JOYDEEP PAL

PhD fellow @ Indian Institute of Science, India

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Academic Achievements and Scholarships

- Granted **CNI** fellowship: August 2021 and August 2022
- GATE (EC) 2017: AIR 754
- AIEEE - 2012. AIR 3330
- Awarded the SHE scholarship from CBSE for being in top 0.1% of students in CBSE Class XII Board Exams.

Technical Strengths

- **Programming:** P4, C/C++. Python, ROS2, Octave/MATLAB, Bash scripting
- **Software Tools:** Arduino IDE, SimuLink
- **Miscellaneous:** Linux, SSH, git, LaTeX, Markdown, VM, Docker

Industrial Experience - Internships

- **Reliance Jio Infocomm:** Industrial training on *telephone exchange*, *main distribution frames* and *switching*.
- **Elin Electronics:** Workshop on wireless technologies, IoT and 5G
- **Avanta:** Built and developed firmware using custom-made electronics for Home Automation systems for business centres
- **STMicroelectronics:** Scripting and firmware development for PacketCable routers

ABOUT ME

I am a PhD fellow in the Electronics Systems Engineering department at the Indian Institute of Science (IISc), Bangalore. My study focuses on building novel networking paradigms on programmable hardware, with works in the field of Tactile Internet, Time-Sensitive Networks and P4. My research is focused on addressing bounded latency and packet loss in Layer-2 based networks and developing new techniques to develop proof-of-concepts of IEEE standards-based mechanisms to acheive deterministic communication. I have a strong background in programming, hardware-software co-design, and packet scheduling in networking. I have also worked on energy-aware autonomous multi-drone and ML projects.

PUBLICATIONS

[1] J. Pal, D. Choudhary, Nithish Krishnabharathi Gnani, T. V. Prabhakar, and C. Singh, “Towards a TSN-DetNet Intercity Testbed for Tactile Cyber-Physical Systems,” in INFOCOM CNERT 2024: The 11th International Workshop on Computer and Networking Experimental Research using Testbeds, Vancouver, Canada: IEEE, Feb. 2024.

[2] R. R. Saxena et al., “Holistic Energy Awareness and Robustness for Intelligent Drones,” ACM Trans. Sen. Netw., p. 3641855, Jan. 2024, doi: 10.1145/3641855.

[3] S. K. Rana, H. Verma, J. Pal, D. Choudhary, T. V. Prabhakar, and C. Singh, “Enhancing Reliability of Scheduled Traffic in Time-Sensitive Networks using Frame Replication and Elimination,” in 2023 IEEE 29th International Symposium on Local and Metropolitan Area Networks (LANMAN), London, United Kingdom: IEEE, Jul. 2023, pp. 1–6. doi: 10.1109/LANMAN58293.2023.10189416.

[4] J. Pal, D. Choudhary, N. K. Gnani, C. Singh, and T. V. Prabhakar, “$µ$TAS: Design and implementation of Time Aware Shaper on SmartNICs to achieve bounded latency,” arXiv, 2023. doi: 10.48550/ARXIV.2310.07480.

[5] N. K. Gnani et al., “EdgeP4: A P4-Programmable Edge Intelligent Ethernet Switch for Tactile Cyber-Physical Systems,” arXiv, 2023. doi: 10.48550/ARXIV.2309.10383.

[6] K. Polachan, J. Pal, C. Singh, and T. V. Prabhakar, “Assessing Quality of Control in Tactile Cyber–Physical Systems,” IEEE Trans. Netw. Serv. Manage., vol. 19, no. 4, pp. 5348–5365, Dec. 2022, doi: 10.1109/TNSM.2022.3164100.

[7] K. Polachan, J. Pal, C. Singh, T. V. Prabhakar, and F. A. Kuipers, “TCPSbed: A Modular Testbed for Tactile Internet-Based Cyber-Physical Systems,” IEEE/ACM Trans. Networking, vol. 30, no. 2, pp. 796–811, Apr. 2022, doi: 10.1109/TNET.2021.3124767.

[8] Pal, Joydeep, “Towards an implementation of a Time-Sensitive Networking switch, Joydeep Pal, IISc Bangalore, Accepted in Graduate Forum,” in [PerfNA] Performance of host-based Network Applications, a workshop in ACM SIGMETRICS / IFIP PERFORMANCE 2022, 2022. [Online]. Available: https://perfna2022.cse.iith.ac.in/papers/forum-paper1.pdf

[9] S. Iyengar et al., “Holistic energy awareness for intelligent drones,” in Proceedings of the 8th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation, Coimbra Portugal: ACM, Nov. 2021, pp. 41–50. doi: 10.1145/3486611.3486651.
[10] K. Polachan, J. Pal, C. Singh, and P. T V, “Quality of Control Assessment for Tactile Internet based Cyber-Physical Systems.” arXiv, Mar. 30, 2020. Accessed: Oct. 20, 2023. [Online]. Available: http://arxiv.org/abs/1910.08743

PROJECTS

- Time-Sensitive Networks - Achieve and demonstrate deterministic networking by building algorithms and mechanisms on programmable networking hardware such as SmartNICs using P4 and C.
- Tactile Internet - Design and develop a real-time teleoperation testbed consisting of haptic devices, robotic arm and TSN switches to demonstrate Tactile Internet applications such as Telesurgery.
- **Other projects:** joygetsit.github.io/portfolio/

EDUCATION

PhD, M.Tech(Res)	Indian Institute of Science	Bengaluru, India	Aug 2018 - Present	CGPA: 7.2/10
B.Tech	Delhi Technological University	Delhi, India	Aug 2012 - Jul 2016	69.2%
10+2	Apeejay School, Sheikh Sarai	Delhi, India	2010 - 2012	95%
Matriculation	Apeejay School, Sheikh Sarai	Delhi, India	2008 - 2010	CGPA: 9.4/10