
Extended Kaos to support variability for goal oriented requirement reuse

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Outline

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Context

- **TACOS** ("Trustworthy **A**ssembling of **C**omponents fr**O**m requirements to **S**pecification") **project**
 - To define a component-based approach in order to specify trustworthy systems from the requirements to the specification phase in the Cycab transportation domain
 - Three main topics :
 - Expression of properties at the requirement level
 - Specification of trustworthy assembly
 - Traceability between requirements and component specifications
 - Partners : LAMIH, LIFC, LORIA Dédale, LORIA Maia and LACL

Requirements Engineering in Cycab domain

- **The concept of Cycab :**



- Designed by INRIA
- Small electric vehicles for restricted access zones,
- Controlled by embedded electronics allowing automatic driving under computer control.

Requirements Engineering in Cycab domain

- Expressing requirements
 - Natural language or
 - Model-driven approach with UML



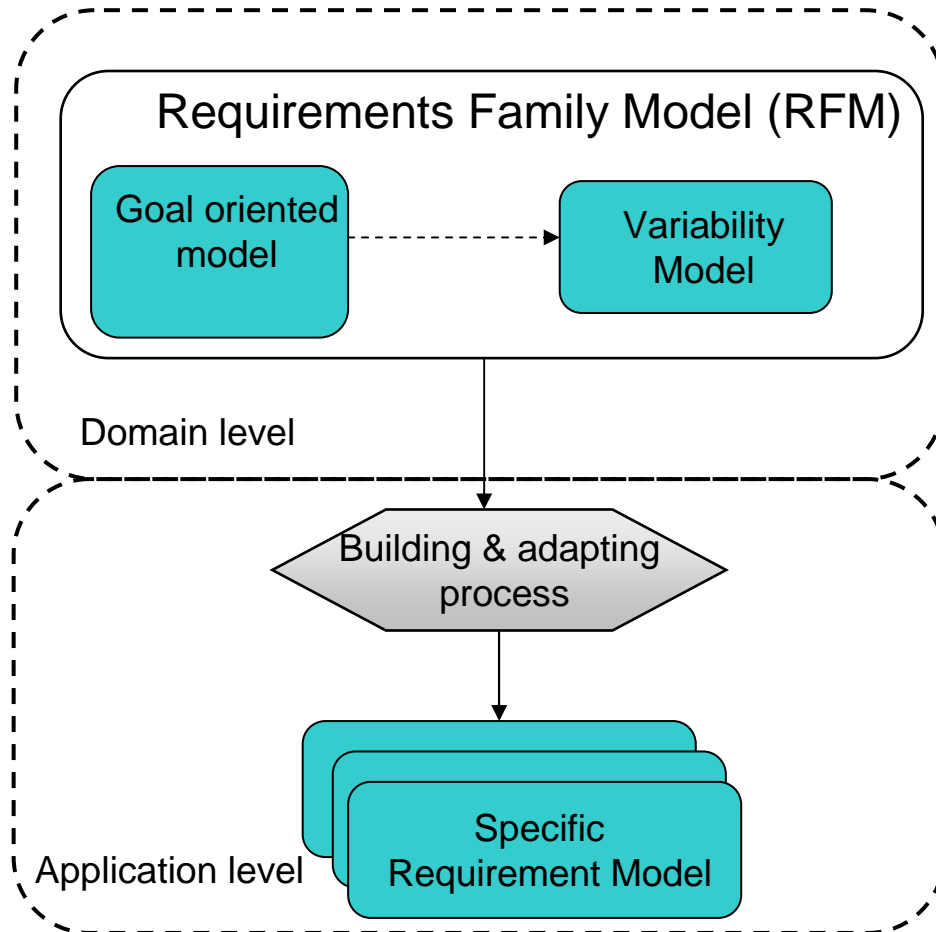
need some approaches to specify requirements at a more abstract level

- Embedded systems in Cycab
 - Represent a diversity of application



need to represent the diversity of Cycab applications and capitalize design effort for reuse

Overview of the Solution



- **Aim** : to improve R.E. in the context of Cycab domain
- **How** : to apply reuse based techniques at goal level
- **Result** : RFM, R.E. model capturing commonality and variability of domain from which SRM can be derived

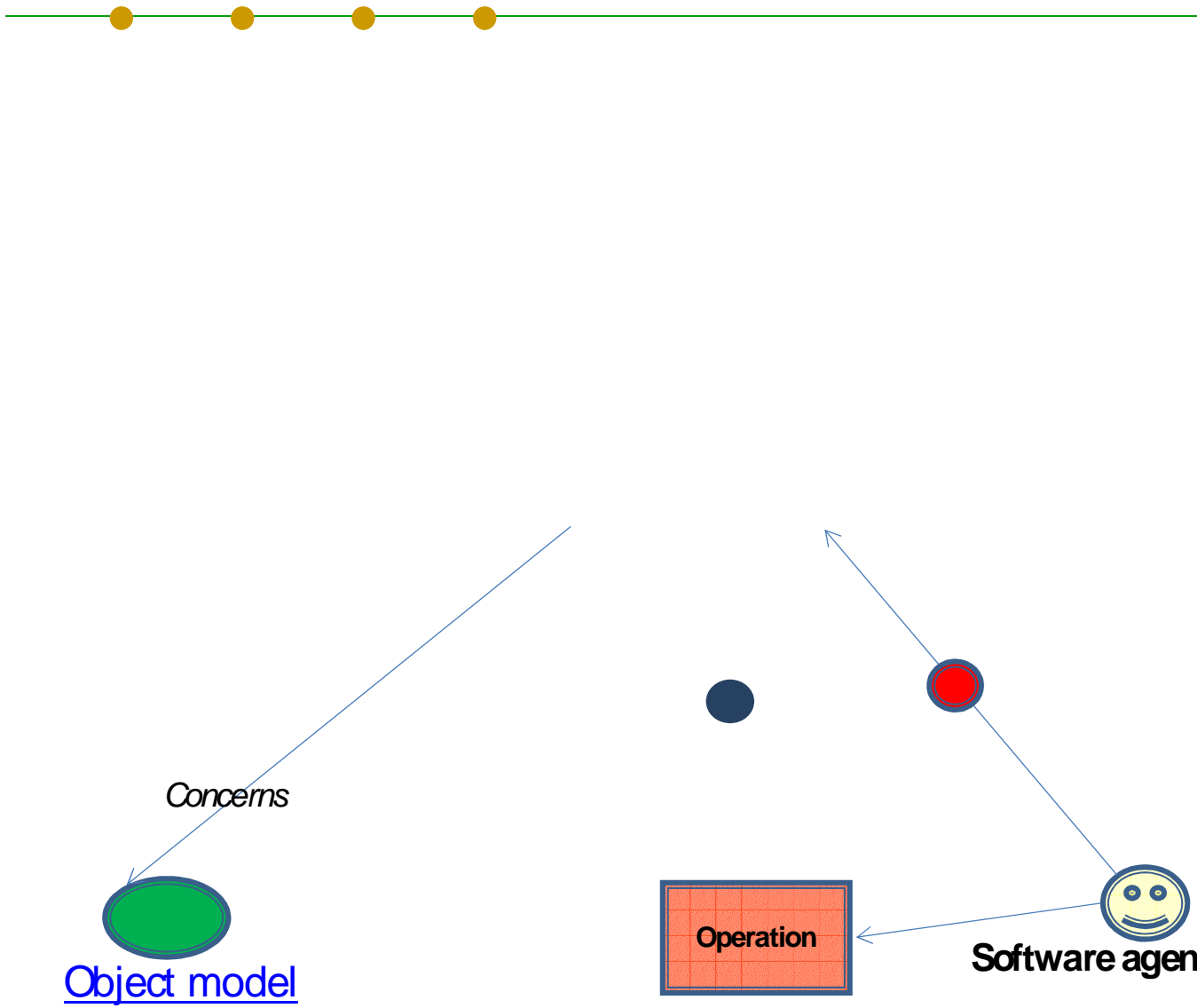
Domain level : RFM

- **Need approaches more adapted to early-phase of R.E.**
 - Choosing KAOS goal-oriented approach to specify requirements
 - Explicit modelling of the intentionality of the system (the "why")
 - Study of alternatives in requirements

- **Need to represent the diversity of Cycab applications**
 - How to deal with an important number of options?
 - How to deal with global variability?

Extending Kaos model with variability concepts

Overview of KAOS



Extended Kaos metamodel

- **Variability concepts and Goal Oriented Requirement**
 - Facet
 - Variant
 - Variation point

Extended Kaos metamodel

Facet

- Viewpoint having an interest for domain
- Classify and organize domain knowledge
- Support specific models generation process

F1: Obstacle detection

F1.1: Range finder

F1.2: Collision detection

V1:
Ultra sound

V2:
Laser

V3:
Radar

...

...

F2: Localization mode

F2.1: Exterioceptive sensor

F2.2: Proprioceptive sensor

V1:
GPS

V2:
WPS

...

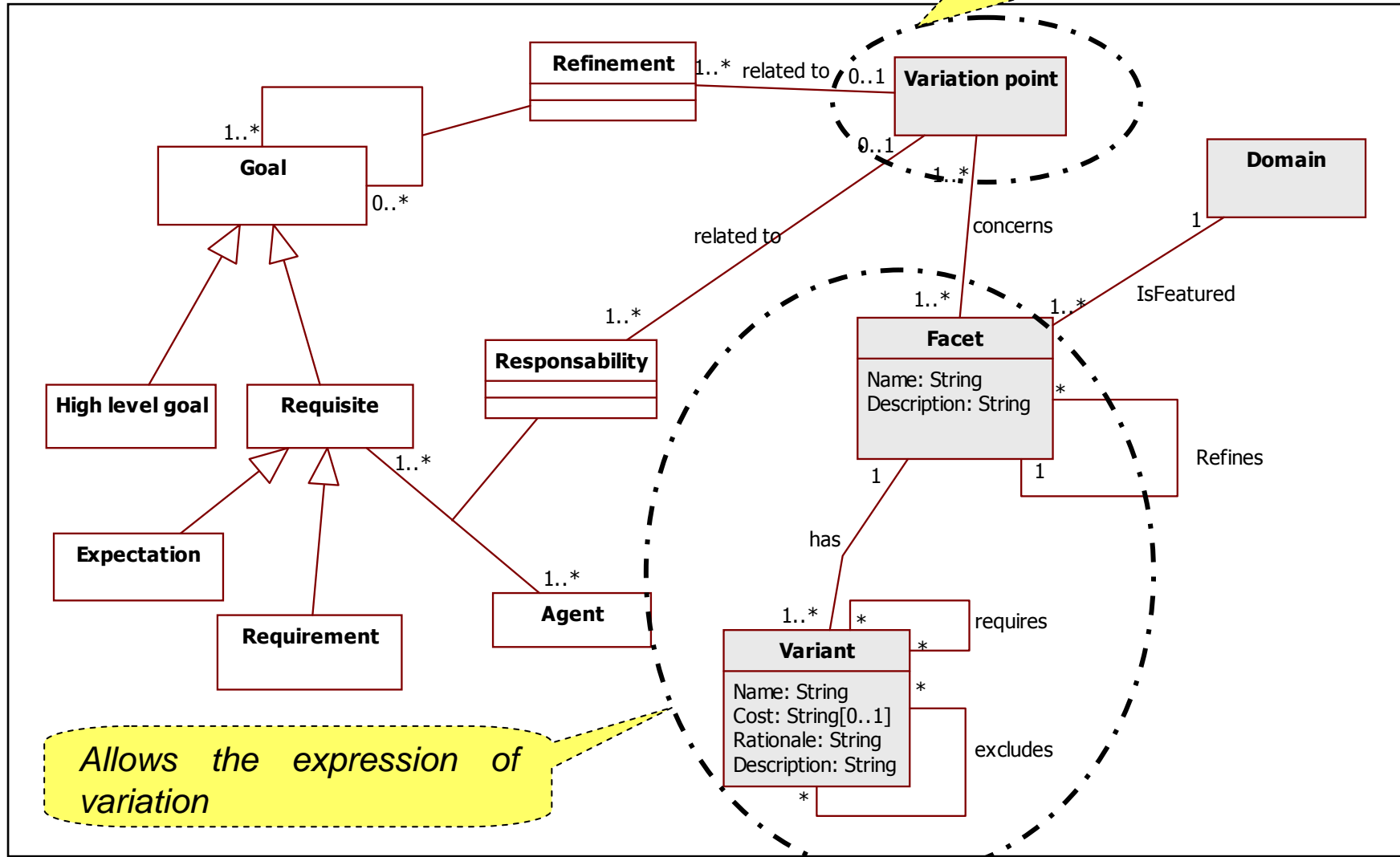
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Variant

- A way to realize a facet

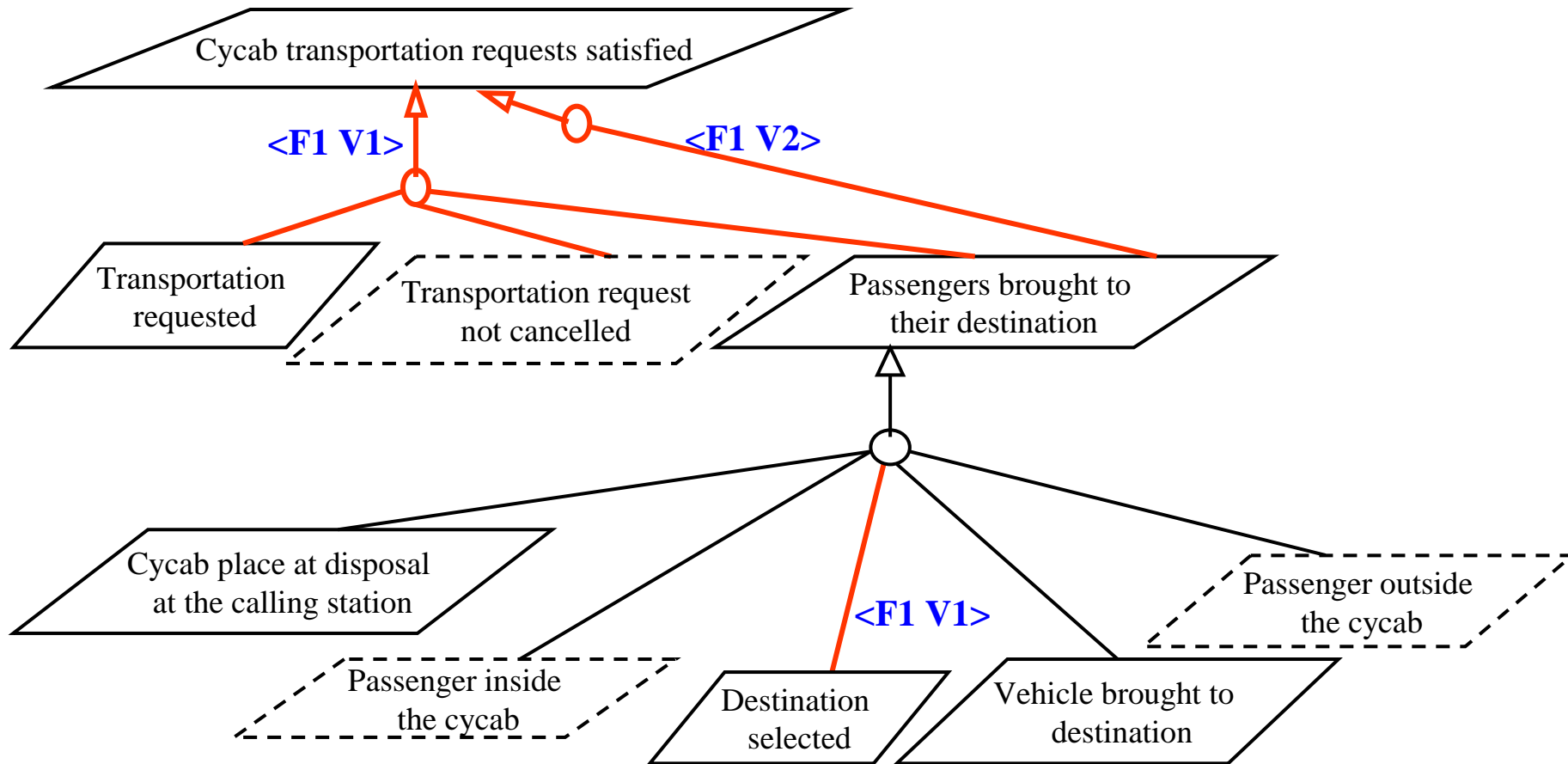
Extended Kaos metamodel

Captures the location of variation (what does vary and why ...?)



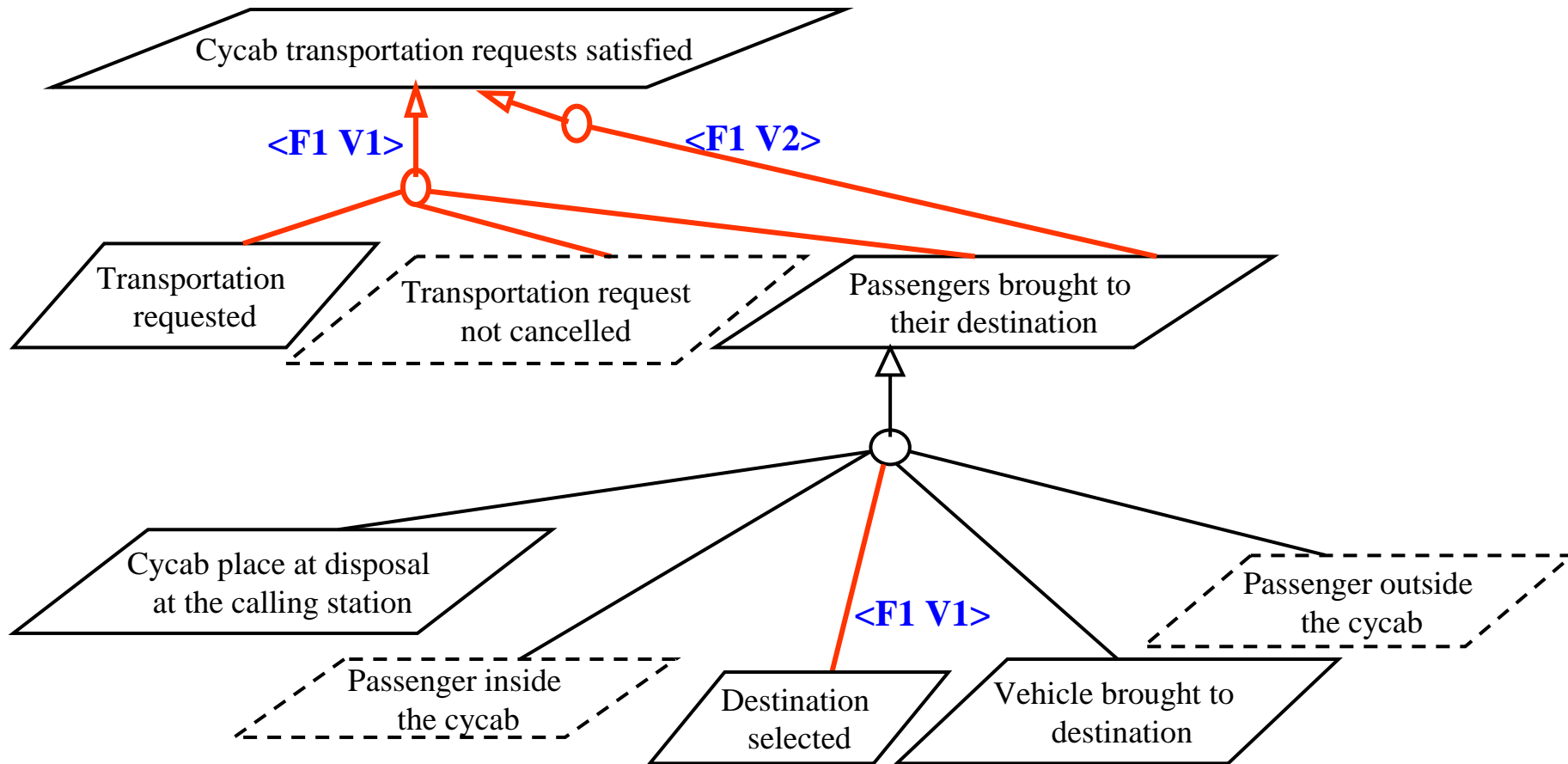
Allows the expression of variation

Extended Kaos: Example 1



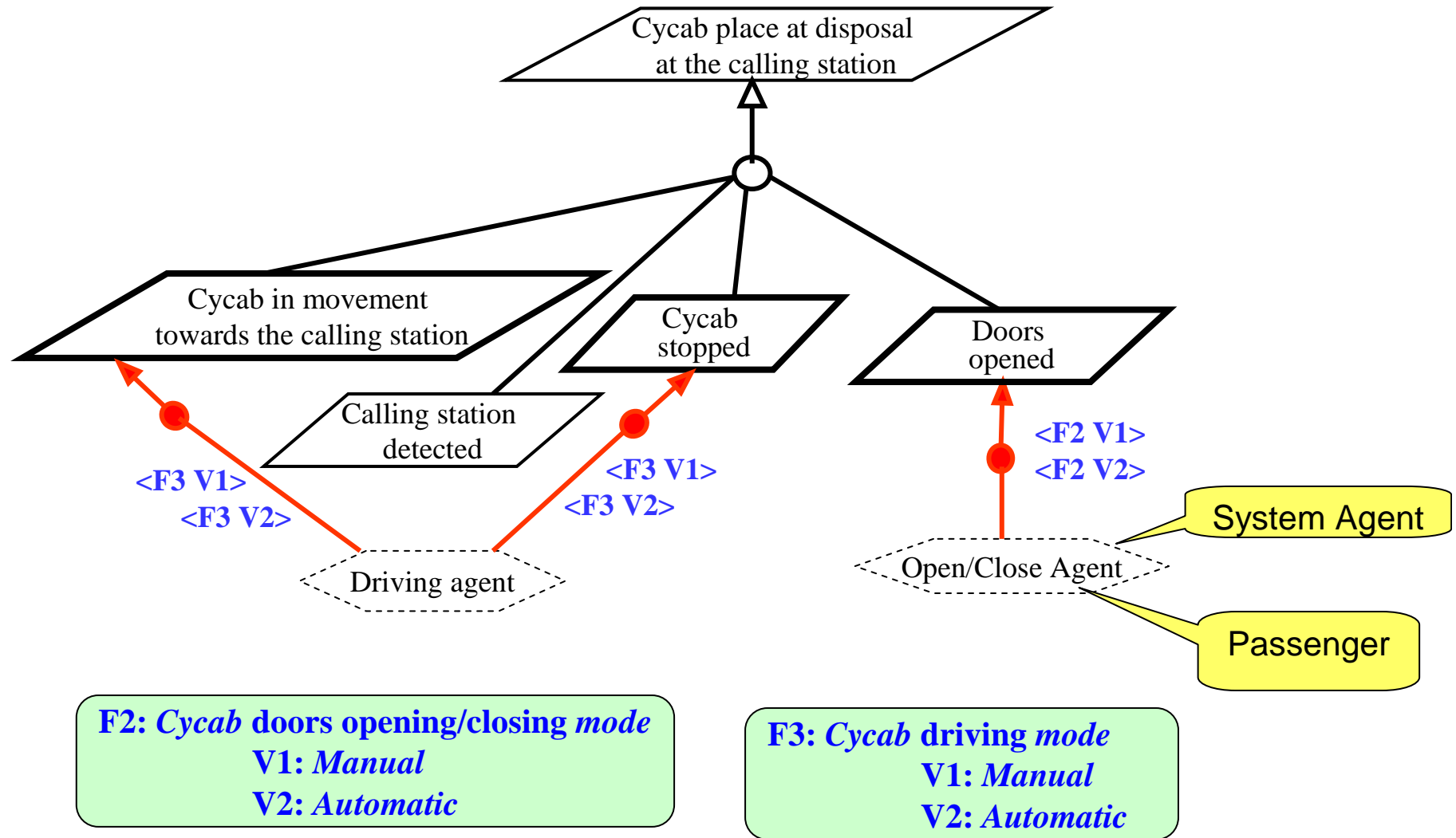
F1: Cycab calling mode
V1: On demand
V2: Automatic

Extended Kaos: Example 1



F1: Cycab calling mode
V1: On demand
V2: Automatic

Extended Kaos: Example 2



Conclusion

- **Improving R.E. in the context of Cycab domain**
 - Some extensions to the KAOS metamodel in order to express variability inherent to this domain.
 - Enable the specification of RFM from which particular models can be derived.
- **Contributions**
 - To deal with variability at goal oriented requirements level.
 - To classify and organize domain knowledge, thanks to the concept of Facet.

Works in progress

- Applying the variability concept to other Kaos submodels.
- Defining the process to build specific requirement models from a Requirements Family Model.
- Providing a tool to support this approach



Expressing Variability with KAOS

