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# L-Bus Proposal

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# Goal

- Eliminate the cross-connects used by EPICS controls
  - Simplify the EMI retrofit
- Replace with design that can operate in low noise environment
  - Mass-termination on backplane
  - Single controller with serial interface
  - Modern bus-type design for both analog and digital
- Clean up the power supplies
  - Locally regulated
- Support of legacy boards

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# Pros

- Drastic reduction of inter-system cabling
- Isolated power supplies
- Reduce susceptibility to EMI problems and noise injection
- Reduce documentation headaches because boards and interfacing go together
- Modifications are easier (new boards don't require re-cabling)
- Going forth and back between two designs is straight forward
- Better testing (boards AND subsystems can be fully tested in the shop without a custom rig)
- Support for loading and storing a digital word
- Sound infrastructure for advanced LIGO?

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# Cons

- Increased complexity (nothing is simpler than a cable!)
- Custom scheme of mass-termination
- Requires a commitment/Are we locked in?
- Requires a lot of individual interfacing for legacy boards

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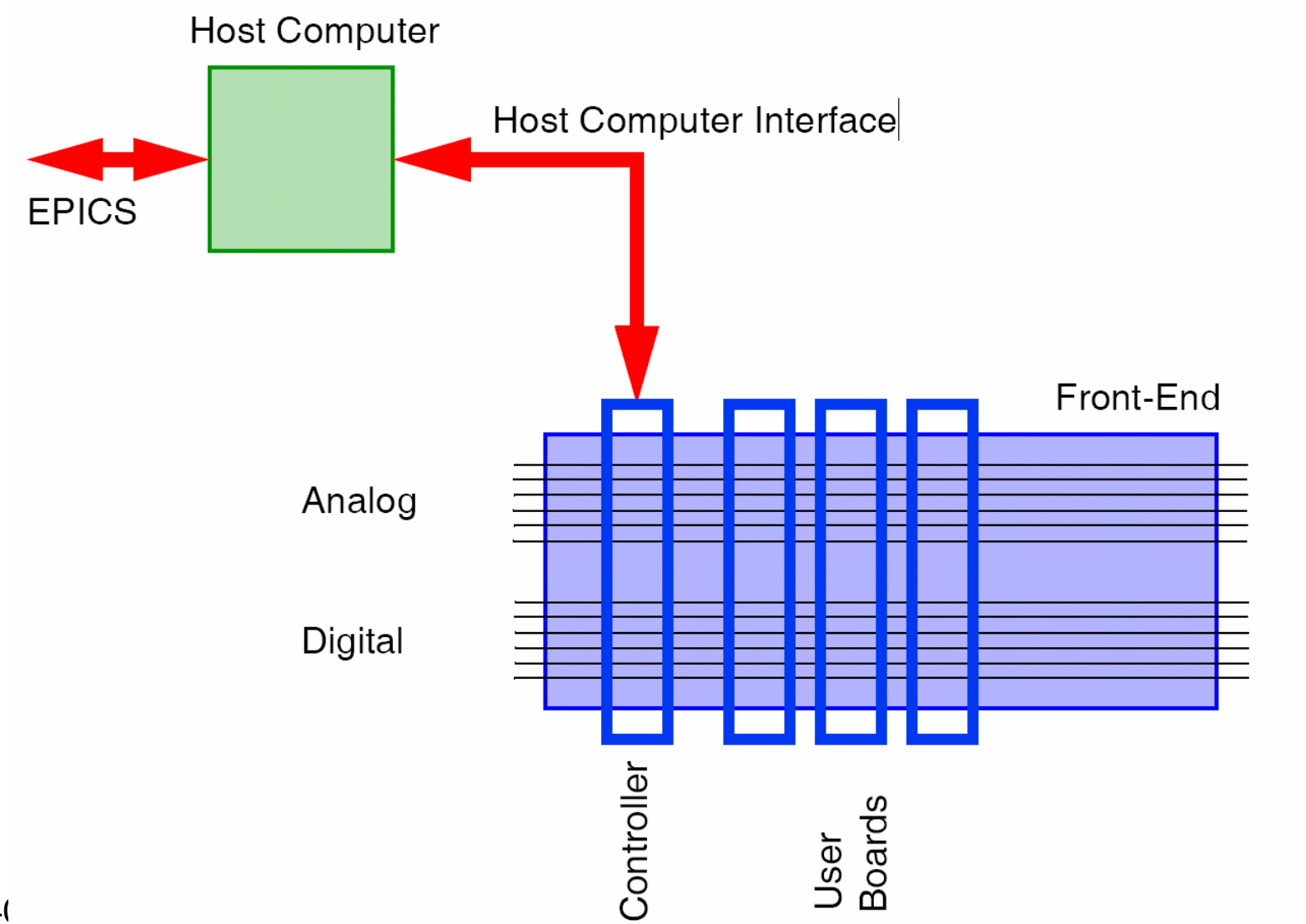
# Basic Layout



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# Analog Backplane

- 16 lines of analog readbacks
  - Each board selects one line
  - Single ADC on controller board that operates at 2048 Hz (16 lines x 16 addresses x 16 Hz)
  - GPS synchronized
- 4 analog addresses for multiplexing 16 analog readbacks on each board
- 8 analog control lines
  - Used by boards that need to adjust voltages during running
  - Typically DACs are on the user board

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# Digital Backplane

- Modern memory mapped architecture
- Multiplexed 16 bit address/16 bit data
  - Boards typically use a 8 bit board identification
  - Up to 128 words can be used locally
- Simple bus interface
  - Address strobe/write indicator/data latch
- Low speed to minimize EMI problems
- Supports zero activity during science running
- Separate power supply

# Power Supplies

- Voltages:
  - +5V at 1A/board, digital, linear post-regulation
  - ±5V at 1A/board, analog, linear post-regulation
  - ±15V at 0.5A/board, analog, linear post-regulation
  - ±24V at 1A/board, unregulated, use for local post-regulation
- Voltage monitoring
  - ± 5% tolerance
- On/off switch

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# Form Factor

- Eurocrate
  - 6U height, 220 mm depth (60 mm deeper than current boards)
  - Full (21 slots) and half (10 slots) backplanes
  - EMI compliant enclosure
  - Support of legacy boards through 60 mm interface adapter
- Stand-alone chassis
  - Everything goes…
- (Field module)

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# Software

- Dumb controller
  - Supports reads, writes and read-modify-writes
  - Supports 16 Hz data dump of analog readbacks
  - Simple protocol to host computer (command, payload, return)
- Host computer provides EPICS and DAQ interface
  - Runs EPICS database
  - Talks to controller to set data values based on EPICS commands and to update readbacks
  - Implements data dump to DAQ system to avoid EDCU bottleneck and maintain timing information

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# Plan

- Prototype by end of year (optimistically)
  - Estimated costs: 10K-15K (buy crate, develop backplane, build power supply, develop controller, develop 1 user board and write software)
  - Support of high density SMD components in EE shop(?): ~15K
  - Support for EPROM/GAL/etc. burner in EE shop(?): ~5K
- Decision of go-ahead before LHO EMI retrofit is set into motion and depending on prototype results