All Architecture Evaluation is not the Same
Lessons Learned from more than 50 Architecture Evaluations in Industry

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Architecture Evaluation is a Mature Discipline …

... but only few Practical Examples Published
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> 50 Architecture Evaluations

2004 - 2013
Goals of this Talk

- Complement literature
- Share experiences with other practitioners
- Give empirical evidences
Companies in these Countries Involved

- United States
- South Korea
- India
- Japan
- Hungary
- Finland
- Germany
- France
Industries Involved
Systems under Evaluation: Code Base

Size: 10 KLoC – 10 MLoC

Languages: Java, C, C++, C#, Delphi, Fortran, Cobol, Gen

Age: 0 years – 30 years
Initiation of Architecture Evaluations
Initiator of Architecture Evaluation

Initiator in same company:
- Top management
- Development management
- Development team
- Method support group

Initiator in other company:
- Current customer
- Potential customer
- Disappointed customer
- Cautious customer
Typical Goals and Evaluation Questions

- How adequate are the solutions for my requirements?
- What is the impact of changing to paradigm SOA, Cloud, OO, …?
- How adequate is our architecture as a basis for our future product portfolio?
- How different are two architectures? How feasible is the migration path?
- How can our system be modularized?
- How can we improve performance, reuse, maintainability, …?
- Which framework/platform/technology fits our needs best?
- How compliant is our solution to a reference architecture?
Initial Situation of Architecture Evaluation

- **Risk Management**: Evaluation only (~ 20 Projects)
- **Quality Management**: Evaluation & Improvement (~ 15 Projects)
- **Emergency**: Project "out of hand" (~ 5 Projects)
- **Clash**: Project "out of hand" (~ 5 Projects)
- **Rescue (Evolution vs. Revolution)**: Project "on plan" (~ 5 Projects)

Criticality vs. Project Type

Project Type:
- Evaluation only
- Evaluation & Improvement

Evaluation:
- ~ 20 Projects
- ~ 15 Projects
- ~ 5 Projects

Initial Situation of Architecture Evaluation

- Evolution vs. Revolution
- Quality Management
- Risk Management
- Emergency
- Clash
- Rescue (Evolution vs. Revolution)
Setup of Architecture Evaluation Projects
Organizational Constellation of Evaluations

Initiating Organization

Organization with product under evaluation

Organization with product under evaluation

[Number of People involved]
Effort Spent on the Evaluation

- **Initiating Organization**: 1-10 Person Days
- **Organization with product under evaluation**: 2-60 Person Days

Total Effort: 4-200 Person Days
Factors Driving Effort for Architecture Evaluation

- Number of stakeholders
- Organizational complexity
- System size and complexity
- Need for fast results
- Evaluation questions
- Criticality of situation
- Required confidence

Overall Effort
Overview on Architecture Evaluation Approach

Stakeholder
Concerns

Concern elicitation check

Architecture
Knowledge Models Documents

Scenario

Solution adequacy assessment
Documentation assessment
Compliance / distance assessment
Code quality assessment

Implementation/system
Source code Code metrics

Rating
Interpretation

- Concern elicitation check
- Scenario
- Solution adequacy assessment
- Documentation assessment
- Compliance / distance assessment
- Code quality assessment
Outcome of Architecture Evaluations
Findings: Requirements that are Often Neglected

**Runtime Quality Attributes**
- Typically known
- Partially missing quantification
- Often addressed well

**Devtime Quality Attributes**
- Often not explicitly known
- Often hard to quantify
- Often not addressed well

**Operation Quality Attributes**
- Typically not explicitly known
- Partially missing quantification
- Often not addressed well
Findings: Adequacy of Architectures under Evaluation

- Architecture typically not thoroughly defined
  - Often Emergency or Rescue projects
- Architecture often not fully adequate any more (older systems)
- Architecture thoroughly defined and maintained
  - Often Risk Management or Quality Management projects

[33 solution adequacy assessments]
Findings: Aspects that are „Over-Elaborated“

Technical Architecture
- Specification of general architectural styles
- Selection of technologies
- Over-Elaborated

Business Architecture
- Definition of concrete components or guidelines how to define them
- Mapping of concrete functionality to technologies
- Neglected

OSGi, ESB, ...

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Findings: Architecture Documentation

Architectural Requirements
- Often not available
- Often very good knowledge

Architecture
- Often not available
- Often very good knowledge

Implementation
- → Missing uniformity, lack of compliance, quality problems

Reconstruction is essential as basis for evaluation
Findings: Architecture Compliance

- Implementation chaotic
- Strong adverse impact on quality of systems
- Impact often perceived by users and developers
- High cost for rework

Typically very high overall quality

[26 compliance checks]
Interpretation of Evaluation Results

- No standard interpretation possible
- Stakeholders partially try to influence the interpretation for their goals
- Interpretation has to consider evaluation questions + many context factors
- Architecture Evaluation often not fully objective and quantitative
- Tool-based reverse engineering often leads to nice but useless visualizations
- Even quantitative data (e.g. number of incompliant relationships) often hard to interpret
- Representation of results for management is challenging (→ actions?)
Follow-Up of Architecture Evaluations
Which Problems can be Fixed, which can’t?

Problems that often can be fixed

- Missing documentation
- Missing support for several new scenarios
- Lower degree of incompliance in code

Problems that often can’t be fixed

- High degree of incompliance in code
- Missing thoroughness in definition of initial architecture
- Strong degree of degeneration of architecture over time
- Missing commitment in the fixing phase
Actions Taken after the Architecture Evaluations

- Project stopped
- New project for future architecture
- Project for removing architecture violations
- Selection of one of the candidate systems / technologies
- Initiative for improvement of architecture capabilities
- Project for improvement of architecture
- None
Evaluate your Architecture – early and regularly!
Effort and method strongly depend on goals and context
Interpretation of results is challenging
Thorough and continuous architecting is key to success