

Homework_3 - Computer Network

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Q1: We made a distinction between the forwarding function and the routing function performed in the network layer. What are the key differences between routing and forwarding?

A1: 转发是数据包从路由器的输入链路到相应的输出链路，路由是确定源和目的地之间的端到端路由。

Q2: Consider a datagram network using 8-bit host addresses. Suppose a router uses longest prefix matching and has the following forwarding table:

Prefix Match	Interface
00	0
010	1
011	2
10	2
11	3

For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

A2:

Destination Address Range		Interface
00000000	00111111	0
01000000	01011111	1
01100000	01111111	2
10000000	10111111	2
11000000	11111111	3

接口 0 的地址数 $2^6 = 64$

接口 1 的地址数 $2^5 = 32$

接口 2 的地址数 $2^5 + 2^6 = 96$

接口 3 的地址数 $2^6 = 64$

Q3: Consider the topology shown in the Figure. Denote the three subnets with hosts (starting clockwise at 12:00) as Networks A, B, and C. Denote the subnets without hosts as Networks D, E, and F.

a. Assign network addresses to each of these six subnets, with the following constraints: All addresses must be allocated from 214.97.254/23; Subnet A should have enough addresses to support 250 interfaces; Subnet B should have enough addresses to support 120 interfaces; and Subnet C should have enough addresses to support 120 interfaces. Of course, subnets D, E and F should each be able to support two interfaces. For each subnet, the assignment should take the form a.b.c.d/x or a.b.c.d/x – e.f.g.h/y.

b. Using your answer to part (a), provide the forwarding tables (using longest prefix matching) for each of the three routers.

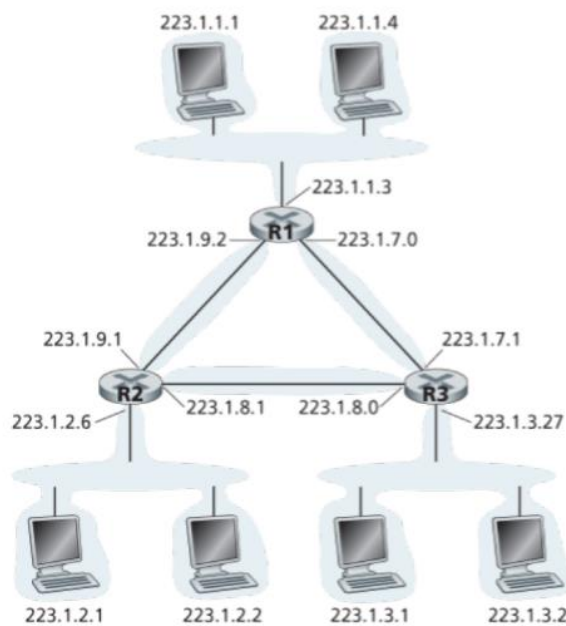


Figure Three routers interconnecting six subnets

A3:

a:

SubnetA : the subnet with hosts and R1

SubnetB : the subnet with hosts and R3

SubnetC : the subnet with hosts and R2

SubnetD : the subnet with R1 and R3

SubnetE : the subnet with R3 and R2

SubnetF : the subnet with R2 and R1

Assign the IP addresses to the six subnets as follows:

Subnet	IP address	Num of available address
A	214.97.255/24	254 (2 for special purpose)
B	217.97.254.0/25-217.97.254.0/29	128-8=120
C	214.97.254.128/25	128
D	214.97.254.0/31	2
E	214.97.254.2/31	2
F	214.97.254.4/30	4

Router 1

11010110 01100001 11111111	SubnetA
11010110 01100001 11111110 00000000	SubnetD
11010110 01100001 11111110 0000001	SubnetF

Router 2

11010110 01100001 11111110 0	SubnetB
11010110 01100001 11111110 00000000	SubnetD
11010110 01100001 11111110 00000001	SubnetE

Router 3

11010110 01100001 11111110 1	SubnetC
11010110 01100001 11111110 00000001	SubnetE
11010110 01100001 11111110 0000001	SubnetF

Q4: Consider sending a 2400-byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

A4: 数据区的最大存储限制是 680 字节 (20 字节被用来当作 IP 数据报头)。因此数据碎片个数是 $(2400-20) / 680 = 4$ 。每个碎片将有 422 的标识。前三个片段的大小为 700 字节，但最后一个片段的大小为 360 字节。4 个片段的偏移量为 0, 85, 170, 255。前

3 个片段的 flag=1，表示还有数据;最后一个片段 flag=0，表示后面没有数据。

Q5: How does generalized forwarding differ from destination-based forwarding?

A5:

基于地址的转发：仅基于目的 IP 地址的转发

广义转发：基于任何报文头部值的转发