"Big Red II: Accelerating Research and Discovery at Indiana University"

Big Red II Dedication

Remarks of Michael A. McRobbie
President, Indiana University
Atrium of the Cyberinfrastructure Building
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INTRODUCTION

In its 2005 report, the National Research Council's Committee on the Future of Supercomputing—to which Dr. Messina was a consultant—noted that "supercomputers can advance knowledge and generate insight that would not otherwise be possible or that could not be captured in time to be actionable. …Supercomputers" the report continued, "have the potential to suggest entirely novel experiments that can revolutionize our perspective of the world. Most of the technical areas that are important to the well-being of humanity use supercomputing in fundamental and essential ways."[1]

There is no question that the supercomputer is the mainstay of both theoretical and applied science. In the areas of climate modeling, genome analysis, protein folding, molecular modeling, nuclear fusion research, and in many, many other disciplines, including in the social sciences and the humanities, scholars and scientists are working with hugely complicated calculations and vast data sets and seeking to solve problems

[1] Susan L. Graham, Marc Snir, Cynthia A. Patterson (eds.), *Getting Up to Speed: The Future of Supercomputing,* Committee on the Future of Supercomputing, National Research Council, (National Academies Press, 2005), 11.

that are becoming more and more complex. All of them benefit from—and, indeed, fundamentally require—advances in processing power.

SUPERCOMPUTING AT INDIANA UNIVERSITY

For the past 15 years, Indiana University has pushed the boundaries of high-speed computing to support the world-class research being conducted by IU's scientists and scholars.

In 2001, we implemented the first university-owned supercomputer capable calculations at the rate of one teraFLOPS—or one trillion mathematical operations per second.

In 2006, IU's Big Red supercomputer debuted as the fastest academic supercomputer in the western hemisphere. Big Red allowed our researchers to analyze and store massive amounts of data and to perform groundbreaking simulations of biological phenomena. It was also a tremendous resource for the state, as we collaborated with groups across Indiana, including the Indiana Economic Development Corporation, to expand the benefits of Big Red's power.

Over nearly seven years, Big Red has run more than 3 million computing jobs, using more than 125 million hours of computer processor time.

IU researchers who use Big Red have secured more than $250 million in external funding since 2006. And, just as suggested in the National Research Council report, IU researchers have been able to understand phenomena in the natural world that simply cannot be understood by experimental methods—processes ranging from the formation of stars to the formation of the compounds that are created in human brains in Alzheimer's disease.

But, at nearly seven years old, the original Big Red is obsolete.

BIG RED II: ACCELERATING RESEARCH AND DISCOVERY

The supercomputer we dedicate today, Big Red II, will ensure that IU remains at the forefront in the use of high-speed and data-intensive computing in support of some of the most vital and complex research in the world.

As I have noted, Big Red II is capable of calculations at the theoretical speed of one petaFLOPS, that is, a thousand trillion mathematical operations per second. To put this in context, if one could perform one calculation per second with a pocket calculator continuously and without interruption, it would take more than 31 million years to do what Big Red II can do in one second.

Big Red II will accelerate discovery and allow new research by hundreds of IU scientists and scholars right across the university including in medicine, biology, physics, chemistry, astronomy, network science, sustainability science, global climate research, public health, and, of course, informatics and computer science. It will also play a major role in the recruitment of new faculty in these and other areas who will make use of Big Red II and its enormous data processing capabilities. In medicine and informatics alone, around 100 new faculty can be recruited over the next five years who will make use of Big Red II.

Big Red II will also help add knowledge-intensive jobs in the state of Indiana, particularly in the state's growing life sciences economy.

SPECIAL THANKS

An initiative such as this, of course, requires the cooperative efforts of many people.

I touched briefly earlier on the contributions of IU's 16th president, Myles Brand. All of us are indebted to him. Myles understood that it was almost impossible in this day and age for a great university such as IU not to have first rate IT services, facilities, and infrastructure. In his memorable and oft-quoted phrase, he wanted IU to be a leader in the "uses and applications of information technology—in absolute terms."

He gave me the honor of leading the initial implementation of this vision when he appointed me the university's first vice president for information technology in 1996. But the implementation of this vision was also due to the sustained efforts over many years of hundreds of other people in this room.

University Information Technology Services and the Pervasive Technology Institute have led IU's effort to acquire Big Red II and bring it online. I especially want to recognize Brad Wheeler, who succeeded me as Vice President for Information Technology and CIO, and Craig Stewart, the executive director of the Pervasive Technology Institute. They have done a superb job in bringing this project through its final stages to reality. Of course, many other colleagues have been involved, including Matthew Link, who as serves the Director of Systems for IU's Research Technologies division. We are grateful to all of them for their outstanding efforts.

We are grateful, as well, to Lilly Endowment for their generous support of the Pervasive Technology Institute. The endowment's grant of $15 million in 2008, led to the establishment of the institute, which had as its foundation the tremendous success of the Pervasive Technology Laboratories, established in 1999 after a grant of $30 million from the Lilly Endowment.

Let me also express my thanks through Peter Ungaro, from whom we will hear in a few moments, to our partners at Cray Incorporated, a company that bear the name of one of the most legendary figures in supercomputing. Some of you may have heard a report on public radio's *Marketplace* just last week which noted that the demand for Cray's

computers has increased five-fold over the past five years.[2] This kind of growth, particularly during a period of recession, is testament to Cray's leadership in the field and to the importance of the technology they produce.

CONCLUSION: A DRIVER OF PROGRESS IN THE 21ST CENTURY

The National Research Council's 2005 report, which I mentioned earlier, also noted that "the net contributions of supercomputing, when summed over a multitude of disciplines, are no less than monumental in their impact on overall human goals. Therefore, supercomputing in some sense transcends its individual uses and can be a driver of progress in the 21st century."[3]

Big Red II, then, will return Indiana University to the forefront of academic high-speed computing and allow the university to continue to reap the benefits of its position as a leader in information technology. The phenomenal success of the original Big Red demonstrated that investing in high-speed computing returns dividends many times over in the form of scientific advances, research funding, and job creation. Big Red II will allow us to build upon this success as it serves as "a driver of progress in the 21st century" for Indiana University, for our state, and for our nation.

Thank you very much.

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[2] Sabri Ben-Achour, "As PC Sales Fall, Supercomputers Soar," *Marketplace,* broadcast April 18, 2013, American Public Media. URL: http://www.marketplace.org/topics/tech/pc-sales-fall-supercomputers-soar

[3] Graham, Snir, Patterson, et. al, 25.