Whalebone admin guide

Release 3.2.1-12

Nov 20, 2020

Contents:

Whalebone is a service for security filtering of DNS traffic. It uses logic on top of own DNS resolvers. Such resolvers could be either cloud ones maintained directly by Whalebone, or on-premise software resolvers using cloud just for threat intelligence updates and reporting. For threat prevention Whalebone relies on external intelligence sources as well as on own methods. More information about the product and company is available on the official Whalebone website

CHAPTER 1

Deployment options

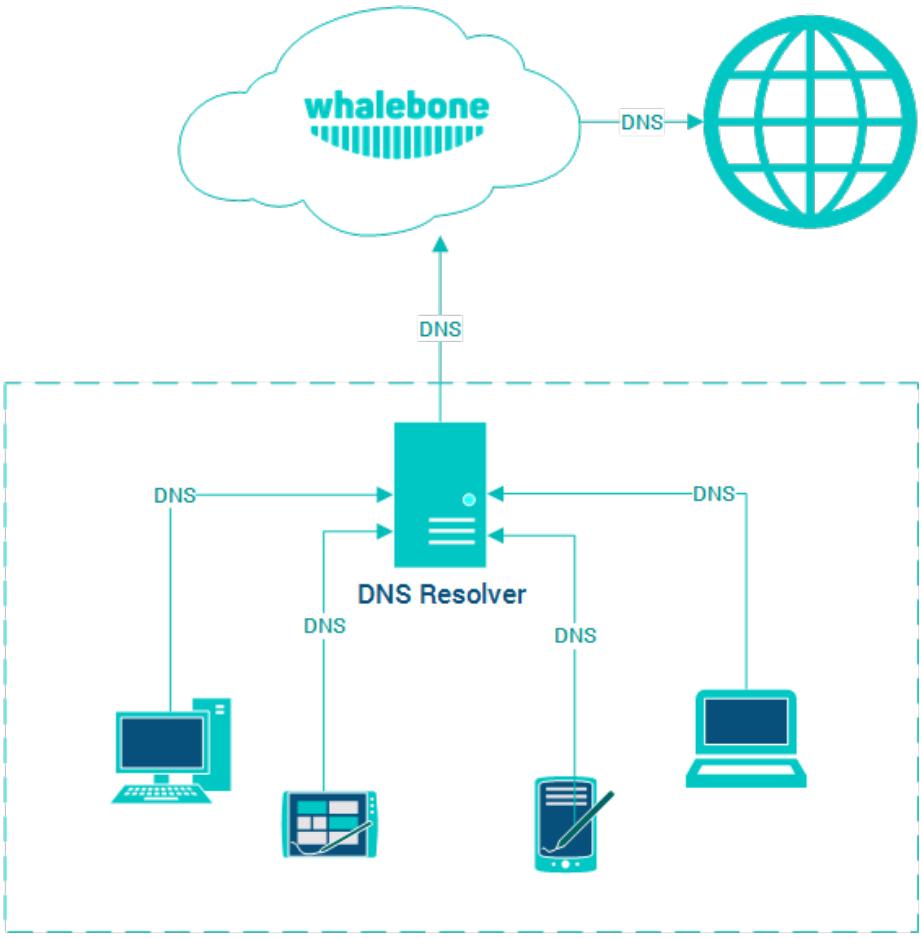
Whalebone could be deployed in several scenarios which can be even combined to satisfy requirements of particular networks. Combination of cloud and local DNS resolver with single management console will satisfy even complex and distributed networks.

Tip: All of the options below could be combined together. Various network segments and zones could have different requirements and possibilities.

Tip: Should you believe none of the scenarios below is applicable to your use case, please contact Whalebone and we will help you with architecture that will suite your needs.

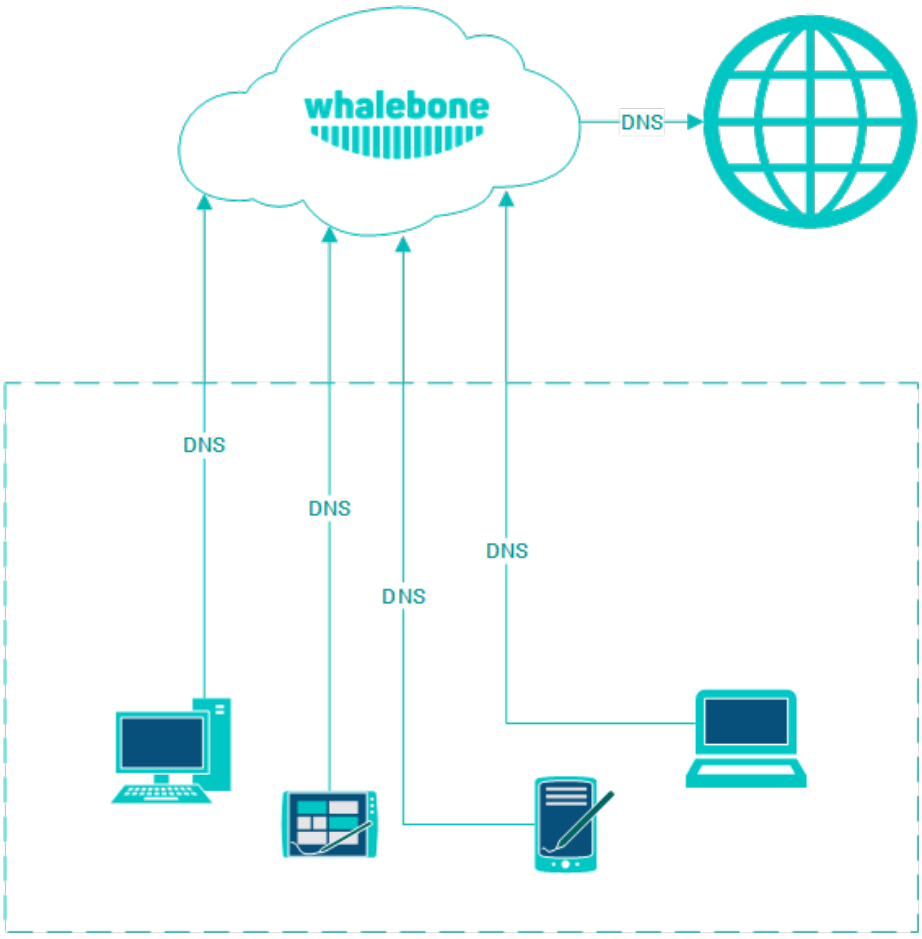
1.1 Cloud DNS

This is the simplest method o deployment. To use Whalebone filtering, just change the configuration of your recent DNS resolvers and point them to Whalebone cloud resolvers. The downside of this deployment is that all of the incidents will be visible with source IP of the DNS forwarder instead of the original source IP. Still this deployment could come in handy if the priority is to prevent the threats with as low effort and infrastructure changes as possible.



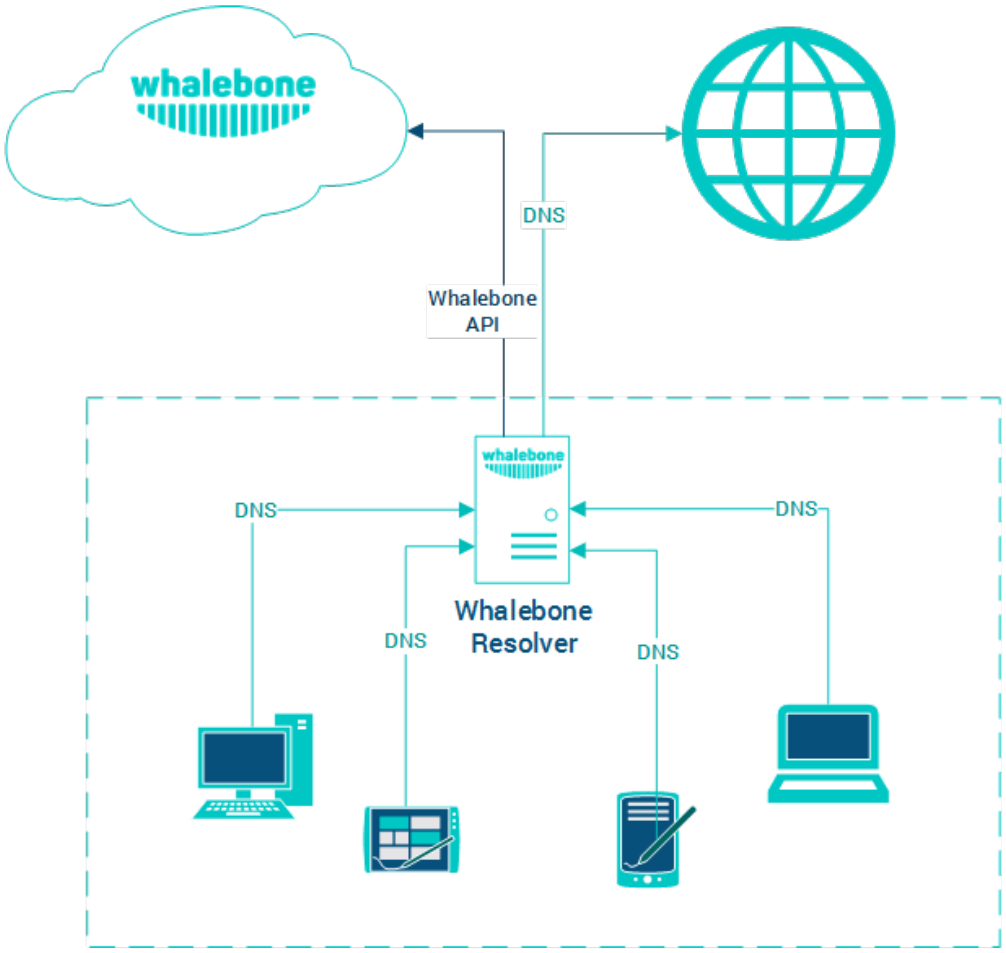
1.2 Cloud DNS (direct connection)

This deployment is similar to forwarding the requests to Whalebone cloud resolvers, but the requests are sent directly to the cloud without local DNS cache. This could be usually set for all endpoints through DHCP. However not using local DNS cache means increased latency introduced by the network communication between the client and cloud resolver. If the individual machines are not hidden behind a NAT, their IP addresses will be directly visible in the Whalebone reporting and the clients could be easilly distinguished.



1.3 Local resolver

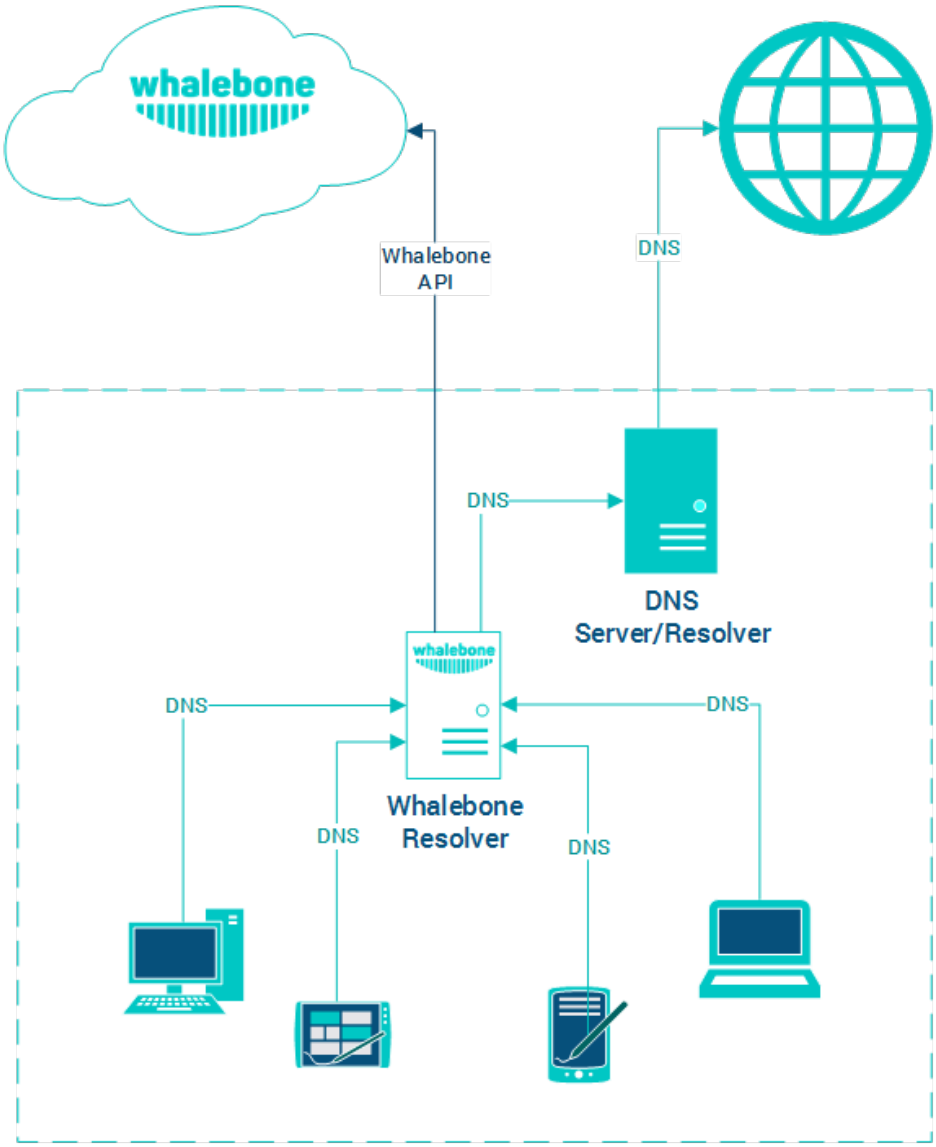
This deployment scenario uses local Whalebone resolver, that communicates with Whalebone cloud through API. The DNS resolution takes place directly on the resolver and is completely independent on the cloud availability. Should the resolver not be able to reach the cloud service, it won't be able to update the threat intelligence and to reports any incidents. The main advantage of this deployment is visibility into local network and individual IP addresses and native DNS resolver latency.



1.4 Local forwarder

Very similar deployment scenario as the local resolver, however Whalebone just forwards the requests to preconfigured resolvers. This scenario is very useful in case there are local DNS zones that has to be available for the clients (e.g. Active Directory) or cases when the recent resolver configuration is very specific and has to be preserved. This deployment has also lower hardware requirements, roughly half of the CPU and RAM recommended.

> **Warning:** We don't recommend to forward the requests to Whalebone cloud resolvers. Such configuration would result in duplicit incident detection, no added security and unnecesary latency for the clients.


whalebone
Whalebone
API
DNS
DNS
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Server/Resolver
whalebone
DNS
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Whalebone
Resolver
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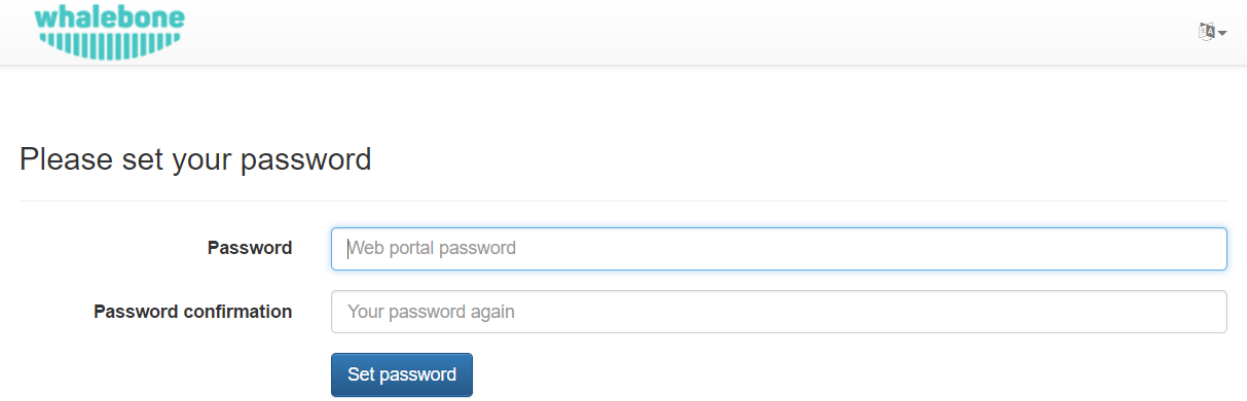
DNS

CHAPTER 2

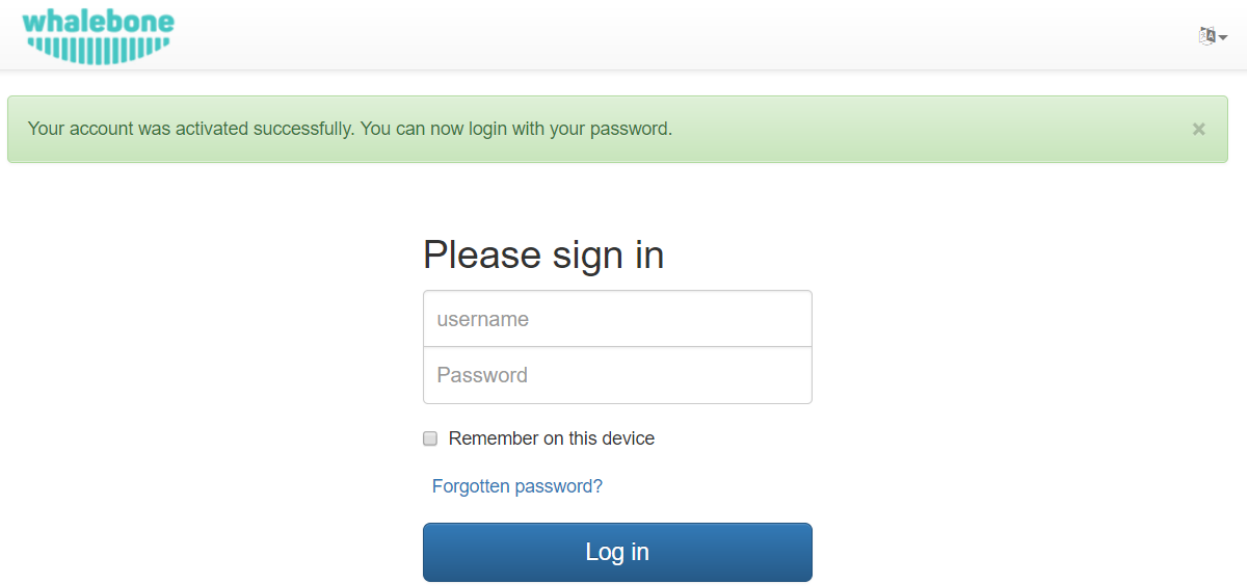
Quickstart

2.1 Creating the portal account

After accessing the URL from your activation email, you will be asked to setup the password for your account. We don't enforce any password complexity, but we recommend using unique and non-trivial password. An unauthorized access would be a threat to users privacy and could misuse the configuration to harm your network.

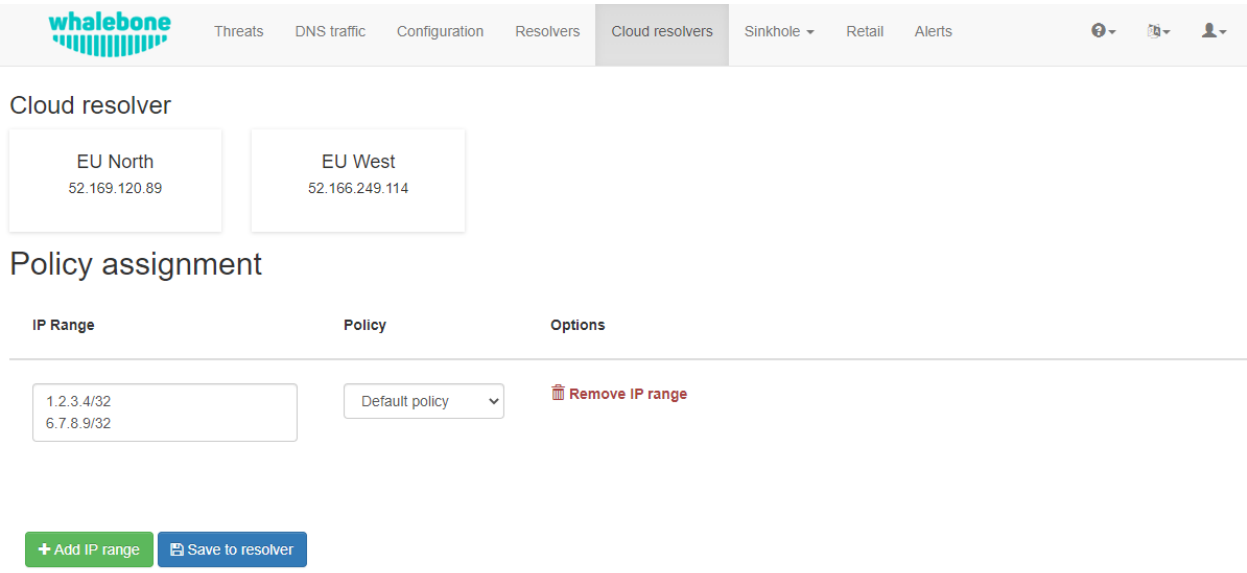


After the password setup you will be asked to login using your username and newly created password.



2.2 Public network ranges

Public network range definition serves to distinguish individual customers and their users. It is necessary to include all the public network ranges that will be used by DNS resolver as well as the users browsing the internet. The definition is used to customize the block page appearance (described later). Single customer can manage more network ranges, such ranges can be assigned to localities to easily distinguish between logical network zones in DNS traffic audit and incidents. The networks can be configured under `Cloud resolvers`.



Warning: Should you not fill in your public network ranges, cloud resolvers will serve as a simple DNS resolvers **without any filtering**. If you use local resolvers, you still have to input your network ranges to display fully customized blocking page (sinkhole) to the blocked users.

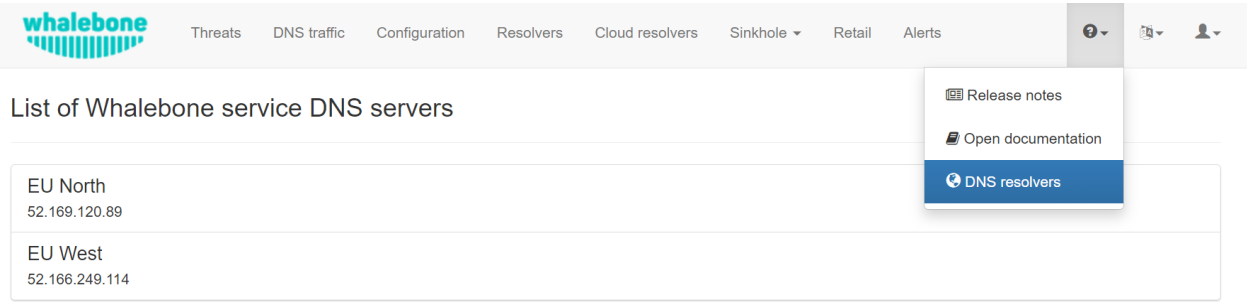
- Into the field `IP Range` insert one or more network ranges using notation <network address>/<mask>, e.g.: `198.51.100.0/24`
- Press button `Add IP range` to add more segments of the network.
- Don't forget to save your new setup through the `Save to resolver` button

Tip: While testing Whalebone (e.g. through adding a testing domain into blacklist) don't forget that many DNS records could be recently in the DNS cache anywhere between the resolver and the user (including the browser, operating system or forwarders). Testing right after the configuration change could therefore fail and the timespan before the protection becomes active could vary based on the TTL of the particular DNS record (should all the caches along the way actually honor the TTL value).

2.3 Cloud DNS resolvers

You should forward your DNS traffic towards Whalebone cloud resolvers if this is your preferred deployment option. Cloud resolver are available on two independent IP addresses: `52.169.120.89` `52.166.249.114`

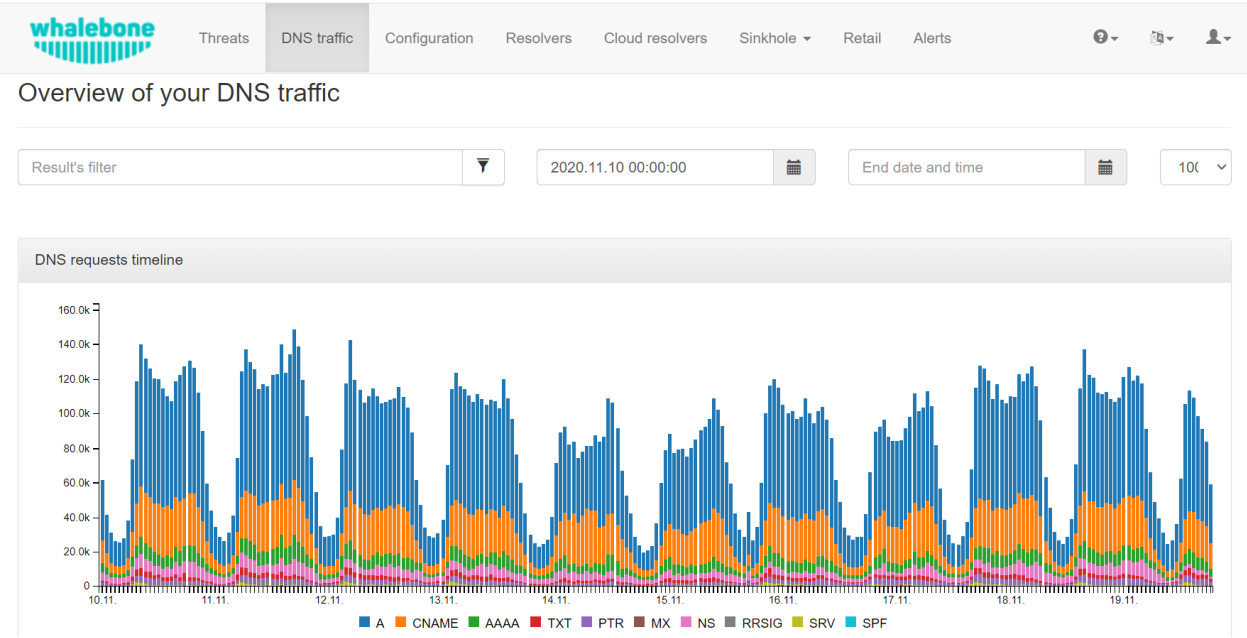
The IP addresses of the resolvers are accessible under `Cloud resolvers` and under the menu `Help > DNS resolvers`



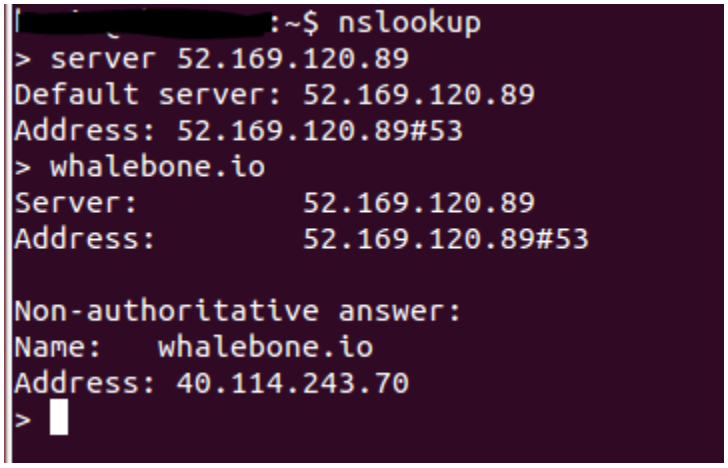
Always use both IP addresses in your configuration The guarantee of availability of the DNS resolution service is applied only in cases where both of the IP addresses are configured to use primary and secondary resolvers automatically.

2.4 DNS traffic

Should the traffic be properly forwarded on Whalebone DNS resolvers (cloud or local) the DNS traffic will be visible under the menu option `DNS traffic`, where the individual request and responses are available for further investigation. The traffic should be visible in several minutes after everything has been properly setup. If there is no traffic recorded even in several hours don't hesitate to contact Whalebone support to help you doublecheck the configuration or any sort of network issues.



The DNS resolution check could be also done manually on Windows or Linux machines through `nslookup` tool. Set the Whalebone resolver IP and try to resolve an existing domain name.



CHAPTER 3

Local resolver

Whalebone local resolver brings the advantage of visibility of local IP addresses that send the actual requests. Whalebone resolver is based on the implementation of Knot Resolver developed in the CZ.NIC labs.

3.1 System requirements

Local resolver is supported on dedicated (hardware or virtual) machine running a supported operating system.

- **Supported operating system** (64-bit, server editions of following distributions):
  - Red Hat Enterprise Linux 7, 8
  - CentOS 7, 8
  - Debian 9, 10
  - Ubuntu 16.04, 18.04, 20.04
- **Supported filesystems**
  - ext4
  - xfs only with d_type support (ftype=1)
- **Minimum hardware sizing** (physical or virtual):
  - 2 CPU cores
  - 4 GB RAM
  - 40 GB HDD (at least 30 GB in /var partition)

Warning: In case the resolver is installed on vSphere you will have to disable the balloon driver to avoid memory issues.

- **Network setup requirements** (local resolver needs the following ports opened):

- `TCP+UDP/53` into the internet destinations if responsible for the resolution
- `TCP/443` to `resolverapi.whalebone.io`, `logger.whalebone.io`, `agentapi.whalebone.io`, `transfer.whalebone.io`, `portal.whalebone.io`, `harbor.whalebone.io`, `download.docker.com`, `data.iana.org`
- Reachability of software repositories for the operating system

Warning: Without communication on port 443 to the domains listed above the resolver won't be installed at all (the installation script will abort).

Note: Should you need sizing estimation for large ISP or Enterprise network contact Whalebone. Whalebone local resolver will need approx. twice the RAM and CPU than usual resolver (BIND, Unbound).

3.2 Installation of a new resolver

In menu **Resolvers** press the button **Create new**. Choose a name (identifier) for your new resolver. The input is purely informative and won't affect the functionality. Once you've entered the name, click **Add resolver** button After clicking the button an informative window will pop up with list of supported platforms and the one-line command for the installation. Copy the command and run on the machine dedicated for the local resolver. The command will run the installation script and will pass the one time token used for the resolver activation (the same command can not be used repeatedly).

Once the command is run the operating system is being checked and requirements installed. Script will inform you about the progress and it creates a detailed log named `wb_install.log` in current directory. Successul run of the installation script is ended with the notification `` `Final tuning of the OS` `` with value `[ OK ]`. Right after the installation also the initialization takes place and it could take several minutes before the resolver starts the services.

Warning: Local resolver is configured as an open resolver. It will respond to any request sent. This is quite comfortable in terms of availability of the services, but also could be a risk if the service is available from the outside networks. Please make sure you limit the access to the local resolver on port 53 (UDP and TCP) from the trusted networks only, otherwise it can be misused for various DoS attacks.

Tip: The resolver's processes need to communicate on localhost. In case some firewall is in place please make sure that the traffic is allowed, i.e. `iptables -A INPUT -s 127.0.0.1 -j ACCEPT`

3.2.1 Verifying the installation

Whalebone resolvers come with a set of testing domains for the verification of the installation and the Security filtering. These domains can be used in order to ensure that you are effectively using a Whalebone resolver:

- `http://malware.test.whalebone.io`

- `http://c2server.test.whalebone.io`
- `http://spam.test.whalebone.io`
- `http://phishing.test.whalebone.io`
- `http://coinminer.test.whalebone.io`

Upon visiting these domains a blocking page similar to the following should be presented:

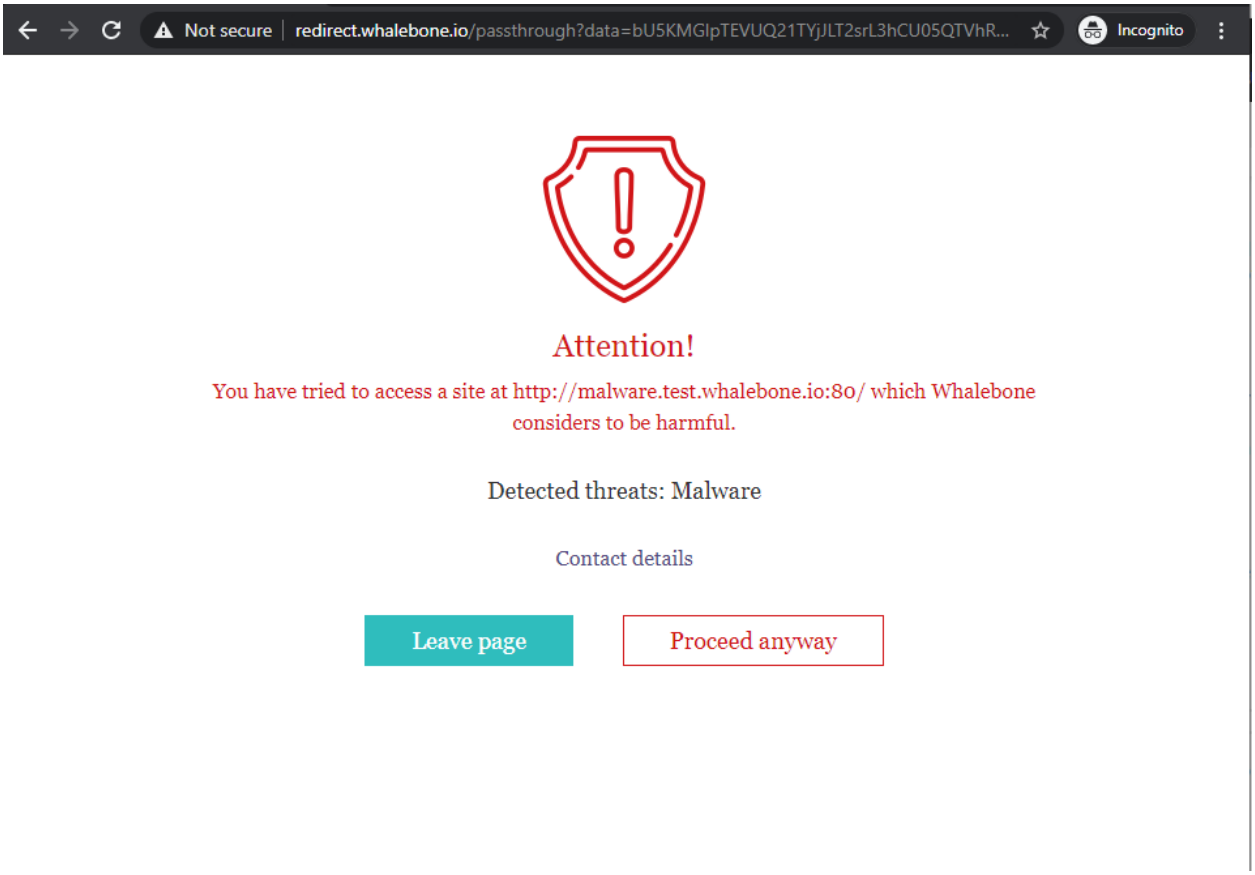


Fig. 1: Blocking Page - Whalebone Resolver is being used

In case you come accross the following page, it means that the request was not blocked and thus a Whalebone resolver is not being used. Please review your settings and if the issue persists, please contact support.

3.3 Security policies

The behavior of DNS filtering on the resolvers could be defined in the menu item **Configuration** and tab **Security poicies**. In the default state there is only the **Default policy**, which is automatically assigned to any new resolver. In any policy there are several options to be defined:

- **Malicious domains filtering**
  - Allows to apply actions Audit (logging) or Block (redirect to blocking page) on resolution of malicious domains
  - Individual actions could be turned off - e.g. turn off the blocking for testing purposes

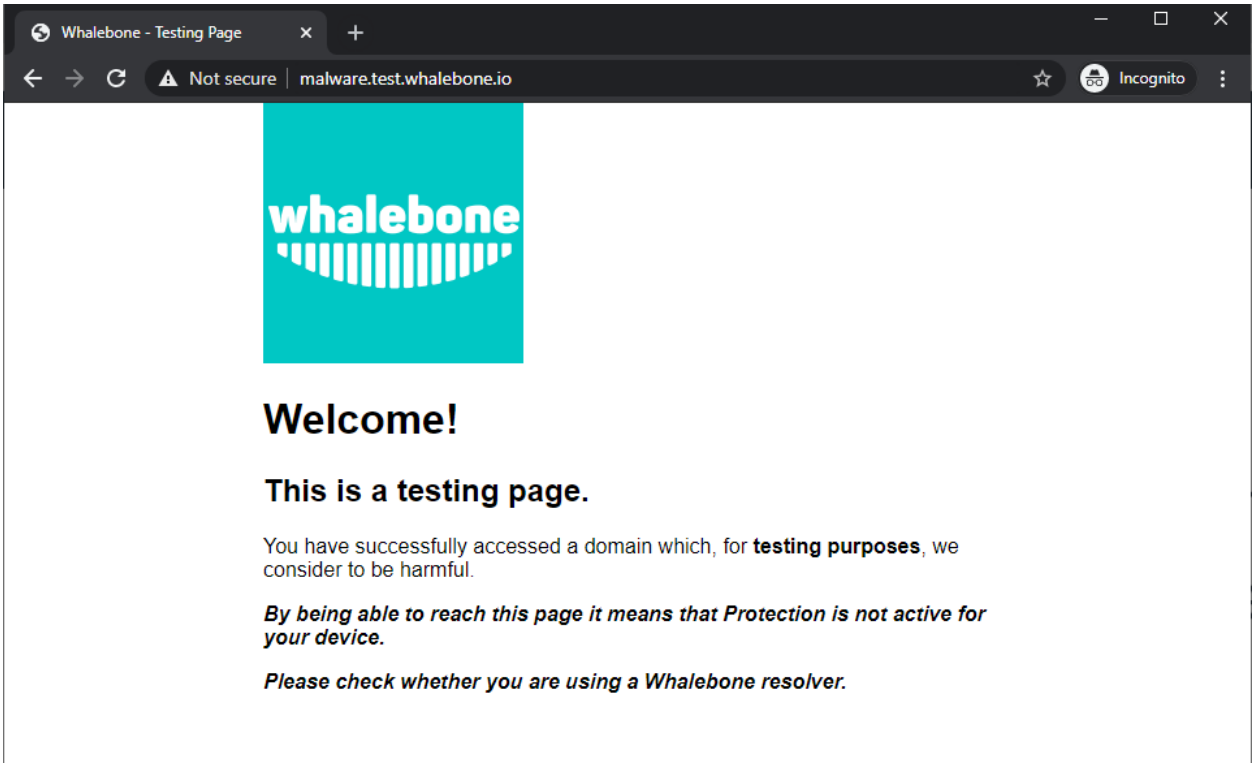


Fig. 2: Blocking Page - Whalebone Resolver is not being used

  - The slider values define the probability that the particular domain is malicious on the scale from 0 to 100 (0 is a safe domain, 100 is malicious)
  - There are available preconfigured policies that cover the most usual cases. This cases are: *Don't Block*, *Block carefully* and *Block strictly*.

Tip: The default threshold for blocking is set to `80` which is safe even for larger network with liberal policy towards the users. For more restrictive policy we suggest setting threshold for blocking to `70-75`, in very restrictive networks even down to `60`. Audit is purely informative, however setting the threshold too low can result in too many logged incidents.

- **Types of threats**
  - The default behavior is to include all types of threats
  - The drop-down menu allows the user to choose a more granular category of the threats they would like to audit or block. The available categories are: *blacklist*, *c&c*, *coinminer*, *compromised*, *malware*, *phishing* and *spam*.

A full list of what each category includes can be found below:

- **C&C (Command and Control)**: domains that facilitate botnet communication for coordination of their activity
- **Malware**: domains that host and distribute malware
- **Phishing**: domains aiming to trick users and extract sensitive information such as credit card details, login credentials etc.
- **Blacklist**: domains that are known to serve multiple nefarious purposes

- **Spam**: domains that are linked with the spreading of spam email messages and scam offerings
- **Compromised**: legitimate domains that have been hacked and are temporarily used for malicious purposes
- **Coinminer**: domains linked with hijacking CPU resources and crypto mining activity

- **Whitelist**
  - Domains that won't be blocked at any time
  - The whitelist is applied to the domain and all of the subdomains, e.g.: whitelisted domain `whalebone.io` will also whitelist `docs.whalebone.io`, but not vice versa
  - The list can be configured on the *Blacklist/ Whitelist* tab
- **Blacklist**
  - Domains that will be blocked at all times (higher priority has only **Whitelist**)
  - The blacklist is applied to the domain and all of the subdomains, e.g.: whitelisted domain `malware.ninja` will also blacklist `super.malware.ninja`, but not vice versa
  - The list can be configured on the *Blacklist/ Whitelist* tab.

Warning: After creating a blacklist or a whitelist, it should be assigned to the specific security policy, or else the changes will not take effect.

Note: Changes will be applied to the resolvers in approx. 2-3 minutes. Saved configuration is used during preparation of the threat data package for the resolvers that download and apply those packages at regular intervals.

- **Regulatory Restrictions**
  - Integrated list of domains that must be applied in order to conform to Regulatory Restrictions of a country.
  - Examples of these domains include cases of illegal gambling or child pornograpy.

Warning: Each country has different Regulatory lists. In case of multi-country deployments different policies can be used in order to apply the proper Regulatory Restrictions.

- **Content Filtering**

  Particular Content categories can be applied on a per-policy level. This is useful in case different segments of the networks come with different requirements. For example, in case of a School environment all the **Adult** categories can be enabled and access to relevant content can be restricted.

  A diverse set of content filtering categories are available:

- **Porn**: sexual and pornographic material
- **Gambling**: games and activities involving betting money
- **Weapons**: guns and weapon-related sites
- **Audio-video**: audio and video streaming services
- **Games**: online games and gaming websites

- **Chat**: instant messaging and chatting applications
- **Social-networks**: social networking sites and applications
- **Drugs**: drug related websites including alcohol and tobacco
- **Racism**: content linked to racism and xenophobia
- **Violence**: explicit violence and gore
- **Terrorism**: domains linked to terrorism support
- **Advertisement**: banners, context advertisements and other advertisements systems
- **Tracking**: web and email tracking systems
- **Fake news**: domains hosting fake news
- **Coinminers**: domains connected to crypto-currency mining activities

3.4 DNS resolution configuration

You can find the options to configure the resolver in the menu **Configuration** and tab **DNS resolution**. This page allows you to do the basic configuration without the knowledge of configuration syntax. Furthermore there is a text area allowing you to define any configuration to the underlying Knot Resolver.

Available configuration options:

- **Enable IPv6**
  - Should the system has the IPv6 properly configured and working, it is possible to enable it. Otherwise the activation of IPv6 could have negative effects on the performance and latency of the resolver.
- **Forward queries to**
  - This option allows to redirect all or chosen queries to upstream resolvers or authoritative DNS servers (suitable e.g. for forwarding to domain controllers of Active Directory)
  - **Disable DNSSEC**
    - If checked, the answers from the forwarded queries won't be DNSSEC validated. We recommend to check this option should the upstream server have not DNSSEC configured properly.
  - **All queries to**
    - Option to forward all queries to one or more resolver
  - **Following domains**
    - Option to choose particular domains that should be forwarded to on more resolvers
    - Different resolvers could be defined for different domains
- **Static records**
  - Predefined answers that should be returned for particular domains
  - Could serve for special purposes such as monitoring or very simple substition of records on authoritative server
- **Advanced DNS configuration**
  - Text area for complete Knot Resolver configuration
  - Supports Lua scripting

– Faulty configuration can impact stability, performance or security functions of the resolver

3.5 Blocking Pages

In the case of blocking access to a domain (due to security, content or regulatory reasons), the resolvers are answering to the clients with a specific IP address that leads to the Blocking pages. Should the clients initiate the HTTP(S) connections towards the blocked domain, they are presented with the custom Blocking page with different content based on the reason of the blocking.

Whalebone provides sample template pages for the Blocking Pages, however, they do not have to be followed and virtually every modification, branding and copywriting is possible. The template code is written to be compatible with the widest range of browsers to avoid problems with older versions.

Different versions of the Blocking Pages can be assigned to different segments of the networks.

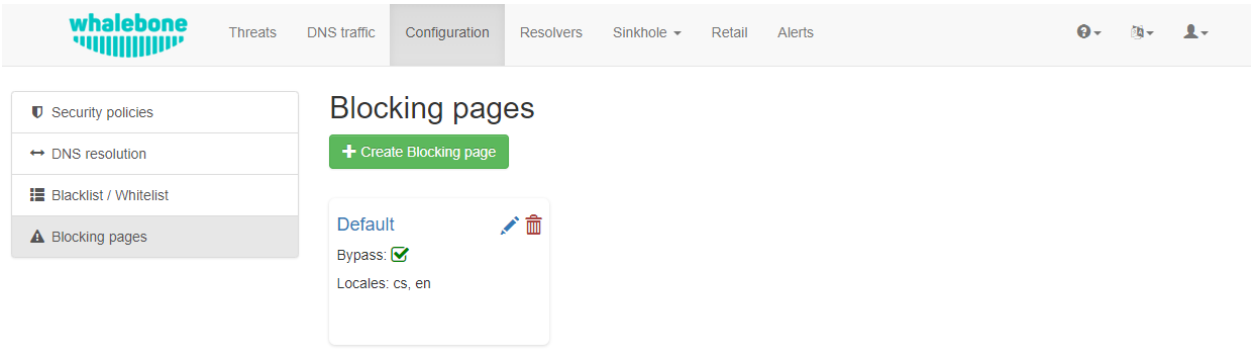


Fig. 3: Blocking Pages Overview

For each version, based on the deployment details, there are four variants of the Blocking Pages that are available and can be configured:

- **Security**: displayed when access is blocked due to security reasons
- **Blacklist**: displayed when access is blocked by the Administrators
- **Regulatory**: displayed when access is regulated due to law or court order
- **Content**: displayed when access is blocked due to the content of the domain

Furthermore, each version can have different localization options. The language that is going to be presented to the user is infered from the language of the browser that is visiting the Blocking Page. New locales can be seamlessly added as an option.

For each Locale several options are available. In the example above, the English version has the following options:

1) Use Template

When using the template option, the information that are provided as input to the following form are injected in the template code. This is the fastest and easiest way to customize the blocking pages.

2) Set as default locale

This option can customize the default language of the Blocking Pages. In case some browser does not declare its preferred language, the “Default” language acts as a fallback mechanism.

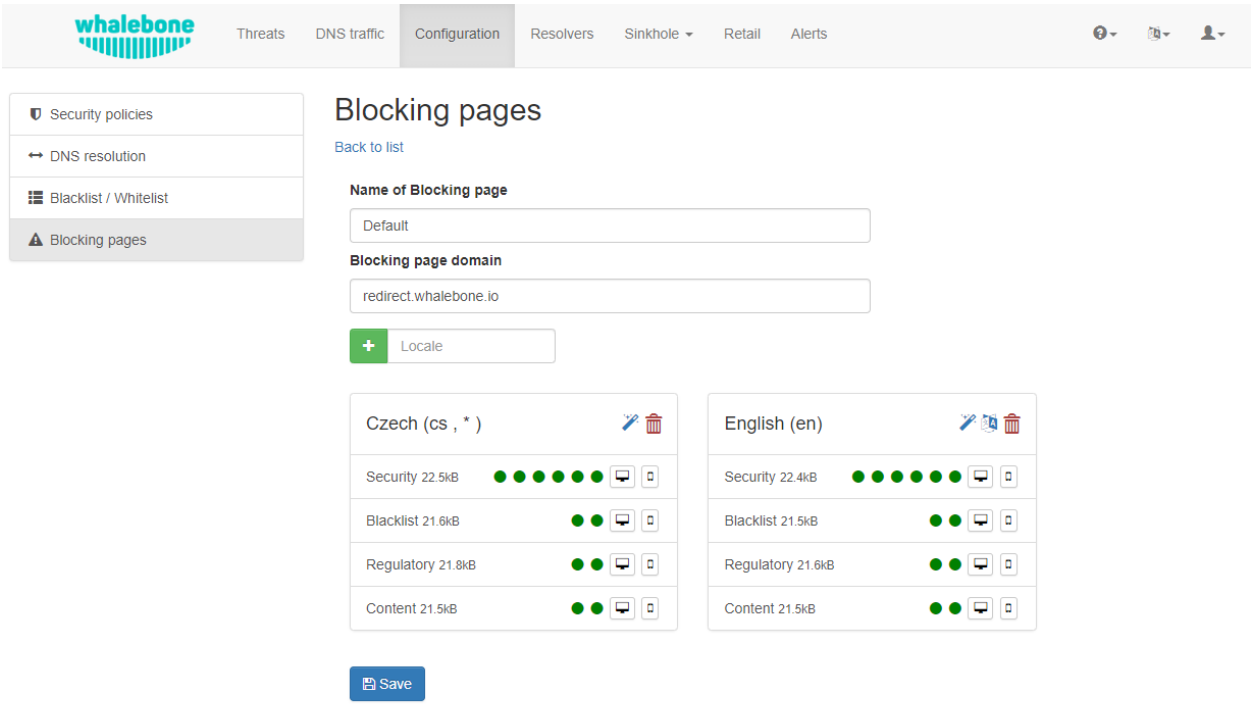


Fig. 4: Blocking Pages Menu

3) Delete the locale

In case the locale is no longer needed, it can be deleted.

Each of the Versions of the Blocking Page (Security, Blacklist, Regulatory, Content) can be customized in more detail by modifying the HTML code. Upon clicking on each version an editor is presented that allows for any required changes.

The editor also exposes a "Verification" interface which parses the final HTML code and checks for the enabled functionalities. The check is based on the `id` of the specific elements. More information and requirements for each functionality can be found by clicking the respective labels.

Note: Each Version of the Blocking Page has unique characteristics that can be selected. For example, the Security Blocking Page can include a "Bypass" button which is not available in the respective Regulatory and Blacklist versions.

After editing and saving the changes to the Blocking Pages it is important that they are applied to the individual resolvers. More information can be found at the *Configure Blocking Pages Section*

Tip: The Redirection Pages are served from a web server directly on the Resolvers. The pages are expected to be a single file so any additional resources (CSS, images, scripts) must be either embedded directly in the HTML code or served from a publicly accessible web server. The resolver does not provide any option to serve other content.

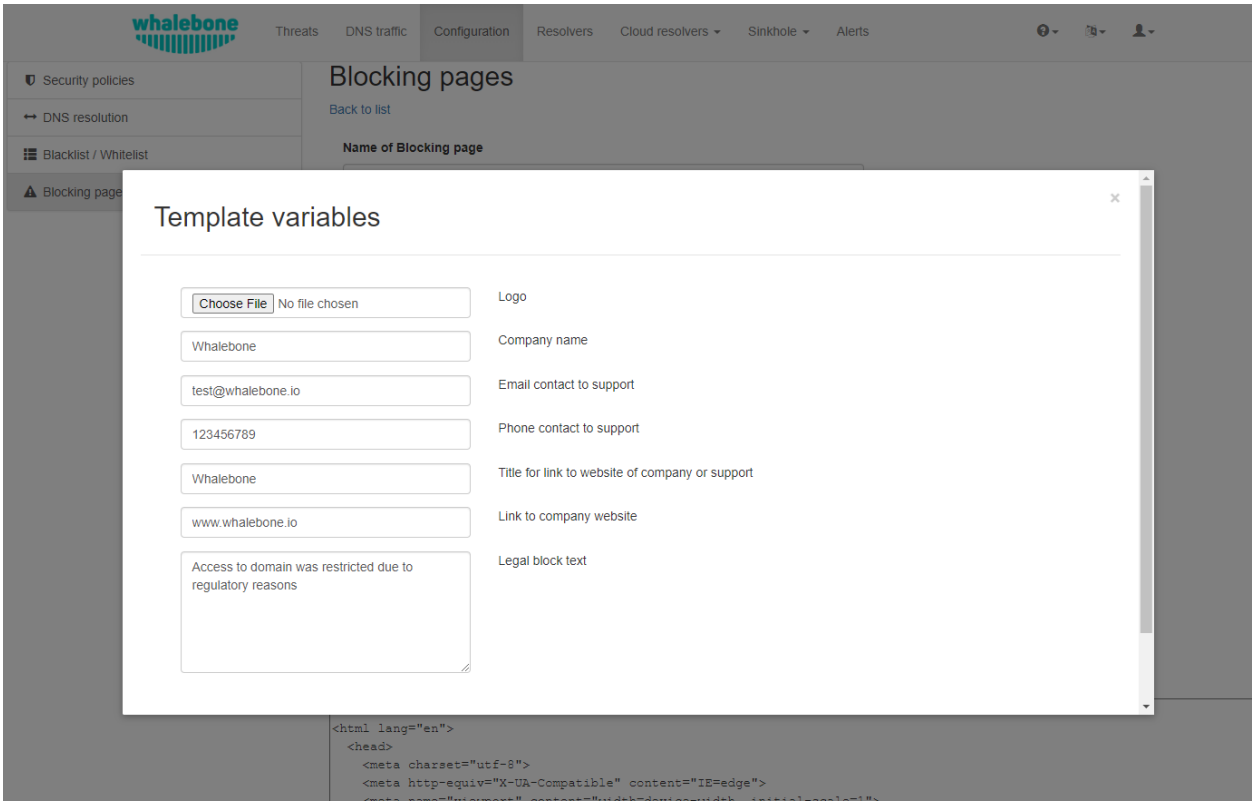


Fig. 5: Template Customization

3.6 Resolver management

On the **Resolvers** page there is an overview of created resolvers. Administrator can adjust the configuration, deploy updates and install new resolvers.

3.6.1 Resolvers overview

In the main resolver overview there are tiles with resolver details and configuration options. The overview includes information about operating system and resources as CPU, Memory and HDD usage. Therre is also the state of services running on the resolvers (should state “Running” if everything is OK) and the status of the communication channel between the resolver and the cloud (it is expected to be “Active”).

3.6.2 Deploy configuration

Should you change any configuration related to the DNS resolution, you have to deploy the configuration afterwards. If there are any configuration changes available to be deployed, there will be a red icon with down right arrow visible on the resolver card. Once clicked, the webpage will ask for confirmation and the successful deployment will be notified in the top right corner.

Note: If the result is an deployment error, try to repeat the action. The reason for the error could be a short term communication outage between the cloud and the resolver.

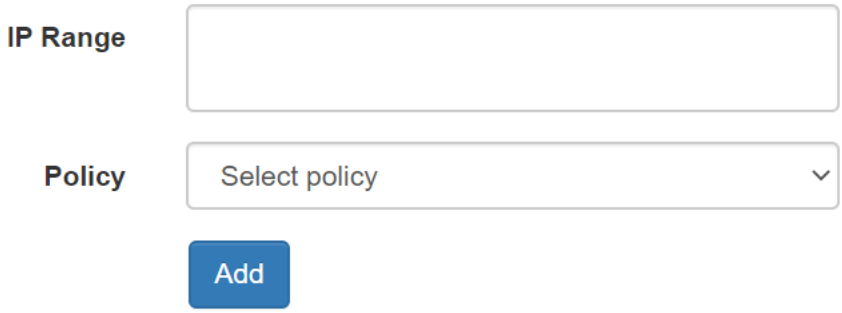
3.6.3 Configure Policy per Network Segment

Security and content polices can be asssigned in a granular manner to different segments of the network.

The setting applies per resolver and can be configured under **Resolvers >** `<Name of the resolver>` **> Policy Assignment**

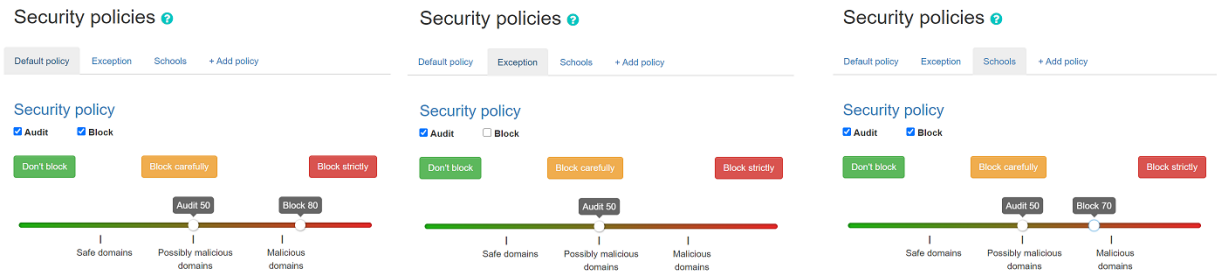
Note: The configuration is **per resolver**. In case you want to apply the configuration to more than one resolvers, please modify all the necessary resolvers.

The policies can be applied by adding IP ranges in the available input form:



In order to provide a better understanding let's consider an example with the network range `10.10.0.0/16`. We have created 3 different policies:

- **Default**: the policy that we want to apply to the whole network, this is the most generic policy
- **Exception**: a policy that must be applied to a specific segment in the network which will have all security and content filtering disabled.
- **School**: a policy that we want to apply to 2 different subnets that have been assigned to school environments. In this case we have chosen to be more strict in the blocking.



Note: The first policy that is defined acts as a **default** policy and is applied in cases where a more granular policy for a network range is not available. This policy is always on the top of the list, is marked with a special icon and cannot be deleted.

Let's summarize the requirements in the following matrix:

Policy	Network
Default	10.10.0.0/16
Exception	10.10.10.0/24
School	10.10.20.0/24 and 10.10.40.0/24

In the following capture the process of assigning the policies is described:

Note: After adding the networks, and in order to take effect, you must click on *Save to resolver*. The changes will be then validated and a pop-up message will provide additional information.

In order to assign additional entries to an existing assignment, a new network range can be appended using *newline* as a separator. Building on the previous example, in case we wanted to add the subnet 10.10.30.0/24 to the Exception Policy:

3.6.4 Configure Blocking Pages

In a similar manner to the Security Policies, the Blocking Pages can be also assigned to particular network ranges.

The first step is to select `On-premise local resolver` for the `Blocking Page Location` option. Two new fields are enabled where the IPv4 and IPv6 addresses of the Blocking Pages must be completed.

Tip: The Blocking Pages are being hosted **directly** on the Resolvers so the IP addresses that are advertised to the clients must be used. The clients will then be redirected to the IP address of the resolver upon blocking. Please ensure that ports 80 and 443 are accessible on the firewall.

For each IP range that is added, there is a drop-down menu for the Blocking Page that should be assigned.

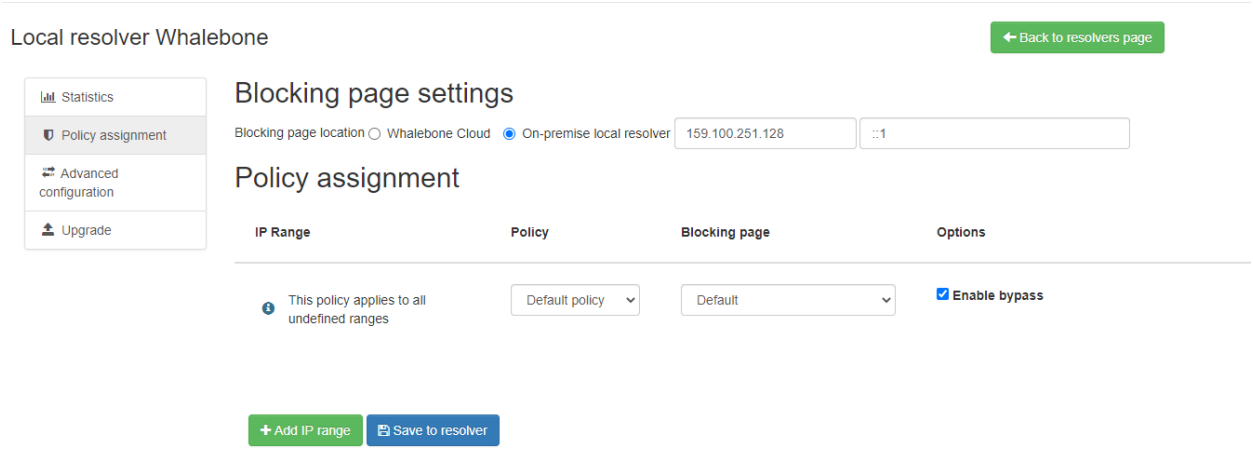


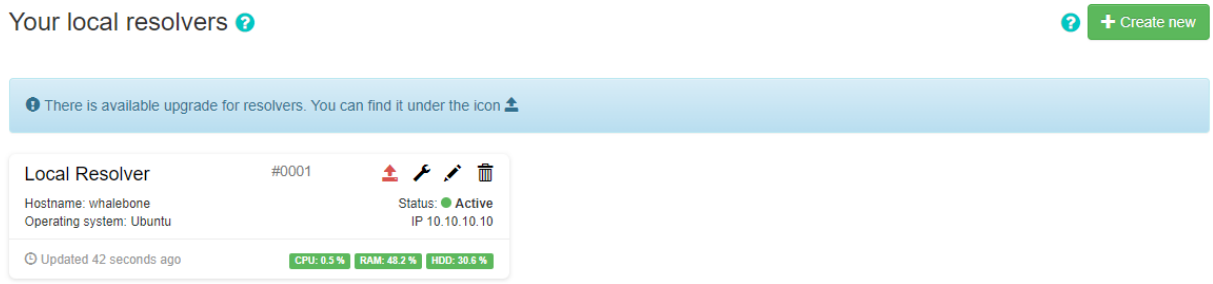
Fig. 6: Assign Blocking Page to IP range

Important: The first entry in the `Policy Assignment` is considered the Default/Fallback. In case a client accesses the resolver from an undefined IP range, the respective options will apply.

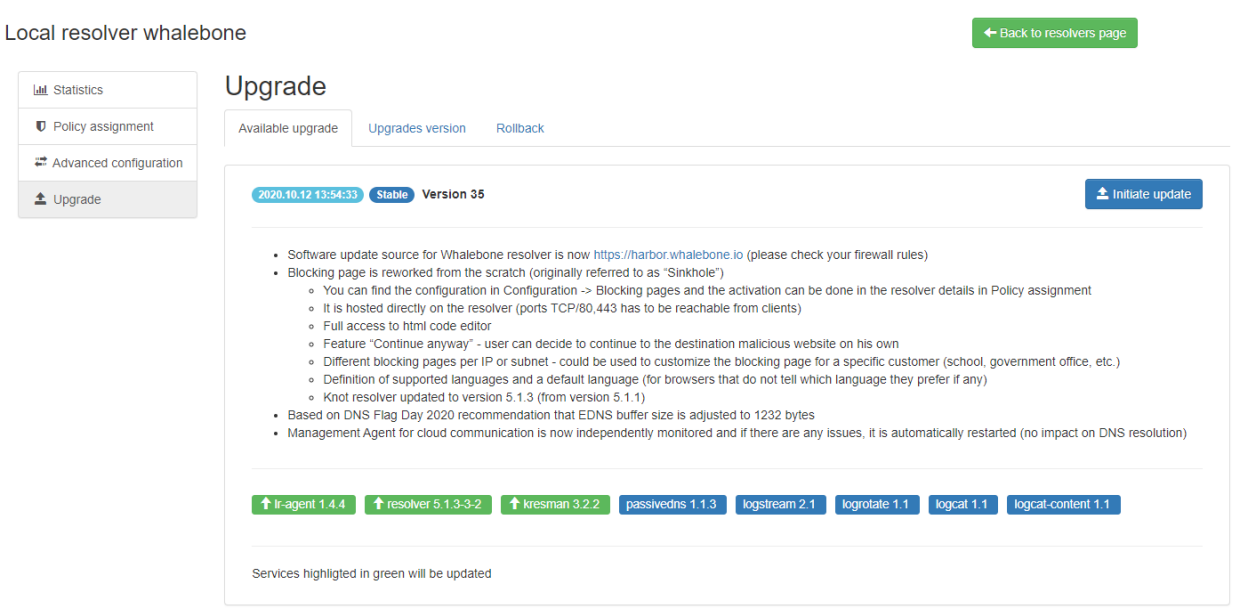
Note: After making the necessary changes to the Blocking Page settings, please check whether the resolvers need to be re-deployed.

3.6.5 Upgrade/Rollback Resolver

When a new version of the Resolver is released, a red `Upgrade` icon appears on the resolvers' management interface.

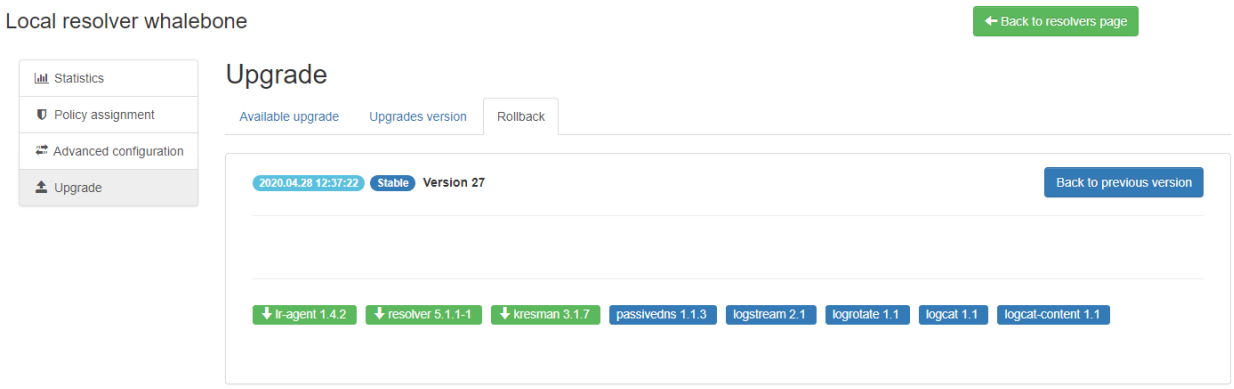


Upon clicking on the `Upgrade` icon, the respective menu is selected and important information about the new release are provided.



From this menu, the upgrade of the resolver can be initiated.

In case the installation of the new version does not yield the expected outcome, a Rollback to the previous version is possible anytime:



3.7 Resolver agent

3.7.1 Command line interface

Agent's actions can be invoked using a proxy bash script present at path **/var/whalebone/cli**. This script calls a python script which handles the execution of the following agent actions:

- **sysinfo - returns the system status data in JSON format.**
  - Parameters: None
  - Output: tested categories on tested key can have two values 'ok' and 'fail'


```
{
   "hostname":"hostname",
   "system":"Linux",
   "platform":"CentOS Linux 7 (Core)",
   "cpu":{
      "count":4,
      "usage":28.6
   },
   "memory":{
      "total":7.6,
      "available":3.9,
      "usage":49.2
   },
   "hdd":{
      "total":50.0,
      "free":14.4,
      "usage":71.1
   },
   "swap":{
      "total":0.0,
      "free":0.0,
      "usage":0
   },
   "resolver":{
      "answer.nxdomain":3284,
      "answer.tc":35,
```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```
      "answer.ad":849,
      "answer.100ms":3983,
      "answer.cd":6,
      "answer.1500ms":74,
      "answer.slow":215,
      "answer.rd":224337,
      "answer.1ms":104683,
      "answer.servfail":215,
      "predict.epoch":24,
      "query.dnssec":6,
      "answer.250ms":14941,
      "query.edns":35498,
      "answer.cached":86713,
      "answer.nodata":3622,
      "answer.aa":2362,
      "answer.do":6,
      "answer.edns0":35498,
      "answer.ra":224337,
      "predict.queue":0,
      "answer.total":224337,
      "answer.10ms":35351,
      "answer.noerror":217216,
      "answer.50ms":59766,
      "answer.500ms":4642,
      "answer.1000ms":653,
      "predict.learned":80
   },
   "docker":{
      "Platform":{
         "Name":""
      },
      "Components":[
         {
            "Name":"Engine",
            "Version":"17.12.1-ce",
            "Details":{
               "ApiVersion":"1.35",
               "Arch":"amd64",
               "BuildTime":"2022-02-27T22:17:54.000000000+00:00",
               "Experimental":"false",
               "GitCommit":"88888fc6",
               "GoVersion":"go1.999.999",
               "KernelVersion":"3.22.66-693.21.1.el7.x86_64",
               "MinAPIVersion":"1.99",
               "Os":"linux"
            }
         }
      ],
      "Version":"19.32.1-ce",
      "ApiVersion":"1.98",
      "MinAPIVersion":"1.12",
      "GitCommit":"7390fc6",
      "GoVersion":"go1.9.4",
      "Os":"linux",
      "Arch":"amd64",
      "KernelVersion":"3.10.0-693.21.1.el7.x86_64",
      "BuildTime":"2018-02-27T22:17:54.000000000+00:00"
```


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```
    },
    "check":{
        "resolve":"ok",
        "port":"ok"
    },
    "containers":{
        "lr-agent":"running",
        "passivedns":"running",
        "resolver":"running",
        "kresman":"running",
        "pcpy":"running",
        "logrotate":"running",
        "logstream":"running"
    },
    "images":{
        "lr-agent":"whalebone/agent:1.1.1",
        "passivedns":"whalebone/passivedns:1.1.1",
        "resolver":"whalebone/kres:1.1.1",
        "kresman":"whalebone/kresman:1.1.1",
        "logrotate":"whalebone/logrotate:1.1.1",
        "logstream":"whalebone/logstream:1.1.1"
    },
    "error_messages":{
    },
    "interfaces":[
        {
            "name":"lo",
            "addresses":[
                "127.0.0.1",
                "::1",
                "00:00:00:00:00:00"
            ]
        },
        {
            "name":"eth0",
            "addresses":[
                "1.1.1.1",
                "::c8",
                "fe80::",
                "00:00:00:00:00:00"
            ]
        },
        {
            "name":"docker0",
            "addresses":[
                "198.1.1.1",
                "00:00:00:00:00:00"
            ]
        }
    ]
}
```


- **stop - stops up to three containers**
  - Parameters: containers to stop (up to 3), Example: ./cli.sh stop resolver lr-agent kresman
  - Output:

```
{
        'resolver': {'status': 'success'},
        'lr-agent': {'status': 'success'},
        'kresman': {'status': 'success'}
}
```

- **remove - removes up to three containers**
  - Parameters: containers to remove (up to 3), Example: ./cli.sh remove resolver lr-agent kresman
  - Output:

```
{
        'resolver': {'status': 'success'},
        'lr-agent': {'status': 'success'},
        'kresman': {'status': 'success'}
}
```

- **upgrade - upgrades up to three containers, the container's configuration is specified by a docker-compose in agent contain**
  - Parameters: containers to upgrade (up to 3), Example: ./cli.sh upgrade resolver lr-agent kresman
  - Output:

```
{
        'resolver': {'status': 'success'},
        'lr-agent': {'status': 'success'},
        'kresman': {'status': 'success'}
}
```

- **create - creates containers, the containers are specified by a docker-compose in agent container (can also be found in /etc/v**
  - Parameters: None, Example: ./cli.sh create
  - Output:

```
{'resolver': {'status': 'success'}


Pending configuration request deleted.
```

- **updatecache - forces the update of resolver's IoC cache (which is used for blocking), this action should be done to manuall**
  - Parameters: None
  - Output:

```
{'status': 'success', 'message': 'Cache update successful'}
```

- **containers - lists the containers and their information which include: labels, image, name and status.**
  - Parameters: None
  - Output:

```
[
   {
```

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```
    "id":"b8f4489379",
    "image":{
       "id":"c893b4df5ca3",
       "tags":[
          "whalebone/agent:1.1.1"
       ]
    },
    "labels":{
       "lr-agent":"1.1.1"
    },
    "name":"lr-agent",
    "status":"running"
 },
 {
    "id":"e433d58f13",
    "image":{
       "id":"2c4b84a7daee",
       "tags":[
          "whalebone/passivedns:1.1.1"
       ]
    },
    "labels":{
       "passivedns":"1.1.1"
    },
    "name":"passivedns",
    "status":"running"
 },
 {
    "id":"2aeec00121",
    "image":{
       "id":"fc442e625539",
       "tags":[
          "whalebone/kres:1.1.1"
       ]
    },
    "labels":{
       "resolver":"1.1.1"
    },
    "name":"resolver",
    "status":"running"
 },
 {
    "id":"662dac2e6c",
    "image":{
       "id":"b37d0d1bd10b",
       "tags":[
          "whalebone/kresman:1.1.1"
       ]
    },
    "labels":{
       "kresman":"1.1.1"
    },
    "name":"kresman",
    "status":"running"
 },
 {
    "id":"05188ac1df",
```


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```
      "image":{
         "id":"5b50cdc924fc",
         "tags":[
            "whalebone/logrotate:1.1.1"
         ]
      },
      "labels":{
         "logrotate":"1.1.1"
      },
      "name":"logrotate",
      "status":"running"
   },
   {
      "id":"01e64dd697",
      "image":{
         "id":"fffb52c2dadd",
         "tags":[
            "whalebone/logstream:1.1.1"
         ]
      },
      "labels":{
         "logstream":"1.1.1"
      },
      "name":"logstream",
      "status":"running"
   }
]
```


Each of those actions execute similarly named actions and the status of that action, or output of that action, is printed. The **list** and **run** actions are intended for the scenario when a confirmation of a certain action is required. The action list shows the action that should be executed and the changes that would be done by that action for containers specified in that action. This serves as an example of what would happen if the awaiting action would have been executed. The run action then executes the awaiting action cleans up afterwards.

The actions of upgrade and create use the docker-compose template present in the agent container to create/upgrade the desired container. This template is mounted in the volume **/etc/whalebone/agent** if the user decides to change it. However this change needs to be done also to the template present at **portal.whalebone.io**, if not than the local changes will be overwritten from the cloud during next upgrade.

The bash script should be invoked like this: **./cli.sh action param1 param2 param3**. Action is the action name and parameters are the action parameters. Only actions for container stop, remove and upgrade use these and specify what containers should be affected by the respective action.

3.7.2 Strict mode

The agent's default option is to execute actions from the cloud management immediately. It is however possible to enable manual confirmation of requests. This gives the administrator control over when and what gets executed. To enable the resolver Strict mode, please create a ticket to Whalebone support.

To list changes the request introduces the cli option **list** option should be used. To execute the request use cli option **run**. There can only be one request pending in the queue. New request from the cloud will ovewrite the previous one, but the new one holds the full desired state anyway. To delete waiting request use cli option **delete_request**. The actions that can be persisted are: **upgrade**, **create** and **suicide**. Please see examples of the CLI command usage.

- **list - lists the awaiting command and the changes that would be made to the containers specified in the awaiting action, thi**

  - Parameters: None, Example: ./cli.sh list
  - Output:

```
--------------------------------
Changes for resolver
New value for label: resolver-1.1.1

        Old value for label: resolver-1.0.0
--------------------------------
```

- **run - executes the awaiting command**
  - Parameters: none, Example: ./cli.sh run

```
{'resolver': {'status': 'success'}
```

- **delete_request - deletes the awaiting request**
  - Parameters: none, Example: ./cli.sh delete_request

3.8 Knot Resolver - Tips & Tricks

Advanced configuration of Whalebone resolver allows to apply any Knot Resolver configuration. In this section we are going to describe the most frequent use cases and examples of such configuration snippets. Views, policies and their actions are evaluated in the sequence as they are defined (except special chain actions that are described in the official Knot Resolver documentation). First match will execute the action, the rest of the policy rules is not evaluated. If you are going to combine different configuration snnippets, you can load the same module just once at the beginning of the configuration.

3.8.1 Allow particular IP ranges

Define a list of IP ranges that will be allowed to use this DNS resolver. Queries from all other ranges will be refused.

```
-- load modules
modules = {'policy', 'view'}

--define list of ranges to allow
--127.0.0.1 should always be allowed
allowed = {
  '127.0.0.1/32',
  '10.10.20.5/32',
  '10.30.10.0/24'
}

-- allow list of ranges
for i,subnet in ipairs(allowed) do
  view:addr(subnet, policy.all(policy.PASS))
end

-- block all other ranges
view:addr('0.0.0.0/0', policy.all(policy.DENY))
```

3.8.2 Refuse particular IP ranges

Define a list of IP ranges that will be blocked to use this DNS resolver. Queries from all other ranges will be allowed.

```
-- load modules
modules = {'policy', 'view'}

--define list of ranges to block
blocked = {
  '10.10.20.5/32',
  '10.30.10.0/24'
}

-- block list of ranges
for i,subnet in ipairs(blocked) do
  view:addr(subnet, policy.all(policy.REFUSE))
end
```

3.8.3 Allow list of domains

```
-- load modules
modules = {'policy'}

--define list of allowed domains
domains = {
  'example.com',
  'anotherexample.org'
}

-- allow list of domains
for i,domain in ipairs(domains) do
  policy.suffix(policy.PASS, {todname(domain)})
end
```

3.8.4 Disable DNSSEC globally

```
trust_anchors.negative = { '.' }
```

3.8.5 Disable DNSSEC validation for a domain

```
trust_anchors.set_insecure({ 'domain.com' })
```

3.8.6 Disable Query Case Randomization

```
policy.add(policy.suffix(policy.FLAGS('NO_0X20'), {todname('domain.com')}))
```

3.8.7 Disable QNAME Minimization

```
policy.add(policy.suffix(policy.FLAGS('NO_MINIMIZE'), {todname('domain.com')}))
```

3.8.8 Disable Domain caching

```
policy.add(policy.suffix(policy.FLAGS('NO_CACHE'), {todname('domain.com')}))
```

3.8.9 Enable Prometheus Metrics

The resolver can expose its metrics in Prometheus text format. The following script enables the HTTP module and the respective `/metrics` endpoint is made available.

More information and configuration options can be found on Knot Resolver Documentation

```
modules.load('http')
function startHttp ()
net.listen('127.0.0.1', 8453, { kind = 'webmgmt' })
end
pcall(startHttp)
```

3.9 Uninstalling a local resolver

In order to uninstall a resolver and remove all Whalebone configuration files the following steps should be followed:

Warning: Before starting the process it should be noted that all the individual components that support the resolver functionality are being executed as docker containers. Steps 1 and 2 apply only in case the host server is **dedicated** and **no other services** are running as containers. Should the situation be different, please contact us and we will provide an up to date list of the containers that should be removed.

1. **Stop and remove all the running docker containers**:

   ```
   docker rm -f lr-agent && docker rm -f $(docker ps -q)
   ```

2. **Uninstall Docker**:

   Please follow the instructions for the applicable operating system:

   - CentOS
   - Red Hat
   - Debian
   - Ubuntu

1. **Remove all resolver configuration files, log files and related data**:

   ```
   rm -rf /etc/whalebone
   rm -rf /var/whalebone
   rm -rf /var/log/whalebone
   rm -rf /var/lib/kres
   ```

CHAPTER 4

Data Analysis

Whalebone Portal (graphical user interface) gives the user number of possibilities how to analyze what is happening on the DNS resolvers and the network.

4.1 Threats

Threats are special events where there is a DNS request for a domain that is present within the reputation database. There are two types of actions when a threat is detected. The first is to audit the event while the second is to block it.

The action that is to be implemented depends on the policies that are assigned to the specific resolver. For more on that please refer to Security Policies.

There are some pre-configured filters that can be applied on the data on the portal. Some sample queries can be found below. These queries depict the majority of the use cases but there is no hard limit as the available search engine is **full-text** and *any* query can be compiled impromptu.

4.1.1 How to search for audit/block events.

There are two options in order to filter the different types of events.
In the first option a visual filter can be applied where the type that a user clicks is disabled from the graph. This can aid the process of having a basic overview of the traffic's qualities.

For more advanced usage a query can be issued:

- `action: block` in order to filter the blocked events
- `action: audit` in order to filter the audited events
- `action: allow` in order to view the Block page bypasses

This query updates the content of the whole dashboard.

4.1.2 How to search for a domain

In order to search for a domain's instances in the events, the easiest way is to click on it in the provided log history. Alternatively a query could be issued in the search engine with the term: `domain:<domain>`

4.1.3 How to search for events based on specific IP address.

A filtering of an IP address is possible by clicking on the specific `Source IP` bar and in this way filtering the content of the whole portal.

A more advanced use case could be to directly search for IP address in the search field and use the operator `client_ip` such as: `client_ip:<IP address>`.

Tip: In the following example the data are anonymized so a reader could consider that instead of the previewed hash value, an IP address is used.

4.1.4 How to search for events based on specific threat category.

There are multiple threat categories available.

To name a few: `legal` , `malware`, `c&c`, `blacklist`, `phishing`, `coinminer`, `spam`, and `compromised`.

A *simple* alternative could be to click on the bar that matches the detected threat and filter only the specific type.

Another approach could be to click on the filter icon and in this way specify the desired category, as can be seen in the next image.

4.1.5 How to change the date range of the available data

The date range of the data that can be previewed in the portal can change in multiple ways.
The following image shows three of the available ways. These can be summarized as simply by clicking on the current date that automatically transcribes to the current time, by inserting the date in text in the `YYYY.MM.DD HH:mm:ss` format or by using the builtin tool that provides quick suggestions.

4.2 DNS Traffic

The `DNS Traffic` tab contains an overview of the traffic that has been logged on the resolver. It contains all the queries along with some additional information such as the type, the answer and the TTL (time to live) of the answer.

Tip: The data are subject to de-duplication. This means that the resolver logs only unique combinations of query, query type and answer per 24 hour time frame. For this reason, a query might not be available on the portal even though it has been resolved.

Below, some of the most useful filtering options of the available data will be described.

4.2.1 How to view all queries of a specific type

In order to view all queries of a specific type the most straight forward way is to click on the filter icon and select the desired value.

Another option is to insert a query in the search field. This query could be in the form `query_type:<type>`. The possible types are: `A`,`AAAA`, `CNAME`, `MX`, `NS`, `PTR`, `RRSIG`, `SPF`, `SRV` and`TXT`.

4.2.2 How to view all answers of a specific type

The answers can be filtered by selecting the specific bar in the respective `Answers` field. Additionally, the answers can be viewed by issuing a query in the form `answer:<answer_type>`. Useful answer types are `NXDOMAIN` or `SERVFAIL`.

4.2.3 How to search for a domain

In order to search for a domain's instances in the logs, the easiest way is to click on it in the provided log history. Alternatively a query could be issued in the search engine with the term: `query:<domain>`

A more fine-grained search can be performed by searching for more specific domain based on the available domain levels. The acceptable search fields are `domain_l1:<domain_l1>` and `domain_l2:<domain_l2>`.

4.2.4 How to change the date range of the available data

Please refer to How to change the date range of the available data of the Threats section.

4.2.5 How to view DGA (Domain Generation Algorithm) indications

Whalebone provides a view of indicators of DGA instances. These indications can be accessed by using the filter icon and selecting DGA as can be seen below. Alternatively the query `dga.class:1` can be issued.

4.2.6 Other Tips and Tricks

Search operators (wildcard (*), logical AND, logical OR) can also be used to improve the search result precision. It should be noted that some requested fields in `DNS traffic` and `Threats` are slightly different.

Example queries are:

- All queries from IP addresses that start with 10:

DNS Traffic	Threats
`client: 10.*`	`client_ip: 10.*`

- All queries for domain whalebone.io:

DNS Traffic	Threats
`query: whalebone.io.` (please also include the dot at the end)	`domain: whalebone.io`

- Queries from IP address 1.2.3.4 for whalebone.io:

DNS Traffic	Threats
`client: 1.2.3.4 AND query: whalebone.io.`	`client_ip: 1.2.3.4 AND domain: whalebone.io`

Tip: Filtering operators are placed statically to the URL address. Therefore, you can create your set of filters in advance (such as view on individual IPs) and to use them when necessary. Afterwards, you can place them to your CRM for the specific user's account and to access the filtered view immediately. It will help saving your time when customer asks for the support as you can immediately open their details.

CHAPTER 5

Reporting

Whalebone Portal provides the tools in order to configure various reporting options and manage the access to Whalebone API.

5.1 Reports

Reporting capabilities can be configured from the drop-down menu under a user's account. The properties that can be customized, include the frequency that the reports are being delivered, the preferred day of the week, the language and the recipients.

Note: The default recipient is the owner of the account and the reports are delivered to their respective registered email address.

5.2 API

Whalebone API is a practical way to access all the data that are gathered by Whalebone's resolvers and integrate them to external systems. The API documentation can be accessed at https://apidocs.whalebone.io/public/

In order to authenticate to the API, every user needs a set of *Access Key* and *Secret Key*. These can be managed from the option *API keys* on the dropdown menu, under the user's account.

- **API Key Generation**

The generation of the API key can be achieved by clicking the *Generate new key* button.

Note: Make sure to copy the *Key secret* as it cannot be retrieved again.

- **API Key Revocation**

In case an API key gets lost or compromised, its revocation can be achieved by the same menu.

CHAPTER 6

User/Organization Management

6.1 User Management

The users can be managed under the respective tab on the User Menu.

Under this menu, an Administrator is able manage user accounts by adding, removing or disabling them. Additionally they are presented with an overview of last login and last password change details per account.

Tip: When a user is invited to join an organization and does not already have a Whalebone account, a new account is created for them and an activation link is being sent to their registered email address.

The two types of users that are supported are:

- **Users**: users that have their primary account registered under the specific organization.
- **External Users: (If available)** users that belong to another organization but can be assigned a role under a different Whalebone Portal tenant. e.g. resellers

Tip: Each user can be assigned one or more roles which can be combined to shape their final role.

Below are described the different roles and the actions that they are able to perform.

Action	Read Traffic	List Editor	Security policy Admin	API Credentials	Read only	Operations Read Only	DNS Admin	Admin
View Threat Data								
View DNS Traffic								
View Whitelists/Blacklists								
Edit Whitelists/Blacklists								
View Security Policies								
Edit Security Policies								
View Resolver Configuration								
Edit Resolver Configuration								
View API Tokens								
Generate API Tokens								
View Network Configuration								
Edit Network Configuration								
View Alerts								
Edit Alerts								
View Reports								
Edit Reports								

6.2 Organization Settings

The Organization Setting can be found under the User Menu.

6.2.1 Portal Access Policy

Portal Access Policy defines security mechanism for users accessing Whalebone's Portal. The following settings can be configured:

- **Allowed IP Ranges**: IPv4 or IPv6 ranges in CIDR notation, e.g. 10.0.0.0/24 that are allowed to access Whalebone Portal.
- **Account Lockout**: If enabled, it can limit the number of failed login attempts. The available options are:
  - **Failed Login Limit**: Number of unsuccessful login attempts before locking the account. Default is 5.
  - **Lockout Duration**: Time duration in minutes for disallowing login requests.
  - **Lockout Reset Time**: Time duration in minutes before resetting the number of failed attempts.
  - **CAPTCHA Threshold**: Number of unsuccessful login attempts before enabling the CAPTCHA verification.

- **Multi Factor Authentication**: Require users to use a two factor authentication (2FA) application and enter additional tokens upon logging to the portal.

6.2.2 Password Policy

The following password settings can be configured:

- **Expiration Time**: Number of days before a password needs to be changed.
- **Password history**: Number of old passwords that cannot be reused when setting up a new passwords.
- **Password Attributes**: The attributes that a new password should have. The attributes that a new password can have are the following:
  - Minimum Length
  - Number of Digits
  - Number of lowercase characters
  - Number of uppercase characters
  - Number of special characters

CHAPTER 7

End user dashboard

Whalebone also provides web UI for the end users. This is usually done in an environment, where ISP or Telco allows customers to configure the security service. UI is fully customizable and can be whitelabeled by the service provider. The integration is done by Whalebone specialists directly with cooperation of the service provider team.

7.1 Integration requirements

There are three four main points of integration of the Whalebone security service with the existing infrastructure and services.

- **DNS resolvers user awareness**
  - Usually done through gathering of authentication audit (e.g. RADIUS)
  - Static IP x User assignemnts are supported and are delivere through API integration (see below)
  - Other authentication services and methods are supported on request
- **End user dashboard**
  - Simple UI to provide the user with configuration and reporting options
  - Authentication through Single sign-on from the service provider existing interface
  - Fully customizable to follow the look and feel of the service provider
- **Blocking page**
  - Simple UI to inform the user about the security incident
  - Fully customizable to follow the look and feel of the service provider
  - Optional Bypass button to allow the user to continue to the destination website
- **API integration**
  - Whalebone offers API to receive calls about subscribed and unsubscribed users
  - Whalebone is able to send API calls containing user alerts and reports