API Testing with Postman

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About the trainer

- 19 years of IT industry experience wearing multiple hats in leadership roles in Dev, QA and Delivery
- Passionate about teaching and imparting knowledge
- 3 years of training experience with over 1000 hours of programs conducted
- Areas of expertise include Automation Testing, API Testing, Performance Testing, Python, Ansible and Network Automation
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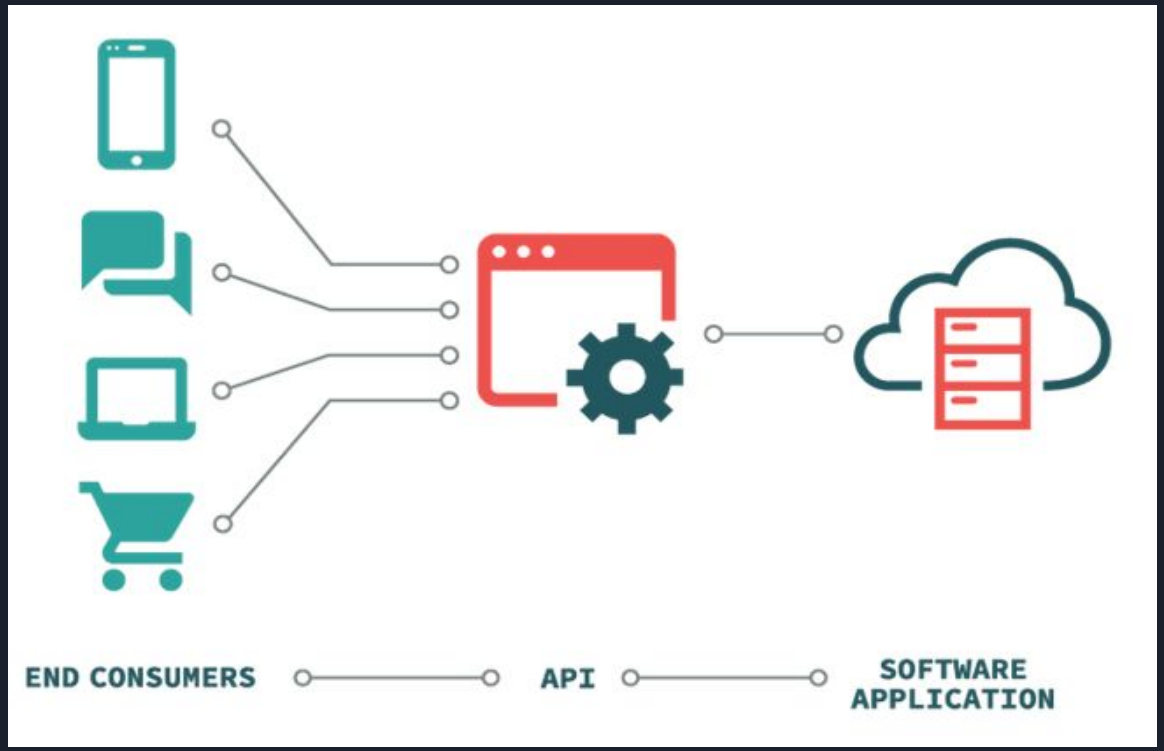
What are APIs?

- API stands for Application Programming Interface
  - Allows applications to talk to each other
- Think of the following
  - Stock tickers
  - Maps
  - Currency Conversion
  - Flight Booking
- Listed above are some of the examples of API uses

Uses of APIs

How do APIs work?

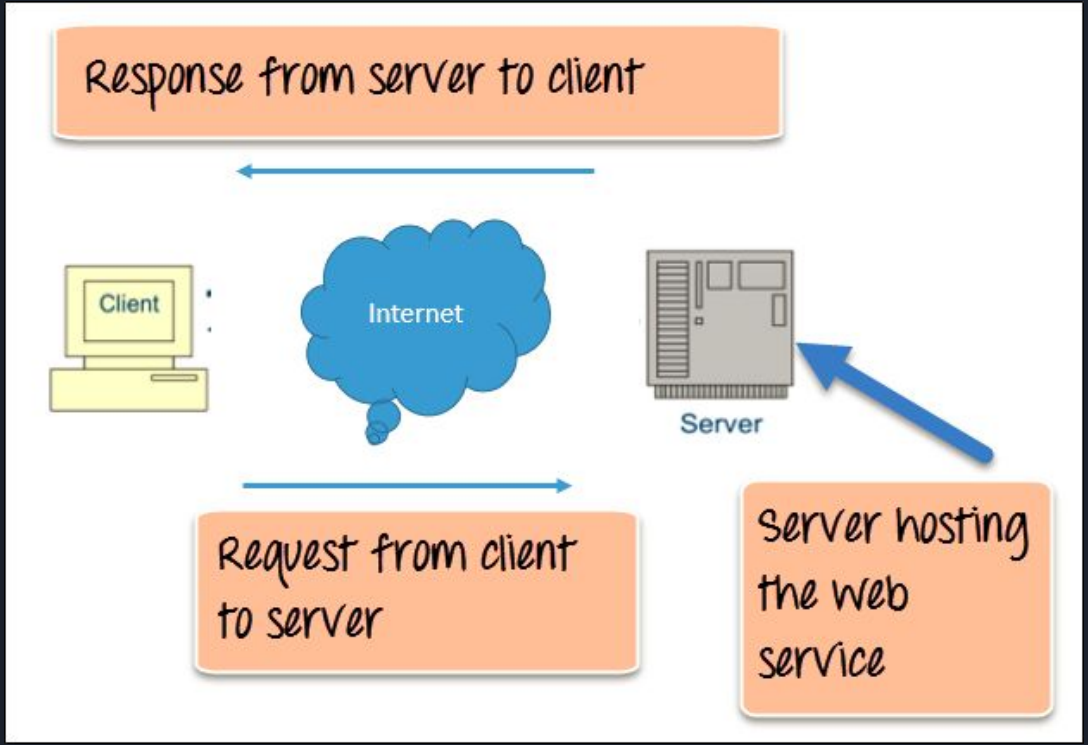


Web Services vs APIs

Web Services

- A standardized medium to propagate communication between the client and server applications on the World Wide Web (WWW)
- A software module that can be searched and invoked over internet (web) that is designed to perform a set of tasks (service)
- Simply put it is a service provided by a Provider to a Consumer over the Web
- Correlate the example we have discussed before with this
- Map Service, Stock Service, Temperature Service, Currently Conversion Service etc.

Web Services



APIs

- Well we have already seen that APIs also do pretty much the same thing as Web Services right?
- Then why two different terms?
- Well there are subtle differences
- All Web Services are APIs, but the converse is not necessarily true
- APIs need not necessarily be accessible over the Web

SOAP vs REST

Types of Web Services

- SOAP Web Services
  - Use a transport independent message exchange protocol called SOAP
  - Simple Object Access Protocol
  - Simply defines the structure of the message exchanged
  - Format used for exchange in this is mostly XML
  - Use WSDL as interface between client and server
  - Web Services Description Language

Types of Web Services (Cont.)

- RESTful Web Services
  - Use HTTP directly
  - Use JSON predominantly though they also support XML
  - Typically called as APIs
  - Usually come with documentation (e.g. Swagger) which contains all the information needed to use them

REST APIs

- REST -- **RE**presentational **S**tate **T**ransfer
- Centered around Web Resources in a textual **representation**
- These resources can be read and modified via a stateless protocol like HTTP using a set of predefined operations like GET, POST, PUT, DELETE etc.
- What do we mean by Stateless?
- E.g. Phone call vs Email

REST APIs (Contd...)

- Follow Object Oriented programming paradigm of noun-verb
- There is an object or entity (noun) and we perform some actions on that (verb)
- Verbs are the actions performed on the nouns or resources
- Actions are performed by sending a request to the server
- And results of the actions are sent back to the client as response
- This request and response happens via one of the machine-readable data interchange formats we discussed earlier like XML, YAML, JSON etc.

REST APIs (Contd...)

Sample API endpoint : https://petstore.swagger.io/v2/pet/10

Resource

Base URL

GET	/pet/{petId}	Find pet by ID
PUT	/pet	Update an existing pet
DELETE	/pet/{petId}	Deletes a pet
POST	/pet/{petId}/uploadImage	uploads an image

HTTP Error Code Categories

Responses are grouped in five classes:

- Informational responses (100 – 199)
- Successful responses (200 – 299)
- Redirects (300 – 399)
- Client errors (400 – 499)
- Server errors (500 – 599)

XML, JSON

- What is the main component which is exchanged between client and server?
- Data
- This Data has to be represented in a standard way
- That is where XML or JSON come into picture
- XML - Extended Markup Language
  - A distant cousin of HTML (Hyper Text Markup Language)
- JSON - Javascript Object Notation

XML

```
<bookstore>
 <book>
  <title>Everyday Italian</title>
  <author>Giada De Laurentiis</author>
  <year>2005</year>
  <price>30.00</price>
 </book>
 <book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
 </book>
</bookstore>
```

JSON

```
{
  "bookstore": {
     "book": [
     {
     "title": "Everyday Italian",
     "author": "Giada De Laurentiis",
     "year": 2005,
     "price": 30,
     "is_available": true
     },
     {
     "title": "Harry Potter",
     "author": "J K. Rowling",
     "year": 2005,
     "price": 29.99
     "is_available": false
     }
     ]
   }
}
```

Root

Object

Array

Object

String

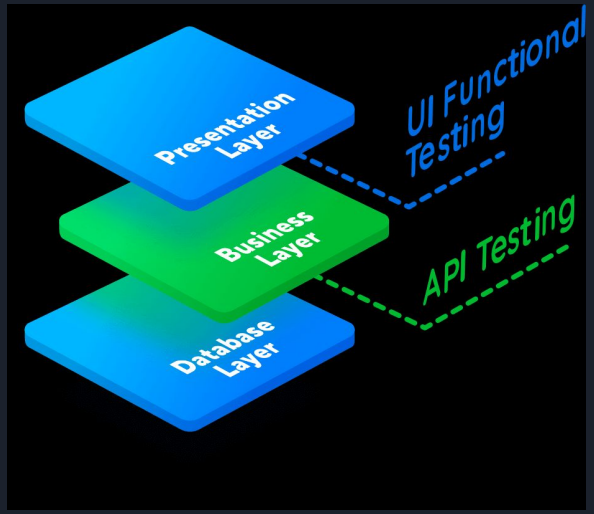
Number

Boolean

API Testing

Getting Started

- What?
  - Software testing practice that tests the APIs directly
- Why?
  - To find the defects early without waiting for the UI to be ready
- Types
  - Functionality
  - Reliability
  - Performance
  - Security



Where is it performed?

- Typical applications have 3 layers
  - UI or Presentation
  - Business Logic
  - Database
- APIs come in the Business Logic layer
- UI can keep changing based on end users likes and dislikes
- Database layer usually does not change once finalized

Importance of API Testing

- Now a days applications are built with core logic independent of backend database and frontend UI
- API layer can be thought of as backbone of the applications
- Hence it is critical that this layer:
  - Does what is it supposed to do (functionality)
  - Does not become a bottleneck (performance)
  - Does not have loopholes that can be exploited by hackers (security)
  - Available when needed (reliability)

API Testing Tools

- Popular Tools used for API Testing are
  - SoapUI
  - Postman

Postman

Installation of Postman

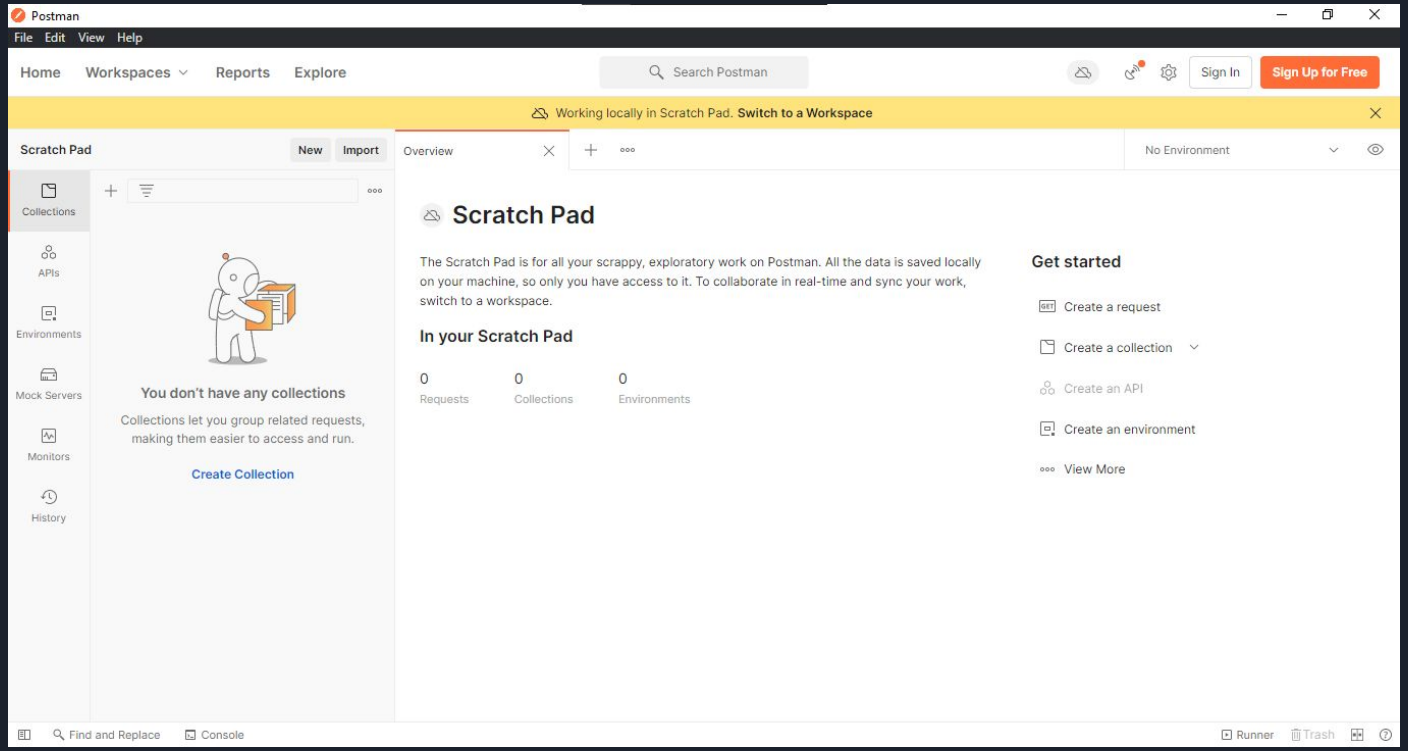
- Installing Postman is straight forward
- Download Postman from Download Postman | Get Started for Free for your OS
- Double click the installer
- Installation is done in a jiffy and you are ready to start using Postman

Finding your way through

Scratch Pad vs Workspace Modes

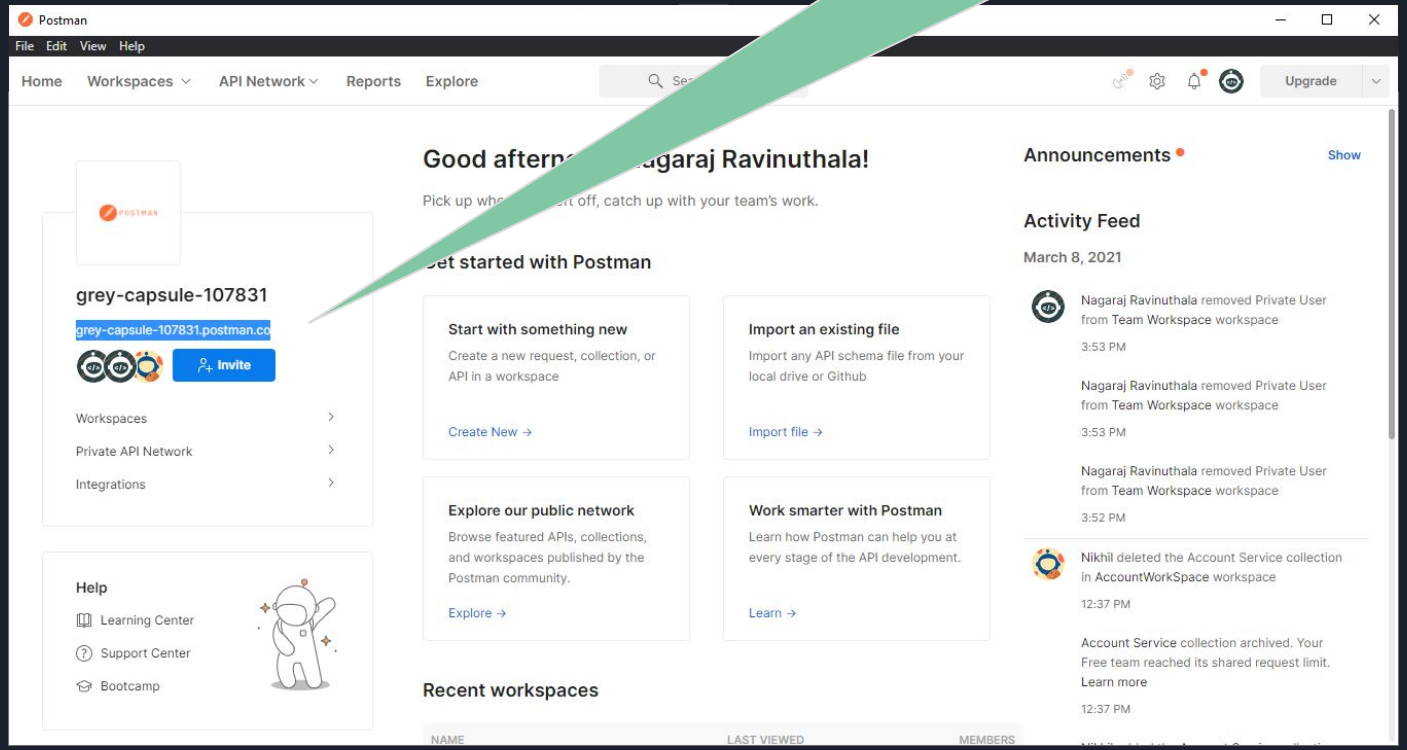
- For someone who is just getting started with Postman, the UI can be quite intimidating
- Postman allows the user to work in 2 modes
  - Scratch Pad or local mode
  - Workspace or cloud mode
- Scratch Pad mode does not require the user to sign in and all the work gets stored locally on the system where Postman is installed
- Workspace mode requires the user to register and sign in and all the work gets synchronized with the server so that it is available from any other system or device where the user might login

Scratch Pad

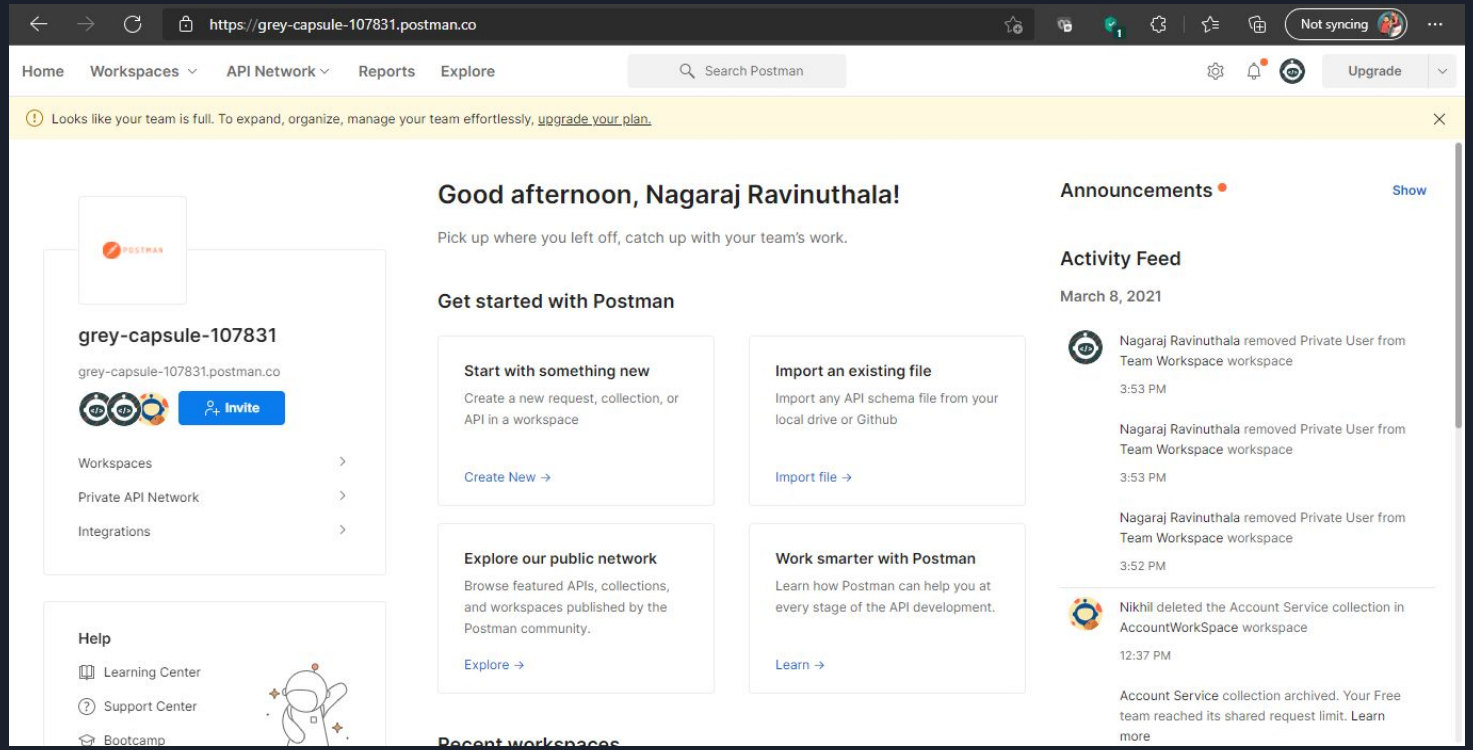

Postman
File Edit View Help
Home
Workspaces
Reports
Explore
Search Postman
Sign In
Sign Up for Free
Working locally in Scratch Pad. Switch to a Workspace
Scratch Pad
New
Import
Overview
No Environment
Collections
APIs
Environments
Mock Servers
Monitors
History
You don't have any collections
Collections let you group related requests, making them easier to access and run.
Create Collection
Scratch Pad
The Scratch Pad is for all your scrappy, exploratory work on Postman. All the data is saved locally on your machine, so only you have access to it. To collaborate in real-time and sync your work, switch to a workspace.
In your Scratch Pad
0
Requests
0
Collections
0
Environments
Get started
Create a request
Create a collection
Create an API
Create an environment
View More
Find and Replace
Console
Runner
Trash

Workspace (Local)

grey-capsule-107831.postman.co

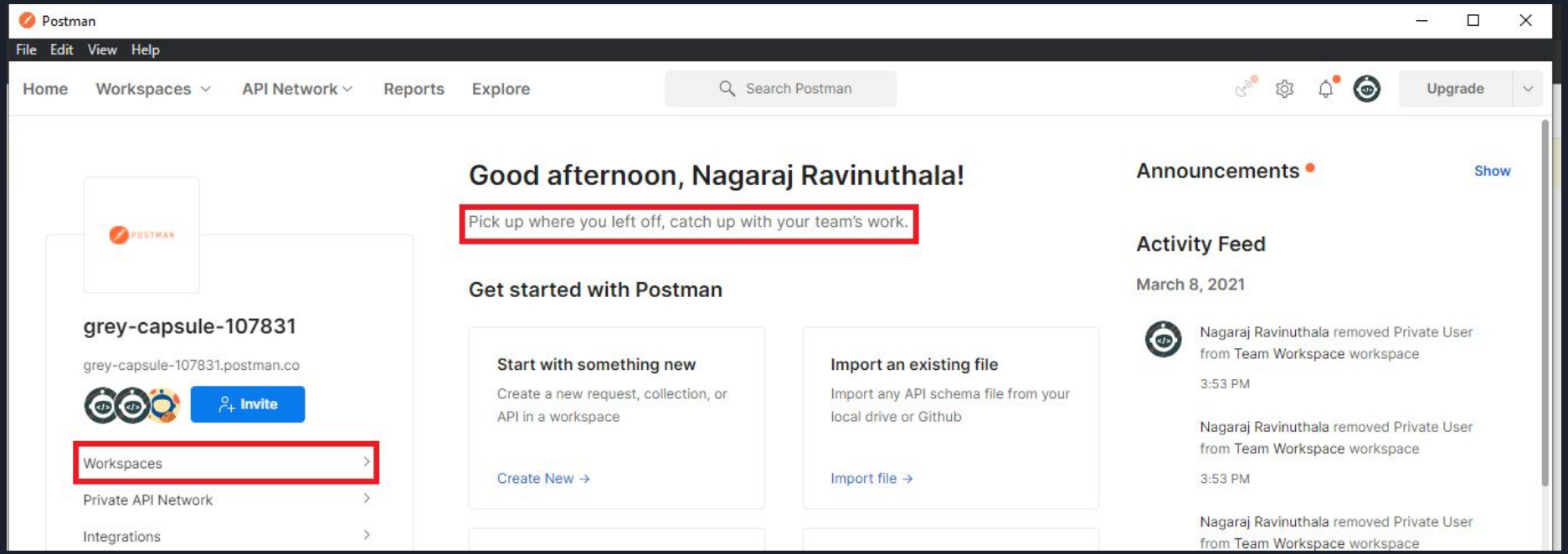


Workspace (On cloud)



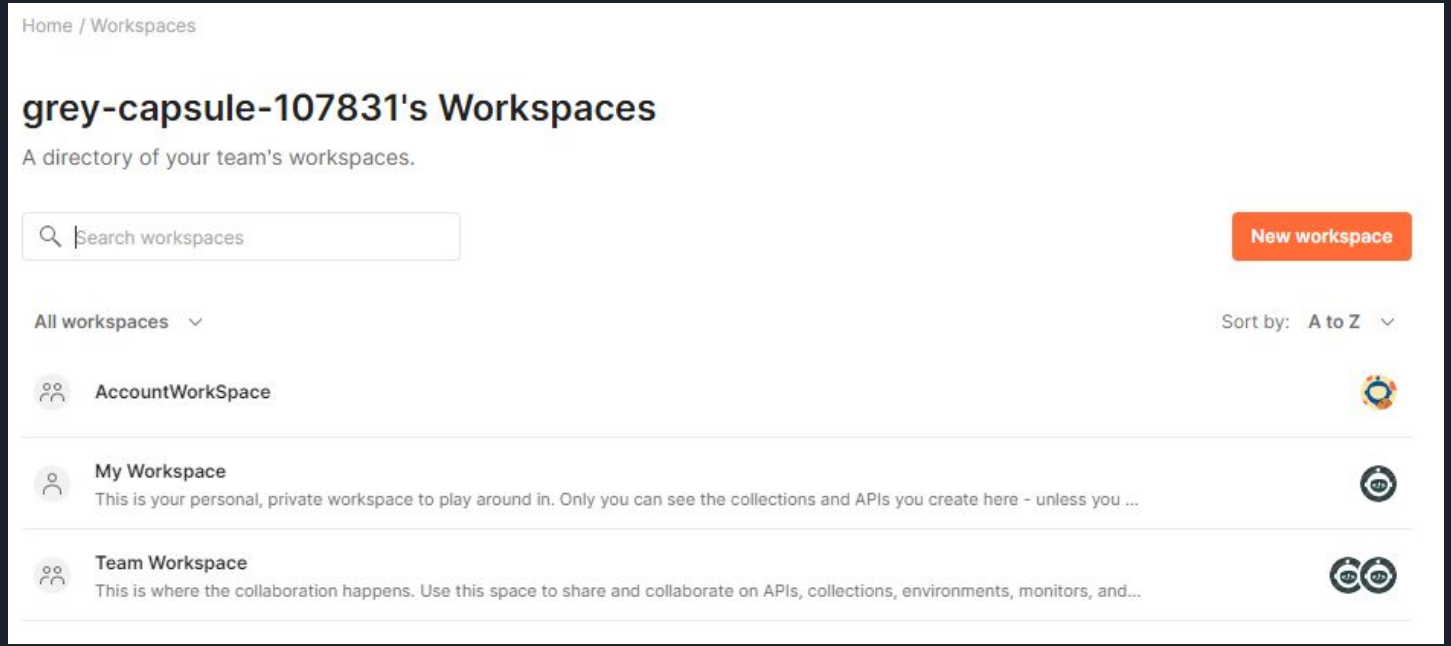
Workspace (Cont.)

- Workspace helps you work in collaboration with your team
- Click on Workspaces to see existing or to create new workspaces



Workspace (Cont.)

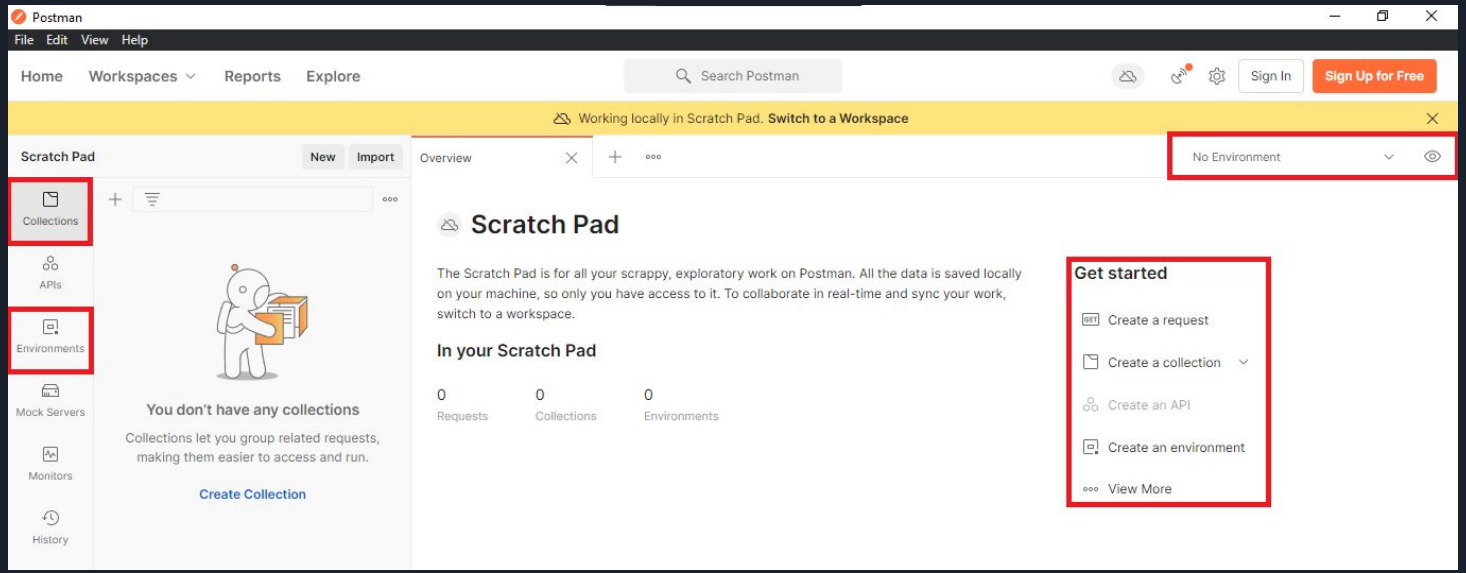
- By default you can see the following workspaces: My Workspace and Team Workspace
- You can create your own workspace using New Workspace button



Working in Scratch Pad vs Workspace

- If:
  - you are working independently
  - saving your work on the local machine is enough
  - Scratch Pad is sufficient
- If:
  - you want to work as part of a team
  - collaborate with your team
  - save your work to the cloud so that it can be accessed by other team members
  - then you can work in Workspace mode

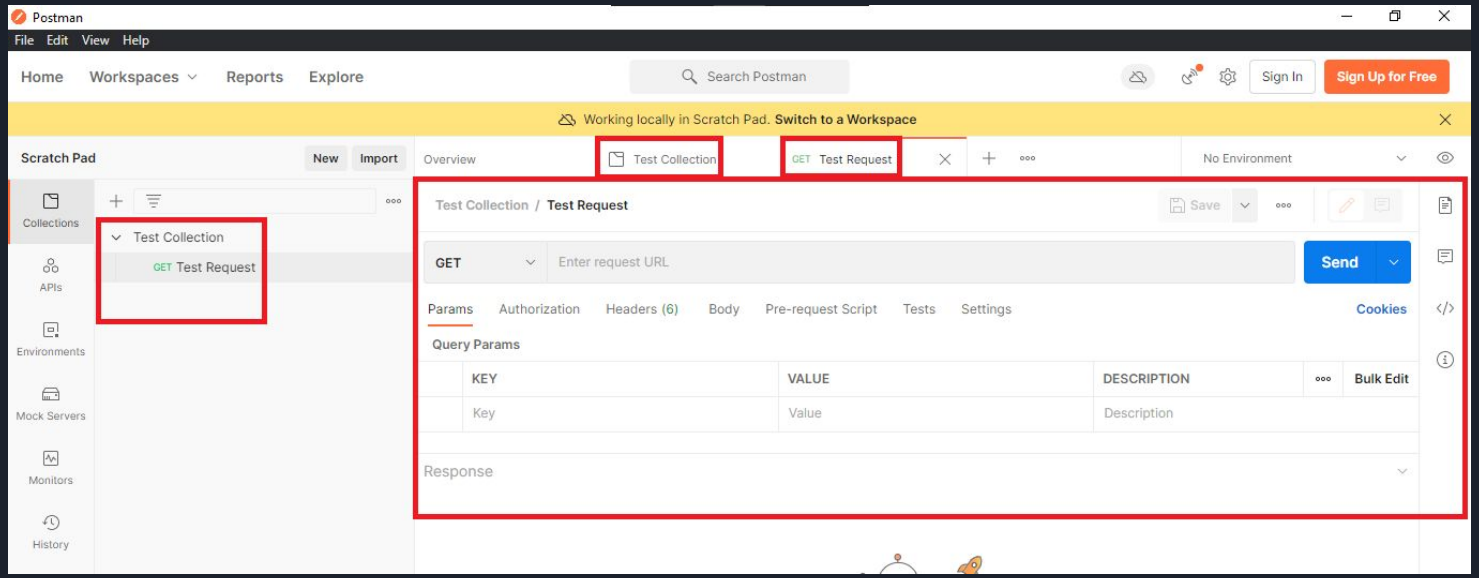
Navigating Scratch Pad Mode



Important sections which we will work with are highlighted in the figure:

- Collections
- Environments
- Get Started
- Variables

Navigating Scratch Pad Mode



Above figure shows the important areas we will be using during our work:

- Collections Explorer
- Main work area which consists of Collections, Requests etc.

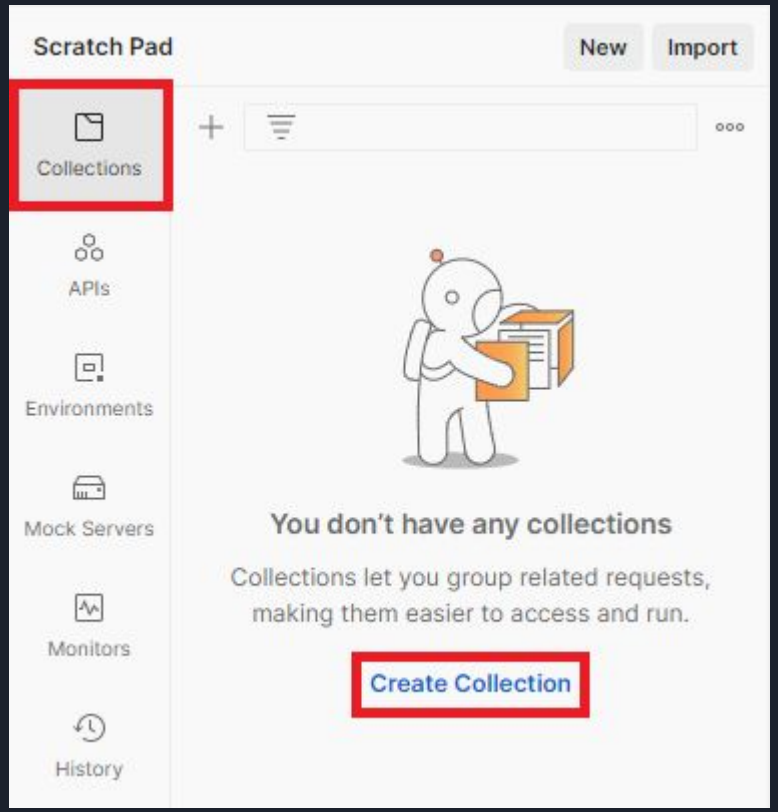
Creating Collections and Requests

Collections

- Simply put Collections are groups of requests used to keep the workspace organized
- Typically all the requests corresponding to a module can be grouped under a collection
- Some uses of grouping Requests into Collections are:
  - To collaborate with teammates
  - To generate API Documentation
  - To organize test suites
  - To automate test runs

Collections (Cont.)

- Creating a collection is the starting point of working with API requests
- Click on Collections tab in the left navigation bar and click Create Collection link
- Remember to group related requests under collections



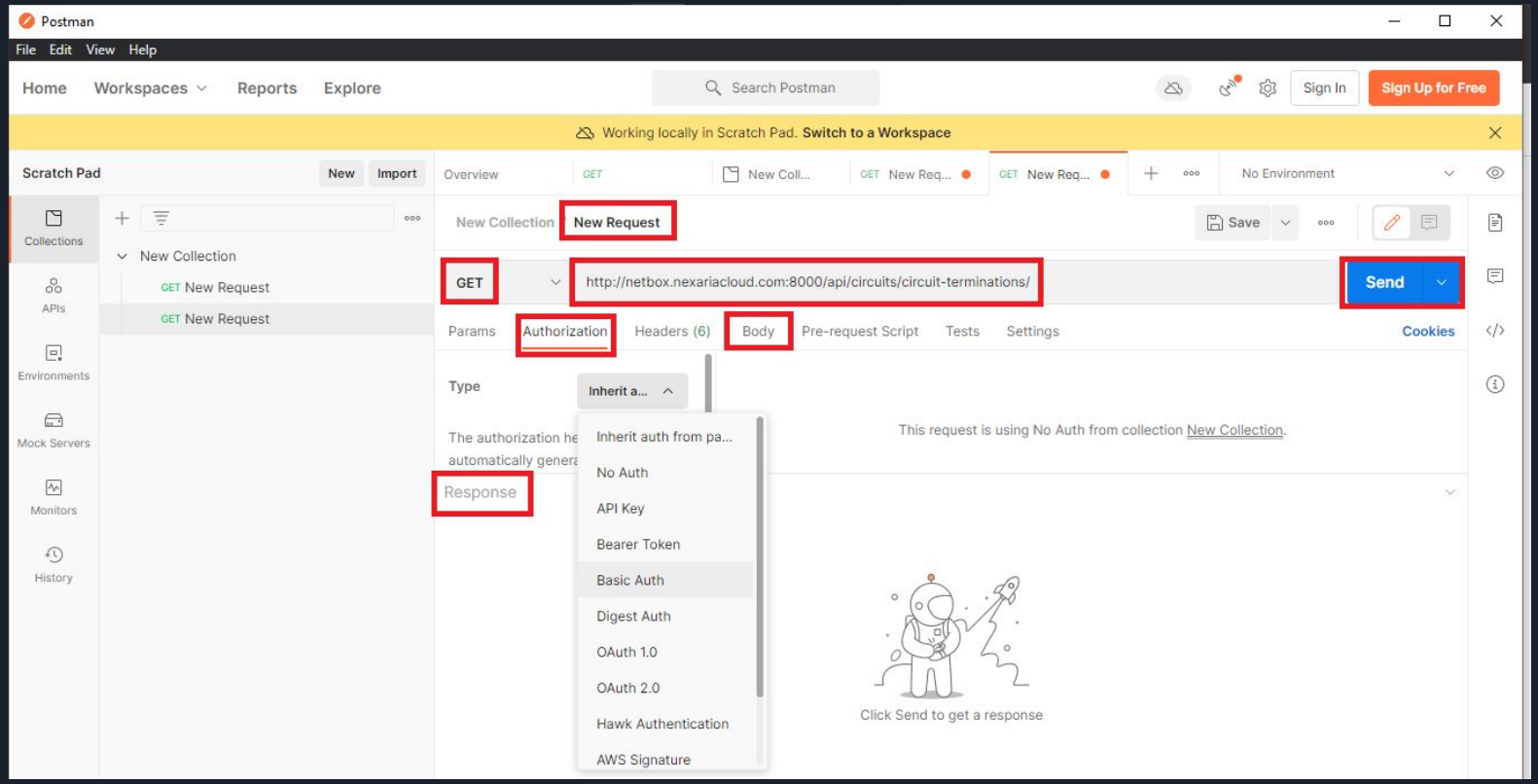
Collections (Cont.)

- You can also optionally specify a description
- Description will appear in the documentation when generated
- Other settings that can be configured at Collection level are:
  - Authorization
  - Pre-request script
  - Tests
  - Variables
- What are all these, will be discussed further but they are defined at Collection level so that they apply to all requests within it

Requests

- Request is nothing but hitting a remote API using any client (Postman in this case)
- Right click on the Collection and click Add Request
- Note that the default method selected is GET
- Change the method as needed
- GIve it a name and fill the other required details
- One primary information to be provided is the request URL or the endpoint URL

Requests (Cont.)



Requests (Cont.)

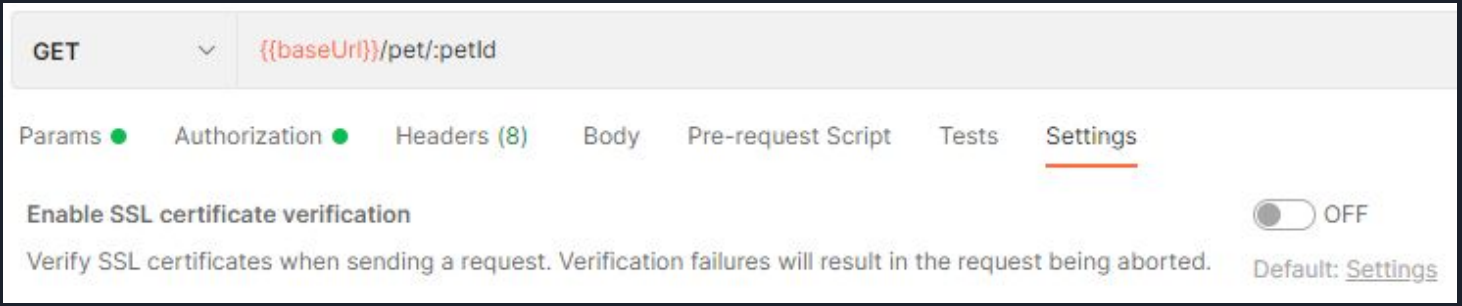
- The type of requests are the same as HTTP verbs
- GET, POST, PUT, PATCH, DELETE
- These correspond to the CRUD operations from the DB world
- GET - READ
- POST - CREATE
- PUT, PATCH - UPDATE
- DELETE - DELETE

HTTPS Requests

- HTTPS is secure version of HTTP
- Refer How To Secure Your Site with HTTPS | Google Search Central to know more about https
- HTTPS involves a certificate usually issues by a certificate authority (CA) (paid) or self signed certificate (free)
- Browsers have the functionality in built to download this certificate from the server the first time and validate it for subsequent requests
- But Postman cannot do this
- So we disable SSL Verification done by Postman
- It means that we trust that the certificate is valid and move ahead

HTTPS Requests (Cont.)

- We get the error shown here is SSL verification is not disabled
- This can be done either globally under Settings or per request under the Settings tabs of the request



GET vs POST

GET Method

- Used to fetch the data about a specified resource
- It is the most common HTTP method
- The query string used to fetch the resource is sent in the URL itself
  - https://petstore.swagger.io/v2/pet/findByStatus?status=available&status=sold
- Can be cached
- Remain in browser history
- Can be bookmarked
- Have length restrictions on the data the can be sent in the requests

POST Method

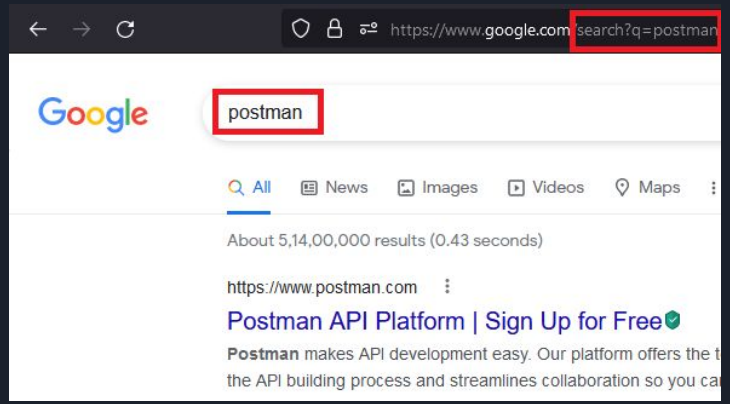
- Used to send data to server to create/ update resource
- The Data sent to the server is sent in body and not in the URL
  - https://petstore.swagger.io/v2/pet
- Are never cached
- Do not remain in browser history
- Are never bookmarked
- Have no length restriction on the data the can be sent in the requests

Request Parameters

- In Postman we have two types of request parameters
  - Query parameters
  - Path parameters
- Let us see them in detail

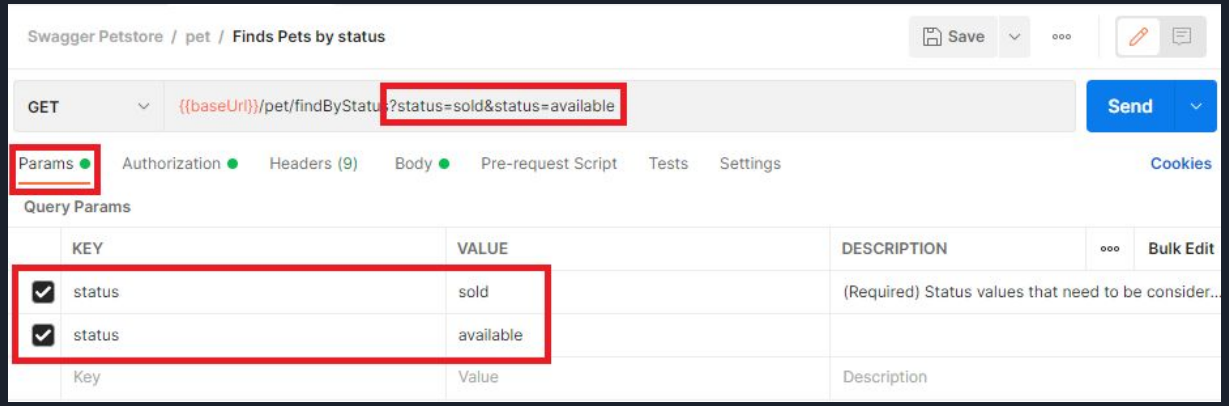
Query Parameters

- Query Parameters are options passed to the endpoint to send additional data to the server
- Are appended to the endpoint using “?”
- Passed as key, value pairs
- E.g. /pet/findByStatus?status=sold&status=available



Query Parameters (Cont.)

- In Postman, query parameters are can be set at the request level
- Under the request, go to the Params tab to set the query parameters
- Additional information like whether they are optional or mandatory can be provided in the description

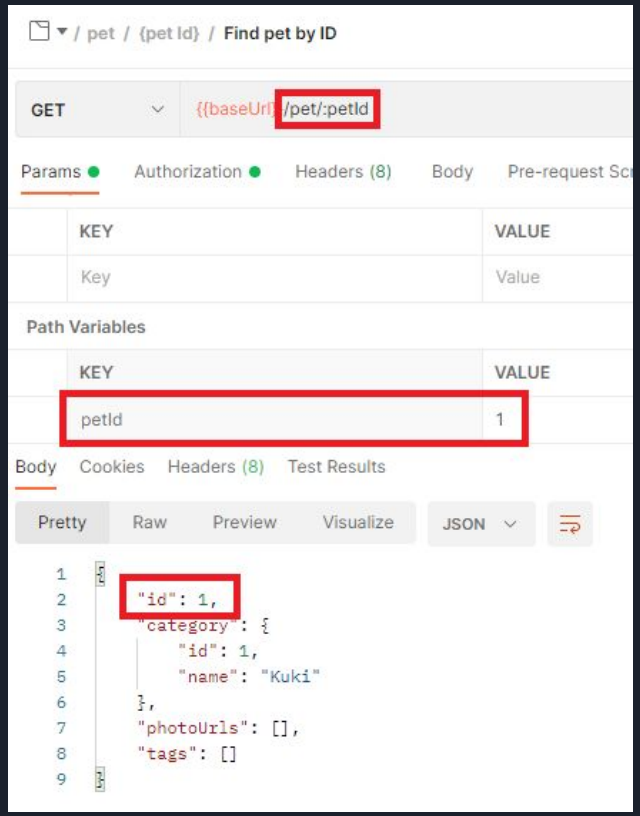


Path Parameters

- Sometimes the additional information forms part of the endpoint url itself instead of being passed as query parameters
- GET method to fetch the ped by id requires the id to be passed in the endpoint url itself
- In such case, should we create 10 separate requests to fetch pets with 10 different ids?
- This is where the path parameter comes handy

Path Parameters (Cont.)

- Path parameters can be specified using a placeholder name preceded by ":"
- In this case we can choose a placeholder name as "id" or "petid"
- Then the endpoint url becomes
  - https://petstore.swagger.io/v2/pet/:id
  - https://petstore.swagger.io/v2/pet/:petid
- Accordingly it is going to appear under the Params tab

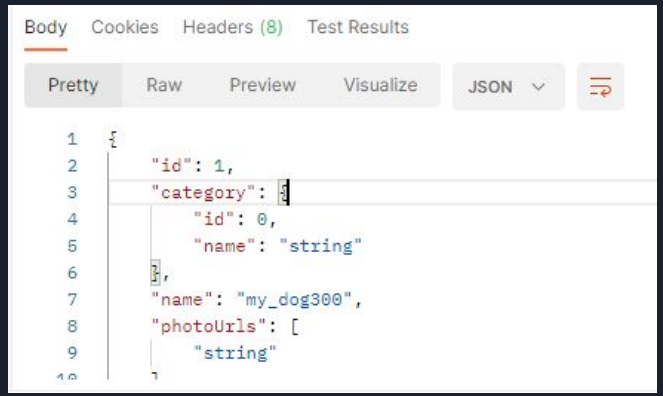


Understanding Responses

- When we send a request and receive a response, we can use the response viewer to know more about it
- Just like request, the response consists of body and headers
- Additionally response comes with a status code and message to help us understand whether it was success or failure
- As we saw earlier successful responses will have response code in 200 series
- Failed responses will have response code in either 400 or 500 series depending on whether the failure was due to client side or server side issue

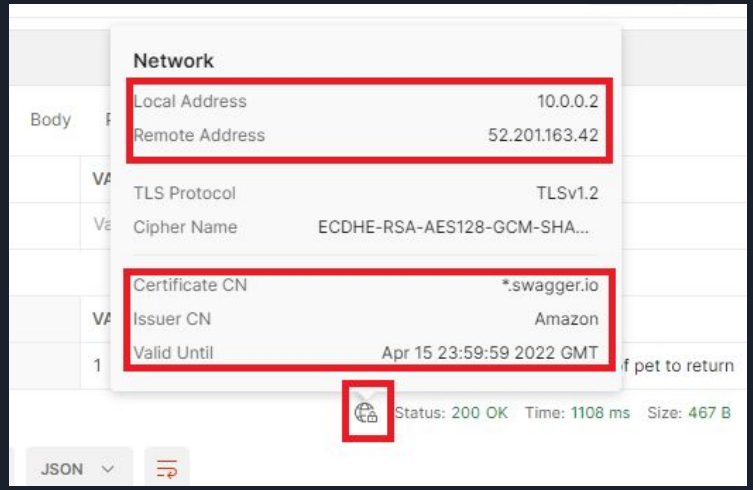
Viewing Responses

- Body tab of the response section shows the main response body
- Response is shown in raw or pretty formats
- Headers tab shows response headers
- Test Results tab shows the results of test (if we added any tests)
- More on the tests later …



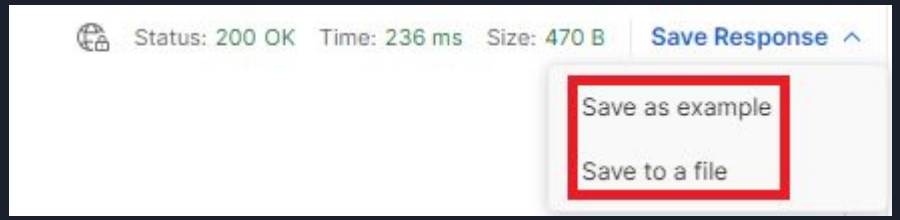
Viewing Responses (Cont.)

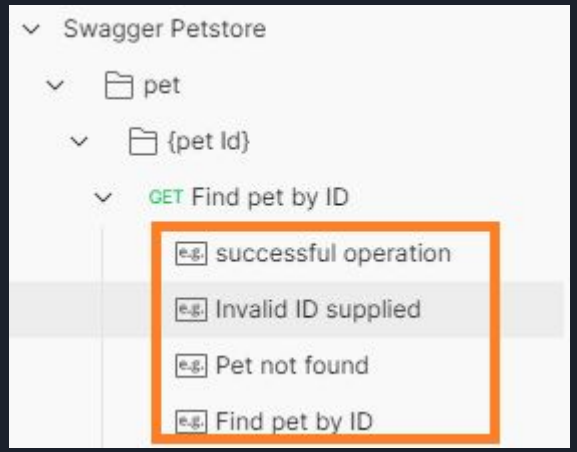
- The network related information like the local and remote IP, certificate information for secure requests etc. can be found by hovering the mouse over the web icon on the tabs section of the response viewer
- For https response there is a lock icon on the web icon
- It also shows issuer of the certificate, validity etc.



Saving Responses

- We can save the responses either in an external file or as examples
- Saving response as an example, helps others to understand more about it
- Saving response to a file will be useful in automation if we want to do response validation via a script





API Authentication

Authorizing requests

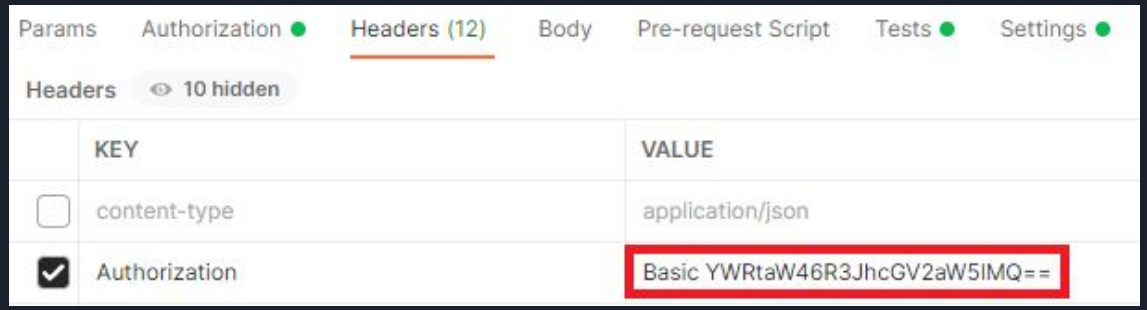
- Authorization ensures that client requests access the data securely
- Postman supports a wide variety of authorization mechanisms
- API Developers make use of them as per the organizational needs
- API Testers will just provide authentication/ authorization details as specified in the API documentation
- Most commonly used are:
  - Basic Auth
  - API Key
  - Bearer Token

Authorizing requests (Cont.)

- Authorization can be set using the Authorization tab under the request
- If we choose No Auth Postman will not send any authorization data with the request
- If the API does not expect any credentials, it returns the data without any authorization
- We can also inherit auth details from the parent
- If the requests are grouped into collections/ folders, auth details can be set at collection/ folder level and they will be inherited by each request

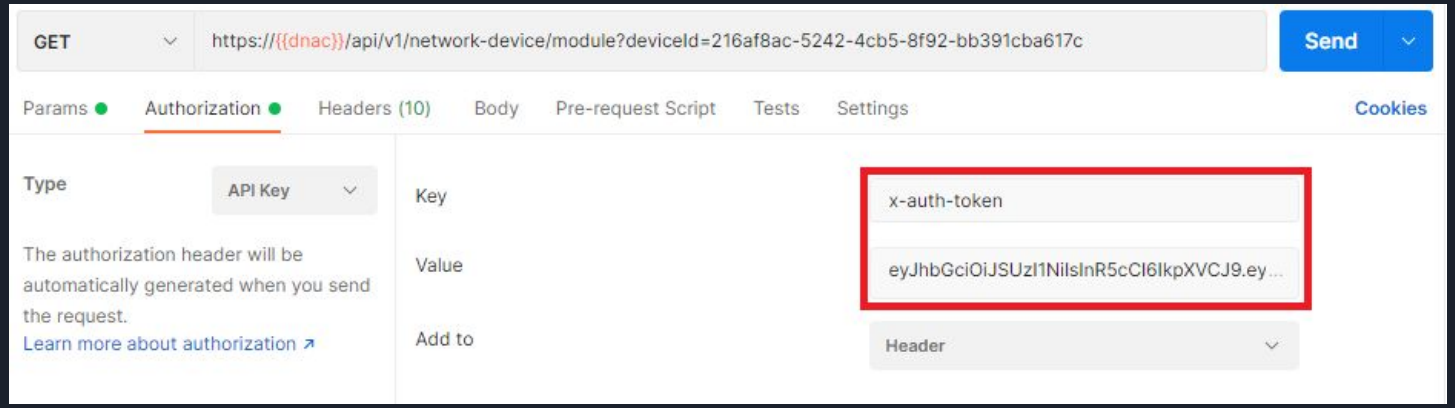
Basic Auth

- Basic Auth involves using a verified username and password to authenticate
- Choose Basic Auth in the dropdown and enter username and password
- Base64 encoded username and password will be generated and appended with the word Basic and set as a header



API Key

- Choosing API Key, we can send a key value pair either in the header or in query parameters
- In the Authorization tab, choose API Key, enter key, value, choose Header
- Note that the API Key is set in the header



Bearer Token

- Choosing Bearer Token lets user authenticate an API using access keys like JSON Web Tokens
- When selected, Postman with append the text “Bearer” to the entered token value

Variables

Introduction to Variables

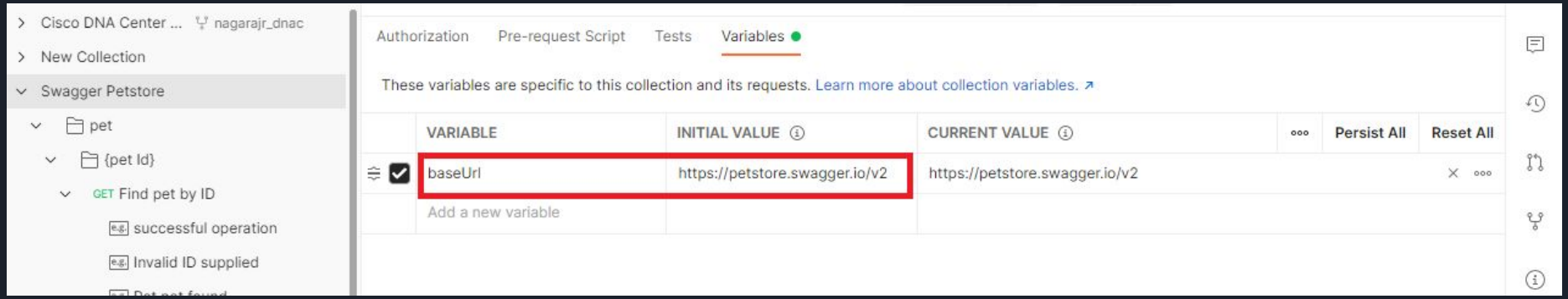
- Variables are like placeholders for data associated with a name
- We can define a variable once by giving ti a name, store the data in it and use it anywhere else, any number of times using the name given
- Suppose we have added close to a hundred requests in Postman
- The developers have changed the endpoint URL
- All our requests will fail, since the endpoint URL has changed
- To make them pass, we need to edit all 100 requests and modify the endpoint URL with the new value
- Tedious and inefficient isn't it?

Introduction to Variables (Cont.)

- Instead, we can create a variable to store the hostname or IP Address of the server which might change
- Refer to this variable in all the 100 requests
- If the endpoint URL changes in future, we just need to modify it in Postman just once
- All our old requests continue to work fine
- Variables can be created at the Collection level and referenced for all the requests within that collection

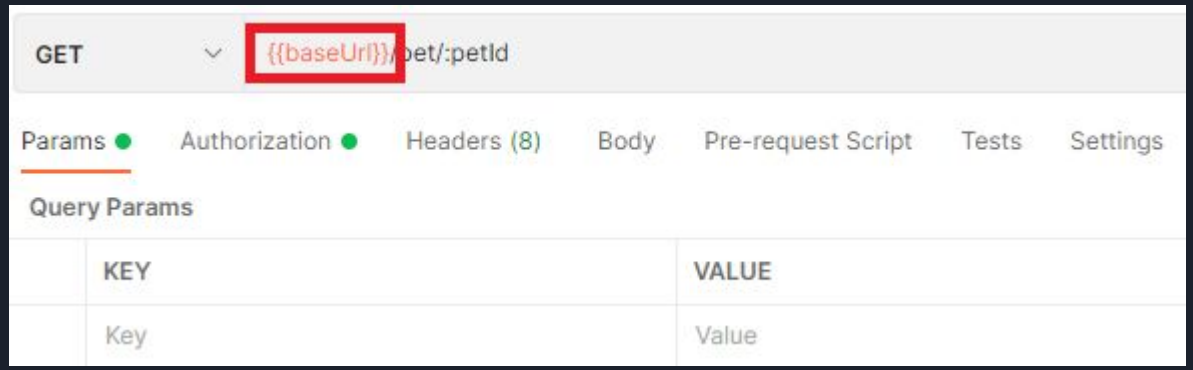
Using Variables

- Click on a Collection and go to Variables tab
- Enter a variable name and set an initial value
- Click on Persist All



Using Variables (Cont.)

- The variables created in the above slide can be accessed as follows
- {{baseUrl}} with now return the value we stored while creating the variable
- E.g. {{baseURL}}/pet etc. can now be used in requests
- If the hostname or IP Address changes, we just need to go to the collection, variables section and modify once



Types of Variables

- In Postman, variables can be created at various levels as follows:
  - Locally within pre-request or test scripts
  - At the collection level
  - At the environment level
  - Variables passed from data files
  - At the Global level

Scope of Variables

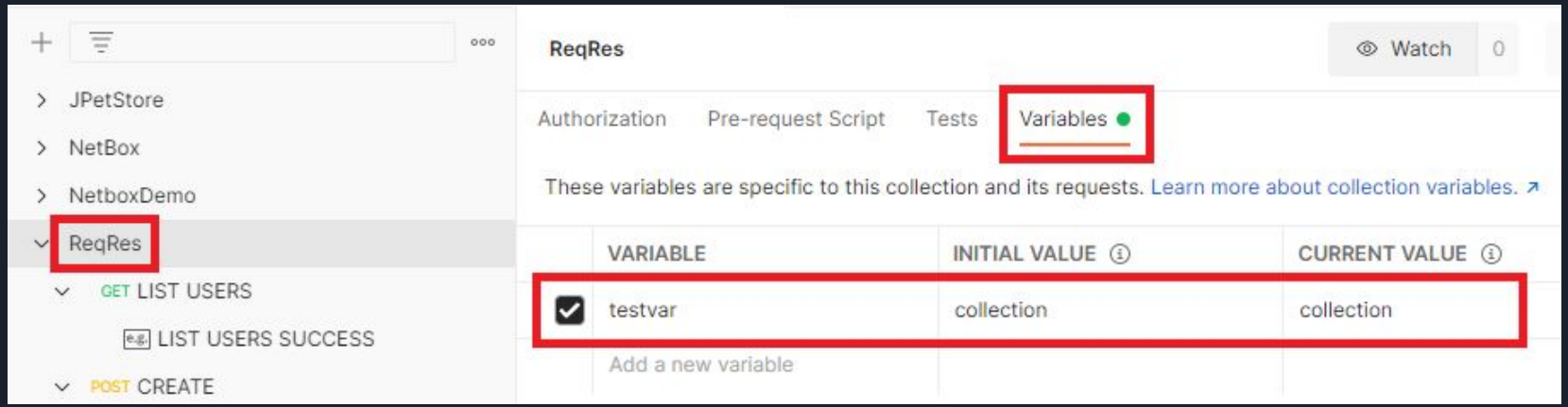
- Scope if the precedence given by Postman to the variables when they are referenced
- The preference is shown below in the descending order
  - Local (Visible only within the request)
  - Data (Variables read from data files)
  - Collection (Visible to all the requests within the collection)
  - Environment (Visible to any request using the environment)
  - Global (Visible to any request within the workspace)

Local Variables

- Local variables have highest precedence and are visible within the request
- We can set local variables using the following command
  - `pm.variables.set("siteid", 20);`

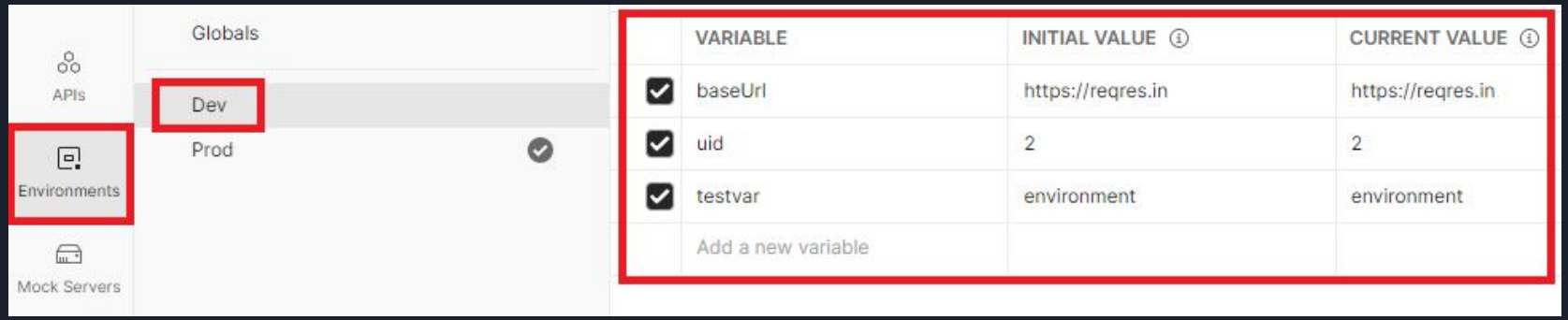
Collection Variables

- Collection variables can be created using the Variable tab available under Collection
- Or using the following command
  - `pm.collectionVariables.set("siteid", 21);`



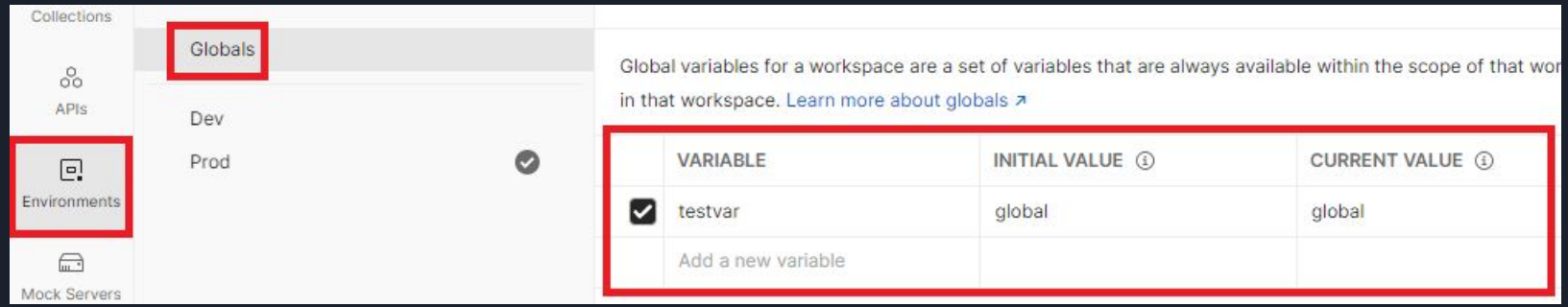
Environment Variables

- Environment variable scan be created by going to the Environments section and setting them under each environment
- Or using the following command
  - `pm.environment.set("siteid",22);`



Global Variables

- Global variable scan be created by going to the Environments section and clicking on Globals section
- Or using the following command
  - `pm.globals.set("siteid",23);`

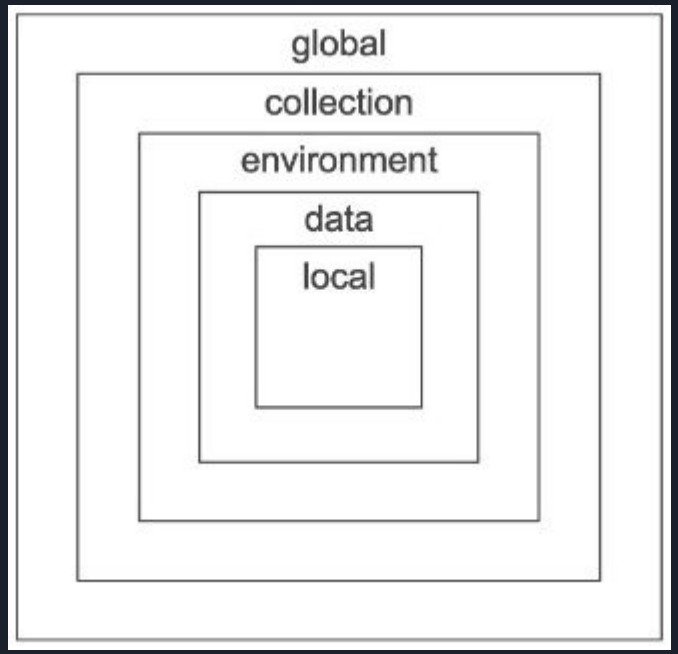


Referencing (using) Variables

- The variables which we have created above can be referenced so that we can use them either in the request URL, body or in pre-request and test scripts
- “siteid” variable can be used outside the scripts (in the url or request body) as:
  - {{siteid}}
- It can be used in the scripts as:
  - `pm.variables.get("siteid");`

Referencing (using) Variables (Cont.)

- If the same variable is defined at multiple places like local, collection, environment and global, when it is referenced, the value which is available at the closest scope will be returned
- So in this case the value of “siteid” is returned as 20, since that is the value present in the variable with local scope
- If “siteid” was not present in local scope, its value is returned as 21 from the collection scope and so on...



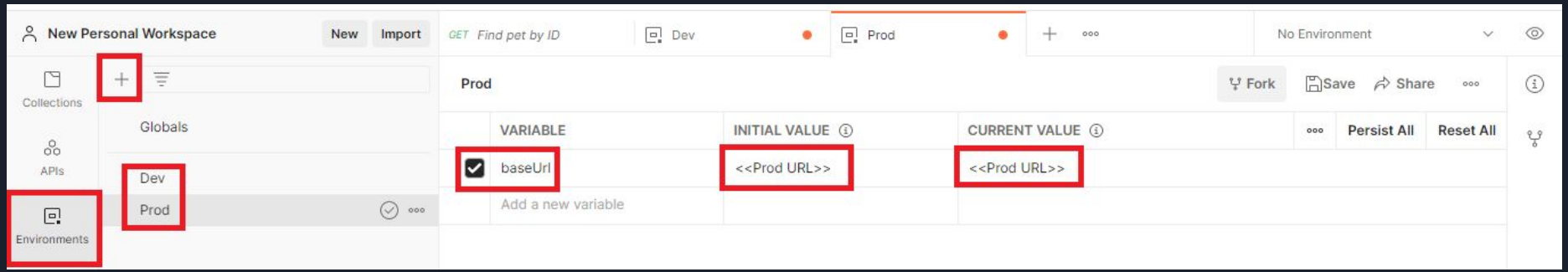
Environments

Introduction to Environments

- Simply put environment is a collection of variables that can be used in Postman requests
- Can be used to group related sets of values together
- What is the use of Environments?
- Usually the development starts on a Dev env, deployed on staging or pre prod env for testing and finally deployed to production once tested right?
- The URL, username, password, etc. are different from Dev to pre prod to prod env right?
- So in Postman we can create an environment corresponding to each of these environments

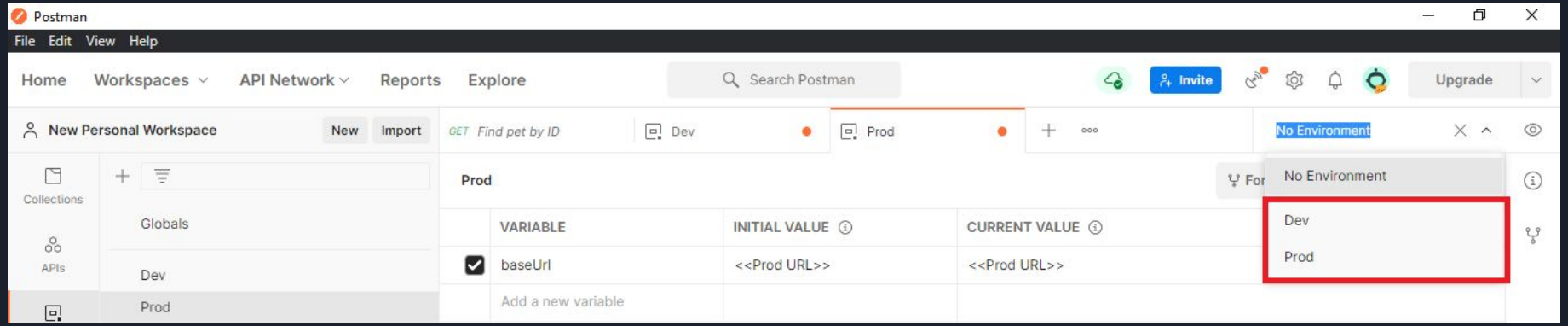
Creating Environments

- We can create an environment by going to Environments section on the left side bar



Using Environments

- Once environments are created with relevant variables, while running the requests we can choose an environment against which the request should be run
- This can be done using Environment dropdown at the top right corner

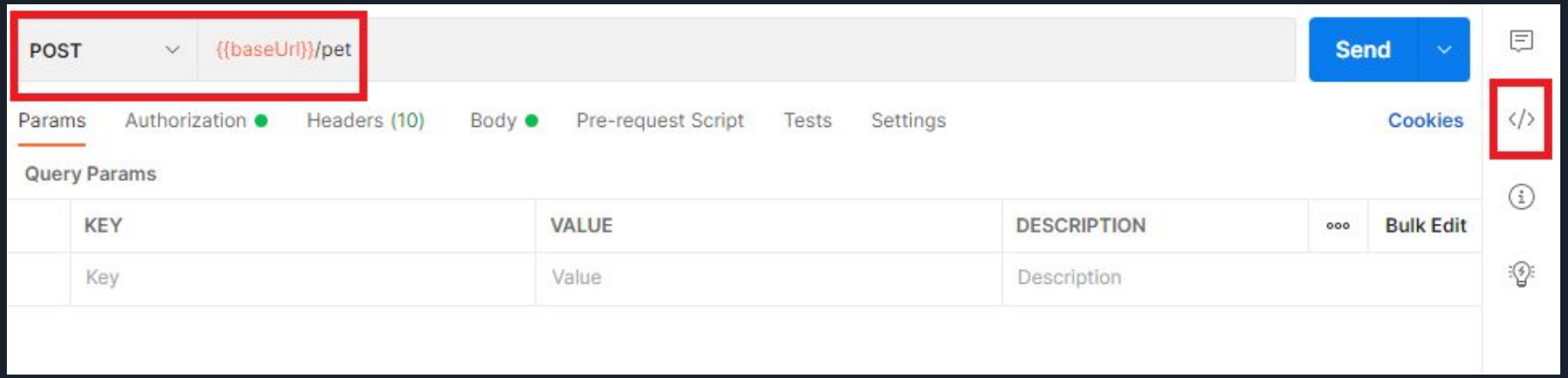


Generating Client Code

- Often times you might want to integrate upir API tests as well into your Automation suite
- In such cases it is useful to have the API requests being made from the language of your choice
- While getting started, it is useful to have these pieces of code generated automatically
- Postman does just that with the “Code” feature

Generating Client Code (Cont.)

- Select any request under a collection and click on Code icon on the extreme right of the window, under the Environment quick look (eye icon)
- Code snippet sections gets expanded with a list of languages displayed in a dropdown



Generating Client Code (Cont.)

POST {{baseUrl}}/pet Send

Params Auth Headers (10) Body Pre-req. Tests Settings

Query Params

	KEY	VALUE	DESCRIP	Bulk Edit
	Key	Value	Description	

Response

Click Send to get a response

Type to filter

- C# - RestSharp
- cURL
- Dart - http
- Go - Native
- HTTP
- Java - OkHttp
- Java - Unirest
- JavaScript - Fetch
- JavaScript - jQuery
- JavaScript - XHR
- C - libcurl
- NodeJs - Axios
- NodeJs - Native
- NodeJs - Request

```
uest POST 'https://
io/v2/pet' \
e: application/json'

qui",
upidatat eu
t"

7,
"

57556,
mollit"

29173,
nostrud sed minim
atat"
```

Generating Client Code (Cont.)

GET {{baseUrl}}/pet/findByStatus?status=available& Send

Params Auth Headers (9) Body Pre-req. Tests Settings

Query Params

	KEY	VALUE	DESCRIP	Bulk Edit
☑	status	available		
☑	status	sold		
	Key	Value	Description	

Body 200 OK 1639 ms 106.07 KB Save Response

Pretty Raw Preview Visualize JSON

Python - http.client

```python
import http.client
import json

conn = http.client.HTTPSConnection
    ("petstore.swagger.io")
payload = json.dumps({
  "status": "available"
})
headers = {
  'Content-Type': 'application/json'
}
conn.request("GET", "/v2/pet/findByStatus?
    status=available&status=sold",
    payload, headers)
res = conn.getresponse()
data = res.read()
print(data.decode("utf-8"))
```

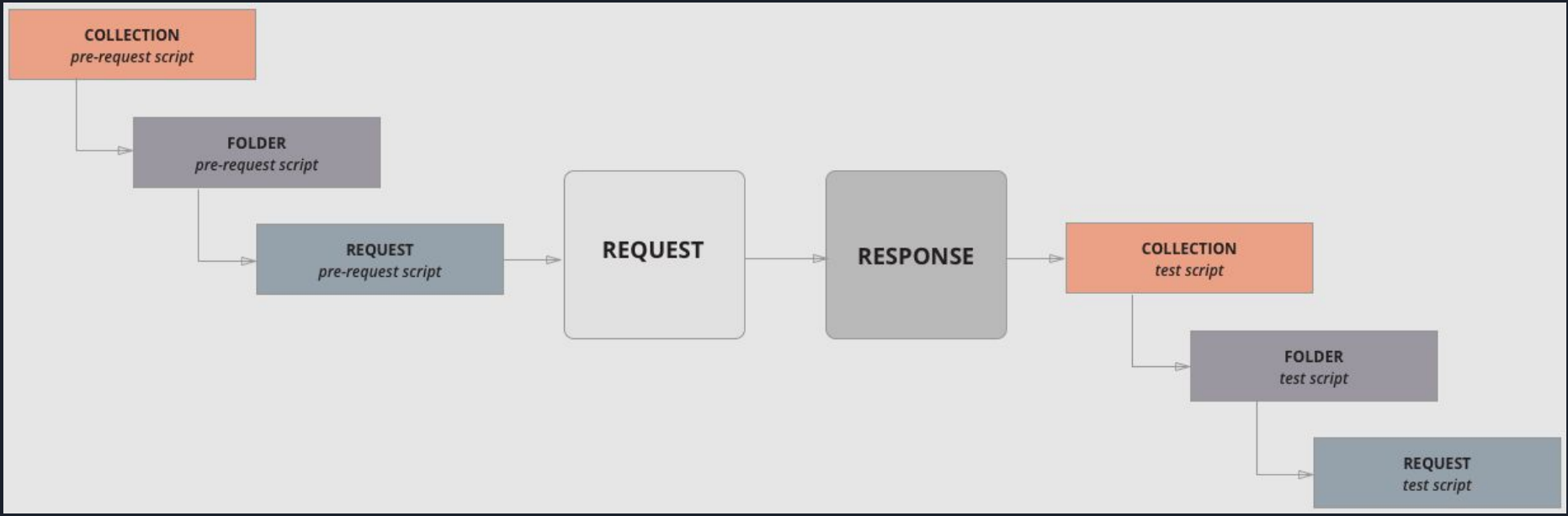
Scripting in Postman

- Postman supports scripting as it contains a powerful runtime based on Node.js
- This helps us to add dynamic behavior to requests and collections
- Scripts can be added to Postman before sending a request and after sending a request
- These are denoted as Pre-request Script and Tests in Postman
- Postman script editor has auto complete feature to simplify writing the script by suggesting as we type

Order of execution

- Pre-request script can be associated with a Collection, a Folder and a Request
- The order of execution in such a case is as follows:
  - Script associated with a collection runs before every request in it
  - Script associated with a folder before every request in it
  - Scripts associated with Requests under a collection / folder
  - Test script associated with a collection runs after every request in it
  - Tests script associated with a folder runs after every request in it

Order of execution (Cont.)



Order of execution (Cont.)

- To verify this add a simple debugging statement using console.log as a pre-request script and a test script at Collection → Folder → Request levels
- E.g. In pre-request script at Collection level, we can write a statement like
  - console.log("pre-request script at collection level");
- And in test script we can put something like
  - console.log("test script at collection level");
- Same way add debug statements for folder and request

Order of execution (Cont.)

- To verify this add a simple debugging statement using console.log as a pre-request script and a test script at Collection → Folder → Request levels
- E.g. In pre-request script at Collection level, we can write a statement like
  - console.log("pre-request script at collection level");
- And in test script we can put something like
  - console.log("test script at collection level");
- Same way add debug statements for folder and request
- These logs can be seen in the console which can be opened using the Console tab at the bottom

Order of execution (Cont.)

Find and Replace | Console | All Logs | Clear

```
"pre-request script at collection level"
"pre-request script at folder level"
"pre-request script at request level"
▸ GET https://petstore.swagger.io/v2/pet/1                    200 | 934 ms
"test script at collection level"
"test script at folder level"
"test script at request level"
```

Writing Pre-request Scripts

- Some of the things for which pre-request scripts can be used are as follows:
  - Setting variables before sending the request
  - Establishing correlation between subsequent requests in a collection by processing the data of the previous request and using it in the next request

POST {{baseUrl}}/pet

Params | Authorization | Headers (10) | Body | Pre-request Script | Tests | Settings

```
1  pm.collectionVariables.set("name", "bucky"+Math.floor(Math.random() * 10 + 1));
```

```
1  {
2      "name": "{{name}}",
3      "photoUrls": [
4          "adipisicing qui",
5          "est fugiat cupidatat eu incididunt"
6      ],
7      "id": 39006160,
8      "category": {
```

Writing Tests

- Tests in Postman are similar to pre-request scripts except that they get executed right after the request
- Hence they are named as such, as they can be used to validate the response data and decide whether a request is working as expected or not
- Tests can be used to make variables dynamic, add assertions on response data, pass data in between requests and so on
- Postman gives sample code snippets that can be added and further modified if needed

Writing Tests (Cont.)

- pm.response object represents the response received from the server
- Test can be added using the pm.test function
- The function pm.test accepts a name which signifies the test being carried out and a function that returns a boolean value (true or false)
- This function evaluates a condition and returns true or false based on the condition
- If the function returns true that test is considered as pass, else fail

Writing Tests (Cont.)

POST {{baseUrl}}/pet

Params Authorization Headers (10) Body Pre-request Script Tests Settings

```
1 pm.test("Status test", function (){
2     pm.response.to.have.status(200);
3 })
```

Body Cookies Headers (8) Test Results (1/1) Status: 200 OK

All Passed Skipped Failed

PASS Status test

Writing Tests (Cont.)

POST {{baseUrl}}/pet2

Params | Authorization | Headers (10) | Body | Pre-request Script | Tests | Settings

```
1  pm.test("Status test", function (){
2      pm.response.to.have.status(200);
3  })
```

Body | Cookies | Headers (8) | Test Results (0/1)

Status: 404 Not Found

All | Passed | Skipped | Failed

FAIL Status test | AssertionError: expected response to have status code 200 but got 404

Writing Tests (Cont.)

- https://documenter.postman.com/view/1559645/RzZFCGFR?version=latest
- ABove URL contains a sample workspace which can be imported into our local Postman
- It contains some sample tests which will help us understand how to write different types of tests

Writing Tests (Cont.)

- Expecting response code to have value 200
  - pm.response.to.have.status(200);
- Expecting env name to be something
  - pm.expect(pm.environment.get("env")).to.equal("production");
- Some other syntax to write tests
  - pm.response.to.not.be.error;
  - pm.response.to.have.jsonBody("");
  - pm.response.to.not.have.jsonBody("error");
  - pm.response.to.be.ok;
  - pm.response.to.be.withBody;
  - pm.response.to.be.json;

Writing Tests (Cont.)

```
pm.test("The response has all properties", () => {
    //parse the response json and test three properties
    const responseJson = pm.response.json();
    pm.expect(responseJson.type).to.eql('vip');
    pm.expect(responseJson.name).to.be.a('string');
    pm.expect(responseJson.id).to.have.lengthOf(1);
});
```

https://www.chaijs.com/api/bdd/

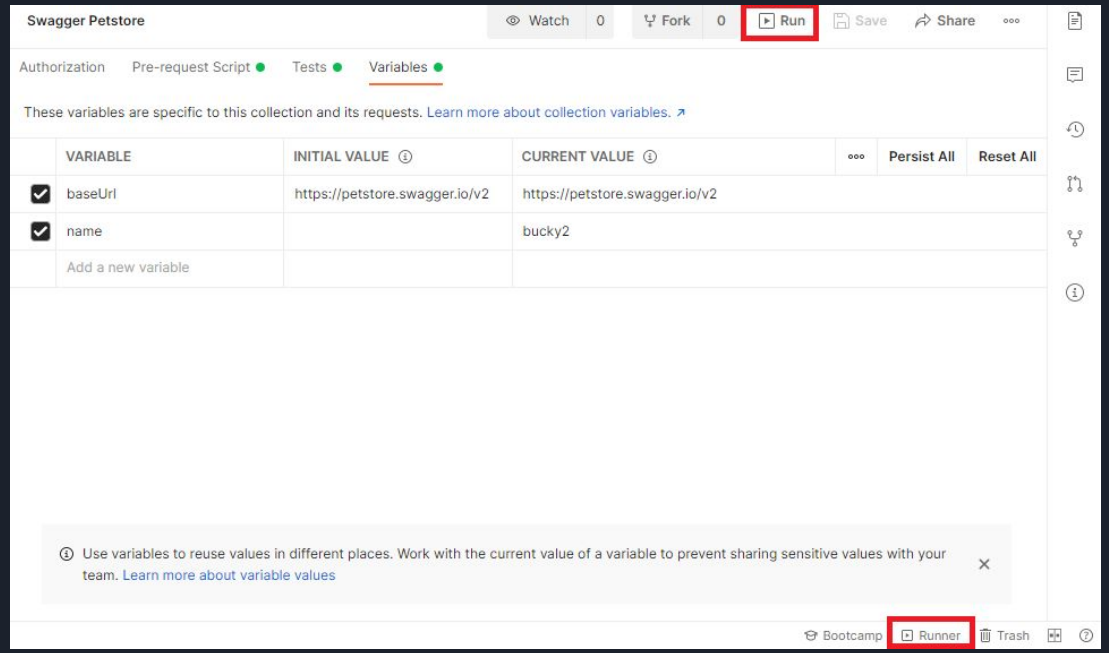
Running Collections

Using Collection Runner

- Collection Runner allows sets of requests to be run in a specified sequence
- Collections can be run against specific environments
- Can be made as data driven, accepting data from CSV and JSON files
- Can be scheduled using monitors
- Can integrate collections with CI/ CD pipeline

Starting Collection run

- Open a collection and click Run button shown at the top
- Or alternately, click Runner at the bottom of the tool



Starting Collection run (Cont.)

- By default the requests will execute on the order they are shown in the runner
- We can drag them up or down to change the order of execution
- Collection can be run against any specific environment by selecting it from the dropdown
- Other options available are:
  - Running tests in multiple iterations
  - Persist variable values
  - Data driving tests
  - Cookies

Data Driven Testing in Postman

- One of the critical aspects of Automation testing, be it UI or API, is being able to run the automation suit against different sets of data
- Data driven testing solves this problem
- Data driven testing simply means supplying test data from different sources like data or file system
- Postman supports reading the data only from files, specifically 2 formats of files namely json and csv
- Data driven option is only available at the collection level
- So while segregating our tests into collections, we need to keep this also in mind

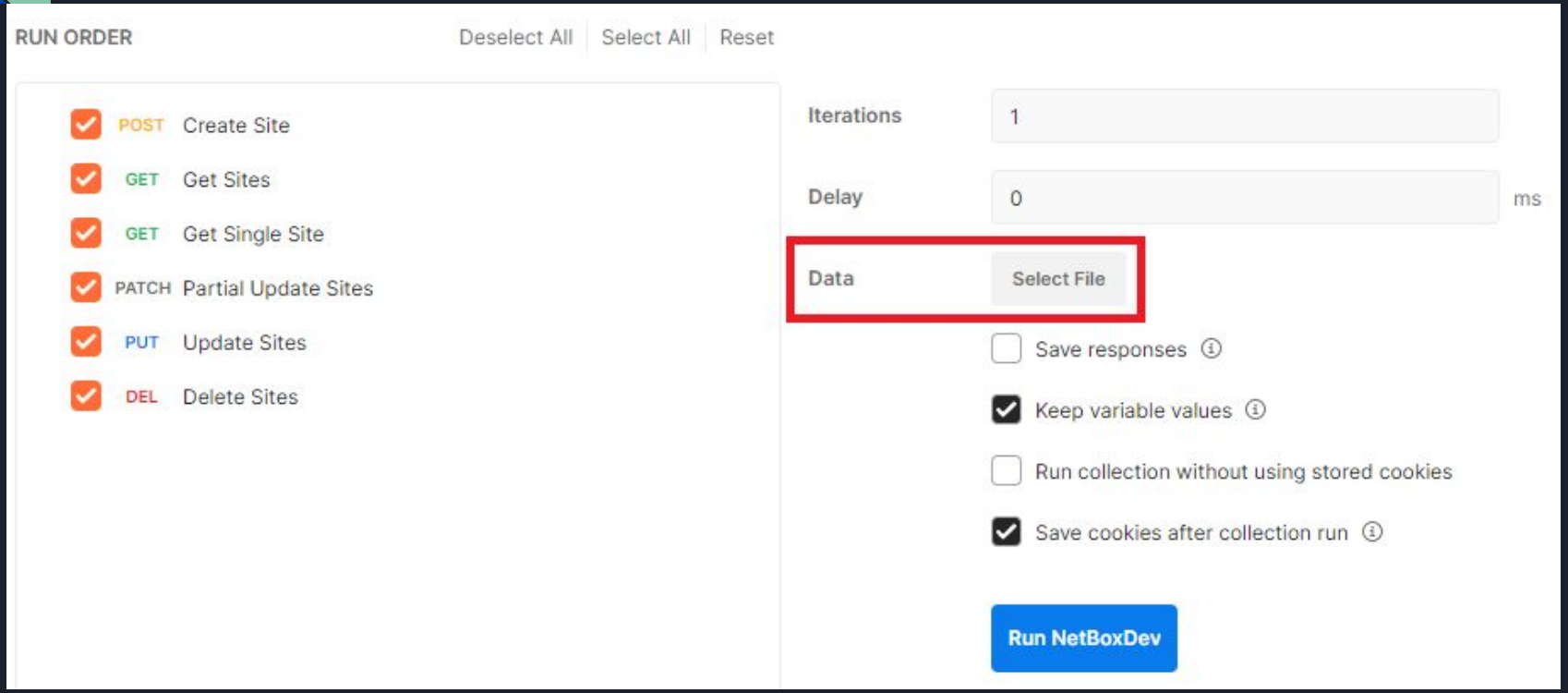
Data Driven Testing in Postman (Cont.)

- Click on Runner and drag a collection into the runner area
- Check/ uncheck the tests to be run
- Click on Select File and choose the data file from the local folder
- You can use the preview option to ensure that the data file is properly recognized by Postman and data is structured as per your need to be supplied to the test
- Click on the run button below to trigger the execution
- Ensure to add the required tests with appropriate assertions before test execution

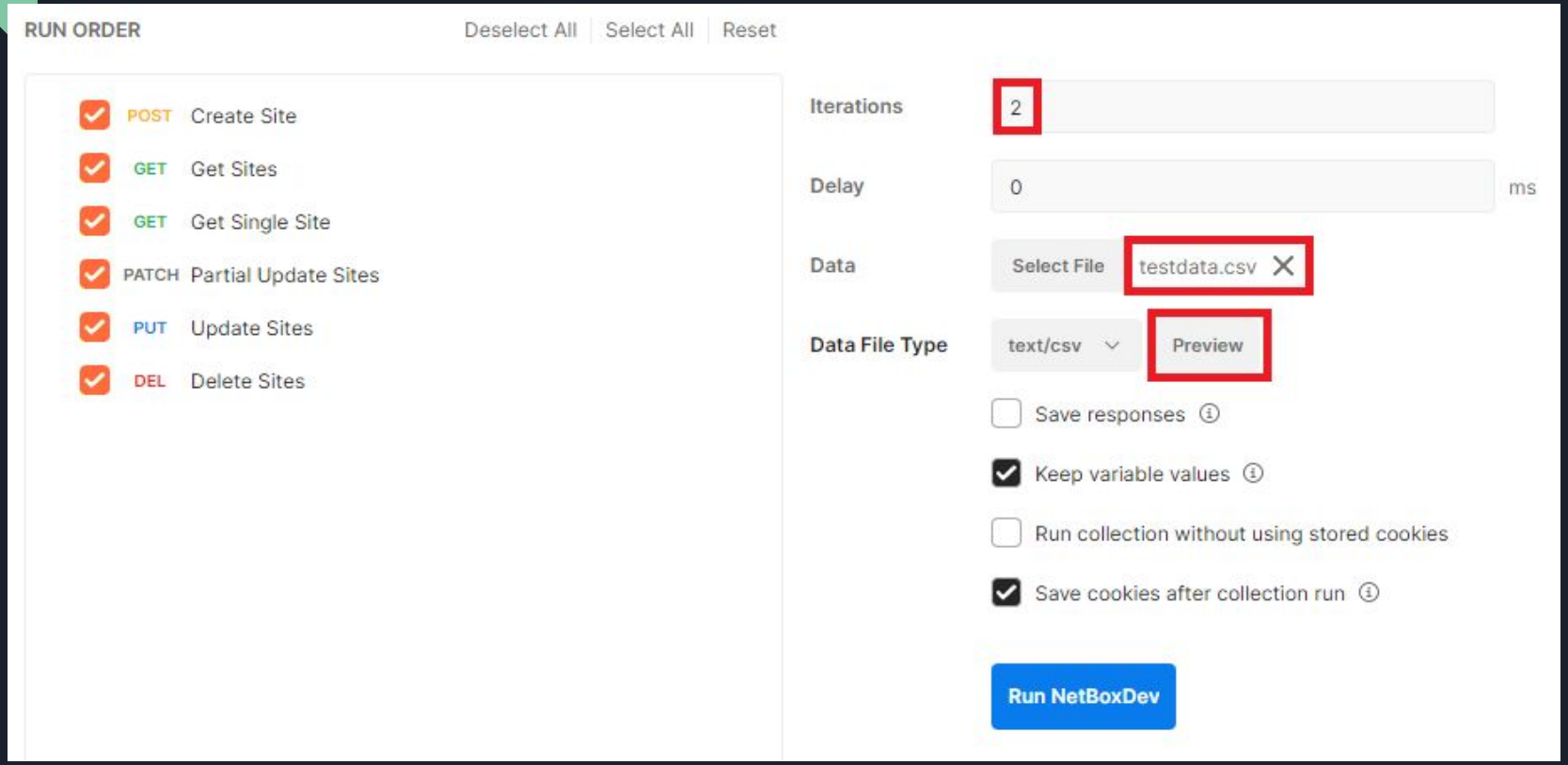
Data Driven Testing in Postman (Cont.)

- Any variable which is being used in the API request or pre-request / test scripts can be passed from data file
- We just need to ensure that the variable names match with column names in CSV format or key names in JSON format

Data Driven Testing in Postman (Cont.)



Data Driven Testing in Postman (Cont.)



Data Driven Testing in Postman (Cont.)

testdata.csv - Notepad

File Edit Format View Help

```
name,slug
test site 161020211150,test-site-161020211150
test site 161020211150,test-site-161020211150
```

PREVIEW DATA

Iteration	name	slug
1	"test site 161020211150"	"test-site-161020211150"
2	"test site 161020211150"	"test-site-161020211150"

Dev

testdata.csv

Preview

POST {{baseUrl}}/dcim/sites/

Params Authorization Headers (10)

none form-data x-www-form-

```
1 {
2     "name": "{{name}}",
3     "slug": "{{slug}}",
4     "status": "planned"
5 }
```

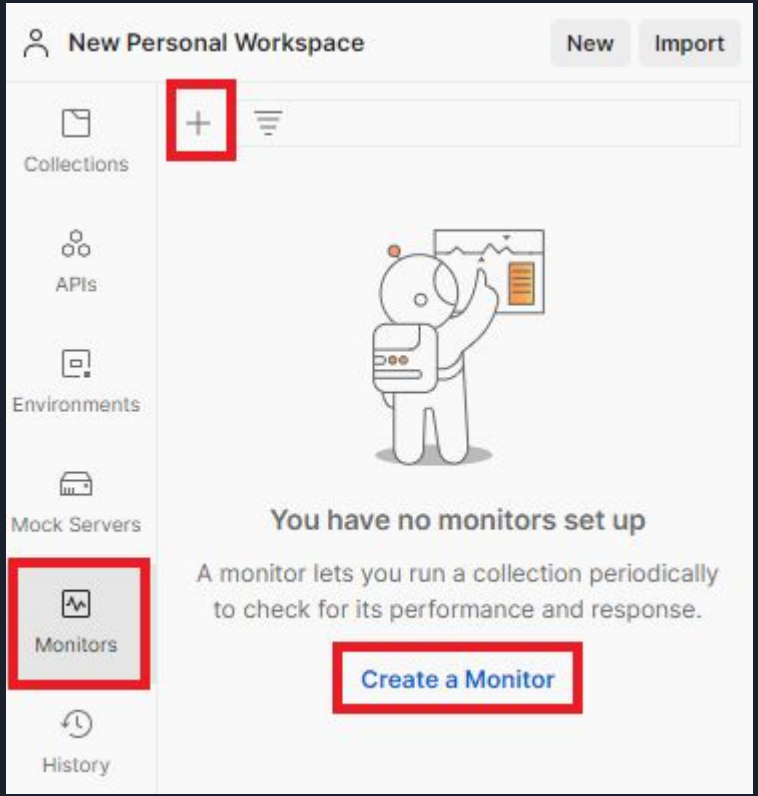
Postman Monitors

Postman Monitors

- In the previous section we have seen how to group requests into collections and run them together
- However this execution still needs to be triggered manually
- Collection run can be automated using Postman Monitors
- Monitors let us schedule automated collection runs and receive reports

Postman Monitors (Cont.)

- On the left navigation bar, click on Monitors and click the + icon or Create Monitor link to create a new monitor
- Enter a name, choose a collection to run and enter other details to create a monitor



Postman Monitors (Cont.)

Edit monitor

Monitor name

NetBox_Site_Monitor

Collection

NetBox API Tests

Collection tag

CURRENT

Choose a collection tag for this monitor. If the collection is not linked to an API, a monitor can only be created on the current tag.

Environment

NetBox_Public_Cloud

The variable values in this environment will be used in all your monitoring calls. Learn more

Run this monitor

Hour Timer

Every Hour

Frequent runs give you a finer view of performance but also cost more monitoring calls which might be limited by your Postman account. Check your usage limits

Regions

- (●) Automatically select region
- ( ) Manually select region
- [x] Receive email notifications for run failures and errors

You can select one or more regions to monitor your requests from. Learn more

nravinuthala@gmail.com

Bootcamp | Runner | Trash

Postman Monitors (Cont.)

Postman Monitors (Cont.)

NetBox_Site_Monitor

NetBox_Site_Monitor UNHEALTHY

Run Refresh

Test Results Console Log

POST	Create Site https://netboxdemo.com/api/dcim/sites/	201 Created 194 ms 517 B
PASS	Status code is 200	
GET	Get Sites https://netboxdemo.com/api/dcim/sites/	200 OK 158 ms 12.3 kB
PASS	Status code is 200	
GET	Get Site By ID https://netboxdemo.com//api/dcim/sites/88/	200 OK 127 ms 624 B
PASS	Status code is 200	
FAIL	Verify Site Name	
PUT	Update Site Description https://netboxdemo.com/api/dcim/sites/	200 OK 251 ms 620 B
PASS	Status code is 200	
FAIL	PUT verify description	
PATCH	Partial Update Site Description https://netboxdemo.com/api/dcim/sites/	200 OK 112 ms 620 B
PASS	Status code is 200	

Postman Monitors (Cont.)

NetBox_Site_Monitor

NetBox_Site_Monitor UNHEALTHY

Run Refresh

Test Results Console Log

```
0:01:48 Preparing run.
0:03:47 Preparing run.
0:04:42 Preparing run.
0:05:42 Preparing run.
0:06:38 Preparing run.
0:07:37 Preparing run.
0:08:33 Preparing run.
0:09:31 Preparing run.
0:09:47 Running... Hide run logs
```

```
1 0:09:47  NetBox_Site_Monitor started
2 0:09:47  Create Site
3 0:09:47  POST https://netboxdemo.com/api/dcim/sites/
4 0:09:49  Get Sites
5 0:09:49  GET https://netboxdemo.com/api/dcim/sites/
6 0:09:50  [
7 0:09:50    1,          2,
8 0:09:50    7,          8,
9 0:09:50    37,         54,
```

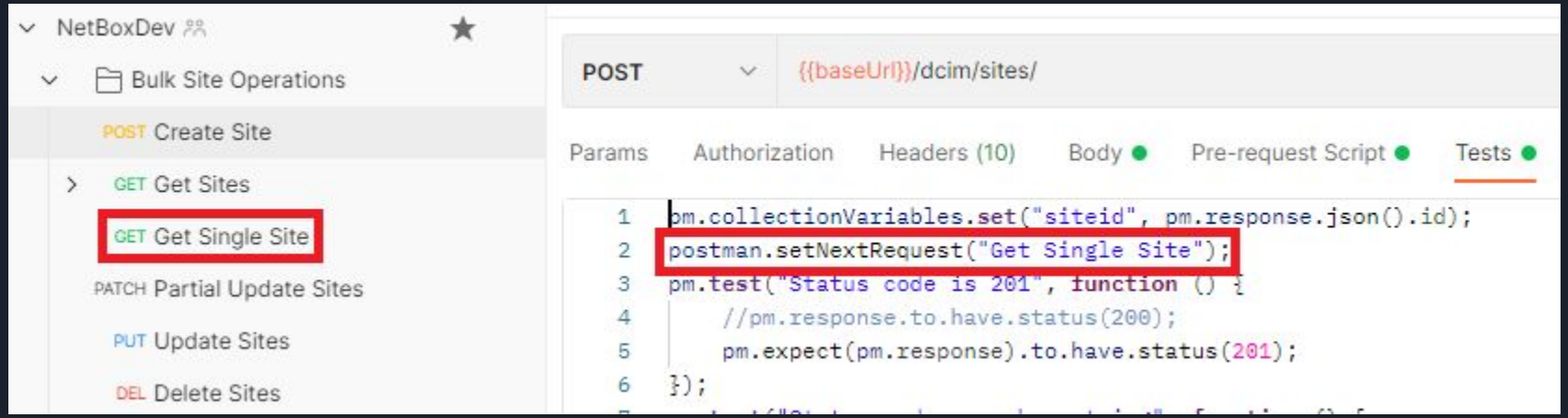
Postman Workflows

Introduction to Workflows

- Collection Runner executes the requests in the order in which they are seen
- We can drag and drop to change the order of execution, but that is not recommended for automating collection run via Monitors or command line execution
- We can change the default order of execution using the concept of Workflows

Building a request workflow

- Postman provides a function `postman.setNextRequest()`
- This can be used to control which request will be called next



Dynamic Variables

Working with dynamic variables

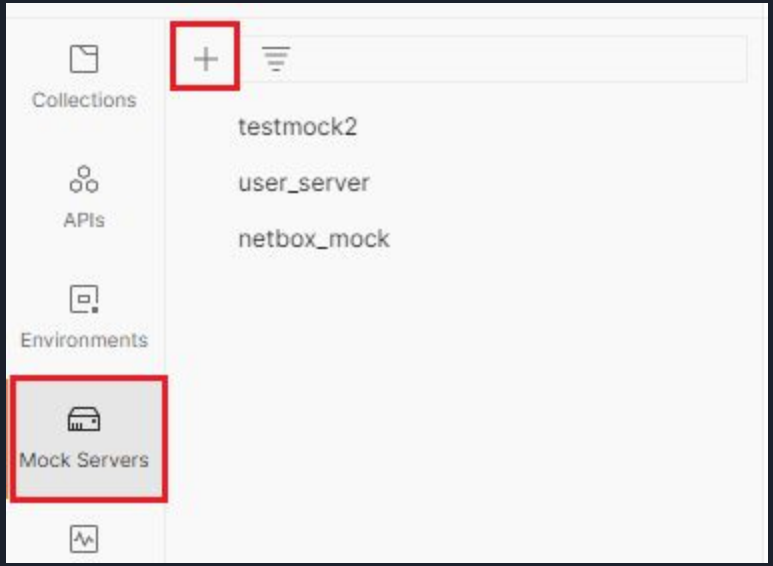
- There would be times when you need to test an API with large amount of data or some dummy data
- If we do not have access to such data, we can make use of Dynamic Variables in Postman
- Postman uses fake.js a Node JS library to generate fake data for different fields like names, titles, email ids, addresses etc.
- Dynamic variable names start with $ sign
- They can be used in pre-request or test scripts
- E.g. to generate a random name we use a command pm.variables.replaceIn('{{randomFirstName}}')
- Refer [Dynamic variables | Postman Learning Center] for further details

Mock Servers

Working with Mock Requests

- Service mocking is an important feature during API development or testing
- If a dependent API is not ready, we can create a mock API that simulates the behavior of the actual API
- This mock API can then be used to continue further development or test automation
- We can create a mock server and add mock requests under it with the required endpoint url, request and response formats response code etc.

Creating Mock Server (Cont.)



Creating Mock Server (Cont.)

- Choose the method, url, response code and response body that we need
- For GET requests we do not have body

Create a mock server

1. Select collection to mock 2. Configuration

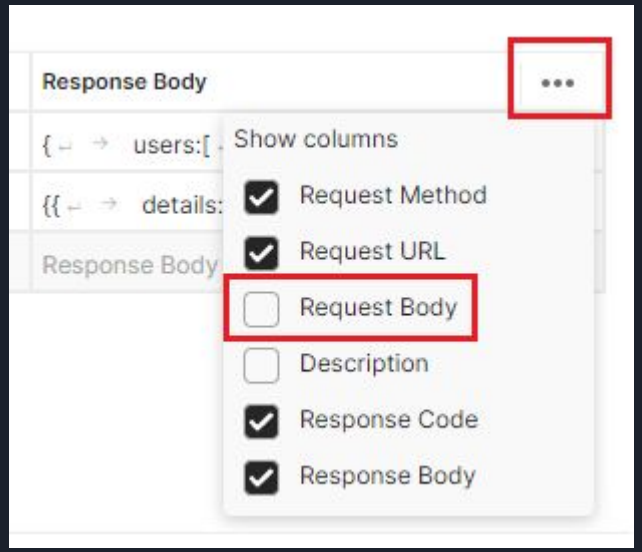
Create a new collection | Select an existing collection

Enter the requests you want to mock. Optionally, add a request body by clicking on the (...) icon.

Request Method	Request URL	Response Code	Response Body	•••
GET	/users	200	{ users:[{ "id...	
GET	/users	404	{{ details: "user not found" }	
GET	URL	200	Response Body	

Creating Mock Server (Cont.)

- But for POST we need to send body
- By default request body is not enabled
- But we can enable it as shown below



Creating Mock Server (Cont.)

Create a mock server

1. Select collection to mock
2. Configuration

Create a new collection | Select an existing collection

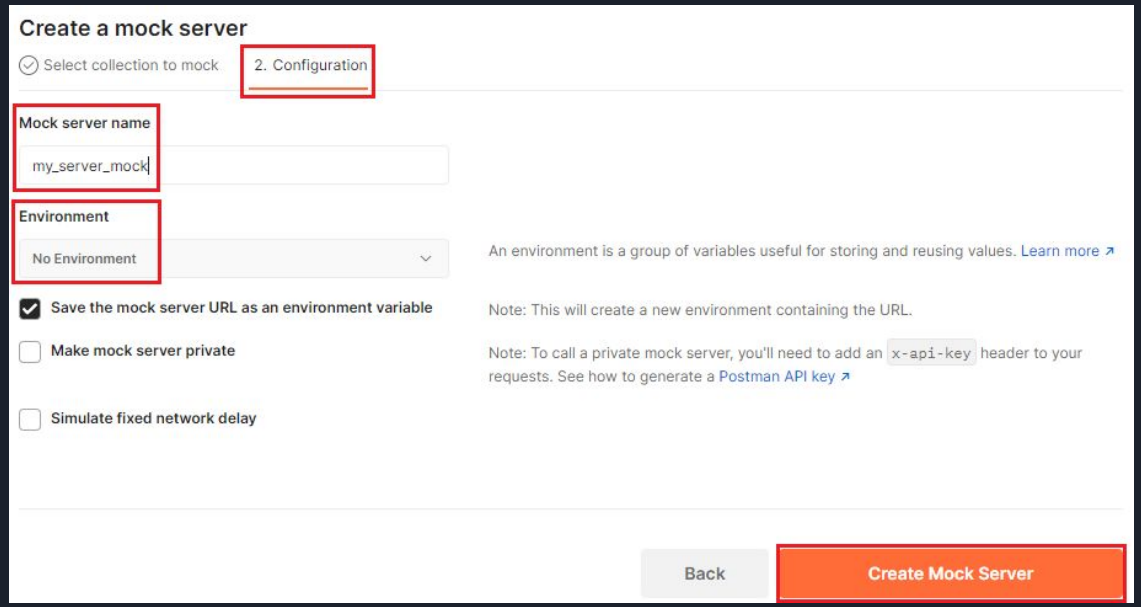
Enter the requests you want to mock. Optionally, add a request body by clicking on the (...) icon.

Request Method	Request URL	Request Body	Response Code	Response Body
GET	/users	Request Body	200	{ users:[{ ...
GET	/users	Request Body	404	{{ details: "user not found" }
POST	/users	{ users:[...	201	{ users:[{ ...
GET	URL	Request Body	200	Response Body

Cancel | Next

Creating Mock Server (Cont.)

- Once done with method selection, click Next
- In the Configuration tab, enter name, choose an environment (optional) and click Create Mock Server



Using Mock Server

- Go to collections to find a collection with the same name as the mock server
- Expand it to find the mock requests we created
- Note that an environment is also created with the mock server name and URL has been converted to a variable
- Send a request and verify whether the behavior is as expected

Using Mock Server (Cont.)

APITesting_Wrkspc
New
Import

Collections
APIs
Environments
Mock Servers
Monitors
Flows
History

NetBoxDev
Bulk Site Operations
POST Create Site
GET Get Sites
GET Get Single Site
PATCH Partial Update Sites
PUT Update Sites
DEL Delete Sites
DNAC_Sandbox
Intro to writing tests - with exam...
my_server_mock
GET /users
GET /users
Default

GET /users

my_server_mock

my_server_mock / /users

Save

GET
{{url}}//users
Send

Params
Authorization
Headers (7)
Body
Pre-request Script
Tests
Settings
Cookies

Query Params

KEY	VALUE	DESCRIPTION	Bulk Edit
Key	Value	Description	

Body
Cookies
Headers (14)
Test Results

Status: 404 Not Found
Time: 1613 ms
Size: 478 B
Save Response

Pretty
Raw
Preview
Visualize
HTML

```
1 {{
2     details: "user not found"
3 }
```

CLI Execution Via Newman

Running API tests from command prompt

- While Postman Monitors help us run a collection in an automated way, this still requires Postman UI
- To be able to integration REST API testing with other automation frameworks or with CI/CD pipeline, we need to be able to trigger the tests from a command line
- This can be achieved using a Node JS library called Newman

Install Newman

- Newman is a command-line collection runner for Postman
- Newman maintains feature parity with Postman, meaning the collection run from Newman is exactly the same as it is from Postman
- Since Newman is a Nods JS library, it requires Node JS for running
- Newman is available from NPM registry as well as Github
- Download and install Node JS from https://nodejs.org/en/download/
- Install newman using the following command
  - `npm install -g newman`

Running collection with Newman

- There are 2 ways to pass the collection to newman to run from command prompt
  - By exporting collection as json file
    - `newman run mycollection.json`
  - By sharing the collection and getting an online link
    - `newman run https://www.postman.com/collections/cb208e7e64056f5294e5`
- Refer the below link for further information
  - [Running collections on the command line with Newman | Postman Learning Center]

Running collection with Newman (Cont.)

- If the collection uses an environment to run we need to export the environment also as a json file and pass it as follows
  - `newman run mycollection.json -e myenvironment.json`
- If the collection run is also data driven, meaning it requires data to be passed from a file (csv or json), then we need to pass the data file also from the command prompt as follows
  - `newman run mycollection.json -e myenvironment.json -d data_file.json`
- You might have to specify the complete path of the files if needed

Postman - Jenkins Integration via Newman

Introduction to Jenkins Integration

- Postman has a Node JS based fully featured testing sandbox using which we can execute JS based tests on our APIs
- Using Node JS library called Newman we can run the same tests via a CLI (Command Line Interface)
- This is our first step towards achieving integration with any of the CI/CD systems
- Once we are able to execute our tests from a command prompt or terminal, we can use the “Execute Shell” or “Execute Windows batch command” option of Jenkins to trigger our tests from Jenkins pipeline

Prerequisites

- We need the following to be installed on the build server master node or slave nodes
  - Node JS
  - NPM
  - Newman

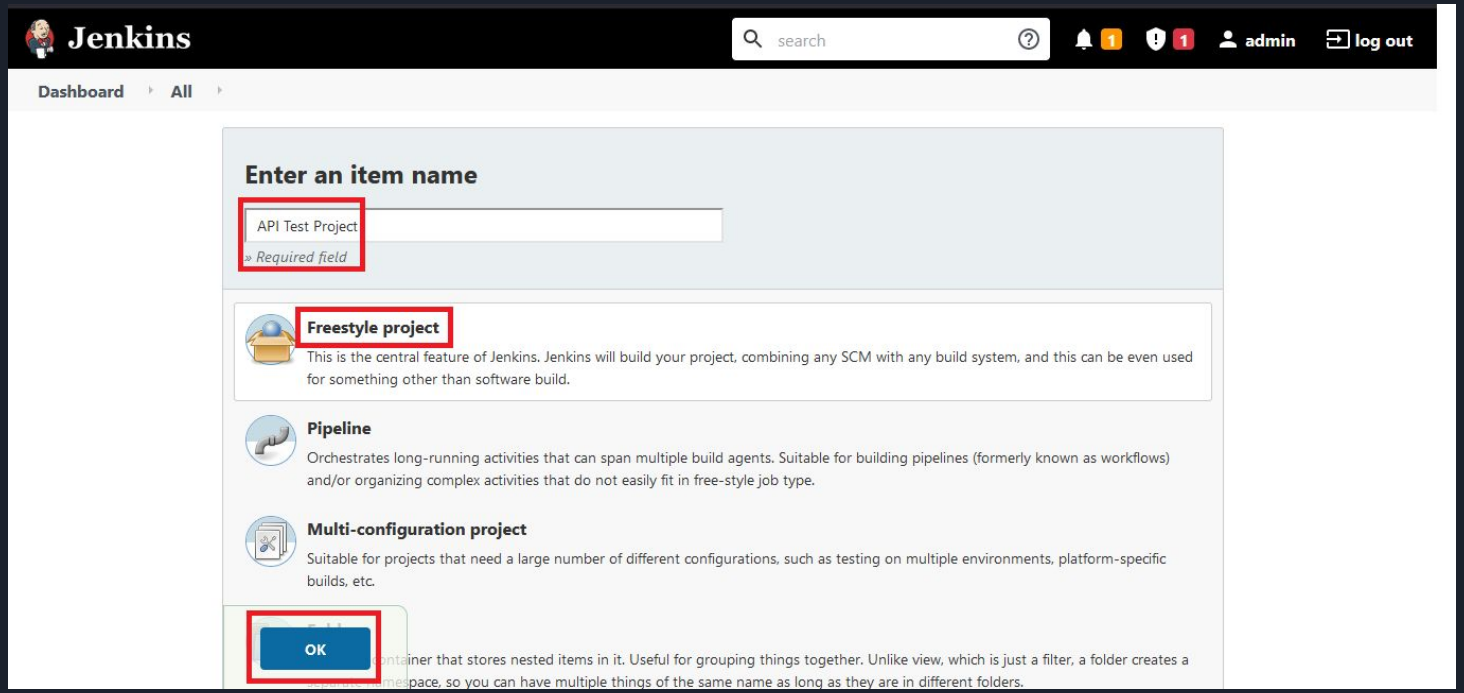
Running the collection from CLI

- Export Postman collection as a JSON link or file
- Use the following command to run the collection from command line
  - Newman run <<collection json link or json file>>
- Ensure that collection runs as expected from command line
- Newman produces the output shown below in the CLI

	executed	failed
iterations	1	0
requests	6	0
test-scripts	12	0
prerequest-scripts	12	0
assertions	9	0
total run duration: 3.8s		
total data received: 5.33kB (approx)		
average response time: 537ms [min: 299ms, max: 1359ms, s.d.: 384ms]		

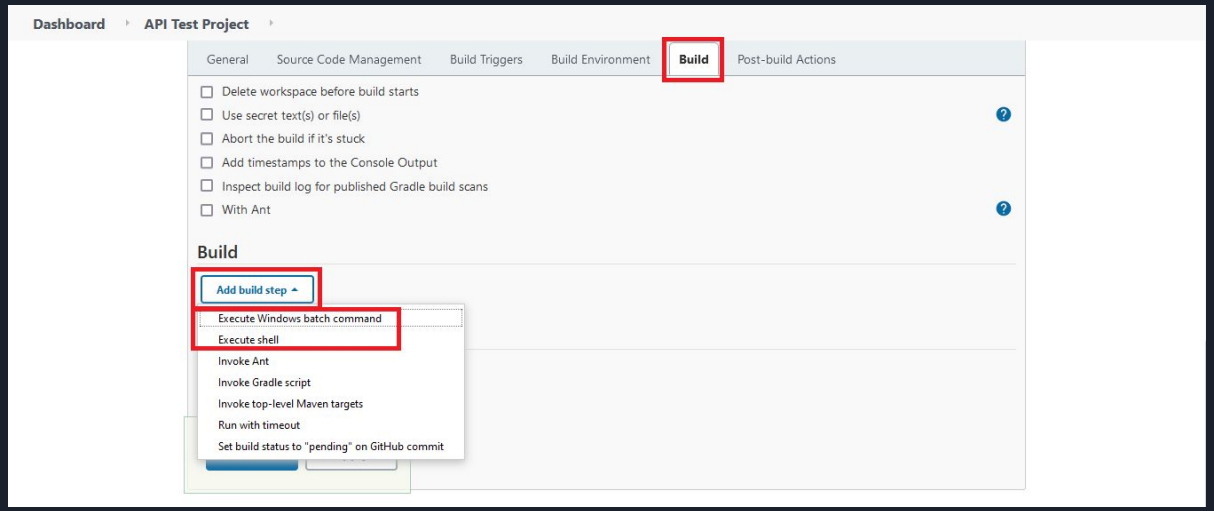
Creating project in Jenkins

- Login to Jenkins and create a freestyle project



Creating project in Jenkins (Cont.)

- In the project go to Build tab and add a build step by choosing one of the following options based on your OS
  - Execute shell
  - Execute Windows batch command

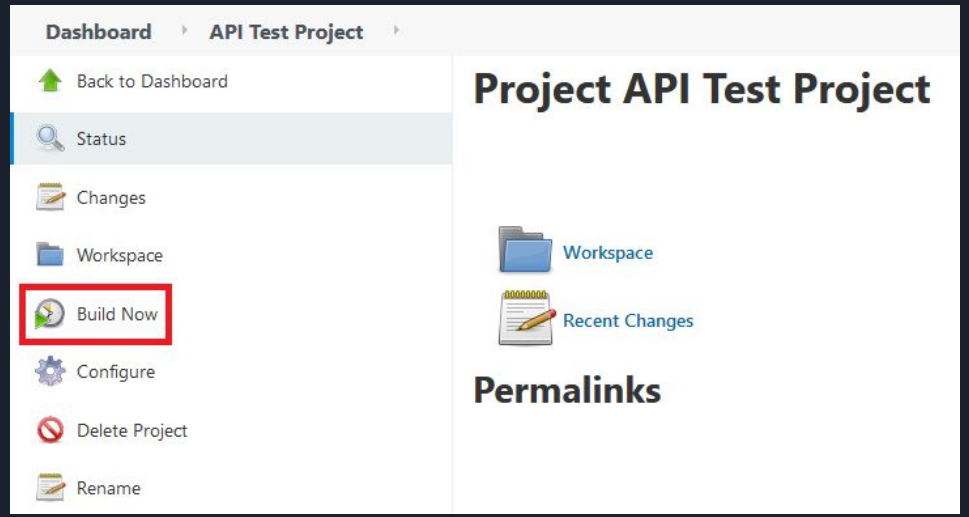


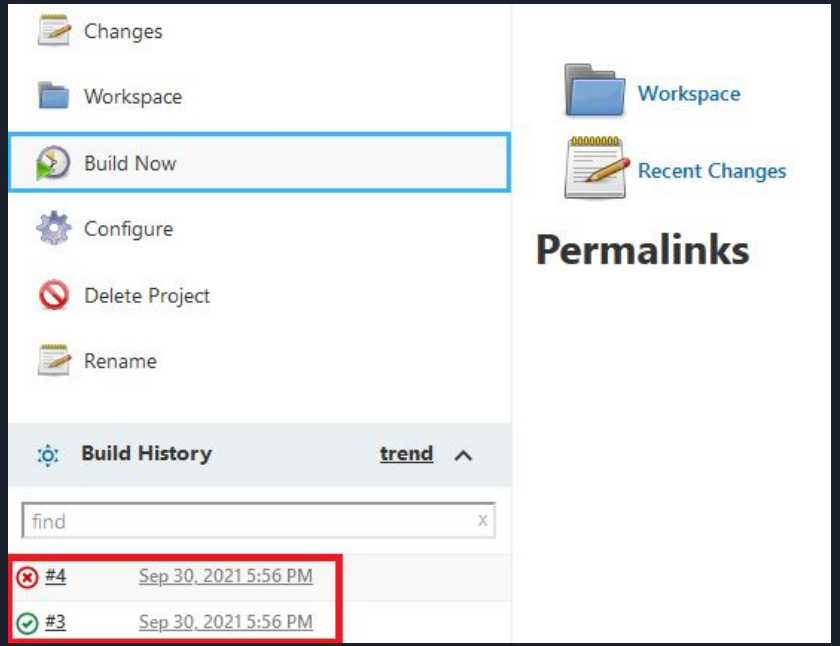
Creating project in Jenkins (Cont.)

- Enter the command we used in the CLI, in the command window of the build step
- Ensure to add --bail option at the end to tell Newman to halt test execution on failure with status code 1
- This will be used by Jenkins to mark the build as fail

Test the build in Jenkins

- Trigger the build by clicking Build Now
- One successful and one failed build are shown below





Check the failed build details

- Click on any failed build and check the console output to see the reason for failure

Dashboard › API Test Project › #4

- Back to Project
- Status
- Changes
- Console Output
- View as plain text

Console Output

```
Started by user admin
Running as SYSTEM
Building in workspace C:\Users\jenkins\AppData\Local\Jenkins\.jenkins\workspace\API Test Project
[API Test Project] $ cmd /c call C:\Users\jenkins\AppData\Local\Temp\jenkins1107080679764670229.bat

C:\Users\jenkins\AppData\Local\Jenkins\.jenkins\workspace\API Test Project>C:\Users\nravi\AppData\Roaming\npm\newman.cmd
run C:\Users\nravi\Downloads\NetBox_API_Tests.postman_collection.json -e C:\Users\nravi\Downloads
\NetBox_Private_Cloud.postman_environment.json -d C:\Users\nravi\Downloads\netbox_data.csv --bail
```

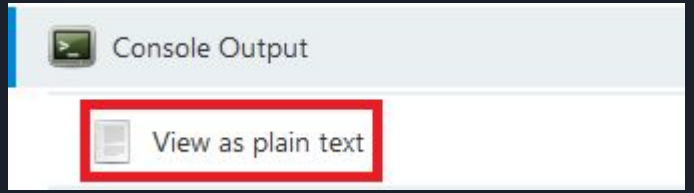
```
  #  failure          detail

 1.  AssertionError   Status code is 200
                      expected 400 to be one of [ 200, 201, 204 ]
                      at assertion:0 in test-script
                      inside "Sites / Create Site"

 2.  AssertionFailure
                      Status code is 200
                      at test-script:38:17
                      inside "Sites / Create Site"
Build step 'Execute Windows batch command' marked build as failure
Finished: FAILURE
```

Check the failed build details (Cont.)

- Click “View as plain text” to see formatted output



	executed	failed
iterations	1	0
requests	2	0
test-scripts	3	1
prerequest-scripts	4	0
assertions	2	1
total run duration: 1121ms		
total data received: 3.1kB (approx)		
average response time: 448ms [min: 270ms, max: 626ms, s.d.: 178ms]		

```
  #  failure           detail

 1.  AssertionError    Status code is 200
                       expected 400 to be one of [ 200, 201, 204 ]
                       at assertion:0 in test-script
                       inside "Sites / Create Site"

 2.  AssertionFailure
                       Status code is 200
                       at test-script:38:17
                       inside "Sites / Create Site"
Build step 'Execute Windows batch command' marked build as failure
Finished: FAILURE
```

That’s all folks!!!