

Editorial

Recent Advances in Cloud-Aware Mobile Fog Computing

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Mobile fog computing (MFC) is an emerging paradigm that extends cloud computing (CC) by adding a new layer between the cloud and its end users. With the cloud-aware MFC, the cloud can pre-push certain important resources to the fog to reduce the networking latency and release the traffic burden over the links. The end user then is able to perform offline computing on the fog layer so that only the important results need to be delivered to and stored in the cloud. Moreover, the dense geographical deployment of fog servers enables the system to be aware of the end user's location. Therefore, some location-sensitive applications could be well supported by the fog-aided cloud systems. Note that the cloud-aware MFC is different from the mobile edge computing (MEC), another promising technology for overcoming the shortcomings of CC, since MFC is able to jointly work with the cloud, but MEC is usually defined by the exclusion of CC. Specifically, in MEC, computing applications, data, and services are pushed away from the centralized nodes to the network edge, which enables network edge to run in an isolated environment from the rest of the network and provides access to local resources and data. In contrast, MFC provides not only a system-level horizontal architecture but also a new way to distribute, orchestrate, and manage secure resources across the network rather than just performing computing at the network edge.

How to design efficient system architectures, transmission strategies, and protocols for MFC and how to efficiently analyze and evaluate the system performance are very important and essential. These topics have carved out a new area rich in research and innovation potential. This special issue aims to address all these topics and invite contributions from worldwide leading researchers.

This special issue received submissions covering a wide range of topics in MFC. The following is a short summary of the findings of each of these papers.

Y. Zhou et al. took the rural vitalization as an objective and proposed a smart collaborative policy for MFC scenarios; the challenges and drawbacks of extending cloud to fog are reviewed at the beginning. Then, the analysis of policy design is presented from the perspectives of feature comparisons, urgent requirements, and possible solutions.

X. Di et al. designed a resource allocation (RA) algorithm to solve the mobile fog computing-assisted RA problem and demonstrated that the achievable rate is significantly increased by using the proposed RA algorithm.

H. Chen et al. proposed a non-task-specific method for Chinese sentiment classification, which used a new structure convolutional layer to enhance the ability of automatic feature extraction and applied global average pooling layer to prevent overfitting. Through experiments and analysis, they proved the method do achieve competitive accuracy.

X. Tan et al. proposed an Extraction-Inference (E-I) algorithm and built a QoS and user Interest based Engagement (QI-E) regression model. Through experiments on the datasets, they demonstrated that the model reaches an improvement in accuracy by 9.99% over the baseline model. The proposed model has potential for designing QoE-oriented scheduling strategies in various network scenarios, especially in the fog computing context.

W. Chen et al. proposed a novel public auditing protocol based on the adjacency-hash table and demonstrated that dynamic auditing and data updating are more efficient than

those of the state of the arts. Computation and communication costs can be reduced effectively by using the authentication structure.

W. Hui-Juan and J. Yong studied the 2-adic complexity attack ability of the periodic balance sequence in the fog computing environment. They proved that the 2-adic complexity of the periodic balanced sequence is not an attacking threat when used in fog computing by using the exponential function as a new approach.

Y. Wang et al. proposed a method that takes advantage of the immune mechanism to schedule tasks in a decentralized way for fog computing. Distributed schedulers are used to generate the optimal scheduler strategies to deal with overloaded computing nodes and achieve the optimal task finishing time.

H. Zheng et al. proposed a fog-assisted real-time QoE prediction scheme, which can predict the QoE of DASH-supported video streaming using fog nodes. Neither client/server participations nor deep packet parsing at network equipment is needed, which makes this scheme easy to deploy.

H. Zhao et al. took advantage of fog computing and studied transcoding based video caching in cellular networks where cache servers are deployed at the edge of cellular network for providing improved quality of online VoD services to mobile users.

L. Liu et al. proposed a novel classification mining algorithm I-Apriori which is based on the Apriori algorithm to increase productivity and allocate resources appropriately to the tasks. They proposed a novel task scheduling model and a TSFC (Task Scheduling in Fog Computing) algorithm based on the I-Apriori algorithm. Association rules generated by the I-Apriori algorithm are combined with the minimum completion time of every task in the task set.

L. Lu et al. proposed a suboptimal approach for resource allocation of massive MIMO-OFDMA systems for high-speed train (HST) applications. Fast convergence can be achieved for the proposed approach within only several iterations. They showed that the algorithm is superior to existing techniques in terms of system energy efficiency and throughput in different system configurations of HST applications.

Y. Huo et al. proposed a real-time stream data aggregation framework with adaptive-event differential privacy (Re-ADP). In the framework, fog servers will only send aggregated secure data to cloud servers, which can relieve the computing overhead of cloud servers, improve communication efficiency, and protect data privacy.

T. Jing et al. designed an integrated system to prevent illegal privacy leak. They defined a trust degree mechanism to evaluate trustworthiness of a communicator dynamically and set up a new message publishing system to determine who can obtain the message of the publisher. They verified the effectiveness of the proposed message publishing system through analysis of confidentiality performance.

L. Wang and L. Li proposed the fog computing-based differential positioning (FCDP) method which introduces fog computing technology to BeiDou satellite navigation system. Compared with the original data center-based differential

positioning method, they demonstrated that the FCDP method decreases the latency of positioning, while ensuring the positioning accuracy.

Y. Fu et al. proposed a novel neighbor-based QoS prediction method for service recommendation and further designed a Nearest Graph algorithm to recognize stable or unstable candidate along with their popularity by a nearest neighbor graph structure which can help make missing QoS values prediction in a certain order to improve final prediction accuracy. Experimental results confirm that the proposed method is effective in predicting unknown QoS values in terms of service recommendation accuracy and efficiency.

S. Li et al. investigated the reliability of concurrent multipath communications in mobile cloud computing (MCC) architectures and proposed two reliability models when paths are in failure. They mainly analyzed that in MCC architectures multipath communications can be achieved with multihomed mobile devices, so as to utilize multiple paths for data transmissions in parallel.

J. Zhang et al. provided a comprehensive overview of key fault tolerance strategies. They mainly summarized three aspects from static fault tolerance strategies, dynamic fault tolerance strategies, and main challenges confronted by fault tolerance for composite service.

Z. Chen et al. proposed a new security scheme based on implicit certificate (IC), which solves the security problem among the access points (APs) in a dynamic APs group (APG) and between the AP and user equipment (UE). They extensively analyzed a lightweight security communication model in terms of security and performance and proved the efficiency of the solution.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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