

DNS options in AWS to enable IP Failover and Client Distribution

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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.

gk-cluster-QSTACK-Q95DT3B86J45	NESTED
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k-cluster-QSTAC	K-Q95DT3B86J45 (NISTRO)		Delete Update Stack actions	-	Create stack 🔻
Stack Info Events R	essurces Outputs Parameters Template Change sets				
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Q. Search outputs					۲
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AWSStackID	arraws: cloud formation: us-west-2:879904047471: stack/gk-duster-QSTACK-Q95DT3B86i45/606dab20-9642-11eb-9286-06e6d1ac322bacdised array a		AWS ARN for this stack		
AWSStackName	gk-cluster-QSTACK-Q95DT3888045		AWS Name for this stack		
ClusterInstanceIDs	I-0158d9c87980abb94, I-0f7613c08b303e125, I-0a2a85a36e5dc66b5, I-09baa1724af745c0d		List of the instance IDs of the nodes in your Qumulo Cluster		
ClusterPlacementGroup	gk-cluster-QSTACK-Q95DT3886I45-QClusterGroup-155ISHI06KGR5		The placement group created for the cluster		
ClusterPrivateIPs	10.0.1.183, 10.0.7.6, 10.0.1.146, 10.0.1.37		List of the primary private IPs of the nodes in your Qumulo Cluster		
ClusterSGID	sg-09ed6b0444ccff152		The security group being used by the cluster network interfaces		
ClusterSecondaryPrivateIPs	10.0.1.75, 10.0.1.30, 10.0.1.207, 10.0.1.201, 10.0.1.43, 10.0.1.173, 10.0.1.98, 10.0.1.203, 10.0.1.46, 10.0.1.24, 10.0.1.237, 10.0.1.45	-	List of the secondary private IPs of the nodes in your Qumulo Cluster		
LinkToManagement	https://10.0.1.183		Use to launch the Qumulo Admin Console		
QumuloknowledgeBase	https://qf2.co/cloud-kb		Knowledge Base for Qumulo in public clouds		
Temporary@assword	1-0158d9c87980abb94*		Temporary admin password for your Qumulo cluster (exclude quotes, matches node1 instance ID).		

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)

Route 53	> Hosted zones > example.local				
exam	ple.local Info				
► Ho	sted zone details				
Record	ds (14) Hosted zone tags (0)				
Reco	rds (14) Info				
Automa	tic mode is the current search behavior optimized for best hits	er results. To change modes go to set	tings.		
Q F	Filter records by property or value			Type 🔻	Routing policy Alias
	Record name	∞ Туре ⊽	Routin v	Differentiator	
	example.local	NS	Simple		ns-1556.awsdns-00.co.uk ns-0.awsdns-00.com, ns-1024.awsdns-00.org.
	example.local	SOA	Simple		ns-512.awsdms-00.net. ns-1536.awsdns-00.co.uk. awsdns-hostmaster.amazon.com. 1 7200 900 1209600 86400
	qumulo.example.local	А	Weighted	1	10.0.1.75
	qumulo.example.local	A	Weighted	1	10.0.1.24
	qumulo.example.local	А	Weighted	1	10.0.1.237
	qumulo.example.local	А	Weighted	1	10.0.1.45
	qumulo.example.local	А	Weighted	1	10.0.1.207
	qumulo.example.local	A	Weighted	1	10.0.1.201
	qumulo.example.local	А	Weighted	1	10.0.1.30
	qumulo.example.local	A	Weighted	1	10.0.1.43
	qumulo.example.local	A	Weighted	1	10.0.1.173
	qumulo.example.local	А	Weighted	1	10.0.1.98
	qumulo.example.local	A	Weighted	1	10.0.1.203
	qumulo.example.local	А	Weighted	1	10.0.1.46

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.

	Managing DNS in AD	Managing DNS in Route 53 Private Hosted Zone
Cost	No additional charges	AWS pricing for hosted zone and queries applies. <u>https://aws.amazon.com/route53/p</u> <u>ricing/</u>
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

Please find the table comparing the two options:

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 <u>this</u> 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.

< Bie	DNS cloud.example.com Proward Lookup Zones Cloud.example.com Cloud.example.com Cloud.example.com Cloud.example.com Turst Points Conditional Forwarders Conditional Forwarders Cached Lookups	Name msdcs .ites dp DomainDnsZones fleystem ForestDnsZones goff	Туре	Data	Timestamp
		(same as parent folder)	Start of Authority (SOA)	[968], win-at95ocj85mh.cl	static
		(same as parent folder)	Name Server (NS)	win-q4ion29et3r.cloud.exa	static
		(same as parent folder)	Name Server (NS)	win-at95ocj85mh.cloud.ex	static
		(same as parent folder)	Host (A)	10.0.1.69	static
		(same as parent folder)	Host (A)	10.0.3.120	4/5/2021 11:00:00 PM
		cloud-q	Host (A)	10.0.1.30	4/9/2021 5:00:00 PM
		win-at95ocj85mh	Host (A)	10.0.3.120	static
		WIN-Q4ION29ET3R	Host (A)	10.0.1.69	static
			Hust (1)	10.0.0.101	4/6/2021 9:00:00 AM
		qumulo	Host (A)	10.0.1.75	
		qumulo	Host (A)	10.0.1.24	
		qumulo	Host (A)	10.0.1.237	
		qumulo	Host (A)	10.0.1.45	
		qumulo	Host (A)	10.0.1.30	
		qumulo	Host (A)	10.0.1.207	
		qumulo	Host (A)	10.0.1.201	
		qumulo	Host (A)	10.0.1.43	
		qumulo	Host (A)	10.0.1.173	
		gumulo	Host (A)	10.0.1.98	
		qumulo	Host (A)	10.0.1.203	
		🖉 gumulo	Host (A)	10.0.1.45	

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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

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DNS	Name	cloud.example.com	Properties		? >
 Forward Lookup Zones _msdcs.cloud.examp 	Reverse Lookup Zones	Debug Logging Interfaces	Event Logging Forwarders	Monitoring Advanced	Security Root Hints
Cloud.example.com Cloud.example.com Reverse Lookup Zones Trust Points Conditional Forwarders Cached Lookups	Conditional Forwarders Name Root Hints	Forwarden are DNS servers that this server can use to resolve DN queries for records that this server cannot resolve.			ve DNS
		IP Address		Server FQDN	

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"





Ioud.example.com Fonward Lookun Zones. New Delegation Wizard Delegated Domain Name Authority for the DNS domain you supply w Specify the name of the DNS domain you w Delegated domain: [itexystem] Fully qualified domain name (FQDN): [ifesystem.doud.example.com	will be delegated to a different zone.	K 68], win-at35ocj85mh.cl in-q4ion2943r.cloud.exa	static
New Delegation Wizard Delegated Domain Name Authority for the DNS domain you supply w Specify the name of the DNS domain you w Delegated domain: [Resystem] Fully qualified domain name (FQDN): [Resystem.cloud.example.com	vil be delegated to a different zone. vant to delegate.	K 68], win-at35ocj85mh.cl in-q4ion2943r.cloud.exa	static
Delegated Domain Name Authority for the DNS domain you supply v Specify the name of the DNS domain you w Delegated domain: [filesystem] Fully qualified domain name (FQDN): [filesystem.cloud.example.com	will be delegated to a different zone.	68], win-at95ocj85mh.cl in-q4ion2943r.cloud.exa	static
Authority for the DNS domain you supply v Authority for the DNS domain you supply v Specify the name of the DNS domain you w Delegated domain: [filesystem] Fully qualified domain name (FQDN): [filesystem.cloud.example.com	will be delegated to a different zone.	68], win-at95ocj85mh.cl in-q4ion29et3r.cloud.exa	static
Specify the name of the DNS domain you w Delegated domain: filesystem Fully qualified domain name (FQDN): filesystem.cloud.example.com	vant to delegate.	68], win-at95ocj85mh.cl in-q4ion29et3r.cloud.exa	static
Specify the name of the DNS domain you v Delegated domain: filesystem Fully qualified domain name (FQDN): filesystem.cloud.example.com	vant to delegate.	168], win-at95ocj85mh.cl in-q4ion29et3r.cloud.exa	static
Delegated domain: filesystem Fully qualified domain name (FQDN): filesystem.cloud.example.com]	68], win-at95ocj85mh.cl in-q4ion29et3r.cloud.exa	static
filesystem Fully qualified domain name (FQDN): filesystem.cloud.example.com]	in-q4ion29et3r.cloud.exa	static
Fully qualified domain name (FQDN): filesystem.cloud.example.com	19	in quone seconcroad.exa	
Fully qualified domain name (FQDN): filesystem.cloud.example.com		in-at95oci85mb.cloud.ex	static
filesystem.cloud.example.com		0.0.1.69	static
		0.0.3.120	4/5/2021 11:00:00 PM
		0.0.1.30	4/9/2021 5:00:00 PM
		0.0.3.120	static
		0.0.1.69	static
		þ.0.0.104	4/6/2021 9:00:00 AM
		0.0.1.75	
		0.0.1.24	
		0.0.1.237	
	< Eack Next > Can	cel 0.0.1.45	
		p.0.1.30	
qumulo	Host (A)	10.0.1.207	
qumulo	Host (A)	10.0.1.201	
qumulo	Host (A)	10.0.1.43	

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

Introd	ducing the new Route 53 console					
We've you'd	redesigned the Route 53 console to make it easier to use. <u>Let</u> prefer to use the old console, click <u>here</u> .	t us know what you think. We are	continuing to make i	mprovements to the user exp	erience based on your feed	back, stay tuned! If
Route	53 > Hosted zones > filesystem.cloud.example.com					
	Hosted zone details					Edit hosted zone
Ree	Hosted zone tags (0)					
Re Aut	ecords (3) Info tomatic mode is the current search behavior optimized for best filter res	sults. To change modes go to settings.		C Delete record	Import zone file	Create record
C	Q Filter records by property or value			Type Routing poli	cy▼ Alias ▼	< 1 > ©
	Record name	⊽ Type ⊽ Ro	outin ⊽ Diff	erentiator $ abla$	Value/Route traffic t	o ⊽ TTL (
	filesystem.cloud.example.com	NS Sir	mple -		ns-1536.awsdns-00.c ns-0.awsdns-00.com. ns-1024.awsdns-00.c ns-512.awsdns-00.ne	o.uk. rg. 172800 t.
	filesystem.cloud.example.com	SOA Sir	mple -		ns-1536.awsdns-00.c	o.uk. awsdns- 900
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New Delegation Wizard	Completing the New Delegation Wizard You have successfully completed the New Delegation Wizard. You specified the following settings: Name: filesystem.cloud.example.com To close this wizard and create the delegation, click Finish.			Data [968], win-at95ocj85mh.cl win-q4ion29et3r.cloud.exa	Timestamp static static
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		Host (a)	10.0.1.207	
	aumulo	Host (A)	10.0.1.201	
	aumulo	Host (A)	10.0.1.43	

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.





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