Serial Support for Diamond

A review of EPICS serial interface options

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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

Daresbury Laboratory — *Mark Heron*

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

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 Cards:
  - Greenspring IPOctal - *8 channel IP card*
  - Hytec 8515 - *8 channel IP card*

EPICS Devices

- devAscii - *Allan Honey/Jeff Hill - Keck*
- Stream Device - *Dirk Zimoch - DELTA*
- MPF - *Marty Kraimer - APS*
- ornlSerial - *John Sinclair - Oak Ridge*

- tyGSOctal - *Peregrine McGehee - Hawaii*
- drvHy8515 - *Walter Scott - Hytec*

devAscii / drvSerial

- *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
- (**ex**) Limitation
  - checksums or complex protocols - now a fix

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)

- *Marty Kraimer - APS*
  - http://www.aps.anl.gov/asd/people/mrk/epics/modules/bus/mpf/
- Client/server design
  - Server side independent of EPICS, giving configuration flexibility.
- Support available for Digitel 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 Digitel 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

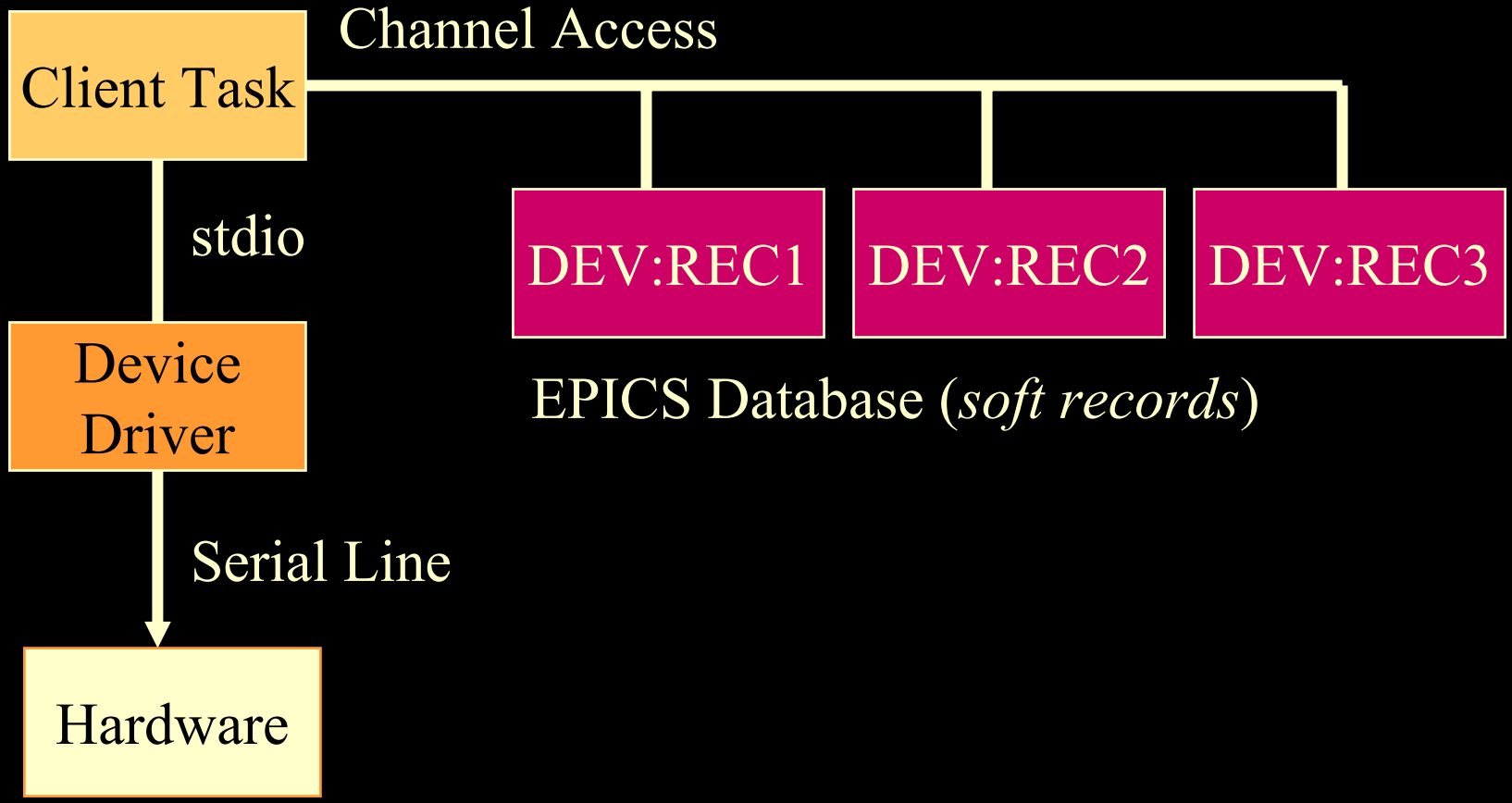
- All software built and worked
  - minor glitches 68k / PPC
- Where existing support exists - use it
- For new development we like:
  - stream device *for most cases*
  - ornlSerial *for complex protocols/checksums*

Questions

- Why didn't you write your own serial interface like everybody else?

We did ...

Channel Access Client



Channel Access Client

Pros

- Flexible - good for complex protocols
- Complete control over timing of I/O
- Easy to integrate with existing non-EPICS code
- No need for mutex

Cons

- Requires coding for each device type
- No existing support from EPICS community

Serial Support for Diamond

The End