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*Mechanizing Meta-Theory in Beluga*

Mechanizing formal systems, given via axioms and inference rules, together with proofs about them plays an important role in establishing trust in formal developments. In this talk, I will survey the proof environment Beluga. To specify formal systems and represent derivations within them, Beluga provides a sophisticated infrastructure based on the logical framework LF; to reason about formal systems, Beluga provides a dependently typed functional language for implementing inductive proofs about derivation trees as recursive functions following the Curry-Howard isomorphism. Key to this approach is the ability to model derivation trees that depend on a context of assumptions using a generalization of the logical framework LF, i.e. contextual LF which supports first-class contexts and simultaneous substitutions.

Our experience has demonstrated that Beluga enables direct and compact mechanizations of the meta-theory of formal systems, in particular programming languages and logics. To demonstrate Beluga's strength in this talk, we develop a weak normalization proof using logical relations.