

**US/UK/AUS Trilateral
Software Intensive Systems Acquisition Improvement Group (SISAIG)**

2006 Annual Workshop Report

1. **Annual Full Meeting Attendees (SEI, Pittsburgh USA):**

US

- **Dr. Jim Linnehan, OASA(ALT) (US Lead)**
- Mr. Clyde Chittister, SEI, Chief Operating Officer
- Mr. Brian Gallagher SEI, Director Acquisition Support Program
- Ms Ceci Albert SEI, SEI, Army Acquisition Support Program
- Ms Kate Ambrose, SEI, Acquisition Support
- Ms Linda Northrop, SEI, Product Line Systems
- Ms Trish Oberndorf, SEI, Dynamic Systems
- Mr. Bertram Myers, SEI, Dynamic Systems
- Mr. Mike Phillips, SEI, CMMI
- Mr. Robert Rosenstein, SEI, Program Integration
- Dr. Richard Turner, Systems and Software Consortium Inc.
- Mr. Rob Gold, DUSD(S&T)/IS
- Mr. Scott Lucero OSD (AT&L)
- Mr. Rob Flowe OSD CAIG
- Mr. James Judy OSD ASA(FM&C)
- Ms Arlene Minkiewicz, Chief Scientist, PRICE Systems
- Ms Jo Ann Lane, USC

UK

- **Mr Dave Baggley, PFG Group Leader (UK Lead)**
- Mr Andy Nicholls PFG Software and Systems

AUS

- **Mr Bradley Doohan, DMO (AUS Lead)**
- Mr Eric Kiem, DMO, Project Wedgetail

2. **Mission:**

The SISAIG provides a focus for working common issues within a joint forum to enrich and amplify the US/UK/AUS national software acquisition improvement efforts. The collaboration will leverage products generated from national and joint programmes to reduce risks associated with performance, cost and schedule in Software Intensive Systems (SIS) projects. Aims are to:

- Have an environment for open and responsive dialogue
- Share and disseminating 'Lessons Learned'
- Leverage resources from National programmes

- Pursue innovation and research

3. **National Executives:**

- US: Mr. Claude Bolton, Assistant Secretary of the Army (Acquisition, Logistics and Technology), US DoD
- UK: Mr. David Gould, Deputy Chief Executive, Defence Procurement Agency, UK MOD
- AUS: Ms Shireane Mckinnie, Head Electronic and Weapons Systems Division, Defence Materiel Organisation, Aus DoD

4. **Leveraging Key National Initiatives:**

The 2006 workshop continued to leverage off key National programs of work that relate to acquisition of software intensive systems. Those programs of most interest include:

US	UK	AUS
Army Strategic Software Improvement Program (ASSIP) Initiatives	DPA Price and Forecast Group Initiatives	DMO Business Improvement Initiatives
OSD Cost Analysis and Investment Group	DSTL Software-related Research projects	DMO Program Management Office Initiatives
US Army Cost Estimation Group		DMO Electronic Sector Plan Initiatives
Software Engineering Institute Initiatives http://www.sei.cmu.edu/		National ICT Australia software research initiatives http://nicta.com.au/

5. **Introduction to 2006 Meeting**

The 2006 SISAIG meeting contained 20 presentations; all of excellent quality. The main purpose of this workshop is to pool together and share the current knowledge of acquisition professionals whom are actively working issues in software intensive systems acquisitions for Defence. The theme for this workshop was: “*Sound systems and software engineering can reduce total system and system of systems ownership costs*”. The workshop was opened by a keynote address by Mr. Clyde Chittister, Chief Operating Officer of SEI. Mr. Chittister briefed the workshop on SEI’s current areas of work, active research, and products and services at the piloting stage.

6. **2006 National Programs Briefings:**

Dr Jim Linnehan, OASA(ALT) (US Lead)

Dr Linnehan briefed the workshop on recent updates to the US Army's Strategic Software Improvement Program (ASSIP) initiative. This initiative continues to be a key driving force behind SISAIG. ASSIP contains long-term commitments to improving Army acquisition, engineering, cost-estimation, testing, sustainment and developing technologies for Ultra-Large Systems of the future. Dr Linnehan re-iterated the key partnership between ASA(ALT), PEO/PM Offices, DOD Software Engineering Centers and the SEI.

Key ASSIP FY07 Tasks include:

- Promoting ULS Research Program
- Mentoring Army PEO/PM improvement plans
- Promoting CMMI-ACQ/Lean Six Sigma
- Delivering Software Training to Army Leadership
- Promoting Software Architecture and Product Line Technologies
- Baselineing the PEO/PM usage of Software Metrics

Mr Dave Baggley, PFG Group Leader (UK Lead)

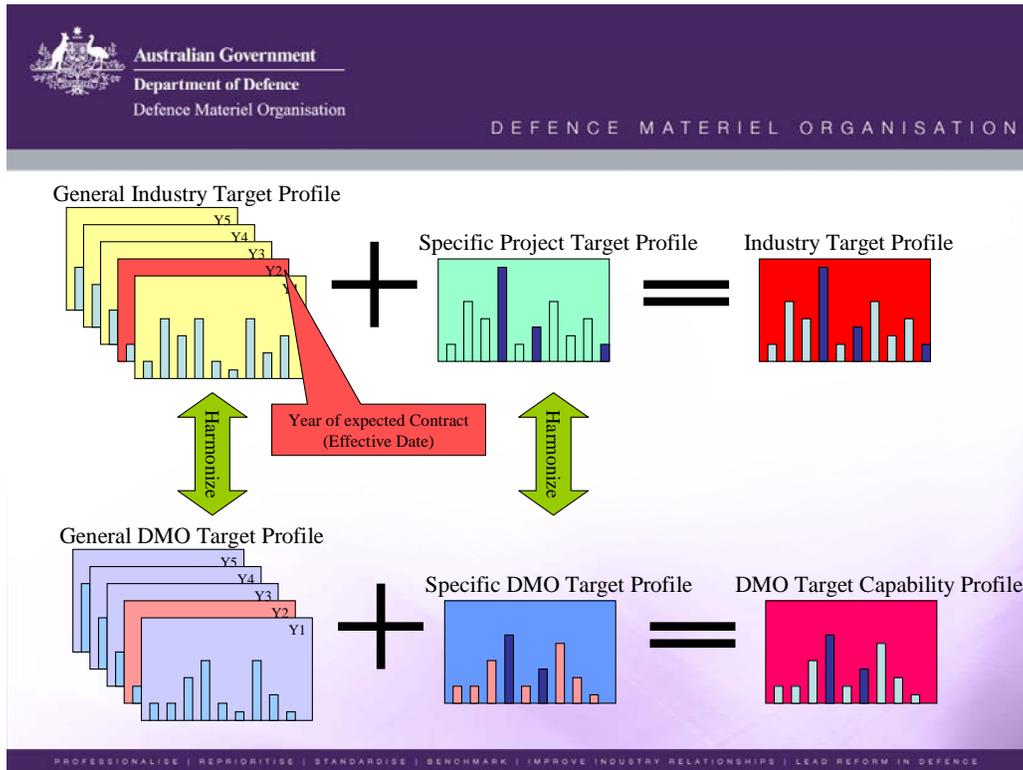
Mr Baggley (UK lead) briefed the workshop on recent updates to the UK MoD acquisition initiatives. The primary issues for 2006 were:

- Defence Industrial Strategy (DIS) to promote a sustainable industrial base, that retains in the UK those industrial capabilities needed to ensure national security.
- McKane Report – Enabling Acquisition Change commissioned to advise whether changes should be made to the MoD structures, organisation, process or culture and behaviours in order to facilitate good through life capability management
- DPA & DLO Merger – formation of the Defence Equipment & Support (DE&S) as a result of the McKane Report recommendations. The best structures and practices from both organisations are taken to form a single entity responsible for procurement, maintenance and sustainment of military capability.

Mr Bradley Doohan, DMO (AUS Lead)

Mr Doohan briefed the workshop on the strategic direction of DMO with regard to full implementation of the program manager certification framework, re-baselining of ACAT programs and formation of the college of complex program managers. Mr Doohan also updated the group on the Electron Sector Plan's "lifting the capability bar" initiative. This initiative is key to Electronic and Weapon Systems Division (EWSD) plans to improve the acquisition performance of projects by augmenting gaps in target industry and DMO capability profiles with CMMI process improvement plans. EWSD commenced in 2006 a series of rolling CMMI capability appraisals of selected projects.

DMO also undertook a pilot of the draft CMMI-ACQ constellation as part of the SEI's development of the new model.



7. Work Stream 1 – Benchmarking Acquisition Processes, Policy

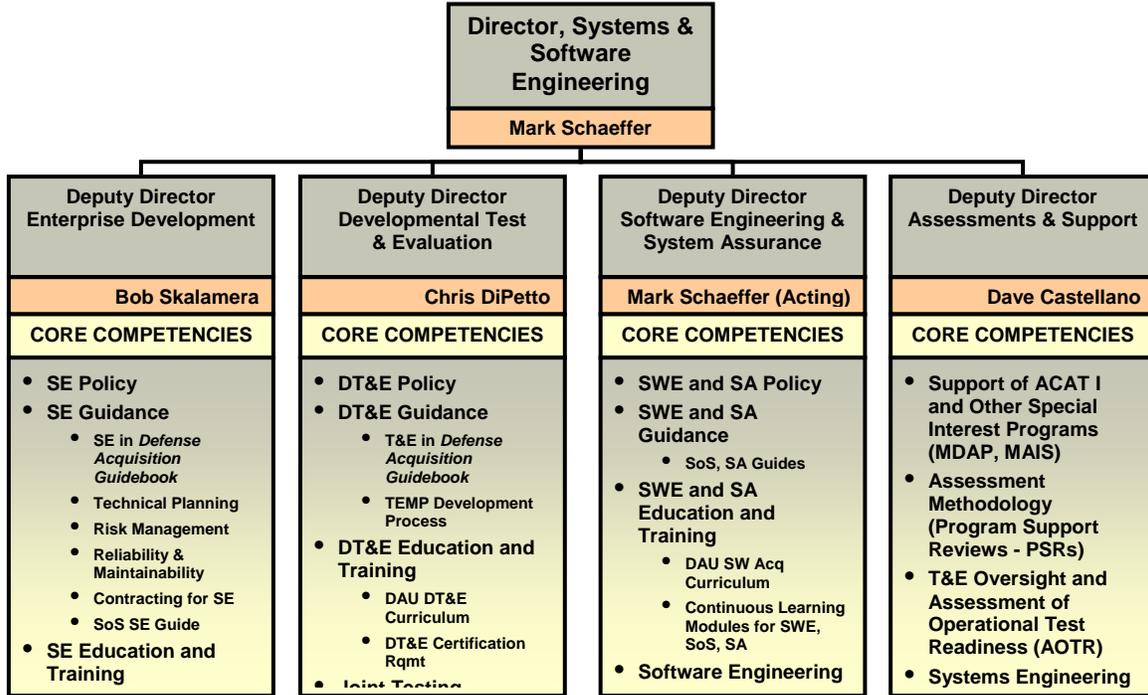
US Brief:

Mr. Mike Phillips, SEI, briefed the workshop on the status of SEI's CMMI v1.2 and development of two CMMI constellations: CMMI-ACQ and CMMI-SERVICES. CMMI-ACQ is currently in the final stages of piloting and change requests are now under consideration for inclusion by the Steering Group. The new constellation has an expected first quarter 2007 release.

Mr. Rich Turner, Systems and Software Consortium, Inc. briefed the group on recent research in agile systems engineering processes and value-based risk driven approaches to complex systems development.

[rich turner slide]

Mr Lucero, OSD (AT&L), briefed the workshop on AT&L's new organizational structure (with effect Aug 06) for systems and software engineering:



Mr Lucero further outlined the DoD vision for a Software Centre of Excellence and recent AT&L and Industry initiatives like the NDIA Strategic Software Summit. Mr Lucero mentions that AT&L’s challenges are to work with Industry to implement the Summit’s recommendations and contribute to ongoing initiatives in SoS, Systems and Software Assurance, and CMMI.

Mr Lucero informed the group about the draft release (for comment) of the new DoD SoS Systems Engineering Guide.

8. **Work Stream 2 – Performance Measures**

AUS Brief:

Mr. Eric Kiem, DMO Wedgetail Project, briefed the workshop on an update to AEW&C software performance measurement program. Mr. Kiem presented a review of relevant insightful metrics and lessons learned over the course of the Project. Mr Kiem summarized the Project Wedgetail lessons as follows:

- In complex systems, [the project] needs metrics to address system integration activities as well as software

- All functional requirements need to be captured and managed, including those in ‘secondary specifications’
- Basis of measurement needs to be understood and agreed
- Flexible Reporting will always be useful.

UK Brief:

Mr Nicholls, MoD PFG, presented the results of a Metrics (PSM based) case study that MoD PFG had conducted. PFG continues to support PSM for implementation of a measurement program. The PFG case study looked at a project delivering 2 safety critical system modules with information needs relating to Schedule and Product Quality. A total of 17 metrics were on contract. PFG concluded that for all 17 metric on contract either no (or incorrect) metric data was found delivered or insufficient correct data was delivered to the IPT as per the contract agreement. The case study experience highlighted PFG concerns with MoD performance measures where DPA PM’s and Contract Technical managers cannot coordinate an Issues action plan based on relevant and appropriate data to monitor the software development process. Too many examples are evident where contractor delivered data has not been shown to contribute to a metrics strategy. In many cases attempts to implement an effective metric program are hijacked by other concerns on the project eg re-focusing attention on meeting key milestones in fear of financial penalties.

Mr Nicholls concluded with the following PFG concerns regarding metric programs and performance measures in DPA.

- Poor take up of performance measurement initiatives
- Deliberate confusion from contractors
- Poor education of IPT and Contractor
- Necessity for culture change
- Incentivisation needed for IPT and contractors to adopt metric programs

9. Work Stream 3 – Software Cost Estimation

US Brief:

Mr James Judy, ODASA (DoD Army) Cost & Economics, updated the workshop on the state of Army software development and software maintenance estimation. Major points include:

- That few Software Resources Data Reports (SRDR) for ACAT 1 programs had been submitted to ODASA to date.
- The intent of SRDRs is to collect data that developers already possess and routinely use to manage their software projects.

- Most large software intensive acquisition SRDRs expect to be delivered 2009-2014 period
- ODASA visited major Software Engineering Centers and have funded those Centers to collect data and analyze effort to perform software maintenance.

Ms Minkiewicz, Chief Scientist Price Systems, presented to the workshop the challenges with cost estimating systems of systems. SoS have cost implications not found in tradition systems. The workshop discussed the following Cost implications in detail:

- Sizing the SoS Cost (e.g. number of unique protocols, components, reqmts)
- Number of Operational Scenarios
- Effect of Key Performance Parameters (e.g. effect of immature technologies)
- Number of Suppliers and Stakeholders (additional complexities)
- Stability and Readiness of components
- Off the Shelf Capability (availability and maturity leads to cost decrease)

Mr. Rob Flowe, DoD Program Analysis & Evaluation, briefed the workgroup on continuing DoD sponsored research on SoS capability cost analysis. DOD is funding SEI, University of North Carolina and Technomics to understand the nature of interdependence to acquisition risk and effect of programmatic interdependence to cost/schedule breeches. Preliminary outcomes from the research support:

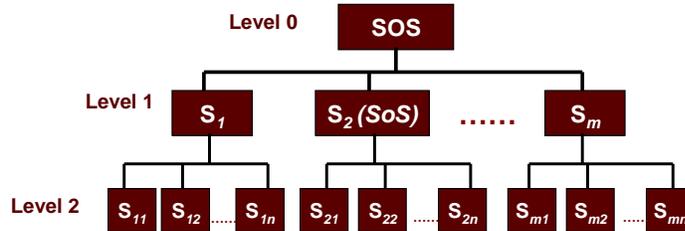
- Failure to understand Interdependence results in unanticipated, uncontrolled cost and schedule growth, and reduction in functionality
- A greater risk taxonomy suggesting potential risk areas for program execution
- Interdependent programs breached APB limits significantly more often than non-interdependent
 - Schedule Breach: 1.9 times as often
 - Development Cost: 3.6 times as often
 - Unit Cost: 1.8 times as often
- A parametric estimating relationship exists between resources required and architecture-based interdependencies

Ms Jo-Anne Lane, USC Centre for Systems and Software Engineering, briefed the workshop on status of Constructive Systems of Systems Integration Cost Model (COSOSIMO). This model will support the estimation of effort associated with System-of-System Engineering (SoSE) by one or more Lead System Integrator (LSI) organizations. COSOSIMO will not estimate the total SoS development costs, rather just the SoSE costs at the SoS level (i.e. Definition and Integration effort). Ms lane presented how COSOSIMO captures effects of new processes in three key areas

- Planning, requirements management, and architecting

- Source selection and supplier oversight
- SoS integration and testing

System of Systems Cost Estimation



Activity	Levels	Cost Model
SoS Lead System Integrator Effort (SoS scoping, planning, requirements, architecting; source selection; teambuilding, re-architecting, feasibility assurance with selected suppliers; incremental acquisition management; SoS integration and test; transition planning, preparation, and execution; and continuous change, risk, and opportunity management)	Level 0, and other levels if lower level systems components are also SoSs (e.g., S ₂)	COSOSIMO
Development of SoS Software-Intensive Infrastructure and Integration Tools	Level 0	COCOMO II
System Engineering for SoS Components	Levels 1-n	COSYSMO
Software Development for Software-Intensive Components	Levels 1-n	COCOMO II
COTS Assessment and Integration for COTS-based Components	Levels 1-n	COCOTS

COSOSIMO is expected to be available in late 2007 depending on participation in SOSE surveys and further SoS program Effort Data to support tool calibration.

UK Brief:

Mr. Any Nicholls, MoD PFG, briefed the workgroup on SoS cost challenges MoD is experiencing. Mr Nicholls discussed SoS concepts and then the challenges in costing Integration & Test for SoS capabilities. Notable UK experience in costing SoS was that

- no specific SoS cost models are available
- immature and incomplete architecture definitions are used
- Little SoS historical data is available to calibrate current models
- Program Offices are still established in “Stove-Pipe” fashions

PFG experience is that SoS I&T Acquisition costs range 15-40% of the total acquisition costs

Work Stream 4 – General Topics

Ms Linda Northrop, SEI Software Product Lines, presented the seminal work on Ultra-Large Systems. The Ultra-Large-Scale Systems Research Agenda could provide a framework for long term SSEI/SEIs joint research

Ms Trish Oberndorf, SEI presented on the nature of Systems of Systems.

CONCLUSIONS AND SISAIG NEXT STEPS

- The theme for 2006 was “sound systems engineering can reduce total system and system of systems ownership costs”. SoS acquisitions are dominate issues for each member country especially with regard to net-centric warfare across joint forces. SISAIG will continue to address this area and look to accomplish improvements in acquisition practices in this area.
- The UK and Australia are in early stages of possibly establishing a Systems and Software Engineering Institute (SSEI) and Software Engineering Institute (SEI), respectively. The UK SSEI, AUS SEI, and the US SEI provide an opportunity to amplify the effectiveness of the SISAIG through partnering and formal collaboration. The SSEI/SEIs could host the annual meeting and provide the possibility of joint work strands and a stable infrastructure for serious joint work addressing issues common to each country.
- The USD(AT&L) Software and Systems Assurance should build on the SISAIG expanding the base of US sponsorship and support.
- Software Science and Technology (S&T) research remains a topic of special interest to SISAIG. Scarce investment in software S&T by each country should be coordinated and results shared. The Ultra-Large-Scale Systems Research Agenda could provide a framework for long term SSEI/SEIs joint research.
- The Australian Wedgetail program with Boeing provides an exemplary model of effective software/system metrics in action. Wedgetail progress and lessons learned should continue to be reported at future meetings.
- SoS cost estimation should emerge from acquisition process artifacts. The UK MOD Architecture Framework (MODAF) and US DoD Architecture Framework (DODAF) are examples of such artifacts. Even more encompassing is the US requirement for an Integrated Support Plan (ISP) at each milestone review. The process of building an ISP forces individual programs to address the interoperability and interrelationship requirements with other programs, and how the capabilities identified in formal user capability documents will be depicted and then realized.

- The SISAIG must remain “acquisition program manger focused”. Acquisition policy, training, SoS, and cost estimation are important aspects of the broader complex defense acquisition process executed by each nation.

The SISAIG must work to remain relevant and value added to trilateral collaboration. All parties recognize that the investment by each participating country is small (travel costs) and the potential benefits from learning and sharing of products is great. The SISAIG is a clearing house for informal and effective collaboration - prioritize common problems, focus on producing products, standing up the UK SEI and AUS SEI, and partnering at some level with the US SEI, provide a framework for continuing working together.

To continue to remain cognizant of the acquisition landscape, SISAIG requires a better understanding of other national software engineering acquisition initiatives. There are opportunities for SISAIG to prioritize work based on collaboration with these other initiatives. The following are examples of the initiatives that SISAIG can form better relationships with to understand the global software acquisition landscape.

- NDIA Systems Engineering Committee
- NDIA Software Engineering Committee Top Seven Defense Software issues
- NDIA summit workshop outcomes
- DHS Software Assurance initiatives
- DMO Electronic Sector Development Forum
- Tri-nation SEI collaborations
- Possible linkages to 5-nation TTCP work

In 2007, the US lead representation on SISAIG will be Mr. Robert Schwenk from ASALT.

ACTION ITEMS 2006

Action Item	Owner/Actionee	Meeting Opened	Status (Open/Closed)	
SEI to provide ISD with 2006 IRAD write-ups	SEI	7 Nov	OPEN	
Update National Leads Slide	AUS	7 Nov	OPEN	
Seek Formal PA&E involvement in SISAIG meetings	US	7 Nov	OPEN	
Update Report on status of Work streams	AUS	7 Nov	OPEN	
US investigate possible changes to the SISAIG workspace, including	AUS	7 Nov	OPEN	

