

FALL–WINTER 2026–2027

STUDENT PROJECT PROPOSALS

DEVELOPMENT PROJECTS IN EMBEDDED SYSTEMS

SUB-MICROSECOND DATA SYNCHRONIZATION USING PRECISION TIME PROTOCOL (PTP)

- Motivations:** The IEEE 1588 Precision Time Protocol (PTP) provides sub-microsecond synchronization accuracy over standard Ethernet, which allows aligning measurement data from an imperix controller with devices from other vendors using a precise timestamp.
- Objectives:** Implement support for PTP on a Zynq UltraScale+ MPSoC based controller and synchronize the FPGA-based acquisition system to the Hardware Time Stamping Unit (TSU). Update the existing data acquisition pipeline to use the TSU timer as the absolute timestamp base for all measurements. Quantify the system synchronization precision through experimental testing.
- Skills:** Previous experience with FPGA design is essential. Experience with SoC and embedded Linux is a plus.

HIGH THROUGHPUT DATA TRANSFER AND RENDERING FOR AN ACQUISITION SYSTEM

- Motivations:** The acquisition system of our flagship product – the B-Box 4 controller – generates massive amounts of data (about 1.9GB/s), which cannot be fully transmitted to the host computer without being previously decimated and/or compressed. On low-end computers, this is also excessive for proper rendering in real time.
- Objectives:** Evaluate and implement strategies to minimize the volume of data to transmit while preserving an accurate visual representation. The approaches to consider include data compression (lossy or lossless), down-sampling with anti-aliasing, and the on-demand fetching of full-resolution data only on the actively zoomed area.
- Skills:** Previous experience with Qt and C++ is desired. Familiarity with computer graphics and rendering is a plus.

SOFTWARE-BASED IMPEDANCE ANALYZER / VECTOR ANALYZER (FULL-STACK)

- Motivations:** Imperix is developing system identification capabilities for the Cockpit software, enabling the measurement of transfer functions or impedances for various systems. The module, however, suffers from a few limitations. An improved version is planned, leveraging more advanced signal processing inside the FPGA.
- Objectives:** Implement the FPGA-based functions required by the impedance analyzer, such as the digital signal synthesis (DSS), demodulators (lock-in amplifier stage) and multiple filters. Update the Cockpit module's implementation and user interface accordingly. Implement software support for open/short/load calibration. Run a full validation and qualification campaign in the laboratory.
- Skills:** A good command of C++ and a solid background in digital signal processing are required. Prior experience with FPGA design is also essential.

REDUNDANT COMMUNICATION FOR DISTRIBUTED CONTROL IN POWER ELECTRONICS

- Motivations:** The current implementation of the imperix "RealSync" protocol doesn't offer any redundant mode of operation.
- Objectives:** Study the possible types network redundancies and implement one. Investigate how to seamlessly switch the reference clock used for synchronization. Test and validate the work results on a realistic real-time control network using numerous imperix controllers.
- Skills:** Previous experience with FPGA design is essential.

DESIGN AND IMPLEMENTATION OF A PHASOR MEASUREMENT UNIT (PMU)

- Motivations:** Phasor Measurement Units (PMUs) are gaining importance for wide-area monitoring systems, and are generating academic interest for distributed generation in low-voltage and medium-voltage systems. At imperix, we'd like to develop a graphical PMU widget for our GUI builder, but also support the IEEE C37.118 and IEC 61850-90-5 synchrophasor standards, so that researchers can experiment with PMUs using our controllers.
- Objectives:** Implement hardware support for data collection and timestamping (embedded Linux). Pre-process/filter the data to extract valuable phasor estimators (Python). Stream the PMU data according to the suitable protocols (C/C++, embedded Linux).
- Skills:** Familiarity with multiple programming languages and embedded Linux is recommended.

YOUR PROFILE

An internship with us will suit you if:

- You are a PhD, MSc, or BSc student.
- You are looking for a 3-to-9 months on-site internship in Sion, Switzerland.
- You are seeking to work in a dynamic, fast-paced environment.
- You are self-motivated and capable of working both individually and as part of a team.
- You expect attentive supervision of your work from highly qualified engineers.
- You are looking for a position that values and makes room for your initiatives.
- You appreciate a young and friendly environment that is also serious and professional.

If you are interested in doing an internship with us, please send your CV along with a cover letter explaining your motivations and what you would bring to the team. Email correspondence should be addressed to jobs@imperix.ch. We reserve the right to maintain correspondence only with profiles that reasonably match the position requirements.

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ABOUT US

Imperix is a leading global provider of high-performance control solutions and rapid prototyping hardware engineered specifically for power electronics. Founded in 2013 as a spin-off from the Swiss Federal Institute of Technology (EPFL), the company accelerates innovation by bridging the gap between numerical simulation and physical implementation.

At the core of the Imperix ecosystem is the flagship B-Box controller family, which unites robust digital processing, the intuitive Cockpit software, and automated code generation from Simulink and PLECS. These control development solutions are complemented by a comprehensive hardware portfolio encompassing modular power stages, high-fidelity sensors, fully integrated inverters, as well as hardware and software interfaces for real-time HIL/PHIL simulation. Together, these tools empower top-tier industrial and academic R&D teams to safely test advanced control algorithms on real hardware within minutes, drastically reducing time-to-market and time-to-publication.

Headquartered in Sion, Switzerland, Imperix serves a prestigious client base across more than 50 countries. By delivering specialized, modular tools for power conversion, smart grids, motor drives, electric mobility, and energy storage, Imperix stands at the forefront of the technology enabling the global energy transition.