# 02-router

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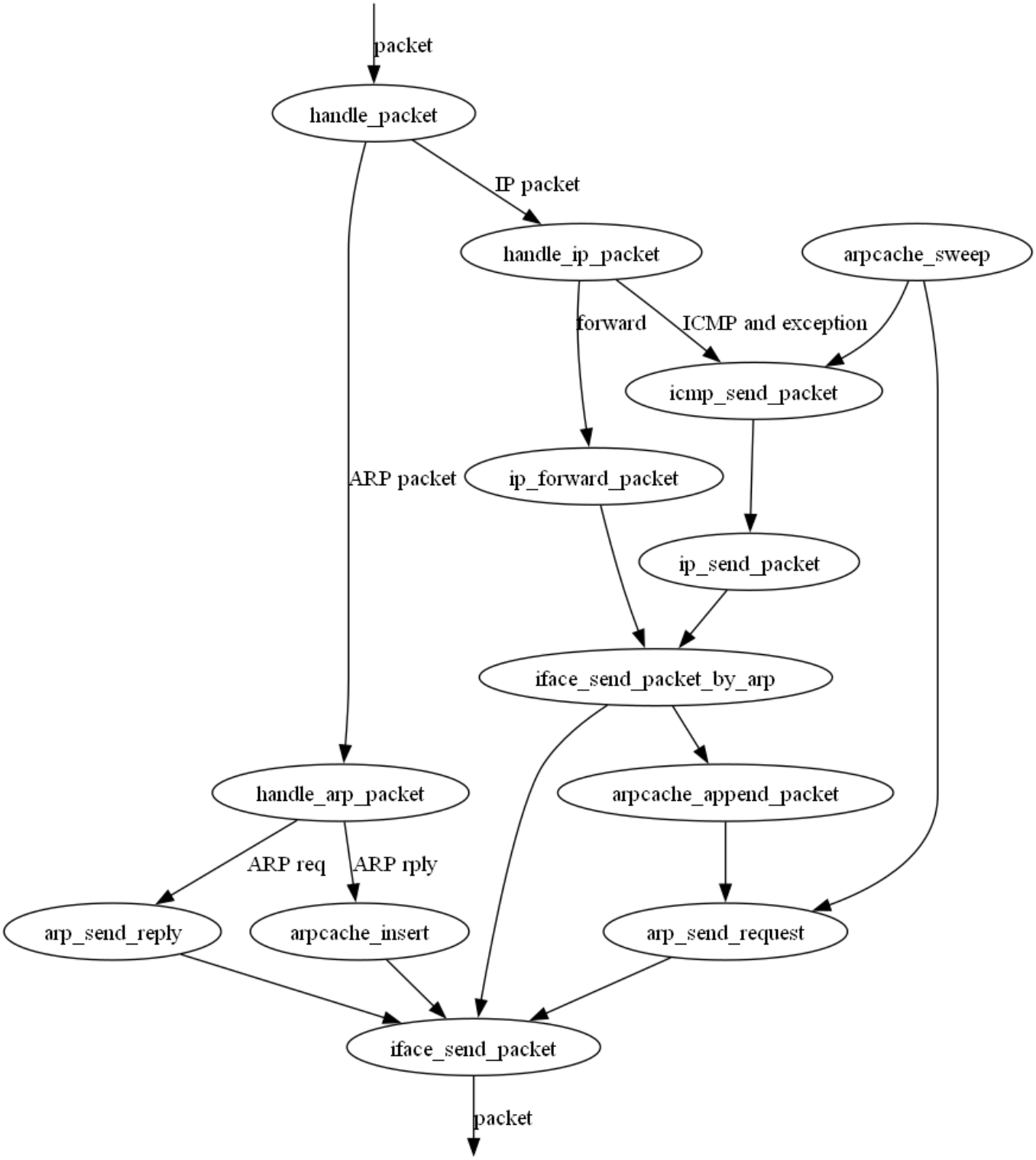
This lab took me about 16 hours to do.

**Implementation Explanation:** 前言：本实现没有采用ppt给出的函数调用拓扑图，理由是认为框架代码原意并非是其图上描述的那样 见ip_base.c：

```
// Different from forwarding packet, ip_send_packet sends packet generated
by
// router itself. This function is used to send ICMP packets.
void ip_send_packet(char *packet, int len);
```

本实现函数调用拓扑图大致如下，略去部分细节

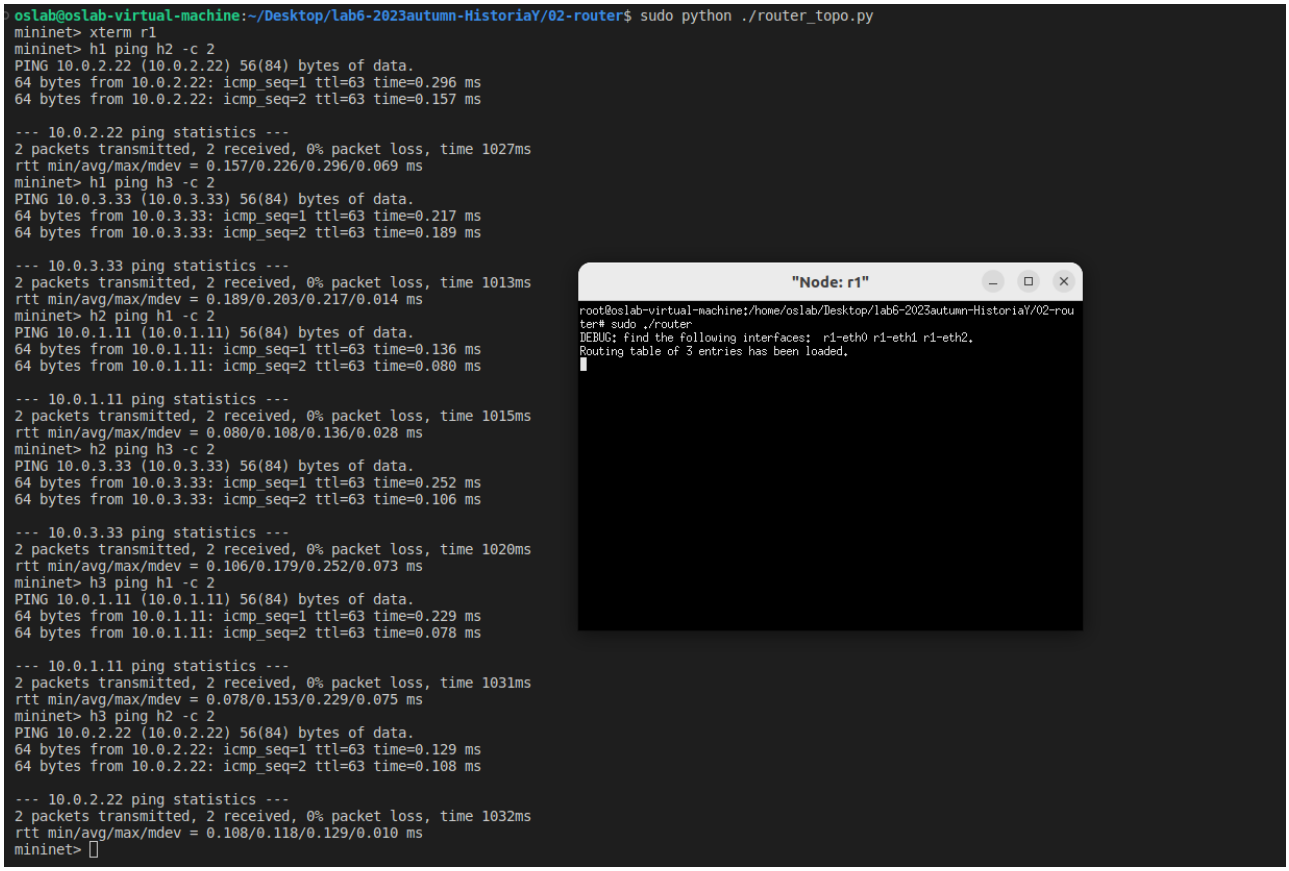



由于大部分函数实现实在是又臭又长，在此不贴源码占用空间，详见源文件及注释

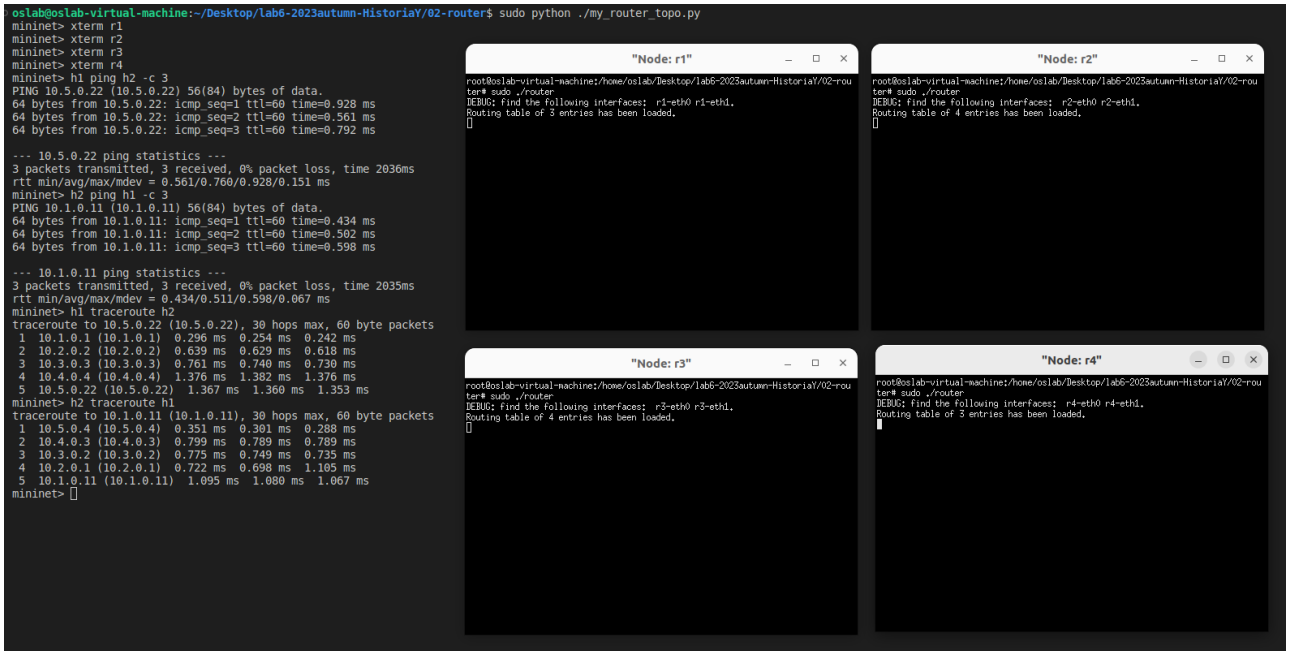
**路由器** 路由器路由时，首先调用longest_prefix_match得到rt_entry_t（若NULL则发送不可达ICMP报文），否则查询gate way得到next hop（gw=0则说明在同一个LAN），通过next hop查询ARP表，得到目的MAC地址（查询失败则发送ARP req，并pending），最后将packet发送即可（通过iface_send_packet）

**Screenshots:**

- **sudo python ./router_topo.py**




- **sudo python ./my_router_topo.py**




拓扑结构：h1-r1-r2-r3-r4-h2 IP地址配置和路由表配置如下（详见my_router_topo.py）：

```
    h1.cmd('ifconfig h1-eth0 10.1.0.11/24')
    h2.cmd('ifconfig h2-eth0 10.5.0.22/24')

    r1.cmd('ifconfig r1-eth0 10.1.0.1/24')
    r1.cmd('ifconfig r1-eth1 10.2.0.1/24')

    r2.cmd('ifconfig r2-eth0 10.2.0.2/24')
    r2.cmd('ifconfig r2-eth1 10.3.0.2/24')
```

```
    r3.cmd('ifconfig r3-eth0 10.3.0.3/24')
    r3.cmd('ifconfig r3-eth1 10.4.0.3/24')

    r4.cmd('ifconfig r4-eth0 10.4.0.4/24')
    r4.cmd('ifconfig r4-eth1 10.5.0.4/24')

    h1.cmd('route add default gw 10.1.0.1')
    h2.cmd('route add default gw 10.5.0.4')

    r1.cmd('route add -net 10.1.0.0 netmask 255.255.255.0 gw 0.0.0.0 dev
r1-eth0')
    r1.cmd('route add -net 10.5.0.0 netmask 255.255.255.0 gw 10.2.0.2 dev
r1-eth1')

    r2.cmd('route add -net 10.1.0.0 netmask 255.255.255.0 gw 10.2.0.1 dev
r2-eth0')
    r2.cmd('route add -net 10.5.0.0 netmask 255.255.255.0 gw 10.3.0.3 dev
r2-eth1')

    r3.cmd('route add -net 10.1.0.0 netmask 255.255.255.0 gw 10.3.0.2 dev
r3-eth0')
    r3.cmd('route add -net 10.5.0.0 netmask 255.255.255.0 gw 10.4.0.4 dev
r3-eth1')

    r4.cmd('route add -net 10.1.0.0 netmask 255.255.255.0 gw 10.4.0.3 dev
r4-eth0')
    r4.cmd('route add -net 10.5.0.0 netmask 255.255.255.0 gw 0.0.0.0 dev
r4-eth1')
```

**Remaining Bugs:** 本次实验测试全部通过，无遗留bug