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Smart Communication Protocols & Algorithms

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Abstract

This Special Issue includes the best revised selected papers from the First International Workshop on Smart Communication Protocols & Algorithms (SCPA 2011), that took place in Houston, TX, USA, at December 05, 2011. This Workshop was organized in conjunction with the IEEE GLOBECOM 2011, December 5-9, 2011. It was technically by the IEEE Communications Society Technical Committee on Communications Software and by the IEEE Communications Society Internet Technical Committee.

Keywords: Smart Protocols, Smart Algorithms.

1. Introduction

Smart communication protocols and algorithms make use of several methods and techniques (such as machine learning techniques, decision making techniques, knowledge representation, network management, network optimization, problem solution techniques, and so on), to communicate the network devices to transfer data between them. They can be used to perceive the network conditions, or the user behavior, in order to dynamically plan, adapt, decide, take the appropriate actions, and learn from the consequences of its actions. The algorithms can make use of the information gathered from the protocol in order to sense the environment, plan actions according to the input, take consciousness of what is happening in the environment, and take the appropriate decisions using a reasoning engine. Goals such as decide which scenario fits best its end-to-end purpose, or environment prediction, can be achieved with smart protocols and algorithms. Moreover, they could learn from the past and use this knowledge to improve future decisions.

Along its four papers, protocols and algorithms solutions are presented, furnishing important contributions to the state of the art and offering, at the same time, an important updated overview about emerging communication technologies for Smart Communication Protocols & Algorithms.

The paper by Oladayo Bello, Antoine Bagula, and H.Anthony Chan, "Multilayer Traffic Engineering in Interworking Multihop wireless networks" [1], presents a framework that ensures continuous service and sustains an acceptable service level quality for network users transiting between multiple multihop wireless networks. The focus is on the scenario where a user utilizes multiple hops to access any of the multiple networks. Authors classify the components of the framework into link discovery, resource optimization and routing processes. A set of analytical models and metrics are defined for these processes and the framework evaluated with simulations. The findings show that despite an increase in simultaneous network users, which degrades network performance, the framework is able to support quality continuous service for users transiting between networks. The advancement in wireless networking and wireless device technology are paving the way for bringing the vision of ubiquitous communication to reality. This vision will be enabled by the interworking of existing wireless multihop wireless networks. However, the diversity in the design and operation of these wireless networks may not enable users to enjoy continuous network service as they traverse between networks.

The paper by Qiang Duan, "Automatic Network Service Discovery and Selection in Virtualization-Based Future Internet" [2], explores application of SOA in network virtualization to address the network service discovery and selection problem. A broker system is proposed based on Service-Oriented Architecture (SOA) for automatic network service discovery and selection, a scalable and efficient protocol is developed for updating network service information, and the multi-attribute decision making technique is employed for ranking and selecting network services to meet application requirements. The next generation Internet is expected to support a wide range of network applications with highly diverse requirements. Network virtualization, which will play a key role in the future Internet,

allows a large number of service providers to offer various network services upon shared network infrastructure. Therefore, discovery and selection of the most appropriate network service for meeting the requirement of each application becomes an important issue in the virtualization-based future Internet. SOA offers an effective architectural principle for heterogeneous system integration that may facilitate realizing the notion of network virtualization. Performance evaluation results are also presented in the paper to show the effectiveness of the developed protocol and algorithm.

The paper presented by Junaid Shaikh, Markus Fiedler, Tahir Nawaz Minhas, Patrik Arlos, and Denis Collange, "Inferring User-Perceived Performance of Network by Monitoring TCP Interruptions" [3], presents a set of criteria to observe the user behavior on the Web, passively from the network-level. The criteria are based on the monitoring of TCP control flags and HTTP requests. Thus, information about user actions performed in the Web browser can be inferred by monitoring the TCP termination flags and by keeping track of the HTTP requests. Along the way, authors also present some anomalies observed in the TCP connection termination process, which may result in performance degradation of Web transfers. The fluctuating performance of wireless and mobile networks has triggered the need for smart algorithms to assess the user perception, resulting from the quality of network services. While efforts have been done to model the user experience resulting from the network performance, there is still the need for practical methods to assess the user-perceived performance, in the real environment.

The paper entitled "On the Performance of Alternating Concurrent Cooperative Transmissions in the High Path-Loss Attenuation Regime" [4], proposed by Aravind Kailas addresses the issue of network broadcasting using alternating concurrent cooperative transmissions for sensor-based wireless networks that are very lossy. The medium access control (MAC)-free broadcast strategy is a simple, energy-efficient, low-overhead form of cooperative diversity-based strategy called the opportunistic large arrays (OLAs), and uses a received power-based threshold to define mutually exclusive sets of nodes during the initial broadcast, such that the union of the sets includes all the nodes in the network or cooperative route. This eliminates the formation of undesirable network coverage holes, a result of the "dead" nodes resulting from repeated usage. This broadcast strategy has been analyzed for wireless channels with $\gamma = 2$. The semi-analytical approach presented here investigates network life extensions for $\gamma > 2$ by considering two extreme continuum network topologies that correspond to the largest and smallest ratios of nodes (or network areas) used up during a successful broadcast, namely discs and strips, analyzing which will then set the bounds for arbitrary shaped static, cooperative routes or networks.

We believe that this special issue provides a better understanding of advances on Smart Communication Protocols & Algorithms. To conclude this special Issue, we would like to thank all the authors that submitted papers for this special Issue and for leveraging the quality of this publication. We would also like to thank the reviewers for their timely comprehensive reviews and constructive comments. Finally, we wish to express our thanks to Jaime Lloret Mauri, Editor-in-Chief, Network Protocols and Algorithms for his help and cooperation on this publication.

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