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For Large-Scale Vehicle Routing with Time Windows
in Disaster Response

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Randomized Adaptive Decoupling For Large-Scale Vehicle Routing with Time Windows in Disaster Response
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In recent years, natural disasters such as Hurricane Katrina and the tsunami in Indonesia have created situations where significant quantities of relief supplies need to be distributed to large numbers of affected people efficiently. The size of combinatorial problems in these situations and the demand to produce high-quality solutions in order to respond quickly provide significant challenges for optimization algorithms. This presentation focuses on our prior work in solving large-scale vehicle routing problems with time windows (VRPTW), a class of very difficult optimization problems involving complex spatial and temporal dependencies that are used to model the relief supply distribution problem in Los Alamos National Laboratory's Disaster Response and Planning tools. We present randomized adaptive decoupling (RAD) schemes for the VRPTW in order to produce high-quality solutions quickly. Experimental results on hard instances with 1,000 customers show that the RAD scheme, together with a constraint-based large neighborhood search, significantly improves the quality of the solutions under time constraints.