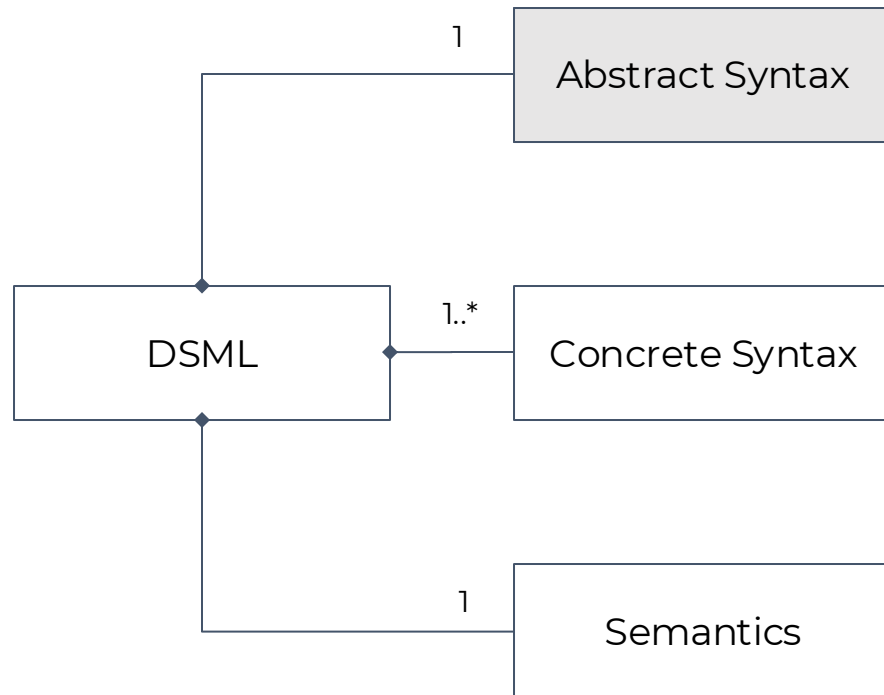




# **TOWARDS ACTIVE PARTICIPATION OF DOMAIN EXPERTS IN MODELING LANGUAGE EVOLUTION**

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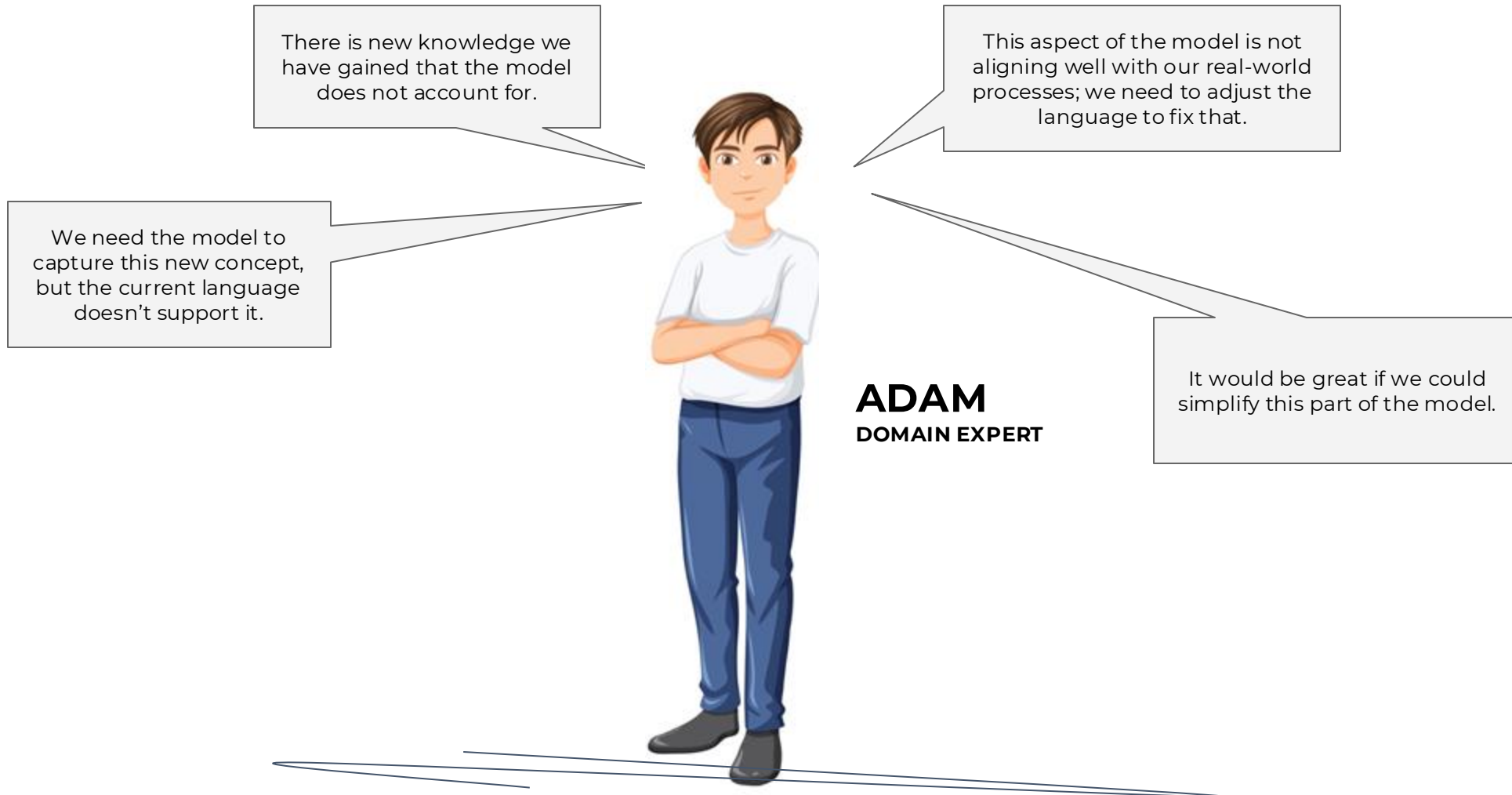
# DOMAIN SPECIFIC MODELING LANGUAGE EVOLUTION



## NEED FOR EVOLUTION

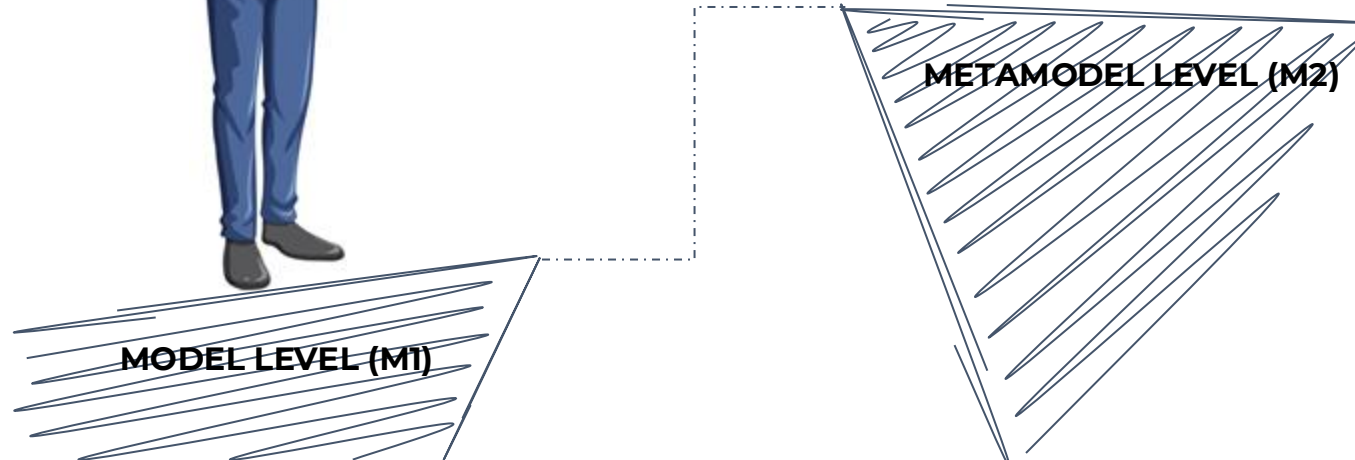
- changing domain requirements
- improved expressiveness
- technological advancements
- user feedback
- ...

# DOMAIN EXPERT'S PERSPECTIVE



# DOMAIN EXPERT'S POSITION

**ADAM**  
DOMAIN EXPERT



# COLLABORATION WITH DSML ENGINEER

**ADAM**  
DOMAIN EXPERT

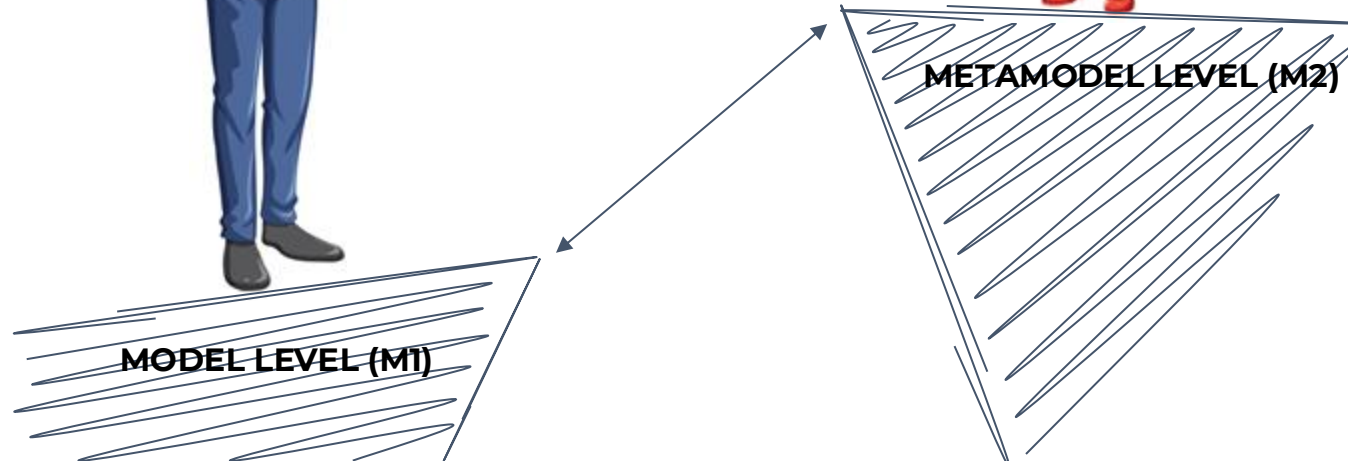


**MODEL LEVEL (M1)**

**EVA**  
DSML ENGINEER

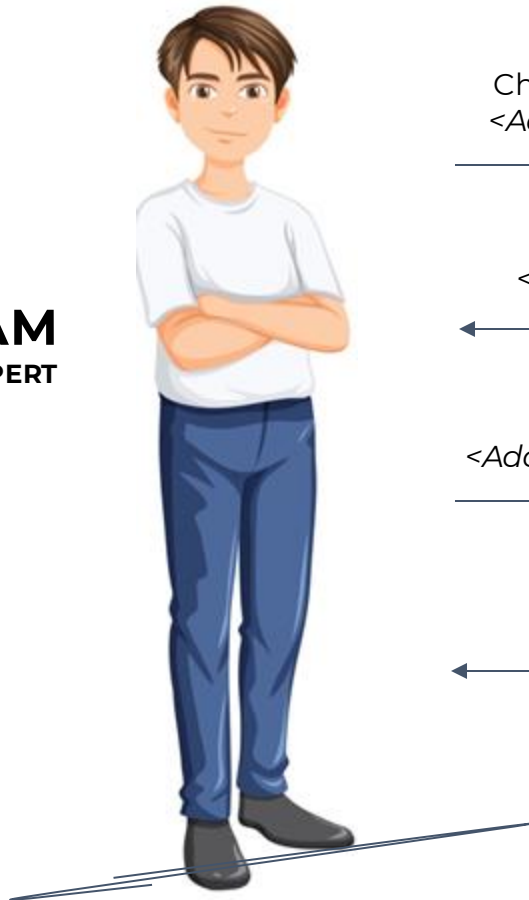


**METAMODEL LEVEL (M2)**



# COLLABORATION WITH DSML ENGINEER

**ADAM**  
DOMAIN EXPERT



Change the language in a way that I can  
<Adam's desired changes on the model>



Did you mean  
<Eva's interpretation of the changes>?



No, I do not mean that. I want  
<Adam's rephrasing of the desired changes>



Ok, there you go.




**EVA**  
DSML ENGINEER



# COLLABORATION WITH DSML ENGINEER

**ADAM**  
DOMAIN EXPERT



I tried instantiating models, but  does not align with what we wanted. The problem is <Adam's description of the problems>



Here is the updated version.



This does what we wanted, but I see now that it affects other parts that should have remained unchanged. <Describes the problem>



⋮



Oh, and the existing models should co-evolve with the language



**EVA**  
DSML ENGINEER



# ISSUES WITH CURRENT EVOLUTION PRACTICES

- Domain experts' participation is often limited to the **initial decision-making** stages, and final stages for **testing** the language.
- **Communication barriers, misunderstandings, and misalignments** between domain experts and DSML engineers can lead to inappropriate language evolution.
- **Iterative cycles lead to delays** and frustration as both parties strive to reach a mutual understanding and ensure proper outcome.
- **Example-driven** metamodel inducement methods are more suitable for building the metamodel from scratch, and **less efficient for evolution scenarios** where models already exist.



# ACTIVE PARTICIPATION OF DOMAIN EXPERTS

- **Increase domain experts' level of participation** in the evolution of modeling languages.
- Give them an **active role** not only in initial discussion and feedback provision, but also in the **technical implementation** of changes.
- **Lower the technical barriers** required for increasing the participation of domain experts in modeling language evolution.

# REQUIREMENTS FOR THE ENVISIONED SOLUTION

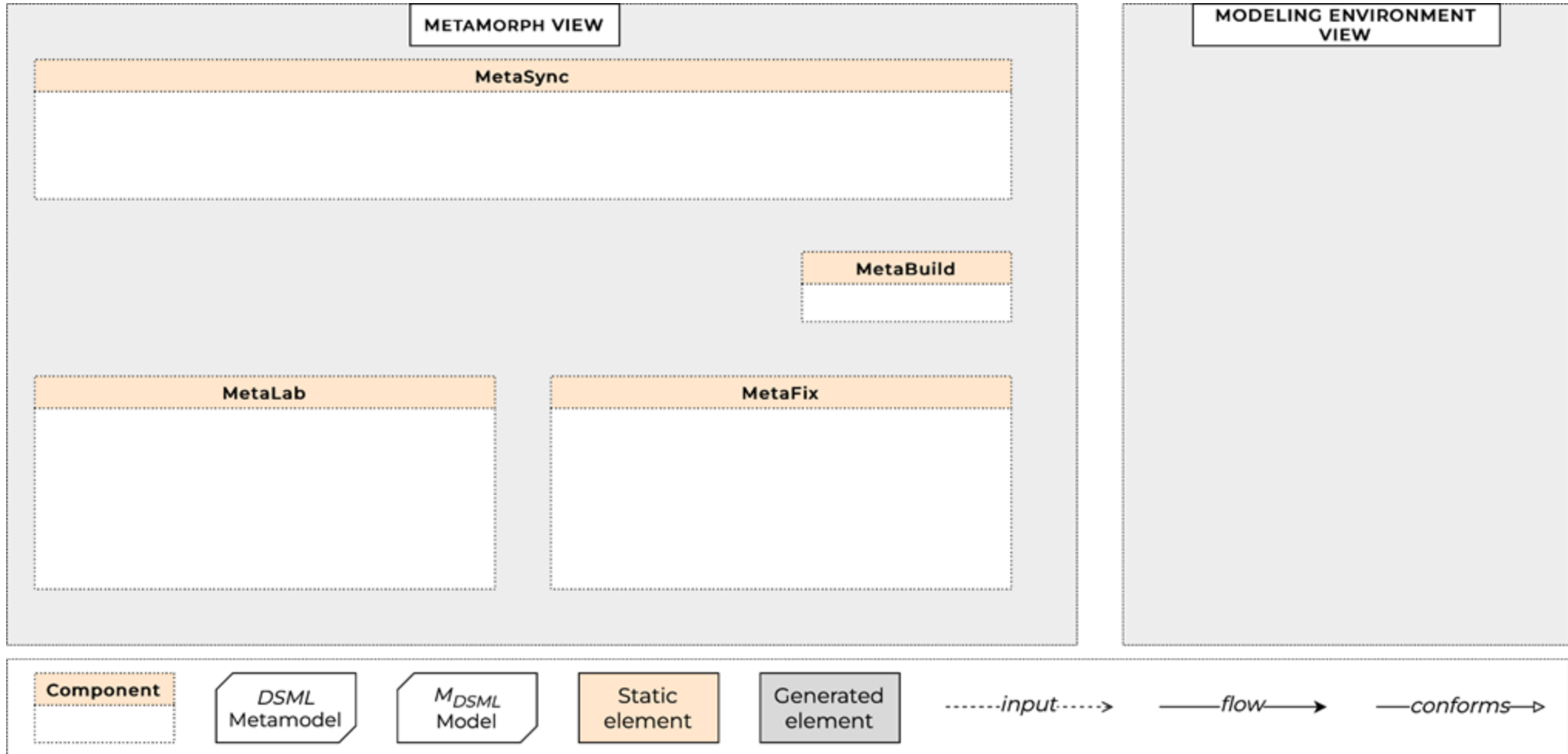
**REQ<sub>1</sub>** - Support the **specification of changes** through **model** instances used in practice.

**REQ<sub>2</sub>** - Implement **inconsistency management** strategies.

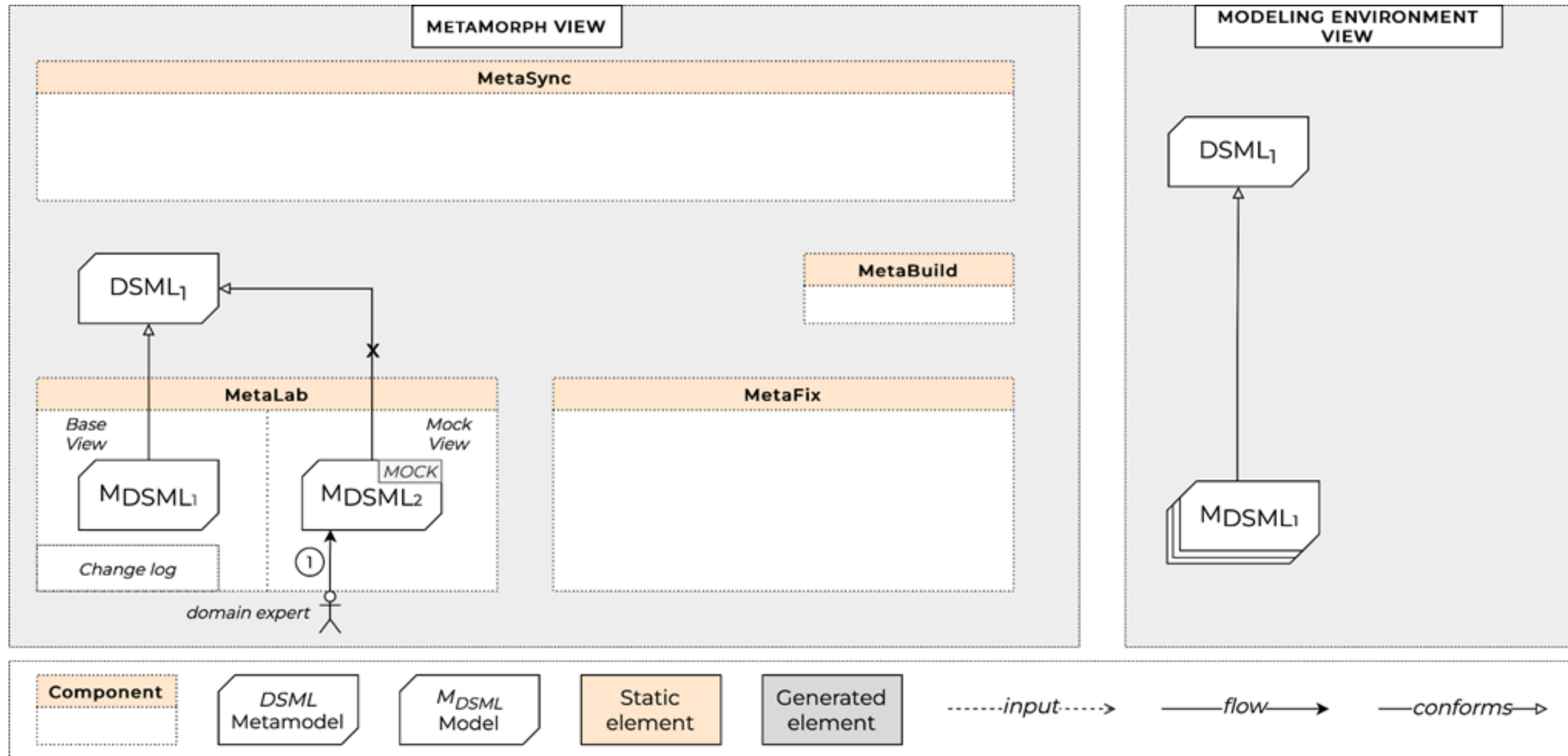
**REQ<sub>3</sub>** - Support the **generation** of the **evolved metamodel**.

**REQ<sub>4</sub>** - Support the **generation** of **model co-evolution** mechanisms.

# METAMORPH ENVISIONED SOLUTION

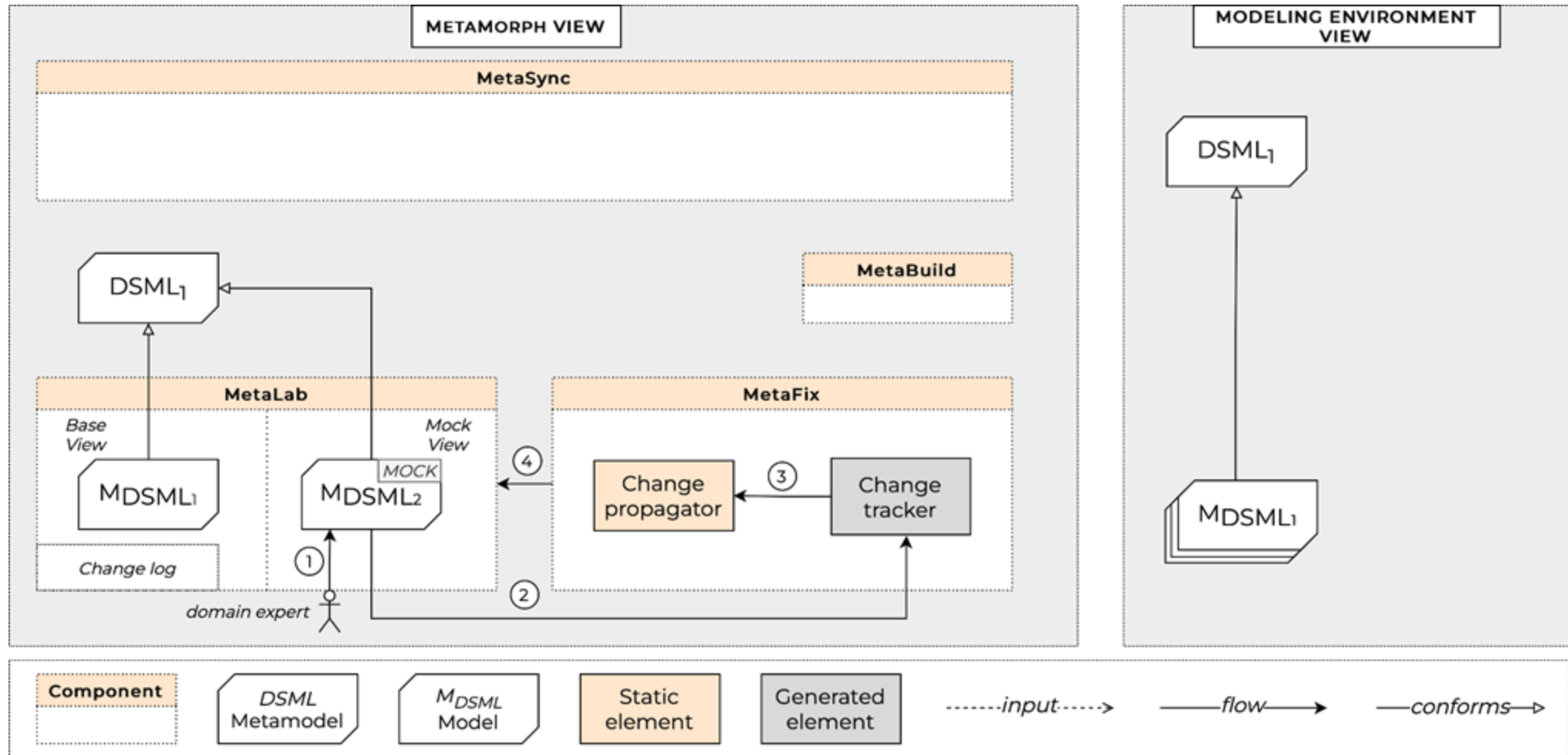


# METAMORPH ENVISIONED APPROACH



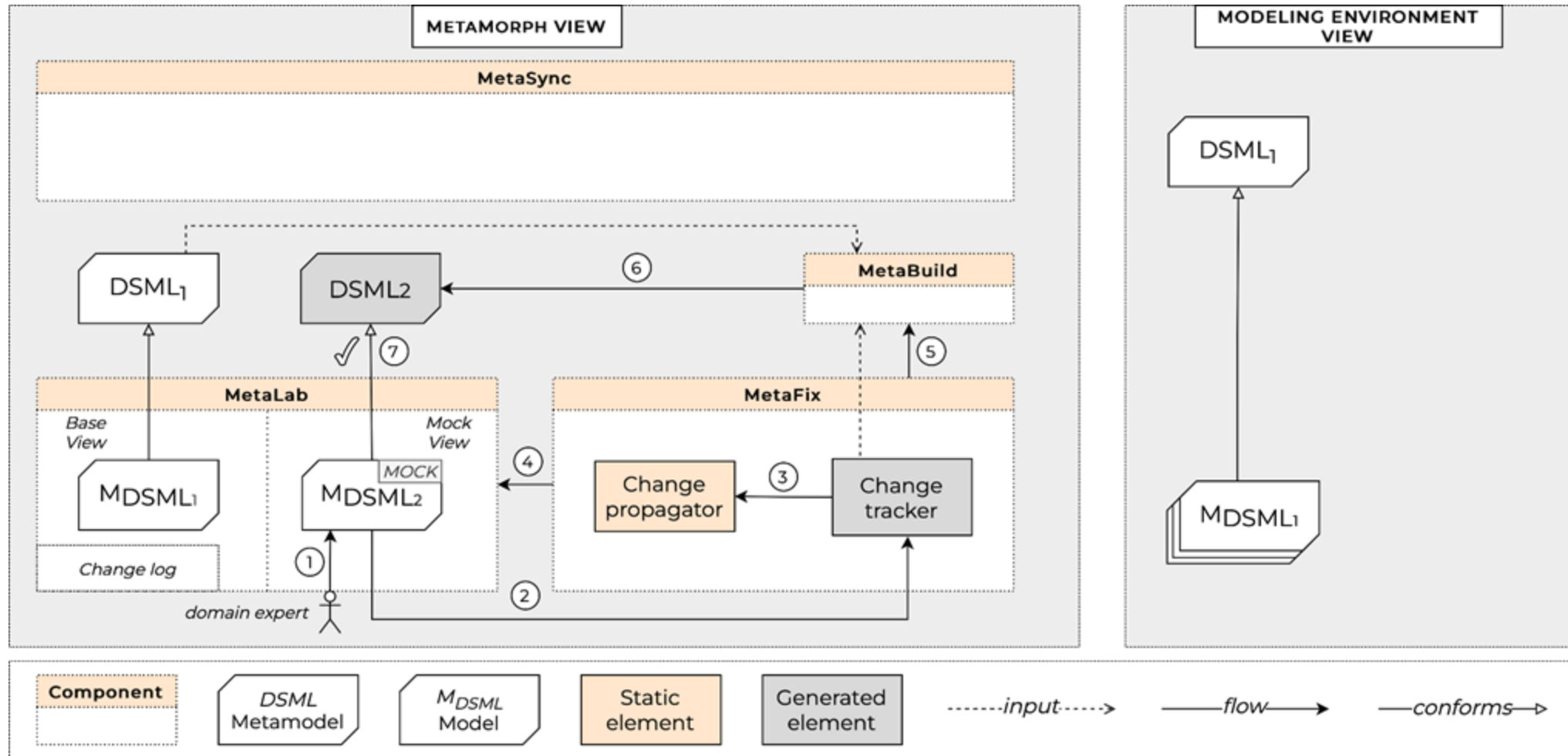
**REQ<sub>1</sub>** - Support the **specification of changes** through **model** instances used in practice.

# METAMORPH ENVISIONED APPROACH



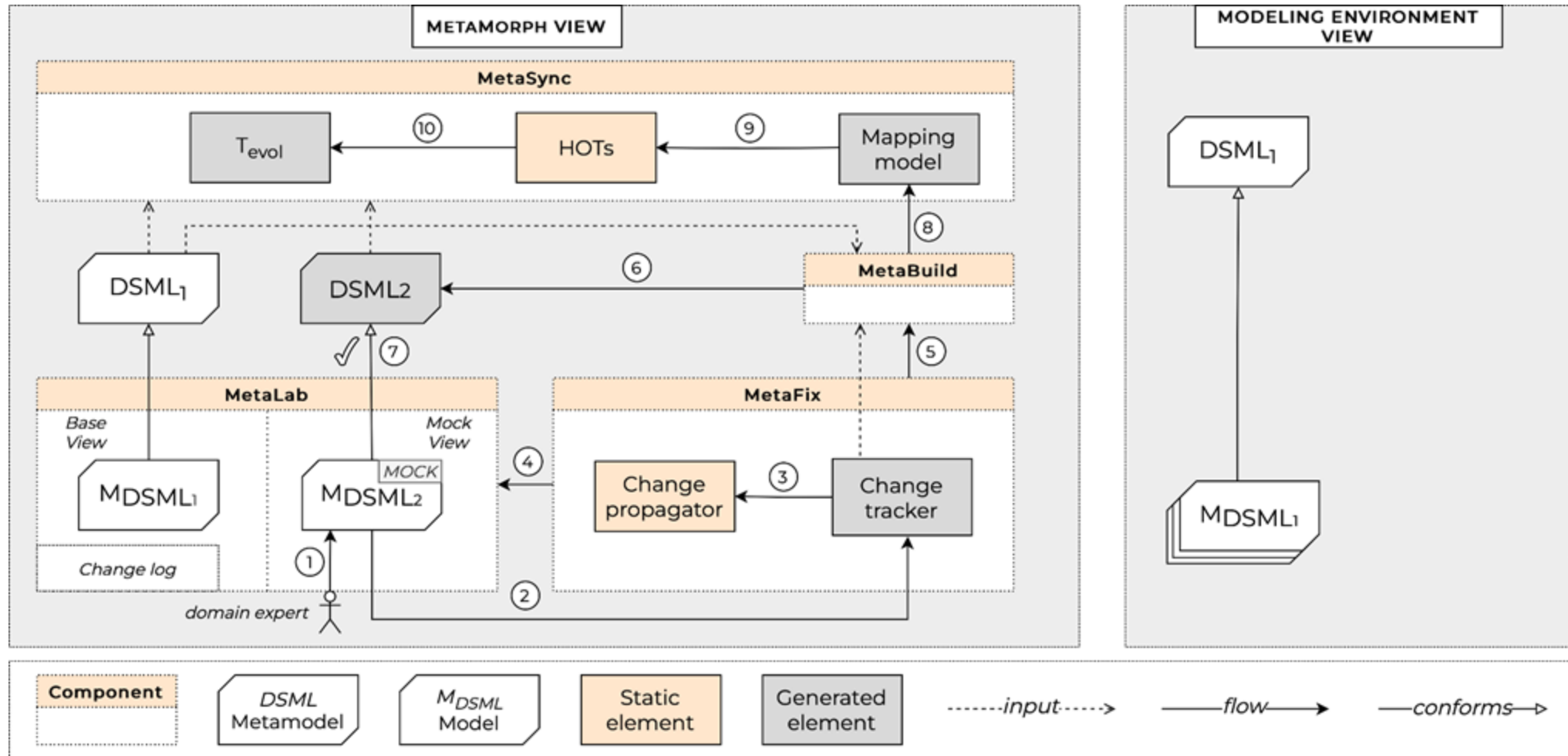
**REQ<sub>2</sub>** - Implement **inconsistency management** strategies.

# METAMORPH ENVISIONED APPROACH



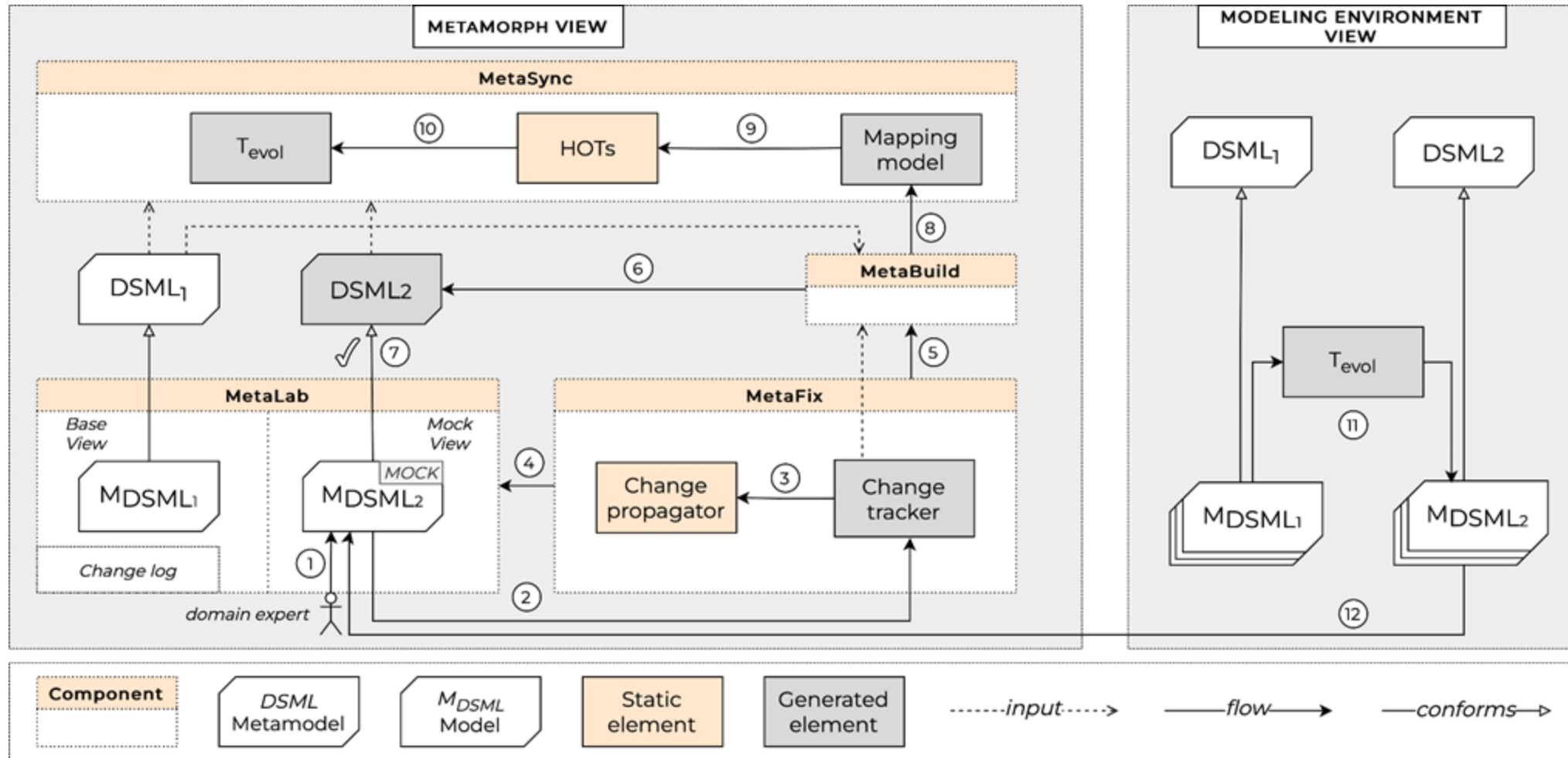
**REQ<sub>3</sub>** - Support the **generation** of the **evolved metamodel**.

# METAMORPH ENVISIONED APPROACH



**REQ<sub>4</sub>** - Support the **generation** of **model co-evolution** mechanisms.

# METAMORPH ENVISIONED APPROACH





# CHALLENGES AND FUTURE DIRECTIONS

- Specification of changes at the model level (MetaLab).
- Automatic propagation of changes to all affected elements in the mock model to avoid inconsistencies (MetaFix).
- Mapping and translation of changes made at the model level to the metamodel level (MetaBuild).
- Model coevolution mechanisms - breakable and unresolvable changes (MetaSync).

# PLANNED VALIDATION

- Usability aspects of MetaLab for domain experts.
- Correctness of the propagation mechanisms of MetaFix and the translation mechanisms of MetaBuild.
- Performance aspects for large and complex models.
- Industrial case-studies.



# THANK YOU!

For offline discussions or possible collaborations please feel free to contact me at:

**[malvina.latifaj@mdu.se](mailto:malvina.latifaj@mdu.se)**