

# CSCI 551, Fall 2019 Lab 1

USCID: [5802330996]

Name: [Zheyu Shen]

## 1 Design

The main target for this assignment is IP forwarding and handling ARP.

- i For IP Forwarding, the router needs to check that the packet is valid, decrement the TTL, recompute the packet checksum. And then, it check the ARP cache to send it or add the packet to the queue.
- ii For handling ARP, the router needs to reply for the ARP request and send the ARP request to get the MAC address of an IP address.

## 2 Implementation

- i In file sr\_router.c, I modify function sr\_handlepacket, and add eight functions sr\_handle\_ip, sr\_handle\_arp, sr\_handle\_arp\_reply, sr\_rt\_for\_dst, sr\_send\_icmp, sr\_send\_icmp\_t3, sr\_send\_arp\_req, and sr\_send\_arp\_reply.

void sr\_handlepacket(struct sr\_instance\* , uint8\_t \* , unsigned int , char\* ): This method is called each time the router receives a packet on the interface. The packet buffer, the packet length and the receiving interface are passed in as parameters. It differs IP packet and ARP packet and calls different methods to process the packet.

void sr\_handle\_ip(struct sr\_instance\*, uint8\_t \*, unsigned int, char \*): This method is called if the packet router received on the interface is IP packet. The receive packet buffer, the packet length and the receiving interface name are passed in as parameters. It checks that the packet is large enough to hold an IP header and that the packet has a correct checksum. If it is for me, the method differs wheather it is for me and the protocol of the IP packet. If it is for me, the method decreases the TTL, recompute the checksum, find out which entry in the routing table to forward this packet, check ARP cache for the nexthop MAC address.

void sr\_handle\_arp(struct sr\_instance\*, uint8\_t \*, unsigned int, char \*): This method is called if the packet router received on the interface is ARP packet. The receive packet buffer, the packet length and the receiving interface name are passed in as parameters. It checks that the packet is large enough to hold an ARP header, differ wheather it is ARP request packet or ARP reply packet.

void sr\_handle\_arp\_reply(struct sr\_instance\*, sr\_arp\_hdr\_t \*, char \*): This method is called to handle ARP reply packet. The ARP header of receive packet and the receiving interface name are passed in as parameters. The method caches the ARP entry, goes through the request queue and sends outstanding packets.

`struct sr_rt* sr_rt_for_dst(struct sr_instance *, uint32_t)`: This method is called to find out which entry in the routing table using longest prefix matching. The destination IP address is passed in as parameters.

`int sr_send_icmp(struct sr_instance*, uint8_t *, uint8_t, uint8_t, char *)`: This method is called to send echo reply message. The packet buffer, ICMP type, ICMP code and the interface name are passed in as parameters. It constructs an echo reply ICMP packet and sends it out.

`int sr_send_icmp_t3(struct sr_instance*, uint8_t *, uint8_t, uint8_t, char *)`: This method is called to send other ICMP message. The packet buffer, ICMP type, ICMP code and the interface name are passed in as parameters. It constructs an ICMP packet and sends it out.

`int sr_send_arp_req(struct sr_instance*, struct sr_arpreq*)`: This method is called to send ARP request. The ARP request is passed in as parameters. It constructs an ARP request packet and sends it out.

`int sr_send_arp_reply(struct sr_instance*, uint8_t *, unsigned int, char *)`: This method is called to send ARP reply. The received packet buffer, packet length and interface to send the packet are passed in as parameters. It constructs an ARP reply packet and sends it out.

ii In file `sr_arpcache.c`, I modify function `sr_arpcache_sweepreqs`.

`void sr_arpcache_sweepreqs(struct sr_instance *)`: This function gets called every second. It drops ARP request and sends ICMP host unreachable to all waiting hosts or sends the ARP request.