Software and IT-CAST Agenda
22-24 August 2017

Lockheed Martin Global Vision Center
2121 Crystal Drive
Arlington, VA 22202
OVERVIEW

The Naval Center for Cost Analysis (NCCA) and the National Geospatial-Intelligence Agency Corporate Assessment and Program Evaluation (NGA CAPE) present the Software and Information Technology Cost Analysis Solutions Team (Software and IT-CAST) meeting from August 22-24, 2017 at the Lockheed Martin Global Vision Center in Crystal City, Virginia. This meeting is organized with the support of US Army ARDEC, Lockheed Martin, and DOD cost agencies.

The Software and IT-CAST meeting is a venue to build coalitions with government and industry, to exchange cost data, share lessons learned, and establish best practices concerning software and information technology cost estimation. Topics include

- Software and Information Technology Cost Estimation
- Software Cost Data Collection and Analysis Best Practices
- Project Cost and Schedule Growth
- Measurements for Agile Software Development
- Measurements for Software Maintenance
- Measurements for Cloud Computing and Cyber Security

The program includes presentations, workshops, and contractor one-on-one discussions. Presentations and workshops are open to all attendees. Contractor one-on-one discussions are restricted to federal employees who have registered.

COMMITTEE

General Chair:
Vjosa Dreshaj (NGA CAPE)
Wilson Rosa (NCCA)
Haset Gebre-Mariam (NCCA)

Program Co-Chairs:
Corinne Wallshein (NCCA)
Corey Boone (NCCA)
Lyle Patashnick (NGA CAPE)

Venue Co-Chair:
Gregory Niemann (Lockheed Martin)

Portal Design Co-Chair:
Don Clarke (NCCA)

ATTENDANCE

General sessions (presentations and workshops) are open to all attendees. Contractor discussions are restricted to federal government employees who have registered.
# Software and IT-CAST Agenda

## 22-24 August 2017

Lockheed Martin Global Vision Center  
2121 Crystal Drive, Crystal City, Arlington, VA 22202

(As of August 17, 2017)

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<td>John Zangardi (Acting DoD CIO)</td>
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<td>Assessing ERP Cost, Schedule and Size Growth</td>
<td>Haset Gebre-Mariam (NCCA) Rob Williams (Herren Associates)</td>
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<td>1005 – 1035</td>
<td>Software Size Growth</td>
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<td>Thomas Coonce (IDA)</td>
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<td>1300 – 1330</td>
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<td>Andrew Kicinski (Integrity Applications Incorporated - NRO)</td>
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<td>1405 – 1415</td>
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<td>1415 – 1700</td>
<td>COCOMO III Workshop: Implementing a New Driver for Software Security</td>
<td>Barry Boehm and Brad Clark (USC)</td>
<td>2nd Floor, GVC-A</td>
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**Tuesday, August 22, 2017 – Contractor Discussions (Restricted)**

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<td>1415 – 1600</td>
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<td>John Sautter (Northrop Grumman)</td>
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<td>1000</td>
<td>SRDR Unified Review Function (SURF): Deeper Focus on Software Data Quality</td>
<td>Nick Lanham (NCCA) and Marc Russo (NCCA)</td>
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<td>1035</td>
<td>Expanding the Horizons of Software Cost Estimation</td>
<td>Jairus M Hihn (NASA JPL)</td>
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<td>Why Does Software Cost So Much? Towards a Causal Model</td>
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<td>Sanathanan Rajagopal (QinetiQ, United Kingdom)</td>
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<td>1355</td>
<td>Cost Assessment Data Enterprise (CADE) – Overview &amp; Software Initiatives</td>
<td>Daron D Fullwood (OSD CAPE) and Ranae Woods, SES (AFCAA)</td>
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<td>1425</td>
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<td>1435</td>
<td>COSYSMO 3 Workshop</td>
<td>Jim Alstad (USC)</td>
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<td>1435</td>
<td>NGA PMO Analytic Services One-on-One</td>
<td>Brian Cali (IAI) and Patrisha Knight (NGA)</td>
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<td>0830</td>
<td>CADE Training Session</td>
<td>Torri Preston and Marc Stephenson (OSD CAPE)</td>
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<td>0830</td>
<td>VMWare One-on-One</td>
<td>Carol Traynor and Don B (VMware)</td>
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<td>1010</td>
<td>Amazon One-on-One</td>
<td>Seabreeze Osburn (Amazon)</td>
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Keynote

Dr. John Zangardi

Department of Defense Chief Information Officer (Acting)

Dr. John Zangardi became the Principal Deputy Department of Defense Chief Information Officer on October 2, 2016, and is currently serving as the Acting DoD CIO. As the Acting DoD CIO, Dr. Zangardi assists as the primary advisor to the Secretary of Defense for Information Management / Information Technology and Information Assurance as well as non-intelligence space systems; critical satellite communications, navigation, and timing programs; spectrum; and telecommunications.

Dr. Zangardi’s background includes acquisition, policy, legislative affairs, resourcing, and operations. In his most recent assignment as the Deputy Assistant Secretary of the Navy for Command, Control, Communications, Computers, Intelligence, Information Operations, and Space (DASN C4I, IO, and Space), he was responsible for providing acquisition oversight for C4I, cyber, space, business enterprise, and information technology programs. In 2014 and 2015, he additionally served as the acting Department of the Navy Chief Information Office (DON CIO).

Dr. Zangardi is a retired Naval Flight Officer and served in a variety of command and staff assignments. After retiring from the Navy, Dr. Zangardi was selected for appointment to the Senior Executive Service (SES) and assigned as the Deputy Director Warfare Integration Programs (N6FB) within the Deputy Chief of Naval Operations Communications Networks (N6) Directorate. With the stand-up of the Deputy Chief of Naval Operations Information Dominance (N2/N6), he was assigned as the Director for Program Integration and as Deputy to the Director for Concepts, Strategy, and Integration.

He is a native of Scranton, Pennsylvania and a graduate of the University of Scranton. Dr. Zangardi was awarded a Master of Science degree from the Naval Postgraduate School and a Doctor of Philosophy degree from George Mason University.
0845 - 0915: Agile and GAO Cost Estimating Best Practices

Karen Richey, Government Accountability Office

Abstract

This paper will examine how GAO’s cost estimating process can be applied to programs that are using an Agile framework. First, it will provide a brief overview of Agile processes and methods. Second, it will examine each of the 12 steps in the GAO cost estimating process and how those steps relate to an Agile framework. Finally, it will discuss how Agile artifacts can be leveraged to fulfill cost estimating documentation needs.

0920 - 0950: Assessing ERP Cost, Schedule and Size Growth

Haset Gebre-Mariam, Naval Center for Cost Analysis

Rob Williams, Herren Associates

Abstract

This study will examine percentage changes in cost, schedule, and size across Milestones A, B, C, and full deployment for DoD Enterprise Resource Planning (ERP) programs. The analysis is based on nine fielded systems collected from DoD authoritative data sources. Cost contributors, drivers, and factors by major cost elements will also be examined. Results may be used for crosschecking cost estimates or business case analyses at an early phase to inform funding decisions.

1005 - 1035: Software Size Growth

Marc Russo and Corinne Wallshein, Naval Center for Cost Analysis

Abstract

Software cost estimating relationships often rely on software size growth percentages. Actual delivered source lines of code (SLOC) may be predicted with categories of early code estimates such as new, modified, reuse, and auto-generated SLOC. Uncertainty distributions will be presented to represent growth by code category for use in cost modeling.

David Seaver, National Security Agency

Abstract
The Business Intelligence and Analysis organization (B4) develops independent cost estimates for the National Security Agency (NSA). For software intensive systems B4 creates independent software size estimate with functional size estimation techniques. The functional size is converted to source lines of code (where relevant) using B4 historical data from prior completed programs. B4 uses a streamlined functional size technique called Simple Function Points (SFP) to develop the functional size estimate. To count and analyze the SLOC B4 uses USC UCC with some custom tools wrapped around UCC.

The first part of this presentation will provide a brief overview of this process, items to be discussed include: Agile and DevOPS defined; What’s different from classic waterfall projects; What business processes (for estimation) need to be changed; What data collection processes (for estimation) have to be changed.

The second part of the presentation will discuss how this process modification has been applied or will be applied to estimate and measure: Business Systems; Analytic Development; Infrastructure Programs.

1115 - 1145: How Should we Estimate Agile Software Development Projects and What Data Do We Need?

Thomas J. Coonce, Institute for Defense Analyses

Abstract
**1300 - 1330: Objective SLOC: An Alternative Method to Sizing Software Development Efforts**

Andrew Kicinski, Integrity Applications Incorporated

**Abstract**

Equivalent Source Lines of Code (ESLOC) is the basis of methodology used by many organizations for collecting and estimating software development costs. Selecting ESLOC parameters requires insight into the software reuse. Too often data collectors are unable to verify the appropriateness of the assigned ESLOC parameters and validate their implementation. This paper examines the drawbacks of ESLOC, and presents an alternative and more objective method to estimating software development effort.

**1335 - 1405: Software Cost Estimation Meets Software Diversity**

Barry Boehm, University of Southern California

**Abstract**

The previous goal of having a one-size-fits-all software cost (and schedule) estimation model is no longer achievable. Sources of wide variation in the nature of software development and evolution processes, products, properties, and personnel (PPPPs) require a variety of estimation models and methods best fitting their situations. This talk will provide a short history of pattern-breaking changes in software estimation methods; a summary of the sources of variation in software PPPPs and their estimation implications; a summary of the types of estimation methods being widely used or emerging; a summary of the best estimation-types for the various PPPP-types; and a process for guiding an organization’s choices of estimation methods as their PPPP-types evolve.

**1415 - 1700: COCOMO III Workshop: Implementing a New Driver for Software Security**

Brad Clark and Barry Boehm, University of Southern California

**Abstract**

COCOMO (COnstructive COst MOdel) is an open-source model that allows analysts to estimate the cost, effort, and schedule when planning a new software development activity. This workshop will begin with a brief overview of the COCOMO III project and the proposed cost estimation model. The focus will then shift to an overview of how to make software applications secure and the associated cost impact.

The main purpose of the workshop and the majority of time will be spent discussing ideas for incorporating software security cost estimation in the COCOMO III model. Participants should come to the workshop prepared to learn about and discuss how to make software secure.
0810 - 0840: Army Software Maintenance Cost Estimating Relationships in a Diverse Execution Environment

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

James Doswell and Jenna Meyers, U.S. Army DASA-CE

Abstract
For the past four years, the Army, under the leadership of DASA-CE, has been collecting and analyzing Army system software maintenance cost and technical execution data to support the development of more accurate cost estimation methods. The presentation will present the cost methods and cost estimation relationships developed from the analysis of the initial execution data sets. It will address how the collected software maintenance data was evaluated, characterized and normalized; show cost distributions across the primary functional domains; and present a set of derived software maintenance CERs and benchmarks.

0845 -0915: Apples and Oranges: a Presentation and Analysis of Results of Cloud Cost Calculators and Rate Cards

Daniel J Harper, MITRE Corporation

Abstract
A recent effort for an Army customer examined over a dozen calculators and rate cards for estimating storage and hosting costs for cloud applications. This presentation will provide an overview of several calculators and tools, guidance for cost estimators on interpreting IT-centric inputs, and a discussion of similarities and variation in results. We will also present a cloud complexity plotter which provides a visual tool for explaining cloud cost and complexity drivers.

0920 - 0950: Rosetta Stone for Software Sizing

Victor Fuster and Taylor Putnam-Majarian, QSM Inc.

Abstract
Wouldn’t it be nice if some sort of software sizing “translator” existed, such as the Rosetta Stone for languages? The original Rosetta Stone listed the same text in three languages (Ancient Greek, Demotic script, and Ancient Egyptian hieroglyphics), serving as a "decoder" that helped give meaningful interpretation to the previously mysterious hieroglyphics. The Rosetta Stone for Software Sizing works to accomplish the same result for software sizing by translating units of need into units of work using gearing factors. This allows one to size the same project using multiple methods (requirements, function points, RICE counts, SLOC, etc.). We present our methodology and show how this technique can provide valuable insights and analysis for oversight, management, and development estimation. Additionally, we discuss at least two examples of the methodology’s recent implementation to Enterprise Resource Planning (ERP) project estimation in the DoD and commercial environments.
1000 - 1030: SRDR Unified Review Function (SURF): A Deeper Focus on Software Data Quality

Nicholas Lanham and Marc Russo, Naval Center for Cost Analysis

Abstract
From December 2015 to December 2016, the SURF team completed the development of a standardized V&V question template that was used to develop over 1,282 additional data quality comments. Throughout the review process and as SURF members' generated V&V comments, each one was "tagged" to a specific section of the SRDR V&V guide to identify specific SRDR variables that generate the most data-quality concerns. This presentation summarizes the V&V comment trends generated by the SURF team's 1,282 V&V comments. In addition, this paper helps to raise attention to specific SRDR variables and illustrates tangible data quality improvements to highly critical DoD software data. It also provides detailed metrics to demonstrate how SURF is working and the significant-positive impact the V&V guide + SURF team + new SRDR review process is making on the Government's data-quality.

1035 - 1105: Expanding the Horizons of Software Cost Estimation

Jairus M Hihn, NASA Jet Propulsion Laboratory

Abstract
This presentation summarizes the results of ten years of research in using data mining and machine learning methods to develop analogy estimation models. These results are based on the analysis of NASA robotic spacecraft flight software data obtained from the NASA CADRe and other data sources that have been collected for over thirty years. The results of the research indicate that cluster based algorithms are an in important supplement to parametric models especially early in the lifecycle when information is limited and uncertain.

1110 - 1140: Why Does Software Cost So Much? Towards a Causal Model

Bob Stoddard and Mike Konrad, Software Engineering Institute

Abstract
How can we control the cost of software intensive systems? Software costs continue to escalate as software continues to become an increasing portion of DoD systems. To contain costs we need to better understand the factors that drive costs and which factors we can control. Although we know relationships, we do not yet separate the causal influences from non-causal spurious correlations. By applying a new set of recently developed causal discovery and modeling tools to the research data, causality can be identified, measured, and tested. Existing literature on software cost contains primarily case studies and correlational studies from project data that continue to suffer from limited, public data and overreliance on correlational techniques. Correlation does not logically imply causation, hence correlational results are not necessarily useful for driving reductions in cost. In this talk, we will share early research results that will differentiate true causal factors from those spuriously correlated with cost.
1245 - 1315: Reliable Non-Design, Code, Test and Integration Cost Relationships
Jeremy Goucher and Brittany Staley, Herren Associates

Abstract
Software cost estimates require ratios derived from historic cost reports for non-design, code, test, and integration (NDCTI) cost elements. Since NDCTI accounts for as much as 50% of the estimate, a comprehensive historical data set is critical to ensuring an accurate estimate. The authors have recently analyzed over ten years of actual cost data from DoD command and control systems to develop a new set of NDCTI ratios. The results also bring new insight into “fixed” versus “variable” cost.

1320 - 1350: Introduction to Software Obsolescence Cost Analysis Framework
Sanathanan Rajagopal, QinetiQ, United Kingdom

Abstract
Software plays an important role in defence. Almost every project in defence has software elements with various degrees of complexity and dependencies. This has brought its own challenges to the availability-based contracts. The challenges to both the contractors and the suppliers is that they have to have a good understanding of the whole life cost of the product and have confidence in the whole life cost model at the time of negotiation and contract signing. In order to understand and see the bigger picture developers and the customers need to foresee the following issues that drive the whole life cost and should be in a position to develop innovative means to mitigate these issues by
- Anticipation of the Software Obsolescence at a very early stage of projects.
- Understanding the technology insertion, technology update requirement.
- Understanding the relationship between Software Maintenance and Software Obsolescence.
- Anticipation of future capability integration to the existing platforms
- Formulation and evaluation of alternative architectural framework to inform the software designers that recognizes the key market and cost drivers.

Software Obsolescence Cost Analysis Framework will help in managing software obsolescence proactively and help to estimate the cost of Software Obsolescence Resolution. This framework is at very early stages of its development and intended to release it once the validation is complete.

1355 - 1425: Cost Assessment Data Enterprise Overview and Software Initiatives
Daron D Fullwood, Cost Assessment and Program Evaluation
Ranae Woods, SES, Air Force Cost Analysis Agency

Abstract
Learn about the future of cost data collection from the CAPE perspective. Will provide an update on CADE and ensure the community is aware of ongoing efforts. This session will focus on CADE’s data initiatives along with an update on the Software Resource Data Reports.
1430 - 1700: COSYSMO 3.0 Workshop: Updating Cost Estimation of Systems Engineering to Support Affordability

Barry Boehm and Jim Alstad, University of Southern California

Abstract
The purpose of the COSYSMO (Constructive Systems Engineering Cost Model) model is to estimate the Systems Engineering effort for large-scale systems (both software and hardware). COSYSMO supports the ANSI/EIA 632 standard as a guide for identifying the Systems Engineering tasks and ISO/IEC 15288 standard for identifying system life cycle phases.

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 with experience in systems engineering, especially as project leads or cost estimators.
**0830 - 1230:** Cost Assessment Data Enterprise (CADE) Training

**Torri Preston and Marc Stephenson, OSD Cost Assessment and Program Evaluation (CAPE)**

**Abstract**
The OSD CAPE mission is to provide high quality, independent program analyses and insights as requested by the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) and Congress, in addition to the review of programs that may be, or already are, struggling in the acquisition process. CAPE initiated development of CADE, the Department's initiative to identify and integrate data from disparate databases and systems for better decision-making, management of, and oversight of the Department's acquisition portfolio. The CADE primary function is to house authoritative data sources that are seamlessly integrated, and easily searchable and retrievable to support analytics.

The CADE training session offers better insight into contract cost reporting and how to follow specific regulations outlined by the DCARC. Major Defense Acquisition Program (MDAP) and Major Automated Information Systems (MAIS) program personnel, government and industry, who are interested and involved in Cost and Software Date Reporting (CSDR) contracting and reporting, are encouraged to attend the event.