Introduction to API testing using Postman tools or how create 1258 tests in 27 minutes

Who are we?

Svitlana Samko

https://www.linkedin.com/in/svitlana-samko-b87532114/

Senior Developer in Test over 10 years web development practice over 10 delivered software projects for middle and large business

My most beneficial skill: I like to learn business from the inside. Only so one can be sure that we build right product in the right way at any stage of development process.





Andrii Stepura

https://www.linkedin.com/in/andriistepura/
Senior Quality Assurance Automation Engineer
over 14 years web development practice
over 300 delivered web projects as PO / Dev / Analyst / QA

My most beneficial skill: Imagination to think like a stakeholder. Every piece of software starts from an idea. The first written code lines are just a half of the delivery of that idea.

Definition of done

- 1) Theory:
 - What is API
 - What is HTTP
 - CRUD by HTTP methods
- 2 Analysis:
 - Example project
 - Familiarizing with business needs
 - Business requirements
 - Develop system requirements
- 3 Configuration:
 - Install tools: Postman, Postman Interceptor, Node.js with NPM, Newman, Notepad++, Git Bash
 - Deploy "Demo API v.1.0"

4 Test:

- Develop system requirements
- Create tests
- Prioritize tests
- Exploratory testing with Postman
- Postman environment variables
- Report bugs with Postman code (cURL)
- Re-testing by Postman Runner with smoke tests set example
- Verification tests with Postman Runner at DDT (data driven tests) example
- 5 Continuous integration:
 - Regression testing with Postman CLI tool Newman
 - Verification of fixed API v.1.x ... 2.0

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What is API?

API - Application Programming Interface

a set of functions and procedures that allow the creation of applications which access the features or data of an operating system, application, or other service.



Purpose:

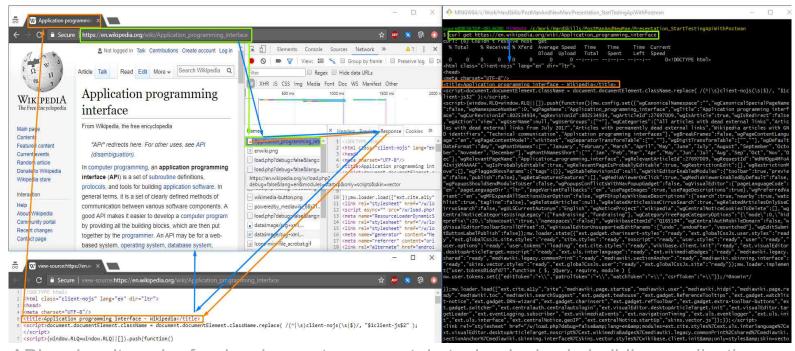
Just as a graphical user interface makes it easier for people to use programs, application programming interfaces make it easier for developers to use certain technologies in building applications.

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What is API? (simplification for web rest APIs)

Just as a graphical user interface makes it easier for people: open https://en.wikipedia.org/wiki/Application_programming_interface

Your browser sends requests to website, receives/sends packages (example in networks tab you can see this), then provides responses to UI model and displays it for you.



API makes it easier for developers to use certain technologies in building applications.

API just sends a request and receives a response

curl get https://en.wikipedia.org/wiki/Application_programming_interface

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What is HTTP?

HTTP means Hypertext Transfer Protocol
The Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative and hypermedia information systems.

HTTP is the foundation of data communication for the World Wide Web. The HTTP/1.0 specification defined the **GET**, **POST** and **HEAD** methods and the HTTP/1.1 specification added 5 new methods: **OPTIONS, PUT, DELETE, TRACE** and CONNECT.

```
rying 208.80.152.2...
  onnected to rr.pmtpa.wikimedia.org.
Escape character is '^]'.
GET /wiki/Main Page http/1.1
  st: en.wikipedia.org
 ate: Thu, 03 Jul 2008 11:12:06 GMT
 erver: Apache
X-Powered-By: PHP/5.2.5
 ache-Control: private, s-maxage=0, max-age=0, must-revalidate
 Content-Language: en
 ary: Accept-Encoding.Cookie
 -Vary-Options: Accept-Encoding; list-contains=gzip, Cookie; string-contains=enwikiToken; string-contains=enwikiLoggedOut; string-contains=enwiki session
 string-contains=centralauth_Token;string-contains=centralauth_Session;string-contains=centralauth_LoggedOut
 ast-Modified: Thu, 03 Jul 2008 10:44:34 GMT
 ontent-Length: 54218
 Content-Type: text/html; charset=utf-8
 (-Cache: HIT from sq39.wikimedia.org
 (-Cache-Lookup: HIT from sq39.wikimedia.org:3128
 C-Cache: HIT from sq38.wikimedia.org
 -Cache-Lookup: HIT from sq38.wikimedia.org:80
 ia: 1.0 sq39.wikimedia.org:3128 (squid/2.6.STABLE18), 1.0 sq38.wikimedia.org:80 (squid/2.6.STABLE18)
 <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
                                                                                                                                     Response body
 <html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en" dir="ltr">
                <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
                                <meta name="keywords" content="Main Page,1778,1844,1863,1938,1980 Summer Olympics,2008,2008 Guizhou riot,2008 Jerusal</p>
"Non-profit organization">nonprofit</a> <a href="http://en.wikipedia.org/wiki/Charitable organization" title="Charitable organization">charity</a>.<b
                                id="privacy"><a href="http://wikimediafoundation.org/wiki/Privacy policy" title="wikimedia:Privacy policy">Privacy
  policy</a>
                                id="about"><a href="/wiki/Wikipedia:About" title="Wikipedia:About">About Wikipedia</a>
                                id="disclaimer"><a href="/wiki/Wikipedia:General disclaimer" title="Wikipedia:General disclaimer">Disclaimer</a>
                        </div>
                <script type="text/javascript">if (window.runOnloadHook) runOnloadHook();</script>
 :!-- Served by srv93 in 0.050 secs. --></body></html>
 Connection closed by foreign host.
josh@blackbox:~$
```

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CRUD by HTTP methods

In computer programming create, read, update, and delete (as an acronym CRUD) are the four basic functions of persistent storage. The Data Distribution Service for real-time systems (DDS) is an Object Management Group (OMG) machine-to-machine (sometimes called middleware) standard that aims to enable scalable, real-time, dependable, high-performance and interoperable data exchanges using a publish—subscribe pattern.

Operation	HTTP	DDS
Create	POST	write
Read (Retrieve)	GET	read / take
Update (Modify)	PUT / PATCH	write
Delete (Destroy)	DELETE	dispose

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Example demo API project

What: Online Currency Converter API

Functionality for API clients:

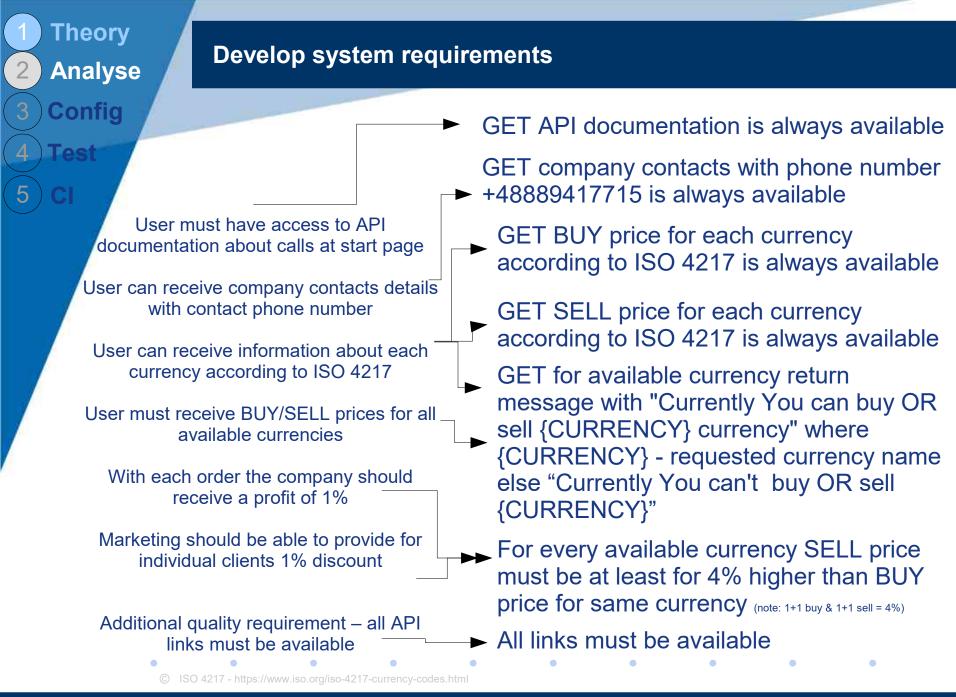
- Receive information about calls available in API
- Receive information about currency BUY price
- Receive information about currency SELL price



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Business requirements

- User must have access to API documentation about calls at start page
- User can receive information about each currency according to ISO 4217
- User must receive BUY/SELL prices for all available currencies
- With each order the company should receive a profit of 1%
- Marketing should be able to provide for individual clients 1% discount
- User can receive company contacts details with contact phone number



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Install tools

Software	Resource	
Postman native apps	https://www.getpostman.com/	
or Postman Chrome app	https://chrome.google.com/webstore/detail/postman/fhbjgbiflinjbdggehcddcbncdddomop?hl=en https://chrome.google.com/webstore/detail/postman-interceptor/aicmkgpgakddgnaphhhpliifpcfhicfo?hl=en	
Node.js with NPM	https://nodejs.org/en/download/	
Newman	https://www.npmjs.com/package/newman \$ npm install newmanglobal;	
Notepad++	https://notepad-plus-plus.org/download/	
Git bash	https://git-scm.com/downloads	

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Deploy "Demo API v.1.0"

- 1. Run Git bash
- 2. Navigate to any folder where create work directory, as ex.: cd c:
- 3. Clone repo with demo API: git clone https://github.com/AndriiStepura/letslearnapitesting.git
- 4. Open directory with demo API: cd c:\letslearnapitesting
- 5. Install json-server for emulate API with command: npm install -g json-server
- 6. run first version of demo API with command: json-server api_1.0.json
- 7. Open in browser this address 127.0.0.1:3000 (or http://localhost:3000)

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Tests prioritization

Let's choose which system requirements will be covered with tests:

Smoke tests:

GET API documentation always available

GET company contacts with phone number always available

GET BUY list always available

GET SELL list always available

Whole set of tests:

GET for any available currency return message with info "Currently You can buy/sell {CURRENCY} currency".
GET for any unavailable currency return message "Currently You can't buy/sell {CURRENCY} currency"

GET BUY price for each currency according to ISO 4217 always available

GET SELL price for each currency according to ISO 4217 always available

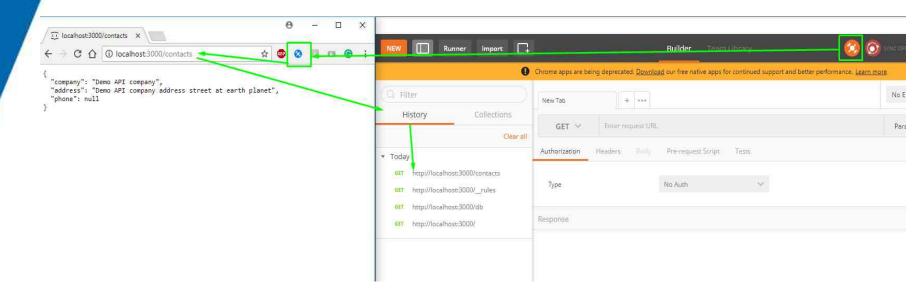
For every available currency SELL price must be at least for 4% highest than BUY price for same currency

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Exploratory testing with Postman (intercept requests)

For fast start capture from your browser you may use Postman Chrome:

- 1. Run Postman Chrome App
- 2. Set Postman Interceptor ON mode
- 3. Open API home page 127.0.0.1:3000 and switch to any resource

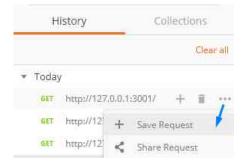


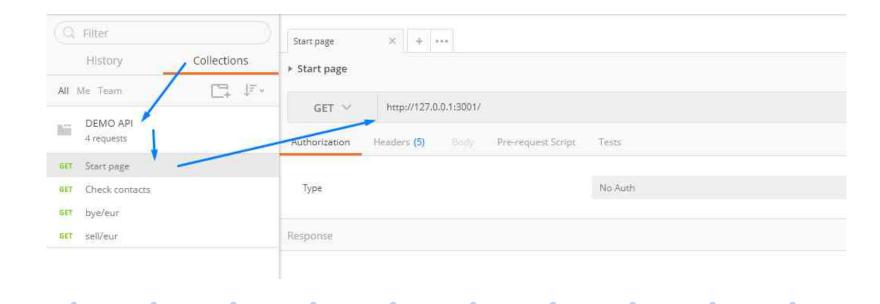
Your browser REST methods from Chrome are available in Postman History

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Exploratory testing with Postman

Save requests as collection for future use:





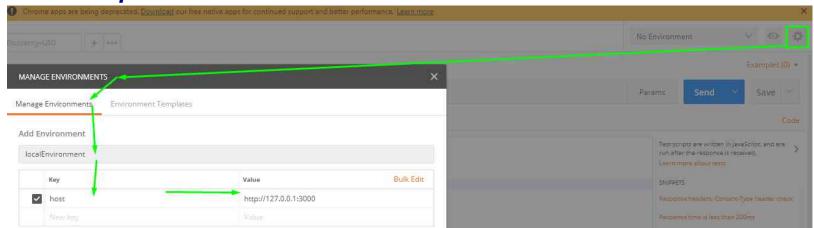
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Postman environment variables

At top right corner click settings and add new environment, as example: *localEnvironment*

with variable key/value (variableName - value)

host - http://127.0.0.1:3000



now we may use this variable in endpoints as {{variableName}} (ex. {{host}})



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Exploratory testing with Postman (intercept requests)

Postman may capture your request from browser, apps, mobile devices...

- 1. For Postman native apps navigate to postman folder/app-* as ex.: Run in cmd console "postman –proxy-server=localhost:5555" or manually
- 2. Create proxy connection
- 3. Open API home page 127.0.0.1:3000 and switch to any resource.

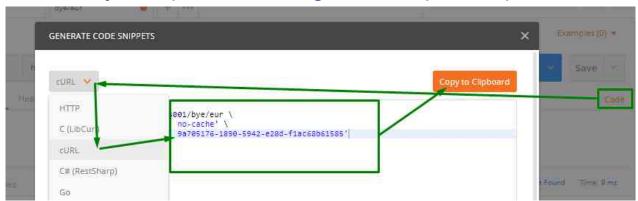
/*IT'S TASK FOR HOME WORK*/

Your requests are available in Postman History now

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Report bugs with Postman code (cURL)

Faster way to report about bugs with steps to reproduce is Postman code:



Postman code is available for many program languages, as ex. - cURL:

```
curl -X GET http://127.0.0.1:3001/bye/eur
            % Received % Xferd Average Speed
 % Total
                                               Time
                                                       Time
                                                               Time Current
                               Dload Upload
                                               Total
                                                       Spent
                                                               Left Speed
     146 100 146
                                 146
                                          0 0:00:01 --:--: 0:00:01 142k<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="utf-8">
<title>Error</title>
</head>
<body>
cpre>Cannot GET /bye/eur
</body>
 /html>
```

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Re-testing by Postman Runner with smoke tests set example

Re-testing with smoke test implementation example:

- 1. According to requirements: let's create collection
- GET API documentation always available GET BUY list always available GET SELL list always available GET company contacts with phone +48889417715 number always available
- 2. For each add in "Test" tab verification rule. Note – very useful as base use snippets at right column.
- 3. Click at collection folder arrow and run all tests set

/*LET'S TRY TO CREATE THESE TESTS NOW OR GET ALL READY EXAMPLES AT NEXT SLIDE*/

Tips:

//how to parse JSON response in Java Script?
var jsonData = JSON.parse(responseBody);
tests["Parameter is equal 3"] = jsonData.ifExistArrayParameter.parameterName == 3;

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Re-testing by Postman Runner with smoke tests set example

Test case: Test script:

GET API documentation always available

GET {{host}}/
tests["Start page is available"] = responseCode.code === 200;

GET BUY list always available

GET {{host}}/buy tests["Buy page is available"] = responseCode.code === 200;

GET SELL list always available

GET {{host}}/sell tests["Sell page is available"] = responseCode.code === 200;

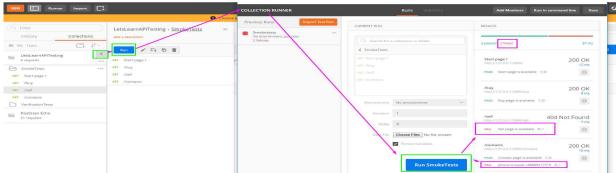
GET company contacts with phone number always available

GET {{host}}/contacts tests["Status code is 200"] = responseCode.code === 200; var jsonData = JSON.parse(responseBody); tests["phone is equal +48889417715"] = jsonData.data.parameterName == "+48889417715";

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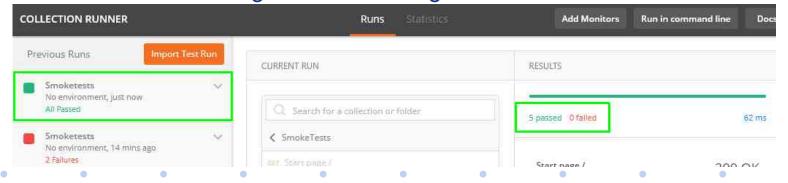
Re-testing by Postman Runner at smoke tests set example

After smoke tests run we receive 2 failed tests



so, our demo API version is not appropriate candidate to release. After report found issues and they were fixed we received new version api_1.1, let's deploy it with commands Ctr+C (for stop previous 1.0) and for run 1.1: **json-server api_1.1.json**

After verifying that all smoke tests passed with the new candidate, we can continue increasing the test coverage with new tests.



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Verification tests with Postman Runner at DDT example

Let's create verification tests for fully test set coverage of all requirements:

According to requirements: GET BUY price for each currency according to ISO 4217 always available

GET BUY price for each currency according to ISO 4217 always available GET SELL price for each currency according to ISO 4217 always available GET for any available currency return message with info at /buy and /sell:

"Currently You can buy {CURRENCY} currency"
"Currently You can sell {CURRENCY} currency"

GET for any not available currency return message with info at /buy and /sell:

"Currently You can't buy {CURRENCY} currency"

"Currently You can't sell {CURRENCY} currency"

For every available currency SELL price must be at least for 4% highest than BUY price for same currency

- 1. Let's create tests as for just one currency, as example USD.
- 2. Change checked currency with tests for variable currencyName.
- 3. Run tests feed with data from csv file with currencies list.

/*LET'S TRY CREATE THESE TESTS NOW OR GET ALL READY EXAMPLES AT NEXT SLIDE*/

Tips:

//How to transfer data between requests?

//You may save response of it as an environment variable postman.setEnvironmentVariable("savedVariableName", jsonData.parameterName1);

//use it anywhere, as example in tests:

tests["Compare from response with saved"] = jsonData.parameterName2 > environment.savedVariableName; //Don't forget to remove an unused variable postman.clearEnvironmentVariable("savedVariableName");

© ISO 4217 - https://www.iso.org/iso-4217-currency-codes.html

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Verification tests with Postman Runner at DDT example

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Test case: Test script:

GET for available currency return messages with info at /buy /sell:

"Currently You can buy {CURRENCY} currency"
"Currently You can sell {CURRENCY} currency"

GET {{host}}/buy?currency=USD

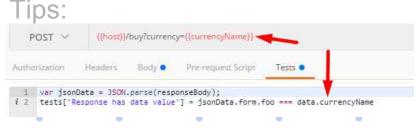
tests["BUY USD page is available"]=responseCode.code===200;varjsonData=JSON.parse(responseBody);tests["USD BUY exchangeRate exist"]=jsonData[0].exchangeRate>=0;if(jsonData[0].exchangeRate>0){
 tests["Message for BUY USD is: \"Currently You can buy USD currency\""]=jsonData[0].message=="Currently You can buy ZWL currency";postman.setEnvironmentVariable("buyPrice", jsonData[0].exchangeRate);
}else{tests["Message for BUY USD is: \"Currently You can buy USD currency\""]=jsonData[0].message=="Currently You can't buy ZWL currency";}

GET for not available currency return messages with info:
"Currently You can't buy {CURRENCY} currency"
"Currently You can't sell {CURRENCY} currency"

For every available currency SELL price must be at least for 4% highest than BUY price for same currency GET {{host}}/sell?currency=USD

tests["SELL USD page is available"]=responseCode.code===200;varjsonData=JSON.parse(responseBody); tests["USD SELL exchangeRate exist"]=jsonData[0].exchangeRate>=0;if(jsonData[0].exchangeRate>0){ tests["Message for SELL USD is: \"Currently You can sell USD currency\""]=jsonData[0].message=="Currently You can sell ZWL currency";tests[data.currencyName+" SELL price "+jsonData[0].exchangeRate+" at least for 4% highest than BUY price "+environment.buyPrice]=jsonData[0].exchangeRate>=environment.buyPrice/1.04; }else{tests["Message for SELL USD is: \"Currently You can't sell USD currency\""]=jsonData[0].message=="Currently You can't sell ZWL currency";if(environment.buyPrice){ tests[data.currencyName+" SELL price is not available when BUY price exists"]=true;}}

GET BUY price for each currency according to ISO 4217 always available GET SELL price for each currency according to ISO 4217 always available 2. Change checked currency USD at all requests endpoints and test for variable currencyName.



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Verification tests with Postman Runner at DDT example

Test case: Test script:

GET BUY price for each currency according to ISO 4217 always available GET SELL price for each currency according to ISO 4217 always available

GET {{host}}/buy?currency={{currencyName}}
tests["BUY "+data.currencyName+" page is
available"]=responseCode.code===200;varjsonData=JSON.parse(responseBody);tests[data.currencyName+"
BUY exchangeRate exist"]=jsonData[0].exchangeRate>=0;if(jsonData[0].exchangeRate>0){
tests["Message for BUY "+data.currencyName+" is: \"Currently You can buy "+data.currencyName+"
currency\""]=jsonData[0].message=="Currently You can buy "+data.currencyName+"
currency";postman.setEnvironmentVariable("buyPrice", jsonData[0].exchangeRate);
}else{tests["Message for BUY "+data.currencyName+" is: \"Currently You can't buy "+data.currencyName+"
currency\""]=jsonData[0].message=="Currently You can't buy "+data.currencyName+" currency";

GET {{host}}/sell?currency={{currencyName}}

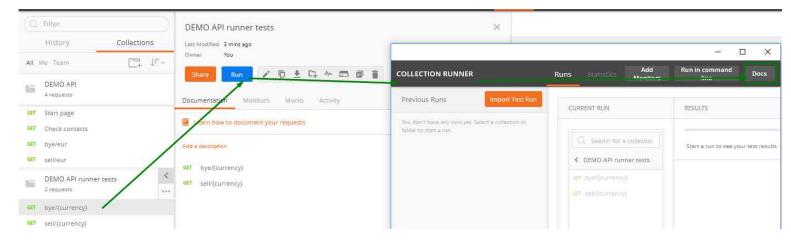
tests["SELL"+data.currencyName+" page is available"]=responseCode.code===200;varjsonData=JSON.parse(responseBody);tests[data.currencyName+" SELL exchangeRate exist"]=jsonData[0].exchangeRate>=0;if(jsonData[0].exchangeRate>0){ tests["Message for SELL "+data.currencyName+" is: \"Currently You can sell "+data.currencyName+" currency\""]=jsonData[0].message=="Currently You can sell "+data.currencyName+" currency";tests[data.currencyName+" SELL price "+jsonData[0].exchangeRate+" at least for 4% highest than BUY price "+environment.buyPrice]=jsonData[0].exchangeRate>=environment.buyPrice/1.04; }else{tests["Message for SELL "+data.currencyName+" is: \"Currently You can't sell "+data.currencyName+" currency\""]=jsonData[0].message=="Currently You can't sell "+data.currencyName+" currency";if(environment.buyPrice){tests[data.currencyName+" SELL price is not available when BUY price exists"]=true;

Next step – we need to "Run tests and feed them with data from .csv file with currencies list"...

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Verification tests with Postman Runner at DDT example

- 3.1. Change currency to variable ex.: http://127.0.0.1:3000/buy/{{currencyName}}
- 3.2. Open Postman Runner



3.4. Open docs in top right corner and download example files

Data

This is used to supply a data file to be used for the collection run. Read more about data files.

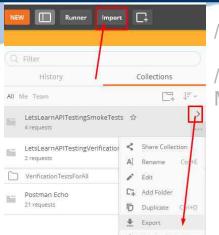
3.5. Change file for data feed. Your test, as example with few volume of test data, as example three currencies:

USD EUR

GBP

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Collections Export/Import and Postman native vs Postman Chrome debug mode

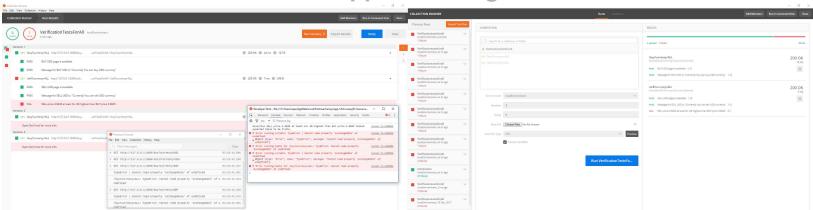


//How to Export/Import collections:

//How export Environments (top right settings button) for Manage Environments:



//Postman native vs Chrome apps in debug at Runner mode:



Postman native pros:

- Request details
- DevTools, Console

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Re-testing by Postman Runner with smoke tests set example

After verification tests run we discovered new bugs, so receive new Demo API version for tests, let's deploy it:

json-server api_1.2.json

and again run our tests runner feed with short currency list.

Now when all our tests passed we are sure that our tests scripts are correct and we can continue and increase test coverage by increment test data for fully covered requirements.

Requirement - for each currency according to ISO 4217

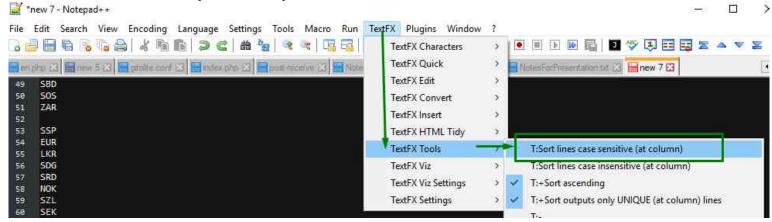
Let's prepare test data...

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Verification tests with Postman Runner at DDT example

Data preparation, create unique currency list from ISO 4217:

- 1. Get list from iso.org
- 2. Sort list for left just unique values



3. Feed this data for the runner and receive newest Demo API version:

```
json-server api_1.3.json and wait .... json-server api_1.4.json and wait ....
```

json-server api_1.5.json and wait ... or maybe let's run faster?

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Regression testing with Postman CLI tool Newman

Let's run Postman tests faster with Newman, just four steps are enough:

- 1. Install Newman "npm install newman --global"
- 2. Export collection from Postman and save in the folder as ex.: with name "fulltestscollection.json"
- 3. **Export environment variables** as ex.: "envar.json" (optional, if they are not created all variables at Pre-request Scripts and Tests)
- 4. Run collection and save reports in all available formats as ex.: newman run collection.json --environment envar.json --iteration-data ddt.csv --iteration-count 178 --reporters html,cli,json,junit or with short keys:

newman run collection.json -e envar.json -d ddt.csv -n 178 -r html

Full tests run failed, so our current demo API version is not appropriate candidate to release. After report found issues and they were fixed we received a new version api_1.2, let's deploy it with commands Ctr+C (for stop previous 1.1) and to run 1.2: json-server api_1.2.json After verifying that all our created **1253 tests** (12 smoke + 1246 verification) are passed we can approve current candidate to release.

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Gratitude:

Thanks for great tools!



POSTMAN https://www.getpostman.com/

Thanks for great team review:



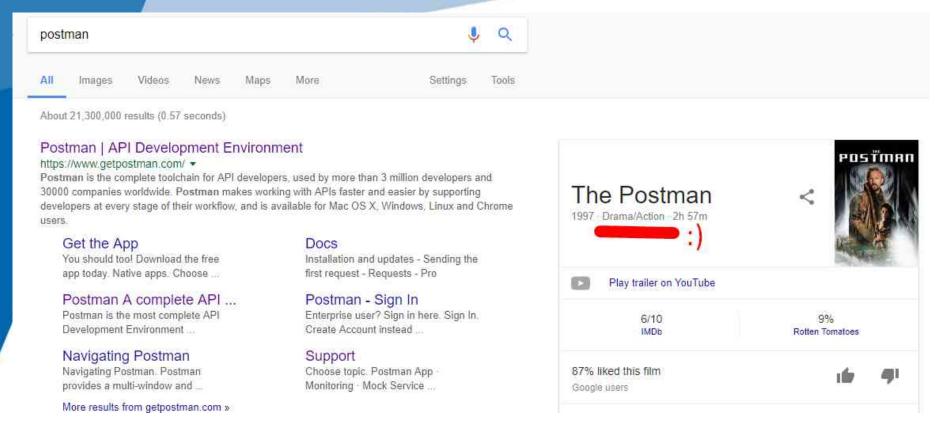
Aleksander Zaleski – QA review https://www.linkedin.com/in/aleksander-zaleski-4821b543/

James Wafer – Translation and grammar review https://www.linkedin.com/in/james-wafer-44712165/

Thanks for the presentation tech background:



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We hope now Postman is not a drama for you!