

A Tool to Support Regional Optical Networks in the U.S. R&E Community

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FiberCo

- Dark fiber holding company
 - Operates on behalf of U.S. higher education and affiliates
 - the Internet2 membership
 - Assignment vehicle for regionals and others, such as NLR
 - Fundamentally, a dark fiber *market maker* for R&E
- Project designed to *support* optical initiatives
 - Regional (RONs) & National
- Not an operational entity
 - Does not light any fiber
- Idea was spin-off from NLR governance discussions
 - Internet2 took responsibility for LLC formation
 - Nat'l R&E Fiber Co. incorporated in Delaware
 - First acquisition of dark fiber through Level 3
 - 2,600 route miles – 3/2003

Underlying hypothesis

- The fundamental nature of regional networking is changing
 - The *GigaPoP* model based on *provisioned, high-capacity services* steadily is being replaced – on the *metro and regional scales*
- A model of *facility-based networking built with owned assets* – Regional Optical Networks (*RONs*) – has emerged
 - Notably, this change *increases* the importance of regional networks in the traditional *three-level hierarchy* of U.S. R&E advanced networking

Distance scales for U.S. R&E optical networking

	<i>Distance scale (km)</i>	<i>Examples</i>	<i>Equipment</i>
Metro	< 60	UWash USC/ISI(LA), MAX(DC/MD/VA)	Dark fiber & end terminals
State/ Regional	< 500	I-WIRE (IL), I-LIGHT (IN), CENIC ONI	Add OO Amplifiers (or optical TDM)
Extended Regional/ National	> 500	TeraGrid 2 nd Gen Abilene, NLR	Add OEO regenerators & O&M \$'s

Leading & Emerging *Regional Optical Networks*

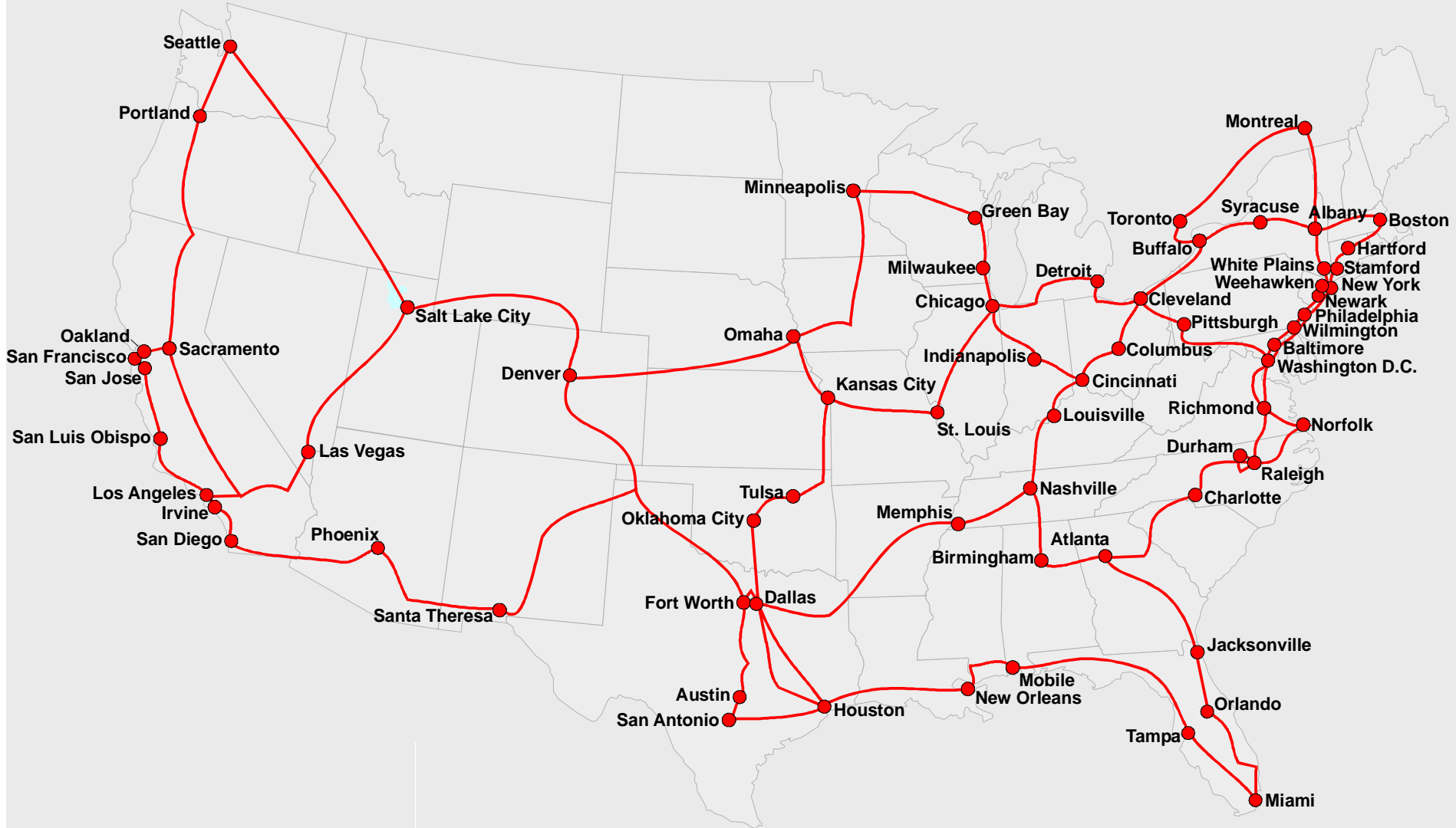
- California (CALREN)
- Colorado (FRGP/BRAN)
- Connecticut (Conn. Education Network)
- Florida (Florida LambdaRail)
- Georgia (Southern Light Rail)
- Indiana (I-LIGHT)
- Illinois (I-WIRE)
- Louisiana (LONI)
- Maryland, D.C. & northern Virginia (MAX)
- Michigan
- Minnesota
- New York + New England region (NEREN)
- North Carolina (NC LambdaRail)
- Ohio (Third Frontier Network)
- Oregon
- Pacific Northwest (Lariat – supported by NIH)
- Rhode Island (OSHEAN)
- SURA Crossroads (southeastern U.S.)
- Texas
- Utah
- Virginia (MATP)
- Wisconsin

Why start with Level 3 fiber?

- National-scale IRU and O&M pricing available on major inter-city segments through March, 2006
- Overall wholesale approach taken by L3
 - Open fiber interconnection policy
 - Co-location space availability
 - No AUP restrictions
- Impact of fiber plant design on total cost of system ownership (over 5 years)
 - Hut spacings & footprint placement
 - Homogeneous fiber type on original plant
- Ease of direct interconnection with NLR



Available fiber topology



Gauging community-wide progress

- Aggregate dark fiber assets held by U.S. R&E optical initiatives (segment-miles)
 - CENIC (for CalREN & NLR) 6,200
 - FiberCo (via Level 3 for NLR & RONs) 4,900
 - SURA (via AT&T) 6,000(+2,000 research)
 - OARnet 1,500
 - ORNL (via Qwest) 900
 - Other projects (IN,IL,MI,OR, ...) 1,500+
 - ***Total (conservative estimate) 21,000+***

- Pending procurements
 - LEARN(TX) & NEREN (New Eng+NY) 1,700+

Lessons learned – I

- Market making function
- Innovative interconnection solutions
- Sophistication of dark fiber RFPs increasing
- Entire acquisition process time consuming
 - Typically 6-9 months
 - Advantage of pre-negotiated IRU and O&M contracts
 - Cyclical nature of acquisitions

Lessons learned - II

- Potential for combined deals
 - Leverage of mixing in λ 's and/or commodity ISP
- Still believe the best IRU/O&M relationship is with the underlying facility owner
- Metro fiber still can be challenging
- No carrier has all routes

Metro Fiber

- Hard to do nationwide in this space
 - Each metro area is unique
- Trying to workout a way to jump start metro acquisitions
- Current thought is a "Starter Kit"
 - Bridge the gap while negotiations run their course
 - Something that can be turned up quickly
 - XX GigE
 - SONET services
- Aid early adopters; provide growth path into metro DF

Expansion beyond original footprint

- Welcome establishing relationships with other providers
 - Discussing with some
- Expect that SURA/AT&T fiber assets will be significant factor in RON development

A new model for carrier support of advanced networking?

- Total system ownership, control, and responsibility represent neither the cost-effective nor the optimum solution for higher ed
- New optical networks offer opportunities for carriers to provide higher-ROI services
 - Higher ed assumes much of the initial and ongoing capital costs

What higher ed really seeks at the minimum?

- Fiber ownership
 - Co-location rights
 - Open fiber interconnectivity
- Significant equity stake in optronics
 - Ability to provision new waves at incremental cost
 - Full management visibility
 - Ability to switch waves
- Many opportunities for carrier services here
 - Fiber O&M
 - Collocation & power
 - Hands & eyes support
 - Optronics anchor tenant
 - Higher level support services
 - Significant ancillary business (off-net waves, IP)

Summary

- Goal is to assist US higher ed & affiliates to build optical networks
- FiberCo doesn't operate or light fiber
- It's a really, really slow process
- Far better if networks deal direct with the facility owner
- Working to add metro assistance
- New business opportunities for facility owners

For more information ...

- www.fiberco.org
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