Rural America & Digital Divide

Deep Fiber + New Business Models

Readout from FCC Broadband Deployment Technology Committee

Regional Broadband Roundtable

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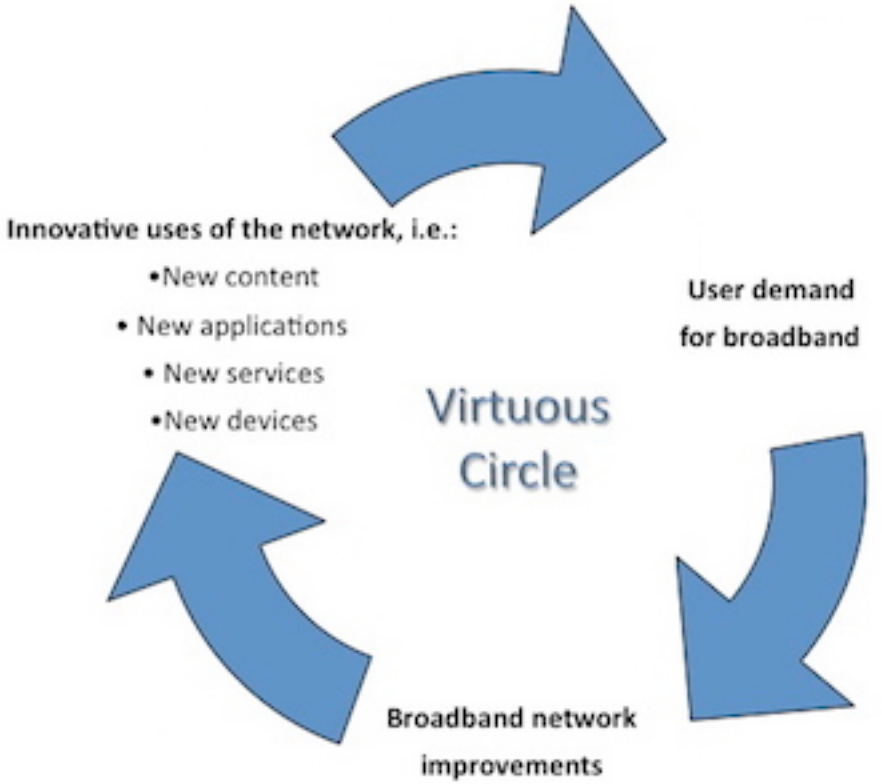
Stagg Newman

stagg@pisgahvu.com

202-669-3248

The Broadband Virtuous Cycle

Rural America Being Left Further Behind



- **Performance doubles Every 2 years in urban and suburban areas**

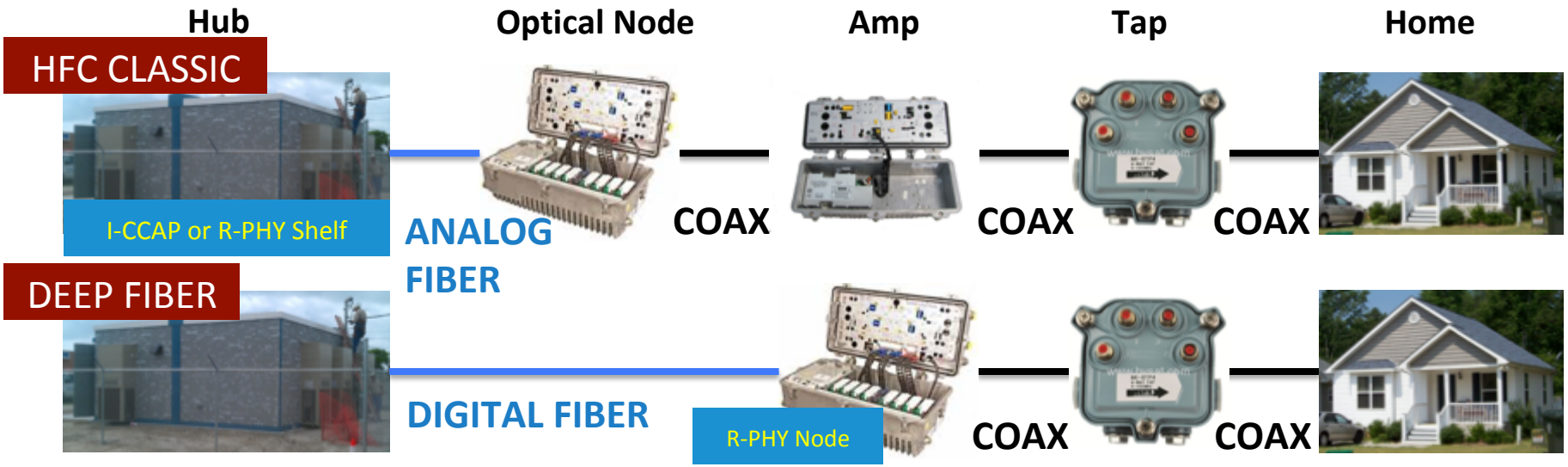
Population Covered	Notional Cost Factor
00% – 90%	1X-2X
90% - 99%	2X-20X
99% - 100%	20X – 200X

- **Telco copper and conventional cellular technology hitting limits**
- **Without deep fiber, rural America will be left further behind.**
- **The economics of rural broadband are daunting – and require a fundamental rethinking across Technologies, Local Conditions, and Business Models.**

Source: Stagg Newman, FCC Subadvisory Committee work

The Future – Cable Network

Gbps w/ Deep Fiber with Coax to Home

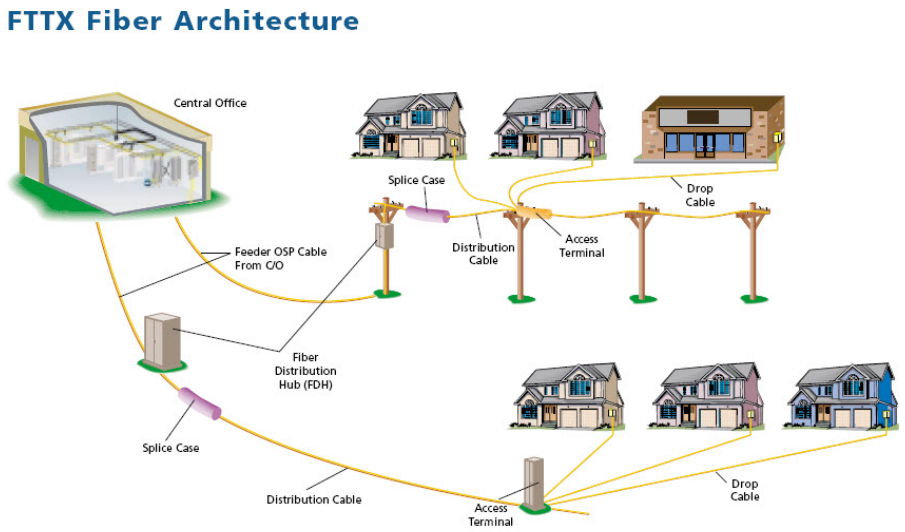


- HFC Classic (100 Mpbs standard service and 1 Gbps premium
- Deep fiber enables 1 Gbps standard and 10 Gbps premium
- From 500 Households passed per node reduced to as low as 50 with deeper fiber
- Attractive evolution plan with relatively low additional capex/sub

Source: John Chapman, Cisco. FCC Subadvisory Committee work

The Future – Telco Network

Gbps w/ Fiber to the Home, MDU, or Curb



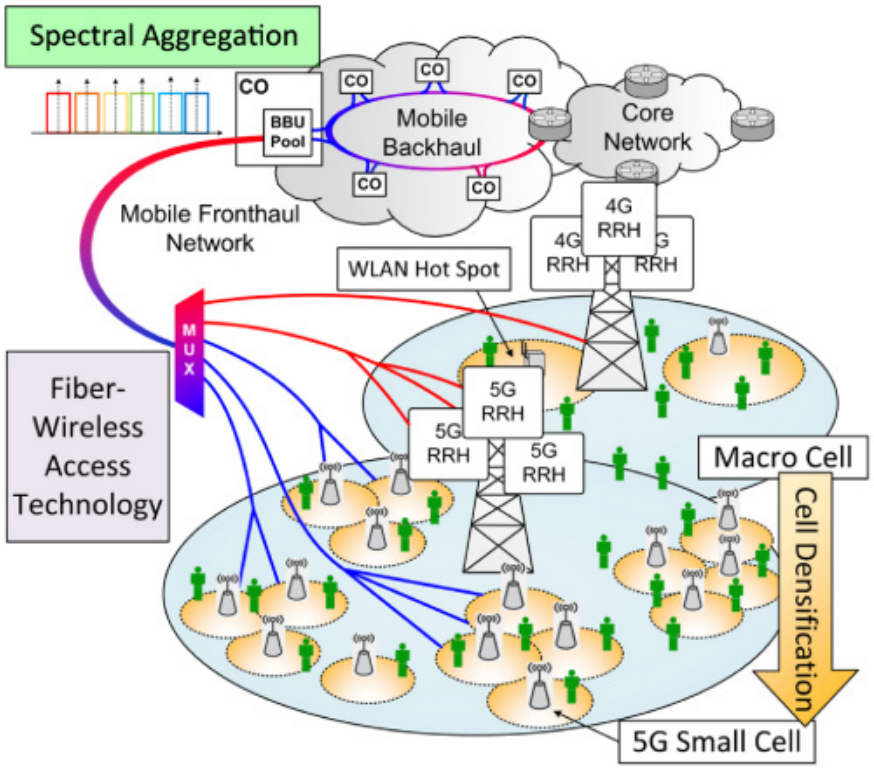
Source: http://www.sitteliesolutions.com/blog/wp-content/uploads/2014/03/ADC_FTTx_Overview.jpg

- Telco DSL w >200 meter copper tails are obsolete; cannot keep pace with demand
- Fiber to building or to “curb”
- Deep fiber enables >1 Gbps service and relatively future proof
- Large upfront capex in most areas of $500 to $5000 per home passed and $300-$1000 per home connected.

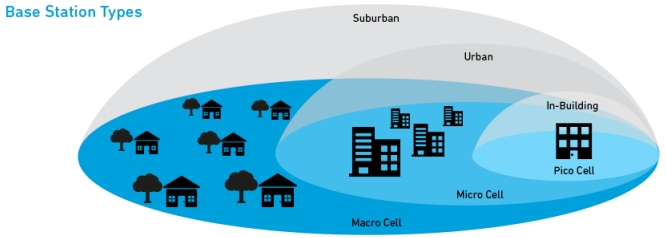
Source: Stagg Newman, FCC Subadvisory Committee work

The Future - Wireless Networks

Gbps with Deep Fiber and 100s of Small Cells/Sq. Mi.



- **Rural macro cells cover tens of square miles w average speed <10 Mbps and cell edge <<1 Mbps**
- **Urban 5G will have >> tens of cells per square mile and average speeds of >100 Mbps**



Cell Type	Output Power (W)	Cell Radius (km)	Users	Locations
Femtocell	0.001 to 0.25	0.010 to 0.1	1 to 30	Indoor
Pico Cell	0.25 to 1	0.1 to 0.2	30 to 100	Indoor/Outdoor
Micro Cell	1 to 10	0.2 to 2.0	100 to 2000	Indoor/Outdoor
Macro Cell	10 to >50	8 to 30	>2000	Outdoor

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The Internet of Things (IOT) Demands Nextgen Wireless

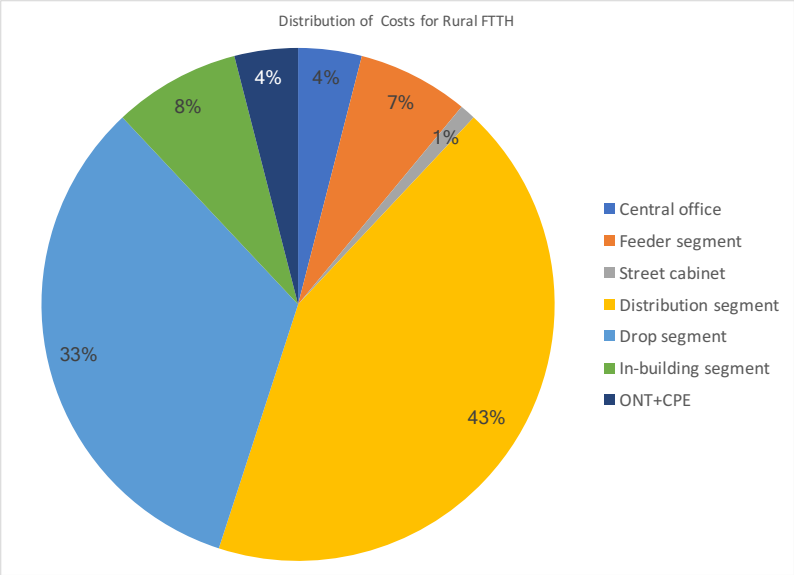
Source: Stagg Newman, FCC Subadvisory Committee work

The Technologies – Deep Fiber

Sine Qua Non – and it is a civil engineering problem

- **Insufficient architectures**
  - **Wide area wireless networks**
  - **DSL**
  - **Satellite except for most remote areas**
  - **Older cable networks**

Capital Cost Distribution for Rural FTTH (1000-3000 Households, density 23 HHs/Km^2)



- 50% of cost is construction of outside plant to the curb
- 33% of cost is drop to the house
- ➢ Both of these are dominated by labor costs

Source: Stagg Newman, FCC Subadvisory Committee work

Source: https://doi.org/10.1016/j.telpol.2016.04.002

What the Local Communities Can Do

Act *now* to close rural gap

- Inventory
- Friendly policies such as dig once, do once for all utilities
- Partnerships including utilities
- RfP for overbuilds and/or upgrades or orchestrate buy-outs if incumbents will not commit to modernize
- Migigate risks through demand commitment and aggregation and anchor contracts

Find Partners to create a Deep Fiber Fixed and Mobile Broadband Evolvable Infrastrutue

Source: Stagg Newman, FCC Subadvisory Committee work

Thank you!