White Space
Database Administrators Group

Apr. 20, 2011

White Space DBA Group

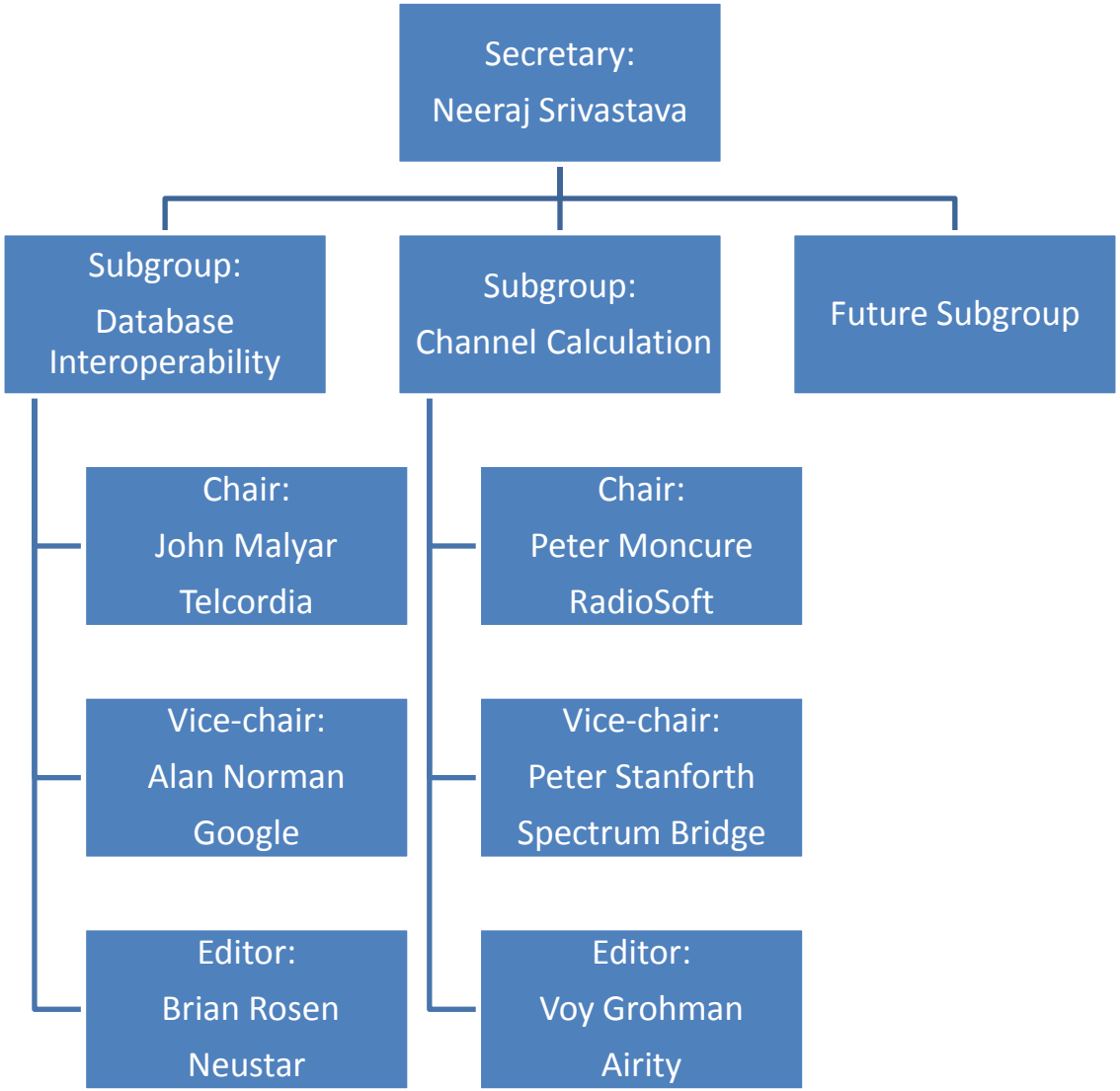
Purpose

- To establish and maintain a database interoperability specification
- To support development of a device to database API specification
  - To submit the above specification to a recognized standards body
- To address technical and operation issues as they arise that affect the operation of database administrators and work with the FCC

Areas with Single Solutions

- **Database interoperability**
- **Available channel calculation**
- Data acquisition from FCC
- Data integrity
- Certification criteria for database
- Certification criteria for device and database as a system
- Process for regulatory issue resolution

Organization



Progress Dashboard

- Indentified two areas for focus
  - Database Interoperability
  - Channel Calculation
- Teams formed, several weeks of detailed work
- First draft achieved – status report today

White Space DBA Group
PROTECTION CONTOUR CALCULATIONS FOR WHITE SPACES GUIDELINES

Presentation to FCC
4/20/2011
Contour Calculation Subcommittee
Peter Moncure, Chair
Peter Stanforth, Vice-Chair
Voy Grohman, Secretary

Subgroup Scope

- This specification covers precise implementation of calculations of protection contours and distances to these contours as defined by FCC rules.
- The intent of this specification is to establish, ensure and validate consistency between WSDBA members. It is developed by all nine Database providers.
- This document is current as of the date of release. All information contained within is subject to change.

Input Data Sources

- The CDBS database shall be retrieved from:
- http://www.fcc.gov/mb/databases/cdbs
- The source file names shall be "tv_eng_data.dat", "ant_pattern.dat" and "facility.dat".
- For current ordering of data fields within the file, refer to:
- http://www.fcc.gov/ftp/Bureaus/MB/Databases/cdbs/_readme.html

Input Data Sources

- The ULS database shall be retrieved from:
- http://wireless.fcc.gov/uls/index.htm?job=transaction&page=weekly
- The following files shall be retrieved from the website:
- l_LMbcast.zip
- l_LMcomm.zip
- l_LMpriv.zip
- l_micro.zip
- l_coast.zip

Terrain Database

- A new, NAD83/WGS84 projected terrain database shall be generated using the publicly available National Elevation Database at seamless.usgs.gov and Canadian data from http://www.cplus.org/rmw/dataen.html.
- Database shall include area necessary to provide for contour calculation of any Canadian or Mexican stations near the border.

Terrain Database Facts

- WSDBA's are asked to use NAD83/WGS84
- Data is seamless across Canadian and Mexican borders
- May be used for spot elevation corroboration
- Formats standardized
- Conformity is necessary to achieve 10 meter contour consistency

Distance Calculations

- The distance between any two points shall be calculated according to the Vincenty method. The method and equations can be found at:
- http://www.ngs.noaa.gov/PC_PROD/Inv_Fwd/

Coordinate Conversion

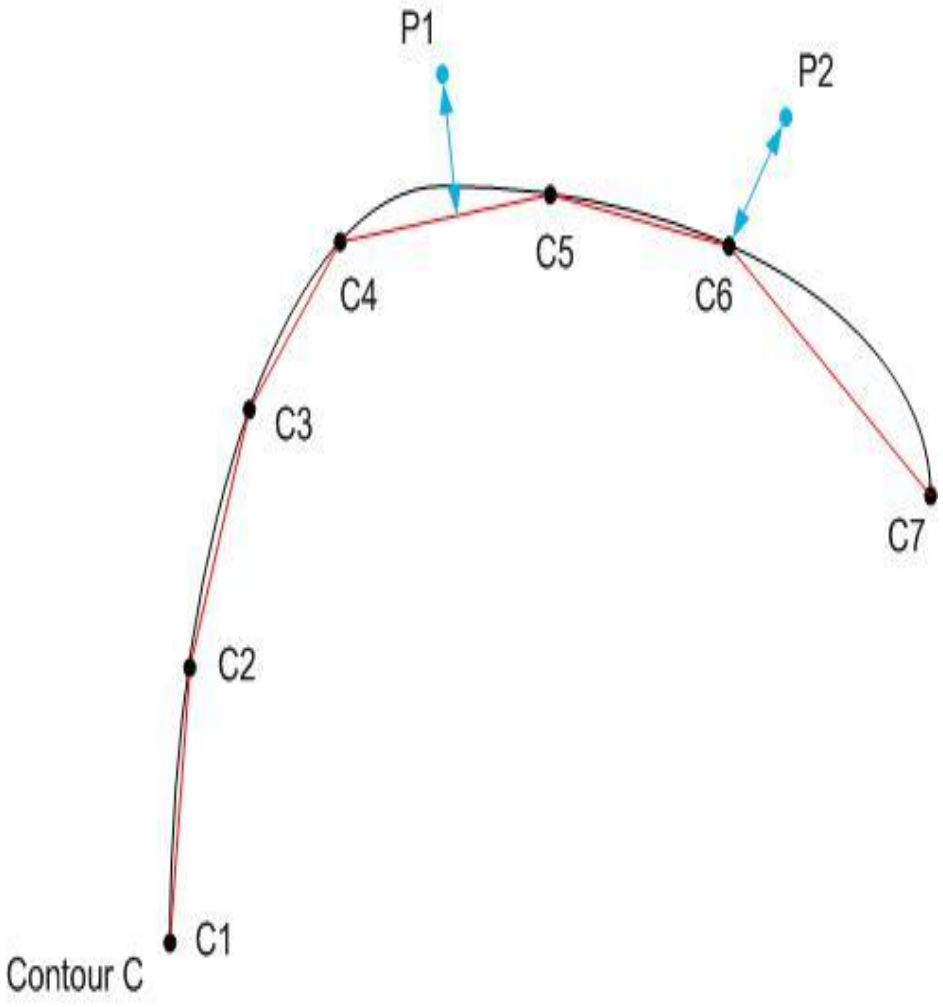
- All geographic coordinates sent by the database shall be projected in the NAD83 or WGS84 format.
- For CDBS TV station location data received in NAD27 format, the NADCON translation algorithm to NAD83 shall be used.

Contour Determination

- Contours shall be defined as 360 straight lines connecting 360 calculated contour vertices. Vertices shall be calculated at one degree increments around the station location, using the Radial HAAT.
- The FCC-supplied algorithm as derived from FCC "F" Fortran code, with FCC extracted tables representing the propagation charts from §73.699 shall be used to calculate the R-6602 contour vertex locations. These must be accurate to within ten meters.
- Distance between any point and a contour is determined by the shortest distance to any contour line or vertex.

Distance to Contour

Two points P1 and P2 are external to contour C. The distance of P1 to the contour is defined as the perpendicular distance from P1 to the line segment C4-C5. The distance of P2 to the contour is defined as the distance of P2 to the contour vertex C6, as it is shorter than the distance of P2 to any point on either of the two line segments C5-C6 and C6-C7.



Radial HAAT

- To calculate a radial HAAT for a given azimuth from a pair of coordinates, a linearly interpolated set of 130 elevations of points at 100 meter intervals beginning at 3.2 kilometers and ending at 16.1 kilometers from the station shall be extracted and averaged. The two endpoints shall be determined using the Vincenty method, and the intervening coordinate pairs obtained by linear interpolation.

Station HAAT

- To calculate station HAAT the entire radial lengths of all eight radials, regardless of borders and water, shall be used.

Summary and Next Steps

- Excellent progress to-date
- Continue to work open items
  - Resolve questions about beam tilt and DTS
- Goal by next FCC Workshop:
  - Finished specification
  - A few sample contour calculations for validation

White Space DBA Group

Database-to-database synchronization and Interoperability Subgroup

Presentation to FCC

4/20/2011

John Malyar, Chair

Alan Norman, Vice-Chair

Brian Rosen, Secretary

Background

- Technical subgroup formed from the nine conditional WSDB Administrators
- Multiple rounds of edits and discussions
- Document still in Draft with “Parking Lot”
- Document contains:
  - Supports specified rules governing interchange of registration among WSDBs
  - Data model information
  - Specific XML example registrations
  - XML Schema (XSD)
- This document is current as of the date of release. All information contained within is subject to change.

Rules

§ 15.715 TV bands database administrator.

(l) If more than one database is developed, the database administrators shall cooperate to develop a standardized process for providing on a daily basis or more often, as appropriate, the data collected for the facilities listed in § 15.713(b)(2) to all other TV bands databases to ensure consistency in the records of protected facilities.

Rules cont'd

Section 15.713 TV bands database.

(b) Information in the TV bands database.
(2) Facilities that are not recorded in Commission databases. Identifying and location information will be entered into the TV bands database in accordance with the procedures established by the TV bands database administrator(s). These include:

(A) Cable television headends
(B) Television translator station receive sites
(C) Sites where low power auxiliary stations, including wireless microphones and wireless assist video devices, are used and their schedule for operation
(D) Fixed TVBDs

Rules Cont'd
Specific Registration Object (e.g.)

§ 15.713 TV bands database.

(7) Television translator, low power TV and Class A TV station receive sites. Registration for television translator, low power TV and Class A receive sites is limited to channels that are received over-the-air and are used as part of the station's service.

(i) call sign of the TV translator station

(ii) location of the TV translator receive site (latitude and longitude in NAD 83, accurate to +/- 50 m)

(iii) channel number of the re-transmitted television station, subject to the following condition: a channel for which the television translator receive site is located within the protected contour of that channel's transmitting station is not eligible for registration in the database

(iv) call sign of the retransmitted television station

(v) location (latitude and longitude) of the transmitter of the retransmitted television station

Possible Transport Mechanisms

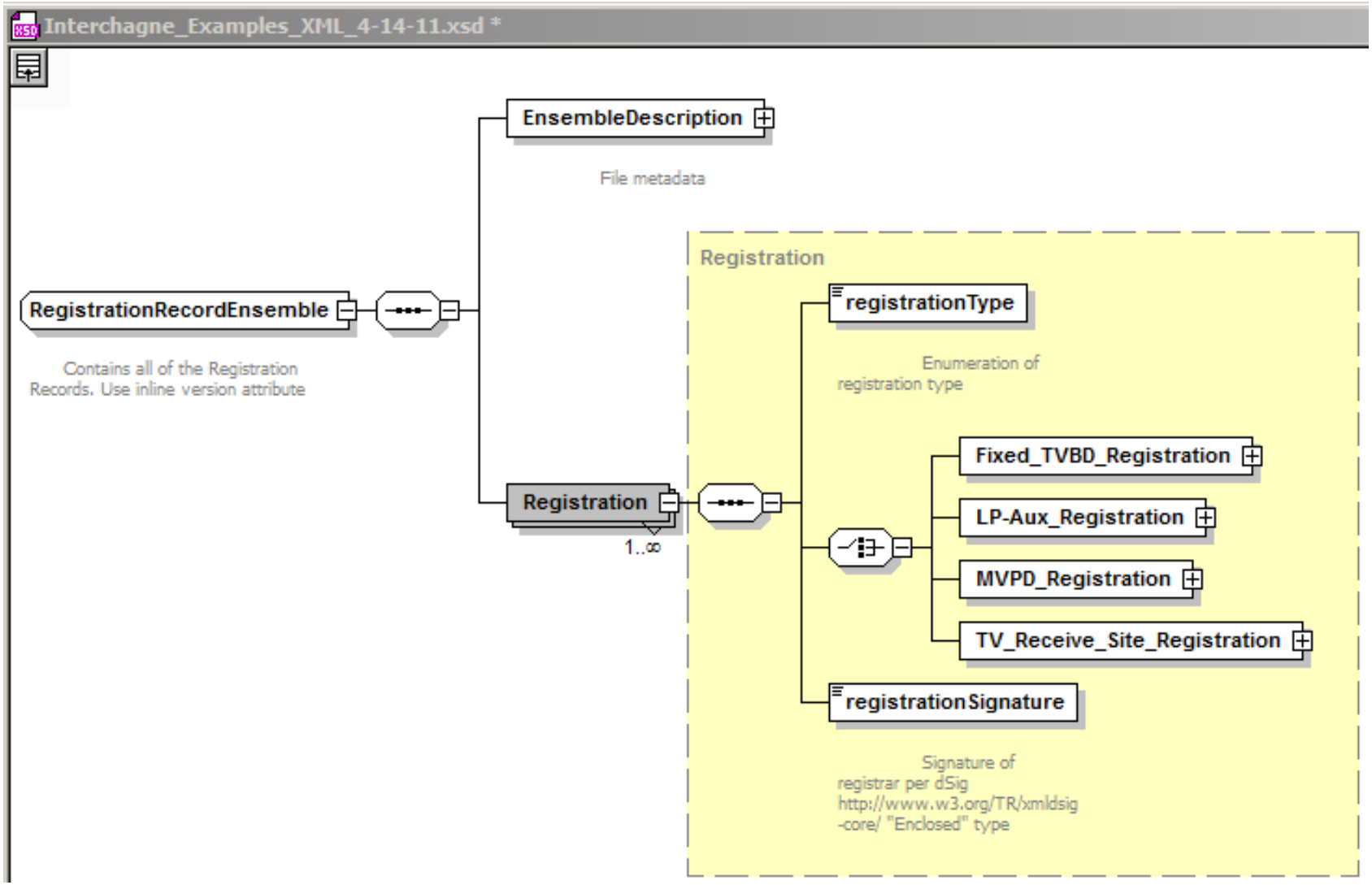
- File Transfer
  - Draft proposal complete
- Real Time
  - Under discussion
- Proprietary Database Replication solutions
  - Eliminated from consideration

File Transfer Mechanism

- Periodic File Transfer via SFTP (initially proposed)
- Standardized file names
  - $TVBandsAdminName.V$Version.$FileType.D$Timestamp.zip

  Where:
  - TVBandsAdminName = 4 characters, upper case: COMS, FFIN, GOOG, LSTM, KEYB, NUES, SPBR, TELC, AIRI
  - Version = VNN (File Specification Version Number)
  - FileType = "All" or "Incr"
  - Timestamp = ISO 8601 date and time, Zulu time required, basic format
- Example: TELC.V01.All. D20110213T2300Z.zip

Registration Structure Overview



RegistrationRecordEnsemble

- Root node of XML document (one per file)
- In-line attribute specifies Version
  - <RegistrationRecordEnsemble ver=”1.0”>

Message Definition: RegistrationRecordEnsemble (wsd:RegistrationRecordEnsemble)

Lev.	Element Name	Element Type	Occ.	Description
1	<RegistrationRecordEnsemble>		1	Contains all of the Registration Records
2	EnsembleDescription	wsd:EnsembleDescription	1	File metadata
2	Registration	wsd:Registration	1+	
1	</RegistrationRecordEnsemble>			

EnsembleDescription

Message Definition: EnsembleDescription (wsd:EnsembleDescription)

Lev.	Element Name	Element Type	Occ.	Description
1	<EnsembleDescription>		1	
2	Registrar	xsd:string	1	4 char WSDB Administrator name
2	GenerationDate	xsd:dateTime	1	Time and Date file was created
2	Scope	wsd:Common.Scope	1	Enumeration ALL or INC
2	RecordsFrom	xsd:dateTime	1	Date and Time of beginning of records range
2	RecordsTo	xsd:dateTime	1	Date and Time of end of records range
1	</EnsembleDescription>			

Registration Record Element

- Wraps around Registration Object
  - Choice element determines which type of entity
- One signature per Registration element

Message Definition: Registration (wsd:Registration)

Lev.	Element Name	Element Type	Occ.	Description
1	<Registration>		1	
2	registrationType	wsd:regType	1	Enumeration of registration type
2 BC			1	Begin Choice
2 C I	TV_Receive_Site_Registration	wsd:TV_Receive_Site_Registration	1	
2 C I	LP-Aux_Registration	wsd:LP-Aux_Registration	1	
2 C I	MVPD_Registration	wsd:MVPD_Registration	1	
2 C I	Fixed_TVBD_Registration	wsd:Fixed_TVBD_Registration	1	
2 EC				End Choice
2	registrationSignature	wsd:Signature	1	Signature of registrar per dSig http://www.w3.org/TR/xmldsig-core/ http://www.w3.org/TR/xmldsig-core/ "Enclosed" type
1	</Registration>			

Registration Objects

- Four types
  - MVPD_Registration
  - TV_Receive_Site_Registration
  - LP-Aux_Registration
  - Fixed_TVBD_Registration
- Each contains a Registration Disposition
  - Registration ID is in Registration Disposition
  - The regID has three parts: date per ISO 8601 YYMMDD, four character WSDB Administrator name (same as used in the filename Sec 4.1.2.1) and a five digit sequence number 00001-99999 which starts at 00001 each day.

TV Receive Site Registration

Message Definition: TV_Receive_Site_Registration (wsd:TV_Receive_Site_Registration)

Lev.	Element Name	Element Type	Occ.	Description
1	<TV_Receive_Site_Registration>		1	Includes Temporary BAS links
2	tvrcRegistrationDisposition	wsd:RegistrationDisposition	1	Items needing to be signed in addition to TV Recv Site info
2	tvrcXmitLocation	wsd:Location	1	Location of transmitter received at this site. Antenna Height info not required.
2	tvrcXmitChannel	wsd:US_TV_Spectrum	1	Channel of transmitter received at this site. Call Sign is part of US_TV_Spectrum datatype
2	tvrcRecvLocation	wsd:Location	1	Location of registered transmitter. Antenna Height info not required.
2	tvrcRecvCallSign	wsd:US_TV_Spectrum	1	Channel of registered transmitter. at Receive site is not required Call Sign is part of US_TV_Spectrum datatype
1	</TV_Receive_Site_Registration>			

Registration Disposition

Message Definition: RegistrationDisposition (wsd:RegistrationDisposition)

Lev.	Element Name	Element Type	Occ.	Description
1	<RegistrationDisposition>		1	
2	RegistrationDate	xsd:dateTime	1	
2	RegID	xsd:string	1	Registration ID YYMMDDWSDBnnnnn
2	Action	xsd:int	1	1=Add 0=Delete
2	RegistrationStatusCode	xsd:int	1	0 if registration was successful, and 1 if the registering DB failed the registration of that object
2	registrationInformation	xsd:string	0-1	Populated if RegistrationStatusCode not 0 (registration not successful)
1	</RegistrationDisposition>			

MVPD Registration

Message Definition: TV_Receive_Site_Registration (wsd:TV_Receive_Site_Registration)

Lev.	Element Name	Element Type	Occ.	Description
1	<TV_Receive_Site_Registration>		1	Includes Temporary BAS links
2	tvrcRegistrationDisposition	wsd:RegistrationDisposition	1	Items needing to be signed in addition to TV Recv Site info
2	tvrcXmitLocation	wsd:Location	1	Location of transmitter received at this site. Antenna Height info not required.
2	tvrcXmitChannel	wsd:US_TV_Spectrum	1	Channel of transmitter received at this site. Call Sign is part of US_TV_Spectrum datatype
2	tvrcRecvLocation	wsd:Location	1	Location of registered transmitter. Antenna Height info not required.
2	tvrcRecvCallSign	wsd:US_TV_Spectrum	1	Channel of registered transmitter. at Receive site is not required Call Sign is part of US_TV_Spectrum datatype
1	</TV_Receive_Site_Registration>			

LP-Aux Registration

Message Definition: LP-Aux_Registration (wsd:LP-Aux_Registration)

Lev.	Element Name	Element Type	Occ.	Description
1	<LP-Aux_Registration>		1	
2	lpauxRegistrationDisposition	wsd:RegistrationDisposition	1	Items needing to be signed in addition to LP-Aux info
2	lpauxOwnerContact	wsd:Contact	1	
2	lpauxOperationalContact	wsd:Contact	0-1	FCC distinguishes between "Owner" and "Contact" for this device. If this field is empty then Owner is also the Operational Contact
2	lpaauxXmiterLocation	wsd:Location	1	Antenna height not required
2	lpauxVenueName	xsd:string	0-1	Name of Venue (Madison Square Garden, Giants Stadium, etc), required for Unlicensed Devices
2	lpauxCallSign	xsd:string	0-1	Required for Licensed Devices
2	lpauxEvent	wsd:Event	1	Single VCALENDER per object. Channels, number of devices, venueName (requred for unlicensed devices) specified by Event and eventChannel
1	</LP-Aux_Registration>			

Fixed TVBD Registration

Message Definition: Fixed_TVBD_Registration (wsd:Fixed_TVBD_Registration)

Lev.	Element Name	Element Type	Occ.	Description
1	<Fixed_TVBD_Registration>		1	
2	RegistrationDisposition	wsd:RegistrationDisposition	1	Items needing to be signed in addition to Fixed_TVBD info
2	tvbdRegContact	wsd:Contact	1	
2	tvbdOperationalContact	wsd:Contact	0-1	FCC distinguishes between "Owner" and "Contact" for this device. If this field is blank then Owner is also the Operational Contact
2	tvbdRegLocation	wsd:Location	1	Antenna Height is required
2	tvbdRegDeviceId	wsd:DeviceId	1	didSeriesName = FCC ID within DeviceId datatype, also includes Manufacturer'sManufacturer's Serial Number
1	</Fixed_TVBD_Registration>			

Subordinate Elements and Data Types

3.7 Contact
3.8 Location
3.9 US_TV_Spectrum
3.10 Event
3.11 Radiation Center
3.12 registrationSignature Element

- Used in Registration Objects as needed

Contact

Message Definition: Contact (wsd:Contact)

Lev.	Element Name	Element Type	Occ.	Description
1	<Contact>		1	
2	contactName	xsd:string	0-1	Must exist if contactOrgName does NOT exist
2	contactOrgName	xsd:string	0-1	Must exist if contactName does NOT exist. Owner may be a corporation with unspecified contact person.
2	contactAddressLine1	xsd:string	1	
2	contactAddressLine2	xsd:string	0-1	
2	contactCity	xsd:string	1	
2	contactState	xsd:string	1	
2	contactPC	xsd:string	1	Postal Code
2	contactPhone	xsd:string	1	
2	contactEmail	xsd:string	1	
1	</Contact>			

Location, US_TV_Spectrum

3.8 Location

Message Definition: Location (wsd:Location)

Lev.	Element Name	Element Type	Occ.	Description
1	<Location>		1	
2	locLatitude	xsd:double	1	Decimal degrees, message has 6 digits past decimal point
2	locLongitude	xsd:double	1	Decimal degrees, message has 6 digits past decimal point
2	locDatum	xsd:string	1	NAD-83, WGS-84, etc.
2	locRadiationCenter	wsd:RadiationCenter	1	
1	</Location>			

3.9 US_TV_Spectrum

Message Definition: US_TV_Spectrum (wsd:US_TV_Spectrum)

Lev.	Element Name	Element Type	Occ.	Description
1	<US_TV_Spectrum>		1	
2	ustChannel	xsd:string	0-1	
2	ustCallSign	xsd:string	0-1	
1	</US_TV_Spectrum>			

Event, RadiationCenter

Message Definition: Event (wsd:Event)

Lev.	Element Name	Element Type	Occ.	Description
1	<Event>		1	
2	eventTimes	xsd:string	1	iCal RFC5545 VCALENDAR block containing multiple VEVENT blocks Other blocks not processed.
2	eventChannel	wsd:US_TV_SPECTRUM	1+	Channels used
1	</Event>			

Message Definition: RadiationCenter (wsd:RadiationCenter)

Lev.	Element Name	Element Type	Occ.	Description
1	<RadiationCentyer>		1	
2	rcAMSL	xsd:int	0	Meters above mean sea level, not transmitted in inter-DB message
2	rcHAAT	xsd:int	0-1	Meters above average terrain level, not Registrant-provided, therefore src="CALCULATED", and sent in inter-DB message for Fixed_TVBD
2	rcHAG	xsd:int	0-1	Meters above ground, Registrant-provided, for Fixed_TVBD only
1	</Antenna>			

Summary and Next Steps

- Excellent progress to-date
- Continue to work open items
  - Message transport recommended implementation. Real-time transfer (TBD e.g. Web Service) and/or periodic File Transfer
  - Recurring LPAUX events
  - Others
- Goal by next FCC Workshop:
  - Finished specification
  - Working demonstration of transport & sync