

# *Deep Dive into the VPP based VNFs of the vCPE Use case*

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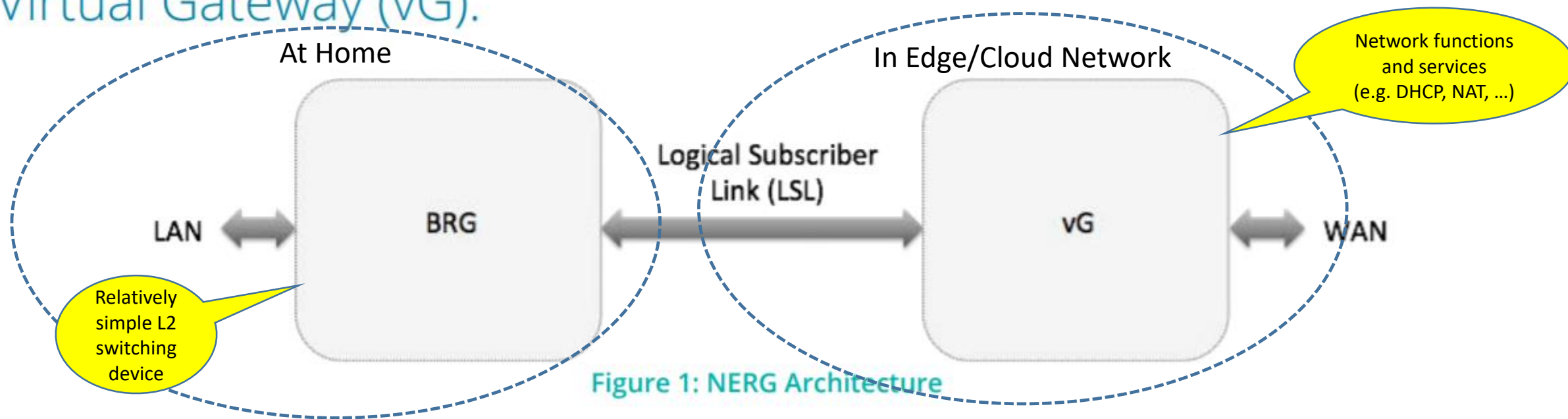
December 12, 2017

# Agenda

- Brief Overview of vCPE Use Case
- Brief Overview of VPP and Honeycomb
- Review functional details of each VPP based VNF
- Learnings, Issues, Next Steps

# Network Enhanced Residential Gateway (NERG)

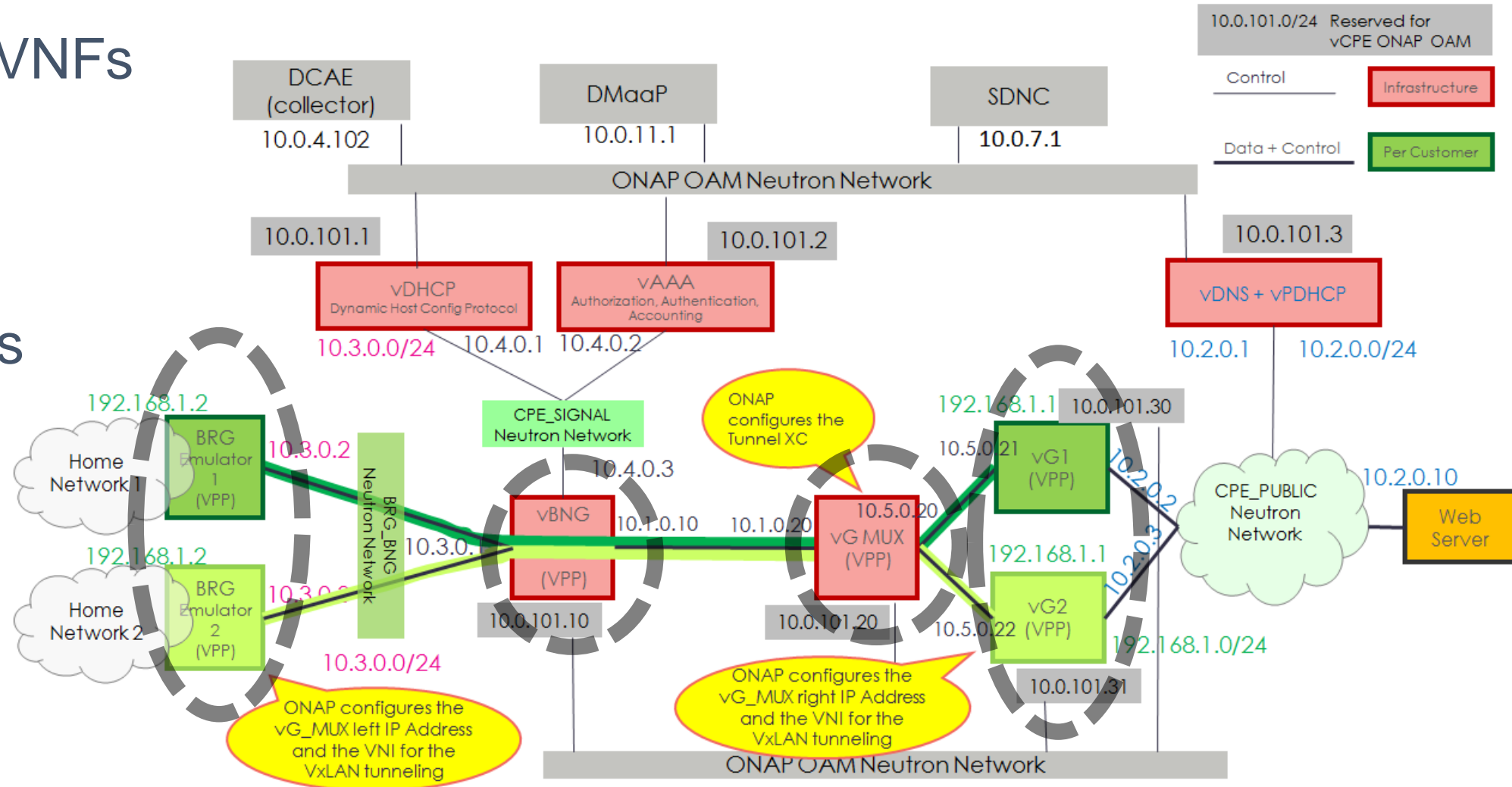
The NERG specification splits the residential gateway into two distinct components: Bridged Residential Gateway (BRG) and Virtual Gateway (vG).



# ONAP vCPE Implementation and the VPP VNFs

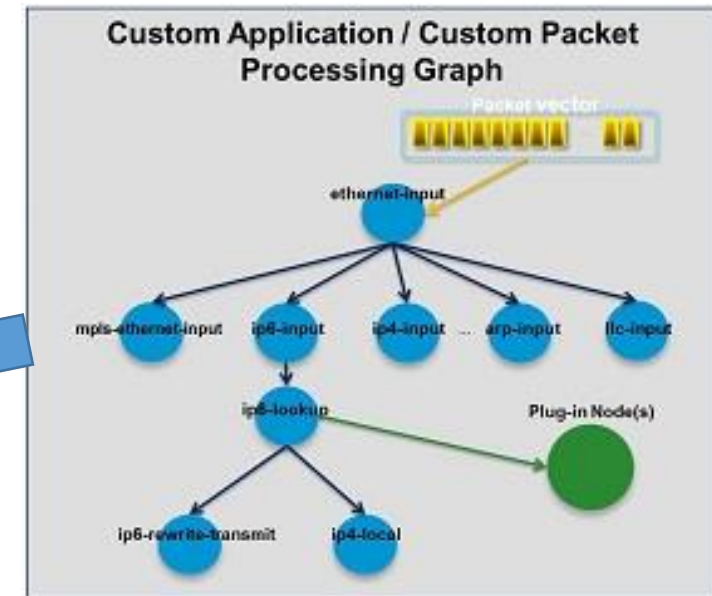
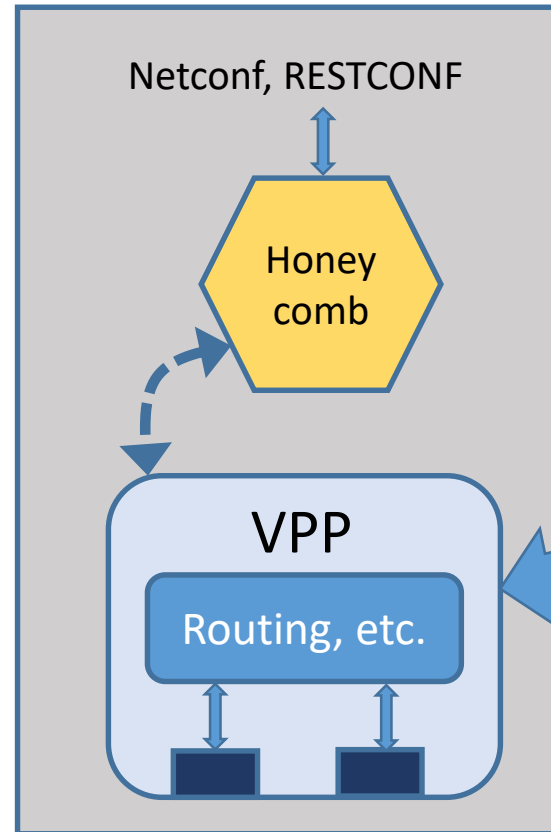
## VPP VNF Goals:

- Open source VNFs
- Dataplane performance
- Basis for EPA enhancements



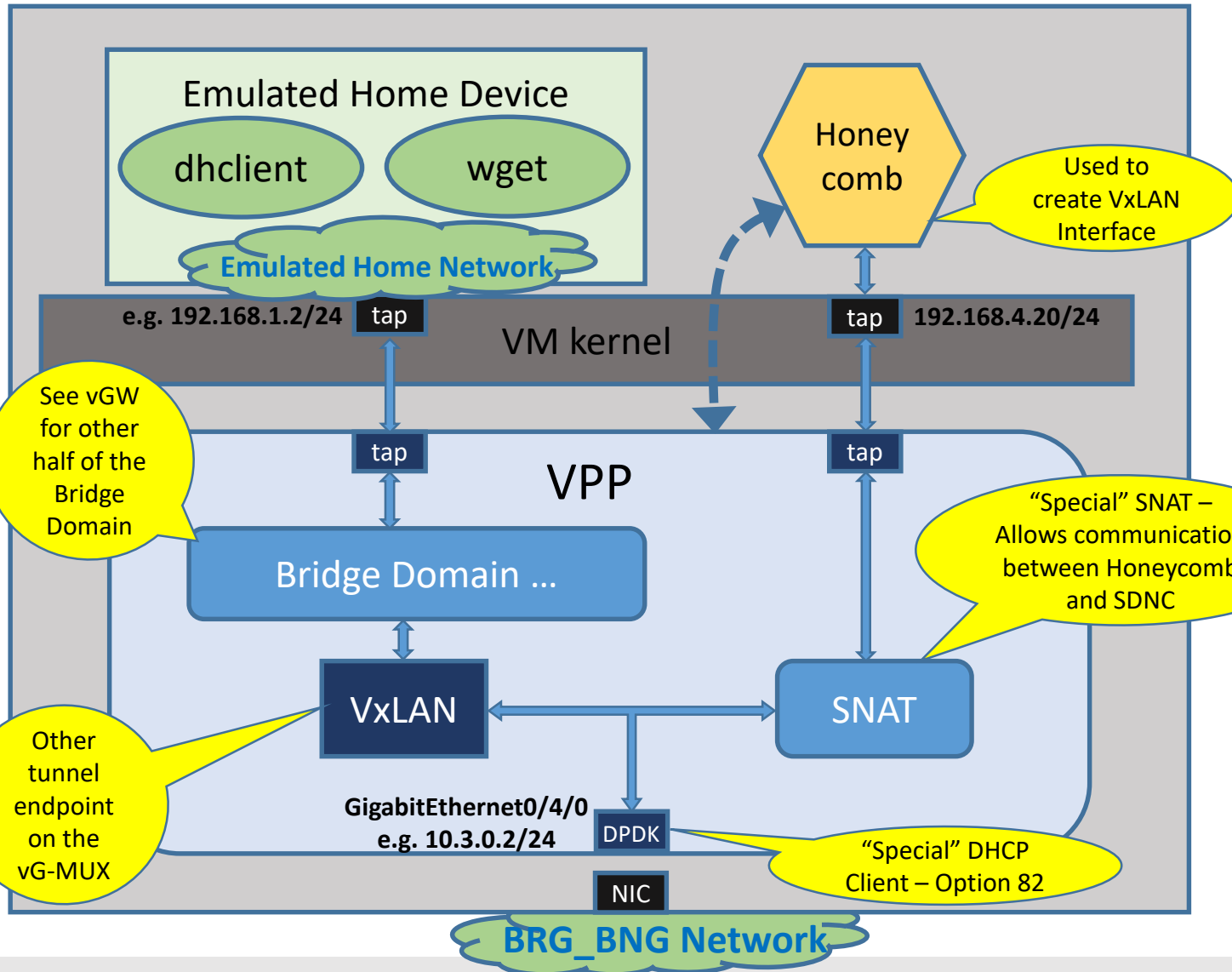
# Overview – VPP / Honeycomb

- VPP Dataplane
  - Vector Packet Processing
  - DPDK interfaces
- Honeycomb – Dataplane management agent
  - Based on ODL components
  - YANG models
- Extensible
  - VPP graph nodes
  - Honeycomb plugins



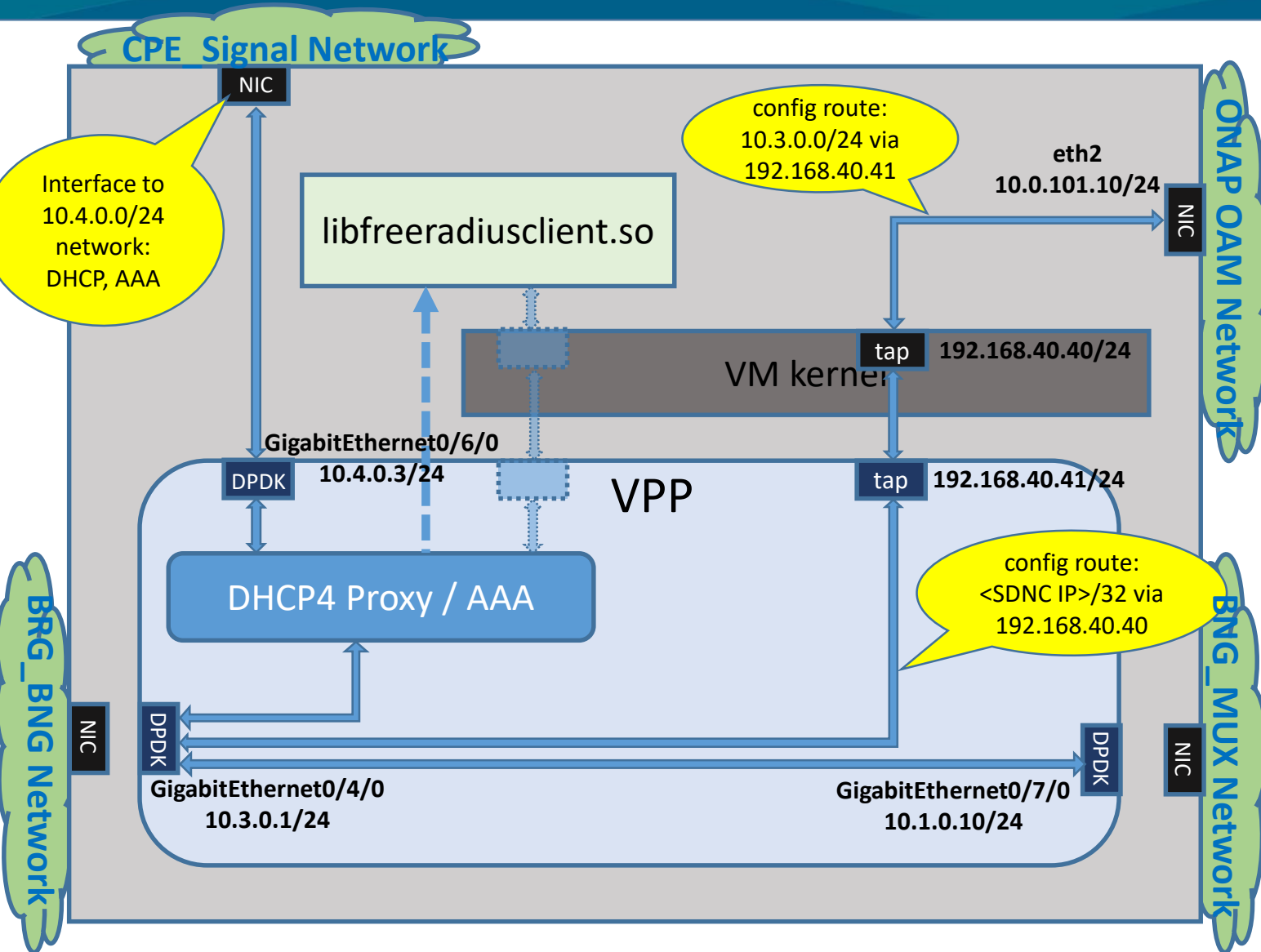
- See: <https://fd.io>

# Deep Dive - vBRG



1. Obtain IP via DHCP on NIC Interface – Opt 82
2. Configure SNAT for Honeycomb Agent access by SDNC  
- SDNC IP provided by Heat
3. VxLAN interface is created and added to Bridge Domain by SDNC
4. “Home Device” may obtain IP address from the vGW. Access to Public Network is now enabled.

# Deep Dive - vBNG



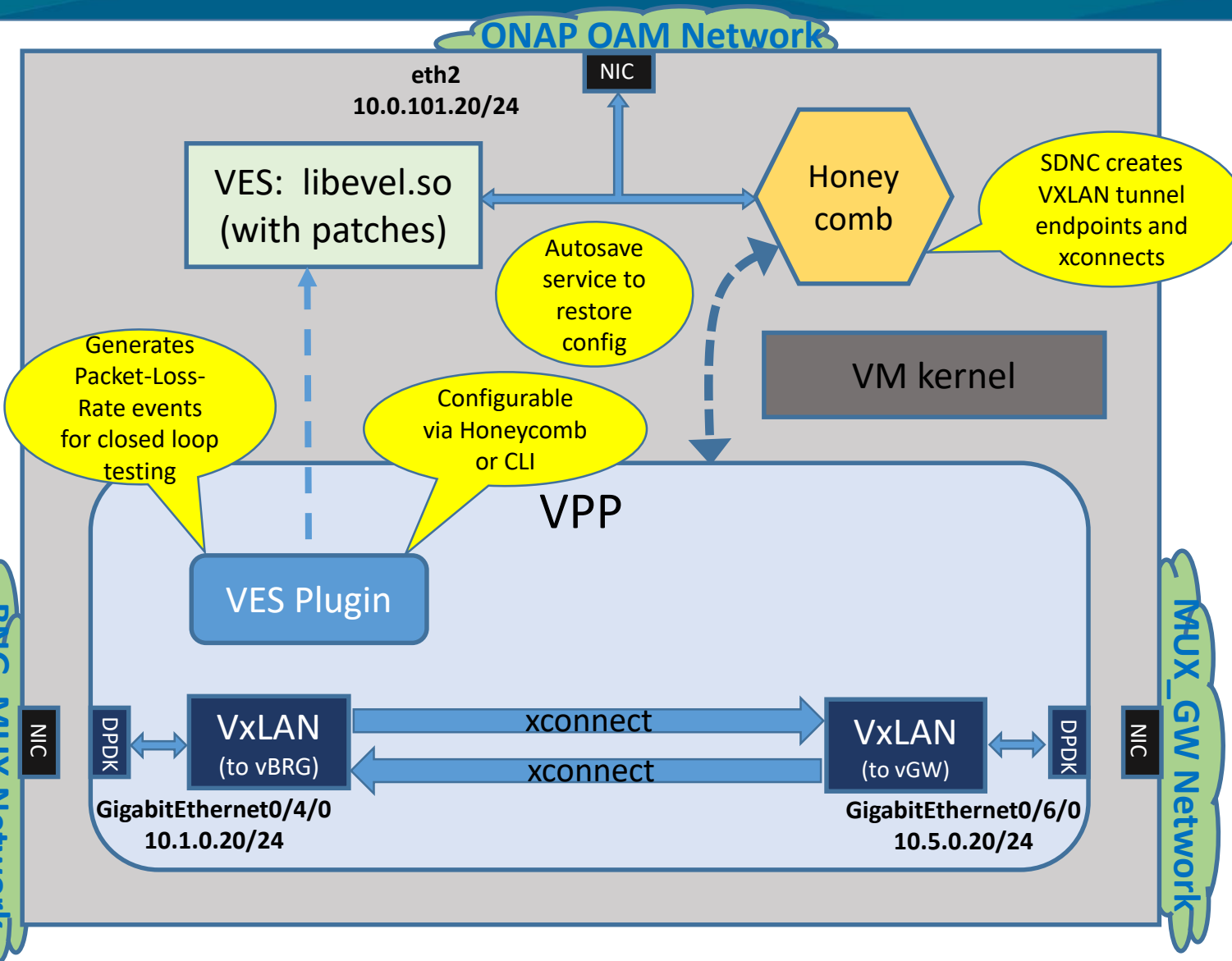
1. Proxy for DHCP request from vBRG – AAA Authentication first
2. Plumbing configured to route management traffic from SDNC on OAM network with the vBRG

## Issues:

- Complete flow with AAA has not been fully configured
- Tricky compile
  - DHCP proxy replaces the native DHCP support



# Deep Dive – vG-MUX



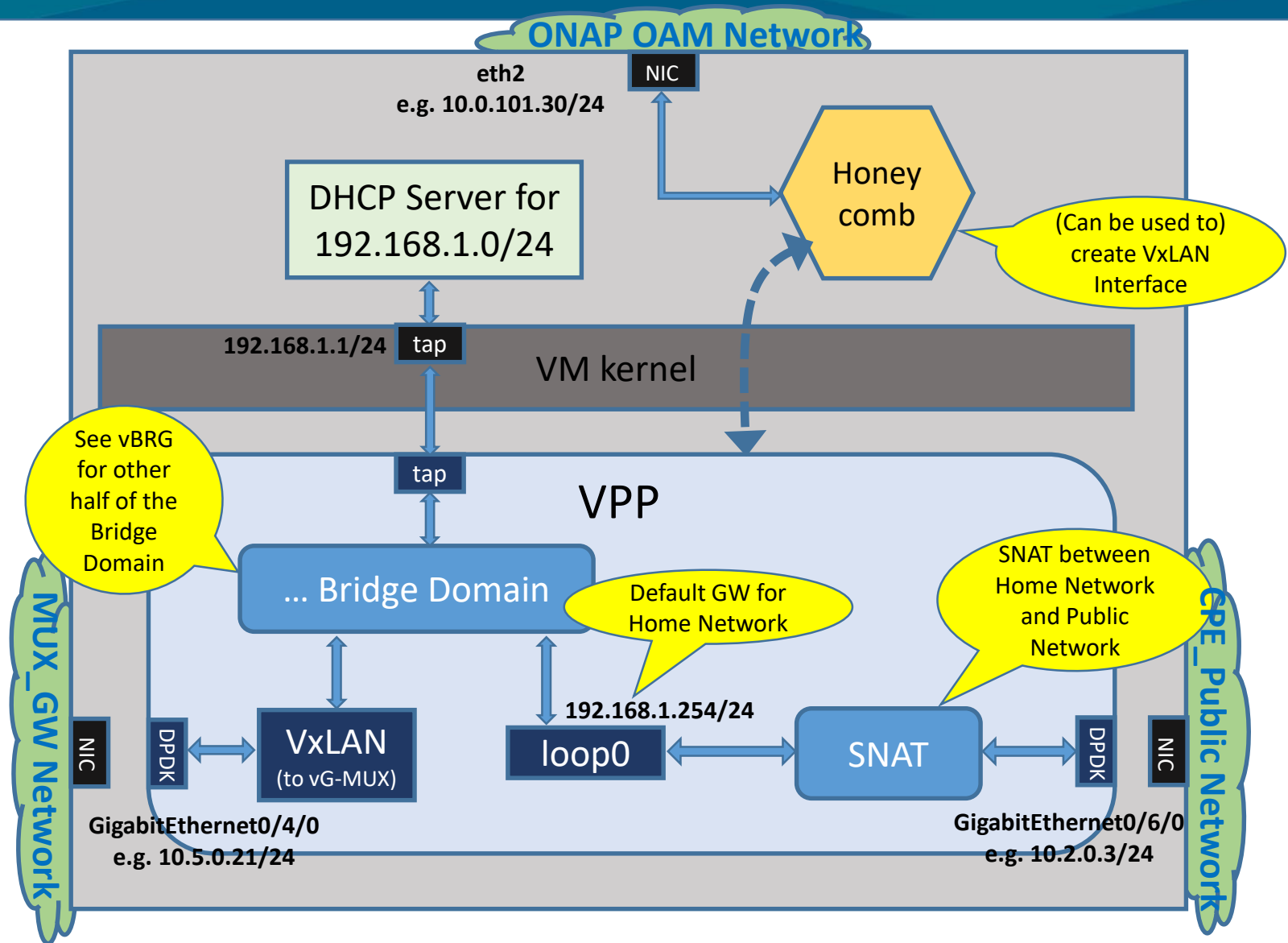
1. VxLAN tunnel endpoints can xconnects are created by SDNC
2. VES plugin configurable to generate events for closed loop testing
  - libevel modifications:
    - VNF ID used for SourceName, SourceId
    - Further, SourceName override
3. Autosave service
  - Saves VES and VxLAN/xconnect configuration
  - Reset Packet-Loss-Rate
  - Should just use Honeycomb persistence

## Build Notes:

- Pulls in VES just for libevel.so
- VES plugin with Honeycomb support



# Deep Dive - vGW



1. No VPP/Honeycomb modifications
2. Provides DHCP to Home Network
3. NAT to Public Network

## Notes:

- VxLAN creation currently driven by Heat environment
  - Could be done by SDNC – timing issue

# Preparing Images

- Compilation of VPP and Honeycomb takes a long time
  - 3 of 4 add code to VPP and/or Honeycomb source and need to be built
  - Current install script provides a method to pre-build images with compiled vpp and honeycomb
  - Save image into the Openstack glance DB and use that image in the Heat env for VNF deployment
  - See wiki for details: <https://wiki.onap.org/display/DW/ONAP+vCPE+VPP-based+VNF+Installation+and+Usage+Information>
- Version Info:
  - Ubuntu 16-04
  - VPP and Honeycomb – ‘stable/1704’

# Technical Notes – VPP Usage

- VPP DPDK interfaces aren't "normal"
  - Normal kernel driver needs to be unbound from the NIC
    - Ubuntu *linux-image-extra-`uname -r`* package needs to be installed for *uio\_pci\_generic*
    - VPP will take control of any NICs that are 'down' when it starts up
  - Learn the vppctl alternatives for common tools:
    - ifconfig, ip -> 'vppctl show int addr'
    - ping -> 'vppctl ping' (! – doesn't always work)
    - tcpdump ->
      - 'vppctl add trace dpdk-input 10'
      - 'dpdk pcap tx trace ...' (tx only tcpdump)
    - etc.

# Mapping Network Devices to Networks – e.g. the vBNG

## From the Heat yaml:

```
networks:  
- network: { get_param: public_net_id }  
- port: { get_resource: vbng_private_0_port }  
- port: { get_resource: vbng_private_1_port }  
- port: { get_resource: vbng_private_2_port }  
- port: { get_resource: vbng_private_3_port }
```

## Where (from Heat):

```
vbng_private_0_port: brgemu_bng_private_net_id  
vbng_private_1_port: onap_private_net_id  
vbng_private_2_port: cpe_signal_net_id  
vbng_private_3_port: bng_gmux_private_net_id
```

## 'lspci' on the vBNG VM

```
00:03.0 Ethernet controller: Red Hat, Inc Virtio network device  
00:04.0 Ethernet controller: Red Hat, Inc Virtio network device  
00:05.0 Ethernet controller: Red Hat, Inc Virtio network device  
00:06.0 Ethernet controller: Red Hat, Inc Virtio network device  
00:07.0 Ethernet controller: Red Hat, Inc Virtio network device
```

- Assume network order in Heat template maps 1:1 to order in PCI device listing
- Thus, the install script invoked by the Heat template will do this:
  - **eth0** - interface to the public network (i.e. access from OpenStack)
  - **GigabitEthernet0/4/0** – VPP DPDK interface for the BRG\_BNG Network
  - **eth2** - interface to ONAP OAM Network
  - **GigabitEthernet0/6/0** – VPP DPDK interface for the CPE\_Signal Network
  - **GigabitEthernet0/7/0** – VPP DPDK interface to the BNG\_MUX Network

# Lessons learned / Issues / Next ...

- Learn to use vpp, honeycomb
  - delete xconnects before vxlan tunnels
- vG-MUX VES support
  - Patches override SourceName / SourceId in the VES library
- vGW
  - During testing – found race condition – SDNC attempted to configure while the vGW was rebooting during it's deployment
    - Fixed by passing in updated 'env'
- Stability
- VNF Packaging
- More EPA

# Links / References

- ONAP vCPE Solution Brief
  - [https://www.onap.org/wp-content/uploads/sites/20/2017/11/ONAP\\_CaseSolution\\_vCPE\\_FNL.pdf](https://www.onap.org/wp-content/uploads/sites/20/2017/11/ONAP_CaseSolution_vCPE_FNL.pdf)
- vCPE VPP wiki page
  - <https://wiki.onap.org/display/DW/ONAP+vCPE+VPP-based+VNF+Installation+and+Usage+Information>
- vCPE use case wiki page
  - <https://wiki.onap.org/pages/viewpage.action?pageId=3246168>
- Honeycomb Overview
  - [https://wiki.fd.io/images/4/45/Honeycomb\\_overview.pptx](https://wiki.fd.io/images/4/45/Honeycomb_overview.pptx)

# Thank You