

Pitch-In IoT Student Placements Report

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Introduction

The University of Sheffield is setting up a LoRaWAN network beginning in Sheffield City but with the ambition of providing coverage across Sheffield City Region, supplementing the work already done in Barnsley. To help develop some prototypes and code that showcases the network's potential to our campus community and local business, Pitch-In supported a 10-week student placement programme for engineering undergraduates from 22 June to 28 August 2020.

The principle aim of these student projects was to provide both system designs, and documentation of some simple but extensible wireless IoT projects. A common and critical block to the adoption of IoT technologies and to the success of small and medium enterprise IoT ventures is the difficulty of producing a proof of concept prototype. Additionally, a thorough and well-grounded understanding of the complexity of different aspects of the (software and electronic) engineering can inform more successful project plans and budgets. By creating case studies with freely available software and hardware designs, as well as documented engineering experiences, the student projects give local and regional enterprises a measurable starting point for their own work.

Following a recruitment process, 11 undergraduate engineering students were selected from second, third, and fourth year of Undergraduate study in various Engineering disciplines (including Computer Science, Electronic Engineering, and Control Systems). The students created a range of project ideas, engaging with their mentors and external people/organisations to do so.

Project Management and Mentoring team

- Ramsay Taylor – University Teacher in the Dept. of Computer Science and IoT expert
- Steve Jubb – University Technical Manager and IoT expert
- Mike Faulks – CTO Ioetec and IoT cybersecurity specialist
- Walter Bassage - Research Assistant at The University of Sheffield
- Ceri Batchelder – University Entrepreneur in Residence and regional IoT ecosystem experience
- Alex Kelly – IT Manager, Tinsley Bridge

Student project topics

- Ahmed Haroun: Temperature Monitoring in Industrial applications
- Ammar Aboagwa: Energy management for the manufacturing sector
- Kennedy Dike/Onyeka Obidiegwu: RFID tag reader as a LoRaWAN application
- Mark Harris: Remote heart monitoring for the healthcare sector

- Mo-anna Tucker: Indoor and outdoor air quality monitoring
- Nathan Brown/Harrison Fretwell: Predictive maintenance of legacy equipment at AMRC
- Robert Bruce: Integrating Local and Wide Area Networks for Use by Smart Buildings
- Seth Roberts: Analysing the use of bicycles in a city environment
- Tom Edwards: Asset Security using Bluetooth Beacons and LoRaWAN

How did the projects go?

When the project was conceived it was anticipated that we would operate in the Diamond, with access to the various lab facilities there. Due to the 2020 Covid pandemic, the students had to work remotely, from their residences either in Sheffield or at their family homes.

Whilst the remote delivery of the project wasn't ideal, we managed to create a sense of community through the regular standups, high level of availability of mentors and technical support and the Slack group.

Our biggest challenge was certainly the lack of hardware for the individual students. Due to various aspects of the students' remote working, we were not able to supply them with electronic components through the project. Some students had access to some components of their own, whilst others were able to pivot their projects to concentrate on the software elements.

The individual student work was collated into a GitHub repository which is publicly available. Additionally, each of the students has provided a report that documents their work and the accumulated experience in their particular sphere. These are all available from the links in the "Project Outcomes" section below.

Which external people/organisations were involved?

Alex Kelly, *IT Manager, Tinsley Bridge* – Alex was hugely enthusiastic and involved, joining our weekly standups and mentoring several of the student projects [Ammar Aboagwa, Ahmed Haroun, Tom Edwards, Onyeka Obidiegwu and Kennedy Dike]

Tracey Johnson, *Barnsley Digital Media Centre* – Tracey enabled Mo-anna Tucker and Steve Jubb to work with Declan Kiely, ICT Engineer, to install a number of air quality sensors at the DMC.

David King, *Digital Design Manager, AMRC* – David was supportive of a project to install sensors at the AMRC, but this project had to pivot to look at network security issues due to the lack of hardware [Harrison Fretwell and Nathan Brown]

Tracy Cook, *Education and Training lead for Diagnostic Cardiology at Sheffield Teaching Hospitals NHS Foundation Trust* [Mark Harris]

Chris Dymond, *Unfolding Ltd and Smart Sheffield* – Chris was very helpful in talking to Robert Bruce about technology for smart cities.

Russell's Bicycle Shed – Russell and his colleague Theo showed some interest in supporting Seth, but the logistics were difficult with Seth being in Canada [Seth Roberts]

Dr Andy Gilchrist, *Business Development Manager in Oxford University* and part of Pitch-In [Ammar Aboagwa]

Dr. Ben M Thomas, *Research Associate, Dept. Materials Science & Engineering, University of Sheffield* - Sheffield Titanium Alloy Research (STAR)

Victor Leh *Missing Link*, a Finnish startup company specialising in wireless security solutions [Tom Edwards]

Dyanda Salshabyll, *isoenergy* - Dyanda is a University of Sheffield student carrying out a year placement as a design engineer [Ammar Aboagwa]

Project Outputs

[GitHub](#)

<https://github.com/ramsay-t/IoTInternships>

[Student presentations](#)

<https://drive.google.com/drive/folders/1VEdakBzl9plrR-9NIkR7Oz83btZ4Dqe4?usp=sharing>

[Student reports](#)

<https://drive.google.com/drive/folders/1OHfeRVr3Vijmx9cO0gySalqFTpy7g-9T?usp=sharing>

Appendices

APPENDIX 1

Selection of Student LinkedIn posts

Nathan Brown

• 1st

4th Year MComp Computer Science Student

1mo • 1 month ago

Excited to take part in this [Sheffield IoT Meetup] presentation as an intern, the experience so far has been great and excited to show my projects progress and hear from others! [#Sheffield](#) [#IoT](#)

Harrison Fretwell

• 1st

Final Year Artificial Intelligence and Computer Science Masters Student

4d • 4 days ago

Really delighted to have been a part of the Pitch-in [#IoT](#) project. Being able to work with the other students to solve some interesting problems in developing solutions for the [#LoRaWAN](#) network has been an amazing opportunity, and even more so in the midst of a global pandemic. It's been a great experience and one I'm proud to have been a part of!

Onyeka Obidiegwu

• 2nd

Vice president human capital at Sheffield consulting Society.

2d • 2 days ago

Delighted to be able to complete a ten week, internet of things summer internship, sponsored by Pitch-in and in collaboration with the University of Sheffield.

The summer internship involved working on a project which makes use of LoRaWAN so as to be able to test the LoRaWAN network currently being set up in Sheffield.

I worked on this project alongside [Kennedy Dike](#) and in collaboration with [Alex Kelly](#) from Tinsley bridge. Elated to say that we were able to successfully build an RFID tag reader which sends information to the things network console using LoRaWAN. We were also given the opportunity to present in both Sheffield summer IOT meetups, hence improving my presentation skills.

I would like to thank [Ceri Batchelder](#) and [Ramsay Taylor](#) for helping organize the program and also [Steve Jubb](#), [Walter Bassage](#) and [Michael Faulks](#) for their assistance in various technical issues we came across. Lastly, I would like to thank Pitch-In for funding this internship and therefore giving me an opportunity to improve my understanding of LoRaWAN and it's applications. [#internetofthings](#) [#LoRaWAN](#) [#summerinternship](#) [#Engineering](#) [#university](#) [#opportunity](#) [#collaboration](#) [#network](#) [#innovation](#)

Mo-anna Tucker

• 1st

Reliability Centered Maintenance Placement Engineer at Recycling Technologies Ltd

5h • 5 hours ago

On Friday I finished my Pitch-In summer placement with the University of Sheffield. I really enjoyed learning more about the hardware and software of LoRaWAN technology. As part of this placement I looked at how LoRaWAN and The Things Network can be used to monitor indoor air quality and used Node Red and Grafana to display data.

Thank you to [Tracey Johnson](#) for allowing me to work with the DMC in Barnsley to monitor indoor air

quality.

Also, thank you [Steve Jubb](#), [Michael Faulks](#), [Walter Bassage](#), [Ramsay Taylor](#) and [Ceri Batchelder](#) for all of your help through these strange times.

[#lorawan](#) [#grafana](#) [#ttn](#)

Kennedy Dike

• 1st

Student at The University of Sheffield

2h • 2 hours ago

Delighted to have completed the 10-week long Internet of Things Summer Placement organised by The University of Sheffield. This project has enabled me explore the huge potential of LoRaWAN network, which I never used before I started this placement.

The project was to design a system that sends information from an RFID tag reader to The Things Network using LoRaWAN. I worked with [Onyeka Obidiegwu](#) and also collaborated with [Alex Kelly](#), from Tinsley Bridge, for the full duration of the placement. Fortunately for us, we were able to achieve our goal.

This placement taught me a whole lot in regard to project management, problem solving, responsibility, remote working amongst others. It was not smooth sailing throughout as we had to overcome some difficulties during the project, but, this only made me become a better Engineer than I was before I started. It was my first foray into any kind of work outside University related projects and I am happy that it was a success.

I would like to say a big thank you to [Ceri Batchelder](#), [Ramsay Taylor](#), [Walter Bassage](#), [Steve Jubb](#) and [Michael Faulks](#) who organised and helped us during the project even during unprecedented times. [#internship](#) [#lorawan](#) [#summerplacement](#) [#internetofthings](#) [#iot](#)

APPENDIX 2

Alex Kelly

• 1st

IT Tinsley Bridge - First Class Honours Degree in Computing - Over 15 years working in IT in a range of diverse sectors

4d • 4 days ago

A big thank you to LORAWan intern team [Ceri Batchelder](#) [Ramsay Taylor](#) [Michael Faulks](#) [Steve Jubb](#) for putting it together. It was fun mentoring/setting challenges for the team [Onyeka Obidiegwu](#) [Ammar Aboagwa](#) [Mo-anna Tucker](#) [Mark Harris](#) (and others) and helping out. Hope its inspired to the possibilities for an exciting technology for the region. [The University of Sheffield](#), [AMRC](#), [Sheffield Digital Limited](#), [#iot](#) [#lorawan](#) [#i40](#) [#industry4point0](#) [#smartsheffield](#)
<https://lnkd.in/eXQF2-Q> [#mentoring](#) [#innovation](#)

[Link to post and video](#)