International Conference

DISTRIBUTED COMPUTER AND COMMUNICATION NETWORKS: CONTROL, COMPUTATION, COMMUNICATIONS

PROCEEDINGS
Moscow, Russia, October 7-10, 2013

This volume contains the Proceedings of the International Conference on Distributed Computer and Communication Networks (DCCN-2013). The conference organized by Russian Academy of Sciences (RAS), V.A. Trapeznikov Institute of Control Sciences of RAS, Research and Development Company «Information and Networking Technologies» and the Institute of Information and Communication Technologies (Bulgarian Academy of Sciences) is a continuation of traditional international conferences of the DCCN series, which took place in Bulgaria (Sofia, 1995, 2005, 2006, 2008, 2009), Israel (Tel-Aviv, 1996, 1997, 1999, 2001) and Russia (Moscow, 1998, 2000, 2003, 2007, 2010, 2011) in the last 16 years.

The main idea of the conference is to assemble researchers from various countries working in the area of theory and applications of distributed computer and communication networks, to exchange the expertise, and to discuss the perspectives of development and collaboration in this area.

The content of this volume is related to the following subjects:

1. Computer and communication networks architecture optimization

2. Control in computer and communication networks

3. Performance and QoS evaluation in wireless networks

4. Modeling and simulation of network protocols

5. Queueing theory

6. Wireless IEEE 802.11, IEEE 802.15, IEEE 802.16 and UMTS (LTE) networks

7. FRID technology and its application in intellectual transportation networks

8. Protocols design (MAC, Routing) for centimeter and millimeter wave mesh networks

9. Internet and web applications and services

10. Application integration in distributed information systems

All papers included into the Proceedings are given in the form presented by authors. The Proceedings are of interest to all people working in the field of computer and communication networks.

Contents

I. Modern computer and communication networks: current state and development trends, networks architecture, control in networks / Современные компьютерные и коммуникационные сети: состояние и перспективы развития, архитектура, управление в сетях.

II. Modeling and simulation of network protocols, network design and optimization / Моделирование сетевых протоколов, оптимизация и проектирование сетей

V

III. Queuing networks and systems / Теория сетей и систем массового обслуживания

VII

NEXT-GENERATION INTERNET

John Geske[1], Peter Stanchev [1, 2]

[1]Kettering University, Flint, USA
[2]Institute of Mathematics and Informatics, Bulgarian Academy of Sciences,
Sofia, Bulgaria
{geske, pstanche}@kettering.edu

This talk give an introduction to US-Ignite, the Global Environment for Network Innovation (GENI), software defined networking, OpenFlow, WiMAX and Internet 2, dealing with the future of the Internet. The goal of the talk is to understand the intricacies and nuances of some of these techniques and show some of the possibilities of next-generation high-speed networking and their applications into education and culture heritage. Further, we will discuss an on-going, collaborative effort with Purdue University, and the city of San Leandro, CA in researching and developing software suites that will allow developers to utilize the vast potentials of next-generation high speed networking infrastructures. The talk will show some of the possibilities of next-generation high-speed networking and their applications into education and culture heritage.

1. US-Ignite

Kettering University - as a partner in the US-Ignite initiative [1] announced by the White House Office of Technology - have the networking infrastructure in place that allow us to collaborate, research, and develop the protocols and applications that will shape the next generation Internet. The goal of US-Ignite is to demonstrate how the emerging research in high-speed networking can help people improve their lives and their communities and enhance the work in the areas of clean energy, advanced manufacturing, education, and health-care delivery. Responsibilities of the Partnership include connecting, convening, and supporting startups, local and state government, universities, industry leaders, federal agencies, foundations, and community and carrier initiatives in conceptualizing and building new applications. The resulting new applications should have a significant impact on the U.S. economy, including providing a broad range of job and investment opportunities. It includes the "programmable broadband", high-speed internet (1Gbs+), a networking infrastructure to research, develop, test, prototype, and deploy, next-generation Software Defined Networking applications; a consortium of potential diverse partners.

2. Software-defined networking

Software-defined networking (SDN) is an approach to building computer networking equipment and software that allows network administrators to have programmable central control of network traffic without requiring physical access to the network's hardware devices [2]. Conceptually, a router or switch is divided into two parts: Control plane: performs configuration and control and Data Plane:

handles packet processing. Vendors tightly couple these two planes. SDN avoid using embedded routing protocols and specify how to handle specific critical cases.

3. OpenFlow

OpenFlow is a new protocol, an instantiation of SDN. OpenFlow [3] enables networks to evolve, by giving a remote controller the power to modify the behavior of network devices, through a well-defined "forwarding instruction set". The growing OpenFlow ecosystem now includes routers, switches, virtual switches, and access points from a range of vendors. OpenFlow is based on an Ethernet switches [4], with an internal flow-table, and a standardized interface to add and remove flow entries.

4. GENI

The Global Environment for Network Innovations (GENI) [5] is a project sponsored by the National Science Foundation. It is open and broadly inclusive, providing collaborative and exploratory environments for academia, industry and the public to catalyze groundbreaking discoveries and innovation in emerging global networks. GENI is a virtual laboratory at the frontiers of network science and engineering for exploring future internets at scale. GENI creates major opportunities to understand, innovate and transform global networks and their interactions with society.

5. WiMAX

As the first 4G wireless technology, WiMAX [6] combines the performance of WiFi with the range and quality of service (QOS) of a carrier-grade cellular technology. WiMAX can provide broadband wireless access (BWA) up to 30 miles (50 km) for fixed stations, and 3-10 miles (5 - 15 km) for mobile stations. In contrast, the WiFi/802.11 wireless local area network standard is limited in most cases to only 100-300 feet (30-100m).

6. Internet2

Internet2 is an exceptional community of U.S. and international leaders in research, academia, industry and government who create and collaborate via innovative technologies [7]. Internet2 operates the Internet2 Network, a next-generation Internet Protocol and optical network that delivers production network services to meet the high-performance demands of research and education, and provides a secure network testing and research environment.

7. Software-defined network protocol

Specifically, we are developing a route configuration mechanism and the constituent protocols that use Software Defined Networking (SON) (specifically OpenFlow) to add redundant packet forwarding capabilities that will provide high reliability communication for critical applications. The Reliable Communication Protocol, being developed in the lab at Purdue and on the NSF's GENI platform for network experimentation, addresses the lack of reliable real-time communication for industrial and medical facilities via the Internet. Such communication is needed for tasks including remote medical procedures, the control of robots used to clean up after a chemical or nuclear disaster, and the control of manufacturing processes.

8. New Generation Internet Applications

Holograms, lenticulars and 3D television systems are the latest additions to high tech museum displays [8] enabling the viewer to see museum artifacts in a whole new light. To bring these apps to life, developers leverage the unique capabilities of next-generation networks, including: systems for High Quality Open Source Web Conferencing, Real-Time 3D Modeling Cameras, Virtual Reality Workforce Development, etc.

9. Conclusions and future work

A vision of a new kind of global virtual museum of the future starts with exhibits anywhere, anytime. We are trying to experiment some of the new techniques in the museum of Parzardjik. Historical Museum in Pazardjik is one of the most popular museums in Bulgaria. It has one of the most complete collections of the Thracian artifacts.

References

1. USIgnaite web side. http://us-ignite.org/
2. D. Comer, Internetworking with TCP/IP Volume One, 6/E, Addison-Wesley, ISBN-13: 9780136085300, 2014
3. OpenFlow web side. http://www.openflow.org/
4. Nick McKeown, Tom Anderson, Hari Balakrishnan, Guru Parulkar, Larry Peterson, Jennifer Rexford, Scott Shenker, Jonathan Turner, OpenFlow: Enabling Innovation in Campus Networks, http://www.openflow.org/documents/openflow-wp-latest.pdf
5. GENI web side. http://www.geni.net/
6. WiMAX web side: http://www.wimax.com/
7. Internet2 web side. http://www.internet2.edu/
8. The official blog of the institute of museum and library services. http://blog.imls.gov/?p=1463