Solving routing and scheduling problems through set-based modeling

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LocalSolver is a heuristic solver designed to practically tackle large-scale optimization problems. Having modeled your optimization problem using common mathematical operators, LocalSolver provides high-quality solutions in short running times. Combining different optimization techniques, LocalSolver scales up to millions of variables, running on basic computers.

One of the strengths of LocalSolver is its rich yet simple modeling framework. Indeed, most usual mathematical operators are available, including arithmetical expressions (sum, product, exponential, logarithm, trigonometric functions) or logical expressions (and, or, comparisons, conditional terms, array indexing). Consequently, there is no need to linearize the considered problem: the user can model it directly and naturally.

Initially, this modeling power was based on numerical decision variables only (binary, integer, or floating-point). A significant extension to this approach was recently brought with the introduction of high-level structured decision variables inspired by constraint programming set-based variables. Many optimization problems involve sequencing or ordering concepts: scheduling, routing, and network design. For these problems, a new type of variables yields even simpler and more compact models. The value of such a variable is not a number but a collection of numbers. More precisely, a list variable *list(n)* represents a sub-permutation of the set {0,1,2,….n-1}. We will show in this presentation how this new kind of variable allows the building of very simple and very effective models for many optimization problems, including routing and scheduling problems.