

Title: Security and Privacy of Connected Autonomous Vehicles

Abstract:

The upcoming smart transportation systems which consist of connected autonomous vehicles, are poised to transform our everyday life. The sustainability and growth of these systems to their full potential will significantly depend on the robustness of these systems against security and privacy threats. Unfortunately, the communication protocols employed in these systems lack mainstream network security capabilities due to energy constraints of the deployed platforms and bandwidth constraints of the communication medium. In this talk, I will present the results of my efforts in anatomizing the two vital communication protocols employed in the smart transportation: (1) vehicle-to-everything (V2X) communication protocol which is utilized to facilitate wireless communication among connected vehicles, and (2) controller area network (CAN) protocol which is utilized within an autonomous vehicle to enable real-time control of critical automotive components including brakes. For each of these two protocols, I will first describe the inquisitive approach which led to the discovery of the new security vulnerabilities. Then, through the experiments on real-world systems, I will demonstrate how these vulnerabilities can be exploited to launch malicious attacks which evade the state-of-the-art defense mechanisms employed in these systems. I will conclude the talk by discussing novel countermeasures which are required to mitigate these fundamental vulnerabilities and prevent their exploitation.

Bio:

Dr. Vireshwar Kumar is a Postdoctoral Research Associate in the Department of Computer Science at Purdue University. Vireshwar earned his B.Tech. in Electrical Engineering at Indian Institute of Technology Delhi in 2009, and Ph.D. degree in Computer Engineering at Virginia Tech in 2016. He was the recipient of the outstanding Ph.D. student award by the Center for Embedded Systems for Critical Applications at Virginia Tech. He also had a short stint as a Project Assistant in the Department of Electrical Communication Engineering at Indian Institute of Science in 2010. His research interests include discovering and mitigating security vulnerabilities in the communication protocols employed in cyber-physical systems, e.g., smart home, smart transportation and smart city. Vireshwar's research work has featured in top-tier security venues including ACM Conference on Computer and Communications Security (CCS) and IEEE Transactions on Information Forensics and Security (TIFS). He has also served on the TPC of flagship conferences including IEEE Conference on Communications and Network Security (CNS) and IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN).