Everton de Matos, Ph.D.

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Summary

- **Lead Security Research Engineer** at the *Technology Innovation Institute*, Abu Dhabi, within the Cryptography Research Center. Research in *computer systems and security*, with a focus on operating systems, embedded virtualization, confidential computing, and AI-based intrusion detection for edge devices. Experience with the *seL4 microkernel* on *ARM* and *RISC-V*, and contributions to the open-source *Ghaf* virtualization platform on *x86*.
- **Assistant Professor at Atitus University, Brazil**. Taught undergraduate Computer Science courses in Operating Systems, Computer Security, Internet of Things, Computer Architecture, and Robotics. Supervised individual and group projects and supported students in developing their research and technical skills. Currently mentors PhD researchers and supervises university research projects at TII.
- **Ph.D. in Computer Science** from the Pontifical Catholic University of Rio Grande do Sul (PUCRS), with a *Fulbright* scholarship for doctoral research at the University of Southern California (USC). Publications include work on systems security, embedded virtualization, and AI-based intrusion detection in *ACM Computing Surveys*, *IEEE Communications Magazine*, and *IEEE Internet of Things Journal*.

Experience

- **Technology Innovation Institute** — Abu Dhabi, United Arab Emirates
  Lead Security Research Engineer — *Apr 2023 - Current*
  Senior Security Research Engineer — *Aug 2020 - Mar 2023*
  - **Research and Development**:
    - Research in embedded systems security, system isolation, and confidential computing on ARM and RISC-V platforms.
    - Implementation and deployment of virtualization solutions using seL4 microkernel and hypervisor on ARM platform.
    - Platform bring-up, operating system support, device virtualization, and kernel module development.
    - Contributor to the Ghaf Virtualization Platform on x86 in the following areas: multi-VM logging, security policies, inter-VM transport layer, and VM and workload attestation.
    - Deployment of an AI-powered Intrusion Detection System (IDS) on an Edge Device within the Ghaf virtualization framework, optimizing real-time anomaly detection in constrained environments.
    - Develop and evaluate research prototypes on embedded and edge platforms.
    - Mentor PhD researchers on research design, implementation, and evaluation.
    - Supervise company-sponsored research projects with international universities (e.g., UNSW, Purdue, Imperial College, PUCRS, and UMINHO).
    - Write scientific papers and technical reports, and organize and present research outcomes to higher management and a broader external audience.
- **Atitus University** — Passo Fundo, Brazil
  Assistant Professor — *Feb 2018 - Aug 2020*
  - **Teaching and Research**:
    - Taught undergraduate Computer Science courses, prepared lectures and assessments, and mentored students on academic and technical projects.
    - Courses taught included: Operating Systems, Computer Security, Internet of Things, Computer Architecture, and Robotics.
    - Supervised independent and group research projects, supported student presentations, and collaborated with faculty on research initiatives.
- **University of Southern California** — Los Angeles, CA
  Visiting Researcher — *Aug 2018 - May 2019*
  - **Research**:
    - Awarded a Doctoral Dissertation Research Award (DDRA) grant from the Fulbright Brazil Commission.
    - Conducted research on Internet of Things (IoT), blockchain-based IoT marketplaces, and context-driven decision-making.
    - Authored scientific papers and technical reports based on the research outcomes.
- **Pontifical Catholic University of Rio Grande do Sul** — Porto Alegre, Brazil
  Researcher — *Mar 2014 - Mar 2020*
  - **Research**:
    - Conducted research in embedded systems, focusing on context-awareness and security aspects of the Internet of Things.
    - Investigated context sharing as a mechanism to support a common definition of context information among heterogeneous IoT entities.
    - Designed and developed a context-sharing framework for IoT environments.
    - Implemented and validated a system to address research challenges related to context-awareness in IoT.
    - Authored scientific papers and technical reports based on the research outcomes.

Education

- **Pontifical Catholic University of Rio Grande do Sul** — Porto Alegre, Brazil
  PhD in Computer Science — *Mar 2016 - Mar 2020*
  Doctorate's dissertation: "Edge-centric context sharing architecture for the internet of things: context interoperability and context-aware security"
- **Pontifical Catholic University of Rio Grande do Sul** — Porto Alegre, Brazil
  MSc in Computer Science — *Mar 2014 - Mar 2016*
  Master's thesis: "Context-aware information services provision for IoT environments".
- **University of Passo Fundo** — Passo Fundo, Brazil
  BSc in Computer Science — *Feb 2010 - Jan 2014*
  Final project: "Development of a low-cost prototype to measure body balance".

Awards and Honors

- **2020**: Approved with honor at the PhD in Computer Science - Pontifical Catholic University of Rio Grande do Sul
- **2018**: Doctoral Dissertation Research Award Scholarship - Fulbright
- **2016**: Approved with honor at the MSc in Computer Science - Pontifical Catholic University of Rio Grande do Sul
- **2015**: Finalist (among 10 best) in the contest of best Masters Thesis in Computer Science of Brazilian Computer Society

Academic Service

- **Conference Organization**: Organizer and Program Committee Member for international conferences, including:
  - International Symposium on Quality Electronic Design (ISQED) – 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026.
  - IEEE World Forum on Internet of Things (IEEE WF-IoT) - 2023, 2024.
- **Reviewing Activities**: Served as a reviewer for leading journals and conferences, including:
  - IEEE Network Magazine
  - IEEE Transactions on Consumer Electronics
  - IEEE Communications Magazine
  - ACM Transactions on Sensor Networks
  - IEEE Transactions on Cloud Computing
  - IEEE Transactions on Engineering Management
  - IEEE Transactions on Parallel and Distributed Systems
  - International Journal of Distributed Sensor Networks

Summary of Research Contributions

- **Research and Development of a Virtualization Framework**:
  - Conducted research in virtualization, contributing to several high-impact publications in leading conferences and journals.
  - Actively contributed to the research and development of the Ghaf framework (https://github.com/tiiuae/ghaf), an open-source virtualization platform for edge devices. My contributions target x86 systems. The Ghaf framework applies a modular, compartmentalized architecture and zero-trust principles to enhance security and isolation across diverse hardware platforms, enabling secure, scalable, and efficient resource control for advanced Edge Computing applications.
- **Research on seL4 Microkernel**:
  - Authored and published multiple research papers on the seL4 microkernel, contributing to the academic and practical understanding of its applications and security features.
  - Actively participated in the seL4 community by serving on the Technical Program Committee of the annual seL4 Summit, helping shape the event's technical content and foster research discussions.
  - Led research on implementing seL4 as a Trusted Execution Environment (TEE) on RISC-V architecture, and on device virtualization using seL4 as a hypervisor on ARM architecture.
- **Research and Publications on Context-Awareness and Context-Aware Security in IoT Environments**:
  - Conducted research and published numerous papers on context-awareness and context-aware security in IoT environments, beginning with my Master's and continuing through my Ph.D. studies.
  - Authored a survey on context information sharing, recognized as a key reference in the field.

All Publications

- **Journals**:
  - Sá, B., Ferraro, D., **de Matos, E.**, Psiakis, R., Marongiu, A., Bastoni, A. and Pinto S., 2026. Advanced Security through Hardware Capabilities: A Comprehensive Survey on CHERI Technology. ACM Computing Surveys. https://doi.org/10.1145/3833870.
  - Girardi, G. V., Ferreira, T. and **de Matos, E.**, 2026. Arduino-based pedagogical aid for enhanced dexterity skill development in periodontal treatment training. BMJ Innovations. https://doi.org/10.1136/bmjinnov-2024-001349
  - Simioni, J. A., Viegas, E., Santin, A.O. and **de Matos, E.**, 2025. An Energy-Efficient Intrusion Detection Offloading Based on DNN for Edge Computing. IEEE Internet of Things Journal. https://doi.org/10.1109/JIOT.2025.3544060
  - **de Matos, E.**, Lawton, G. and Lennon C., 2025. Towards seL4 for Enhanced System Isolation and Security on Embedded Devices. IEEE Open Journal of the Computer Society, vol. 6, pp. 1329-1340. https://doi.org/10.1109/OJCS.2025.3592377
  - **de Matos, E.** and Ahvenjärvi, M., 2022. seL4 Microkernel for virtualization use-cases: Potential directions towards a standard VMM. Electronics, 11(24), p.4201. https://doi.org/10.3390/electronics11244201
  - Tiburski, R.T., Moratelli, C.R., Johann, S.F., **de Matos, E.** and Hessel, F., 2021. A lightweight virtualization model to enable edge computing in deeply embedded systems. Software: Practice and Experience, 51(9), pp.1964-1981. https://doi.org/10.1002/spe.2968
  - **de Matos, E.**, Tiburski, R.T., Moratelli, C.R., Johann Filho, S., Amaral, L.A., Ramachandran, G., Krishnamachari, B. and Hessel, F., 2020. Context information sharing for the Internet of Things: A survey. Computer Networks, 166, p.106988. https://doi.org/10.1016/j.comnet.2019.106988
  - Tiburski, R.T., Moratelli, C.R., Johann, S.F., Neves, M.V., **de Matos, E.**, Amaral, L.A. and Hessel, F., 2019. Lightweight security architecture based on embedded virtualization and trust mechanisms for IoT edge devices. IEEE Communications Magazine, 57(2), pp.67-73. https://doi.org/10.1109/MCOM.2018.1701047
  - Tiburski, R.T., Amaral, L.A., **de Matos, E.**, De Azevedo, D.F. and Hessel, F., 2016. The role of lightweight approaches towards the standardization of a security architecture for IoT middleware systems. IEEE Communications Magazine, 54(12), pp.56-62. https://doi.org/10.1109/MCOM.2016.1600462CM
  - Tiburski, R.T., Amaral, L.A., **de Matos, E.** and Hessel, F., 2015. The importance of a standard security architecture for SOA-based iot middleware. IEEE Communications Magazine, 53(12), pp.20-26. https://doi.org/10.1109/MCOM.2015.7355580

- **Conferences**:
  - **de Matos, E.**, Alameri, H., Lunardi, W., Andreoni, M. and Viegas, E., 2026, April. Toward an Intrusion Detection System for a Virtualization Framework in Edge Computing. In 2026 IEEE Wireless Communications and Networking Conference (WCNC). IEEE. https://doi.org/10.1109/WCNC65185.2026.11555541
  - de Oliveira, P. R., Viegas, E., Santin, A.O., Horchulhack, P. and **de Matos, E.**, 2024, July. Toward a Reliable Network-Based Intrusion Detection Model for SCADA: A Classification with Reject Option Approach. In 2024 International Joint Conference on Neural Networks (IJCNN). IEEE. https://doi.org/10.1109/IJCNN60899.2024.10650735
  - **de Matos, E.**, Lunardi, W., Ukkonen, J. and Salminen, T., 2024, May. An seL4-based Trusted Execution Environment on RISC-V. In 2024 International Wireless Communications and Mobile Computing (IWCMC). IEEE. https://doi.org/10.1109/IWCMC61514.2024.10592332
  - **de Matos, E.**, Lennon, C., Viegas, E., Ahvenjärvi, M., Lyytinen, H., Kuznetsov, I., Onatsu, J. and Huy Bui, A., 2023, November. Integrating VirtIO and QEMU on seL4 for Enhanced Devices Virtualization Support. In 2023 IEEE 22nd International Conference on Trust, Security and Privacy in Computing and Communications (TrustCom). IEEE. https://doi.org/10.1109/TrustCom60117.2023.00149
  - de Oliveira, P. R., Santin, A.O., Horchulhack, P., Viegas, E. and **de Matos, E.**, 2023, November. A Dynamic Network-based Intrusion Detection Model for Industrial Control Systems. In 2023 IEEE 22nd International Conference on Trust, Security and Privacy in Computing and Communications (TrustCom). IEEE. https://doi.org/10.1109/TrustCom60117.2023.00204
  - **de Matos, E.**, Viegas, E. and Hessel, F., 2023, March. Context-Aware Security in the Internet of Things: A Review. In 2020 37th International Conference on Advanced Information Networking and Applications (AINA-2023) (pp. 518-531). Springer. https://doi.org/10.1007/978-3-031-28694-0_49
  - Viegas, E.K., **de Matos, E.**, de Oliveira, P.R. and Santin, A.O., 2023, March. A Dynamic Machine Learning Scheme for Reliable Network-Based Intrusion Detection. In 2020 37th International Conference on Advanced Information Networking and Applications (AINA-2023) (pp. 439-451). Springer. https://doi.org/10.1007/978-3-031-28451-9_39
  - **de Matos, E.**, Tiburski, R.T. and Hessel, F., 2022, December. ConShar: An Edge-based Context Sharing Model for the Internet of Things. In 2022 IEEE 8th World Forum on Internet of Things (WF-IoT) (pp. 1-6). IEEE. https://doi.org/10.1109/WF-IoT54382.2022.10152096
  - Moratelli, C.R., Tiburski, R.T., Johann, S.F., Moura, E., **de Matos, E.** and Hessel, F., 2022, December. MIPS and RISC-V: Evaluating Virtualization Trade-off for Edge Devices. In 2022 IEEE 8th World Forum on Internet of Things (WF-IoT) (pp. 1-6). IEEE. https://doi.org/10.1109/WF-IoT54382.2022.10152084

- Kyusuk, H., Al Blooshi, S., Alnuaimi, N., Al Nuaimi, E., **de Matos, E.** and Psiakis, R., 2022, December. Improving Drone Mission Continuity in Rescue Operations with Secure and Efficient Task Migration. In 2022 IEEE 8th World Forum on Internet of Things (WF-IoT) (pp. 1-6). IEEE. https://doi.org/10.1109/WF-IoT54382.2022.10152279
- Portal, G., **de Matos, E.** and Hessel, F., 2020, June. An edge decentralized security architecture for industrial iot applications. In 2020 IEEE 6th World Forum on Internet of Things (WF-IoT) (pp. 1-6). IEEE. https://doi.org/10.1109/WF-IoT48130.2020.9221176
- Tiburski, R.T., **de Matos, E.** and Hessel, F., 2019, April. Evaluating the DTLS Protocol from CoAP in Fog-to-Fog Communications. In 2019 IEEE International Conference on Service-Oriented System Engineering (SOSE) (pp. 90-905). IEEE. https://doi.org/10.1109/SOSE.2019.00022
- **de Matos, E.**, Tiburski, R.T., Amaral, L.A. and Hessel, F., 2018, August. Providing context-aware security for IoT environments through context sharing feature. In 2018 17th IEEE international conference on trust, security and privacy in computing and communications/12th IEEE international conference on big data science and engineering (TrustCom/BigDataSE) (pp. 1711-1715). IEEE. https://doi.org/10.1109/TrustCom/BigDataSE.2018.00257
- **de Matos, E.**, Tiburski, R.T., Amaral, L.A. and Hessel, F., 2018, June. Context interoperability for IoT through an edge-centric context sharing architecture. In 2018 IEEE Symposium on Computers and Communications (ISCC) (pp. 00667-00670). IEEE. https://doi.org/10.1109/ISCC.2018.8538491
- Tiburski, R.T., Amaral, L.A., **de Matos, E.**, de Azevedo, D.F. and Hessel, F., 2017, January. Evaluating the use of TLS and DTLS protocols in IoT middleware systems applied to E-health. In 2017 14th IEEE Annual Consumer Communications & Networking Conference (CCNC) (pp. 480-485). IEEE. https://doi.org/10.1109/CCNC.2017.7983155
- **de Matos, E.**, Amaral, L.A., Tiburski, R.T., Schenfeld, M.C., de Azevedo, D.F. and Hessel, F., 2017, January. A sensing-as-a-service context-aware system for internet of things environments. In 2017 14th IEEE annual consumer communications & networking conference (CCNC) (pp. 724-727). IEEE. https://doi.org/10.1109/CCNC.2017.7983223
- **de Matos, E.**, Amaral, L.A., Tiburski, R., Lunardi, W., Hessel, F. and Marczak, S., 2015, September. Context-aware system for information services provision in the internet of things. In 2015 IEEE 20th Conference on Emerging Technologies & Factory Automation (ETFA) (pp. 1-4). IEEE. https://doi.org/10.1109/ETFA.2015.7301624
- Lunardi, W.T., **de Matos, E.**, Tiburski, R., Amaral, L.A., Marczak, S. and Hessel, F., 2015, September. Context-based search engine for industrial IoT: Discovery, search, selection, and usage of devices. In 2015 IEEE 20th Conference on emerging technologies & factory automation (ETFA) (pp. 1-8). IEEE. https://doi.org/10.1109/ETFA.2015.7301477
- Amaral, L.A., Tiburski, R.T., **de Matos, E.** and Hessel, F., 2015, April. Cooperative middleware platform as a service for internet of things applications. In Proceedings of the 30th Annual ACM Symposium on Applied Computing (pp. 488-493). https://doi.org/10.1145/2695664.2695799

- **Book Chapters**:
  - Moratelli, C.R., Tiburski, R.T., **de Matos, E.**, Portal, G., Johann, S.F. and Hessel, F., 2020. Privacy and security of Internet of Things devices. In Real-Time Data Analytics for Large Scale Sensor Data (pp. 183-214). Academic Press. https://doi.org/10.1016/B978-0-12-818014-3.00009-7
  - **de Matos, E.**, Amaral, L.A. and Hessel, F., 2017. Context-aware systems: technologies and challenges in internet of everything environments. Beyond the internet of things: Everything interconnected, pp.1-25. https://doi.org/10.1007/978-3-319-50758-3_1
  - Amaral, L.A., **de Matos, E.**, Tiburski, R.T., Hessel, F., Lunardi, W.T. and Marczak, S., 2016. Middleware technology for IoT systems: Challenges and perspectives toward 5G. Internet of Things (IoT) in 5G mobile technologies, pp.333-367. https://doi.org/10.1007/978-3-319-30913-2_15