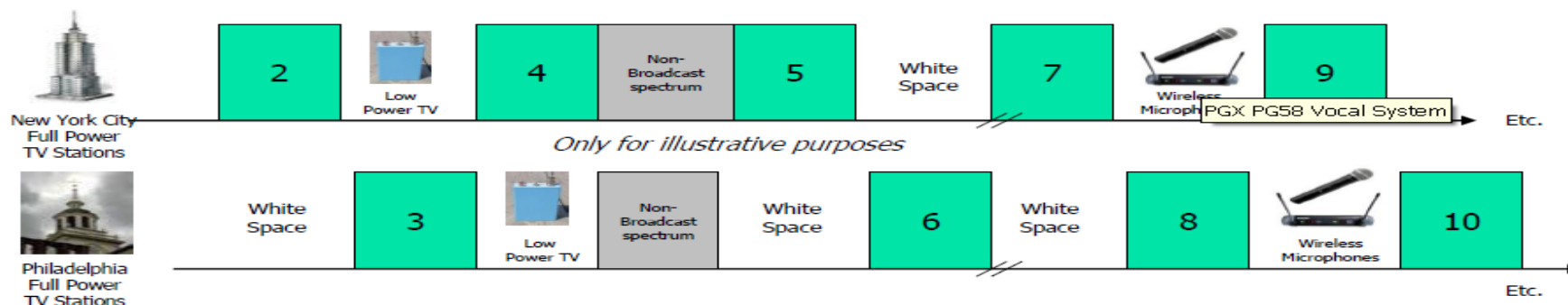


Inaugural Event – Centre for White Space Communications

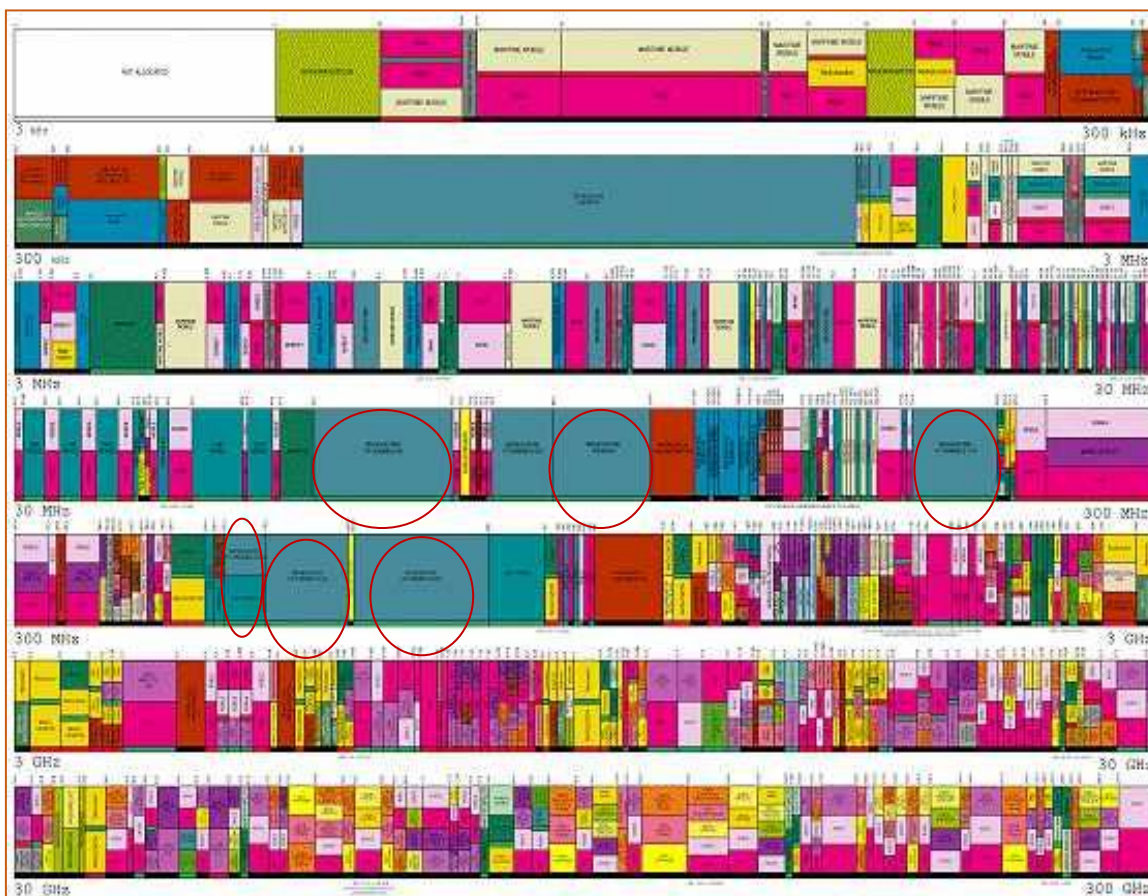
U.S. TVWS Update
22nd January , 2013

John P. Malyar
Chief Architect
Interconnection Solutions
jmalyar@telcordia.com

TVWS Background

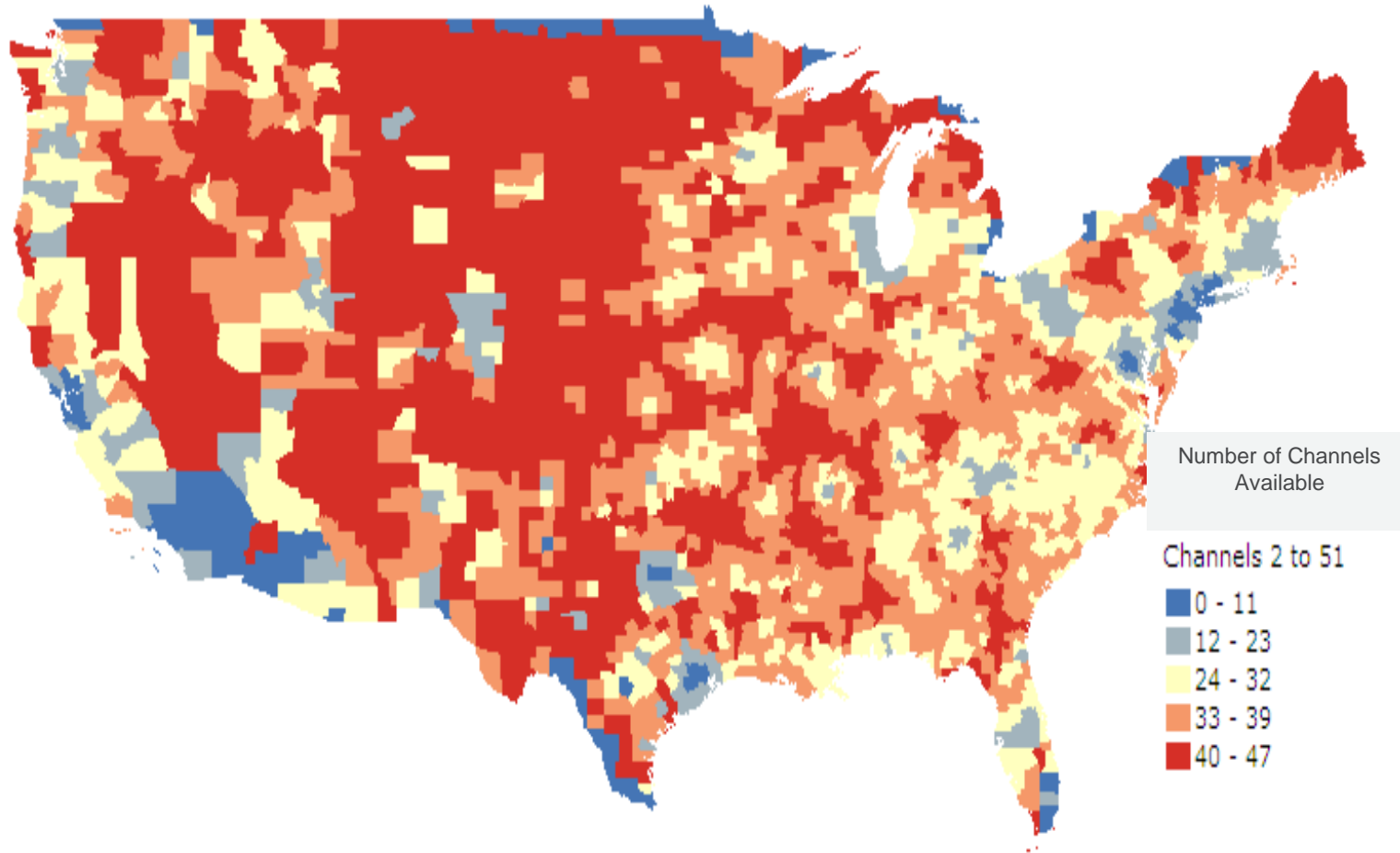


- In the TV Bands spectrum freed up by the transition to digital, occurring world wide.
- Primary use of licensed spectrum is often limited geographically; depends on assigned use and build out



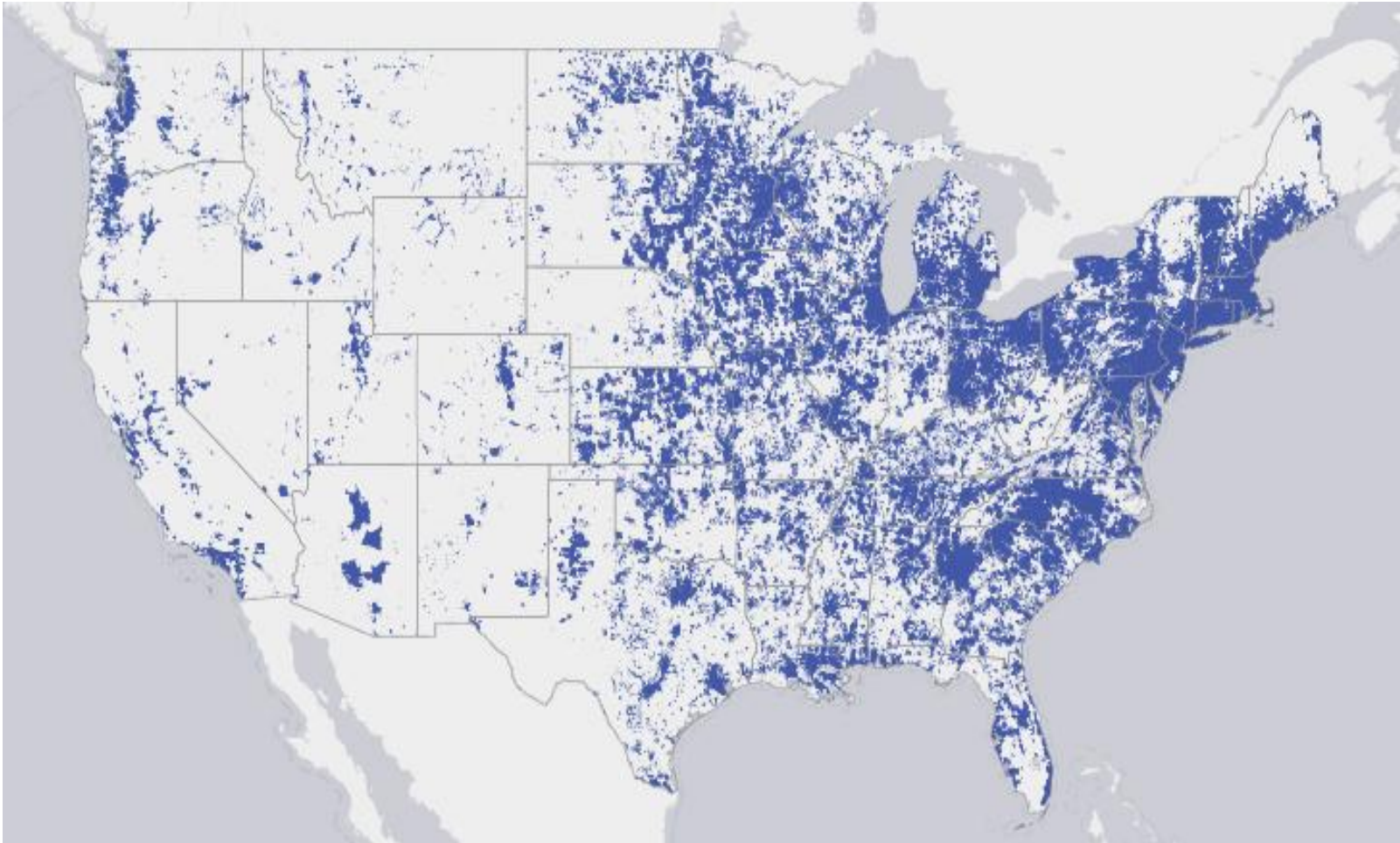
Projected TVWS in U.S.

- Number of TV channels available throughout the US



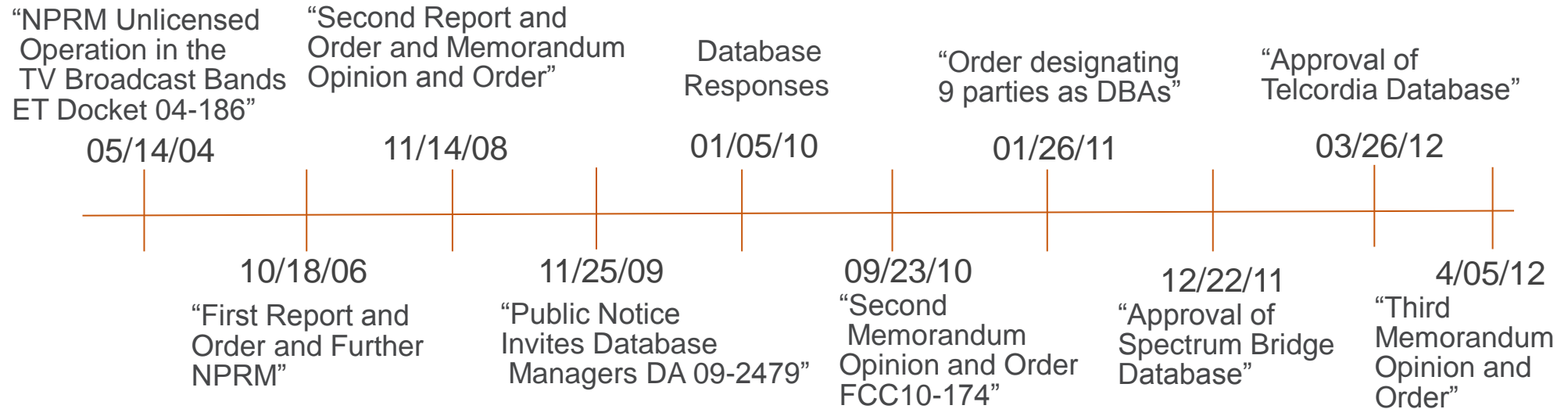
→ Rural Broadband Synergy/Opportunity

- 28 Million Customers Waiting for Broadband
 - Broadband need concentrated in same regions as available TV channels
 - Broadband defined as 3Mb down and 768kb up.



Map Source: Broadbandmap.gov

U.S. TV White Space Docket Summary



■ First 8 Years

- Originally heavily debate regarding what to do with Spectrum
- Over 35,000 filings for this Docket

■ Over last 12 Months

- Commercial Launch Wilmington County , NC
- Commercial Pilot Nottaway County, VA
- 9/12 ULM Registration NE Region
- 12/12 ULM Registration Nationwide

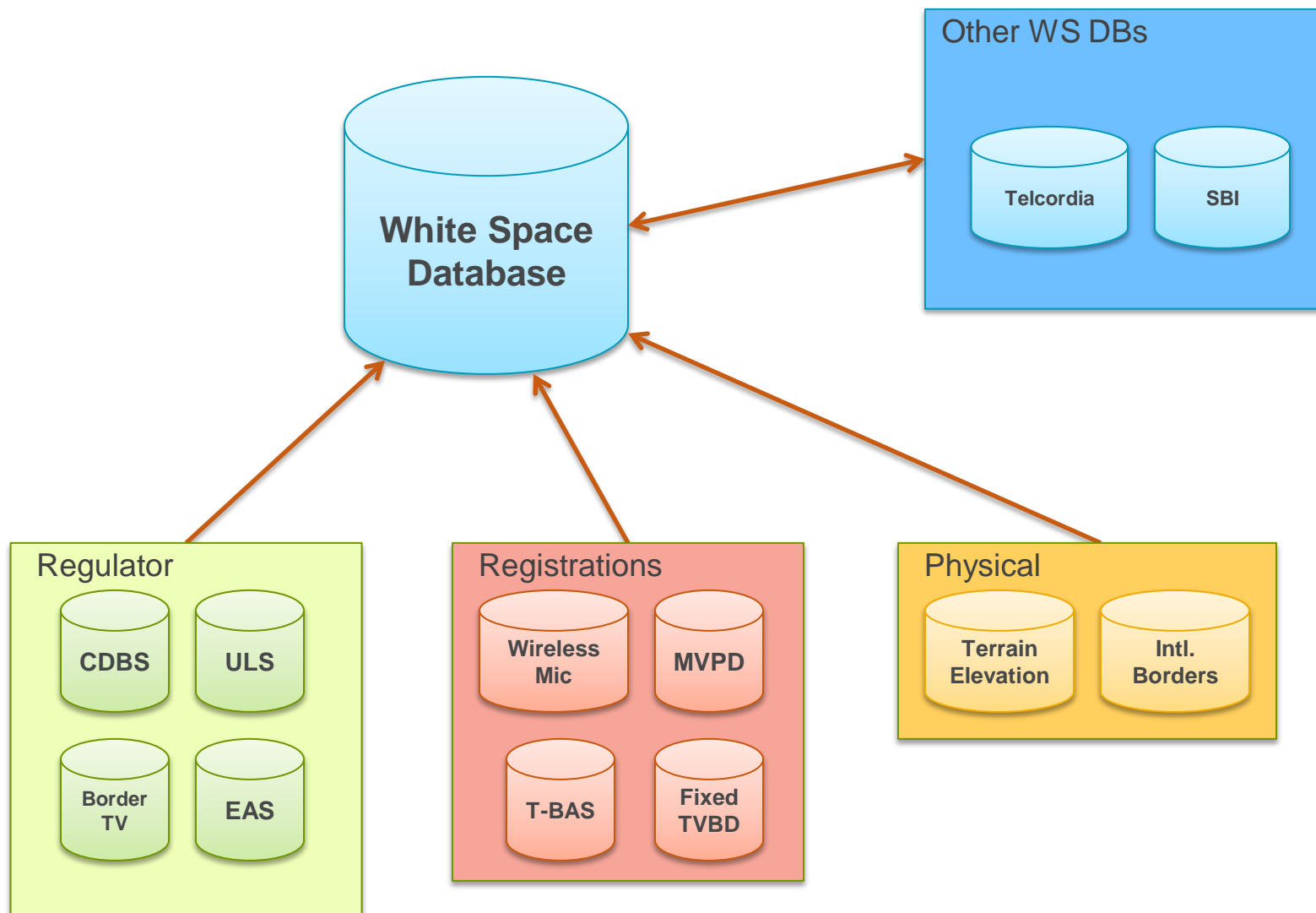
U.S. TV White Space Database

- The U.S. FCC issued rules permitting use of the spectrum (54MHz -698MHz) within power limits and terrain height/antenna height limits if a certified device obtains the list of available channels at a geo-location from an authorized database.
- Exclusion Model implemented. Protected transmitters/receivers broadcast area is excluded (protected) from WSD operation
- 10 conditional DBs named two have been authorized SBI and Telcordia.
- The database obtains licensed entities from the various FCC databases and accepts registrations from authorized protected entities at a location and calculates protection contours per the rules to determine the available channels for use at any given location in the U.S. and its territories.

U.S. WSDBA Group Objectives

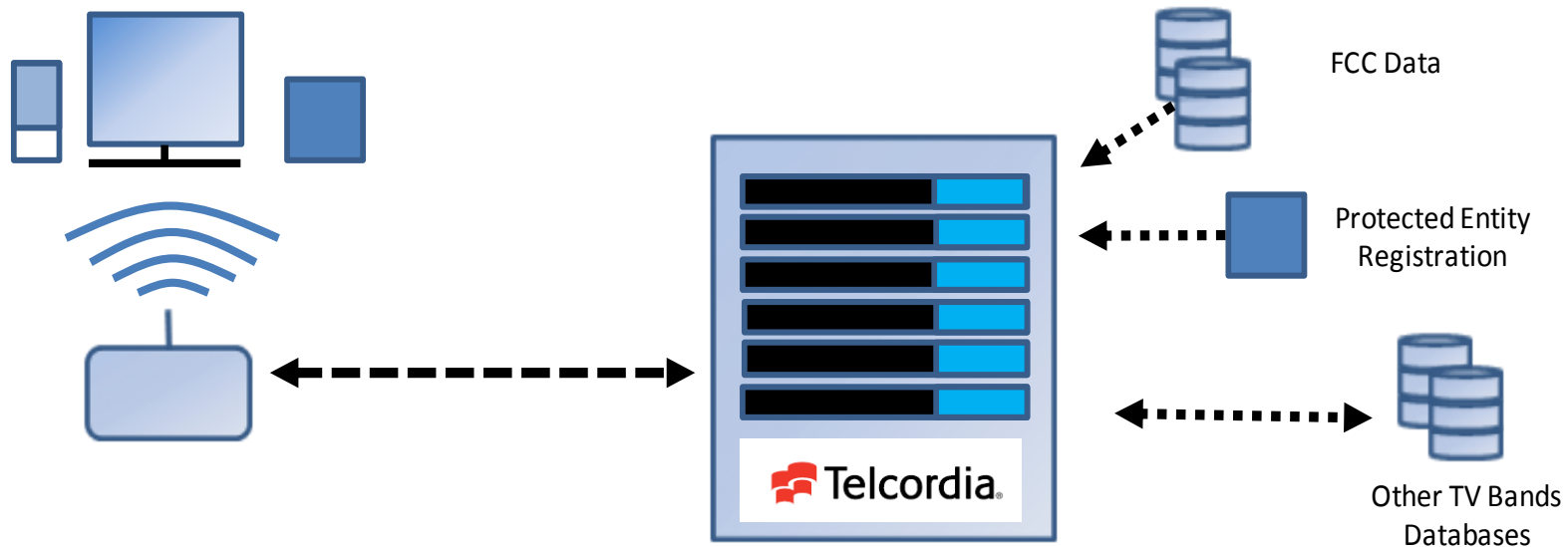
- Multiple DBAs ecosystem valued (competition, reliability, innovation, etc.)
- White Space Database Administrator (WSDBA) Group formed
- WSDBA Subgroups:
 - Database Interoperability: specification to support synchronization of registrations across multiple WSDBs
 - Channel Calculation: consistent channel availability calculation in accordance with FCC Rules and practices
- Objectives:
 - Common Interface
 - Publicly Available
 - Royalty Free

- Source information as DB input – DBs must synchronize registered data and provide practically identical results



→ Telcordia Database for TV White Space

- Lightweight device to database interface
- FCC Authorized with **Value Added** features
- Device agnostic
- Fully functional



Whitespace Device using unlicensed spectrum registers w/database, reports its geo-location, and queries for available channels. Queries again when moved or every 24 hours.

Telcordia Database calculates contours according to FCC rules, authenticates device, and provides device with list of available channels based on geo-location and power of device.

Contour GUI and Channel Availability

- Applies protection algorithm to terrain and visually displays area of licensee/registrant protection
- Links to details of each protection contour and can filter by type and channel
- Displays available channel and co and adjacent channel interference information

The screenshot displays the 'Contours' application interface. On the left, a map of Ohio shows blue concentric circles representing TV protection contours around Columbus. A callout box titled 'Info about contour' provides details for the topmost contour: 'Info for Topmost Contour: (Contours behind this one can be accessed using "Filter by Chan"). contour type: TV id: 1058869 call sign: WOUC-TV channel: 35 More info from FCC'. A black box labeled 'Protected TV contours' points to the map. On the right, a 'Results' panel shows a table of channel availability for Athens, OH 45701. The table lists channels 2 through 50, categorized by frequency band (Low VHF, High VHF, UHF) and their availability status (green check for available, red X for unavailable). A legend below the table indicates 'Available' (green check), 'Unavailable' (red X), and 'Reserved Mic' (tower icon). An 'Interference Level' scale from Low (green) to High (red) is also shown. At the bottom, a control bar includes buttons for 'Enter Location', 'Get Contours at Marker', 'Get Contours in View', 'Clear Contours', 'Fit View to Contours', 'Filter by Type', and 'Filter by Chan'.

Results				
Avail. Chans.	Details	Help	Entities	
Telcordia Whitespace Database Solution				
Place: Athens, OH 45701				
Coords: (39.34797, -82.11386)				
HAAT: -11.8 m, (-8.9 m antenna HAAT)				
Total Available: 120 MHz - 20 channels				
Low VHF: 18 MHz - 3 channels				
2	3	4	5	
6				
High VHF: 30 MHz - 5 channels				
7	8	9	10	
11	12	13		
UHF: 72 MHz - 12 channels				
14	15	16	17	
18	19	20	21	
22	23	24	25	
26	27	28	29	
30	31	32	33	
34	35	36	37	
38	39	40	41	
42	43	44	45	
46	47	48	49	
50	51			

→ Telcordia TVWS Database Features

- Allows feedback from connected devices to report chosen channel and interference measurements
 - Enables centralized intelligent channel assignment and interference prediction improvement
 - Telcordia contributing to standardization efforts of interface (IETF PAWS)
- Incorporates several propagation models
- Secure communication between devices and database
- Protected entity/licensee and border input from regulator
- Web based system allows protected entity registration

Protected entity (PE) contour types

TV stations



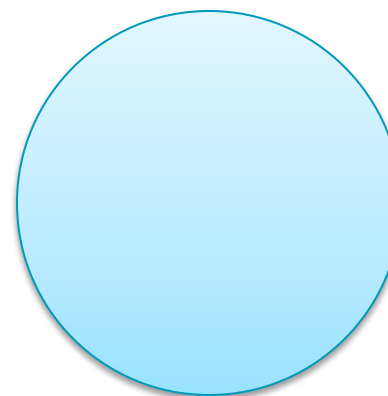
Irregular, determined by terrain, ERP, antenna pattern, channel

MVPD, BAS, TVRS



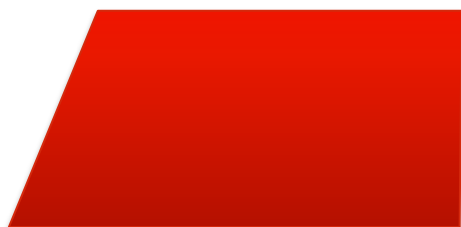
Determined by FCC to protect directional antennas

Radio astronomy, PLMRS/CMRS



Determined by FCC to protect services with varying size circles

Offshore radio telephone service



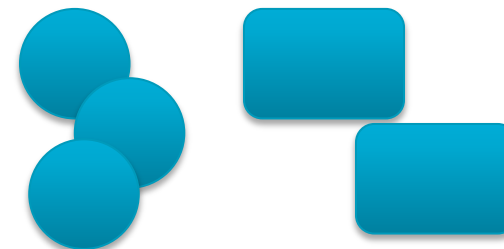
Determined by ORTS service areas on channels 15-18 in Gulf of Mexico area

Border areas



Special protection for border areas

Wireless Mic (LP Aux)



Collection of points (25) or quadrilaterals (4)

Dynamic Spectrum What's Next

- Dynamic Spectrum Access Expanding
 - TVWS Around the World!
 - Consultations Ofcom, Industry Canada
 - CEPT SE43
 - Europe, Asia and Africa all have Pilots/Trials
 - Other Bands and Models
 - PCAST Report
 - FCC NPRM Commercial Operation 3550-3650 MHz
 - LSA/ASA FM53