HE/HB ngCCM Prototype Development

next generation Clock, Control and Monitor[1] (ngCCM) Module for the CMS End-Cap & Barrel Hadron (HE/HB) Calorimeter

Stephen Goadhouse

Electronics Engineer for the UVa Physics Dept.

1 - as defined in CMS DocDB #3298

Form Factor

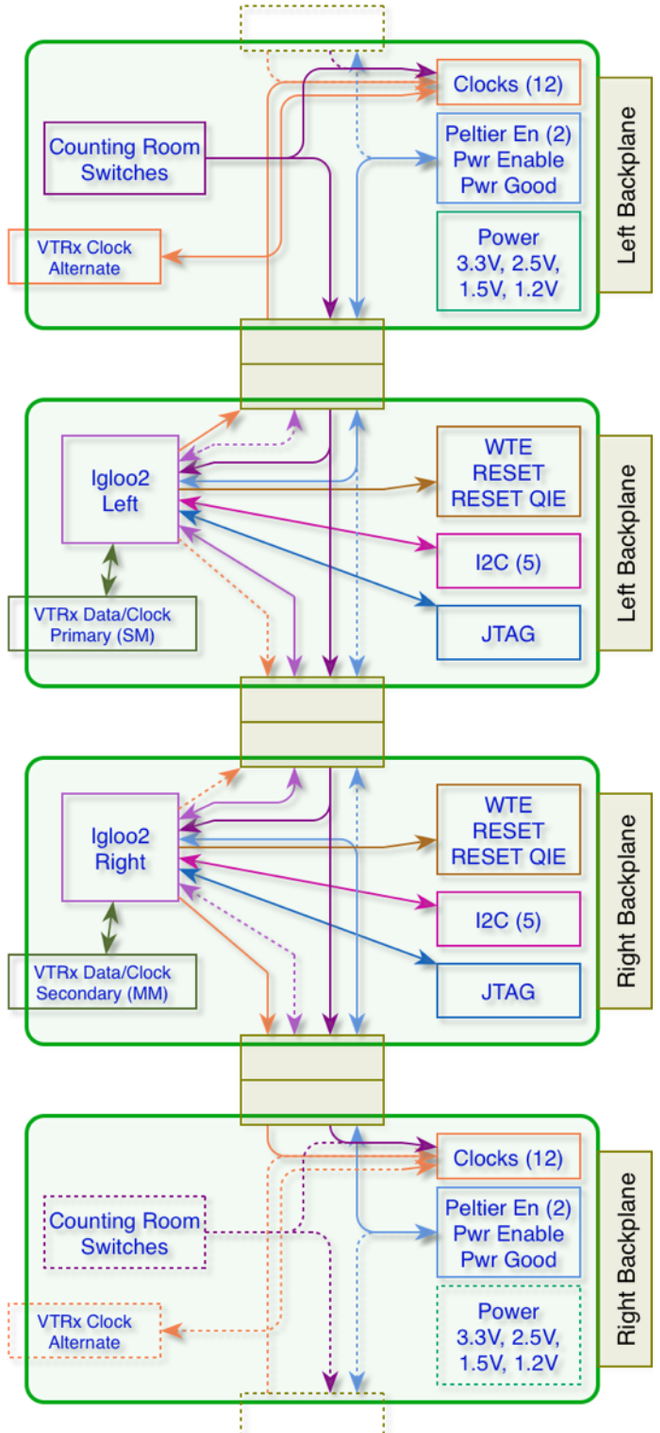
Original Prototype ngCCM

120 mm x 88.8 mm x 4

- Similar Form Factor to CCM and original prototype ngCCM
- ~~Now, 40 mm longer~~
  - ~~160 mm x 88.5 mm~~
- Need to reduce card size due to mechanical impediments
  - 140 mm x 88.5 mm

Conceptual Block Diagram

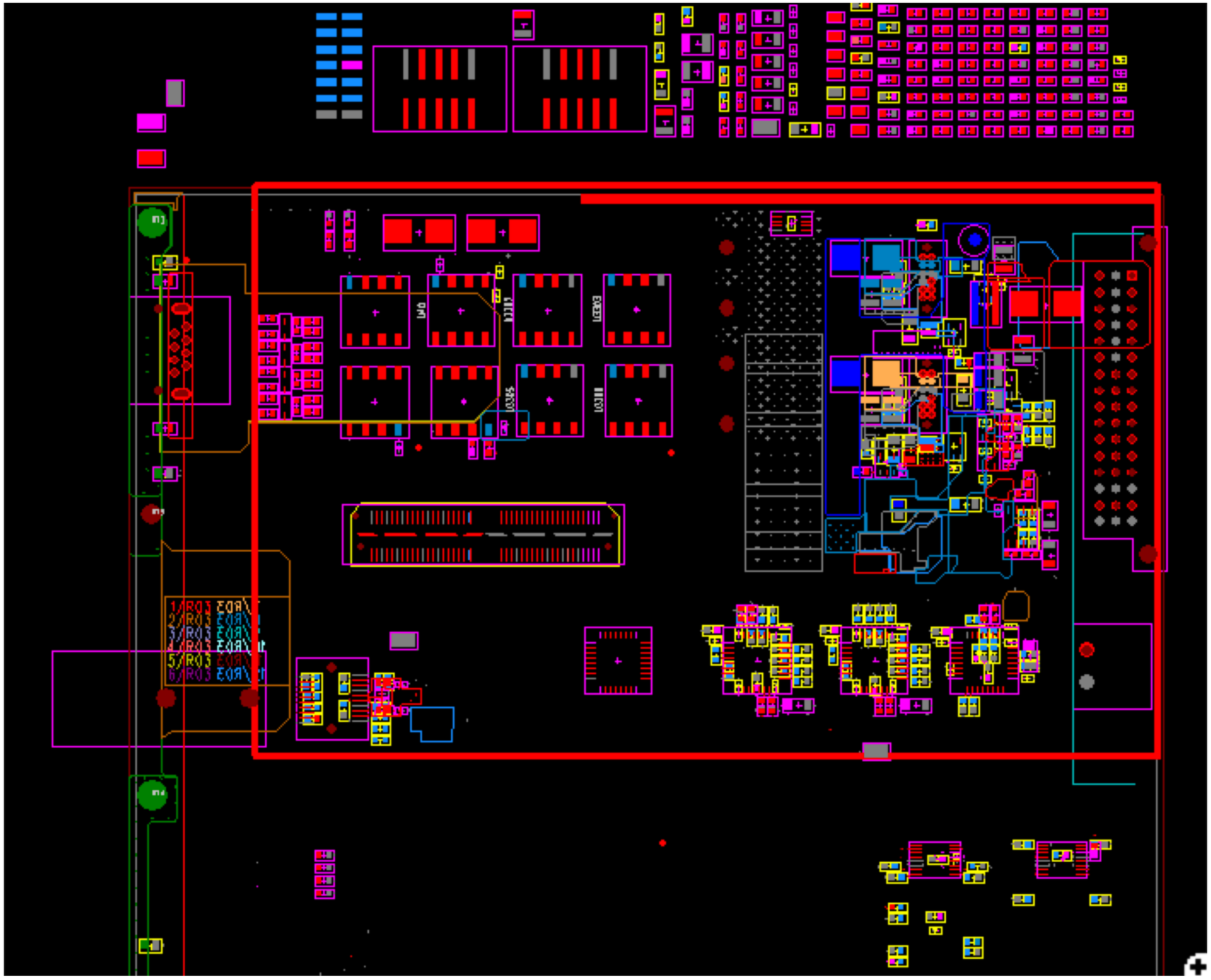
- Backplane Signals are roughly separated by function
  - Clock/Timing
  - Control/Monitor
- So designing two distinct boards instead of four
- Clock board with two different assembly variants
  - Only one will support the DC/DC modules
  - Only one will house alternate clock VTRx
  - Only one has counting room jumper optocouplers
  - Board assignment determined by mechanical constraints
- Identical Control/Monitor boards with Igloo2 programmed differently for Left and Right
  - Igloo2's communicate with spare SERDES across board-to-board connector



Current Status

- Schematic now ready to begin component placement
  - Preliminary schematic and BOMs on CMS DocDB #12666
  - Now with separate PDF schematics for clock and control boards
- Using the HF ngCCM layout as a starting point
- Stan Chidzik at Princeton plans to handle placement and layout of the clock board
  - financial paperwork in process
  - hopes to be able to start next week
- Local engineering firm, Neoventus, will help with placement and layout of control board
  - also hopes to start next week

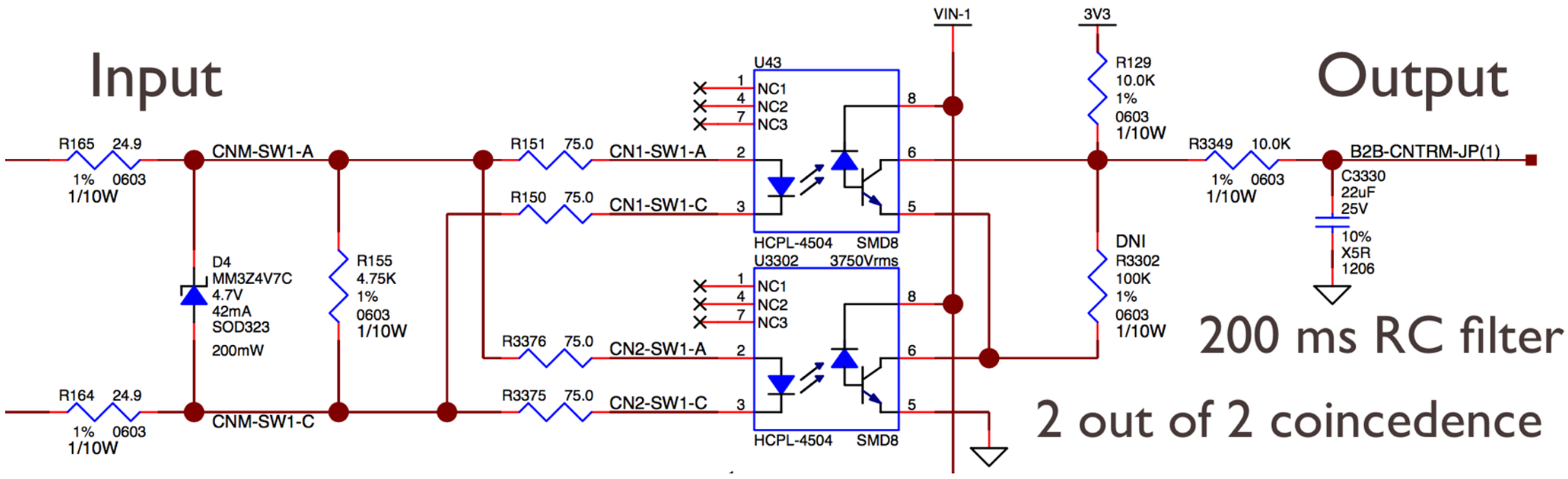
Clock Board



Control Board

Delays

- Had expected to start placement on Monday
- However, needed to take time to improve optocoupler circuit
- Also, looked over old HF ngCCM design verification results
  - decided that the LVDS to LVPECL termination needed to be improved



Need PCB Dimensions

- Need specifics
  - board size (currently 140 mm x 88.5 mm)
  - backplane connector placement
  - mounting hole and thermal strip dimensions
  - keep-out areas for the front connectors
- Need to know how to assign circuits to Clock board
  - RJ conn. and optocouplers - left or right Clock board?
  - Alternate Clock VTRx - left or right Clock board?
  - DC/DC modules - left or right Clock board?
  - Answers impact schematics
- Ionos Schmidt is working on this - thanks!

Next Steps

- Create a test FPGA build to confirm I/O signal assignments
- Verify assignment of board-to-board signal routing
- Update schematics per mechanical constraints
- Conduct formal design review with other engineers
- Start ordering long lead-time components
  - assembling ~10 prototype ngCCMs?
  - oscillators on order - thanks to Tullio!
  - waiting on quote for FPGAs
    - Digikey currently shows mid-November lead time

Schedule Comments

- Very aggressive schedule
- No room for delays
- Heavily relies on leverage of layout of HF ngCCM
- One week PCB and one week assembly
- Only allows one week for basic power up tests
- Only allows one week for basic integration tests
- Experience with HF system will help
- Expect some slippage of schedule

Proposed Schedule

- Aug. 25 - Schematics complete enough to begin layout
- Aug. 31 - Begin component placement
  - Clock and Control boards in parallel
  - Will take longer to fit components on smaller board
  - Other mechanical constraints could further delay placement
- Sept. 11 - Formal Design Review
- Sept. 21 - Begin routing
- Oct. 16 - Design ready for assembly
  - Requires Igloo2's available in time
- Nov. 2 - Receive assembled boards and begin initial board tests
- Nov. 9 - Integration tests with RMs and backplane
- Nov. 16 - Prototype HE/HB ngCCM ready for review