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The bridge to possible

Intro to Meraki Dashboard API Python Library

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@aidevnet

DEVNET-1073

Agenda

- Introduction
- Meraki APIs
- Meraki Dashboard API Python library
- AsyncIO
- Conclusion

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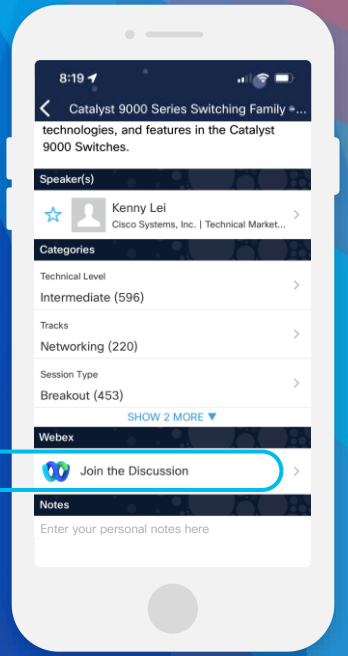

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Introduction

Adrian ILIESIU

Senior Developer Advocate

Enterprise Networking (Cisco DNAC, SD-WAN, Meraki & IOS XE)

- Building networks since 2003
- Network engineer, systems engineer, team leader, QA engineer
- CCNA, CCNP, CCIP, CCIE EI
- Co-author of the DEVASC official certification guide

Meraki APIs

The Value of APIs

Why do customers use APIs?

AUTOMATE

Accelerate everything from minor adjustments to enterprise-sized deployments by **automating configuration changes, provisioning, and data collection.**

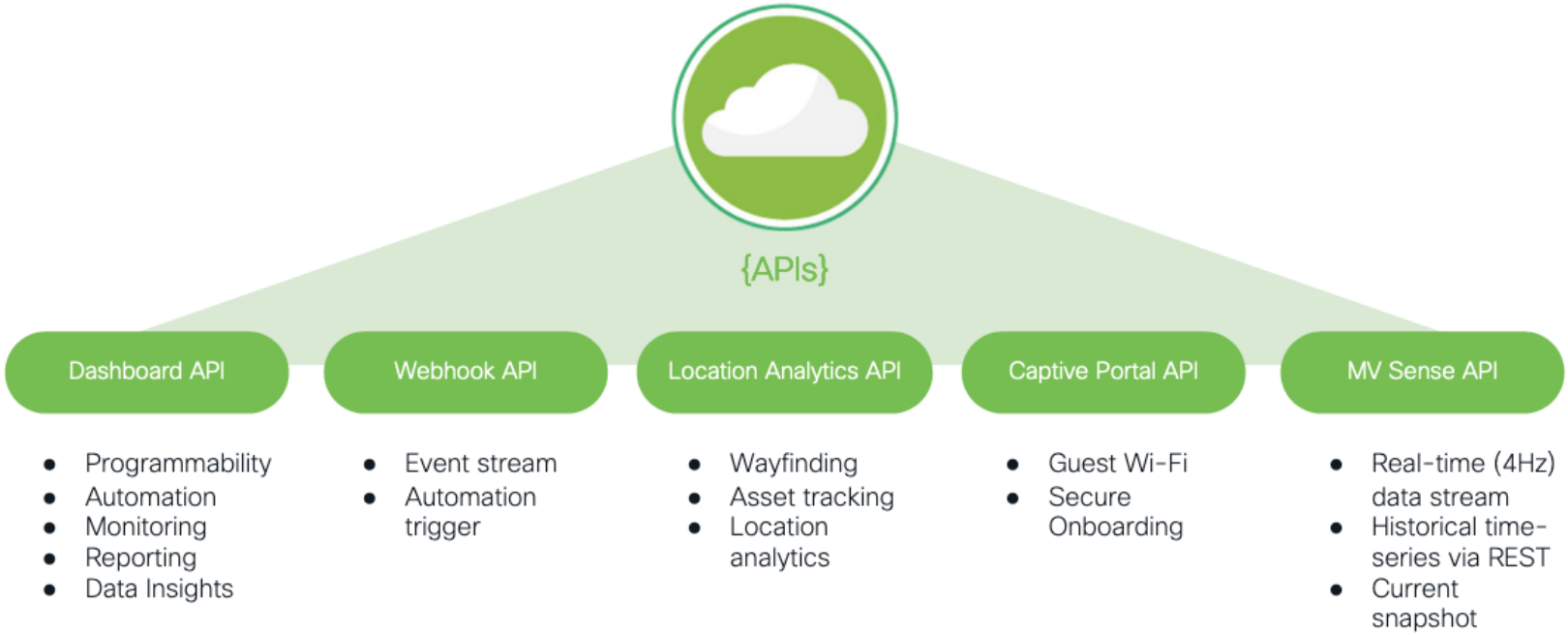
INTEGRATE

Unlock new insights, streamline business workflows and **realize additional value from your existing business systems** by integrating Meraki dashboard with your line-of-business applications.

ANTICIPATE

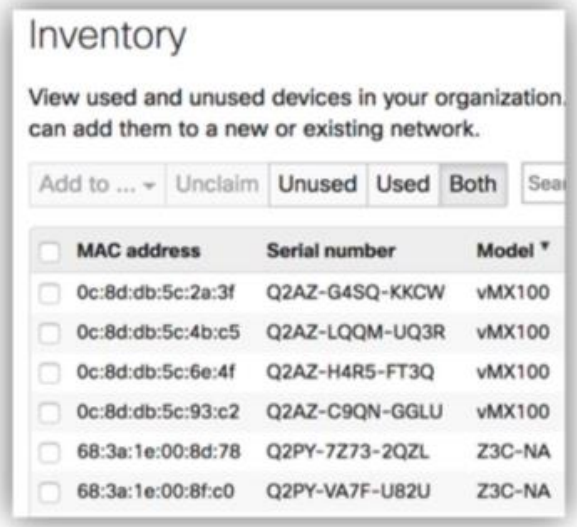
Plan for the future with historical metrics, real-time telemetry and client location analytics to **make data-driven business decisions.**

Meraki API Services, Each with Different Purposes



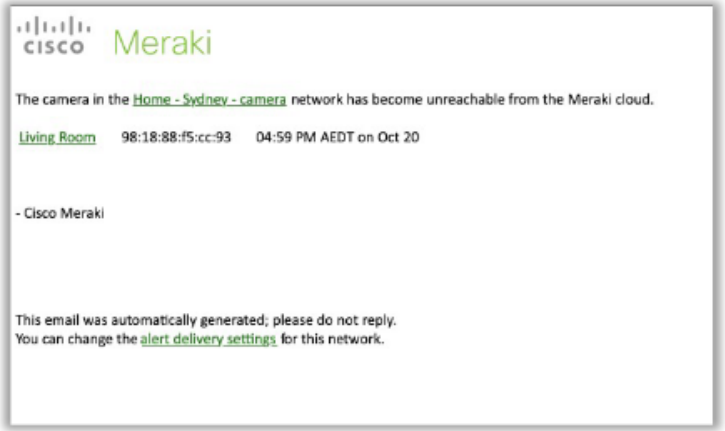
Dashboard API

Dashboard Web UI	APIs



Webhook API

Dashboard Web UI	APIs



cisco Meraki

The camera in the Home - Sydney - camera network has become unreachable from the Meraki cloud.

Living Room 98:18:88:f5:cc:93 04:59 PM AEDT on Oct 20

- Cisco Meraki

This email was automatically generated; please do not reply.
You can change the alert delivery settings for this network.


```
{
    "version": "0.1",
    "sharedSecret": "",
    "sentAt": "2022-10-
20T06:28:24.377119Z",
    "organizationId": "734417",
    "organizationName": "Yuji Terada
Personal",
    "organizationUrl":
"https://n290.meraki.com/o/vSj8Qb/manage
/organization/overview",
    "networkId": "L_726205439913496800",
    "networkName": "Home - Sydney",
    "networkUrl":
"https://n290.meraki.com/Home-Sydney-
came/n/leTphdIe/manage/nodes/list",
    "networkTags": [],
    "deviceMac": "98:18:88:f5:cc:93",
    "deviceName": "Living Room",
```

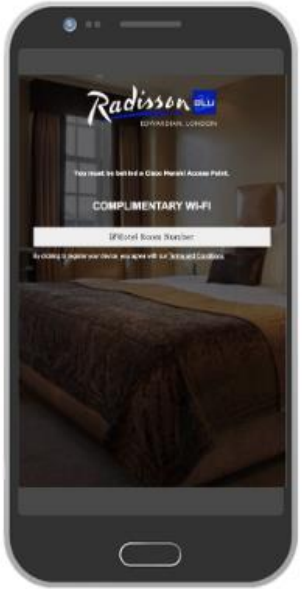
Location Analytics API

Dashboard Web UI	APIs


```
{
    "ipv4": "/192.168.0.63",
    "location": {
        "lat": 51.5355157,
        "lng": -0.06990350000000944,
        "unc": 0.20755340376944298,
        "x": [],
        "y": []
    },
    "seenTime": "2016-09-24T00:06:27Z",
    "ssid": ".interwebs",
    "os": null,
    "clientMac": "18:fe:34:e1:b4:7a",
    "seenEpoch": 1474675587,
    "rssi": 56,
    "ipv6": null,
    "manufacturer": "Espressif"
```

Captive Portal API

Dashboard Web UI | APIs




```
<html>
<head><title>Internet Access Login</title></head>
<body>
<h2>Internet Access Login</h2>
<form method="POST" action="https://example.meraki.com/splash
/
login/?mauth=ABCDEFG123456">
<input type="hidden" name="success_url" value="http://www.
example.com/success/" />
Username: <input type ="text" name="username" />
Password: <input type ="text" name="password" />
<input type="submit" value="Login" />
</form>
</body>
</html>
```

MV Sense API

Dashboard Web UI	APIs

```
'{"lux": 88.4}'
'{"ts":1666242984676, "counts":{"person":0}}'
'{"lux": 88.6}'
'{"ts":1666242984753, "counts":{"person":0}}'
'{"lux": 88.4}'
'{"ts":1666242984947, "counts":{"person":0}}'
'{"ts":1666242985077, "counts":{"person":0}}'
'{"lux": 88.6}'
'{"ts":1666242985151, "counts":{"person":0}}'
'{"ts":1666242985361, "counts":{"person":0}}'
'{"lux": 88.4}'
'{"ts":1666242985478, "counts":{"person":0}}'
'{"lux": 88.6}'
'{"ts":1666242985553, "counts":{"person":0}}'
'{\n\t"objects" : [],\n\t"ts" : 1666242985753\n}'
'{"ts":1666242985753, "counts":{"person":0}}'
'{"lux": 88.4}'
'{"ts":1666242985876, "counts":{"person":0}}'
'{"lux": 88.4}'
'{"ts":1666242985953, "counts":{"person":0}}'
'{"lux": 88.2}'
'{"ts":1666242986156, "counts":{"person":0}}'
```

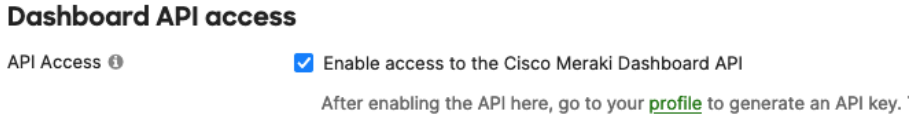
Meraki Dashboard API Python library

Introduction

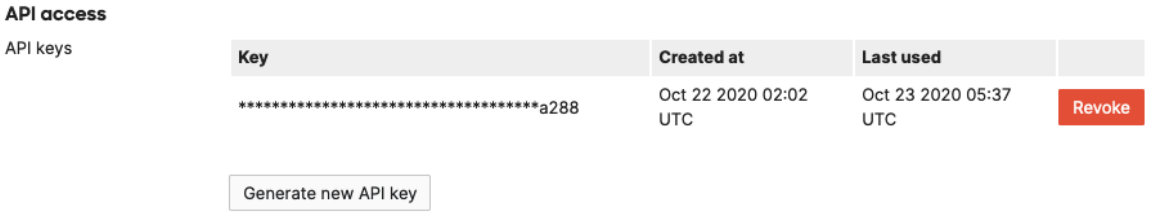
- The Meraki Dashboard API Python library provides all current Meraki Dashboard API calls to interface with the Cisco Meraki cloud-managed platform
- Python >= 3.7
- **pip install meraki**
- Meraki Dashboard API versions:
  - **v0**: August-05-2020 deprecation, February-05-2022 sunset, August-05-2022 End of Grace period (no support escalations, operation not guaranteed)
  - **v1**: Active version (API endpoint to help with migration: GET /organizations/:organizationId/apiRequests?version=0)

Meraki Dashboard API access

- Enable API access: Organization > Settings > Dashboard API access



- Generate API key: My Profile



Features

- **Support for all API endpoints**, as it uses the OpenAPI specification to generate source code
- **Log all API requests** made to a local file as well as on-screen console
- **Automatic retries** upon 429 rate limit errors, using the Retry-After field within response headers
- Get all (or a specified number of) pages of data with **built-in pagination control**
- Tweak settings such as **maximum retries, certificate path, suppress logging**, and other options
- **Simulate POST/PUT/DELETE calls to preview first**, so that network configuration does not get changed
- Includes the legacy module's (version 0.34 and prior) functions for **backward compatibility**

DashboardAPI Class Parameters

```
class DashboardAPI(builtins.object)
 |  DashboardAPI(api_key=None, base_url='https://api.meraki.com/api/v1', single_request_timeout=60, certificate_path='', requests_proxy='', wait_on_rate_limit
=True, nginx_429_retry_wait_time=60, action_batch_retry_wait_time=60, retry_4xx_error=False, retry_4xx_error_wait_time=60, maximum_retries=2, output_log=True,
 log_path='', log_file_prefix='meraki_api_', print_console=True, suppress_logging=False, simulate=False, be_geo_id='', caller='', use_iterator_for_get_pages=F
alse, inherit_logging_config=False)
 |
 |  **Creates a persistent Meraki dashboard API session**
 |
 |  - api_key (string): API key generated in dashboard; can also be set as an environment variable MERAKI_DASHBOARD_API_KEY
 |  - base_url (string): preceding all endpoint resources
 |  - single_request_timeout (integer): maximum number of seconds for each API call
 |  - certificate_path (string): path for TLS/SSL certificate verification if behind local proxy
 |  - requests_proxy (string): proxy server and port, if needed, for HTTPS
 |  - wait_on_rate_limit (boolean): retry if 429 rate limit error encountered?
 |  - nginx_429_retry_wait_time (integer): Nginx 429 retry wait time
 |  - action_batch_retry_wait_time (integer): action batch concurrency error retry wait time
 |  - retry_4xx_error (boolean): retry if encountering other 4XX error (besides 429)?
 |  - retry_4xx_error_wait_time (integer): other 4XX error retry wait time
 |  - maximum_retries (integer): retry up to this many times when encountering 429s or other server-side errors
 |  - output_log (boolean): create an output log file?
 |  - log_path (string): path to output log; by default, working directory of script if not specified
 |  - log_file_prefix (string): log file name appended with date and timestamp
 |  - print_console (boolean): print logging output to console?
 |  - suppress_logging (boolean): disable all logging? you're on your own then!
 |  - inherit_logging_config (boolean): Inherits your own logger instance
 |  - simulate (boolean): simulate POST/PUT/DELETE calls to prevent changes?
 |  - be_geo_id (string): optional partner identifier for API usage tracking; can also be set as an environment variable BE_GEO_ID
 |  - caller (string): optional identifier for API usage tracking; can also be set as an environment variable MERAKI_PYTHON_SDK_CALLER
 |  - use_iterator_for_get_pages (boolean): list* methods will return an iterator with each object instead of a complete list with all items
```

Usage

- Export the API key as an environment variable 👍:

```
export MERAKI_DASHBOARD_API_KEY=093b24e85df15a3e66f1fc359f4c48493eaa1b73
```

- Alternatively, define the API key as a variable in the source code 👎:

```
API_KEY = 'fd6dd87d96915f21bc0e0b3d96a866ff0e53e381'
```

Usage (cont.)

```
import os
import meraki

dashboard = meraki.DashboardAPI(
        api_key=os.getenv('MERAKI_DASHBOARD_API_KEY'),
        base_url='https://api.meraki.com/api/v1/',
        output_log=True,
        log_file_prefix=os.path.basename(__file__)[:-3],
        log_path='',
        print_console=False
)
```

Usage – Get networks in organization

```
# Get list of organizations to which API key has access
organizations = dashboard.organizations.getOrganizations()

# Iterate through list of orgs
for org in organizations:
        print(f'\nAnalyzing organization {org["name"]}:')
        org_id = org['id']

        # Get list of networks in organization
        try:
                networks = dashboard.organizations.getOrganizationNetworks(org_id)
        except meraki.APIError as e:
                print(f'Meraki API error: {e}')
                print(f'status code = {e.status}')
                print(f'reason = {e.reason}')
                print(f'error = {e.message}')
                continue
        except Exception as e:
                print(f'some other error: {e}')
                continue
```

Usage – Get clients in networks

```
# Iterate through networks
total = len(networks)
counter = 1
print(f' - iterating through {total} networks in organization {org_id}')
for net in networks:
        print(f'Finding clients in network {net["name"]} ({counter} of {total})')
        try:
        # Get list of clients on network, filtering on timespan of last 14 days
        clients = dashboard.networks.getNetworkClients(net['id'],
                        timespan=60*60*24*14, perPage=1000, total_pages='all')
        except meraki.APIError as e:
                print(f'Meraki API error: {e}')
                print(f'status code = {e.status}')
                print(f'reason = {e.reason}')
                print(f'error = {e.message}')
        except Exception as e:
                print(f'some other error: {e}')
        counter += 1
```

Usage – Create new network and SSID

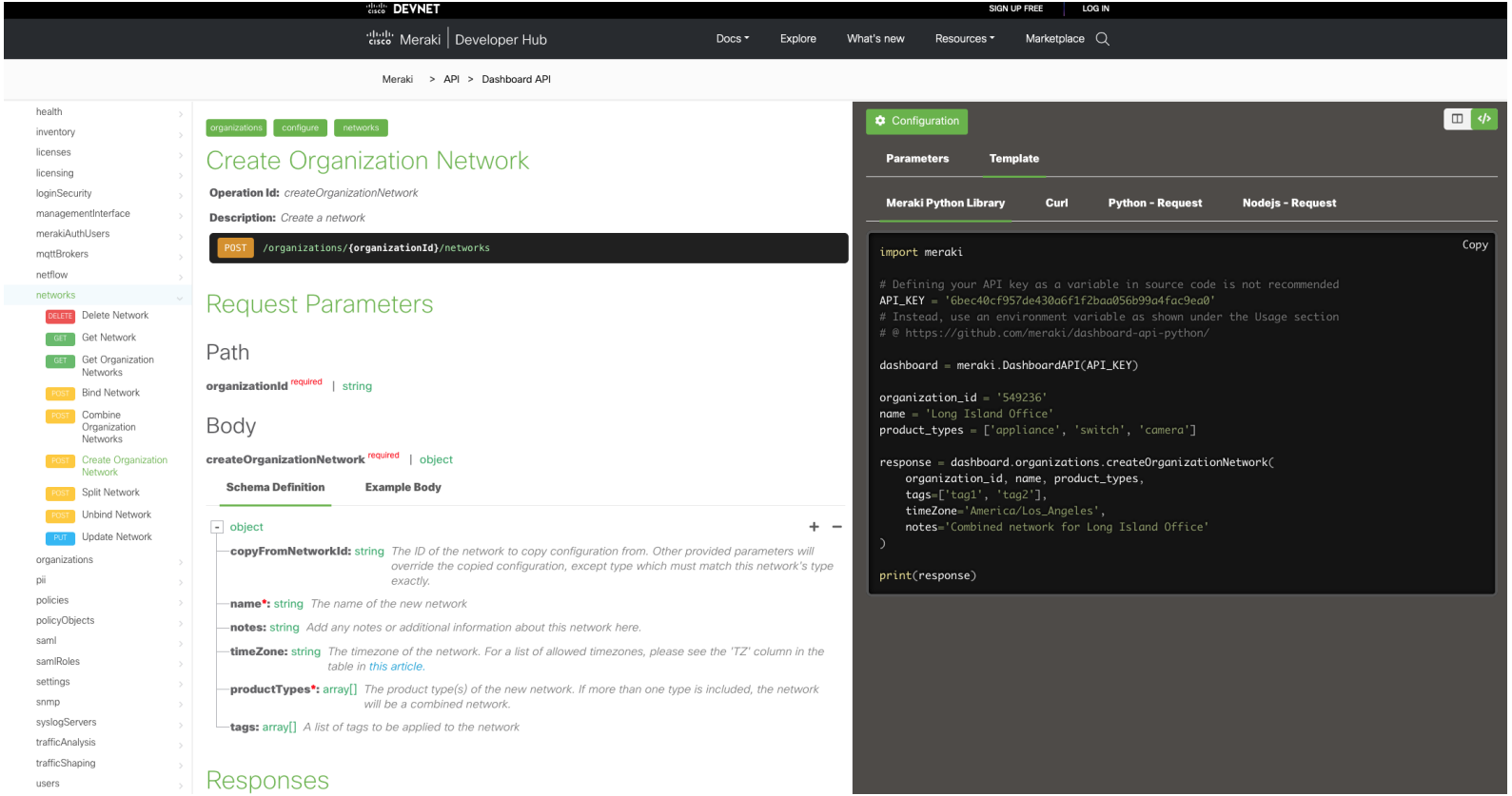
```
# Create a new organization network
organization_id = '549236'
name = 'Long Island Office'
product_types = ['appliance', 'switch', 'camera']

new_network = dashboard.organizations.createOrganizationNetwork(
        organization_id, name, product_types,
        tags=['tag1', 'tag2'],
        timeZone='America/Los_Angeles',
        notes='Combined network for Long Island Office'
)

# Create a new SSID
network_id = 'L_646829496481105433'
number = '0'

new_ssid = dashboard.wireless.updateNetworkWirelessSsid(
        network_id, number,
        name='My SSID',
        enabled=True
)
```

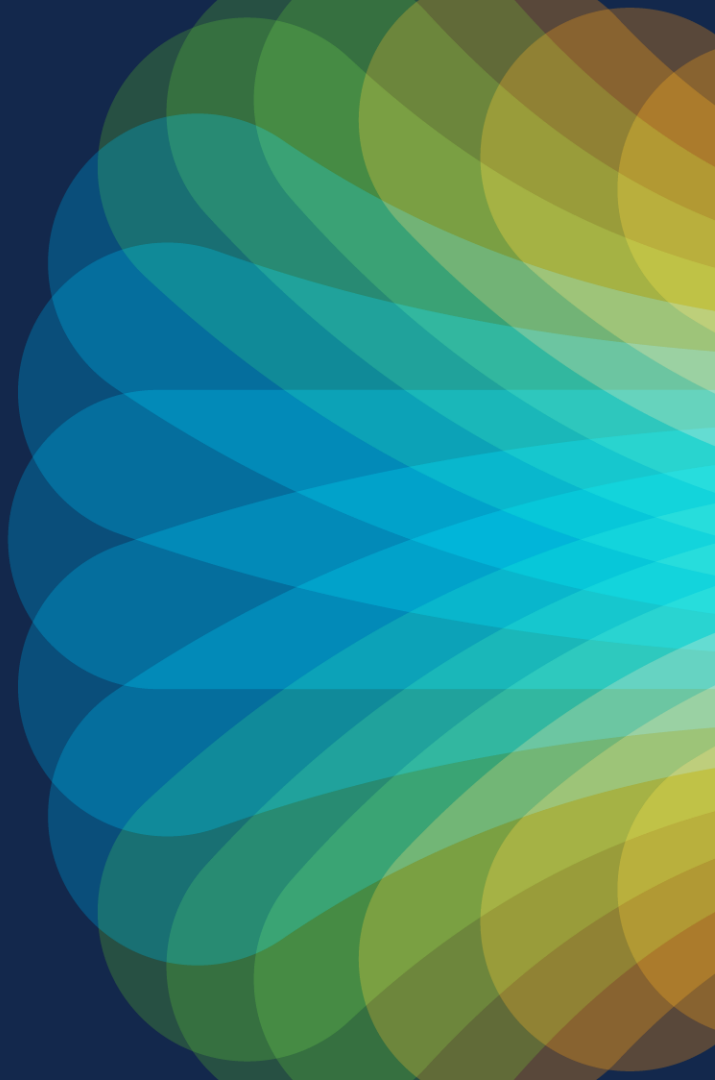
Meraki Python Library Documentation



Usage

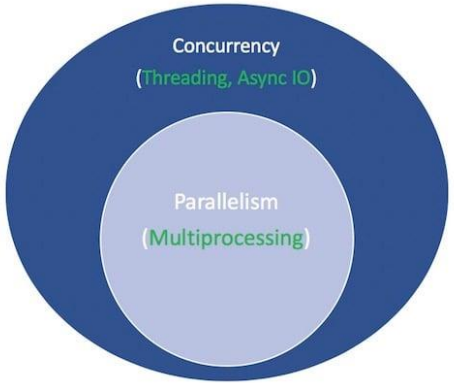
- Make dashboard API calls using the format ***client.scope.operation***
  - ***client*** is the name of the DashboardAPI hook (*dashboard* in our example)
  - ***scope*** is the corresponding scope that represents the *first tag from the OpenAPI spec*
    - *organizations*
    - *networks*
    - *switch*
    - *wireless*
  - ***operation*** is the operation of the API endpoint
    - *createOrganization*
    - *updateNetworkSwitchRoutingOspf*
    - *deleteNetworkMqttBroker*
    - *getNetworkSwitchAccessPolicies*

AsyncIO



Introduction

- asyncio is a library to write concurrent code using the async/await syntax
- asyncio is not threading or multiprocessing
- asyncio takes long waiting periods in which functions would otherwise be blocking and allows other functions to run during that downtime



Source: https://realpython.com/async-io-python/

Usage

```
import asyncio
import os
import meraki.aio

async def main():
        # Instantiate a Meraki dashboard API session
        async with meraki.aio.AsyncDashboardAPI(
                        api_key=os.getenv("MERAKI_DASHBOARD_API_KEY"),
                        base_url="https://api.meraki.com/api/v1",
                        log_file_prefix=__file__[:-3],
                        print_console=False,
        ) as aiomeraki:
                # Get list of organizations to which API key has access
                organizations = await aiomeraki.organizations.getOrganizations()

                # Create a list of all organizations so we can call them all concurrently
                organizationTasks = [listOrganization(aiomeraki, org) for org in organizations]
                for task in asyncio.as_completed(organizationTasks):
                # as_completed returns an iterator, so we just have to await the iterator
        organizationName = await task
                        print(f"finished organization: {organizationName}")
```

Usage – Get networks in organizations

```
async def listOrganization(aiomeraki: meraki.aio.AsyncDashboardAPI, org):
        print(f'Analyzing organization {org["name"]}:’)
        org_id = org["id"]

        # Get list of networks in organization
        try:
                networks = await aiomeraki.organizations.getOrganizationNetworks(org_id)
        except meraki.AsyncAPIError as e:
                print(f"Meraki API error: {e}")
                return org["name"]
        except Exception as e:
                print(f"some other error: {e}")
                return org["name"]
```

Usage – Get clients in networks

```
async def listNetworkClients(aiomeraki: meraki.aio.AsyncDashboardAPI, network):
        print(f'Finding clients in network {network["name"]}')
        try:
                # Get list of clients on network, filtering on timespan of last 14 days
                clients = await aiomeraki.networks.getNetworkClients(
                        network["id"],
                        timespan=60 * 60 * 24 * 14,
                        perPage=1000,
                        total_pages="all",
                )
        except meraki.AsyncAPIError as e:
                print(f"Meraki API error: {e}")
        except Exception as e:
                print(f"some other error: {e}")
```

Conclusion

- Meraki provides several APIs: Dashboard API, Webhook API, Location Analytics API, Captive Portal API, MV Sense API
- Meraki Dashboard API Python library provides all current Meraki Dashboard API calls
- Extra functionality compared to manually building API calls (simulate calls, tweak settings, automatic retries, logging, etc.)
- AsyncIO option also available

Resources

- Meraki Dashboard API Python Library
  - https://github.com/meraki/dashboard-api-python
- Meraki API Documentation
  - https://developer.cisco.com/meraki/api-v1/
- Meraki OpenAPI spec
  - https://api.meraki.com/api/v1/openapiSpec

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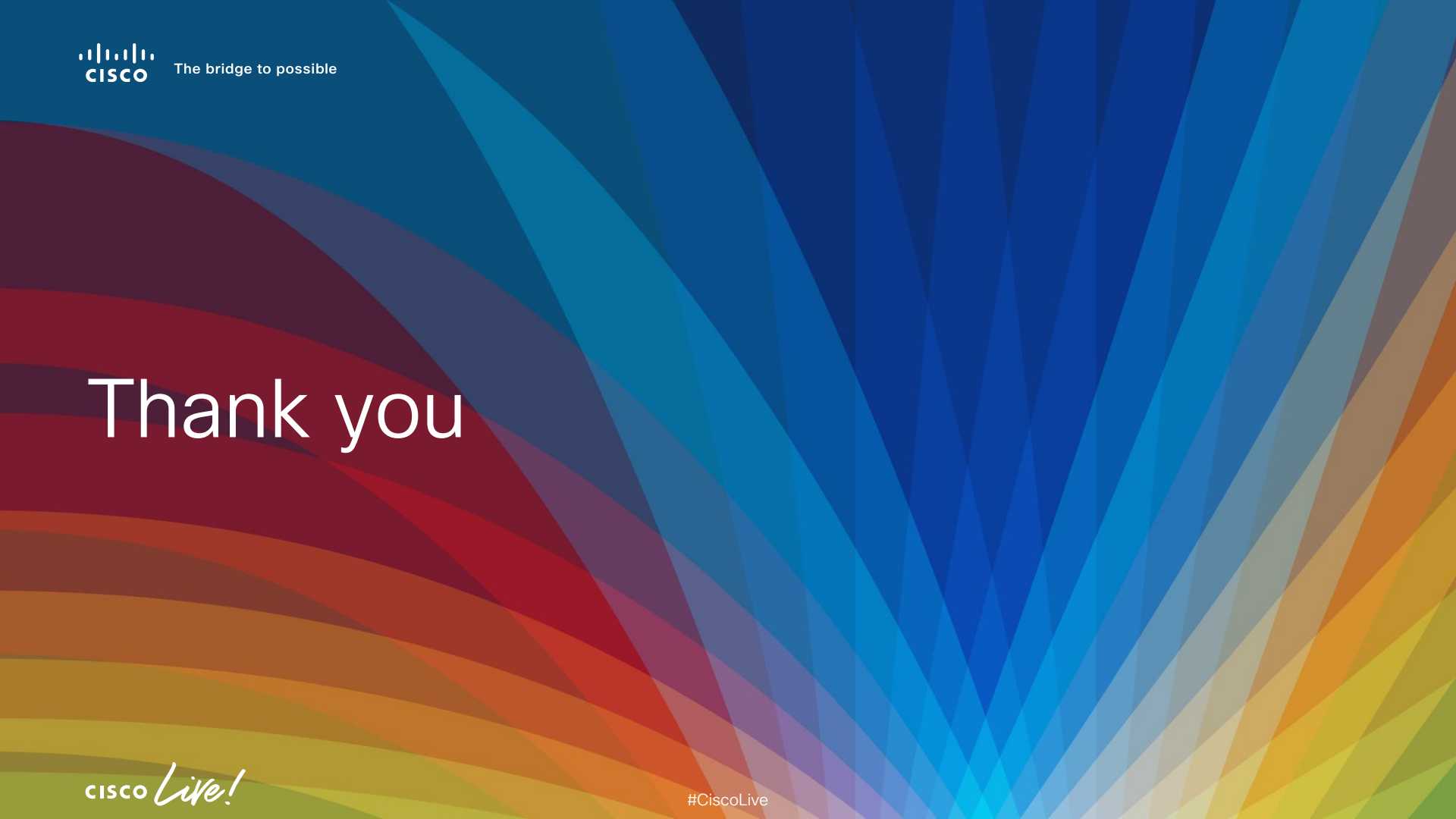
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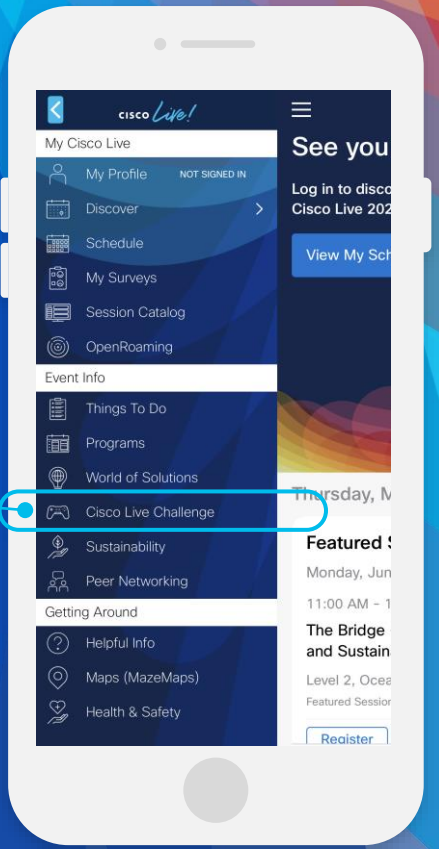


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