Objective-C is a popular programming language primarily used on the OS X and iOS platforms. We present a practical approach to decompilation of programs written in Objective-C and compiled for the x86 and AArch64 architectures using LLVM. Based on already-known generic reverse engineering techniques and compiler theory, this thesis analyzes new challenges and opportunities that occur in Objective-C binaries. We then offer solutions and algorithms that allow a decompiler to better recognize the high-level structures commonly used in Objective-C source codes. The thesis introduces an implementation of a new decompiler called “Cricket”, an interactive GUI application for OS X, which uses the described algorithms and pattern matching methods to reconstruct source code in Objective-C. The decompiler tries to maximize readability of the output and allows user interaction to further modify the generated source code. The implemented software is then evaluated on a popular open-source framework and the results are compared to a competing product.