EXPReS Update from Metsähovi

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Updates on WP1.1.1/2

- WP1.1 Data Acquisition...
  - .1 ...Architecture
  - .2 ...Prototype
- First: demo 0.5 Gbps over 1GE (using VSIBs; done)
- Then: demo n Gbps (4?) over 10GE (using iBOBs/iADCs and data acquisition PCs)

“Add-on” eVLBI

- Piggybacking VSIB+Tsunami onto regular Mark5A+FS experiments
  - Tested with regular IVS geo experiments (On, Mh, Bonn)
    - Mark5A takes disk backup, VSIB sends data from Mark5A outputs (via VSIC) in real-time /w Tsunami to correlator
  - Automated scripts to use regular FS schedule files
    - Demonstrates data acq control and FS compatibility
    - Used in all Mh IVS geo experiments recently (5)

./08jan_geo/recexpt_EURO91_Mh.sh
./07sep_geo/recexpt_EURO89_Mh.sh
./07jul_geo/recexpt_T2051_Mh.sh
./07may_geo/recexpt_EURO87_Mh.sh
./07may_geo/recexpt_T2050_Mh.sh

•Quick UT1 with eVLBI

- On, Mh, Tsukuba, and Kashima ”long-distance” transfers (256, 512 Mbps) for geodetic near-real-time UT1 observations
  - Tsunami to K5 software correlator, UT1 results out 30 minutes after transfer
  - Took part in 16..18-Jan-2008 JGN2 eVLBI demo (NICT/Ka)

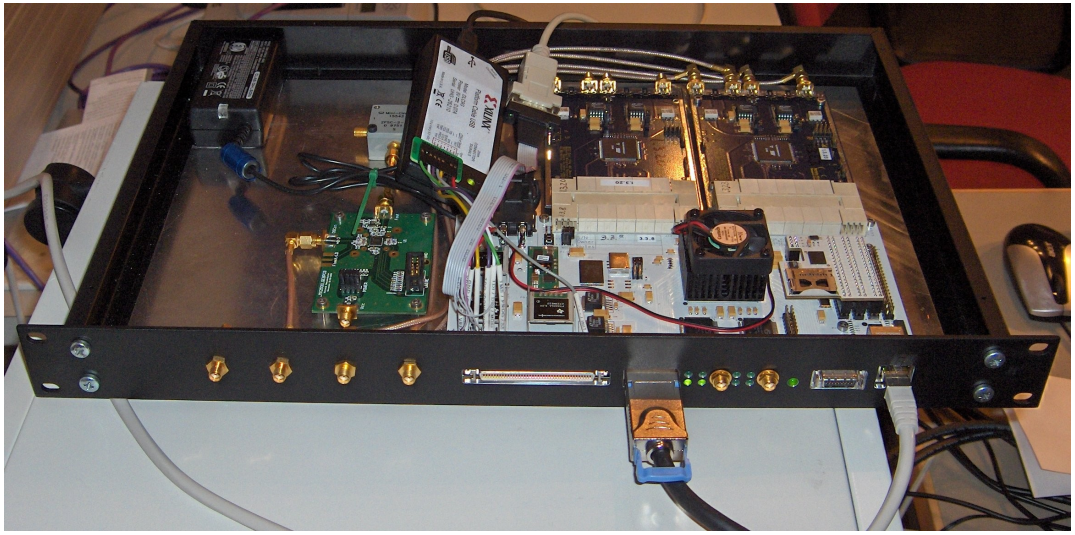
./08jan_geo_jpn/recexpt_u8016a_Mh.sh
./08jan_geo_jpn/recexpt_u8016b_Mh.sh
./08jan_geo_jpn/recexpt_u8016c_Mh.sh
./08jan_geo_jpn/recexpt_u8017a_Mh.sh
./08jan_geo_jpn/recexpt_u8017b_Mh.sh
./08jan_geo_jpn/recexpt_u8017c_Mh.sh
./07nov_geo_jpn/recexpt_u7326a_Mh.sh
./07nov_geo_jpn/recexpt_u7326b_Mh.sh
./07nov_geo_jpn/recexpt_u7326f_Mh.sh
./07oct_geo_jpn/recexpt_h07302_Mh.sh
./07oct_geo_jpn/recexpt_v07302_Mh.sh
./07oct_geo_jpn/recexpt_g07302_Mh.sh
./07oct_geo_jpn/recexpt_u7302_Mh.sh
./07sep_geo/recexpt_U07247_Mh.sh
./07sep_geo/recexpt_V07247_Mh.sh
./07sep_geo/recexpt_W07247_Mh.sh

•Software Items

- DiFX on PS3 (directly ported, mainly PowerPC)
  - on hold
- Minicorrelator on PS3 with SPU
  - http://cellspe-tasklib.cvs.sourceforge.net/
    - Look for ”minicorrelator”..
- fuseMk5A
  - Makes Mark5 8-pack recordings readable as regular Linux files
  - http://fusemk5a.sourceforge.net/
- tsunamifs
  - A ”user space” file system layer being developed on top of connections to Tsunami server(s)
  - on hold

iBOB/iADC Status

- At end of October 2007 Digicom finally delivered the boards
  - On received 1 iBOB and 1 iADC
  - Mh received 3 iBOBs and 3 iADCs
  - Jb already has 10 iBOBs but no iADCs
- Tested 2048.0/1024.0MHz iADC clock synthesizer boards
  - Report by Guifré Molera at:
    - http://www.metsahovi.fi/en/vlbi/ibob/Comparing-ADI-NAT.pdf
- Boxed one iBOB with iADCs, synth board, and pwr



Current 10GE Networking

- Extended our 10 Gbps Funet connection (Extreme Summit X450 switch) with a second 10GE module (10GBASE-SR)
- Purchased one HP 6400cl switch with
  - 6 10GBASE-CX4 integral copper ports
  - 2 10GBASE-SR additional fiber modules (X2, not XFP...)
- Purchased two Myri-10GE boards
  - One CX4 and one XFP with SR module
- Purchased a pair of Chelsio 10GE-CX4 boards (”eval kit offer”)
- Purchased just one Asus L1N64-WS to see if it is any good
- €: Extr 2k, HP 3k, SR 5k, boards 2.5k, Asus 1.5k /wo disks

10GE Networking, Boards

- Recommendations from Jb/RHJ that Myrinet and Chelsio PCIe boards perform well; backed up with test results
  - They were not too expensive, either...

Myri 10G-PCIE-8A-C+E

$695

Myri 10G-PCIE-8A-C+E
plus SR XFP

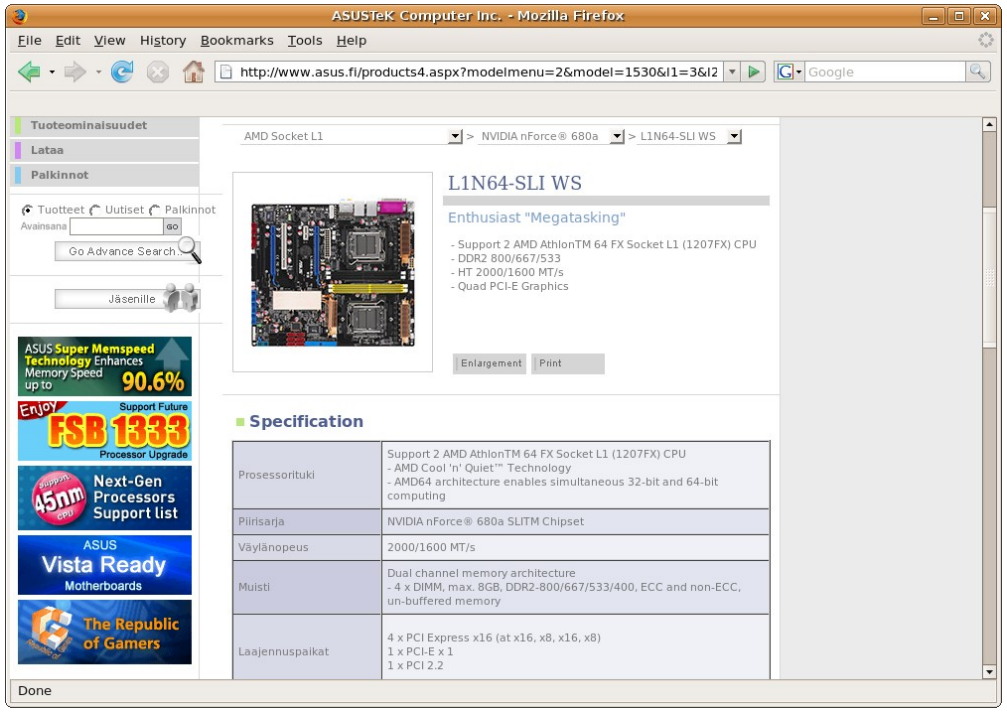
$795 + $500

Chelsio N310E-CX

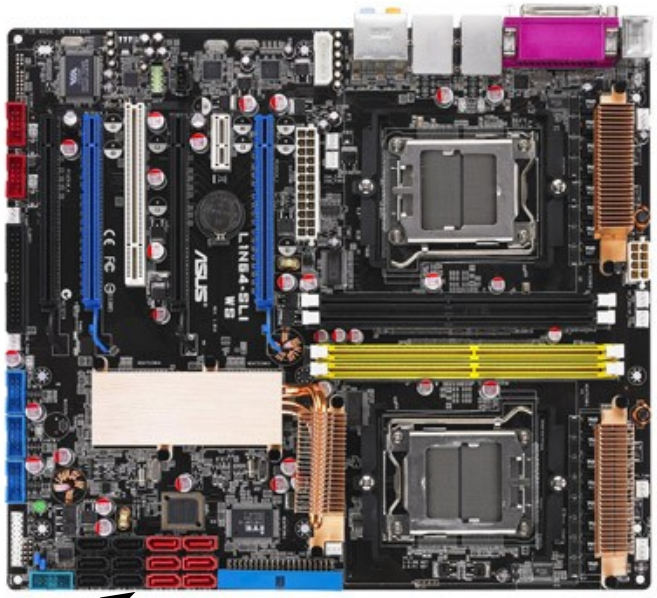
$695 (evkit $995 per pair)

PCIe x8 capable PCs?

- 10GE board is not of much use unless there are PCs which can pump data at >>4Gbps around
- Just starting to appear; first ones might not be too good in practice
- For instance Asus L1N64-WS:



L1N64-SLI WS



12 SATA ports!

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”abidal.kurp.hut.fi”

- Test notes at http://www.metsahovi.fi/en/vlbi/10gbps/10gbNetworkTests.html

”abidal” Performance

- Out-of-box 4470 or 9000 MTU
  - ~9 Gbps TCP, 8 Gbps UDP(!), 1.5Gbps Tsunami(?)
- Some TCP tweaking: TCP ~9.5Gbps
- Both Chelsio and Myrinet benefit a lot from switching off UDP data payload checksums (SO_NO_CHECK)
  - Checksummed iperf: 4.9 Gbps / 1 core (can run two)
  - No checksums: 9.9Gbps / 1 core
- Tsunami: a new v1.2 ”Petabit Tsunami” at
  - http://tsunami-udp.sf.net/
  - 7 Gbps memory-to-memory, 3.5 Gbps memory-to-raid-XFS
  - Original protocol parameters 32-bit, not enough for 10Gbps!
  - Interpacket timing had ~50usec resolution, now ~1usec
- Reasonable performance for an entry-level PCIe x8 PC
  - Net *10, disks *4, CPU *2, memory bandwidth *~1.5 when compared to the previous generation

Performance Lessons

- 10GE is really ***ten*** times faster than 1GE...
  - Where 3 old SATA disks could do 1Gbps...
  - ...you would need 30 old or faster new SATA disks
    - Faster SATA disks are coming, e.g. Samsung F1 series
  - Extra memory copies did not cause too much CPU consumption in 1GE...
  - ...whereas those hurt 10x times more with 10Gbps rate
    - Would benefit from zero-copy drivers and user sw
      - Net driver, disk drivers, filesystem drivers, userland..
  - It is easier to hit main memory bandwidth bottleneck
  - It is quite easy to consume the CPU power of e.g. four cores
    - Luckily more cores are coming...

Remoting Disk Accesses

- Juha Aatrokoski tested direct disk access network protocols in ”abidal”--”juliano”--PS3 environment with 1&10GE
  - AoE (ATA-over-Ethernet)
  - NBD (Network Block Device)
- As an alternative means to make data available to grid correlator nodes (ix86/Cell/...)
- Test report in http://www.metsahovi.fi/en/vlbi/vsib-tests/aoe-nbd/index.html
- Not spectacularly fast, except NBD gets data to PS3 ~0.5Gbps, faster than e.g. NFS

iBOB Development

- Xilinx ISE +EDK/XPS + Matlab Simulink + Xilinx SysGen pretty finicky to install and maintain
  - Old versions needed for CASPER MSSGE flow
  - With help from Jb, now finally being able to build MSSGE-based designs
- Linux expansion board for iBOB (memory + SD flash)
  - Yet to find out how useful this is...
- Next, trying to feed the data acquisition PC (with udp2raid software) with iBOB

So, what next?

- Get iBOB-based UDP transmitters (Jb+Mh; deploy at On, too) and receivers (data acq PC @Mh, iBOB @Jb) running
- Add real iADC data into UDP packets (Jb, Mh)
  - Take a look if there is any useful channelization firmware available that can be added
    - Mileura 1024-ch? Haystack DBE?
- Add more advanced protocols to iBOB (Jb)?
- See what we can and want to demo at 4(?)Gbps