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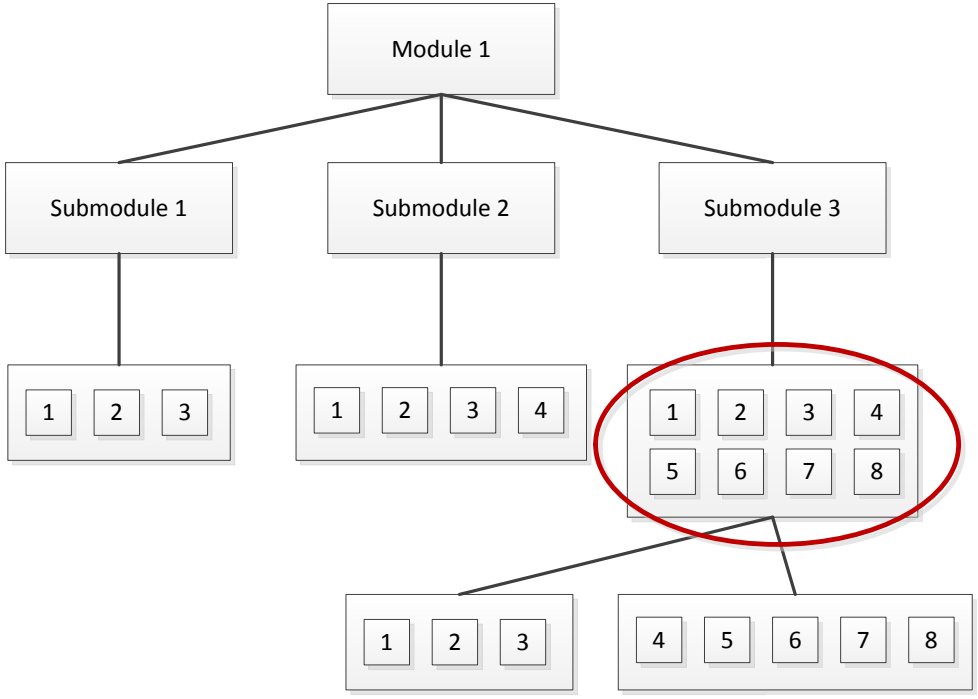
Towards Quantitative Metrics for Architecture Models

Introduction
Problem Statement

- Problem
  - Track progress of architecture design continuously
  - Indicators of quality of early design based on given criteria
  - Architecture reviews, e.g., ATAM, require high effort
- Assumptions:
  - Documentation available
    - E.g., UML models, Documentation of decisions and requirements
  - Usually no formal models
  - Cannot directly observe the architecture

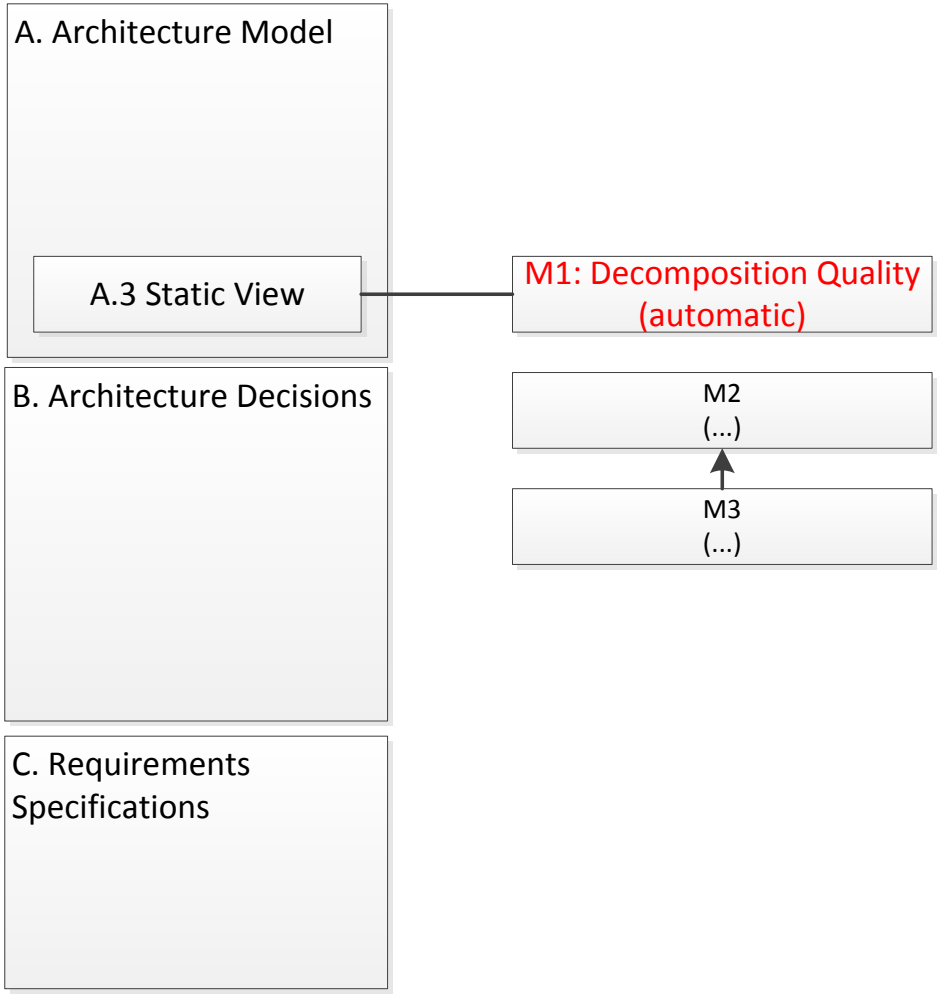
Architecture Model Metrics
What we would like to have

- Example Metric: Decomposition Quality (M1)
  - Use, e.g., Gini Coefficient to reveal that the decomposition was not done to a similar degree for all modules/submodules of a system
  - M1 = 1-Gini(submodules)



Architecture Model Metrics
What we would like to have (cont.)

- M1 = 0.3
- M2 = 0.9
- M3 = 0.86
- …



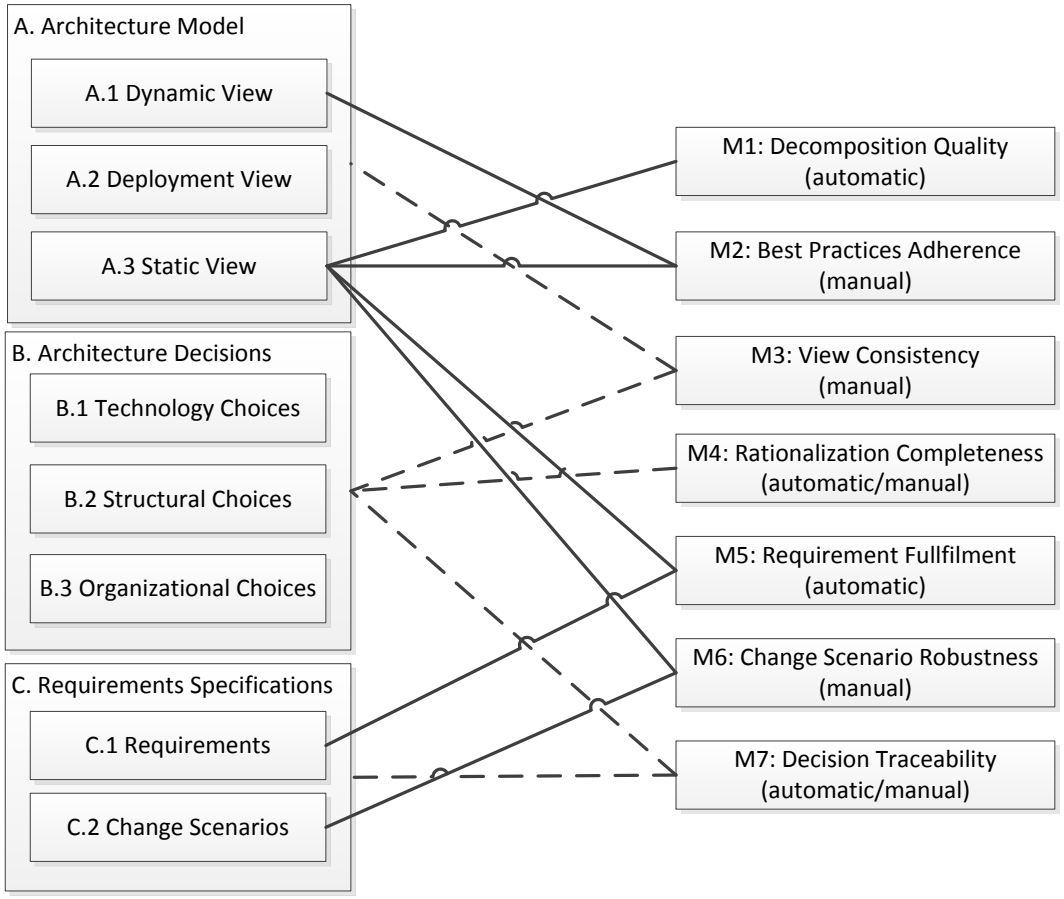
Architecture Model Metrics
Goal

- Goal: Have metrics to support us in evaluating the quality of our architecture models/documentation
  - Technology independent
  - Actionable
  - Usable for e.g., preparing architecture reviews, reporting to management
  - Lightweight approach (low overhead)
  - Addressing well defined criteria

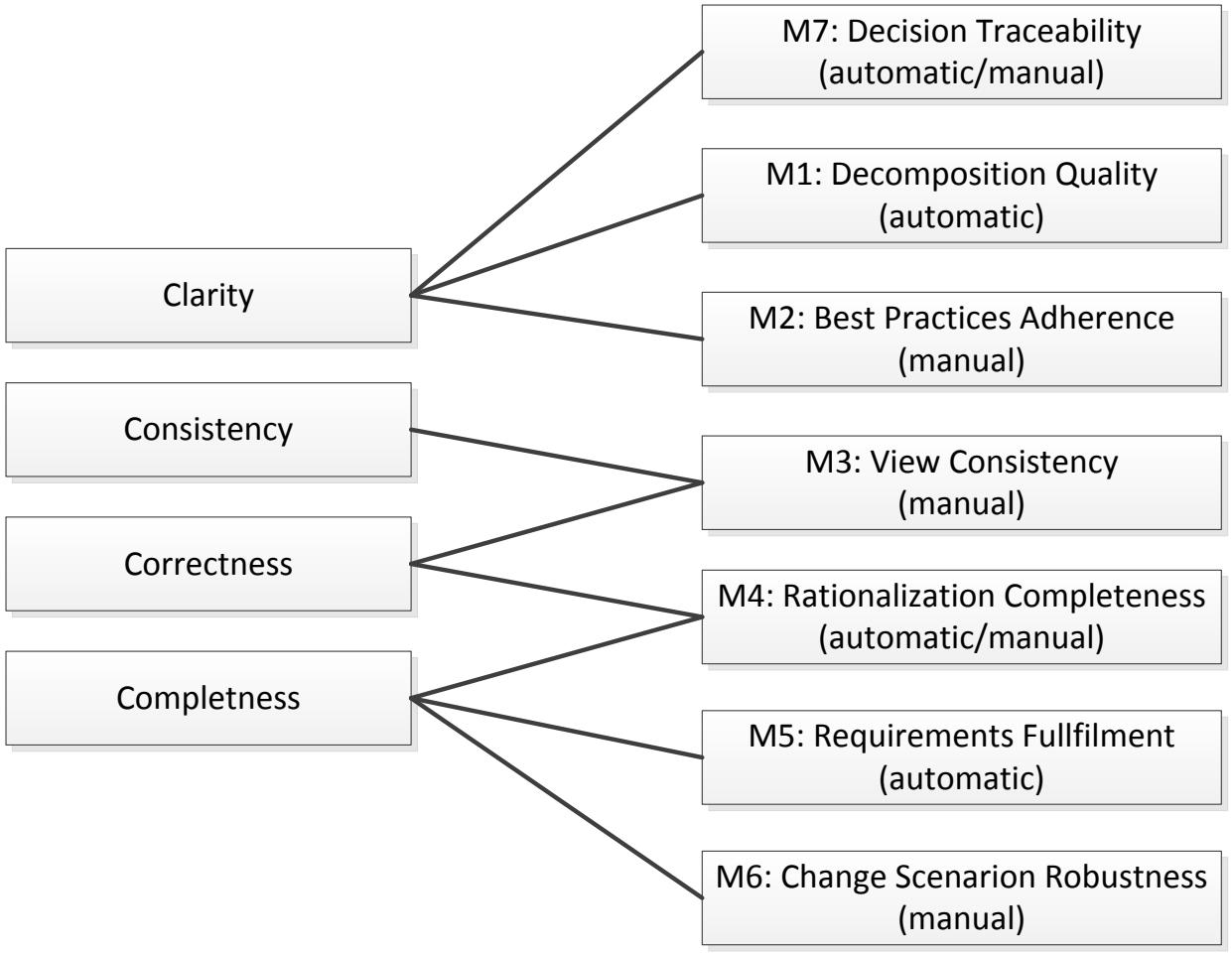
Architecture Model Evaluation
4-C Criteria

- Clarity: Is my model clear (understandable)?
- Consistency: Is my model consistent in itself?
- Correctness: Is my model correct?
- Completeness: Is my model complete?

Architecture Model Evaluation
The Metrics‘ Input



Architecture Model Evaluation
4-C Criteria



Summary

- Currently
  - We use architecture reviews, e.g., ATAM
  - Metrics working on source code
- We would like
  - Tracking metrics for architecture design
- We propose
  - 4-C criteria, here covered by 7 metrics to support an architect in producing a good model of an architecture
  - Some manually and automaticly calculated metrics
  - Applicable in industry as the overhead should be low

Some open questions

- Are there more Cs than the 4-C criteria?
- Should the 4-C be weighed?
- Does ranking well in the 4-C result in a good architecture?
- Are quantitative metrics better than qualitative judgements?

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