EECS 489 PA1

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Code base

- How many of you still cannot get the program running?
  - Download the new code
- Functions already implemented in .o
  - But you need to implement them again
  - Check with it as the specification
- Incrementally implement your code and replace old .o with yours.
Task 1

• vip_input()
  – Get VIP header, integrity check, receive or forward
• vip_output()
  – Find next hop to send packet, error?
• vip_forw()
  – Route the packets to the next vrouter
• vip_drop()
  – Discard packets and generate error code when appropriate
Task 1 - Common questions

- Byte order
  - ntohs() vs. htons()
- When to convert from char* to int and vice versa
- Hop count
- vif_pullup() vs. vif_pullupn()
- How to clear interface?
- packets_buf full error
Byte order

• `ntohs()` vs. `htons()`
  – `ntohs()`: Network byte order to host
  – `htons()`: Host to network

• Example:
  – 0x12345678 vs. 0x78563412
When to convert from char* to int and vice versa

char* a = “123”;  
int b = atoi(a);

• No need to do it when you pull up the header.
  1. char* buf = malloc(sizeof(vip_t));
     vif_pullupn(vif, buf, sizeof(vip_t));
     vip_t* vip = (vip_t*) buf;
  2. vif_pullupn(vif, (char *) &vip, sizeof(vip_t));

• You can check on you own by trying to print out the content
struct _vip_hdr {
    u_short vip_ver;    /* version number */
    u_short vip_hop;    /* hop limit */
    u_short vip_len;    /* packet size, excluding header */
    u_short vip_prot;   /* protocol number */
    vin_addr_t vip_src; /* source vin address, see vnet.h */
    vin_addr_t vip_dst; /* destination vin address */
};

typedef struct _vip_hdr vip_t;
Hop count

- Decrement the hop count field in VIP header by 1 whenever the packet goes through a vrouter.
- In `vip_forw()`
- Not related to link cost at this point
vif_pullup() vs. vif_pullupn()

- Better guarantee by vif_pullupn()
- Should use vif_pullupn() in most cases
  - Except for clearing interface
packets_buf full error

• Reliable VTP Packets unACKed.
How to clear interface?

• Look at the comments at the end of vip_input()
• Use vip_pullup()
Task 2 - VCMP error messages

• When to generate VCMP messages
  – Hop count exceeded
  – Host unreachable (no route to the host)
  – Link down (route found but error in transmission)
  – Unknown protocol (in VIP header)

• For all other errors, you are not required, but encouraged to think about when it is necessary to generate error message

• Never generate error message for VCMP packet
Task 2 - VCMP error messages

• Don’t forget to wrap the original VIP header in the error message
Task 3 – end-to-end retransmission

• Simulate TCP’s basic functionality
• TCP has:
  – Retransmission
  – In-order delivery
  – congestion control
• We only need to implement retransmission
• End-to-end vs. Hop-by-hop retransmission
Task 3 - end-to-end retransmission

- Concepts
  - Reliable VTP packet vs. Unreliable VTP packet
  - ACK packet
  - Retransmission window
  - Timeout
- Retransmit ACK?
- Piggyback ACK
Q&A

- Thanks!