



NIST US Measurement System (USMS) Project Software Measurement & Technological Innovation

National Software Strategy Steering Group (NSG) Meeting
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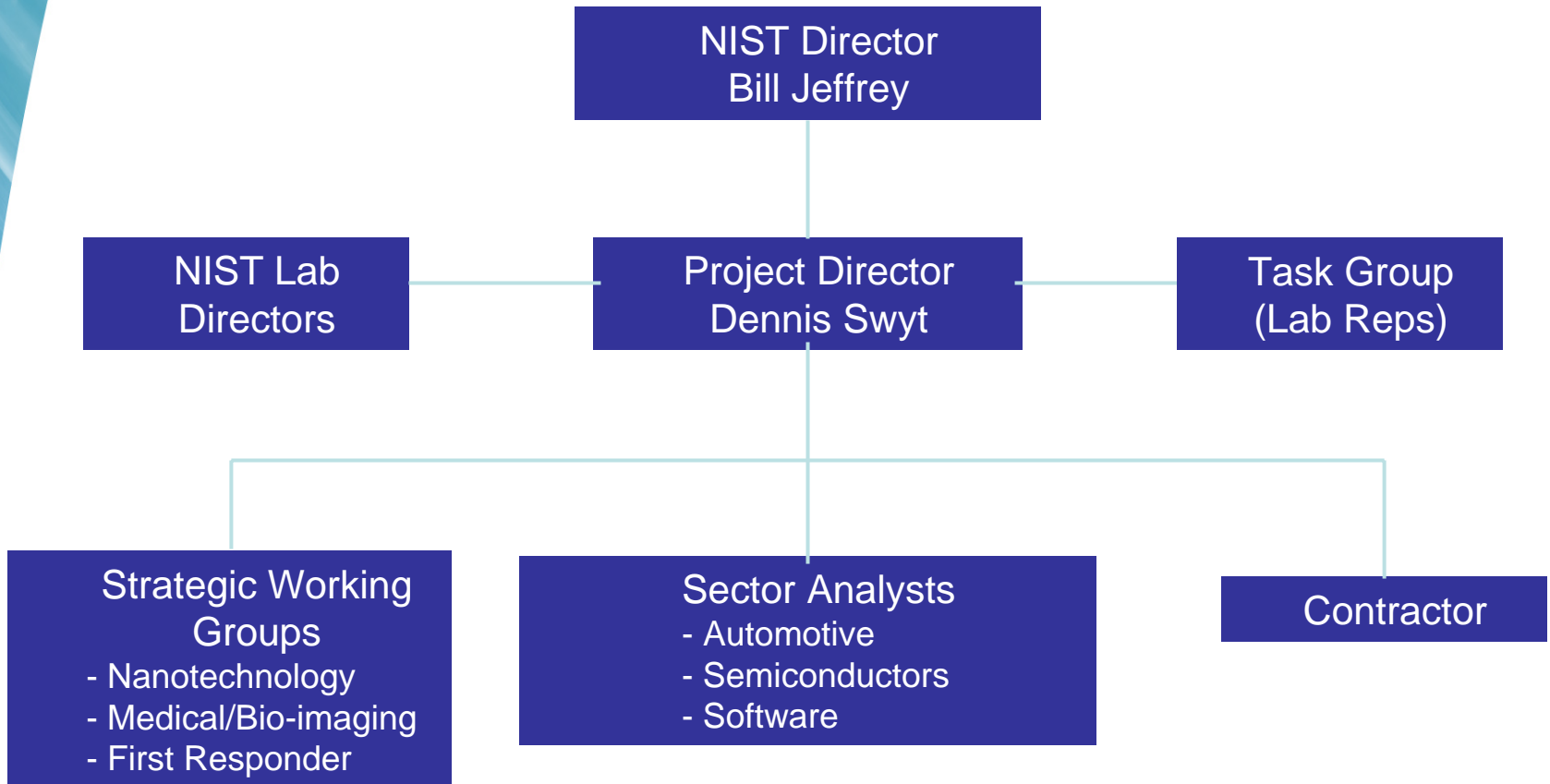


USMS Project Overview

- NIST is conducting a broad survey and assessment of the state of the US Measurement System (Report by June 2006).
- Focus is on U.S. industry measurement needs (MNs) that are barriers to technological innovation.
- Measurement needs arise from measurement problems in R&D, production, marketing, and end-use stages in developing new products and processes.



USMS Project Organization





Logic of the USMS Effort and Report

- Technology is a foundation of the U.S.'s economy and defense.
- Innovation in technology is a major source of the nation's economic well-being and military strength.
- Technological innovation is a basis for increased competitiveness, productivity, and quality.



Approach to Survey of Industry Measurement Needs

The USMS project approach is to look at the overall space of measurement needs (MNs) from different perspectives; that is, from different bases, at the same time in parallel:

- By Targeted Industry Sectors
- By Technologies
- By Disciplines
- By SI Units



MN Submission and Authentication

- MNs may be prepared and submitted by NIST staff or external sources for any of the USMS Bases.
- MNs submitted by industry workshops, expert groups, etc, may be self-authenticated by these groups.
- NIST submitted MNs must be authenticated by an external authority.
 - e.g., industry groups/workshops, industry reports, industry roadmaps, noted experts, etc.
 - Authentication Kits are available for guidance.



Measurement Need (MN) Template - Summarizes MN for USMS Assessment and Report

Style: One page only, with back-up documentation support.

Sections:

- Technology at Issue
- Technological Innovation at Stake
- Economic Significance of Innovation
- Technical Barrier to the Innovation
- Stage of Innovation In Which Barrier Appears
- Measurement-Problem Part of Technical Barrier
- Potential Solutions to Problem
- Potential Providers of Solutions
- Role for Government?
- Why Industry Says It Can't/Won't Pay for Solution



MNs Submitted

- Approximately 170 MNs submitted by NIST Staff
- Additional MNs also expected from USMS/NIST Workshops and Industry
- Approximately 300 MNs are expected

IT and Software Focus

- IT & software are critical to technological innovation and are essential to U.S. industry and products, and national security.
- U.S. industry presence and leadership in the global marketplace requires continued technological innovation.
- The impact on the US economy, security, and health due to poor quality software, software defects, and faults and failures is enormous.

IT and Software Metrology

- Software/IT metrology plays a key supporting role throughout the software and system lifecycle:
 - Development
 - Testing
 - Integration
 - Deployment
 - Maintenance



Software Metrology and Measurement Needs

- Software metrology includes measurement of quantities as well as conformance to specifications:
 - Size
 - Complexity
 - Errors
 - Function Points
 - State
 - Conformance
 - Correctness
 - Usability
 - Quality
 - Reliability
 - Maintainability
 - Interoperability
- What problems result from inadequate or insufficient software metrics and measurements?
- What are their impacts on the software and systems lifecycle? Economic impact?
- What critical problems and technical issues exist in software metrology? Short-term? Long-term?
- What is needed? What should be done? By whom?



IT and Software Application Challenges

- Many areas face major software/technical challenges:
 - Mission/safety critical systems
 - Semantic interoperability
 - Quality & assurance
 - Image processing
 - Signal processing
 - High performance computing
 - Knowledge management
 - Networking/Communications
 - High integrity systems
 - Privacy & security
 - Cryptography
 - Pattern recognition
 - Inference & reasoning
 - Quantum computing
 - Conformance testing
 - Usability/Accessibility
- What impact does software/IT metrics and measurement technology have in these areas?
- What metrology is lacking and what is needed?
- What are the potential economic and technological benefits from improved software/IT metrology?



IT and Software Measurement Needs by Sector

- How does software/IT measurement needs impact:
 - Manufacturing
 - Financial
 - Transportation
 - Chemicals
 - Utilities
 - Aerospace
 - Healthcare and Life Sciences
 - Defense
 - Telecommunications
 - Mining & Petroleum
 - Electronics
 - IT & Software
- What are the software/IT measurement needs of:
 - SDOs and consortia
 - Developers
 - Testing, certification, and accreditation facilities
 - System integrators
 - Platform vendors
 - Government and Defense
 - Universities and research labs



IT and Software MN Questions

- What technological innovations are being impeded by software/IT problems?
- Which industries or applications are affected?
- What are the economic impacts?
- What are the technical barriers to innovation?
- What software/IT metrics and measurements are needed?
- What solutions and providers are available?



How Can You Help?

- Provide external review and authentication of NIST software MNs.
- Consider submitting software MNs to the NIST USMS project.



NIST SW MNs Submitted

Technology At Issue	Submitter
Semantic Web Metrics	Barkley (ITL)
Software Interoperability Measurements	Quirologico (ITL)
Software Quality Assurance	Fong (ITL)
Software Measurement Framework	Rhodes (ITL)
Computer Modeling	Boisvert (ITL)
XML Modeling	Jones (MEL)
Embedded Control Software	Wavering (MEL)
Healthcare Systems Interoperability	Snelick (ITL)

How to Proceed

- Visit the NIST USMS Web Site for further information.
- Obtain the tool-kit/checklist for Generating and Authenticating MNs.
- Obtain NIST software MNs for review and authentication (from me).
- Authenticate/validate each software/IT MN using the tool-kit as a guide.
- Submit SW Authentications (or any SW MNs) to the NIST USMS contact (me).
- Contact me if you need assistance, have questions, comments, or want to discuss anything further.



**Objective: *Deliver to NIST Director by June 2006
an assessment of state of USMS***

USMS Timetable

NIST approves USMS project plan	Oct 18
Initial set of MNs submitted by NIST	Jan 6
TG produces initial set of findings	Feb 1
Last date for submitting MNs with Authentications	Apr 1*
TG/Contractor analyze findings & produces report	April-May
Final report to NIST Director	June 2006



For Further Information

- NIST Contacts for USMS Project:
 - USMS Project Director - Dennis Swyt, (301) 975-3463, dswyt@nist.gov
 - USMS Software Sector Analyst – Tom Rhodes, (301) 975-3295/3423, trhodes@nist.gov
- NIST Web Sites:
 - NIST: <http://www.nist.gov>
 - NIST USMS: <http://usms.nist.gov/>
 - USMS MN Template: <http://usms.nist.gov/MN-template.doc>