NSF Program: Campus Cyberinfrastructure (CC-NIE)

**Program Area:** Small Institutions   **Award Number:** 1541352

PI: Jorge Crichigno

co-PIs: Ivan Lopez-Hurtado, Mario Izaguirre-Sierra

Project Title: Northern's Network Expansion for Large Science and Engineering Data Flows

Project Goals:

- Address the severe LAN and WAN data movement limitation imposed by the current 100 Mbps capacity.
- Establish a 10 Gbps dedicated research network and Science DMZ.
- Increase the undergraduate research activities in Science and Engineering.
- Enhance undergraduate programs to address workforce needs and preparation for graduate schools.
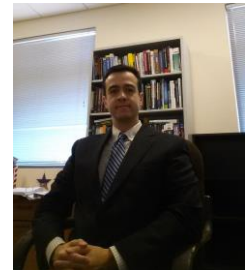
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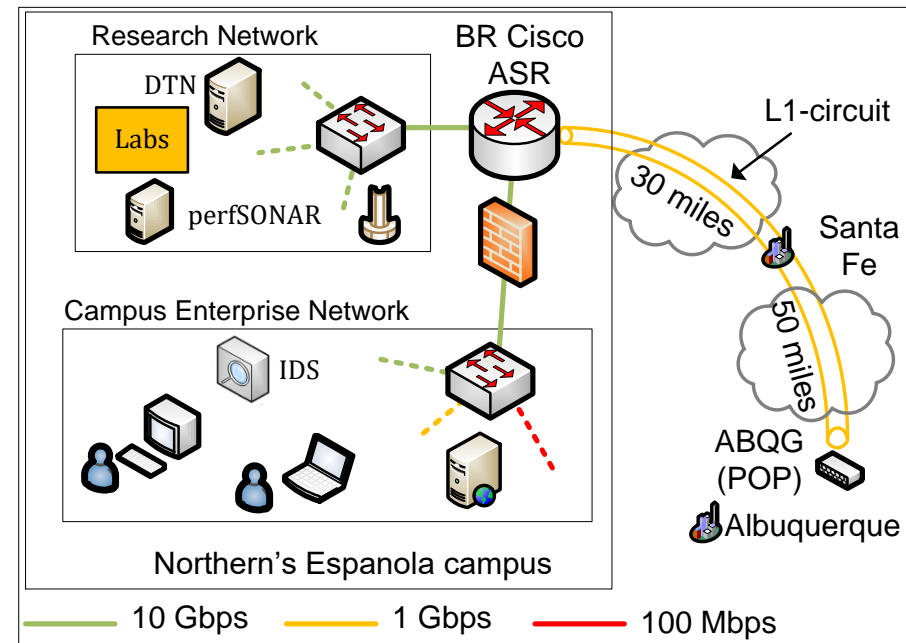*ilopez@nnmc.edu*
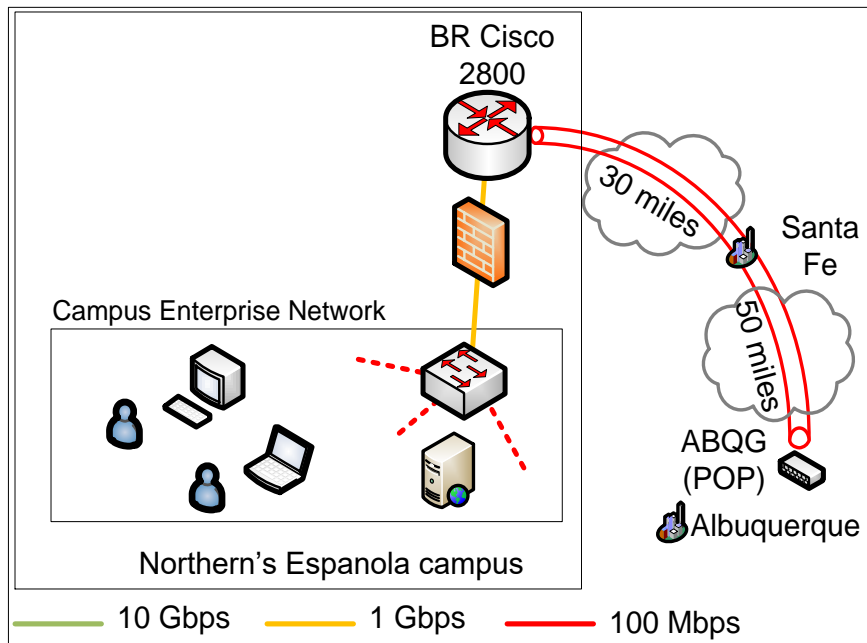

Mario Izaguirre-Sierra
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- Northern New Mexico College (NNMC) is located in Espanola, NM
- Student population of 75% Hispanics and 15% Native Americans
- First designated community college of NM, dual-mission since 2005
- 100 Mbps switched network and WAN connectivity

- ~50 msec RTT to ABQG, no traffic monitoring
- Border router Cisco 2800
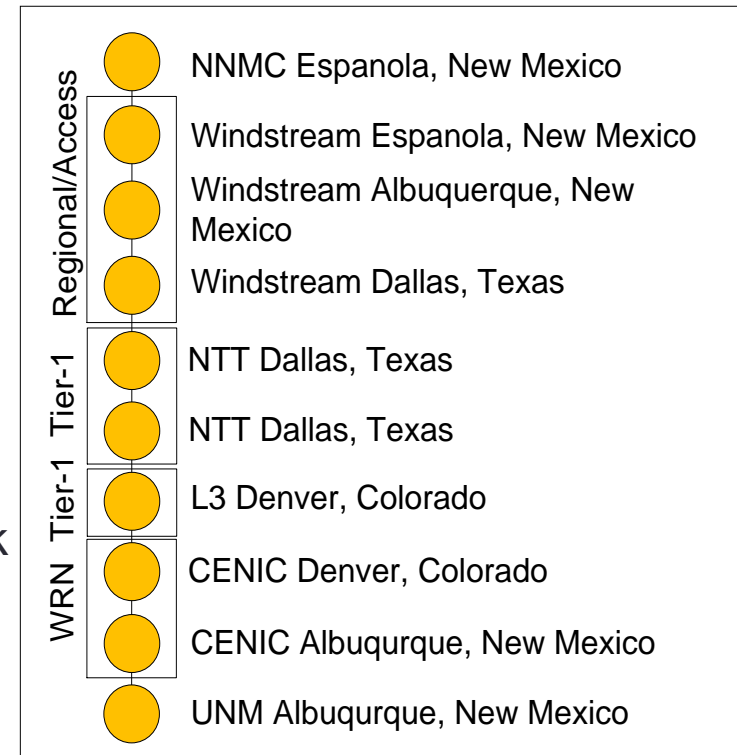- Single-mode 1 Gbps fiber among some buildings only

- P2P connection to ABQG; traffic monitoring
- Cisco ASR-family border router
- Multi-mode 10 Gbps; research network
- Research activity; workforce development

- No network engineer

- Available expertise includes engineering faculty, IT director

- Cyberinfrastructure funded by grants
  - EPSCoR 2010: campus enterprise network
  - CC*DNI 2015: Science DMZ and research network
  - EPSCoR 2015: storage area network

- Maintenance and operation
  - IT, faculty member and students
  - University of New Mexico
  - Contractor when needed

- Engagement
  - Teaching load is four classes per semester; motivated faculty usually includes tenure track
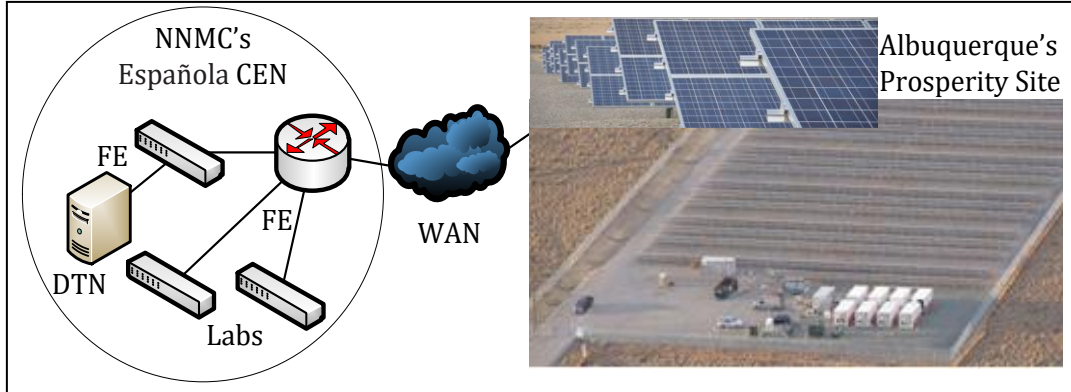 - Undergraduate research, hands-on activities more recognized now

Regional/Access
- NNMC Espanola, New Mexico
- Windstream Espanola, New Mexico
- Windstream Albuquerque, New Mexico
- Windstream Dallas, Texas

Tier-1
- NTT Dallas, Texas
- NTT Dallas, Texas

WRN Tier-1
- L3 Denver, Colorado
- CENIC Denver, Colorado
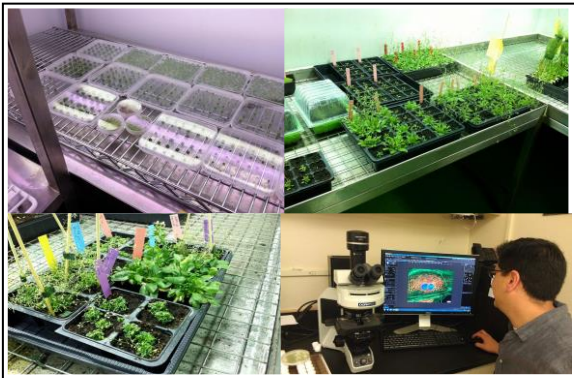- CENIC Albuqurque, New Mexico
- UNM Albuqurque, New Mexico

- Undergraduate research and workforce development
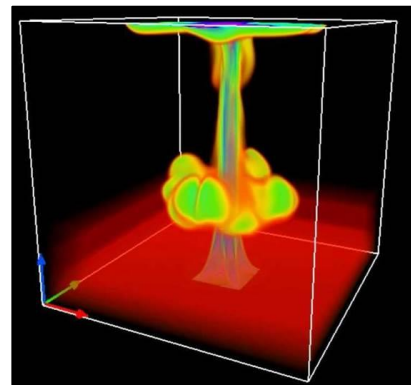

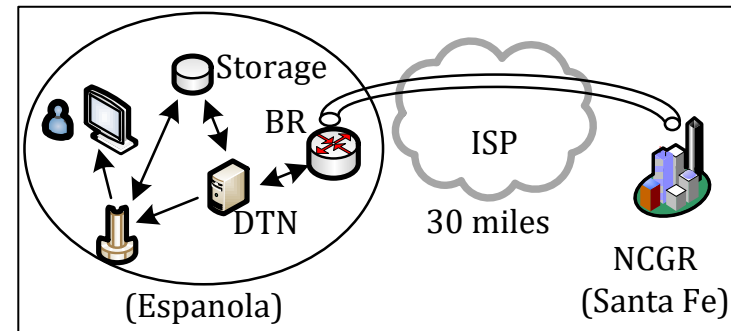Albuquerque's Prosperity site (utility company) to NNMC (finalist Platts Global Energy Award)

Undergraduate research and workforce development

Plant genomics

3D convection modeling

National Center for Genome Resources (NCGR)

Nurturing Success: Northern New Mexico College Student Lands Dream Job At LANL
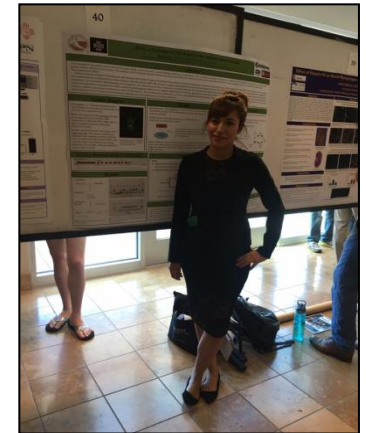
Submitted by Carol A. Clark on July 17, 2017 - 10:00am

Los Alamos Daily, July 17, 2017

Science DMZ team, from left to right Chase: Comp. Sys. Professional 2, LANL; Joseph: Scientist 1 at LANL, GA Tech Master program; Sergio: to graduate in Fall 2017, intern at LANL, Analysis, Intelligence, and Technology, plan to attend GA Tech

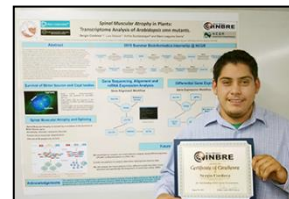**NM college lands funding to launch high-growth tech field program**

Albuquerque Business First, Aug. 24, 2017

Co-PI Biology team, NM IMBRE '16 Conf.

- LANL – NNMC: Internship program, Biology and Information Engineering Technology, starting Spring 2018

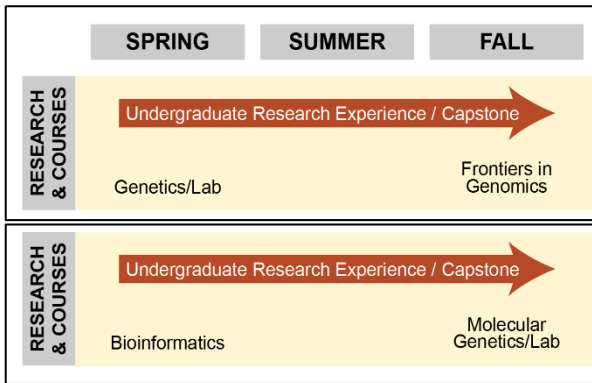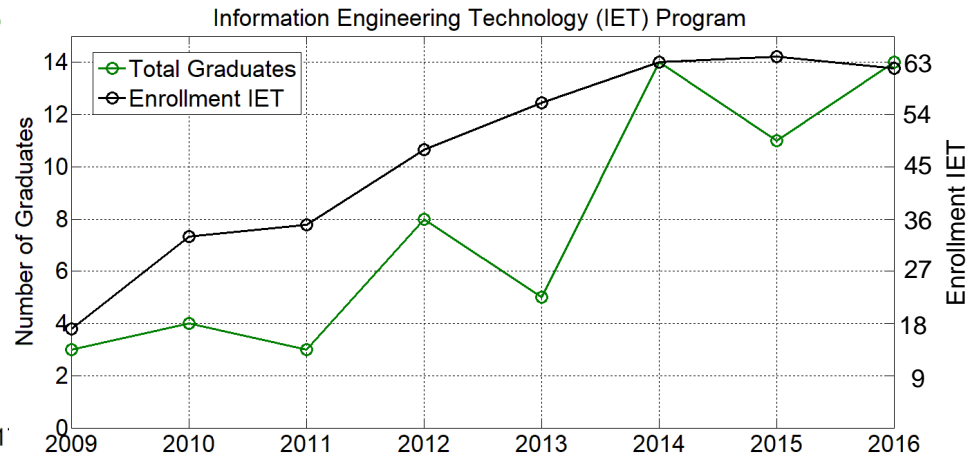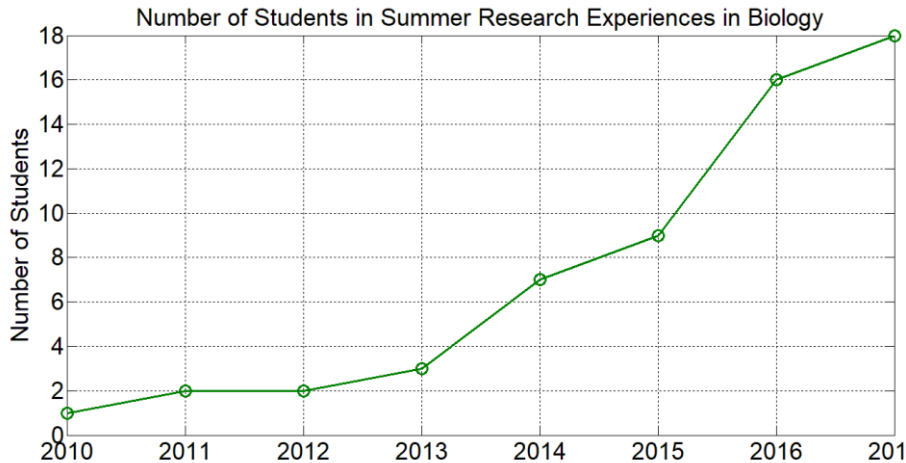

1st place award, Bioinformatics; 2016 NM IMBRE conference

Top: Maria, Colo. State Research Symp. '16, 2nd place award
Bottom: Britney, NM Biomedical Symp. '16

- Undergraduate research and workforce development

Number of Students in Summer Research Experiences in Biology

Information Engineering Technology (IET) Program
- Total Graduates
- Enrollment IET

LANL – NNMC

	SPRING	SUMMER	FALL
RESEARCH & COURSES	Undergraduate Research Experience / Capstone		
	Genetics/Lab		Frontiers in Genomics

	SPRING	SUMMER	FALL
RESEARCH & COURSES	Undergraduate Research Experience / Capstone		
	Bioinformatics		Molecular Genetics/Lab

- 3-5 years for an employee to be fully involved
- Need for technicians, 2-year / 4-year degrees
- 3.0 GPA, no drug history, get Q-clearance
- Skills, aptitude, local, long-term employment
- Information Engineering Technology program: 10 interns technicians starting Spring 2018
  - To expand in cybersecurity
- Sciences: radiation protection, radiation control: 10 interns technician starting Spring 2018
- Bachelor graduates: analysts, net. engineers, Scientist I
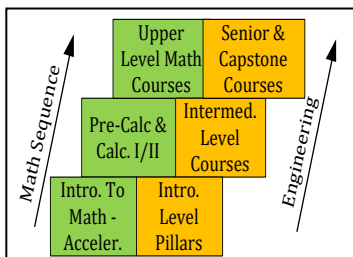
Northern's Network Expansion for Large Science and Engineering Data Flows: Advancement

Entropy - Destination Port

Netflow-based IDS

Window-based Vs Rate-based Congestion Control

Throughput vs RTT - 1,500-byte MSS

Virtualization Effect on 10 Gbps Science DMZ

Maximum Segment Size (MSS) Impact