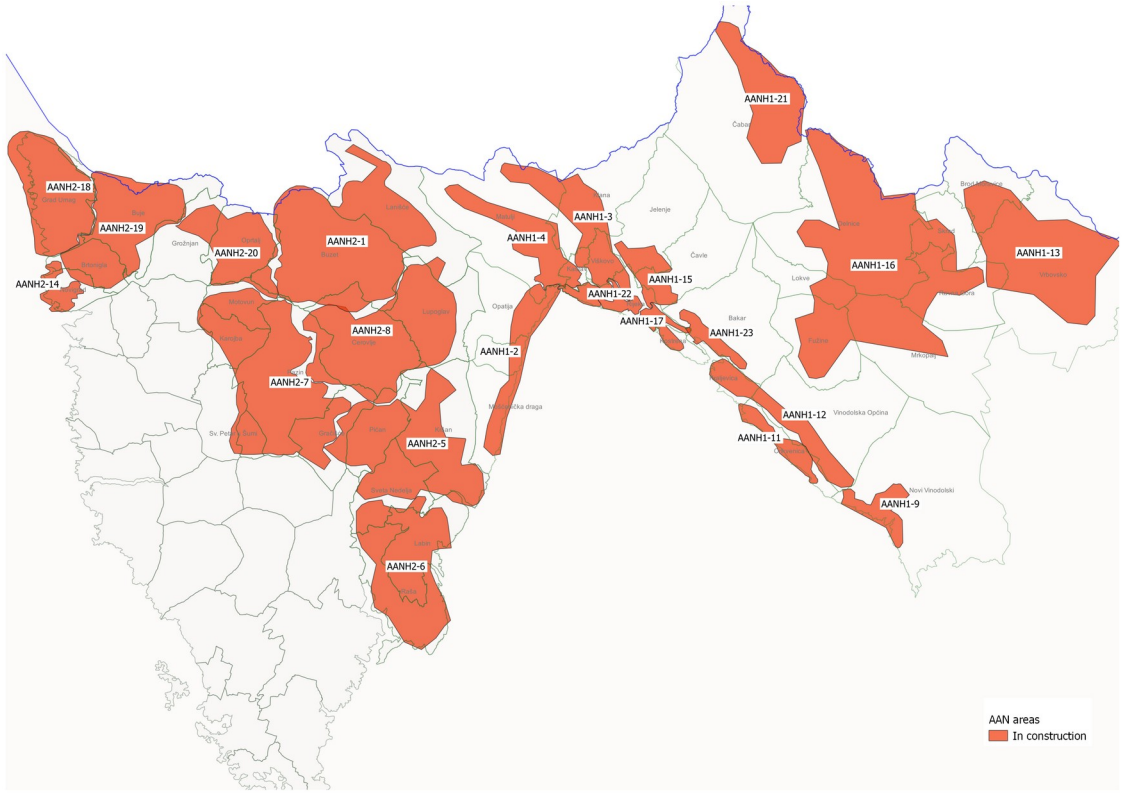
EVPN as a Building Block of Rune Infrastructure Service Provider

Agenda

- Presentation of the Rune Crow
- Infrastructure service provider building blocks
- EVPN
- Network automation and Monitoring
- Summary

Rune project



- Cube IM and Connecting Europe Broadband Found (CEBF) as a greenfield private investor
- Rune CROW area of construction:
  - Istrska
  - Primorsko goranska županija

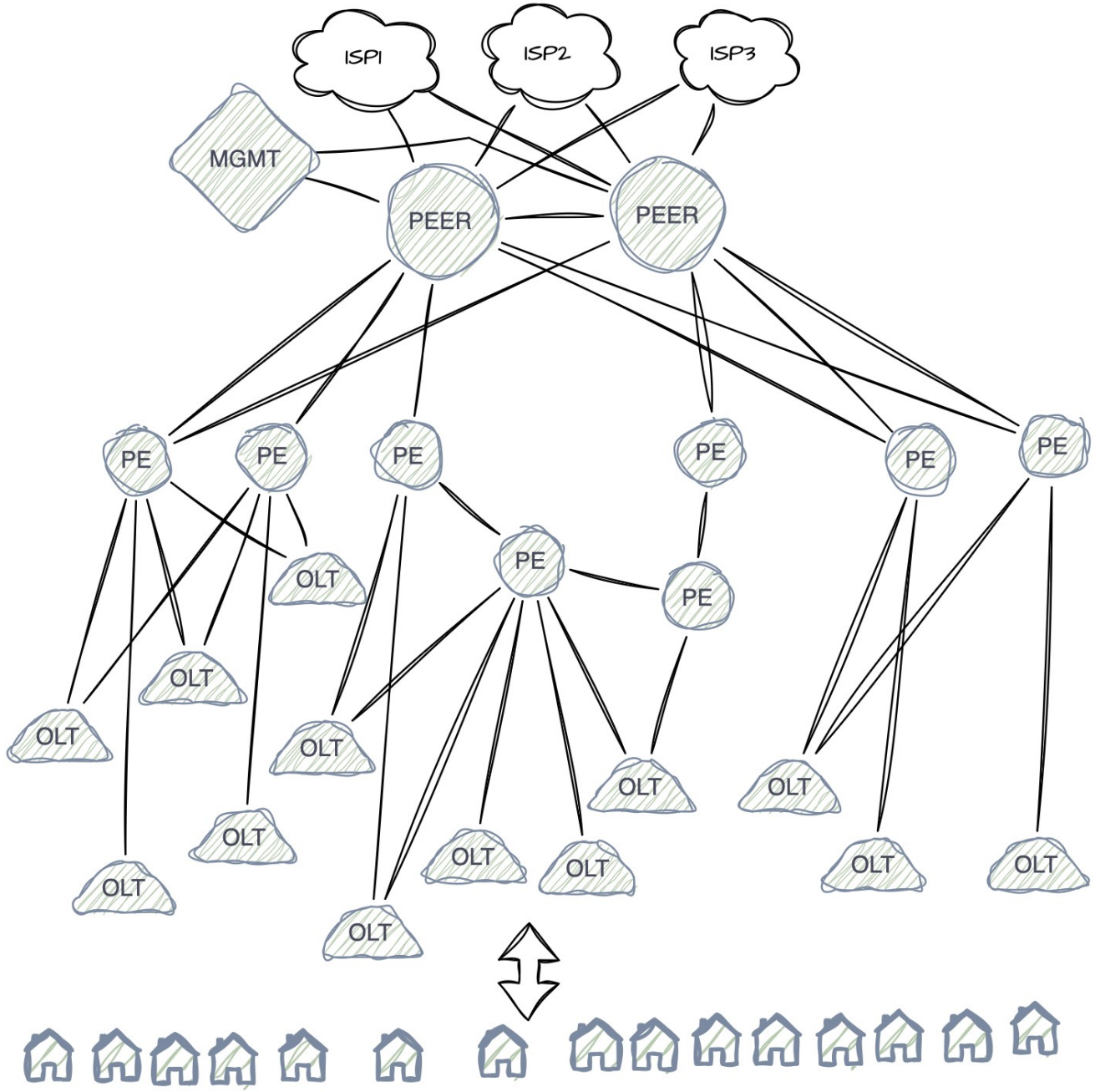
Rune Crow's footprint

More than 5,000 users connected

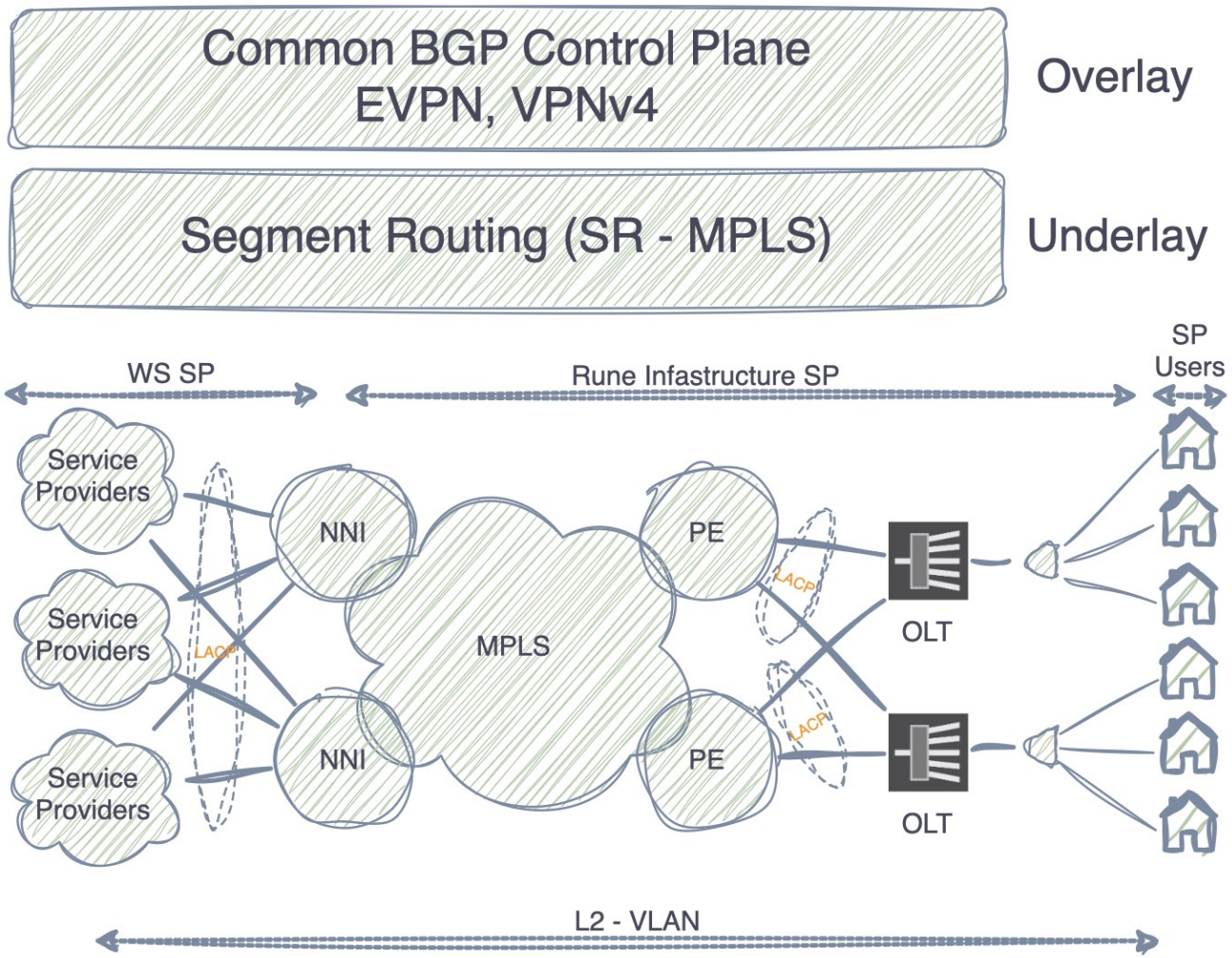
More than 10 ISPs are using our WS solution

More than 22 POPs

2 POPs with Network-to-Network Interfaces (NNI) interfaces



What do we choose for the Control Plane and Data Plane?



EVPN basics

EVPN Instance (EVI)

EVI identifies a VPN in the network

Ethernet Segment

Represents a site connected to one or more PEs

BGP Route types

1	**Ethernet Auto-Discovery (A-D) route**
2	**MAC/IP advertisement route**
3	**Inclusive Multicast Route**
4	**Ethernet Segment Route**
5	IP Prefix Route
6	**Selective Multicast Ethernet Tag Route**
7	**IGMP Join Synch Route**
8	**IGMP Leave Synch Route**

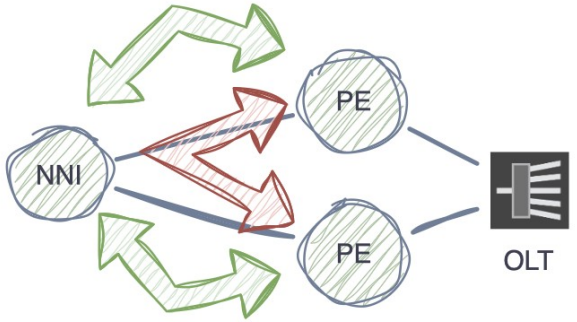
EVPN ETREE – RT Constrains (Scenario 1a)

- L2 isolation or allowing Leaf (PE) to talk **only** with Root (NNI)

BGP route-target is used for make the isolation

Root Configuration:

```
evpn
 evi 1000
  bgp
   route-target export 1:1000
   route-target import 1:1000
   route-target import 1:4019
```



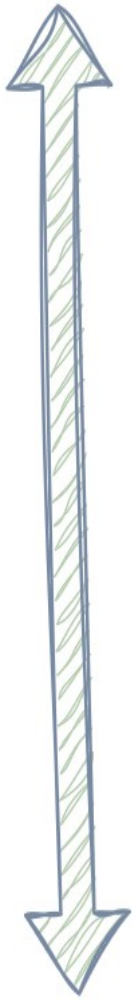
Leaf Configuration:

```
evpn
 evi 1000
  bgp
   route-target export 1:4019
   route-target import 1:1000
   !
   etree
    rt-leaf <- All Active Sync
```

Additional config to prevent OLT-to-OLT communication:

```
l2vpn
 bridge group EVPN-RUNE
  bridge-domain EVPN-RUNE-EXAMPLE
   interface Bundle-Ether1902.300
    split-horizon group
   interface Bundle-Ether1903.300
    split-horizon group
  !
  evi 1000
```

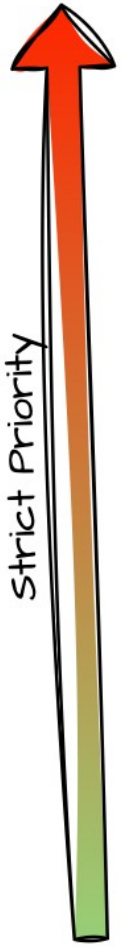
Summarize EVPN protocol



- All-active Multi-homing & PE load-balancing (ECMP)
- Easy to manage and troubleshoot
- Fast convergence (link, node)
- Hub and spoke E-TREE L2 resources distribution
- Efficiency multicast distribution – EVPN Selective Multicast
- Scalable for future usage
- Open-Standard

Quality of Service (QOS)

Queue	Traffic Name
7	Network protocols
6	Netowrk protocols
5	VoIP
4	Multimedia multicast traffic
3	Multimedia unicast traffic
2	Business traffic
1	Best Effort INET
0	Scavenger



L2 - COS
MPLS -EXP

Monitoring and Network Automation

EVPN helps us to automate network configuration

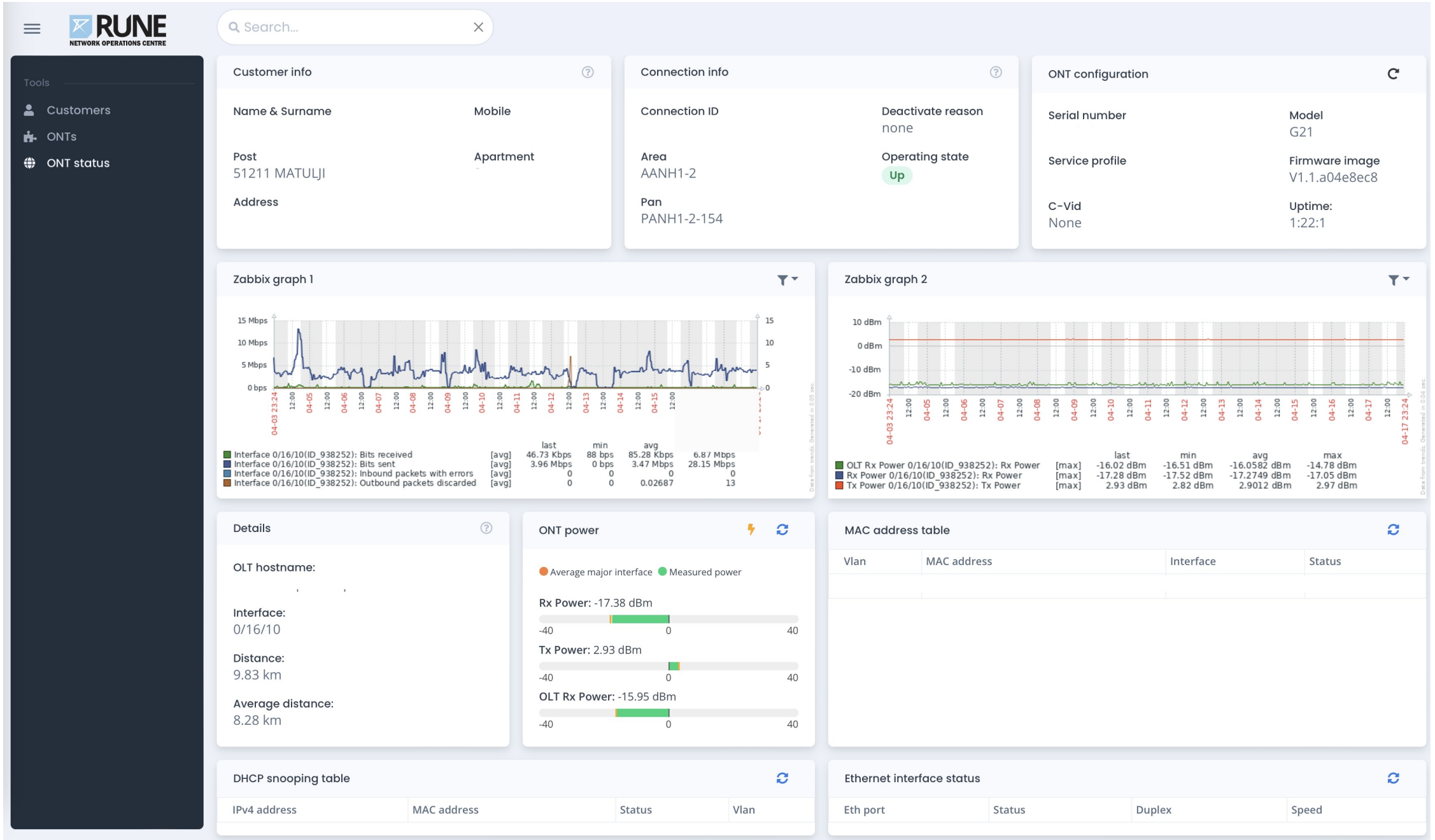
- 99% of network configuration changes are made by an automation

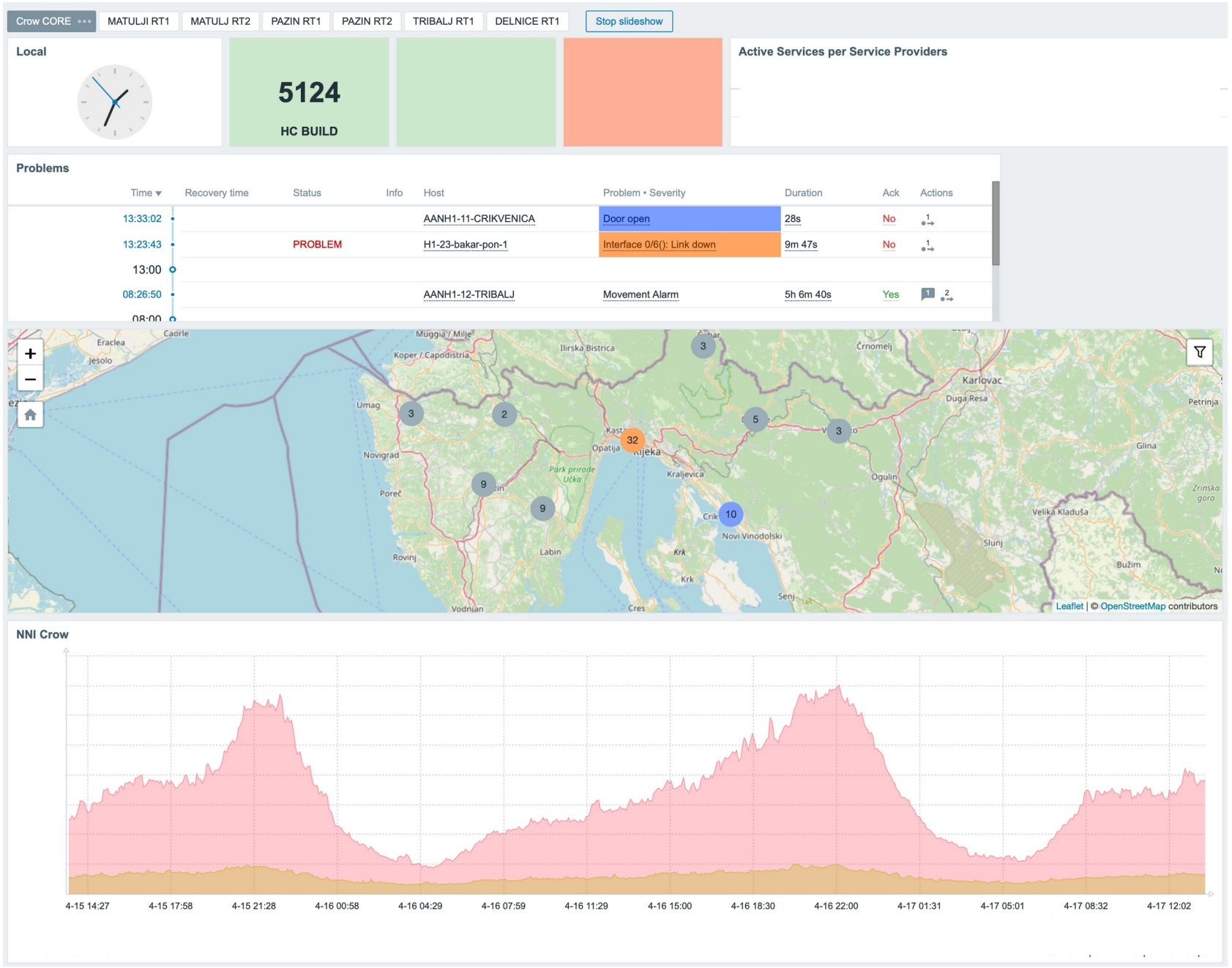
We made in-house automation with well-known languages:

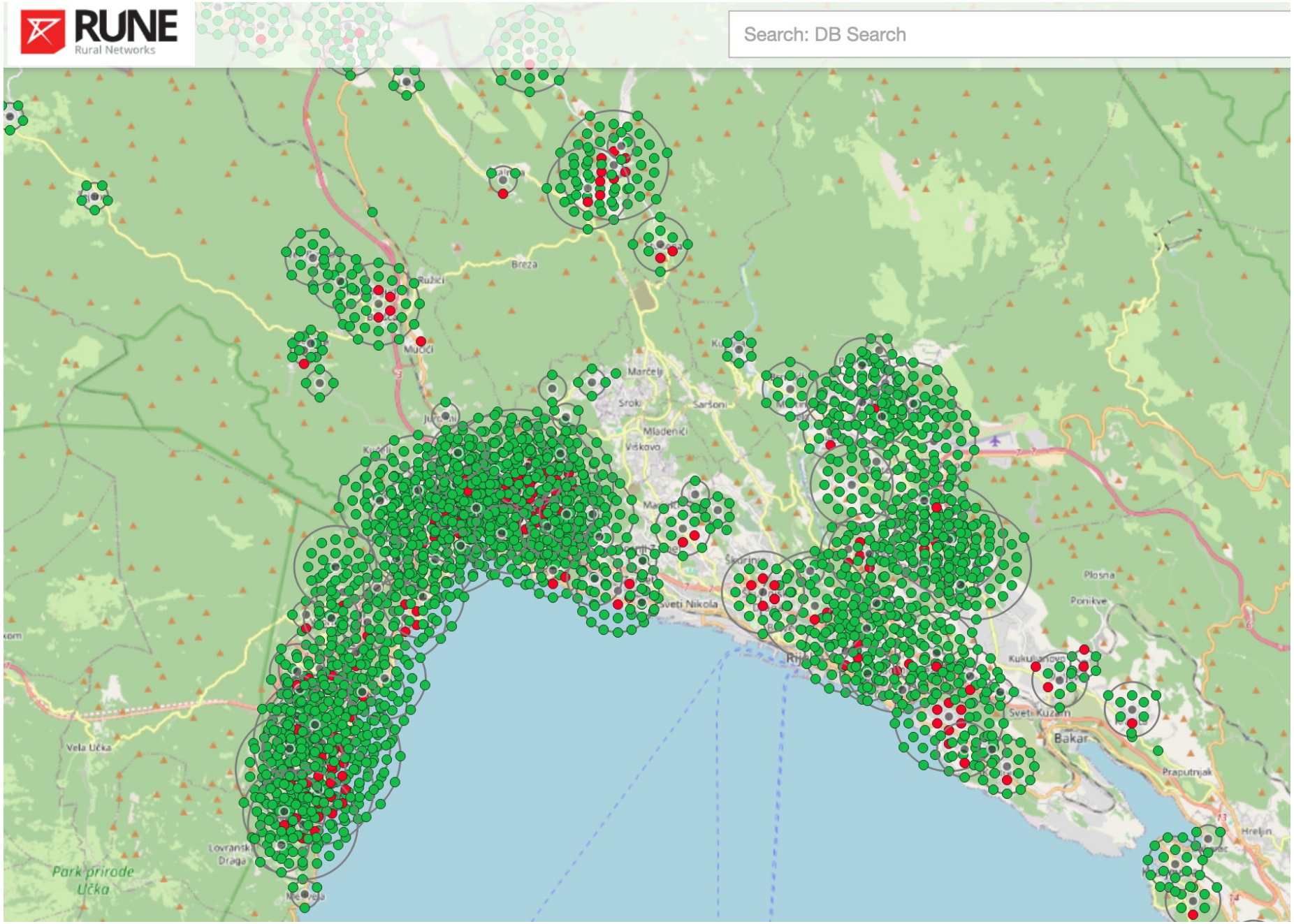
- Python
- Jinja2
- NETCONF/YANG

Our system management relies heavily on open-source software:

- Zabbix for network monitoring and growth analysis
- GrayLog for log analysis
- NetBox as our inventory system
- Our BSS/CRM solution is also in-house developed, based on open API.


RUNE
NETWORK OPERATIONS CENTRE
Search...
Tools
Customers
ONTs
ONT status
Customer info
Name & Surname
Mobile
Post
51211 MATULJI
Apartment
Address
Connection info
Connection ID
Deactivate reason
none
Area
AANH1-2
Operating state
Up
Pan
PANH1-2-154
ONT configuration
Serial number
Model
G21
Service profile
Firmware image
V1.1.a04e8ec8
C-Vid
None
Uptime:
1:22:1
Zabbix graph 1
15 Mbps
10 Mbps
5 Mbps
0 bps
Interface 0/16/10(ID_938252): Bits received [avg] 46.73 Kbps 88 bps 85.28 Kbps 6.87 Mbps
Interface 0/16/10(ID_938252): Bits sent [avg] 3.96 Mbps 0 bps 3.47 Mbps 28.15 Mbps
Interface 0/16/10(ID_938252): Inbound packets with errors [avg] 0 0 0 0
Interface 0/16/10(ID_938252): Outbound packets discarded [avg] 0 0 0.02687 13
Zabbix graph 2
10 dBm
0 dBm
-10 dBm
-20 dBm
OLT Rx Power 0/16/10(ID_938252): Rx Power [max] -16.02 dBm -16.51 dBm -16.0582 dBm -14.78 dBm
Rx Power 0/16/10(ID_938252): Rx Power [max] -17.28 dBm -17.52 dBm -17.2749 dBm -17.05 dBm
Tx Power 0/16/10(ID_938252): Tx Power [max] 2.93 dBm 2.82 dBm 2.9012 dBm 2.97 dBm
Details
OLT hostname:
Interface:
0/16/10
Distance:
9.83 km
Average distance:
8.28 km
ONT power
Average major interface
Measured power
Rx Power: -17.38 dBm
Tx Power: 2.93 dBm
OLT Rx Power: -15.95 dBm
-40
0
40
MAC address table
Vlan
MAC address
Interface
Status
DHCP snooping table
IPv4 address
MAC address
Status
Vlan
Ethernet interface status
Eth port
Status
Duplex
Speed


Crow CORE
MATULJI RT1
MATULJ RT2
PAZIN RT1
PAZIN RT2
TRIBALJ RT1
DELNICE RT1
Stop slideshow
Local
5124
HC BUILD
Active Services per Service Providers
Problems
Time
Recovery time
Status
Info
Host
Problem • Severity
Duration
Ack
Actions
13:33:02
AANH1-11-CRIKVENICA
Door open
28s
No
13:23:43
PROBLEM
H1-23-bakar-pon-1
Interface 0/6(): Link down
9m 47s
No
13:00
08:26:50
AANH1-12-TRIBALJ
Movement Alarm
5h 6m 40s
Yes
Leaflet | © OpenStreetMap contributors
NNI Crow
4-15 14:27
4-15 17:58
4-15 21:28
4-16 00:58
4-16 04:29
4-16 07:59
4-16 11:29
4-16 15:00
4-16 18:30
4-16 22:00
4-17 01:31
4-17 05:01
4-17 08:32
4-17 12:02


RUNE
Rural Networks
Search: DB Search
Breza
Ružići
Mučići
Marčelji
Sroki
Sarsoni
Mladeniki
Viškovo
Sveti Nikola
Plosna
Ponikve
Sveti Kuzam
Bakar
Praputnjak
Hreljin
Vela Učka
Lovranski Draga
Park prirode Učka

Summary

The Rune project, emphasizing efficient bundling and management of the network is a central objective.

EVPN is ideal for Infrastructure Service Providers whitch relay on L2 transport.

EVPN is a standardized protocol

EVPN gives us the flexibility to manage large numbers of services on the network and future growth

Redundancy is a key factor in transport networks.

Automated processes and the ability to monitor the network are important elements for efficient network management and operation

Hvala za pozornost.

Primož Dražumerič