Abstracts for Technical Presentations

Session 1 – Tools, Methods, and Performance

Chair: Jarmo Prokkola (VTT)

1.1 Qos Provisioning in Mobile Ad-Hoc Networks

Presenter: Hans van den Berg (TNO)

Roughly spoken two approaches to QoS provisioning in mobile ad hoc networks have been proposed: (i) packet scheduling at the MAC layer, and (ii) resource reservation at the network level. An important drawback of reservation-based mechanisms (mostly relying on detailed network state information) is their inherent complexity. In our presentation we focus on the effectiveness of locally acting MAC layer packet-scheduling mechanisms for supporting real-time applications over multi-hop wireless paths. In particular, using a detailed ad-hoc network simulator developed within the EW project, we investigate and explain the shortcomings of existing mechanisms (i.e. the standardized IEEE 802.11E EDCA), and propose several enhancements. In addition, we present a novel analytical performance model of a relay node that provides fundamental insights into the impact of radio resource sharing on end-to-end QoS in mobile ad-hoc networks.

1.2 Qos Measurements Methods and Tools

Presenter: Jarmo Prokkola (VTT)

Measurements are performed to acquire information about the performance of the considered existing and developed systems, solutions and protocols. Also, monitoring actively the networking performance and providing feedback to the application helps services to provide better user experience. Knowledge of the network and service status helps the server to share and administrate resources with great efficiency providing better quality to the user.

Network traffic measurements can be categorized to as active and passive measurements. Active measurements are performed by injecting traffic with known properties into the network, while observing the network behaviour and performance. Passive measurements consist of monitoring the existing traffic at one or more points to acquire information about the traffic flow behaviour, while not affecting the traffic itself. Traffic traces can also be used to research and develop traffic models.

QoS measurements lie logically above network traffic measurements, and typically focus on the performance observed by the network user. Thus, QoS measurements are not only about the performance of the network, but include also the application and its behaviour over the network. QoS measurement architecture typically includes one or more measurement points, located at network nodes (e.g., hosts, routers, firewalls); traffic measurement tool, which captures packets and collects information; and a QoS analysis tool, which analyzes the collected data. Data analysis can be done in real-time, and/or after the traffic traces have been collected. In addition, analysis can be centralized to a specific server, or distributed to the network.

QoS measurement tools developed and used in EW will be presented. These include QoSMeT for measuring the application performance in real-time, MOSET for active HTTP response performance, and an agent-based solution for controlling a heterogeneous network by the collected measurement information. In addition, a multipoint network monitoring architecture is presented.

1.3 Network Performance under Mobility in Ad Hoc Networks

Presenter: Roland de Haan (University of Twente)

Network performance is clearly affected by connectivity that in turn is determined by the position of the stations in an ad hoc network.

When stations move, connectivity may change over time, and therefore also network performance. We present a first-step approach to understanding the performance of such mobile ad hoc networks. In particular, we study a network model with a single mobile station and multiple fixed stations. Communication is between the fixed stations and the mobile station, and can only take place when the stations are within range of each other.
The resulting model is analyzed as a variant of the time-limited polling model, that allows for an explicit characterization of network performance.

Session 2 – Service Continuity

Chair: Carlos García-Rubio (University Carlos III of Madrid)

2.1 Handover with mSCTP

Presenter: Carlos García-Rubio (University Carlos III of Madrid)

The integration of 802.11-based WLANs and GPRS/UMTS cellular networks has attracted considerable research interest during the last few years. Several topics need to be addressed, including authentication, security, QoS support, mobility management, and seamless service continuity. In this presentation we concentrate on seamless service continuity. The 3GPP defines seamless service ontinuity as a handover between two wireless networks without user intervention and with minimal service disruptions (i.e., packet loss, etc.). In this presentation we review the alternative architectures proposed so far to solve this problem, with their advantages and disadvantages. We present a transport layer mobility management based on SCTP (Stream Control Transmission Protocol) with some extensions. Location management is achieved using application layer protocols, such as SIP (Session Initiation Protocol) and Dynamic DNS. We also present the demonstrator where we are showing that seamless handover can be fully accomplished with our solution, and the future lines for research.

2.2 Access Network Controlled Fast Handoff for Streaming Multimedia in WLAN

Presenter: Bart Jooris (IBBT)

Within the EW project, a novel way (Moving Access Point or MAP concept) to support voice over IP (VoIP) and streaming video applications on mobile devices over a 802.11 access network has been developed. Fast handoff in a wireless local area network (WLAN) environment has been the research topic of many previous studies, the majority of which described ways to optimise the three main 802.11 handoff phases - scanning, authentication, and re-association. In this presentation, however, we propose a fast handover scheme that skips all mentioned phases. In our approach, the handover is controlled and prepared by the access network and is triggered by sending a hop request message to the mobile station (STA). At the STA the three phases are reduced to a single frequency change phase. The proposed solution extends the standard 802.11 scheme. If the extension is not available at the access network or the STA, the devices will fall back on the standard handoff procedure. Because the access network fully controls the handover process and actively invokes the frequency change on the STA, we can guarantee a minimal duration of the time the STA stays disconnected. The presentation will cover a description of the: Moving Access Point concept, implementation details, simulations, demonstrator & experimental results.

2.3 Cross Layer Routing in Ad Hoc Networks

Presenter: Erlend Larsen (UNIK)

We present an overview of cross-layer based routing protocols for multihop wireless networks. The paper describes the motivation for cross layering and the various mechanisms used. Most proposals focus on cross-layer interaction in the three lowest layers in the OSI protocol stack. Also, taxonomy of different cross-layer categories and possible cross-layer implementation architectures is presented. Further, to clarify the concept of cross layering, we present and evaluate a selection of state of the art proposals related to cross-layer based routing.

2.4 (Invited paper) Internet on Train – Architecture for Service Continuity

Ingrid Moerman (IBBT)

Internet-on-the-train is a rising concept in the last few years. Several trials in different countries have proved the feasibility of offering Internet access to train commuters, but none of them combines broadband access, scalability, seamless handover and quality of service guarantees in one solution. In this presentation, we propose a new architecture to satisfy these needs. Using real handover measurement data of several common broadband wireless technologies, we compare two possible inter-working mobility solutions: Mobile Multi-Path SCTP (MMP-SCTP) and Mobile IP (MIP).

Session 3 Quality of Service (QoS)

Chair: Ingrid Moerman (IBBT)

3.1 A Generic Architecture for End-to-End QoS in Heterogeneous Networks

Presenter: Johnny Choque (University of Cantabria)

The ongoing relevant growth of portable devices, characterized by having more than one radio interface, brings about the possibility for the end-user to use the surrounding heterogeneous wireless technologies. The user expects that when shifting from one network to another one, the current Quality of Service (QoS) parameters are maintained, independently of the intrinsic characteristics of the subjacent wireless technologies. In this sense, this paper proposes a generic end-to-end QoS architecture, mainly focused on keeping QoS between the wireless access networks when the user performs handover. We define a number of different entities, most of them centered at the end-user, thus building a user-centric architecture. In order to transport the signaling messages within the network architecture, the Next Step In Signaling (NSIS) suite is used. Finally, a QoS Model for the wireless access network is sketched.

3.2 (Invited paper) A Pragmatic QoS Solution in Wireless Mesh Networks: The ADHOCSYS Approach

Luca Leschiutta (Politecnico di Torino)

The main objective of the ADHOCSYS project is to provide a reliable broadband Internet access solution, based on wireless mesh networks, to people who live in rural and mountain regions where xDSL is not available or non-profitable, also considering persons living outside towns and villages.
This presentation gives a summary of the QoS solution and its implementation proposed by the ADHOCSYS project that aims at both guaranteeing access to an essential set of services (web browsing, e-mail services) under all conditions and increasing network efficiency for other types of applications/services.
In particular, the mechanisms for the prioritization of the essential set of services and the related implementation issues are highlighted.
The investigated mechanisms include: scheduling and flow classification, network and channel utilization measurement, Connection Admission Control (CAC), network and radio resource management and rate adaptation for multimedia services. These mechanisms will be used both for service differentiation and load balancing.
Finally the implementation and testing tasks based on a real-life pilot network deployed in North Italy will be presented.

3.3 Multi-Radio Multi-Channel Ad-Hoc Networks

Presenter: Jan Stemerdink (WMC)

This contribution discusses the capacity improvements of a class of multi-radio multi-channel wireless ad-hoc networks as compared to their single-channel counterparts. We have performed simulations to evaluate the performance of configurations with various numbers of radios and channels. In addition,

we have developed an algorithm that optimises the diversity of the channel usage while maintaining maximum connectivity between neighbouring nodes. The presentation also shows the running simulation, where the influence of various parameters, as number of channels, number of nodes, and transmission power, on the throughput can be seen in real-time.