

Regular Workshop – May 19, 2014
Agenda Item 12

Agenda Item: Wireless Workgroup Presentation

Presenter: Tom Freiwald, Wireless Workgroup Member

Summary: The citizens committee, Wireless Workgroup, has been researching telecommunications issues on Longboat Key and possible technology solutions. The Wireless Workgroup has asked staff to schedule them for a presentation to the Town Commission to discuss their findings and recommendations.

Attachments: Presentation, Telecommunications Primer
Handout, How to Get Cell Phone Reception in Spanish Main
Without Roaming

Recommended
Action: None, informational only

MEMORANDUM

Date: May 12, 2014

TO: Town Commission
THROUGH: Dave Bullock, Town Manager
FROM: Anne Ross, Assistant Town Manager
SUBJECT: Wireless Workgroup Presentation

The citizens committee, Wireless Workgroup, has been researching telecommunications issues on Longboat Key and possible technology solutions. The Workgroup has asked staff to schedule them for a presentation to the Town Commission.

The committee is comprised of the following members:

- Gene Jaleski, Chair
- Bill Cook
- Tom Freiwald
- Michael Hodges
- Joe Iannello
- Ed Krepela

Due to the extent and technical nature of the information, the presentation is included as an agenda item. This group is not an appointed committee for the Town. The Wireless Workgroup's information is presented for informational purposes only.

If you should have any questions, please let me know.

Telecommunications Primer

***Prepared for the
Longboat Key Town Commission
May 19, 2014 Regular Workshop***

by

***The Longboat Key
Wireless Workgroup***

G. Jaleski – Chair, B. Cook, T. Freiwald, M. Hodges, J. Iannello, E. Krepela



Rev 4.2

Introduction

This Telecommunications Primer is designed for use by the LBK Town Commission, Staff, and Residents in order to advance community-wide discussion about LBK's "smart" future, by creating a common vocabulary and understanding of the issues



LBK Wireless Workgroup Mission Statement

- **The mission of the Wireless Workgroup is to identify, research, and recommend unified island-wide solutions to the Town Commission **in order to establish Longboat Key as a recognized leader in community telecommunications****



The Recommendation

- **The Wireless Workgroup recommends the LBK Town Commission hire a technology-neutral telecommunications expert (a telecommunications “architect”) to design a turnkey island-wide network (not just another study)**
- **This presentation explains the research leading to the recommendation**

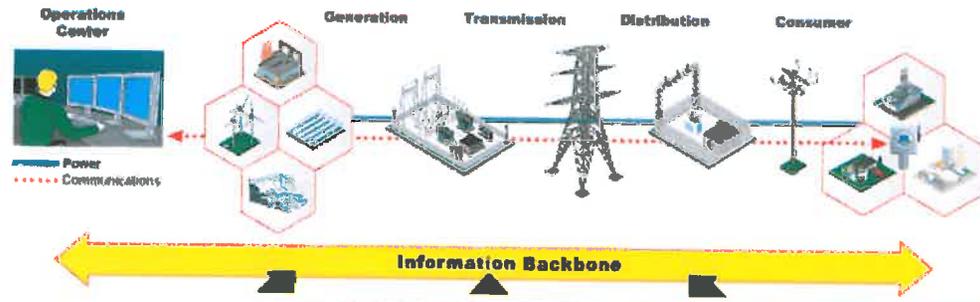


Today's Agenda

- **Definition of Terms** p.6
- **Telecommunications Trends** 19
- **Conclusion** 33
- **Recommendations** 36
- **Doing the math** 40



Definition of Terms



Backbone

- **The primary high-speed hardware and transmission lines of a telecommunications network**

Source - Webster





WiFi

- **A technology that allows electronic devices to exchange data or connect to the Internet wirelessly**



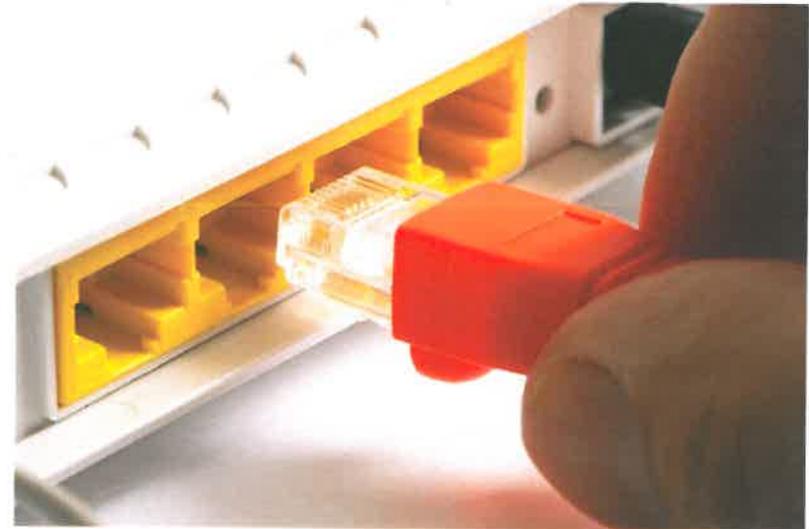
Broadband

- **High-speed Internet access that is always on and faster than the traditional dial-up access. Broadband is available as:**
 - **Digital Subscriber Line (DSL)**
 - **Cable modem**
 - **Optical fiber cable**
 - **WiFi**
 - **Satellite / Microwave**

(Note the absence of “cell” as broadband)



Source – Broadband.gov



Wireless Local Area Networks (WLAN)

- Provide wireless broadband access over short distances and are often used to extend the reach of a "last-mile" wireline or fixed wireless broadband connection



Node (AKA access point or AP)

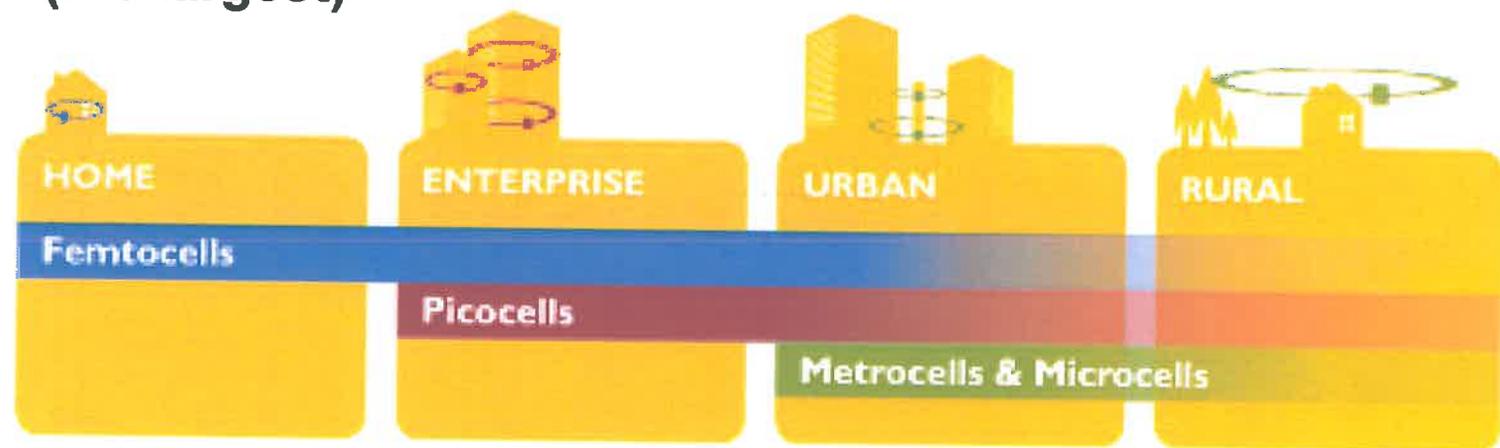
- **In telecommunication systems a node is either a connection point, a redistribution point, or a communication endpoint**

Source – Wikipedia



Small Cell

- An umbrella term for low-powered radio access nodes. Small cells typically have a range from 10 meters to several hundred meters
- Small cells provide improved cellular coverage, capacity and applications for homes and enterprises as well as metropolitan and rural public spaces
- Types of small cells include femtocells, picocells, metrocells and microcells – broadly increasing in size from femtocells (the smallest) to microcells (the largest)



Source – The Small Cell Forum

Distributed Antenna System (DAS)

- A network of antenna nodes connected to a common source via a transport medium that provides wireless service within a geographic area or structure



Microwave Data Transmission

- **Microwave technology is extensively used for point-to-point communications. Microwaves are more easily focused into narrower beams than radio waves and their higher frequencies allow broad bandwidth. Much of the world's data, TV, and telephone communications are transmitted by microwaves between ground stations and orbiting satellites**



Source - Wikipedia

Bandwidth

The rate of data transfer

**Cell
bandwidth**



**Fiber
bandwidth**



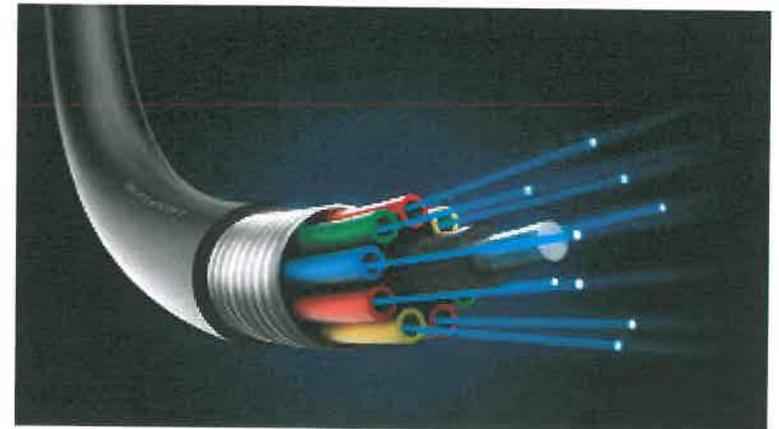
Source - Webster

Optical Fiber Cable

Often referred to simply as “Fiber”

- A cable containing one or more optical fibers used to carry light. Different types of cable are used for different applications
- In 2012, NTT Japan demonstrated a single fiber cable that was able to transfer one petabit of data per second over a distance of 50 kilometers. One petabit is the equivalent of one million megabits

Source - Wikipedia



Dark Fiber

(Sometimes called “unlit” fiber)

- A fiber network infrastructure installed by an enterprise, community, or municipality, and not by a content provider such as Verizon. Content providers lease the network, “light it up,” and subscribers pay monthly fees for access, providing income streams to the owner of the fiber



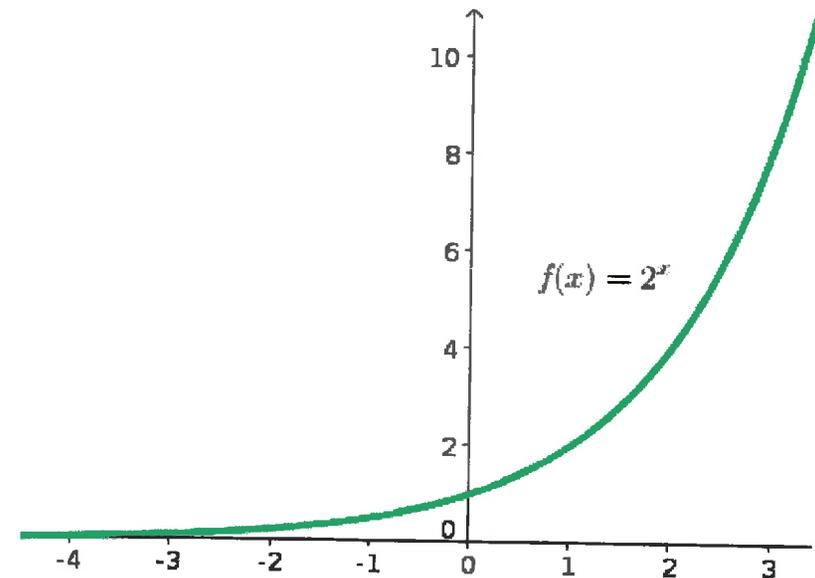
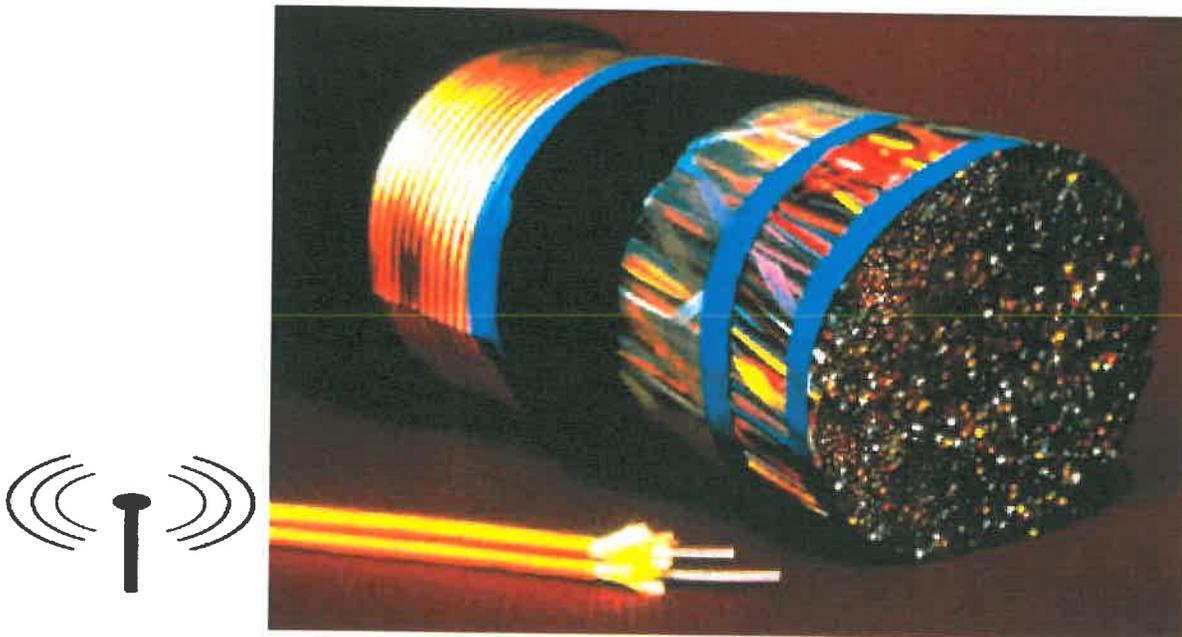
Heterogeneous Network (Het-Net)

- **A combination of technologies that enable wireless broadband telecommunications, such as existing cell towers, small cells, and DAS**



Source – Sanford.edu
& HetNet Forum

The exponential demand for bandwidth



A Google search of “Increasing demand for bandwidth” produces 11.3 million results

The screenshot shows a Google search results page for the query "increasing demand for bandwidth". The search bar at the top contains the text "increasing demand for bandwidth" and a magnifying glass icon. Below the search bar, the Google logo is visible on the left, and the user's email address "tomfrelvaid@gmail.com" is on the right. The search results are displayed in a list format, with the first result being "Optical Networks Will Come To The Rescue As Bandwidth ...". A red callout box with the number "11,300,000" is overlaid on the page, pointing to the search results count. The Windows taskbar is visible at the bottom of the screen, showing the Start button and several application icons.

Google increasing demand for bandwidth

Web News Images Videos Shopping Books Search tools

About 11,300,000 results (0.56 seconds)

Optical Networks Will Come To The Rescue As Bandwidth ...
electronicdesign.com/.../optical-networks-will-come-res...
Optical Networks Will Come To The Rescue As Bandwidth Demands Increase. New fiber optical technologies and components promise to help solve the ...

Bandwidth explosion: As Internet use soars, can bottlenecks ...
arstechnica.com/.../bandwidth-explosion-as-internet-use-soars...
May 1, 2012 - Bandwidth usage is soaring, driven by the proliferation of internet-connected devices. ... bandwidth demand is growing faster than our capacity to deliver it. ... According to Cisco, global IP traffic increased eightfold over the five ...

Bandwidth Explosion Expected, Demand for Fiber will ...
www.10gee.org/article/bandwidth-explosion-expected/
by Marco Wild
As bandwidth consumption continues to grow, we at line-provider.com continue to see an increased demand for bigger bandwidth pipes. Growing trends in ...

Increasing Need for High-Speed Bandwidth Drives Demand...
www.prweb.com/releases/fiber_optic.../fiber.../prweb11386994.htm
Date: 3/28/13 - Increasing Need for High-Speed Bandwidth Drives Demand for Fiber Optic Components, According to New Report by Global Industry Analysts, ...

Coming Optical Fiber | Drivers of Bandwidth
www.coming.com/opticalfiber/.../bandwidth/index.aspx
The demand for a faster, more affordable delivery system of communications with universal access is a principal driver of the need for increased bandwidth.

Need for increased network bandwidth is IT's biggest ...
www.computerweekly.com/.../need-for-incre...
By Archana Venkatraman - in 189 Google+ circles
Sep 26, 2012 - A majority of IT executives have said that a growing demand

11,300,000

Windows taskbar: Start button, Internet Explorer, File Explorer, Microsoft Word, Adobe Photoshop, and other applications. System tray shows the time as 3:06 PM on 4/29/2014.



USA Today Cover Story

4/24/2014

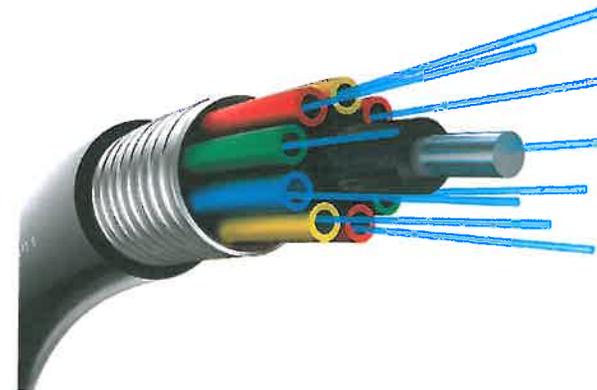
- **“Apple, Facebook results get thumbs up!”**
- **“Financial results underscored that the future of the entire industry is in mobile technology”**



Global Industry Analysts

12/3/2013

- **The global market for Fiber Optic Components is projected to reach \$80.6 billion by 2018, driven by growing bandwidth requirements as a result of robust mobile broadband penetration**



2013 mobile data traffic 18 times greater than year 2000

- 526 million mobile devices added in 2013, with the world population of mobile devices over 7 billion
- 45% of mobile traffic offloaded via WiFi and small cell
- By 2018 WiFi traffic will exceed cell traffic
- Smartphone traffic compound annual growth rate is 63%
- By 2017 the average consumer will own at least three Web-connected mobile devices



CISCO SYTEMS Global Mobile Data Update 2/5/2014



New York Times

K. Murphy, 2/2/2014

- **“Only 7.7% of US users have access to optical fiber, the fastest and highest quality available”**
- **“People just haven't conceived of what fiber will mean and how it will change the way we live.”**
- **“Los Angeles, Louisville, and College Station Texas have issued formal and informal requests for [fiber] proposals as well as offering significant tax incentives and other financial sweeteners”**



Alcatel-Lucent *GRID Talk* 2013

- **Opelika, Alabama, population 16,000, installed its own dark fiber network**
- **Expects to earn back its infrastructure investment in five years**
- **“Internet speed is a big deal to young people. We think we are going to attract a younger demographic”**
- **High bandwidth networks are increasingly becoming today what electric networks were a century ago – a critical platform for everything we do at work, home, or play**
- **“Anyone [a community] who doesn’t have bandwidth is fundamentally disadvantaged. And fiber is future-proof”**



The Internet of Things

- The wireless world is rapidly morphing from M2M technology (machine to similar machine), to

The Internet of Things

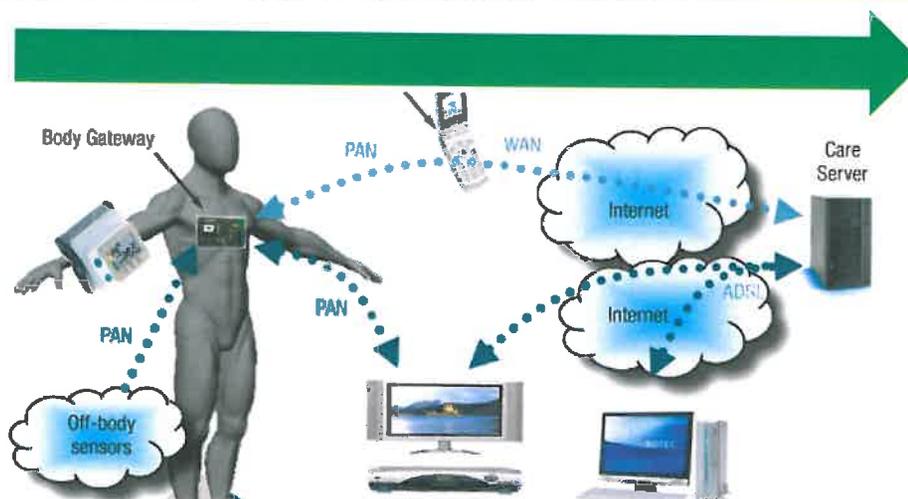
- The advanced connectivity of devices, systems and services that goes beyond the traditional and covers a variety of protocols, domains and applications
- According to Gartner, Inc., by 2020 the Internet of Things will include 26 billion wireless devices



“Wearable” technology will transform how we interact with our healthcare providers



“The Doctor will see you now Mr. Jones”



Smartphone apps that monitor our fitness goals today will tomorrow keep an eye on a diabetic's insulin level or a cardiac patient's heart rate, alerting doctors instantly to a potential problem

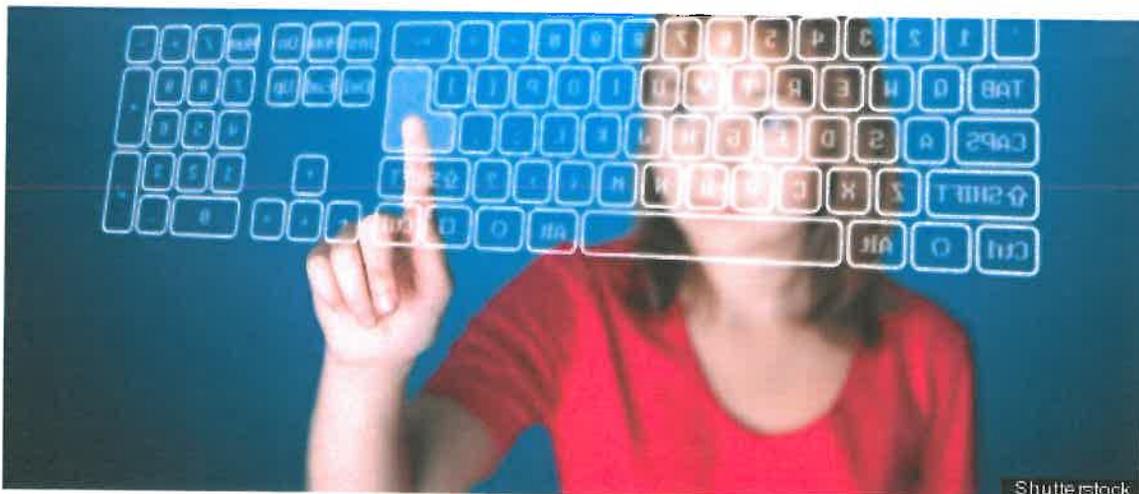


“Mr. Jones, I am monitoring your data stream and would like to see you today”



LBK's Future Residents

- **Tech savvy, active, and managing businesses remotely. Which telecommunications capability will they demand?**



Free WiFi Coming to Tampa Parks

Sarasota Herald Tribune – May 8, 2014 – p. 4B

“Expanding wireless access has been a priority for Mayor Bob Buckhorn, who wants to attract tech-savvy young professionals to Tampa”



TAMPA

Free Wi-Fi coming to Tampa parks

The city of Tampa and Bright House Networks plan to offer free Wi-Fi service in downtown Tampa parks.

The announcement was made Tuesday.

Bright House was one of two companies that responded last year to a city request for proposals to provide free, outdoor wireless Internet access in certain public parks.

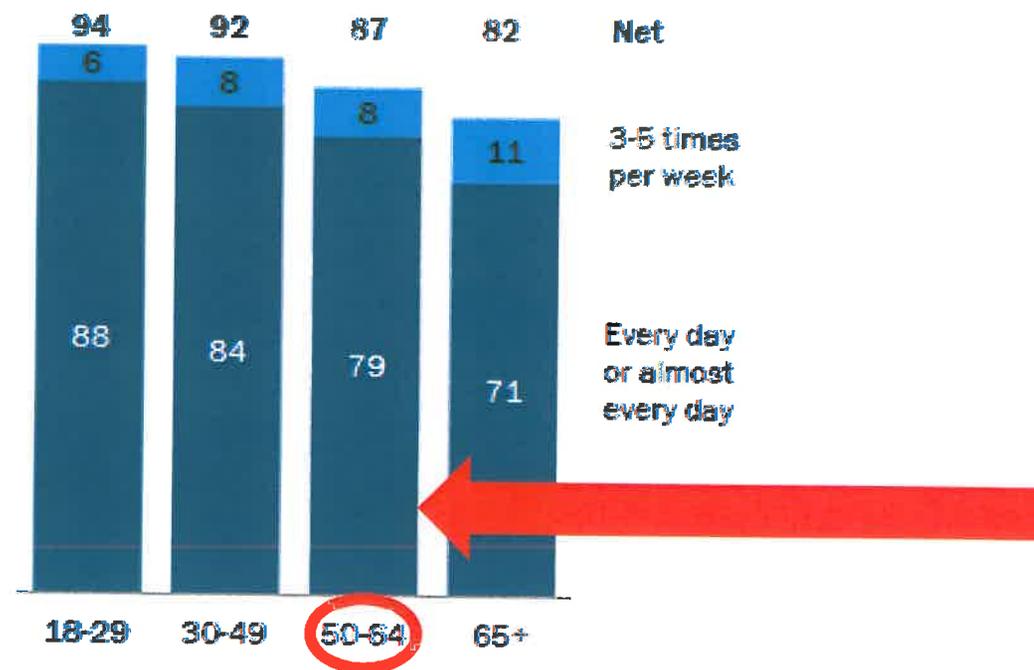
Expanding wireless access has been a priority for Mayor Bob Buckhorn, who wants to attract tech-savvy young professionals to Tampa. Last year, the city spent \$9,500 to create seven free Wi-Fi hot spots at City Hall, the police department and in other city offices.

The Tampa Bay Times said officials expect installation to be complete and the Wi-Fi available by the end of this year.

Is bandwidth important to Baby Boomers?

A majority of older internet users go online on a daily basis

% of internet users in each age group who go online ...



Pew Research Center's Internet Project July 18-September 30, 2013 tracking survey.

PEW RESEARCH CENTER

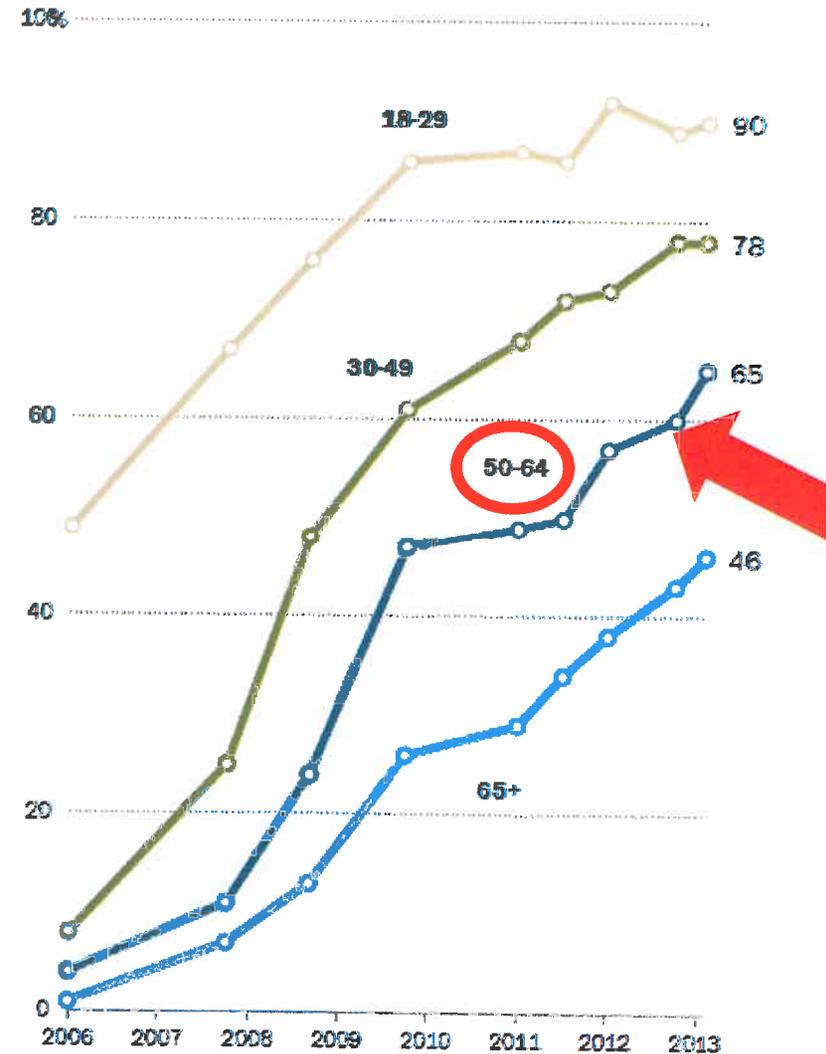


Is social networking a fad for teenagers?



Social networking site use over time, by age group

% of internet users in each age group who use social networking sites



Pew Research Center's Internet Project surveys.

PEW RESEARCH CENTER

Due to LBK's small customer base, growing competition for market share may leave **LBK technically and pricing disadvantaged** as carriers focus on large markets

May 1, 2014, WSJ, "AT&T may be interested in acquiring the largest U.S. satellite TV company. Such a combination would serve about 26 million subscribers and be the second largest player in the pay-tv industry, not far behind the proposed combination of Comcast and Time Warner Cable"



Google fiber



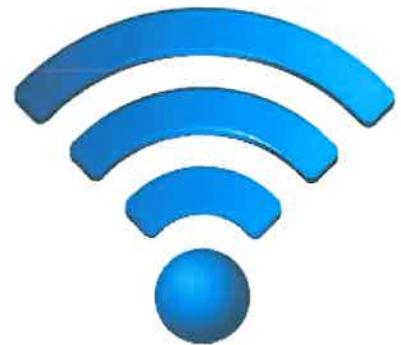
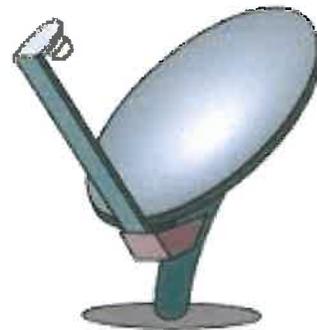
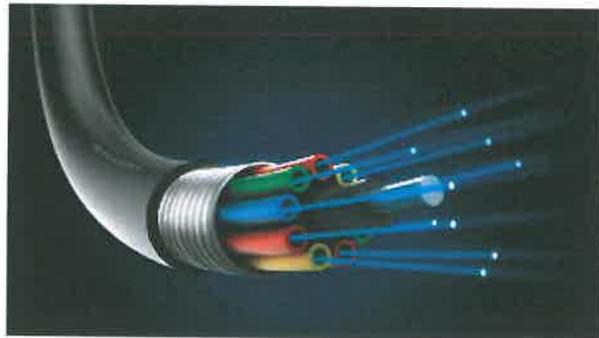
bright
house
NETWORKS



Time
Warner
Cable®

Conclusion

- **The best forward-thinking and long term solution for LBK is a Het-Net, consisting of fiber, microwave, small cell, and Wi-Fi, with the Town owning the dark fiber backbone for revenue & control of its telecommunications destiny**

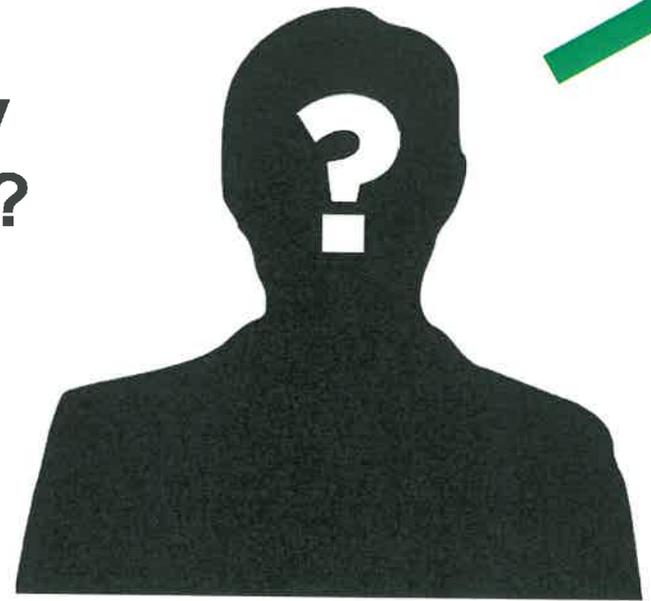


LBK can take advantage of its small geographic footprint

- With an area only 4.5 square miles, which includes the golf courses, LBK can more easily and cost effectively WiFi the entire island than almost any other community in the region**



So, how does LBK progress from understanding the issues, to being recognized as a leader in community telecommunications?



The issues

Being the leader

Why LBK needs a telecommunications architect

- **Because of the number of stakeholders and issues**
 - **The costs, income streams, and business models**
 - **Funding sources**
 - **Telecommunications & technology trends**
 - **Regulations & agencies**
 - **Infrastructure providers**
 - **Content providers**
 - **Needs, issues, & capabilities of municipalities such as LBK**
 - **Design, installation, operation, maintenance & management of het-net telecommunications systems**
 - **The expertise and experience to build collaboration among all stakeholders**



Recommendations Short Term

- **Address the cell reception issues on LBK's North End**
 - **Educate residents, condo associations, and visitors about options to improve service on their own, such as upgraded smart phones and services (plans)**
 - **Network extenders and small-cell technology**
 - **Work with carriers to provide free or low-cost devices**
 - **Promote Google Voice and similar technologies that use routers and the Internet in place of cell signals**
 - **Reprogram phones by dialing special numbers provided by the carriers to improve cell phone roaming capability**
- **On a test basis, establish a cell phone reception help desk in the Town IT department**



Recommendations Long Term

- **Establish a goal that in order to keep and attract high value and energetic residents, Longboat Key will become a leader in modern community telecommunications**
- **Engage the services of a technology-neutral telecommunications architect**



The LBKWW

- **The LBK Wireless Workgroup will assist the Town and the architect in any way requested**



In 2010, Sarasota and more than 1,000 other municipalities bid to become the test city for Google Fiber. City Island was temporarily renamed Google Island

- **Google Fiber provides broadband Internet and Ultra-HDTV with three pricing options. An indicator of the income stream possibilities**
 - **Broadband Internet - Free**
 - **Ultra high speed Internet - \$70 / month**
 - **Ultra-HDTV - \$120 / month**



Doing the math

(The highest quote received by the LBKWW)

- **Cost for a “Ferrari” Het-net system**

- **Fiber**

- » 27.5 miles (every street on LBK)

- \$6.24 / ft + 58 pull boxes =

~ \$1,000,000

- **DAS**

- » 8 DAS nodes =

\$1,200,000

- **Wi-Fi**

- » 1,050 antennas / nodes =

\$3,000,000

- » Controls & testing=

\$500,000

- » Installation =

\$2,500,000

- **Architect**

- »

\$85,000

- **Total =**

~\$8,300,000



Doing the math

- **\$8,300,000 amortized for 10 years = \$830,000 / year**
- **Assume 2,500 users (business, condo, hotel, individual) = \$332 / year / user**
- **Monthly cost per user = \$28**
- **Other factors to consider**
 - **Current monthly user rates for phone / Internet will likely decrease by a similar amount**
 - **Infrastructure partners will share some / much of the cost**
 - **The Town's telecommunication expenses will decrease**
 - **Hanging the fiber rather than trenching, and / or using microwave technology will reduce costs significantly**
 - **It is unlikely that every street on LBK will require installed fiber**



Doing the math

- **The Town's \$1,000,000 investment in owning the fiber**
 - **Amortized over 10 years = \$100,000 year**
 - **Assume 2,500 users = \$40 / user**
 - **Monthly cost per user = \$3.33**





LBKWW

**The Longboat Key
Wireless Workgroup**

**The Slides That Follow
are supplemental and
will not be shown at
the May 19 workshop**

Additional Considerations

- **Fiber**
 - **Low cost VOIP phone service**
 - **Ability to easily add new digital services that become available**
 - **Utility monitoring and metering**
 - **Low cost WiFi based home monitoring systems (water leakage, AC malfunction, etc.**
 - **Neighborhood video monitoring for public safety**
 - **Instant traffic monitoring via smart phone apps**
 - **All new advanced real estate agent apps require more bandwidth**





Telecommunications Trends

- For the purpose of this Primer, telecommunications includes: cell phone, ultra-HDTV, Wi-Fi, fiber, microwave, & public safety

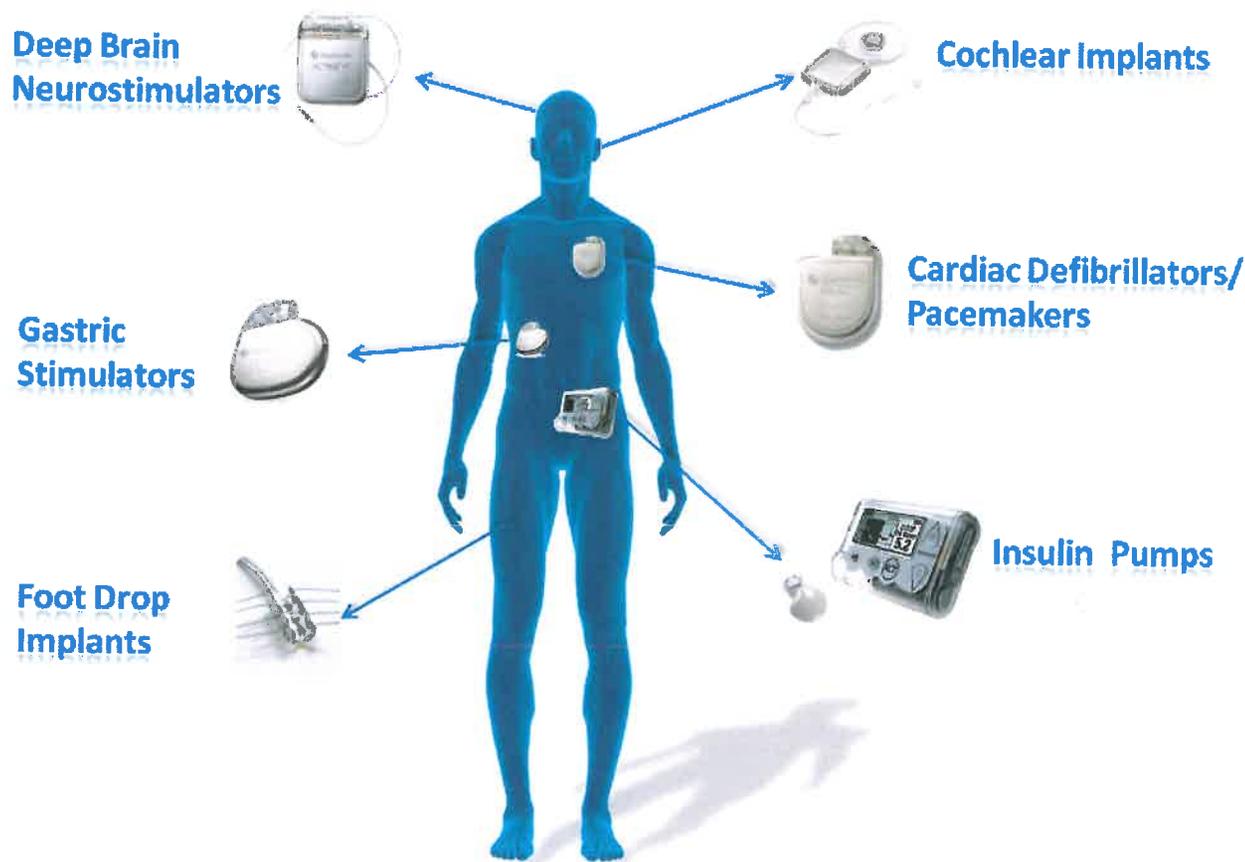


Source - Wikipedia



These devices are available today

WIRELESS IMPLANTABLE MEDICAL DEVICES



“Het-Nets” are common on LBK, for example

- **Electricity**
 - From the grid, solar, generator sets, batteries, and wind
 - Delivered by overhead or underground wires
 - 240v, 110v, 12v
 - Powering incandescent, LED, halogen, and florescent lighting
 - Used for cooking & heating
- **Gas**
 - Natural gas from a pipeline
 - Propane from tanks
 - Used for cooking & heating



A few of the telecommunication macro-cells on LBK



Possible microwave path using rooftops of existing buildings



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2014 TerraMetrics

Google earth

Tele

- A prefix that means distance, or to transmit over a distance, such as telegraph, telephone, television



Global Industry Analysis Report 9/4/2013

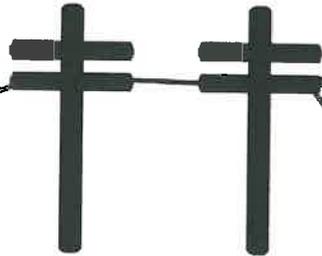
- **Growing demand for bandwidth spurs growth in submarine optical fiber cables market, driven by increasing IP traffic and rising demand for bandwidth – Two Million more kilometers of cable will be laid by 2018**



Google fiber



Google Fiber Hut



Global Internet Connectivity

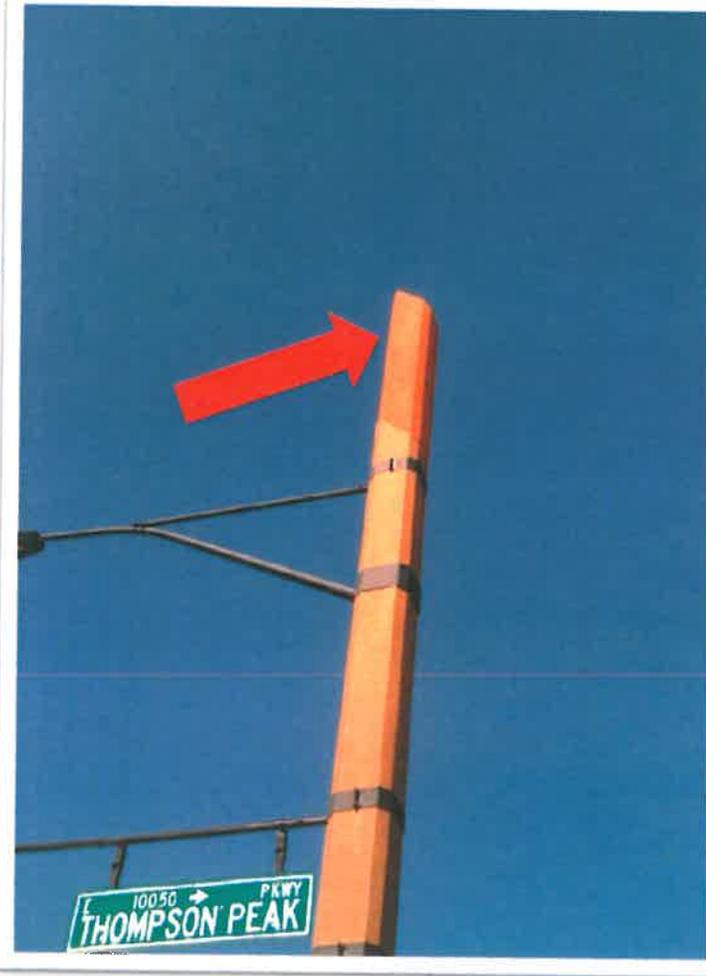


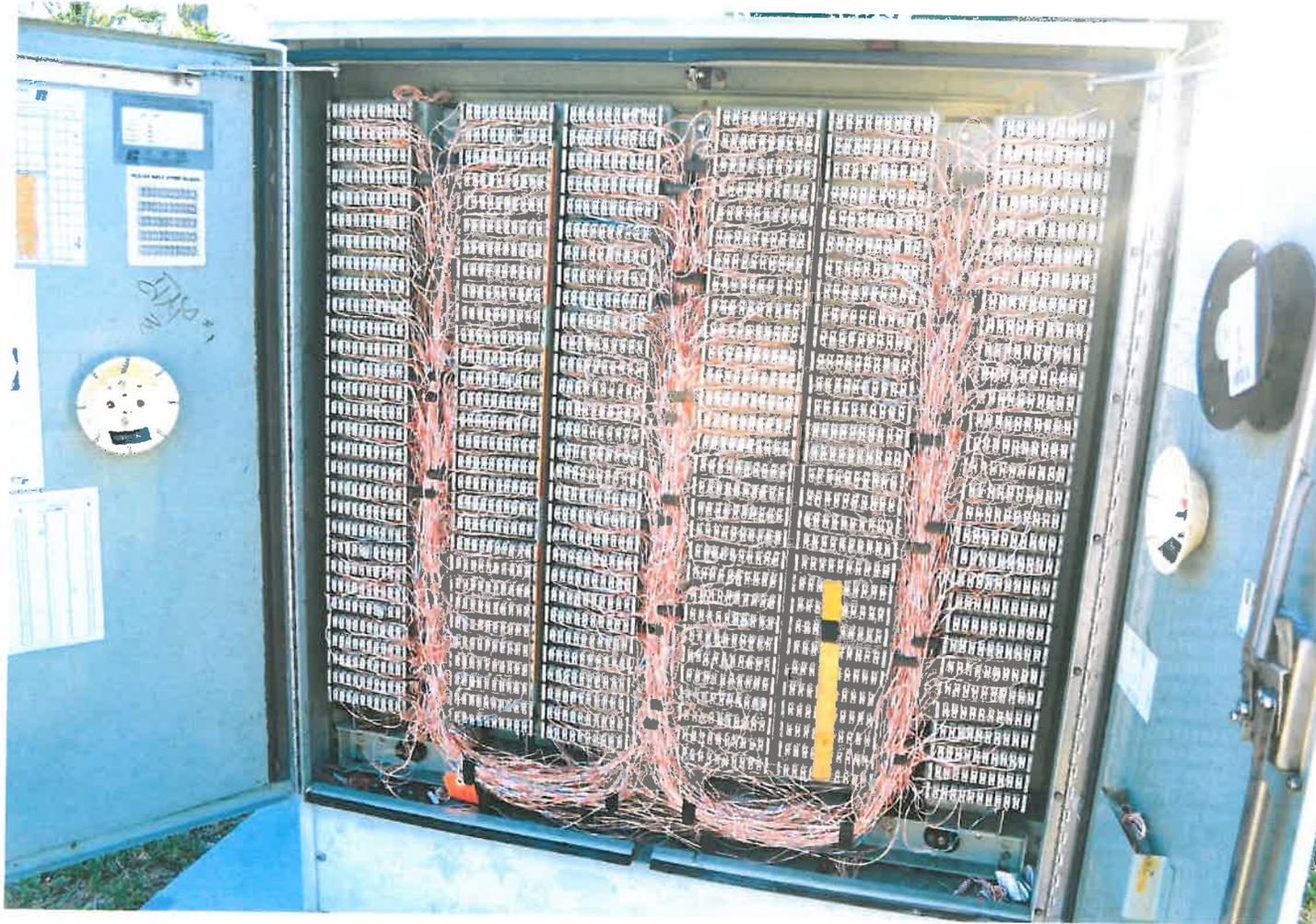
Gigabit Symmetric Fiber Connectivity

Google uses poles to connect the fiber backbone directly to homes and businesses



DAS Antenna Designs





**The telecommunications
technology currently serving
LBK**





How to Get Cell Phone Reception in Spanish Main Without Roaming

Excerpts from an article dated March 8, 2012 by Tamika Thompson published in www.pbs.org

*The secret is ordering a **femtocell** from your cell phone carrier!*

Femtocells are small devices that look like routers and tap into your existing **high-speed Internet connection** to bring outdoor cell phone service indoors where it might not otherwise reach.

The result? A strong, consistent signal that covers about 5,000 sq. ft., improves call quality, yields faster data speed for Web browsing and picture messages. Better yet, the femtocell won't slow down your Internet connection. You can take a call and surf the Web on your computer at the same time. You can designate certain cell phone for your femtocell to use, so your neighbors won't be able to hitch a ride on your device unless you want them to. The following cell carrier's femtocells are:

Verizon Wireless – Network Extender (Creates its own signal - does not depend on receiving a cell signal from a cell tower)

AT&T – 3G MicroCell

Sprint – Airave

T-Mobile – Cel-Fi Signal Booster (Has self-contained device that doesn't need an Internet connection.)

Check the cost of the device and service. Verizon's is a one-time price for \$250. Sprint's is \$200, but with a monthly \$5 service charge or more depending on calling plan.

If you're a Verizon, AT&T or Sprint subscriber, first make sure that you have a **high-speed Internet connection**. If you're using dial-up or the SMYC Wi-Fi, the femtocell is not for you. Most DSL or broadband connections with speeds around 1.5 Megabits per second or higher will do the trick.

Next be sure you have a **3G or 4G cell phone**.

Once you have the femtocell, plug into a power outlet and wait for the lights and you're femto-ing; you have yourself a mini cell phone tower!

Some dead zone or non-cell area customers have successfully gotten the device or service for **free** by pointing out that very fact to their mobile carriers. One who was successful was our very own Tom Freiwald who contacted Verizon Wireless. As an example, here's how the conversation went:

Tom: *"I live on an island in Florida and we do not have a cell tower near us. The signal inside our home is weak and many times we have to go to the street to make or receive calls. The Town advised me to ask you for a femtocell."*

Verizon Rep: *Verizon Wireless has what's called a Network Extender (requires a high speed internet connection) that can be used to bolster phone service (boost service up to 5000 feet). However, the Verizon tech support team would have to process the order for you. They can be reached directly at 866-406-5154 and would be happy to help."*





End of Agenda Item