Workshop on ns-3
Held in conjunction with SIMUTools '09
2 March 2009
Rome, Italy

Program

09:00 - 10:30	Tutorial part 1: Overview of ns-3 features, and using ns-3
10:30 - 11:00	Coffee Break
11:00 - 12:30	Tutorial part 2: Overview of ns-3 system, and extending ns-3
12:30 - 14:00	Lunch
14:00 - 16:00	Session 1: Focus on ns-3 WiFi (Session chair: Mathieu Lacage)
16:00 - 16:30	Coffee Break
16:30 - 18:00	Session 2: Short talks (Session chair: Tom Henderson)

Session 1: Focus on ns-3 WiFi

Authors: Ruben Merz, Cigdem Sengul, and Mustafa Al-Bado
Title: Accurate Physical Layer Modeling for Realistic Wireless Network Simulation
Abstract: The main focus of our research is the development and validation of fast and accurate wireless physical layer models for packet level network simulators. One of the principal objectives of most network simulators is a short simulation running time. A second, but equally important objective, is accurate simulation results. In the case of wireless network simulations, the short running time is typically obtained at the cost of a simplified wireless physical layer modeling. Unfortunately, the use of such simplified models in current simulators often results in extremely inaccurate results. This clearly limits the current use of simulators for wireless networking. Indeed, two prevalent issues with most existing wireless physical layer models are (1) the lack of a clear presentation of the underlying models and, especially, of the modeling assumptions and (2) the lack of validation with real environments. Hence, our goal is to develop a model that achieves a reasonable running time without significantly sacrificing accuracy. Our main contribution will lie in validating our model through a wireless network testbed. We believe this work will be a first enabler for more trustworthy wireless simulations

Authors: Timo Bingmann and Jens Mittag
Title: An overview of PHY-layer models in ns-3
Abstract: This short talk discusses the current state of the Wifi model inside of ns-3 (SINR-based, BER-based, Capture Model) and the differences between them.

Author: Mirko Banchi
Title: Realization of 802.11n and 802.11e models
Abstract: The IEEE 802.11n standard aims to provide new features for wireless communications. The standard achieve new data rates, MIMO (Multiple Input Multiple Output) channel, multiple stream data transfer, frame aggregation, LDPC and more. Our focus is to include some of these new options in the ns-3 simulator. In order to simulate an efficient system behaviour, we will develop an EDCA mechanism and QoS support such as specified in 802.11e standard. Our first goal is 802.11e support (already implemented partially in ns-3) and MSDU frame aggregation (A-MSDU). In the future we also include in ns-3 wifi module the following milestones: support for Block Ack mechanism, MPDU aggregation (A-MPDU), Transimission of multiple frame in the same Txop, MIMO, and HT Terminal. We will discuss how to realize the above features.

Author: Kirill V. Andreev
Title: Realization of the draft standard for Mesh Networking (IEEE802.11s)
Abstract: The purpose of this model is the realization of IEEE802.11s in accordance with draft 2.0 of the standard. The model is aimed to support multi-interface mesh networks and mesh portals.
To create this model we have developed three new concepts in NS:
1) We have written an L2RoutingProtocol, which interface is similar to Ipv4RoutingProtocol. The HWMP is inherited from L2RoutingProtocol
2) We have written an L2RoutingNetDevice, which interfaces are similar to BridgeNetDevice with a slight difference, and L2RoutingProtocol can be attached to L2RoutingNetDevice
3) We have written a MeshWifiMac and MeshWifiPeerLinkManager. They support beacons with vendor-specific elements, support peer link management state frame exchanges, support sending data frames to neighbours over established peer-links.
So, the L2RoutingNetDevice with attached protocol and list of ports (NetDevices) construct Layer 2 routing model. MeshWifiPeerLinkManager is attached to the MeshWifiMac and handles peer links at it, but a mechanism of choosing peer links may be attached easily to multi-interface mesh point, and some ports may be disabled or enabled 'on the fly'.

Author: Guangyu Pei and Tom Henderson
Title: 802.11b PHY models and validation
Abstract: We describe some initial efforts to produce a validated 802.11b PHY model.

Session 2: Short talks

Authors: Ramon Bauza, Miguel Sepulcre, and Javier
Gozalvez
Title: ns-3 scalability constraints in
heterogeneous wireless simulations: iTETRIS a case study
Abstract: This is a short talk about preliminary results on ns-3 scalability.

Authors: Francisco Carmona, Juan Carlos Moreno, Ana Cabello, Francisco Lobo, and David Mora
Title: ns-3 Script Generator
Abstract: The goal of this work is to develop a software tool that eases the task of simulating a network using ns-3 (Network Simulator 3) and that allows to emulate an application layer protocol (over the TCP/IP stack) data flow. Both of them could be done via a GUI (Graphical User Interface) or just by directly writing an input file defining all the needed parameters.

Author: Mohamed Amine Ismail
Title: A Mobile WiMAX Module for ns-3
Abstract: Mobile WiMAX (Worldwide Interoperability for Microwave Access) has made major strides over the past year and is rapidly proving itself as a leading solution for broadband wireless service. The Mobile WiMAX air interface is based on the IEEE 802.16 standard and the IEEE 802.16e Amendment. WiMAX defines the MAC (Medium Access Control) and the physical layer for the broadband wireless access networks.n this paper we propose a Mobile WiMAX module for ns-3 with Point-to-Multipoint (PMP) mode and the OFDM physical layer. Our module is based on the IEEE 802.16e standard and ns-3 version 3.2. The code is available under the GNU General Public License. It implements the Point-to-Multipoint (PMP) topology and the OFDM physical layer with TDD mode and aims to provide standard compliant implementation of the standard supporting QoS scheduling services, bandwidth management and OFDM PHY layer. The design of the module is fully object-oriented, facilitating modularity, re-usability, scalability and maintenance of software. The proposed

module is mainly composed of three layers: The Convergence Sublayer (CS), the MAC Common Part Sublayer (CPS) and the PHY layer. The module is built in C++ with more than 36 classes. The Class WimaxNetDevice represents the MAC layer of WiMAX network device. It extends the NetDevice class of ns-3 API that provides abstraction of a network device. WimaxNetDevice is further extended by BaseStationNetDevice and SubscriberStationNetDevice classes defining MAC layers of BS and SS, respectively. Besides these main classes, the key functions of MAC layer are distributed to several other classes including Link Manager, Scheduler, Connection Manager and Bandwidth Manager. The WiMAX PHY module provides two different physical layers. The first one (SimpleWiMAXPhy) is a basic PHY implementation which simply forward bursts received by the MAC layer ignoring any underlying PHY layer details. The second one (OfdmWimaxPhy) is the OFDM PHY layer based on the Wireless MAN-OFDM specification. This class deals with channel coding block, it converts the packet bursts to bit-streams then splits them into smaller FEC blocks. As future work we intend to implement a convergence sub-layer for IP over IEEE 802.16 applications and updating scheduler with more efficient algorithms.