- Modeling Workbench
    - **Notation:** The notation of the modeling language.
        - **Textual:** The end-user edits the model through text.
            - **Symbols:** The end-user can use symbols such as mathematical notations.
        - **Graphical:** The end-user edits the model through different graphical representations such as diagrams.
        - **Tabular:** The end-user edits the model through a table.
        - **Tree:** The language designer edits the model through a tree editor.
        - **Block:** The end-user edits the model through a block representation like Blockly.
        - **Form:** The end-user edits the model through a form representation.
        - Notation Paradigm
            - **Internal:** The meta-language is presented as an internal language of another language such as a GPL. “using a host language to give the host language the feel of a particular language.” [1]
                - **Fluent API:** Method of designing an API to allow method chaining, making code more readable and expressive.
                - **Shadow embedding:** Capability to embed in the host language custom syntaxes. For instance, TSX from React embedding HTML concepts.
                    - **Specialization:** Capability to specialize some concepts of the host language for the internal DSL.
            - **External:** The meta-language is presented as an external language, with its own syntax uncoupled from the host language.
    - **Semantics:** Features concerning the model semantics
        - **Translational:** Compilation to a program expressed in another language.
            - **M2T:** Compilation from a model of the developed language to the text of another language.
            - **M2M:** Compilation from a model of the developed language to the model of another language.
        - **Interpretative:** Direct execution by the host language without prior translation.
    - **Editor:** Available modeling workbench’s editor features.
        - **Editing mode:** How the models are edited.
            - **Free-form:** The end-user freely edits the persisted model.
            - **Representation:** The end-user edits a representation of the model, and both are persisted. The representation does not necessarily have a fixed layout.
            - **Projectional:** The end-user edits a projection of the persisted model in a fixed layout.
        - **Syntactic services:** Model workbenches syntactic services.

- **Highlighting:** Visually distinguishes syntax elements of models in the editor using colors and styles to improve readability.
- **Outline:** Displays a structured, hierarchical view of a model's components to aid navigation.
- **Folding:** Allows collapsing and expanding sections of models based on structural elements to improve focus and readability.
- **Syntactic completion:** Suggests possible completions for model elements based on syntax rules.
- **Diff:** Compares different versions of a model, highlighting added, removed, or modified parts.
- **Auto-formatting:** Automatically adjusts indentation, spacing, layout, and structure according to predefined style rules.

■ **Semantic services:** model workbenches semantic services.

- **Reference resolution:** Identifies and links model elements to their declarations or definitions.
- **Semantic completion:** Provides context-aware suggestions by analyzing the meaning of model parts.
- **Refactoring:** Supports automated model transformations (e.g., renaming, extracting parts) to improve maintainability without altering functionality.
- **Error marking:** Detects and highlights syntactic or semantic issues in the model, often with tooltips explaining the problem.
- **Quick fixes:** Suggests and applies automated solutions for detected issues.
- **Origin tracking:** Keep track of model's elements during the different transformation steps. Useful for error displays.
- **Live translation:** Capability to use the designed model during its development.

■ **Views:**

- **Debugger:** A dedicated view for debugging, e.g., buttons for setting breakpoints, going into, forward.
- Call Hierarchy: A dedicated view for seeing the hierarchy of past calls, similar to method call hierarchy in IDEs for GPLs
- **Model Hierarchy:** A view for observing inheritance trees of hierarchical models. Similar to class hierarchy view in OO GPLs

■ **Viewpoint management:** How the different models are presented to the end-user.

- **Multi-views:** Capability to propose different viewpoints over the whole modeling workbench.
- **Blended modeling:** Capability to propose different notations for a single model.

○ **Validation:** Features concerning the validation of a model made with the developed language.

■ **Syntactic check:** Validation of the structure of the model (syntaxes).
■ **Naming:** Name binding
■ **Types:** Type systems

        - **Formal verification:** Capability to prove parts of the model definitions, through a compilation to Coq for instance.
        - **Data Flow Analysis:** Analysis for data flow within models, e.g., to detect cyclic dependencies or deadlocks.
        - **Test model generation:** Capability to generate models conform to a language definition, allowing the end-user to have first examples.
    - **Testing:** Features to help the end-user verify their models.
        - **Model debugging:** The modeling workbench provides a debugger to debug some model definition concerns.
            - Omniscient debugging: Capability of a debugger to go backward in addition to forward.
        - **Model testing:** The modeling workbench provides ways to unit-test models.
    - **Collaboration:** Features specific to the collaboration between different end-users.
        - **Live collaboration:** Collaboration at the same moment in time.
            - **Strategy:** How the live collaboration is done inside the modeling workbench.
                - **Optimistic:** Model designers can edit the same model or even the same element at the same time. Requires modification merge strategy.
                - **Pessimistic:** Editing an element causes it and possibly its related items to be locked.
            - **Collaboration architecture:** In technical terms, how the collaboration is done among the different end-users clients.
                - **Distributed:** Each client is independent and can work offline. The data are exchanged among the different clients (*e.g.*, Git or CRDT).
                - **Centralized:** A central server is required to manage and control the collaboration (*e.g.*, SVN).
        - **Versioning:** The modeling workbench proposes an integrated way to version developed languages.
    - **Architecture:** Features concerning the architecture of the modeling workbench.
        - **Platform:** On which kind of platform does the modeling workbench run?
            - **Desktop:** The backend and frontend of the language workbench cannot be uncoupled and are both directly executed on the language designer device.
            - **Cloud-native:** The backend and frontend of the language workbench are uncoupled and may be executed on different devices.
        - **Modular:** The modeling workbench is thought to be extended, proposing APIs.