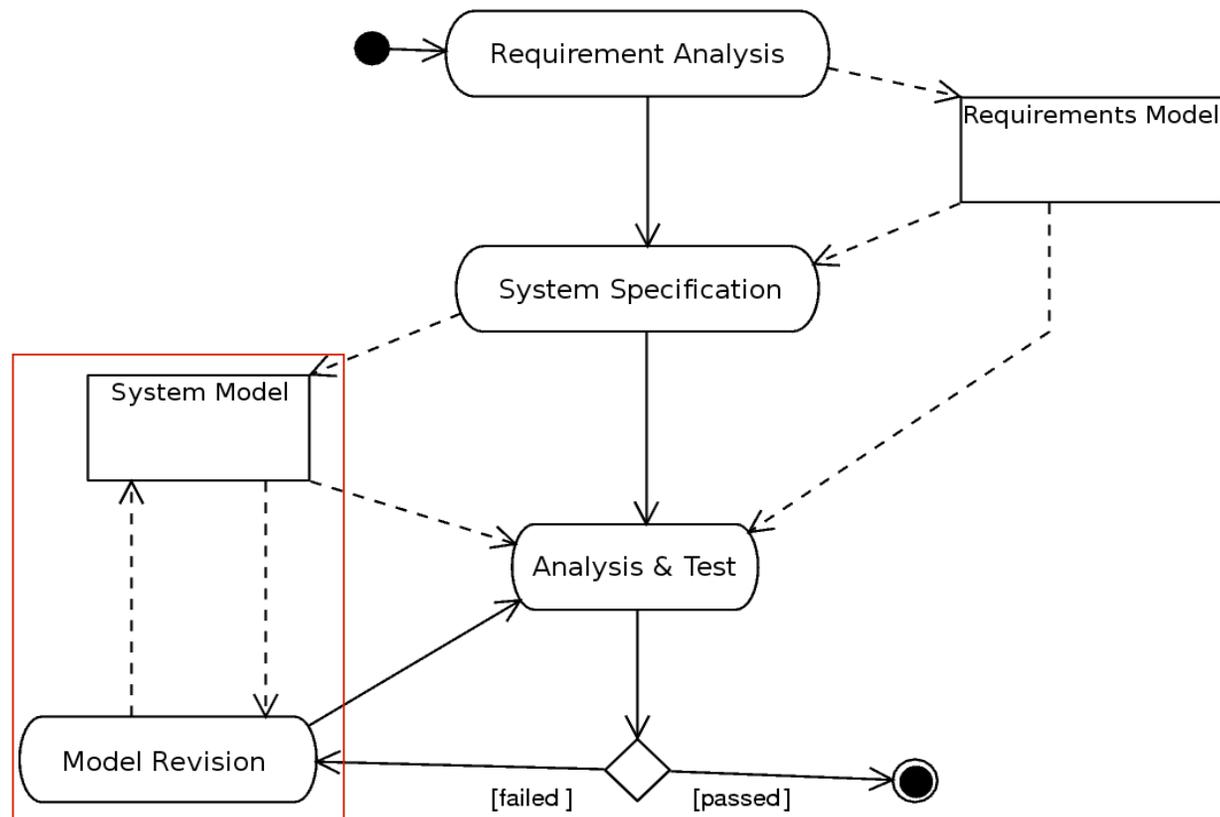


Pattern-Based System Design and Design Verification

(of Dependability Features)

Matthias Sand and Mario Dal Cin
Informatik 3
University of Erlangen-Nürnberg
Germany

General Modelling Workflow



Patterns

- A pattern is a **generic** (and verified) solution for a **common** (system) design problem.
- Goal: catalogues of **reusable** patterns for a large variety of problem domains (e.g. dependability).

Patterns

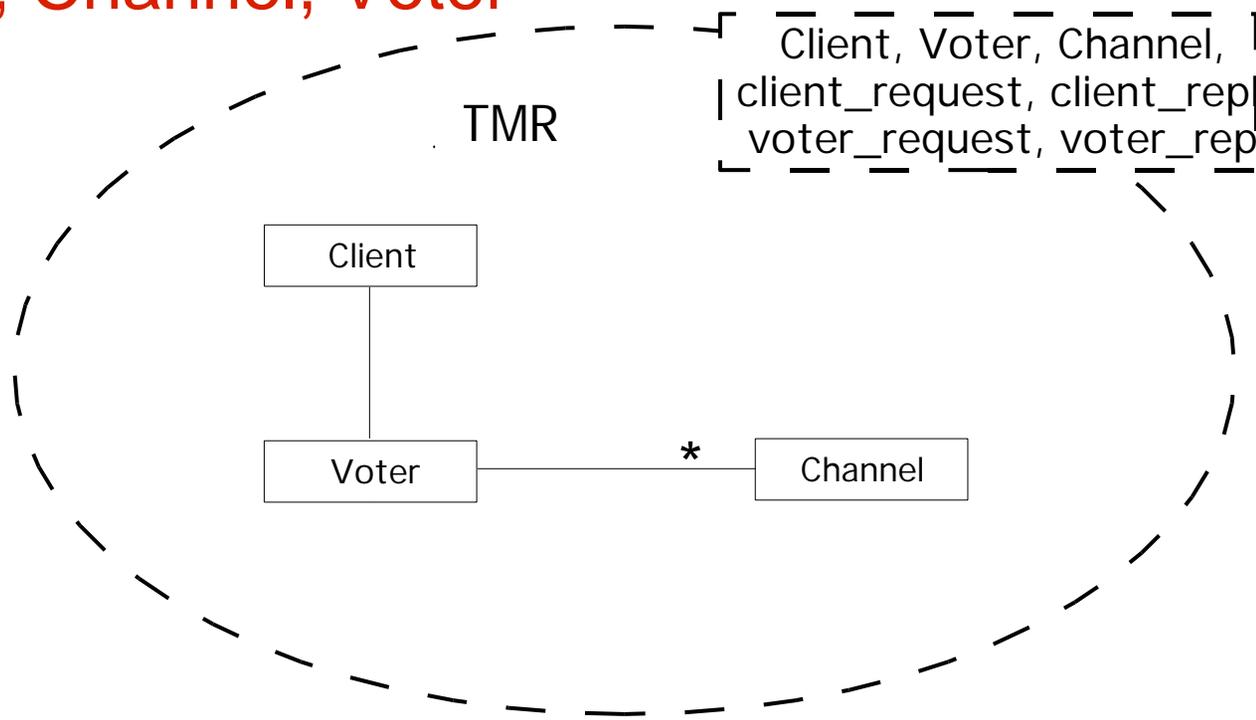
Patterns describe structures as
parametrized collaborations

- generic structural description for `roles` of objects and their interactions,
- parameters for roles and their interactions.

Example: MR-Pattern (UML-Notation)

Parametrized collaboration comprising 3 roles:

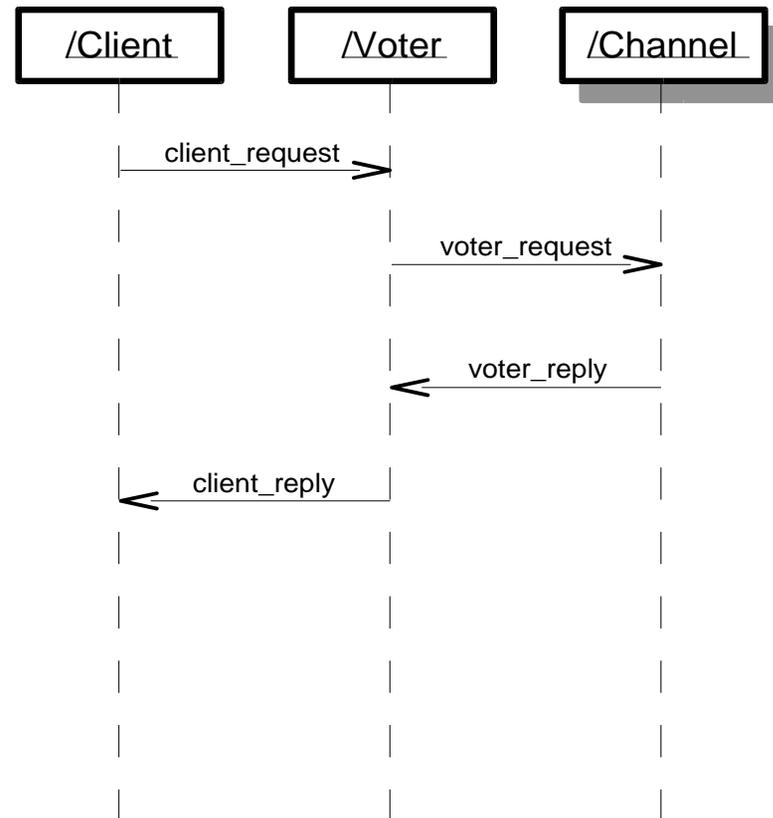
Client, Channel, Voter



Patterns (Sequence Charts, UML)

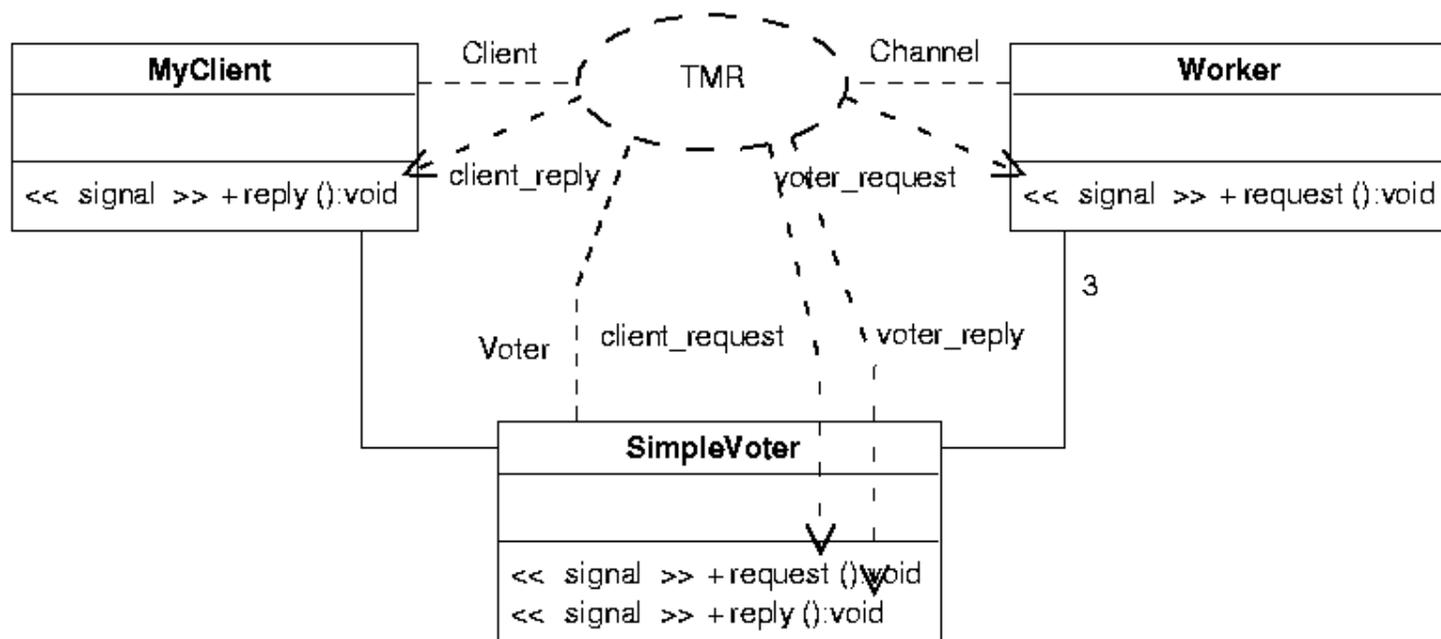
Patterns describe role behavior as:

- generic interactions,
- (partially) ordered occurrences of messages.



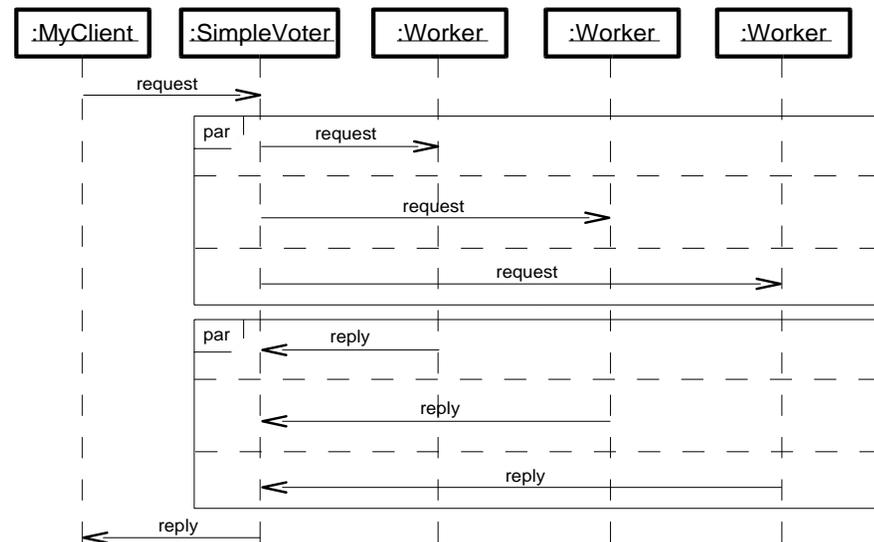
Binding Patterns to System Model

- mapping of roles to system model elements.



Expansion (TripleMR)

System objects,
the generic pattern
and
binding information,
result in partially
ordered occurrences
of concrete messages
(**expanded scenarios**).



Design Verification

Expanded scenarios provide specifications for:

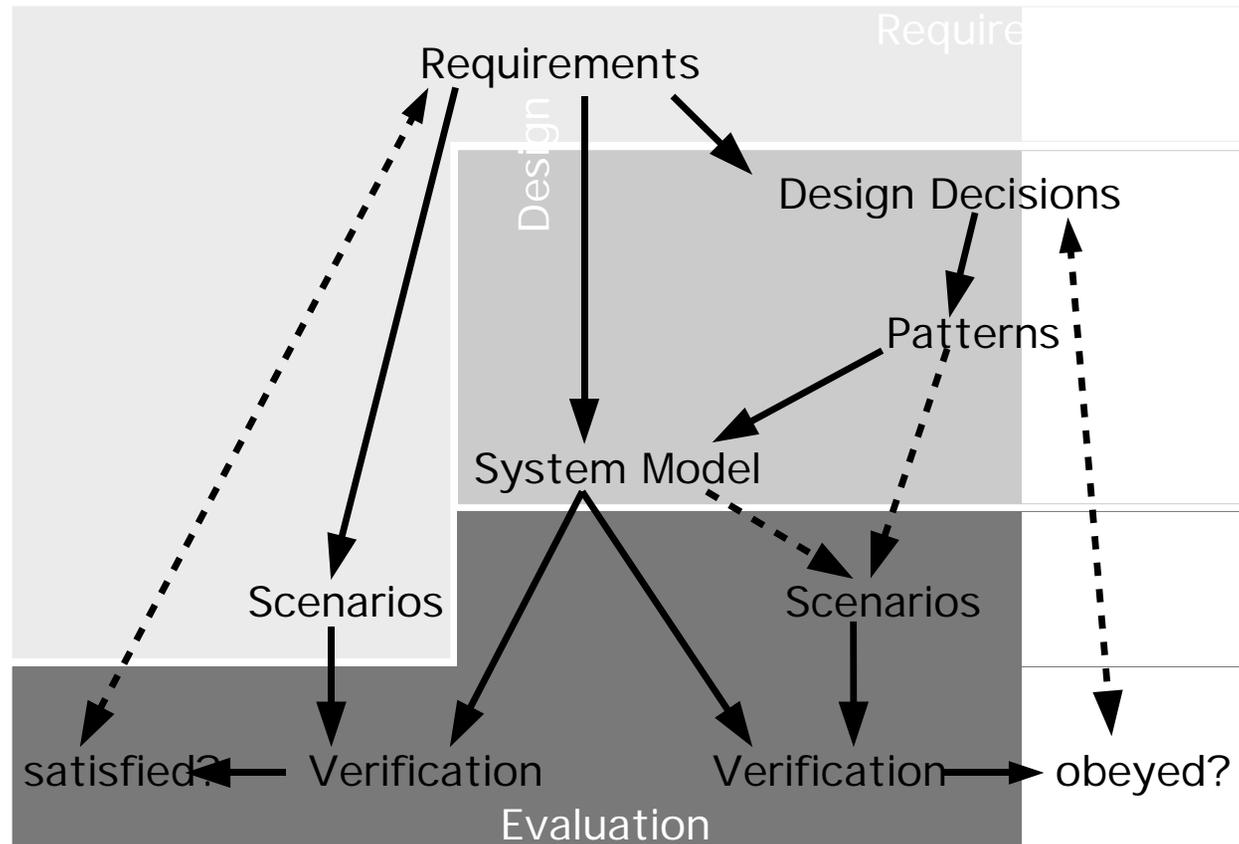
- Model verification
- Simulation based system tests and validation

Design Verification

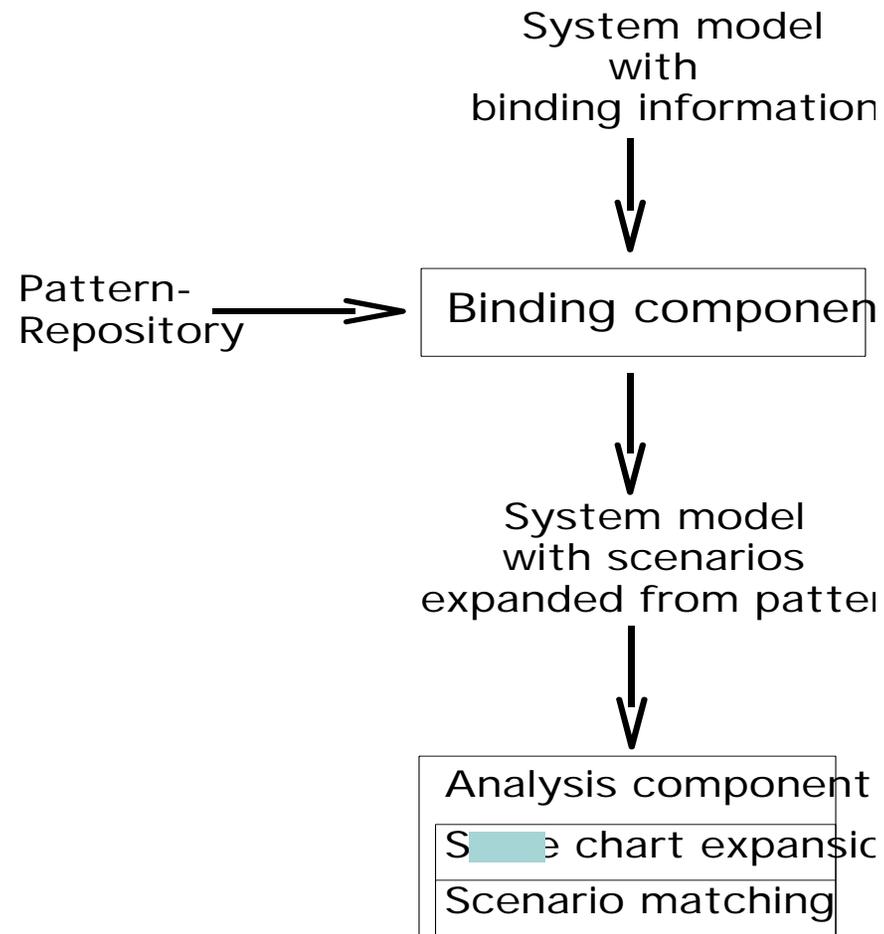
Design (Model) Verification checks whether the specified pattern scenarios **do** occur in the model.

That is, whether the behavior of model elements is indeed made up by these scenarios.

Pattern-Enhanced Workflow



Our Toolchain (prototype implementation)



References & Contact

- (1) Sand, Matthias: **Modelling Dependable Systems with Patterns.** Supplement to Proc. EDCC-4, 4th European Dependable Computing Conference, Toulouse, France, October 2002
- (2) Sand, Matthias: **Verification and Test of Critical Systems with Patterns and Scenarios in UML.** Poster Presentation, Proc. 3rd International Workshop on Critical Systems Development with UML, Lisbon, Portugal, 2004
- (3) Sand, Matthias: **Patterns for Model Verification.** Supplement to Proc. HASE 2005: International Symposium on High Assurance Systems Engineering, Heidelberg, Germany 2005

Matthias Sand – sand@informatik.uni-erlangen.de