

Resilient Placement of Virtualized Smart Grid Control Functions

Abstract

Distribution system automation relies on a suite of power grid control functions and applications. In the smart grid era, the control functions will face many challenges, e.g., they have to adapt to the reconfiguration of distribution feeders, they need to support fast recovery in case of controller failure, and they have to be resilient to the threats imposed by cyber attacks on the communication networks. To cope with these challenges, our ongoing research virtualizes the control functions as software instances in general purpose cloud servers, enabling the dynamic placement of the virtualized control functions (VCFs). As an example of a widely used control function we consider Volt-VAR Control (VVC), and we formulate the problem of the resilient placement of virtualized VVC controllers, taking the service cost, service quality and security risks into consideration. We finally discuss approximations with bounded approximation ratio for solving the optimization problem.