Opportunistic resource utilization networks, or oppnets, are a paradigm for specialized ad hoc networks. The Oppnet Virtual Machine (OVM) is a collection of primitives designed to create a middleware for application-level resource acquisition by oppnets and oppnet-enabled systems and devices (where the latter are defined as the computational entities able to communicate with other oppnets or oppnet-enabled systems and devices). Acquisition of communication resources is the foundation for acquisition of other resources.

The OVM primitives can be downloaded by any computational entity—making that entity oppnet-enabled. OVM ensures that oppnets and oppnet-enabled entities can communicate and acquire resources in an opportunistic and ad hoc manner. This OVM-based interaction between entities can support the following required oppnet characteristics, which together distinguish oppnets from other available collaborative distributed systems: (i) support for the helper paradigm—as the basis for resource acquisition; (ii) universality—regardless of the system or device make or function, and through any communication media, protocols, etc.; (iii) lack of third-party mediators—since interactions among oppnet-enabled entities take place without (trusted) third
parties; and (iv) ad hoc operation—with the exception of the need for a predesigned formation of the so called oppnet seed in which the expanded oppnet grows.

In this study, the improved second version of the OVM primitives, capable of supporting a very broad and diverse set of applications, were developed and validated. As a proof of feasibility, the set of OVM primitives was used to develop non-monolithic OVM-based oppnet middleware that implements a healthcare and wellness monitoring scenario. The features that distinguish this oppnet middleware from the previous oppnet work are: (i) implementation of the object-oriented OVM primitives in a non-monolithic fashion; (ii) utilization of a wider number of resources; (iii) more autonomy in oppnet operations; and (iv) employment of more kinds of communication technologies. The performance of the monolithic oppnet middleware was then compared with the non-monolithic OVM-based oppnet middleware by simulating both middlewares for the above scenario. This study also applied analytical methods in order to evaluate and to compare the performance for the two middlewares. The evaluation criteria included, but were not limited to time overhead, resource usage, and success rate for the scenario.