STFC – NARIT 2017

Capacity Building in Software & Hardware Infrastructure and Data handling through Astronomy Scoping Projects

Justification of Resources

COMPLIANCE WITH THE DATA PROTECTION ACT 1998

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This template should be completed using Arial (or an equivalent) and a minimum font size of 11. A minimum of single line spacing and standard character spacing must be used. Margins must not be less than 2cm and the full document must be no more than **2 A4 pages**.

Summary of combined total requested

Please complete all boxes.

	In Thai Baht	In UK pounds
Thailand funding requested	2,884,000	66,566
UK funding requested	3,828,234	88,360
Total funding requested	6,712,234	154,926

UK Applicants – All PIs and Co-Is listed must be added to the JeS system

Role (PI or co-I)	Name	Organisation	Division or Department
PI	Dr. James Mullaney	The University of Sheffield	Department of Physics and Astronomy
Co-I	Dr. Krzysztof Ulaczyk	The University of Warwick	Department of Physics
Co-I	Dr. Justyn Maund	The University of Sheffield	Department of Physics and Astronomy

Thai Applicants – All PIs and Co-Is listed must be added to the JeS system

Role (PI or co-I)	Name	Organisation	Division or Department
PI	Dr.Utane Sawangwit	NARIT	Research and Development
co-I	Dr. Supachai Awiphan	NARIT	Research and Development
co-I	Dr.Natthakan Iam-	Mae Fah Luang U.	School of IT
co-I	Dr. Surapong	Mae Fah Luang U.	School of IT
co-I	Dr.Anan Eungwanichayapant	Mae Fah Luang U.	School of Science
co-I	Dr.Tossapon Boongoen	Mae Fah Luang U.	School of IT

Justification of UK costs [One A4 page maximum]

We request funding for three UK partners: Mullaney, Ulaczyk, and Maund. All are needed for their unique roles within GOTO. Ulaczyk is involved with instrument development and in-house data processing, Mullaney has experience in adapting the LSST software stack to process and analyse GOTO data, and Maund has experience in developing ML algorithms for source classification. Mullaney and Ulaczyk will devote 20% FTE to the project. Maund's FEC is funded via a Royal Society Fellowship, so he requests only travel funds to visit Thailand (see later).

We request a total of 10120 GBP to support visits to the UK by Thai partners and staff. This is broken down as follows: two staff visiting for a total of 14 days @ 100 GBP per day, one student visiting for a total of 1 month @ 60 GBP per day, one student visiting for 3 months @ 60 GBP per day (lower rate is based on self-catering rental accommodation, as opposed to hotels).

Outside the periods when the Thai students are visiting the UK, the UK partners' time will be broken down approximately as follows (averaged over the year):

- one hour preparing for the weekly telecons. Reviewing notes from the previous week's telecon and setting an agenda for the current week's telecon.
- one hour spent attending the weekly telecons.
- two hours spent reviewing the progress of the Thai students. This will involve downloading the latest updates to the software from GitHub, testing this software and determining what is required to make improvements.
- one hour addressing students' questions. More time will be allocated to this during the first few months of the project as the students get up to speed with the project.

While the students are visiting the UK, the UK partners will spend the equivalent of one day per week working with the students.

Over the 24-month period of funding, the UK partners will allocate 200 hours each to the organization and preparation of the practical workshops. This will include working with the Thai staff and students in establishing appropriate cloud-based infrastructure and material for the workshops, planning the content of the workshop and preparing lectures, practical sessions, reading material, and homeworks.

The UK partners request funding for two return economy flights to Thailand per person per year, costed at 1000 GBP per return (total 12,000 GBP). One of these return flights will be to attend the practical workshop each July. The second of these flights will be roughly six months after each workshop to spend a week working alongside the Thai partners and students. From our experience from Phase 1, these face-to-face meetings are immensely important for providing ready feedback on current progress and work with the Thai partners and students to decide the direction of the project during the remaining 5-6 months.

We also request 2000 GBP to lease computing time on Amazon Web Service's Elastic MapReduce system to test the feasibility of a HDFS GOTO database. This is based on a 4-core, 15GB memory system priced at 0.35 GBP per hour, averaging at 12 hours per day for 12 months (1520 GBP) plus 2TB storage for 12 months at 20 GBP per month (480 GBP). This also covers the cost of the using this service for the 5-day practical workshops.

The FECs for Mullaney, Ulaczyk and Maund are broken down as (values in brackets give STFC's 80% contribution; all values in GBP):

Mullaney (The University of Sheffield):

- Dir. Incurred: Travel: 4000 (3200); Computing: 2000 (1600); Visits: 10120 (8440)
- Dir. Alloc: Investigators: 23843 (19074), Estates: 4754 (3803), Infrastructure: 429 (343)
- Indirect: 15577 (12462)

Ulaczyk (The University of Warwick):

- Dir. Incurred: Travel: 4000 (3200)
- Dir. alloc.: Investigators: 18644 (14915), Estates: 6578 (5262), Infrastructure: 308 (246)
- Indirect: 16198 (1298)

Maund (The University of Sheffield):

- Dir. Incurred: Travel: 4000 (3200)

Total: 110460 (88360)

Justification of Thai costs

Please break down your Thai costs, explaining why the resources requested are appropriate for the activities proposed, taking into account the nature and complexity of the proposal. One A4 page maximum.

(a) Cost of human resources (total of 2,124k Thai Baht): 6 Thai investigators contributing 8 months FTE (15k per person per month FTE + 25% overhead = 900k), 3 M.Sc. (288k each) RAs are included in the project. All staff and students will be involved in the training and contribute to the development of the data centre by researching either optimal DM systems and/or ML software to run on the facility, as well as writing publications for conferences and journals. Specifically, the Thai staff and students will work on the following:

- Research and development of the data storage and retrieval that is effective for Big data and domain-specific requirements, with a well-designed connection to down-streaming analysis. One M.Sc. RA is responsible for this task, jointly supervised by Thai and UK investigators.
- Applying and adapting the true/false positive classification algorithm developed in Phase 1 to real GOTO data and installing it on the data centre. One MSc student (the same student who developed the algorithm in Phase 1) will be responsible for this task, jointly supervised by the Thai and UK investigators.
- Development of ML algorithms for source classification (i.e., star, galaxy, supernovae etc), including the exploration of various feature-based and pixel-based techniques. One M.Sc. RA is responsible for this task. A Ph.D. student based at MFU will also work on this task, but they are already fully-funded by a separate studentship. Both will be jointly supervised by Thai and UK investigators.

(b) Cost of practical workshops held in Thailand (total: 600k Thai Baht): this is to disseminate the skills and knowledge the research team has acquired to general students, staff of NARIT, and associates. This will provide attendees with the skills to set up databases at their own institutes as well as give them a solid foundation in ML-based techniques. As a result, a potential outcome would be an enhanced possibility for Thai students/researchers with an astronomy background to enter economically important sectors with a need for Big Data analyses (e.g., finance, insurance, medical, defence, etc).

(c) Cost of international travel (subsistence for two UK delegates in Thailand, 400k Thai Baht): Each UK investigator will visit Thailand four times to attend each of the two workshops, plus another group meeting per year. Refreshments and group meals during the group meetings are included in these costs. Maund will cover the cost of his subsistence from his own grant.

(d) Cost of return flights from Thailand to the UK (120k Thai Baht): Two staff and two students will visit the UK in March, 2018. The purpose of this trip is two-fold: (i) Work with GOTO scientists in developing the UK GOTO data centre (ii) Train one of the students in the use of and outputs of the GOTO data processing pipeline.

Summary of Thai Costs (Baht)

Description	Year 1		Total (Baht)
	Months 1-6	Months 7-12	
Investigator salary costs	225k	225k	450k
Salary of research assistant	216k	216k	432k
Consumables/ materials	-	-	-
Other expenses	300k (b)	-	300k
Equipment	-	-	-
International travel	100k (c) + 120k (d)	100k (c)	320k
Total per period (6 months)	961k	541k	1,502k

Description	Year 2		Total (Baht)
	Months 1-6	Months 7-12	
Investigator salary costs	225k	225k	450k
Salary of research assistant	216k	216k	432k
Consumables/ materials	-	-	-
Other expenses	300k (b)	-	300k
Equipment	-	-	-
International travel	100k (c)	100k (c)	200k
Total per period (6 months)	841k	541k	1,382k