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DEVNET express

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REST APIs Demystified

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Test SE
28th Sep, 2021

ALL ABOUT DIGITAL NETWORK ARCHITECTURE

Learning objectives

1. What?
2. Why?
3. How?

REST API Fundamentals

Learn concepts and terminology for REST APIs, how to get started with REST APIs, how to use POSTMAN to test APIs, and how to create scripts that can access a REST API.

1 Hour

What is REST? What are APIs? **Completed**
A look at REpresntational State Transfer (REST) and a REST API overview.

Getting Started with REST APIs **In Progress**
Learn how to get started with any REST API.

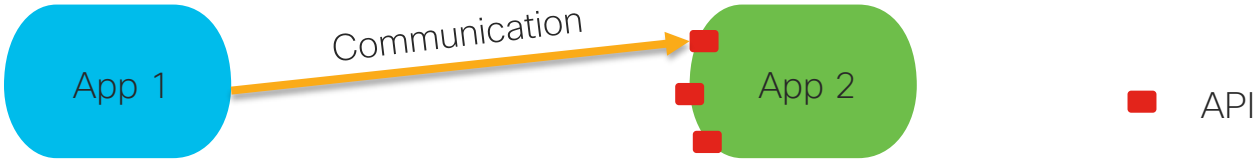
Hands On Exercise: Using Postman to Interact with REST APIs **Completed**
A deep dive into using Postman for REST API testing, discovery, and coding.

67% Complete

Continue Module

Definitions

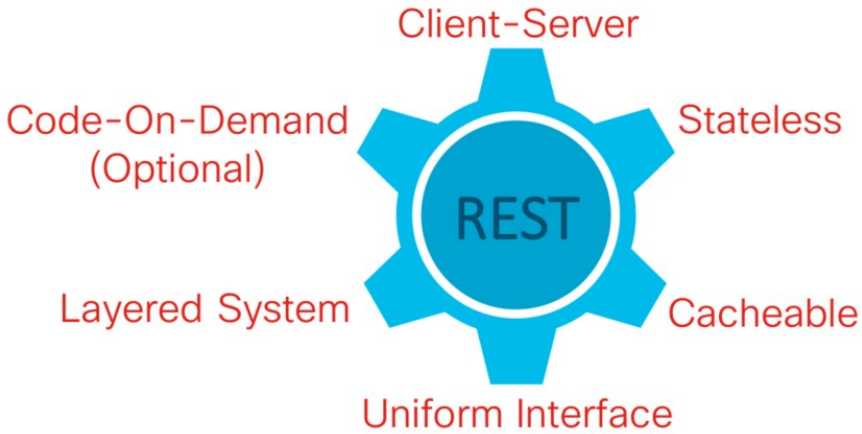
API: application programming interface



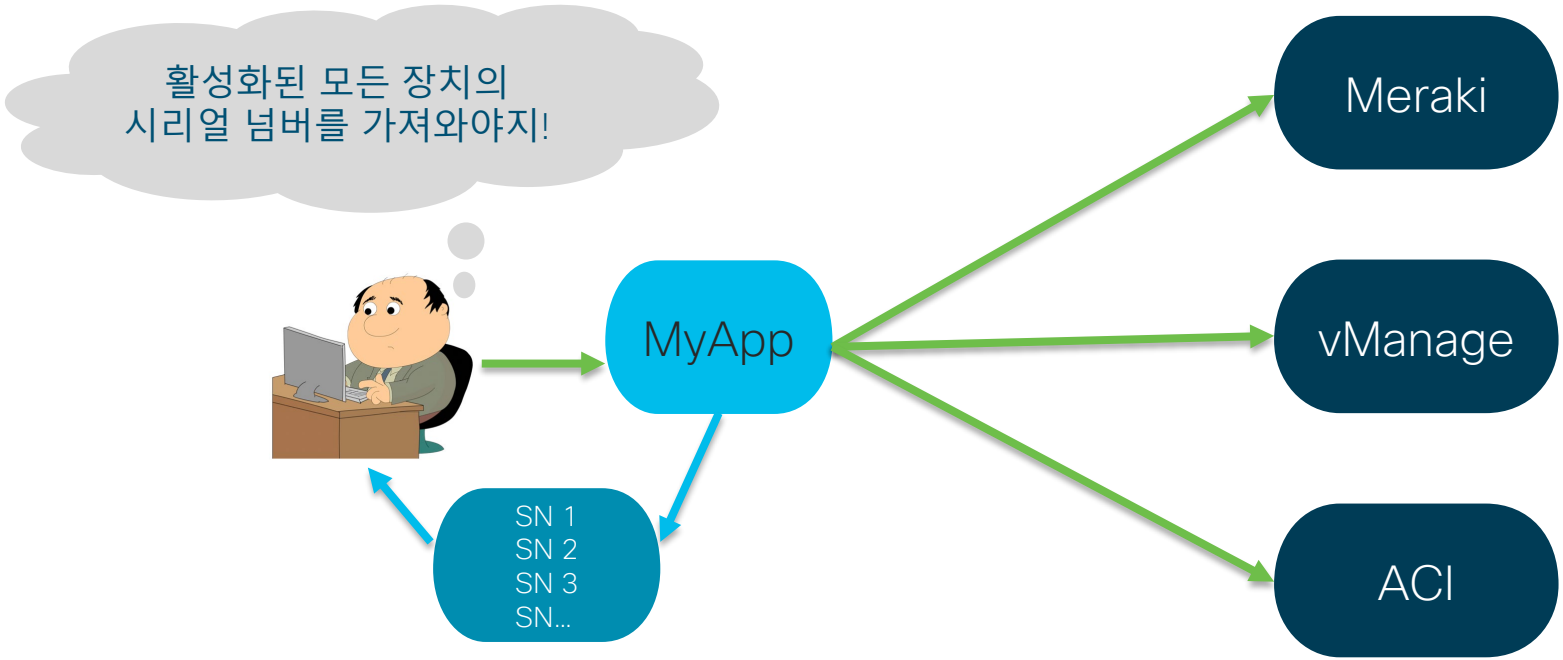
API는 두 애플리케이션이 서로 대화하는 방법입니다.
GUI는 인간을 위한 인터페이스이고 API는 기계를 위한 인터페이스입니다.

What is REST?

- Representational State Transfer
- Is an API architectural style
- Most commonly applied to HTTP(s)
- 6 Principles:



Example: Serial Numbers application



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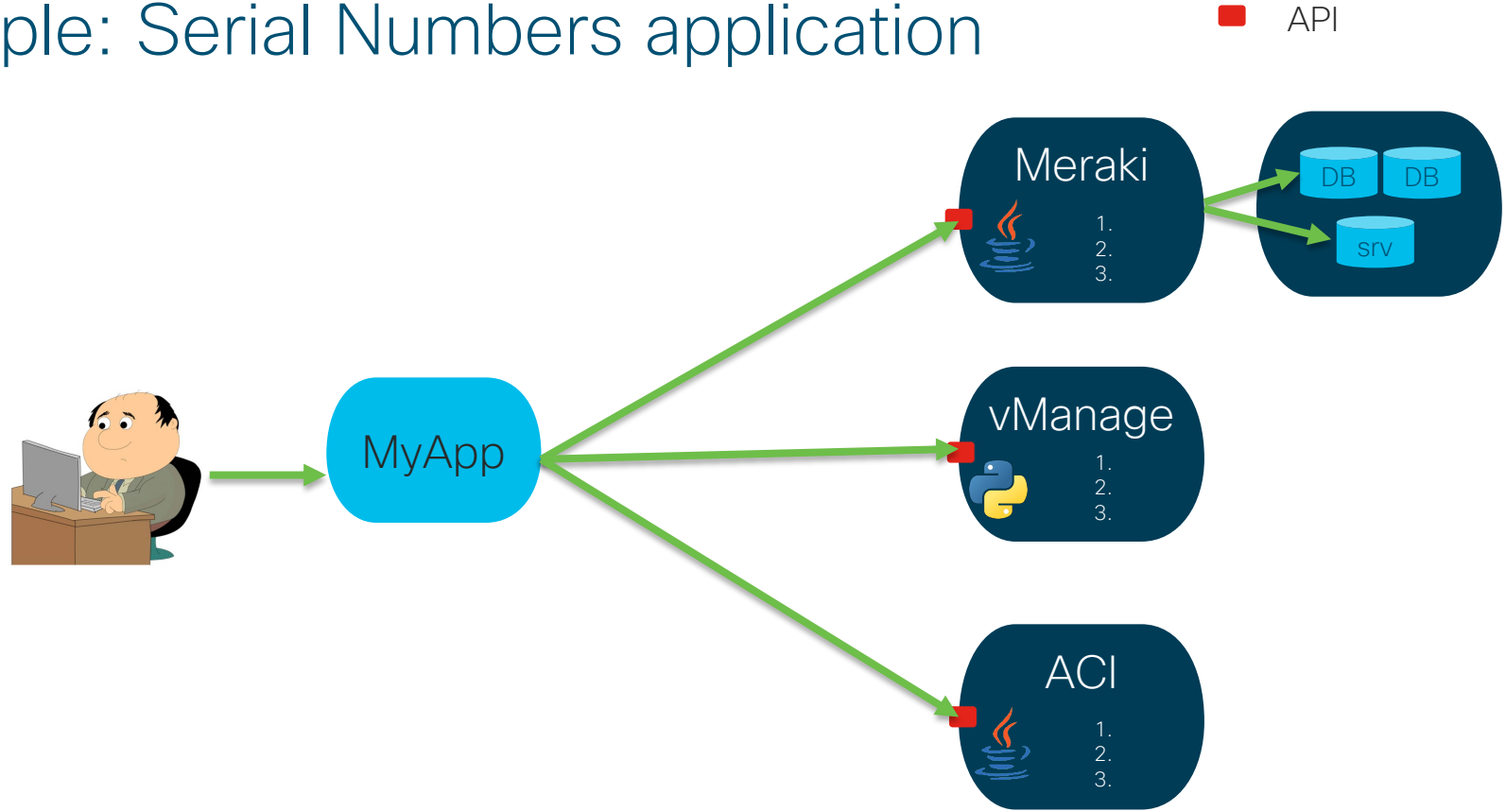
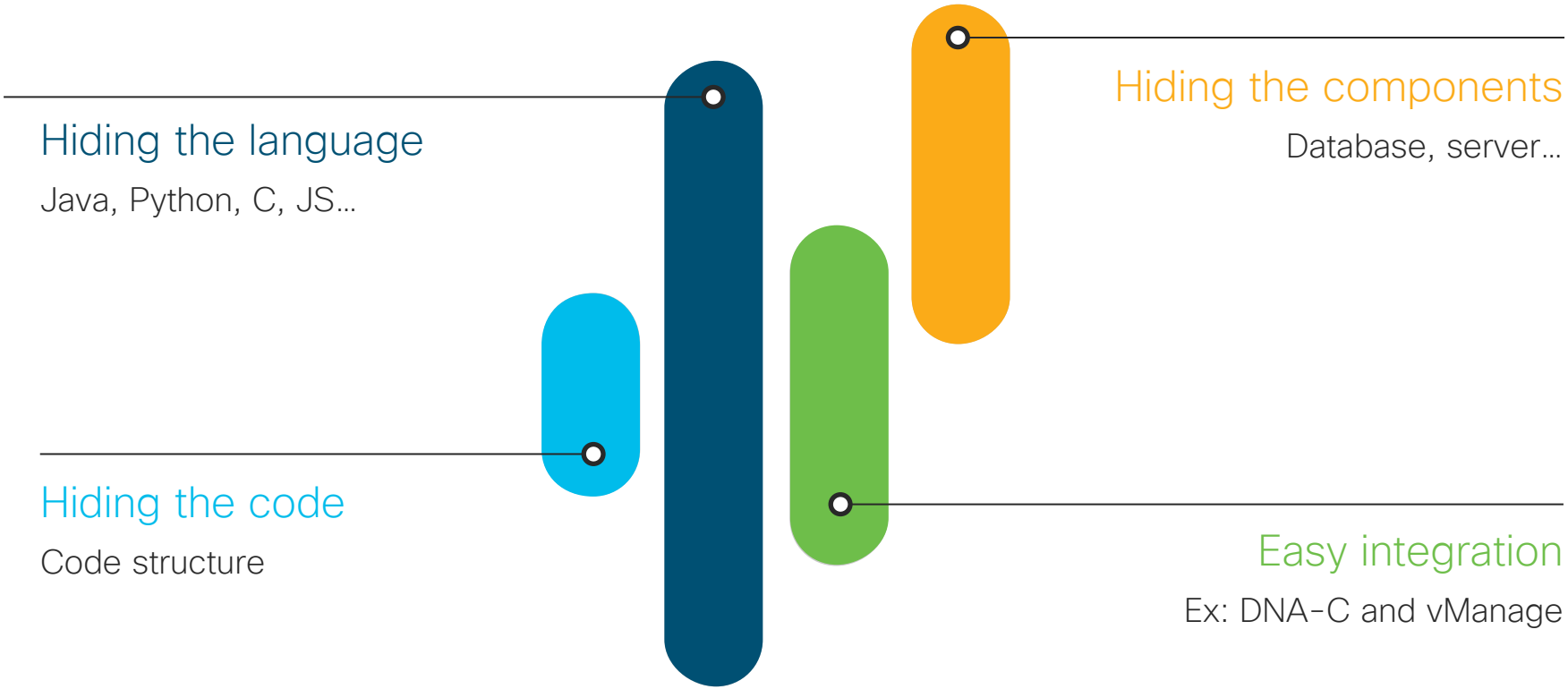


API: 애플리케이션의 복잡한 특징을 추상화



Building Blocks

1) URI (Unified Resource Identifier):
== 요청할 자원

http://maps.googleapis.com/maps/api/geocode/json?address=sanjose

Server or Host **Resource** **Parameters**

- http:// or https://

- Server or Host
  연결할 IP와 port

- Resource
  요청할 데이터 또는 개체의 위치

- Parameters
  scope, filter 및 요청을 명확히 하기 위한 세부정보(선택사항)

2) HTTP Methods:
== 수행할 작업

- **CRUD**: persiste storage의 기본 4가지 동작:
  Create, Read, Update, Delete
- Mapped to HTTP nt methods in REST

HTTP Verb/Method	Typical Purpose (CRUD)	Description
POST	Create	새 개체 또는 리소스를 만드는 데 사용됩니다. 예: 스위치에 새 VLAN 추가
GET	Read	시스템에서 리소스 세부 정보를 검색합니다. 예: 스위치에서 인터페이스 통계 가져오기
PUT	Update	일반적으로 리소스를 교체하거나 업데이트하는 데 사용됩니다. 수정 또는 작성에 사용할 수 있습니다. 예: 라우터의 BGP 구성 업데이트
PATCH	Update	리소스에 대한 일부 세부 정보를 수정하는 데 사용됩니다. 예: 스위치의 포트 구성 변경
DELETE	Delete	시스템에서 리소스를 제거합니다. 예: ACI 패브릭에서 테넌트 삭제

3) Data:
== Payload data

- requests와 responses에 포함 될 수 있습니다.
- Body에 들어있습니다.
- POST, PUT, PATCH requests 에 일반적으로 포함하고 있습니다.
- GET responses에 포함합니다.
- 일반적으로 JSON 또는 XML과 같은 구조화된 형식을 사용합니다.
  - “Content-Type” header에서 확인

```
{
    'title': 'Hamlet',
    'author': 'Shakespeare'
}
```

4) Status Codes:
== (in response) 요청의 상태

Status Code	Status Message	Meaning
200	OK	모두 정상입니다.
201	Created	새 리소스 생성되었습니다.
400	Bad Request	요청이 잘못되었습니다.
401	Unauthorized	인증이 누락되었거나 잘못되었습니다.
403	Forbidden	요청을 이해했지만 허용되지 않습니다.
404	Not Found	리소스를 찾을 수 없습니다.
500	Internal Server Error	서버에 문제가 있습니다.
503	Service Unavailable	서버에서 요청을 완료할 수 없습니다.

- 2xx: ALL OK
- 4xx: Client-side error
- 5xx: Server-side error

5) Headers:
== 추가적인 세부정보와 metadata

Header	Example Value	Purpose
Content-Type	application/json	Specify the format of the data in the body
Accept	application/json	Specify the requested format for returned data
Authorization	Basic dmFncmFudDp2YWdyYW50	Provide credentials to authorize a request
Date	Tue, 25 Jul 2017 19:26:00 GMT	Date and time of the message

- 클라이언트와 서버 간에 정보를 전달하는 데 사용됩니다.
- REQUEST 와 RESPONSE 둘 다 포함합니다.
- 일부 API는 인증 또는 기타 목적으로 custom header를 사용합니다.

HTTP Authentication Options:

- None: 웹 API 리소스는 공용이며 누구나 호출할 수 있습니다.
- Basic HTTP: 사용자 이름과 암호는 인코딩된 문자열로 서버에 전달됩니다.
  - 인증: Basic ENCODEDSTRING
- Token: 웹 API 개발자 포털에서 일반적으로 얻을 수 있는 키이며,키워드 (예를 들어 token)은 API에 따라 다릅니다.
  - 인증: Token aikasf8adf9asd9akasdf0asd
- OAuth: Identity Provider로부터 액세스 토큰을 얻는 절차에 대한 표준 프레임워크입니다.
  - Authorization: Bearer 8a9af9adadf0asdf0adfa0af

Note: 인증 기간은 짧을 수 있으며 토큰을 재발급 해야 합니다.

Request & Response

HTTP Request

Request Headers

HTTP Response

Response Headers

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Response Payload

GET /v1/people/me HTTP/2
Host: webexapis.com
Authorization: Bearer *<redacted>*
Accept: */*
Accept-Encoding: gzip, deflate, sdch
Connection: keep-alive
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_4) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/49.0.2623.112 Safari/537.36

HTTP/2 **200 OK**
Date: Wed, 03 Jun 2020 16:26:01 GMT
Content-Type: application/json;charset=UTF-8
Content-Encoding: gzip
Content-Length: 323
Trackingid: ROUTER_5ED7CF19-9434-01BB-0103-AC12D8820103
Vary: Accept-Encoding
X-Cf-Requestid: 8634487a-8c9e-417e-60bf-06ead6ffe950


```
{  "id":"Y2l...YjY",
   "emails":[
     "clunsford@cisco.com"
   ],
   "phoneNumbers":[
     {
       "type":"work",
       "value":"+1 512 321 7654"
     }
   ],
   "displayName":"Chris Lunsford",
   "nickName":"Chris",
   "firstName":"Chris",
   "lastName":"Lunsford",
   "avatar":"https://avatar-prod-us-east-2.webexcontent.com/Avtr...600",
   "orgId":"Y2l...MGY",
   "created":"2016-04-01T15:47:34.726Z",
   "lastActivity":"2020-06-03T16:20:50.642Z",
   "status":"meeting",
   "type":"person"
}
```


Note: This is all exchanged as simple text over a TCP/TLS connection.

REST API Fundamentals

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1 Hour

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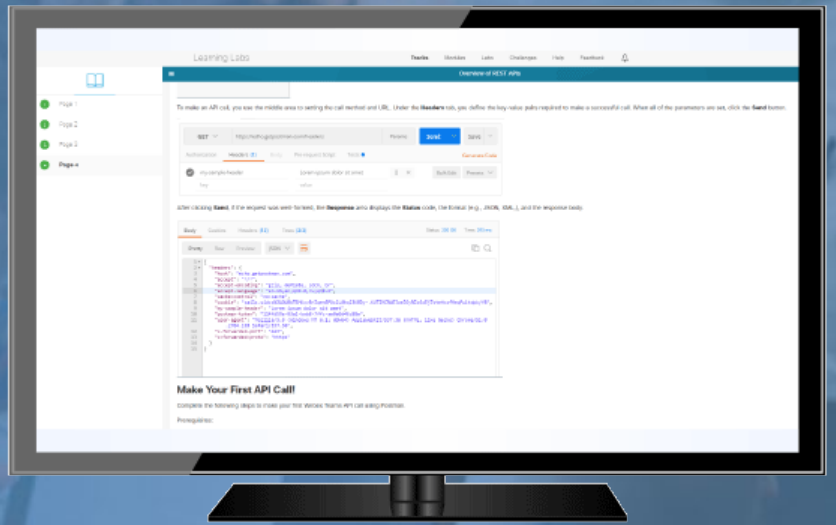
67% Complete

Continue Module

Hands-on Exercise ...



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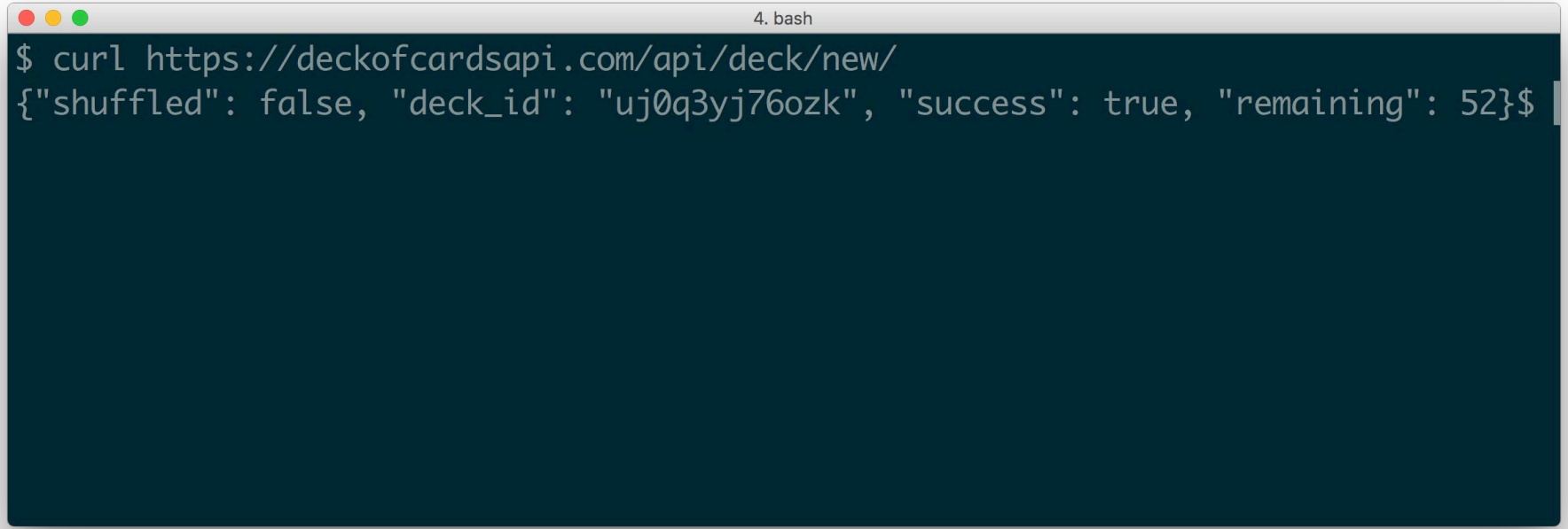
The Deck of Cards API

- https://deckofcardsapi.com
- 인증이 필요 없습니다.



Step 1. 덱 만들기

- ‘curl http://deckofcardsapi.com/api/deck/new/’실행

A Brand New Deck:

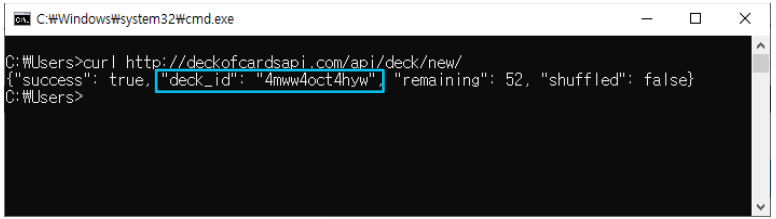
```
http://deckofcardsapi.com/api/deck/new/
```

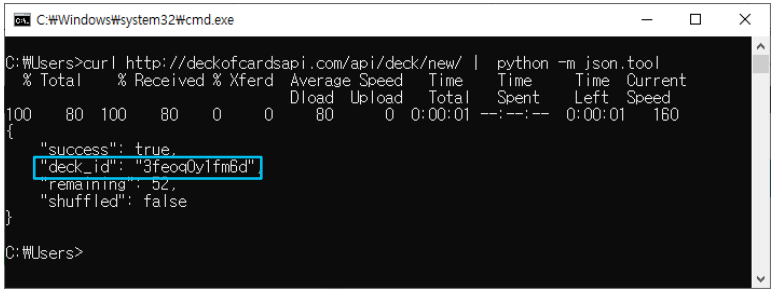
Open a brand new deck of cards.
A-spades, 2-spades, 3-spades... followed by diamonds, clubs, then hearts.

NEW (Oct 2019): Add *jokers_enabled=true* as a GET or POST parameter to your request to include two Jokers in the deck.

Response:

```
{
    "success": true,
    "deck_id": "3p40paa87x90",
    "shuffled": false,
    "remaining": 52
}
```





Step 2. 덱 셔플하기

- ‘curl http://deckofcardsapi.com/api/deck/<<deck_id>>/shuffle/’ 실행

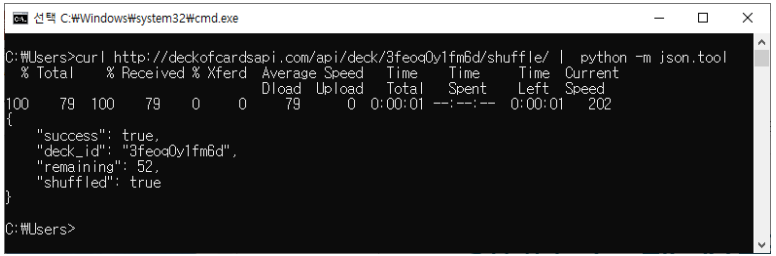
Reshuffle the Cards:

```
http://deckofcardsapi.com/api/deck/<<deck_id>>/shuffle/
```

Don't throw away a deck when all you want to do is shuffle. Include the *deck_id* on your call to shuffle your cards. Don't worry about reminding us how many decks you are playing with.

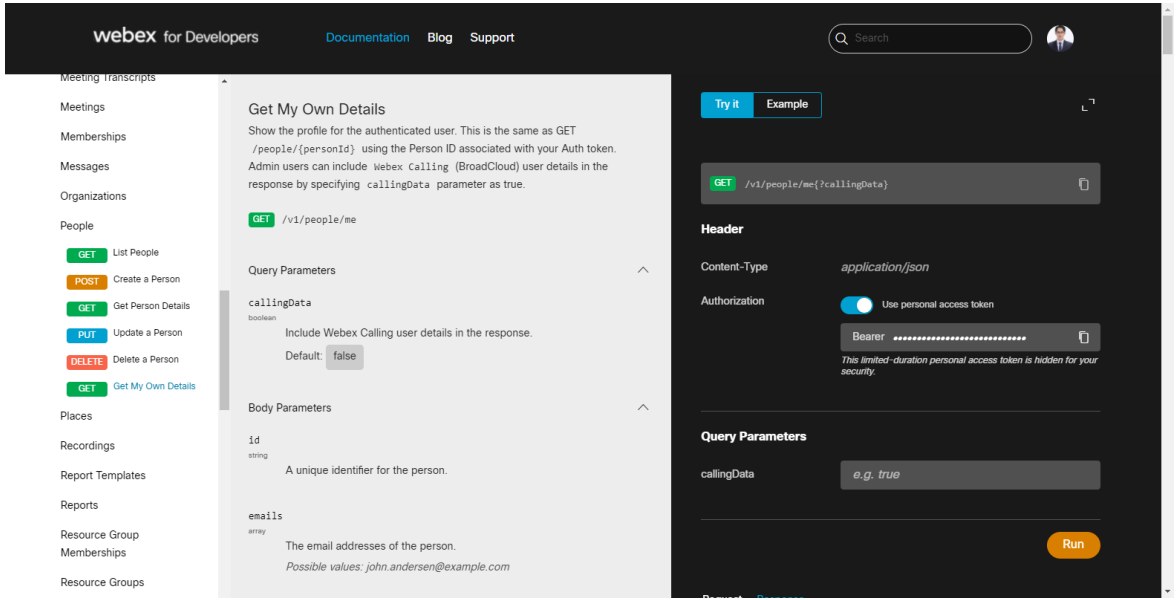
Response:

```
{
    "success": true,
    "deck_id": "3p40paa87x90",
    "shuffled": true,
    "remaining": 52
}
```



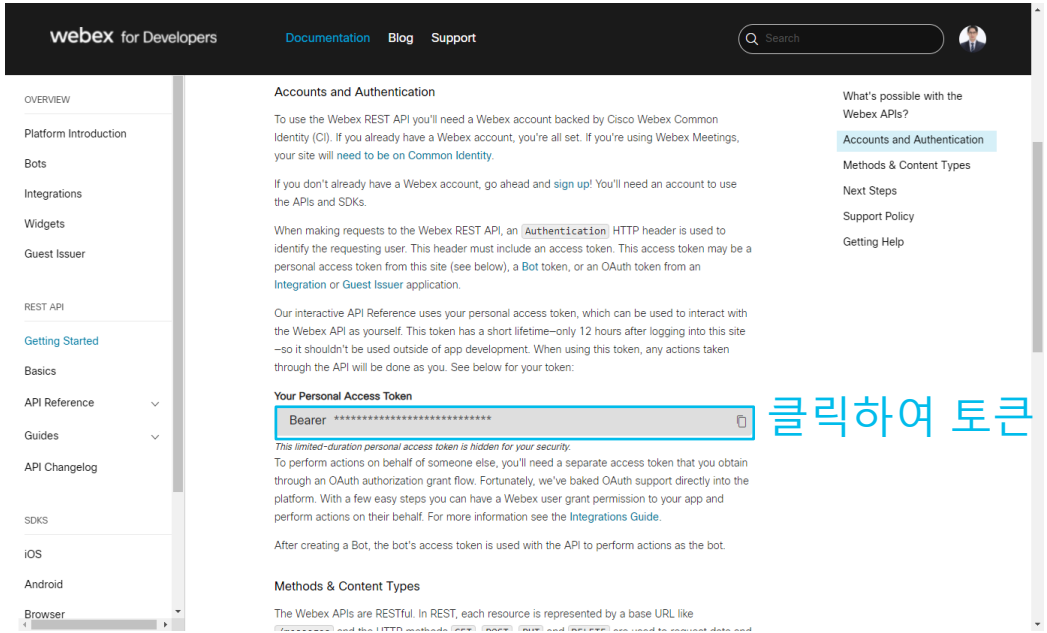
Cisco Webex API

- 토큰으로 인증하고 계정의 정보를 받습니다.
- https://developer.webex.com/docs/api/v1/people/get-my-own-details



Step 1. 토큰 얻기

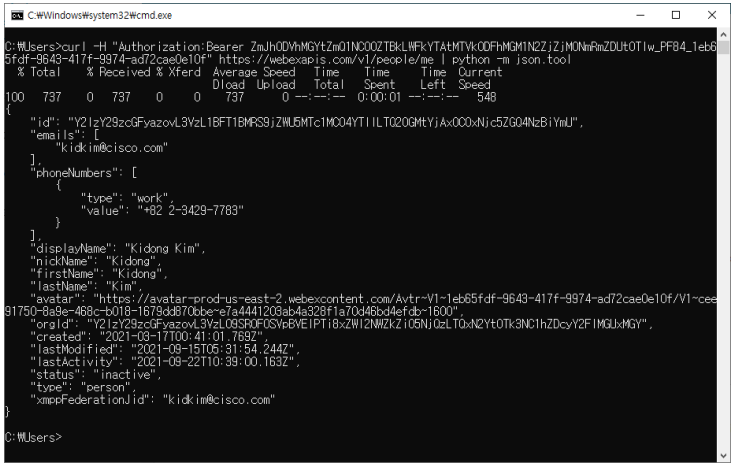
- https://developer.webex.com/docs/api/getting-started#accounts-and-authentication

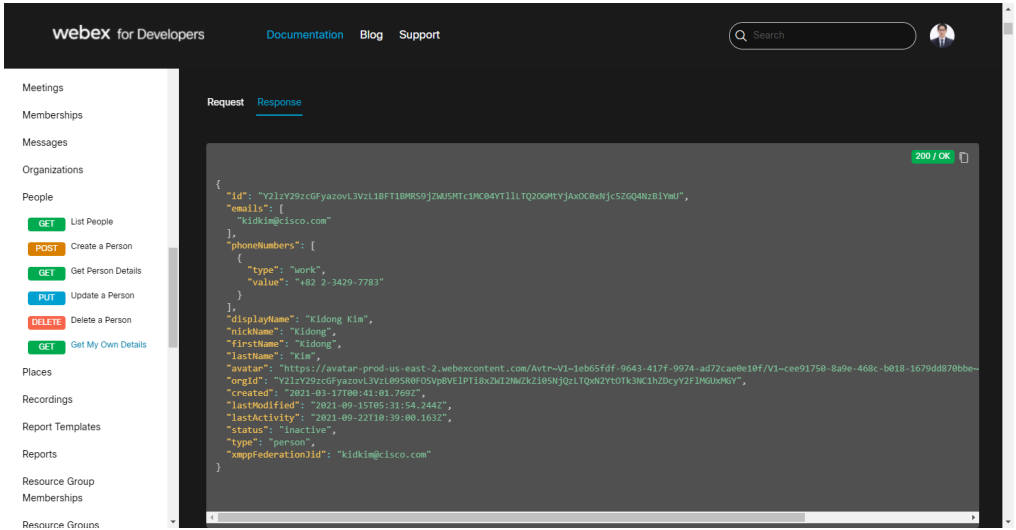


클릭하여 토큰 복사

Step 2. 계정 정보 얻기

- ‘curl -H "Authorization:Bearer <<Token>>" https://webexapis.com/v1/people/me | python -m json.tool’ 실행





API Tools & Demos

REST API 작업을 위한 다양한 옵션들

curl

- Linux command line application

OpenAPI/Swagger

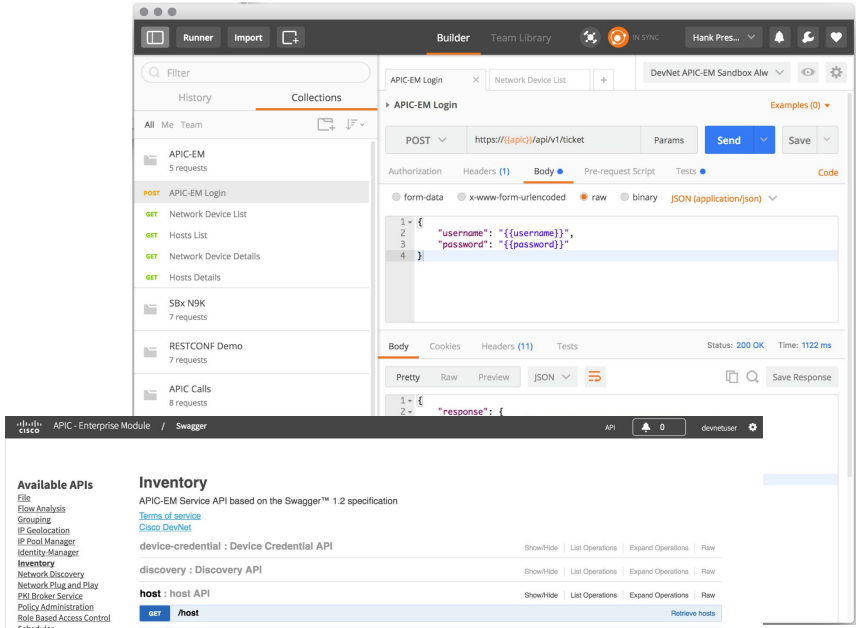
- Dynamic API Documentation

Postman

- API testing desktop App and framework

Programming Language Library

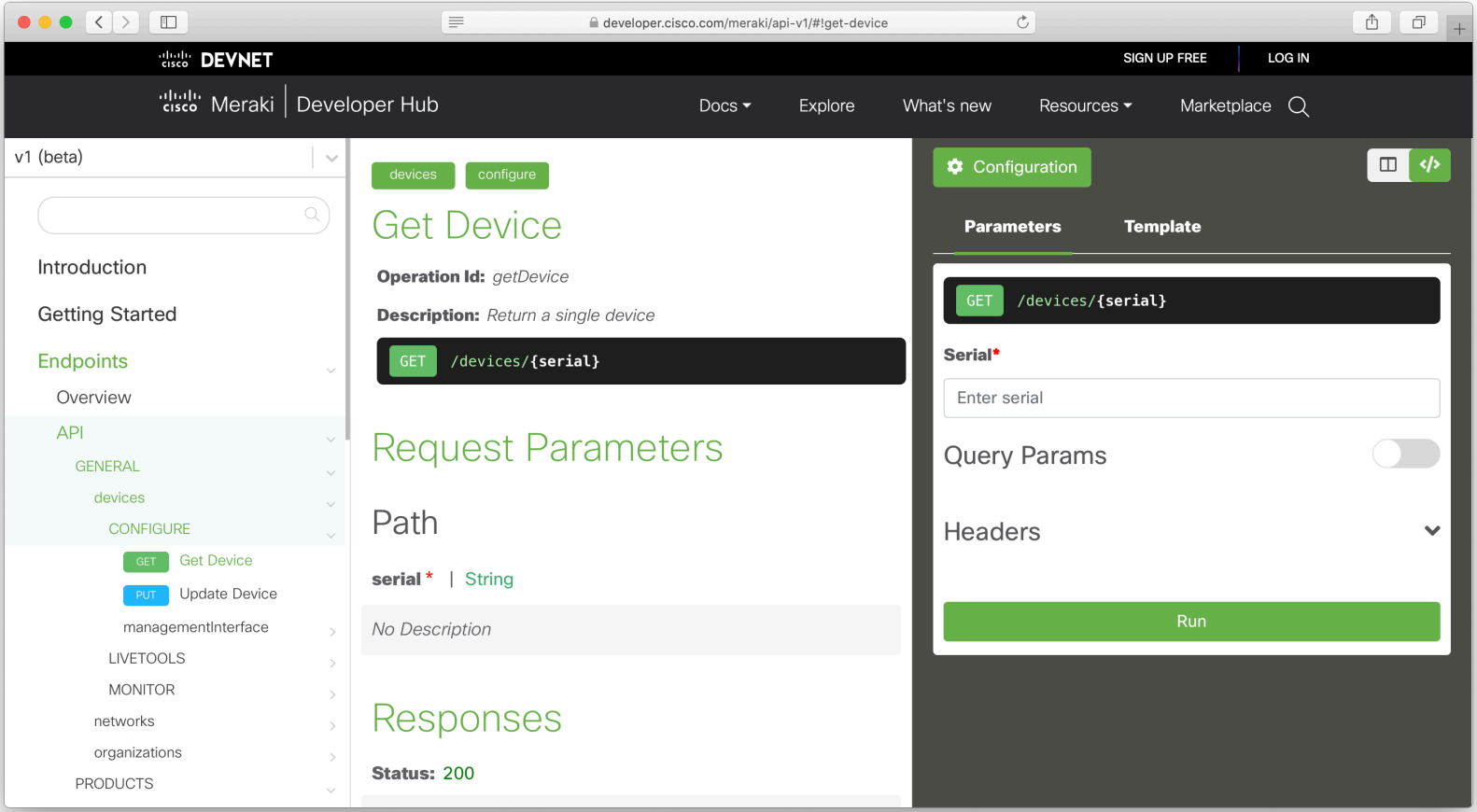
- Like *Python Requests*
- *programmatically* executing API calls



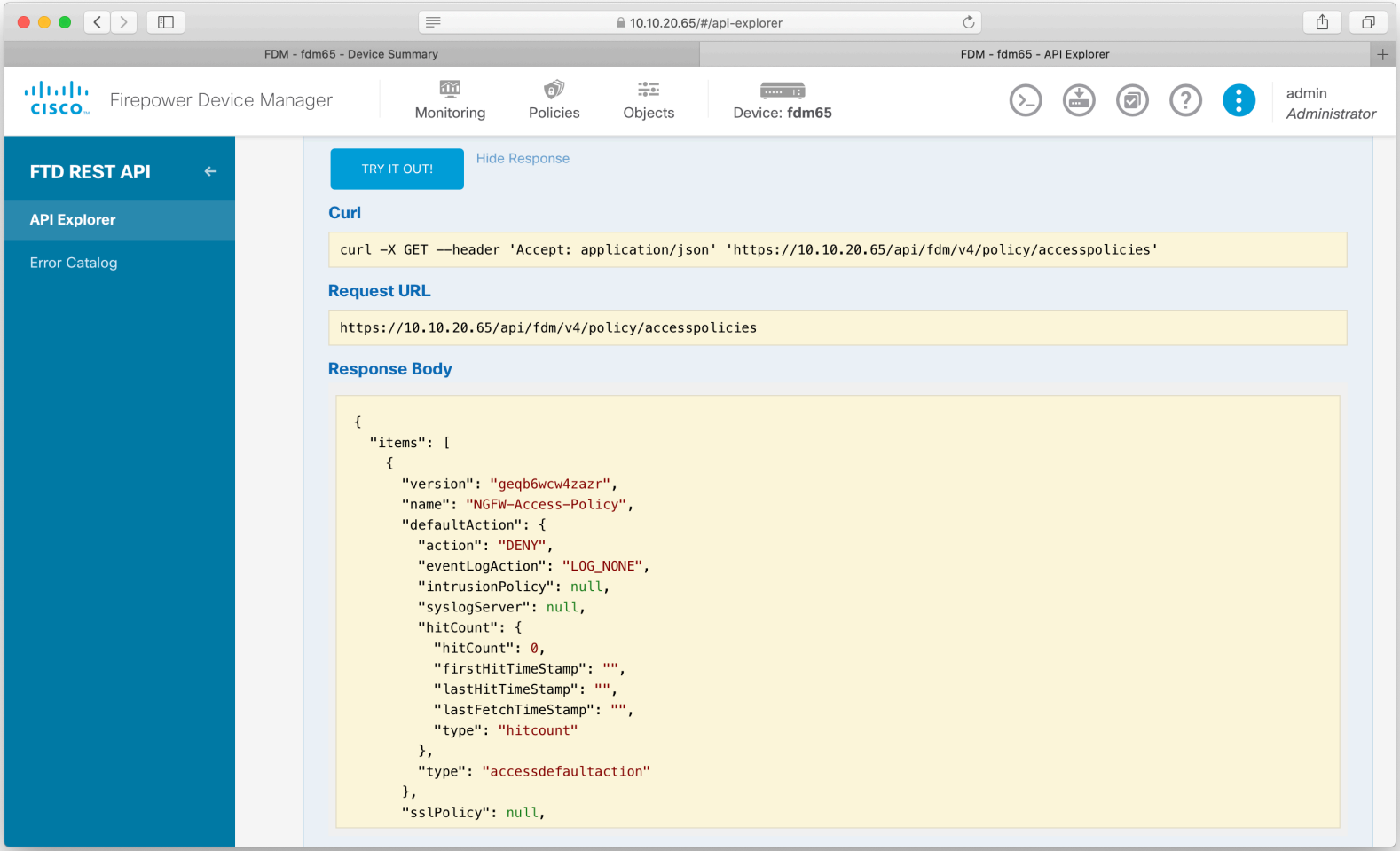
A) OpenAPI(Swagger) 대화형 기능 사용

- 많은 API 설명서 웹 페이지에는 설명서 GUI 자체 내에서 라이브 API 호출을 실행할 수 있는 기능을 제공합니다.
  - 예: Meraki, Webex Teams
- 제품 GUI에 API 탐색기 또는 개발자 툴킷을 내장하여 대시보드 인터페이스에서 실시간으로 변경할 수 있습니다.
  - 예: Firepower Device Manager, DNA Center
- 일부 다른 제품도 샌드박스 웹 페이지 내에서 유사한 기능을 제공합니다.
  - 예: Standalone Nexus NX-API
- app code 만드는 데 사용할 수 있는 code auto-generation 기능을 제공할 수 있습니다.

API Documentation Example:



API Explorer Example:



B) curl 사용하기

- “Client URL” Linux CLI tool
- Usage: **curl [options...] <url>**
- Common args:

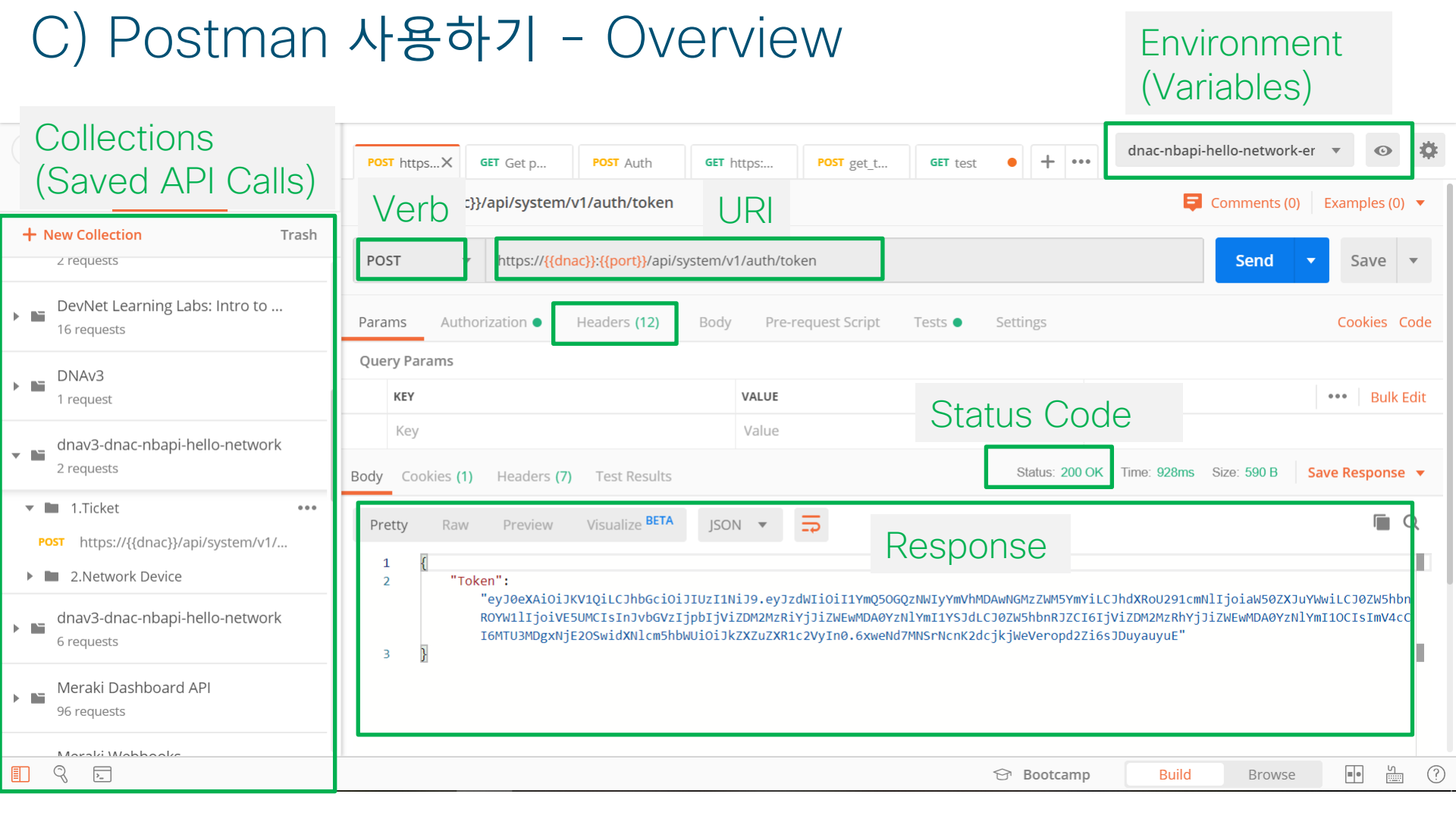
-H, --header <header>	Pass custom header(s) to server
-X, --request <method>	Specify request method to use
-d, --data <data>	HTTP POST data
-I, --head	Return the headers only
-k, --insecure	Ignore SSL certificate warnings
-L, --location	Follow redirects
-i, --include	Include the header in the response
-u, --user <user:password>	User/pass basic authentication
-v, --verbose	Make the operation more talkative

Curl Example:

- Using Meraki API
- https://documentation.meraki.com/zGeneral_Administration/Other_Topics/The_Cisco_Meraki_Dashboard_API
- Examples using the key of a demo Meraki Account:

```
$ curl --request GET -L \
--url https://api.meraki.com/api/v0/organizations \
--header 'X-Cisco-Meraki-API-Key: 6bec40cf957de430a6f1f2baa056b99a4fac9ea0'

$ curl --request GET -L \
--url https://api.meraki.com/api/v0/organizations/549236/networks \
--header 'X-Cisco-Meraki-API-Key: 6bec40cf957de430a6f1f2baa056b99a4fac9ea0'
```

C) Postman 사용하기 - Overview



Postman Example:

DNA Center APIs 사용하기:

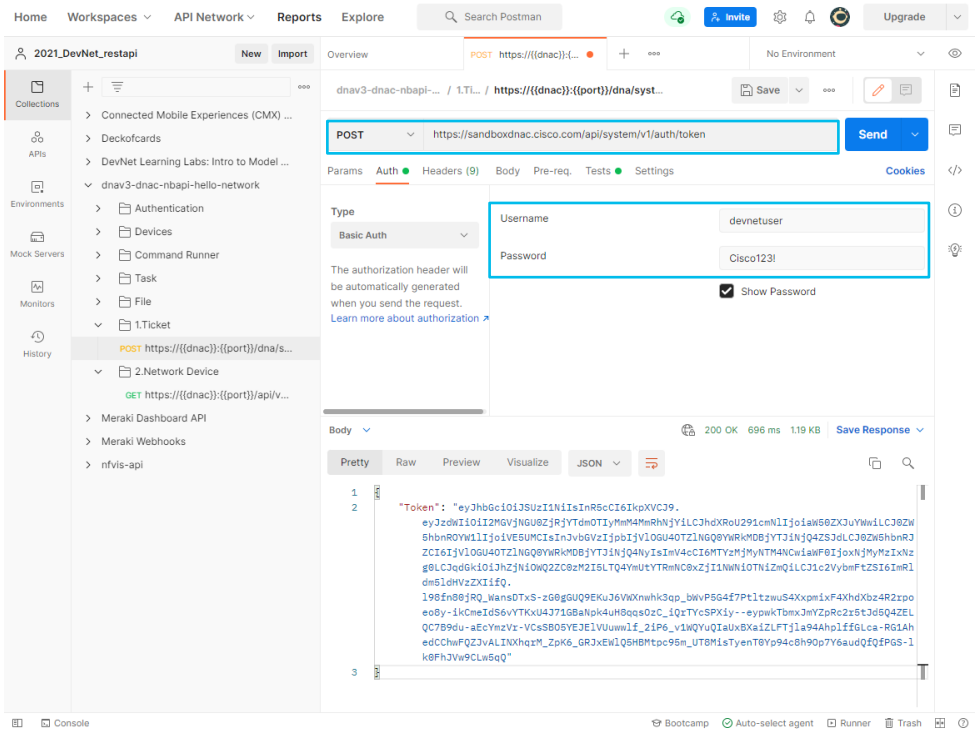
- 먼저 인증 토큰을 얻기 위해 POST Request 합니다.
- 수신한 토큰을 사용하여 IP Pools data를 반환하는 GET Request 합니다.

Notes:

- These calls are saved under a “COLLECTION” folder and use “VARIABLEs” defined in an “ENVIRONMENT” for ease of reusability
- They were identified by referencing the DNA Center API Documentation

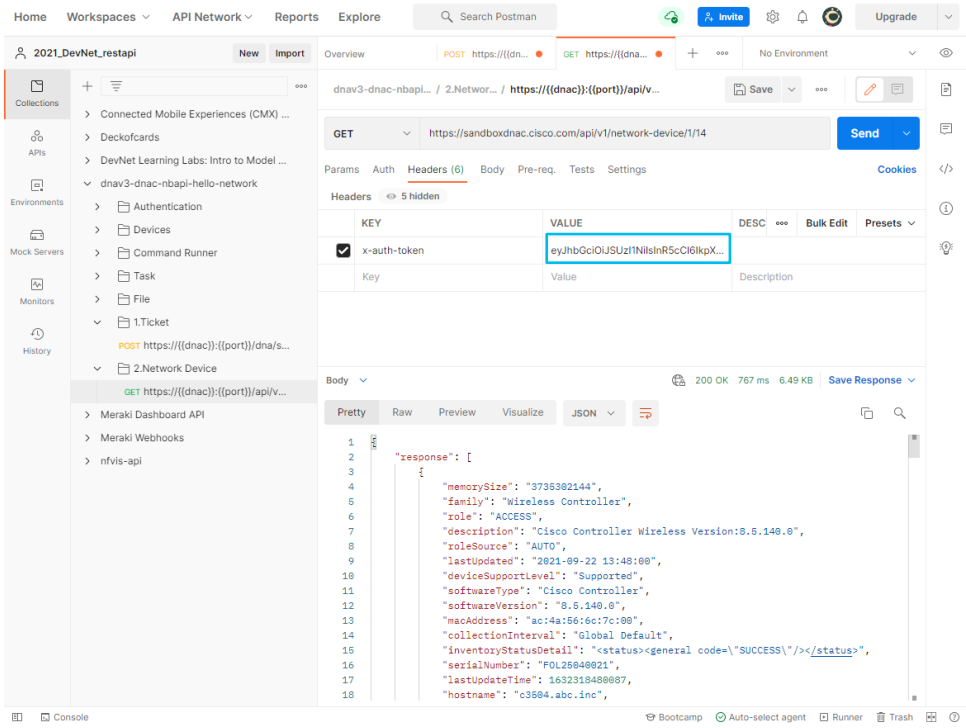
Step 1. 토큰 얻기

- 서버주소 입력:
  https://sandboxdnac.cisco.com
  /dna/system/api/v1/auth/token
- 아이디/비밀번호 입력:
  devnetuser / Cisco123!
- Send 클릭



Step 2. Network device data 얻기

- 토큰 입력 후 Send 클릭



D) Python “requests” 라이브러리 사용하기

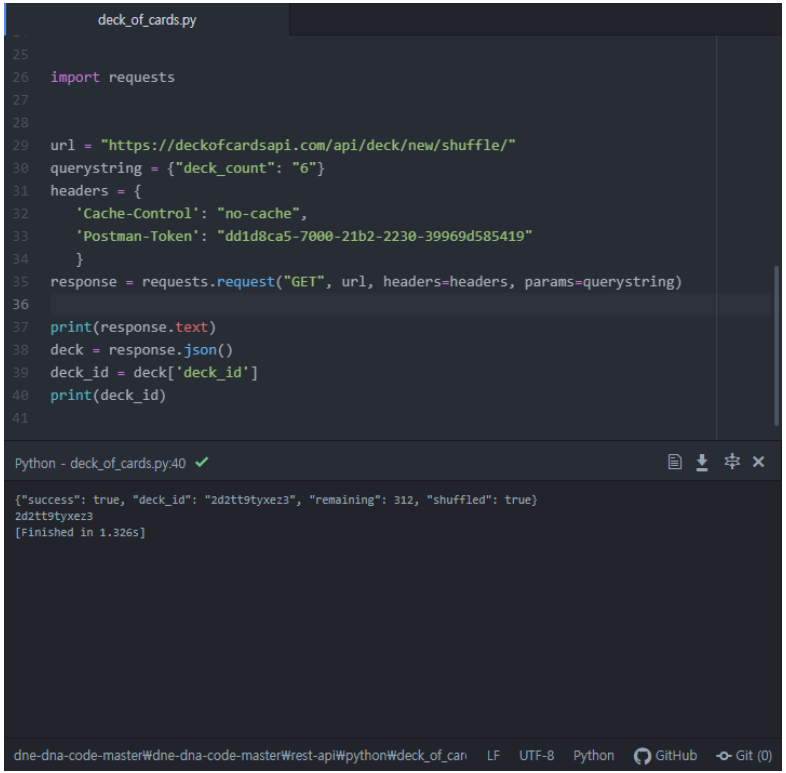
- 파이썬에서 HTTP 요청을 만드는 사실상의 표준입니다.
- 다음을 사용하여 venv에 설치합니다 : pip install requests
- 파이썬 코드에 “import requests”를 추가하여 사용합니다.

```
url='http://bru-n9k3-1.cisco.com/ins'
switchuser='admin'
switchpassword='cisco!123'

myheaders={'content-type':’application/json'}
payload={
  "ins_api": {
    "version": "1.0",
    "type": "cli_conf",
    "chunk": "0",
    "sid": "1",
    "input": "conf ;vlan 126 ;name api_test_126",
    "output_format": "json"
  }
}
```

```
response = requests.post(url,data=json.dumps(payload),
        headers=myheaders,auth=(switchuser,switchpassword))

response.status_code      # returns the status code as integer
response.text             # returns the data as string
response.json()           # convert the data into dictionary
response.headers          # returns the headers
```

D) Python “requests” 를 사용하여 새 덱 만들기

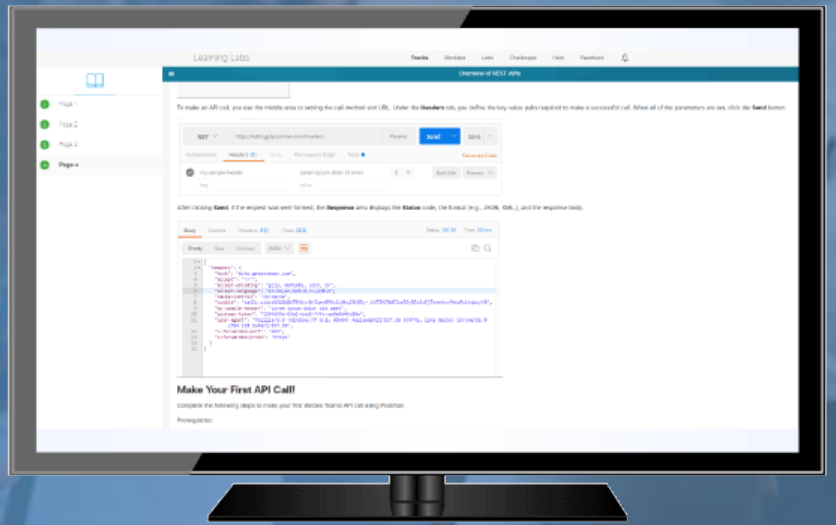
- deckofcardsapi를 사용합니다.



Key Takeaways:

- REST API는 HTTP(S)를 사용하여 requests를 보내고 responses를 수신합니다.
- 호출의 내용과 방법을 이해하려면 API Documentation을 참조하는 것이 매우 중요합니다.
- REST API는 CRUD 연산(Create, Read, Update, Delete)에 해당하는 GET, PUT, POST 및 DELETE와 같은 표준 동사를 사용합니다.
- curl, Postman, Python requests 같은 도구는 REST API 호출을 사용하여 테스트/개발하는 데 일반적으로 사용됩니다.

Hands-on Exercise ...



cisco DEVNET express

LISTEN > LEARN >> PUT IT INTO PRACTICE

ALL ABOUT DIGITAL NETWORK ARCHITECTURE

REST API Fundamentals

Learn concepts and terminology for REST APIs, how to get started with REST APIs, how to use POSTMAN to test APIs, and how to create scripts that can access a REST API.

1 Hour

What is REST? What are APIs? **Completed**

A look at REpresntational State Transfer (REST) and a REST API overview.

Getting Started with REST APIs **In Progress**

Learn how to get started with any REST API.

Hands On Exercise: Using Postman to Interact with REST APIs **Completed**

A deep dive into using Postman for REST API testing, discovery, and coding.

67% Complete

Continue Module

Hands-on Exercise

Estimated time: 20 minutes

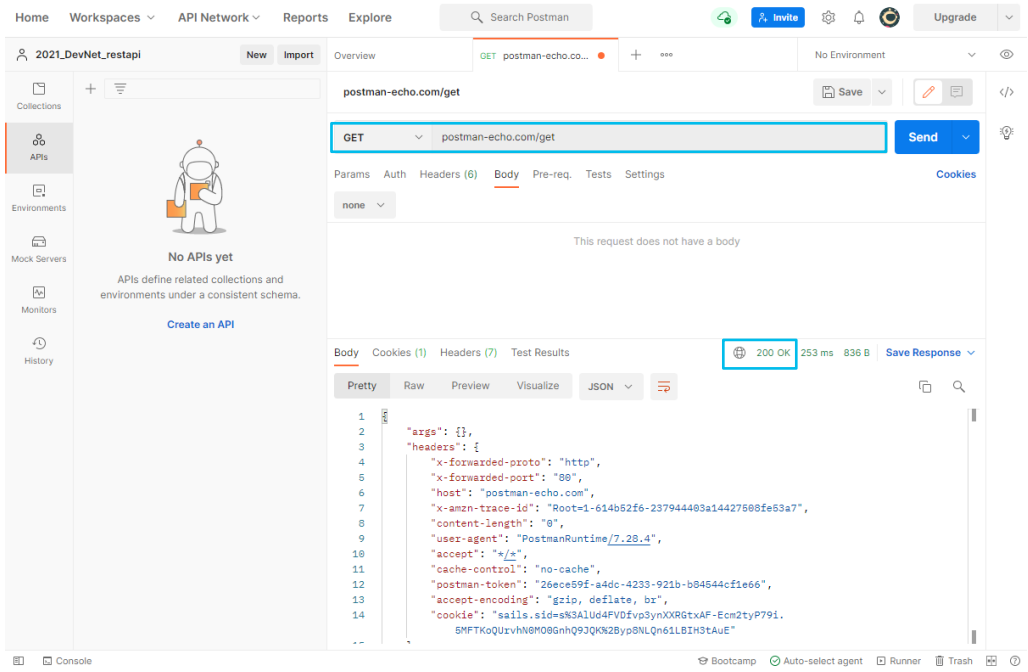
Hands On Postman

- REST API 사용의 기본 사항 이해합니다.
- Postman REST 클라이언트를 사용하여 API 호출하는 방법을 알아봅니다.
- Postman의 환경이 endpoint 또는 API 간에 전환하는 데 어떻게 유용한지 알아봅니다.
- Postman의 collections이 API 호출의 참조 목록을 제공하는 방법 알아봅니다.

- Your DevBox workstation has Postman installed already, but you can also install it locally.

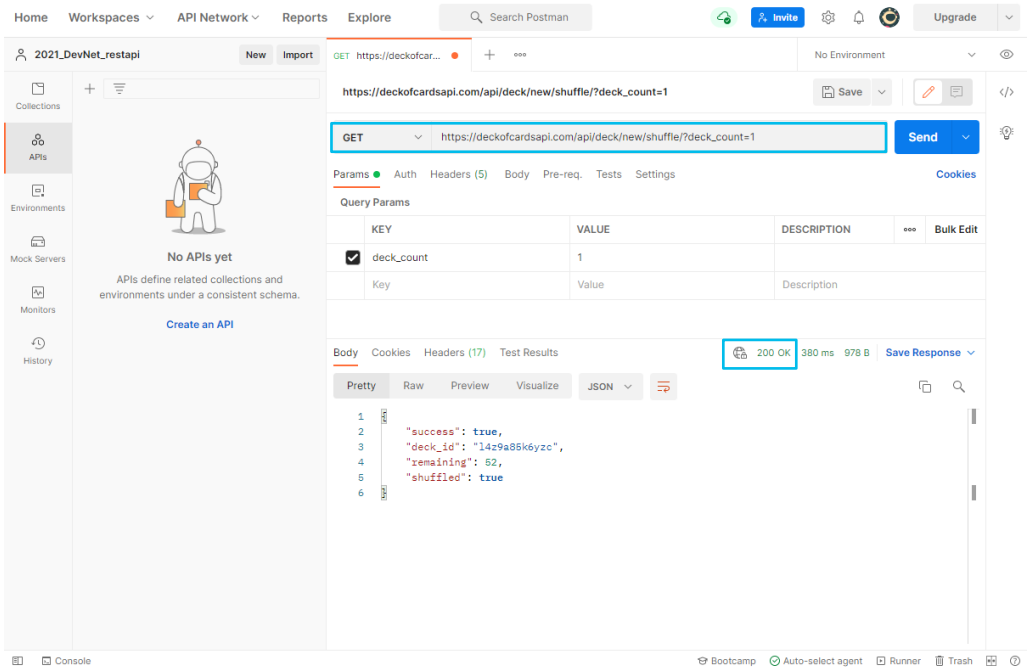
Step 1. postman 테스트

- postman-echo.com/get GET Request 후 Response 확인합니다.



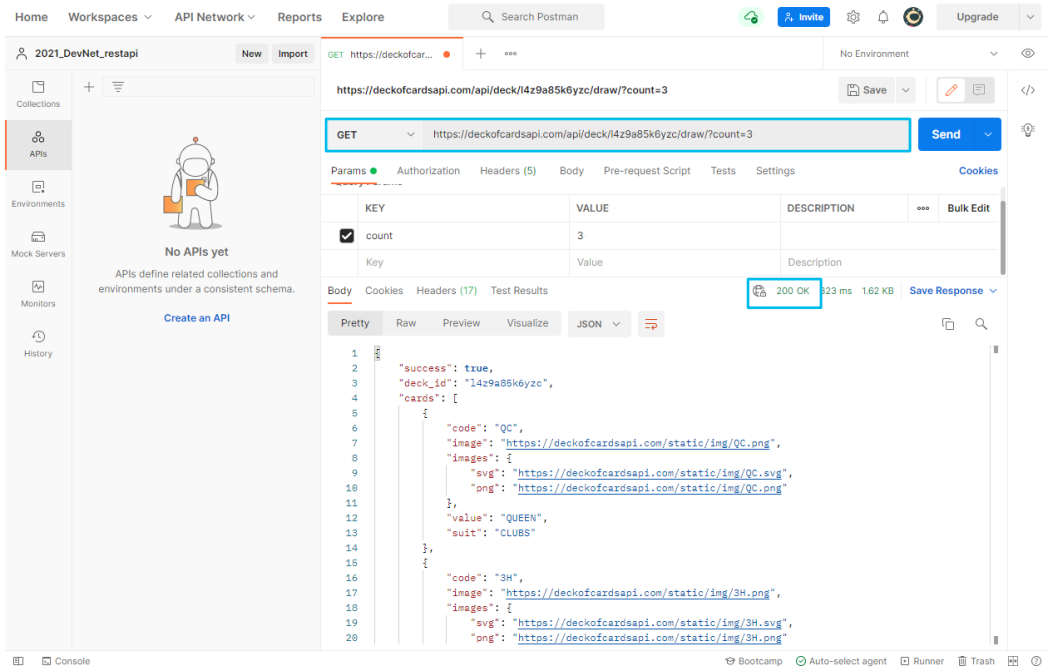
Step 2. Deck of Cards API로 새 덱을 만들고 셔플

- https://deckofcardsapi.com/api/deck/new/shuffle/?deck_count=1
  GET Request 후 결과 확인합니다.



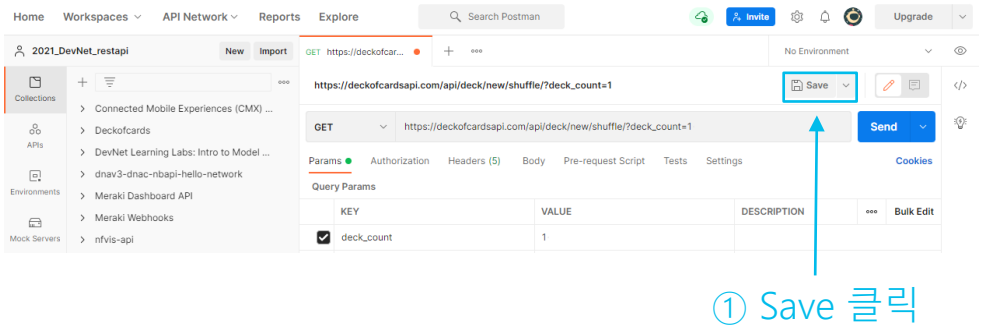
Step 3. 덱에서 3장 뽑기

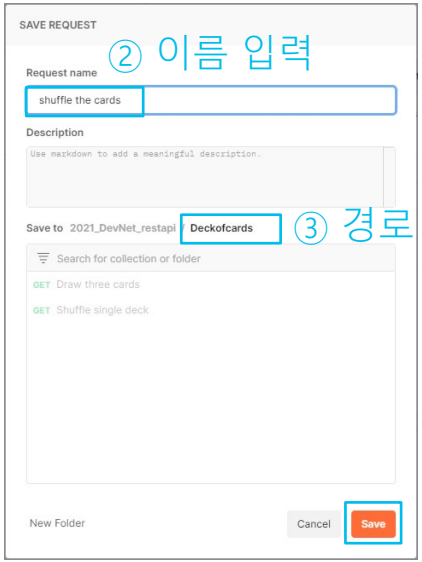
- https://deckofcardsapi.com/api/deck/<<deck_id>>/draw/?count=3
  GET Request 후 결과 확인합니다.
- <<deck_id>>는 Step 2에서 구한 값을 입력합니다.



Step 4. Collections 에 request 저장하기

- Step 2의 Request를 저장합니다.

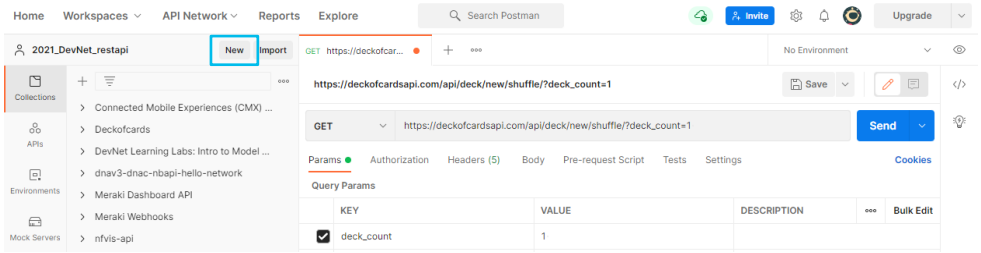




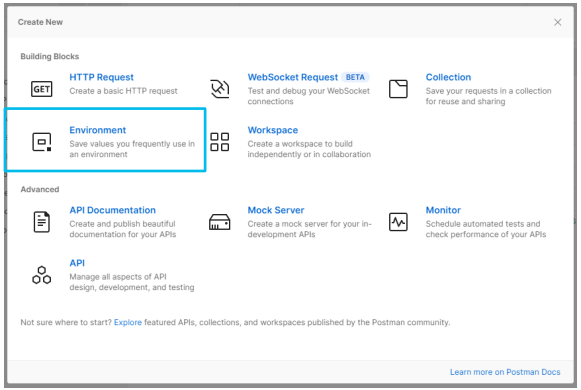
Step 5. Environments 설정하기

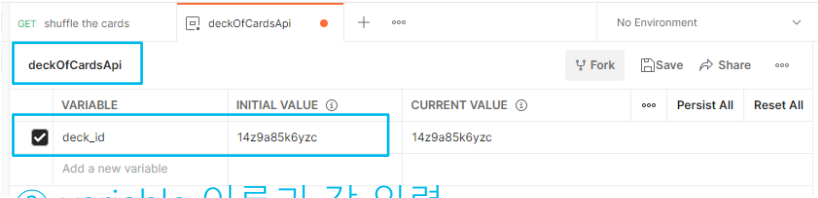
- Step 2의 deck id를 저장합니다.

① New클릭



② Environment 클릭

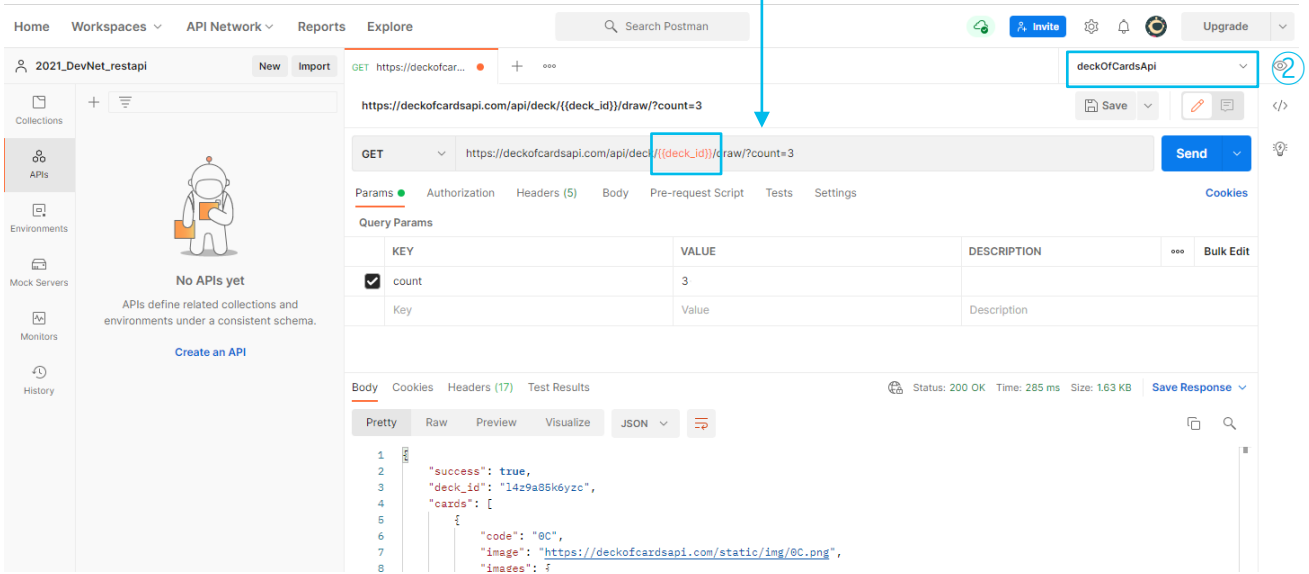




③ variable 이름과 값 입력

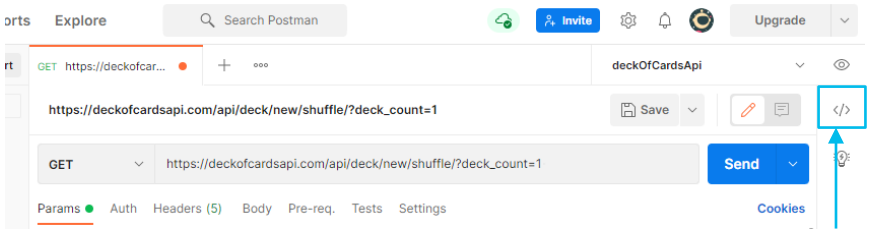
Step 5. Environments 설정하기

- Step 3의 Request를 수정합니다.



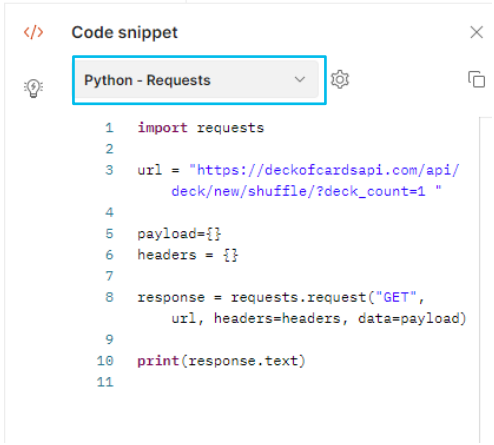
Step 6. Python Requests로 가져오기

- Step 2의 GET request를 사용합니다.

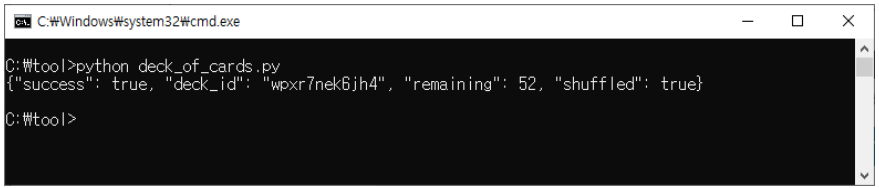


① Code 클릭

② Python-Requests로 설정



③ 코드를 복사하여 저장한 후 실행



Q/A

What you learned in this module…

- API는 Application Programming Interface입니다.
- REST는 Representational State Transfer 를 의미하며 HTTP 또는 HTTPS를 사용하여 요청을 보내고 응답을 수신합니다.
- REST API는 GET, PUT, POST, DELETE와 같은 표준 동사를 사용하며 이 동사는 Create, Read, Update, Delete에 해당됩니다.
- Curl, Postman 및 Python Requests과 같은 도구는 REST API 호출에 일반적으로 사용됩니다.
- Postman은 REST API를 테스트하고 테스트하는 데 매우 유용한 유틸리티입니다.
- Postman에서 collections 과 environments 를 사용하여 REST API를 테스트할 수 있습니다.

References + Further Readings:

1. DevNet Learning Module:
   https://developer.cisco.com/learning/modules/rest-api-fundamentals
2. CL Breakout Session DEVNET-1897.b:
   https://www.ciscolive.com/global/on-demand-library.html?search=devnet%201897#/session/1542224340213001r1m6

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