




Cisco Expressway Metrics

Tech Note

August 2021

MUST READ

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Overview

This document covers the System Metrics feature and its use in Cisco Expressway. It explains how an admin of the Expressway can configure to push system metrics to the remote server. It also covers tools you can use to collect system metrics on the remote server and generate dashboards using them.

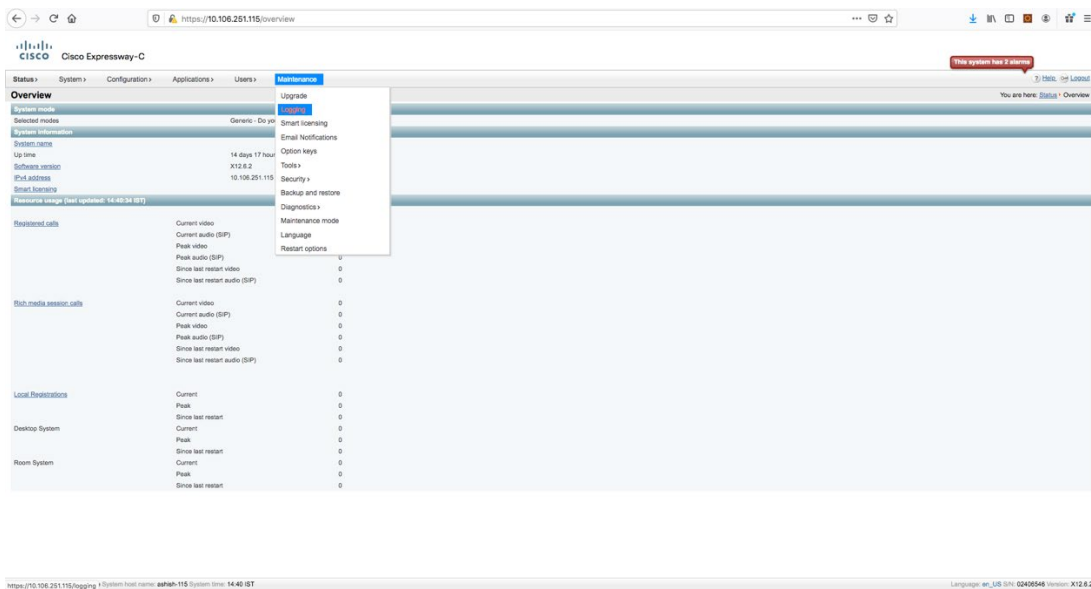
This document

- Visualizes a few system metrics
- Discusses select metrics among the numerous metrics that the Expressway server generates.
- Provides a few general guidelines about the ranges between which the Expressway server optimally operates. These metrics can be changed based on the usage of the Expressway box.
- Lists Metrics/graphs for initial/reference purposes. Administrators can create dashboards according to their convenience/requirements.

Enable Metrics Collection

Perform these steps to enable metrics collection on the Expressway box:

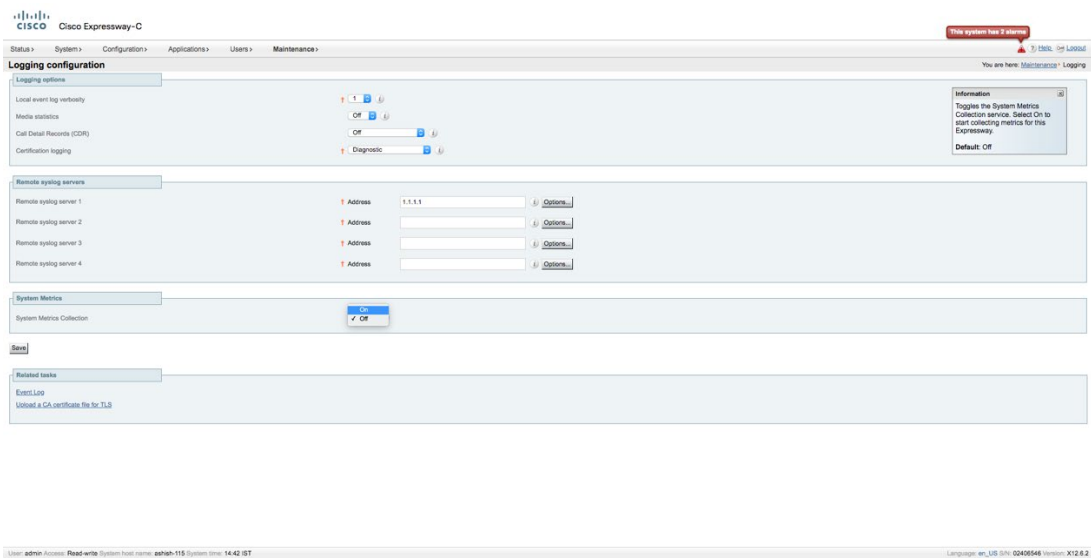
1. On the **Cisco Expressway-C Overview** window, click **Maintenance**. Choose **Logging** from the drop-down list.



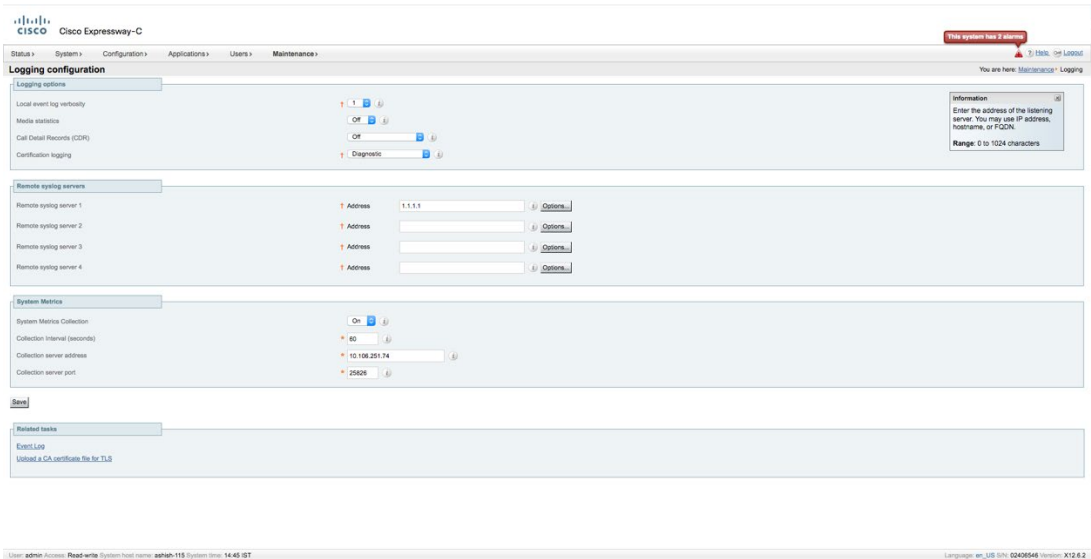
The **Logging Configuration** window appears.

Enable Metrics Collection

- On the **Logging Configuration** window, under the **System Metrics** section, turn **On System Metrics Collection**.



- Add the **IP Address/FQDN/Hostname** and **PORT** for the Collection server designated to collect data (Graphite/Collectd Server).



- Click the **Save** button.

Note: The System metrics configuration is a cluster wide configuration. Configuring system metrics on one box in a cluster applies it across all the nodes in the cluster.

Installation of the Graphite Server on Ubuntu

To install and configure the Graphite server on Ubuntu, proceed as follows:

1. Execute this command to update your system to the latest stable version:

```
sudo apt-get update -y
sudo apt-get upgrade -y
sudo reboot
```

2. Install Graphite. Graphite has several components including, the graphite web application, carbon storage backend, and the database library, whisper. Each of these components is available in the Ubuntu default repository. Execute the following command to install these:

```
sudo apt-get install graphite-web graphite-carbon -y
```

3. Install and configure PostgreSQL. The Graphite web application is a Django Python application that needs PostgreSQL to store its data. Execute this command to install PostgreSQL and the helper packages:

```
sudo apt-get install postgresql libpq-dev python3-psycopg2 -y
```

4. Create a PostgreSQL user and database for Graphite to use.

5. Login to PostgreSQL shell with the following command:

```
sudo -u postgres psql
```

6. Create a graphite user and secure it with a password:

```
postgres=# CREATE USER graphite WITH PASSWORD 'password';
```

7. Create a graphite database and provide ownership to the graphite user:

```
postgres=# CREATE DATABASE graphite WITH OWNER graphite;
```

8. Exit from the PostgreSQL shell:

```
postgres=# \q
```

9. Configure Graphite. Once the database is set up properly, configure the Graphite web application. Edit the **local_settings.py** file as shown below:

```
SECRET_KEY = 'your-secret-key'
TIME_ZONE = 'America/Los_Angeles'
USE_REMOTE_USER_AUTHENTICATION = True
DATABASES = {
    'default': {
        'NAME': 'graphite',
        'ENGINE': 'django.db.backends.postgresql_psycopg2',
```

Installation of the Graphite Server on Ubuntu

```

        'USER': 'graphite',
        'PASSWORD': 'password',
        'HOST': '127.0.0.1',
        'PORT': ''
    }
}

```

Save and close the file.

10. Execute the following command to sync the database to create the correct structure:

```
sudo sed -i 's/from cgi import parse_qs/from urllib.parse import parse_qs/' /usr/lib/python3/dist-packages/graphite/render/views.py
```

Next, execute the following command.

Command

```
vcadmin@metricsserv34:~$ sudo graphite-manage migrate auth
```

However, administrator may still see an error, 'ImportError: cannot import name 'parse_qs' from 'cgi'' when executing graphite-manage migrate auth command.

Error

Traceback (most recent call last):

```
File "/usr/bin/graphite-manage", line 15, in <module>
```

```
execute_from_command_line(sys.argv)
```

```
File "/usr/lib/python3/dist-packages/django/core/management/_init_.py", line 381, in execute_from_command_line
```

```
utility.execute()
```

```
utility.execute()
```

```
File "/usr/lib/python3/dist-packages/django/core/management/_init_.py", line 375, in execute
```

```
self.fetch_command(subcommand).run_from_argv(self.argv)
```

```
File "/usr/lib/python3/dist-packages/django/core/management/base.py", line 323, in run_from_argv
```

```
self.execute(*args, **cmd_options)
```

```
File "/usr/lib/python3/dist-packages/django/core/management/base.py", line 361, in execute
```

```
self.check()
```

```
File "/usr/lib/python3/dist-packages/django/core/management/base.py", line 387, in check
```

```
all_issues = self._run_checks()
```

```
File "/usr/lib/python3/dist-packages/django/core/management/commands/migrate.py", line 65, in _run_checks
```

```
issues.extend(super()._run_checks(**kwargs))
```

```
issues.extend(super()._run_checks(**kwargs))
```

```
File "/usr/lib/python3/dist-packages/django/core/management/base.py", line 377, in _run_checks
```


Installation of the Graphite Server on Ubuntu

```
return checks.run_checks(**kwargs)
File "/usr/lib/python3/dist-packages/django/core/checks/registry.py", line 72, in run_checks
new_errors = check(app_configs=app_configs)
File "/usr/lib/python3/dist-packages/django/core/checks/urls.py", line 40, in
check_url_namespaces_unique
all_namespaces = _load_all_namespaces(resolver)
File "/usr/lib/python3/dist-packages/django/core/checks/urls.py", line 57, in _load_all_namespaces
url_patterns = getattr(resolver, 'url_patterns', [])
File "/usr/lib/python3/dist-packages/django/utils/functional.py", line 80, in _get_
res = instance._dict_[self.name] = self.func(instance)
File "/usr/lib/python3/dist-packages/django/urls/resolvers.py", line 584, in url_patterns
patterns = getattr(self.urlconf_module, "urlpatterns", self.urlconf_module)
File "/usr/lib/python3/dist-packages/django/utils/functional.py", line 80, in _get_
res = instance._dict_[self.name] = self.func(instance)
File "/usr/lib/python3/dist-packages/django/urls/resolvers.py", line 577, in urlconf_module
return import_module(self.urlconf_name)
File "/usr/lib/python3.8/importlib/_init_.py", line 127, in import_module
return _bootstrap._gcd_import(name[level:], package, level)
File "<frozen importlib._bootstrap>", line 1014, in _gcd_import
File "<frozen importlib._bootstrap>", line 991, in _find_and_load
File "<frozen importlib._bootstrap>", line 975, in _find_and_load_unlocked
File "<frozen importlib._bootstrap>", line 671, in _load_unlocked
File "<frozen importlib._bootstrap_external>", line 848, in exec_module
File "<frozen importlib._bootstrap>", line 219, in _call_with_frames_removed
File "/usr/lib/python3/dist-packages/graphite/urls.py", line 22, in <module>
url('^render', include('graphite.render.urls')),
File "/usr/lib/python3/dist-packages/django/urls/conf.py", line 34, in include
urlconf_module = import_module(urlconf_module)
File "/usr/lib/python3.8/importlib/_init_.py", line 127, in import_module
return _bootstrap._gcd_import(name[level:], package, level)
File "<frozen importlib._bootstrap>", line 1014, in _gcd_import
File "<frozen importlib._bootstrap>", line 991, in _find_and_load
File "<frozen importlib._bootstrap>", line 975, in _find_and_load_unlocked
File "<frozen importlib._bootstrap>", line 671, in _load_unlocked
File "<frozen importlib._bootstrap_external>", line 848, in exec_module
File "<frozen importlib._bootstrap>", line 219, in _call_with_frames_removed
File "/usr/lib/python3/dist-packages/graphite/render/urls.py", line 16, in <module>
from . import views
File "/usr/lib/python3/dist-packages/graphite/render/views.py", line 23, in <module>
```

Installation of the Graphite Server on Ubuntu

```
from cgi import parse_qs
ImportError: cannot import name 'parse_qs' from 'cgi' (/usr/lib/python3.8/cgi.py)
```

As a workaround, execute the following command:

Command

```
sudo sed -i 's/from cgi import parse_qs/from urllib.parse import
parse_qs/' /usr/lib/python3/dist-packages/graphite/render/views.py
```

Again, execute the following command.

Command

```
vcadmin@metricsserv34:~$ sudo graphite-manage migrate auth
```

However, administrator may still see the following error.

Error

SystemCheckError: System check identified some issues:

ERRORS:

?: (admin.E406) 'django.contrib.messages' must be in INSTALLED_APPS in order to use the admin application.

As a workaround, execute the following command:

Command

```
sudo sed -i -E "s/('django.contrib.contenttypes')/\1,\n 'django.contrib.messages'/" /usr/lib/python3/dist-packages/graphite/app_settings.py
```

Then, execute the following command.

Command

```
vcadmin@metricsserv34:~$ sudo graphite-manage migrate
```

Operations to perform

Apply all migrations: account, admin, auth, contenttypes, dashboard, events, sessions, tagging, tags, url_shortener

Running migrations:

Applying account.0001_initial... OK

Applying admin.0001_initial... OK

Applying admin.0002_logentry_remove_auto_add... OK

Applying admin.0003_logentry_add_action_flag_choices... OK

Applying dashboard.0001_initial... OK

Installation of the Graphite Server on Ubuntu

```
Applying events.0001_initial... OK
```

```
Applying sessions.0001_initial... OK
```

```
Applying tagging.0001_initial... OK
```

```
Applying tagging.0002_on_delete... OK
```

```
Applying tags.0001_initial... OK
```

```
Applying url_shortener.0001_initial... OK
```

Execute the command to create a superuser account for the database.

Command

```
sudo graphite-manage createsuperuser
```

Output

```
You have installed Django's auth system, and don't have any superusers defined.
```

```
Would you like to create one now? (yes/no): yes
```

```
Username (leave blank to use 'root'):
```

```
Email address: you@example.com
```

```
Password:
```

```
Password (again):
```

```
Superuser created successfully.
```

11. Edit the graphite-carbon service configuration file to configure Carbon - the Graphite storage backend.

```
sudo nano /etc/default/graphite-carbon
```

12. Change the file to enable carbon-cache to start on boot:

```
CARBON_CACHE_ENABLED=true
```

Save and close the file.

13. Open the Carbon configuration file:

```
sudo nano /etc/carbon/carbon.conf
```

Change the file as shown below to enable log rotation:

```
ENABLE_LOGROTATION = True
```

14. Save the file and configure storage schemas. Edit the storage schema file to tell Carbon how long to store values and the details it must capture:

```
sudo nano /etc/carbon/storage-schemas.conf
```

Add the following section at the end of the file:

```
[collectd]
```

Installation of the Graphite Server on Ubuntu

```
pattern = ^collectd.*  
retentions = 30s:1d,1m:7d,10m:1y
```

Save and close the file.

15. Define the way you want aggregation to occur in `storage-aggregation.conf`. Copy the example configuration file to the Carbon configuration directory:

```
sudo cp /usr/share/doc/graphite-carbon/examples/storage-aggregation.conf.example /etc/carbon/storage-aggregation.conf
```

16. Start the Carbon service with the following command:

```
sudo systemctl start carbon-cache
```

17. Configure Apache for Graphite. Install the Apache webserver to use the Graphite web interface with the following command:

```
sudo apt-get install apache2 libapache2-mod-wsgi -y
```

18. Copy the graphite example configuration file to Apache with the following command:

```
sudo cp /usr/share/graphite-web/apache2-graphite.conf  
/etc/apache2/sites-available/
```

Once the installation is complete, disable the default virtual host file and enable the graphite virtual host file with the following command:

```
sudo a2dissite 000-default  
sudo a2ensite apache2-graphite
```

19. Restart the Apache service to apply these changes:

```
sudo systemctl restart apache2
```

20. Allow port **80** through the UFW firewall to access the Graphite web interface. Execute these commands:

```
sudo ufw allow 80
```

21. Access the Graphite web interface. Open your web browser and type the URL <http://192.168.0.227>.

22. Provide your login credentials (your root username and password).

The **Graphite login** window appears.

23. Install Collectd module and utility.

Note: Without collectd module installation, graphite server will not work even if Expressway sends collectd data to it.

```
sudo apt-get install collectd collectd-utils -y
```

24. Modify the collectd configuration file (add following configuration).

```
sudo nano /etc/collectd/collectd.conf
```

25. Restart the collectd service.

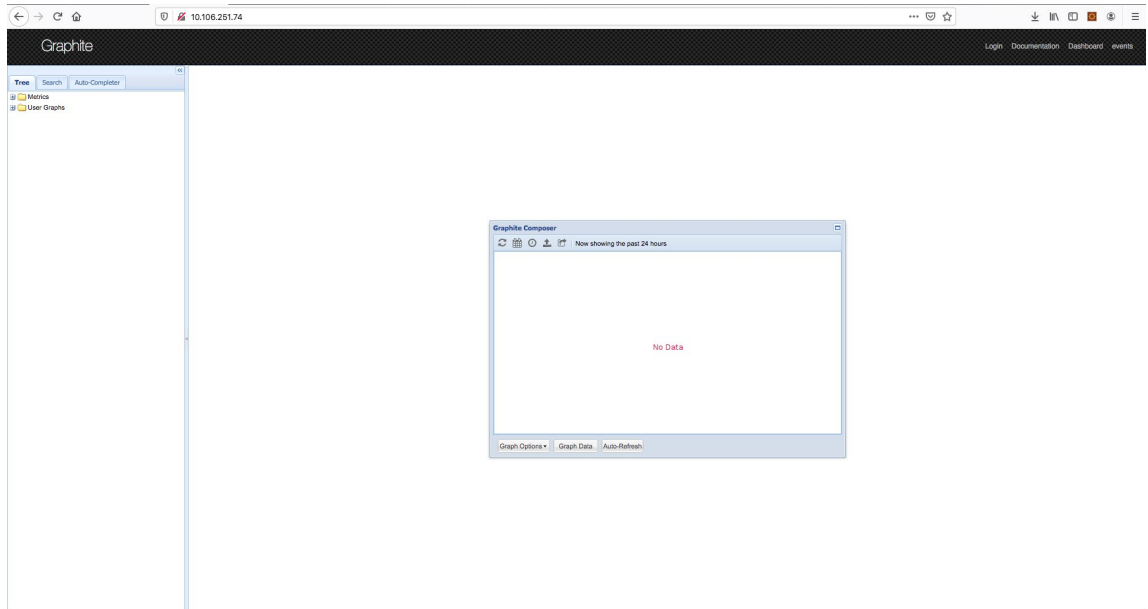
Installation of the Graphite Server on Ubuntu

```
sudo service collectd restart
```

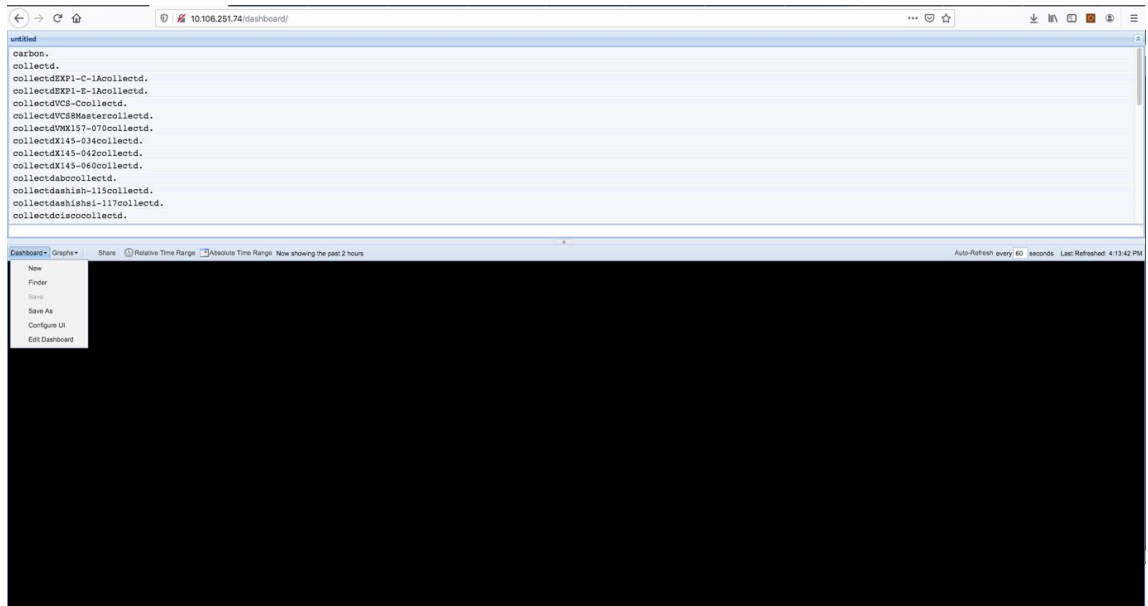
Note: The **step 23** to **step 25** enables you to install collectd module/utility and modify *collectd.configuration* file so that Graphite starts listening to metric data from Expressway.

Create a Dashboard in Graphite

1. Connect to the Graphite server. On the top-right corner, click on **Dashboard**.



2. Go to **Dashboard** -> **Edit Dashboard**.

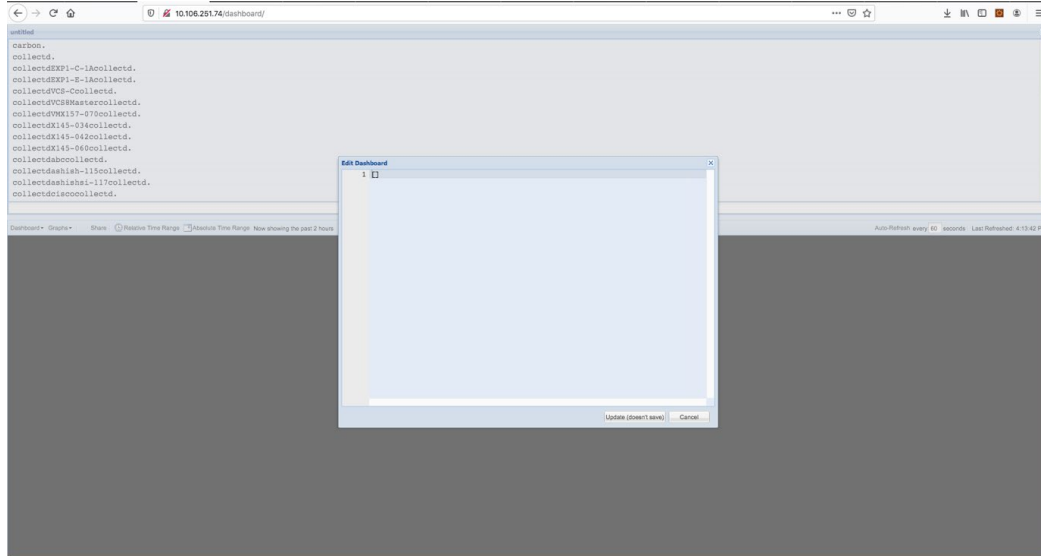


Note: collectd., collectExpressway, etc., will not be available on Dashboard until metric server receives at least one metric data from Expressway.

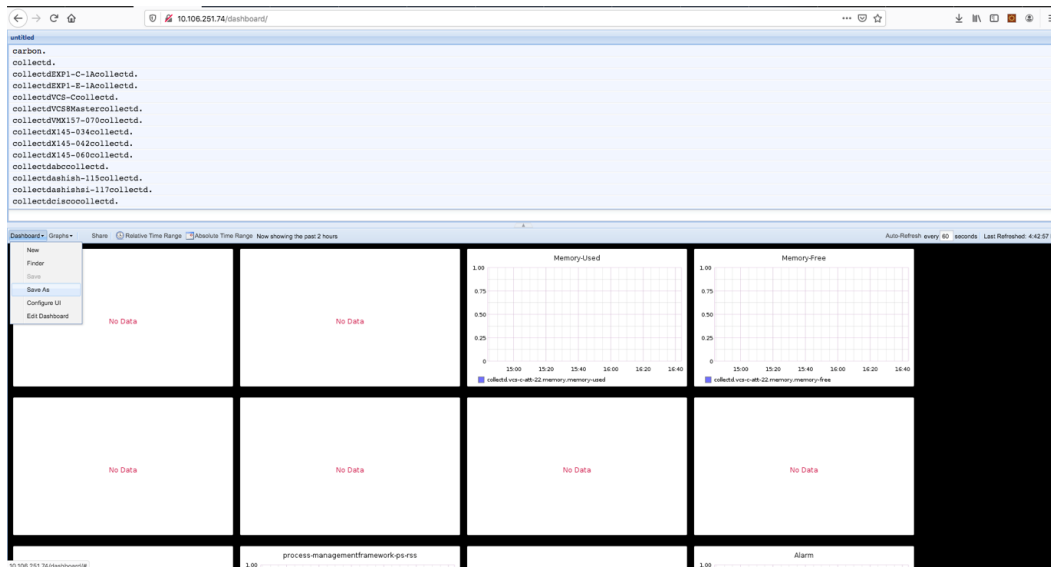
Cisco Expressway Metrics

Create a Dashboard in Graphite

- Update the given script from "[Cisco Expressway Metrics-Graphite Configuration-Sample.txt](#)" file attached, replace <Server-1> with the node-1 hostname of expressway, etc. if you do not have 6 nodes cluster, then remove the extra rows.
- Paste the modified script in the **Edit Dashboard**.



- Click **Update** (don't Save).
- Go to **Dashboard** -> **Save As** and provide the name to graph (like Exp-Metric).



- You can access this dashboard with this link [http<Graphite-Server>/dashboard/#Exp-Metric](http://<Graphite-Server>/dashboard/#Exp-Metric).

Installation of Grafana Server on Ubuntu

Follow this link to understand the requirements for executing Grafana on the Linux/Ubuntu system.

<https://grafana.com/docs/grafana/latest/installation/requirements/>

Follow this link to install the Grafana in the Ubuntu box. At the time of writing this document, Grafana version 7.4.5 is the latest. Select the Grafana installation based on your platform.

<https://grafana.com/grafana/download?platform=linux>

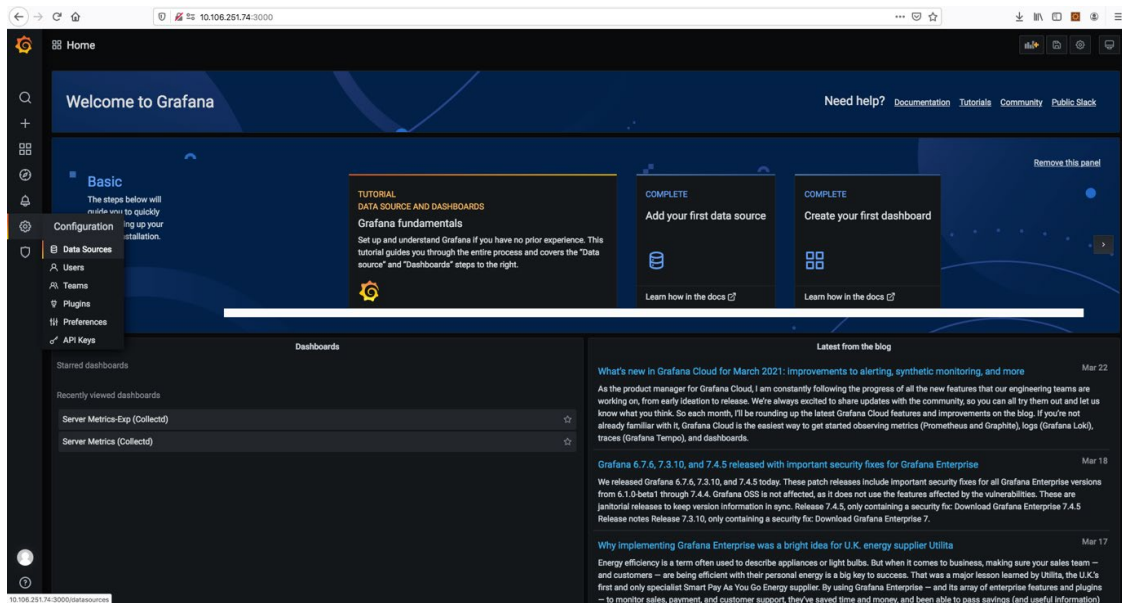
Use these commands for Linux/Ubuntu.

```
sudo apt-get install -y adduser libfontconfig1
wget https://dl.grafana.com/oss/release/grafana_7.4.5_amd64.deb
sudo dpkg -i grafana_7.4.5_amd64.deb
```

Configure and Import an Expressway Dashboard in Grafana

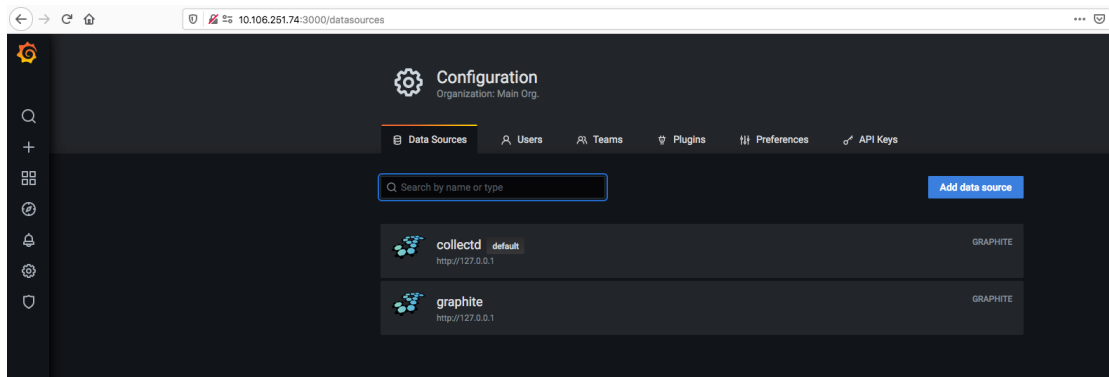
In Grafana, configure the data source first. Since we have created graphite in the above section, use graphite as the data source for the Grafana. Follow these steps to create the Graphite data source in Grafana.

1. Access your Grafana server with the following http://<server_ip>:3000.
2. Enter user id and password (default is *admin/admin*).
3. Go to **Settings** -> **DataSources**.

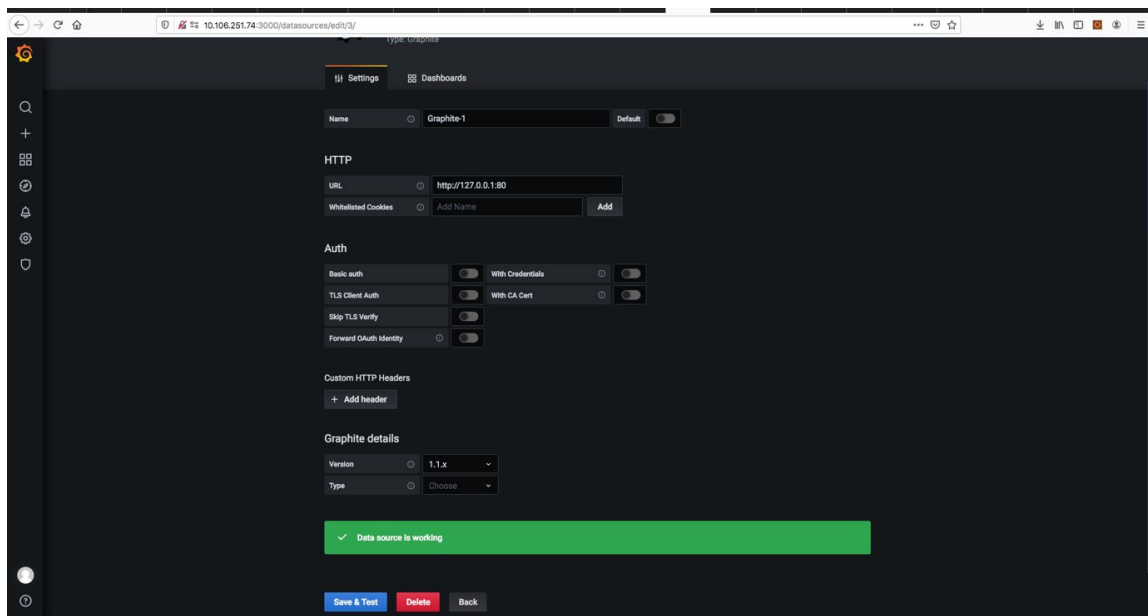


4. Add data source.

Installation of Grafana Server on Ubuntu

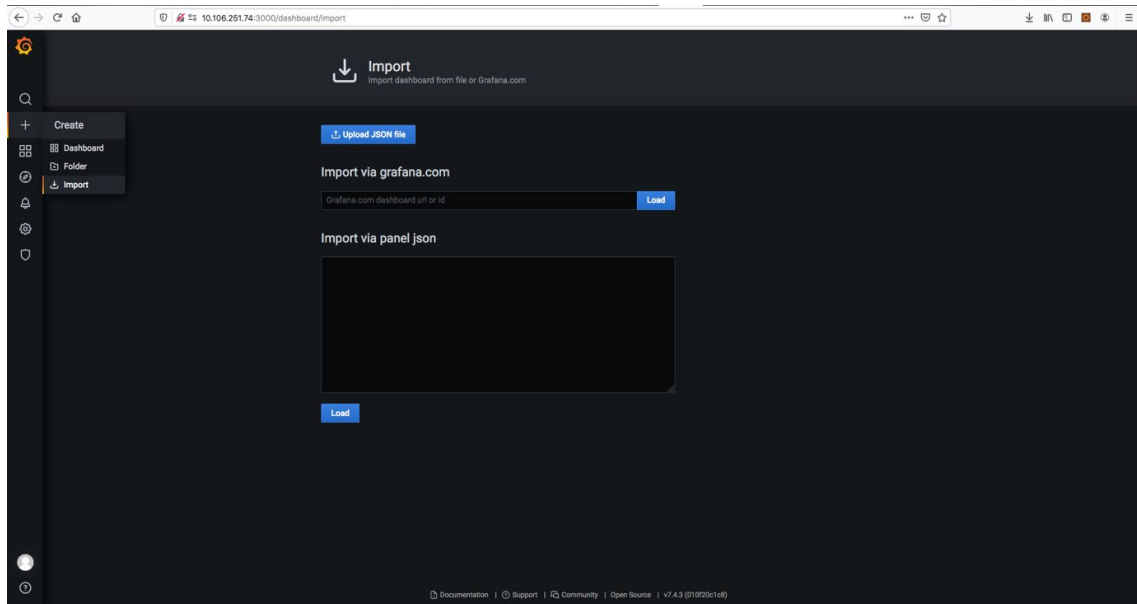


5. Select **Graphite** option.
6. Fill the required details
 - a. **Name** - <some_meaningfull name> (Make it default).
 - b. **URL** - it can be <http://127.0.0.1:80> (Assuming your graphite server is running in the same box).
 - c. Click **Save** and **Test**.



7. Import the file to create the dashboard.

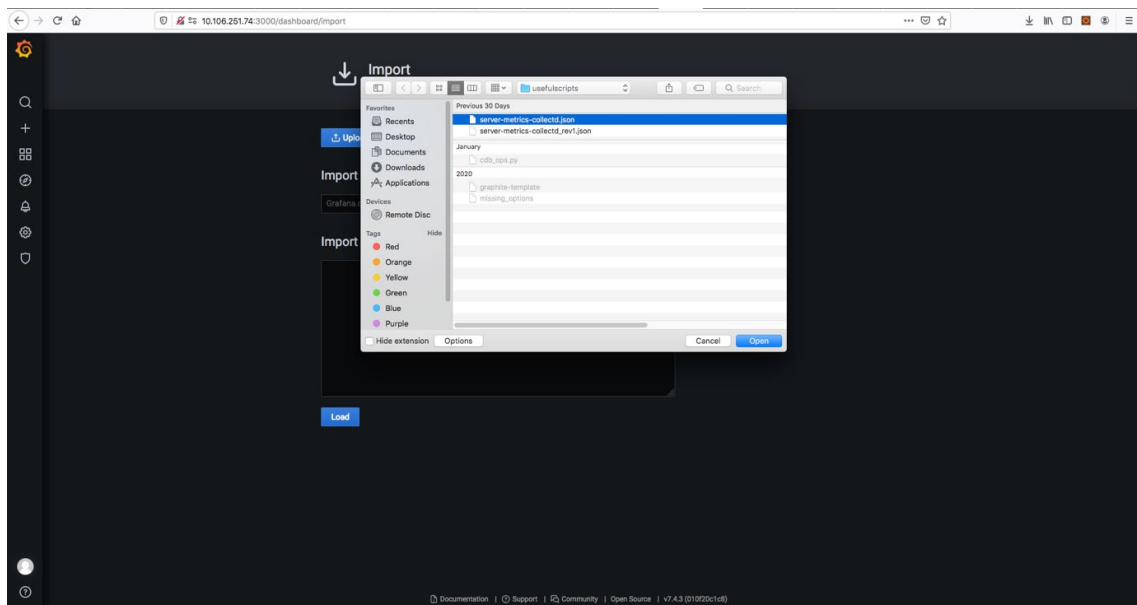
8. Choose **Create -> Import**.



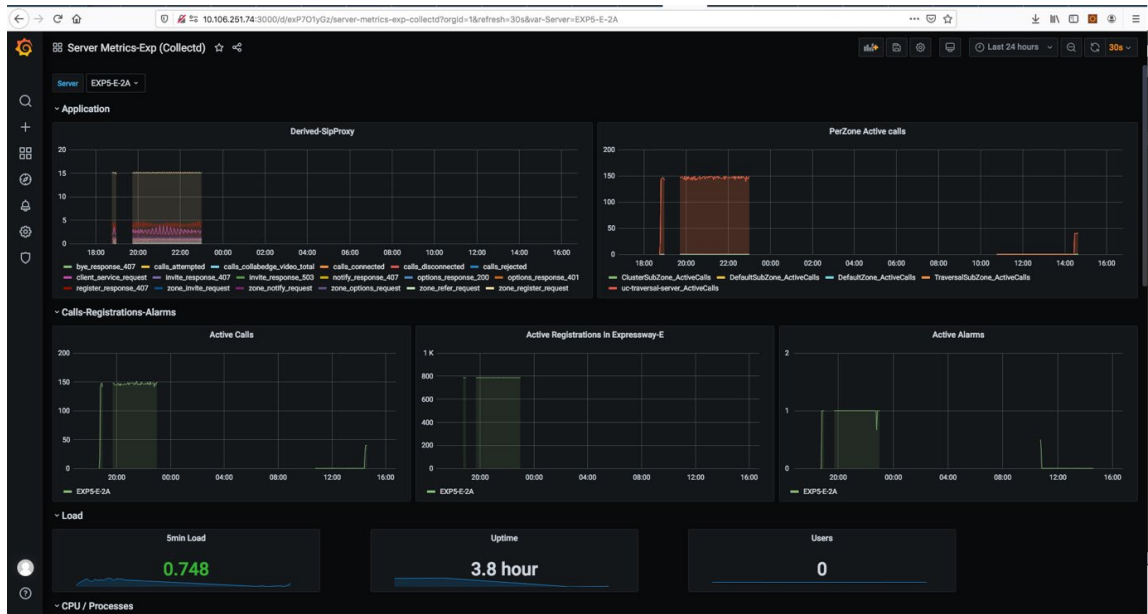
9. Click **Upload JSON file**.

10. Create a .json file with the contents in "[Cisco Expressway Metrics-Grafana Configuration.txt](#)" file attached.

11. Choose the created file.



12. The Dashboard is ready to view.



Important Metrics

- **Load Average:** Mid-term load average is a key parameter. Investigate the reason if the Mid-term load average is continuously increasing or its value is high. A high value for the Mid-term load average may indicate a high volume of continuous calls.
- **CPU Utilization:** CPU utilization is a measure of system performance. It is important to track User and System CPU utilization. The CPU utilization must not go beyond 70% (though a negligible spike is allowed).
- **Memory Utilization:** Memory utilization indicates the portion of system Memory, currently in use. The Administrators must monitor used memory, track and understand any variation in the memory utilization patterns. It is also important to identify reasons for memory utilization growing beyond 60% and take appropriate action.
- **Free DiskSpace:** Monitor Free disk space. Identify the reasons for any sudden drop of free disk space.
- **Calls, Alarms, Registrations:** These application-specific parameters provide reasons for higher CPU/Memory utilization.
 - **Calls** parameter indicates the number of active calls at any time in the given Expressway node.
 - **Alarm** parameters indicate the number of alarms raised in the system at any time. The Administrator must monitor any new alarm in the system and take appropriate action to lower/acknowledge the alarm.
 - **Registrations** apply to MRA registrations only. These apply to Expressway-E and indicate the number of active MRA registrations through the given Expressway-E.

References

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For configuration information, see the following attachments **Sample Graphite Configuration** and **Grafana Configuration** in the *Cisco Expressway Metrics* PDF document.

- Cisco Expressway Metrics - Graphite Configuration - Sample
Filename - Cisco_Expressway_Metrics-Graphite_Configuration-Sample.txt (Attached in the PDF)
- Cisco Expressway Metrics - Grafana Configuration
Filename - Cisco_Expressway_Metrics-Grafana_Configuration.txt (Attached in the PDF)