Stardust Meeting

December 19th 2022

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Oxford Tasks

- **Multiparty Session Types**
- **Scribble language (nuScr)**
- **Static Actor Languages (Scala, Rust, Go)**
- **Reliability in Communicating Automata**

Tasks by Oxford

- Developing ***Reliable*** Multiparty Session Type Theory
- Developing Implementation of an extension of **Scribble** specification language
- Developing Scala API generated from Scribble with Reliability for ***EffPi*** which is an extension of Scala 3 (Scalas and Yoshida 2019)
- Other Actor-based languages such as ***Rust*** and ***Go***
- Developing ***Case Studies***

Main Outcomes (1)

Generalised Multiparty Session Types with Crash-Stop Failures

Adam D. Barwell, Alceste Scalas, NY, and Fangyi Zhou
(**CONCUR'22**) **Bottom Up & Synchronous**

Designing Asynchronous Multiparty Protocols With Crash-Stop Failures Adam D. Barwell, Alceste Scalas, NY, and Fangyi Zhou
(**ECOOP'23**) **Top-down & Asynchronous**

- Extension of Scribble (nuScr) and EffPi (Scala 3)
- Case Studies: Auth, Distributed Logger and Cyclic Breaker
- **Distinguished Paper Award** by **ECOOP'23**
- **Teaching (Laboratory) & Projects in Oxford University**

Main Outcomes (2)

- ***Dynamic Updatable Multiparty Session Types***, David CASTRO-PEREZ (Kent) & NY (**ECOOP'23**)

- New participants can dynamically join to a running multiparty sessions
- Implemented in an extension of nuScr (GoScr)
- Generated to Go API
- Case studies: dynamic task delegation, recursive Domain Name System, and a parallel Min-Max strategy

Main Outcomes (3)

Rollback Recovery in Session Based Programming, Claudio ANTARES MEZZINA , Francesco TIEZZI , NY (**COORDINATION'23**)

- Commitment, Check-Point and Roll-back, ensuring Reliability by Design-time
- a decidable compliance check at the type level, satisfying *error-freedom* and progress of a session
- Mechanised by MAUDE
- **Distinguished Paper Awards** by **Coordination'23** and **DiscoTech'23**

Event structures for the reversible early internal π-calculus, Eva GRAVERSEN Iain PHILLIPS , NY (**JLAMP**)

Industry and Related Collaborations

- EU Horizon Project (TaRDIS) with **Roland Kunh**, Alceste Scalas (DTU), Novi Sad & Nova

- **Trustworthy and Resilient Decentralised Intelligence for Edge Systems**
- Develop a language-independent, event-driven programming model that offers distribution abstractions and decentralised machine learning primitives.
- Build a development environment for correct-by-design heterogeneous swarms with embedded semantic analyses to achieve a correctness-by-design approach.
- Develop schemes to support decentralised intelligence for the purpose of heterogeneous swarms.
- Development of decentralised algorithms and protocols for supporting the TaRDIS programming model at runtime.

Other News

- Postdocs obtained Lectureships since last meeting: Dr Adam Barwell (St Andrews, since 01/03/23), Dr. Lorenzo Gheri (Liverpool, since 01/10/23) and Dr Mukesh Tiwari (Swansea, from 01/02/24)
- Postdoc started: Dr Amrita Suresh (since April 2023)
- Visitors: Dr Ilaria Castellari (Inria), Federik Krogsdal Jacobsen (DTU), Dawit Tirore (ITU), Prof Marco Carbone (from February 24)
- Teaching: Oxford, Keio, L'Aquila

On-Going Works

- Refactoring Reliable Multiparty Session Types and Scribble (MSC student, Ping Hou, NY)
- Timed Affine Multiparty Session Types (Ping Hou, Nicolas Lagaillardie & NY)
- Reversible Computation (Ping Hou, Martin Vassor, Adam Barwell, NY)
- Reliable Communicating Automata (Amrita Suresh, NY)

Aims:

- More collaborations with Industry Partners
- Teaching at Oxford & Keio