Qumulo

DNS options in AWS to enable IP Failover and Client Distribution

May, 2021

Qumulo provides a feature called floating IPs that allows automatic failover of client traffic on a failed Qumulo node to the remaining healthy nodes. In order for this to work effectively, the clients are required to use a Universal Naming Convention (UNC) path to mount the Qumulo file system. UNC paths are resolved to an IP address via DNS. As such, Qumulo recommends an identically named A-Record for each floating IP address on the cluster with TTL=0. This enables Round-Robin distribution of the IP addresses from the DNS side, which facilitates client distribution across the cluster in addition to IP failover managed by the cluster.

In this post, you will learn about common scenarios our customers leverage to configure their DNS for their floating IPs in AWS depending on their requirements. But, first let's look at some key terminologies that will be used.

Terminologies

Route 53 Private Hosted Zone
In AWS, a Route 53 private hosted zone is a container for records for a domain that you host in one or more Amazon virtual private clouds (VPCs). You create a hosted zone for a domain (such as example.com), and then you create records to tell Amazon Route 53 how you want traffic to be routed for that domain within and among your VPCs.

DHCP option set
The Dynamic Host Configuration Protocol (DHCP) provides a standard for passing configuration information to hosts on a TCP/IP network. The options field of a DHCP message contains configuration parameters, including the domain name, domain name server, and the netbios-node-type. When you create a VPC, AWS automatically creates a set of DHCP options and associates them with the VPC. You can configure your own DHCP options set for your VPC.

Microsoft Active Directory
Active Directory (AD) is a Microsoft technology used to manage domains, users, computers and other devices on a network. Among other features, it also supports DNS.

Now, let's move onto common scenarios for DNS options in AWS.

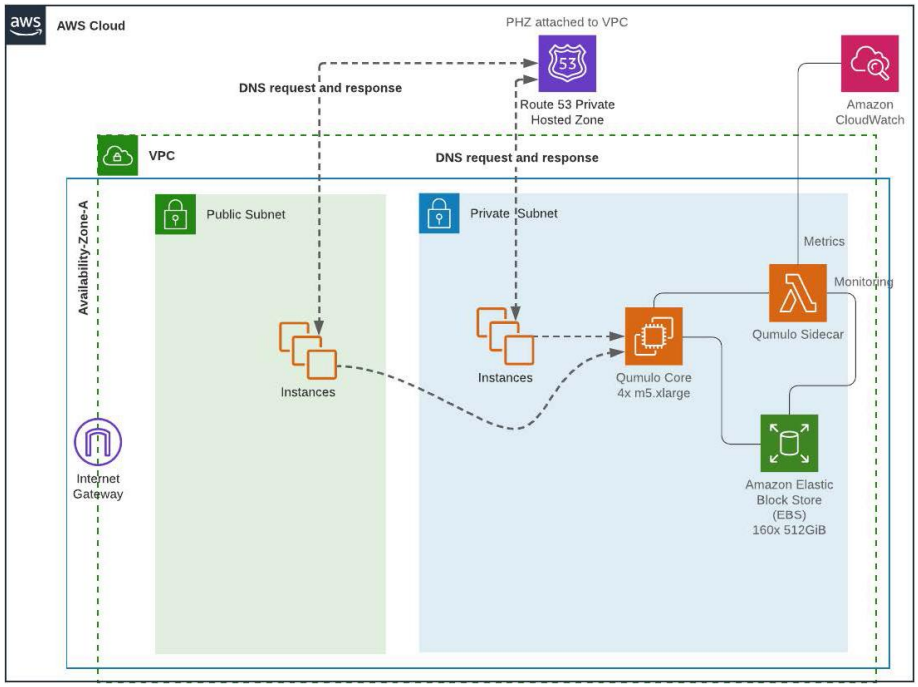
Scenario A

Requirements

1. You choose to configure your private DNS in Route 53's Private Hosted Zone and don't use/have Microsoft Active Directory.

2. Your DNS in DHCP option set for your VPC is pointing to AmazonProvidedDNS which is the default setting in AWS.

In this scenario, since you are using Amazon Provided DNS for your VPC and don't use Microsoft AD, it makes sense to configure private DNS in Route 53 Private Hosted Zone. Now, let's look at the step by step guidance.

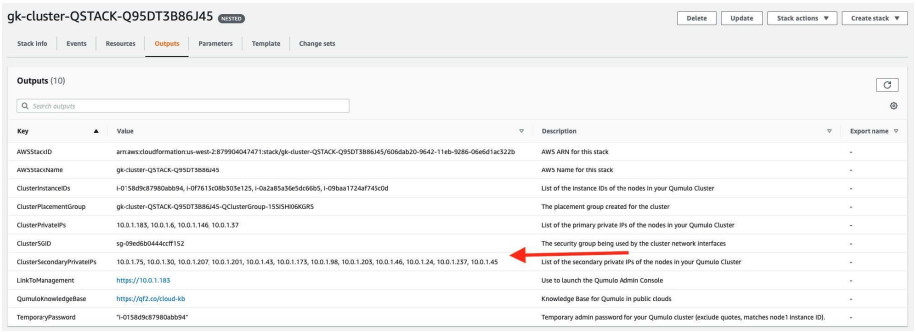


Configuring private DNS in Route 53 Private Hosted Zone

Note: The following steps are automated, if you are using the SA well architected framework cloudformation templates provided by Qumulo.

Step 1

Get the list of secondary IPs provisioned for your Qumulo cluster. In my example cluster, I have provisioned a 4 node cluster with 3 floating IPs for each node. Hence I have a total of 12 floating IPs. If you are using the cloudformation templates provided by Qumulo, this information is found under the outputs tab of your cloudformation cluster nested stack.



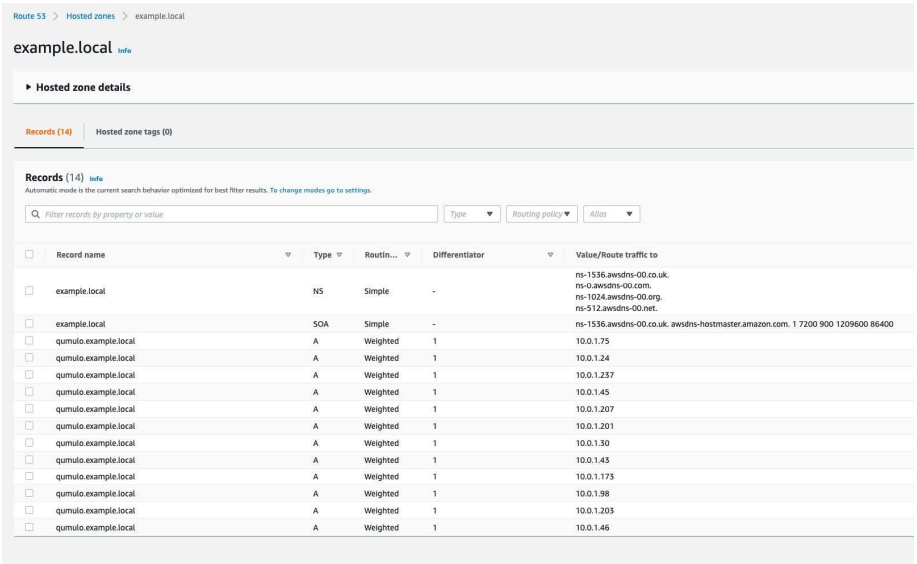
Step 2

Navigate to the AWS Route 53 console and create a private hosted zone. In my example, I have created a zone named “example.local”. Make sure to associate the correct VPC from which DNS resolutions need to occur.

Step 3

Create an A record with the following settings for each of the floating IPs captured in step 1.

Record Name: Same for all the records (In my example, I choose “qumulo”)
TTL = 0
Routing policy: Weighted
Weight = same for all the records (In my example, I choose ‘1’)
Record ID = unique across the records (In my example, I have sequentially numbered them)



Now, machines in the associated VPCs are able to resolve the configured DNS records. In my example, this is qumulo.example.local.

Scenario B

Requirements

1. You have a Microsoft Active Directory running either on EC2 or as an AWS managed Microsoft AD which is a part of an AWS Directory service.

2. Your DNS in your VPC's DHCP option set is pointing towards your Microsoft AD servers.

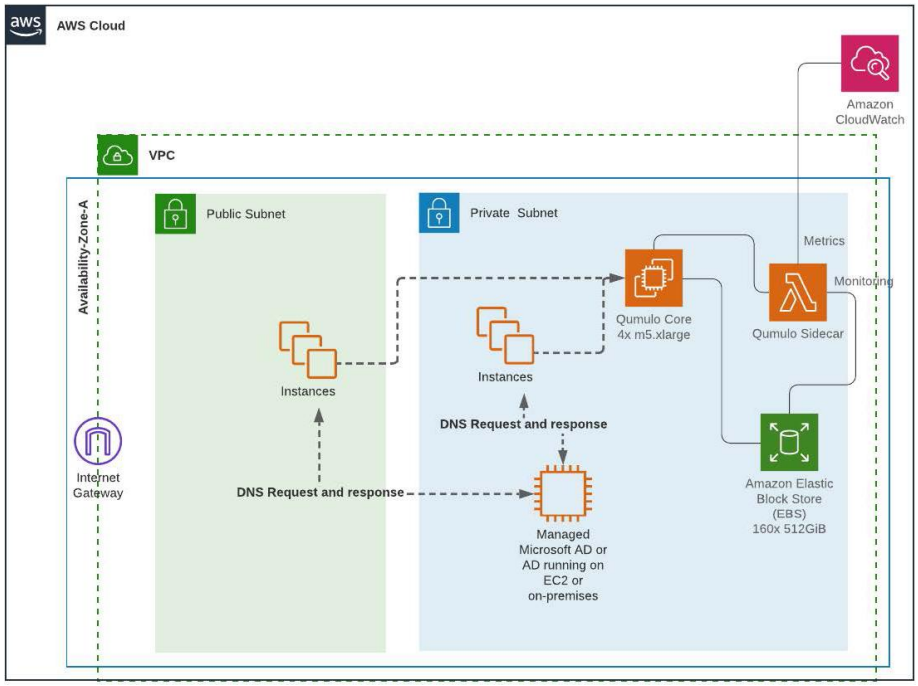
In this scenario, you can decide to configure your private DNS either on Amazon's Route 53 or Microsoft AD.

Please find the table comparing the two options:

	Managing DNS in AD	**Managing DNS in Route 53 Private Hosted Zone**
Cost	No additional charges	AWS pricing for hosted zone and queries applies. https://aws.amazon.com/route53/pricing/
Configuration and Management	Manage via UI or tools like powershell	Manage via AWS route 53 console, CLI or APIs
Redundancy	Dependent on the AD server redundancy	Route 53 is globally distributed, so redundancy is high

Now, let's look at step by step guidance for each option.

Option 1: DNS configuration in Microsoft AD



Step 1

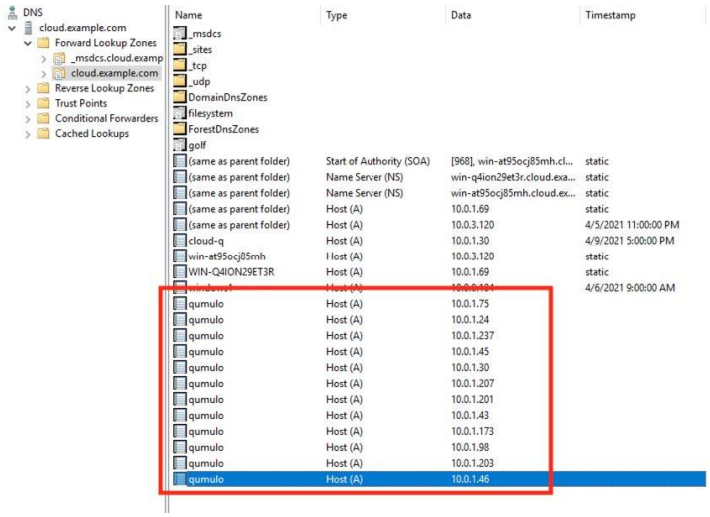
Get the list of secondary IPs provisioned for your Qumulo cluster. For details, refer to step 1 of “Configuring private DNS in Route 53 Private Hosted Zone”

Step 2

Access your AD’s DNS settings by navigating to DNS -> [Your domain name] ->Forward Lookup Zones -> [Your domain name].

Step 3

Create an A record with the same record name for each of your floating IPs captured in step 1. **Note:** Set the TTL to 0 for each of your records and make sure DNS round robin is enabled. Details on how to adjust TTL and confirm/set round robin DNS is shown in this Qumulo knowledge article.

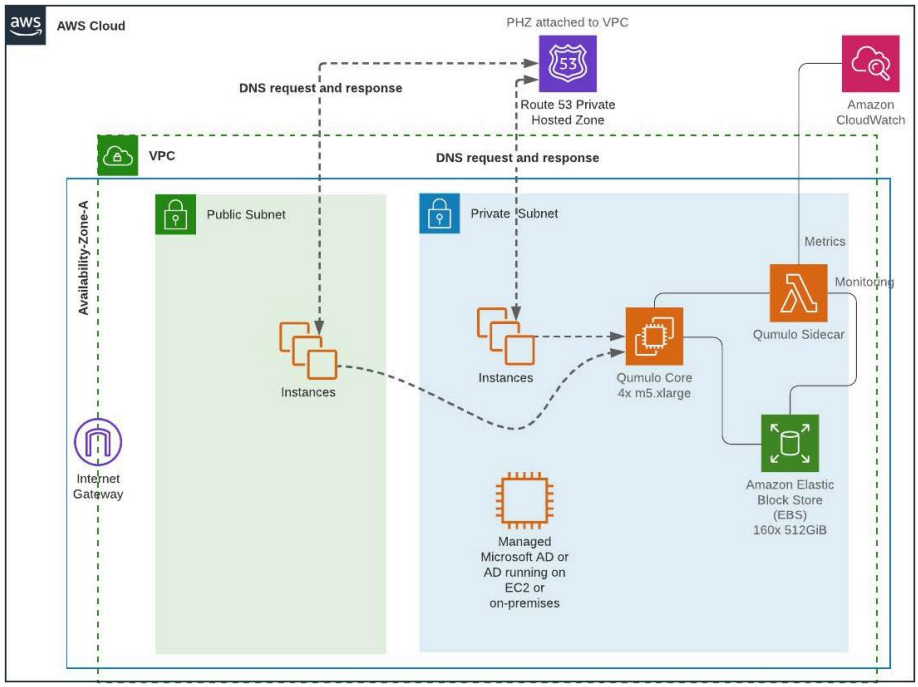


In my example, I have an AD domain called “cloud.example.com” running in AWS managed Microsoft AD and have created A records with host “qumulo” pointing to each of the floating IP addresses. I have set the TTL to 0 and enabled DNS round robin.

Option 2: Configuring private DNS in Route 53 private hosted zone with Microsoft AD

Within this option, you can decide to either have a domain name that is different from your AD domain name or choose a domain name that is a sub-domain of your AD domain.

We will look at the steps you can take for both options individually.



A. You decide to configure DNS in Amazon Route 53 and choose a **domain name that is different from your AD domain.**

Step 1

Choose a domain name for your qumulo cluster that is different from your AD domain.

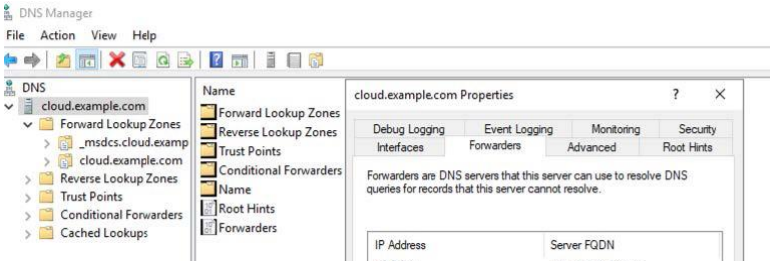
Step 2

Follow the steps under **"Configuring private DNS in Route 53 Private Hosted Zone"** to configure DNS for your chosen domain name.

Step 3

In your Microsoft AD, configure your forwarder to point to Route 53 resolver.

In my example, my AD domain is "cloud.example.com" and I wish to have my



clients resolve the qumulo cluster via, “qumulo.example.local”. So, I first configure the private DNS in Route 53 private hosted zone and set up a forwarder in Microsoft AD to forward queries to Route 53 resolver.

Note: The above configuration will forward any domain outside of “cloud.example.com” to Route 53 resolver.

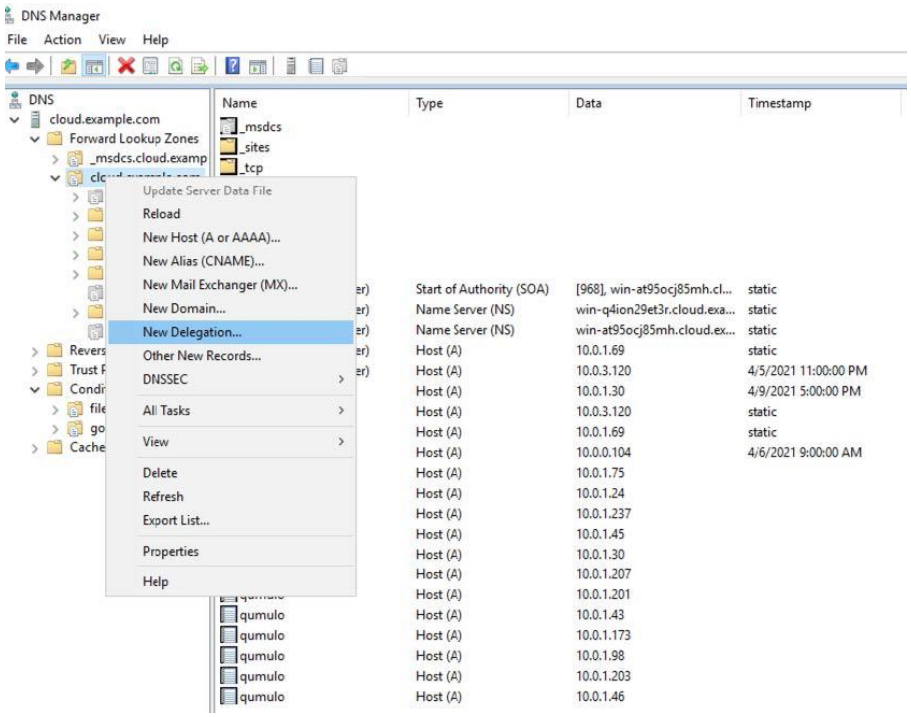
B. You decided to configure DNS in Amazon Route 53, but made a decision to use a **sub-domain of your AD domain.**

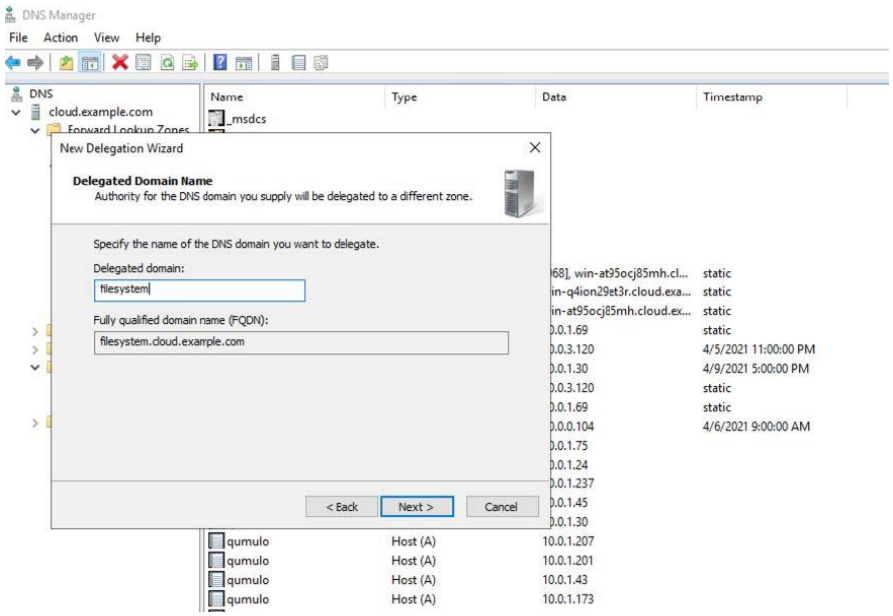
Step 1

Create your sub-domain in Route 53 private hosted zone by following the steps under **“Configuring private DNS in Route 53 Private Hosted Zone”.**

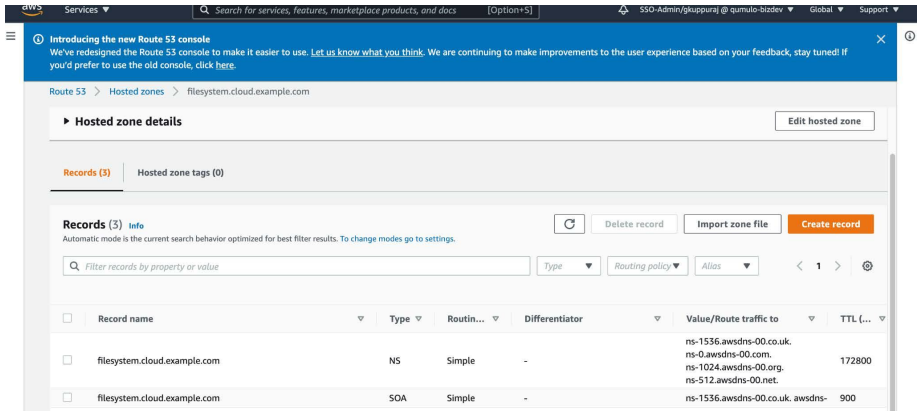
Step 2

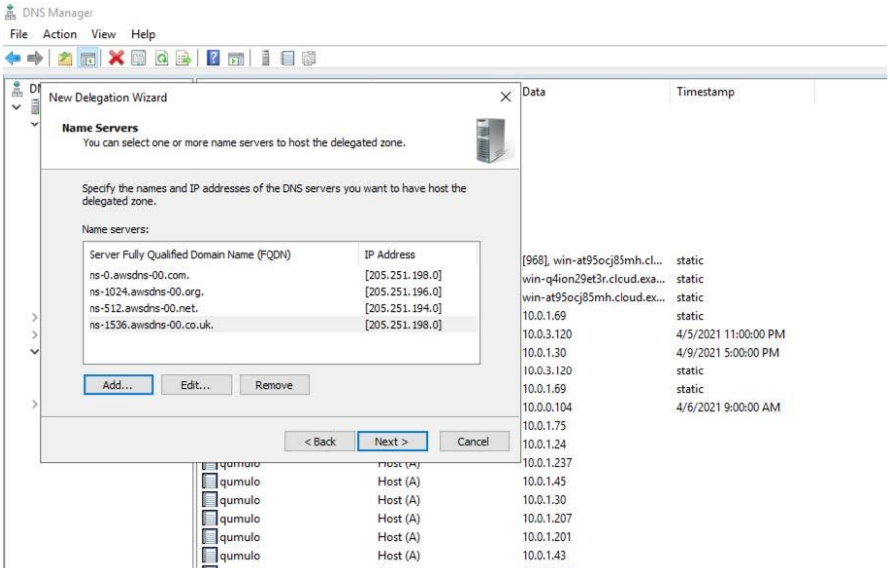
Add a new delegation to the DNS server for the sub-domain.
In my example, my subdomain is “filesystem.cloud.example.com”

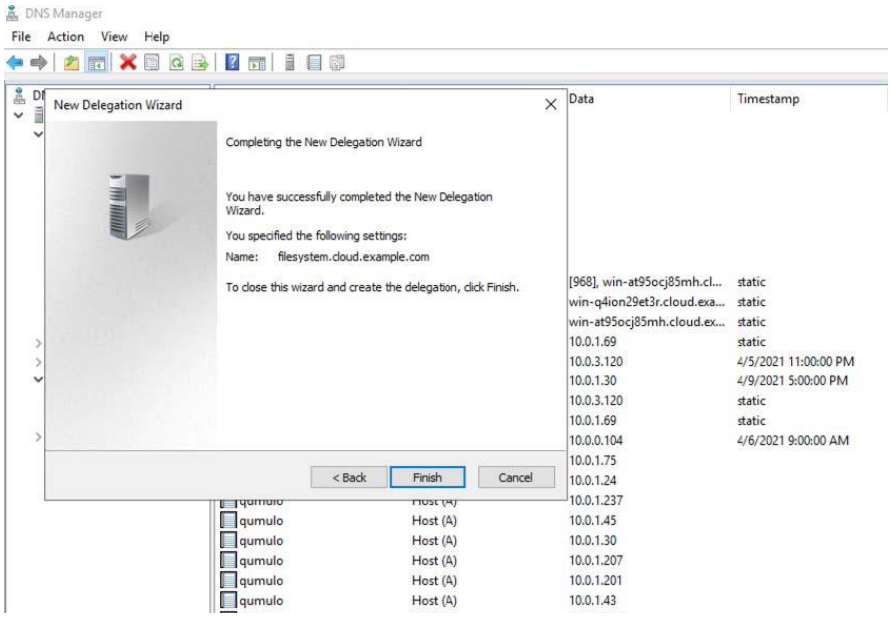




Now, you need to add the authoritative name servers for the sub-domain. You can get it from Route 53 private hosted zone.

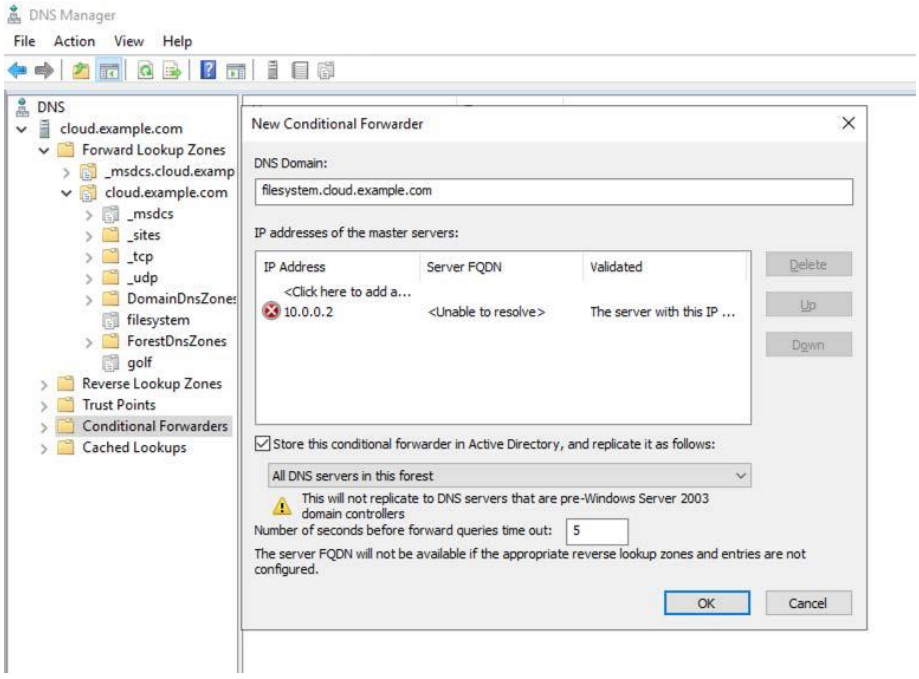






Step 3

Next, you need to create a conditional forwarder for the sub-domain pointing to AWS DNS server for the VPC.



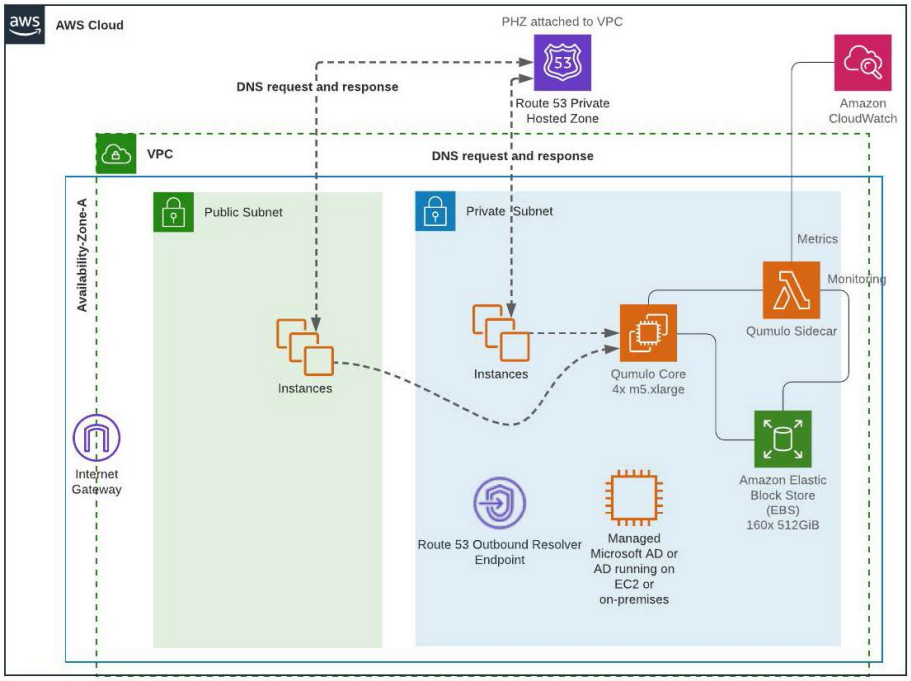
Scenario C

Requirements

1. You have a Microsoft Active Directory running either on EC2 or as an AWS managed Microsoft AD which is a part of AWS Directory service.

2. Your DHCP option set for your VPC is pointing to AmazonProvidedDNS which is the default setting in AWS.

The above scenario is becoming popular among customers using Microsoft AD, as it simplifies the number of hops to resolve private DNS. In this set-up only AD domain's requests are forwarded to AD using Route 53 outbound endpoints and rules.



Now, let's look at the steps to achieve this.

Step 1

Choose a DNS name and follow the steps under **Configuring private DNS in Route 53 Private Hosted Zone in Scenario A** to configure your DNS for Qumulo floating IPs.

Step 2

Create a Route 53 Resolver outbound endpoint and rules. Your Outbound end-point should point to the Microsoft AD and the rules will have your domain name served by your AD.

Steps to configure outbound endpoints and rules can be found here.

Note: It is important to understand that you understand the charges for using Route 53 Resolver Endpoints if choosing this option. https://aws.amazon.com/route53/pricing/

Conclusion

In this post, you have seen various options to configure DNS for your Qumulo's cluster floating IPs. You can decide to choose an option that works for your Organization's set up.