OVN: DHCP Relay Agent Support For Overlay Subnets

Naveen Yerramneni
Huzaifa Calcuttawala
Mary Manohar

NUTANIX

Agenda

- Introduction
- DHCP Relay Agent Packet flow in Underlay Network
- DHCP Relay Agent Implementation in OVN
- DHCP Relay Agent Packet flow in OVN
- OVSDB Schema changes
- Config Example
- Limitations
- References and Status

Introduction

- Why we need DHCP Relay Agent on OVN ?
  - IP address management for overlay subnets cannot be done by an external DHCP server hosted in the underlay network.
- What are we doing ?
  - Enable OVN to act as DHCP relay agent for overlay subnets.
- What does DHCP Relay Agent do ?
  - DHCP Relay Agent relays the DHCP messages between the DHCP clients and DHCP server where server is on different subnet.
  - DHCP Relay Agent functionality is generally enabled on the routers.

DHCP Relay Agent Packet Flow - Underlay

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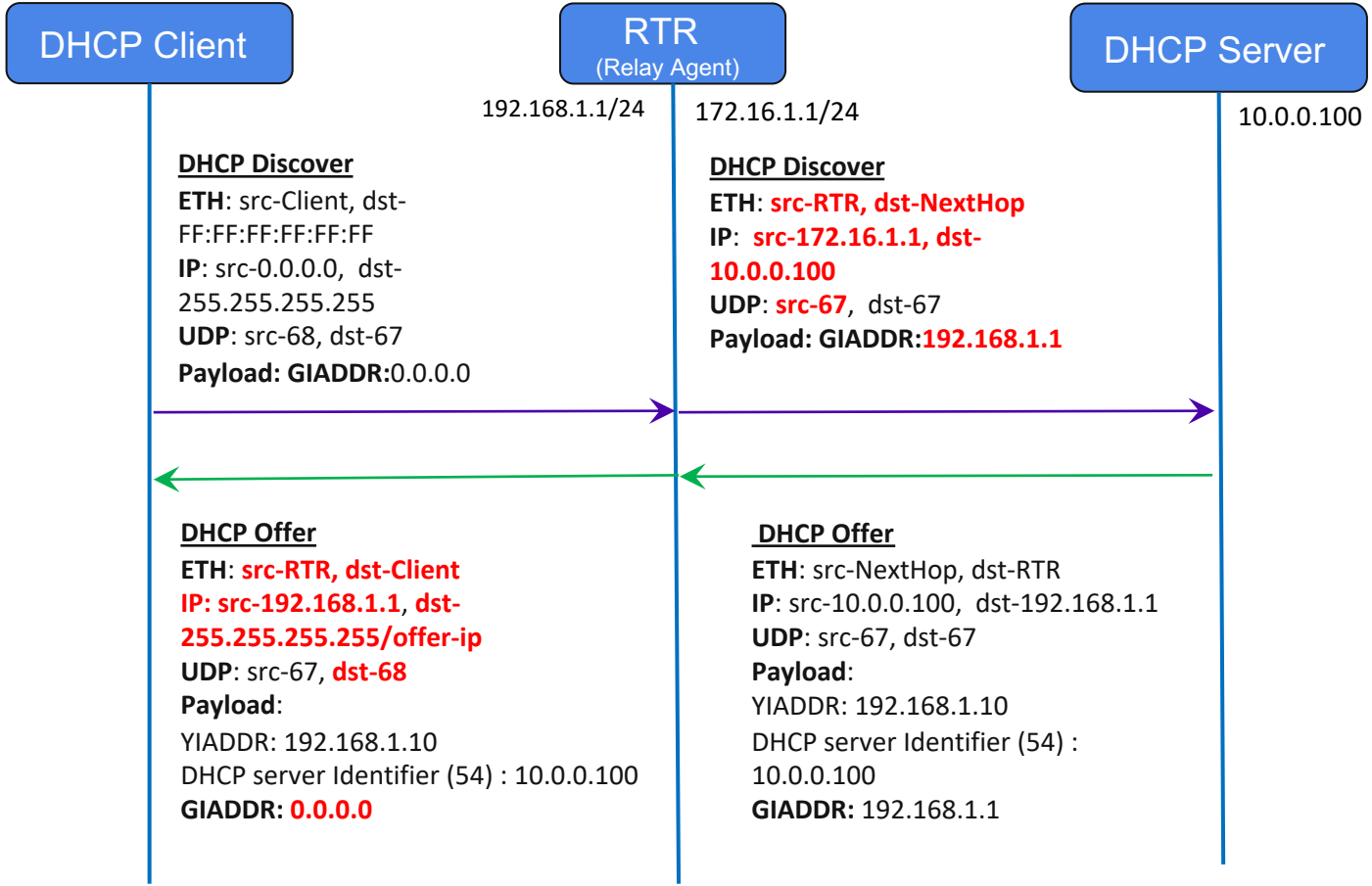
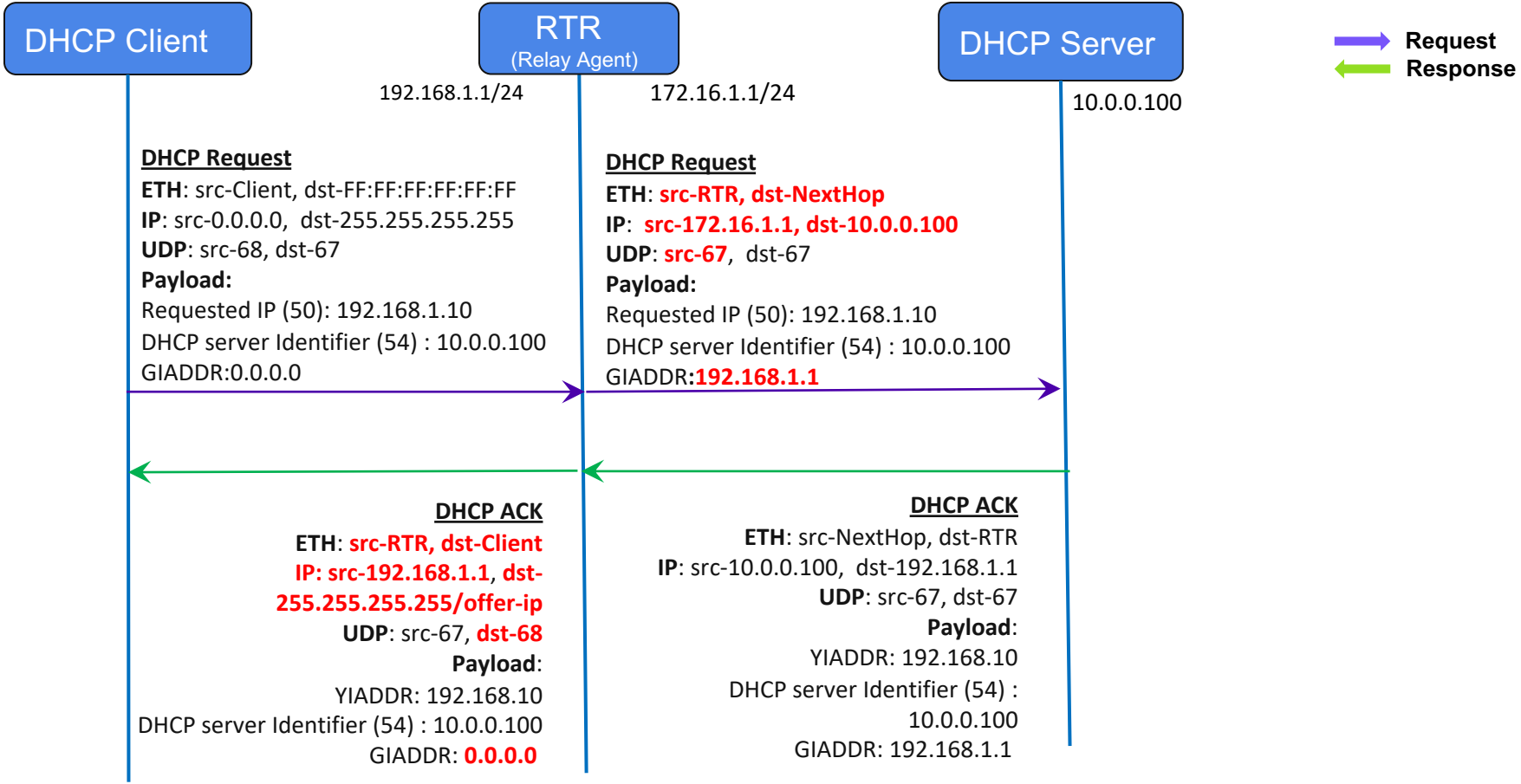
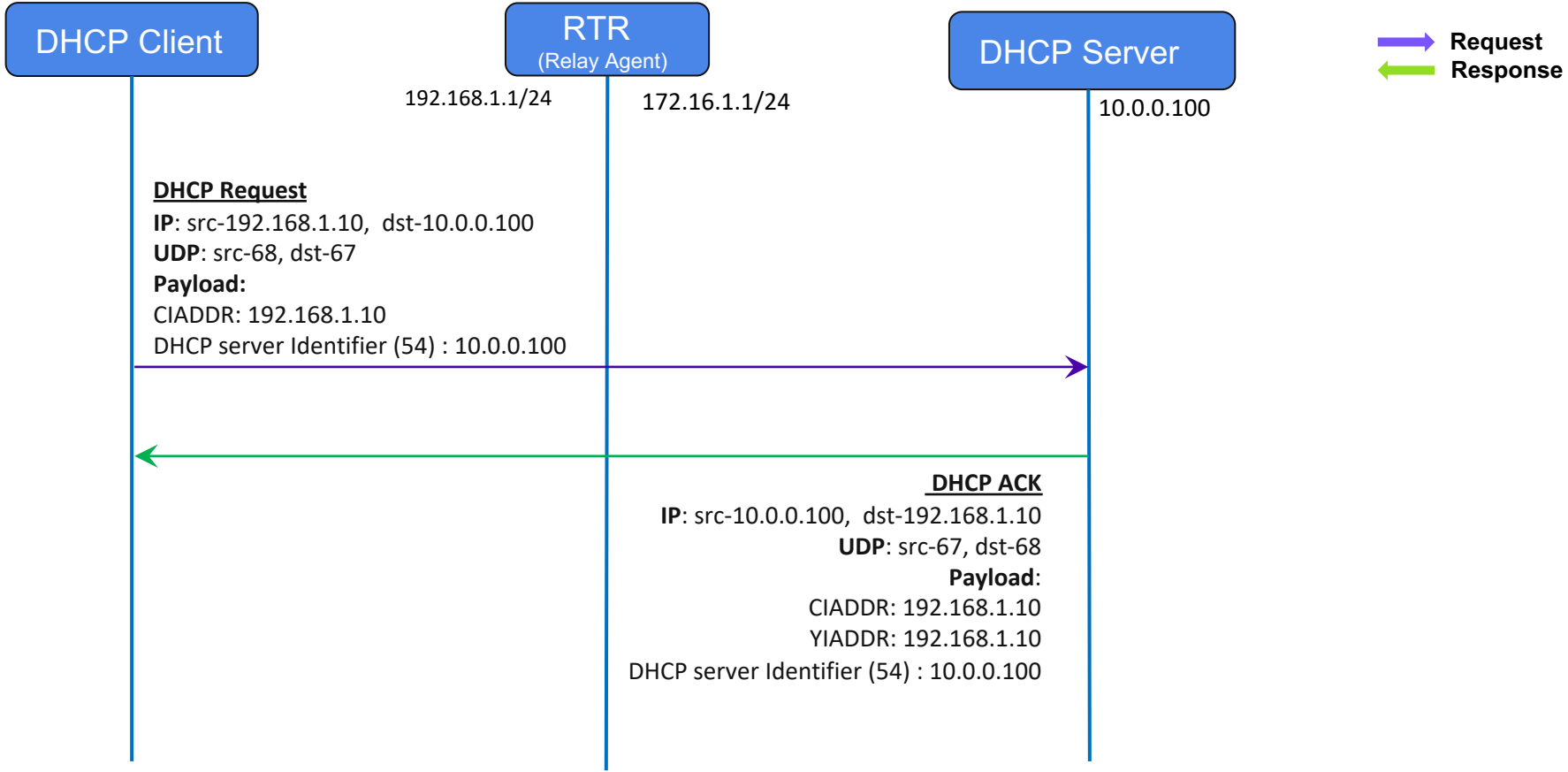
DHCP Discover / Offer Packet Flow



DHCP Request / Ack Packet Flow



DHCP Renew Packet Flow



OVN: DHCP Relay Agent Implementation

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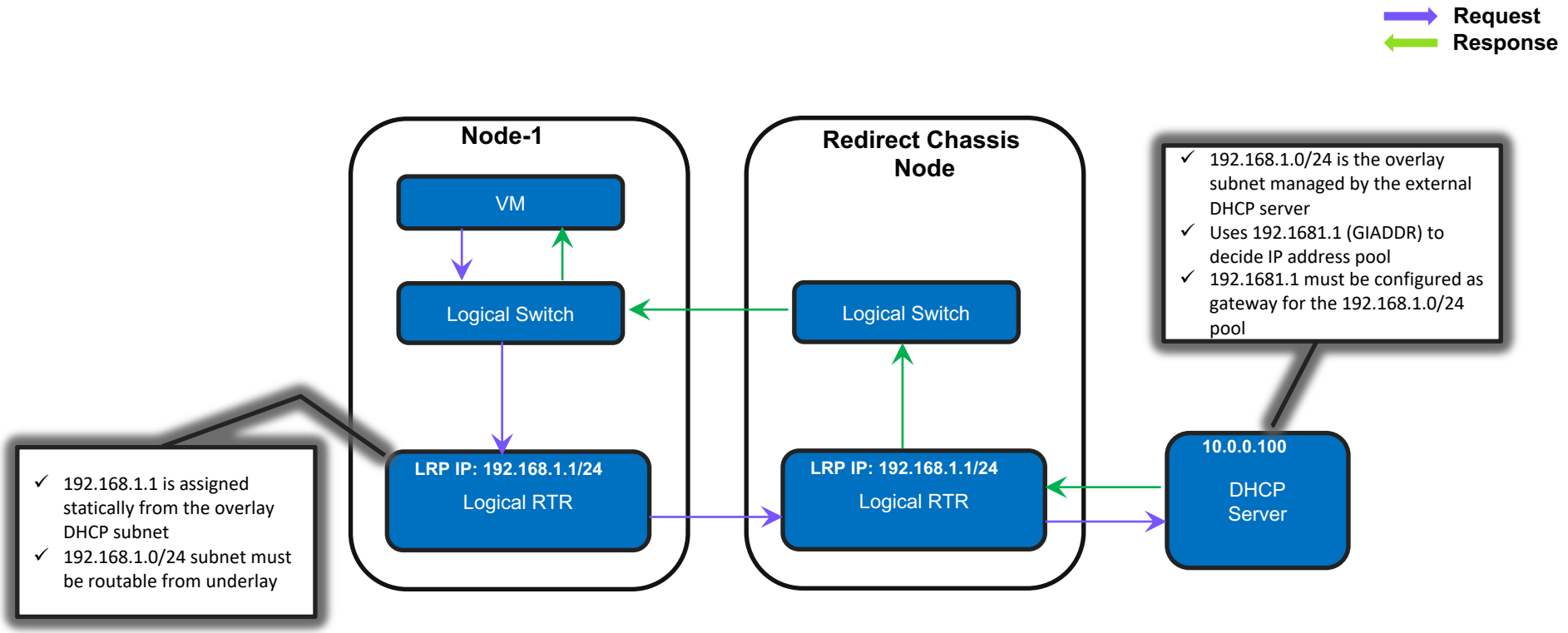
OVN DHCP Relay Agent Overview

- DHCP Relay Agent is implemented in Logical Router Pipeline
  - Request packets are processed on the source node where VM is deployed.
  - Response packets are processed on the node (redirect chassis) that first processes the packets coming from the underlay network.
  - Implemented only for IPv4 networks.

- Prerequisites to use OVN DHCP Relay Agent feature
  - Logical Router Port (LRP) IP should be assigned (statically) from the same overlay subnet which is managed by DHCP Server.
  - Overlay subnets managed by external DHCP server are expected to be routable from the underlay network.
  - LRP IP should be configured as default gateway for the overlay subnet on DHCP Server.

OVN DHCP Relay Agent Overview



Pipeline Stage and Actions

- New Pipeline Stage
  - **lr_in_dhcp_relay_resp_fwd**
    - Processes the DHCP responses from the server.
- New Actions
  - **dhcp_relay_req:**
    - Process DHCP request packets.
      Do required sanity checks on the packet and drop the packet if any check fails.
      Update GIADDR in the packet and return it to OVS.
  - **dhcp_relay_resp_fwd**
    - Process DHCP resposne packets.
      Do required sanity checks on the packet and drop the packet if any check fails.
      Update dest MAC, dest IP, reset GIADDR in the packet and return it to OVS.

DHCP Relay Agent Packet Flow - OVN

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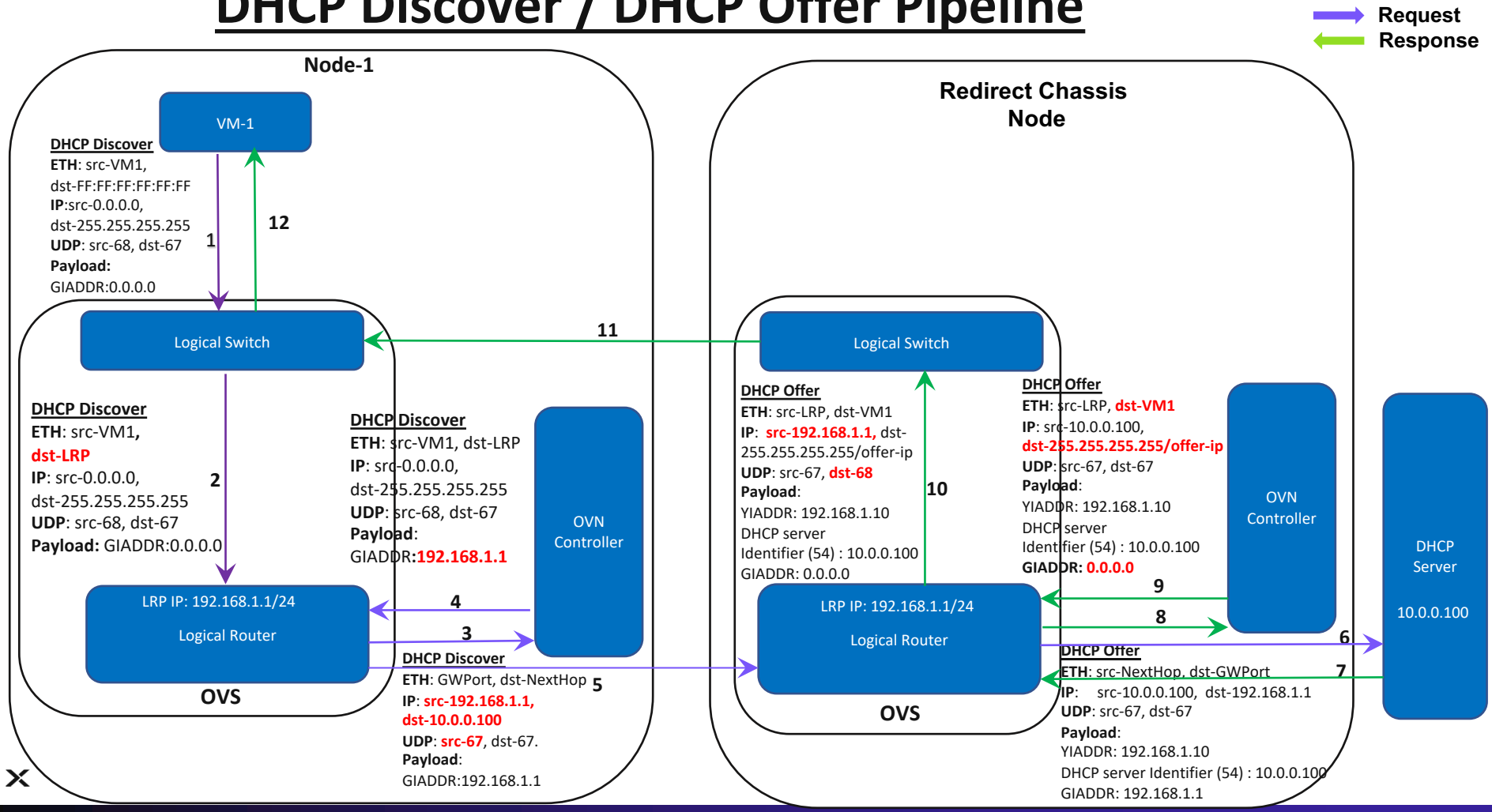
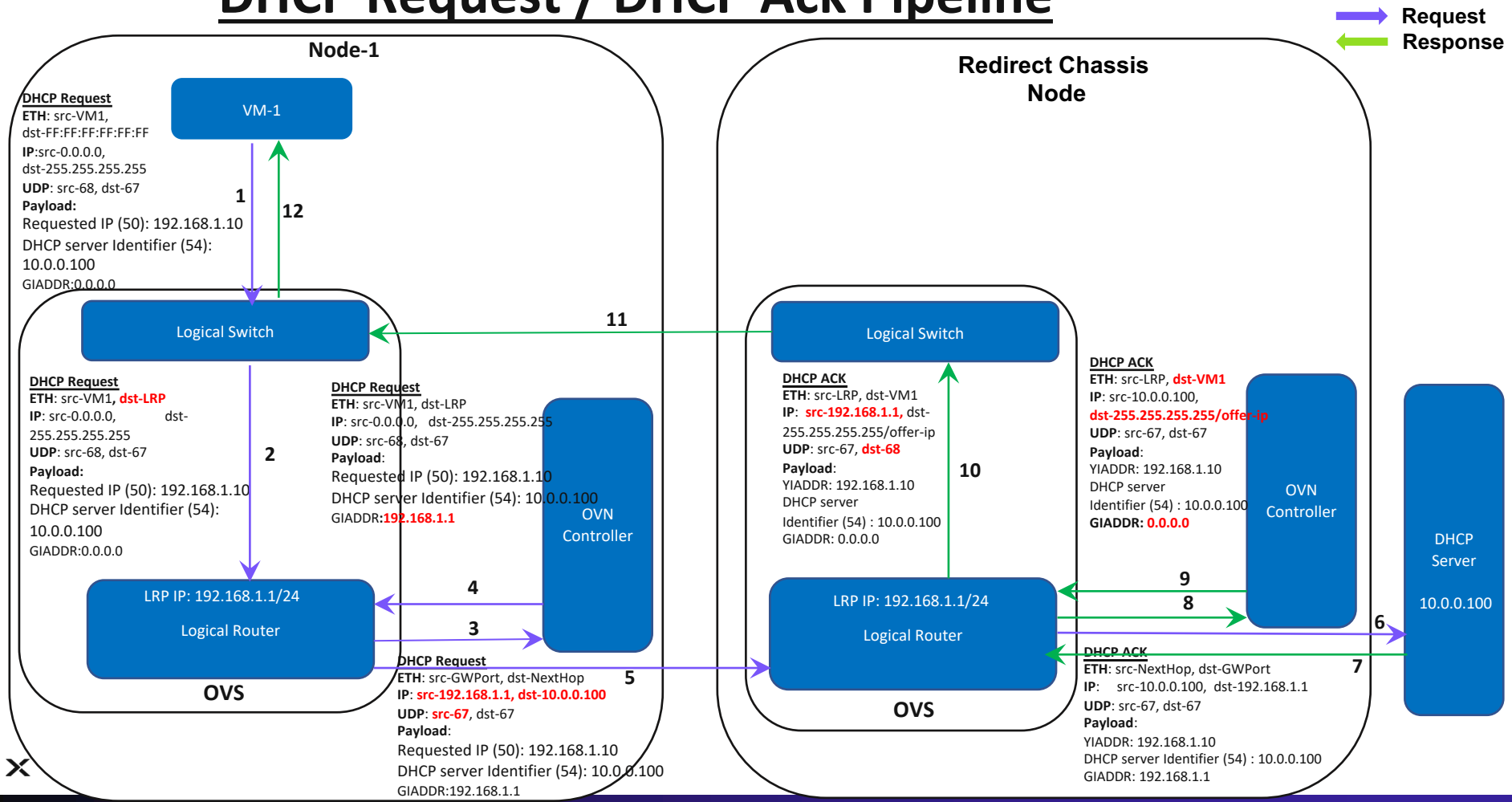
DHCP Discover / DHCP Offer Pipeline



DHCP Request / DHCP Ack Pipeline



Logical Flows

Following flows are added to enable DHCP Relay Agent for one Subnet (with one VM)

table=27(ls_in_l2_lkup), priority=100 , match=(inport == <vm_port> && eth.src == <vm_mac> && ip4.src == 0.0.0.0 && ip4.dst == 255.255.255.255 && udp.src == 68 && udp.dst == 67), action=(eth.dst=<lrp_mac>;outport=<lrp-port>;next;/* DHCP_RELAY_REQ */)

table=3 (lr_in_ip_input), priority=110 , match=(inport == <lrp_port> && ip4.src == 0.0.0.0 && ip4.dst == 255.255.255.255 && udp.src == 68 && udp.dst == 67), action=(dhcp_relay_req(<lrp_ip>,<dhcp_server_ip>);ip4.src=<lrp_ip>;ip4.dst=<dhcp_server_ip>;udp.src=67;next; /* DHCP_RELAY_REQ */)

table=3 (lr_in_ip_input), priority=110 , match=(ip4.src == <dhcp_server_ip> && ip4.dst ==<lrp_ip> && udp.src == 67 && udp.dst == 67), action=(next; /* DHCP_RELAY_RESP */)

table=17(lr_in_dhcp_relay_resp_fwd), priority=110 , match=(ip4.src == <dhcp_server_ip> && ip4.dst == <lrp_ip> && udp.src == 67 && udp.dst == 67), action=(dhcp_relay_resp_fwd(<lrp_ip>,<dhcp_server_ip>);ip4.src=<lrp_ip>;udp.dst=68;outport=<lrp_port>;output; /* DHCP_RELAY_RESP */)

OVSDB Schema Change

1. New DHCP_Relay table

```
"DHCP_Relay": {
      "columns": {
  "name": {"type": "string"},
         "servers": {"type": {"key": "string",
                              "min": 0,
                              "max": 1}},
         "external_ids": {
             "type": {"key": "string", "value": "string",
                      "min": 0, "max": "unlimited"}}},
      "isRoot": true},
```

2. New column to Logical_Router_Port table

```
"dhcp_relay": {"type": {"key": {"type": "uuid",
                      "refTable": "DHCP_Relay",
                      "refType": "weak"},
                      "min": 0,
                      "max": 1}},
```

3. New column to Logical_Switch_table

```
"dhcp_relay_port": {"type": {"key": {"type": "uuid",
                             "refTable": "Logical_Router_Port",
                             "refType": "weak"},
                              "min": 0,
                              "max": 1}}},
```

Example Config

1. ovn-nbctl ls-add sw1
2. ovn-nbctl lsp-add sw1 sw1-port1
3. ovn-nbctl lsp-set-addresses sw1-port1 <MAC> ***# LSP is configured with MAC Address, IP is not known.***
4. ovn-nbctl lr-add lr1
5. ovn-nbctl lrp-add lr1 lr1-port1 <MAC> <LRP_IP/Prefix> ***# GIADDR = LRP_IP in the DHCP packets.***
6. ovn-nbctl lsp-add sw1 lr1-attachment
7. ovn-nbctl lsp-set-type lr1-attachment router
8. ovn-nbctl lsp-set-addresses lr1-attachment <MAC>
9. ovn-nbctl lsp-set-options lr1-attachment router-port=lr1-port1
10. ovn-nbctl create DHCP_Relay servers=<DHCP_SERVER_IP>
11. ovn-nbctl set Logical_Router_port <lrp_uuid> dhcp_relay=<relay_uuid>
12. ovn-nbctl set Logical_Switch <ls_uuid> dhcp_relay_port=<lrp_uuid>

Limitations

OVN features that needs IP address to be configured on Logical Port (like proxy arp, etc) will not be supported for the DHCP relay agent enabled subnets.

References

- Rfc 1541
- Rfc 1542
- Rfc 2131

Status

Development In-Progress

OVN RFC Patch

https://www.mail-archive.com/ovs-dev@openvswitch.org/msg80899.html

Thank You

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