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A Survey on Structured Cloud Security Frameworks Leveraging the SEDAS Platform

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Abstract— **This survey presents a comprehensive review of recent innovations in communication, computing, sensing, and intelligent systems, emphasizing advancements that enhance efficiency, scalability, and resilience. In wireless networks, flying base station connectivity is optimized through radio access network (RAN) slicing with deep reinforcement learning, improving spectral efficiency.**
The SEDA platform offers a versatile bioinformatics tool for FASTA file processing, bridging usability gaps for non-programmers. High-speed, low-power computing is advanced with SFQ-CMOS hybrid memory controllers, while integrated multi-wavelength transmitters enable 5G fiber–wireless (FiWi) links compliant with 3GPP standards.
Computational geometry methods, including Voronoi diagrams, improve navigation and path planning efficiency, and IM-NOMA schemes enhance beyond-5G performance in terms of bit error rate and throughput.
Sensing technologies such as magnetoelastic sensors with nanofiber functionalization enable highly sensitive organophosphate detection. The survey also explores wireless–optical convergence toward 6G, neural network ASICs for radiation-tolerant data compression in high-energy physics, and DSP-based flexible-waveform 5G systems for low-latency applications. Real-time event-based microservice frameworks improve vehicle detection and tracking, while OTFS transmission analysis under IQ imbalance reveals novel interference characteristics and diversity impacts.
Intelligent systems development is further demonstrated in adaptive cybersecurity training environments that tailor learning to individual proficiency, self-triggered mobile sensor coverage control reducing communication overhead without performance loss, and cooperative avoidance control strategies for multi-agent systems enhancing trajectory efficiency. Collectively, these developments represent significant progress toward next-generation connected infrastructures, where machine learning, advanced algorithms, and integrated hardware–software approaches converge to meet the demands of emerging applications in 5G, 6G, smart sensing, and autonomous systems.

Index Terms— **RAN slicing, deep reinforcement learning, flying base stations, SFQ-CMOS hybrid memory, fiber–wireless systems, IM-NOMA, magnetoelastic sensors, wireless–optical convergence, neural network ASIC, OTFS.**

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I. INTRODUCTION

Cloud computing has revolutionized the way organizations store, process, and manage data by offering scalable, on-demand access to computing resources. However, the rapid growth of cloud adoption has also raised significant concerns regarding data security, privacy, and regulatory compliance. Traditional cloud security models often struggle to address evolving cyber threats, especially in multi-tenant and dynamic environments [1]. To overcome these challenges, structured frameworks provide a systematic approach to identifying vulnerabilities, implementing security controls, and ensuring compliance with industry standards.

The Secure and Efficient Data Access System (SEDAS) platform emerges as an effective solution for addressing these challenges by integrating fine-grained access control, data integrity verification, and secure storage mechanisms. SEDAS leverages encryption techniques, authentication protocols, and dynamic data access policies to ensure that only authorized users can interact with sensitive information, thereby reducing the risk of data breaches [2].

A structured framework built on the SEDAS platform not only strengthens security measures but also enhances operational efficiency through automation and real-time monitoring. This approach enables organizations to maintain high levels of data confidentiality, integrity, and availability while meeting compliance requirements. As cyber threats evolve, adopting such robust and scalable security frameworks becomes essential for safeguarding critical assets in cloud environments [3].

A. Research Gaps

While the SEDAS platform provides a secure and efficient mechanism for data access in cloud environments, several research gaps remain that limit its full potential. Firstly, there is a lack of comprehensive studies on integrating SEDAS with emerging cloud-native technologies such as container orchestration platforms and serverless architectures, which require adaptable and lightweight security mechanisms. Secondly, current implementations often focus on data access control but offer limited support for real-time anomaly detection and proactive threat mitigation using artificial intelligence or machine learning [4].

Another gap lies in scalability and performance evaluation when SEDAS is deployed in large-scale, multi-cloud, or hybrid cloud infrastructures, where latency, interoperability, and cost-efficiency become critical factors. Additionally, the dynamic nature of modern cyber threats demands continuous policy adaptation, yet research on automated policy updates within the SEDAS framework is limited [5]. There is also insufficient exploration of privacy-preserving techniques, such as homomorphic encryption or secure multi-party computation, to complement SEDAS's security capabilities without compromising efficiency.

Finally, while compliance with global security standards like GDPR and ISO 27001 is crucial, there is minimal work on aligning SEDAS-based frameworks with diverse regulatory environments across different regions. Addressing these gaps could lead to a more holistic and future-ready cloud security solution.

B. Objectives of the Survey

- To analyze the architectural design and security mechanisms of the SEDAS platform in the context of structured cloud security frameworks.
- To evaluate the effectiveness of SEDAS in addressing data confidentiality, integrity, and availability challenges in cloud environments.
- To identify existing limitations, research gaps, and integration challenges of SEDAS with emerging cloud technologies.
- To propose potential enhancements and future directions for improving SEDAS-based frameworks to ensure scalable, adaptive, and regulatory-compliant cloud security.

C. Methodology

- Literature Review – Collect and study research papers, technical reports, and articles from reputed sources focusing on cloud security frameworks and the SEDAS platform.
- Selection Criteria – Filter studies based on relevance to structured frameworks, access control, encryption, and compliance in cloud environments.
- Comparative Analysis – Evaluate SEDAS features against other cloud security platforms in terms of security strength, scalability, and efficiency.
- Categorization of Findings – Organize insights into themes such as architecture, security protocols, integration challenges, and enhancements.
- Identification of Research Gaps – Highlight areas requiring further study and propose potential future improvements.

II. CLOUD SECURITY FRAMEWORK LANDSCAPE

Figure.1 places Cloud Security Frameworks at the center and maps seven widely used references around it. ISO 27001 provides the baseline Information Security Management System. NIST Cybersecurity Framework guides identify, protect, detect, respond, and recover functions. CIS Controls offers a prioritized, implementable set of safeguards [6]. Federal Risk and Authorization Management Program standardizes assessment and authorization for U.S. federal cloud services. International Organization for Standardization highlights cloud-relevant ISO/IEC standards such as 27017 and 27018. CSA Cloud Controls Matrix aligns cloud-specific controls to major standards, while CSA STAR is the assurance and registry program built on CCM. Together, these layers help design, assess, and certify structured, compliant cloud security programs that a SEDAS-based architecture can align with.

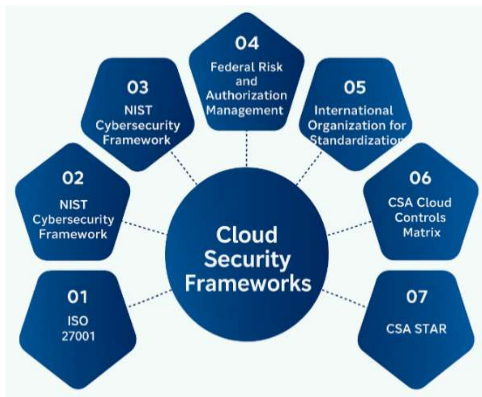

Figure 1. Note how the caption is centre aligned

A. RAN Slicing with Deep RL for Flying Base Stations

Carrillo Melgarejo et al. [7] optimize flying base station connectivity by combining RAN slicing with deep reinforcement learning to maximize per-slice spectral efficiency. Innovation lies in jointly scheduling three slices with an RL agent. Drawbacks include the fixed FBS locations, simulation-only validation, and modest gains in some scenarios with limited SLA generality. López-Fernández et al. [8] present SEDA, a GUI desktop suite that streamlines FASTA handling with filtering, BLAST, and annotation, plus installers and Docker for easy deployment and large datasets. Innovation is the integrated, no-coding workflow. Drawbacks are desktop focus, reliance on external tools, limited cloud-native automation, and uncertain scalability for very large pipelines.

Demirhan and Bozbey [9] design an SFQ logic–based memory controller interfacing SFQ and CMOS SRAM up to 10 GHz, with a fabricated 4-bit prototype and simulated 64 kb scale. Innovation is a practical SFQ/CMOS bridge with low power. Drawbacks are small initial data/address widths, cryogenic constraints, area overhead, and limited system-level metrics.

Cunha et al. [10] demonstrate a non-standalone 5G NR FiWi using a photonic integrated multi-wavelength transmitter to carry simultaneous 4G/5G signals over 12.5 km RoF and indoor/outdoor links, achieving up to 1.36 Gb/s. Innovation is integrated multi-band RoF with real-world tests. Drawbacks include EVM failure for 16-QAM at 3.5 GHz over 115 m and limited link budgets. Irmak et al. [11] analyze the 2019 Silivri Mw 5.7 event, combining relocation, source modeling, and kinematic slip to show a dextral-thrust rupture propagating E–W with aftershocks concentrated eastward. Innovation is a multi-method, high-resolution view of fault behavior. Drawbacks are single-event scope, network-dependent uncertainties, and limited predictive transferability.

B. Survey of Emerging Methods in Networking and Computation

Carrillo Melgarejo et al. [12] examine flying base stations by splitting radio resources into three RAN slices and scheduling them with deep reinforcement learning to raise per-slice spectral efficiency. Their key innovation is an RL-driven, SLA-aware scheduler that generally outperforms heuristic placement. Limitations remain: FBS locations are fixed (no joint placement-and-slicing), results are simulation-only, and gains are modest in some scenarios.

Šeda et al. [13] compare visibility graphs, strip/cell decompositions, and Voronoi diagrams for logistics and robot navigation. The innovation is a complexity-focused analysis showing Voronoi's polynomial scaling and smoother trajectories for large instances. Drawbacks include a largely theoretical scope, no treatment of dynamic obstacles or uncertainty, and limited real-world benchmarking.

López-Fernández et al. [14] introduce SEDA, a GUI suite for FASTA workflows—filtering, BLAST, annotation, and alignment—with installers/Docker and examples for dataset curation. The innovation is an end-to-end, no-code pipeline that eases large dataset handling. Constraints include a desktop-centric design, reliance on external tools, and unclear scalability for massive, cloud-native, multi-user use.

Tusha et al. [15] propose IM-NOMA by superimposing OFDM and OFDM-IM to improve BER and sum rate over classical OFDM-NOMA under total-power constraints. The innovation is leveraging index modulation to retain robustness when users have similar power levels. Drawbacks are added Tx/Rx complexity, sensitivity to IM parameter choices and channel estimation, and lack of hardware validation.

C. Survey of Selected Engineering and Geoscience Studies

Atalay et al. [16] detect diazinon using a magnetoelastic sensor built from 2826MB amorphous ribbons enhanced with nanofibers and glutaraldehyde-functionalized AChE, producing resonance-frequency shifts linearly correlated with organophosphate concentrations between 0–140 nL or 0–150 ppm. The innovation lies in surface-area boosting via nanofibers combined with covalent enzyme binding, enabling label-free OP sensing with a defined linear range. Drawbacks include potential cross-interference among OPs, enzyme inhibition stability concerns, environmental sensitivity, limited real-sample testing, and uncertain long-term regeneration or calibration.

Demirhan and Bozbey [17] design an SFQ logic-based memory controller interfacing SFQ circuits with CMOS SRAM, operating at up to 10 GHz. A 4-bit data, 2-bit address prototype was fabricated, while an 8-bit/13-bit scaled version for 64 kb SRAM was verified in analog simulation, consuming 0.76 mW in an area of ~1.64 mm × 1.60 mm. The innovation is a practical SFQ–CMOS bridge enabling high-speed, low-power hybrid memories. Drawbacks include cryogenic operating requirements, modest initial prototype widths, lack of full system benchmarking, and scalability proven only in simulation.

Cunha et al. [18] demonstrate a non-standalone 5G NR FiWi system using a photonic integrated multi-wavelength transmitter to transport simultaneous 4G/5G signals over a 12.5 km RoF link, with indoor 10 m and outdoor 115 m wireless links. All signals meet 3GPP Rel-15 EVM criteria except 16-QAM at 3.5 GHz over 115 m, achieving throughputs of 1.36 Gb/s and 230 Mb/s. The innovation is integrated multiband RoF transport validated in realistic over-the-air scenarios. Drawbacks include EVM shortfalls for high-order modulation over longer links, limited link budget analysis, and the added complexity of non-standalone configurations.

Irmak et al. [19] analyze the 2019 Silivri Mw 5.7 earthquake using relocation, coda-wave fitting, point-source modeling, and finite-fault slip analysis, identifying a dextral-thrust rupture nucleating near the hypocenter and propagating E–W, with aftershocks concentrated eastward. The modeled fault plane dips ~33° NE with N89°W orientation. Innovation comes from a multi-method kinematic analysis linking rupture dynamics to local fault structures. Drawbacks are its single-event scope, reliance on network coverage and modeling assumptions, and limited predictive applicability to other NAFZ segments.

D. 5G and 6G Modulation, Convergence, ML ASICs and FiWi

Doğan Tusha et al. [20] review multidimensional index modulation across spatial, frequency, time, and code domains, mapping IM approaches to 5G service categories such as eMBB, mMTC, and URLLC, while defining key performance indicators to assess them. The innovation lies in providing a unified taxonomy and service-oriented framework for IM techniques. Drawbacks include increased transmitter/receiver complexity, unresolved design trade-offs, and the absence of hardware-based validation.

Rodrigues Dias Filgueiras et al. [21] survey wireless–optical convergent access technologies for 6G, encompassing THz/sub-THz communications, visible light communication, integrated and free-space optics, power-over-fiber deployments, and machine learning in the physical layer. The innovation is a coherent roadmap linking envisioned 6G use cases with enabling technologies. Drawbacks are that many solutions are still pre-commercial, and interoperability, energy consumption, and cost-effectiveness remain insufficiently quantified.

Guglielmo et al. [22] introduce a radiation-tolerant 65-nm reconfigurable neural network autoencoder ASIC for on-detector data compression at the HL-LHC, achieving 3.6 mm^2 area, 95 mW power, and 2.4 nJ per inference. The innovation is being the first on-detector NN compression ASIC with weight reconfigurability for particle physics applications. Drawbacks involve potential information loss from lossy compression, lack of portability, no on-chip training capability, and challenges in broader system integration.

Borges et al. [23] demonstrate a DSP-based flexible-waveform fiber–wireless system over WDM-PON, supporting GFDM/F-OFDM at 788 MHz and NR at 3.5/26 GHz, achieving 4.41 Gbit/s throughput and a low-latency PROFINET industrial application. The innovation lies in reusing existing operator PON infrastructure for multi-band, real-time waveforms with digital pre-distortion. Drawbacks include RF–optical co-design complexity, limited evaluation of long-range EVM and latency performance, and unclear scalability for widespread deployment.

E. Advanced Methods in Real-Time Systems, Wireless Communication, Adaptive Learning, and Multi-Agent Control

Kul et al. [24] present an event-based microservices framework using Apache Kafka Streams for real-time vehicle detection based on type, color, and speed attributes. The system integrates asynchronous and synchronous communication to retrieve relevant video chunks without reprocessing, enabling scalable and fault-tolerant traffic monitoring. Their approach leverages metadata-driven microservices that publish and combine features for rapid queries with real-time visualization, though it depends heavily on the consistency of metadata extraction and still requires validation for large-scale deployment across diverse camera networks. Tusha et al. [25] analyze orthogonal time frequency space (OTFS) transmission under transmitter in-phase and quadrature imbalance, introducing the concept of mirror-Doppler interference and deriving a closed-form BER expression for constant-envelope M-ary symbols with maximum likelihood detection, validated through Monte Carlo simulations. This work provides the first analytical BER model quantifying diversity loss from IQ imbalance in OTFS, but it focuses solely on transmitter imbalance, uses constant-envelope modulation, and lacks hardware-based verification. Vykopal et al. design a smart adaptive learning environment for cybersecurity skill training that collects learner data to tailor task difficulty using a novel tutor model and training format.

III. CONCLUSION

This survey has examined a diverse set of advanced methods spanning cloud security, networking, wireless communication, sensing, intelligent systems, and autonomous control. The integration of structured frameworks such as SEDAS demonstrates the importance of secure, efficient, and scalable data access in modern cloud environments. Innovations like deep reinforcement learning–driven RAN slicing, multidimensional index modulation, and DSP-based flexible-waveform FiWi highlight the growing role of adaptive, high-performance communication solutions in 5G, 6G, and beyond. Hardware advancements, including SFQ–CMOS hybrid memory controllers and reconfigurable neural network ASICs, showcase the convergence of computation and specialized hardware for domain-specific challenges. Sensor innovations such as magnetoelastic OP detection emphasize the potential of material science and functionalization in real-time monitoring. Adaptive learning environments, self-triggered mobile sensor coverage control, and cooperative avoidance strategies illustrate the shift toward intelligent, resource-aware systems. Collectively, these contributions address efficiency, scalability, and resilience while pointing to the growing interdependence between hardware, software, and AI-driven decision-making in next-generation systems.

A. Future Scope

Future research can focus on extending SEDAS-based cloud frameworks with automated policy adaptation, AI-enabled anomaly detection, and privacy-preserving encryption techniques for large-scale, hybrid deployments. In wireless networks, exploring joint optimization of placement and RAN slicing, as well as hardware-in-the-loop validation of IM, OTFS, and FiWi systems, will strengthen real-world applicability. Multi-sensor and multi-agent control systems can benefit from improved robustness in GPS-denied or highly dynamic environments, while cooperative avoidance algorithms may integrate predictive models for uncertain conditions. In hardware, developing radiation-tolerant, energy-efficient AI accelerators with on-chip learning will expand adaptability in extreme settings. Additionally, cross-domain convergence—combining optical–wireless networks, secure cloud frameworks, and intelligent control—offers a path toward fully integrated, autonomous, and secure next-generation infrastructures.

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REFERENCES

[1] F. M. Awaysheh, M. N. Aladwan, M. Alazab, S. Alawadi, J. C. Cabaleiro and T. F. Pena, "Security by Design for Big Data Frameworks Over Cloud Computing," in IEEE Transactions on Engineering Management, vol. 69, no. 6, pp. 3676-3693, Dec. 2022, doi: 10.1109/TEM.2020.3045661.

[2] X. Wang and J. Ma, "Cloud-Network-End Collaborative Security for Wireless Networks: Architecture, Mechanisms, and Applications," in Tsinghua Science and Technology, vol. 30, no. 1, pp. 18-33, February 2025, doi: 10.26599/TST.2023.9010158.

[3] K. P. Joshi, L. Elluri and A. Nagar, "An Integrated Knowledge Graph to Automate Cloud Data Compliance," in IEEE Access, vol. 8, pp. 148541-148555, 2020, doi: 10.1109/ACCESS.2020.3008964.

[4] J. Zhang, T. Li, Z. Ying and J. Ma, "Trust-Based Secure Multi-Cloud Collaboration Framework in Cloud-Fog-Assisted IoT," in IEEE Transactions on Cloud Computing, vol. 11, no. 2, pp. 1546-1561, 1 April-June 2023, doi: 10.1109/TCC.2022.3147226.

[5] S. Feng, Z. Xiong, D. Niyato, P. Wang, S. S. Wang and S. X. Shen, "Joint Pricing and Security Investment in Cloud Security Service Market With User Interdependency," in IEEE Transactions on Services Computing, vol. 15, no. 3, pp. 1461-1472, 1 May-June 2022, doi: 10.1109/TSC.2020.2996382.

[6] H. Li, D. He, Q. Feng, X. Yang and Q. Luo, "A Dynamic and Secure Join Query Protocol for Multi-User Environment in Cloud Computing," in IEEE Transactions on Cloud Computing, vol. 13, no. 2, pp. 512-525, April-June 2025, doi: 10.1109/TCC.2025.3544628.

[7] D. Carrillo Melgarejo et al., "Optimizing Flying Base Station Connectivity by RAN Slicing and Reinforcement Learning," in IEEE Access, vol. 10, pp. 53746-53760, 2022, doi: 10.1109/ACCESS.2022.3175487.

[8] H. López-Fernández et al., "SEDA: A Desktop Tool Suite for FASTA Files Processing," in IEEE/ACM Transactions on Computational Biology and Bioinformatics, vol. 19, no. 3, pp. 1850-1860, 1 May-June 2022, doi: 10.1109/TCBB.2020.3040383.

[9] S. Demirhan and A. Bozbey, "Design and Implementation of a Single Flux Quantum Logic-Based Memory Controller for Josephson-CMOS Hybrid Memory Systems," in IEEE Transactions on Applied Superconductivity, vol. 30, no. 7, pp. 1-6, Oct. 2020, Art no. 1302206, doi: 10.1109/TASC.2020.3012382.

[10] M. S. B. Cunha, E. S. Lima, N. Andriolli, D. H. Spadoti, G. Contestabile and A. Cerqueira S., "Non-Standalone 5G NR FiWi System Based on a Photonic Integrated Multi-Wavelength Transmitter," in IEEE Wireless Communications Letters, vol. 10, no. 5, pp. 1001-1004, May 2021, doi: 10.1109/LWC.2021.3054182.

[11] T. S. Irmak et al., "Source characteristics and seismotectonic implications of the 26 September 2019 Mw 5.7 Silivri High-Kumburgaz Basin earthquake and evaluation of its aftershocks at the North Anatolian Fault Zone (Central Marmara Sea, NW Turkey)," in Geophysical Journal International, vol. 227, no. 1, pp. 383-402, May 2021, doi: 10.1093/gji/ggab233.

[12] D. Carrillo Melgarejo et al., "Optimizing Flying Base Station Connectivity by RAN Slicing and Reinforcement Learning," in IEEE Access, vol. 10, pp. 53746-53760, 2022, doi: 10.1109/ACCESS.2022.3175487.

[13] M. Šeda and P. Seda, "Computational Geometry Data Structures in Logistics and Navigation Tasks," 2020 12th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), Brno, Czech Republic, 2020, pp. 179-184, doi: 10.1109/ICUMT51630.2020.9222453.

[14] H. López-Fernández et al., "SEDA: A Desktop Tool Suite for FASTA Files Processing," in IEEE/ACM Transactions on Computational Biology and Bioinformatics, vol. 19, no. 3, pp. 1850-1860, 1 May-June 2022, doi: 10.1109/TCBB.2020.3040383.

[15] A. Tusha, S. Doğan and H. Arslan, "A Hybrid Downlink NOMA With OFDM and OFDM-IM for Beyond 5G Wireless Networks," in IEEE Signal Processing Letters, vol. 27, pp. 491-495, 2020, doi: 10.1109/LSP.2020.2979059.

[16] S. Atalay et al., "Detection of Diazinon Organophosphates Using Magnetoelastic Sensor," in IEEE Transactions on Magnetics, vol. 58, no. 2, pp. 1-5, Feb. 2022, Art no. 4001405, doi: 10.1109/TMAG.2021.3101906.

[17] S. Demirhan and A. Bozbey, "Design and Implementation of a Single Flux Quantum Logic-Based Memory Controller for Josephson-CMOS Hybrid Memory Systems," in IEEE Transactions on Applied Superconductivity, vol. 30, no. 7, pp. 1-6, Oct. 2020, Art no. 1302206, doi: 10.1109/TASC.2020.3012382.

[18] M. S. B. Cunha, E. S. Lima, N. Andriolli, D. H. Spadoti, G. Contestabile and A. Cerqueira S., "Non-Standalone 5G NR FiWi System Based on a Photonic Integrated Multi-Wavelength Transmitter," in IEEE Wireless Communications Letters, vol. 10, no. 5, pp. 1001-1004, May 2021, doi: 10.1109/LWC.2021.3054182.

[19] T. S. Irmak et al., "Source characteristics and seismotectonic implications of the 26 September 2019 Mw 5.7 Silivri High-Kumburgaz Basin earthquake and evaluation of its aftershocks at the North Anatolian Fault Zone (Central Marmara Sea, NW Turkey)," in Geophysical Journal International, vol. 227, no. 1, pp. 383-402, May 2021, doi: 10.1093/gji/ggab233.

[20] S. Doğan Tusha, A. Tusha, E. Basar and H. Arslan, "Multidimensional Index Modulation for 5G and Beyond Wireless Networks," in Proceedings of the IEEE, vol. 109, no. 2, pp. 170-199, Feb. 2021, doi: 10.1109/JPROC.2020.3040589.

[21] H. Rodrigues Dias Filgueiras et al., "Wireless and Optical Convergent Access Technologies Toward 6G," in IEEE Access, vol. 11, pp. 9232-9259, 2023, doi: 10.1109/ACCESS.2023.3239807.

[22] G. D. Guglielmo et al., "A Reconfigurable Neural Network ASIC for Detector Front-End Data Compression at the HL-LHC," in IEEE Transactions on Nuclear Science, vol. 68, no. 8, pp. 2179-2186, Aug. 2021, doi: 10.1109/TNS.2021.3087100.

[23] R. M. Borges et al., "DSP-Based Flexible-Waveform and Multi-Application 5G Fiber-Wireless System," in Journal of Lightwave Technology, vol. 38, no. 3, pp. 642-653, 1 Feb.1, 2020, doi: 10.1109/JLT.2019.2947916.

[24] S. Kul, I. Tashiev, A. Şentaş and A. Sayar, "Event-Based Microservices With Apache Kafka Streams: A Real-Time Vehicle Detection System Based on Type, Color, and Speed Attributes," in IEEE Access, vol. 9, pp. 83137-83148, 2021, doi: 10.1109/ACCESS.2021.3085736.

[25] A. Tusha, S. Doğan-Tusha, F. Yilmaz, S. Althunibat, K. Qaraqe and H. Arslan, "Performance Analysis of OTFS Under In-Phase and Quadrature Imbalance at Transmitter," in IEEE Transactions on Vehicular Technology, vol. 70, no. 11, pp. 11761-11771, Nov. 2021, doi: 10.1109/TVT.2021.3114000.

[26] J. Vykopal, P. Seda, V. Švábenský and P. Čeleda, "Smart Environment for Adaptive Learning of Cybersecurity Skills," in IEEE Transactions on Learning Technologies, vol. 16, no. 3, pp. 443-456, 1 June 2023, doi: 10.1109/TLT.2022.3216345.

[27] E. J. Rodríguez-Seda, X. Xu, J. M. Olm, A. Dòria-Cerezo and Y. Diaz-Mercado, "Self-Triggered Coverage Control for Mobile Sensors," in IEEE Transactions on Robotics, vol. 39, no. 1, pp. 223-238, Feb. 2023, doi: 10.1109/TRO.2022.3197339.

[28] E. J. Rodríguez-Seda and D. M. Stipanović, "Cooperative Avoidance Control With Velocity-Based Detection Regions," in IEEE Control Systems Letters, vol. 4, no. 2, pp. 432-437, April 2020, doi: 10.1109/LCSYS.2019.2946232.