Relative importance of traceability

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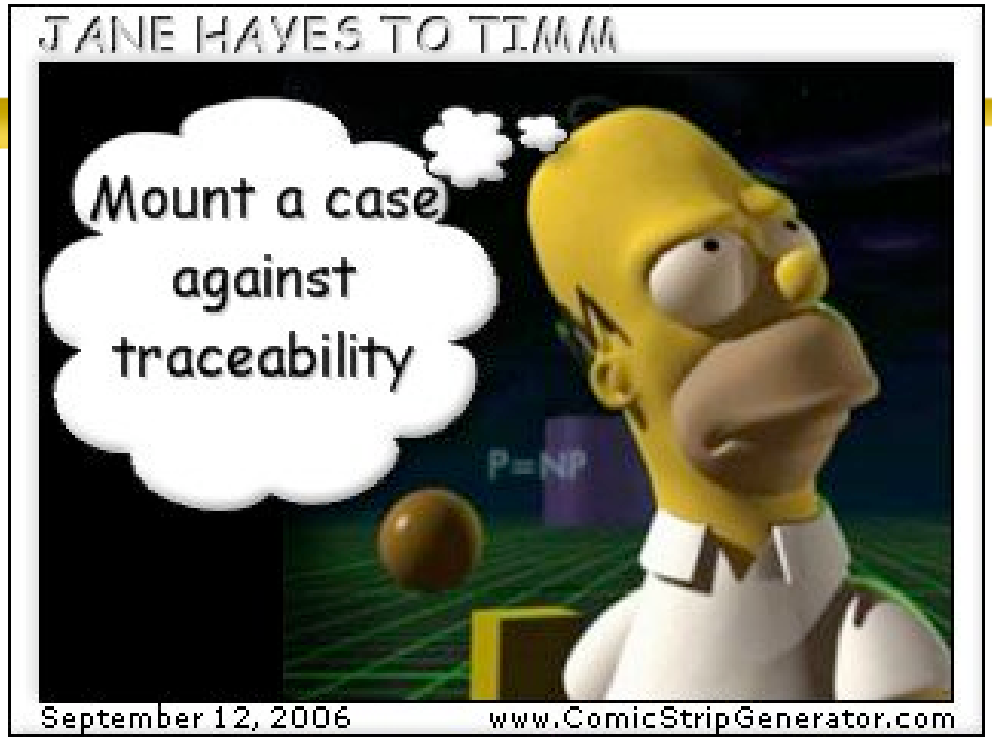
Presentation to an RE'06 panel on Traceability

http://unbox.org/wisp/trunk/silap/doc/re06.{ppt|pdf}



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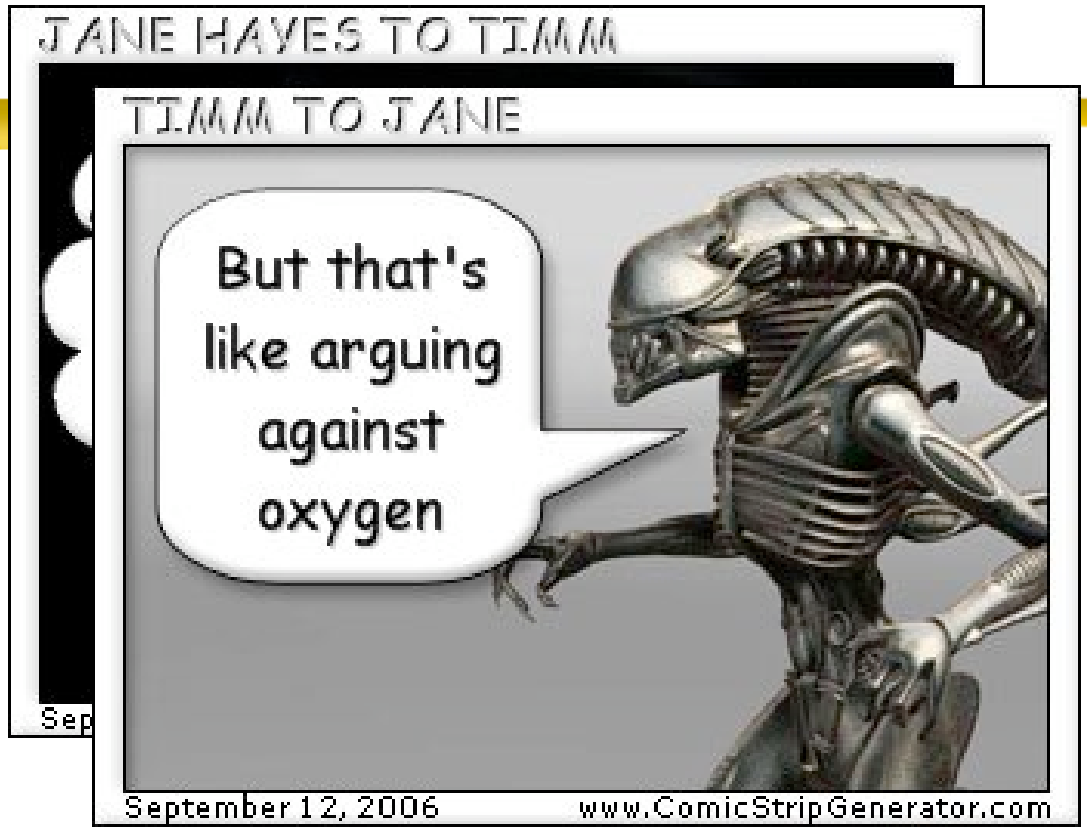

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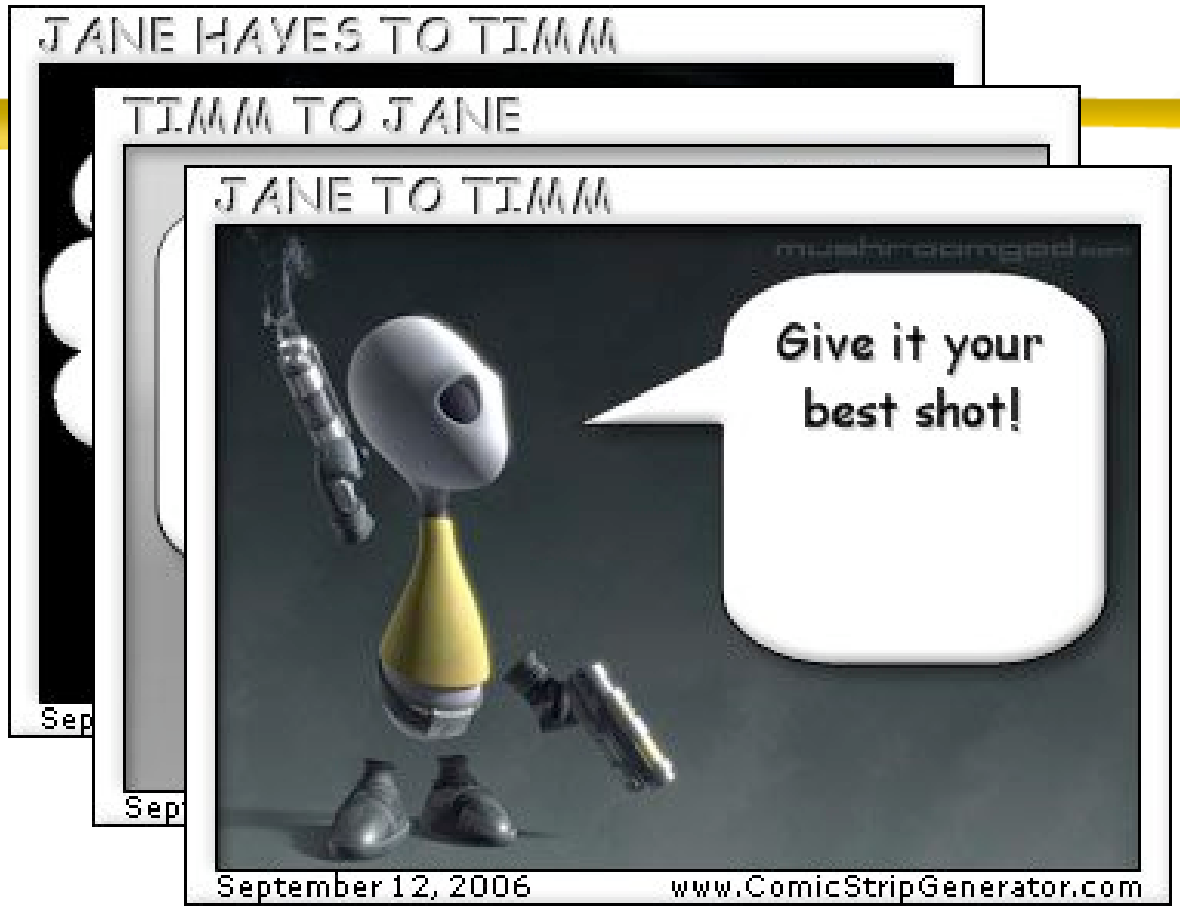

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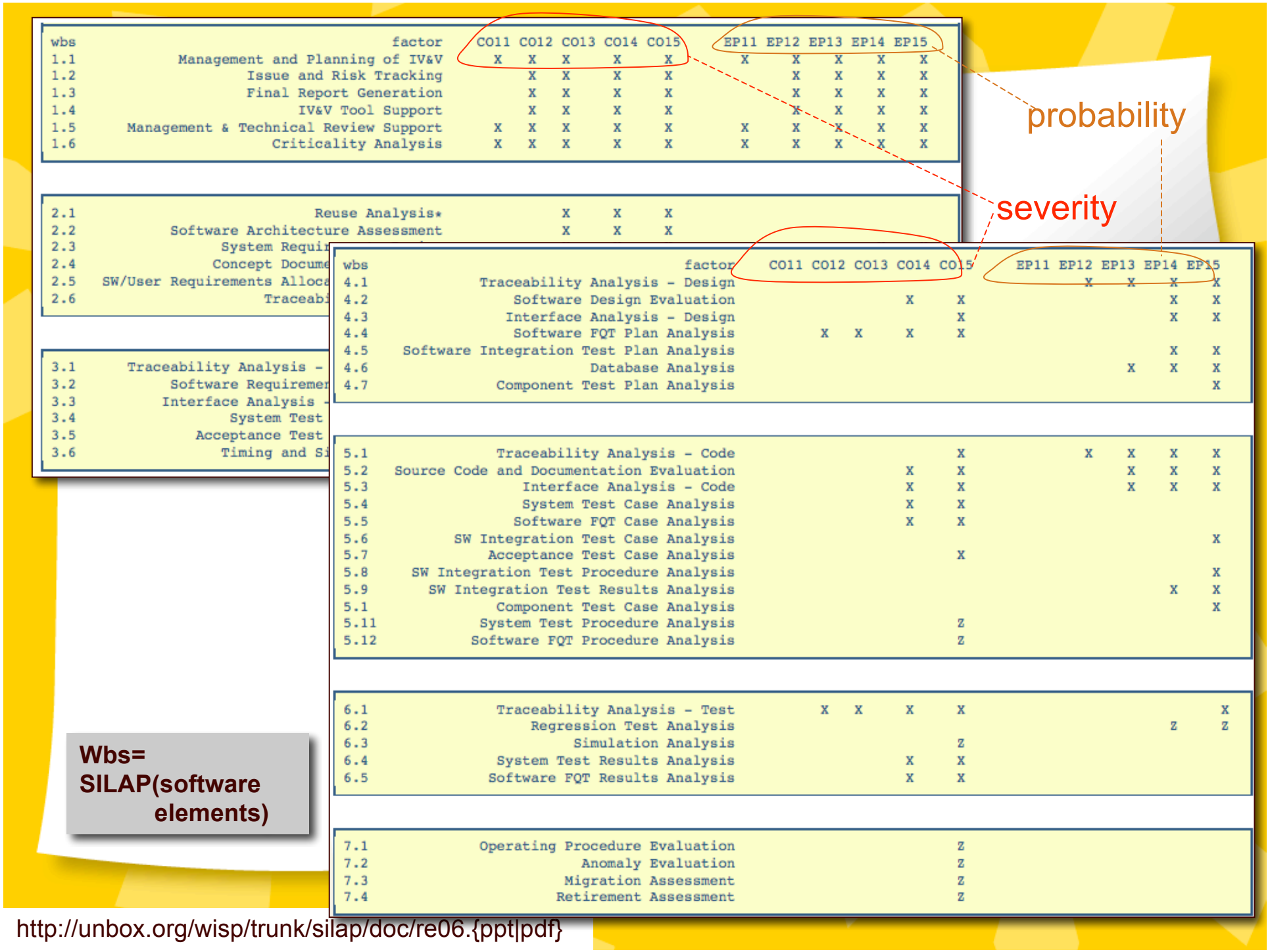
O.k. lets argue the relative merits of traceability vs other techniques

- NASA Software Independent Verification & Validation facility
- NASA's software police
- Adapted the IEEE 1012 standard for Software V&V
  - 45 tasks, selected by..
    - Error probability and severity of each software elements
  - What tasks are most expensive and most frequent?

Caveat Emptor

- Only based on the NASA IV&V work practices
  - NASA IV&V does more static code work than anything else
- Only based on current NASA practices
  - And that will change as the CONSTELLATION project progresses
- Assumes the costing structures of NASA
  - May generalize at least to the rest of the aerospace industry
- Unaware of a similar data source



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Monte Carlo SILAP

- Generate 500 software elements
  - at the same frequency as those seen at NASA
- Pass to each to SILAP
  - Compute {probability,severity} for each
- Cache the frequency (F) with which the 1012 tasks are selected
  - Multiply those frequencies (F) by the cost (C) of each task

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Predicted normalized frequencies (F) of IEEE 1012 tasks seen @ ivv.nasa

only 23 out of 46 have F > 0

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                  Traceability Analysis -  Requirements, 7, *******
                             Traceability Analysis - Test, 7, *******
                               Software FQT Plan Analysis, 7, *******
                            Component Test Case Analysis, 6,  ******
                             Traceability Analysis - Code, 6,  ******
                           Traceability Analysis - Design, 6,  ******
                                      Reuse Analysis*, 5,   *****
                          Software Requirements Evaluation, 4,    ****
                                System Requirements Review, 4,    ****
                                 Interface Analysis - Code, 4,    ****
Source Code and Documentation Evaluation, 4,    ****
                         Interface Analysis - Requirements, 4,    ****
                                 System Test Plan Analysis, 4,    ****
                          Software Architecture Assessment, 4,    ****
                                      Database Analysis, 2,      **
                                Software Design Evaluation, 2,      **
                             Software FQT Results Analysis, 2,      **
                              System Test Results Analysis, 2,      **
                                Software FQT Case Analysis, 2,      **
                                System Test Case Analysis, 2,      **
                                    Traceability Analysis, 1,       *
SW/User Requirements Allocation Analysis, 1,       *
                             Concept Document Evaluation, 1,       *
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Sums to 100

http://unbox.org/wisp/trunk/silap/doc/re06.{ppt|pdf}

Normalized costs (C) of IEEE 1012 tasks seen @ IVV.Nasa

only 25 out of 46 have C > 0

Simulation Analysis,	22,	**********
Source Code and Documentation Evaluation,	11,	**********
Interface Analysis - Code,	5,	*****
SW Integration Test Results Analysis,	4,	****
Software Requirements Evaluation,	4,	****
Software Design Evaluation,	4,	****
Software FQT Results Analysis,	3,	***
Traceability Analysis - Code,	3,	***
Software FQT Plan Analysis,	3,	***
Regression Test Analysis,	3,	***
Traceability Analysis - Design,	2,	**
Traceability Analysis - Test,	2,	**
System Test Results Analysis,	2,	**
Interface Analysis - Design,	2,	**
Software FQT Case Analysis,	2,	**
Software Integration Test Plan Analysis,	1,	*
Traceability Analysis - Requirements,	1,	*
Interface Analysis - Requirements,	1,	*
Software Architecture Assessment,	1,	*
System Test Procedure Analysis,	1,	*
Acceptance Test Case Analysis,	1,	*
System Requirements Review,	1,	*
System Test Plan Analysis,	1,	*
System Test Case Analysis,	1,	*
Reuse Analysis*,	1,	*

Sums to 100

http://unbox.org/wisp/trunk/silap/doc/re06.{ppt|pdf}

Normalized (frequency * costs) of IEEE 1012 tasks @ ivv.nasa

Traceability: in the top 9 of 46

only 18 out of 46 have F*C > 0

Source Code and Documentation Evaluation,	20,	**********
Interface Analysis - Code,	9,	*********
Traceability Analysis - Code,	9,	*********
Software FQT Plan Analysis,	8,	********
Traceability Analysis - Design,	7,	*******
Software Requirements Evaluation,	7,	*******
Traceability Analysis - Test,	6,	******
Software Design Evaluation,	4,	****
Traceability Analysis - Requirements,	4,	****
Reuse Analysis*,	3,	***
Software FQT Results Analysis,	2,	**
Simulation Analysis,	2,	**
System Test Plan Analysis,	2,	**
Interface Analysis - Requirements,	2,	**
System Requirements Review,	2,	**
Software Architecture Assessment,	2,	**
System Test Results Analysis,	1,	*
Software FQT Case Analysis,	1,	*

Top 50%

Sums to 100

Requirements traceability: ranks fourth

To do:
1) Focus on code & design traceability
2) Reactive the missing 28 tasks
3) Assess tasks by F,C & effectiveness

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