

CPS-IoTBench 2019

Summary and take-aways

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The proceedings of the workshop can be downloaded from
<https://dl.acm.org/citation.cfm?id=3312480>

Workshop papers and speakers' presentation
are available on the workshop website
<https://cps-iotbench2019.ethz.ch/program/>

Keynote: Christian Collberg - Dare to Share

Opening research data is important, for at least three reasons

- Repeatability (reproduce on same setup)
- Reproducibility (reproduce on different setup)
- Benefaction (improvement on current state)

Artefacts are not often made available. To get it, one must be able to contact the authors! In some conferences/journals, contact email are not always provided. The problem is even worse with email bounces once people change affiliations, or when they die (don't laugh, that's a real thing).

A key hurdle for sharing artefact is the lack of incentive (not enough/no reward), while the time and efforts required to produce good/useful artefacts is significant.

This could be changed by working on both technical and sociological incentives.

- Facilitate sharing of artefact
 - checklist of "what to think about" (could such a checklist be obtained somewhere?)
 - Indexing websites such as [FindResearch.org](https://www.findresearch.org/)
 - Using tools such as ReProZip (<https://www.reprozip.org/>) or VisTrail (https://www.vistrails.org/index.php/Main_Page)
- Reward sharing
 - ACM badges
 - Organizing artefact evaluation committees, maybe even sharing awards?

- Constraint sharing
 - Some journals do that (e.g., some economics journal): Papers are sent for review only once the artefacts are available. It is somewhat extreme, but effective!
 - Demand a sharing statement or contract in all papers; something like: "The authors commit to make the artefacts available and maintain them for at least 3 years." This **does not mean you have to share**; but if you don't (whatever the reason), you must state it: "The authors do not share the artifacts related to this work". That might already be a strong incentive...
- Improve education
 - In the US, there is currently no courses (or very few) on research methodology in CS, while this is done in other fields and/or countries. Such courses are necessary and should be offered everywhere.
 - Some Professors even go further and made a public statement about fostering reproducible research in their group. See e.g., <http://lorenabarba.com/gallery/reproducibility-pi-manifesto/>

Objectively, there are both (potential) risks and rewards for sharing research artifacts

- Reward
 - More trust when artefacts are shared
 - Increased visibility
- Risk
 - May endanger your credibility (if/when errors are found)
 - Unclear return on investment

At the end of the day, everybody can do something to improve repeatability and artifact sharing

Educators Create/Participate in a "research methodology" course in your university.
Researchers Prepare to share from day 1.
Editors Ask for artifact sharing statements and contact emails in every paper.
Funders Ask for artifact sharing (e.g., code), not just the data.

Open discussion and closing

Should the workshop happen again?

- The workshop is a useful platform for the community. It would be a great place to publish reproducibility studies.
Note Reproducibility studies were already welcome in this year's workshop, but none has been submitted...
- The closeness in spirit with the [SenSys DATA](#) workshop has been pointed out. It might be good for the two groups to join forces (maybe in one joint workshop?)
- The workshop is a good way of pushing IoT Bench forward.
- Who would be willing to organize it next year?

How to move forward with IoTBench?

- Currently, one important driving force is the Dependability Competition. It is not yet clear how the competition will evolve in 2020. The needs/requirements for a competition might be different from those of IoTBench (more focused on repeatability).
- To be credible, we (the community) needs to start applying the method and using the experimental framework that IoTBench proposes. The ideas are there but there is still some work needed to formalized them and make them usable (there is an ongoing Master Thesis at ETH which may help in that respect).
- It seems more and more clear that IoTBench cannot be sustained by academia:
 - Lack of funding makes it very difficult to dedicate enough time and manpower into driving the initiative, building/maintaining the infrastructure, etc.
 - Moreover, the work is largely engineering, especially in the long-run, so there is a lack of interest for academics to drive this thing forward
- However, it seems that industry is calling for something like IoTBench. A way forward might be to reach out to some companies to invest on the idea: "you/your client need to benchmark networking solutions? Here is how it must be done".
- The vision would be that a company could sell this as a service. However, it must be kept in mind that academics should still be able to access the facilities/contribute their own protocols/etc., free of charge (or very cheap).
- Potential industry/external interested parties
 - [Digital Catapult](#) (innovation technology center in UK) is particularly interested in contributing to/driving IoTBench as most of the companies approaching its IoT team are looking for "the best networking solution for my use-case", "most accurate localization solution for my indoor/outdoor asset tracking scenario", "which technology should I invest in: LoRa, Sigfox, NB-IoT", "which solution has the longest lifetime given my application requirements...", "which nodes/gateways should I buy for my use-case", "what are the energy harvesting solutions that are available now, what is gonna be available from now in 2 or 5 years, which one is best for my use-case" etc. Moreover, the industrial partners are interested in the lab based, hands-on analysis of platform/protocol capabilities and usability and in performance testing for the assessment of production-scale technical durability (some even allow deployments on their site for testing the solutions in the final target environment); there is high interest in geo-location technology benchmarking, LPWAN device benchmarking, comparison of network technologies for specific use cases.
 - [EEMBC](#). What we envision is very similar to what they do. We could reuse their model; or maybe even directly include IoTBench within EEMBC?