Sequence diagrams are a subset of UML diagrams. UML 2.1 brings new features to sequence diagrams allowing them to model system behavior on the program code level. These features carry a possibility for creating tools allowing reverse engineering of sequence diagrams from program code. The goal of this thesis is to analyze and implement a tool for reverse engineering of UML 2.1 sequence diagrams from program code. The presented approach allows reverse engineering of a whole application, as well as of individual application class methods. Run-time dynamic analysis is used for generating application diagrams. Static control-flow analysis is used for generating method diagrams. This work includes a diagram editor, created using domain-specific languages technology, which also allows diagram export to standardized XMI format.