ICALEPCS 2001 TRENDS & IMPRESSIONS

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There is an exciting breadth of topics covered in this conference. Here's the list of things that interested me:

1. Successful Projects. SLS, RHIC, D0. More examples of successful control systems. Control Systems are no longer the high-risk systems for a project. The trained (and experienced) people, tools, equipment, and bandwidth are there. It's still possible to do it wrong – but there are plenty of successful examples.
2. Big Systems well along in the construction phase: NIF, LIGO, LHC, LHC Experiments – ATLAS, CMS. Others coming soon: ALMA.
3. EPICS. The explosive growth continues. Expanding well beyond the United States, and beyond accelerators. Incredibly successful.
   - IOC's OS. Ready for alternatives to VxWorks. Will they come?
   - Thank you Mike Thuot.
4. Ethernet.
   - It's ubiquitous. Why do we need field buses at all?
   - Plenty of tools available: Nice measurements from Spring-8, good design from NIF, SNS.
   - Lots of bandwidth here already, and more coming (Thanks to Andy Bectolsheim of CISCO for an informative talk and question & answer session).
5. Database:
   - Oracle. It seems to be almost everywhere. And its performance keeps getting better. And the license cost seems to be not a problem (since most of us seem to be able to use the license of some higher level organization).
   - Uses: Perfect example of a tool and technique for implementing and managing complexity (Intriguing BESSY paper).
6. Linux. Seems to be everybody's choice for servers. And thank you to Straumann, Kraimer, and Odagiri for their talks on RTOS, especially their discussion of the RT-Linux architecture.
7. The Web: Can't do without it. Ubiquitous. It's now part of the SW design process.
8. Java: Web and GUI tools. We are exploring other avenues of application (e.g., RT Java, alternative to C++). Where will be the successes?
9. Software Engineering.
   - There are more development tools and techniques to attack hard, complex problems. And the development which makes it possible is the availability of still more computing and communications bandwidth and memory.
   - This makes it more difficult for managers. Lots of choices.

- Formal Testing – See NIF. Clearly moves the bar up. Requires project commitment and money. But all of us expect it to pay off at "first light" and beyond. Applicable to the Global Accelerator Network?

10. Hardware engineering. Same as the SWE item above regarding the availability of tools and techniques.

- Right now, the SWEs have the upper hand for system architecture. But the hardware people are coming back. More and more smart, complex device designs, incorporating significant computing and communications capabilities are being built (INP at Moscow State U, Numerous posters). How are the network and system architectures going to change when there are many such devices – each one an IOC? (See the report from the SNS beam diagnostics and controls teams at ICALPECS 2003.)

11. CORBA. Lots happening.

- NIF's CORBA should work, if good SWE and Network Design mean anything. We anxiously await the results at "first light," and beyond – as the performance requirements grow.
- Enough CORBA projects are around that the viability of the approach is no longer in question. KGB, Riken, SLS, etc. However, CORBA is not simple to use, and, as NIF points out, performance is strongly dependent on the network (e.g., the need for TCP/IP tuning).
- Lots of ways to use CORBA (Application Layer to Utilities, Application Layers to Devices, others?). Complicated to understand and design. Multiple CORBA implementations. Lots of project management decisions to be made here. Risk potential (e.g., Make the wrong choice, and performance may be a problem. And the performance problem may not appear until later, since it will be load dependent.).
- People issue. Finding staff that can do this stuff well.

12. Feedback and Special Innovative Solutions. Lots of examples here – LIGO, Accelerator Orbit Feedback, Accelerator RF Feedback, NIF Wavefront Control, etc. The trend here is the continued creative use of very sophisticated electronic hardware and software tools to solve difficult special problems.

13. PLC's, Industrial Controls. They work. We can integrate them, given competent engineering. What's the big deal? More challenging is getting industry to deliver systems incorporating your control system approach, but SLS (and SNS) are showing us that can be done also.

14. Large Collaborations and Management:

- Global Accelerator Network: "Can be accomplished with today's technology. The sociological and management issues are more difficult."
- Geographically Distributed Development Teams – a requirement for large collaborations. Doable, but fundamentally still requires a lot of travel on the part of the senior coordination team (SNS experience). And the involvement of project management to resolve the effect of competing designs. Today's solution is to put lots of money in your travel budget.