

OX PowerDNS Cloud Control

Reference

Mar 04, 2022

Release 2.1.0-ALPHA3

©2022 by Open-Xchange AG and PowerDNS.COM BV. All rights reserved. Open-Xchange, PowerDNS, the Open-Xchange logo and PowerDNS logo are trademarks or registered trademarks of Open-Xchange AG. All other company and/or product names may be trademarks or registered trademarks of their owners. Information contained in this document is subject to change without notice.

Contents

1	Overview	1
2	Registry configuration	2
3	Cluster networking	3
3.1	IPv4 only (default)	3
3.2	IPv6 only	3
3.3	Dualstack - IPv4 primary	4
3.4	Dualstack - IPv6 primary	4
4	Exposing dnsmdist	5
4.1	Example: Exposing via NodePort	6
4.2	Example: Exposing via LoadBalancer	7
5	Exposing auth API	8
6	Default configuration	10
6.1	auth	10
6.2	dnsmdist	12
6.3	recursor	16
6.4	resolver	17
6.5	zoneControl	17
7	Instances	19
7.1	auths	19
7.1.1	Parameters	19
7.1.2	Parameter Sets	19
7.1.3	Backends	22
7.1.3.1	Postgres (pre-existing)	22
7.1.3.2	Postgres (Operator-managed)	23
7.1.3.3	GeoIP	23
7.1.3.4	GeoIP - MaxMind Database	23
7.1.3.5	GeoIP - MaxMind Database - HTTP	24
7.1.3.6	GeoIP - MaxMind Database - OCI	25
7.1.3.7	GeoIP - Custom Database	25
7.1.3.8	LightningStream	26
7.2	dnsmdists	27
7.2.1	Parameters	27
7.2.2	Parameter Sets	28
7.2.3	Server Pools	31
7.3	recursors	32
7.3.1	Parameters	32

7.3.2	Parameter Sets	32
7.4	resolvers	34
7.4.1	Parameters	34
7.4.2	Parameter Sets	34
7.5	rulesets	36
7.5.1	Rules	36
7.5.2	Combinators	37
7.5.3	Selectors	37
7.5.3.1	TCP	37
7.5.3.2	MaxQPS	37
7.5.3.3	MaxQPSIP	37
7.5.3.4	NetmaskGroup	38
7.5.3.5	Opcode	38
7.5.3.6	QName	39
7.5.3.7	QType	39
7.5.4	Actions	39
7.5.4.1	Pool	39
7.5.4.2	QPS	40
7.5.4.3	RCode	40
7.6	zonecontrols	40
7.6.1	Parameters	40
7.6.2	Parameter Sets	41
7.6.3	Postgres Database	41
7.6.3.1	Postgres (pre-existing)	41
7.6.3.2	Postgres (Operator-managed)	42
8	Prometheus	43

1 Overview

Configuration of a deployment can be achieved by overriding specific values that are exposed by the Helm chart. This reference guide lists all the values that can be set/configured. Since there are many different configuration options available, these have been separated into the following sections inside the helm values:

Generic configuration:

- **global**: Overrides to pull images from a private registry
- **registrySecrets**: Configuration of credentials for the image registry
- **ipFamily**: Configuration of the cluster networking
- **prometheus**: Configuration of Prometheus scrape settings

Configuration of default settings:

- **auth**: Default configuration for all auth instances
- **dnsdist**: Default configuration for all dnsdist instances
- **recursor**: Default configuration for all recursor instances
- **resolver**: Default configuration for all resolver instances
- **zonecontrol**: Default configuration for all zonecontrol instances

Configuration of instances:

- **auths**: Collection of auth instances to deploy
- **dnsdists**: Collection of dnsdist instances to deploy
- **recursors**: Collection of recursor instances to deploy
- **resolvers**: Collection of resolver instances to deploy
- **rulesets**: Sets of rules to deploy, for dnsdist to use
- **zonecontrols**: Collection of zonecontrol instances to deploy

Each of these sections is explained in detail in the chapters below.

For a basic example of how to use the values, please refer to the *Getting Started* chapter in the *Overview* guide.

2 Registry configuration

All images referenced are stored on a registry at registry.open-xchange.com. To ensure the images can be pulled you need to provide the corresponding registry's credentials. This can be done in the following block in the helm values (replace the username & password accordingly):

```
registrySecrets:  
  registry: registry.open-xchange.com  
  username: REGISTRY_USERNAME_HERE  
  password: REGISTRY_PASSWORD_HERE  
  email: user@some.domain.com
```

If you intend to run the monitoring stack on a kubernetes cluster which makes use of a local/private registry, you can use one or more of the following settings in your helm values to configure that registry:

```
# Monitoring - global overrides  
global:  
  # Override image-related settings for this chart and all subcharts  
  image:  
    # Override registry for all images  
    registry: "myregistry.local:8085"  
  
    # Override repository for all images  
    repository: "myrepository"  
  
    # Override pullPolicy for all images  
    pullPolicy: "IfNotPresent"
```

Each setting explained:

global.image.registry

All images will be attempted to be pulled from this registry (format: host:port)

global.image.repository

All images will be attempted to be pulled from this repository, on above configured registry

global.image.pullPolicy

This pull policy will be specified for each image

If you have a need to override the above settings for specific images, you can find the corresponding 'image:' configuration blocks in the helm values file.

3 Cluster networking

To be able to support Kubernetes clusters with IPv4, IPv6 or dual stack (IPv4 & IPv6) configurations, it is required to ensure the 'ipFamily' configuration in the helm values matches your cluster. The 'ipFamily' section contains the following parameters:

- **ipFamily.ipv4:** Whether or not your cluster has IPv4 enabled (Default: true)
- **ipFamily.ipv6:** Whether or not your cluster has IPv6 enabled (Default: false)
- **ipFamily.families:** Preference of IP families on your cluster, if it is a dualstack cluster

To ensure your deployment is correctly configured, you need to provide one of the 4 possible variations:

3.1 IPv4 only (default)

```
# Networking configuration
ipFamily:
  ipv4: true
  ipv6: false
  families:
    - "IPv4"
    - "IPv6"
```

Note: 'families' is ignored in this configuration. It is only used in a dualstack setup.

3.2 IPv6 only

```
# Networking configuration
ipFamily:
  ipv4: false
  ipv6: true
  families:
    - "IPv4"
    - "IPv6"
```

Note: 'families' is ignored in this configuration. It is only used in a dualstack setup.

3.3 Dualstack - IPv4 primary

If you are running a dualstack cluster, you can check any Pod to see if your cluster has a preference for IPv4 or IPv6. Your pods will have a 'podIP' and 2 values for 'podIPs'. If the 'podIP' is an IPv4 address as shown in the example below, then you are running a cluster with IPv4 as primary:

```
podIP: 172.17.183.4 # IPv4
podIPs:
- ip: 172.17.183.4 # IPv4
- ip: fd43:128b:8658:b73b:3eb7:2e30:8815:3f6 # IPv6
```

Configuration for dualstack with IPv4 primary:

```
# Networking configuration
ipFamily:
  ipv4: true
  ipv6: true
families:
- "IPv4" # IPv4 is primary
- "IPv6"
```

3.4 Dualstack - IPv6 primary

If you are running a dualstack cluster, you can check any Pod to see if your cluster has a preference for IPv4 or IPv6. Your pods will have a 'podIP' and 2 values for 'podIPs'. If the 'podIP' is an IPv6 address as shown in the example below, then you are running a cluster with IPv6 as primary:

```
podIP: fd43:128b:8658:b73b:3eb7:2e30:8815:3f6 # IPv6
podIPs:
- ip: fd43:128b:8658:b73b:3eb7:2e30:8815:3f6 # IPv6
- ip: 172.17.183.4 # IPv4
```

Configuration for dualstack with IPv6 primary:

```
# Networking configuration
ipFamily:
  ipv4: true
  ipv6: true
families:
- "IPv6" # IPv6 is primary
- "IPv4"
```

4 Exposing dnssdist

By default a set of dnssdist instances will have a Service object created with type ClusterIP. The default configuration is as follows (Values: dnssdist.service):

```
service:
  type: ClusterIP
  ports:
    udp:
      port: 53
      protocol: UDP
    tcp:
      port: 53
      protocol: TCP
```

The above results in a Service object with UDP & TCP listeners on port 53. To modify the default service, you can specify a *service* item in the dnssdist instance, such as:

```
dnssdists:
  mydnssdist:
    replicas: 2
    pools:
      default:
        serverGroups:
          - group: myrecursor
        packetcache:
          maxEntries: 200000
    service:
      type: NodePort
```

This will override the type of the Service object from *ClusterIP* to *NodePort*.

Available parameters:

- type
- loadBalancerIP (Only applicable if type = LoadBalancer)
- loadBalancerSourceRanges (Only applicable if type = LoadBalancer)
- loadBalancerClass (Only applicable if type = LoadBalancer)
- clusterIP
- clusterIPs
- externalIPs
- externalName
- externalTrafficPolicy

- internalTrafficPolicy
- sessionAffinity
- healthCheckNodePort
- sessionAffinityConfig

These parameters directly expose Kubernetes' configuration equivalents, for their usage & accepted values please refer to: <https://kubernetes.io/docs/reference/kubernetes-api/service-resources/service-v1/>

4.1 Example: Exposing via NodePort

To expose dnsmdist via a NodePort, you can specify the appropriate type. In this example, both UDP & TCP will be exposed via a NodePort, where the NodePort will be randomly selected from the node-port range:

```
dnsdists:
  mydnsmdist:
    replicas: 2
    pools:
      default:
        serverGroups:
          - group: myrecursor
        packetcache:
          maxEntries: 200000
    service:
      type: NodePort
```

You can also specify the NodePort which you want to use, for example:

```
dnsdists:
  mydnsmdist:
    replicas: 2
    pools:
      default:
        serverGroups:
          - group: myrecursor
        packetcache:
          maxEntries: 200000
    service:
      type: NodePort
      ports:
        udp:
          port: 53
          protocol: UDP
          nodePort: 30053
        tcp:
          port: 53
          protocol: TCP
          nodePort: 30053
```

4.2 Example: Exposing via LoadBalancer

To expose dnsmdist via a LoadBalancer, you can specify the appropriate type. When 'LoadBalancer' is configured as type, it will create the default ClusterIP Service + 1 LoadBalancer Service for each specified port. This is done to satisfy a Kubernetes constraint regarding LoadBalancer objects when multiple protocols are requested.

In this example, both the default UDP & TCP ports will be exposed via a LoadBalancer Service (MetalLB annotation provided as example, substitute with annotations required by your LoadBalancer provider) on port 53:

```
dnsdists:
  mydnsdist:
    replicas: 2
    pools:
      default:
        serverGroups:
          - group: myrecursor
        packetcache:
          maxEntries: 200000
    service:
      type: LoadBalancer
      annotations:
        metallb.universe.tf/address-pool: name_of_pool
```

If necessary, you can also request a specific LoadBalancer IP, as shown in the following example:

```
dnsdists:
  mydnsdist:
    replicas: 2
    pools:
      default:
        serverGroups:
          - group: myrecursor
        packetcache:
          maxEntries: 200000
    service:
      type: LoadBalancer
      annotations:
        metallb.universe.tf/address-pool: name_of_pool
      loadBalancerIP: 12.34.56.78
```

5 Exposing auth API

By default a set of auth instances will not have an Ingress object created. If you wish to expose auth's API you can do so by configuring the Ingress object.

Note: We highly recommend providing the necessary stickiness annotations to any created Ingress object. Below examples include nginx stickiness annotations, please use your ingress controller's corresponding equivalents if using a different ingress controller.

For these examples we will assume the following auth instance is to be exposed:

```
auths:
  myauth:
    replicas: 2
```

If the above is deployed, 2 replicas of auth will be created, but no Ingress object will exist. To add an Ingress, use the following additional config:

```
auths:
  myauth:
    replicas: 2
    api:
      ingress:
        enabled: true
        annotations:
          <Annotations required by your Ingress controller>
        hosts:
          - <Hosts on which to have the Ingress listen>
      tls:
        - secretName: <Secret containing certificates - if HTTPS is desired>
          hosts:
            - <Hosts for which HTTPS is desired>
```

Example for plain HTTP using *nginx* Ingress Controller for host *myhost.mydomain.com*:

```
auths:
  myauth:
    replicas: 2
    api:
      ingress:
        enabled: true
        annotations:
          kubernetes.io/ingress.class: "nginx"
          nginx.ingress.kubernetes.io/affinity: "cookie"
          nginx.ingress.kubernetes.io/session-cookie-name: "ccroute"
          nginx.ingress.kubernetes.io/session-cookie-expires: "172800"
          nginx.ingress.kubernetes.io/session-cookie-max-age: "172800"
```

(continues on next page)

(continued from previous page)

```
hosts:
  - myhost.mydomain.com
```

Example for HTTPS using *nginx* Ingress Controller & certificates generated into a secret named *auth-api-certs* by a cert-manager cluster issuer named *letsencrypt-prod* on host *myhost.mydomain.com*:

```
auths:
  myauth:
    replicas: 2
    api:
      ingress:
        enabled: true
        annotations:
          kubernetes.io/ingress.class: "nginx"
          nginx.ingress.kubernetes.io/affinity: "cookie"
          nginx.ingress.kubernetes.io/session-cookie-name: "ccroute"
          nginx.ingress.kubernetes.io/session-cookie-expires: "172800"
          nginx.ingress.kubernetes.io/session-cookie-max-age: "172800"
          cert-manager.io/cluster-issuer: letsencrypt-prod
        hosts:
          - myhost.mydomain.com
      tls:
        - secretName: auth-api-certs
          hosts:
            - myhost.mydomain.com
```

6 Default configuration

6.1 auth

Default settings for all auth instances, configurable under 'auth' in helm values.

- **affinity**: Kubernetes pod affinity (default: *{}*)
- **antiAffinityPreset**: Pod anti affinity, if *affinity* is not set (default: *preferred*)
- **apiKey**: API key used to access the /api endpoint, used to configure a static key (default: generated and stored in a secret)
- **nodeSelector**: Kubernetes pod nodeSelector (default: *{}*)
- **podAnnotations**: Annotations to be added to each Pod
- **podLabels**: Labels to be added to each Pod
- **readinessFailureThreshold**: When a probe fails, Kubernetes will try this many times before marking the container as Unready. Updates deployment, resulting in respawn of recursor pods (default: 2)
- **readinessInitialDelaySeconds**: Number of seconds after the containers have started before readiness probes are initiated. Updates deployment, resulting in respawn of recursor pods. (default: 5)
- **readinessPeriodSeconds**: How often (in seconds) to perform the readiness probes. Updates deployment, resulting in respawn of recursor pods (default: 2)
- **readinessStateProbeInterval**: How often (in seconds) the agent will judge the health state of the recursor agent. (default: 2)
- **readinessSuccessThreshold**: Minimum consecutive successful probes before a container is marked Ready. Updates deployment, resulting in respawn of recursor pods (default: 2)
- **readinessTimeoutSeconds**: Number of seconds after which the readiness probes time out. Updates deployment, resulting in respawn of recursor pods (default: 1)
- **replicas**: Default number of replicas in a recursor deployment (default: 2)
- **webserverACLAllowAll**: Allow all inbound traffic to auth webserver, regardless of source IP (default: *true*)
- **webserverACL**: Netmasks to allow webserver traffic from (default: *127.0.0.1/32, 192.168.0.0/16, 10.0.0.0/8, 172.16.0.0/12, ::1, fc00::/7*)
- **webserverPassword**: Instead of generating a password for the webserver, set a static one (default: generated and stored in a secret)

- **hpa:** (Horizontal Pod Autoscaler defaults)
 - **enabled:** Enable or disable the HPA (default: *false*)
 - **minReplicas:** Minimum # of replicas (default: 2)
 - **maxReplicas:** Maximum # of replicas (default: 4)
 - **metrics:** Metric(s) upon which to make decisions regarding scaling. Must be an array of MetricSpec (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#metricspec-v2beta2-autoscaling>). Examples are in the helm values.
 - **behavior:** Behavior of the HPA, must be instance of HorizontalPodAutoscalerBehavior (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#horizontalpodautoscalerspec-v2beta2-autoscaling>).
- **agentResources:** (auth agent resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)
- **resources:** (auth resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)
- **lightningStreamResources:** (LightningStream resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)
- **lightningStream:** (LightningStream defaults)
 - **logLevel:** Loglevel for LightningStream containers (default: *info*, available options: *debug, info, warning, error, fatal*)

6.2 dnsmist

Default settings for all dnsmist instances, configurable under 'dnsmist' in helm values.

- **aclAdd:** Netmasks allowed to access dnsmist, in addition to the loopback, RFC1918 and other local addresses. Only applicable if `aclAllowAll` is *false* (default: `[]`)
- **aclAllowAll:** Allow all inbound traffic to dnsmist, regardless of source IP. (default: *true*)
- **affinity:** Kubernetes pod affinity (default: `{}`)
- **antiAffinityPreset:** Pod anti affinity, if *affinity* is not set (default: *preferred*)
- **consistentHashingBalancingFactor:** Set the maximum imbalance between the number of outstanding queries intended for a given server, based on its weight, and the actual number, when using the chashed consistent hashing load-balancing policy. Default is 0, which disables the bounded-load algorithm. (default: 0)
- **do53Locals:** Default amount of Do53 listen sockets per dnsmist pod (default: 1)
- **do53TcpFastOpenQueueSize:** Default size of the TCP Fast Open queue on Do53 listen sockets (Dnsmist default)
- **do53TcpListenQueueSize:** Default size of the listen queue on Do53 listen sockets (Dnsmist default)
- **nodeSelector:** Kubernetes pod nodeSelector (default: `{}`)
- **podAnnotations:** Annotations to be added to each Pod
- **podLabels:** Labels to be added to each Pod
- **port:** Port on which dnsmist will listen for Do53 traffic (default: 5353)
- **readinessDo53ProbeInterval:** How often (in seconds) the agent will judge the health state of dnsmist via tests against the Do53 listeners. (default: 2)
- **readinessDo53QDomain:** Domain used in the query to judge whether the Do53 listeners of a dnsmist container are healthy and ready for traffic. (default: *a.root-servers.net*)
- **readinessDo53QTimeout:** Number of seconds after which the query used to judge whether the Do53 listeners of a dnsmist container are healthy and ready for traffic time out. (default: 1)
- **readinessDo53QType:** Type of query used to judge whether the Do53 listeners of a dnsmist container are healthy and ready for traffic. (default: A)
- **readinessFailureThreshold:** When a probe fails, Kubernetes will try this many times before marking the container as Unready. Updates deployment, resulting in respawn of dnsmist pods (default: 2)
- **readinessInitialDelaySeconds:** Number of seconds after the containers have started before readiness probes are initiated. Updates deployment, resulting in respawn of dnsmist pods. (default: 5)
- **readinessPeriodSeconds:** How often (in seconds) to perform the readiness probes. Updates deployment, resulting in respawn of dnsmist pods (default: 2)
- **readinessStateProbeInterval:** How often (in seconds) the agent will judge the health state of the dnsmist agent. (default: 2)

- **readinessSuccessThreshold**: Minimum consecutive successful probes before a container is marked Ready. Updates deployment, resulting in respawn of dnsdist pods (default: 2)
- **readinessTimeoutSeconds**: Number of seconds after which the readiness probes timeout. Updates deployment, resulting in respawn of dnsdist pods (default: 1)
- **replicas**: Default number of replicas in a dnsdist deployment (default: 2)
- **roundRobinFailOnNoServer**: By default the roundrobin load-balancing policy will still try to select a backend even if all backends are currently down. Setting this to true will make the policy fail and return that no server is available instead. (default: *false*)
- **servFailWhenNoServer**: If true, return a ServFail when no servers are available, instead of the default behaviour of dropping the query. (default: *false*)
- **webserverACLAllowAll**: Allow all inbound traffic to dnsdist webserver, regardless of source IP (default: *true*)
- **webserverACL**: Netmasks to allow webserver traffic from (default: *127.0.0.1/32, 192.168.0.0/16, 10.0.0.0/8, 172.16.0.0/12, ::1, fc00::/7*)
- **webserverPassword**: Instead of generating a password for the webserver, set a static one (default: generated and stored in a secret)
- **weightedBalancingFactor**: Set the maximum imbalance between the number of outstanding queries intended for a given server, based on its weight, and the actual number, when using the whashed or wrandom load-balancing policy. Default is 0, which disables the bounded-load algorithm. (default: 0)
- **ecs**: (dnsdist ECS functions)
 - **setECSSourcePrefixV4**: Whether to override an existing EDNS Client Subnet option present in the query (only effective when the backend server has annotation useClientSubnet = true). (Dnsdist default)
 - **setECSSourcePrefixV4**: Truncate the requestors IPv4 address to this length, in bits (only effective when the backend server has annotation useClientSubnet = true). (Dnsdist default)
 - **setECSSourcePrefixV6**: Truncate the requestors IPv6 address to this length, in bits (only effective when the backend server has annotation useClientSubnet = true). (Dnsdist default)
- **hpa**: (Horizontal Pod Autoscaler defaults)
 - **enabled**: Enable or disable the HPA (default: *false*)
 - **minReplicas**: Minimum # of replicas (default: 2)
 - **maxReplicas**: Maximum # of replicas (default: 4)
 - **metrics**: Metric(s) upon which to make decisions regarding scaling. Must be an array of MetricSpec (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#metricspec-v2beta2-autoscaling>). Examples are in the helm values.
 - **behavior**: Behavior of the HPA, must be instance of HorizontalPodAutoscalerBehavior (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#horizontalpodautoscalerspec-v2beta2-autoscaling>).

- **ringBuffers:** (Ringbuffer configuration)
 - **retries:** Number of shards to attempt to lock without blocking before giving up and simply blocking while waiting for the next shard to be available. Defaults to 5 if there is more than 1 shard, else it defaults to 0. (Dnsdist default)
 - **shards:** Number of shards to use to limit lock contention, defaults to 1. (Dnsdist default)
 - **size:** Maximum amount of queries to keep in the ringbuffer, defaults to 10000. (Dnsdist default)
- **securityPolling:** (Security polling configuration)
 - **securityPollInterval:** Interval between security pollings, in seconds. Defaults to 3600. (Dnsdist default)
 - **securityPollSuffix:** Domain name from which to query security update notifications. Setting this to an empty string disables secpoll. (Dnsdist default)
- **tuning:** (dnsdist tuning functions)
 - **setCacheCleaningDelay:** Interval in seconds between two runs of the cache cleaning algorithm, removing expired entries. (Dnsdist default)
 - **setCacheCleaningPercentage:** Percentage of the cache that the cache cleaning algorithm will try to free by removing expired entries. By default (100), all expired entries are removed. (Dnsdist default)
 - **setMaxTCPClientThreads:** Maximum amount of TCP client threads, handling TCP connections. By default this value is 10, unless more than 10 TCP listen sockets have been defined. (Dnsdist default)
 - **setMaxTCPConnectionDuration:** Maximum duration of an incoming TCP connection, in seconds. 0 (the default) means unlimited. (Dnsdist default)
 - **setMaxTCPConnectionsPerClient:** Maximum number of TCP connections per client. 0 (the default) means unlimited. (Dnsdist default)
 - **setMaxTCPQueriesPerConnection:** Maximum number of queries in an incoming TCP connection. 0 (the default) means unlimited. (Dnsdist default)
 - **setMaxTCPQueuedConnections:** Maximum number of TCP connections queued (waiting to be picked up by a client thread), defaults to 1000. 0 means unlimited. (Dnsdist default)
 - **setMaxUDPOutstanding:** Maximum number of outstanding UDP queries to a given backend server, defaults to 65535. (Dnsdist default)
 - **setStaleCacheEntriesTTL:** TTL for expired cache entries to be eligible as answer when no backends are available for a query, in seconds. (Dnsdist default)
 - **setTCPRecvTimeout:** Read timeout on TCP connections from the client, in seconds. (Dnsdist default)
 - **setTCPSendTimeout:** Write timeout on TCP connections from the client, in seconds. (Dnsdist default)
 - **setUDPTimeout:** Maximum time dnsdist will wait for a response from a backend over UDP, in seconds. Defaults to 2. (Dnsdist default)

- **agentResources:** (dnsmdist agent resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)
- **rpcServerResources:** (dnsmdist RPC server resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)
- **stateResources:** (dnsmdist state resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)
- **resources:** (dnsmdist resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)

6.3 recursor

Default settings for all recursor instances, configurable under 'recursor' in helm values.

- **affinity**: Kubernetes pod affinity (default: *{}*)
- **antiAffinityPreset**: Pod anti affinity, if *affinity* is not set (default: *preferred*)
- **apiKey**: API key used to access the /api endpoint, used to configure a static key (default: generated and stored in a secret)
- **nodeSelector**: Kubernetes pod nodeSelector (default: *{}*)
- **podAnnotations**: Annotations to be added to each Pod
- **podLabels**: Labels to be added to each Pod
- **readinessFailureThreshold**: When a probe fails, Kubernetes will try this many times before marking the container as Unready. Updates deployment, resulting in respawn of recursor pods (default: 2)
- **readinessInitialDelaySeconds**: Number of seconds after the containers have started before readiness probes are initiated. Updates deployment, resulting in respawn of recursor pods. (default: 5)
- **readinessPeriodSeconds**: How often (in seconds) to perform the readiness probes. Updates deployment, resulting in respawn of recursor pods (default: 2)
- **readinessStateProbeInterval**: How often (in seconds) the agent will judge the health state of the recursor agent. (default: 2)
- **readinessSuccessThreshold**: Minimum consecutive successful probes before a container is marked Ready. Updates deployment, resulting in respawn of recursor pods (default: 2)
- **readinessTimeoutSeconds**: Number of seconds after which the readiness probes time out. Updates deployment, resulting in respawn of recursor pods (default: 1)
- **replicas**: Default number of replicas in a recursor deployment (default: 2)
- **webserverACLAllowAll**: Allow all inbound traffic to recursor webserver, regardless of source IP (default: *true*)
- **webserverACL**: Netmasks to allow webserver traffic from (default: *127.0.0.1/32, 192.168.0.0/16, 10.0.0.0/8, 172.16.0.0/12, ::1, fc00::/7*)
- **webserverPassword**: Instead of generating a password for the webserver, set a static one (default: generated and stored in a secret)
- **hpa**: (Horizontal Pod Autoscaler defaults)
 - **enabled**: Enable or disable the HPA (default: *false*)
 - **minReplicas**: Minimum # of replicas (default: 2)
 - **maxReplicas**: Maximum # of replicas (default: 4)
 - **metrics**: Metric(s) upon which to make decisions regarding scaling. Must be an array of MetricSpec (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#metricspec-v2beta2-autoscaling>). Examples are in the helm values.

- **behavior:** Behavior of the HPA, must be instance of HorizontalPodAutoscalerBehavior (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#horizontalpodautoscalerspec-v2beta2-autoscaling>).
- **agentResources:** (recursor agent resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)
- **resources:** (recursor resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)

6.4 resolver

Default settings for resolver instances, configurable under 'resolver' in helm values.

- **backendDefaultPort:** Port on which the endpoints belonging to a resolver partition will receive traffic (default: 53)
- **servicePort:** Port on which a resolver service will listen (unused in normal operation, as the service is only used to discover the corresponding endpoints). (default: 53)

6.5 zoneControl

Default settings for all ZoneControl instances, configurable under 'zonecontrol' in helm values.

- **affinity:** Kubernetes pod affinity (default: *{}*)
- **antiAffinityPreset:** Pod anti affinity, if *affinity* is not set (default: *preferred*)
- **nodeSelector:** Kubernetes pod nodeSelector (default: *{}*)
- **podAnnotations:** Annotations to be added to each Pod
- **podLabels:** Labels to be added to each Pod
- **replicas:** Default number of replicas in a recursor deployment (default: 2)
- **syncJobTTL:** Keep finished synchronisation jobs for this amount of seconds before allowing Kubernetes to remove them (default: *86400*)

- **operator:** (Synchronisation operator defaults)
 - **podAnnotations:** Annotations to be added to each Pod
 - **podLabels:** Labels to be added to each Pod
- **resources:** (auth resource allocation defaults)
 - **limits:** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests:** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)

7 Instances

7.1 auths

Configuration of auth instances

Key: name (Name of the auth instance)

7.1.1 Parameters

- **affinity:** Kubernetes pod affinity
- **antiAffinityPreset:** Pod anti affinity preset (Accepted values: *preferred* or *required*)
- **hostNetwork:** Use host networking for auth pods
- **nodeSelector:** Kubernetes pod nodeSelector
- **replicas:** Default number of replicas in a auth deployment (default: 2)
- **revisionHistoryLimit:** Default 'revisionHistoryLimit' for auth deployments (default: 0)

7.1.2 Parameter Sets

- **api** (Configuration of access to the auth API endpoint)
 - **ingress:** Ingress object to expose the auth API endpoint via an ingress managed by an ingress controller (For formatting example, see the *Exposing auth API* chapter)
 - **service:** Service object to expose the auth API endpoint (For formatting example, see the *Exposing dnsdist* chapter, which covers the *service* format to add ClusterIP, NodePort or LoadBalancer services)
- **dnsdist** (Settings to be applied to each auth instance when added to dnsdist as a server)
 - **addXPF:** Add the client's IP address and port to the query, along with the original destination address and port. Default is disabled (0)
 - **checkClass:** Number to use as QCLASS in the health-check query, default is DNSClass.IN
 - **checkInterval:** The time in seconds between health checks
 - **checkName:** String to use as QNAME in the health-check query, default is "a.root-servers.net."
 - **checkTimeout:** The timeout (in milliseconds) of a health-check query, default to 1000 (1s)

- **checkType**: String to use as QTYPE in the health-check query, default is "A"
 - **disableZeroScope**: Disable the EDNS Client Subnet 'zero scope' feature, which does a cache lookup for an answer valid for all subnets (ECS scope of 0) before adding ECS information to the query and doing the regular lookup. This requires the *parseECS* option of the corresponding cache to be set to true
 - **maxCheckFailures**: Allow this amount of check failures before declaring the back-end down, default is 1
 - **mustResolve**: Set to true when the health check MUST return a RCODE different from NXDomain, ServFail and Refused. Default is false, meaning that every RCODE except ServFail is considered valid
 - **order**: The order of servers in this set, used by the *leastOutstanding* and *firstAvailable* policies
 - **qps**: Limit the number of queries per second to this amount, when using the *firstAvailable* policy
 - **reconnectOnUp**: Close and reopen the sockets when a server transits from Down to Up. This helps when an interface is missing when dnssdist is started. Default is false
 - **retries**: The number of TCP connection attempts to servers in this set, for a given query
 - **rise**: Require NUM consecutive successful checks before declaring the backend up, default is 1
 - **setCD**: Set the CD (Checking Disabled) flag in the health-check query, default is false
 - **sockets**: Number of sockets (and thus source ports) used toward the backend server, defaults to 1
 - **tcpConnectTimeout**: The timeout (in seconds) of a TCP connection attempt
 - **tcpFastOpen**: Whether to enable TCP Fast Open
 - **tcpRecvTimeout**: The timeout (in seconds) of a TCP read attempt
 - **tcpSendTimeout**: The timeout (in seconds) of a TCP write attempt
 - **useClientSubnet**: Add the client's IP address in the EDNS Client Subnet option when forwarding the query to this backend
 - **useProxyProtocol**: Add a proxy protocol header to the query, passing along the client's IP address and port along with the original destination address and port. Default is false
 - **weight**: The weight of servers in this set, used by the *wrandom*, *whashed* and *chashed* policies, default is 1
- **config** (Auth configuration, any configuration item listed in the auth documentation (<https://doc.powerdns.com/authoritative/settings.html>) can be referenced here. Settings which are explicitly ignored due to conflicts with Cloud Control are filtered by 'web-server*', 'local*', 'disable-syslog', 'daemon', 'chroot', 'socket*', 'config*', 'primary', 'secondary' and 'autosecondary')
 - **hpa** (Horizontal Pod Autoscaler - see helm values 'auth.hpa' for examples)

- **enabled:** Enable or disable the HPA (default: *false*)
- **minReplicas:** Minimum # of replicas (default: 2)
- **maxReplicas:** Maximum # of replicas (default: 4)
- **metrics:** Metric(s) upon which to make decisions regarding scaling. Must be an array of MetricSpec (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#metricspec-v2beta2-autoscaling>). Examples are in the helm values.
- **behavior:** Behavior of the HPA, must be instance of HorizontalPodAutoscalerBehavior (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#horizontalpodautoscalerspec-v2beta2-autoscaling>).
- **postgres** (Settings to be applied to each postgres cluster/database when an auth deployment requests a postgres operator-managed database)
 - **parameters.max_connections:** Max connections parameter (default: 128)
 - **storage.size:** Size of the volume to request for each Postgres pod (default: 5Gi)
 - **storage.storageClassName:** Name of the Storage Class for the volumes in which Postgres data will be stored (default: unset, which means the Kubernetes cluster's default storage class)
 - **resources.limits.cpu:** Limit amount of CPU (default: 250m)
 - **resources.limits.memory:** Limit amount of memory (default: 256Mi)
 - **resources.requests.cpu:** Request amount of CPU (default: 500m)
 - **resources.requests.memory:** Request amount of memory (default: 512m)
 - **nodeAffinity:** Kubernetes node affinity (Note: Only configures the subset *nodeAffinity* of the parent *affinity*. See <https://kubernetes.io/docs/concepts/scheduling-eviction/assign-pod-node/#node-affinity>)
- **resources** (auth resource allocation defaults)
 - **limits** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)

7.1.3 Backends

When deploying Auth as part of CloudControl there are several backends you can choose (and combine, multiple backends is supported):

- **Postgres:** This backend allows storing zones in a Postgres database, either pre-existing on your cluster or created at runtime using a Postgres Operator.
- **GeoIP:** This backend allows visitors to be sent to a server closer to them, with no appreciable delay, as would otherwise be incurred with a protocol level redirect.
- **LightningStream:** This backend allows synchronisation of multiple instances via an s3 bucket. This can be done within a single datacenter or spread over multiple datacenters.

7.1.3.1 Postgres (pre-existing)

If you have an existing Postgres database available, you can configure a backend to utilize it. Configuring a pre-existing Postgres database can be done via the following configuration:

Format:

```
backends:  
- type: postgres  
  host: host-of-postgres-cluster  
  dbname: auth  
  user: some_user  
  password: some_user_password
```

Available parameters:

- type - Must be set to *postgres*
- host - Host of the Postgres cluster/service
- port - Port over which to access the Postgres database (Optional, default: 5432)
- dbname - Name of the database
- user - User with which to connect
- password - Password for *user*
- sslmode - Postgres *sslmode* to use while connecting (Optional, omitted if no value is provided)
- dnssec - Whether or not to enable DNSSEC processing for this backend (Optional, default: *false*)

7.1.3.2 Postgres (Operator-managed)

If you have deployed the postgres-operator chart to your Kubernetes cluster, you can configure a backend to use a operator-managed Postgres database. Configuring such a Postgres database can be done via the following configuration:

Format:

```
backends:  
- type: postgres  
  operator: true
```

Available parameters:

- type – Must be set to *postgres*
- operator - Must be set to *true*

The Postgres database which is created utilizes the default values which are exposed via the helm values in *auth.postgres*.

7.1.3.3 GeoIP

Configuring a GeoIP backend requires configuring the following options:

Format:

```
backends:  
- type: geoip  
  databases: <Configuration of one or more GeoIP databases>  
  domains: <Configuration of domains>
```

Configuring *domains*: Please refer to the OX PowerDNS Authoritative Server documentation at <https://doc.powerdns.com/authoritative/backends/geoip.html#keys-explained>

Configuring *databases*:

The databases used by the GeoIP backend are MMDB files, which allows you to use databases from several sources:

- MaxMind – A provider of GeoIP databases
- Custom - A database built by the Auth init container based on data you provide in the Helm configuration values

7.1.3.4 GeoIP - MaxMind Database

Configuring a GeoIP backend using a MaxMind database can be done via 2 methods:

- HTTP - Download the database using HTTP
- OCI - Download the database from an OCI-enabled registry, using the ORAS Client

7.1.3.5 GeoIP - MaxMind Database - HTTP

Format:

```
databases:
- name: MyDatabase
  type: http
  url: https://my_host/folder/my-database.mmdb
  insecure: false
  headers:
    <List of additional headers to be passed>
  params:
    <List of additional parameters to be passed, these must be valid Curl parameters>
```

Explanation of each parameter:

- name - Required, must be unique for this backend
- type - Required, must be *http* to force a MaxMind HTTP download
- url - Required, full address of the database to be downloaded
- insecure - Optional, set to *true* if you need to download the database from an HTTPS URL without valid certificates
- headers - Dict of *key: value* pairs, where *key* is the header name and *value* is the value of the header
- params - Dict of *key: value* pairs, where *key* is the name of the Curl parameter and *value* is the value of the parameter

Minimal required configuration for downloading a MaxMind database using HTTP(S):

```
databases:
- name: MyDatabase
  type: http
  url: https://some_host/my-database.mmdb
```

Example using headers & params:

```
databases:
- name: MyDatabase
  type: http
  url: https://some_host/my-database.mmdb
  headers:
    Authorization: Basic bXl1sfdc2Vy0m15cGFzetbcvbc3sdfdvcmQ=
  params:
    proxy: "http://my_user:my_password@some_proxy:8080"
```

Above example will send a Basic auth header & attempt to connect via the proxy *some_proxy:8080*

7.1.3.6 GeolIP - MaxMind Database - OCI

Format:

```
databases:
- name: MyOCIDB
  type: oci
  artifact: my_registry/repository/geo-city-mmdb:v2.4.0
  user: MyUser
  token: MyPassword
```

Explanation of each parameter:

- name - Required, must be unique for this backend
- type - Required, must be *oci* to force a MaxMind OCI download
- artifact - Required, full address of the database to be downloaded
- user - Required, User with which to connect to the registry
- token - Required, Token/Password for *user*

7.1.3.7 GeolIP - Custom Database

Configuring a GeolIP backend using a custom database can be done via the following configuration:

```
databases:
- name: localdb
  type: generate
  datacenters:
    <List of datacenters - see below>
```

Explanation of each parameter:

- name - Required, must be unique for this backend
- type - Required, must be *generate* to force a custom database to be generated
- datacenters - Required, must be populated according to the below format

Example datacenter configuration:

```
- name: Amsterdam
  networks:
    - 10.0.1.0/24
    - 10.0.2.0/24
    - 10.0.3.0/24
    - 10.0.4.0/24
    - 10.0.5.0/24
    - 10.0.6.0/24
  lat: 52.370216
  long: 4.895168
```

Explanation of each parameter:

- name - Required, must be unique for this datacenter

- networks - Required, list of networks to be assigned to this datacenter
- lat - Required, longitude of this datacenter
- long - Required, latitude of this datacenter

The latitude & longitude are used to calculate distances between datacenters, which is how the GeoIP backend determines the closest available recipient of traffic. There are many tools available online to obtain the latitude & longitude of locations.

The following example simulates a setup where we have 2 datacenters, in Amsterdam & Rotterdam:

```
databases:
- name: localdb
  type: generate
  datacenters:
  - name: Amsterdam
    networks:
    - 10.0.1.0/24
    - 10.0.2.0/24
    - 10.0.3.0/24
    - 10.0.4.0/24
    - 10.0.5.0/24
    - 10.0.6.0/24
    lat: 52.370216
    long: 4.895168
  - name: Rotterdam
    networks:
    - 10.1.1.0/24
    - 10.1.2.0/24
    - 10.1.3.0/24
    - 10.1.4.0/24
    - 10.1.5.0/24
    - 10.1.6.0/24
    lat: 51.924419
    long: 4.477733
```

7.1.3.8 LightningStream

Configuration of a LightningStream backend primarily requires supplying the details required to connect to a shared s3 bucket.

Notes: * Account used to access the s3 bucket must have privileges to read, write & list * All auth instances that have the same s3 bucket configured will contain the same zones & records. You cannot share the same s3 bucket amongst auth instances which you intend to have different data.

The format to configure a LightningStream backend:

Format:

```
backends:
- type: ls
  access_key: MY_ACCESS_KEY
  secret_key: MY_SECRET_KEY
```

(continues on next page)

(continued from previous page)

```
bucket: mybucket
endpoint: https://my.s3.endpoint
```

Explanation of each parameter:

- **type** - Required, must be *Is* to force a LightningStream backend
- **access_key** - Required, access key to authenticate with the endpoint
- **secret_key** - Required, secret key to authenticate with the endpoint
- **bucket** - Required, name of the s3 bucket
- **endpoint** - Required, URL to access the s3 service
- **region** - Optional, set this to the region associated with your s3 bucket, if your s3 service requires this
- **loglevel** - Optional, defaults to *info*. Available options: *debug, info, warning, error, fatal*

7.2 dnssdists

Configuration of dnssdist instances

Key: name (Name of the dnssdist instance)

7.2.1 Parameters

- **aclAdd:** Netmasks allowed to access dnssdist, in addition to the loopback, RFC1918 and other local addresses. Overrides a AllowAll setting (if configured) on the global dnssdist defaults.
- **aclAllowAll:** Allow all inbound traffic to dnssdist, regardless of source IP.
- **affinity:** Kubernetes pod affinity
- **antiAffinityPreset:** Pod anti affinity preset (Accepted values: *preferred* or *required*)
- **do53Locals:** Default amount of Do53 listen sockets per dnssdist pod (default: 1)
- **do53TcpFastOpenQueueSize:** Default size of the TCP Fast Open queue on Do53 listen sockets (Dnssdist default)
- **do53TcpListenQueueSize:** Default size of the listen queue on Do53 listen sockets (Dnssdist default)
- **hostNetwork:** Use host networking for dnssdist pods
- **nodeSelector:** Kubernetes pod nodeSelector
- **replicas:** Default number of replicas in a dnssdist deployment (default: 2)
- **revisionHistoryLimit:** Default 'revisionHistoryLimit' for dnssdist deployments (default: 0)
- **verbose:** Be verbose (default: *false*)

7.2.2 Parameter Sets

- **config** (Dnsdist Configuration)
 - **addEDNSToSelfGeneratedResponses**: Whether to add EDNS to self-generated responses, provided that the initial query had EDNS. (Dnsdist default)
 - **allowEmptyResponse**: Set to true (defaults to false) to allow empty responses (qd-count=0) with a NoError or NXDomain rcode (default) from backends. dnsdist drops these responses by default because it can't match them against the initial query since they don't contain the qname, qtype and qclass, and therefore the risk of collision is much higher than with regular responses. (Dnsdist default)
 - **consistentHashingBalancingFactor**: Maximum imbalance between the number of outstanding queries intended for a given server, based on its weight, and the actual number, when using the chashed consistent hashing load-balancing policy. Default is 0, which disables the bounded-load algorithm. (Dnsdist default)
 - **payloadSizeOnSelfGeneratedAnswers**: Set the UDP payload size advertised via EDNS on self-generated responses. In accordance with RFC 6891, values lower than 512 will be treated as equal to 512. (Dnsdist default)
 - **roundRobinFailOnNoServer**: By default the roundrobin load-balancing policy will still try to select a backend even if all backends are currently down. Setting this to true will make the policy fail and return that no server is available instead. (Dnsdist default)
 - **servFailWhenNoServer**: If set, return a ServFail when no servers are available, instead of the default behaviour of dropping the query. (Dnsdist default)
 - **verboseHealthChecks**: Set whether health check errors should be logged. This is turned off by default. (Dnsdist default)
 - **weightedBalancingFactor**: Maximum imbalance between the number of outstanding queries intended for a given server, based on its weight, and the actual number, when using the whashed or wrandom load-balancing policy. Default is 0, which disables the bounded-load algorithm. (Dnsdist default)
- **ecs** (dnsdist ECS functions)
 - **setECSSetOverride**: Whether to override an existing EDNS Client Subnet option present in the query (only effective when the backend server has annotation useClientSubnet = true). (Dnsdist default)
 - **setECSSourcePrefixV4**: Truncate the requestors IPv4 address to this length, in bits (only effective when the backend server has annotation useClientSubnet = true). (Dnsdist default)
 - **setECSSourcePrefixV6**: Truncate the requestors IPv6 address to this length, in bits (only effective when the backend server has annotation useClientSubnet = true). (Dnsdist default)
- **hpa** (Horizontal Pod Autoscaler - see helm values 'dnsdist.hpa' for examples)
 - **enabled**: Enable or disable the HPA (default: *false*)
 - **minReplicas**: Minimum # of replicas (default: 2)
 - **maxReplicas**: Maximum # of replicas (default: 4)

- **metrics:** Metric(s) upon which to make decisions regarding scaling. Must be an array of MetricSpec (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#metricspec-v2beta2-autoscaling>). Examples are in the helm values.
- **behavior:** Behavior of the HPA, must be instance of HorizontalPodAutoscalerBehavior (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#horizontalpodautoscalerspec-v2beta2-autoscaling>).
- **readiness** (Readiness probe Configuration)
 - **disabled:** Whether or not to instruct Kubernetes to poll the agent for readiness state. (default: *false*)
 - **do53ProbeInterval:** How often (in seconds) the agent will judge the health state of dnsdist via tests against the Do53 listeners. (default: 2)
 - **do53QDomain:** Domain used in the query to judge whether the Do53 listeners of a dnsdist container are healthy and ready for traffic. (default: *a.root-servers.net*)
 - **do53QTimeout:** Number of seconds after which the query used to judge whether the Do53 listeners of a dnsdist container are healthy and ready for traffic time out. (default: 1)
 - **do53QType:** Type of query used to judge whether the Do53 listeners of a dnsdist container are healthy and ready for traffic. (default: A)
 - **failureThreshold:** When a probe fails, Kubernetes will try this many times before marking the container as Unready. Updates deployment, resulting in respawn of dnsdist pods (default: 2)
 - **initialDelaySeconds:** Number of seconds after the containers have started before readiness probes are initiated. Updates deployment, resulting in respawn of dnsdist pods. (default: 5)
 - **periodSeconds:** How often (in seconds) to perform the readiness probes. Updates deployment, resulting in respawn of dnsdist pods (default: 2)
 - **stateProbeInterval:** How often (in seconds) the agent will judge the health state of the dnsdist agent. (default: 2)
 - **successThreshold:** Minimum consecutive successful probes before a container is marked Ready. Updates deployment, resulting in respawn of dnsdist pods (default: 2)
 - **timeoutSeconds:** Number of seconds after which the readiness probes time out. Updates deployment, resulting in respawn of dnsdist pods (default: 1)
- **resources** (dnsdist resource allocation defaults)
 - **limits** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)

- **ringBuffers** (Ringbuffer configuration)
 - **retries**: Number of shards to attempt to lock without blocking before giving up and simply blocking while waiting for the next shard to be available. Defaults to 5 if there is more than 1 shard, else it defaults to 0. (Dnsdist default)
 - **shards**: Number of shards to use to limit lock contention, defaults to 1. (Dnsdist default)
 - **size**: Maximum amount of queries to keep in the ringbuffer, defaults to 10000. (Dnsdist default)
- **securityPolling** (Security polling configuration)
 - **securityPollInterval**: Interval between security pollings, in seconds. Defaults to 3600. (Dnsdist default)
 - **securityPollSuffix**: Domain name from which to query security update notifications. Setting this to an empty string disables secpoll. (Dnsdist default)
- **service** (Configuration of the Kubernetes service object **Note**: See the section 'Exposing dnsdist' for more details and examples on how to configure this)
 - **type**: Type of service (One of NodePort, ClusterIP, LoadBalancer). Defaults to ClusterIP
 - **annotations**: List of annotations to add to the Service
 - **loadBalancerIP**: For a Service of type LoadBalancer, a loadbalancer IP can be requested here. If left empty/undefined, this will be assigned by your LoadBalancer provider
 - **ports**: A dictionary of ports you want to have exposed via the Service
- **tuning** (dnsdist tuning functions)
 - **setCacheCleaningDelay**: Interval in seconds between two runs of the cache cleaning algorithm, removing expired entries. (Dnsdist default)
 - **setCacheCleaningPercentage**: Percentage of the cache that the cache cleaning algorithm will try to free by removing expired entries. By default (100), all expired entries are removed. (Dnsdist default)
 - **setMaxTCPClientThreads**: Maximum amount of TCP client threads, handling TCP connections. By default this value is 10, unless more than 10 TCP listen sockets have been defined. (Dnsdist default)
 - **setMaxTCPConnectionDuration**: Maximum duration of an incoming TCP connection, in seconds. 0 (the default) means unlimited. (Dnsdist default)
 - **setMaxTCPConnectionsPerClient**: Maximum number of TCP connections per client. 0 (the default) means unlimited. (Dnsdist default)
 - **setMaxTCPQueriesPerConnection**: Maximum number of queries in an incoming TCP connection. 0 (the default) means unlimited. (Dnsdist default)
 - **setMaxTCPQueuedConnections**: Maximum number of TCP connections queued (waiting to be picked up by a client thread), defaults to 1000. 0 means unlimited. (Dnsdist default)

- **setMaxUDPOutstanding:** Maximum number of outstanding UDP queries to a given backend server, defaults to 65535. (Dnsdist default)
- **setStaleCacheEntriesTTL:** TTL for expired cache entries to be eligible as answer when no backends are available for a query, in seconds. (Dnsdist default)
- **setTCPRecvTimeout:** Read timeout on TCP connections from the client, in seconds. (Dnsdist default)
- **setTCPSendTimeout:** Write timeout on TCP connections from the client, in seconds. (Dnsdist default)
- **setUDPTimeout:** Maximum time dnsdist will wait for a response from a backend over UDP, in seconds. Defaults to 2. (Dnsdist default)

7.2.3 Server Pools

pools (Configuration of pools)

Key: name (Name of the pool)

- **ecs:** Set to true if dnsdist should add EDNS Client Subnet information to the query before looking up into the cache, when all servers from this pool are down. If at least one server is up, the preference of the selected server is used, this parameter is only useful if all the backends in this pool are down and have EDNS Client Subnet enabled, since the queries in the cache will have been inserted with ECS information. Default is false. (Dnsdist default)
- **serverGroups:** List of [Name] of recursor & resolver instances whose endpoints will be member of this pool (Dnsdist default)
- **serverPolicy:** Policy for dnsdist to use to select the server in this pool to send a query to. Supported policies are 'leastOutstanding', 'firstAvailable', 'wrandom', 'whashed', 'chashed' & 'roundrobin' (Dnsdist default)
- **packetcache** (Configurable cache that holds responses from prior requests served by the pool)
 - **cookieHashing:** Whether EDNS Cookie values will be hashed, resulting in separate entries for different cookies in the packet cache. This is required if the backend is sending answers with EDNS Cookies, otherwise a client might receive an answer with the wrong cookie. (Dnsdist default)
 - **deferrableInsertLock:** Whether the cache should give up insertion if the lock is held by another thread, or simply wait to get the lock. (Dnsdist default)
 - **keepStaleData:** Whether to suspend the removal of expired entries from the cache when there is no backend available in at least one of the pools using this cache. (Dnsdist default)
 - **maxEntries:** Max (Dnsdist default)
 - **maxNegativeTTL:** Cache a NXDomain or NoData answer from the backend for at most this amount of seconds, even if the TTL of the SOA record is higher. (Dnsdist default)
 - **maxTTL:** Cap the TTL for records to his number. (Dnsdist default)
 - **minTTL:** Do not cache entries with a TTL lower than this. (Dnsdist default)

- **numberOfShards**: Number of shards to divide the cache into, to reduce lock contention. (Dnsdist default)
- **parseECS**: Whether any EDNS Client Subnet option present in the query should be extracted and stored to be able to detect hash collisions involving queries with the same qname, qtype and qclass but a different incoming ECS value. (Dnsdist default)
- **staleTTL**: When the backend servers are not reachable, and global configuration set-StaleCacheEntriesTTL is set appropriately, TTL that will be used when a stale cache entry is returned. (Dnsdist default)
- **temporaryFailureTTL**: On a SERVFAIL or REFUSED from the backend, cache for this amount of seconds. (Dnsdist default)

7.3 recursors

Configuration of recursor instances

Key: name (Name of the recursor instance)

7.3.1 Parameters

- **affinity**: Kubernetes pod affinity
- **antiAffinityPreset**: Pod anti affinity preset (Accepted values: *preferred* or *required*)
- **hostNetwork**: Use host networking for recursor pods
- **nodeSelector**: Kubernetes pod nodeSelector
- **replicas**: Default number of replicas in a recursor deployment (default: 2)
- **revisionHistoryLimit**: Default 'revisionHistoryLimit' for recursor deployments (default: 0)

7.3.2 Parameter Sets

- **dnsdist** (Settings to be applied to each recursor instance when added to dnsdist as a server)
 - **addXPF**: Add the client's IP address and port to the query, along with the original destination address and port. Default is disabled (0)
 - **checkClass**: Number to use as QCLASS in the health-check query, default is DNSClass.IN
 - **checkInterval**: The time in seconds between health checks
 - **checkName**: String to use as QNAME in the health-check query, default is "a.root-servers.net."
 - **checkTimeout**: The timeout (in milliseconds) of a health-check query, default to 1000 (1s)
 - **checkType**: String to use as QTYPE in the health-check query, default is "A"

- **disableZeroScope:** Disable the EDNS Client Subnet 'zero scope' feature, which does a cache lookup for an answer valid for all subnets (ECS scope of 0) before adding ECS information to the query and doing the regular lookup. This requires the *parseECS* option of the corresponding cache to be set to true
- **maxCheckFailures:** Allow this amount of check failures before declaring the backend down, default is 1
- **mustResolve:** Set to true when the health check MUST return a RCODE different from NXDomain, ServFail and Refused. Default is false, meaning that every RCODE except ServFail is considered valid
- **order:** The order of servers in this set, used by the *leastOutstanding* and *firstAvailable* policies
- **qps:** Limit the number of queries per second to this amount, when using the *firstAvailable* policy
- **reconnectOnUp:** Close and reopen the sockets when a server transits from Down to Up. This helps when an interface is missing when dnsmgr is started. Default is false
- **retries:** The number of TCP connection attempts to servers in this set, for a given query
- **rise:** Require NUM consecutive successful checks before declaring the backend up, default is 1
- **setCD:** Set the CD (Checking Disabled) flag in the health-check query, default is false
- **sockets:** Number of sockets (and thus source ports) used toward the backend server, defaults to 1
- **tcpConnectTimeout:** The timeout (in seconds) of a TCP connection attempt
- **tcpFastOpen:** Whether to enable TCP Fast Open
- **tcpRecvTimeout:** The timeout (in seconds) of a TCP read attempt
- **tcpSendTimeout:** The timeout (in seconds) of a TCP write attempt
- **useClientSubnet:** Add the client's IP address in the EDNS Client Subnet option when forwarding the query to this backend
- **useProxyProtocol:** Add a proxy protocol header to the query, passing along the client's IP address and port along with the original destination address and port. Default is false
- **weight:** The weight of servers in this set, used by the *wrandom*, *whashed* and *chashed* policies, default is 1
- **config** (Recursor configuration, any configuration item listed in the recursor documentation (<https://doc.powerdns.com/recursor/settings.html>) can be referenced here. Settings which are explicitly ignored due to conflicts with Cloud Control are filtered by 'web-server*', 'local*', 'disable-syslog', 'daemon', 'cpu-map', 'chroot', 'socket*' and 'config*')
- **hpa** (Horizontal Pod Autoscaler - see helm values 'recursor.hpa' for examples)
 - **enabled:** Enable or disable the HPA (default: *false*)
 - **minReplicas:** Minimum # of replicas (default: 2)

- **maxReplicas:** Maximum # of replicas (default: 4)
- **metrics:** Metric(s) upon which to make decisions regarding scaling. Must be an array of MetricSpec (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#metricspec-v2beta2-autoscaling>). Examples are in the helm values.
- **behavior:** Behavior of the HPA, must be instance of HorizontalPodAutoscalerBehavior (<https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.22/#horizontalpodautoscalerspec-v2beta2-autoscaling>).
- **resources** (recursor resource allocation defaults)
 - **limits** (Limit amounts)
 - * **cpu:** Limit amount of CPU (Kubernetes default)
 - * **memory:** Limit amount of memory (Kubernetes default)
 - **requests** (Request amounts)
 - * **cpu:** Request amount of CPU (Kubernetes default)
 - * **memory:** Request amount of memory (Kubernetes default)

7.4 resolvers

Configuration of external resolvers

Key: name (Name of the resolver instance)

7.4.1 Parameters

- **ips:** List of IP addresses of resolver endpoints
- **port:** Port to send traffic to for resolver endpoints

7.4.2 Parameter Sets

- **dnsdist** (Settings to be applied to each resolver instance when added to dnsdist as a server)
 - **addXPF:** Add the client's IP address and port to the query, along with the original destination address and port. Default is disabled (0)
 - **checkClass:** Number to use as QCLASS in the health-check query, default is DNSClass.IN
 - **checkInterval:** The time in seconds between health checks
 - **checkName:** String to use as QNAME in the health-check query, default is "a.root-servers.net."
 - **checkTimeout:** The timeout (in milliseconds) of a health-check query, default to 1000 (1s)
 - **checkType:** String to use as QTYPE in the health-check query, default is "A"

- **disableZeroScope:** Disable the EDNS Client Subnet 'zero scope' feature, which does a cache lookup for an answer valid for all subnets (ECS scope of 0) before adding ECS information to the query and doing the regular lookup. This requires the *parseECS* option of the corresponding cache to be set to true
- **maxCheckFailures:** Allow this amount of check failures before declaring the backend down, default is 1
- **mustResolve:** Set to true when the health check MUST return a RCODE different from NXDomain, ServFail and Refused. Default is false, meaning that every RCODE except ServFail is considered valid
- **order:** The order of servers in this set, used by the *leastOutstanding* and *firstAvailable* policies
- **qps:** Limit the number of queries per second to this amount, when using the *firstAvailable* policy
- **reconnectOnUp:** Close and reopen the sockets when a server transits from Down to Up. This helps when an interface is missing when dnsmgr is started. Default is false
- **retries:** The number of TCP connection attempts to servers in this set, for a given query
- **rise:** Require NUM consecutive successful checks before declaring the backend up, default is 1
- **setCD:** Set the CD (Checking Disabled) flag in the health-check query, default is false
- **sockets:** Number of sockets (and thus source ports) used toward the backend server, defaults to 1
- **tcpConnectTimeout:** The timeout (in seconds) of a TCP connection attempt
- **tcpFastOpen:** Whether to enable TCP Fast Open
- **tcpRecvTimeout:** The timeout (in seconds) of a TCP read attempt
- **tcpSendTimeout:** The timeout (in seconds) of a TCP write attempt
- **useClientSubnet:** Add the client's IP address in the EDNS Client Subnet option when forwarding the query to this backend
- **useProxyProtocol:** Add a proxy protocol header to the query, passing along the client's IP address and port along with the original destination address and port. Default is false
- **weight:** The weight of servers in this set, used by the *wrandom*, *whashed* and *chashed* policies, default is 1

7.5 rulesets

Rulesets allow for the configuration of dnsmdist Packet Policies. For a detailed example of how to use these rulesets, please refer to the *Getting Started* chapter in the *Overview* guide.

A basic ruleset looks as follows:

```
rulesets:
  tcp-refusal-ruleset:
    group: block-traffic
    type: DNSDistRule
    priority: 100
    rules:
      - name: Refuse TCP
        combinator: AND
        selectors:
          - TCP: true
          - QName: "tcptrue.example.com"
        action:
          RCode:
            rcode: "REFUSED"
```

Where 'tcp-refusal-ruleset' is the name of the ruleset, which will be used to create a uniquely named object. Under this name, the ruleset is defined, using the following values:

- **group:** The value of this parameter can be referenced in a dnsmdist configuration to apply the rules from this ruleset to that instance
- **type:** Type of ruleset, currently limited to 'DNSDistRule'
- **priority:** Priority of this ruleset. If multiple are assigned to a dnsmdist instance, it will process the rule with the lowest 'priority' value first.
- **rules:** An array of rules to be applied to this ruleset (see below for more details on rules)

7.5.1 Rules

Rules are configurable via 4 different parameters:

- **name:** Name of the rule
- **combinator:** One of 'AND', 'OR' or 'NOT'
- **selectors:** List of filters on which to apply the logic of the combinator
- **action:** Action to apply to the traffic selected by the above selectors

As a result, a single rule will look as follows:

```
name: Refuse TCP
combinator: AND
selectors:
  - TCP: true
  - QName: "tcptrue.example.com"
action:
  RCode:
    rcode: "REFUSED"
```

7.5.2 Combinators

The available combinators function as follows:

- **AND:** If all selectors match, the action will be applied
- **OR:** If any of the selectors match, the action will be applied
- **NOT:** If the selector does not match, the action will be applied (Only 1 selector is allowed when using a NOT combinator)

7.5.3 Selectors

The following selectors are available:

7.5.3.1 TCP

Format:

```
TCP: true
```

If 'true', this will select queries received over TCP. If 'false' it will select non-TCP traffic (ie: UDP)

7.5.3.2 MaxQPS

Format:

```
MaxQPS:  
qps: 50
```

Matches traffic not exceeding this qps limit. If e.g. this is set to 50, starting at the 51st query of the current second traffic stops being matched. This can be used to enforce a global QPS limit.

7.5.3.3 MaxQPSIP

Format:

```
MaxQPSIP:  
qps: 20  
v4Mask: 32  
v6Mask: 64  
burst: 20  
expiration: 300  
cleanupDelay: 60  
scanFraction: 10
```

Explanation of each parameter:

- qps (int) – The number of queries per second allowed, above this number traffic is matched
- v4Mask (int) – The IPv4 netmask to match on. Default is 32 (the whole address)
- v6Mask (int) – The IPv6 netmask to match on. Default is 64

- burst (int) – The number of burstable queries per second allowed. Default is same as qps
- expiration (int) – How long to keep netmask or IP addresses after they have last been seen, in seconds. Default is 300
- cleanupDelay (int) – The number of seconds between two cleanups. Default is 60
- scanFraction (int) – The maximum fraction of the store to scan for expired entries, for example 5 would scan at most 20% of it. Default is 10 so 10%

Since most of the parameters have defaults, you can define a basic MaxQPSIP selector as follows:

```
MaxQPSIP:  
  qps: 20
```

7.5.3.4 NetmaskGroup

Format:

```
NetmaskGroup:  
  nmg:  
  - "192.0.2.0/28"  
  - "2001:db8:1234::/64"  
  src: true  
  quiet: false
```

Explanation of each parameter:

- nmg (NetMaskGroup) – The NetMaskGroups to match on
- src (bool) – Whether to match source or destination address of the packet. Defaults to true (matches source)
- quiet (bool) – Do not display the list of matched netmasks in Rules. Default is false.

Since most of the parameters have defaults, you can define a basic NetmaskGroup selector as follows:

```
NetmaskGroup:  
  nmg:  
  - "192.0.2.0/28"  
  - "2001:db8:1234::/64"
```

7.5.3.5 Opcode

Format:

```
Opcode: "Notify"
```

This selector matches queries with the specified opcode exactly. An example usecase for this selector is to route zone update notification queries to secondary Auth instances, ie:

```
name: authnotify
combinator: AND
selectors:
  - Opcode: "Notify"
action:
  Pool:
    poolname: "auth"
```

7.5.3.6 QName

Format:

```
QName: "host.example.com"
```

This selector matches queries with the specified qname exactly.

7.5.3.7 QType

Format:

```
QType: "SOA"
```

This selector matches queries with the specified qtype exactly. An example usecase for this selector is to route zone transfer related queries to Auth instances, ie:

```
name: authxfr
combinator: OR
selectors:
  - QType: "SOA"
  - QType: "AXFR"
  - QType: "IXFR"
action:
  Pool:
    poolname: "auth"
```

7.5.4 Actions

The following actions are available:

7.5.4.1 Pool

Format:

```
Pool:
  poolname: "name-of-a-pool"
```

The Pool action will send the packet into the specified pool

7.5.4.2 QPS

Format:

```
QPS:  
maxqps: 10
```

Drop a packet if it does exceed the maxqps queries per second limits.

7.5.4.3 RCode

Format:

```
RCode:  
rcode: "REFUSED"
```

The RCode action will answer any selector queries with the rcode specified.

7.6 zonecontrols

Configuration of zonecontrol instances

Key: name (Name of the zonecontrol instance)

7.6.1 Parameters

- **affinity:** Kubernetes pod affinity
- **antiAffinityPreset:** Pod anti affinity preset (Accepted values: *preferred* or *required*)
- **hostNetwork:** Use host networking for zonecontrol pods
- **ingress:** Ingress object to expose the zonecontrol endpoint via an ingress managed by an ingress controller (For formatting example, see the *Exposing auth API* chapter)
- **nodeSelector:** Kubernetes pod nodeSelector
- **postgres:** Postgres database configuration (See: *Postgres Database* chapter below for details)
- **replicas:** Default number of replicas in a auth deployment (default: 2)
- **service:** Service object to expose the zonecontrol endpoint (For formatting example, see the *Exposing dnsmdist* chapter, which covers the *service* format to add ClusterIP, NodePort or LoadBalancer services)

7.6.2 Parameter Sets

- **authEndpoints** (Configuration of authoritative DNS server API endpoints)
 - **name**: Name of the endpoint (If there are multiple endpoints, the name of endpoints must be unique)
 - **url**: URL of the API endpoint (Including protocol, port)
 - **key**: API key to authenticate against the endpoint
- **resources** (zonecontrol resource allocation defaults)
 - **limits** (Limit amounts)
 - * **cpu**: Limit amount of CPU (Kubernetes default)
 - * **memory**: Limit amount of memory (Kubernetes default)
 - **requests** (Request amounts)
 - * **cpu**: Request amount of CPU (Kubernetes default)
 - * **memory**: Request amount of memory (Kubernetes default)

7.6.3 Postgres Database

ZoneControl requires a Postgres database to run. You can either specify the details of an existing database or have the bundled Postgres Operator create one. Both options are described in further detail below.

7.6.3.1 Postgres (pre-existing)

If you have an existing Postgres database available, you can configure a zonecontrol instance to utilize it. Configuring a pre-existing Postgres database can be done via the following configuration:

Format:

```
postgres:  
  host: host-of-postgres-cluster  
  dbname: auth  
  user: some_user  
  password: some_user_password
```

Available parameters:

- host - Host of the Postgres cluster/service
- port - Port over which to access the Postgres database (Optional, default: 5432)
- dbname - Name of the database
- user - User with which to connect
- password - Password for *user*
- sslmode - Postgres *sslmode* to use while connecting (Optional, omitted if no value is provided)

7.6.3.2 Postgres (Operator-managed)

If you have deployed the postgres-operator chart to your Kubernetes cluster, you can configure a zonecontrol instance to use an operator-managed Postgres database. Configuring such a Postgres database can be done via the following configuration:

Format:

```
postgres:  
  operator: true
```

Available parameters:

- operator - Must be set to *true*

The Postgres database which is created utilizes the default values which are exposed via the helm values in *zonecontrol.postgres*.

8 Prometheus

This section allows you to configure 2 forms of Prometheus scraping configurations:

- Via PodMonitor objects (if a Prometheus Operator) is available
- Via Prometheus scraping annotations on Pods

By default, all Pods will have the following annotations present for Prometheus scraping:

- `prometheus.io/scrape` = whether or not to scrape this endpoint (default: *true*)
- `prometheus.io/port` = the port to which the metrics endpoint listens (default: *8083*)
- `prometheus.io/path` = the path where the metrics endpoint serves metrics (default: */metrics*)

To disable this default behavior, you can set the value `prometheus.annotations` to *false* (default: *true*)

If you have a Prometheus Operator available or if you deployed the stack including the *Monitoring Operators* chart, you can set the value `prometheus.operator.available` to *true* (default: *false*). As a result PodMonitor objects will be created for each `dnsdist` & `recursor` instance, with all the necessary scraping details automatically included. These pods should then all be discovered automatically by the Prometheus Operator.