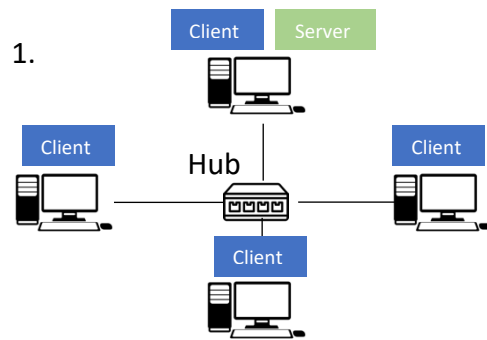
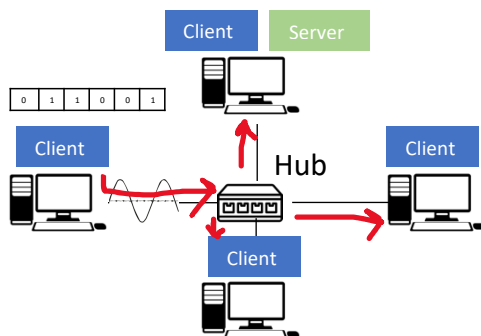


## Correction TD1



2. A hub regenerates signal and broad casts it on every port: no way to identify at this level a machine to guarantee information switching or routing. No need to decode signal to data even if it is a layer 1 device.

3.



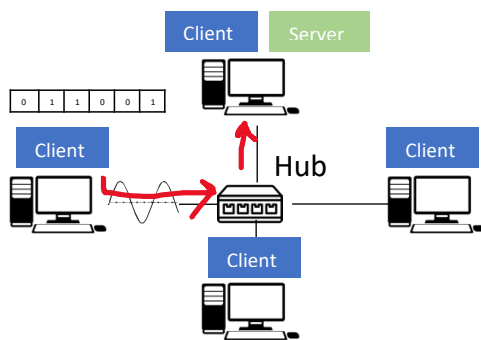
The message is encoded into a digital signal (as baseband links are used in a local network), then the signal is sent on the link to be received by the hub. This later propagates the signal without any modification or decoding but with a regeneration of its power. All the machines in the server receive the signal and decode it. The server machine knows that the message is intended for it thanks to the functionality of the higher layers (2 and 3) and send the information to higher layers until it is processed by the server application (the obtained message is identical to the original message send by the client). The other machines of the network also receive the same signal but ignore it once decoded and the physical address is checked at layer 2 (based on the physical address of the message, the receiving machine knows that it is not intended for it).

4. yes the use of a hub as an interconnection device in our case could cause problems. As our application sends messages permanently at a high frequency, and as the hub broadcasts the signals on all the links, this multiplies the number of information processed upon receipt on all the network machines, it therefore slows down the processing of information. it also congests the network with unnecessary circulating messages. on top of that, as it is a level 1 device, the messages are sent without any medium access control which creates enough collisions then data loss, which makes the application unusable in some cases.

5. the best alternative to avoid these problems is to use a switch (layer 2 device) instead of a hub

6. A switch allows, thanks to the physical address (layer 2), to switch the messages sent, so only the machine to which the message is intended receives it => no network and machine congestion. Also, as the medium access control is managed by layer 2 protocols, the use of a switch reduces collision rate and therefore data loss.

7.



8. the final data transmitted correspond to the frame (layer 2 data unit) containing the application message combined with layer 2, 3 and 4 headers that contains information necessary to ensure each layer functionalities

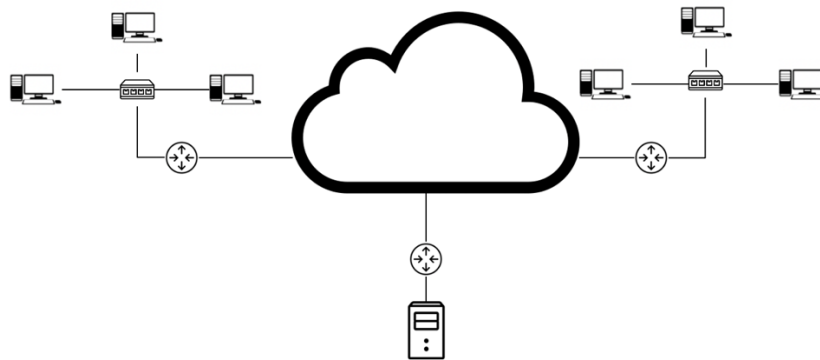
## Part2

1. A) Since latency depends on the time it takes for a message to reach a destination, the signal's propagation time affects it directly. The longer the propagation time, the greater the latency. B) As the round-trip time and the latency is measured considering high layer information as a source, data emission rate and time affect the latency because the time the data takes to be sent depends on these two parameters. The slower the rate, the greater the emission time, the greater the latency. C) the time and the transfer rate not only affect but clearly define the latency. The latency is the transfer time of a message from machine A to machine B + the time needed to transfer from machine B to machine A. note that the rate is important because It defines the information emission speed (event to send 1 bit), this latter does not affect dramatically the latency, as usually the application messages rate is much less important than the transfer rate.
2. The host player (who host the server on his machine) has the least latency even if the difference is very minimal at this scale.

3. The host player has the advantages with its low latency: the actions done and transmitted by this player achieve the server faster than the other players. So host player actions are considered before those of other players at each update iteration on the server. This implies an advance in critical operations, such as a confrontation between this player and another. This affect also the view synchronization in another manner : any pair of players (A,B), including the host, will have a symmetric view latency, because the time it takes to the same time for a message to go from A to the server then to B that from B to the server then to A. but this time may not be the same for other pairs (this does not give advantage to any player).
4. Put the server on a dedicated machine
5. We should put the latency simulation program at the application layer (at the same level of our game application). Because changing the latency on a lower layers would affect other services, as many application shares the same lower layers protocols.

### Part 3

1.



2. Modulation

4.

