CSC4200/5200 – COMPUTER NETWORKING

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ROUTING - CONTINUED

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Tennessee TECH

Apps (HTTP)

Data

Apps (HTTP)

Transport (TCP/UDP)

Segments

Transport (TCP/UDP)

Network (IP)

Packets

Network (IP)

Link (Ethernet)

Frames

Ethernet Interface

Ethernet Interface

Link (Ethernet)

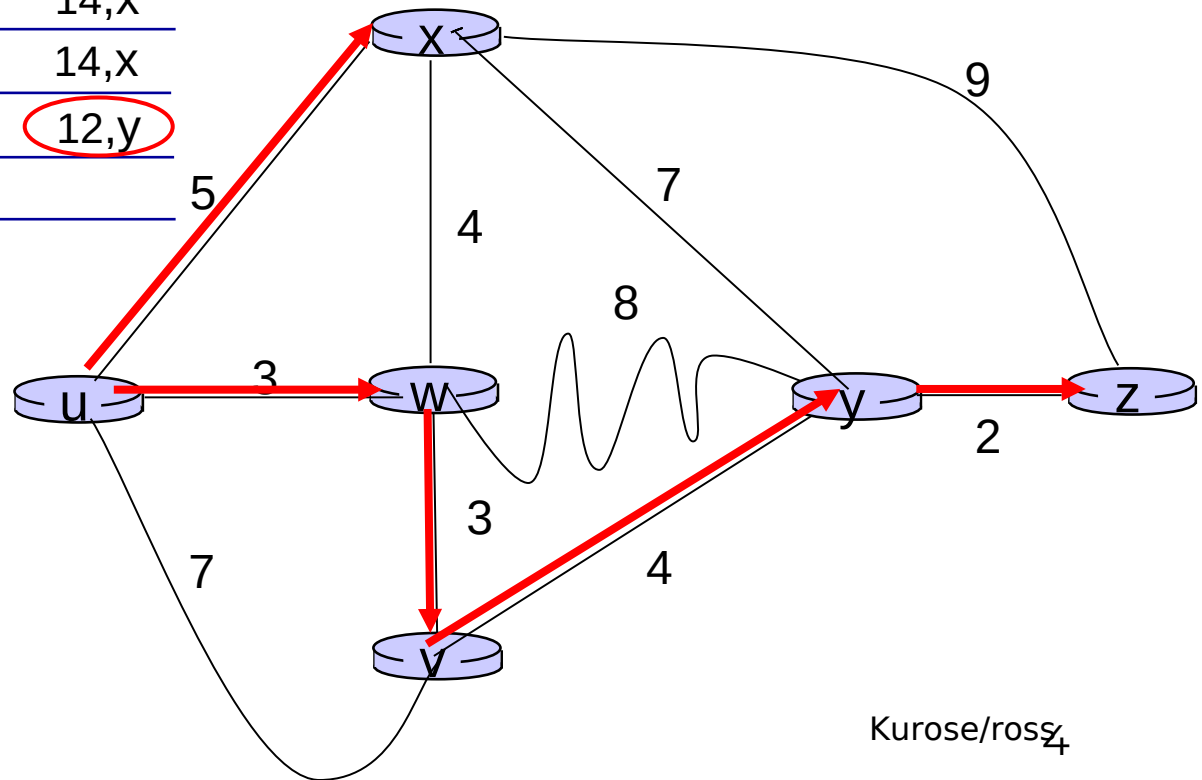
Bits (1010001)

So far...

- Routing – Distance Vector

Link State - Dijkstra's algorithm

Step	N'	D(v) p(v)	D(w) p(w)	D(x) p(x)	D(y) p(y)	D(z) p(z)
0	u	7,u	3,u	5,u	∞	∞
1	uw	6,w		5,u	11,w	∞
2	uwx	6,w			11,w	14,x
3	uwxv				10,v	14,x
4	uwxvy					12,y
5	uwxvyz					

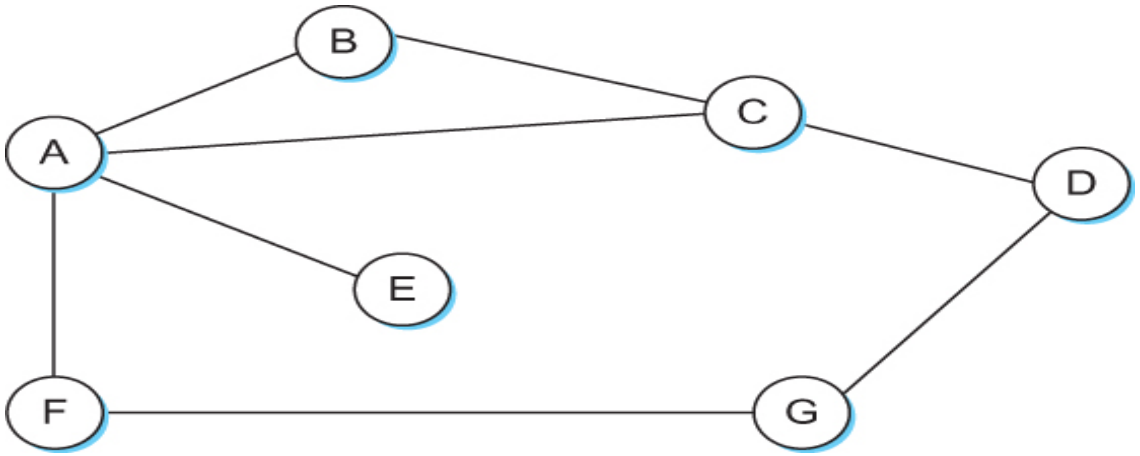


notes:

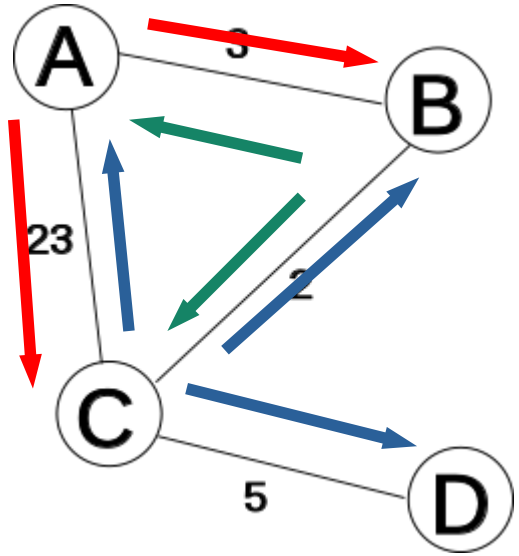
- construct shortest path tree by tracing predecessor nodes
- ties can exist (can be broken arbitrarily)

Distance Vector

- Each node has an one dimensional array (a vector) containing the “distances” (costs) to all other nodes
- Each node knows the cost to neighbors
- Each node distributes that vector to its immediate neighbors



Distance vector algorithm



T=4

from A	via A	via B	via C	via D
to A				
to B		3	25	
to C		5	23	
to D		10	28	

from B	via A	via B	via C	via D
to A	3		7	
to B				
to C	8		2	
to D	13		7	

from C	via A	via B	via C	via D
to A	23	5		15
to B	26	2		12
to C				
to D	33	9		5

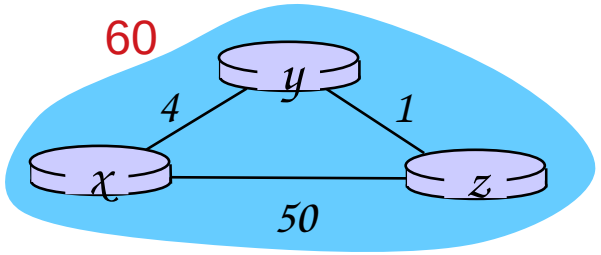
from D	via A	via B	via C	via D
to A			10	
to B			7	
to C			5	
to D				

Wikipedia

Initial distances stored at each node (global view)

Distance vector: link cost changes

$d_x(y)$ - Distance from x to y

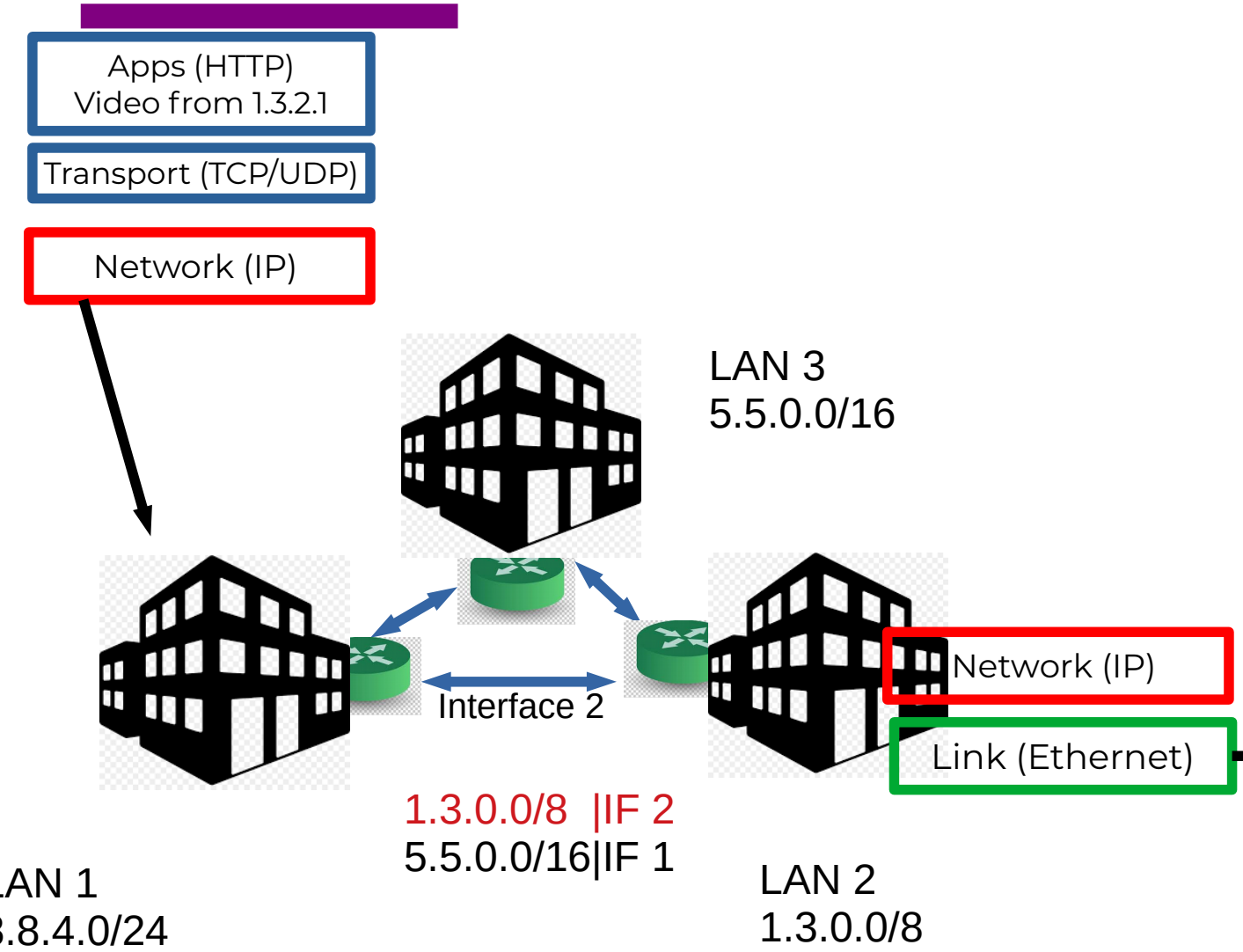


from \ cost to	x	y	z
x	0	4	5
y	4 6	0	1
z	5	1	0

← Y's table at convergence

Distance to x = Max (Direct path, Path via Z) = Max(60, 5+1) = 6
Y's path changed, advertise
Y → Z = Cost to x is 6
Z → Y = Cost to x is 7
....
Z finally realizes cost to x via y is 51, chooses direct path.

Routing – Summarized



Routing will get you to the door (to another network)

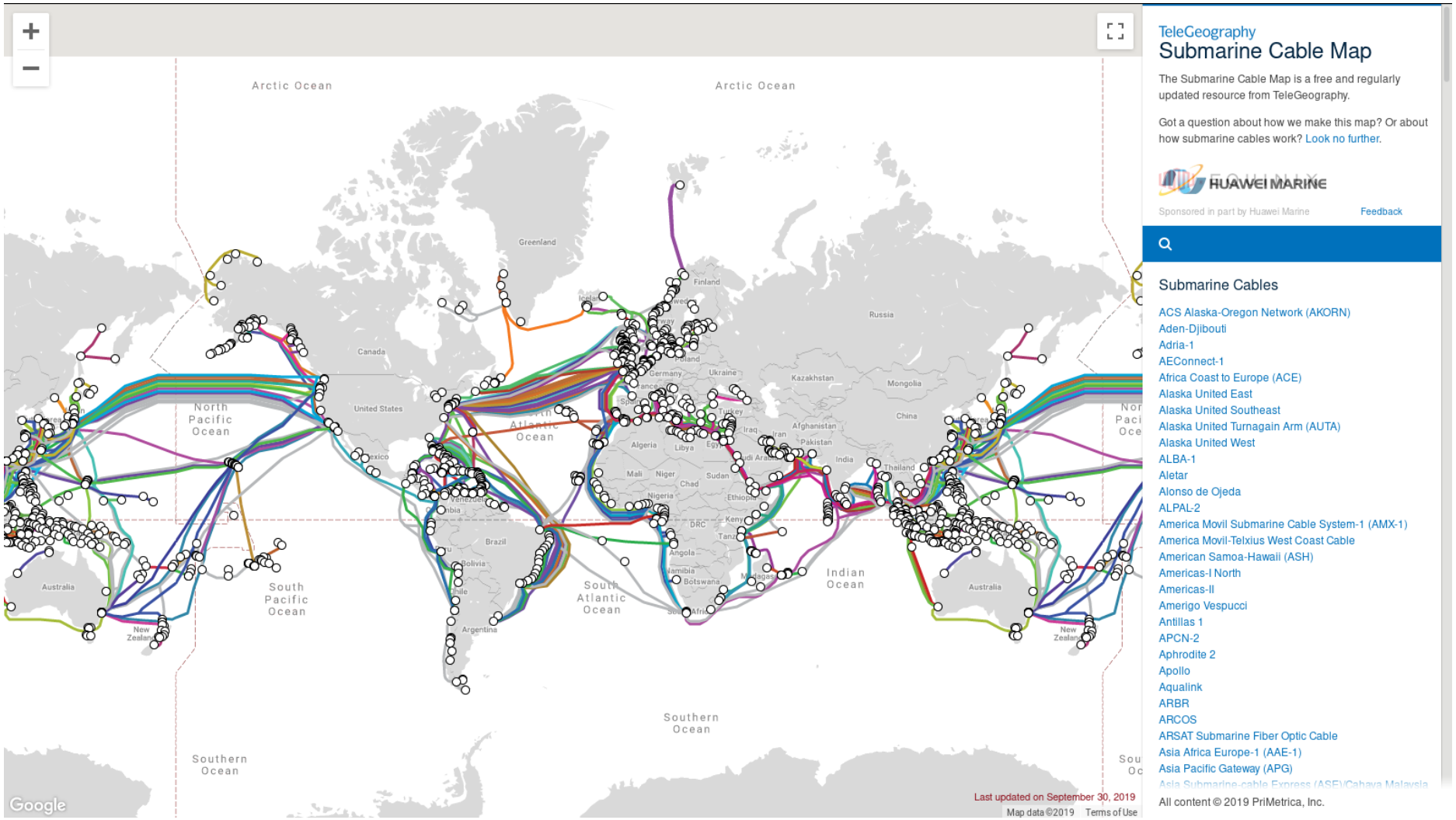
A routing table tells you the most efficient way to get there

Once inside the building, use Layer 3 to Layer 2 mapping get to the actual hosts

IP: 1.3.2.1 → MAC:52:54:00:86:38:14

How do we scale this thing?

https://
www.submarinecablemap.com/



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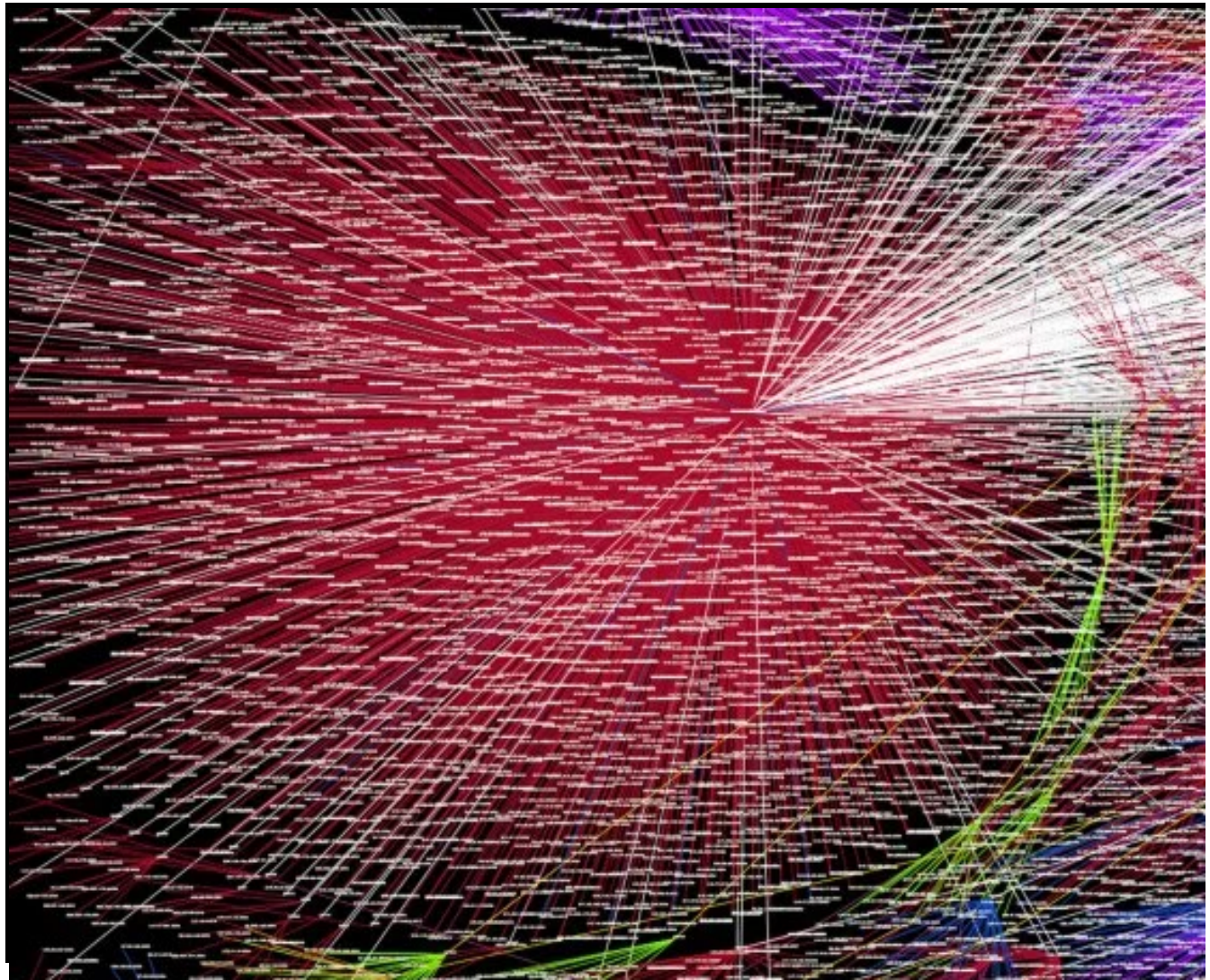

2003

2006

2009

2012

2015

http://www.opte.org/

https://time.com/3952373/internet-opte-proje

Local Routing – Gets you to the door.

What gets you to the campus?

Next Steps

Monday – Midterm review
How do we scale routing to the Internet?