WORKSHOP GARR 2022

NET MAKERS

Programmabilita' della rete Datacenter

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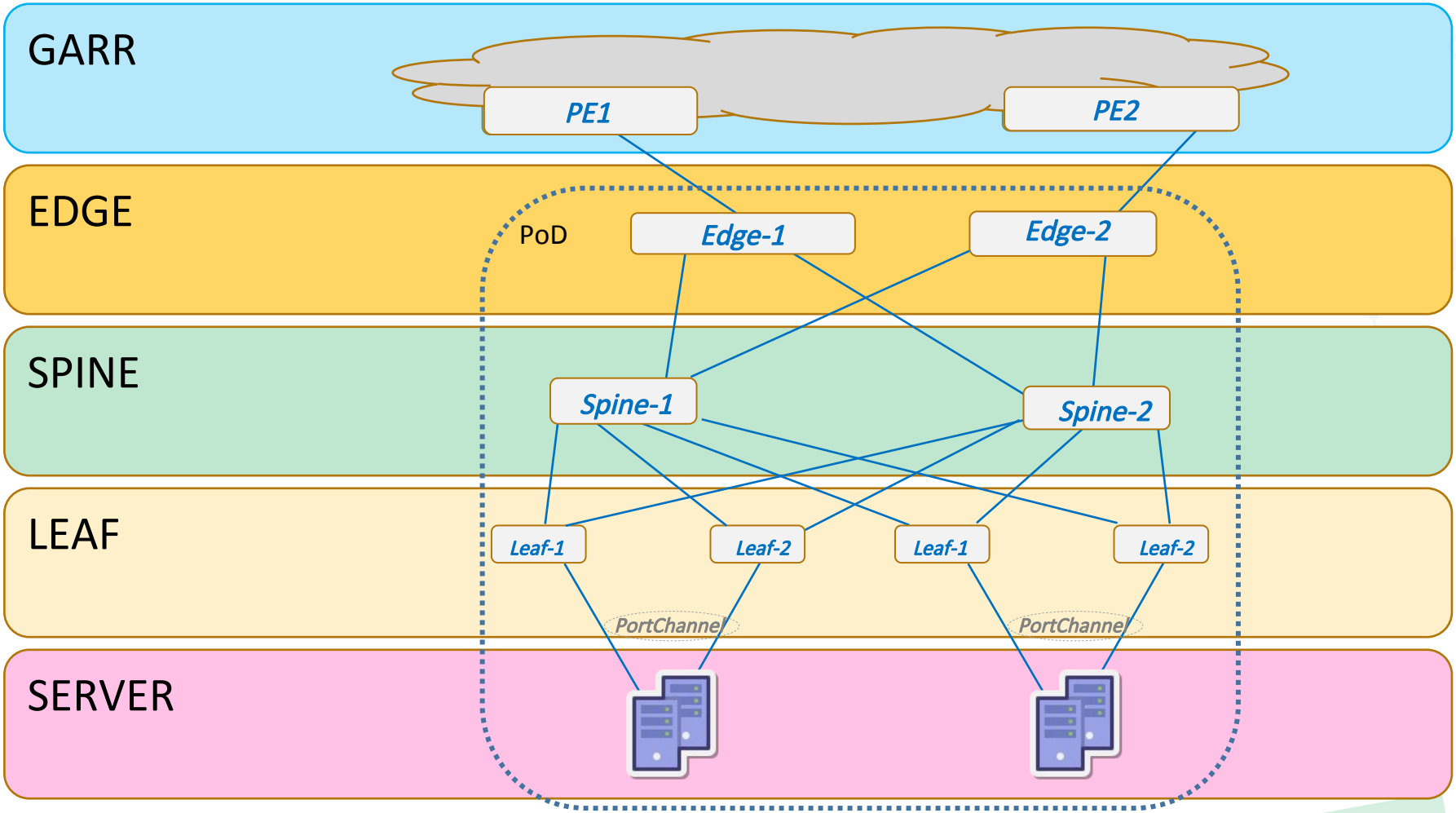
Agenda

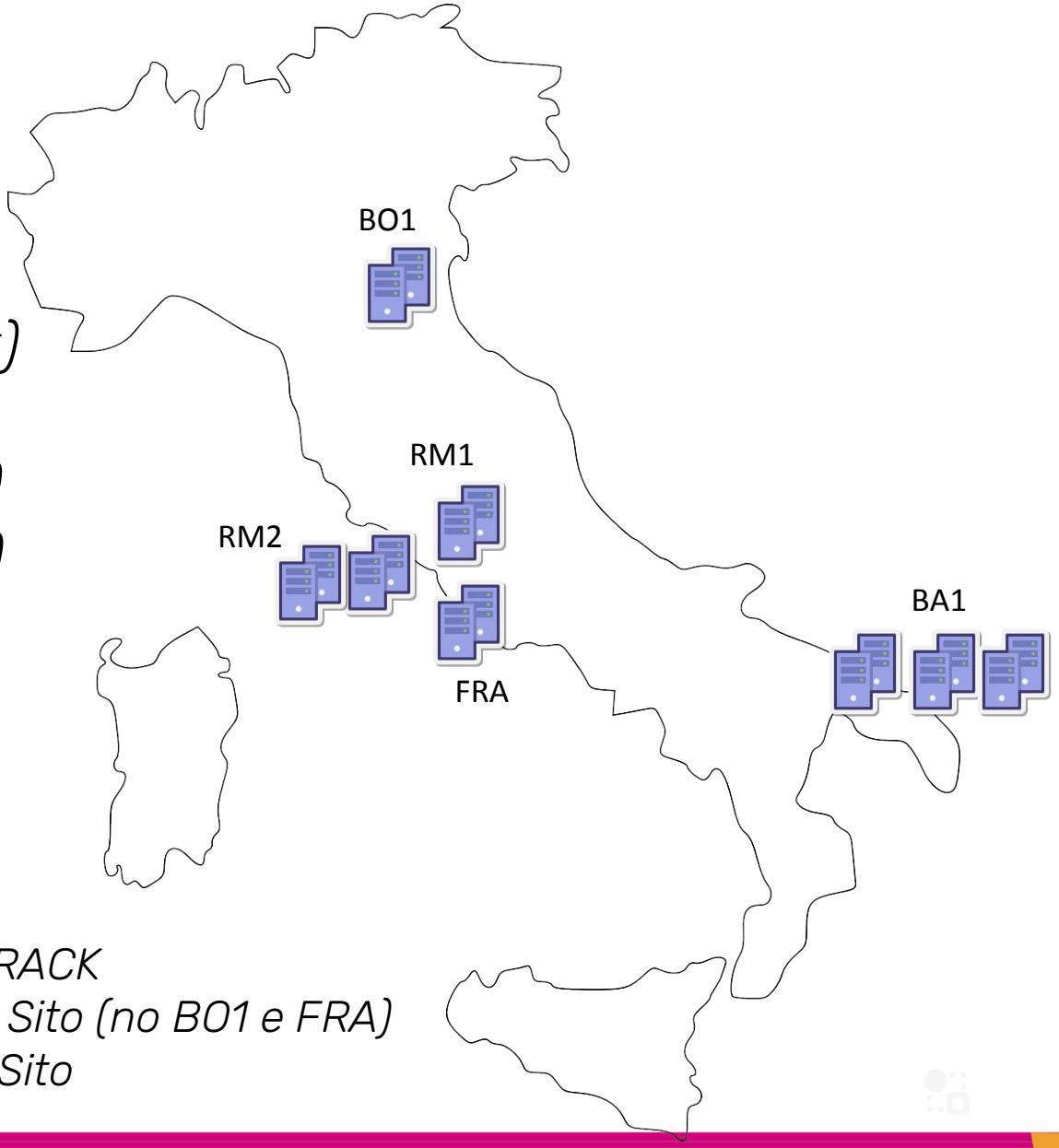
- *Come e' fatta la nuova rete DC GARR Infra*
  - *Architettura*
  - *Siti*
  - *Routing*
  - *Requisiti servizi di rete*
- *Gestire la complessita'*
  - *Automation*
    - *Cloud Vision Portal (CVP)*
    - *Ansible playbooks*
    - *Arista Validated Design (AVD)*
  - *Documentazione automatica*
  - *Statistiche*
  - *Alerting*

Architettura nuova rete DC



Siti DC

- *RM2 (2 rack)*
- *RM1 (1 rack)*
- *FRA (1 rack)*
- *BA1 (3 rack)*
- *BO1 (1 rack)*



2xLEAF per ogni RACK
2xSPINE per ogni Sito (no BO1 e FRA)
2xEDGE per ogni Sito

Componenti di un sito DC

MX-204
(4x 100G + 8x 10/1G)

BL

JUNIPER NETWORKS

7050CX3-32S-F
(32x 100G)

SPINE

7050SX3-48YC8-F
(8x 100G + 48 25/10/1G)

LEAF

ARISTA

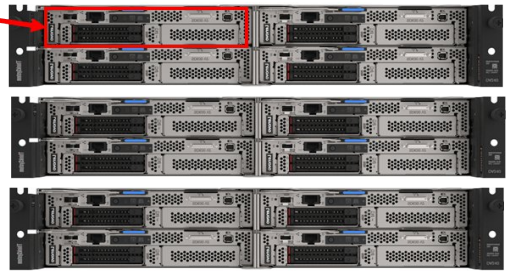
CloudVision

Network

Mini DC

SD630 v2
64 CORE
1T RAM
2x 25GE

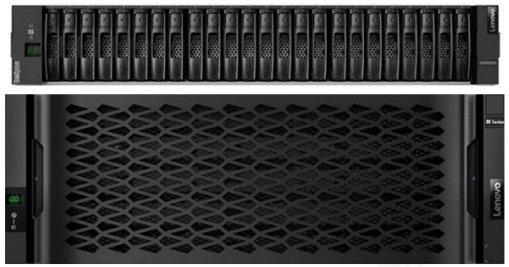
Lenovo



CPU
3x enclosure **DA240**

DE6000H
96 TByte SSD

DE600S
1 PByte meccanico
8x 25GE

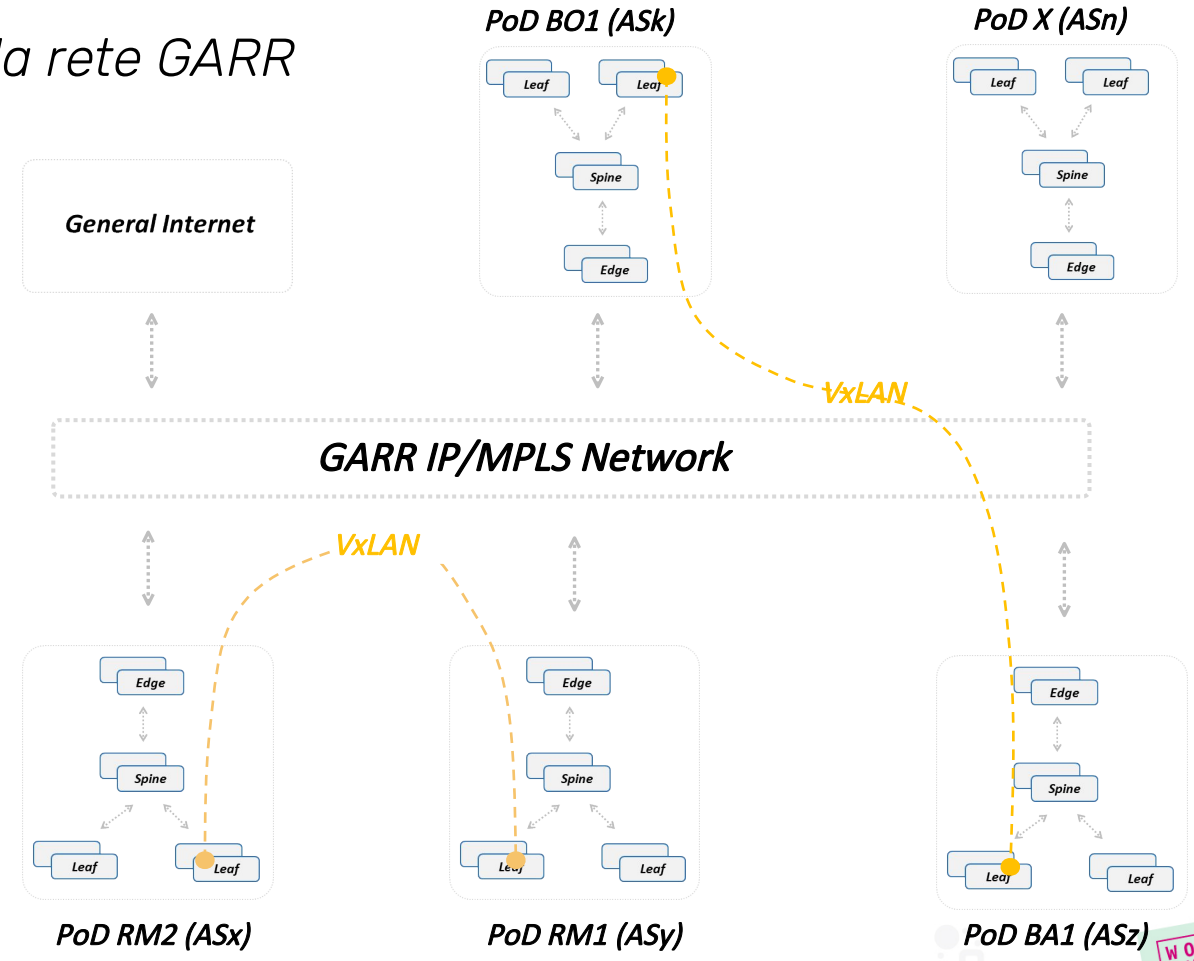


Storage

Architettura a POD

I Datacenter fanno parte di un unico sistema:

- *ogni PoP un PoD*
- *ogni PoD un AS*
- *PoD connessi alla rete GARR*



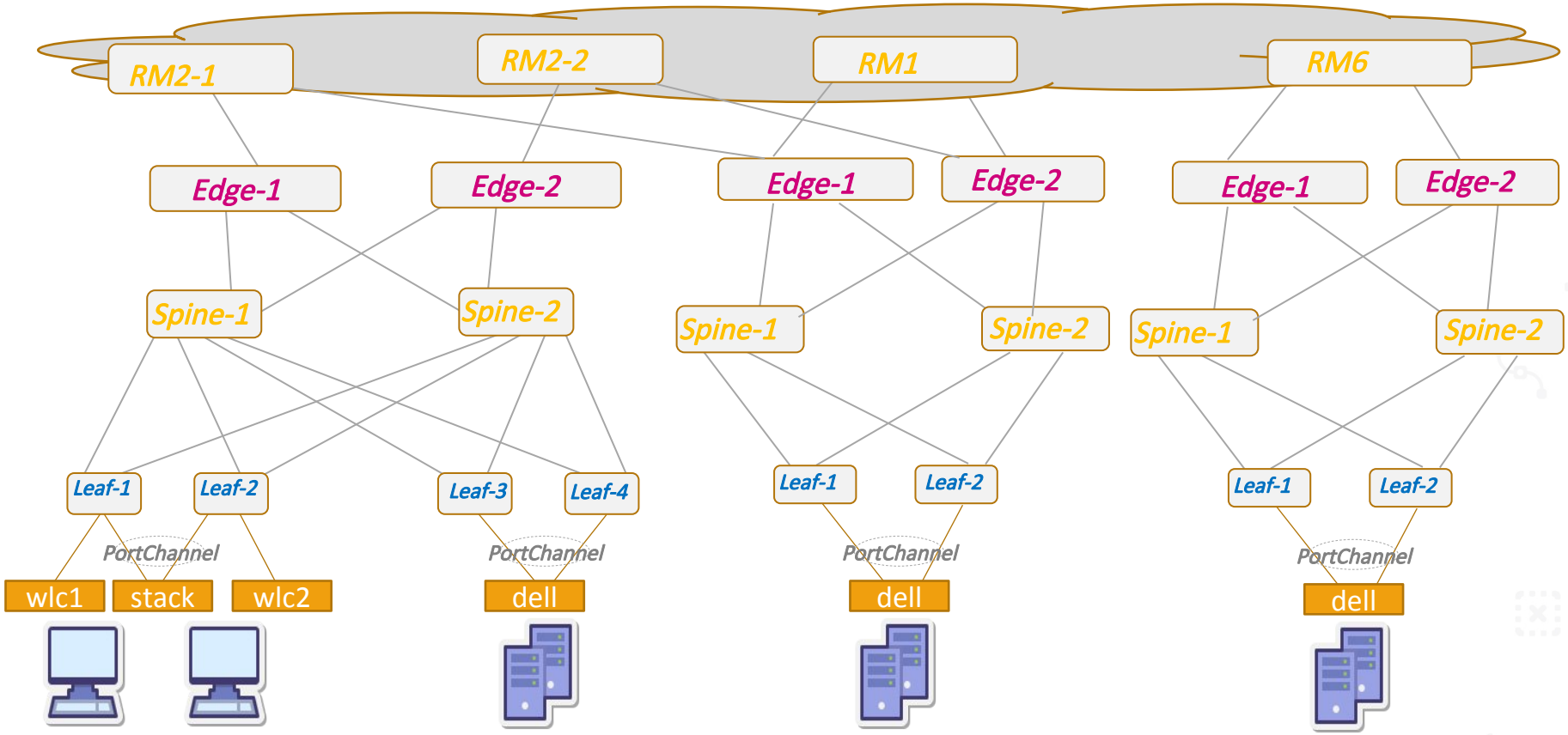
Protocolli di routing

- *ISIS all'interno dei PoD*
- *Segnalazione BGP EVPN per MAC e IP*
- *VARP (tra leaf e server): GW distribuito su due leaf*
  - *Anche in caso di punto-punto*
- *VXLAN tunnel terminati su VTEP (solo su LEAF/EDGE):*
- *Gli SPINE trasportano solo traffico IP*
- *Anycast gateway*
  - *Indirizzo IP gateway duplicato su piu' nodi contemporaneamente*
- *full-mesh BGP EVPN tra EDGE*
- *BGP EVPN sulla rete GARR non necessario*
  - *solo trasporto IP / VXLAN*

Requisiti dei servizi di rete

- *Segregazione delle LAN*
  - *Le LAN devono essere piu' isolate possibile*
- *Aggregregazione LAN in VRF per categorie di traffico*
  - *Alcune LAN devono scambiare traffico tra loro, indipendentemente dalla loro locazione geografica.*
- *Anycast Gateway (possibilita' di spostare le VM tra PoD)*
- *Sicurezza*
  - *Solo i servizi esplicitamente esposti devono essere raggiugibili*
- *Possibilita' di ospitare LAN estranee nei Data Center GARR*
  - *Garantendone la separazione con le altre LAN*

Molteplicita'

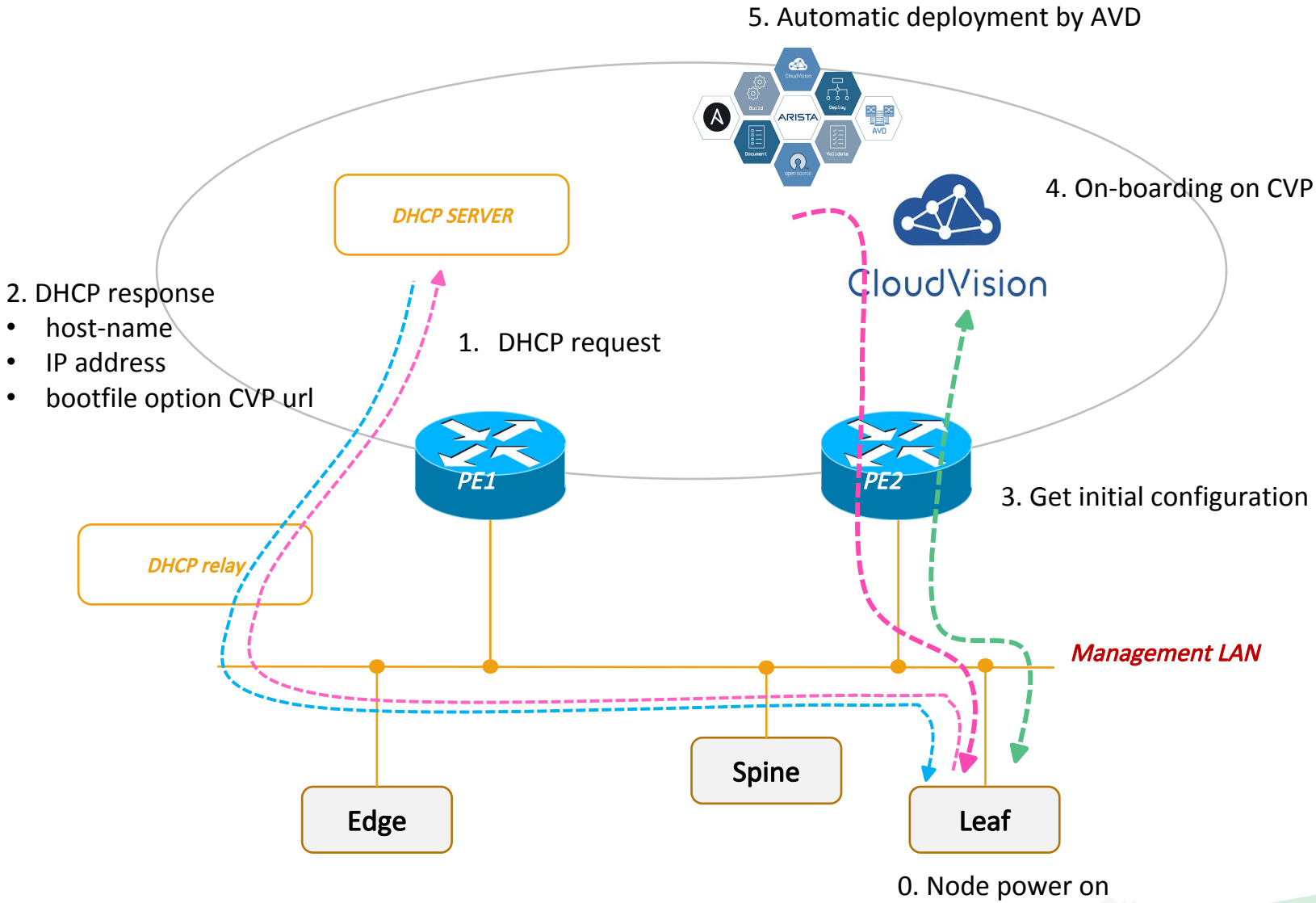


pc Server

Gestire la complessita'

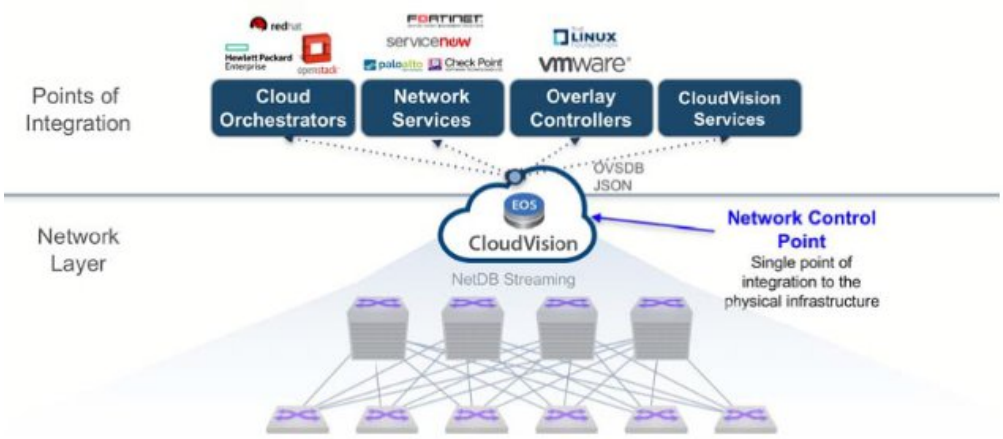
- *Zero touch provisioning*
- *Cloud Vision Portal*
  - *System upgrade*
  - *Configlets*
- *Arista Validated Design*
- *Ansible playbook*
  - *Juniper Firewall*
- *Bash script per la migrazione*
- *Documentazione automatica*
  - *Via CI/CD*
  - *Integrazione con RtD*
- *Telemetria*

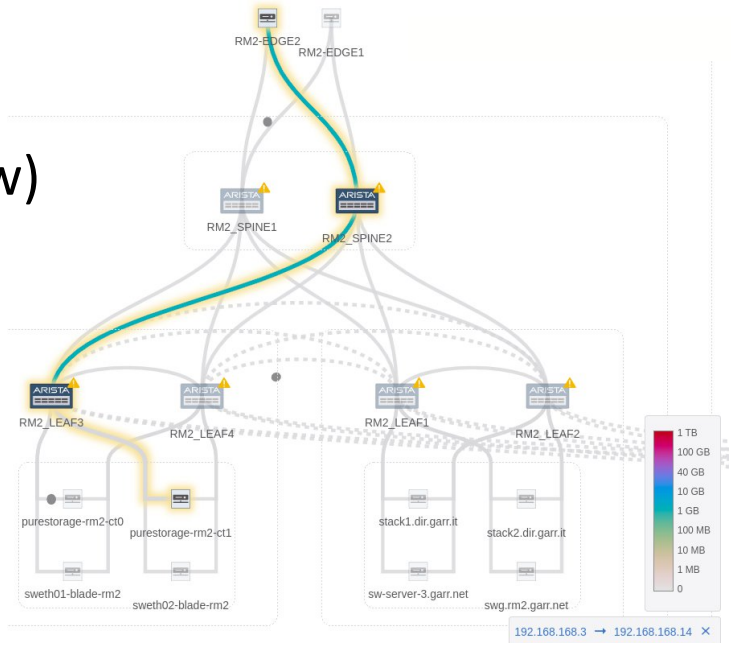
Procedura zerotouch provisioning



Management System (Cloud Vision Portal)

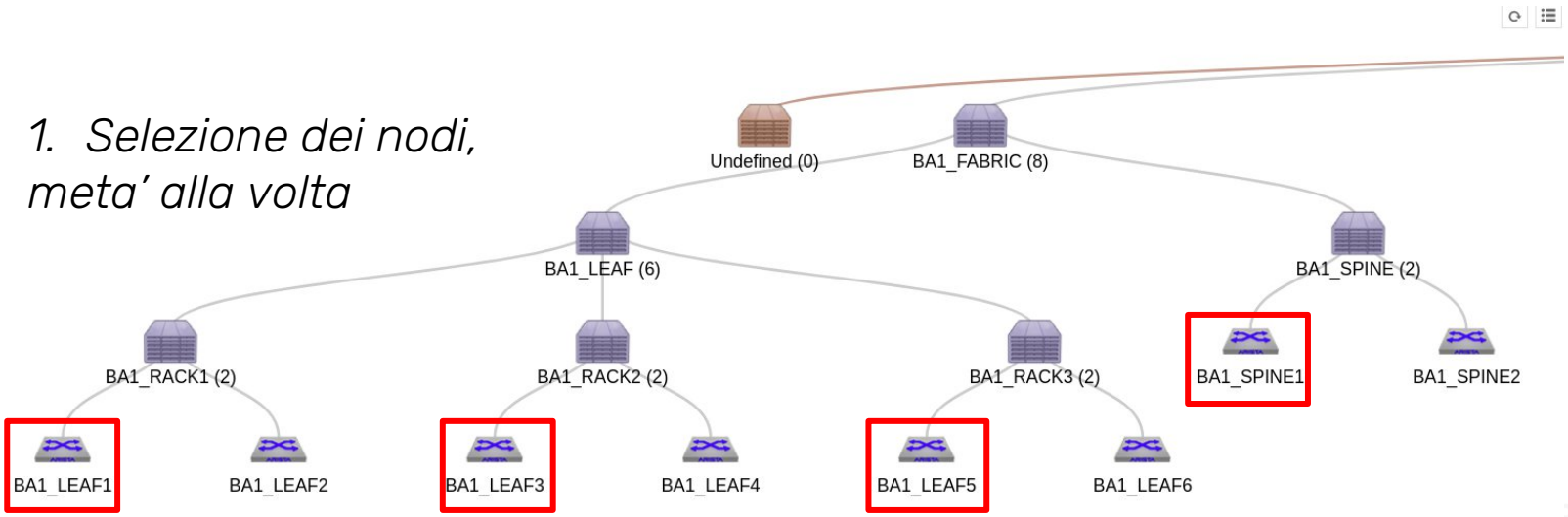
- Provisioning
  - zerotouch
  - configurazione via configlet
  - system upgrade massivo
- Inventory hardware
- Monitoring integrato
  - Dashboards
  - Telemetry
  - Logs
  - Flows (sflow)





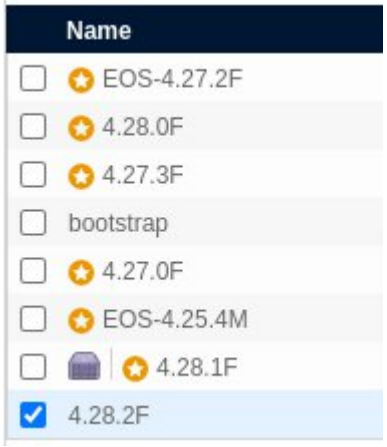
Procedura system upgrade

1. Selezione dei nodi, meta' alla volta



2. Selezione della release

3. Lancio del'upgrade



4. rete aggiornata

Device ↑	Issues	Model	Software
Filter	Filter	Filter	Filter
BA1_LEAF1	✓	7050SX3-48YC8	4.28.2F
BA1_LEAF2	✓	7050SX3-48YC8	4.28.2F
BA1_LEAF3	✓	7050SX3-48YC8	4.28.2F
BA1_LEAF4	✓	7050SX3-48YC8	4.28.2F
BA1_LEAF5	✓	7050SX3-48YC8	4.28.2F
BA1_LEAF6	✓	7050SX3-48YC8	4.28.2F

Senza disservizio!

Configlet

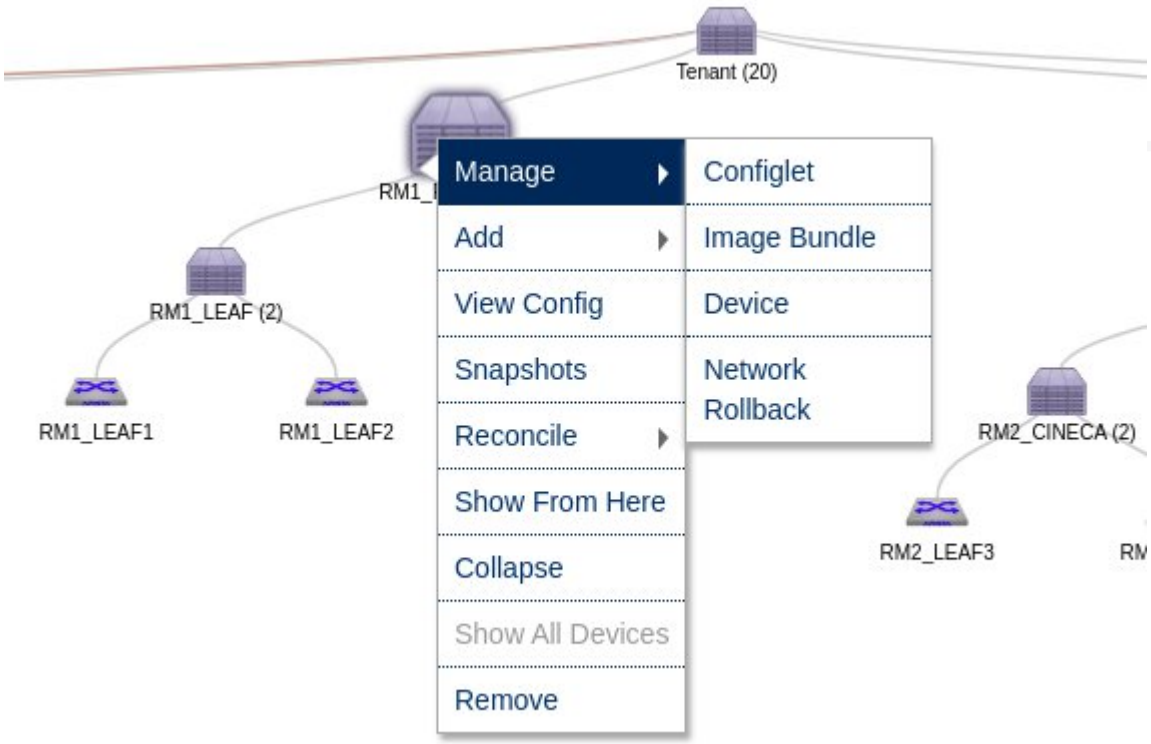
Configlets > GNMI

Summary | Logs | Change History

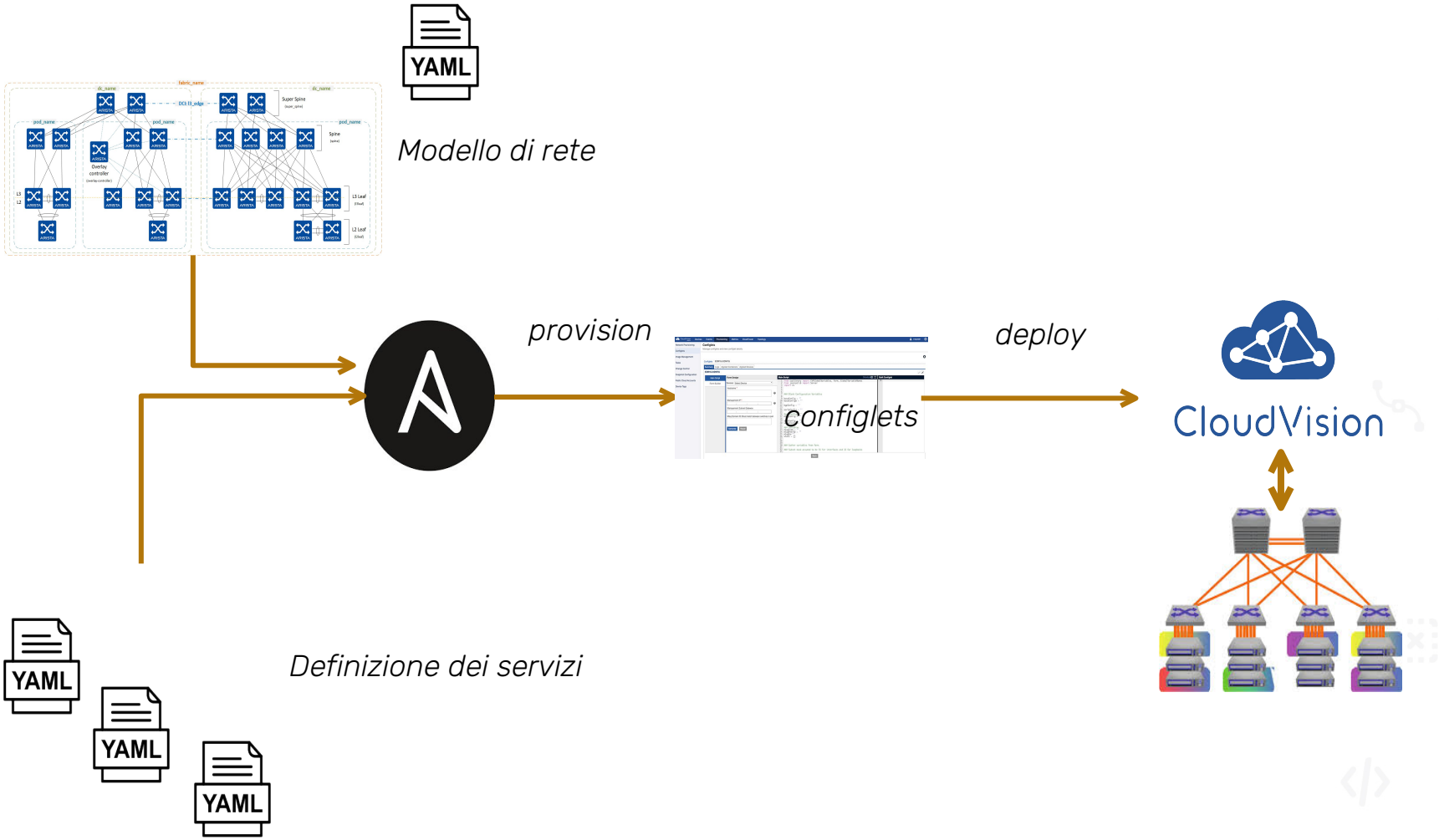
GNMI

Configuration

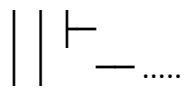
```
1  management api gnmi
2     transport grpc def
3        vrf MGMT
4     provider eos-native
5
```



Arista Validatad Design



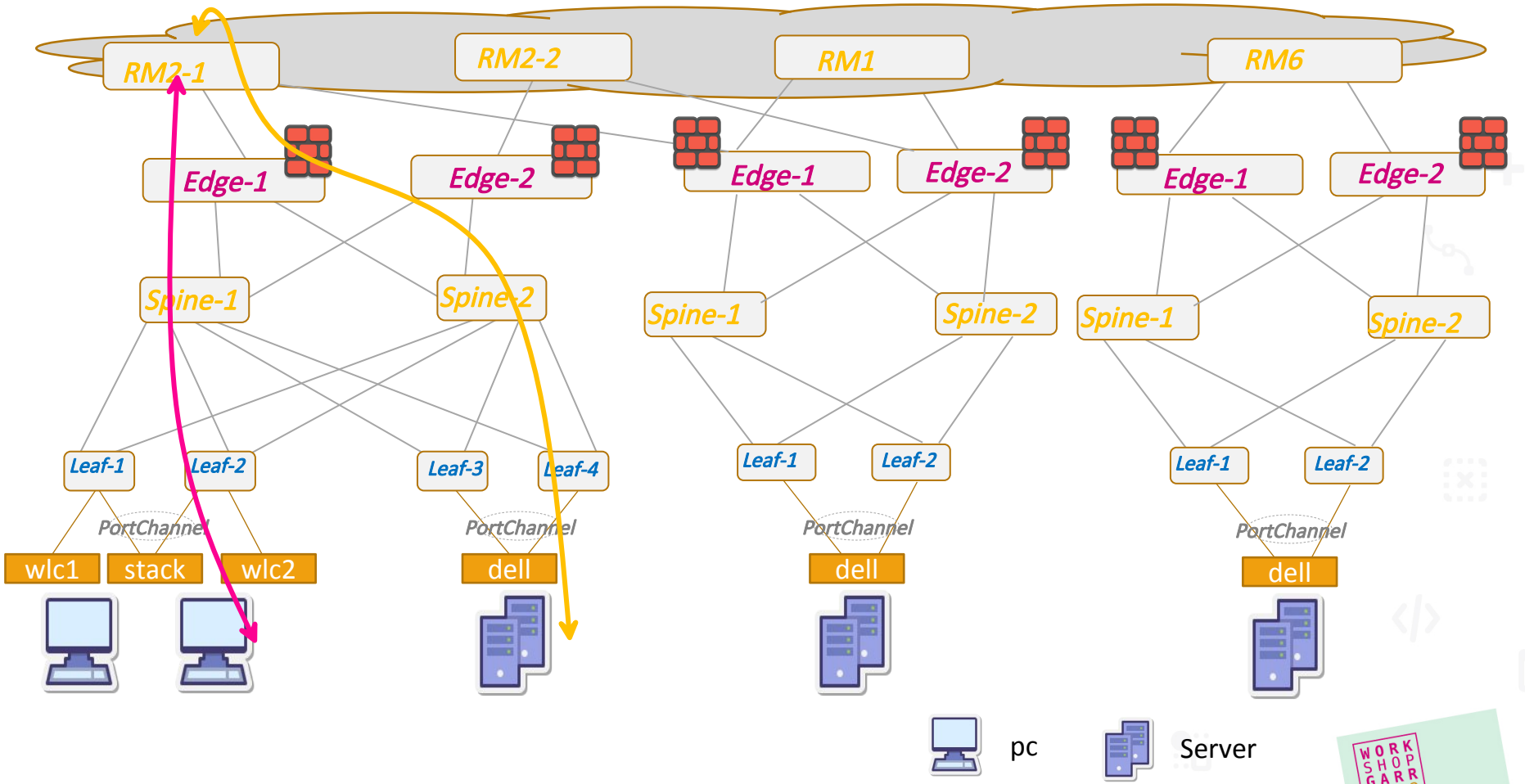
Gestione dei servizi via AVD



```
---
tenants:
  # Tenant A Specific Information - VRFs / VLANs
  Infra:
    mac_vrf_vni_base: 10000
    vrfs:
     <vrf name> :
       vrf_vni: <vni>
       svis:
         # per la gestione della posta
         <vlan ID>:
          name: mail
          tags: [<tag1>,<tag2>,..,<tag n>]
          enabled: true
          ip_address_virtual: <ip gateway>/<bitmask>
          nodes:
            <leaf1>:
            <leaf2>:
            <leaf3>:
            ...:
            <leaf n>:
```

Gestione policy di sicurezza

- *Firewall stateless su tutti gli EDGE per il traffico esterno*
- *E' permesso solo il traffico dei servizi da esporre*
- *Anche il traffico tra VRF diverse dello stesso DC passa attraverso il Firewall*



Playbook per le policy

INVENTORY

```
EDGES:
  hosts:
    RM2_EDGE1:
      ansible_host: 10.1.100.26
    RM2_EDGE2:
      ansible_host: 10.1.100.27
  vars:
    site: RM
```

```
EDGES:
  hosts:
    RM1_EDGE1:
      ansible_host: 10.2.100.26
    RM1_EDGE2:
      ansible_host: 10.2.100.27
  vars:
    site: RM
```

FIREWALL/TERMS

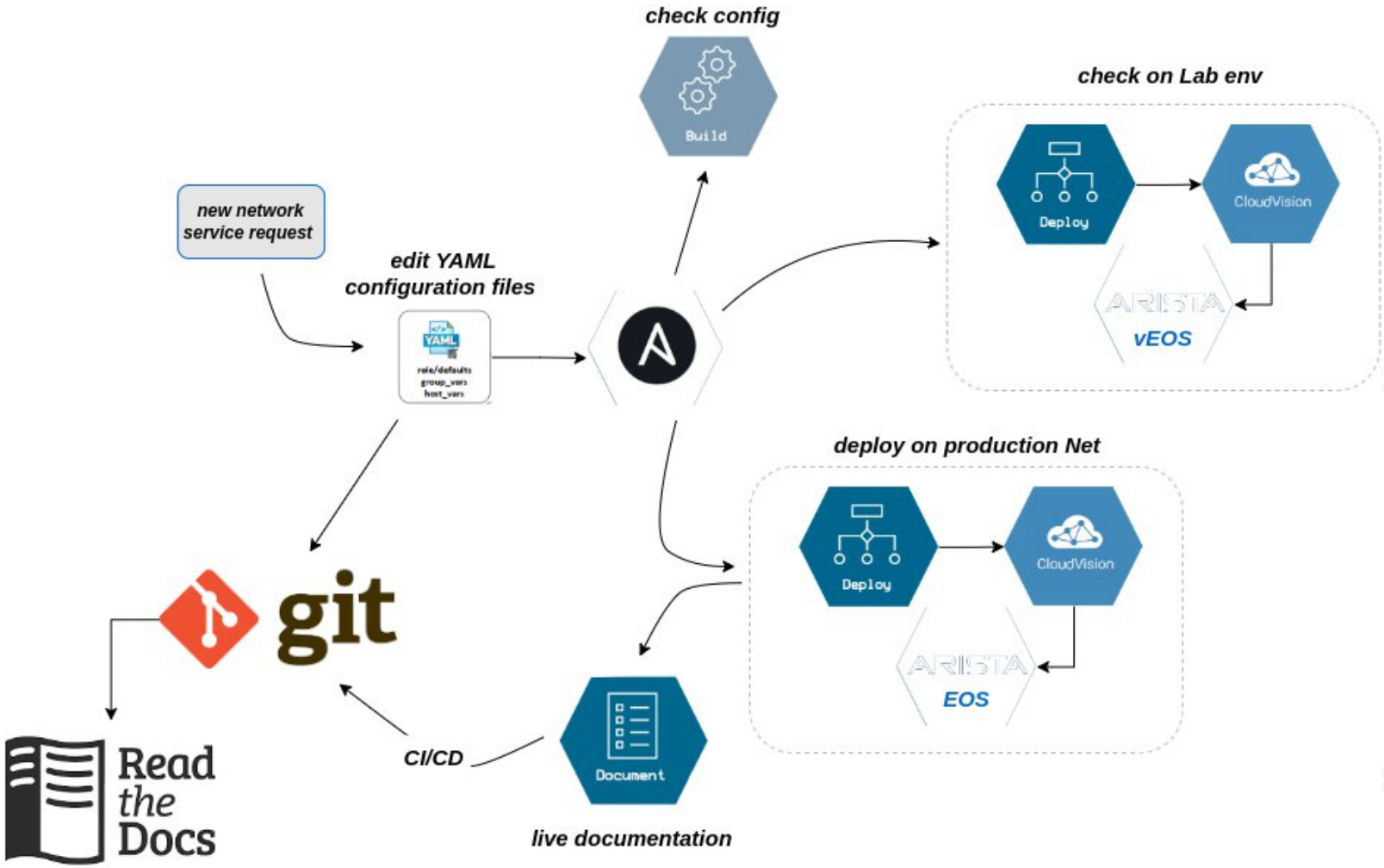
```
firewall_filter:
  RM:
    - WEB
    - SMTP
    - ...
terms:
 WEB:
   comment: Siti WEB
   match-conditions:
     destination-prefix-list:
web-server
     destination-port:
       - 80
       - 443
     protocol:
       - tcp
   actions:
     count: web
     traffic-control: accept
```

PREFIX LIST

```
prefix_lists:
  web-server:
   RM:
      - 90.147.96.29/32
      - 90.147.96.81/32
      - ...
      - 2001:760:0:158::6/128
      - 2001:760:0:158::13/128

  smtp-server:
   RM:
      - 90.147.96.61/32
      - 193.206.158.1/32
      - 193.206.158.62/32
      - 2001:760:0:158::1/128
```

Procedura di deploy

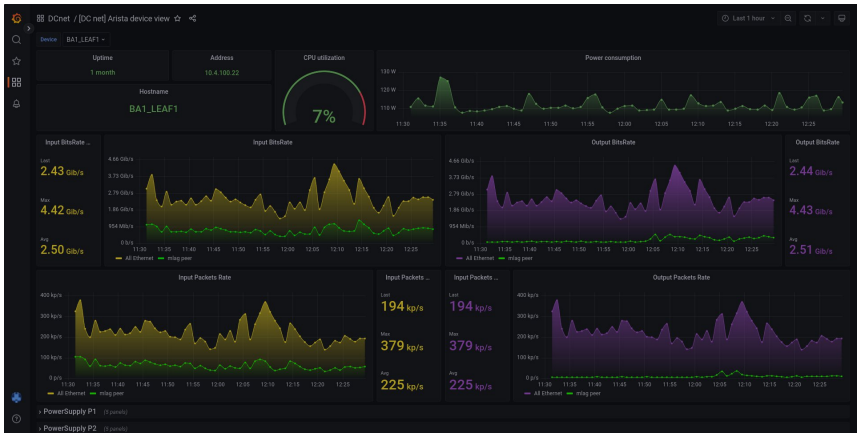


Flusso di lavoro

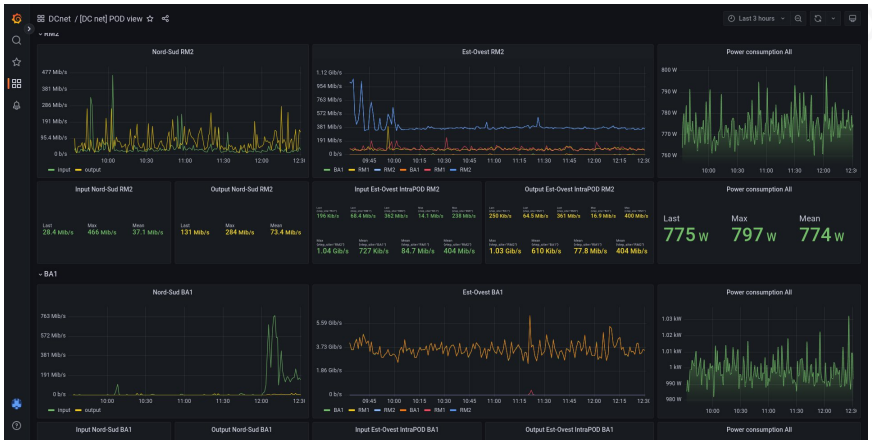
1) Chi sviluppa l'applicazione decide:
    1) In quale rete deve stare
    2) Con quali eventuali altre reti deve parlare
    3) Che servizi devono essere esposti
2) Clone del repo GIT e modifica dei file yaml:
    1) File del servizio
    2) File delle firewall policy
3) Merge request
4) Validazione del codice da parte degli amministratori di rete:
    1) Eventuale test su laboratorio
5) Merge
6) Lancio dei playbook sulla rete di produzione

Statistiche del DC: Telegraf InfluxDB Grafana

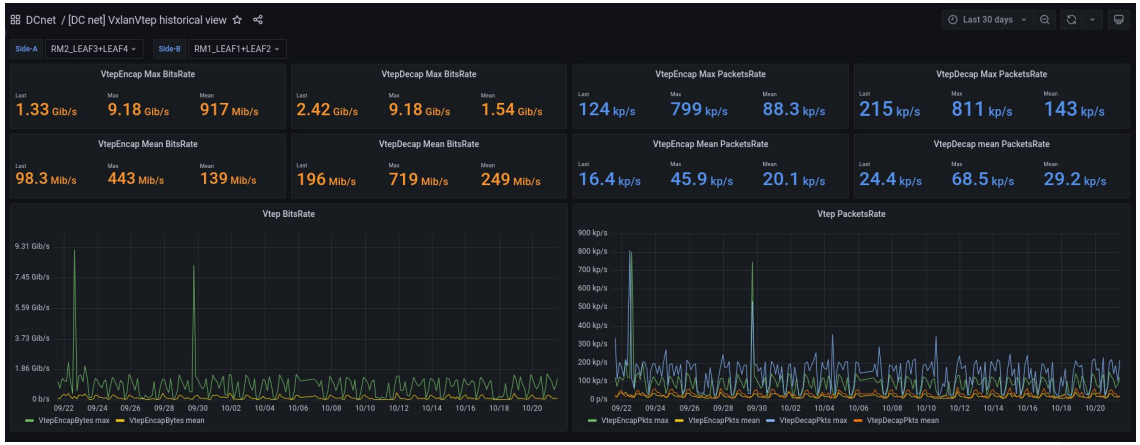
Device view



PoD view



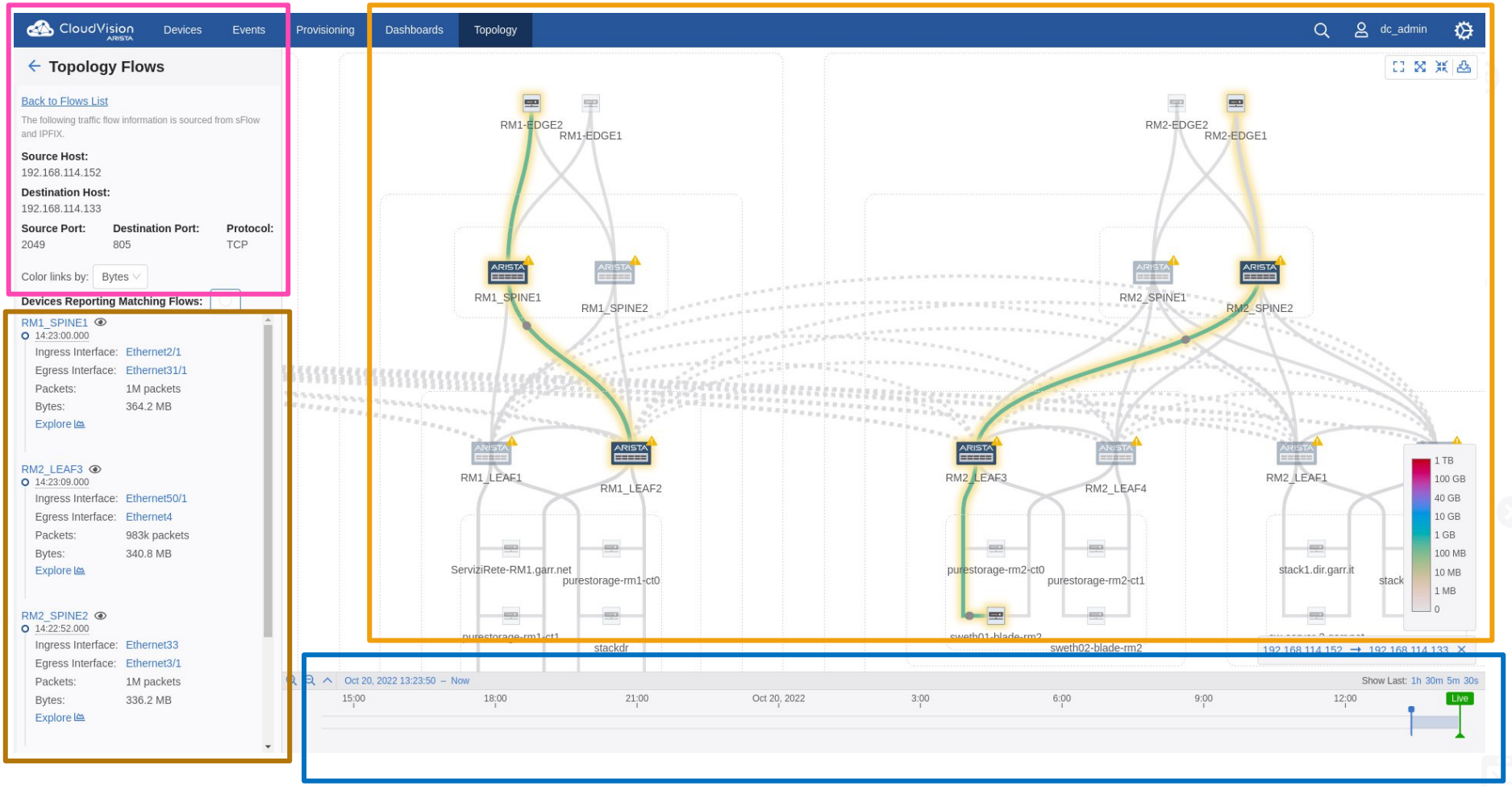
VxLAN counters



Sflow

Dettagli

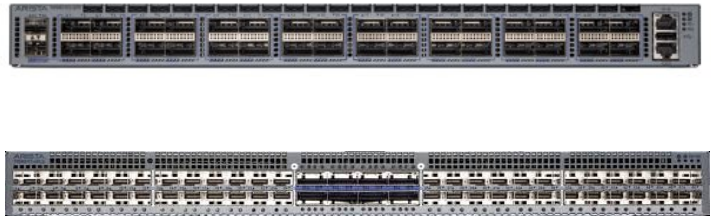
Percorso del flusso



Volume di traffico per nodo/interfacce

Selezione temporale

Alerts



CloudVision

ARISTA

Poll

Telemetria

ZABBIX

TIG stack

slack

Check routing via Telemetria (in sviluppo)

ISIS adjacency state

ISIS Adjacency State

Router	Interface	system_id	Status
10.1.100.22	Ethernet49/1	0001.0000.0001	UP
10.1.100.22	Ethernet50/1	0001.0000.0002	UP
10.1.100.22	Vlan4093	0001.0001.0002	UP
10.1.100.23	Ethernet49/1	0001.0000.0001	UP
10.1.100.23	Ethernet50/1	0001.0000.0002	UP
10.1.100.23	Vlan4093	0001.0001.0001	UP
10.1.100.24	Ethernet49/1	0001.0000.0001	UP
10.1.100.24	Ethernet50/1	0001.0000.0002	UP
10.1.100.24	Vlan4093	0001.0001.0004	UP
10.1.100.25	Ethernet49/1	0001.0000.0001	UP
10.1.100.25	Ethernet50/1	0001.0000.0002	UP
10.1.100.25	Vlan4093	0001.0001.0003	UP
10.2.100.22	Ethernet49/1	0001.0000.0001	UP
10.2.100.22	Ethernet50/1	0001.0000.0002	UP
10.2.100.22	Vlan4093	0001.0001.0002	UP
10.2.100.23	Ethernet49/1	0001.0000.0001	UP
10.2.100.23	Ethernet50/1	0001.0000.0002	UP
10.2.100.23	Vlan4093	0001.0001.0001	UP

BGP peering state

BGP Peering State

outer	neighbor_address	State
0.1.100.22	10.1.20.1	ESTABLISHED
0.1.100.22	10.1.20.2	ESTABLISHED
0.1.100.23	10.1.20.1	ESTABLISHED
0.1.100.23	10.1.20.2	ESTABLISHED
0.1.100.24	10.1.20.1	ESTABLISHED
0.1.100.24	10.1.20.2	ESTABLISHED
0.1.100.25	10.1.20.1	ESTABLISHED
0.1.100.25	10.1.20.2	ESTABLISHED
0.2.100.22	10.2.20.1	ESTABLISHED
0.2.100.22	10.2.20.2	ESTABLISHED
0.2.100.23	10.2.20.1	ESTABLISHED
0.2.100.23	10.2.20.2	ESTABLISHED
0.3.100.22	10.3.20.64	ESTABLISHED
0.3.100.22	10.3.20.65	ESTABLISHED
0.3.100.23	10.3.20.64	ESTABLISHED
0.3.100.23	10.3.20.65	ESTABLISHED
0.4.100.22	10.4.20.1	ESTABLISHED
0.4.100.22	10.4.20.2	ESTABLISHED

Segnalazione dello stato del routing in tempo reale

Rovescio della medaglia

- *Servono molte piu' competenze informatiche*
- *Non si puo' tornare indietro alle procedure manuali*
- *Troubleshooting su CLI*

FINE

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