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Custom Application Deployment Instructions

Release date: Aug 31, 2021

Contents

Version: EN-20210831-YJ

1. Overview

Cassia's Bluetooth gateways E1000, X1000, X2000 and ATX2000 support edge computing which can improve response time, reduce cost of data transmission & cloud service, and improve reliability, security and scalability. The user can run custom applications in the gateway's container.

The container and APP share CPU, memory, and storage with the host gateway. Please check the table below for more information. When there is no APP installed, the container CPU usage is usually lower than 5%, the container memory usage is usually lower than 1%, and there is about 1.1 GB storage free (container uses about 1.2 GB).

Type	**S2000**	**E1000**	**X1000**	**X2000/ATX2000**
Support edge computing	No	Yes	Yes	Yes
Maximum memory can be used by container and APP	N/A	128 MB	128 MB	700 MB
Maximum CPU can be used by container and APP	N/A	2 cores, 1.5 GHz	2 cores, 1.5 GHz	2 cores, 1.5 GHz
Maximum storage can be used by container and APP	N/A	2.3 GB	2.3 GB	2.3 GB

The container version is v1.1.1. The container OS is Ubuntu 16.04.3 LTS. The Default password of container root user is "cassia". The ASP.NET core is not pre-installed.

Please download the container firmware from the link below:
https://www.cassianetworks.com/knowledge-base/router-gateway-firmware/

2. Pre-installed Utilities and Packages in Container v1.1.1

Name	**Container 1.1.1 Version**
BlueZ	5.37
Bluetoothd	5.37
Dbus	1.10.6
Python 2	2.7.12
Python 3	3.5.2
Python Pip	8.1.1
python-gobject	3.20.0
dbus	1.10.6

Name	Container 1.1.1 Version
python3-dbus	No
Node	6.11.5
Nodejs	4.2.6
NPM	3.10.10
node-gyp	6.11.5
noble	4.4.6
GCC	5.4.0
G++	5.4.0
curl	7.47.0
ASP.NET Core	No

3. Notes

<u>Container functions</u>

- Please remember to change the container’s SSH password upon the first login.
- Cassia’s gateway container uses a compact version of Ubuntu. Certain packages may not be pre-installed and/or available. Please see chapter 2 for information.
- Resetting the container will delete and re-create the container. The files under /opt will be kept. The custom APPs files not under /opt will be deleted.
- The user has SSH/root access to the Ubuntu container. However, Ubuntu is running as a container, so its core cannot be modified, and the properties of sysfs, e.g., /proc, is read-only.
- For security reasons, factory reset gateway will not impact the container, APP, and container files.
- From firmware 2.0.2, an option to enable and disable container local SSH login is added in the Container tab for security reasons. It is set to **OFF** by default. If you want to local SSH login the container, please turn it **ON**. Resetting the gateway will change this option into the default value **OFF**.

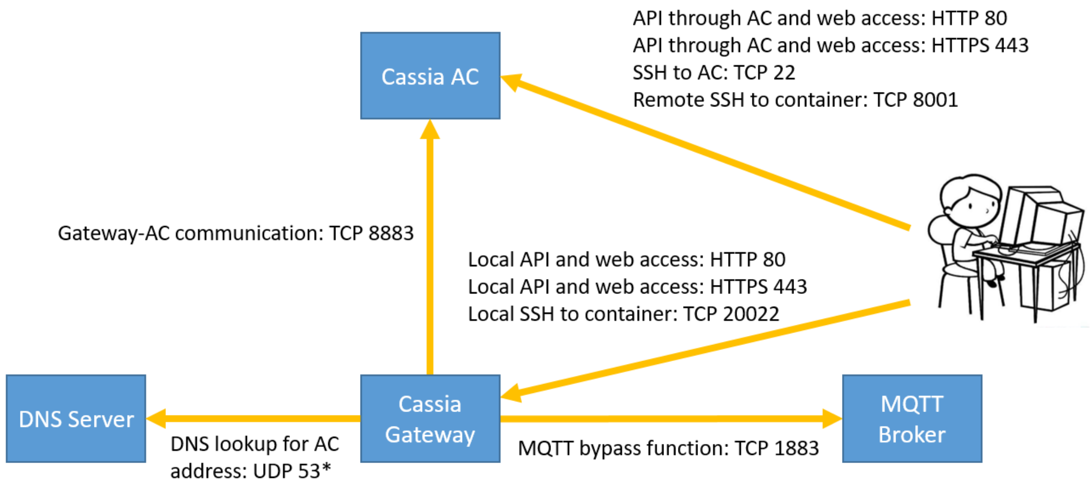
APP design

- Please implement APP log rotation to avoid flooding container storage. For the gateways with firmware versions below 1.4.3, if APP log floods gateway storage, the gateway may be offline and can't recover by a reboot. The user has to press the factory reset button to reset the gateway and then delete the container.
- It is suggested to keep the memory usage in the container below 70%. The other 30% is for peak hours and unusual cases.
- If the end user wants to upgrade an existing APP, please make sure that the name and/or version is different.
- Please consider compiling your APP code in a full development environment before loading and attempting to run in the container.
- Before firmware 2.0.3, when HTTPS is enabled on the gateway, the Cassia API URL used in the container APP should be updated to use port 443. From firmware 2.0.3, port 80 between container and gateway firmware is always enabled, so APP doesn't need to be updated regardless of the gateway's HTTPS settings.
- After upgrading gateway firmware to 2.0, if the APP uses BlueZ with Gatttool and Bluetoothd (e.g., noble or python Bluetooth lib) instead of Cassia Bluetooth stack and Cassia RESTful API, **please change 'Cassia Bluetooth Stack' to close** (in AC console -> Gateway -> Config-> Bluetooth Setting, or gateway console -> Other -> Bluetooth Setting). Otherwise, Bluetooth operations in the APP may return failure.

  Cassia's Bluetooth stack and Cassia's RESTful API offer state of the art Bluetooth scan and connection performance. It is highly recommended to keep the Cassia Bluetooth stack open and use Cassia's RESTful API to achieve the best performance Bluetooth IoT system.
- From firmware 2.0, the output of the RESTful API to obtain gateway configuration from AC will be changed (GET http://{your AC domain}/api/cassia/info?mac=<hubmac>). The container status will be removed from the default API output, to avoid the oversized UDP packets problem. The user can get container status separately by the same API with the additional parameter 'fields=container'. Please refer to SDK WIKI for details.
- From gateway firmware 2.0, DNS name server in Cassia Bluetooth gateway will be propagated into container /etc/resolv.conf. Besides two default DNS name servers 8.8.8.8 and 114.114.114.114, the container will use the DNS setting in the Network section of the gateway webpage Config tab as an additional DNS name server. This feature solves the problem that the firewall blocks two default DNS servers.

4. Network Requirements

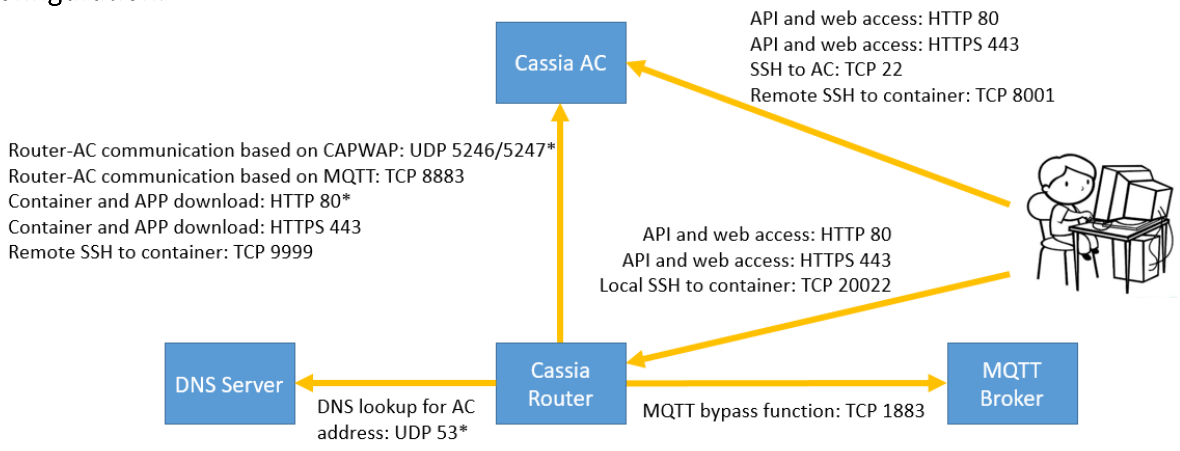
From v2.1.1, for the gateways that use MQTT to communicate with AC (default setting), the following ports are used and required for firewall configuration. TCP ports 80, 443 and 9999 are not required anymore.


API through AC and web access: HTTP 80
API through AC and web access: HTTPS 443
SSH to AC: TCP 22
Remote SSH to container: TCP 8001
Cassia AC
Gateway-AC communication: TCP 8883
Local API and web access: HTTP 80
Local API and web access: HTTPS 443
Local SSH to container: TCP 20022
DNS Server
DNS lookup for AC address: UDP 53*
Cassia Gateway
MQTT bypass function: TCP 1883
MQTT Broker

Please make sure the following ports are opened outbound on the gateway side firewall.

Type	Port	M/O	Description
TCP	8883	Mandatory	Gateway-AC communication
UDP	53	Mandatory*	DNS lookup for AC address. *Optional if internal DNS is specified in gateway network configuration
TCP	1883	Optional	For MQTT bypass function only

For the gateways that use CAPWAP to communicate with AC or the gateways using firmware below v2.1.1, the following ports may be used and required for firewall configuration.


API and web access: HTTP 80
API and web access: HTTPS 443
SSH to AC: TCP 22
Remote SSH to container: TCP 8001
Cassia AC
Router-AC communication based on CAPWAP: UDP 5246/5247*
Router-AC communication based on MQTT: TCP 8883
Container and APP download: HTTP 80*
Container and APP download: HTTPS 443
Remote SSH to container: TCP 9999
API and web access: HTTP 80
API and web access: HTTPS 443
Local SSH to container: TCP 20022
DNS Server
DNS lookup for AC address: UDP 53*
Cassia Router
MQTT bypass function: TCP 1883
MQTT Broker

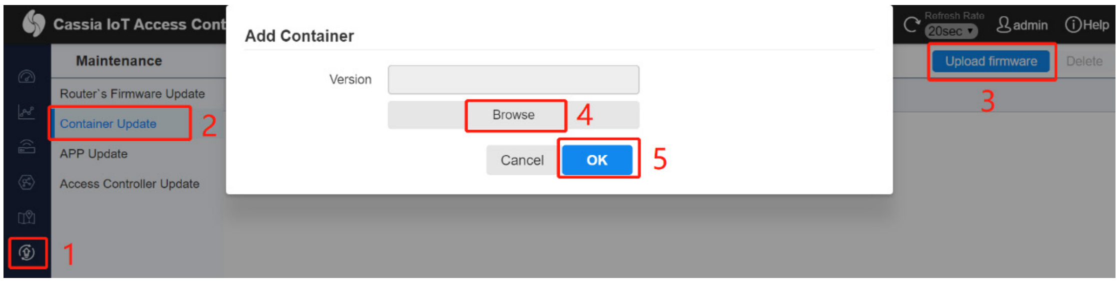
Please make sure the following ports are opened outbound on the gateway side firewall. The user can check if a TCP port is opened by using Netcat in gateway's local console.

Type	Port	M/O	Description
UDP	5246, 5247*	Mandatory	Gateway-AC communication based on CAPWAP. *Port 5246 and 5246 can be disabled after migrating gateway-AC communication to MQTT
TCP	8883		Gateway-AC communication based on MQTT (recommended from firmware v2.0.2)
HTTP	80*	Mandatory	Container and APP download from AC based on HTTP. *HTTP port 80 can be disabled if HTTPS is enabled
HTTPS	443		Container and APP download from AC based on HTTPS
UDP	53	Mandatory*	DNS lookup for AC address. *Optional if internal DNS is specified in gateway network configuration
TCP	9999	Mandatory	Remote SSH to container (laptop->8001->AC<-9999<-container)
TCP	1883	Optional	For MQTT bypass function only

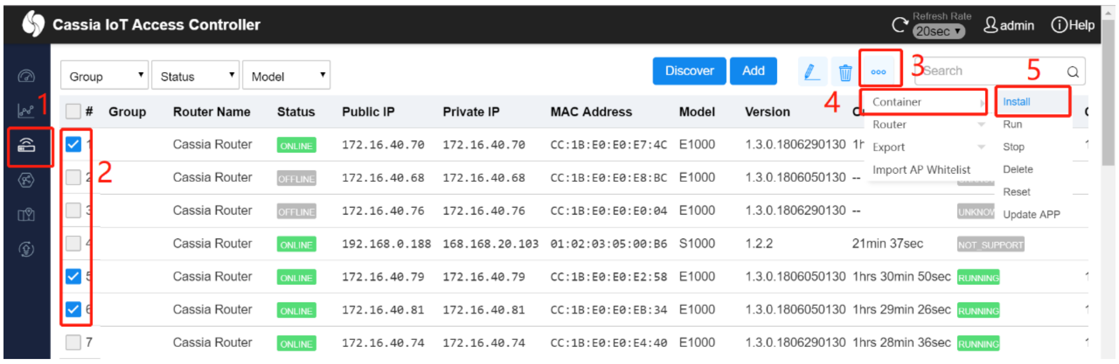
5. Install Container

5.1. Install Container via AC Console

First, please follow the steps on the AC to upload container software to AC: Maintenance->Container Update->Upload->Browse->OK.

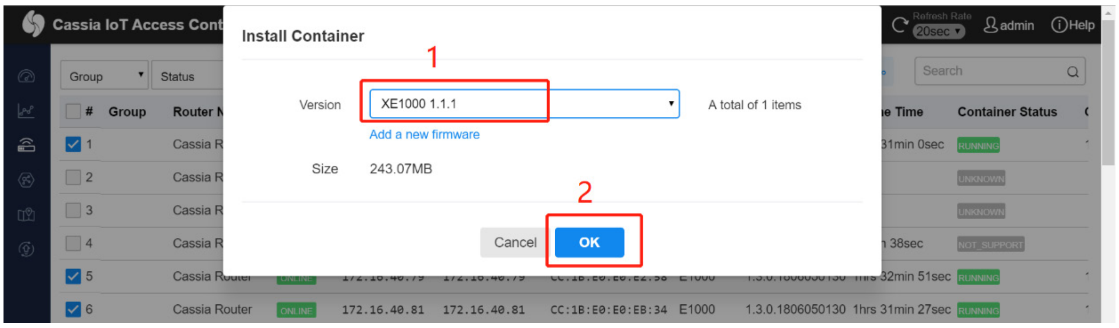


Second, please follow the steps on the AC console to install a container to a batch of gateways: Gateways->select the gateways that need to install Container->More->Container->Install.



	#	Group	Router Name	Status	Public IP	Private IP	MAC Address	Model	Version	C	
✓	1		Cassia Router	ONLINE	172.16.40.70	172.16.40.70	CC:1B:E0:E0:E7:4C	E1000	1.3.0.1806290130	1h	
	2		Cassia Router	OFFLINE	172.16.40.68	172.16.40.68	CC:1B:E0:E0:E8:BC	E1000	1.3.0.1806050130	--	
	3		Cassia Router	OFFLINE	172.16.40.76	172.16.40.76	CC:1B:E0:E0:E0:04	E1000	1.3.0.1806290130	--	UNKNOW
	4		Cassia Router	ONLINE	192.168.0.188	168.168.20.103	01:02:03:05:00:B6	S1000	1.2.2	21min 37sec	NOT_SUPPORT
✓	5		Cassia Router	ONLINE	172.16.40.79	172.16.40.79	CC:1B:E0:E0:E2:58	E1000	1.3.0.1806050130	1hrs 30min 50sec	RUNNING
✓	6		Cassia Router	ONLINE	172.16.40.81	172.16.40.81	CC:1B:E0:E0:EB:34	E1000	1.3.0.1806050130	1hrs 29min 26sec	RUNNING
	7		Cassia Router	ONLINE	172.16.40.74	172.16.40.74	CC:1B:E0:E0:E4:40	E1000	1.3.0.1806290130	1hrs 28min 36sec	RUNNING

Please select the right container version and click the OK button.

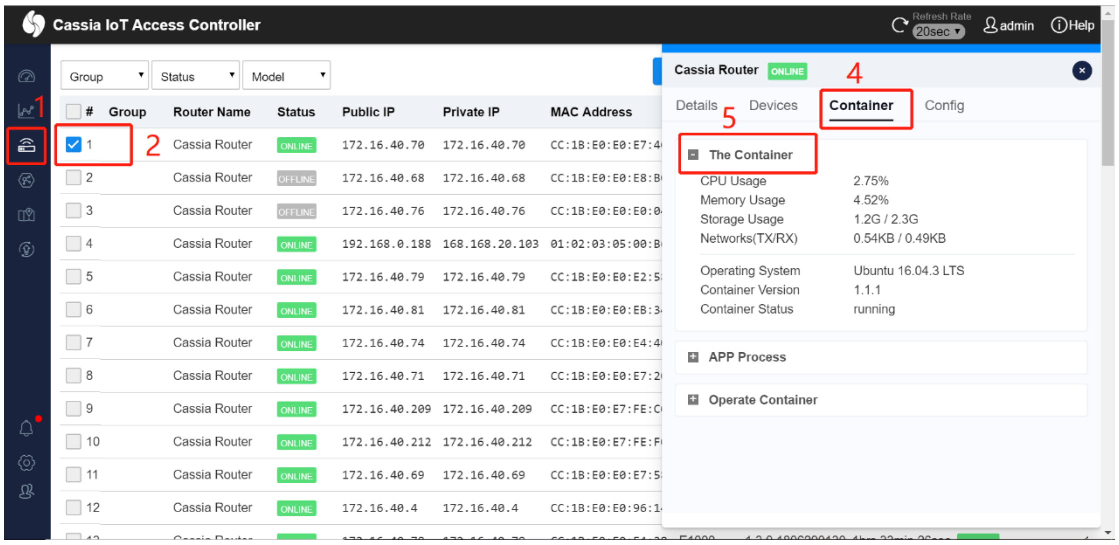


Install Container

Version	XE1000 1.1.1
	Add a new firmware
Size	243.07MB

A total of 1 items

The end user can check container information and status from AC. Please follow below steps on AC console: Gateways ->select the gateway ->Edit->Container->The Container.



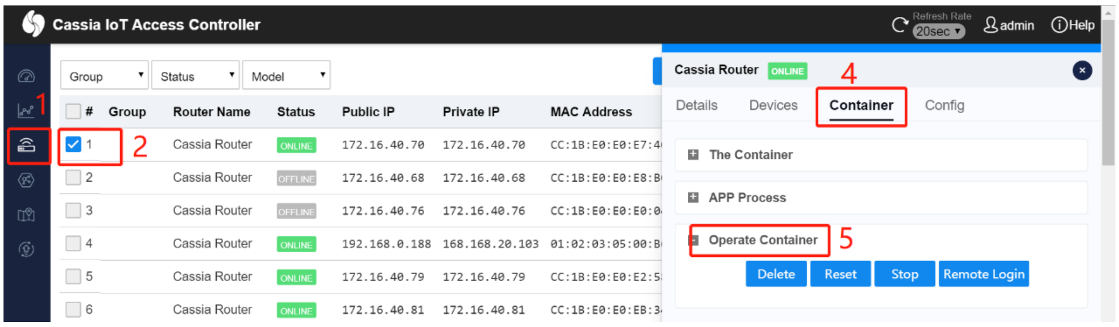
#	Group	Router Name	Status	Public IP	Private IP	MAC Address
✓ 1		Cassia Router	ONLINE	172.16.40.70	172.16.40.70	CC:1B:E0:E0:E7:4
2		Cassia Router	OFFLINE	172.16.40.68	172.16.40.68	CC:1B:E0:E0:E8:B
3		Cassia Router	OFFLINE	172.16.40.76	172.16.40.76	CC:1B:E0:E0:E0:0
4		Cassia Router	ONLINE	192.168.0.188	168.168.20.103	01:02:03:05:00:B
5		Cassia Router	ONLINE	172.16.40.79	172.16.40.79	CC:1B:E0:E0:E2:5
6		Cassia Router	ONLINE	172.16.40.81	172.16.40.81	CC:1B:E0:E0:EB:3
7		Cassia Router	ONLINE	172.16.40.74	172.16.40.74	CC:1B:E0:E0:E4:4
8		Cassia Router	ONLINE	172.16.40.71	172.16.40.71	CC:1B:E0:E0:E7:2
9		Cassia Router	ONLINE	172.16.40.209	172.16.40.209	CC:1B:E0:E7:FE:C
10		Cassia Router	ONLINE	172.16.40.212	172.16.40.212	CC:1B:E0:E7:FE:F
11		Cassia Router	ONLINE	172.16.40.69	172.16.40.69	CC:1B:E0:E0:E7:5
12		Cassia Router	ONLINE	172.16.40.4	172.16.40.4	CC:1B:E0:E0:96:1

Cassia Router ONLINE

The Container

CPU Usage	2.75%
Memory Usage	4.52%
Storage Usage	1.2G / 2.3G
Networks(TX/RX)	0.54KB / 0.49KB
Operating System	Ubuntu 16.04.3 LTS
Container Version	1.1.1
Container Status	running

The user can also delete, reset, start, stop, and remote login containers from the AC. Please follow the steps on AC console: Gateways ->select gateway->Edit->Container->Operate Container

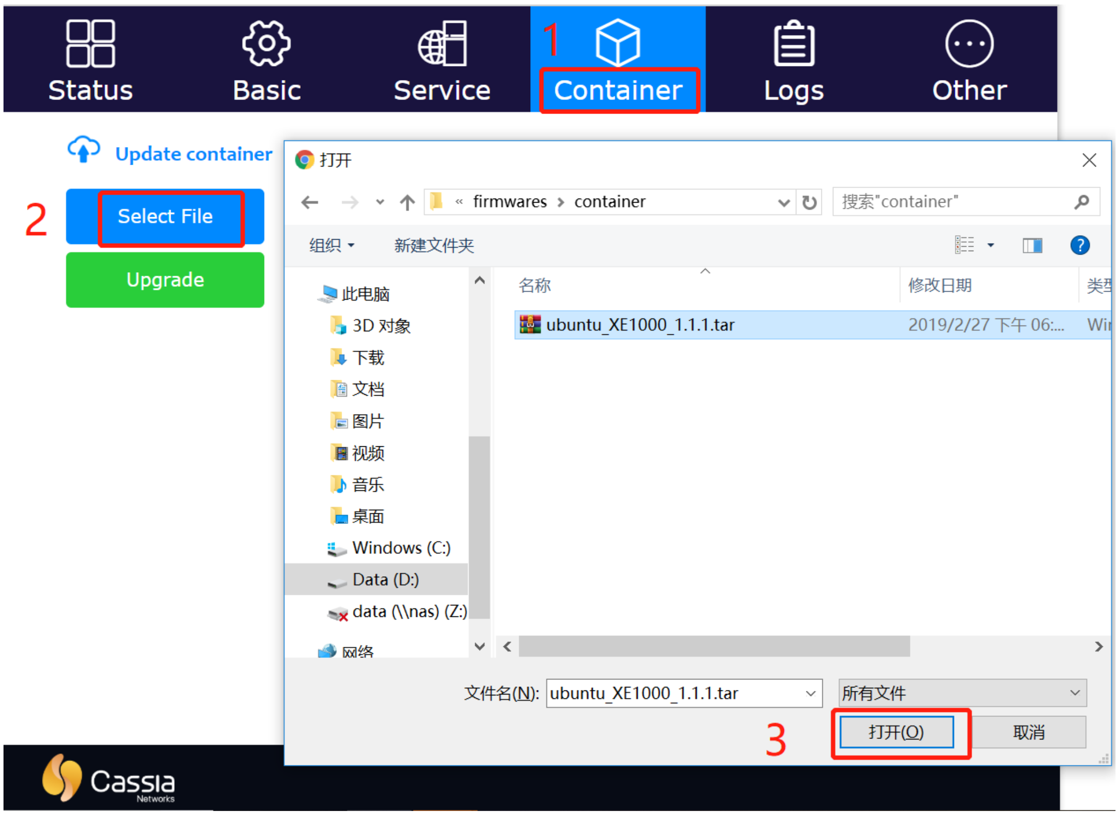


#	Group	Router Name	Status	Public IP	Private IP	MAC Address
✓ 1		Cassia Router	ONLINE	172.16.40.70	172.16.40.70	CC:1B:E0:E0:E7:4
2		Cassia Router	OFFLINE	172.16.40.68	172.16.40.68	CC:1B:E0:E0:E8:B
3		Cassia Router	OFFLINE	172.16.40.76	172.16.40.76	CC:1B:E0:E0:E0:0
4		Cassia Router	ONLINE	192.168.0.188	168.168.20.103	01:02:03:05:00:B
5		Cassia Router	ONLINE	172.16.40.79	172.16.40.79	CC:1B:E0:E0:E2:5
6		Cassia Router	ONLINE	172.16.40.81	172.16.40.81	CC:1B:E0:E0:EB:3

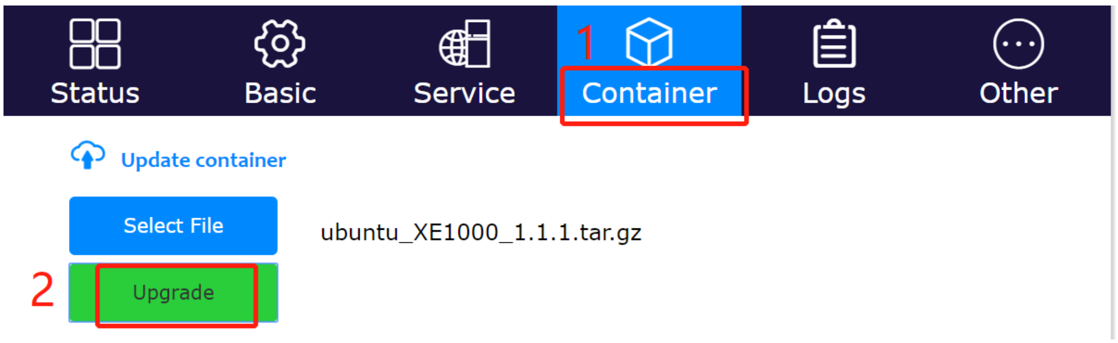
Cassia Router ONLINE

5.2. Install Container via Gateway Console

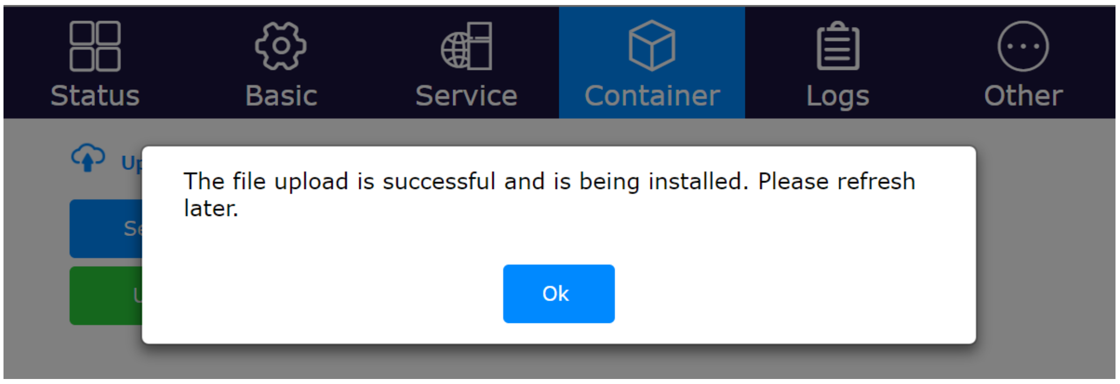
Please follow the steps on the gateway console: Container->Select File->Open.



Click Container->Upgrade.

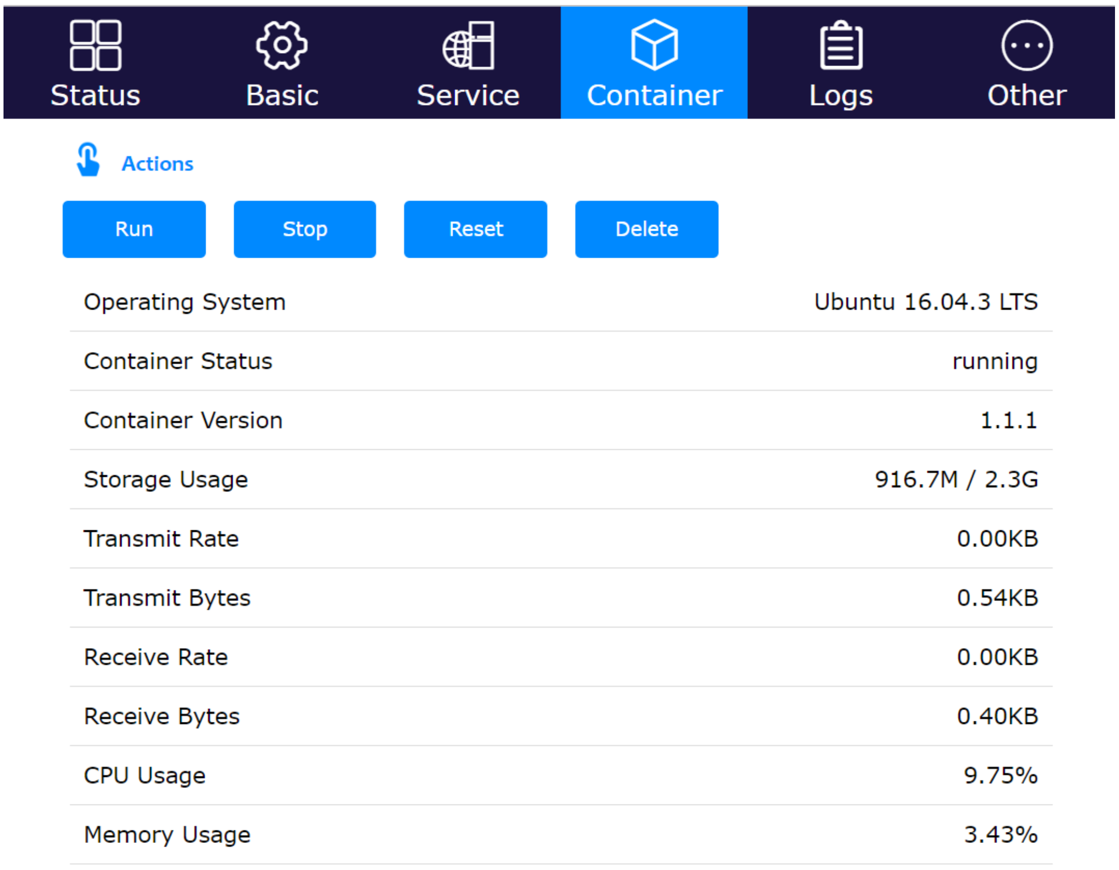


Now, the container will be uploaded and installed on the gateway.



The file upload is successful and is being installed. Please refresh later.

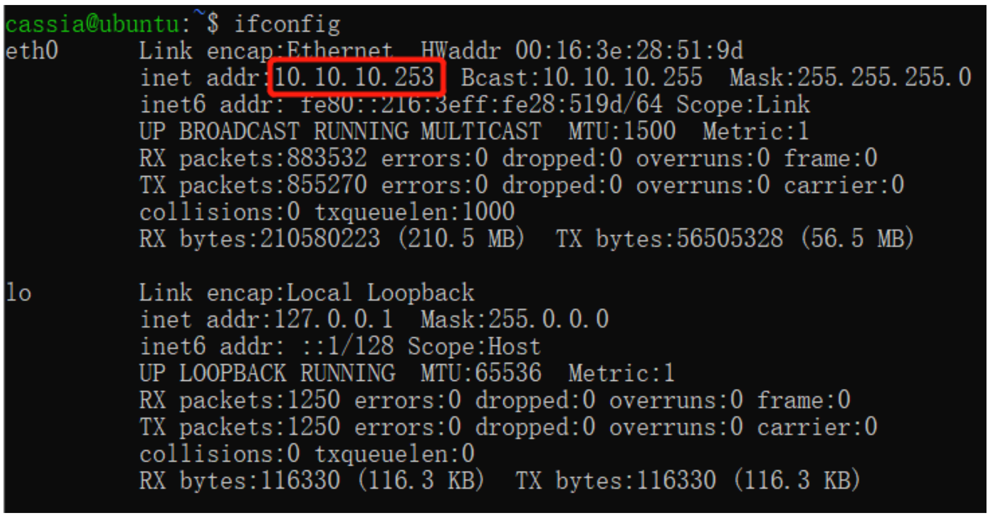
Please refresh the web browser. You will see the container information in the Container tab. The user can install their APP or take actions for the container (Run, Stop, Reset, Delete).



Operating System	Ubuntu 16.04.3 LTS
Container Status	running
Container Version	1.1.1
Storage Usage	916.7M / 2.3G
Transmit Rate	0.00KB
Transmit Bytes	0.54KB
Receive Rate	0.00KB
Receive Bytes	0.40KB
CPU Usage	9.75%
Memory Usage	3.43%

6. Container and Gateway Interaction

After the container is installed, the gateway and container will be in the same subnet. The IP address of the gateway is 10.10.10.254/24. The IP address of the container is 10.10.10.253/24.

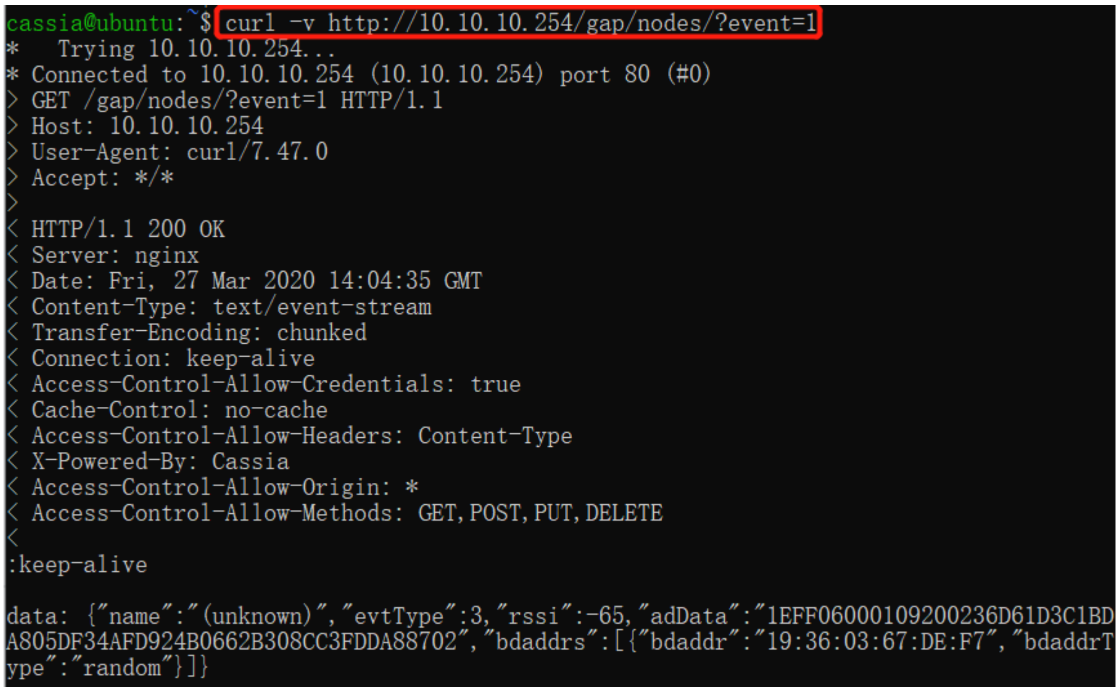


```
cassia@ubuntu:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 00:16:3e:28:51:9d
          inet addr:10.10.10.253  Bcast:10.10.10.255  Mask:255.255.255.0
          inet6 addr: fe80::216:3eff:fe28:519d/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:883532 errors:0 dropped:0 overruns:0 frame:0
          TX packets:855270 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:210580223 (210.5 MB)  TX bytes:56505328 (56.5 MB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:1250 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1250 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:116330 (116.3 KB)  TX bytes:116330 (116.3 KB)
```

The APP in the container can call local RESTful API like below (Turn on scanning as an example).

$curl –v 10.10.10.254/gap/nodes/?event=1&active=1



```
cassia@ubuntu:~$ curl -v http://10.10.10.254/gap/nodes/?event=1
*   Trying 10.10.10.254...
* Connected to 10.10.10.254 (10.10.10.254) port 80 (#0)
> GET /gap/nodes/?event=1 HTTP/1.1
> Host: 10.10.10.254
> User-Agent: curl/7.47.0
> Accept: */*
>
< HTTP/1.1 200 OK
< Server: nginx
< Date: Fri, 27 Mar 2020 14:04:35 GMT
< Content-Type: text/event-stream
< Transfer-Encoding: chunked
< Connection: keep-alive
< Access-Control-Allow-Credentials: true
< Cache-Control: no-cache
< Access-Control-Allow-Headers: Content-Type
< X-Powered-By: Cassia
< Access-Control-Allow-Origin: *
< Access-Control-Allow-Methods: GET,POST,PUT,DELETE
<
:keep-alive

data: {"name":"(unknown)","evtType":3,"rssi":-65,"adData":"1EFF06000109200236D61D3C1BD
A805DF34AFD924B0662B308CC3FDDA88702","bdaddrs":[{"bdaddr":"19:36:03:67:DE:F7","bdaddrT
ype":"random"}]}
```

7. Create APP Package

7.1. What Should be Included

The APP package should include all the program files, configuration files, and data files. It should also include a startup script (autorun.sh). From firmware v2.1.1, the user can include a delete script too (delete_app.sh).

First, the codes that the user wants to run automatically when the container starts up should be added in autorun.sh. Second, the user should save all the files following container root file system architecture, set access rights (read and write), and set user group permissions. Last, the user should use tar –zvcf command to build the APP package.

From firmware v2.1.1, the user can include a delete script (delete_app.sh) which will run automatically when deleting the APP from the AC or gateway console. The user can add codes in this script to clean up their APP logs, etc.

Please check APP sample code: https://github.com/CassiaNetworks/CassiaSDKGuide

7.2. Naming Rule

APP package name format: name.major.minor.tar.gz

- “Name” is the name of the APP, which is made up of the letter A-Z, a-z, digit 0-9, underline “_”, en dash “-”. The length of the name string should be equal to or less than 16 characters.

- “Major” is the major version number. Made up of 0-9 only. The length should be no more than 3 digits.

- “Minor” is the minor version number. Made up of 0-9 only. The length should be no more than 3 digits.

- tar.gz is the compression format of the APP package.

7.3. APP Package Example

Assuming the user wants to generate an APP named abcd with version 1.1., the APP includes startup script autorun.sh, delete script delete_app.sh, executable program file /usr/bin/eeee, configuration file /etc/ff.conf, and lib file /usr/lib/gg.so in folder abcd.1.1.

What is more, from firmware 1.4.1, the user can add meta.json under folder /root/config/<app_name>/ to define their own APP configuration console.

The file architecture looks like the below:

```
abcd.1.1/autorun.sh
abcd.1.1/delete_app.sh
abcd.1.1/etc/ff.conf
abcd.1.1/usr/bin/eeee
abcd.1.1/usr/lib/gg.so
abcd.1.1/root/config/abcd/meta.json
```

When a user runs the command: tar-zcvf abcd.1.1.tar.gz abcd.1.1/, the system will generate the APP package file abcd.1.1.tar.gz.

After installing this APP package on the gateway, the end user will find the below files in the container. The content of abcd.sh is the same as autorun.sh. The content of abcd.uninst is the same as delete_app.sh:

```
/etc/ff.conf
/usr/bin/eeee
/usr/lib/gg.so
/root/apps/abcd.sh
/root/apps/abcd.uninst
/root/apps/abcd.version
/root/config/abcd/meta.json
```

7.4. APP Configuration Customization

From firmware 1.4.1, the user can add their own APP configuration console in Cassia gateway's local console and the AC's console.

First, please create meta.json under folder /root/config/<app_name>/. This file defines the configuration items.

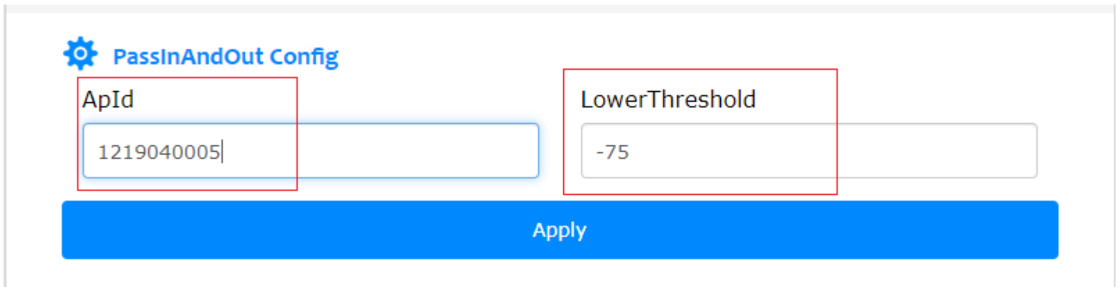
Below is the format:

```
{
  "name": "<app_name>",
  "config_items" : [
    {"name": "<configure_1>", "type":"string"},
    {"name": "<configure_2>", "type":"string"},
    {"name": "<configure_3>", "type":"string"},
    ……
    {"name": "<configure_n>", "type":"string"}
  ]
}
```

Below is an example:

```
{
  "name": "PassInAndOut",
  "config_items" : [
    {"name": "ApId", "type":"string"},
    {"name": "LowerThreshold", "type":"string"}
  ]
}
```

Then, on the gateway's local console and the AC's console, the user can find their own APP configuration console as seen below.



ApId: 1219040005
LowerThreshold: -75

After the configuration, the gateway will generate file config.json under folder /root/config/<app_name>/.

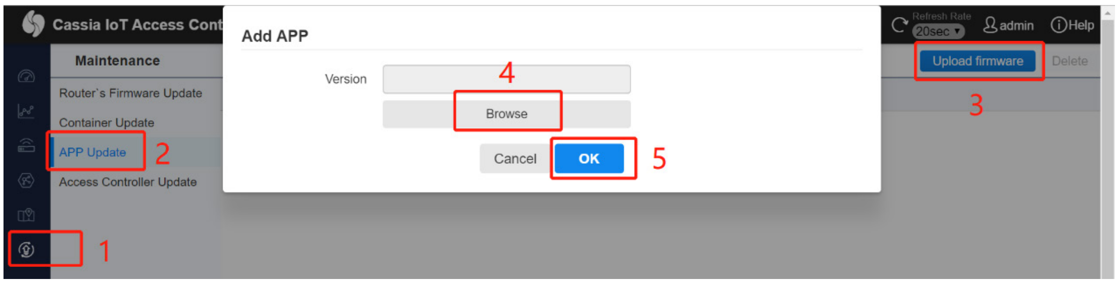
Below is an example:

```
{
  " ApId": "1219040005",
  " LowerThreshold": "-75"
}
```

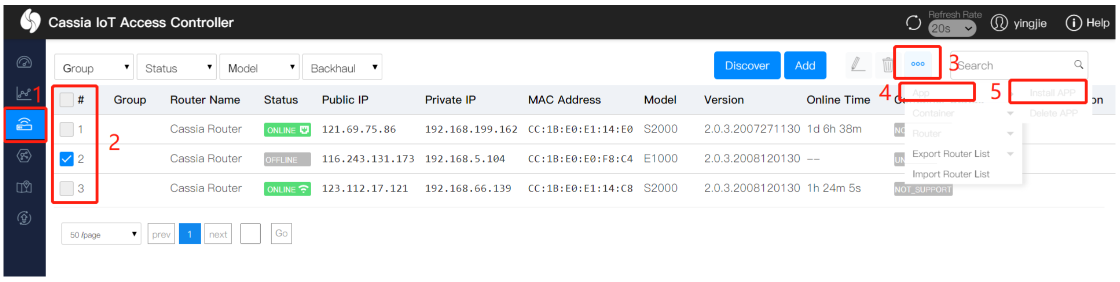
8. Install and Delete APP

8.1. Install APP via AC Console

Please follow the steps on the AC console to upload the APP to the AC: Maintenance->APP Update->Upload firmware->Browse->OK.

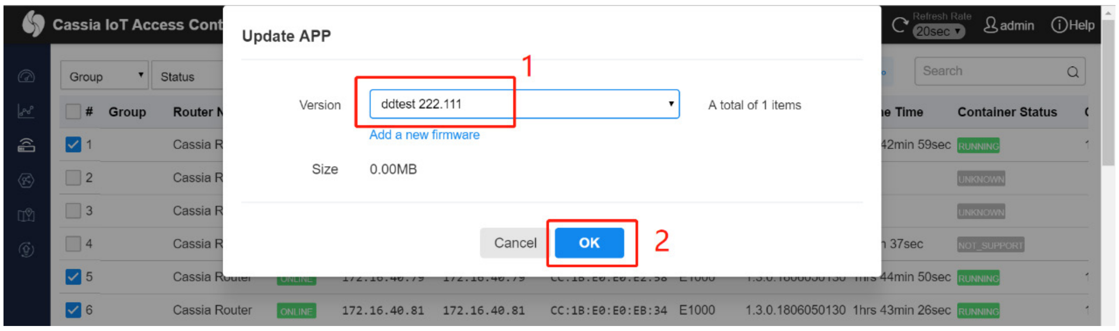


Please follow the steps on the AC console to install an APP to a batch of gateways: Gateways->select the gateways that need to install APP->More->App->Install APP.



#	Group	Router Name	Status	Public IP	Private IP	MAC Address	Model	Version	Online Time
1		Cassia Router	ONLINE	121.69.75.86	192.168.199.162	CC:1B:E0:E1:14:E0	S2000	2.0.3.2007271130	1d 6h 38m
✓ 2		Cassia Router	OFFLINE	116.243.131.173	192.168.5.104	CC:1B:E0:E0:F8:C4	E1000	2.0.3.2008120130	--
3		Cassia Router	ONLINE	123.112.17.121	192.168.66.139	CC:1B:E0:E1:14:C8	S2000	2.0.3.2008120130	1h 24m 5s

Please select the APP version and click the OK button. The APP will be installed or updated.



Version: ddtest 222.111

A total of 1 items

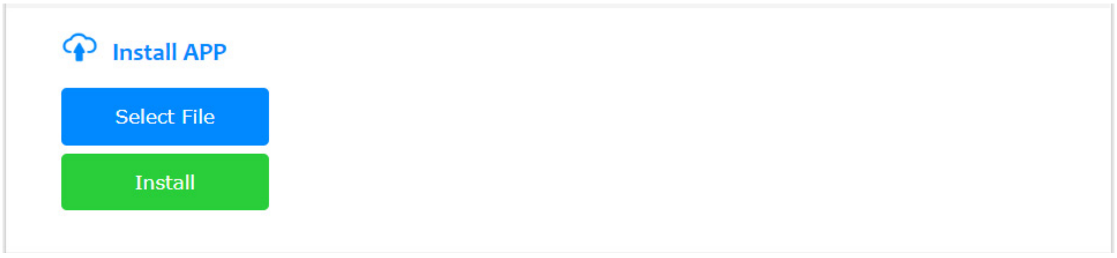
Size: 0.00MB

Now, the user can check the installed APPs on the container page of AC and gateway console.

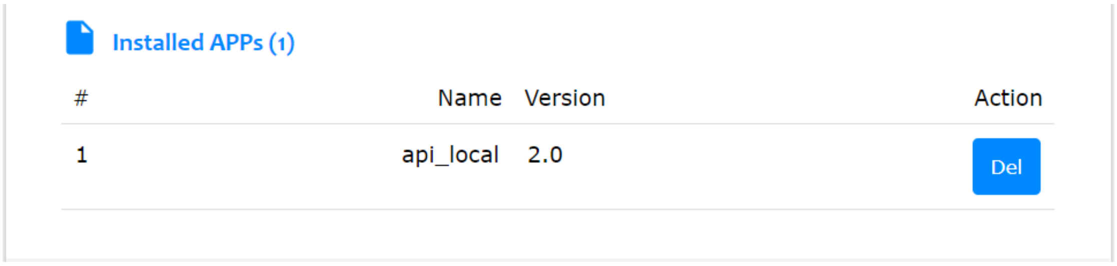
The user can also check the first installed APP for a batch of gateways on the AC gateway page.

8.2. Install APP via Gateway Console

The user can also install their APP via the gateway console.

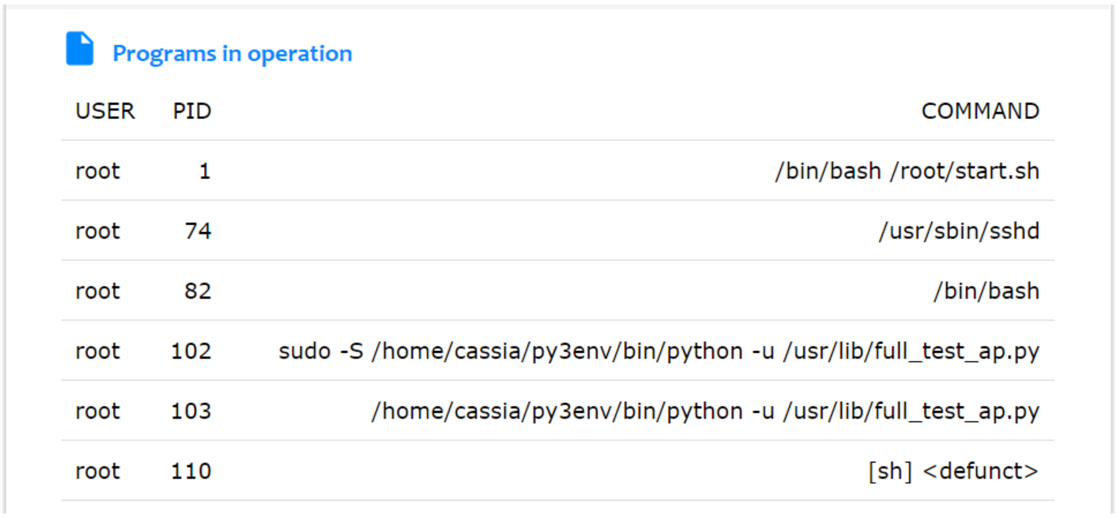


After installation, the user can check the installed APP and programs in operation.



Installed APPs (1)

#	Name	Version	Action
1	api_local	2.0	Del


Programs in operation

```
USER    PID                                                   COMMAND
root      1                                   /bin/bash /root/start.sh
root     74                                             /usr/sbin/sshd
root     82                                                  /bin/bash
root    102  sudo -S /home/cassia/py3env/bin/python -u /usr/lib/full_test_ap.py
root    103          /home/cassia/py3env/bin/python -u /usr/lib/full_test_ap.py
root    110                                            [sh] <defunct>
```

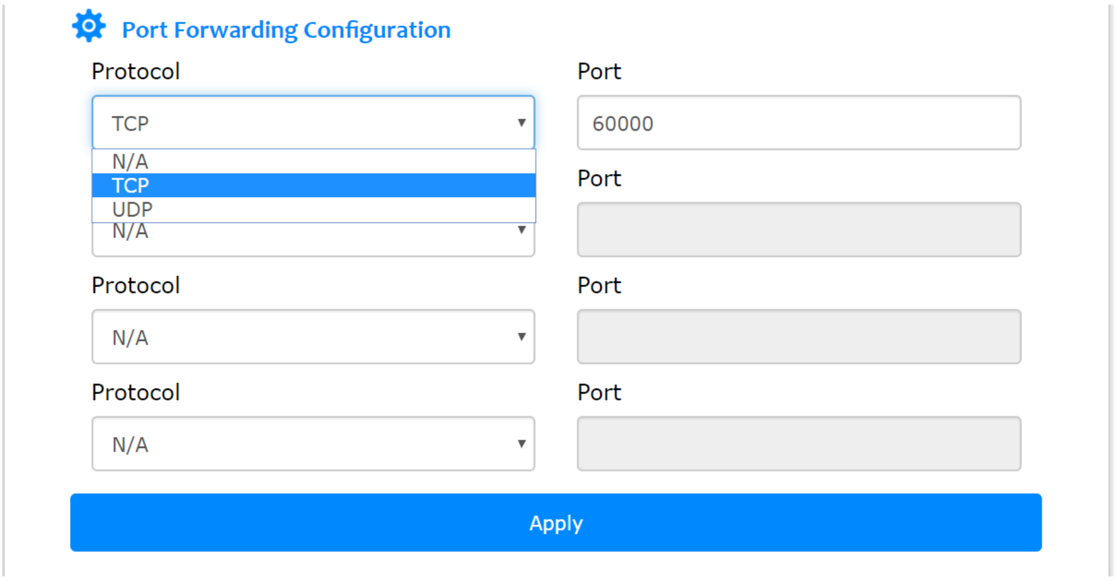
8.3. Delete APP

From firmware 2.0.3, the user can delete the installed APP by clicking the Del button. This action will delete /root/apps/${app_name}.sh and /root/apps/${app_name}.version, but will remain all other APP files unchanged (avoid deleting important customer data).

Please delete the other APP files, if necessary, by adding delete script (recommended, available from firmware v2.1.1), adding codes in autorun.sh of the new APP, or by SSH into the container.

9. Container Port Forwarding

From firmware 1.4.1, the user can configure a maximum of four TCP or UDP ports for container port forwarding.


Port Forwarding Configuration

Protocol	Port
TCP	60000
N/A	
N/A	
N/A	

By using this functionality, the user can set up a server (for example webserver) in the container and access it via the gateway's private IP address and the configured port. The port range is [60000, 65525]. N/A means the port is closed.

10. SSH into Container

The SSH username is "cassia". The default SSH password of the container version 1.1.1 is "cassia".

NOTE: Please remember to change the container's SSH password upon the first login.

10.1. Local SSH login

NOTE: From firmware 2.0.2, an option to enable and disable container local SSH login is added in the Container tab. The container local SSH login is OFF by default for security reasons. Please turn it **ON** before you want to local SSH login the container. Resetting the gateway will change this option into the default value **OFF**.

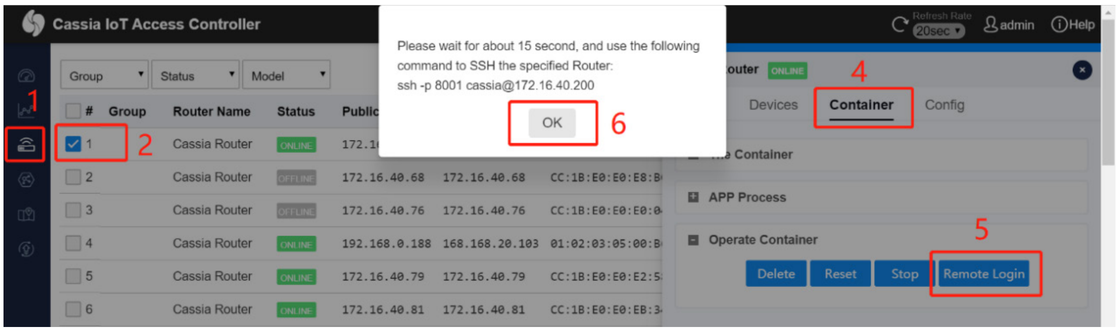
If localhost and gateway are in the same network, please follow the below examples (x.x.x.x is the IP address of gateway and cassia is the username).

Login example with Linux Shell "ssh -p 20022 cassia@x.x.x.x"
Login example with Xshell "ssh cassia@x.x.x.x 20022"

10.2. Remote SSH login with AC

If localhost and gateway are in a different network and the gateway is running in AC managed mode, please follow steps on the AC console: Gateways ->select gateway ->Edit->Container->Remote Login->OK.

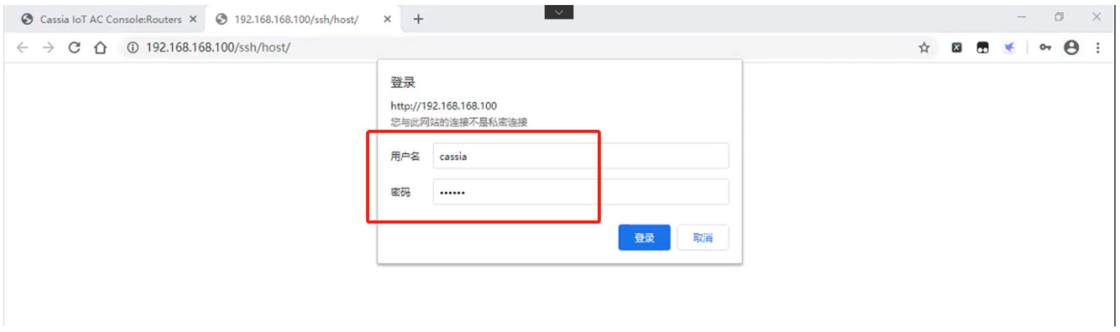
Before firmware 2.0, please follow the guideline in the popup window.

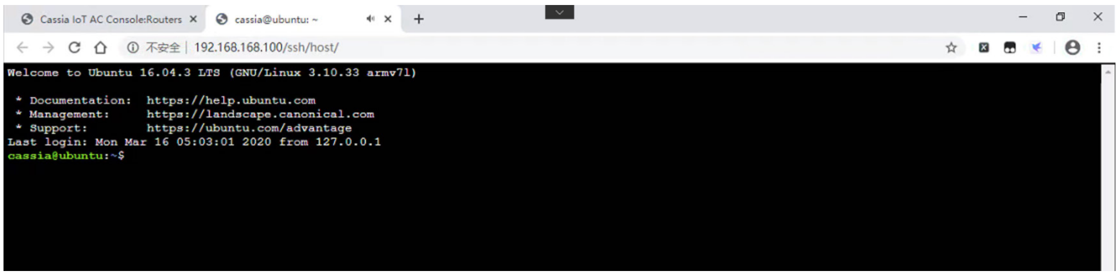


Please wait for about 15 second, and use the following command to SSH the specified Router:
ssh -p 8001 cassia@172.16.40.200

#	Group	Router Name	Status	Public		
1		Cassia Router	ONLINE	172.1		
2		Cassia Router	OFFLINE	172.16.40.68	172.16.40.68	CC:1B:E0:E0:E8:B
3		Cassia Router	OFFLINE	172.16.40.76	172.16.40.76	CC:1B:E0:E0:E0:0
4		Cassia Router	ONLINE	192.168.0.188	168.168.20.103	01:02:03:05:00:B
5		Cassia Router	ONLINE	172.16.40.79	172.16.40.79	CC:1B:E0:E0:E2:5
6		Cassia Router	ONLINE	172.16.40.81	172.16.40.81	CC:1B:E0:E0:EB:3

From firmware 2.0, a new tab will pop up on the web browser as an SSH terminal. After pressing the “Remote Login” button, the user can still log in to the container by “ssh -p 8001 cassia@ac_ip_address” in other terminals.


Cassia IoT AC Console:Routers
192.168.168.100/ssh/host/
登录
http://192.168.168.100
您与此网站的连接不是私密连接
用户名
cassia
密码
••••••
登录
取消


Cassia IoT AC Console:Routers
cassia@ubuntu: ~
不安全 | 192.168.168.100/ssh/host/

```
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 3.10.33 armv7l)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage
Last login: Mon Mar 16 05:03:01 2020 from 127.0.0.1
cassia@ubuntu:~$
```

After logging into the container with SSH, the user can control Bluetooth with RESTful API, noble, or dbus. Users can also use apt-get command to install Linux tools. For example, the user can run “apt-get install lrzsz” to install lrzsz.

NOTE: In the AC console, users can only establish and maintain SSH sessions to one gateway at a time.

11. Select a Specific Bluetooth Chip in Container

Cassia’s E1000, X1000, X2000 and ATX2000 gateways include two Bluetooth chips. The user can select a specific Bluetooth chip in the container.

If the user is using Cassia’s RESTful API, please add the parameter “-chip”.

- chip (Optional): 0 or 1, indicates which chip of the Cassia gateway is used for scan and connect. By default, the gateway will pick up the chip automatically based on an internal algorithm. The S2000 only supports chip 0. The E1000, X1000, X2000 and ATX2000 support 0 and 1.

If the user is using BlueZ, please follow the below guideline. **NOTE:** It is highly recommended to use Cassia’s RESTful API which has better performance and filters.

BlueZ has two ways to work with Bluetooth chips.

- Through Bluetoothd and DBUS: Bluetoothd will register interface on DBUS after starts up. It has a fixed interface.

- Call BlueZ command, such as hcitool, gatttool, etc. below are some examples.

```
hcitool -i hci0 lescan       // open scan for chip 0
hcitool -i hci1 lescan       // open scan for chip 1
gatttool -i hci0 -t public -b CC:1B:E0:01:02:03          // connect by chip 0
```