

Desarrollo de Software VII

Laboratorio # 22 – Prof. Regis Rivera

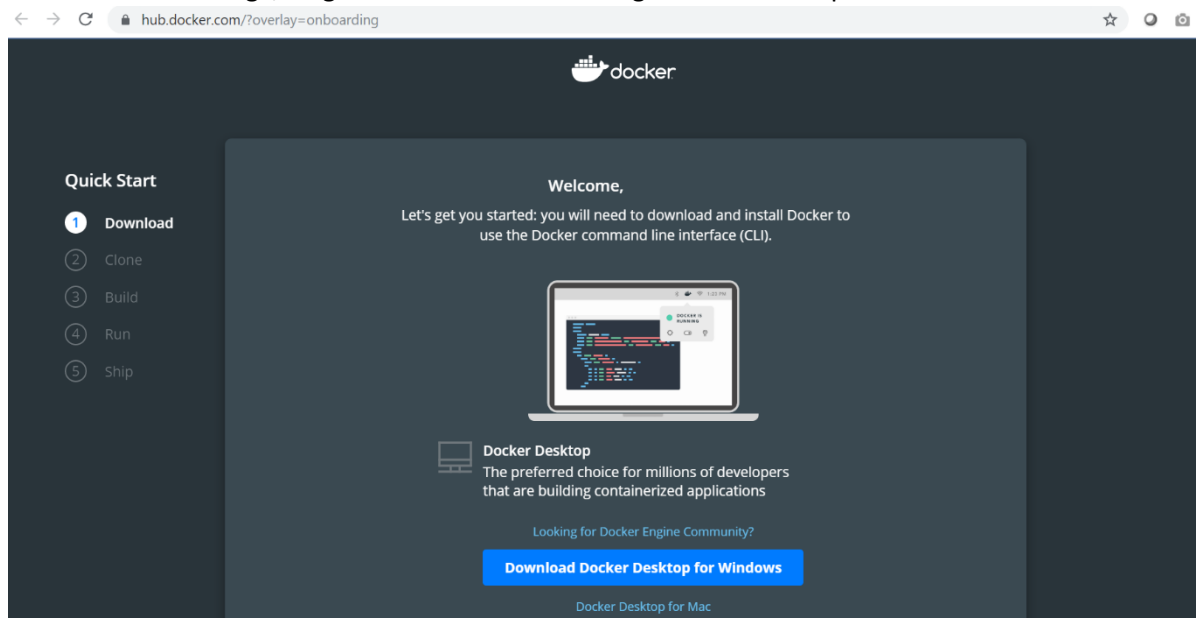
Objetivo: Introducción a contenedores, imágenes, ejecución de contenedores y dockerhub

Parte A. Instalación de Docker

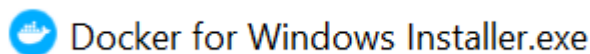
1. Ingresar a <http://www.docker.com>



2. Registrarse en el sitio
3. Ir a productos y seleccionar descarga de docker desktop
<https://www.docker.com/products/docker-desktop>
4. En el sitio de descarga, elegir la versión de docker según su sistema operativo

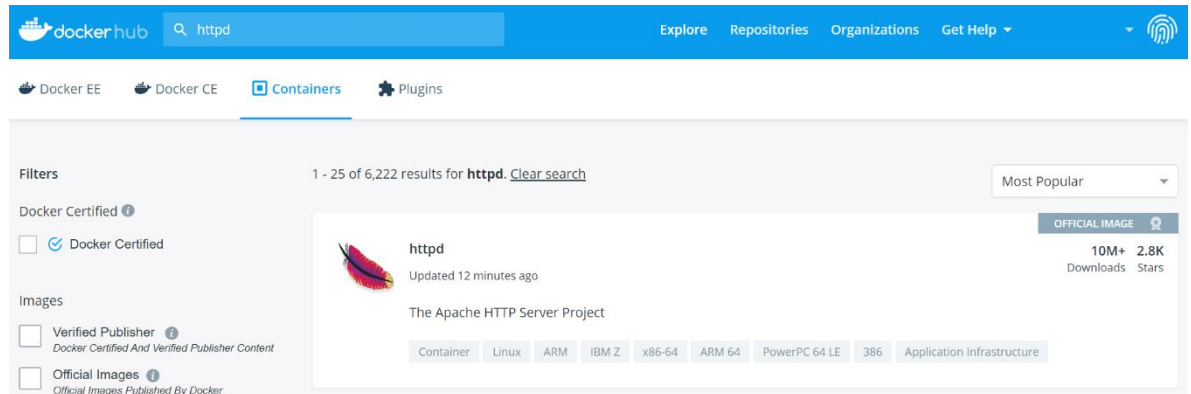


5. Una vez descargado, proceder a instalar



Parte B. Uso de DockerHub

1. Ingresar a <http://hub.docker.com>
2. Autenticarse en el sitio
3. Buscar en Docker Hub la imagen httpd (apache)



4. Abrir el CMD o Línea de comandos (bash), escribir `docker pull httpd` para descargar la imagen vista (se mostrarán de referencia capturas de pantallas bajo Windows SO)
5. Bajando la imagen

```
C:\Users\RRR90902>docker pull httpd
Using default tag: latest
latest: Pulling from library/httpd
b8f262c62ec6: Downloading [=====] 6.118MB/27.09MB
2c31b9311798: Download complete
7422a3cdf4e3: Downloading [=====] 4.947MB/10.37MB
1919d4fbf9e1: Downloading [=====] 2.571MB/19.09MB
60812fa1ab4c: Waiting
```

6. Descarga completa

```
C:\Users\RRR90902>docker pull httpd
Using default tag: latest
latest: Pulling from library/httpd
b8f262c62ec6: Pull complete
2c31b9311798: Pull complete
7422a3cdf4e3: Pull complete
1919d4fbf9e1: Pull complete
60812fa1ab4c: Pull complete
Digest: sha256:39d7d9a3ab93c0ad68ee7ea237722ed1b0016ff6974d80581022a53ec1e58797
Status: Downloaded newer image for httpd:latest
docker.io/library/httpd:latest
C:\Users\RRR90902>
```

7. Mostrando las Imágenes con docker images, observar esta httpd

```
C:\Users\RRR90902>docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
httpd                latest             19459a872194       3 weeks ago        154MB
hello-world          latest             fce289e99eb9       9 months ago       1.84kB
C:\Users\RRR90902>
```

8. Ejecutar un contenedor
- d ejecutar el contenedor en segundo plano e imprima la ID del contenedor
 - name es el nombre del contenedor
 - p es el # de puerto

```
C:\Users\RRR90902>docker run -d --name apache1 -p 3000:80 httpd
303a6ec2acee173139885c2c5afd6ab21a0239611b15884cbac145e9135affda
C:\Users\RRR90902>
```

Otros parámetros: <https://docs.docker.com/engine/reference/commandline/run/>

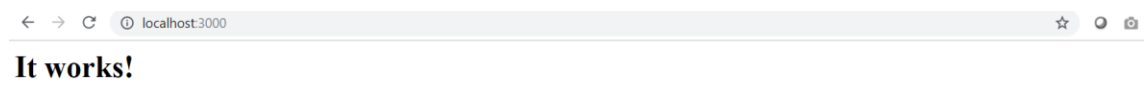
9. Ejecutar otro contenedor

```
C:\Users\RRR90902>docker run -d --name apache11 -p 3001:80 httpd
cdb9f66c5713e23feed567146915b11a0535c4ee39a14986efd14ca934b61e1a
C:\Users\RRR90902>
```


10. Mostrar Contenedores Corriendo

```
C:\Users\RRR90902>docker ps
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS
NAME
cdb9f66c5713   httpd      "httpd-foreground"      22 seconds ago Up 20 seconds  0.0.0.0:3001->80/tcp
p   apache11
303a6ec2acee   httpd      "httpd-foreground"      2 minutes ago Up 2 minutes   0.0.0.0:3000->80/tcp
p   apache1
C:\Users\RRR90902>
```

11. Probar ejecución de apache en ambos contenedores (puerto 3000 y 3001)



The screenshot shows a web browser window with the address bar set to 'localhost:3000'. The page content is 'It works!' in a bold, black font.



The screenshot shows a web browser window with the address bar set to 'localhost:3001'. The page content is 'It works!' in a bold, black font.

12. Crear el siguiente código y guardarlo en c:\tmp\htdocs\docker.html

```
1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4   <meta charset="UTF-8">
5   <title>Ejemplo de Apache server bajo Docker</title>
6 </head>
7 <body>
8   <h1>Ejemplo de Apache server bajo Docker</h1>
9 </body>
10</html>
```

13. Entrar a la consola de apache del contenedor apache1

```
C:\Tmp>docker exec -it apache1 bash
root@c1cd826d1e5c:/usr/local/apache2#
```

Importante recordar comandos en linux OS, ya que los contenedores son bajo este OS:

<https://www.ochobitshacenunbyte.com/2018/12/04/los-42-comandos-mas-importantes-en-gnu-linux/>

14. Hasta aquí tenemos dos contenedores con apache estático, ahora levantemos un tercer contenedor con el parámetro -v (Volumen hacia la carpeta donde esta nuestro html)

```
C:\Tmp>docker run -d --name apache21 -v c:\Tmp\htdocs\:/usr/local/apache2/htdocs -p 3002:80 httpd
2cb1e25f2aee64e19c5c4dcff27f840af4b2fdb5a69debe524ad8de81ca4ebb4
C:\Tmp>
```

15. Otorgar permisos (-v volumen) en caso tal, sean solicitados

File Sharing ×

Docker needs to access your computer's filesystem

Please type your username and password so Docker Desktop can mount files inside your containers. Files will be mounted as this user.

16. Utilizar el comando docker ps para mostrar información de los contenedores que se ejecutan

Tenemos 3 contenedores asociados a la imagen httpd

```
C:\Tmp>docker ps
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS
2cb1e25f2aee   httpd      "httpd-foreground"      53 seconds ago Up 52 seconds 0.0.0.0:3002->80/tcp
97c2560c455e   httpd      "httpd-foreground"      47 hours ago  Up 47 hours   0.0.0.0:3001->80/tcp
c1cd826d1e5c   httpd      "httpd-foreground"      47 hours ago  Up 47 hours   0.0.0.0:3000->80/tcp
C:\Tmp>
```

Más información del atributo ps:

<https://docs.docker.com/engine/reference/commandline/ps/>

17. Observar el nuevo contenedor, nuestro html ya está a nivel de contenedor

```
C:\Tmp>docker exec -it apache21 bash
root@2cb1e25f2aee:/usr/local/apache2# ls
bin build cgi-bin conf error htdocs icons include logs modules
root@2cb1e25f2aee:/usr/local/apache2# cd htdocs
root@2cb1e25f2aee:/usr/local/apache2/htdocs# ls
docker.html
root@2cb1e25f2aee:/usr/local/apache2/htdocs#
```

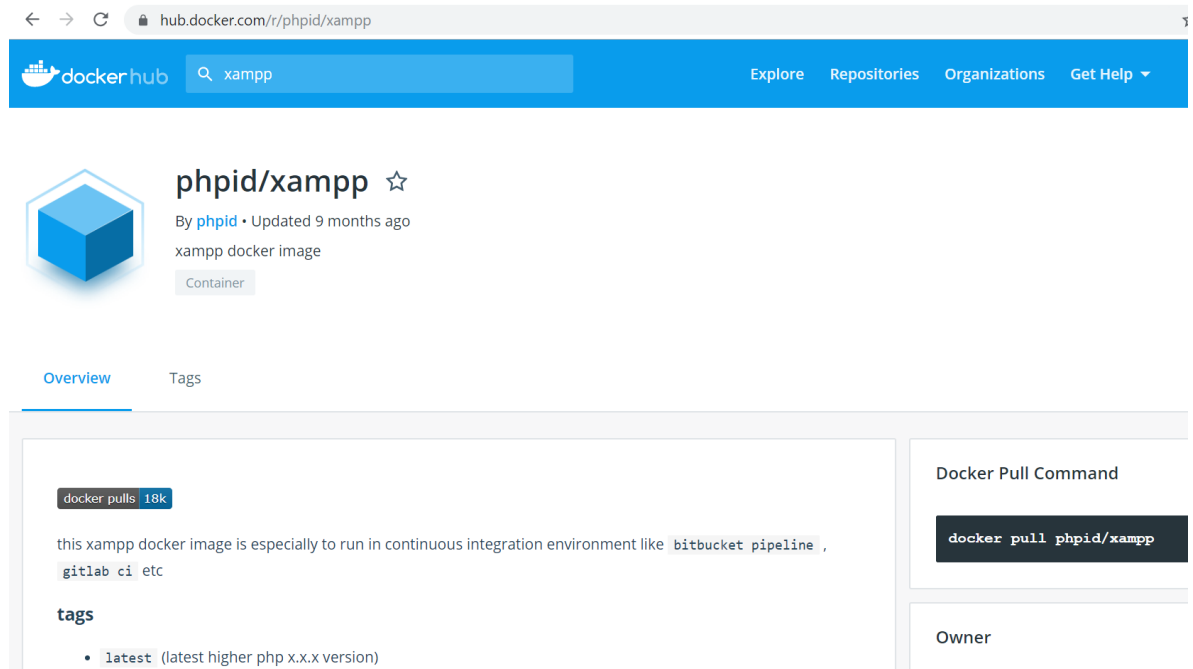
18. Podemos verlo en nuestro navegador apuntando al puerto 3002

← → ↻ ⓘ localhost:3002/docker.html

Ejemplo de Apache server bajo Docker

Parte C. Imagen XAMPP

1. Ubicar la imagen phpid/xampp



The screenshot shows the Docker Hub interface for the `phpid/xampp` image. The page header includes the Docker Hub logo, a search bar with `xampp` entered, and navigation links for Explore, Repositories, Organizations, and Get Help. The main content area displays the image details: a blue cube icon, the name `phpid/xampp` with a star, and the text "By `phpid` • Updated 9 months ago" and "xampp docker image". Below this is a "Container" label. The "Overview" tab is selected, showing "docker pulls 18k" and a description: "this xampp docker image is especially to run in continuous integration environment like `bitbucket pipeline`, `gitlab ci` etc". The "tags" section lists `latest` (latest higher php x.x.x version). On the right, the "Docker Pull Command" section shows the command `docker pull phpid/xampp` in a dark box, and the "Owner" section is partially visible.

2. Hacer Pull de la imagen en mención

```
C:\Users\RRR90902>docker pull phpid/xampp
Using default tag: latest
latest: Pulling from phpid/xampp
8ac9f5ca4429: Pull complete
b75b25fa7149: Pull complete
ad7fb91b9a36: Pull complete
7e7db9ec7508: Pull complete
d555c2f9bcaa: Pull complete
d19f9b38d650: Pull complete
c8d6866a82ff: Pull complete
337f20832788: Pull complete
0cb729b6cbc5: Pull complete
f9f016003f2f: Pull complete
b71a0fb63506: Pull complete
f339a4658f18: Pull complete
531aced80e4a: Pull complete
69bc0485b369: Pull complete
2a93d0ba42f4: Pull complete
6697e67684f8: Pull complete
446f637e7f8c: Pull complete
35f5e6a50e15: Pull complete
807980459039: Pull complete
290f734e9615: Pull complete
aa36c49cf2a5: Pull complete
7274a42559a3: Pull complete
8fe2d96104c7: Pull complete
5b52aa6f1f62: Pull complete
```

3. Observar la nueva imagen descargada con docker images

```
C:\Users\RRR90902>docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
xampp-custom	latest	ea516d45acc0	4 hours ago	1.47GB
php	latest	f010df9bd886	7 days ago	403MB
ubuntu	latest	2ca708c1c9cc	3 weeks ago	64.2MB
httpd	latest	19459a872194	4 weeks ago	154MB
phpid/xampp	latest	a7bb1e73c5a7	8 months ago	1.46GB
hello-world	latest	fce289e99eb9	9 months ago	1.84kB
garland/xampp-base	latest	21861acf735a	5 years ago	1.44GB

```
C:\Users\RRR90902>
```

4. Crear un contenedor sobre la imagen descargada apuntando al puerto 3010 llamado xamppid

```
C:\Users\RRR90902>docker run -it -d --name xamppid -p 3010:80 phpid/xampp /bin/bash
e9769f5e4aa3761968e9f105ecfa05161455964d722f395fbc6d02499f711336
```

5. Validar con docker ps los contenedores que están en ejecución

```
C:\Users\RRR90902>docker ps
```

CONTAINER ID	IMAGE	NAMES	COMMAND	CREATED	STATUS	PORTS
e9769f5e4aa3	phpid/xampp	xamppid	"/bin/bash"	3 minutes ago	Up 3 minutes	22/tcp, 3306/tcp, 80/tcp, 0.0.0.0:3010->80/tcp
35e971551589	xampp-custom	xampp	"/bin/bash"	5 hours ago	Up 56 minutes	21/tcp, 433/tcp, 0.0.0.0:3030->80/tcp
30fc4a6787c7	httpd	apache21	"httpd-foreground"	27 hours ago	Up 6 hours	0.0.0.0:3002->80/tcp

6. Ir al bash (línea de comandos a lo interno) del contenedor levantado

```
C:\Users\RRR90902>docker exec -it xamppid bash
root@e9769f5e4aa3:/project#
```

7. Iniciar servicios dentro del contenedor en ejecución

- Ruta: opt/lampp
- Aplicativo: Lampp
- Comando: start
- Servicios a levantar: Apache, MySQL y ProFTPd

```
C:\Users\RRR90902>docker exec -it xamppid bash
root@e9769f5e4aa3:/project# ls
root@e9769f5e4aa3:/project# cd /
root@e9769f5e4aa3:/# ls
bin boot dev etc home lib lib64 media mnt opt proc project root run sbin srv sys tmp usr var
root@e9769f5e4aa3:/# cd opt
root@e9769f5e4aa3:/opt# ls
lampp
root@e9769f5e4aa3:/opt# cd lampp
root@e9769f5e4aa3:/opt/lampp# ls
COPYING.thirdparty  build          etc           info          logs          mysql          properties.ini  uninstall.dat
README-wsrep        cgi-bin        htdocs        lampp         man           pear           sbin           var
RELEASENOTES        ctlscrip.sh   icons         lib           manager-linux-x64.run  php           share           xampp
apache2             docs          img           libexec       manual         phpmyadmin     temp
bin                 error         include       licenses      modules       proftpd        uninstall
```

```
root@e9769f5e4aa3:/opt/lampp# lampp start
Starting XAMPP for Linux 7.3.1-0...
XAMPP: Starting Apache...ok.
XAMPP: Starting MySQL...ok.
XAMPP: Starting ProFTPD...ok.
root@e9769f5e4aa3:/opt/lampp#
```

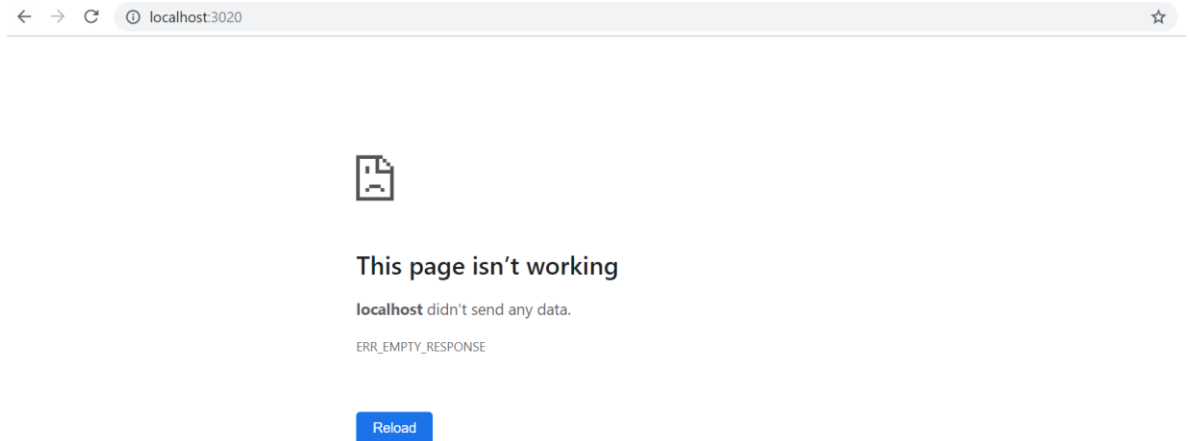
- Validar que este arriba xampp, ir a <http://localhost:3010/>



- Ahora crear otro contenedor, pero con volumen en C:\xampp\htdocs

```
C:\Users\RRR90902>docker run -it -d --name xamppid2 -p 3020:80 -v C:\xampp\htdocs:/opt/lampp/htdocs phpid/xampp /bin/bas
h
ea8dbbae9f0b3ded83092adf45c09384c8e38d177d9dfd59c98620396e56fd59
```

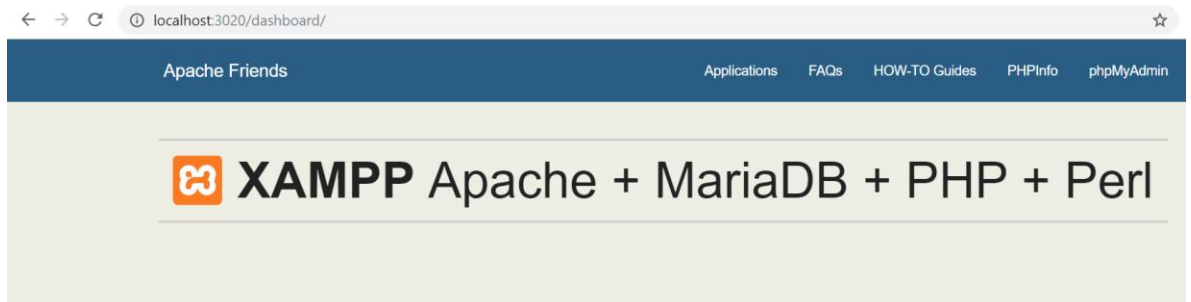
10. Intentar ingresar al localhost del puerto 3020, observar resultados:



11. Entrar al bash para levantar los servicios

```
C:\Users\RRR90902>docker exec -it xamppid2 bash
root@ea8dbbae9f0b:/project#
root@ea8dbbae9f0b:/project# cd /
root@ea8dbbae9f0b:/# cd opt/lampp/
root@ea8dbbae9f0b:/opt/lampp# lampp start
Starting XAMPP for Linux 7.3.1-0...
XAMPP: Starting Apache...ok.
XAMPP: Starting MySQL...ok.
XAMPP: Starting ProFTPD...ok.
root@ea8dbbae9f0b:/opt/lampp#
```

12. Confirmar que todo en orden en el xampp del puerto 3020



Welcome to XAMPP for Windows 7.2.22

You have successfully installed XAMPP on this system! Now you can start using Apache, MariaDB, PHP and other components. You can find more info in the [FAQs](#) section or check the [HOW-TO Guides](#) for getting started with PHP applications.

XAMPP is meant only for development purposes. It has certain configuration settings that make it easy to develop locally but that are insecure if you want to have your installation accessible to others. If you want have your XAMPP accessible from the internet, make sure you understand the implications and you checked the [FAQs](#) to learn how to protect your site. Alternatively you can use [WAMP](#), [MAMP](#) or [LAMP](#) which are similar packages which are more suitable for production.

Start the XAMPP Control Panel to check the server status.

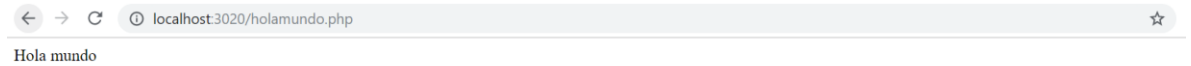
13. Crear holamundo.php (o utilizar uno creado previamente) y guardarlo en c:\xampp\htdocs


```

1  <!DOCTYPE html>
2  <html lang="es">
3  <head>
4  <meta charset="UTF-8" />
5  <title> Ejemplo básico PHP</title>
6  </head>
7  <body>
8  <?php echo 'Hola mundo'; ?>
9  </body>
10 </html>

```

14. Realizar pruebas, observar hola mundo desde el contenedor xampp



Parte D. Imagen personalizada XAMPP

Crear una imagen personalizada de la imagen phpid/xampp y que incluya holamundo.php creado en la parte C de esta guía dentro de un nuevo contenedor utilizando DockerFile

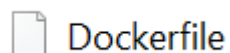
1. Crear este archivo llamado "Dockerfile" (sin extensión) y guardarlo en la carpeta c:\xampp\htdocs

```

1  FROM phpid/xampp
2
3  COPY holamundo.php /opt/lampp/htdocs/
4
5  RUN /opt/lampp/lampp start
6
7  EXPOSE 80
8  EXPOSE 433
9  EXPOSE 21
10
11 WORKDIR /opt/lampp/htdocs
12
13 CMD ["/bin/bash"]

```

2. Archivo creado



3. Construir imagen personalizada con el comando docker build llamada xampp-custom

```
C:\xampp\htdocs>docker build -t xampp-custom .
Sending build context to Docker daemon 13.02MB
Step 1/8 : FROM php:7.3.1-0
--> a7bb1e73c5a7
Step 2/8 : COPY holamundo.php /opt/lampp/htdocs/
--> d6fc3efac294
Step 3/8 : RUN /opt/lampp/lampp start
--> Running in 8a493ddd9a17
Starting XAMPP for Linux 7.3.1-0...
XAMPP: Starting Apache...ok.
XAMPP: Starting MySQL...ok.
XAMPP: Starting ProFTPD...ok.
Removing intermediate container 8a493ddd9a17
--> 5cb5243a6027
Step 4/8 : EXPOSE 80
--> Running in 3d9b49787fa8
Removing intermediate container 3d9b49787fa8
--> ba2b5f5971a5
Step 5/8 : EXPOSE 433
--> Running in 54c8b047bca7
Removing intermediate container 54c8b047bca7
--> 3fb1f9d120b1
Step 6/8 : EXPOSE 21
--> Running in bd7533c62d3f
Removing intermediate container bd7533c62d3f
--> 8158fc4f3ac9
Step 7/8 : WORKDIR /opt/lampp/htdocs
--> Running in fe2a1b8fc328
Removing intermediate container fe2a1b8fc328
--> 5274f6519a98
Step 8/8 : CMD ["/bin/bash"]
--> Running in fada1b9e361e
Removing intermediate container fada1b9e361e
--> 40e9039947af
Successfully built 40e9039947af
Successfully tagged xampp-custom:latest
SECURITY WARNING: You are building a Docker image from Windows against a non-Windows Docker host. All files and directories added to build context will have '-rwxr-xr-x' permissions. It is recommended to double check and reset permissions for sensitive files and directories.
```

Más información del parametro build:

<https://docs.docker.com/engine/reference/commandline/build/>

4. Listar las imágenes con docker ps, observar la nueva imagen creada:

```
C:\xampp\htdocs>docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
xampp-custom	latest	40e9039947af	2 minutes ago	1.55GB
<none>	<none>	ea516d45acc0	22 hours ago	1.47GB
php	latest	f010df9bd886	7 days ago	403MB
ubuntu	latest	2ca708c1c9cc	3 weeks ago	64.2MB
httpd	latest	19459a872194	4 weeks ago	154MB
php:7.3.1-0	latest	a7bb1e73c5a7	8 months ago	1.46GB
hello-world	latest	fce289e99eb9	9 months ago	1.84kB
garland/xampp-base	latest	21861acf735a	5 years ago	1.44GB

```
C:\xampp\htdocs>
```

5. Ahora a crear un contenedor de la nueva imagen llamado xampp3

```
C:\xampp\htdocs>docker run -it -d --name xampp3 -p 3030 xampp-custom
79361e8d5bb9a4cb82dcb081b373d2a5e69c59278142e728fba7b21e610019a
```

```
C:\xampp\htdocs>docker ps
```

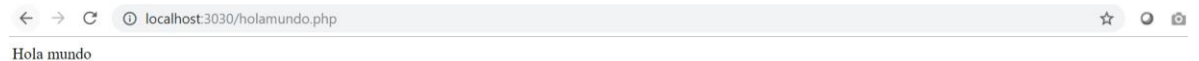
CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS
79361e8d5bb9	xampp-custom	"/bin/bash"	39 seconds ago	Up 38 seconds	21-22/tcp, 80/tcp, 433/tcp, 3306/tcp, 0.0.0.0:32768->3030/tcp
ea8dbbae9f0b	php:7.3.1-0	"/bin/bash"	28 minutes ago	Up 28 minutes	22/tcp, 3306/tcp, 8080/tcp, 0.0.0.0:3020->80/tcp
e9769f5e4aa3	php:7.3.1-0	"/bin/bash"	17 hours ago	Up 17 hours	22/tcp, 3306/tcp, 8080/tcp, 0.0.0.0:3010->80/tcp
35e971551589	ea516d45acc0	"/bin/bash"	22 hours ago	Up 18 hours	21/tcp, 433/tcp, 0.0.0.0:32768->3030/tcp

6. Correr los servicios dentro del bash del contenedor creado

```
C:\WINDOWS\system32\cmd.exe - docker exec -it xampp3 bash
```

```
C:\xampp\htdocs>docker exec -it xampp3 bash
root@f91db75def56:/project# cd ..
root@f91db75def56:/# cd opt/lampp
root@f91db75def56:/opt/lampp# lampp start
Starting XAMPP for Linux 7.3.1-0...
XAMPP: Starting Apache...ok.
XAMPP: Starting MySQL...ok.
XAMPP: Starting ProFTPD...ok.
root@f91db75def56:/opt/lampp#
```

7. Realizar las pruebas, observar resultados



A screenshot of a web browser window. The address bar shows 'localhost:3030/holamundo.php'. The page content displays 'Hola mundo'.

8. Si desea, puede hacer docker push de la imagen personalizada (xampp-custom) a su cuenta en docker hub

Mas información:

<https://docs.docker.com/engine/reference/commandline/push/>