A hybrid planning approach is developed for intersection assistance systems up to fully automated driving through intersections. Route planning, task planning and motion planning methods are integrated in a hierarchical planning framework to deal with the various information and constraints in different layers. The navigation agent provides a global driving direction at an intersection according to the selected route. The task planner decides a sequence of actions to accomplish the driving mission taking into consideration traffic rules and semantic conditions. The motion planner generates detailed trajectories to execute the tasks. Meanwhile, the task sequence and the motion trajectory are verified periodically against the actual traffic situation, and re-planning is triggered when necessary in the motion planning or task planning level. The hierarchical planning framework is evaluated in several intersection scenarios. The result shows that it can handle the complex planning problems with dynamic objects and provide a modular solution for automated driving that can be easily extended for different traffic rules and applications.