Towards Self-Adaptable Languages

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Context

Software ...

- Evolves in complex/changing environments (e.g, Cloud, embedded systems)
- Needs dynamic adaptation to best deliver the service (e.g., Waymo, Netflix)

Software languages ...

- Can abstract concerns into high level constructs (e.g., memory management)

Vision : abstract self-adaption into high level language constructs

What are Self-Adaptable Languages (SALs) ?

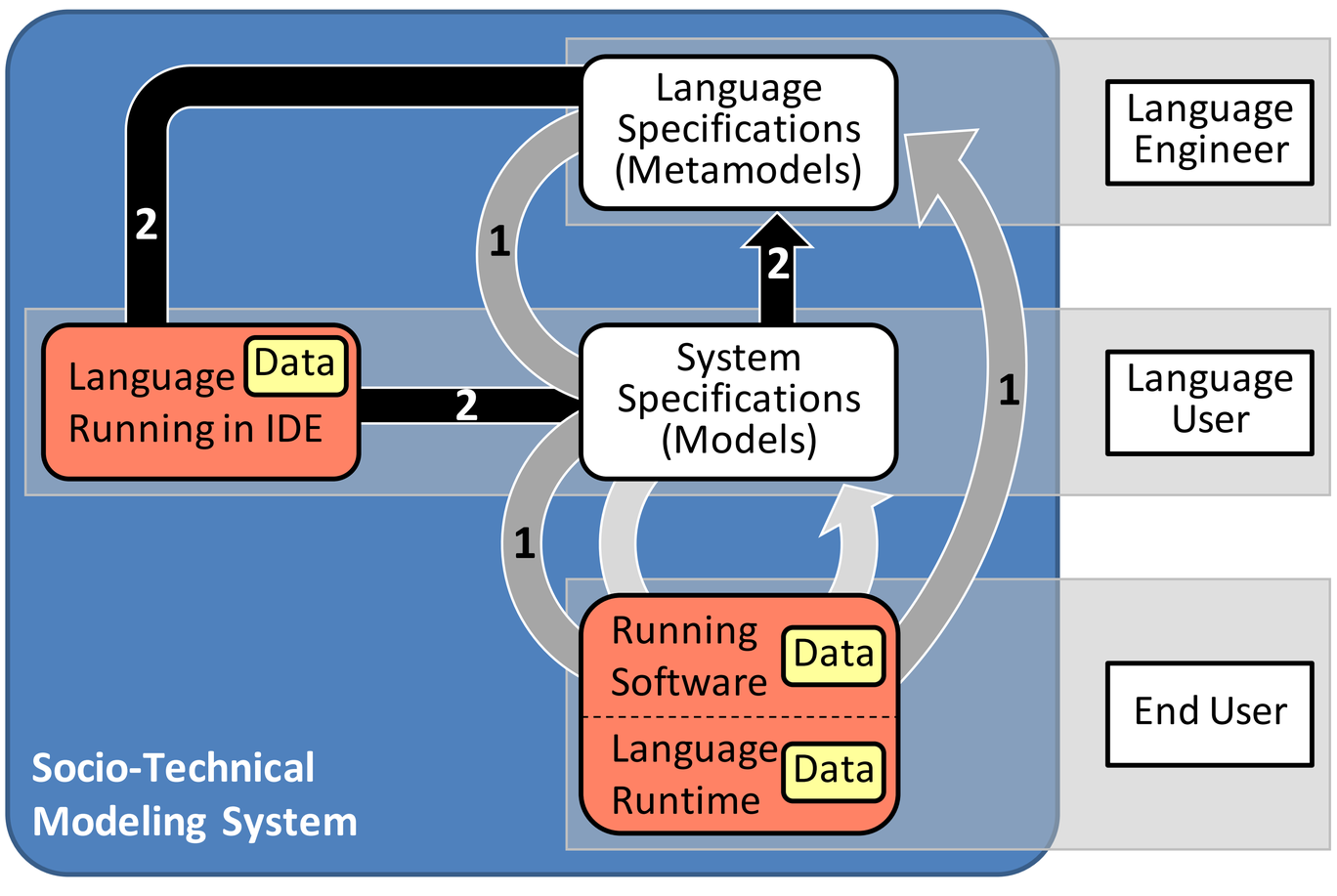
SALs abstract the design and execution of feedback loops in:

- The run-time environment
- The design-time environment

Concretely a Self-Adaptable Language:

1. Free the language user from the implementation of
   - The feedback loop
   - The associated trade-off analysis
2. Allow continuous and automatic evolution of itself

L-MODA Conceptual Framework *Languages, Models and Data*



L-MODA Conceptual Framework for Self-Adaptable Languages

1) Runtime Feedback Loop

Use information from stakeholders:

Language Engineer	→	Language specifications
Language User	→	System specifications
End User	→	Run-time data

Adaptation of language semantics

2) Design Feedback Loop

Use information from stakeholders:

Language Engineer	→	Language specifications
Language User	→	Systems specifications
	→	Design-time data

Adaptation of syntax, semantics and pragmatics

Research Roadmap

Support of the Runtime Feedback Loop

- Feedback loop setup and configuration
- A reference framework for common implementation [2]
- Tools for software analysis
- Tools for broader impact analysis

Support of the Design Feedback Loop

- Model the development context
- Detect evolution opportunities
- Navigate in evolution of programs
- Closed and open-world adaptations
- ...

Preprint QR Code

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References

[1] G. Jouneaux, O. Barais, B. Combemale, and G. Mussbacher, "Towards Self-Adaptable Languages," in *Onward! 2021 - ACM SIGPLAN International Symposium on New Ideas, New Paradigms, and Reflections on Programming and Software*, Chicago, United States, Oct. 2021. DOI: 10.1145/3486607.3486753.

[2] ——,"SEALS: A Framework for Building Self-Adaptive Virtual Machines," in *Proceedings of the 14th ACM SIGPLAN International Conference on Software Language Engineering (SLE '21)*, Chicago, United States, Oct. 2021. DOI: 10.1145/3486608.3486912. [Online]. Available: https://hal.inria.fr/hal-03355253.

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