prueba.json.html (10.5 KB • Hace 3 horas)

Lo ubicamos en la misma carpeta donde almacenamos las carpetas anteriores.

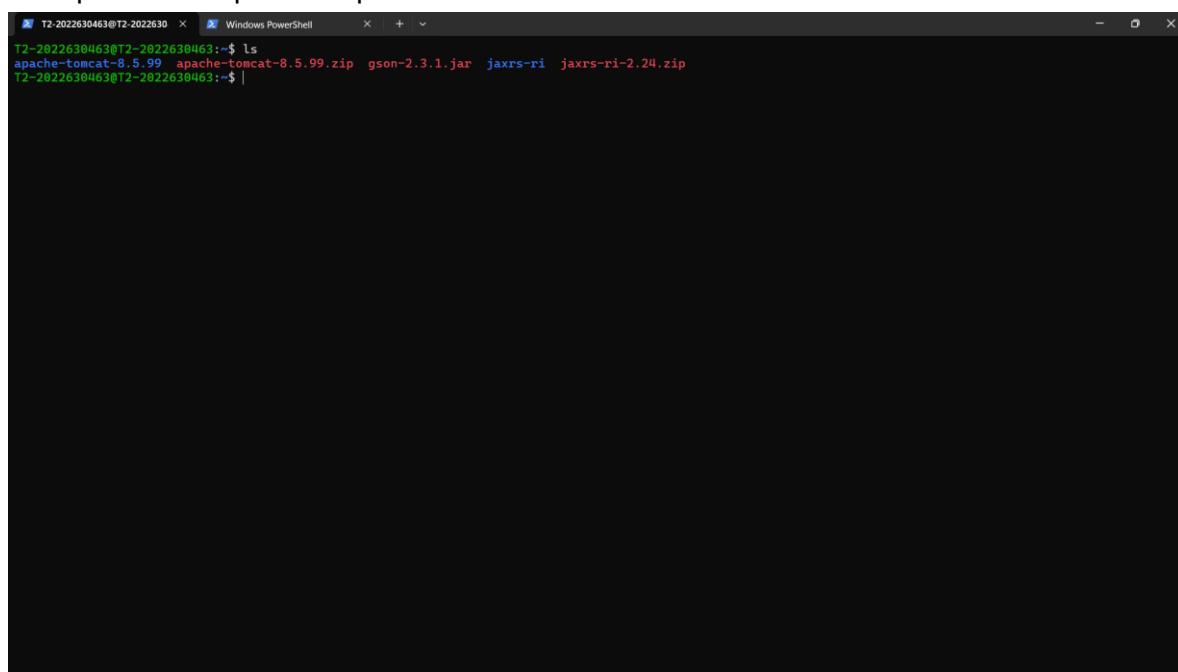


Lo copiamos a la máquina virtual



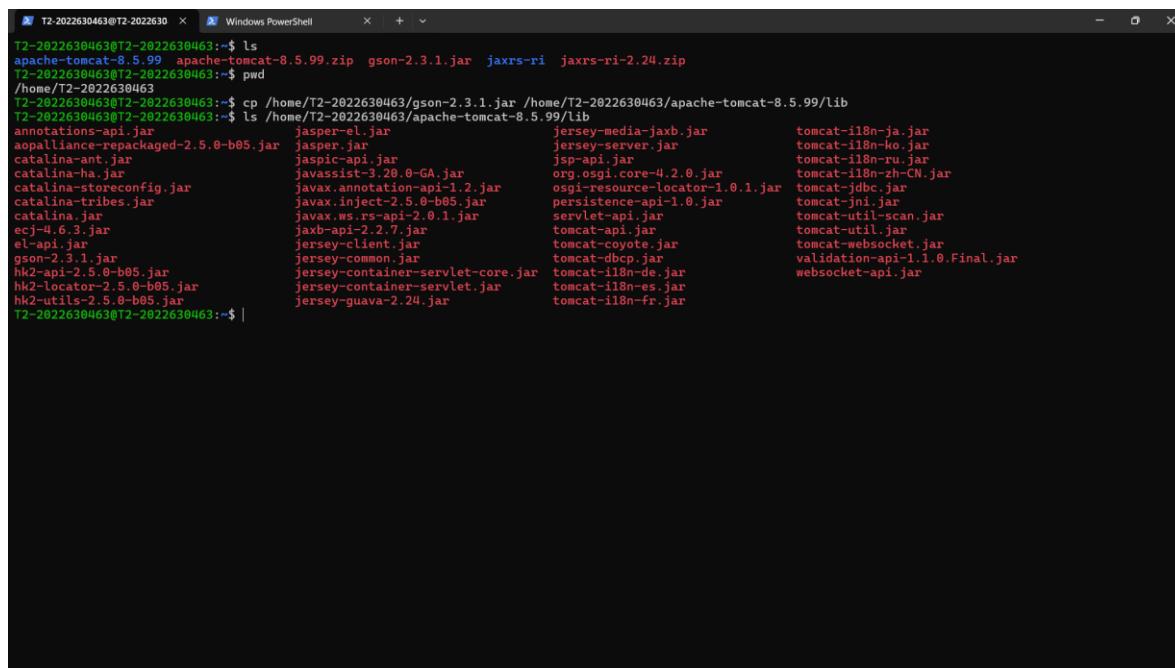
```
T2-2022630463@T2-2022630463: ~ % Windows PowerShell T2-2022630463@13.91.86.51: /home/T2-2022630463  
PS C:\Users\Emmanuel> scp C:\Users\Emmanuel\Pictures\T2-2022630463\gson-2.3.1.jar T2-2022630463@13.91.86.51:/home/T2-2022630463  
T2-2022630463@13.91.86.51's password:  
gson-2.3.1.jar 100% 206KB 403.8KB/s 00:00  
PS C:\Users\Emmanuel>
```

Comprobamos que se copió correctamente.



```
T2-2022630463@T2-2022630463: ~ % Windows PowerShell T2-2022630463@13.91.86.51: /home/T2-2022630463  
T2-2022630463@T2-2022630463: ~ % ls  
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip gson-2.3.1.jar jaxrs-ri jaxrs-ri-2.24.zip  
T2-2022630463@T2-2022630463: ~ %
```

10. Copiar el archivo gson-2.3.1.jar al directorio "lib" de Tomcat.

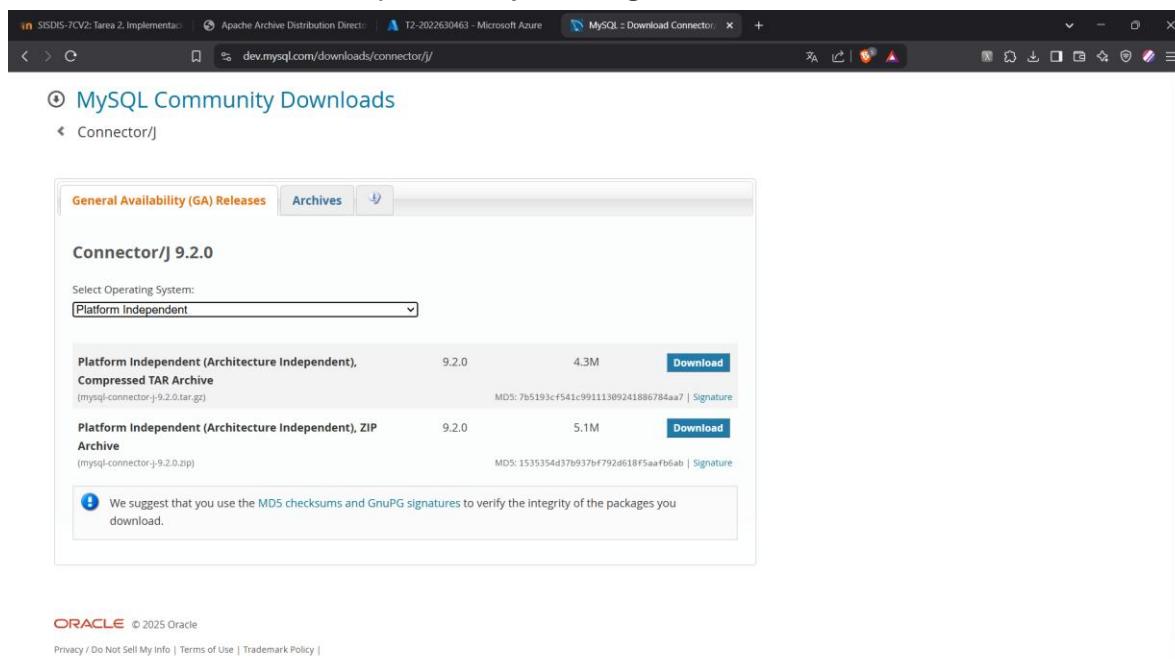


```
T2-2022630463@T2-2022630463 ~ % ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip gson-2.3.1.jar jaxrs-ri jaxrs-ri-2.24.zip
T2-2022630463@T2-2022630463 ~ % pwd
/home/T2-2022630463
T2-2022630463@T2-2022630463 ~ % cp /home/T2-2022630463/gson-2.3.1.jar /home/T2-2022630463/apache-tomcat-8.5.99/lib
T2-2022630463@T2-2022630463 ~ % ls /home/T2-2022630463/apache-tomcat-8.5.99/lib
annotations-api.jar jasper-el.jar jersey-media-jaxb.jar tomcat-i18n-ja.jar
aopalliance-repackaged-2.5.0-b05.jar jasper.jar jersey-server.jar tomcat-i18n-ko.jar
catalina-ant.jar jaspic-api.jar jsp-api.jar tomcat-i18n-ru.jar
catalina-ha.jar javassist-3.20.0-GA.jar org.osgi.core-4.2.0.jar tomcat-i18n-zh-CN.jar
catalina-storeconfig.jar javax.annotation-api-1.2.jar osgi-resource-locator-1.0.1.jar tomcat-jdbc.jar
catalina-tribes.jar javax.inject-2.5.0-b05.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
ejc-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
gson-2.3.1.jar jersey-common.jar tomcat-dbcp.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-lifecycle-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
```

11. Ahora vamos a instalar el driver de JDBC para MySQL. Ingresar a la siguiente URL:

<https://dev.mysql.com/downloads/connector/j/>

Seleccionar “Platform independent” y descargar el archivo ZIP.

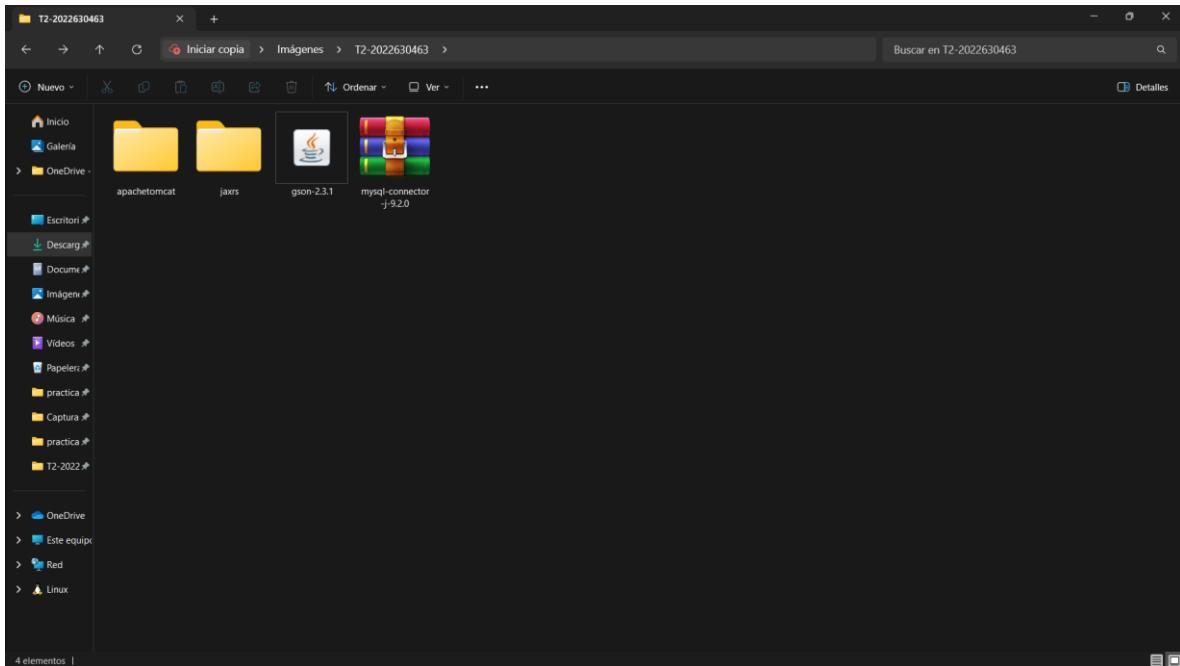


The screenshot shows a web browser window with the URL <https://dev.mysql.com/downloads/connector/j/>. The page displays the MySQL Community Downloads section for Connector/J 9.2.0. It features two main download options: a Compressed TAR Archive and a Platform Independent (Architecture Independent), ZIP Archive. Both options have their respective file sizes (4.3M and 5.1M) and download links. A note at the bottom encourages users to verify the integrity of the packages using MD5 checksums and GnuPG signatures.

Type	Version	Size	Action
Platform Independent (Architecture Independent), Compressed TAR Archive	9.2.0	4.3M	Download
Platform Independent (Architecture Independent), ZIP Archive	9.2.0	5.1M	Download

We suggest that you use the MD5 checksums and GnuPG signatures to verify the integrity of the packages you download.

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12. Copiar el archivo descargado a la máquina virtual, desempacarlo y copiar el archivo mysql-connector...jar al directorio "lib" de Tomcat.

```
PS C:\Users\Emmanuel> scp C:\Users\Emmanuel\Pictures\T2-2022630463\mysql-connector-j-9.2.0.zip T2-2022630463@13.91.86.51:/home/T2-2022630463
T2-2022630463@13.91.86.51's password:
mysql-connector-j-9.2.0.zip                                100% 5213KB   3.1MB/s   00:01
PS C:\Users\Emmanuel> |
```

Descomprimimos el zip.

```
T2-2022630463@T2-2022630  x  Windows PowerShell  x  +  v
T2-2022630463@T2-2022630:~$ ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip gson-2.3.1.jar jaxrs-ri jaxrs-ri-2.24.zip mysql-connector-j-9.2.0.zip
T2-2022630463@T2-2022630463:~$ unzip mysql-connector-j-9.2.0.zip
Archive:  mysql-connector-j-9.2.0.zip
creating: mysql-connector-j-9.2.0/
creating: mysql-connector-j-9.2.0/src/
creating: mysql-connector-j-9.2.0/src/build/
creating: mysql-connector-j-9.2.0/src/build/java/
creating: mysql-connector-j-9.2.0/src/build/java/documentation/
creating: mysql-connector-j-9.2.0/src/build/java/instrumentation/
creating: mysql-connector-j-9.2.0/src/build/misc/
creating: mysql-connector-j-9.2.0/src/build/misc/debian.in/
creating: mysql-connector-j-9.2.0/src/build/misc/debian.in/source/
creating: mysql-connector-j-9.2.0/src/demo/
creating: mysql-connector-j-9.2.0/src/demo/java/
creating: mysql-connector-j-9.2.0/src/demo/java/demo/
creating: mysql-connector-j-9.2.0/src/demo/java/demo/x/
creating: mysql-connector-j-9.2.0/src/demo/java/demo/x/devapi/
creating: mysql-connector-j-9.2.0/src/generated/
creating: mysql-connector-j-9.2.0/src/generated/javaj/
creating: mysql-connector-j-9.2.0/src/generated/java/com/
creating: mysql-connector-j-9.2.0/src/generated/java/com/mysql/
creating: mysql-connector-j-9.2.0/src/generated/java/com/mysql/cj/
creating: mysql-connector-j-9.2.0/src/generated/java/com/mysql/cj/x/
creating: mysql-connector-j-9.2.0/src/generated/java/com/mysql/cj/x/protobuf/
creating: mysql-connector-j-9.2.0/src/legacy/
creating: mysql-connector-j-9.2.0/src/legacy/java/
creating: mysql-connector-j-9.2.0/src/legacy/java/com/
creating: mysql-connector-j-9.2.0/src/legacy/java/com/mysql/
creating: mysql-connector-j-9.2.0/src/legacy/java/com/mysql/jdbc/
creating: mysql-connector-j-9.2.0/src/main/
creating: mysql-connector-j-9.2.0/src/main/core-api/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/cj/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/cj/callback/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/cj/conf/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/cj/exceptions/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/cj/interceptors/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/cj/log/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/cj/protocol/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/cj/result/
creating: mysql-connector-j-9.2.0/src/main/core-api/java/com/mysql/cj/telemetry/
T2-2022630463@T2-2022630  x  Windows PowerShell  x  +  v
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/simple/StatementsTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/simple/TestLifecycleInterceptor.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/simple/TransactionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/simple/TraversalTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/simple/UpdatabilityTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/simple/UtilsTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/simple/XATest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/AsyncQueryTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/BaseCollectionTestCase.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/BaseTableTestCase.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/BindTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/CollectionAddTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/CollectionFindTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/CollectionModifyTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/CollectionRemoveTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/CollectionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/CompressionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/DevApibaseTestCase.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/Ipv6SupportTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/MetadataTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/ResultTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/RowlockingTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/SchemaTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/SecureSessionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/SessioFailoverTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/SessionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableDeleteTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableInsertTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableSelectTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableUpdateTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TransactionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/package-info.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/InternalBaseTestCase.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/MySQLSessionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/XProtocolAsyncTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/XProtocolAuthTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/XProtocolTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/package-info.java
T2-2022630463@T2-2022630463:~$ ls mysql-connector-j-9.2.0/
CHANGES INFO_BIN INFO_SRC LICENSE README Build.xml mysql-connector-j-9.2.0.jar src
T2-2022630463@T2-2022630463:~$ |
```

Copiar el archivo .jar al directorio lib de tomcat.

```
T2-2022630463@T2-2022630 | Windows PowerShell | + - x
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/Ipv6SupportTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/MetadataTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/ResultTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/RowLockingTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/SchemaTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/SecureSessionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/SessionFailoverTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/SessionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableDeleteTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableInsertTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableSelectTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TableUpdateTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/TransactionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/devapi/package-info.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/InternalBaseTestCase.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/MySQLSessionTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/XProtocolAsyncTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/XProtocolAuthTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/XProtocolTest.java
inflating: mysql-connector-j-9.2.0/src/test/java/testsuite/x/internal/package-info.java
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip gson-2.3.1.jar jaxrs-ri jaxrs-ri-2.24.zip mysql-connector-j-9.2.0 mysql-connector-j-9.2.0.zip
T2-2022630463@T2-2022630463:~$ ls mysql-connector-j-9.2.0/
CHANGES INFO_BIN INFO_SRC LICENSE README build.xml mysql-connector-j-9.2.0_src
T2-2022630463@T2-2022630463:~$ cp /home/T2-2022630463/mysql-connector-j-9.2.0.jar /home/T2-2022630463/apache-tomcat-8.5.99/lib
cp: -r not specified; omitting directory '/home/T2-2022630463/mysql-connector-j-9.2.0/'
cp: cannot stat '/mysql-connector-j-9.2.0.jar': No such file or directory
T2-2022630463@T2-2022630463:~$ cp /home/T2-2022630463/mysql-connector-j-9.2.0.jar /home/T2-2022630463/apache-tomcat-8.5.99/lib
T2-2022630463@T2-2022630463:~$ ls /home/T2-2022630463/apache-tomcat-8.5.99/lib
annotations-api.jar jasper-el.jar jersey-media-jaxb.jar tomcat-118n-fr.jar
appliance-repackaged-2.5.0-b05.jar jasper.jar jersey-server.jar tomcat-118n-ja.jar
catalina-ant.jar jaspic-api.jar jsp-api.jar tomcat-118n-ko.jar
catalina-ha.jar javassist-3.20.0-GA.jar mysql-connector-j-9.2.0.jar tomcat-118n-ru.jar
catalina-storeconfig.jar javax.annotation-api-1.2.jar org.osgi.core-4.2.0.jar tomcat-118n-zh-CN.jar
catalina-tribes.jar javax.inject-2.5.0-b05.jar ospi-resource-locator-1.0.1.jar tomcat-jdbc.jar
catalina.jar javax.ws.rs-api-2.0.1.jar persistence-api-1.0.jar tomcat-jni.jar
ecj-4.6.3.jar javax-api-2.2.jar servlet-api.jar tomcat-util-scan.jar
el-api.jar jersey-client.jar tomcat-api.jar tomcat-util.jar
gson-2.3.1.jar jersey-common.jar tomcat-coyote.jar tomcat-websocket.jar
hk2-api-2.5.0-b05.jar jersey-container-servlet-core.jar tomcat-dbcp.jar validation-api-1.1.0.Final.jar
hk2-locator-2.5.0-b05.jar jersey-container-servlet.jar tomcat-118n-de.jar websocket-api.jar
hk2-utils-2.5.0-b05.jar jersey-guava-2.24.jar tomcat-118n-es.jar
T2-2022630463@T2-2022630463:~$ |
```

Iniciar/detener el servidor tomcat

1. Para iniciar el servidor Tomcat es **necesario** definir las siguientes variables de entorno:

```
export CATALINA_HOME= "aquí va la ruta absoluta del directorio de Tomcat 8"
```

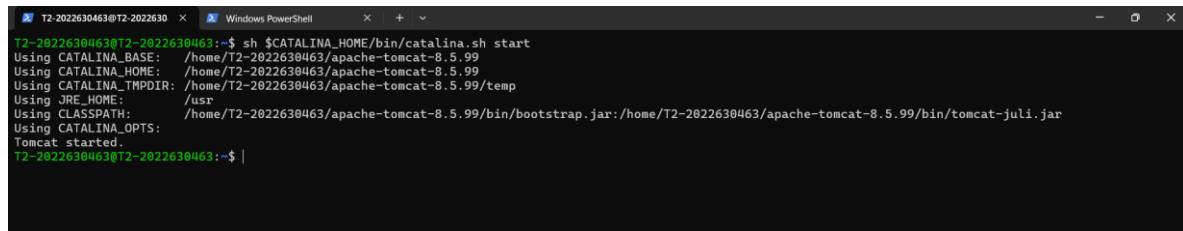
```
export JAVA_HOME= "aquí va la ruta absoluta del directorio donde está el directorio bin que contiene el programa java"
```

Nota. Si se instaló openjdk-8-jdk-headless entonces JAVA_HOME=/usr

```
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99 apache-tomcat-8.5.99.zip gson-2.3.1.jar jaxrs-ri jaxrs-ri-2.24.zip mysql-connector-j-9.2.0 mysql-connector-j-9.2.0.zip
T2-2022630463@T2-2022630463:~$ apache-tomcat-8.5.99
-bash: apache-tomcat-8.5.99: command not found
T2-2022630463@T2-2022630463:~$ cd apache-tomcat-8.5.99
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ pwd
/home/T2-2022630463/apache-tomcat-8.5.99
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ export CATALINA_HOME = "/home/T2-2022630463/apache-tomcat-8.5.99"
-bash: export: '=': not a valid identifier
-bash: export: '/home/T2-2022630463/apache-tomcat-8.5.99': not a valid identifier
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ export CATALINA_HOME="/home/T2-2022630463/apache-tomcat-8.5.99"
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ echo $CATALINA_HOME
/home/T2-2022630463/apache-tomcat-8.5.99
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ export JAVA_HOME="/usr"
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99$ echo $JAVA_HOME
/usr
T2-2022630463@T2-2022630463:~/apache-tomcat-8.5.99 |
```

2. Iniciar la ejecución de Tomcat:

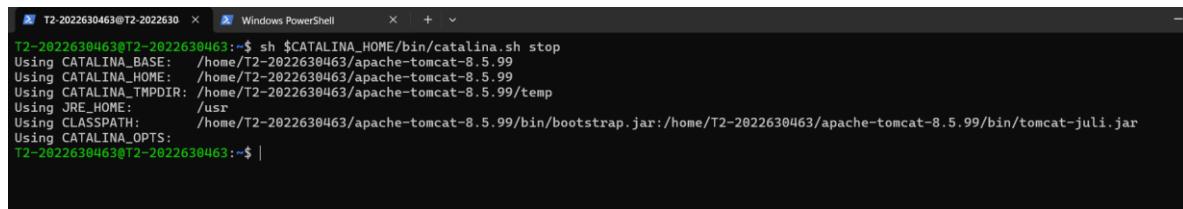
```
sh $CATALINA_HOME/bin/catalina.sh start
```



```
T2-2022630463@T2-2022630 ~ % sh $CATALINA_HOME/bin/catalina.sh start
Using CATALINA_BASE: /home/T2-2022630463/apache-tomcat-8.5.99
Using CATALINA_HOME: /home/T2-2022630463/apache-tomcat-8.5.99
Using CATALINA_TMPDIR: /home/T2-2022630463/apache-tomcat-8.5.99/temp
Using JRE_HOME: /usr
Using CLASSPATH: /home/T2-2022630463/apache-tomcat-8.5.99/bin/bootstrap.jar:/home/T2-2022630463/apache-tomcat-8.5.99/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
T2-2022630463@T2-2022630463 ~ %
```

3. Para detener Tomcat se deberá ejecutar el siguiente comando:

```
sh $CATALINA_HOME/bin/catalina.sh stop
```

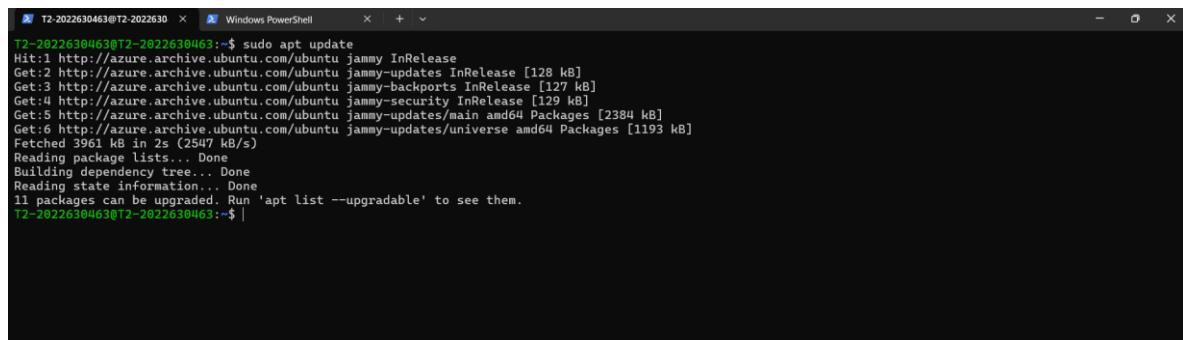


```
T2-2022630463@T2-2022630 ~ % sh $CATALINA_HOME/bin/catalina.sh stop
Using CATALINA_BASE: /home/T2-2022630463/apache-tomcat-8.5.99
Using CATALINA_HOME: /home/T2-2022630463/apache-tomcat-8.5.99
Using CATALINA_TMPDIR: /home/T2-2022630463/apache-tomcat-8.5.99/temp
Using JRE_HOME: /usr
Using CLASSPATH: /home/T2-2022630463/apache-tomcat-8.5.99/bin/bootstrap.jar:/home/T2-2022630463/apache-tomcat-8.5.99/bin/tomcat-juli.jar
Using CATALINA_OPTS:
T2-2022630463@T2-2022630463 ~ %
```

Instalación de MySQL

1. Actualizar los paquetes en la máquina virtual ejecutando el siguiente comando:

```
sudo apt update
```



```
T2-2022630463@T2-2022630463 ~ % sudo apt update
Hit:1 http://azure.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://azure.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Get:5 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [2384 kB]
Get:6 http://azure.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1193 kB]
Fetched 3961 kB in 2s (2547 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
11 packages can be upgraded. Run 'apt list --upgradable' to see them.
T2-2022630463@T2-2022630463 ~ %
```

2. Instalar el paquete default de MySQL:

```
sudo apt install mysql-server
```

```
T2-2022630463@T2-2022630 > Windows PowerShell > + >
T2-2022630463@T2-2022630463:~$ sudo apt install mysql-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
libcgifast-perl libcgipm-perl libclone-perl libencode-locale-perl libevent-core-2.1-7 libevent-pthreads-2.1-7 libfcgi-bin libfcgi-perl libfcgioldbl
libhtml-parser-perl libhtml-tagset-perl libhtml-template-perl libhttp-date-perl libhttp-message-perl libio-html-perl liblwp-mediatypes-perl libmecab
libprotobuf-lite23 libtimestruct-perl liburi-perl mecab-ipadic mecab-ipadic-utf8 mecab-utils mysql-client-8.0 mysql-client-core-8.0 mysql-common
mysql-server-8.0 mysql-server-core-8.0 psmisc
Suggested packages:
libdata-dump-perl libIPC-sharedCache-perl libbusiness-isbn-perl libWWW-perl mailx tinyca
The following NEW packages will be installed:
libcgifast-perl libcgipm-perl libclone-perl libencode-locale-perl libevent-core-2.1-7 libevent-pthreads-2.1-7 libfcgi-bin libfcgi-perl libfcgioldbl
libhtml-parser-perl libhtml-tagset-perl libhtml-template-perl libhttp-date-perl libhttp-message-perl libio-html-perl liblwp-mediatypes-perl libmecab
libprotobuf-lite23 libtimestruct-perl liburi-perl mecab-ipadic mecab-ipadic-utf8 mecab-utils mysql-client-8.0 mysql-client-core-8.0 mysql-common
mysql-server-8.0 mysql-server-core-8.0 psmisc
0 upgraded, 30 newly installed, 0 to remove and 11 not upgraded.
Need to get 29.8 MB of archives.
After this operation, 244 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 mysql-common all 5.8+1.0.8 [7212 B]
Get:2 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 mysql-client-core-8.0 amd64 8.0.41-0ubuntu0.22.04.1 [2716 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 mysql-client-8.0 amd64 8.0.41-0ubuntu0.22.04.1 [22.7 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libevent-core-2.1-7 amd64 2.1.12-stable-1build3 [93.9 kB]
Get:5 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libevent-pthreads-2.1-7 amd64 2.1.12-stable-1build3 [7642 B]
Get:6 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libmecab2 amd64 0.996-14build9 [199 kB]
Get:7 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libprotobuf-lite23 amd64 3.12.4-1ubuntu7.22.04.1 [209 kB]
Get:8 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 mysql-server-core-8.0 amd64 8.0.41-0ubuntu0.22.04.1 [17.6 kB]
Get:9 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 psmisc amd64 23.4-2build3 [119 kB]
Get:10 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 mysql-server-8.0 amd64 8.0.41-0ubuntu0.22.04.1 [1443 kB]
Get:11 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libhtml-tagset-perl all 3.20-4 [12.5 kB]
Get:12 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 liburi-perl all 5.10-1 [78.8 kB]
Get:13 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libhtml-parser-perl amd64 3.76-1build2 [88.4 kB]
Get:14 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libcgi-pm-perl all 4.54-1 [188 kB]
Get:15 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libfcgioldbl amd64 2.4.2-2build2 [28.0 kB]
Get:16 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libfcgi-perl amd64 0.82+ds-1build1 [22.8 kB]
Get:17 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libcgifast-perl all 1:2.15-1 [10.5 kB]
Get:18 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libclone-perl amd64 0.45-1build3 [11.0 kB]
Get:19 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libencode-locale-perl all 1.05-1.1 [11.8 kB]
Get:20 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libfcgi-bin amd64 2.4.2-2build2 [11.2 kB]
Get:21 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libhtml-template-perl all 2.97-1.1 [59.1 kB]
Get:22 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libtimestruct-perl all 2.3300-2 [34.0 kB]
Get:23 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libhttp-date-perl all 6.05-1 [9920 B]
Get:24 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libio-html-perl all 1.004-2 [15.4 kB]
```

```
T2-2022630463@T2-2022630 > Windows PowerShell > + >
T2-2022630463@T2-2022630463:~$ 
reading /usr/share/mecab/dic/ipadic/Noun.adjv.csv ... 3328
reading /usr/share/mecab/dic/ipadic/Noun.demonst.csv ... 128
reading /usr/share/mecab/dic/ipadic/Noun.proper.csv ... 27328
reading /usr/share/mecab/dic/ipadic/Filler.csv ... 19
reading /usr/share/mecab/dic/ipadic/Suffix.csv ... 1393
reading /usr/share/mecab/dic/ipadic/Auxil.csv ... 199
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:amd64 (3.76-1build2) ...
Setting up libhttp-message-perl (6.36-1) ...
Setting up mysql-server-8.0 (8.0.41-0ubuntu0.22.04.1) ...
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line 78.)
debconf: falling back to frontend: Readline
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 5267
Created symlink /etc/systemd/system/multi-user.target.wants/mysql.service → /lib/systemd/system/mysql.service.
Setting up libcgifast-perl (4.54-1) ...
Setting up libhtml-template-perl (2.97-1.1) ...
Setting up liblwp-mediatypes-perl (2.00-1) ...
Setting up mysql-server (8.0.41-0ubuntu0.22.04.1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.9) ...
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line 78.)
debconf: falling back to frontend: Readline
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
T2-2022630463@T2-2022630463:~$ |
```

3. Ejecutar el script de seguridad:

```
sudo mysql_secure_installation
```

```
T2-2022630463@T2-2022630 X Windows PowerShell + ~
T2-2022630463@T2-2022630463:~$ sudo mysql_secure_installation
Securing the MySQL server deployment.

Connecting to MySQL using a blank password.
The 'validate_password' component is installed on the server.
The subsequent steps will run with the existing configuration
of the component.

Skipping password set for root as authentication with auth_socket is used by default.
If you would like to use password authentication instead, this can be done with the "ALTER.USER" command.
See https://dev.mysql.com/doc/refman/8.0/en/alter-user.html#alter-user-password-management for more information.

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.
```

```
T2-2022630463@T2-2022630 X Windows PowerShell + ~
Skipping password set for root as authentication with auth_socket is used by default.
If you would like to use password authentication instead, this can be done with the "ALTER.USER" command.
See https://dev.mysql.com/doc/refman/8.0/en/alter-user.html#alter-user-password-management for more information.

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.

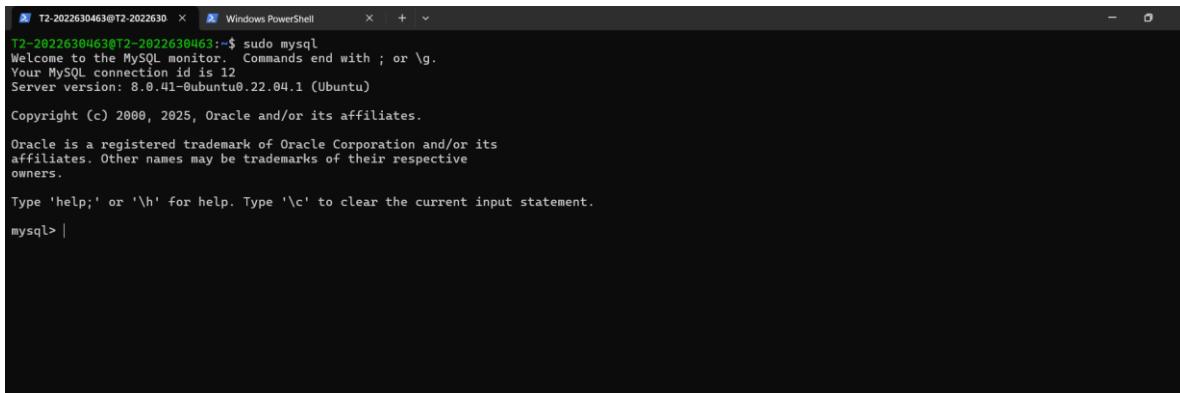
- Removing privileges on test database...
Success.

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!
T2-2022630463@T2-2022630463:~|
```

4. Ejecutar el monitor de MySQL:



```
T2-2022630463@T2-2022630 X Windows PowerShell + 
T2-2022630463@T2-2022630463:~$ sudo mysql
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 12
Server version: 8.0.41-0ubuntu0.22.04.1 (Ubuntu)

Copyright (c) 2000, 2025, Oracle and/or its affiliates.

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

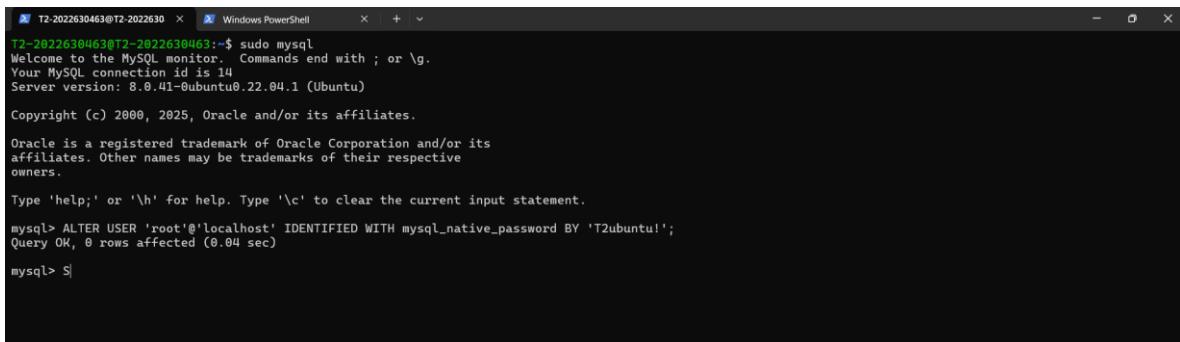
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> |
```

5. Ejecutar el siguiente comando SQL para modificar la contraseña de root:

```
ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password BY 'aquí-va-la-contraseña-de-root-de-mysql'
```

La contraseña debe de combinar mayúsculas, minúsculas y caracteres especiales con un mínimo de 8 caracteres.



```
T2-2022630463@T2-2022630 X Windows PowerShell + 
T2-2022630463@T2-2022630463:~$ sudo mysql
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 14
Server version: 8.0.41-0ubuntu0.22.04.1 (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 'T2ubuntu!';
Query OK, 0 rows affected (0.04 sec)

mysql> $|
```

6. Actualizar los privilegios:

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

7. Ejecutar el siguiente comando para salir del monitor de MySQL:

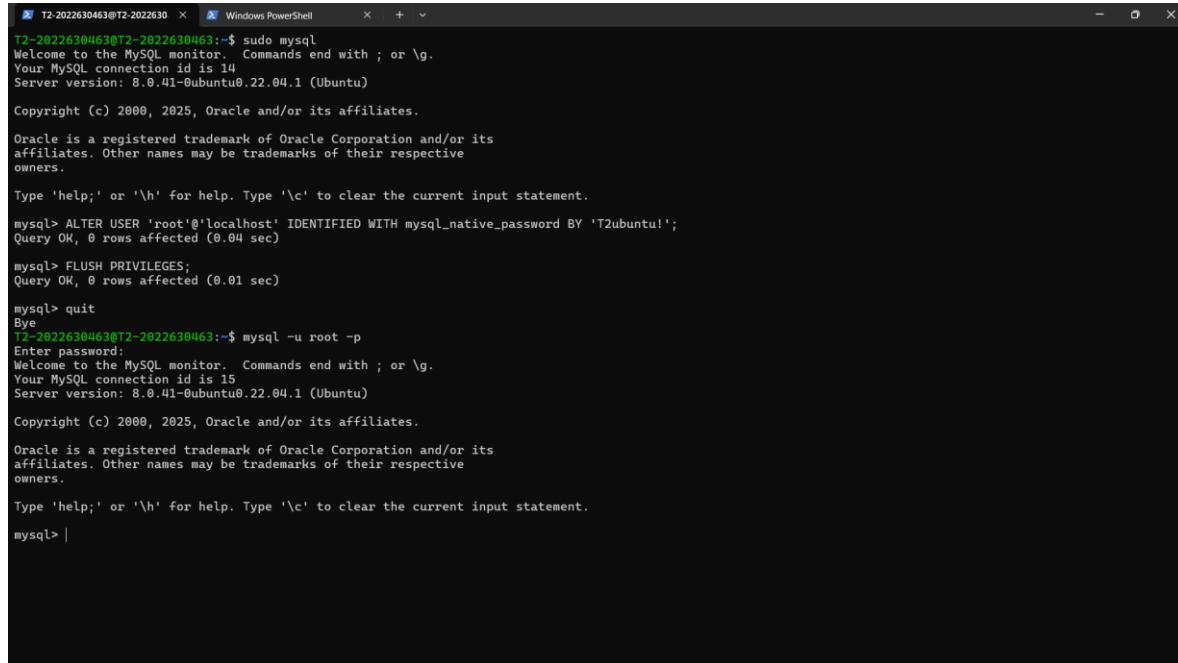
```
quit
```

```
mysql> quit
Bye
T2-2022630463@T2-2022630463:~$ |
```

Crear un usuario en MySQL

1. Ejecutar el monitor de MySQL:

```
mysql -u root -p
```



```
T2-2022630463@T2-2022630463:~$ sudo mysql
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 14
Server version: 8.0.41-0ubuntu0.22.04.1 (Ubuntu)

Copyright (c) 2000, 2025, 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> ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password BY 'T2ubuntu!';
Query OK, 0 rows affected (0.04 sec)

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

mysql> quit
Bye
T2-2022630463@T2-2022630463:~$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 15
Server version: 8.0.41-0ubuntu0.22.04.1 (Ubuntu)

Copyright (c) 2000, 2025, Oracle and/or its affiliates.

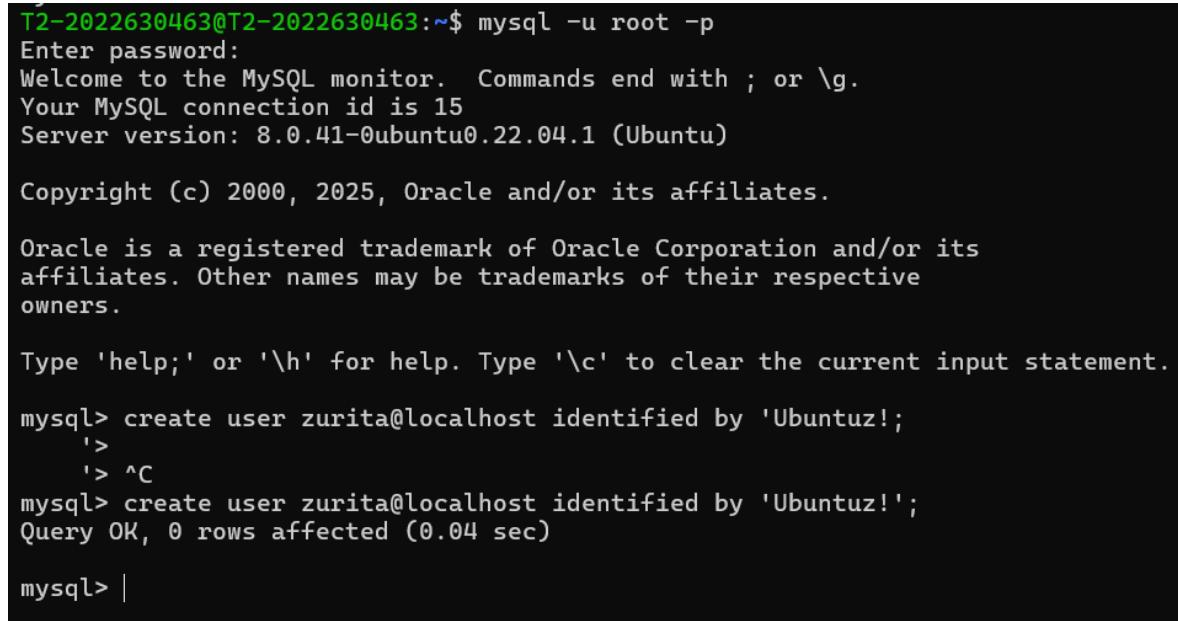
Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

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

mysql> |
```

2. Crear un usuario con el comando:

```
create user usuario@localhost identified by 'aquí-va-la-contraseña-del-usuario-hugo';
```



```
T2-2022630463@T2-2022630463:~$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 15
Server version: 8.0.41-0ubuntu0.22.04.1 (Ubuntu)

Copyright (c) 2000, 2025, 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 user zurita@localhost identified by 'Ubuntuz!';
      '^'
      '^C
mysql> create user zurita@localhost identified by 'Ubuntuz!';
Query OK, 0 rows affected (0.04 sec)

mysql> |
```

3. Otorgar todos los permisos al usuario nuevo sobre la base de datos "servicio_web":

```
grant all on servicio_web.* to usuario@localhost;
```

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

4. Ejecutar el siguiente comando para salir del monitor de MySQL:

```
quit
```

```
T2-2022630463@T2-2022630463:~$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 15
Server version: 8.0.41-Ubuntu0.22.04.1 (Ubuntu)

Copyright (c) 2000, 2025, 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 user zurita@localhost identified by 'Ubuntuz!';
      '>
      '> ^C
mysql> create user zurita@localhost identified by 'Ubuntuz!';
Query OK, 0 rows affected (0.04 sec)

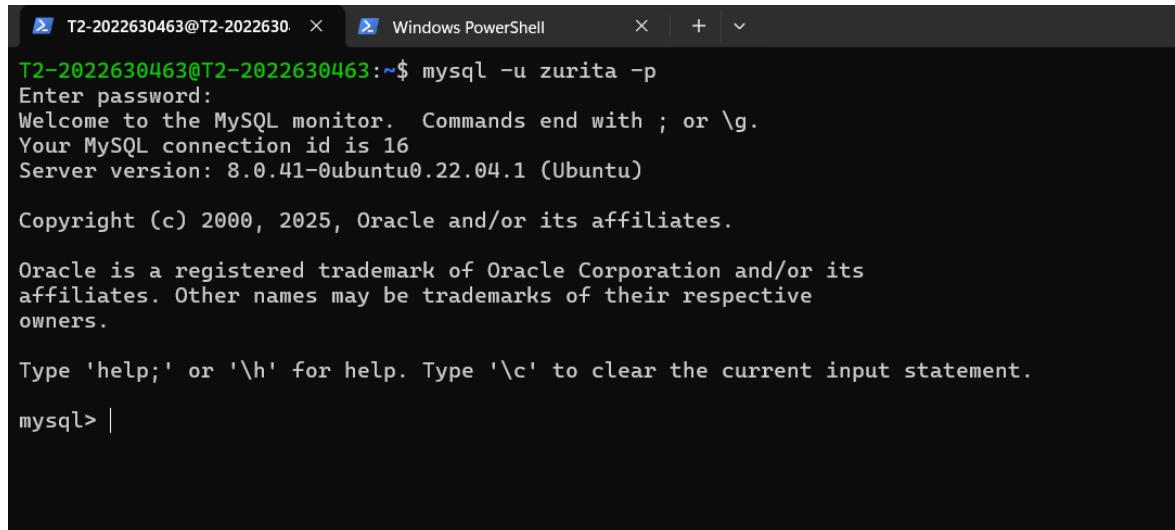
mysql> grant all on servicio_web.* to zurita@localhost;
Query OK, 0 rows affected (0.02 sec)

mysql> quit
Bye
T2-2022630463@T2-2022630463:~$ |
```

Crear la base de datos

1. Ejecutar el monitor de MySQL (notar que ahora se utiliza el usuario "zurita"):

```
mysql -u zurita -p
```



```
T2-2022630463@T2-2022630463:~$ mysql -u zurita -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 16
Server version: 8.0.41-0ubuntu0.22.04.1 (Ubuntu)

Copyright (c) 2000, 2025, 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> |
```

2. Crear la base de datos "servicio_web":

```
create database servicio_web;
```

```
mysql> create database servicio_web;
Query OK, 1 row affected (0.02 sec)
```

3. Conectar a la base de datos creada anteriormente:

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

4. Crear las tablas "usuarios" y "fotos_usuarios", así mismo, se crea una regla de integridad referencial y un índice único:

```
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)
);

create table fotos_usuarios
(
    id_foto integer auto_increment primary key,
    foto longblob,
    id_usuario integer not null
);

alter table fotos_usuarios add foreign key (id_usuario) references
usuarios(id_usuario);
create unique index usuarios_1 on usuarios(email);

```

```

T2-2022630463@T2-2022630  x  Windows PowerShell  x  +  v
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 16
Server version: 8.0.41-0ubuntu0.22.04.1 (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 database servicio_web;
Query OK, 1 row affected (0.02 sec)

mysql> use servicio_web;
Database changed

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 (0.14 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 (0.12 sec)

mysql> alter table fotos_usuarios add foreign key (id_usuario) references usuarios(id_usuario);
Query OK, 0 rows affected (0.31 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> create unique index usuarios_1 on usuarios(email);
Query OK, 0 rows affected (0.08 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> |

```

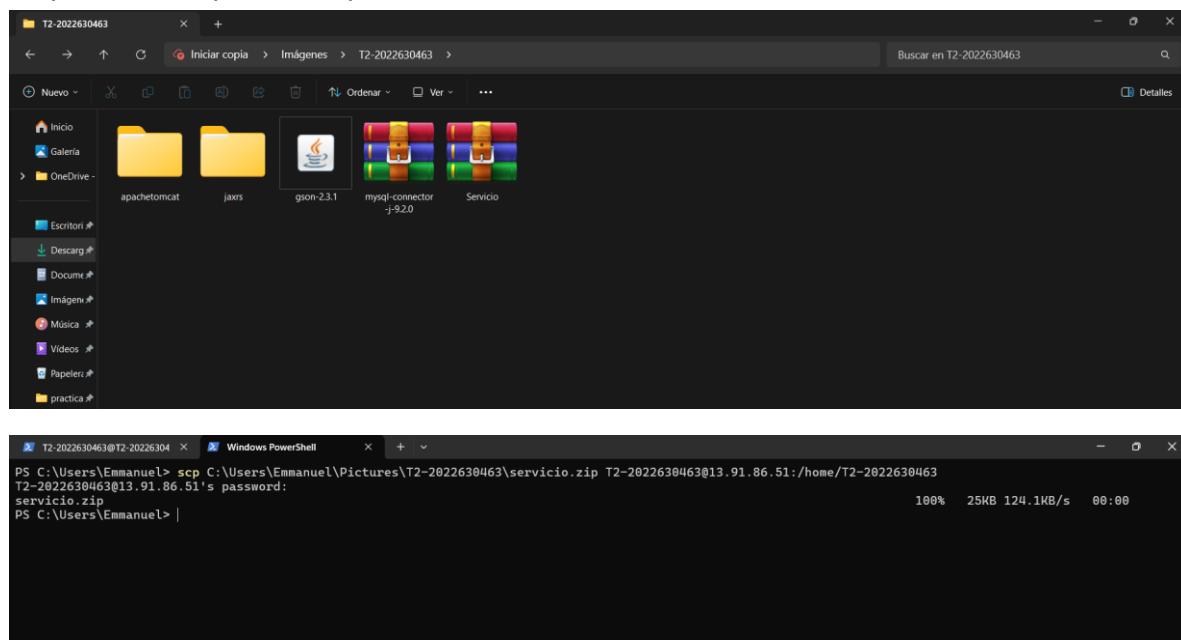
5. Salir del monitor de MySQL:

Quit

```
mysql> quit
Bye
T2-2022630463@T2-2022630463:~$ |
```

Editar el archivo "context.xml" que está en el directorio "META-INF" y definir el username de la base de datos y el password correspondiente.

Copiamos el zip a la máquina virtual.



```

T2-2022630463@T2-2022630 ~ % ls
apache-tomcat-8.5.99 gson-2.3.1.jar jaxrs-ri-2.24.zip mysql-connector-j-9.2.0.zip
apache-tomcat-8.5.99.zip jaxrs-ri mysql-connector-j-9.2.0 servicio.zip
T2-2022630463@T2-2022630463 ~ % unzip servicio.zip
Archive: servicio.zip
  creating: Servicio/
  inflating: Servicio/compila_json.sh
  inflating: Servicio/compila_url.sh
  creating: Servicio/META-INF/
  inflating: Servicio/META-INF/context.xml
  inflating: Servicio/Servicio.war
  creating: Servicio/Servicio_json/
  inflating: Servicio/Servicio_json/AdaptadorGsonBase64.java
  inflating: Servicio/Servicio_json/Error.java
  inflating: Servicio/Servicio_json/ParamAltaUsuario.java
  inflating: Servicio/Servicio_json/ParamBorraUsuario.java
  inflating: Servicio/Servicio_json/ParamConsultaUsuario.java
  inflating: Servicio/Servicio_json/ParamModificaUsuario.java
  inflating: Servicio/Servicio_json/Servicio.java
  inflating: Servicio/Servicio_json/Usuario.java
  creating: Servicio/Servicio_url/
  inflating: Servicio/Servicio_url/AdaptadorGsonBase64.java
  inflating: Servicio/Servicio_url/Error.java
  inflating: Servicio/Servicio_url/Servicio.java
  inflating: Servicio/Servicio_url/Usuario.java
  creating: Servicio/WEB-INF/
  creating: Servicio/WEB-INF/classes/
  creating: Servicio/WEB-INF/classes/servicio_json/
  creating: Servicio/WEB-INF/classes/servicio_url/
  inflating: Servicio/WEB-INF/classes/servicio_url/AdaptadorGsonBase64.class
  inflating: Servicio/WEB-INF/classes/servicio_url/Error.class
  inflating: Servicio/WEB-INF/classes/servicio_url/Servicio.class
  inflating: Servicio/WEB-INF/classes/servicio_url/Usuario.class
  inflating: Servicio/WEB-INF/web.xml
T2-2022630463@T2-2022630463 ~ %

```

Accedemos al directorio META-INF y comprobamos que existe el archivo context.xml

```

T2-2022630463@T2-2022630463 ~ % ls
Servicio apache-tomcat-8.5.99.zip jaxrs-ri mysql-connector-j-9.2.0 servicio.zip
apache-tomcat-8.5.99 gson-2.3.1.jar jaxrs-ri-2.24.zip mysql-connector-j-9.2.0.zip
T2-2022630463@T2-2022630463 ~ % cd servicio
-bash: cd: servicio: No such file or directory
T2-2022630463@T2-2022630463 ~ % cd Servicio
T2-2022630463@T2-2022630463 ~ % ls
META-INF Servicio.war WEB-INF compila_json.sh compila_url.sh servicio_json servicio_url
T2-2022630463@T2-2022630463 ~ % Servicio cd META-INF
T2-2022630463@T2-2022630463 ~ % Servicio/META-INF ls
context.xml
T2-2022630463@T2-2022630463 ~ % Servicio/META-INF %

```

Para modificar el archivo necesitamos instalar la paquetería de nano

```

T2-2022630463@T2-2022630 ~ % /Servicio/META-INF$ sudo apt install nano
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Suggested packages:
  hunspell
The following NEW packages will be installed:
  nano
0 upgraded, 1 newly installed, 0 to remove and 11 not upgraded.
Need to get 280 kB of archives.
After this operation, 881 kB of additional disk space will be used.
Get:1 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 nano amd64 6.2-lubuntu0.1 [280 kB]
Fetched 280 kB in 0s (9470 kB/s)
debconf: delaying package configuration, since apt-utils is not installed
Selecting previously unselected package nano.
(Reading database ... 49757 files and directories currently installed.)
Preparing to unpack .../nano_6.2-lubuntu0.1_amd64.deb ...
Unpacking nano (6.2-lubuntu0.1) ...
Setting up nano (6.2-lubuntu0.1) ...
update-alternatives: using /bin/nano to provide /usr/bin/editor (editor) in auto mode
update-alternatives: warning: skip creation of /usr/share/man/man1/editor.1.gz because associated file /usr/share/man/man1/nano.1.gz (of link group editor) doesn't exist
update-alternatives: using /bin/nano to provide /usr/bin/pico (pico) in auto mode
update-alternatives: warning: skip creation of /usr/share/man/man1/pico.1.gz because associated file /usr/share/man/man1/nano.1.gz (of link group pico) does not exist
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line 78.)
debconf: falling back to frontend: Readline
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

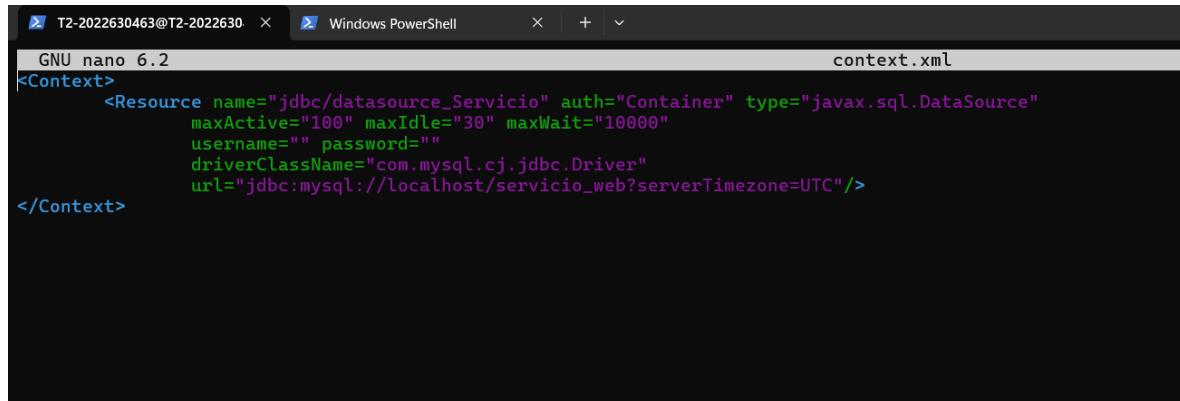
No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
T2-2022630463@T2-2022630463 ~ % Servicio/META-INF %

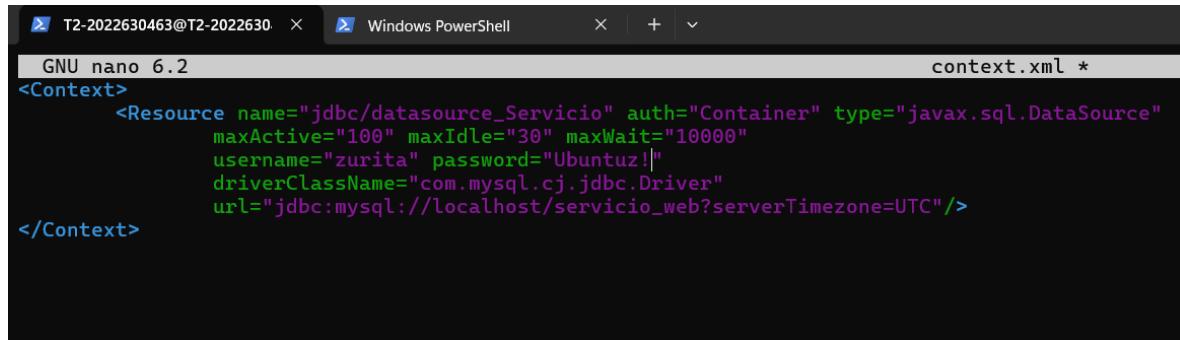
```

Con el comando **sudo nano context.xml** accedemos al contenido del archivo y aquí ya se puede modificar.



```
GNU nano 6.2                                     context.xml
<Context>
    <Resource name="jdbc/datasource_Servicio" auth="Container" type="javax.sql.DataSource"
        maxActive="100" maxIdle="30" maxWait="10000"
        username="" password=""
        driverClassName="com.mysql.cj.jdbc.Driver"
        url="jdbc:mysql://localhost/servicio_web?serverTimezone=UTC"/>
</Context>
```

En **username** y **password** ponemos el usuario y contraseña configurados anteriormente.



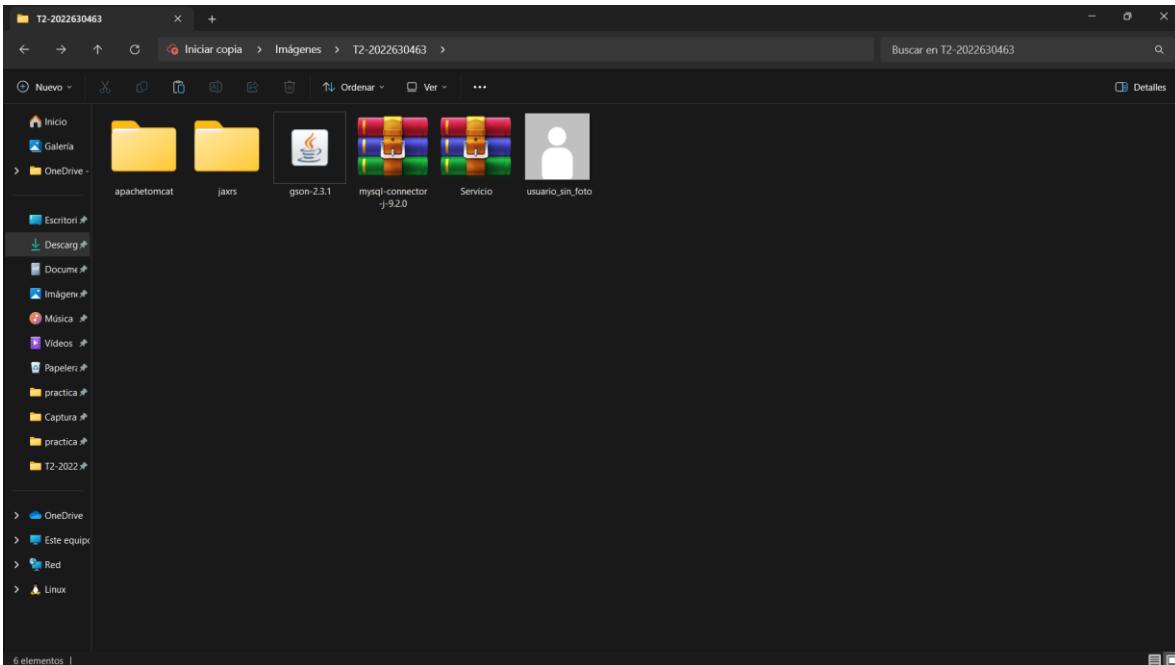
```
GNU nano 6.2                                     context.xml *
<Context>
    <Resource name="jdbc/datasource_Servicio" auth="Container" type="javax.sql.DataSource"
        maxActive="100" maxIdle="30" maxWait="10000"
        username="zurita" password="Ubuntuz!@"
        driverClassName="com.mysql.cj.jdbc.Driver"
        url="jdbc:mysql://localhost/servicio_web?serverTimezone=UTC"/>
</Context>
```

Y pulsando **ctrl+o** o guardamos el contenido modificado.

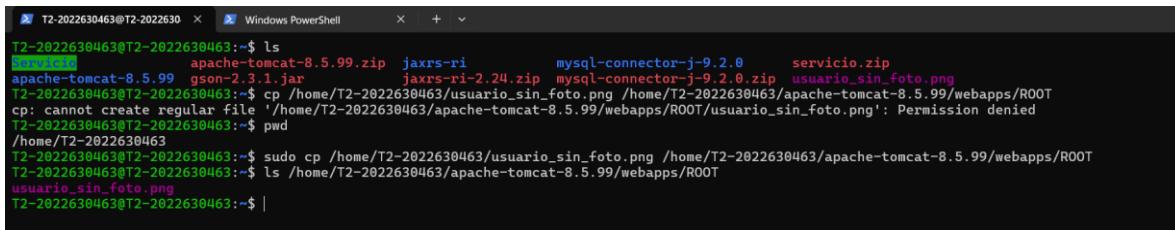
Y salimos del archivo con **ctrl+x**

Publicar el cliente en tomcat

1. Copiar el archivo usuario_sin_foto.png al subdirectorio webapps/ROOT de Tomcat.

A screenshot of a Windows PowerShell window titled 'Windows PowerShell'. The command 'scp C:\Users\Emmanuel\Pictures\T2-2022630463\usuario_sin_foto.png T2-2022630463@13.91.86.51:/home/T2-2022630463' is being typed. The progress bar shows '100% 1662 16.4KB/s 00:00'. The prompt 'PS C:\Users\Emmanuel>' is visible at the bottom.A screenshot of a Linux terminal window titled 'Windows PowerShell'. The command 'ls' is run, showing the contents of the directory: 'apache-tomcat-8.5.99.zip', 'jaxrs-ri', 'mysql-connector-j-9.2.0', 'servicio.zip', 'apache-tomcat-8.5.99', 'gson-2.3.1.jar', 'jaxrs-ri-2.24.zip', 'mysql-connector-j-9.2.0.zip', and 'usuario_sin_foto.png'. The prompt 'T2-2022630463@T2-2022630463:>' is visible at the bottom.

Copiamos la imagen a la carpeta webapps/root de tomcat.



```
T2-2022630463@T2-2022630463:~$ ls
apache-tomcat-8.5.99.zip  jaxrs-ri      mysql-connector-j-9.2.0      servicio.zip
apache-tomcat-8.5.99      gson-2.3.1.jar  jaxrs-ri-2.24.zip  mysql-connector-j-9.2.0.zip  usuario_sin_foto.png
T2-2022630463@T2-2022630463:~$ cp /home/T2-2022630463/usuario_sin_foto.png /home/T2-2022630463/apache-tomcat-8.5.99/webapps/ROOT
cp: cannot create regular file '/home/T2-2022630463/apache-tomcat-8.5.99/webapps/ROOT/usuario_sin_foto.png': Permission denied
T2-2022630463@T2-2022630463:~$ pwd
/home/T2-2022630463
T2-2022630463@T2-2022630463:~$ sudo cp /home/T2-2022630463/usuario_sin_foto.png /home/T2-2022630463/apache-tomcat-8.5.99/webapps/ROOT
T2-2022630463@T2-2022630463:~$ ls /home/T2-2022630463/apache-tomcat-8.5.99/webapps/ROOT
usuario.sin.foto.png
T2-2022630463@T2-2022630463:~$ |
```

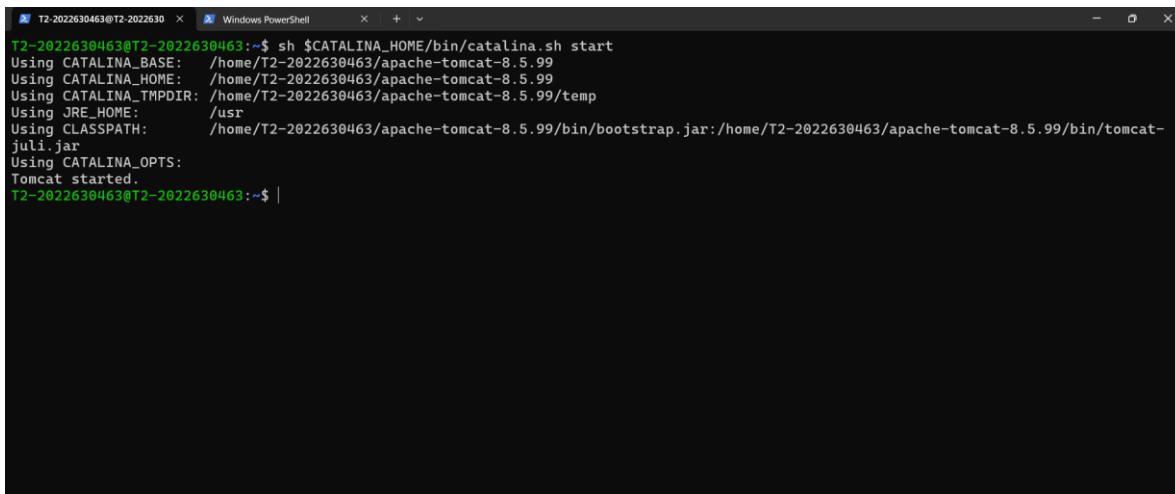
Nota. Todos los archivos que se encuentran en el directorio webapps/ROOT de Tomcat son accesibles públicamente.

Para poder ejecutarlo correctamente agregando a la parte del comando de cp, la parte de comando sudo, debido a que no tiene permisos

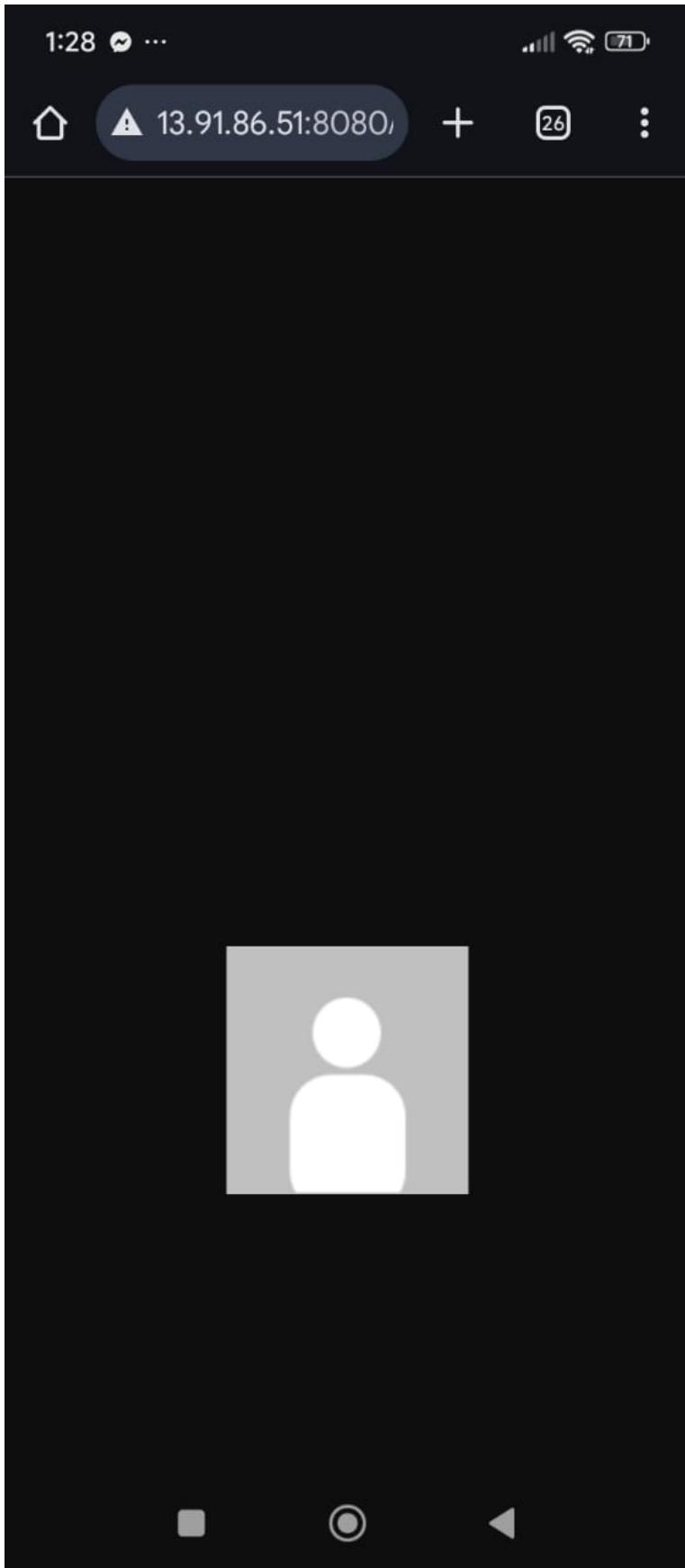
Para probar que Tomcat esté en línea y el puerto 8080 esté abierto, ingresar la siguiente URL en un navegador:

http://ip-de-la-máquina-virtual:8080/usuario_sin_foto.png

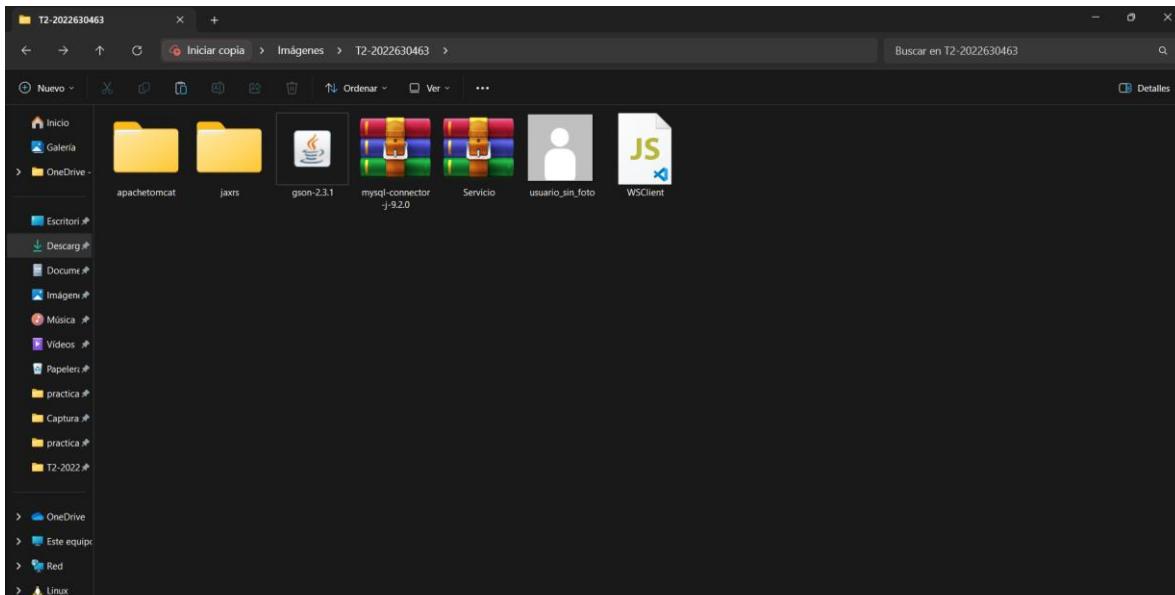
Primero debemos iniciar el servidor de tomcat.



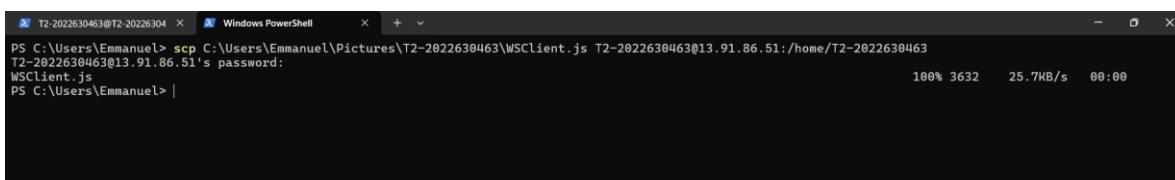
```
T2-2022630463@T2-2022630463:~$ sh $CATALINA_HOME/bin/catalina.sh start
Using CATALINA_BASE:  /home/T2-2022630463/apache-tomcat-8.5.99
Using CATALINA_HOME:   /home/T2-2022630463/apache-tomcat-8.5.99
Using CATALINA_TMPDIR: /home/T2-2022630463/apache-tomcat-8.5.99/temp
Using JRE_HOME:        /usr
Using CLASSPATH:       /home/T2-2022630463/apache-tomcat-8.5.99/bin/bootstrap.jar:/home/T2-2022630463/apache-tomcat-8.5.99/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
T2-2022630463@T2-2022630463:~$ |
```



2. Copiar el archivo WSClient.js al directorio webapps/ROOT de Tomcat.

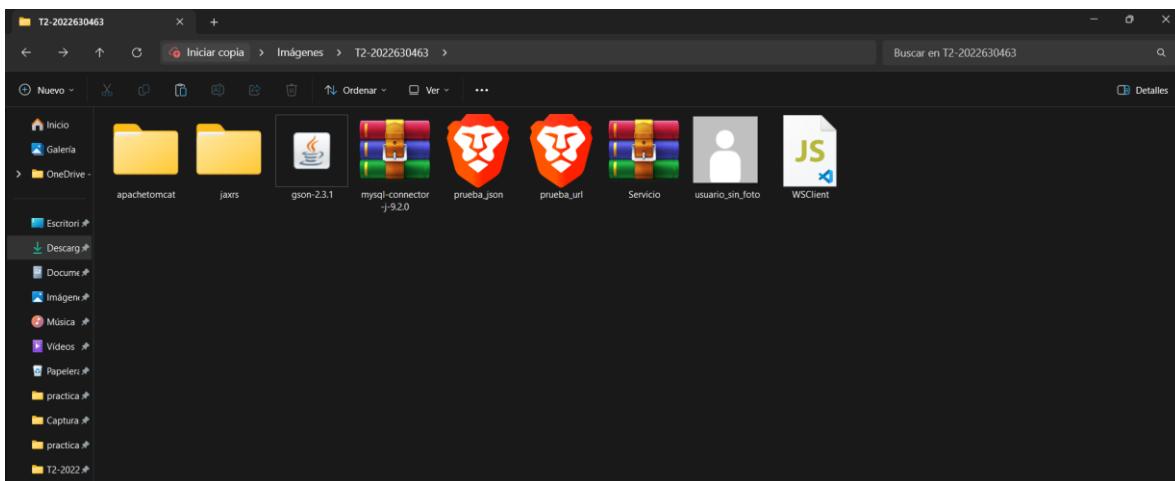


```
PS C:\Users\Emmanuel> scp C:\Users\Emmanuel\Pictures\T2-2022630463\WSClient.js T2-2022630463@13.91.86.51:/home/T2-2022630463
T2-2022630463@13.91.86.51's password:
WSClient.js
PS C:\Users\Emmanuel>
```



```
T2-2022630463@T2-2022630463:~$ ls
servicio apache-tomcat-8.5.99 gson-2.3.1.jar jaxrs-ri-2.24.zip mysql-connector-j-9.2.0.zip usuario_sin_foto.png
WSClient.js apache-tomcat-8.5.99.zip jaxrs-ri mysql-connector-j-9.2.0 servicio.zip
T2-2022630463@T2-2022630463:~$ sudo cp /home/T2-2022630463/WSClient.js /home/T2-2022630463/apache-tomcat-8.5.99/webapps/ROOT
T2-2022630463@T2-2022630463:~$ ls
servicio apache-tomcat-8.5.99 gson-2.3.1.jar jaxrs-ri-2.24.zip mysql-connector-j-9.2.0.zip usuario_sin_foto.png
WSClient.js apache-tomcat-8.5.99.zip jaxrs-ri mysql-connector-j-9.2.0 servicio.zip
T2-2022630463@T2-2022630463:~$ ls /home/T2-2022630463/apache-tomcat-8.5.99/webapps/ROOT
WSClient.js usuario_sin_foto.png
T2-2022630463@T2-2022630463:~$
```

3. Copiar los archivos prueba_json.html y prueba_url.html al directorio webapps/ROOT de Tomcat.



```

T2-2022630463@T2-2022630463 ~ % Windows PowerShell
PS C:\Users\Emmanuel> scp C:\Users\Emmanuel\Pictures\T2-2022630463\prueba_json.html T2-2022630463@13.91.86.51:/home/T2-2022630463
T2-2022630463@13.91.86.51's password:
prueba_json.html
PS C:\Users\Emmanuel> scp C:\Users\Emmanuel\Pictures\T2-2022630463\prueba_url.html T2-2022630463@13.91.86.51:/home/T2-2022630463
T2-2022630463@13.91.86.51's password:
prueba_url.html
PS C:\Users\Emmanuel>

```

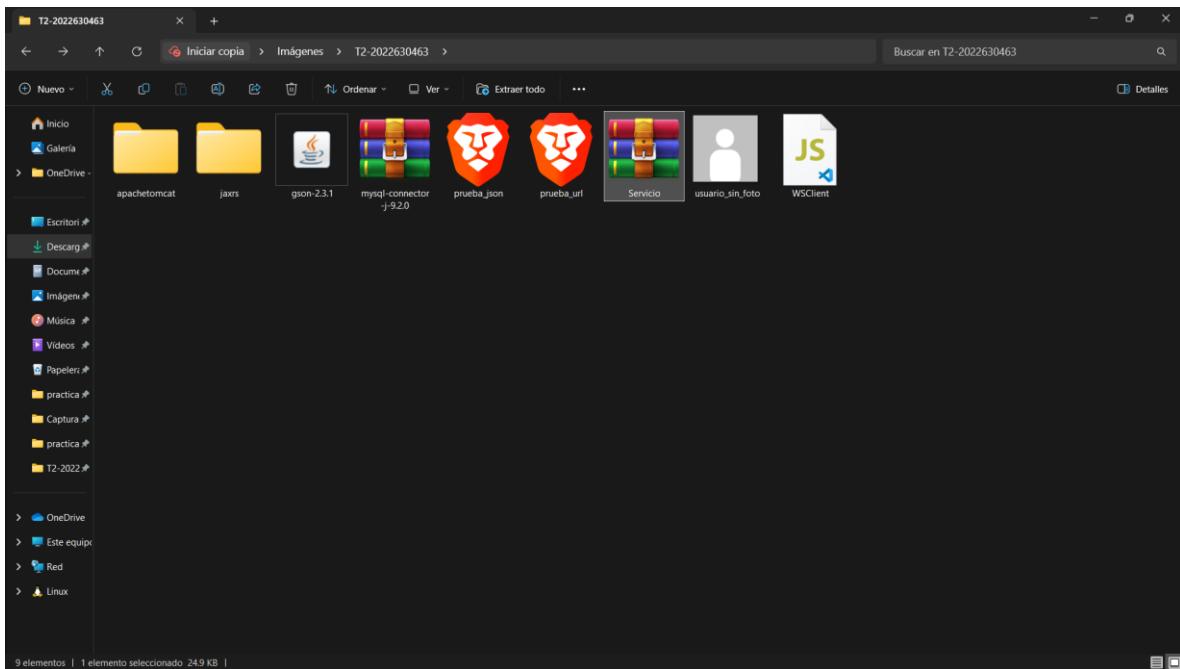
```

T2-2022630463@T2-2022630463 ~ % Windows PowerShell
T2-2022630463@T2-2022630463:~$ ls
servicio           apache-tomcat-8.5.99.zip  jaxrs-ri-2.24.zip          prueba_json.html  usuario_sin_foto.png
WSClient.js        gson-2.3.1.jar            mysql-connector-j-9.2.0    prueba_url.html
apache-tomcat-8.5.99  jaxrs-ri              mysql-connector-j-9.2.0.zip  servicio.zip
T2-2022630463@T2-2022630463:~$ sudo cp /home/T2-2022630463/prueba_json.html /home/T2-2022630463/prueba_url.html /home/T2-2022630463/apache-tomcat-8.5.99/webapps/ROOT
T2-2022630463@T2-2022630463:~$ ls /home/T2-2022630463/apache-tomcat-8.5.99/webapps/ROOT
WSClient.js  prueba_json.html  prueba_url.html  usuario_sin_foto.png
T2-2022630463@T2-2022630463:~$ 

```

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

1. Descargar de la plataforma y desempacar el archivo Servicio.zip



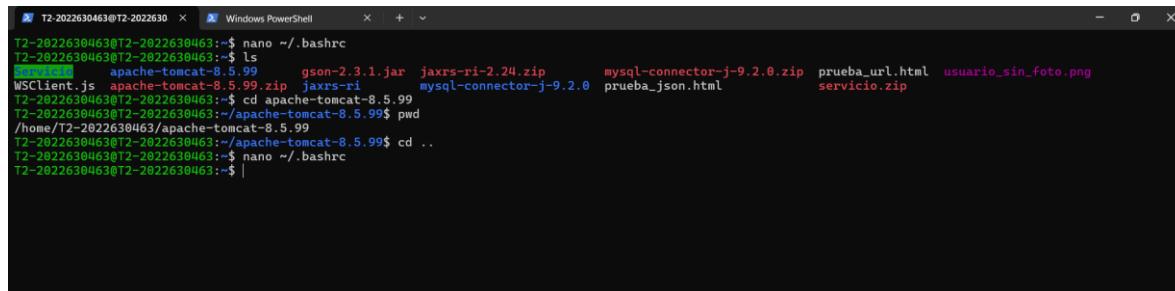
```

T2-2022630463@T2-2022630463 ~ % Windows PowerShell
PS C:\Users\Emmanuel> scp C:\Users\Emmanuel\Pictures\T2-2022630463\servicio.zip T2-2022630463@13.91.86.51:/home/T2-2022630463
T2-2022630463@13.91.86.51's password:
Permission denied, please try again.
T2-2022630463@13.91.86.51's password:
servicio.zip
PS C:\Users\Emmanuel>

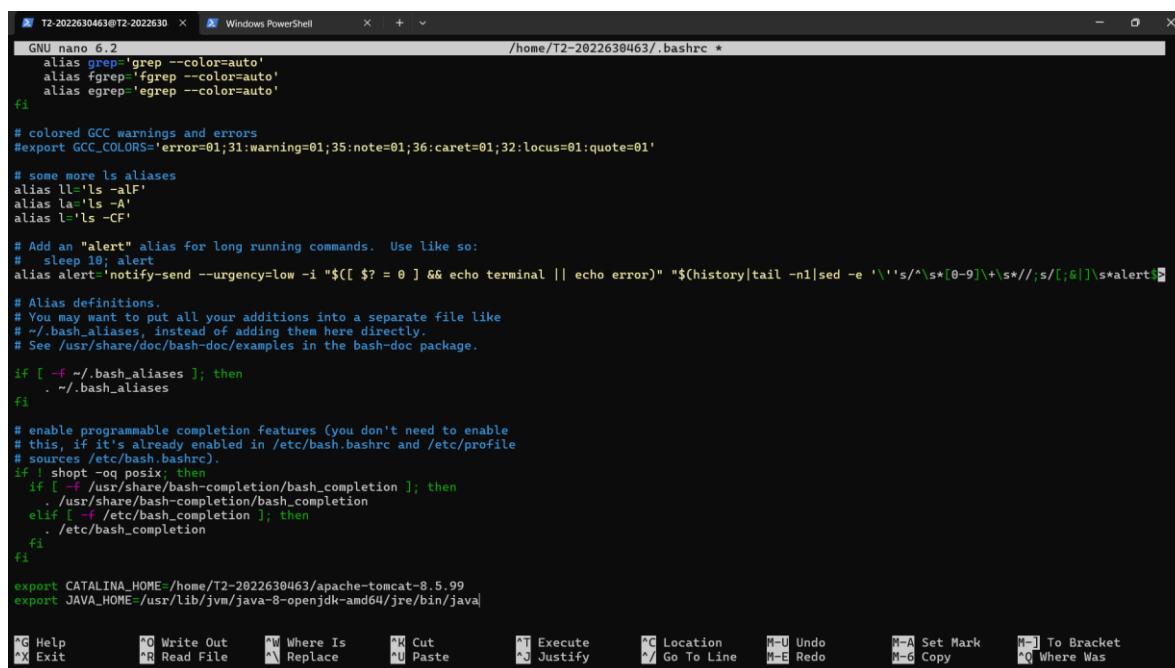
```

2. Definir la variable de ambiente CATALINA_HOME:

Accedemos a nano ~/.bashrc para agregar al final del archivo las nuevas variables de entorno.



```
T2-2022630463@T2-2022630:~$ nano ~/.bashrc
T2-2022630463@T2-2022630:~$ ls
servicio apache-tomcat-8.5.99 gson-2.3.1.jar jaxrs-ri-2.24.zip mysql-connector-j-9.2.0.zip prueba_url.html usuario_sin_foto.png
WSClient.js apache-tomcat-8.5.99.zip jaxrs-ri mysql-connector-j-9.2.0 prueba_json.html servicio.zip
T2-2022630463@T2-2022630:~$ cd apache-tomcat-8.5.99
T2-2022630463@T2-2022630:~/apache-tomcat-8.5.99$ pwd
/home/T2-2022630463/apache-tomcat-8.5.99
T2-2022630463@T2-2022630:~/apache-tomcat-8.5.99$ cd ..
T2-2022630463@T2-2022630:~$ nano ~/.bashrc
T2-2022630463@T2-2022630:~$ |
```



```
GNU nano 6.2 /home/T2-2022630463/.bashrc *
alias grep='grep --color=auto'
alias fgrep='fgrep --color=auto'
alias egrep='egrep --color=auto'
+f

# colored GCC warnings and errors
#export GCC_COLORS='error=01;31:warning=01;35:note=01;36:caret=01;32:locus=01:quote=01'

# some more ls aliases
alias ll='ls -alF'
alias la='ls -A'
alias l="ls -CF"

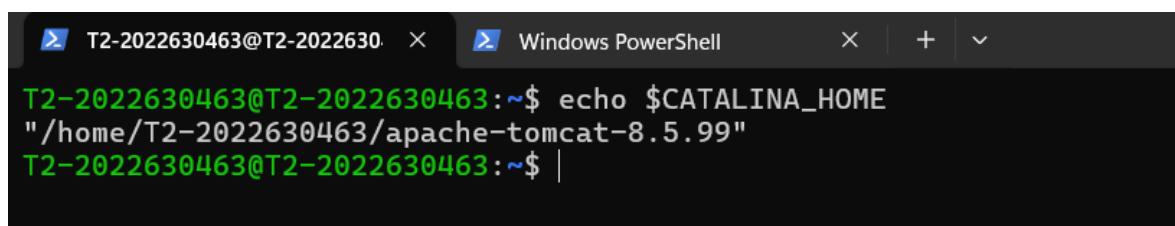
# Add an "alert" alias for long running commands.  Use like so:
#   sleep 10; alert
alias alert="notify-send --urgency=low -i "$( [ $? = 0 ] && echo terminal || echo error)" "$(history|tail -n1|sed -e '\''$'\''\s*\([0-9]\)\+\$'//;s/\[\&\]\)\$*alert$'""

# Alias definitions.
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.
if [ -f ~/.bash_aliases ]; then
  . ~/.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if ! shopt -q posix; then
  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
fi

export CATALINA_HOME=/home/T2-2022630463/apache-tomcat-8.5.99
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java

^G Help      ^O Write Out    ^W Where Is     ^X Cut        ^T Execute    ^C Location    M-U Undo    M-A Set Mark    M-J To Bracket
^X Exit      ^R Read File    ^W Replace     ^U Paste      ^D Justify    ^L Go To Line  M-E Redo    M-G Copy      M-Q Where Was
```



```
T2-2022630463@T2-2022630:~$ echo $CATALINA_HOME
"/home/T2-2022630463/apache-tomcat-8.5.99"
T2-2022630463@T2-2022630463:~$ |
```

3. Cambiar al directorio donde se encuentran los directorios "servicio_url" y "servicio_json".

```
T2-2022630463@T2-2022630463:~$ echo $CATALINA_HOME  
/home/T2-2022630463/apache-tomcat-8.5.99  
T2-2022630463@T2-2022630463:~$ ls  
servicio apache-tomcat-8.5.99.zip jaxrs-ri-2.24.zip prueba_json.html usuario_sin_foto.png  
WSClient.js gson-2.3.1.jar mysql-connector-j-9.2.0 prueba_url.html  
apache-tomcat-8.5.99 jaxrs-ri mysql-connector-j-9.2.0.zip servicio.zip  
T2-2022630463@T2-2022630463:~$ cd Servicio  
T2-2022630463@T2-2022630463:~/Servicio$ ls  
META-INF Servicio.war WEB-INF compila_json.sh compila_url.sh servicio_json servicio_url  
T2-2022630463@T2-2022630463:~/Servicio$ |
```

4. Compilar el servicio web:

```
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
```

```
T2-2022630463@T2-2022630463:~$ echo $CATALINA_HOME  
/home/T2-2022630463/apache-tomcat-8.5.99  
T2-2022630463@T2-2022630463:~$ ls  
servicio apache-tomcat-8.5.99.zip jaxrs-ri-2.24.zip prueba_json.html usuario_sin_foto.png  
WSClient.js gson-2.3.1.jar mysql-connector-j-9.2.0 prueba_url.html  
apache-tomcat-8.5.99 jaxrs-ri mysql-connector-j-9.2.0.zip servicio.zip  
T2-2022630463@T2-2022630463:~$ cd Servicio  
T2-2022630463@T2-2022630463:~/Servicio$ ls  
META-INF Servicio.war WEB-INF compila_json.sh compila_url.sh servicio_json servicio_url  
T2-2022630463@T2-2022630463:~/Servicio$ javac -cp $CATALINA_HOME/lib/javax.ws.rs-api-2.0.1.jar:$CATALINA_HOME/lib/gson-2.3.1.jar:. ser  
vicio_url/Servicio.java  
T2-2022630463@T2-2022630463:~/Servicio$ |
```

5. Crear el archivo Servicio.war:

```
rm WEB-INF/classes/servicio_url/*  
rm WEB-INF/classes/servicio_json/*  
cp servicio_url/*.class WEB-INF/classes/servicio_url/.  
jar cvf Servicio.war WEB-INF META-INF
```

```
T2-2022630463@T2-2022630 x Windows PowerShell x + - 
T2-2022630463@T2-2022630463:~/Servicio$ 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
T2-2022630463@T2-2022630463:~/Servicio$ rm WEB-INF/classes/servicio_url/*
T2-2022630463@T2-2022630463:~/Servicio$ rm WEB-INF/classes/servicio_json/*
rm: cannot remove 'WEB-INF/classes/servicio_json/*': No such file or directory
T2-2022630463@T2-2022630463:~/Servicio$ ls
[hidden] Servicio.war [hidden] compila_json.sh compila_url.sh servicio_json servicio_url
T2-2022630463@T2-2022630463:~/Servicio$ cd WEB-INF
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF$ ls
-bash: LS: command not found
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF$ ls
web.xml
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF$ cd classes
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF/classes$ ls
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF/classes$ rm /servicio_json/*
rm: cannot remove '/servicio_json/*': No such file or directory
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF/classes$ cd servicio_json
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF/classes/servicio_json$ ls
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF/classes/servicio_json$ cd ..
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF/classes$ cd ..
T2-2022630463@T2-2022630463:~/Servicio/WEB-INF$ cd ..
T2-2022630463@T2-2022630463:~/Servicio$ cp servicio_url/*.class WEB-INF/classes/servicio_url/
T2-2022630463@T2-2022630463:~/Servicio$ jar cvf Servicio.war WEB-INF META-INF
added manifest
adding: WEB-INF/(in = 0) (out= 0)(stored 0%)
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/AdaptadorJsonBase64.class(in = 1804) (out= 741)(deflated 58%)
adding: WEB-INF/classes/servicio_url/Servicio.class(in = 831) (out= 3864)(deflated 53%)
adding: WEB-INF/classes/servicio_url/Error.class(in = 283) (out= 219)(deflated 22%)
adding: WEB-INF/classes/servicio_url/User.class(in = 1070) (out= 664)(deflated 43%)
adding: WEB-INF/classes/servicio_json/(in = 0)(stored 0%)
adding: WEB-INF/web.xml(in = 656) (out= 294)(deflated 55%)
ignoring entry META-INF/
adding: META-INF/context.xml(in = 292) (out= 208)(deflated 28%)
T2-2022630463@T2-2022630463:~/Servicio$ |
```

6. Para remover (undeploy) y desplegar (deploy) el servicio web, se deberá eliminar el archivo Servicio.war y el directorio Servicio (en este orden), y luego copiar el archivo Servicio.war al directorio webapps de Tomcat:

```
rm -rf $CATALINA_HOME/webapps/Servicio.war $CATALINA_HOME/webapps/Servicio
cp Servicio.war $CATALINA_HOME/webapps/.
```

```
T2-2022630463@T2-2022630463:~/Servicio$ rm -rf $CATALINA_HOME/webapps/Servicio.war $CATALINA_HOME/webapps/Servicio
T2-2022630463@T2-2022630463:~/Servicio$ cp Servicio.war $CATALINA_HOME/webapps/
cp: cannot create regular file '/home/T2-2022630463/apache-tomcat-8.5.99/webapps/Servicio.war': Permission denied
T2-2022630463@T2-2022630463:~/Servicio$ sudo cp Servicio.war $CATALINA_HOME/webapps/
```

El comando cp se debe de ejecutar con sudo ya que de lo contrario te bloquea los permisos.

7. Utilizando un teléfono inteligente o una tableta, ingresar la siguiente URL en un navegador:

http://ip-de-la-máquina-virtual:8080/prueba_url.html

```
T2-2022630463@T2-2022630 X Windows PowerShell X + v
T2-2022630463@T2-2022630463:~/Servicio$ sh $CATALINA_HOME/bin/catalina.sh start
Using CATALINA_BASE: /home/T2-2022630463/apache-tomcat-8.5.99
Using CATALINA_HOME: /home/T2-2022630463/apache-tomcat-8.5.99
Using CATALINA_TMPDIR: /home/T2-2022630463/apache-tomcat-8.5.99/temp
Using JRE_HOME: /usr
Using CLASSPATH: /home/T2-2022630463/apache-tomcat-8.5.99/bin/bootstrap.jar:/home/T2-2022630463/apache-tomcat-8.5.99/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started!
T2-2022630463@T2-2022630463:~/Servicio$ |
```



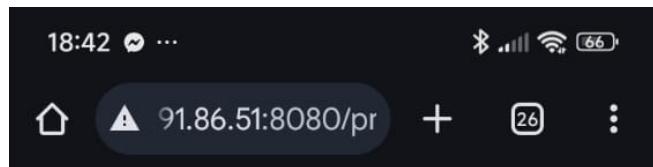
Alta usuario
Consulta usuario
Borra usuario

Probar el servicio web utilizando el cliente HTML-Javascript

1. Utilizando un teléfono inteligente o una tableta, ingresar la siguiente URL en un navegador:



2. Dar clic en el botón “Alta usuario” para dar de alta un nuevo usuario. Capturar los campos y dar clic en el botón “Alta”,



Alta de usuario

Email *

prueba@gmail.com

Nombre *

Aaaaaa

Apellido paterno *

Sjsjsjdn

Apellido materno

Dijjsjdjsn

Fecha de nacimiento *

12/03/2025, 6:42 p.m.

Teléfono

5533669955

Género

Masculino



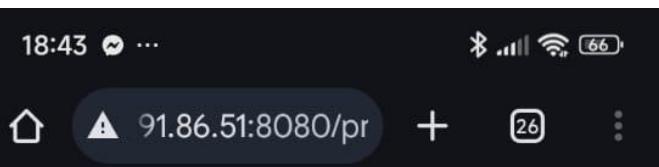
Elegir archivos

Sin archivos seleccionados

Agregar usuario

Limpiar pantalla

Regresar



Alta de usuario

Email *

prueba@gmail.com

Nombre *

Aaaaaa

Apellido paterno *

Sjsjsjdn

Apellido materno

Dijjsjdjsn

13.91.86.51:8080 dice

OK

Aceptar



Elegir archivos

Sin archivos seleccionados

Agregar usuario

Limpiar pantalla

Regresar

3. Intentar dar de alta otro usuario con el mismo email (se deberá mostrar una ventana de error indicando que el email ya existe).

The image consists of two side-by-side screenshots of a mobile application interface. Both screenshots show the same 'Alta de usuario' (User Creation) screen.

Left Screenshot (Successful Submission):

- At the top, there are two status bars showing the time as 18:46, signal strength, and battery level.
- The main screen has a title 'Alta de usuario'.
- Form fields:
 - Email *: prueba@gmail.com
 - Nombre *: Eeeee
 - Apellido paterno *: Dndndn
 - Apellido materno: Pppsjjsj
 - Fecha de nacimiento *: 05/08/2024, 6:42 p.m.
 - Teléfono: 5534316123
 - Género: Femenino
- A placeholder profile picture icon is shown.
- Buttons at the bottom:
 - Elegir archivos: Sin archivos seleccionados
 - Agregar usuario
 - Limpiar pantalla
 - Regresar

Right Screenshot (Error Message):

- The screen is dimmed, indicating an error.
- A dark overlay box contains the error message:

```
{"message": "Duplicate entry 'prueba@gmail.com' for key 'usuarios.usuarios_1'"}
```
- An 'Aceptar' (Accept) button is visible in the bottom right corner of the error box.
- The bottom buttons are identical to the left screenshot:
 - Elegir archivos: Sin archivos seleccionados
 - Agregar usuario
 - Limpiar pantalla
 - Regresar

4. Dar clic en el botón “Consulta usuario” para consultar el usuario dado de alta en el paso 2. Capturar el email y dar clic en el botón “Consulta”.

18:48 91.86.51:8080/pr 18:48 91.86.51:8080/pr

Consulta usuario

Email *

Buscar usuario

Regresar

Modifica usuario

Email *

Nombre *

Apellido paterno *

Apellido materno

Fecha de nacimiento *

Teléfono

Género



Elegir archivos Sin archivos seleccionados

Quitar foto

Guardar cambios

Regresar

5. Modificar algún dato del usuario y dar clic en el botón “Modifica”.

18:51 91.86.51:8080/pr 18:51 91.86.51:8080/pr

Modifica usuario

Email *

Nombre *

Apellido paterno *

Apellido materno

Fecha de nacimiento *

6. Recargar la página actual y consultar el usuario modificado, para verificar que la modificación se realizó.

The image consists of two side-by-side screenshots of a mobile application interface, likely from an Android device, demonstrating a user modification process.

Screenshot 1: Consulta usuario

- Top status bar: 18:53, signal strength, battery level 65%.
- Address bar: 13.91.86.51:8080/
- Content:
 - Email *: prueba@gmail.com
 - Buttons: Buscar usuario, Regresar

Screenshot 2: Modifica usuario

- Top status bar: 18:53, signal strength, battery level 65%.
- Address bar: 91.86.51:8080/pr
- Content:
 - Email *: prueba@gmail.com
 - Text input: Nombre *: Aaaaaaa
 - Text input: Apellido paterno *: Sjsjsjdn
 - Text input: Apellido materno: Djjsjdjsn
 - Date input: Fecha de nacimiento *: 12/03/2025, 6:42 p.m.
 - Text input: Teléfono: 5555555555
 - Text input: Genero: Femenino
 - Image placeholder: Placeholder for user photo, showing a generic person icon.
 - Buttons: Elegir archivos (Select files), Sin archivos seleccionados (No files selected), Quitar foto (Remove photo)
 - Buttons: Guardar cambios (Save changes), Regresar (Back)

7. Dar clic en el botón “Borra usuario” para borrar el usuario. Capturar el email del usuario borrado y dar clic en el botón “Consulta”.

18:55

18:55

18:55

18:55



▲ 13.91.86.51:8080/



26



▲ 13.91.86.51:8080/



26



Borra usuario

Email *

prueba@gmail.com

Borrar usuario

Regresar

Borra usuario

Email *

prueba@gmail.com

Borrar usuario

Regresar

13.91.86.51:8080 dice

OK

Aceptar



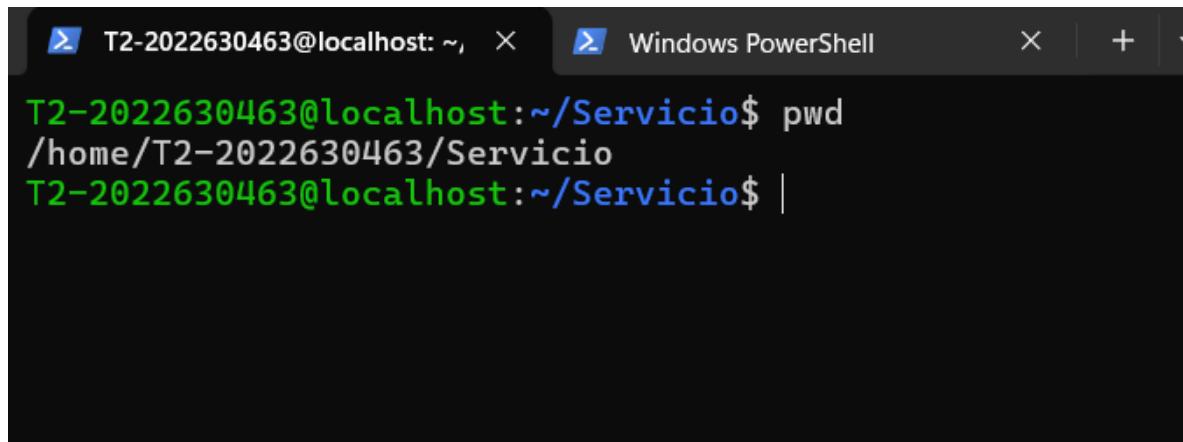
Compilar, empacar y desplegar el servicio web(versión JSON)

1. Remover (undeploy) el servicio web anterior.

```
rm -rf $CATALINA_HOME/webapps/Servicio.war $CATALINA_HOME/webapps/Servicio  
cp Servicio.war $CATALINA_HOME/webapps/
```

```
T2-2022630463@localhost:~/Servicio$ sudo rm -rf $CATALINA_HOME/webapps/Servicio.war $CATALINA_HOME/webapps/Servicio  
T2-2022630463@localhost:~/Servicio$ sudo cp Servicio.war $CATALINA_HOME/webapps/  
T2-2022630463@localhost:~/Servicio$ |
```

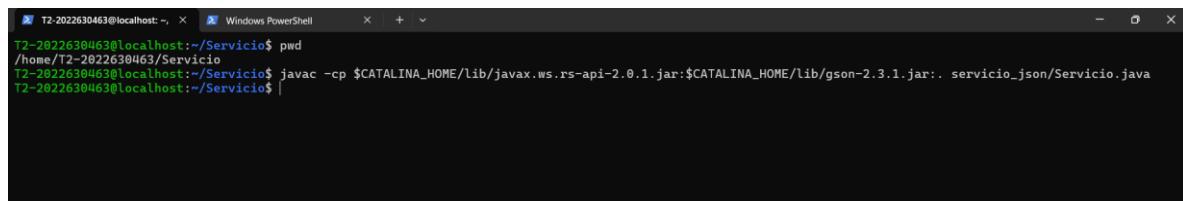
2. Cambiar al directorio donde se encuentran los directorios "servicio_url" y "servicio_json".



```
T2-2022630463@localhost:~/Servicio$ pwd  
/home/T2-2022630463/Servicio  
T2-2022630463@localhost:~/Servicio$ |
```

- 3.- Compilar la clase Servicio.java:

```
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
```



```
T2-2022630463@localhost:~,~ Windows PowerShell x + v  
T2-2022630463@localhost:~/Servicio$ pwd  
/home/T2-2022630463/Servicio  
T2-2022630463@localhost:~/Servicio$ 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  
T2-2022630463@localhost:~/Servicio$ |
```

4. Ejecutar los siguientes comandos para crear el servicio web para Tomcat (notar que los servicios web para Tomcat son archivos JAR con la extensión .war):

```
rm WEB-INF/classes/servicio_json/*  
rm WEB-INF/classes/servicio_url/*  
cp servicio_json/*.class WEB-INF/classes/servicio_json/.  
jar cvf Servicio.war WEB-INF META-INF
```

```
T2-2022630463@localhost: ~/Servicio$ rm WEB-INF/classes/servicio_json/*
rm: cannot remove 'WEB-INF/classes/servicio_json/*': No such file or directory
T2-2022630463@localhost: ~/Servicio$ rm WEB-INF/classes/servicio_url/*
T2-2022630463@localhost: ~/Servicio$ cp servicio_json/*.class WEB-INF/classes/servicio_json/
T2-2022630463@localhost: ~/Servicio$ jar cvf Servicio.war WEB-INF META-INF
added manifest
adding: WEB-INF/(in = 0) (out= 0)(stored 0%)
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/AdaptadorGsonBase64.class(in = 1805) (out= 741)(deflated 58%)
adding: WEB-INF/classes/servicio_json/Servicio.class(in = 8683) (out= 3999)(deflated 53%)
adding: WEB-INF/classes/servicio_json/Error.class(in = 284) (out= 220)(deflated 22%)
adding: WEB-INF/classes/servicio_json/ParamAltaUsuario.class(in = 264) (out= 198)(deflated 25%)
adding: WEB-INF/classes/servicio_json/ParamBorraUsuario.class(in = 259) (out= 206)(deflated 20%)
adding: WEB-INF/classes/servicio_json/ParamConsultaUsuario.class(in = 265) (out= 208)(deflated 21%)
adding: WEB-INF/classes/servicio_json/Usuario.class(in = 435) (out= 295)(deflated 32%)
adding: WEB-INF/classes/servicio_json/ParamModificaUsuario.class(in = 272) (out= 205)(deflated 24%)
adding: WEB-INF/web.xml(in = 656) (out= 294)(deflated 55%)
ignoring entry META-INF/
adding: META-INF/context.xml(in = 306) (out= 216)(deflated 29%)
T2-2022630463@localhost: ~/Servicio$ |
```

5. Para remover (undeploy) y desplegar (deploy) el servicio web, se deberá eliminar el archivo Servicio.war y el directorio Servicio (en este orden), y luego copiar el archivo Servicio.war al directorio webapps de Tomcat:

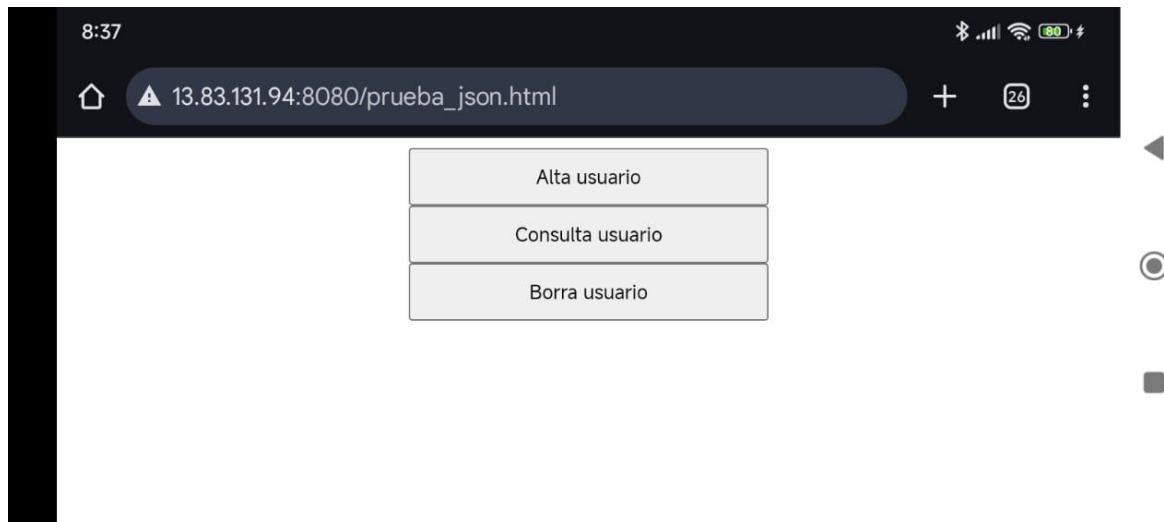
```
rm -rf $CATALINA_HOME/webapps/Servicio.war
$CATALINA_HOME/webapps/Servicio
cp Servicio.war $CATALINA_HOME/webapps/.
```

```
T2-2022630463@localhost: ~/Servicio$ rm -rf $CATALINA_HOME/webapps/Servicio.war $CATALINA_HOME/webapps/Servicio
T2-2022630463@localhost: ~/Servicio$ cp Servicio.war $CATALINA_HOME/webapps/.
cp: cannot create regular file '/home/T2-2022630463/apache-tomcat-8.5.99/webapps/./Servicio.war': Permission denied
T2-2022630463@localhost: ~/Servicio$ sudo cp Servicio.war $CATALINA_HOME/webapps/.
T2-2022630463@localhost: ~/Servicio$ |
```

Probar el servicio web utilizando el cliente JSON

1. Utilizando un teléfono inteligente o una tableta, ingresar la siguiente URL en un navegador:

http://ip-de-la-máquina-virtual:8080/prueba_json.html



2. Dar clic en el botón “Alta usuario” para dar de alta un nuevo usuario. Capturar los campos y dar clic en el botón “Alta”

8:45

8:45

8:45

8:45

Home ▲ 3.83.131.94:8080 + 26 □ ▪ Home ▲ 3.83.131.94:8080 + 26 □ ▪

Alta de usuario

Email *

prueba@gmail.com

Nombre *

Eeeee

Apellido paterno *

Msndmdk

Apellido materno

Ndndnd

Fecha de nacimiento *

13/03/2025, 8:45 a.m.

Teléfono

5588888858

Genero

Masculino



Elegir archivos

Sin archivos seleccionados

Agregar usuario

Limpiar pantalla

Regresar



Alta de usuario

Email *

prueba@gmail.com

Nombre *

Eeeee

Apellido paterno *

Msndmdk

Apellido materno

Ndndnd

13.83.131.94:8080 dice

OK

Aceptar

Elegir archivos

Sin archivos seleccionados

Agregar usuario

Limpiar pantalla

Regresar



3. Intentar dar de alta otro usuario con el mismo email (se deberá mostrar una ventana de error indicando que el email ya existe).

The image consists of two side-by-side screenshots of a mobile application interface, likely from an Android device, showing the process of creating a new user.

Left Screenshot (Successful User Creation):

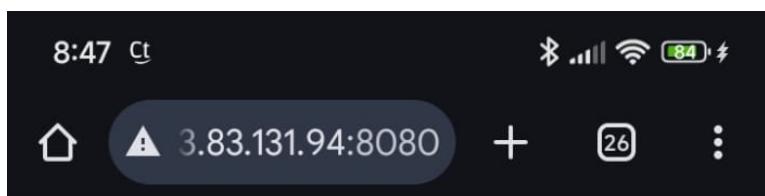
- Header:** Shows the time as 8:40 and various system icons (Wi-Fi, signal strength, battery level).
- Title:** "Alta de usuario".
- Form Fields (filled with placeholder text):**
 - Email *
 - prueba@gmail.com
 - Nombre *
 - Nensnds
 - Apellido paterno *
 - Ndndndkd
 - Apellido materno
 - Djndnd
 - Fecha de nacimiento *
 - 13/03/2025, 8:40 a.m.
 - Teléfono
 - 553333333
 - Género
 - Masculino
- Profile Placeholder:** A gray square placeholder icon with a white silhouette of a person.
- Buttons at the bottom:**
 - Elegir archivos
 - Sin archivos seleccionados
 - Agregar usuario
 - Limpiar pantalla
 - Regresar

Right Screenshot (Duplicate Email Error):

- Header:** "Alta de usuario".
- Form Fields (identical to the left screenshot):**
 - Email *
 - prueba@gmail.com
 - Nombre *
 - Nensnds
 - Apellido paterno *
 - Ndndndkd
 - Apellido materno
 - Djndnd
 - Fecha de nacimiento *
 - 13/03/2025, 8:40 a.m.
 - Teléfono
 - 553333333
 - Género
 - Masculino
- Message Box:** A dark overlay box containing the text:

```
13.83.131.94:8080 dice
{"message":"Duplicate entry
'prueba@gmail.com' for key
'usuarios.usuarios_1'"}
```
- Buttons at the bottom:**
 - Aceptar
 - Elegir archivos
 - Sin archivos seleccionados
 - Agregar usuario
 - Limpiar pantalla
 - Regresar

4. Dar clic en el botón “Consulta usuario” para consultar el usuario dado de alta en el paso 2. Capturar el email y dar clic en el botón “Consulta”.



Modifica usuario

Email *

prueba@gmail.com

Nombre *

Eeeee

Apellido paterno *

Msndmdk

Apellido materno

Ndndnd

Fecha de nacimiento *

13/03/2025, 8:45 a.m.



Teléfono

5588888858

Género

Masculino



Elegir archivos

Sin archivos seleccionados

Quitar foto

Guardar cambios

Regresar



5. Modificar algún dato del usuario y dar clic en el botón “Modifica”.

8:48 Ct

8:48 Ct

8:48 Ct

8:48 Ct



▲ 3.83.131.94:8080



26



▲ 3.83.131.94:8080



26



Modifica usuario

Email *

prueba@gmail.com

Nombre *

Eeeee

Apellido paterno *

Msndmdk

Apellido materno

Ndndnd

Fecha de nacimiento *

08/09/2018, 8:45 a.m.

Teléfono

5588888858

Genero

Femenino



Elegir archivos

Sin archivos seleccionados

Quitar foto

Guardar cambios

Regresar

Modifica usuario

Email *

prueba@gmail.com

Nombre *

Eeeee

Apellido paterno *

Msndmdk

Apellido materno

Ndndnd

13.83.131.94:8080 dice

OK

Aceptar

Elegir archivos

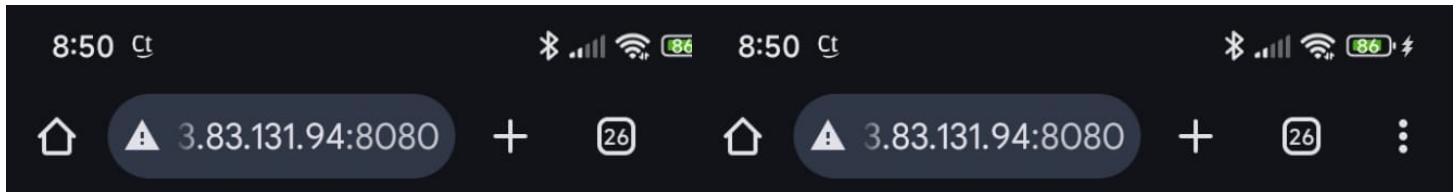
Sin archivos seleccionados

Quitar foto

Guardar cambios

Regresar

6. Recargar la página actual y consultar el usuario modificado, para verificar que la modificación se realizó.



Consulta usuario

Email *

prueba@gmail.com

Buscar usuario

Regresar

Modifica usuario

Email *

prueba@gmail.com

Nombre *

Eeeee

Apellido paterno *

Msndmdk

Apellido materno

Ndndnd

Fecha de nacimiento *

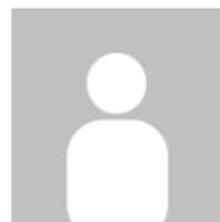
08/09/2018, 8:45 a.m.

Teléfono

5588888858

Genero

Femenino



Elegir archivos

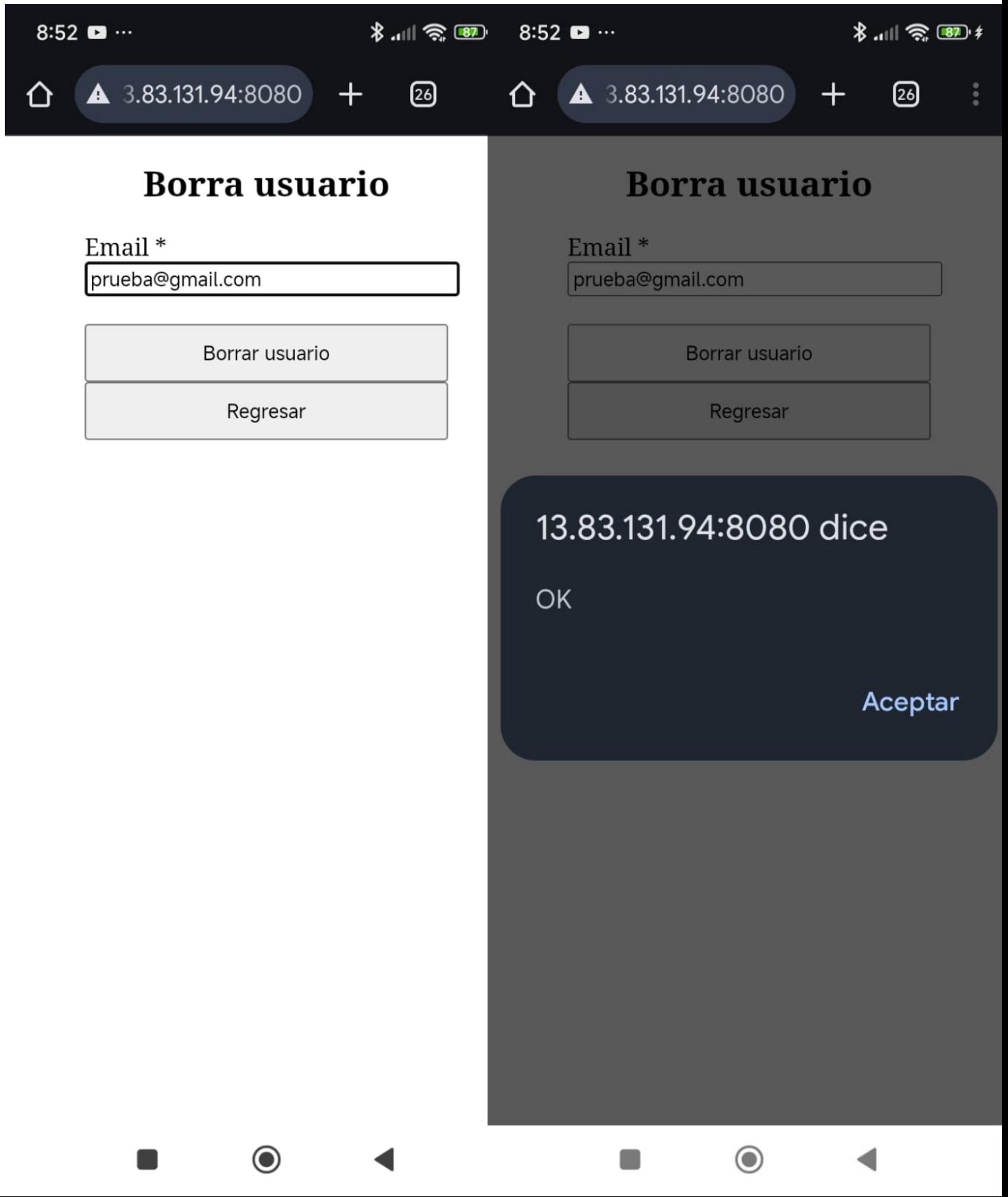
Sin archivos seleccionados

Quitar foto

Guardar cambios

Regresar

7. Dar clic en el botón “Borra usuario” para borrar el usuario. Capturar el email del usuario borrado y dar clic en el botón “Consulta”.

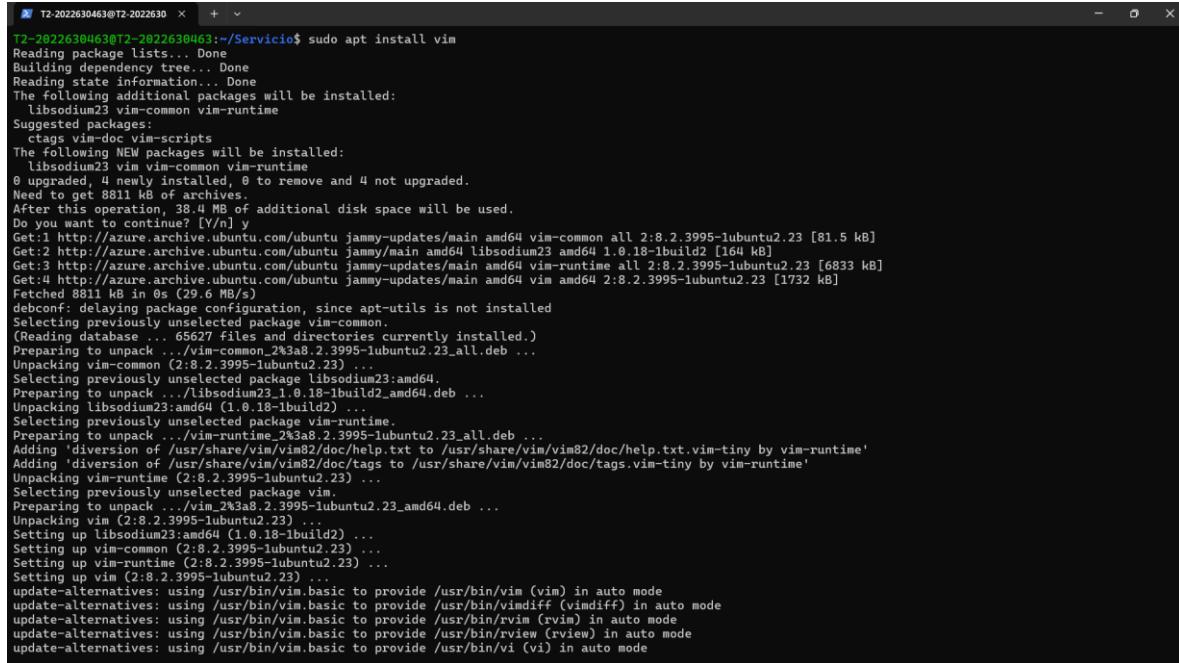


Iniciar Tomcat cuando encienda la máquina virtual

1. Crear el archivo /etc/rc.local ejecutando el siguiente comando:

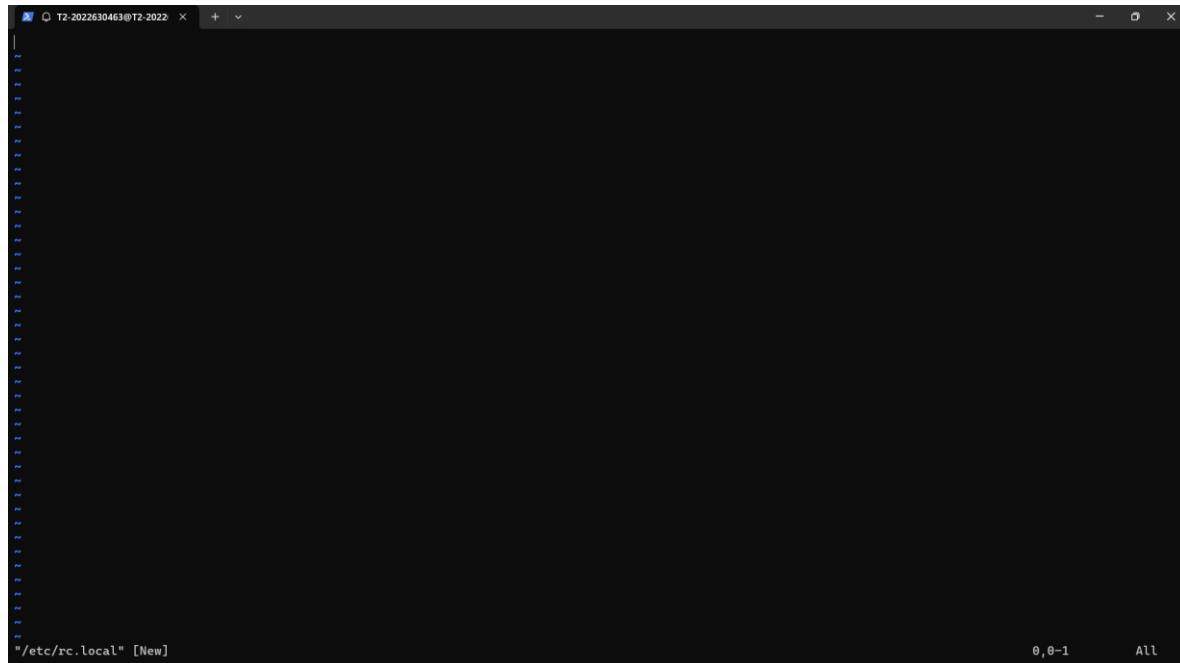
```
sudo vi /etc/rc.local
```

Instalación del comando vi



```
T2-2022630463@T2-2022630 X + ~
T2-2022630463@T2-2022630463:~$ sudo apt install vim
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libstdc++23 vim-common vim-runtime
Suggested packages:
  ctags vim-doc vim-scripts
The following NEW packages will be installed:
  libstdc++23 vim vim-common vim-runtime
0 upgraded, 4 newly installed, 0 to remove and 4 not upgraded.
Need to get 8811 kB of archives.
After this operation, 38.4 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 vim-common all 2:8.2.3995-1ubuntu2.23 [81.5 kB]
Get:2 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 libstdc++23 amd64 1:0.18-1build2 [164 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 vim-runtime all 2:8.2.3995-1ubuntu2.23 [6833 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 vim amd64 2:8.2.3995-1ubuntu2.23 [1732 kB]
Fetched 8811 kB in 0s (29.6 MB/s)
debconf: delaying package configuration, since apt-utils is not installed
Selecting previously unselected package vim-common.
(Reading database ... 65627 files and directories currently installed.)
Preparing to unpack .../vim-common_2%3a8.2.3995-1ubuntu2.23_all.deb ...
Unpacking vim-common (2:8.2.3995-1ubuntu2.23) ...
Selecting previously unselected package libstdc++23:amd64.
Preparing to unpack .../libstdc++23_1:0.18-1build2_amd64.deb ...
Unpacking libstdc++23:amd64 (1:0.18-1build2) ...
Selecting previously unselected package vim-runtime.
Preparing to unpack .../vim-runtime_2%3a8.2.3995-1ubuntu2.23_all.deb ...
Adding 'diversion of /usr/share/vim/vim82/doc/help.txt to /usr/share/vim/vim82/doc/help.txt.vim-tiny by vim-runtime'
Adding 'diversion of /usr/share/vim/vim82/doc/tags to /usr/share/vim/vim82/doc/tags.vim-tiny by vim-runtime'
Unpacking vim-runtime (2:8.2.3995-1ubuntu2.23) ...
Selecting previously unselected package vim.
Preparing to unpack .../vim_2%3a8.2.3995-1ubuntu2.23_amd64.deb ...
Unpacking vim (2:8.2.3995-1ubuntu2.23) ...
Setting up libstdc++23:amd64 (1:0.18-1build2) ...
Setting up vim-common (2:8.2.3995-1ubuntu2.23) ...
Setting up vim-runtime (2:8.2.3995-1ubuntu2.23) ...
Setting up vim (2:8.2.3995-1ubuntu2.23)
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/vim (vim) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/vimdiff (vimdiff) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/rvim (rvim) in auto mode
update-alternatives: using /usr/bin/rview (rview) in auto mode
update-alternatives: using /usr/bin/vi to provide /usr/bin/vi (vi) in auto mode
```

Al ejecutar el código sale esto:



```
"/etc/rc.local" [New]
|
```

2. Agregar al archivo lo siguiente:

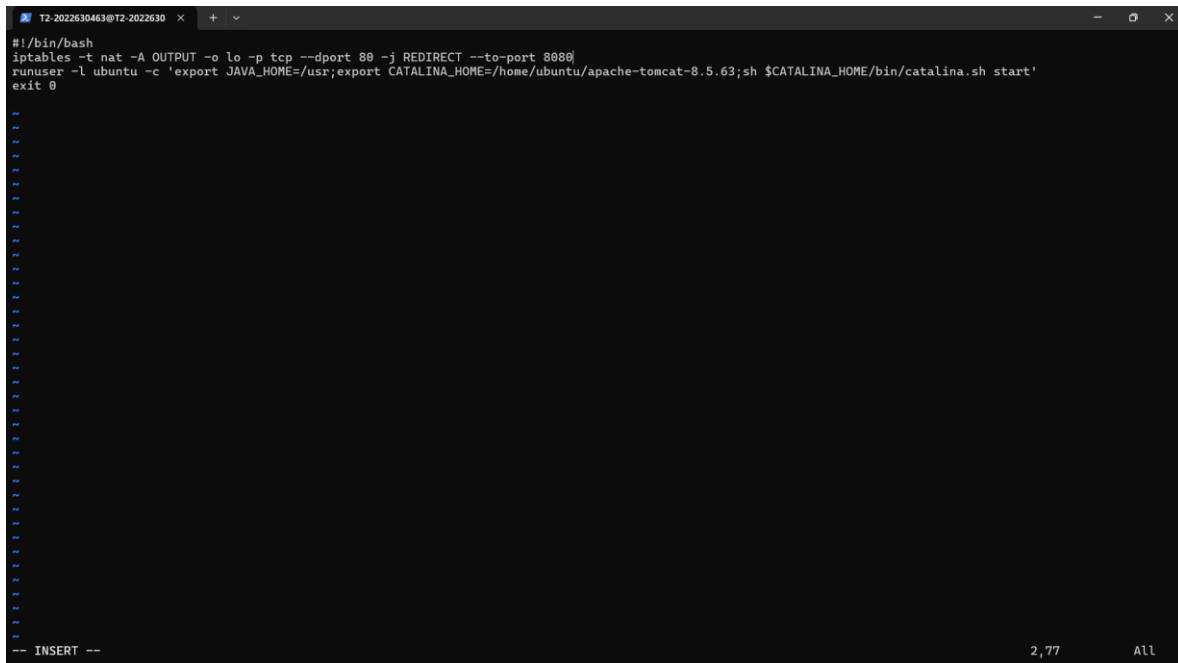
Pulsamos la tecla i para ingresar al modo inserción y poder agregar el siguiente código:

```
#!/bin/bash
```

```
iptables -t nat -A OUTPUT -o lo -p tcp --dport 80 -j REDIRECT --to-port 8080
```

```
runuser -l ubuntu -c 'export JAVA_HOME=/usr;export  
CATALINA_HOME=/home/ubuntu/apache-tomcat-8.5.63;sh  
$CATALINA_HOME/bin/catalina.sh start'
```

```
exit 0
```



The screenshot shows a terminal window titled "T2-2022630463@T2-2022630". The command history at the top of the window shows the following sequence of commands:

```
#!/bin/bash
iptables -t nat -A OUTPUT -o lo -p tcp --dport 80 -j REDIRECT --to-port 8080
runuser -l ubuntu -c 'export JAVA_HOME=/usr;export CATALINA_HOME=/home/ubuntu/apache-tomcat-8.5.63;sh $CATALINA_HOME/bin/catalina.sh start'
exit 0
```

Below the command history, there is a large area of the terminal window that is mostly blank, indicating the text has been inserted. At the bottom left of this area, the text "-- INSERT --" is visible. In the bottom right corner of the terminal window, the numbers "2,77" and "All" are displayed.

3. Guardar el archivo.

Pulsamos ESC para salir del modo inserción.

Posteriormente escribí :wq y presioné enter para guardar los cambios y cerrar el editor

```
#!/bin/bash
iptables -t nat -A OUTPUT -o lo -p tcp --dport 80 -j REDIRECT --to-port 8080
runuser -l ubuntu -c 'export JAVA_HOME=/usr;export CATALINA_HOME=/home/ubuntu/apache-tomcat-8.5.63;sh $CATALINA_HOME/bin/catalina.sh start'
exit 0

```
: wq|
```

4. Ejecutar el siguiente comando para hacer ejecutable el archivo /etc/rc.local:

***sudo chmod +x /etc/rc.local***

```
T2-2022630463@T2-2022630: ~ /Servicio$ sudo vi /etc/rc.local
T2-2022630463@T2-2022630463: ~ /Servicio$ sudo chmod +x /etc/rc.local
T2-2022630463@T2-2022630463: ~ /Servicio$ |
```

## Crear una imagen de la máquina virtual

## 1.- Crear la máquina virtual

2.- Utilizando el power Shell de Windows nos conectaremos a la máquina virtual a replicar por ssh.

El comando es:

**ssh nombre\_maquina@ip\_publica**

Posteriormente les pedirá su contraseña para acceder a la máquina virtual

```
Windows PowerShell
Copyright (C) Microsoft Corporation. Todos los derechos reservados.

Instale la versión más reciente de PowerShell para obtener nuevas características y mejoras. https://aka.ms/PSWindows

PS C:\Users\Emmanuel> ssh T2-2022630463@13.91.86.51
T2-2022630463@13.91.86.51's password:
Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 6.8.0-1021-azure x86_64)

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

 * Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
 just raised the bar for easy, resilient and secure K8s cluster deployment.

 https://ubuntu.com/engage/secure-kubernetes-at-the-edge

This system has been minimized by removing packages and content that are
not required on a system that users do not log into.

To restore this content, you can run the 'unminimize' command.

Expanded Security Maintenance for Applications is not enabled.

3 updates can be applied immediately.
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 '24.04.2 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Thu Mar 13 00:12:20 2025 from 187.188.225.79
T2-2022630463@T2-2022630463:~$ |
```

4.- Para generalizar la máquina virtual y eliminar la última cuenta de usuario creada incluyendo el directorio del usuario, ejecutar el comando:

**sudo waagent -deprovision+user**

Si se quiere conservar en la imagen la última cuenta de usuario creada, ejecutar el comando:

**sudo waagent -deprovision**

En este caso utilicé el comando **sudo waagent -deprovision**

```

T2-2022630463@T2-2022630 | Windows PowerShell | Windows PowerShell
/usr/bin/waagent:27: DeprecationWarning: the imp module is deprecated in favour of importlib and slated for removal in Python 3.12; see the module's documentation for alternative uses
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)?
T2-2022630463@T2-2022630463:~$ |

```

5. En el portal de Azure seleccionar la máquina virtual que se quiera capturar como imagen.

**Información general**

Estado: En ejecución  
Ubicación: West US  
Suscripción: Azure for Students  
Id. de suscripción: 269a505c-76da-4067-8681-4f716970514b

**Captura**

Etiquetas: Agregar etiquetas

**Propiedades**

| Máquina virtual                                                                                                                                            | Redes                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nombre del equipo: T2-2022630463<br>Sistema operativo: Linux (ubuntu 22.04)<br>Generación de VM: V2<br>Arquitectura de VM: x64<br>Estado del agente: Ready | Dirección IP pública: 13.91.86.51 (Interfaz de red T2-2022630463128)<br>Dirección IP pública (IPv6): -<br>Dirección IP privada: 10.0.0.4<br>Dirección IP privada (IPv6): -<br>Red virtual/subred: T2-2022630463-vnet/default |

6.- Pulsar en el botón que dice captura y elegir la opción de imagen

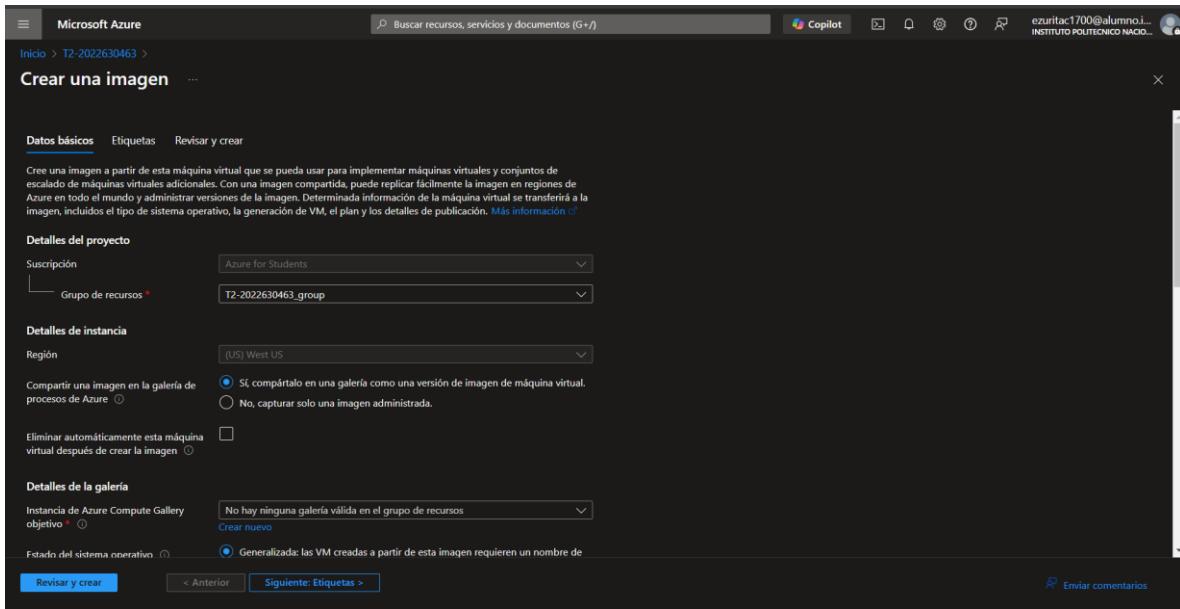
**Imagen**

**Información esencial**

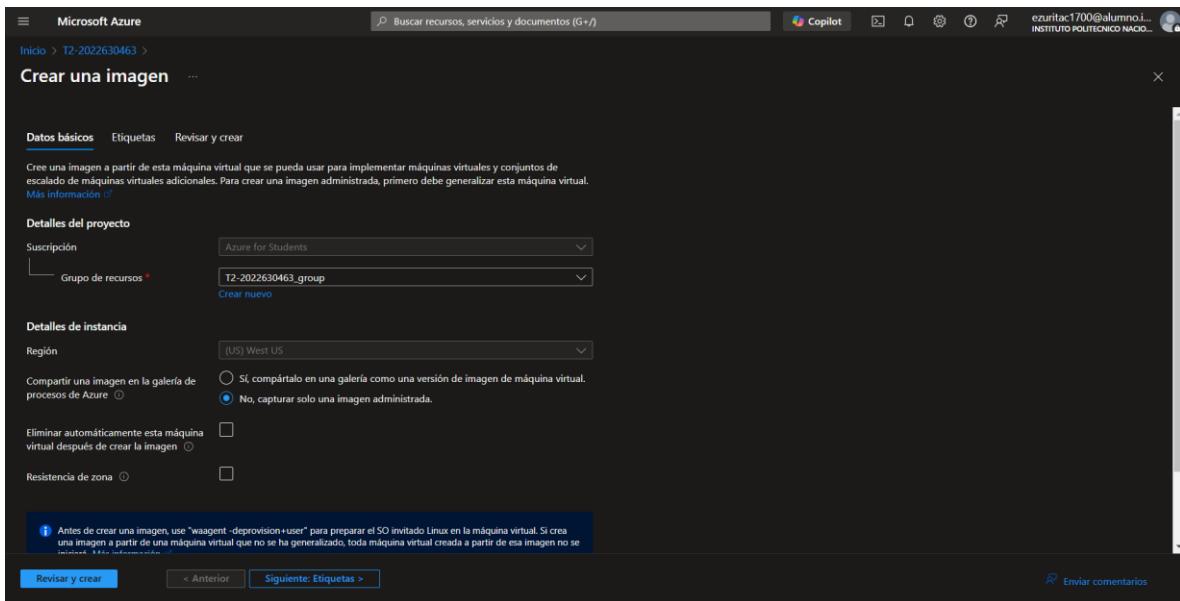
Estado: En ejecución  
Ubicación: West US  
Suscripción: Azure for Students  
Id. de suscripción: 269a505c-76da-4067-8681-4f716970514b

**Propiedades**

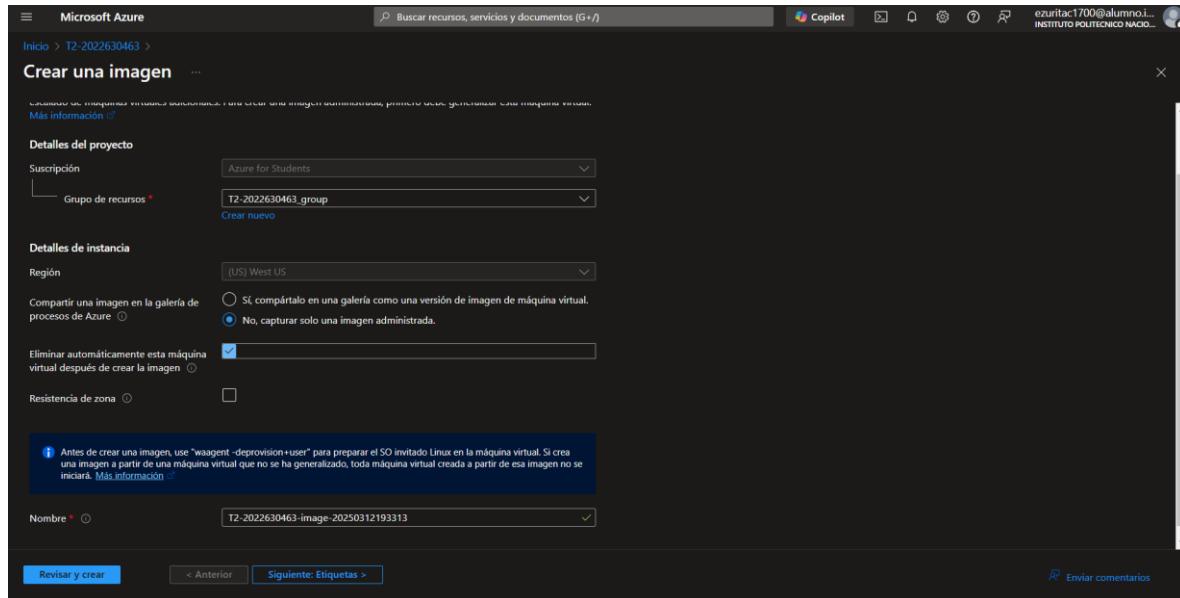
| Máquina virtual                                                                                                                                            | Redes                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nombre del equipo: T2-2022630463<br>Sistema operativo: Linux (ubuntu 22.04)<br>Generación de VM: V2<br>Arquitectura de VM: x64<br>Estado del agente: Ready | Dirección IP pública: 13.91.86.51 (Interfaz de red T2-2022630463128)<br>Dirección IP pública (IPv6): -<br>Dirección IP privada: 10.0.0.4<br>Dirección IP privada (IPv6): -<br>Red virtual/subred: T2-2022630463-vnet/default |



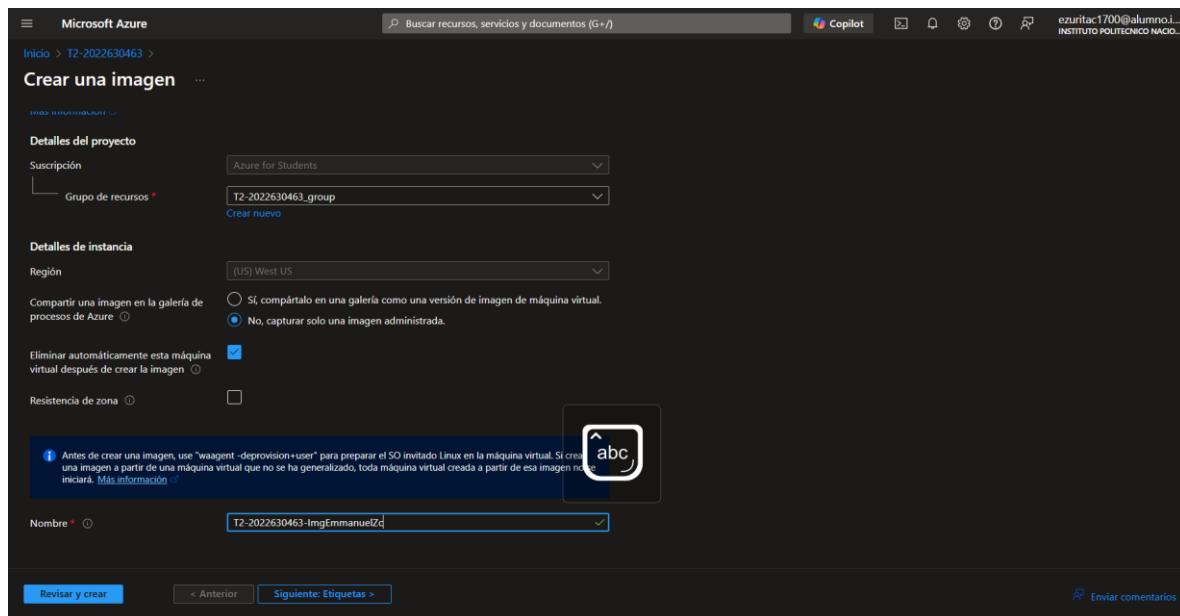
En la opción "Compartir imagen con Shared Image Gallery" seleccionar "No, capturar solo una imagen administrada".



7. Marcar la casilla "Eliminar automáticamente esta máquina virtual después de crear la imagen", ya que una máquina virtual generalizada no se puede iniciar o modificar.



8. Ingresar el nombre de la imagen a crear y posteriormente pulsar Revisar y crear.



**Microsoft Azure**

Inicio > T2-2022630463 >

## Crear una imagen ...

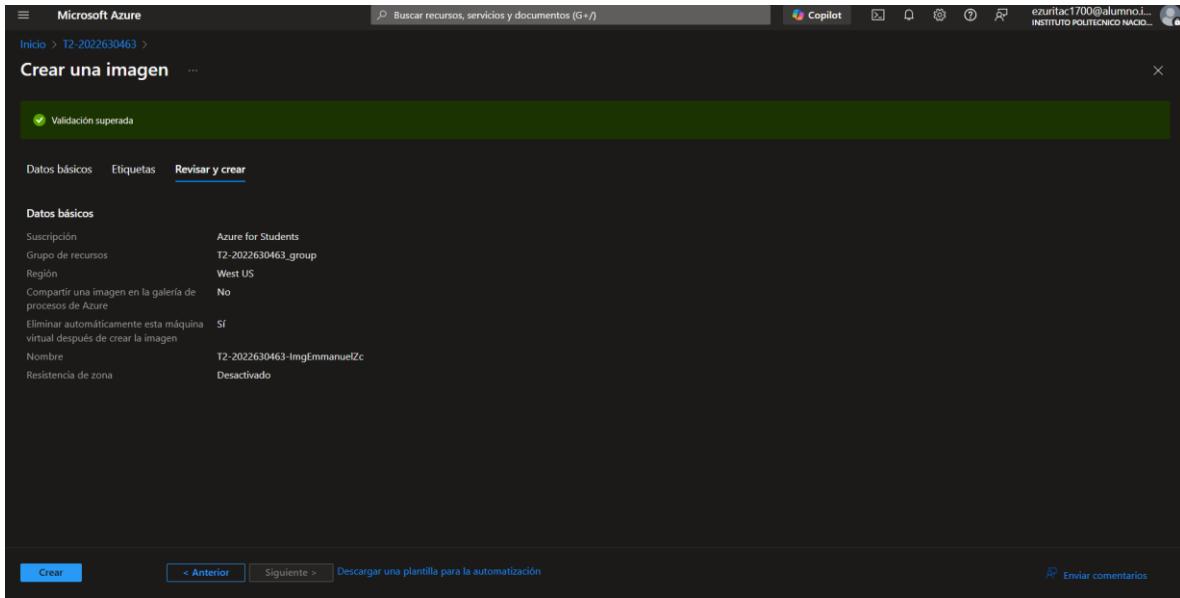
Validación superada

Datos básicos    Etiquetas    **Revisar y crear**

**Datos básicos**

|                                                                          |                             |
|--------------------------------------------------------------------------|-----------------------------|
| Suscripción                                                              | Azure for Students          |
| Grupo de recursos                                                        | T2-2022630463_group         |
| Región                                                                   | West US                     |
| Compartir una imagen en la galería de procesos de Azure                  | No                          |
| Eliminar automáticamente esta máquina virtual después de crear la imagen | Sí                          |
| Nombre                                                                   | T2-2022630463-ImgEmmanuelZc |
| Resistencia de zona                                                      | Desactivado                 |

**Crear**    < Anterior    Siguiente >    Descargar una plantilla para la automatización    Envío comentarlos



## Pulsar crear

**Microsoft Azure**

Inicio >

## Microsoft.Compute-CaptureVM-20250312193315 | Información general

Implementación

Buscar    Eliminar    Cancelar    Volver a implementar    Descargar    Actualizar

Información general

Entradas    Salidas    Plantilla

Se completó la implementación

Nombre de implementación : Microsoft.Compute-CaptureVM-202503121...    Hora de inicio : 12/3/2025, 19:37:56  
Suscripción : Azure for Students    Id. de correlación : bf841b9-7738-49af-8453-53b60ed02192  
Grupo de recursos : T2-2022630463\_group

Detalles de implementación    Pasos siguientes

Ir al recurso

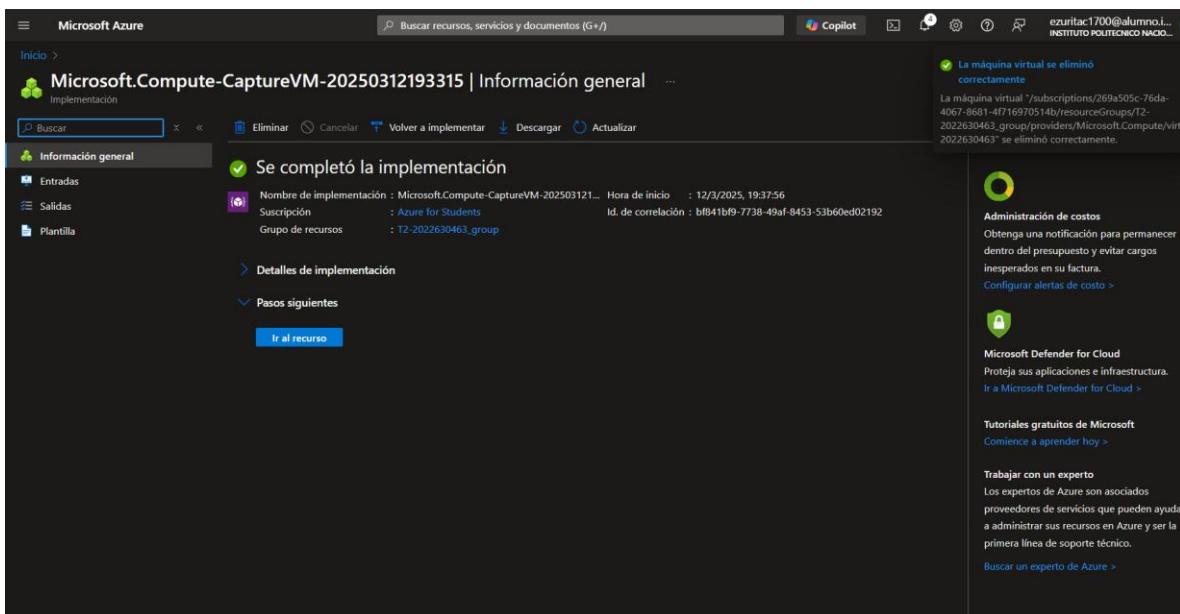
La máquina virtual se eliminó correctamente  
La máquina virtual "subscriptions/269a05c-76da-4067-8681-4f716970514b/resourceGroups/T2-2022630463\_group/providers/Microsoft.Compute/virtualMachines/T2-2022630463" se eliminó correctamente.

Administración de costos  
Obtenga una notificación para permanecer dentro del presupuesto y evitar cargos inesperados en su factura.  
Configurar alertas de costo >

Microsoft Defender for Cloud  
Proteja sus aplicaciones e infraestructura.  
Ir a Microsoft Defender for Cloud >

Tutoriales gratuitos de Microsoft  
Comience a aprender hoy >

Trabajar con un experto  
Los expertos de Azure son asociados proveedores de servicios que pueden ayudar a administrar sus recursos en Azure y ser la primera línea de soporte técnico.  
Buscar un experto de Azure >



The screenshot shows the Microsoft Azure portal interface. The main title bar says "Microsoft Azure". Below it, the navigation path is "Inicio > Microsoft.Compute-CaptureVM-20250312193315 | Información general >". The main content area is titled "T2-2022630463-ImgEmmanuelZc". On the left, there's a sidebar with various options like "Información general", "Registro de actividad", "Control de acceso (IAM)", "Etiquetas", etc. The "Información general" section is selected. It shows the following details:

|                             | Valor                                |
|-----------------------------|--------------------------------------|
| Grupo de recursos (mover)   | T2-2022630463_group                  |
| Ubicación (mover)           | West US                              |
| Suscripción (mover)         | Azure for Students                   |
| Id. de suscripción          | 269a505c-76da-4067-8681-4f716970514b |
| Estado de aprovisionamiento | Succeeded                            |
| Etiquetas (editar)          | Agregar etiquetas                    |

Below this, there's a section for "Disco del SO" (Operating System Disk) with the following table:

| Sistema operativo | URI del blob de origen | Tipo de almacenamiento | Almacenamiento en caché |
|-------------------|------------------------|------------------------|-------------------------|
| Linux             | -                      | LRS de HDD estándar    | Lectura y escritura     |

Under "Discos de datos" (Data Disks), it says "No hay ningún disco de datos conectado".

## Uso de chatgpt

Lo utilicé para consultar algunos de los comandos utilizados en Linux

<https://chatgpt.com/share/67d237f8-8948-800e-9a8f-a50aa8b131e5>

## Conclusión

Considero que esta tarea fue más fácil que la anterior. Sin embargo, no es menor su importancia, ya que lo que se busca con esta tarea es configurar bien todos estos elementos para que trabajen juntos de forma eficiente en la nube. Así, la aplicación no solo tendrá una estructura clara y funcional, sino que también será capaz de escalar y adaptarse a las necesidades que puedan surgir más adelante. La clave aquí está en integrar bien las tres capas para que la aplicación sea rápida, segura y fácil de usar.