CYBER-PHYSICAL SYSTEMS VIRTUAL ORGANIZATION (CPS-VO)

SYSTEMS SCIENCE FOR CYBER-PHYSICAL SYSTEMS:
A New Systems Science that Integrates Computing, Communications, Control, and Science and Technology to Achieve High-Confidence Cyber-Physical Systems

WHO ARE WE?

The Cyber-Physical Systems Virtual Organization (CPS-VO) is a broad, complex, networked, socio-technical community of interest comprising research scientists, program managers, developers, and people from academy, Government, and industry who work on a wide range of disciplines with different approaches, methods, tools, and experimental platforms for scientific discovery in cyber-physical systems.

GOAL

To advance human knowledge in the science and engineering of cyber-physical systems

OBJECTIVES

- To facilitate and foster collaboration, interaction, and exchanges among CPS researchers across a broad range of institutions, programs, and disciplines

- To enable sharing of knowledge generated by projects within the broader engineering and scientific communities

- To enable sharing and integrating of experimental tools, platforms, and simulations among researchers and stakeholders

- To help international collaboration by facilitating the establishment of shared scientific technologies, technical standards, and testing methods

Federal NITRD CPS Agencies: AFRL, ARO, DARPA, DOE, DOT, FAA, FDA, NASA, NIH, NIST, NRC, NSA, NSF, ONR

UPCOMING EVENT

Third Annual Cyber-Physical Systems Principal Investigator's Meeting, October 3-5, 2012

Gaylord National Hotel and Convention Center, National Harbor, MD
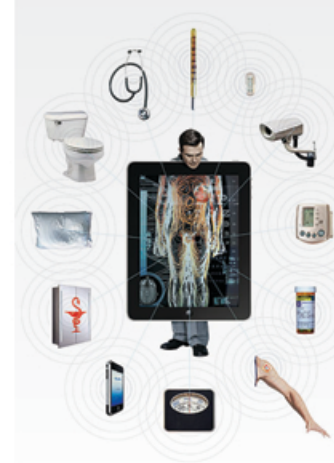
ENERGY

GOAL

To develop real-time, networked control strategies for building next generation energy systems with emphasis on intermittent resources, controllable loads, and storage while preserving objectives of today's Grid, including power Grid stability and rapid response, to ensure voltage and frequency support.

MEDICAL DEVICES

GOAL

Identify and explore new CPS manifestations in design methods and platforms that would encourage radical innovation in next generation of safer and more effective, capable, and reliable diagnostic and therapeutic devices and their control, integration, and manufacturing.

UPCOMING EVENT

National Workshop on Medical Device Innovation Using Cyber-Physical Systems, TBD

SCIENCE OF SECURITY

GOAL

The creation of a unified body of knowledge that can serve as the basis of a trusted engineering discipline, curriculum, and rigorous design methodologies.

UPCOMING EVENT

Secure and Trustworthy Computing Principal Investigators Meeting, November 27-29, 2012

Gaylord National Hotel and Convention Center, National Harbor, MD

First Science of Security Principal Investigators Meeting, November 29-30, 2012

Gaylord National Hotel and Convention Center, National Harbor, MD

TIME-CRITICAL CPS

GOAL

To develop robust foundations for reasoning about time on cyber-physical systems across scales, managing resources to meet timeliness requirements, and ensuring service agreements through new tools, techniques and methodologies.

UPCOMING EVENT

National Workshop on the New Clockwork for Time-Critical Systems, TBD

TRANSPORTATION

To define a coherent and compelling vision that supports both the shared and separate needs of the transportation sectors (i.e., automotive, aviation, rail, etc.) to identify cross-domain (e.g., electrical, control, system, mechanical, software) improvements for developing CPS correctly; and to quickly pinpoint new applications, innovations, and powerful cross-layer abstractions that will satisfy the challenging requirements of future CPS; and to identify potentially transformative technologies that will enable future capabilities.

AVIATION
Goal

The aviation sector is challenged by the need for a Next Generation airspace, in which many classes of air vehicles can interoperate safely with increased autonomy, and new airspace capacity, and operational models can enable decentralized airspace management. These innovations will require dependable software for aircraft avionics as well as the airspace management system.

AUTOMOTIVE
Goal

To define and refine the technology needs and gaps for deeply-embedded software-intensive electronic control systems that interact deeply with the physical world in ways that have stringent reliability, availability, and safety requirements across and within the transportation sectors.
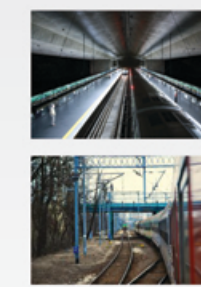
RAIL
Goal

To create a multi-domain CPS that integrates dispatch centers, maintenance operations, tracks, signals, individual cars, and trains as a unified dynamic system that operates optimally according to real-time conditions. Such a system is essential if passenger, commuter and freight rail systems are to continue to operate at increasing densities on overlapping infrastructures.