

Serial Support for Diamond

A review of EPICS serial interface options

Pete Owens

Daresbury Laboratory

Serial Interfaces

Number of Interfaces

- From the Assessment of Equipment the number particular interfaces is derived

Analogue	1677
Digital	1111
VME back plane	73
Video	8
GPIB	2
Serial	2116
System Integration	8

Sharp intake
of breath!

This is NOT necessarily channels but interfaces

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Overview of DIAMOND to the
European EPICS Meeting at PSI May 2001

Mark Heron

Serial Interfaces

- **Need to support serial interfaces to equipment**
- **Advantages:**
 - **Increased functionality per connection**
 - **Minimises calibration errors from Control System ADCs**
 - **Widely accepted use of RS232/422 etc**
 - **Integration of systems**
 - **Faster commissioning**
- **Disadvantages:**
 - **High processor load**
 - **Development to support vendor protocols**
 - **Asynchronous I/O**
 - **Need signals for fast logging and interlocks**

Vacuum Equipment Test Rack

- MKS 937A - *multi-sensor vacuum gauge system*
- Balzers TPG 300 - *pressure gauge controller*
- Varian Dual - *ion pump controller*
- Digitel MPC - *ion pump controller*
- Mitsubishi 'A' Series PLC - *valve control*

Vacuum Equipment Test Rack

- VME 64x Crate
- Processors:
 - MVME 167 & PPC 604
- IP Carriers:
 - Hytec VICB8002
 - Greenspring VIPC601
- Serial Interface Card:
 - Greenspring IPOctal - *8 channel IP card*

EPICS Devices

- *devAscii - Allan Honey/Jeff Hill - KECK*
- *Stream Device - Dirk Zimoch - DELTA*
- *MPF - Mohan Ramanathan - APS*
- *ornlSerial - John Sinclair - Oak Ridge*

- *tyGSOctal - Peregrine McGehee - Hawaii*

devAscii

- *Allan Honey/Jeff Hill - KECK Observatory*
- De-facto standard
- Format string in INP or OUT field

```
field(INP, "@/tyGS/0/0 <R2><%f>")
```

- Special records for terminators, timeout etc.

devAscii - Experience

- Implemented database for MKS 937A
- Good points
 - easy to use
 - widely used
- Not so good
 - special records
- Limitation
 - checksums or complex protocols

Stream Device

- *Dirk Zimoch - DELTA*
 - <http://www.delta.uni-dortmund.de/controls/pub/doc/streamDevice/>
- Device support for common record types.
- Allows to connect records to multiple hardware via arbitrary field bus architectures (*CAN & GPIB supported*).
- Bus data must appear as a stream of bytes.
- Protocol defined in a file.

Stream Device - Protocol File

```
# Stream Device Protocol for the MKS 937A Multi-Sensor System

terminator      = CR;
replytimeout    = 1000; # milliseconds
extrainput      = Ignore;

pressure { out "R\%1"; in "%f"; }
enable  { out "%{X|E}CC\%1"; in "OK"; }
status {
    out "R\%1";
    in "%{HI|A|Lo|F|H|W|L|CON|P|NOG|M|NOT|Not|C}";
}
```

Stream Device - Experience

- Added bus support for tty devices
 - modular design, good documentation
- Produced protocol files for:
 - MKS 937A, Varian dual, TPG 300
- Good points
 - protocol files, multi-stage protocols, delays...
- Limitation
 - checksums

MPF (Message Passing Facility)

- *Mohan Ramanathan - APS*
 - <http://www.aps.anl.gov/aod/people/mohan/>
- Client/server design
 - Server side independent of EPICS, giving configuration flexibility.
- Support available for Digital MPC
- Custom record

MPF - Experience

- Implemented support for Varian Dual
- Software complex to build and modify
 - Mods to C++ module for the server side, handling the hardware interface
 - Mods to C++ module for the client side, scheduling command requests
 - Mods to C module for custom record support
 - Mods to build files
 - Mods to include files

MPF - Evaluation

- Good points
 - flexibility
 - custom record for Digital MPC included
 - well-structured software design.
- Bad points
 - development overhead for new devices
 - over-engineered for diamond project.

ornlSerial

- *John Sinclair - Oak Ridge*
 - <http://www.sns.gov/projectinfo/ics/epicsCollabMtg/serialSupport.ppt>
- Device Manager for configuration
 - Baud, parity, etc.
- Generic interface module
- Device specific plugin modules
 - Construct and parse I/O strings

ornlSerial - Experience

- Implemented plugin module for MKS 937A
- Added record support for standard ai & ao
- Coding straightforward

Device Manager

- tyGSOctal doesn't implement
 - ioctl (... , SIO_HW_OPTS_SET, ...)

ornlSerial - Evaluation

- Good points
 - Useful for complex protocols (eg. checksums needed).
- ORNL features
 - Non standard use of DISA field (warm start)
 - Non standard ai/ao records
- However
 - requires some programming for device-specific modules.

Summary

- All software built and worked
 - minor glitches 68k / PPC
- Where existing support exists - use it
- For new development we like:
 - **stream device** *for most cases*
 - **ornlSerial** *for complex protocols/checksums*

Possible Developments

- Stream Device
 - bus support module for device manager
- tyGSOctal
 - SIO_HW_OPTS_SET ioctl call
 - hot swap support
- ornlSerial
 - record support for waveform record

*Serial Support for
Diamond*

The End