XCube Data System

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XCube data system

- Real-time high-data-rate disk-array data system based on fully COTS hardware
- 8 Gbps sustained recording rate from RDBE demonstrated
- Developed by small company in Nashua, NH for automobile industry
- First COTS-hardware system that (to my knowledge) properly handles slow and/or failed disks
- Runs on Linux platform with some modified kernel code and drivers for efficient memory management
- Hardware/software combination is highly tuned for performance

Characteristics

- Two 10GigE data interfaces
- 8Gbps sustained to 16 SATA disks
- Supports inexpensive commodity SATA disks, but disks must be qualified
- eSATA cable connections from controller to disk module(s) [four disks per cable]; cable ordering does not matter
- Records to standard Linux files
- Can use XCube disk modules (similar to Mark 5 modules) or existing Mark 5 modules modified with new module backplane and front panel (with e-SATA and power connectors)
- Playback as standard Linux files
- Appears to be potentially good fit to two current VLBI projects:
    – VLBI2010 – currently planning 16Gbps/stn, possibly expanding to 32Gbps/stn
    – mm-VLBI – currently planning 16Gbps/stn, expanding to 64Gbps/stn over next few years

These connections will be fixed
until cables are swapped

Can be turned 180
to double lifespan

These connections will used
when switching disk packs

Demonstrations

- Haystack: Dec 2010
  - Recorded two 10GigE data streams at 4Gbps each (from RDBE) to 20 disks
  - One 4-disk eSATA cable was disconnected from a module while recording; system transferred load to remaining 16 disks within <1 second
- Socorro: Jan 2011
  - Simultaneously recorded identical 2Gbps data stream from RDBE to both Mark 5C and XCube systems; no problems
  - Cross-correlated Mark 5C vs XCube data
    - With exception of minor bookkeeping hiccup, cross-correlation worked perfectly on first try

Work in Progress

- Minor software revisions being made to support several VLBI-specific issues:
  - VSN support
  - Gather individual disk-performance statistics
  - Allow one disk module to record/playback undisturbed while utility operations are peformed on another (mount/dismount, read VSN, etc)
- Write VSI-S wrapper for VLBI control/monitor
- Design new module backplane and front panel to retrofit existing PATA/SATA Mark 5 modules for XCube compatibility (though must use only SATA disks); external cooling must be provided by user (can use Mark 5 chassis, for example)

Plans

- Continue to evaluate
- Work with XCube to support VLBI-specific requirements
- Plan to have a full XCube demo system at May 2011 TOW meeting at Haystack
- Work with XCube to develop business model compatible with VLBI community requirements
- Current system will actually support ~12Gbps, and possibly 16Gbps by adding more 10GigE interfaces and another disk controller
- Future upgrades to 32Gbps expected over next couple of years

A comprehensive document by Michael Taveniku about the XCube system for VLBI is available.

Questions?