MGHPCC
-The Massachusetts Green High Performance Computing Center

Dr. Jack M. Wilson

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 $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.

Why Cooperate?

Current Examples

Research Project
BU Atlas

PI Coalition
MIT Bates

Department
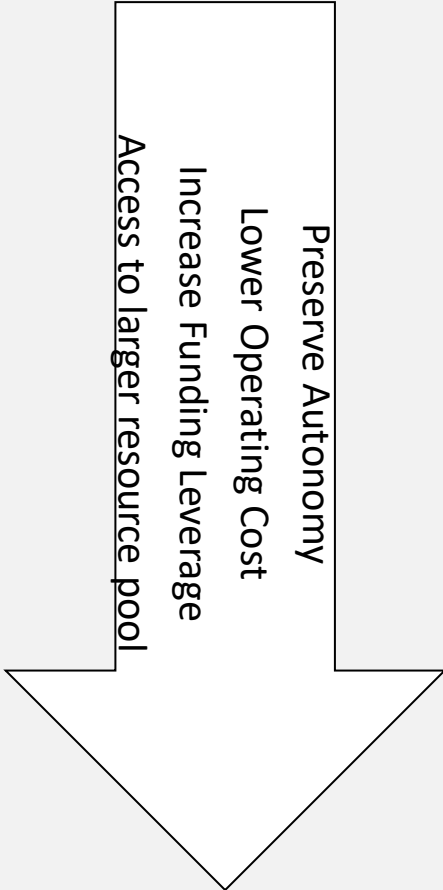MIT CSAIL

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

Goals

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

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
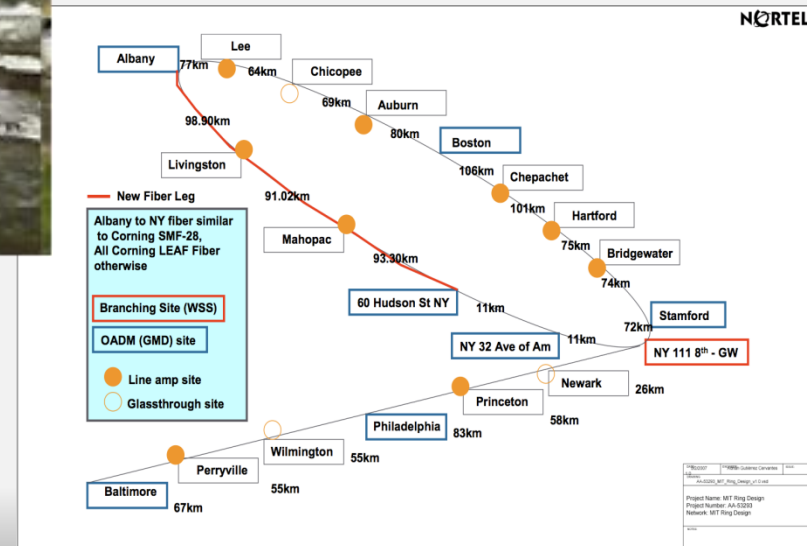Opportunity to share idle resources

Why Holyoke?

- Existing industrial site

- Green, low cost power

- Fiber Crossroads

Case: Mass Green High Performance Computing Center 11

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.

- The Pain is addressed.