ConnectED

November 5, 2013
Workshop Presented at Tindley Park, Illinois

BROADBAND COMMUNITIES
Regional Economic Development Conference
PRESENTERS

- JANE PATTERSON
- MARK JOHNSON
- MYRA BEST
- PHIL EMER
- FRANK ODASZ
- AUDIENCE DISCUSSION/QUESTIONS
JANE SMITH PATTERSON

- Chair, RURAL TELECON AMERICA
- Upper Management positions held in state government, high tech industry and universities
- Intensive Career focused in technology
- Involvement nonprofit and foundations. Creator of 3 nonprofits
- janessmithpatterson@gmail.com
MARK JOHNSON

- Extensive involvement with network development for MCNC, NC Information Highway, Lambda Rail, Internet 2(Abilene) and USCANN

- MCNC Chief Technology Officer and vice-president for data architecture

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MYRA BEST

- DigiLEARN, Executive Director
- Education Advisor to Governor of NC
- Director of eLearning Commission & BETA Project
- Founder of NC Network (non-profit)
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- **Lone Eagle Consulting**
- lone-eagles.com/
- Creators of internet training guides, education resources, and online courses
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QUESTIONS AND DISCUSSION

- ANY QUESTION WILL BE ENTERTAINED WITH HUMILITY AND GRACE!
JANE SMITH PATTERSON

CONNECT ED
CONNECTING AMERICA’S SCHOOLS. *

- WITHIN 5 YEARS, CONNECT 99% OF America’s students through next generation broadband (speeds no less than 100 Mbps and target of 1 Gbps)

- FCC to modernize and leverage the e-RATE PROGRAM

- * content from White House Flyer
Level Playing Field for Rural Schools

- Leverage the Expertise of NTIA to deliver connectivity to states and community access institutions
TRAIN TEACHERS

- All teachers receive support/training
- To improve student learning through use of technology tools.
- Use Title II funds of Elementary/Secondary Education Act
- Title VI training educators to use ed tech to implement computer based assessments of students learning.
New Resources for Teachers

- New Real Time Resources through digital education tools assist in real time student assessment
- Interactive online courses
- Teachers can build online learning communities
More Private-Sector Innovation

- Educational Devices-purchased in volume by collaborative schools
- Purchasing choices in hands of local educational leaders
- Feature rich devices that are price-competitive with textbooks
Students gain access to global world through technology

- Visualization of complex concepts
- Instruction in foreign language
- More engaging classes
- Students work at their own speed
- Gain one-on-one assistance to develop their knowledge and skills
Support for Digital Education Content

- World market of educational software over $1 trillion
- Educational software that can match content and alignment with college and career ready standards—being adopted and implemented by States in America
Restoring America’s Leadership

- Clinton-Gore pushed hard
- Hiatus under Bush Administration
- Obama has roared back with commitment to Broadband and Schools.
Successful Schools Identified

Loris, SC
- Loris Elementary
- Rose from 41st in state rankings in 2011 to 19th 2012
- All kids have laptops In grades 3-5
- Learning software
- Blended learning rotations

Mooresville, NC
- 1 device per student in grades 3-12
- Use digital content
- Teachers trained to integrate technology into their teaching
- Changes culture of instruction
Philadelphia Pennsylvania

- Science Leadership Academy

- A magnet school – students combine project based learning with modern tools - laptops for every student

- Students create and produce their own content for learning

- School addresses chronic high dropout rates

- 97% of 2010 graduating class went to college
Tool Kit For You Will Include slides & other articles

Example of proposed network and implementation

Redesigned implementation through eLearning Commission in NC

Governor is critical to success with partnership of legislature and private sector
Merit MICHIGAN MISSOURI

- Merit provides statewide service but not to all schools...see tool kit
- Missouri – see example of technology survey
- See timeline from NC
- Various examples in tool kit
- Note example of cloud services
Community anchor institutions in Tool Kit

- SEE Florida & NC, etc.
- NCREN Community Anchor Network
- NC Telehealth Network  NCTN
Preparing students, communities and states for their future and not their past!! And at the same time building a new economy for the future as well.
MCNC as a catalyst

- Attracting industry
- Establishing partnerships and collaborations
- Driving technology
- Supporting the missions of “anchor” institutions
Evolution of NCREN

• MCNC was created (1980) with an economic development and technology mission
  • Recruiting tool for microelectronics industry, particularly IBM
  • Tech R&D support for that industry
  • Networking was an essential factor in accomplishing that mission
  • Collaboration has always been a cornerstone
    • In development of technology with private firms and universities
    • In deployment of technical capability with equipment vendors and service providers
Buy when possible, build when necessary

- Seek to use available leading-edge tech in the network
- Be willing to build when leading-edge is not adequate
  - facilities-based microwave network for interactive video conferencing
  - First wide-area gigabit network for cancer treatment (VistaNet)
Innovative partnerships with service providers

- NCIH collaboration with State Gov, telcos, equipment vendors to deliver fiber-based broadband services statewide ...in 1993 (NCIH – North Carolina Information Highway - first statewide SONET/ATM network)

- Unique business partnership with CLEC to acquire lambda (not fiber) IRUs
Innovative partnerships with equipment vendors

- Operated our own dark-fiber-based network since 1999 through many generations of technology in partnership with Cisco, Nortel, Lucent, and others
- In partnership with NCSU and CODEC vendor deployed 100% IP-based, broadcast video in 1999
Partnership and leadership with universities locally and nationally

• Developed and built first distributed “gigapop” to access Internet2 in 1997

• Fully instrumented network using OCxMon (developed at UCSD and NZ researchers) to provide network measurement and traffic characterization data in support of UNC computer scientists

• Charter member of The Quilt (www.thequilt.net)

• Developed and operated the Experiment Support Services function for NLR

• Collaborated with Indiana University and the MaX GigaPoP to operate the Hybrid Optical and Packet Infrastructure (HOPI) for Internet2
U.S. UCAN
U.S. Unified Community Anchor Network

- Internet2’s BTOP project
- Provide a backbone to interconnect state-level BTOP projects
- Enable “Community Anchor Institutions” to have a national backbone
- Create an ecosystem to deliver advanced services and applications to CAIs
U.S. UCAN’s Goals

Provide broadband connectivity to satisfy growing anchor needs

• Change the way content, applications, and services are delivered

• Foster regional, national, and international anchor collaboration

• Ultimately, transform communities
U.S. UCAN by the Numbers

4,203 Libraries

84,146 K-12 Schools

2,237 Health Institutions

33 Telehealth Networks

200+ Museums, Science Centers, Zoos, Aquariums, Parks & Reserves, and Performing Arts Organizations

799 Community & Vocational Colleges

31 Public Radio, TV, Streaming Media Organizations

1,491 Colleges & Universities

For more information: usucan@internet2.edu
Dramatic increases in scale

- Network capacity has increased >25,000 times
- Number of connections has increased 100 times
- Cost to operate NCREN have only increased about 5x
Reliability

- Transparency - more and better reporting
  - how are we doing?
  - What went wrong?
  - How will we fix it?
- Roughly 5 nines (99.999% uptime)
  - One year rolling average
- Latency SLA <25ms (average about 7ms)
Traffic capacity over time

- Bandwidth history
- Bandwidth Future

~200 Gbps
Network evolution
• Aggregate capacity 80+ Gigabits per second
• Resilient
  • multiple connections to each external provider can tolerate failures without disrupting service
• Targeted to the needs of our users
  • Content Distribution Networks (CDN) like Akamai keep traffic on-net reducing costs and improving performance
  • Direct peering with heavily used content providers like Google reduce costs and improve performance
  • Access to research and education networks like Internet2 support the missions of our CAIs
Support for education

Unified K-20 network for education

- Universities first but others could always opt in
- K12 added en masse in 2006/7
- CCs added en masse in 2011
Support for government

- Have always been the internet provider for state government
- Support a number of local governments
- Provide additional services (circuits, hosting) for government
Healthcare

• Medical schools (UNC, Duke, WFU, ECU) were among our earliest users

• NC Telehealth Network (NCTN) created under RHCPP and now HCF is fastest growing segment
  • E-NC and Cabarrus Health Alliance

RHCPP - Rural HealthCare Pilot Program
HCF - Healthcare Connect Fund
Facilities-based (again)

- Confluence of ever increasing demand, desire to serve rural areas with leading-edge capability, and BTOP have enabled us to deploy over 2500 miles of fiber
- Much fiber being marketed to new and existing service providers to enhance rural broadband and econ dev
Fiber Cable (144 strands of fiber)

96 strands
Economic dev
Commercial use

40 strands
In reserve

Each pair of strands: 40-80 colors, each color 100Gbps
Each color supports 20,000 times the capacity of a home broadband connection
Moving on up

MCNC as service manager for cloud services
• For each service determine the optimal build vs buy arrangement
• Working with Internet2, our peers around the country and vendors to provide those services
• Early focus on Identity and Access Management supporting RttT
The vision
- Individualized/Personal instruction – the end game

How to get there
- Policy, budget and advocacy framework
  - Education, business and policy leaders

A plan to meet the vision
- Assess/plan/implement/adjust
  - Infrastructure
  - Above the net/cloud
The Business Education Technology Alliance chaired by Lt. Governor Bev Perdue was created and developed a plan for implementing technology in P20 recommended the creation of the NC.

**Vision:** “Put technology in the hands of every student so that the learning is customized or personalized to his or her needs and he or she actively takes ownership of their own learning.”
2006-2007

- Developed the NC Virtual Public School to provide learning options for all students no matter their zipcode 24/7.
- Feasibility Study for connectivity in K12 schools
- Strategic development of a technology infrastructure (NCREN) that provides the connectivity and networking services necessary to support and sustain digital learning P20.
2008

- Expanded the School Connectivity Initiative SCI by $10M for a total of $22M to complete the implementation of the SCI increase schools' abilities to use up-to-date instructional technology.

- The General Assembly directed the State Board of Education to implement an allotment formula for NCVPS effective in the 2009-2010 fiscal year.
Lessons Learned

- **Role of the state:**
  - Policy/budget framework
  - Level the playing field by providing Access

- Digital Learning can only take place if there is a robust technology infrastructure in place.

- Public Private Partnerships are critical
Moving Forward

- Continue to build on state investments-
  - RttT plan ($400M) is an example:
    - development of the NC EDCloud for shared services leading to cost efficiencies for schools,
    - on line assessment system and
    - Instructional Learning Management System that supports personalized learning for students.
Moving Forward

- Develop a policy structure that supports digital learning.
- Revision of existing state policies, rules, or regulations that may inhibit North Carolina from maximizing eLearning’s potential for students and learners of all ages (PK-20)
Moving Forward

- Digital as a part of teaching and learning:
  - Broadband to the home
  - Quality standards/accountability for Virtual Learning (P20)
  - Digital Learning Media/Content
  - On Line Professional Development
For Community Fiber Networks
November 5, 2013

SHARED SERVICES AND THE NC EDUCATION CLOUD
NC Education Cloud Basics

- The end-game is individualized instruction
- The cloud is plumbing, process, and supporting service
- De-emphasize buying and hosting infrastructure
- Emphasize procuring services
- Raise the bar on reliability
- Towards 24x7 access to services
- The cloud isn’t the backup – it’s the primary
- Defragmentation – fewer providers, more competition
- Avoid custom integration – adopt standards
- Fill in the gaps
- Engineering approach
Process and Timeline

Planning

2011  2012  2013  2014

Design & Build

All services operational by January 2014

Deploy

Operate

RttT funding ends August 2014
Use of LEA Survey Data – Identity Management

Directory Environments Used by LEAs

- ActiveDirectory (40.0%)
- ActiveDirectory + eDirectory (8.7%)
- eDirectory (24.3%)
- ActiveDirectory + OpenLDAP (8.7%)
- OpenLDAP (3.5%)
- eDirectory + OpenLDAP (1.7%)

CGZ 9.15.2011

From page 58 of the Identity and Access Management Plan
Use of LEA Survey Data – Assessment in LEAs

From page 6 of the Findings from NC Education Cloud Interview and Survey Process report
Five NCEdCloud Strategies

1. Transition LEA infrastructure to a cloud-centric **IT Enterprise** service model

2. Deploy an NC **shared learning infrastructure**

3. Modernize statewide **business operations systems** opportunistically

4. Form a **dedicated NCEdCloud support organization** and support network

5. Initiate a **digital inclusion** model to address anywhere any time access to the Shared Learning Infrastructure platform
Cloud-Enabled LEA

Services Available TODAY Through The Cloud

Directory Structure
Storage Pools
Media & Content
VoIP Call Managers
Application Delivery
Web servers
LMS
Email & Collaboration

Wireless Controllers/ Network Mgmt
Administrative Apps

Firewalls & Filters

Directory Structure determines access privileges

LEA Router

LEA Local Services

PoE Switch

School Router

Traditional Switch

Other Schools
Administrative Sites

Mobile Devices

Desктops & Lab PC’s

Network Appliances
Cloud-centric Services

Network Services
- Voice over IP
- Content Filtering
- Firewall
- Managed WiFi

Enterprise Services
- Application Services
- Web Collaboration
- Virtual Desktop Learning Management

Application Services
- Mobile Devices
- Desksops & Lab PC's
- Network Appliances

Cloud Services
- EMAIL
- Storage
- Computing Datacenter Directory

Technology Providers
- Microsoft
- Google
- Pearson
- SAS
- MoodleRoo
- SchoolDude
- IBM
- Dell
- Amazon
- Peak 10
- Rackspace
- AT&T
- MCNC
- AT&T
- ENA
- Windstream
- Time Warner
- Centurylink
LEA IT Infrastructure Platforms

Platforms and Services
- SI S
- IIS
- PD System

Learning
- BI
- AP/AR
- HR
- Finance
- Child Nutrition

Data and Content
- Student Data
- Class
- Common Core
- Identity
- Messages
- Docs

Shared Infrastructure
- Identity and Access Management
- Content and Learning Management
- LOR & Collection Management
- Data Management
Identity and Access Management

1. User logs into a cloud service once
2. Cloud service passes user request to IAM for authentication
3. IAM passes user authorization information back to cloud service
4. User granted access to all relevant cloud services
Data Integration

Data Integration - Basic ETL + ODS

- Data Sources
  - Extract
  - Data Integration Service
    - Transform
    - Load
  - Operational Data Source
    - API
    - Load
    - Target Services
  - Target Services

- Load
- Transform
Learning Object Repository

[Image of a webpage from the North Carolina Learning Object Repository (NC ExpLORe). The page includes a logo, a navigation bar, and a section titled "NC School of Science and Math Adds Instructional Music Videos to NCLOR" with a brief description and a thumbnail image of a person playing guitar.]
FRANK ODASZ

- Lone Eagle Consulting
- 25 years teaching educators and citizens online
- 15 years; Rural Ecommerce and Telework Strategies – Free Simple Online Lessons
- Building Online Learning Communities Among Educators and Citizens
- Teaching the Innovation Process....
Big Sky Telegraph 1988-1998
“Low Cost, High Imagination”
Linking 100 One-Room Rural Schools
Alaska 99% Broadband Access?
Broadband and Gigacities: The Platform for Innovation

- Platform For Whose Innovation?
- Crowd-Sourcing; the Bottom-Up is Out-Performing the Top Down.
- Who Teaches the Innovation Process? Opportunity Literacy?
- Accelerated Learning Innovations
- Everyone’s Potential Optimized!
America’s Challenge: Mining Raw Human Potential

- Once Everyone is Online;
- Anyone, Anywhere Can Learn Anything, Anytime. Or Teach Too!
- Free Open Education Everywhere
- New Digital “Just-in-Time” Services
- The Secret of Broadband; Collaboration
- Doing for Ourselves, Together
- “We’ll Make it or Break it at the Local Level.” Former FCC Chairman
BTOP Disbursements by Project Type (as of December 31, 2012)
Erate is Essential!

- 90% of Alaska’s schools go dark w/o Erate
- .05% eligible schools apply for Erate
- 9 billion/year estimated
- $5/month on your phone bill, OK?
- Initial Access, and Monthly Costs
Erate Reforms

- Remove Threats for Community Use; Entrepreneurial, Inappropriate Uses
- Include Community Inclusion, Home Access for In-home Learning K-100
- Y/N? -Social Media, Youtube, Facebook
- Freedompop; Cheap Wifi for 26 million
- It takes a village to raise a child.
- It takes digital youth to sustain a village.
Evolution of Distance Learning

- Most scalable ongoing educational solution
- MOOCs Massively open online courses
- Mobile Learning
- Apps replacing Web pages
- Less in More; Value vs Volume
- Mobile, Personal, Social, Timely
- Video instruction and Learning Apps
Evolution of the Learning Society

- Converging; Community Networking and Elearning
- Learning to Build our Own Knowledge; Constructivism
- Social Media as Personal Learning Networks
- Everyone Both Learner and Teacher
- Everyone Both Consumer and Producer
Community Learning is Everyone’s Responsibility

- K12 Schools, Universities
- Economic Developers
- Government Agencies
- Businesses
- Elected community leaders
- Parents, Youth, Citizens
- Telecommunications Companies
- Time Sensitive Paradigm Shift: Silos to Collaboration
Growing an Entrepreneurial Culture; The Key to Global Competitiveness

K-100 Lifelong Learning:

“Planting seeds of entrepreneurship must begin early enough in a child’s primary education to establish entrepreneurship as a lifelong choice.”

*More Entrepreneurs over 50 yrs of age than under (?)!!*)
## Info-Diet Needs; Free or Fee?

<table>
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<tr>
<th>Application</th>
<th>1GB</th>
<th>12GB</th>
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<tr>
<td>Stream Video</td>
<td>165 videos</td>
<td>1980 videos</td>
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<tr>
<td>Stream Music</td>
<td>570 songs</td>
<td>6840 songs</td>
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<td>Download apps, games, and songs</td>
<td>255 downloads</td>
<td>3060 dnlds</td>
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<td>Post photos/video</td>
<td>2850 posts</td>
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<td>Go online</td>
<td>600 webpages</td>
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<tr>
<td>Email</td>
<td>4500+ emails</td>
<td>54000+ email</td>
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<tr>
<td>Skype phone calls</td>
<td>1020 minutes</td>
<td>12240 minutes</td>
</tr>
</tbody>
</table>

### Measuring Info-Diet

**Socioeconomic Capacity-Building - Inputs and Outputs**
Join the Rural Telecom Congress

- Eight Broadband Toolkits
  - [http://innovativecommunities.pbworks.com](http://innovativecommunities.pbworks.com)
  - [http://ruraltelecon.org](http://ruraltelecon.org)
- $80/year – Collaborate with Peers
- Monthly Updates, Sage Advice
- Become the Voice of Rural Prosperity