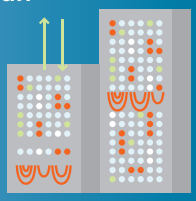
FUTURE COMPUTING AT NIST

BY THE NUMBERS

$514.70
Is returned for every dollar invested in high-performance computing *(IDC)*

4,352 square feet
Of floor space are taken up by the fastest U.S. supercomputer, called Titan *(Department of Energy)*

33.86 petaflops
The speed of the world's fastest supercomputer, China's Tianhe-2, which is nearly double the speed of Titan *(National Super Computing Center in Guangzhou)*



233
Of the world's 500 fastest computers are in the U.S. *(ExtremeTech)*

High-performance computing (HPC) supports efforts vital to national security, economic competitiveness and scientific discovery, such as defense and aerospace research and development, financial forecasting and climate prediction. Past national investment in HPC has contributed substantially to national economic prosperity and rapidly accelerated scientific discovery in areas such as neuroscience and energy technologies. Sustaining the United States' decades-long leadership in HPC requires a national response to increasing computing demands, emerging technological challenges and growing international competition. A central element of this response will be foundational research and development that tackles the hardest measurement challenges in HPC technology, including hardware, software, data analytics and discovery tools, and other forward-looking technologies.

What NIST Does

NIST has supported the U.S. semiconductor industry from its inception, providing measurement tools and scientific insights that have helped to drive the steady increase in computing power. As we reach the limits of today's semiconductor technology, NIST is poised to enable transformative new approaches to future computing by:

- Developing the measurement tools needed to support all apects of next-generation technologies and applications.
- Providing a coherent strategy for the co-design of hardware, software and architecture, supporting the wide variety of requirements across the federal government.
- Providing technical expertise and leadership, and cutting-edge capabilities through our user facilities and collaborations, to agencies tasked with the development and deployment of HPC systems.

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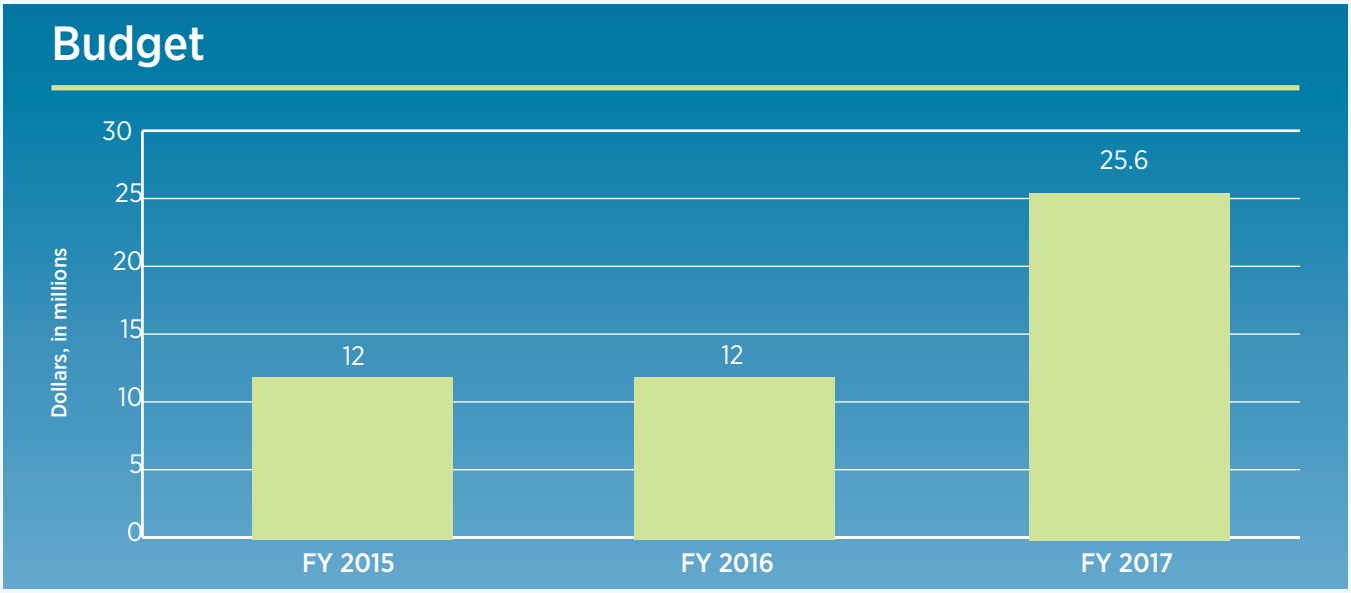
NIST
National Institute of Standards and Technology
U.S. Department of Commerce

Program Goals

- Develop measurements for the structure and function of new computer logic switches.
- Coordinate logic, memory, storage and systems concepts needed in HPC platforms.
- Support alternative future computing paradigms such as quantum computing and brain-like computing.
- Assess the reliability and uncertainty of results produced by HPC systems.
- Provide measurements, standards and guidelines for the robustness and cybersecurity of HPC systems and networks.

Recent Program Highlights

- Pushed the limits of nanoscale measurement by developing techniques to use X-rays and other wavelengths of light to nondestructively measure miniscule features and flaws on silicon wafers.
- Broke the distance record for quantum teleportation, confirming that quantum communication is feasible over long distances in fiber and opening up the possibility of one day creating a "quantum Internet" based on light.
- Held a successful International Conference on Frontiers of Characterization and Metrology for Nanoelectronics to help the semiconductor industry confront the problem of what to do when conventional microprocessors simply cannot shrink any further.



New for FY 2017

NIST will strengthen the nation's leadership in high-performance computing.

The request includes a $13.6 million increase to:

- Develop measurements for atomic-scale computer chip features, benchmark and test new logic and memory devices, and enable new paradigms such as brain-like computers or quantum computers.
- Determine how much we can trust "virtual prototyping" for complex designs and better connect simulation to real-world measurements to improve product design tools.