

Adhoc Assignment 1

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1 - Compare the differences between cellular and Adhoc wireless networks.

Cellular	Adhoc
<ul style="list-style-type: none">• Centralized and Infrastructure dependent.	<ul style="list-style-type: none">• De-centralized and Infrastructure Independent.
<ul style="list-style-type: none">• Uses Circuit Switching	<ul style="list-style-type: none">• Uses Packet Switching
<ul style="list-style-type: none">• Single Hop transmission	<ul style="list-style-type: none">• Multiple Hop transmission
<ul style="list-style-type: none">• Uses Star Topology	<ul style="list-style-type: none">• Uses Mesh Topology
<ul style="list-style-type: none">• High cost since central servers requires periodic maintenance and takes more time for deployment	<ul style="list-style-type: none">• Less cost since nodes are self-organizing to and takes less time for deployment
<ul style="list-style-type: none">• Easy time synchronization.	<ul style="list-style-type: none">• Difficult time synchronization.

<ul style="list-style-type: none"> • Low call drops during mobility due to seamless connectivity across region 	<ul style="list-style-type: none"> • Higher breaks in the path during mobility
<ul style="list-style-type: none"> • It utilizes same frequency channels in the nearby cells with proper RF planning and antenna placement. This is known as static frequency re-use. 	<ul style="list-style-type: none"> • Dynamic frequency re-use is employed using carrier sense mechanism.
<ul style="list-style-type: none"> • The allocation of BW is guaranteed and easy. 	<ul style="list-style-type: none"> • The allocation of BW is based on shared channel using complex MAC algorithms.
<ul style="list-style-type: none"> • Low complexity in the network 	<ul style="list-style-type: none"> • High complexity in the network due to self-routing.
<ul style="list-style-type: none"> • Designed and developed for voice traffic 	<ul style="list-style-type: none"> • Designed to meet best effort data traffic requirements

2 - Explain MACA and MACAW protocols

MACA Protocol

- It is used at MAC layer in wireless adhoc network.
- It can be used to solve collisions encountered due to hidden terminal and exposed terminal in wireless system.
- It is alternative to CSMA (Carrier Sense Multiple Access).
- MACA uses two types of short, fixed-length (32 byte) signalling packets:
 - RTS (Request-to-Send)
 - CTS (Clear-to-Send).
- When a station wants to send something, it sends an RTS first.
- If the receiver is free, it replies with an CTS.
- Upon receiving CTS, the sender immediately sends data.
- Any station overhearing RTS waits long enough for a CTS to pass through.
- Anyone, overhearing CTS waits for the length of data (length of data is carried in signalling headers).
- As a result, hidden-terminal problem is completely avoided and exposed-terminal problem is simplified.
- If the sender does not receive CTS within some period, it will time out and schedule for retransmission using a binary exponential backoff (BEB).
- Once data transmission is completed it will be responded by "ACK" signal.

MACAW Protocol

- Multiple Access with Collision Avoidance for Wireless (MACAW) is a medium access control protocol broadly utilized in ad hoc network systems.
- The problem in MACA that if there are two sender and two receiver A, B, C and D respectively.
- If B has sent RTS to C and D at the same time and but only send data upon receiving CTS from C.
- Now A wants to send data to D but will not able to send because it will sense that D is currently busy and will increase the backoff counter (for how much time A will wait before re-transmitting) value by twice because of which it will get stuck in a loop until the D gets free.
- Blockage data trade between pairwise stations, prompting better clog control and backoff approaches.
- This problem is solved by Multiple Access with Collision Avoidance for Wireless protocol because it introduces packet containing current transmission nodes' s backoff counter value to be copied into the other sender node.
- This will reduce the wait time very significantly.

MACAW replaces RTS-CTS-DATA to RTS-CTS-DS-DATA-ACK:

- ACK: An extra ACK at the end ensures that errors can be recovered in the link layer, which is much faster than transport layer recovery.
- If an ACK is lost, next RTS can generate another ACK for the previous transmission.
- DS: This signal ensures a 3-way handshake between sender and receiver (similar to TCP) so that everyone within hearing distance of the two stations know that a data transmission is about to happen.
- Without the DS packet, stations vying for the shared media cannot compete properly and one is always starved due to the lack of its knowledge of the contention period. DS enables synchronization.
- RRTS: RRTS is basically a proxy RTS, when the actual RTS sender is too far away to fight for the contention slot.
- However, there is one scenario where even RRTS cannot guarantee fair contention.
- Multicast: Multicast is handled by sending data right away after the RTS packet, without waiting for CTS.
- It suffers from the same problems as in CSMA, but the authors leave it as an open challenge.

Thankyou!!