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BGP RIB COMPLIANCE USING MDT

<https://github.com/petermoorey/NANOG-8o-Hackathon/>

NANOG-8o Hackathon



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GOAL

- Evaluate various technology stacks
- Evaluate network telemetry capabilities
- Develop a network capable of showcasing various routing scenarios
- Provide real-time evaluation of BGP routes to detect:
 - Poorly configured route-maps
 - Incorrect provider policies
 - Route hijacking

TECHNOLOGY STACK



- CSR 1000v
- CML



- Service Provisioning
- Service Chaining



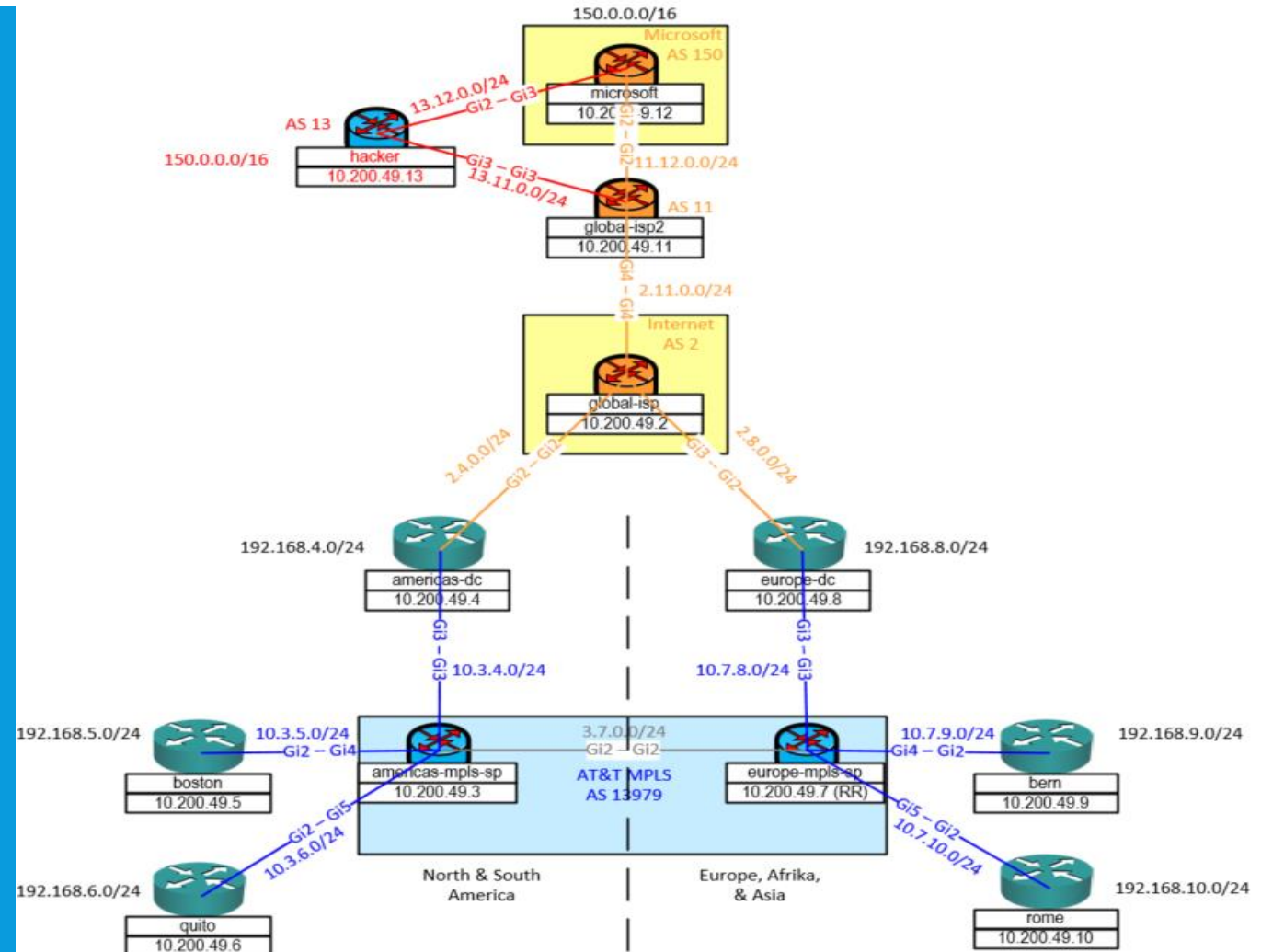
- InfluxDB
- Telegraf
- Chronograph



- Policy Processing
- Notification Handling
- Websocket Manager

LAB SETUP

- Challenges:
 - Are the regional route preferences being honored for the default route?
 - Is traffic to/from our providers being hijacked?



DATA COLLECTION

templates > `mdt_xml.jinja2`

```
1 <config>
2 <mdt-config-data xmlns="http://cisco.com/ns/yang/Cisco-IOS-XE-mdt-cfg">
3 {% for id, sub in data["subscriptions"].items() %}
4 <mdt-subscription>
5 <subscription-id>{{ id }}</subscription-id>
6 <base>
7 <stream>yang-push</stream>
8 <source-vrf>{{ sub["sourcevrf"] }}</source-vrf>
9 <encoding>encode-kvgpb</encoding>
10 {% if sub["period"] == "on_change" %}
11 <no-synch-on-start>false</no-synch-on-start>
12 {% else %}
13 <period>{{ sub["period"] }}</period>
14 {% endif %}
15 <xpath>{{ sub["xpath"] }}</xpath>
16 </base>
17 <mdt-receivers>
18 <address>{{ sub["rx"]["ip"] }}</address>
19 <port>{{ sub["rx"]["tcp_port"] }}</port>
20 <protocol>grpc-tcp</protocol>
21 </mdt-receivers>
22 </mdt-subscription>
23 {% endfor %}
24 </mdt-config-data>
25 </config>
```

```
def main(grpc_host):

    hosts = []

    with open("mdt_subscriptions.yml", "r") as f:
        mdt_sub = safe_load(f)

    with open(INVENTORY_FILE, "r") as f:
        inventory = safe_load(f)

    for router in inventory['routers']:
        if inventory['routers'][router]['mdt_bgp']:
            hosts.append(inventory['routers'][router]['ip'])

    for subscription in mdt_sub['subscriptions']:
        mdt_sub['subscriptions'][subscription]['rx']['ip'] = grpc_host
    j2_env = Environment(loader=FileSystemLoader("."), trim_blocks=True, autoescape=True)
    template = j2_env.get_template("templates/mdt_xml.jinja2")
    new_config = template.render(data=mdt_sub)

    for host in hosts:

        connect_params = {
            "host": host,
            "username": USER,
            "password": PWD,
            "hostkey_verify": False,
            "allow_agent": False,
            "look_for_keys": False,
            "device_params": {"name": "csr"},
        }

        with manager.connect(**connect_params) as conn:
            print(f"NETCONF session connected: {host}")

            # Perform the update, and if success, print a message
            config_resp = conn.edit_config(target="running", config=new_config)
            if config_resp.ok:
                print(f"Added ({len(mdt_sub['subscriptions'])}) subscriptions")

            print(f"NETCONF session disconnected: {host}")
```

POLICY EVALUATION

```

1 # BGP RIB Compliance Policy file for demo lab
2
3 root_source: Cisco-IOS-XE-bgp-oper:bgp-state-data/bgp-route-vrfs/bgp-route-vrf
4 root_path: bgp_route_af/bgp_route_filter/bgp_route_entry/bgp_path_entry/
5 regions:
6     emea:
7         - 10.200.49.9      # Bern
8         - 10.200.49.10    # Rome
9     americas:
10        - 10.200.49.5      # Boston
11        - 10.200.49.6      # Quito
12    external:
13        - 10.200.49.4      # Americas DC
14        - 10.200.49.8      # Europe DC
15 policy:
16     0.0.0.0/0:             # Match default route
17         match: explicit    # Match type is explicit. RIB prefix must match 0.0.0.0/0 exactly
18         region: americas   # Region to monitor for RIB updates on
19         attributes:        # List of attributes to evaluate and expected values
20             community: 100:1 # Community value expected in RIB update
21     0.0.0.0/0:             # Match default route
22         match: explicit    # Match type is explicit. RIB prefix must match 0.0.0.0/0 exactly
23         region: emea       # Region to monitor for RIB updates on
24         attributes:        # List of attributes to evaluate and expected values
25             community: 100:2 # Community value expected in RIB update
26     192.168.0.0/16:
27         match: any          # any match will include any network prefix that is within the subnet, or the subnet itself
28         region: external
29         attributes:
30             origin: 100
31             # community: 100
32             as_path: 13|79 13979
33     150.0.0.0/16:
34         match: any
35         region: external
36         attributes:
37             origin: 150
38

```

[illegible]

VISUALIZATION

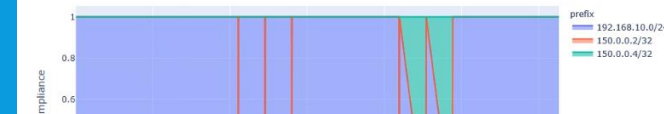
BGP Routing Compliance Dashboard

NANOG 80 Hackathon

Select a prefix

Select...

Origin - Count of Non-Compliant Events



AS Path Compliance - Count of Non-Compliant Events



BGP Routing Compliance

:Router: R04-america-dc
:Prefix: 150.0.0.2/32

+ Add Template Variable

Count of BGP events by Router Name



Count of Non-Compliant BGP Events by Router

