Modelling architectural decisions under changing requirements

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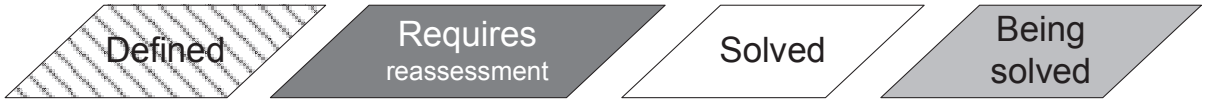
Introduction

- Architectural decision models show the decision making process of the architectural design
- Architectural decisions may undergo changes, e.g. in response to changed requirements
- Problem: How to perform changes in the architectural decision models in a rigorous way?

Maps of Architectural Decisions (MAD)

Symbols representing decision problems and their possible states:

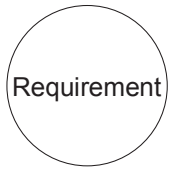


A connector between two decision problems:

"leads to" relation

Symbols representing solutions to the problem and their different statuses:

A relevant requirement:



- Other elements: Decision-maker, Pro or Con (for a solution)
- Additional attributes, e.g. name and creation date

Decision problem context

The context of an architectural decision problem contains:

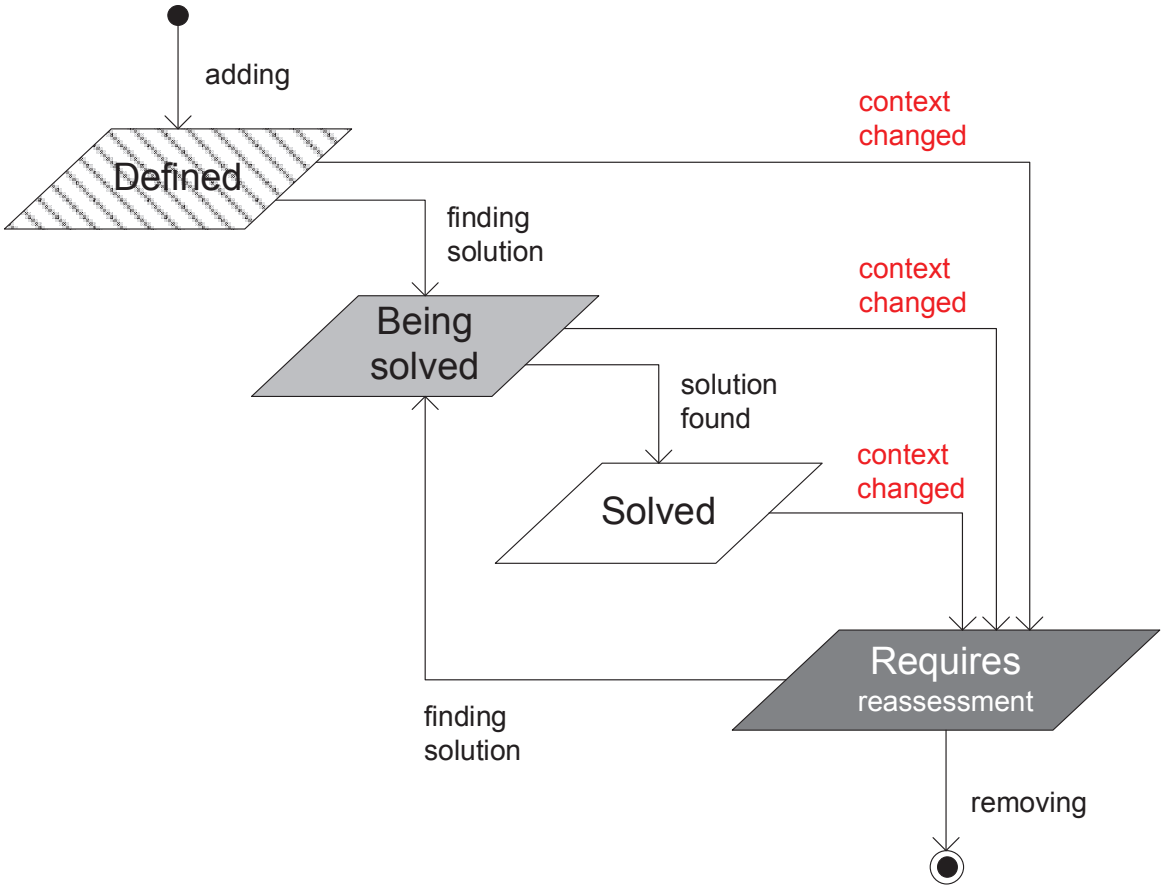
- relevant requirements and
- earlier decisions (chosen solutions)

More formally:

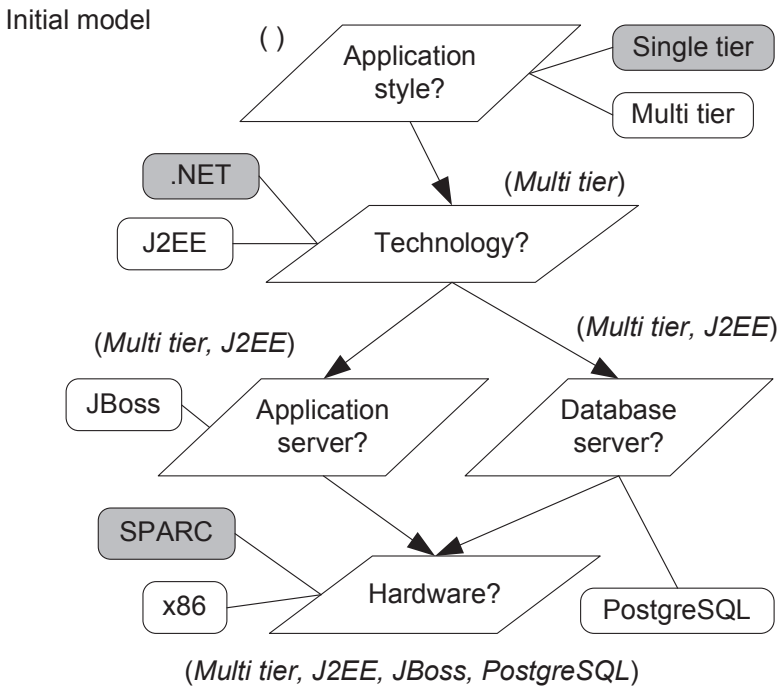
$$context(p) = requirements(p) \cup \bigcup_{q \succ p} solution(q)$$

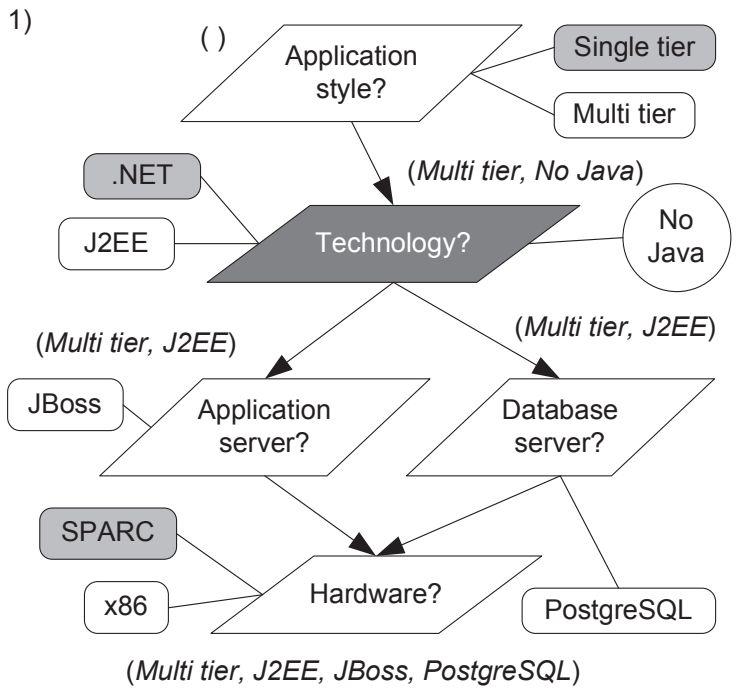
- $requirements(p)$ – a set of requirements relevant to p
- $solution(p)$ – a finally selected solution to p
- $\succ$ – a transitive closure of "leads to"

Decision problem life cycle

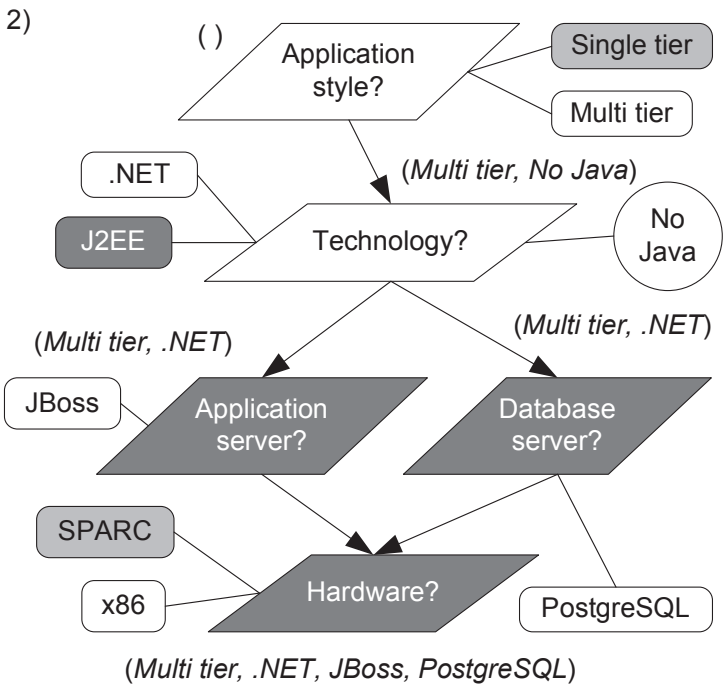


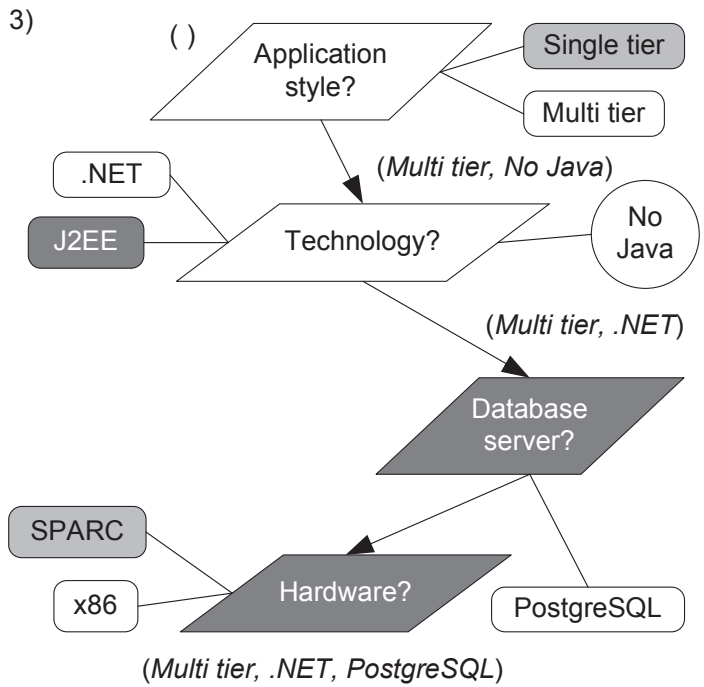
An example of model rebuilding (1)



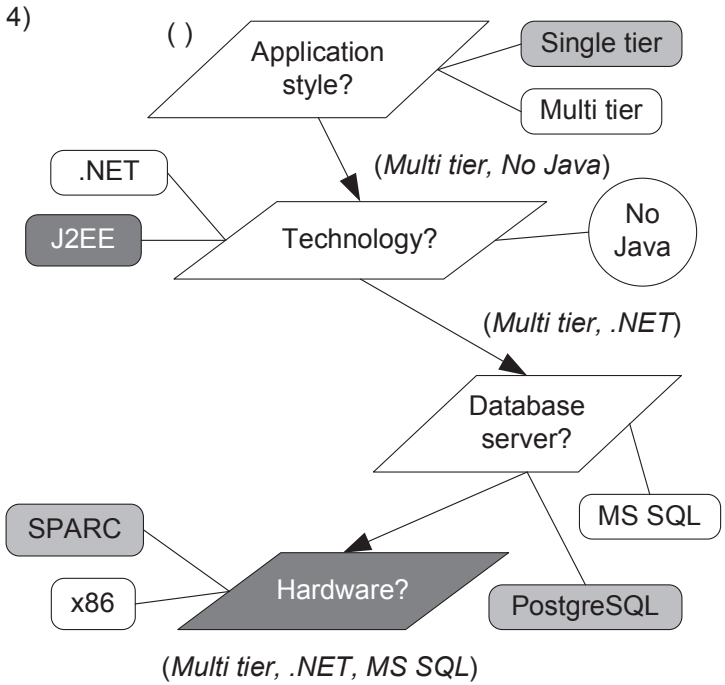


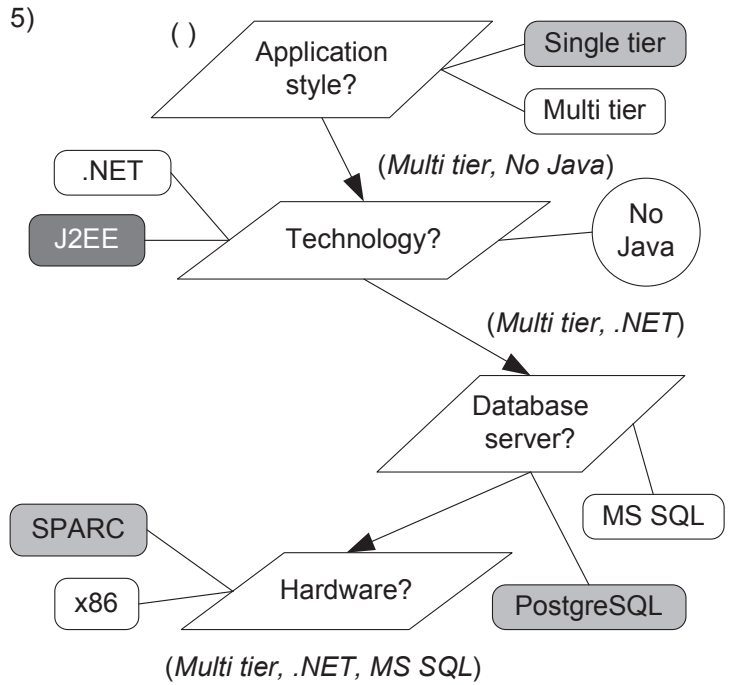
An example of model rebuilding (2)



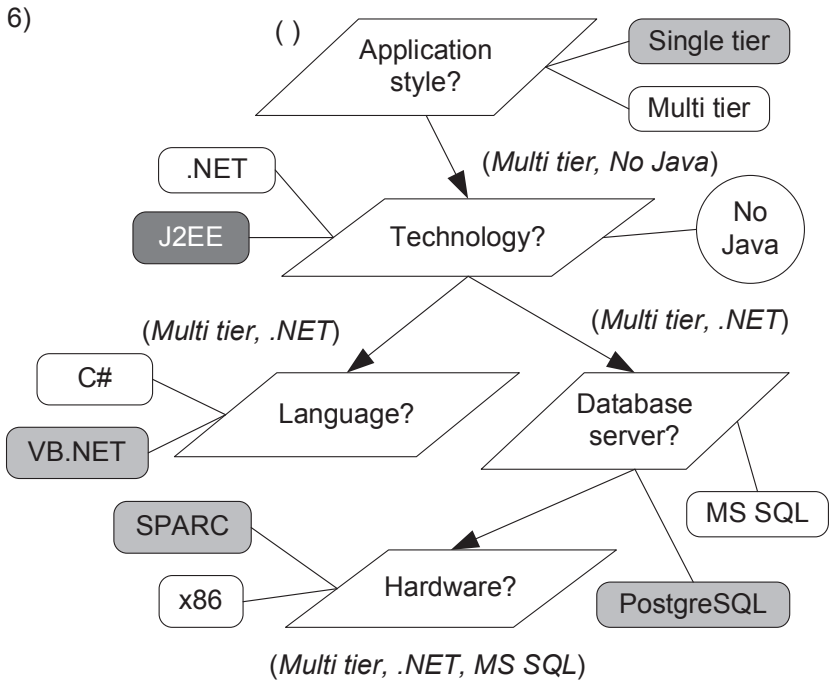


An example of model rebuilding (3)





An example of model rebuilding (4)



Summary and further work

- MAD notation has been developed to support architects working on systems evolution
- The notation has been validated in the real life conditions of one of the telecom companies in Poland
- MAD models can be built in an iterative way, where new requirements appear after parts of the model were created
- The tool supporting the process of rebuilding models is now under development