Week 12: Industrial Embedded Network

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Some embedded systems are defined as industrial, as opposed to "Commercial".
Commercial systems *may* fail without severe risks, while industrial has the same meaning as "the system requires high reliability".
Though high reliability may also be required for systems not typically denoted as industrial.

As always, we can't optimize for everything; we have to prioritize certain properties, which will have trade-offs with other metrics.

Critical data often coexists with non-critical data
- For example, in airplanes we might have navigation data and entertainment-system data. We should prioritize the critical data, while being more lenient with the non-critical data.

We commonly use schedule-based communication because we can have some determinism on communication.
Time synchronization is often necessary to use schedule-based communication.

TSCH: Time Slotted Channel Hopping
- Traditional IEEE 802.15.4-2011 MAC
  - RFD: dont conduct data
    - Can only be at the edge of a network
  - FFD: Can forward data
- Timeslots are an *opportunity* to transmit, but if there's nothing to send, the timeslot goes unused.
- Because timeslot duration is flexible, it means guard time is flexible as well.

- 6TOP is a protocol which serves to interface with the timeslots/schedule of TSCH. Using this, we can dynamically update the schedule to fit our needs
  - Autonomous Scheduling is a non-standard use of 6TOP.
    - For example, Orchestra

TSN: Time-sensitive Networking (wired equivalent of TSCH)
- 802.1Qbv Enhancements to Traffic scheduling: Time-aware shaper (TAS)
  - Time slices: multiple packets in one timeslot

Answers to practice exam:
Q1: D
Q2: A, it saturates if voltage goes above the max, which means it caps out at 1023.
Q3: C
Q4: A, because the dominant 0 wins. A has the first unique 0 going from left-to-right.
Q5: B
Q6: A
Q7: C, this device is comparatively more in active-mode than the other devices
Q8: D
Q9: B (due to search slots or EB, or scheduled created with shared slots)
Q10: B