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# Meraki Network Automation Solution Overview

The Meraki network automation solution was designed to make network engineering/support tasks simpler and efficient. The automation solution leverages the python scripts developed and Meraki API calls to achieve following network functions in Meraki dashboard.

* Create store networks using cloning of base network
* Create network configurations and deploy to store which includes
  + Create store specific subnets and update store network’s vlan’s.
  + Create summary routes for store networks.
  + Create store specific layer 3 firewall rules and upload rules to Meraki dashboard.
  + Enable site to site vpn.
* Pull existing layer3 firewall rules from store networks
* Deploy new layer3 firewall rules to store networks
* Pull existing site to site vpn rules from store networks
* Deploy new site to site vpn rules to store networks

The Meraki network automation solution consists of following key components.

* Meraki dashboard
* Meraki API functions
* Gateway
* Automation server
* Men & Mice
* DNS server &
* LDAP

The figure below shoes how the key components tie together for Meraki network automation solution.

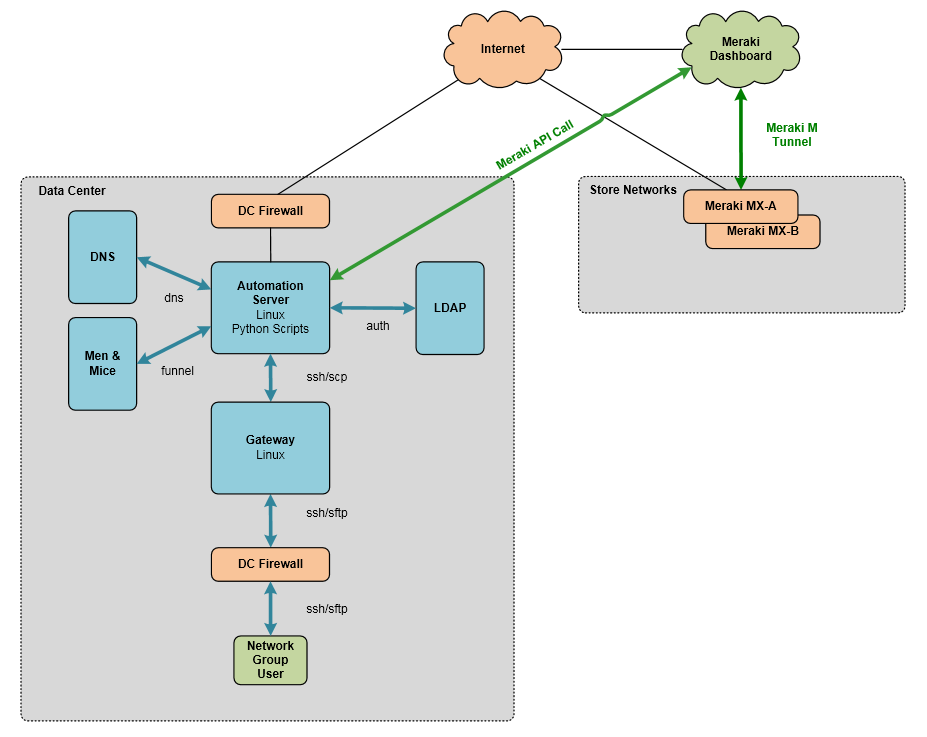


Figure 1: Automation Solution Overview

# Meraki Network Automation Scripts Design Overview

This document has the details for design and functionality of Meraki automation scripts written in Python 3.

The system provides a simple “cli” interface that allows deploying networks (cloning stores), deploying stores (setup of vlan, static routes, vpn and l3fwrules) as well as updates of l3fwrules and s2svpnrules to store lists.

The system uses templates for vlans and l3fwrules, obtains subnet’s Safeway’s proprietary Netx conversion generates actual absolute vlans and l3 firewalls rules.

The documentation for the conversion process and logic is contained in the relevant files. (netx.py, vlans.py and vlans\_handlers, and firewall\_handlers.py) and is outside the scope of this document.

Additionally, the system provides “csv” to “json” conversion and validation (schema and firewall semantics) for the required files in order to sanitize input data.

Another aspect is keeping extensive logs for support, traceability, auditability and future enhancements.

At this point the system does not support multi-users, but the basic design was done considering future need for this enhancement.

# Meraki Network Automation Scripts Functions

## Overview

A “cli” controller controls and dispatches commands to the lower layers.

The structure is such that handlers take care of manipulating the data and calling API drivers. These API drivers essentially interface directly to Meraki-API and provide logging and isolation. An automation layer contains handlers for the various modules. The Automation layer is mostly concerned about generating proper API-Calls with proper inputs. It is also responsible for bulk and aggregated operations.

## CLI

This is a layer which receives “cli” commands, does some initial parsing and passes valid commands down to the automation layer.

Note: A text UI (tui.py) framework was also developed and could be incorporated into the system if needed.

## Automation Layer

This layer composed of several handlers is mainly concerned with bulk-updates (multi-store) and template specialization using Safeway’s proprietary Netx Logic for the stores (l3 and Vlan’s)

* Bulk update
* Firewall handler (l3rwrules)
* Network handler  
  Access to the network/store layer, mostly bulk support
* Static route handler
* Store Orchestration
* Vlan Handler
* Vpn firewall handler (s2svpnrules)
* Vpn handler

## API Layer

This layer contains the drivers to interface to external API’s. It is mostly composed of Meraki API wrappers, but it also contains the Men and Mice interface and the Netx (Safeway’s proprietary logic for store subnet generation)

In order to improve error logging and error logging capabilities the open-source Meraki-API driver is hot-patched (python monkey patching). This allows for the automation scripts to be run in dry-mode, which means that scripts and input data can be exercised without incurring delays due to real Meraki-API calls and being totally transparent to the Meraki network.

Below are the modules supported by the API layer:

* network
* netx
* static route
* vlans
* vpn

# Directory Structure of Scripts

The directory structure for the automation scripts is described in this section.

## Top level directories

Code contains following top level directories

* code directory
* data directory
* templates

## “code” directory contents

Code directory contains following python scripts

* + cli.py – cli handler.
  + global\_var.py – caters for global flags used in debugging.

(see debugging hints for more info)

* + “get, deploy, select, convert” - linux scripts to simply use of the cli for the get, deploy, select and convert functions.
  + “VERSION.sh” – displays the git branch label for the current deployment
  + tui.py – text ui handler framework, not yet integrated into the system.

Code contains following subdirectories.

* Code base directory
  + automation
  + api
  + utils
  + GUI
  + menAndMice

The details for each directory are given below

### “automation” sub-directory contents

* + bulk\_update.py – handler for bulk updates and gets for l3 and vpn firewall
  + firewall\_handler.py – handler for the l3 firewall. Includes template (/templates/l3fwrules\_template\_xxx.json) specialization to create proper meraki api calls.
  + network\_handler – supports bulk cloning of stores/networks. (used by deploy networks)
  + static\_rouge – support for adding static routes
  + store\_orchestration – aggregation of multiple handlers, namely vlan\_handler, static\_route, l3fwrules and vpn\_handler to support a single cli deploy stores bulk command.
  + vlan\_handler – specializes jinja\_vlan\_template using Safeway’s Netx logic in order to create absolute value vlans for a give store/network.
  + vpn\_firewall\_handler – support for getting and setting a vpn firewall for a given org.
  + vpn\_handler – implements setup of vpn for a given org.

### “api” sub-directory contents

The directory “api” contains all the API drivers afore-mentioned.

* men\_and\_mice.py
* network.py
* vlans.py
* devices.py
* meraki.py
* netx.py
* vpn.py
* firewall.py
* meraki\_patch.py
* static\_route.py
* vpn\_firewall.py

Please note that meraki.py is simply a copy of a Meraki release.(This is done so that Meraki updates do not impact the code, and also that there more control over the stability of the code, at any point a new version can be pulled in, but it is advisable that full regression testing should be done)

### “utils” sub-directory contents

This directory contains general use utilities such as:

logging,

csv conversion and validation,

json,

jinja support,

global variables.

### “GUI” sub-directory contents

This directory contains a flask python web-server, which was integrated for GUI testing. No longer supported, however it could be useful in for REST-API support development.

### “menAndMice” sub-directory content

This directory contains Python 2.7 SOAP based men and mice client. Tested but not operational. Will need run as an external service periodically in order to provide full Men and Mice integration.

## Data Directories

There are three data directories as shown below.

* templates
* data

### “templates” directory

This directory contains the in-use definitions for store-lists, org-lists, l3fwrules, s2svpn rules.

Please note the “valid inputs. json” file contains a list of valid schemas that is used in the convert utility (“csv-to-json”)

## “data” directory

This directory contains run time data and logs generated by the scripts. This is useful for debugging and auditing.

### “config” sub-directory contents

This directory contains system level configuration.

At this point the main function for this settings file is to support new Orgs.

Modify the “safeway-config.json” file in two places:

1. In the networks section as per example below:

"network": [

{

"org\_name": "AutomationTestOrg\_DONOTDELETE",

"org\_id" : 686798943174000795,

"clone\_store": "0\_Base\_Config\_v1"

},

1. In the vpn/hubnetworks section as per example below:

"vpn":

{

"hubnetworks" : [

{

"org\_name": "Store\_QA\_Org",

"id": [

"N\_686798943174004323",

"N\_686798943174004324"

]

},

## “runtime” sub-directory contents

This directory contains run time transient settings. Useful for debugging and monitoring.

## “doc” sub-directory contents

Used for loose storage of development relevant documentation.

# Store IP subnet generation and templates

## Overview

The Meraki API for vlan creation and updates, uses a format, which requires absolute values which are specific for each store.

Additionally, the Meraki API for l3fwrules updates also requires absolute values.

One of the purposes of the automation scripts is to automatically generate the above files/formats based on templates and store name. This allows for bulk deployments and consistency across the network.

The subnet generation logic is as follows:

* Stores map to device names, which translates into an IP address. Based on this IP the netx logic, explained below, creates eight subnets.
* A men and mice funnel file, explained below, contains the last octet and mask, which together with the vlan\_netx file provides all the information required for sub-netting. We call this process store-subnetting.

Template use is as follows:

The store subnetting is used to specialise a VLAN jinja template, which produces the required vlans\_generated\_<xx>, used to call the Meraki API

So, with inputs netx + funnel and using /config/jinja\_vlans\_template we obtain /data/…./vlans\_generated which is used by the Meraki API to update and or create the vlans.

For l3fwrules the process is very similar but uses an l3fwrules\_template\_<xxx> provided and constantly updated by the Safeway Security team. This template follows the Meraki standard for firewall templating. This choice of template format was done for the sake of consistency and the ability to easily compare Safeway Templates against Meraki deployed templates. This template is specialized by the automation scripts code instead of jinja, as jinja was not suitable for this task. The firewall\_handler.py contains the code that specializes this template.

## VLAN generation Overview

Store names will always be in the format <ABC>\_<nnnn>, where ABC is the Safeway Division (e.g. SHA, JEW, etc.), this is always an uppercase non-numeric A-Z character and nnnn is the actual store four-digit number 0000-9999.

The store numbers are unique and each store has a network controller cc<nnnn> associated with it.

For example, the SHA\_0012 store will have a cc0012 controller which should be visible on the Safeway network.

The VLAN generation is done using the following steps:

* From the Men and Mice external utility a vlans\_funnel.csv file is obtained. This file is patched using the config/vlan\_funnels.patch.csv, which contains internal, across store constant addresses in the 192.168 subnet.
* The first column is the VLAN number, the second line which follows the format

10.x.a.nn/nn is the subnetting.

10.x.a is translated into a select for the subnet “a” (three octets subnet created by the netx function)

* Conversely 10.x.b. selects subnet “b”, and so forth up to 10.x.h which selects subnet “h”.
* The last octet is exactly that the last octet (4th octet, plus mask)

## Subnet generation process

This entails three steps which are detailed below:

* Netx IP subnet generation
* Funnel generation
* Template Specialization

### Netx IP subnet generation

The vlan\_netx.json describes 8 subnets for a given store.

It is easier to understand the logic by example:

How to generate netx by example

a) ping cc8501

b) Pinging cc8501 [10.218.31.5] with 32 bytes of data:

c) netx["upper"] = {1:10, 2:218, 3:28, 4:0} (31-3 = 28 for 3rd octet)

d) netx["lower"] = {1:10, 2:154, 3:28, 4:0} (218-0x40=154 for 2nd octet)

3:28} (copy 1,2,3 octets from netx["upper"]

f) next{"b"] = {1:10. 2:218. 3:29} (copy 1,2 octets from netx["a"] and 3rd octet = netx["a"][3] + 1

g) next{"c"] = {1:10. 2:218. 3:30} (copy 1,2 octets from netx["b"] and 3rd octet = netx["b"][3] + 1

e) next{"d"] = {1:10. 2:218. 3:31} (copy 1,2 octets from netx["c"] and 3rd octet = netx["c"][3] + 1

e) next{"e"] = {1:10. 2:154. 3:28} (copy 1,2,3 octets from netx["lower"]

f) next{"f"] = {1:10. 2:154. 3:29} (copy 1,2 octets from netx["a"] and 3rd octet = netx["f"][3] + 1

g) next{"g"] = {1:10. 2:154. 3:30} (copy 1,2 octets from netx["b"] and 3rd octet = netx["g"][3] + 1

e) next{"h"] = {1:10. 2:154. 3:31} (copy 1,2 octets from netx["c"] and 3rd octet = netx["b"][3] + 1

e) next{"a"] = {1:10. 2:218.

So for

ip = 10.218.31.5

netx = {

"upper": "10.218.28.0",

"lower": "10.154.28.0",

"a": "10.218.28",

"b": "10.218.29",

"c": "10.218.30",

"d": "10.218.31",

"e": "10.154.28",

"f": "10.154.29",

"g": "10.154.30",

"h": "10.154.31"

}

Below the generated vlans\_netx.json

{

"upper": "10.195.200.0",

"lower": "10.131.200.0",

"a": "10.195.200",

"b": "10.195.201",

"c": "10.195.202",

"d": "10.195.203",

"e": "10.131.200",

"f": "10.131.201",

"g": "10.131.202",

"h": "10.131.203"

}

### “vlans\_funnel” generation

The vlans\_funnel.csv (copied from ./menAndMice/funnel.csv is patched with ./config/vlans\_funnel\_patch.csv and is ultimately an old-style template. The first column is the vlan number, the second column contains the 3 octet subnet reference and the actual last octet + mask. (e.g. 10.x.a.16/27, translates to use netx subnet “a” with the last octet as 16 and mask 27)

The netx logic explained below produces 8 subnets , named “a”, “b“, “c’, “d’, “e”, ”f”, ”g”, ”h”, for a given absolute fixed IP.

Therefore, the netx logic and the funnel-vlan logic above provide subnets which are used in VLAN and Firewall Rule generation.

Below a sample vlans\_funnel.csv obtained from Men and Mice.

Vlan,Subnet,Description

1,10.x.a.16/27,Network Management

4,10.x.a.32/27,Network Management

6,10.x.a.64/27,Extranet Vendors

7,10.x.a.96/27,Pharmacy

8,10.x.a.128/27,Backstage Users

14,10.x.a.248/29,Store Content Engine

16,10.x.b.0/24,Store Wireless

19,10.x.c.0/24,General Store LAN

24,10.x.d.0/24,POS LAN

35,10.x.e.0/27,Digital Signage

40,10.x.e.32/27,Thin Wireless Mgmt.

45,10.x.h.192/26,Cisco Wireless Management

60,10.x.h.128/27,Vendor VLAN II (2nd Subnet)

70,10.x.e.64/26,New Pharmacy

75,10.x.e.128/25,Macauthenticated Wireless Clients

79,10.x.g.192/26,VOIP Clients

80,10.x.f.0/24,Secure Wireless

81,10.x.g.160/28,Field Service Wireless

82,10.x.g.176/28,iPad quarantine vlan

85,10.x.h.0/26,Retail Cluster Management VLAN

95,10.x.g.128/27,Printer VLAN

The above vlans\_funnel.csv file is patched with the patch below:

vlans\_funnel\_patch has vlans where subnets do not change per store

992,"192.168.192.0/24","Digital Signage - I"  
995,"192.168.1.0/24","Guest WIFI"  
996,"192.168.100.0/24","Cache VPN"  
997,"192.168.101.0/24","Cache Internet"

Vlan,Subnet,Description

1,10.x.a.16/27,Network Management

4,10.x.a.32/27,Network Management

6,10.x.a.64/27,Extranet Vendors

7,10.x.a.96/27,Pharmacy

8,10.x.a.128/27,Backstage Users

14,10.x.a.248/29,Store Content Engine

16,10.x.b.0/24,Store Wireless

19,10.x.c.0/24,General Store LAN

24,10.x.d.0/24,POS LAN

35,10.x.e.0/27,Digital Signage

40,10.x.e.32/27,Thin Wireless Mgmt.

45,10.x.h.192/26,Cisco Wireless Management

60,10.x.h.128/27,Vendor VLAN II (2nd Subnet)

70,10.x.e.,New Pharmacy64/26

75,10.x.e.128/25,Macauthenticated Wireless Clients

79,10.x.g.192/26,VOIP Clients

80,10.x.f.0/24,Secure Wireless

81,10.x.g.160/28,Field Service Wireless

82,10.x.g.176/28,iPad quarantine vlan

85,10.x.h.0/26,Retail Cluster Management VLAN

95,10.x.g.128/27,Printer VLAN

96,10.x.g.178/27,Printer VLAN

992,"192.168.192.0/24","Digital Signage - I"

995,"192.168.1.0/24","Guest WIFI"

996,"192.168.100.0/24","Cache VPN"

997,"192.168.101.0/24","Cache Internet"

## Template Specialization

The vlan generation is a two-step template specialization process.

The first step uses netx as input data which is applied to the vlans\_funnel\_netx and creates a vlan\_funnels\_table.

For vlan generation the second step uses vlan\_funnels\_table and applies it to jinja\_vlans\_template and obtains vlan\_generated\_<netid>

For L3fwrules generation the second step uses vlan\_funnels\_table and applies it to l3fwrules\_template\_<desc> and obtains l3fwrules\_deploy\_<store-number>

### Process Steps

* Create vlans\_funnel\_subnet:

A vlans\_netx subnet file, described in the previous chapter is used to specialize a vlans\_funnel file, described in previous chapter, and it produces a vlans\_funnel\_subnet file as depicted below:

Vlan,Subnet,Description  
1,10.218.28.16/27,Network Management

* Create vlans\_funnel\_table:

vlans\_funnel\_subnet is used to create vlans\_funnel\_table. which provides a simple json subnet vlan lookup file as depicted below:

{ "1": "10.218.28.16/27", "4": "10.218.28.32/27", "6": "10.218.28.64/27",… }

* Vlan generation - create vlans\_generated\_<netid>:

This is the file which is used for the Meraki API call.

Using the jinja the /config/jinja\_vlans\_template.json and the vlans\_funnel\_table the vlans\_generated\_<netid> is created

* L3 firewall generation - create l3fwrules\_deploy\_<store-number>:

This is the file which is used for the Meraki API call.

Using the logic in /automation/firewall\_handler and a selected templated provided in /templates/l3fwrules\_template\_<desc> and the vlans\_funnel\_table the l3fwrules\_deploy\_<store-number>.

### Create vlans\_funnel\_subnet

/data/../vlan\_funnel\_netx is created from vlans\_funnel by simply removing irrelevant information. A snapshot of vlans\_funnel\_netx is depicted below.

Vlan,Subnet,Description

1,a.16/27,Network Management

4,a.32/27,Network Management

6,a.64/27,Extranet Vendors

7,a.96/27,Pharmacy

By specializing vlans\_funnel\_netx, vlans\_funnel\_subnet is obtained.

Vlan,Subnet,Description

1,10.195.200.16/27,Network Management

4,10.195.200.32/27,Network Management

6,10.195.200.64/27,Extranet Vendors

7,10.195.200.96/27,Pharmacy

8,10.195.200.128/27,Backstage Users

14,10.195.200.248/29,Store Content Engine

16,10.195.201.0/24,Store Wireless

19,10.195.202.0/24,General Store LAN

24,10.195.203.0/24,POS LAN

35,10.131.200.0/27,Digital Signage

40,10.131.200.32/27,Thin Wireless Mgmt.

45,10.131.203.192/26,Cisco Wireless Management

60,10.131.203.128/27,Vendor VLAN II (2nd Subnet)

70,10.131.200.64/26,New Pharmacy

75,10.131.200.128/25,Macauthenticated Wireless Clients

79,10.131.202.192/26,VOIP Clients

80,10.131.201.0/24,Secure Wireless

81,10.131.202.160/28,Field Service Wireless

82,10.131.202.176/28,iPad quarantine vlan

85,10.131.203.0/26,Retail Cluster Management VLAN

95,10.131.202.128/27,Printer VLAN

992,192.168.192.0/24,Digital Signage - I

995,192.168.1.0/24,Guest WIFI

996,192.168.100.0/24,Cache VPN

997,192.168.101.0/24,Cache Internet

### Create vlans\_funnel\_table

The file “vlans\_funnel\_subnet”, which is a list, is transformed into a table

Below vlans\_funnel\_table (note that the description info field is being dropped and the description is being picked up from the jinja template file), this maps vlans to respective subnets.

{

"1": "10.195.200.16/27",

"4": "10.195.200.32/27",

"6": "10.195.200.64/27",

"7": "10.195.200.96/27",

"8": "10.195.200.128/27",

"14": "10.195.200.248/29",

"16": "10.195.201.0/24",

"19": "10.195.202.0/24",

"24": "10.195.203.0/24",

"35": "10.131.200.0/27",

"40": "10.131.200.32/27",

"45": "10.131.203.192/26",

"60": "10.131.203.128/27",

"70": "10.131.200.64/26",

"75": "10.131.200.128/25",

"79": "10.131.202.192/26",

"80": "10.131.201.0/24",

"81": "10.131.202.160/28",

"82": "10.131.202.176/28",

"85": "10.131.203.0/26",

"95": "10.131.202.128/27",

"992": "192.168.192.0/24",

"995": "192.168.1.0/24",

"996": "192.168.100.0/24",

"997": "192.168.101.0/24"

}

### Vlan generation - create vlans\_generated\_<netid>

Also note that the jinja template uses the 3 octets for the appliance-IP and this is generated by the code on the flight, so there is no file mapping for this.

The network ID is also picked up on the flight and uses the correct Meraki-netid for that particular store.

So now we have to generate a proper specialized version of the vlans which can be applied to Meraki. The template for Meraki Vlans is in /config/jinja\_vlans\_template.json

{

"id": 19,

"networkId": "{{networkid}}",

"name": "generalstorelan",

"applianceIp": "{{vlan[19]['octets']}}.1",

"subnet": "{{vlan[19]['subnet']}}",

"dnsNameservers": "upstream\_dns",

"fixedIpAssignments": {},

"reservedIpRanges": []

},

{

"id": 24,

"networkId": "{{networkid}}",

"name": "storelan",

"applianceIp": "{{vlan[24]['octets']}}.1",

"subnet": "{{vlan[24]['subnet']}}",

"dnsNameservers": "upstream\_dns",

"fixedIpAssignments": {},

"reservedIpRanges": []

},

The final output is vlans\_generated\_N\_686798943174007640.json and is used against the Meraki API

[

{

"id": 4,

"networkId": "N\_686798943174007640",

"name": "networkmgmt",

"applianceIp": "10.195.200.33",

"subnet": "10.195.200.32/27",

"dnsNameservers": "upstream\_dns",

"fixedIpAssignments": {},

"reservedIpRanges": []

},

{

"id": 6,

"networkId": "N\_686798943174007640",

"name": "extranetvendor",

"applianceIp": "10.195.200.65",

"subnet": "10.195.200.64/27",

"dnsNameservers": "upstream\_dns",

"fixedIpAssignments": {},

"reservedIpRanges": []

},

{

"id": 7,

"networkId": "N\_686798943174007640",

"name": "pharmacy",

"applianceIp": "10.195.200.97",

"subnet": "10.195.200.96/27",

"dnsNameservers": "upstream\_dns",

"fixedIpAssignments": {},

"reservedIpRanges": []

}

]

### L3 firewall generation - create l3fwrules\_deploy\_<store-number>

Applying the vlans\_funnel\_table to the selected l3fwrules\_template\_<desc>, generates the l3fwrules\_deploy depicted below:  
   
[  
{  
"comment": "413",  
"policy": "allow",  
"protocol": "tcp",  
"srcPort": "Any",  
"srcCidr": "10.218.31.23/32",  
"destPort": "58019",  
"destCidr": "10.154.28.126/32",  
"syslogEnabled": false  
},

# Convert and Validation

The CLI “convert csv-to-json” and “convert json-to-csv” was developed to convert “csv” format file to “json” format file as accepted by Meraki API.

Conversion is supported for following file types.

* l3fwrules
* s2svpnrules
* store-list
* org-name

The convert utility also validates the above files for errors. The validation is done only when using “convert csv-to-json”. There is no validation in “convert json-to-csv”.

The details of validation are provided below.

## Schema Validation

For every file there is a schema defined in /templates/valid\_inputs.json. This allows for validation-based file name standards, required fields and field content type. For new file types this schema file should be amended.

A snapshot of valid\_inputs.json is depicted below:

[

{

"l3fwrules" : {

"fname\_pattern" : "l3fwrules\_template\_",

"json\_schema" : {

"type": "object",

"properties": {

"comment": {"type": "string"},

"policy": {"enum": ["allow", "deny"]},

"protocol": {"enum": ["udp", "tcp", "any", "icmp", "Any"]},

"srcPort": {"type": "string"},

"srcCidr": {"type": "string"},

"destPort": {"type": "string"},

"destCidr": {"type": "string"},

"syslogEnabled": {"type": "string"}

}

}

},

]

## “l3fwrules” Fields Validation

Following validation is done on l3fwrule fields

* “syslogEnabled”

Forces it to be always lower case “false” and “true”

* “srcCidr”, “destCidr”, "comment", "srcPort", "destPort"

Remove “\n” (spurious fake carriage-return inserted by Excel)

* "protocol", "srcCidr", "destCidr", "comment", "srcPort", "destPort"

Changes “Any” to “any”

* "destPort", "srcPort"

Limit field to be either:

* + “any”
  + Numeric range number1-number2, where number1 and number are in the range of 1-65535 (e.g 1-24000)
  + A list of comma separated ports, where ports are in the range of 1-65535. (e.g. 1, 65000, 234)
* “destCidr”

Limit vlan and IP to be:

* + A list containing valid vlans templates and IPs.
  + Valid vlan templates should be in the format VLAN(nnn).zzz, where “nnn” is a non-zero number and “zzz” can be “\*” or non-zero number.
  + Valid IPs should be in one of the formats below:
    - o1.o2.o3,o4/nn,
    - o1.o2.o3.o4 mask m1.m2.m3.m4
    - “any”
    - Where nn is within the range of 1-32 and o1, o2, o3, o4 and
    - m1, m2, m3, m4 are in the range 0-255
    - Also, destCidr is not allowed to be blank.
* “srcCidr”

Limit vlan and IP to be:

* + A list containing valid vlans templates and IPs.
    - Valid vlan templates should be in the format VLAN(nnn).zzz, where “nnn” is a non-zero number and “zzz” can be “\*” or non-zero number.
  + Valid IPs should be in one of the formats below:
    - o1.o2.o3,o4/nn,
    - o1.o2.o3.o4 mask m1.m2.m3.m4
    - “any”
    - Where nn is within the range of 1-32 and o1 is 192 and o2 is 168.

## “s2svpnrules” Fields Validation

* “destCidr”, “srcCidr”

Limit IP to be:

* + A list containing valid IPs.
  + Valid IPs should be in one of the formats below:
    - o1.o2.o3,o4/nn,
    - o1.o2.o3.o4 mask m1.m2.m3.m4
    - “any”
    - Where nn is within the range of 1-32 and o1, o2, o3, o4 and
    - m1, m2, m3, m4 are in the range 0-255
    - Also, destCidr is not allowed to be blank.

# Increase the log messages and debugging scripts

## Increase the log messages verbosity on Automation Server

When running in production log messages a kept to a minimum. In the case of errors where the messages are not sufficient it is possible to increase the verbosity by changing a variable in the global\_vars.py

Simply change the line

log\_verbose = False

to

log\_verbose = True

Do not forget to change it back once the problem has been resolved.

## Debugging on local laptop using Pycharm

Given that debug capabilities on the automation server are very limited, it might be necessary to resort to Pycharm in order to seek a faster resolution/debug to the problem.

The steps should be the following:

* An existing Pycharm environment should be already setup. It is outside the scope of this document how to setup such an environment.
* The version of code in nsmk-qa/code should be the same as the one which is being used in production.

These are the steps to obtain a sync-up version on your environment.

On the server run ./VERSION.sh

(same as doing a git describe –tags)This will provide which version is running on the server.

<VERSION\_IN\_PRODUCTION> e.g. P25

On your machine clone the same version: git clone -b <VERSION\_IN\_PRODUCTION> [https://github.com/<repo](https://github.com/%3crepo)> code

Now you are ready to start debugging the code.

If the problem is a crash, simply put a breakpoint just before the crash and attempt to find the problem that way.

## Common production issues and possible remedies

It is always advisable to deploy l3 firewall and s2svpn rules against a test org.

* Deploy l3fwrules fails

The networks/stores have been corrupted.

Delete and re-deploy networks and stores again.

An actual problem with the l3fwrules\_template.json file.

Ensure the converted csv-to-json is passing without errors, watch for the actual error messages from the convert script. (A message will point you to a line that can be offset but one of two depending if you are using csv or excel source input)

* Deploy s2sfwrules fails

An actual problem with the l3fwrules\_template.json file.  
Ensure the convert csv-to-json is passing without errors, watch for the actual error messages from the

Script. (The message will point to a line that can be offset but one of two depending if you are using csv or excel)

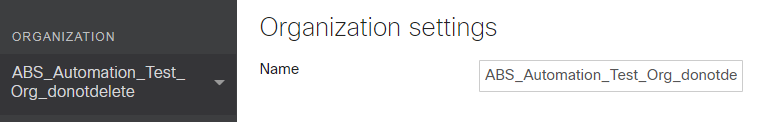
# Changing Organization Name

The automation scripts have Meraki organization names defined in configurations files. If the Meraki organization names are changed then the configurations files in autmation scripst also needs to be changed to reflect the new organization name.

Follow the steps given below to change the configuration in automation scripts to change the Meraki Organization name.

## Change the org name in Meraki dashboard.

In Meraki Dashboard, navigate to Organization > Settings. The first option on the page is to change the organization name. Update this field as desired and click to save changes.



## Update /setup/safeway-config

Logon to automation server. Change directroy to /appl/nms/nsmk/code/setup and update safeway-config with new organizations name as shown below (highlighted).

[

{

"network": [

{

"org\_name": "ABS\_Automation\_Test\_Org\_donotdelete",

"org\_id" : 686798943174000795,

"clone\_store": "0\_Base\_Config\_v1"

},

{

"org\_name": "Ecert\_Org2",

"org\_id": 686798943174000764

},

{

"org\_name": "Firewall\_Testing\_Org",

"org\_id" : 686798943174000817,

"clone\_store": "0\_Base\_Config\_v1"

},

{

"org\_name": "New\_Production\_MX\_Org",

"org\_id": 686798943174000779,

"clone\_store": "0\_Base\_Config\_v1"

},

{

"org\_name": "Pilot\_Org",

"org\_id": 686798943174000822,

"clone\_store": "0\_Base\_Config\_v1"

},

{

"org\_name": "Store\_QA\_Org",

"org\_id": 686798943174000752,

"clone\_store": "0\_Base\_Config\_v1"

}

],

"vlan":

{

"device\_prefix": "cc",

"device\_postfix": "",

"funnel\_file": "vlans-funnel",

"netx\_file": "vlans-netx"

}

,

"firewall": {

"static\_route\_next\_hop": "24"

},

"vpn":

{

"hubnetworks" : [

{

"org\_name": "Store\_QA\_Org",

"id": [

"N\_686798943174004323",

"N\_686798943174004324"

]

},

{

"org\_name": "Ecert\_Org2",

"id": [

"N\_686798943174004604",

"N\_686798943174004605"

]

},

{

"org\_name": "New\_Production\_MX\_Org",

"id": [

"N\_686798943174005061",

"N\_686798943174005062"

]

},

{

"org\_name": "ABS\_Automation\_Test\_Org\_donotdelete",

"id": [

"N\_686798943174005998",

"N\_686798943174005999"

]

},

{

"org\_name": "Firewall\_Testing\_Org",

"id": [

"N\_686798943174006638",

"N\_686798943174006639"

]

},

{

"org\_name": "Pilot\_Org",

"id": [

"N\_686798943174006976",

"N\_686798943174006977"

]

}

]

,

"defaultroute": [

true,

true

]

}

}

]

## Run setup script and validate changes

While still in folder /appl/nms/nsmk/code/setup, run the setup utility.

$ ./set-default.sh

default settings have been set.

Change directory to /appl/nms/nsmk/config and open the files “safeway-config.json” and make sure the new organization name is shown there.

## Update the organization files in templates folder.

Change the directory to /appl/nms/nsmk/templates and list the file starting with name “org-\*”.

$ ls -l ../templates/org-\*

-rw-r--r-- 1 user01 1049089 77 Jun 4 09:24 ../templates/org-ABS\_Automation\_Test\_Org\_donotdelete.json

-rw-r--r-- 1 user01 1049089 77 Jun 4 11:30 ../templates/org-DONOTUSE.json

-rw-r--r-- 1 user01 1049089 48 May 23 15:49 ../templates/org-Ecert\_Org2.json

-rw-r--r-- 1 user01 1049089 62 May 23 15:49 ../templates/org-Firewall\_Testing\_Org.json

-rw-r--r-- 1 user01 1049089 63 May 23 15:49 ../templates/org-New\_Production\_MX\_Org.json

Move the current file for org name to be changed to refelct the new name.

$ mv org-<oldname>.json org-<newname>..json

Example:

$ mv org-AutomationTestOrg\_DONOTDELETE.json org-ABS\_Automation\_Test\_Org\_donotdelete.json

Move the current file for org name to be chnaged to refelct the new name.

$ mv org-<oldname>.json org-<newname>..json

Example:

# Resetting the CLI selection to default

The automation scripts at present uses flat files for configurations of selections using CLI. All the configurations specific files are stored in templates folder.

CLI can cause error if configuration selection has reference to a configuration file and the specific configuration file is moved away from the templates folder.

In event the selections needs to be reset to base configurations, we can run setup utility. The setup utility will reset the configuration files selections and also copy relevant configuration files in templates folder.

To run the setup utility change directory to /appl/nms/nsmk/code/setup and run the setup script.

cd/appl/nms/nsmk/code/setup

./setup-default <enter>

After the “setup-default” utility is run the configuration selections in config folder will look as shown below. This utility will also copy “.DONOTUSE.json” files to templates folder.

cd/appl/nms/nsmk/code/config

cat “cli-selections.json”

{

"networks-org": "org-DONOTUSE",

"networks-store-list": "store-list-DONOTUSE",

"networks-clone-source": "0\_Base\_Config\_v1",

"networks-serials": "networks-serials-DONOTUSE",

"sites-org": "org-DONOTUSE",

"sites-store-list": "store-list-tst1",

"sites-l3fwrules-version": "l3fwrules\_template-DONOTUSE",

"store-lists-org": "org-DONOTUSE",

"l3fwrules-org": "org-DONOTUSE",

"l3fwrules-store-list": "store-list-DONOTUSE",

"l3fwrules-version": "l3fwrules\_template-DONOTUSE",

"s2svpnrules-org": "org-DONOTUSE",

"s2svpnrules-version": "s2svpnrules-DONOTUSE",

"vlans-add-org": "org-DONOTUSE",

"vlans-add-store-list": "store-list-DONOTUSE",

"vlans-add-list": "vlans-add-list-non-routable-DONOTUSE",

"vlans-delete-org": "org-DONOTUSE",

"vlans-delete-store-list": "store-list-DONOTUSE",

"vlans-delete-list": "vlans-delete-list-DONOTUSE",

"dry-run": false,

"dryrun-next-fake-ip": "10.1.1.5"

}

# Subnets for “non-netx vlans”

Safeway network team wanted automation scripts to support a scenario for “vlans-add” where the store subnets will come from the specified file. These subnets are called as “not-netx” subnets as it does not use the Safeway “netx” formula for calculating the ip subnets for the stores. The “non-netx” subnets uses the format of “10.x.i.0 to 10.x.z.0” and are listed in file “vlans-non-netx.json” in templates folder. Recall that the subnets “10.x.a.0 to 10.x.h.0” are used by netx.

To add unique subnets for each store open the file named as “vlans-non-netx.csv” in templates folder and add unique subnets for each store. The sample file shows the two “non-netx” subnets for two test stores “1234” and “8501” in “csv” format.

Store,FunnelSubnet,ActualSubnet,Summary

8501,10.x.i.0/27,10.11.11.0/27,10.11.11.0/24

8501,10.x.j.0/27,10.11.11.32/27,10.11.11.0/24

1234,10.x.i.0/27,10.22.22.0/27,10.22.22.0/24

1234,10.x.j.0/27,10.22.22.32/27,10.22.22.0/24

The automation scripts does not use file “vlans-non-netx” in “csv” format and needs the file in “json” format. Use the “convert csv-to-json” to convert the file to json format. The sample file shows the two “non-netx” subnets for two test stores 1234 and 8501 in “json” format.

[

{

"Store": 8501,

"FunnelSubnet": "10.x.i.0/27",

"ActualSubnet": "10.11.11.0/27",

"Summary": "10.11.11.0/24"

},

{

"Store": 8501,

"FunnelSubnet": "10.x.j.0/27",

"ActualSubnet": "10.11.11.32/27",

"Summary": "10.11.11.0/24"

},

{

"Store": 1234,

"FunnelSubnet": "10.x.i.0/27",

"ActualSubnet": "10.22.22.0/27",

"Summary": "10.22.22.0/24"

},

{

"Store": 1234,

"FunnelSubnet": "10.x.j.0/27",

"ActualSubnet": "10.22.22.32/27",

"Summary": "10.22.22.0/24"

}

]