



24TH INTERNATIONAL CONFERENCE ON DISTRIBUTED COMPUTER AND COMMUNICATION NETWORKS: CONTROL, COMPUTATION, COMMUNICATIONS (DCCN-2021)



The 24th International Conference on *Distributed Computer and Communication Networks: Control, Computation, and Communications* (DCCN-2021) was held on September 20–24, 2021, at Trapeznikov Institute of Control Sciences, Russian Academy of Sciences. This annual conference is devoted to discussing topical problems and innovative tasks in the information and telecommunication industry.

Like in 2020, the conference was held online due to the challenging global pandemic.

The traditional organizers of the conference were Trapeznikov Institute of Control Sciences, Russian Academy of Sciences (ICS RAS), Peoples' Friendship University of Russia (RUDN University), National Research Tomsk State University (TSU), and Institute of Information and Communication Technologies, Bulgarian Academy of Sciences. As in the previous five years, the organization of the conference together with RUDN University and TSU significantly expanded the geography of Russian participants and strengthened the integration of academic institutions and research schools of universities. Dr. Sci. (Eng.), Prof. *V.M. Vishnevsky* (ICS RAS) acted as the Chair of the Program Committee, and Dr. Sci. (Eng.), Prof. *K.E. Samouylov* (RUDN University) as the Vice-Chair of the Program Committee.

Traditionally, the conference was supported by IEEE Russia Section. Information support for DCCN-2021 was provided by Springer and MDPI.

The event united researchers from universities and research centers in the field of theory and practice of building computer and telecommunication networks, mathematical modeling, control and optimization methods of distributed systems and continued the series of conferences that have been held in Russia, Bulgaria, and Israel in the recent 25 years.

DCCN-2021 was held in the format of plenary and sectional sessions with a wide range of issues covering the most relevant areas of research in the field of information and telecommunication technologies:

- Communication networks algorithms and protocols.
- Computer and telecommunication networks control and management.
- Performance analysis, QoS/QoE evaluation and network efficiency.
- Analytical modeling and simulation of communication systems.
- Evolution of wireless networks toward 5G/6G.
- Centimeter- and millimeter-wave radio technologies.
- RFID technologies and their applications.
- Internet of Things and Fog Computing.
- Cloud computing, distributed and parallel systems.
- Machine learning, big data, artificial intelligence.
- Probabilistic and statistical models in information systems.
- Queuing theory and reliability theory applications.
- High-altitude telecommunications platforms.

Despite pandemic limitations, the conference received 150 papers from 240 participants representing 26 countries. In particular, the breadth of the conference geography is emphasized by the list of plenary speakers, which included leading experts in the theory and practice of communication networks from the USA, Israel, Hungary, Portugal, Italy, India, and Russia.

The following events took place within DCCN-2021.

- Conference opening (September 20, 2021), including the opening address and information message about the event by *V.M. Vishnevsky*, the Chair of the Program Committee; welcome speech by *D.A. Novikov*, Director of ICS RAS, RAS Corresponding Member, and *K.E. Samouylov*, Head of the Department of Applied Computer Science and Probability Theory at RUDN University.



- Plenary session (September 20–21, 2021) with the papers on actual problems presented by leading Russian and foreign researchers:

- *D. Selvamuthu* (India) “Performance Analysis of DRX Mechanism in LTE-A Networks using Markov Modeling.” The problem of prolonging the life cycle of smartphone batteries was considered. As noted, modern devices use *Discontinuous Reception* (DRX) mechanism for energy saving. Recommendations were provided to achieve the minimum power consumption of the device using the mechanism.

- *E. Levner* (Israel) and *V. Vishnevsky* (Russia) “Recent Advances in Scheduling Theory and Applications in Robotics and Communications.” The survey’s main focus was on the latest achievements in scheduling theory and a wide range of its new applications: from cloud computing to robots and communication networks. The authors’ view on current trends and acute problems and limitations inherent in this promising area of research was presented.

- *L. Correia* (Portugal) “Bridging 5G to 6G Networks: Problems and Challenges.” The paper discussed the problems of mobile and wireless networks that have not been solved when implementing 5G networks. These problems should be properly considered when designing 6G networks. The need for further network virtualization and continued research on cloud computing was emphasized. The existing physical constraints (network bandwidth) were considered to address these issues and limitations of service devices (latency).

- *J. Sztrik* (Hungary) “Recent Results in Performance Modelling of Finite-Source Retrial Queues with Collisions and Their Applications.” The author surveyed modern achievements in the models of finite-source retriial queues with collisions. Some examples were provided to illustrate the accuracy and area of applicability of the asymptotic method for studying the probability distribution of retrials.

- *K. Trivedi* (USA) “Software Fault Tolerance via Environmental Diversity.” The paper discussed the fault-tolerance problem of software systems in the light of ensuring their high reliability. Software errors were classified; methods to reduce the damage from software errors were described; examples of existing systems involving these methods were provided.

- *G. Araniti* (Italy) “Towards 6G Non-Terrestrial Networks.” The concept of *non-terrestrial networks* (NTN) was presented, and their properties allowing future generations of telecommunication networks to meet users’ expectations better were considered. The latest developments and ongoing research in this field were described, and the still open problems were dis-

cussed. The importance of using non-terrestrial networks for building next-generation wireless communication networks was highlighted.

- Sectional Sessions (September 21–23, 2021) with over 150 papers presented by researchers from Russian and foreign universities, academia and industry, and research centers. Sectional sessions were grouped into three main thematic areas (tracks):

- Track A: Computer and Communication Networks: Architecture, Protocols and Technologies.

- Track B: Modeling of Distributed Systems and Networks.

- Track C: Distributed Systems Applications.

Please visit the conference website <https://2021.dccn.ru/> for detailed information about the participants and paper abstracts.

- Conference closing (September 24, 2021). In his closing speech, the Chair of the Organizing Committee, *V.M. Vishnevsky*, summarized the event, noting the high level and versatility of the conference papers and the originality of approaches to the problems posed. The Organizing Committee made several official statements:

- The high level of organization and conduct of the conference was noted.

- The conference topics were considered important and applicable to a wide range of problems covering the most relevant research areas in information and telecommunication technologies and the development of science in general.

- The papers presented at the conference were recognized for their high level and diverse nature. The authors were noted for a deep analysis of the state-of-the-art research in the theory and practice of building computer and telecommunication networks, mathematical modeling, information-telecommunication technologies, methods of management and optimization of distributed systems, and forecast of their development for the coming years.

- The conference Organizing Committee was decided to promote further expansion of scientific contacts with representatives of universities, academia and industry, and research centers, in Russia and neighbor and faraway countries, to cooperate in the field of information and telecommunication technologies, information exchange, development of new research methods, etc.

- Sincere gratitude was expressed to the co-organizers of the conference: Peoples’ Friendship University of Russia (RUDN), National Research Tomsk State University, and Institute of Information and Communication Technologies, Bulgarian Academy of Sciences.

– The next, 25th, International Conference on Distributed Computer and Communication Networks: Control, Computation, and Communications (DCCN-2022) was scheduled for September 2022.

The papers of the DCCN-2021 participants were published in the Conference Proceedings¹. Based on the results of the sectional sessions, 65 papers in English were recommended by the Section Chairs and selected by the Program Committee for publication in *Communications in Computer and Information Science* (CCIS) and *Lecture Notes in Computer Science* (LNCS) series by Springer. In addition, extended versions of the conference papers recommended by the Program Committee will be submitted to special issues of two MDPI journals, *Mathematics* and *Sensors*.

Chair of the Organizing Committee
V. M. Vishnevsky

Secretary of the Organizing Committee
D. V. Kozyrev

Author information

Vishnevsky, Vladimir Mironovich. Dr. Sci. (Eng.), Trapeznikov Institute of Control Sciences, Russian Academy of Sciences, Moscow, Russia
✉ vishn@inbox.ru

Kozyrev, Dmitry Vladimirovich. Cand. Sci. (Phys.-Math.), Trapeznikov Institute of Control Sciences, Russian Academy of Sciences, Moscow, Russia
✉ kozyrevdv@gmail.com

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Translated into English by *Alexander Yu. Mazurov*, Cand. Sci. (Phys.-Math.), Trapeznikov Institute of Control Sciences, Russian Academy of Sciences, Moscow, Russia
✉ alexander.mazurov08@gmail.com

¹https://dccn.ru/downloads/DCCN-2021_Proceedings.pdf