# Homework 4

Review Questions

- What is the polling round ?
- Protocols in the 5-layer internet layers.

Layer	Protocol names
Application layer	RTP, DHCP, HTTP, SMTP, SNMP, FTP,SIP
Transport layer	UDP, TCP,
Network layer	IGRP, IPv4, RIP, OSPF, IS-IS, IPv6, ICMP
Data link layer	VLAN, Ethernet, MAC, ARP, MPLS, PPP, RLC
Physical layer	

Problems

1. There are four wireless nodes, A, B, C, and D. The radio coverage of the four nodes is shown via the shaded ovals; all nodes share the same frequency. When A transmits, it can only be heard/received by B; when B transmits, both A and C can hear/receive from B. Suppose now that each node has an infinite supply of messages that it wants to send to each of the other nodes. If a message′s destination is not an immediate neighbor, then the message must be relayed. Time is slotted, with a message transmission time taking exactly one time slot, e.g., as in slotted Aloha. During a slot, a node can do one of the following: (i) send a message; (ii) receive a message (if exactly one message is being sent to it), (iii) remain silent. As always, if a node hears two or more simultaneous transmissions, a collision occurs and none of the transmitted messages are received successfully. You can assume here that there are no bit-level errors, and thus if exactly one message is sent, it will be received correctly by those within the transmission radius of the sender.
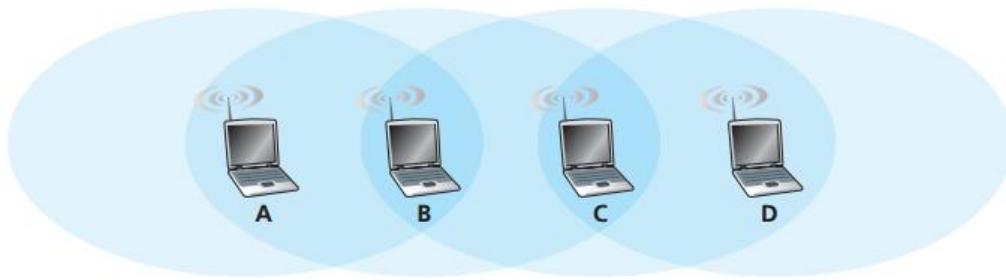
<Fig> Ad-hoc Network

a) Suppose now that an omniscient controller (i.e., a controller that knows the state of every node in the network) can command each node to do whatever it (the omniscient controller) wishes, i.e., to send a message, to receive a message, or to remain silent. Given this omniscient controller, what is the maximum rate at which a data message can be transferred from C to A, given that there are no other messages between any other source/destination pairs?

b) Suppose now that A sends messages to B, and D sends messages to C. What is the combined maximum rate at which data messages can flow from A to B and from D to C?

c) Suppose now that A sends messages to B, and C sends messages to D. What is the combined maximum rate at which data messages can flow from A to B and from C to D?