T-LADIES
Typeful Language Adaptation for
Dynamic, Interacting and Evolving Systems

WP2: Interaction Mechanisms

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Target

IoT applications are based on the interaction of "things" that dynamically vary in number and kind, which poses issues of correctness, dynamic evolution, and adaptation. Thus, the notion of interaction should be enriched to support variability, dynamic monitoring, property enforcing, and orchestration of "things"

⇒ Example of a system of systems (SoS) that consists of loosely coupled, distributed, and possibly heterogeneous entities that interact and cooperate — and whose functionality depends on other entities that enter into/exit from the SoS scenario

⇒ The agent metaphor provides the right level of abstraction to support dynamic interactions between low-level entities and high-level applications

⇒ Trust systems can support the dynamic evolution, variability, and adaptation of entities by measuring the level of mutual trustworthiness

T2.1: Design and implementation of dynamic monitoring [GE,MI,MR,PI]

- Devise micro-languages for the design and implementation of nodes able to dynamically monitor the correct interactions of entities in IoT systems [GE,MR]

- Develop a load and performance monitoring system for the Erlang ecosystem to be used to monitor the interaction of the micro-language based nodes with the IoT systems [GE,MR]

- Model the variability space of the micro-languages and their associated application features with concepts from (multi-) SPLs to study their compositionality, based on suitable interfaces mediating the interactions [MI,PI]

T2.2: High-level abstractions for intelligent integrating behavior [CT,MR]

- Investigate how software agents can be used to provide a layer of intelligent integration among distributed entities by using the abstractions provided by the AP JADE and its dedicated AOP language Jadescript [CT,MR]

- Study how agents can employ the tools for the rich description of interactions identified in the project to serve as flexible orchestrators of complex interactions [CT,MR]

- Provide the abstractions needed by lower levels of the application stack to use the services for the flexible coordination that agents provide [CT,MR]

- Investigate how agents can exploit information about entities' trustworthiness to improve the "quality" of the interactions among the distributed entities [CT,MR]

T2.3: First-class interaction protocols for dynamic adaptation [CT,GE,MI,MR,PI]

- Study the notion of first-class interaction protocols in the context of micro-languages based nodes to allow entities to exchange behavior and to obtain dynamic adaptation through interactions ("safe by construction") [GE,MR]

- Investigate safe communication (no message loss, no deadlocks, . . .) in SoS and criteria to ensure the preservation of such safe communication by composition/construction [PI]

- Explore the variability space of the evolution of micro-languages and associated features to adopt dynamic SPLs to orchestrate the dynamic evolution and reconfiguration of IoT systems via JavAdaptor and Erlang [CT,GE,MI,MR,PI]

- Study how to integrate information about the "quality" of the interactions (represented by a kind of feedback) into the interaction protocols [CT,MR]

Today

17:45–18:15 *Specification, Synthesis and Implementation of Contract-based Applications via Contract Automata* by Davide Basile [PI] [T2.3] [T3]

18:15–18:45 *A Brief Introduction to Software Agents and their Programming Languages* by Giuseppe Petrosino [MR] [T2.2]

18:45–19:00 Questions and (Maybe) Answers, Discussion and Brainstorming

Tomorrow

12:00–12:30   *Incremental variability models for language composition inference*
by Luca Favalli [MI] [T2.3]

12:30–13:00   *Featured Team Automata*
by Maurice ter Beek [PI] [T2.3]

Future

T2.1 [GE,MR]: micro-languages to monitor IoT systems + load & performance monitoring for Erlang ecosystem

[MI,PI]: compositionality of micro-languages through (multi-)SPLs (Paolini et al.)

T2.2 [CT,MR]: use software agents (intelligent integration, flexible orchestration & coordination, trustworthiness)

T2.3 [GE,MR,PI?]: safe "by construction" protocols & SoS

[CT,GE,MI,MR,PI]: orchestrate & reconfiguration of IoT systems via JavAdaptor & Erlang (Bettini et al.)

[CT,MR]: integrate trustworthiness into the protocols