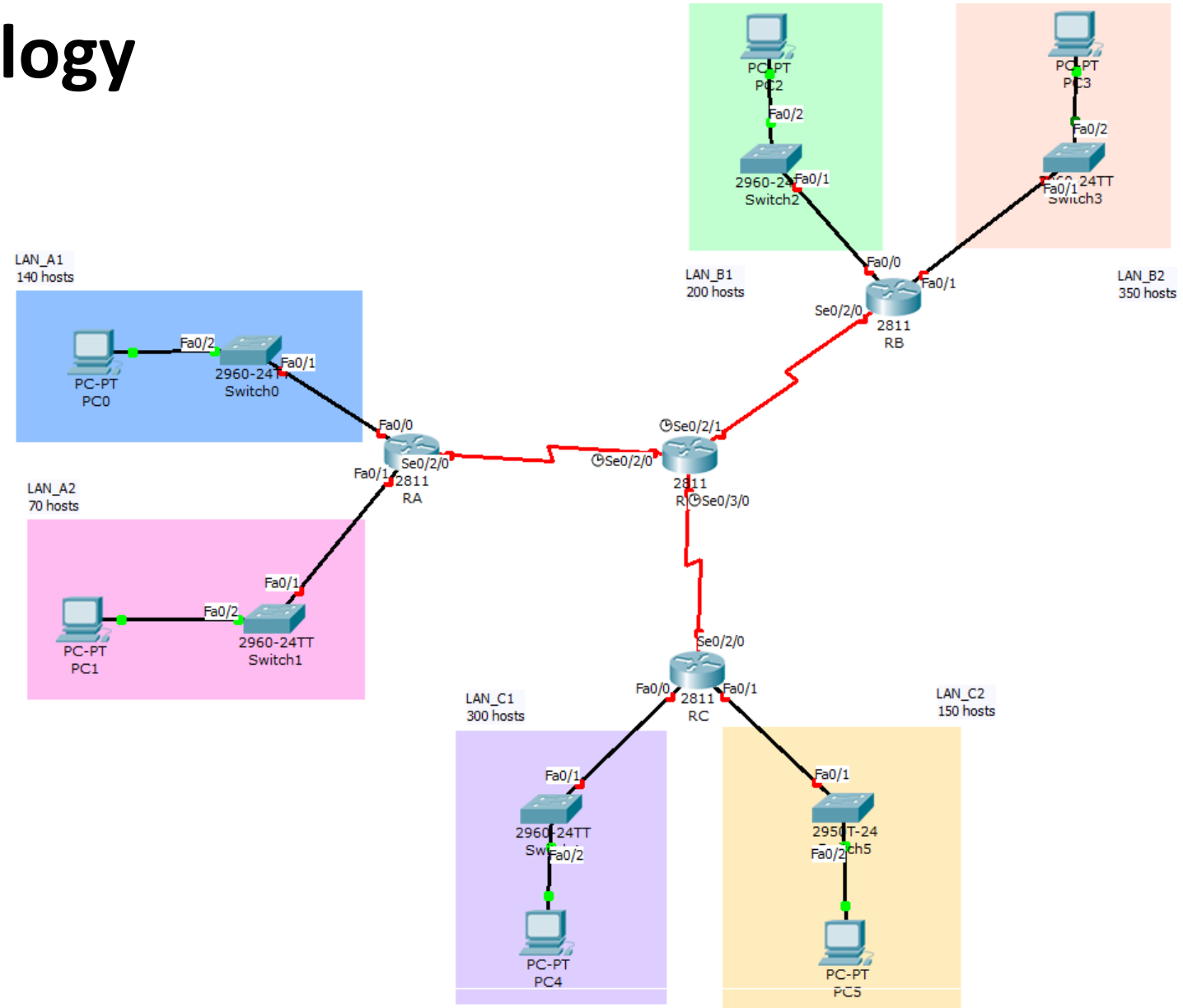
Classful Routing
Classless Routing

Classful and CIDR Example

Topology


LAN_A1
140 hosts
PC-PT
PC0
Fa0/2
2960-24TT
Switch0
Fa0/1
Fa0/0
Se0/2/0
2811
RA
Fa0/1
LAN_A2
70 hosts
PC-PT
PC1
Fa0/2
2960-24TT
Switch1
Fa0/1
PC-PT
PC2
Fa0/2
2960-24TT
Switch2
Fa0/1
LAN_B1
200 hosts
Fa0/0
Se0/2/0
2811
RB
Fa0/1
Se0/2/1
Se0/2/0
2811
R
Se0/3/0
PC-PT
PC3
Fa0/2
Fa0/1
Switch3
LAN_B2
350 hosts
Se0/2/0
Fa0/0
2811
RC
Fa0/1
LAN_C1
300 hosts
Fa0/1
Fa0/2
PC-PT
PC4
LAN_C2
150 hosts
Fa0/1
Fa0/2
PC-PT
PC5

Address Requirements

ROUTER	LINK	HOSTS
RA	LAN_A1	140
	LAN_A2	70
RB	LAN_B1	200
	LAN_B2	350
RC	LAN_C1	300
	LAN_C2	150
RBB→RA		2
RBB→RB		2
RBB→RC		2

ISP Address

172.55.0.0 /16

10101100.00110111.00000000.00000000

Classful Routing

Subnets

Required subnets: 9

$$2^n - 2 = usable\ subnets$$

n=4

10101100.00110111.0000**0000**.00000000

New prefix: /20

11111111.11111111.11110000.00000000

Subnets

Subnet 1:

N: 10101100.00110111.00010000.00000000

172.55.16.0

B: 10101100.00110111.00011111.11111111

172.55.31.255

R: 172.55.16.1 – 172.55.31.254

Subnets

Subnet 2:

N: 10101100.00110111.00100000.00000000

172.55.32.0

B: 10101100.00110111.00101111.11111111

172.55.47.255

R: 172.55.32.1 – 172.55.47.254

Subnets

Subnet 3:

N: 10101100.00110111.00110000.00000000

172.55.48.0

B: 10101100.00110111.00111111.11111111

172.55.63.255

R: 172.55.48.1 – 172.55.63.254

Subnets

Subnet 4:

N: 10101100.00110111.01000000.00000000

172.55.64.0

B: 10101100.00110111.01001111.11111111

172.55.79.255

R: 172.55.64.1 – 172.55.79.254

…

Subnets

	Subnet ID	Host Addresses	Subnet Broadcast
0	172.55.0.0	172.55.0.1 - 172.55.15.254	172.55.15.255
1	172.55.16.0	172.55.16.1 - 172.55.31.254	172.55.31.255
2	172.55.32.0	172.55.32.1 - 172.55.47.254	172.55.47.255
3	172.55.48.0	172.55.48.1 - 172.55.63.254	172.55.63.255
4	172.55.64.0	172.55.64.1 - 172.55.79.254	172.55.79.255
5	172.55.80.0	172.55.80.1 - 172.55.95.254	172.55.95.255
6	172.55.96.0	172.55.96.1 - 172.55.111.254	172.55.111.255
7	172.55.112.0	172.55.112.1 - 172.55.127.254	172.55.127.255
8	172.55.128.0	172.55.128.1 - 172.55.143.254	172.55.143.255
9	172.55.144.0	172.55.144.1 - 172.55.159.254	172.55.159.255
10	172.55.160.0	172.55.160.1 - 172.55.175.254	172.55.175.255
11	172.55.176.0	172.55.176.1 - 172.55.191.254	172.55.191.255
12	172.55.192.0	172.55.192.1 - 172.55.207.254	172.55.207.255
13	172.55.208.0	172.55.208.1 - 172.55.223.254	172.55.223.255
14	172.55.224.0	172.55.224.1 - 172.55.239.254	172.55.239.255
15	172.55.240.0	172.55.240.1 - 172.55.255.254	172.55.255.255

VLSM

Hosts

140	350
70	300
200	200
350	150
300	140
150	70
2	2
2	2
2	2

Subnet for 350 host

Required hosts 350.

$$2^n - 2 \geq hosts$$

n=9

10101100.00110111.00000000.00000000

0 – host

0 – subnet

New prefix /23

Subnet for 350 host

№	Subnet ID	Host Range	Subnet Broadcast	Prefix
0	172.55.0.0	172.55.0.1-172.55.1.254	172.55.1.255	/23
1	172.55.2.0	172.55.2.1-172.55.3.254	172.55.3.255	/23
2	172.55.4.0	172.55.4.1-172.55.5.254	172.55.5.255	/23
3	172.55.6.0	172.55.6.1-172.55.7.254	172.55.7.255	/23
4	172.55.8.0	172.55.8.1-172.55.9.254	172.55.9.255	/23
5	172.55.10.0	172.55.10.1-172.55.11.254	172.55.11.255	/23
6	172.55.12.0	172.55.12.1-172.55.13.254	172.55.13.255	/23
7	172.55.14.0	172.55.14.1-172.55.15.254	172.55.15.255	/23
….				

Addresses

ROUTER	LINK	HOSTS	NETWORK	Prefix
RA	LAN_A1	140		
	LAN_A2	70		
RB	LAN_B1	200		
	LAN_B2	350	172.55.0.0	/23
RC	LAN_C1	300	172.55.2.0	/23
	LAN_C2	150		
RBB→RA		2		
RBB→RB		2		
RBB→RC		2		

Subnet for 200 host

Free subnet: 172.55.4.0 /23

Required hosts 200.

n=8

10101100.00110111.00000100.00000000

0 – host

0 – subnet

New prefix /24

Subnet for 200 host

№	Subnet ID	Host Range	Subnet Broadcast	Prefix
0	172.55.4.0	172.55.4.1-172.55.4.254	172.55.4.255	/24
1	172.55.5.0	172.55.5.1-172.55.5.254	172.55.5.255	/24

Addresses

ROUTER	LINK	HOSTS	NETWORK	Prefix
RA	LAN_A1	140		
	LAN_A2	70		
RB	LAN_B1	200	172.55.4.0	/24
	LAN_B2	350	172.55.0.0	/23
RC	LAN_C1	300	172.55.2.0	/23
	LAN_C2	150	172.55.5.0	/24
RBB→RA		2		
RBB→RB		2		
RBB→RC		2		

Subnet for 140 host

Not enough addresses in 172.55.4.0 /23

We shall use the next free subnet – 172.55.6.0/23

Required hosts 140.

n=8

10101100.00110111.00000110.00000000

0 – host

0 – subnet

New prefix /24

Subnet for 200 host

№	Subnet ID	Host Range	Subnet Broadcast	Prefix
0	172.55.6.0	172.55.6.1-172.55.6.254	172.55.6.255	/24
1	172.55.7.0	172.55.7.1-172.55.7.254	172.55.7.255	/24

Addresses

ROUTER	LINK	HOSTS	NETWORK	Prefix
RA	LAN_A1	140	172.55.6.0	/24
	LAN_A2	70		
RB	LAN_B1	200	172.55.4.0	/24
	LAN_B2	350	172.55.0.0	/23
RC	LAN_C1	300	172.55.2.0	/23
	LAN_C2	150	172.55.5.0	/24
RBB→RA		2		
RBB→RB		2		
RBB→RC		2		

Subnet for 70 host

Free subnet 172.55.7.0 /24

Required hosts 70.

n=7

10101100.00110111.00000111.00000000

0 – host

0 – subnet

New prefix /25

Subnet for 350 host

№	Subnet ID	Host Range	Subnet Broadcast	Prefix
0	172.55.7.0	172.55.7.1-172.55.7.126	172.55.7.127	/25
1	172.55.7.128	172.55.7.129-172.55.7.254	172.55.7.255	/25

Addresses

ROUTER	LINK	HOSTS	NETWORK	Prefix
RA	LAN_A1	140	172.55.6.0	/24
	LAN_A2	70	172.55.7.0	/25
RB	LAN_B1	200	172.55.4.0	/24
	LAN_B2	350	172.55.0.0	/23
RC	LAN_C1	300	172.55.2.0	/23
	LAN_C2	150	172.55.5.0	/24
RBB→RA		2		
RBB→RB		2		
RBB→RC		2		

Subnet for 2 host

Free subnet 172.55.7.128 /24

Required hosts 70.

n=2

10101100.00110111.00000111.1000000

0 – host

0 – subnet

New prefix /30

Subnet for 2 host

№	Subnet ID	Host Range	Subnet Broadcast	Prefix
0	172.55.7.128	172.55.7.129-172.55.7.130	172.55.7.131	/30
1	172.55.7.132	172.55.7.133-172.55.7.134	172.55.7.135	/30
2	172.55.7.136	172.55.7.137-172.55.7.138	172.55.7.139	/30
3	172.55.7.140	172.55.7.141-172.55.7.142	172.55.7.143	/30
…				

Addresses

ROUTER	LINK	HOSTS	NETWORK	Prefix
RA	LAN_A1	140	172.55.6.0	/24
	LAN_A2	70	172.55.7.0	/25
RB	LAN_B1	200	172.55.4.0	/24
	LAN_B2	350	172.55.0.0	/23
RC	LAN_C1	300	172.55.2.0	/23
	LAN_C2	150	172.55.5.0	/24
RBB→RA		2	172.55.7.128	/30
RBB→RB		2	172.55.7.132	/30
RBB→RC		2	172.55.7.136	/30

Network Hierarchy

510 – B2
510 – C1
510 – 200 – B1
– 200 – C2
510 – 200 – A1
– 200 – 70 – A2
– 70 – 2 – RA→RBB
– 70 – 2 – RB→RBB
– 70 – 2 – RC→RBB