



GFN SDN Controller User Manual

FRR Service

Release 2.5.0

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1. Acronyms

AD – Administrative Domain

AI – Artificial intelligence

ASIC – Application Specific Integrated Circuit

BGP – Border Gateway Protocol

BNG – Border Network Gateway

BRAS – Broadband Remote Access Server

BSS – Business Support System

CBS – Committed Bust Size

CEN -Carrier Ethernet Network

CG-NAT – Carrier Grade Network Address Translation

CIR – Committed Information Rate

CLI - Command Line Interface

CPU – Central Processing Unit

CRM – Customer Relationship Management

CRUD - Create, Read, Update, Delete

DB - Database

DC – Datacenter

DPI – Deep Packet Inspection

DPID – Data Path Identificator

E2E – End-to-End (services)

E-Access - OVC-based service with at least one UNI OVC End Point and one ENNI End Point

EBS – Excess Burst Size

EIR - Excess Information Rate

E-LAN – multipoint-to-multipoint EVC

E-Line – point-to-point EVC accordingly to MEF

EMS – Element Managements System

ENNI – External Network-to-Network Interface

EP-LAN – Ethernet Private LAN

EPL – Ethernet Private Line

E-Transit - OVC-based Carrier Ethernet service in which all OVC End Points are at ENNIs

E-Tree – point-to-multipoint EVC

ETSI – European Telecommunications Standards Institute

EVC – Ethernet Virtual Circuit

EVPL - Ethernet Virtual Private Line

IGMP – Internet Group Management Protocol

LAN – Local Area Network

LPM - Longest Prefix Match

MEF – Metro Ethernet Forum

MPLS – Multiprotocol Label Switching

NAT – Network Address Translation

NBI – North Bound Interface

NE – Network Element

NPU – Network Processing Unit

NVF – Network Functions Virtualization

NFVI – Network Functions Virtualization Infrastructure

OAM – Operations, Administration and Management

OF – OpenFlow protocol

OF-DPA – OpenFlow Data Plane Abstraction

ONF – Open Networking Foundation

OSS – Operation Support System

OVC – Operator Virtual Connection

OVS – Open vSwitch

PNE – Physical Network element

PNF – Physical Network Element

PoP – Point of Presence, see also Datacenter

QinQ – IEEE 802.1ad standard

QoS – Quality of Service

RFC – Request for Comments

SBI – South Bound Interface

SDN – Software Defined Network

SLA – Service Level Agreement
SQL – Structured Query Language
SR – Segment Routing
SRAM – Static Random Access Memory
TAP – Terminal Access Point
TCAM – Ternary Content Addressable Memory
TE – Traffic Engineering
T/T – Troubleshooting
TTP – Table Type Pattern
UDF - User-Defined Field
UNI – User Network Interface
VLAN – Virtual Local Area Network
VIM – Virtual Infrastructure Manager
VM – Virtual Machine
VNE – Virtual Network Element
VNF – Virtual Network Function
VNFD – Virtual Network Function Descriptor
VNFM – Virtual Network Function Manager
VPLS – Virtual Private Area Network
WAN – Wide Area Network
ZTP – Zero Touch Provisioning

2. FRR Service Review

While L2VPN service provides full link/node protection. FRR service is complementary to L2VPN and it is targeted for UNI protection.

FRR service unites a set of L2VPNs which can protect each other under a common umbrella. The algorithm of FRR service chooses only one of these L2VPNs as active while others are backup ones. Switching active L2VPN is triggered by states of a set of UNI ports.

FRR Service Attributes

FRR service has following general attributes:

- ID
- L2vpnPorts

ID is unique FRR identifier which is represented as string.

L2vpnPorts is set of L2 VPN services with triggers. If trigger conditions are met – associated service is activated, else it is deactivated.

FRR Ports' Attributes

Each l2vpnPort has following attributes:

- L2VPN ID
- VLAN
- Ports
- Description

L2VPN ID is L2 VPN service ID to be activated/deactivated when trigger conditions are met/not met.

VLAN must be the same as chosen L2 VPN service vlan.

Ports is set of triggers, each containing following parameters:

- Device ID
Device ID attribute identifies a device (Data Path ID), represented as string.
- Port number

Port number attribute identifies a device port, represented as integer.


- State

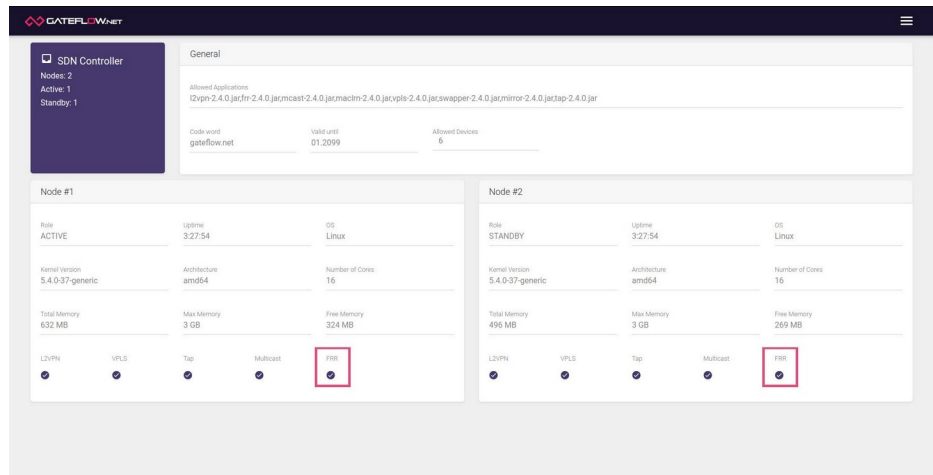
State attribute identifies a state of port upon which this trigger is fired, represented as either "UP" or "DOWN".

Description parameter is optional.

3. Prerequisites

To use FRR service FRR application has to be running on SDN Controller. Check if FRR application is running can be done in two ways:

- Via controller CLI by using command `app show`, FRR application status has to be *running*.
- Via Web UI, by going to controllers page (Menu→Inventory→Controllers), FRR application should be marked with icon 



4. Operation of FRR Service

There are three generic ways to operate FRR service:

- CLI
- REST API
- Web UI

These interfaces are described in details below.

CLI

CLI provides command for viewing existing FRR policies

- frr show

For creating and updating FRR policies please use either Web UI or REST API.

REST API

FRR REST API implements a standard CRUD (Create, Read, Update, Delete) data manipulation paradigm. Any REST API call operates with data in JSON format.

Below is an example of JSON file for REST API call to create FRR policy:

```
{
  "l2vpn": "b2b-b2c-1",
  "vlan": 1,
  "ports": [
    {
      "deviceId": "00:00:00:00:00:00:00:01",
      "portNumber": 5,
      "state": "DOWN"
    },
    {
      "deviceId": "00:00:00:00:00:00:00:01",
      "portNumber": 6,
      "state": "UP"
    }
  ]
}
```

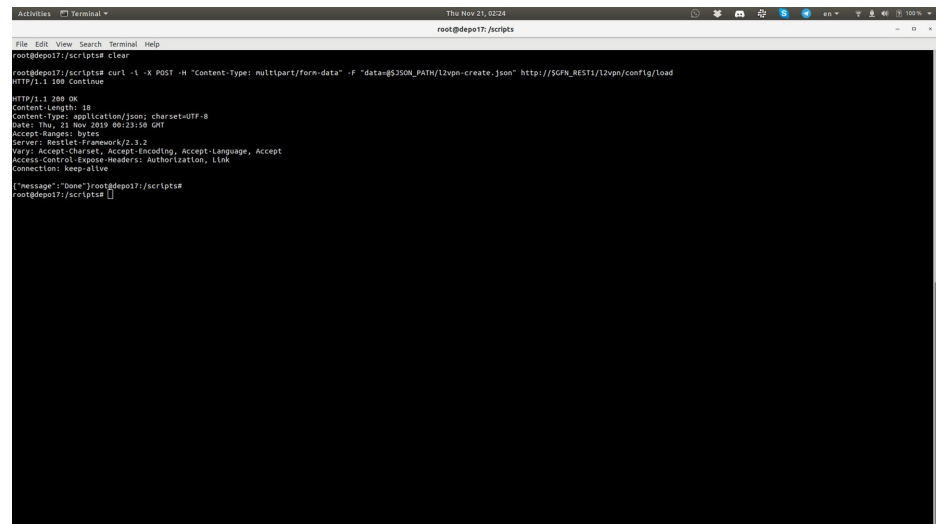
This FRR policy will activate L2 VPN service “b2b-b2c-1” when port 5 on device 00:00:00:00:00:00:01 is down and port 6 on device 00:00:00:00:00:00:01 is up and will deactivate L2 VPN service “b2b-b2c-1” when port 5 on device 00:00:00:00:00:00:01 is up and port 6 on device 00:00:00:00:00:00:01 is down.

REST API Service URLs

There are several REST API URLs available for FRR:

- Create FRR policy
http://sdn-node:8084/frr/create (Method - POST)
- Get all FRR policies
http://sdn-node:8084/frr/find (Method - GET)
- Get specific FRR policy
http://sdn-node:8084/frr/find/{l2vpn} (Method - GET)
- Delete FRR policy
http://sdn-node:8084/frr/delete/{l2vpn} (Method - DELETE)

To send a REST API call on Linux command line utility “curl” can be used as shown below:



```

Activities Terminal
Thu Nov 21, 00:24
root@depo17:/scripts

root@depo17:/scripts# clear
root@depo17:/scripts# curl -i -X POST -H "Content-Type: multipart/form-data" -F "data=@$SSON_PATH/l2vpn-create.json" http://$GFN_REST/l2vpn/config/load
HTTP/1.1 200 OK
Content-Length: 18
Content-Type: application/json; charset=UTF-8
Date: Thu, 21 Nov 2019 00:23:50 GMT
Accept-Ranges: bytes
Server: Redhat/Framework/2.3.2
Vary: Accept-Charset, Accept-Encoding, Accept-Language, Accept
Access-Control-Expose-Headers: Authorization, Link
Connection: keep-alive

{"message": "Done"}root@depo17:/scripts
root@depo17:/scripts#

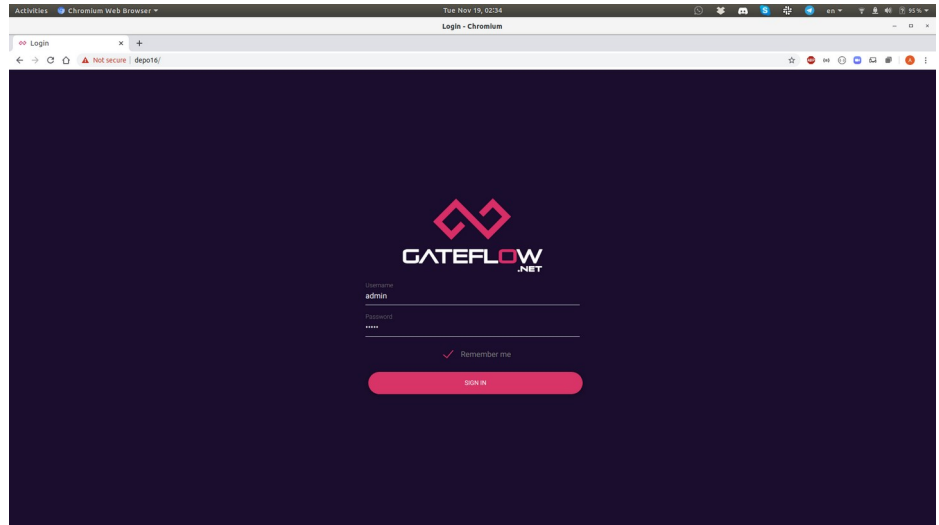
```



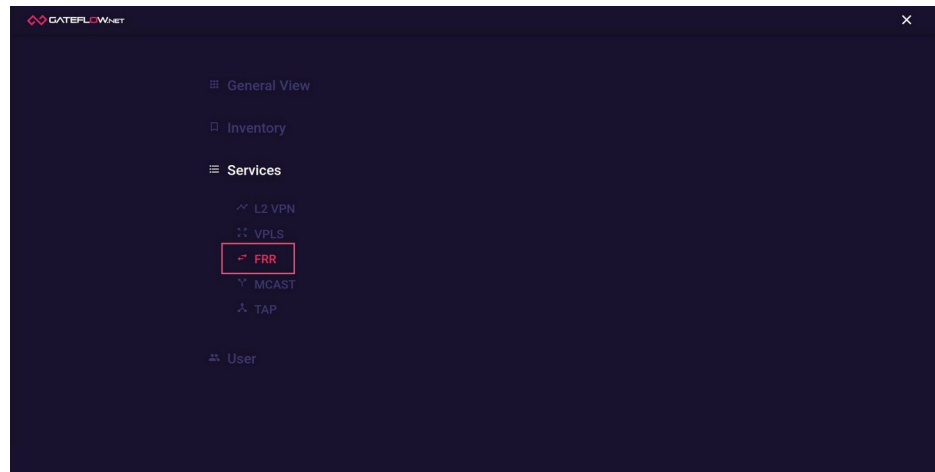
For detailed description of all FRR service JSON file fields format and constraints please refer to GFN SDN Controller Admin Manual.

Web UI

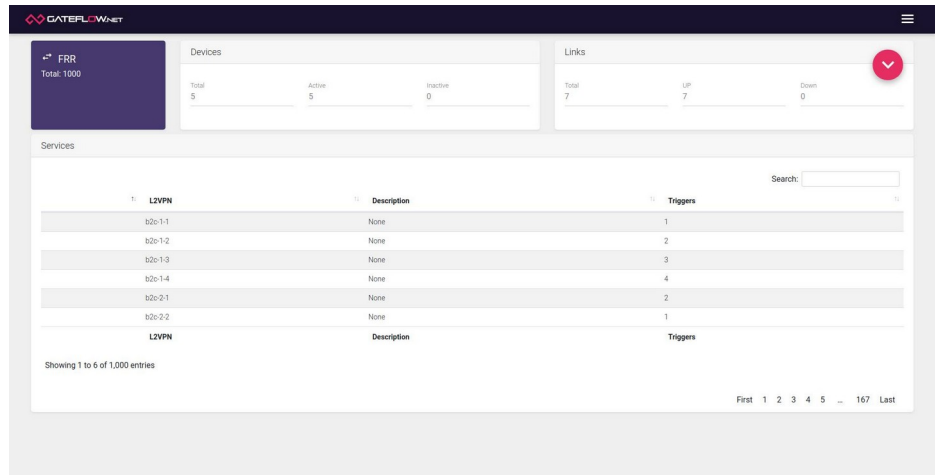
To access FRR management graphic interface via web browser one has to login to GFN SDN Controller Web UI first as shown in the example below:



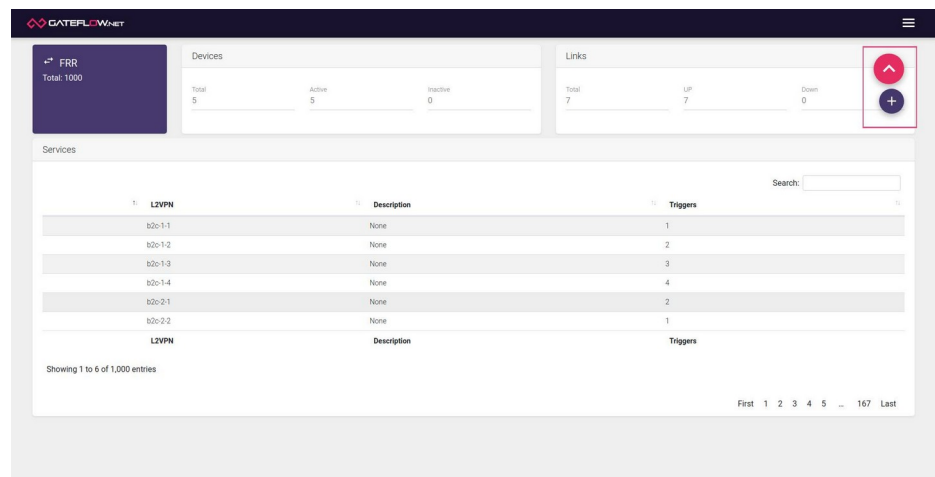
After logging in one has to open a full screen menu using icon at the top bar and choose drop-down Menu->Services->FRR section as shown below:



A FRR policies list will appear. This list contains brief information about every existing FRR policy. Clicking on a policy in the list will open policy details page for corresponding policy.



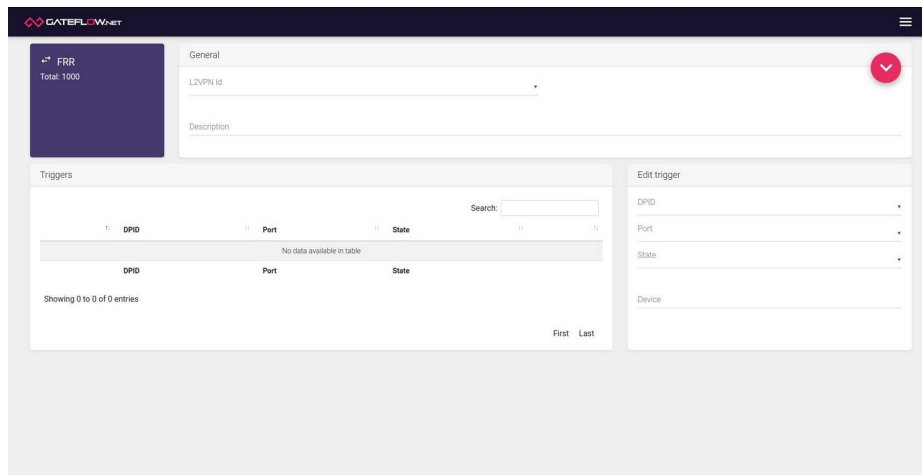
One can open FRR submenu by clicking the floating button in the top-right corner of the screen.



To create a new FRR policy press the corresponding button in the submenu and the creation form will appear.



Note: creating, editing and deleting policy functions are only available for users with admin privileges.



Here one can fill in general parameters for the policy and create triggers by filling in “Edit trigger” form and pressing “Add trigger” button in the submenu (opened by clicking the floating button). Created triggers will be listed in the “Triggers” list and can be deleted by pressing “Delete” button on the corresponding trigger.

To create policy press “Save” button in the submenu. If policy was created successfully one will be redirected to new policy details page. If something went wrong – a floating error message will appear.

To delete policy press “Edit” button in the submenu, then press “Delete” button in the submenu. Policy will be deleted and you will be redirected to FRR policies list.

Pressing “Back to List” button in the submenu at any point will return one to FRR policies list.



All changes must be saved by pressing “Save” button in the submenu beforehand, otherwise they will be lost.