

# CPS Summit

## Holistic Approaches to Cyber-Physical Integration

Thursday evening - Friday, April 24-25, 2008

St. Louis, Missouri, USA

### *Preliminary Agenda*

**Note:** Before the Summit, attendees should

- read the *CPS Executive Summary* that will be available on the CPS Summit website: <http://varma.ece.cmu.edu/Summit/>
- review this Agenda, including the Breakout Session questions on page 2
- review the Proposed Outline for the CPS Summit Report to NSF on page 3

### Thursday, April 24, 2008

#### Evening

- 06:00 pm      *Social Hour*
- 07:00 pm      *Dinner*
- 08:00 pm      CPS Summit Kickoff
- “A Vision for CPS”, [Dr. Jeannette Wing](#), Assistant Director, NSF
  - “What’s happened so far”, [Dr. Helen Gill](#), Program Director, NSF CISE CNS

### Friday, April 25, 2008

#### Morning

- 07:30 am      *Breakfast*
- 08:00 am      CPS Overview & Q&A: Members of the Organizing Committee
- 08:30 am      Organization of the Breakout Sessions
- 08:45 am      Breakout I (see page 2)
- 10:00 am      *Coffee Break*
- 10:15 am      Breakout I - continued
- 11:15 am      Plenary – Reports from Breakout I
- 11:45 am      *Lunch*

#### **Afternoon**

- 12:30 pm      Breakout II (see page 2)
- 14:30 pm      Break
- 14:45 pm      Breakout II - continued
- 15:45 pm      Plenary – Reports from Breakout II
- 16:30 pm      Wrap up: Plans for writing the Workshop Report

## **Guidelines for Breakout Session Discussions**

- The aim of these discussions is to identify the key points that should appear in the report for NSF to be prepared after the workshop (see pg. 3).
- Questions/topics below and the draft outline of the final report are suggestions. Participants should introduce and organize topics as they see fit.
- Think in terms of a 7-9 year NSF initiative.
- Mid-range (3-5 years) and long-term (7-9 year) goals should be identified wherever appropriate.
- Each session should culminate with a prioritization of the key points to be presented as a summary at the plenary reporting sessions.
- Keep notes from the discussion kept to serve as a resource for preparing the final report.

## **Morning Breakout Sessions (2 hr 15 min, 8:45-10:00, 10:15-11:15)**

- All groups will discuss and identify the following
  - 3-5 grand challenge problems (15-to-20-year-out visionary applications)
  - 3-5 top scientific/theoretical challenges
  - 3-5 top technological challenges

## **Afternoon Breakout Sessions (3 hr, 12:30-14:30, 14:45-15:45)**

Create initial assignments to groups that cut across domain boundaries. Allow participants to move to other groups if they prefer.

- **Group 1: Architecture for a CPS research initiative**
  - What disciplines and domains should be included in a CPS program?
  - What types of projects will be most effective (emphasis, duration, size, etc.) over the program life cycle?
  - How should interdisciplinary research be encouraged and structured?
  - How should industrial collaboration be encouraged and supported?
  - What on-going participation and dissemination mechanisms are fundamental to a successful CPS program? (workshops, open source, SBIR, ...?)
- **Group 2: Scientific Foundations of CPS**
  - What fundamental questions need to be addressed?
  - What are the new elements needed in a science of CPS?
  - What do we anticipate will be the foundational disciplines?
  - What cross-disciplinary barriers need to fall?
  - What barriers need to be addressed within the foundational disciplines?
- **Group 3: Engineering and Technological Foundations of CPS**
  - What should the goals and expectations be for developing tool chains for analysis, design, and implementation?
  - What types of testbeds are needed and how should they be developed and supported?
  - What technological substrates and architectures are needed to enable CPS (HW, networking, and SW)?
  - What is required to achieve high-confidence and security technology substrates?
  - What might future CPS certification practice look like?
- **Group 4: Broader Impact of CPS**
  - What are the broader societal impacts of CPS and how should they be addressed in a CPS research program?
  - What are the educational issues and how should the CPS research initiative address them at the graduate/undergraduate/K-12 levels?
  - How should technology transition be encouraged and supported?
  - What are effective mechanisms for supporting international collaboration?
  - How can the NSF CPS initiative be coordinated with other government and industrial initiatives?

# Draft Outline for the Report from the CPS Summit

## 1. The CPS Vision

- grand challenge problems
- scientific challenges
- technological challenges

## 2. Architecture of a CPS Research Initiative

- scope: disciplines and domains
- types of projects over the program life cycle
- structure of interdisciplinary projects
- models for industrial collaboration
- dissemination of results

## 3. Scientific Foundations

- fundamental questions
- elements of the science of CPS
- foundational disciplines
- interdisciplinary barriers
- intra-disciplinary barriers
- motivating applications

## 3. Engineering and Technological Foundations

- vision for tool chains that support analysis, design, implementation, and certification
- development of test beds
- technological substrates and architectures
- high confidence and security
- off-line computational tools
- on-line capabilities
- certification

## 4. Broader Impact

- societal impacts of CPS
- addressing societal impacts in the CPS research program
- education: graduate/undergraduate/K-12
- addressing education in the CPS research program
- technology transition
- international collaboration