

# ComSoc Technology News

## Localized Geographic Routing to a Mobile Sink with Guaranteed Delivery in Sensor Networks

The energy needed for reporting from a sensor to the sink in wireless sensor network is proportional to the average number of hops. In large scale networks, this may become a bottleneck. Mobile sinks reduce the number of hops and, therefore, energy consumption by collecting sensor measurements in their neighborhoods. Sensors route their periodic readings toward the current location of the mobile sink via other sensors in multi-hop fashion. In this paper, the authors propose a novel localized Integrated Location Service and Routing (ILSR) scheme, based on the geographic routing protocol GFG (greedy-face-greedy, see below), for data communications from sensors to a mobile sink in wireless sensor networks. GFG ensures successful communication as long as a sensor remains connected to the mobile sink. Considering both unpredictable and predictable sink mobility, the authors present two versions of their scheme and prove that both of them guarantee delivery in a connected network modeled as unit disk graph. ILSR is the first localized protocol that has this property. They further propose to reduce message cost, without jeopardizing this property, by dynamically controlling the level of location update. A few add-on techniques are also suggested to enhance the algorithm performance. It is observed that ILSR generates routes close to shortest paths at dramatically lower (90% lower) message cost. [IEEE Journal on Selected Areas in Communications](#)  
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## Smart Grid Forensic Science: Applications, Challenges and Open Issues

Smart grid forensics is emerging as a powerful security component of the power system, with applications in cyber-security, natural disaster recovery and damage prevention, and law enforcement. Challenges range from privacy to handling of the enormous amount of data thrown off by the monitoring systems. This article provides an interesting introduction to the emerging area of smart-grid forensics, with a discussion of the challenges and open issues. [IEEE Communications Magazine](#)  
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## Radio Resource Allocation in LTE-Advanced Cellular Networks with M2M Communications

The paper presents the Machine-to-Machine (M2M) communications as a means for providing ubiquitous connectivity between machines without the need of human intervention. In particular,

when opposed to the traditional human-to-human (H2H) services, M2M services are shown to have very different requirements on a communication system due to their characteristics and given the large increase in the number of Machine-Type Communication (MTC) devices. Following, various radio resource allocation schemes are described and quantified in terms of their applicability to LTE-Advanced cellular networks with the aim of minimising co-channel interference and maximising network efficiency, and then supported with system-level simulation results demonstrating that the proposed schemes can improve the network performance in terms of user utility. The paper concludes that M2M communications are to be an emerging technology facilitating the deployment of the Internet of Things (IoT) concept by means of, among others, the aforementioned cellular technology. [IEEE Communications Magazine](#)  
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## **Cognitive Network Interference**

Cognitive radio techniques for opportunistic spectrum access are a promising solution to efficiently share the spectrum. Radio devices with cognitive capabilities can learn from the environment spatial and temporal utilization status of the radio spectrum and opportunistically exploit underutilized resources if doing so does not cause interference for other systems. Spectrum sharing is challenging since it creates interference from an unknown number of nodes randomly scattered in the network. This article introduces a new statistical model for cognitive network interference (CNI) based on the theory of truncated-stable distributions. The model accounts for sensing procedures, spectrum reuse protocols, and environment-dependent conditions such as path loss, shadowing, and channel fading. This provides an accurate characterization of CNI in realistic environments, making the model very attractive for operators deploying efficient mobile networks, industry developing new wireless applications, and regulators planning modern spectrum utilization. [IEEE Journal on Selected Areas in Communications](#)  
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## **Cooperative Spectrum Sensing with Ternary Local Decisions**

Cognitive radio has recently emerged as a promising solution for the current spectrum shortage by allowing the unlicensed secondary users to re-utilize the spectrum temporarily released by the licensed primary users. For simplicity, most cooperative spectrum sensing designs only consider the case of single-bit local decision, where each secondary user only sends a 1-bit message to the fusion center. However, some system setups may allow for multi-bit information forwarding from the cooperative secondary users to the fusion center for an improved sensing performance. As a transition to cooperative spectrum sensing with multi-bit local decisions, this paper considers the ternary case. This paper uses binary sensing as a baseline to design a low-complexity ternary sensing strategy with diversity as the performance measure. Readers who are interested in practical cooperative sensing designs under a given reporting channel bandwidth constraint would find this paper very insightful. [IEEE Communications Letters](#)  
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## **Auction-based resource allocation in cognitive radio systems**

Cognitive radio has emerged as a promising technology to efficiently utilize the scarce radio

resources by allowing the unlicensed users to opportunistically and dynamically access the spectrum owned by licensed users. By allowing the secondary users to access the licensed radio resources, the licensed users can gain monetary returns from the unlicensed users. In this context, models based on market- and microeconomic theory can be used to efficiently manage the radio resources to bring benefits to both the primary and secondary systems. Recently, auction theory, which provides rich economic tools and solutions, has been employed to model, analyze, and optimize the radio resource allocation and management in cognitive radio systems. This article provides a comprehensive survey on auction methods adopted for resource allocation in cognitive radio systems. [IEEE Communications Magazine](#)  
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## **Incentivizing Time-Shifting of Data: A Survey of Time-Dependent Pricing for Internet Access**

ISPs are starting to use pricing as a congestion management tool, as seen from the elimination of flat-rate data plans in favor of usage-based pricing. This article outlines the sources of today's congestion and pricing challenges and then discusses regulatory and technological trends that influence this issue. Proposals for incentivizing time-shifting of data by customers are also described. This article would be of considerable interest to readers who wish to go beyond technology-based issues to the underlying business aspects of telecommunications and mobile networks. [IEEE Communications Magazine](#)  
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## **New Models for Long-Term Internet Traffic Forecasting Using Artificial Neural Networks and Flow Based Information**

Despite many Internet Service Providers (ISPs) administrators still perform the prevision of resource's future needs based on experience and intuition, this approach is not adequate for planning large networks. Since it can be a limitation when there is a need for information in other layers of the protocol stack, the paper by Miguel et al. proposes a different method for collecting historical data from Internet data flows. They also present the use of new long-term forecasting models based on multiple settings of Time-Lagged Feedforward Networks (TLFN), which is a static neural network whose model includes a delay window that works as a short-term memory. Results show that this approach is a good option for planning network links that transport Internet traffic. [Network Operations and Management Symposium 2012](#)  
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## **Smart Attacks in Smart Grid Communications Networks**

Smart grids are the hot topic of the day, and issues around their integrity are very important because of the critical dependence of modern societies on power Networks. As control grids potentially share public networks, and at the same time as security issues are affected by non-state actors, it could well be that the success or failure of smart grids will depend heavily on whether they can be made sufficiently secure. The article by Chen. et. al. provides an excellent overview of the challenges facing smart grids from a network security standpoint.[IEEE Communications Magazine](#)

## **Synchronous Ethernet to Transport Frequency and Phase/Time**

Traditional Ethernet networks operated using local clocks with relatively low accuracy compared with traditional optical network clocks. In 2005, the ITU initiated a study on transport of synchronization information over Ethernet links. The goal of this work was to facilitate a transition from the traditional optical network to the newer data-centric, packet-based networks. This has resulted in the definition of a new technology called Synchronous Ethernet, which is capable of carrying telecom-quality synchronization information over Ethernet links. This paper provides an introduction to this technology suitable for the general reader. It then provides background on the relevant standards, and on an underlying messaging protocol, which may be followed up for further information.

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