Municipal Broadband

Let’s have a **conversation**.

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Municipal Broadband Feasibility Study

City of Newark, Delaware
October 7, 2015
CTC Technology & Energy
Andrew Afflerbach, Ph.D., P.E.

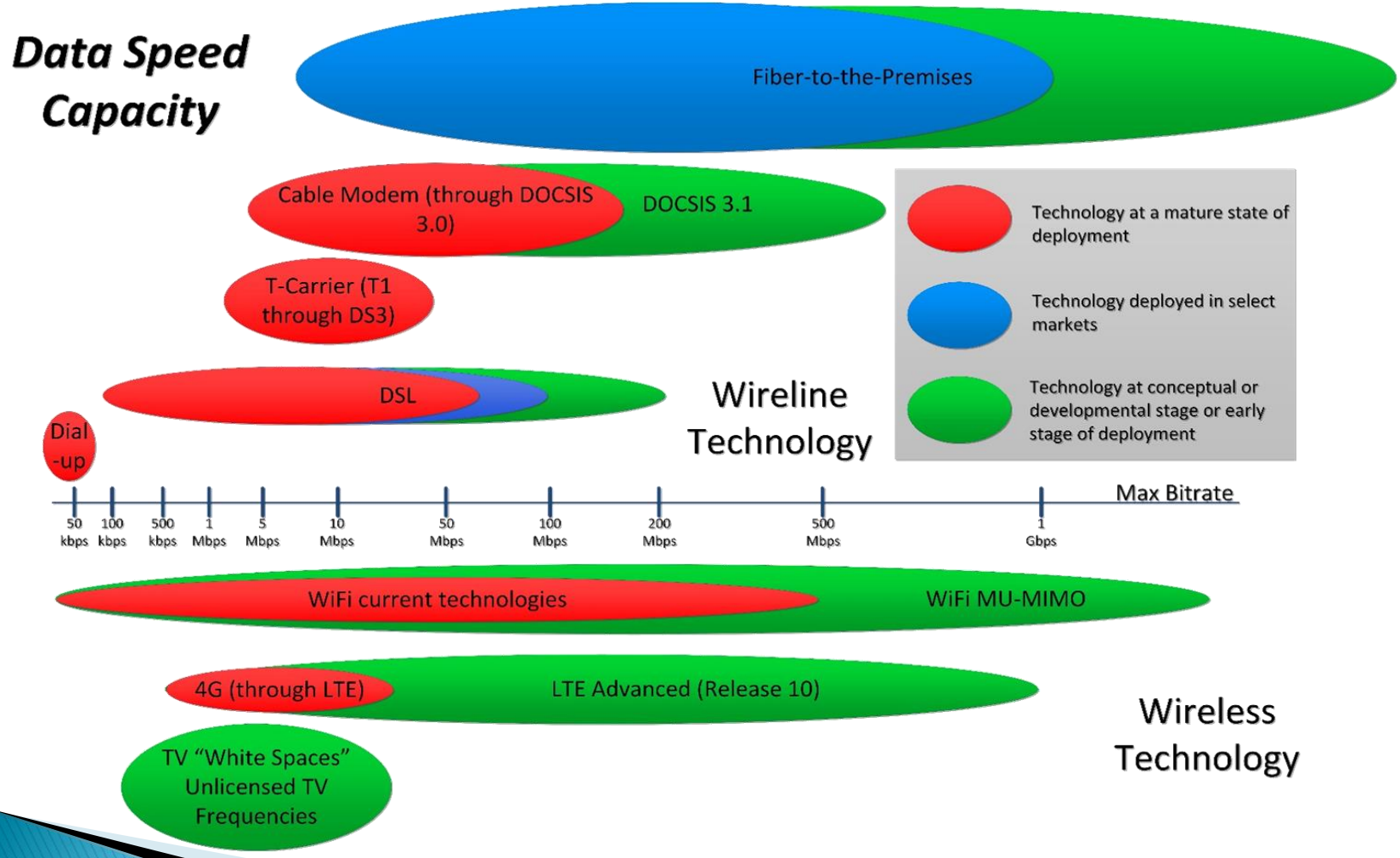
Agenda

- Introductions
- Incremental steps/meeting government needs first
- Emerging public-private partnership (P3) environment
- Funding opportunities
- Feasibility analysis

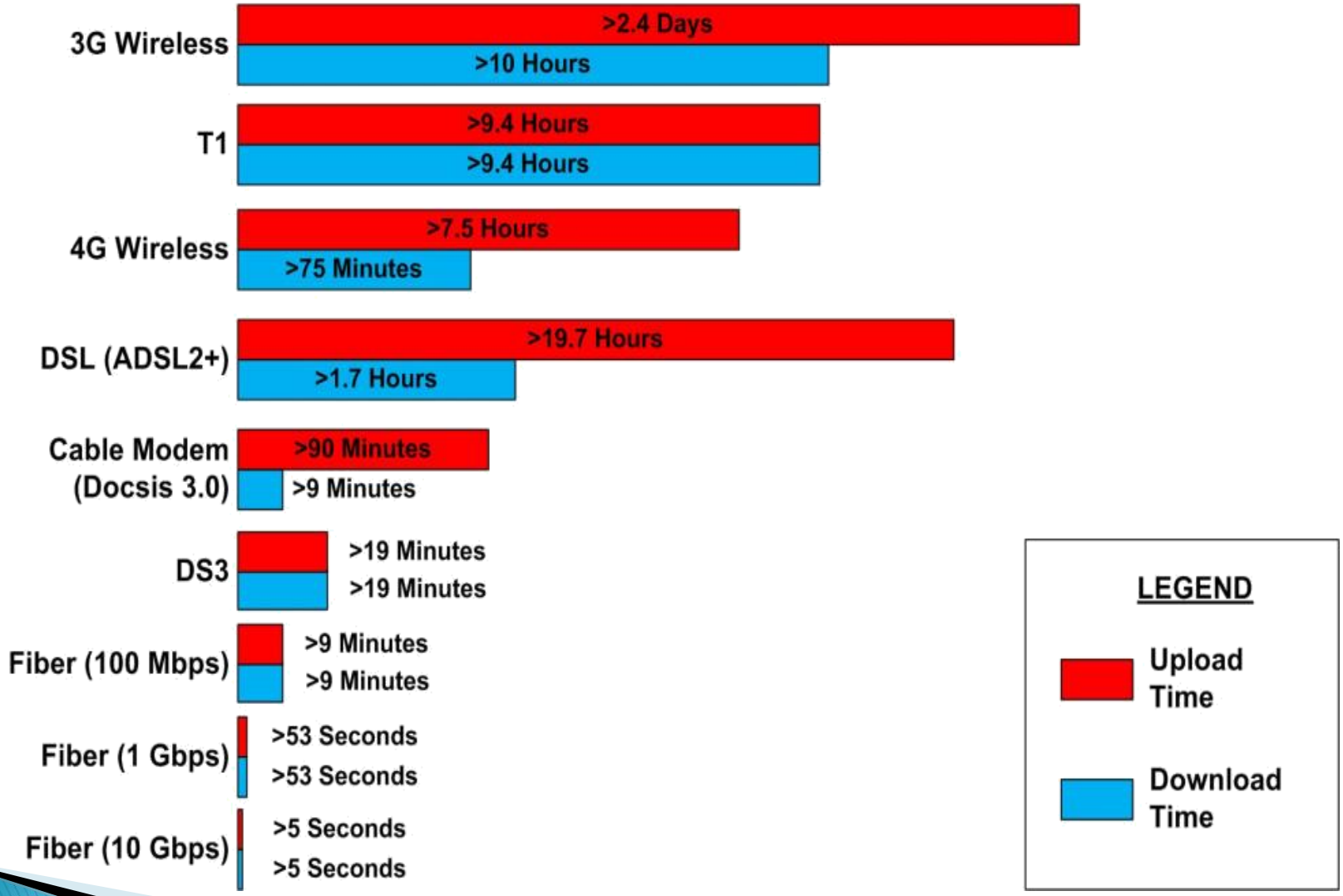
CTC Technology and Energy

- 30 years of experience in engineering and business planning for government
- 30 highly specialized staff
  - Joanne Hovis Director of Business Planning
  - Andrew Afflerbach Director of Engineering
- Wide range of expertise
  - Fiber, wireless, public safety, public power
  - Policy advice to FCC and Department of Commerce
  - San Francisco, Seattle, DelDOT, Madison, Washington DC, Boulder, Santa Cruz

Technologies and Speeds: *Fiber Ahead of All Others*



Minimum Time Required for Downloading and Uploading a 5 GB File



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Benefits to pioneering gig cities

- Currently limited data on economic development outcomes
- Documented perceived increase in home values and rental rates for FTTP-- $5,000 on $300,000 house
- Handful of gig cities to date, many of which have had extensive press coverage and host international visitors
  - http://www.slideshare.net/ceobroadband/michael-render-16959210

Benefits to pioneering gig cities

- Fitch cited fiber as one reason for posting bond rating of Kansas City, KS at AA and A+
  - "The [Google Fiber] network is attracting smaller internet and data companies to the city and has the potential to make a significant economic impact"
- Impact in attracting and retaining businesses, workers, and graduating students (anecdotal thus far, given early stage)

- https://www.fitchratings.com/site/fitch-home/pressrelease?id=979337

Incremental steps

- Case studies

City digital roads

↓

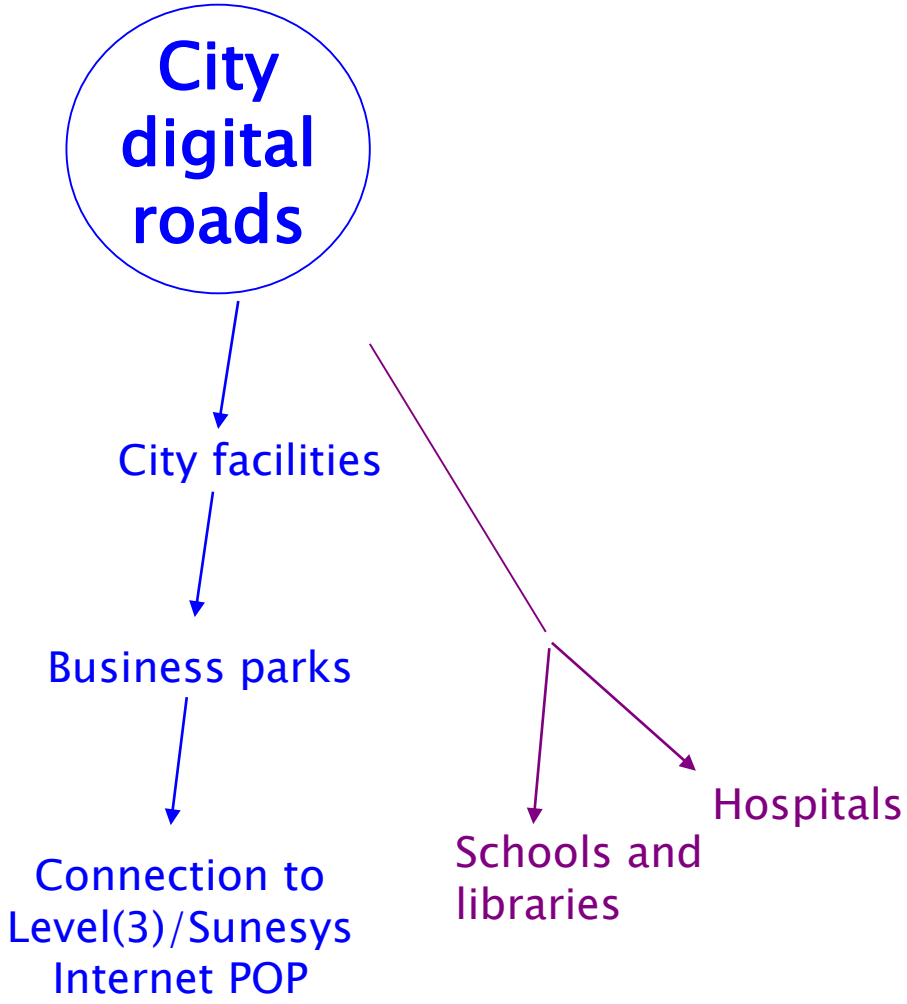
City facilities

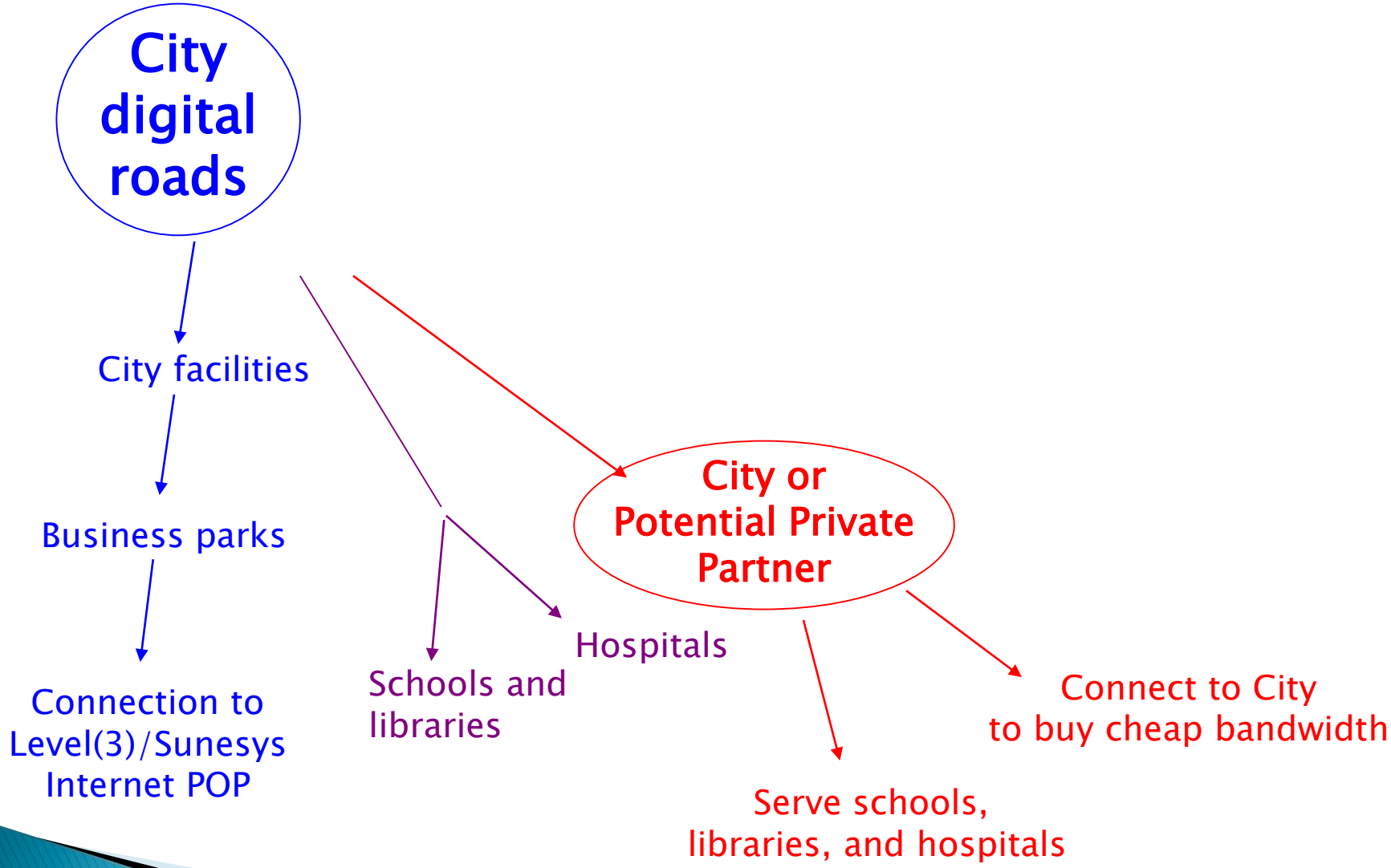
↓

Business parks

↓

Connection to Level(3)/Sunesys Internet POP


City digital roads
City facilities
Business parks
Connection to Level(3)/Sunesys Internet POP
Schools and libraries
Hospitals


City digital roads
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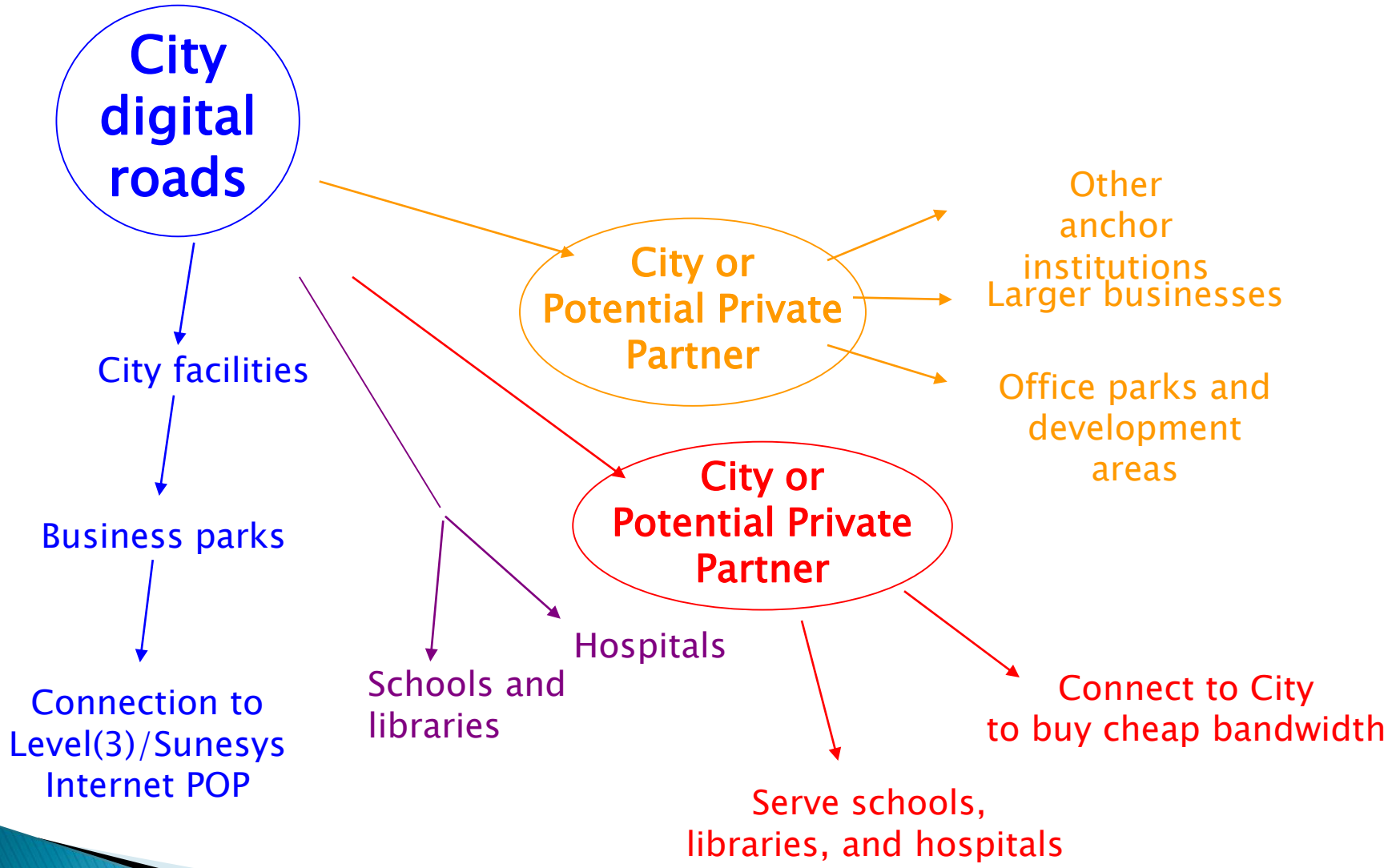
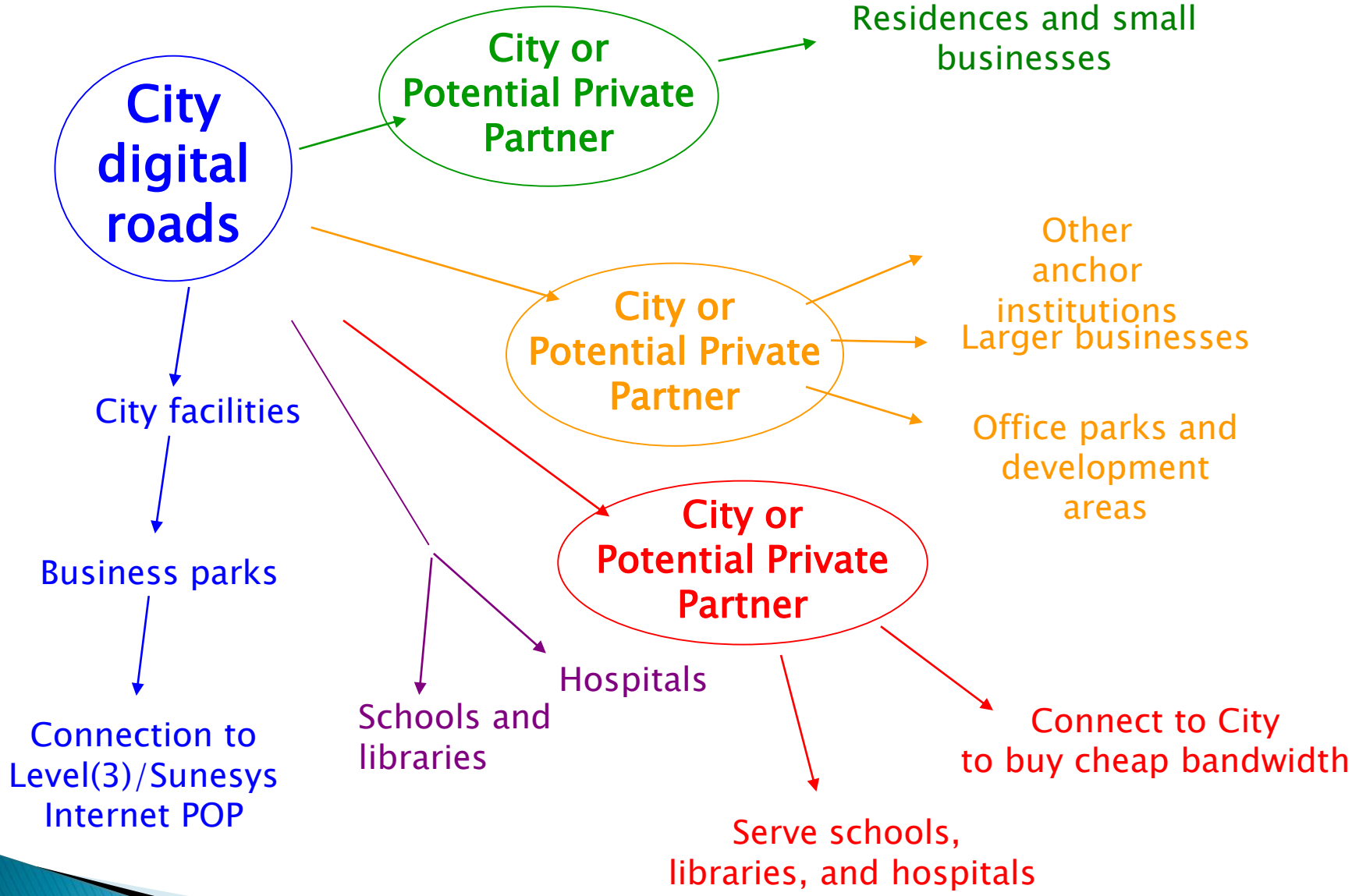
Connection to Level(3)/Sunesys Internet POP
Schools and libraries
Hospitals
City or Potential Private Partner
Serve schools, libraries, and hospitals
Connect to City to buy cheap bandwidth

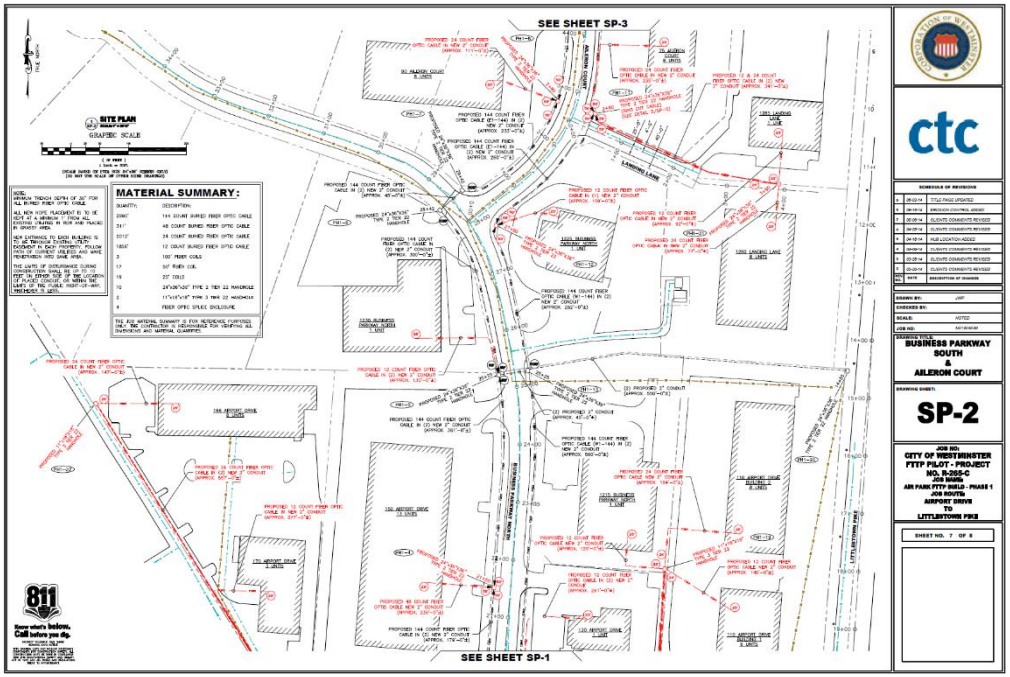

City digital roads
City facilities
Business parks
Connection to Level(3)/Sunesys Internet POP
Schools and libraries
Hospitals
City or Potential Private Partner
Other anchor institutions
Larger businesses
Office parks and development areas
City or Potential Private Partner
Serve schools, libraries, and hospitals
Connect to City to buy cheap bandwidth


City digital roads
City or Potential Private Partner
Residences and small businesses
City or Potential Private Partner
Other anchor institutions
Larger businesses
Office parks and development areas
City facilities
Business parks
Connection to Level(3)/Sunesys Internet POP
Schools and libraries
Hospitals
City or Potential Private Partner
Connect to City to buy cheap bandwidth
Serve schools, libraries, and hospitals

Electric utility provides cost and functionality advantages

- Pole lines and conduit reduce costs and make construction quick
  - $5/foot vs $10 to $15/foot aerial
- Operational efficiencies from staff and materials
- Synergies with electrical operations
- Customer service infrastructure
- Ability to borrow

Case study: Culver City, CA



- Deploy fiber strategically, with focus on key economic development targets
- Connect to Internet peering point (could be local meet point)
- City to build and own, lease to private partners on open access basis
- Pricing designed to attract ISPs and non-traditional users such as building owners

Case study: Mesa AZ

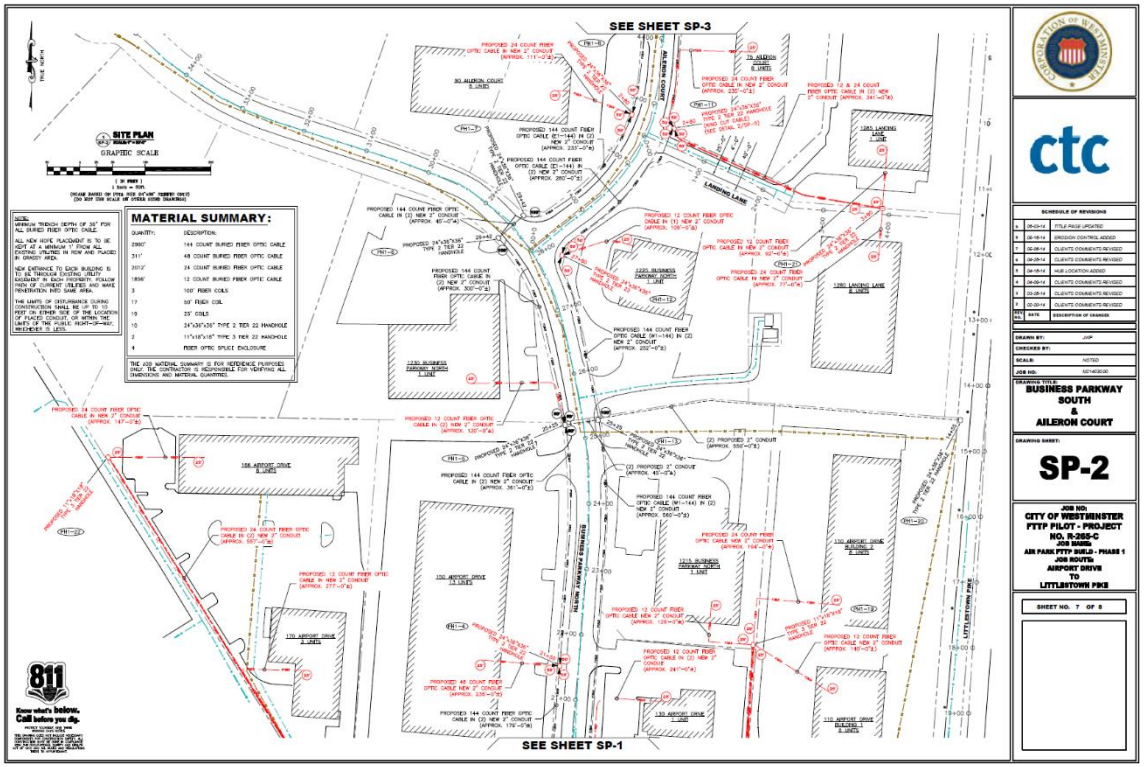
- Concern about impact of fiber construction on ROW, city costs
- Long-term strategy to build conduit in all new road/utility projects
- Four target economic development areas
- Apple silicon manufacturing lab

Emerging P3 environment

- Range from Google/facilitation model to Macquarie Capital traditional P3 model
- Early days
- Untested but we believe it is the most likely model for the future– growing interest
- City and private partner split risk

Case study: Westminster, MD

- City near D.C., Baltimore
- About 20,000 residents and 3,000 businesses
- City building FTTP, leasing to private partner to operate Gigabit Internet to residents



Case study: Westminster, MD

- City first constructed pilot projects – residential and business
- Full citywide network deployment is expected to require approximately 80 route miles of fiber
- Network operator—Ting Internet—shares risk with City

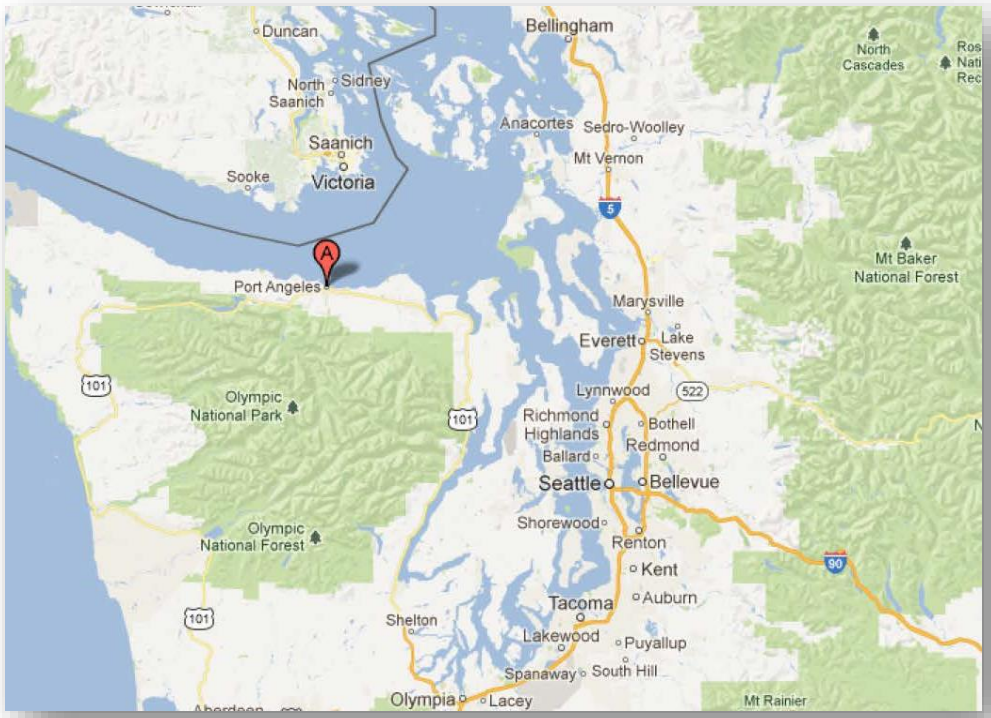
Ting/Westminster contract terms

- Ting established Canadian MVNO wireless provider
- 10 year lease agreement with 2 year exclusivity
- Ting pays $6/home passed, $17/activated customer
- Must offer services comparable to other FTTP

Other PPP Models

- Metronet
  - Growing private-equity funded operator in Indiana cities
  - Indiana allows cities to provide property tax rebates
  - Exploring other options in Kentucky, elsewhere
  - Private company owns fiber, selects service areas and rates
  - Less risk for City
- ITV-3 (Family Video)
  - Urbana-Champaign
  - Long term lease of city backbone fiber and ITV buildout to city

Case study: Port Angeles, WA



- 19,000 residents
- 10.7 square miles
- Canadian border and international point of entry
- Classified rural by Department of Commerce
- Statistically underpoliced
- Tourist traffic
- Municipal utility with fiber optic network
- Regional NoaNet fiber network

Port Angeles functional requirements

- Video streaming to and from 90+ public safety vehicles and 200+ CCTV
  - Several Mbps up and down and no caps
- "Same functionality in vehicles as command center"
- Reliable, affordable public Internet service
  - DSL equivalent
  - Homes/businesses
  - Nomadic
  - Flexible plans
- Tourist demand
- Scalability

Source: commons.wikimedia.org, Kevin Krejci

Meeting government needs first

- Benefits
  Funding
  Revenue

Newark and the 21st century city network

- Starting point for analysis is internal savings and efficiencies
- Reduced costs from leased circuits—current and future
- Begun discussions with City departments about increasing needs
- Consider long term service options
  - Leverage and enhance city fiber
  - Current leased services
  - Long term fiber lease

Avoided costs, future growth

- Imagine unconstrained use
- Operational efficiencies
- Hardware and software efficiencies
- Smart city applications and devices/sensors
- Assume exponential growth of need
- Build your hedge

City broadband needs

- Monitoring/SCADA
- CCTV (substations, parking lots)
- Internet
- Voice
- GIS
- Smart city
- Work order management system
- Code enforcement (2-way video)
- Public space WiFi (reservoir)
- Mobile command unit
- Parking meters
- Cloud applications

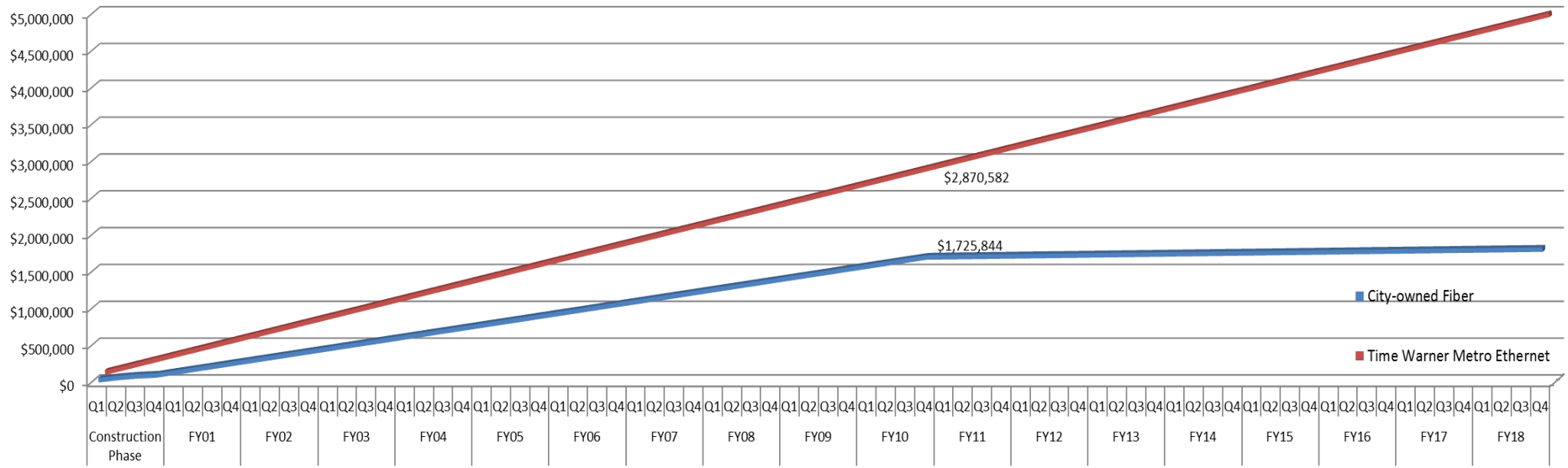
City broadband needs

- Public Safety
  - Radio backhaul
  - CAD/RMS
  - Wireless broadband
  - CCTV
  - Shot spotter
  - Interconnection with state and federal
  - Training
  - Internet

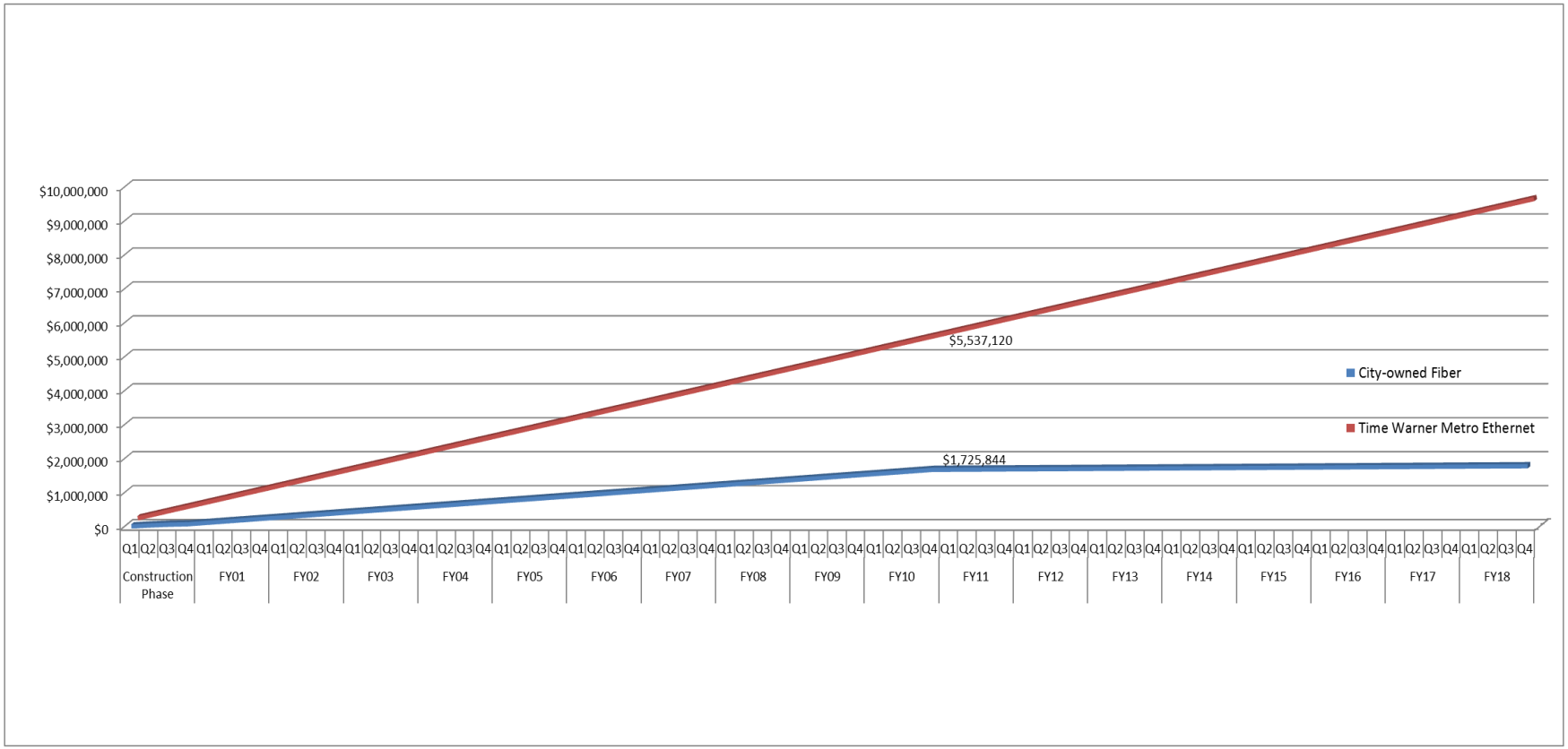
City broadband needs

- Educational
  - Internet
  - Cloud applications
  - Distance learning
  - Learning at home
  - Test-taking
  - In-service training
- Libraries

Cumulative payments, fiber build (low estimate) vs. gigabit services



Cumulative payments, fiber build (low estimate) vs. 10 gigabit service



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Service to schools over FiberNet

- T-1 to elementary schools
  - 1.54 Mbps symmetrical
  - $3,600/Mbps/site annual cost
  - $1,800/Mbps/site after E-rate

- FiberNet to elementary schools
  - 100 Mbps symmetrical
  - $70/Mbps/site annual opex
  - Opex cost includes voice and video
  - Scalable to 1 Gbps at $7/Mbps/ site

Revenue opportunities

- Dark fiber leasing
- Conduit leasing
- Service to public institutions
- E-rate and schools/libraries
- Health Care Connect and health care institutions

Funding sources

- Subscriber revenues
- Federal programs
  - Health Care Connect
  - E-Rate
- Grants
  - Capital
  - Ongoing O&M
- Bonding
- Internal loans
- Electric allocations
  - Capital
  - Ongoing O&M

E-Rate (USF Schools and Libraries)

- Administered by Universal Service Administrative Company (USAC) under FCC
- Created in ’96; first granted funds in ’98
- >$2.25B/annum
- Subsidizes dark fiber, services, and fiber lateral construction
- Funding level is based on degree of rurality and level of poverty
- Recent increase in fund size and 10 year, $15B infrastructure investment

Calculating the E-rate discount

Poverty, as measured by % of students eligible for free/reduced school lunch program	Discount level in rural areas/ urban areas
Less than 1%	25%, 20%
1 to 19%	50%, 40%
20 to 34%	60%, 50%
35 to 49%	70%, 60%
50 to 74%	80%
75 to 100 %	85-90%

Lateral fiber construction opportunity

- Compelling economics
- School/library contribution can be amortized over three years
- Requires showing of cost-effectiveness
- Even without capex contribution, consider financing fiber based on revenue potential

Health Care Connect

- New program (December 2012 order) that allocates funding from the Universal Service Fund to subsidize service to health care institutions
- Replaces and reforms Rural Health Care program created by '96 Act (widely considered poorly designed)
- Adopts the E-Rate model with variation

Health Care Connect funding

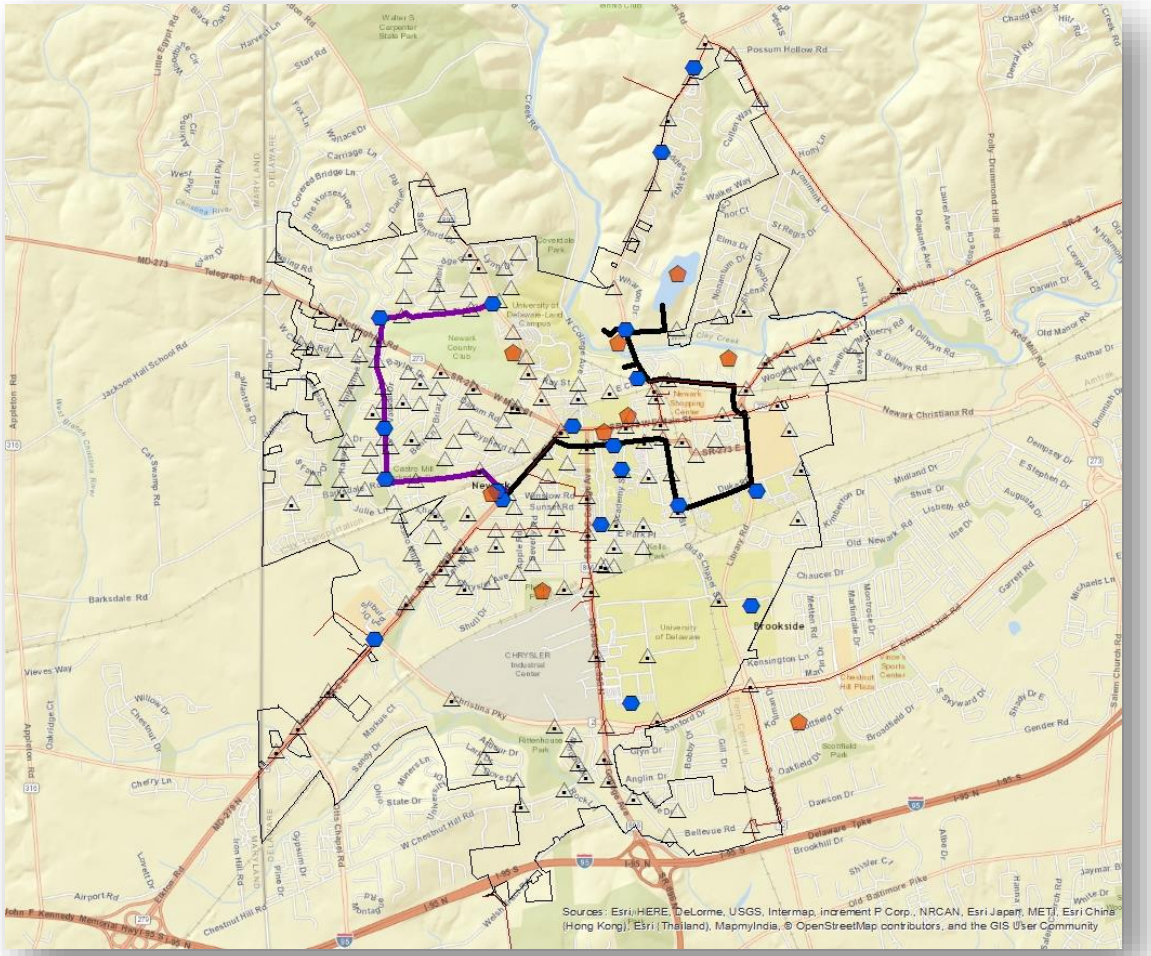
- $400M/annum cap until now (appears undersubscribed)
- 65 percent subsidy
- Local government networks eligible to serve subsidized entities
- Rural health care institutions can apply, as can non-rural entities who are part of a consortium

Feasibility Analysis

- Technical model
  Financial analysis

Technical model

- Technical architecture
- High level routing and costs
- Staffing and operational requirements
- Ability to leverage existing resources
- Availability of poles and rights of way



Financial analysis

- Pro forma for city network operations
- High level model following accounting standards
- Sensitivity to
  - Market penetration
  - Pricing
  - Tiered revenue structures
  - Operating fees
  - System construction
  - Staffing levels

Financial analysis

- Order of magnitude estimate of cost and feasibility
  - Operating income and cash flow
  - Net present value analysis
  - Subscriber revenue by service and customer class
  - Debt service analysis
  - Reserve fund requirements
  - Uses and sources of funds
  - Operating expenses
  - Operational savings
  - Depreciation summary
  - Projected construction costs for network, hardware, buildings and other equipment
  - Return on investment (ROI)

Financial analysis

- Will incorporate city needs based on discussions begun with city staff
- Will incorporate input from city staff and public to develop architecture and project goals
  - Degree of service to homes and businesses
  - Wireless vs. fiber

Financial analysis

- Potential hybrid
  - Tiered free WiFi
  - Premium WiFi at higher speeds
  - Fiber to large businesses, institutions, “power” users

Financial analysis

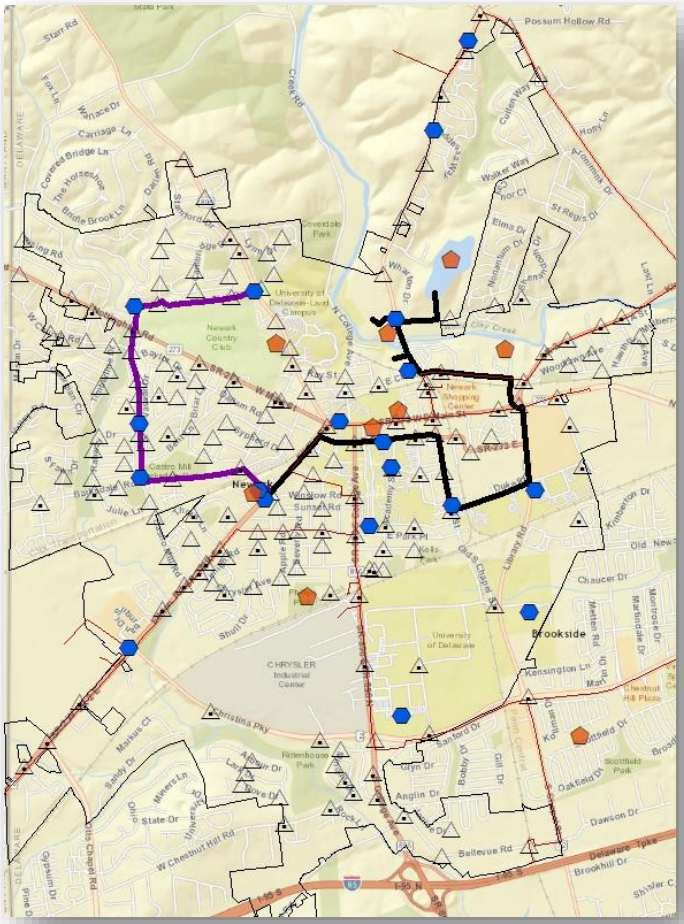
- Areas of risk
  - Strong Verizon and Comcast residential presence
  - Large commercial fiber providers
    - Level(3)
    - Windstream
    - Sunesys
  - Strong reaction from incumbent providers

Strategies: grow your assets

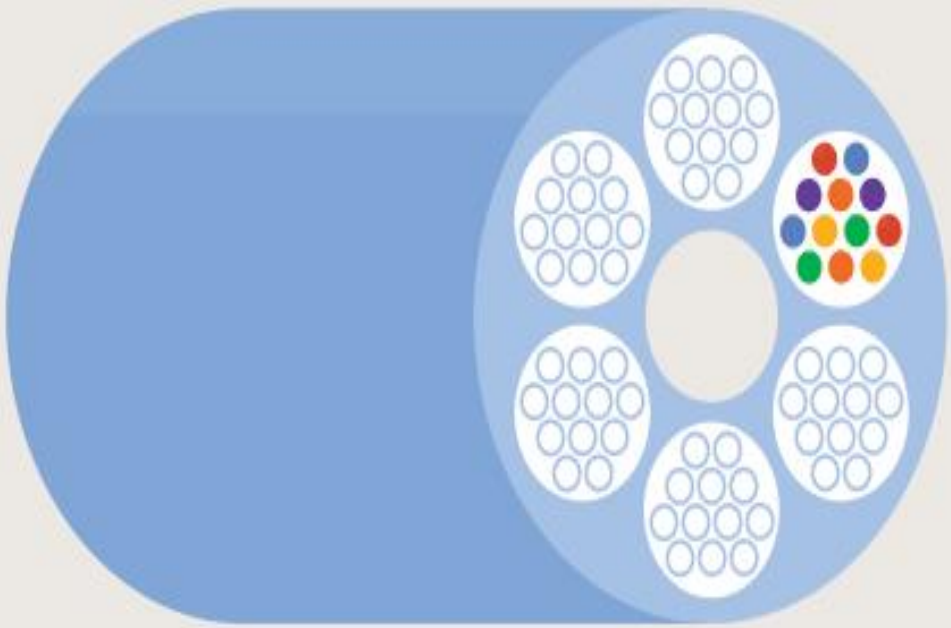
Access to Key Assets

- ✓ **Lease public assets such as fiber, conduit, and real estate**
  - Lease middle-mile fiber
  - Lease fiber in hard-to-reach areas
  - Increase existing fiber capacity if insufficient fiber exists
- ✓ **Facilitate underground construction**
  - Develop a "dig-once" policy
  - Maintain future-proof conduit specifications
  - Enable all parties to take advantage of "dig-once"
  - Place conduit banks in congested areas
- ✓ **Facilitate aerial construction through access to utility poles**
  - Facilitate make-ready process to streamline pole access
  - Eliminate the need for make-ready
- ✓ **Facilitate in-building access for wireline infrastructure**
  - Ensure availability of conduit from street to building
  - Ensure installation of in-building pathways and cabling

Current state

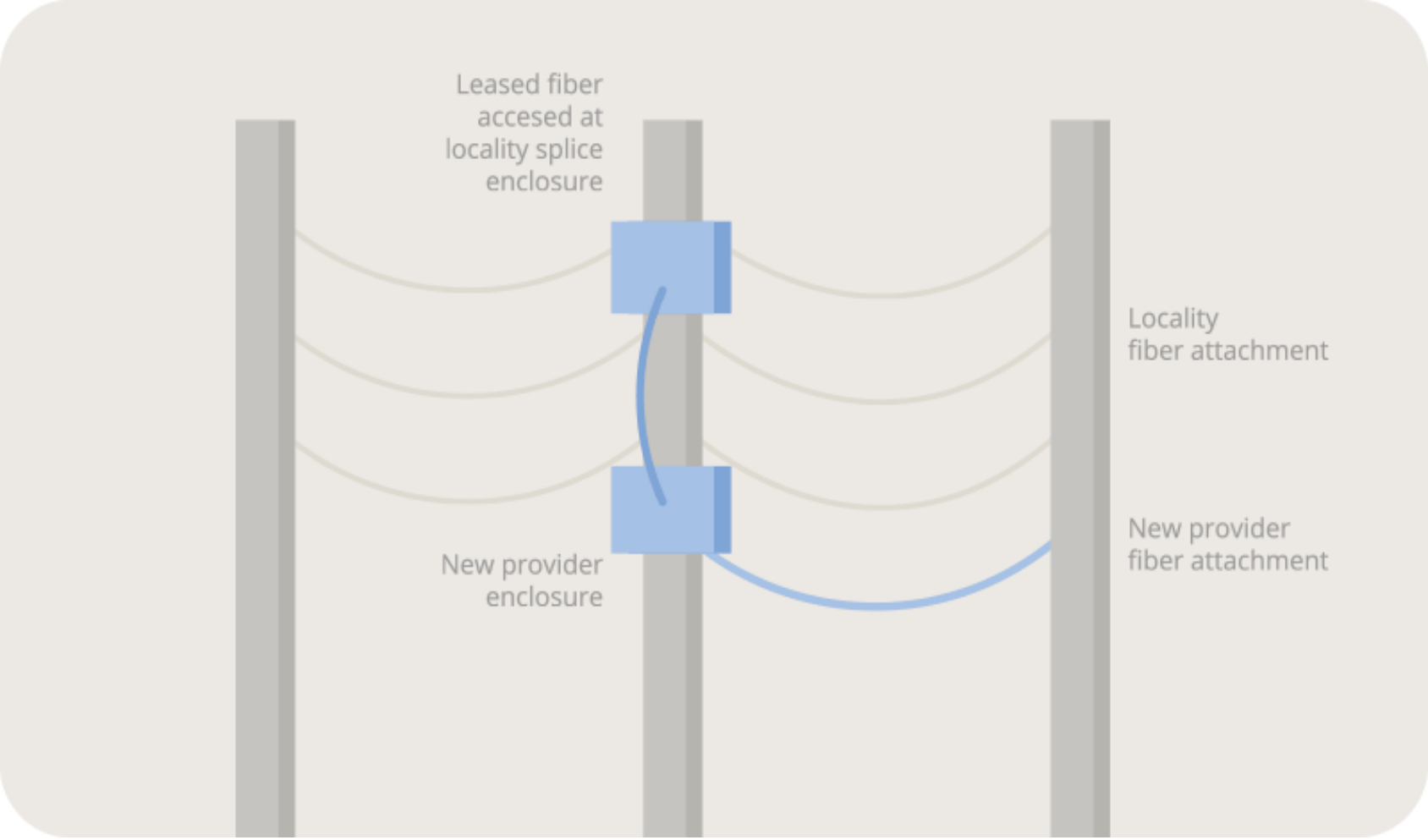

Possum Hollow Rd
Stirr Rd
Fox Ln
Wonace Dr
Carriage Ln
Connect Bridge Ln
The Horseshoe
Bridle Brook Ln
Creek Rd
Dallas Rd
Lyons Rd
Stanford Dr
Sage Dr
Riverside Park
University of Delaware-Laird Campus
Newark Country Club
Kay St
Elm St
Cleveland Ave
Wyoming Rd
Dallas Dr
Cleveland Ave
Cleveland Ave
Cleveland Ave

Asset: underground fiber



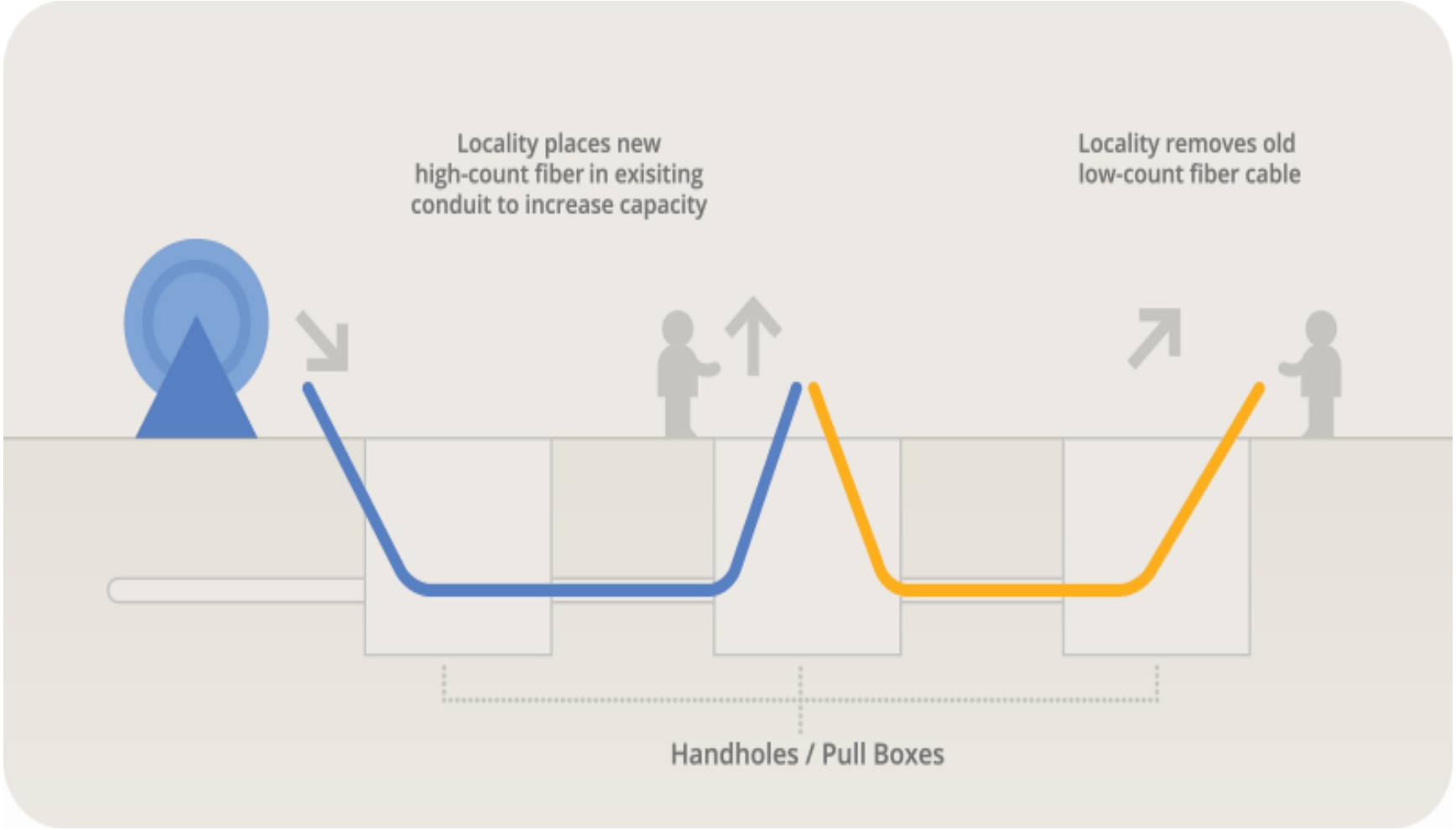
Locality leases or sells 12-count fiber tube to broadband network providers (shown as colored fiber strands)

Asset: aerial fiber

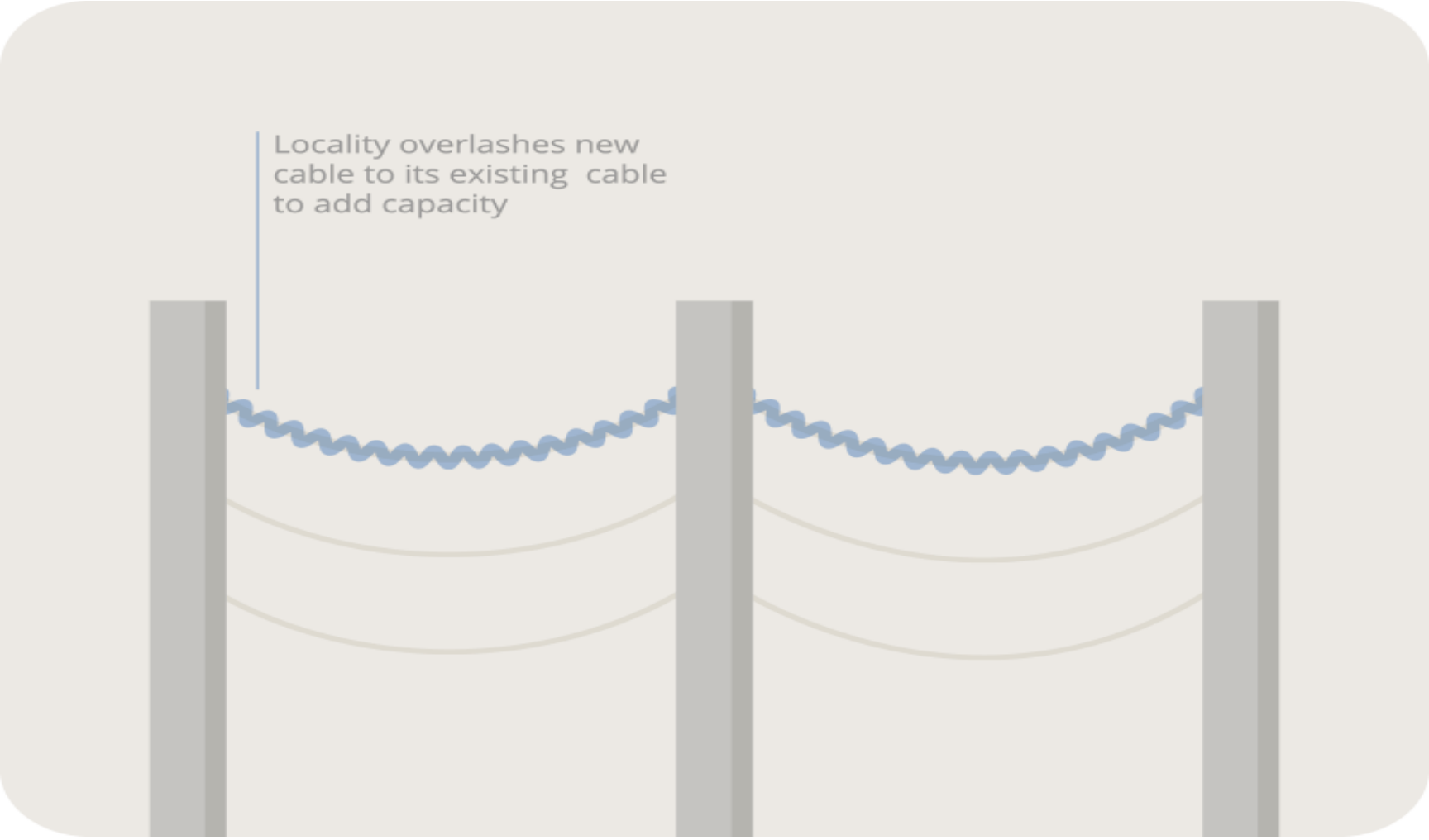


Grow your asset base: conduit

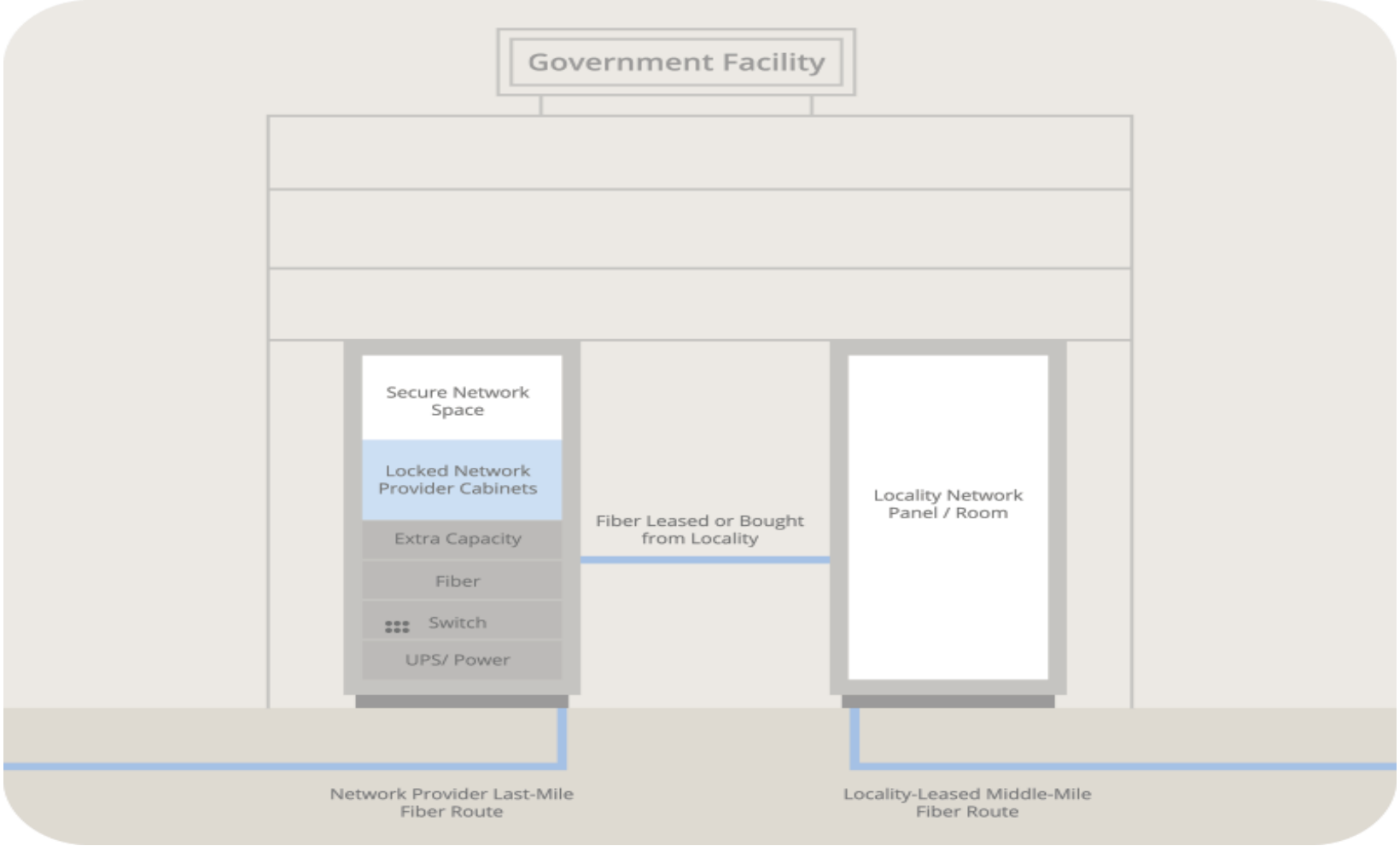
Grow your asset base: fiber



Grow your asset base: fiber



Asset: interconnection facility



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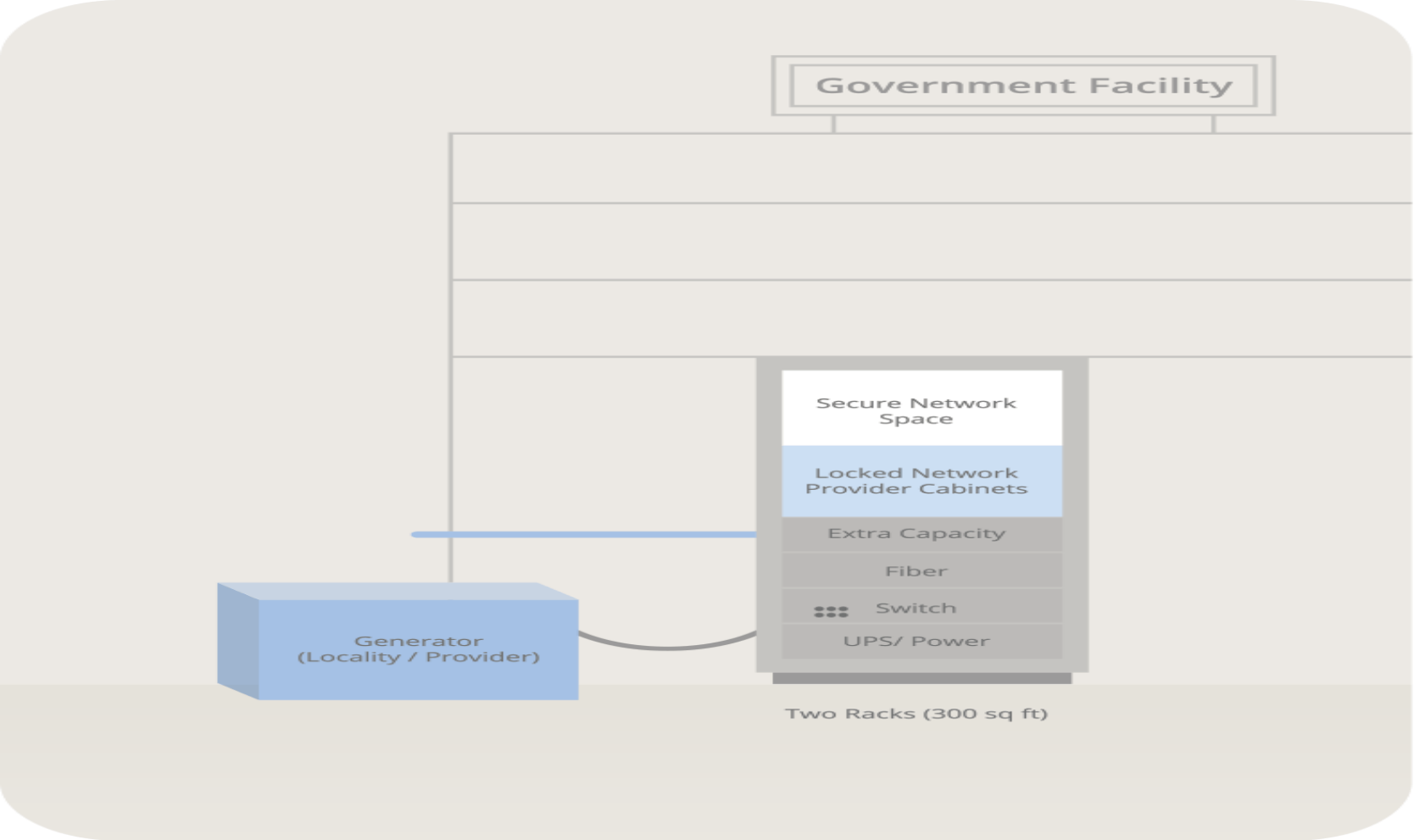
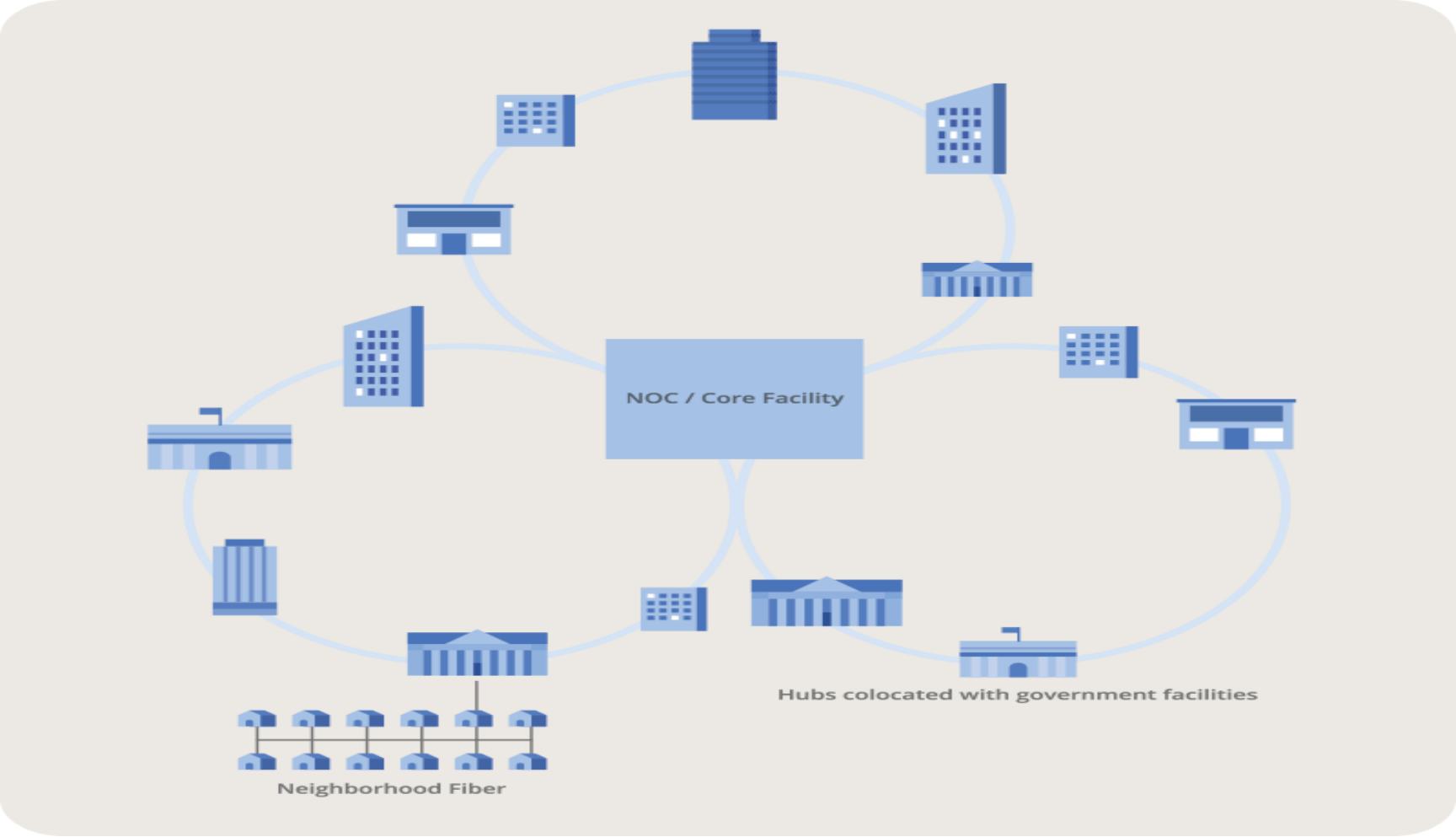
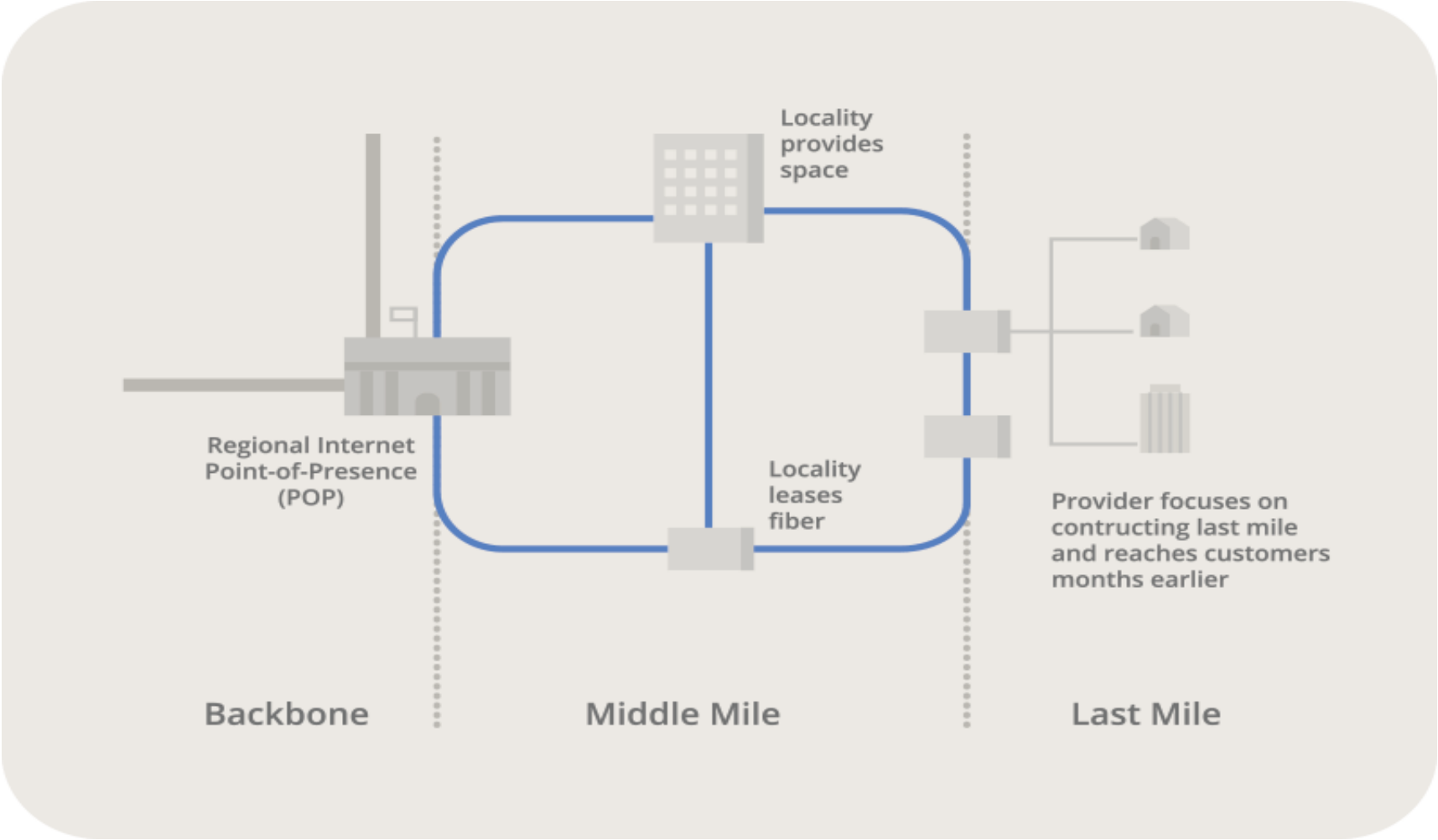


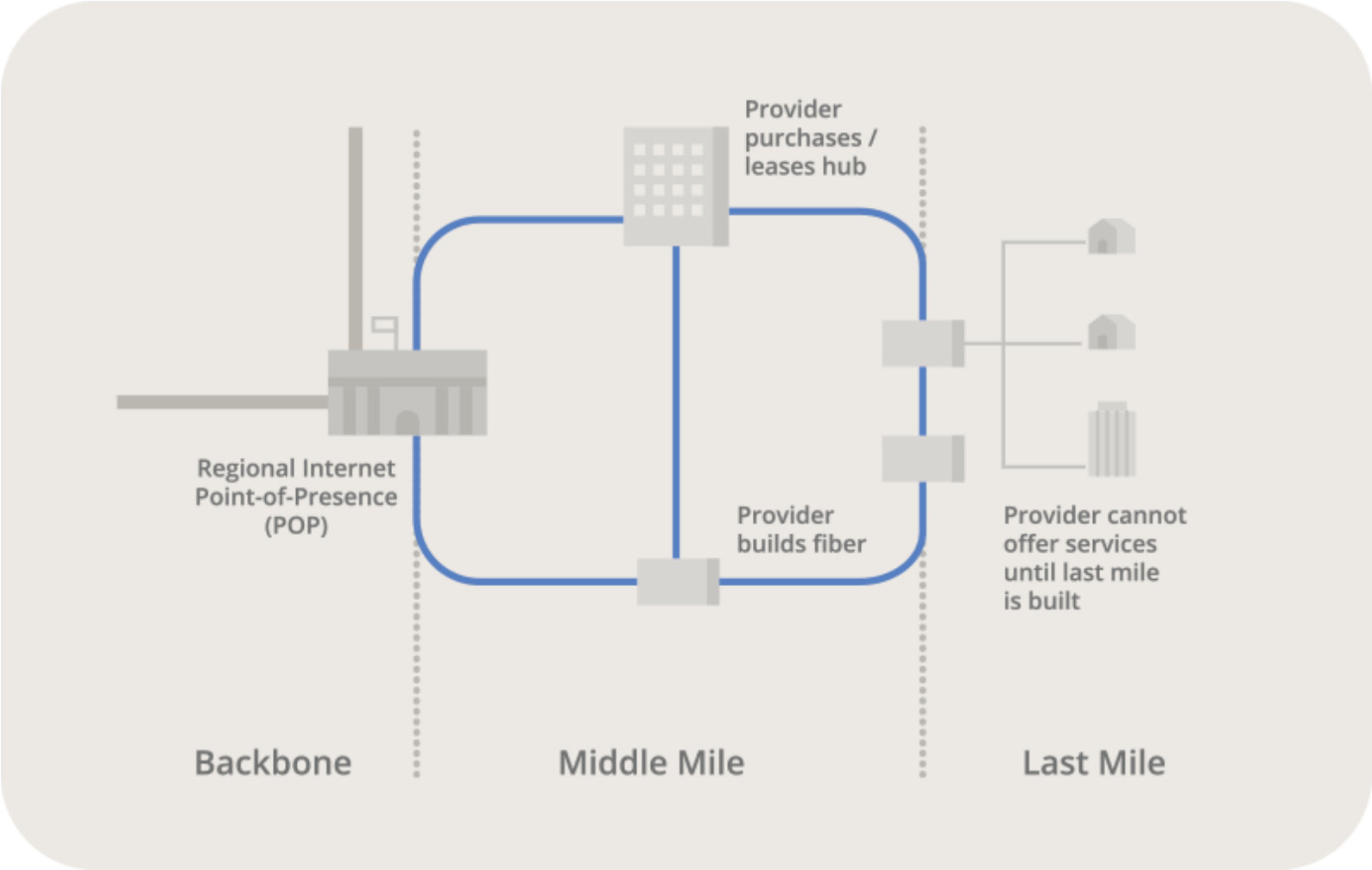
Your fiber reaches neighborhoods



Assets: fiber and real estate



Your assets make a difference



Strategies: access to information

Information Access

- ✓ **Make data available wherever possible**
  - Make GIS data sets available
- ✓ **Document and publish data regarding available conduit, fiber, and other assets**
  - Document your fiber assets
  - Document your conduit assets

Strategies: maximize processes

Process Efficiency

- ✓ Build broadband into planning and staffing of all relevant agencies
- ✓ Streamline and publicize procedures and timeframes for permitting and inspections
- ✓ Allow network operators to contract pre-approved third-party inspectors to speed processes and reduce local burdens

Thank you

Andrew Afflerbach, Ph.D., P.E.
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