

# Igor KONNOV

Vienna, Austria

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GitHub: [<https://github.com/konnov>]

Languages: English (fluent), German (ÖSD Zertifikat B2), Russian (mother tongue), French (beginner)

**Research interests:** model checking, parameterized verification, verification of distributed algorithms, fault tolerance, blockchains, temporal logic of actions (TLA<sup>+</sup>)

## Appointments

Informal Systems AG, Vienna, Austria:

**Jan 2020 – present.** Principal Research Scientist

**Oct 2022 – present.** Product Owner of Quint and Apalache

**Jan 2020 – Oct 2022.** Project Lead of the Apalache Team

Interchain Foundation (Switzerland), location in Vienna, Austria:

**Oct 2019 – Dec 2020.** Senior Research Scientist

INRIA Nancy — Grand Est, Nancy, France:

**Mar 2018 – Sep 2019 (leave of absence).** Researcher (permanent, chargé de recherche de classe normale)

Vienna University of Technology (TU Wien), Faculty of Informatics, Austria:

**Jan 2016 – Feb 2018.** Postdoctoral researcher, principal investigator in the WWTF project APALACHE

**Dec 2011 – Dec 2015.** Postdoctoral assistant professor (Universitätsassistent, limited contract)

**Jul 2011 – Dec 2011.** Postdoctoral researcher (Projektassistent)

Moscow State University (MSU), Faculty of Computational Mathematics and Cybernetics, Russia:

**Jan 2010 – Jun 2011.** Junior research fellow (m.n.s.)

**Dec 2006 – Jan 2010.** Pre- and postdoctoral research and teaching assistant

Sytech LLC, Russia: **2006–2010**, Part-time systems architect, **2004–2006**, Software developer

IFirst LLC, Russia: **01.09.2002–15.09.2003**, Part-time programmer

## Higher education, degrees, and titles

**Dec 2019.** Vienna University of Technology (TU Wien), Austria: Privatdozent — Habilitation in Computer Science

**Oct 2003– Nov 2008.** Moscow State University, Russia: Ph.D. in Computer Science (awarded in **Feb 2009**)

**Sep 1998– Jul 2003.** Moscow State University, Russia: Specialist (approx. MSc) in Applied Math. & Informatics

*With distinction, 97% are the best score: avg. score 1.06 (German scale) = avg. score 4.87 (Russian scale)*

## Project acquisition and participation

<b>2021–2022.</b> Vienna Business Agency. Project Atlantic <i>A TLA<sup>+</sup> Tool Portfolio for Reliable Distributed Systems</i> <b>Role:</b> scientific leader, <b>Project leader:</b> J.Widder	<b>181k€</b> Informal Systems
<b>2016–2019.</b> WWTF: Vienna Science and Technology Fund. Project ICT15–103 APALACHE <i>Abstraction-based Parameterized TLA Checker</i> <b>Role:</b> <u>principal investigator</u> , <b>with:</b> J.Widder (co-PI), H. Veith (core team) Acceptance rate: <u>10 out of 137 proposals (approx. 7%)</u>	<b>539k€</b> TU Wien
<b>2015–2018.</b> FWF: Austrian National Research Network S11403-N23 SHiNE <i>Systematic Methods in Systems Engineering</i> <b>Role:</b> researcher, <b>Coordinator:</b> R. Bloem ( <b>3.7 Mio.€</b> ), <b>PI:</b> H. Veith	TU Wien <b>625k€</b>
<b>2011–2014.</b> WWTF: Vienna Science and Technology Fund. Project PROSEED <i>Proof Seeding for Software Verification</i> <b>Role:</b> researcher, <b>PI:</b> H. Veith	<b>598k€</b> TU Wien
<b>2010–2014.</b> FWF: Austrian National Research Network S11403-N23 RiSE <i>Rigorous Systems Engineering</i> <b>Role:</b> researcher, <b>Coordinator:</b> R. Bloem ( <b>3.7 Mio.€</b> ), <b>PI:</b> H. Veith	TU Wien <b>582.8k€</b>
<b>2010–2012.</b> Russian Federal Special-Purpose Programme, Project 14.740.11.0399 <i>Developing a Prototype for Computer Simulation of Real-Time Distributed Systems</i> <b>Role:</b> responsible for coordination, research agenda, and report writing, <b>PI:</b> R.L. Smeliansky	approx. <b>200k€</b> MSU
<b>2009–2011.</b> RFBR: Russian Fund for Basic Research, Project Nr. 09–01–00277-a <i>Structural and Semantic Analysis Using Formal Models of Sequential and Parallel Processes</i> <b>Role:</b> researcher, <b>PI:</b> R.I. Podlovchenko	approx. <b>32k€</b> MSU
<b>2006–2009.</b> INTAS: EU research cooperation with the New Independent States, Project Nr. 05–1000008–8144 <i>Practical Formal Verification Using Automated Reasoning and Model Checking</i> <b>Role:</b> researcher, <b>Coordinator:</b> T. Jebelian, <b>PI:</b> V.E. Plisko	MSU
<b>2006–2008.</b> RFBR: Russian Fund for Basic Research, Project Nr. 06–01–00106-a <i>Formal Models of Sequential and Parallel Processes and the Analysis of Their Semantic Properties</i> <b>Role:</b> researcher, <b>PI:</b> R.I. Podlovchenko	approx. <b>52k€</b> MSU

## R&D projects with industry and state companies

<b>2009–2010.</b> <i>Obfuscation techniques on intermediate code representation</i> <b>Role:</b> team lead of 1 master student and 1 PhD student, <b>PI:</b> R.L. Smeliansky	Computer Systems Lab/MSU
<b>2007–2008.</b> <i>Obfuscation techniques for C++</i> <b>Role:</b> team lead of 1 master student and 1 PhD student, <b>PI:</b> R.L. Smeliansky	Computer Systems Lab/MSU
<b>2008.</b> <i>Teachable static analysis workbench</i> <b>Role:</b> developer, <b>PI:</b> D.D. Kozlov	The Open Web Application Security Project (OWASP)
<b>2007–2008.</b> <i>Static analysis of python web applications for vulnerabilities</i> <b>Role:</b> developer, <b>PI:</b> R.L. Smeliansky	Computer Systems Lab/MSU

## Selected invited talks & lectures

<b>FORTE20</b> , Valletta/Malta – online tutorial <i>Parameterized Verification with Byzantine Model Checker</i>	<b>June 2020</b>
<b>VMCAI Winter School</b> , New Orleans, LA/USA tutorial <i>Model checking of distributed algorithms: from classics towards Tendermint blockchain</i>	<b>Jan 2020</b>
<b>Dagstuhl Seminar 18211</b> : “Formal Methods and Fault-Tolerant Distributed Computing: Forging an Alliance” Dagstuhl/Germany, invited tutorial <i>What my computer can find about your distributed algorithm</i>	<b>May 2018</b>
<b>Bertrand Meyer’s Vericlub seminar</b> , U. Toulouse, Toulouse/France invited seminar talk <i>Model checking of threshold-guarded distributed algorithms: beyond reachability</i>	<b>Nov 2016</b>
<b>Rigorous System Design Laboratory, EPFL</b> , Lausanne/Switzerland invited seminar talk <i>Model checking of fault-tolerant distributed algorithms: safety and liveness</i>	<b>Sep 2016</b>
<b>Workshop on Program Semantics, Specification &amp; Verification at CSR’16</b> , St. Petersburg/Russia invited talk <i>Model checking of threshold-based fault-tolerant distributed algorithms</i>	<b>Jun 2016</b>
<b>Spring School Logic &amp; Verification</b> , Vienna/Austria lectures on <i>Complete parameterized &amp; bounded model checking of threshold-based fault-tolerant distributed algorithms</i>	<b>Apr 2016</b>
<b>Amazon</b> , Herndon, VA/USA invited talk <i>Model checking of threshold-based fault-tolerant distributed algorithms</i>	<b>Jun 2015</b>
<b>Dagstuhl Seminar</b> : “Distributed Cloud Computing”, Dagstuhl/Germany talk <i>Model checking of threshold-based fault-tolerant distributed algorithms</i>	<b>Feb 2015</b>
<b>Tools &amp; Methods of Program Analysis’14</b> , Kostroma/Russia invited talk <i>Parameterized model checking of fault-tolerant distributed algorithms by abstraction</i>	<b>Nov 2014</b>
<b>Summer School’14</b> : “Verification Technology, Systems & Applications”, Luxembourg lectures on <i>Model checking of fault-tolerant distributed algorithms</i> (together with Helmut Veith)	<b>Oct 2014</b>
<b>Dagstuhl Seminar</b> : “Formal Verification of Distributed Algorithms”, Dagstuhl/Germany invited talk <i>Counter attack on Byzantine generals</i>	<b>Apr 2013</b>
<b>Concurrency Seminar</b> , Computing Laboratory, Oxford/UK invited talk <i>An invariant-based approach to the verification of asynchronous parameterized networks</i>	<b>Feb 2011</b>

## Teaching experience

### Vienna University of Technology (TU Wien)

<b>2013–2017</b> . Computer Aided Verification <i>In 2017, held the lecture course. Until 2017, read parts of the lecture course, teaching assistance.</i>	Master students, compulsory, lectures & practicals, 3 ECTS
<b>2013–2017</b> . Program & Systems Verification <i>Teaching assistance</i>	Bachelor students, compulsory, lectures & practicals, 6 ECTS
<b>2011–2015</b> . Formal Methods of Informatics <i>Teaching assistance</i>	Master students, compulsory, lectures & practicals, 6 ECTS

## Moscow State University (MSU)

- 2008–2010.** Software model checking (Dr. Savenkov) 8th semester, compulsory, lectures & seminars, 32 hrs.  
*Designed the course together with K. Savenkov, read parts of the lecture course, teaching assistance*
- 2004.** Seminars on The C Programming Language and UNIX 3rd semester, compulsory, 32 hrs.  
*Instructed at all seminars (approx. 20 students)*
- 2005.** Seminars on Syntax Analysis and C++ 4th semester, compulsory, 32 hrs.  
*Instructed at all seminars (approx. 20 students)*
- 2004.** Operating Systems (Prof. Terekhov) 3rd semester, compulsory, lectures, 54 hrs.  
*Teaching assistance*
- 2003–2011.** Computer Networks (Prof. Smeliansky) 6th semester, compulsory, lectures, 64 hrs.  
*Teaching assistance*
- 2003–2004.** The Java Programming Language optional, lectures, 32 hrs.  
*Read parts of the lecture course, teaching assistance*
- 2003–2004.** MSU math entrance exams compulsory  
*Corrected written math exams, participated in the oral math exams*

## Kazakhstan branch of Moscow State Univ., Astana/Kazakhstan

- 2011.** Software model checking 8th semester, compulsory, lectures & seminars, 32 hrs.  
*held the lecture course and the seminars*

## Tashkent University, Tashkent/Uzbekistan

- 2011–2013.** Participated in EU project CANDI: Teaching Competency & Infrastructure for e-Learning and Retraining

## Advising

PhD students (TU Wien): Associated Faculty of Doctoral College LogiCS [[logic-cs.at](http://logic-cs.at)]

- 2016–present.** Thanh Hai Tran (advising) with Priv.-Doz. Dr. Josef Widder
- 2016–present.** Jure Kukovec (advising) with Priv.-Doz. Dr. Josef Widder
- 2015–2019.** Frau Dr. Marijana Lazić (co-advising) with Priv.-Doz. Dr. Josef Widder  
*Reduction techniques for parameterized model checking and synthesis of fault-tolerant distributed algorithms*
- 2011–2014.** Frau Dr. Annu Gmeiner (informal co-advising) advisors: Prof. Helmut Veith and PD. Dr. Josef Widder  
*Parameterized model checking of fault-tolerant distributed algorithms*

Master students:

- 2019.** Viktor Sergeev (Univ. of Lorraine)  
*Bounded Model Checking of Liveness Properties of TLA+ Specifications* co-advised with Stephan Merz
- 2016.** Jure Kukovec (Univ. Ljubljana)  
*Extensions of Threshold Automata for Reachability in Parameterized Systems* co-advised with Prof. Andrej Bauer
- 2015–2016.** Thanh Hai Tran (TU Wien)  
*User-guided Predicate Abstraction of TLA+ Specifications* co-advised with Prof. Helmut Veith

**2009–2011.** Alexander Mischenko (MSU)

*Static Type Analysis of Python Programs on Bytecode Level*

**2007–2009.** Denis Sigaev (MSU)

*Detection of Programs Protected from Reverse Engineering*

co-advised with A. Kachalin

**2008.** Alexey Schevchenko (MSU)

*Application of Regular Model Checking to Infinite State Systems*

**2007.** Peter Bulychev (MSU)

*Game-Theoretic Methods of Protocol Verification*

co-advised with Prof. Vladimir Zakharov

Bachelor students:

**2013.** Sebastian Neumaier (TU Wien)

*A Simple Simulation Language for Distributed Algorithms*

**2011.** Andrey Babak and Anton Artyomov (MSU)

*Static Analysis of Python Programs*

## Community service

### Conference organization:

PC co-chair of CONCUR 2020 ~~in Vienna~~ – online (owing to COVID19)

[concur2020.forsyte.at]

Artifact evaluation chair: Computer-Aided Verification (CAV'18)

[cavconference.org/2018]

Workshop chair: Computer-Aided Verification (CAV'13)

[cav2013.forsyte.at]

### Program Committees:

9th International Conference on Rigorous State Based Methods (ABZ'23)

Nancy, FR

20th International Workshop on Satisfiability Modulo Theories (SMT'22)

Haifa, Israel

27th International SPIN Symposium on Model Checking of Software (SPIN'21)

Aarhus, DK

2nd, 3rd, 4th workshops on Formal Methods for Blockchains 2020 – 2022 Online; Los Angeles, CA; Haifa, Israel

ACM Symposium on Principles of Distributed Computing (PODC'18)

London/UK

Formal Methods in Computer-Aided Design (FMCAD) 2017 & 2018

Vienna/Austria & Austin/TX, US

Computer Aided Verification'16 (External Reviewer Committee)

Toronto/Canada

Symbolic and Numeric Algorithms for Scientific Computing 2013, 2016, and 2017

Timisoara/Romania

Stabilization, Safety, and Security of Distributed Systems'15

Edmonton/Canada

Intl. Conf. on Verification & Evaluation of Computer & Comm. Systems (VECoS'18)

Grenoble/France

Intl. Symposium on Formal Approaches to Parallel and Distributed Systems

(4PAD) 2018 & 2019 Orléans/France & Dublin/Ireland

Workshop on Methods and Tools for Rigorous System Design (MeTRiD'18)

Thessaloniki/Greece

Tools & Methods of Program Analysis 2015 & 2017

St. Petersburg & Moscow/Russia

Workshop on Program Semantics, Specification, and Verification 2017–2019

Russia

Parallel, Distributed, and Network-based Processing'17 (Formal approaches track)

St. Petersburg/Russia

**Journal and book chapter reviews:** FMSD (2018), Computing (2018), LMCS (2017), ACM ToCL (2017), MAIS (2017), MiCS (2017), TIME (2015),

Handbook of Model Checking (eds. E. Clarke, T. Henzinger, H. Veith)

**Guest editor:** Special issue on Computer Aided Verification’13 in Formal Methods in System Design (Springer)  
(with Helmut Veith and Natasha Sharygina)

**External reviewer:** PODC’21, ITP’21, ISOLA’20, FSTTCS’20, IFM’20, FSTTCS’17, QEST’17, TACAS’17, STACS’17, VMCAI’17, MARS’17, SYNASC’17, ICFEM’16, CONCUR’16, IJCAR’16, LICS’16, EuroPar’16, AAMAS’16, CAV’15, FMCAD’15, TACAS’15, FoSSaCS’15, CAV’14, SAS’14, GandALF’14, ESOP’14, HVC’14, CAV’13, LATA’13, SSS’13, CAV’12, NFM’12, SPIN’12, VMCAI’12, FMICS’11, CSL’11

**PhD thesis reviewer.** Joshua Schmidt: New Applications and Techniques for Constraint Programming in B. Heinrich-Heine-Universität Düsseldorf, 2023

**Student Award Committee.** VCLA International Student Awards 2014–2015

## Tools

**2020–present.** QUINT: engineer-friendly specification language [<https://github.com/informalsystems/quint>]

**2016–present.** APALACHE: symbolic model checker for TLA<sup>+</sup> [<https://apalache.informal.systems>]

**2012–present.** BYMC: model checker of parameterized fault-tolerant distributed algorithms  
[<https://github.com/konnov/bymc>]

**2004–2009.** CHEAPS: model checker of parameterized asynchronous distributed systems

## Scholarships & sponsored summer schools

**2009–2010.** Fellowship for young researchers: Faculty of Computational Mathematics and Cybernetics, MSU

**2009.** Marktoberdorf Summer School *Engineering Methods and Tools for Software Safety and Security*

**2008.** Marktoberdorf Summer School *Logics and Languages for Reliability and Security*

**2005.** Microsoft Summer School *Mathematics and Programming: from Theory Towards Practice*

**2003–2005.** PhD student scholarship: LSI Logic

## Publications and talks

### Book

- [1] R. Bloem, S. Jacobs, A. Khalimov, I. Konnov, S. Rubin, H. Veith, and J. Widder. *Decidability of Parameterized Verification*. Vol. 6. 1. Morgan & Claypool, 2015, pp. 1–170. DOI: 10.2200/S00658ED1V01Y201508DCT013.

### PhD and Habilitation

- [2] I. Konnov. “Techniques and Tools for Automated Verification of Fault-tolerant and Parameterized Distributed Systems”. Habilitation in computer science. Technische Universität Wien (TU Wien), Faculty of Informatics, Dec. 2018, pp. 1–235. URL: <https://konnov.github.io/doc/konnov-habil19.pdf>.
- [3] I. V. Konnov. “Parameterized Model Checking of Distributed Systems”. In Russian. PhD thesis in Computer Science (Kandidat physiko-matematicheskikh nauk 05.13.11). PhD thesis. Lomonosov Moscow State University, Faculty of Computational Mathematics and Cybernetics, Nov. 2008, pp. 1–198. URL: [http://lvk.cs.msu.su/~konnov/publications/konnov\\_phd\\_thesis.pdf](http://lvk.cs.msu.su/~konnov/publications/konnov_phd_thesis.pdf).

## Proceedings Editor

- [4] I. Konnov and L. Kovács, eds. *31st International Conference on Concurrency Theory, CONCUR 2020, September 1-4, 2020, Vienna, Austria (Virtual Conference)*. Vol. 171. LIPIcs. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2020.

## Book chapter

- [5] A. Gmeiner, I. Konnov, U. Schmid, H. Veith, and J. Widder. “Tutorial on Parameterized Model Checking of Fault-Tolerant Distributed Algorithms”. In: *Formal Methods for Executable Software Models*. LNCS. Springer, 2014, pp. 122–171. DOI: 10.1007/978-3-319-07317-0\_4.

## Invited papers

- [6] I. Konnov, M. Kuppe, and S. Merz. “Specification and Verification with the TLA+ Trifecta: TLC, Apalache, and TLAPS”. In: *ISoLA*. Vol. 13701. Lecture Notes in Computer Science. Springer, 2022, pp. 88–105.
- [7] S. Braithwaite, E. Buchman, I. Konnov, Z. Milosevic, I. Stoilkovska, J. Widder, and A. Zamfir. “Tendermint Blockchain Synchronization: Formal Specification and Model Checking”. In: *ISOLA, Part I*. 2020, pp. 471–488. DOI: 10.1007/978-3-030-61362-4\_27.
- [8] I. Konnov, M. Lazic, I. Stoilkovska, and J. Widder. “Tutorial: Parameterized Verification with Byzantine Model Checker”. In: *FORTE*. 2020, pp. 189–207. DOI: 10.1007/978-3-030-50086-3\_11.
- [9] I. Konnov and J. Widder. “ByMC: Byzantine Model Checker”. In: *Leveraging Applications of Formal Methods, Verification and Validation. Distributed Systems*. Cham: Springer International Publishing, 2018, pp. 327–342. DOI: 10.1007/978-3-030-03424-5\_22. URL: <https://hal.inria.fr/hal-01909653>.
- [10] I. Konnov, H. Veith, and J. Widder. “What You Always Wanted to Know About Model Checking of Fault-Tolerant Distributed Algorithms”. In: *Perspectives of System Informatics: PSI 2015, in Memory of Helmut Veith, Revised Selected Papers*. Springer, 2016, pp. 6–21. DOI: 10.1007/978-3-319-41579-6\_2.

## Journal articles

- [11] I. Konnov, M. Lazic, I. Stoilkovska, and J. Widder. “Survey on Parameterized Verification with Threshold Automata and the Byzantine Model Checker”. In: *Log. Methods Comput. Sci.* 19.1 (2023).
- [12] T. Tran, I. Konnov, and J. Widder. “A case study on parametric verification of failure detectors”. In: *Log. Methods Comput. Sci.* 19.1 (2023).
- [13] I. Stoilkovska, I. Konnov, J. Widder, and F. Zuleger. “Verifying safety of synchronous fault-tolerant algorithms by bounded model checking”. In: *Int. J. Softw. Tools Technol. Transf.* 24.1 (2022), pp. 33–48.
- [14] N. Bertrand, I. Konnov, M. Lazic, and J. Widder. “Verification of randomized consensus algorithms under round-rigid adversaries”. In: *Int. J. Softw. Tools Technol. Transf.* 23.5 (2021), pp. 797–821.
- [15] J. Kukovec, T.-H. Tran, and I. Konnov. “Extracting symbolic transitions from TLA+ specifications”. In: *Science of Computer Programming* 187 (2020), p. 102361. DOI: <https://doi.org/10.1016/j.scico.2019.102361>.
- [16] I. Konnov. “**Review:** Edmund M. Clarke, Thomas A. Henzinger, Helmut Veith, and Roderick Bloem (eds): *Handbook of model checking* - Springer International Publishing AG, Cham, Switzerland, 2018”. In: *Formal Asp. Comput.* 31.4 (2019), pp. 455–456. DOI: 10.1007/s00165-019-00486-z.
- [17] I. Konnov, J. Kukovec, and T. Tran. “TLA+ model checking made symbolic”. In: *PACMPL* 3.OOPSLA (2019), 123:1–123:30. URL: <https://doi.org/10.1145/3360549>.
- [18] I. Konnov, M. Lazic, H. Veith, and J. Widder. “Para<sup>2</sup>: Parameterized Path Reduction, Acceleration, and SMT for Reachability in Threshold-Guarded Distributed Algorithms”. In: *Formal Methods in System Design* (2017). (**Extended version of the conference paper** I. Konnov, H. Veith, J. Widder. “SMT and POR Beat Counter Abstraction: Parameterized Model Checking of Threshold-Based Distributed Algorithms”. In *Computer-Aided Verification*, vol. 9206, LNCS, 2015, pp. 85–102.) DOI: 10.1007/s10703-017-0297-4. URL: <https://link.springer.com/article/10.1007/s10703-017-0297-4>.
- [19] I. V. Konnov, H. Veith, and J. Widder. “On the completeness of bounded model checking for threshold-based distributed algorithms: Reachability”. In: *Information and Computation* 252 (2017). (**Extended version of the conference paper** I. Konnov, H. Veith, J. Widder. “On the Completeness of Bounded Model Checking for Threshold-Based Distributed Algorithms: Reachability”. In *Concurrency Theory – 25th International Conference, CONCUR*, 2014, pp. 125–140), pp. 95–109. DOI: 10.1016/j.ic.2016.03.006.

- [20] R. Bloem, S. Jacobs, A. Khalimov, I. Konnov, S. Rubin, H. Veith, and J. Widder. “Decidability in Parameterized Verification”. In: *ACM SIGACT News* 47.2 (2016), pp. 53–64. DOI: 10.1145/2951860.2951873.
- [21] D. Y. Volkanov, V. A. Zakharov, D. A. Zorin, V. V. Podymov, and I. V. Konnov. “A combined toolset for the verification of real-time distributed systems”. In: *Programming and Computer Software* 41.6 (2015), pp. 325–335. DOI: 10.1134/S0361768815060080.
- [22] I. Konnov, V. Podymov, D. Volkanov, V. Zakharov, and D. Zorin. “How to Make a Simple Tool for Verification of Real-Time Systems”. In: *Automatic Control and Computer Sciences* 48.7 (2014), pp. 534–542. DOI: 10.3103/S0146411614070232.
- [23] I. V. Konnov. “On application of weaker simulations to parameterized model checking by network invariants technique”. In: *Automatic Control and Computer Sciences* 44.7 (2010), pp. 378–386. DOI: 10.3103/S0146411610070035.
- [24] I. V. Konnov and V. A. Zakharov. “An invariant-based approach to the verification of asynchronous parameterized networks”. In: *Journal of Symbolic Computation* 45.11 (2010), pp. 1144–1162. DOI: 10.1016/j.jsc.2008.11.006.
- [25] I. V. Konnov and V. A. Zakharov. “Using Adaptive Symmetry Reduction for LTL Model Checking”. In Russian. In: *Modelling and Analysis of Information Systems* 17.4 (2010), pp. 78–87. URL: [http://www.mathnet.ru/php/archive.phtml?wshow=paper&jrnid=mais&paperid=38&option\\_lang=eng](http://www.mathnet.ru/php/archive.phtml?wshow=paper&jrnid=mais&paperid=38&option_lang=eng).
- [26] I. V. Konnov and V. A. Zakharov. “An Approach to the Verification of Symmetric Parameterized Distributed Systems”. In: *Programming and Computer Software* 31.5 (2005), pp. 225–236. DOI: 10.1007/s11086-005-0034-4.

### Peer-reviewed conference proceedings

- [27] R. Otoni, I. Konnov, J. Kukovec, P. Eugster, and N. Sharygina. “Symbolic Model Checking for TLA+ Made Faster”. In: *TACAS*. Vol. 13993. LNCS. Springer, 2023, pp. 126–144.
- [28] N. Bertrand, V. Gramoli, I. Konnov, M. Lazic, P. Tholoniati, and J. Widder. “Brief Announcement: Holistic Verification of Blockchain Consensus”. In: *PODC*. ACM, 2022, pp. 424–426.
- [29] N. Bertrand, V. Gramoli, I. Konnov, M. Lazic, P. Tholoniati, and J. Widder. “Holistic Verification of Blockchain Consensus”. In: *DISC*. Ed. by C. Scheideler. Vol. 246. LIPIcs. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2022, 10:1–10:24.
- [30] I. Stoilkovska, I. Konnov, J. Widder, and F. Zuleger. “Eliminating Message Counters in Synchronous Threshold Automata”. In: *VMCAI*. Vol. 12597. LNCS. Springer, 2021, pp. 196–218.
- [31] T. Tran, I. Konnov, and J. Widder. “A Case Study on Parametric Verification of Failure Detectors”. In: *FORTE*. Vol. 12719. LNCS. Springer, 2021, pp. 138–156.
- [32] I. Stoilkovska, I. Konnov, J. Widder, and F. Zuleger. “Eliminating Message Counters in Threshold Automata”. In: *ATVA*. 2020, pp. 196–212. DOI: 10.1007/978-3-030-59152-6\_11.
- [33] T. Tran, I. Konnov, and J. Widder. “Cutoffs for Symmetric Point-to-Point Distributed Algorithms”. In: *NETYS*. Vol. 12129. LNCS. Springer, 2020, pp. 329–346.
- [34] N. Bertrand, I. Konnov, M. Lazic, and J. Widder. “Verification of Randomized Consensus Algorithms Under Round-Rigid Adversaries”. In: *CONCUR 2019*. Vol. 140. LIPIcs. 2019, 33:1–33:15. DOI: 10.4230/LIPIcs.CONCUR.2019.33.
- [35] I. Stoilkovska, I. Konnov, J. Widder, and F. Zuleger. “Verifying Safety of Synchronous Fault-Tolerant Algorithms Bounded Model Checking”. In: *TACAS*. 2019, pp. 357–374. DOI: 10.1007/978-3-030-17465-1\_20.
- [36] J. Kukovec, I. Konnov, and J. Widder. “Reachability in Parameterized Systems: All Flavors of Threshold Automata”. In: *29th International Conference on Concurrency Theory, CONCUR 2018, September 4-7, 2018, Beijing, China*. 2018, 19:1–19:17. DOI: 10.4230/LIPIcs.CONCUR.2018.19. URL: <https://doi.org/10.4230/LIPIcs.CONCUR.2018.19>.
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- [40] M. Lazic, I. Konnov, J. Widder, and R. Bloem. “Synthesis of Distributed Algorithms with Parameterized Threshold Guards”. In: *OPODIS*. Vol. 95. LIPIcs. 2017, 32:1–32:20. URL: <https://doi.org/10.4230/LIPIcs.OPODIS.2017.32>.
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- [49] I. V. Konnov and V. A. Zakharov. “On the Verification of Parameterized Symmetric Distributed Programs”. In Russian. In: *Proc. 1st All-Russia Conf. on Methods and Techniques of Information Processing*. MAKS Press, Moscow, 2003, pp. 395–400. ISBN: 5-89407-163-1.

## Invited speaker at conferences and workshops

- [50] I. Konnov. *Quint: Quintessence of your protocols*. Talk at Gateway to Cosmos 2023 (Industry), June. 2023. URL: <https://gateway.events>.
- [51] I. Konnov. *Threshold-guarded distributed algorithms: Verification and practical challenges*. Talk at SynCoP 2023, co-located with TACAS 2023, March. 2023. URL: <https://project.inria.fr/syncop23/>.
- [52] I. Konnov. *Model Checking of Threshold-based Fault-Tolerant Distributed Algorithms*. Invited talk at the 7th Workshop on Program Semantics, Specification & Verification, St. Petersburg, Russia, June. 2016. URL: <http://pssv-conf.ru/en/2016/program>.
- [53] I. Konnov. *Parametrized Model Checking of Fault-tolerant Distributed Algorithms by Abstraction*. Tutorial at the International Conference Tools and Methods of Program Analysis, Kostroma, Russia, November. 2014. URL: <http://tmpaconf.org/pastevenstmaterialsen/keynote-speakersen#2014>.

## Tutorials

- [54] I. Konnov and S. Merz. *Tutorial on the TLA+ language and its support tools*. Invited tutorial at TLA+ Community Meeting, co-located with TACAS 2023, March. 2023.
- [55] I. Konnov. *Symbolic model checking for TLA+ using Apalache*. Invited talk at TLA+ tutorial, co-located with DISC 2021, Online, October. 2021. URL: [https://www.youtube.com/watch?v=M17d\\_3v1H88](https://www.youtube.com/watch?v=M17d_3v1H88).
- [56] I. Konnov. *Thinking about protocols with TLA+ and Apalache before code is written*. Online tutorial/workshop at Hackatom Russia (online), March. 2021. URL: <https://ru.hackatom.org/>.
- [57] I. Konnov. *Model checking of distributed algorithms: from classics towards Tendermint blockchain*. Tutorial at VMCAI Winter School, New Orleans, LA, USA, January. 2020. URL: <https://popl20.sigplan.org/home/VMCAI-2020>.

- [58] I. Konnov. *What my computer can find about your distributed algorithm*. Tutorial at the Dagstuhl seminar 18211 “Formal Methods and Fault-Tolerant Distributed Computing: Forging an Alliance”, Dagstuhl, Germany, May. 2018. URL: <https://www.dagstuhl.de/en/program/calendar/semhp/?semnr=18211>.
- [59] I. Konnov. *Model Checking of Fault-tolerant Distributed Algorithms*. Tutorial at the Spring School Logic and Verification, Vienna, April. 2016. URL: <http://forsyte.at/events/love2016/>.
- [60] H. Veith and I. Konnov. *Model Checking of Fault-tolerant Distributed Algorithms*. Tutorial at the Summer School on Verification Technology, Systems & Applications, Luxembourg, Luxembourg, October. 2014. URL: <http://resources.mpi-inf.mpg.de/departments/rg1/conferences/vtsa14/>.

## Peer-reviewed workshop contributions

- [61] I. Konnov and S. Merz. *Model Checking of Fault-Tolerant Distributed Algorithms: from Classics towards Contemporary*. Contribution to DSN Workshop on Byzantine Consensus and Resilient Blockchains, Luxembourg City, Luxembourg, June. 2018. URL: <https://bcrb18.fim.uni-passau.de/shortpapers/bcrb18-konnov-merz.pdf>.
- [62] I. Konnov, H. Veith, and J. Widder. *Challenges in Model Checking of Fault-tolerant Designs in TLA+*. Contribution to the 8th International Workshop on Exploiting Concurrency Efficiently and Correctly, San Francisco, CA, USA, July. 2015. URL: <http://multicore.doc.ic.ac.uk/events/ec2/KonnovVeithWidder.pdf>.
- [63] I. Konnov. “CheAPS: a Checker of Asynchronous Parameterized Systems”. In: *WING 2010*. Ed. by A. Voronkov, L. Kovacs, and N. Bjorner. Vol. 1. EPiC Series. EasyChair, 2012, pp. 128–129. URL: <http://www.easychair.org/publications/?page=355792421>.
- [64] I. V. Konnov and V. A. Zakharov. “Using Adaptive Symmetry Reduction for LTL Model Checking”. In: *Proc. International Workshop on Program Semantics, Specification and Verification (PSSV 2010) affiliated with CSR 2010*. 2010, pp. 5–11. URL: <http://csr2010.ksu.ru/PSSV.html>.
- [65] V. Zakharov and I. Konnov. “An Invariant-based Approach to the Verification of Asynchronous Parameterized Networks”. In: *International Workshop on Invariant Generation (WING’07)*. 2007, pp. 41–55. URL: [http://www.risc.uni-linz.ac.at/publications/download/risc\\_3128/proceedings.pdf](http://www.risc.uni-linz.ac.at/publications/download/risc_3128/proceedings.pdf).

## Conference contributions

- [66] V. V. Antonenko and I. V. Konnov. “On the Choice of a Simulation Run-Time Infrastructure based on High-Level Architecture”. In Russian. In: *17th International Conference on Computational Mechanics and Contemporary Application Software Systems 2011 (VMSPPS’2011), Alushta, Ukraine*. 2011, pp. 36–38. ISBN: 978-5-7035-2269-1.
- [67] G. A. Klimov, D. D. Kozlov, and I. V. Konnov. “Static analysis for security of web applications developed in Python”. In Russian. In: *Proc. 5th All-Russia Scientific and Technical Conf. Microsoft technologies in theory and practice of programming*. 2008.
- [68] I. V. Konnov. “The system for verification of parameterized models of asynchronous distributed systems (CHEAPS)”. In Russian. In: *Proc. 5th All-Russia Scientific and Technical Conf. Microsoft technologies in theory and practice of programming*. 2008.

## Workshop contributions

- [69] S. Feder, I. Konnov, J. Kukovec, G. Moreira, and T. Pani. *Quint: protocols as code in the logic of TLA+*. Talk at TLA+ Community Meeting, co-located with TACAS 2023, March. 2023.
- [70] J. Kukovec and I. Konnov. *Type inference for TLA+ in Apalache*. Contribution to TLA+ Community Meeting, DISC 2020, Online, October. 2020. URL: <https://youtu.be/hnp25hmcMN8>.
- [71] A. Kupriyanov and I. Konnov. *Type inference for TLA+ in Apalache*. Contribution to TLA+ Community Meeting, DISC 2020, Online, October. 2020. URL: <https://youtu.be/aveoIMphzW8>.
- [72] I. Konnov. *Making TLA+ model checking symbolic*. Talk at VeriDis + Matryoshka workshop, Amsterdam, Netherlands. June 2019. URL: <http://matryoshka.gforge.inria.fr/matryoshka2019/index.html>.
- [73] I. Konnov. *Towards symbolic model checking of fault-tolerant designs in TLA+*. Talk at the Helmut Veith Memorial Workshop, Obertauern, Austria, January. 2018. URL: <http://hvw2018.cs.uni-salzburg.at/schedule>.
- [74] I. Konnov, J. Kukovec, and T.-H. Tran. *BmcMT: Bounded Model Checking of TLA+ Specifications with SMT*. Contribution to TLA+ Community Meeting, Oxford, UK, July. 2018. URL: <http://tla2018.loria.fr/contrib/konnov.pdf>.

- [75] I. Konnov. *Verifying Safety and Liveness of Threshold-guarded Fault-Tolerant Distributed Algorithms*. Talk at the Helmut Veith Memorial Workshop, Obergurgl, Austria, February. 2017. URL: <http://cbr.uibk.ac.at/events/hvw/schedule.php>.
- [76] I. Konnov. *SMT and POR beat Counter Abstraction: Parameterized Model Checking of Threshold-based Distributed Algorithms*. Workshop contribution at Alpine Verification Meeting, Attersee, Austria, May. 2015.
- [77] A. B. Glonina, I. Konnov, V. V. Podymov, D. Y. Volkanov, V. A. Zakharov, and D. A. Zorin. *An experience on using simulation environment DYANA augmented with UPPAAL for verification of embedded systems defined by UML statecharts*. Contribution to the CAV workshop VES13, St. Petersburg, Russia, July. 2013. URL: <http://forsyte.at/wp-content/uploads/ves13-gkpvzz.pdf>.
- [78] I. Konnov. *Parameterized Model Checking by Network Invariants: the Asynchronous Case*. Contribution to: LICS Workshop AISS, Dubrovnik, Croatia, June 2012. 2012. URL: <http://forsyte.at/wp-content/uploads/12konnov-aiss.pdf>.
- [79] I. Konnov, H. Veith, and J. Widder. *Who is afraid of Model Checking Distributed Algorithms?* Contribution to the 5th International Workshop on Exploiting Concurrency Efficiently and Correctly, Berkeley, CA, USA, July 2012. 7 citations excl. self-citations. 2012. URL: <http://forsyte.at/wp-content/uploads/2012/07/ec2-konnov.pdf>.
- [80] I. V. Konnov and O. Letichevsky. “Model Checking GARP Protocol using Spin and VRS”. In: *International Workshop on Automata, Algorithms, and Information Technologies*. 2010. DOI: 10.1007/s10559-010-9244-8.

## Invited Seminar Talks

- [81] I. Konnov. *Improving usability of TLA+ tools for blockchain engineers*. Talk at Dagstuhl Seminar 23112, Unifying Formal Methods for Trustworthy Distributed Systems, March. 2023. URL: <https://www.dagstuhl.de/en/seminars/seminar-calendar/seminar-details/23112>.
- [82] I. Konnov. *Testing Cosmos applications with TLA+ and Apache*. Talk at Dagstuhl Seminar 21431, Rigorous Methods for Smart Contracts, Online, October. 2021. URL: <https://www.dagstuhl.de/en/program/calendar/semhp/?semnr=21431>.
- [83] I. Konnov. *How TLA+ and Apache Helped Us to Design the Tendermint Light Client*. Online talk at Interchain Conversations (online conference), December. 2020. URL: <https://www.crowdcast.io/e/interchain-conversations-II/38>.
- [84] I. Konnov. *TLA+ and Apache to specify and check the Tendermint light client*. Online talk at LABRI seminar, Bordeaux, France, October. 2020.
- [85] I. Konnov. *Bounded Model Checking of TLA+ Specifications with SMT*. Invited talk at ANR “FREDDA” meeting, Univ. Paris-Diderot, Paris, France. 2019. URL: <https://www.irif.fr/~freda/meetings.html>.
- [86] I. Konnov. *Making TLA+ model checking symbolic*. Talk at NETYS workshop on Verification of Distributed Systems, Marrakech, Morocco. June 2019. URL: <http://goto.ucsd.edu/~gleissen/vds-test/>.
- [87] I. Konnov. *TLA+ Model Checking Made Symbolic*. Talk at LARA seminar, EPFL, Lausanne, Switzerland, November. 2019.
- [88] I. Konnov. *Synthesizing Distributed Algorithms with Parameterized Threshold Guards*. Talk at the NETYS Workshop on Verification of Distributed Systems, Essaouira, Morocco, May. 2018. URL: <http://netys.net/VDS2018.html>.
- [89] J. Widder and I. Konnov. *Logical Methods for the Correctness of Distributed Algorithms*. RISE PI talk at “Alpine Verification Meeting”, Wagrain, Austria, September. 2018. URL: <https://avm2018.iaik.tugraz.at/program/>.
- [90] I. Konnov. *Model checking of distributed algorithms for LARGE-scale systems*. Interview talk at INRIA (awarded 1 of 4 researcher positions (CR1) at INRIA), Paris, France, May. 2017.
- [91] I. Konnov. *Verifying Safety and Liveness of Threshold-guarded Fault-Tolerant Distributed Algorithms*. Talk at LORIA/INRIA seminar, Nancy, France, May. 2017.
- [92] I. Konnov. *Model Checking of Fault-tolerant Distributed Algorithms: Safety and Liveness*. Invited talk at the Seminar of Rigorous System Design Laboratory, Lausanne, Switzerland, September. 2016.
- [93] I. Konnov. *Model Checking of Threshold-based Fault-tolerant Distributed Algorithms*. Invited talk at the Seminar on Foundations of Mathematics and Theoretical Computer Science, Ljubljana University, Ljubljana, Slovenia, May. 2016.
- [94] I. Konnov. *Model Checking of Threshold-Guarded Distributed Algorithms: Beyond Reachability*. Invited talk at the Vericub Seminar (Bertrand Meyer), Toulouse, France, November. 2016.

- [95] I. Konnov. *Model Checking of Threshold-based Fault-tolerant Distributed Algorithms*. Invited talk at Amazon, Herndon, VA, USA, June. 2015.
- [96] I. Konnov. *Model checking of threshold-based fault-tolerant distributed algorithms*. Talk at the Dagstuhl Seminar on Distributed Cloud Computing, Dagstuhl, Germany, February. 2015. URL: <https://www.dagstuhl.de/en/program/calendar/semhp/?semnr=15072>.
- [97] I. Konnov. *SMT and POR beat Counter Abstraction*. Invited talk at the RiSE Seminar at Institute of Science and Technology Austria, Klosterneuburg, Austria, April. 2015.
- [98] I. Konnov. *On Completeness of Bounded Model Checking for Threshold-based Distributed Algorithms: Reachability*. Talk at the Seminar on Theoretical Problems in Programming, Moscow State University, Moscow, Russia, February. 2014.
- [99] I. Konnov. *Counter Attack on Byzantine Generals*. Talk at the Dagstuhl Seminar on Formal Verification of Distributed Algorithms, Dagstuhl, Germany, April. 2013. URL: <https://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=18211>.
- [100] I. Konnov. *Counter Attack on Byzantine Generals*. Talk at the Seminar on Theoretical Problems in Programming, Moscow State University, Moscow, Russia, February. 2013.
- [101] I. Konnov. *Who is Afraid of Model Checking Distributed Algorithms*. Talk at the PUMA/RiSE Seminar, Goldegg, Austria, September. 2012.
- [102] I. Konnov. *An invariant-based approach to the verification of asynchronous parameterized networks*. Talk at the Concurrency Seminar, Computing Laboratory, Oxford University, Oxford, UK, February. 2011.
- [103] I. Konnov. *Two Techniques of Parameterized Model Checking and Symmetry Reduction*. Talk at the RiSE Seminar, TU Vienna, Vienna, Austria, April. 2011.
- [104] I. V. Konnov. *CheAPS: Parameterized Model Checking Tool*. Joint Workshop of Microsoft Research and Institute for System Programming Russian Academy of Sciences, Moscow, June 2009. 2009.

## Technical reports

- [105] N. Bertrand, V. Gramoli, I. Konnov, M. Lazic, P. Tholoniati, and J. Widder. *Holistic Verification of Blockchain Consensus*. 2022.
- [106] T. Tran, I. Konnov, and J. Widder. *A case study on parametric verification of failure detectors*. 2021.
- [107] S. Braithwaite, E. Buchman, I. Khoffi, I. Konnov, Z. Milosevic, R. Ruetschi, and J. Widder. *A Tendermint Light Client*. 2020. URL: <https://arxiv.org/abs/2010.07031>.
- [108] I. Konnov, M. Lazic, I. Stoilkovska, and J. Widder. *Survey on Parameterized Verification with Threshold Automata and the Byzantine Model Checker*. 2020. URL: <https://arxiv.org/abs/2011.14789>.
- [109] N. Bertrand, I. Konnov, M. Lazic, and J. Widder. *Verification of Randomized Distributed Algorithms under Round-Rigid Adversaries*. Nov. 2018. URL: <https://hal.inria.fr/hal-01925533>.
- [110] I. Konnov, M. Lazic, H. Veith, and J. Widder. *A Short Counterexample Property for Safety and Liveness Verification of Fault-Tolerant Distributed Algorithms*. Extended version of the POPL'17 paper including the proofs. 2016. URL: <http://arxiv.org/abs/1608.05327>.
- [111] A. John, I. Konnov, U. Schmid, H. Veith, and J. Widder. *Counter Attack on Byzantine Generals: Parameterized Model Checking of Fault-tolerant Distributed Algorithms*. Oct. 2012. URL: <http://arxiv.org/abs/1210.3846>.
- [112] A. John, I. Konnov, U. Schmid, H. Veith, and J. Widder. *Starting a Dialog between Model Checking and Fault-tolerant Distributed Algorithms*. Oct. 2012. URL: <http://arxiv.org/abs/1210.3839>.
- [113] P. Bulychev, I. V. Konnov, and V. A. Zakharov. "Computing (bi)simulation relations preserving  $CTL^*_X$  for ordinary and fair Kripke structures". In: *Mathematical Methods and Algorithms, Institute of Systems Programming of the Russian Academy of Sciences*. Vol. 12. 2006, pp. 59–76. URL: <http://discopal.ispras.ru/pdfs/issue-2006-12/cs-isp-sbornik.pdf>.
- [114] I. Konnov and V. Zakharov. "On the verification of asynchronous parameterized networks of communicating processes by model checking". In: *Mathematical Methods and Algorithms, Institute of Systems Programming of the Russian Academy of Sciences*. Vol. 12. 2006, pp. 37–58. URL: <http://discopal.ispras.ru/pdfs/issue-2006-12/cs-isp-sbornik.pdf>.