Lifelong Verification of Dynamic Service Compositions

Università della Svizzera italiana

Domenico Bianculli

domenico.bianculli@lu.unisi.ch - Università della Svizzera italiana, Facoltà di scienze informatiche, Lugano, Switzerland

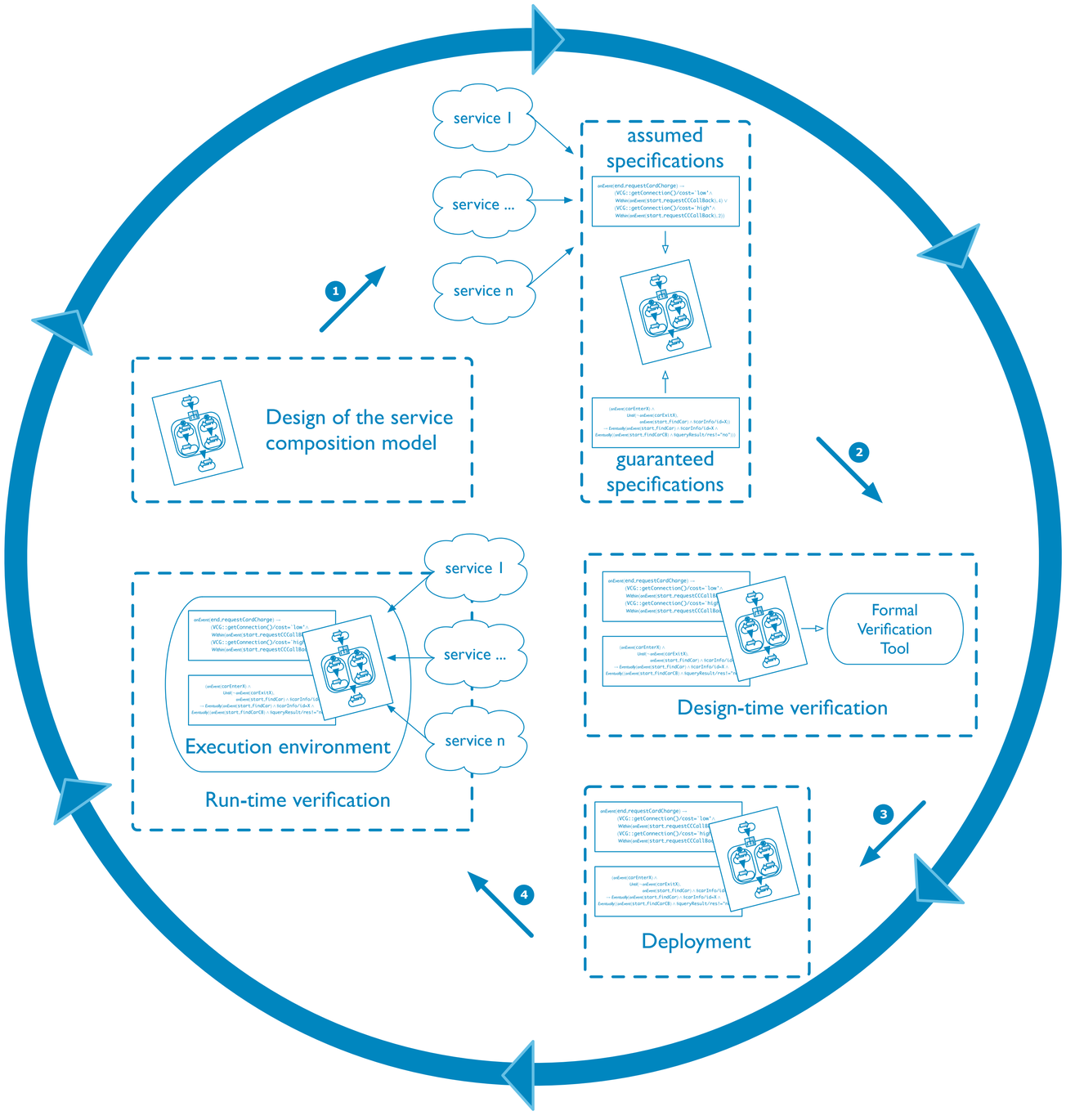
Advisor: prof. Carlo Ghezzi

Motivations

- Service-based applications are an instantiation of open-world software
- Service compositions are made out of components that are and remain out of the control of the service aggregator
- The dynamic characteristics of the services and of the environment may invalidate verification results obtained at design time
- Additional verification activities are required at run time
- Existing approaches focus on analysis and verification techniques only for a specific service life cycle phase

Approach

- Model-driven and technology-neutral approach for continuous lifelong verification
- Goal: to provide a methodology and the accompanying tools to engineer dependable service compositions
- External services are known through their *assumed* specifications
- A service composition is verified against some *guaranteed* specifications
- Reuse of existing work on service compositions modeling languages
- Contributions:
  - a formal specification language
  - a design-time verification technique
  - a run-time verification technique



Specification language

- Support for:
  - assertions on service state
  - properties on events traces
  - QoS attributes (response time, throughput, reliability)
  - stateless and stateful interactions
- Specifications can be associated with specific executions points
- Technology-neutral

Design-time verification

- Based on model checking
- Challenges:
  - finding the proper abstraction level for modeling the environment and the exchanged data
  - support for compositional verification
  - handling time-related and probabilistic properties

Run-time verification

- Architecture based on software monitors and failure detectors
- Goal: minimal execution overhead
- Design decisions:
  - how to collect and analyze data
  - degree of invasiveness of the instrumentation
  - timeliness in discovering undesirable situations