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Homework #1.A

2 hours (watched the talk twice)

Summary/Response To:

Wireless Sensor Networks: Technology and Applications

Kris Pister, Berkeley

https://www.youtube.com/watch?v=PVH1K1Eocz0

1. Pister's talk is a solid overview of the many-facetted applications for wireless sensors networks. He talks specifically about the commercial product line that he worked on: Dust; a product that aims to replace wired sensor networks with equivalent wireless networks. To argue this product choice, he makes many arguments for the benefits from using a wireless network. One of his final driving points to customers is to market a Dust network as a wireless conduit, replacing in-wall conduit. This specific difference causes a very large difference in installation cost; a major advantage to Dust Networks, and to all wireless sensor networks.

2.

1. The power utilization results that were seen are astounding. 5 years on a C-cell battery is a surprisingly long time; it almost seams infeasible. Makes you wonder what Rx/Tx prevention tricks they did to make the battery last so long.
2. The security implementation was surprising. Though I may be mostly coming at it from a hobbyist perspective. The overhead for their security methods are quite minimal though. But I doubt it's very secure. You can only be so secure with such limited resources.
3. There's a larger set of industrial companies investing in wireless sensor networks than I would have initially expected. There are some big-name industrial companies mentioned in this talk.

3. By removing wires from a sensor network, the largest benefit I see is portability. With traditional wired networks, moving a fully installed system can be extremely difficult; increasing quickly in difficulty with number of sensors installed. By going wireless, the difficulty for moving a system gets closer to being directly proportional to the number of sensors.

4. Biggest challenge of WSN adaptation: predicting RF on an open spectrum. Such an odd,

complicated, but powerful technology. The dependence on bouncing EM-waves causes many problems in uncontrolled environments. Pister mentions some problems that they had: many days of a channel being unusable. Without channel-switching, the WSN could be inoperable for the entire duration, and switching channels doesn't sound easy at all. Other potential problems I could see are durability of the sensors; they don't seem particularly durable in extreme environments. Solving these problems isn't something I could probably consider. I'd need a bigger focus on EM-waves. And consistently, all I hear about how RF works is “black magic.” Channel switching seems like a logical solution that can cover a variety of scenarios, but at the cost of a complex implementation, and a potential to have the network fall apart (what happens if someone starts blasting on all channels for 5 days?). Are there better frequency bands that can suit themselves better for specific environment? And with that, could multiple bands be used? Eg: Wi-Fi AC, which utilizes 2.5 and 5.0GHz bands. Could result in an increase in power, but would the potential for double reliability be worth it?

5. Wonders while watching the video: It's 2013; 6 years later: how accurate were the predictions presented in the talk? Is there now a concensus to go with wireless sensors now (among industry)? Also, performance, efficiency, and relability surely have gotten better; what are the possibilities now, that didn't used to be feasible?

6. Issues I had with the video:

- His budget was 40 million... Where did that go?
- He assumed time syncronization for most of the video, and also focused on time-division mote multiplexing. TDM is not something I would say is an efficient method for mote transmission. Easy to do, sure, but there's no way that's the most effective methodology. But what do I know? I've barely worked with WSNs.
- I was surprised with the closed nature of the dust chip. Though to guarantee 5-9s of network reliability, measures like that seem to be necessary.
- How big of a solar panel would be need to keep an arduino continuously transmitting (assuming pure sunny days). Is it thus feasible for a mote to be in deployment until chip creep becomes the primary concern? With such low-power devices, ideas like this can become possible.