

# SARATH BABU

Department of Electrical and Computer Engineering, Iowa State University

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## Career Objective

Pursue research in distributed and networked systems focusing on the design and development of scalable, resilient, and secure next-generation wireless networking infrastructures.

## Research Interests

**Distributed Systems, Testbeds, and Network Measurement:** Design, development, and deployment of scalable, resilient, and secure distributed computing and communication systems across heterogeneous compute, storage, and wireless platforms, including building prototypes and testbeds, and performing real-world network measurements for evaluating and optimizing system performance, reliability, fault-tolerance, and security.

**Next Generation Wireless Networks:** Experimental design, evaluation, and deployment of real-world wireless and distributed system testbeds for 5G and beyond, and Open Radio Access Networks (Open RAN), wireless mesh networks, and satellite networks.

**Software Defined Wireless Networks and Internet of Things (IoT):** Modeling and implementation of Software Defined Networking (SDN)-based approaches in wireless systems (including wireless mesh networks, delay/disruption tolerant networks, and sensor networks) and building lightweight solutions (such as blockchain-based frameworks for IoT) to support emerging applications.

**Complex Network Analysis for Applied Systems:** Applying complex network tools to analyze practical systems such as road networks and intelligent transportation systems, enabling the design and development of mobility models, routing protocols, and security frameworks.

**Systems Security:** Analysis of security threats and attacks on Software Defined Networking (SDN) architectures, and the design and implementation of practical defense mechanisms to ensure reliability and resilience.

## Education

### Indian Institute of Space Science and Technology

*Doctor of Philosophy (Ph.D.)*

THESIS: *Software defined disruption tolerant networks*

ADVISOR: Prof. B. S. Manoj

FEB 2014–MAY 2021

Thiruvananthapuram, India

CGPA: 9.25/10

### National Institute of Technology, Calicut

*Master of Technology (M.Tech.) in Computer Science and Engineering (Information Security)*

THESIS: *A usage control based model for multi-domain environments with distributed attributes*

ADVISOR: Prof. Priya Chandran

AUG 2009–MAY 2011

Calicut, India

CGPA: 8.97/10

### Mahatma Gandhi University

*Bachelor of Technology (B.Tech.) in Information Technology*

PROJECT: *Remote system access through universal serial bus*

AUG 2005–AUG 2009

Kottayam, India

Percentage: 82.28%

### Board of Higher Secondary Examination, Kerala

*Higher Secondary Examination (HSE) in Computer Science*

*Brahmanandodayam Higher Secondary School, Kalady*

JUL 2003–MAR 2005

Ernakulam, India

Percentage: 91.83%

### Board of Public Examinations, Kerala

*Technical High School Leaving Certificate (THSLC) in Electronics*

*Model Technical Higher Secondary School, Kaprassery*

JUN 2000–MAR 2003

Ernakulam, India

Percentage: 81.5%

## Experience

### Iowa State University

*Research Assistant Professor, Department of Electrical and Computer Engineering*

*Center for Wireless, Communities and Innovation (WiCI)*

FEB 2025–CURRENT

Ames, IA, USA

### Iowa State University

*Research Scientist II, Department of Electrical and Computer Engineering*

*Center for Wireless, Communities and Innovation (WiCI)*

OCT 2021–FEB 2025

Ames, IA, USA

Recognitions | Scholarships | Certifications

• IEEE International Conference on Network Softwarization (IEEE NetSoft '25)	JUN 2025
Best Paper Award	Budapest, Hungary
• Midscale Experimental Research Infrastructure Forum 2024 (MERIF '24)	SEP 2024
Best Demo Award	Kansas City, MO, USA
• IEEE Future Networks World Forum (FNWF '23)	NOV 2023
Honorable Mention for the Paper	Baltimore, MD, USA
• ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization (WiNTECH '23)	OCT 2023
Best Paper Award	Madrid, Spain
• Indian Institute of Space Science and Technology	NOV 2019
Outstanding Teaching Assistant Award in the Department of Avionics	Thiruvananthapuram, India
• ICTS-Northeastern Discussion Meeting on Games, Epidemics, and Behavior	JUN 2016
Selected Participant supported by Travel Grant	Bangalore, India
• Department of Space, Government of India	FEB 2014–JAN 2019
Ph.D. Scholarship, Indian Institute of Space Science and Technology	Thiruvananthapuram, India
• Ministry of Human Resource Development, Government of India	JUL 2009–MAY 2011
Master's Scholarship, National Institute of Technology, Calicut	Calicut, India
• Ministry of Human Resource Development, Government of India	MAR 2009
Graduate Aptitude Test in Engineering (GATE), Percentile: 96.84	
• Infosys	SEP 2009
Campus Connect Program	
• Red Hat	APR 2007
Linux 4.0 Essentials, Linux 4.0 System Administration, and Network and Security Administration	

Projects Involved

Principle Investigator (PI) | Co-Principal Investigator (Co-PI)

1. SITE CO-PI, “ArMORED: Architecture for massive-MIMO Open RAN Energy-efficient Devices,” **NTIA Innovation Fund**, (Total Funding: \$10,118,112; ISU: \$2,400,000), Skylark Wireless (PI) and Iowa State University, Jan 2025–Dec 2027.
2. SITE CO-PI, “Acceleration of Compatibility and Commercialization for Open RAN Deployments (ACCoRD),” **NTIA Innovation Fund**, (Total Funding: \$42,299,693; ISU: \$1,000,000), AT&T (PI), Verizon, University of Texas at Dallas, Northeastern University, Iowa State University, Rutgers University, Virginia Tech, NTT DOCOMO, and Reliance Jio, Jan 2024–Dec 2027.
3. CO-PI, “Open RAN Research, Testing, and Integration for Rural Industries and Communities,” **NSF NeTS and TIP**, (Total Funding: \$1,400,000), Iowa State University (PI), May 2023–Apr 2025.
4. CO-PI, “ARA Launchpad: Open Wireless Platforms, Data and Co-Prototyping for Integrative Research and Community Building,” **NSF NeTS**, (Total Funding: \$784,000), Iowa State University (PI), Oct 2023–May 2026.

Senior Personnel | Other Roles

1. RESEARCH SCIENTIST/RESEARCH ASSISTANT PROFESSOR, “Ara4Rural: ARA Infrastructure and Community Building for Rural Wireless Applications,” **NSF NeTS**, (Total Funding: \$1,000,000), Iowa State University (PI), Dec 2024–Nov 2026.
2. RESEARCH SCIENTIST/RESEARCH ASSISTANT PROFESSOR, “NSF AI Institute for Intelligent Cyber-Infrastructure with Computational Learning in the Environment (ICICLE),” **NSF AI Research Institute**, (Total Funding: \$20,000,000; ISU: \$450,579), Ohio State University (PI) et al., Nov 2021–Oct 2026.
3. RESEARCH SCIENTIST, “POSE: Phase 1: OPERA: An Open-Source Ecosystem for Broadband Prairie,” **NSF POSE**, (Total Funding: \$299,999), Iowa State University (PI), Sep 2022–Aug 2024.

4. RESEARCH SCIENTIST, “*Collaborative Research: CNS Core: Medium: Real-Time Liquid Wireless Networking for Data-Intensive Rural Applications*,” **NSF CNS Core**, (Total Funding: \$600,000; ISU: \$300,000), Iowa State University (PI), International Computer Science Institute, and Boston University, Oct 2022–Sep 2025.
5. RESEARCH SCIENTIST/RESEARCH ASSISTANT PROFESSOR, “*ARA: Wireless Living Lab for Smart and Connected Rural Communities*,” **NSF PAWR**, (Total Funding: \$16,000,000), Iowa State University (PI), University of California Irvine, Ohio State University, and International Computer Science Institute, Jun 2021–May 2026.
6. GRADUATE STUDENT, “*Indo-US Collaborative Research on Pervasive Computing for Disaster Response*,” **NSF, DIT, and IIST**, (Total Funding: ₹32,00,000), Indian Institute of Space Science and Technology (IIST), University of California Irvine, and California Institute of Technology (Caltech), Jun 2013–Jun 2016.
7. GRADUATE STUDENT, “*MICRONet—Mobile Infrastructure for Coastal Region Offshore Communication & Networks*,” **IIST, ISRO-HQ, and ITRA/DIT**, Indian Institute of Space Science and Technology, Antrix Corporation (ISRO), Amrita University, and Indian Institute of Information Technology and Management-Kerala, Feb 2014–Jun 2016.
8. GRADUATE STUDENT, “*IIST MeshNet: A Programmable Hybrid Wireless Mesh Network Testbed*,” **IIST**, (Total Funding: ₹7,50,000), Indian Institute of Space Science and Technology (PI), Mar 2013–Mar 2016.

## Publications

### Journals

1. T. U. Islam, J. O. Boateng, M. Nadim, G. Zu, M. Shahid, X. Li, T. Zhang, S. Reddy, W. Xu, A. Atalar, V. Lee, Y. Chen, E. Gossling, E. Permatasari, C. Somiah, O. Perrin, Z. Meng, R. Afzal, **Sarath Babu**, M. Soliman, A. Hussain, D. Qiao, M. Zheng, O. Boyraz, Y. Guan, A. Arora, M. Y. Selim, A. Ahmad, M. B. Cohen, M. Luby, R. Chandra, J. Gross, K. Keahey, and H. Zhang, “*Design and Implementation of ARA Wireless Living Lab for Rural Broadband and Applications*,” **Elsevier Computer Networks**, vol. 263, pp. 111188, May 2025. DOI: [10.1016/j.comnet.2025.111188](https://doi.org/10.1016/j.comnet.2025.111188)
2. D. Dalai, **Sarath Babu**, B. S. Vineeth, and B. S. Manoj, “*A novel space based hosting approach for ultra low latency web services*,” **IEEE Access**, vol. 12, pp. 142838–142862, Sep. 2024. DOI: [10.1109/ACCESS.2024.3462252](https://doi.org/10.1109/ACCESS.2024.3462252)
3. **Sarath Babu**, A. Rajeev, and B. S. Manoj, “*A medium-term disruption tolerant SDN for wireless TCP/IP networks*,” **IEEE Transactions on Network and Service Management (IEEE TNSM)**, pp. 2318–2334, Dec. 2020. DOI: [10.1109/TNSM.2020.3023889](https://doi.org/10.1109/TNSM.2020.3023889)
4. A. Chakraborty, **Sarath Babu**, and B. S. Manoj, “*On achieving capacity-enhanced small-world networks*,” **Physica A: Statistical Mechanics and its Applications**, vol. 556, p. 124729, Oct. 2020. DOI: [10.1016/j.physa.2020.124729](https://doi.org/10.1016/j.physa.2020.124729)
5. **Sarath Babu** and B. S. Manoj, “*Toward a type-based analysis of road networks*,” **ACM Transactions on Spatial Algorithms and Systems (ACM TSAS)**, vol. 6, no. 4, pp. 28:1–28:45, Aug. 2020. DOI: [10.1145/3397579](https://doi.org/10.1145/3397579)
6. P. Koshy, **Sarath Babu**, and B. S. Manoj, “*Sliding window blockchain architecture for Internet of Things*,” **IEEE Internet of Things Journal**, vol. 7, no. 4, pp. 3338–3348, Apr. 2020. DOI: [10.1109/JIOT.2020.2967119](https://doi.org/10.1109/JIOT.2020.2967119)
7. **Sarath Babu**, P. V. Mithun, and B. S. Manoj, “*A novel framework for resource discovery and self-configuration in software defined wireless mesh networks*,” **IEEE Transactions on Network and Service Management (IEEE TNSM)**, vol. 17, no. 1, pp. 132–146, Mar. 2020. DOI: [10.1109/TNSM.2019.2922107](https://doi.org/10.1109/TNSM.2019.2922107)
8. N. Anand, **Sarath Babu**, and B. S. Manoj, “*On detecting compromised controller in software defined networks*,” **Elsevier Computer Networks**, vol. 137, pp. 107–118, Jun. 2018. DOI: [10.1016/j.comnet.2018.03.021](https://doi.org/10.1016/j.comnet.2018.03.021)
9. D. S. Yadav, **Sarath Babu**, and B. S. Manoj, “*Quasi path restoration: A post-failure recovery scheme over pre-allocated backup resource for elastic optical networks*,” **Elsevier Optical Fiber Technology**, vol. 41, pp. 139–154, Mar. 2018. DOI: [10.1016/j.yofte.2018.01.011](https://doi.org/10.1016/j.yofte.2018.01.011)

### Conferences

1. M. Nadim, X. Li, S. Reddy, **Sarath Babu**, A. Ahmad, O. Boyraz, D. Qiao, A. Arora, and H. Zhang, “*AraOptical system and testbed for long-range, high-capacity FSOC in rural wireless x-haul networks*,” accepted for publication in 21st **ACM International Conference on emerging Networking EXperiments and Technologies (ACM CoNEXT 2025)**, HKUST, Hong Kong, 1–4 December, 2025.
2. G. Zu, J. O. Boateng, V. S. Advani, T. U. Islam, V. Lee, **Sarath Babu**, M. Nadim, D. Qiao, M. Y. Selim, and H. Zhang, “*Real-world integration and evaluation of open-source 5G core with commercial RAN*,” accepted for publication in **IEEE Military Communications Conference (IEEE MILCOM 2025)**, Los Angeles, CA, USA, 6–10 Oct. 2025.
3. J. O. Boateng, T. Zhang, G. Zu, T. U. Islam, **Sarath Babu**, F. Kaltenberger, R. Schmidt, H. Zhang, D. Qiao, “*AraRACH: Enhancing NextG random access reliability in programmable wireless living labs*,” in the Proceedings of the 11th **IEEE International Conference on Network Softwarization (IEEE NetSoft)**, Jun. 2025, pp. 362–370, DOI: [10.1109/NetSoft64993.2025.11080601](https://doi.org/10.1109/NetSoft64993.2025.11080601) [**Best Paper Award**]

4. M. Shahid, K. Das, H. Ushaq, H. Zhang, J. Song, D. Qiao, **Sarath Babu**, Y. Guan, Z. Zhu, A. Ahmad, “*ReVeal: A physics-informed neural network for high-fidelity radio environment mapping*,” in Proceedings of the 2025 **IEEE International Symposium on Dynamic Spectrum Access Networks (IEEE DySPAN '25)**, May 2025, pp. 1–10. DOI: [10.1109/DySPAN64764.2025.11115911](https://doi.org/10.1109/DySPAN64764.2025.11115911)
5. M. Nadim, T. Islam, S. Reddy, T. Zhang, Z. Meng, R. Afzal, **Sarath Babu**, A. Ahmed, D. Qiao, A. Arora, H. Zhang, “*AraSync: Precision time synchronization in rural wireless living lab*,” in Proceedings of the 30th Annual **International Conference on Mobile Computing and Networking (ACM MobiCom '24)**, Nov. 2024, pp. 1758–1763. DOI: [10.1145/3636534.3697318](https://doi.org/10.1145/3636534.3697318)
6. J. O. Boateng, T. Zhang, G. Zu, T. U. Islam, **Sarath Babu**, H. Zhang, and D. Qiao, “*AraSDR: End-to-end, fully-programmable living lab for 5G and beyond*,” in the Proceedings of the **IEEE International Conference on Communications (IEEE ICC)**, Jun. 2024, pp. 1758–1763. DOI: [10.1109/ICC51166.2024.10623061](https://doi.org/10.1109/ICC51166.2024.10623061)
7. E. K. A. Permatasari, E. Gosling, M. Nadim, **Sarath Babu**, D. Qiao, H. Zhang, M. Luby, J. W. Byers, L. Minder, and P. Aggrawal, “*Real-time liquid wireless transport for video streaming in rural and agricultural applications*,” in Proceedings of the 3rd **ACM Mile High Video (ACM MHV)**, Feb. 2024, pp. 54–60. DOI: [10.1145/3638036.3640806](https://doi.org/10.1145/3638036.3640806)
8. G. Zu, M. Nadim, S. Reddy, T. U. Islam, **Sarath Babu**, T. Zhang, D. Qiao, H. Zhang, and A. Arora, “*AraHaul: Multi-modal wireless x-haul living lab for long-distance, high-capacity communications*,” in Proceedings of the 2023 **IEEE Future Networks World Forum (IEEE FNWF)**, Nov. 2023, pp. 1–6. DOI: [10.1109/FNWF58287.2023.10520543](https://doi.org/10.1109/FNWF58287.2023.10520543)
9. T. Zhang, G. Zu, T. U. Islam, E. Gossling, **Sarath Babu**, D. Qiao, and H. Zhang, “*Exploring wireless channels in rural areas: A comprehensive measurement study*,” in the Proceedings of the 2023 **IEEE Future Networks World Forum (IEEE FNWF)**, Baltimore, MD, USA, Nov. 2023, pp. 1–6. DOI: [10.1109/FNWF58287.2023.10520408](https://doi.org/10.1109/FNWF58287.2023.10520408) [**Honorable Mention**]
10. T. U. Islam, T. Zhang, J. O. Boateng, E. Gossling, G. Zu, **Sarath Babu**, H. Zhang, and D. Qiao, “*AraMIMO: Programmable TVWS mMIMO living lab for rural wireless*,” in Proceedings of the 17th **ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization (ACM WiNTECH '23)**, Oct. 2023, pp. 9–16. DOI: [10.1145/3615453.3616512](https://doi.org/10.1145/3615453.3616512) [**Best Paper Award**]
11. M. Shahid, **Sarath Babu**, H. Zhang, D. Qiao, Y. Guan, J. O. Boateng, T. U. Islam, G. Zu, A. Kamal, and M. Zheng, “*Wireless guard for trustworthy spectrum management*,” in Proceedings of the 16th **ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization (ACM WiNTECH '22)**, Oct. 2022, pp. 32–39. DOI: [10.1145/3556564.3558241](https://doi.org/10.1145/3556564.3558241)
12. K. Keahey, J. Anderson, M. Sherman, C. Hammock, Z. Zhen, J. Tillotson, T. Bargo, L. Long, T. U. Islam, **Sarath Babu**, H. Zhang, and F. Halbach, “*CHI-in-a-Box: Reducing operational costs of research testbeds*,” in Proceedings of the **ACM Practice and Experience in Advanced Research Computing (ACM PEARC)** Conference Series, Jul. 2022, pp. 1–8. DOI: [10.1145/3491418.3530768](https://doi.org/10.1145/3491418.3530768)
13. T. Abhiroop, **Sarath Babu**, and B. S. Manoj, “*A machine learning consensus based light-weight blockchain architecture for Internet of Things*,” in Proceedings of the 14th **International Conference on Communication Systems & Networks (COMSNETS)**, Jan. 2022, pp. 1–6. DOI: [10.1109/COMSNETS53615.2022.9668487](https://doi.org/10.1109/COMSNETS53615.2022.9668487)
14. A. Salas, **Sarath Babu**, and B. S. Manoj, “*A light-weight delay tolerant networking framework for resource-constrained environments*,” in Proceedings of the 27th **National Conference on Communications (NCC)**, Jul. 2021, pp. 1–6. DOI: [10.1109/NCC52529.2021.9530075](https://doi.org/10.1109/NCC52529.2021.9530075)
15. **Sarath Babu**, I. Ghosh, and B. S. Manoj, “*Effort: A new metric for roadside unit placement in 5G enabled vehicular networks*,” in Proceedings of the 3rd **IEEE 5G World Forum (IEEE 5GWF)**, Sep. 2020, pp. 263–268. DOI: [10.1109/5GWF49715.2020.9221228](https://doi.org/10.1109/5GWF49715.2020.9221228)
16. D. Dalai, **Sarath Babu**, and B. S. Manoj, “*On using edge servers in 5G satellite networks*,” in Proceedings of the 3rd **IEEE 5G World Forum (IEEE 5GWF)**, Sep. 2020, pp. 553–558. DOI: [10.1109/5GWF49715.2020.9221366](https://doi.org/10.1109/5GWF49715.2020.9221366)
17. R. Suraj, **Sarath Babu**, D. Dalai, and B. S. Manoj, “*DebriNet: An opportunistic software defined networking framework over PSLV debris*,” in Proceedings of the **IEEE International Conference on Advanced Networks and Telecommunications Systems (IEEE ANTS)**, Dec. 2019, pp. 1–6. DOI: [10.1109/ANTS47819.2019.9118082](https://doi.org/10.1109/ANTS47819.2019.9118082)
18. **Sarath Babu**, P. Rathod, and B. S. Manoj, “*On optimizing information gathering in shanty town emergency response*,” in Proceedings of the **IEEE Region 10 Conference (IEEE TENCON)**, Oct. 2019, pp. 129–134. DOI: [10.1109/TENCON.2019.8929340](https://doi.org/10.1109/TENCON.2019.8929340)
19. T. Abhiroop, **Sarath Babu**, and B. S. Manoj, “*A machine learning approach for detecting DoS attacks in SDN switches*,” in Proceedings of the 24th **National Conference on Communications (NCC)**, Feb. 2018, pp. 1–6. DOI: [10.1109/NCC.2018.8600196](https://doi.org/10.1109/NCC.2018.8600196)
20. P. V. Mithun, **Sarath Babu**, and B. S. Manoj, “*On resolving network view inconsistencies in SDN control plane*,” in Proceedings of the **IEEE International Conference on Advanced Networks and Telecommunications Systems (IEEE ANTS)**, Dec. 2017, pp. 1–6. DOI: [10.1109/ANTS.2017.8384108](https://doi.org/10.1109/ANTS.2017.8384108)
21. G. Gupta, **Sarath Babu**, and B. S. Manoj, “*Dual-mode TCP: An alternative approach for delay tolerant networks*,” in Proceedings of the 23rd **National Conference on Communications (NCC)**, Mar. 2017, pp. 1–6. DOI: [10.1109/NCC.2017.8077040](https://doi.org/10.1109/NCC.2017.8077040)



22. Sarath Babu and B. S. Manoj, “On the topology of Indian and Western road networks,” in Proceedings of the 8th **International Conference on Communication Systems and Networks (COMSNETS)**, Jan. 2016, pp. 1–6. DOI: [10.1109/COMSNETS.2016.7440027](https://doi.org/10.1109/COMSNETS.2016.7440027)
23. R. Raj, Sarath Babu, K. Benson, G. Jain, B. S. Manoj, and N. Venkatasubramanian, “Efficient path rescheduling of heterogeneous mobile data collectors for dynamic events in shanty town emergency response,” in Proceedings of the **IEEE Global Communications Conference (IEEE GLOBECOM)**, Dec. 2015, pp. 1–7. DOI: [10.1109/GLOCOM.2015.7417610](https://doi.org/10.1109/GLOCOM.2015.7417610)
24. A. V. Mamidi, Sarath Babu, and B. S. Manoj, “Dynamic multi-hop switch handoffs in software defined wireless mesh networks,” in Proceedings of the **IEEE International Conference on Advanced Networks and Telecommunications Systems (IEEE ANTS)**, Dec. 2015, pp. 1–6. DOI: [10.1109/ANTS.2015.7413638](https://doi.org/10.1109/ANTS.2015.7413638)
25. G. Jain, Sarath Babu, R. Raj, K. Benson, B. S. Manoj, and N. Venkatasubramanian, “On disaster information gathering in a complex shanty town terrain,” in Proceedings of the **IEEE Global Humanitarian Technology Conference - South Asia Satellite (IEEE GHTC-SAS)**, Sep. 2014, pp. 147–153. DOI: [10.1109/GHTC-SAS.2014.6967574](https://doi.org/10.1109/GHTC-SAS.2014.6967574)

## Demos | Posters

1. X. Li, A. Atalar, M. Nadim, Sarath Babu, O. B. Boyraz, C. J. Margison, R. Chen, M. M. Bayer, A. Ahmad, D. Qiao, H. Zhang, and O. Boyraz, “Demonstration of a 4.2km MISO free-space optical communication link using COTS SFP+ transceivers,” accepted in **SPIE Photonics West**, San Francisco, CA, 17–22 Jan. 2026.
2. G. Zu, J. O. Boateng, V. S. Advani, T. U. Islam, V. Lee, Sarath Babu, M. Nadim, D. Qiao, M. Y. Selim, and H. Zhang, “Demo: Real-world integration and evaluation of open-source 5G core with commercial RAN,” in **IEEE Military Communications Conference (IEEE MILCOM 2025)**, Los Angeles, CA, USA, Oct. 2025.
3. X. Li, A. Atalar, M. Nadim, Sarath Babu, C. J. Margison, M. M. Bayer, A. Ahmad, D. Qiao, H. Zhang, and O. Boyraz, “Long-range, high-capacity FSO system for rural wireless x-haul using COTS transceivers,” in 51th **European Conference on Optical Communication (ECOC)**, Copenhagen, Denmark, Sep–Oct. 2025.
4. M. Nadim, T. Islam, S. Reddy, T. Zhang, Z. Meng, R. Afzal, Sarath Babu, A. Ahmed, D. Qiao, A. Arora, and H. Zhang, “Demo: AraSync: Precision time synchronization in rural wireless living lab,” in 30th Annual **International Conference on Mobile Computing and Networking (ACM MobiCom '24)**, Washington, D.C., USA, Nov. 2024.
5. T. U. Islam, J. O. Boateng, M. Nadim, G. Zu, M. Shahid, X. Li, T. Zhang, S. Reddy, W. Xu, A. Atalar, V. Lee, Y. F. Chen, E. Gosling, E. Permatasari, Z. Meng, Sarath Babu, M. Soliman, A. Hussain, D. Qiao, M. Zheng, O. Boyraz, Y. Guan, A. Arora, M. Selim, A. Ahmad, M. B. Cohen, and H. Zhang, “Demo: ARA PAWR wireless living lab for smart and connected rural communities,” in 32nd **IEEE International Conference on Network Protocols (IEEE ICNP 2024)**, Charleroi, Belgium, Oct. 2024, pp. 1–3. DOI: [10.1109/ICNP61940.2024.10858584](https://doi.org/10.1109/ICNP61940.2024.10858584)
6. J. O. Boateng, T. Zhang, Sarath Babu, and H. Zhang, “ARA-enabled end-to-end 5G and Open RAN prototyping using srsRAN and FlexRIC”, in **srsRAN Project Fall Workshop**, Arlington, VA, USA, Oct. 2024.
7. T. U. Islam, M. Nadim, G. Zu, V. Lee, O. J. Perrin, J. O. Boateng, M. Shahid, T. Zhang, E. K. A. Permatasari, Z. Meng, Sarath Babu, D. Qiao, and H. Zhang, “ARA PAWR: Enabling wireless experiments with programmable COTS RAN and x-Haul platforms,” in **Midscale Experimental Research Infrastructure Forum (MERIF '24)**, Kansas City, MO, USA, Sep. 2024. [**Best Demo Award**]
8. Sarath Babu, T. U. Islam, J. O. Boateng, M. Nadim, T. Zhang, and H. Zhang, “ARA PAWR: Wireless living lab for smart and connected rural communities,” in **IEEE International Conference on Communications (IEEE ICC)**, Denver, CO, USA, Jun. 2024.
9. T. U. Islam, J. O. Boateng, G. Zu, M. Shahid, M. Nadim, W. Xu, T. Zhang, S. Reddy, X. Li, A. Atalar, Y. Chen, Sarath Babu, H. Zhang, D. Qiao, M. Zheng, Y. Guan, O. Boyraz, A. Arora, M. Selim, and M. B. Cohen, “ARA PAWR: Wireless living lab for smart and connected rural communities,” in Proceedings of the 29th Annual **International Conference on Mobile Computing and Networking (ACM MobiCom '23)**. ACM, Article 98, Madrid, Spain, Oct. 2023, pp. 1–3. DOI: [10.1145/3570361.3614068](https://doi.org/10.1145/3570361.3614068)
10. J. O. Boateng, T. Zhang, Sarath Babu, T. U. Islam, M. Shahid, and H. Zhang, “ARA rural wireless living lab and end-to-end OTA containerized OAI 5G-NR support,” in Fall 2022 **OpenAirInterface North American Workshop**, San Diego, CA, USA, Nov. 2022.

## Book Chapters

1. A. D. Dhruva, Sarath Babu, A. Chakraborty, and B. S. Manoj, “Computing platforms for the Internet of Things,” In: Abraham, Martin A. (eds.) **Encyclopedia of Sustainable Technologies**, 2nd Edition, 2024, vol. 3, pp. 780–799. Oxford: Elsevier. DOI: [10.1016/B978-0-323-90386-8.00068-1](https://doi.org/10.1016/B978-0-323-90386-8.00068-1)

## arXiv Preprints

1. T. U. Islam et al., “*Design and implementation of ARA wireless living lab for rural broadband and applications*,” **arXiv** preprint arXiv:2408.00913v1, Aug. 2024. DOI: [10.48550/arXiv.2408.00913](https://doi.org/10.48550/arXiv.2408.00913)
2. M. Shahid et al., “*Wireless spectrum in rural farmlands: Status, challenges and opportunities*,” **arXiv** preprint arXiv:2407.04561v1, Jul. 2024. DOI: [10.48550/arXiv.2407.04561](https://doi.org/10.48550/arXiv.2407.04561)
3. D. Dalai, **Sarath Babu**, and B. S. Manoj, “*Satellite-6G network integration roadmap on reference architectures*,” **TechRxiv**. Preprint. (2022). DOI: [10.36227/techrxiv.20624685.v1](https://doi.org/10.36227/techrxiv.20624685.v1)
4. **Sarath Babu**, G. Jain, and B. S. Manoj, “*Urban Delay Tolerant Network Simulator (UDTNSim v0.1)*,” **CoRR**, vol. abs/1709.05645, Sep. 2017. DOI: [10.48550/arXiv.1709.05645](https://doi.org/10.48550/arXiv.1709.05645)

## Technical Reports

1. S. Kota, G. Giambene, et al., “*Satellite, IEEE INGR International Network Generations Roadmap, 2023 Edition*,” 2023 **IEEE Future Networks World Forum (IEEE FNWF)**, Baltimore, MD, USA, 2023, pp. 1–195. DOI: [10.1109/FNWF58287.2023.10520529](https://doi.org/10.1109/FNWF58287.2023.10520529)
2. S. Kota, G. Giambene, et al., “*Satellite, IEEE INGR International Network Generations Roadmap, 2022 Edition*,” 2022 **IEEE Future Networks World Forum (IEEE FNWF)**, Montreal, QC, Canada, 2022, pp. 1–182. DOI: [10.1109/FNWF55208.2022.00141](https://doi.org/10.1109/FNWF55208.2022.00141)

## Patents

1. P. Koshy, A. S. Ananthakrishnan, **Sarath Babu**, and B. S. Manoj, “*IoT enabled biomedical wearable clothing system for healthcare assistance*,” **IN 449773**, 2023.

## Software Developed

1. **OpenFlow Software Switch with Controlled Buffering**  
OBJECTIVE: Enable an SDN switch capable of controlled buffering of packets in order handle link disruptions in software defined wireless environments.
2. **Software Defined Optimized Link State Routing (SD-OLSR) Protocol**  
OBJECTIVE: Provide an automated SDN resource discovery and self-configuration scheme for software defined wireless environments involving mobile switches and controllers.
3. **Urban Delay Tolerant Network Simulator (UDTNSim)**  
URL: <https://github.com/4sarathbabu/UDTNSim>  
OBJECTIVE: Design and develop mobility models and routing protocols for ad hoc vehicular networks in real-world road network environments and analyze the performance.

## Professional Affiliations

### Institute of Electrical and Electronics Engineers (IEEE)

- **Working Groups**
  - IEEE Future Networks, **International Network Generations Roadmap (INGR), Satellite** APR 2020–CURRENT
- **Member** DEC 2021–CURRENT
  - Societies
    - IEEE Communications Society (ComSoc) DEC 2021–CURRENT
    - IEEE Computer Society DEC 2021–CURRENT
  - Communities
    - IEEE Smart Cities JAN 2022–CURRENT
    - IEEE Future Networks JAN 2021–CURRENT
    - IEEE Internet of Things JAN 2021–CURRENT
    - IEEE Sensors Council JAN 2015–CURRENT
    - IEEE Systems Council JAN 2015–CURRENT
- **Graduate Student Member** JAN 2014–NOV 2021
  - Societies
    - IEEE Communications Society (ComSoc) MAR 2014–DEC 2014, JAN 2016–NOV 2021
    - IEEE Computer Society MAR 2016–NOV 2021
- **IEEE Student Branch, Indian Institute of Space Science and Technology**
  - Executive Committee Member FEB 2018–FEB 2020
  - Secretary DEC 2014–JAN 2018

## Association of Computing Machinery (ACM)

- Professional Member
- Graduate Student Member

DEC 2020–CURRENT  
JAN 2014–NOV 2020

## Professional Services

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### Journal Reviews

- IEEE Transactions on Network and Service Management (IEEE TNSM)
- IEEE Transactions on Wireless Communications (IEEE TWC)
- IEEE Transactions on Communications (IEEE TCOM)
- IEEE Transactions on Mobile Computing (IEEE TMC)
- IEEE Transactions on Network Science and Engineering (IEEE TNSE)
- IEEE Transactions on Aerospace and Electronic Systems (IEEE TAES)
- IEEE Transactions on Intelligent Transportation Systems (IEEE T-ITS)
- IEEE Journal of Selected Areas in Communications (IEEE JSAC)—Series on Network Softwarization & Enablers
- IEEE Internet of Things Journal
- IEEE Sensors Journal
- IEEE Communications Letters (IEEE COMML)
- IEEE Networking Letters (IEEE LNET)
- IEEE Systems Journal
- IEEE Open Journal of Vehicular Technology (IEEE OJVT)
- IEEE Open Journal of the Communications Society (IEEE OJCOMS)
- IEEE Wireless Communications Magazine
- IEEE Communications Magazine
- IEEE Computer Magazine
- IEEE Communications Standards Magazine
- IEEE Network Magazine
- IEEE Access
- ACM Transactions on Asian and Low-Resource Language Information Processing
- Elsevier Computer Networks
- Springer Nature Computer Science

### Technical Program Committees (TPCs)

- COMSNETS 2023, 2024, 2025, 2026
- IEEE NFV-SDN 2025
- ACM WiNTECH 2022, 2023, 2024, 2025
- IFIP Networking 2024, 2025
- IEEE Future Networks World Forum (IEEE FNWF) 2023, 2024, 2025
- IEEE RAICS 2015

### Conference Reviews (In addition to TPCs)

- IEEE INFOCOM 2023, 2024, 2025, 2026
- IEEE GLOBECOM 2023
- IEEE ICC 2023
- IEEE INDICON 2022
- IEEE WF-IoT 2021, 2022

### Volunteering

- State Science and Technology Fair of Iowa (SSTFI) 2025 [Served in the Judging Panel], Ames, Iowa, USA MAR 2025
- IEEE Shannon Centennial Workshop on Communications and Information Theory (SCWIT) DEC 2016
- IEEE Recent Advances in Intelligent Computational Systems (RAICS) DEC 2015
- 7th International Conference on COMMunication Systems & NETWORKS (COMSNETS) JAN 2015

## Teaching

### Indian Institute of Space Science and Technology (IIST)

*Thiruvananthapuram, India*

- AV484—Wireless Mesh Networks AUG–NOV 2014, 2015, 2016, 2018, 2019
- AV321—Computer Networks JAN–MAY 2018
- AV341—Computer Networks Lab JAN–MAY 2015, 2016, 2017, 2018
- AV482—Data Structures and DBMS AUG–NOV 2017
- AV231—Analog Electronic Circuits Lab AUG–NOV 2014, 2015, 2016
- AV141—Basic Electrical and Electronics Engineering Lab MAR–MAY 2015

### National Institute of Technology, Calicut (NITC)

*Calicut, India*

- CS3092—Operating Systems Lab JAN–MAY 2011
- CS6103—Software Systems Lab AUG–DEC 2010

## Talks | Workshops | Tutorials

- TALK: “*Real-World Experimental Testbed for 5G and Beyond Communication Systems*” OCT 2024  
VENUE: IEEE Student Branch, IIST *Thiruvananthapuram, India*
- TUTORIAL: “*Introduction to ARA Wireless Living Lab for Smart and Connected Rural Communities*” SEP 2024  
VENUE: Midscale Experimental Research Infrastructure Forum (MERIF '24) *Kansas City, MO, USA*
- TUTORIAL: “*ARA Wireless Living Lab for Smart and Connected Rural Communities*” MAY 2023  
VENUE: Midscale Experimental Research Infrastructure Forum (MERIF '23) *Boston, MA, USA*
- TALK: “*WiCI & ARA: Advancing Frontiers of Wireless Innovation in Rural Broadband*” MAR 2022  
VENUE: Friday Activities at Noon (FAN), Iowa State University *Ames, IA, USA*
- TALK: “*Type-based Analysis of Road Networks*,” SEP 2020  
VENUE: Avionics Ph.D. Talk Series, Department of Avionics and IEEE Student Branch, IIST
- WORKSHOP: “*Programming in Python*” OCT 2018, AUG 2019  
VENUE: IEEE Student Branch, IIST *Thiruvananthapuram, India*
- WORKSHOP: “*L<sup>A</sup>T<sub>E</sub>X: An Introduction*” MAR 2018, MAR 2019  
VENUE: Conscientia, IIST *Thiruvananthapuram, India*
- WORKSHOP: “*Introduction to Software Defined Networking*” OCT 2016  
VENUE: AV484 Wireless Mesh Networks, IIST *Thiruvananthapuram, India*

## Technical Skills

- PROGRAMMING LANGUAGES: C, C++, Python, Bash Shell Scripting
- DOCUMENTATION & EDITORS: L<sup>A</sup>T<sub>E</sub>X, GNU Emacs
- PLOTTING & VISUALIZATION: Gnuplot, TikZ, Inkscape, draw.io
- OPERATING SYSTEMS: Linux, TinyOS
- CLOUD: OpenStack
- HYPERVISORS/CONTAINERIZATION: VirtualBox, Docker
- DATABASE MANAGEMENT SYSTEM: MariaDB, MySQL, SQLite
- SOFTWARE DEFINED NETWORKING: OpenFlow, Open vSwitch, Ryu, POX
- SIMULATORS: UDTNSim, SUMO, Mininet, STK
- LANGUAGES: Malayalam (Native), English