



Data Simulation for the DMT

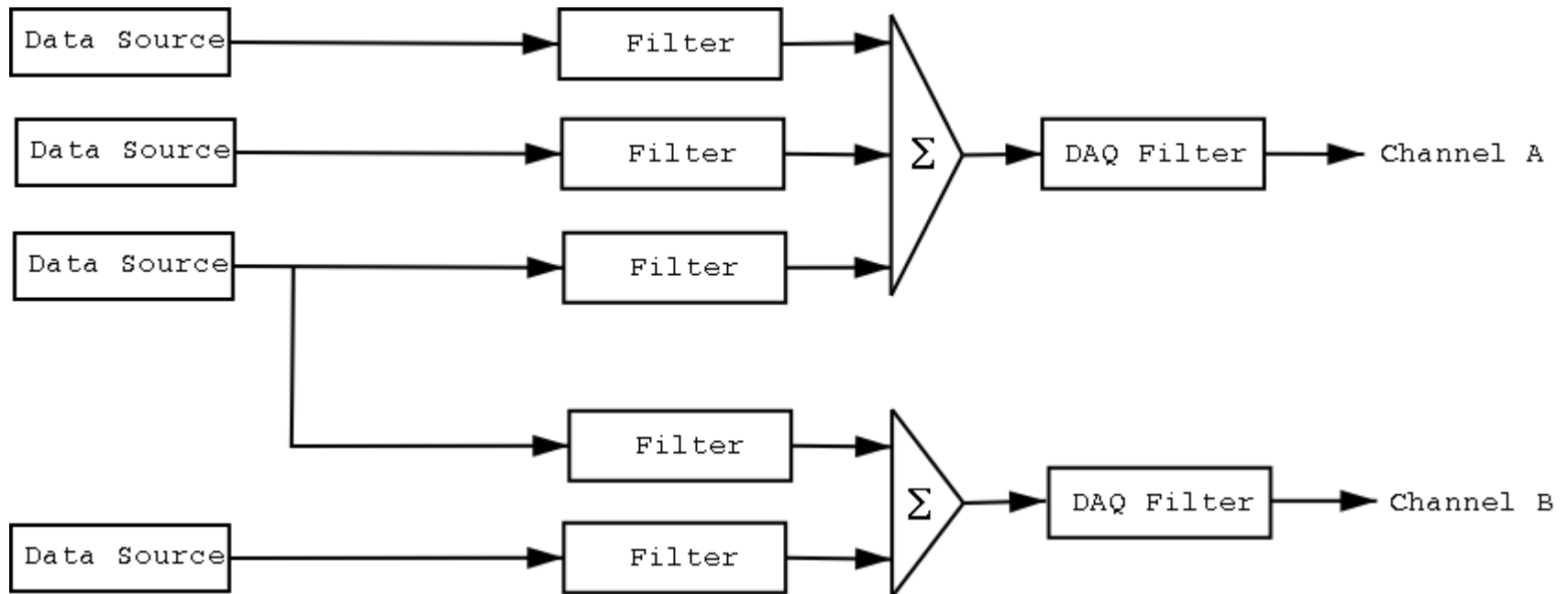
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Purpose

Generate data in the form of frame files to:

- Debug DMT monitor code
- Measure monitor performance/efficiency
- Compare performance of different algorithms
- Tune parameters
- Generate injection functions?
- Astrophysical simulation?

Generator Structure



Data Sources

- Continuous distributions
 - » Gaussian noise
 - » Sinusoid
 - » Recorded data (from frame)
- Discrete events
 - » May have the following functional forms
 - Sine-gaussian: $x(t) = A \cdot \sin(\omega t + \varphi) e^{-t^2 \omega^2 / Q^2}$
 - Damped sinusoid: $x(t) = A \cdot \sin(\omega t + \varphi) e^{-t \omega / Q}$
 - Gaussian burst: $x(t) = A \cdot \chi_t e^{-t^2 / \tau^2}$
 - » Generated in time according to
 - Fixed probability per time interval
 - Constant time steps
 - Once only

Data Source Parameters

- Data source distribution parameters may be
 - » Constant (string or number)
 - » Fixed steps
 - » Random distributions
 - $\text{exp}(b, \text{min}, \text{max})$: $P(x) \sim e^{-x/b}$ ($\text{min} < x < \text{max}$)
 - $\text{flat}(\text{min}, \text{max})$: $P(x) \sim 1$ ($\text{min} < x < \text{max}$)
 - $\text{gauss}(\sigma, x_0)$: $P(x) \sim e^{-(x-x_0)^2/2\sigma^2}$
 - $\text{power}(n, \text{min}, \text{max})$: $P(x) \sim x^n$ ($\text{min} < x < \text{max}$)

Generator Class

- Holds source, channel databases
- Generates data by calling data source classes and summing appropriate data into channels
- Typical usage
 - » Construct Generator
 - » Define sources
 - » Define channels from component sources, filters and DAQ filter
 - » Generate data in a specific a time interval
 - » Get data source or channel contents

DMTGen

- Stand-alone program
 - » Reads ASCII configuration
 - » Constructs generator class
 - » Generates data
 - » Writes frames
 - FrAdcData for each defined channel
 - FrSimData as requested for data sources

Running DMTGen

Configuration file (genSG+FD.cfg)

```
#  
# DMTGen configuration for a Sine-gaussian plus recorded AS_Q  
#  
Parameter StartGPS 729760000  
Parameter EndGPS 729760480  
Filter hp100 Design 16384 ellip('HighPass',4, 1, 60,100)  
Source SG \  
    SinGauss(A=power(2,2),F=100,Q=10,Phi=flat(0,360)) \  
    -rate 1.0 -simdata  
Source FD \  
    FrameData(Files=/usr1/store/S2/LLO/L-R-72976*.gwf,Channel=L1:LSC-AS_Q)  
Channel L1:LSC-AS_Q SG FD|hp100
```

Running DMTGen

```
DMTGen -conf genSG+FD.cfg
```


Status of DMTGen

- Basic program written, available with release 2.6.2 of DMT (now tagged in cvs).
- Still needs:
 - » Complete documentation
 - » Standard filters for: calibration, ifo response and DAQ response
 - » Histogramming random parameters.
 - » Detector specification
 - » More data source definitions: e.g. astrophysical sources?, tabulated waveform in xml, etc.