NIST’s Unique Mission

To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

- Mission focus: Targeting Investments to Advance U.S. Innovation and Boost Economic Recovery
- Deep research expertise underpins technological innovation – e.g. lasers, memory, GPS, wireless
- Non-regulatory status enables important role as a convener that facilitates collaboration between industry and government

Cybersecurity: Improved response to cyber threats
Nanomanufacturing: New measurement tools for advanced materials manufacturing
Energy: Measurements and standards for energy security
Executive Office of the President

Interagency Advanced Manufacturing National Program Office (AMNPO) – Housed at DOC / NIST
PCAST AMP and Manufacturing
Challenge: US losing leadership in Advanced Products

U.S. Trade Balance for Advanced Technology Products

Source: Census Bureau
Products invented here, now made elsewhere
- not driven by labor cost
PCAST: The independent basis of NNMI

President’s Council of Advisors on Science and Technology

PCAST 2011
Recommends Advanced Manufacturing Initiative as national innovation policy

PCAST 2012
Recommends Manufacturing Innovation Institutes to address key market failure

PCAST 2014
Recommends strong, collaborative network of Manufacturing Innovation Institutes
PCAST Message on **HOW**.... Partnership

*Industry – Academia – Government*

Working better, together to create transformational technologies and build new products and industries

And when... **NOW**

We can’t wait to restore US Manufacturing Leadership
Interagency Federal Team supporting

National Network for Manufacturing Innovation
NNMI: addressing the “Scale-up” Gap

Focus is to address market failure of insufficient industry R&D in the “missing middle” or “industrial commons” to de-risk promising new technologies.
Public Engagement on Design
Workshops & Request for Information

Broad & Diverse Stakeholder Input
1,200 voices on the NNMI Design!

Industry 31%
Academia 31%
Economic Development 6%
Research & non-profits 8%
Federal State & Local Gov’t 14%
All Other 10%

National Academies Beckman Center
Irvine California

University of Colorado
Boulder, Colorado

Rensselaer Polytechnic Institute
Troy New York

Cuyahoga Community College
Cleveland Ohio

U.S. Space and Rocket Center
Huntsville, Alabama
The Institute Design
Creating the space for Industry & Academia to collaborate

Partnership: Industry – Academia – Government
Working better, together to create transformational technologies and build new products and industries
The Institute Summary

Applied Research + Education/Workforce Skills + Development of Future “Manufacturing Hubs”

The Federal investment in the National Network for Manufacturing Innovation (NNMI) serves to create an effective manufacturing research infrastructure for U.S. industry and academia to solve industry-relevant problems. The NNMI will consist of linked Institutes for Manufacturing Innovation (IMIs) with common goals, but unique concentrations. In an IMI, industry, academia, and government partners leverage existing resources, collaborate, and co-invest to nurture manufacturing innovation and accelerate commercialization.

As sustainable manufacturing innovation hubs, IMIs will create, showcase, and deploy new capabilities, new products, and new processes that can impact commercial production. They will build workforce skills at all levels and enhance manufacturing capabilities in companies large and small. Institutes will draw together the best talents and capabilities from all the partners to build the proving grounds where innovations flourish and to help advance American domestic manufacturing.
The NNMI Mission

“The Network serves the Institutes, the Institutes connect through the Network, and the Program serves the Nation.”

Program
Advance American domestic manufacturing innovation by creating an effective manufacturing research and development infrastructure for U.S. industry and academia to solve industry-relevant problems.

Institute
Create and strengthen American manufacturing hubs through sustainable industry-led innovation institutes that create, showcase, and deploy new capabilities.

Network
Maximize the integrated impact of the manufacturing innovation institutes on U.S. manufacturing competitiveness.
Example Institute: Digital Manufacturing

UI LABS/DMDII Facility, Chicago IL
GRAND OPENING MAY 11 2015

94,000 square feet - digital manufacturing instructional and collaboration space
1) Clear, unique Institute Focus

*Each Institute has a clear mission based on a critical Industry need*

**Opportunity**

A “Digital Manufacturing Renaissance” will revolutionize how products are designed, and processes engineered and validated. Current software tools are expensive, do not talk to each other, and require expertise that does not exist at many manufacturing companies.

**Big Idea**

Accessible, interoperable, cutting edge, common approach and open source software tools will allow companies to bring new products to market, faster and at lower cost via a “digital thread”.

The consortium includes many of America’s best manufacturing companies. These companies have committed to use these new tools and to encourage their supply networks – which represent tens of thousands of small manufacturing businesses – to do the same. Through this network, this Institute will drive the adoption of digital manufacturing technologies in a way that will improve the competitiveness of the entire U.S. manufacturing sector.
2) Clear Industry Value Proposition

*Each Institute creates value for industry participation and funding*

- **Applied R&D**: Leverage significant government, industry, and academic investments to implement innovative solutions to member challenges

- **Digital Manufacturing Commons**: Exchange product information and transmit detailed design information on a secure, neutral and IP-safe digital environment

- **Workforce Training**: Access specialized training to prepare current and future workforces for the latest manufacturing methods and technologies
3) Strong Private-Public Partnership

Each Institute is operated by a consortium; serving a partnership of Industry, Academia and government

A partnership of world-class companies including:
- GE
- Rolls Royce
- P&G
- Siemens
- Dow
- Lockheed Martin

Top universities including:
- University of Illinois
- Northwestern University
- University of Texas at Austin
- Purdue University
- Texas A&M University
- Iowa State University
- University of Cincinnati

Proven talent from numerous state, educational, and vocational institutions:

Hundreds of Small and Medium Sized Manufacturing Enterprises (SMEs) seeking to improve competitiveness:
4) Addressing Critical Challenges

By workshops and Technology Roadmaps, Each Institute works on the industry priorities and big challenges only solvable by collaboration

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-theme</th>
<th>Industry</th>
<th>Academia</th>
<th>Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration of the digital thread</td>
<td>Optimization across value chain</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td></td>
<td>Big data</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td></td>
<td>Standard data format and machine communication</td>
<td>★</td>
<td></td>
<td>★</td>
</tr>
<tr>
<td></td>
<td>Cyber-Security</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td></td>
<td>Make-design link</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td></td>
<td>Tracking product performance in the field</td>
<td>★</td>
<td></td>
<td>★</td>
</tr>
<tr>
<td></td>
<td>“Real time” supplier visibility</td>
<td></td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Leadership/organization capabilities</td>
<td>Commercialization of lab technologies</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td></td>
<td>Articulation of business case for digital</td>
<td>★</td>
<td>★</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Workforce training/availability</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Other</td>
<td>Enabling of mass-customization</td>
<td></td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td></td>
<td>Barriers to user adoption</td>
<td></td>
<td>★</td>
<td>★</td>
</tr>
</tbody>
</table>

Top priority for DMDII ★ Secondary priority for DMDII ★
## 5) Balanced Portfolio of Projects

*From Technology Roadmaps and Strategic Investment Plan, Each Institute manages a balanced portfolio of real projects for Industry*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. First Projects</strong></td>
<td>• First Project Call – DARPA AVM Transition</td>
</tr>
<tr>
<td>Identified in proposal and</td>
<td>• Digital Manufacturing Commons (GE online collaboration platform)</td>
</tr>
<tr>
<td>by federal government customer</td>
<td>• 1000 Jobs (Workforce Development Initiative)</td>
</tr>
<tr>
<td></td>
<td>• Project calls 6, 7 &amp; 8 in each technology thrust area</td>
</tr>
<tr>
<td><strong>2. Technology Roadmap</strong></td>
<td>• Identifies value opportunities from digital manufacturing, and obstacles preventing the value from being realized</td>
</tr>
<tr>
<td>Driven by DMDII Technical</td>
<td>• Offers taxonomy and ranking of biggest market pull opportunities</td>
</tr>
<tr>
<td>Advisory Committee</td>
<td></td>
</tr>
<tr>
<td><strong>3. Strategic Investment</strong></td>
<td>• Identifies 13 specific technology investment topics</td>
</tr>
<tr>
<td>Plan</td>
<td>• Investment plan is structured into problem statements with near-term impact (rather than potential solutions)</td>
</tr>
<tr>
<td>Driven by DMDII Technical</td>
<td>• Next Project Call – open NOW</td>
</tr>
<tr>
<td>Advisory Committee</td>
<td></td>
</tr>
</tbody>
</table>
The NNMI Vision

“In my State of the Union Address, I asked Congress to build on a successful pilot program and create 15 manufacturing innovation institutes that connect businesses, universities, and federal agencies to turn communities left behind by global competition into global centers of high-tech jobs.

“Today, I’m asking Congress to build on the bipartisan support for this idea and triple that number to 45 – creating a network of these hubs and guaranteeing that the next revolution in manufacturing is ‘Made in America.’”

- President Barack Obama, July 30, 2013
NNMI Authorized: Revitalize American Manufacturing & Innovation Act

118 bipartisan RAMI Bill Sponsors

September 15, 2014 – Passed House
100 Cosponsors (51D, 49R)

December 11, 2014 – Passed Senate with 2015 Appropriations
18 Cosponsors (10D, 7R, 1I)

December 16, 2014 – Signed By President Obama

Bipartisan Momentum Supporting NNMI Passage
Legislative Requirements: A Call To Action

The Revitalize American Manufacturing Innovation Act of 2014 (RAMI) calls upon the U.S. Secretary of Commerce to establish:

- The “Network for Manufacturing Innovation Program” (*Network function*) - to convene and support a network of Institutes

- New “Centers for Manufacturing Innovation” (*Institutes*) - using an open topic, open competition process

- The National Program Office at NIST - to oversee and carry out the program (*coordination, network support, and reporting*)
Building the Network: *Network Status and FY16 Plans*

**FORTHCOMING FY15**
- **Integrated Photonics**
- **Smart Mfg.**
- **Flex. Hybrid Electronics**

**Full Network Goal:** 45 regional hubs

**New Institutes Planned for FY16:**
- Open topic competition – *addressing “white space” between mission agency topics*
- Selected topic competitions supporting Agency mission – *using agency authorities and budgets*

**FY17-26** – central fund proposed for remaining institutes, via open topic process
Enabling a Manufacturing Renaissance
Huge STEM Education Potential of Digital Mfg.
Opportunities from Digital Manufacturing

Democratization of tools needed to **Design** and **Make**

Shared access to non-profit and commercial makerspaces.
Inspiration to Innovation to MAKING

Enabled by a Digital Manufacturing Renaissance!

There are exactly **10** types of people in this world...

1. Those that understand binary

10. Those that do not.
Thank you

Connecting with the
Advanced Manufacturing National Program Office (AMNPO)

Phone: 301-975-2830
Email: amnpo@nist.gov
Web: www.manufacturing.gov
Twitter: @AdvMfgNPO

Unless otherwise labeled, images are courtesy of The White House, the National Institute of Standards and Technology, and Shutterstock