DAQ status qua GPS

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Eric Church, Yale

GPS

- At Nevis in August, we hashed out a way to put the GPS time into the frames -- or at least every Nth frame.

- A pulse-per-second from our GPS (resident in the SEB-10 server, connected to the PMT crate) will be an input into trigger card. Chi will make such an input at that instant store the frame # and the 16 MHz clock value internally on the trigger card. Simultaneous to the PPS going out we will grab in software the latched GPS time and query the quantities above on the trigger card (through controller card). We will shove that time into that frame header when we see it in DMA stream.

- Steps in blue below require a Nevis/VT expert.

Rules of this presentation

- I have heard no reason we need to exceed the 1 usec GPS accuracy of the proposed card for MicroBooNE DAQ.

- Given that seb-10 in which the card will be resident will not be rebooted and itself will be on UPS, I don't see the need for a standalone receiver. I like this PCIe solution.

- If you think above are wrong let's hash it out **after** this meeting. Let's please not have that argument here in the interest of time.

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So, let's break this down

- We need in hardware to know the GPS time corresponding to the frame number NOW.

- We can not wait to see the frame DMA'd into the seb–10 server, because by then there's been latency.

- Hence, Nevis's idea: on a GPS PPS event, over a lemo input we, the Trigger card stores away the current Frame # somewhere. (This is magic to me, as yet. But not to Chi.)

- The frame number and its 16 MHz clock time is now in Trigger board memory, and safe for 1 second.

Wednesday, September 12, 2012

Breakdown 2

☐ Simultaneously, the GPS card interrupts seb–10. This happens at the software/hardware level. We have a full second, so perhaps this is slightly overkill, but we now are the kernel's top priority.

Breakdown 3

▫ The seb-10 kernel holds a table with a pointer to a function in user space and calls it when it sees this interrupt. In that code we query the GPS time, via the driver functions, and put that time in shared memory, hard-linked.

▫ Also on this interrupt: We also issue a command across the controller card to the Trigger card and ask for the Magic Frame Number and Internal Clock Value. (This is perhaps threaded/forked so as to not hold onto the interrupt too long.)

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Breakdown, 4

□ The effect is that we have in memory a 3-column table of GPS time, DAQ Clock Time, Frame Number, as many rows as seconds that we want to keep in a circular buffer.

PPS interrupt: results from Cosimo

☐ Internal Crystal mode:

```
pps_routine: 79:146:129.0042647
pps_routine: 79:146:130.0042842
pps_routine: 79:146:131.0053143
pps_routine: 79:146:132.0033362
pps_routine: 79:146:133.0023608
pps_routine: 79:146:134.0023864
pps_routine: 79:146:135.0024116
pps_routine: 79:146:136.0024371
pps_routine: 79:146:137.0024626
pps_routine: 79:146:138.0024879
pps_routine: 79:146:139.0055135
pps_routine: 79:146:140.0025389
pps_routine: 79:146:141.0065642
pps_routine: 79:146:142.0045894
pps_routine: 79:146:143.0056173
pps_routine: 79:146:144.0026406
```

PPS interrupt: results from Cosimo

☐ In GPS mode

Am going back
to vendor tech
with this question

pps_routine: 80:156:66.0040402
bcIntHandlerRoutine
pps_routine: 80:156:67.0140657
bcIntHandlerRoutine
pps_routine: 80:156:68.0030917
bcIntHandlerRoutine
pps_routine: 80:156:69.0041193
bcIntHandlerRoutine
pps_routine: 80:156:70.0041424
bcIntHandlerRoutine
pps_routine: 80:156:71.0041674
bcIntHandlerRoutine
pps_routine: 80:156:72.0141917
bcIntHandlerRoutine
pps_routine: 80:156:73.0052188
bcIntHandlerRoutine
pps_routine: 80:156:74.0032431
bcIntHandlerRoutine
pps_routine: 80:156:75.0032680
bcIntHandlerRoutine
pps_routine: 80:156:76.0022934
bcIntHandlerRoutine
pps_routine: 80:156:77.0023189
bcIntHandlerRoutine
pps_routine: 80:156:78.0023439
bcIntHandlerRoutine
pps_routine: 80:156:79.0023694

DAB work

- Cosimo has implemented the relevant bits, to the extent possible w.o. the Trigger card.

- If we can confirm that the times ought to have this msec–ish jitter when we're on the internal Symmetricom crystal, then ....

- We need to wire the antenna to the DAB roof. We've done proof–of–satellite–acquire with a temporary and unsafe set–up at Linda's portakamp.

GPS at DAB

D0

This $3k Symmetricom PCIe card advertises 170 nsec accuracy.
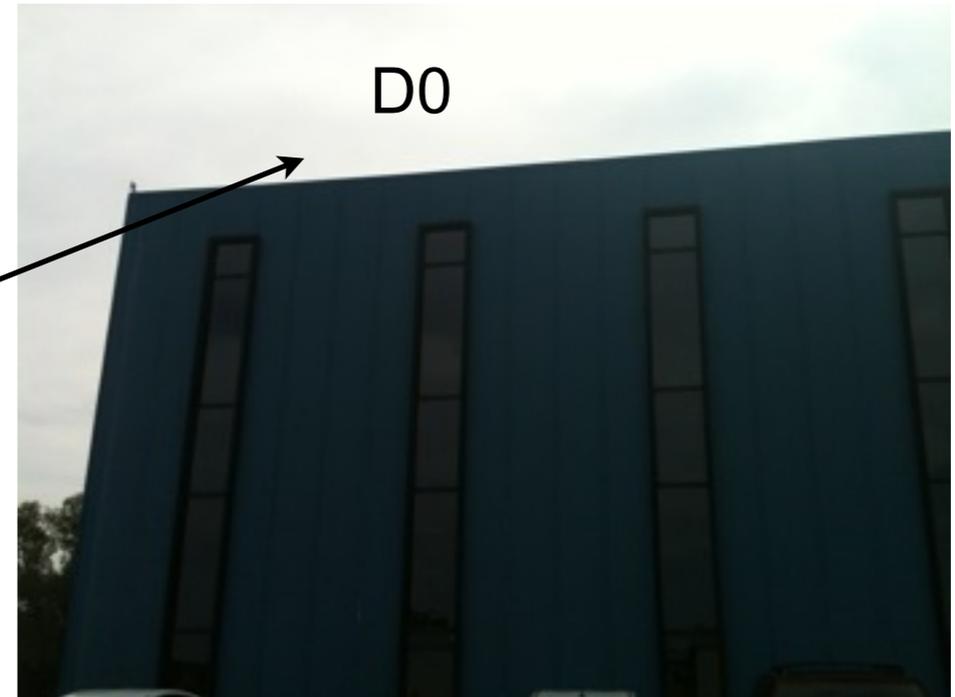
Cosimo is writing/modifying the linux module the code now to watch for the PPS hardware interrupt to grab the GPS time. We'll simultaneously increment a scaler in NIM bin: this will be "proof" of concept.

PCIe card In ren/uboonedaq-seb-10

Equipment

- We've had a Symmetricom loaner card way past the grace period.

- I'd like to go buy it now: ~$3k.

- Out at LArTF seb–10 is in DAQ computer room, antenna will be on its roof.

- Trigger card is on the platform, so we'll run a fiber out there from the card, just as we'll run the ACNET BNB/NuMI fibers from the DAQ room. All are lemo inputs into the Trigger card.

- An amusing fact: SEB–10 will need a 5–slot PCIe bus, or an extender. Not an issue.

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