

# DSP prototype test flow.

July 5, 2001

## Initial Firmware tests:

Look for life among the chips.

- FPGA first - Make JTAG port work for serial EPROM for FPGAs.
- FPGA later - Make JTAG interface chip work to reprogram EPROM for FPGAs.
- DSP Boot ROMs first – ISP connection to load DSP BIOS.
- DSP Boot ROMs later – use DSP application code to reprogram boot ROMS from compact Flash card. Also have host port connection from PTSM.
- Hitachi firmware initial – special cable to ISP boot monitor.
- Hitachi later – program through dedicated serial port. Later load boot code from compact flash. Test the watchdog timer.
- Make Arcnet work simply then with more complex protocol.
- Hardware indicators and helpers - activity LEDs on each Hitachi and DSP processor. Logic analyzer port to look at bits. An LCD port on each Hitachi micro. Serial port out of each Hitachi micro.

## Control Tests:

Connect things together.

- Write simple command message structure.
- Make Arcnet Hitachi micro command software work. Write firmware to make PTSM to HPI link work. DSPs are memory mapped into Hitachi memory space.
- Make BSP to GL1 work. Size FIFO so all DSPs can send a result message at the same time.
- Send commands back and forth on Arcnet from the host to the DSP and back. Measure the rate and bandwidth possible.
- Try loop test going out from host on control link and back on message link (?)
- Quantify latency in host-Arcnet-micro-DSP command path.
- Quantify latency in DSP-micro-Arcnet-host message path.
- Provide for burst commands and burst messages.
- Add message passing between the two Hitachi micros so GL1 message errors can go to the PTSM. Can use unused serial ports.

## Data Movement Tests:

Move data among the parts

- Make PTA to DSP data link work. Structure memory buffers and firmware to accept events and notify/distribute to DSPs. Size buffers/FIFOs. Select size balance between one input buffer/FIFO and four output buffers/FIFOs. Select polling vs. interrupts for new data notice. How fast can we get data into the boards? Test overrun conditions in memory buffer (?). Need connections to PTSM controller.

- Make DSPP to PTA data link work. Is this a FIFO or memory mapped? How fast can we get data out of the boards? Can the PTA take pushed data?
- Make DMA work on DSP. How fast can we get data into and out of the DSP?
- Make interrupts work on DSPs. Quantify latency. Test other methods of notification like mailboxes.
- How fast can the DSP cycle data using a simple data processing algorithm like flipping all the bits. Include messages on the output links.

### **Host software:**

- Control Arcnet hardware. Control PTA hardware
- Put commands together to download firmware.
- Put commands together to initialize hardware, start DSPs send data, receive messages and read primitives data.
- Display error messages.
- Run long-term tests.
- User GUI.

### **Glossary:**

BIOS – Basic Input/Output System. Kernel operating system.

BSP – Buffered Serial Port. A serial port on the DSP running at one MHz.

DSP – Digital Signal Processor.

EPROM – Erasable Programmable Read-Only Memory. Non-volatile memory that can be erased and reprogrammed.

FPGA – Field programmable Gate Array. Programmable logic.

HPI – Host Port Interface. A port with unobtrusive access into the DSP registers and memory.

ISP – In Circuit Programming. Serial connection into hardware that supports programming of memory devices.

JTAG – Serial connection into hardware that supports raw loading, testing and monitoring of complex logic devices. Supports multiple devices per chain.

LED – Light emitting Diode.

LCD – Liquid Crystal Display.

PTSM – Pixel Trigger Supervisor and Monitor. The command and monitoring network that will control the DSP farm. There is a Muon version.

PTA – PCI test adapter. A PC based test card for support of test stands.

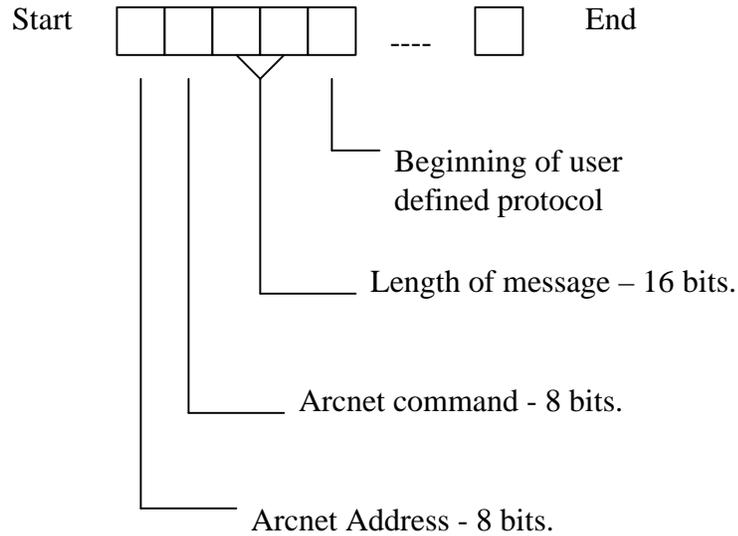
## ARCNET:

Basic physical layer protocol has 1 byte address, one byte command and two bytes of message size. Message limited to 512 bytes. Max message is 516 bytes?

1 Megabit/sec divided by a five byte minimum message is 25k mini-messages per second maximum.

We add an address byte and a command byte for a 7 byte minimum message. Max message rate is 17k messages/sec.

### Arcnet message format



# Software Block Diagram

