



# I-Light & I-Light2 Updates

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# I-Light Success – Fostering Research

## *Providing the foundation for innovation*



I-Light makes possible extensive growth in research across a wide variety of applications and areas.

This increases Indiana's involvement in national and international research activities

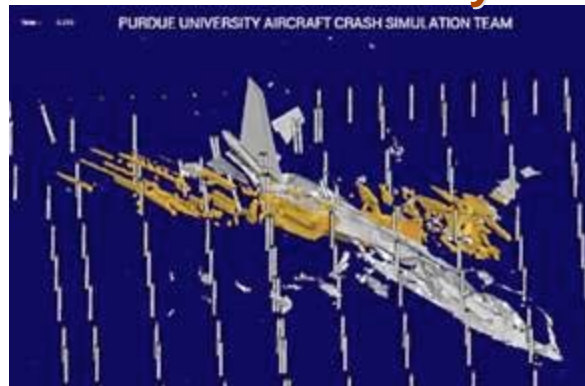
### Educational Advances



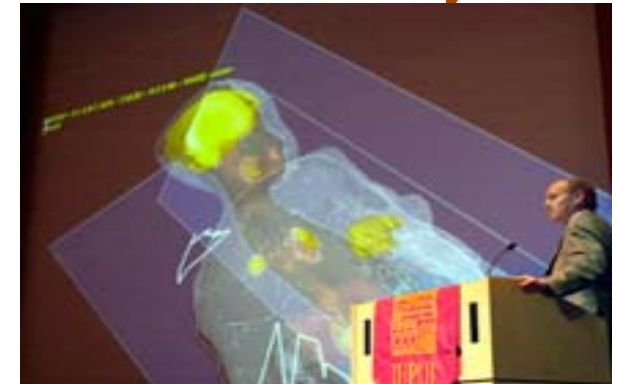
### Visualizing Complex Data



### Homeland Security



### Virtual Reality



# I-Light's Continuing Impact



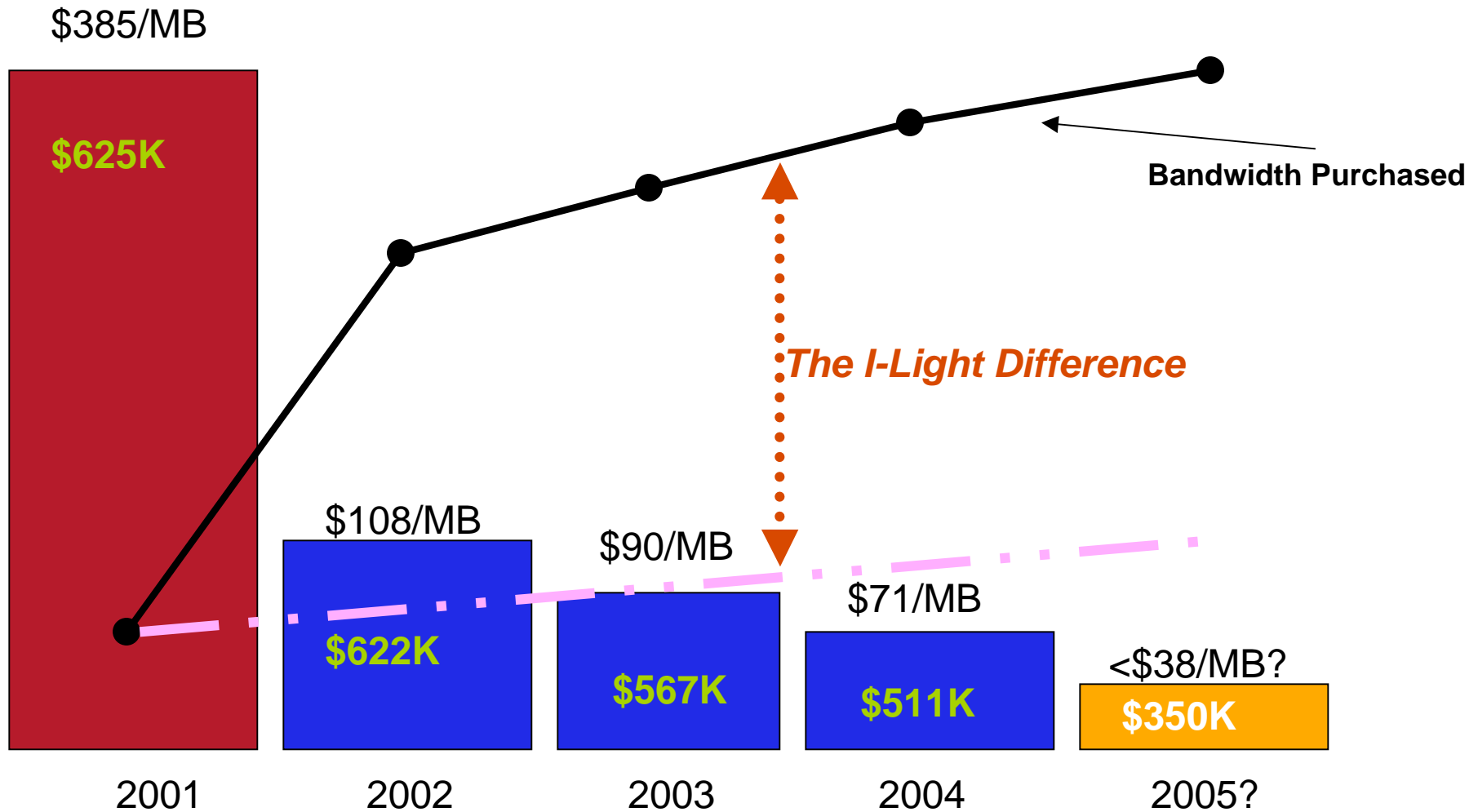
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- **Intercampus bandwidth remains completely unconstrained**
  - The Doritos Principle of bandwidth scarcity – *Go ahead and crunch it ... we'll just light more!*
- **Positioning with co-location and our Quilt membership (as a GigaPoP) has allowed us to negotiate even better commodity internet rates (dropped 10%! ... may drop another 10% next year)**
- **Eliminates barriers to collaboration**
  - Witness the many examples in this year's program
- ✓ **Educause 2003 Award for Best Practices in Networking**



# Costs for Internet Usage

(IU as an example)



- **What's Next?**

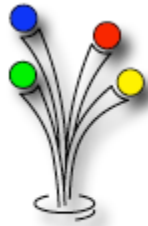


- Connecting to Chicago ... ***the Holy Grail***
- Connecting to National Cyberinfrastructure
  - TeraGrid
  - National LambdaRail

# **NSF's Extensible Terascale Facility**

**a.k.a. The TeraGrid**





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IP•grid



IU and Purdue wrote a proposal in June 2003 to join the TeraGrid Community in response to an NSF call for proposals

- Current members included NCSA, Argonne National Labs, SanDiego Supercomputing Center, CalTech, and Pittsburgh Supercomputing Center
- Quid-pro-quo – we contribute computation, storage, and data resources and NSF funds our connectivity to the nearest ‘hub’ ...



IP•grid



IP•grid



IP•grid



IP•grid



IP•grid



IP•grid

## IU and Purdue formed IP-grid in our proposal to the NSF

- We were chosen (with **Oak Ridge National Labs** and **Texas Advanced Computing Center**) to join this elite high-performance computational/ research community!
- NSF formal announcement 9/29 - **\$3-million in funding**
- Expect our connection to be completed ***THIS MONTH!***
  - We'll be the first of the new sites connected – by >5months!



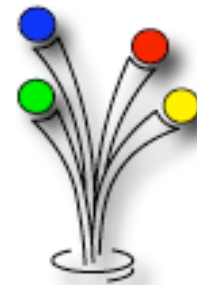
# What does it mean?

- We have acquired a **pair of fibers** and run advanced dense-wave-division-multiplexing (DWDM) connectivity across it
  - Were the first customer of FiberCo – the new Internet2 subsidiary providing fiber across the nation for regional optical network development
- IU and Purdue will each have a **10-Gbit Wave** connecting us to the TeraGrid backplane
- We will have **co-location facilities** in a key carrier facility in downtown Chicago, as well as connection to StarLight
- We not only got \$3-million for 2003-05, but also have a path to pick up ~\$1-million *per year per institution* for the next four years after that!

## What does that mean???

- **We will have the ability to add more waves to get other kinds of connectivity in Chicago**
  - Likely even cheaper commodity internet
- **We will have a network ‘beach-head’ in one of the largest network ‘hubs’ in the nation/world**
  - We may be able to overcome some peering issues with national high-speed internet services to homes
  - We can connect to others as the national cyberinfrastructure grows
- **We have managed to get Federal Grant money to fund a part of I-Light2**
  - *More on that in a moment ...*

# National LambdaRail (NLR)

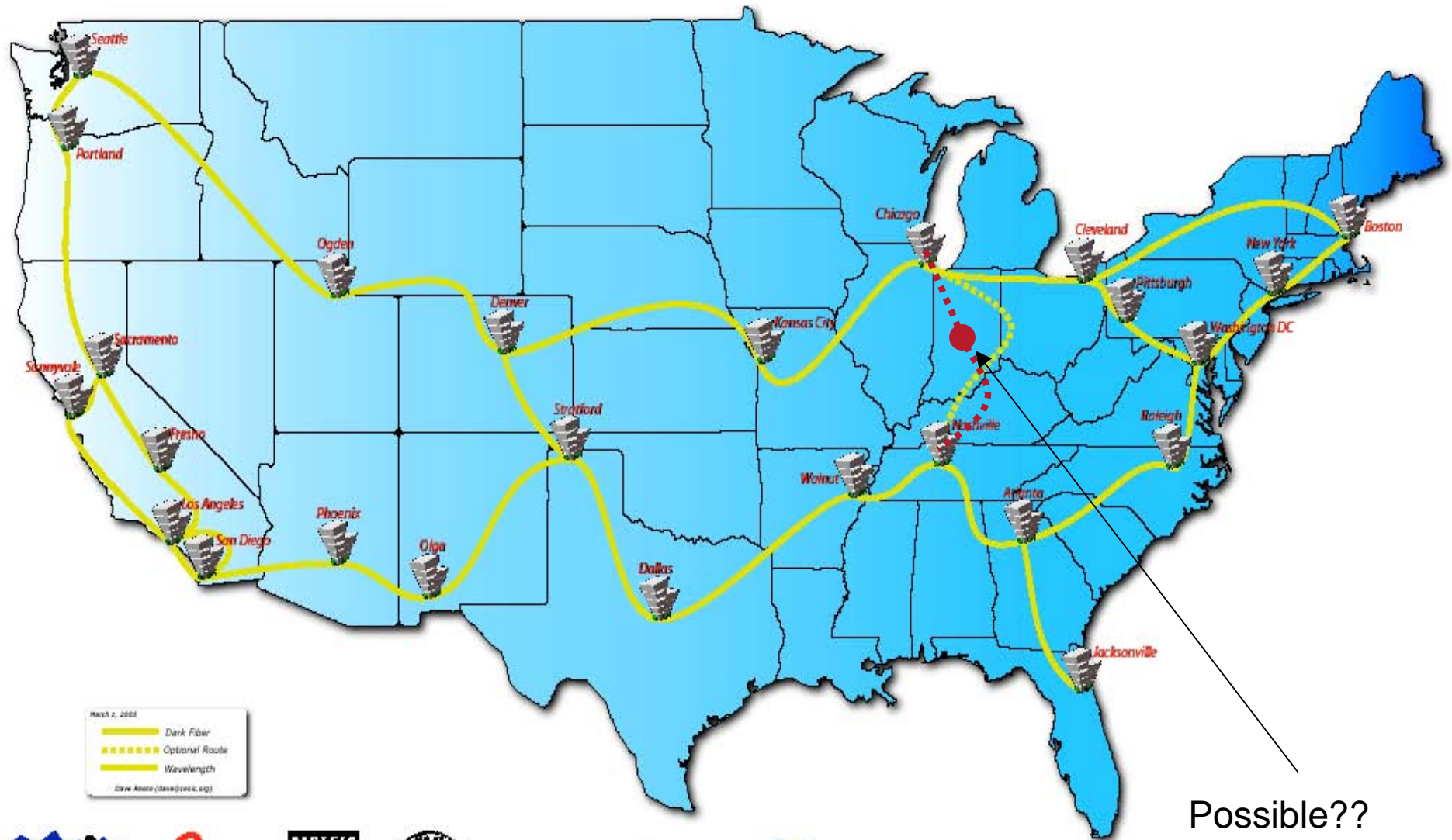


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**Globalnoc** Global Research Network Operations Center  
at INDIANA UNIVERSITY

# NLR National Fiber Network



Possible??



Virginia Tech  
Sponsored Consortium





## What is NLR?

- **Basically a larger, consortium-owned version of I-Light**
  - Designed to facilitate point-to-point \_ (10 Gbit) ‘waves’ (i.e., individual light-waves on a fiber)
  - Research focused
- **A experimental network**
  - A place to test new networking technologies



## What is NLR *not* ?

### – ***NOT*** A replacement for Internet2/Abilene

- UCAID is an active Partner
- UCAID will provide it's own advanced services to I2 members using 2 \_'s on the backbone
- UCAID may eventually make use of NLR \_'s for it's production Abilene traffic

### – ***NOT*** A new carrier

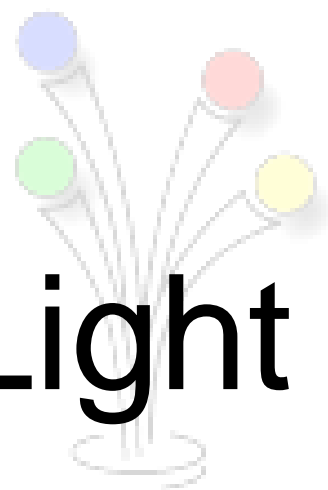
- Think of it as the Sam's Club of coast-to-coast high-speed bandwidth for research collaboration



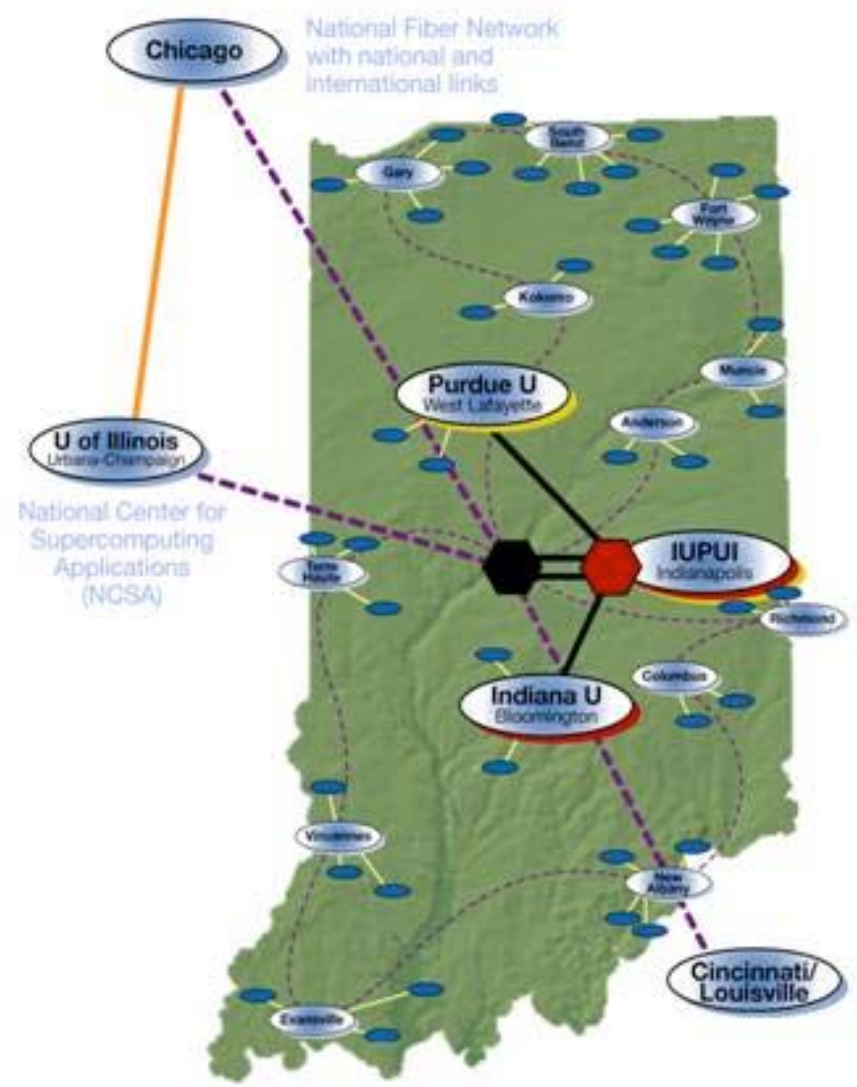
## **How are Purdue and IU involved?**

- Joined NLR as part of the CIC**
  - 13 institutions splitting the \$5-mil investment (5-years)
- IU led the CIC efforts to form the NLR**
- IU was selected to provide NOC and L2/L3 Engineering Services to NLR**

# I-Light 2



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*Illinois I-Wire Network*



## **I-Light 2 – Transmission Infrastructure**

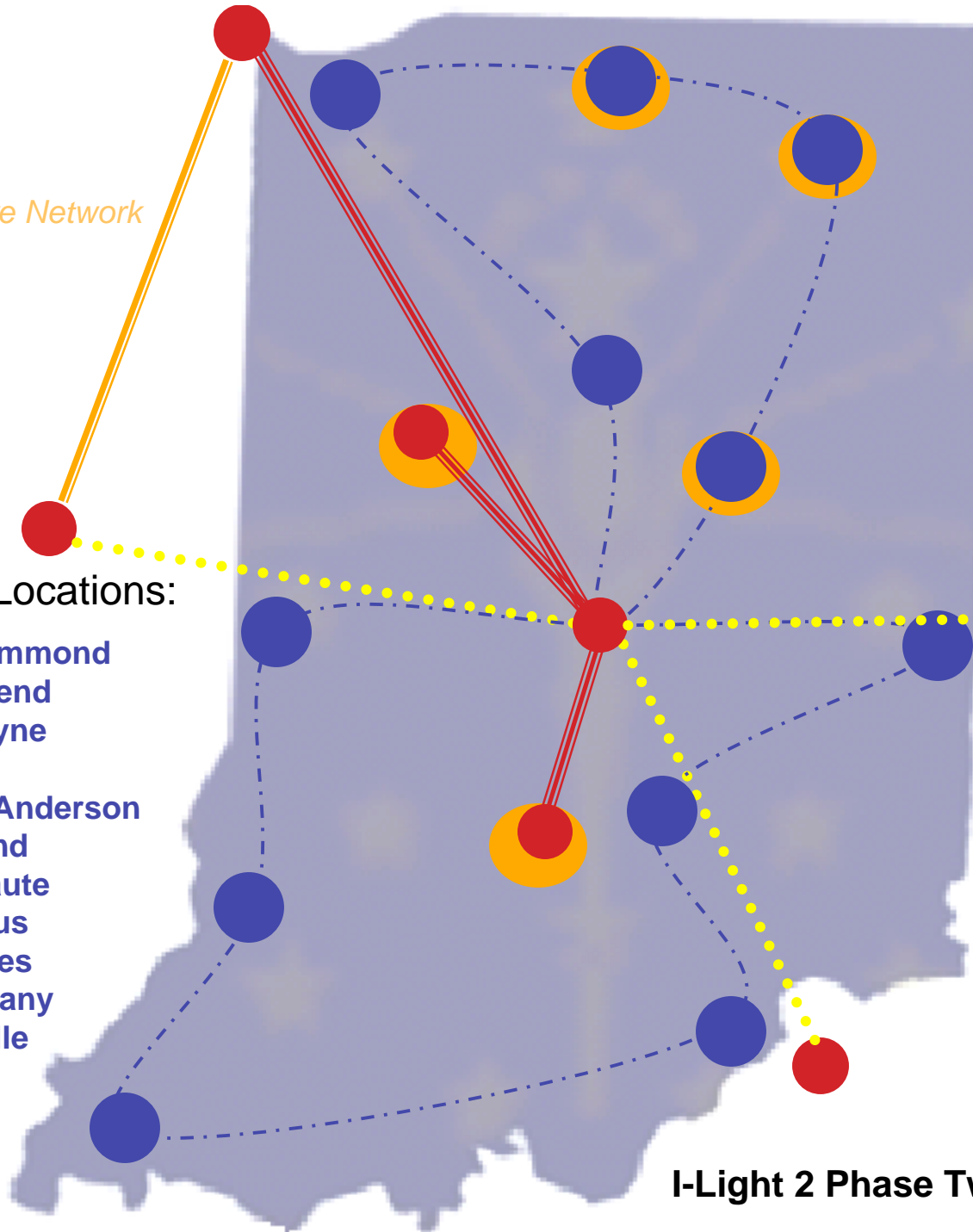
Multi-fiber high speed communication pathway connecting I-Light to national and international fiber and internet infrastructure in Chicago, and connecting I-Light into Regional high performance fiber network (as part of Nationwide initiatives) with links to University of Illinois and to high-performance networks developing in Ohio

**I-Light 2 Phase One – “Up-streams”**

Illinois I-Wire Network

General Locations:

- Gary/Hammond
- South Bend
- Fort Wayne
- Kokomo
- Muncie/Anderson
- Richmond
- Terre Haute
- Columbus
- Vincennes
- New Albany
- Evansville



## I-Light 2 – Distribution Infrastructure (POPs)

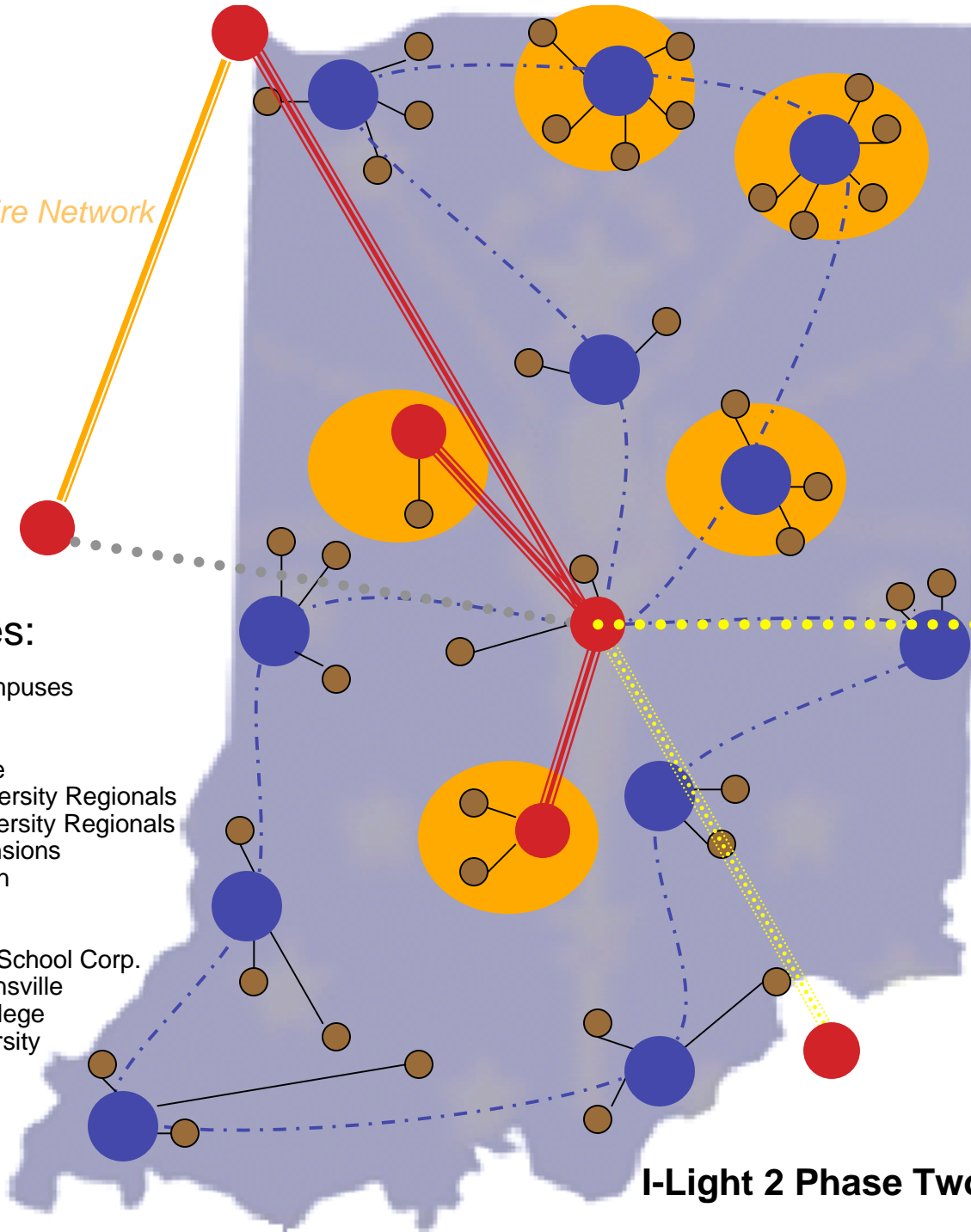
Establishing **eleven (11) points of presence (POPs)** across the State and **linking** these POPs to I-Light with a variety of high-speed communication technologies to establish a Statewide I-Light network backbone

I-Light 2 Phase Two-A – “Down-streams”

*Illinois I-Wire Network*

**Examples:**

- Ivy Tech campuses
- Notre Dame
- Ball State
- Indiana State
- Indiana University Regionals
- Purdue University Regionals and extensions
- Rose Hulman
- Wabash
- DePauw
- Monroe Co. School Corp.
- Univ. of Evansville
- Hanover College
- Butler University



**I-Light 2 –  
Distribution  
Infrastructure  
(Connectors)**

Establishing links from the Regional POPs to up to 40 institutions (higher education, libraries, K-12 districts) across the State with a variety of high-speed communication technologies to establish a pervasive Statewide I-Light network infrastructure

**I-Light 2 Phase Two-B – “Down-stream Build-out”**

# What is I-Light2?

- Collaborative effort of a new Partnership:
  - State Budget Agency
  - Intelenet Commission
  - IHETS
  - Indiana Department of Commerce
  - Purdue University
  - Indiana University
- A way to “tap in” and use some of the miles of unused ‘dark fiber’ cables in place generating no revenue for the private sector owners and no benefit today to Indiana Communities
- A way to help connect regional networking projects and technology centers around the State

# What Else Will I-Light2 Do?

- Act as an **'Anchor Tenant'** to lighting the dark fiber, lowering the cost of lighting more of it for providing broadband services in communities across the State.
- Help **eliminate the 'academic digital divide'** by providing high-speed access beyond just IU and Purdue to the rest of Indiana's higher education community, and K-12, Libraries, etc.
- **Enhance the research, education, and economic development** through the State and expand Indiana's growing reputation in advanced high-speed networking

# Project Status (March 2004)

- **State appropriated \$10-million in the 2003-04 biennium for the project**
  - Was estimated to cost \$15-million -- \$5-mil each phase
  - Here's where that TeraGrid grant really paid off!
    - Transmission Phase is essentially externally funded (though \$1-mil held in reserve for extending/expanding these out-of-state connections)
- **RFP distributed to build in-state PoPs and acquire connectivity fiber paths**
  - RFP responses returned last month – in evaluation now by a select committee made up of people from the Universities, IHETS, Intelenet, Budget, and
- **Plans being discussed to “jump-start” I-Light2 by using I-Light’s *State-Use Fibers* to establish PoPs in Bloomington and West Lafayette**

# I-light – Watch it in 2004!

- Watch the IP-grid network come live and yield not only TeraGrid connectivity, but broader connectivity and services for I-Light
- Watch national cyberinfrastructure developments relating to Internet2 and NLR
- Watch I-Light2 Unfold across the State with the first PoPs being lit before the end of the year

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