Abstract

This poster presents the objectives of my present work within a team of the ParaDiSe Laboratory. Our team focuses on the Verification of Component-Based Systems. The main results of my present work will become a part of my Ph.D. thesis.

1 Introduction

Component-based systems (CBSs)

- Benefits of
  - reusing prefabricated components
  - increasing flexibility of software products
  - reducing development costs

- New issues
  - components delivered by third parties
  - no source code available
  - component environment changes (reconfiguration)

- Serious questions on the correctness of
  - each primitive component
  - third party certification
  - the assembled system
  - verification of component interactions

2 The topic of my research

Formal analysis of CBSs in view of component interactions

- Verification of coordination errors
  - Deadlock, computational progress, ...
  - Interaction between specific components

- Reconfiguration correctness
  - Component substitutability
  - Regression verification

- Assembly strategies
  - Identification of proper components
  - Binding of the components together

- Component-interaction analysis
  - Component placement in a distributed environment
  - Identification and removal of inactive components

Formal methods are applied to a formal model of the reality, not the reality itself. There is a need for a formal specification language which could be used to create the model of a real system.

3 A language for specifying component interactions

Component-Interaction automata (CI automata)

Proposed in [1] on the Faculty of Informatics MU

- Flexible – respect various component models
  - Respect the architecture of a system
  - Single/multiple bindings on interfaces
  - Synchronization strategies

- Capture important information
  - Components – participants of communication
  - Hierarchical structure of the system

- Produce models of manageable size
  - To enable automated verification and formal analysis

Example of a CI automaton for a specific system:

4 Other early results

- Behavioural equivalencies
  - component equivalence
  - component substitutability
  - specification/implementation relation

- Composition operator
  - with respect to the architecture
  - with respect to synchronization

- Temporal logic for formal verification
  - respecting both state-based and action-based properties

5 Future work

We aim to address the issues that were mentioned above. In particular the verification of coordination errors, reconfiguration correctness, assembly strategies, and other formal analytical techniques for CBSs in view of component-interactions.