

Staged Evolution with Quality Gates for Model Libraries

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Motivation

- Model Libraries
 - „Place to **store** your **models**“
 - Enables **model reuse**
- Challenges
 - What model should I reuse?
 - What happens if models change?

- **Research challenges:**
 - Structuring models for reusability
 - Describe model evolution in model libraries



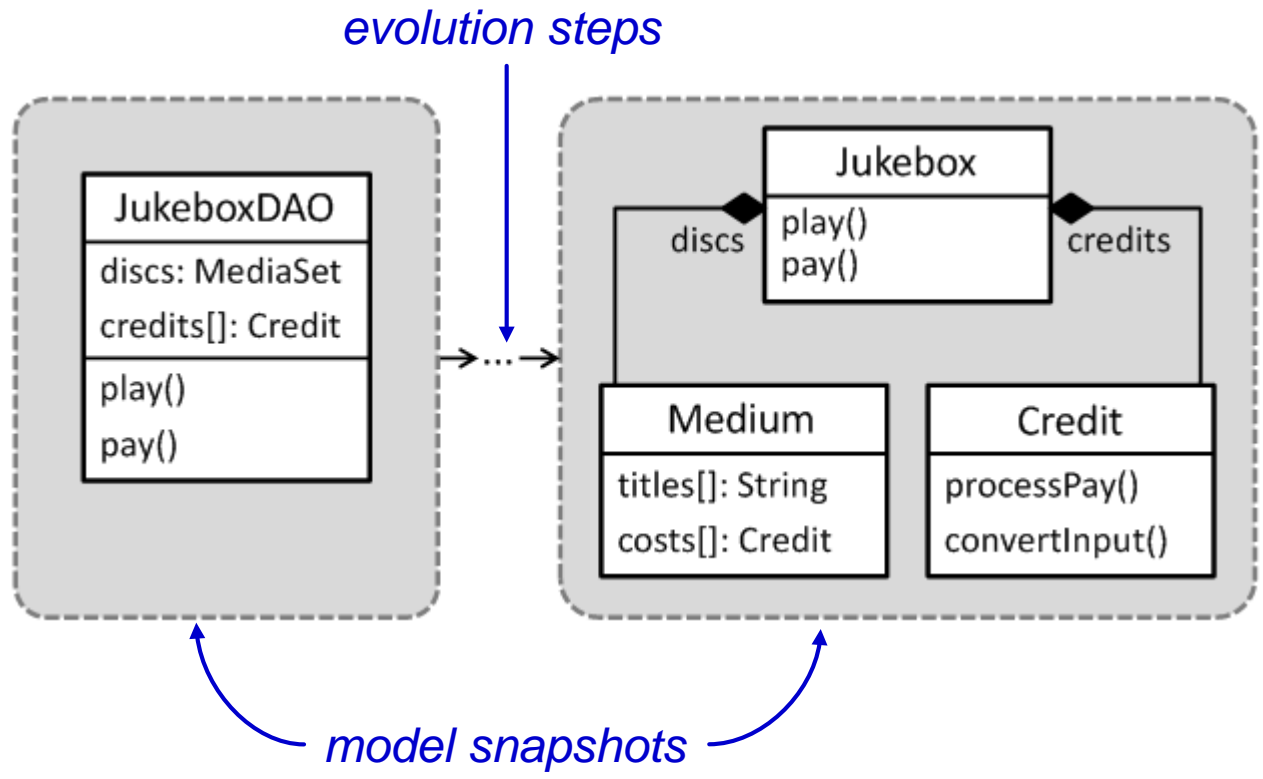
Agenda for Today

1. Define **model evolution for model libraries**
 - More formal approach based on graphs
2. Provide **model quality characteristics**
 - 4-dimensional quality model
3. Show **Prototype** implementation



1. Define Model Evolution for Model Libraries

- Model Evolution **means changes** during a period of time
 - Only add, delete, rename, and retype operations

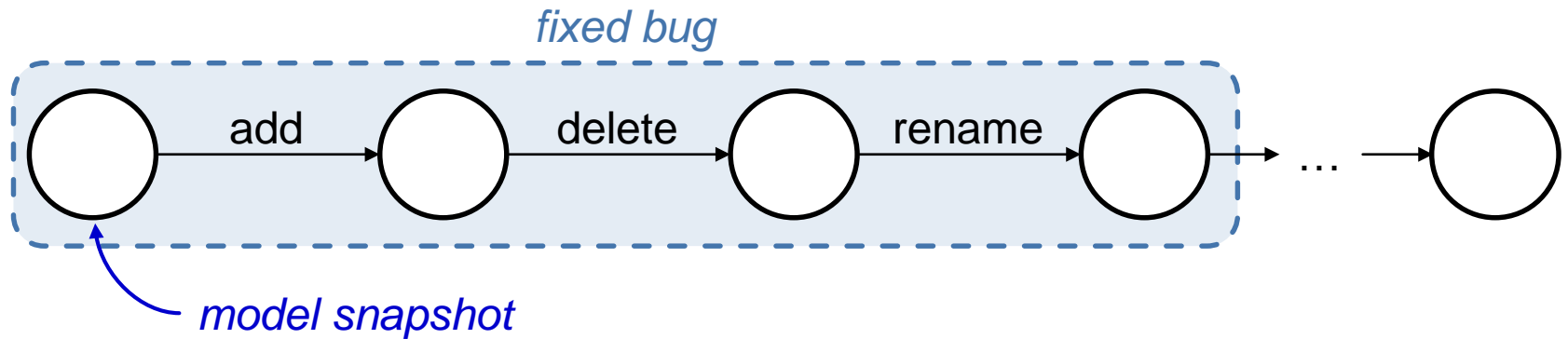


- Model Evolution** = sequence of model snapshots

Model Evolution Stages

- Hypothesis: „Model evolution can be partitioned in stages“
- Performed small field study
 - Task
 - Create a model
 - Describe how you created the model

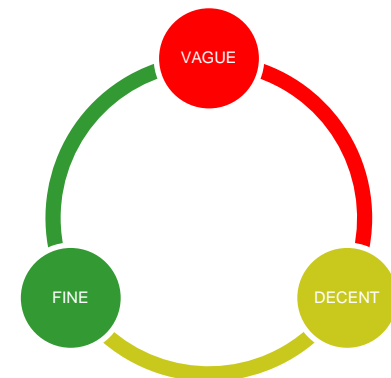
Model Evolution Stages – Results



- Some sequences of model evolution steps belong together
 - Rough Idea
 - First, create a sketchy model
 - Then, make it better
 - Finally, make it productive
- Each partition influences reusability of models

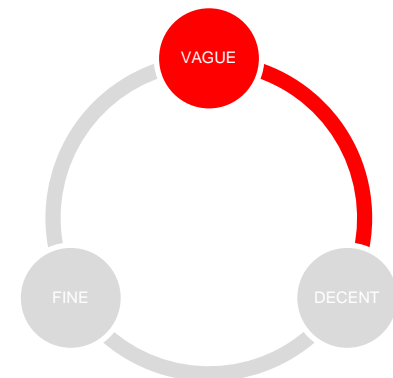
Staged Model Evolution

- Simplification
 - Keep the identified three stages
 - Reusability is rooted on traffic lights
 - Red = not recommended to reuse
 - Yellow = reuse with caution
 - Green = free for reuse
 - Side effect: **cognitive load is small**
- Resulting stages with respect to reusability
 - Vague – red
 - Decent – yellow
 - Fine – green



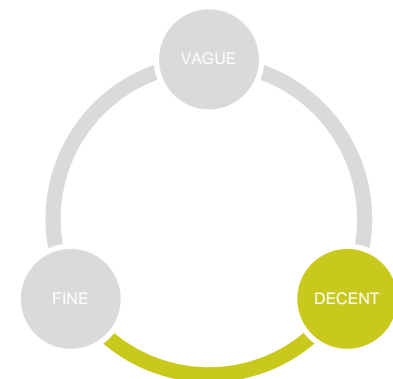
Staged Model Evolution

- Vague stage – red
 - Initial stage of the model after added to a model library
 - Needs further processing
 - Modelers should be cautious, when reusing because of
 - ... technical oriented naming („DAO“ suffix)
 - ... technology dependent elements
 - ... adapters for legacy use
 - ... errors
- Models in vague stage are thought to be reusable but need further improvements



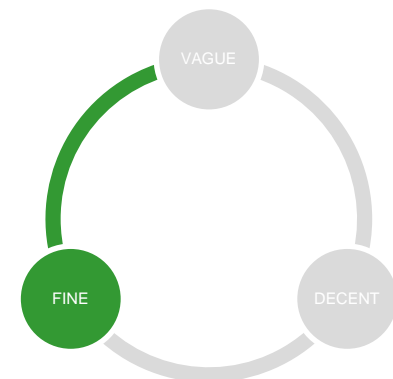
Staged Model Evolution

- Decent stage – yellow
 - All major issues of the vague stage are fixed
 - However, it might be that ...
 - the overall purpose of the model has changed
 - design decisions require improvements
 - Layout might not be pleasing
 - Qualitative statements rely on assessments rather than experience
- Models in the decent stage, are mostly separated from their original context



Staged Model Evolution

- Fine stage – green
 - Model focuses on one aspect (is in line with purpose)
 - Quality is most reasonable
 - However, model is not reusable „out-of-the-box“
 - Template mechanisms (modeler needs to fill the holes)
 - Adaptions
- Models in fine stage can be recommended to other modelers



2. Provide model quality characteristics

- Providing a structure for model evolution is not sufficient
- How to separate one stage from another? – Quality?!
- Challenges with model quality
 - Very subjective
 - Not really measurable
- Benefits of model libraries
 - Only generic qualities are of interest
 - Simplified model is sufficient



Quality Model and Quality Gates

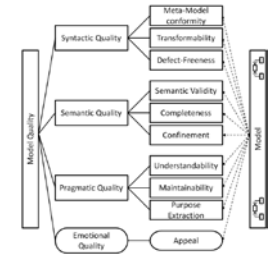
■ Quality Model

• Four dimensions

- Syntactic quality
- Semantic quality
- Pragmatic quality
- Emotional quality

- Each quality dimension contains quality characteristics

- How to measure: model metrics, model smells, model reviews



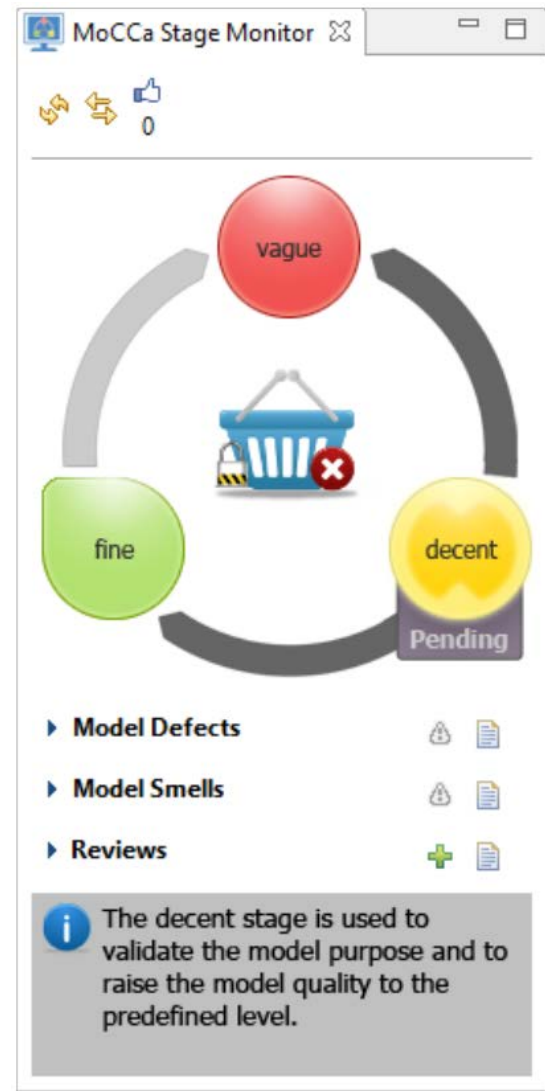
■ Quality Gates

- Separate each stage in the staged model evolution
- Defined by a set of model quality characteristics

3. Prototype implementation

- Eclipse plugin prototype
 - Shows staged model evolution
 - Uses *proactive approach*
 - Uses color encoding
- Evaluation
 - Most participants understood and accepted the staged evolution model
 - Some identified the fine stage as the initial stage
 - „*My model is reusable!*“
 - Some were missing automated traversing

EXTRA



What to take home?

- Described staged model evolution in model libraries via stages
 - Enable model recommendation
- Lightweight quality model with measurable characteristics
 - Simplified reviews with views
- Define quality gates to guide users through staged model evolution
 - Mapping of quality model
 - Proactive quality guidance

Bibliography

- A. Ganser, H. Lichter, [Engineering Model Recommender Foundations – From Class Completion to Model Recommendations](#), (Modelsward 2013)
- A. Ganser, T. N. Viet, H. Lichter, [Multi Back-Ends for a Model Library Abstraction Layer](#), (ICCSA 2013)
- A. Roth, A. Ganser, H. Lichter, B. Rumpe, [Proactive Quality Guidance for Model Evolution in Model Libraries](#), (MoDELS ME 2013)
- A. Dyck, A. Ganser, H. Lichter, [Model Recommenders for Command-Enabled Editors](#), (MoDELS MDEBE 2013)