DRACeo: A smart simulator to deploy energy saving methods in a services/microservices based network

Hernán Álvarez Valera, Marc Dalmau, Philippe Roose, Christina Herzog, Jorge Larracoechea

DRACeo: A smart simulator to deploy energy saving methods in a services/microservices based network

Hernan Humberto Alvarez Valera, Marc Dalmau, Philippe Roose, Christina Herzog and Jorge Larracoechea.

Université de Pau et des Pays de l'Adour (UPPA)

In this work, we present DRACeo: a simulator for the application QoS and energy consumption analysis by deploying and scheduling microservices and their dependencies on various devices with software and hardware heterogeneity. DRACeo is able to apply various scheduling heuristics algorithms, including various management philosophies: centralized vs non-centralized.

Inside, the user is able to define the parameters that represent the QoS by selecting ad hoc parameters such as application response time, high availability criteria, stress management etc. On the other hand, DRACeo manages devices and sets of devices like clusters in terms of: (1) type, like PCs or battery dependant as smartphones (2) heterogeneous capabilities like CPU turbo boost, PCPG, RAM capacity, HDD capacity, etc. (3) geographic position (4) movement, apparition or disappearance. Furthemore, DRACeo installs in each device and by default a special microservice called “supervisor” which is able to: (1) act as a central entity to perform centralized scheduling algorithms and (2) analyze the energy consumption, the current applications and microservices and hardware capacity/load in order to perform a non-centralized scheduling algorithms.

Finally, DRACeo schedules (i.e. move, duplicate, start and stop) several types of microservices (and it’s dependencies) such as user interface microservices or database microservices in order to deal with schedule restrictions and user needs. This feature allows to perform the most fine grained analysis in terms of QoS and energy consumption.

We performed a detailed analysis of DRACeo against other simulators and their characteristics finding that DRACeo counts with all together unique features such as: (1) the microservices relocation, allowing DRACeo to move and duplicate microservices to any part of the network structure considering the profundity, the direction and dependencies. (2) Real time data display of devices and microservices metrics and simulator operations both during design and runtime in GUI. (3) Custom definition of QoS parameters (previously described). (4) The ability to simulate a physical location for each device allowing to pinpoint the geographical position and control its geographical displacement, according to its type. (5) A GUI that allows a quick scenario design and customization of microservices and devices to deploy. (6) A simple API to implement and perform scheduling algorithms. (7) Real time QoS (previously defined) and energy consumption display and last but not limited to (8) real time position display of devices.