



## **School of Computing, Engineering, and the Built Environment Edinburgh Napier University**

### **PHD STUDENT PROJECT**

#### **Funding and application details**

**Funding status:** Self funded students only

**Application instructions:**

Detailed instructions are available at <https://blogs.napier.ac.uk/scebe-research/available-phd-student-projects/>

*Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.*

#### **Project details**

**Supervisory Team:**

- DIRECTOR OF STUDY: Matthew Broadbent (Email: M.Broadbent@napier.ac.uk)
- 2<sup>ND</sup> SUPERVISOR:

**Subject Group:** Cyber-security and system engineering

**Research Areas:** Computer Science – Networks, Engineering - Communications Engineering

**Project Title:** Realising Internet-scale Network Telemetry

**Project description:**

The Internet is a vital conduit to many part of our daily lives. From banking to education, it has become an integral part of how society functions and operates. Fundamentally, the Internet is made of up of many smaller networks, each of them varying in scale and technology.

This poses a significant challenge when it comes to optimising and troubleshooting networks on a macro scale; many of these infrastructures will be operated by different organisations, often with different motivations and values.

This PhD will explore how emerging technologies can be used to capture information from every part of the network, combining this together to provide an end-to-end picture across many different domains.

There are several challenges associated with this, including the heterogeneity of network topologies and technologies, organisational barriers to sharing and the privacy implications of doing so. The focus of this PhD will be determined by the candidate's interests and experience.

**References:**

- [1] Network Telemetry Framework: <https://www.ietf.org/archive/id/draft-ietf-opsawg-ntf-11.html>
- [2] P4: programming protocol-independent packet processors: <https://dl.acm.org/doi/abs/10.1145/2656877.2656890>
- [3] In-band Network Telemetry (INT) Dataplane Specification: [https://p4.org/p4-spec/docs/INT\\_v2\\_1.pdf](https://p4.org/p4-spec/docs/INT_v2_1.pdf)

## Candidate characteristics

**Education:**

A first-class honours degree, or a distinction at master level, or equivalent achievements in Computer Science or Telecommunications Engineering with a good fundamental knowledge of Computer Networks.

**Subject knowledge:**

- Computer Networks

**Essential attributes:**

- Experience of fundamental computer networking concepts and protocols
- Competent in building and evaluating technical systems
- Knowledge of software development (Python or Java preferred)
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

**Desirable attributes:**

- Experience with Software Defined Networking technologies, such as OpenFlow or P4
- Experience with the C programming language
- Experience configuring and/or running large-scale computer networks
- Knowledge of cyber security and privacy challenges associated w