Get an HTTPS Certificate for Your Server

In the lab, Create a VM, installed a web server on a Linux VM. However, we only used HTTP to reach this server. Now we set-up the web server so that HTTPS can be used. However, for this, we need a TLS certificate (recall our discussion on HTTPS in the class Introduction to CyberSecurity).

You need to use your own GCP project for this lab. But it might also work with a longer qwiklab. The lab is not very long, but you will need to wait for your own domain name to register. It is probably best to use your own GCP account for this project, but a qwiklab project might also work.

Video for this lab.

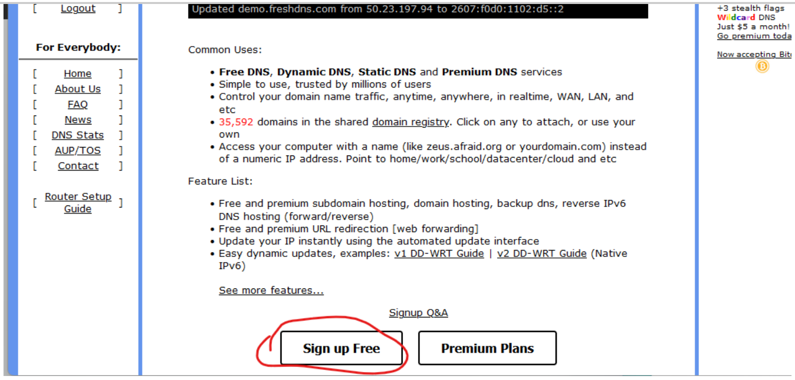
This lab requires four screenshots.

Register a Domain Name

We can get free (sub) domains at freedns.afraid.org. Usually domains cost a little or even a large amount of money. Check out GoDaddy domains and find a domain that cost more than $1000: https://www.godaddy.com/offers/domain. But in this lab we will use freedns.afraid.org which only gives us subdomains, but that is fine for this lab.

Sign-Up for freedns.afraid.org

Go to freedns.afraid.org
Click, **Sign up Free**



Updated demo.freshdns.com from 50.23.197.94 to 2607:f0d0:1102:d5::2

Common Uses:

- **Free DNS**, **Dynamic DNS**, **Static DNS** and **Premium DNS** services
- Simple to use, trusted by millions of users
- Control your domain name traffic, anytime, anywhere, in realtime, WAN, LAN, and etc
- 35,592 domains in the shared domain registry. Click on any to attach, or use your own
- Access your computer with a name (like zeus.afraid.org or yourdomain.com) instead of a numeric IP address. Point to home/work/school/datacenter/cloud and etc

Feature List:

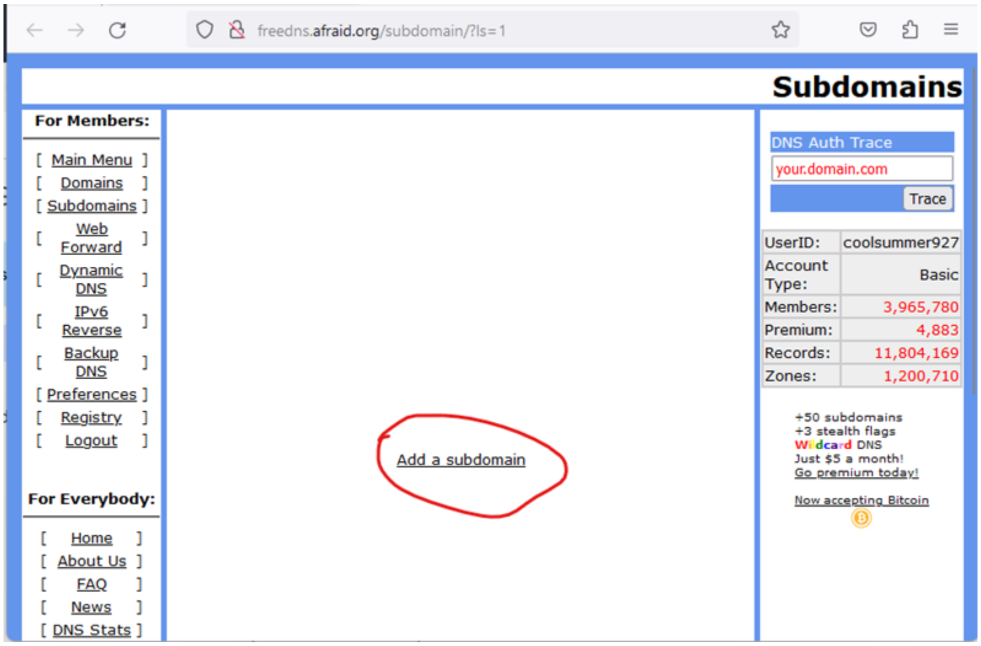
- Free and premium subdomain hosting, domain hosting, backup dns, reverse IPv6 DNS hosting (forward/reverse)
- Free and premium URL redirection [web forwarding]
- Update your IP instantly using the automated update interface
- Easy dynamic updates, examples: v1 DD-WRT Guide | v2 DD-WRT Guide (Native IPv6)

See more features...

Signup Q&A

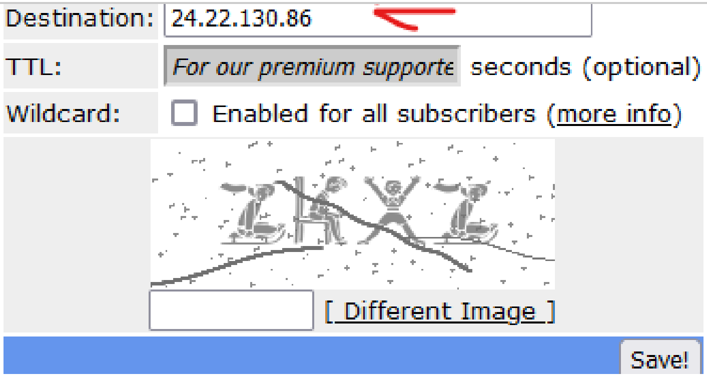
Use any of your emails to sign up. Once you have filled the form, click. “Send activation email.” Check your email, and click on the link in the email.

Click on Add a subdomain



UserID:	coolsummer927
Account Type:	Basic
Members:	3,965,780
Premium:	4,883
Records:	11,804,169
Zones:	1,200,710

The screen should look like this



Destination: 24.22.130.86

TTL: For our premium supporte seconds (optional)

Wildcard: □ Enabled for all subscribers (more info)

There are three things to fill out or select

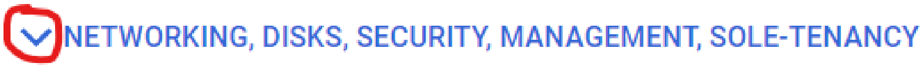
1. Your subdomain name. I will use coolsummer
2. The domain. I will leave it as chickenkill.com. That means that my domain is coolsummer.chickenkill.com
3. Destination. We don't have a destination yet.

So we pause here and will return once we have an IP address.

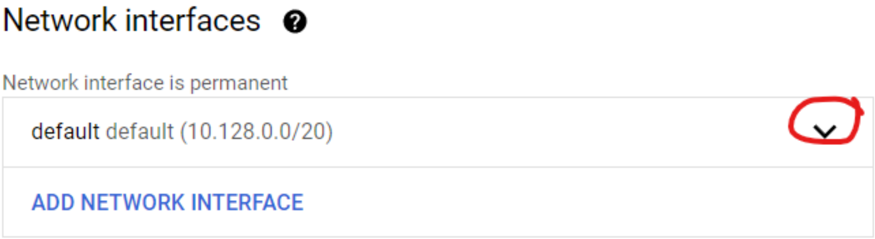
Create a VM and get an IP Address

This is nearly the same as creating a VM in the lab Create a VM.

1. Go to the GCP Console
2. Click Navigator Menu > Compute Engine
3. Click **Create Instance**
4. Under **Firewall**, click
    a. Allow HTTP traffic
    b. Allow HTTPS traffic
5. Expand NETWORKING, DISKS, SECURITY, MANAGEMENT, SOLE-TENACNY
    a.



6. Expand **Networking**
7. Scroll down to **Network interfaces**
8. Expand the Default interface
    a.

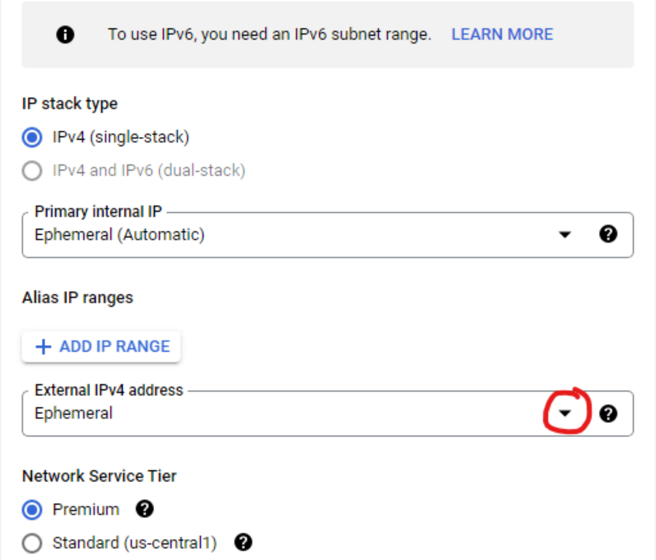


Network interfaces

Network interface is permanent

default default (10.128.0.0/20)

9. Expand External IP



To use IPv6, you need an IPv6 subnet range. LEARN MORE

IP stack type

● IPv4 (single-stack)

○ IPv4 and IPv6 (dual-stack)

Primary internal IP: Ephemeral (Automatic)

Alias IP ranges

External IPv4 address: Ephemeral

Network Service Tier

● Premium

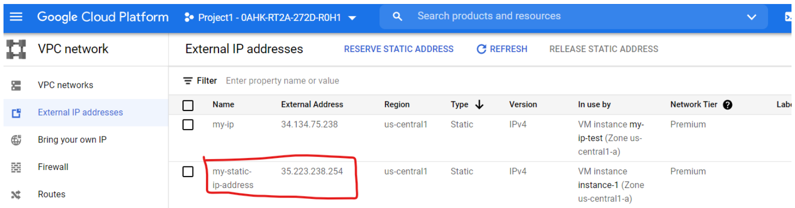
○ Standard (us-central1)

a.

10. Click CREATE IP ADDRESS
11. Enter
    a. Name
        i. my-static-ip-address
    b. Description
        i. my-static-ip-address
12. Click RESERVE
13. Note that an IP address is given
14. Click CREATE

Check Your Static IP Address

1. Go to Navigator Menu > VPC Network > External IP addresses
2. Your new IP address should be shown.
3. Take a screenshot like this:
    a.



External IP addresses

Name	External Address	Region	Type	Version	In use by	Network Tier	Labe
my-ip	34.134.75.238	us-central1	Static	IPv4	VM instance my-ip-test (Zone us-central1-a)	Premium	
my-static-ip-address	35.223.238.254	us-central1	Static	IPv4	VM instance instance-1 (Zone us-central1-a)	Premium	

4. Take note of your IP address. It is also shown on your list of VMs
    a. Navigator Menu > Compute Engine

□	✓	instance-1	us-central1-a	10.128.0.15 (nic0)	35.223.238.254	SSH

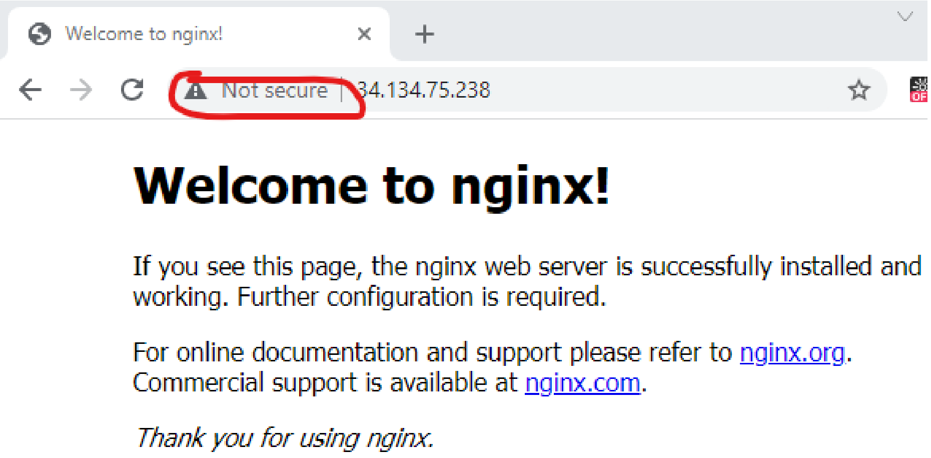
Important: Once you delete your VM, you must also delete the Reserved IP. Otherwise, $0.24 per day. Interestingly, Cloud Service providers charge more for when an IP is not attached to a machine than when it is attached to a machine. But don't delete anything yet!

Install NGINX

1. SSH to your VM
2. sudo apt update
3. sudo apt install nginx

Test

With nginx installed and the VM running, go to your browser and enter your static IP address. It should look like this:



Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

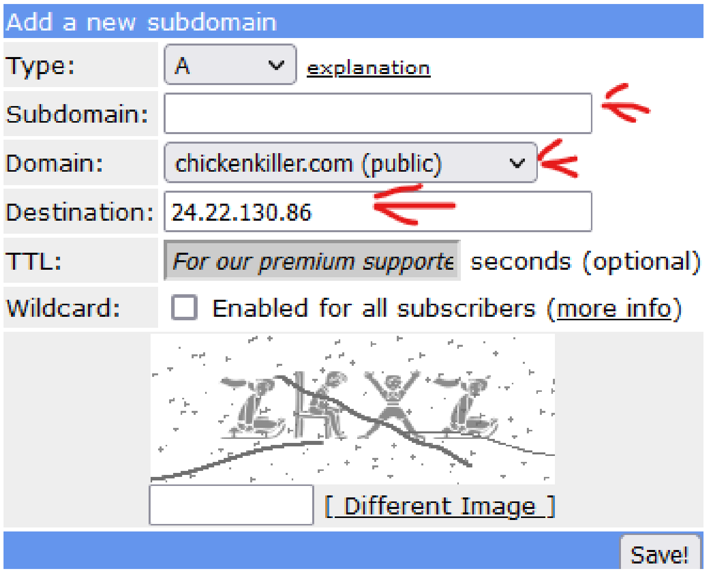
Click on the "Not Secure" that is shown circled in the image above. The text indicates that the connection is not secure.

Test Again

1. Use the GCP console to stop the VM. Do not delete the VM, just stop it.
2. Once it is stopped, start it.
3. Once it is started, reload your browser (with the same static IP address). You should see the same result with the message

freedns.afraid.org

1. Return back to freedns.afraid.org and fill in the information
   a.



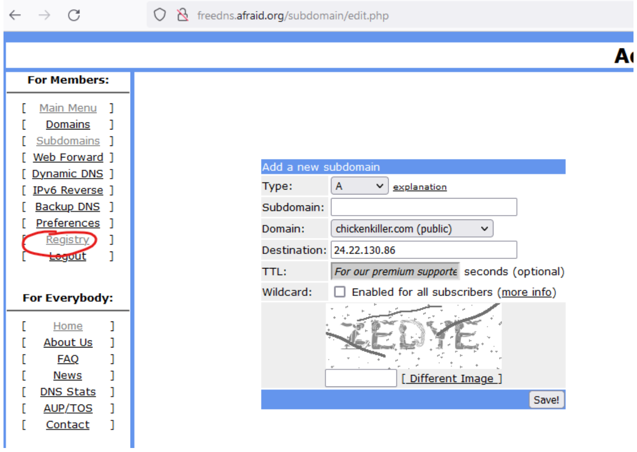
Add a new subdomain

Type:	A explanation
Subdomain:	
Domain:	chickenkiller.com (public)
Destination:	24.22.130.86
TTL:	*For our premium supporte* seconds (optional)
Wildcard:	□ Enabled for all subscribers (more info)

2. The destination is the static IP address you got from GCP
3. Enter the captcha and click save

USEFUL NOTE: Instead of chickenkill.com, pick a different domain. Do this as follows

- Click on Registry on the left



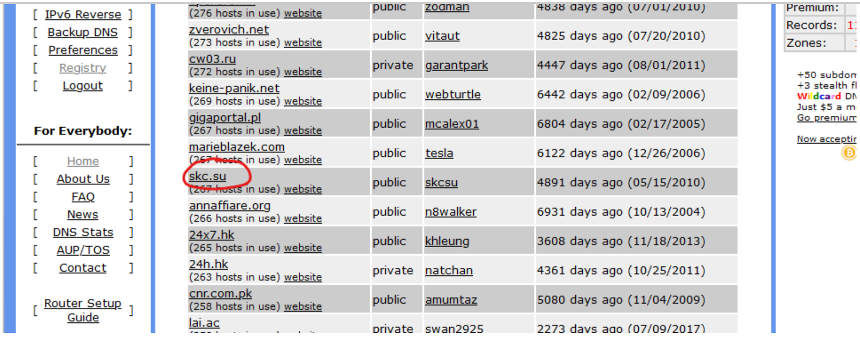
freedns.afraid.org/subdomain/edit.php

Add a new subdomain

Type:	A explanation
Subdomain:	
Domain:	chickenkiller.com (public)
Destination:	24.22.130.86
TTL:	*For our premium supporte* seconds (optional)
Wildcard:	□ Enabled for all subscribers (more info)

  ○

- Scroll down to the bottom and click next page, perhaps repeat that a few times.
- Click on a randomly selected domain



[IPv6 Reverse]
[Backup DNS]
[Preferences]
[Registry]
[Logout]

For Everybody:

[Home]
[About Us]
[FAQ]
[News]
[DNS Stats]
[AUP/TOS]
[Contact]

[Router Setup Guide]

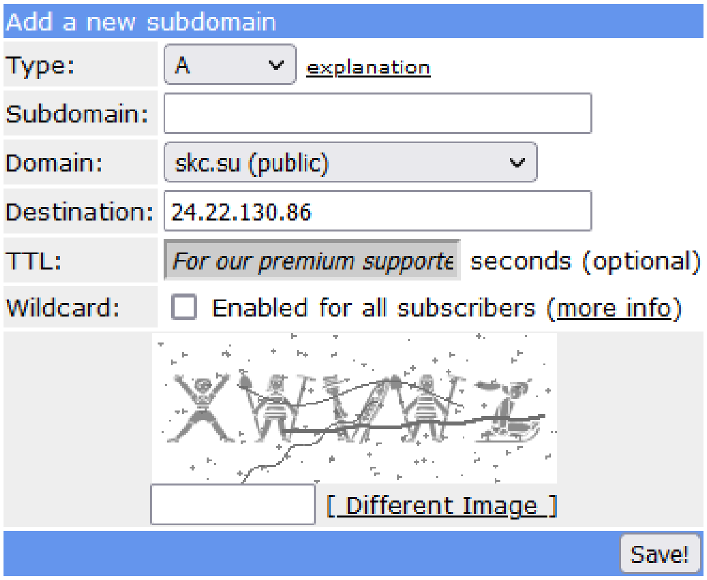
(276 hosts in use) website	public	zodman	4838 days ago (07/01/2010)
zverovich.net (273 hosts in use) website	public	vitaut	4825 days ago (07/20/2010)
cw03.ru (272 hosts in use) website	private	garantpark	4447 days ago (08/01/2011)
keine-panik.net (269 hosts in use) website	public	webturtle	6442 days ago (02/09/2006)
gigaportal.pl (267 hosts in use) website	public	mcalex01	6804 days ago (02/17/2005)
marieblazek.com (267 hosts in use) website	public	tesla	6122 days ago (12/26/2006)
skc.su (267 hosts in use) website	public	skcsu	4891 days ago (05/15/2010)
annaffiare.org (266 hosts in use) website	public	n8walker	6931 days ago (10/13/2004)
24x7.hk (265 hosts in use) website	public	khleung	3608 days ago (11/18/2013)
24h.hk (263 hosts in use) website	private	natchan	4361 days ago (10/25/2011)
cnr.com.pk (258 hosts in use) website	public	amumtaz	5080 days ago (11/04/2009)
lai.ac	private	swan2925	2273 days ago (07/09/2017)

Premium:
Records: 1
Zones:

+50 subdom
+3 stealth fl
Wildcard DN
Just $5 a m
Go premium

Now acceptir

- Now fill in the information, including the IP address
  -



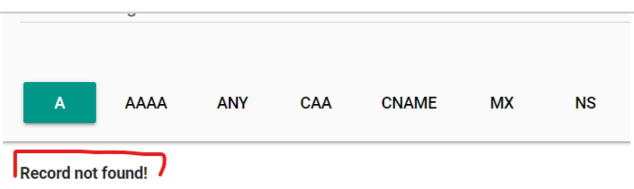
Add a new subdomain

Type:	A explanation
Subdomain:	
Domain:	skc.su (public)
Destination:	24.22.130.86
TTL:	For our premium supporte seconds (optional)
Wildcard:	□ Enabled for all subscribers (more info)

[Different Image]

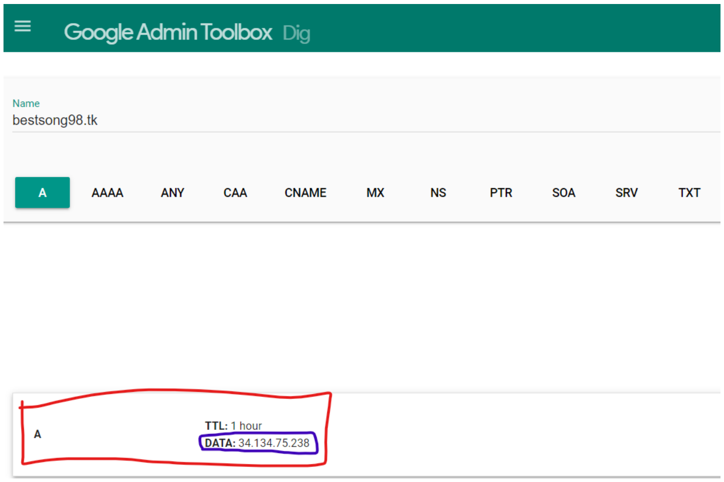
Test Whether Your Domain is Set-up

1. Go to https://toolbox.googleapps.com/apps/dig/
2. In Name, enter <YOUR_NEW_DOMAIN> or www.<YOUR_NEW_DOMAIN>
3. With a high probability, the domain is not ready, and the output will be



a. Record not found!

4. Wait a few minutes, reload and try again. Eventually, you will get something that looks like
   a.



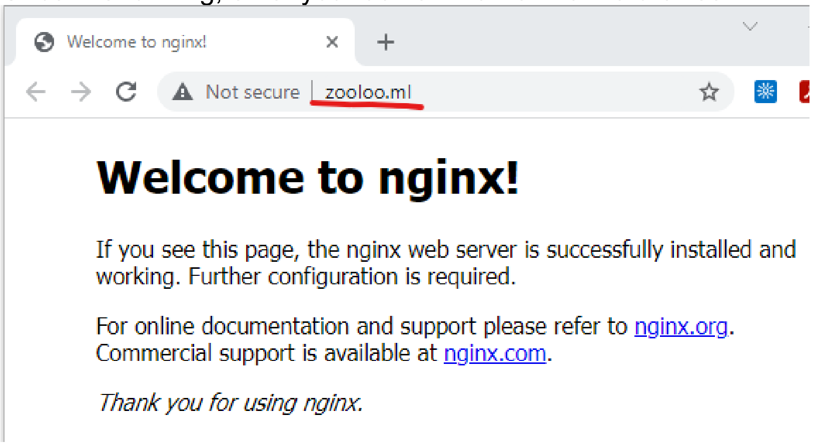
Name: bestsong98.tk

A TTL: 1 hour DATA: 34.134.75.238

   b. Where the IP address is your static IP address
   c. The time it takes for freenom to announce your URL will vary. Sometimes it is a few minutes, but sometimes it takes an hour or even days.

Test Domain

Start your VM.
Once it is running, enter your domain name into the browser.



Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

Take a screenshot, highlighting your URL
Note that the connection is still labeled as “Not Secure.” We will fix that next.

websites should use HTTPS.

1. SSH into your VM
2. Install snap
   a. `sudo apt update`
   b. `sudo apt install snapd`
3. Check that snap is installed, working correctly, and up to date
   a. `sudo snap install core; sudo snap refresh core`
4. Install the program, CertBot, to get the certificate from Lets-Encrypt.com
   a. `sudo snap install --classic certbot`
5. Check that everything it installed and ready
   a. `sudo ln -s /snap/bin/certbot /usr/bin/certbot`
   b. No error message should appear
6. Get the certificate
   a. `sudo certbot --nginx`
   b. When asked
      i. Provide an email
      ii. Yes, you have read the T&S
      iii. You can share your email with EFF, it is up to you
      iv. Enter your domain
         1. *Carefully* enter your domain.
         2. This should be the same one that you created with freenom.com and you tested in section Test Domain.
         3. You add www in the front, like www.zooloo.ml
   c. Lets Encrypt and CertBot work and then should finish. Your certificate has been installed into nginx

Test Your Certificate

Go back to your browser and enter your URL/domain. Now the "Welcome to nginx" page should show, but now without the "Not Secure" message.

Welcome to nginx!

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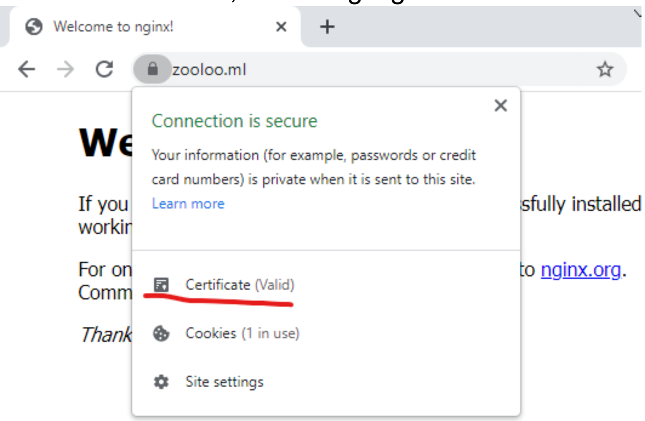
Commercial support is available at nginx.com.

Thank you for using nginx.

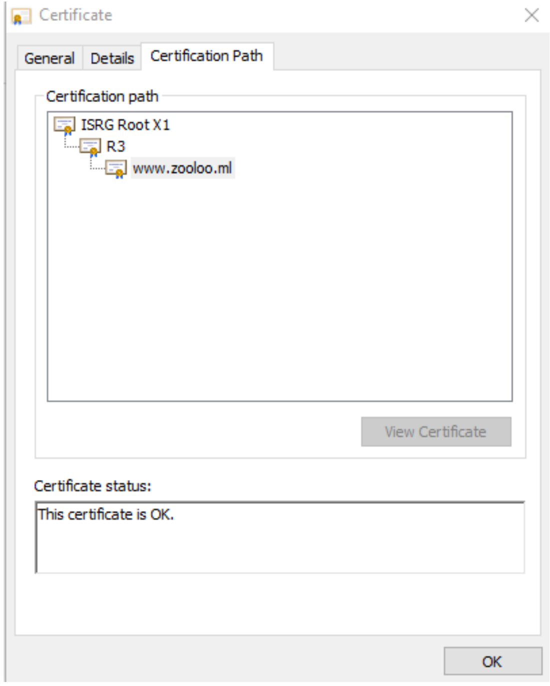
Click on the lock icon that is highlighted in the image above.
Note that the dialog box message says that the connection is secure.
Click on Certificate, that is highlighted below



Connection is secure

Your information (for example, passwords or credit card numbers) is private when it is sent to this site. Learn more

Click on the Certification Path tab. Take a screenshot that shows how your certificate is validated.



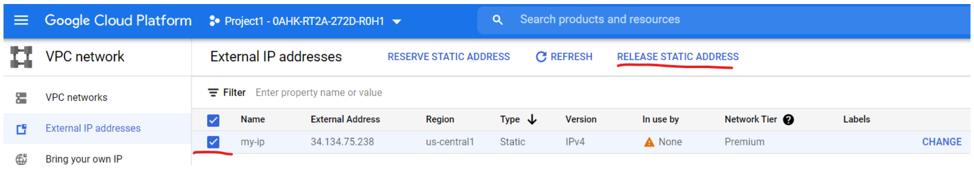
Certification path

```
ISRG Root X1
  R3
    www.zooloo.ml
```

Certificate status:

This certificate is OK.

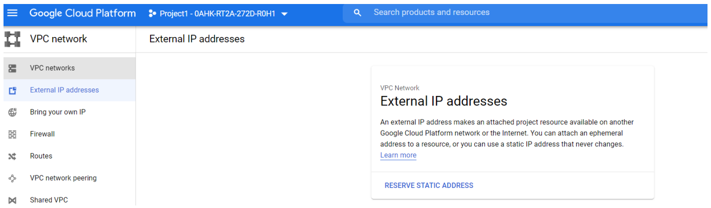
1. In GCP Console: Delete your VM
1. Navigator Menu > VPC Network > External IP Address
2. Note that the In use by says None ⚠ None
    a. This means that you are being charged to use this IP address
3. Click the check-box to select the IP to be deleted
    a.



External IP addresses

☑	Name	External Address	Region	Type	Version	In use by	Network Tier	Labels	
☑	my-ip	34.134.75.238	us-central1	Static	IPv4	⚠ None	Premium		CHANGE

4. And click RELEASE STATIC ADDRESS
5. When asked if you are sure, click DELETE
6. Take a screenshot your empty list of External IP Addresses
    b.



VPC Network

External IP addresses

An external IP address makes an attached project resource available on another Google Cloud Platform network or the Internet. You can attach an ephemeral address to a resource, or you can use a static IP address that never changes. Learn more

[Link to editable version](#)