Post-cloud Computing Models: from Cloud to CDEF

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Since cloud computing has been widely accepted, progress in research and development enriched the landscape of this area. Such progress can be summarized in the following way: **From cloud to CDEF**, where C represents Cloudlet, D represents Dew Computing, E represents Edge Computing, and F represents Fog Computing. CDEF starts with C also implies that these four models all started from Cloud Computing.

The cloudlet model promotes to put small-scale cloud data centers at locations where they are closer to users [1][2].

The key features of dew computing are that on-premises computers provide functionality independent of cloud services and they also collaborate with cloud services. Dew computing promotes that all on-premises computer applications get support from cloud services, if possible. With dew computing, cloud computing can reach its greatest popularity. Dew computing is complementary to cloud computing [3][4][5].

Edge computing pushes applications, data, and services away from central servers (core) to the edge of a network; it is based on the core-edge topology. Edge Computing refers to the enabling technologies allowing computation to be performed at the edge of the network, on downstream data on behalf of cloud services and upstream data on behalf of IoT services [6][7][8][9].

Fog computing is a scenario where a huge number of heterogeneous devices communicate and potentially cooperate among them and with the network to perform storage and processing tasks without the intervention of third-parties. Fog computing extends cloud computing and services to devices such as routers, routing switches, multiplexers, and so on [10][11][12].

All these computing models share a common feature: they all perform computing tasks at devices that are closer to users [13].

CDEF (Cloudlet, Dew computing, Edge computing, and Fog computing) appeared after cloud computing was widely accepted; they could be called *post-*

cloud computing models. CDEF is an unofficial, easy-to-remember way to refer to these models. CDEF starts with C also implies that these models all started from cloud computing.

CDEF originated from different background, proposed to solve different problems, related to different disciplines/industries, involved different devices, and have different methodologies. The relationships among CEDF are similar to the relationships among different programming languages: although each programming language has full computing power of a Turing Machine, each language has its own style, strength, and characteristics. In the similar way, although the definitions of each of these CDEF computing models may be expanded to cover wider application areas, each of these models are more suitable to be used in some specific areas. From cloud to CDEF, the landscape of post-cloud computing is more versatile and prosperous.

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