Formalizing and proving a typing result for security protocols in Isabelle/HOL

There are several works on the formalization of security protocols and proofs of their security in Isabelle/HOL; there have also been tools for automatically generating such proofs. This is attractive since a proof in Isabelle gives a higher assurance of the correctness than a pen-and-paper proof or the positive output of a verification tool. However several of these works have used a typed model, where the intruder is restricted to "well-typed" attacks. There also have been several works that show that this is actually not a restriction for a large class of protocols, but all these results so far are again pen-and-paper proofs. In this work we present a formalization of such a typing result in Isabelle/HOL. We formalize a constraint-based approach that is used in the proof argument of such typing results, and prove its soundness, completeness and termination. We then formalize and prove the typing result itself in Isabelle. Finally, to illustrate the real-world feasibility, we prove that the standard Transport Layer Security (TLS) handshake satisfies the main condition of the typing result.
Projects:

**Composec: Secure Composition of Distributed Systems**

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