ECEN 5053-002 Developing the Industrial Internet of Things Product Teardown

Description

For this assignment you are to do some research into an embedded system of your choice and submit a written technical report in the form of a product teardown. See *"Wireless mouse teardown example.pdf"*.

We will define an embedded system to be a "Computerized system that is purpose built for its application."[1] Ideally the embedded system is IIoT focused and should contain:

- Compute (CPU, MCU)
- Memory
- Actuator(s)
- Sensor(s)
- Communication (ethernet, wireless etc)

Some embedded systems may not manifest all of these components. Students are to analyze and apply the concepts discussed in this class (markets, application area, software, security etc. plus any prior embedded systems engineering coursework/experience) to a real-world product currently in use or in development.

This is a formal paper and must be on an appropriate topic. The report needs to be succinct in content and interesting to read. Finding a balance between interesting and informative is a difficult task and you should often ask yourself about the content you are reporting on. Try to avoid redundant, superfluous and wordy descriptions. Ask yourself if the content you are writing is adding to the understanding of the device.

Have fun with this assignment. Pick a device that interests or inspires you. Something that you will enjoy researching. If you have trouble picking a product, stop and look around you. You are surrounded by hundreds of manufactured products. All of these products were manufactured by systems, many of them quite probably employed robotic machinery controlled by some type of embedded system. This is an opportunity to teach me about a cool piece of technology out in the world. Do not wait until the last week to begin work on this assignment.

Content Points to Address

Below is a list of bullets you **must address** in your report. Not all will apply to every device. If there is something else of interest or importance, please address that in your report.

- Introduction/background/history and problem solved by the device
- Device market and application area
- A block diagram of your system, **that you draw** of the device with interface descriptions. Use open source LibreOffice to create your drawings.
- Technical details/description on the device and how it works
  - Electro-mechanical interfaces, sensor technologies used, etc.

[1] White, Elecia. *Making Embedded Systems.* Sebastopol, California: O'Reilly, 2012. Print.

- o What is the architecture (Microcontroller, DSP, FPGA, ASIC, etc.)?
- o Power Requirements
- o Software and Hardware operation and description
- o Are there any important constraints or specifications that the device must adhere to in order to be able to function?
- Bill of materials (BOM) with cost estimate (in a separate file, see below "To turn in")
- Security concerns
- Concluding statements on the device and the relation to this Embedded Systems Engineering course.
  - o Could the device be improved? Could it be expanded to hit other markets?
  - o How has this case study related to the course?
  - o Has this investigation inspired you in any way?
  - o How easy/hard was it for you to understand the technical parameters of the device?
  - o How hard was it to find technical information on the device?
  - o After what you learned in the course, did you have any intuitive feel for how the hardware and software system operated?

Report Requirements

- You can select any embedded system device. Each students product must be unqiue. Be warned, I plan to check for plagiarism, so write your own content.
- All sources must be cited including descriptions, quotes, and figures. If you cite an internet source include it:
  - o With the text from your source, and
  - o As a footnote at the bottom of the page
  - o See example below
- No **Wikipedia** sources!
- Report must be between 6 and 11 pages in length
- Cover page with date, class and title. Use the template file provided as a starting point.

To Turn in to the dropbox:

- Your written report file in PDF format:
  - o file name = **<your_name>-<device>.pdf**
- A filled-out BOM for your device in .xlsx format:
  - o file name = **<your_name>-<device>-BOM.xlsx** (start with the BOM template)

Pay attention to the file naming conventions. This helps me to help you get your graded paper back in a reasonable amount of time. If you don't follow the file naming convention, I may be take points off of your paper at my discretion. It takes me about 30 to 45 minutes to grade each assignment, so please help me here.

Citation example

This text would be in the body of your paper:

This revolutionary experience is enabled by the new ultra-low power Apple W1 chip, which enables AirPods to deliver high-quality audio and industry-leading battery life in a completely wireless design. AirPods will be available starting in late October.[1]

This text would be in the footnotes on the same page where first referenced:
[1] https://www.apple.com/newsroom/2016/09/apple-reinvents-the-wireless-headphones-with-airpods/