THE BROADBAND OPPORTUNITY

THE SOUTHWESTERN COMMISSION | NOVEMBER 2017

The Broadband Opportunity

- Your Presenter

- What is Broadband

- Why is Broadband Important?

- How does Broadband Work?

- When will Broadband be Available?

Your Presenter

- **Education**   ECU BSBA Accounting w/Minors Computer Science & History
  NCSU MS Economics

- **Professional**   Ernst & Whinney – Tax Staff
  Large Computer Sales (including one startup and IPO)
  VP Sales & Distribution Vanguard Cellular (startup and IPO)
  EVP Sales Marketing & Operations Southern Comms. (The Southern Company)
  VP National Wireless Data Sales GTE
  AVP E Business Sales & Marketing BellSouth
  Co-founder and COO ITO (Wholesale provider for BellSouth, Verizon, Century.)
  Several other start-ups and turn arounds

- **Consulting**   Charlotte Hornets
  Water Systems, Inc.
  East Tennessee Brain & Spine
  Palmetto Behavioral Health

What is Last Mile?

- Last Mile is a marketing term.

- This term suggests any entity with a "complete" connection to a customer has a unique advantage in the marketplace.

- Last mile providers mainly include:
  - Electric utilities,
  - Water and sewer authorities,
  - Cable providers, and
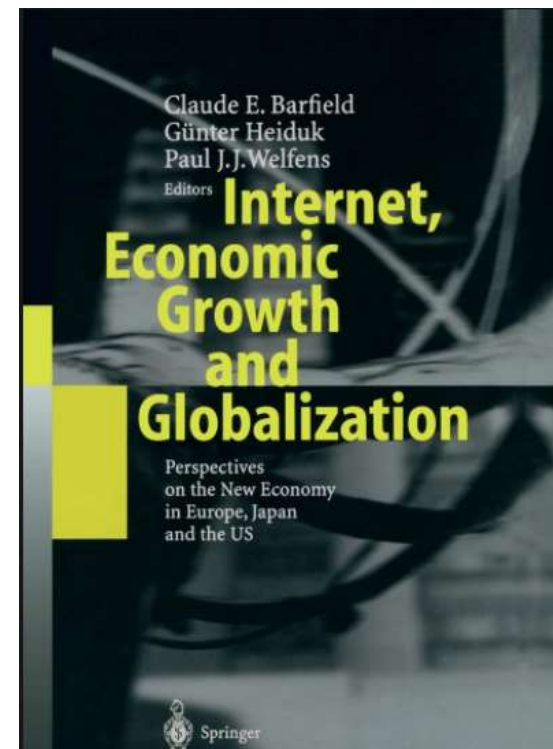 - Wireline telephone companies.

THE LAST MILE

What is Last Mile?

- Changes in technology have shifted perceptions about the last mile though most last mile services are considered to be utility type services;
    - For profit organizations who are "last mile" based, now have an increase focus to maintain MRC and margins;
    - Current margin erosion has providers scrambling for alternate services to "sell" to supposedly captive customers
    - Examples include premium content from cable providers; infrastructure protection plans from gas companies; surge suppression from electric utilities; convenience features from telephone companies, and even special pickup days from trash collectors

The Importance of Last Mile

- Governments have an increasing recognizance of last mile capabilities.

- Internet access:
  - Utility for many individuals and businesses
  - An alternate, and often more cost effective, enabler for voice communications
  - A key component of infrastructure for supporting business; whether knowledge based or manufacturing
  - An equalizer for families / constituents for education, health care, jobs, and convenience
  - A fundamental building block for increased effectiveness for governments

Claude E. Barfield
Günter Heiduk
Paul J. J. Welfens
Editors

Internet, Economic Growth and Globalization

Perspectives on the New Economy in Europe, Japan and the US

Springer

The Importance of Last Mile

- Governments have an increasing recognizance of last mile capabilities.

- Governments have unique approaches to last mile within their jurisdictions.
  - Own and operate networks
  - Encourage alternate providers
  - Build partnerships for shared infrastructure

- Financial and operational aspects are significant discussion points.
  - What is the appropriate role of the government entity which is progressive, pragmatic, and prudent?


Local Government and the Connected County

What is Broadband?

- Broadband represents the ability to move information or data, at a high rate from one source to another.

- Often referred to as "speed;" the correct term is throughput.

- Broadband leverages multiple "channels" in the transmission medium to deliver higher throughput.

- Today the official definition of broadband is the ability to maintain a transfer rate of 25 million bits of information per second from one remote location to an end user; this is termed download.

What is Broadband?

- The definition further includes the movement of information from an end user to another source; this is termed upload and the current standard is 8 million bits of information/second.

- Bits are an electrical way to designate information – 8 bits equal to a unit of data termed a "Byte."

- A byte is approximately equal to one character in the alphabet – i.e. , a letter – a number – or a symbol.
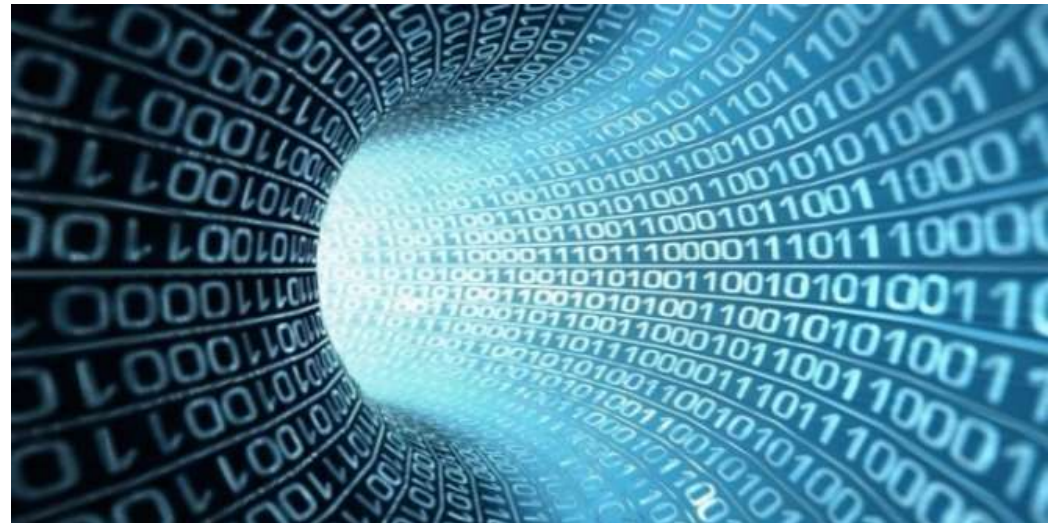
Why Is Broadband Important?

- Increasingly, internet access with sufficient throughput is an increasingly part of the world in which we all live.

- Governments perceive broadband access as important for citizen quality of life, as well as support for education, health care and job creation.

- For most people, bandwidth is best represented by Internet Access.

Why Is Broadband Important?

- Uses of the Internet are well known:
  - Education
  - Entertainment
  - Online banking
  - News and Information
  - Electronic medical and legal information
  - Email, texting, Skype, and voice communications
  - Online business applications including accounting, payroll, estimates, purchase orders

How is Last Mile Delivered Today?

- If citizens and businesses are receiving broadband services, how is it happening?
  - Telephone Company via twisted pair copper (dialup and DSL) or via FTTH (fiber to the home).
  - Electric Utility via Ethernet over Powerline
  - Gas, Water & Sewer Utility via selling or lease of right of way to provider
  - Cable Television via franchise rights
  - Wireless via cellular, fixed wireless, or satellite.
  - Governments also operate their own networks

Breaking Down the Last Mile

- Last mile understanding is made simpler by understanding several components:
  - How the Internet works.
  - How devices access the Internet.
  - The financial model of providing service – i.e. where the revenues and costs are.

The Internet
FULL PRODUCT ECOSYSTEM
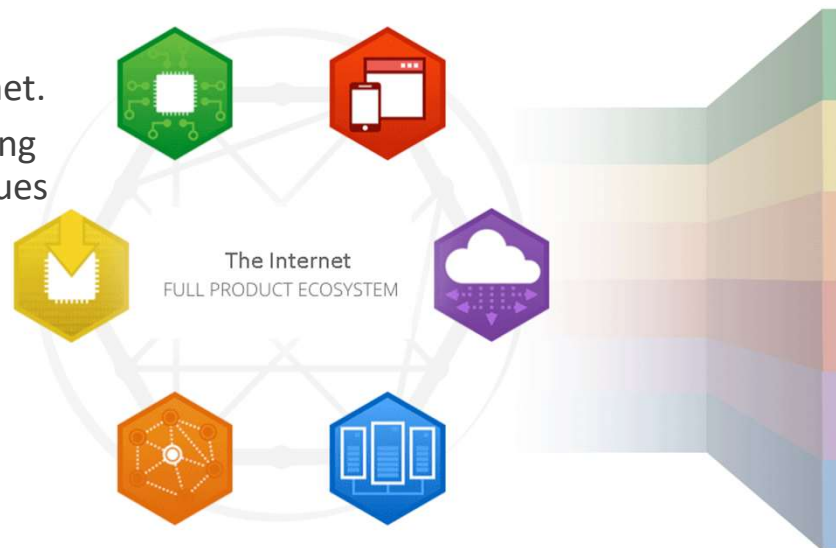
EMBEDDED DEVICES
Physical and logical threats to embedded systems

DEVICE FIRMWARE
Device firmware and update distribution process

WIRELESS PROTOCOLS
Local wireless communication protocols (M2M)

APPLICATIONS
Web applications, mobile apps, 3rd-party integrations

CLOUD SERVICES
Web services, RESTful APIs, analytics, 3rd-party services

INFRASTRUCTURE
Supporting platforms, networks, servers, and data

How Does the Internet Work?

- Fundamentally, you are either getting or providing information to another computer or server.

- You utilize connections – via fiber, copper or wireless – to access the other computer.

- You have to securely identify your computer to that other computer – and vice – versa.

- The routing protocol of the internet allows for computers to be located and connected.
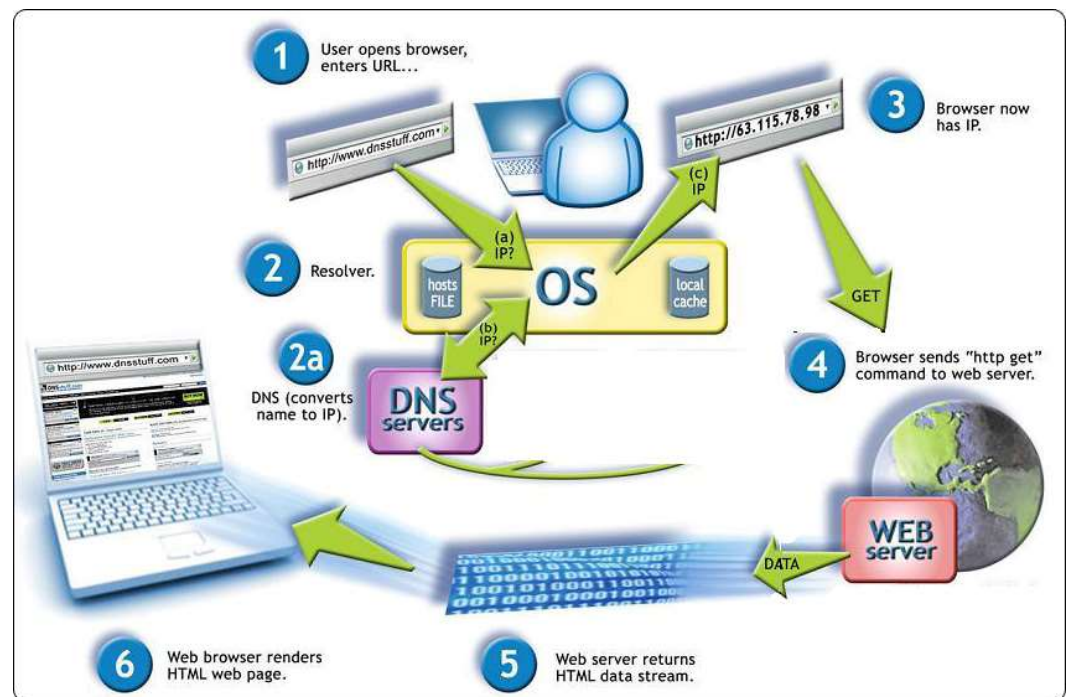
How Does Routing Work?

- Your data – what you send and receive, is broken down into packets.

- Packets know which package was "in front" and which packet is "just behind"

- Packets contain error correcting information.

- Some packets are prioritized in transit – i.e. voice and video. Others are not – such as email and web pages.
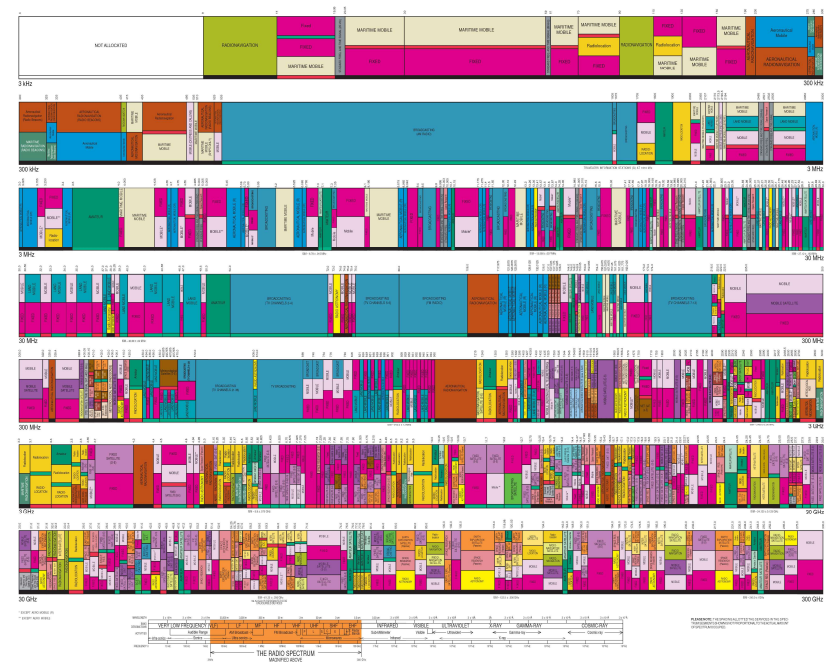
● **INTERNET NODE**
(traffic controller / ISP)

DATA TRAFFIC
(routed communication)
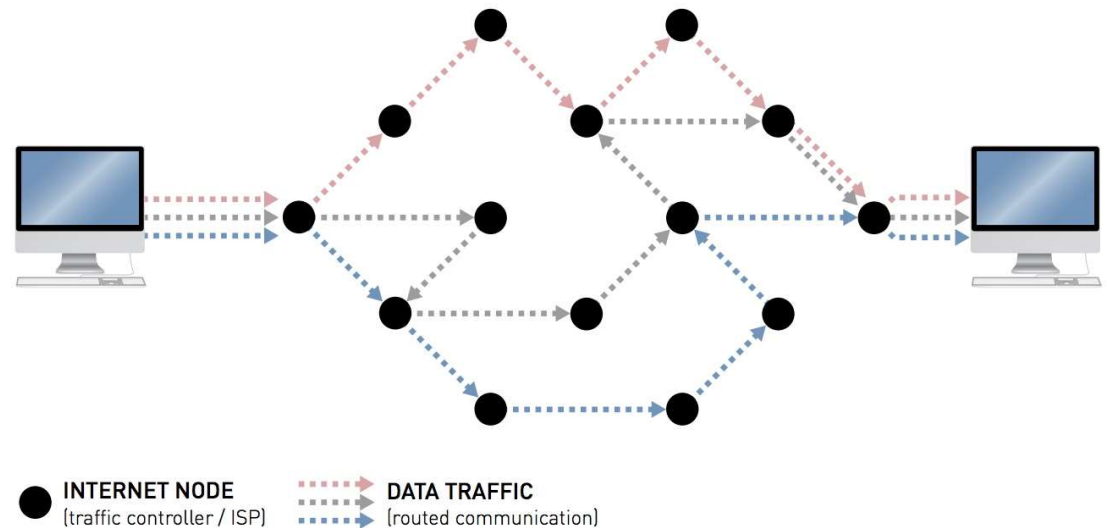
The Financial Model for Providers

COMPONENTS	NRC	MRC
Base Stations (AP's}	$ 1,000	
Installation	$ 1,500	
Colo	$ 10,000	$ 500
Tower Rental		$ 500
Backhaul (circuit)		$ 750
Peering		$ 500
Billing		$ 250
Subscriber Units (60) @ 200	$ 12,000	
Subscriber Installation @$100	$ 6,000	
Payroll (4x)		$17,500
Total	**$ 30,500**	**$ 20,000**

| OPERATING RESULTS		
Average Residential Bill = $50.00 MRC		
Oversubscription 4:1	$ 60	Subs
	$ 50	MRC
	$ 3,000	Gross
	$ 2,000	Less COGS
	$ 1,000	Gross Profit

How Does Fixed Wireless Work?

- There are a variety of frequencies available for use – some have to purchased or acquired – others are "free."

- Common fixed wireless frequencies used in PTMP service include:
  - 900 Mh
  - 2.4 Ghz
  - 3.65 Ghz
  - 5.8 Ghz

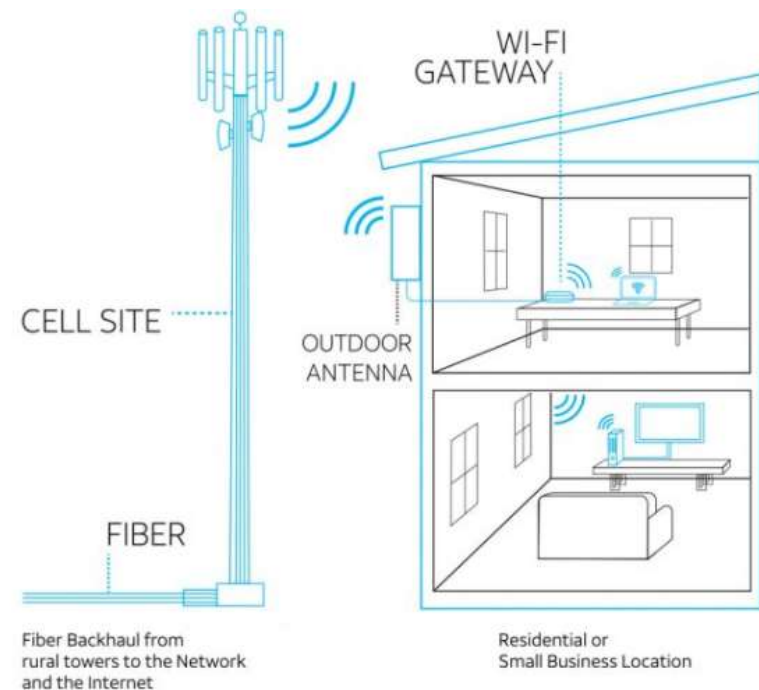
UNITED STATES FREQUENCY ALLOCATIONS
THE RADIO SPECTRUM

How Does Fixed Wireless Work?

- This is an example of a fixed wireless network using PTP (Point to Point) and PTMP (Point to Multi Point Connections.

- The internet connection can be seen.

- Also visible are "direct peers" which increases throughput for those services. Common direct peers including Netflix and Hulu.

- Larger business generally opt for synchronous communication – identical up and download throughput as well as SLA's.

- Note the use of wireless as "middle mile."
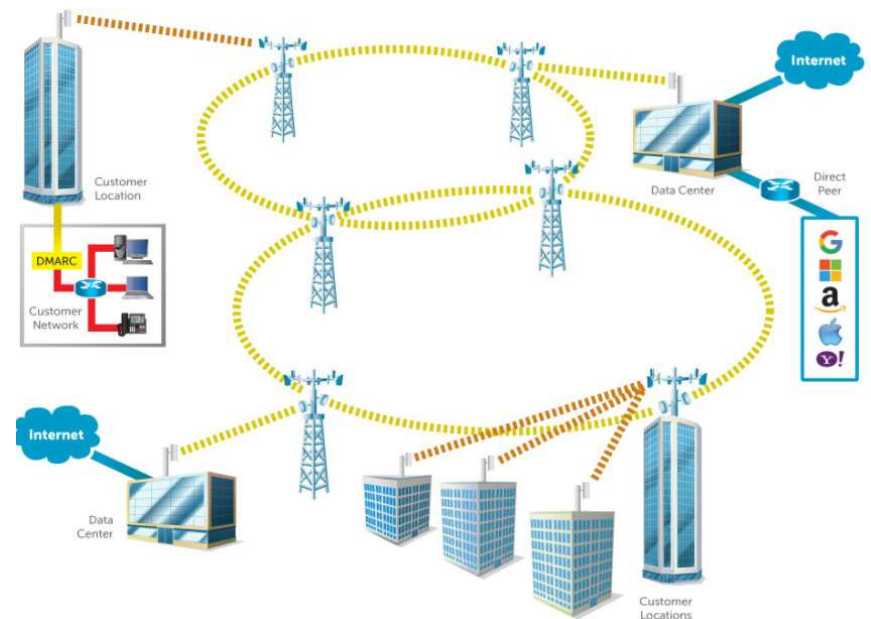
How Does Fixed Wireless Work?

- Fixed wireless to a residence of small business is generally an asynchronous connection – i.e. the download throughput is greater than the upload.

- This type of connection is generally a "best efforts" connection rather that an SLA based connection.

- Residential services are often more challenging due to higher levels of foliage, as well as the lack of density in some areas.

WI-FI GATEWAY

CELL SITE

OUTDOOR ANTENNA

FIBER

Fiber Backhaul from rural towers to the Network and the Internet

Residential or Small Business Location

Summary

- We have discussed Internet access in relation to a county government, and service to its citizens.

- We have looked at some components which allow for internet access.

- We have discussed various building blocks including how to access the internet, routing, the financial components of wireless last mile access, and an overview of wireless last mile.

For questions please contact:

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Thank You!

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