



**Carnegie Mellon
Software Engineering Institute**

Pittsburgh, PA 15213-3890

Sustaining Software-Intensive Systems - A Conundrum

Mary Ann Lapham

**Sponsored by the U.S. Department of Defense
© 2005 by Carnegie Mellon University**

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE JAN 2005		2. REPORT TYPE		3. DATES COVERED 00-00-2005 to 00-00-2005	
4. TITLE AND SUBTITLE Sustaining Software-Intensive Systems - A Conundrum				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Carnegie Mellon University, Software Engineering Institute, Pittsburgh, PA, 15213				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Carnegie Mellon
Software Engineering Institute



Agenda

What is Sustainment

Software Entrance Criteria for Sustainment

Top 10 Sustainment Challenges

Examples of Challenges

Conclusions



What is Sustainment?

Joint Publication 4-0 (Doctrine for Logistic Support of Joint Operations):
“The provision of personnel, logistic, and other support required to maintain and prolong operations or combat until successful accomplishment or revision of the mission or the national objective”

DoDI 5000.2: “The first effort of the Operations and Support (O&S) phase established and defined by DoDI 5000.2. The purpose of the sustainment effort is to execute the support program to meet operational support performance requirements and sustain the system in the most cost effective manner of its life cycle. Sustainment includes supply, maintenance, transportation, sustaining engineering, data management, Configuration Management (CM), manpower, personnel, training, habitability, survivability, environment, safety (including explosives safety), occupational health, protection of critical program information, anti-tamper provisions, and information technology (IT), including National Security Systems (NSS), supportability and interoperability functions. Sustainment overlaps the Full Rate Production and Deployment (FRP&D) effort of the Production and Deployment (P&D) phase.”



Software Sustainment - Definition

Software maintenance and software sustainment are often used interchangeably. We will make a distinction.

Software Maintenance: “The process of modifying a software system or component after delivery to correct faults, improve performance or other attributes, or adapt to a changed environment.”

No definitive definition of software sustainment has been found, so our working definition is:

Software Sustainment: “The processes, procedures, people, materiel, and information required to support, maintain, and operate the software aspects of a system.”



Software Sustainment - Distinction

Software maintenance consists of:

- correcting the faults
- improving performance or other attributes
- adapting to a changed environment

Software sustainment addresses other issues not always included in maintenance, such as:

- operations
- documentation
- deployment
- security
- CM
- training
- help desk
- COTS management
- technology refresh



Software Entrance Criteria for Sustainment

- Signed Source of Repair Assignment Process (SORAP)
- Completed Operational Test & Evaluation
- Stable software production baseline
- Complete current software documentation
- Authority to Operate (ATO)
- Sustainment Plan
- Current & negotiated sustainment transition plan
- Sustainment staff training plan

Key: ● Good ● Caution ● Warning ● Critical

Note: Based on SEI experience with actual programs



Top 10 Sustainment Challenges

Lack of funding for transition planning

Lack of signed SORAP

Unclear Information Assurance requirements to finalize ATO

Unaddressed support database transition logistics

Unclear COTS license management

Sustainer inexperience with COTS-based systems

Loss of key contractor staff and expertise

Over reliance on contractor development processes and proprietary tools

No formal training for sustainers

Lack of parallel Sustainment/Development Management Plan



Selected Examples of Challenges

COTS

Programmatic

System Transition

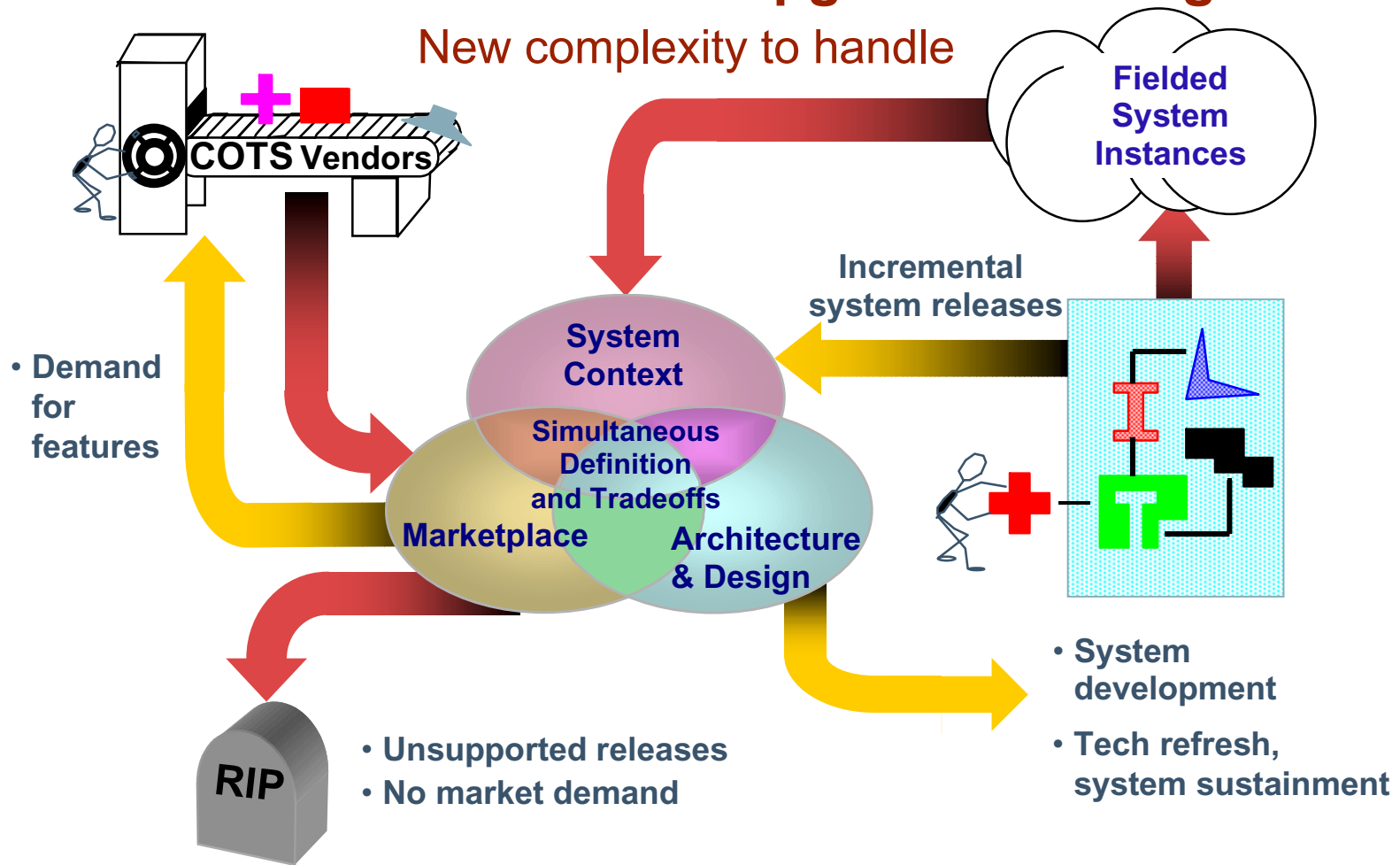
Information Assurance (IA)



• Indicates Major Concern

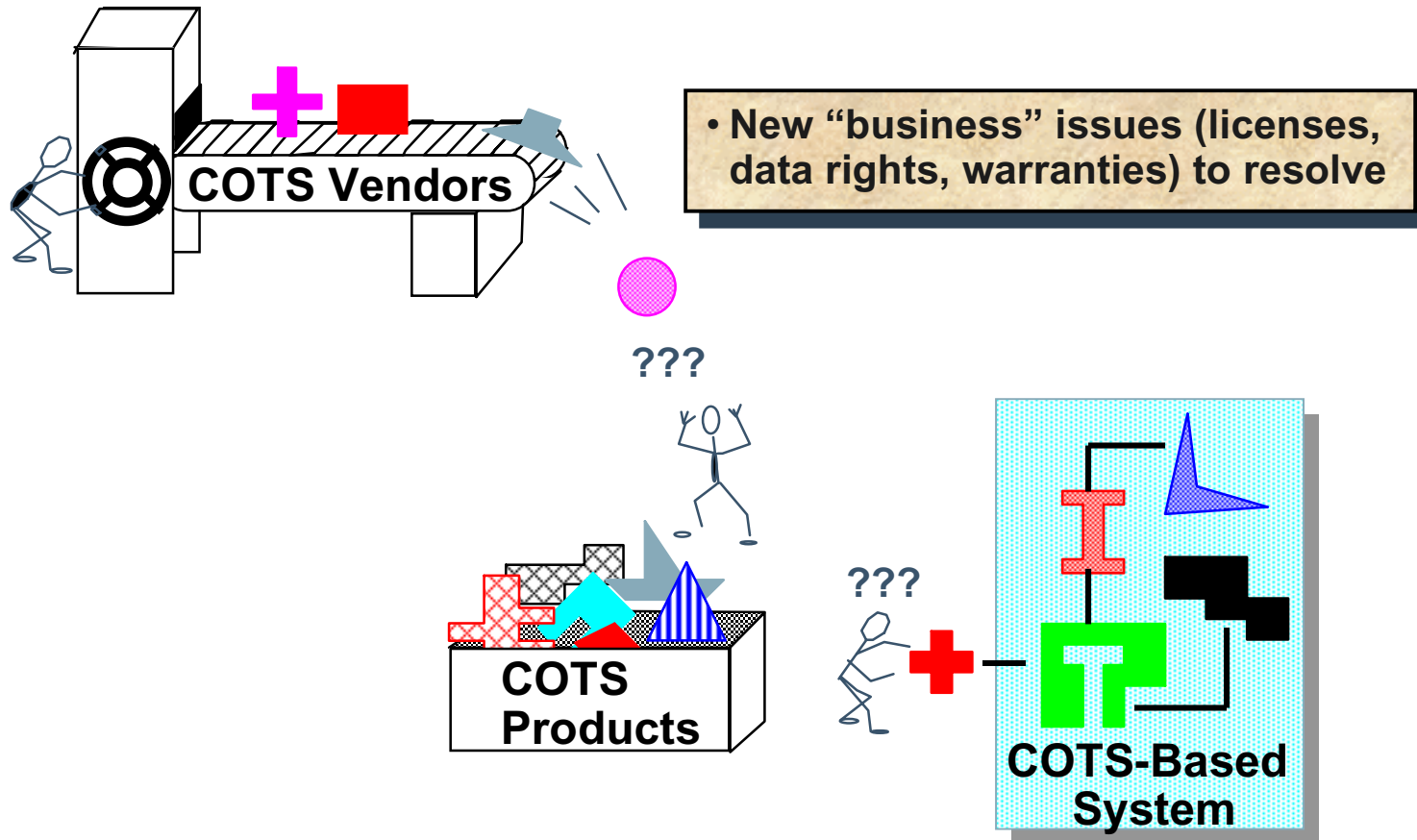


COTS Obsolescence & Upgrade Planning





COTS “Business” Issues





Programmatic Issues

- Transition tasks in development contract
- Funding for development contractor
- Funding for sustainer
- Transition plans created and implemented
- Sustainer training created



- Signed SORAP required



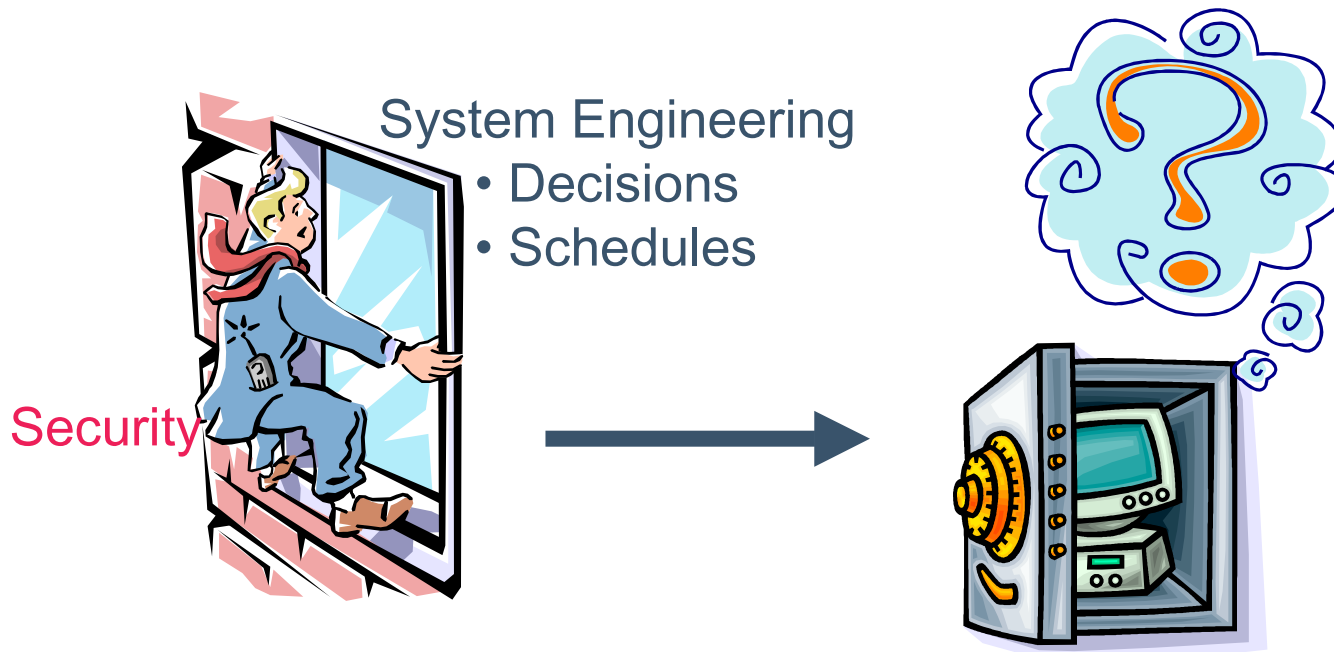
System Transition



- Staffing issues – loss of staff
- Training issues – staff up to speed
- Complete documentation – hand-off
- Expert knowledge transfer/loss



Information Assurance



- Security not involved in system engineering decisions
- How secure is the overall system?



Carnegie Mellon
Software Engineering Institute



Conclusions

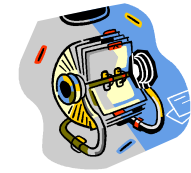


Sustainment is a balancing act

- Definitions (what's included)
- Planning
- Coordination on issues
- Risk Mitigation



Carnegie Mellon
Software Engineering Institute



Contact Information

Mary Ann Lapham
Software Engineering Institute
Carnegie Mellon University
4500 Fifth Avenue
Pittsburgh, PA 15213-3890

mlapham@sei.cmu.edu
412-268-5498