Towards Context Independent Extra-functional Properties Descriptor for Components

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Motivation

Components

- Components independently deployable
- Third-party composition

Problem

- Developer needs to verify components compatibility
- Need for extra-functional properties

Extra-functional Properties

- Guarantee level of quality
- Must be context independent in area of components
Extra-functional Properties (EFPs)

- EFP stored in registries
- Global registry - definitions of EFP
- Local registry - context values

Figure: Components related to registries
Figure: Example of registry usage
Formalisation of Extra-functional Properties

- We defined meta-model and mathematical formulations

\[
\begin{align*}
    e_{\text{simple}}^{\text{def}} &= (n, \gamma, t, \text{META}) \\
    e_{\text{derived}}^{\text{def}} &= (n, E, \gamma, t, \text{META}) \\
    e_{\text{deployment_contract}} &= e_{\text{simple}} \lor e_{\text{deployment_contract}} \\ &= e_{\text{derived}}
\end{align*}
\]

- \( n \) the name of a property
- \( \gamma \) comparing function
- \( t \in \{\text{real}, \text{integer}, \text{boolean}, \text{enum}, \text{set}, \text{ratio}, \text{string}\} \) - a data type
- \( \text{META} \) - extensible information
- \( E = \{e_1, \ldots, e_N\} \) properties composing this derived ones
Extra-functional Properties in Global Registry

Global registry

\[ GR = (\text{loc}, \{e_i\}) \]  

\text{loc} \quad \text{registry’s URI location}

\{e_i\} \quad \text{a set of (simple or derived) extra-functional properties}
Local registry

\[ LR = (\text{loc}, \text{loc}_{gr}, S, D) \]  \hspace{1cm} (5)

- \text{loc} \quad \text{the URI of the registry}
- \text{loc}_{gr} \quad \text{a link to the global registry}
- \text{S} = \{ s_i \} \quad \text{set defining context dependent values}
- s_i = (name, value\_name, range) \quad \text{a tuple of a property name, a value name and the value’s range}
Extra-functional Properties in Local Registry (II)

Local registry (continued)

\[ LR = (loc, loc_{gr}, S, D) \]

\[ D = \{ d_i : \{ r_{i1}, \cdots, r_{ik} \} \} \] set of rules expressing that a derived property \( d_i \) is given by \( r_{ij} \) rules

\[ d_i = (name); \] a derived property name

\[ r_{ij} : F \Rightarrow x; x = value\_name \text{ or } x = value \in T^{enum} \] is a name or an enum value, \( F \) is a logical expression
Attaching Extra-functional Properties To Components

- Each component links the particular registry
- Only EFPs selected from global registry are allowed

Figure: Assignment of property to component or features
Example of assignment

ExtraFunc-Catalog: http://services.kiv.zcu.cz/v1/

Bundle-ExtraFunc:
  performance = sufficient,
  update_period = 3.0

Bundle-DeplConstr: db_engine = \{db = Oracle, transactional = true \}

Provided-Services: cz.zcu.kiv.services.DataReader;
  extrafunc=(data_transferred = average,
              time_to_process = low)

Bold text

ValueName

AvailableValue
Open Issues

Technical Issues

• Versioning of registry
• A location of registry files need to be considered

Research Issues

• Properties computed as functions depending on environment
• Better formalisation of context
• Composition rules for derived properties has to be improved – they are currently computed at the Local registry level
• Function transforming values between contexts is desired

Thank you for your attention