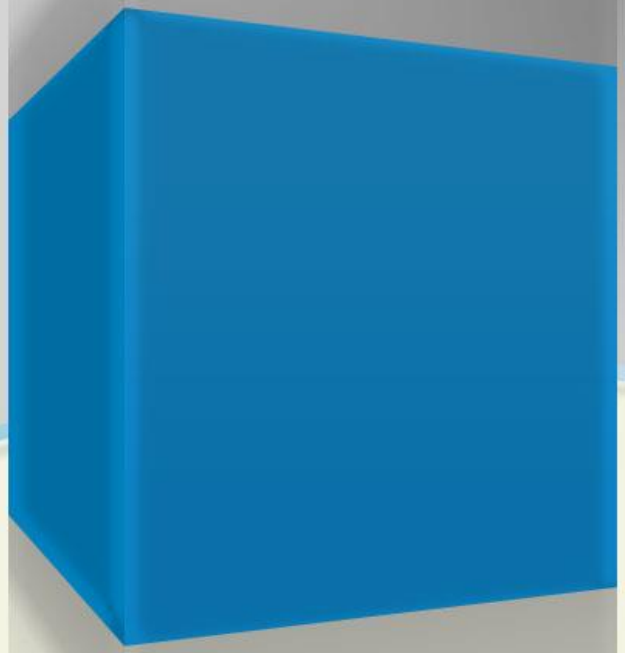
Computer Network Protocols
Network Layer (Part 1)
Lesson 4



كلية المستقبل الجامعة
قسم هندسة تقنيات الحاسوب
المرحلة الرابعة

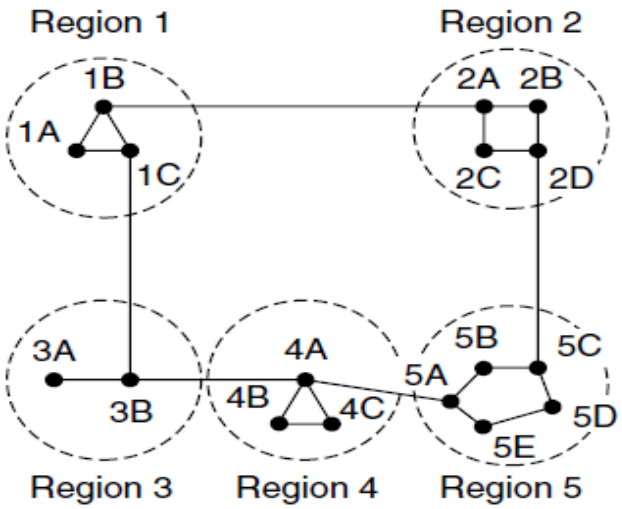
By

Dr. Layth Abdulkareem Hassnawi

Hierarchical Routing

- *As networks **grow in size**, the router routing tables grow proportionally.*
- *Not only is **router memory consumed by ever-increasing tables**, but **more CPU time** is needed to scan them and **more bandwidth** is needed to send status reports about them.*
- *So **router cannot have table about the entire network**.*
- *When **hierarchical routing** is used, the **routers are divided into what we will call regions**.*
- *Each router knows all the details about how to route packets to destinations within its own region but **knows nothing** about the internal structure of **other regions**.*

Hierarchical Routing



(a)

Full table for 1A

Dest.	Line	Hops
1A	–	–
1B	1B	1
1C	1C	1
2A	1B	2
2B	1B	3
2C	1B	3
2D	1B	4
3A	1C	3
3B	1C	2
4A	1C	3
4B	1C	4
4C	1C	4
5A	1C	4
5B	1C	5
5C	1B	5
5D	1C	6
5E	1C	5

(b)

Hierarchical table for 1A

Dest.	Line	Hops
1A	–	–
1B	1B	1
1C	1C	1
2	1B	2
3	1C	2
4	1C	3
5	1C	4

(c)

Broadcast Routing

- *For some applications, hosts need to* ***send messages to many or all other hosts****.* ***Broadcast*** *routing is used for that purpose.*

- *The* ***source should send the packet to all the necessary destinations****. One of the* ***problems*** *of this method is that the* ***source has to have the complete list of destinations****.*

Multicast Routing

- ***Sending a message to such a group*** *is called* ***multicasting****, and the* ***routing algorithm used is called multicast routing****.*

- *All multicasting schemes* ***require some way to create and destroy groups*** *and to* ***identify which routers are members of group****.*

Network Service Models

From the network layer points of view, it has to make sure the packets received are in correct order. There are a lot of models existed to help address this problem, among them, two conceptual models namely:

1. Virtual Circuits Model

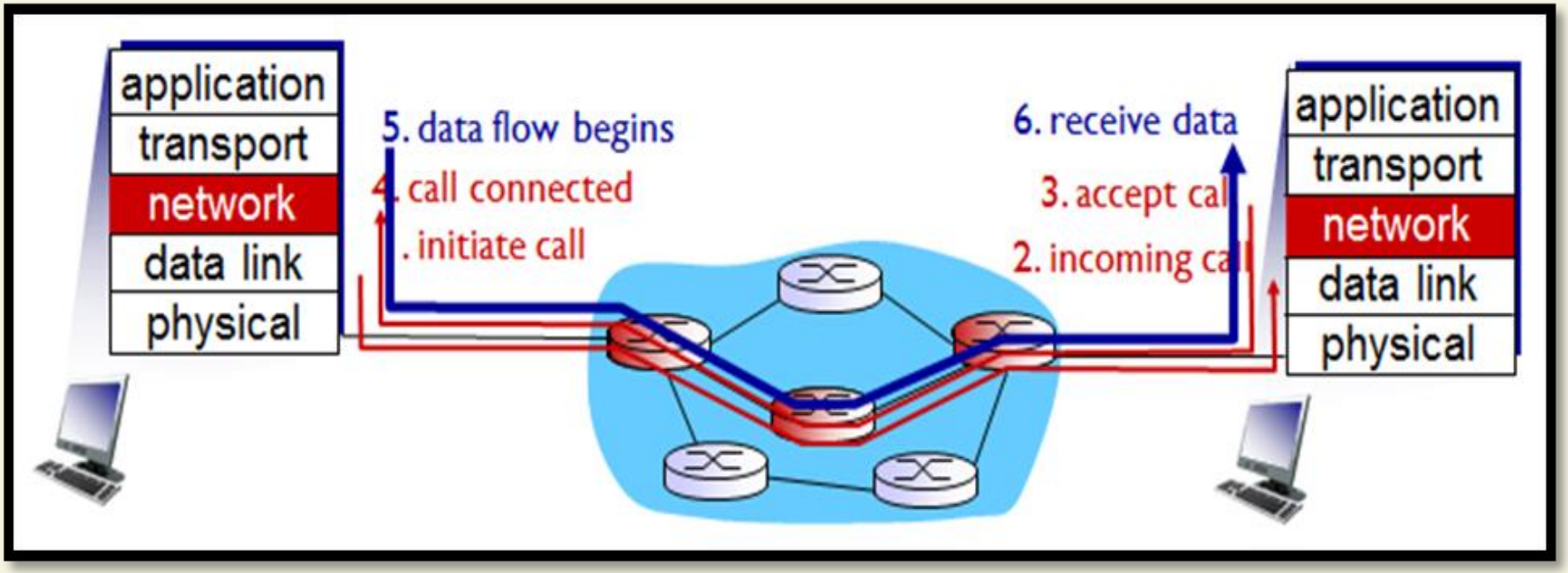
2. Datagrams Model

Virtual Circuits Model

*The network layer provides the transport layer with a **perfect source-to-destination path**" behaves much like "telephone circuit" and **all packets delivered in order**.*

- *Network provides network-layer **connection oriented service**.*
- ***call setup**, **teardown** for each call before data can flow*
- ***each packet carries VC identifier** (not destination host address)*
- ***used in ATM, frame-relay, X.25.***
- ***not used in today's Internet***

Virtual circuits: signaling protocols



Datagram Network Model

- ***No call setup*** *at network layer*
- *Routers:* ***no state about end-to-end connections***
- *Packets forwarded using* ***destination host address***

Differences between Virtual Circuit and Datagram Models

Virtual Circuits	Datagram Networks
1. It is connection-oriented simply meaning that there is a reservation of resources like buffers, CPU, bandwidth, etc. 2. Since data follows a particular dedicated path, packets reach in-order to the destination. 3. **Call setup, teardown for each call before data can flow.** 4. **Each packet carries VC identifier (not destination host address)** 5. Virtual Circuits are highly reliable means of transfer. 6. its costly to implement Virtual Circuits. Since each time a new connection has to be setup with reservation of resources and extra information handling at routers. 7. used in ATM, frame-relay, X.25. not used in today's Internet.	1. It is connectionless service. There is no need of reservation of resources as there is no dedicated path for a connection session. 2. The connectionless property makes data packets reach destination in any order. 3. **No call setup** at network layer. 4. Packets forwarded using destination **host address**. 5. Datagram networks are not reliable as Virtual Circuits. 6. But it is always easy and cost efficient to implement datagram networks as there is no extra headache of reserving resources and making a dedicated each time an application has to communicate. 7. used in today's Internet.

End Of Lesson 4

Thanks For Listening