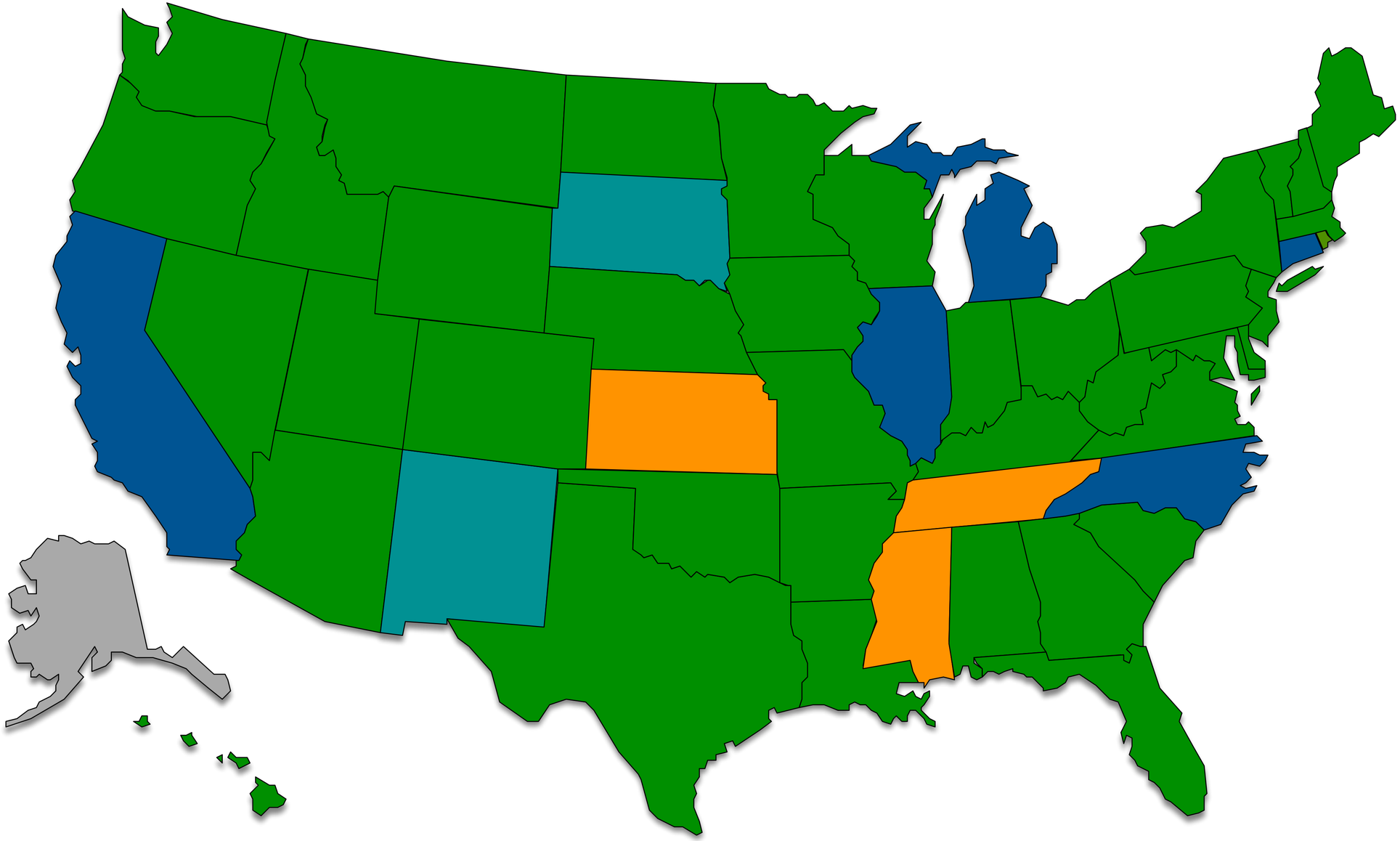
The Future

21 April 2022

Cort Buffington, Executive Director
Brad Fleming, Director of Technology

Funding Opportunities

R&E Fiber Backbones Across the US



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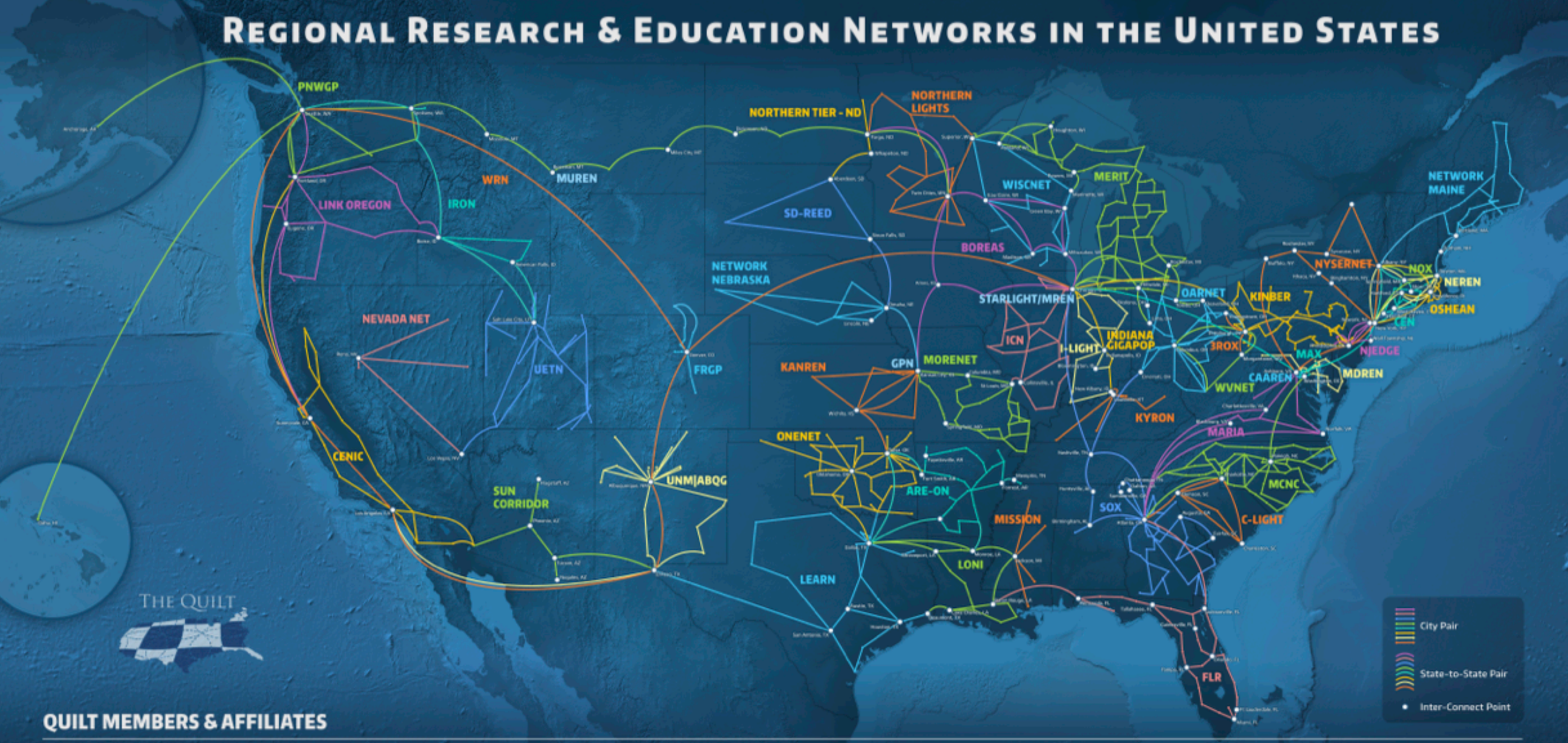
Regional Research & Education Networks in the United States



QUILT MEMBERS & AFFILIATES

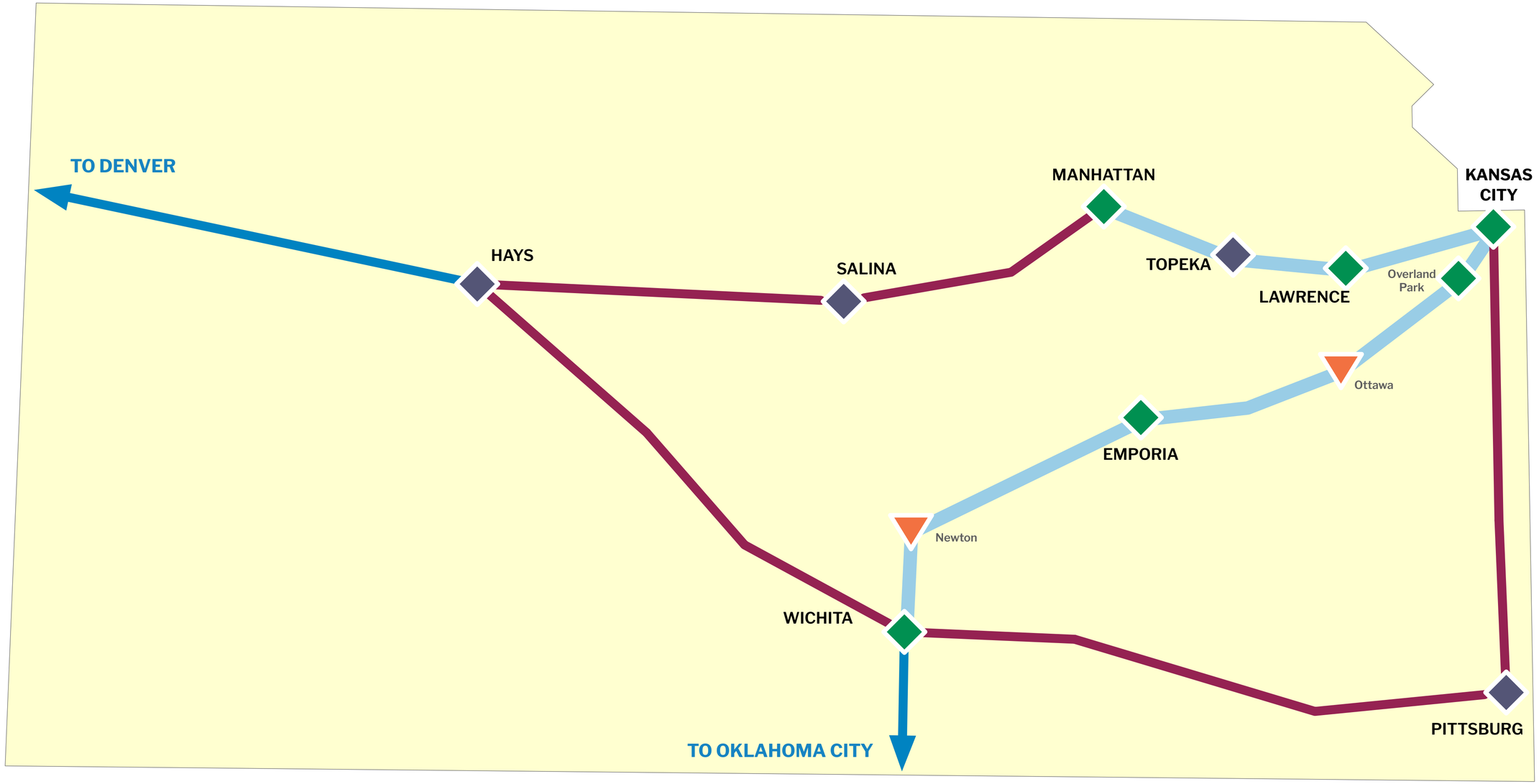
3ROX · ARE-ON · Light R&E Network · CAAREN · CEN · CENIC · FRGP Front Range GigaPop · GPN · I-Light · Indiana GigaPOP · KANREN · KINBER · KyRON · LEARN · LINK OREGON

NI · MARIA · MAX · MCNC · MDREN · merit · MOREnet · MREN · NCREN · NETWORKMAINE · NEVADA NET · NJEdge

Northern Lights · OARnet · OneNet · OSHEAN · PACIFIC NORTHWEST GIGAPOP · SoX · Sun Corridor Network · uen · NM Information Technologies · WiscNet · WV NET

Vision for a Connected Kansas

More typical “Well Connected” state network



Funding Sources

- **ARPA/CPF** — Recipients discouraged from direct funding of middle-mile broadband projects. Kansas has chosen not to highlight any necessary (and applicable) middle-mile components within last-mile projects.

- **IIJA** — Infrastructure Investment and Jobs Act.

  - **BEAD** — Broadband Equity, Access and Deployment. $42B

    - Projects are last-mile, middle-mile can be a component if incidental to or required for last-mile success. Mon

  - **EMMBI** — Enabling Middle-Mile Broadband Infrastructure. $1B

    - Direct applications to the NTIA likely, though “state-based” applications will be given priority.

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Open Access Middle Mile

- Concept of making middle-mile assets available at multiple levels:
  - Fiber, ILA and add/drop points
  - Wave services out of a hosted optical platform (native/alien)
  - Transport services
  - Wholesale IP service
- Economies of scale when lighting fiber
- Non-profit/state-based business model
- Can be constructed/operated under contract by for-profits

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R&E differentiators here, and our need to evolve

- Bespoke services
- Emphasis on quality of connectivity (e.g. cloud connect is quality)
- Cybersecurity
- Objective training/education
- Ability to work with state on broadband issues (ie. Middle mile)
- Scope limited only to membership base

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Supply Chains, Tariffs, Technology Cycle and more….

Mr. Brad Fleming

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KanREN Annual Meeting
Future Casting – Technical

Wednesday, April 27th, 2022
3:20pm – 3:50pm

Supply Chain Issues

- Tariffs, Pandemic, Global Material Shortages, Work Stoppages, Availability of Shipping Containers, etc all lead to massive lead times and increased prices on hardware.

- Throughout the year vendors informed us of ever increasing lead times for any new hardware; as of this week a major network vendor is reporting 220 days for service provider gear.

- These realities lead us to push back any planned hardware upgrades for an additional year.

- Appears to have worked in our favor as multiple new hardware platforms were introduced over the last 12 months giving more options.

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Future of Tail Circuits

- **10Gbps gear has dropped in price**; some pretty good options with 1g/10g ports for downlinks with 25g/50g core links; 100g in carrier distribution networks also becoming much more cost effective as well

- Unfortunately **burying fiber isn't getting cheaper** and that's a non-trivial part of the costs carriers must recover

- Many carriers are incentivizing the move tails from 1Gbps —> 2Gbps but not really discounting the cost of 1Gbps circuits; i.e.: cost neutral move to more bandwidth

- 10Gbps "wave" services have dropped in price as well but still represent a string of single-points-of-failure

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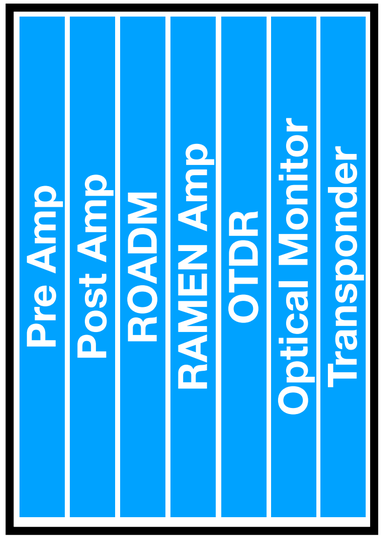
Future of Optical (General)

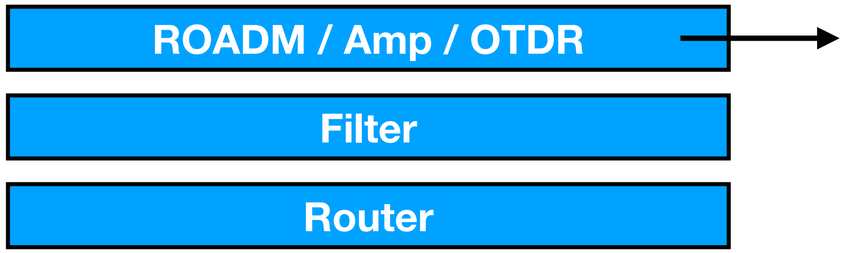
Old School Optical

- Big, monolithic box with a bunch of card slots
- Consumes tons of electricity and rack space
- Linecard for basically each task, separate ROADM, EDFA, RAMAN, etc
- Vendor lock-in
- Hard, grid-based services; everything goes into 100GHz or 50GHz channel
- Simple ROADMs are expensive and not flexible



New Stuff Optical

- Disaggregated, separate shelf for discrete tasks
- Each system consumes only a small amount of electricity and typically 1RU or 2RU
- “Degree” infrastructure elements (ROADM, EDFA, OTDR) combined for simpler operation
- Best vendor can be used for each element
- Typically features Colorless, Contentionless, and/or Directionless ROADMs for maximum flexibility
- Complex ROADM configurations can be “affordable”
- Typically FlexGrid ROADM



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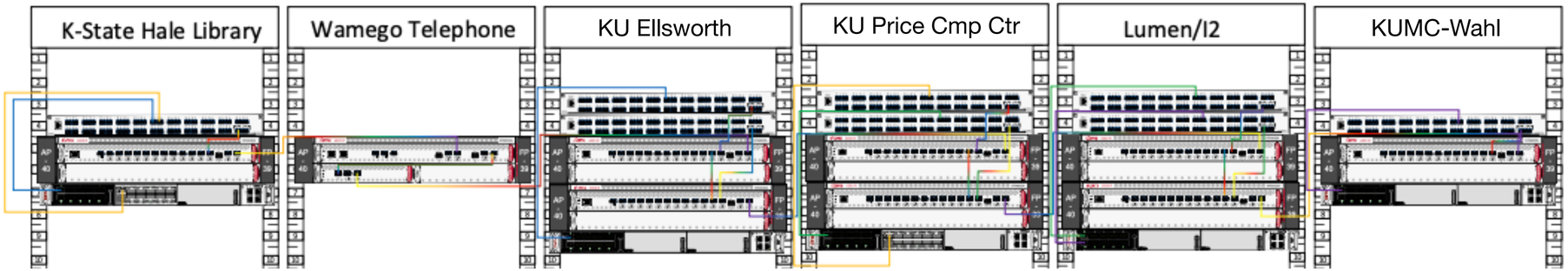
Future of KanREN’s Optical

- KanREN’s future optical platform will probably be **Ciena**’s **disaggregated** RLS system combined with their WaveServer WaveLogic5 transponders
- Smaller footprint vs today’s solution
- Much less electricity consumption
- WaveLogic5 sleds scale from **200Gbps to 800Gbps** per wave in 50Gbps increments
- RLS sets us up to easily support 400G ZR+ optics when they’re more proven and cost effective
- RLS also allows for future non-grid “super channel” waves
- Targeting purchase of gear by May/June 2022 and deployment in February or March 2023



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Future of Route/Switch (General)

- Merchant silicone unless you absolutely require special features
- Lots of very fast interfaces.. but **everything requires a license** to enable now; both to turn the port on and year over year for support on the port
- Fixed port chassis in 1RU and 2RU form factors can really pack a punch; especially when combined with a subtending switch for link aggregation

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Future of Route/Switch (KanREN)

- Move from Juniper MX960 and MX480 to either Cisco NCS or Juniper MX304
- Both the Cisco NCS and Juniper MX304 feature some modularity but nothing like the MX960 and MX480 we operate today
  - Must buy a reasonably “big” box Day1 to avoid running out of ports in Year2
- Both options are much smaller physically than the existing MX class routers they would replace
- Dramatically reduced electricity footprint
- Targeting purchase of gear no later than September/October 2022 and deployment of new core route/switch for Summer 2023

Questions and Answers

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