Editorial: Collaborative Next Generation Networking

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Editorial:

Over the last two decades, many organizations and individuals have relied on electronic collaboration between distributed teams of humans, computer applications, and/or autonomous robots to achieve higher productivity and produce joint products that would have been impossible to develop without the contributions of multiple collaborators. Technology has evolved from standalone tools, to open systems supporting collaboration in multi-organizational settings, and from general-purpose tools to specialized collaboration grids. Future collaboration solutions that fully realize the promises of electronic collaboration require advancements in networking, technology and systems, user interfaces and interaction paradigms, and interoperation with application-specific components and tools.

This special issue features nine selected papers with high quality. The first article, “Time-Based Access Control for Multi-attribute Data in Internet of Things”, authored by Baowei Wang, propose a novel Time-based Access Control (TAC) scheme for multi-attribute data in Internet of Things. All the data are partitioned into 2-D subspaces representing generation time and data attribute. Data in each subspace is encrypted with the corresponding sub-key before its transmission to the base station to achieve data privacy and access control. TAC can generate a sub-key for data in each subspace in an efficient manner in terms of less sub-key generation time and low memory space usage. The experimental results show that TAC can be applied to the resource limited WSNs efficiently.

The second article titled “A Survey on the Development of Self-Organizing Maps for Unsupervised Intrusion Detection” describe a focused literature survey of self-organizing maps (SOM) in support of intrusion detection. The ultimate goal of SOM architecture is to accurately represent the topological relationship of data to identify any anomalous attack. The overall goal of this survey is to comprehensively compare the primitive components and properties of SOM-based intrusion detection systems, we can clearly understand the existing challenges of SOM-based intrusion detection systems and indicate the future research directions.

In the next article with the title “Cloud-Based Data Offloading for Multi-focus and Multi-views Image Fusion in Mobile Applications”, the authors propose an image fusion strategy and mobile data offloading method based on cloud computing platform. They design a cloud computing environment to fuse the images captured by the mobile phone where mobile terminal uploads and downloads images to the cloud through 5G signal. And a continuous time Markov model is applied to offload the mobile network data. The results show that the proposed image fusion and data offloading method achieves satisfactory image quality and execution performance.

In the next article with the title “A Multi-grained Log Auditing Scheme for Cloud Data Confidentiality”, the authors propose a multi-grained log auditing scheme to make logs volume smaller and log auditing more efficient. They design a logging mechanism to support multi-grained data access with Merkle Hash Tree structure. Based on multi-grained log, they present a log auditing approach to achieve data confidentiality auditing and leakage investigation by making an Access List. The experiments results indicate that our scheme obtains about 54% log volume and 60% auditing time of fine-grained log auditing scheme in their scenario.

In the next article with the title “Indoor Geofencing Based on Sensorless Motion Sensing and Fingerprint Self-Updating”, the authors present a hybrid electronic geofence approach that combines self-updating RSS fingerprints based localization and Channel State Information (CSI) motion detection. Multidimensional matching and filtering principle achieves fingerprints self-updating and improves the localization accuracy. CSI-

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based speed estimation reduces localization frequency and overhead. Extensive real-world experiment results show that the proposed indoor geofencing method works well for more than 30 days without manual Wi-Fi fingerprints updating.

In the next article with the title “VariSecure: Facial Appearance Variance Based Secure Device Pairing”, the authors propose a secure key pairing protocol for NGN, VariSecure, to enable confidential communication for smartphones. Utilizing the facial appearance as a secret substitution, the initiator delivers a randomly generated key to the other user, thus establishing a confidential communication channel between their devices. VariSecure achieves secure device pairing without the complex operations needed in prior works. They implement VariSecure on the commercial off-the-shelf (COTS) smart devices. The experimental results show that VariSecure can establish a face-to-face secure pairing in less than 3 s.

In the next article with the title “An Extendable Layered Architecture for Collective Computing to Support Concurrent Multi-sourced Heterogeneous Tasks”, the authors present a collective computing architecture for supporting concurrent multi-sourced heterogeneous tasks. This architecture provides a common infrastructure for processing heterogeneous tasks by heterogeneous devices which do not only design for some specialized systems or functions. They implement a prototype system by this architecture for proving that the architecture can perform multi-sourced heterogeneous tasks well.

In the next article with the title “Cost Efficient Edge Service Placement for Crowdsensing via Bus Passengers” the authors consider the MCS applications supported by the mobile phones of bus passengers, who transfer between different bus stations equipped with edge servers. Taking the bus passenger mobility characteristics into consideration, they shall seek a tradeoff between the communication cost and service deployment cost to pursue overall cost efficiency. They first formulate the problem into a mixed integer linear programming model and then design a low-complexity heuristic algorithm. Performance evaluation results verify the high efficiency of our algorithm by the fact that it can much approach the optimal solution.

In the next article with the title “Joint User Association and Time Partitioning for Load Balancing in Ultra-Dense Heterogeneous Networks” the authors design two types of offloading (load balancing) schemes for UDHNs to maximize a logarithmic utility of long-term rates. To guarantee the load balancing gain, a frequency partitioning scheme is designed to degrade the cross-plane interference, and a time partitioning strategy is developed to eliminate the strong interference received by some users offloaded from macrocells. Numerical results show that the proposed schemes yield some significant performance gains relative to some traditional ones, and the centralized algorithm often achieves a better association performance than a distributed one since the former almost always tries to optimize a time partitioning factor.

In the next article with the title “Ergodic Capacity Analysis on MIMO Communications in Internet of Vehicles” the authors present a framework for ergodic capacity analysis on Multiple-input multiple-output (MIMO) communications among multi-antenna mounted vehicles. They model a Rayleigh fading channel with standard path-loss and lognormal shadowing, then adopt the tools of stochastic geometry to characterize the MIMO geocast channels. After analyzing the co-channel interference among MIMO geocast sessions, the upper and lower bounds on ergodic capacity of single link MIMO and MIMO geocast channels are derived with careful consideration of the important issues like antenna number, shadow fading, and transmission radius. Results reveal that ergodic capacity of MIMO VANETs can be significantly improved by appropriately mounting multiple transmit and receive antennas on vehicles.

The last article titled “Secure Data Sharing Framework via Hierarchical Greedy Embedding in Darknets”, the authors propose a Secure Data Sharing framework (SeDS) for future darknets via hierarchical greedy embedding. SeDS adopts a hierarchical topology and uses a set of secure nodes to protect the whole topology. To support geometric routing in the hierarchical topology, a two-level bit-string prefix embedding approach (Prefix-T) is first proposed, and then a greedy forwarding strategy and a data mapping approach are combined with Prefix-T for data sharing. SeDS guarantees that the publication or request of a data item can always pass through the corresponding secure node, such that security strategies can be performed. The experimental results show that SeDS provides scalable and efficient end-to-end communication and data sharing.

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