RED TEAM SERIES

Red Teaming in Cloud: Leverage Azure FrontDoor CDN for C2 Redirectors

Nairuz Abulhul · Follow
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Evading Detection: Obfuscating C2 Infrastructure with Azure FrontDoor

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A redirector is a server that acts as a middleman between the C2 server and the targeted network. Its primary function is redirecting all communication between the C2 and the compromised target. Redirectors are commonly used to hide the origin of the traffic of the C2 server, making it more challenging for defenders to detect and block the C2 infrastructure.

Cloud-based redirectors present a good opportunity to obscure the C2 traffic by routing it through a global network of servers such as the Content

Delivery Network (CDN). They are simple to set up, and if a C2 channel is detected, the red team can quickly create a new redirector instead of reconstructing the entire infrastructure.

In this blog post, we will continue our *Red Team series*. We'll discuss the Azure FrontDoor CDN service and how it can be utilized as a redirector for our C2 infrastructure.

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Redirector Setup

The setup involves a CDN redirector that communicates with a targeted system via HTTPS on port 443 and between the CDN and the C2 server via HTTP on port 80, as shown in the diagram.

This setup ensures that any callback from a compromised system will not directly go to the C2 server, thus hiding the actual location of the C2 server.

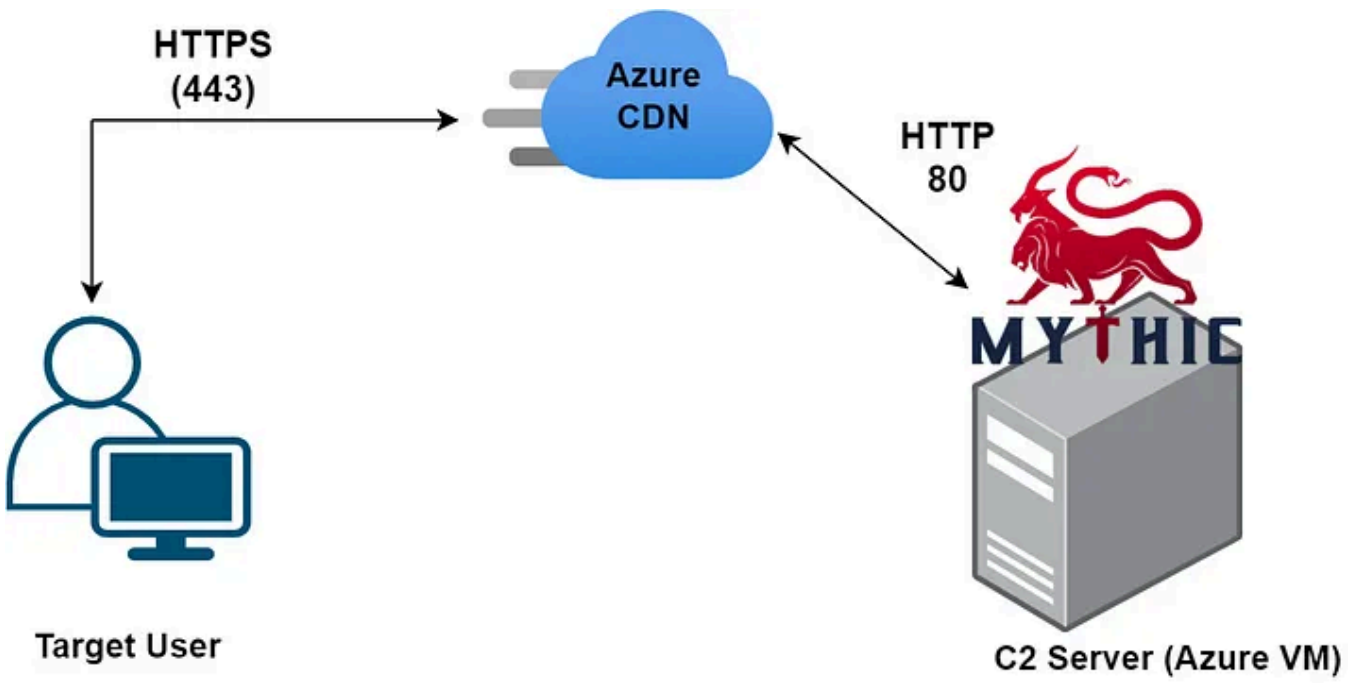

Figure 01 — shows the connection between the target user, Azure CDN, and the C2 server.

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Prerequisites

This section outlines the key steps required to set up CDN redirectors. These steps include enabling the *Microsoft.CDN* Provider and configuring VM Firewall Rules.

If you need to get a better understanding of the Azure environment, you can refer to the first article in this guide titled *"Red Teaming in the Cloud: Deploying Azure VMs for C2 Infrastructure."*

Enabling Microsoft.CDN Provider (Azure Trial)

If you are currently using the Azure Free trial service and want to create a CDN profile, you must enable the "Microsoft.CDN" provider.

To do this, search for your subscription name and select it. From there, navigate to the left menu and select "**Resource providers**" under *Settings*.

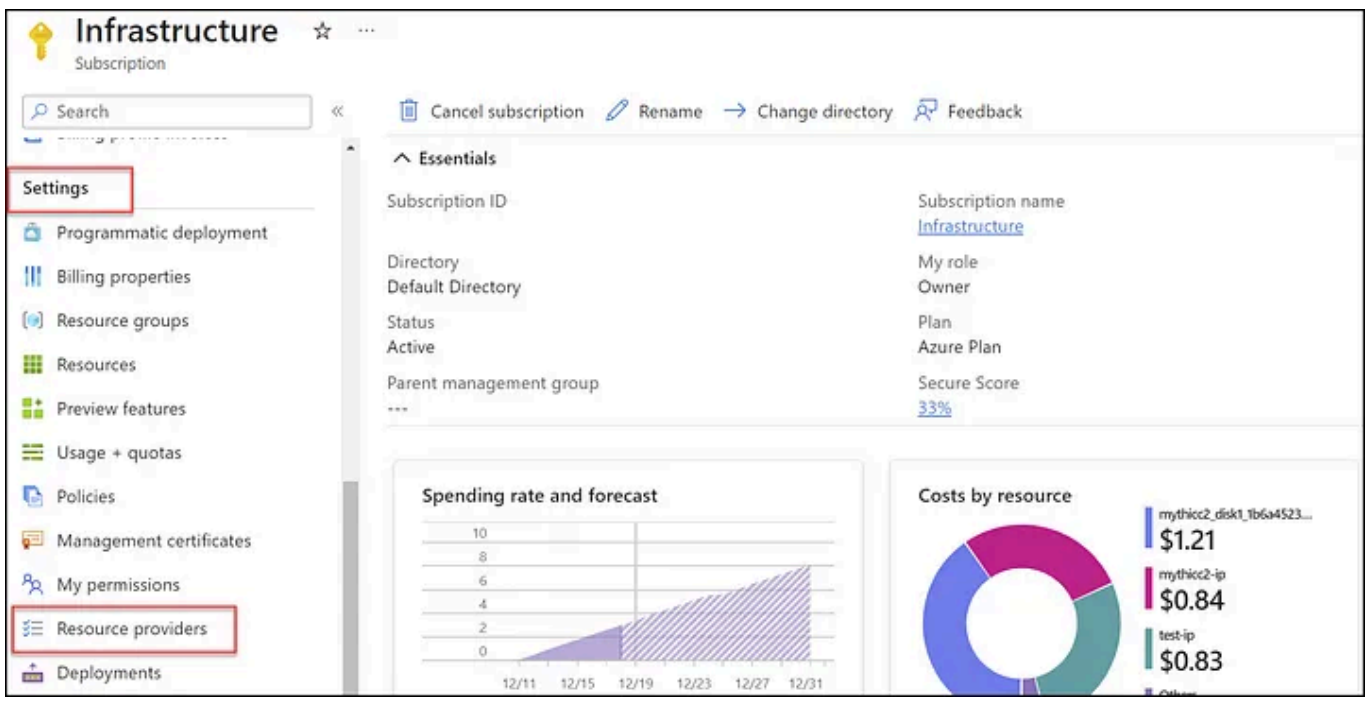

Figure 02 — shows the location of the Resource Providers in the Subscription settings.

In the "**Resource Providers**" section, search for ***Microsoft.Cdn***. If the provider is not registered, you will see the status as "*Not Registered*." To register the provider, click on ***Microsoft.Cdn*** and then click the **Register** button.

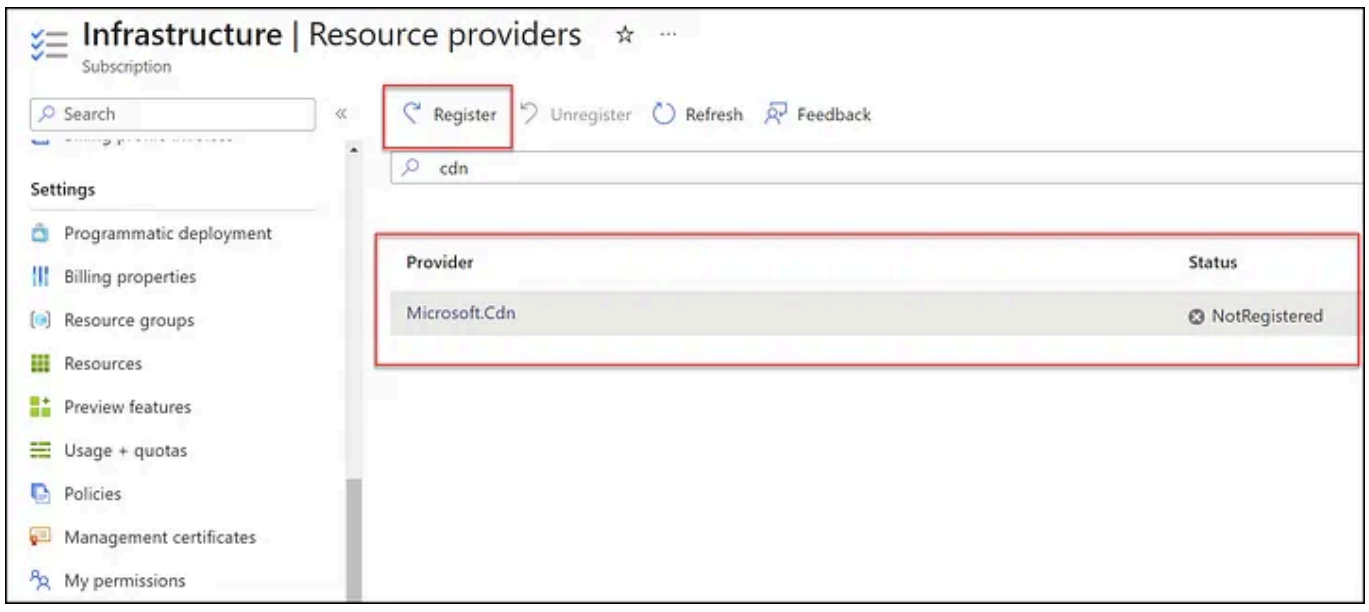

Figure 03 — shows the default Microsoft.Cdn is not registered.

The registration process takes a few seconds to complete. When done, a green check mark will appear next to the Registered Status.

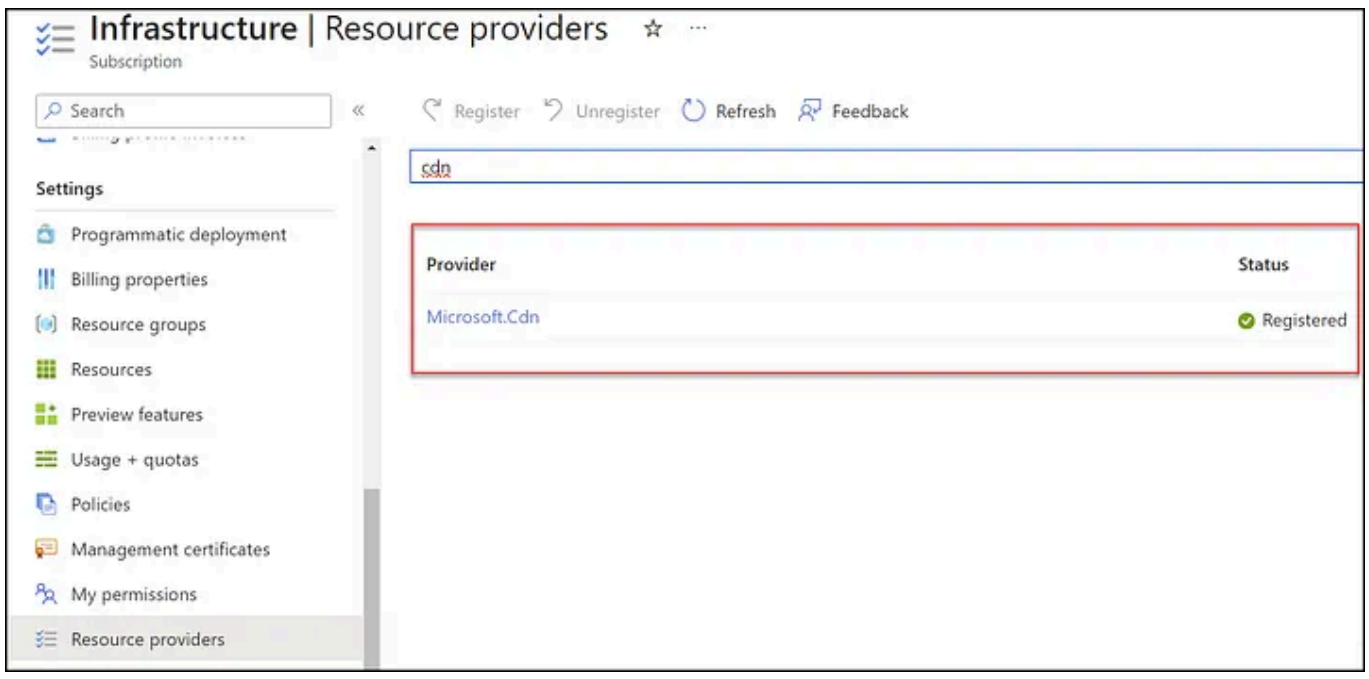

Figure 04 — shows the Microsoft.Cdn status as Registered.

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Configuring VM Firewall Rules

The next step is to set up the firewall rules on the virtual machine hosting the C2 server. For this guide, I'm using an Azure-hosted virtual machine with the Mythic C2 framework deployed on it.

The objective is to open ports 80 and 443 to communicate with the CDN endpoint and the targeted system. If you want to follow along, you can refer to the previous articles:

- Deploying Azure VMs for C2 Infrastructure
- Installing Mythic C2 on Azure VM

To add a new firewall rule, we need to select the VM machine and then click on the **Networking** section. Currently, we have only one (1) rule added,

which is for port 22/TCP for SSH. We will add two (2) more rules; the first one will be for port 80, and the second one will be for port 443.

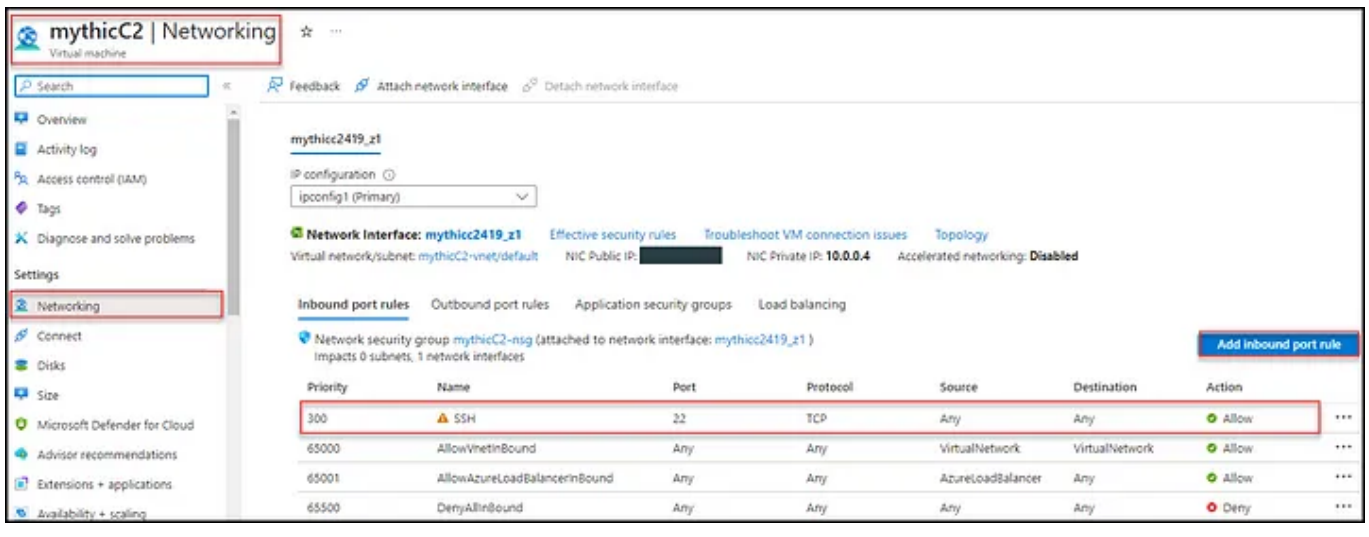


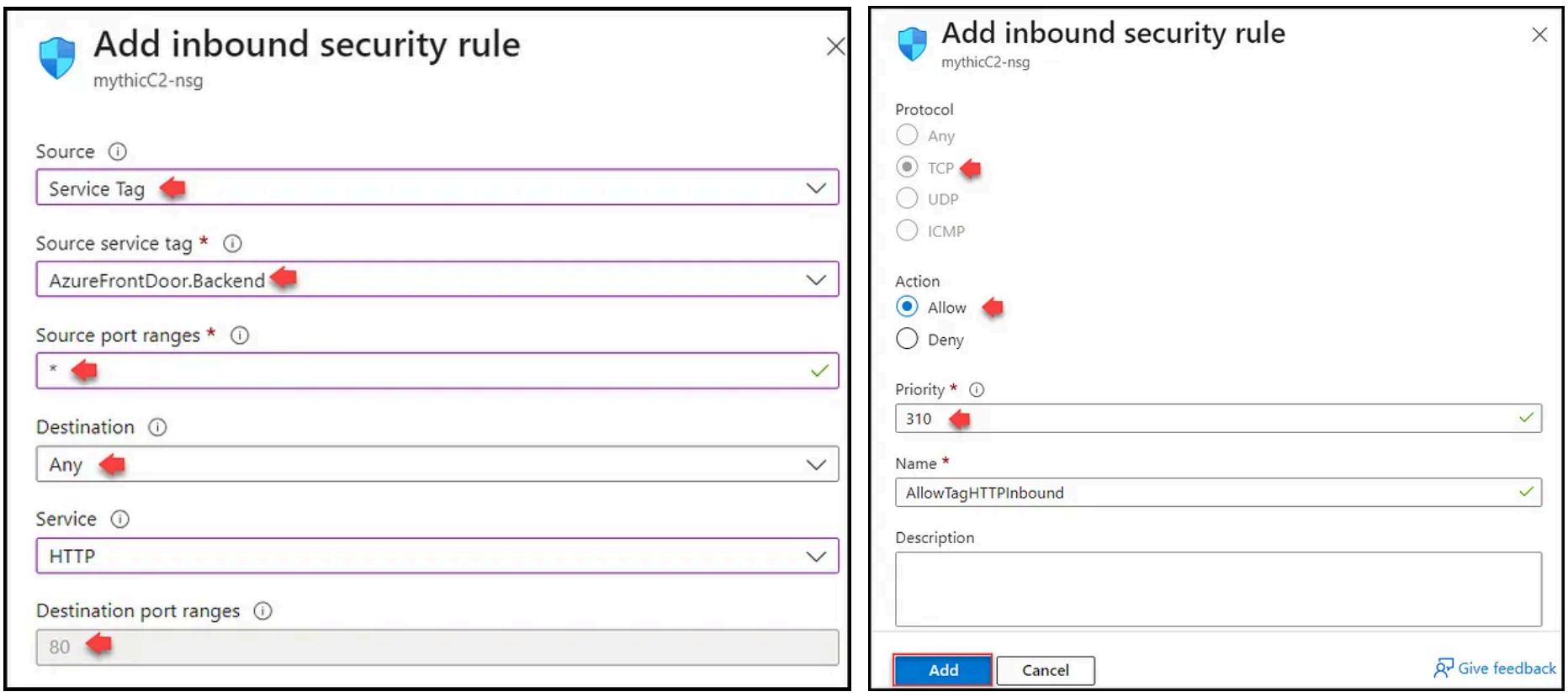
Figure 05— shows the Networking location in the VM settings.

To create a new rule, click on the "**Add Inbound port rule**" option. In the **Source** field, we can select the specific source IP addresses that we want to allow inbound traffic from. This can be a range of IP addresses in the form of CIDR ranges, or we can use the Microsoft Service tag option, which has predefined identifiers that represent a category of IP addresses, such as the Azure FrontDoor service, which we will be using.

To set up the HTTP port 80 rule, we will follow the below configuration and then click on the "**Add**" button to add the new rule.

```
** Firewall Rule Configuration for HTTP port 80 **

Source: Service Tag
Source service tag:  AzureFrontDoor.Backend
Source port ranges: *
Destination: Any
Service: HTTP
Destination port range: 80
Protocol: TCP
Action: Allow
Priotiry: 310
```

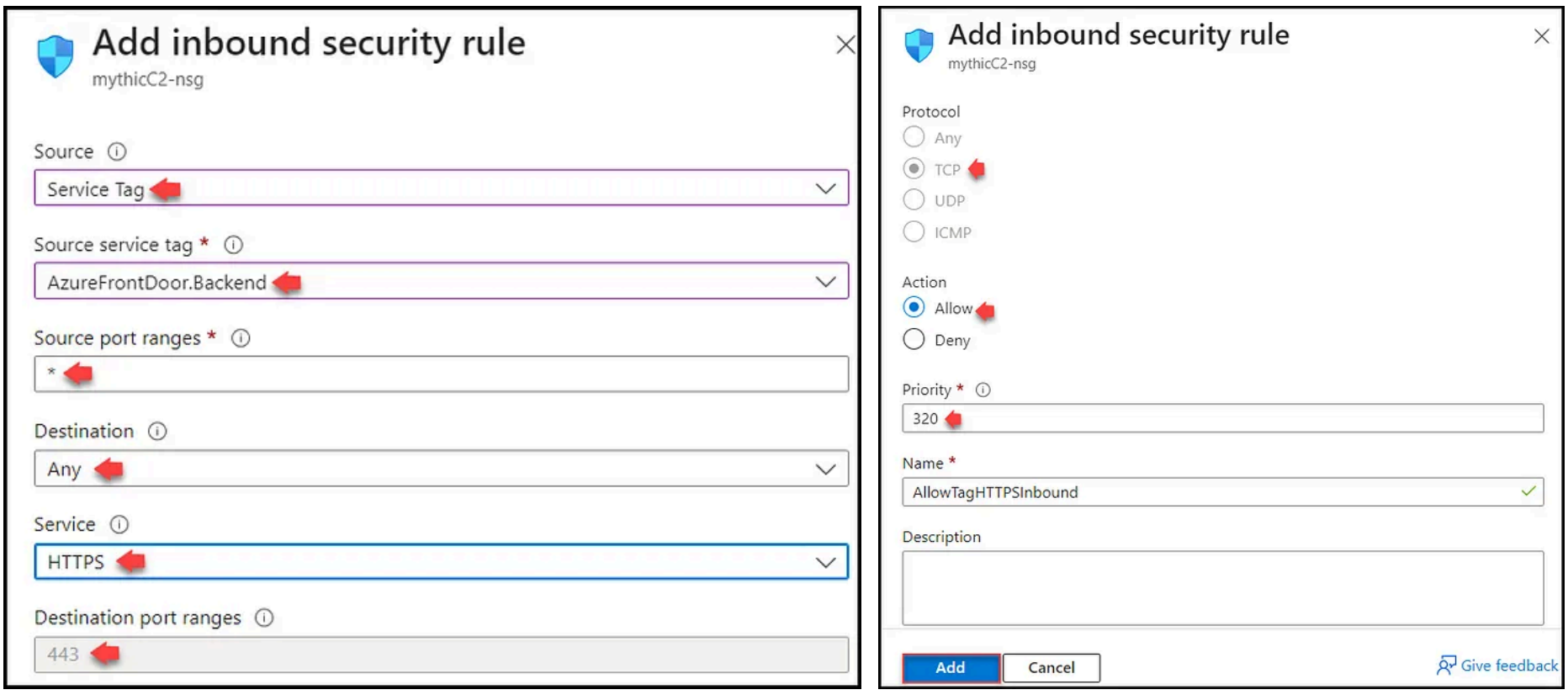


Figures 06 & 07 — show the Firewall configs for the HTTP port 80 Inbound rule.

We'll follow the same steps to create the HTTPS rule on port 443.

```
** Firewall Rule Configuration for HTTPS port 443**

Source: Service Tag
Source service tag:  AzureFrontDoor.Backend
Source port ranges: *
Destination: Any
Service: HTTPS
Destination port range: 443
Protocol: TCP
Action: Allow
Priotiry: 320
```



Figures 07 & 08 — show the Firewall configs for the HTTPS port 443 Inbound rule.

After completing the setup, we should have three rules added: SSH, HTTP, and HTTPS. The other rules are auto-generated for the load balancer and virtual network when creating the VM.

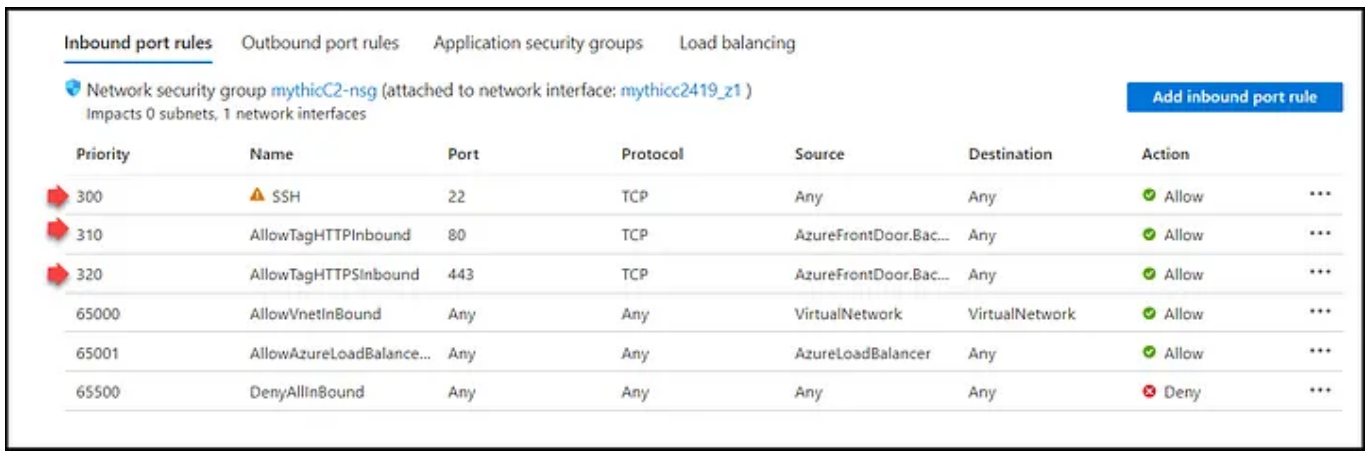


Figure 09 — shows the Firewall Inbound rules for the Azure VM.

💡 Microsoft publishes their Azure IP ranges and Service Tags on their site in JSON file called “*ServiceTags_Public.json*”. This file contains the IPv4 address ranges for Public Azure as a whole, divided by regions and services . This file gets updated weekly.

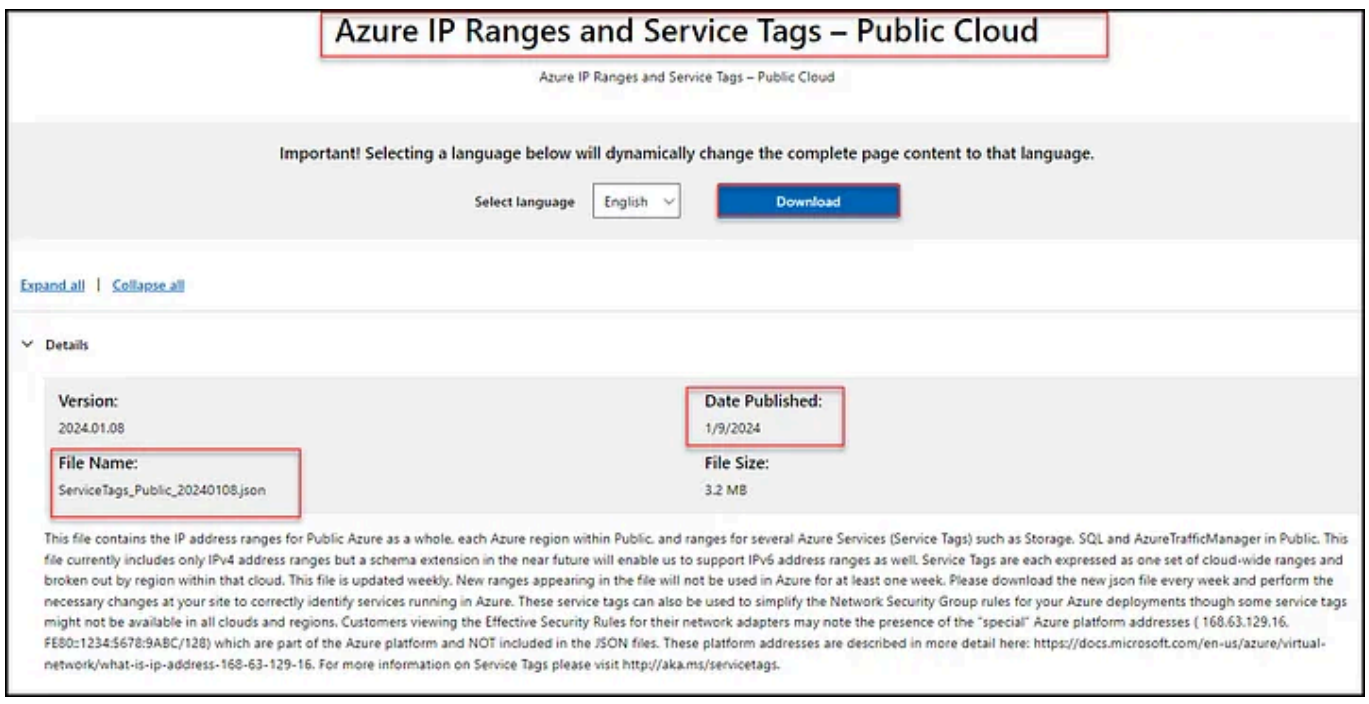


Figure 10 — shows the JSON file for the Azure IP Ranges and Service Tags.

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Configuring Azure Front Door CDN Endpoint

There are several CDN options available on Microsoft Azure. These options differ in their capabilities, such as additional security features like Web Application Firewall (WAF), Private Link, Microsoft Threat Intelligence, and Security Analytics. The pricing of each option also varies.

For our objective, we’ll use the Azure Front Door offer and select the Quick Create option. To create a new CDN, type CDN in the Azure search bar and select *“Front Door and CDN profiles”.*

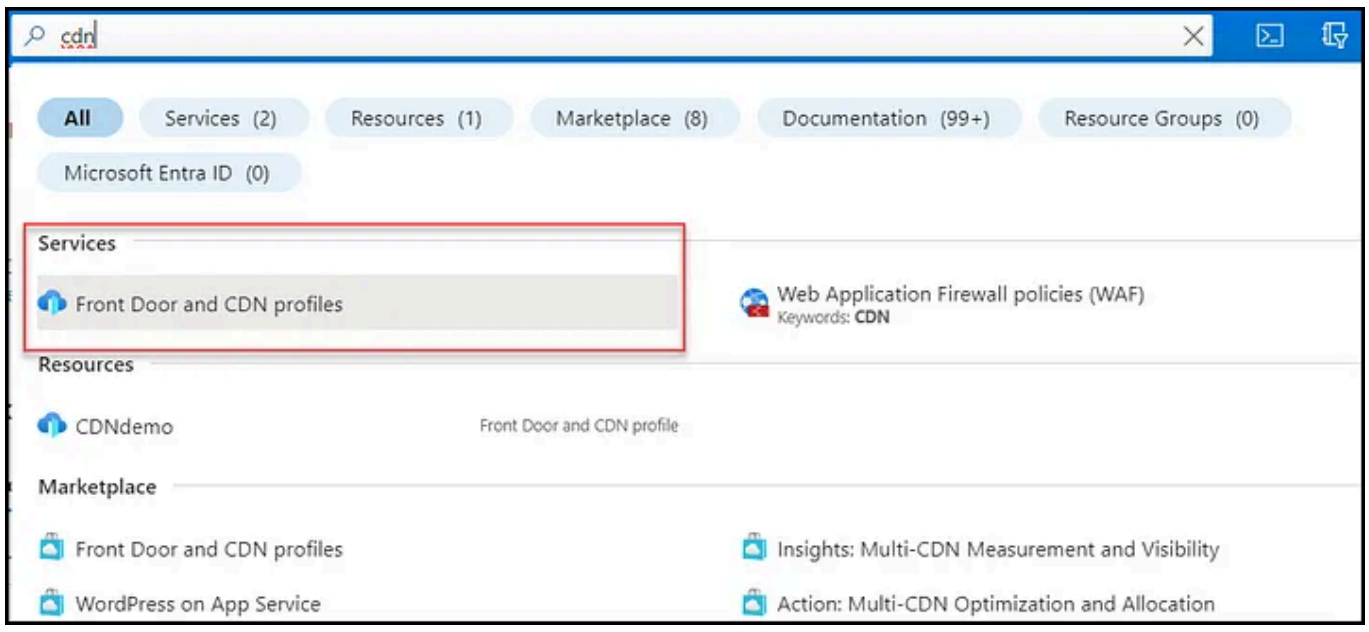

Figure 11 — Shows searching for CDNs in the Azure search bar.

In the CDN dashboard section, we click **Create** to add a new CDN. This dashboard is for listing all of the active CDNs.

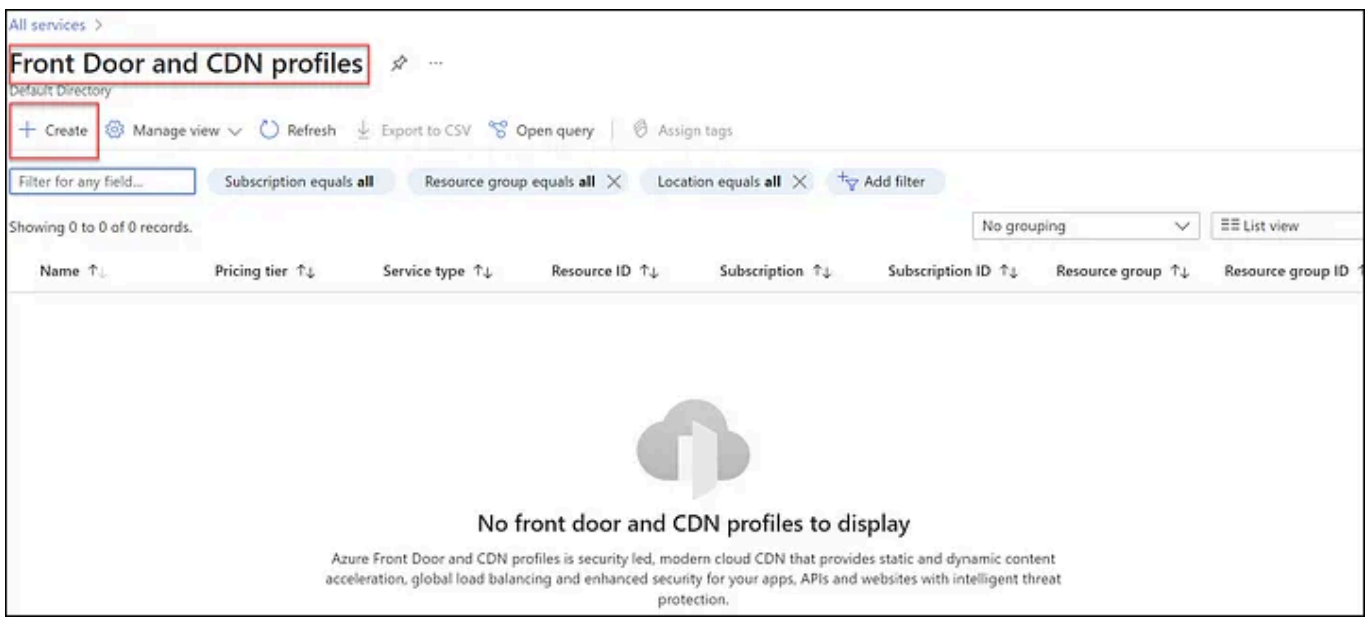

Figure 12 — shows creating a new CDN profile.

Next, click on the **Azure Front Door** and **Quick Create** in the available offering, and click **Continue.**

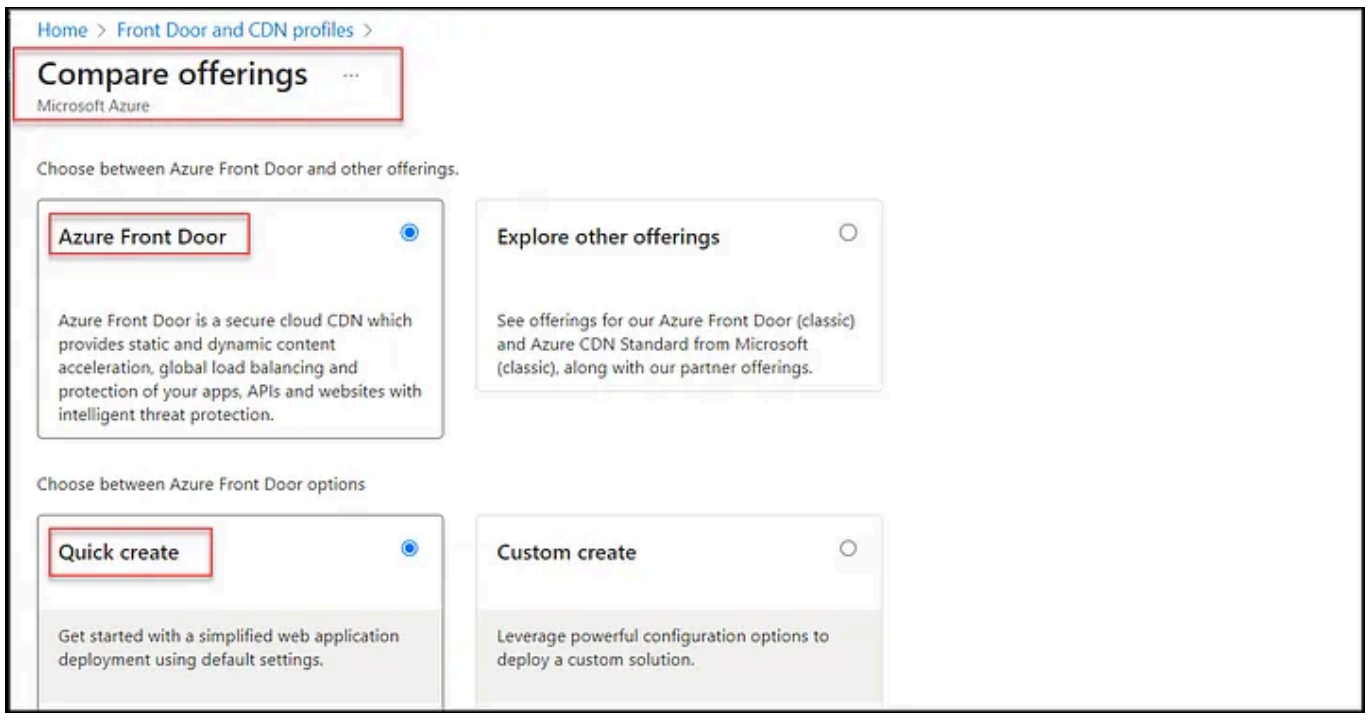

Figure 13 — shows selecting Azure Front Door CDN offer and Quick Create option.

In the Azure Front Door profile, we select the subscription and resource group we previously created, "*infrastructure*" and "*red-ops*".

After that, name the CDN and select a Tier; we will have it as default at "Standard." Tier refers to the Azure service capabilities that determine the cost and access latency for retrieving the content. *(Learn more about it on Azure CDN offers)*

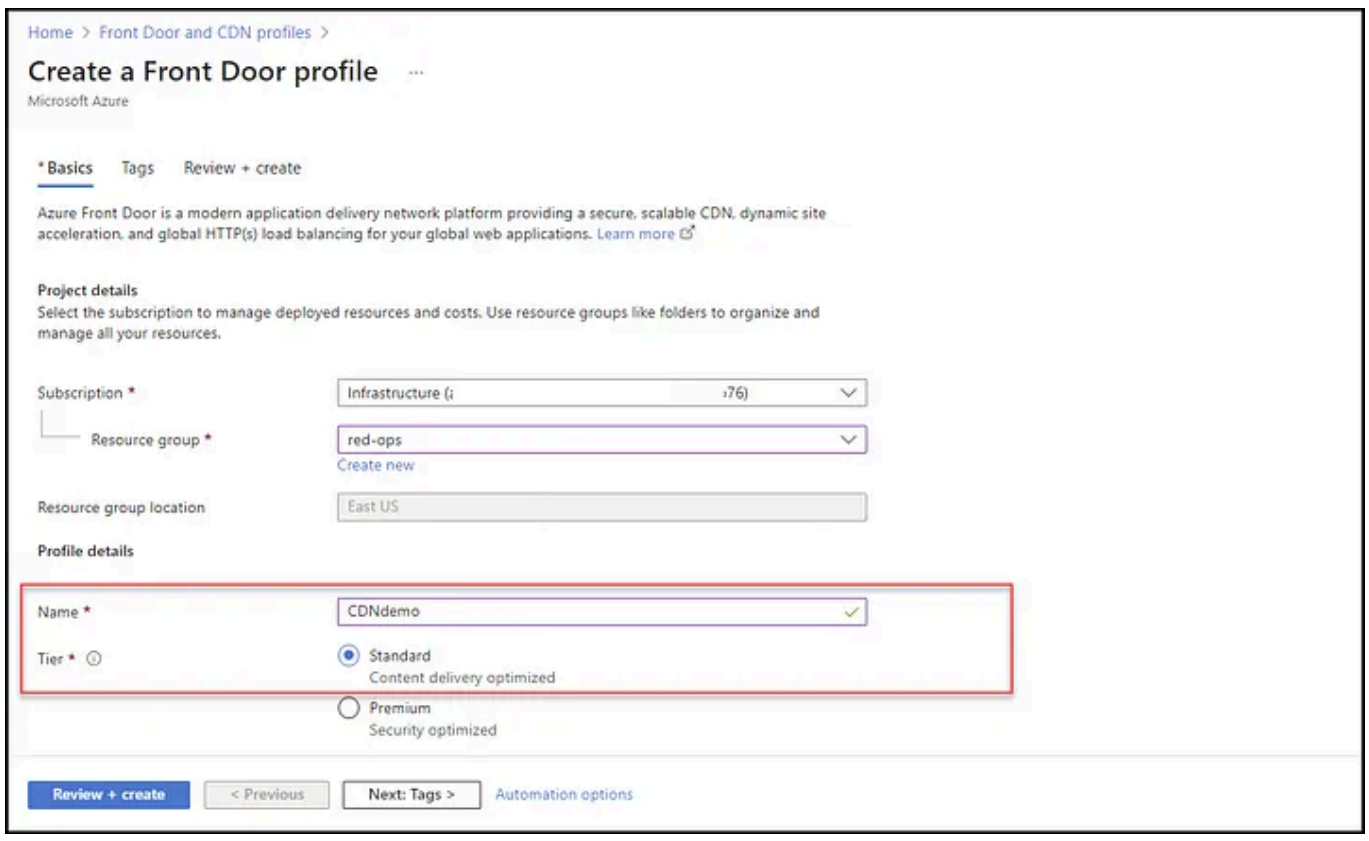

Figure 14 — shows creating the Azure CND Front Door Profile.

To create an endpoint for a CDN, check the box and create a unique name. This endpoint is what the client will see and connect to when the CDN is set up.

It's important to name the CDN something that looks legitimate and blends in with the client's regular expected requests. Avoid sketchy names like "*c2 infrastructure*" or "*redops*". Instead, name it something like "*availabilitycalendar*" or "*reservation-api*" if the client is in the hospitality industry or "*destinations*" or "*book-flight*" if the client is an airline company.

By default, the URL format for the CDN will follow the `{endpoint-name-randomString}.azurefd.net`, but you can also configure a custom domain name. We'll talk about it in future articles.

```
reservation-api-cqf6eva8a7efdvhp.z02.azurefd.net
```

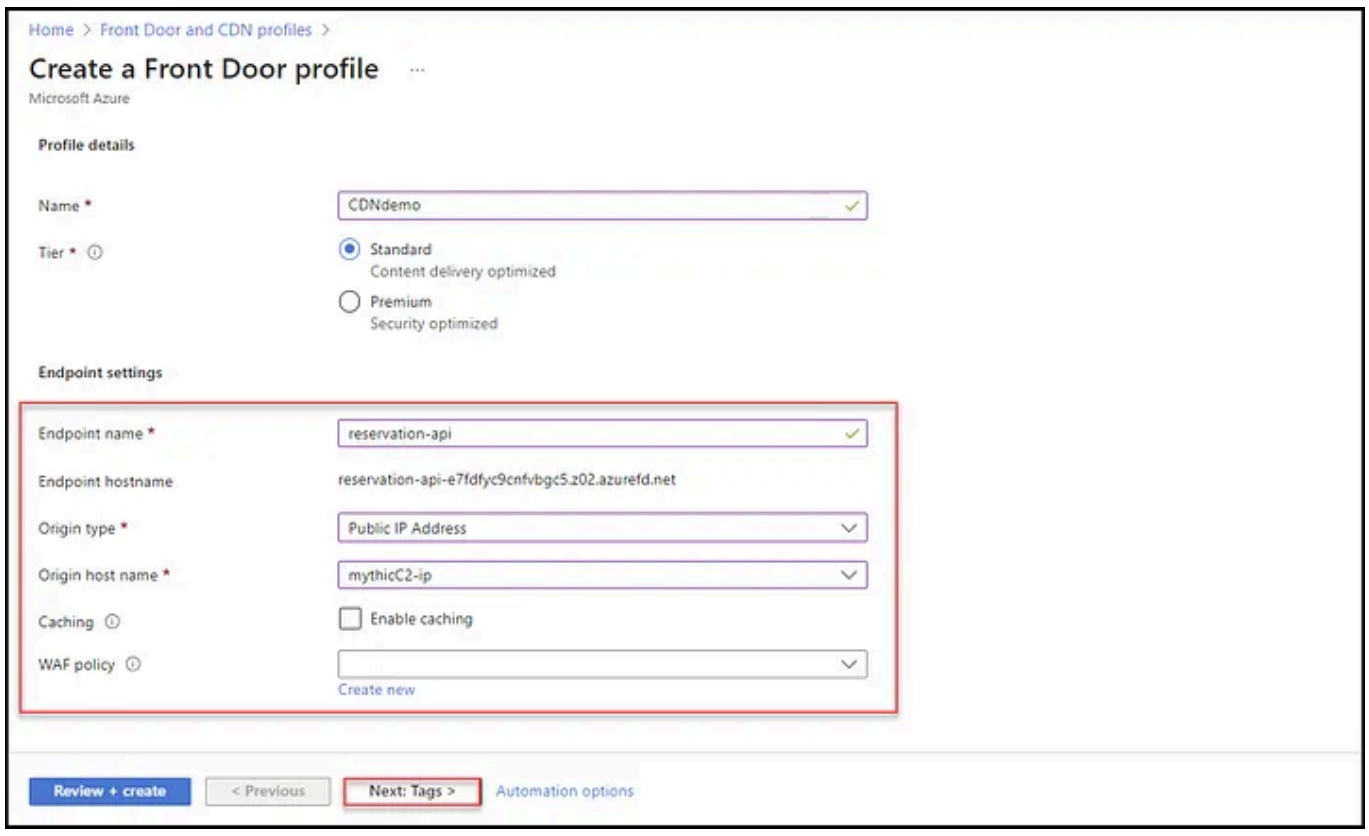

Figure 15 — shows creating the CDN endpoint.

Azure provides various options for **Origin type** depending on the need. The following are the common ones:

- **Storage (Static website)** is for content stored in Azure Storage accounts (blobs, files, containers).
- **Cloud Service** is for Azure Cloud Services.
- **Web App** is for web applications and APIs.
- **Custom origin** is for any other publicly accessible origin web server hosted in Azure or elsewhere.
- **Public IP address**

In this guide, we will refer to the Azure VM that we created in the first part of the guide, *"Deploying Azure VMs for C2 Infrastructure,"* by using its Public IP Address. The hostname, on the other hand, is the name of the VM machine.

To prevent the C2 payload from failing, we ensure that the **Caching** option is unchecked. Enabling caching may cause the payload to be cached at the CDN level if the query string is called twice, which could lead to failure.

For the **WAF policy**, we will keep it as the default — undefined.

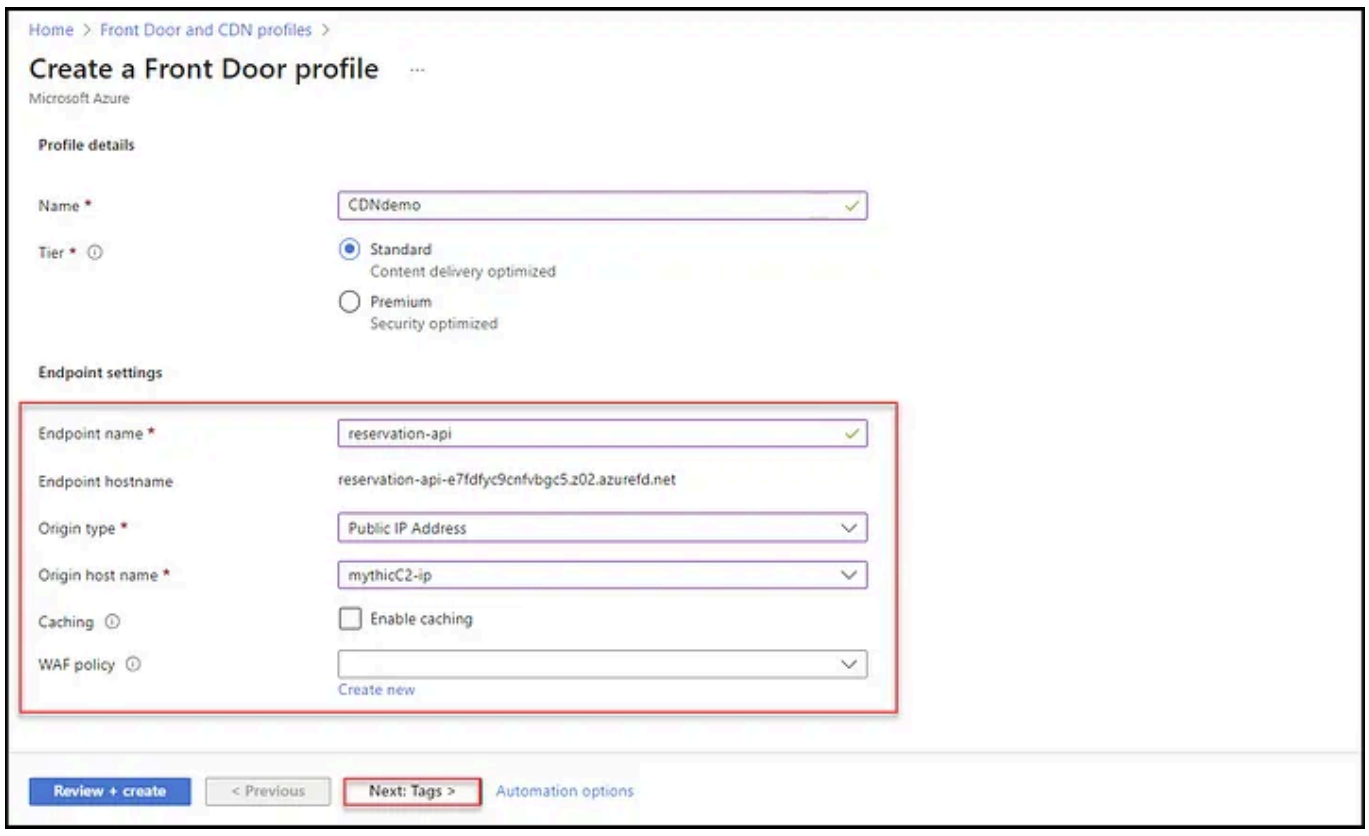

Figure 16 — shows setting the CND endpoint.

Next, we add **Tags** to our CDN profile and click **Review + Create.** Tags are like labels that can be attached to any Azure service to help you manage and track resource costs.

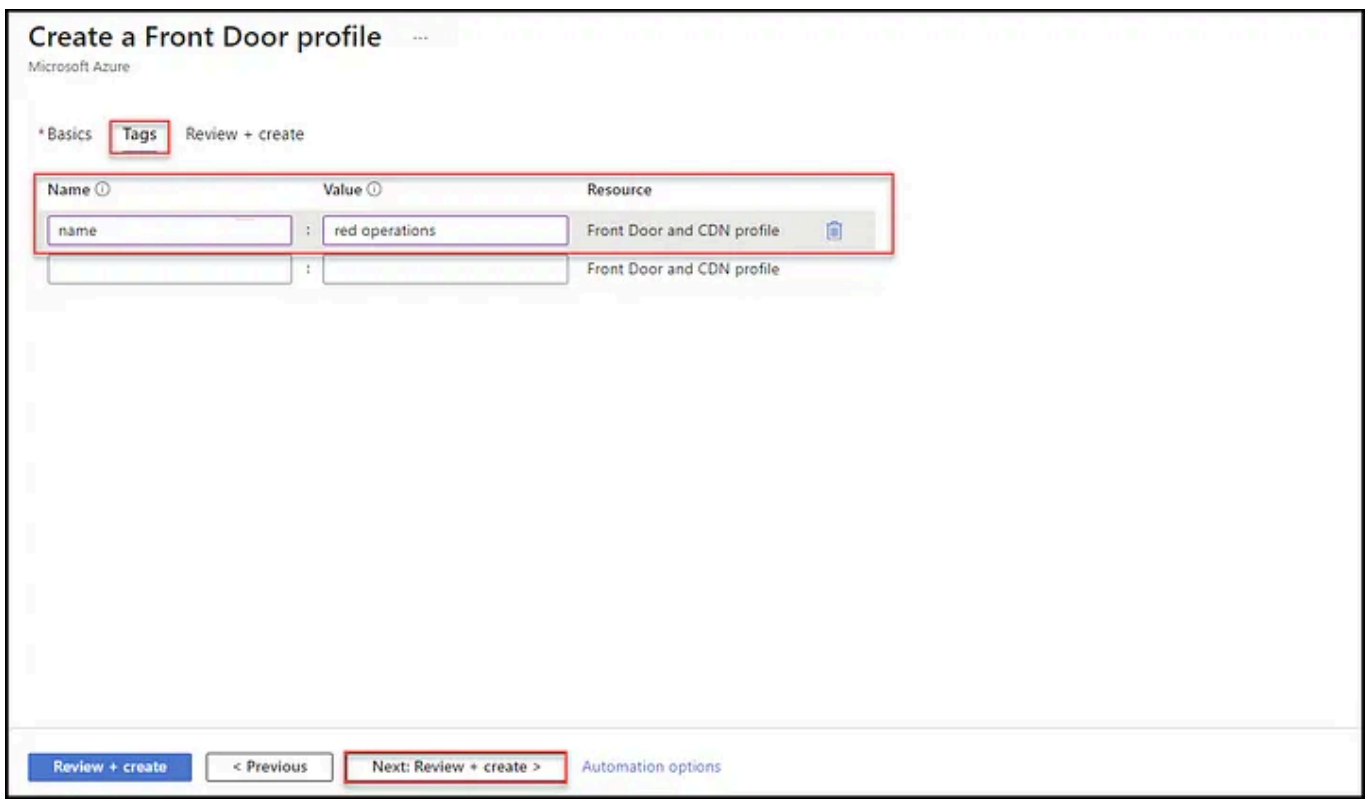

Figure 17 — shows adding tags to the CDN profile.

Then, review the entered information and click **Create.** Once the CDN is deployed, you'll see a "*Your deployment is complete*" message. Click on "***Go to resource"***.

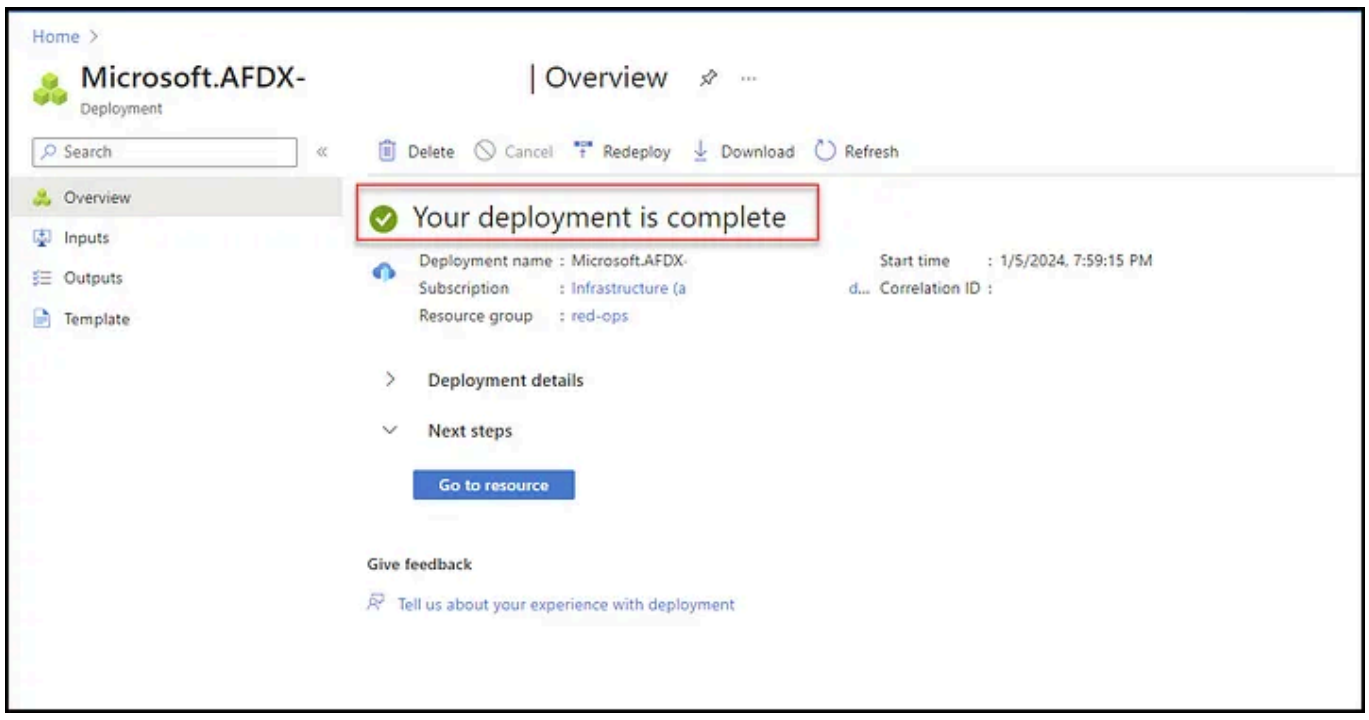

Figure 18 — shows deploying the CND profile.

Accessing the Endpoint

In the newly created CDN profile, the endpoint "*reservation-api*" has been successfully enabled and provisioned. We will make a few changes to the **Routes** and **Origin groups** to meet our objective.

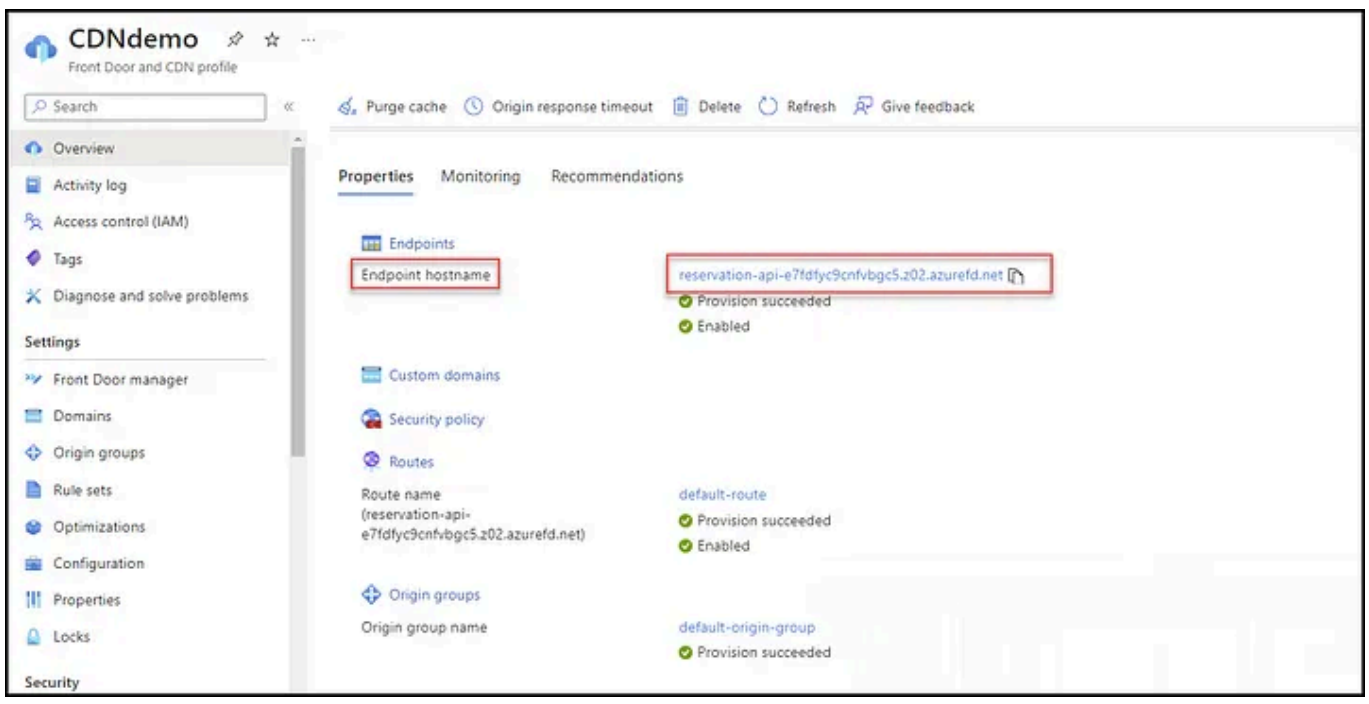

Figure 19 — shows the CDN configurations after deployment.

Routing Options Configuration

In the *Redirector Setup* diagram, we mentioned that client-to-Azure CDN communication takes place over HTTPS on port 443. The reason for this is that Azure CDN redirectors are required to use SSL for encrypted traffic. On the other hand, the CDN communicates with the C2 server via HTTP on port 80.

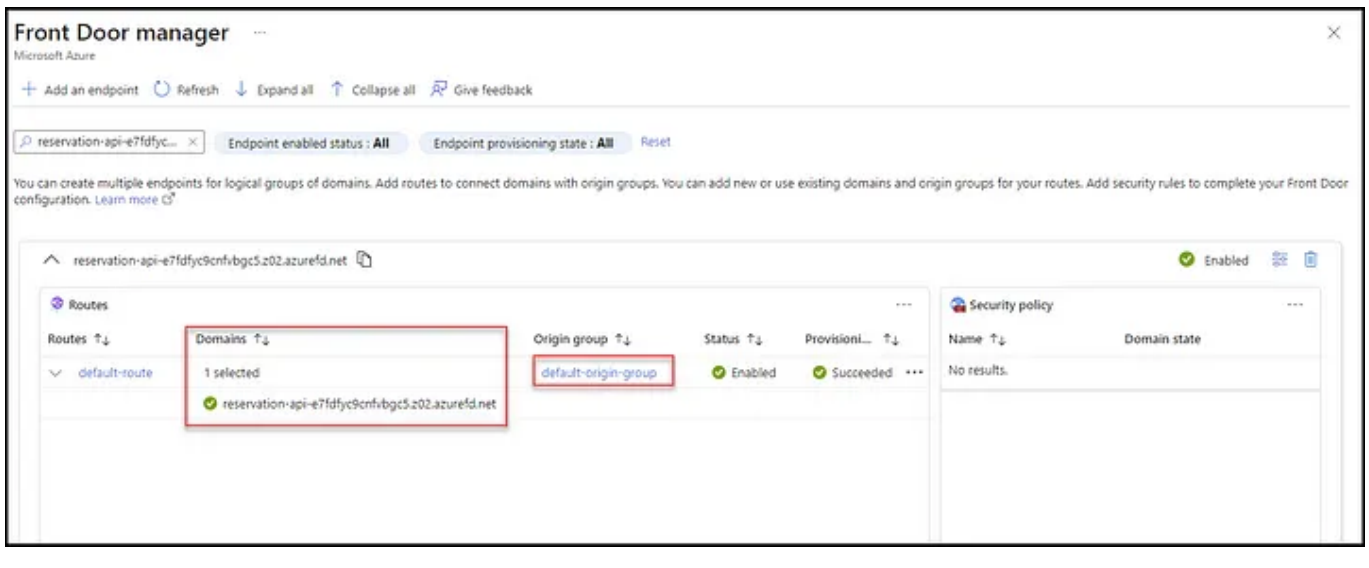

Figure 20 — shows the default route for the CDN endpoint.

Now that we have created the CDN, clients will communicate with it on port 443. However, to enable the CDN to communicate with the C2 server on port 80, we need to update the route settings of the endpoint.

To do so, click on the "*default route*", change the forwarding protocol from *HTTPS only* to ***HTTP only,*** and click **Update.**

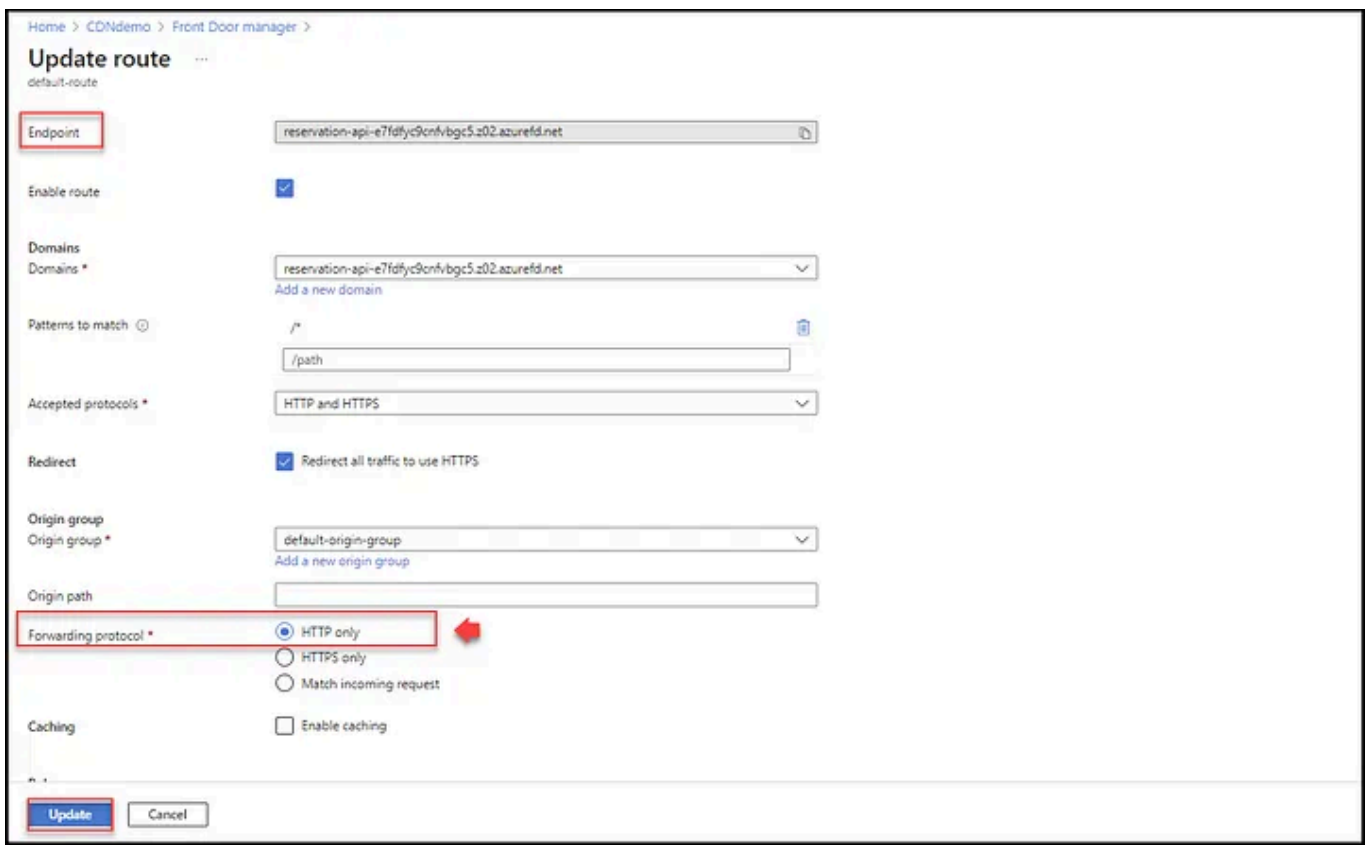

Figure 21 — shows changing the default-route forwarding protocol to HTTP only.

Origin groups Configuration

Origins are the servers that receive incoming requests from the Front Door. The *default-origin-group* is a specific set of origins that serves as the primary source for delivering content.

It is the first group of origins that the CDN will attempt to contact when a user requests content. For our redirector, we have the Azure VM in the *default-origin-group*.

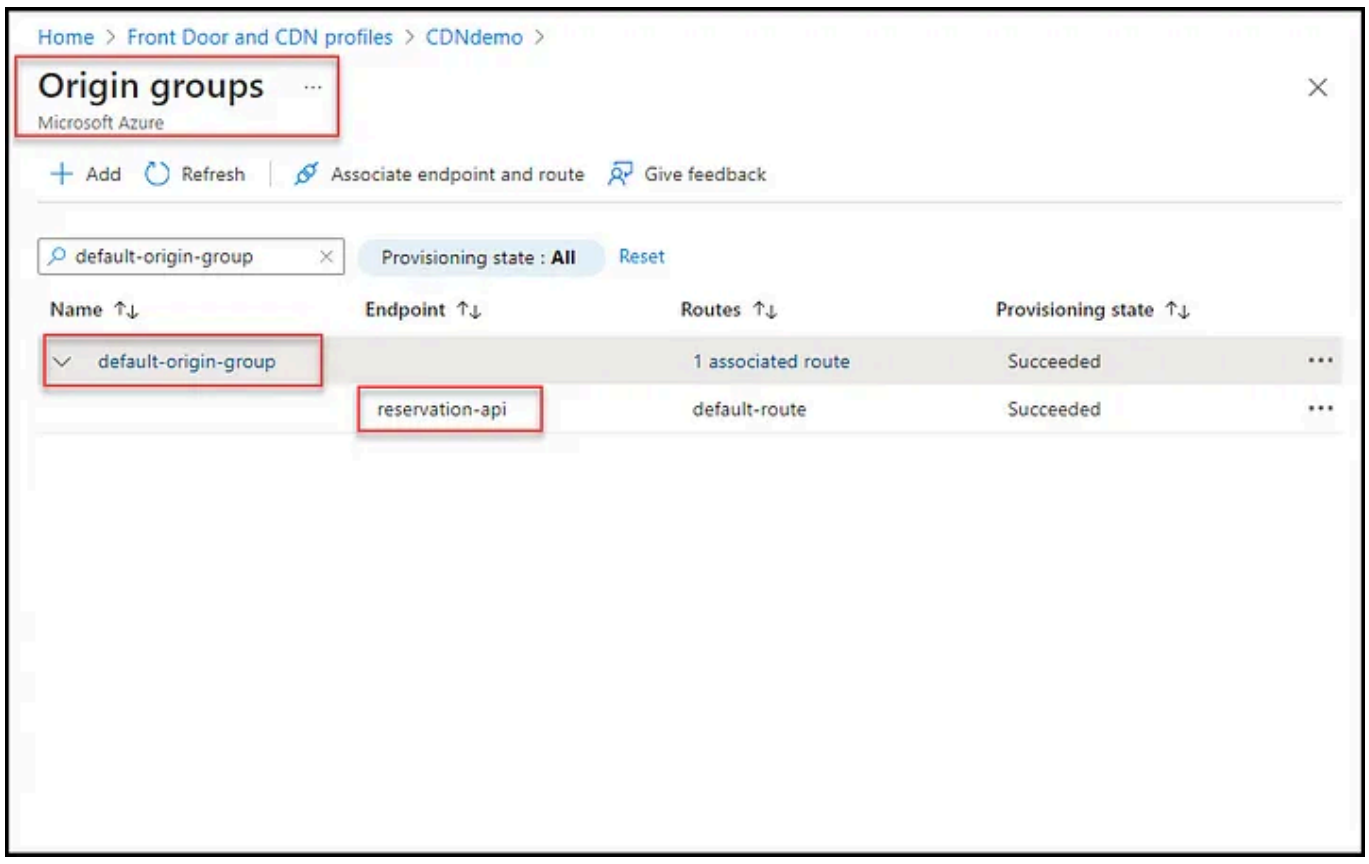

Figure 22 — shows the location of Origin groups inside the CDN profile.

In this section, we will not modify anything except unchecking the *Session Affinity* and *Health Probes* options and clicking the **Update** button.

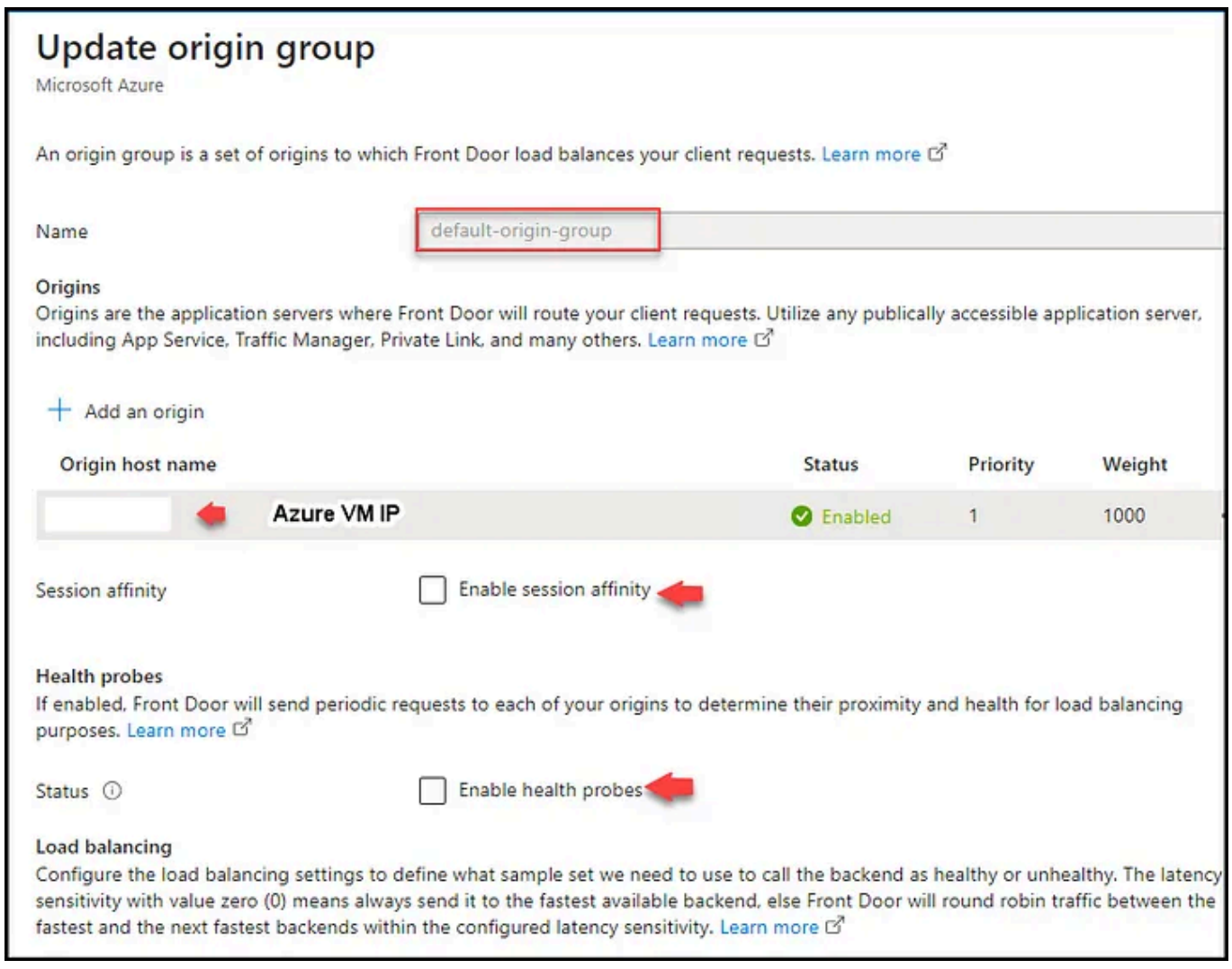

Figure 23— shows the configuration of the default-origin-group.

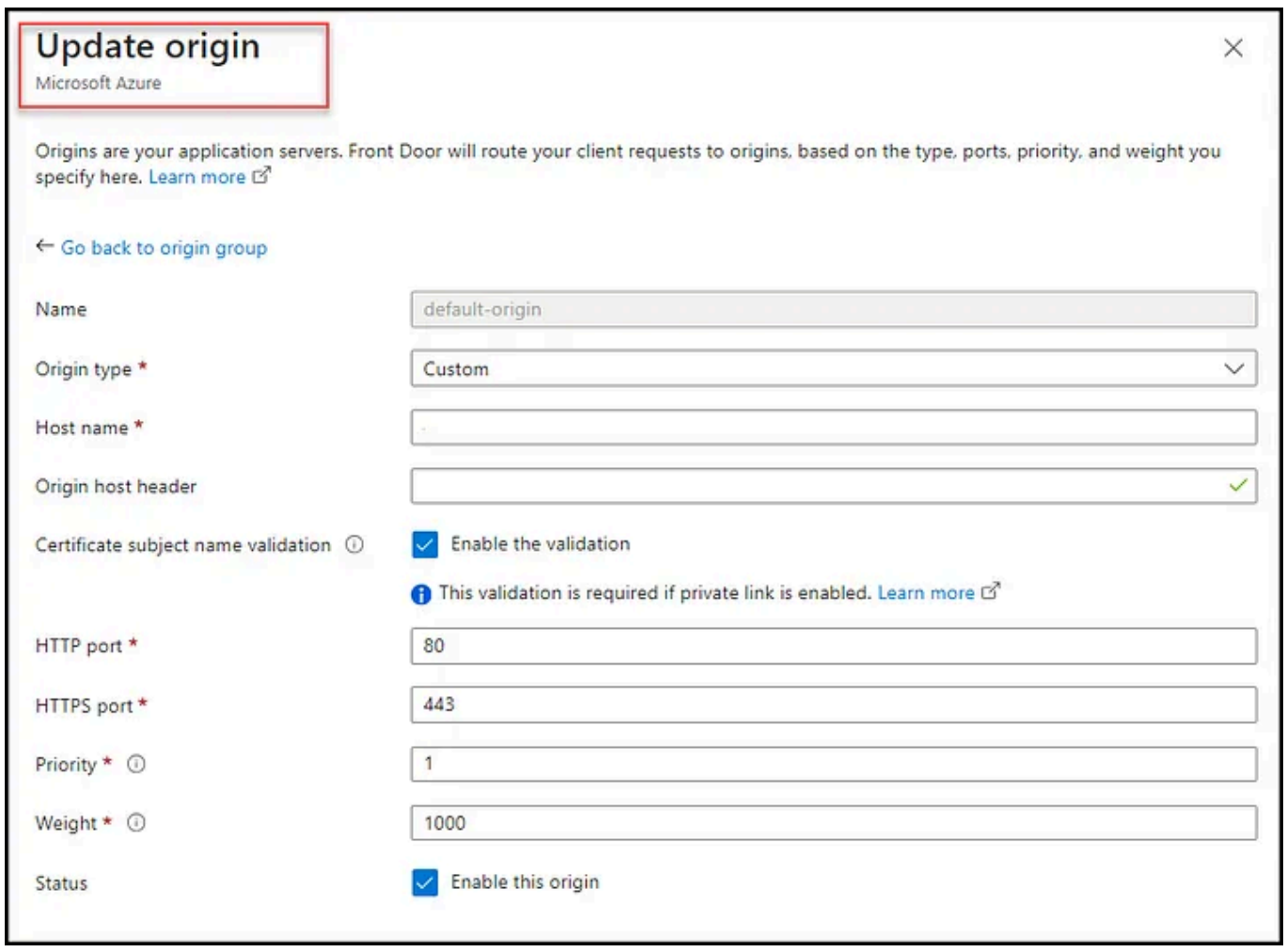

Figure 24— shows the configuration of the origin — Azure VM.

💡 *Session affinity is a feature that ensures that requests from a particular user are directed consistently to the same backend server or instance. If this feature is disabled, incoming requests will be randomly directed to any available backend server without maintaining a consistent connection to a specific server throughout the client's session.*

💡 *Disabling the health probe feature can help reduce additional traffic between the CDN and the C2 server.*

CDN Endpoint

After the provisioning process is completed, you might encounter a 405 HTTP response containing an error message stating that *"Our services are unavailable right now"* while trying to access the endpoint through Curl or a web browser. This happens because rules for HTTP requests need to be established.

However, for our redirector objective, we don't require it. The payload will connect fine to the CDN endpoint and connect back to us. We'll see that in the next article when we talk about generating payloads.

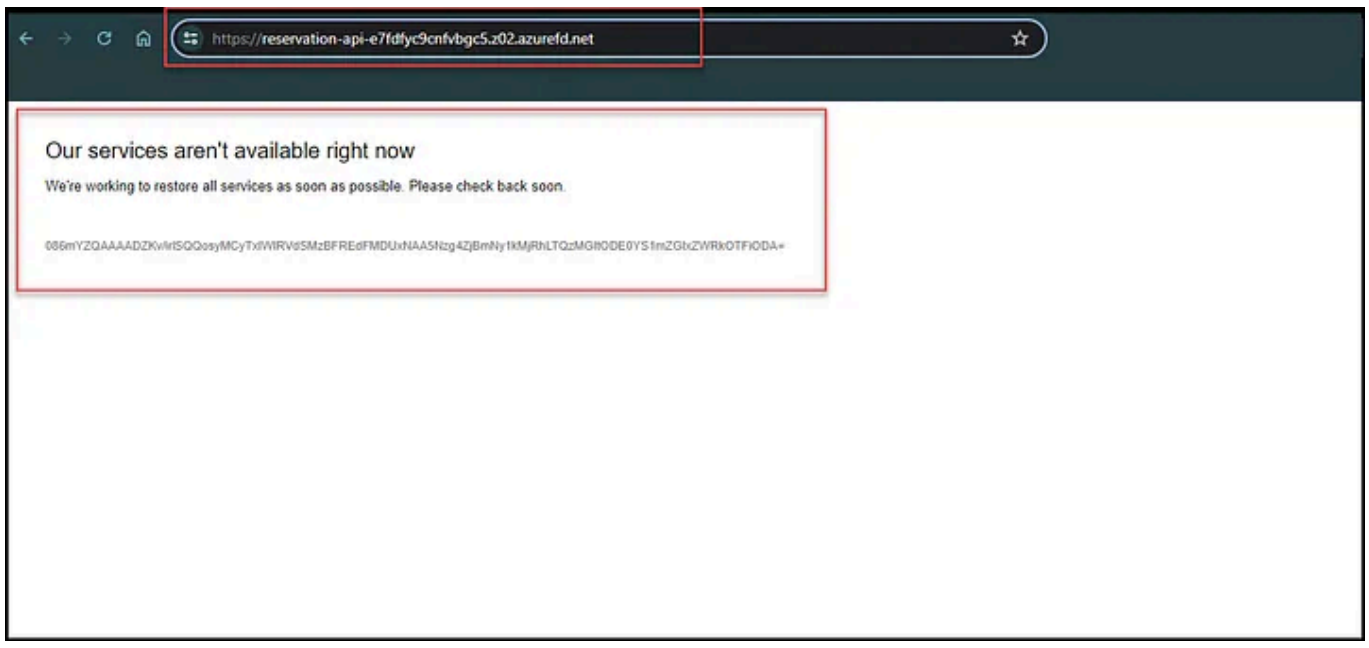

Figure 25 — shows the error when accessing the CDN endpoint in the browser.

```
curl -I https://reservation-api-e7fdfyc9cnfvbgc5.z02.azurefd.net

HTTP/2 405
content-length: 22
content-type: text/plain
x-cache: CONFIG_NOCACHE
x-azure-ref: 0yiagZQAAAADpHDPiaxzxRLySP35acrwwTU5aMjIxMDYwNjEyMDM1ADk3ODhmMGY3LWQyNG
date: Thu, 11 Jan 2024 17:35:06 GMT
```

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We have reached the end of today's post. In this article, we have discussed the Azure Front Door CDN service and how it can be configured to serve as a redirector for a red team operation, to obscure the C2 server.

In the next article, we will create a Mythic C2 payload that uses the redirector endpoint we created today to communicate with the compromised machine. To access the previous article, refer to the resources section.

Thank you for taking the time to read this post!

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Resources

- Microsoft Download Center
- Azure Front Door CDN Comparison
- Cyberwarfare Live — Red Team Infra Developer

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- Red Teaming in the Cloud: Installing Mythic C2 on Azure VM
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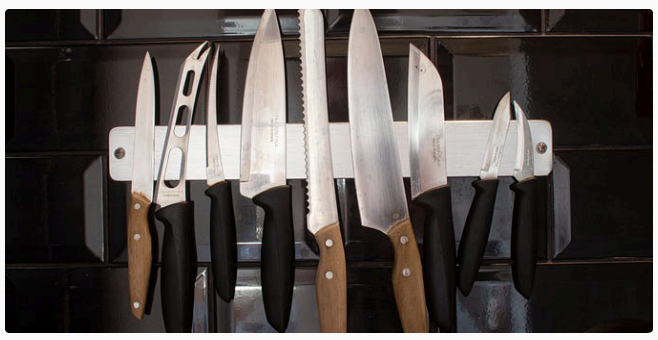

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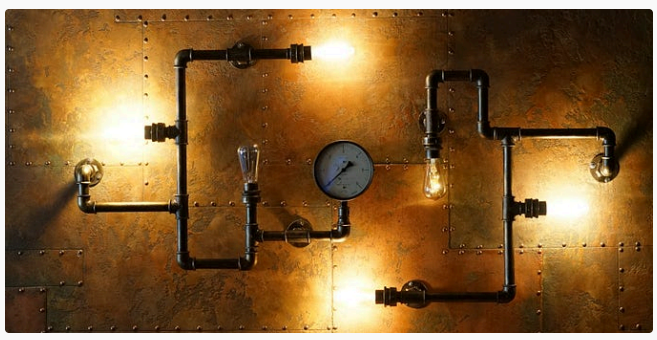

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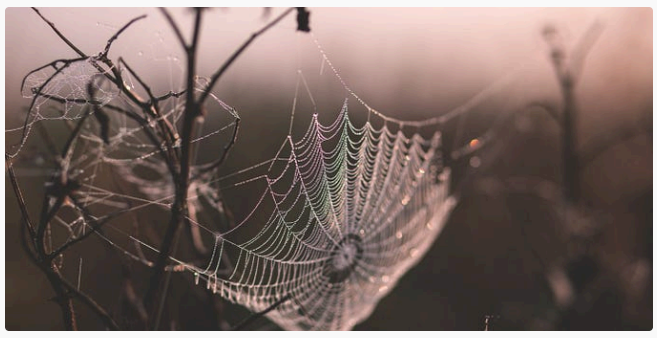

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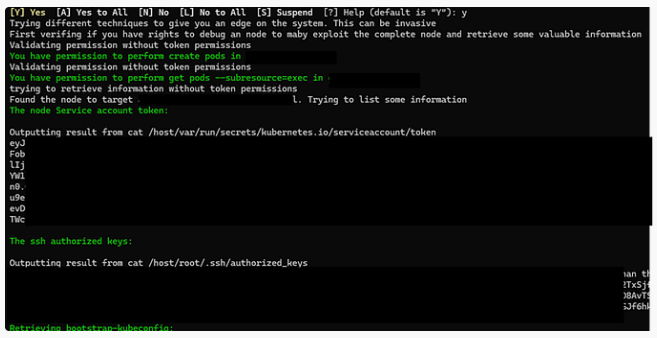

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