1a)

1. Hidden terminal problem - 2 senders can communicate with a receiver but not with each other so they might transmit at the same time causing interference. MACs can use RTS/CTS to coordinate with the receiver.
2. Exposed terminal problem - Multiple senders and multiple receivers. Senders are in range of each other but receivers are not so one sender thinks there could be interference and won’t send even though there wouldn’t be because the receivers are out of range.

1b)

1. F->B->G 180ms
2. Fill in the other slots. Tighten the schedules

1c)

i)

ts, the transmission time of the shortest packet.

ts > 0.716 ms

= 179 bits in 0.716ms. So 179 bits is the minimum

ii) Add enough padding on a lower layer to cover 179 bits?

1d)

Idea is to do the averaging client side and only send every 60 seconds.

Can add an array to hold 60 numbers and then calculate mean just before sending or we can have an incremental average which saves from having to calculate at the end as well as the memory cost of an array.

Also add a counter and increment every time the etimer expired. Have an if statement for the send\_packet() call, e.g. if (counter == 60) {send\_packet(); counter = 0;}

2a)

i) The Fresnel Zone is the 3D elliptical region between the receiver and the transmitter free from any obstructions. Area around the visual line of sight. Obstructions in the zone will cause interference.

ii) ADR can change the Spreading Factor which determines how many bits are used per symbol. A higher SF will result in a lower bit rate and slower transmission but will be able to travel further. A higher SF will result in less bit-errors?

iii) Receiver sensitivity is a measure of receiver performance. It’s the ability of a receiver to identify and amplify signals. Weakest signal that a receiver will be able to process.

2b) i) -174 + 51 + 7 - 20 = -136dBm

ii) -136-16 = -152db

3a) Radio Link Asymmetry is where connections between different nodes are not bidirectional. A may be able to communicate with B but not the other way round. It makes it very difficult to get accurate link estimates by sending beacons.

b) RSSI is simpler and requires no extra implementation details. RSSI is absent for dropped packets which can bias measurements. PRR doesn’t vary as much and is more stable.

c) Probably decreases performance because certain nodes in popular routing paths will become overwhelmed

d) Sensor coverage is the area where it can make reliable measurements. Transmission coverage is the area where it can transmit to where nodes can detect the signal. They don’t have to match at all. Not sure about the clash

e) Not sure.

f) Not sure but maybe something to do with an rtimer and a queue. Every time very\_complex\_function() finishes it adds to the list of done messages and we send to that receiver at the same defined rate. And then very\_complex\_function() takes the next data from the queue. Rtimer will preempt so could possibly be used but also has some caveats