

Context

- Complex systems design.
- Separation of concerns: several subsystems, several business viewpoints (e.g. social, ecological, technical ones).
- Heterogeneous models.



Needs

- Create a global view across the viewpoints models.
- Ensure a collaborative matching by involving models' designers.
- Maintain the consistency of the global system in case of models evolution.

Fig. 1. A sustainable city viewpoints

Approach

Principles

- A generic and extensible set of relationships (MMC):
 - **Similarity**: Overlapping concepts or having close meaning
 - **Induction**: Behavioral connection between concepts
 - **Generalization**: A concept is a subtype of another one
 - **Dependency**: Conceptual connection between concepts.
- Collaborative definition of inter-model links (**correspondences**)(Fig. 2) in an abstract level then refining them in an assisted way (software) to the concrete level (system's models level).
- Formalizing the group decision-making: **Proposals generation and evaluation** (Fig. 3).

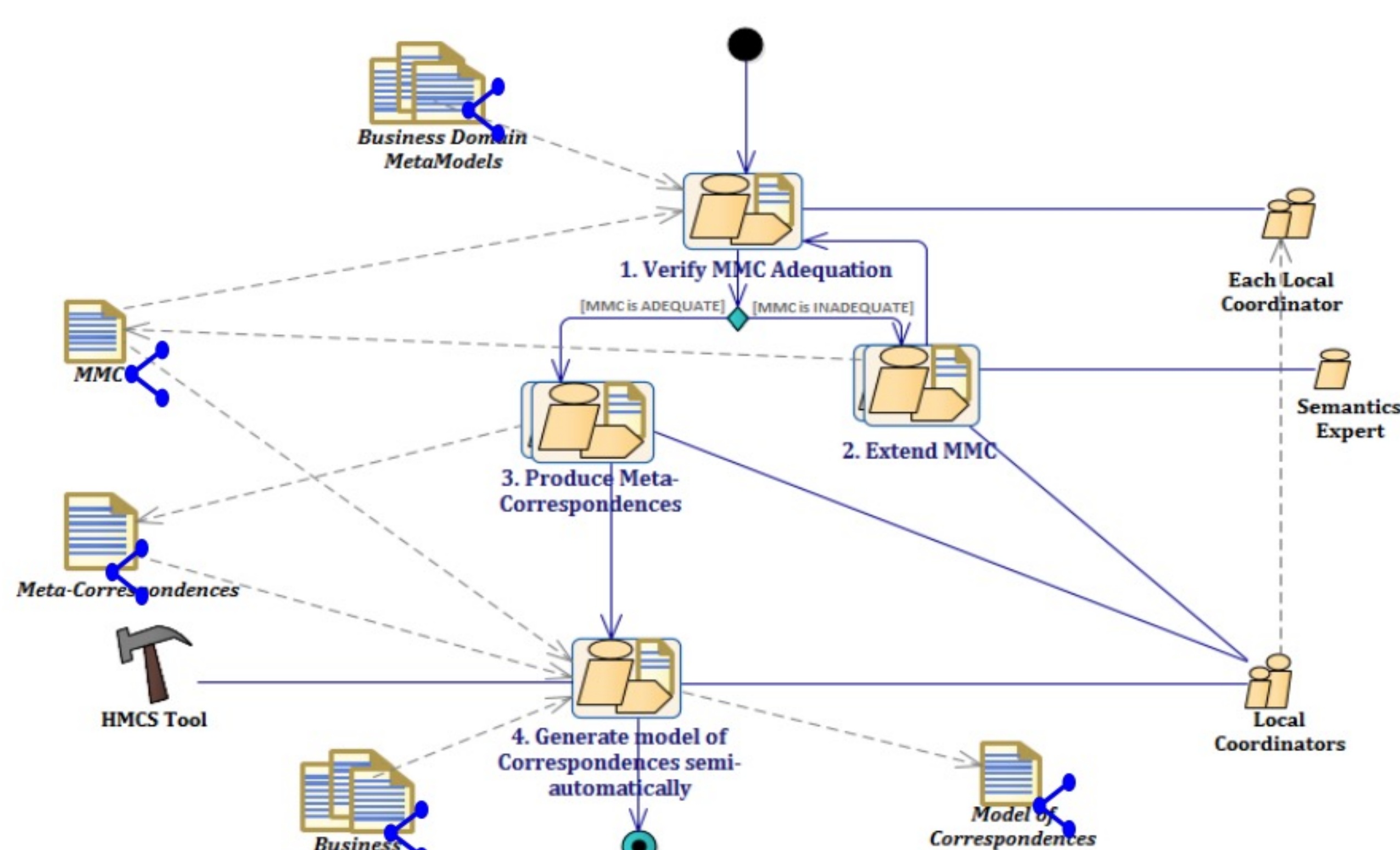


Fig. 2. Collaborative matching process

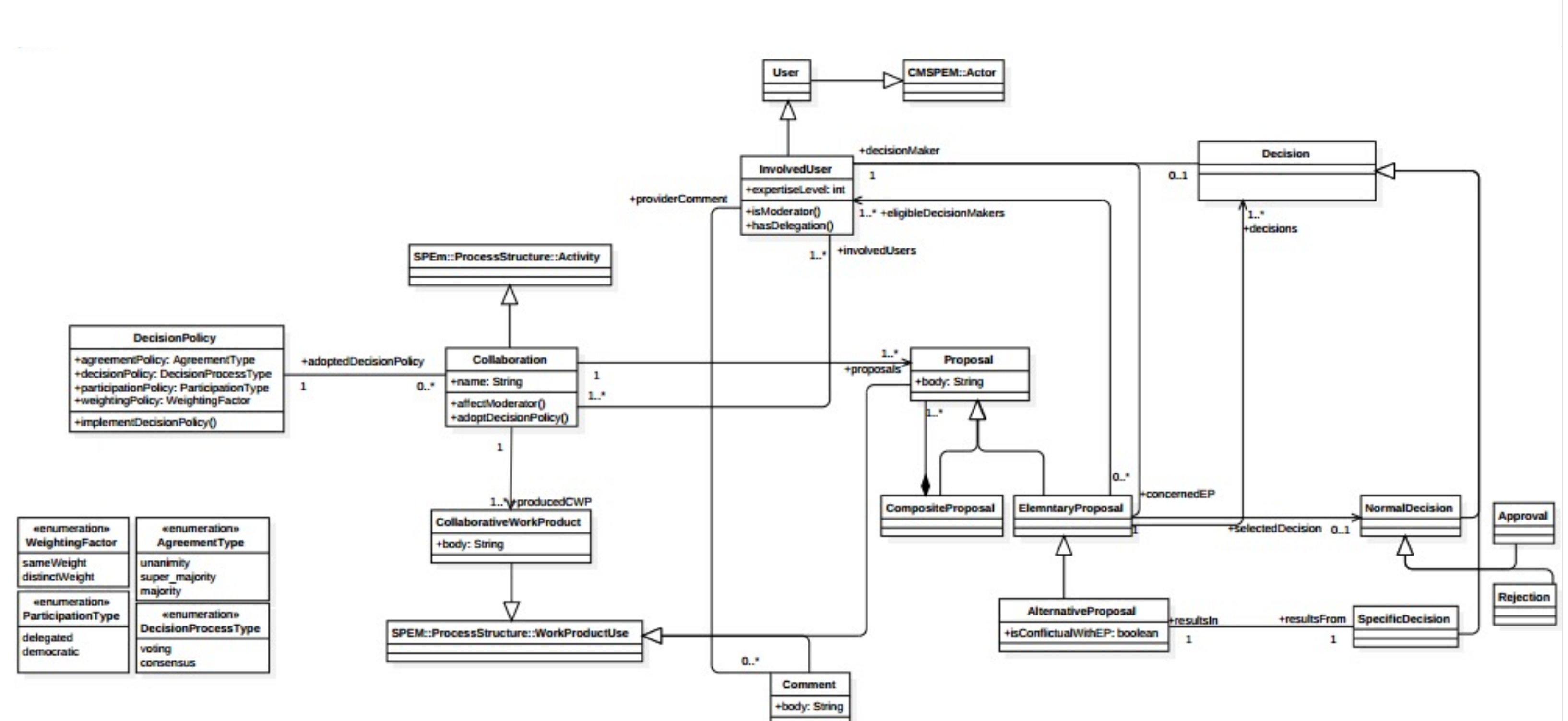


Fig. 3. Formalizing collaborative decision-making

Contributions for sustainable cities

Application cases

- Switchover from a traditional city to a sustainable one by validating the consistency of the inter-subsystems correspondences.
- City daily management purposes: interconnecting critical subsystems and identifying correspondences among them. Thus, once a subsystem is triggered, the dependent other subsystems are also notified.

Benefits

- Interconnect a city complex subsystems.
- Ensure the complementarity between them.
- Enhance the efficiency of the city management to meet sustainability goals.

Examples

1. An Emergency (fire/ accident)

Dependent subsystems: public transport, GPS applications, police, nearest hospital, etc.
Relationships: Dependency, Induction, Similarity.
The location of the emergency leads to the deviation of public transport means passing through the concerned area.

2. A Mega-event

Dependent subsystems: public transport, security & safety.
Relationships: Dependency, Similarity.
Increase the number of means of transport passing through the event venue and adjust their schedules.