* Combining sponsor meeting with Gary’s meeting at 9am on Fri
* Questions:
  + What specs do we need for “success” at the end?
  + Are there any papers we need to read or anything we should learn about?
  + What existing technologies/products should we be familiar with it?
  + How often does he want to meet with us?
  + Does he want to have meetings with all of us present or are subset(s) okay?
  + What is his envisioned timeline for the project?
  + What are big problems with SiP that you have seen?
  + How can we break down the project?
  + Requirements:
    - Size limit 50 x 50 x 10 mm
    - Self powered
    - Flood team compatible

Meeting Notes

* Use them for specific meetings, break it up to when meeting is needed
* Slack is a good way to reach Eric and Ray
* Part of the design process- learn the fab process, make pcb, put plastic around it → IC
* Manufacturing cost ~$12-$15
* All the dies are commercial (bare die)
  + They got a wafer from TI and packaged it
  + Die itself can act like a BGA
* Originally called chiclet, but that is far down the path. We don’t have to worry about that
  + When Gary says what’s your goal do not say chiclet, 50 mm (chocolate square)
* When looking at discrete die, you can easily make it smaller than a chiclet gum…
* You want to look at major vendors sd micro, microchip...there’s the ones that do the m0 on adafruit…. Microchip, TI, ST
* If you do something with solar cells, you need to go elsewhere
* By designing with major vendors you know you can get die in the future...at some point we can look at sip integration/die if schedule aggressive
* 3 parts ~2”x2”
  + Power management
  + Processor, wireless communications, memory
  + Personality
  + stack, integrate upward. Problem though is you can’t stack transistors
* Gene working on stacking substrate…
* You need to be thinking through having everything small, battery
* You’re going to have a microcontroller with general I/O, I2C, so anything you hook up needs to wire up with it easily
* I2C everyone has that now (Thanks, Kemere!)
* We are using eeprom...there’s spi flash, fram
* \*The end product will have no pins...but we should probz have USB for debug (and for illustrating aggregator)
* Processing task will be determined by whether it’s lower power to do A vs. B
* **Aggregator** depends on application
  + LoRa? Bluetooth? To sensors, ultra low power comms. But wifi comms to the world...
* ~The Cloud~
* Encased in clear plastic (so solar cells could work as power)
* 50 x 50 x 10 mm by the end of the semester ideal
* BLE, LoRA, sigfox,
  + Understand what is the data rate you need for the sensor
* Processing: should we transmit data or process in system and then transmit result?
* Power layer- super-capacitors...is there any way to communicate w light? Modulated LED “Optical telephone”
* Challenge: interfaces between 3 board layers
* \* DO NOT make connectors your big problem...high density
* Power and processor boards should be flexible so if you put in a new “personality” board, those would be compatible. SW for processing is specific to application
* Consider power that isn’t sunlight
* How many mips do we get to have? Let the aggregator do the heavy lifting
* Breaking it down
  + Power board
    - What is the power budget
    - Solar cell/energy scavenger
    - Battery (LiPo, Lion, Super Cap, …)-energy storage
    - PMIC (Power Management Integrated Circuit)-energy management
      * Stuff on TI site about power regulators
  + Processor board
    - cost/bit
    - cost/mip
    - How much does it cost from an energy point of view to process a bit, do 1 million instructions
    - What is the interface you want to present to the personality board
    - Processor (MC)
    - COMM
    - Storage
    - O/S
      * Arduino based?
  + Personality board
    - Sensor
    - I/F CKTs
    - comm
  + System integration- interfaces
    - Make sure you have the right abstraction between each layer
  + software/firmware dev. - how do you program for over the air or reprogramming
    - JTAG to start with
  + Aggregator design- possibly arduino on same wireless comm board (or Jen’s bluetooth board with Ray), important for Showcase
* Start looking at processors, IoT sensors
* What is your cool demo that you’re going to show at showcase?
* SiP is pretty new, ASE presentation...look at papers that they are affiliated with
* Ray thought of a good book about system design issues
* Gene saw an interesting demo: Natural sample period-everytime there is enough energy, power on
* Not all sensors are digital, do we need DAC, PWM channels, ADCs
* In a digital sensor, most of the energy used is in the digital conversion
  + There was a case where 95% of energy was spend on adc lol
* Get proposal together for each of the boards
* What does the processor do to gate power down to the personality board, how much time
* WOODS
  + sensor, 5 volts unregulated, 10 mA, when on, have it on 10s of milliseconds
* Gene’s Timeline
  + Design complete by end of october
  + First past end of semester
  + Second pass by spring break
  + Third pass showcase
* Ray: This is a software intensive project. Do not put 1 person!!!
  + How do we get the writing software as soon as possible
  + Duplicate hardware
  + Gene: The real innovation is in the software
  + Unit tests, prove you can turn things on and off
  + You don’t have to build the whole system before you write any software
* Flood sensor project-uses LoRa, aggregator has LoRa reciever, then uses GSM
  + LoRa is a km… Woods thinks ~100m range is ok
* \*Pick your version control system and use it
  + Bitbucket is nice