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The growing demand for connectivity induces the wireless communication research community to constantly innovate. The novel techniques which are currently being explored allow to significantly increase spectral efficiency. However, a larger number of users and greater amounts of information on the same bandwidth require increased signal processing capacities. In this context, the computing power of programmable platforms has considerably increased, thereby requiring designers to deal with the exponential rise of their complexity. Due to the very intense competition in this market, the industry and designers try to get the most out of all the techniques that are likely to speed up their design process and to optimize the performances. The current research project conducted by Professors Thibeault and Gagnon in collaboration with Octasic since May 2006 has allowed to demonstrate the importance of partitioning and that this crucial stage constitutes a bottleneck during the design process. This research proposal aims to explore various ways to optimize partitioning. These approaches are compared for a multiprocessor platform with signal processing systems in order to achieve a judicious allocation of available resources. The specific needs of the final application will also be considered. Constrained and unconstrained partitioning scenarios will be compared. The aim of the unconstrained scenario is to manage the partitioning problem at a high level of abstraction with a minimum of initial constraints. It is based on a metaheuristic evolutionary algorithm which has the capacity to solve such complex problems. It will be combined to two other constrained partitioning scenarios in order to evaluate its full potential. The novelty of this project resides in the exploration of several partitioning techniques for a reduced set of criteria. They are specifically evaluated for Software-Defined Radio applications with multi-user transmission and reception. These applications are available and continuously evaluated in our laboratories.