

# Challenge 3

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The implemented MAC algorithm is heavily based upon the SCMA/CD approach combined with the frame/slot principle of TDMA.

Every Client got assigned a unique random identifier which they propagated to the other clients connected as their first data message through the control Information. This way every client was aware of any other client in the network. Whenever a client wants to transmit something it tells the other clients in the network. If multiple clients want to transmit they take turns, similar to a TDMA approach, just that the number of slots is based upon the number of clients that want to transmit thereby not having constant idle states. If a client is finished transmitting it sends a message and the slot it prior occupied is freed again for the other clients.

If clients collide in the case that two clients want to start transmitting at the same time they timeout for random amount of frames in a bound region depending on the number of clients present as it is unknown how many clients may collide at the same time. Since they then start retransmitting at different times the beforehand solution can handle the process again. Should they collide again the process repeats. Practice shows that carefully choosing the bound of time out frames can make the system rarely collide multiple times in a row. This was tested for up to 4 clients.

Frame	1	2	3	4	5	6	7	8	9	10	11	12	13
Client 1			Crash						Done				
Client 2			Crash										
Client 3													
Client 4													

Normal situation. Client 1 is already sending, then client 2 causes a collision. Now client 1 knows there is another client and skips a frame while client 2 immediately sends a frame. Then both clients send their ID data alternating. Once a client is done (frame 9) it will send a NoData message with its ID and the other clients will then remove that reserved timeslot.

Frame	1	2	3	4	5	6	7	8	9	10	11	12	13
Client 1		Crash				Crash							
Client 2		Crash	Crash	Time	Out	Crash			Crash				
Client 3		Crash	Crash	Time	Out		Time	Out	Crash				
Client 4													

In the case that multiple clients want to start sending at the same time then there will be a crash in the next frame (frame 3) because it is impossible to know how many clients are trying to interrupt. Each of the new clients will then receive a random timeout after which they can join the channel and have the collision handled normally.