

The History, Status, & Future of DiFX at NRAO

Walter Brisken (NRAO)

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NRAO's Interest in DiFX

- * VLBA is in nearly full-time operation
- * VLBA correlation
 - o Usually 10 antennas
 - o Often 11-14 antennas (HSA)
 - o Occasionally 15+ antennas (Global, geodetic)
- * Supports data recorded on Mark5 modules
- * New correlator required to exploit planned upgrades
 - o mini-WIDAR and SW were the two contenders
- * Good thing we chose DiFX
 - o WIDAR @ EVLA only now being brought to life
 - o DiFX was far more cost effective and made best use of personnel

VLBA Sensitivity Upgrade Project

- * Three main components
 - o Roach Digital Back-End (RDBE)
 - o Mark5C Recorder
 - o Correlator (DiFX)
- * Memo series available to all:
<http://www.vlba.nrao.edu/memos/sensi/>

DiFX Development at NRAO

- * 2006 Jan: WFB's first involvement
 - o Visited Swinburne for correlation of science project
 - o Helped add support for VLBA and Mark4 formatted data
- * 2007 Feb 23: Official start of DiFX exploration within NRAO
- * 2007 Apr 23: First in-house fringes
- * 2007 May 1: First fringes off Mark5 modules
- * 2007 Nov 5: Agreement between DiFX and VLBA hardware correlator demonstrated
- * 2008 Apr 25: Current cluster completed
- * 2009 Dec 23: DiFX 1.5 becomes sole correlator in Socorro

DiFX computing infrastructure

- * 20 · · · 16 Mark5 units (talk from last year available on demand)
- * Cluster elements
 - o 5× Twin dual Intel E5420 quad-core CPUs (2.5 GHz)
 - o Head node: Dual dual Intel E5420 with RAID storage
- * 1-Gbps network
- * Upgrades coming
 - o Infiniband
 - o More CPUs (Intel X5650 dual hex-core CPUs; 2.66 GHz)
- * Throughput: 10 Stn @ 550 Mbps (for regular continuum)
- * While this computing platform is quite stable, we lean heavily on the computing group for help

Correlator slow down: May-Aug 2010

- * Unexplained slowdown recognized/confirmed in June
- * Performance behavior was very strange
 - o Short jobs (such as those used for testing) ran at normal speed
 - o Longer jobs exhibited decreasing performance over time
 - o Some tentative connection to particular Mark5 units was noted
- * Confused by contemporaneous events
 - o Installation of *boom* just weeks prior
 - o During installation of *boom* a network cable was damaged
 - o Occasional software updates made to cluster, but usually await reboots at different times on different machines
 - o Minor updates to DiFX over the course of the slowdown
- * No stability problems connected to this slowdown
- * Aug 25: Linux kernel upgrade occurred; problem fixed

Configuration control desired!

Range of DiFX applications to date at NRAO

- * Continuum VLBA experiments from 330 MHz to 86 GHz at up to 512 Mbps
- * High spectral resolution OH maser spectroscopy in full polarization
- * High-precision (10-20 μas) astrometry
- * Asteroid radar with ~ 15 Hz spectral resolution
- * Near-real-time demonstration of spacecraft tracking (Phoenix at Mars)
- * Pulsar gating and binning
- * Multiple (300+) phase center observations
- * Wideband testing (2 Gbps) testing of RDBE/Mark5C data
- * Demonstration of fringes with EVLA VDIF data to VLBA Mark5A data