

Short-Term Scientific Mission Grant - APPLICATION FORM¹ -

Action number: CA20111

Applicant name: Ciarán Dunne

Details of the STSM

Title: From Dedukti to MMT: A Comparative Study of Modular Frameworks for Logical Systems

Start and end date: 2025-03-10 to 2025-03-21

Detail of the cost in EUROS:

As reference, you can use the daily allowances by country for ITCGs (<https://europroofnet.github.io/itcg-daily-allowance/>) and the associated Excel sheet (https://europroofnet.github.io/_pages/grant.xlsx).

- Transport (upload screen capture): 120 euro

- Hotel/day (upload screen capture): 109 euro

- Food/day: 55 euro

TOTAL: 2125 euro

Goals of the STSM

Purpose and summary of the STSM.

(max.200 word)

The goal of this Short-Term Scientific Mission is to deepen my understanding of the connections between the research conducted by Deducteam at ENS Paris-Saclay and the work being done at FAU, particularly in the context the MMT framework. This visit aims exchange knowledge regarding logical frameworks, particularly the differences between Dedukti/LambdaPi and MMT.

Through discussions with researchers at FAU, I intend to refine my expertise in translating and combining logical systems expressed in Dedukti and MMT, with an emphasis on the practical challenges and solutions for interoperability. This collaboration will advance the shared goal of modular reasoning about type theories, contributing to the development of FAIR (Findable, Accessible, Interoperable, and Reusable) proof systems and facilitating effective proof translation tools.

This mission directly supports EuroProofNet's objectives of advancing modular type theories, enhancing formal proof interoperability, and fostering collaboration among European researchers in the field of proofs and formal verification.

¹ This form is part of the application for a grant to visit a host organisation located in a different country than the country of affiliation. It is submitted to the COST Action MC via-e-COST. The Grant Awarding Coordinator coordinates the evaluation on behalf of the Action MC and informs the Grant Holder of the result of the evaluation for issuing the Grant Letter.

Working Plan

Description of the work to be carried out by the applicant.

Week 1:

- Meet with researchers at FAU, including Michael Kohlhase and Florian Rabe, to understand ongoing projects involving the MMT framework and its role in expressing modular theories and translations.
- Present my work with Deducteam on translating proof systems from cvc5 to Dedukti, outlining the motivations and challenges in my work.
- Discuss the theoretical foundations of Dedukti's $\lambda\Pi$ -calculus modulo theory and MMT's approach to theory morphisms and logical frameworks.

Week 2:

- Explore practical approaches for interoperability between Dedukti and MMT by investigating possible translation mechanisms between the two systems.
- Conduct collaborative brainstorming sessions to identify gaps in current tools and propose future directions for enhancing interoperability.

Throughout the Mission:

- Document findings, insights, and potential avenues for further research, ensuring that they align with deliverables such as FAIR proof libraries and tools for proof translation and management.

Expected outputs and contribution to the Action MoU objectives and deliverables.

Main expected results and their contribution to the progress towards the Action objectives (<https://europroofnet.github.io/objectives/>) and deliverables (<https://europroofnet.github.io/deliverables/>).

Working groups to which this mission contributes:

The expected outcome of this Short-Term Scientific Mission is an enriched understanding of the theoretical and practical connections between Dedukti and MMT frameworks, which will inform future efforts toward interoperability and modular reasoning in formal proofs. This visit will yield a detailed report that captures insights from discussions between researchers. These outcomes will directly contribute to EuroProofNet's objectives of developing modular type theories and enhancing the FAIR principles in proof systems by advancing the creation of tools and techniques for proof translation. The mission also supports the capacity-building goals of EuroProofNet by fostering collaboration between researchers at Deducteam and FAU, promoting knowledge transfer, and laying the foundation for sustained partnerships in the formal proofs community. This collaboration aligns with and will contribute to EuroProofNet deliverables such as tools for managing dependencies and translations in proof libraries, as well as prototypes for modular reasoning frameworks and extensions to broader systems.