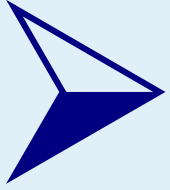


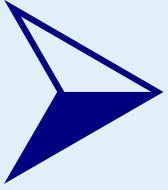
# **EXPreS/Fabric Data Acquisition System**

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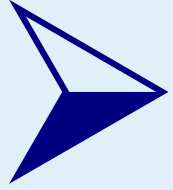
# Three options

- Recycle old junk
- Develop the PCEVN further
- Move to new technologies (eg. iBOB)



# Recycling old junk

- Pros:
  - (Almost) everybody has an 20-year-old Mk4 or 15-year-old VLBA data acquisition rack
  - The PCEVN is good enough for these
  - The PCEVN has significant advantages for eVLBI
- Cons:
  - Old DARs are falling apart, no upgrade path
  - Nothing new, except working eVLBI
    - Always the last “pump into correlator playbacks” problem



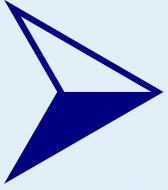
# Developing PCEVN further

- Pros:
  - Working design, upgrade to 4Gbit/s possible
  - Interoperable with DBE or dBBC or old systems
- Cons:
  - 4-lane PCIe chips not available yet
  - VSI is at end of life cycle, should be phased out
  - Some work is involved

# Moving to iBOB and 10Gbps Ethernets

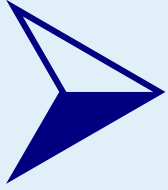
- Hardware-assisted UDP/IP packetizer
- On-chip Linux needed only for initialization and retransmissions
- The network distributes the data to correlating computers





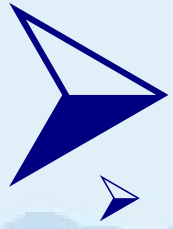
# iBOB pros and cons

- Pros:
  - Easy upgrade to multi-Gbps systems
  - Easy upgrade to distributed software correlation
  - Rate-based protocols easier with FPGAs than CPUs
- Cons:
  - VHDL programming not always fun
  - 10Gbps Ethernet firmware ETA 3Q/4Q 2006



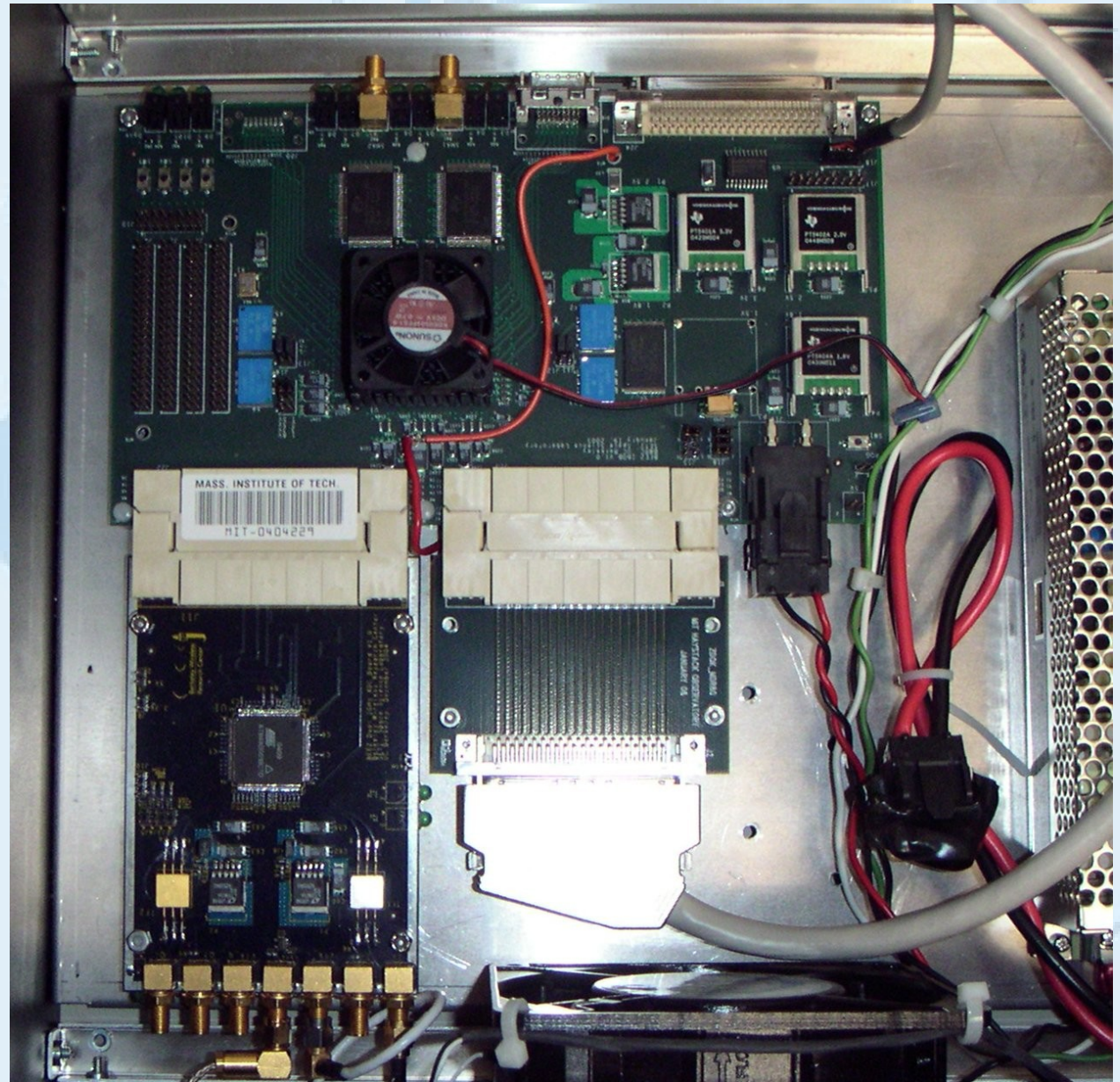
# What exactly is an iBOB?

- A large Xilinx FPGA with two input board connectors and two 10Gbps Ethernets (CX4)
- Plus a VSI-H connector, at Haystack's request...
- A 2Gsps 8-bit A/D (or 2x 1Gsps A/Ds) board
- Cheap: iBOB \$1800(+\$1600), A/D \$1300
- Used in many other instruments supported by UC Berkeley

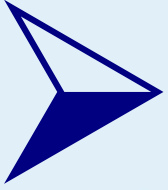


# iBOB (aka DBE) exists!

As seen in  
Haystack  
20-Sep-2006:







# iBOB @ Haystack

- Busy fitting iBOB via VSI-H to Mark5B+
  - Both 2x2Gbps demo RSN and “standard mode” geo-VLBI with an iBOB or two
  - Plans to use 10G Ethernet only “well after Mark5B+ lifetime”, probably with a weird direct 10GE hookup to yet another new incarnation of a (\$10k) Conduant Streamstor board
- Offers much less compatibility than dBBC but at a far lower cost (5—10x cheaper?)



# Can iBOB work with Mark5B correlator playbacks?

- Sure...
  - The Haystack way: via VSI-H to recording Mark5Bs and PATA 8-packs
  - The network way, using 10GE:
    - Provided that Mark5B network input can be improved
    - Either eVLBI directly to correlator Mark5Bs
    - Or local net to “buffer farm” and from there to correlator
      - Software reformatting easy at these farms for grid correlation format and Mark5B format compatibility



# Can iBOB remote-connect us to e-MERLIN?

- Sure, but...
  - The  $n \times 10\text{msec}$  delay problem must be worked out
  - The WIDAR input is a 96-bit LVDS @256MHz
    - Not exactly a piece of cake at these frequencies!
  - Saw the NRAO-designed EVLA fiber “deformatter” board to connect here, so it can be done, but hard at 256MHz...



# So what's going to happen?

- Old racks are going to get VSI-H @1Gbps for Mark5B with no improvement in eVLBI
- iBOB (disguised as DBE) is going to bring 1—2xVSI-H @2Gbps each, just like dBBC
  - But at far less cost as dBBC, and less features
- The eVLBI & std. computer interfacing facilities hidden in 10GE will not be utilized until Mark5B+ has “cooled off” for long enough



# Can we do anything?

- We could take iBOBs (aka DBEs) into use and put 10GEs (which are already there!) into eVLBI & std. disk use, but...
- Haystack will try to make as difficult as possible for us to “bypass” the VSI-H and Mark5B(+)
- We could embrace the VSI-H and make PCEVN2 just for eVLBI, but...
- Be limited to  $\leq 4$ Gbps; could hardly compete with Mark5B(+) in the field of “8-pack PATA” disk VLBI
  - PCEVN2 “just for eVLBI” hardly will gain popularity...