



# Software Quality Attributes Panel Outbrief

17 October 2007

DoD Software In Acquisition Workshop  
16-17 October  
Software Engineering Institute, Arlington, VA



# Software Quality Attributes Panel Attendees

1. Paul Croll
2. Shawn Rahmani
3. Ray Menell
4. Becky Grant
5. Lisa Cohen
6. Geoff Draper
7. Terry Dailey
8. Tim Morrow
9. Mike Gagliardi
10. John Bergey
11. Bill McKeever
12. Frank Fratook
13. David Bart
14. Jack VanKirk
15. Terry Carlson
16. Sue LaFortune
17. Art Pyster
18. Gail Haddock



## Panel #3: Software Quality Attributes – Top Level Summary

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- **Panel Theme/Focus:**
  - Policy, guidance, and training for identifying and achieving quality attributes for software architectures
- **2006 NDIA Top Software Issues Findings:**
  - Software quality attributes were not directly discussed as an issue, such attributes related to a large cross section of the issues such as:
    - Software verification techniques are costly and ineffective for dealing with the scale of complexity of modern systems.
    - There is a failure to assure correct, predictable, safe, secure execution of complex software in distributed environments.
    - Inadequate attention is given to total life cycle issues for COTS/NDI impacts on life cycle cost and risk
    - SW not consistently involved in architectural decisions early in the life cycle
- **Recommendations:**
  - Define software assurance quality attributes that can be addressed during architectural trade-offs
  - Ensure defined quality attributes and testability are addressed in requirements, architecture, and design



# Panel Activities

- 8+ hours
- 40 Issues
- 16 Work Products
- 16 Sets of Recommended Actions
- 1 Team Organizing Work Product

. . . And a fun time was had by all !!!



# Issues Mapped to Categories (1 of 2)

Issue Keyword	Detailed Issue
Architecture attributes	1.Architecting QA into new systems, especially for extensibility 10.Arch centric approaches for QA 37.Product: repository of architectural options for a given QA, to be provided as a guide
Definitions (Guidance)	11.Quality vs. quality attributes 12.Quality means non-functional attributes 17.Need clear definition of quality attributes, architecture, etc 19.Work product – common terms definition 21.Instead of concise definition, what questions would you ask about (reliability) – definition by inference 27.Product – take one of the quality attributes and establish common understanding
Identifying and Defining QAs (Guidance)	13.Which attributes are core to software 14.Attributes are system and environment specific 15.Which attributes are important to the buyer 18.Could ask the stakeholder to give a scenario-based definition – what would it look like to them 2.How to measure QAs 20.Can't put all the QAs on a program. Cost would be astronomical – must pick and choose 22.Key attribute of attributes is quantification 23.For each attribute there is a different set of techniques to define, address and quantify attributes 24.Workshop to elicit scenario-based descriptions 25.Acquirers don't have insight into architecture/QAs, can only give KPPs 28.Should be priorities – bottom line parameters of an ility for classes of systems 29.Exercise should be driven by a set of stakeholders 3.What are core /std SW QA, to be measured; What are the quality gates 34.Right now we don't even identify what are quality attributes are 36.Shawn – survey programs to find out which quality attributes have higher priority for which classes of programs 38.Non-architecture products such as documentation also need quality attributes 4.Predict QA early in lifecycle 40.Kristen: Should avoid any specific tool or technique recommendation for SW QA (QAW and ATAM are just exa 6.Extension of SW QA into SoS 9.SW reliability



## Issues Mapped to Categories (2 of 2)

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Lifecycle Methods for QAs	16.How do we measure to determine that the buyers expectation has been met 26.Kristen – Could evaluate architectures at PDR 39.QA should be applied, eventually, to entire SW lifecycle activities, processes, and products 8.ATAM and how it should be used/enhanced; how to bounce them against the requirements
OSD policy and assets	30.Kristen – DoD guidance is silent on QAs – discuss benefit of QAs 5.Inadequate attention to Sw & QA 7.Use of QA in contracts
Training and Education	31.Need to identify DAU training in quality/QAs – get in in IDP + part of performance statement 32.PMs don't care about architecture – just performance (customer-centric) 33.Different levels of education – for both gov't and contractor 35.Where does the CMMI talk about quality attributes – could focus more on quality in courses



# Work Product Strategy

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- Identification of
  - Products
  - Actions
  - Resources
- Grouped into three tiers
  - Tier 1
    - Five products
    - Roughly 6 month window
      - Including interim products
  - Tier 2
    - Four products
    - Roughly 12 month window
  - Tier 3
    - Seven products
    - Roughly 18 month window



## Top Tier Work Products (1 of 2)

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### **1. Product: Recommended guidance on engineering issues such as: quantitatively identifying, predicting, evaluating, verifying, and validating Quality Attributes**

#### Actions to include:

- 1.1. Address tie-in to KPPs and TPMs
- 1.2. Identify methods for quantitative assessment of individual and integrated Quality Attributes
- 1.3. Define the specific pieces of evidence required to pass acquisition milestones
- 1.4. Identify methods for predicting quality attribute outcomes for the delivered system, throughout the life cycle

Resources: Recommend dedicated staffing/funding

### **2. Product: Recommendations for improving OSD/Service-level acquisition policy regarding Quality Attributes**

#### Actions to include:

- 2.1. Identify benefits of addressing software quality attributes as part of an acquisition risk reduction strategy
- 2.2. Address gaps in SEP, TEMP, JCIDS, DAG
- 2.3. Develop model RFP language
- 2.4. Define expectations for Quality Attribute review during Acquisition Milestone Reviews (e.g. PDR)

Resources: Morrow (SEI), Bart (Aerospace), Cohen (MITRE)



## Top Tier Work Products (2 of 2)

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### **3. Product: Taxonomy of software quality attributes and how they are related**

#### Actions to include:

- 3.1. Collect and organize definitions of Quality Attributes
- 3.2. Enumerate relationships to systems quality expectations
- 3.3. Survey existing information on selection and prioritization of software quality attributes for different classes of programs

Resources: Haddock (Aerospace)

### **4. Product: Program Manager guidance on Introduction to Software Architectural Evaluation of Quality Attributes**

#### Actions to include:

- 4.1. Evaluate existing guidance documents
- 4.2. Synthesize results into recommended guidance

Resources: Bergey (SEI)

### **5. Product: Collaboration site for collecting data, sharing work products, facilitating on-going discussion**

#### Actions to include:

- 5.1. Identify host/collaboration tool
- 5.2. Define site framework/rules

Resources: Croll (CSC)



## 2<sup>nd</sup> Tier Work Products

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### **1. Product: Catalog of architectural approaches with respect to their Quality Attribute profiles**

#### Actions to include:

1.1. Develop catalog format and approach

### **2. Product: Process for selecting the subset of Quality Attributes for specific systems of interest**

#### Actions to include:

2.1. Develop strategy for attribute trade-offs

2.2. Identify risk implications

2.3. Develop a checklist of questions to identify attributes important to the stakeholder(s)

### **3. Product: Recommendations for basic research on quality attributes**

#### Actions to include:

3.1. Address inadequacies in state of the art/state of the practice

### **4. Product: Guidance on how to engineer quality attributes into systems**

#### Actions to include:

4.1. Define engineering processes to achieve specific quality attribute levels

4.2. Report on current research and practice



## 3<sup>rd</sup> Tier Work Products (1 of 2)

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### **1. Product: Guidance on addressing Quality Attributes in the Systems of Systems Context**

#### Actions to include:

- 1.1. Perform mission thread analysis
  - 1.1.1. Use workshop outline (funded)
- 1.2. Define systems of Systems software architecture evaluation approach

### **2. Product: Examination of Root Cause Analysis Workshop data with respect to Quality Attributes implications**

#### Actions to include:

- 2.1. Examine root cause analysis workshop data to determine quality attribute implication

### **3. Product: Examination of what DAU teaches regarding Quality Attributes and recommendations for improvement (tied to policy and guidance in #2)**

#### Actions to include:

- 3.1. Review course material used for PMs and Systems Engineers about quality attributes
  - 3.1.1. Provide recommendations for additions to course materials

### **4. Product: White paper on how to reason about Quality Attributes in architecture model standards (e.g. DODAF)**

#### Actions to include:

- 4.1. Produce white paper on how to reason about Quality Attributes in architecture model standards (e.g. DODAF)



## 3<sup>rd</sup> Tier Work Products (2 of 2)

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### **5. Product: Guidance on addressing quality attributes of COTS/NDI**

#### Actions to include:

5.1. Develop guidance on addressing quality attributes of COTS/NDI

### **6. Product: White paper on quality attributes implications of agile methods for large scale defense systems**

#### Actions to include:

6.1. Develop White paper on quality attributes implications of agile methods for large scale defense systems

### **7. Product: Guidance/lessons learned from commercial practice**

#### Actions to include:

7.1. Collect and provide guidance/lessons learned from commercial practice



## Team Organizational Work Product

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- **Product: Quality Attributes Working Group Charter/Roadmap**

Actions to include:

- Capture existing data on the usage of quality attributes relevant to Defense systems
- Develop plans for work products to improve policy, guidance, and evaluation related to the quality of operational defense systems
- Identify requirements for funding/volunteer support

Resources: Menell (Army)



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# Questions?