Second Workshop on *ns*-2 (W*NS2* 2008)

Organised in association with

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Thursday 23 October, Athens, Greece

8:30 – 8:40: OPENING REMARKS

8:40 – 10:00: SESSION 1, "SIMULATOR USE"

8:40 – 9:00: Alexander Sayenko, Oleksandr Puehko, Vitaliy Tykhomyrov and Henrik Martikainen,
"Link Adaptation Thresholds for the IEEE 802.16 Base Station".
The IEEE 802.16 technology defines a number of the modulation and coding schemes that the base station can use to achieve the best tradeoff between the spectrum efficiency and the resulting application level throughput. However, the 802.16 specification does not define any particular link level adaptation algorithm, neither does it specify the SNR thresholds for switching between the modulation and coding schemes. In this paper we consider a link adaptation model and conduct a number of simulation runs to find transition thresholds for ARQ and HARQ retransmission mechanisms.

9:00 – 9:20: Tubtim Sanguanwongthong and Prawit Chumchu,
"Design and Implementation of Micro Mobile MPLS for NS-2".
In this paper, we extend NS-2 to simulate Micro-Mobile MPLS frameworks. The extension supports most of important mechanisms used in the literature. The simulator is based on IEEE 802.11. The important mechanisms are multi-channel support used in IEEE 802.11, directional antennas, multiple interfaces, L2-handoff, L2-trigger, bicasting, pre-established LSP, and buffering mechanism. MPLS modules used in this simulator is based MNS [8]-[10]. This simulator could be configured to assess performance of Mobile MPLS protocols such as micro mobility-enabled multiprotocol label switching (M-MPLS) [21], fast handoff (FH) and master forwarding chain (MFC)-Micro Mobile MPLS [2], [23] and MiM-MPLS [30]. The simulator is validated for each mechanism. The validation results follow to the theory.

9:20 – 9:40: Nelson Vicuna, Yezekael Hayel, and Tania Jiminez,
"Performance of SCTP in Wi-Fi and WiMAX networks with multi-homed mobiles".
This paper provides an exhaustive performance analysis by simulation of the SCTP transfer protocol in WiMAX and Wi-Fi networks. We provide also a comparison of SCTP with both transfer protocols UDP for VoIP applications and TCP for FTP sessions, as SCTP can support these two types (elastic and non-elastic) of traffic. Finally, we study how SCTP performs when a mobile is multi-homed, i.e. connected simultaneously to two wireless networks (Wi-Fi and WiMAX).

9:40 – 10:00: Abdulmohsen Mutairi and Uthman Baroudi,
"NS-2 Enhancements for Detailed HSPDA Simulations".
The Enhanced UMTS Radio Access Network Extensions (EURANE) provided UMTS and HSDPA support in the Network Simulator (NS-2). The main components of EURANE include the Radio Link Control (RLC) layer with the Acknowledged and Unacknowledged Modes, MAC layer for the main UMTS and HSDPA transport channels and a physical-layer simulation tool for simulating the fast channel variations in HSDPA. Although it has added most of the UMTS protocol stack to NS-2, EURANE does not support multiple cells, user mobility or handover which are necessary to study the system-level performance of RLC layer, handover and Iub flow control. In this paper, we describe new extensions and a redesign of EURANE to overcome these limitations and provide additional functionality. The new simulator supports user mobility using Random Waypoint mobility models and handover. In addition, the simulator provides an enhanced signaling protocol for Iub flow control that allow adding new flow control algorithms to EURANE whenever needed.

10:00 – 10:40: COFFEE BREAK

10:40 – 12:00: SESSION 2, "STRUCTURAL DEVELOPMENTS/ENHANCEMENTS"

10:40 – 11:00: Laurent Paquereau and Bjarne Helvik ,
"Simulation of Wireless Multi-* Networks".
Multi-technology, multi-homed, multi-hop, multi-interface, multi-channel, multi-route, multi-destination... Emerging wireless networks are multi-* networks. Emerging wireless networks are also no longer stand-alone and self-contained networks but connected to external networks. Simulating such complex systems requires advanced network simulation tools. The network simulator 2 (ns-2) is one of the most widely used simulators and has constantly been enriched to design, test and evaluate new network architectures and protocols. This paper motivates and presents the design and implementation of a network layer that extends the functionality of ns-2 to support the aforementioned features. In particular, it provides support for multiple interfaces, potentially of different types, and multiple routing and forwarding protocols running on the same node.

11:00 – 11:20: Nicola Baldo, Marco Miozzo and Federico Maguolo,
"**A new approach to simulating PHY, MAC and Routing**".
In recent years, network simulation has become a very difficult task due to the proliferation and integration of wireless technologies. In this paper, we discuss the new challenges that have arisen regarding the simulation of the wireless channel and the PHY, MAC and Routing layers. We then present a novel framework designed to address these challenges. This framework has been developed as an extension of NS-Miracle, and is made up of two components. The first component is the Miracle PHY and MAC framework, which provides support for the development of Channel, PHY and MAC modules, providing support for features currently lacking in most state-of-the-art simulators, while at the same time giving a strong emphasis on code modularity, interoperability and reusability. The second component is the Miracle Routing framework, which enables the integration of different routing schemes in a multi-tier architecture to provide support for the simulation of multi-technlogy and heterogeneous networks.

11:20 - 11:40: Julien Montavont, Sebastien Vincent and Nicolas Montavont,
"Implementation of an IPv6 stack for NS-3".
This paper presents the implementation of an IPv6 stack within the network simulator NS-3. IPv6 is currently being deployed in the world, and will be the Internet Protocol for at least the next fifty years. On another hand, NS-3 aims at being the reference for simulation of the Internet based communication and thus it is important that NS-3 proposes a framework for IPv6. In this paper, we present the main components of our implementation and how we tackle the new mechanisms introduced by IPv6. Finally, we provide some simulation scenarios and results to show that most IPv6 features are already working in our framework, such as the Neighbor Discovery protocol.

11:40 - 12:00: Ryad Ben-El-Kezadri, Guy Pujolle and Farouk Kamoun,
"XAV: A Tracing Framework for Exploring Large Network Simulation Outputs".
This paper presents our ongoing works towards the exploration of large network simulation outputs. Data exploration supposes the ability of the navigation system to project

interactive representations of the network to users and to decorate them with navigation aids. The sequence of user actions and system reactions represents the data exploration process. To simplify and speed up this process, our proposed tracing framework, namely XAV, i) locates the trace file content in space and time to tie it to a three dimensional network representation and ii) elevates the packet data paths to first class entities. The result is that XAV simulation outputs are structured in space and time and populated with data paths. XAV has been implemented in the NS-2 simulator and tested over a wireless ad-hoc network composed of 25 nodes. The performance evaluation shows that XAV enables to extract about 1000 packet paths per second from 100 MB raw files.

12:30 – 13:30: LUNCH BREAK

13:30 – 18:30: TUTORIAL ON ns3 (open to Valuetools participants)

George F. Riley - Biography

Dr. Riley received his Ph.D. from the Georgia Tech College of Computing in August 2001, and joined the faculty of ECE at that time. Mr. Riley received a MSCS from Florida Tech in 1996, and a BSEE from University of Alabama in 1972. Prior to enrolling at Tech in 1996, Mr. Riley was president and CEO of Infoware, Inc. of Cocoa Beach Florida. From 1987 to 1996 Infoware provided software and system design services to the United States Air Force at Patrick Air Force Base, Florida. During that time, Infoware designed, implemented, and deployed numerous systems in support the missile launch activities at Cape Canaveral Air Force Station, including a communications front-end processor for real-time data gathering and a real-time distributed flight safety display system. Concurrently, from 1984 to 2000, Mr. Riley was also vice-president and co-owner of CAM Systems Inc. of Atlanta Georgia. CAM systems developed, under Mr. Riley's direction, a suite of PC based software tools for residential property management.

Tutorial Abstract. We will start with an overview of the history, core design team, and design goals of the ns-3 network simulator. We will then go through software code snippets of the various components of ns-3, including the basic event scheduler, the smart pointer class, the function of the Object class, the use of the QueryInterface design approach, and the design of the Packet object. We will then go through a number of example programs, demonstrating how to construct a topology, add data flows, monitor the state of the simulation, and analyze results after the simulation has completed.

13:30 - 15:30: Tutorial on ns3, Part I

15:30 – 16:00: Coffee Break

16:00 – 18:30: Tutorial on ns3, Part II