

# A proof theory for dual nominal quantifiers

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## Abstract

One approach in relating logic and process calculus is via the formula-as-process interpretation, where process constructors are interpreted by logical connectives. In this talk I will discuss a problem of embedding the pi-calculus in linear logic, and highlight some problems with the interpretation of the restriction operator of the pi-calculus as a quantifier in logic. In particular, I will show that self-dual nominal quantifiers, such as Gabbay and Pitts's new quantifier or Miller and Tiu's nabla quantifier are both unsuitable in this setting. A key requirement seems to be that the nominal quantifier must not distribute over the par connective. This motivated a recent work on the introduction of a dual pair of nominal quantifiers, called 'new' and 'wen', where the distributivity property of par is absent. The proof rules for the 'new' quantifier have a similar flavour to the universal quantifier rules, whereas the 'wen' quantifier rules are similar to the existential ones, except that the wen-quantified variable can only be instantiated with a fresh name. I will present a proof system featuring these dual nominal quantifiers, extending the BV proof system for a non-commutative multiplicative linear logic. I will sketch the cut-elimination proof and show how one can interpret pi-processes in logic such that implication gives rise to a process pre-order. I will then discuss some open problems, in particular, in the interaction between the nominal quantifiers and the sequential operator of BV.

This talk is based on a joint work with Ross Horne, Bogdan Aman, and Gabriel Ciobanu.