Dynamically Updatable Multiparty Session Protocols (Artifact)

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─── **Abstract** ───

Multiparty Session Types (MPST) are typing disciplines that guarantee the absence of deadlocks and communication errors in concurrent and distributed systems. However, existing MPST frameworks do not support protocols with *dynamic unbounded participants*, and cannot express many common programming patterns that require the introduction of new participants into a protocol. This poses a barrier for the adoption of MPST in languages that favour the creation of new participants (processes, lightweight threads, etc) that communicate via message passing, such as Go or Erlang.

This artifact contains an implementation of *Dynamically Updatable Multiparty Session Protocols*, a new MPST theory (DMst) that supports protocols with an *unbounded* number of fresh participants, whose communication topologies are *dynamically*

updatable. DMst guarantees deadlock-freedom and liveness. The artifact comprises a toolchain, GoScr (Go-Scribble), which generates Go implementations from DMst, ensuring **by construction**, that the different participants will only perform I/O actions that comply with a given protocol specification. We evaluate GoScr by (1) implementing representative parallel and concurrent algorithms from existing benchmarks, textbooks and literature; (2) showing that GoScr does not introduce significant overheads compared to a naive implementation, for computationally expensive benchmarks; and (3) building three realistic protocols (dynamic task delegation, recursive Domain Name System, and a parallel Min-Max strategy) in GoScr that could not be represented with previous theories of session types.

1 Scope

This artifact is the GoScr implementation of the DMst theory presented in the companion paper, as well as relevant benchmarks and use cases. It can be used to develop concurrent systems in Go.

2   Content

The artifact package includes:

- the GoScr code, including the benchmarks and use cases described in the companion paper;
- a Getting Started guide that illustrates a common GoScr workflow.

3   Getting the artifact

The artifact endorsed by the Artifact Evaluation Committee is available free of charge on the Dagstuhl Research Online Publication Server (DROPS).

4   Tested platforms

We have packaged a Docker image that contains all the necessary dependencies to run our tool. The artifact was packaed and tested using Docker version 23.0.5.

5   License

The artifact is available under license GPLv3.

6   MD5 sum of the artifact

3e53a6f7f7205c6beca84de5f3d9907a

7   Size of the artifact

1.23 GB