Async Hydra Node

DUNE Collab. Talk:
https://indico.fnal.gov/event/60987/contributions/282811/

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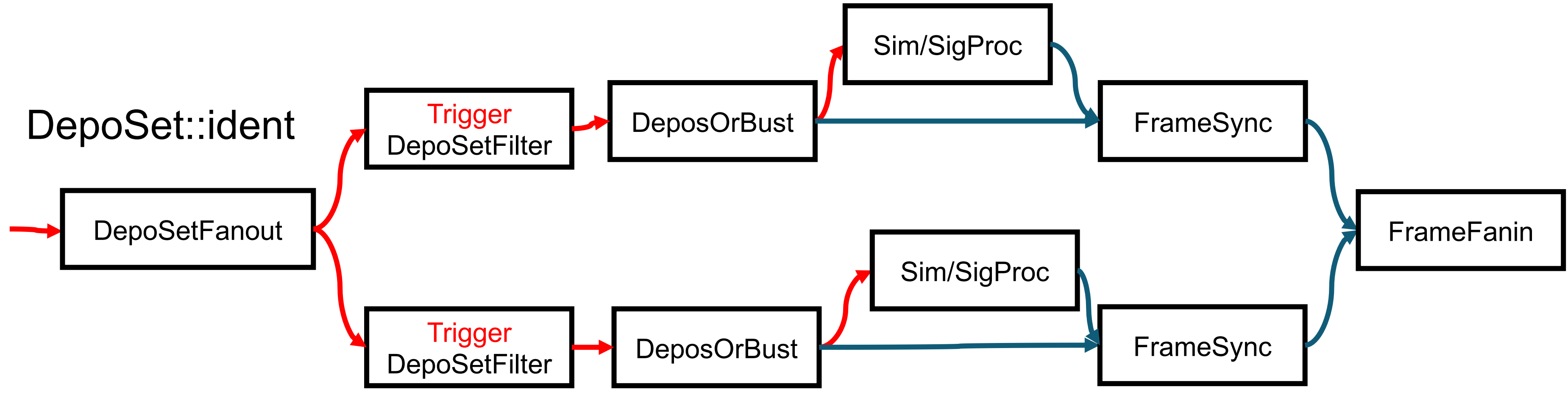
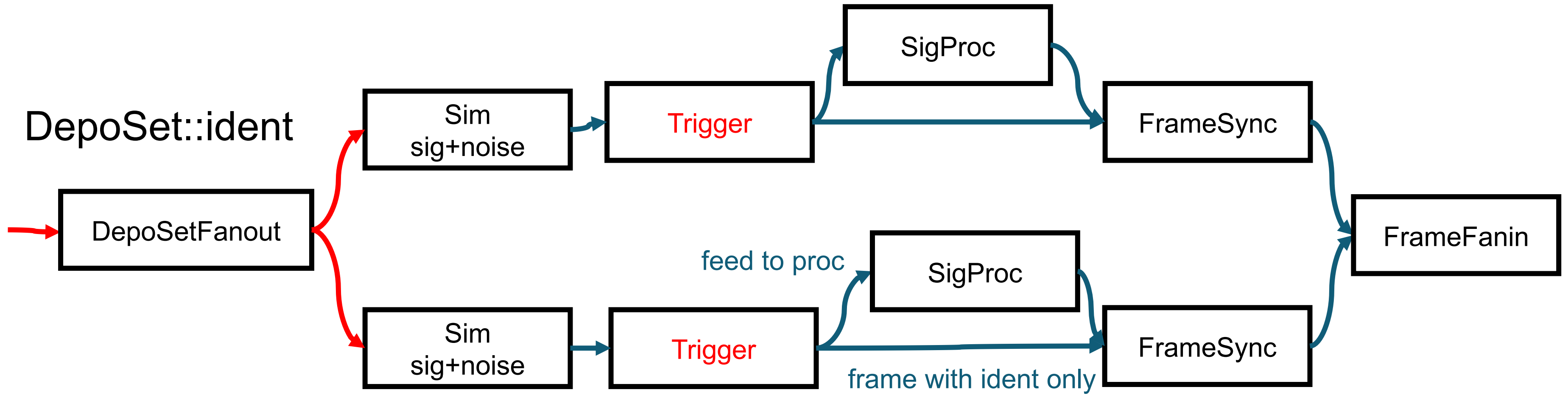
Shortcuts to skip some processing

issue #148

Cheat trigger to skip both Sim/SigProc



- Sim all APAs
- Trigger alg. to determine whether to do SigProc



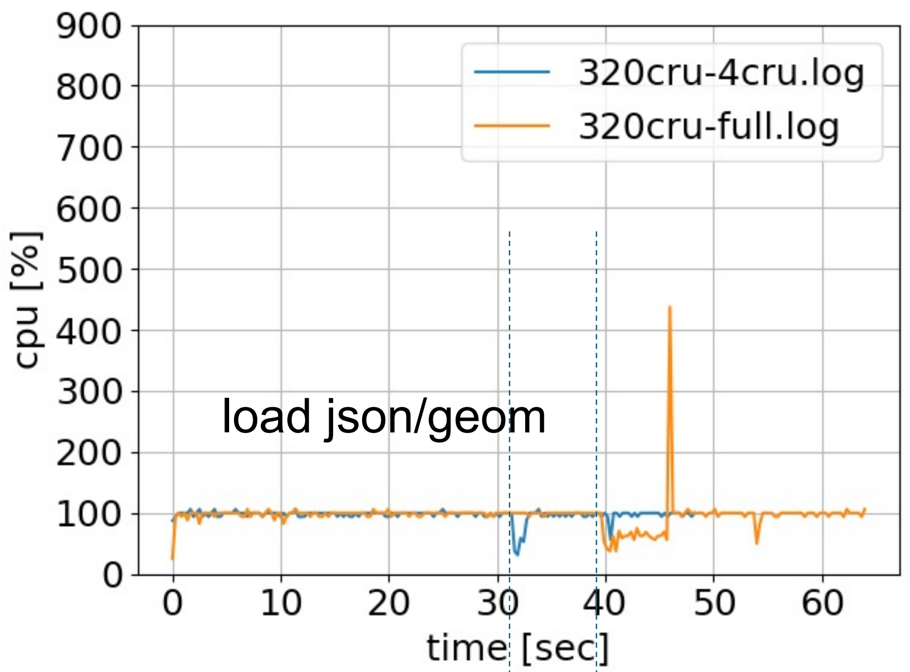
Initial tests of the Shortcuts

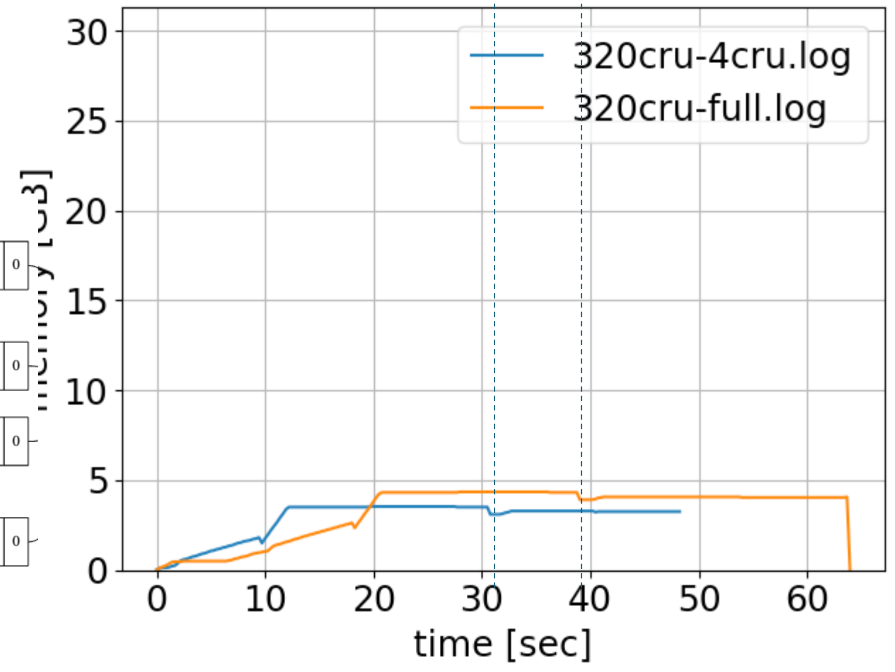
We were able to make async node "Hydra" working in Wire-Cell:

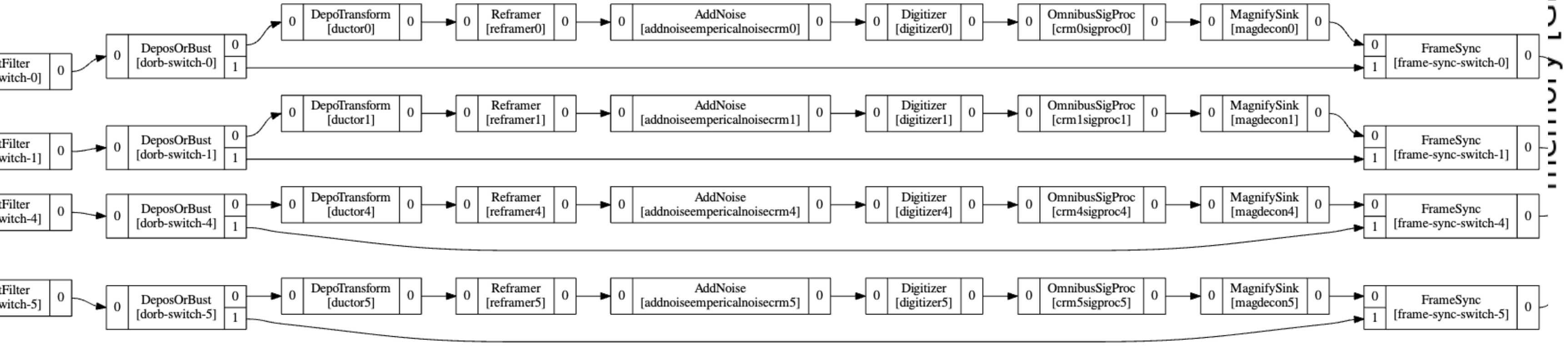
- https://github.com/WireCell/wire-cell-toolkit/pull/169
- https://github.com/WireCell/wire-cell-toolkit/pull/271

Initial tests for full 320CRU geom, ideal depo tracks in 0, 4

- process 4CRU: **~18sec**
- process all with shortcut: **~25sec reduced from ~2400sec**







Filter [switch-0]
DeposOrBust [dorb-switch-0]
DepoTransform [ductor0]
Reframer [reframer0]
AddNoise [addnoiseempericalnoisecrm0]
Digitizer [digitizer0]
OmnibusSigProc [crm0sigproc0]
MagnifySink [magdecon0]
FrameSync [frame-sync-switch-0]
Filter [switch-1]
DeposOrBust [dorb-switch-1]
DepoTransform [ductor1]
Reframer [reframer1]
AddNoise [addnoiseempericalnoisecrm1]
Digitizer [digitizer1]
OmnibusSigProc [crm1sigproc1]
MagnifySink [magdecon1]
FrameSync [frame-sync-switch-1]
Filter [switch-4]
DeposOrBust [dorb-switch-4]
DepoTransform [ductor4]
Reframer [reframer4]
AddNoise [addnoiseempericalnoisecrm4]
Digitizer [digitizer4]
OmnibusSigProc [crm4sigproc4]
MagnifySink [magdecon4]
FrameSync [frame-sync-switch-4]
Filter [switch-5]
DeposOrBust [dorb-switch-5]
DepoTransform [ductor5]
Reframer [reframer5]
AddNoise [addnoiseempericalnoisecrm5]
Digitizer [digitizer5]
OmnibusSigProc [crm5sigproc5]
MagnifySink [magdecon5]
FrameSync [frame-sync-switch-5]

4CPU cfg

Potential Hydra usage

Skip processing (shortcut)
- skip Sim/SigProc with trigger sim or truth cheating
- Other event selections, e.g., bad event tagging before uboone imaging

Alternative processing chains
- Don’t have an existing example right now, could be potentially different versions of SigProc or Imaging?

backups

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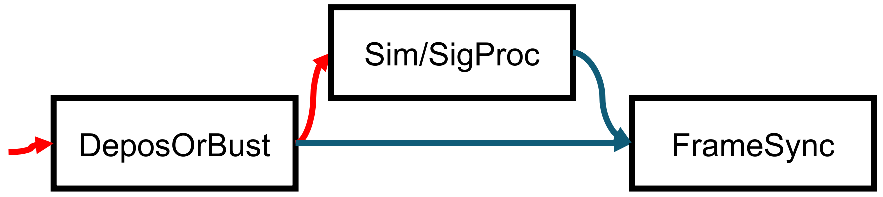
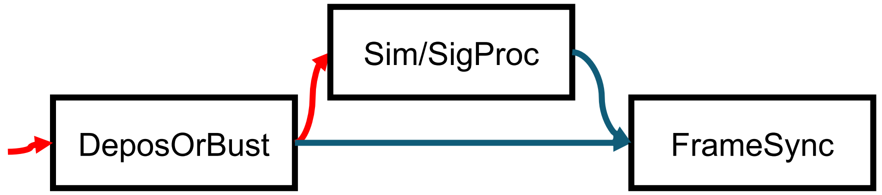
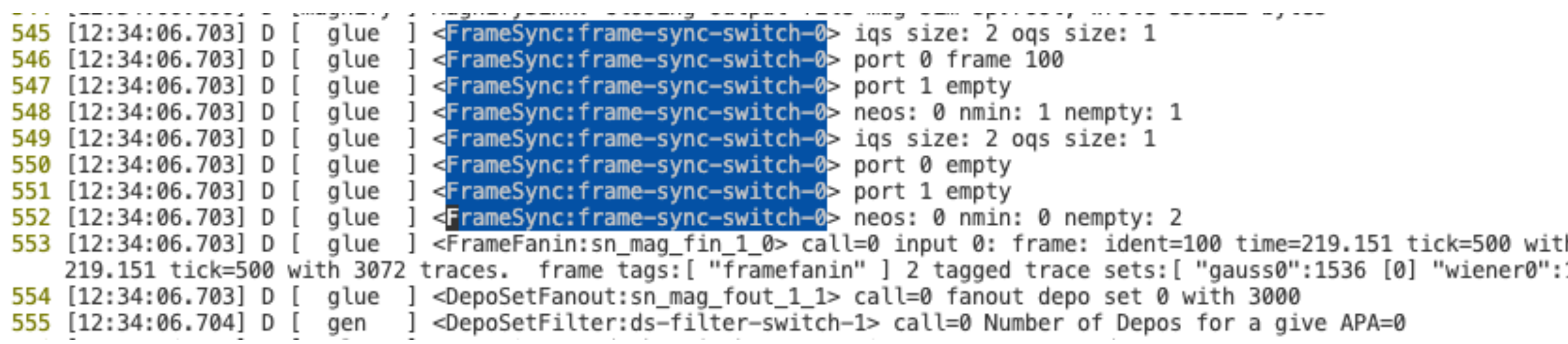
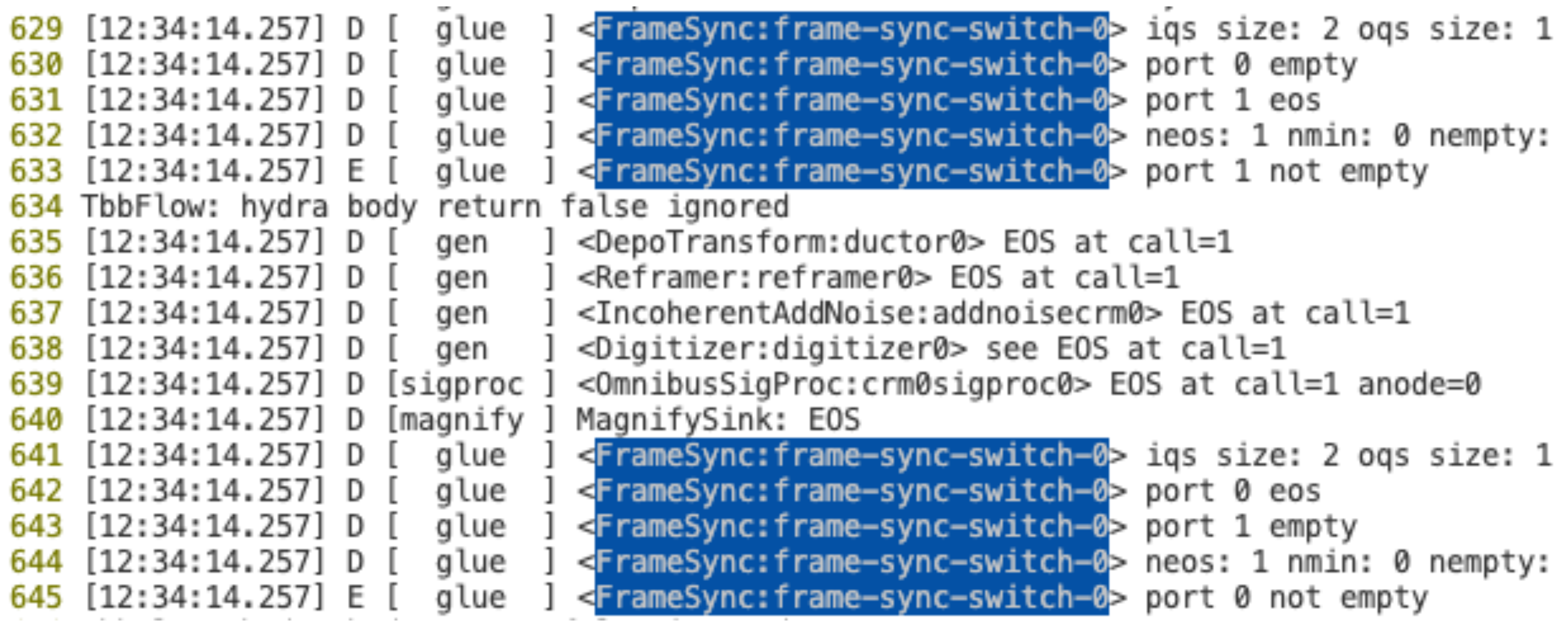


	DeposOrBust (out)	Slow (out)	Fast	Sync (in|out)
good	depo, empty	frame (good)	empty	frame,empty | frame
bad	empty, frame	empty	frame (bad)	empty, frame | frame
eos	eos, eos	eos	eos	eos, eos | eos





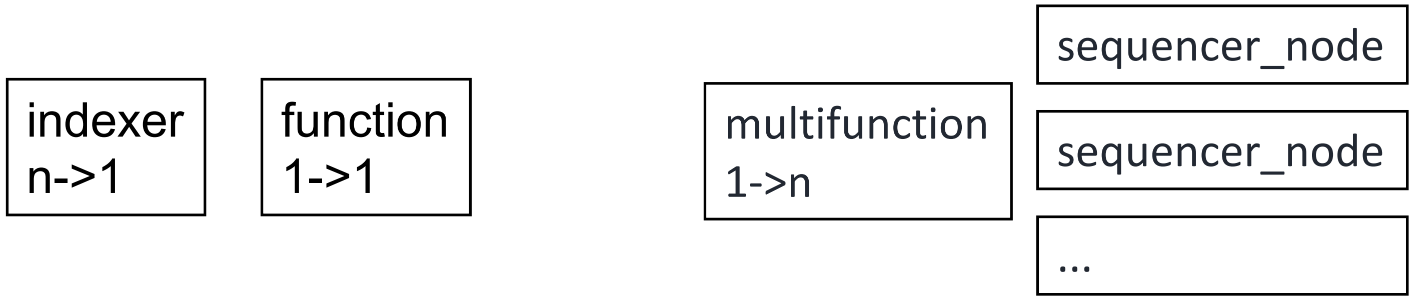
```
[12:34:06.703] D [  glue  ] <FrameSync:frame-sync-switch-0> iqs size: 2 oqs size: 1
[12:34:06.703] D [  glue  ] <FrameSync:frame-sync-switch-0> port 0 frame 100
[12:34:06.703] D [  glue  ] <FrameSync:frame-sync-switch-0> port 1 empty
[12:34:06.703] D [  glue  ] <FrameSync:frame-sync-switch-0> neos: 0 nmin: 1 nempty: 1
[12:34:06.703] D [  glue  ] <FrameSync:frame-sync-switch-0> iqs size: 2 oqs size: 1
[12:34:06.703] D [  glue  ] <FrameSync:frame-sync-switch-0> port 0 empty
[12:34:06.703] D [  glue  ] <FrameSync:frame-sync-switch-0> port 1 empty
[12:34:06.703] D [  glue  ] <FrameSync:frame-sync-switch-0> neos: 0 nmin: 0 nempty: 2
[12:34:06.703] D [  glue  ] <FrameFanin:sn_mag_fin_1_0> call=0 input 0: frame: ident=100 time=219.151 tick=500 wit
219.151 tick=500 with 3072 traces.  frame tags:[ "framefanin" ] 2 tagged trace sets:[ "gauss0":1536 [0] "wiener0":
[12:34:06.703] D [  glue  ] <DepoSetFanout:sn_mag_fout_1_1> call=0 fanout depo set 0 with 3000
[12:34:06.704] D [  gen   ] <DepoSetFilter:ds-filter-switch-1> call=0 Number of Depos for a give APA=0
```



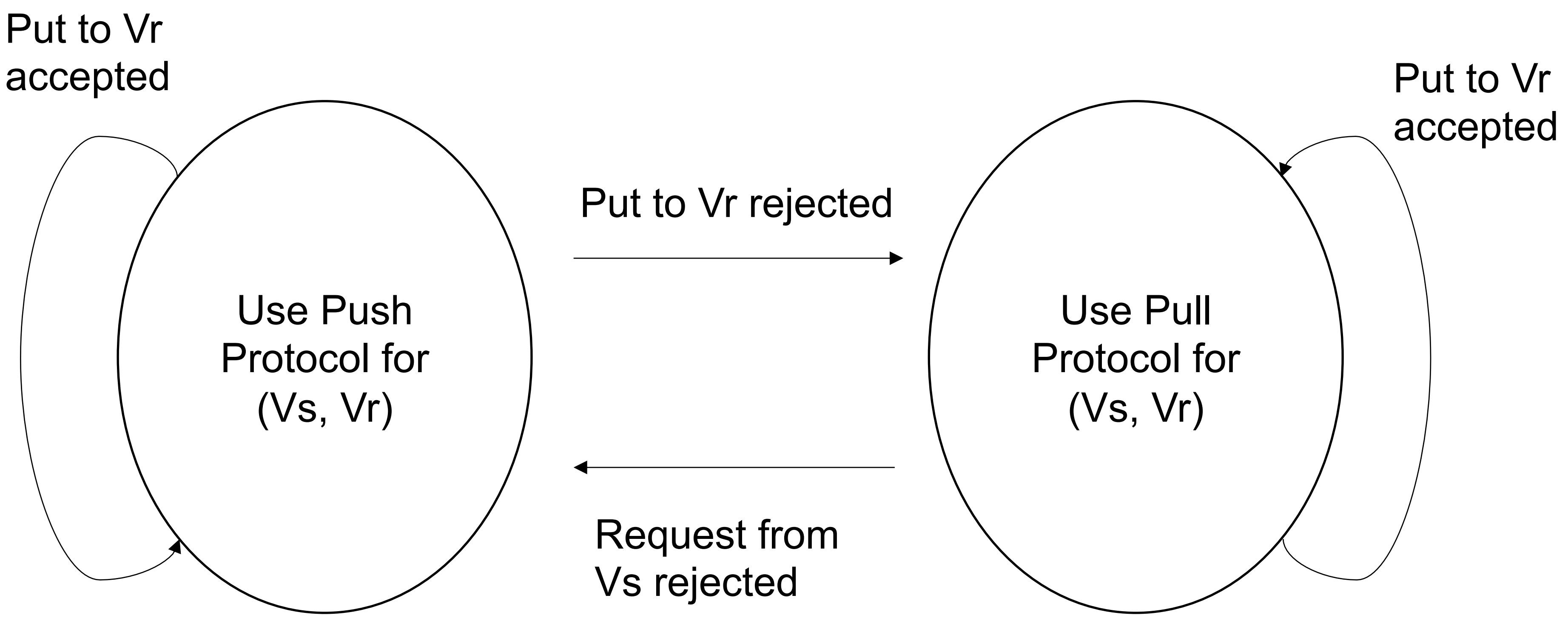
```
[12:34:14.257] D [  glue   ] <FrameSync:frame-sync-switch-0> iqs size: 2 oqs size: 1
[12:34:14.257] D [  glue   ] <FrameSync:frame-sync-switch-0> port 0 empty
[12:34:14.257] D [  glue   ] <FrameSync:frame-sync-switch-0> port 1 eos
[12:34:14.257] D [  glue   ] <FrameSync:frame-sync-switch-0> neos: 1 nmin: 0 nempty:
[12:34:14.257] E [  glue   ] <FrameSync:frame-sync-switch-0> port 1 not empty
TbbFlow: hydra body return false ignored
[12:34:14.257] D [  gen    ] <DepoTransform:ductor0> EOS at call=1
[12:34:14.257] D [  gen    ] <Reframer:reframer0> EOS at call=1
[12:34:14.257] D [  gen    ] <IncoherentAddNoise:addnoisecrm0> EOS at call=1
[12:34:14.257] D [  gen    ] <Digitizer:digitizer0> see EOS at call=1
[12:34:14.257] D [sigproc  ] <OmnibusSigProc:crm0sigproc0> EOS at call=1 anode=0
[12:34:14.257] D [magnify  ] MagnifySink: EOS
[12:34:14.257] D [  glue   ] <FrameSync:frame-sync-switch-0> iqs size: 2 oqs size: 1
[12:34:14.257] D [  glue   ] <FrameSync:frame-sync-switch-0> port 0 eos
[12:34:14.257] D [  glue   ] <FrameSync:frame-sync-switch-0> port 1 empty
[12:34:14.257] D [  glue   ] <FrameSync:frame-sync-switch-0> neos: 1 nmin: 0 nempty:
[12:34:14.257] E [  glue   ] <FrameSync:frame-sync-switch-0> port 0 not empty
```

```
{
    auto* dxn = new indexer_node<Nin>(graph);
    nodes.push_back(dxn);
    receivers = indexer_ports(*dxn, std::make_index_sequence<Nin>{});
    auto* fn = new tbb::flow::function_node<indexer_msg_t<Nin>, tagged_msg_t>(graph, 1, HydraInputBody<Nin>{
    nodes.push_back(fn);
    make_edge(*dxn, *fn);
}

{
    auto mfn = new mfunc_node_type<Nout>(graph, 1, HydraOutputBody<Nout>(wcnode, info));
    nodes.push_back(mfn);
    auto spv = outdexer_ports(*mfn, std::make_index_sequence<Nout>{});
    for (size_t ind=0; ind<Nout; ++ind) {
        auto qn = new seq_node(graph, [](const msg_t& m) {return m.first;});
        nodes.push_back(qn);
        tbb::flow::make_edge(*spv[ind], *qn);
        senders.push_back(dynamic_cast<sender_type*>(qn));
    }
}
```



edge mode switching


Put to Vr accepted
Use Push Protocol for (Vs, Vr)
Put to Vr rejected
Request from Vs rejected
Use Pull Protocol for (Vs, Vr)
Put to Vr accepted