Al Conrad <aconrad@lbto.org>

Fwd: usb3 new fiber run

1 message

Jonathan Crass <j.crass@nd.edu> Wed, Oct 19, 2022 at 6:22 AM
To: Al Conrad <aconrad@lbto.org>

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---------- Forwarded message ---------
From: **Matthieu Bec** <mbec@lbto.org>
Date: Wed, 25 Nov 2020 at 22:42
Subject: Re: usb3 new fiber run
To: Jonathan Crass <j.crass@nd.edu>
Cc: fernando pedichini <fernando.pedichini@inaf.it>, Brian Sands <bsands@nd.edu>, Roberto Piazzesi <roberto.piazzesi@inaf.it>

Hi Jonathan,
My thoughts were a 10Gb Ethernet would be able to absorb 5Gb burst from those cameras.
Of course that means isolating that traffic from the existing general net traffic and infrastructure. But that was also the point of the new bundle, it wouldn't be just usb extenders but possibly new network gear.
It's getting late for me to really think about it and we might want to call in the local experts. Something to follow up.

Thanks and Happy Thanksgiving all!
Matthieu

> On Nov 25, 2020, at 8:30 PM, Jonathan Crass <j.crass@nd.edu> wrote:

>
> Hi Matthieu,
> The camera outputs USB 3 which runs with a bandwidth of approximately 5Gbps. That bandwidth means it can't go over a standard ethernet connection unfortunately, hence the need for dedicated extenders/fibers no matter what the solution. We discussed that extensively at our PDRs and FDRs.
>
> Most vendors (including Andor) will sign up for 100m so if we can get below that, I do think we'll be fine. That length has been tested both by us and the SHARK team I believe and shown to work even with none optimized hardware.
>
> I suggest we come back to all of this next week once you've looked at the need to go via the ULTH (I think this is actually a "nice to have" from the IT side but not a "need").
>
> And in the meantime, yes, Happy Thanksgiving to everyone.
>
> J
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> On Wed, Nov 25, 2020, 19:20 Matthieu Bec <mbec@lbto.org> wrote:
>
> Hi Jonathan,
>
> I can ask for a more detailed breakdown, but my second point remains: we seem to be on the edge of what those devices can offer, and not necessarily a great place to be.
> What I was thinking with local hardware, you wouldn't store frames locally beyond the buffer needed to pipe them over Ethernet and as they come in, there might not be much local storage needed.
> But I don't know your latency requirements and other details.
>
> It's about time to say Happy Thanksgiving, but we should iterate.
>
> Thanks, and Happy Thanksgiving!
>
> Matthieu
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> > On Nov 25, 2020, at 7:55 PM, Jonathan Crass <j.crass@nd.edu> wrote:
> >
> > Hi Matthieu,
> > The previous 130m run goes via the ULTH I believe - is that right? If so, that adds approximately 16m in each direction i.e. 32m extra length.
> >
> > Why can't a break out be made below the telescope gallery which removes this 30m backwards and forwards run and bring us under 100m? There's already fiber breakouts on LBTI for example so this isn't something new on the gallery.
> >
> > As to local hardware - this is a sheer question of data volume and having a machine which is able to handle that - it will need a multi-drive SSD raid machine.
> >
> > I'd be interested in understanding why things still need to go via the ULTH.
> >
> > Thanks
> > Jonathan
> >
> >
> > On Wed, Nov 25, 2020, 15:04 Matthieu Bec <mbec@lbto.org> wrote:
> > Hi all,
> >
> > I met with the IT group today and we discussed the possibility of making the fiber run shorter.
> > In a nutshell, the number we provided you seems to be what can be achieved with the current setup.
> > I heard from them: "unless we punch holes in the walls, run new ducts" (and more humorously, "pull on those fibers like guitar strings")

> > So if we wanted to shorten the run below 100m, it would probably extend beyond IT and need to involve Engineering and Mountain.
> >
> > On my end, I have discomfort thinking we have to rely on a communication device that works <100m but not beyond.
> > Keeping controllers close to their IO when needed isn't something new, as seems to be the case here.
> > Keeping a small PC close to the camera to acquire images, and use Ethernet as a more reliable and tolerant bridge to push images to CRB seems to be a better option.
> > I don't know your control scheme well enough but it seems to be a more viable option. I would not see the heat load and vibration from a small camera acquisition PC being of considerable concern. But I'll admit not really knowing about rack space and location.
> >
> > Both options have pros and cons, and there might be others. We may have to think our next steps a little more.
> >
> > Thanks,
> > Matthieu
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> > > On Nov 20, 2020, at 12:59 PM, Matthieu Bec <mbec@lbto.org> wrote:
> > >
> > > Thanks bringing those different discussions all together.
> > > "intuitively", Fernando's comment and Brian's reply also make sense to me.
> > >
> > > On my end, I'll double check if the run could be made shorter, and if we can run the test in-situ at the telescope, as we had bounced the idea pre-covid.
> > > please let me know if I miss something or have other recommendations!
> > >
> > > Thanks,
> > > Matthieu
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> > > > On Nov 20, 2020, at 12:50 PM, Jonathan Crass <j.crass@nd.edu> wrote:
> > > >
> > > > I've reached out to Fresh Digit to see a) if there's any way their senders could be introducing the jitter and b) what the changes in the lower level hardware are to see if the new ones would be a more 'stable' USB 3.0. Once I hear anything back, I'll let you know.
> > > >
> > > > J
> > > > _____
> > > >
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> > >> On Fri, 20 Nov 2020 at 14:45, Brian Sands <bsands@nd.edu> wrote:
> > >> Hi all,
> > >>
> > >> My quick look at the new extender model on Fresh Digit's website suggests that it adds USB 3.1 compliance; there doesn't appear to be any additional changes in the hardware. That would imply that we may not see any additional benefit, given the Andor cameras are USB 3.0. I would agree with Fernando that the limiting factor here appears to be Andor's software/firmware and not necessarily the extender hardware.
> > >>
> > >> Brian.
> > >>
> > >> On Fri, Nov 20, 2020 at 2:29 PM fernando pedichini <fernando.pedichini@inaf.it> wrote:
> > >> Dears, according to our experience with the other type of fiber repeater (the one using multimode) we started to think that the problem may be more in the Andor protocol than in the fiber repater hardware, because we get more or less the same limit distance of 100meters and then our conclusion was that should be some software handshake signal between camera and computer that make crash the connection if the answer is too late...and the too late is due only to the propagation time on the physical media (may be glass or copper) and not in the conversion process. In other words computer says to camera "send me your pixels" and waits only a few hundred of ns, than if pixels are not yet arrived signals an error despite the fact that we have a media with an high pixel throughput but an initial latency that cannot be shorter than the lenght of fiber / speed of light!
> > >>
> > >> Does it make sense?
> > >>
> > >> Does anybody of us asked Andor for a reliable fiber extender to their systems? Sincerely we did not yet! It is worth to try, nobody of us like computers scattered away of computer rooms at LBT :)
> > >>
> > >> All the best
> > >>
> > >> Fernando
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> > >> On 20/11/2020 20:11, Jonathan Crass wrote:
> > >>> Hi Matthieu,
> > >>>
> > >>> The general rule which has come from LBTO has to keep computers in CRB for general accessibility/service, to avoid disks changing orientation, fan vibrations, heat loads etc. We always had the fall-back of putting a server on the gallery, however, our initial tests showed we should be ok running to CRB from the ULTH and that's why our server hardware is in CRB.
> > >>>
> > >>> What we're generally seeing is that below 100m, things seem fine (this is the limit ANDOR says should work). Beyond 100m, things seem to need to be very finely tuned with optimized hardware to provide a stable connection with minimal latency/overheads. My guess is the 100m limit provides enough buffer in the timing to allow the computer to handle the USB data at the same time as its other processes - above that, the spare overhead you have before the data stream gets into trouble decreases. This is really the only explanation I can come up with when trying to make sense of the results we've seen.
> > >>>
> > >>> I will say that if we can run fibers from the center of the gallery to CRA, that would save 32m or so from the current run (ULTH and back gets saved) which would bring things under 100m.
> > >>>
> > >>> J
> > >>> _____
> > >>>
> > >>> Dr. Jonathan Crass (he/him)
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> > >>> On Fri, 20 Nov 2020 at 14:00, Matthieu Bec <mbec@lbto.org> wrote:
> > >>> Hi Jonathan, all
> > >>>
> > >>> Genuine and very candid question:
> > >>> We have been looking at these devices for quite some time and always seem to come back to the same: are we pushing these extender capabilities to some extreme, a plan B might be the more reasonable option?
> > >>> I don't fully grasp all the ramification of having your camera controller on the telescope, for example does that imply more storage/compute needs to move along with them?
> > >>>
> > >>> Thanks,
> > >>> Matthieu
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> > >>> On Nov 19, 2020, at 3:59 PM, Jonathan Crass <j.crass@nd.edu> wrote:
> > >>>
> > >>> Hi All,
> > >>> We did some testing today with the additional fibers. You can see that here:
> > >>>
> > >>> https://docs.google.com/document/d/1nR22gmMPEoIrewllZTHDWbMfJv3quu4rrYQ9tF4HK1M/edit?usp=sharing
> > >>>
> > >>> That all said, what we're seeing is not particularly consistent with other testing we've done where we have been successful with these tests over longer lengths. Brian and I have talked about this and have a few thoughts:
> > >>> • This could be due to us using different computer hardware at Notre Dame for this testing. That is likely fine to confirm 100m performance, but not sufficient to really assess the limit where better optimized hardware may increase the distance. The only way we can really think to do this is to do these tests with our hardware down at the LBT which is more optimized for this testing (or possibly with the setup in Italy).
> > >>> • If we have fibers which are back-reflecting, this may cause some problems. For example, switching one fiber propagation direction today did change behaviour a little bit which makes us think about losses, back reflections at interfaces etc.
> > >>> Unfortunately it's hard for us to give a definitive answer right now given what we're seeing. 100m looks acceptable, but I can't say if 130m with all of the breaks is going to work with the data we have.
> > >>>
> > >>> J
> > >>> _____
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> > >>>> On Tue, 17 Nov 2020 at 04:28, fernando pedichini <fernando.pedichini@inaf.it> wrote:
> > >>>> Thank you Jonathan,
> > >>>>
> > >>>> I can suggest our typical stress test:
> > >>>>
> > >>>> • ROI format 200x200 pix vertical and horizontal centered
> > >>>> • 16 bit low noise
> > >>>> • max sampling speed (I remember 240 MHz, anyway use the fastest)
> > >>>> • ~1ms exposure time and rolling shutter to achieve about 1000 frame per second
> > >>>> • acquire a kinetic serie of 100000 frames as you prefer on disk or PC RAM
> > >>>> • internal trigger
> > >>>> Take care to verify that the kinetic serie is long enough to saturate the internal camera buffer and then if this test doesn't failto stress the USB link close to its maximum throughput with a 2kx2k image at 30 or 40 Hz
> > >>>>
> > >>>> Thank you again and let me know
> > >>>>
> > >>>> Cheers
> > >>>>
> > >>>> fernando
> > >>>>
> > >>>>
> > >>>>
> > >>>> On 16/11/2020 17:43, Jonathan Crass wrote:
> > >>>>> Hi All,
> > >>>>> We're planning on looking at these ANDOR tests in the next day or two.
> > >>>>>
> > >>>>> Fernando - were there any specific tests you want us to run with our setup? Right now we're primarily testing if SOLIS is stable when running the camera in different modes. I'm happy to do any you want (providing they aren't too complicated to setup).
> > >>>>>
> > >>>>> Thanks
> > >>>>> Jonathan
> > >>>>> _____
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> > >>>>> On Tue, 3 Nov 2020 at 04:08, fernando pedichini <fernando.pedichini@inaf.it> wrote:
> > >>>>> Hi Matthieu, we will update you within this day about the order of the
> > >>>>> adapter.

> > >>>>>
> > >>>>> Thank you and cheers
> > >>>>>
> > >>>>> Fernando
> > >>>>>
> > >>>>> On 03/11/2020 00:56, Matthieu Bec wrote:
> > >>>>>> Thank you Jonathan. Given the small price difference, it makes sense to stick to the extended temperature range, USB31-S-T
> > >>>>>> Fernando, do you want us to order it here and ship it, or we leave the order to you?
> > >>>>>> For both of you, tests are starting be of the essence if we want to order the telescope bundle under this fiscal year. Expected budget for next year isn't particularly looking great but we have a bit of reserve for 2020.
> > >>>>>>
> > >>>>>> Thanks,
> > >>>>>> Matthieu
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> > >>>>>>
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> > >>>>>> On Nov 2, 2020, at 4:42 PM, Jonathan Crass <j.crass@nd.edu> wrote:
> > >>>>>>
> > >>>>>> Hi Matthieu,
> > >>>>>> I had a reply back from Fresh Digit:
> > >>>>>>
> > >>>>>> " USB31 (USB3.1 Gen1 fiber extender) is an upgrade version and a direct replacement for USB3FE (USB3.0 fiber extender). USB31 has two USB3 ports on the camera module. It is more reliable and compatible with more hardware."
> > >>>>>>
> > >>>>>> Attached is a quote for the current model including the low temperature version (what we got in the previous model).
> > >>>>>>
> > >>>>>> Thanks
> > >>>>>> Jonathan
> > >>>>>> _____
> > >>>>>>
> > >>>>>> Dr Jonathan Crass
> > >>>>>> Research Assistant Professor
> > >>>>>> he/him
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> > >>>>>> On Mon, 2 Nov 2020 at 12:38, Jonathan Crass <j.crass@nd.edu> wrote:
> > >>>>>> Hi Matthieu,
> > >>>>>> This does look like the closest item but I've reached out to Fresh Digit to confirm.
> > >>>>>>
> > >>>>>> As for testing in Italy - as we're already testing the Fresh Digit extender (this is the same which is used with LMIRCam) with an Andor Zyla 4.2, I'm not sure if there's a need to buy one in Italy for testing? If the model has changed, then perhaps that might be useful however - I'll know more once I hear back from Fresh Digit.
> > >>>>>>
> > >>>>>> As for the FIRENEX - 5000H, this appears to be for a OM3 multi-mode fiber and therefore is not compatible with the fiber already sent or what is planned to be installed at the telescope. Given that, I would not go ahead with that purchase.

> > >>>>>>>
> > >>>>>>> Jonathan
> > >>>>>>> _____
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> > >>>>>>> Dr Jonathan Crass
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> > >>>>>>> On Mon, 2 Nov 2020 at 10:06, Matthieu Bec <mbec@lbto.org> wrote:
> > >>>>>>> Hi Fernando,
> > >>>>>>>
> > >>>>>>> I thought Massimiliano had ordered it. This is the information I had, but the link is broken now.
> > >>>>>>>
> > >>>>>>>> FreshDigit:
> > >>>>>>>> https://www.freshdigit.com/fdt/product/usb3-fiber-extender/
> > >>>>>>>> Brian Sands from Notre Dame noted the extenders have to be specifically ordered as such to be specified for
> > >>>>>>>>>>>>>>> 'single mode duplex', Part Number: USB3FE-S
> > >>>>>>>
> > >>>>>>> The closest equivalent seems to be https://www.freshdigit.com/fdt/product/usb-3-1-gen1-fiber-extender/
> > >>>>>>> Part Number: USB31-S
> > >>>>>>> LC Single Mode Duplex Transceiver
> > >>>>>>>
> > >>>>>>> Jonathan, can you confirm?
> > >>>>>>>
> > >>>>>>> Thanks,
> > >>>>>>> Matthieu
> > >>>>>>>
> > >>>>>>>
> > >>>>>>>
> > >>>>>>>> On Nov 2, 2020, at 7:39 AM, fernando pedichini <fernando.pedichini@inaf.it> wrote:
> > >>>>>>>>
> > >>>>>>>> Hi Matthieu and Jonathan, after some delay, during the last week we did a test of the new fiber spool you sent to Rome. The problem is that we do not have any singlemode fiber to USB3.0 transceiver so we are going to order the already approved model FIRENEX - 5000H USB3.0 optical repeater. Can you both please confirm. Consider we are facing serious problem about hardware procurement so we need a double check for any step we do.
> > >>>>>>>>
> > >>>>>>>> Thank you and cheers
> > >>>>>>>>
> > >>>>>>>> fernando & roberto
> > >>>>>>>>
> > >>>>>>>> On 06/10/2020 21:46, Matthieu Bec wrote:
> > >>>>>>>>> Hi Jonathan, Fernando
> > >>>>>>>>>
> > >>>>>>>>> With the understanding of the current pandemic situation, and you may have many other things to do:
> > >>>>>>>>> for budgetary reason, it would be great to hear a go/no-go from your tests, as we (LBTO) and if it passes, would try to get the telescope bundle and associated equipment on the telescope under this year budget. For that to happen, everything needs to be _delivered_ by end of December to count. With university closure, etc. that puts the deadline more like the second week of December, and I don't know how the order / delivery might take. In summary, the sooner the better.
> > >>>>>>>>>

> > >>>>>>>>> Thank you!
> > >>>>>>>>> Matthieu
> > >>>>>>> <USB31 Spec v1_1.pdf><FDQ-021120 University of Notre Dame USB31-S.pdf>
> > >>>
> > >
> >
>