



Agile in the DoD Environment

Presented to:
Lockheed Martin

Kristen Baldwin

Deputy Director,
Software Engineering and System Assurance
Office of the Under Secretary of Defense
(Acquisition, Technology and Logistics)



Briefing Outline

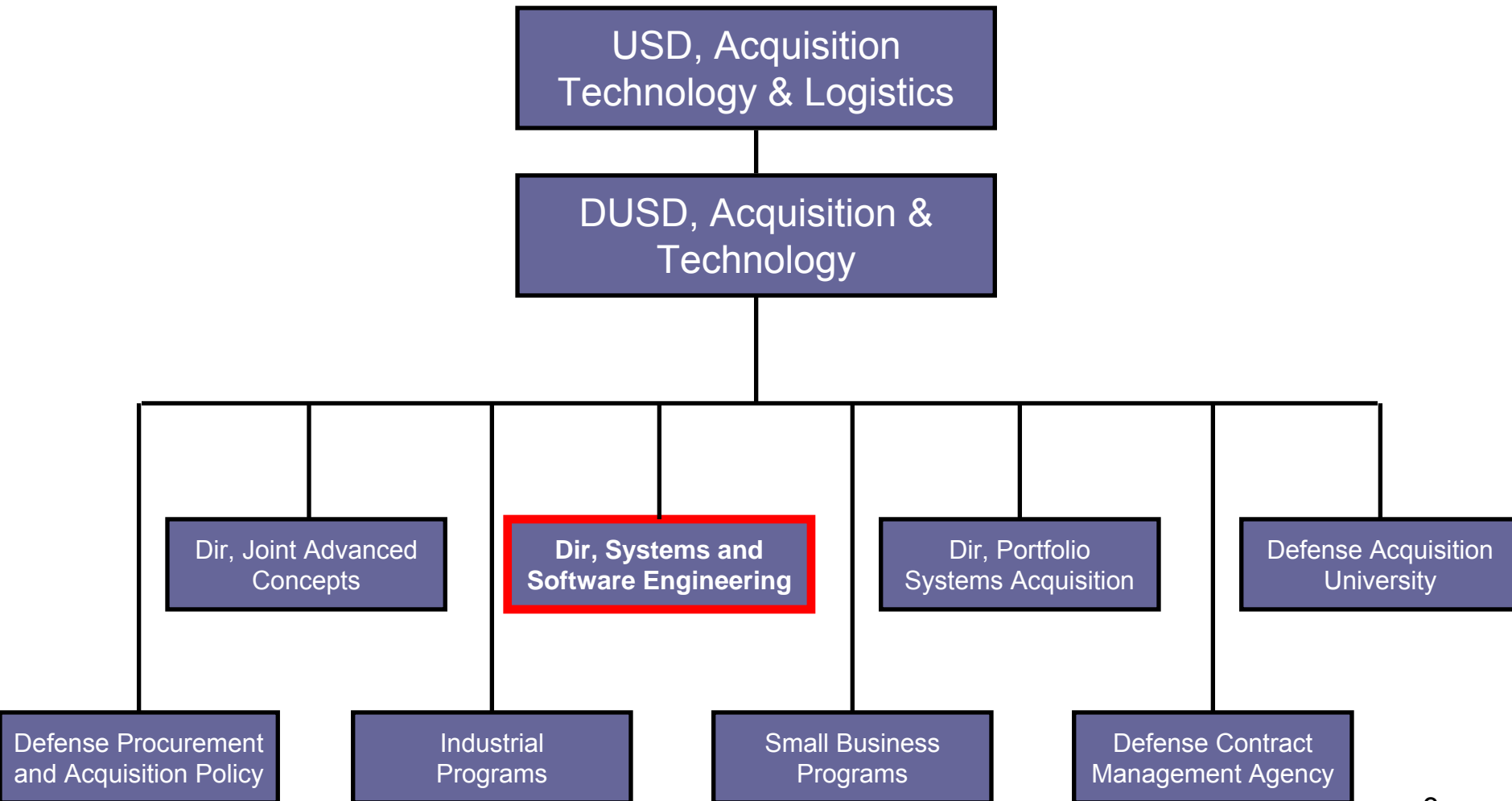
- New Software and System Assurance Organization
- Agile software development values
- Informal DoD study of agile methods
- DoD Challenges and Opportunities: Successfully fielding software-intensive systems
- Defense Software Strategy Summit perspectives on the DoD software environment
- A challenge to Industry

Can Agile development methods succeed in the DoD environment?



OUSD (AT&L) Organization

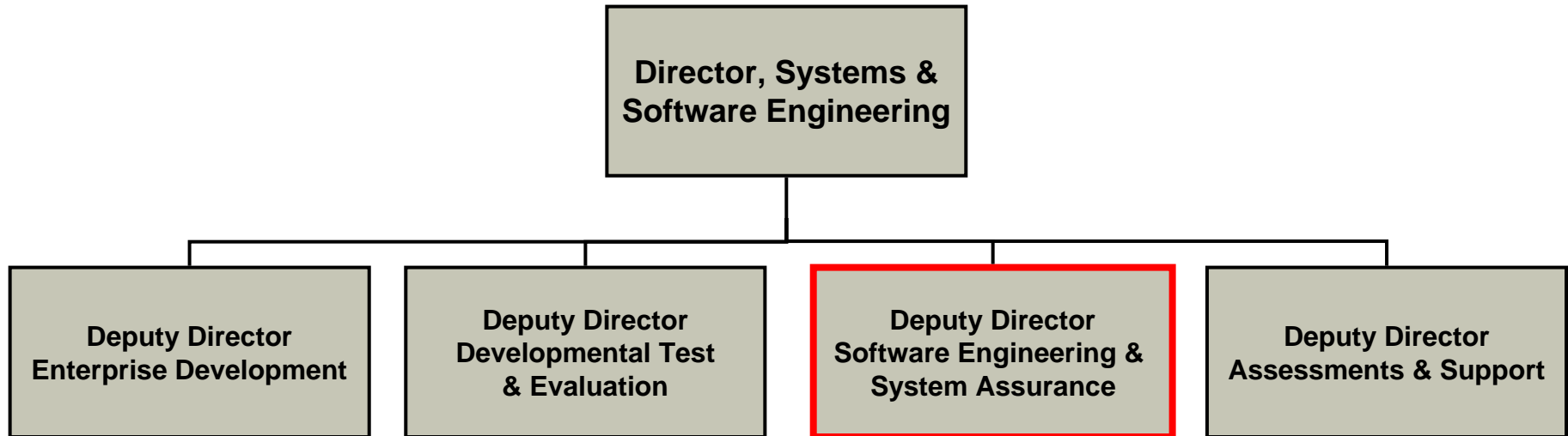
May 2006





Systems and Software Engineering

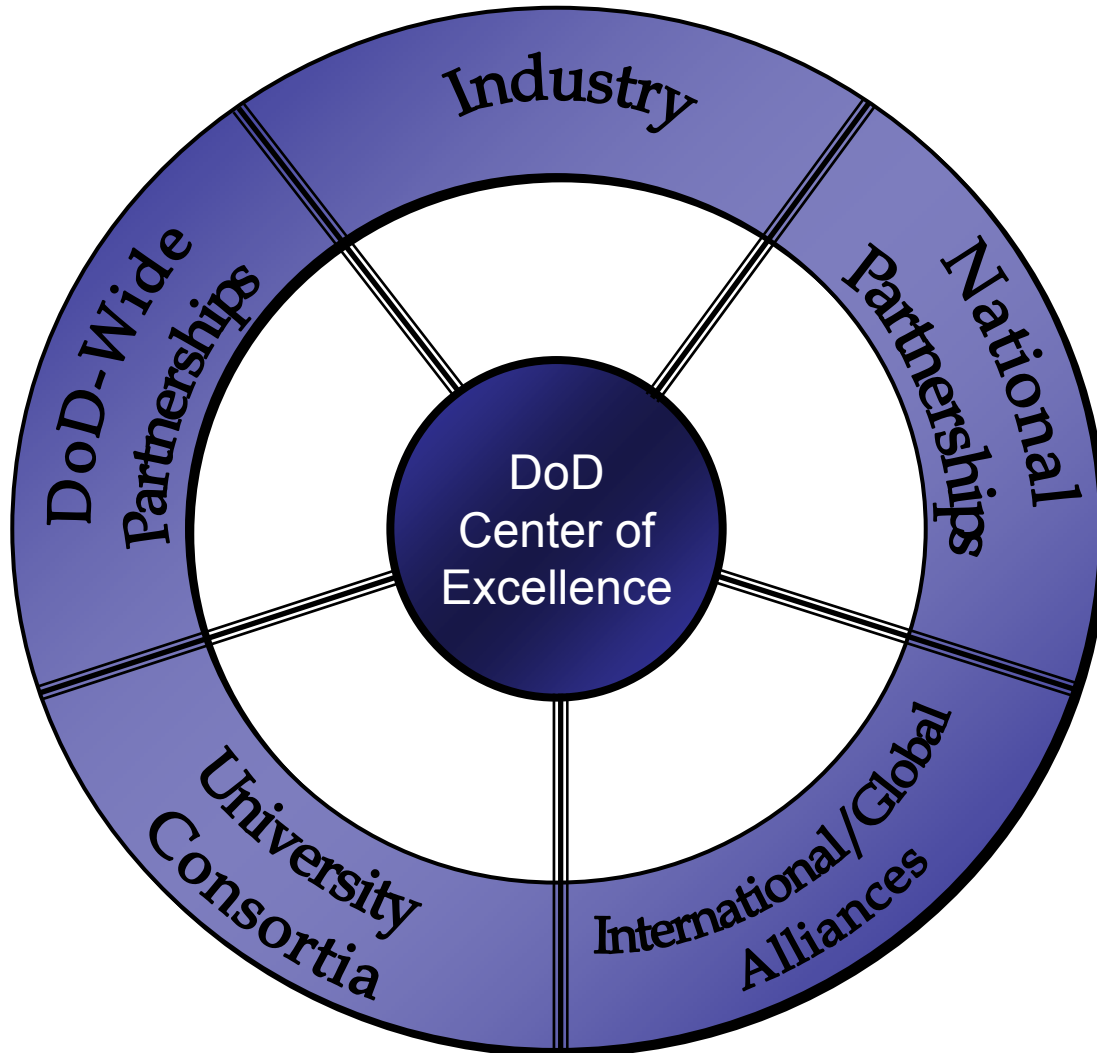
An Organizational Construct



Acquisition program excellence through sound systems and software engineering



Establishing a DoD Engineering Center of Excellence



DoD Engineering Center of Excellence

- Support Acquisition Success
- Improve State-of-the-Practice of Engineering
- Leadership, Outreach and Advocacy
- Foster Resources to Meet DoD Needs



Getting Started – What are we Doing?

- Identifying issues, needs
 - Software Industrial Base Study
 - NDIA Top SE and Software Issue Workshops
 - Defense Software Strategy Summit
- Creating opportunities, partnerships
 - Established network of Government software POCs
 - Co-chair NDIA System Assurance Committee
 - Chair, DoD Systems Assurance Working Group
 - Information exchanges with Government, Academia, and Industry
 - Sponsoring the Systems & Software Technology Conference, 18-21 Jun 07, Tampa, FL
- Executing focused initiatives
 - Handbook on Engineering for System Assurance
 - SoS Systems Engineering Guide
 - CMMI Integrity, CMMI-ACQ, CMMI Guidebook
 - Providing support to acquisition programs



Top Software Issues*

1. The impact of requirements upon software is not consistently quantified and managed in development or sustainment.
2. Fundamental system engineering decisions are made without full participation of software engineering.
3. Software life-cycle planning and management by acquirers and suppliers is ineffective.
4. The quantity and quality of software engineering expertise is insufficient to meet the demands of government and the defense industry.
5. Traditional software verification techniques are costly and ineffective for dealing with the scale and complexity of modern systems.
6. There is a failure to assure correct, predictable, safe, secure execution of complex software in distributed environments.
7. Inadequate attention is given to total lifecycle issues for COTS/NDI impacts on lifecycle cost and risk.



Agile Software Development Observations



Software Development Thought Leaders' Values Have Influenced Industry

Manifesto for Agile Software Development

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

- Individuals and interactions** over processes and tools
- Working software** over comprehensive documentation
- Customer collaboration** over contract negotiation
- Responding to change** over following a plan

That is, while there is value in the items on the right, we value the items on the left more.

Kent Beck	James Grenning	Robert C. Martin
Mike Beedle	Jim Highsmith	Steve Mellor
Arie van Bennekum	Andrew Hunt	Ken Schwaber
Alistair Cockburn	Ron Jeffries	Jeff Sutherland
Ward Cunningham	Jon Kern	Dave Thomas
Martin Fowler	Brian Marick	



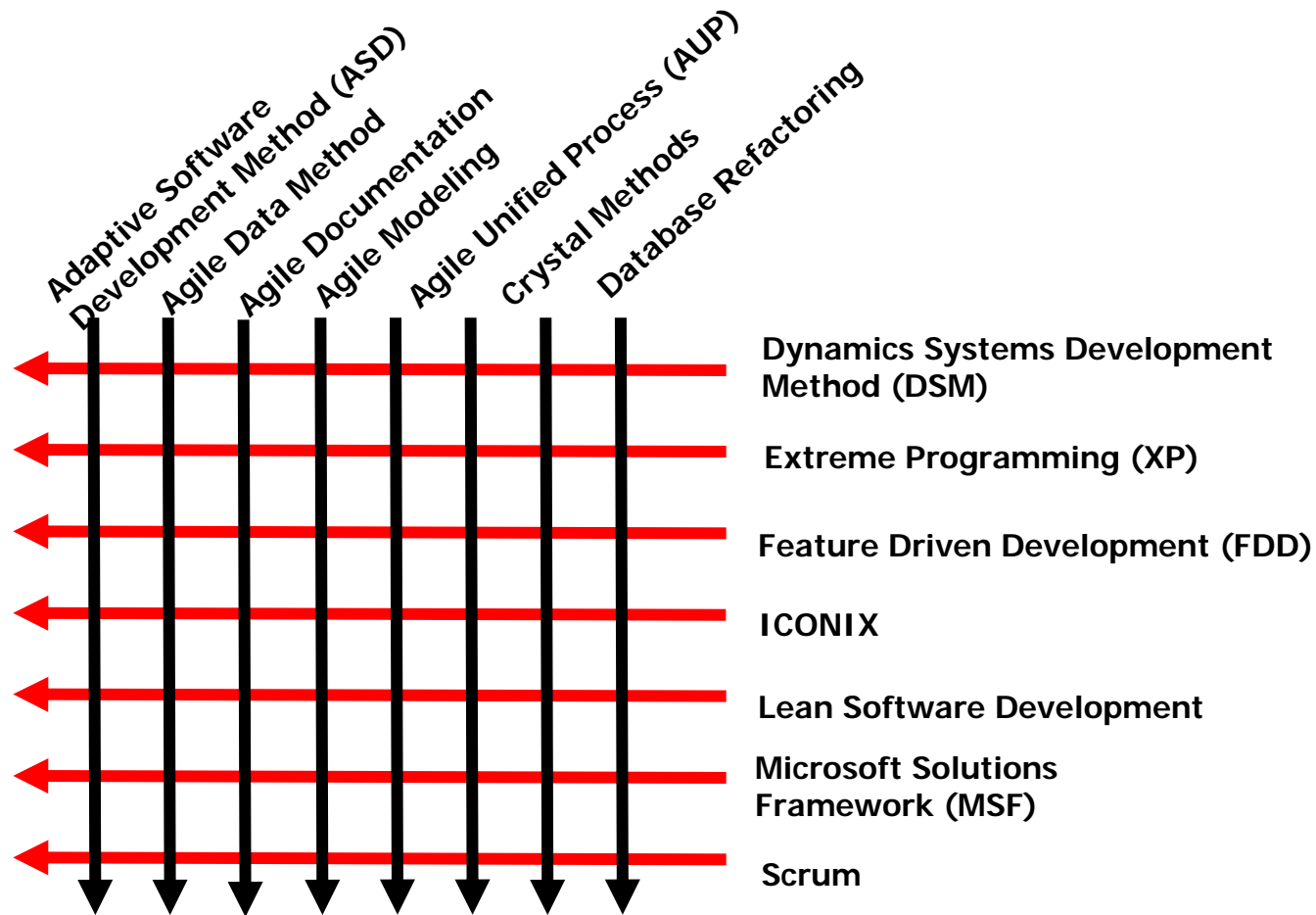
Software Developers in Many Industries Are Adopting Agile Methods

- According to a 2006 commercial survey:
 - 84% of 722 respondents indicated their software organizations adopted agile development methods
 - Respondents had on average 2.3 years of personal agile experience
- Survey responses of estimated specific improvements actually realized from implementing agile practices:

	≥ 10%	≥ 25%
Reduced schedule	86%	60%
Increased productivity	87%	55%
Reduced software defects	86%	55%
Reduced cost	63%	26%



What Agile Methods May You Be Using?



Agile methods are employed most often as hybrids.



Informal Study by ODUSD(A&T)/SSA: DoD Use of Agile Methods

- Information obtained on 18 systems acquisition programs; Three programs recognized for being on the annual *"Top 5" DoD Programs* list
- Study reports on:
 - Cited Benefits of Agile Methods
 - Drivers of Agile Benefits
 - Concerns from DoD PMs



Informal DoD Agile Report: Improvements Seen From Employing Agile Methods

- XP, MSF, ASD, and Scrum were the most frequently used agile methods
- Most improved areas cited:
 - Schedule control
 - Cost control
 - User interaction
 - Requirements management



Informal DoD Agile Report: Essential Contributors to Agile Benefits

People

- Strong program leadership
- Dedicated & experienced developers
- Easy access to users
- Small collocated teams
- Government & Contractor software skill parity
- Daily stand up meetings
- Prioritizing all efforts jointly with customer
- Pair programming
- Early visibility to management of accurate status

Procedures

- Not short-changing SE
- Properly balancing documentation & planning without compromising agile flexibility
- Fixing scope of at start of agile iteration to ensure small amounts of Lines of Code
- Time-boxing each increment
- Planning & measuring every iteration
- Short increments & frequent delivery to real users
- Schedule slack for each iteration to address previous iteration discrepancies
- Strong Configuration Management (CM) of all artifacts

Can the DoD Acquisition Environment accommodate these drivers?



Informal DoD Agile Report: Concerns Identified from DoD Programs' Experiences with Agile Methods

- Challenge to meet customer expectations
- Decrease in quality of coding
- Difficult to perform CM
- Less time to test software
- Higher software costs
- Increased project risk
- Lack of support for agile methods within DoD
- Multi-level security certifications get no easier with agile methods



DoD Challenges and Potential Opportunities for Agile



Acquiring Defense Capabilities: Challenges

- Capability needs will be satisfied by groupings of legacy systems, new programs, and technology insertion – Systems of Systems (SoS)
- Issues:
 - Scale: Size of defense enterprise makes a single integrated architecture infeasible
 - Ownership/Management: Individual systems are owned by the military component or agencies
 - Legacy: Current systems will be part of the defense inventory for the long-term and need to be factored into any approach to SoS
 - Changing Operations: Changing threats and concepts mean that new (ad hoc) SoS configurations will be needed to address changing, unpredictable operational demands
 - Criticality of Software: SoS are constructed through cooperative or distributed software across systems
 - Enterprise Integration: SoS must integrate with other related capabilities and enterprise architectures, e.g. the GIG



The System Assurance Problem

- Growing system complexity makes vulnerabilities (*malicious, exploitable logic*) within SoS much more difficult to discover and mitigate
- Commercial components are highly desirable from standpoint of program cost, schedule and performance, *but*:
 - Risks inherent due to globalization of production
- High Assurance Components are difficult and expensive to make, and deliver limited functionality
- *How do we acquire SoS with mission-worthy system-level assurance properties?*

System Assurance Definition

Level of confidence that system functions as intended and is free of exploitable vulnerabilities

Whether intentionally or unintentionally introduced, designed, or otherwise inserted.



Opportunities for Successfully Fielding Complex DoD Capabilities

SW Opportunities

- Software lends itself to small incremental development
- Software links SoS
- Software adapts hardware to changing threats

Agile Opportunities

- Can DoD software benefit from agile methods
- Can the lessons learned from agile methods benefit the greater SE and Acquisition community
 - Integration with SE?
 - Engineering for SoS?
 - Adaptable and assured capabilities?
 - Enterprise Solutions?

Can Agile methods help DoD be responsive?



Our Challenge

For Agile to succeed in DoD we must answer the following questions:

1. Can agile methods scale or are DoD systems acquisition programs just too complex?
2. Can agile methods complement systems engineering?
3. How can the Government and Industry adequately collaborate in this different paradigm of software development?
4. Can systems assurance risks benefit from agile development?