NIST Cyber-physical Systems Public Working Group

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So, Why is NIST Convening this Public Working Group?

- The field of cyber-physical systems is growing rapidly.
- But much of this growth is happening in a sector-by-sector fashion, leading to an inevitable duplication of effort, and isolated solutions that aren't interoperable.
- We can all make progress much more quickly -- and efficiently -- if we work together, sharing ideas and collaborating on interoperable solutions.
- But, this requires that we develop a shared language and a common understanding of the basic functional elements of a cyber-physical system.
- And, in a nutshell, that's the goal of the Cyber-Physical Systems Working Group
- to develop a consensus set of definitions and a taxonomy, a reference architecture for CPS, and a shared understanding of the critical roles of cybersecurity and timing.
- NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.
- The Engineering Laboratory, which provides the home for NIST's Cyber-Physical Systems effort, complements the overall NIST mission by anticipating and meeting the measurement science and standards needs for technology-intensive manufacturing, construction, and cyber-physical systems.
- Pursuing our mission requires active collaboration and coordination with our industrial, academic, and other agency partners.
- Providing strong technical expertise and maintaining a technology-neutral approach are the hallmarks of NIST's approach to collaborative efforts.
- And that's the role NIST will play in convening the Cyber-Physical Systems Public Working Group.

So, Why Now?

- In the field of cyber physical systems we see three fast-paced trends:

    - Widespread deployment in sector-specific applications;

    - explosive growth of the Internet of Things; and

    - an increasing need for integrating cyber-physical systems for systems-of-systems solutions at scale

- Let's consider each of these trends and how they might conflict.

CPS Deployment is Widespread

- The good news in the CPS field is the growth of applications in many sectors ranging from energy to health care, disaster resilience, transportation, manufacturing, building management, and many others that may directly involve you.
- But – and here's the catch -- these deployments are often sector-specific and are not designed for interoperability across sectors.
- Further, individual communities, states, and countries are implementing their own, unique solutions that are also not designed for interoperability with their neighbors.
- The resulting landscape of isolated, legacy systems will only continue to grow, making solutions to create interoperability more and more difficult.
- So, the time to act is now.

Growth in the Internet of Things

- I'm sure that you're all familiar with the rapid growth of smart devices connected to the web.
- Here are some numbers from Intel showing the growth in the number of those devices over time.
- Sometime between 2000 and 2010 the number of devices on the Internet exceeded the number of people using the web, and the concept of an "Internet of Things" was born.
- While the Internet of Things is growing rapidly, it lacks a common foundation for interoperability leaving 'things' in an Internet of Things world unable to connect broadly, and realize their fullest potential.
- So, the sooner we take on the challenge of shared metrics, standards, and protocols for a more powerful Internet of Things, the better.

When Trends Collide

- The increasingly complexity of a 21st century society cries out for systems-of-systems solutions that require integrating Cyberphysical Systems across diverse domains, and at multiple scales. Here are some examples:

  - Traffic moves not just within a community but between cities, and across regions. Our combined Maryland, Virginia, and District of Columbia traffic challenge is a prime example. That traffic cannot be managed city-by-city, with isolated systems that don't interact. Interoperability across traffic management systems is critical for them to be effective.

  - Similarly, vehicle manufacturers producing intelligent vehicles that connect via numerous different protocols is inefficient and certainly inhibits progress.

  - Modern manufacturing, advanced manufacturing, if you will, is all about reducing the time for the design to production cycle, linking the members of extended supply chains, providing for just-in-time capabilities, and achieving economical mass customization to meet customer needs. These and other advanced manufacturing goals require integrating the elements of the manufacturing landscape into a comprehensive, responsive interoperating system. Isolated systems just can't meet that need.

  - Today's health care systems are fractured around provider organizations, with each having its own approach and requiring the patient to integrate their own care. Moving towards a more effective and efficient health care system centered around the patient rather than on institutions requires integrating health systems for primary care, assisted living, , the pharmacy, hospitals and other providers.

All of this requires developing a common technical foundation that will enable us to work together to create the cyber-physical systems of the future. That's the goal of the CPS Public Working Group.

And now is a great time to get started on this important work.