

## 4<sup>th</sup> ICSE Workshop on Component-Based Software Engineering: Component Certification and System Prediction

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### Abstract

*This workshop brings together researchers from the areas of component trust and certification, component technology, and software architecture. The goal of this workshop is to ensure that work in the areas of certification of software components and architectural analysis for prediction of system quality attributes will be mutually aware, if not mutually reinforcing. The output of the workshop will be a defined set of community model problems that reflects this intersection of interests.*

### Keywords

Software component, software architecture, component certification, compositional reasoning

### 1. Background

The critical role of software components in modern business systems is no longer a matter of analyst speculation but rather an accomplished fact. However, consumers of components are concerned about the trustworthiness of components developed by third-party providers. This concern is reflected in the recent attention to issues of component certification. Indeed, Underwriter Laboratories (UL) has already ventured into the arena of certifying software in programmable components, a fact that demonstrates the economic incentives in improving the level of trust in software components. Efforts to improve the level of trust in software components has also drawn the attention of researchers, as is evidenced by the work of the Trusted Components Initiative as well as the recent development of a variety of technical foundations or independent component certification.

Yet, despite these efforts, fundamental questions remain. What does it mean to trust a component. What technical and/or social processes are needed and appropriate for generating trust? Which properties of a component make it trustworthy? Still more fundamental: what ends are served by certifying (or developing trust) in these properties? Assume, for example, that we can devise a measure of reliability for software component; what would this tell us? It may reveal something essential about the component, but this knowledge would not necessarily translate to a measure of reliability for systems that use the component. Moreover, there are many other properties of interest besides reliability, including responsiveness, throughput, security, availability, modifiability, testability, and so forth. Without the ability to perform compositional reasoning over a variety of quality attributes, trustworthy components may be little more than a chimera.

The study of software architecture provides techniques for compositional analysis that can be applied to assemblies of components. The conceptual languages of software architecture and software components have much in common. Two key concepts of software component technology, component models and their implementation by component infrastructures, allow us to think of component technologies as a direct embodiment of architectural style, while component infrastructures provide a compose-time and run-time environment to enforce these style constraints.

Software architecture analyses are based, at least in part, on the properties of a system's architectural components and their interconnections. The utility of such predictions is greatly enhanced if the properties of software components are certifiably conformant to the properties of the architectural components they implement. Conversely, the utility of component certification, or some other means of achieving trust in component properties, is greatly enhanced if certified properties are linked with compositional reasoning.

## 2. Workshop Goals

This workshop brings together researchers from the software architecture, software components, and trusted components communities. The goal of this workshop is to develop a shared understanding of how the work of these communities can lead to the twin objectives of certifiable component properties and predictable assembly of components. The concrete objectives for the workshop are to:

- Define the problem space, for example software properties amenable to compositional analysis, measurement, and prediction.
- Specify one or more open problems, "grand challenges", or critical gaps that can provide a cynosure for community development.
- Relate the research activities of targeted workshop participants to community problems and identify collaboration potential.

## 3. Workshop Participation

The workshop is open. Those attending the workshop were encouraged to submit position papers. These position papers were prioritized by relevance to the goals and objectives of the workshop. The most relevant papers are included in the workshop proceedings. These papers relate to the concrete workshop objectives listed above and state a position with respect to the following issues:

1. What do developers want to predict about component assemblies?
2. What compositional reasoning techniques are available to support prediction?
3. Which of these techniques benefit from knowledge of component internals and what do they need to know?
4. What can be known about component properties in the absence of knowledge of the context in which it will be deployed and used?
5. How do we measure those properties and what degree of precision is required?
6. How is this information made available by the component?

Position papers were posted at the workshop's web site in advance of the workshop, providing a forum for advanced discussion and group development of the workshop agenda.

## 4. Workshop Agenda

The workshop is broken into eight sessions; six working sessions sandwiched between a welcome session and a closing session. The opening session includes introductions to the three focus areas: component trust and certification, component technology, software architecture.

The six working sessions each focus on one of the six issues listed above starting with a short presentation by the session chair describing the issue and its relationship to the other five issues. Where appropriate this presentation includes synopses of some attendee positions on the question at hand. The closing session reviews of the six working sessions and discussion of directions for follow-on research.

## 5. Workshop Program Committee

Jan Bosch, University of Groningen, The Netherlands  
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