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Chair's Message

By Dr. Dave Cavalcanti, Chair of TCSIM

Dear TCSIM members,

Welcome to the third issue of the TCSIM newsletter. This issue features an invited article on the NS-3 simulator, which has been designed as a potential replacement for the well known NS-2 simulator. This issue also includes a list of upcoming events and new conferences supported by the TCSIM.

Finally, I'd like to use this opportunity to congratulate the winners of the most recent student awards sponsored by the TCSIM at MASS 2009, CGAMES 2009 and HiBi 2009.

Please feel free to forward this message to potential new members. The information on how to join the TCSIM is available at the TCSIM web site: <http://tab.computer.org/tcsim/>

Hope you enjoy the reading and thanks for your collaboration!

Members Corner

We continue to welcome contributions to future issues of TCSIM newsletter in the format of small articles, news or links that might be of interest to TCSIM members. Please submit your ideas, suggestions and contributions to Dr. Mostafa El-Said (Editor-in-Chief) at elsaidm@gvsu.edu with "Member Update" in the subject line.

TCSIM Endorsed Conferences

The TCSIM endorses and contributes to selected conferences that are sponsored by the IEEE Computer Society.

Upcoming events held in technical cooperation with the TCSIM:

- (ISSPIT 2009) IEEE International Symposium on Signal Processing and Information Technology**
Dec 14 2009, - Ajman University, Ajman, UAE (United Arab Emirates)
<http://www.isspit.org/isspit/2009/>
- (IPCCC 2009) 28th IEEE International Performance Computing and Communications Conference**
Dec 14 – 16, 2009
Phoenix, Arizona, USA
<http://www.ipccc.org/>
- (ISGT 2010) Innovative Smart Grid Technologies**
January 19-21, 2010
Washington DC, USA
http://ewh.ieee.org/conf/isgt/2010/_private/January%20Conference.pdf

TCSIM is sponsoring new events in 2010:

1. (SIMUTools 2010) The Third International Conference on Simulation Tools and Techniques

March 15-19, 2010

Torremolinos, Malaga, Spain

<http://www.simutools.org/>

The SIMUTools 2010, which builds on the success of 2008 and 2009, will focus on all aspects of simulation modeling and analysis. High quality papers are sought on simulation tools, methodologies, applications, and practices. The aim of the conference is to bring academic and industry researchers together with practitioners (from both the simulation community and from the numerous simulation user communities). The conference will address current and future trends in simulation techniques, models and practices, and foster interdisciplinary collaborative research in this area. While the main focus of the conference is on simulation tools, the conference also encourages the submission of broader theoretical and practical research contributions.

TCSIM Student Awards

In order to encourage and help increase student participation in technical conferences and workshops, the TCSIM sponsors several Student Best paper and Travel Support Awards every year. The awards are intended to help students, with accepted works in the events, to pay for part of their travel expenses. The awards selection process and distribution are fully managed by the organizing committees of the events.

For more information on the 2009 TCSIM Student Awards, please visit the TCSIM webpage:
<http://tab.computer.org/tcsim/>

Congratulations to the winners of TCSIM awards in the following events:

- MASS 2009 - IEEE International Conference on Mobile Adhoc and Sensor Systems
<http://www.cs.cityu.edu.hk/mass09/>
- CGAMES 2009 - 14th International Conference on Computer Games: AI, Animation, Mobile, Interactive Multimedia, Educational & Serious Games
<http://www.cgamesusa.com/09/index.php>
- HiBi 2009 - High performance computational systems Biology workshop
<http://www.cosbi.eu/hibi09/>

NS-3 Simulator

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The role of simulation is gaining significant attention in computer networks from the perspective of performance analysis and system implementation. Before the actual realization of new protocols, simulation results provide a better appreciation in varying scenarios. Hence, the credibility of simulation results is of paramount importance. Most cited network simulators are NS (Network Simulator)-2, OPNET, GloMoSim, and Qualnet. Recently, NS-3 is gaining importance and acceptance in academia and industrial research after its first stable release in June 2008. In this article, I briefly discuss about NS-3 and its edge over the existing network simulators. NS-3 is an event-driven simulator, *i.e.*, the operation of a system is represented as a chronological sequence of events. From its inception, documents of NS-3 are available online at www.nsnam.org. Although, the name NS-3 suggests a natural descendant of NS-2, it is not an innate form of NS-2's code base or neither is backward compatible. The major emphasis of NS-3 is improving the MAC (medium access control), network and transport layers of the protocol stack.

The goals of NS-3 are to:

- develop a simulator credible enough and validate with well-established theoretical results;
- be scalable, modular, extensible to support variants of IEEE 802.11 standards, for example, the emerging IEEE standard like WiMax;
- be aligned with the needs of networking research as well as be user-friendly to developers;
- leverage inclusion and permission of other free and open source networking software.

NS-3 is written in C++ and Python [2] and is available as source code releases for Linux and Unix variants, OS X, and Windows via Cygwin. Unlike other simulators, NS-3 is well documented and maintained using Doxygen, a tool used for API (Application Programming Interface) documentation, generation of on-line documentation browser, and aids in extracting code structures from undocumented source files. The core concept of NS-3 is illustrated in Figure 1 which shows peer-to-peer and ad-hoc network support among various nodes in a network.

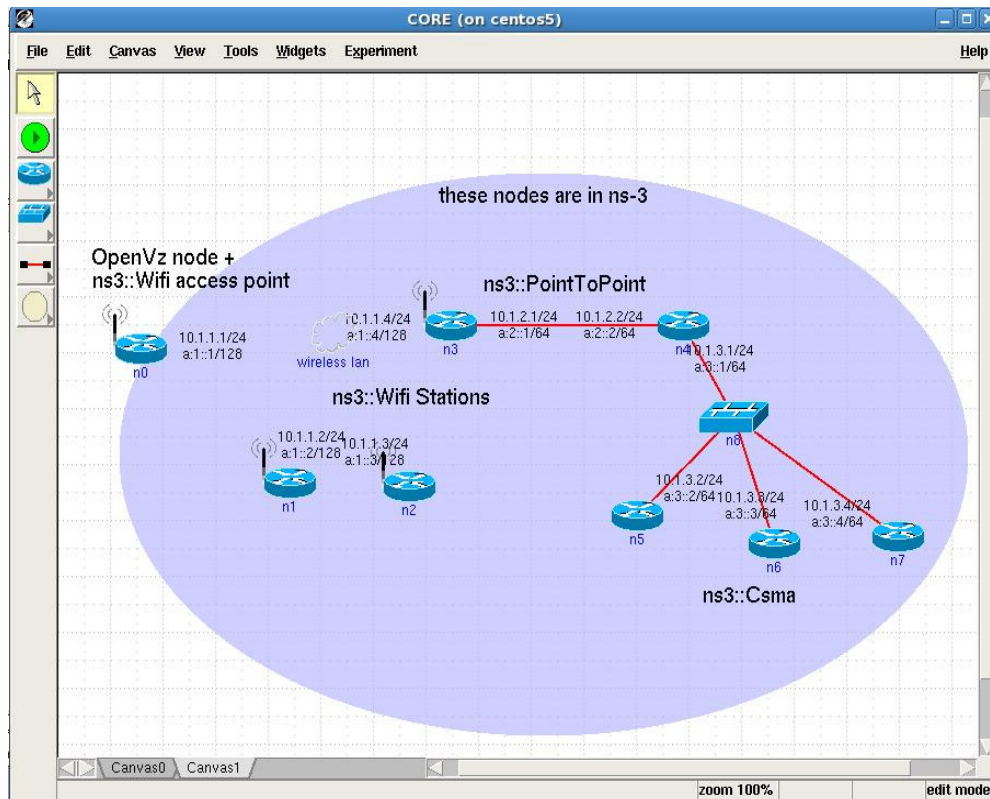


Figure 1: Core concept of NS-3 implementation of peer-to-peer and ad-hoc communications [1]

The additional features of the new release [1] of NS-3 which are not present in NS-2 are as follows:

- WiFi enhancements (Minstrel rate control, Athstats, 10 MHz and 5 MHz channels, channel switching),
- IPv6 extensions (Ping6, Neighbor Discovery, and Router Advertisements),
- Qt-based animator (NetAnim) for point-to-point links,
- Flow Monitor statistics module, and
- Ported the Nix-Vector routing framework.

In other words, compared to NS-2, the additional features of NS-3 comprises the following additions in different layers of the protocol stack: (i) **Application layer**: ability of simulating a peer-to-peer connection and implementation of sockets for porting applications distinctly; (ii) **Transport layer**: emulation of the TCP stack and implementation of various high-speed transport control protocol (TCP) variants; (iii) **Network layer**: extensive support of IPv4 and IPv6 with future extensions and other routing protocols namely, BGP, OSPF, RIP, IGMP/MLD, IS-IS, PIM-SM; (iv) **Link layer**: ability to perform simulations on variants of 802.11 networks, 802.16 (WiMax), additional multiple access features like time division multiple access (TDMA) and code division multiple access (CDMA); and (v) **Physical layer**: new additions of Rayleigh and Rician fading channels as well as channel models suitable for 802.11 networks. In addition, substantial research is now carried at the University of Washington, Seattle to improve interference issues in NS-3 for 802.11 a, b, and g networks. The unique feature, unlike that in NS-2, is the ability of performing simulations in multi-core processors, resulting in enhanced efficiency in terms of execution time.

NS-3 is built using an open source script called *Waf* [2] and is used for running simulations. All the libraries in NS-3 are properly linked using *Waf*. Hence, it takes into considerations any modifications or change of variables in the new simulation execution. This reduces individual compilations of library files or inconsistent simulation executions. The other potential of *Waf* exploited in NS-3 is the definition of values to variables even from the command line with *Waf*, instead of changing the source files. For better comprehension of results, NS-3 provides the researchers with a logging module, which stores the execution results according to the configurable level of details. Additionally, packet capture traces are available in *libpcap* format. These traces can be further analyzed using a software package *tcpdump*. Especially, for interference studies and modeling, understanding the results of these traces are critical.

Finally, NS-3, with all its additional features, is highly scalable even with an exhaustive number of nodes (for example 20,000 [3]), modular and capable of managing multiple technologies working in tandem. The capability of NS-3 in working on multi-core processors will definitely impact the execution time of simulations. Finally, logging of execution results and traces will lead to better understanding of inherent issues like interference, system capacity, and coexistence in wireless networks.

References

1. www.nsnam.org
 2. L. F. Perrone, C. Cicconetti, and B. C. Ward, "On the automation of computer network simulators," *SIMUTools 2009*, Rome, Italy.
 3. R. Bauza, J. Gonzalez, and M. Sepulcre, "ns-3 scalability constraints in heterogeneous wireless simulations: iTETRIS a case study," *SIMUTools 2009*, Rome, Italy.
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Call for Papers – IEEE Simulation Letters

The IEEE TCSIM Newsletters will publish original and high-quality ideas for publication in the form of short technical papers. The submissions should emphasize modeling, design, and analysis of computational methods for simulations and its applications in various areas, including, but not limited to, computer science, engineering, communications, and simulation applications. The submissions are invited covering, but not limited to, the following topics:

1. Simulation architecture modeling and prototyping
2. Simulation algorithm design, implementation, and analysis
3. Simulation complexity in computing
4. Parallel and distributed simulation
5. Design and usage of simulation tools
6. Real-time simulation monitoring
7. Simulation tools for communications and networks
8. Simulation of computer systems and applications
9. Agent-based simulation tools focus on the use of agents in engineering, human and social dynamics, military applications
10. Systems and process simulation
11. Simulation of ubiquitous networking and computing
12. Simulation of transportation systems
13. Automotive simulation applications
14. Building and energy management simulations
15. Machine learning
16. Virtual reality systems
17. Knowledge and data systems
18. Systems optimization
19. Web-based simulation and applications
20. Department of Defense Architecture Framework (DoDAF)-based network simulations
21. DoDAF-based vulnerability assessment

Submission

All papers must be submitted to elsaidm@gvsu.edu in four pages or fewer, including all figures, tables, and references. A manuscript submitted for publication should be original work that should not have been previously published and should not be under consideration for publication elsewhere. If an author uses charts, photographs, or other graphics from previously printed material, he/she is responsible for obtaining written permission from the publisher to use the material in his/her manuscript. The maximal number of figures and tables are five, and the number of reference is limited to ten. Submissions exceeding this length will be returned without review. Papers should use 7.875in x 10.75 in (20cm x 27.30cm) trim size and the IEEE transactions two-column format in 10-pt. font. Please submit electronically in PDF file, and ensure that the submitted file can be viewed in Acrobat Reader 8.0. No hard copy is necessary. A standard IEEE copyright release will also be required before fully acceptance.

All papers must include the authors' affiliation and e-mail addresses of all authors. All papers will be fully refereed for accuracy, technical content, and relevance. Contact Dr. El-Said at elsaidm@gvsu.edu with any questions concerning the paper submission and review process, or questions regarding the relevance of a paper to the IEEE TCSIM Newsletters.

Special Issues

IEEE TCSIM Newsletter is seeking for special issue proposals. Each special issue typically includes 3-5 peer-reviewed articles and a Guest Editors' Introduction. To propose a theme to guest edit, please contact the editor in chief or TCSIM chair for details.

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