Education SUPERHIGHWAY

Introduction to K-12 Broadband

November 2015

About EducationSuperHighway

Non-profit, non-partisan organization

Our Mission: To upgrade the Internet access in every public school classroom in America so that all students can take advantage of the promise of digital learning

Our funders enable us to serve K-12 at no cost

The Bill and Melinda Gates Foundation

Startup: Education

The Leona M. and Harry B. Helmsley Charitable Trust

Timothy and Michele Barakett Foundation

Draper Richards Kaplan Foundation

Devon and Pete Briger

The Learning Accelerator

Philip and Alicia Hammarskjold

The A.L. Mailman Foundation

Hank and Bonnie Miller Family

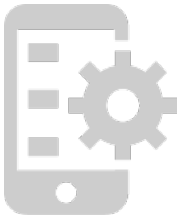
Leeds Family Foundation

Maverick Capital Foundation

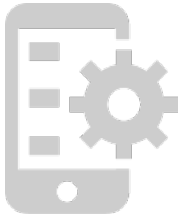
Ford Foundation

Sappi Ideas that Matter

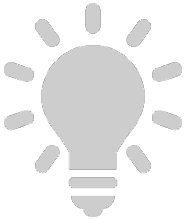
Digital learning is changing education in Texas



McAllen Independent School District **made mobile devices available to all students and teachers** as part of its digital learning framework



Houston Independent School District will provide **all 65,000 students with a laptop in school and at home by 2016**



Students in rural communities now have **access to Advanced Placement** classes through online courses

El Paso Independent School District uses PowerUp, which provides **1:1 laptops and Bring Your Own Device programs for all 18,000 high school students**

Schools are shifting to 1:1 and blended models

Basic Access and Assessment Capable

- Computers clustered in labs/carts
- Online assessments driving district requirements
- Technology is a special resource

Individual Classroom Technology Use

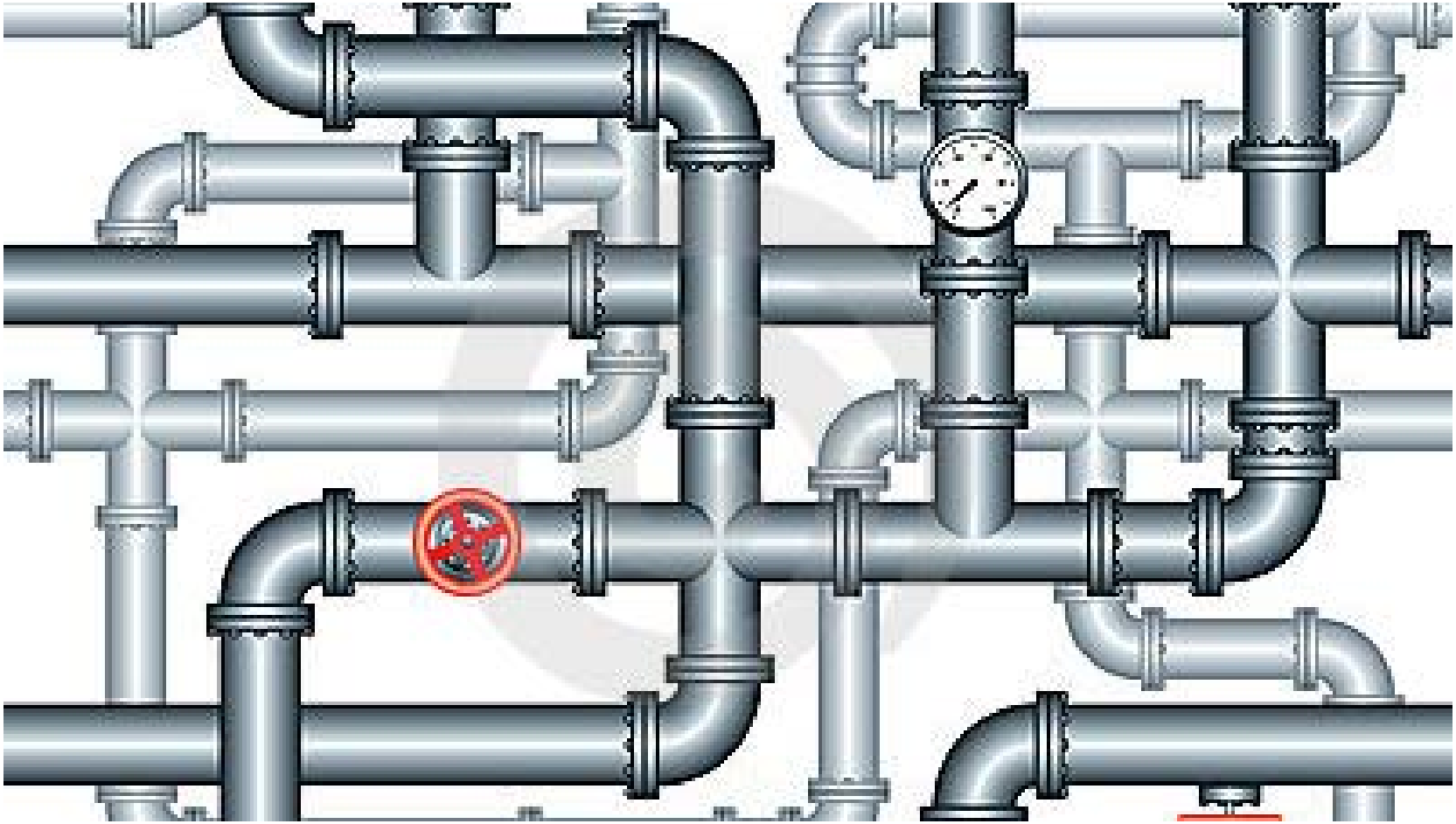
- Basic network infrastructure
- Infrastructure supports basic and media-rich assessments
- Classroom use is supported by staff and curriculum

Everyday 1:1 Campus-wide Technology Use

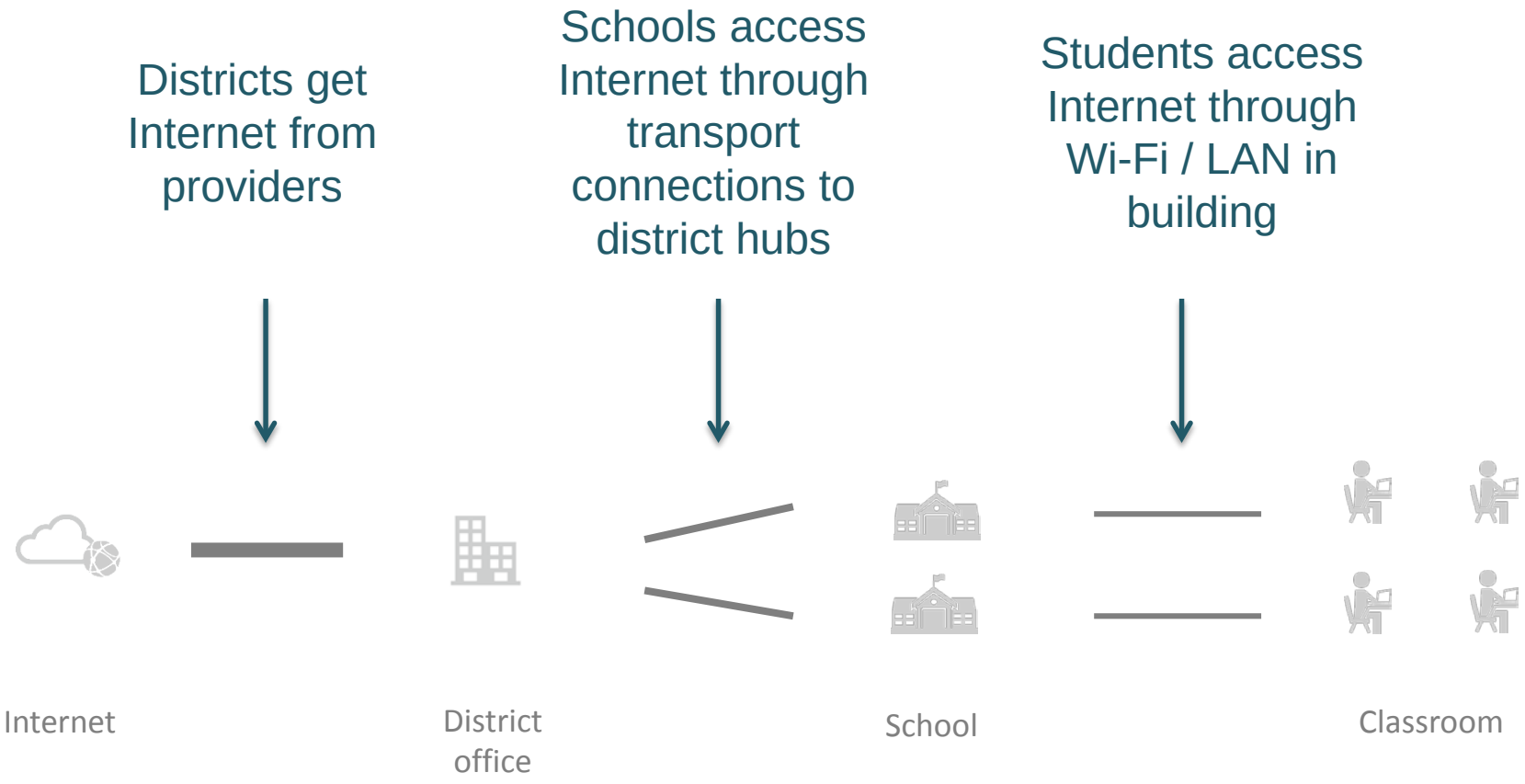
- Technology is widely available
- Students and teachers use devices daily
- Digital curriculum is critical to one or more subjects

50-100% annual growth in broadband demand

Broadband is a lot like plumbing…bottlenecks can slow down the show



Broadband in schools is a chain of linkages



Sources: E-rate 2015-16 | EducationSuperHighway research via E-rate and COSN Survey

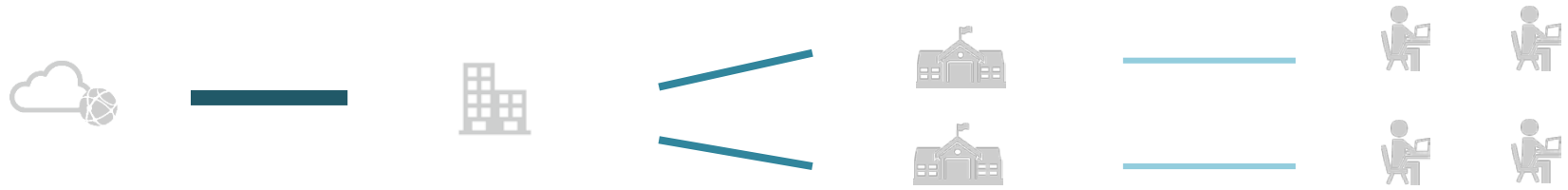
Goals for each link support digital learning needs

INTERNET ACCESS
1 Mbps per student

TRANSPORT
Fiber to every school

Wi-Fi / LAN
1:1 in every classroom

All schools should meet these goals by 2018



Common roadblocks to provide digital learning

ECONOMIC

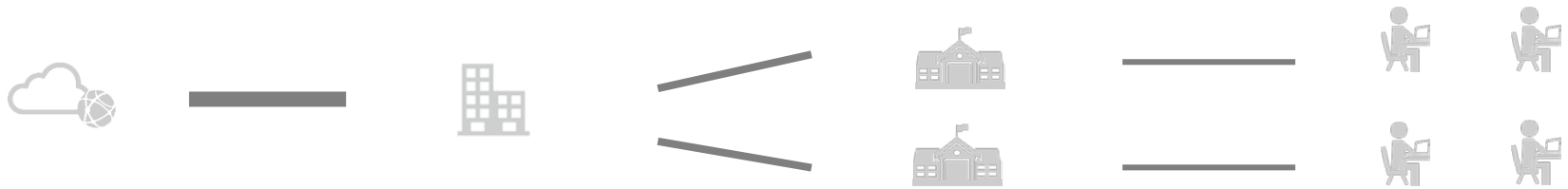
- District budgets
- Service provider limitations
  - Geographic challenges
  - Rural access
  - Provider competition

ORGANIZATIONAL

- Leadership to make broadband connectivity a priority
- Technical expertise to understand key challenges and opportunities
  - Monitor bandwidth utilization
  - Leverage funding opportunities
  - Purchasing
  - Technology planning

Texas' current status of K-12 broadband connectivity

INTERNET ACCESS 1 Mbps per student	TRANSPORT Fiber to every school	Wi-Fi / LAN 1:1 in every
33% < 100 Kbps 98% < 1 Mbps	15% are not on fiber	42% of districts have not accessed E-rate for Wi-Fi



Internet | District office | Schools | Classroom

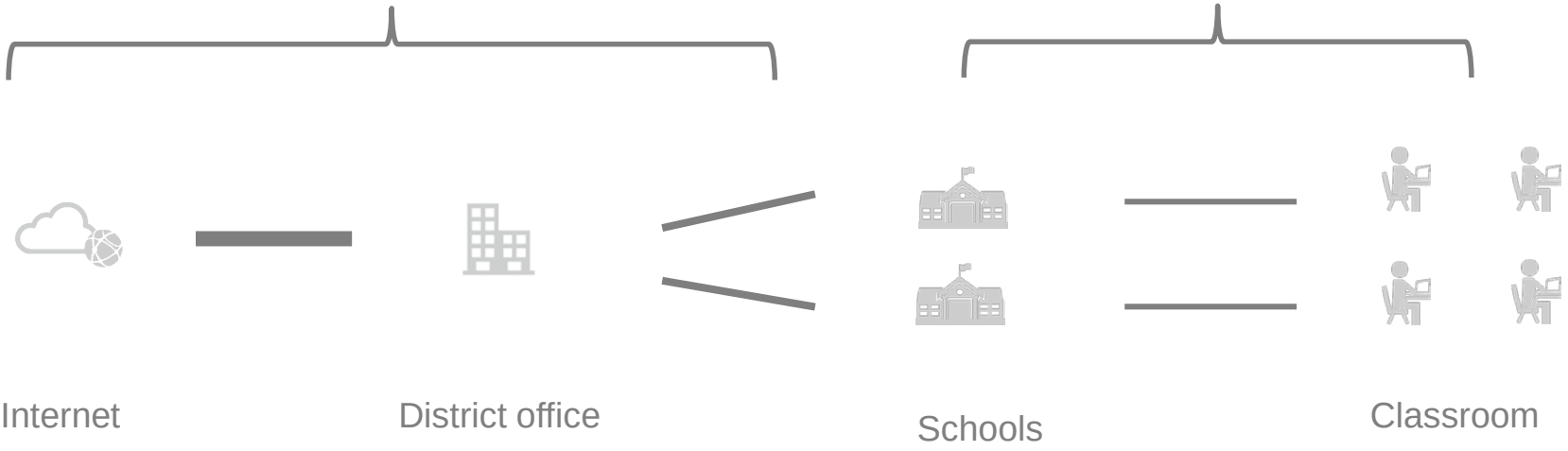
The FCC e-Rate program funds these linkages

CATEGORY 1 FUNDING
connectivity *to* schools

- $2.9 B in funding for discounts toward **INTERNET ACCESS** and **TRANSPORT**
- Funding for fiber construction, up to 10% additional E-rate discount for state matching funds

CATEGORY 2 FUNDING
connectivity *within* schools

- $1 B in funding for discounts toward **Wi-Fi / LAN**
- $311 M in E-rate funds are available to support Wi-Fi in Texas



Sources: E-rate data 2015-16 | EducationSuperHighway research via E-rate and COSN Survey

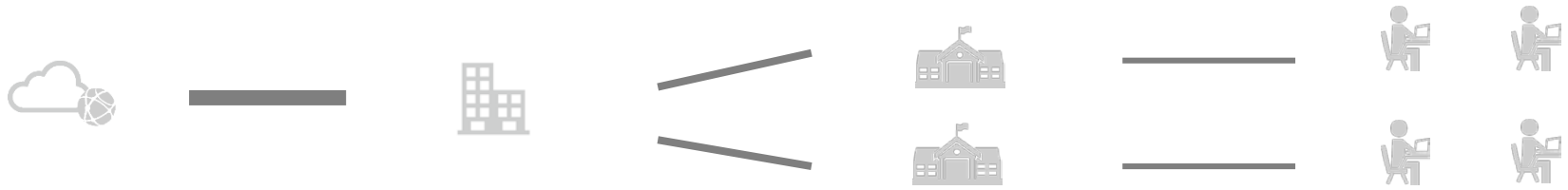
State action can help Texas schools upgrade

Programs to increase INTERNET ACCESS and TRANSPORT connectivity

- Analyze drivers that impact K-12 broadband connectivity. Recommend next steps for action
- Consult districts on fiber connectivity solutions
- Increase bandwidth and affordability through aggregation programs and district support

Programs to upgrade Wi-Fi / LAN networks

- Regional or statewide procurement collaboration for Wi-Fi



Q&A Session

Snapshot of K-12 connectivity in Texas

Fiber

85% of schools have fiber connections to meet FCC goals

49% of new fiber connections will be for rural and small town schools

Affordability

4% of school districts are meeting the $3/Mbps target

1.3 M more students will have enough bandwidth if target is met

Wi-Fi

58% of districts have accessed E-rate for Wi-Fi

$311 M in E-rate funds are available to support Wi-Fi

Sources: E-rate 2015-16 data, verified by school districts and tech directors

Key Modernization Changes: Fiber Construction

Change	Outcome
• Fiber construction costs can be charged in one fiscal year	• More districts will evaluate fiber builds as an option
• Non-discounted portion of special construction costs can be paid over 4 years	• Ability to extend payment window makes this more affordable for districts
• Dark fiber acquired by IRU or construction is a fully eligible service	• Lit service must also be bid to compare to dark fiber option
• E-rate will match state funding up to an additional 10% for special construction	• Districts with an 80% discount rate could have 100% of costs covered

Key Modernization Changes: Program Funding

Change	Outcome
• Annual funding cap increased from $2.4B to $3.9B	• Districts should receive more of their requested funding, including fiber construction and Wi-Fi
• $1B Cat 2 funding target is extended to 2019	• Wi-Fi Upgrades can be planned over the next four years
• Cat 2 budget is up to $150 per student pre-discount	• Per student funding helps larger districts meet connectivity targets

Key Modernization Changes: Program Administration

Change	Outcome
• SETDA connectivity goals were recommended for IA and WAN and special construction/dark fiber funding is only available if targets are met	• Progress will be measured towards 2018 goals
• Increasing data and pricing transparency through USAC	• Better negotiating power for states and districts
• Maintenance and managed Wi-Fi are now eligible services	• More options for districts to take advantage of E-rate
• Legacy voice services will be phased down at 20% per year until 2019	• More E-rate money for broadband infrastructure

Fiber Construction Matching Funds

E-rate will pay up to an additional 10% above an applicant's discount rate if states provide matching funds for fiber construction

What state funds are eligible for the additional fiber construction match from E-rate?

- New funding, if possible. Contact the FCC to see if existing funding qualifies.
- Funding must be administered by an agency of the state.
- Must include language that
  1. Dedicates the funds to construction of broadband infrastructure by E-rate applicants
  2. Recognizes that the new infrastructure must deliver service that meets or exceeds FCC goals to the E-rate facility

- E-rate will not match beyond the cost of services
  - Example: If a district has an 85% discount rate and the state matches 10% of the costs, E-rate will kick in an additional 5%

- Case Study: CA BIIG Fiber Grant

California's BIIG Program: Backstory

- A field test of California's Smarter Balanced Summative Assessments in 2014 revealed that a subset of schools in the state lacked sufficient broadband capacity for online assessment and digital learning
- Governor Jerry Brown allocated $27M in his 2014-15 budget for a K-12 network connectivity infrastructure grant program
- K12HSN, the organization that administers California's K-12 network and associated services, was designated to administer the grant program
- California has reached out to the FCC/USAC fiber team to gain input on the viability of their match

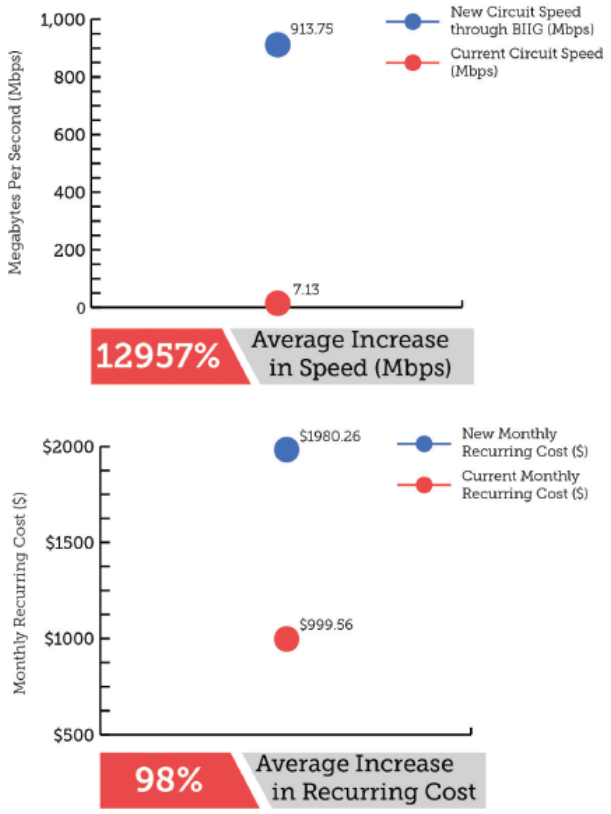
California's BIIG Program: Implementation

How did California implement the grant?

1. Establish eligibility criteria
   - P1: Schools that could not administer online tests
   - P2: Schools whose broadband infrastructure was not scalable to future needs
2. Identify eligible sites
   - Pre-identification
   - Self-nomination
   - Validation and Technical Evaluation
3. RFP Process
   - CENIC, the network operator of CalREN, provided expertise to help craft the RFP
   - Bidders conferences were held to communicate the opportunity to potential service providers
   - After bids were received, CENIC and K12HSN reviewed the proposals and recommended awardees for each site
4. Grant Awards
   - A review committee validated the grant process and confirmed funds to be awarded

California's BIIG Program: Results

The chart below shows the average increase in both monthly recurring cost, and Internet connectivity:



- 90% of grant sites upgraded to a 1 Gbps connection or greater
- 95% of grant sites were connected to fiber

Source: K12HSN - Connecting California's Children 2015

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Category 2 funding cap changes

WI-FI

How are Category 2 funds currently capped?

- Category 2 funding is calculated on a “per student” basis, and is capped over a 5-year period
- Five-year period starts with the 1st year of funding and ends 4 years later
- The “2 in 5 rule” – where applicants could only access funds within 2 out of any 5 sequential years – is no longer in effect.
- FCC rule applies to applicants first funded between 2015 and 2019
- Once funded in any year from 2015 to 2019, the applicant is locked into the pre-discount budget process for the full 5 years
- In 2020 and beyond, it is unclear how the FCC rule will apply

Source: http://e-ratecentral.com/archive/News/News2015/weekly-news-2015-0323.asp

Category 2 budget calculation

- Pre-discount budget for a school = # students x $150
- Minimum of $9,200 if the school has fewer than 62 students
- **Example: school with 1,000 students**

  85% discount rate (the maximum for Cat 2)

  Pre-discount budget: $150,000

  E-rate discounts: up to $127,500

  Budget is capped to a 5-year window

Source: http://www.usac.org/_res/documents/sl/training/2014/8-Setting-Applicant-Budgets.pdf

Eligible non-recurring costs (NRC)

WI-FI

Are non-recurring costs eligible for discounts?

- Not all non-recurring charges are eligible, but at a high level, most installation, activation, and initial setup charges qualify (presuming the service being installed is itself eligible).
- There are special areas of E-rate rules that govern the eligibility of customer-premise equipment such as terminating electronics, and "special construction charges" for fiber deployments vary depending on whether a lit or dark fiber service is being procured.
- Starting in FY 2016, both dark and lit fiber services will be treated more or less equally with respect to recurring, non-recurring, construction, and maintenance charges.
- On-premise installation of wireless and microwave services does qualify, but there can be some eligibility limitations on the amount, type, and configuration of equipment involved.

Source: https://www.fundsforlearning.com/blog/2015/03/funding-year-2015-e-rate-eligibility-q&a

Examples

How E-rate can support getting fiber to schools

FIBER

Example: Sample School District wants to procure a fiber connection to one of their schools currently on a T-1 connection. The district received multiple bids for both lit and dark services and determined that a $100,000 bid for a fiber build was the most cost-effective option. How much money would this fiber project cost the district?

Fiber build quote from vendor		$100,000
E-rate reimbursement rate	70%	$70,000
Total cost to Sample SD	30%	$30,000

Sample Data

E-rate match for state contribution

FIBER

Example: Sample School District wants to procure a fiber connection to one of their schools currently on a T-1 connection. The district received multiple bids for both lit and dark services and determined that a $100,000 bid for a fiber build was the most cost-effective option. How much money would this fiber project cost the district?

Fiber build quote from vendor, $100,000
E-rate reimbursement rate, 70%, $70,000
State contribution, 10%, $10,000
Bonus E-rate match, 10%, $10,000

Total cost to Sample SD, 10%, $10,000

Note: Sample SD can pay their match over 4 years, if agreed to by the service provider. $10,000 / 48 months = $208 per month.

Leveraging E-rate for cost allocation (1 of 2)

FIBER

E-rate will not fund capacity beyond what the applicant needs in that funding year. Applicants may not seek E-rate funds for excess fiber that is not in use.

Example: Sample School District finds that self construction is the most cost effective option.

- The district only needs 4 strands of cable to the nearest connection point
- However, fiber typically comes in increments of 12 strands (12, 24, 48, 96, etc.)
- Other community institutions are also in need of fiber

Sample SD opts to construct a network with 144 strands to help serve other local community institutions.

How do you allocate costs?

Sources: USAC, http://erate.training/cost-allocation-of-fiber-strands-when-self-constructing/

Leveraging E-rate for cost allocation (2 of 2)

How does Sample School District cost allocate additional fiber?

1. Per E-rate rules, Sample School district needs to cost allocate out the strands that are not being used to serve the school (144-4=140)
2. The cost for adding an additional 140 strands of fiber is $15,000, which represents the price difference for 12 v. 144 strands
3. The E-rate funding request for a fiber build with 144 strands would be for $115,000

	Fiber build for 12 strands	Fiber build for 144 strands
Construction cost to lay down 1 mile of fiber	$100,000	$100,000
Fiber strands	$15,000 (12 strands)	$30,000 (144 strands)
Total cost	**$115,000**	**$130,000**

Source: http://erate.training/cost-allocation-of-fiber-strands-when-self-constructing/

E-rate eligible services list

Category 1 services

- Fiber (lit and dark)
- Wireless (e.g., microwave)
- Cable modem
- DSL
- Satellite service
- Broadband over power lines
- T-1, T-3
- Dial-up
- Voice services

Category 2 services

- Access points
- Antennas and cabling
- Caching
- Network switches
- Firewall services and components
- Switches
- Routers
- Racks
- UPS/battery back up
- Supporting software
- Managed services (e.g., Wi-Fi)
- Basic maintenance, repair, and installation

Source: http://usac.org/_res/documents/sl/pdf/ESL_archive/EligibleServicesList-2016.pdf

Other Resources

- FCC Modernization Order Summaries:
  - Summary of the E-Rate Modernization Order
  - Summary of the Second E-Rate Modernization Order
- Summaries
  - Modernization Order – December 2014 – Wisconsin DPI
  - A Summary of Major Changes to the E-Rate Program from the December 11 FCC Report and Order – American Library Association: January 2015
  - FCC Releases Second E-Rate Order On Modernizing The E-Rate Program – Wemble Carlyle: January 7, 201
  - The FCC Delivers Phase II of E-Rate Modernization – Open Technology Institute: January 14, 2015
- E-rate Training (3rd party): Helping you with E-rate