17th Practical Software and Systems Measurement Users' Group Meeting and Workshops

"Measurement: A Foundation for Affordable Solutions"

February 22-26, 2106
Arlington, Virginia

Meeting and Workshops Agenda

Time	Monday	Tuesday	Wednesday[1]	Thursday	Friday
7:30 – 8:30	Continental Breakfast	Continental Breakfast	Continental Breakfast	Continental Breakfast	Continental Breakfast
Morning Session* 8:30 – 12:20	PSM Training	Welcome & Introductions Keynote Presentations	Keynote Presentations	Keynote Presentations	Presentations Workshop Outbriefs Wrap-up
Lunch 12:20 – 1:30	Lunch	Lunch	Lunch	Lunch	
Afternoon Session* 1:30 – 5:00	PSM Training	Concurrent Workshops 1-2	Concurrent Workshops 3-4	Concurrent Workshops 5-6	

* Morning and afternoon breaks included

Other Agenda Items and Schedule

Monday, 22 February 2016

7:30am - 8:30am On-Site Conference Registration

8:30am – 5:00pm **PSM Training**: This course is an introduction to PSM for those who are new to PSM or who want a refresher course on the PSM principles and information-driven measurement process.

4:30pm - 5:30pm **PSM Discussion – Updates and Key Changes in the Latest Version**: This meeting is for current PSM Trainers, and interested PSM practitioners, to understand and discuss recent PSM updates.

Tuesday, 23 February 2016

7:30am - 8:30am On-Site Conference Registration

Wednesday, 24 February 2016

10:40am PSM Picture
6:00pm PSM Dinner

Friday, 26 February 2016

10:00am - 12:00pm Workshop Outbriefs
Each workshop lead will summarize the results of their workshop and discuss future goals.

12:00am - 12:20pm Conference Wrap-Up

[1] **Group picture Wednesday AM - location will be announced**

17th PSMUG Users' Group Meeting and Workshops: "Measurement: A Foundation for Affordable Solutions

Presentations: Tuesday - Friday **Presentation Abstracts are provided starting on page 10.**

Time	Tuesday	Wednesday	Thursday	Friday
8:30 - 920	***Keynote: Army Software Maintenance - Addressing the Critical Issues*** ***John McGarry and Robert Charette***	***Keynote: Maintainability Readiness Levels for Software-Intensive Systems*** ***Barry Boehm***	***Keynote: Measurement in the Department of Defense*** ***James Thompson***	***Establishing Standards as the Basis for Effective Measurement and Affordability*** ***Marc Jones***
9:20 - 10:00	***SRDRs - A success story ready for its next chapter*** ***Ranae Woods***	***Brave New World: Measurement, Big Data and Analytics*** ***Bill Golaz***	***COSYSMO 3.0: Updating Cost Estimation of Systems Engineering to Support Affordability*** ***Jim Alstad***	***Early Phase Software Effort and Schedule Estimation Models*** ***Wilson Rosa***
10:00 - 10:40	***At the Intersection of Technical Debt and Software Maintenance Costs*** ***Arlene Minkiewicz***	***System of Systems*** ***Judith Dahmann***	***Inherent Issues of AgileEVM and A Viable Solution for Effective Agile Project Controls*** ***Omar Mahmoud***	***Workshop Outbriefs***
11:00 - 11:40	***Struggles at the Frontiers of Measurement: Special Focus on Achieving System and Software Assurance for Software-Reliant Systems*** ***Ken Nidiffer***	***COCOMO III Project Overview*** ***Brad Clark***	***Challenges with Sizing and Estimating Enterprise Information Systems*** ***Chris Miller***	***Workshop Outbriefs***
11:40 - 12:20	***Simulation of Kanban-based scheduling for systems of systems*** ***Alexey Tregubov***	***Why Are Estimates Always Wrong: Estimation Bias and Strategic Mis-estimation*** ***Joe Dean***	***Metrics to Support Effective Estimation of On-Going Operations and Sustainment*** ***Denton Tarbet - Bakari Dale***	***Workshop Outbriefs*** ***Conference Wrap-up***

* Presentations are in the auditorium.

PSM Users' Group 2016 Workshops

Descriptions on following pages

Workshops to be held afternoons from 1:30pm to 5:00 pm

Workshops: Tuesday – Thursday

Time	Tuesday	Wednesday	Thursday
1:30 - 5:00	**Workshops**	**Workshops**	**Workshops**
	1. Transitioning Defense Software Maintenance/ Sustainment to DevOps **Facilitators: Cheryl Jones, John McGarry, Robert Charette, James Judy, James Doswell** **Room: Poseidon**	**3. COCOMO III** **Facilitator: Brad Clark** **Room: Poseidon**	**5. Software Aspects of Dependability (IEEE 982.1 - security)** **Facilitator: Rita Creel** **Room: Poseidon**
	2. Affordability **Facilitators: Kirk Michealson, Garry Roedler, Mike Yokell** **Room: Auditorium, GVC-A, GVC-B**	**4. System of Systems Measurement** **Facilitators: Judith Dahmann, Mimi Hailegiorghis, Cheryl Jones, Garry Roedler** **Room: GVC-A, GVC-B**	**6. COSYSMO** **Facilitators: James Alstad, Barry Boehm, Jo Ann Lane, Garry Roedler, Marilee Wheaton, Gan Wang** **Room: GVC-A**

Workshop #1: Transitioning Defense Software Maintenance/Sustainment to DevOps

Facilitators

Cheryl Jones and John McGarry, U.S. Army RDECOM-ARDEC

James Judy and James Doswell, U.S. Army DASA-CE

Dr. Robert Charette, ITABHI Corporation

Prerequisites

A general understanding of US Department of Defense software maintenance/sustainment practices, activities and funding, including the policies and regulations underlying or influencing them.

Materials to Bring

Any lessons learned in migrating software maintenance/sustainment towards a DevOps approach.

Discussion:

DevOps is a concept that promises to speed up delivery of software system capability to users by "merging" together the two traditionally separate and sequential software activities of development and maintenance/sustainment. Much work has been spent on introducing DevOps into new programs and projects, yet an area that seems ripe for exploitation is in programs and projects that are already in the maintenance/sustainment phase of their life cycle. In fact, an on-going US Army study into software maintenance and sustainment has found several programs that are in effect practicing DevOps concepts, while not explicitly calling it by this name.

The reason that these programs are taking a DevOps type of approach is simple: necessity. The Army is under extreme budgetary pressures, meaning virtually all enhanced war fighting capability is (and will be for the foreseeable future) coming from improvements in and refinements of currently deployed software-intensive systems, not from entirely new acquisitions. In addition, operational and security demands are increasing the pressure to field system enhancements more much quickly than in the past.

There are several roadblocks in the way of making DevOps a common practice in defense maintenance/sustainment program, not the least of which is that the same Army study has found several major disconnects between how resources are allocated to software maintenance/sustainment and their actual expenditures. This workshop is focused on examining how defense programs in software maintenance/sustainment can best take advantage of a DevOps approach given the current constraints, as well as what needs to be done from a policy and funding perspective to accelerate DevOps adoption.

Goals/Products

The goal of the workshop is to produce practical guidance for DoD program/project managers on how to move to a DevOps approach, including the identification of various technical, policy, funding, etc. roadblocks, and the related implications to performing cost estimates and tracking execution performance. In addition, the workshop will document the top level advantages and disadvantages in moving to a DevOps concept.

Workshop #2: Affordability Analysis Capability – Determining a Relevant / Common Set of Candidate Measures

Facilitators: Kirk Michealson, Tackle Solutions LLC; Garry Roedler, Lockheed Martin; and Mike Yokell, Lockheed Martin

Prerequisites:

Participants are recommended to review the Military Operations Research Society (MORS) "Big A" Affordability Analysis Interim Process Guide.

Materials to Bring:

Examples of affordability measures their organization has used for different analyses.

Discussion:

- History of affordability analysis (including organizations involved)
- What is affordability analysis? (example comparing to buying a house for perspective)
- Affordability perception & key definitions (including "BIG A" and "little a")
- Exit criteria (quality & sufficiency)
- Process overview (framework, process charts)
- Interim guide overview (TOC & Appendices)
- Other community best practices & lessons learned

Goals/Products:

- Develop a taxonomy to identify and align measurement needs,
- Update set of preliminary information needs,
- Define a measurement approach to determine measurement needs and measures related to affordability analysis for the following activities:
  - Baseline and Gap Assessments
  - Alternative Assessments
  - Trade-Off Analysis
- Identify an initial set of preliminary relevant / common set of candidate measures for each affordability analysis activity

Workshop #3: COCOMO III

Facilitator: Brad Clark, USC Center for Systems and Software Engineering

Prerequisites:

An understanding of how software cost estimation models are used in creating independent cost estimates. Knowledge of the COCOMO II Software Cost Estimation Model would be helpful but not absolutely necessary.

Materials to Bring:

Bring pen and paper. Handouts will be provided.

Discussion:

Participants should come to the workshop prepared to learn about and discuss the COCOMO cost drivers. There will be two exercises, one group and one individual, to quantify the influence of each cost driver on increasing or decreasing the nominal amount of effort on a software development project.

Goals/Products:

- Input and feedback on each COCOMO III Cost Driver as they are discussed
- Rank and quantification of the productivity range of each COCOMO III Cost Driver

Workshop #4: System of Systems Measurement

Facilitator: ***Judith Dahmann, Mimi Hailegiorghis, MITRE***
Cheryl Jones, US Army RDECOM-ARDEC
Garry Roedler, Lockheed Martin

Prerequisites:

Participants in this workshop should:

- have knowledge of the system life cycle and an understanding of system of systems (SOS)
- review the draft version of the ISO Special SoSE Study Group Report (this will be available on the PSM web site in early February)
- have an interest in improving our ability to measure system of systems.

Materials to Bring:

- Any examples of of system of systems (SOS) measures that have been used on existing systems.

Discussion:

The SoS measurement workshop will layout the basic characterization of SoS, the SoS engineering workflow and the implications for measurement, with some examples. The workshop will then focus on reviewing the PSM measurement approach and how it applies or can be adapted to SoS, including challenges and opportunities.

An eventual goal is to develop an ICM table for SOS measurement. That is an "Information Category (I)" - "Measurement Concept (C)" - "Measure (M)" table that includes the measures that are most relevant to SOS. At this workshop we will begin by discussing information needs and potential measures.

Goals/Products:

- ICM Table for SOS measurement
- SOS measurement white paper (in FY17)

Workshop #5: Measuring Software Aspects of Dependability: Revisiting IEEE 982.1

Facilitator: Rita Creel, Carnegie Mellon University Software Engineering Institute

Prerequisites:

Participants in this workshop should have

- knowledge of the software-reliant system life cycle and the engineering "ilities,"
- exposure to frameworks or standards for software quality attributes, and
- an interest in improving our ability to understand and express, in measurable terms, attributes of software that contribute to system dependability.

Materials to Bring:

These don't need to be written—you can "bring" them into the discussion:

- General experiences building dependability into software-reliant systems (prerequisites, activities, results)
- Relevant research and practice in specifying dependability requirements and measures, and in methods and tools that support their use.

Discussion:

Released in 1988 and revised in 2005, IEEE 982.1 is described as follows: "A standard dictionary of measures of the software aspects of dependability for assessing and predicting the reliability, maintainability, and availability of any software system; in particular, it applies to mission critical software systems." Over the past decade, the use of mission critical software systems—and software systems in general—has expanded and evolved, prompting new questions, expectations, and concerns regarding their dependability.

Stakeholders for the standard include acquires, developers, users, operators, and maintainers of software-reliant systems who are concerned about the dependability of these systems. Other stakeholders include organizations and individuals studying the software aspects of dependability or comparing the dependability attributes of systems.

In this workshop, participants will discuss the standard in the context of today's environment and propose areas of evolution for the standard and measures that are feasible to collect, process, and use in a variety of analysis and decision processes.

Goals/Products:

- Workshop briefing report summarizing discussion points, conclusions, areas for further exploration, and recommendations
- Shared understanding, among workshop participants, of approaches to identifying software aspects of dependability and how usable measures can be derived and applied
- At least a few new P982.1 Working Group Members

Workshop #6: COSYSMO 3.0: Expert Input to Parameter Values

Facilitator: James P Alstad/USC Center for Systems and Software Engineering

Prerequisites:

Attendees should be familiar with systems engineering at a project level; previous experience estimating systems engineering cost is very helpful. Experience with previous versions of the COSYSMO estimating model would also be very helpful; even experience with COCOMO would be helpful. Attendance at today's COSYSMO 3.0 presentation is recommended.

Materials to Bring:

No specific materials are required, but information suggested above is desirable.

Discussion:

The purpose of the Workshop is to improve expert values of key parameters of the COSYSMO 3.0 model.

Expert input will be gathered via a technique called Wideband Delphi. The session will include a detailed presentation on parameter definitions. Attendees will be presented with a questionnaire of parameter values, which they will submit anonymously; then the responses will be summarized and presented for discussion. After that, a second round will be conducted, where attendees will again submit parameter values, this time in light of the results of the first round and its discussion. For each parameter, additional rounds can be conducted until the results stabilize, as time permits.

Goals/Products:

- Results of the Delphi: for each parameter, this would include simple statistics (average, standard deviation, etc) for expert opinions for each Delphi round.

Additional Facilitators:

Dr Barry W Boehm
University of Southern California

Dr Jo Ann Lane
University of Southern California

Mr Garry Roedler
Lockheed Martin

Ms Marilee Wheaton
The Aerospace Corporation

Dr Gan Wang
BAE Systems

Presentation Abstracts

Tuesday

Keynote Presentation

Title: Army Software Maintenance - Addressing the Critical Issues

Presenters

John McGarry, U.S. Army RDECOM-ARDEC, Quality Engineering & System Assurance Directorate; Dr. Robert Charette, President, ITABHI Corporation

Abstract: Rapidly changing mission, technology, and economic environments are significantly impacting a key component of Army systems capability - the ability to upgrade and maintain large scale software systems across multiple domains. The policies and practices employed to support system software changes during fourteen years of offshore armed conflict defined an infrastructure that cannot now support emerging combat and readiness requirements. With much of the combat effectiveness of the Army based on the maintenance of software intensive systems, it is imperative that new approaches to software maintenance estimation, portfolio based resource and funding allocations, transparent execution performance, and mission impact evaluation be as objective and accurate as possible. Better software maintenance decision information is mandatory at all Army command levels.

An on-going Army study into software maintenance cost management has found that there is only a tenuous link between what budgetary resources are being allocated to software maintenance and what is actually being expended. This raises questions about the efficacy of the current $1.3 billion annual software maintenance budget and how this investment actually supports the warfighter.

This presentation will discuss the current state of software maintenance cost estimation and management in the Army, the extensive software maintenance budgeting to execution information gap and its implications, and the Army effort currently underway close it.

Title: SRDRs - A success story ready for its next chapter

Presenters: Ms. Ranae Woods

Abstract: Software development/support cost in the DOD is significant. Quality data underpins a quality software cost estimate. Data collection via SRDRs began in 2004, with a focus on size and effort, but collecting over 170+ data fields. However, there are inconsistent/non-standard data and formats in the existing data. SRDRs are available from DCARC but data is manually input in various "databases". The data is data widely used by the cost community, but in need of more standardization and quality improvement.

A SRDR Working Group was established to improve the state of the practice. The vision of the working group is one OSD-hosted, central, user-friendly, authoritative, real-time software cost, technical, programmatic database and tool. There are four main recommendations that were proposed, developed, and that are being implemented. These are:

1) a revised SRDR Development Data Item Description (DID)

2) a new SRDR Maintenance DID

3) a joint Validation & Verification (V&V) guide, team, and process, and

4) a CADE software database design and implementation

This presentation will describe these efforts and current status.

Title: At the Intersection of Technical Debt and Software Maintenance Costs

Presenter: Arlene Minkiewicz PRICE Systems, LLC

Abstract: Attendees will learn:

- What is technical debt as a metaphor
- How technical debt can be characterized
- What are some common ways to measure or assess technical debt
- How can technical debt measures be used to inform estimates of software maintenance costs.

Title: Struggles at the Frontiers of Measurement: Special Focus on Achieving System and Software Assurance for Software-Reliant Systems

Presenter: Kenneth Nidiffer SEI

Abstract: This presentation focuses on efforts of organizations to enhance their measurement approaches for achieving system and software assurance of software-reliant systems. Specifically it addresses the gaps and struggles between systems and software engineering in the area of system and software assurance and the associated need to evolve our ability to measure the effectiveness of software assurance processes, methods and tools across the system life cycle.

Title: Simulation of Kanban-based scheduling for systems of systems

Presenter: Alexey Tregubov USC

Abstract: The presentation describes the KSS workflow, Kanban-based scheduling principles and a simulation model designed to measure performance of the software and system engineering processes using these principles. In order to measure expected performance of the KSS versus other scheduling techniques, the proposed simulation model measures value delivered over time, number of delivered system capabilities, effort distribution (effort spent on context switching and multitasking, effort spent on delivered system capabilities, etc.). Once calibrated, the simulation model can be used for effort, schedule, and value delivery cadence estimation.

The presentation will discuss the KSS process, the simulation model, simulation results and findings.

Wednesday

Keynote Presentation

Title: Maintainability Readiness Levels for Software-Intensive Systems

Presenter: Dr, Barry Boehm

Abstract: One of the major projects of the DoD Systems Engineering Research Center focuses on System Qualities (SQs) Tradespace and Affordability, where Affordability is defined as life cycle cost-effectiveness. The project has found that Maintainability is a particularly important SQ, not only for Total Cost of Ownership (TCO), but also for Dependability, Changeability and Mission Effectiveness support. In researching Maintainability, we have found that significant progress has been made for physical systems maintainability such as via performance-based logistics and multisensor-based smart systems, but that less progress has been made for software and information-technology aspects of systems. This presentation elaborates on these findings. Discussed are the differences between hardware and software maintainability and the main sources of high software total cost of ownership; a proposed Software Maintainability Readiness Level (SMRL) framework to focus attention on the sources of added system-software maintenance cost is presented.

Title: Brave New World: Measurement, Big Data and Analytics

Presenters: Greg Niemann, Bill Golaz; Lockheed Martin

Abstract: The tidal wave of data available through the digital world presents a resource that can be used for program forecasts, SE measurement, and enterprise analysis.

One consideration is the growing volume of data. This presentation will discuss the new sources of information, the problems of making rational decisions with this data, and the application of PSM to the problem. We will look beyond SAP and tool metrics, to newer resources such as internal social media.

We will then look at the positive and negative implications of these new measurement information products. A positive result is such as better predictability on development. Other considerations will include the implications on closer monitoring of work activities.

Title: System of Systems

Presenter: Dr. Judith Dahmann; The MITRE Corporation

Abstract: In today's networked world, few user capabilities are supported by an individual system and most systems operate as part of a larger systems of system (SoS). Increasingly systems engineering have addressed SoS considerations as important drivers for the engineering of systems and are increasingly looking to apply systems engineering and measure to systems of systems as systems in their own right. This presentation will review basic characteristics and definitions of SoS as they compare to systems, present current approaches to the SoS SE continuous lifecycle, discuss challenges to systems engineering posed by SoS, and highlight current efforts in SoS standards. The presentation will provide context for the workshop on SoS measurement.

Title: COCOMO III Project Overview

Presenter: Brad Clark; Software Metrics Inc.

Abstract: This presentation discusses the progress and current status of defining the new COCOMO III Software Cost Estimation Model. Based on the COCOMO II 2000 model, this model has added new cost drivers, a quality model, and will be compatible with the System Engineering Cost Model, COSYSMO 3.0. This presentation if recommended for those who will attend the COCOMO III Workshop.

Title: Estimation Bias: Why Are Estimates Always Wrong: Estimation Bias and Strategic Mis-estimation

Presenter: Joe Dean, Galorath Incorporated

Abstract: This paper discusses the issues of estimation bias and strategic mis-estimation as well as how to mitigate these issues.

Thursday

Keynote Presentation

Title: Measurement in the Department of Defense

Presenter: Mr. James Thompson, Director, Major Program Support (MPS) within the Office of the Deputy Assistant Secretary of Defense for Systems Engineering

Abstract: Mr. Thompson is the Director for Major Program Support for DASD(SE). In this role, he is responsible for assessing major defense and software-intensive systems. In his keynote presentation, Mr. Thompson will discuss the role of measurement and quantitative data in supporting the assessment of the health of programs and how these measures are used to support fact-based decisions. He will discuss measurement requirements for programs, how measures are being applied and used, and what measures are most useful.

Title: COSYSMO 3.0: Updating Cost Estimation of Systems Engineering to Support Affordability

Presenter: Jim Alstad, USC Center for Systems and Software Engineering

Abstract: This presentation will cover a mature draft of the COSYSMO 3.0 model, explaining both the new features and the unchanged features. The presentation is recommended for those who will attend the COSYSMO 3.0 Workshop.

Title: Inherent Issues of AgileEVM and A Viable Solution for Effective Agile Project Controls

Presenter: Omar Mahmoud, Barakah Consulting

Abstract: Although AgileEVM does provide an effective solution for managing Agile software development cost, schedule, and scope, we do not believe that it is the most effective and efficient way of doing so. Agile project control techniques should more align to the way Agile teams function and operate and provide metrics that are meaningful to the developing environment.

Title: Challenges with Sizing and Estimating Enterprise Information Systems

Presenter: Dr Christopher L. Miller, QSM Inc.

Abstract: Enterprise-wide information Systems (EIS) are commonplace in managing today's civilian and military personnel information, payroll, healthcare, logistics, and other enterprise resource planning (ERP) systems. These ERP systems are based on existing Commercial off The Shelf (COTS) products that are continuously evolving and changing to extend functionality, repair vulnerabilities, and address changing business requirements. This presentation will discuss the challenges facing programs in terms of sizing and estimating the level of effort to develop and sustain an operational capability in a release rhythm environment. It will critique common used sizing measures (e.g., Business requirements, Business processes, RICEFW objects, Agile user stories, package implementations), in terms of their strengths, weaknesses, and opportunities for improving their usage.

Title: Metrics to Support Effective Estimation of On-Going Operations and Sustainment

Presenter: Denton Tarbet, Galorath Incorporated and Bakari Dale, US Army DASA-CE

Abstract: This presentation will provide a discussion on the metrics identified as necessary and estimation approaches used, with abstracted results from actual estimates drawn from experience both commercial and government IT systems experience.

Friday

Title: Establishing Standards as the Basis for Effective Measurement and Affordability

Presenter: Marc Jones, Director of Public Sector Outreach at CISQ and VP of Public Sector at CAST

Abstract: Measurement of application development output has long been a controversial topic. Yet as contracting relationships within industry and public sector become more strategic, buyers and sellers of software development and sustainment services require consistent and effective measures of application development output to provide:

- Objective visibility into application development output
- A rational basis for Application Development and Maintenance (ADM) investment decisions
- Vendor and buyer accountability supported by data, not subjective judgments
- Identification of compliance to ADM best practices
- Support for ADM budgeting decisions and spending decisions
- Comparison of ADM performance over time within a contract or benchmarking with broader market measurements
- Prediction of future ADM behavior based on historical performance

However, formal initiatives to analyze and measure software development activity (risk standards compliance, estimation, benchmarking, and vendor management) are only effective if the measures are consistent, repeatable, and objective.

Software-sizing standards such as Lines of Code (SLOC), Function Points, etc. have existed for decades and while the benefits are well understood, the drawbacks are too. The deployment of function point analysis relies primarily on trained staff or consulting firms to execute regular manual counts, which is a time intensive process.

Title: Early Phase Software Effort and Schedule Estimation Models

Presenter: Mr. Wilson Rosa

Abstract:

Context: Software effort estimates are more useful at early phase as decision makers need this information to establish the initial budget and acquisition strategy. The challenge is that initial user requirements may be the only measure available for estimating DoD software projects at elaboration phase. Leveraging this information to produce defensible estimates is difficult if you don't have access to historical software project benchmarks.

Objective: This study introduces a set of regression equations for predicting software development effort at early elaboration phase using initial functional requirements as size input.

Method: The first model examines the effect of estimated functional requirements on software development effort. The second examines the combined effect of estimated functional requirements along with estimated peak staff on software development effort. The analysis is based on data from 40 military and IT programs delivered from 2006 to 2015.

Result: Results show that estimated functional requirements and estimated peak staff are statistically correlated to software development effort.