Architecture Best Practices for Project and Technical Leaders

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213

Felix Bachmann
Jim McHale
Tim Morrow
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Architecture-Centric Engineering (ACE) Design and Analysis – with TSP

IMPLEMENT AND EVOLVE

DESIGN

BUSINESS AND MISSION GOALS

TSP

ARCHITECTURE

IMPLEMENT

TSP

SYSTEM

SATISFY

CONFORM

SATISFY
What Drives Architectural Need?

There are no definitive studies or guidelines, probably because the answer is context dependent.

- More than 2 people
- More than 6 months effort
- More than 25-30 KLOC (thousands of lines of code; a VERY high number for 2 people over 6 months)
- Critical non-functional attributes (performance, safety, security, etc.)
- No pre-existing architecture! (…especially if someone other than the developer is attempting to maintain or enhance it)
Why is Architecture Needed?

Represents *earliest* design decisions

• hardest to change
• most critical to get right
• communication vehicle among stakeholders

*First* design artifact addressing

Quality attributes (i.e., performance, security, usability)

Key to systematic *reuse*

• transferable, reusable abstraction

What do I need to know?
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Key

Initial level

Second level

Acquisition

Visual Representation

Context
"As is" and "To be"

Second level

Processes

Specifications

Architecture Best Practices
Citizen calls 911

Emergency Management Organization

Local govt

Emergency Alerting System

Social media

First Responders

Carriers’ Gateway

Message Recipient

Emergency Alerting System

IPAWS
Integrated Public Alert and Warning System

www.fema.gov/emergency/ipaws

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"As-Is" Standalone Implementation

**Acme Purchasing System (APS)**

- **Reviewer client**
  - Internet
- **User client** (Using approved desktop, laptop, mobile device)
  - Internet
- **APS admin client**
  - Internet
- **Vendor Portal**
  - Internet (SSL)
- **Interfaces to supporting systems**
  - Internet
- **Vendors**
  - Internet
- **public**

**Legend:**
- Part of APS
- Outside APS
“To-be” Hosting view

- Public
- Vendors
- Reviewer client
- User client
- APS admin
- Internet
- Internet (SSL)
- Hosted environment admin
- Data Warehouse (site 1)
- Data Warehouse (site 2)
- Data Warehouse (site 3)
- Load balancers
- APS
- Interfaces to supporting systems
Architecture Guidelines & Principles Document

Table of Contents

- Timeline
- Quality Attributes
- Guidelines
- Strategies
- Constraints
- Design/Coding Guidance
- Architecture Evolution
- Decisions
Conceptual Flow of the MTW

SoS Drivers and Capabilities ➔ Mission Threads and Vignettes ➔ SoS Quality Attributes ➔ Quality Attribute Augmentation (with stakeholders)

SoS Architecture Plan ➔ Views - operational development sustainment ➔ Legacy Systems ➔ Mission Threads Augmented with Quality Attribute, Capability, Engineering Considerations

impacts

SoS Challenges ➔ distilled into

Architecture Issues ➔ Engineering Issues ➔ Capability Issues ➔ Qualitative Analysis of Augmented Mission Threads (w/o stakeholders)
Conceptual Flow of the QAW

1. Business Drivers
2. Software Architecture Plans
3. Quality Attributes
4. Quality Attribute Scenario elicitation, prioritization, refinement (with stakeholders)
5. Prioritized Quality Attribute Scenarios
6. Refined QA Scenarios (subset of scenarios, in priority order)

Impacts distilled into:
- Architecture Challenges
- Qualitative Analysis of Refined Scenarios (w/o stakeholders)
System Engineering Timeline

- System Design Review
- Preliminary Design Review
- Critical Design Review
- Production Readiness Review
- In-Service Review
Contact Information

Jim McHale/Tim Morrow
Senior Members of Technical Staff
SEI Software Solutions Division
Telephone: +1 412-268-5800
Email: jdm@sei.cmu.edu
tbm@sei.cmu.edu

U.S. Mail
Software Engineering Institute
Customer Relations
4500 Fifth Avenue
Pittsburgh, PA 15213-2612
USA

Web
www.sei.cmu.edu
www.sei.cmu.edu/contact.cfm

Customer Relations
Email: info@sei.cmu.edu
Telephone: +1 412-268-5800
SEI Phone: +1 412-268-5800
SEI Fax: +1 412-268-6257