Presenting Information During PDR

1. What do we need from a GPIO pin expander? How do you propose to use it?
   1. Expander for each component
   2. Is i2C protocol just what bits are what? How is that protocol implemented? Ie. how do I make something that follow i2c protocol?
   3. How many pins do we need? Per expander?
   4. Size constraints
2. Is it feasible to use an FPGA to make a GPIO pin expander?
3. What is the FPGA design cycle
4. How do we program all the ports? Through the MCU
   1. Are there any libraries we have to #include (like msp430.h)?
5. Show commonly available gpio pin expanders
   1. Make a block diagram based of datasheets from 3-7 i2c gpio pin expanders
6. Look at some more FPGA dev boards
   1. What do we need from a dev board?
   2. <https://www.electronicsforu.com/electronics-projects/software-projects-ideas/designing-fpgas-i2c-master-controller-part-1-5>
   3. <https://www.youtube.com/watch?v=hHH3rKQESdk>
   4. <https://www.circuitbasics.com/basics-of-the-i2c-communication-protocol/>

* Serial Communication IC and physical connection (Abisha, Nida)
  + Build i2c bus and slide about how i2c works
  + Talk about future of making parts work with i1c with IC
  + How does it interface with the larger project
  + What is feasible with a custom IC?
  + What are the limits of serial communication?
  + I need top Level Pins
  + How does the GPIO pin expander work without MCU and mostly digital block (buy extra memory)
  + Look at some more FPGA dev boards, figure out what is the difference and make the table

Is a custom IC the right solution for a GPIO pin expander?

* pcb ??
  + Hahah no, nvm, lol
  + Turns out a pcb is mostly for traces and connections
* Concerns about re-inventing the wheel (larger device, more expensive, no novel features…)
* How exactly does the pin expander work??
  + How to control addressing…w/o a mcu?

Is a custom IC feasible for us to manufacture in one year?

* Minimum cost to make the masks required for an [IC is $35,000](https://news.ycombinator.com/item?id=14511234#:~:text=An%20FPGA%20conversion%20ASIC%20would,to%20amortize%20the%20NRE%20cost.)
  + That is an FPGA to ASIC conversion
  + Immediately out of the question
  + https://www.edn.com/low-cost-fpga-cpld-to-asic-conversion/
* Fabricate at MRC?
  + Yes, but still an issue of masks ($$, skill)
  + It’s kinda a skill issue (I don’t know how to do layout, like at all)
    - ECE 546? ECE 720]
* Is an FPGA feasible?
  + Definitely more accessible
  + Are there any FPGA dev boards in Troxler?
    - Yes,
    - Normally $349
  + Sparkfun Dev 18030 [link](https://www.digikey.com/en/products/detail/sparkfun-electronics/DEV-18030/16499310?utm_adgroup=&utm_source=google&utm_medium=cpc&utm_campaign=PMax%20Shopping_Product_Low%20ROAS%20Categories&utm_term=&utm_content=&gclid=CjwKCAjw38SoBhB6EiwA8EQVLk9QzyF01-9HW79naV9RSRiEUAofRaipVckAibMMniOKKinzUHv4bhoCKl4QAvD_BwE) ($52)
    - I’m not sure atm what exactly our requirements are for the FPGA/dev board so I’m not sure if this has the features we need
    - Arduino??

