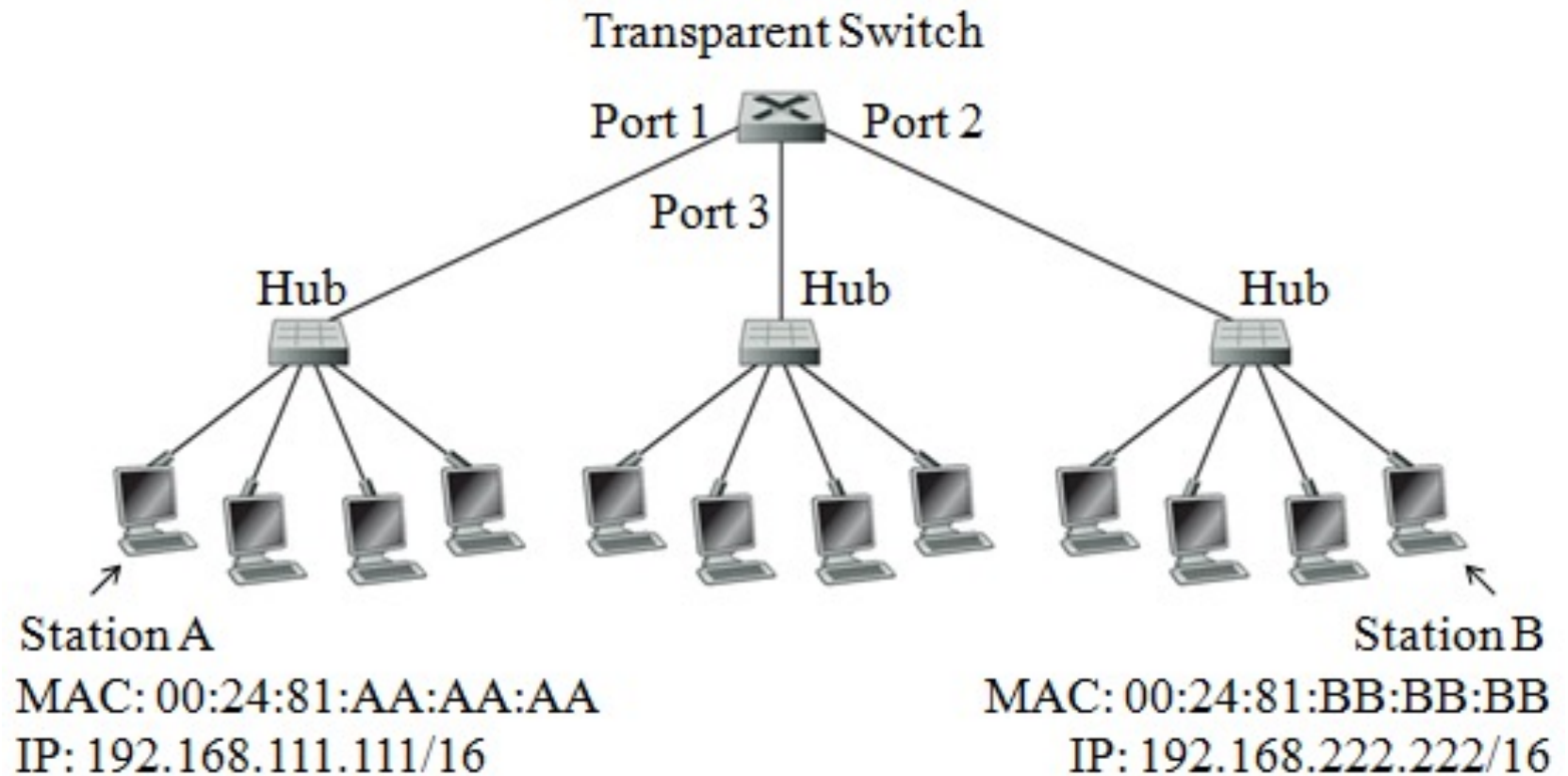


SC2008
CE3005:Computer Networks
CZ3006: Netcentric Computing

IP routing

Q1



Q1: ping, ARP and switch operation

Frame	MAC Address		Purpose of Frame	Actions taken by Switch
	Source	Destination		
1.	00-24-81-AA-AA-AA	FF-FF-FF-FF-FF-FF broadcast	ARP request for 192.168.222.222 end station	- new entry forwarding table 00-24-81-AA-AA-AA/port 1/time - broadcast ARP request frame to both port 2, 3
2.	00-24-81-BB-BB-BB end station	00-24-81-AA-AA-AA	ARP reply	- new entry forwarding table 00-24-81-BB-BB-BB/port 2/time - forward ARP reply to port 1

Transparent switch

ARP request end stn
ARP reply
ping request end stn
ping reply

MAC address: start-broadcast
the rest: end-start alternate

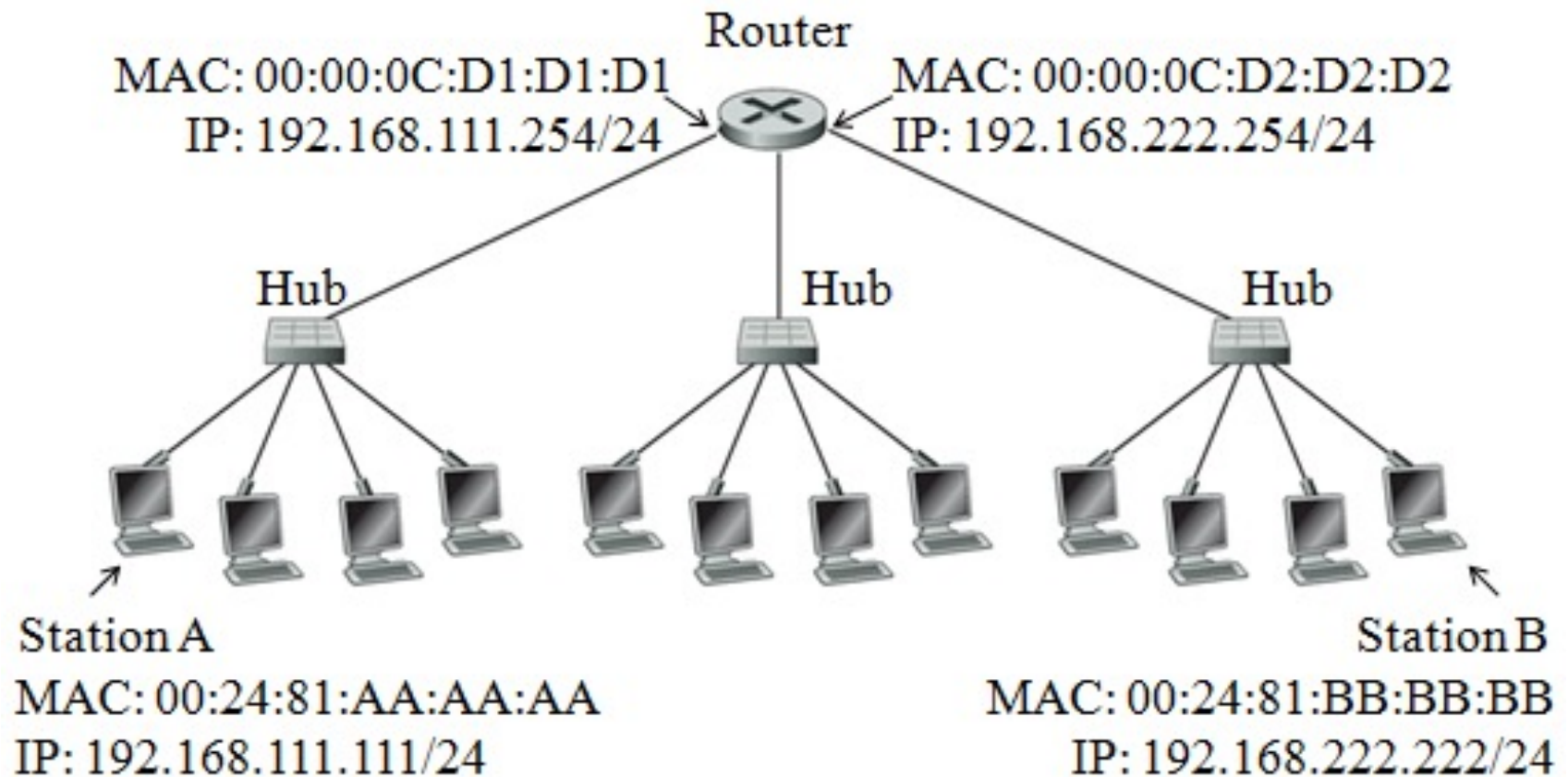
ARP: new entry forwarding table
Ping: update forwarding table

Q1: ping, ARP and switch operation

Frame	MAC Address		Purpose of Frame	Actions taken by Switch
	Source	Destination		
3.	00-24-81-AA-AA-AA	00-24-81-BB-BB-BB end	ping request for 192.168.222.222	- update forwarding table 00-24-81-AA-AA-AA/port 1/ new time - forward ping request to port 2
4.	00-24-81-BB-BB-BB end	00-24-81-AA-AA-AA	ping reply	- update forwarding table 00-24-81-BB-BB-BB/port 2/ new time - forward ping reply to port 1

For simplicity, assume ping sends 1 packet instead of 4.

Q2



: ping, ARP and router operation

Frame	MAC Address		Purpose of Frame	Actions taken by Router
	Source	Destination		
1.	00-24-81-AA-AA-AA	FF-FF-FF-FF-FF-FF broadcast	ARP request for default gateway 192.168.111.254	- new entry ARP cache 192.168.111.111/00-24-81-AA-AA-AA
2.	00-00-0C-D1-D1-D1	00-24-81-AA-AA-AA	ARP reply	- send ARP reply

router

router

ARP request router
ARP reply
ping request end stn
ping reply

Q2: ping, ARP and router operation

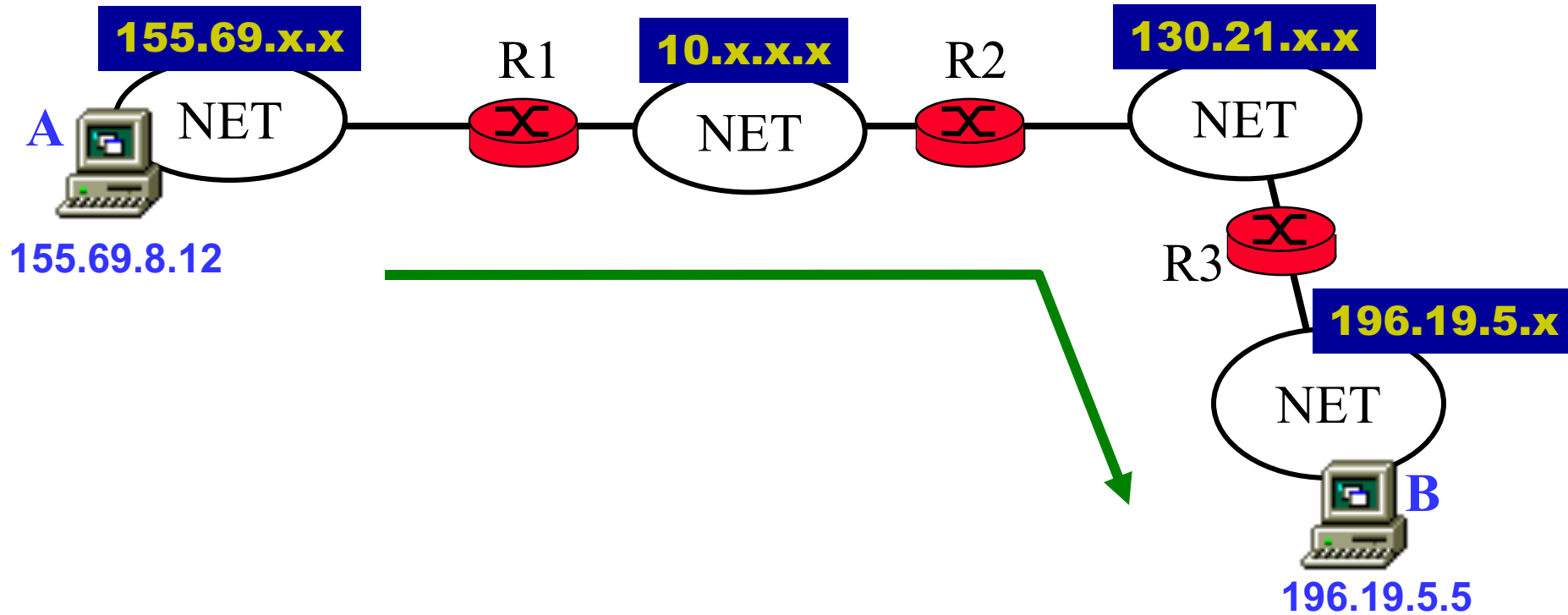
Frame	MAC Address		Purpose of Frame	Actions taken by Router
	Source	Destination		
3.	00-24-81-AA-AA-AA	00-00-0C-D1-D1-D1 router	ping request for 192.168.222.222	<ul style="list-style-type: none">- broadcast ARP request for 192.168.222.222 at subnet 192.168.222.0/24- receive ARP reply- new entry ARP cache 192.168.222.222/00-24-81-BB-BB-BB- forward ping request to 192.168.222.222
4.	00-00-0C-D1-D1-D1 router	00-24-81-AA-AA-AA	ping reply	<ul style="list-style-type: none">- receive ping reply- forward ping reply to 192.168.111.111

For simplicity, assume ping sends 1 packet instead of 4.

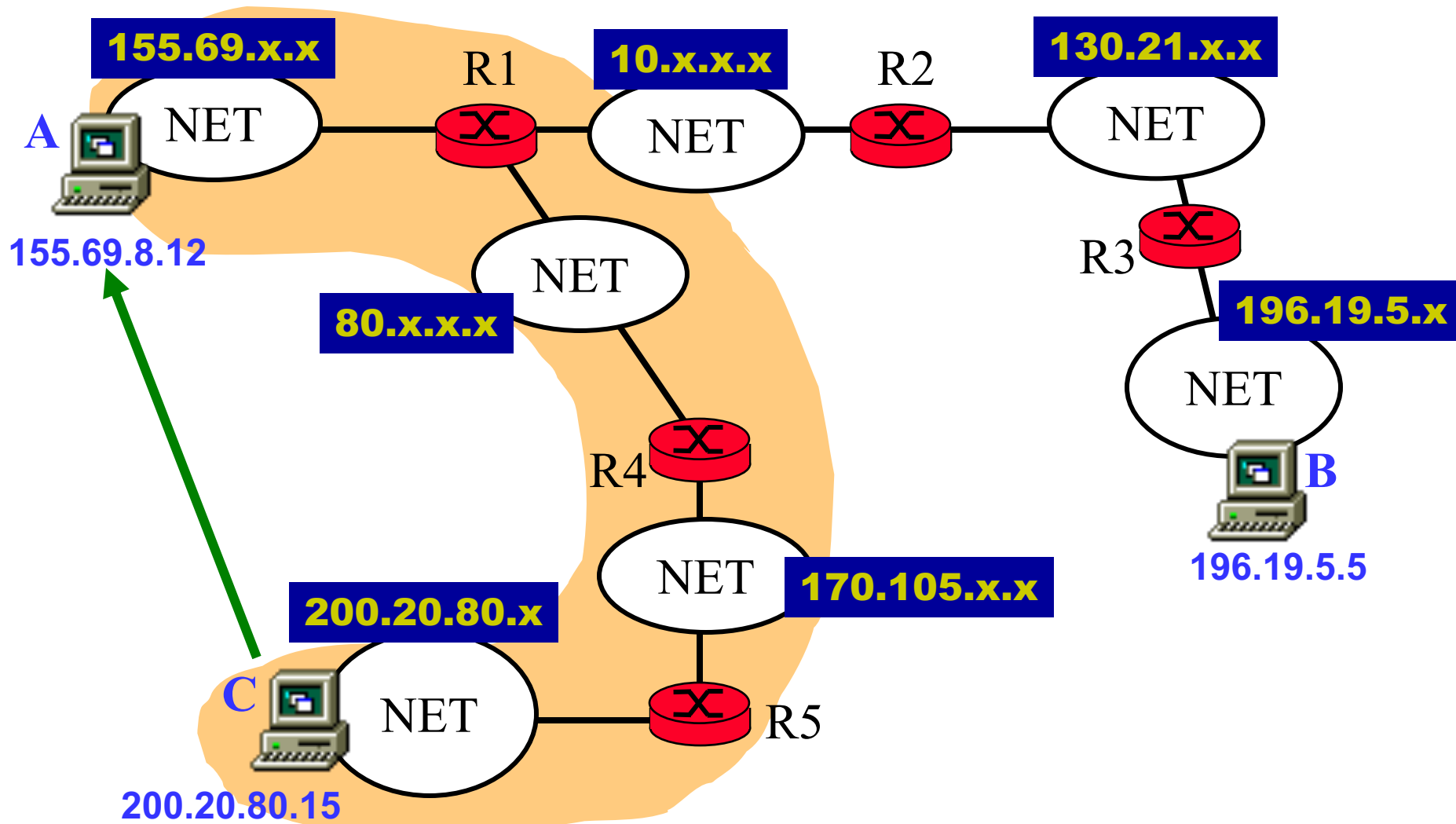
Q3

From Station A to B	From Station C to A	From Station B to C
155.69.8.10	200.20.80.12	196.19.5.104
10.203.20.10	170.105.10.21	130.21.80.90
130.21.10.30	80.90.10.3	90.80.120.10
196.19.5.5	155.69.8.12	170.105.10.20
		200.20.80.15

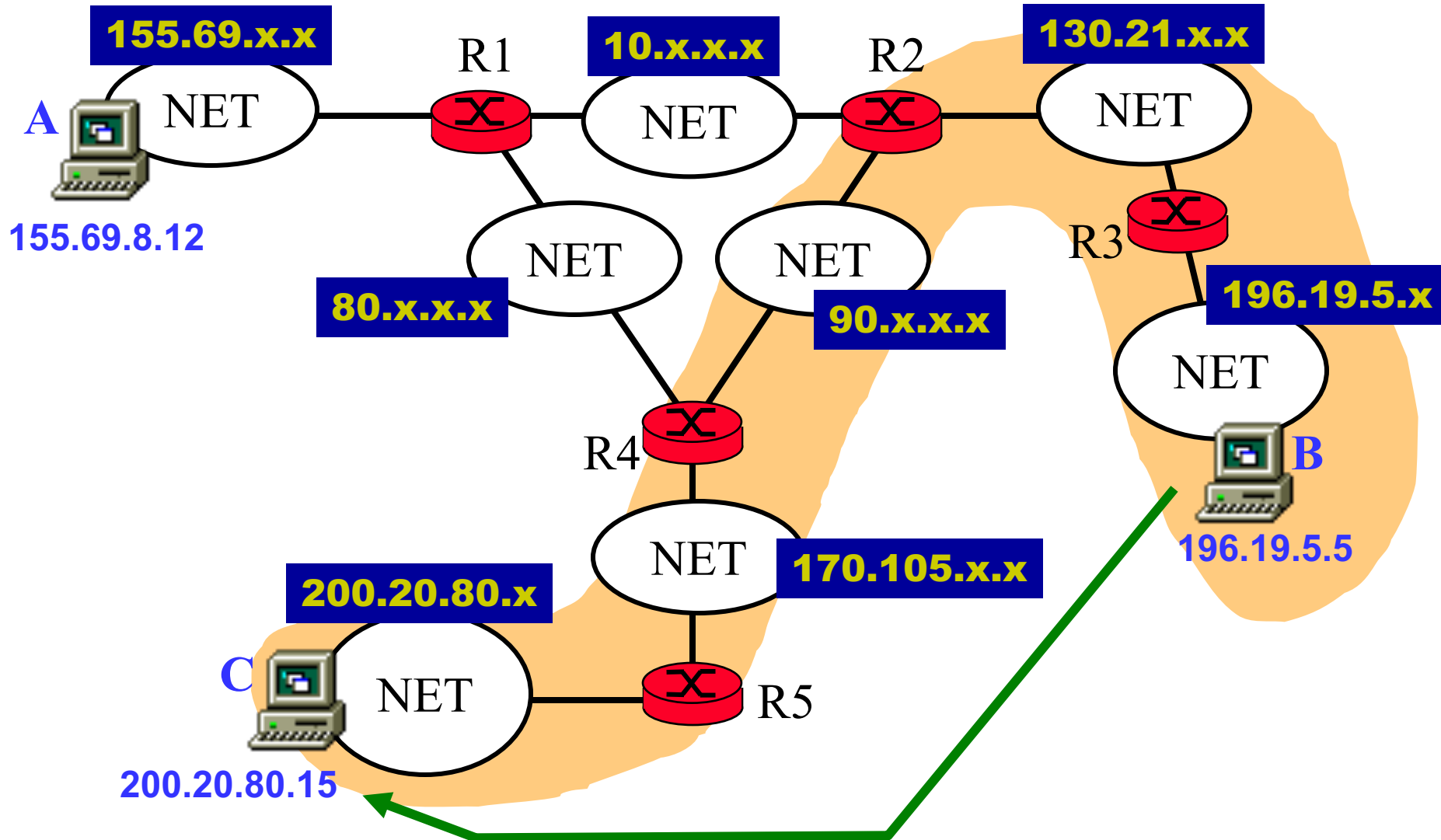
Q3: tracer A→B



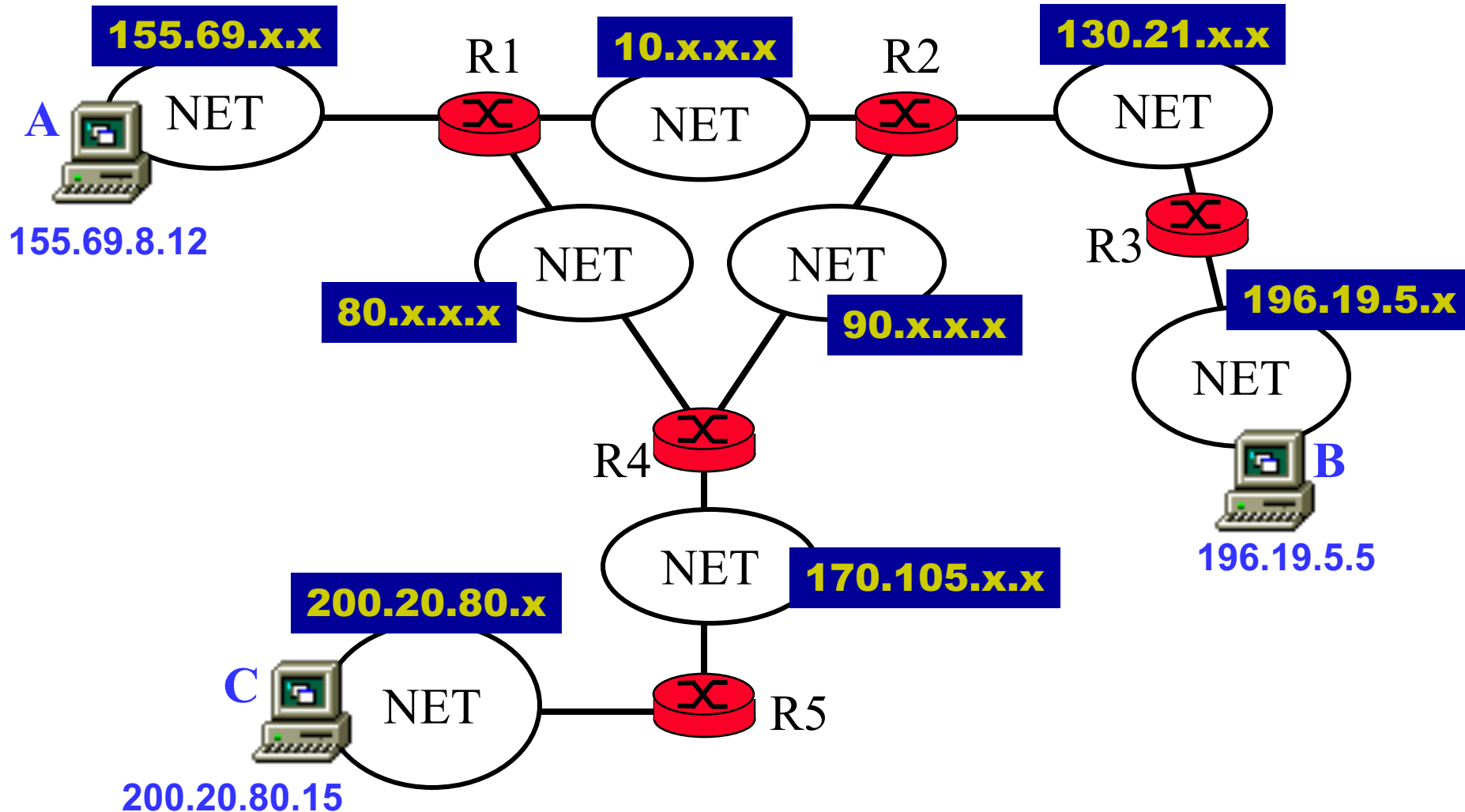
Q3: tracer C→A



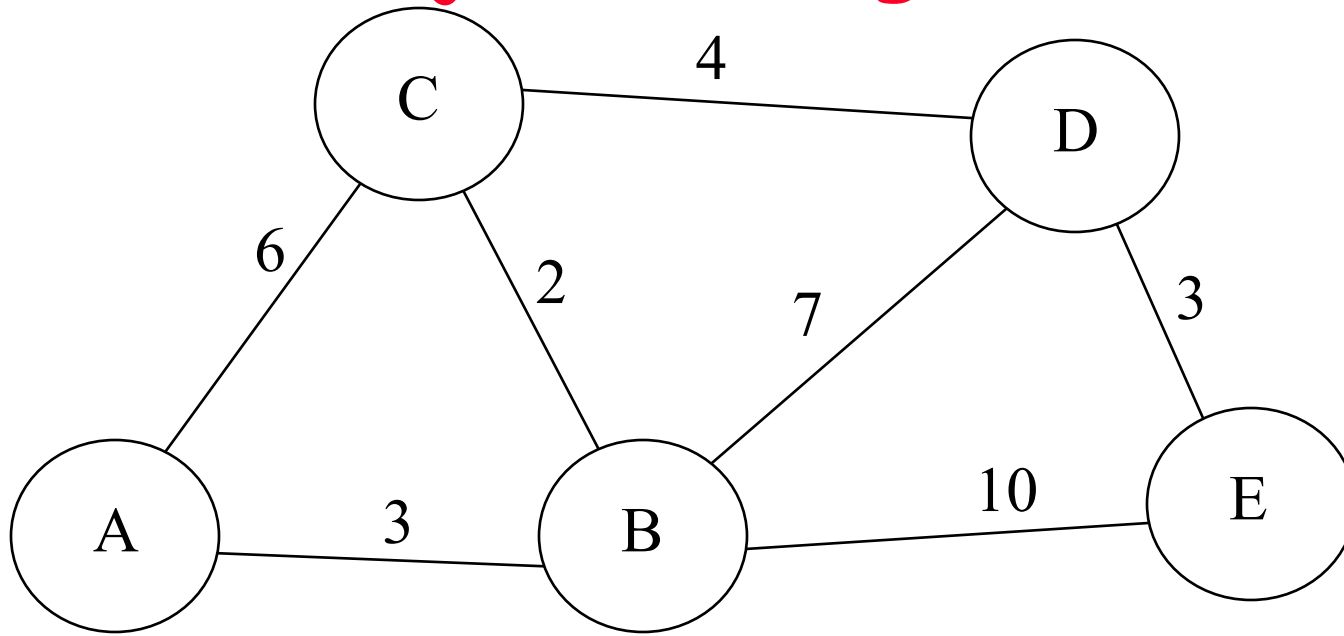
Q3: tracer B→C



Q3: tracer



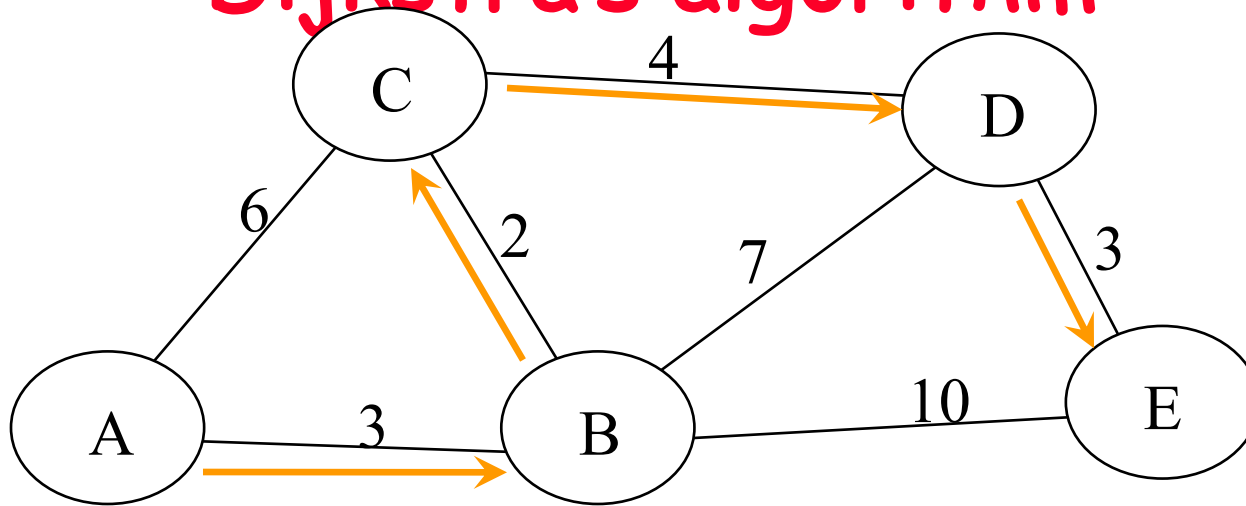
Q4: Link state routing protocol - Dijkstra's algorithm



LSA:

A	B	C	D	E
B=3	A=3	A=6	B=7	B=10
C=6	C=2	B=2	C=4	D=3
	D=7	D=4	E=3	
	E=10			

Q4: Link state routing protocol - Dijkstra's algorithm



Iterations of the algorithm

	B	C	D	E
{A}	3✓	6	∞	∞
{A,B}	3	5✓	10	13
{A,B,C}	3	5	9✓	13
{A,B,C,D}	3	5	9	12✓
{A,B,C,D,E}	3	5	9	12

In addition to the office hours listed in the previous slide, please feel free to contact Assistant Professor Jun ZHAO as follows to schedule appointments to ask questions. Thanks!

WhatsApp: <http://personal.ntu.edu.sg/JunZhao/whatsapp.png>

WeChat: <https://personal.ntu.edu.sg/JunZhao/wechat.png>

Singapore Phone Number (WhatsApp): 8648 3534

Email or Microsoft Teams: JunZhao@ntu.edu.sg

Skype ID: live:junzhaocmu

Office: Block N4, Room 02C-111, 50 Nanyang Ave, Singapore 639798

Homepage: <http://personal.ntu.edu.sg/JunZhao/>