TUWRS **GENEVA2024**

2-6 December 2024 Geneva, Switzerland





ITU World Radiocommunication Seminar

BR Geospatial Platform and Applications

2-6 December 2024, Geneva, Switzerland







- Geospatial data
 - Vector/rasters and GIS systems
- BR Geospatial Platform
 - Infrastructure and data
 - Visualization tools
- BR Geospatial services applications
 - Geospatial data services and radio wave propagation prediction models
 - Geospatial activities for broadcasting services
 - GE84 optimization process

Geospatial data (vectors and rasters)





The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of ITU and of the Secretariat of the ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.





Source: GAO.

Infrastructure and data: BR GIS platform





Challenges

- Data in different formats (non-geospatial)
- Mix of open-source/commercial software
- IDWM vs UN political boundaries data
- IDWM: old system to be re-engineered

Opportunities

- Integrated GIS platform for the BR
- Reuse services across the BR
- Consistent look-and-feel of map for BR users
- Modern geospatial data access for BR users

Infrastructure and data: IDWM vector datasets



Datasets converted from IDWM ASCII files into geospatial vector format and stored into SQL Server spatial data tables.

The IDWM layers in the database can be used:

- for all visualization projects in the BR.
- as the central repository for the future IDWM ensuring consistencies in the BR calculations and visualization tools.







Raster data

- Row data in text format from Membership
- Georeferenced and optimized as GeoTIFF
- Image Mosaic (time series)
- Being currently transferred in the BR Geospatial Portal

Infrastructure and data: GeoServer

https://www.itu.int/ITU-R/BR-Geo/web/ C ሰ

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SG3 raster: GeoTIFF files IDWM vectors: SQL Server

Styles prepared with QGIS, then uploaded in GeoServer and linked to the relevant dataset

GeoServer

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Infrastructure and data: Geospatial Metadata Catalogue



Geonetwork catalogue

- Data search by keywords
- Data visualization
- Data download (various formats)
- Data sharing via OGC services



Completed	Ongoing	Pending
Deployment of a BR geospatial platform comprising an SQL server database, a geospatial server and a metadata catalogue (preview)	Investigating possible Cloud deployment.	Production release and fine- tuning of the geospatial platform
IDWM datasets all converted in geospatial format and stored in the platform	Upload of SG3 raster datasets and related metadata on the BR Geospatial platform Upload of IDWM metadata datasets	Provide suitable public access to users





Visualization tools: Map template library integration





Visualization tools: Map production





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GE2006 Propagation Zones



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Ground Conductivities (MF band, ITU-R P.368)

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AP25 Allotment Areas



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Visualization tools: one BR geospatial application





Satellite services

- Geostationary (GEO): nominal position and service area
- Low Earth Orbit (LEO), Medium Earth Orbit (MEO), Highly Elliptical Orbit (HEO) : orbital parameters
- Earth stations: coordinates
- Earth stations in motions (ESIMS): no coordinate, but must be within service areas of satellite filing

Terrestrial services

- Broadcasting
- HF broadcasting
- LF, MF broadcasting
- Fixed and Mobile
 - IMT (3G, 4G, 5G)
 - Radionavigation (maritime,
 - aeronautical)
 - ...
- Monitoring stations
- Coastal stations
- Aids to Navigation





Completed	Ongoing	Pending
JavaScript map library (based on IDWM and other map services) which can be reused to ensure a consistent look and feel to maps in BR web applications	Integration of the map library in other eBroadcasting and eTerrestrial web tools.	Development of an integrated one-BR geospatial application to display terrestrial and space radio-station locations and satellite orbits in 3D
 Integration of the above-mentioned library for coverage display in: <u>ePropagation</u> web tools tool to visualize frequency assignments to terrestrial stations located in disputed areas (using UN maps, high-resolution satellite imagery) 		
Map production for IDWM datasets		





Resolution <u>ITU-R 40-4</u> Worldwide database of terrain height and surface features provides guidance on use of DEM - 1 arc second resolution is suitable for planning

Geospatial data services and radio wave propagation prediction models



1) ITU-R P.1812 output vector data (location and fs) **dB(µV/m)**• -20 • 0 • 20 • 40 • 60 • 80 • 100 • 117.58

2) Convert to raster



3) Interpolate to fill voids



5) Simplify geometry



4) Extract fs_wanted contour



OSGeo: GDAL/OGR open source libraries

Geospatial data services and radio wave propagation prediction models







Completed	Ongoing	Pending
Enhancement to the <u>effective antenna height</u> <u>calculation service</u> to provide global coverage, by using ASTER GDEM V3 data in regions not covered by SRTM1 data.	Integration in <u>ePropagation</u> of Rec. ITU-R P.452 simulations.	Integration in <u>ePropagation</u> of additional radio wave propagation prediction models developed and maintained by SG3
 Enhancement to <u>ePropagation</u> to: allow the user to choose a DTM for performing Rec. ITU-R P.1812 point-to-point and point-to-area calculations include a tool to predict 4G coverages following BDT GIGA project request, which allowed BDT to perform more than 6 500 4G coverages simulations using DTM. 		

Geospatial activities for broadcasting services



GE84 plan

implements GE84 propagation curves (interference analyses).

Terrain information considered only via effective antenna height

GE84Opt allows the user to choose between the GE84 model or the Rec. ITU-R P.1812 (several DTM possible) propagation prediction model.

When using GE84 model, the user can perform on the fly Point to Point field strength calculations with the Rec. ITU-R P.1812



Geospatial activities for broadcasting services



GE84Opt allows to calculate on the fly Point to Point field strength calculations (terrain data) using Rec. ITU-R P.1812 The user can choose to use different Digital Terrain Models.





The End



Thank you!

ITU – Radiocommunication Bureau Questions to <u>brbcd@itu.int</u>