Cambium Networks™

Integrating External Captive Portal with cnMaestro API

Table of contents

Chapter 1 Contents

Note: This document is applicable for both On-premises and Cloud cnMaestro version

Please refer the cnMaestro API document for more details on API infrastructure.

Introduction

Guest access WLAN is designed specifically for BYOD (Bring your own device) setup, where large organizations have both staff and guests running on same WLAN or similar WLANs. Cambium Networks Provides different options to the customers to achieve this based on where the captive portal page is hosted and who will be validating and performing authentication process.

They are 3 locations where the captive portal page can be hosted:

1. Internal Access Point (Limited customization like Logo and Background Image)
2. External Hotspot (External 3rd party Web/Cloud hosted captive portal, fully customized)
3. cnMaestro (Semi customized portal, with additional features like SMS Authentication, Payment Gateways and Vouchers)

Authentication Methods:

1. Clickthrough (Portal page with a button to accept terms & conditions and get internet access)
2. RADIUS (External Authentication server like, Windows NPS / IAS or Free RADIUS)
3. LDAP (Authenticate using LDAP/Active Directory)
4. Local Guest Account (Single username /password stored on Access Point)

In this document, we will be specifically talking about External Hotspot integrating with both on-premises and cloud version of cnMaestro to securely POST the user credentials to authenticate the user using External RADIUS

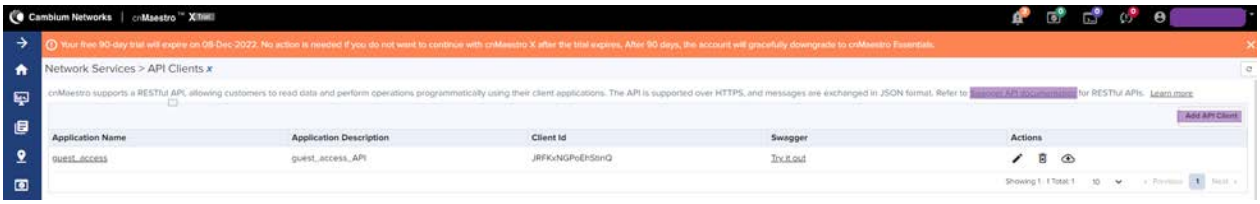
Since the secure POST needs a secure connection between cnMaestro and the Web server. RESTful API support on the cnMaestro server will facilitate the webserver to POST user credentials to cnMaestro securely.

An AP client should be added in the Network services >> RESTful API section of the cnMaestro and the API client id and secret should be added in the server from where the POST message will be triggered. (For more information on API client creating,

please refer cnMaestro RESTful API document https://docs.cloud.cambiumnetworks.com/api/3.1.0/index.html)

How to create an API client and swagger documentation are available in cnMaestro network services section.

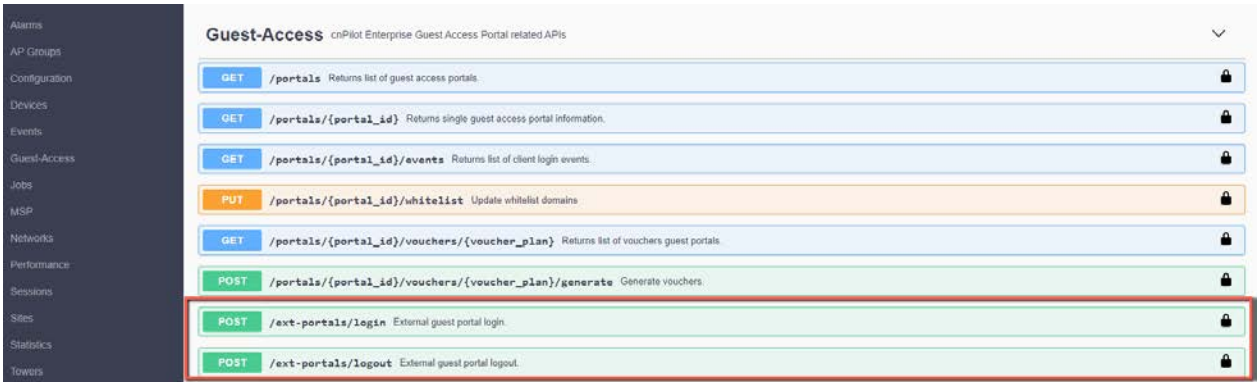
Please refer the screenshot below



API client creation and swagger documentation

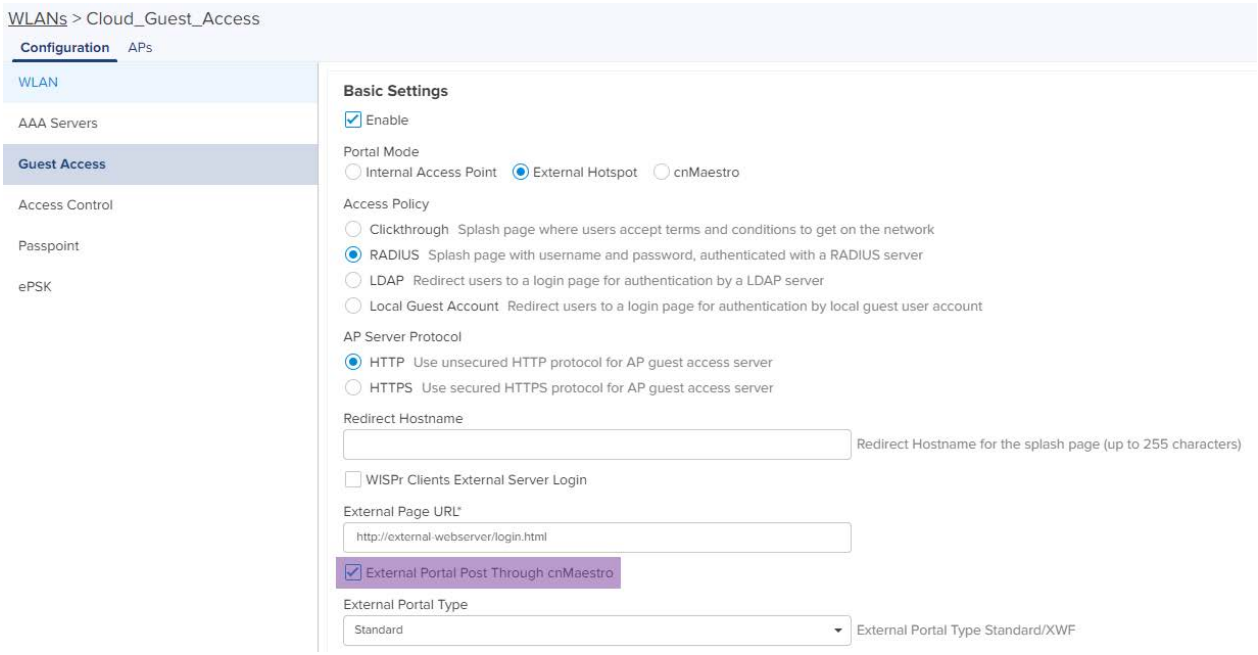
Note: RESTful API is a licensed feature and need cnMaestro-X software for configuration.

API supported (Login and Logout)



Feature Details

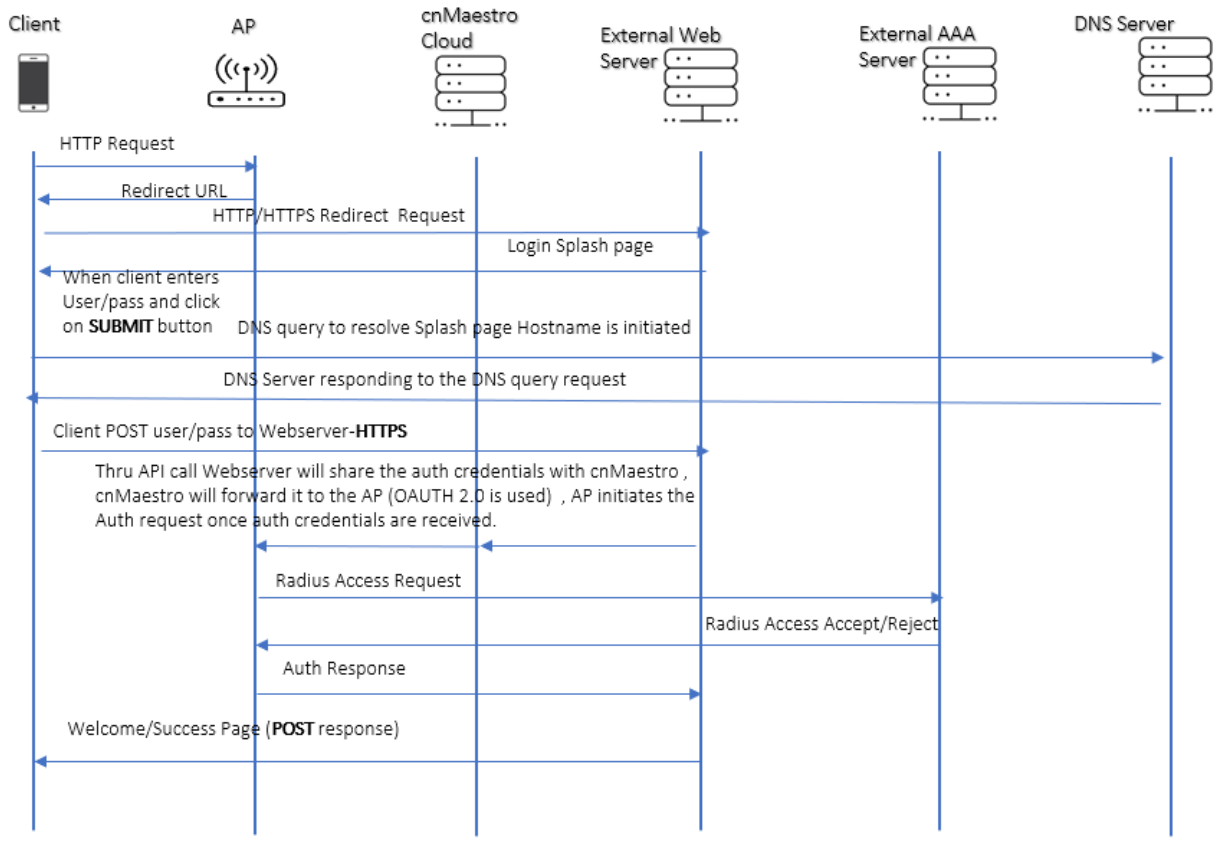
Customers who wanted a secure communication channel to authenticate the user securely should choose to POST the user credentials to cnMaestro. To enable this feature, one must enable **External Portal Post Through cnMaestro** available in Guest Access.



Guest Access UI Screenshot:

Workflow

A general workflow when an external webserver and cnMaestro cloud is configured to accept HTTPS POST messages from client.



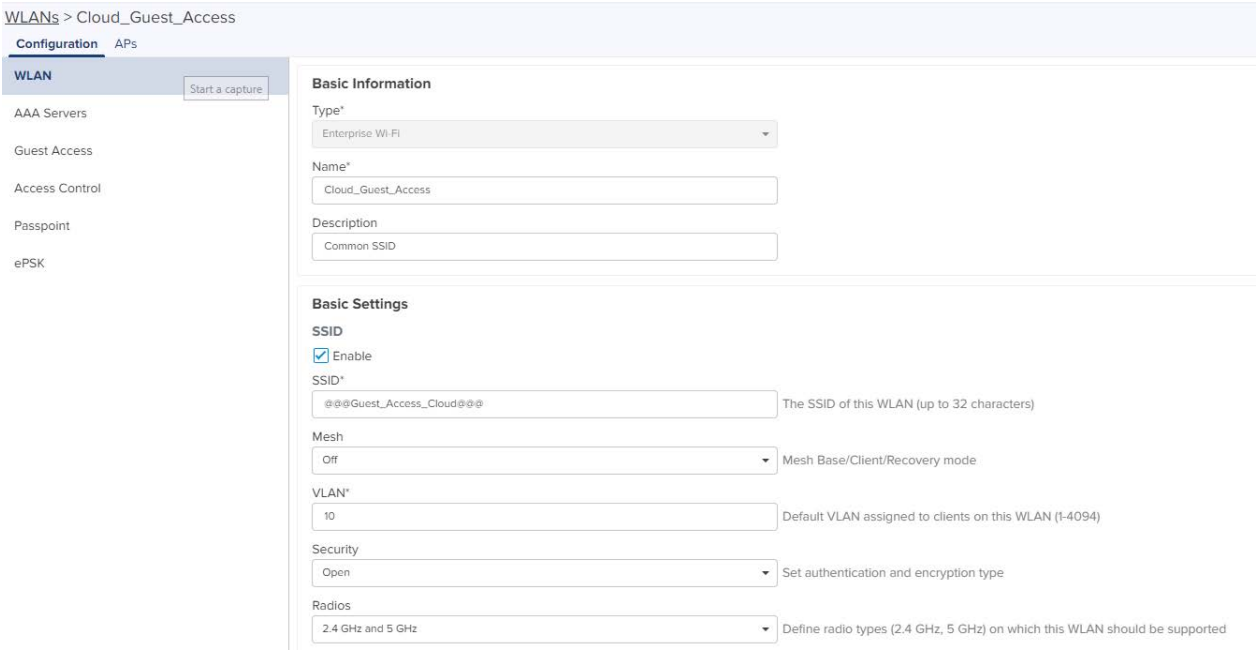
This setup consists of below main parts:

1. Supplicant (Wireless clients- Laptops, mobile phones etc)
2. External Web Server
3. DNS server
4. cnMaestro
5. Authenticator (Cambium Access Point)
6. Authentication Server (RADIUS)

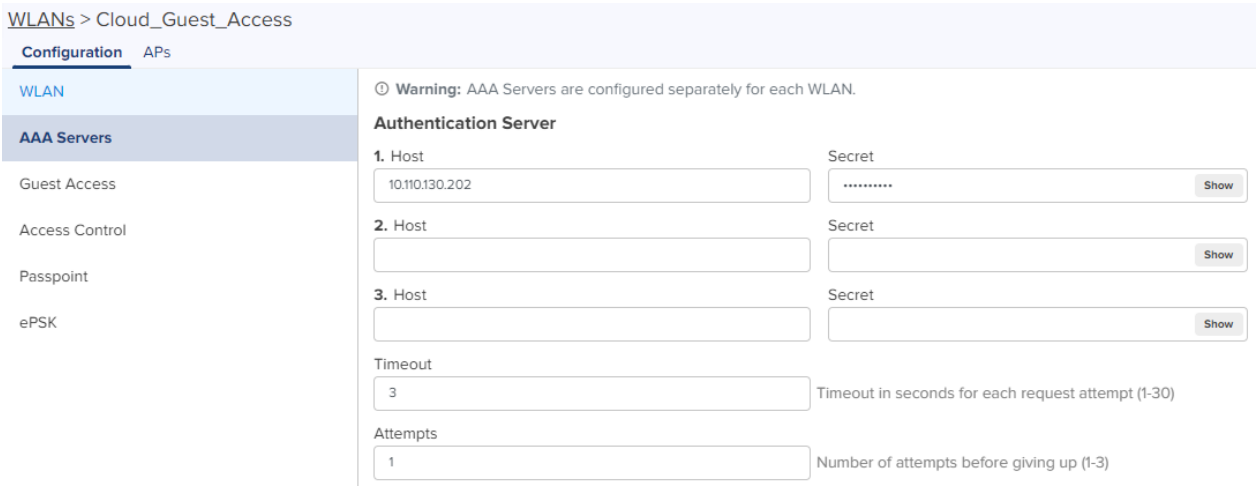
Configuration

1. On cnPilot Access Points: Configure >> WLAN
2. On cnMaestro: Shared Settings/ WLANs and AP Groups >> WLANs

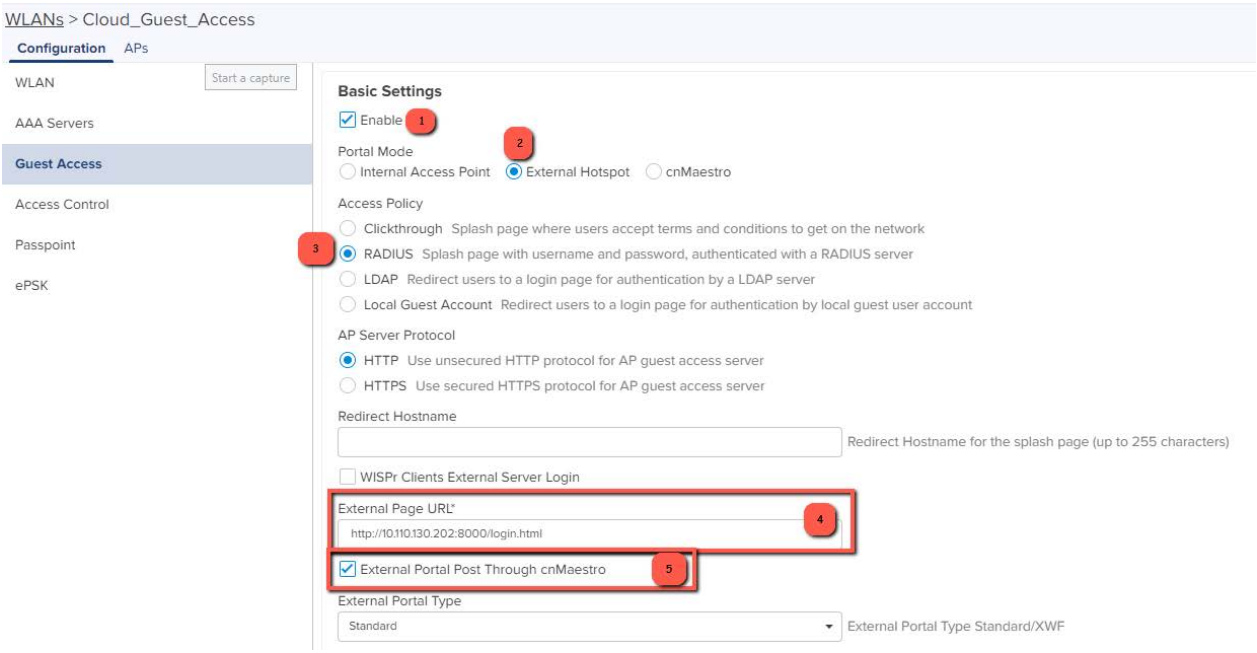
WLAN: Key in the **WLAN name** and **description**. By default, WLAN Name is taken as **SSID Name**.



AAA Server: Key in the AAA server setting like **IP address (RADIUS server)** and **shared secret** (This shared secret should match to the secret created on RADIUS server).



Guest Access: Enter the URL of captive portal hosted on external web server and select other required parameters.



*Note: If cnMaestro **On-Premises** is used for integration, please add the cnMaestro URL/IP address in the whitelist*

Example External page URL

1. IP address: http://10.110.200.100:8000/login_cnMaestro.html
2. URL : https://dev.xyznetworkmanager.com/portal/index.php?hotspotname=laCambium

The external Page URL should contain a script running in it which will capture the information (user/pass) user enters and POST it back to the 3rd party webserver.

Client connection of through Swagger API

Workflow in detail

In normal case when cloud API is used, when a wireless client connects to the AP, AP will redirect the client to the configured external 3rd party captive portal server. Client will fetch the splash page from the external 3rd party server and provide the user/pass to get authenticated. This user/pass information is captured by the webserver through a script and the API server running on the webserver POST this to the cnMaestro. Up on receiving the information through API's, cnMaestro will forward this to the AP and AP will initiate an authentication request to the AAA server. This flow is explained below through swagger API (inbuilt application available in cnMaestro).

Client login

Step 1: client connects to the AP and gets redirected to the splash page.

Client will be in non-authenticated state now on the AP.

Login to the cnMaestro and access swagger API, and go to Guest Access POST section of

/api/v2/ext-portals/login

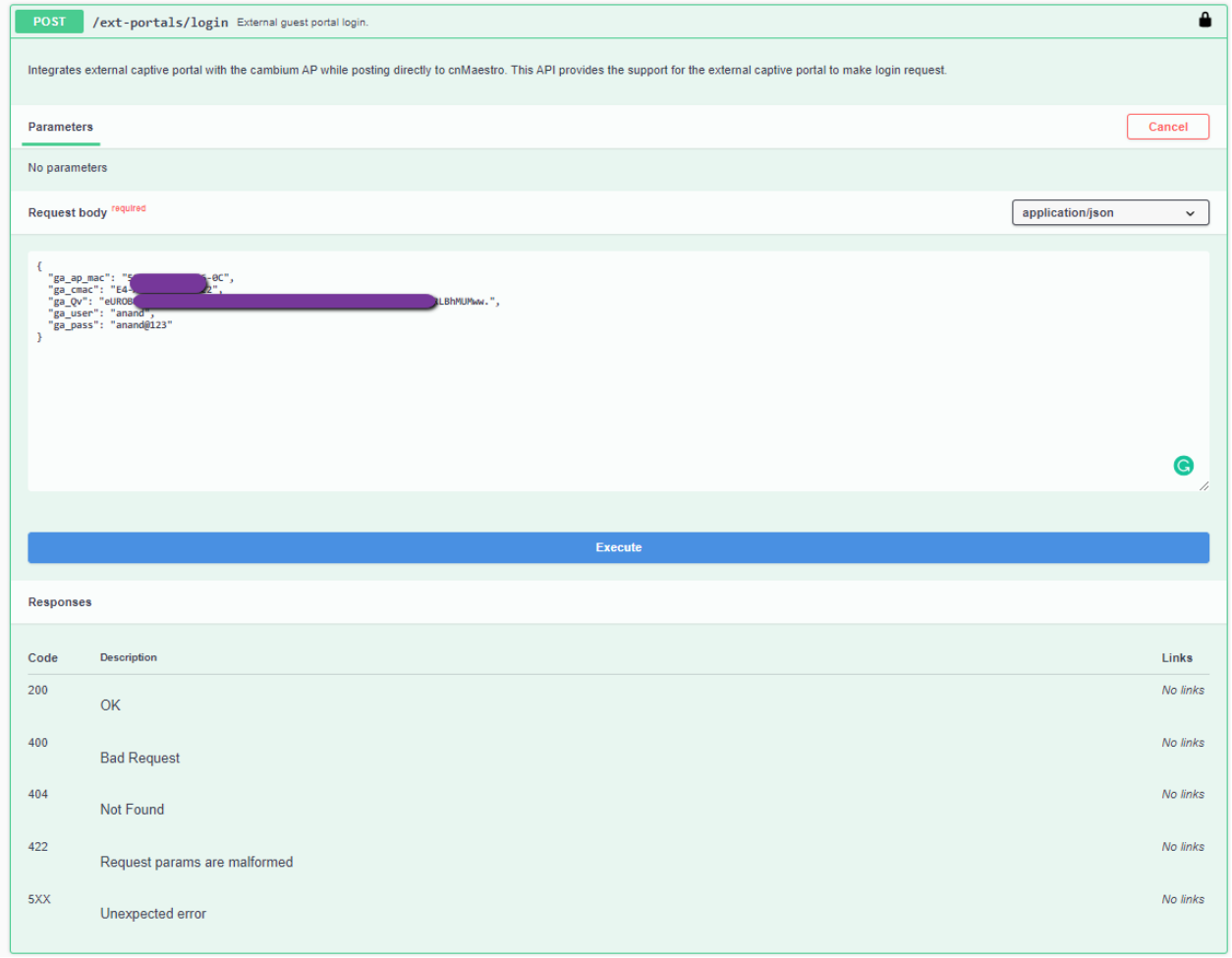
Access the swagger API and key in the

AP MAC address	"ga_ap_mac"
Client MAC address	"ga_cmac"
Signature	"ga_Qv"
Username	"ga_user"
Password	"ga_pass"

Above details manually on the request body section. These details can be copied from the URL which is presented to the client by the webserver.

A sample URL is given below for reference.

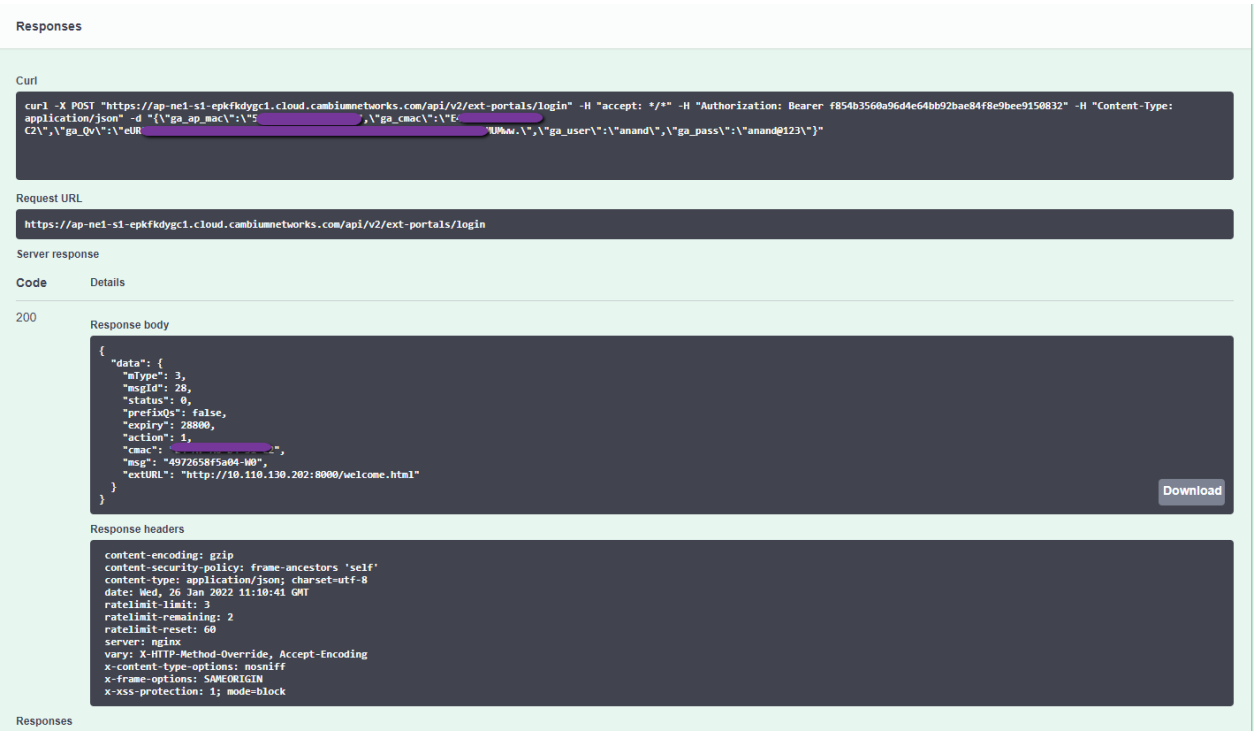
http://10.110.130.202:8000/login.html?ga_ssid=%40%40%40Guest_Access_Cloud%40%40%40&ga_ap_mac=58-C1-7A-29-86-0C&ga_nas_id=E600-29860C&ga_srvr=ap-ne1-guest.cloud.cambiumnetworks.com&ga_cmac=E4-A7-A0-D4-31-C2&s=1NOF3YCYgA7w0lOw2W_wfQkQ3oa0VCbFjYPzlJcPK5IA.&ga_Qv=eUROBR86HBgAGDEEVgQAGw4UWRUCACYVMgFPRy5ZXlFfUSVGWS9FVghZRyRLBhMUMww.



Swagger API login request screenshot

Once all the requisite fields are keyed-in click on execute for swagger API to post this message to the cnMaestro.

Once execute is clicked, cnMaestro will receive this info and forward to the AP for authentication.



Swagger API screenshot after executing done (response)

We can see that the response is 200 OK which means the client is authenticated successfully,

Status codes and their details

Status value as Integer and it's interpretation:

0: Login is successful

1: Invalid login request, the client is not currently associated to the AP which is being requested for login here.

2: RADIUS reject due to invalid username/password

3: RADIUS timeout, AP didn't receive the RADIUS response.

4: Missing RADIUS server config on the WLAN config of the AP.

5: If LDAP configured on the AP for authentication, then LDAP server responded back with reject

6: LDAP timeout happened on the AP for the request

7: Missing LDAP configuration on the WLAN configuration of the AP.

8: Logout is successful

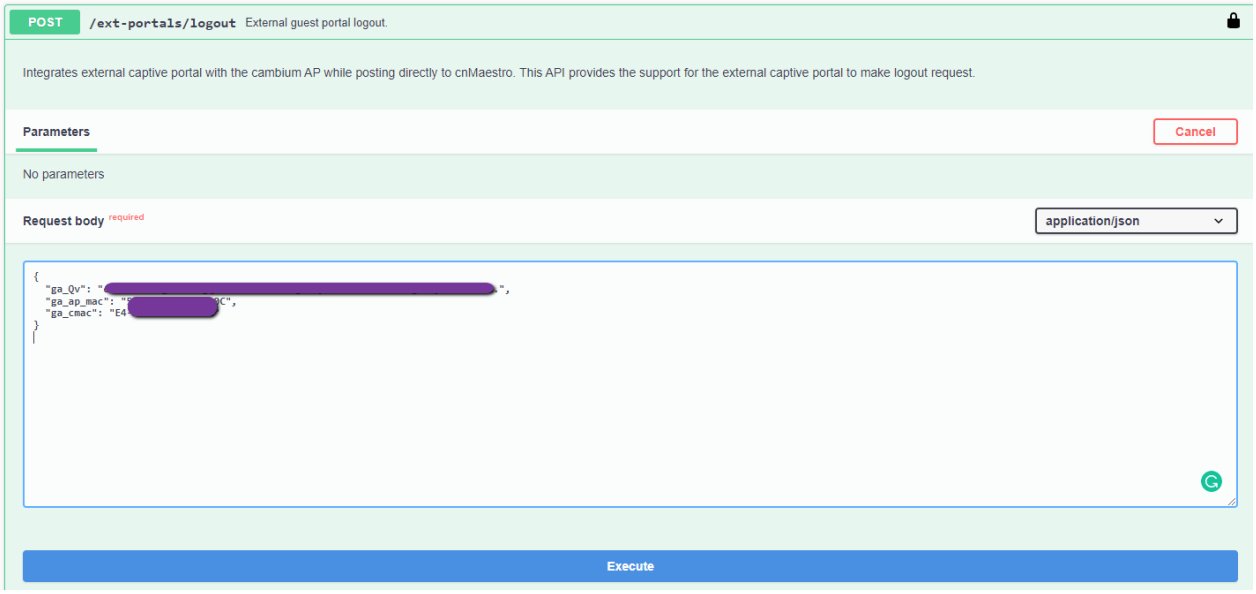
Client logout

Client logout through swagger API, and go to Guest Access POST section of

/api/v2/ext-portals/logout

Access the swagger API and key in the

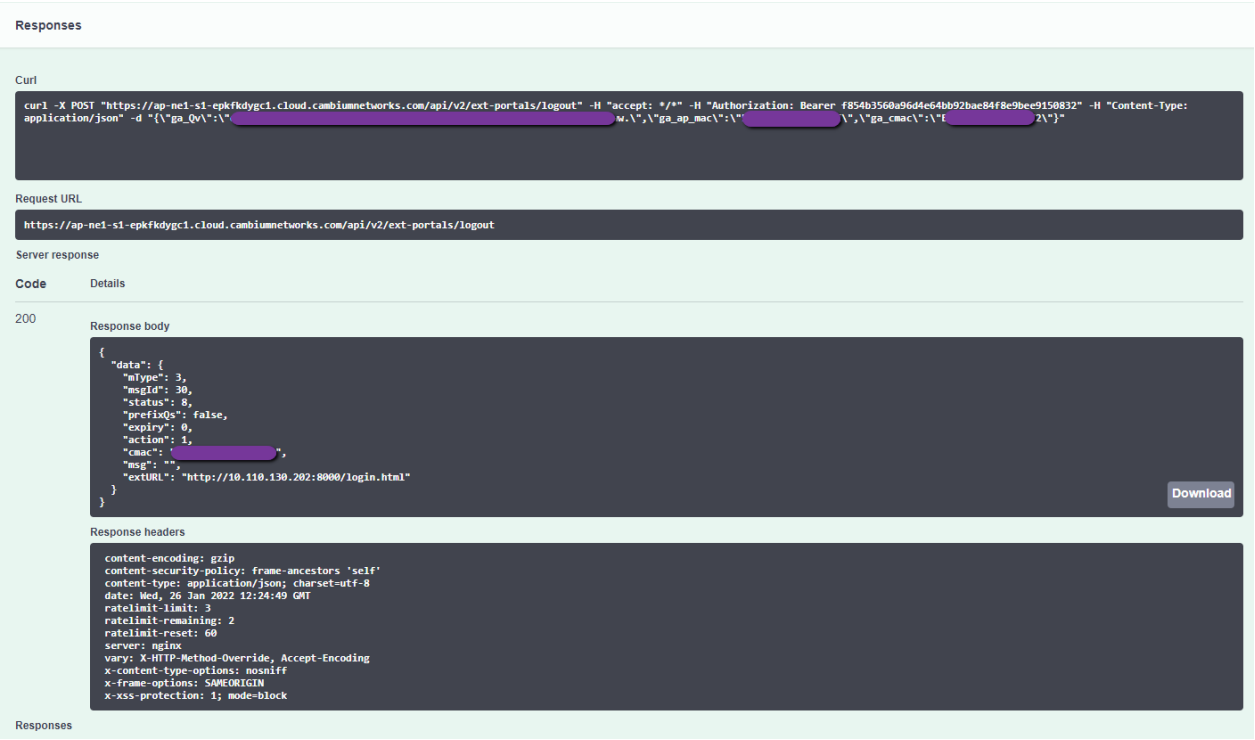
AP MAC address	"ga_ap_mac"
Client MAC address	"ga_cmac"
Signature	"ga_Qv"



Swagger API Logout screenshot,

Once all the requisite fields are keyed-in click on execute for swagger API to post this message to the cnMaestro.

Once execute is clicked, cnMaestro will receive this info and forward to the AP to disconnect the client.

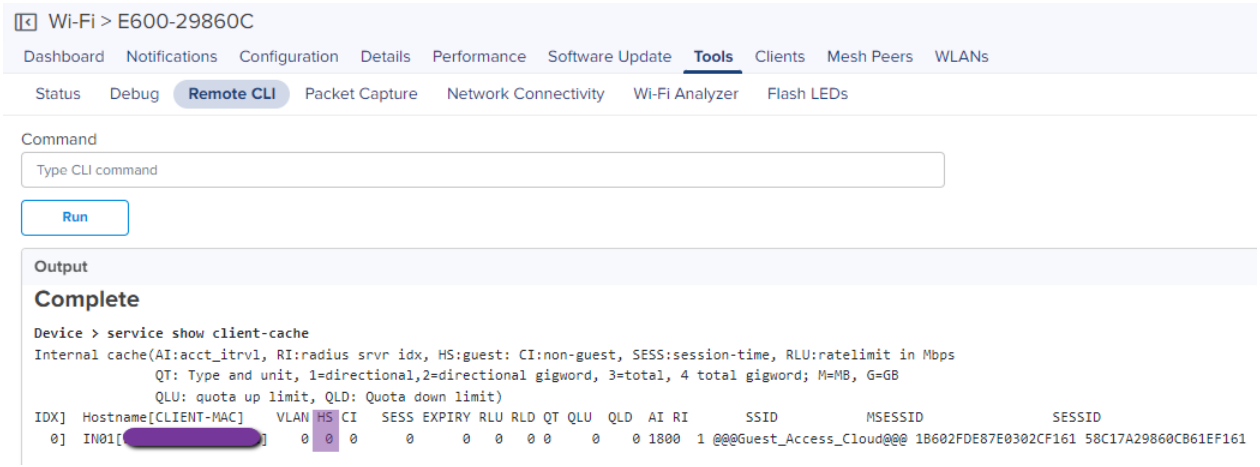


Swagger API screenshot after executing done (response)

We can see that the response is 200 OK which means the client is disconnected successfully,

Debugging and Troubleshooting

If the client is not connecting, please go to Tools > Remote CLI on cnMaestro and run *service show client-cache* to verify client is connected



Here one can see that the HS bit is “0” means the client is connected but not authenticated.

Once user/pass is POST to the cnMaestro, “*service show debug-logs wifid live”* will display the authentication logs.

Login Logs

```
Jan 26 18:20:12: lldp frame:dmac 01-80-C2-00-00-0E smac 58-C1-7A-FC-23-67 type 88cc
 (lldp.c:89)
Jan 26 18:20:36: DA sent[261]: {"id": "12c323710e124693b5f12e7c3ec3fb50-W0", "msgId": 27, "ga_ap_mac": "58-C1-7A-29-86-0C", "ga
Jan 26 18:20:36: From cnmaestro rcvd msg type[27], total recvd reply count[4] (cache.c:4080)
Jan 26 18:20:36: Ext CP msg_sub_type[27] received from cnmaestro (cache.c:3960)
Jan 26 18:20:36: EXT CP msg[27] from cnmaestro for client[E4-A7-A0-D4-31-C2]  with id[12c323710e124693b5f12e7c3ec3fb50-W0] (cac
Jan 26 18:20:36: Login request received for client[E4-A7-A0-D4-31-C2] (hotspot.c:2232)
Jan 26 18:20:36: req type[0] with ID[12c323710e124693b5f12e7c3ec3fb50-W0] copied to hotspot session for access type[1] (hotspot
Jan 26 18:20:36: RAUTH 10.110.130.202[UP:0], [UP:0], [UP:0] (radius.c:685)
Jan 26 18:20:36: Initiated hotspot auth RADIUS authentication for client[E4-A7-A0-D4-31-C2] to radius server[0]:10.110.130.202
Jan 26 18:20:36: Handling hotspot login request for user[anand] (radius.c:3333)
Jan 26 18:20:36: Hotspot client[E4-A7-A0-D4-31-C2] rad_acct_sess_id[58-C1-7A-29-86-0C-06-41-F1-61-E4-A7-A0-D4-31-C2] (radius.c:
Jan 26 18:20:36: Sending RADIUS authentication for client[E4-A7-A0-D4-31-C2] to radius server[10.110.130.202] (radius.c:3103)
Jan 26 18:20:36: Initiate hotspot radius exchange sta[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] using FD[43] (radius
Jan 26 18:20:36: RADIUS Server IP [10.110.130.202] (radius.c:3154)
Jan 26 18:20:36: Process RADIUS response for client[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] (radius.c:1432)
Jan 26 18:20:36: Client[E4-A7-A0-D4-31-C2] WG state[unknown] (radius.c:1154)
Jan 26 18:20:36: RADIUS[10.110.130.202] success for client[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] (radius.c:1613)
Jan 26 18:20:36: Hotspot Client[E4-A7-A0-D4-31-C2] on vlan[10] traffic policy skipped; dyn_vlan[0] (cache.c:810)
Jan 26 18:20:36: process RADIUS auth response code 2 for hotspot sta[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] (radi
Jan 26 18:20:36: process RADIUS response code 2 for hotspot sta[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] (radius.c:
Jan 26 18:20:36: hotspot_handle_radius_response is 2 (hotspot.c:2635)
Jan 26 18:20:36: RADIUS provided session time[0], idle timeout[0], reply-msg=2e7c3ec3fb50-W0 (hotspot.c:2636)
Jan 26 18:20:36: radio_idx=1, bss_idx=0, APD_NUM_RADIOS=2, APD_NUM_BSS_PER_RADIO=16 (apd.c:589)
Jan 26 18:20:36: client[E4-A7-A0-D4-31-C2] hostapd vlan=10 and wlan vlan=10 (cache.c:1841)
Jan 26 18:20:36: client [E4-A7-A0-D4-31-C2] on ssid @@@Guest_Access_Cloud@@@ vlan 10 state sync (type:2) sent, len[704] (cache.
Jan 26 18:20:36: client[E4-A7-A0-D4-31-C2] hotspot session updated ga_allowed[1] to coplane (hotspot.c:416)
Jan 26 18:20:36: Client[E4-A7-A0-D4-31-C2] EXT CP reply to controller for id[12c323710e124693b5f12e7c3ec3fb50-W0], status_code[
Jan 26 18:20:36: Sent ctlr ext cp login rsp for client[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] (cache.c:262)
Jan 26 18:20:36: Setup rate limit up[0] down[0] for client[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] (radius.c:1732)
Jan 26 18:20:36: client[E4-A7-A0-D4-31-C2] custom per client rate limit not in use, skip update to coplane (radius.c:516)
Jan 26 18:20:36: RADIUS exchange completed for client[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] closing FD[43] (radi


Jan 26 18:20:42: lldp frame:dmac 01-80-C2-00-00-0E smac 58-C1-7A-FC-23-67 type 88cc
 (lldp.c:89)

E600-29860C(config)# service show client-cache
Internal cache(AI:acct_itrvl, RI:radius srvr idx, HS:guest: CI:non-guest, SESS:session-time, RLU:ratelimit in Mbps
               QT: Type and unit, 1=directional,2=directional gigword, 3=total, 4 total gigword; M=MB, G=GB
               QLU: quota up limit, QLD: Quota down limit)
IDX]  Hostname[CLIENT-MAC]    VLAN HS CI   SESS EXPIRY RLU RLD QT QLU  QLD  AI RI       SSID          MSESSID               SESSID
  0]  IN01[E4-A7-A0-D4-31-C2]   10  1  0  28800  28784   0   0 0     0    0 1800  1 @@@Guest_Access_Cloud@@@ A95ABA29B9EB9C43F161 58C17A29860C0641F161
```

Once the client is connected look for the HS bit set to “1” which indicates that the client is authenticated and data ready state.

Logout logs

```
E600-29860C(config)#
E600-29860C(config)# service show debug-logs wifid live
Jan 26 18:20:36: Sent ctlr ext cp login rsp for client[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] (cache.c:262)
Jan 26 18:20:36: Setup rate limit up[0] down[0] for client[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] (radius.c:1732)
Jan 26 18:20:36: client[E4-A7-A0-D4-31-C2] custom per client rate limit not in use, skip update to coplane (radius.c:516)
Jan 26 18:20:36: RADIUS exchange completed for client[E4-A7-A0-D4-31-C2] on ssid[@@@Guest_Access_Cloud@@@] closing FD[43] (radi
Jan 26 18:20:42: lldp frame:dmac 01-80-C2-00-00-0E smac 58-C1-7A-FC-23-67 type 88cc
 (lldp.c:89)
Jan 26 18:20:55: radio0 intr num 49 intr cnt 226548 (main.c:1529)
Jan 26 18:20:55: radio1 intr num 231 intr cnt 68917 (main.c:1529)
Jan 26 18:20:55: Loudest neighbours on 2.4GHz band (autocell.c:263)
Jan 26 18:20:55: Loudest neighbours on 5GHz band (autocell.c:263)

Jan 26 18:21:09: DA sent[217]: {"id": "4396dleeae0349cb80f22fdd0c8a36e4-W0", "msgId": 29, "ga_ap_mac": "58-C1-7A-29-86-0C", "ga
Jan 26 18:21:09: From cnmaestro rcvd msg type[29], total recvd reply count[5] (cache.c:4080)
Jan 26 18:21:09: Ext CP msg_sub_type[29] received from cnmaestro (cache.c:3960)
Jan 26 18:21:09: EXT CP msg[29] from cnmaestro for client[E4-A7-A0-D4-31-C2]  with id[4396dleeae0349cb80f22fdd0c8a36e4-W0] (cac
Jan 26 18:21:09: Logout request received for client[E4-A7-A0-D4-31-C2] (hotspot.c:2232)
Jan 26 18:21:09: client[E4-A7-A0-D4-31-C2] acct stop; acct running[0], roamed away[0] (radius.c:3823)
Jan 26 18:21:09: client[E4-A7-A0-D4-31-C2] ctx[0];crx[0], otx[0];orx[0], ntx[28];nrx[38] (wifi_stats.c:97)
Jan 26 18:21:09: radio_idx=1, bss_idx=0, APD_NUM_RADIOS=2, APD_NUM_BSS_PER_RADIO=16 (apd.c:589)
Jan 26 18:21:09: client[E4-A7-A0-D4-31-C2] hostapd vlan=10 and wlan vlan=10 (cache.c:1841)
Jan 26 18:21:09: client [E4-A7-A0-D4-31-C2] on ssid @@@Guest_Access_Cloud@@@ vlan 10 state sync (type:2) sent, len[704] (cache.
Jan 26 18:21:09: client[E4-A7-A0-D4-31-C2] hotspot session updated ga_allowed[0] to coplane (hotspot.c:416)
Jan 26 18:21:09: Client[E4-A7-A0-D4-31-C2] EXT CP reply to controller for id[4396dleeae0349cb80f22fdd0c8a36e4-W0], status_code[
Jan 26 18:21:09: Sent ctlr ext cp logout rsp for client[E4-A7-A0-D4-31-C2] on ssid[☰] (cache.c:262)

Jan 26 18:21:12: lldp frame:dmac 01-80-C2-00-00-0E smac 58-C1-7A-FC-23-67 type 88cc
 (lldp.c:89)
E600-29860C(config)# service show client-cache
Internal cache(AI:acct_itrvl, RI:radius srvr idx, HS:guest: CI:non-guest, SESS:session-time, RLU:ratelimit in Mbps
               QT: Type and unit, 1=directional,2=directional gigword, 3=total, 4 total gigword; M=MB, G=GB
               QLU: quota up limit, QLD: Quota down limit)
IDX]  Hostname[CLIENT-MAC]    VLAN HS CI   SESS EXPIRY RLU RLD QT QLU  QLD  AI RI       SSID          MSESSID               SESSID
  0]  IN01[E4-A7-A0-D4-31-C2]    0  0  0      0      0   0   0 0     0    0 1800  1 @@@Guest_Access_Cloud@@@ A95ABA29B9EB9C43F161 58C17A29860C0641F161
```

Once the client is disconnected look for the HS bit set to “0” which indicates that the client is not in authenticated state