



Systems Integration for Manufacturing Applications

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Today

- **Brief Program Overview**
 - Some background on SIMA and HPCC
 - Industry motivation for pursuing integrated systems
 - As Seen from the Manufacturing Sector
- **Project demonstrations**
 - NIST B2B Testbed
 - NIST Electronic Commerce Testbed
 - NIST AEX Testbed
 - Manufacturing Integration: STEP NC
 - Protein Data Integration
 - Anthropometric Data Integration (Beer Bellies)
 - UnitsML
- **Wrap up**



Growing Impact of eCommerce

- **B2B transactions over the Internet totaled \$433 billion in 2000 and topped \$680 billion in 2001 (a 68% increase). Projections are that eCommerce transactions will soon exceed \$1 trillion [Gartner, IDC]**
- **Companies conducting business-to-business electronic-commerce could be part of a market expected to total \$8.5 trillion worldwide in 2005 [Gartner]**



Interoperability: Motivating Factors

GM CIO Keynote at NIST-OAGIS meeting

“GM recognizes that it can no longer afford to support multiple, incompatible methods of exchanging information and will pursue open standards as replacements for proprietary solutions.”



Interoperability: Motivating Factors

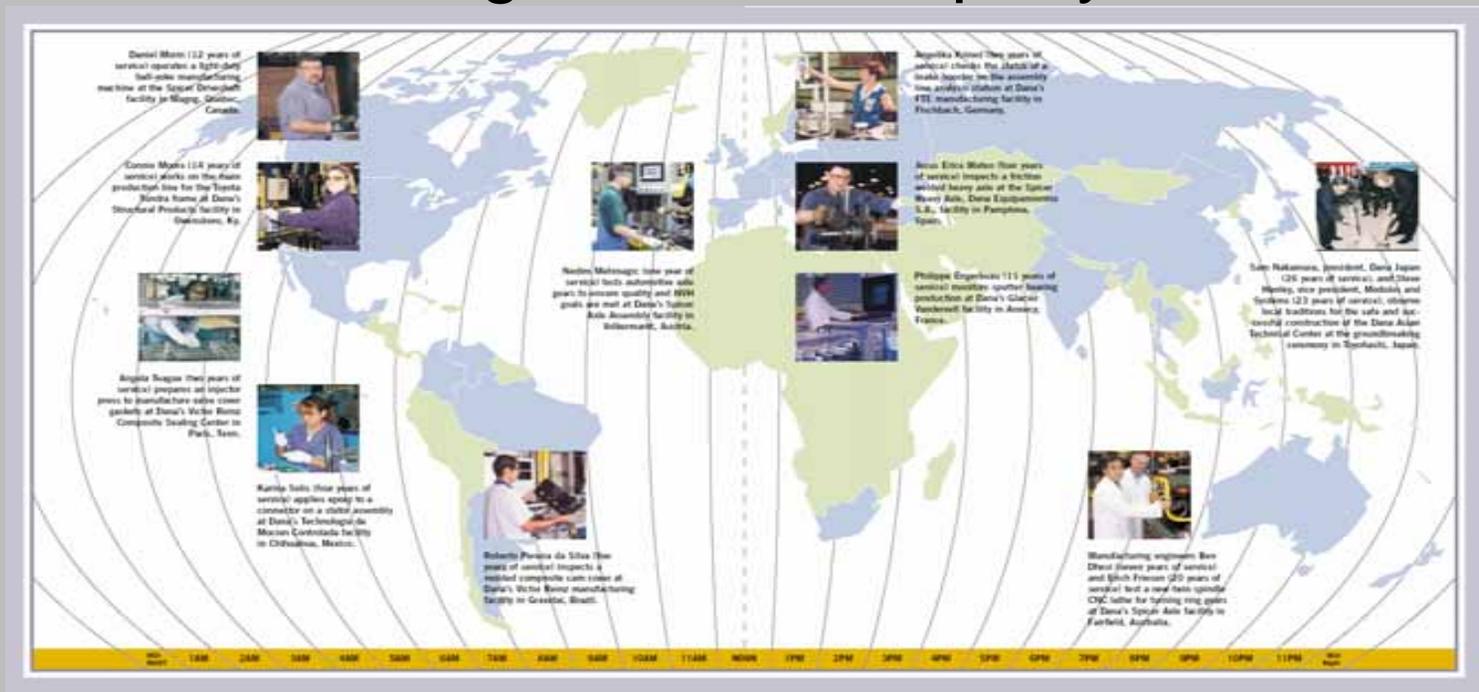
- Global Operations
- Outsourcing
- Mergers & Acquisitions
- Joint Ventures
- Multiple Solution Choices
- Cross Domain Interactions



Global Operations

Dana Corporation

- Operations in 35 countries
- 27 different CAD systems alone are in use throughout the company





Outsourcing

- **Continuing growth in outsourcing**
 - **Electronics, Automotive, Aerospace, Pharmaceuticals**
- **Reliance on contract manufacturer increases necessity for interoperability among software systems**

SANTA CLARA, Calif. (CBS.MW)-- 3Com Corp. said Tuesday it would shed real estate as part of a plan to outsource manufacturing to Flextronics.

Philips Hangs Up Mobile Phone Business

By Jay Wroldstad, Wireless.NewsFactor.com

European consumer electronics giant Royal Philips Electronics ([NYSE: PHG -news](http://NYSE:PHG)) has joined the ranks of companies that are shedding mobile phone manufacturing operations, announcing that it will outsource its handset production as part of a corporate restructuring strategy.

Alcatel Plans to Shed the Bulk of Its Manufacturing Operations

By Kevin J. Delaney
Staff Reporter of The Wall Street Journal

LONDON -- The head of Alcatel SA said the company will sell most of its factories by the end of 2002, marking a further streamlining for the company that just a few years ago made products ranging from cruise ships to wine to batteries.

With Some Help From Solectron, Sony Learns to Love Outsourcing

By Peter Landers
Staff Reporter of the Wall Street Journal



Mergers & Acquisitions

- Ford Motor Co.
 - Acquisitions of luxury automakers using incompatible systems exacerbates interoperability issues
 - Primary CAD supplier is being acquired by competitor

THE CORPORATION

Ford's Gamble on Luxury

Can it make its portfolio of acquired brands work together?

Ford's Luxury Portfolio...

LINCOLN (since 1922) Added a small sedan and an SUV to stress "American luxury."

VOLVO (bought 1999) Stylish new S60 adds to safety image

JAGUAR (bought 1989) Big hopes for new, moderately priced X type

LAND ROVER (bought 2000) Sharing Ford truck platforms is key to profits

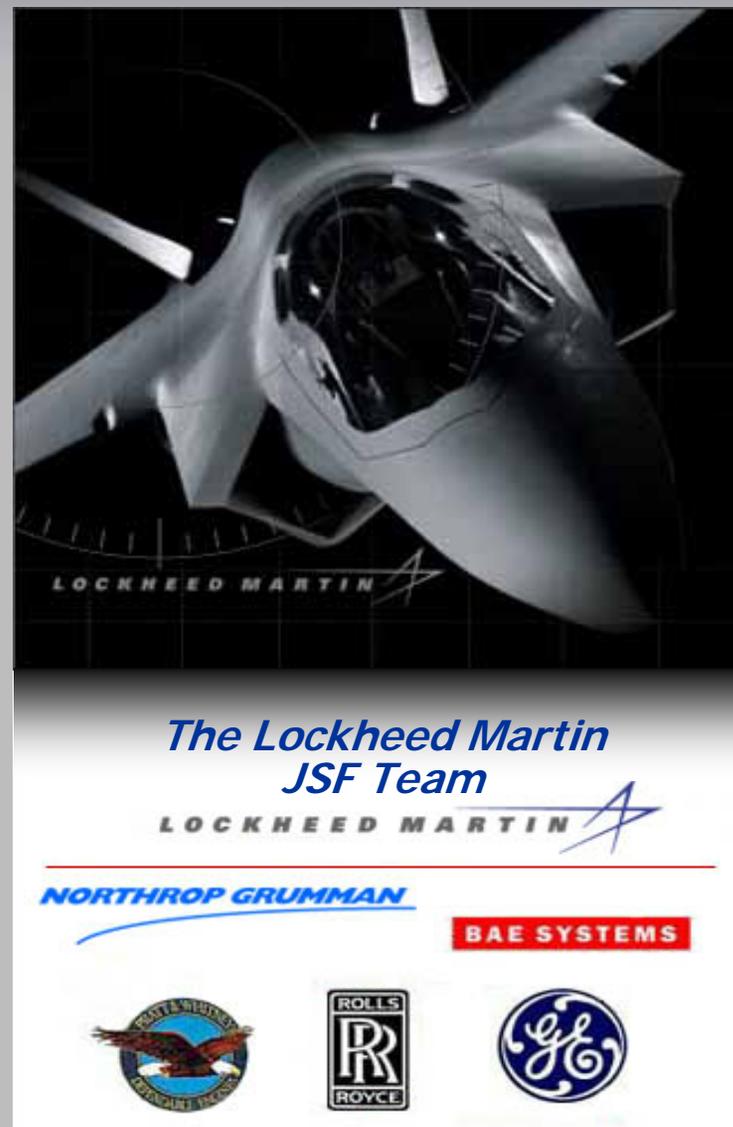
ASTON MARTIN (bought 1987) James Bond's car costs \$150,000 to \$220,000.

EDS to Acquire SDRC; Intends to Take Unigraphics Private; Creates Leader in Software for Digitized Product Development



Joint Ventures

- Team-based bids for major weapons contracts, e.g., Joint Strike Fighter
 - design and configuration management integration critical





Standards Proliferation

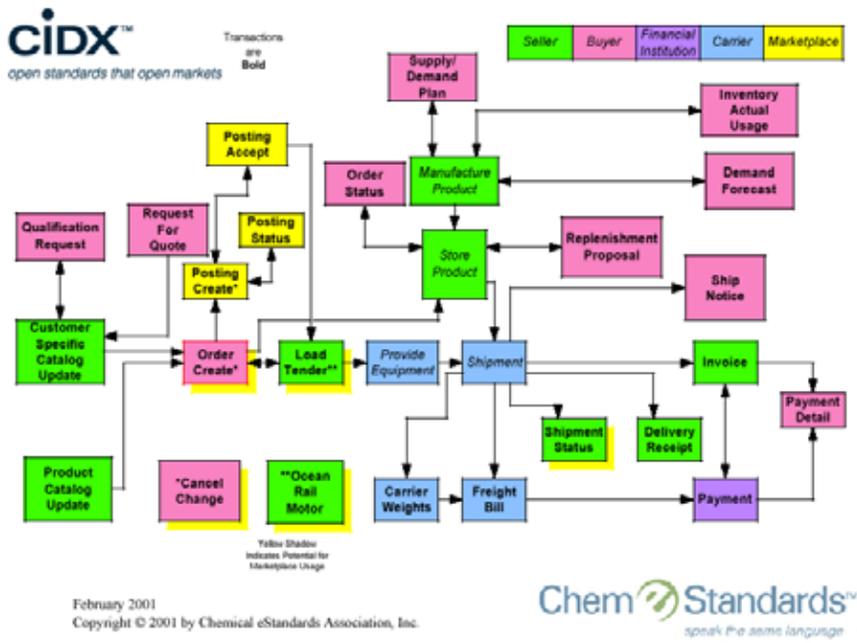
- Prevalent in B2B
 - Overlapping but non-equivalent interoperability solutions



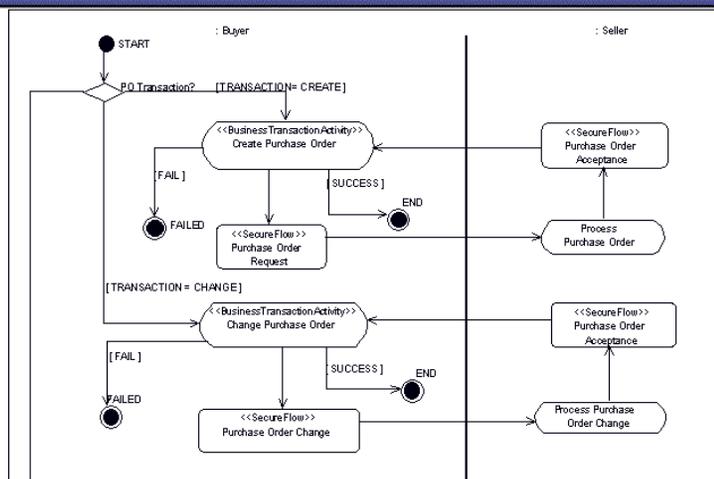
Open Applications Group

Industry Consortium working to achieve dramatically easier business software integration for:

- Business to Business
- Application to Application
 - Legacy
 - Packaged
- Outside the Enterprise
- Across the Enterprise
- Down the Enterprise



From PIP™3A4 Business Process Flow Diagram in BOV





Moving to a Multi-Sector Reality

Aerospace

Automotive



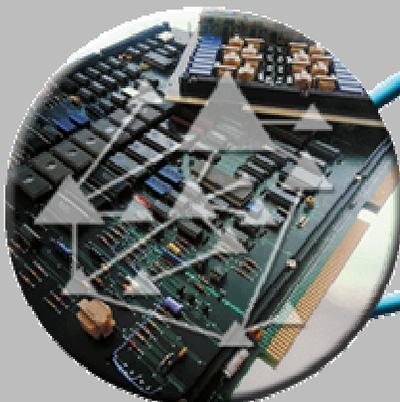
Construction



Health Care



Chemistry



Electronics



Textiles





Automotive Sector Views on eBusiness Adoption

- **Tier-one suppliers expect to reduce costs from implementing eBusiness**
 - Demand planning / inventory management
 - Collaborative engineering
- **Tier-one suppliers are confident that eBusiness will reduce costs across the supply chain**
- **Tier-one suppliers plan to reduce the number of their suppliers, keeping only those that are proficient in eBusiness technologies**



Interoperability: A Significant Concern

“There is little question that the interoperability problem is a significant one. It consumes tremendous resources that could be more productively deployed elsewhere. It inhibits the achievement of broad corporate and national goals. It jeopardizes quality and safety of manufactured products by allowing error to persist in the design and production process.”

Exploiting eManufacturing: Interoperability of Software Systems Used by U.S. Manufacturers, NACFAM, February 2001.



SIMA Background

- The SIMA Program began under the auspices of the High Performance Computing & Communications (HPCC) initiative at NIST
- The program is a unique multi-laboratory effort managed from within MSID to address HPCC research areas dealing with information integration and information access

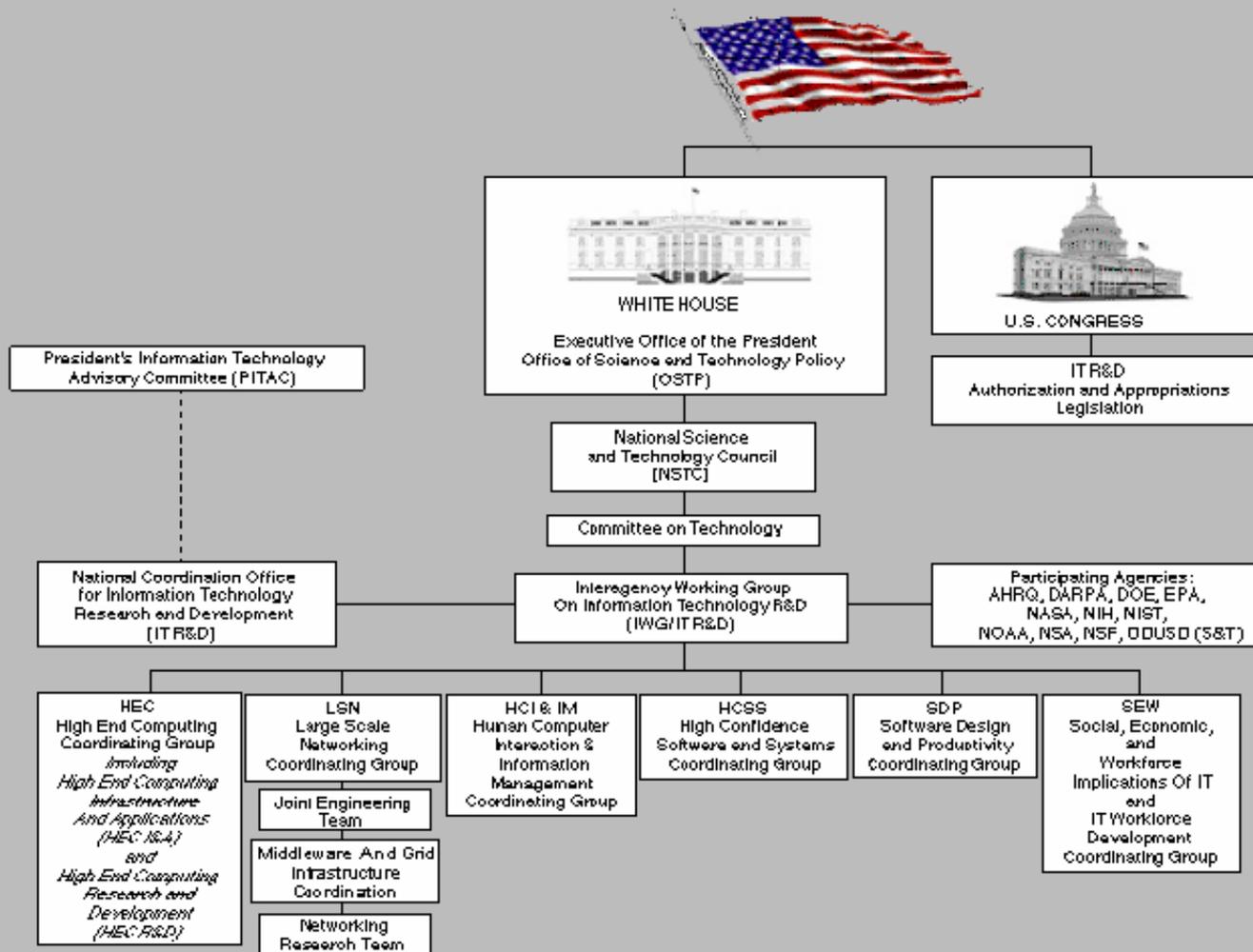


HPCC

- High Performance Computing Act
 - Establishes multi-agency High Performance Computing & Communications effort coordinated under the National Science & Technology Council
 - HPCC was intended to accelerate development of future generations of high performance computers/networks and use of these resources throughout the U.S. economy
 - **SIMA provides the coordination function for NIST participation in several HPCC component areas**

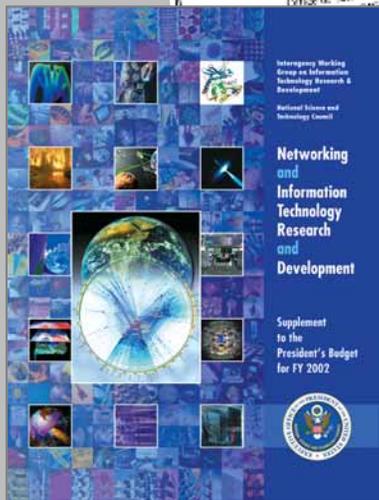
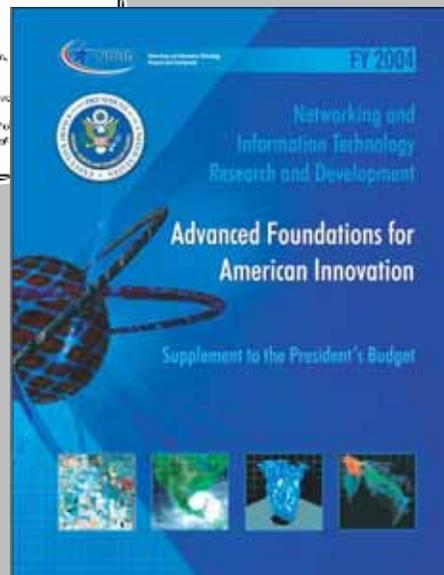


HPCC Organizational Structure





HPCC Planning/Reporting



- Work with ITL on agency submissions
- Budget information identified in Program Component Areas (e.g., for NGI, HCIIM, SDP)
- Selected milestones submitted for annual "Implementation Plan"
- Relevant Program activities described in the annual "Blue Book"
- Participate in PCA working groups, e.g., SDP



SIMA Vision & Goal

Vision

NIST as a world-recognized resource for approaches to interoperability issues.

Goal

Reduced time-to-market and maintenance costs for highly engineered products by improving the productivity of engineering and manufacturing through the widespread adoption of open information standards.



Addressing Industry Priorities and Problems

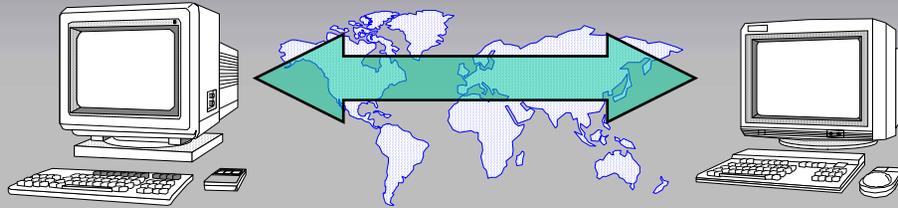


SIMA Program Activities

- 17 NIST technical efforts focusing on interface standards and information access
 - All NIST Labs
 - Focus on integration
 - SIMA Program provides coordination and promotes cooperation
 - SIMA Program conducts industry needs analysis and return on investment analysis
 - SIMA Program provides a venue for initiative development



Integration Focus



- **Activities**

- Development of domain-specific standards specifying information to be exchanged/shared or the interfaces among systems
- Development of rigorous methods to define/test interoperability solutions
- Performance of tests validating potential standards solutions and implementations

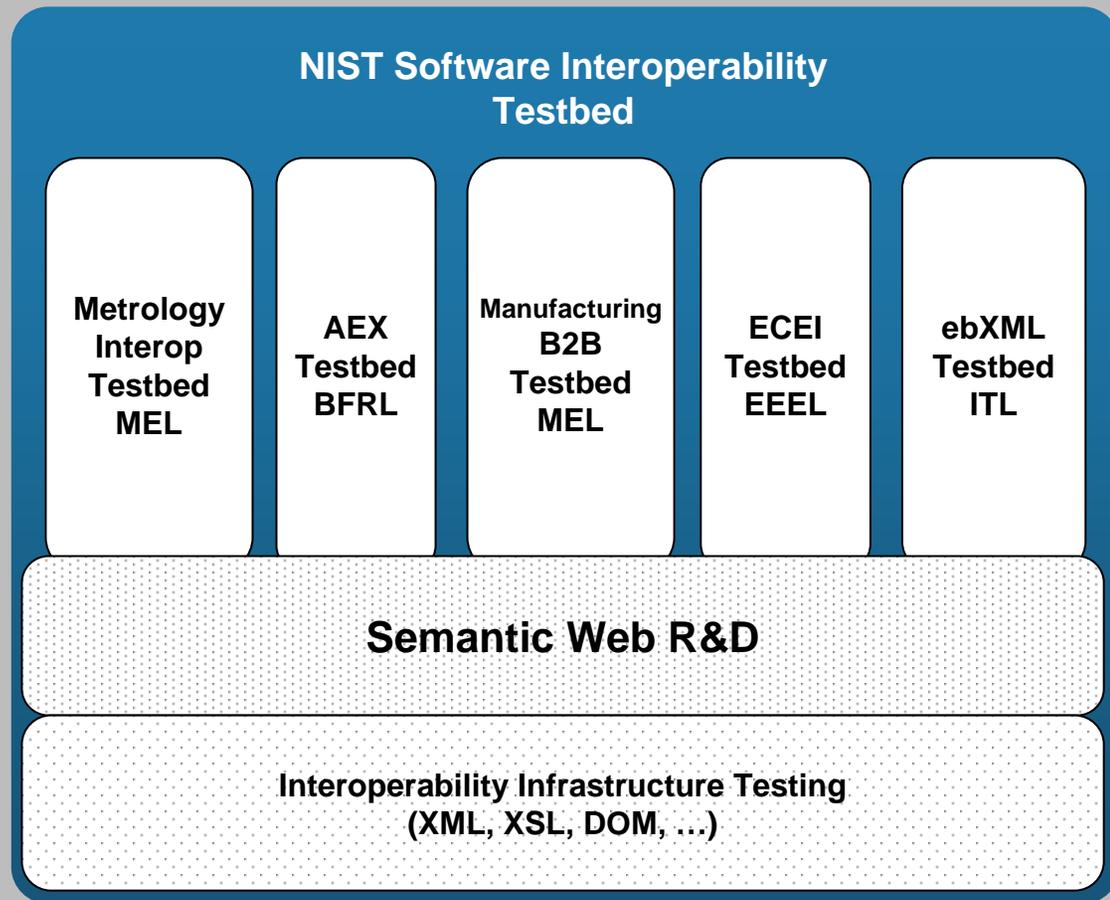
- **Customers**

- **Aerospace, Automotive, Bio, Constructors, Electronics, Genomics, Pharmaceutical, Power, Process, Software Vendors, Standards Development Organizations**



Coordination: NIST Interoperability Testbed

- Provide a unified perspective for external customers
- Combine ITL's infrastructure testing expertise with domain testing expertise
- Leverage existing experiences for new undertakings
- Proving ground for new interoperability approaches





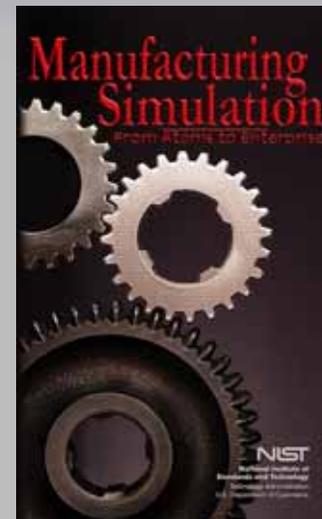
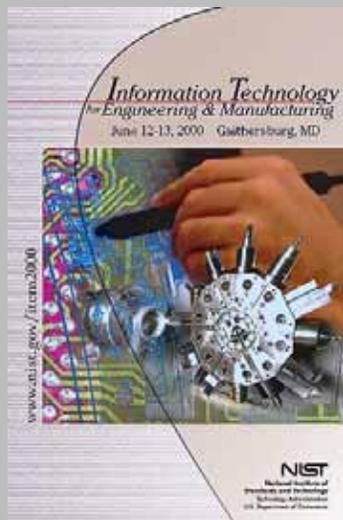
Strategic Studies

- Interoperability Cost Analysis of the U.S. Automotive Supply Chain (MEL) - March 1999
- Economic Impacts of Inadequate Infrastructure for Software Testing (ITL/MEL) - May 2002
- Economic Impact of NIST's Contributions to STEP (MEL) - 2002
- Economic Impacts of Inadequate Infrastructure for Supply Chain Integration for Automotive and Electronics Industries (EEEL/MEL) - In process
- Strategies for E-Manufacturing Standards (MEL) - In process



Raising Visibility

- Annual reports
- Conferences
- Seminars
- Information Resources



NIST
National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce

Manufacturing Engineering Laboratory
Manufacturing Systems Integration Division
Systems Integration for Manufacturing Applications

Focusing on:

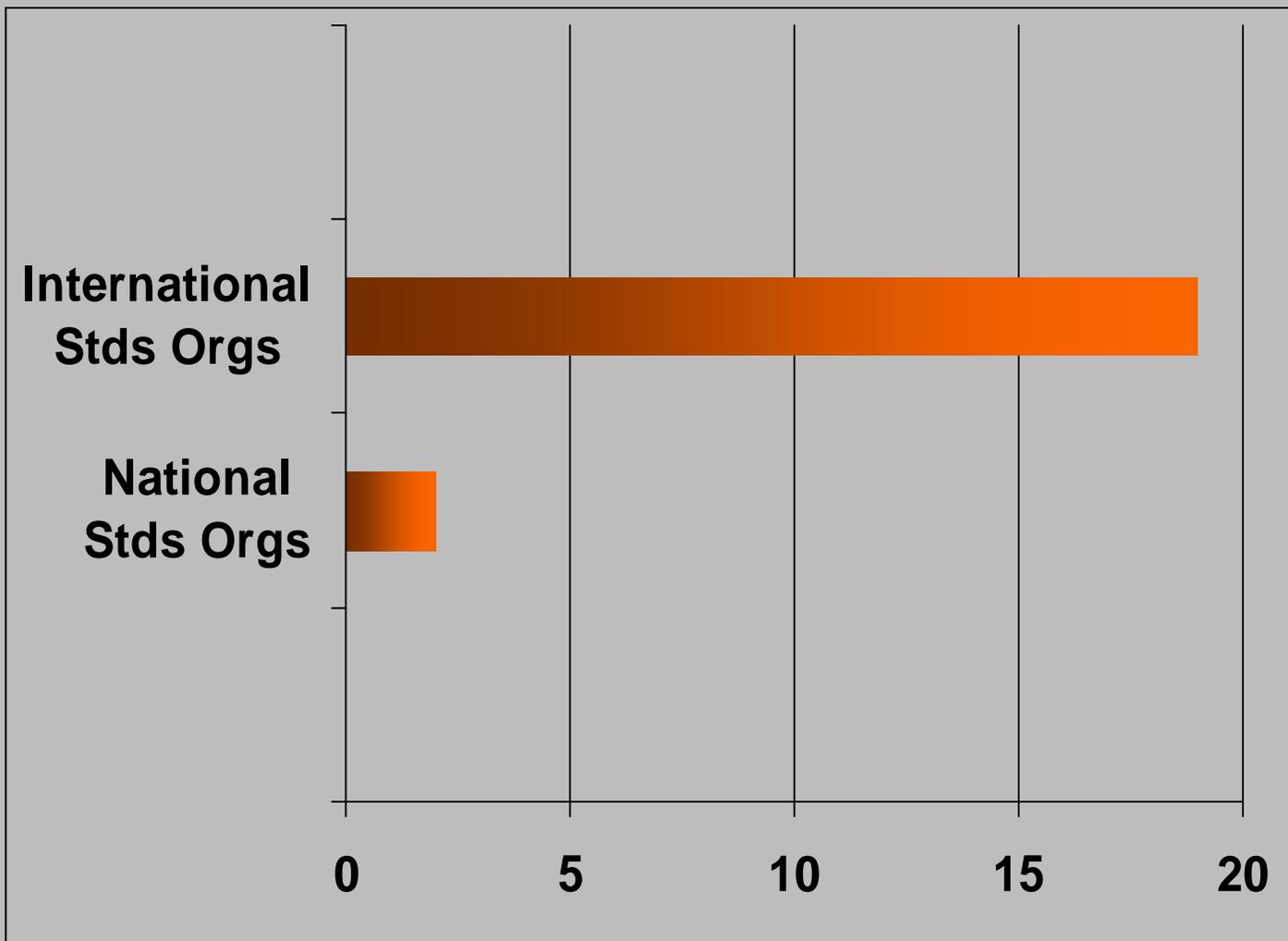
- ▶ Defining, testing, and promoting standards for interoperability solutions
- ▶ Facilitating remote access to scientific and engineering data

Overview

- Organization
- Projects Collaborators
- Publications
- Events
- Contact Information



FY03 Standards Participation

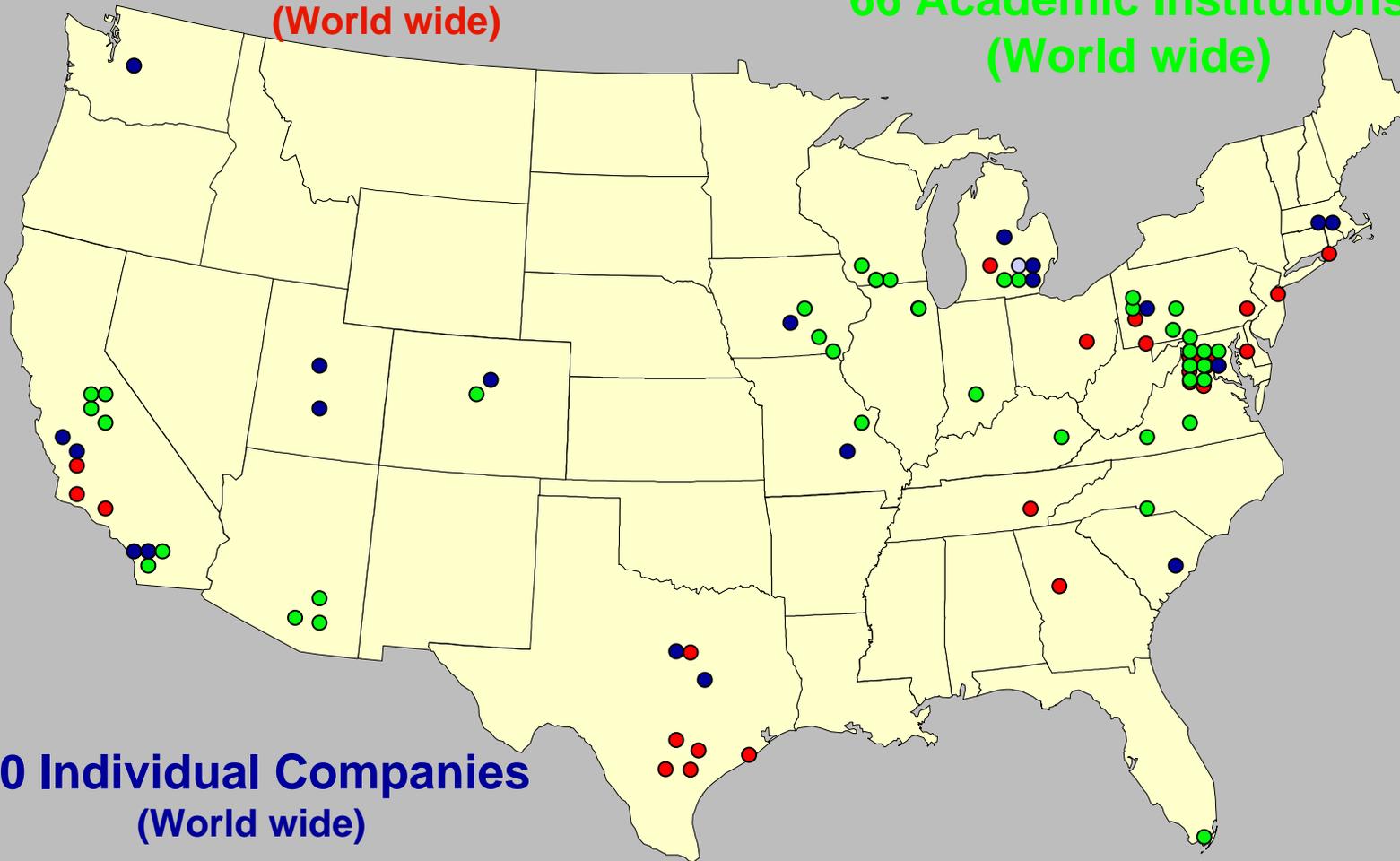




SIMA Collaborators

**43 Consortia, National Programs,
Professional and Trade
Associations
(World wide)**

**66 Academic Institutions
(World wide)**



**30 Individual Companies
(World wide)**



FY03 SIMA Projects

- [Automating Equipment Information Exchange \(AEX\)](#) – BFRL
- Cross-industry eBusiness Convergence Framework - BFRL
- [Data Uniformity and Standards in Structural Bioinformatics](#) – CSTL
- Digital Library of Math Functions – ITL
- [Electronic Commerce for the Electronics Industry \(ECEI\)](#) – EEEL
- Information Technology Infrastructure Conformance Testing – ITL
- Interoperability of Databases for the Structure, Stability and Properties of Inorganic Materials – MSEL
- [Manufacturing Enterprise Integration](#) – MEL
- NeXus Data Exchange Standard – MSEL
- [Numerical Data Markup Language](#) – PL
- [Open Architecture Control](#) – MEL
- Predictive Process Engineering - MEL
- Product Data Standards for HVAC/R Systems – BFRL
- Product Engineering Program – MEL
- Standards for Exchange of Instrument Data and NIST Chemical Reference Data – CSTL
- Standards for Physical and Chemical Property Data Interchange – CSTL
- [Visualization and Virtual Reality for Collaboration and Manufacturing](#) - ITL



Summary



Why Continue with Coordinated Effort?

- Interoperability problems increasingly require multi-disciplinary solutions
- **Collaborative knowledge sharing among SIMA efforts increases likelihood of individual successes**
- **Message to customers and legislators is that NIST is taking a holistic approach**
- Successful standards adoptions and deployments have led to documented productivity improvements and industry cost-savings
- Provides focal point for development and management of new initiatives (e.g. Enterprise Integration Act)



Future of SIMA

- Supply chain integration
- Focus on small business integration needs
- Multi-disciplinary approach
- Multi-laboratory teaming (e.g., BFRL, MEL, ITL, MEP)
- NIST-wide integration testbed (one-stop shopping for NIST customers)
- Cross domain standards convergence
- Support MEL with effective strategic studies