Editorial

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Biographical notes: Timothy I. Matis is an Associate Professor in the Department of Industrial Engineering at Texas Tech University. His research interests are in operations research and applied stochastic processes, and he has led numerous investigations into the design of mobile ad hoc wireless networks. Specifically, his research has focused on the impact of multipath-fading on network performance, and ways in which this can be mitigated. He presently serves on editorial boards and in professional societies related to telecommunications networks.

Ivan G. Guardiola received his BS in Electrical Engineering and MS in Industrial Engineering from New Mexico State University. He continued his education by obtaining his PhD in Industrial Engineering from Texas Tech University. This led to a post-doctoral position at the DoE/NNSA's Pantex Plant Site where he was entitled Associate Researcher from The Center for Engineering Logistics and Distribution, which is an industry/university cooperative research centre sponsored by the National Science Foundation. He currently holds the position as an Assistant Professor at the Missouri University of Science and Technology (formerly known as UMR) in the Department of Engineering Management and Systems Engineering. His research and teaching interests includes wireless ad hoc networks, systems engineering, operations research and stochastic modelling.

The area of wireless communication has seen a great deal of growth in recent years. The introduction of cheap reliable communication in the late 1980s and early 1990s has brought a change in the way society communicates. The need for wireless mobile communication continues to inspire a great deal of interest as true communication freedom is realised. Cellular communication capabilities have brought about a mobile information sharing society, which continues to grow today. This growth has brought about a new need of data sharing and real time data transfers. Moreover, in recent years new forms of communication have been realised and hand-held capabilities have been increased. This new communication need is thru infrastructure free communication systems and networks. In an effort to resolve these new requirements a new field has emerged. This field is known as mobile ad-hoc networks or MANETs, it allows communication without the need of pre-existing infrastructure and/or wired way points such as the cellular towers. MANETs have begun to realise the capability of true mobility and freedom. Hence, MANETs have spawned a great deal of interest within both industry and academic communities, as they are capable of supplying self-organising and self-controllable communication systems in remote areas where no pre-existing infrastructure is present. The applications of such networks are those of high interest to military, civil service and regular consumers. This special journal issue is dedicated to explore new limitations, approaches and current methodologies, within the field wireless ad hoc communication networks.

The first paper in this issue is a tutorial titled 'Game theory for cooperative and relay communications in mobile ad hoc networks: a brief tutorial'. Considering that nodes in a MANET lack a central authority, and that forwarding data for others costs valuable resources such as energy and bandwidth, one could reasonably assume that the nodes would behave rationally and in their own self interest. Such an interpretation invokes game theory. Lu Yan proceeds to analyse possible incentive strategies to promote cooperation amongst nodes. Branching off from past research, he loosens the simultaneous, perfect measurement and uni-strategy assumptions.

The paper 'CIDS: cross-layer intrusion detection system for mobile ad hoc networks' considers the numerous

security threats faced my MANETs due to their wireless nature. Beyond security prevention techniques such as encryption, intrusion detection systems (IDS) have been successful in recognising security threats in infrastructure based wireless networks by monitoring centralised access points such as routers and gateways, points which are not present in MANETs. There are two common problems occur when applying traditional IDS to MANET. First, it is limited to monitoring only one protocol layer at a time and secondly, it is subject to frequent Type 1 errors, sensing threats when only network irregularities have occurred. Since every layer is subject to attack, a cross-layer IDS (CIDS) is proposed.

The paper 'Exploiting space/time trade-offs in real-time mobile ad hoc networks' addresses the issue of real-time communication in MANETs. A new communication model, the space-elastic model, is introduced, from whence a real-time routing protocol, the space elastic adaptive routing protocol (SEAR), is designed. While a time elastic model that utilises timely transmission to maintain a desired coverage area already exists, the newly proposed model does the opposite by reducing the desired coverage area to one that can support timely communication. The SEAR protocol maintains awareness of the dynamic coverage area (route breaks) and broadcasts this information to the rest of the nodes, which respond accordingly. In conclusion, the space elastic model minimises transmission jitters and provides timeliness guarantees to an adaptable actual coverage space.

The paper 'Power-aware node-disjoint multipath source routing with low overhead in MANET' addresses the issue of limited battery life in MANET nodes by introducing the power-aware node-disjoint multipath source routing (PNDMSR) protocol. The PNDMSR protocol is based on the dynamic source routing (DSR) protocol with additional node-disjoint and power-awareness characteristics. Its success lies in reducing the number of route request packets (RREQs) sent throughout the network. The benefits of this decline in RREQs include a reduction in overhead and power consumption as well as an increase in reliability.

The paper 'Using GPS based link exclusion to reduce overhead and increase route reliability in FTP/TCP-based MANETS' further investigates the use of GPS information to develop a node silencing mechanism to increase routing reliability. Previous research was under the constant bit rate (CBR) transmission of data packets over the user datagram protocol (UDP), and in this paper it is extended to the file transfer protocol (FTP) transmission over the transport control protocol (TCP). Simulations were performed using NS2 is a designed experiment setting, and key performance metrics analysed.

The paper 'Distributed node scheduling method for wireless sensor networks' investigates the issue of limited energy supply in the sensor nodes that comprise a wireless sensor network (WSN). It is often very difficult to retrieve the nodes in order to recharge them, and node scheduling methods have become the desired means to combat this issue. This paper first proposes a new two-hop cluster (THCNS) concept and proceeds to develop a new distributed node scheduling algorithm from this. Unlike its predecessors, the THCNS does not require location information.