Curriculum Vitae

Name:	Andreas Biri
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Date of Birth:	March 1st 1994
Nationality:	Swiss

Background & education

02/2017 – 12/2018 **ETH Zürich**, Department "Information Technology & Electrical Engineering"

Master of Science (MSc) "Information Technology & Electrical Engineering"

Specializations:
- Communication
- Computer Networks
- Network Security

- Semester thesis: *"Localizing mobile nodes in a relative coordinate system"*
- Semester thesis: *"Unleashing the power of real-time Internet of Things"*
- Master thesis: *"TotTernary: A wearable platform for social interaction tracking"*

(for more details, please refer to the "Appendix" on page 5)

10/2015 – 12/2016 **Swiss Armed Forces**, compulsory military service as Swiss citizen
Finished as an officer of rank "Leutnant" (equivalent to Second Lieutenand)

09/2012 – 09/2015 **ETH Zürich**, Department "Information Technology & Electrical Engineering"

Bachelor of Science (BSc) "Information Technology & Electrical Engineering"

Average mark 5.41 / 6 (first year exams passed with mark 5.58 / 6)

07/2008 – 08/2012 **Kantonsschule Zug**, Zug

Swiss Federal Matura

Specialization:
- Physics & Applied Mathematics
- Immersion class with four subjects in English

Best male graduate in the Canton with mark 5.73 / 6

08/2006 – 07/2008 **Kantonsschule Hohe Promenade**, Zurich

Achievements

- Röthlisberger-Prize 3rd place for the Matura project „A Hexapod's Gaits"
- Award „Very good" of „Schweizer Jugend forscht" for the Matura project
- Member of the "Swiss Study Foundation", which mentors distinguished Swiss students
- One of the best 25 entries to the "Swiss Startup Awards" for student project "Banabird"
- 3rd place at the *Cyber Student Challenge* 2018 in Geneva out of 20 international teams

Work experiences

08/2015 – 10/2015 **Leica Geosystems**, Heerbrugg, as a *Software Engineer*

Design, evaluation and implementation of a two-way communication link over Long Range Bluetooth in-between laser measurement stations
- Embedded systems based on two systems designed by Leica
- Programming in C

12/2013 – 07/2015 **Banabird (Startup)**, Zurich, as *Chief Operating Officer (COO)*

Development of an online tool for writing and reading interactive stories with individual paths for personalized experiences with fellow students from ETH Zurich and University of Zurich
- Operational planning and internal coordination & management
- Designing and implementing the website, especially the entire backend using REST and Hibernate for the database access
- Programming of an Android app for mobile interaction

Attended the "Swiss Startup Awards" as one of the 25 best entries

08/2012 – 09/2012 **IBM Research Laboratory**, Rueschlikon, as a *Research Assistant*

High-frequency S-parameter measurements on a multi-channel printed circuit board designed by IBM and converting the measurements into time domain using *the Cadence/Spectre* circuit simulator

09/2010 – 10/2010 **Siemens Building Technologies**, Zug, as a *Software Engineer*

Integration of publicly available weather information and predictions over radio into a building information systems for further processing
- Embedded systems programming on the *DESIGO Tx-Open* Platform
- Programming in C++ and C# including designing the GUI

07/2010 – 08/2010 **Super Computing Systems (SCS)**, Oerlikon, as an *Intern*

Assistant of the company-wide IT Support
- Setup & Installation of workstations and servers
- Maintenance on IT infrastructure and public website
- Working with Linux and Windows operating systems

Didactical experiences

02/2015 – 08/2015 **Teaching Assistant** for Prof. Novotny
- Lecture „Elektromagnetische Felder und Wellen D-ITET"
- PVK (exam preparation course) assistant chosen by the students

09/2014 – 02/2015 **Teaching Assistant** for Prof. Steger
- Lecture „Diskrete Mathematik D-ITET"

09/2013 – 07/2014 **Teaching Assistant** for Prof. Tröster
- Lecture „Digitaltechnik D-ITET"
- PVK (exam preparation course) assistant chosen by the students

Computer Science knowledge

Programming languages

C++

- Professional programming for an audio component of a laser measurement device at *Leica Geosystems*
- Semester thesis "*Localizing mobile nodes in a relative coordinate system*" on an embedded platform using PlatformIO and Arduino Due
- Semester thesis "*Unleashing the power of real-time IoT*" using the Contiki OS and custom-built hardware running TI Microprocessors
- Practice oriented C++ & C# - programming during an internship at *Siemens*
- Lecture „Informatik 1" D-ITET ETHZ

Java

- Extensive experience in Java over more than 1 ½ years through a project with friends, during which we worked at length with JSF
- Android App programming for a semester project at ETH Zurich, for which we received the maximum grade 6
- Programming of a robot in Java for the Matura project
- Lecture „Informatik 2" D-ITET ETHZ

Various

- *Python* programming for a semester thesis, for multiple lectures as well as in Computer Science lessons at the Kantonsschule
- *JavaScript, HTML, CSS, XML & HQL* for a large web project with fellow students which was hosted on private servers
- *Matlab* through various projects at university, notably during a semester project in which we simulated the flow of pedestrians
- *Microsoft DirectShow* implementations for recording and playing audio and transmitting it over the network at *Leica Geosystems*
- Extensive practical experience with the agile project management SCRUM framework for project management of a group project
- Used to revision control systems for software such as Subversion and Git

Hardware related skills

- Extensive experience working on embedded devices through two semester theses
- Experience in the building of desktops & servers, as well as their set up & installation
- Network and problem solving skills as well as extensive knowledge with Windows

Language skills

German: Native language (C2)

English: Proficient user (C2)

Certificate of Advanced English (CAE) Grade A (91/100 Points)

- 3 years immersion classes (Biology/History/Math in English)
- optional course *English Conversation* during 1 ½ years
- three-weekly language stay in Torquay, GB (Group Advanced), Summer 09

French: Intermediate

Hobbies

Handball, hiking, jogging, general fitness, Piano, reading, ice hockey

References

Available on request

Appendix

Theses

Semester theses

"Localizing mobile nodes in a relative coordinate system" with Prof. Dr. Srdjan Capkun

- Design, implementation and evaluation for GNSS-less positioning systems using two-way UWB communication for secure distance measurements without given infrastructure
- Embedded system based on *Arduino Duo* and custom-built hardware
- Programming with C++, Python, R and Matlab using PlatformIO

Abstract: This thesis presents an infrastructure-less, scalable, real-time positioning system for mobile entities. The system is designed based on multidimensional scaling (MDS) and multilateration. One of the key features is that there is no need for fixed anchor nodes. We achieve this by leveraging multidimensional scaling to generate a relative 3D coordinate system, after which all nodes can be mobile. The system can support real-time position estimation of multiple mobile nodes with high accuracy. We evaluated systems using both simulations and a prototype implementation. The implementation achieves an accuracy of 30 cm and supports up to 40 moving nodes updating their position every second. This thesis is a first step towards evaluating the feasibility of building an infrastructure-less secure positioning system.

"Unleashing the power of real-time Internet of Things" with Prof. Dr. Lothar Thiele

- Implementation, optimization and evaluation of a paper written by Romain Jacob et al. for enabling hard real-time constraints on wireless networks with distributed applications
- Embedded system based on a custom-built platform from ETH with multiple processors
- Programming with C and Matlab on a modified version of the Contiki OS

Abstract: With the recent surge in the interest for the Internet of Things (IoT) and an increased deployment of cyber-physical systems (CPS) in commercial and industrial applications, distributed systems have gained a significant influence on modern civilization and are performing increasingly complex tasks. Building such platforms in a reliable manner is challenging, as they include concurrent tasks on the application and the communication layers. As the majority of such devices features a single processor, tasked with both communicating over the network as well as sensing and computing, real-time scheduling conflicts arise as the resource separation of the applications in software is difficult to manage.
To achieve such independence, we propose a platform consisting of dedicated application (AP) and communication (CP) processors which are completely decoupled in terms of resource access, clock speeds and power management using BOLT. Leveraging this hardware separation, we then use the Distributed Real-time Protocol (DRP) to provably provide end-to-end real-time guarantees for the communication between distributed applications over a multi-hop wireless network. By establishing a set of contracts at run-time, DRP ensures that all messages reaching their destination meet their hard deadline. To demonstrate this, we implement the BLINK scheduler directly on the AP and adapt the LWB round structure to use DRP as a control layer protocol. We show that our system is capable of supporting several hundred simultaneous streams and can respond to requests in maximally 3 stream periods over up to 10 hops.

Master thesis

"TotTernary: A wearable platform for social interaction tracking"

with Prof. Dr. Prabal Dutta (UC Berkeley) and Prof. Dr. Lothar Thiele (ETH Zurich)

- Development of a prototype social interaction tracking platform at the University of California, Berkeley in collaboration with researchers at Vanderbilt University
- Hardware design and assembly of a custom PCB including narrowband and ultra wideband RF layout for a size and weight-constraint platform
- Programming with C, JavaScript and Matlab for bare metal embedded applications

Abstract: Commercial ultra-wideband radios leverage the availability of accurate timestamps to estimate distances based on two-way time of flight measurements with centimeter accuracy and hence enable high-precision localization. Their superior performance compared to previous technology encourages the use of such devices for social interaction tracking and the study of human behaviour in various environments with high fidelity. To enable the observation of cohorts under real-life circumstances, domain scientists require an infrastructure-free and configurable solution which satisfies both the severe space and energy constraints common for such applications. Currently, no system can satisfy lifetime requirements for deployments of more than a week and achieve the decimeter accuracy sought by sociologists and epidemiologists while respecting mobility and latency demands of diverse populations.

TotTernary provides a mobile, accurate, responsive, and reliable platform for ranging measurements which allows users to gather both distance and position information with decimeter accuracy. Measuring only 61mm x 35mm and weighing 7.7 g, it integrates two radios to achieve both low-power neighbour discovery and direct user interactions using Bluetooth Low Energy as well as precise ultrawideband ranging measurements. The system leverages a novel energy-efficient ranging protocol with linear message complexity to achieve lifetimes of up to 39 days. We show how the platform can be tailored to varying scenarios by adjusting the ranging fidelity and the update rate and demonstrate the use of dynamic adaptions to changing environments. Furthermore, leveraging both antenna as well as frequency diversity, we demonstrate that the median ranging error can be reduced by up to 86% and that our system is capable of highly reliable and consistent measurements with as little as 14.8 cm of ranging error in the 99th percentile and a 90% confidence interval of 11.3 cm. This work presents the first infrastructure-free, long-term research platform which enables domain scientists to measure human interactions with previously unprecedented accuracy and flexibility.