

---

# Editorial of the Workshop on *Very Large Internet of Things (VLIoT 2018)*

Sven Groppe<sup>A</sup>, Carlo Alberto Boano<sup>B</sup>

<sup>A</sup> Institute of Information Systems (IFIS), University of Lübeck,  
Ratzeburger Allee 160, D-23562 Lübeck, Germany, [groppe@ifis.uni-luebeck.de](mailto:groppe@ifis.uni-luebeck.de)

<sup>B</sup> Institute for Technical Informatics, Graz University of Technology,  
Inffeldgasse 16/1, A-8010 Graz, Austria, [cboano@tugraz.at](mailto:cboano@tugraz.at)

---

## ABSTRACT

The 2nd “Very Large Internet of Things” (VLIoT) workshop in conjunction with the 44th International Conference on Very Large Data Bases (VLDB) taking place in Rio de Janeiro, Brazil in 2018 is a forum for all researchers in the area of Internet of Things especially interested in related data management issues. This editorial of a special issue containing the workshop’s papers provides an overview over the aims and scope of the workshop and the review procedure. Furthermore, we determine and shortly analyze a statistics of the topics addressed by the accepted papers.

## TYPE OF PAPER AND KEYWORDS

Editorial: *Internet of Things, databases, very large Internet of Things, VLIoT@VLDB 2018, workshop, open access, Open Journal of Internet of Things, OJIOT, RonPub*

## 1 AIMS OF THE WORKSHOP

An increasing number of real-world objects are becoming accessible and manageable through the Internet. According to Cisco<sup>1</sup>, the number of these devices will reach 50 billion by 2020, forming a very large Internet of Things (VLIoT). This massive number of “smart” objects will cooperate with each other, have their own metadata, and may continuously produce new data (in form of events, sensor data, or actuator

states). Data management will be a major challenge in the VLIoT. Hence, efficient IoT infrastructure and technologies must be developed to handle masses of IoT data with high performance. This will include: new techniques to filter and store relevant data; efficient replication approaches for objects with constrained resources in order to increase availability and durability; new protocols for voting about decisions among objects; and smooth integration of heterogeneous objects.

The goal of this workshop is to bring together academic researchers and industry practitioners working in the field of IoT and to allow them to report and exchange their findings addressing these challenges. This workshop also intends to discuss other closely-related topics, such as nanotechnologies, fog-, edge-, and dew-computing for the IoT. Works in these domains may indeed solve or attenuate the problems of a very large

<sup>1</sup> [http://www.cisco.com/c/dam/en\\_us/about/ac79/docs/innov/IoT\\_IBSG\\_0411FINAL.pdf](http://www.cisco.com/c/dam/en_us/about/ac79/docs/innov/IoT_IBSG_0411FINAL.pdf)

This paper is accepted at the *International Workshop on Very Large Internet of Things (VLIoT 2018)* in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. The proceedings of VLIoT@VLDB 2018 are published in the Open Journal of Internet of Things (OJIOT) as special issue.

Internet of Things, with respect to performance, energy-efficiency, as well as security and privacy aspects.

### 1.1 Types of Papers

The second edition of the VLIoT workshop solicited papers of different types containing contributions describing original ideas, promising new concepts, and practical experience, namely:

- **Research papers:** proposing new approaches, theories or techniques related to IoT, including new data structures, algorithms, whole systems, and frameworks. They should make substantial theoretical and empirical contributions to the research field.
- **Experiments and analysis papers:** focusing on the experimental evaluation of existing approaches including data structures and algorithms for the IoT and bring new insights through the analysis of these experiments. Results of experiments and analysis papers can be, for example, showing benefits of well-known approaches in new settings and environments, opening new research problems by demonstrating unexpected behavior or phenomena, or comparing a set of traditional approaches in an experimental survey.
- **Application papers:** reporting practical experiences on Internet of Things applications. Application papers might describe specific application domains in the IoT such as smart homes/offices/cities, continuous health care, waste management, emergency response, intelligent response, and Industry 4.0.
- **Vision papers:** identifying emerging or future research issues and directions, and describing new research visions in the IoT area that may have a great impact on our society.

### 1.2 Topics of Interest

The topics of interest of the VLIoT workshop include:

- Semantic IoT
- Privacy-by-design and security-by-design in IoT
- System architectures for IoT, e.g.
  - things-centric,
  - data-centric,
  - event-centric, and
  - service-centric.
- IoT applications including:
  - smart homes/offices/cities,
  - waste management,

- health care,
- emergency response, and
- intelligent shopping.

- IoT programming toolkits and frameworks
- IoT prototypes and evaluation test-beds
- IoT data mining and analytics
- IoT management and interoperability
- Management of IoT streams
- Enabling technologies and standards for the IoT
- Spatial and temporal reasoning for IoT
- Sustainability of IoT platforms, e.g. business models for deployment and maintenance
- Societal challenges and IoT, e.g. urban planning and decision making tools
- Ownership of data in IoT scenarios
- Fog, Edge and Dew Computing for IoT
- IoT benchmarks and performance measurement
- Indexing and search in IoT environments
- IoT transactions, concurrency control and recovery
- Hardware accelerators and energy savers for IoT applications and core infrastructure
- IoT discovery of devices, services and data
- Nano Technology including:
  - Nano Networks,
  - Nano communication,
  - Nano applications,
  - Nano computing, and
  - Internet of Nano Things.

## 2 SUBMISSIONS AND REVIEWS

### 2.1 General Co-Chairs and Technical Program Committee

Two general co-chairs (see Appendix A) and nineteen technical program committee members (listed in Appendix B) have served as experts on the topics of interest of the workshop. They are researchers and practitioners from academia and industry from fifteen nations. Figure 1 presents a map depicting how many technical program committee (TPC) members reside in which country. Five of the nineteen TPC members are women (26%).

### 2.2 Submission Statistics and Review Procedure

The workshop received fourteen paper submissions, twelve of which were accepted for presentation and

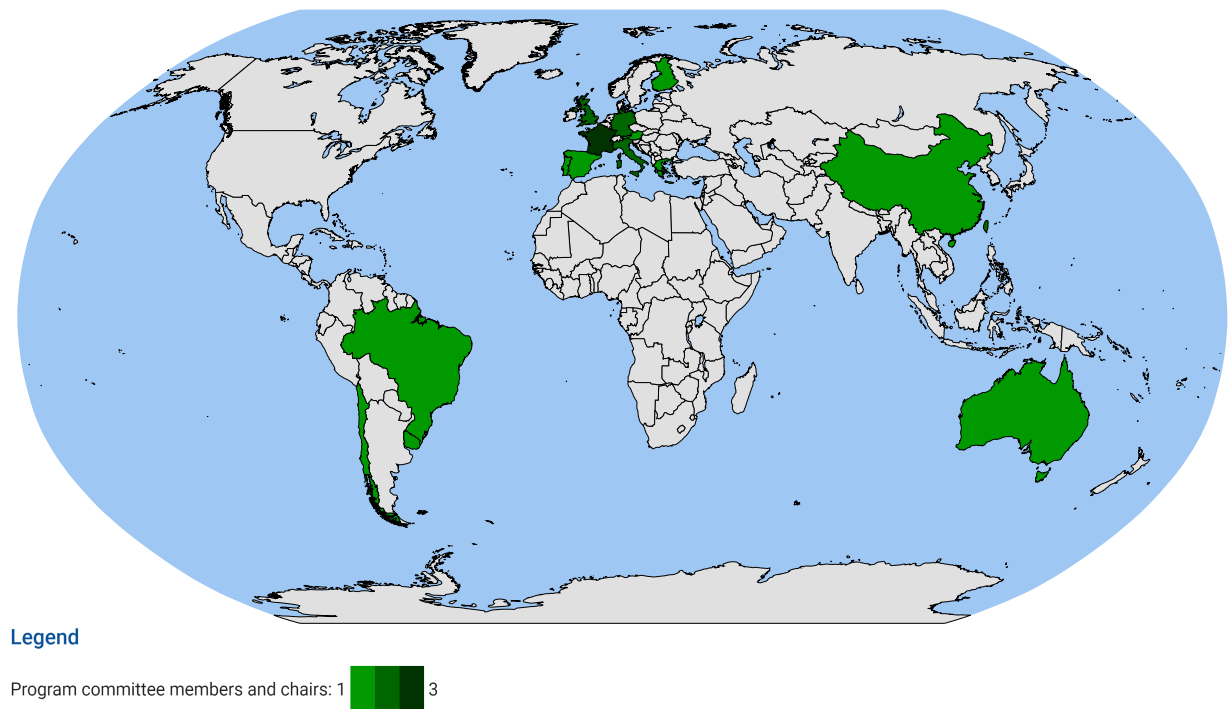


Figure 1: Number of PC members per country.

publication in the workshop proceedings (85%). Each paper was typically reviewed by at least two members from the program committee (by three members in most of the cases), who remained anonymous to the authors (*single blind review*). The reviewers evaluated the papers according to the following aspects:

- Relevance to the workshop
- Novelty and practical impacts
- Technical soundness
- Appropriateness and adequacy of:
  - Literature review
  - Background discussion
  - Analysis of issues
- Presentation, including:
  - Overall organization
  - English
  - Readability

### 3 WORKSHOP PROCEEDINGS

In this section, we first discuss in Section 3.1 why we have decided to publish the workshop proceedings in the Open Journal of Internet of Things (OJIOT). We then provide a short overview of the accepted papers in Section 3.2.

#### 3.1 Publisher of the Workshop Proceedings

The open access model guarantees high visibility in the research community and usage of published results – hence leading to a potentially high impact. We have therefore chosen a journal applying the open access model for publishing the workshop proceedings of VLIoT 2018 as special issue. Furthermore, we attach importance to a journal not asking for transferring copyright, but applying the license model. Hence, we finally decided to choose the Open Journal of Internet of Things (OJIOT)<sup>2</sup>, which is an open access, peer-reviewed, academic journal published by RonPub<sup>3</sup>. OJIOT distributes its articles under Creative Commons Attribution License<sup>4</sup>, which permits unrestricted use, distribution, and reproduction free of charge in any medium, provided that the original work is properly cited. Furthermore, by publishing in OJIOT, the papers will be indexed in major scientific indexes and long-term preservation of the articles is ensured by the German National Library<sup>5</sup>.

<sup>2</sup> <https://www.ronpub.com/ojiot>

<sup>3</sup> <https://www.ronpub.com>

<sup>4</sup> <http://creativecommons.org/licenses/by/4.0/>

<sup>5</sup> [http://www.dnb.de/EN/Home/home\\_node.html](http://www.dnb.de/EN/Home/home_node.html)

**Table 1: Overview of the accepted papers and their topics.**

Topic category	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	Total
Vision Paper		✓								✓			17%
Regular Research Paper	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	83%
Security and Privacy		✓						✓					17%
IoT Framework/Architecture			✓	✓		✓		✓		✓	✓	✓	58%
Cloud-Sensor Systems		✓	✓		✓					✓	✓	✓	50%
Networking Aspects				✓					✓				17%
Machine Learning								✓			✓		17%
Middleware for the IoT			✓	✓	✓	✓						✓	33%
Nano-technologies	✓						✓						17%

### 3.2 Overview of Accepted Papers

Ten out of twelve accepted papers (i.e., 83%) are regular research papers [1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12]; two are vision papers [2, 10].

Table 1 provides an overview of the topics addressed by the accepted papers. The majority of works addresses frameworks or architectures for the Internet of Things, as well as cloud-sensor systems. One third of the accepted papers focuses on IoT middleware. This year's edition of VLIoT also includes contributions on security and privacy, IoT networking, machine learning, as well as nano-technologies.

## 4 SUMMARY

The VLIoT workshop gathers researchers and practitioners working on problems occurring in large-scale Internet of Things environments. This year's edition has put special emphasis on data management, middleware, and nano-technologies. In this article, we have analyzed the topics of our accepted papers, which may provide hints for current trends in IoT research.

We believe that the VLIoT workshop is a great success and a (small but fine) step towards a breakthrough of IoT approaches in industry and daily life. We hope our readers enjoy this selection of papers at the intersection of IoT and database research.

## REFERENCES

- [1] G. Ardel, C. Külls, and H. Hellbrück, "Towards intrinsic molecular communication using isotopic isomerism," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 135–143, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online].

Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n11\\_Ardelt.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n11_Ardelt.html)

- [2] L. d'Orazio and J. Lallet, "Semantic caching framework: An fpga-based application for iot security monitoring," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 150–157, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n13\\_Orazio.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n13_Orazio.html)
- [3] M. Endler and F. S. e Silva, "Past, present and future of the contextnet iomt middleware," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 7–23, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n02\\_Endler.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n02_Endler.html)
- [4] J. Fürst, M. F. Argerich, K. Chen, and E. Kovacs, "Towards adaptive actors for scalable iot applications at the edge," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 70–86, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n06\\_Fuerst.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n06_Fuerst.html)
- [5] H. Grunert and A. Heuer, "Query rewriting by contract under privacy constraints," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 54–69, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro,

- Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n05\\_Grunert.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n05_Grunert.html)
- [6] A. E. Khaled, W. Lindquist, and A. S. Helal, "Service-relationship programming framework for the social iot," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 35–53, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n04\\_Khaled.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n04_Khaled.html)
- [7] F.-L. Lau, K. Stahl, and S. Fischer, "Techniques for the generation of arbitrary three-dimensional shapes in tile-based self-assembly systems," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 126–134, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n10\\_Lau.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n10_Lau.html)
- [8] X. Liu, M. Abdelhakim, P. Krishnamurthy, and D. Tipper, "Identifying malicious nodes in multihop iot networks using dual link technologies and unsupervised learning," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 109–125, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n09\\_XinLiu.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n09_XinLiu.html)
- [9] C. B. Margi, R. C. A. Alves, G. A. N. Segura, and D. A. G. Oliveira, "Software-defined wireless sensor networks approach: Southbound protocol and its performance evaluation," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 99–108, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n08\\_Margi.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n08_Margi.html)
- [10] I. Miladinovic and S. Schefer-Wenzl, "Dynamic allocation of smart city applications," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 144–149, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n12\\_Miladinovic.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n12_Miladinovic.html)
- [11] A. H. Ngu, P.-T. Tseng, M. Paliwal, C. Carpenter, and W. Stipe, "Smartwatch-based iot fall detection application," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 87–98, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n07\\_Ngu.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n07_Ngu.html)
- [12] S. Valim, M. Zeitune, B. Olivieri, and M. Endler, "Middleware support for generic actuation in the internet of mobile things," *Open Journal of Internet Of Things (OJIOT)*, vol. 4, no. 1, pp. 24–34, 2018, Special Issue: Proceedings of the International Workshop on Very Large Internet of Things (VLIoT 2018) in conjunction with the VLDB 2018 Conference in Rio de Janeiro, Brazil. [Online]. Available: [https://www.ronpub.com/ojiot/OJIOT\\_2018v4i1n03\\_Valim.html](https://www.ronpub.com/ojiot/OJIOT_2018v4i1n03_Valim.html)

## APPENDIX A - WORKSHOP CHAIRS

The workshop is organized by:

- Sven Groppe, University of Lübeck, Germany
- Carlo Alberto Boano, Graz University of Technology, Austria

## APPENDIX B - PROGRAM COMMITTEE

Our Program Committee members include the following experts:

- Whai-En Chen, National Ilan University, Taiwan
- Lorena Etcheverry, Universidad de la República, Uruguay
- Mirian Halfeld Ferrari, Université d'Orléans, France
- Aidan Hogan, Universidad de Chile, Chile
- Andrew Hudson-Smith, University College London, United Kingdom
- Abdessamad Imine, INRIA-LORIA Nancy Grand-Est, France
- Peiquan Jin, University of Science and Technology of China, China
- Verena Kantere, University of Geneva, Switzerland
- Abdelmajid Khelil, Landshut University of Applied Sciences, Germany
- Jan Lindström, MariaDB Corporation, Finland
- Uden Lorna, Staffordshire University, United Kingdom

- Riccardo Martoglia, University di Modena and Reggio Emilia, Italy
- Cédric du Mouza, Conservatoire National des Arts et Métiers, France
- Luis Muñoz, University of Cantabria, Spain
- Daniel Cardoso Moraes de Oliveira, Universidade Federal Fluminense, Brazil
- Elaheh Pourabbas, National Research Council of Italy, Italy
- Sherif Sakr, School of Computer Science and Engineering University of New South Wales, Australia, and King Saud bin Abdulaziz University for Health Sciences, Saudi Arabia
- Mu-Chun Su, National Central University, Taiwan
- Marco Vieira, University of Coimbra, Portugal

#### AUTHOR BIOGRAPHIES



**Sven Groppe** earned his diploma degree in Informatik (Computer Science) in 2002 and his Doctor degree in 2005 from the University of Paderborn. He earned his habilitation degree in 2011 from the University of Lübeck. He worked in the European projects B2B-ECOM, MEMPHIS, ASG and TripCom. He was a member of the DAWG

W3C Working Group, which developed SPARQL. He was the project leader of the DFG project LUPOSDATE, an open-source Semantic Web database, and one of the project leaders of two research projects, which research on FPGA acceleration of relational and Semantic Web databases. He is also the chair of the Semantic Big Data workshop series, which is affiliated with the ACM SIGMOD conference (so far 2016 to 2018), and of the Very Large Internet of Things workshop in conjunction with the VLDB conference in 2017. His research interests include databases, Semantic Web, query and rule processing and optimization, Cloud Computing, peer-to-peer (P2P) networks, Internet of Things, data visualization and visual query languages.



**Carlo Alberto Boano** is an assistant professor at the Institute for Technical Informatics of Graz University of Technology (TU Graz), Austria. He received a doctoral degree sub-auspiciis praesidentis from TU Graz in 2014 with a thesis on dependable wireless sensor networks and holds a double

Master degree from Politecnico di Torino, Italy, and KTH Stockholm, Sweden. Before joining TU Graz, Carlo Alberto was researcher at the University of Lübeck, Germany (2009-2013) and at the SICS Swedish ICT, Sweden (2008-2009). Carlo Alberto's research interests encompass the design of dependable networked embedded systems, with emphasis on the energy-efficiency and reliability of low-power wireless communications, as well as on the robustness of networking protocols against environmental influences. More info at: <http://www.carloalbertoboano.com>.