TESTINGMIND

ANNUAL SOFTWARE TESTING SYMPOSIUM

TALK: BASIC POSTMAN API TESTING

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#STS18

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BASIC POSTMAN API TESTING

Presenter: Arnold Miller, Senior Software QA-Tester

- Lessons learned using the basic Postman API tool to automate ReST API messages (micro services) validation along with manual checking the API supported Web, Mobile, other applications.
- **First, Basic (Free) Postman API features**
- Second, API Request/Response checks
- Third, Runner and Command Line Execution
- Fourth, Web spot checks of API Failures
- Fifth, Conclusion and Summary

POSTMAN API OVERVIEW

- Postman API, https://www.getpostman.com, Java Script internet based testing tool that automates building, sending, receiving and evaluating ReST API messages (**Plus**)
  - Able to export to file system and Import from file system (**Plus**)
  - Developers use and like more than cURL command line (**Plus**)
  - Internet documents, videos, training and support (**Plus**)
- Newman, https://www.npmjs.com/package/newman, command line tool to execute Postman API tests with JUNIT results for CI/CD (Jenkins, TeamCity, Scripts) tool integration (**Plus**)

VALIDATE API AND WEB OVERVIEW

- Public SaaS ReST API messages and supported Web App.
- Web App: http://www.dishanywhere.com/
- Provide Dish Network subscribers with Shows and Movies videos for on demand watching. Along with
  - Promote up-sales and new customers
  - Subscriber's Guide and Network Information
  - Subscriber's DVR Remote Recording and Watching on demand
  - Sport Team and League Information
- The Dish Network on-demand ReST APIs controls about 90% of what this Web App and similar Mobile App displays, along with providing data to other applications.

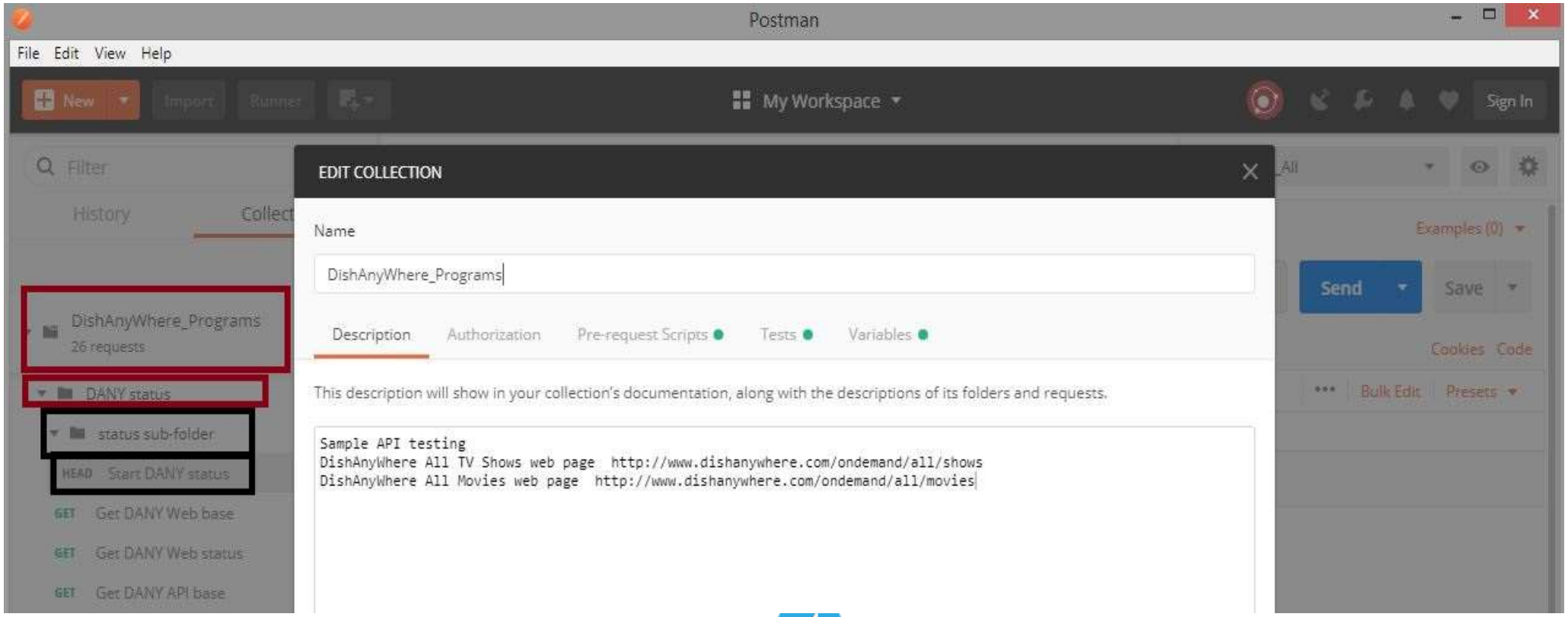
SAMPLE WEB SITE

POSTMAN API REQUEST GROUPS (**PLUS**)

- **API requests grouped in Collections, Folders, Sub-Folders**
- These all have Description, Authorization, Pre-requests Script, Test Script and Requests
- **Collection**: Top level group also has Variables
  - **Request** (Send, Request, Get Response)
  - **Folder**: Next Level group
    - **Request** (Send, Request, Get Response)
    - **Sub-Folders**: Next level groups
      - **Request** (Send, Request, Get Response)

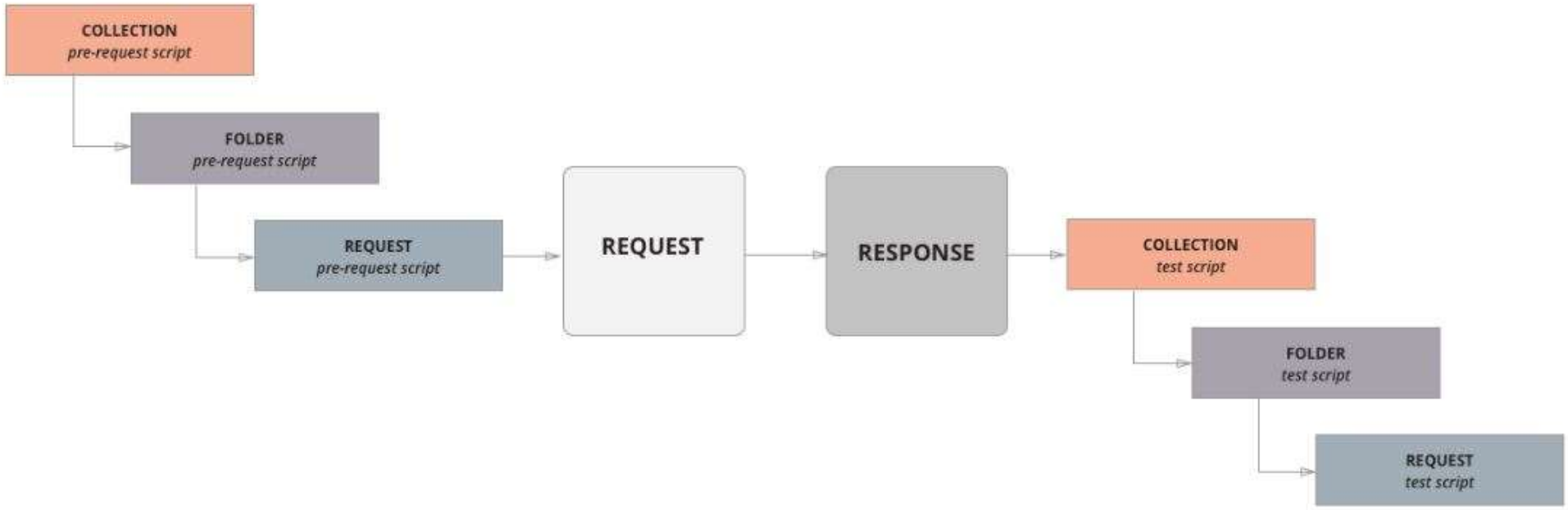
COLLECTION, FOLDER, SUB-FOLDER

Collection: DishAnyWhere_Programs
Folder: DANY status
Sub: status sub-folder
Req: HEAD Start DANY status
Req: Get DANY Web base



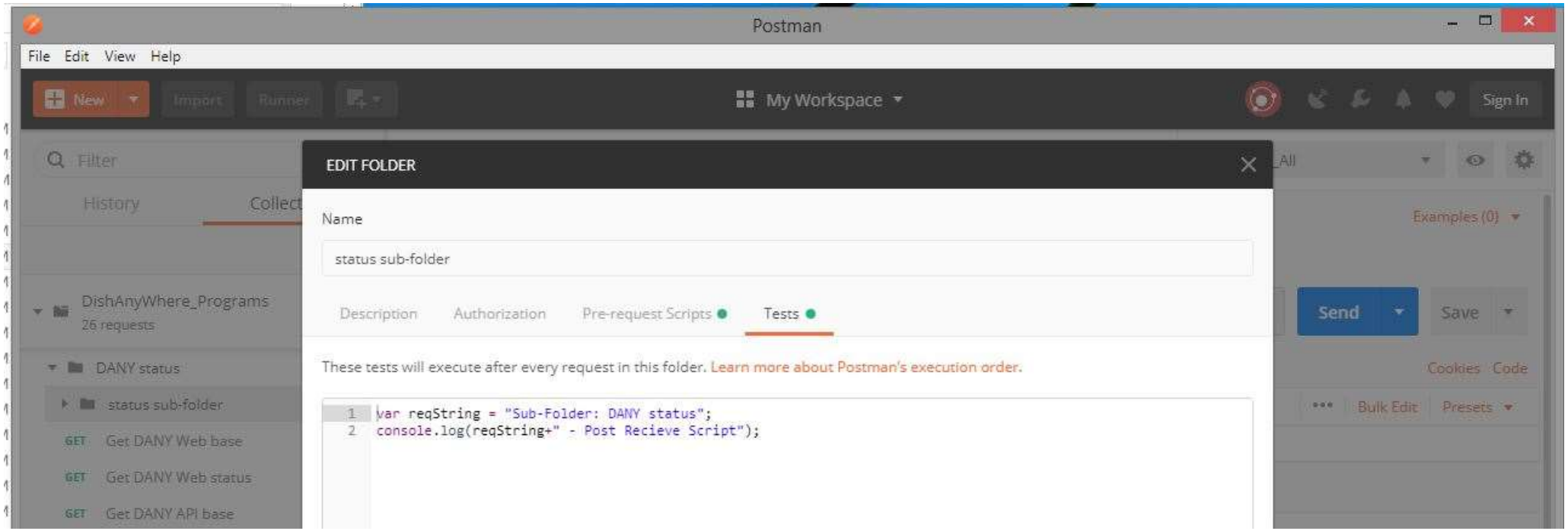
POSTMAN SCRIPT EXECUTION ORDER

Per Request Script Execution Order:
https://www.getpostman.com/docs/v6/postman/scripts/intro_to_scripts



SUB-FOLDER TEST SCRIPT

PLUS: console.log(<string>) sends <string> to **Postman Console**

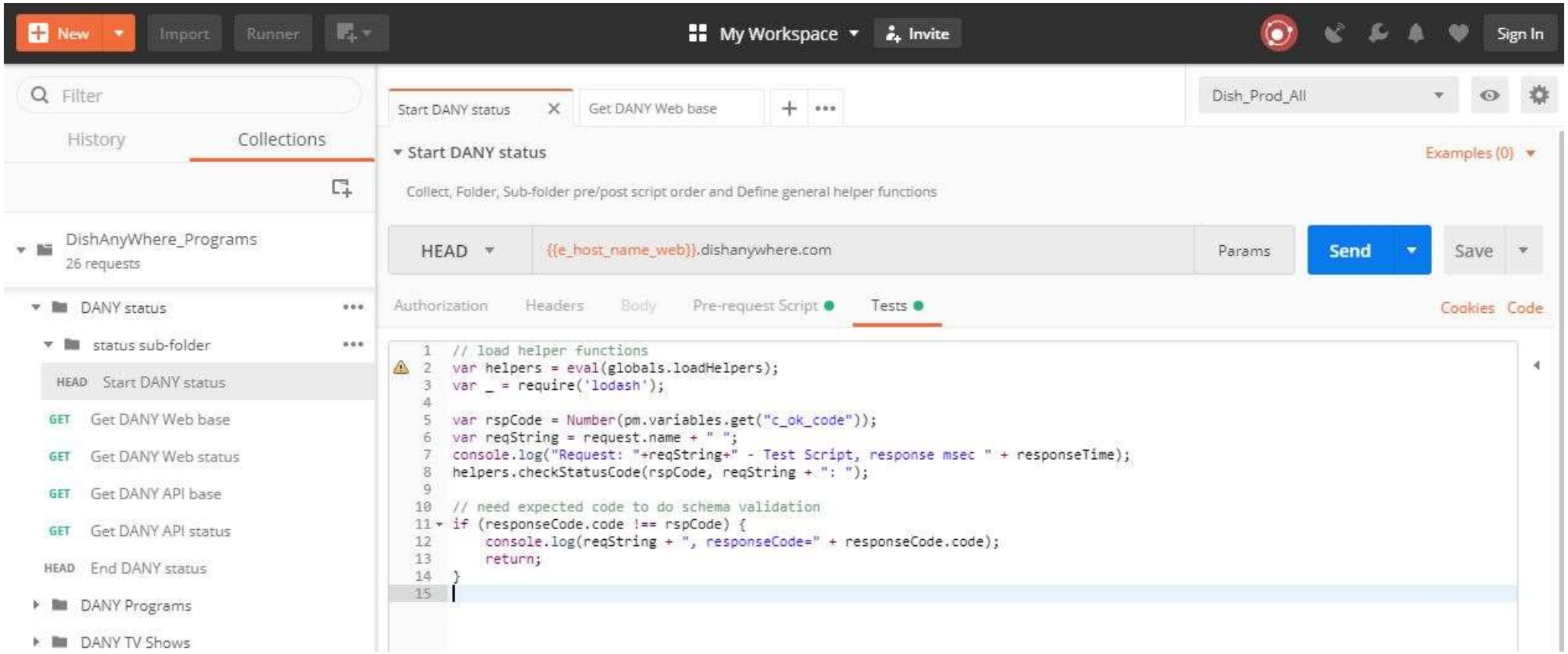


POSTMAN OUTPUT CONSOLE (**PLUS**)

- Besides console.log(<string>) also has
  - Request: Method, URL, Path, Query parameters
  - Request Headers; Response Headers; Response Body

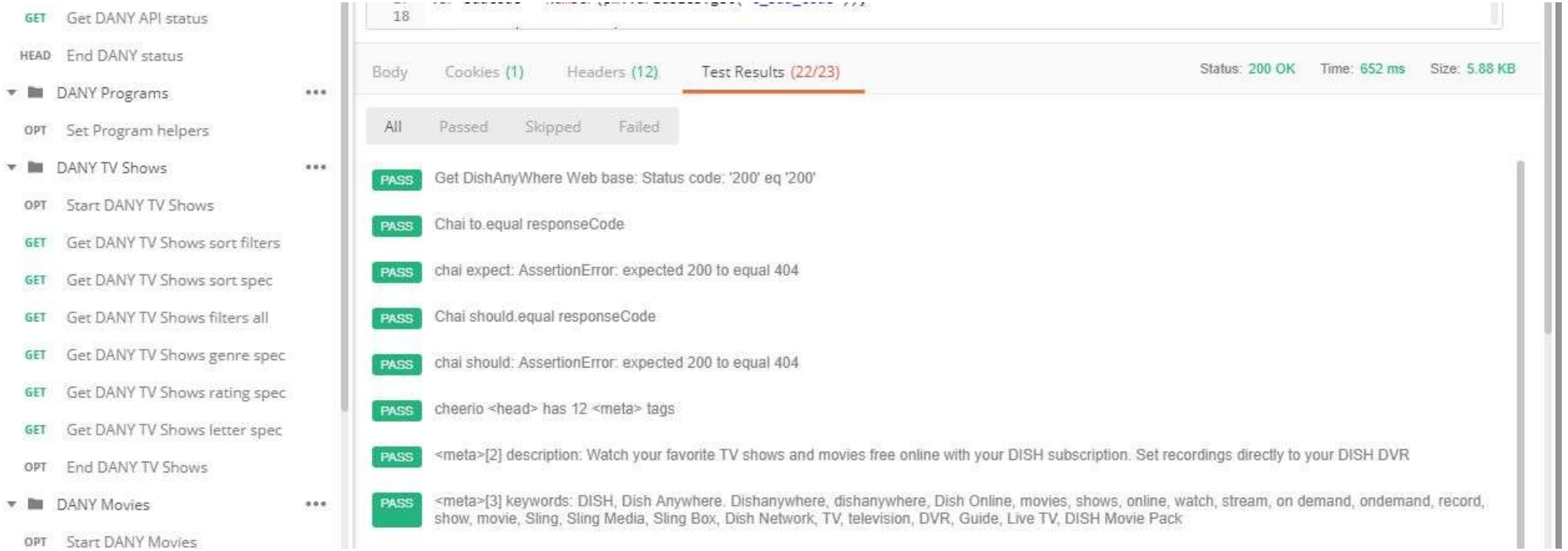
API REQUEST AREA

- Method, URI, arguments
  - Authorization, Headers, Body, Pre-request script, Tests script



API RESPONSE AREA

- **Response Body** display in different formats: HTML, XML, JSON, Text.
  - Default format based on response header: Content Type value
- **Response Cookies, Headers**
- **Response Test Results**
  - Each test compare result with output tests with AssertionError when False
  - Via tests[<output string>] = <Boolean>

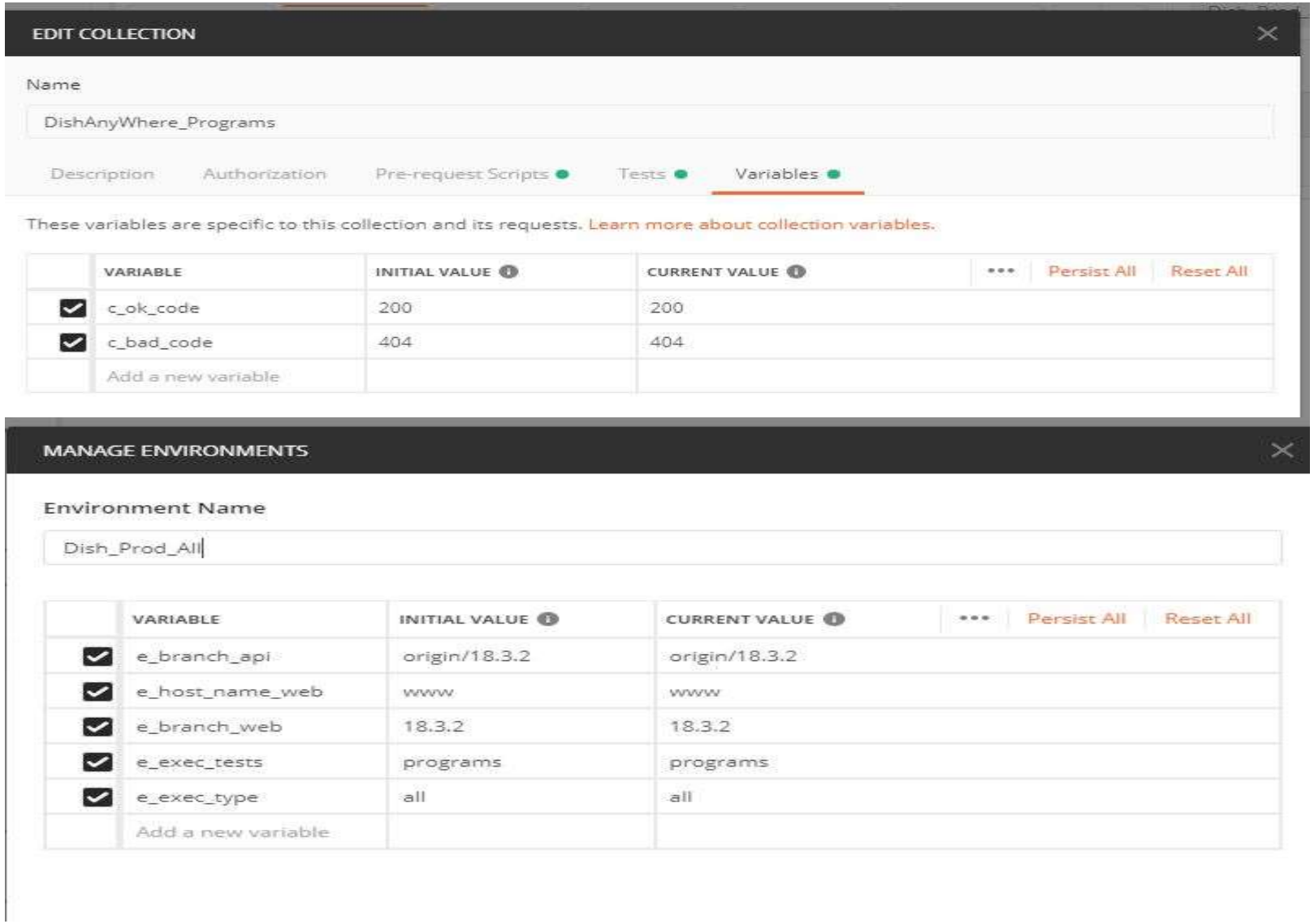


API SCRIPT VARIABLES (**PLUS**)

API Script Variables and their priority
https://www.getpostman.com/docs/v6/postman/environments_and_globals/variables

- **Global, Collection, Environment :** String type (**Minus**)
  - Store via to-string functions; Use via from-string functions
- **Global**: share values between Pre-Request and Test scripts
- **Collection**: Initial value via Collection Set,
  - Only in its Collection (folders, subfolders and request)
- **Environment**: Initial set via Environment. (**Minus**)
    - Have multiple Environments for different test execution types
- **Local**: Any JavaScript types only in its Pre-Request or Test script
- **Data**: only Execution Iteration via Runner or Command Line

INITIAL VARIABLE VALUES (**PLUS**)



GENERATE CODE SNIPPETS (**PLUS**)

Generate API Request Code Snippets

- Uses current variable key values
- Formats: HTTP, cURL, C#, Java, JavaScript, PHP, Python, Ruby

Request: Get DANY Web base

```
GET {{e_host_name_web}}.dishanywhere.com
```

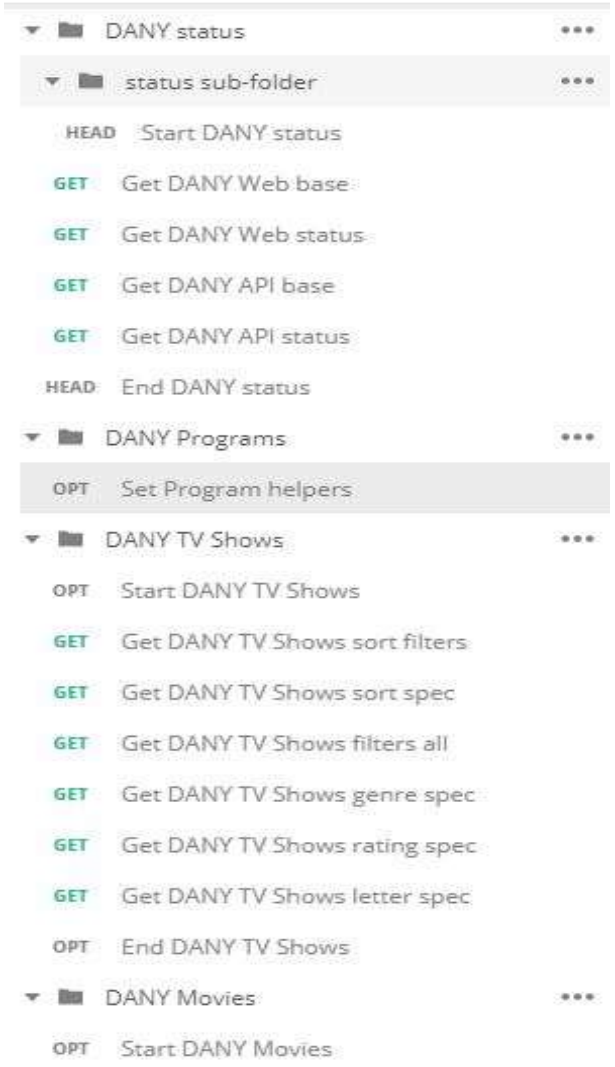
```
curl -X GET \
  http://www.dishanywhere.com \
  -H 'Cache-Control: no-cache' \
  -H 'Postman-Token: dba1dab9-7204-4585-ad49-
59b094e11f08'
```

REQUEST EXECUTION ORDER (**PLUS**)

https://www.getpostman.com/docs/v6/postman/scripts/branching_and_looping

- Normal API Request order is linear from top to bottom Request in Collection, Folder, Sub-Folder
  - State-machine like execution order
  - Change this order via postman.setNextRequest(<request_name>)
  - Where <request_name> the name or ID of the subsequent request and the collection runner will take care of the rest
  - May be used in the pre-request or the test script. In case of more than one assignment, the last set value is used.
  - When postman.setNextRequest() is absent in a request, the collection runner defaults to linear execution and moves to the next request
  - Stop execution,when <request_name> is null

CHANGE EXECUTION ORDER (**PLUS**)



Request: Set Program helpers (Test Script)

```
// set next test group via environment variable
switch(environment.e_exec_tests.toLowerCase()) {
  case "status":
    postman.setNextRequest(null);
  break;
  case "movies":
    postman.setNextRequest("Start DANY Movies");
  break;
  case "programs":
    postman.setNextRequest("Start DANY TV Shows");
  break;
  case "shows":
    postman.setNextRequest("Start DANY TV Shows");
  break;
  default:
    postman.setNextRequest(null);
  break;
}
```

BUILT-IN JAVA SCRIPT PACKAGES (**PLUS**)

https://www.getpostman.com/docs/v6/postman/scripts/postman_sandbox_api_reference

- **chai** for BDD expect and should validation
  - **Request:** GET DANY Web base (Test Script)
- **cheerio** for HTML paring and validation
  - **Request:** GET DANY Web base (Test Script)
- **lodash** for numbers strings arrays and objects utilities
  - **Request:** GET DANY API base (Pre-Request Script, Test Script)
- **momentum** for date-time utilities
  - **Folder:** DANY status (Pre-Request Script, Test Script)
- **tv4** for JSON schema validation
  - **Helper Function**: **tv4** to define verify schema, pattern-validate functions
  - **Request**: Get DANY API base (Pre-Request Script, Test Script)

CREATE, USE COMMON FUNCTIONS

Helper functions definition via Set Global variables (Minus)

Request: Start DANY status (Pre-request script)

```
// define helper functions
postman.setGlobalVariable("loadHelpers", function loadHelpers() {
  let helpers = {};
  helpers.CompareSame = function testCompare(compString, compA, compB) {
    tests[compString + ": '" + compA + "' is '" + compB +"'"] = compA == compB; };
 helpers.CompareEqual = function testEqual(compString, compA, compB) {
    tests[compString + ": '" + compA + "' is '" + compB +"'"] = compA === compB; };
. . .
// check response status code value
  helpers.checkStatusCode = function verifyStatusCode(
    statusCode, msgString = "") {
      helpers.CompareEqual(msgString + " Status code",responseCode.code, statusCode); };
. . .
  // ...additional helpers
    return helpers;
} + '; loadHelpers();');
```

CREATE, USE COMMON FUNCTIONS

Helper functions usage via eval Global variables (Minus)

Request: Start DANY status (Test script)

```
// load helper functions
var helpers = eval(globals.loadHelpers);
var _ = require('lodash');
var rspCode = Number(pm.variables.get("c_ok_code"));
var reqString = request.name + " ";
console.log("Request: "+reqString+" - Test Script, response msec "
   + responseTime);
helpers.checkStatusCode(rspCode, reqString + ": ");
```

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CHECK DISH WEB'S BRANCH RELEASE

GET http://www.dishanywhere.com/

Contain web html meta tag with release information

```
<meta content="Dish Anywhere" name="dany" data-branch="18.3.3" data-
hash=". . . ">
```

Request: Get DANY Web base (Test Script)

```
var webDataBranch = metaDanyHTML.attr('data-branch');
helpers.CompareSame("Web Deploy Branch: ", webDataBranch,
environment.e_branch_web);
postman.setGlobalVariable("g_Web_Branch", webDataBranch);
```

CHECK DISH WEB'S API URL PATH

GET www.dishanywhere.com/health/config_check

Contains web release/build information

```
"branch": "18.3.3", "hash": ". . . ."
```

Contains URL for its ReST API messages (micro services) path

```
"radish_url": "http://radish.dishanywhere.com/",
```

Request: Get DANY Web status (Test Script)

```
var webBranch = globals.g_Web_Branch;
helpers.CompareSame(reqString + " branch:",respBody.git.branch,
webBranch);
. . .
var danyBaseURL = "http://" + environment.e_host_name_web +
".dishanywhere.com";
helpers.CompareSame(sesString + ".dany_base_url:",
session.dany_base_url, danyBaseURL);
```

CHECK DISH API BRANCH RELEASE

GET http://radish.dishanywhere.com/health/config_check

Contains API release/build information

```
"branch": "origin/18.3.3", "hash": " . . ."
```

Request: Get DANY API status (Test Script)

```
var respBody = JSON.parse(responseBody);
var apiBranch = environment.e_branch_api;
helpers.CompareSame(reqString + " branch:",respBody.git.branch,
apiBranch);
```

DISH WEB PROGRAMS

Displays Subscriber viewable (unlocked) TV Shows or Movies

- **GET http://www.dishanywhere.com/ondemand/all/shows**
- **GET http://www.dishanywhere.com/ondemand/all/movies**

1. **Get Sort By Values (API Request)**
   - GET http://radish.dishanywhere.com/v20/dol/shows/sorts.json
   - GET http://radish.dishanywhere.com/v20/dol/movies/sorts.json

2. **Get Filter (Genres, Ratings, Starting Letters) Values (API Request)**
   - GET http://radish.dishanywhere.com/v20/dol/shows/filters.json
   - GET http://radish.dishanywhere.com/v20/dol/movies/filters.json

3. **Display Programs via specific Sort and Filter Value (API Request)**

DISH API PROGRAMS SORTS

GET http://radish.dishanywhere.com/v20/dol/shows/sorts.json

```
[{"name": "What's Hot",      "slug": "whats_hot”},
 {"name": "Recently Added", "slug": "recent"},
 {"name": "Title",          "slug": "name"},
 {"name": "Most Popular",   "slug": "most_popular"}
]
```

GET http://radish.dishanywhere.com/v20/dol/movies/sorts.json

```
[{"name": "Release Date",        "slug": "date"},
 {"name": "Critics Rating",     "slug": "rating"},
 {"name": "Tomatometer Rating", "slug": "tomatometer"},
 {"name": "Title",              "slug": "name"},
 {"name": "Most Popular",       "slug": "most_popular"}
]
```

DISH API PROGRAMS FILTERS

GET http://radish.dishanywhere.com/v20/dol/shows/filters.json


```
{"genres":[{"name": "All","slug": "all"},{"name": "Action","slug":”action"},
    ... , {"name": "Thriller", "slug": "thriller"}],
 "ratings":[{"name": "All","slug": "all"},{"name": "TVY","slug":"tvy"},
    ... , {"name":"TV14","slug":"tv14"},{"name":"TVMA", "slug":"tvma"}],
 "a-z:[{"name":"A", "slug":"a"},{"name":"B", "slug":"b"},
    ... , {"name":"Z","slug":"z"},{"name":"#","slug":"123"}]
}
```


GET http://radish.dishanywhere.com/v20/dol/movies/filters.json


```
{"genres":[{"name":"All","slug":"all"},{"name":"Action","slug":"action"},
    ... , {"name":"Thriller","slug":"thriller"}],
ratings":[{"name":"All","slug":"all"},{"name":"G","slug":"g"},
    ... , {"name":"NC17","slug":"nc17"},{"name":"NR","slug":"nrao"}],
a-z":[{"name":"A","slug":"a"},{"name":"B","slug":"b"},
   ... , {"name":"Z","slug":"z"},{"name":"#","slug":"123"}]}
```

DISH DISPLAY PROGRAMS

Display Programs via specific Sort and Filter Values (API Request)

Via Only by Sort Value

- GET http://radish.dishanywhere.com/v20/dol/shows.json?sort=name
- GET http://radish.dishanywhere.com/v20/dol/movies.json?sort=name

Via Only by Filter Genre Value

- GET http://radish.dishanywhere.com/v20/dol/shows.json?genres=newscast
- GET http://radish.dishanywhere.com/v20/dol/movies.json?genres=drama

Via Only by Filter Rating Value

- GET http://radish.dishanywhere.com/v20/dol/shows.json?ratings=tvy7
- GET http://radish.dishanywhere.com/v20/dol/movies.json?ratings=r

Via Only by Filter Starting Letter Value

- GET http://radish.dishanywhere.com/v20/dol/shows.json?a-z=p
- GET http://radish.dishanywhere.com/v20/dol/movies.json?a-z=s

CHECK DISH API PROGRAMS

General API Response:

- Response Code Ok
- Positive item count (Allow Zero for special cases)

- **Program General:** (General TV Shows, Movies)
  - **Name** has positive length
  - **Type** is Program with **Kind** as Show or Movies via Request
  - **Description** at least 5 characters long
  - **Rating** array values same as **Rating List** of array values
  - Has at least 1 **Genre**
  - Has at least 1 **Network (Channel)**

- **Specific Sort, Genre, Rating, Starting Letter**(Specific Sort, Filter)
  - **Sort**: Items in request Order (only **Title** sorted request)
  - **Genre**: Each Item's **Genre** Array has the Filter **Genre**
  - **Rating:** Each Item's **Rating** Array has the Filter **Rating**
  - **Starting Letter**: Each item's **Name** begins with the Filter **Letter**

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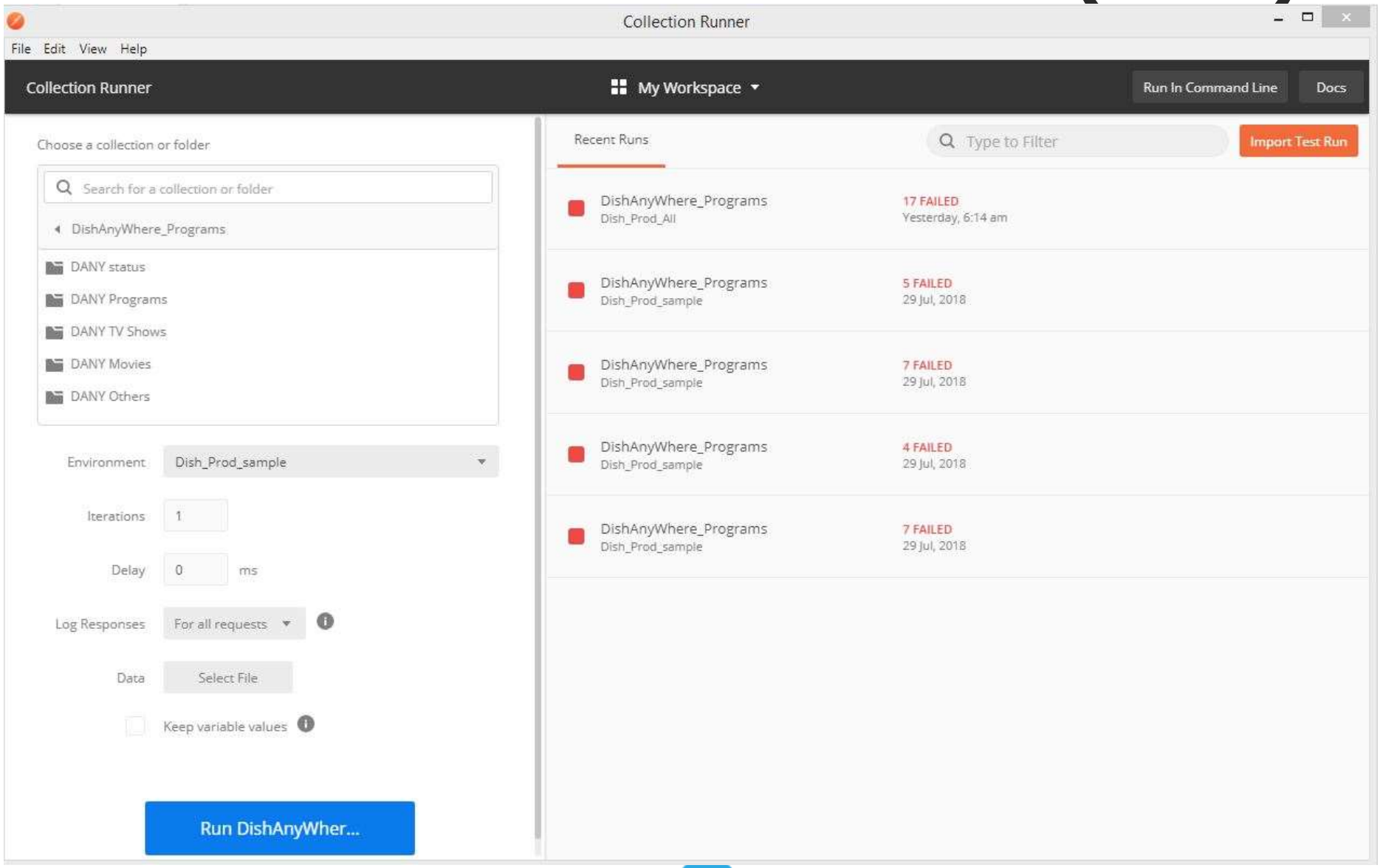
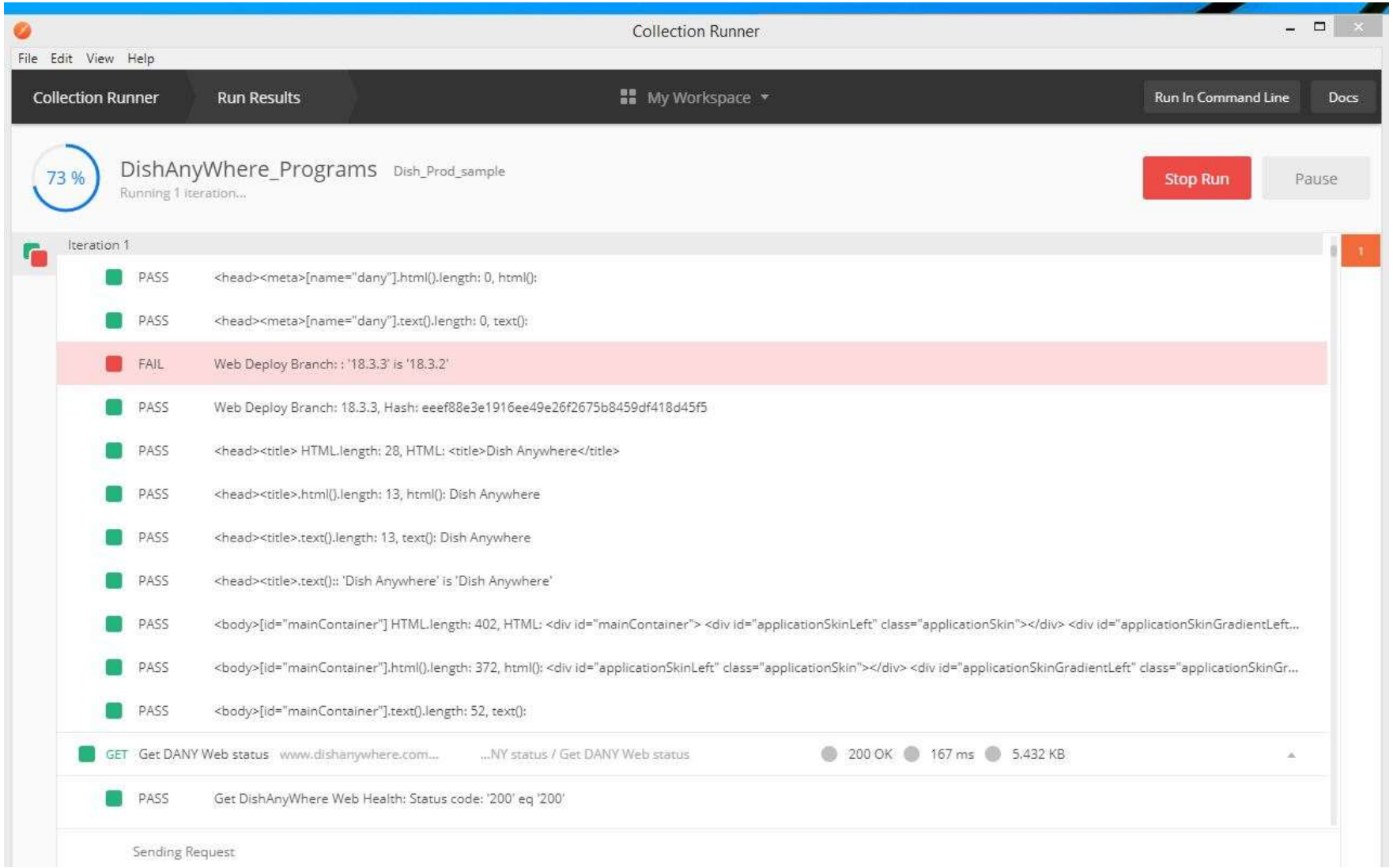
POSTMAN COLLECTION RUNNER (PLUS)

- Execute Collection, Folder, Sub-Folder Requests with a specific Environment with for N iteration and Data-file.
- Has Recent Runs with
  - Iteration counter
  - API Request
  - Pass/Failed Test Results
  - Filter for Passed, Failed or Both

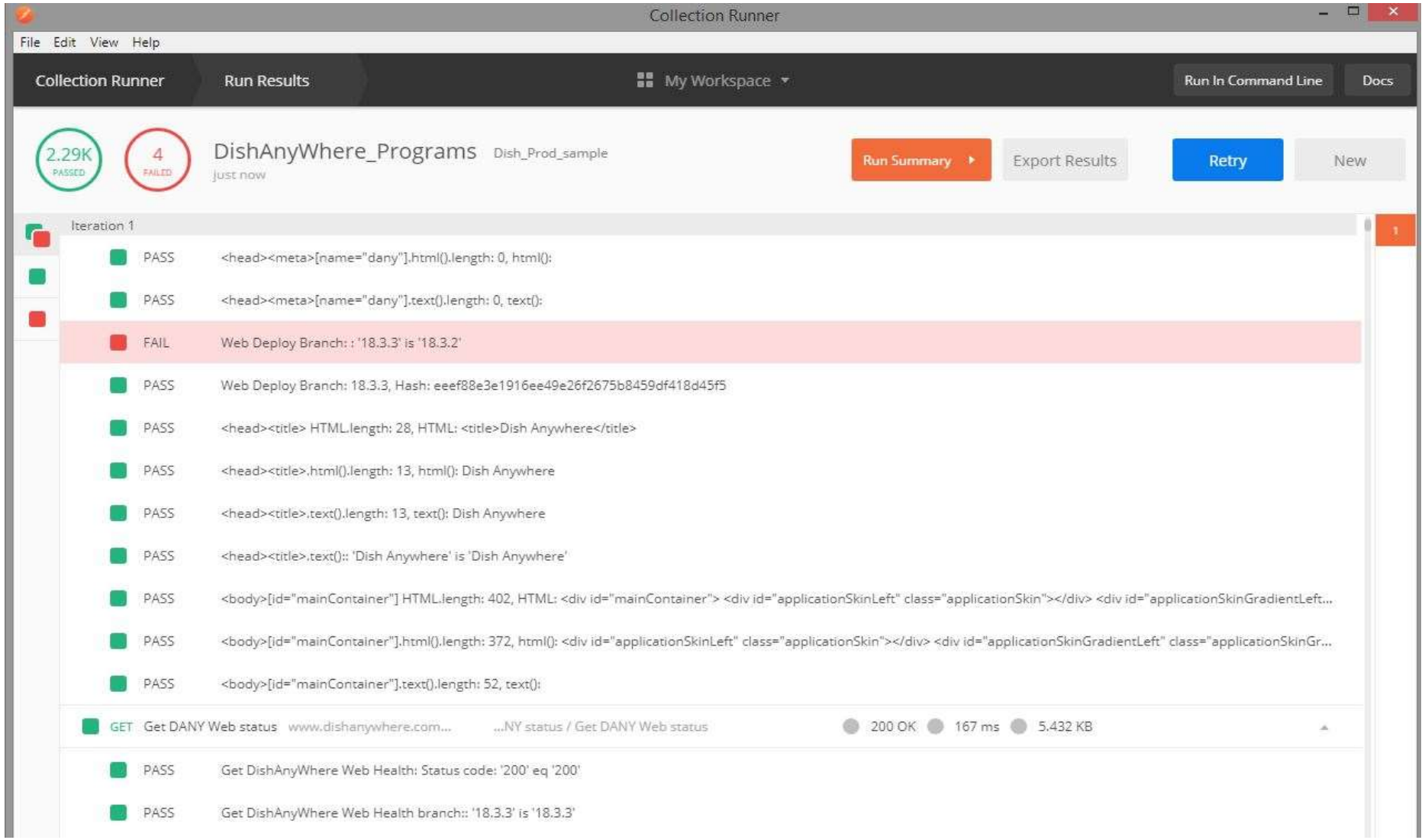
COLLECTION RUNNER: SETUP (PLUS)



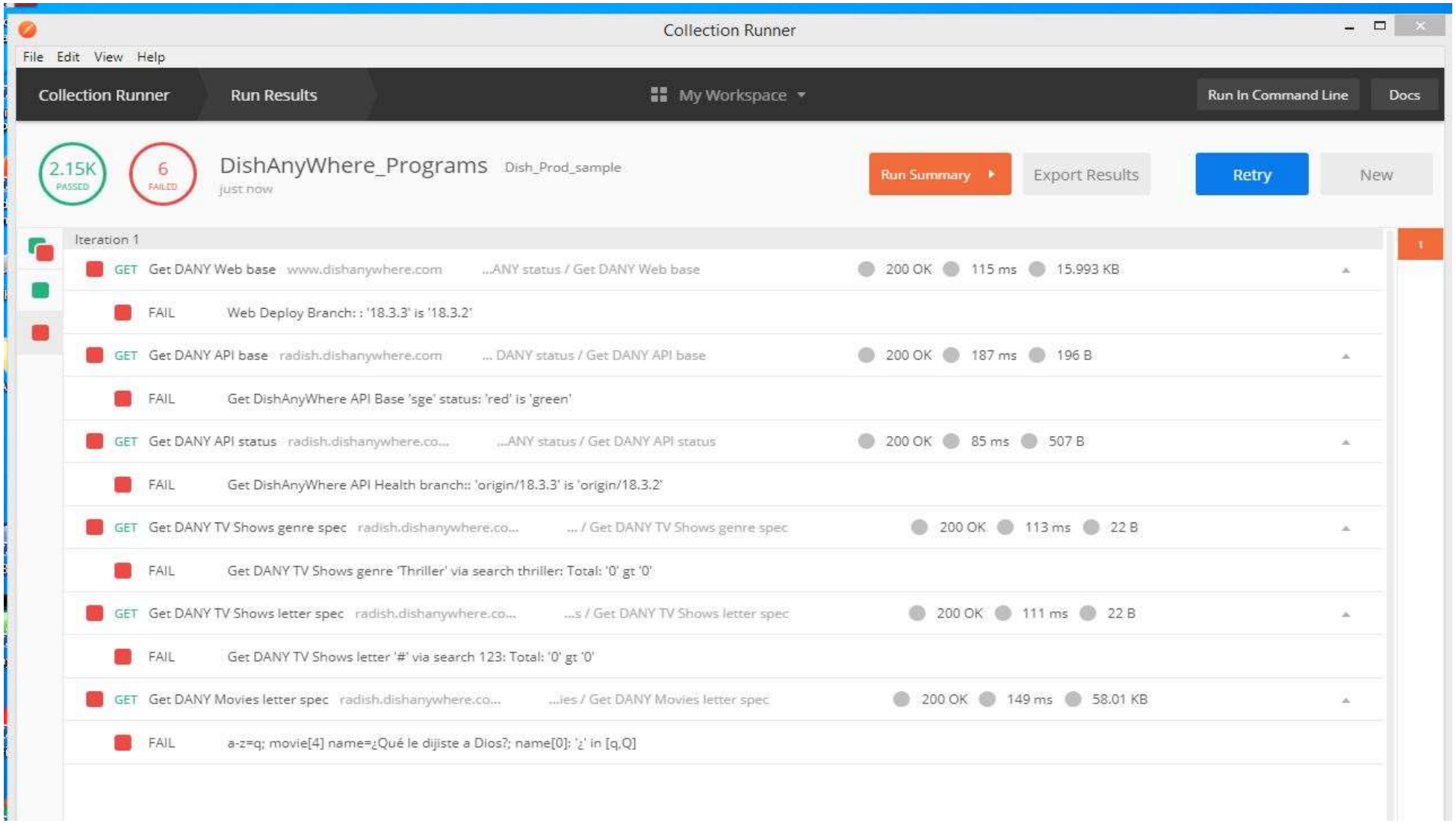
COLLECTION RUNNER: EXECUTING



COLLECTION RUNNER: DONE (PLUS)



COLLECTION RUNNER: FAIL (PLUS)



NEWMAN COMMAND LINE (PLUS)

Execute Collection Requests with a specific Environment generating reports (Unix/Linux Shell version)

```
newman run $postman_run -e $post_out_env -r junit,cli --timeout-request
$req_timeout
```

Have Problem maintaining many Postman Environment files (**Minus**)

- Branch Build/Release ID (Web, API, tools)
- What APIs to test (Status, Shows, Movies, Networks)
- Where is API URL target (Production, Pre-Prod, Beta, SQA-test)
- Execution type (Smoke, Install, Feature, Regression)

Noticed: Postman Environment file are text editor JSON readable

```
"values": [
  {"enabled": true,"key":"e_branch_web","value":"18.3.2","type":"text"},
  {"enabled": true,"key":"e_branch_api","value":"origin/18.3.2","type":"text"},
  . . . ]
```

NEWMAN COMMAND LINE

Solution to maintaining many Postman Environment files (**Plus**)

Write program that inputs a Postman Environment file and CSV Key-Value pair file Outputs a Postman Environment File with changing any found Key's to have their pair value

Example CSV Key-Pair file

```
row,Variable,Value,Meaning
1,e_branch_web,18.3.0,web version
2,e_branch_api,origin/18.3.0,api version
```

Output Postman Environment File

```
"values": [
  {"enabled": true,"key":"e_branch_web","value":"18.3.0","type":"text"},
  {"enabled": true,"key":"e_branch_api","value":"origin/18.3.0","type":"text"},
  . . . ]
```

Found easier to maintain many CSV Key-Pair files (**Plus**)

NEWMAN EXECUTING (PLUS)

```
Get DANY API status

  ┌
  │ 'Collection: DANY - Pre Request Script'
  │ 'Folder: before Get DANY API status - Pre Request
  │  Script at 2018-08-12 20:09:14.759 -06:00'
  └

  GET radish.dishanywhere.com/health/config_check [200 OK, 1.02KB, 124ms]

  ┌
  │ 'Collection: DANY - Post Receive Script'
  │ 'Folder: Get DANY API status after - Post Receive Script at 2018-08-12 20:09:14.926 -
06:00'
  │ 'Folder: Get DANY API status after - milliseconds since PreReq 167'
  └

  √  Get DishAnyWhere API Health:  Status code: '200' eq '200'
  3. Get DishAnyWhere API Health branch:: 'origin/18.3.3' is 'origin/18.3.0'
```

NEWMAN SUMMARY RESULTS (PLUS)

Postman start at Sun, Aug 12, 2018 8:09:08 PM

	executed	failed
iterations	1	0
requests	6	0
test-scripts	19	0
prerequest-scripts	19	0
assertions	47	3
total run duration: 2s		
total data received: 19.23KB (approx)		
average response time: 134ms		

Postman ended at Sun, Aug 12, 2018 8:09:15 PM

NEWMAN FAILURE DETAILS (PLUS)

```
Used: dish_chg_vars.csv

Postman start at Sun, Aug 12, 2018  8:09:08 PM
 #   failure          detail
 1.  AssertionError  Web Deploy Branch: : '18.3.3' is '18.3.0'
                     expected false to be truthy
                     at assertion:14 in test-script
                     inside "DANY status / Get DANY Web base"
 2.  AssertionError  Get DishAnyWhere API Base 'sge' status: 'red' is 'green'
                     expected false to be truthy
                     at assertion:3 in test-script
                     inside "DANY status / Get DANY API base"
 3.  AssertionError  Get DishAnyWhere API Health branch:: 'origin/18.3.3' is 'origin/18.3.0'
                     expected false to be truthy
                     at assertion:1 in test-script
                     inside "DANY status / Get DANY API status"
Postman ended at Sun, Aug 12, 2018  8:09:15 PM
```

NEWMAN JUNIT XML RESULT FILE (PLUS)

```
 <testcase name="Web Deploy Branch: : '18.3.1' is '18.1.1'" time="0.282"
classname="JUnitXmlReporter.constructor">
  <failure type="AssertionFailure">
    <![CDATA[Failed 1 times.]]>
    <![CDATA[Collection JSON ID: fdeb44ba-76ea-424b-9a8c-39645bca44b9.]]>
    <![CDATA[Collection name: DishAnyWhere_Programs.]]>
    <![CDATA[Request name: DANY status / Get DANY Web base.]]>
    <![CDATA[Test description: Web Deploy Branch: : '18.3.1' is '18.1.1'.]]>
    <![CDATA[Error message: expected false to be truthy.]]>
    <![CDATA[Stacktrace: AssertionError: expected false to be truthy
at Object.eval sandbox-script.js:15:2).]]>
  </failure>
</testcase>
```

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API PROGRAMS SAMPLE FAILURES

Used: dish_progs_smp_vars.csv

Failures not reported on previous slides

```
Postman start at Sun, Aug 12, 2018  8:24:26 PM
 #   failure         detail
 3.  AssertionError  a-z=q; show[4] name=¿Quién Da Más?; name[0]: '¿' in [q,Q]
 4.  AssertionError  a-z=q; show[5] name=¿Quién da más?; name[0]: '¿' in [q,Q]
 5.  AssertionError  sort=name; movie[8] name=1 Message; desc.length: '0' ge '5'
 6.  AssertionError  a-z=q; movie[4] name=¿Qué le dijiste a Dios?; name[0]: '¿' in [q,Q]
Postman ended at Sun, Aug 12, 2018  8:25:17 PM
```

API PROGRAMS ALL FAILURES

Used: dish_progs_all_vars.csv

Failures not reported on previous slides

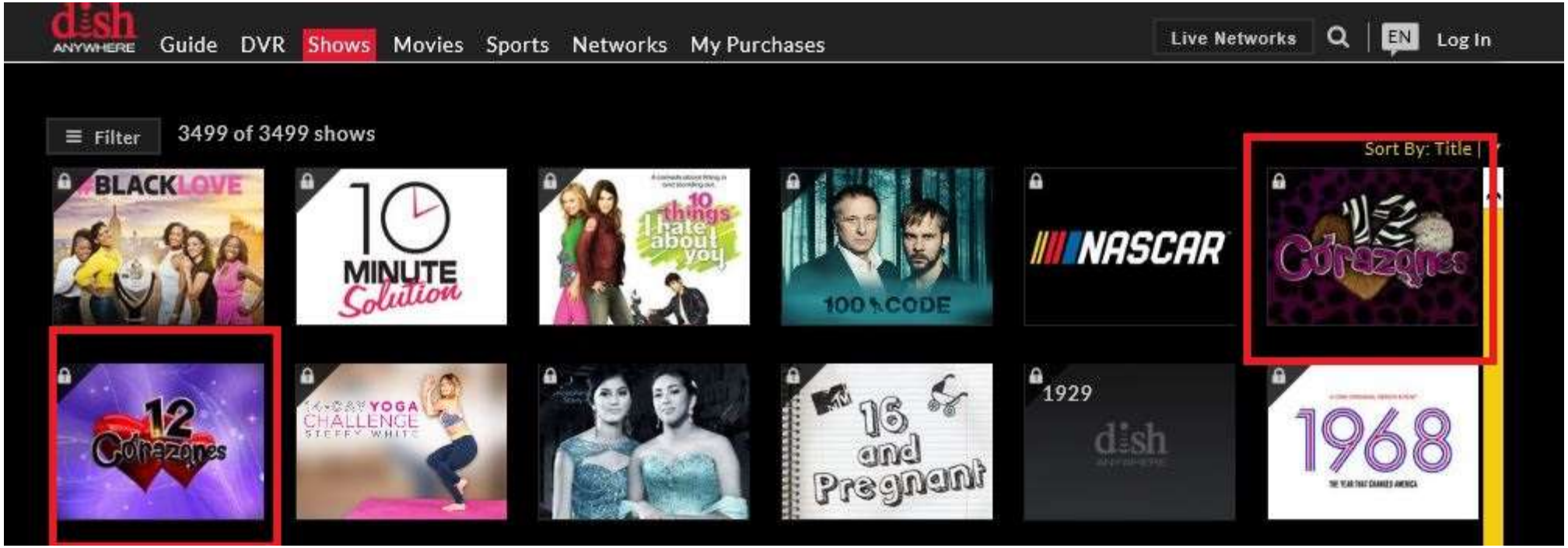
```
Postman start at Sun, Aug 12, 2018  8:29:44 PM
 #  failure         detail
04.  AssertionError sort=name; show[1] name=10 Minute Solutions; desc.length: '0' ge '5'
05.  AssertionError sort=name; show[3] name=100 Code; desc.length: '0' ge '5'
06.  AssertionError sort=name; show[6].name > show[5].name: '12 Corazones' gt '12 Corazones'
07.  AssertionError sort=name; show[6].search > show[5].search: '12_corazones_e1570408' gt
'12_corazones_e32940'
08.  AssertionError Get DANY TV Shows genre 'Thriller' via search thriller: Total: '0' gt
'0'
11.  AssertionError Get DANY TV Shows letter '#' via search 123: Total: '0' gt '0'
13.  AssertionError a-z=1; movie[9] name= La Casa De Beatriz; name[0]: ' ' in [l,L]
15.  AssertionError Get DANY Movies letter '#' via search 123: Total: '0' gt '0'
Postman ended at Sun, Aug 12, 2018  8:34:03 PM
```

TV SHOW: 10 MINUTE SOLUTIONS

```
AssertionError sort=name; show[1] name=10 Minute Solutions; desc.length: '0' ge '5'
```

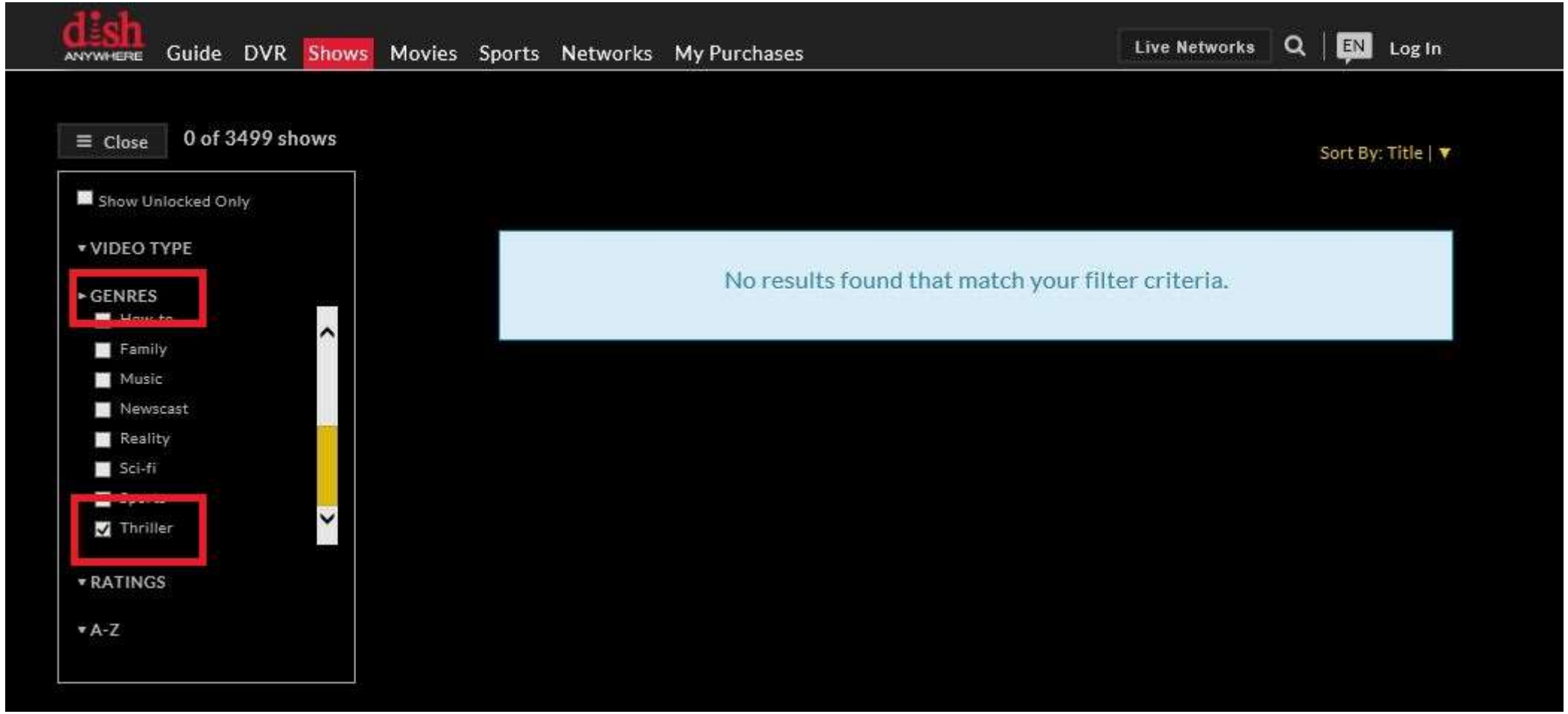
TV SHOW: '12 CORAZONES'

```
AssertionError sort=name; show[6].name > show[5].name: '12 Corazones' gt '12 Corazones'
AssertionError sort=name; show[6].search > show[5].search: '12_corazones_e1570408' gt
'12_corazones_e32940'
```



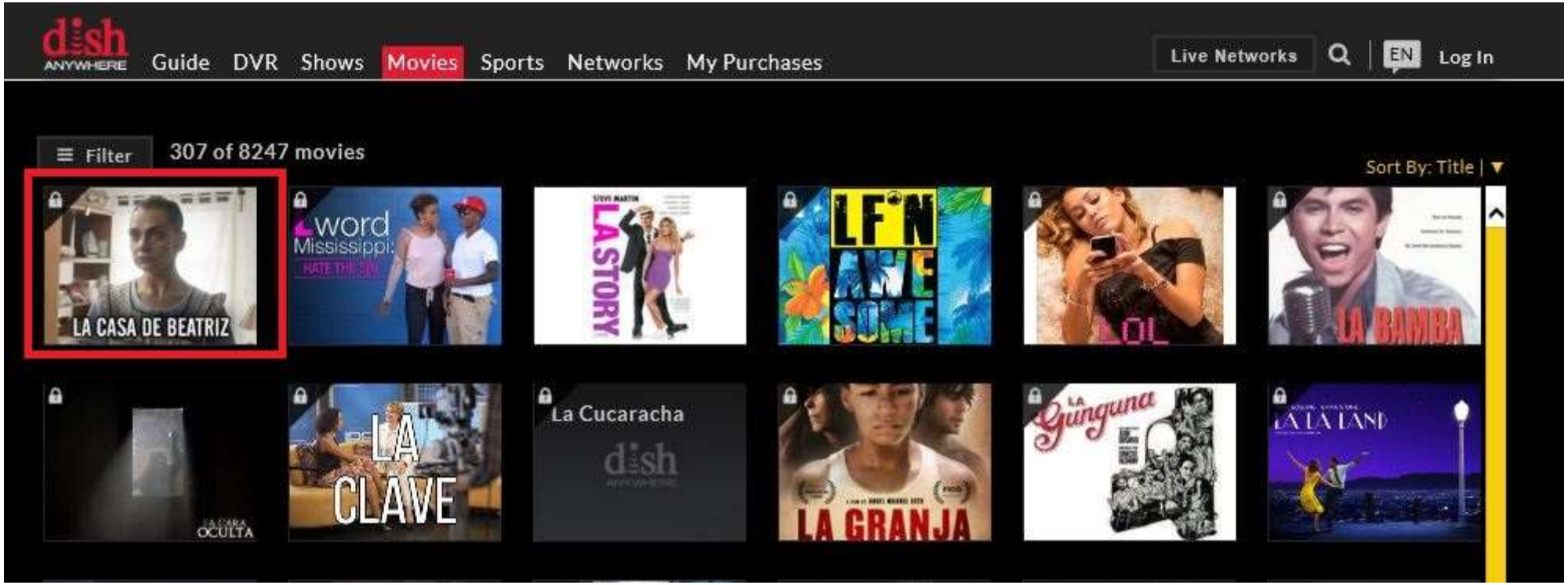
TV SHOW: GENRE THRILLER

```
AssertionError Get DANY TV Shows genre 'Thriller' via search thriller: Total: '0' gt '0'
```



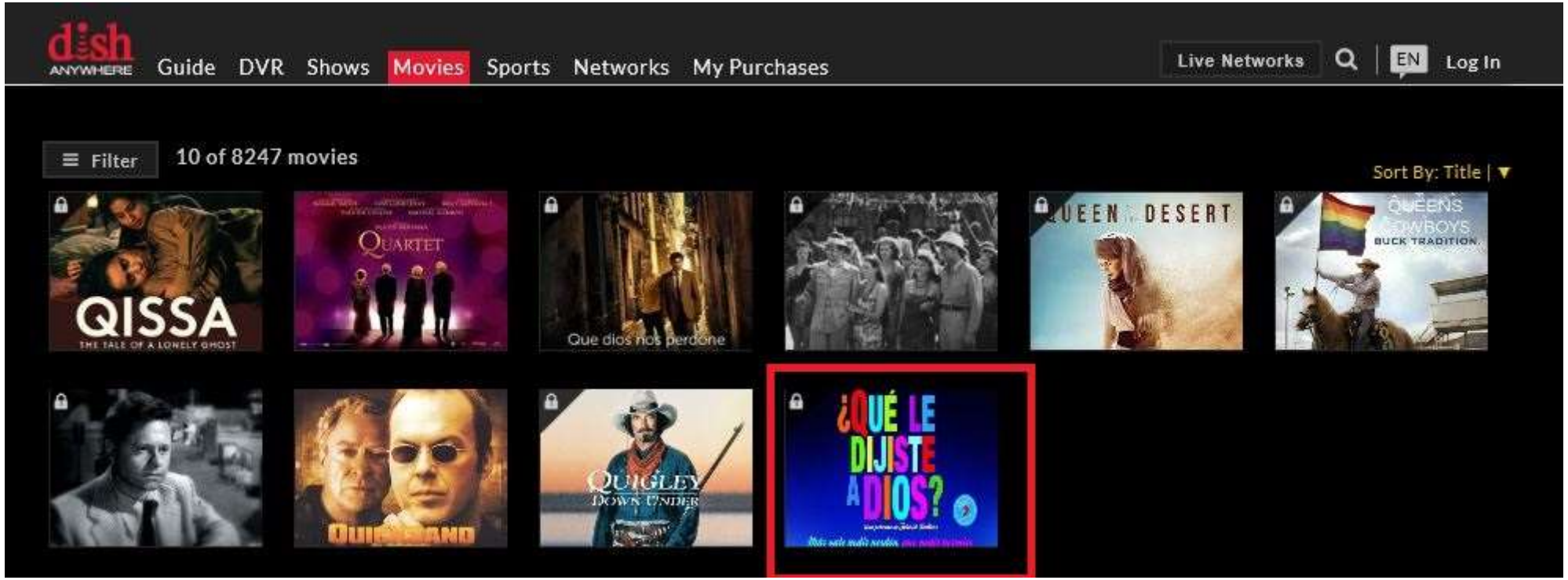
MOVIE : STARTS LETTER L

```
AssertionError a-z=l; movie[9] name= La Casa De Beatriz; name[0]: ' ' in [l,L]
```



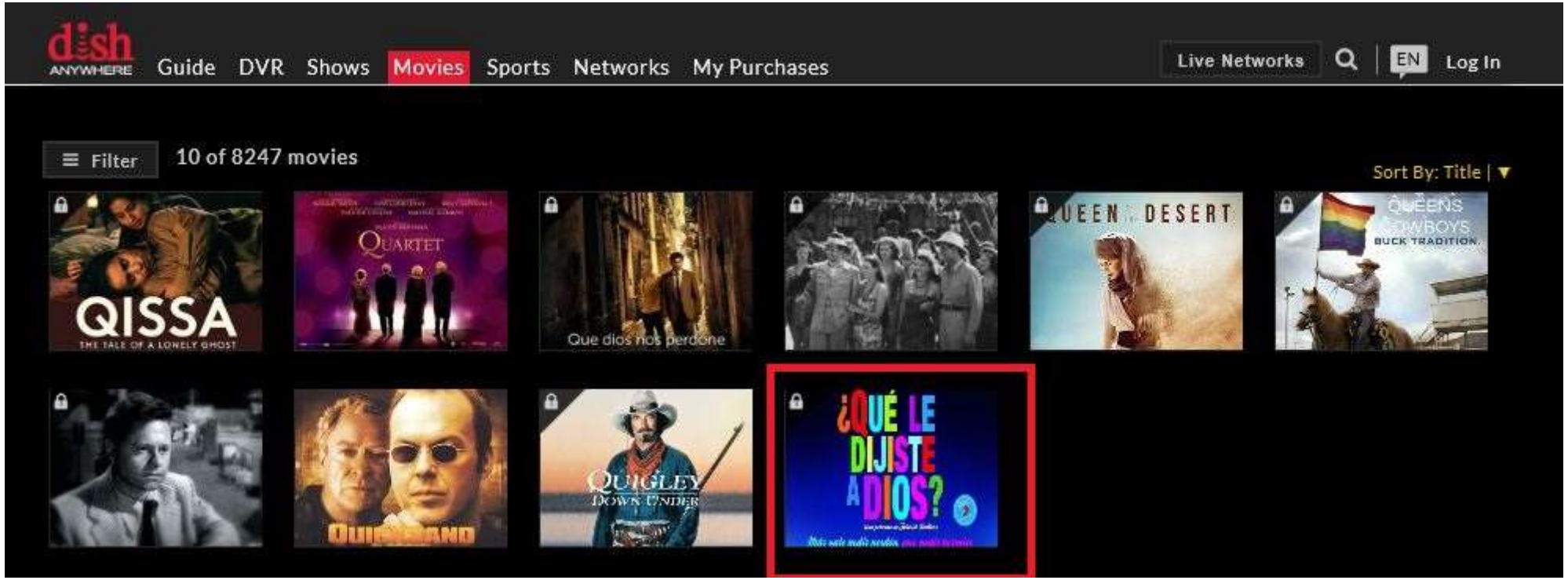
MOVIE : STARTS LETTER Q

```
AssertionError a-z=q; movie[4] name=¿Qué le dijiste a Dios?; name[0]: '¿' in [q,Q]
```



MOVIE : STARTS LETTER Q

```
AssertionError a-z=q; movie[4] name=¿Qué le dijiste a Dios?; name[0]: '¿' in [q,Q]
```



BASIC POSTMAN API TESTING

- First, Basic (Free) Postman API features
- Second, API Request/Response checks
- Third, Runner and Command Line Execution
- Fourth, Web spot checks of API Failures
- **Fifth, Conclusion and Summary**

BASIC POSTMAN API: PLUS

- Java Script: builds, sends, receives, evaluates API ReST messages
- Export to File System, Import from File System
- Developers use it and like more than cURL command line
- Internet documents, videos, training and support
- Command Line Execution tool
  - Console Output, Summary Results, Failure Details
  - Support Ci/CD Junit XML result format
  - Environment exported format supports variable value changes
- Groups API Requests in to Folder-like Hierarchy
- Support Output Console information
- Different variable types (Global, Environment, Collection, Local, Data)
  - Initialize Global, Environment, Collection variable values
- Generate Code Snippets in different languages
- State Machine Request Execution order with override ability
- Built-in Popular Java Script Node Packages
- Tool based Collection Execution: Results Pass, Fail summary

BASIC POSTMAN API: CONCLUSION

Minus:

- Global, Environment, Collection variable stored as string
  - Store via to-string functions (example: JSON.stringify, toString)
  - Use via from-string functions (example: JSON.parse, parseInt)
- **Helper Variables that define common functions and libraries**
  - Paid Versions support libraries and other shareable functions
  - Would like ability to load non-built-in Java Node Packages and personal packages
- Too Many Environments (group of Environment variables)
  - Convert Environment via CSV files before Command Line execution
  - Prefer many CSV files to many Environments

Conclusion:

- Overall Very Good Tool for API ReST testing
- Major problem: Helper Variables for common functions and libraries

DONE

Slides, Postman Collection, Shell Scripts, etc.
https://github.com/arnold-miller0/Postman-Denver-Aug-2018