

# Introduction from the session chair

## Component-based development process

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In a component-based development process we distinguish development of components from development of systems [1]. When developing component-based systems we focus on identification of reusable entities and selection of components that fulfils system's requirements. When developing components our focus is on reusability. Components are developed as reusable entities to be used in many products. For this reason they must be general enough but also sufficiently specific to be easily identified, understood and used. Components communicate with their environment only through the interface, so it is the interface which provides all the information needed and it is only the interface that provides this information. For this reason it is natural that component-development is interface-focused. One of the main challenges of component development is to design an appropriate interface.

The development of systems as an assembly of components is similar to the development of non-component based systems but there is an important difference in a component-based system development process. The emphasis is not on the implementation of the system designed. The emphasis is rather on the reuse of pre-existing components. This approach has many obvious advantages but also a number of disadvantages. It is first necessary to find reusable units which will meet the requirements specified and will be compliant with the system design. Secondly, the amount of extra effort required to use reusable units instead of units dedicated to a particular purpose must be determined. There are several questions that must be decided upon before acquiring component-based development; How much performance overhead can be tolerated? How far can we trust component specifications (if we have any)? How can we test these components?

In component-based development the implementation part will be decreased as already existing components will be used. However some other phases require more efforts. These phases are requirement analysis and specification, component evaluation, system integration, test and verification. For example in requirement analysis the first task is the capture of the system requirements and the definition of the system

architecture. The second task is the identification of component requirements to permit the selection or development of the required components. However is not easy to derive component requirements from system requirements and we must accept that they may be (as requirements often are) inconsistent, insufficient and not precisely defined. The process of finding components to meet these requirements may be even more difficult. We can be almost certain that we will not find any component which exactly satisfies the requirements. The next problem that we will meet is the problem of incompatible component assemblies; even if we find components which meet the component requirements defined, it is not at all certain that they will interact as intended when assembled. In reality the process of design and even requirements engineering will be combined with component selection and the evaluation process.

The process of evaluation will include several aspects, of both technical and non-technical nature. Technical aspects of evaluation include integration, validation and verification. Examples of non-technical issues include the marketing position of the component supplier, maintenance support provided, alternative solutions, etc. In many cases, it may be more relevant to evaluate a set of components composed as an assembly than to evaluate a component. There maybe a case where each component is correct but assembled together do not work correctly.

Similar challenges we can find in other phases of the development process. The efficient methods that can meet these challenges are still not established in the practice, and there is a lack of supporting tools. For this reason the component-based development process is a topic of high interest for research, case studies and experience reports.

### Reference

- [1] Ivica Crnkovic, Magnus Larsson: Building reliable component-based systems, Artech House Publisher, 2002.