Cooperation Between Industry And Research Institutes

a personal experience Note: I was on both sides....

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Your **TRUSTED** Control System Partner



2 The Company Cosylab

Worldwide leader for control system integration of nuclear accelerators and large physics facilities, chosen by the majority of large accelerator projects

- We develop state-of-the-art electronics and software.
- We integrate them into mankind's most complex systems.





ann: Annia and Anniazzoi in Analy

Your **TRUSTED** Control System Partner

Customers From Nearly All Major Labs Worldwide

PUTE COSYLAB

38 Canadian Light Source - CLS (CA) 2. Brookhaven National Laboratory - BNL (US) 3. Facility for Rare Isotope Beams - FRB (US) 1 3 Advanced Photon Source - APS at Argonne National Laboratory (US) 36. Clerget (ES) Stanford Linear Accelerator Center SLAC (US) 37. Observatori 6. Varian medical systems (US) 4. Fermi National Accelerator Laboratory - FNAL (US) 8. Los Alamos National Laboratory - LANL IUSI 9. Indiana University (US) 10. National Instruments - NI (US) 11. Spallation Neutron Source - SNS (US) 12. National Radio Astronomy Observatory - NRAO (US) 13. Thomas Jefferson National Accelerator Facility - JLAB (US) 14. Atacama Large Millimeter Array - ALMA (RGn 15. Macedonia Ministry of Agriculture (FYROM) 16. Fisheries and Rural Development, Zagreb (CRO) 17. Cividec Instrumentation GmbH (AT) 18. EBG MedAustron (AT) 19. Sinchrotrone Trieste - ELETTRA (IT) 20. Kyma (IT) 21. Instituto Nazionale di Fisica Nucleare - INFN-LNL BT 22. CERN - European Organization for Nuclear Research (CH) 23. Paul Scherer Institut - PSI (CH) 24. Linde Kryotachnik (CH) 25. Maatel Scientific Instrumentation (FR) 26. Xenocs (FR) 27. French Atomic Energy Commision (FR) 28. International Thermonuclear Experimental Reactor - ITER (FR) 29. European Synchrotron Radiation Facility - ESRF (FR) 30. bioMérieux (FR) 31. Synchrotron Soleil (FR) 32. Atos Origin (FR) 63. MAX-lab, Lund University (SE)

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37 33. Ion Beam Applications - IBA (B) 34. 9 Son Systems (ES) 35. CELLS - ALBA (ES) 37. Obse Patorio Astronómico Nacional - DAN (ES) 38. ESS Bilbao (ES) 39. Geographic Data Support Ltd (UK) 40. Infoterra Ltd (UK) 41. STAR-APIO (DK) 42. Rutheford Appelton Laboratory (UK) 43. Daresbury Laboratory (UK) 44. Diamond (UB) 45. FMBO Oxford (UK) 46. Siemens (DE) 31 47, ACCEL (DE) 48. Electron accelerator FLSA (DE) 49. Helmholtz Zentrum berlin fur Materialien und Energie 23(9. BioSistemika (SI) 80. Tsinghua University (CN) (DE) 50. European Molecular Babag28bo236r2 6/12 5E24 51. Physikalisch-Technische Bundesanstalt Berlin - PTB (DE) 52. Jenoptik AG Jena (DE) 53. Forschungzentrum Karlsruhe (DE) 54. Dortmunder Elektronen Speicherring Anlage (DE) 55. Deutsches Elektronen-Synchrotron DESY (DE) 56. European Southern Observatory ESO (DE) 57. Gesselshaft fur Schwerionenforschung (DE) 58. Feinwerk-und-Messetechnik GmbH (DE) 59. Imtech Vonk (NL) 60. Kernfysisch Versneller Instituut - KVI (NL) 61. Danfysik (DK) 62. European Spallation Source (SE)

16 64. J. Stefan Institute (SI) 65. Hidria (9) 66. ISKRATEL (SI) 67. Telsima (51) 68. AET (51) 70. Seaway SI) 225mart Com (SI) 78. SOU (SI) 82. Hiroshima University (JP) 84. Riken (JP) 85. Repic Corporation (JP) 89. The University of Tokyo (JP) 90. Hitachi Zosen (JP)

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69. Slovenian Ministry of Agriculture Food and Forestry (SI), 71. Slovenian Environmental Agency - ARSO (SI) 72. The purveying and Mapping Authority of the Republic of Slovenia-GURS (SI) 93 73. The National Veterinary Administration- VURS (SI) 74-Instrumentation Technologies - I-TECH (SI 75-Electronic Institute Milan Vidmar -EIMV (S 76. Slovenian Ministry of the Environment and Spatial Planning (SI) 81. Pohang Accelerator Labolatory (KR) 83. Institute for Molecular Science (JP) 86. Nichizou Denshi Seigyo Kabushikigaisha (JP) 87. Japan Atomic Energy Research Institute - JAERI (JP) 88. High Energy Accelerator Research Organisation - KEK (JP) 91. Japan Synchrotron Radiation Research Institute - JASRI (JP) 92. NSRRC -National Synchrotron Radiation Research Center (TW) 93. Raja Ramanna Centre of Advanced Technology - RRCAT (IN) 94. Australian national nuclear research and development organisation - ANSTO (AU)

nnn COSYLAB

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95. Australian Synchrotron - AS (AU)

We Participate at 6 of the 10 Largest Big Physics International Projects

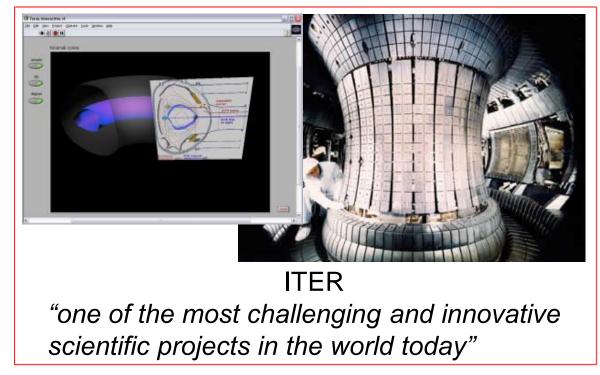


- Radiotelescope: ALMA (Munich, Atacama Desert)
- Neutron source: SNS (Oak Ridge), ESS (Lund)
- Nuclear physics: FAIR (Darmstadt), LHC (CERN)
- Fusion: ITER (Cadarache)



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CERN Large Hadron Collider *"the most powerful instrument on earth"*



5 Who are we?



- 60 FTE engineers, developers and system architects
 - additional ~30 students in the pipeline
- Branches in the USA and Japan

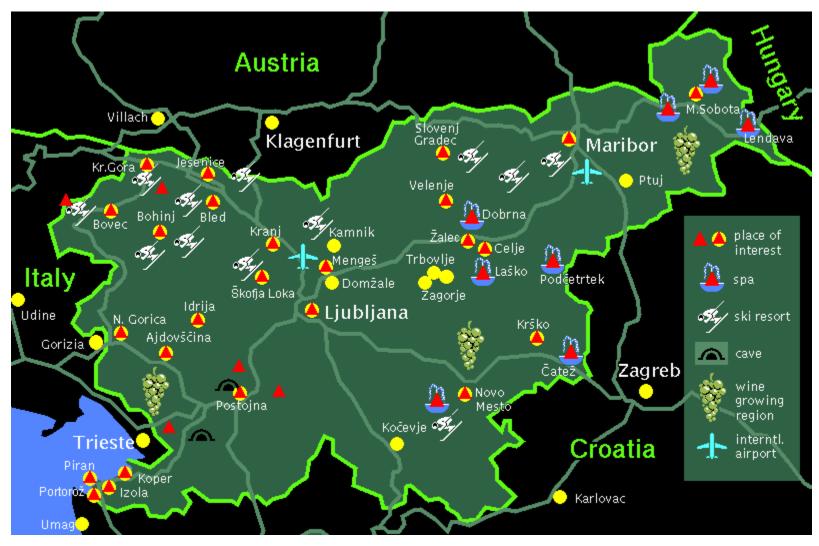






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Where is Slovenia?



Cooperation On A Project

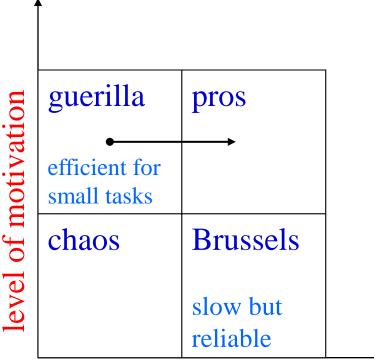


- ANKA light source, Karlsruhe Germany
 - Construction phase 1997-2000
- Cooperation: Danfysik J. Stefan Institute for Forschungszentrum Karlsruhe
 - Danfysik built turn-key booster
 - JSI was developing control system for whole ANKA
 - Tight cooperation to use ANKA control system directly for booster
 - No contractual relation!
 - Just good spirit



But Where To Get All The People? Int COSYLAB

- Undergraduate Students !
- Fun to work with
 - can be motivated
 - learn quickly
- modern technologies allow almost any reasonable solution to work properly
 - who cares about project management anyway?



level of structure&organization

Next step: Spin-Off



- Money ?
 Time = Money
 Knowledge = Power
 - Power = Work / Time
 -
 - Money = Work / Knowledge
- Start spin-off company
 keep existing way of work and life
 team members are co-owners
 tightly connected to institute
 continue to recruit new students as before

10 Not How, But Who Does It



A real "Spin-off"

- 1 researcher and 5 graduates must earn their living
- Research competence and business culture

Getting the best people

- Recruit the most talented undergraduate students
- Add culture and loyalty (also through shares)
- Money is less important than one thinks
 - it's a negative motivator
 - Must find positive motivators, too!
- Now over 50 students in the pipeline, from simple exercises to production work

<u>Cooperation: In-house or Industry? Inc. COSYLAB</u>

- □ For in-house: maintenance, upgrades
- □ Wrong!
- In-house people are smart: but get N different solutions
- Nobody is writing documentation unless forced
 "Outsourcer" is forced, because of payment
 In-house person will just tell you, until she/he is gone
 In-house knowhow rests with people, not the lab
 Outsourced knowhow from competent suppliers is like an escrow vault:
 You pay, but it is well kept for you
 - Over the whole lifetime of the project

Framework Agreements ESS

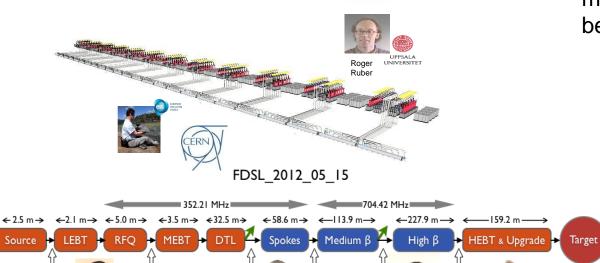


3 MeV

75 keV

Your





79 MeV 201 MeV

Sebastien Bousson 623 MeV

Guillaume

Devanz

2500 Me

Søren Pape

Møller

Investment: 1478 M€ / ~10y Operations: 106 M€ / y Decomm. : 346 M€ (Prices per 2008-01-01)

Facility for the search of new states of matter (ie new materials)

Proposals for nEDM, muons, neutrino physics are being studied

> 5 MW long pulse source: -2.86 ms, 50 mA pulse current, 14 Hz -Protons (H+) -High availability, >95% -First neutrons 2019 with 7 instruments and completion 2025 with 22 instruments at 5 MW operation

The Three Phases of Non-cooperation



- 1. We will cooperate, but we don't know yet what
- 2. We have some specs, but we can handle them ourselves
- 3. We should have cooperated with you, but now we have already invested so much of our work that we can not justify throwing it all away
- Reminds me of unsuccessful dating ③





14 Real Problems



- □ It's faster to do it yourself than to write specs
 - True, but if you don't write specs for yourself, you'll be in trouble later
- □ Specs, targets are not clear, can't control cost
 - True, but then also your own cost wouldn't be under control
 - Let's make a fixed price contract, if the effort deviates more than by 10-20%, we renegotiate the contract.
- In-house people can fix problems overnight
 - True: keep one person permanently at lab to collect requests and make quick fixes

The Right Way to Outsourcing: Rightsourcing (you name it!)



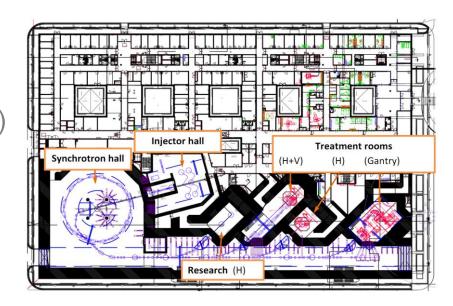
- □ start with smaller projects (2-4 man-weeks)
- regular visits or work on-site
- Get benefits from both "in-sourcing" and "out-sourcing":
 - I person on-site (gather requirements, communicate with customers, organize, support, service...)
 - expert team at home, professionally organized and managed
 - Benefits for the lab:
 - pay only <u>one</u> person, get an expert in <u>every</u> area
 - scientists retain the established work practice: (almost) no specs, creative academic environment, ask and get (almost) next day
 - value for money (efficiently managed, optimized procedures, no cure no pay!)
 - Lifetime support (see what happened at CERN PS)

<u>16</u> Licensing MedAustron Controls Int COSYLAB

- Proton and carbon ion therapy
- Clinical and non-clinical research
- 3 medical irradiation rooms
- 2015 medical operation
- We are the core team for the control system:
 - Ion source integration
 - iLLRF integration
 - sLLRF integration
 - Power converter controller
 - Timing system (synchronization)
 - Front end control system (FECOS)
 - Signal acquisition distribution system (100+ nodes)



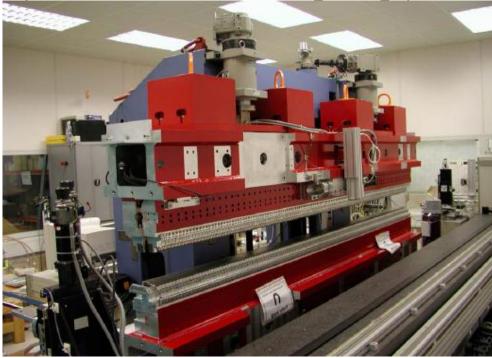
Wiener Neustadt, Austria



Joint Venture with Sincrotrone Trieste (Italy)



Kyma, a company to produce undulators for synchrotron radiation light sources (FELs and electron storage rings)



- Buzzword compliant: Public-private partnership, Technology transfer, Cross-border cooperation
- Need to master both the research and business cultures, join them effectively and get them to cooperate

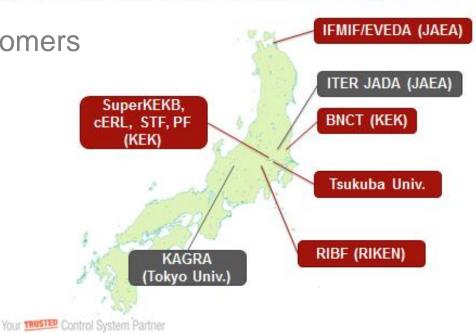
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A Different Kind Of Cooperation

to gain market knowhow and find new employees

- Branch in Japan
- Led by prof. emeritus Shin-Ichi Kurokawa, retired head of all accelerators at KEK (Tsukuba)
 - First work for KEK 😳 🥂 Map of Major Potential Customers 🔤 🛄
 - Identified other potential customers
- Still lost first 2 tenders





<u>19</u> So is Cooperation with Industry Int COSYLAB Possible?

yes, but...

- you must first choose the right company, one with good understanding of your field and with proven competence
- Even if not, it is wise to write specifications anyway
- We believe Industry can deliver extra value to in-house development of control systems:

"Do what you do best and let others do the rest"



20 Summary: Types of cooperation Int COSYLAB

- Joint R&D
 - And how great this is (I didn't talk about that)
- Work together on projects
- Spin-off
 - Get really rich, but risky
 - I still don't have a Porsche ☺
- Framework agreement: industrial suppliers to institute during build-up of project (write specs together)
- Licensing
- Joint-ventures between institutes and industry
 - Buzzword compliant
- Industry gets lab people and market know-how
 - Nice job if you're experienced and a networker