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Fixed Wireless

THE MORE THINGS CHANGE, THE MORE
THEY STAY THE SAME

A brief overview

- ▶ PACNOG 3, 2007 – Deploying an island-wide fixed wireless network
- ▶ PACNOG 29, 2021 – Fixed Wireless (again)
- ▶ The bad
- ▶ The good
- ▶ What have we learned?

2007

Bluesky

- ▶ Mobile
 - ▶ Voice
 - ▶ Data (2.5G EDGE 128kbps)
- ▶ ISP
 - ▶ Fixed Wireless
 - ▶ 128kbps/64kbps standard plans
 - ▶ FTTB/IPLC/IPLE
 - ▶ 1Mbps - 5Mbps standard plans
 - ▶ T1
 - ▶ L2 Transport over Ethernet

Major Changes

2009

Submarine cable in American Samoa (ASH)

- Significant off-island bandwidth increase

Pacific Island Cable

- TV services

2011

Mobile 3G/HSPA+

- HSPA 21Mbps/7Mbps
- 3G 3Mbps

DOCSIS CMTS

- Cable Modem (1Mbps/128kbps)

Digital TV

- Channel bonding
- Digital delivery

2016

Mobile LTE

- 150Mbps
- 2G network retired

IPTV

- Digital Delivery plus Digital Control Plane
- Multicast

MPLS

- 10Gbps backbone
- L2VPN/XCONNECT

2021

Bluesky

- ▶ Mobile
 - ▶ Voice
 - ▶ Data (3G/LTE)
- ▶ ISP
 - ▶ LTE
 - ▶ Mobile Mifi Routers
 - ▶ Home Wifi Routers
 - ▶ Fixed Wireless (2020)
 - ▶ 30Mbps/10Mbps
 - ▶ DOCSIS 3.0
 - ▶ 8Mbps/1Mbps
 - ▶ FTTB/IPLC/IPLE
 - ▶ 50Mbps - 100Mbps+ standard plans
 - ▶ T1 (still)
 - ▶ L2 Transport over Ethernet
 - ▶ MPLS

What's changed?

- ▶ From 2011 to 2016
 - ▶ Mobile Wireless eclipsed fixed Home Wireless in throughput (for Bluesky)
 - ▶ Existing infrastructure for TV delivery was leveraged to provide internet access
 - ▶ Fixed wireless fell by the wayside
- ▶ From 2017 to 2021
 - ▶ LTE Network no longer sufficient for today's internet
 - ▶ Existing TV plant is near the end of its useful life and maintenance costs increasing faster
 - ▶ Fixed wireless back on the table



The Internet Itself
has changed

Social Media

2007



The screenshot shows a MySpace profile for a user named Tom. The page has a blue header with navigation links like Home, Browse, Search, Invite, Film, Mail, Blog, Favorites, Forum, Groups, Events, Videos, Music, and Classifieds. The profile includes a profile picture of Tom, his name, age (30), gender (Male), and location (Santa Monica, California). There are sections for "Contacting Tom" with options like Send Message, Add to Friends, and Block User. A "Tom's Interests" section lists various topics like Internet, Movies, Reading, and Music. A "Tom's Blurbs" section contains several paragraphs of text, including an "About me" section and a note about a system update.

2021



The screenshot shows Mark Zuckerberg's Facebook profile. The page features a blue header with the Facebook logo, a search bar, and navigation icons for home, video, marketplace, and notifications. The profile picture is a circular portrait of Mark Zuckerberg, and the cover photo is a blue world map. The name "Mark Zuckerberg" is displayed with a verified badge. Below the name are "Follow" and "Message" buttons. The profile is divided into sections: "Intro" with the tagline "Bringing the world closer together," "About" with "Founder and CEO at Meta" and "Works at Chan Zuckerberg Initiative," and "Posts" with a recent post from November 16, 2021, about haptic gloves.

Multimedia

2007

The screenshot shows the YouTube homepage from 2007. At the top left is the YouTube logo with the tagline "Broadcast Yourself™". Navigation tabs include "Videos", "Categories", "Channels", "Community", and "Upload". A search bar is located below the navigation, with "powered by Google" text. The "Promoted Videos" section features four video thumbnails: "Caught on Tape -- d...", "Foo Fighters-Long R...", "M.I.A.'s Best Story...", and "Changing Room Conf...". The "Featured Videos" section includes "NASCARGOT - A NASCAR Parody" (25,661 views) and "Tribute To Kevin's Hair" (93,134 views). A "Login" form is visible on the right side, and a "What's New" section promotes the YouTube Nonprofit Program and YouTube Mobile app.

2021

The screenshot shows the YouTube homepage from 2021. The layout is more modern, with a search bar at the top right and a navigation menu on the left. The "History" section is prominent, displaying a grid of video thumbnails. The first row includes "Tafuna High School Pageant 2021" (5.3K views) and "SAGONE : Pese fa'aleagan'u" (454K views). The second row includes "Best Man Speech - Receives Standing Ovation" (4.6M views) and "TAFUNA TEST" (2 views). A "Subscriptions" sidebar on the right shows the channel "Bluesky American Samoa" with 13 subscriptions, 55 uploads, and 24 likes. The "Watch later" section at the bottom shows 2 videos.

Disadvantages Comparison

2007

- ▶ Use of the unlicensed band presents issues
- ▶ Radio frequency interference is always a concern
- ▶ Line-of-sight is almost always required

2021

- ▶ Using a licensed band has solved some of these issues but presented its own challenges
- ▶ Line-of-sight is now near-line-of-sight, only a slight improvement
- ▶ Multicast delivery over wireless is painful

The bad

- ▶ Wireless technology still has the same physical limitations
 - ▶ Near line-of-sight
 - ▶ Frequency planning
- ▶ The licensed band solves some issues but also presents its own
 - ▶ Requires at least one staff member to be a Certified Professional Installer
 - ▶ Authorization via a 3rd party server
 - ▶ We lost access to 1/3 of our spectrum for a month
 - ▶ APs must have access to this server to operate at all
- ▶ Multicast over wireless has growing pains
 - ▶ Multicast control plane for TV Set-Top-Boxes loses sync
 - ▶ Balancing unicast and multicast delivery even with QoS is finicky

The good

- ▶ Wireless technology has improved
 - ▶ MU-MIMO
 - ▶ 500Mbps+ throughput per 20Mhz channel
 - ▶ Licensed band (CBRS*)
- ▶ Multicast Support
 - ▶ IPTV
- ▶ CPE has more features
 - ▶ DTA ISDN Adapter for phone services
 - ▶ Centralized management and provisioning (SM + CPE)

Advantages Comparison

2007

- ▶ Requires relatively less infrastructure
- ▶ Lack of outside plant maintenance
- ▶ Comparatively quick rollout
- ▶ Modular equipment
- ▶ Simple installation

2021

- ▶ The same plus:
 - ▶ Higher throughput per \$\$\$ than other last-mile technologies
 - ▶ Integration into existing billing and provisioning systems
 - ▶ Existing core competencies in wireless systems
 - ▶ Much higher throughput
 - ▶ More customers per Access Point



What have we learned?

2021

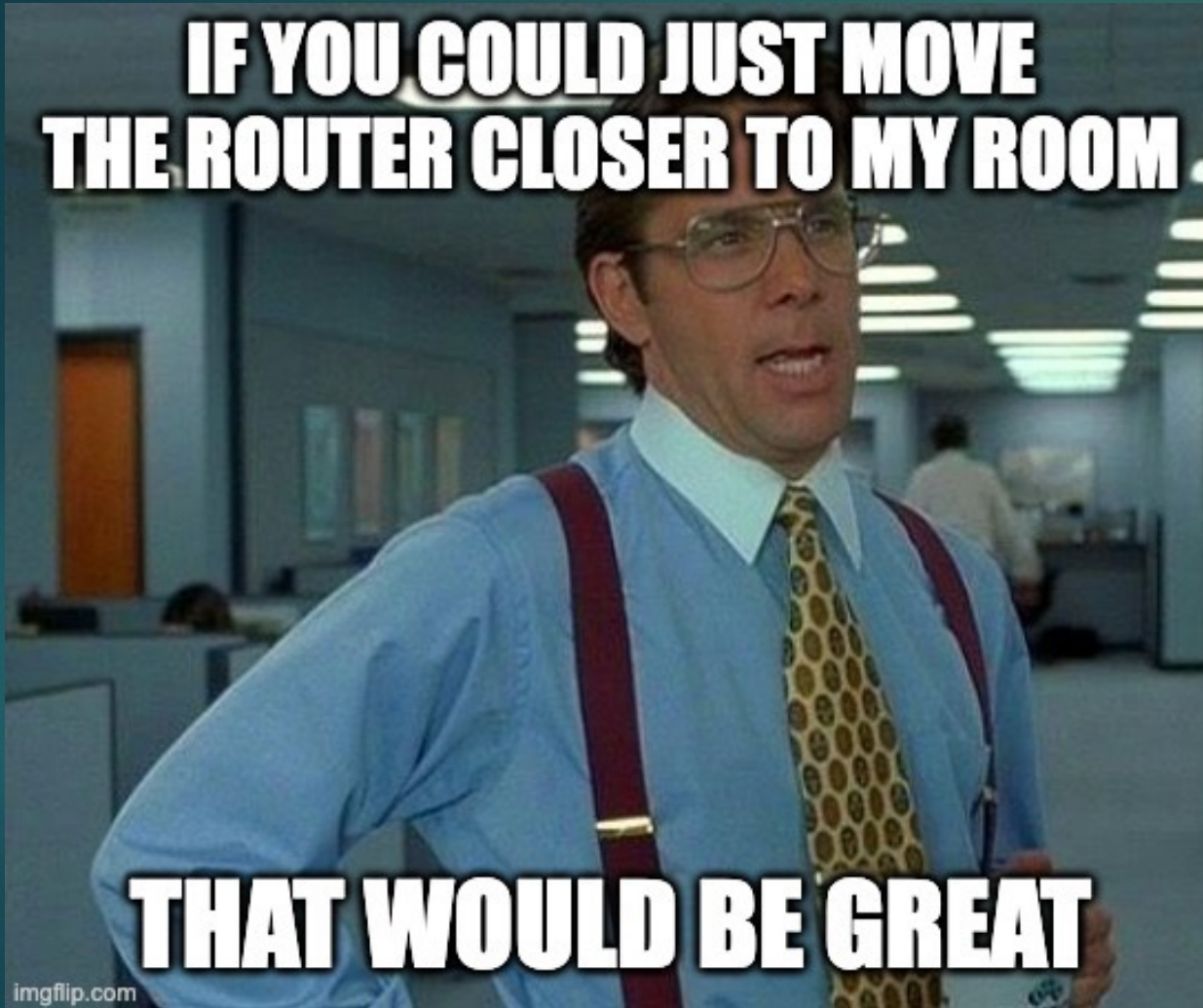
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A Cohesive Approach

- ▶ Diversify last mile delivery as much as possible
 - ▶ More options, more flexibility
- ▶ All technologies have tradeoffs
 - ▶ Be aware of what they are
 - ▶ Keep in mind the value proposition
- ▶ Bandwidth grows to fill the available throughput
 - ▶ This is good, it means you're making use of the infrastructure you paid for
 - ▶ This is bad, customers will complain
 - ▶ But, there is a level above which improvements are less noticeable
 - ▶ Try to stay ahead of the curve

**IF YOU COULD JUST MOVE
THE ROUTER CLOSER TO MY ROOM**



THAT WOULD BE GREAT

imgflip.com

#1 customer
complaint
2007-2021

Thank you