

# A Fast Acquisition Archiver

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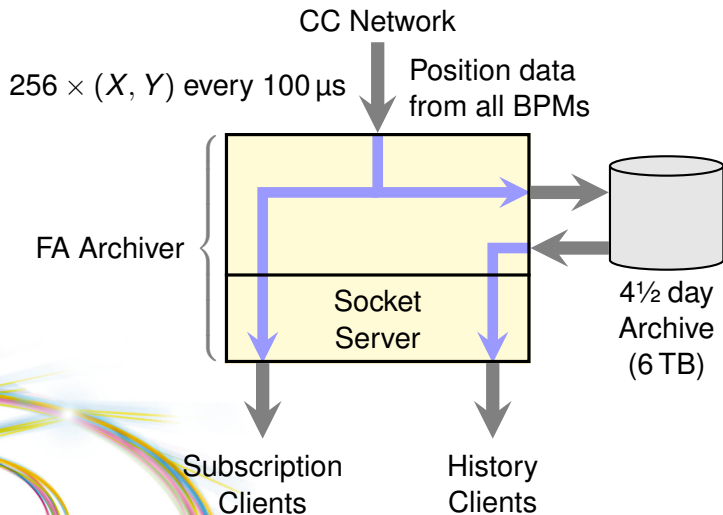


# The Fast Acquisition Archiver

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  $\mu$ 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

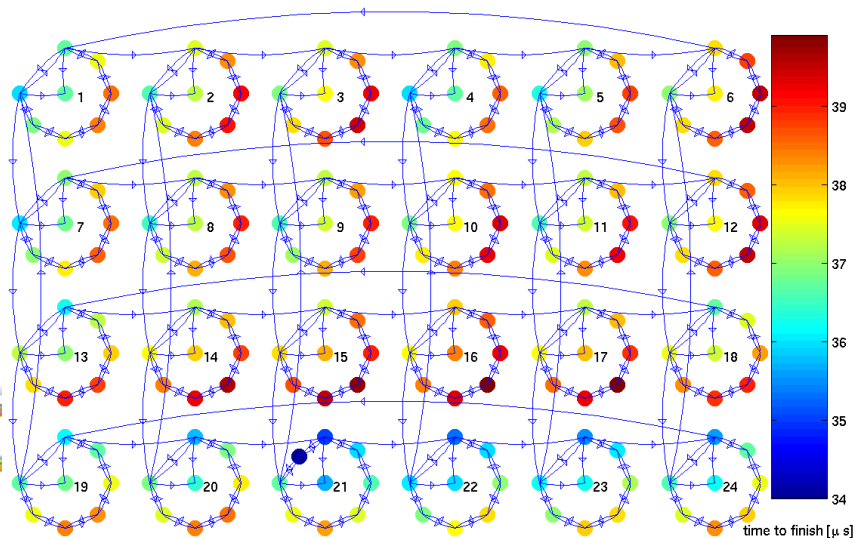


# Getting Fast BPM Data

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  $\mu$ 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.

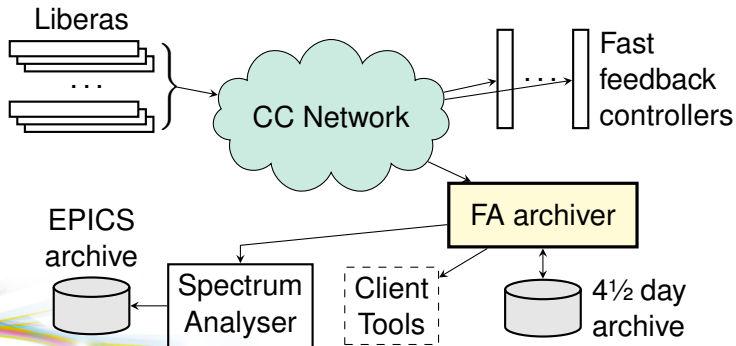
# Communication Controller Network Topology



# 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

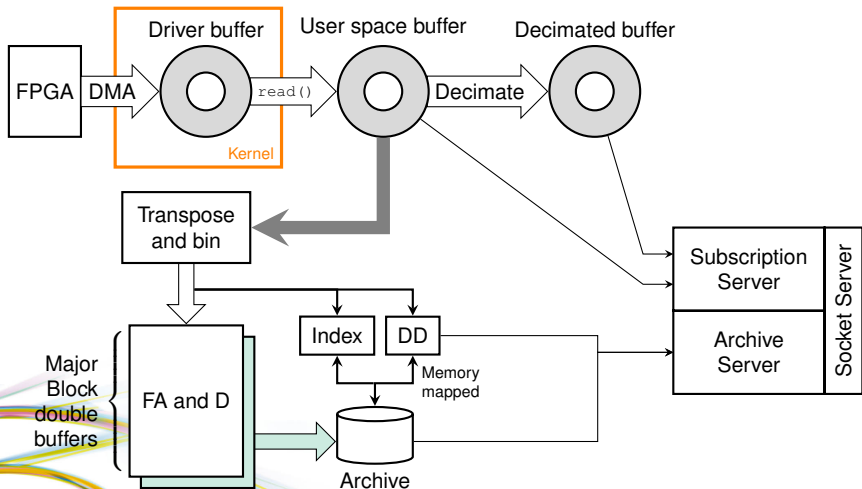


# FA Archiver Architecture

- 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:

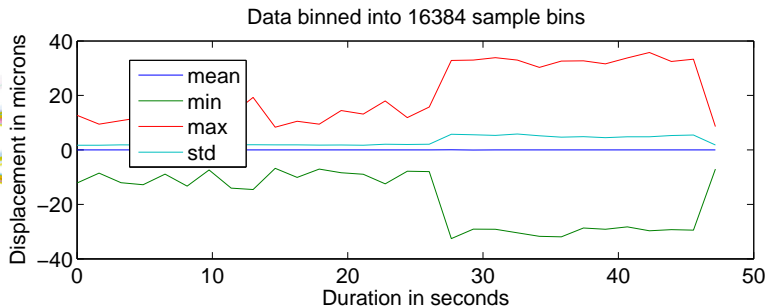
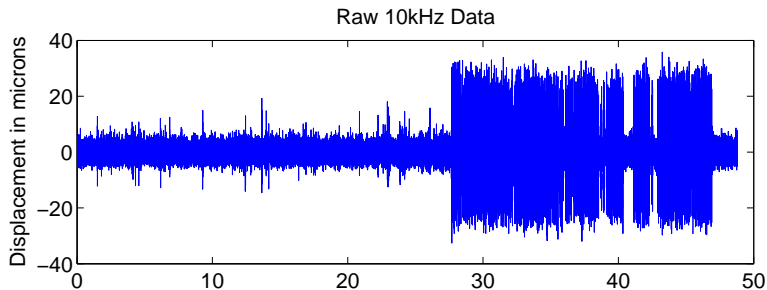
- Subscription to any subset of the complete CC data stream.
- Subscription to any subset of the complete CC data stream decimated by a factor of 10.
- Access to any part of the historical archive, both full and decimated, indexed by timestamp.

# Decimated Archive Data

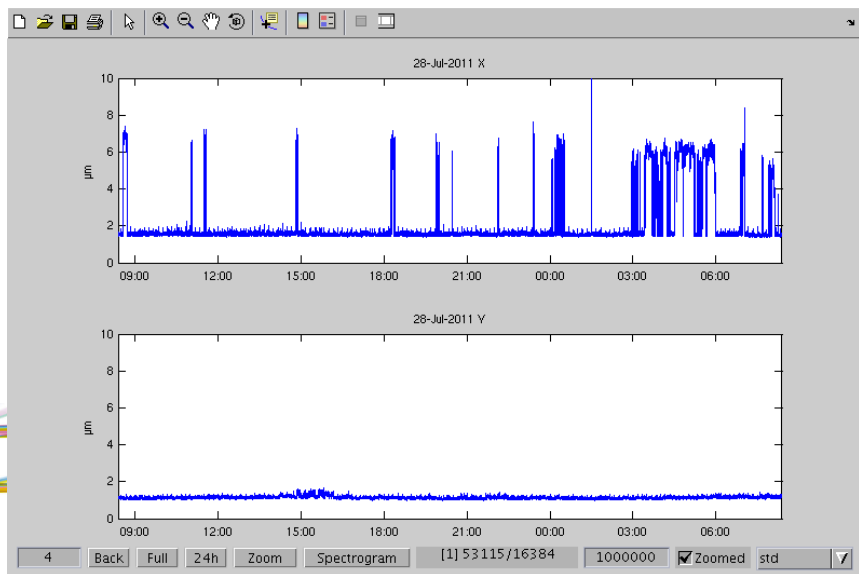
To help with reviewing beam movement over hours or days, the archived data is also stored in decimated format.

- 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!

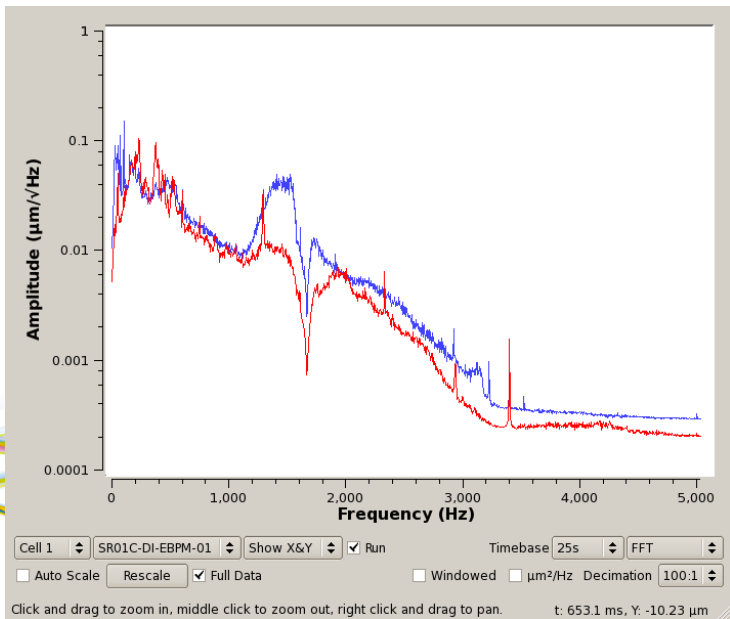
# Binned Archive Data



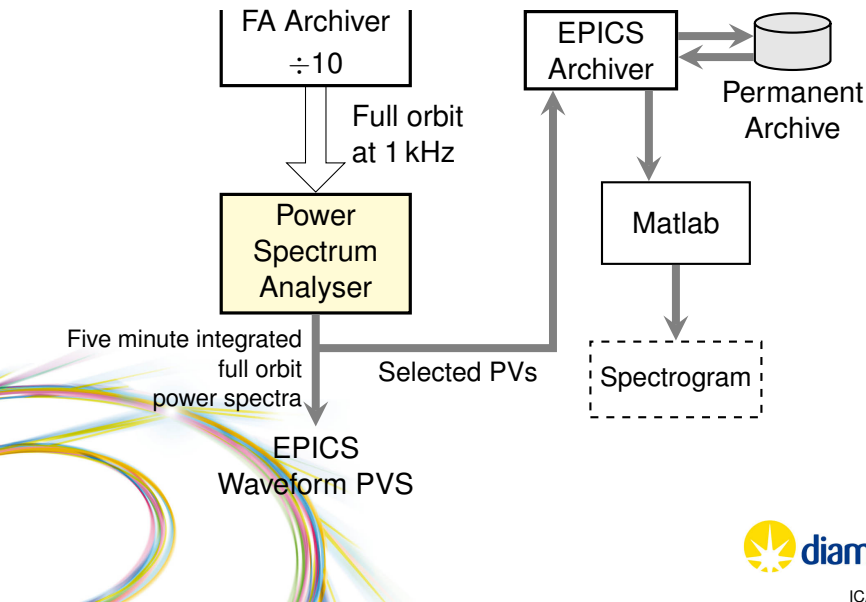
# FA Zoomer Matlab Interface



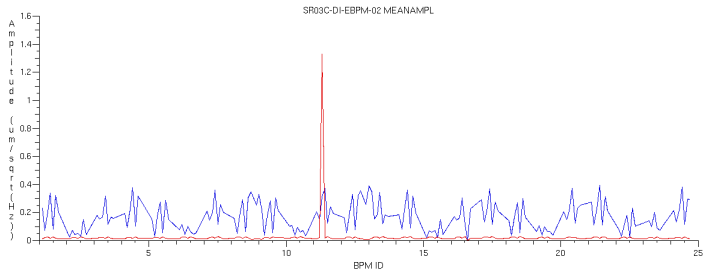
# FA Viewer



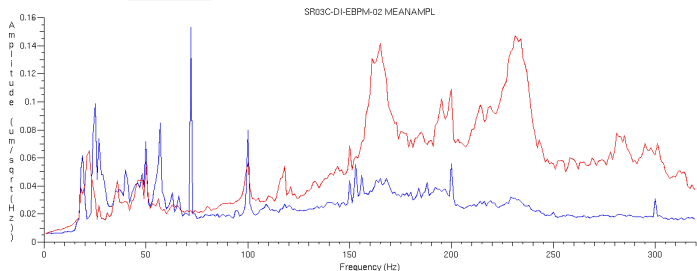
# Spectrum Analysis Tool



# 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

