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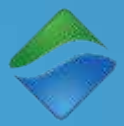
Kentucky Digital Summit 2014

NEXT GENERATION KIH

KENTUCKY COUNCIL ON POSTSECONDARY EDUCATION



COMMONWEALTH OFFICE OF BROADBAND OUTREACH AND DEVELOPMENT
Promoting a 21st century economy

NEXT GENERATION KIH

Presenters

- Mike Hayden
- Larry Combs
- Mike Leadingham
- Al Lind
- Derek Nesselrode
- Brian E. Kiser

Commonwealth Initiatives

- Kentucky Information Highway (KIH3)

Statewide networking contract. Used by state government, K-12 and other public sector entities

- Kentucky Regional Optical Network (KyRON)

The Council for Postsecondary Education and Higher Education are key stakeholders

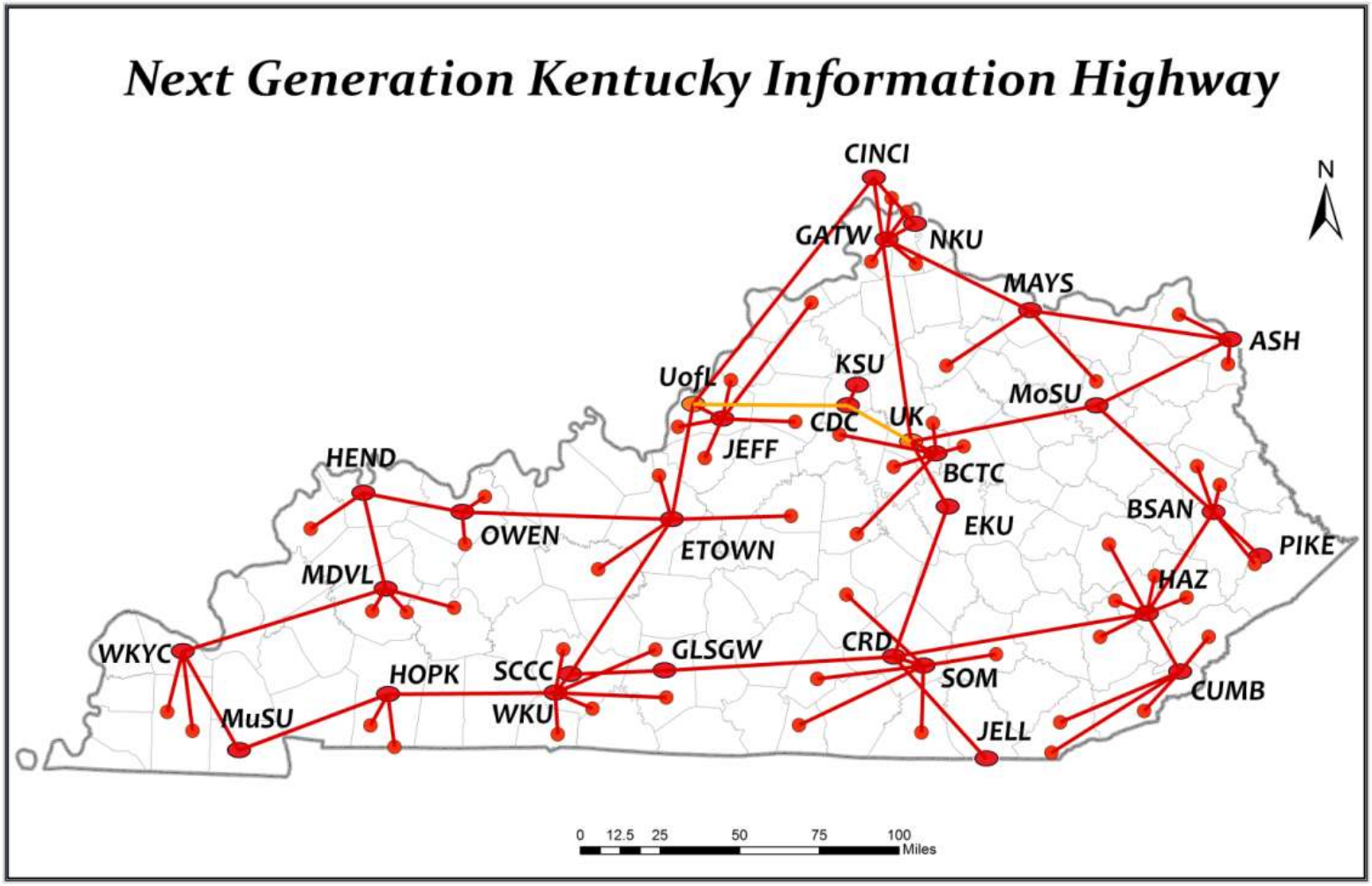
- Kentucky Postsecondary Education Network (KPEN)

Existing contract providing network connectivity - similar to KIH3 (typically at higher speeds)

- Center for Rural Development (CRD)

Feasibility Study completed March 2014

Coverage Map: Example Representing ~ 3000 Fiber Miles*



This is a representation only and it is not intended to be the final fiber map.

NEXT GENERATION KIH

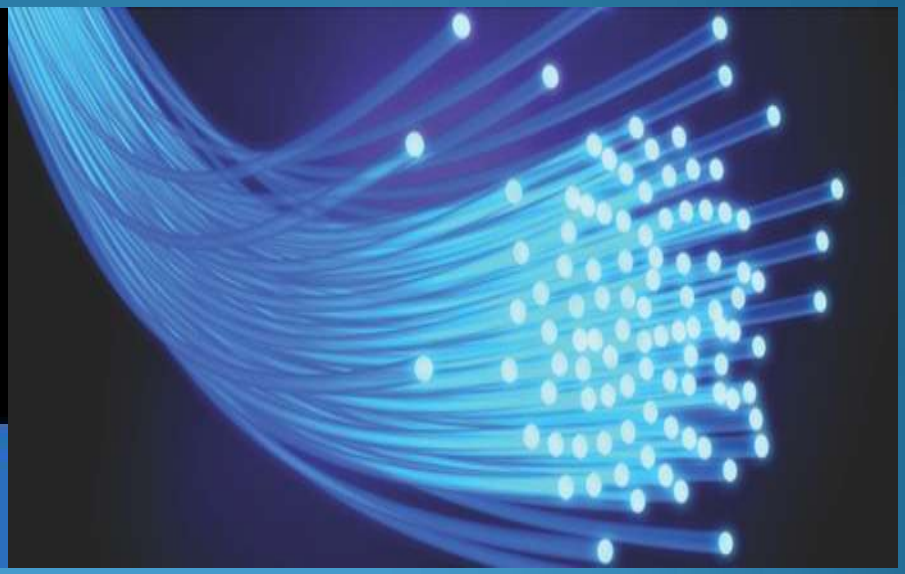
Projected Timeline

- **Ongoing Stakeholder Discussions** — April - May
- **RFI Issued to over 125 potential partners** — Responses due May 7th
- **Assess Partner RFI Responses** — End of May
- **Develop Technical Architecture and Business Model Recommendations** — End of June
- **Component Solicitations (engineering, design, placement, fiber, electronics, management)** — Mid July
- **Build and light** — Sept.'14–Dec'16

NG KIH

Project Proposal
The Kentucky Super I-WAY

The Center
for Rural Development

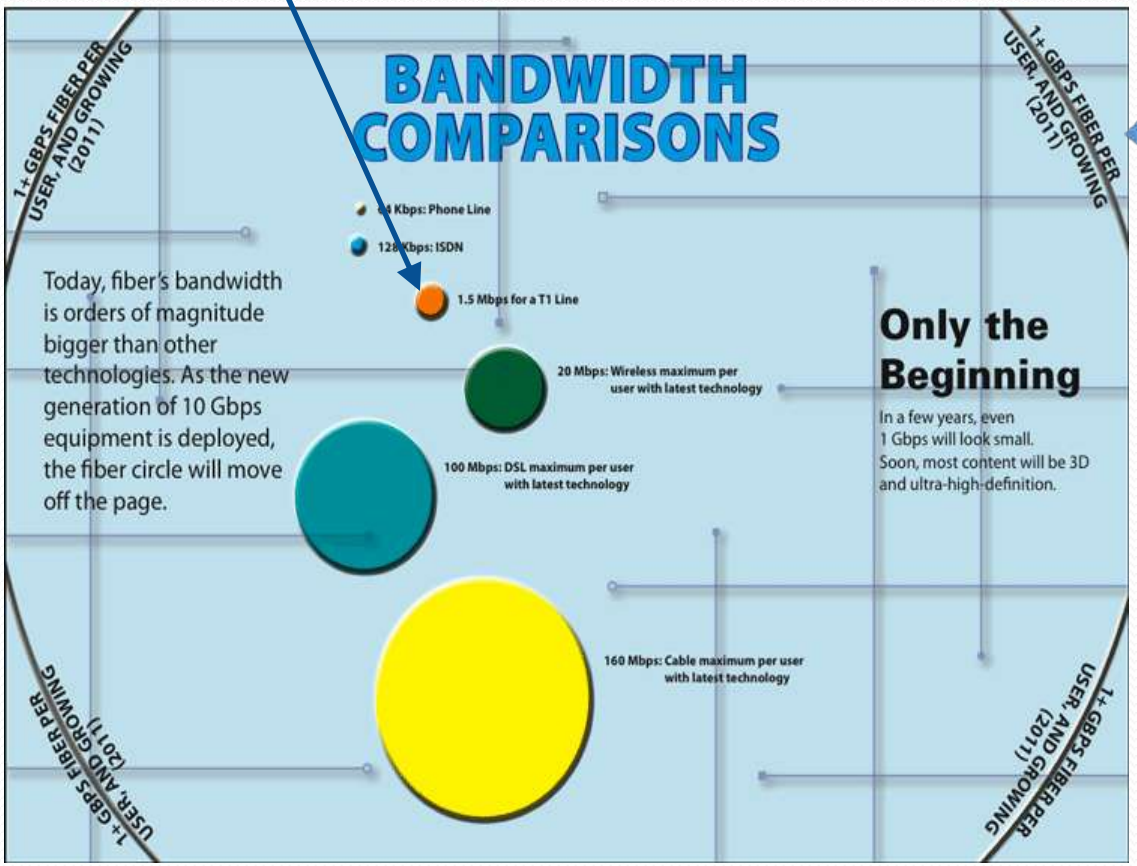


Leading The ARC Feasibility Study
The Center for Rural Development

- One of Kentucky's leading High-Technology Non-Profits
- We began managing Dark Fiber for Economic Development in 2005. Creating an "on-ramp to the Internet", in an empty field that soon became a Technology Park with over 700 jobs.
- The Center currently provides "Private Cloud" managed solutions to Education, Government and Business utilizing the latest technologies in redundant, High Speed Broadband delivery.

The fastest internet access most rural Kentucky communities can get is a T-1 line

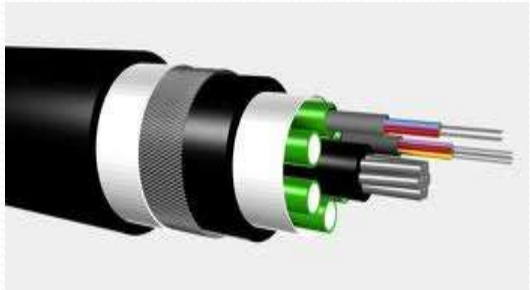
Most metro areas have access to Fiber and High Speed Broadband



The Center for Rural Development

What is dark fiber?

- **Dark fiber is a term used to describe fiber optic cable that is not being used at the time**
- **This is contrasted with active fiber optic cable, often referred to as lit cable**
- **Optical, physical connection between 2 or more locations**



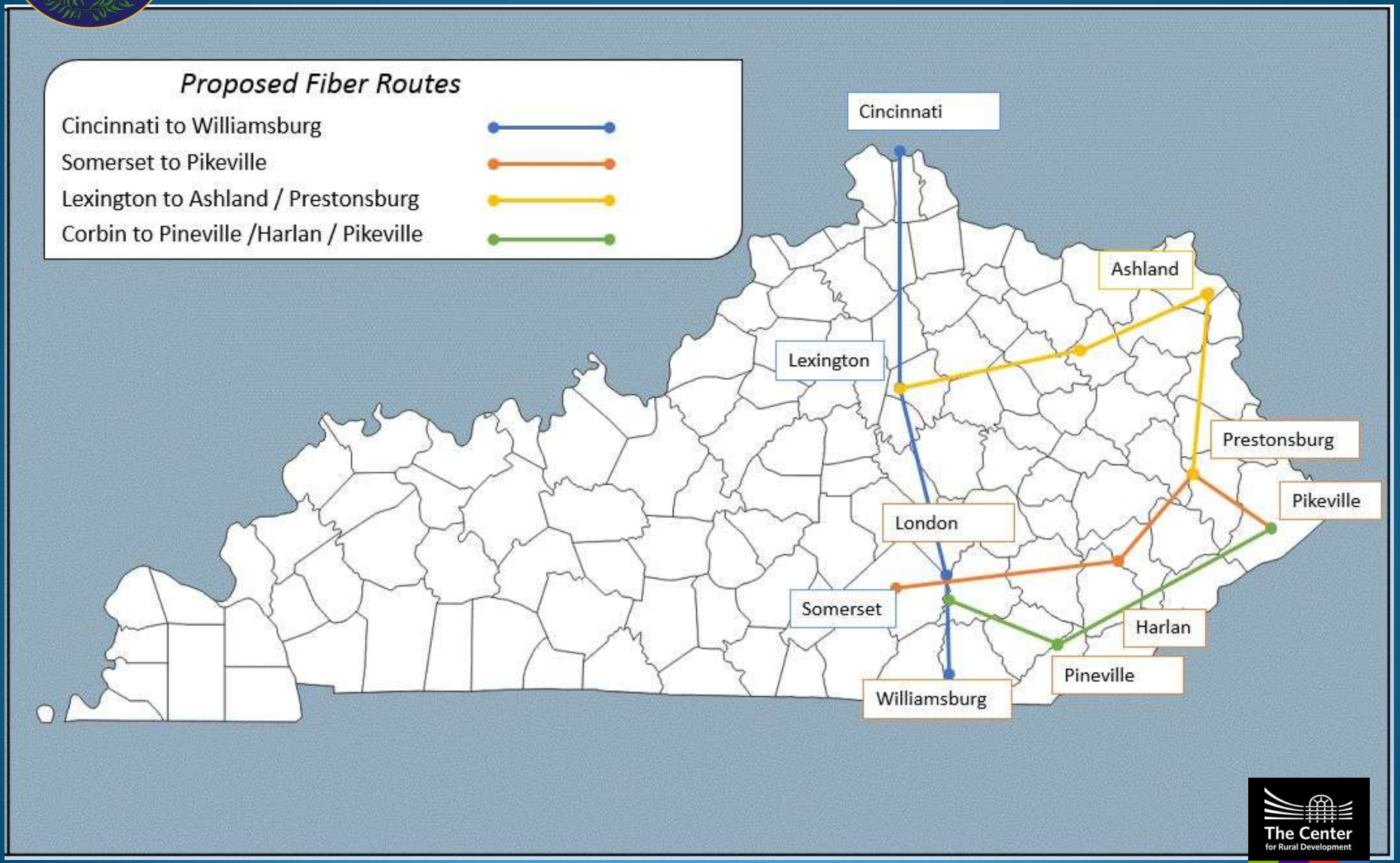
Dark Fiber

Can transform an Internet Back road

Into an Internet Super Highway

The Center for Rural Development

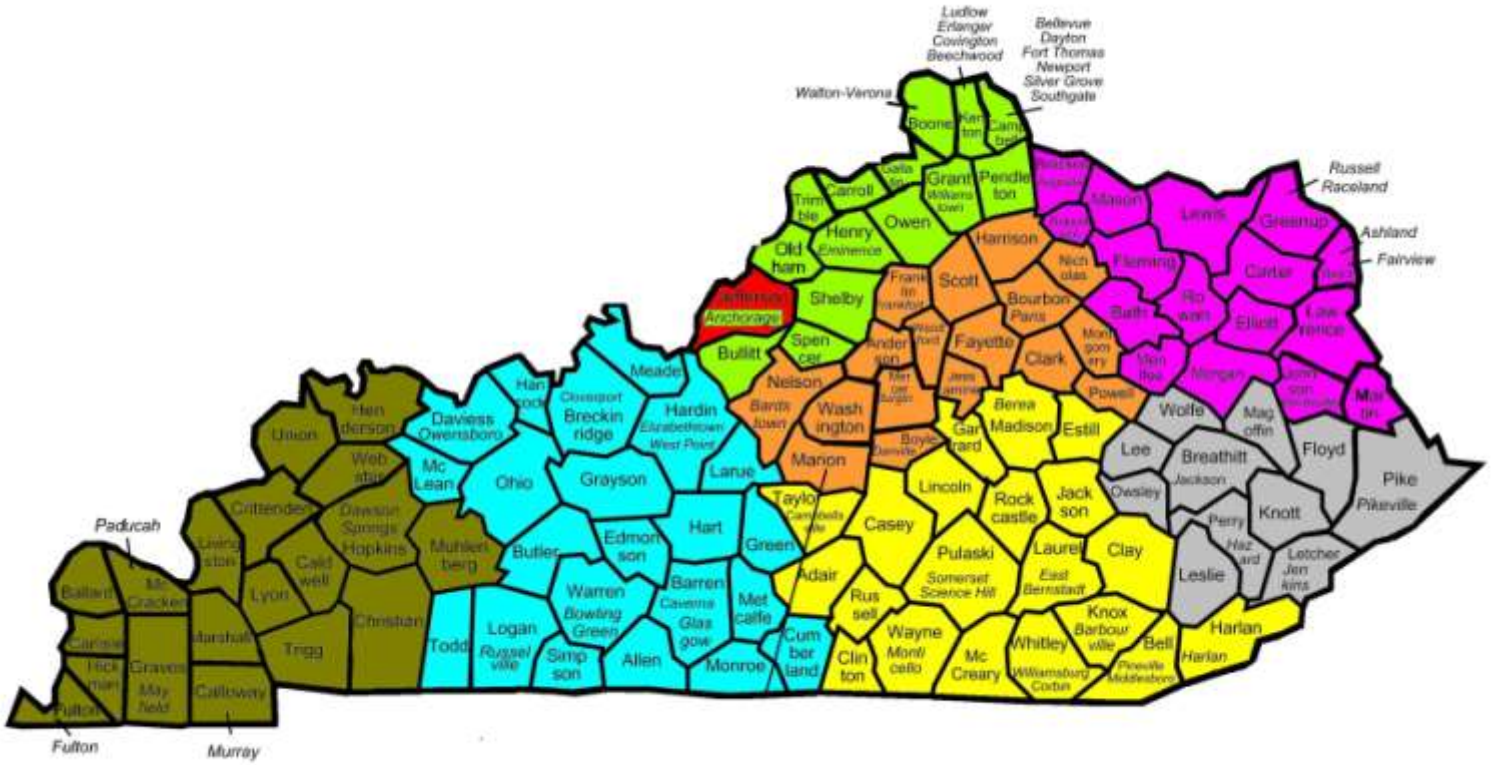
NG KIH


Proposed Fiber Routes
Cincinnati to Williamsburg
Somerset to Pikeville
Lexington to Ashland / Prestonsburg
Corbin to Pineville /Harlan / Pikeville
Cincinnati
Ashland
Lexington
Prestonsburg
Pikeville
London
Somerset
Harlan
Pineville
Williamsburg

Kentucky Department of Education

Overcoming the Digital Divide

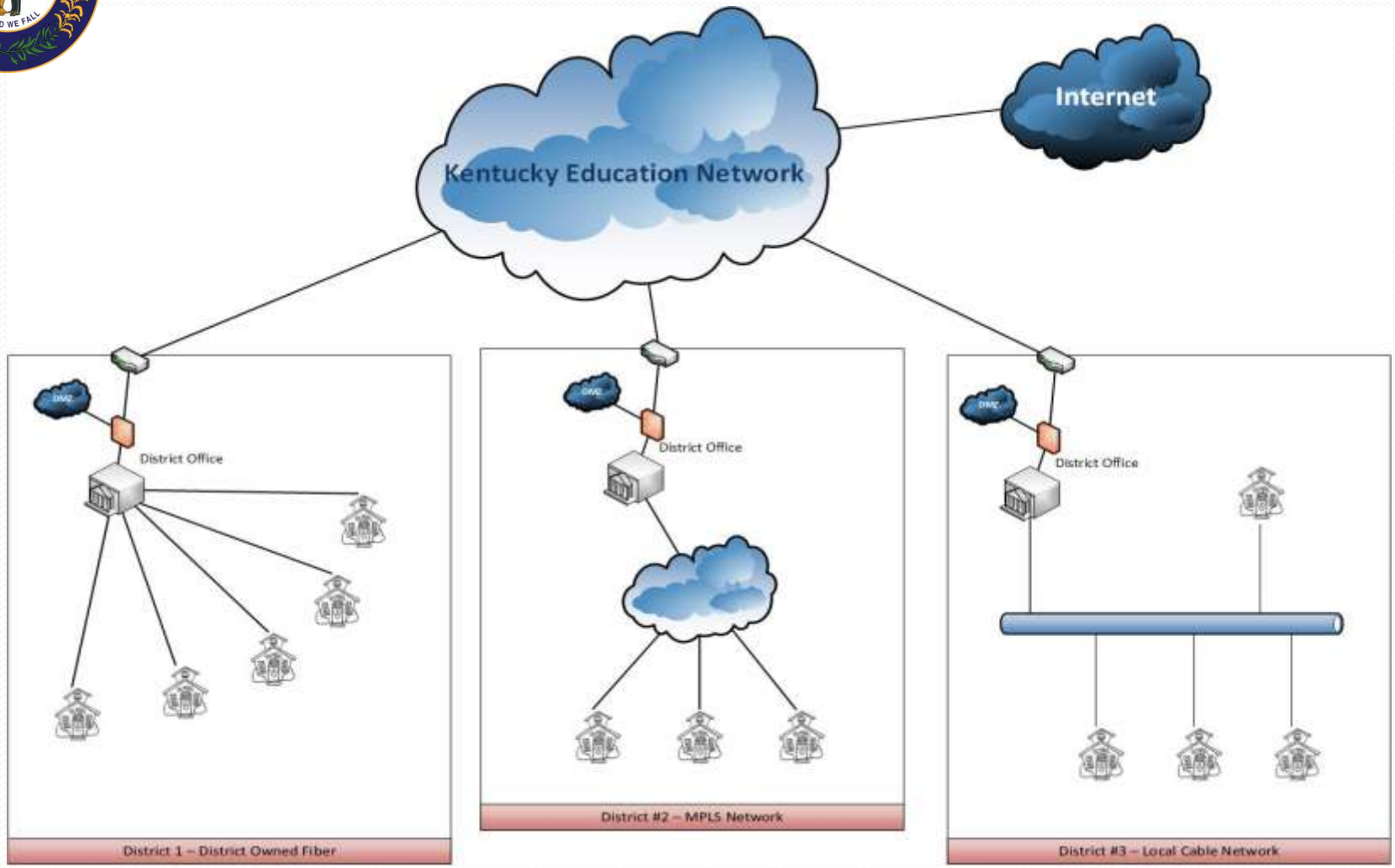
NG KIH



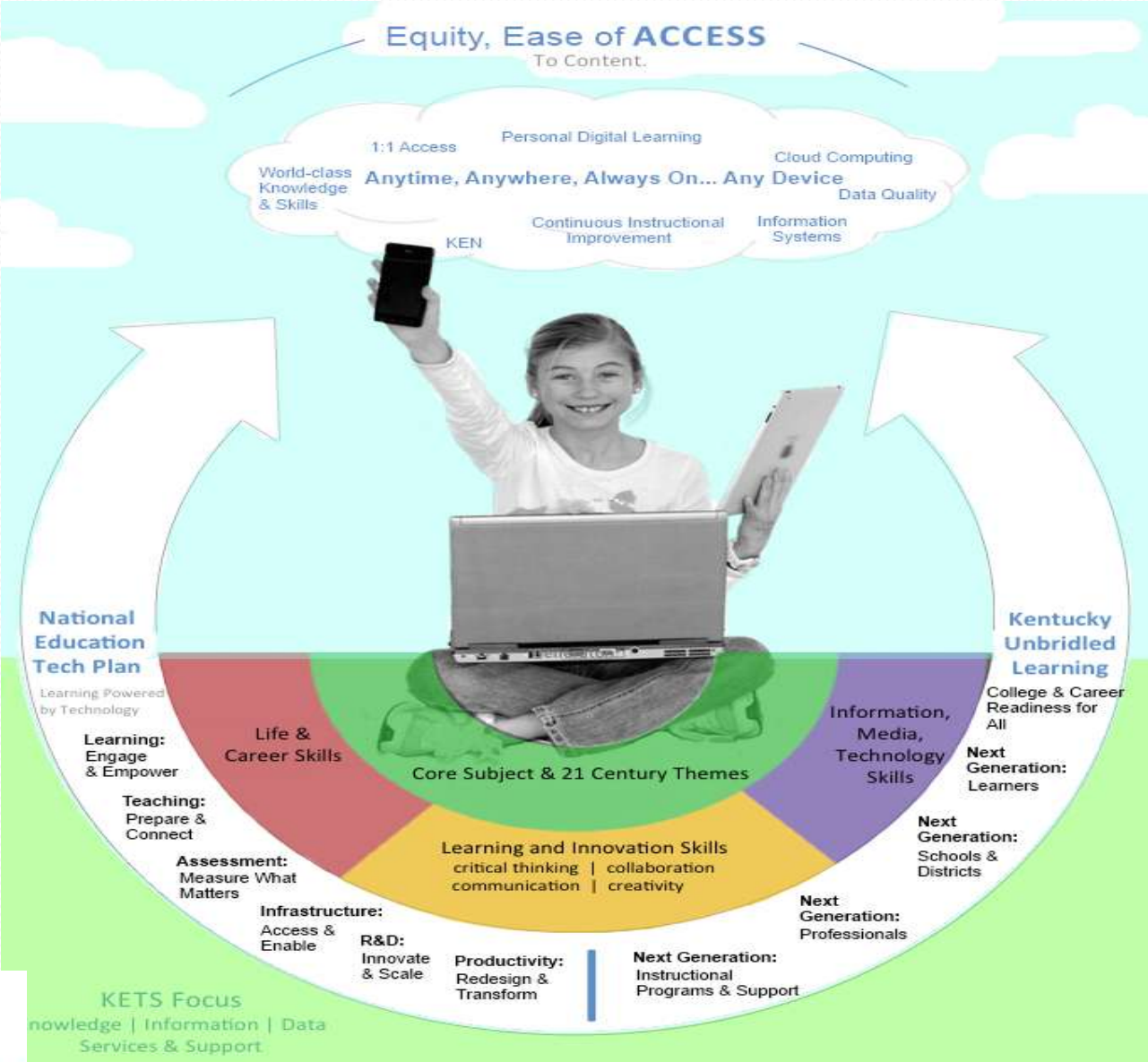
- **173 Districts**
- **1,233 Schools**
- **675,530 Students**
- **43,767 Teachers**

College/Career Readiness for All

NG KIH



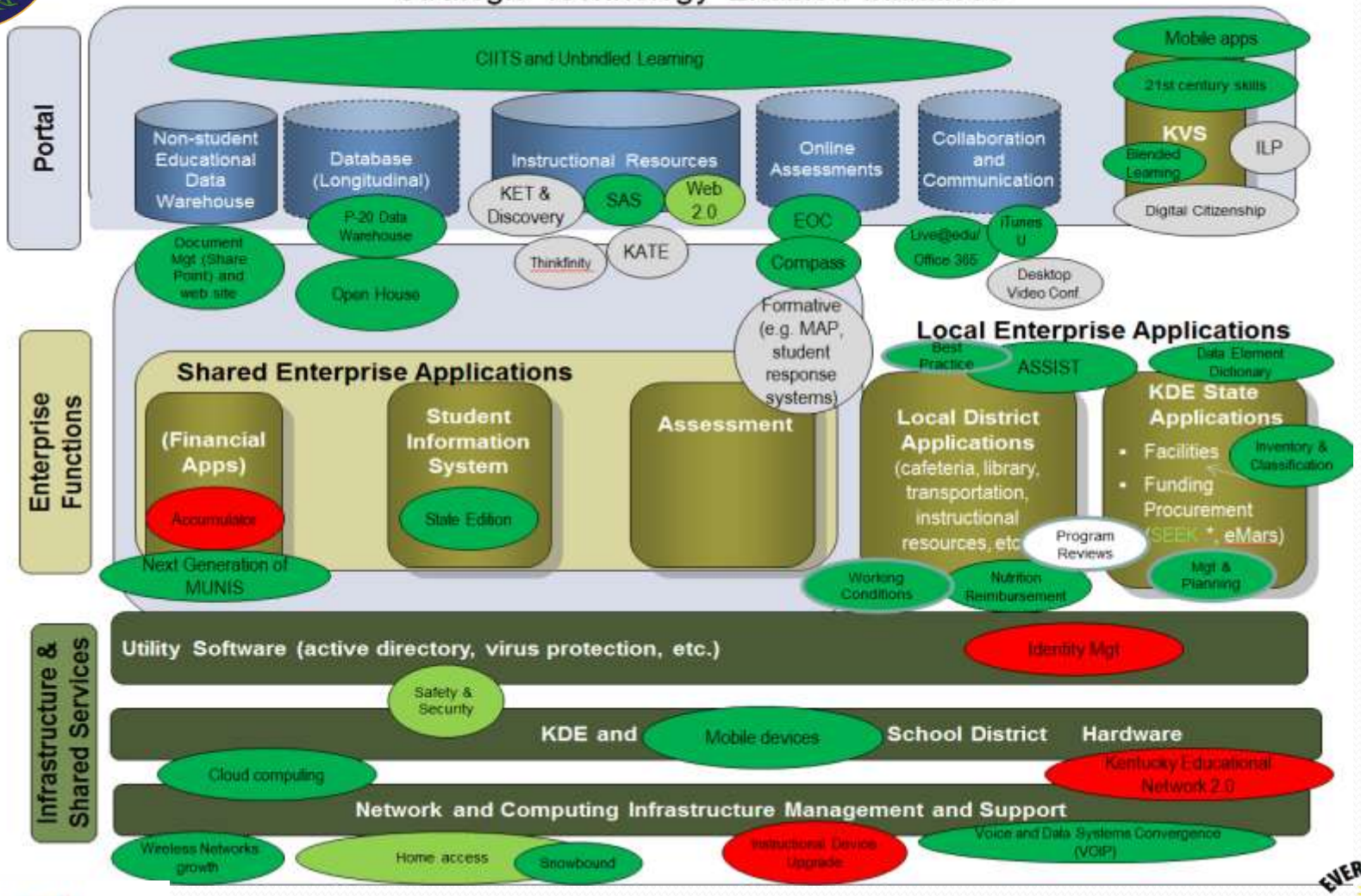
College/Career Readiness for All



UNBRIDLED LEARNING
College/Career Readiness for All

EVERY CHILD
PROFICIENT & PREPARED FOR SUCCESS
KENTUCKY DEPARTMENT OF EDUCATION

Strategic Technology Enabled Initiatives



College/Career Readiness for All

KETS Major Achievements Since 1992

- 1st state to have all districts and schools connected to the Internet.
- Top state in equity of access and services.
- Top state in K-12 cloud based computing.
- Top state in K-12 product standards.
- Top 5 state in access and use in instruction.
- Top 10 state in data quality.
- Top state stewardship of taxpayer funds.
- Kentucky Top 10 state in education quality.

Next Generation Kentucky Education Network (KEN) Kentucky Information Highway

- **"First Wave" bandwidth upgrades for all districts to minimum of 50K/student (due for completion before FY14/15 school year)**
- **"Second Wave" bandwidth upgrades for all districts to a minimum of 100K/student (targeted for completion before FY15/16 school year)**
- **Internet Management**
  - ***Bandwidth Utilization***
  - ***Bandwidth Control/Shaping***
  - ***User Monitoring (CIPA, Filtering)***
  - ***Cyber Protection***
  - ***Caching***
- **Reliability a Must for Daily Instructional Use**
- **Performance a Must for Teacher & Student Engagement**

NG KIH

KENTUCKY COUNCIL ON POSTSECONDARY EDUCATION

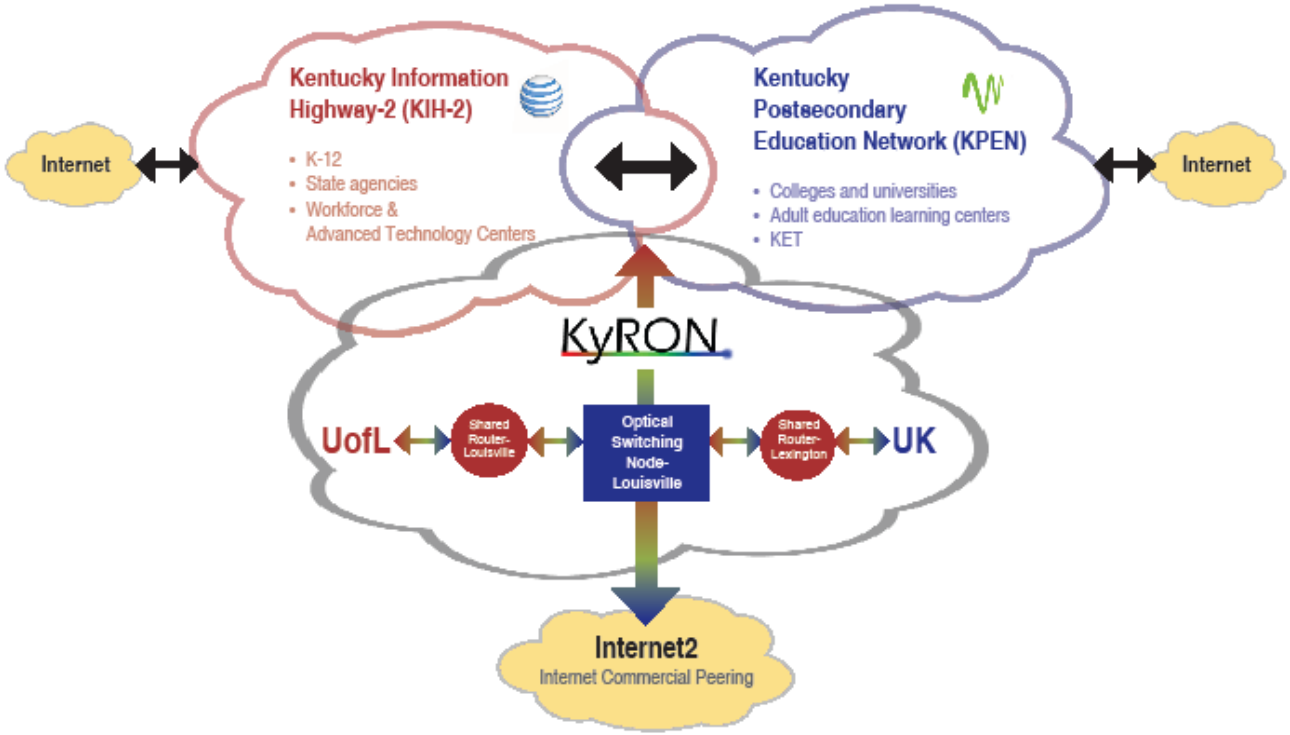
KyRON

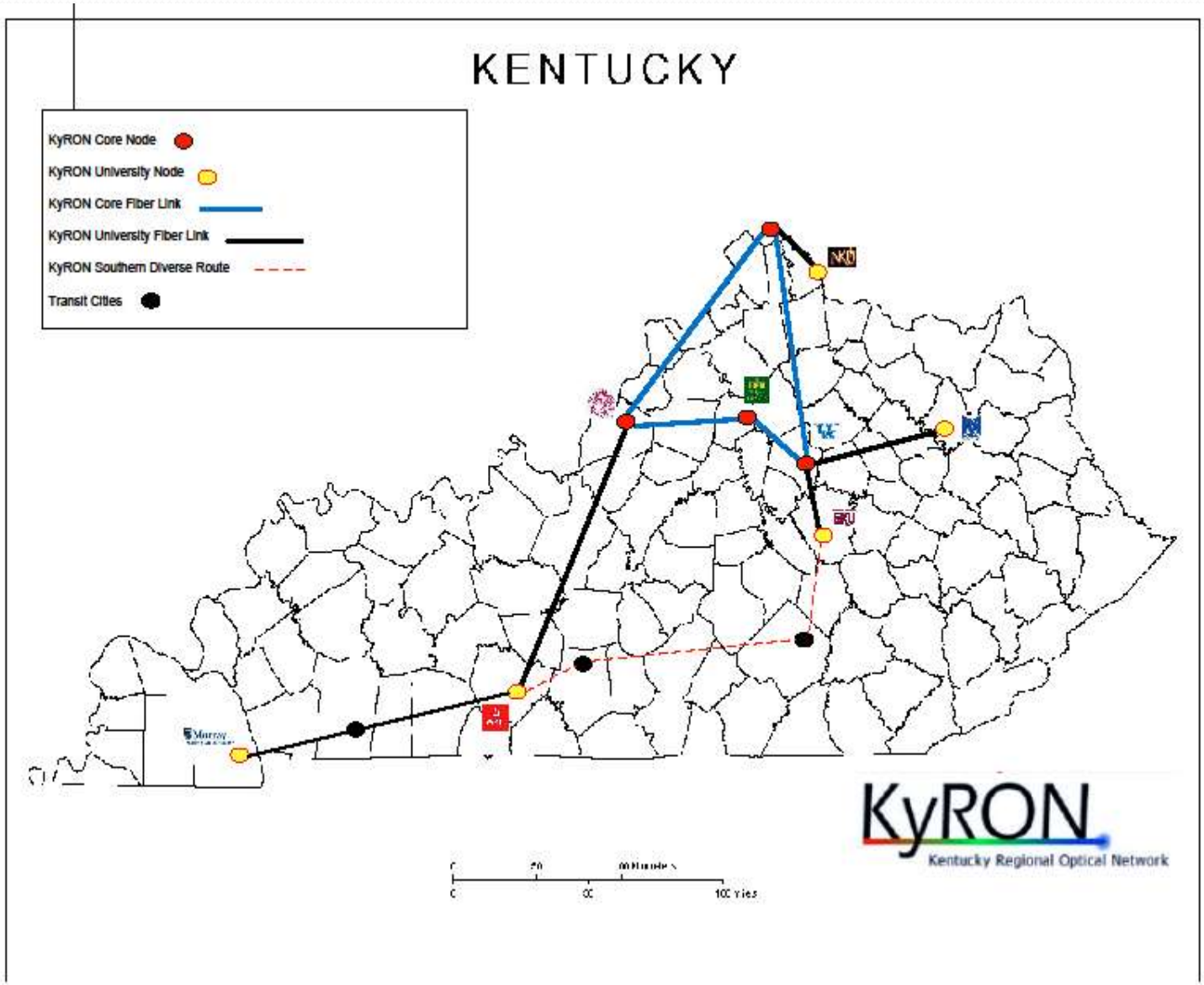
Vision

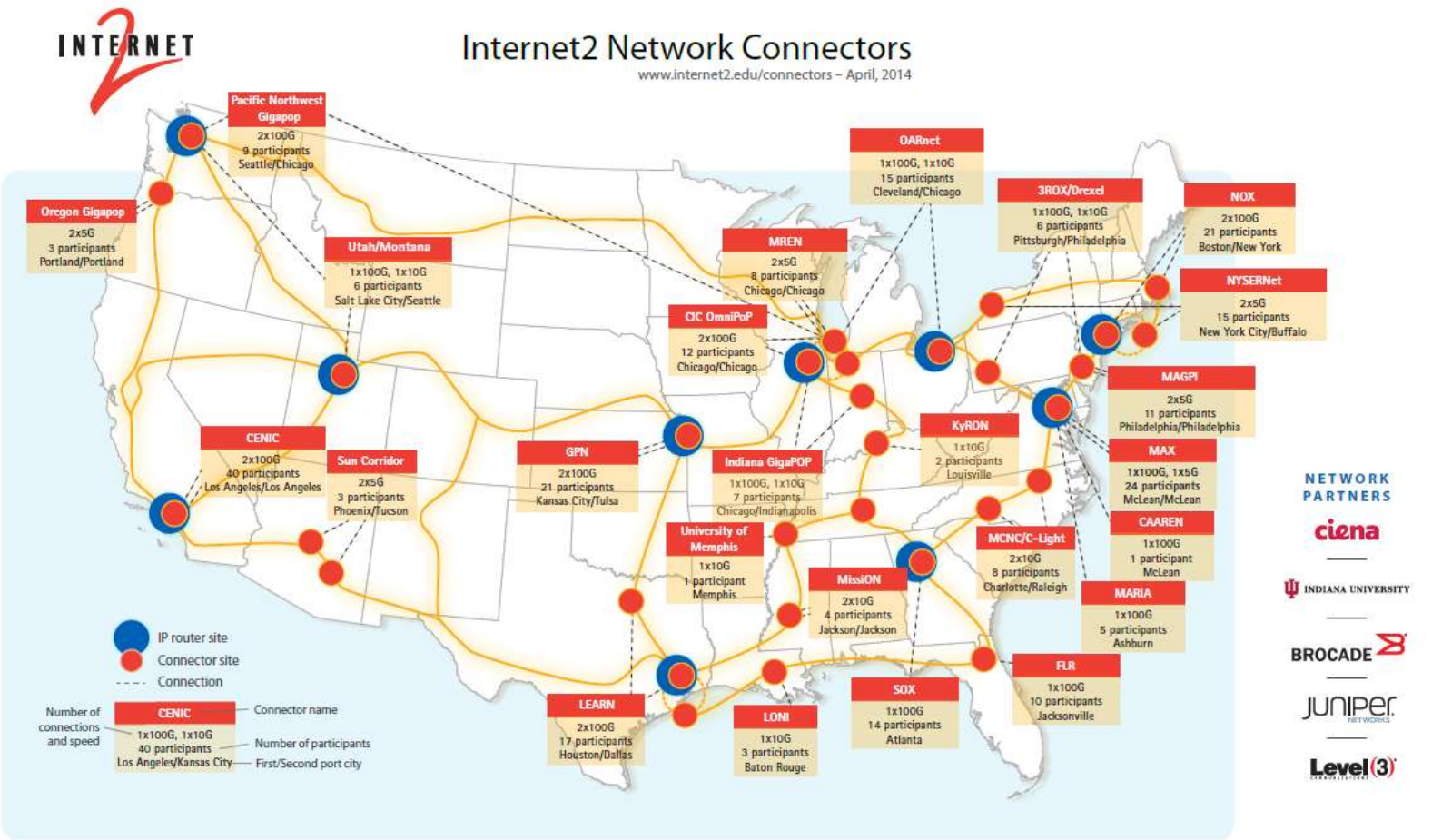
- KyRON serves the Kentucky Postsecondary Research and Education Community
- And Community Anchor Institutions
- And provides infrastructure for Kentucky's economic development
- On a fiber backbone to higher education institutions who provide outreach and support in their geographic areas
- With statewide leadership from postsecondary education

KyRON

KENTUCKY EDUCATION NETWORK



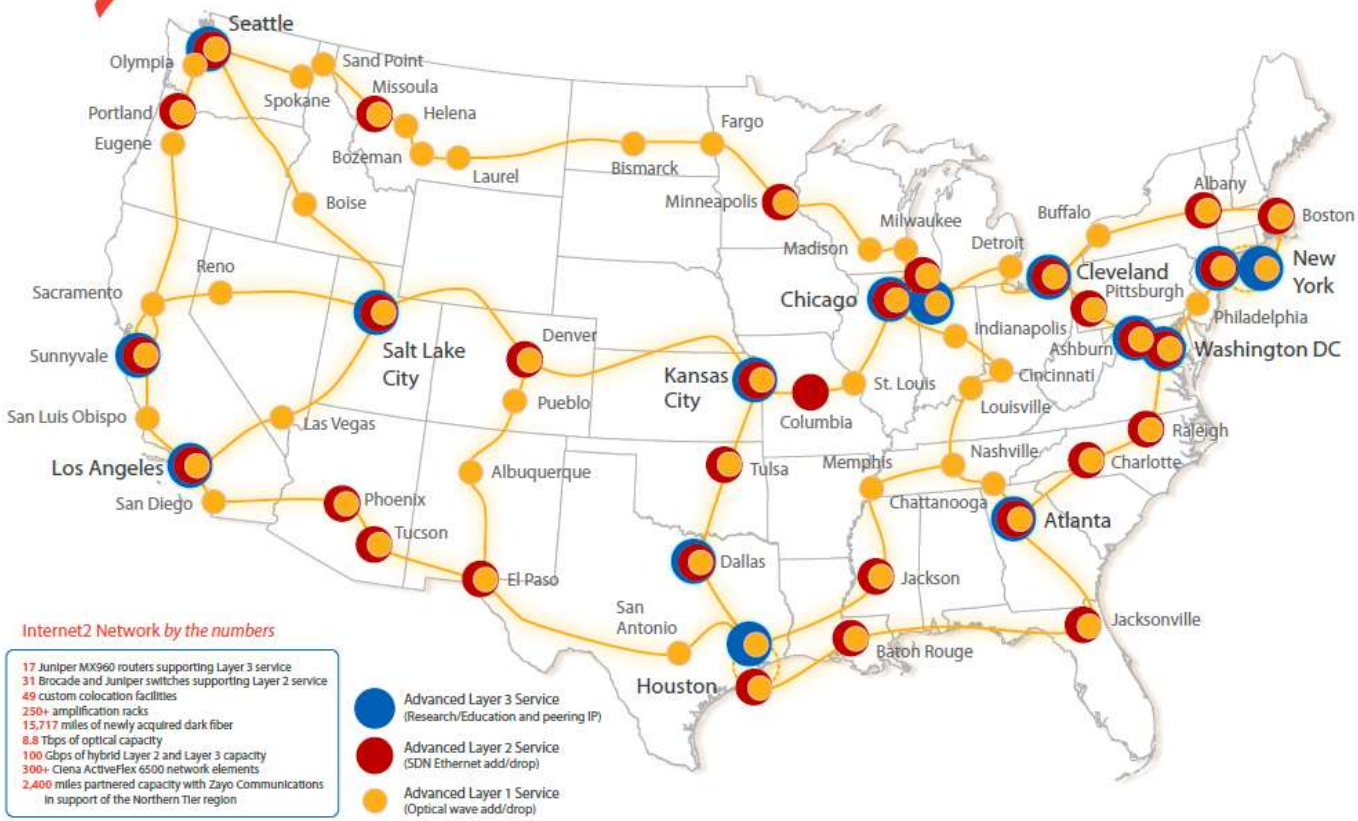

KENTUCKY
KyRON Core Node
KyRON University Node
KyRON Core Fiber Link
KyRON University Fiber Link
KyRON Southern Diverse Route
Transit Cities
NKU
EKU
Murray
KyRON
Kentucky Regional Optical Network


INTERNET 2
Internet2 Network Connectors
www.internet2.edu/connectors – April, 2014
Pacific Northwest Gigapop
2x100G
9 participants
Seattle/Chicago
Oregon Gigapop
2x5G
3 participants
Portland/Portland
Utah/Montana
1x100G, 1x10G
6 participants
Salt Lake City/Seattle
CENIC
2x100G
40 participants
Los Angeles/Los Angeles
Sun Corridor
2x5G
3 participants
Phoenix/Tucson
GPN
2x100G
21 participants
Kansas City/Tulsa
MREN
2x5G
8 participants
Chicago/Chicago
CIC OmniPoP
2x100G
12 participants
Chicago/Chicago
Indiana GigaPOP
1x100G, 1x10G
7 participants
Chicago/Indianapolis
University of Memphis
1x10G
1 participant
Memphis
OARnet
1x100G, 1x10G
15 participants
Cleveland/Chicago
3ROX/Drexel
1x100G, 1x10G
6 participants
Pittsburgh/Philadelphia
NOX
2x100G
21 participants
Boston/New York
NYSERNet
2x5G
15 participants
New York City/Buffalo
MAGPI
2x5G
11 participants
Philadelphia/Philadelphia
KyRON
1x10G
2 participants
Louisville
MAX
1x100G, 1x5G
24 participants
McLean/McLean
CAAREN
1x100G
1 participant
McLean
MCNC/C-Light
2x10G
8 participants
Charlotte/Raleigh
MARIA
1x100G
5 participants
Ashburn
MissiON
2x10G
4 participants
Jackson/Jackson
FLR
1x100G
10 participants
Jacksonville
SOX
1x100G
14 participants
Atlanta
LEARN
2x100G
17 participants
Houston/Dallas
LONI
1x10G
3 participants
Baton Rouge
IP router site
Connector site
Connection
Number of connections and speed
CENIC
1x100G, 1x10G
40 participants
Los Angeles/Kansas City
Connector name
Number of participants
First/Second port city
NETWORK PARTNERS
ciena
INDIANA UNIVERSITY
BROCADE
juniper NETWORKS
Level(3)

KyRON

Internet2 Network Infrastructure Topology

April 2014



Internet2 Network *by the numbers*

- 17 Juniper MX960 routers supporting Layer 3 service
- 31 Brocade and Juniper switches supporting Layer 2 service
- 49 custom colocation facilities
- 250+ amplification racks
- 15,717 miles of newly acquired dark fiber
- 8.8 Tbps of optical capacity
- 100 Gbps of hybrid Layer 2 and Layer 3 capacity
- 300+ Ciena ActiveFlex 6500 network elements
- 2,400 miles partnered capacity with Zayo Communications in support of the Northern Tier region

- Advanced Layer 3 Service (Research/Education and peering IP)
- Advanced Layer 2 Service (SDN Ethernet add/drop)
- Advanced Layer 1 Service (Optical wave add/drop)

IN SUPPORT OF U.S.UCAN

NETWORK PARTNERS

ciena

cisco

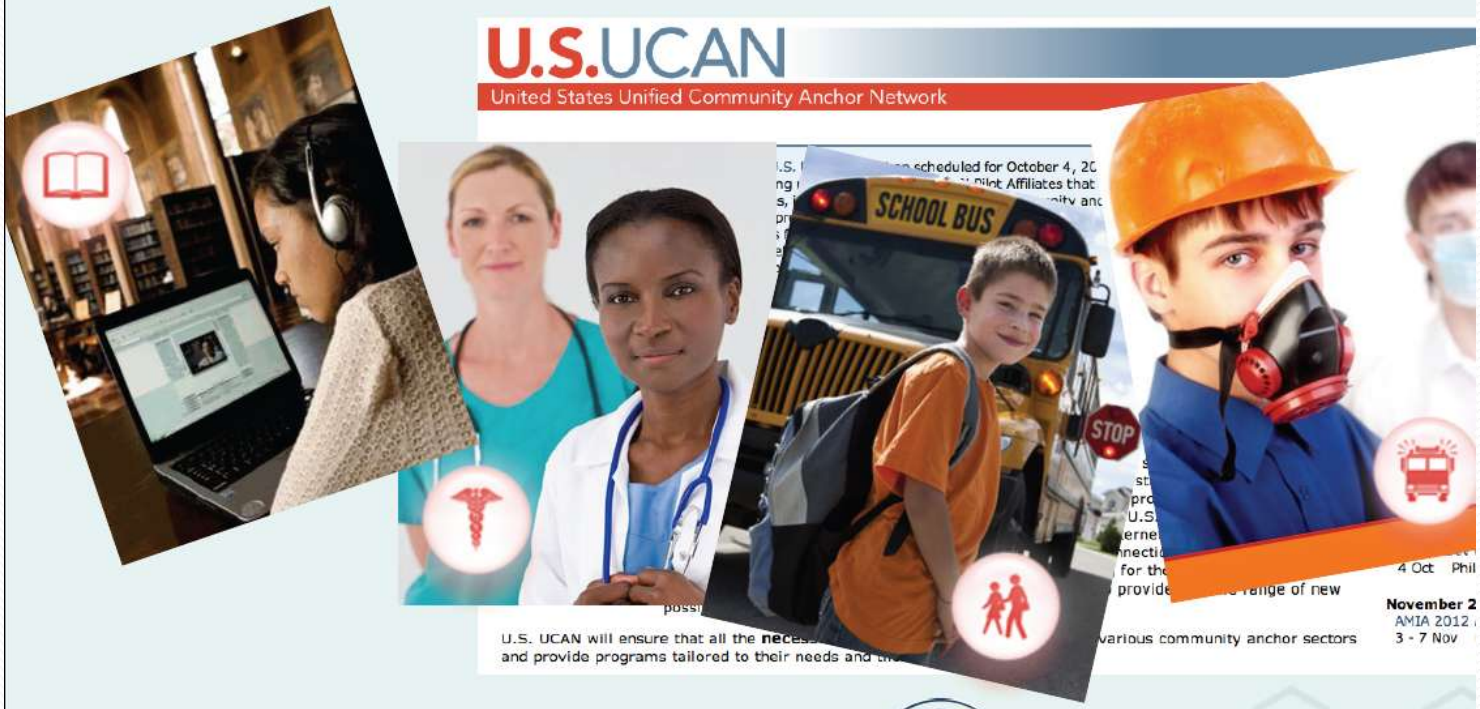
INDIANA UNIVERSITY

infinera

juniper

U.S.UCAN

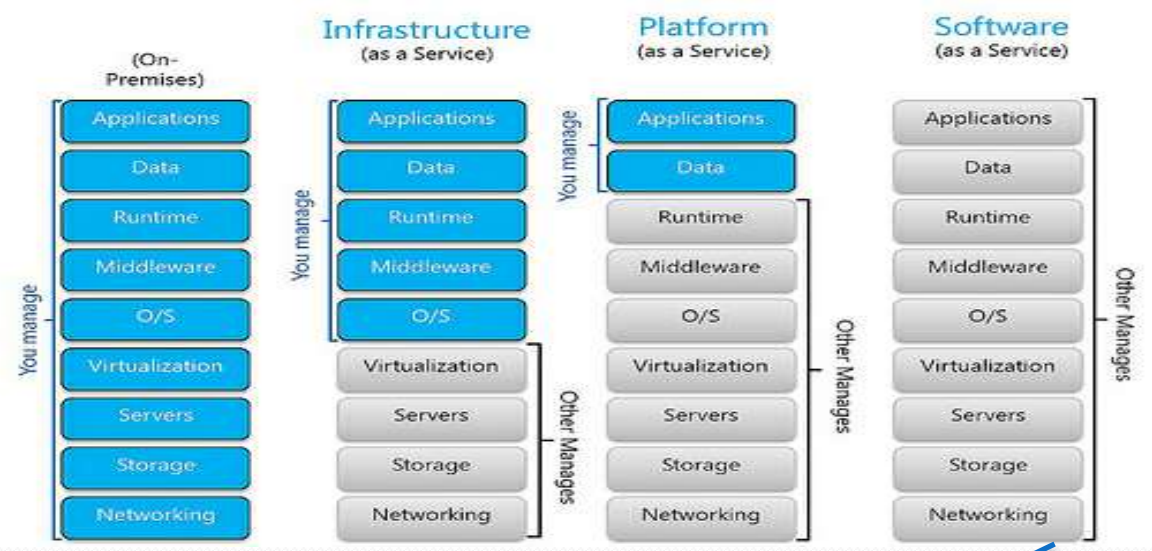
Internet2 Project U.S. UCAN

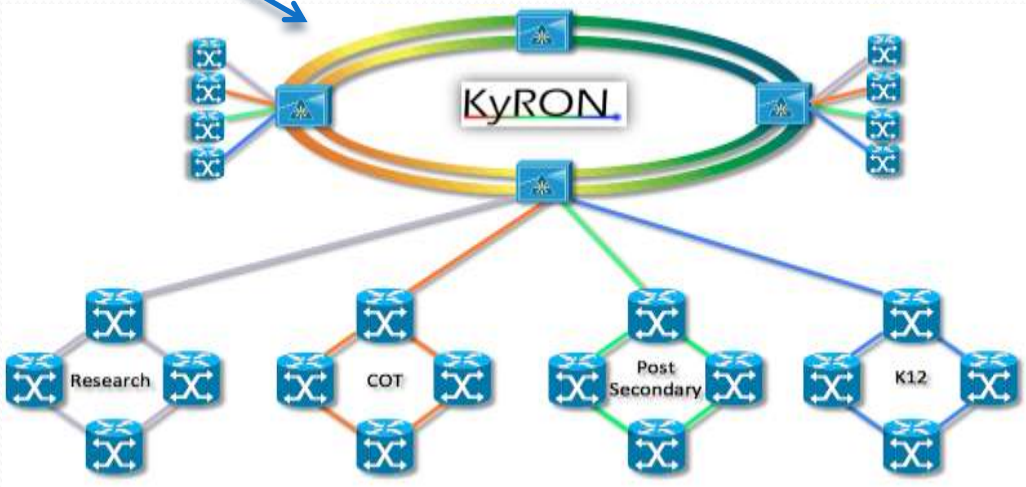


All the power of the Internet2 community—delivered to community anchor institutions across the country

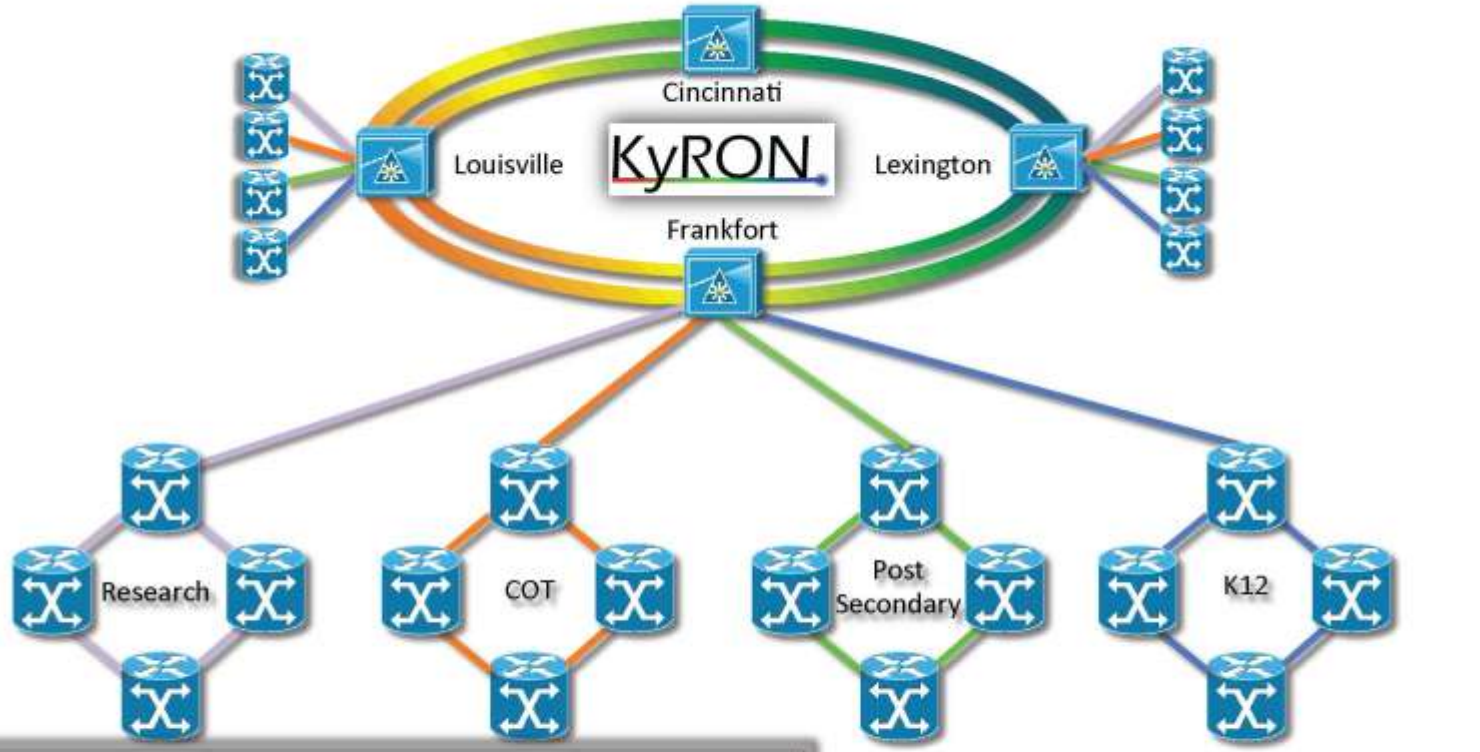
September 16, 2013 © 2013 Internet2

KyRON Integration Enable All Models

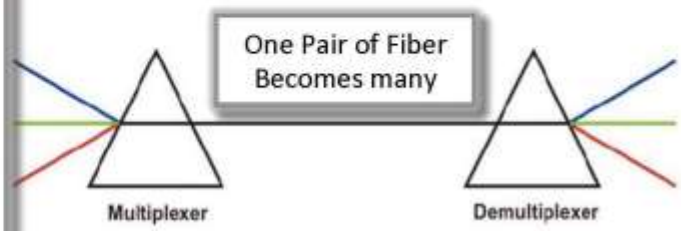




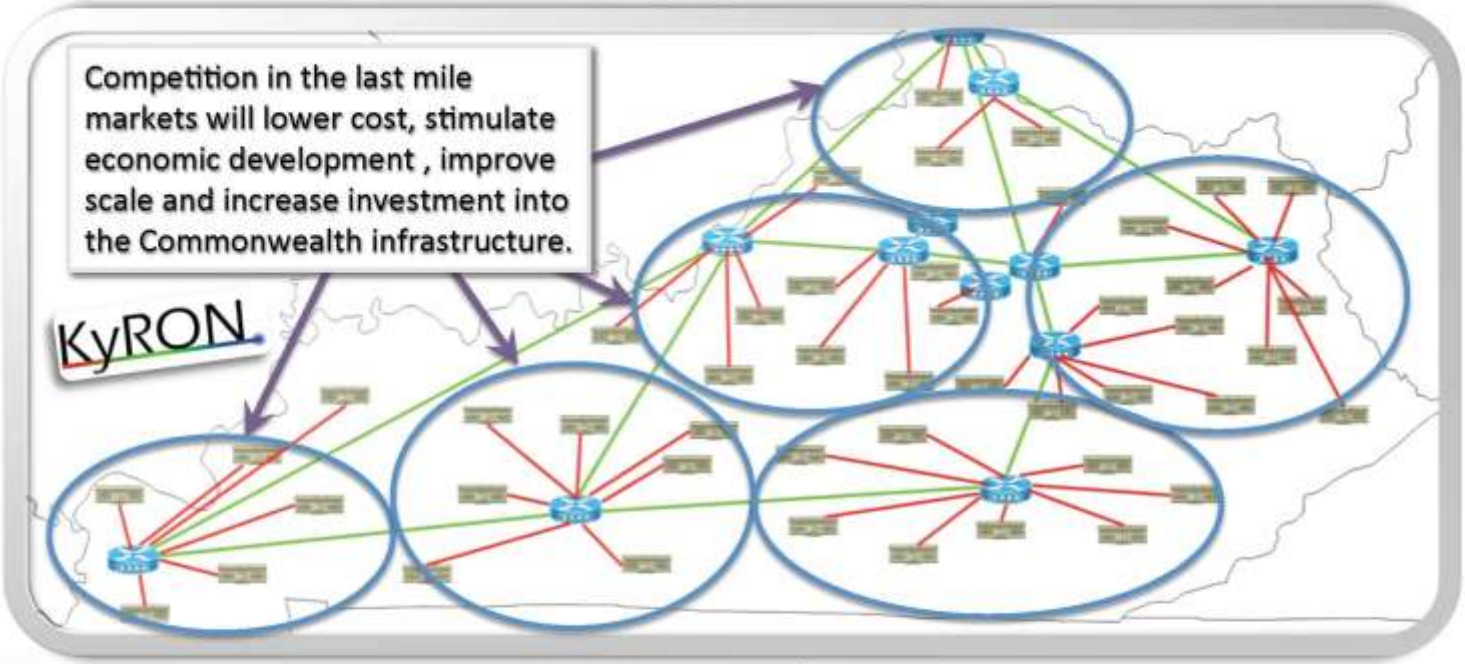
A Flexible and Scalable Fiber Network for All Stakeholders of the Commonwealth



- All tenants are completely autonomous and unaware of one another from layer 1 up.
- There is such a complete isolation between tenants, many of the links we lease in the state are being traded between carriers in this exact fashion.



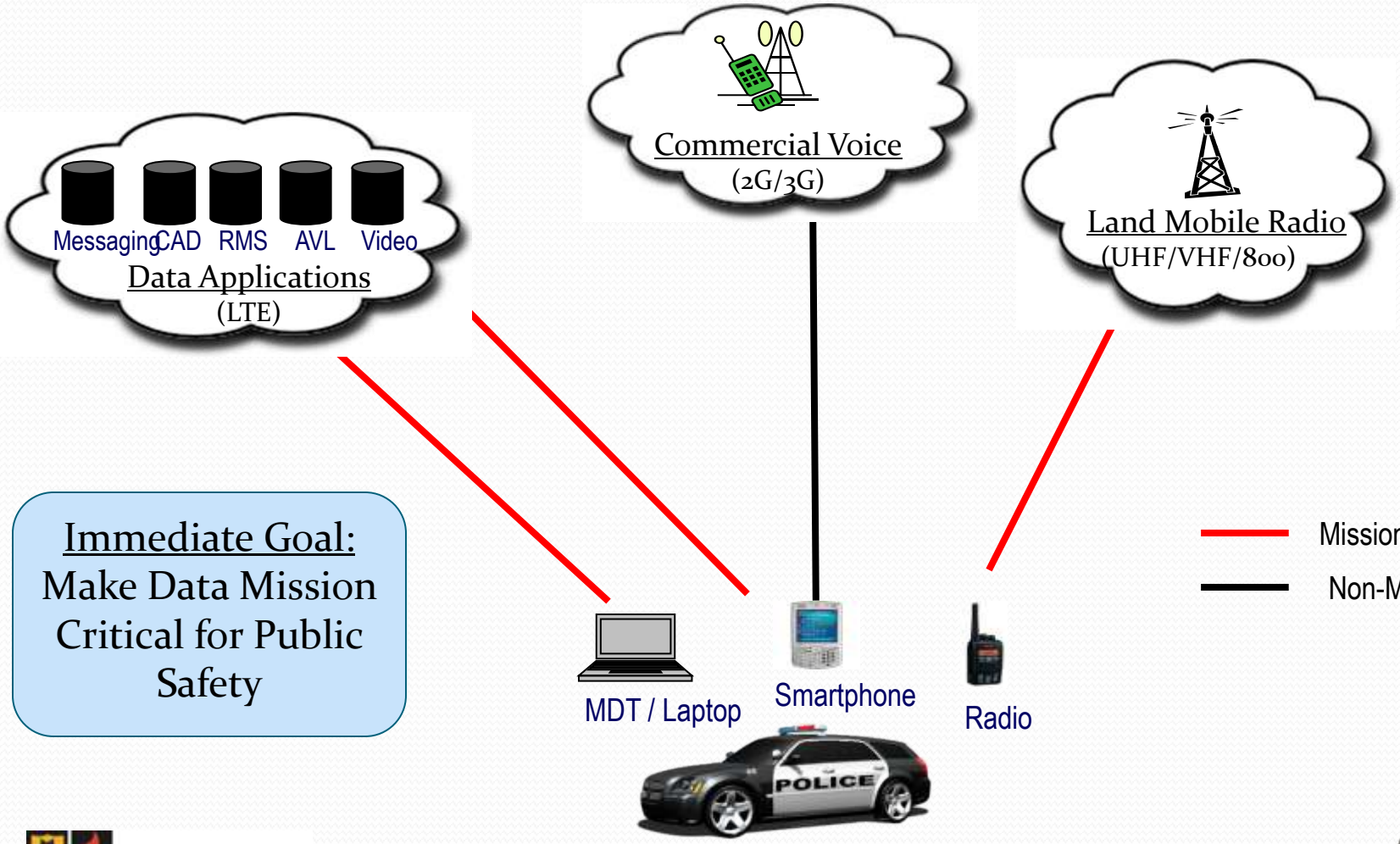
Planned Usage for the Commonwealth of the KyRON Backbone



- 39 other states have regional networks that partner and serve community anchor institutes.
- The concept has been adopted by our neighboring states WV, OH, IN, VA, IL and MO.
- Many states use a last mile broker to find savings and improve service delivery including e-Rate brokerage.

- Community Anchor Institutions
- KyRON POPs
- KyRON Backbone
- Carriers Competing and Postalized e-Rate

Kentucky State Police



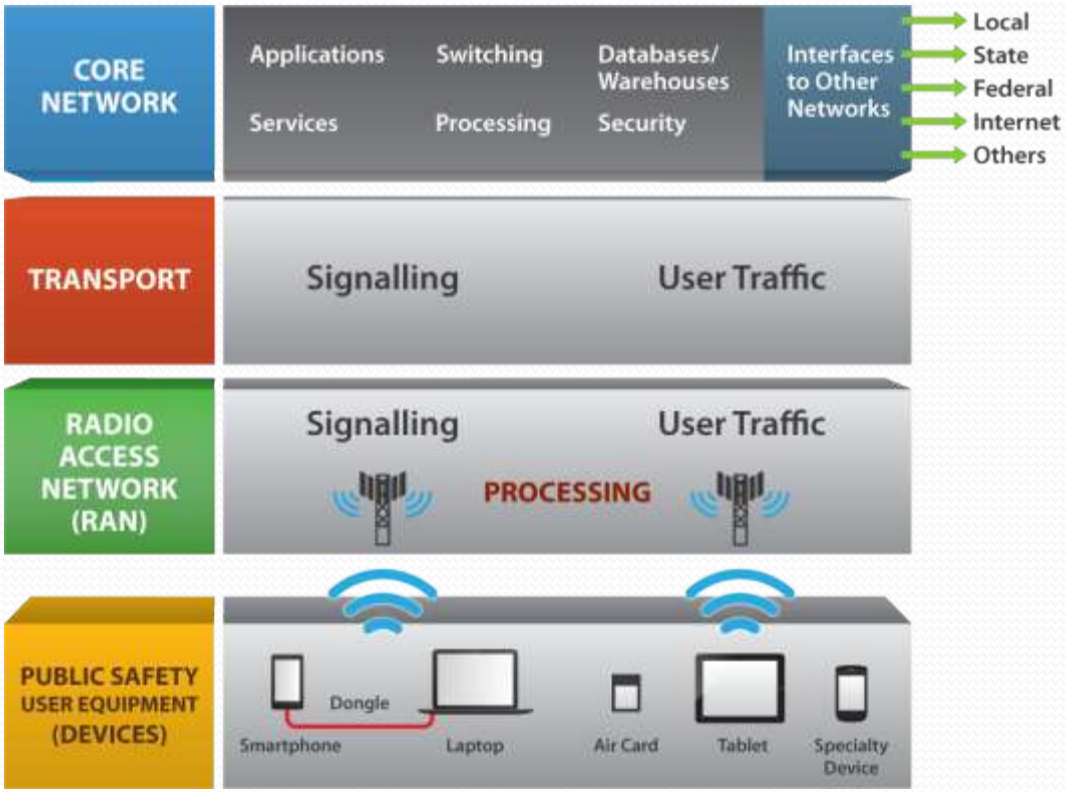
Immediate Goal:
Make Data Mission Critical for Public Safety

FirstNet

Basic LTE Network Components & Potential State Assets

The network has 4 basic Components:

1. **Core Network** Evolved Packet Core (EPC) or "Core"
2. **Transport** "Backhaul"
3. **Radio Access Network** (RAN) or "Radio Sites"
4. **User Equipment** (UE) or "User Device"



FirstNet Vision of the Consultation and Design Process

Initiation

- **Initial Consultation** *(Aligned with SLIGP Phase 1)*

Design

- **State RAN Design** *(Iterative Design Reviews)*
- **Asset Identification & Selection** *(Aligned with SLIGP Phase 2)*
- **State Operations** *(National Template Customized by State)*

Approval

- **Final State Plan** *(Presented to Governor)*

PSAC | Tribal Working Group | NTIA SLIGP Monitoring/Support | ECPC Federal Agency Inputs

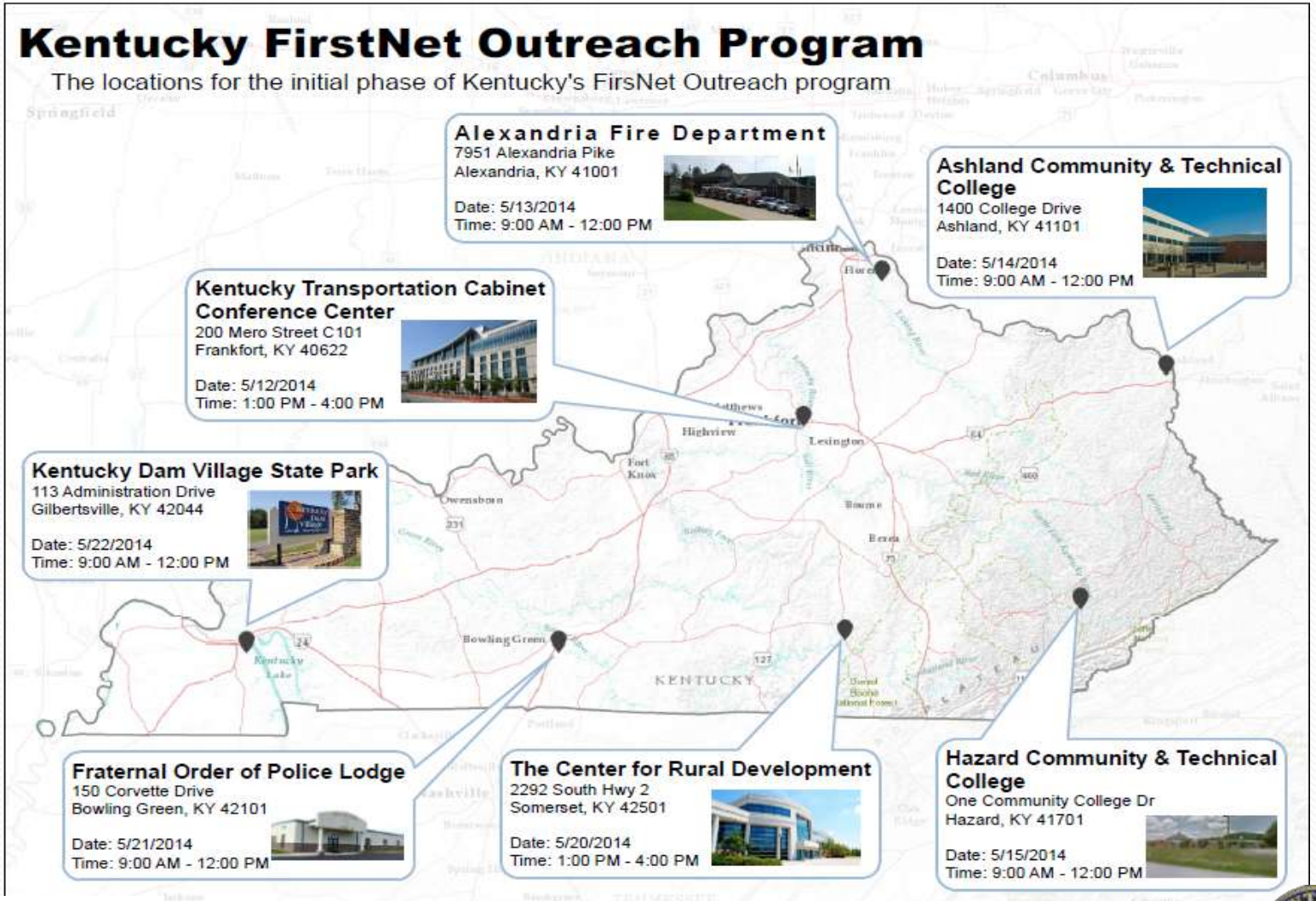
Preliminary Design Review	Intermediate Design Review	Draft State Plan Review
Based on coverage and users from coverage baseline Preliminary infrastructure estimates	Incorporates revisions from Preliminary Design Review Targets best value sites from asset data collection Incorporates RFP/ partnering information	Incorporates revisions from Intermediate Design Review Includes tradeoffs/ prioritization based on state plan

FirstNet

Action Plan

- **Perform a geographically –based needs assessment** to compile PS broadband coverage/capacity needs; will drive RAN design
- **Maximize the use of existing assets**: both government and commercial (part of outreach and data collection);
- **Coordinate and negotiate network design** and business plan with FirstNet
- **Provide completed plan and recommendations to the Governor**

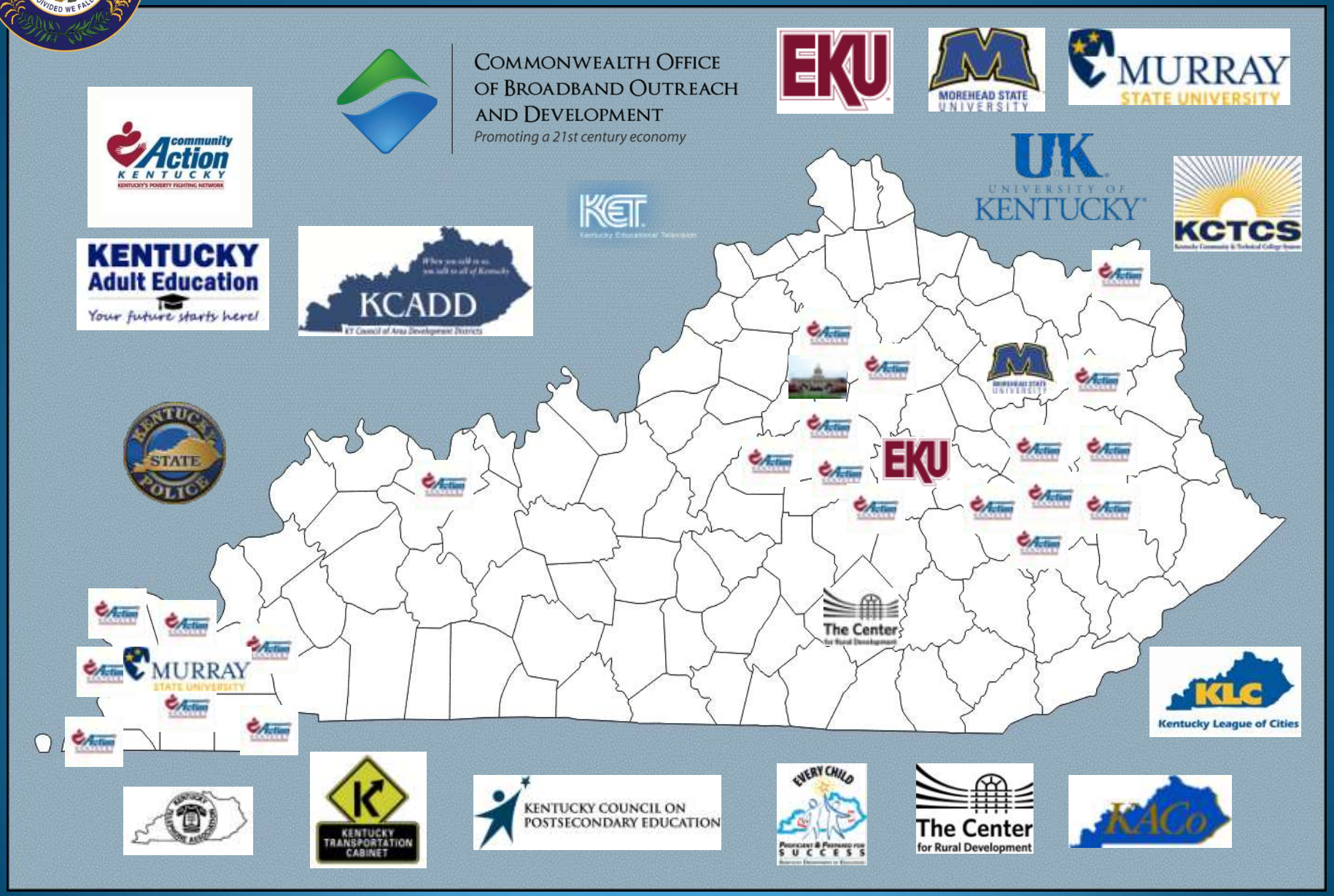
Education and Outreach Locations



Commonwealth Office of Broadband Outreach and Development

Promoting a 21st century economy

NG KIH


Commonwealth Office of Broadband Outreach and Development
Promoting a 21st century economy
EKU
Morehead State University
Murray State University
UK University of Kentucky
KCTCS
KET
Kentucky Educational Television
Community Action Kentucky
Kentucky's Poverty Fighting Network
Kentucky Adult Education
Your future starts here!
KCADD
KY Council of Area Development Districts
Kentucky State Police
The Center for Rural Development
KLC
Kentucky League of Cities
Kentucky Transportation Cabinet
Kentucky Council on Postsecondary Education
Every Child Prepared & Prepared for Success
KACo

COMMONWEALTH OFFICE
OF BROADBAND OUTREACH
AND DEVELOPMENT
Promoting a 21st century economy

This technology has the potential to touch the life of every citizen of Kentucky.

Telehealth **Economic Development** **Education**

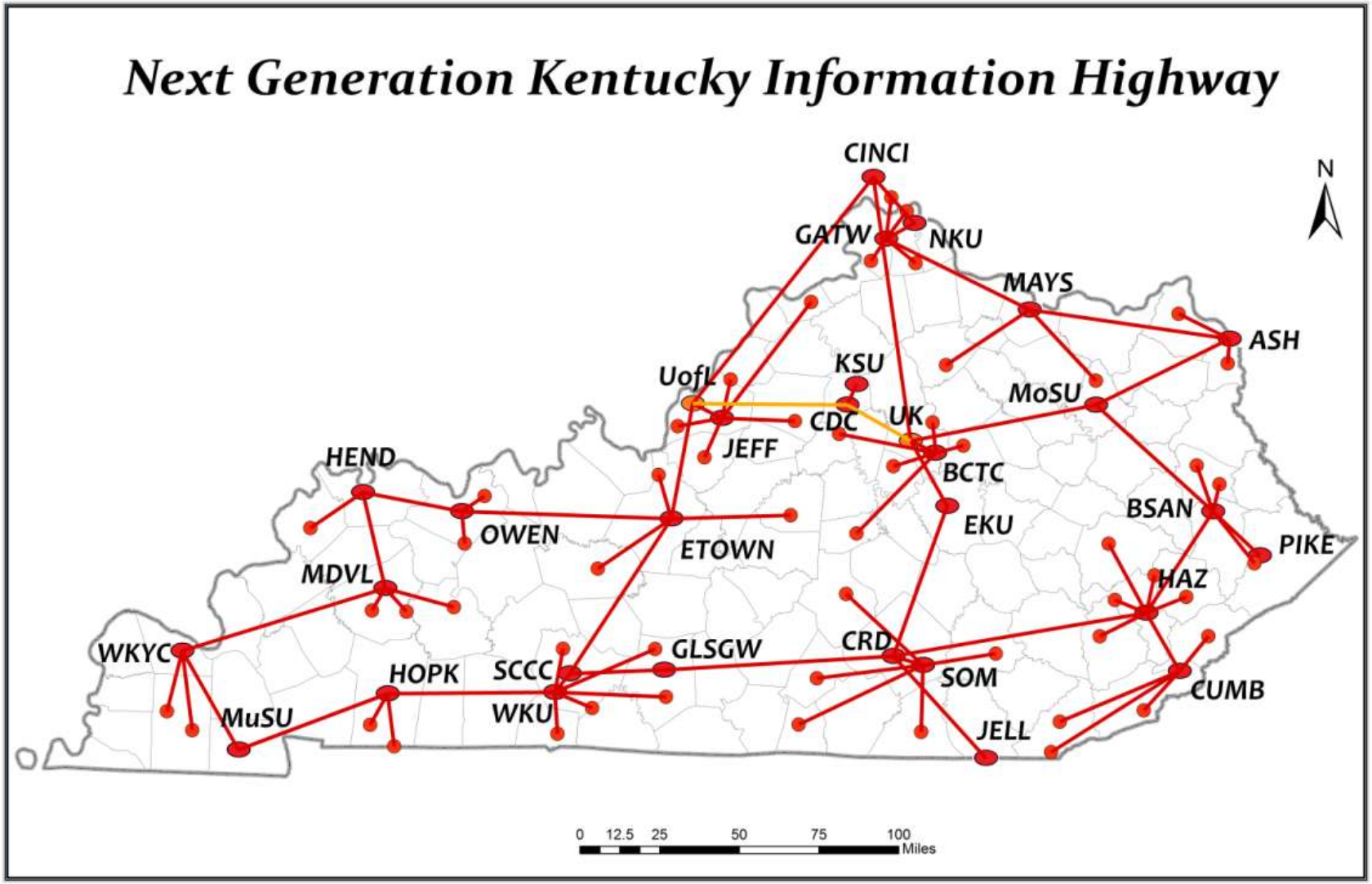
eGovernment **eCommerce** **Public Safety**

First Responders **Entertainment** **Telemedicine**

New Communications **Communications for the Disabled**

The next thing?

QUESTIONS ?


Next Generation Kentucky Information Highway
CINCI
GATW
NKU
MAYS
ASH
KSU
UofL
MoSU
CDC
UK
JEFF
BCTC
HEND
EKU
BSAN
OWEN
ETOWN
PIKE
MDVL
HAZ
WKYC
GLSGW
CRD
HOPK
SCCC
SOM
CUMB
MuSU
WKU
JELL
N
0 12.5 25 50 75 100
Miles