EE290 Guest Lecture
Chip Bringup

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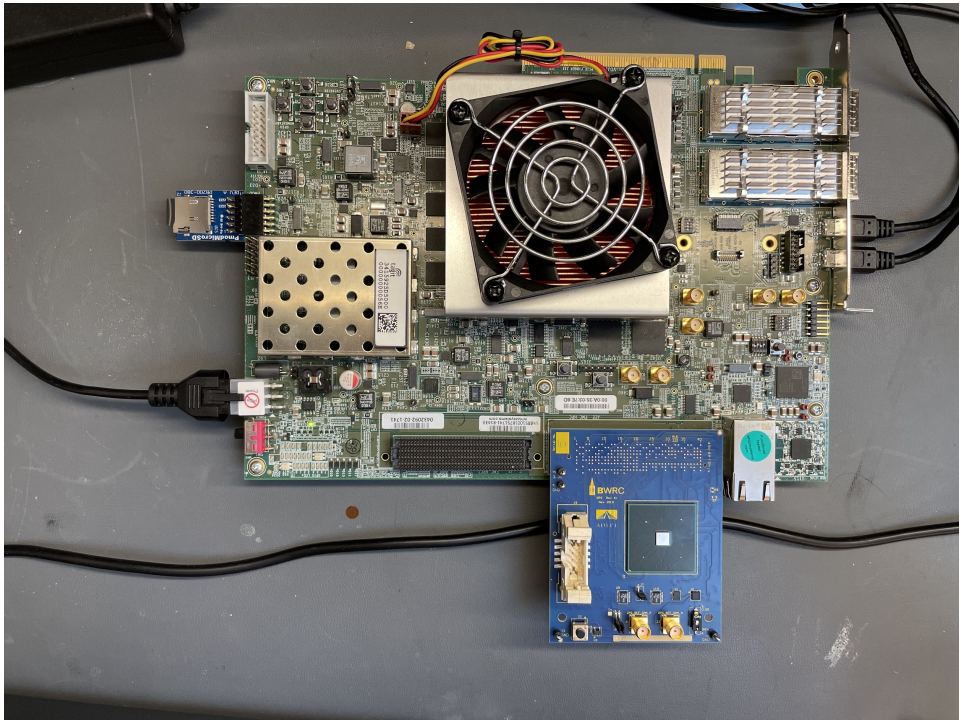
Outline

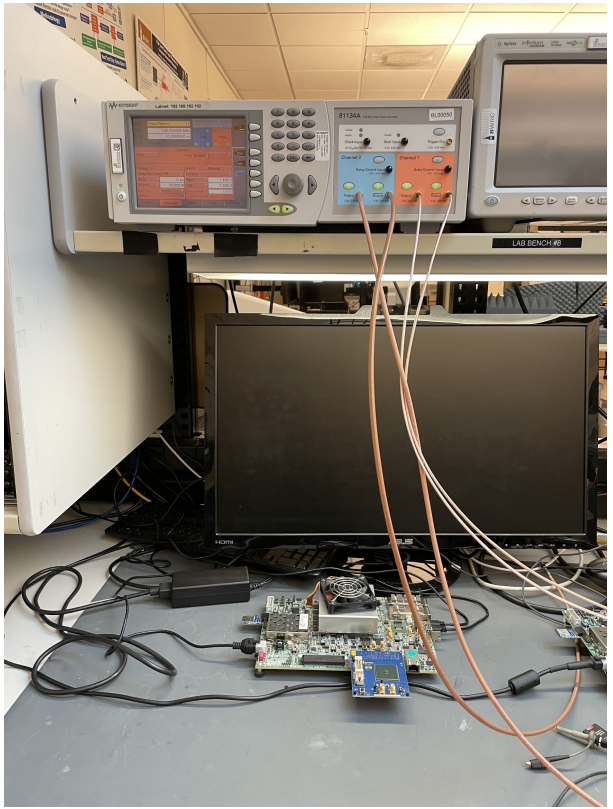
- Bringup goals
- Bringup test setup
- Interacting with your chip and booting
- Lab equipment
- General advice

You sent off some polygons, what next?

- Don’t lose sight of your goals
- How do you know if the thing you made actually works?
- How do you get the bits from your computer to the chip itself?
- Bringup goals
  - Need to physically interface with the chip
    - Signs of life
  - Need to debug the chip
    - Clocks, resets, board, etc.
  - Demonstrate functionality
  - Run experiments
    - Make nice plots
- The process isn’t standard, but hopefully will give you some insight

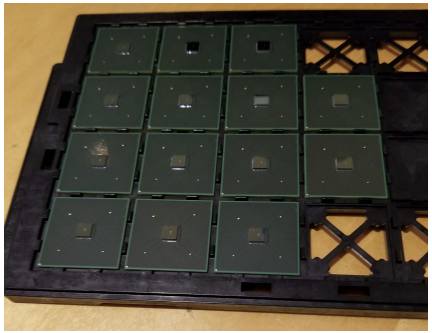
Bringup Test Setup

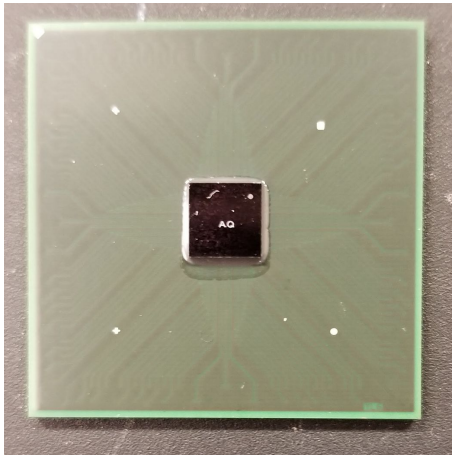


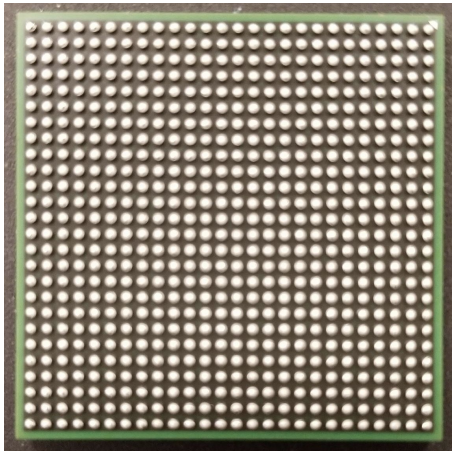


What’s on your chip?

- Power
- Clock
- Reset
- Your modules
- PMU core / CPU0
- Top level interfaces
  - JTAG
  - SPI
  - Others

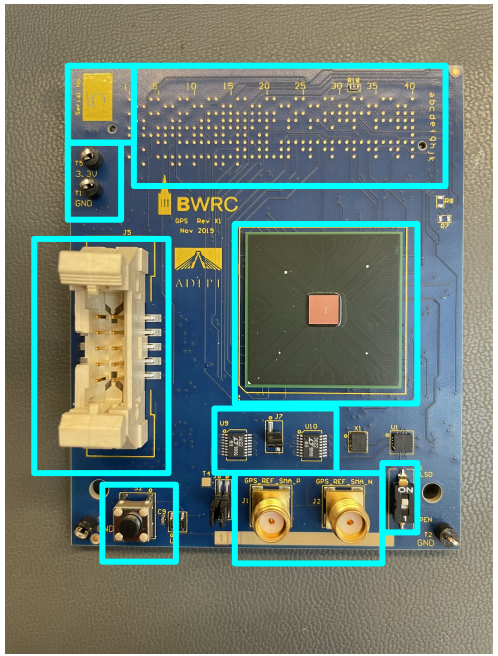


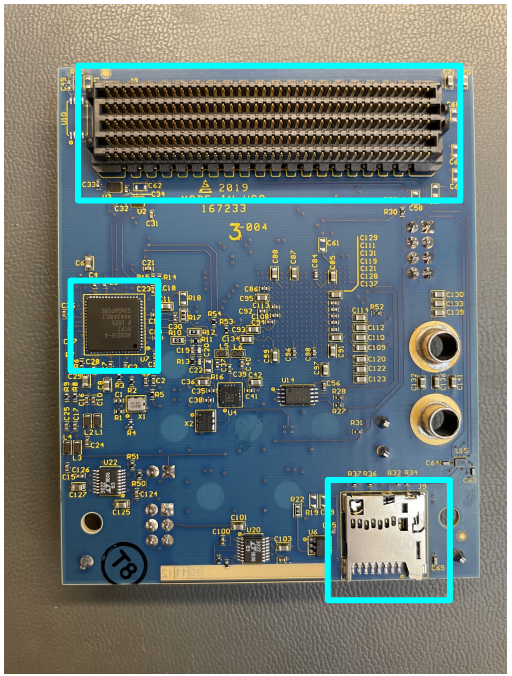




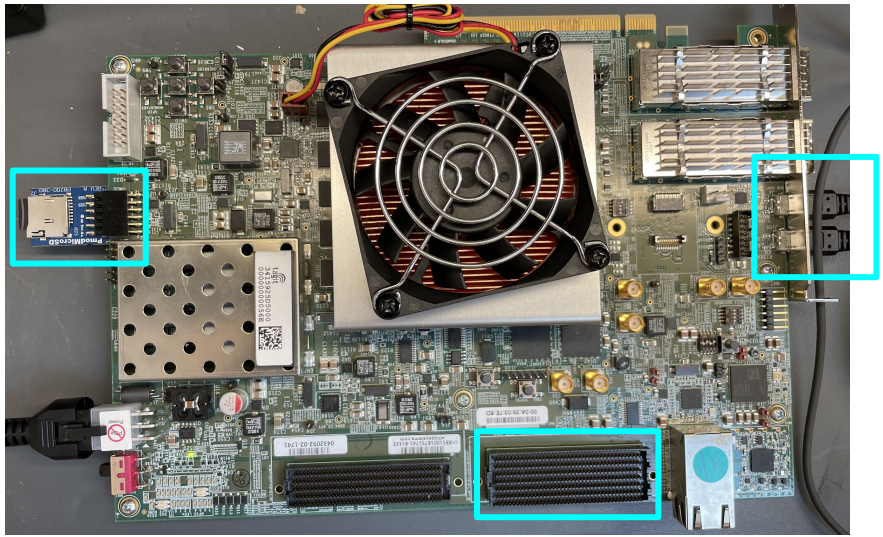
What’s on your board?

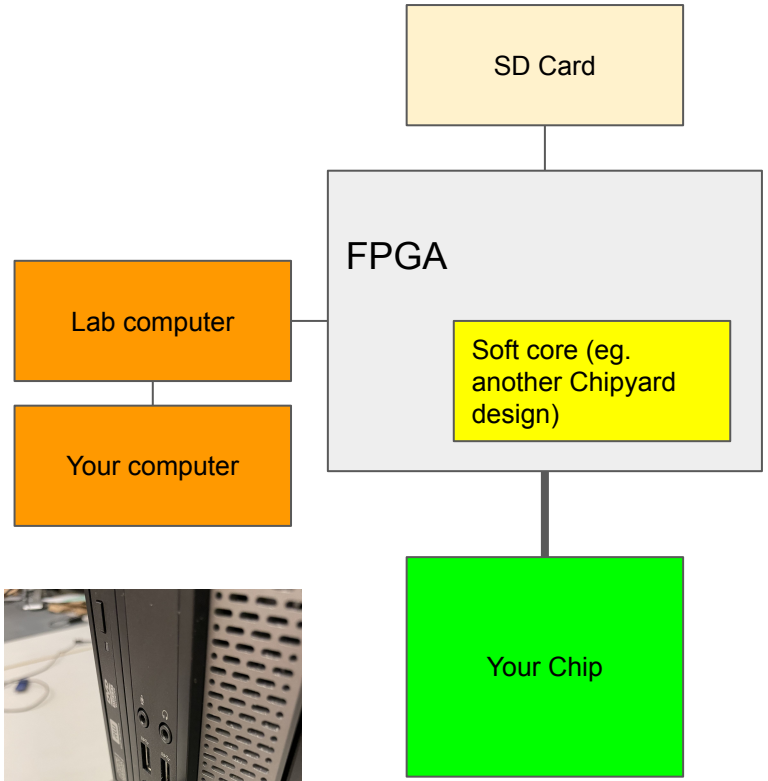
- FPGA connection
- Test points
- Clocking
- Power
- Other miscellaneous parts / quality of life





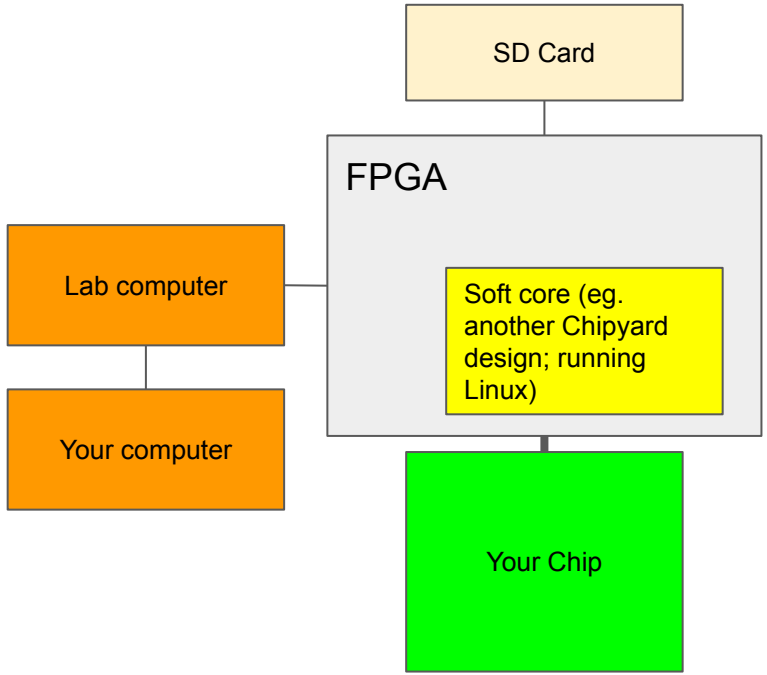
What's on the FPGA/board?

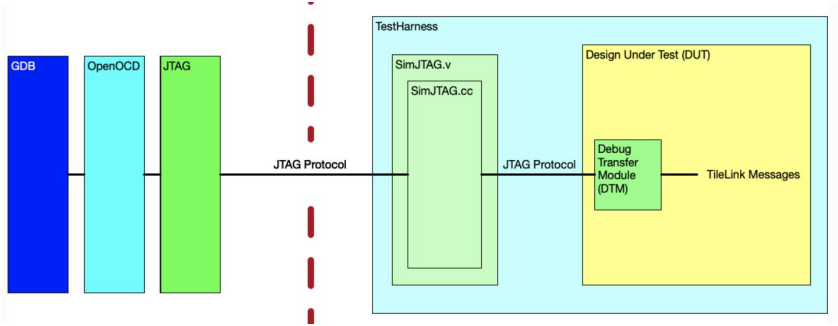


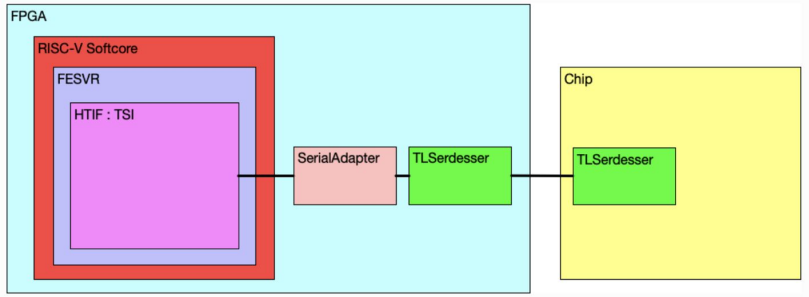


How do I talk to the chip?

- Access soft core on FPGA via UART
- Can use this to write GPIOs, push data to chip, and execute programs
- BootROM on chip
- Interrupt from the host
- Chip executes program
- Booting Linux on chip is more complicated

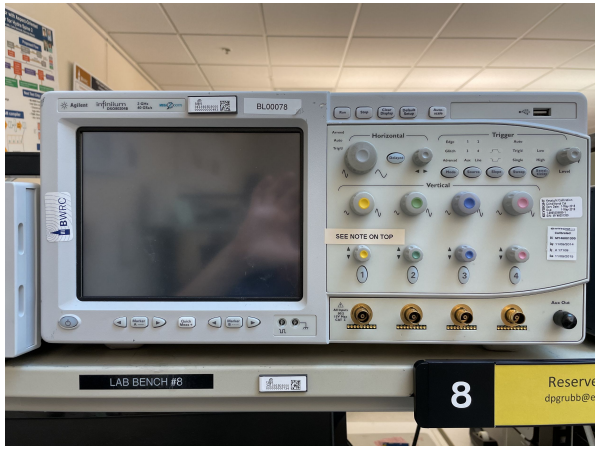






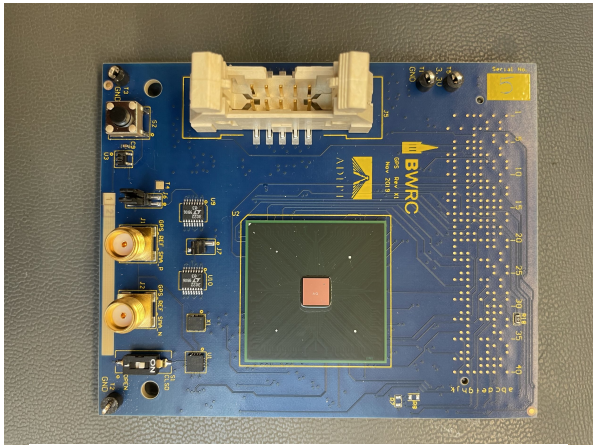
Lab Equipment

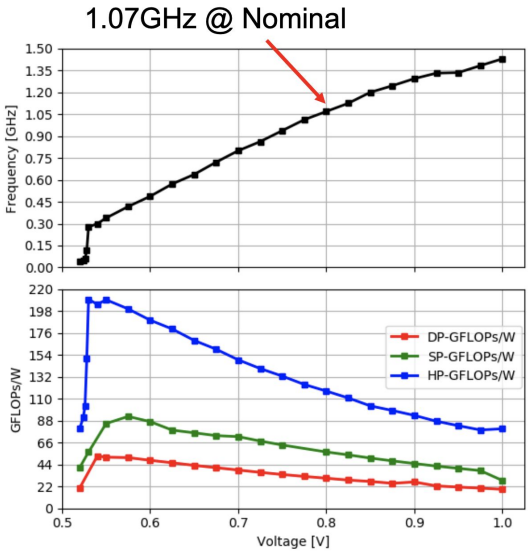
- Scope
- Clk generator
- Power supply
- DMM
- Soldering station
- Logic analyzer
- Others
  - RF equipment
  - Probe station



Basic Process

- Sanity check your setup
- Check signs of life
- Board debugging
  - Test points
  - Resets
  - Clocks (redundancies)
  - Power
- Use the lab equipment at your disposal
  - DMMs, scope, logic analyzer, etc.
  - Host FPGA
    - ILAs
- Run through your bringup sequence
- Run test programs
- Gather data





General Bringup Advice

- Run through your bringup sequence in simulation
  - Try to match exactly what you're going to do in the real world
- Sanity check what you're doing on the lab bench
  - Buzzing
  - Clocks
  - Resets
  - Test points
- When something goes wrong
  - Think hierarchically
  - Check simulations
- Label your boards so you know exactly what you're testing
- **Meticulously record everything that you do in the lab**
  - This will save you headaches...

Questions?