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WELCOME to the third issue of 2011 of the IEEE Communications Surveys and Tutorials. Paper in this issue survey the research effort in several areas such cloud computing, management of heterogeneous wireless connectivity, video and underwater sensor networks as well as security aspects in these networks, resource allocation in wireless networks, design of mesh networks and coding aided communications.

In the last two decades, the continuous increase of computational power has produced an overwhelming flow of data. Moreover, the recent advances in Web technology has made it easy for any user to provide and consume content of any form. This has called for a paradigm shift in the computing architecture and large scale data processing mechanisms. Cloud computing is associated with a new paradigm for the provision of computing infrastructure. Such paradigm shifts the location of this infrastructure to the network to reduce the costs associated with the management of hardware and software resources. In "A Survey of Large Scale Data Management Approaches in Cloud Environments", Sherif Sakr, Anna Liu, Daniel M. Batista, and Mohammad Alomari give a comprehensive survey of numerous approaches and mechanisms of deploying data-intensive applications in the cloud which are gaining a lot of momentum in both research and industrial communities. They analyze the various design decisions of each approach and its suitability to support certain classes of applications and end-users. A discussion of some open issues and future challenges pertaining to scalability, consistency, economical processing of large scale data on the cloud is provided. The characteristics of the Best candidate classes of applications that can be deployed in the cloud are also highlighted.

The growing market of wireless devices with multiple connectivity technologies, e.g., Wi-Fi, Bluetooth, and UMTS, is pushing toward the necessity of seamless autonomic selection of the proper connectivity network at any time. That selection should be context-dependent and consider several elements, at different abstraction layers, from bandwidth requirements to network congestion, from connectivity costs to user preferences. As a symptom of the recognized relevance of this topic, relevant research work has recently addressed context-dependent connectivity management. In "A Unifying Perspective on Context-Aware Evaluation and Management of Heterogeneous Wireless Connectivity" Paolo Bellavista, Antonio Corradi and Carlo Giannelli provide both practitioners and newcomers of this research field with a comprehensive survey with a unifying perspective, to better point out similarities and specific aspects of the numerous solutions in the literature. In particular, the paper aims to achieve the twofold goal of i) identifying the primary design choices, together with corresponding tradeoffs, emerging from recent proposals and ii) better positioning the wide variety of related work based on a single classification scheme. To that purpose, the authors introduce an original model to represent solution architectures, by showing how it makes the adopted design choices manifest and facilitates the positioning of proposed approaches, e.g., by throwing new light on the usage of 4th Generation and Always Best Connected terms. A novel taxonomy is introduced to cluster the proposals in the field along three first-level classification directions: management scope, evaluation process, and continuity management.

While the demand for wireless cellular services continues to increase, radio resources remain scarce. As a result, network operators have to competently manage these resources in order to increase the efficiency of their Wireless Cellular Networks (WCN) and meet the Quality of Service (QoS) of different users. A key component of Radio Resource Management (RRM) is congestion control. Congestion can severely degrade the performance of WCN and affect the satisfaction of the users and the obtained revenues. Several congestion control techniques have been proposed for WCN. These techniques, however, do not provide incentives to the users to use the wireless network rationally, and hence they cannot solve the problem of congestion. Recently, there has been some research on providing monetary incentives to the users through congestion pricing to use the wireless network rationally and efficiently. Congestion pricing is a promising solution that can help alleviate the problem of congestion and generate higher revenues for network operators. In "Congestion Pricing in Wireless Cellular Networks", Bader Al-Manthari, Nidal Nasser, and Hossam Hassanein survey recent research work on congestion pricing in WCN. They also provides detailed discussions and comparisons of the surveyed work as well as open problems and possible future research directions in the area.

Multiple access methods in a wireless network allow multiple nodes to share a set of available channels for data transmission. The nodes can either compete or cooperate with each other to access the channel(s) so that either an individual or a group objective can be achieved. Game theory, which is a mathematical tool developed to understand the interaction among rational entities, can be applied to model and to analyze individual or group behaviour of nodes for multiple access in wireless networks. Game theory also enables us to model the

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selfish/malicious behaviour of nodes, and subsequently design the punishment or defense mechanisms for robust multiple access in wireless networks. In addition, game models can provide distributed solutions to the multiple access problems, which are based on solid theoretical foundations. In "Game Theoretic Approaches for Multiple Access in Wireless Networks: A Survey", Khajonpong Akkarajitsakul, Ekram Hossain, Dusit Niyato, and Dong In Kim provide a comprehensive review of the game models (e.g., noncooperative/cooperative, static/dynamic, and complete/incomplete information) developed for different multiple access schemes (i.e., contention-free and contention-based random channel access) in wireless networks. The authors consider time-division multiple access (TDMA), frequency-division multiple access (FDMA), and codedivision multiple access (CDMA), ALOHA, and carrier sense multiple access (CSMA)-based wireless networks. In addition, game models for multiple access in dynamic spectrum accessbased cognitive radio networks are reviewed. The major findings from the game models used for these different access schemes are highlighted. To this end, several of the key open research directions are outlined.

Over the last decade, the paradigm of Wireless Mesh Networks (WMNs) has matured to a reasonably commonly understood one, and there has been extensive research on various areas related to WMNs such as design, deployment, protocols, performance, etc. The quantity of research being conducted in the area of wireless mesh design has dramatically increased in the past few years, due to increasing interest in this paradigm as its potential for the "last few miles", and the possibility of significant wireless services in metropolitan area networks. This recent work has focused increasingly on joint design problems, together with studies in designing specific aspects of the WMN such as routing, power control etc. in isolation. While excellent surveys and tutorials pertaining to WMNs exist in literature, the explosive growth of research in the area of specific design issues, and especially joint design, has left them behind. In, "A Survey of Network Design Problems and Joint Design Approaches in Wireless Mesh Networks", Parth H. Pathak and Rudra Dutta identify the fundamental WMN design problems of interference modeling, power control, topology control, link scheduling, and routing, and provide brief overviews, together with a survey of the recent research on these topics, with special stress on joint design methods.

In "A Survey on Cluster-Based Group Key Agreement Protocols for WSNs", Eleni Klaoudatou, Elisavet Konstantinou, Georgios Kambourakis, and Stefanos Gritzalis examine and thoroughly evaluate the cluster-based Group Key Agreement (GKA) protocols for Wireless Sensor Networks (WSNs). Towards this goal, they grouped the WSNs application environments into two major categories (i.e., infrastructure-based and infrastructureless) and have examined: a) which of the cluster-based Group Key Agreement (GKA) protocols that appear in the literature are applicable to each category, and b) to which degree these protocols will impact performance and energy consumption. In order to answer these questions, the authors calculated the complexity of each protocol and the energy cost it will add to the system. The evaluation of all discussed protocols can serve as a reference point for future evaluations and for the design of new, improved GKA protocols. Sensor networks with battery-powered nodes can seldom simultaneously meet the design goals of lifetime, cost, sensing reliability and sensing and transmission coverage.

Energy-harvesting, converting ambient energy to electrical energy, has emerged as an alternative to power sensor nodes. By exploiting recharge opportunities and tuning performance parameters based on current and expected energy levels, energy harvesting sensor nodes have the potential to address the conflicting design goals of lifetime and performance. In "Energy Harvesting Sensor Nodes: Survey and Implications", Sujesha Sudevalayam and Purushottam Kulkarni survey various aspects of energy harvesting sensor systems— architecture, energy sources and storage technologies and examples of harvesting-based nodes and applications. The paper also discusses the implications of recharge opportunities on sensor node operation and design of sensor network solutions.

The video capture, processing, and communication in wireless video sensor networks critically depend on the resources of the nodes forming the sensor networks. In "Towards Efficient Wireless Video Sensor Networks: A Survey of Existing Node Architectures and Proposal for A Flexi-WVSNP Design", Adolph Seema and Martin Reisslein survey wireless video sensor node platforms (WVSNPs). From a comprehensive literature review, they fselect the node architectures that meet basic requirements for a WVSNP and introduce a classification of WVSNPs into general purpose architectures, heavily coupled architectures, and externally dependent architectures. The authors thoroughly survey and contrast the existing WVSNPs within this classification framework. They develop a novel Flexi-WVSNP design which includes dual-radio communication, a middleware for sensor operation and communication control, as well as a cohesive hardware and software design.

The widespread adoption of the Wireless Sensor Networks (WSNs) in various applications in the terrestrial environment and the rapid advancement of the WSN technology have motivated the development of Underwater Acoustic Sensor Networks (UASNs). UASNs and terrestrial WSNs have several common properties while there are several challenges particular to UASNs that are mostly due to acoustic communications, and inherent mobility. These challenges call for novel architectures and protocols to ensure successful operation of the UASN. Localization is one of the fundamental tasks for UASNs which is required for data tagging, node tracking, target detection, and it can be used for improving the performance of medium Access and network protocols. Recently, various UASN architectures and a large number of localization techniques have been proposed. In "A Survey of Architectures and Localization Techniques for Underwater Acoustic Sensor Networks" Melike Erol-Kantarci, Hussein T. Mouftah, and Sema Oktug present a comprehensive survey of these architectures and localization methods. To familiarize the reader with the UASNs and localization concepts, the paper starts by providing background information on localization, state-of-theart oceanographic systems, and the challenges of underwater communications. A detailed survey, followed by a discussion on the performance of the localization techniques and open research issues.

In "A Unified Treatment of Superposition Coding Aided Communications: Theory and Practice", Rong Zhang and Lajos Hanzo provide a unified treatment of the topic of SuperPosition Coding (SPC) aided communications systems, attention is given not only to the theoretical background of SPC but also on its implementation techniques. The design methodology of SPC aided communications transceivers is described, including the Multiple Level Modulation (MLM) concept, the corresponding iterative Successive Interference Cancellation (SIC) aided receiver and the quasirandom coding principle. Building on these fundamental discussions, various future wireless applications of the SPC technique are furnished, which encompass cooperative communications assisted relay systems and cross-layer SPC aided multiplexed Hybrid Automatic Repeat reQuest (HARQ) techniques. Discussions demonstrate that the SPC technique is a promising enabler for diverse future wireless communications scenarios, ranging from cellular networks to cooperative networks. I hope that you found the articles of this issue informative and useful. Please bear in mind that we have an open call for submissions of surveys and tutorials on any communications or networking related topic. I hope that you will consider developing and submitting an article. In addition, we would appreciate if you could please encourage others to develop an article whenever you believe sharing their expertise would be valuable to our community. Please refer to the Author Guidelines at http://www.comsoc.org/pubs/surveys for detailed submission instructions and submit your paper at http://mc.manuscriptcentral.com/comst-ieee.

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