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\*Academic age as  
defined by the SNSF

## Romain Jacob

Postdoctoral Researcher – Open Science Enthusiast

Doctorate in Computer Science  
Master in Mechanical Engineering  
Master in Pedagogy

Wireless Embedded Systems  
Automatic Control  
Engineering Sciences

5.7 FTE of research activities\*

### Main qualifications

Low-power Wireless Communication  
Computer Networks  
Embedded and Cyber-Physical Systems

Networking protocols  
Real-time Scheduling  
Formal Methods

### Education

2015–2019

Doctorate in Computer Science  
“Leveraging Synchronous Transmissions for the  
Design of Real-time Wireless Cyber-Physical System”  
Supervised by Prof. Lothar Thiele  
**ETH Zurich**, Switzerland

2011–2014

Master in “Engineering of Complex Systems”  
Advised by Prof. Jean-Jacques Lesage  
**École Normale Supérieure (ENS) de Cachan**, France

2012–2013

Agrégation in Industrial Science—Mechanics major  
*French national exam for higher education teachers*

Master in “Faculty Training for Higher Education”  
**École Normale Supérieure (ENS) de Cachan**, France

2010–2011

Bachelor in Mechanical Engineering  
**Université Pierre et Marie Curie (UPMC, Paris 6)**, France

### Languages

Native

French

Fluent

English

Basic proficiency (B1)

German

Basic proficiency (A2)

Spanish

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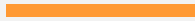
## *Experience*

2020–current	Postdoctoral Researcher Networked Systems Group, headed by Prof. Laurent Vanbever <b>ETH Zurich</b> , Switzerland
2015–2020	Doctoral Student and Scientific Assistant Computer Engineering group, headed by Prof. Lothar Thiele <b>ETH Zurich</b> , Switzerland
2013–2014	Visiting Scholar Vehicle Dynamics and Control laboratory, headed by Prof. Karl J. Hedrick <sup>†</sup> <b>University of California (UC) Berkeley</b> , CA, USA
2012–2013	Scientific Consultant Project with <b>Aldebaran-Robotics</b> , creators of Nao the humanoid robot Paris, France
2012	Research Intern Automation research group, supervised by Prof. Martin Fabian <b>Chalmers University of Technology</b> , Göteborg, Sweden

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## *Distinctions*

2019	Best Paper Award, ACM ICCPS Best Demo Award, ACM/IEEE IPSN Future Prize, second prize, <b>Ewald Marquardt Foundation</b>
2017	Finalist, <b>Famelab Switzerland</b>
2016	Finalist, "My Thesis in 180s" competition organized by <b>Nano-Tera.ch</b>
2014	Ranked 1st at the Agrégation in Industrial Science (national exam)
2013	Research scholarship from the French Academy (Walter-Zellidja Foundation)



## Supervision

Doctoral [D], master [M] semester [S] and bachelor theses [B] I (co-)supervised.  
Undergraduate projects that led to a peer-reviewed publication are marked with ●

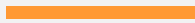
Ongoing	[D]	Alexander Dietmüller
	[D]	Tobias Bühler
2021	[S]	Kévin Selänne Process Mining for Networking
	[B]	Fredrik Nestaas In Search of Network Shifts
2020	[M]	Raphael Schnider Pushing the Internet to the Edge
2019	[M]	Anna-Brit Schaper Truth be told: Benchmarking BLE and IEEE 802.15.4
	●	
	[S]	Jan Müller Low-Power Network Design: Work Hard, Play Hard (I)
	[S]	Anna-Brit Schaper Low-Power Network Design: Work Hard, Play Hard (II)
	[S]	Antonios Koskinas Is low-power wireless networking a reproducible science?
2018	[M]	Jonathan Candel Dynamic Range Low-power Wireless Protocols for Environmental Monitoring
	[M]	Jonas Bächli Creating a Flexible Middleware for Low-Power Flooding Protocols
2017	[S]	Andreas Biri Unleashing the Potential of Real-Time Internet of Things
	[S]	Alexander Dietmüller Fault-Tolerance Mechanisms for Glossy-Based Wireless Communication Networks
	[S]	Fabian Walter Real-Time Network Functions for the Internet of Things
2016	[S]	Jonas Bächli A Protocol Gateway for the Internet of Things

## *Teaching*

2021	Seminar in Communication Networks ETH Zurich (Switzerland) <b>Co-lecturer</b>
2020 – 2021	Advanced Topics in Communication Networks ETH Zurich (Switzerland) <b>Coordinator</b>
2017–2019	Embedded Systems ETH Zurich (Switzerland) <b>Teaching assistant</b> —Laboratory classes
2017–2019	Low-Power System Design ETH Zurich (Switzerland) <b>Teaching assistant</b> —Laboratory classes
2015–2017	Discrete Event Systems ETH Zurich (Switzerland) <b>Teaching assistant</b> —Exercises
2014	Second year Mechanics course—kinematics, kinetics, and dynamics Institute of Technology of Tremblay-en-France (France) <b>Lecturer</b> —Lectures, exercises, and laboratory classes

## *Invited talks*

Tutorial Tutorial	<a href="#">Supporting Replicable Networking Experiments with TriScale</a> 4th CPS-IoTBench Workshop, Virtual (May 2021) ACM SIGCOMM (August 2021)
Invited talk	<a href="#">IoTBench: Reproducibility challenge in wireless networking research</a> 5th CROSS Symposium, Virtual (October 2020)
Invited talk	<a href="#">Confidence in experimental evaluations: Time to do better than “Believe me, it’s true!”</a> EWSN Conference, Lyon, France (February 2020)
Seminar	<a href="#">Leveraging Synchronous Transmissions for the Design of Real-time Wireless Cyber-Physical Systems</a> INSA Lyon, Lyon, France (February 2020)
Invited talk	<a href="#">IoTBench—Past, present, and future of a community-driven benchmarking initiative</a> CPS-IoTBench Workshop, Montréal, Canada (April 2019)
Seminar Seminar	<a href="#">Providing Guarantees in Wireless Cyber-Physical Systems</a> TU Delft, Delft, The Netherlands (January 2018) Chalmers, Göteborg, Sweden (August 2018)



### *Scientific service*

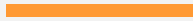
2021	PC Member	<ul style="list-style-type: none"><li>■ ACM SIGCOMM—Artifact Evaluation</li><li>■ ECRTS—Artifact Evaluation</li><li>■ JSys—Artifact Evaluation</li><li>■ JSys—Networking Area</li></ul>
2020	Organizer	CPSIoT Bench Workshop
	Reviewer	<ul style="list-style-type: none"><li>■ PeerJ Computer Science</li><li>■ MDPI Sensors</li></ul>
	PC Member	<ul style="list-style-type: none"><li>■ ACM SIGCOMM—Artifact Evaluation</li><li>■ IEEE RTSS—Artifact Evaluation</li><li>■ DATA Workshop</li><li>■ FAILSAFE Workshop</li></ul>
2019	Organizer	CPSIoT Bench Workshop
	Reviewer	MDPI Information
2018	Web chair	CPS Bench Workshop
	Reviewer	MDPI Sensors
2017	Reviewer	Information Sciences













2017–current  
2020  
2017–2020  
2019  
  
2016–2018  
2014–2015  
2011–2013


*University service*



Co-president	<b>VMITET</b> —Representative of the scientific staff in my department
Committee	Student panel for faculty hiring committee (twice)
Representative	International Forum, ETH Zurich
Committee	Student panel for faculty hiring committee
Workshop facilitator	ETH Symposium on Doctoral Supervision
Board member	<b>AVETH</b> —Leader of the Politics Team (2016–2017)
Representative	Scientific Council, ENS Cachan
Representative	Student Council, ENS Cachan










Webpage   
Paper   
Software   
Video 



Paper   
Presentation   
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Software   
Poster   
Webpage 

Best Paper Award 

Paper   
Video 

Paper   
Presentation   
Software   
Webpage 

Paper   
Presentation   
Software 

Paper   
Presentation 

## *Selected publications*

TriScale: A Framework Supporting Replicable Performance Evaluations in Networking  
Romain Jacob, Marco Zimmerling, Carlo Alberto Boano, Laurent Vanbever, Lothar Thiele  
Under submission (2020)

[triscala.ethz.ch](https://triscala.ethz.ch)  
[doi:10.5281/zenodo.3464273](https://doi.org/10.5281/zenodo.3464273)  
[github.com/romain-jacob/triscala](https://github.com/romain-jacob/triscala)  
[youtu.be/KVA0MZszl-4](https://youtu.be/KVA0MZszl-4)

The Time-Triggered Wireless Architecture  
Romain Jacob, Licong Zhang, Marco Zimmerling,  
Jan Beutel, Samarjit Chakraborty, Lothar Thiele  
ECRTS (2020)

[doi:10.4230/LIPIcs.ECRTS.2020.19](https://doi.org/10.4230/LIPIcs.ECRTS.2020.19)  
[doi:10.3929/ethz-b-000422402](https://doi.org/10.3929/ethz-b-000422402)  
[youtu.be/WWWtUFUAcXQ](https://youtu.be/WWWtUFUAcXQ)  
[github.com/romain-jacob/TTW-Artifacts](https://github.com/romain-jacob/TTW-Artifacts)  
[osf.io/jh9pg](https://osf.io/jh9pg)  
[ttw.ethz.ch](https://ttw.ethz.ch)

Feedback Control Goes Wireless:  
Guaranteed Stability over Low-power Multi-hop Networks  
Fabian Mager, Dominik Baumann, Romain Jacob,  
Lothar Thiele, Sebastian Trimpe, Marco Zimmerling  
ICCPs (2019)

[doi:10.1145/3302509.3311046](https://doi.org/10.1145/3302509.3311046)  
[youtu.be/1i6oBsat\\_Ww](https://youtu.be/1i6oBsat_Ww)

Synchronous Transmissions Made Easy: Design Your Network Stack with Baloo  
Romain Jacob, Jonas Bächli, Reto Da Forno, Lothar Thiele  
EWSN (2019)


[doi:10.3929/ethz-b-000324254](https://doi.org/10.3929/ethz-b-000324254)  
[doi:10.3929/ethz-b-000328814](https://doi.org/10.3929/ethz-b-000328814)  
[github.com/ETHZ-TEC/Baloo](https://github.com/ETHZ-TEC/Baloo)  
[romainjacob.net/baloo](https://romainjacob.net/baloo)

End-to-End Real-Time Guarantees in Wireless Cyber-Physical Systems  
Romain Jacob, Marco Zimmerling, Pengcheng Huang, Jan Beutel, Lothar Thiele  
RTSS (2016)

[doi:10.3929/ethz-a-010881673](https://doi.org/10.3929/ethz-a-010881673)  
[osf.io/ckdv4/](https://osf.io/ckdv4/)  
[github.com/romain-jacob/drp](https://github.com/romain-jacob/drp)

Overview of discrete event systems opacity: Models, validation, and quantification  
Romain Jacob, Jean-Jacques Lesage, Jean-Marc Faure  
Annual Reviews in Control (2016)

[doi:10.1016/j.arcontrol.2016.04.015](https://doi.org/10.1016/j.arcontrol.2016.04.015)  
[osf.io/qtxra/](https://osf.io/qtxra/)



## *Open source projects*

### Dataset

Synchronous transmissions on Bluetooth 5 and IEEE 802.15.4

Dataset and analysis scripts of a replication study of synchronous transmissions using the nRF52840 Dongle

[10.5281/zenodo.3964354](https://doi.org/10.5281/zenodo.3964354)

Data visualization: [explore-st-data.ethz.ch](https://explore-st-data.ethz.ch)

### Software

TriScale

Framework helping to make the experiment design and data analysis more replicable

[github.com/TriScale-Anon/triscale](https://github.com/TriScale-Anon/triscale) (temporary repository)

### Software

Time-Triggered Wireless Architecture

Public software and artifacts related to the Time-Triggered Wireless Architecture project

[10.5281/zenodo.3759221](https://doi.org/10.5281/zenodo.3759221)

### Dataset

Wireless Link Quality Estimation on FlockLab – and Beyond

Dataset of wireless link quality estimation for the [FlockLab testbed](#)

[10.5281/zenodo.3354717](https://doi.org/10.5281/zenodo.3354717)

### Software

Baloo

Design framework for network stacks based on Synchronous Transmissions

[10.5281/zenodo.3510171](https://doi.org/10.5281/zenodo.3510171)

### Software

The Distributed Real-time Protocol

Simulation code and experiment results for the Distributed Real-time Protocol project

[10.5281/zenodo.3530757](https://doi.org/10.5281/zenodo.3530757)


### Software

The Low-power Wireless Bus

Implementation of LWB for the TelosB mote

[github.com/ETHZ-TEC/LWB-Baseline](https://github.com/ETHZ-TEC/LWB-Baseline)





Past and current  
collaborators

## *References*

Prof. Dr. Lothar Thiele  
ETH Zurich (Switzerland)  
[thiele@ethz.ch](mailto:thiele@ethz.ch)

Prof. Dr. Laurent Vanbever  
ETH Zurich (Switzerland)  
[lvanbever@ethz.ch](mailto:lvanbever@ethz.ch)

Prof. Dr. Jean-Jacques Lesage  
ENS Paris-Saclay (France)  
[jean-jacques.lesage@ens-paris-saclay.fr](mailto:jean-jacques.lesage@ens-paris-saclay.fr)

Dr. Marco Zimmerling  
TU Dresden (Germany)  
[marco.zimmerling@tu-dresden.de](mailto:marco.zimmerling@tu-dresden.de)

Independent experts

Prof. Dr. Thiemo Voigt  
Uppsala Universitet (Sweden)  
RISE Computer Science (Sweden)  
[thiemo.voigt@it.uu.se](mailto:thiemo.voigt@it.uu.se)

Prof. Dr. Martina Maggio  
Saarland University (Germany)  
Lund University (Sweden)  
[martina.maggio@control.lth.se](mailto:martina.maggio@control.lth.se)

Prof. Dr. Sanjoy Baruah  
Washington University in St. Louis (USA)  
[baruah@wustl.edu](mailto:baruah@wustl.edu)

Reference for university  
representation and outreach

Prof. Dr. Sarah Springman  
ETH Zurich (Switzerland)  
[sarah.springman@sl.ethz.ch](mailto:sarah.springman@sl.ethz.ch)

## Contribution to the generation of knowledge

During my doctoral studies, I demonstrated that the wireless communication technique known as **synchronous transmissions** (*ST*) allows designing (wireless) cyber-physical systems with provable end-to-end real-time guarantees. To facilitate the use and adoption of that technique, I developed *Baloo*,<sup>1</sup> a tool providing a high-level programming interface to design communication protocols based on *ST*. *Baloo* allows a non-expert to specify the communication protocol logic (i.e., when each device sends its packets) without worrying about the low-level radio control, which is particularly challenging due to the stringent time synchronization requirements of the technique (orders of  $\mu s$ ). This facilitates the application of synchronous transmissions to new domains and contexts. Using synchronous transmissions, I designed two wireless cyber-physical systems providing real-time guarantees for distributed cyber-physical system applications. These systems have been implemented and are openly available.<sup>2</sup> In particular, the Time-Triggered Wireless design has been used to demonstrate the **first-ever remote closed-loop control of inverted pendulums over a multi-hop wireless network**. This work received the ICCPS Best Paper<sup>3</sup> and IPSN Best Demo<sup>4</sup> awards in 2019, as well as one of the Future Prizes of the Ewald Marquardt Foundation<sup>5</sup> recognizing “its potential for innovation and industrial applications” (yet to be announced publicly).

In addition, I worked on improving the **replicability of networking experiments**, which is made particularly challenging by the inherent variability of the experimental conditions. I explored the statistics literature to identify appropriate approaches and used these to define a concrete and rationale methodology for the design and analysis of experiments. This methodology has been implemented in a framework called *TriScale*<sup>6</sup> which is openly available for the different networking communities to use, extend, and build upon.<sup>7</sup> In 2020, I was invited to present this work at the EWSN conference<sup>8</sup> and the CROSS symposium.<sup>9</sup>

I strongly believe in **openness and sharing in science**. I strive to publish tools and datasets to enable the community to build upon my own research; one of our datasets shows more than 800 downloads<sup>10</sup> which illustrates the community’s need for such contributions. In a similar spirit, I invested some efforts to realize a replication study<sup>11</sup>—an underrated research contribution in our field. We not only published our code and dataset; we went the extra mile and released an online app to visualize and explore the data.<sup>12</sup>

## Contribution to the development of projects and individuals

I see research as a collaborative endeavor that benefits from the expertise of multiple people. During my doctorate, most of my projects were **international collaborations** in which I had the driving seat; I believe I efficiently managed those projects, collected opinions before making decisions, distributed tasks, and ultimately drove these projects toward a satisfactory conclusion. The largest project I have been involved in (IoT Bench, see “Wider research community” below) brought together more than ten professors and young researchers from around the world. While still a doctoral student, I took on the responsibility of managing this project for a couple of years, after the initiator left academia.

I am really **passionate about teaching** and always welcome opportunities to help students learn. My first experience was in 2014 when I taught a second year university-level

<sup>1</sup> [romainjacob.net/baloo](http://romainjacob.net/baloo)

<sup>2</sup> [tw.ethz.ch](http://tw.ethz.ch)  
[github.com/romain-jacob/drp](https://github.com/romain-jacob/drp)

<sup>3</sup> [10.1145/3302509.3311046](https://doi.org/10.1145/3302509.3311046)

<sup>4</sup> [10.1145/3302506.3312483](https://doi.org/10.1145/3302506.3312483)

<sup>5</sup> [www.stiftung-ewaldmarquardt.de/de/der\\_zukunftspreis](http://www.stiftung-ewaldmarquardt.de/de/der_zukunftspreis)

<sup>6</sup> [10.5281/zenodo.3464273](https://doi.org/10.5281/zenodo.3464273)

<sup>7</sup> [10.5281/zenodo.3451417](https://doi.org/10.5281/zenodo.3451417)

<sup>8</sup> Presentation: [osf.io/aktn7/](https://osf.io/aktn7/)

<sup>9</sup> Presentation: [osf.io/m7a6w/](https://osf.io/m7a6w/)

<sup>10</sup> [10.5281/zenodo.3354717](https://doi.org/10.5281/zenodo.3354717)

<sup>11</sup> [10.3929/ethz-b-000442044](https://doi.org/10.3929/ethz-b-000442044)

<sup>12</sup> [explore-st-data.ethz.ch](https://explore-st-data.ethz.ch)

Mechanics course on kinematics, kinetics, and dynamics at the Institute of Technology of Tremblay-en-France (France). During my doctorate, I worked as a teaching assistant in *Embedded Systems*, *Low-Power System Design*, and *Discrete Event Systems* lectures. I am currently responsible for the coordination of a Master-level course on *Advanced Topics in Communication Networks*, which we completely renewed and adapted to a fully-online format; a new—and time-consuming—but very interesting challenge! We plan to make our material openly available at the end of the semester.

<sup>13</sup> [romainjacob.net/students](http://romainjacob.net/students)

I am also **active in research supervision**. I supervised a number of semester and master theses,<sup>13</sup> always trying to set the students' learning opportunities first. As a postdoctoral researcher, I am currently co-supervising two doctoral students, one of which happen to have already done a semester thesis with me three years ago! Helping to nurture their research skills is one of the most satisfying part of my job at the moment.

### *Contribution to the wider research community*

<sup>14</sup> [iotbench.ethz.ch](http://iotbench.ethz.ch)

My research in wireless communication made me aware of the so-called “reproducibility crisis” that plagues many research fields and is particularly challenging in wireless experiments. This led me to be heavily involved in **IoT Bench**,<sup>14</sup> a community-driven effort aiming to **establish benchmarks** for low-power wireless communication. With IoT Bench, we reflected on tools and methods to improve the replicability of experimental evaluations in our field, resulting in the *TriScale* work (see “Generation of knowledge”). In addition, we organized a series of international workshops<sup>15</sup> to raise awareness in our community and discuss practical solutions. In this forum, I presented some of my own work as well as the vision and goals of IoT Bench.<sup>16</sup>

<sup>15</sup> [cpsbench2018.ethz.ch](http://cpsbench2018.ethz.ch)  
[cps-iotbench2019.ethz.ch](http://cps-iotbench2019.ethz.ch)  
[cps-iotbench2020.ethz.ch](http://cps-iotbench2020.ethz.ch)  
<sup>16</sup> [10.3929/ethz-b-000339242](https://doi.org/10.3929/ethz-b-000339242)

Naturally, I also serve as reviewer for the work of others. I have been involved in so-called Artifact Evaluation committees, which aim to foster research data and code sharing. I recently reviewed for such committees at the ACM SIGCOMM and IEEE RTSS conferences. I also served as program committee member for the FAILSAFE and DATA workshops.

I believe in the principles generally known as “**Open Science**.” In my work, this implies e.g., favoring open and free software over commercial tools and submitting to open access conferences. Moreover, I try to systematically release data and code with all publications, aiming to make any plot or experiment reproducible by others; I believe this should be a standard in science. About a year ago, I wrote down my own objectives and expectations regarding the way I intend to do research; this has materialized into a “**Pledge to Open Science**” which is publicly available on my personal website.<sup>17</sup> I will do my best to live and work by these principles because I believe this is the right thing to do.

<sup>17</sup> [romainjacob.net/pledge-to-open-science](http://romainjacob.net/pledge-to-open-science)

<sup>18</sup> [jsysr.org](http://jsysr.org)

In addition, I am involved in the launch of a **new diamond open access journal**<sup>18</sup> (i.e., free to read, free to publish) called JSys and covering the wide scope of computer science systems research. This project is entirely driven by researchers and aims to offer an inclusive, high-quality, and high-throughput venue for systems research, which is currently suffocating within the conference-based publishing model. The journal is hosted by the University of California Digital Library which provides infrastructure and support free of charge. The journal is just getting public now, and we expect the first call for papers to be published early 2021. This is a time-consuming commitment but I believe a worthy one; if

we succeed, JSys will have an important impact in our research community in the long run.

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## Contribution to the broader society

I try to communicate about my research to a wide audience, which I consider being a part of my job as a scientist. In this spirit, I took part in various science communication activities, such as producing short videos and giving 3-minutes talks.<sup>19</sup>

<sup>19</sup> [romainjacob.net/science-communication](http://romainjacob.net/science-communication)

During my doctorate, I actively contributed to the **representation of the scientific staff**. In 2016, I directed a survey on the supervision of doctoral students<sup>20</sup> which highlighted some systematic issues, triggered many discussions and actions taken by ETH, and resulted in a revision of the regulations of doctoral studies (currently ongoing). Since 2017, I co-preside VMITET, the association of the scientific staff in my department,<sup>21</sup> where I have been actively involved in representation activities towards the department management.

<sup>20</sup> [10.3929/ethz-b-000262661](https://doi.org/10.3929/ethz-b-000262661)

<sup>21</sup> [vmitet.ethz.ch](http://vmitet.ethz.ch)

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## Personal statement

As a scientist, I am very sensitive to the problems related to the **replicability of research findings**. If I become faculty, I want to raise awareness of these issues and mentor my students to produce replicable research and follow the principles of Open Science.

As a teacher, I want to be in close contact with students for both in teaching and mentoring. The most important thing I want to pass on is **critical thinking**: do not simply do as you are told; listen carefully to opinions and advice, but make up your own mind!

As a researcher and engineer, I want to work on some of today's concrete challenges. As such, I believe collaboration with **industry partners and governmental institutions** can be extremely useful and efficient. This is something I do not yet have experience with, but I would like to make this happen as a faculty.

Finally, as a leader, I want to foster a **healthy work environment**. Well-being is important not only for oneself but for the entire group; good time management, organization, and friendly co-workers go a long way in generating intrinsic motivation and driving the entire team to do great work. I want to help my mentees finding a right balance between work and other activities that are important to them; because it is human, and because I believe this is how one can have a successful yet sustainable life and career in the long run.