600 MHz Repacking Analysis

September 5, 2014

Topics

- Observations
- T-Mobile’s goal in studying repacking
- T-Mobile’s optimizing solver
- Scenario results

Observations

1. Successful clearing of more than 84 MHz of 600 MHz broadband spectrum on a national basis is feasible without any major network affiliates' participation and is likely assuming even limited participation by network affiliates in select markets.
2. Successful clearing of at least 84 MHz of 600 MHz broadband spectrum on a national basis is likely even if only 200 to 400 UHF television stations participate in the auction.
3. Significant opportunities for reverse-auction participation in smaller markets exist, especially east of the Mississippi river.
4. Major markets are most in need of broadcast participation in the incentive auction.
   - Major markets with multiple PBS stations offer important opportunities for clearing.
5. Support for border area solutions will prove valuable.
   - Using vacant Canadian allotments likely opens up Buffalo, Detroit, and Seattle
   - Using vacant Mexican allotments likely opens up McAllen, San Diego, Los Angeles

Goals and Questions

- T-Mobile sought to identify how much spectrum the 600 MHz Incentive Auction could clear using conservative assumptions about both the level of broadcast participation and the clearing target.
- Questions for analysis:
  - Do one or more major networks need to participate in the incentive auction to clear 84 MHz of spectrum? (other amounts undergoing study)
  - How much broadcaster participation is minimally needed to clear this amount of spectrum?
  - Can non-participating stations in certain markets prevent realization of a common, nearly nationwide band plan?

T-Mobile's Optimizing Solver

- T-Mobile employed a customized implementation of the open-source software package PicoSAT using the optimization goal of repacking broadcasters into the lowest number of channels to achieve the most wireless broadband spectrum.
- When a solution was found, a station would be assigned a channel.
- T-Mobile used FCC Constraint files as of May 2014
  - Modified domain files to simplify the Mexican and Canadian border analysis

Scenario Background

- 2204 Stations listed in July 13, 2013 Baseline
- Steps to narrow the review:
  1. Removed repetitive entries due to distributed antennas systems to arrive at 2177 stations
  2. Removed 505 VHF stations to arrive at 1672 stations
- Perform nationwide repacking analysis
  - Disregarded Alaska and Hawaii for purposes of analysis

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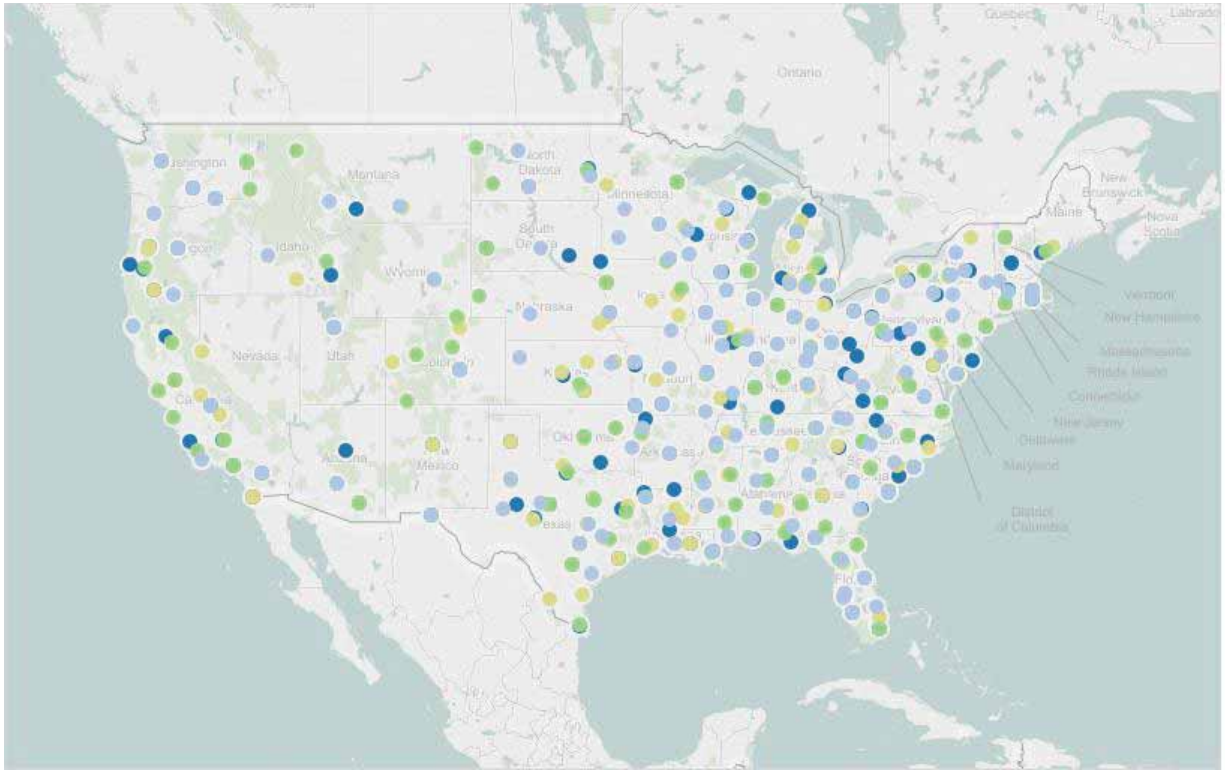
Scenarios Examined

1. Big 4 networks stations (ABC, CBS, NBC, FOX)
2. Big 5 networks (add PBS)
3. Big 6 networks (add CW)
4. Big 8 networks (add Telemundo and Univision)
5. Lowest broadcaster participation needed

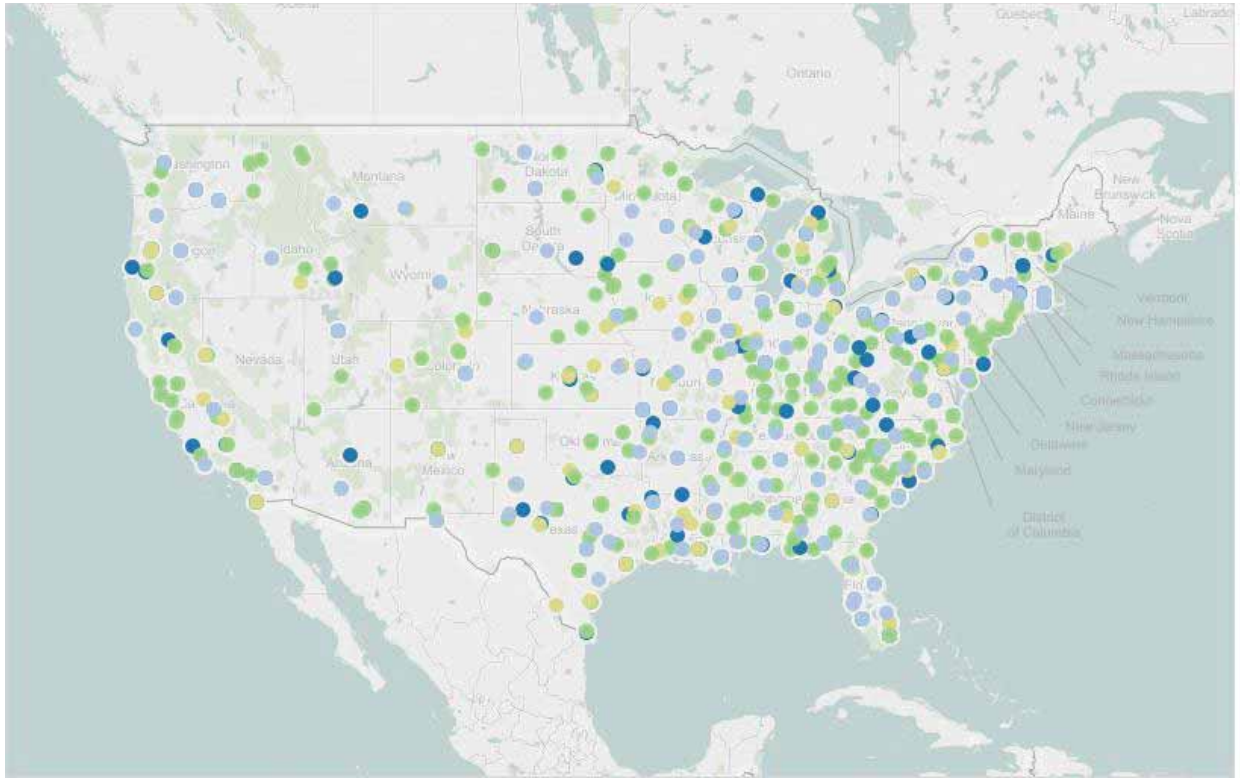
Can an Auction Clear 84 MHz Without the Big 4? YES



Network	Station Count
ABC	~129
CBS	~124
Fox	~153
NBC	~140
Total UHF Operators Assumed to Sit Out the Auction:	~546
Total UHF Operators that May Participate:	~1126

8 Note – use of "approximately" because of changes to network affiliation of some broadcasters since simulations were executed.

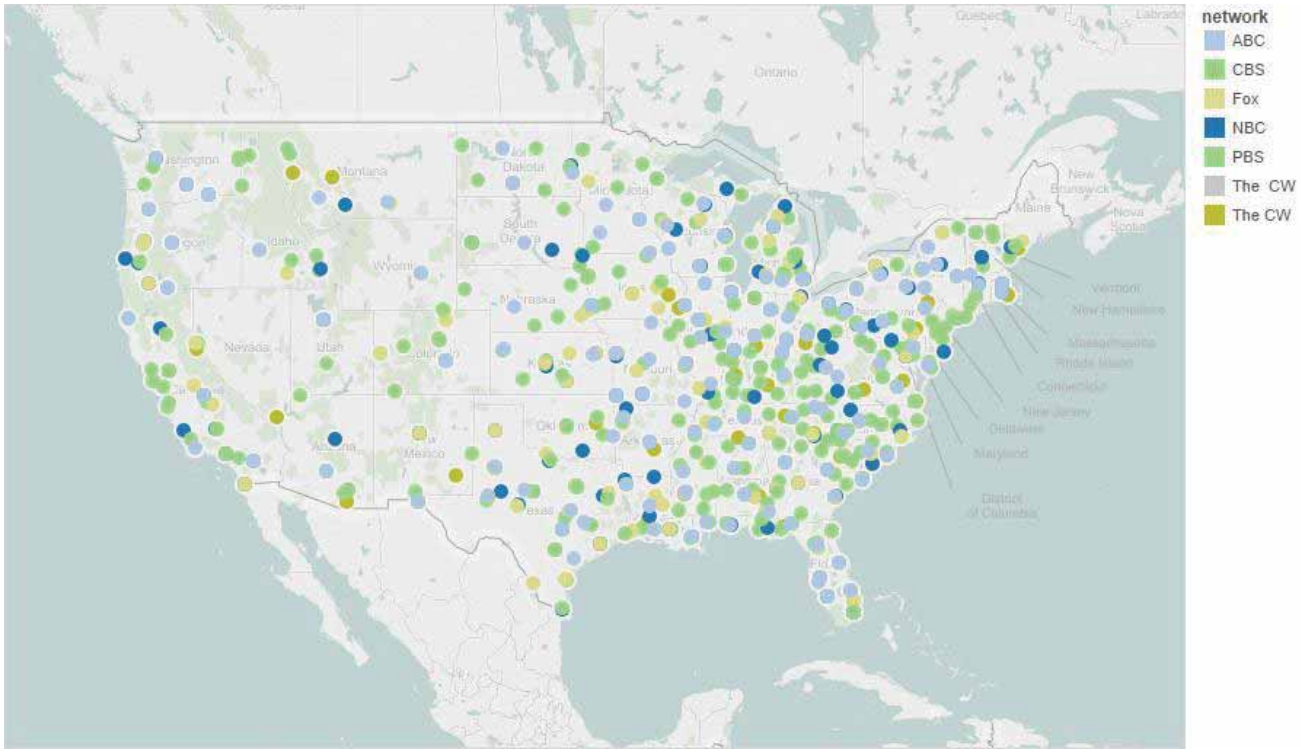
Can an Auction Clear 84 MHz Without the Big 5? YES



Network	Station Count
ABC	~129
CBS	~124
Fox	~153
NBC	~140
PBS	~241
Total UHF Operators Assumed to Sit Out the Auction:	~787
Total UHF Operators that May Participate:	~885

Note – T-Mobile used self reported data from FCC's CDBS, which likely undercounts the number of PBS affiliates.

Can an Auction Clear 84 MHz Without the Big 6? YES



Network	Station Count
ABC	~129
CBS	~124
Fox	~153
NBC	~140
PBS	~241
The CW	~89
Total UHF Operators Assumed to Sit Out the Auction:	~876
Total UHF Operators that May Participate:	796

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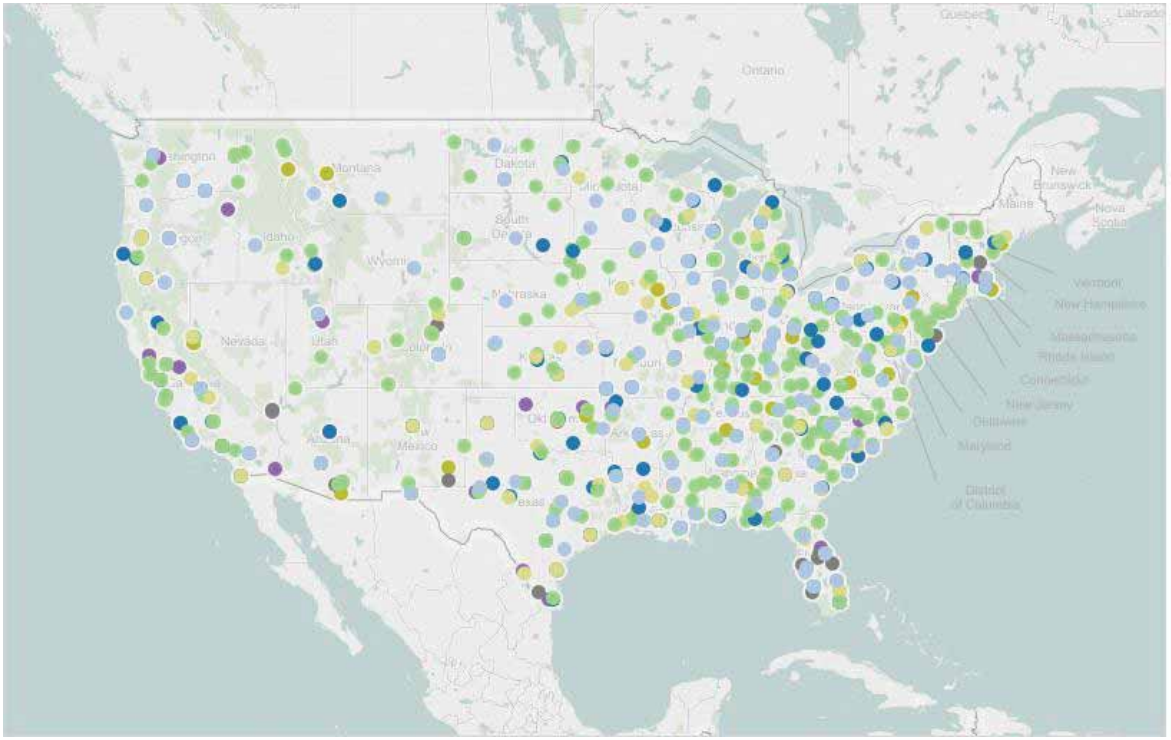
Can an Auction Clear 84 MHz Without the Big 8? YES



Network	Station Count
ABC	~129
CBS	~124
Fox	~153
NBC	~140
PBS	~241
The CW	~89
Telemundo & Univision	~82
Total UHF Operators Assumed to Sit Out the Auction:	~958
Total UHF Operators that May Participate:	714

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Scenario 5 – Fewest Participating Stations

- Analyzed how many non-big 8 stations would remain while still clearing 84 MHz of spectrum
- Assumed no participation by any of the big 8 network stations (ABC, CBS, FOX, NBC, PBS, CW, Telemundo, Univision)
- Performed state-by-state and region-by-region analysis, adding in stations to the remain/repack list as needed
  - Very tedious, labor intensive
- Developed multiple potential solutions
  - The following solution represents just one solution among many possible solutions, based on analysis of potential non-affiliated broadcasters that might participate in the auction
  - The selection criteria used for solution identification include: publicly stated interest, low estimated revenue, limited signal coverage, and related criteria.

Scenario 5 – Fewest Participating Stations (cont.)

Remaining Stations (more than 1200)

Winning Stations (less than 400 stations)

Modified domain files to simplify the Mexican and Canadian border analysis

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