

New Mexico Computing Applications Center

Building a Success Story for the State

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NEW MEXICO
COMPUTING
APPLICATIONS
CENTER

New Mexico Computing Applications Center

Building a Success Story for the State

Created as a New Mexico Non-Profit by the UNM, NMT, + NMSU Regents
as a University Park and Economic Development Act Corporation.

Center's Mission:

Create well-paying jobs in New Mexico by driving the development of high-tech industries. This is accomplished by coupling the talented people, natural resources, and favorable business environment in NM with the power of world-class high-performance computing.

Business plan included becoming self-sustaining after 5 years
State provided initial capital (\$14M) and two years of operating support
(*\$2.855M FY09 + \$3.0M FY10*)

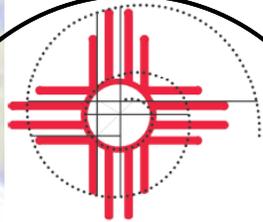
Current Status:

The Center has brought new business, grants, and initiatives to NM.
The Center is supporting strong education and outreach efforts in NM.
We are well along the way to becoming self-sustaining.

NMCAC Resources



- **Founding Partners:**
State of New Mexico, UNM, NMT, NMSU LANL, Sandia, Intel
- **Access to world-class talent**



**New Mexico
Computing
Applications
Center**



- **Fastest commercially accessible computer in the world**
- **Highly reliable and productive**
- **Remarkably efficient operations**
- **3 university “exemplar” clusters**



- **27 education gateways provide:**
 - **HD Video Conferencing**
 - **3D HD stereo visualization**
- **Sites creating and sharing programs across the State**

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Education Gateway Exemplars

- Exemplars at UNM, NMT, NMSU are small (1%) versions of Encanto
- They are used by students and faculty for:
 - *developing and testing computer programs*
 - *computer science classes*
 - *small research projects*
- Exemplars are important to test programs before running on Encanto
- The three exemplars are highly oversubscribed
 - *Cannot support use by other college campuses*
 - *Requested use of last \$250K of initial capital funding to procure “Peralta”, a newest-generation Intel exemplar for use by 24 NM college campuses*
 - *Peralta would be a “refresh” system*
 - *Peralta would provide new capabilities for digital media and other business areas*
 - *Procurement of Peralta was not approved by Governor’s office*
 - *Trying to find alternative solution to address these needs*

Providing Value to the State



- **Advantaging small/medium size businesses:**
Enabling NM companies to compete nationally
- **Faster to market**
Quickly address design, regulatory, safety issues
- **High-wage, high-tech workforce in NM**



- **Education Gateways Video Conferencing**
Reduce travel time and cost
- **Addressing important issues: Oil, Gas, U**
- **Addressing important issues: Health**
Emergency response management
Preventing viral infections



- **Distance learning / collaboration**
Leverage resources statewide
- **Computer resource for R&D**
- **Partner for funding opportunities**



- **Unparalleled range of expertise**
- **Partner on Federal grants**
- **Facilitate tech transfer**

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Providing Value to the State

Partnering with Applied Research Associates and ANSYS to provide a computer simulation of the crash of an Airbus A-380 aircraft (largest commercial aircraft ever: 835 passenger double-deck airplane w 50% more fuel) to meet FAA airport Fire Protection requirements.



Partnering with Cerelink and Dreamworks to produce digital films in NM.



Partnering with Intel, Sematech, Sandia and Los Alamos Nat'l Labs, Edwards, and Advanced Materials to develop intelligent manufacturing systems

- Incorporate sensors and control systems into manufacturing lines to monitor and control use of energy and material resources.
 - *Offers prospect of 20% energy reduction in semiconductor plants.*

We are working to keep Intel in New Mexico!

Providing Value to the State – Green Grid

NMCAC is leading the statewide Green Grid Initiative

- Goal is to carry out demonstration projects that address the full range of issues (technical, economic, environmental, regulatory, consumer, workforce) that must be addressed to implement a full-scale smart grid w clean energy in NM.

Projects underway:

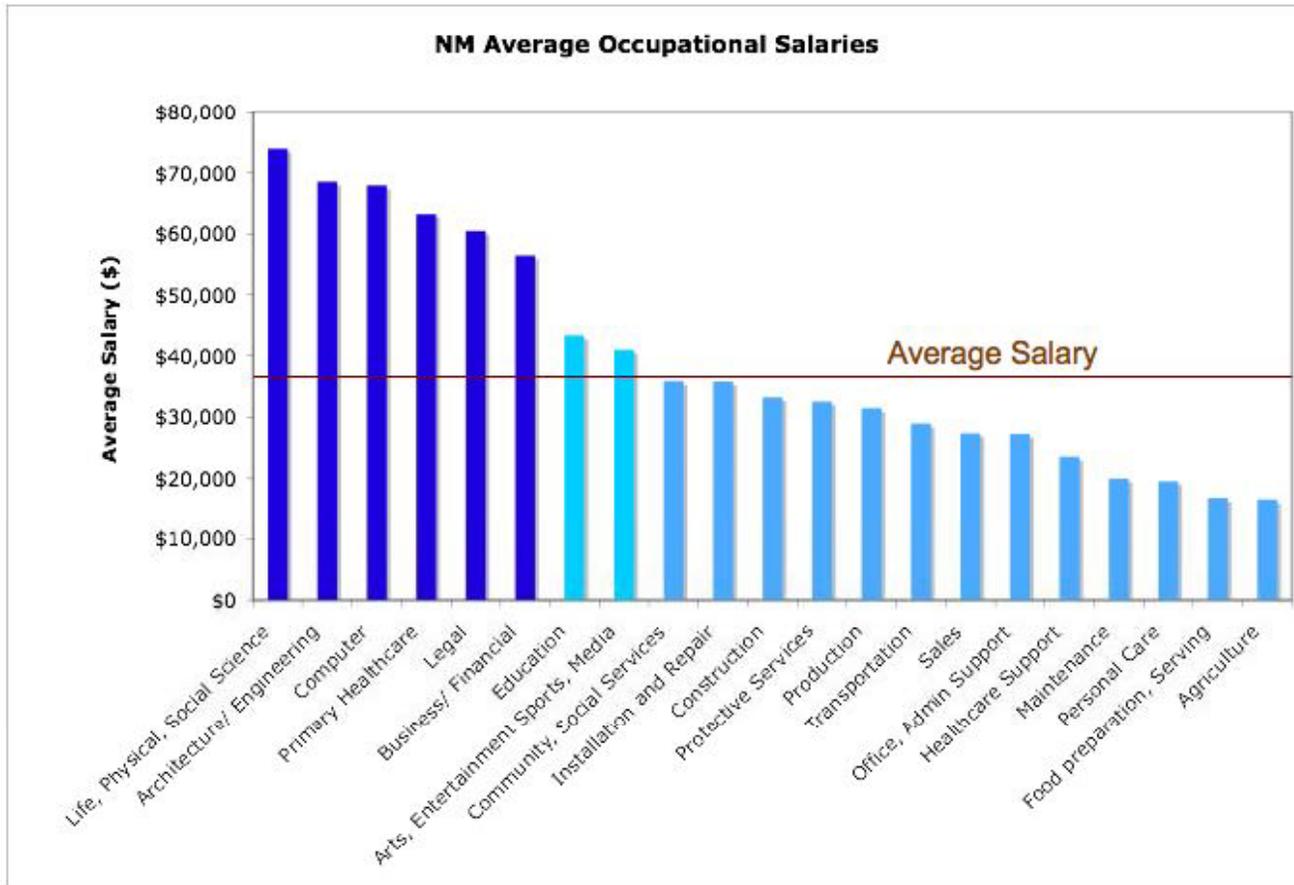
- Los Alamos (NEDO, LACU, LANL)
 - Residential smart grid w 1 MW solar w battery storage
- Mesa del Sol (NEDO, PNM, Sandia, UNM, Mesa del Sol)
 - 100% clean energy smart grid in commercial environment
- Development of up to 700 MW wind energy in eastern NM

Green Grid members include LANL, Sandia, 5 utilities (PNM, Roosevelt, Kit Carson, Los Alamos County, El Paso), Intel, NEDO (gov't of Japan), Galvin Electricity Initiative, UNM, NMT, NMSU, SFCC, NNMC, RETA, PRC, Viridity, Energy Controls.

Green Grid Initiative has resulted in \$40M investment:

NEDO has involved 9 Fortune 500 Global Companies in the project
Intel has established an Energy Systems Research Center at Rio Rancho

Growing High-Wage Jobs in NM



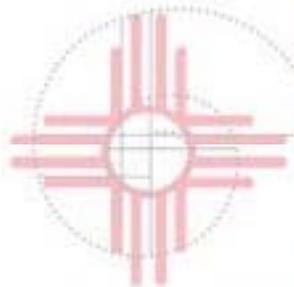
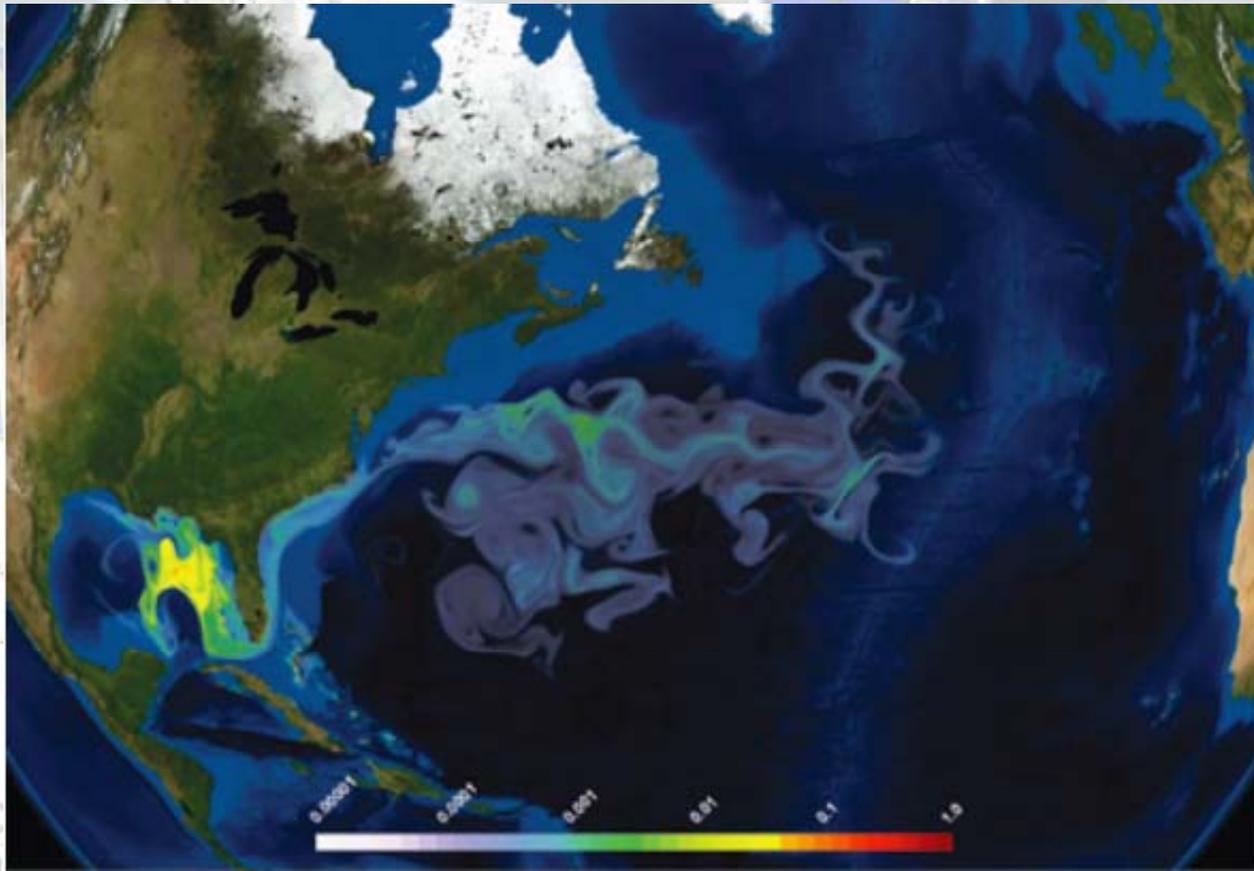
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COMMUNITY
COLLEGE
SYSTEM

NMCAC creating jobs in high-tech areas that provide high salaries

Addressing Important Issues: Oil

LANL scientists used Encanto to model the flow of oil from the Deepwater Horizon well.

The results impacted the Federal response to the spill.

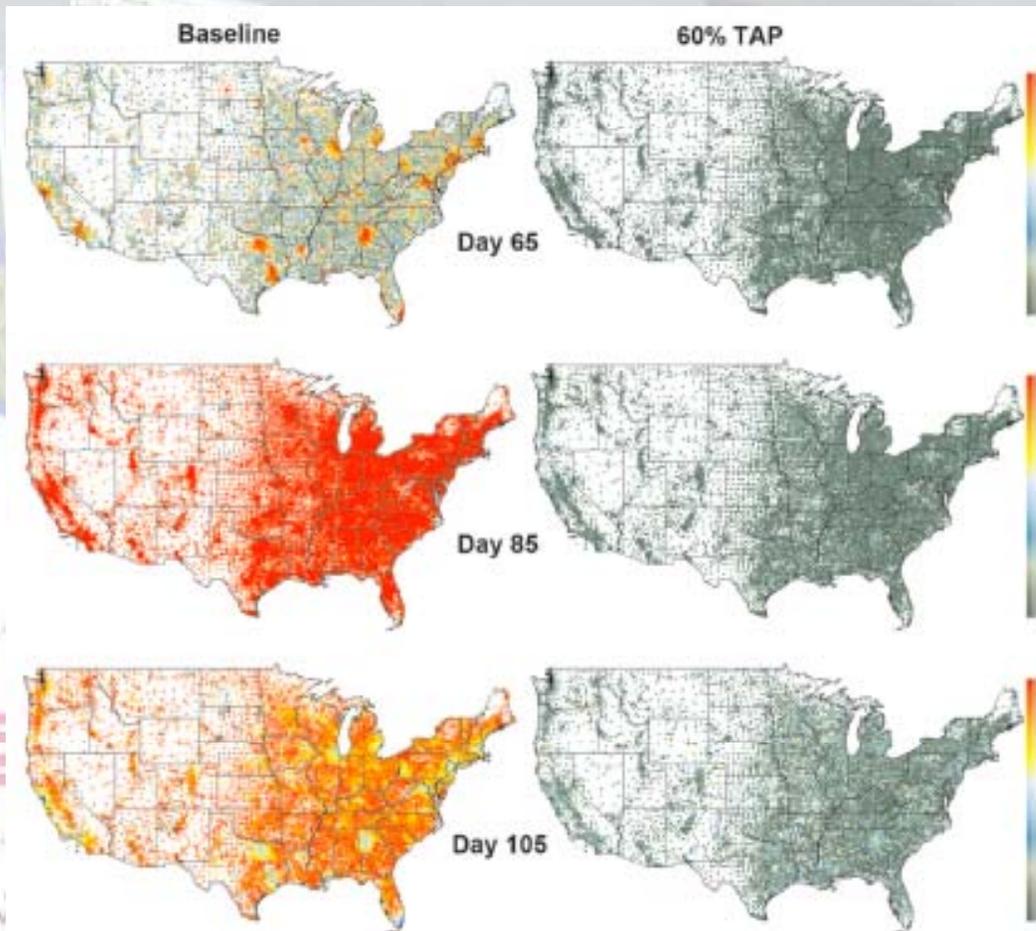


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Important to NM: Gulf oil production impacts the price of NM oil

Addressing Important Issues: Pandemic Disease

LANL Emergency Response Modeling



**Effect of
Emergency Response
on Influenza Spread**

**Baseline Case:
No Emergency Response**

Targeted Response:

- Treat w antiviral drugs
- Mass vaccination
- Close schools
- Travel restrictions

Relevance to NM:

- Spread of Horse Herpes
- Avian Flu spread along Rio Grande Flyway

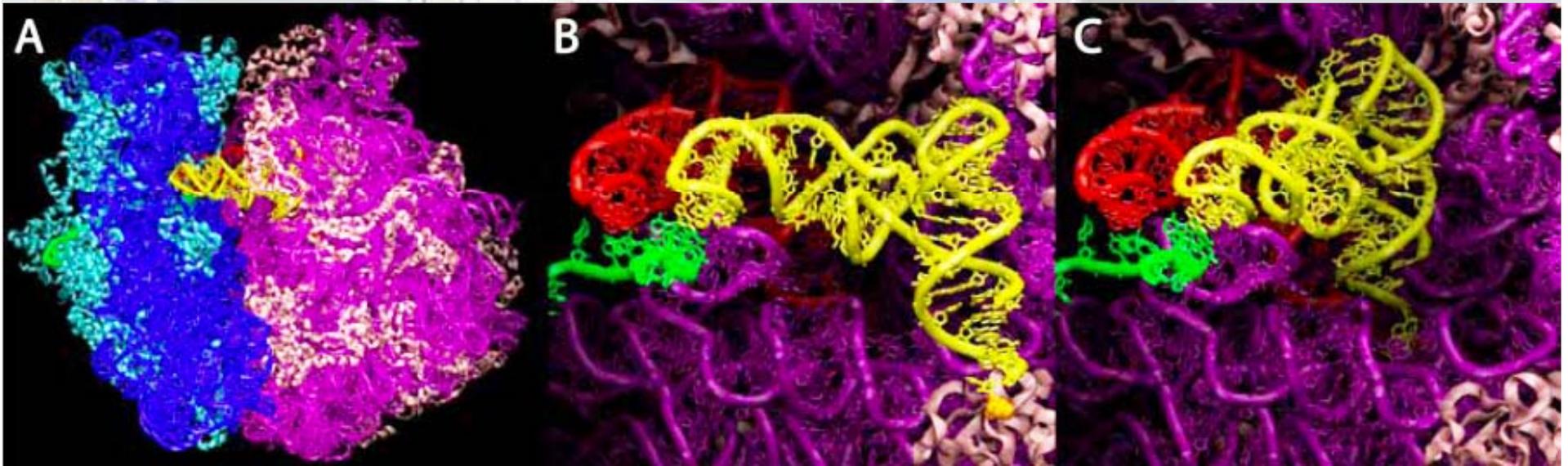
Quickly Enable Information-Based Decision Making

Addressing Important Issues: Health

Encanto allowed LANL scientists to compute how the human ribosome functions.

This is the largest molecular dynamics calculation (2.6M atoms) ever done.

The ribosome (with messenger RNA) produces all the proteins used by living cells.



This research has tremendous potential for advancing human health as we can now start to develop antibiotics on the computer that inhibit protein production in bacterial superbugs (like methicillin-resistant *Staphylococcus aureus*) while leaving the functions of human ribosomes unaffected.

This research is being published in the Proceedings of the National Academy of Sciences. It is being touted by the National Academy as a landmark achievement in bioscience.

Education Gateways

**Supporting
Education
Research
Economic Development**

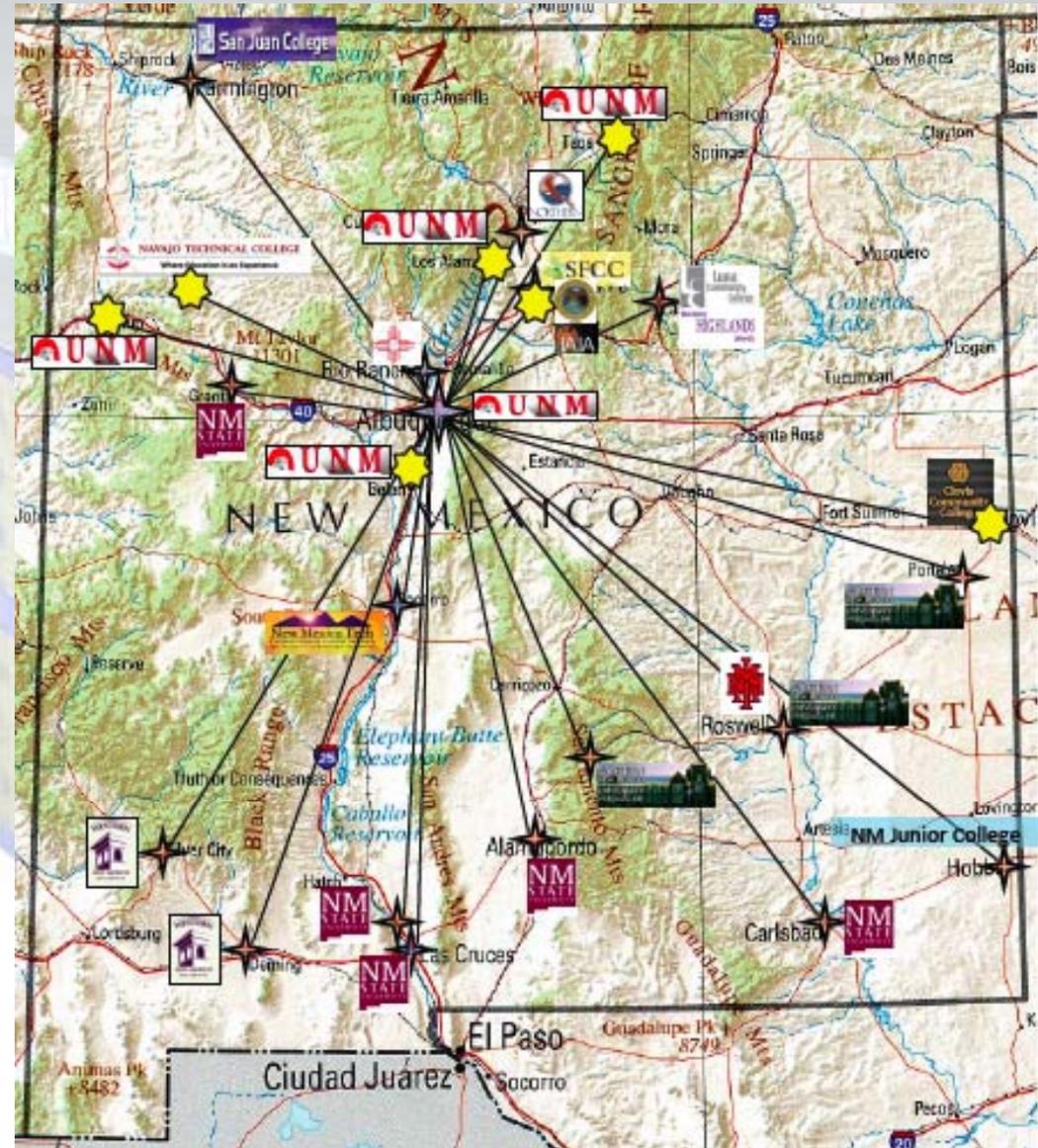
**Gateways at public colleges
across New Mexico (27 sites)**

*The Center is about
connecting the people,
science, education, and jobs*

*This is a new paradigm for
people working together
in New Mexico*



Final Gateways Across New Mexico



Education Gateway Systems

3 Sony Pan/Tilt/Zoom Cameras

2 65" HD DLP 3D Ready TVs



Room
Speaker
System



Wireless
Microphone
System



3D glasses



Instructor
Workstation
with microcluster,
wireless KB/mouse



3D LCD
Instructor
Display



Student
Desktop
computers



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Gateways Supporting Education

- Dual Credit Programs with 7 area High Schools
(NM Junior College - Hobbs)
- Cybersecurity curriculum development – computer and network security using 3D graphics modeling *(Eastern NM Univ – Ruidoso)*
- Engineering Department Focus - wireless networking, optical networks, and control systems *(Northern NM College - Espanola)*
- Digital Media Program – Rendering, 3D Animation
(Dona Ana Community College – Las Cruces)
- Parallel computing study for upper level/graduate students to develop capabilities in data parallel and message passing.
(Eastern NM University – Portales)
- High Performance Computing curriculum development in 3-D visualization modeling and simulation for engineering analyses and problem solving.
(NM State University – Grants)

Gateways Supporting Economic/Workforce Development

- Arrowhead Center presentations for Monterrey and Jalisco, Mexico
(NM State University – Las Cruces)
- Ruidoso Economic Development Foundation
(Eastern NM University - Ruidoso)
- Professional Development Workshops via Videoconference
(Western NM University – Silver City)
- Special Projects for Art and Cultural Education
(Luna Community College - Las Vegas)
- Modeling three watershed projects in conjunction with the Army Corp of Engineers *(Navajo Technical College – Crownpoint)*
- Parallel computing study for upper level/graduate students to develop capabilities in data parallel and message passing.
(Eastern NM University – Portales)

Education Gateways Connecting NM

- Coordinate NM STEM Education Efforts (*Innovate + Educate*)
- Universities can connect to every college and university in New Mexico
- A new mode for Distance Learning and Collaboration (*NM EPSCoR*)
- Helping NM Universities and Colleges Achieve Objectives
- Organizations using the education gateways:
 - *Intel's Think Parallel Workshops*
 - *NM Supercomputing Challenge*
 - *Rio Grande SIGGRAPH*
 - *Challenger Learning Center*
 - *Fractal Foundation*
 - *NM MESA*
- Future Projects w HED
 - Unify NM's Nursing Programs
(*5-6 community sessions to discuss accreditation, state-wide training*)
 - Higher Education Funding Formula (*Consensus Workforce Projection*)

Challenges

Compressing 5 years of revenue growth into 2 years to become self-sustaining

- Requires reduction of scope of activities and severe cost-cutting measures
- Requires flexibility from service providers on payment schedules
- Current state of the national economy is an issue

Have defined a path forward, but this remains challenging

Commercial users have customer-friendly requirements for user interface, visualization of results, broadband, and support

- Partnering with national firms (Penguin, Ansys, Altair, ...) to provide this
- Working with service providers on broadband issues

Have identified creative solutions that address these issues

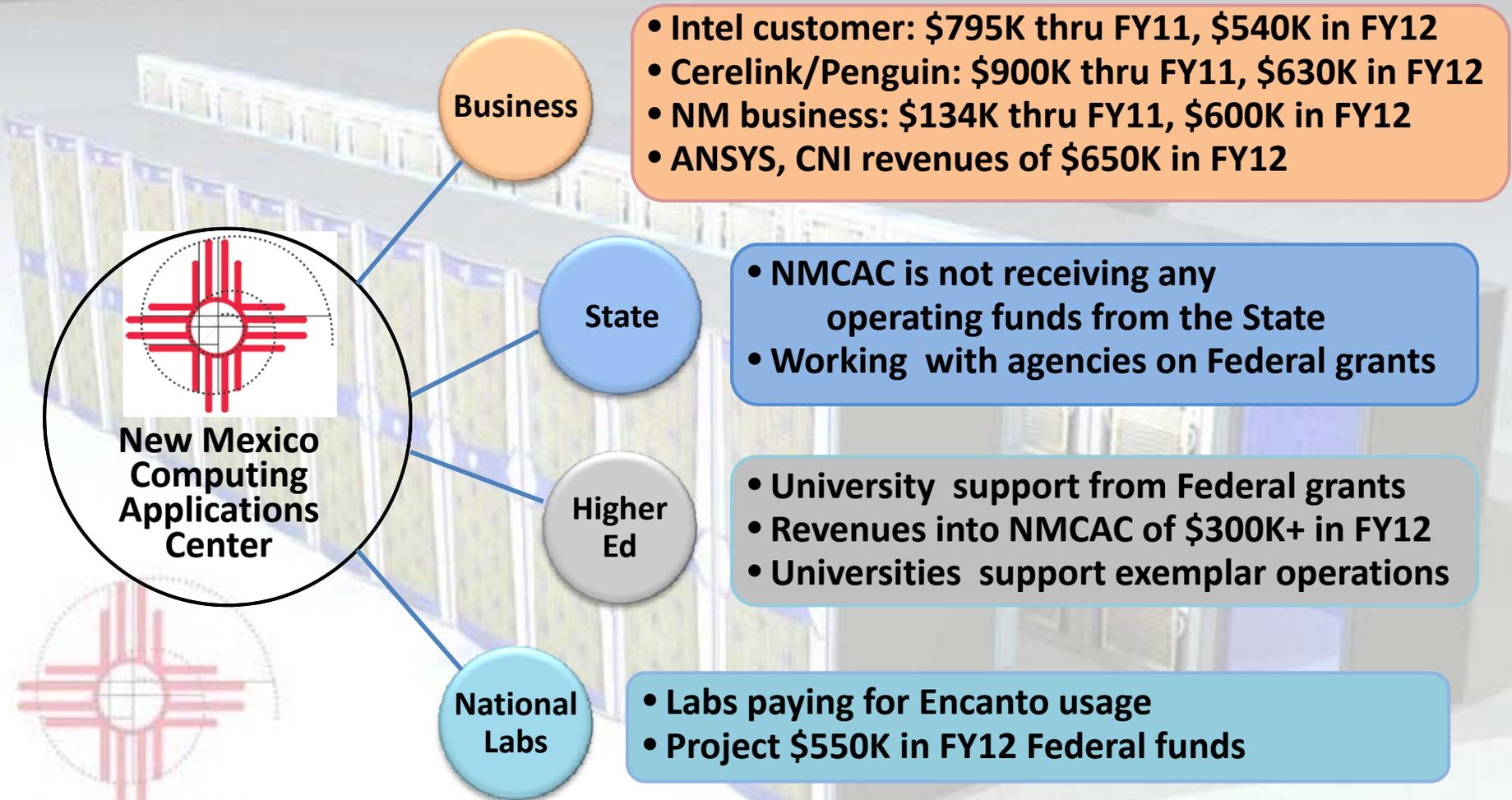
Engagement of State government

- Disapproval of use of last of capital funds to support outlying schools
- Statement by Governor Martinez that the State should sell Encanto
- Lack of participation of State-appointed Board members

Working w Sec. Ackley and Ryan Cangiolosi to resolve issues

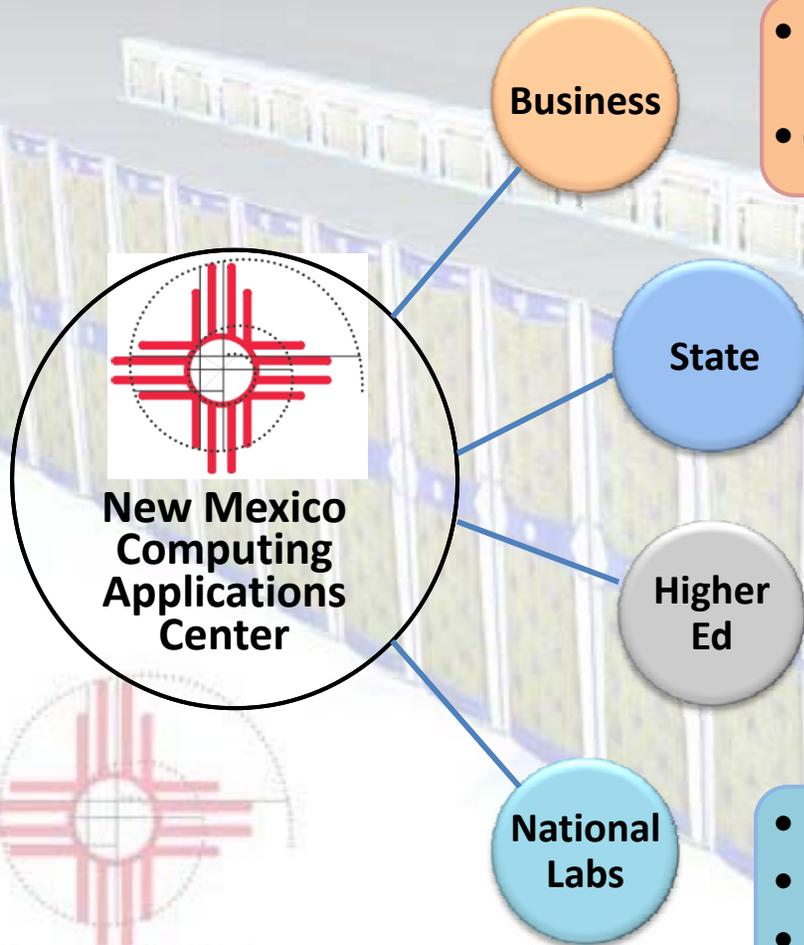
No resolution on issues at this time

NMCAC Financial Status



\$3.27M NMCAC revenues in FY12 (probability-based approach)
This will ensure self-sustaining operations.

Shaping New Mexico's Future



- **Missing Middle Initiative:**
Making America businesses more competitive
- **Creating presence of national companies in NM**

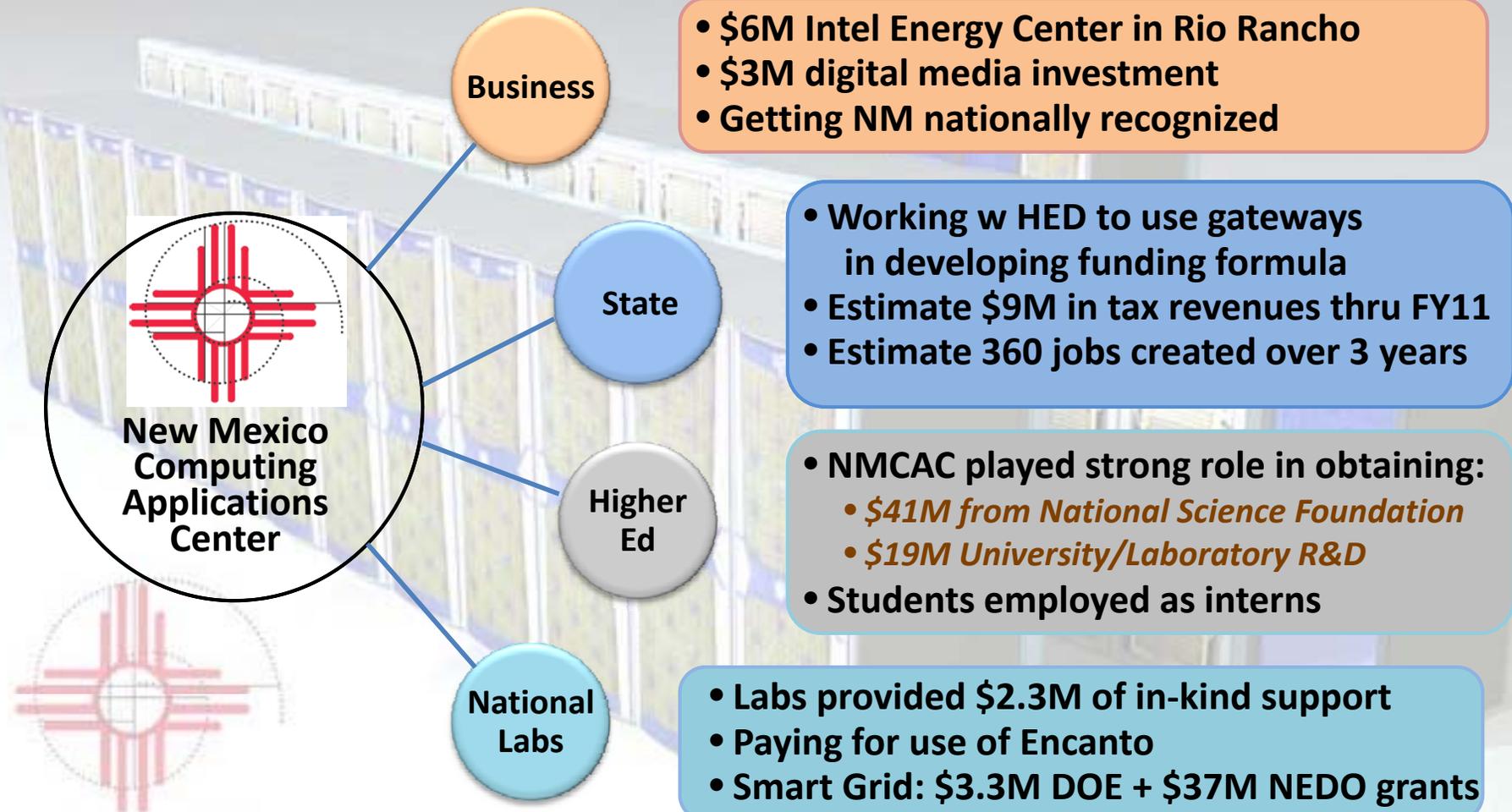
- **Gateways for video conferencing**
- **Support disaster response planning**
- **Support energy development planning**
- **Support communities in growth planning**

- **Educate students for high-tech careers**
- **Distance learning**
- **Increase university collaborations**
- **Support computing needs of R&D grants**

- **Bring additional Federal funding to NM**
- **Facilitate tech transfer, commercialization**
- **Make formal connection of Labs and business**

**Provide high return on investment to the State:
Advantage NM Business, Support Education, Increase Federal Funding**

Return on Investment



**ROI has been significant: \$111M investments and 360 jobs in NM
This has resulted in \$9M additional state taxes.**