
MGHPCC

-The Massachusetts Green High Performance Computing Center

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Distinguished Professor of Higher Education, Emerging Technologies, and Innovation



The Need and the Pain

- There was no High Performance Computing Center or Super Computing Center in the Northeast.
 - Illinois was the first
 - San Diego, Research Triangle North Carolina, Pittsburgh
- The Pain: To be great research universities you need access to high performance computing.
 - Massachusetts had five great research universities
 - Had to use outside centers for their research
 - Had to provide expensive local facilities run with a lot of expensive electricity.
 - Problems with high cost of electricity and providing suitable facilities to host computers.

VISION

- World-class Green High Performance Computing Center (1st in the Northeast)
- First multi-university HPC facility of its kind in the nation
- Platform for collaboration in R&D that will strengthen Mass R&D leadership in computing applications
- Catalyst for economic & workforce development in the state, region and Holyoke (Innovation District)
- Holyoke has a municipal utility that provided electricity from hydropower.
 - Less expensive and better environmental impact (Green)
- Most significant state/industry/university partnership in state history

Working Together

Governor Deval Patrick signs the agreement for the Commonwealth of Massachusetts as Susan Hockfield, President of MIT, looks on from his right and Jack Wilson, President of UMass, and Bob Brown, President of Boston U., look on from his left. Wilson served as the first Chair of the Board of the MGHPCC.



MGHPCC

A partnership between 5 universities



\$736.1M



\$468.7M



\$280.8M



\$61.3M



HARVARD
UNIVERSITY

\$462.3

Total Research Revenue in 2009 of \$2,009,078,000 (\$2.0B)

(Source NSF: http://www.nsf.gov/statistics/nsf11313/content.cfm?pub_id=4065&id=2)

With additional support from the commonwealth and industrial sponsors



MGHPCC



- 1/6/09 Discussion: Boston Research University Presidents' Dinner
 - At MIT President, Susan Hockfield's, home.
- 1/9/09 Friday call from Susan Hockfield, MIT to Jack Wilson, UMass
 - The Scientific Fantasy: Boston Research Universities Build MGHPCC
- 1/27/09 Meet with Gov. Deval Patrick and Sec. of Econ. Dev.
- 1/28/09: MIT & UMass Teams first meet in my office -fantasy into reality
 - City closed by snow
 - Jack Wilson, President, UMASS
 - Rafael Reif, Provost, MIT
 - Claude Canizares, Vice President for Research and Associate Provost, MIT
 - James Kurose, Dean of Natural Sciences and Mathematics, UMASS Amherst
 - Rick Adrion, Professor and Past Chair of Computer Science, UMASS Amherst
 - Tom Chmura, Vice President for Economic Development, UMASS
(Titles as of 2009)



MGHPCC



- Susan and I decided to expand the group by chatting with other Presidents.
 - She called Drew Faust, Harvard
 - I called Bob Brown, Boston University
 - Brown: You called the wrong guy! I am the only person in the world to fail twice at building a HPCC! Brown was the former Provost at MIT
- CEO Joe Tucci, EMC and CEO John Chambers, CISCO agreed to help
- Accenture provides project management guidance
- Northeastern joins the group. Now the five largest research universities in Massachusetts are collaborating
- Many other companies involved in the conversation
 - Akamai, Google, Microsoft, IBM, etc.



MGHPCC



- First steps were fundraising and developing a detailed scope of the project.
 - We raised well over \$100 million.
- We were working in secrecy.
- Governor Patrick, Joe Tucci, John Chambers, I, and others do trade mission to California.
 - Governor speaks about this at every stop!
 - So much for secrecy.




And today: It serves all five universities.

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ABOUT

The MGHPCC provides world-class computational infrastructure, indispensable in the increasingly sensor and data-rich environments of modern science and engineering discovery. Today, virtually no major breakthrough — be it designing a new drug, developing new materials for clean energy or addressing climate change — can take place without computation. In silico experimentation adds a powerful new dimension to knowledge discovery in all fields, alongside theory, physical experimentation and observation. With the increasingly integrated role of computation in fundamental and applied research, the MGHPCC is a critical piece of infrastructure that will continue to fuel the world-leading innovation economy of the Commonwealth of Massachusetts through cooperative research, education and outreach activities.



Completed in November 2012, the 90, 000 square foot, 15 megawatt facility is located on an 8.6 acre former industrial site just a few blocks from City Hall in Holyoke, MA.

Currently, computers in the MGHPCC run millions of virtual experiments per month, supporting thousands for researchers in Massachusetts and around the world.

UNIVERSITY PARTNERS

IN PARTNERSHIP WITH

BOSTON UNIVERSITY Northeastern University HARVARD UNIVERSITY UMASS MIT

EMC² CISCO

Why Cooperate?

Current Examples

Research Project

BU Atlas

PI Coalition

MIT Bates

Department

MIT CSAIL

Campus/School

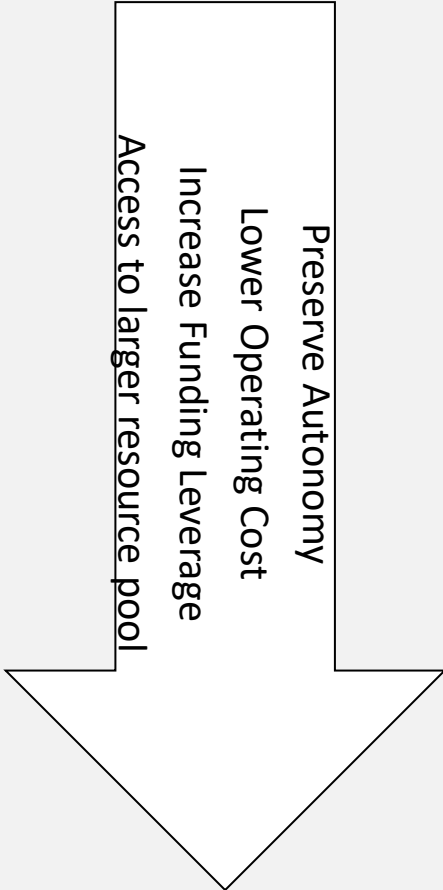
UMass Medical
Harvard FAS
Harvard Medical
BU Medical

University-wide

Purdue, Princeton
Stanford, NYU
UNH, Colorado State

University Coalition

MGHPCC facility
Multi-university MRI proposal



Access to larger resource pool
Increase Funding Leverage
Lower Operating Cost
Preserve Autonomy

Goals

Preserve Autonomy / simplify operation

Local administration and application support
Faster install
Space/power/cooling/security taken care of

Lower Operating Cost

Leveraged capital investment
Locate for low cost of power
Design for cooling efficiency
Amortize staff cost/expertise
Green Power Source

Greater Funding Leverage

Pooling of research grant funds
Greater leverage for university subsidies
Higher impact for major infrastructure grants

Access to larger resource pool

Control access to what you own
Opportunity to share idle resources

Why Holyoke?

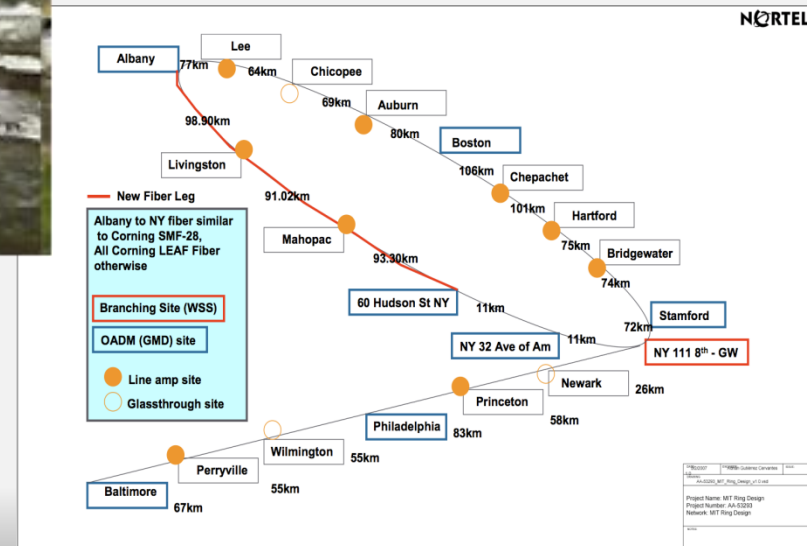


- Existing industrial site

- Green, low cost power



• Fiber Crossroads



WHY HOLYOKE?

- Low-cost, clean energy (primarily hydro, potentially wind)
- Extremely low carbon footprint
- Superior IT connectivity, located at the IT cross-roads of New England
- Economic development incentives for developing in downtown “canal district”



Hydropower that drove the mills drives the MGHPCC

- Electricity supply
 - More than 78% of the local electricity supply is from renewable resources – primarily hydropower
 - (several nearby wind farms are permitted)
- Facility Design
 - Designed for LEED certification
 - Energy-efficient power distribution
 - Advanced cooling techniques that minimize electricity use
 - Green landscaping and storm water management
- Research
 - Collaborative research enabled by the MGHPCC will address fundamental questions in energy sciences, the environment, and green computing.

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- The Pain is addressed.