Abstract:
Freight transportation is of outmost importance for our society and is continuously increasing. At the same time, transporting goods on roads accounts for about 26% of all energy consumption and 18% of all greenhouse gas emissions in the European Union. Despite the influence the transportation system has on our energy consumption and the environment, road transportation is mainly done by individual long-haulage trucks with no real-time coordination or global optimization. In this talk, we discuss how modern information and communication technology supports a cyber-physical transportation system architecture with an integrated logistic system coordinating fleets of trucks traveling together in vehicle platoons. From the reduced air drag, platooning trucks traveling close together can save about 10% of their fuel consumption. Control and estimation challenges and solutions on various level of this transportation system will be presented. It will be argued that a system architecture utilizing vehicle-to-vehicle and vehicle-to-infrastructure communication enable receding horizon optimal control of individual trucks as well as optimized platoons and fleets of platoons. Experiments done on test trucks will illustrate system performance and safety requirements. Some preliminary results from a large-scale evaluation currently being performed on the highway road network in Northern Europe will also be discussed. The presentation will be based on joint work with collaborators at KTH and at the truck manufacturer Scania.

Biography of the speaker:
Karl H. Johansson is Director of the ACCESS Linnaeus Centre and Professor at the School of
Electrical Engineering, KTH Royal Institute of Technology, Sweden. He is a Wallenberg Scholar and has held a six-year Senior Researcher Position with the Swedish Research Council. He is also heading the Stockholm Strategic Research Area ICT The Next Generation. He received MSc and PhD degrees in Electrical Engineering from Lund University. He has held visiting positions at UC Berkeley (1998-2000) and California Institute of Technology (2006-2007). His research interests are in networked control systems, cyber-physical systems, and applications in transportation, energy, and automation systems. He has been a member of the IEEE Control Systems Society Board of Governors and the Chair of the IFAC Technical Committee on Networked Systems. He has been on the Editorial Boards of several journals, including Automatica, IEEE Transactions on Automatic Control, and IET Control Theory and Applications. He is currently on the Editorial Board of IEEE Transactions on Control of Network Systems and the European Journal of Control. He has been Guest Editor for special issues, including one issue of IEEE Transactions on Automatic Control on cyber-physical systems and one of IEEE Control Systems Magazine on cyber-physical security. He was the General Chair of the ACM/IEEE Cyber-Physical Systems Week 2010 in Stockholm and IPC Chair of many conferences. He has served on the Executive Committees of several European research projects in the area of networked embedded systems. He received the Best Paper Award of the IEEE International Conference on Mobile Ad-hoc and Sensor Systems in 2009 and the Best Theory Paper Award of the World Congress on Intelligent Control and Automation in 2014. In 2009 he was awarded Wallenberg Scholar, as one of the first ten scholars from all sciences, by the Knut and Alice Wallenberg Foundation. He was awarded Future Research Leader from the Swedish Foundation for Strategic Research in 2005. He received the triennial Young Author Prize from IFAC in 1996 and the Peccei Award from the International Institute of System Analysis, Austria, in 1993. He received Young Researcher Awards from Scania in 1996 and from Ericsson in 1998 and 1999. He is a Fellow of the IEEE.

**Organizer:** Dr. G. Chesi