

Now with extra
Edge ;)



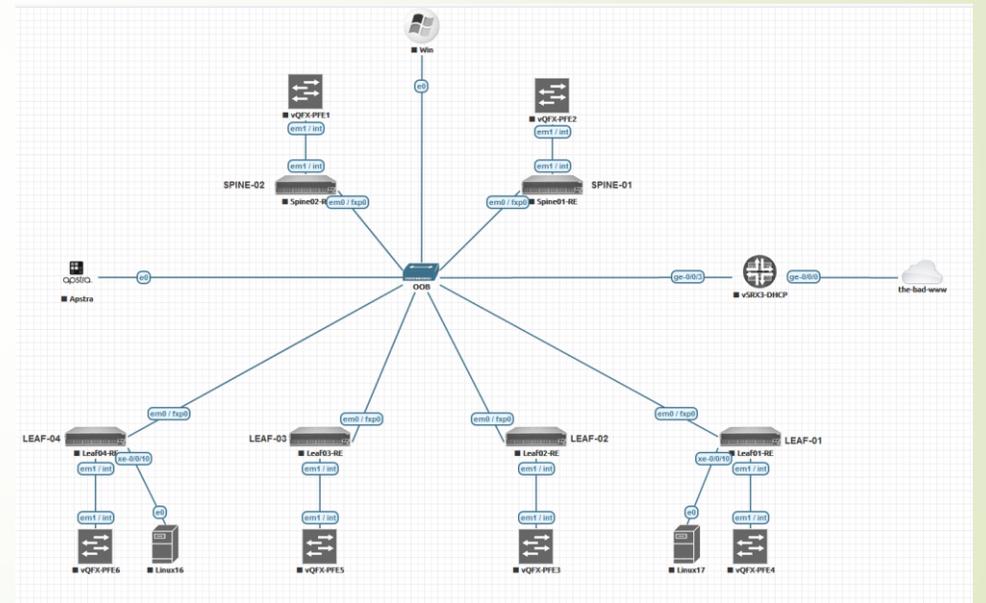
Juniper Open Learning

Building a Juniper Lab Environment with EVE-NG for Daily Usage

June 18th
2 PM Pacific Time

Why Virtual Labs

Save Power / Rackspace / Hardware Costs



What is EVE-NG?



Emulated Virtual Environment
Next Generation



Why EVE-NG | Why Virtual Labs

- ▶ Quickly Lab / Test a new Design
- ▶ No additional Hardware Costs for Equipment
- ▶ GREAT for Certification → Combine with vLabs and AATP
- ▶ Get started for free with the Community Edition
- ▶ Vendor-Neutral! Great for Migrations / Interop Tests
- ▶ Extremely Flexible (Bare-Metal, VM | On-Prem | Colocation | Cloud)

EVE-NG Flavors

- Bare-Metal (best performance)
Needed for some vDevices
- VMware (best flexibility)
- Cloud (best „power-boost“ option)



EVE-NG Installation, Setup and more

- 3-Part Video Series
- https://learningportal.juniper.net/juniper/user_activity_info.aspx?id=EDU-JUN-WBT-JOL-EVENG

Course Modules ▲

#	Module	Duration	Lab	Required	Status
1	Module 01: Building a Juniper EVE-NG Lab Environment for Daily Usage Part 1: EVE-NG Overview ●	52m		<input type="radio"/>	Not Started
2	Module 02: Building a Juniper EVE-NG Lab Environment for Daily Usage Part 2: Overview of vMX, vSRX, and vQFX ●	59m		<input type="radio"/>	Not Started
3	Module 03: Building a Juniper EVE-NG Lab Environment for Daily Usage Part 3: Overview of Clustering ●	50m		<input type="radio"/>	Not Started

Course Details ▲

Juniper Ambassador Christian Scholtz teams up with the Juniper Open Learning to teach you how to build virtual lab environments to help with your preparation for Juniper Networks certification. The video starts with an overview of EVE-NG. It then details how to perform the initial setup of EVE-NG with a demonstration. Basic and advanced lab actions are then covered. If you plan to pursue Juniper certification, this video will help you build a virtual lab for practice.

Difficulty: Foundational
Last Updated: Wednesday, October 26, 2022

[Copy Shortcut](#)

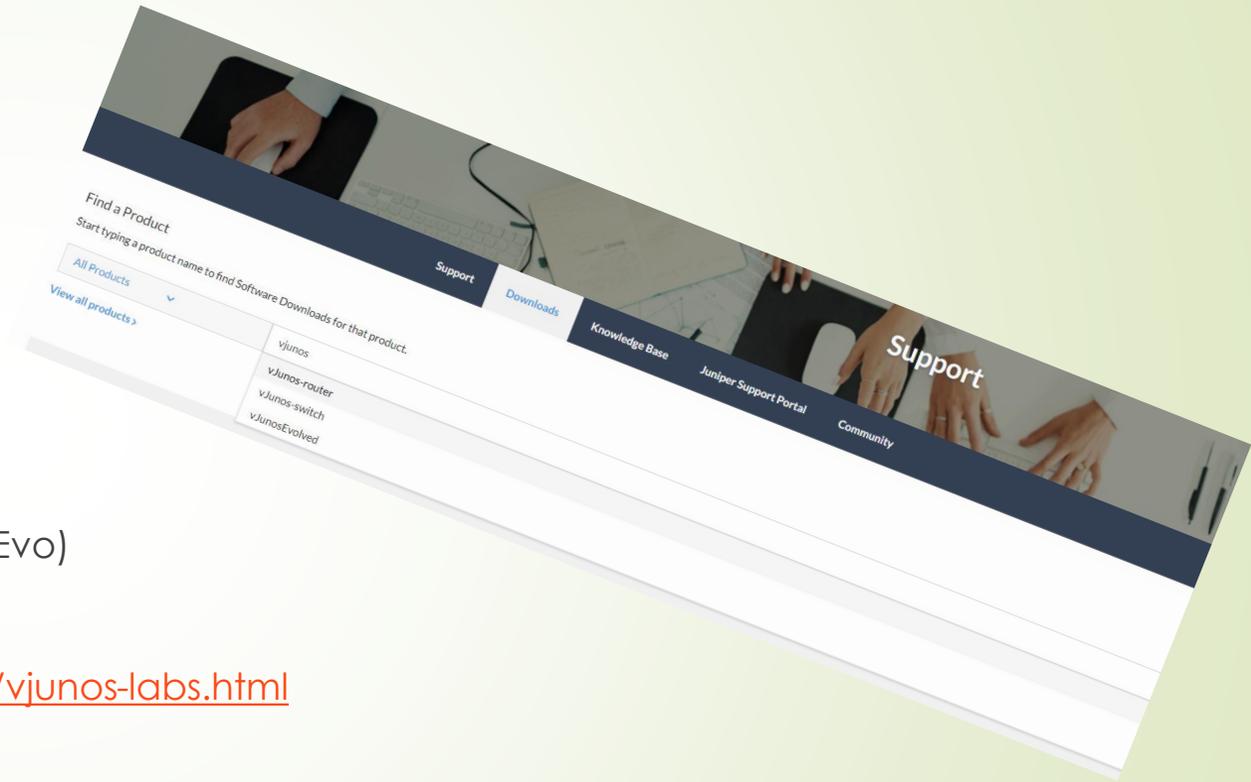


Lab Environment Considerations

- DHCP needed?
- DNS needed?
- AD? Management-PC's? Clients? Test-Servers? (commit Feature in EVE-NG)
- Outside Network? Test-Lab (Hardware) needed? Interface-Cards in Server?
- Firewalls / NAT?
- VPN / MIST-Edge into your Lab?
- Traffic-Generators? Tip: <https://ostinato.org/>
- Your own „Chaos-Monkey“ / „Break-Fix-Tools“?
- One Big Topology VS multiple smaller ones?

Fetching images

- 3 „base“ v-Images:
- vJunOS-Switch (virtual EX9214)
- vJunOS-Router (virtual MX304)
- vJunOS-Evolved (based on JunOS Evo)
- <https://www.juniper.net/us/en/dm/vjunos-labs.html>





Fetching images

- ▶ „Specialized“ images:
- ▶ 128T:
Reach out to your Juniper SE
- ▶ APSTRA + APSTRA-ZTP + APSTRA-Flow (4.2.1):
<https://support.juniper.net/support/downloads/?p=apstra>
- ▶ JSA:
<https://support.juniper.net/support/downloads/?p=juniper-secure-analytics>
- ▶ vRR:
<https://support.juniper.net/support/downloads/?p=virtual-route-reflector>

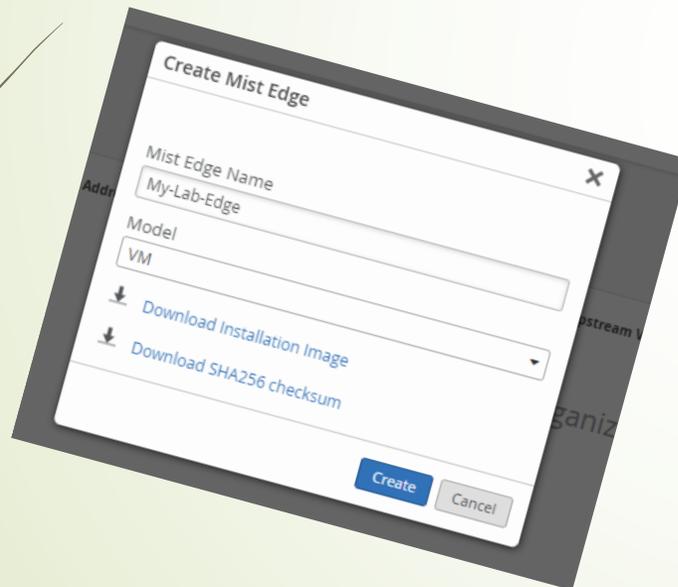


MIST-Edge

- ▶ This service lets you make a seamless transition, moving from an existing centralized data plane with legacy controller architectures to the modern Juniper Mist microservices cloud, without affecting network design.
- ▶ For large campus networks, Edge provides seamless roaming through on-premises tunnel termination of traffic to and from access points.
- ▶ Juniper Mist Edge supports an elastically scalable cluster (with options for backup clusters) composed of an unlimited number of nodes within a cluster.
- ▶ <https://www.juniper.net/us/en/products/access-points/edge.html>

MIST-Edge

- Hardware-Appliance or VM
- Subscription needed (1 per AP tunneling Traffic)
- Easy to deploy



MIST-Edge

▸ Requirements

Hardware Specifications for a Mist Edge Virtual Machine

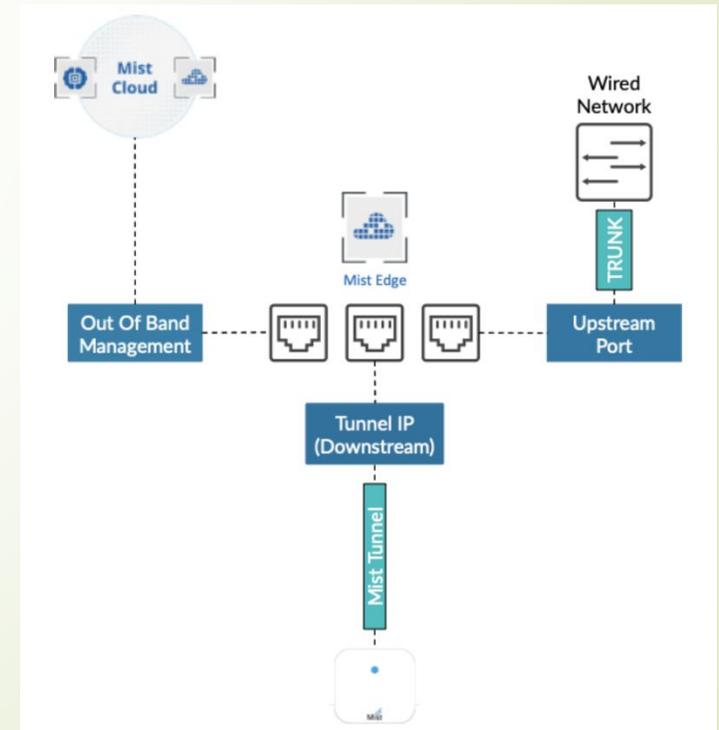
The following are the minimum hardware requirements to implement a Mist Edge VM.

Table 1: Hardware Specifications for a Mist Edge VM

Hardware Component	Quantity or Capacity
CPU	4 vCPUs
RAM	32 GB
Hard disk	100 GB (thick provisioned)
NIC	Three virtual NICs

MIST-Edge

- Create a new Edge-VM in MIST and configure it (including WLAN's to MIST-Tunnel mapping)!!!
- Download the iso for MIST-Edge (select VM and download the iso)
- Upload the iso into EVE-NG
- Create a new Linux-based-Template for MIST-Edge with iso mapped as cdrom-file
<https://www.eve-ng.net/index.php/documentation/howtos/howto-create-own-linux-host-image/>
- Deploy one or more Edge-VM's in EVE-NG
- Assign Interfaces
- Start labbing 😊



MIST-Edge

- 3 Interfaces: Upstream (Tunnel), Downstream (Switch), OOB
- **Note: Tunnel IP SVI on Mist Edge is a protected interface, so even if it is not connected to a firewall, it is only open for ports UDP: 1701 (L2TPv3), 500 and 4500 (IPsec) and TCP port 2083 for RADSEC.**

The Out-of-Band-Management (OOBM)

Interface communicates with the Mist cloud and is there to configure, send stats and check status of Mist Edge, Mist Edge Cluster and AP Tunnels.

Interface expects a DHCP IP address by default and can be configured with static IP address

Tunnel IP is the interface where AP communicates with to setup the L2TPv3 Tunnel between AP and Mist Edge. This IP needs to be configured from Tunnel IP section on Mist UI. If there is a firewall between AP management subnet and Mist Edge Tunnel IP, traffic destined to Tunnel IP on port 1701 needs to be allowed.



Data Port is connected to a trunk port that has all the VLANs configured where the WLAN need to be mapped to

MIST-Edge

- Use the Linux-Template for Mist-Edge
- Official Template will follow soon
- `/opt/qemu/bin/qemu-img create -f qcow2 hda.qcow2 100G`
- **DO NOT USE VIRTIOA.QCOW2!** The Installer will FAIL!

Edit node

Template
Linux

ID
1

Node instance path
`/opt/unetlab/tmp/0/35f7dc0c-549e-4525-85fa-091d7f71e191/1`

Image
linux-mistedge-deb11

Name/prefix
MistEdge

Icon
Switch-2D-L2-Generic-S.svg

UUID
103233e4-281c-4bb7-97ee-6146c0e72cec

CPU Limit

CPU	RAM (MB)	Ethernets
<input type="text" value="4"/>	<input type="text" value="32768"/>	<input type="text" value="3"/>

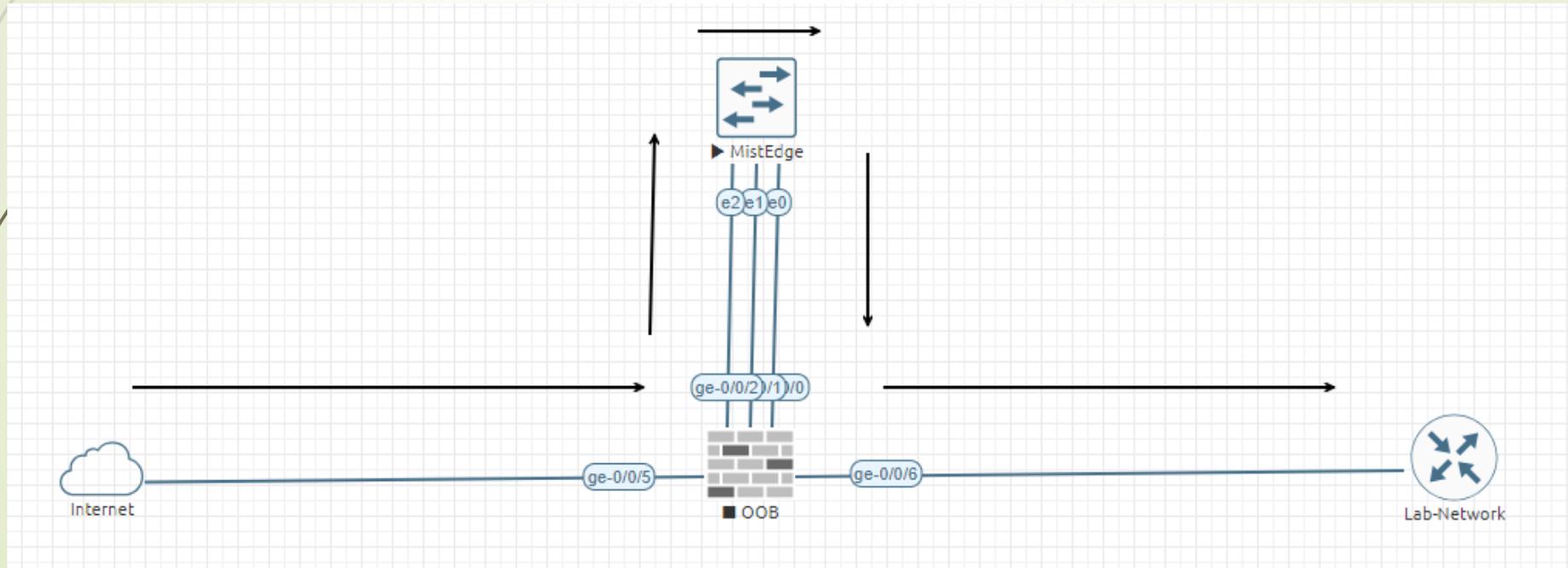
First Eth MAC Address

QEMU Version	QEMU Arch	QEMU Nic
<input type="text" value="6.0.0"/>	<input type="text" value="x86_64"/>	<input type="text" value="virtio-net-pci"/>

QEMU custom options

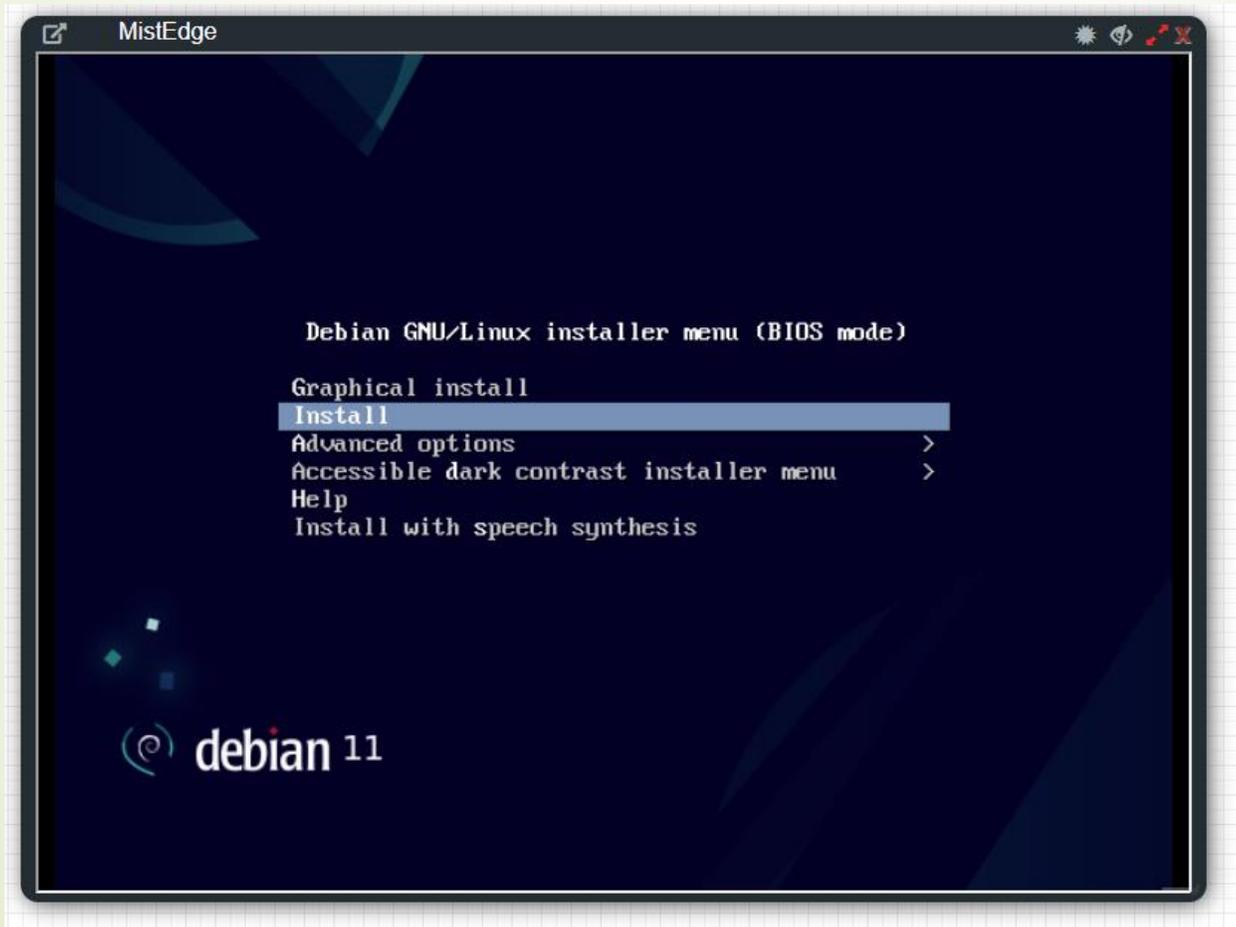
MIST-Edge

- Create a Topology utilizing all 3 Interfaces
- This can be 3 separate links to 3 separate devices
- Or it can be 3 Links towards a central firewall in your lab-environment



MIST-Edge

- Install MIST-Edge by selecting „Install“ (NOT Graphical install)!
- OOB-Interface grabs a DHCP-Address by default



MIST-Edge

- The MIST-Edge will take care of everything for you – lean back and enjoy 😊

```
OOB
root@vSRX# run show dhcp server binding
IP address      Session Id  Hardware address  Expires   State   Interface
172.16.40.100   1          50:00:00:01:00:00 86313    BOUND  ge-0/0/0.0

[edit]
root@vSRX# run show dhcp server binding
IP address      Session Id  Hardware address  Expires   State   Interface
172.16.40.100   1          50:00:00:01:00:00 86353    BOUND  ge-0/0/0.0

[edit]
root@vSRX# run show dhcp server binding
IP address      Session Id  Hardware address  Expires   State   Interface
172.16.40.100   1          50:00:00:01:00:00 86352    BOUND  ge-0/0/0.0

[edit]
root@vSRX# run show dhcp server binding
IP address      Session Id  Hardware address  Expires   State   Interface
172.16.40.100   1          50:00:00:01:00:00 86352    BOUND  ge-0/0/0.0

[edit]
root@vSRX# run show dhcp server binding
IP address      Session Id  Hardware address  Expires   State   Interface
172.16.40.100   1          50:00:00:01:00:00 86351    BOUND  ge-0/0/0.0

[edit]
root@vSRX#
```

```
MistEdge
Installing the base system
83%
Retrieving file 4 of 4
```

MIST-Edge

- ssh into the Edge (from your Lab / Firewall)

```
172.16.40.101      2          50:00:00:01:00:00  86261      BOUND      ge-0/0/0.0

[edit]
root@vSRX# run ssh mist@172.16.40.101
The authenticity of host '172.16.40.101 (172.16.40.101)' can't be established.
ECDSA key fingerprint is SHA256:kd9bitkqfdtzIvajDsoUw2py15cluPrJA+RxkmT9n+E.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '172.16.40.101' (ECDSA) to the list of known hosts.
mist@172.16.40.101's password:
Linux mxedge 5.10.0-26-amd64 #1 SMP Debian 5.10.197-1 (2023-09-29) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
sourced /etc/skel/.mxagent_aliases
mist@mxedge:~$ █
```

MIST-Edge

- JNPR MIST-Edge Docs:

<https://www.juniper.net/documentation/us/en/software/mist/mist-edge-virtual-solution/mist-edge/topics/topic-map/vm-deployment-example.html>

Use SSH to connect to the Juniper Mist Edge with the username `mist`

`ssh mist@OOBM-IP`. Enter `Mist@1234` as the password.

Switch to root by issuing the command `su-`. Enter `mist` as the password.

To bootstrap the device and onboard it to the Mist Cloud, issue the following commands from CLI:

```
mist@mxedge:~$ su - Password: mist root@mxedge:~# apt-get update
```

After the update, register the device. Enter the command `mxagent-helper configure ----claim-code REGISTRATION CODE`.

At the end of the process, you see the following message:

```
registration finished successfully. (regfile at /var/lib/mxagent/mxagent.reg)
```

After the process is complete, the Juniper Mist Edge reboots automatically. At this point, you do not need SSH to connect to the Juniper Mist Edge. The device pulls the configuration from the Juniper Mist cloud.

After the reboot, the Juniper Mist Edge appears as connected on the Mist Edge Inventory page. An orange dot also indicates the connected status of the device.

Name	Status	Registration	N. Cluster	Serial ID	Size	Model	Configuration	Uptime	Last Seen	Version	General IP Address
MIST-Edge-1	Connected	Registered	-	7027481836	Unassigned	31	0	0%	2023-03-14 PM 3:21	4.0.0.1.190	28.702.41.314

MIST-Edge

- ▶ JNPR MIST-Edge Docs:

<https://www.juniper.net/documentation/us/en/software/mist/mist-edge-virtual-solution/mist-edge/topics/topic-map/vm-deployment-example.html>

- ▶ `mxagent register -- registration-code <CODE>`

Registration Code

EggwJH-yi-1EAfbFJgvsmyaAL6rr7Zloqsr1



- ▶ Wait 5min, then Reboot once

MIST-Edge

Mist Edge Inventory org Entire Org

Filter

Status	Name	Registration	Cluster	Tunnel IP	OOBM IP Address	OOBM MAC Address	Site	Model
Connected	EVE-NG-OpenLearning	Registered	-	172.16.40.201	172.16.40.101	--	Unassigned	VM

- The Edge will be shown as registered and „connected“
- Assign your Edge to a Site ;)
- Your AP's can now connect to it (Template)

Monitor Wireless Wired Insights mist edge EVE-NG-OpenLearning Today



EVE-NG-OpenLearning
Netchron

12:00 AM Jun 18 - 3:11 PM Jun 18 (drag an area of interest to Zoom in)



12:40 PM - 12:50 PM Jun 18: Tunnel: no data

Mist Edge Events

15 Total 4 Good 7 Neutral 4 Bad

Event	Time
Service Started	3:08:37.495 PM Jun 18, 2024
Restarted	3:08:36.780 PM Jun 18, 2024
Configuration Modified by User	3:07:52.873 PM Jun 18, 2024
Configuration Modified by User	3:07:31.817 PM Jun 18, 2024
Restarted	3:06:42.142 PM Jun 18, 2024
Service Started	3:05:40.749 PM Jun 18, 2024
Restarted	3:05:40.123 PM Jun 18, 2024
Configuration	3:05:26.331 PM Jun 18, 2024

Property	Value
Service	mxagent
Description	ME service started

Port

Current Values
These values are not affected by the Time Range selection

Current Mist Edge Properties

Property	Value	Status	Value
Model	VM	Status	Connected

MIST-Edge

- Custom Forwarding to „Site Edge“

SSID
MistEdge-WiFi

WLAN ID
523ac467-14aa-4bf5-b9b7-1277e9227862

Labels
DEMO

WLAN Status
 Enabled Disabled
 Hide SSID
 Broadcast AP name

Radio Band
 2.4 GHz 5 GHz 6 GHz

Band Steering
 Enable

Client Inactivity
Drop inactive clients after seconds: 1800

Security
Security Type
WPA3 WPA2 OWE Open Access
Enterprise (802.1X) Personal (PSK)
 Passphrase [Reveal](#)
 Multiple passphrases

MAC address authentication by RADIUS lookup
 Prevent banned clients from associating
[Edit banned clients in Network Security Page](#)

Fast Roaming
 Default
 .11r

Apply to Access Points
All APs AP Labels Specific APs
AP43-Scholz-10G

Isolation
Prohibit peer to peer communication
 Disabled Same AP Same Subnet

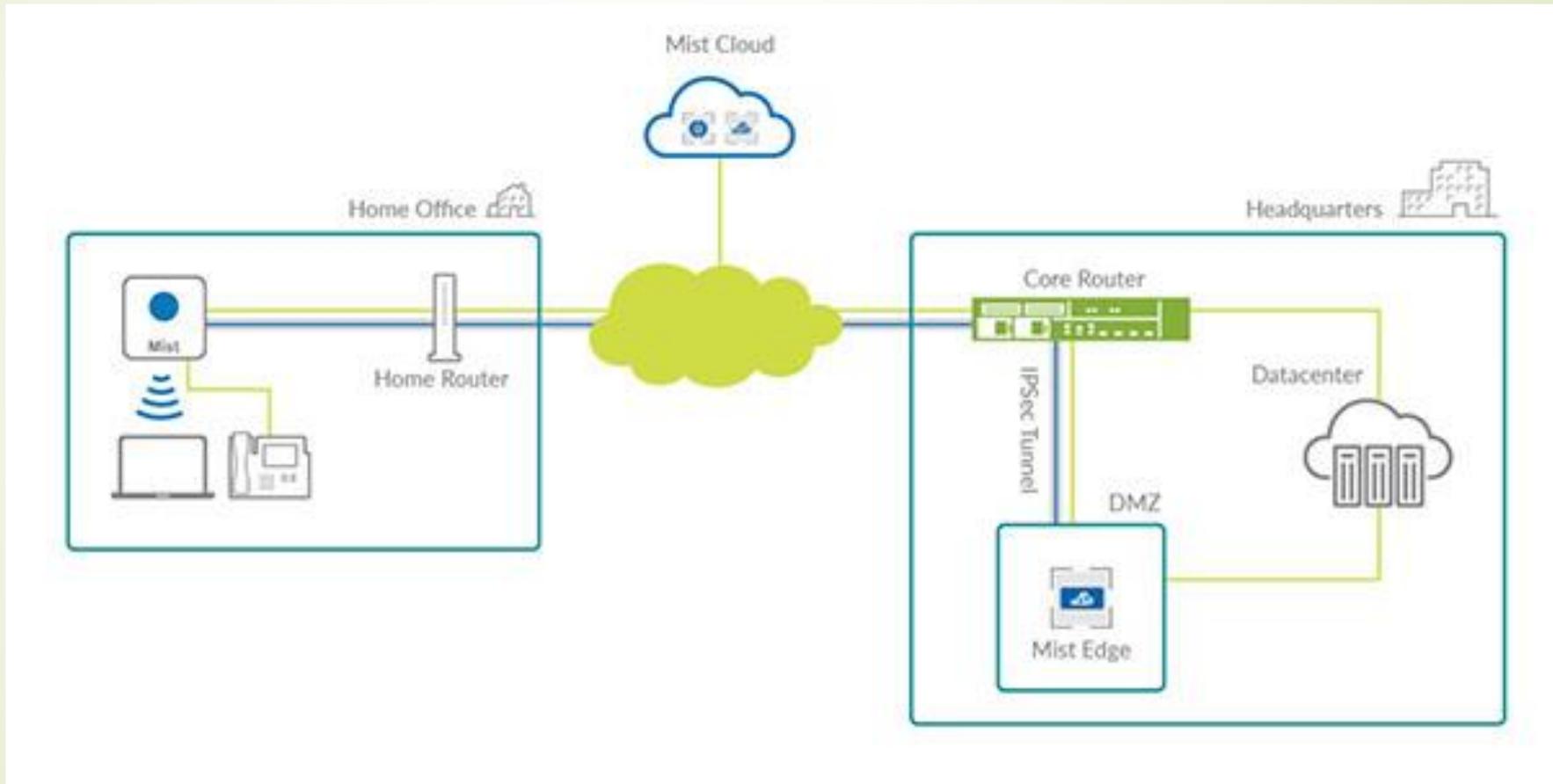
Filtering (Wireless)
 ARP
 Broadcast/Multicast
 Allow mDNS
 Allow SSDP
 Allow IPv6 Neighbor Discovery
 Ignore Broadcast SSID Probe Requests

VLAN
 Untagged Tagged Pool Dynamic
VLAN ID 400
(1 - 4094)

Custom Forwarding
 Custom Forwarding to Site Edge

MIST-Edge

- Congrats – your Lab can now be accessed via your Home-WiFi ☺



<input type="checkbox"/>	● Connected	CORP01	X1	Registered	CORP	172.16.99.4	172.16.3.2	Unassigned	2	1
<input type="checkbox"/>	● Connected	CORP2	X1-M	Registered	CORP	172.16.99.3	172.16.3.18	Unassigned	2	1

MIST-Edge





MIST-Edge

- ▶ The Mist APs and Mist Edge support IPv6 only and dual stack environments.
- ▶ **For AP's:**
The AP supports DHCPv6 and SLAAC for address assignment

Global 02 and Global 04 cloud environments support AP to cloud connectivity over IPv6.
For ALL other cloud environments, you will need to perform NAT64.

APs support RADIUS and Mist Edge connectivity over IPv6
- ▶ **For Mist Edge:**
The Mist Edge supports DHCPv6 and SLAAC for OOBM address assignment

The tunnel IP address supports IPv6 assignment

Global 02 and Global 04 cloud environments support ME to cloud connectivity over IPv6.
For ALL other cloud environments, you will need to perform NAT64.

Mist Edge tunnel/AP connectivity over IPv6 supported
- ▶ **For Wi-Fi Clients**
Several policy related features such as WxLAN support of IPv6 and Mist guest portal support of IPv6 are still in development.

What to do in case something goes wrong?



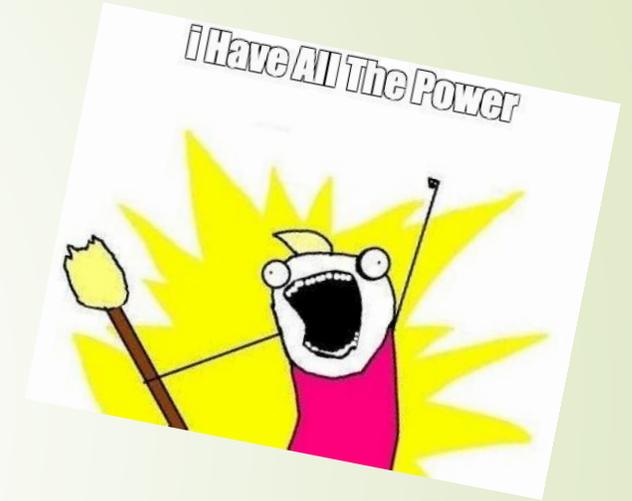


Pitfall: not enough resources (CPU / RAM)

- ▶ Symptom:
 - ▶ Multiple unexplainable errors / strange behavior in multiple ways
 - ▶ Cause:
 - ▶ Device has not enough CPU / RAM to perform basic tasks
 - ▶ Solution:
 - ▶ NEVER go below the recommendation from the template
- 

Pitfall: booting up everything at once

- Symptom:
- Lab takes literally forever to start
- Cause:
- Device takes WAY more resources during bootup and CPU is overwhelmed
- Solution:
- Use the „delay“-option to start the devices one after another



Startup configuration	Satellite
None ▾	master ▾
Delay (s)	
0	

Pitfall: eve-ception

- Symptom:
- Running EVE-NG on your Laptop in vmware Workstation and starting a lab is not working

➤ Cause:



- Solution:
- Don't use EVE-NG on your Laptop
Use a proper Server (Vmware, Cloud or Bare-Metal)
and access it via your Webbrowser
Usually cheap to fetch on eBay



More Infos

- ▶ YouTube Video Series covering EVE-NG and Juniper:
<https://www.youtube.com/netchron>
- ▶ EVE-NG YouTube Channel:
<https://www.youtube.com/@eve-ng-emulatedvirtualenvi9759>
- ▶ EVE-NG Website:
<https://www.eve-ng.net/>
- ▶ EVE-NG Forum:
<https://www.eve-ng.net/forum/>
- ▶ EVE-NG Helpdesk (Live-Chat):
<https://www.eve-ng.net/index.php/live-helpdesk/>

KAHOOT Time!



Q&A



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