Networks and systems part 2:

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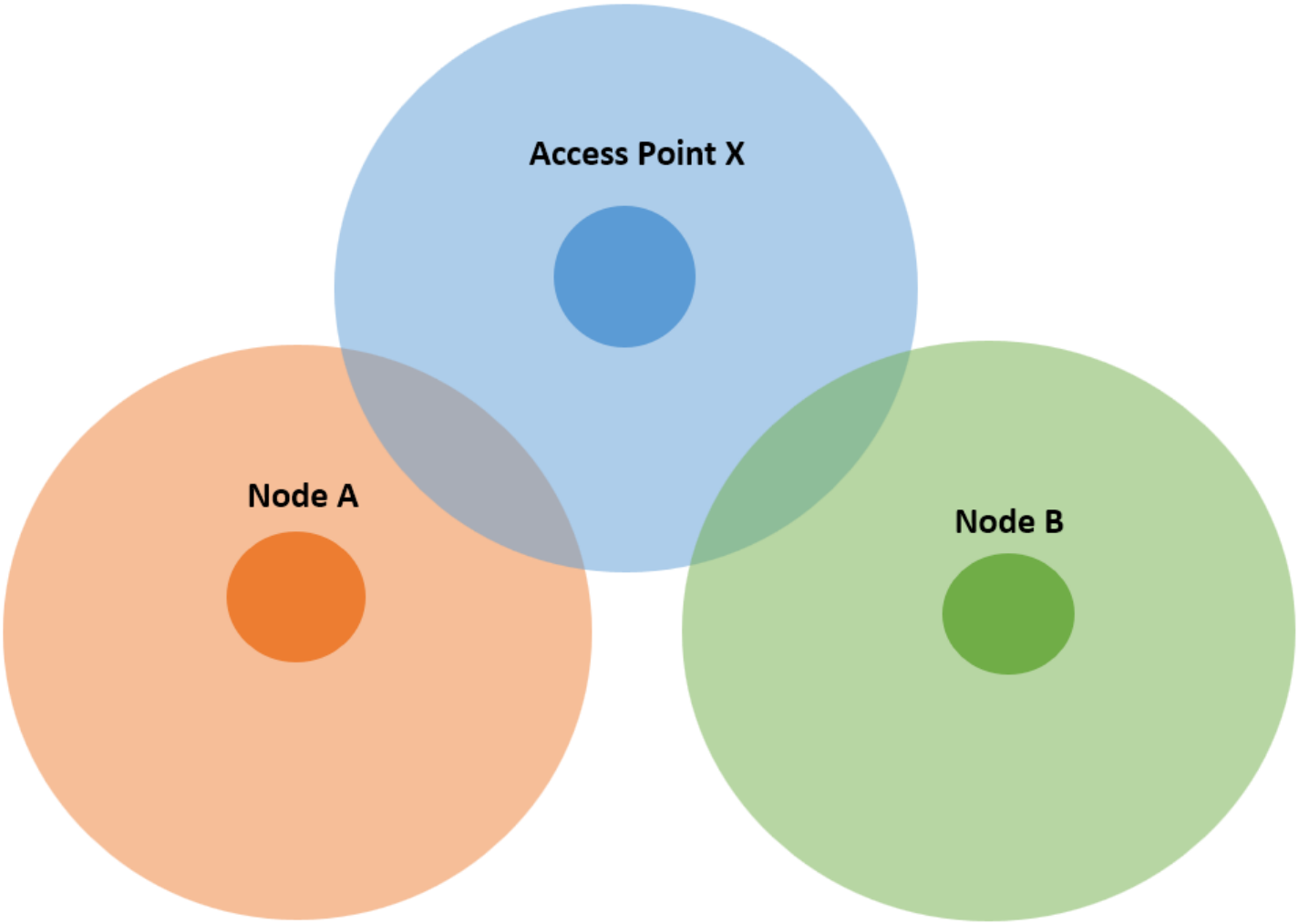
1) Sketch the topology of wireless nodes A ,B and X to include and their coverage.



2) Analyse the above transmission situation and describe the transmission procedure. In your description, clearly state which node starts to sense and transmit at what time and how long it would take. Start your description from 0 us in the network.

Answer: Starting at 0µs Node x first attempts to send a packet to some arbitrary node y (not specified or in the above diagram) and would take 100µs. At 30µs A has a packet to send and attempts to do so which would take 200µs. At 70µs B is now ready to send a packet and attempts to do so which would take 100µs. At 70µs a collision occurs due to B and A sending packets at the same time causing B and A to tigger their backoff timers 60µs and 40µs respectively. Since their backoff timers are too close in time too allow the transmissions to complete these collisions occur repeatedly and no packet ever reaches their respective destinations.

3) Design a protocol to address an issue that potentially happen during the above transmissions. In your protocol description, you will use one paragraph to state the issue that you want to address and your idea to address this issue. You will then present the steps of your protocol operations. Note, in each step, you should include all types of messages and who should send these messages.

Answer: The current problem the network is facing is that nodes in the same collision domain are trying to send packets at the same time and their backoff timers are not long enough to allow the other device to complete the transmission. There are a few possible solutions.

Introduce hardware that will change the collision domains each respective node is in or implement CMSA and RTS. CMSA is not possible to use by itself because in this case, B and A cannot hear each other. Hardware such as bridges, routers and switches can prevent collisions. This is because switches have one collision domain per port and bridges have two ports and two collision domains (but since this is a wireless network, we cannot use a switches or bridges between the device and access point) routers on the other hand create multiple broadcast domains meaning nodes do not share the same collision domain. Assuming that we do not want to introduce a new piece of hardware into the network, instead we will use request to send message (RTS) and CMSA/CA to sense if the node is busy. RTS sends a request to reserve a channel. Once a channel is reserved when other nodes check to see if the access point is idle using CMSA/CA they will see the access point is not idle and will wait for a specified or random amount of time and check again. Although RTS transmissions are short, without CMSA/CA these requests could still possibly collide which would result in some time wasted.