
BLEKINGE TEKNISKA HÖGSKOLA
BTH

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VISIR

Virtual Instrument Systems in Reality

www.bth.se
BLEKINGE INSTITUTE OF TECHNOLOGY

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Background to the VISIR project

- In 1999 a remote electronics lab project was started to supplement local instructional laboratories and provide free access to expensive experimental equipment
- Today laboratories in electronics, security, radio and signal processing are online and used in regular courses for students who can be on campus or off campus
- At the end of 2006 a disseminating project, VISIR, was started

Virtual Instrument Systems in Reality (VISIR)

- Ingvar Gustavsson (inspired in Max Planck):

‘‘Experimenting could be compared to a conversation with nature. The experimenter asks and nature answers. The tricky thing is formulating a useful question and above all interpreting the answer. The only way to learn the language of nature is performing many experiments in laboratories that can be hands-on ***or remote.***”

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VISIR is about

- Opening laboratories at universities for remote access
- Preserving the context
- Cooperation and standardization

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Why start with open electronics labs?

- Instructional laboratories for electrical experiments contain the same equipment at most universities – a kind of de facto standard
- There are a large number of such laboratories around the globe
- They are easy to open for online access preserving the context

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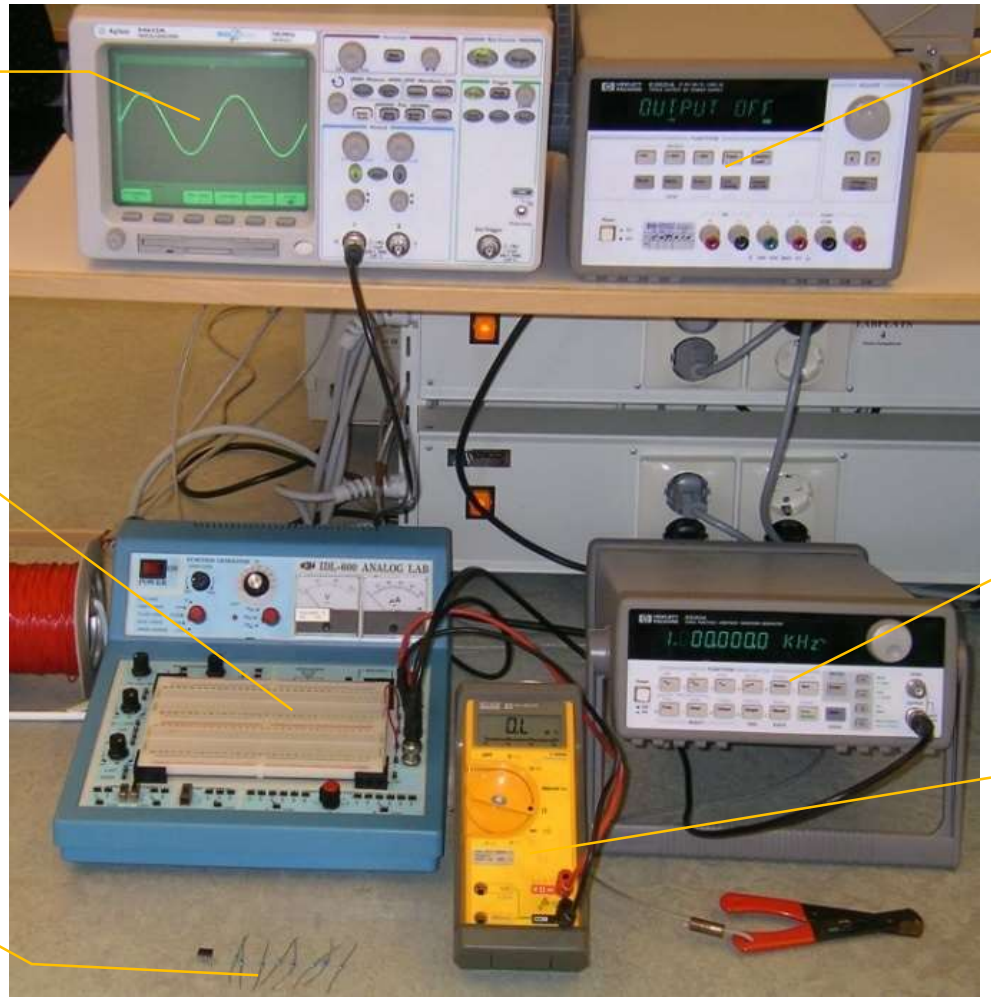
The VISIR Open Laboratory

- Provides physical lab equipment supplementing local laboratories
- Can be used 24/7 by enrolled students on their own or in groups
- Existing learning material can be used
- Offers a known interface as well as a known context for both students and teachers
- The web interface supports multi language

Local electronics laboratory for undergraduate education at BTH

- Open during 4 hour supervised lab sessions only
- 8 identical workbenches
- 2 students share a workbench

Workbench in a local laboratory for electrical experiments



Oscilloscope

Power supply

Detachable breadboard

Function generator

DMM

Component set for the student

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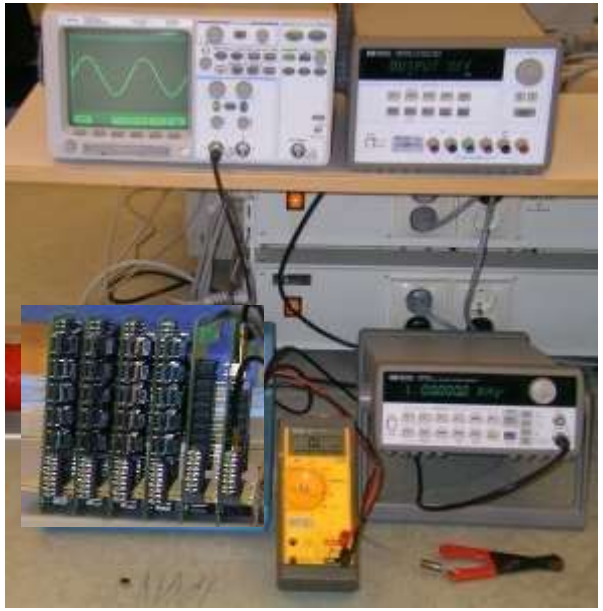
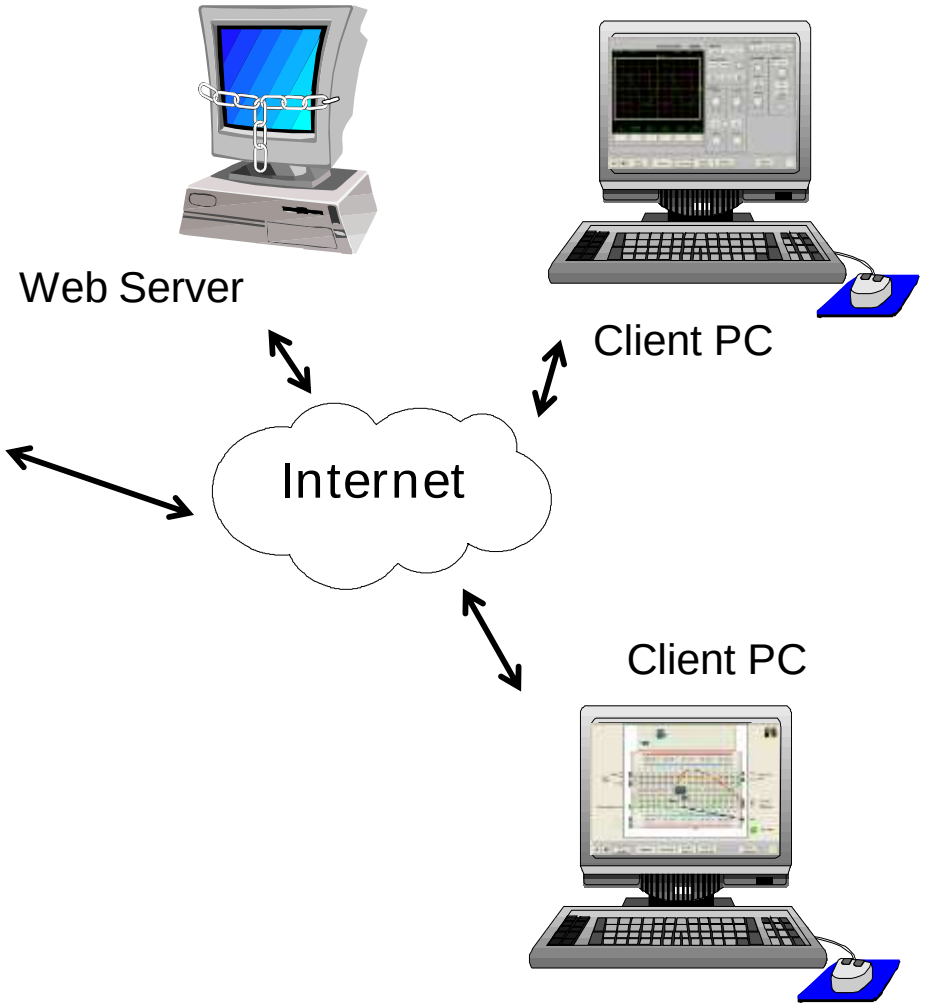
The VISIR Open Electronics Lab





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The workbench emulates a whole laboratory by time sharing

- Each experimenter wires a circuit and sets the instruments locally in his own computer
- When ready the *Perform Experiments* button is pressed to send the circuit and instrument settings to the workbench
- The actual experiment (circuit creation, instrument set up and measurement) is performed in the workbench during 0.1 s or less

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Benefits

- Students
  - can use the workbench on their own or together with others, for example, to prepare supervised lab sessions when they want
- Universities and other teaching organizations
  - can produce engineers with more lab experience without significantly increased cost per student
  - can offer lab sessions for students off campus
  - Collaborating on labs may also led to collaboration on learning material

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Benefits cont.

- The local lab sessions can be more effective because
  - The students can learn trivial things such triggering the oscilloscope on their own
  - The local lab sessions can be dedicated to more complicated things such as EMC problems

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Online workbench

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The VISIR switching matrix supports lab sessions where

- Novices practice wiring and experiment on simple circuits described in lab instruction manuals
- Advanced students test ready-made complex circuits and use the matrix to move the test probes

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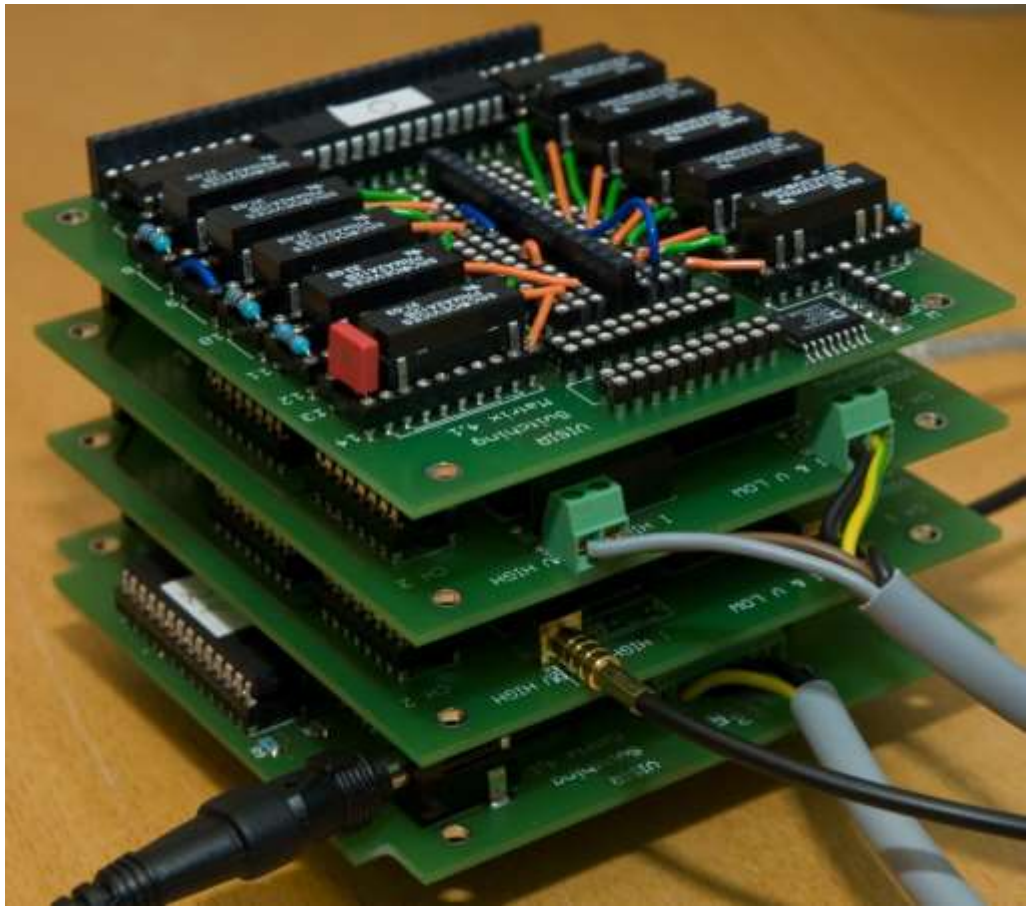
The switching matrix is a card stack



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Component handling and circuit checking in a local laboratory

- The instructor puts a set of components to be used in the lab session on each workbench
- During the session the students are permitted to activate the sources in their circuits only when the instructor have checked that the circuits are harmless

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VISIR Laboratory - Providing components

- As in the traditional laboratory the user is provided with a set of components needed for the experiment
- These will be available on the breadboard in the lab client
- The component set is prepared in advance by the teacher

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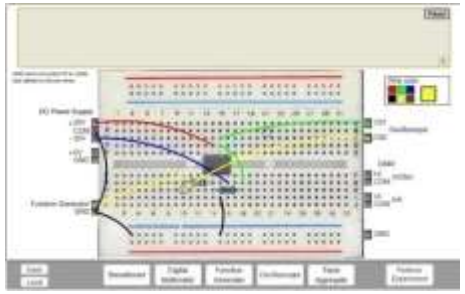
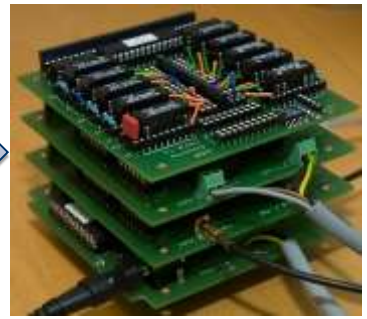
From Circuit to Matrix





- Circuit is wired on the virtual breadboard
- Circuit is checked by the Virtual Instructor
- If the circuit is safe it is allowed to be constructed in the switching matrix

Further development of the VISIR platform

- Additional virtual front panels depicting instrument models used in the VISIR community
- Introduction of lab assignments existing at other universities
- Interface to a learning management system such as Moodle
- Adding new tools for communication between people in the laboratory
- A VISIR grid laboratory based on web services

The VISIR software distribution

- Development pages can be found at http://svn.openlabs.bth.se/trac/
- All software modules can be downloaded from our subversion server
- Members of the VISIR group will be granted write access to branches in the repository
- Write to the trunk is limited and will require code review
- The Trac software project management system (http://trac.edgewall.org) is used

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Conclusions

- The workbench supplements the local laboratory in the following ways
  - The students on campus or off campus can work in the laboratory 24/7
  - The students can, for example, learn how use the instruments at home
- It should be possible to produce engineers with solid and documented lab experience with low additional costs