

A Fast Acquisition Archiver

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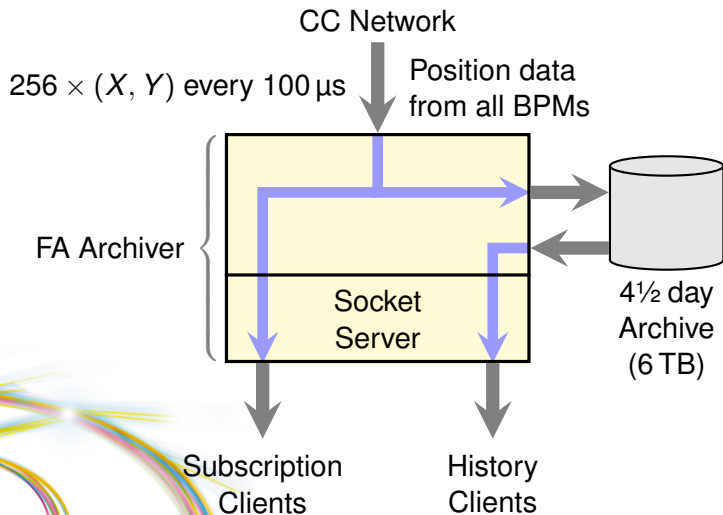


The Fast Acquisition Archiver

The FA archiver captures X , Y position data from a network of electron beam position monitors (EBPMs) and other sources at 10 kHz, maintains a rolling historical record and rebroadcasts the complete data stream to all interested parties.

- 256 X , Y position updates every 100 μ s, sustained 20 MB/s.
- At Diamond we archive the last 4½ days of orbit position.
- Any number of clients (limited by network connection to archive server) can read the archive and subscribe to the rebroadcast live data stream.

The Fast Acquisition Archiver

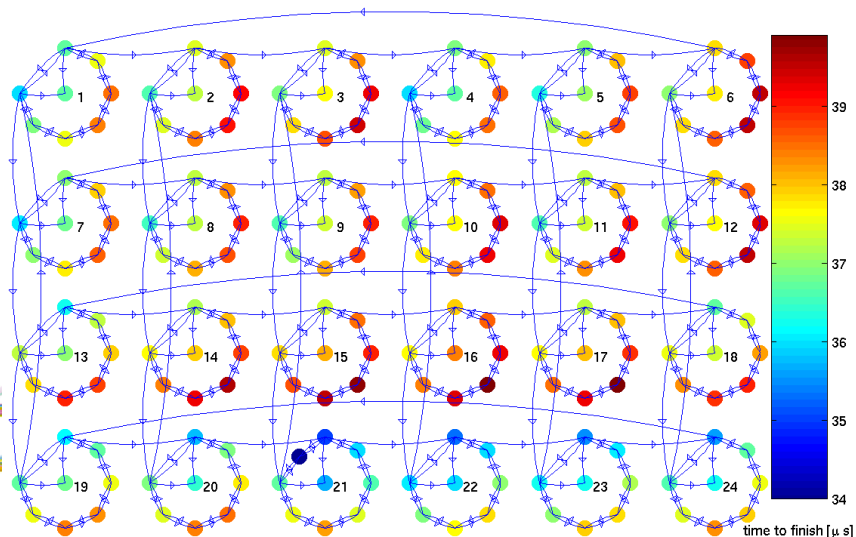


Getting Fast BPM Data

The archiver connects to the Diamond Communication Controller (CC) fast orbit feedback network.

- All storage ring EBPMs are connected to CC network.
- Network is based on synchronous broadcast via store and forward: every 100 μ s, every node has complete position information.
- Easy to add new nodes, both as listeners and contributors.
- FA archiver “piggy backs” on existing feedback infrastructure.

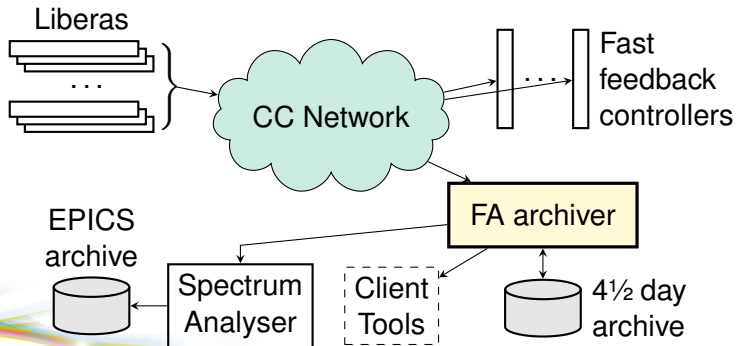
Communication Controller Network Topology



Hardware Requirements for FA Archiver

- Need FPGA with Rocket I/O and Diamond Communication Controller FPGA image to connect to CC network.
Diamond CC FPGA image is freely available from Diamond subject to a standard “Memorandum of Understanding”.
- FA Archiver uses Xilinx PCI express FPGA development board to connect to CC network.
Unfortunately this board is large and abnormally tall, so won't fit in all PCs.
- Archiver works on relatively low spec hardware; we use a dual core Dell R200 1U server.

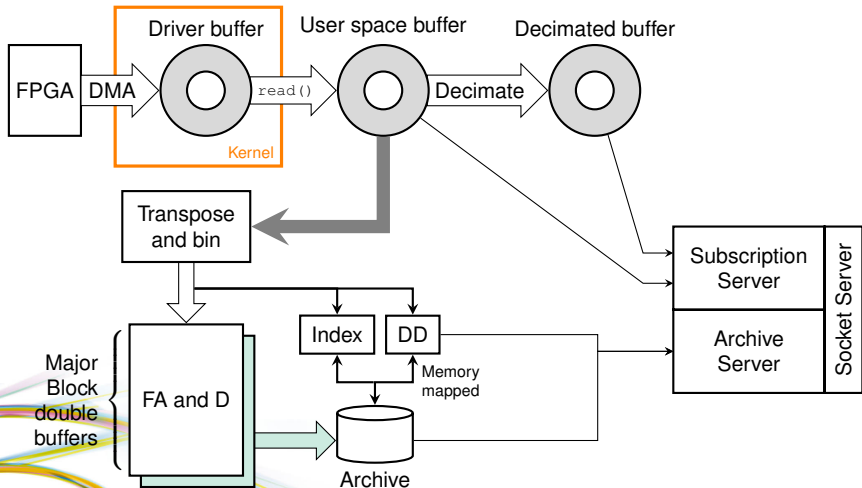
FA Archiver in Context



FA Archiver Architecture

- Very regular data feed: fixed size updates at fixed intervals. Makes archiver design much simpler than an EPICS archiver.
- The historical archive is fixed length, determined by disk size. Old data is discarded as new data arrives.
- Data is reordered for fast read access before storage to disk.
- Overview data (decimated by binning) also stored.
- Archive indexed by timestamp of arrival of CC data.

FA Archiver Architecture



Archiver Services

The FA archiver provides the following data over TCP/IP to any connecting machine:

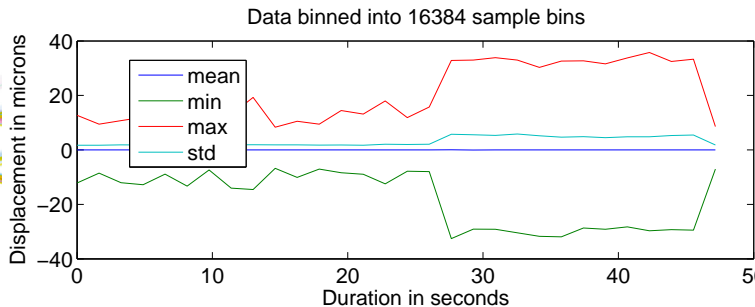
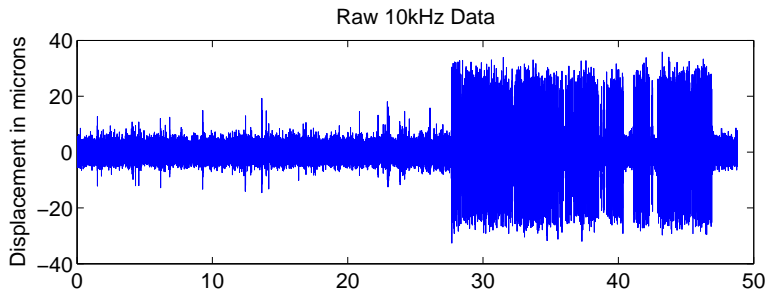
- Subscription to any subset of the complete CC data stream.
- Subscription to any subset of the complete CC data stream decimated by a factor of 10.
- Access to any part of the historical archive, both full and decimated, indexed by timestamp.

Decimated Archive Data

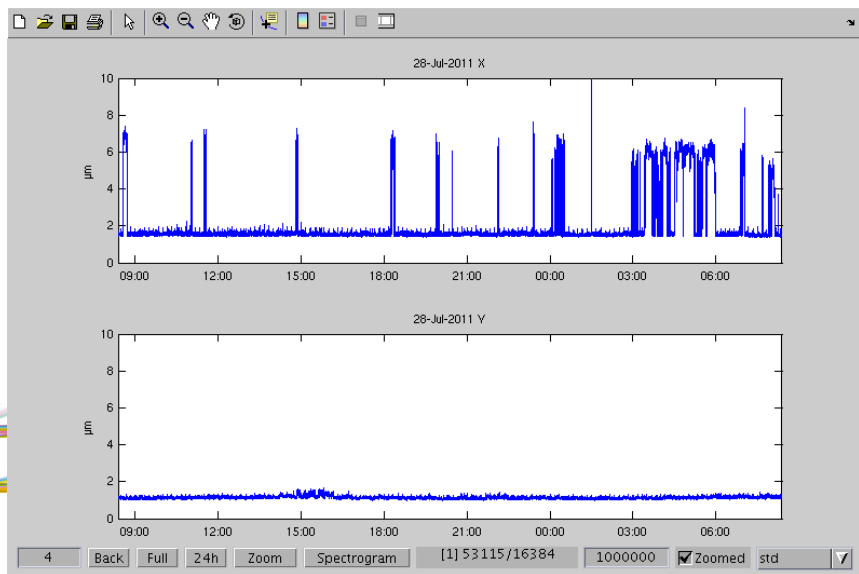
To help with reviewing beam movement over hours or days, the archived data is also stored in decimated format.

- Two degrees of decimation: $\div 128$ (approx 80 Hz) and $\div 16384$ (approx 1½ seconds per sample).
- Archived decimation is by binning; for each bin the archiver stores: mean, minimum, maximum and standard deviation.
- Entire archive for one data source can be previewed with a 250,000 point waveform, rather than 4,000,000,000 points!

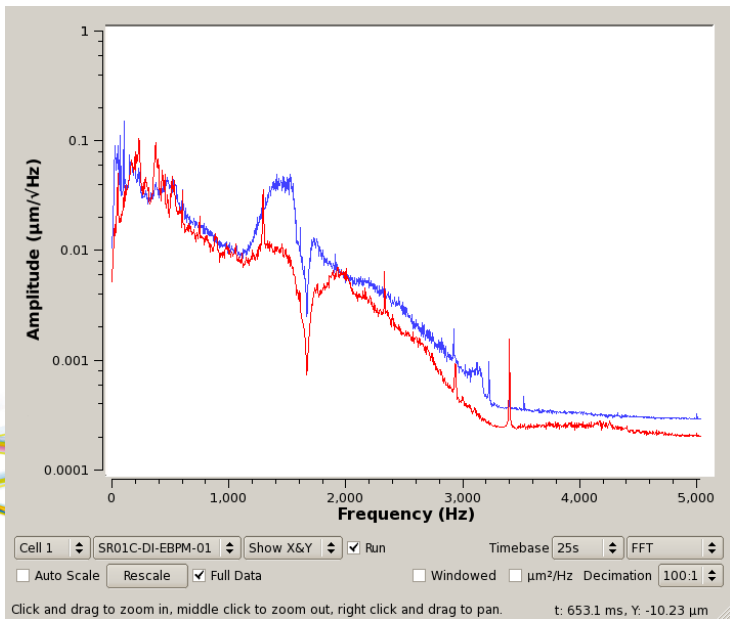
Binned Archive Data



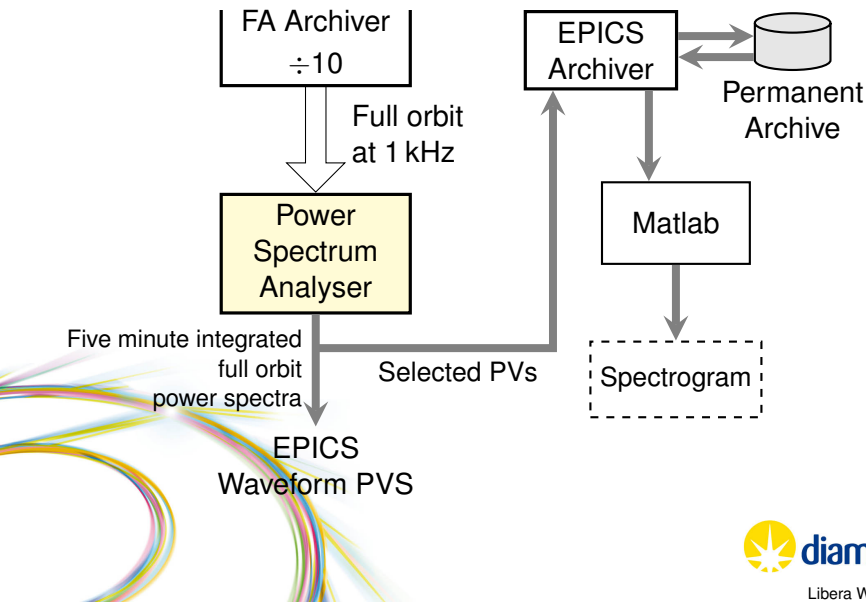
FA Zoomer Matlab Interface



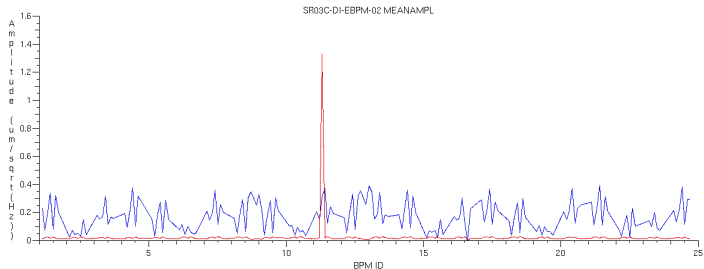
FA Viewer



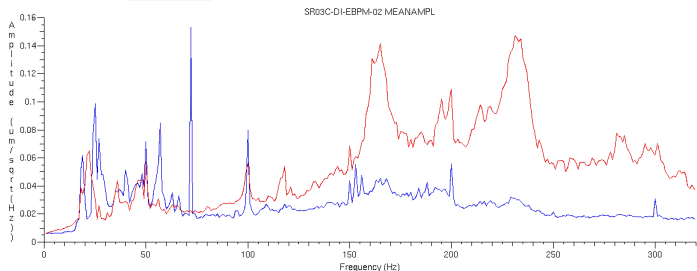
Spectrum Analysis Tool



Spectrum Analysis Tool: EDM Screen



72 Mean Orbit



SR03C-DI-EBPM-02

Mean Ampl

Threshold: 1.00

Running

Sample Count: 64

Sample Target: 75

EXIT

iamond

Spectrogram at one EBPM for a Week

