\*\*2 dim parity to have a row and column of bits to make sure the sum is either odd or even. Detects 3 bit errors and sometimes 4.

\*\*IP packet format- version(IPv4), HLen(header length in 32bit words), TOS(type of service,might be in special queue for low delay), Length(length of whole datagram including header in bytes), Ident(id for fragment.),Flags,Offset(in 8 bytes),TTL(decremented each hop, default 64),Protocol(demultiplexing key to identify higher lvl protocol TCP or UDP…),Checksum(considers header as sequence of 16 bit words, adding with onesComplement), SourceAddr, DestAddr, Options, Pad,Data.

\*\*MTU(MaximumTransmissionUnit)

\*\*SlidingWindow- delay(RTT) bandwidth product equals the amount of data allowed to send at one time. Divide by packet size to get SWS(sendWindowSize). 2x SWS should be the maxSequenceNum when SWS=RWS. Not stopAndWait. Wait for ACK(acknowledgment) until timeout, then send again.

\*\*Wireless-Exposed node problem with CSMA(CarrierSense,MulitpleAccess)/CA(CollisonAvoidence). Sends if cant hear other transmissions. Need an explicit ACK from receiver to sender. If packet decoded and passed its CRC, then receiver sends an ACK to sender.

\*\*RTS-CTS(Ready to Send-ClearToSend)-Sender sends RTS to receiver. If packet received successfully, then receiver responds with CTS. CTS is heard by hidden terminal and tells them to not send anything for the amt of time specified in RTS and CTS. If RTS not responded, then wait random. After successful RTS-CTS exchange then attempt to send. If no ACK received, then try RTS-CTS again.

\*\*Bluetooth-Slaves and master. 10m range

\*\*Ethernet-Ethernet adaptor receives all frames and accepts-Frames addressed to its own address-Frames addressed to the broadcast address-Frames addressed to a multicast address, if it has been instructed

to listen to that address-All frames, if it has been placed in promiscuous mode. Addr of all 1s is broadcast. Addr with 1st bit 1 is multicast addr.

\*\*Global Internet- AS(autonomous system) are administered independently of other Ass

\*\*IGP(interior gateway protocol) also known as intradomain routing protocol.. Domain is where all routers are under same administrative control.

\*\*Distance-Vector(RIP Routing Information Protocol)-each node constructs 1D array containing the “distances”(costs) to all other nodes. Distributes this to immediate neighbors.(Dest|Cost|NextHop) If cost is less, then remembers it. Unknown nodes have cost of infinity. Nodes send periodic update, so other nodes know its still up.

\*\*Count to infinity problem-with RIP trying to converge after link fails. Split horizon technique(to not send route to same node as the next hop for the path it takes). Poison Reverse(put negative info about route. So sending the distance to reach a node to be infinity.)These only work with routing loop of 2 nodes. Solution is for nodes to wait after hearing link failure. They would find that neither had correct route, but problem with convergence speed.

\*\*RIP-sends adverts every 30 sec. with packet taken up with (address,mask,distance)triples. RIPv2 supports multiple address families and introduced subnet masks. 16 hops represent infinity, so can only run in fairly small networks

\*\*LinkState(OSPF)- Each node is assumed to be capable of finding out the state of the link to its neighbors (up or down) and the cost of each link. Every node will be able to build complete map of network. Each node creates update packet or LSP(link state packet) contains-ID of node that created the LSP-List of directly connected neighbors of that node, with cost-Sequence num-TTL for this packet. 1st 2 are to enable routing calc. last 2 make process of flooding packet to all nodes reliable. First transmission of LSPs between adjacent routers made reliable using ACKs and retransmission. If new LSP has larger sequence num, then assumed to be newer. LSP flooded. Each node gens LSPs when periodic timer expires or change in topology. Periodic LSPs on order of hours. Sequence num doesn’t wrap, so has 64 bits. TTL decremented each node.Pros(stabilizes quickly, doesn’t gen much traffic, responds rapidly to topology changes or node failures). Cons(large amt of stored info).

\*\*OSPF(OpenShortestPathFirstProtocol)-features-Authentication of routing messages(so bad info cannot impact entire network with 8 bit password, for security), Additional hierarchy(partition areas so router doesn’t need to know how to reach every network in domain to make more scalable), Loading balancing(allows multiple routes to same path. Helps with network capacity)

transmission delay of one packet at A is 1250\*8/2\*10^6 = 5ms. At B it is 2.5ms. It takes A 15ms to transmit all three packets. When the last bit of the last packet arrives at B, the previous packet has already been transmitted onto BC, thus B can start transmitting the last packet right away. Therefore the total time that it takes is 15 + 2 + 2.5 + 2 = 21.5ms.ypt