Contents

Getting GCP Credit and Creating your First Project

Before getting started you must request your credits and supply your Google (Gmail) email address to your instructor. Follow these short steps to complete this task:

1. First (assuming you have a gmail account) follow the provided link to get your Google Cloud Platform (CGP) credit and fill in the form.
2. Next, again in Fleming's email account verify your Fleming email is correct by clicking on the verification link (check your spam folder in Outlook!).
3. Still on Fleming's email account, check your (spam) folder for another email now containing the credit code string. You can then follow the steps to apply the credit to your gmail account(any standard account will do—none associated with a company or other school).
4. Once completed, this should create a new GCP billing project *My First Project* and assign the academic credits to this project.

   Thanks to Google's Academic team for supplying this credit to you, our students!
5. Submit your google email address for the account where credits were applied to the instructor. Your account will be added to the list to access the virtual machine image used in this assignment.
6. If you have been granted permissions to see the class virtual image, do not select that account as you will have no privileges to perform any tasks. This is NOT your image and you cannot do anything with it.

Shawn's ArcGIS Server is the instructors' project and only visible if permissions have been granted for your gmail account. It is not a project you can modify.

7. Select your project. Usually, during the credit application process a new project is created called My First Project. Always have YOUR project selected to perform the tasks shown in this document.

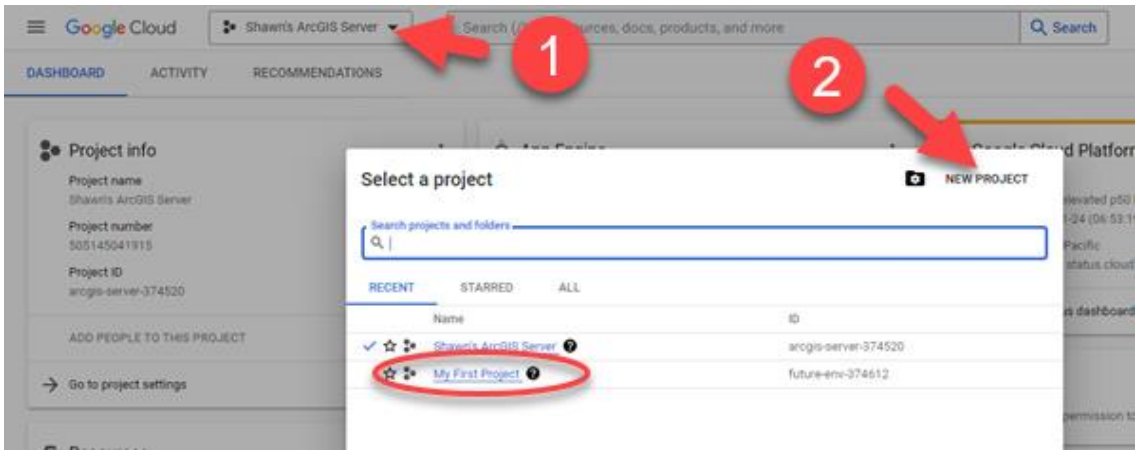
Always select YOUR project to work in. Is no other project shown?
Continue on the next steps to create one.

Create a GCP Project (if needed)

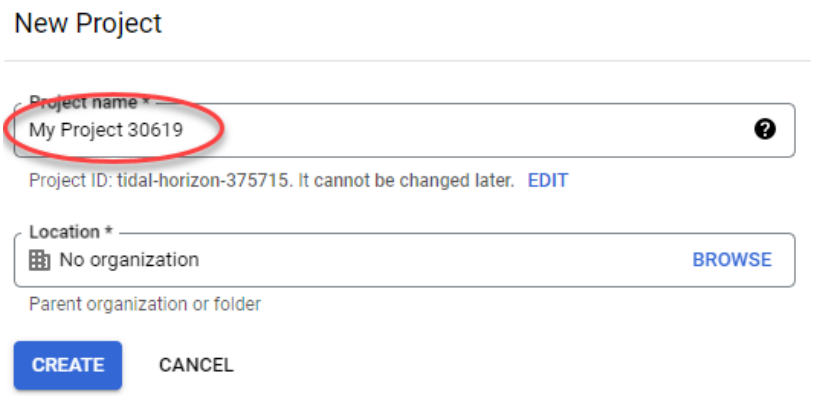
If your account does not have a GCP project, you must create one to follow the steps. Only one project owned by you is needed for all tasks in this document.

1. To create a project (if not automatically created in Step 4) then click on the project list (above) and click New Project. The screen capture below shows a second project already created (circled

in red). If you do not have this, then you can create a new project by clicking on the New Project link top-right of the window.



2. The new project window appears. Enter a unique project name for your content. Your account is an individual one, so no organization will be set.



3. Once created, select this project to continue the steps in this document.

Run a GCP Virtual Machine to test ArcGIS Server

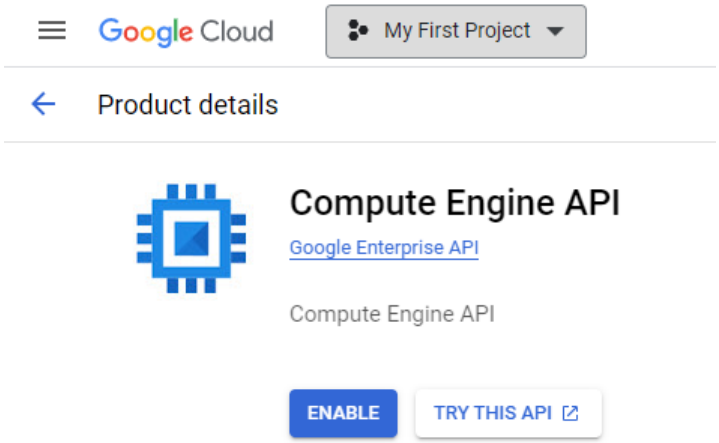
These instructions copy and launch a virtual machine image into your account. These steps only need to be done once to copy the VM into your account. After, you can stop/start your copy of the image to work with ArcGIS Server.

Do not continue until your Gmail account has been added to access the VM image. Without this access, you will not be able to access the VM image needed.

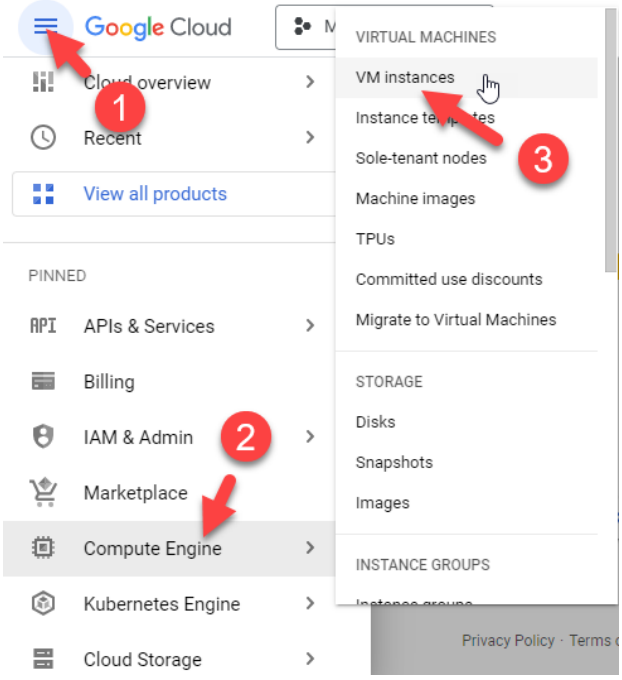
If you have been granted permissions to see the class virtual image you will be able to see Shawn's ArcGIS Server in the projects list. This is NOT your image and you cannot do anything with it. DO NOT SELECT THIS PROJECT. Use your own personal GCP project to follow these steps.

Shawn's ArcGIS Server is the instructors' project and only visible if permissions have been granted for your gmail account. It is not a project you can modify.

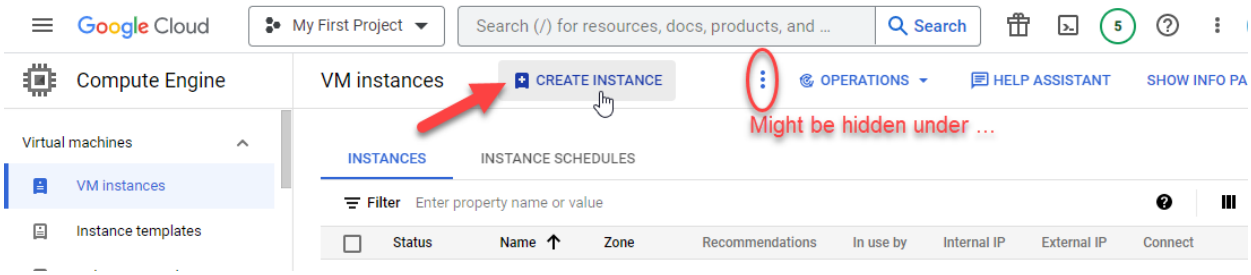
1. Open google cloud console and enable CGP Compute Engine API (if not already enabled). This is what will be used to create the virtual machine (VM).



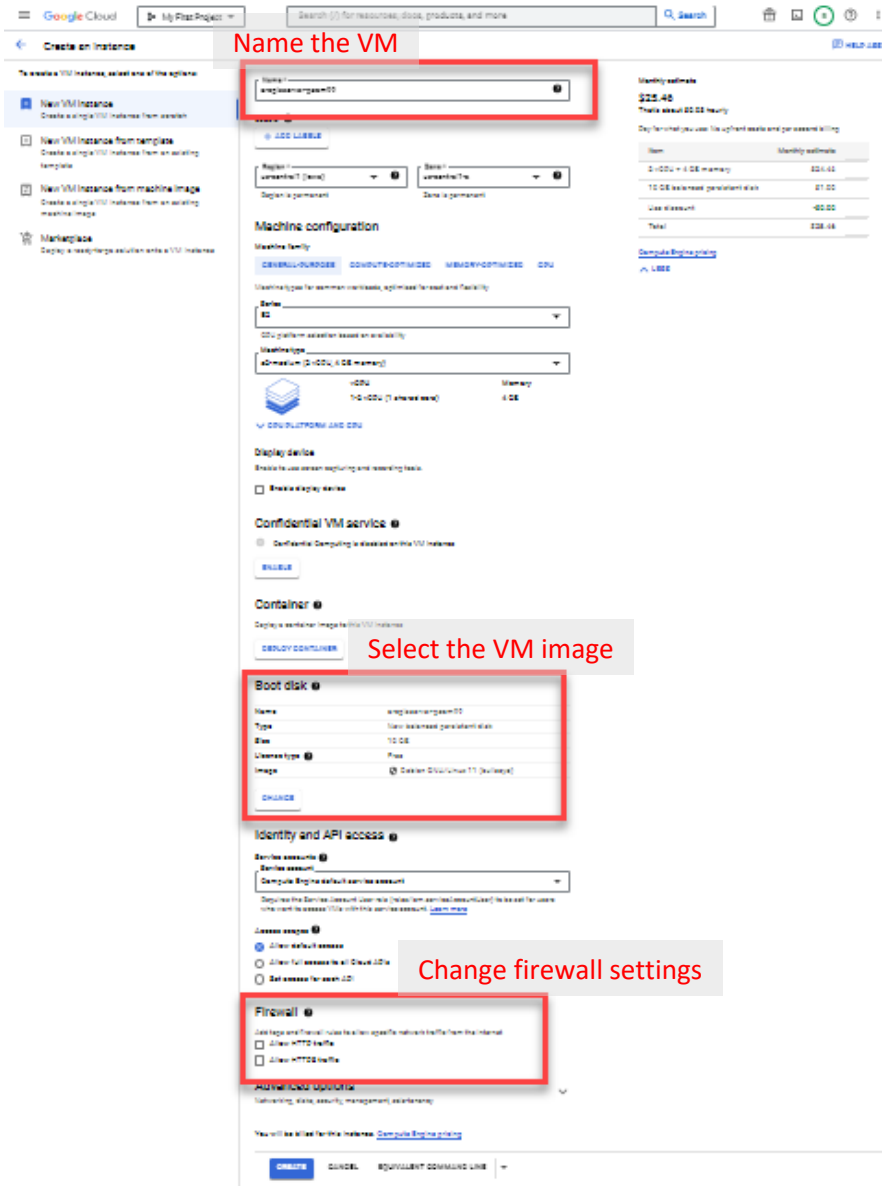
2. Once enabled open the Compute Engine console to start creating the new virtual machine.



3. Once in the compute engine console, initiate the Create Instance tool using the button (the button might be hidden in the ellipsis (… but vertical) depending on your screen width).



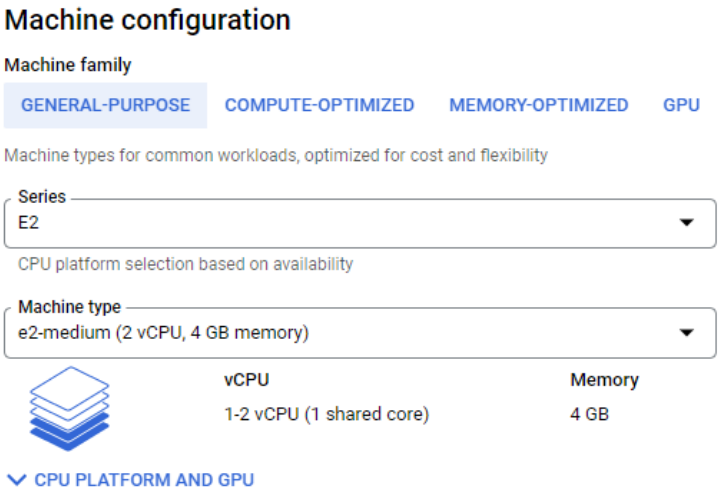
4. In this next step we will make some changes to the defaults for a new virtual machine before proceeding. These changes are detailed after this, but this capture highlights in red were the instructions ask you to make changes and are completed from top to bottom.



5. First, name the virtual machine. The recommended name is below, but this can be set to anything meeting GCP's requirements without concern.

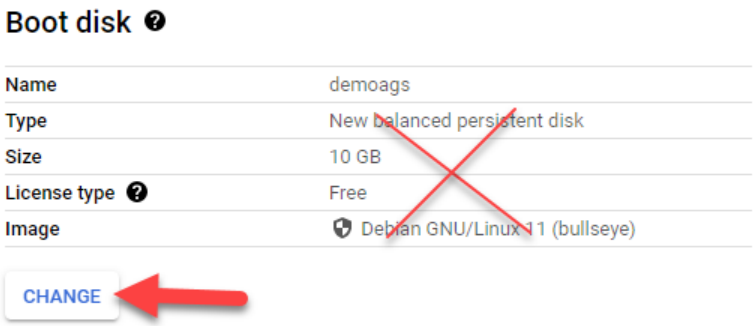
6. While we are not going to make changes, it is important to understand where this virtual machine will be created. The cloud is not a mythical place—it always has a location, and in this case we will be creating this virtual machine on a server in Iowa (take a look at the facility on google maps: https://goo.gl/maps/MQi2Hb1A18AqXZPA6).

7. For machine configuration we will use the defaults. This sets the "size" of the virtual machine: You can allocate more virtual CPUs, or more ram by changing the series or machine family (but will cost more). This can be changed with the VM not running if needed using the GCP console. The costs increase significantly with more CPUs and ram! For this task the *e2-medium* is enough, but in a business or production environment use Esri's requirements (8gb RAM).



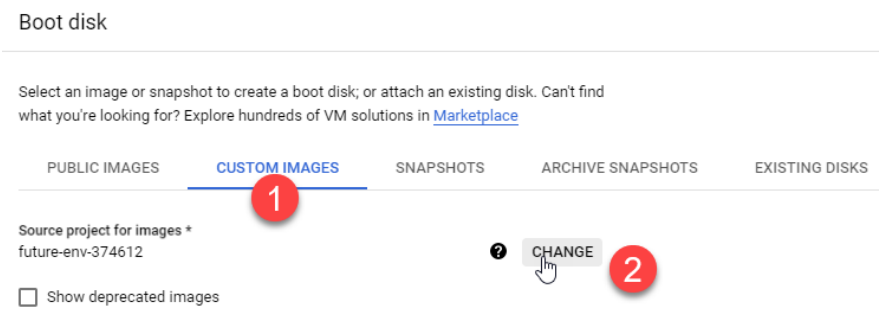
8. Google cloud provides different images to start from. Most are Linux-based, since the operating system is free. We will use Windows systems since that is what you are more familiar with (which premium charge is levied given Microsoft Windows Server is not free!). The image we

will select was custom created with ArcGIS Server pre-installed and configured on a Windows Server. Click Change to find the instructors' provided image.

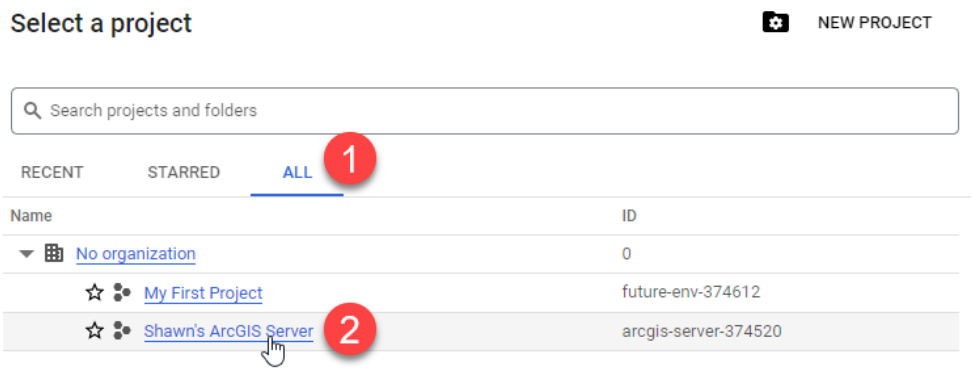


9. The image provided is a custom one (select Custom Images). This custom image is not in your Google Cloud Project—it is stored in the instructor's account. You must change the project to be the one indicated by your instructor (*ArcGIS Server* for 2023)

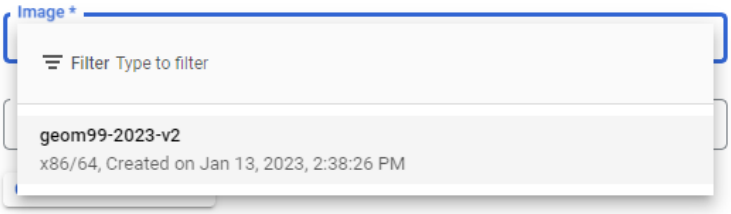
Note: This step will not work if your google account has not been granted the necessary permissions. If you cannot see the ArcGIS Server project, then you must contact the instructor with your google account username to be given access.



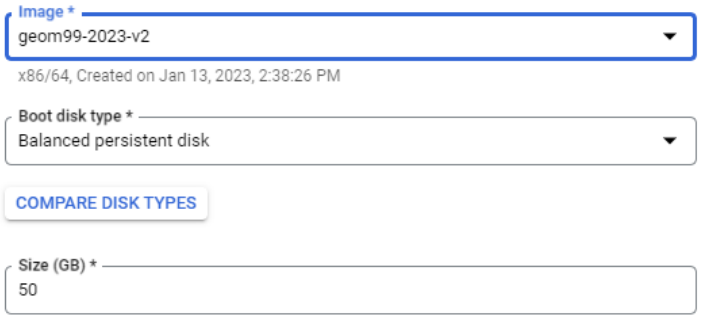
10. Click **All** and click on *Shawn's ArcGIS Server* project entry. (again, if you cannot see this contact the instructor and provide your google email address to be given access).



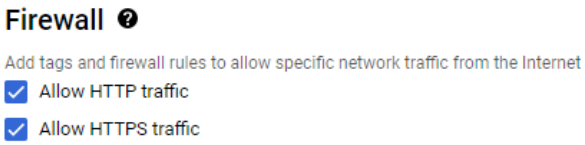
11. Once the project is selected, you will be able to see the custom images in the image dropdown list. There should only be one image listed, but if there are multiple pick the one with the latest version number/date.



12. With that image selected your settings should look like this:

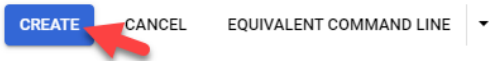


13. Now enable the Firewall to allow both HTTP and HTTPS traffic. These allow the web server pre-installed to work.

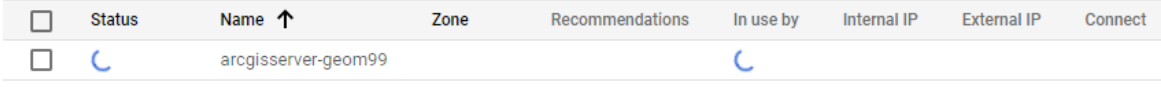


14. Once all the settings have been changed, you can click Create and the Virtual Machine will be created and started (it will be running so incurring charges). It may take a few minutes for this to finish.

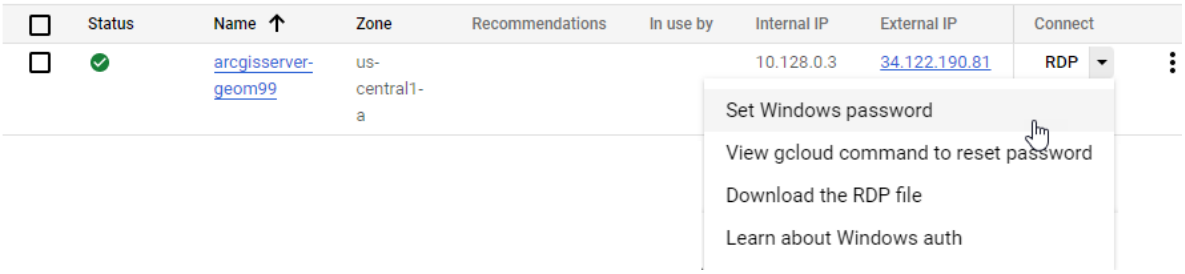
15. This is where Google Cloud starts costing your account money (against the academic credits—thanks Google!). After this step be sure to complete the entire process and shut-down the VM to not exhaust your cloud credit money.



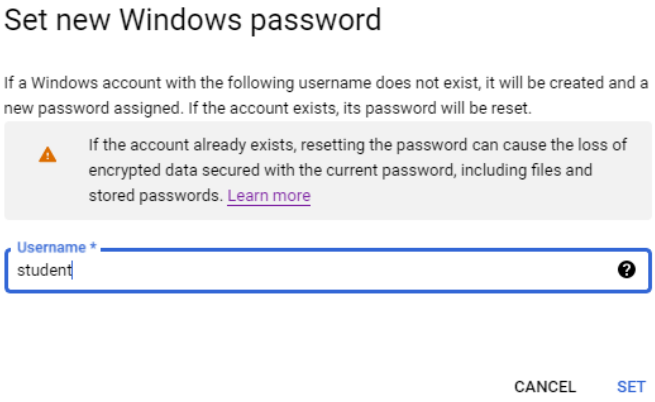
16. While the virtual machine is being created you will see the *Status* and *In use by* columns with an animated icon indicating it is still processing. Wait this one out (for about 3-5 minutes).



17. Once complete, you will see the Status a green checkmark, and now you can get started to configure the instance to connect and log in. Find the Connect column on the VM and click the down arrow next to RDP. Select the *Set Windows password*.



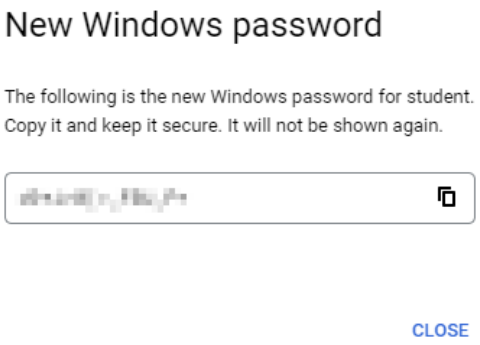
18. Change the username to be *student*. This is a specific account pre-configured for this course. Although you could enter any username and GCP will create that user as an administrator in your new VM, best use the provided and configured account so the provided instructions work. This command will reset the password and show you that generated password. Enter "student" and click SET.



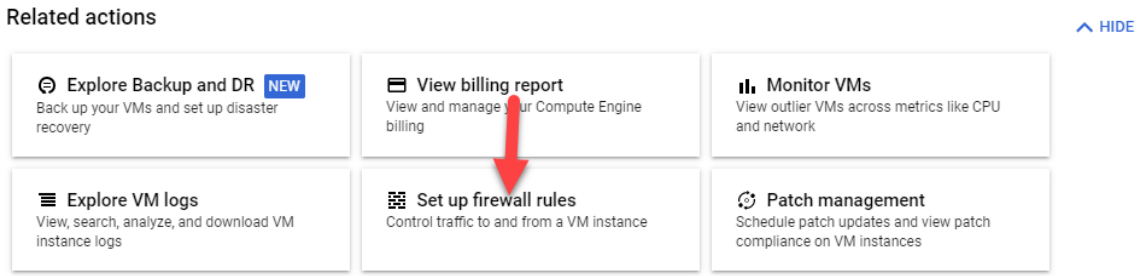
19. The new windows password for this account will be shown.

IMPORTANT: The password is changed and saved on the VM and this will be the only time the password shows. Be sure to write this down as you will need it each time you start and want to log into the VM! I recommend you copy-paste it into a notepad++ document as sometimes the random characters used can be difficult to interpret (is it an I ! l l or |--all of those are different characters but look the same!). (PS: You can re-run this process to reset the password again if you do have problems, but shouldn't

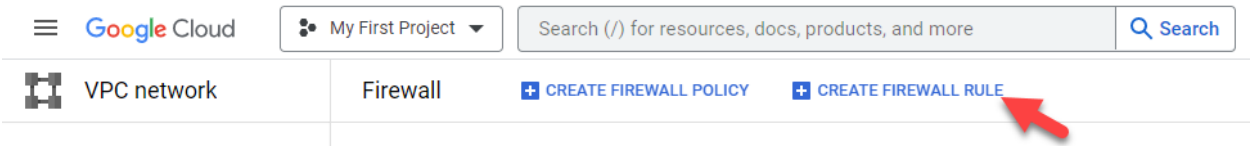
ever need to repeat this process again if you properly record and re-use this provided password).



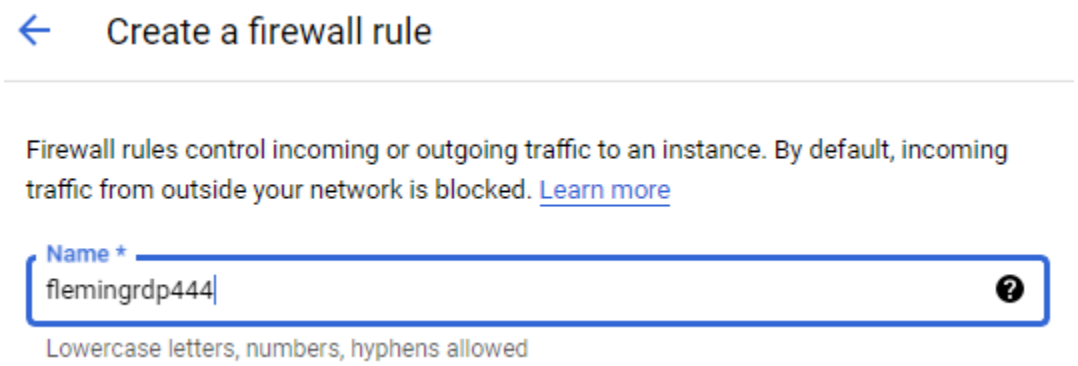
20. Now that the VM has a password set that you know, a change to a firewall rule is necessary to make it work from Fleming computers. We use remote desktop/RDP to connect to the desktop of the remote machine. The default for RDP is it to use TCP port 3389, but that TCP port is blocked by Fleming IT for security reasons. This VM image has been specially configured to listen to 444 for remote desktop instead of 3389. We now need to configure your new VM to have TCP 444 open on the firewall to allow you to RDP into the machine. Click *Set up firewall rules* on the related actions on the bottom of the status window.



21. In the firewall rules, click *Create Firewall Rule*.



22. Here, set the name to be `flemingrdp444`. (although the name can be different, best use the provided one for technical support and consistency in this course).



23. Next, under the targets dialog select the *All instances* in the network option. This means this rule will apply to any VM on your account.

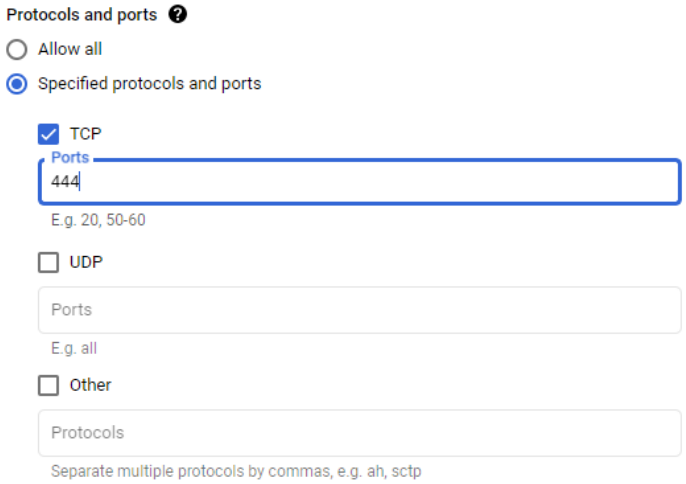
24. After, find the *Source filter* and select *IPv4 ranges*. Enter where you would like to log into the Virtual Machine's Windows desktop from (choose the most restrictive ideally, but if unsure or having issues select any computer).

- (best for working from the college) Any Fleming Campus computer: `142.237.0.0/16`
- (most restricted/for working from home) A specific computer network, like at home: Enter your public IP number. An example is 24.242.25.53 (just google whatsmyip to see yours). Note this number should never start with 192.168.x.x or 10.x.x.x where x is any number from 0 through 255 as those are special internal-only numbers.
- Any computer on the internet (no restrictions): `0.0.0.0/0`

You can come back and modify the rule and change the address later if your IP or situation changes, like logging in from home after being on campus.

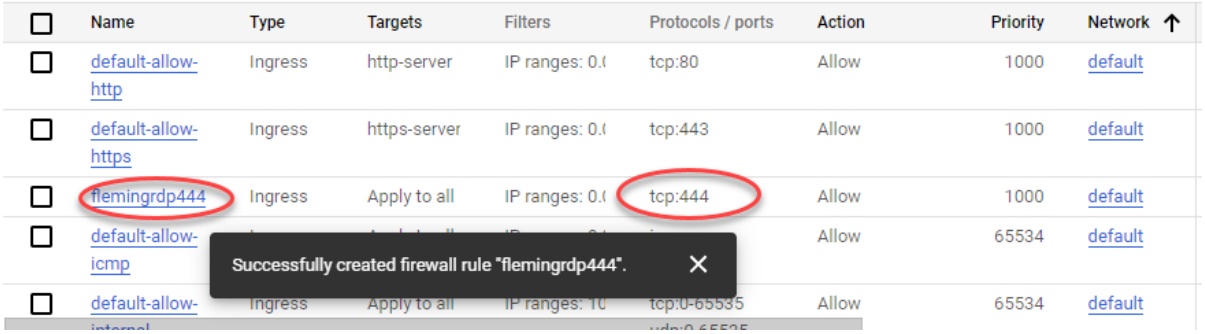
---

25. Next, set the port to be 444. This again is not the normal RDP port (remote desktop protocol), the default is 3389 (remember this!). But to facilitate on-campus students, this port default has changed to be 444 for this custom image virtual machine.



26. Now click Create to make this rule and apply it to all VMs on your project.

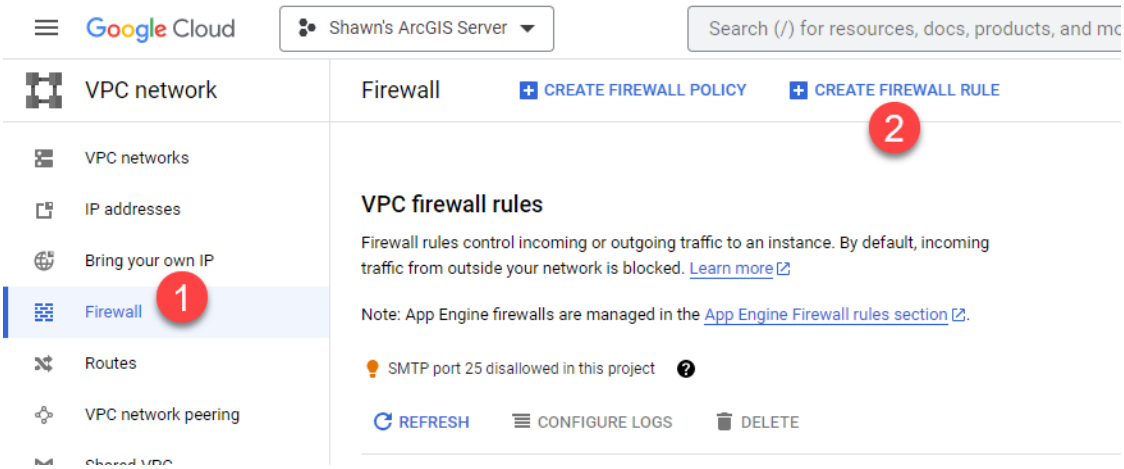
27. If you cannot access the Remote Desktop to login, go back to the rule entry and edit it to make it work for your situation. Entering 0.0.0.0/0 the least restriction and should always work but is not the best option for being secure.



Part 1: Setting a GCP Firewall Rule to allow ArcGIS Server Management Ports

ArcGIS Server management has two ports, 6443 and 6080, both of which are not open by default Google Cloud Platform firewall rules. Before any request to these ports is permitted from outside of the VM, they must be enabled as open. This section will enable these ports to work.

1. In GCP's console open *Firewall* under the main category *VPC network*, and click *Create Firewall Rule* to get started.



2. Name your firewall rule `arcgisserveradmin` (any name will be accepted, but we ask you to use this specific name for instructor support).

3. Next, under Targets set it to *All instances in the network*. This means the firewall rule applies to all VMs in your project, so this is not specific to any one VM.

4. After, find the *Source filter* and select *IPv4 ranges*. Enter the IP address where you would like to run ArcGIS Pro from (choose the most restrictive ideally, but if unsure or having issues select the 0.0.0.0/0 option).

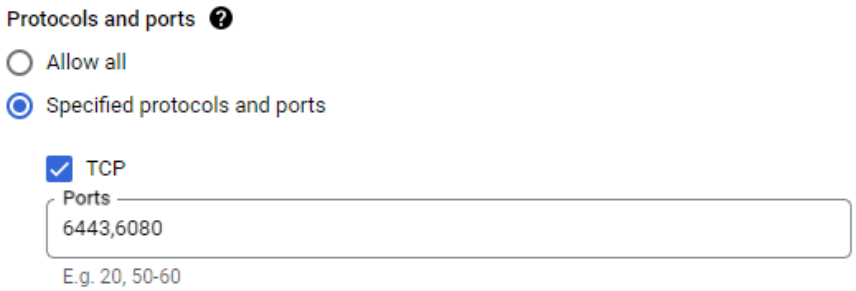
   - (best for working from the college) Any Fleming Campus computer: `142.237.0.0/16`
   - (most restricted/for working from home) A specific computer network, like at home: Enter your public IP number. An example is 24.242.25.53 (just google whatsmyip to see yours). Note this number should never start with 192.168.x.x or 10.x.x.x where x is any number from 0 through 255 as those are special internal-only numbers.

- Any computer on the internet (no restrictions—not recommended): `0.0.0.0/0`

You can come back and modify the rule and change the address later if your IP or situation changes, like logging in from home after being on campus.

---

5. Now set the TCP ports to open as 6443 and optionally 6080 (rarely is this non SSL port used and by default ArcGIS Server will no longer communicate with it. The provided VM has been configured to allow viewing on TCP Port 6080 for testing purposes).



6. Click Save and now the rule has been created in your account. It will apply to all VMs (so if you do not need to repeat this process if repeating the redeploying image to VM process).

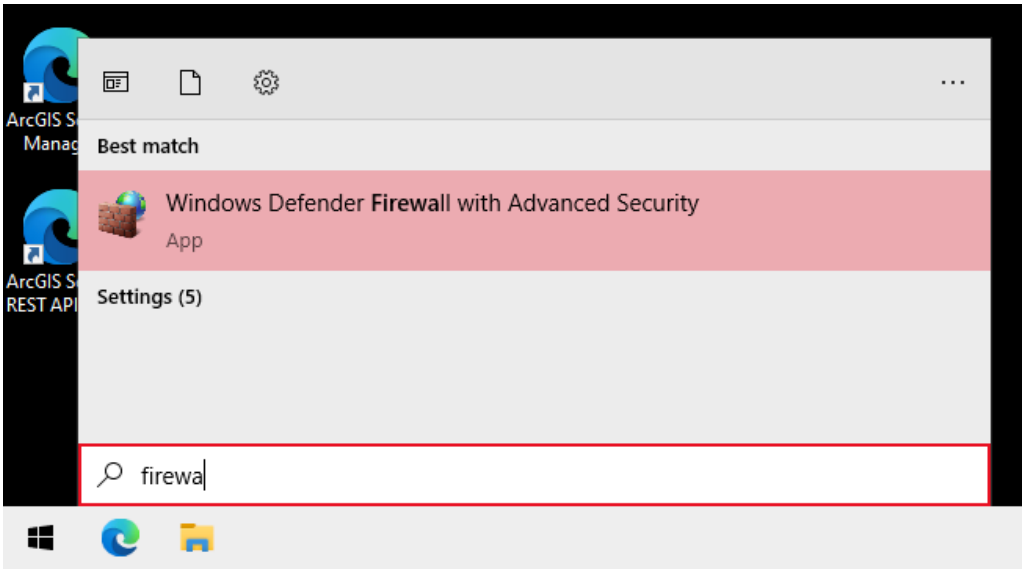
Part 2: Setting a Windows Firewall Rule to allow ArcGIS Server Management Ports

There is another firewall built into Windows itself. This Windows firewall must also be configured to allow TCP 6443 and 6080 to pass through from outside the network. This is a permanent setting in windows that needs to be completed once per virtual machine.

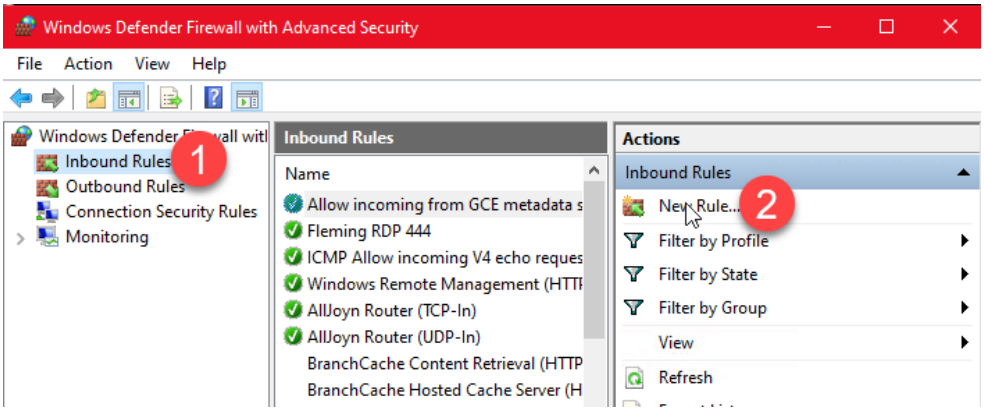
Log into the remote desktop on the started Windows Server and follow these steps.

Important: This must be completed on the server itself, not on your local computer.

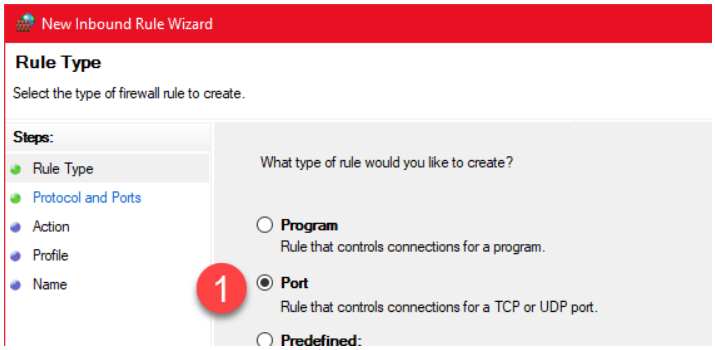
1. In the Start menu on the server type firewall and select the Windows Defender Firewall with Advanced Security option.



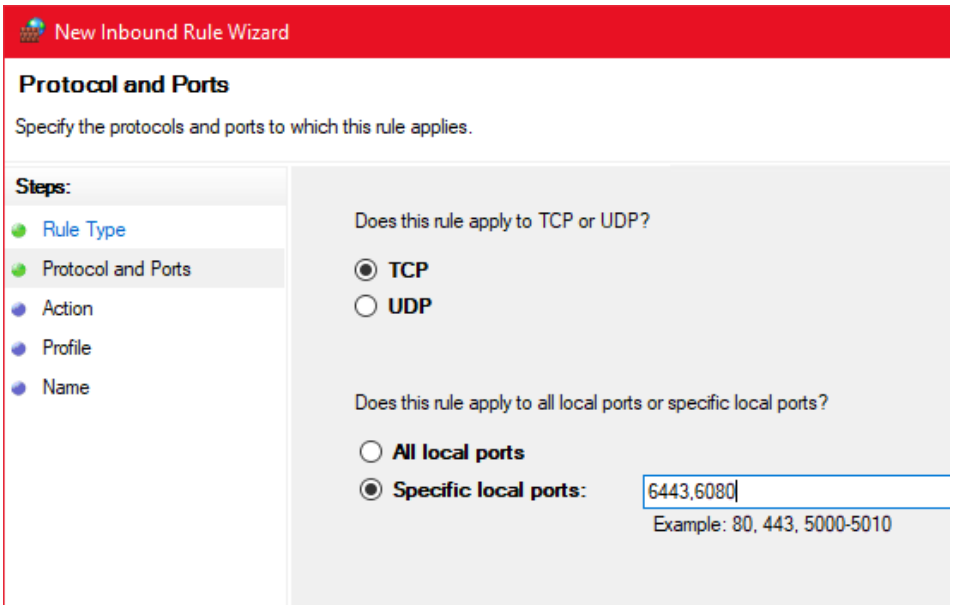
2. Click on the Inbound Rules and select New Rule. (If the dialog that opens looks different, select Advanced Options in the firewall to provide the full settings as shown below).



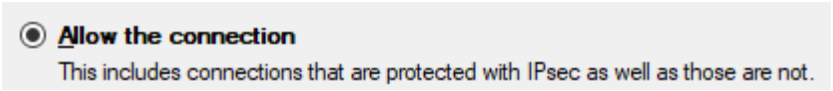
3. Select Port for the rule type so we set what will be permitted through the firewall from the public side. Click NEXT.



4. Select TCP and enter the two ports we are permitting through for ArcGIS Server administration, 6443 and optionally 6080. Click NEXT.



5. The default of Allow the connection is correct. Click Next.



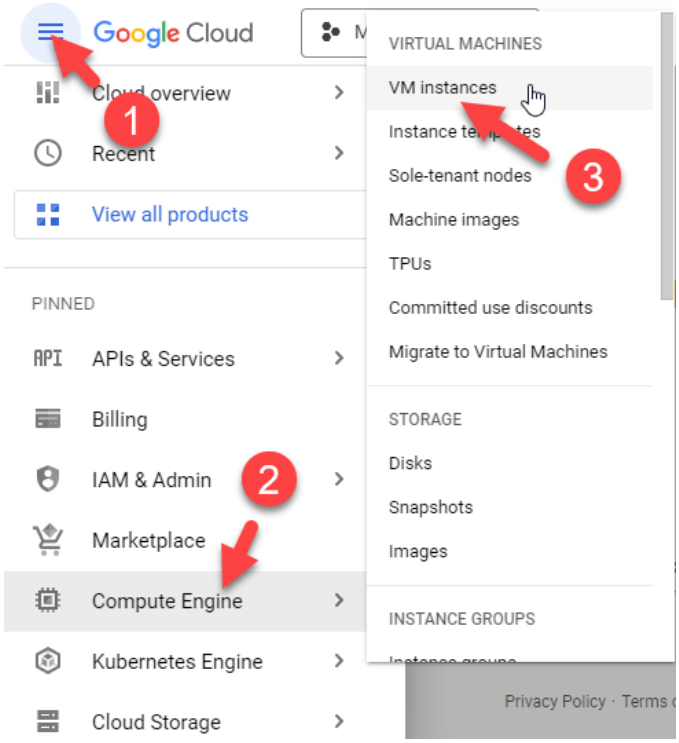
6. The rule will apply for all options, Domain, Private and Public. Click Next
7. Name your rule ArcGIS Server Admin Ports to be consistent and for instructor support. Click Finish to create and enable this rule.

The firewall rule will go live immediately and persist after any restart of the server, so does not need to be changed. Note the configuration here makes the Google Firewall (configured in Step 1) more restrictive (ideally open only to access on one IP address) and the Windows firewall permit any connection to these ports since the GCP rule is first in the line of firewalls.

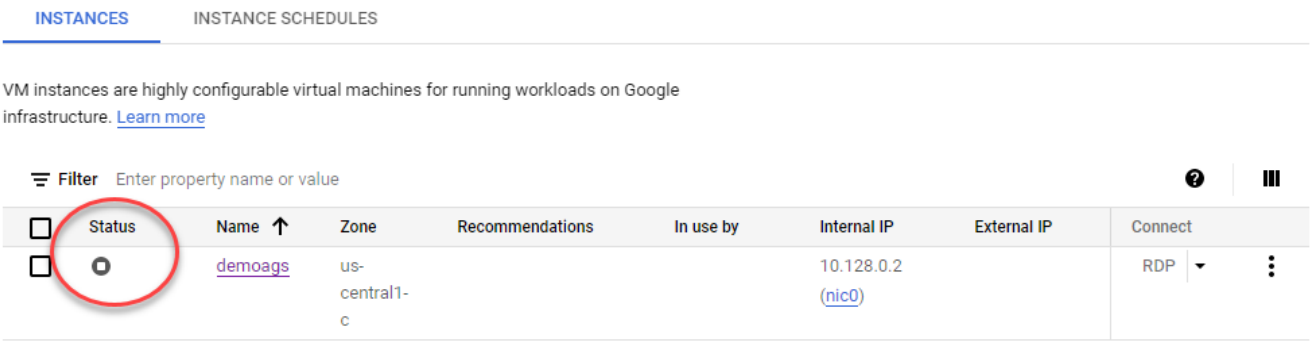
Starting an existing/shut down Virtual Machine on GCP

The first time the VM is created it will be started. Anytime you wish to use the VM after this you must start it up (assuming you have stopped it before to reduce costs and save your free $$$ credits). Starting the VM is only a few steps:

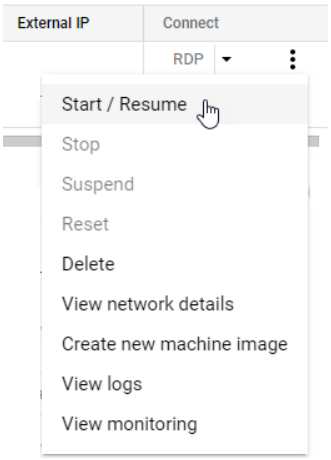
1. Open the Google Cloud Platform (CGP) Compute Engine's VM instances console.



2. Under the list of instances find the one you wish to start and confirm it is not currently running. The status should show a stopped icon. This means it is not running.

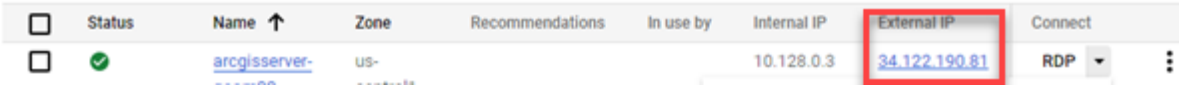


3. On the rightmost side click the vertical … to open the control menu. Click Start / Resume on the menu that appears to start up the stopped VM.



4. Confirm you wish to start the VM and give it a moment to initiate the start-up. The status will turn to a green checkbox and an external IP will be assigned. Take note of the assigned External IP. This will be used to connect to the ArcGIS Services and remote desktop.

In this assignment, each time the VM is started a new External IP is generated. Any connections set in ArcGIS Pro or bookmarks saved on your web browser need to be updated using this new IP address. IP numbers assigned from previous sessions are not valid and can be safely removed/or updated with this new setting.



5. After a few minutes to let Windows and the ArcGIS Server services to boot, your system will be accessible using the current External IP address. ArcGIS Server is on a delayed start, so can take 5 or more minutes to become available.

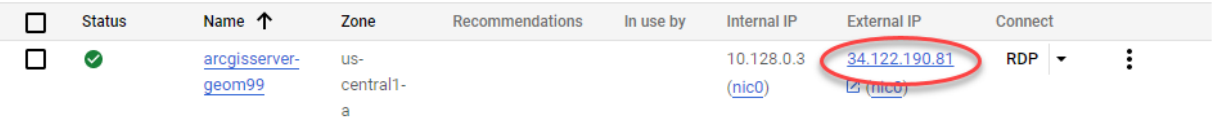
Remote Desktop to a Virtual Machine Desktop

Remote Desktop allows you to log into the windows desktop. This is not always necessary but is the only way to interact with files and administer some items within Windows. Using ArcGIS Server through URLs can be done from your own computer's web browser or ArcGIS Pro, so no need to be logged into the desktop!

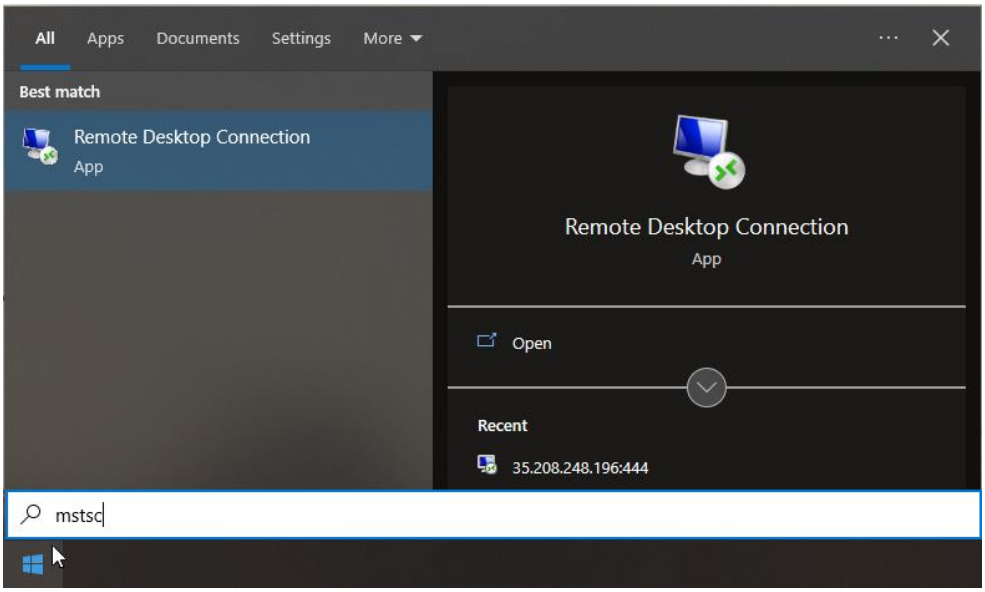
Once the VM has been given a chance to start up follow these instructions to connect (think of how long a windows machine starting takes: usually 1-2 minutes).

1. Find the running VM External IP number from the GCP Compute Engine console. You will need to enter this into a command in a moment to connect to the desktop.

This IP will change each time you start the virtual machine, so you will need to get the new IP each time you want to start the VM. Static IPs (one that does not change) are possible, but cost more.



2. On your Windows desktop locally, start the Remote Desktop Connection tool by clicking Start and typing Remote Desktop Connection (or mstsc for the short name).

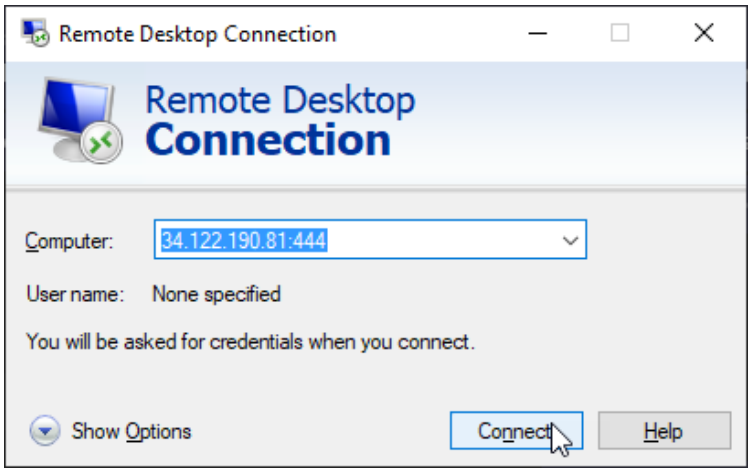


3. The Remote Desktop connection interface will appear. Enter the IP address that your virtual machine started on (again, this changes each time so be sure to check what yours is!). Add :444 at the end to tell what port the connection will be made (remember this from web? Yeah, it's a standard method of specifying a port!).

Your IP number will change each time. Be sure to use your current IP number from the GCP compute engine console or you will not be able to connect!

Without specifying :444 the connection would use TCP 3389, the default port for Remote Desktop Protocol. This custom VM image has been set to use TCP 444

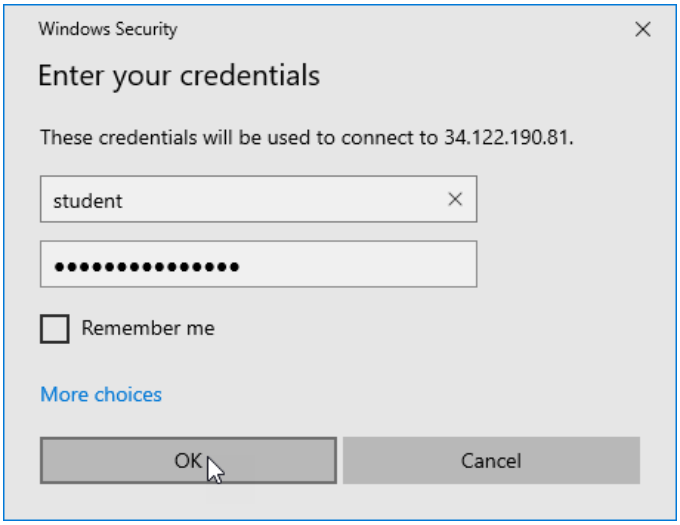
because of restrictions on the Fleming network. If creating your own GCP VMs to use at home or at work, you would use the default and not include the :444 part.



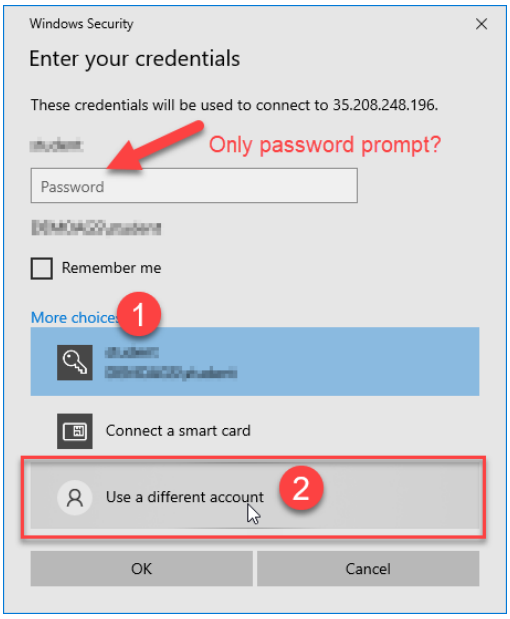
4. The system will then ask you for your credentials. Note this dialog will be different depending on your computers' network. You may need to select *More Choices* to specify a username.

You MUST type both the username and password, if you are getting only a password prompt choose More Choices.

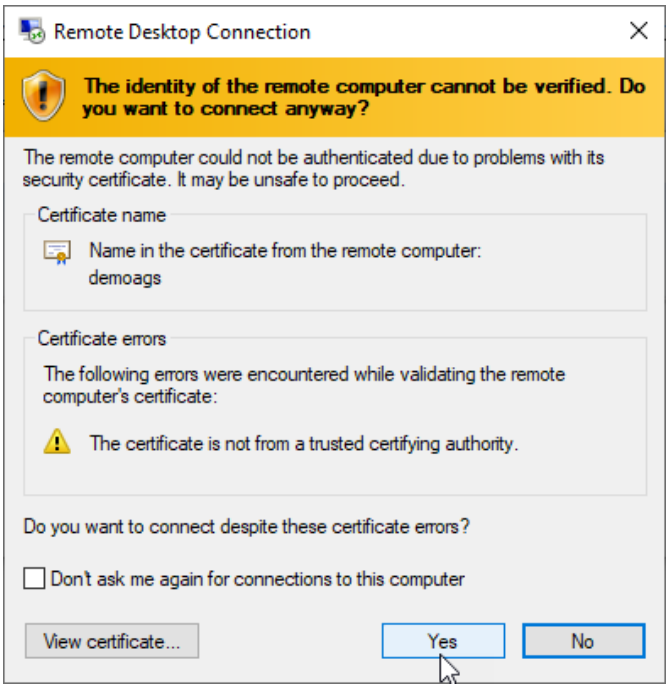
5. Enter Student and then the password you wrote down earlier when creating the virtual machine (no, you do not need to reset the password each time you start it—the password will be consistent once reset).



Not seeing a place to chage or enter the username and only space to enter a password? Click More Choices and select use a different acount.

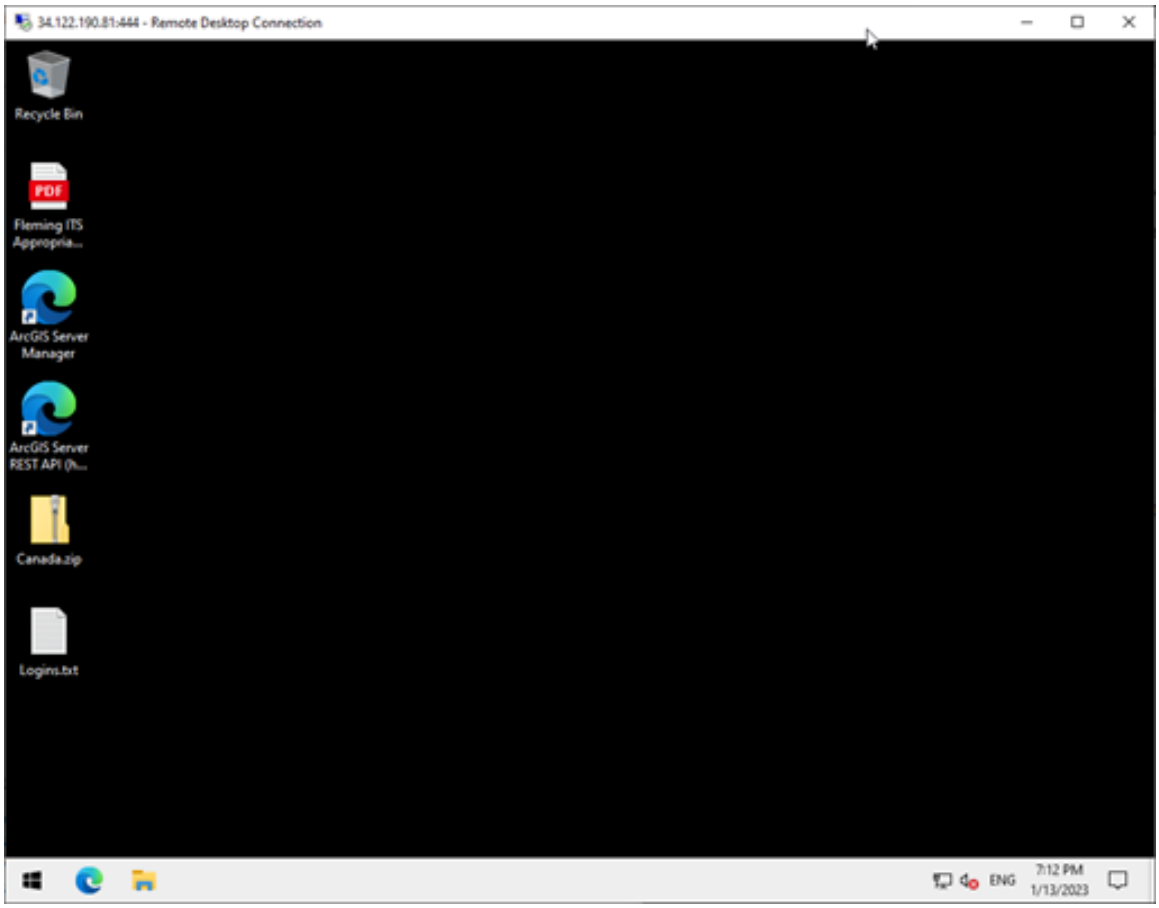


6. Once entered, click OK and then the connection will be made and, if the server can be found and 444 port accessed, will prompt with this. Click *Yes* (this is fine—we're not setting up certs here).



7. Now you will have the remote desktop window open (likely taking the full screen). This is the computer you created located in Iowa!

Note: You are bound by the same Fleming ITS policies for on-campus computer use. This provided system must only be used for Geom99 and program-related academic purposes.



Turning off the VM when not in use

It is important to only keep the VM running for when you are doing something with it. Whenever it is running, it costs money. While you do have academic credits donated by Google to test this out, it is important to try and not waste them.

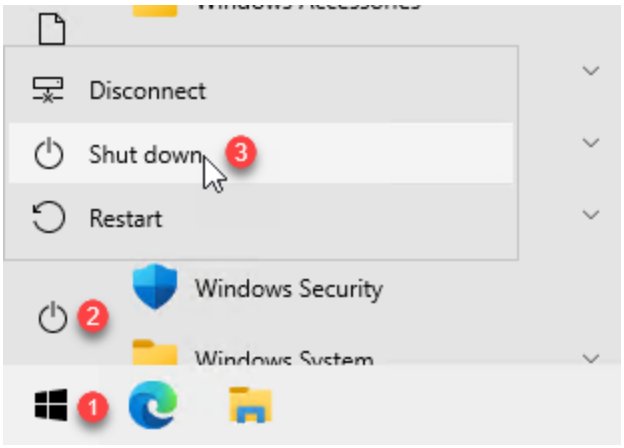
Once a VM instance is stopped, none of the server's services will be usable and the IP address formally assigned will be released. Any links or connections used previously will no longer function. That means ArcGIS Pro will no longer be able to publish or manage services and any applications created from those published services will fail if opened.

Most costs associated with having a VM is allocating RAM and CPUs to a running system. Shutting it down will eliminate these costs and your account will only be charged for storing the stopped image (hard drive) of the system, which is $0.04/a month per GB (https://cloud.google.com/compute/disks-image-pricing). This VM is 50gb, so $2.00/month cost for the VM to be not running/stopped. The running VM set up here, with 4gb Ram and 2CPUs, would be about $30/month, plus any metered data charges in/out of the VM.

There are two ways to turn off a VM, using the windows desktop console and using the Google Cloud Platform console. Choose whichever is easiest for you:

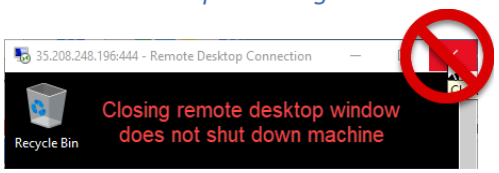
Turn off using a Windows Desktop Console

This method is identical to turning off your own computer. With a Remote Desktop connection established (see above how to do this), select the Start Menu on the VM desktop, click the Power icon and then Shutdown.



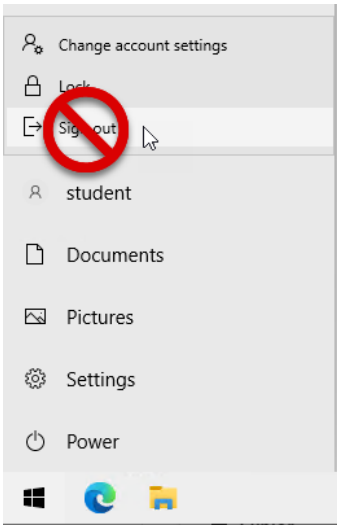
***Pressing the X** or **closing the Remote Desktop Window** does not shut down the machine. This is disconnecting, which is like turning off your monitor. The machine*

keeps running.



***Disconnecting** does not shut down the machine. It is like turning off your monitor only. The machine keeps running.*

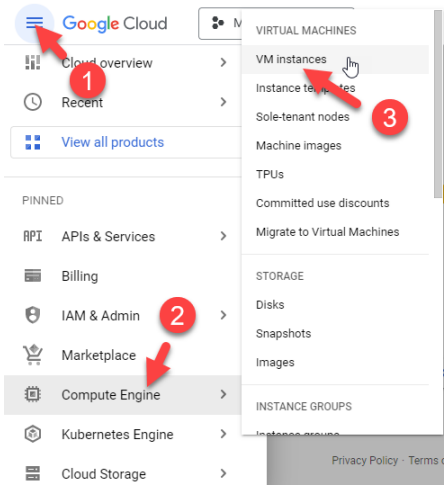
***Signing Out** of the machine does not shut down the machine. The machine will continue to run. It is a good idea if you wish to use the machines' services to log off to release some memory, but you will need to still shut down the machine if you no longer want to be charged for the server running.*



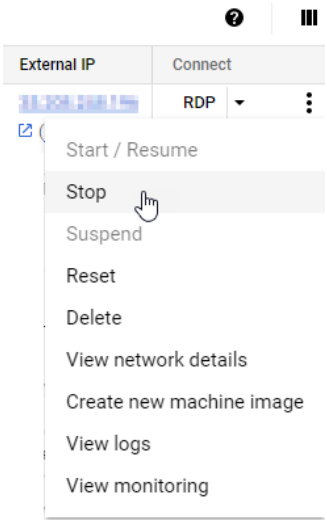
Turning off using the GCP Compute Engine Console (recommended method)

You do not need to be logged into the console to shut down a machine. Follow these instructions using the GCP Compute Engine console to shut down a running VM instance.

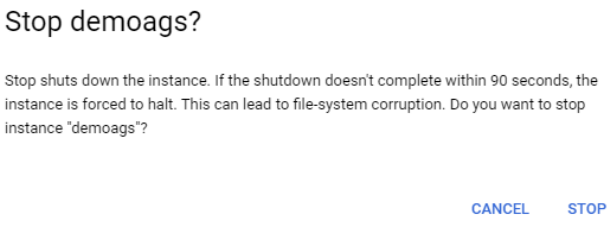
1. Open the GCP VM instances console for Compute Engine.



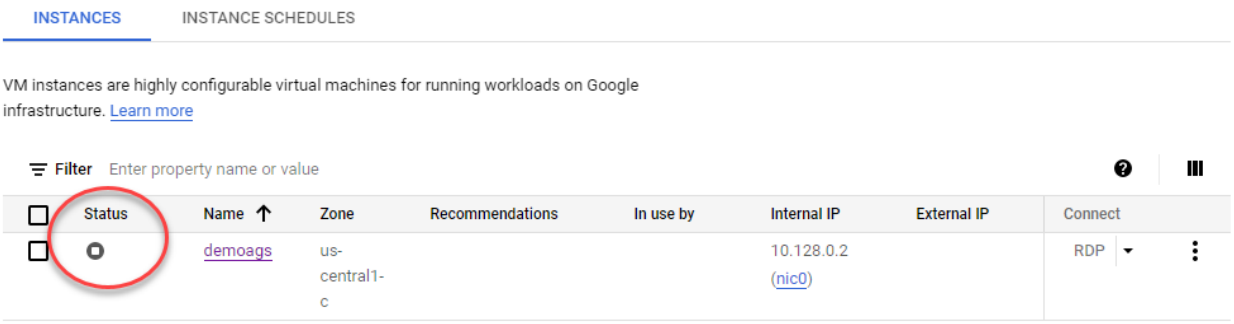
2. Next locate the running VM instance and click on the ellipsis on the right-hand side of the entry. Select Stop from the pull-down menu.



3. Confirm you wish to stop the VM instance.

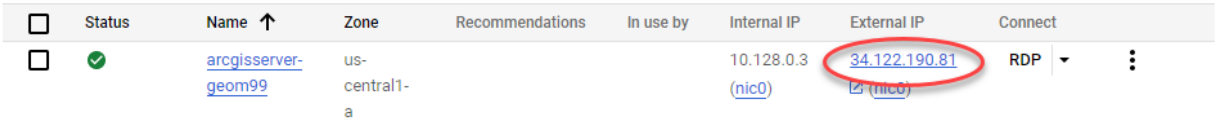


4. Now the VM will shut down. Confirm this by going into the GCP console and checking that the image is stopped. A green checkbox will show if it is still running. Sometimes it can take a moment to shut down, so try refreshing the console display to see if the status has changed.



Open ArcGIS Server REST Service directory with self-signed certificate

With the server running you can use a web browser on your own computer to connect to the ArcGIS Server REST endpoint to see all published services and open the Manager to control those services. You must know the IP number for your running server to use a browser. See the section on starting an existing VM to find the External IP number (example is shown below)



1. To start, on your own computer start a web browser.

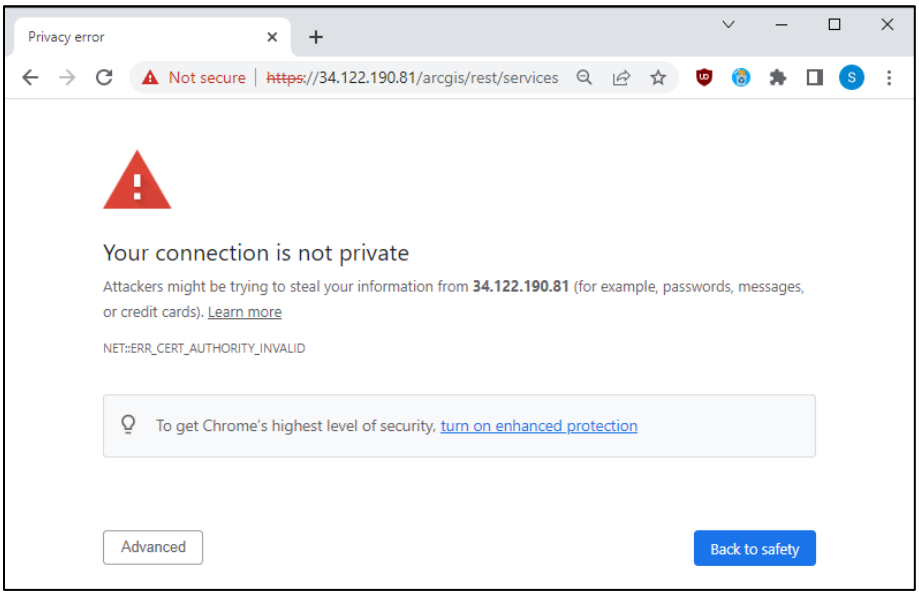
It is best you run these commands on your own desktop, not on the server itself. They should also work on the server too if you wanted to test something, but a logged in person with a browser on the server takes up valuable memory and we're trying to keep things inexpensive—so best use your own computer.

---

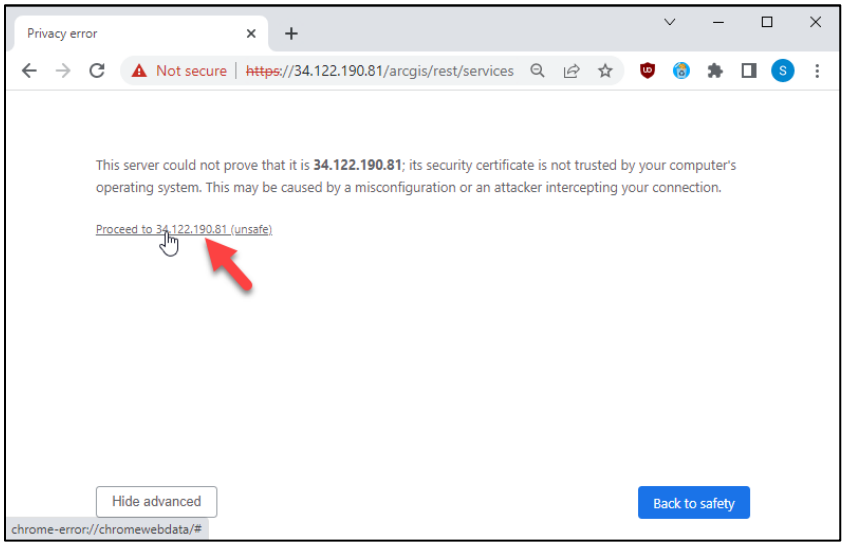
2. Type in https://YOURIPNUMBER/arcgis/rest/services . Note that you must replace the YOURIPNUMBER with the current number for YOUR ip. Do not use the number shown in the screen shots as it will differ for yours, and does change each time you log in.

3. The first time you open this window you will be prompted with a security warning about privacy. Click Advanced to continue.

Our testing server does not have an SSL certificate issued, which requires a domain name to be purchased and an SSL certificate issued against this—which costs money and takes time, so we skip this for this testing server.



4. Next tell the browser you want to accept the risk (given this is our own server image with a self-signed certificate so we know what we are doing, so no real risk exists). Click on *Proceed to IPNUMBER*. If the link is not an option you can use the "secret" bypass method by clicking on a blank spot in the browser window, then typing "thisisunsafe" and it will load the page.



5. Then the browser will open the ArcGIS Server REST Services Directory displaying all published services. You can proceed normally even with the warning about the website being not secure given this is a known server.