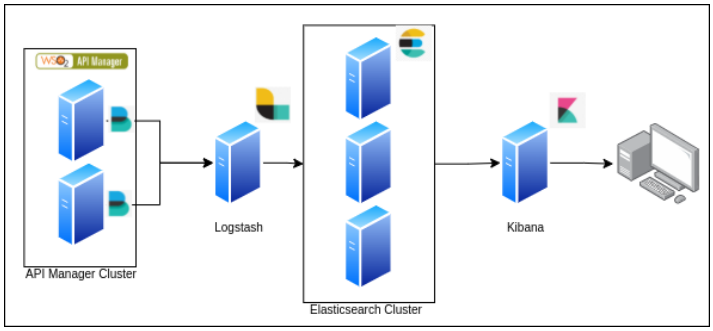
ELK Based Analytics Installation Guide

Update Level 90

This feature is available only as an update, after Update level 90 and further. For more information, see Updating WSO2 API Manager [https://apim.docs.wso2.com/en/4.0.0/administer/product-administration/updating-wso2-api-manager].



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/architecture.png]

Analytics Data flow

The new On-Premise Analytics solution for WSO2 API Manager will publish analytics data into a log file and that file will be used as the source for the analytics solution.

ELK based WSO2 API Manager On-Premise Analytics deployment architecture has 4 main components.

1. Filebeats
2. Logstash

3. Elasticsearch
4. Kibana

This section will cover the steps required to configure the WSO2 API-M and then publish it to an external ELK cluster.

Step 1 - Configuring API Manager

Step 1.1 - Configuring the deployment.toml file.

The Choreo based analytics will be enabled by default. Specify the `type` as `elk` to enable ELK analytics as shown below. Open the `wso2am-4.x.x/repository/conf` directory. Edit `apim.analytics` configurations in the `deployment.toml` file with the following configuration.

```
[apim.analytics]
enable = true
type = "elk"
```

Step 1.2 - Enabling Logs

Open the `wso2am-4.x.x/repository/conf` directory. To enable logging for a reporter, edit the `log4j2.properties` file following the instructions given below.

1. Add APIM_METRICS_APPENDER to the appenders list:

   ```
   appenders = APIM_METRICS_APPENDER, .... (list of other
   available appenders)
   ```

2. Add the following configuration after the appenders:

   ```
   appender.APIM_METRICS_APPENDER.type = RollingFile
   appender.APIM_METRICS_APPENDER.name =
   APIM_METRICS_APPENDER
   appender.APIM_METRICS_APPENDER.fileName =
   ```

```
${sys:carbon.home}/repository/logs/apim_metrics.log
   appender.APIM_METRICS_APPENDER.filePattern =
${sys:carbon.home}/repository/logs/apim_metrics-%d{MM-dd-
yyyy}-%i.log
   appender.APIM_METRICS_APPENDER.layout.type =
PatternLayout
   appender.APIM_METRICS_APPENDER.layout.pattern =
%d{HH:mm:ss,SSS} [%X{ip}-%X{host}] [%t] %5p %c{1} %m%n
   appender.APIM_METRICS_APPENDER.policies.type =
Policies
   appender.APIM_METRICS_APPENDER.policies.time.type =
TimeBasedTriggeringPolicy
   appender.APIM_METRICS_APPENDER.policies.time.interval
= 1
   appender.APIM_METRICS_APPENDER.policies.time.modulate
= true
   appender.APIM_METRICS_APPENDER.policies.size.type =
SizeBasedTriggeringPolicy

appender.APIM_METRICS_APPENDER.policies.size.size=1000MB
   appender.APIM_METRICS_APPENDER.strategy.type =
DefaultRolloverStrategy
   appender.APIM_METRICS_APPENDER.strategy.max = 10
```

3. Add a reporter to the loggers list:

```
loggers = reporter, ...(list of other available
loggers)
```

4. Add the following configurations after the loggers:

```
logger.reporter.name =
org.wso2.am.analytics.publisher.reporter.elk
logger.reporter.level = INFO
logger.reporter.additivity = false
logger.reporter.appenderRef.APIM_METRICS_APPENDER.ref =
APIM_METRICS_APPENDER
```

Note

The `apim_metrics.log` file be rolled each day or when the log size reaches the limit of 1000 MB by default. Furthermore, only 10 revisions will be kept and older revisions will be deleted automatically. You can change these configurations by updating the configurations provided in step 2 given above in this. section.

Step 2 - Configuring ELK

Installing Elasticsearch

1. Install Elasticsearch [https://www.elastic.co/guide/en/elastic-stack-get-started/current/get-started-elastic-stack.html#install-elasticsearch] according to your operating system.
2. Make sure Elasticsearch is up and running [https://www.elastic.co/guide/en/elastic-stack-get-started/current/get-started-elastic-stack.html#_make_sure_that_elasticsearch_is_up_and_running].

Info

As recommended by ELK, a minimum 3 node cluster is required for a production environment.

Installing Filebeat

1. Install Filebeat [https://www.elastic.co/guide/en/beats/filebeat/current/filebeat-installation-configuration.html#installation] according to your operating system.
2. Configure **Filebeats** to read the log file in the `repository/logs` folder.

```
filebeat.inputs:
-   type: log
    enabled: true
    paths:
        - {apim_home}/repository/logs/apim_metrics.log
    include_lines: ['(apimMetrics):']
output.logstash:
```

```
# The Logstash hosts
     hosts: ["{LOGSTASH_URL}:5044"]
```

Installing Logstash

1. Install Logstash [https://www.elastic.co/guide/en/logstash/current/installing-logstash.html] according to your operating system.

```
input {
    beats {
        port => 5044
    }
}

filter {
    grok {
        match => ["message", "%{GREEDYDATA:UNWANTED}\
apimMetrics:%{GREEDYDATA:apimMetrics}\, %
{GREEDYDATA:UNWANTED} \:%{GREEDYDATA:properties}"]
    }
    json {
        source => "properties"
    }
}
output {
    if [apimMetrics] == " apim:response" {
        elasticsearch {
            hosts => ["http://{ELK_URL}:9200"]
            index => "apim_event_response"
            user => "elastic"
            password => "Admin1234"
        }
    } else if [apimMetrics] == " apim:faulty" {
        elasticsearch {
            hosts => ["http://{ELK_URL}:9200"]
            index => "apim_event_faulty"
            user => "elastic"
            password => "Admin1234"
        }
    }
}
```

Installing Kibana

1. Install Kibana [https://www.elastic.co/guide/en/elastic-stack-get-started/current/get-started-elastic-stack.html#install-kibana] according to your operating system.
2. Launch [https://www.elastic.co/guide/en/elastic-stack-get-started/current/get-started-elastic-stack.html#_access_the_kibana_web_interface] the Kibana web interface.
3. Log in to the Kibana dashboards.
4. Navigate to Stack Management > index pattern. If you already have any index patterns created under the following names, delete them before importing the saved artifacts.

```
apim_event*
apim_event_faulty
apim_event_response
```

5. Download the artifact file here [https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/export.ndjson].
6. Navigate to **Stack Management** > **Saved Object** and click on **Import**. Add the downloaded artifact file as an import object, and import

> **Info**
>
> Follow the recommendations of Elastic in order to optimize the performance of the system.

Step 3 - Configure Security in ELK

Elastic search supports several authentication modes [https://www.elastic.co/guide/en/kibana/current/kibana-authentication.html#basic-authentication] ranging from basic authentication to Single sign-on with several identity providers.

In this section, we mainly focus on configuring single-sign-on with WSO2 API Manager via OpenID Connect. If you are looking for other supported authentication providers, refer the ElasticSearch documentation [https://www.elastic.co/guide/en/kibana/current/kibana-authentication.html#basic-authentication].

> **Info**
>
> Note that you can either configure Basic Authentication or SSO with OpenID Connect.

Configure Basic Authentication

ElasticSearch supports basic authentication via an internal user store. If you need to set up basic authentication in ElasticSearch and Kibana, refer the ElasticSearch documentation [https://www.elastic.co/guide/en/elasticsearch/reference/7.17/security-minimal-setup.html].

Configure Single-Sign-On with WSO2 API Manager via OpenID Connect

ElasticSearch/Kibana deployment can be configured to enable Single-sign-on with WSO2 API Manager via OpenID Connect. To set up SSO with WSO2 API Manager, follow the steps given below.

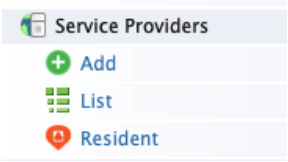
> **Prerequisite**
>
> To enable Single-sign-on security features in ELK, an ElasticSearch Platinum subscription [https://www.elastic.co/subscriptions] is required.

CONFIGURE A SERVICE PROVIDER AT WSO2 API MANAGER

To enable SSO with WSO2 API Manager, a service provider needs to be created. Follow the steps given below to create a service provider.

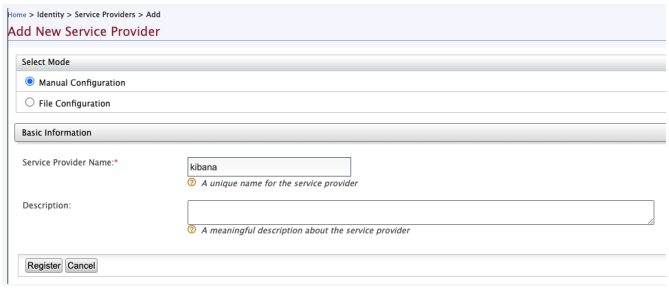
1. Login to the WSO2 API Manager management console via `https://<API-M_HOST>:9443/carbon`.

2. From the **Main**, click **Add** under the **Service Providers** section.



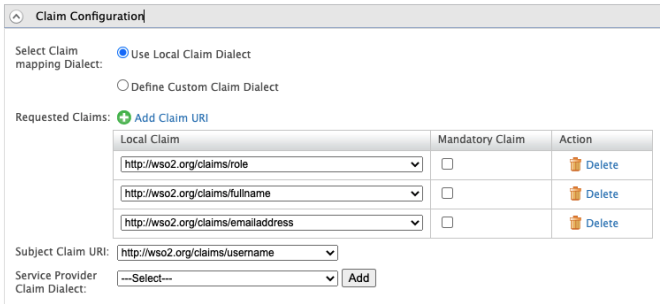
[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/service-providers.png]

3. In the **Add New Service Provider** page, create a new service provider by providing the service provider name (e.g.,kibana).



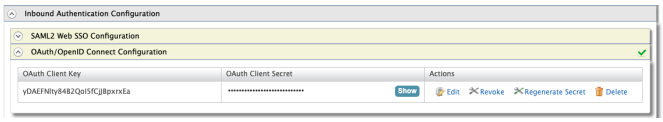
[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/add-new-sp.png]

4. Once the service provider is created, go to the service provider, expand the **Claim Configuration** section. Configure the claims as shown in the image below and click **Update**.



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/claim-config.png]

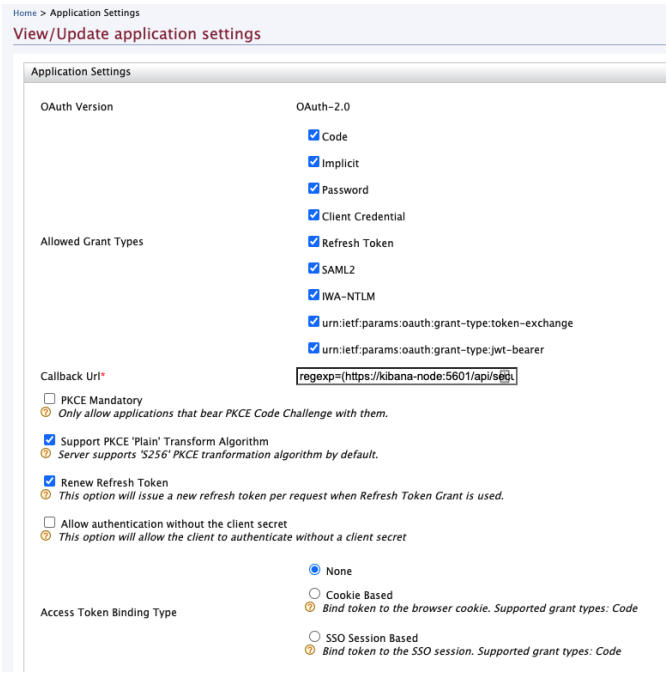
5. Expand the **Inbound Authentication Configuration** section, then **OAuth/OpenID Connect Configuration** and click **Edit**.



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/inbound-auth-config.png]

6. In the **View/Update Application Settings** page, set the `callback URL` as follows.

```
regexp=
(https://kibana.example.com:5601/api/security/oidc/callback|https://kibana.example.com:5601/security/logged_out)
```



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/update-settings.png]

7. Click **Update** to save your changes.

CONFIGURE OIDC REALM IN ELASTIC SEARCH

To configure single sign-on to the Elastic Stack using OpenID connect, follow the steps given here [https://www.elastic.co/guide/en/elasticsearch/reference/7.16/oidc-guide.html].

A sample OpenID connect realm is as follows.

OpenID Connect realm configurations

```
xpack.security.authc.realms.oidc.oidc1:
 order: 2
 rp.client_id: "&lt;CLIENT_ID>"
 rp.response_type: code
 rp.redirect_uri:
"https://kibana.example.com:5601/api/security/oidc/callbac
k"
 op.issuer: "https://apim.example.com:9443/oauth2/token"
 op.authorization_endpoint:
"https://apim.example.com:9443/oauth2/authorize"
 op.token_endpoint:
"https://apim.example.com:9443/oauth2/token"
 op.jwkset_path:
"https://apim.example.com:9443/oauth2/jwks"
 op.endsession_endpoint:
"https://apim.example.com:9443/oidc/logout"
 rp.post_logout_redirect_uri:
"https://kibana.example.com:5601/security/logged_out"
 claims.principal: sub
 claims.groups: groups
 ssl.verification_mode: none
 claims.name: name
 claims.mail: email
```

CONFIGURE ROLE MAPPING FOR KIBANA DASHBOARD

Once the above steps are completed, role mapping needs to be configured in Kibana to allow WSO2 API Manager users to access the dashboards in Kibana. For that follow the steps mentioned below.

Create Users and Roles in WSO2 API Manager

1. Login to WSO2 API Manager management console via `https://<API-M_HOST>:9443/carbon`.
2. From the **Main** menu in the left panel, click **Add** under the **Users and Roles** section.

[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/main-menu.png]

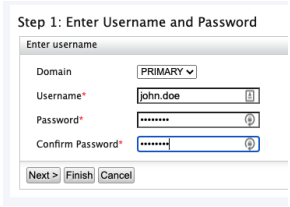
3. In **Add Users and Roles**, click **Add new role**.

[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/add-new-role.png]

4. Create a new role (e.g., `AnalyticsViewer`) and click **Finish**.

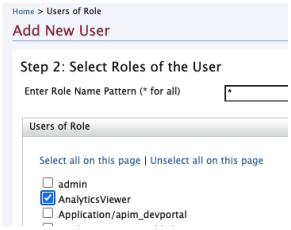
[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/add-new-role.png]

5. In **Add Users and Roles**, click **Add new user**.
6. Create a new user and click the **Next**.



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/add-new-user.png]

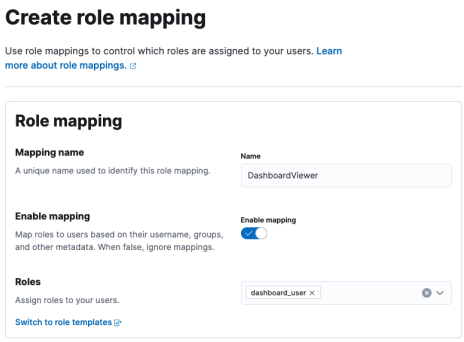
7. In the “Step 2: Select Roles of the User” page select the previously created role and click “Finish”.



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/select-user-role.png]

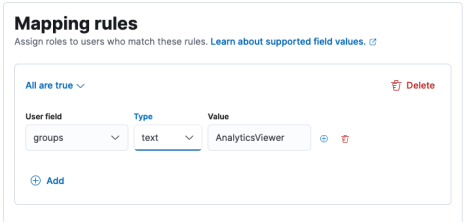
Create role mapping

1. Login to Kibana using basic authentication and go to **Stack Management** under the **Management** section in the left menu. Click **Role Mappings** under the **Security** section.
2. In the **Create Role Mapping** section, add a new role mapping by providing a **Mapping name**.
3. Select a role that has access to the particular dashboard from the **Roles**.



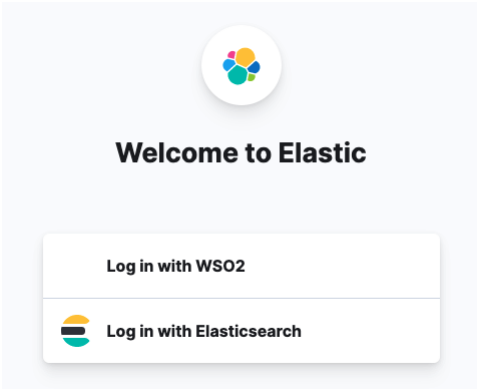
[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/create-role-mapping.png]

4. Under **Mapping Rules** select **groups** as the user field and name of the previously-created role as the value and click **Add**.



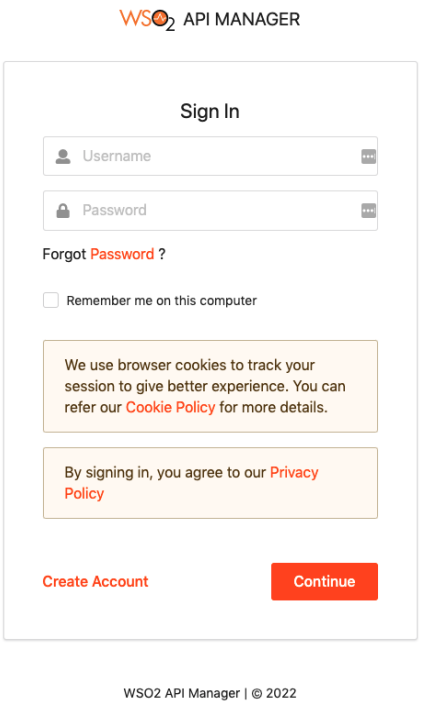
[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/mapping-rules.png]

5. Logout from the Kibana and re-login by selecting the **Log in with WSO2** option.



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/login-elastic.png]

6. This will navigate to the WSO2 API Manager login page. Try login with the previously created user credentials.



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/login-apim.png]

CONFIGURE SSL/TLS TO SECURE ELASTICSEARCH, KIBANA, BEATS, AND LOGSTASH

For more information regarding configuring SSL/TLS to secure ElasticSearch, Kibana, Beats, and Logstash follow the steps mentioned

in this article [https://www.elastic.co/blog/configuring-ssl-tls-and-https-to-secure-elasticsearch-kibana-beats-and-logstash].

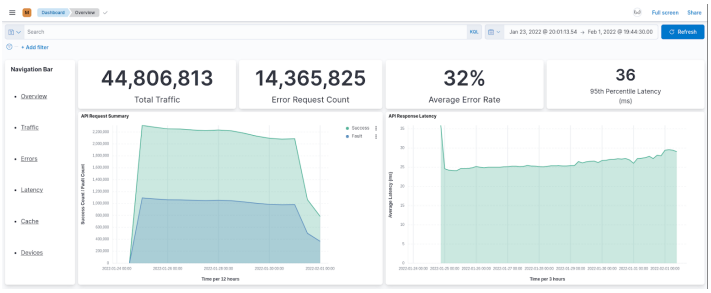
Dashboards

Analyzing statistics

Once you have set up the Kibana dashboards, you can access the following dashboards.

OVERVIEW

The Overview page gives you a quick overview of the performance of the system. It can be used as a dashboard to view the current system status.



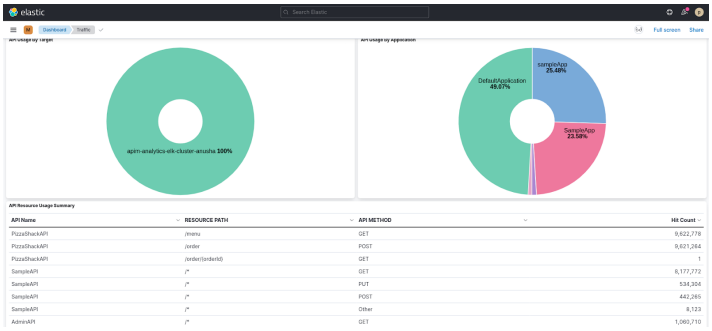
[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/overview.png]

TRAFFIC

The Traffic page shows information related to the traffic that goes through your API management deployments. This includes API usage, application usage, resource usage, etc. You can use this page to investigate the usage of APIs and applications, traffic patterns, etc.

[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/tr

affic1.png]



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/traffic2.png]

ERRORS

The Errors page shows information related to erroneous API calls that are received by your system. The errors are categorized based on the error type. You can further drill down using the error subtypes. Use this page as the starting point for debugging any API errors.

[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/errors.png]

LATENCY ¶ [#LATENCY]

The Latency page shows information related to the latency of API calls within the API management deployment. You can view a summary of the slowest APIs and then drill down into the API view for further analysis. Use this page as a starting point to debug API slowness.

[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/latency1.png]

[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/latency2.png]

CACHE

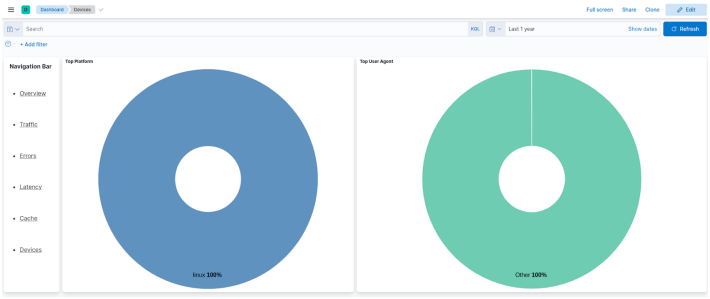
The Cache page shows statistics that indicate the efficiency with which response caching is carried out for the requests sent to your APIs.

[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/cache.png]

DEVICES

The Devices page displays information about operating systems and HTTP agents that end users use to invoke the APIs. You can use this

page to get an idea of the distribution of your user base and improve your APIs to match the audience.



[https://apim.docs.wso2.com/en/4.0.0/assets/img/analytics/cloud/devices.png]