



STATE TELECOMMUNICATIONS

How Higher Education Can/Does Help

Presented to the New Mexico Finance Authority

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Agenda

- Higher Ed has to have advanced networks
- Overview of the HE Network Landscape
- HE's key assets
- Description of major operational expenses
- How Higher Ed Networking is improving the NM's public sector broadband ecosystem, which ultimately lifts our potential for economic development
- There are gaps in funding, especially shared "middle mile"
- It makes sense to invest capital with higher education, municipalities, K-12, counties for the purpose of improving broadband, where possible in the acquisition of assets, in collaboration and coordination with other public utilities.
- A good focus for this investment would be for middle mile (state roads) that connect across geographies and institutional interests

R1 Universities Must do Advanced Networking (and Computing)

- Our researchers must collaborate with global peers
- Leading Edge Researchers are Demanding
 - Compute intensive work needs supercomputing nodes here and on the Teragrid
 - Data intensive work needs fast block/stream transfer speeds
 - Time sensitive work needs low latency
 - Network research requires an experimental “band”
 - Geographically disperse work requires collaboration among networks
- This work is frequently outside of the service parameters of commercial providers, and this will always be the case, as such:
- Universities have always been and must remain on the forefront of global networking
- The Networking Engineers at NM Universities have and must be highly qualified to support leading edge work
- NM Universities have and continue work with their communities to improve the broadband ecosystem

Higher Education Network Landscape

- Building Networks
 - UNM has 425 buildings, 11.5 million sq. feet
 - Typically funded from internal revenue & I&G, in the past through building occupant
 - UNM IT has “nationalized” all edge switches through borrowing
- Campus Networks
 - UNM has 1259 acres to cover
 - Typically funded from internal revenue, capital building projects; inter-building and “core” infrastructure remains challenging; funding moving from voice to “communications”
 - Wireless is the biggest challenge: 83K sessions every day on campus, folks have 2-4 “computing devices with them every day. Think about gaming in the dorms.
 - UNM first digital upgrade was with Banner bond funds, latest refresh is borrowed funds, but voice fees will have to be comm fees and increase (double) to keep up
- Metro Networks
 - Some funded via capital building projects; collaboration with municipalities and franchise agreements are essential
 - ABQG seed money from State, now self-sustaining, Comcast/CABQ partnerships provide long-term assets, and FCC telehealth leverage helps with circuit costs

Higher Education Network Landscape

- State Networks
 - Very challenging to fund; federal stimulus money will help: NTUA, Redi-Net, etc. but challenge will be effective business model
 - RGON, Eastern Loop and National networks traversing the state
- Regional Networks: NSF/NIH grants live on the network
 - UNM participates in WRN to the benefit of all Research Institutions
 - NM Research Network agreement in place
- National/Global
 - Internet 2 participation gives access to national backbone
 - National Lambda Rail yielding lower costs paths to key locations
 - Key links are still missing for resiliency: El Paso to Denver

Higher Ed Broadband Asset Types (and we like moving expenses to assets)

- **Facilities** (20+ year assets, most leased)
 - Albuquerque Gigapop (TW donated building upgrades, leased space downtown
 - A facility where public sector equipment can be placed for internal communications
 - Aggregation of Traffic and peering
 - Volume purchasing with carriers, delivered at the Gigapop
 - Handoff of traffic to commodity internet (CL, TW, etc.) or research (WRN, I2, NLR, etc.)
- **Fiber and Capacity Agreements** (typically 20 year agreements)
 - Comcast and the City of Albuquerque
 - Rio Grande Optical Network (NMT, NMSU, DoIT)
 - Eastern Loop (NMSU)
 - Regional paths: WRN
 - National higher education network fiber and paths: I2, NLR

Higher Ed Broadband Asset Types (and we like moving expenses to assets)

- **Equipment** (oops, 3-7 year assets)
 - Switches, Routers, Access Points, Appliances, Transponders, etc.
- **Software** (a bit ...these are moving to subscriptions..)
 - Security and security
 - Management: Routing, Shaping, yada yada yada
- **Skills** (require competitive salaries and tlc)
 - Significant investment in human capital
 - University pay is more flexible than state pay, thank goodness....

Higher Education Broadband Costs

- Cost of Monthly Leased Circuits
- As we can, upfront payments for IRU's
- Refresh of lower cost equipment that tends not to be capitalized
 - Access Points
 - Boards in chassis
- Equipment that could be considered capital, but I&G picks up the slack
- Software subscription costs
- Salaries
- Constant negotiation/contracting/bidding/reviewing options with partners/suppliers to share and reduce costs, optimize our assets and share our expertise on the research and cyber-infrastructure levels

Examples of Benefits beyond HE

- **Internet to the Hogan (ITTH)**
 - Microwave link between Navajo Technical College (NTC)
 - New link between NTC and Gallup Campus
- **Navajo Preparatory**
 - Worked with PNM to bring traffic to ABQG
- **Zia Pueblo**
 - Facilitated agreement between NTC and Zia to share tower
- **Zuni Pueblo**
 - Microwave link from Zuni branch/twig to Gallup Campus

Examples of Benefits beyond HE

- State Engineering Community
- Mesa del Sol Integrated Film and Digital Media Building with City of Albuquerque
- APS inter-connection with UNM; we are an e-rate provider
- Specialized support to Economic Development (Film)
- State Government leverages ABQG
- Shared investment in downtown fiber State
- State Engineer's Office needs low latency circuit
- RGON and Eastern Loop resiliency
- UNM Gallup, City & County of Gallup, and the EDC working together to get a second connection to Gallup, share that with among all, lay the foundation for the Intermodal facility and improve the overall ecosystem

Structural Issues Discussion

- What is capital?
 - IRU's are challenging with all funding sources; these can be paid up front with small operations cost each year. These types of long-term leases should be eligible for capital funds
 - State capital geared toward brick and mortar
 - BR&R never anticipated so dang much inter-building and fixed equipment rooms and data centers
 - ER&\$ capital funding amounts never anticipated this kind of rapid turnover and amount of "stuff".. Traditionally it has been geared toward HVAC/Security, etc.
 - IT thus seems to be everybody's least favorite line item: it looks like a cost and those IT guys want more and more....
- Should all investments be individual institutions?
 - That works for buildings, somewhat for campuses, less for metro and even less for state and regional
- Federal funding for infrastructure projects is scarce
 - STEM folks understandably put the money to programmatic activities
 - PI's want to build/control their own, thus not growing foundational systems

Structural Issues Discussion

- State funding has evaporated
 - \$10M GO bond earmark got eaten by “MVD”
 - The recession hit
 - Networking foundations are hard to sell: who wants to declare they voted for routers?
- How can we fund key linkage points in the state?
 - Some investments can be “self sustaining” but others may need full to some help
 - Seed money seems to work: ABQG and NLR
 - Structurally, *an* institution needs to own the assets and accountability for each shared service
 - Earmark some “financing” for key projects at some level?

In closing

- Thank you for your time and attention
 - Questions?
 - Next steps?