

# 32 Gbit/s VLBI from a correlator perspective

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# VDIF: Threads & Channels

VDIF basics:

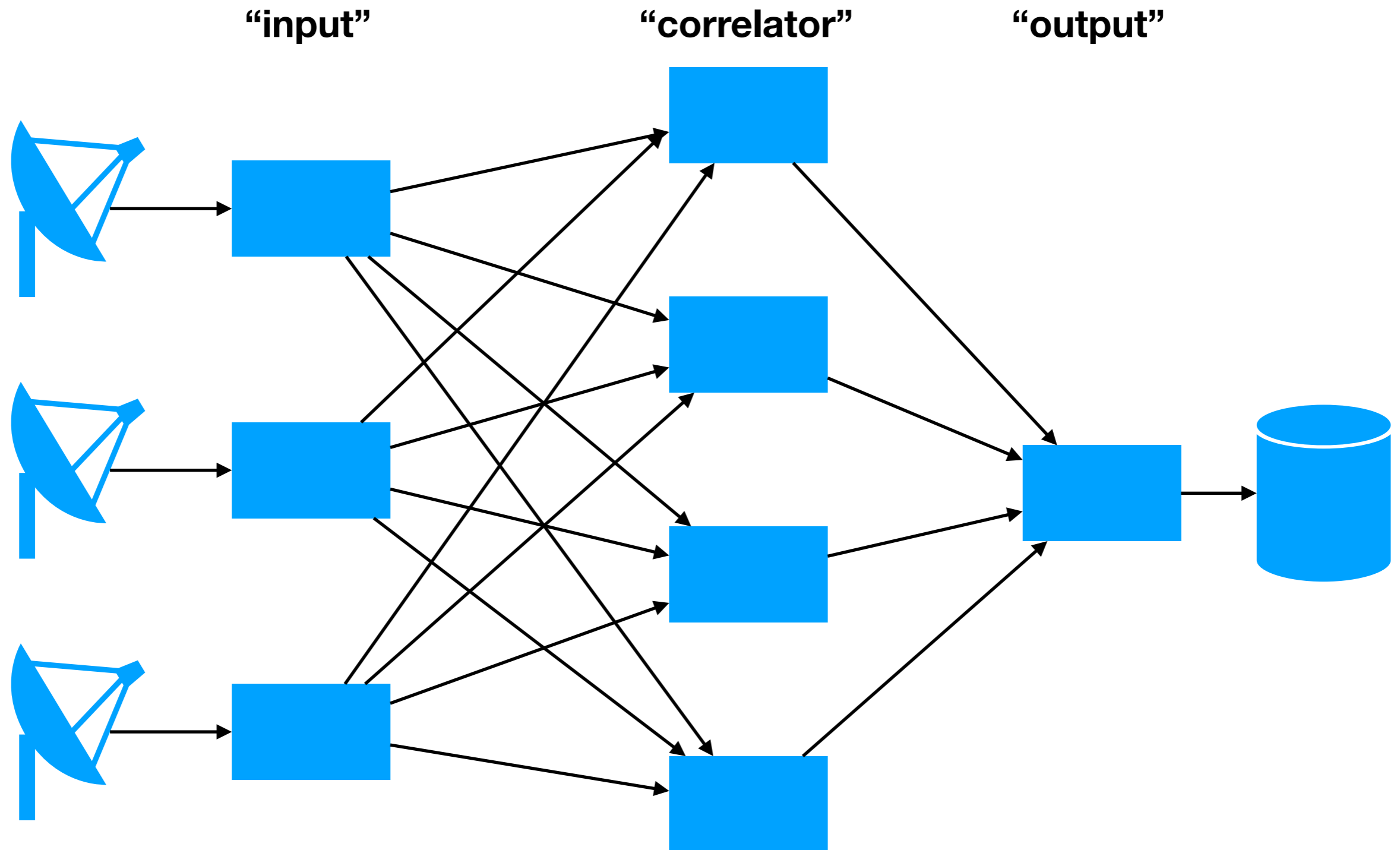
- VDIF data streams contain threads
- VDIF threads contain channels

Keep it “simple”:

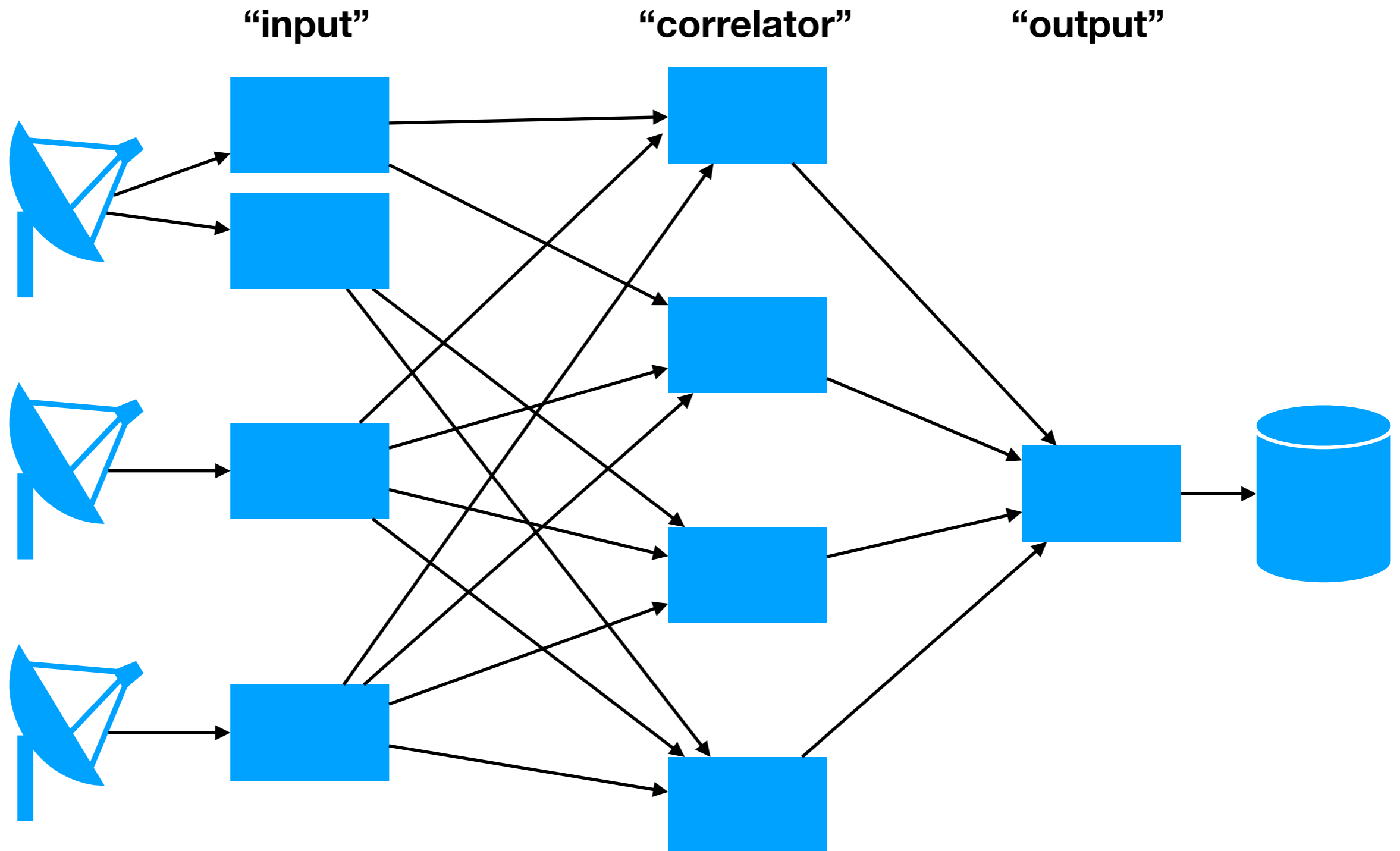
- Single-threaded multi-channel VDIF
- Multi-threaded single-channel VDIF

Merging single-threaded multi-channel VDIF leads to “complex” VDIF!

# SFXC Parallelization



# SFXC Multiple Inputs



# Multiple Data Streams in VEX

VEX2:

```
$DATASTREAMS;  
*  
def DVP;  
  datastream = &DS1 : VDIF_legacy;  
  thread = &DS1 : &THR1 : 0 : 32 : 8 Ms/sec : 2 : real : 8000;  
  channel = &DS1 : &THR1 : &CH00 : 0;  
  ...  
  channel = &DS1 : &THR1 : &CH15 : 15;  
  datastream = &DS2 : VDIF_legacy;  
  thread = &DS2 : &THR2 : 0 : 32 : 8 Ms/sec : 2 : real : 8000;  
  channel = &DS2 : &THR2 : &CH16 : 16;  
  ...  
  channel = &DS2 : &THR2 : &CH31 : 31;  
enddef;
```

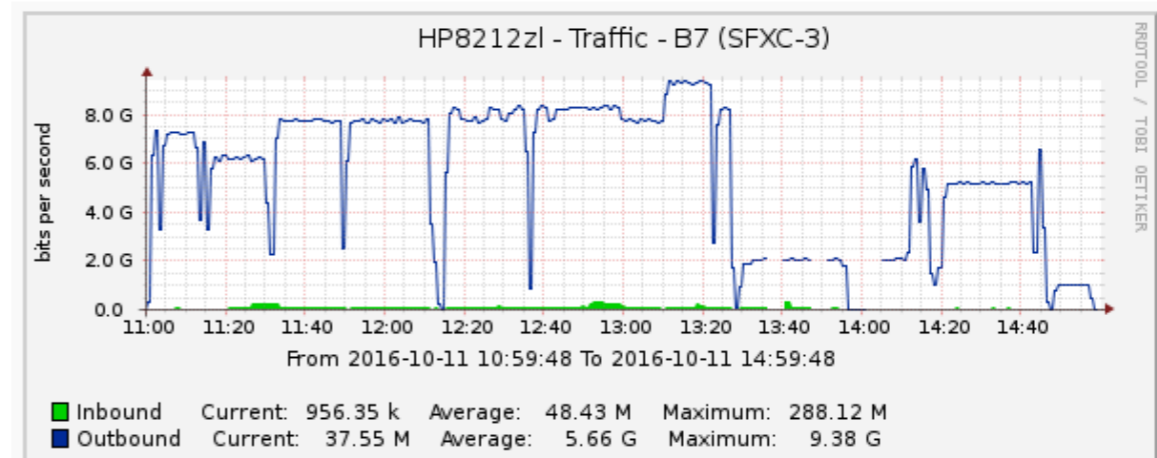
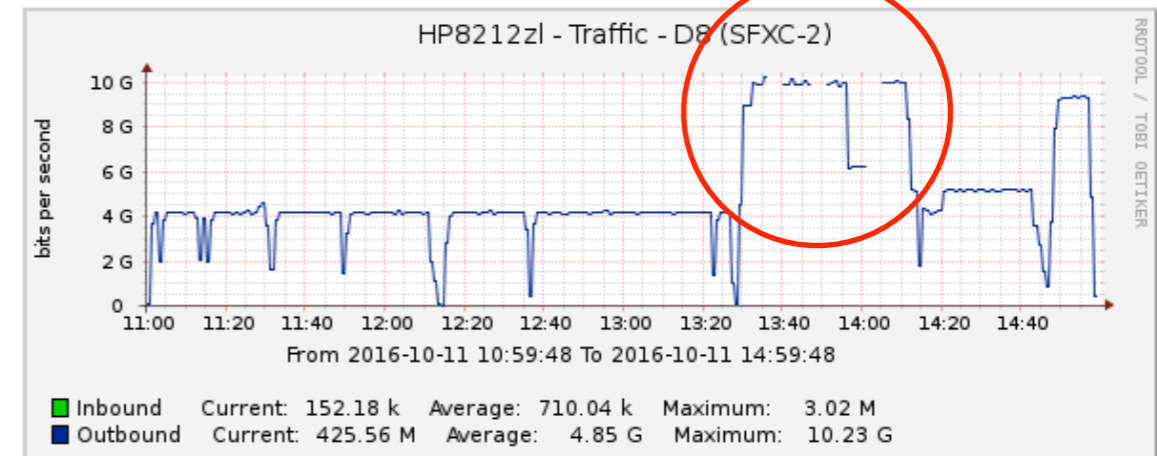
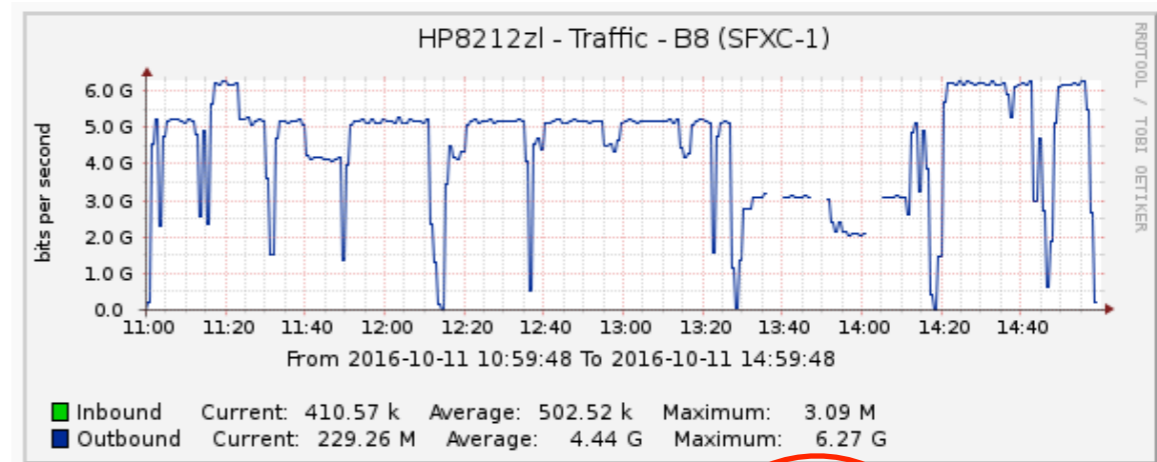
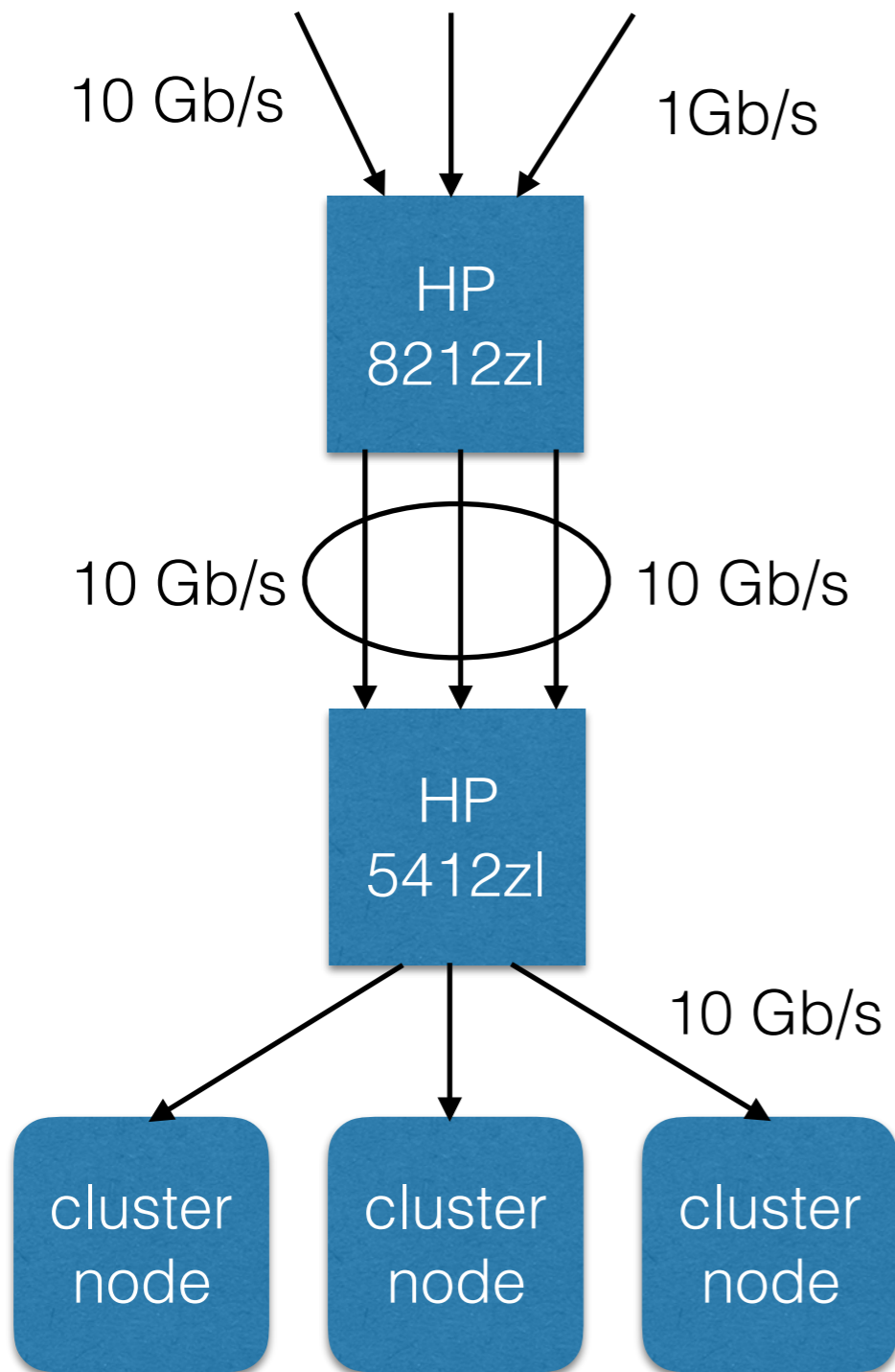
Control file:

```
"data_sources": {  
  "6a": {  
    "DS1": [  
      "file:///scratch/eur129/EUR129_60_0109.vdif"  
    ],  
    "DS2": [  
      "file:///scratch/eur129/EUR129_60_0109.vdif"  
    ]  
  },  
  "Wz": [  
    "file:///scratch/eur129/eur129_wz_191-0534"  
  ],  
}
```

# Bottlenecks

- Input node: ~2 Gbit/s
- Correlator node: ~4 GB memory
  - Needs to buffer 1 integration
  - Restricts maximum bandwidth
- Network: 10 Gbit/s -> 40 Gbit/s -> 100 Gbit/s
  - Smaller streams are better!

# Internal Network Bottleneck



# Conclusions

- Record/transfer VDIF threads as separate data streams
- Keep total bandwidth per thread at ~2Gbit/s
- Standard way to organize/split VDIF threads is desirable