NOM POUPA

Prénom Adrien

Promo M1 2018

Date 10/01/17

POUPA Adrien
M1 - 2016

8,00

MATIÈRE Infrastructures et Équipements

1. 4G network is not ready at all for the Internet of Things and the Future Internet because the bandwidth available, hence the number of devices that can connect to a single antenna is too low. Right now, 4G networks work well for smartphones, but is not ready for the IoT. By 2020, 20 billions of objects could be connected to the net using mobile networks. 4G cannot scale to support all of them.

That is why 5G is being developped. It will need the following to support the Future Internet.

It will to be safe to prevent massive DDoS attacks such as what happened in October.

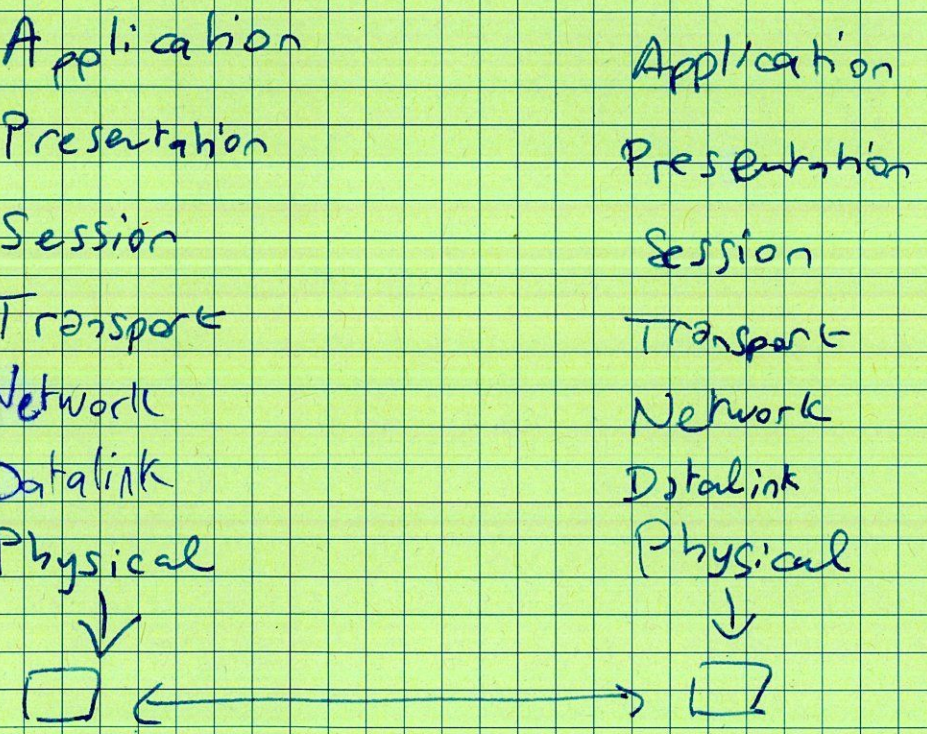
It will have to be available worldwide to be adopted, which is a challenge considering the high costs involved for ISPs.

It will have to be reliable : some IoT devices using mobile networks are critical and need to be constantly connected to the Internet ; there must be no interruption.

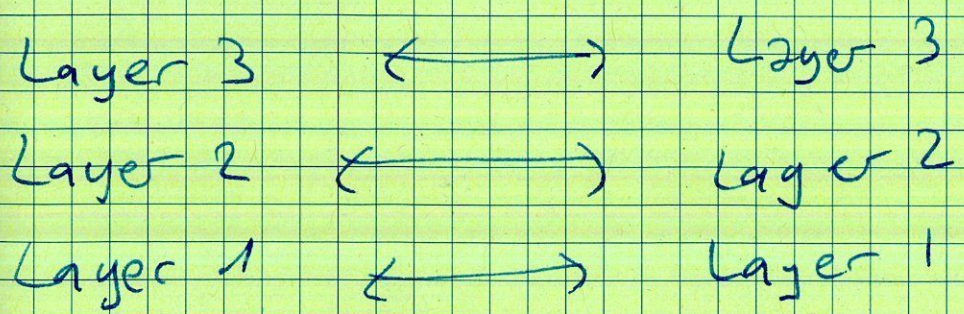
5G network also need to be scalable in order to welcome a very large number of devices unlike current 4G. This is why it will need to have a much larger band width.

2. This example is not an example of multilayer protocol in the sense of the OSI model because in the OSI model, only low-level layers talk to each other. Here, every layer communicate with its counterpart.

OSI:



Here:



3. a) 50 requests → 1 second
? → 4.10^{-3} second

? = $50 . 4 . 10^{-3}$ requests

? = 2 requests

Each new slot secs 2 new requests being added.

Considering we just started to generate, we have a chance of $\frac{1}{2} = 0,5 = 50\%$ to succeed on first attempt.

b) c)

Slot number	0	1	2	3	4	...	n
Prob. of collision	1/2	2/3	3/4	4/5	5/6		n+1/n+2
Prob. of success	1/2	1/3	1/4	1/5	1/6		1/n+2

I think we should use Poisson's law but I cannot remember it since we have not done this in TD.

4. a) Having a lot of data means we have a lot of packets to deal with so packet-switching is more desirable in this case,

b) On the opposite, if all of the network sources are bursty, there will only be a few packets and in this case, it will be more convenient to do circuit

switching.

5. HSPA is limited to a maximum speed of 8 Mbps (3.5G), up to 42 Mbps if a dual carrier is used. On the other hand, LTE allows much faster speeds. 4G should not be confonded with false 4G (3.9G) which is common due to its earlier release.
HSPA is more common than LTE Advanced because telecom operators started to deploy it sooner. Its signal is generally stronger, but that also depends on the frequency used. In France "gold frequencies" (previously used for TV broadcasting) are used for 4G, allowing a deeper signal reception in buildings.
Unlike 3.5G, 4G allows the use of MIMO and Dual carrier technologies simultaneously.

A critical technical difference between 3.5G and 4G is that the latter is only based on IP whereas 3.5G still uses traditional mobile architecture, both used for internet and voice. 4G requires phone calls to go through IP (the Internet) with the VoLTE (Voice on LTE) technology. Currently, French operators switch back users to 3G for phone calls. This also a reason why switching the whole network to 4G will be a long and costly process yet necessary for the future Internet: they need to get rid of the old infrastructure and upgrade to a new IP-based.