

Fifteenth Annual INCOSE Region II Mini-Conference

30 October 2010

San Diego

Test-Driven Systems Engineering

“In the beginning, there was nothing, and all was darkness. And The Great Tester said, ‘Let there be light’, and there was light. There was still nothing, but at least now you could see there was nothing.”

The Legend of the Great Tester

Pursuit of the Goal



**Test-Driven
Systems Engineering:
Creating Things That Work**

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ABSTRACT

Test-Driven Systems Engineering

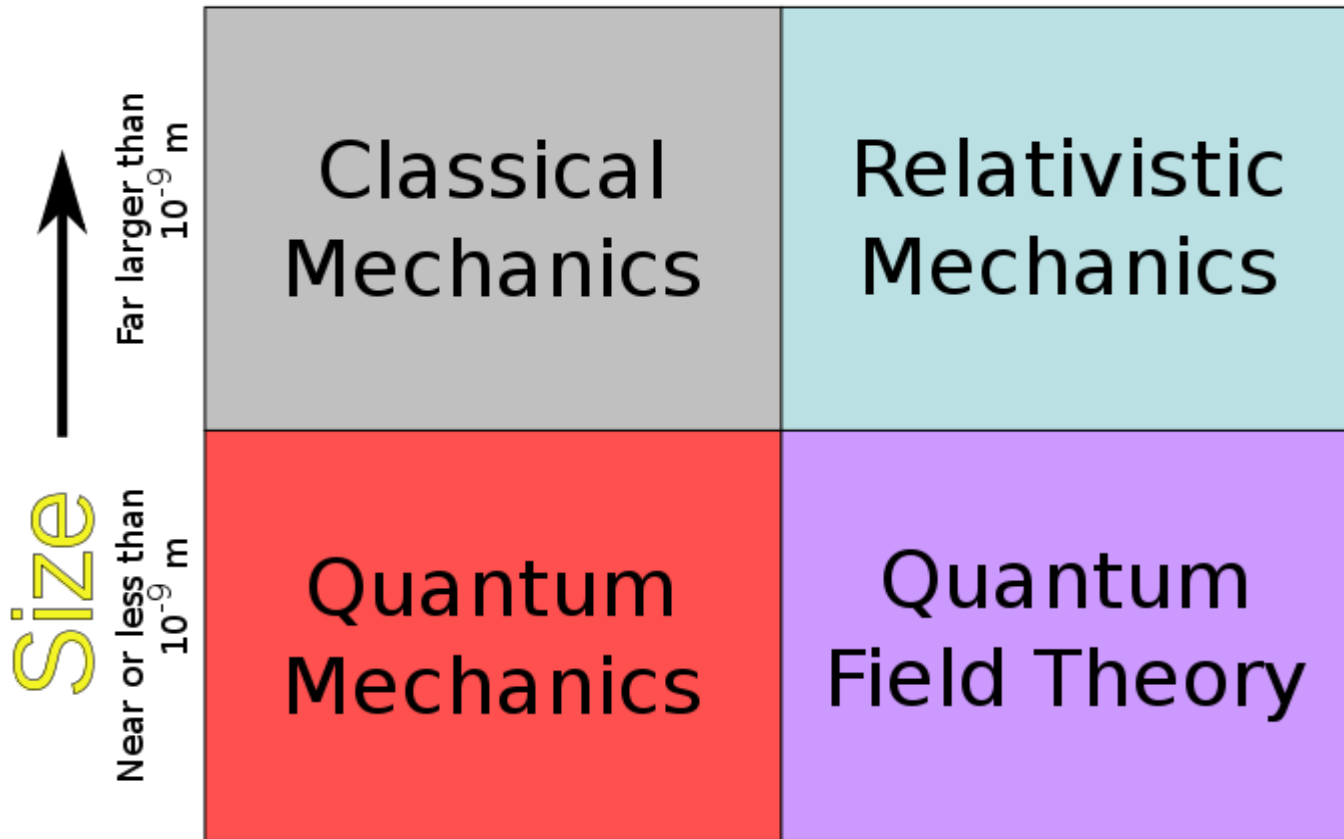
The fundamental basis of all systems engineering (SE) activity in system development is a comprehensive articulation of requirements for the system. Regrettably, real-world requirements documentation is usually incomplete, out-of-date, asynchronous with current technology capabilities, in dispute among stakeholders and otherwise less than ideal as a driver of the SE function. Exploiting a domain understanding of test and evaluation (T&E), the systems engineer can utilize processes and tools enabling SE to create systems which will “automatically” meet their intended goals and thresholds, i.e., the systems will “work”. The basic concept is to drive the SE function “backward” from the T&E Master Plan (TEMP) to a System Engineering Plan (SEP) and System Engineering Management Plan (SEMP) consistent with system success against the TEMP criteria. In practice, the inherent “Test-Analyze-Fix” nature of complex system development guarantees that much program activity after DoD acquisition Milestone A, including SE, is actually driven by T&E events. The described processes and tools will allow this to take place in a disciplined, organized manner, rather than as a series of reactions to emergencies. Users will comprehend the valuable ROI, since success in verification and validation testing is “baked in”. As with all SE efforts, this approach can be viewed as a risk reduction enabler (cost, schedule, technical performance, safety, etc.).

Scope of Test-Driven Systems Engineering

Speed 

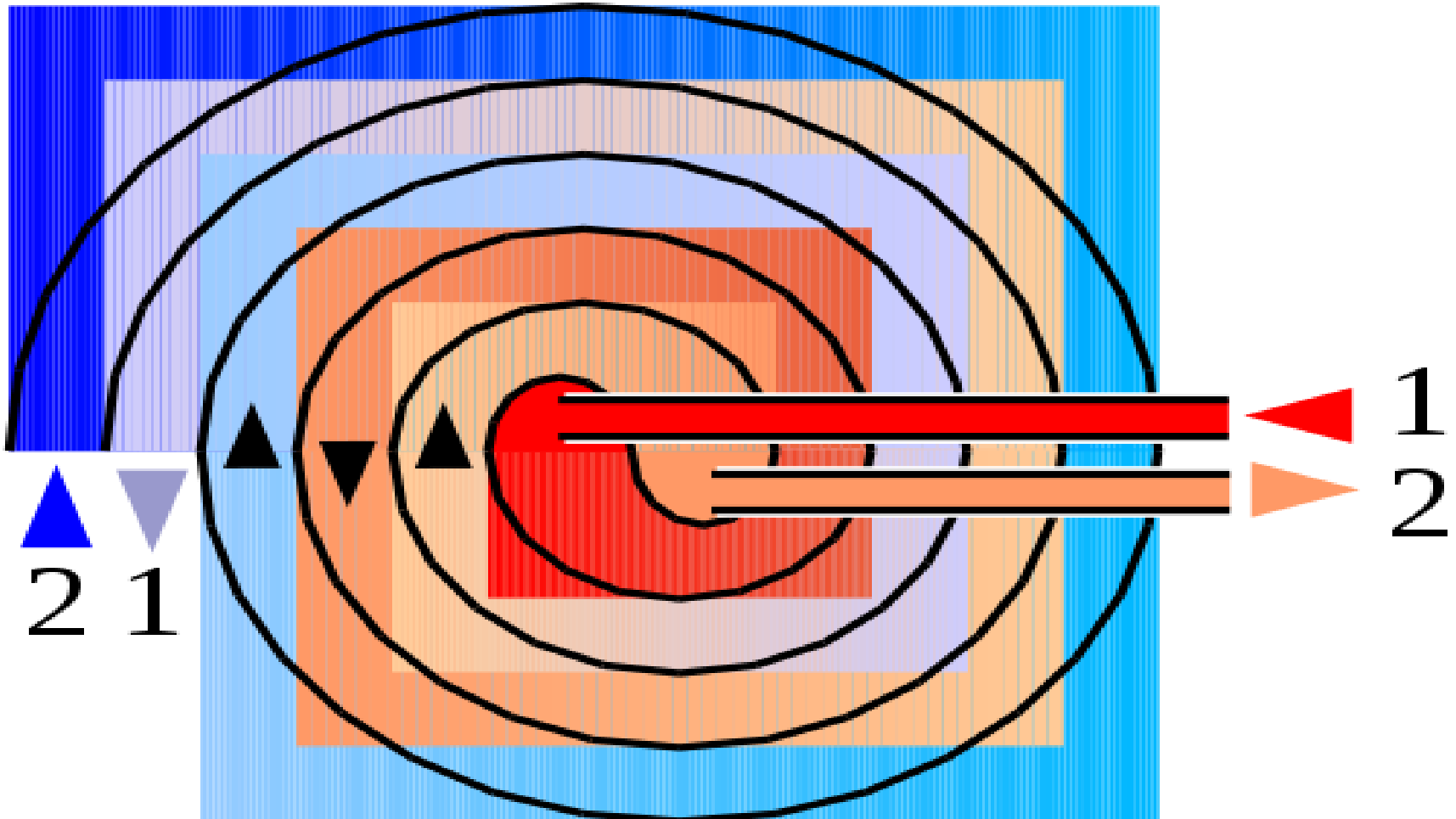
Far less than 3×10^8 m/s

Comparable to 3×10^8 m/s



Test-Driven SE Process

(Level 2, Simplified)



A Description, Not Another Definition

***Systems engineering*, noun: “a process comprising numerous best practices in system development and test informed by lessons learned from previous experiences, usually bad”.**

A T&E Approach for SE

T&E LLs → T&E BPs → Test-Driven SE

Some T&E BP Collections

- Defense Science Board, ***Report of Task Force on Test & Evaluation*** (10 vols.), April 1974
- Department of the Navy, ***Best Practices: How to Avoid Surprises in the World's Most Complicated Technical Process***, March 1986
- ITEA/MORS Minisymposium, ***How Much Testing Is Enough?***, Feb/March 1994

Some T&E BP Collections (Cont'd.)

- OSD Director, Test, Systems Engineering & Evaluation, ***Best Practices Applicable to DoD Developmental T&E***, June 1999
- U.S. “General Accounting” Office, ***Best Practices: A More Constructive Test Approach Is Key to Better Weapon System Outcomes***, July 2000
- ITEA Workshop, ***Best Practices in Test & Evaluation***, October 2000

Some T&E BP Collections (Cont'd.)

- OSD Deputy Director, Developmental T&E, ***A Study of Commercial Industry Best Practices in T&E***, July 2002
- Defense Acquisition University, ***Test and Evaluation Management Guide*** (Chapter 25 – Best Practices in T&E of Weapon Systems), January 2005
- Pete Adolph, ***The DoD Acquisition/Test Process: What Went Wrong and How to Fix the Process***, ITEA Journal of Test and Evaluation, March 2010

Observations re LLs and BPs

- Lessons Learned:

“We don’t learn our lessons”

- Best Practices:

“We can’t afford our best practices”

A Description, Not Another Definition*

***Systems engineering*, noun: “a process comprising numerous best practices in system development and test informed by lessons learned from previous experiences, usually bad”.**

***Repeat of earlier slide (running out of material here)**

Deep-Fried SE on a Stick

Pick a process and **tailor** it

- INCOSE SE Handbook
- IEEE Standard 1220
- NASA SE Handbook (Space & Aero)
- DAU SE Fundamentals
- Mil Dep-oriented Guidebooks

Go ahead, the BPs are already baked in...

We Need to Talk

- **INCOSE T&E Working Group (1995)**
- **INCOSE V&V Working Group (rename)**
- **ITEA/INCOSE Memo of Agreement
“regarding cooperation in professional
activities”(signed 18 & 20 Sept 2007)**
- **INCOSE Autonomous System T&E
Working Group**

Questions?



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