Next Gen TV

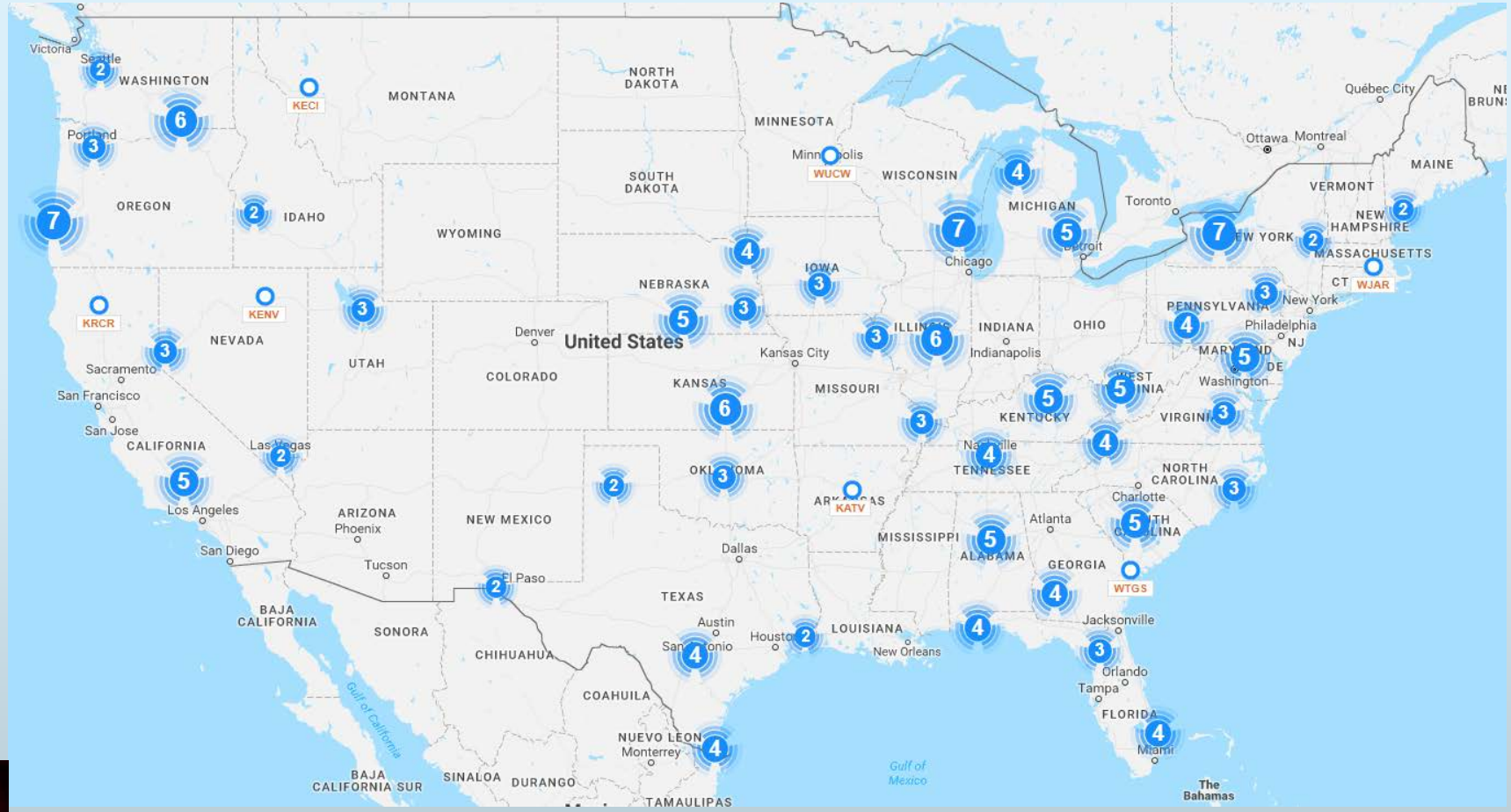
Why I'm in Hunt Valley Maryland…

Fred Baumgartner
Director Next Generation Deployment
ONEMedia - Sinclair

ONEMedia
OPEN NETWORK ENABLED

193 42 235 10,000

45.5% 39% & Big Four

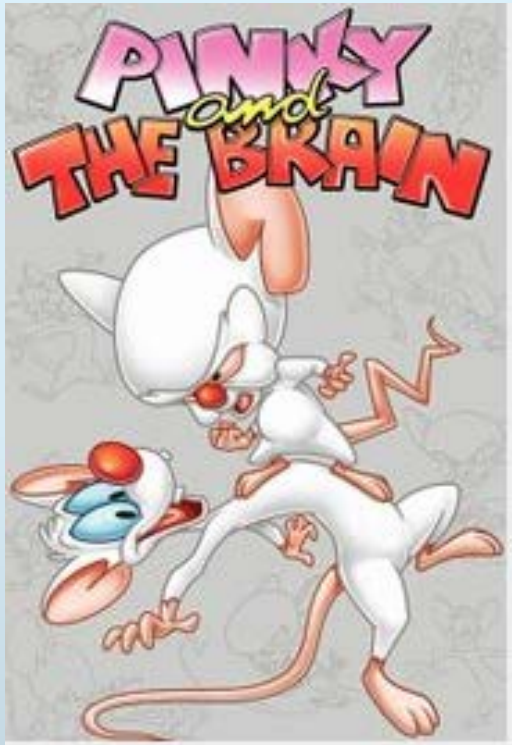


193
TELEVISION STATIONS

575
CHANNELS

89
US MARKETS

ONEMedia
OPEN NETWORK ENABLED



A genius mouse and his stupid sidekick try to conquer the world each night.

Stars: Maurice LaMarche, Rob Paulsen, Tress MacNeille |
See full cast & crew »

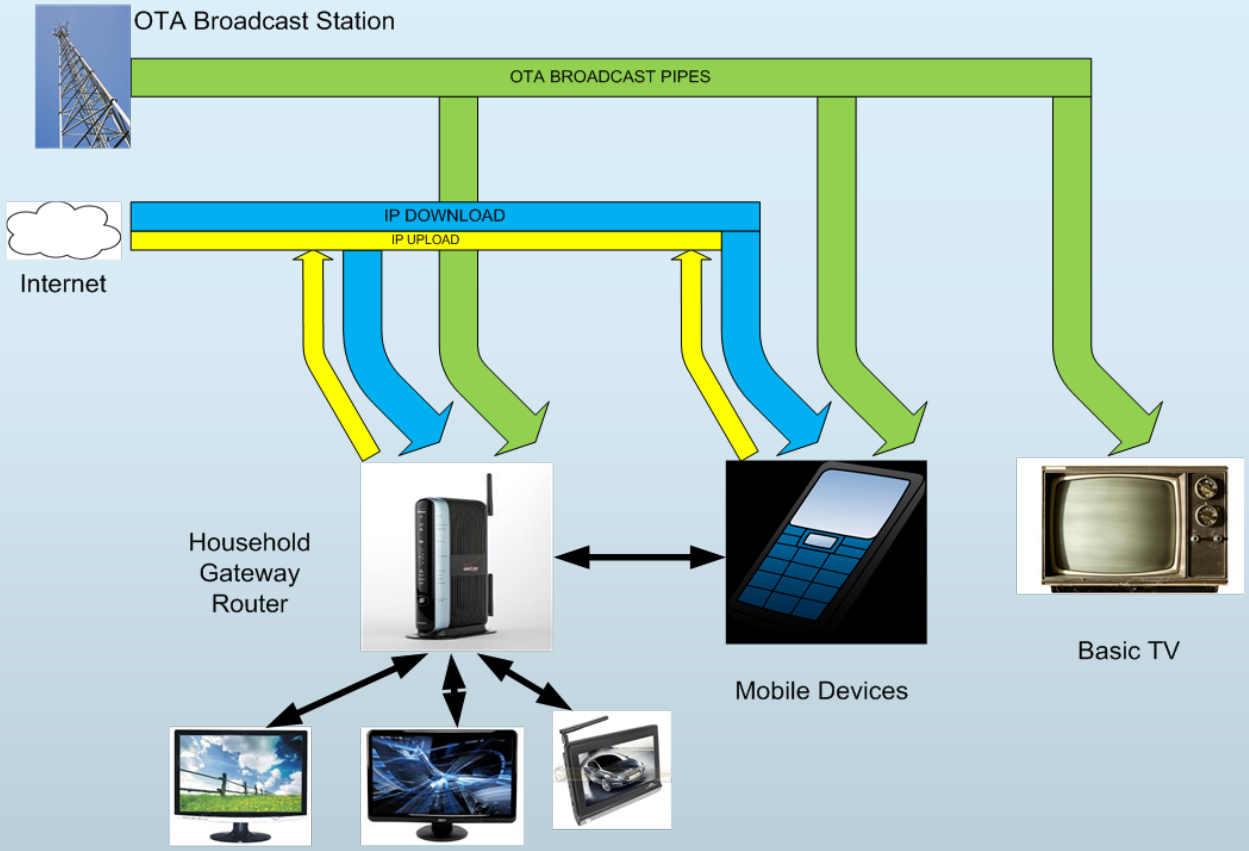
Reviews
37 user | 8 critic

Popularity
2,702 (▼ 209)

ONEMedia
OPEN NETWORK ENABLED

Big Things

- Not Backward Compatible
- Feeds a Router, not a TV
  - Or a Device
  - Or a “Granny TV” Dongle



Bootstrap A321

- System Discovery and Signaling
- Describes the modulation waveform
- Everything else can be changed
- -15 dB below noise is OK
- Emergency warnings go here

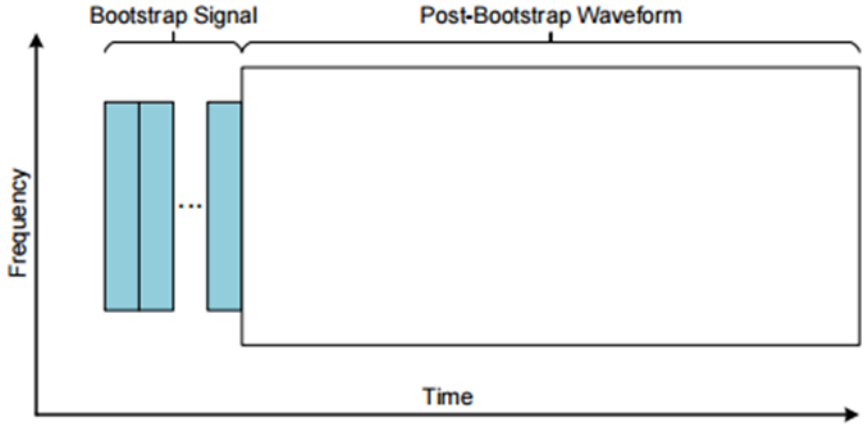
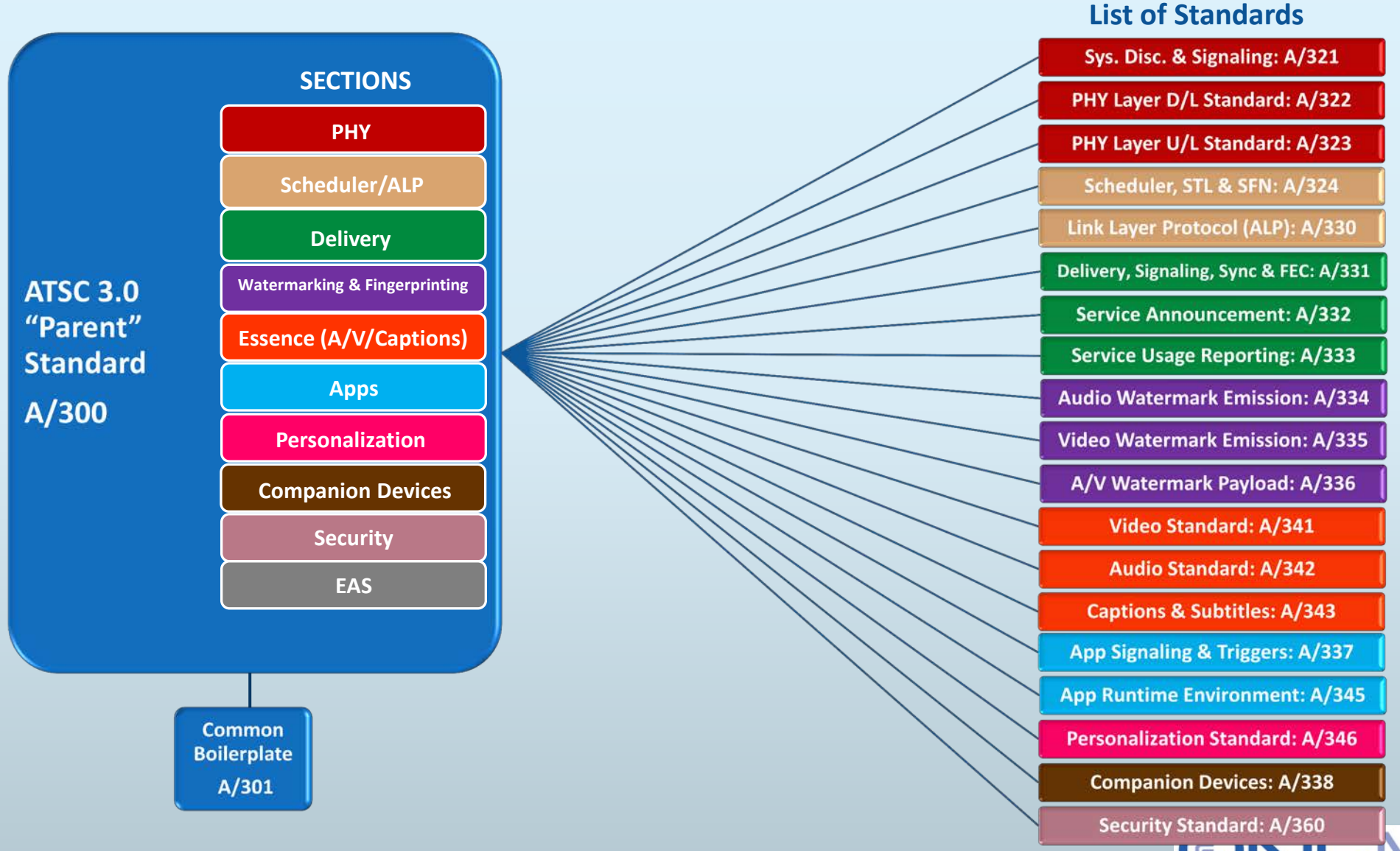


Figure 4.1 General physical layer frame and bootstrap structure.

ONEMedia
OPEN NETWORK ENABLED

ATSC 3.0 Document Structure



Dictionary

extensible

ex·ten·si·ble

/ikˈstensəb(ə)l/

adjective
adjective: **extensible**

able to be extended; extendable.
"an extensible architecture designed to accommodate changes"

Translate extensible to Choose language

Use over time for: extensible

Show less

ONEMedia
OPEN NETWORK ENABLED

New Broadcast Community Cloud System Architecture (SDN/NFV)

Channels (2-36) USA

BMX Entity is Master (see next slide)

BMX
Business Function

Management Services (OSS/BSS, Analytics, Dashboards)

Software-defined **Spectrum Controller**

Service requests

Licensed Spectrum Business Models

Waveforms Built Here

Regional Data-center (NFV/SDN based)

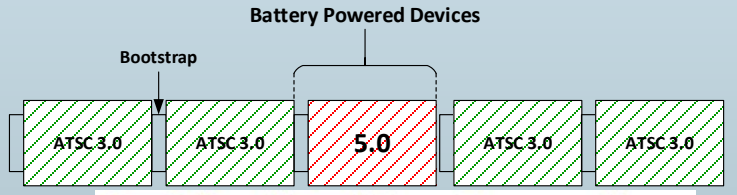
Data

Broadcaster/Content Providers/CDN **Tenants**

IP Data enters Here

ATSC 3.0
Broadcast 5.0

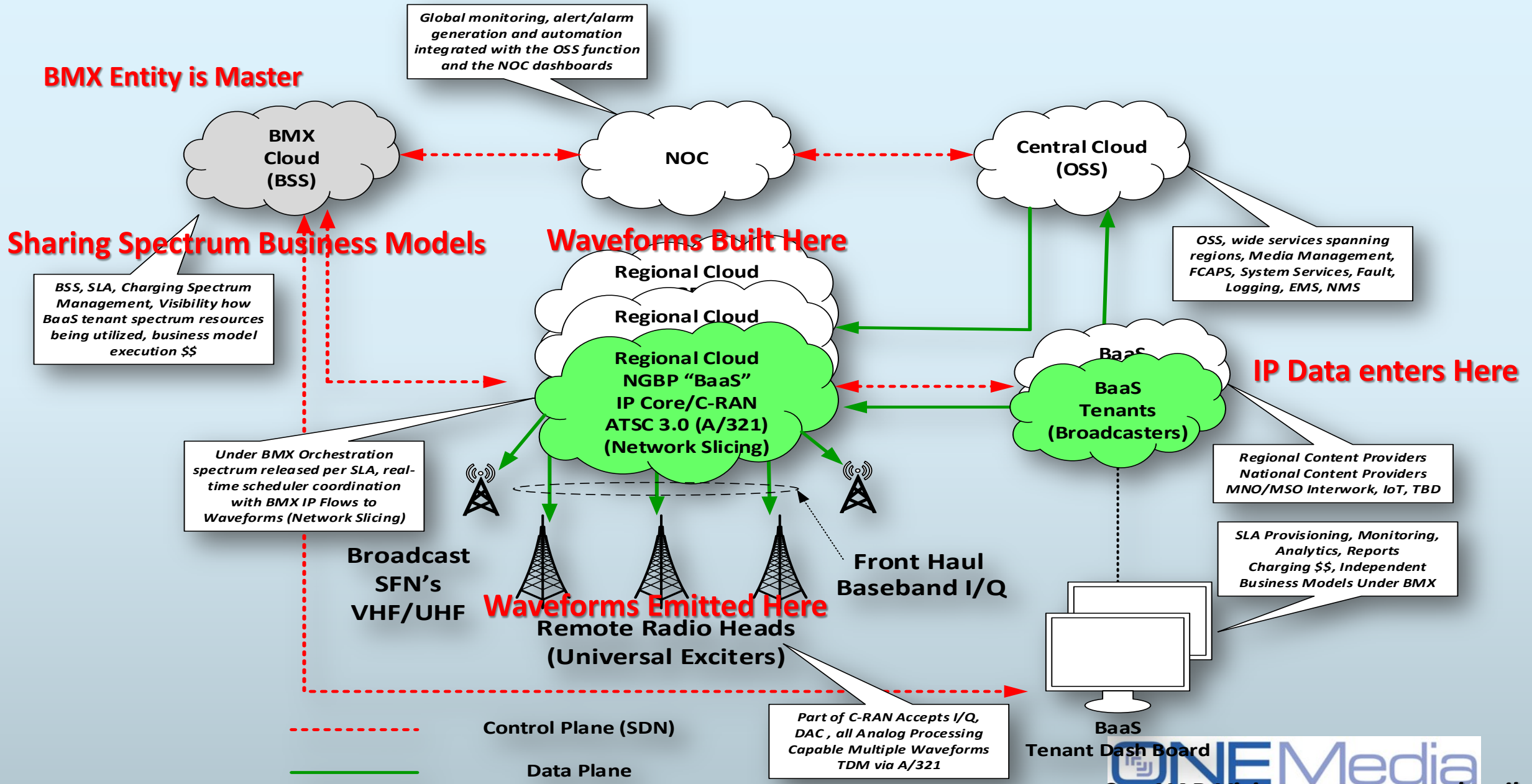
Waveforms Emitted Here



BMX: Broadcast Market Exchange
NFV: Network Function Virtualization
SDN: Software-defined Networking
OSS: Operations Support Systems
BSS: Business Support Systems

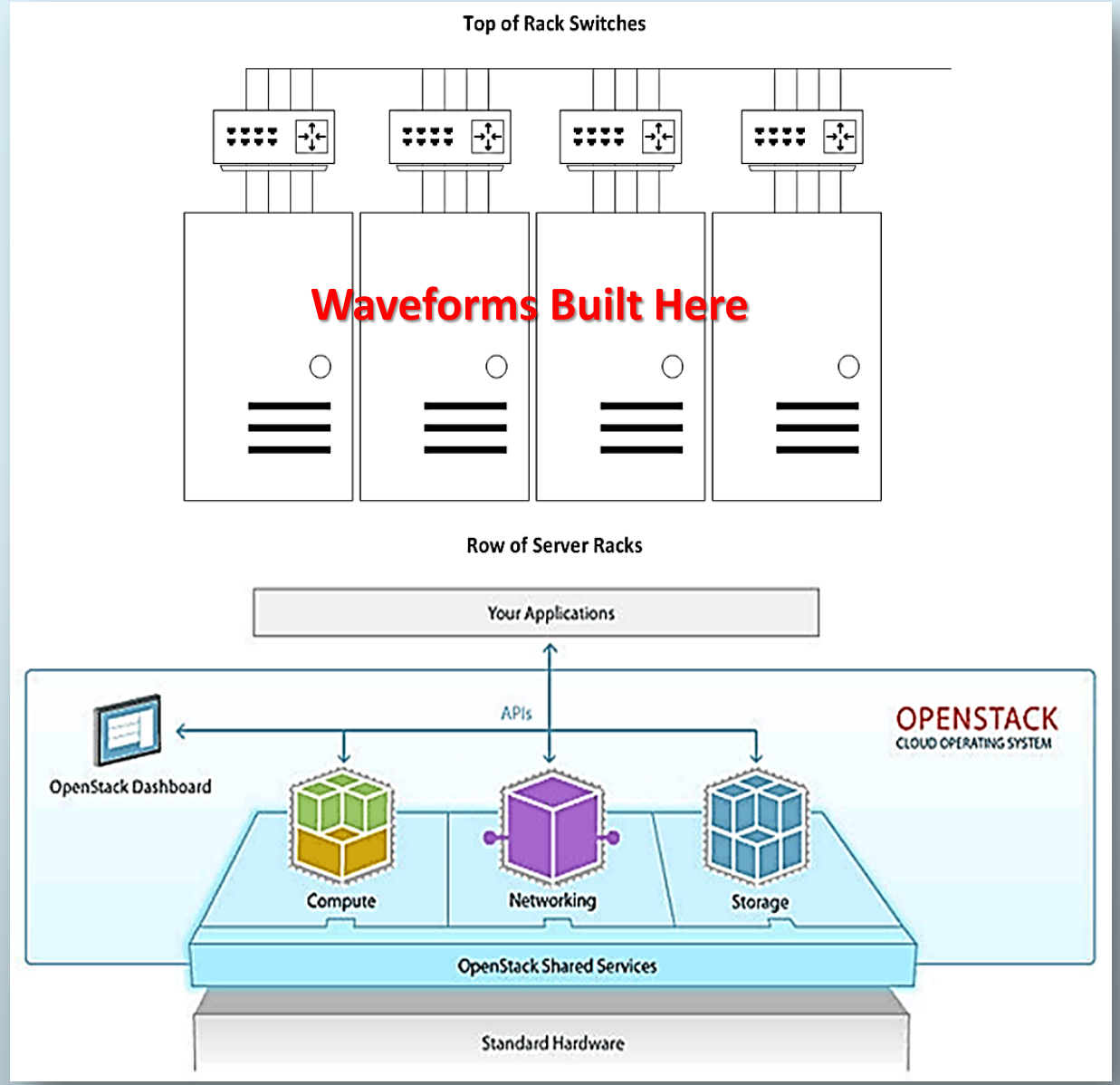
See NAB Vision paper more details

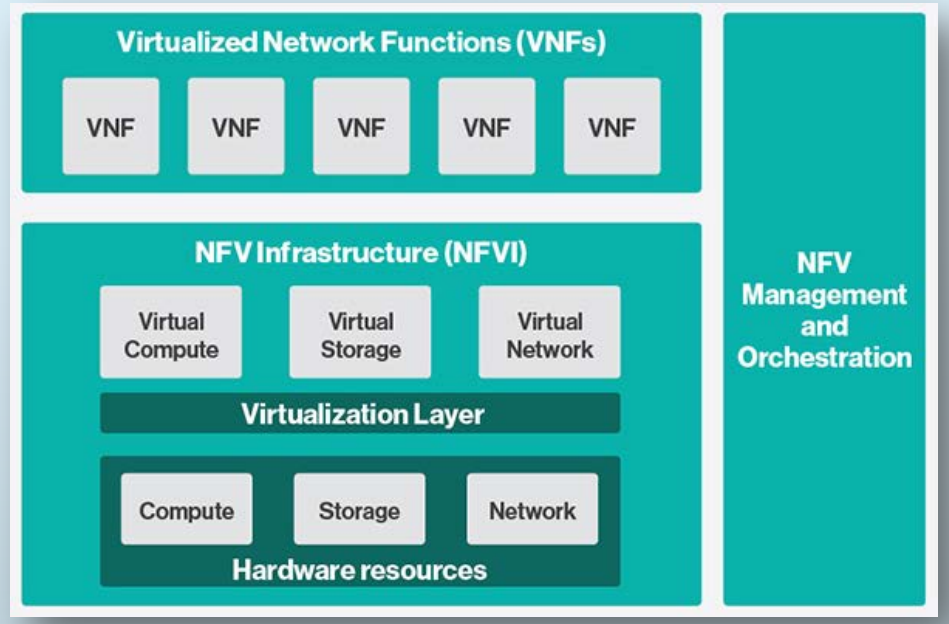
Nationwide Community Cloud Architecture using "BaaS"



See NAB Vision paper more details

Web-Scale IT Broadcast Regional Data Center





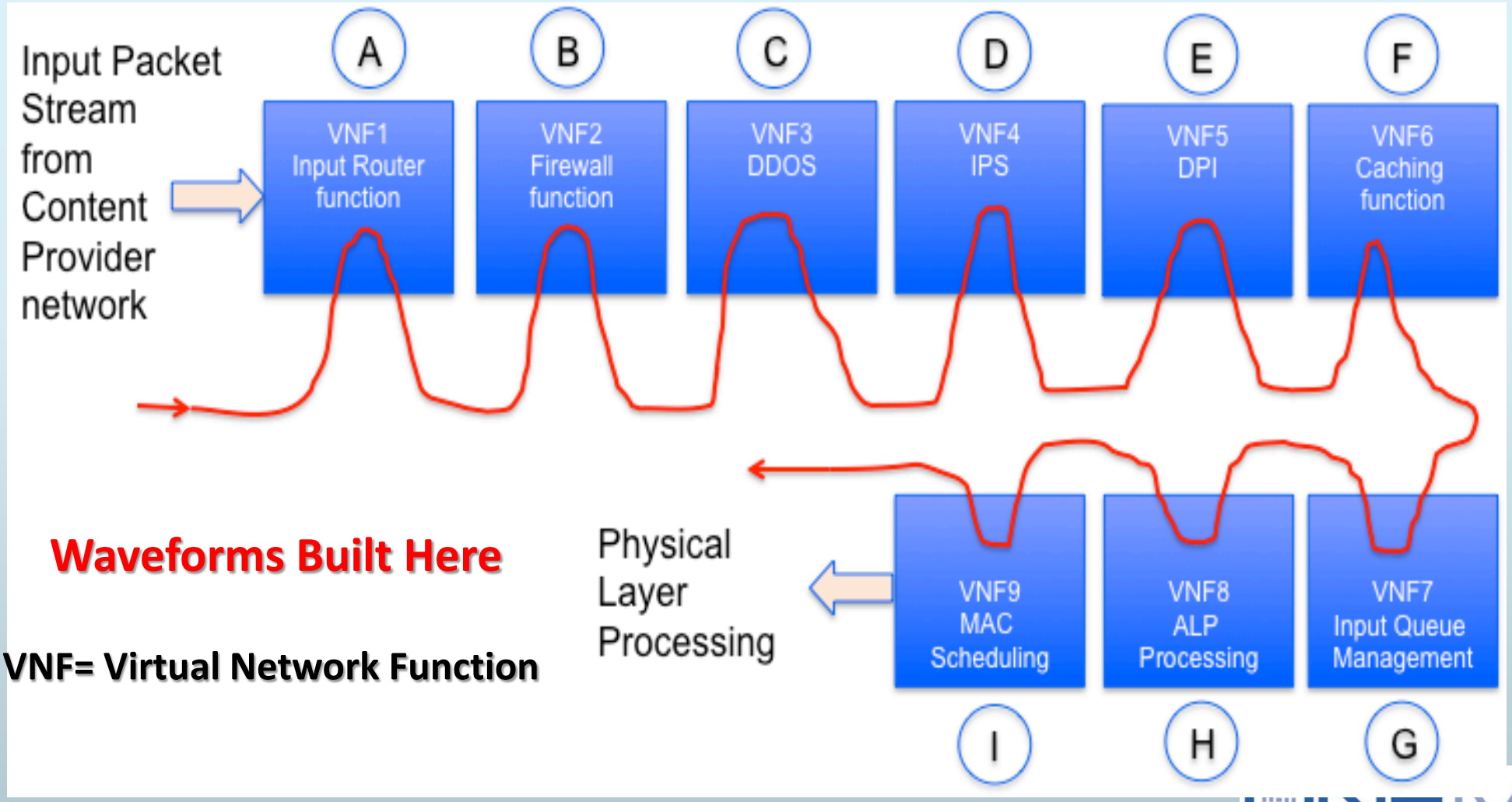
Waveforms Built Here

Common Basic Cloud Computing Architecture

ONEMedia
OPEN NETWORK ENABLED

Web-Scale Broadcast Regional Data Center

Chaining of VNF's on a PLP by PLP or Service basis is termed Network Slicing

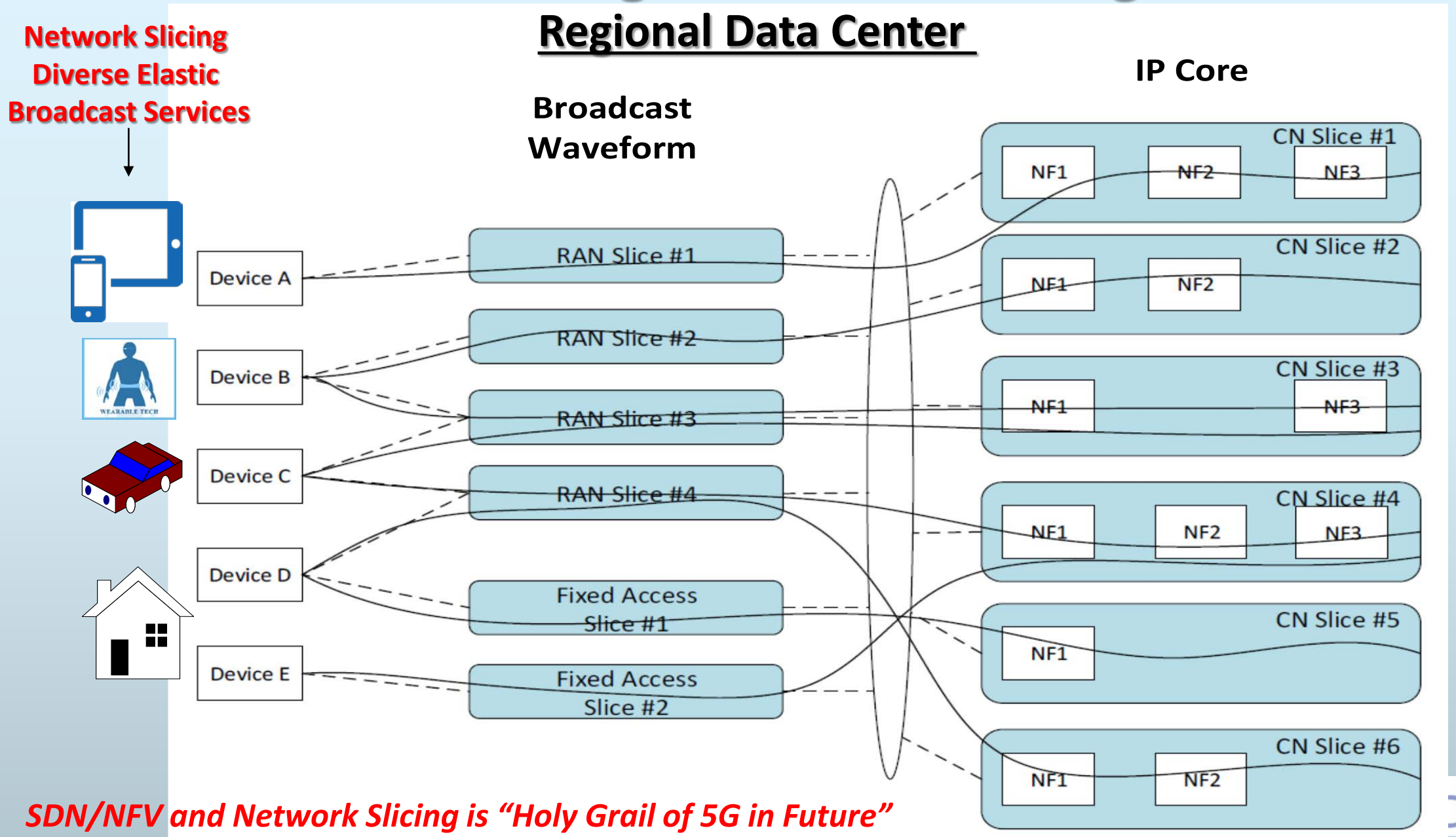


VNF= Virtual Network Function

What use to be built as HW boxes such as Gateways / Exciters is now instantiated in Software

ULNE Media
OPEN NETWORK ENABLED

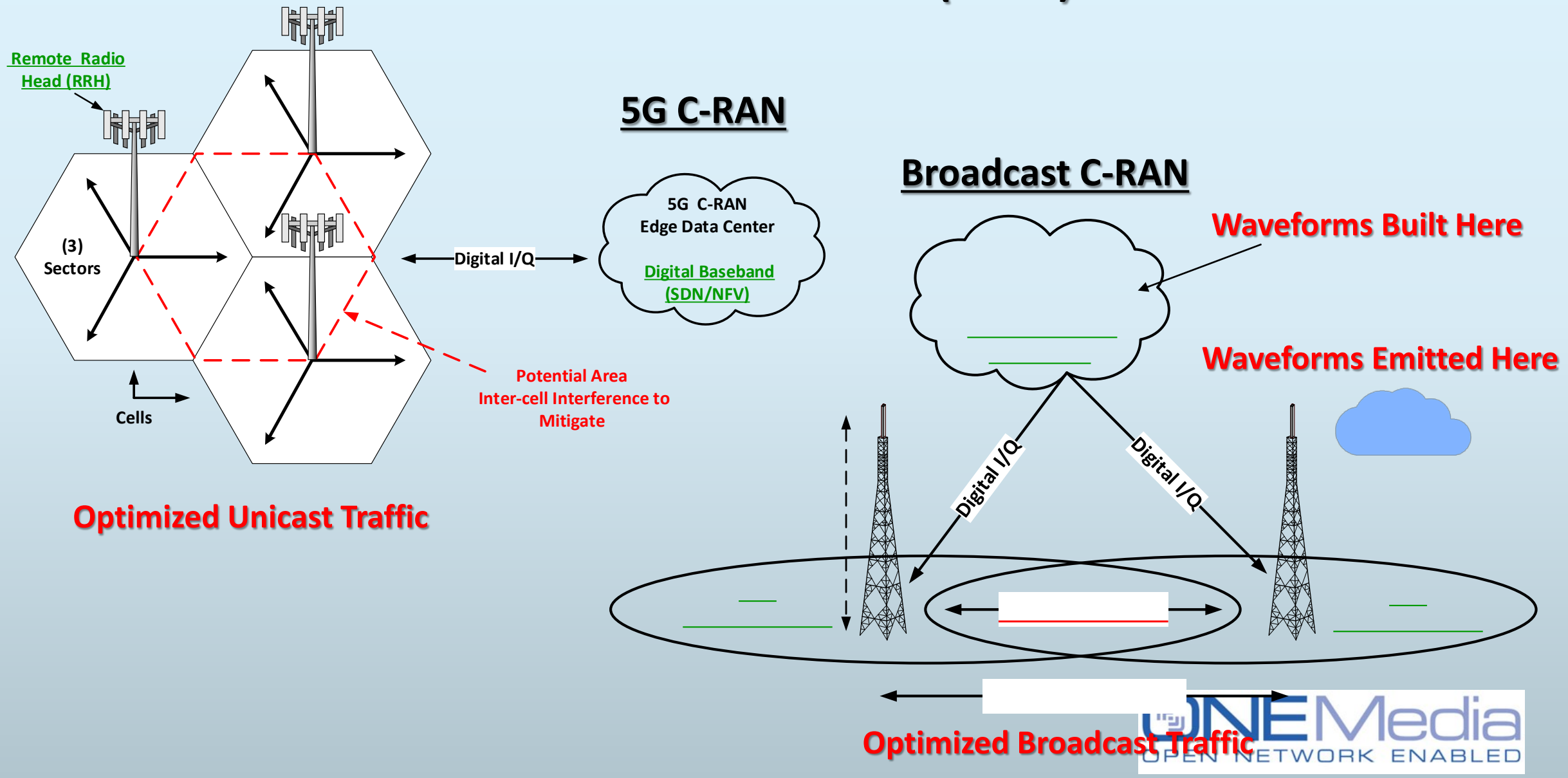
PLP Service Chaining or Network Slicing in Cloud



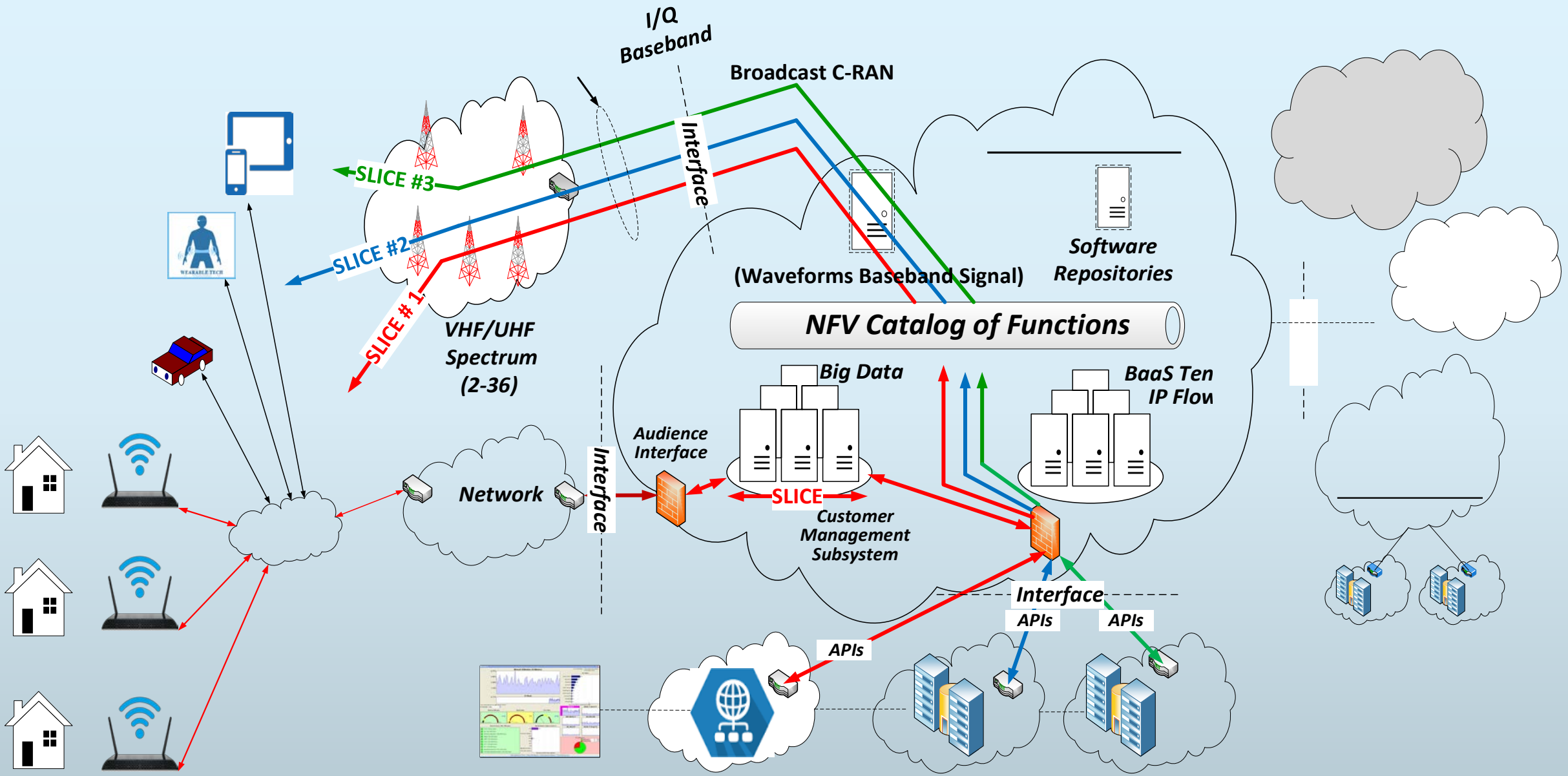
SDN/NFV and Network Slicing is "Holy Grail of 5G in Future"

5G C-RAN Equated to Broadcast C-RAN

Radio Access Networks (RANs)



Hybrid Network Slicing and Diverse Services



See NAB Vision paper more details

New Broadband Broadcast Business Opportunities Leveraging New Architecture

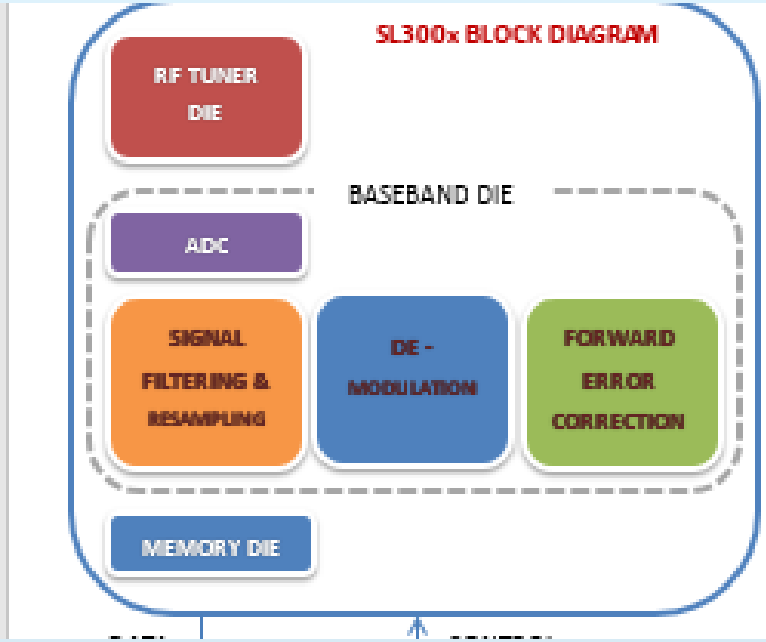
ONEMedia
OPEN NETWORK ENABLED

ONEMedia
OPEN NETWORK ENABLED

$\sum$

- Mobile 1st
- BaaS

ONEMedia
OPEN NETWORK ENABLED



- ✓ Standard PCIe interface to application processor/TV SoC
- ✓ Transport Stream (TS interface) Serial / Parallel
- ✓ I²C / SPI slave interface for programming, code download and control path from external processor
- ✓ SPI master for interfacing to system-level components
- ✓ JTAG and UART for diagnostics and debug
- ✓ RF interface to antenna

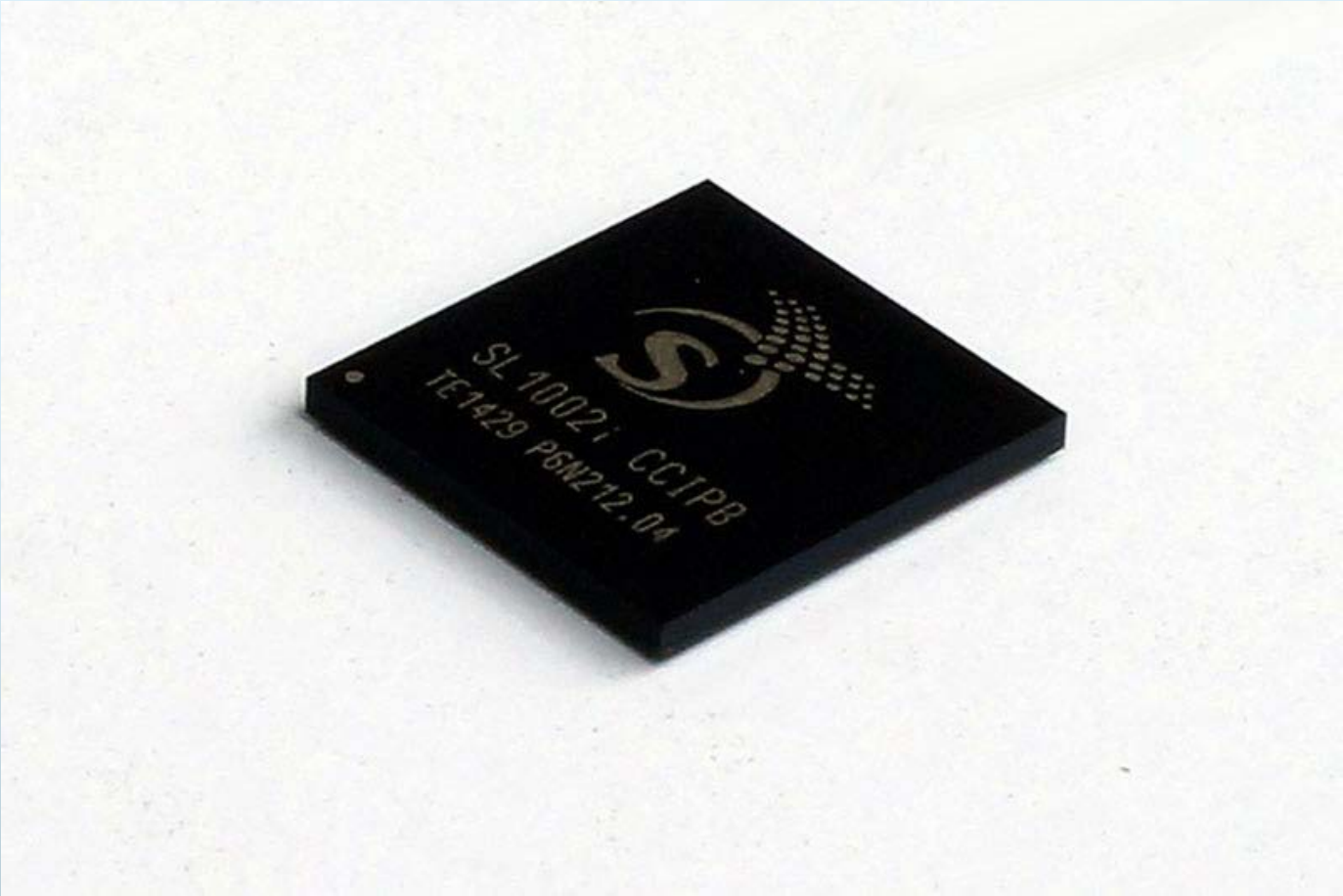
AVAILABILITY

- ✓ Sampling in Q2 2018

Note: Preliminary data, subject to change without notice

- Sinclair-funded ATSC 3.0 chipset under development
- SDR-based allows flexibility
- Mobile first version available for Holiday 2019 devices
- Sinclair's offer of up to 1 million free chipsets per OEM

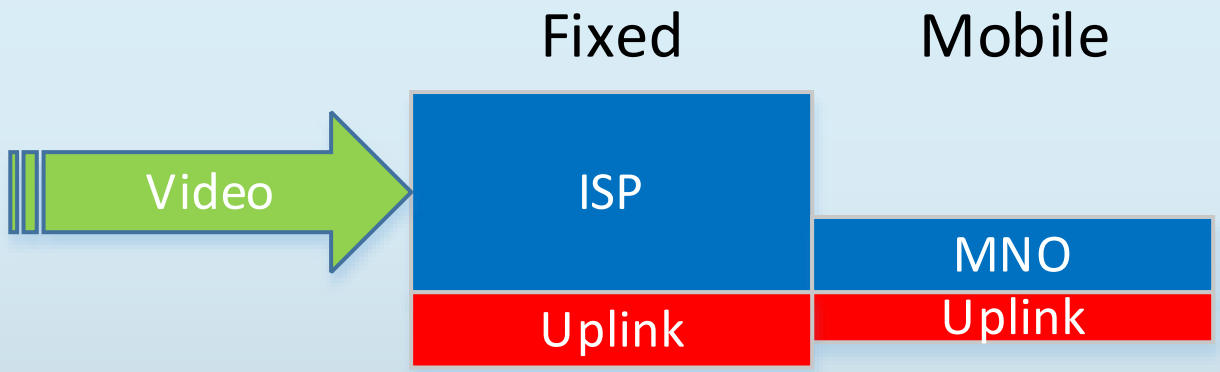
1,000,000 Chips



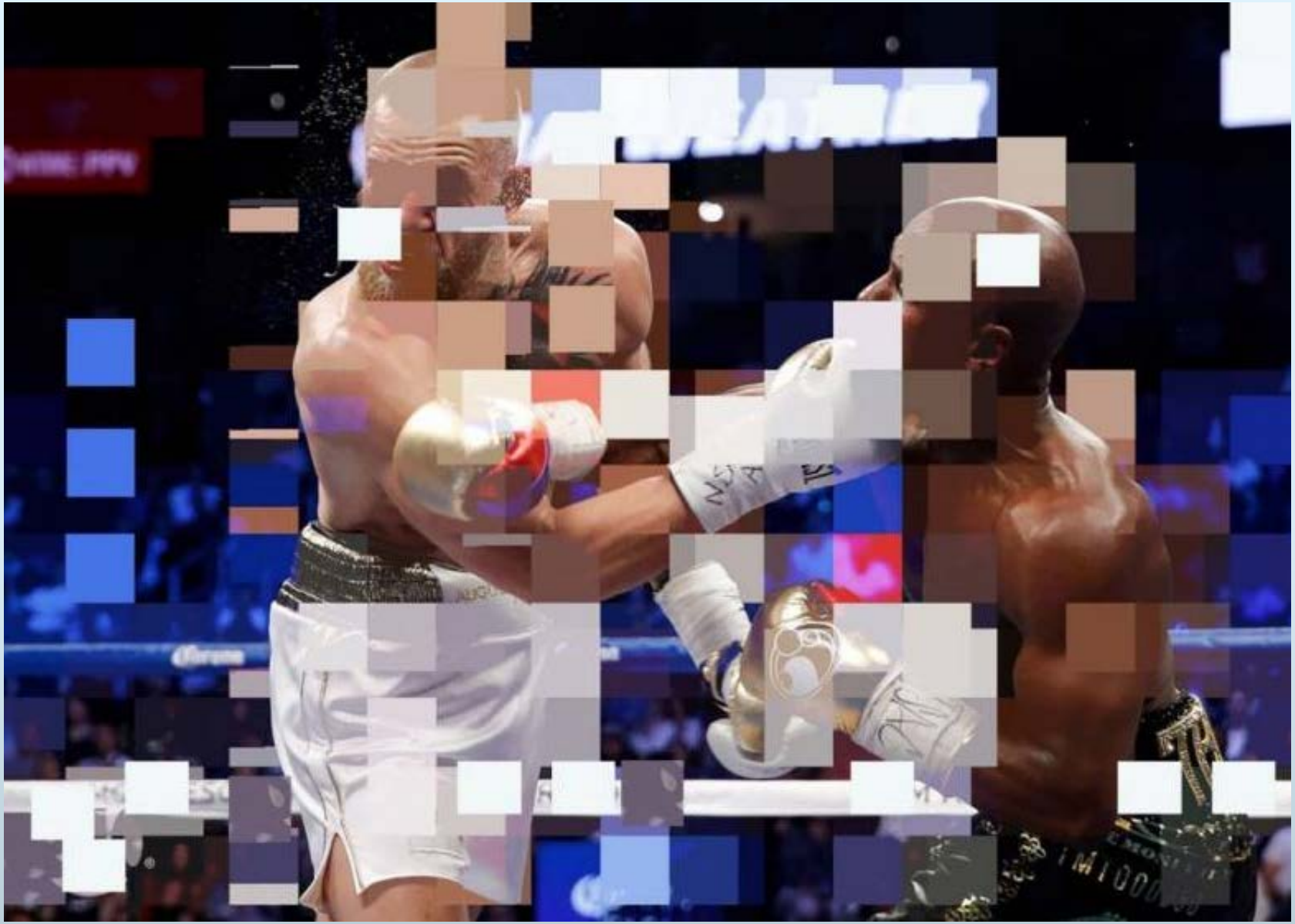
ONEMedia
OPEN NETWORK ENABLED

POV: OTT on Current Internet

- ISP
  - $
  - Potentially Walled
  - Wireless Network Spectrum Limited
- CDN
  - Expensive Edge Servers
  - Infrastructure Lags Demand



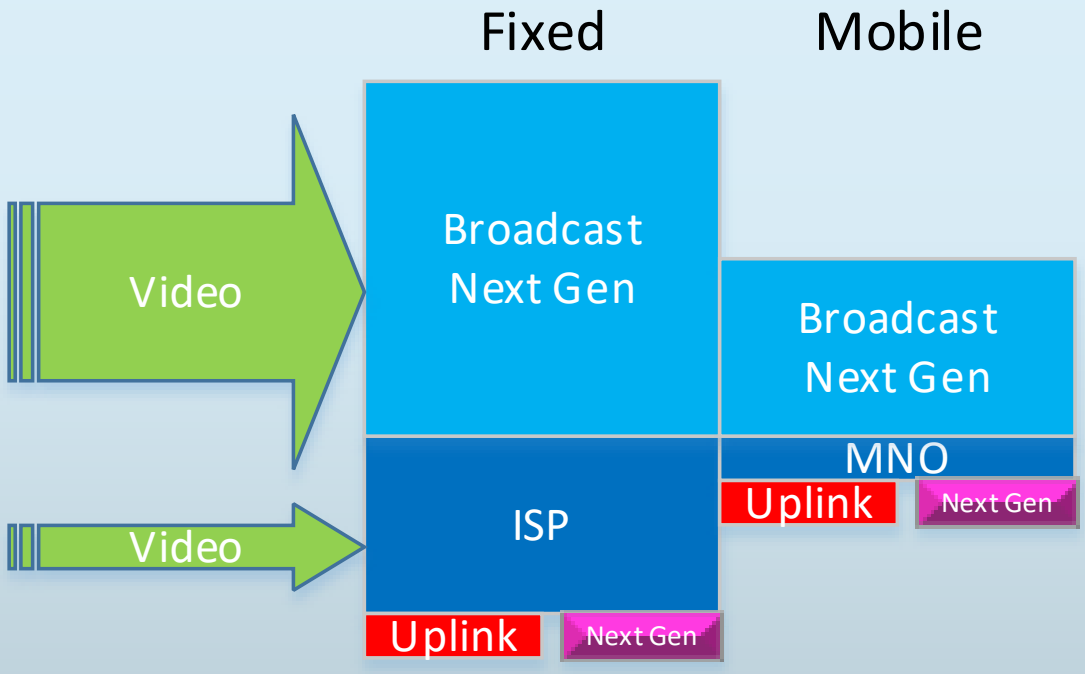
ONEMedia
OPEN NETWORK ENABLED



ONEMedia
OPEN NETWORK ENABLED

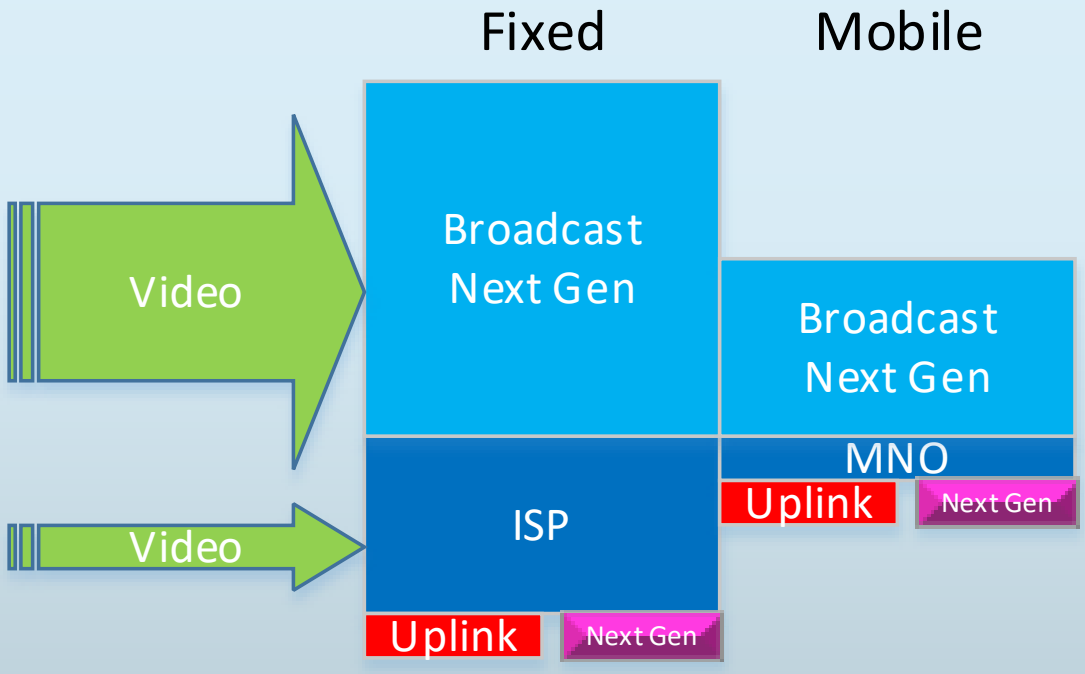
POV Next Gen Internet

- 3.0 is a Wireless Overlay of the Internet
- Perfect for NetFlix (all OTT)
  - Extremely Economical
  - Customers don't need an ISP
  - Unlimited Subscribers
  - Max QOS
- Broadcast is "Enhanced" to OTT
  - All the "Web" features



POV Next Gen Internet

- Requires Gateways
- Requires 600 MHz Portables
- Depends on Others for Return



ONEMedia
OPEN NETWORK ENABLED

VHF

- Lighthouse
- Nightlight
- STL
  - Serious Sinclair Patents
  - Feed 6 SFNs
  - For a very long way
  - Until Sporadic E hits
- Cheap Wireless Mics
- Garage Doors
- Remote Thermometers

- The path for VHF is different

ONEMedia
OPEN NETWORK ENABLED

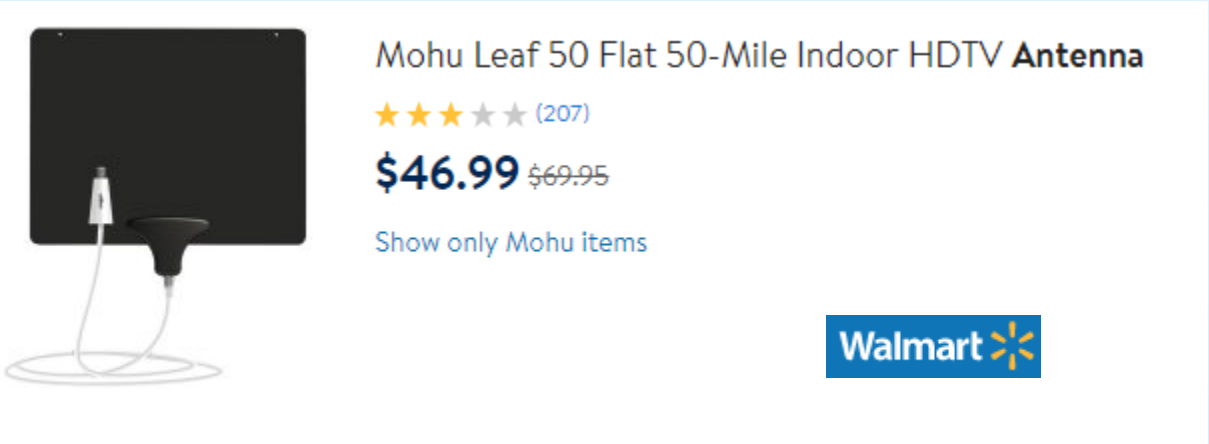
- Lighthouse – 8 VSB “Condo” of refuge
  - Nightlight – Last 8VSB station(s) standing

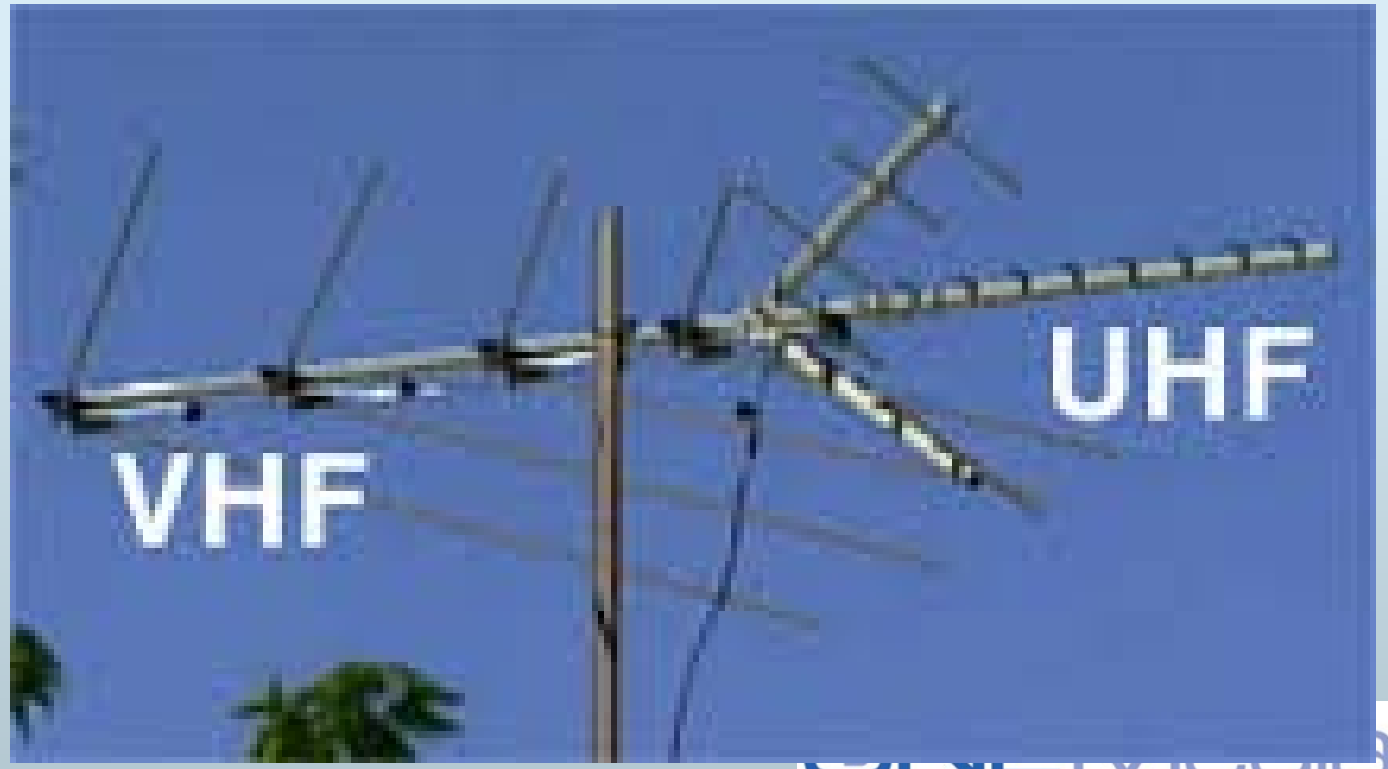
- Spotlight – Beacon – 1st Next Gen cluster.

ONEMedia
OPEN NETWORK ENABLED

Some 3.0 SFN physics

- VHF is not UHF
  - Low V antennas are BIG
  - UHF does Mobile
  - VHF does rural homes

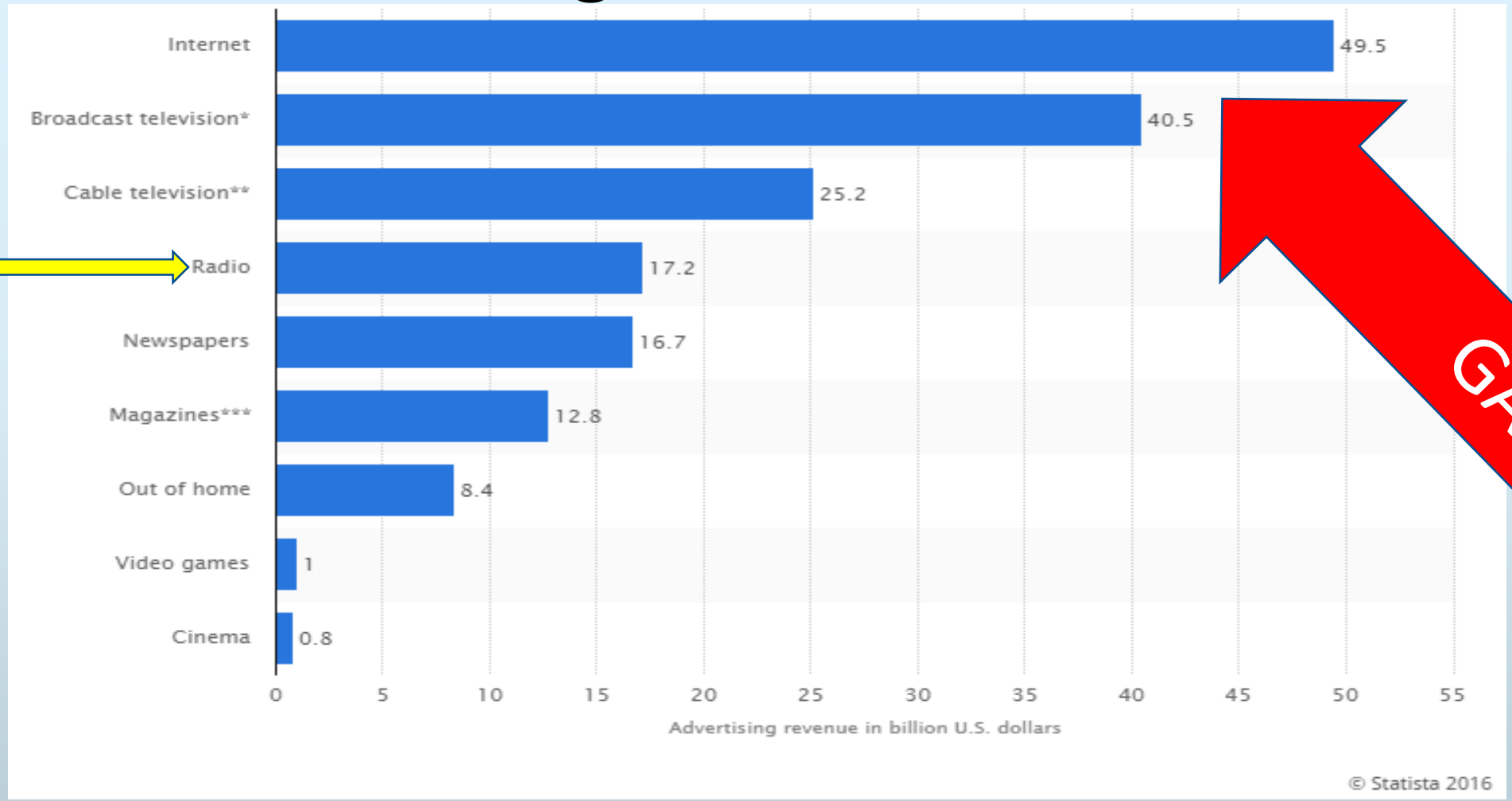




OPEN NETWORK ENABLED

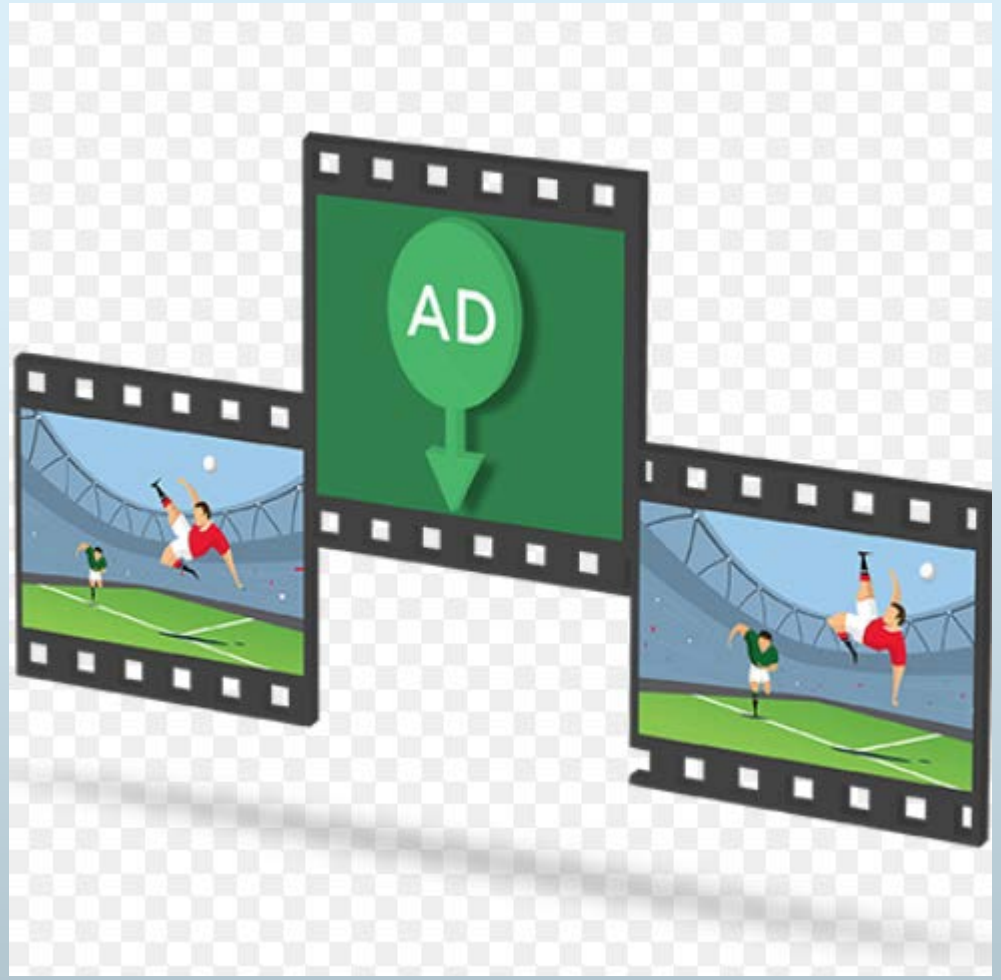
ONEMedia
OPEN NETWORK ENABLED

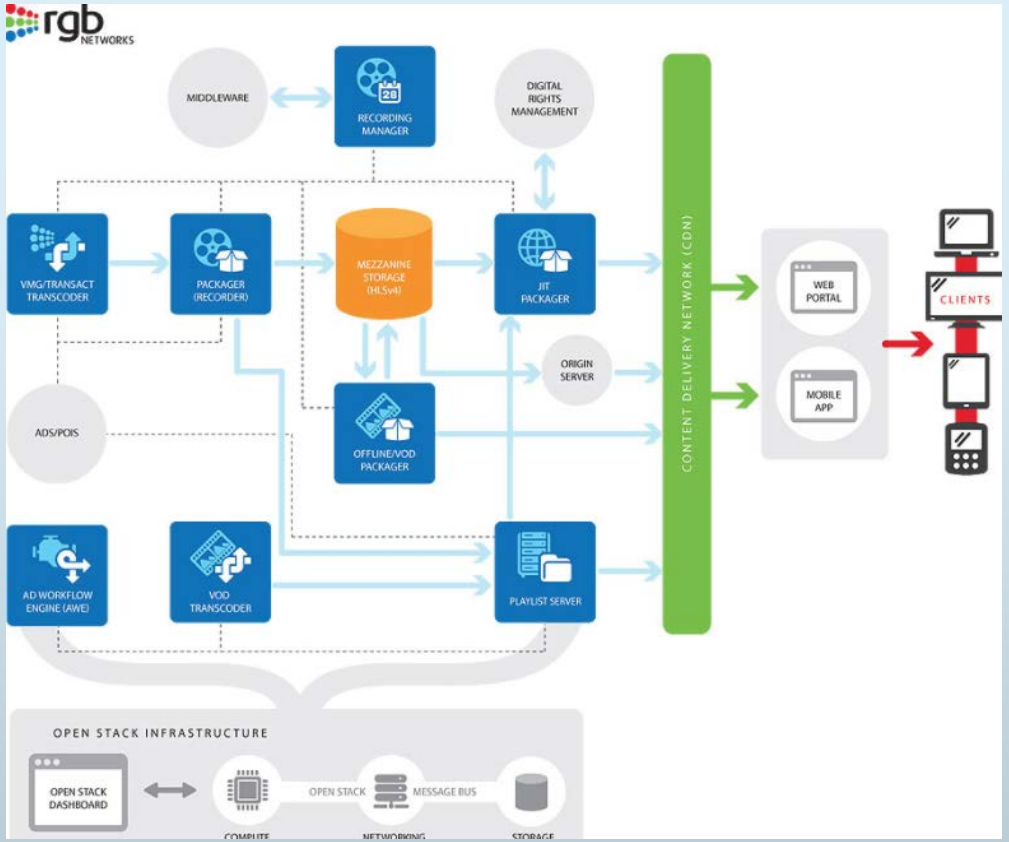
Where Advertising Dollars Go



GAP

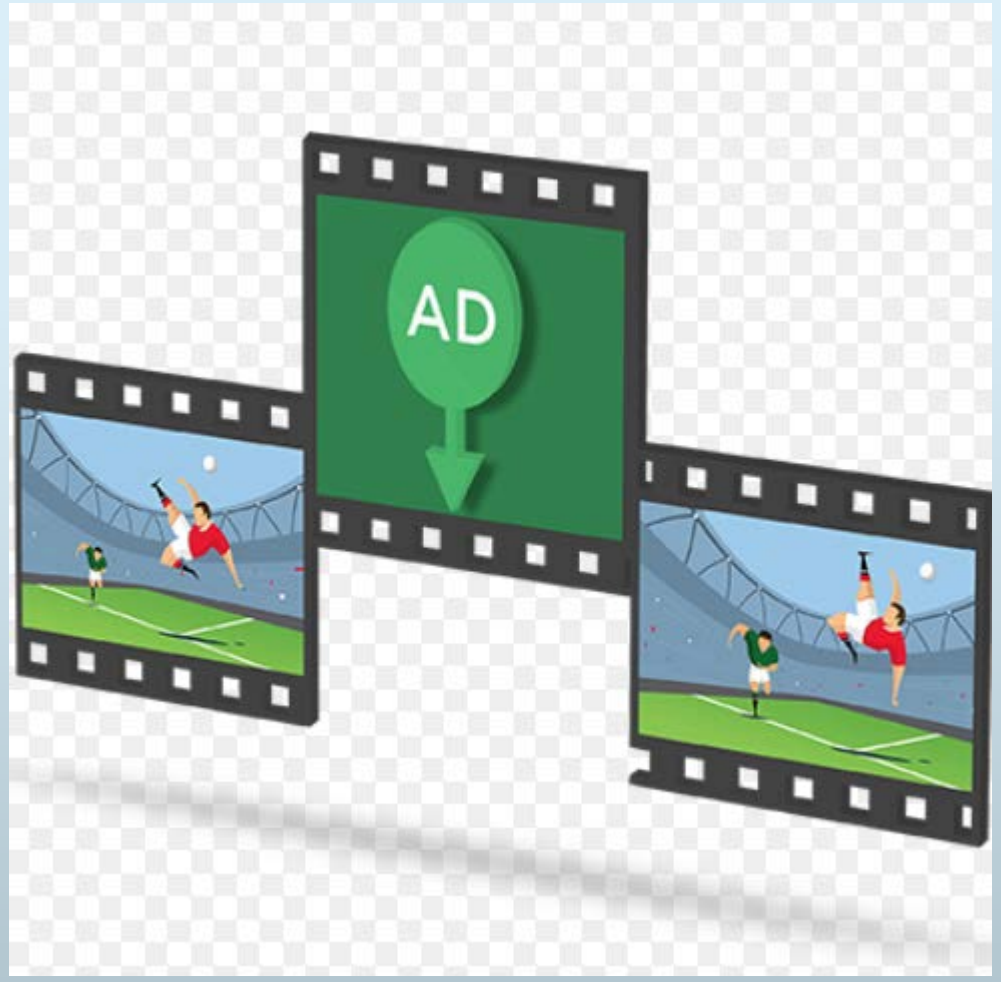
Digital Ad Insertion





ONEMedia
OPEN NETWORK ENABLED

Digital Ad Insertion



ONEMedia
OPEN NETWORK ENABLED

8CH Channel Digital Video Recorder 960H D1 HDMI DVR For Security CCTV Camera USA

1 viewed per hour ☆☆☆☆☆ Be the first to write a review.

Item condition: **New**

Quantity: 1 — 2 available
55 sold / See feedback

Price: **US $33.85**

Buy It Now

Add to cart

Qualifies for: ☐ 3-year protection plan from SquareTrade - $8.49

74 watching

Add to watch list

Add to collection

100% buyer satisfaction	55 sold	More than 95% sold

Shipping: FREE Economy Shipping | See details
Item location: Chino, California, United States
Ships to: United States See exclusions

Delivery: Estimated between **Wed. Aug. 2 and Tue. Aug. 15**

Payments: PayPal VISA MasterCard AMERICAN EXPRESS DISCOVER
Credit Cards processed by PayPal

PayPal CREDIT
Get more time to pay. Apply Now | See terms
See details

lendingtree Personal Loans, Get $1k-$35k in 24hrs | Learn More

Returns: 14 days money back, buyer pays return shipping | See details

$ Have one to sell? **Sell now**

Add to watch list

Seller information
lxxstore88 (72591 ★)
98.6% Positive feedback

Follow this seller

Visit store: lxxstore88
See other items

AdChoices
WHICH TAMPON WILL YOU CHOOSE?

GET A COUPON

ONEMedia
OPEN NETWORK ENABLED

the ONION

Mohu Leaf 50 Amplified Indoor HDTV...

$39.99

GoMohu

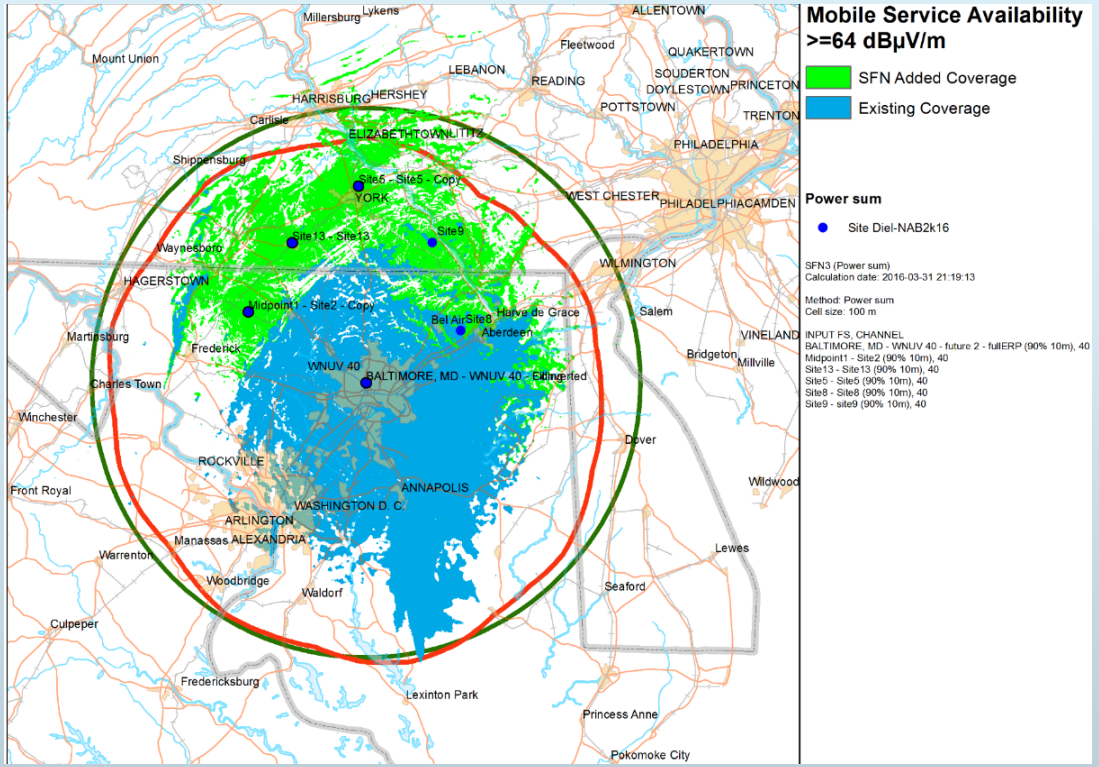
NEWS IN BRIEF · 10.4.17 VOL 53 / ISSUE 39

Stunned Family Watches As Grandmother Wolfs Down Sandwich In 33 Minutes

ONEMedia OPEN NETWORK ENABLED

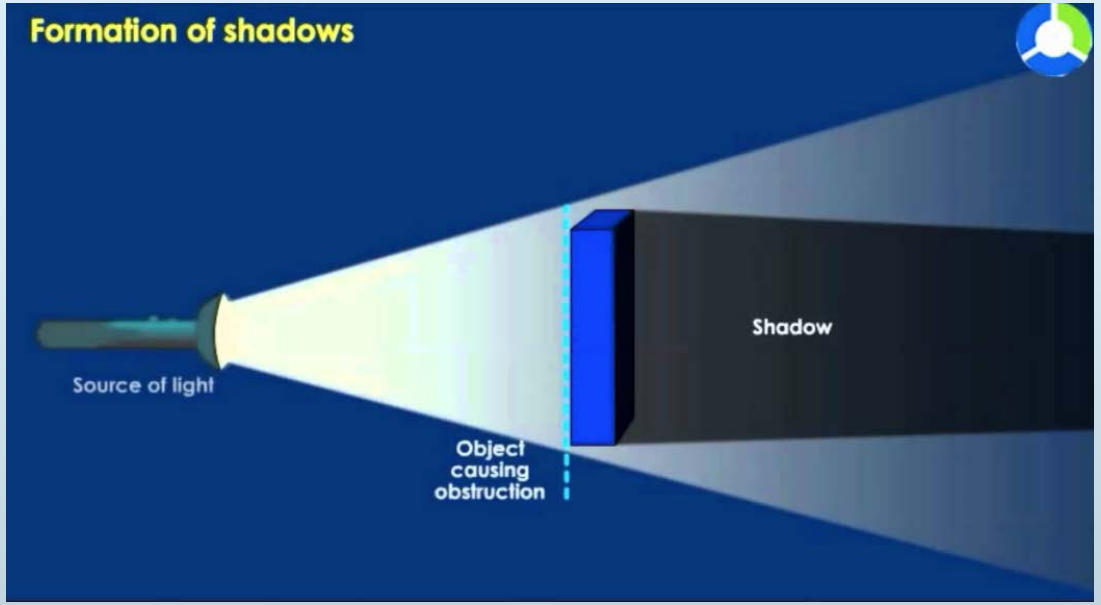
SFNs

- The third knob – more power more payload/penetration
- 2 Use Cases
  - Portable
    - Cars
    - Smartphones OOH
  - Gateway
    - Living Room
    - Smartphones In Home
    - Everything
      - IoT even



ONEMedia
OPEN NETWORK ENABLED

SFNs are about Shadows & Angle of Attack



ONEMedia
OPEN NETWORK ENABLED

Making the 3.0 Transition

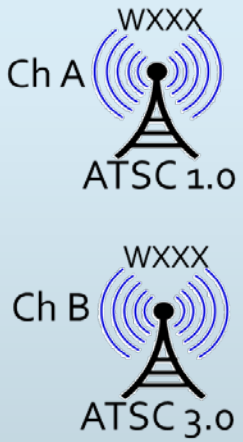
- SFNs are a big part of 3.0's potential
- We don't have the luxury of excess spectrum anymore
- 3.0 is not backward compatible
- BUT Displays are forward compatible
  - Dongle / gateway
- Chicken & Egg scenario
  - Transmission
  - Devices/dongles/gateways
- Hot Buttons
  - Mobile
  - UHDTV – HDR – Immersive Sound

ONEMedia
OPEN NETWORK ENABLED

Classic 3.0 Transition Thinking

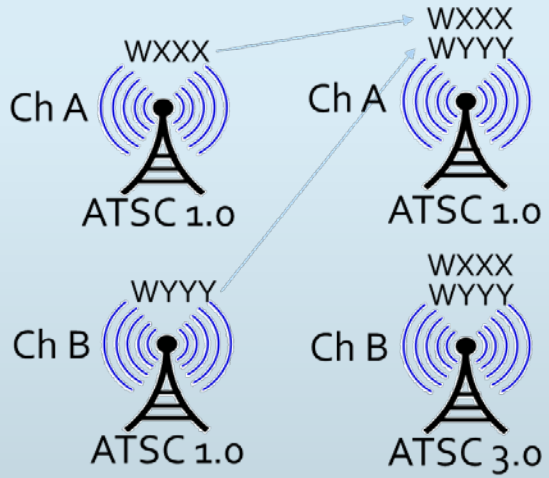
Three basic transition "tools"

Simulcasting



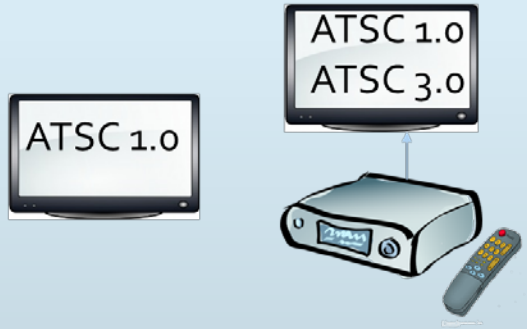
- Used for DTV transition
- Requires 2X spectrum
- Not enough available

Channel Sharing



- Degrades/reduces existing service
- Requires extensive broadcaster collaboration

Receiver "seeding"

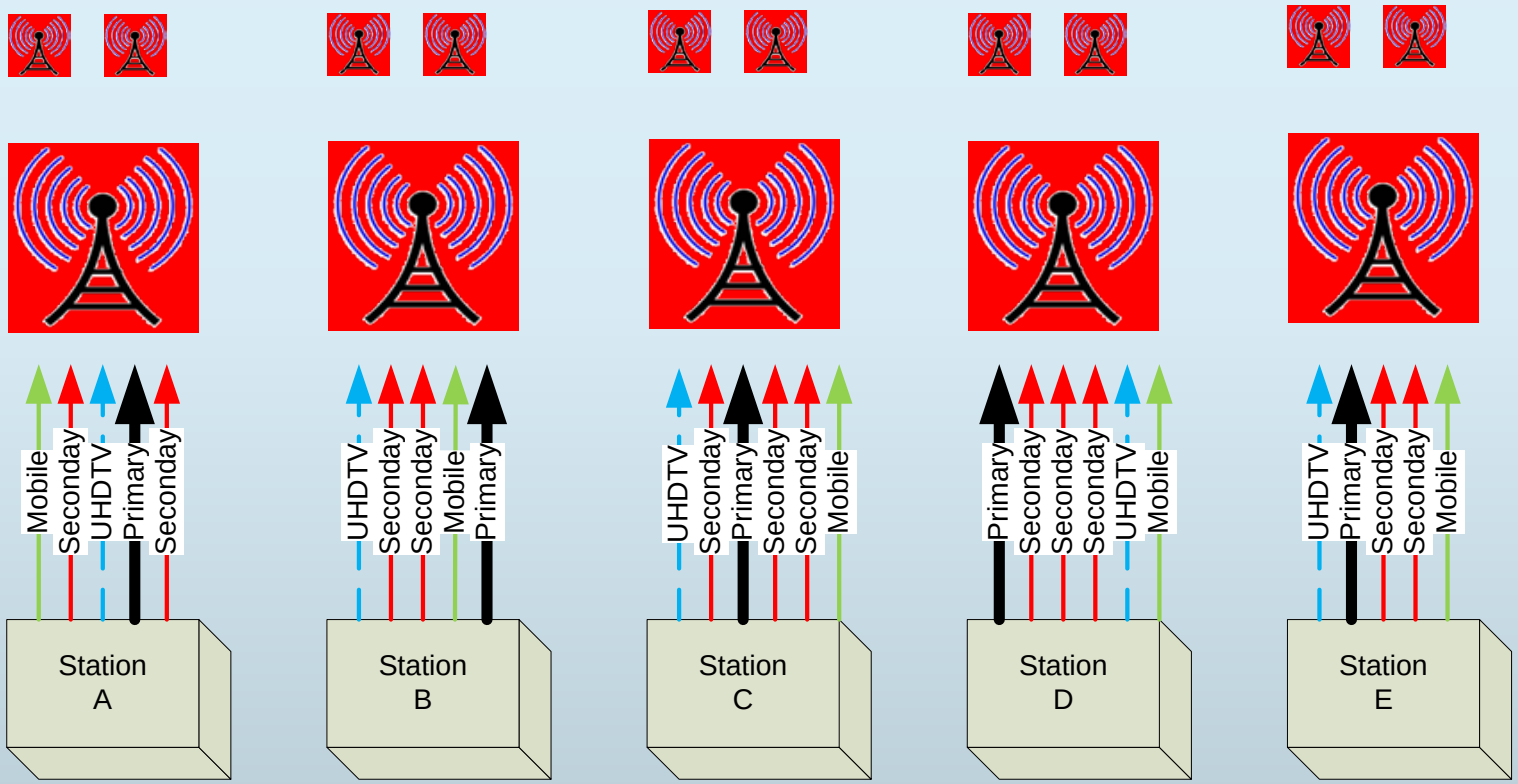


- Unclear motivation for device manufacturers
- May require broadcaster investment

ONEMedia
OPEN NETWORK ENABLED

Goal oriented possibility – by Service *not* Station

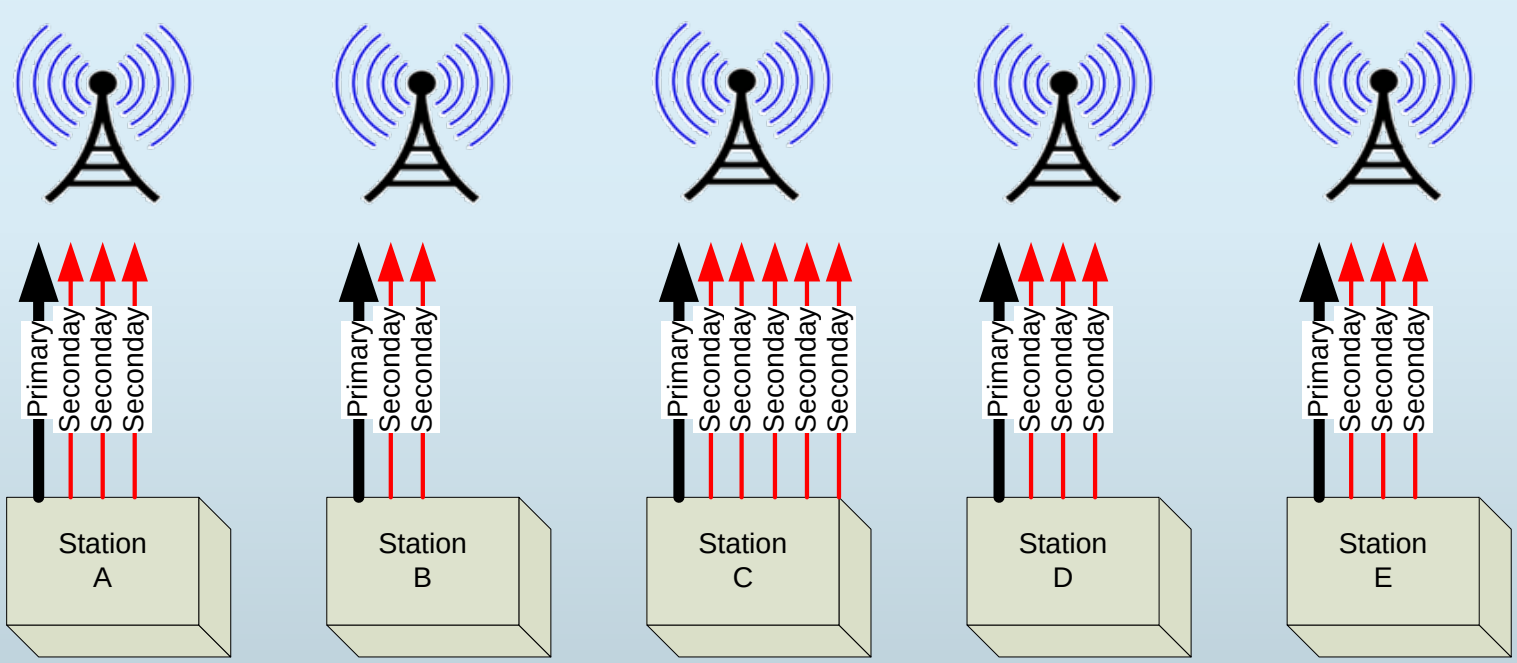
Beyond two cooperative stations scenario
Hits Mobile hard first – but also a marque UHDTV / HDR service
The SFN is designed, contracted and provisioned for the end game



This is the end game…

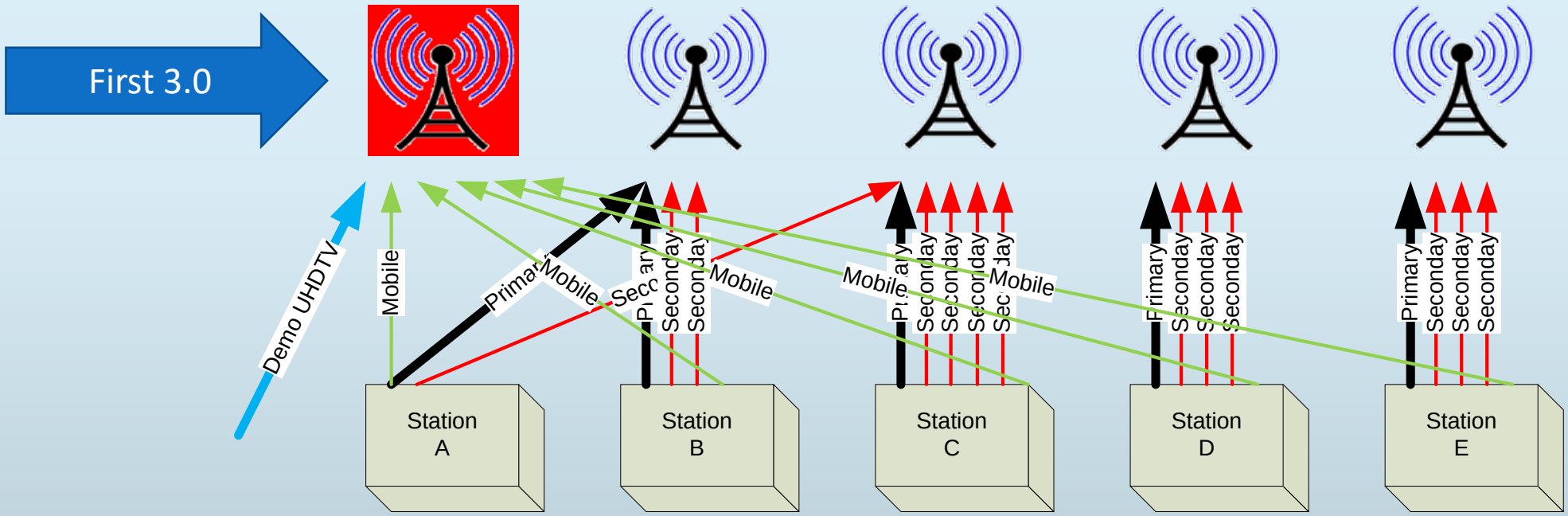
Today

All 8VSB ATSC 1.0



ONEMedia
OPEN NETWORK ENABLED

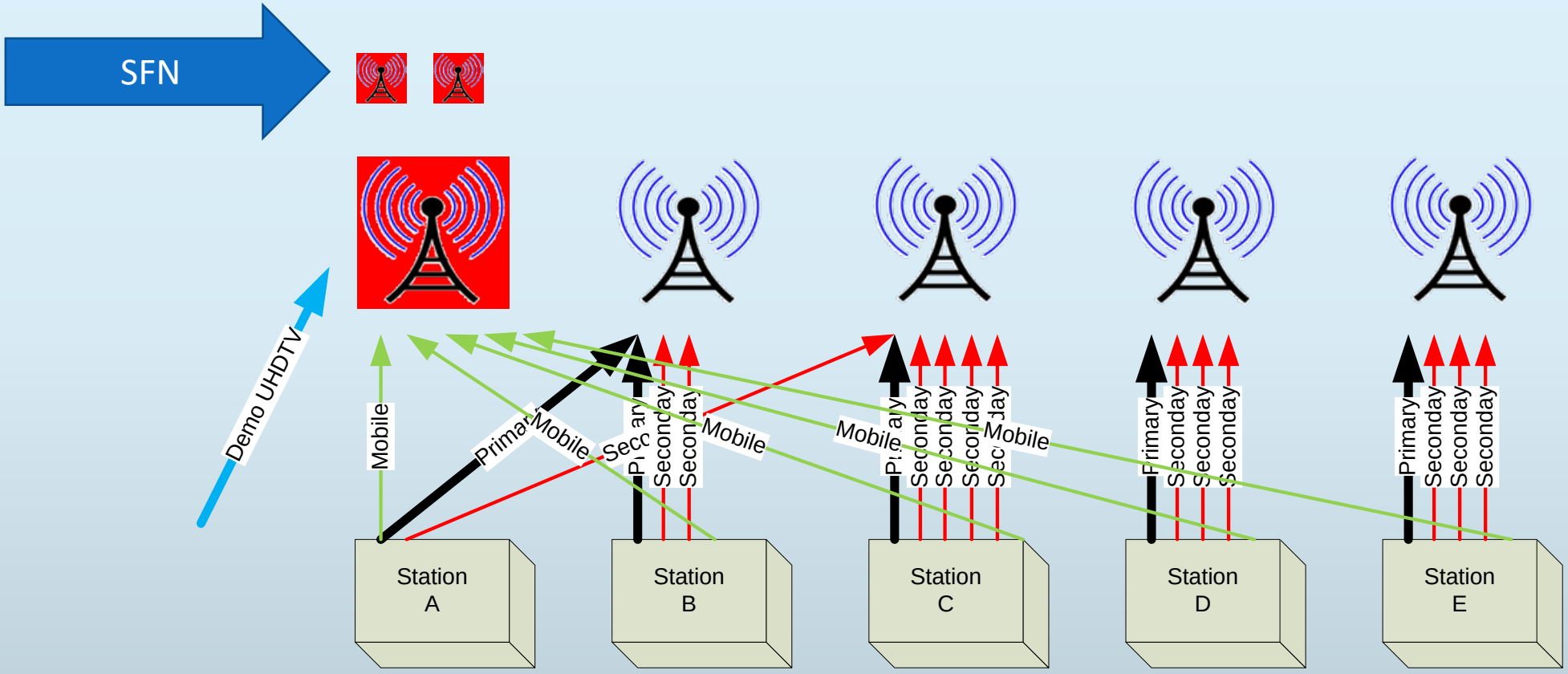
Step 1, the ATSC 3.0 “Lighthouse”



This is all about store shelves… and devices

ONEMedia
OPEN NETWORK ENABLED

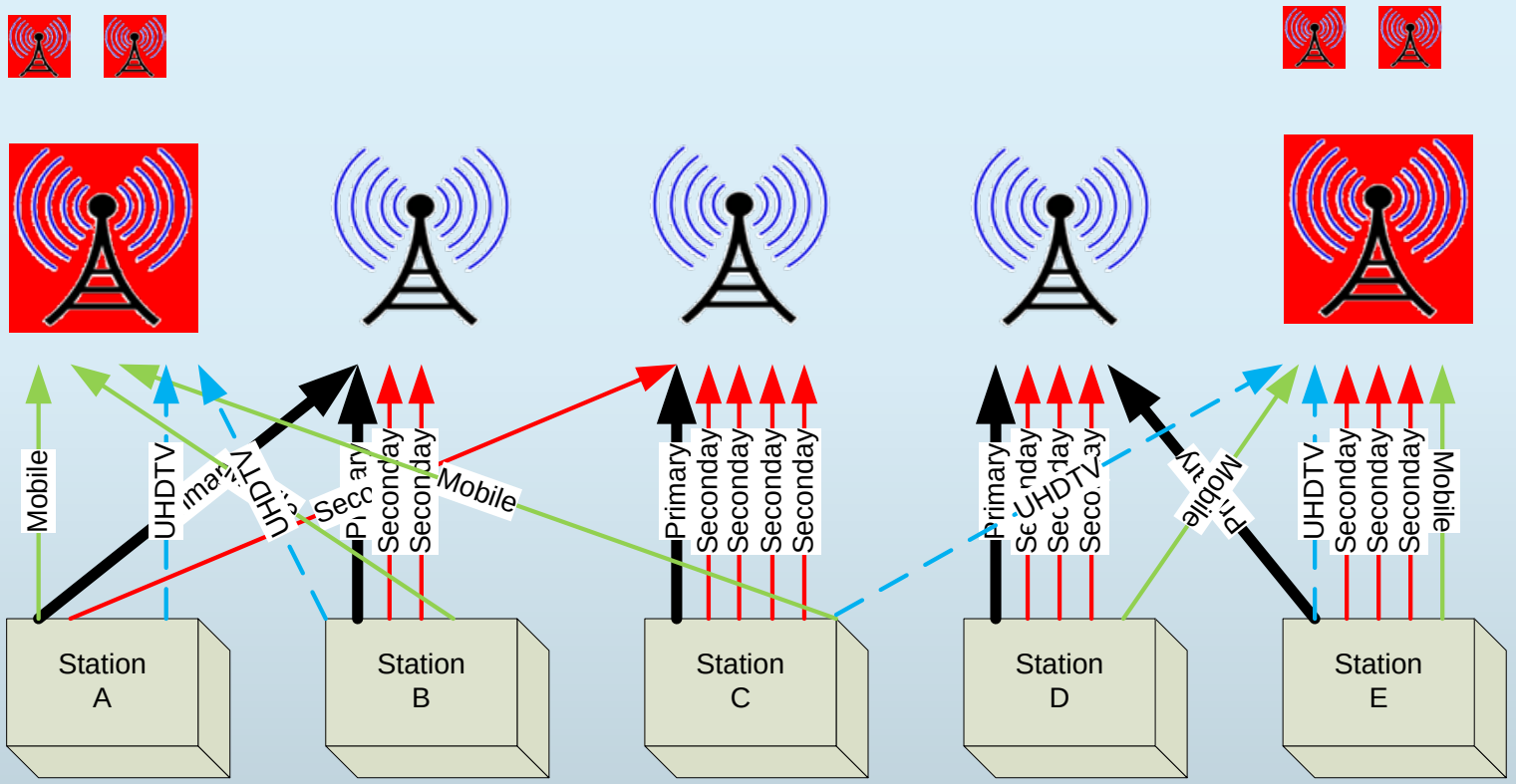
Step 1, the ATSC 3.0 “Lighthouse” + SFN



This is so those devices work outside of the store

ONEMedia
OPEN NETWORK ENABLED

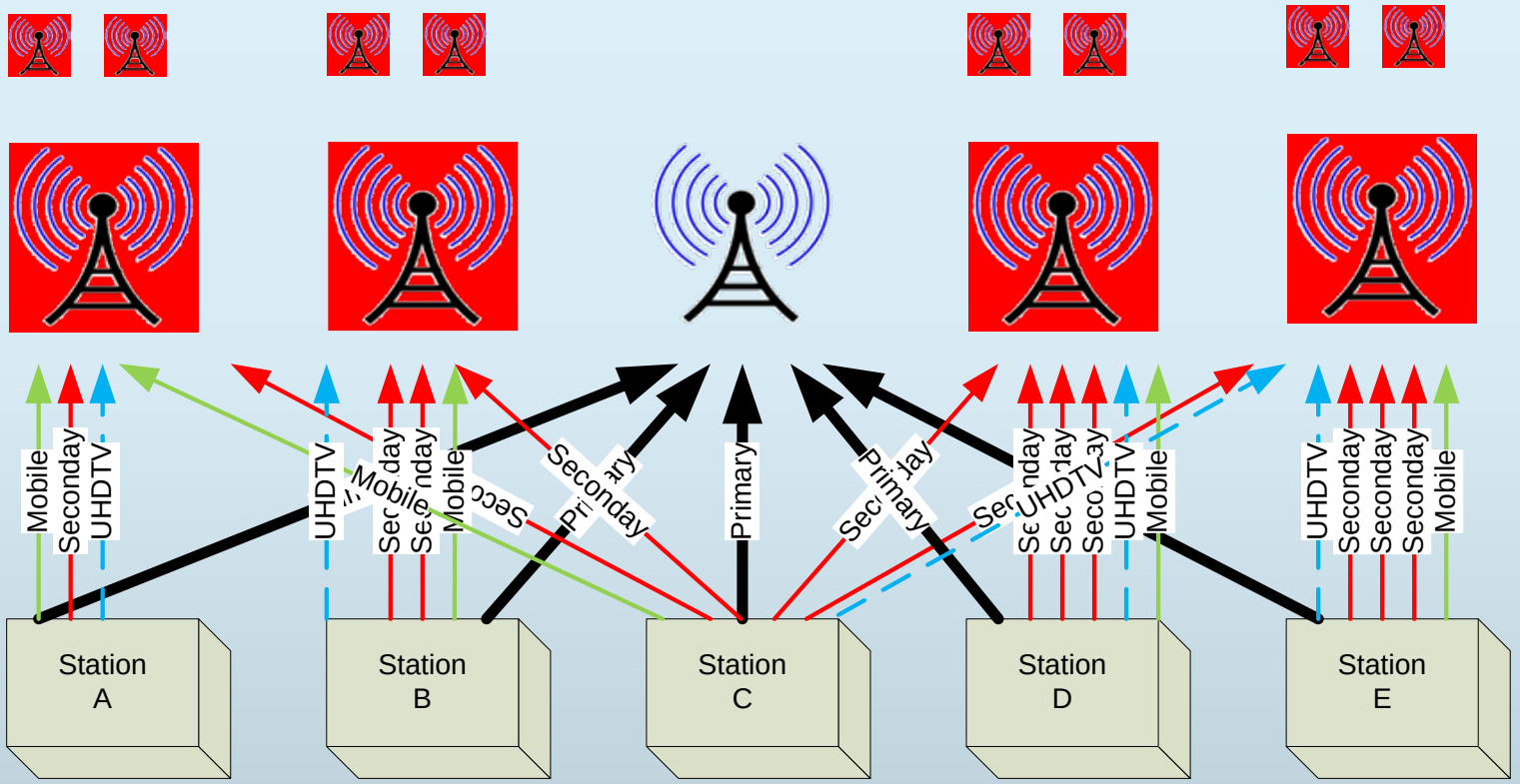
Step 2, The Conversion Continues



This is about making those big TVs work

ONEMedia
OPEN NETWORK ENABLED

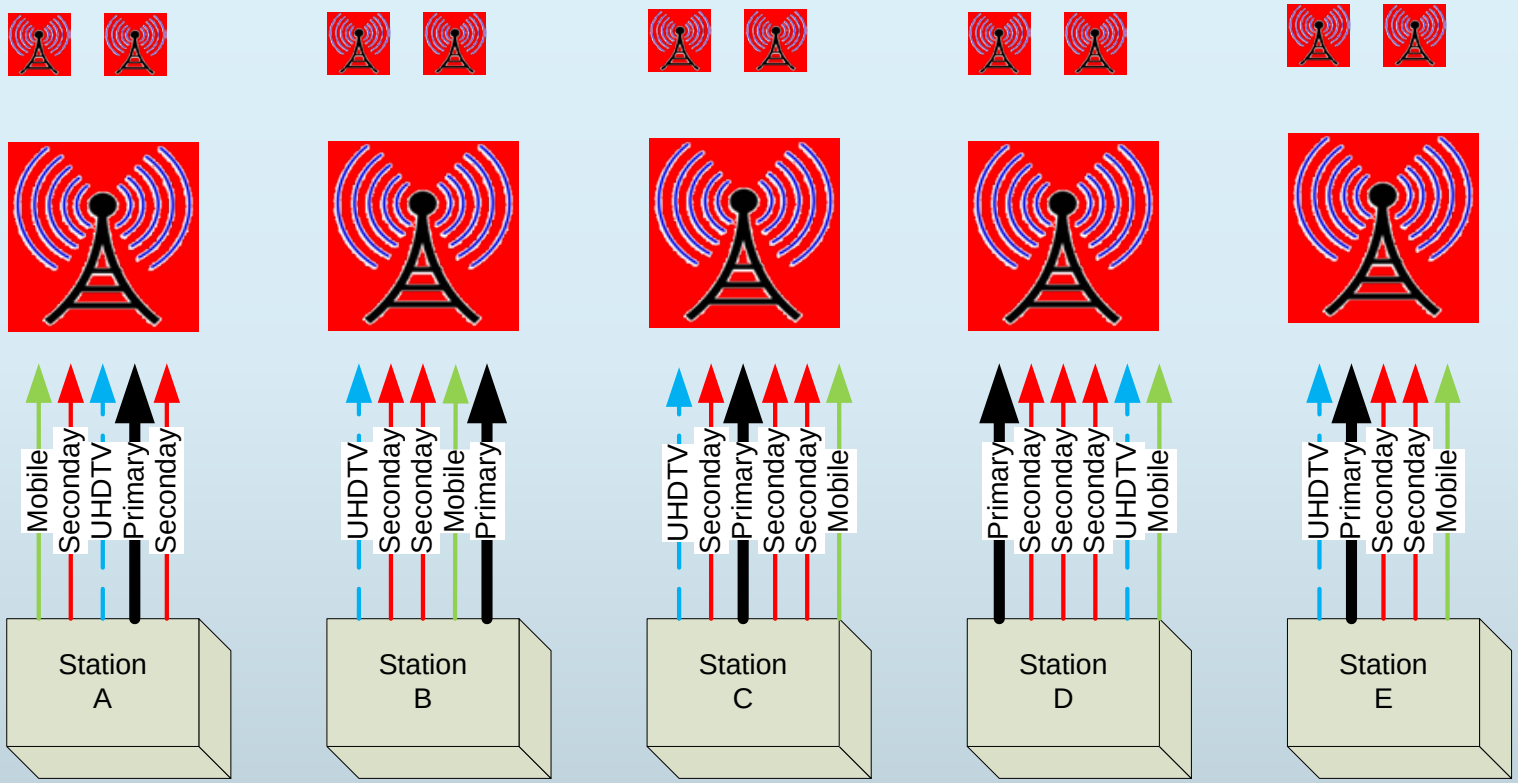
Step 4, the last 8-VSB



This is all about supporting the last 8-VSB viewers

ONEMedia
OPEN NETWORK ENABLED

Step 5, The New Normal



This is the end game… Soon, no one will even remember 8-VSB

ONEMedia
OPEN NETWORK ENABLED

The Problem with Mobile 3.0

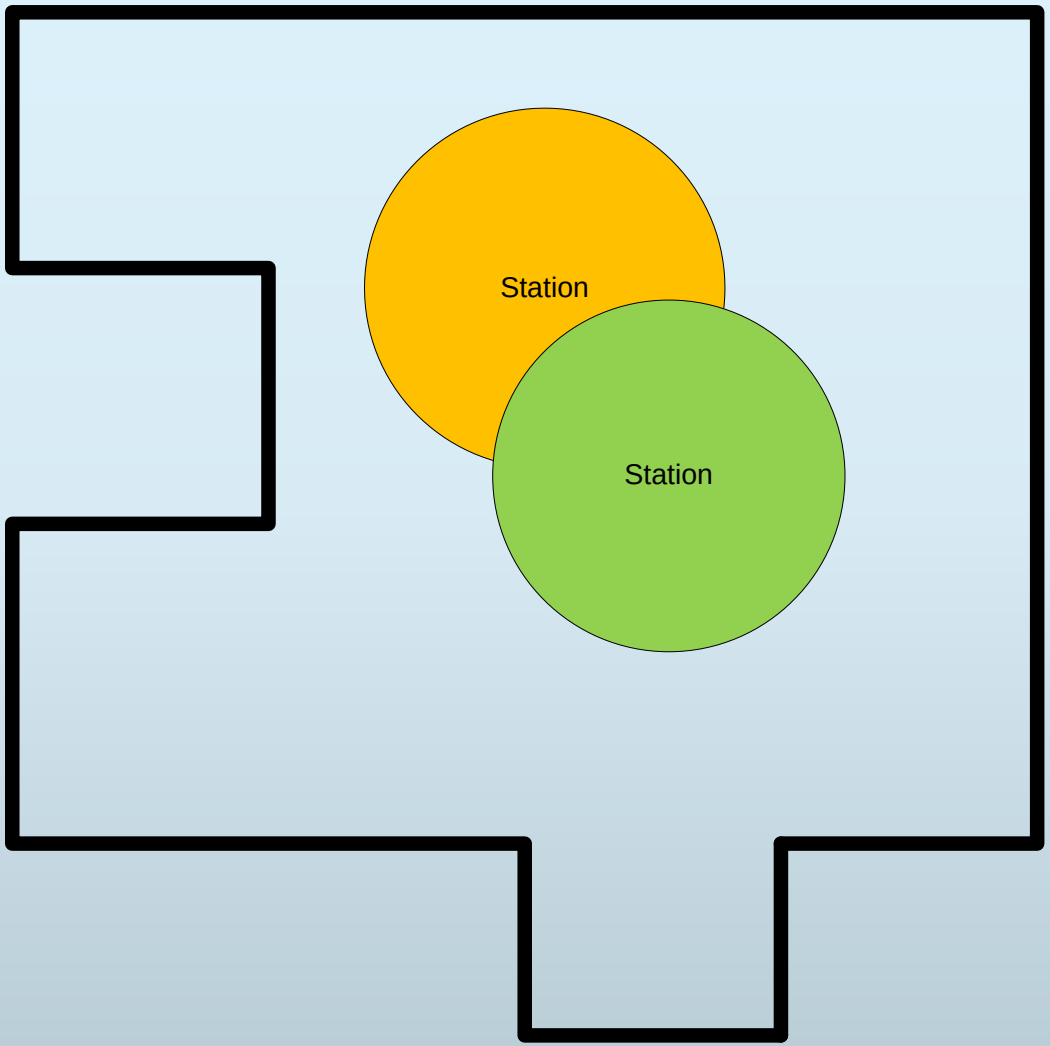
- MNO's "own" the cell phones
- What is the motivation to add 3.0?
- Race with eMBMS - Unicast

ONEMedia
OPEN NETWORK ENABLED

OTA Coverage is Round DMAs are Not

The basic philosophy of 3.0 is to “jump over”

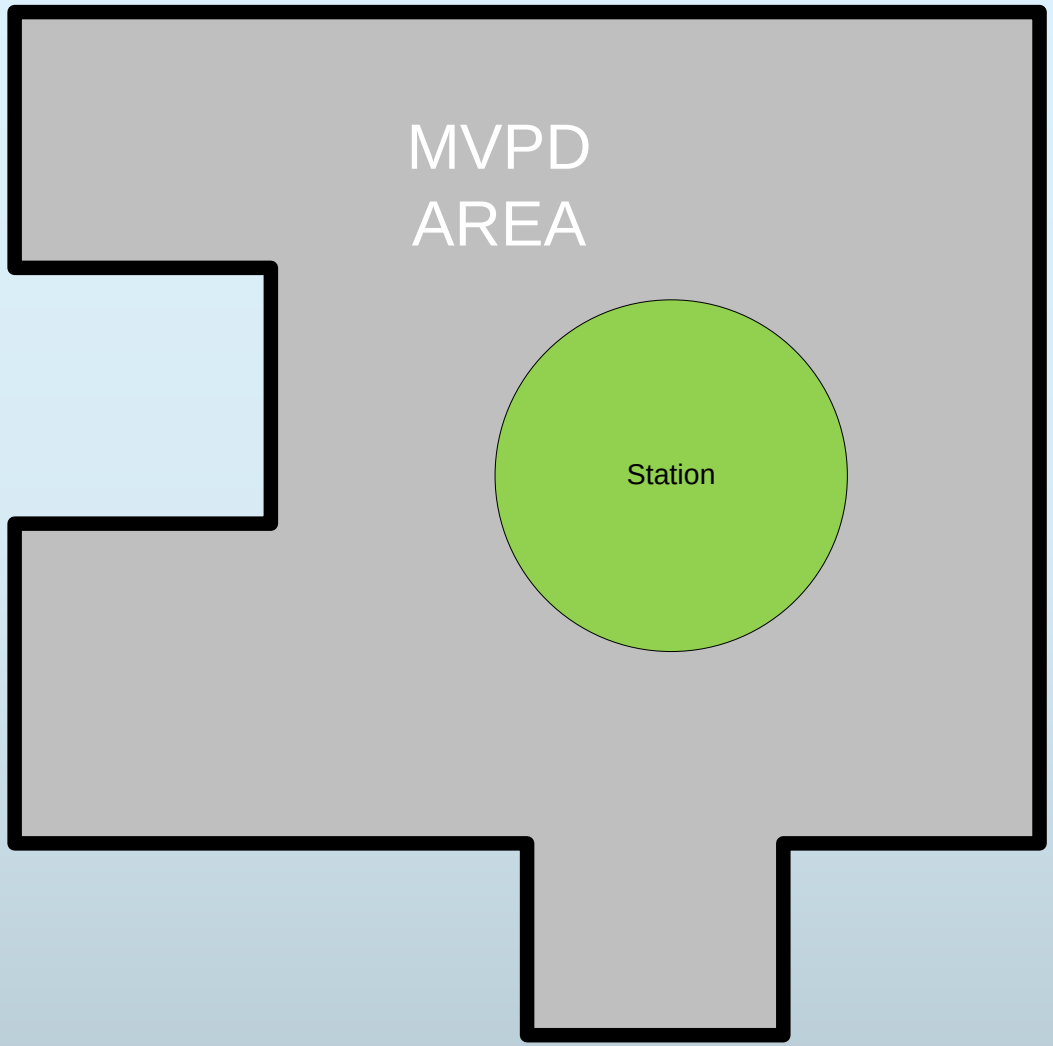
ISPs, MVPDs…



ONEMedia
OPEN NETWORK ENABLED

OTA Coverage is Round DMAs are Not

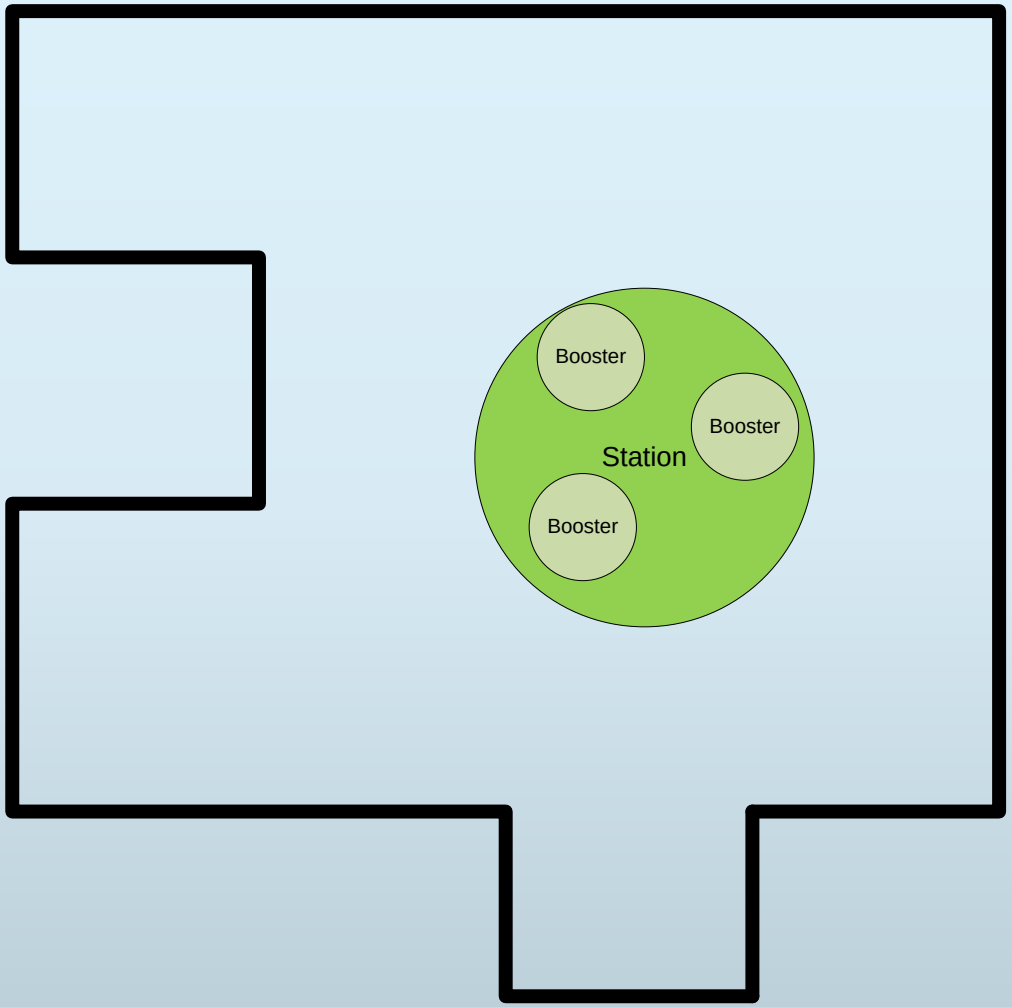
MVPD's role is major in ATSC 1.0



Add SFN Support

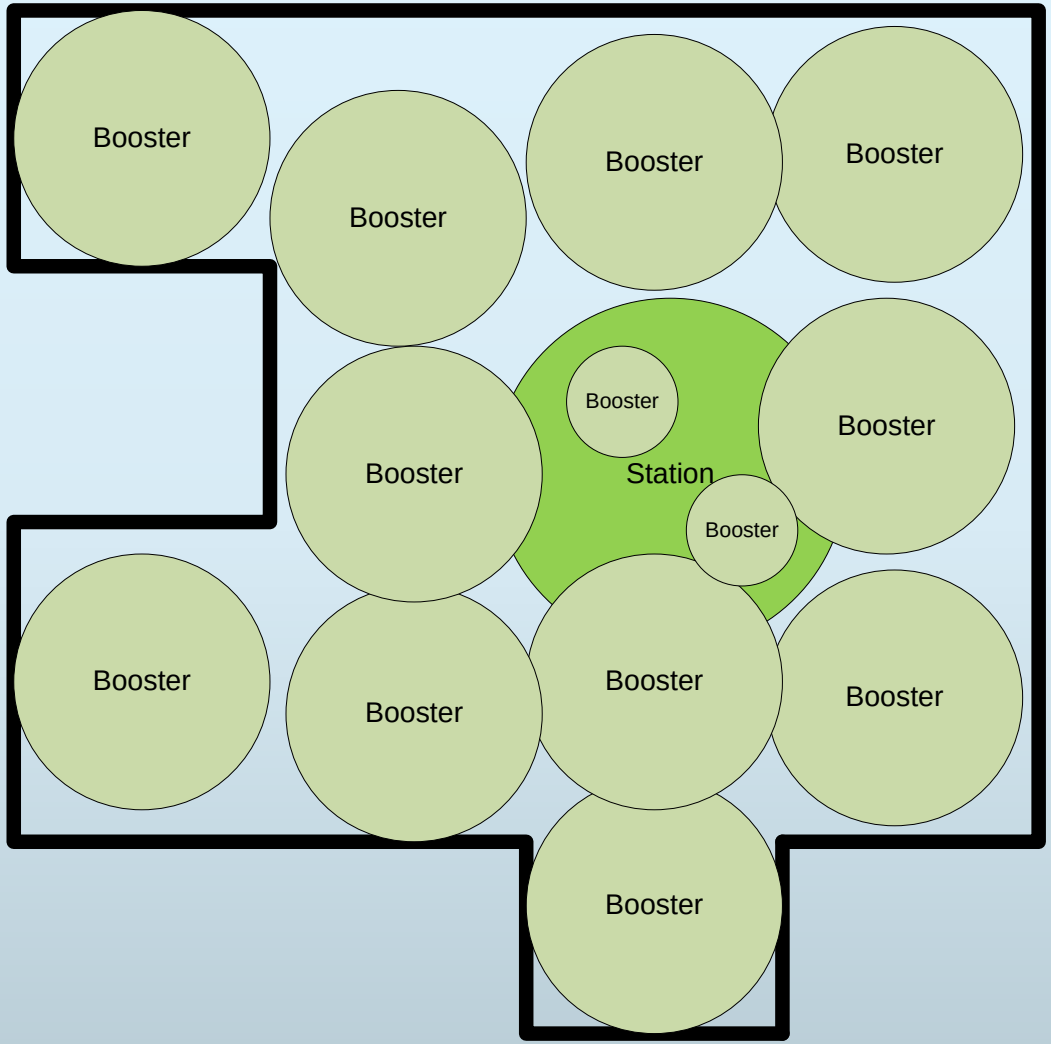
Good for pumping up intensity

Doesn’t help with extending coverage



ONEMedia
OPEN NETWORK ENABLED

SFN to Cover DMA



Next Gen Testing

- What MOD/CODs are magic?
- How much?
- 30’
- Shadows
- What we don’t know we don’t know.

ONEMedia
OPEN NETWORK ENABLED

73?

- ...-- --...
- Big Bang
- https://en.wikipedia.org/wiki/73_(number)

In mathematics [edit]

73 is:

- the 21st prime number. The previous is seventy-one, with which it comprises the 8th twin prime.
- a permutable prime with thirty-seven.
- a star number.[1]
- the largest minimal Primitive root in the first 100,000 primes. In other words, if p is one of the first 100,000 primes, then at least one of the primes
- the smallest prime congruent to 1 modulo 24.
- an emirp, meaning that the reverse of 73, that is, 37, is also a prime number.[2] 73 is the 21st prime number while 37 is the 12th prime number.
- the smallest prime with a composite sum of digits, in base 5.
- palindromic in bases 2 (1001001_2) and 8 (111_8).
- 73 is the only prime repunit in base 8 (111_8).
- 73 is the smallest factor of the first composite generalized Fermat number in base 10 ($10^4 + 1 = 10{,}001 = 73 \times 137$).

Also:

- The number 21 has prime factors 7 and 3. The number 21 in binary is 10101; 7 in binary is 111, 3 in binary is 11, and seventy-three in binary is 10 Additionally, both 73 and its mirror, 37, are sexy primes twice over, as 31, 43, 67 and 79 are all prime numbers.
- Every positive integer can be written as the sum of 73 or fewer sixth powers (see Waring's problem).

In science [edit]

- The atomic number of tantalum

In astronomy [edit]

- Messier object M73, a magnitude 9.0 apparent open cluster in the constellation Aquarius
- The New General Catalogue object NGC 73, a barred spiral galaxy in the constellation Cetus
- The number of seconds it took for the Space Shuttle Challenger OV-099 shuttle to explode after launch.
- 73 is the number of rows in the 1,679-bit Arecibo message, sent to space in search for extraterrestrial intelligence.

In other fields [edit]

73 is also:

- the number of days in 1/5 of a non-leap year.
- The year AD 73, 73 BC, or 1973.
- The number of books in the Catholic Bible.[3]
- Amateur radio operators and other morse code users commonly use the number 73 as a "92 Code" abbreviation for "best regards", typically wher palindrome - (- - · · · · · · · - -).
- *73* (also known as *73 Amateur Radio Today*), was an amateur radio magazine published from 1960 to 2003.
- 73 was the number on the TV Torpedo Patrol (PT) boat in the TV show McHale's Navy
- 73 is Sheldon Cooper's favorite integer in The Big Bang Theory for its mathematical properties
- The registry of the U.S. Navy's nuclear aircraft carrier USS George Washington (CVN-73), named after U.S. President George Washington.
- *No. 73* was the name of a 1980s children's television programme in the United Kingdom. It ran from 1982–1988 and starred Sandi Toksvig
- Pizza 73 is a Canadian pizza chain with 51 stores
- Game show Match Game '73 in 1973
- Fender Rhodes Stage 73 Piano
- Sonnet 73 by William Shakespeare
- The number of the French department Savoie
- On a CB radio, 10-73 means "speed trap at..."

In sports [edit]

- In international curling competitions, each side is given 73 minutes to complete all of its throws.
- In baseball, the single-season home run record set by Barry Bonds in 2001.
- In basketball, the number of games the Golden State Warriors won in the 2015-16 season (73-9), the most wins in NBA history.
- NFL: In the 1940 NFL championship game, the Bears beat the Redskins 73–0, the largest score ever in an NFL game. (The Redskins won their p

ONEMedia
OPEN NETWORK ENABLED

The Most Advanced ATSC 3.0 Lab On Earth

ONEMedia
OPEN NETWORK ENABLED

When does 3.0 come to an end?

- Most Technologies have a Life Cycle
- Most of 3.0 is Extensible
- ***"3.0 lasts as long as it is a good use of the Spectrum"***
- 3.0 at roll out "wastes" a lot of Spectrum
  - Based on Protecting Contour – Not Provide Universal Coverage
- 3.0 can occupy all the Spectrum from Coast-to-Coast
  - That's not a stretch goal

ONEMedia
OPEN NETWORK ENABLED

SINCLAIR
BROADCAST GROUP

ONEMedia
OPEN NETWORK ENABLED

ONEMedia
OPEN NETWORK ENABLED