Tolga O. Atalay

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Research Summary

- 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**)
- Isolation of critical microservices (ARPF, SIDF, SEAF) for the 5G core control plane using different isolation strategies including Intel SGX. (**private repo**)
- 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 in the public cloud. (**private repo**)

Experience

2021–May-Dec **5G R&D Intern** at *Kryptowire Labs*

2022–May-Aug **Project:** *DARPA Open, Programmable, Secure 5G (OPS-5G) - Technical Area 4 - Principled programmable defences*

- Construction of a state-of-the-arit open source 5G testbed for integration and testing of cybersecurity primitives.
- System design an evaluation of large-scale 5G deployments for DDoS mitigation and malware detection.
- System design, implementation and evaluation of OpenRAN security frameworks for 5G integration.
- Large scale 5G core deployments in the AWS public cloud to assess real-life performance of next generation infrastructure deployments.
- Prepared/presented presentations and demos at DARPA PI meetings and site-visits.

Education

2018 – Present **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*

Skills

Programming: C, C++, Go, Python
Platforms: AWS, Cloud (OpenStack, Kubernetes, Docker), shell scripting, OpenTelemetry, TTCN-3, MATLAB
Background: 5G/OpenRAN architecture, 3GPP/ETSI/OpenRAN standardization, microservices, side car proxies, system design/architecture, networking, cybersecurity, software-defined radios, conformance testing

Publications (* denotes co-primary authorship)

12. [**TDSC '23**] *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)

11. [**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.* (In Submission)

10. [**ESORICS '23**] *Sudip Maitra, *Tolga O. Atalay, Angelos Stavrou, Haining Wang. "**P-AKA: Security Platform for Isolating Critical 5G Core Microservices**." *European Symposium on Research in Computer Security.* (In Submission)

9. [**IMC '23**] Tolga O. Atalay, Dragoslav Stojadinovic, Alireza Famili, Angelos Stavrou, Haining Wang. "**Is the Public Cloud Ready for 5G? Understanding Its Deployment Patterns**." *ACM Internet Measurement Conference.* (In Submission)

8. [**JSAC '23**] Alireza Famili, Tolga O. Atalay, Angelos Stavrou, Haining Wang. "**Wi-Six: Precise Positioning in the Metaverse via Optimal Wi-Fi Router Deployment in 6G Networks**." *Journal on Selected Areas in Communication Special Issue on 5G/6G Precise Positioning on Cooperative Intelligent Transportation Systems (C-ITS) and Connected Automated Vehicles (CAV).* (In Submission)

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.* (In Submission)

6. [**METACOM '23**] Alireza Famili, Tolga O. Atalay, Angelos Stavrou, Haining Wang. "**Wi-Six: Precise Positioning in the 2023 IEEE Metaverse via Optimal Wi-Fi Router Deployment in 6G Networks**." *IEEE 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

2023	**Computer Networks Journal**	*Reviewer*
2023	**iMETA**	*Program Committee*
2022	**ICCCDS**	*Program Committee*
2021	**IEEE Transactions on Cloud Computing**	*Reviewer*
2021	**USENIX Security Symposium**	*External Reviewer*
2020	**IEEE Transactions on Information Forensics and Security**	*Reviewer*