2nd Workshop on

Analytic Virtual Integration of Cyber-Physical Systems

AVICPS

AVICPS '11 is held in conjunction with the
32nd IEEE Real-Time Systems Symposium (RTSS '11)
November 29 - December 2, Vienna, Austria

www.analyticintegration.org

Cyber Physical Systems (CPS) are software-based systems that control and interact with physical processes. Such systems play a key role in an ever-increasing number of industries spanning medical devices, automotive electronics, industrial automation, avionics and energy systems. For example, over 80% of the innovations in automotive systems are for cyber-enabled system capabilities. Modern aircraft are designed as distributed components, which are then "*virtually integrated*" before physical integration.

However, the co-design of physical platforms, control systems, and embedded software systems and their tight integration also creates a high degree of complexity of interactions within and across these systems. This integration process far exceeds the capability of existing system composition technologies. These technologies are of paramount importance to industries that integrate independently developed parts into their final products. Furthermore, even though analytical models of such systems are currently used to predict different system-level properties they are often developed on a property-by-property basis by different teams leading to inconsistent assumptions and conclusions. The lack of effective system-wide analytical results prevents the discovery of design flaws that stem from the interaction complexity of the system parts; i.e. prevented until the system is physically integrated. Due to such flaws, the system integration time often exceeds 50% of the total development time for non-safety critical applications. In safety critical systems, such as avionics, the system integration and certification time often exceeds 70% of total development time and costs.

Looking ahead, the success of next generation CPS systems demands system-wide architecture design patterns and supporting technologies that can integrate legacy components, COTS components and co-designed new components in such a way that properties such as real-time, safety, fault tolerance and security can be analyzed and predicted before the systems are physically built. Moreover, it is necessary to have a system-wide composition model that integrates the different analyses into a single consistent semantic framework to avoid conflicting results.

This workshop focuses on analytical system composition technologies that include:

1) Composition technologies to automatically propagate the impact of modifications in one modeling domain into others.
2) Assumption resolution between modeling abstractions and constructs of different analysis domains.
3) Analytical techniques that leverage architecture abstractions to address scalability.
4) System-level schedulability optimization technologies that integrate constraints imposed by other analytic domains (E.g: security, mechanical stress, heat dissipation, etc.)
5) A quantitative and early analysis of the system architecture performance in an end-to-end fashion
6) Fault tolerance technologies and reliability analysis techniques that integrate the different natures of physical, hardware and software faults in a common, consistent framework.
7) Safety analysis such as model checking for mixed criticality CPS applications, for example, flight management systems and/or safe medical devices plug and play (MDPnP)
8) Security protocol development and verification techniques for CPS applications.
9) Models for describing/quantifying the environments where such systems must operate.

The goal of this workshop is to explore architecture design patterns, tools and the theoretical analytical foundations for creating common system-wide composition models where key properties can be studied and guarantees provided before the start of actual development. Of particular interest are the case studies on the challenges of expressing the properties of the final product in terms of component properties and the architecture that governs their interactions. Both solutions and/or open problems are welcome.

PAPER SUBMISSION

Submissions should be no more than 8 pages in two-column, single-spaced, 10 pt format. For more details please see http://www.analyticintegration.org

IMPORTANT DATES

Submission deadline:	September 23, 2011 (Extended!)
Notification:	October 25, 2011
Camera-ready version:	November 3, 2011
Workshop:	November 30, 2011

ORGANIZERS

Rahul Mangharam. University of Pennsylvania. (co-chair)
Peter Feiler. Software Engineering Institute (SEI) (co-chair)

PROGRAM COMMITTEE

Kirstie Bellman, Aerospace Corp.
Jerome Hugues, Institut supérieur de l'aéronautique et de l'espace (ISEA)
Bruce Krogh, Carnegie Mellon University.
Jorgen Hansson, Chalmers University.
Dionoso de Niz. Software Engineering Institute (SEI)
Sibin Mohan. University of Illinois at Urbana-Champaign (UIUC)
Thomas Noll, RWTH Aachen
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Eric Senn, Université de Bretagne Sud (UBS)
Mirko Jakovljevic, TTTech
K. C. Shashidhar, Max Planck Institute for Software Systems, Germany
Ken Butts, Toyota
Rodolfo Pellizzoni, University of Waterloo
Boudewijn Haverkort, University of Twente and Embedded Systems Institute
Oleg Sokolosky, University of Pennsylvania
Marco Caccamo, University of Illinois at Urbana-Champaign (UIUC)

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