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This thesis explores a language-based approach to programming network software in embedded systems. The domain-specific language Protege has been developed, with the goal to improve programming productivity for protocol stack implementation targeting resource-constrained embedded systems. Protege provides abstractions close to the notations used in protocol specifications. From high-level protocol stack descriptions, the Protege compiler generates C code with predictable memory consumption which can be integrated with other system software. Protege is implemented as a compiled domain-specific embedded language with host language Haskell.