ANSYS Short Course

Title: Simulation in Complex Wireless Environments

Description: This past decade has witnessed a revolution in wireless connectivity. The scale of networked devices is enormous and cuts across practically all industries. Miniaturization and economies of scale create opportunities as greater numbers of devices are now "Wi-Fi enabled". This proliferation of wireless devices also creates challenges due to overcrowded radio spectrum, interference, and thermal management. A sophisticated design approach is necessary to ensure compliance specifications are met. This includes antenna design, product integration, and platform installation. Virtual prototyping enables a path to reliable design evaluation based on accurate physics-based simulation. This allows engineers to test ideas against the laws of physics without having to rely solely on costly hardware prototypes.

In this short course ANSYS application engineers will introduce state-of-the art techniques in simulation with a focus on complex wireless applications. Attendees will be introduced to simulation methods that enable evaluation of antenna performance in real environments including smart homes and automotive and aerospace scenarios. Simulation techniques to be covered include finite element method (FEM), integral equations (IE), and shooting and bouncing rays (SBR). Also included will be an overview of hybridization techniques allowing full simulation of large-scale environments. In addition to an overview of the fundamental methods, practical examples will include antenna optimization, array construction, chassis/radome integration, and installation – all of which can impact the intended performance of the system. We will also introduce interference analysis and demonstrate how physics-based models can be used in conjunction with system-level simulation to predict receiver desensitization. Finally, a discussion on multi-physics simulation will also be provided showing how ohmic losses from the electromagnetics simulation can drive structural deformation, potentially degrading overall performance.

Course Objective:

In this course students will learn state-of-the art engineering simulation techniques and workflows. Practical applications will cover antenna design and optimization, integration in real environments, and interference mitigation.

 Course Outline:

1) Introduction – Simulation and the Wireless Environment
2) Electromagnetic Simulation Techniques and Multiscale Analysis
    a. Finite Element Method
    b. Integral Equation Method
    c. Shooting and Bouncing Rays
    d. Hybridization
3) Antenna Design and Optimization
4) Antenna Placement and Multi-system Environment
    a. Coupling and Isolation
    b. Interference Mitigation
5) Multiphysics
    a. Effects of thermal loading on Electrical System

Jason Bommer is a Senior Application Engineer with ANSYS, providing technical support in high frequency electromagnetics (EM) and Radio Frequency Interference (RFI) applications. Jason holds a BS degree in Physics from the University of New Orleans and Master's in Applied Physics from the University of Washington in Seattle. He has over 20 years of experience developing and applying computational electromagnetic tools to a wide variety of high frequency problems. Prior to ANSYS, Jason served an electromagnetics engineer with Boeing Research and Technology, where he supported multiple programs in the defense, space and commercial business units. He holds publications and patents in sensors, energy harvesting and nondestructive inspection techniques.

Eldon Staggs is a Principal Engineer for ANSYS, Inc. with specialization in high-frequency electromagnetic, circuit and system simulation and design. He works closely with ANSYS' top tier customers on their high frequency designs. Eldon has over 25 years of experience with high frequency applications, has delivered numerous technical lectures internationally, and has published technical papers on related topics. He earned his BSEE degree from the University of New Mexico in Albuquerque, NM, and his MSEE degree from the University of California at San Diego.