CS4222 Semester 2, 2020/2021

Tutorial for Week Sarting on Feb 8, 2021

Note:-

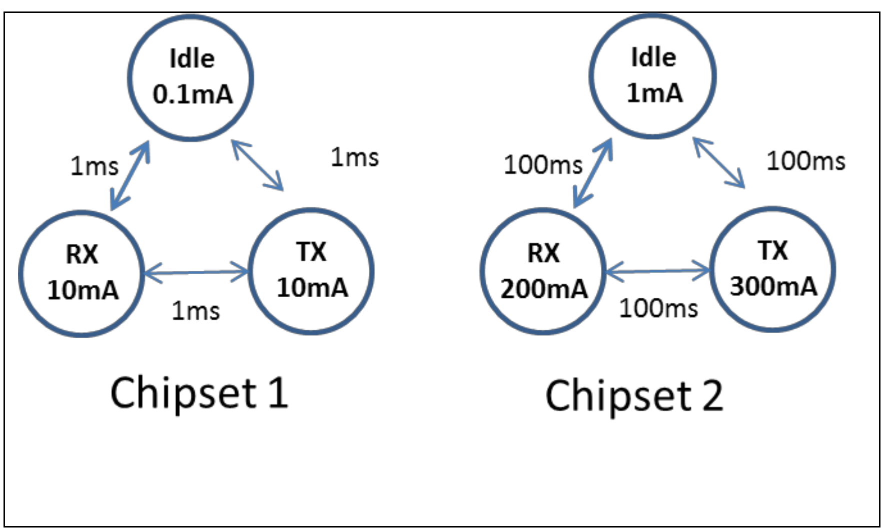
- All students must come prepared with ideas/solutions and participate in the group discussion and present the solutions to the entire class. Thinking about the solution during the solution in the tutorial class will not be of much use.
- Please note that all questions in this tutorial need not be discussed in full in the class.

Question 1

Find out the capacities of the batteries in 2 mobile devices you have, e.g. your smartphone and/or laptops.

Iphone 11: 3969 mAh

Question 2



(a) In the figure above, which chipset is more suitable for used in low power wireless sensor network? Explain your reasoning.

(b) For the chipset chosen in the question above, assume that the devices are designed to operate at a very low duty-cycle (<0.01%) and you are allowed to reduce the current drawn from only one of the states (idle, receive (RX) or transmit (TX)). Which state would you reduce the current from?

a) CIPset 1

- Consume less for each state
- Time to switch is faster ⇒ 1ms

Chipset 2 is for more computing power

Check latency between state

duty: Trans idle

b) ~~Recieve~~

Reasoning: Idle very low alr

- Transmit need more current to transmit to it appropriate range
  ⇒ Its also the main pt

Low duty cycle: idle most of the time

∴ we should reduce ∴ By order of Etime ⇒ Recieve (Rx)

Question 3

The iPhone 5's battery capacity is 1400mAh (running at 3.8V). Consider the follow scenario. The phone wakes up every 1 minute, sends a small message and then goes back to sleep. However, due to various control overheads, the network interface stays in a waiting state for at least 20s whenever there is network activity before going back to sleep. The power consumption for wait and sleep states are 600mW and 60mW respectively.

(a) You can assume that energy consumed during transmission is negligible. How long does it take a fully-charged battery to be drained completely?

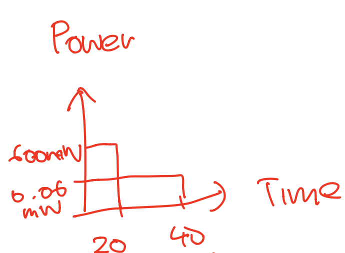
(b) How do you reduce such overheads for short message exchanges to extend battery life? Note that in practice, communication is two way, apps on the device want to send messages to the server(s) and servers want to deliver messages to the apps/device.

~~WH (Sleep) = 60mW / 5.56mh = 10.8mWh~~

~~WH (wait) = 600mW / 16.67mh = 35.993mWH~~

Batt Cap → 1400 × 3.8 = 368.42 mWH → 5320   Cal ! ERROR

Time → 368.42 ÷ (10.8 + 35.993) = 7.87h



① Total energy supplied = 5.32 × 3600 (sec in an hour)
= 19152J

② 0.6 × 20 + 0.06 × 40 = 0.24J (P × t)

③ 0.24 × Batt life = 20K
Batt life = 49800s
= 22.2h

b) ◦ increase wait time to recieve msg
◦ do not poll for msg all the time ✓
◦ Have cap such that its stores count of outgoing short msg, when cap is reach, send all msg

↳ increase sleep time (increase latency ☹)
↳ How long wait in idle
↳ Find a compromise