Contracting Turn Key Systems with EPICS

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Contracting Turn Key Systems with EPICS

- What is Cosylab
- Standards and EPICS
- Two sample turnkey systems
  - Cosylab is subcontractor for CS
- Technical issues
- Organizational issues
Cosylab

- 1997-2000 ANKA CS: “cheap”
  - PC, commercial fieldbus, own I/O
- 2001 students finish, start company
  - Professional: work to spec/wishes + documentation
  - CS development and integration
- Development more fun, but difficult to sell
  - VDCT, CAJ, Abeans, ACS (CORBA for astronomers)
- 2004 10 employees, 10 external, 15 students
  - Add: GIS, Telecom, Automotive electronics
Cosylab Abeans Customer Base
// description of read-only double channel
struct RODoubleDesc {
    double graphMin; // minimal value on graph
    double graphMax; // maximal value on graph
    double warningMin; // below this warning color is enabled
    double warningMax; // above this warning color is enabled
    double alarmMin; // below this alarm color is enabled
    double alarmMax; // above this alarm color is enabled
    string unit; // units
    string format; // format of value
    string description; // description of value
    double minStep; // minimal possible change in value
};

// description of read-only double channel
struct RWDoubleDesc {
    double minValue; // minimal allowed value
    double maxValue; // maximal allowed value
    double graphMin; // minimal value on graph
    double graphMax; // maximal value on graph
    string unit; // units
    string format; // format of value
    string description; // description of value
    double minStep; // minimal possible change in value
};

/* Possible conditions of a physical device or its state.
The names correspond to colours of typical LEDs.
GREY corresponds to the LED being off. */
enum Condition {
    RED,
    YELLOW,
    GREEN,
    GREY
};

typedef sequence <Condition> ConditionSeq;
typedef sequence <string> stringSeq;

// description of read-only status (pattern) channel
struct ROPatternDesc {
    string description; // description of the status channel
    stringSeq bitDescription; // string description for each single bit in status
    ConditionSeq whenSet; // describes which color has status bit when it is 1
    ConditionSeq whenCleared; // describes which color has status bit when it is 0
};

/*------------------------*/
/* Power Supply Interface */
/*------------------------*/

interface PowerSupply : Device {
    long setCurrent(in double dCurrent);
    long getCurrent(out double dCurrent);
    readonly attribute RWDoubleDesc currentDesc;
    short retPutOn();
    short retPutOff();
    short retPutReset();
    long getStatus(out long status);
    readonly attribute ROPatternDesc statusDesc;
    long getReadback(out double ampVal);
    readonly attribute RODoubleDesc readbackDesc;
};
Outsourcing, Turnkey and Standards

- In-house systems are proprietary and not open
  - Doesn’t matter if free or with source code
- Difficult to outsource: extensive learning time
- Impossible to buy turn-key: who is responsible for bugs?
  - Example ANKA: turnkey booster, but without CS
- Lessons from human history: need standards
EPICS as Standard (1/2)

[whether EPICS is a de-facto standard is left as an exercise to the reader]

- Is sufficiently stable and known that labs can expect equipment vendors to know and support it
- Has sufficient "market share" that it is worthwhile for equipment vendors to consider
- Has cases of excellent documentation and courses so that anybody can learn it
  - Fortunately for Cosylab, EPICS is still not easy 😊
EPICS as Standard (2/2)

• International tenders for equipment require EPICS, such as:
  – Australian Synchrotron Project (ASP)
    • Turnkey injector (linac+booster synchrotron) with control system (not necessarily EPICS) that integrates into ASP EPICS system
  – Diamond Light Source (DLS)
    • EPICS required, DLS even free issues hardware and developing environment to ensure compatibility

• Clarifications
  – ASP linac and RF including EPICS subcontracted to Accel and PPT, Cosylab makes only booster CS
Particularities of the Control System Subcontract

- **Fixed price contract**
  - Time management is a big problem:
    - we have to sell our time but not oversell
    - If project is delayed for any reason, we can’t just get a new project to fill the hole => we lose money!
  - Commissioning included in price, additional help is extra

- **Contractor (our client) wants to control communication with the lab (end user)**
  - Understandable, but slows down progress
  - Good direct relations with end user are essential
    - Cosylab is lucky that it comes from the community
Status of ASP Booster and DLS Diffraction Beamlines

- Slideshow.....
Technical Issues

- EPICS community support much better than commercial
  - asynDriver (in particular Marty and Eric)
  - PLC S7 driver (Dirk) – paid by PPT (on Danfysik contract)
  - DG535 (delay generator) device support (Marty)
  - autoSaveRestore (Tim Mooney) for bumpless reboot
  - caSR (John Winans, ?) channel access save/restore (snapshot)
  - stream device (Dirk), given to us by DLS
  - motor record, transform record, sscan record, waveAnl record (Synapps package, APS beamlines)

- Lots of commercial devices with serial/GPIB interfaces
  - Use our microIOC (embedded PC box with EPICS - see presentation on Friday) to integrated and decouple from the rest.
Organizational Issues

- Need each type of equipment at our premises
  - Soft records -> protocol simulator -> 1 device connected
- Prefer to work at home
  - Early visit to build trust in our competences
  - Install at “factory” on all devices, first acceptance
  - Participate in commissioning on site, final acceptance
- Diplomacy is important
  - How to be committed, but still get paid for all the extra work?
  - Refering to specs and contract just doesn’t work
  - Sometimes need to negotiate between contractor and end user
- We usually deliver more than internal people, just because we know that we get only paid at the end!
Conclusions

- Will equipment vendors provide EPICS inside? Yes
  - Will they still need integrators like Cosylab? Yes (I hope)
- Will EPICS become a monopoly? No
  - But labs will have to decide on some standard, else they will pay a higher price
- Labs can accelerate this development by requesting EPICS for each piece of equipment!
  - Everyone will profit (wink, wink 😊)