An Overview of Component Models: Part 1

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Outline

- Component Models
  - Kmelia Component Model [5 Papers]
  - Fractal Component Model [1 Paper + 1 Technical Report]
  - Kmelia and Fractal Models: Comparison
- Perspectives

Kmelia is a Formal Component Model [Attiog06]

$Component \stackrel{def}{=} < \mathcal{W},\ Init,\ \mathcal{A},\ \mathcal{N},\ \mathcal{I},\ \mathcal{D}_s,\ v,\ \mathcal{C}_s >$

- $\mathcal{W} \stackrel{def}{=} < T,\ V, V_T,\ Inv >$
- $\mathcal{D}_s \stackrel{def}{=} < I_s,\ \mathcal{B}_s >$
  - $I_s \stackrel{def}{=} < \sigma,\ P,\ Q,\ V_s,\ S_s >$
    - $S_s \stackrel{def}{=} < sub_s,\ cal_s,\ req_s,\ int_s >$
  - $\mathcal{B}_s \stackrel{def}{=} < S,\ L,\ \delta,\ \phi,\ S_0,\ S_F >$

$Assembly \stackrel{def}{=} < \mathcal{C},\ links,\ subs >$

A component composition is defined as a well-formed assembly which is encapsulated within a component.

Kmelia is a Hierarchical Component Model [Pascal06]

- Services in Kmelia are not simple operations
- Kmelia introduces the concept of Assemblies
- Kmelia proposes three hierarchy levels :
  - Links Hierarchy
  - Services interfaces Hierarchy
  - Component Composition is an encapsulation of an assembly

Kmelia defines Components Protocols [Pascal07a]

- A protocol is a pre-ordering of services calls that should be respected during the system execution.
- A protocol has a behavior
- A protocol in Kmelia is a specific service defined using vertical structuring operators
  - Sate annotation << >>
  - Transition annotation [[ ]]
- Protocol inconsistency detection can be made using pre/post conditions.

Kmelia introduces HBIDL to describe components and services [Pascal07b]

- HBIDL extends IDL by the specification of the behavior of services with their architectures
- HBIDL has many advantages:
  - provides detailed documntations of complex interaction services
  - supports compatibility levels
  - serves as an intermediate between CBSE and SBSE
- HBIDL has some adaptation problems such as:
  - Parameters vs Messages mismatch
  - Hierarchichal mismatch

Kmelia has a Formal Anlyser Toolbox: COSTO [Pascal07c]

- COSTO is a toolbox that supports the design and analysis of Kmelia's abstract component model
- COSTO is an eclipse plugin
- COSTO toolbox includes:
  - COSTO core module
  - Verification module
  - LOTOS Module
  - MEC Module
  - Export Module
- COSTO takle state explosion problem

Fractal Component Model (1) [Bruneton04, Bruneton06]

A Fractal Component is an entity that has two parts:

- Membrane
- Content

Fractal Model supports three kind of Components:

- Basic Components
- Primitive Components
- Composite Components

Fractal Supports two kinds of Components Binding:

- Primitive binding
- Composite Binding

Fractal Component Model (2) [Bruneton04, Bruneton06]

Fractal Component Model has the following main features:

- Fractal is a hierarchical model
- Fractal supports sharing components
- Fractal is a reflective model
- Fractal has an implementation model named Julia

Kmelia and Fractal Component Models

- Kmelia is Service Based Model $\neq$ Fractal is a Component Based Model
- Kmelia follows monadic semantics $\neq$ Fractal follows semi-polyadic semantics
- Three hierarchy levels are allowed in Kmelia $\neq$ One hierarchy level for Fractal
- No sharing Components for Kmelia $\neq$ Sharing Components is allowed with Fractal
- reconfiguration is limited in Kmelia $\neq$ reconfiguration is more developed in Fractal

Perspectives