LabsLand

Experiment for real

https://labsland.com

FPGA laboratories
April 2022
fpgas@labsland.com

LabsLand:
FPGA labs, available online

Learn anywhere, anytime

View and interact with real FPGA devices

The FPGAs are real, not simulated, and located at LabsLand or partner universities

First, design the logic

Upload <u>your binary file</u>

OR

Use <u>our online code editor</u>:

VHDL, Verilog, SystemVerilog
No installation required

Then, send your design to a real FPGA through web
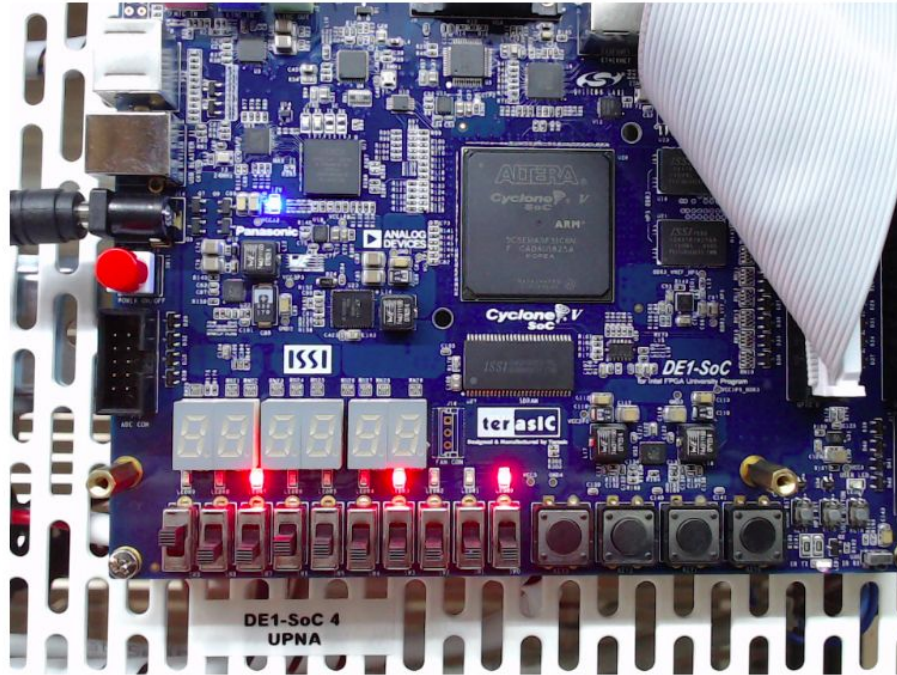
Real-time camera
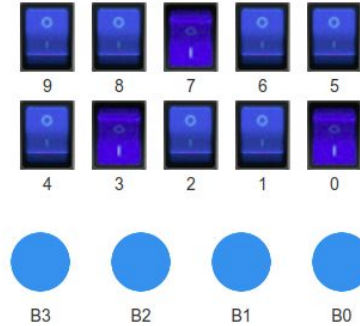
Controls

Other controls available:

Real-time VGA
Oscilloscope
Audio (input, output)
Virtual peripherals

See video in action
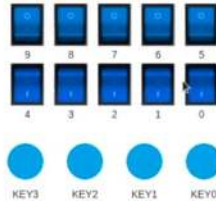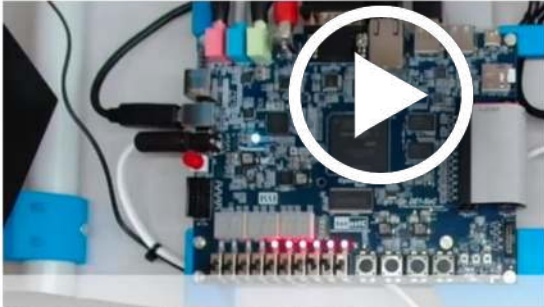
Students can control the hardware through a web browser

Click on video for demo

https://www.youtube.com/watch?v=tAcvIVb4clU

How does it work?

FPGAs are real and physically located in partner universities.

Camera

4 FPGAs
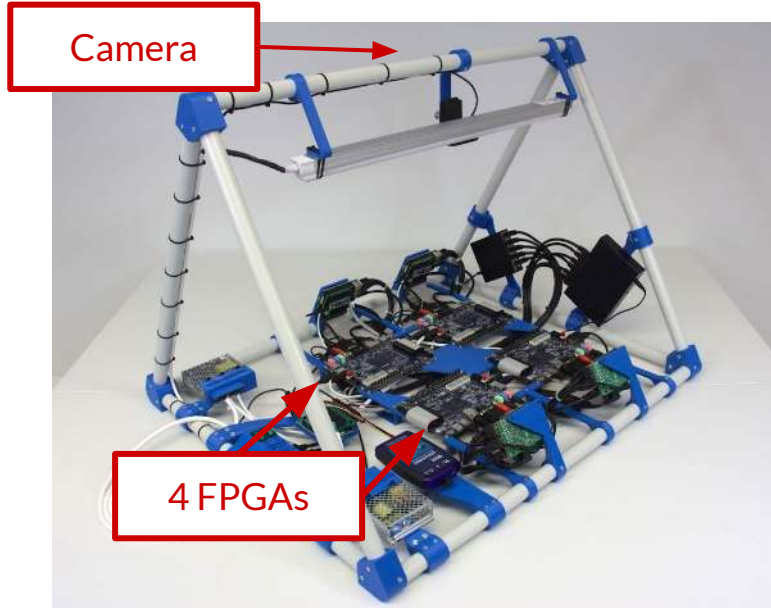
You can either:
a) buy labs that for your institution
b) or get licenses to access labs of other partners

Soon in:

Digi-Key
ELECTRONICS

Testimonials

"We use Labsland in conjunction with our in person labs. Labsland has allowed us to expand our support model with remote support and 24/7 access to the lab."

Matthew Smith
Adjunct Assistant Professor,
Senior Engineer,
University of Michigan

"Remote labs bridge the times before and after COVID-19 in engineering education. A sustainable and cost efficient solution that connects hardware labs located in different places worldwide."

Rania Hussein
Assistant Teaching Professor,
University of Washington

"This is a REAL FPGA programming experience. Students write code in an integrated design environment. Then they download their programs to a real FPGA and see it operating in real time!"

Paul Furth
Associate Professor,
New Mexico State University

intel

UNIVERSITY OF MICHIGAN

UNIVERSITY of WASHINGTON

SUU SOUTHERN UTAH UNIVERSITY

MONASH University

NM STATE UNIVERSITY

Proven enhanced pedagogic results

ASEE 2021 - July 2021

"Remote Versus In-hand Hardware Laboratory in Digital Circuits Courses"

Rania Hussein (University of Washington),
Denise Wilson (University of Washington)

*"Results show that **students performed better** in terms of overall scores, understand skills, and analyze skills when presented **with remote access to laboratory hardware than when having that hardware in hand**."*

https://peer.asee.org/remote-versus-in-hand-hardware-laboratory-in-digital-circuits-courses

Article awarded with the ECE Division Best Paper Award

https://sites.asee.org/eced/awards/

Advantages

Equipment is **always ready**, with all peripherals

- ○ It's 24/7: **anytime, anywhere**

- ○ Use it while teaching theory in class

Forget maintenance issues - everyone has the same setups!

Engage students

Students <u>dramatically increase the time</u> they can use the boards

They can use them <u>anytime, anywhere</u>

RHL-Beadle

https://rhlab.ece.uw.edu/projects/rhl-beadle/

- Ready-to-use open-source contents for Digital Design using **LabsLand FPGAs**

- Developed by the Remote Hub Lab (RHLab) of the University of Washington

- Funded by Intel Corporation

Your institution's space in LabsLand

Institution space where you can manage students, permissions, and obtain usage analytics

Integrated in your Learning Management System

Many more ECE labs

Coming soon: **ARM**

Arduino board

Many more ECE labs
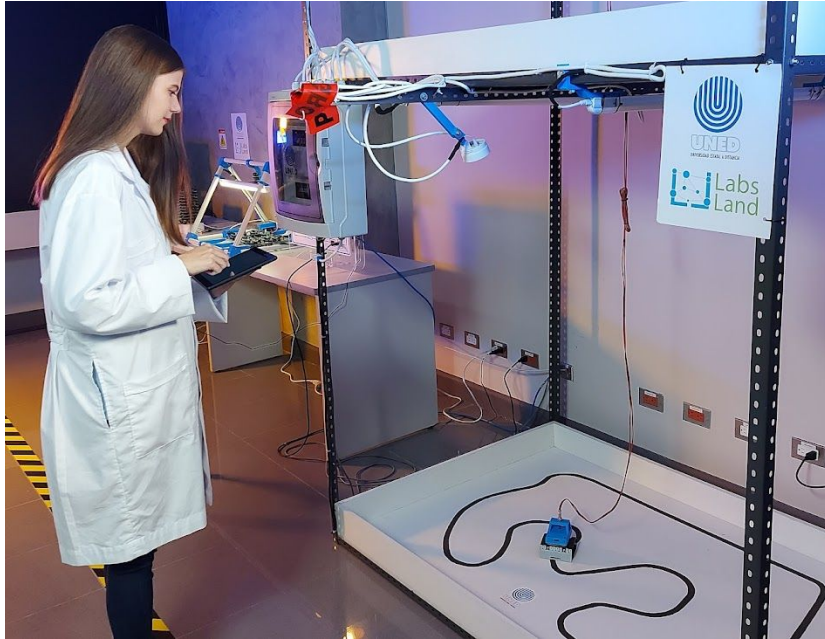
Arduino **robots**
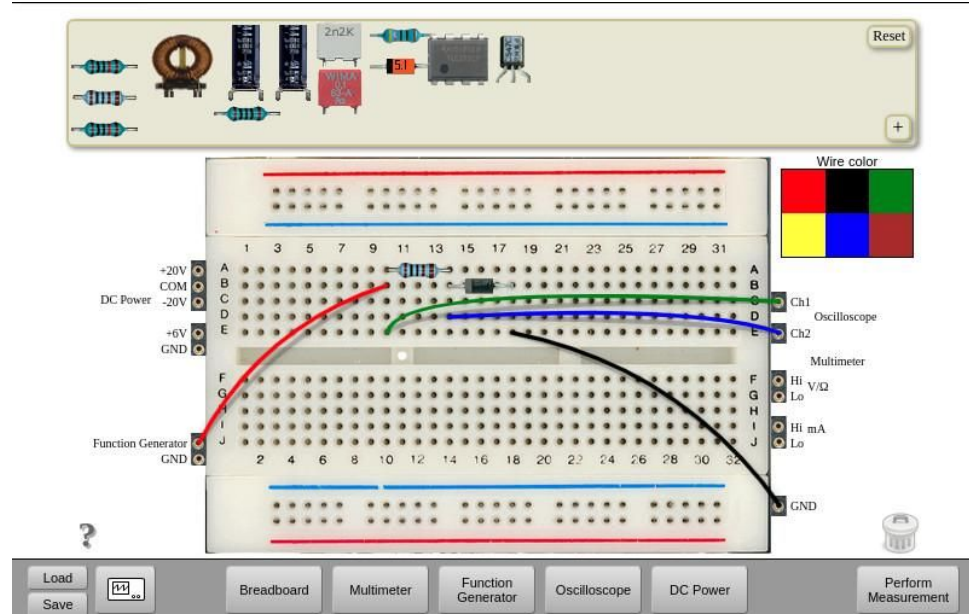
Analog electronics

Featured in
The Institute
section of
IEEE Spectrum
June 2021

STARTUP

Online Labs Give Remote Learners Hands-On Experience

More than 100 universities are running LabsLand's experiments

BY KATHY PRETZ

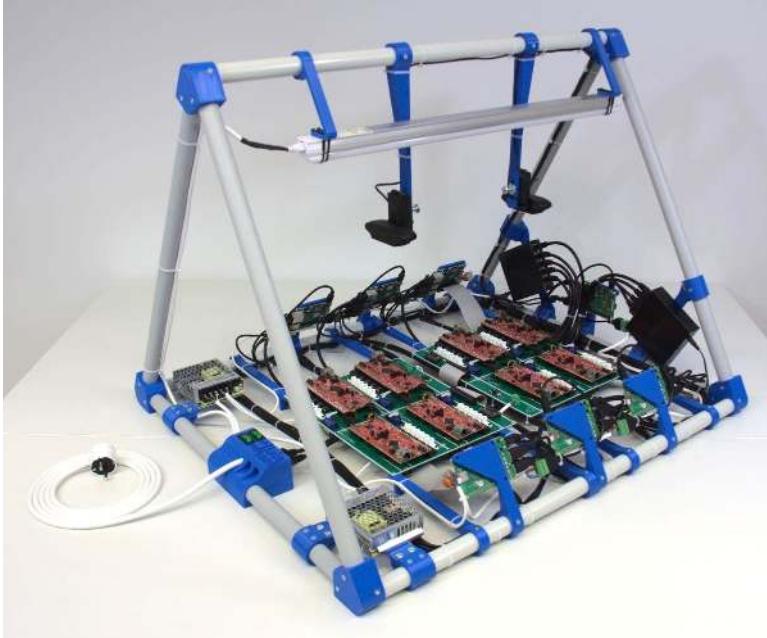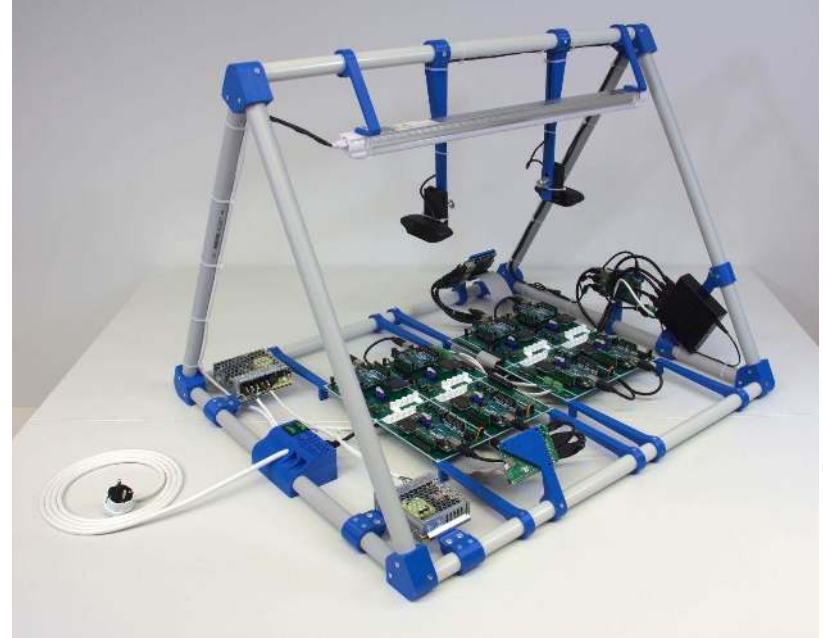**HANDS-ON ONLINE LABORATORIES** have grown in popularity now that schools around the world are conducting classes remotely or restricting the number of students on campus because of the COVID-19 pandemic. The remote options allow students access to a physical laboratory to conduct experiments. They are real labs, not simulations; students use actual hardware and software.

Some universities have their own remote labs, while others are using ones offered by LabsLand, a startup with offices in Bilbao, Spain, and St. Louis.

The company provides preuniversity schools and colleges with access to a network of 30 university labs that cover six topics: biology, chemistry, electronics, physics, robotics, and technology.

Students can learn how to program an Arduino Uno board, for example, or experiment with principles of analogic electronics.

LabsLand and its partner universities use cameras, sensors, and other equipment to enable students to monitor and interact with the laboratory setups. The students use Web-based interfaces designed by LabsLand.

The company also can build labs for schools and provide technical support for those that operate their own remote lab.

The startup's labs can be integrated with learning platforms such as Blackboard, Canvas, Classroom, and Moodle.

LabsLand provides analytics programs so instructors can monitor their students' progress.

Schools pay a subscription fee for the use of the lab network, but LabsLand provided free access to its labs from March to September 2020. Since October it has been offering discounts on its subscriptions in certain circumstances.

The startup's founders are IEEE Senior Members Pablo Orduña and Luis Rodriguez-Gil.

"Our labs [were] used more than 200,000 times in 2020 by 120 universities," Orduña says. "Students are remotely able to upload their code and run it. They're able to move switches and touch key pads and see the effect in real time of what's happening in the hardware."

Companies have also expressed interest. Orduña reports that Intel recently started exploring using LabsLand in its workshops.

Proof of concept

Virtual labs might seem like a new concept, but Orduña and Rodriguez-Gil have been working in the field for more than a decade.

The two founders met in Bilbao at the University of Deusto. They worked on remote hands-on labs as part of the university's WebLab-Deusto research group. LabsLand, which launched in 2015, is a spin-off of the WebLab-Deusto group.

"We saw that as our university's [remote lab] was growing, there were some [pieces] missing, and [it also] needed technical and organization support," Orduña says.

Instructor feedback

Dominik May, an assistant professor and education researcher in the Engineering Education Transformations Institute at the University of Georgia, in Athens, says that even before the pandemic, several electrical and computer engineering classes had started using remote labs in addition to traditional in-person labs. Now, he says, LabsLand provides several of the college's labs, which are used for teaching electronics and circuit design as well as chemical engineering courses.

"Our aim is to not only integrate remote labs into courses as some kind of additional service, but also we see that online labs have the potential to be transformative for engineering education as a whole," May says. "They are a perfect way to customize learning experiences and to prepare students for an environment in which remote working is becoming more important."

Engineering professors who were teaching digital design using field-programmable gate array boards at the University of Washington in Seattle, started looking for ways to make the boards available to students.

Rania Hussein, a UW assistant professor, says the school shipped lab kits to students, but some sent

overseas were lost in customs. The IEEE senior member teaches electrical and computer engineering technology. The labs are offered jointly to electrical engineering, computer science, and engineering students. They serve "a large number of students," she says.

Hussein says switching to remote labs allows students to get the same experience as in an actual classroom, and at their convenience. The instructors can access the students' work by viewing their demonstration via a webcam. For example, a teacher might ask a student to flip a switch to see LEDs turn on or check that a counter is working correctly. These are the same assessments they would conduct in face-to-face classes.

"Students are everywhere now in the world. [When] they cannot be on campus, they still need to do the

labs, and they still need access to the hardware. We needed a reliable and sustainable solution for this," Hussein says. "That's why I believe educators need to think differently given the new circumstances such that they provide the same experience as much as possible to the students without the hassle of the logistics."

Hussein deployed eight FPGA boards at UW for her digital design class. They are integrated into the LabsLand network. This year she plans to expand their collaboration.

LabsLand is supported by Arch Grants, Impact EdTech, and BBK Venture Philanthropy.

The startup recently received an award from the Global Online Laboratory Consortium, which promotes the development and research into remotely accessible laboratories for educational use.

Spanish Prime Minister Pedro Sánchez cited the company in a recent presentation about the country's entrepreneurs. "This company has proven to be a great example illustrating that there is no barrier to education," Sánchez said.

Rania Hussein, an assistant professor at the University of Washington in Seattle, is shown with the Intel field-programmable gate array remote laboratory at the school. Students use a Web browser to test their hardware designs on the boards.

Students at the Universidad Publica de Navarra in Spain, gained experience with LabsLand's remote labs during class before the COVID-19 pandemic.

WHAT LABSLAND'S REMOTE LABS HAVE TO OFFER

These are just some of the 40 labs available: ● AC electronics ● Arduino robot ● Buoyancy ● Electronics ● High-pass filter circuit board ● Luxometer ● Optics ● Radioactivity ● Sonometer ● Thermographic cameras
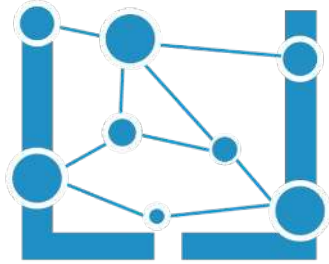
Contact us today!

fpgas@labsland.com