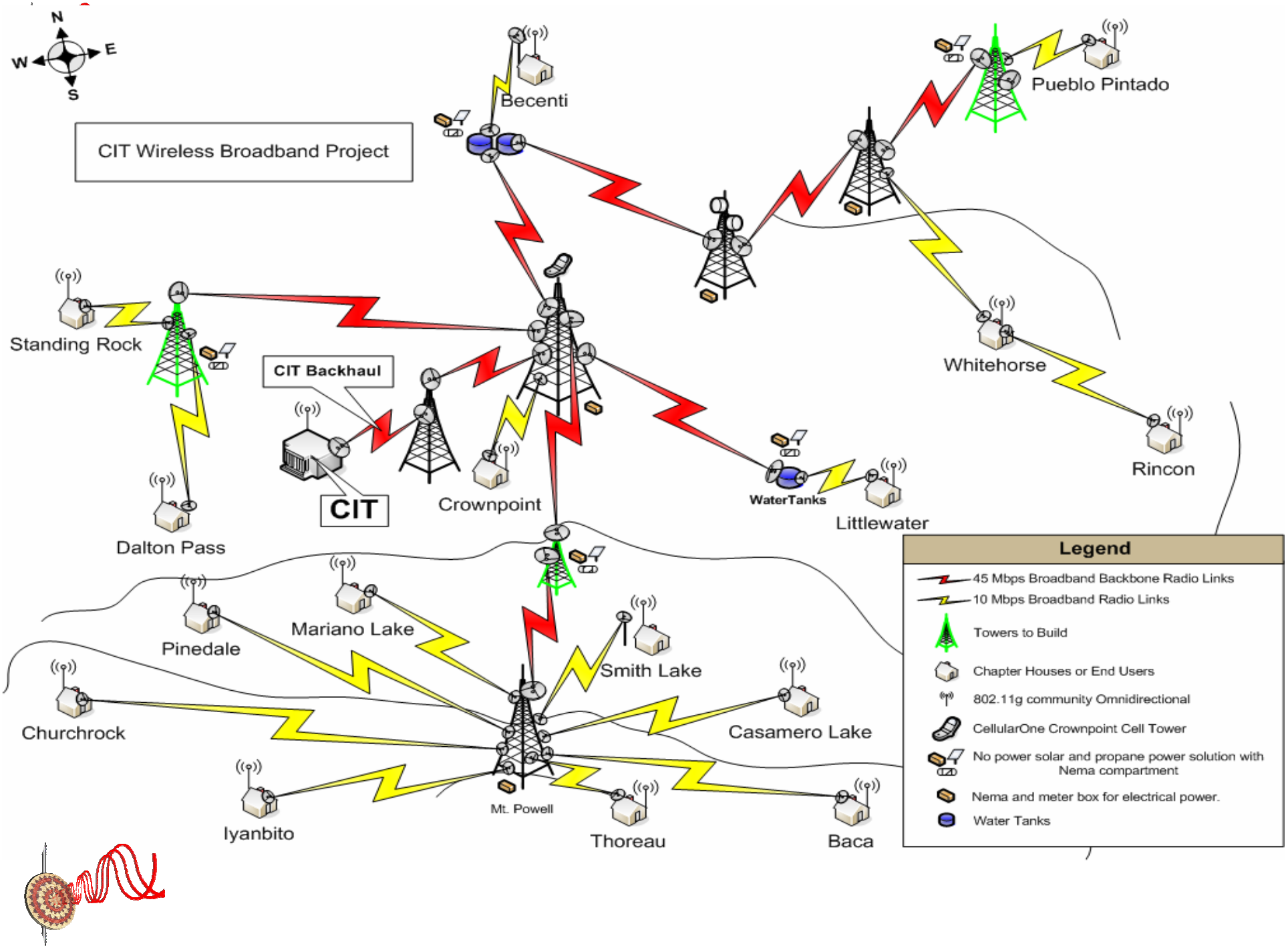
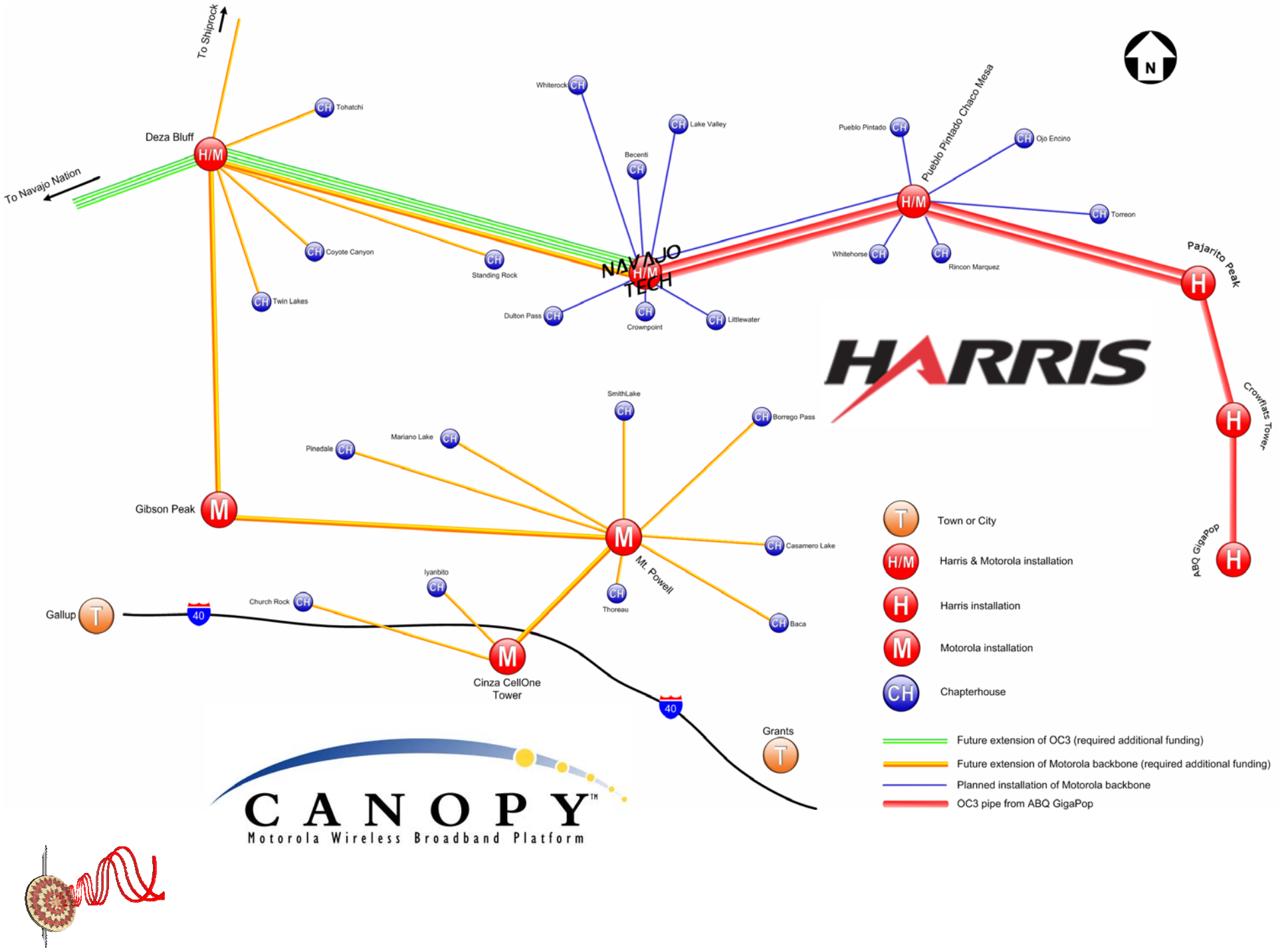
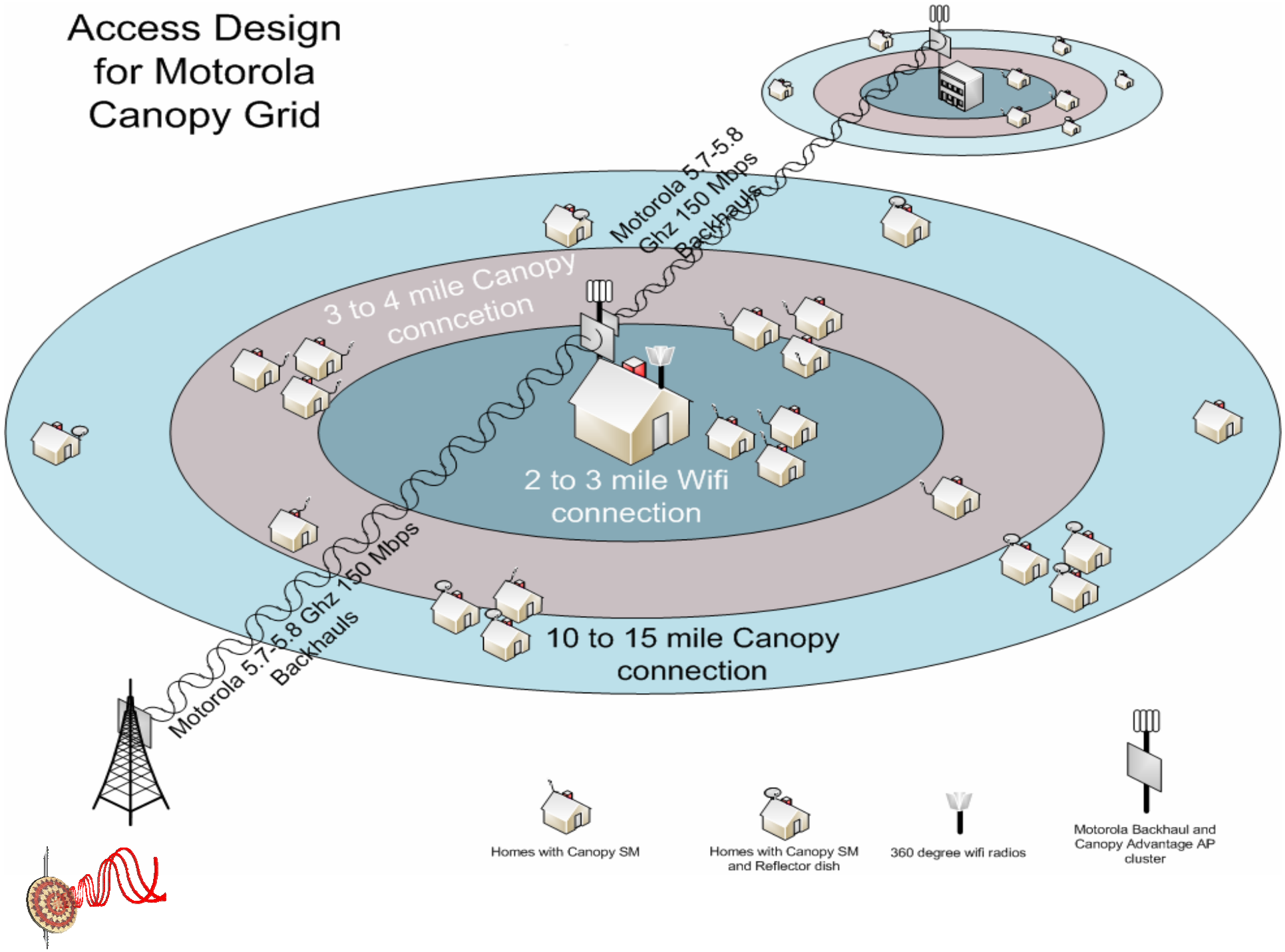
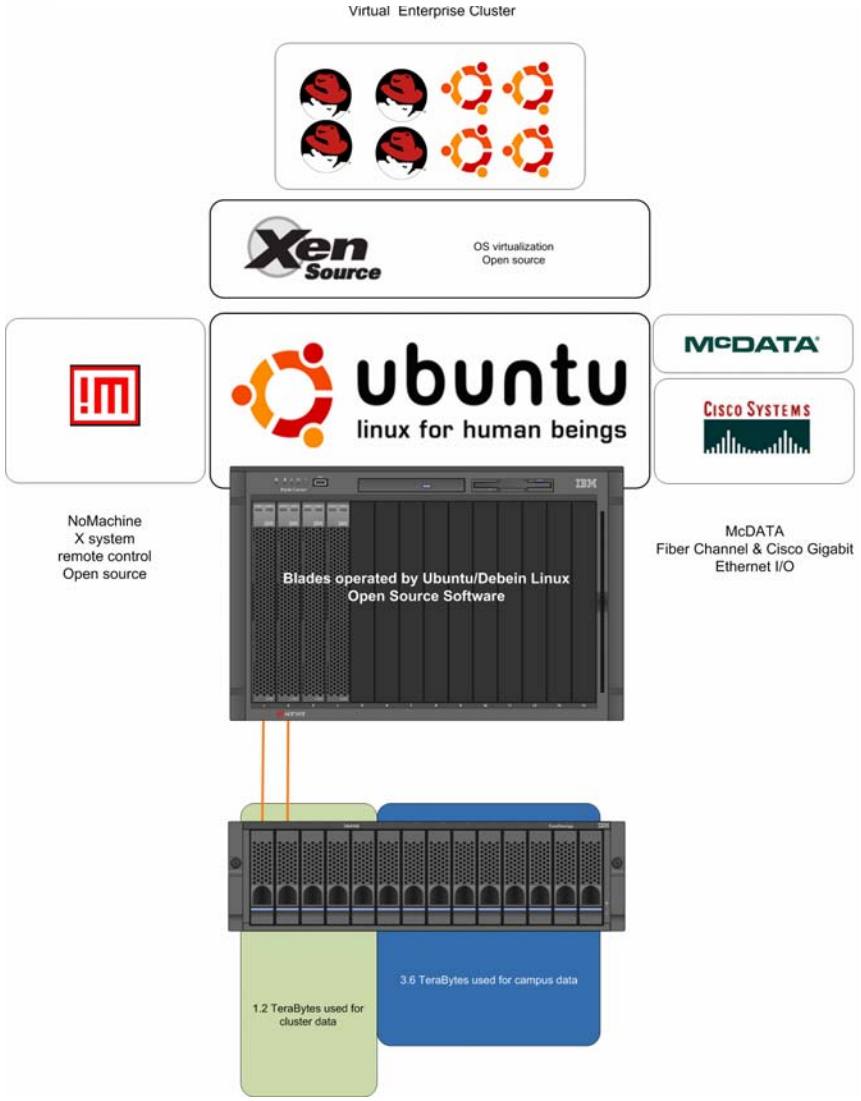

Navajo Technical College
Internet to the Hogan
Dine' Grid


N
W
E
S
CIT Wireless Broadband Project
Becenti
Pueblo Pintado
Standing Rock
CIT Backhaul
CIT
Crownpoint
Whitehorse
Rincon
WaterTanks
Littlewater
Dalton Pass
Pinedale
Mariano Lake
Smith Lake
Churchrock
Casamero Lake
Iyanbito
Mt. Powell
Thoreau
Baca
Legend
45 Mbps Broadband Backbone Radio Links
10 Mbps Broadband Radio Links
Towers to Build
Chapter Houses or End Users
802.11g community Omnidirectional
CellularOne Crownpoint Cell Tower
No power solar and propane power solution with Nema compartment
Nema and meter box for electrical power.
Water Tanks


To Shiprock
To Navajo Nation
Deza Bluff
H/M
Tohatchi
Twin Lakes
Coyote Canyon
Standing Rock
Whiterock
Becenti
Lake Valley
Dulton Pass
Crownpoint
Littlewater
NAVAJO TECH
H/M
Pueblo Pintado
Pueblo Pintado Chaco Mesa
Ojo Encino
Torreon
Whitehorse
Rincon Marquez
Pajarito Peak
Crowflats Tower
ABQ GigaPop
Gibson Peak
SmithLake
Borrego Pass
Mariano Lake
Pinedale
Casamero Lake
Mt. Powell
Thoreau
Baca
Iyanbito
Church Rock
Cinza CellOne Tower
Gallup
Grants
40
HARRIS
CANOPY™
Motorola Wireless Broadband Platform
Town or City
Harris & Motorola installation
Harris installation
Motorola installation
Chapterhouse
Future extension of OC3 (required additional funding)
Future extension of Motorola backbone (required additional funding)
Planned installation of Motorola backbone
OC3 pipe from ABQ GigaPop


Access Design for Motorola Canopy Grid
Motorola 5.7-5.8 Ghz 150 Mbps Backhauls
3 to 4 mile Canopy conncetion
2 to 3 mile Wifi connection
Motorola 5.7-5.8 Ghz 150 Mbps Backhauls
10 to 15 mile Canopy connection
Homes with Canopy SM
Homes with Canopy SM and Reflector dish
360 degree wifi radios
Motorola Backhaul and Canopy Advantage AP cluster

NavajoTech’ s Blade Cluster



moodle

SDSC

INTERNET 2

NLR

LITTLE FE
Computational Science Education on the Move
http://littlefe.net/

The University of New Mexico

TeraGrid
EMPOWERING DISCOVERY

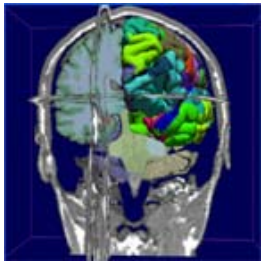
NSF

Scalable Distributed Supercomputing Environment

The Diné Grid

A scalable system refers to network systems: In this case the Diné Grid is scalable in two ways. The most important of these has to do with usage. A user at a chapterhouse or home can access the Internet at a minimal bandwidth, or they can access Supercomputing resources through the Gigapop in Albuquerque to the TeraGrid, the world's largest supercomputing grid. As Little Fe's are manufactured at Navajo Tech and placed in chapterhouses, schools, public safety buildings, clinics, etc. The distributed environment is also scalable in that it becomes increasingly powerful as a distributed supercomputer. The supercomputer on campus is the center of the Dinè Grid. Every new Little Fe increases the supercomputing power available to users.

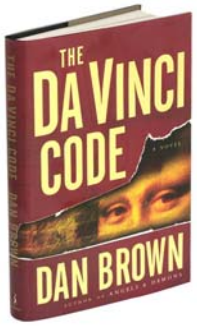
How much Digital Data*?



1 human brain at the micron level = 1 PetaByte

iPod Shuffle (up to 120 songs) = 512 MegaBytes

Printed materials in the Library of Congress = 10 TeraBytes

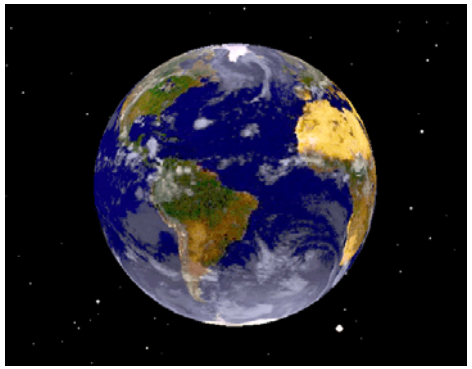


1 novel = 1 MegaByte

1 Low Resolution Photo = 100 KiloBytes

Kilo	10^3
Mega	10^6
Giga	10^9
Tera	10^{12}
Peta	10^{15}
Exa	10^{18}

SDSC HPSS tape archive = 6 PetaBytes



All worldwide information in one year = 2 ExaBytes

** Rough/average estimates*

The Dinè Grid enables advanced technologies that serve Navajo needs in:

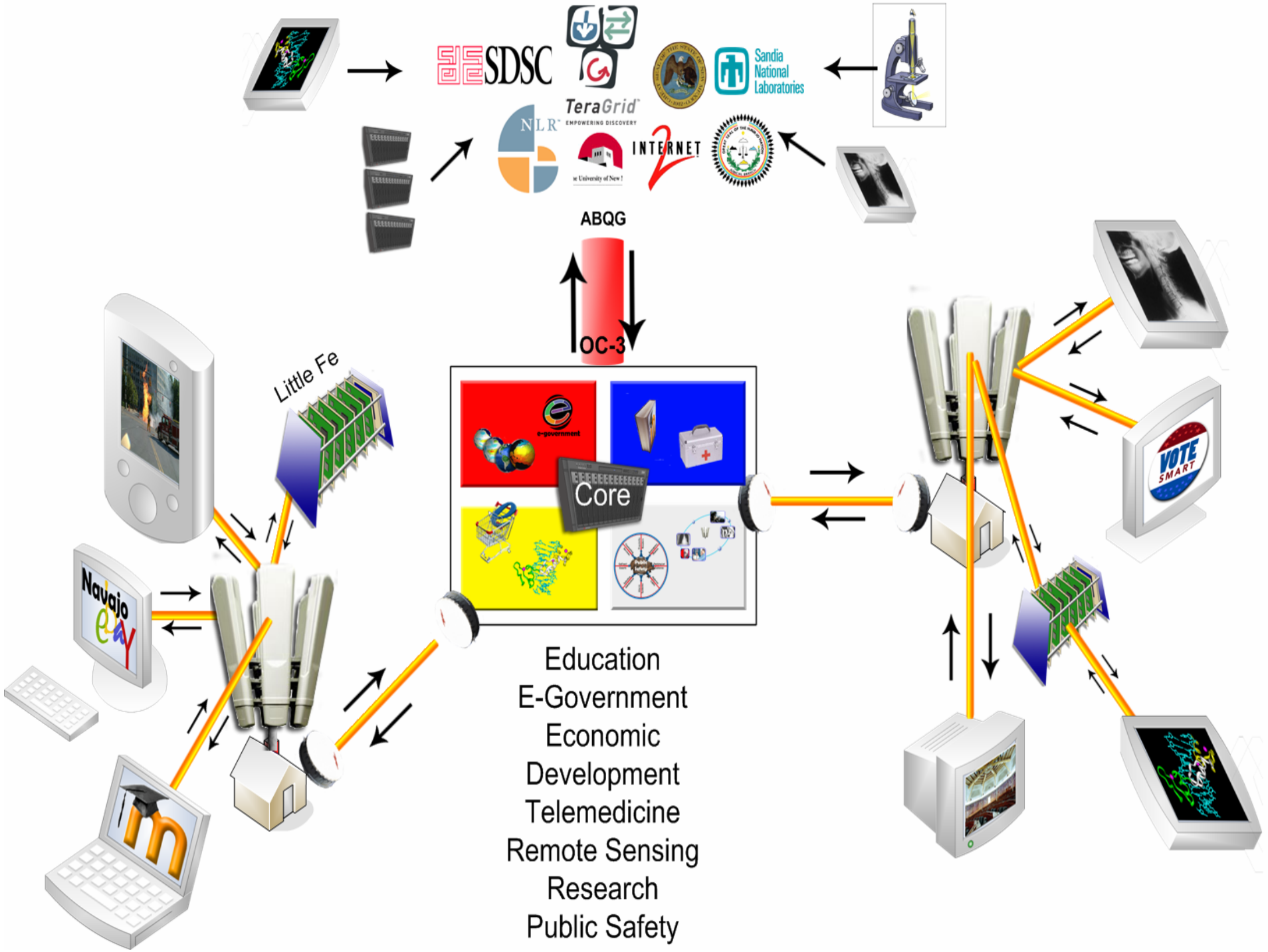
- Education
- Telemedicine
- Public Safety
- E Government
- Economic Development
- Remote Sensing
- Research

Technologies the Dinè Grid Enables

- Visualization
- Haptics
- Virtualization
- Simulation
- Rendering
- Data Mining
- Exotic Technologies
- Advanced Telecommunications
- Access Grid
- Modeling
- Computational Collaborative Science
- Nano-technologies
- Parallel Computing

The Internet to the Hogan and the Dinè Grid are two sides of one system

- Internet to the Hogan builds a state-of-the-art wireless infrastructure capable of supporting the Dinè Grid with 155 megabit connectivity and higher
- The Dinè Grid integrates into the infrastructure and makes it more effective in providing extended services to chapterhouses and the Navajo people.
- Grid science is a brand new science.


SDSC
TeraGrid
EMPOWERING DISCOVERY
NLR
INTERNET 2
Sandia National Laboratories
ABQG
OC-3
Little Fe
Navajo
e-government
Core
VOTE SMART
Education
E-Government
Economic
Development
Telemedicine
Remote Sensing
Research
Public Safety

Constructing the Dinè Grid

- Train students in grid technologies
- Navajo Tech will manufacture the Little Fe's on campus
- The grid management software will be located in the supercomputer on campus and managed on campus
- Development kits will be programmed on campus
- Little Fe's will be deployed
- Training in use of Little Fe will be offered in communities

Communities Served with DOD, State of New Mexico Funding in the First Phase Buildout

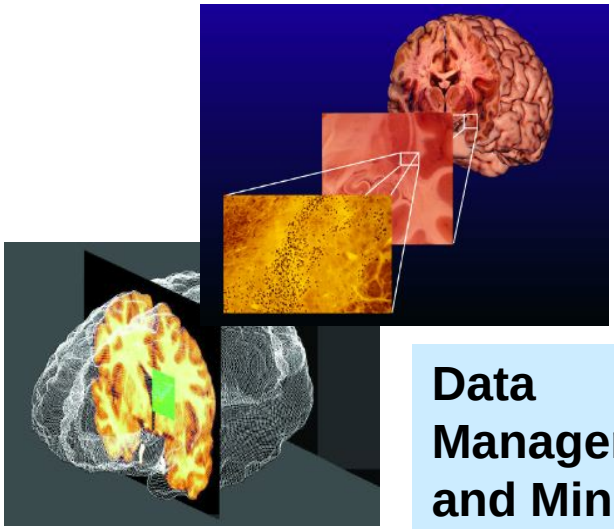
- Crownpoint
- Pueblo Pintado
- White Horse
- Rincon Marquez
- Becenti
- Red Mesa
- Little Water
- Standing Rock
- Coyote Canyon
- White Rock
- Dalton Pass

Internet to the Hogan and the Dinè Grid in Education

- The initial idea that led to development of the project was a desire by Navajo Tech to deliver high quality distance education to chapterhouses in the Navajo Nation
- This led to development of the wireless grid and work with Hans Werner Braun, the most important wireless scientist in the world.
- An examination of the current state-of-the-art in E-Learning led to a realization of the need for the Dinè Grid
- Science, Technology, Engineering, and Math (STEM) education has a new paradigm.
- STEM provides high skill, high wage jobs. Navajo Tech has strong STEM programming. But in the contemporary world work in these fields is completed on a collaborative basis. This demands a collaborative toolkit for teaching and learning—a toolkit not currently available to any school in the Navajo Nation.

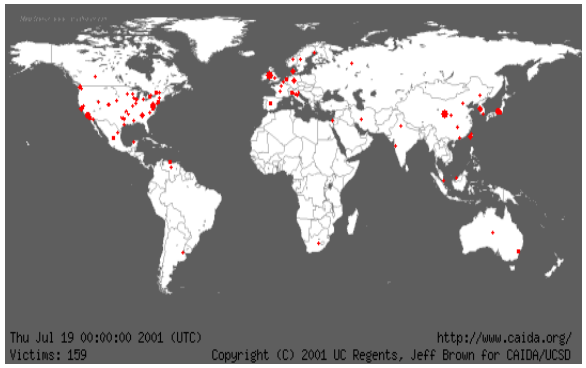
Science is a Team Sport

Astronomy

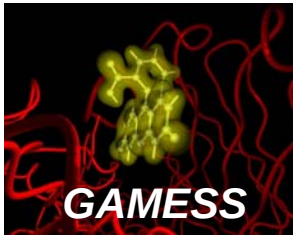


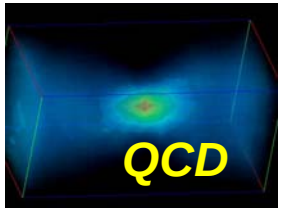
Data Management and Mining

Geosciences



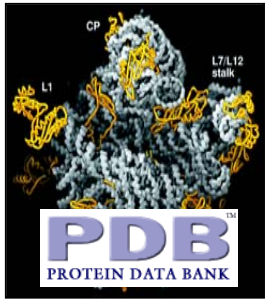
Modeling and Simulation



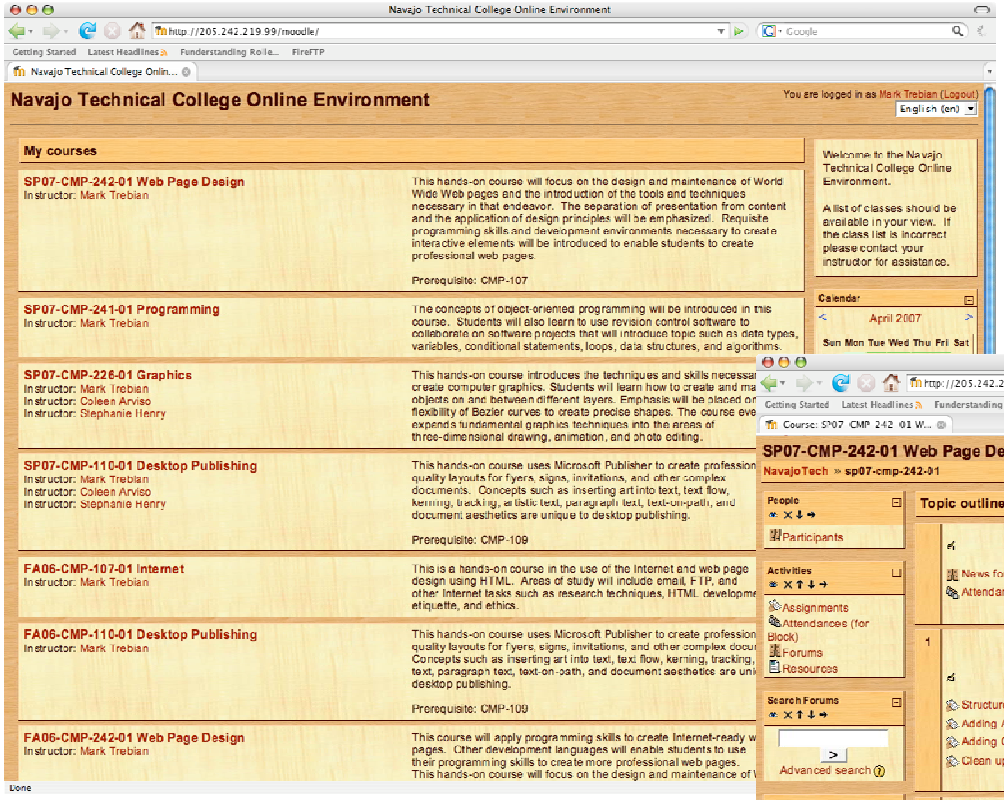


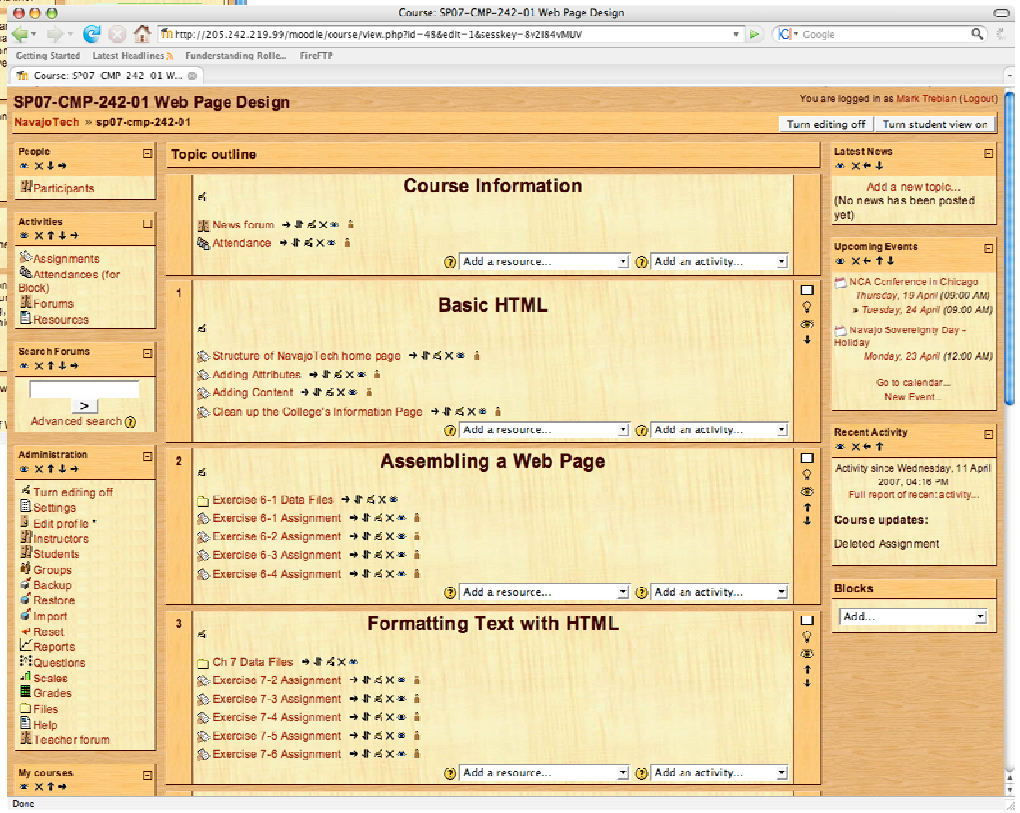
Physics

Life Sciences



Online Education



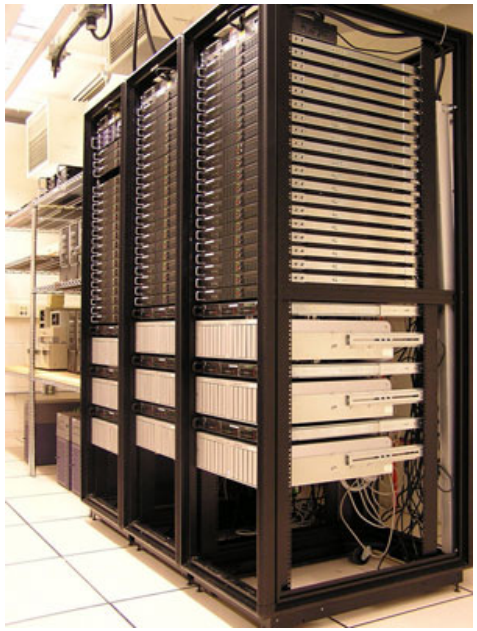


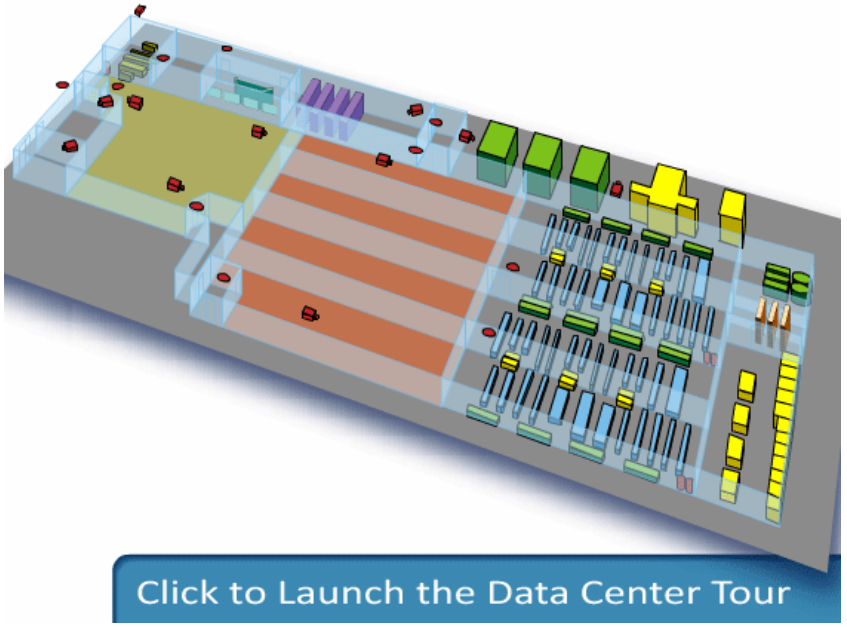
Internet to the Hogan & the Dine' Grid will be the vehicle through which NavajoTech and their partners will deliver online content using Moodle and advanced multimedia resources to affect fundamental changes…

…in the communities served by the project. Communities touched by the project will have access to advanced scientific curricula, cutting-edge cyber-infrastructure facilities, and resources that are currently unavailable.

Economic Development

- The project will create a data center on campus and market a Navajo location for a major data center





Navajo Tech is a founding Gateway partner in the New Mexico Computing Applications Center

The Gateway Project, as the Center is more commonly known, is designed to:

a) Attract large high-tech companies by drawing on both intellectual and supercomputing resources, including those at Navajo Tech,

b) Work with major high tech, and businesses that need supercomputers to design products, so that New Mexico's scientists, including those at Navajo Tech, can show these companies how useful a New Mexico, or Navajo, location can be

c) Make start-up businesses more competitive by using computing to advance them quickly through the development to commercialization phase,

d) Work to solve issues such as water, energy, environment faced by Navajo and New Mexico communities

e) In education the Gateway Center will help enthuse K-12 and college students and teachers about science and technology through direct exposure to scientific computing, and provide supercomputers and computing expertise to help schools improve science, technology, engineering, and math education.

NASA has asked Navajo Tech

- To participate, using the Dinè Grid, for important work on design and rapid-prototyping
- Navajo Tech's Auto-CAD curriculum area is a partner in the project
- NASA computational scientists will be working with Navajo Tech personnel to install and make functional software usually used by major government agencies and/or major corporations
- This effort is only the first effort to attract such projects to the Navajo Nation, thus creating technology transfer opportunities down the road

The most important task Internet to the Hogan and the Dinè Grid is undertaking

- Using all of the project's elements to give Navajo Tech technology students practical hands-on experience with the most advanced technologies currently being developed from around the world
- Inspiring Jason Arviso, Coleen Arviso, Jared Ribble, Chris Yazzie, Derickson Begay, and Mark Trebian to work on increasingly advanced degrees
- Developing a pathway where selected technology students can graduate, work at the college, and then begin working on increasingly advanced degrees
- Ensuring that the next generation of Navajo people have the high wage skills to move the Navajo Nation to the engine of the world's technology train