

Session Types, Control Effects, and Linear Logic

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While sophisticated structural type systems have become mainstream for quite a while, *behavioural types* are being increasingly acknowledged as a powerful instrument to reason about stateful interactive concurrent systems at a level of abstraction suitable to adoption by practitioners and programming languages and tools. Moreover, as is the case for usual structural types, the concept of behavioural type naturally fits within the common home of standard type theory, by means of Curry-Howard correspondences between name passing process calculi and various fragments of linear logic [Caires and Pfenning (2010), Caires et al. (2016), Wadler (2012)].

In this talk, we discuss principled extensions to our basic framework, which accommodate true *non-determinism* but also other control effects, such as *abortable sessions* and *exceptions*. All of these phenomena are highly relevant ingredients of distributed computation; some have been already considered in the context of session typed languages [Mostrous and Vasconcelos (2014), Carbone, Honda, Yoshida (2008)] but still lack a systematic foundation. Moreover, there are many well-known tensions between the joint presence of control effects, linearity, and non-determinism; such phenomena may violate confluence (typical of logical interpretations) and resource strictness (typical of linear logic). We present a type system for session-based communication that preserves logical compatibility by supporting a Curry-Howard correspondence with a variant of classical linear logic, here conservatively extended with an extra pair of dual modalities. As is often the case for logically motivated systems, our system intrinsically ensures deadlock-freedom and is compatible with all other logically motivated typing constructs.

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