



CPS Overview



What are Cyber-Physical Systems?

- **Cyber**
 - computation, communication, and control that are discrete, logical, and switched
- **Physical**
 - natural and human-made systems governed by the laws of physics and operating in continuous time
- **Cyber-Physical Systems**
 - systems in which the cyber and physical components are tightly integrated at all scales and levels



Some Typical CPS Characteristics

- Cyber capability in every physical component
- Networked at multiple and extreme scales
- Complex at multiple temporal and spatial scales
- Highly automated, real-time control loops at scales
- Dynamically reconfigurable and re-organizable
- Innovative computational & physical substrates including biological, flexible hybrid electronics, MEMS
- Dependable and certified in practice



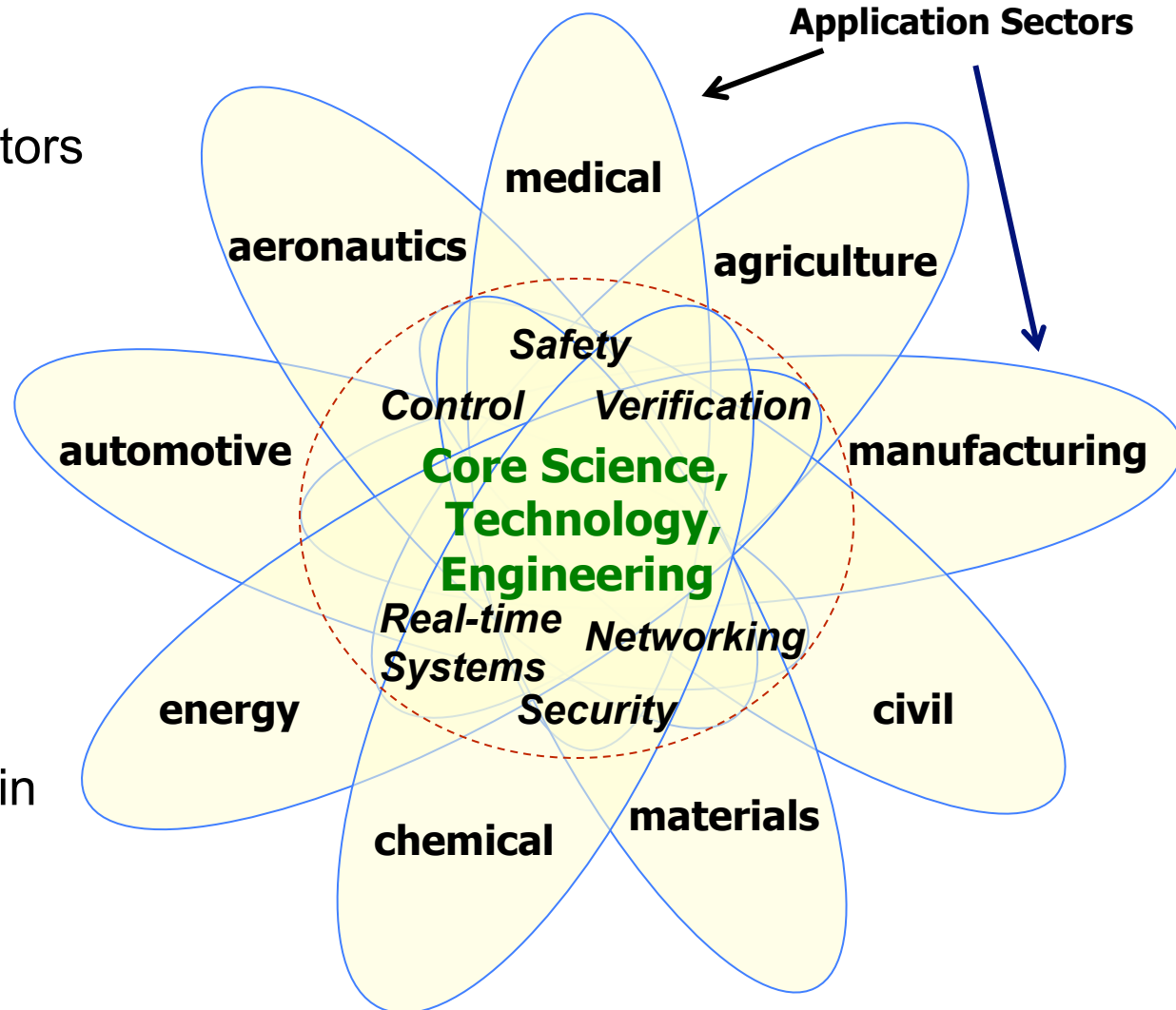
What are **Not** Cyber-Physical Systems?

- **Not** desktop computing
- **Not** traditional high-performance, high-end computing
- **Not** isolated embedded real-time components
- **Not** today's sensor nets
- **Not** post-hoc bolt-on electronics
- **Not** cyber that is *merely appliqué*d on the physical
- **Not** physical with commodity "computing as parts" that are "*bolted-on*"
- **Not** just simulations/models of physical systems
- **Not** scientific data acquisition/control of experiments



NSF model for expediting progress

- Abstract from sectors to more general principles
- Apply these to problems in new sectors
- Build a new CPS community
- Encourage other communities to join





Goals of the NSF CPS Program

- Enable a new research community and workforce
Address the challenges of next-generation systems
- **Bridge previously separated areas of research**
Develop a unified systems science for cyber-physical systems
- Develop new 21st century educational strategies
Create a knowledgeable CPS workforce and public internationally
- Support foundational and translational research that will be transformative
Move from ad hoc to grounded, assured development



Goals of Workshop

- Provide Community input to NSF for CPS Medical research agenda
- What are the challenges where CPS can help?
- What foundational CPS research can provide high leverage to enable medical breakthroughs?
- Produce a timely, impactful workshop report