Tolga O. Atalay

Senior Research and Development Engineer
A12XT Inc.

A12XT Inc.
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Skills

Programming Languages: C++, C, Go, Python
Platforms and Tools: AWS, Kubernetes, Docker, eBPF, Linux, shell scripting, OpenStack, OpenTelemetry, Jaegar, Airflow, Matlab, TTCN-3
Areas of Expertise: 5G/OpenRAN architecture, 3GPP/ETSI/O-RAN standardization, microservices, side car proxies, system design/architecture, networking, cybersecurity, eBPF, software-defined radios, conformance testing

Research Summary

I am the architect of a full-stack 5G testbed comprised of different open-source Radio Access Network and Core network solutions. Primarily, I specialize in experimenting with, analyzing, and enhancing the cellular core to create more secure and scalable deployments.

- System design, implementation and evaluation of a novel discovery framework for the authentication and authorization of xApps in the O-RAN architecture. (**https://github.com/tolgaoa/xrfoauth**)
- Analysis of 5G core computational resource consumption patterns under different user and control plane traffic loads. Experimenting with modern-day use cases such as Virtual Reality, Streaming, Internet of Things, Voice over IP, to observe the impact of different use cases on the 5G core computational resource utilization across different 5G core VNFs.
- Isolation of critical microservices (ARPF, SIDF, SEAF) for the 5G core control plane using different isolation strategies including Intel SGX. (**private repo - please contact me for details**)
- Creating a distributed tracing framework for end-to-end 5G core deployments (OAI) by augmenting VNFs with Side Car Proxies that enable indirect communication. Collecting context spans using OpenTelemetry to forward to a Jaeger collector. (**https://github.com/tolgaoa/monitor5G**)
- 5G core deployments with different network slice topologies. User traffic recreation over AWS edge zones in 7 different countries and 18 different edge zones. Assessing the 5G control plane latency and user plane throughput for large-scale network slice deployments.(**https://github.com/tolgaoa/devdep5g**)
- Design of a Service mesh Tailored for Rapid, Efficient and Authorized Microservices (STREAM) in a decentralized 5G core deployment to reduce control plane processing latency. Refactoring the monolithic 5G core VNFs to be deployed as finer-grained microservices. (**private repo - please contact me for details**)

Experience

2024 –Jul - Present — **Senior Research and Development Engineer** at *A12XT Inc*
- Designed secure 5G and OpenRAN frameworks in public clouds. Collaborated on peer-reviewed publications and advanced cybersecurity measures in network virtualization.
- Led proposal preparation for securing project funding; managed the development and execution of telecommunications research projects.
- Evaluated and optimized cellular network deployments in public clouds, and developed software solutions for scalable network services.

2018 - 2024 — **Graduate Research Assistant** at *Virginia Tech*

2022–May-Aug — **5G R&D Intern** at *Kryptowire Labs*

2021–May-Dec — **Project:** *DARPA Open, Programmable, Secure 5G (OPS-5G) - Technical Area 4 - Principled programmable defences*
- Construction of a state-of-the-art open-source 5G testbed for integration and testing of cybersecurity primitives.
- Design and evaluation of large-scale 5G deployments for DDoS mitigation and malware detection.
- Large-scale 5G core deployments in the AWS public cloud to assess the real-life performance of next-generation infrastructure deployments.
- Prepared/presented presentations and demos at DARPA PI meetings and site visits.

Education

2018 – 2024 **Doctor of Philosophy** in Computer Engineering, *Virginia Tech*
2016 – 2018 **Master of Science** in Telecommunications, *Danmarks Tekniske Universitet (DTU)*
2012 – 2016 **Bachelor of Science** in Electrical and Electronics Engineering, *Bilkent University*

Publications (* denotes co-primary authorship)

23. [**INFOCOM '25**] Tolga O. Atalay, Dragoslav Stojadinovic, Alireza Famili, Angelos Stavrou, Haining Wang. "**A First Look at 5G Core Deployments in the Cloud: Performance Evaluation of Control and User Planes**." *IEEE International Conference on Network Protocols* ***(In Submission)***

22. [**IEEEIoT '24**] Alireza Famili, Shihua Sun, Tolga O. Atalay, Angelos Stavrou "**Harnessing Meta Reinforcement Learning for Enhanced Tracking in Geofencing Systems**." *IEEE Internet of Things Journal* ***(In Submission)***

21. [**OJCOMS '24**] Alireza Famili, Tolga O. Atalay, Angelos Stavrou, Haining Wang "**Si-Fi: Collaboration of 6G and Wi-Fi for Seamless Geolocation in Metaverse**." *IEEE Open Journal of the Communication Society* ***(In Submission)***

20. [**NFV-SDN '24**] Tolga O. Atalay, Alireza Famili, Angelos Stavrou "**Evaluating 5G Core Service Mesh Encapsulations in the Cloud Deployments**." *IEEE Conference on Network Function Virtualization and Software Defined Networks* ***(In Submission)***

19. [**JSAC '24**] Sudip Maitra, Tolga O. Atalay, Kenechukwu Nwodo, Angelos Stavrou, Haining Wang "**Towards Securing Access Control in 5G and Beyond with Zero Trust**." *IEEE Journal on Selected Areas in Communication* ***(In Submission)***

18. [**CoNEXT '24**] Tolga O. Atalay, Alireza Famili, Sudip Maitra, Dragoslav Stojadinovic, Angelos Stavrou, Haining Wang. "**Service Mesh Encapsulation for Optimizing the 5G Core Control Plane in Distributed Cloud Deployments**." *International Conference on emerging Networking EXperiments and Technologies* ***(In Submission)***

17. [**IPCCC '24**] Alireza Famili, Shihua Sun, Tolga O. Atalay, Angelos Stavrou "**Precision Tracking in Geofencing Systems using Deep Reinforcement Learning**." *International Performance Computing and Communications Conference* ***(In Submission)***

16. [**iMETA '24**] Alireza Famili, Amin Tabrizian, Tolga O. Atalay, Angelos Stavrou "**Behind the Scenes of Successful Metaverse User Traversal**." *International Conference on Intelligent Metaverse Technologies & Applications* ***(In Submission)***

15. [**TDSC '24**] *Tolga O. Atalay, *Sudip Maitra, Dragoslav Stojadinovic, Angelos Stavrou, Haining Wang. "**An OpenRAN Security Framework for Scalable Authentication, Authorization and, Discovery of xApps with Isolated Critical Services**." *IEEE Transactions on Dependable and Secure Computing.* ***(In Submission)***

14. [**METACOM '24**] Alireza Famili, Tolga O. Atalay, Amin Tabrizian, Angelos Stavrou, Peng Wei. "**GREEN: Precise Geolocation in Metaverse using Reinforcement Learning-Enabled Sensor Placement**." *IEEE International Conference on Metaverse Computing, Networking, and Applications*

13. [**iTHINGS '24**] Alireza Famili, Amin Tabrizian, Tolga O. Atalay, Angelos Stavrou, Peng Wei. "**RADIO: Reinforcement Learning-Aided Deployment of Wi-Fi Routers in 5G Networks for Indoor Drone Orchestrating**." *IEEE International Conference on Internet of Things*

12. [**ICCCN '24**] Alireza Famili, Amin Tabrizian, Tolga O. Atalay, Angelos Stavrou, Peng Wei. "**RAPID: Reinforcement Learning-Aided Femtocell Placement for Indoor Drone Localization** ." *IEEE International Conference on Computer Communications and Networks*

11. [**DSN '24**] Sudip Maitra, Tolga O. Atalay, Angelos Stavrou, Haining Wang. "**Towards Shielding 5G Control Plane Functions**." *IEEE/IFIP International Conference on Dependable Systems and Networks.*

10. [**INFOCOM '24**] Pragya Sharma, Tolga O. Atalay, Dragoslav Stojadinovic, Hans Andrew Gibbs, Angelos Stavrou, Haining Wang. "**5G WAVE: A Core Network Framework with Decentralized Authorization for Network Slices**." *IEEE Conference on Computer Communications.*

9. [**ICNC '24**] Alireza Famili, Tolga O. Atalay, Angelos Stavrou. "**5GPS: 5G Femtocell Placement Strategies for Ultra-Precise Indoor Localization in the Metaverse**." *IEEE International Conference on Computing, Networking and Communications.*

8. [**JSAC '23**] Alireza Famili, Tolga O. Atalay, Angelos Stavrou, Haining Wang, Jung-min (Jerry) Park "**OFDRA: Optimal Femtocell Deployment for Accurate Indoor Positioning of RIS-Mounted AVs**." *IEEE Journal on Selected Areas in Communication*

7. [**GLOBECOM '23**] Tolga O. Atalay, Alireza Famili, Dragoslav Stojadinovic, Angelos Stavrou, Haining Wang. "**Demystifying 5G Traffic Patterns with an Indoor RAN Measurement Campaign**." *IEEE Global Communications Conference.*

6. [**METACOM '23**] Alireza Famili, Tolga O. Atalay, Angelos Stavrou, Haining Wang. "**Wi-Six: Precise Positioning via Optimal Wi-Fi Router Deployment in 6G Networks**." *IEEE International Conference on Metaverse Computing, Networking, and Applications* (**BEST PAPER AWARD**)

5. [**VTC '23**] Alireza Famili, Tolga O. Atalay, Angelos Stavrou, Haining Wang. "**Wi-Five: Optimal Placement of Wi-Fi Routers in 5G Networks for Indoor Drone Navigation**." *IEEE Vehicular Technology Conference.*

4. [**INFOCOM '23**] Tolga O. Atalay, Sudip Maitra, Dragoslav Stojadinovic, Angelos Stavrou, Haining Wang. "**Securing 5G OpenRAN with a Scalable Authorization Framework for xApps**." *IEEE Conference on Computer Communications.*

3. [**GLOBECOM '22**] Tolga O. Atalay, Dragoslav Stojadinovic, Alireza Famili, Angelos Stavrou, Haining Wang. "**Network-Slice-as-a-Service Deployment Cost Assessment in an End-to-End 5G Testbed**." *IEEE Global Communications Conference.*

2. [**LATINCOM '22**] Alireza Famili, Mahsa Foruhandeh, Tolga O. Atalay, Angelos Stavrou, Haining Wang. "**GPS Spoofing Detection by Leveraging 5G Positioning Capabilities**." *IEEE Latin-American Conference on Communications.*

1. [**WCNC '22**] Tolga O. Atalay, Dragoslav Stojadinovic, Angelos Stavrou, Haining Wang. "**Scaling Network Slices with a 5G Testbed: A Resurce Consumption Study**." *IEEE Wireless Communications and Networking Conference.*

Service

2025	**Network and Distributed System Security (NDSS) Symposium**	*Artifact Eval. Committee*
2024	**iMETA Conference**	*Program Committee*
2023-2024	**Computer Networks Journal**	*Reviewer*
2024	**USENIX WOOT Conference on Offensive Technologies**	*Artifact Eval. Committee*
2024	**IEEE Journal on Selected Areas in Communications**	*Reviewer*
2024	**IEEE Conference on Dependable Systems and Networks (DSN)**	*Artifact Eval. Committee*
2023	**ACM ASIA CCS**	*External Reviewer*
2023	**IEEE Open Journal of the Communications Society**	*Reviewer*
2023	**iMETA Conference**	*Program Committee*
2021	**IEEE Transactions on Cloud Computing**	*Reviewer*
2021	**USENIX Security Symposium**	*External Reviewer*
2020	**IEEE Transactions on Information Forensics and Security**	*Reviewer*

Talks

1. [**August 2023**], IEEE Standards Association OpenRAN Rapid Reaction Standardization Activities, **OpenRAN Security Standardization Efforts for xApp Security** (**session**)