

ITU World Radiocommunication Seminar

Additional Software tools

2-6 December 2024, Geneva, Switzerland

The background of the slide is a composite image. The left side features a large, semi-transparent satellite dish in a light blue hue, set against a pale blue sky. The right side is a vertical strip showing a more detailed, darker blue image of a satellite dish against a bright blue sky with white clouds. The overall theme is satellite technology and space exploration.

Additional software tools

Orbit simulation

radians.vis

Small tool used to provide orbit visualization of non-GSO system using RR Appendix 4 data elements.

1. Download radians.vis from <https://www.itu.int/epfdsupport/resources/>

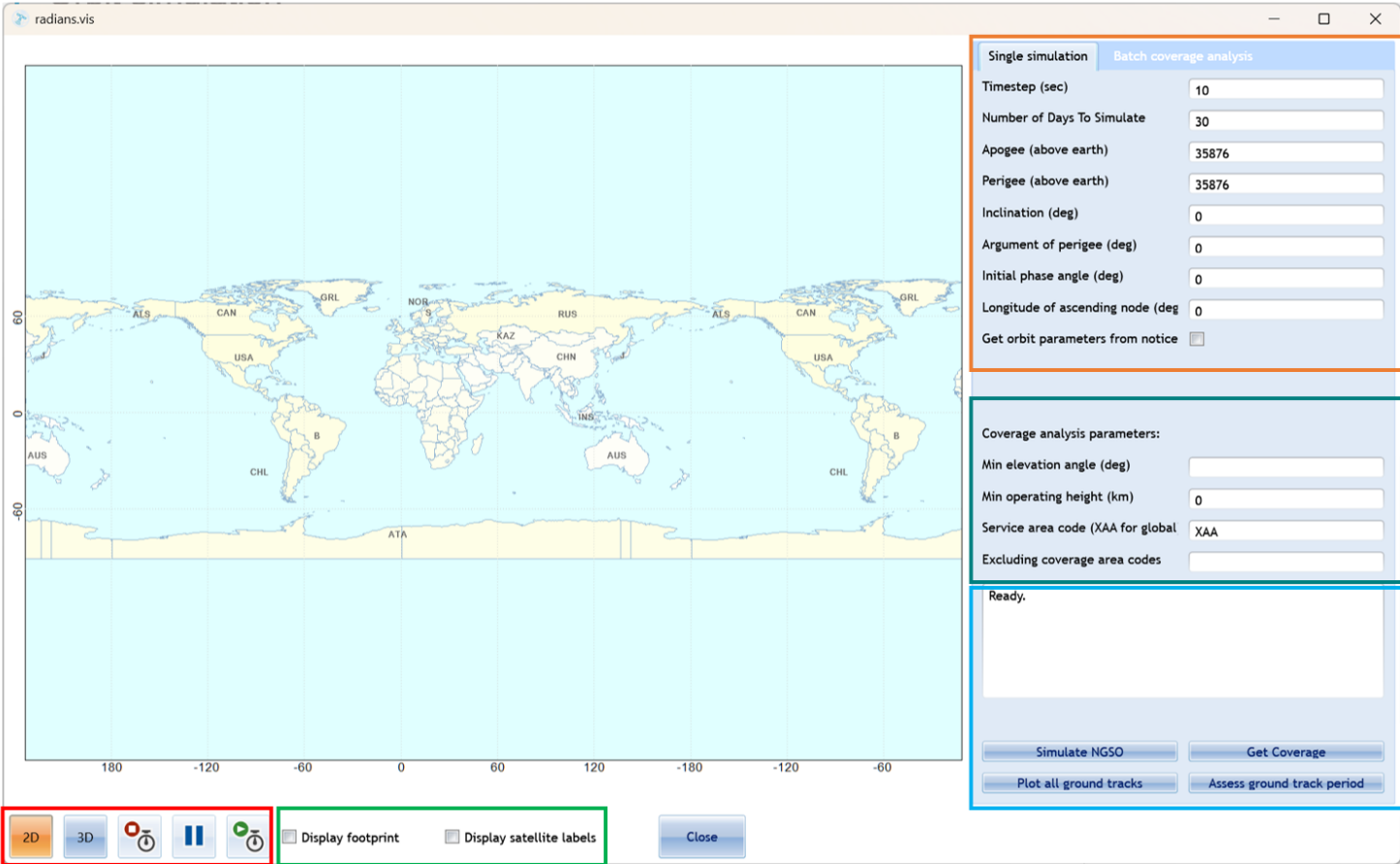
radians.vis a small tool to visualize orbits presented in non-GSO submission using R



radians.vis

2. Run radians.vis.Install.exe to install it.
3. Run radians.vis from Start Menu

Overview of interface



The screenshot displays the **radians.vis** interface, which includes a world map and several control panels. The interface is divided into several sections:

- Simulation run time controls:** Located at the bottom left, this section includes buttons for 2D, 3D, and simulation controls (start, pause, stop, and a timer).
- Display options:** Located at the bottom center, this section includes checkboxes for "Display footprint" and "Display satellite labels", along with a "Close" button.
- Orbital parameters:** Located on the right side, this section includes input fields for Timestep (sec), Number of Days To Simulate, Apogee (above earth), Perigee (above earth), Inclination (deg), Argument of perigee (deg), Initial phase angle (deg), and Longitude of ascending node (deg). It also has a checkbox for "Get orbit parameters from notice".
- Parameters for coverage analysis:** Located on the right side, this section includes input fields for Min elevation angle (deg), Min operating height (km), Service area code (XAA for global), and Excluding coverage area codes.
- Status and simulation tasks:** Located on the right side, this section includes a "Ready." status indicator and buttons for "Simulate NGSO", "Get Coverage", "Plot all ground tracks", and "Assess ground track period".

Arrows point from the labels to the corresponding sections in the interface.

Orbital parameters

Two modes of operation:

- a) Define orbital parameters of a single satellite
- b) Read orbital parameters from the SRS database (BR IFIC)

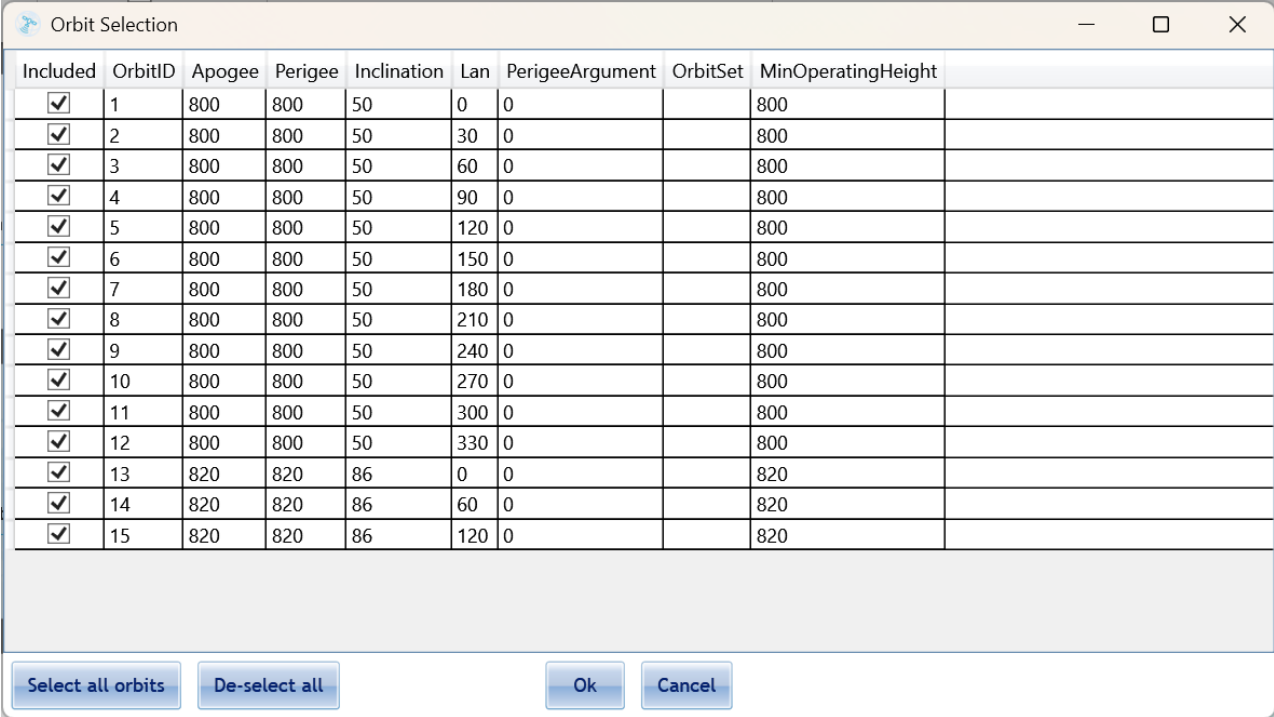
Single simulation	Batch coverage analysis
Timestep (sec)	10
Number of Days To Simulate	30
Apogee (above earth)	35876
Perigee (above earth)	35876
Inclination (deg)	0
Argument of perigee (deg)	0
Initial phase angle (deg)	0
Longitude of ascending node (deg)	0
Get orbit parameters from notice	☐

Single simulation	Batch coverage analysis
Timestep (sec)	10
Number of Days To Simulate	30
Get orbit parameters from notice	☒
Enter notice ID	120520155
Select database	

Orbital parameters from the notice

When option is selection 'Get orbit parameters from notice'

1. Select source database
2. Enter notice ID
3. Select orbits do use in simulation:



The dialog box titled "Orbit Selection" contains a table with 10 columns: Included, OrbitID, Apogee, Perigee, Inclination, Lan, PerigeeArgument, OrbitSet, MinOperatingHeight, and an empty column. There are 15 rows of data, all with the "Included" checkbox checked. The data is as follows:

Included	OrbitID	Apogee	Perigee	Inclination	Lan	PerigeeArgument	OrbitSet	MinOperatingHeight	
☒	1	800	800	50	0	0		800	
☒	2	800	800	50	30	0		800	
☒	3	800	800	50	60	0		800	
☒	4	800	800	50	90	0		800	
☒	5	800	800	50	120	0		800	
☒	6	800	800	50	150	0		800	
☒	7	800	800	50	180	0		800	
☒	8	800	800	50	210	0		800	
☒	9	800	800	50	240	0		800	
☒	10	800	800	50	270	0		800	
☒	11	800	800	50	300	0		800	
☒	12	800	800	50	330	0		800	
☒	13	820	820	86	0	0		820	
☒	14	820	820	86	60	0		820	
☒	15	820	820	86	120	0		820	

At the bottom of the dialog box, there are four buttons: "Select all orbits", "De-select all", "Ok", and "Cancel".

Coverage analysis parameters

1. Min elevation angle – to define minimum elevation angle at which satellite would transmit/receive
2. Min operating height – for non-circular orbits defines minimum operating height above which satellite transmits
3. Service area code – define service area using ITU Space Preface codes
There could be multiple codes. For example, “UZB KAZ TJK”
4. Excluding coverage area codes. Additional option to indicate that a satellite would not transmit when in visibility from any country indicated in this field.

Coverage analysis parameters:

Min elevation angle (deg)

Min operating height (km)

Service area code (XAA for global)

Excluding coverage area codes

Simulation tasks

1. Simulate NGSO – run orbit simulation and display dynamic position of the satellite(s)
2. Get coverage – conduct coverage analysis using coverage analysis parameters and display countries covered by the satellite(s)
3. Plot all ground tracks – run orbit simulation and plot all ground tracks
4. Assess ground track period – estimate a period when ground tracks will repeat

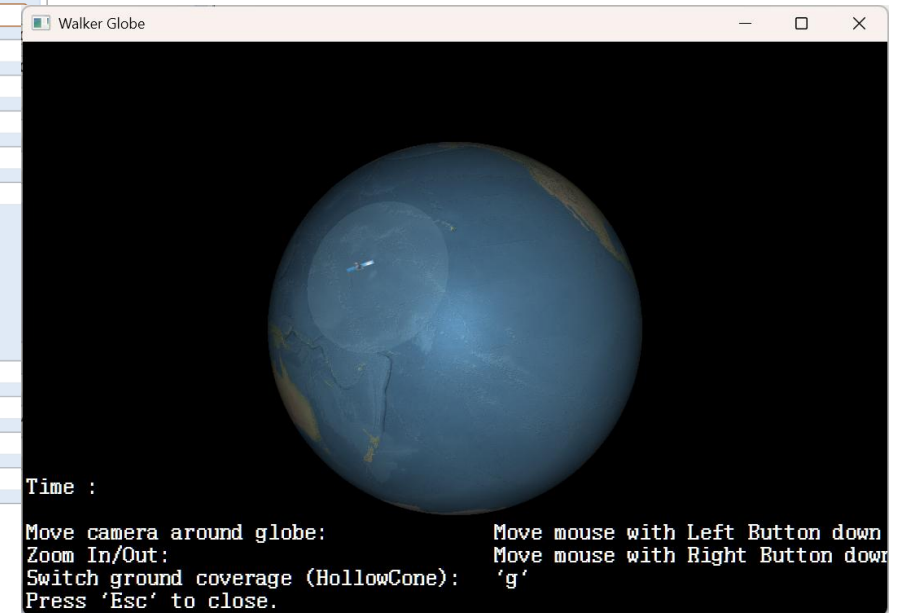
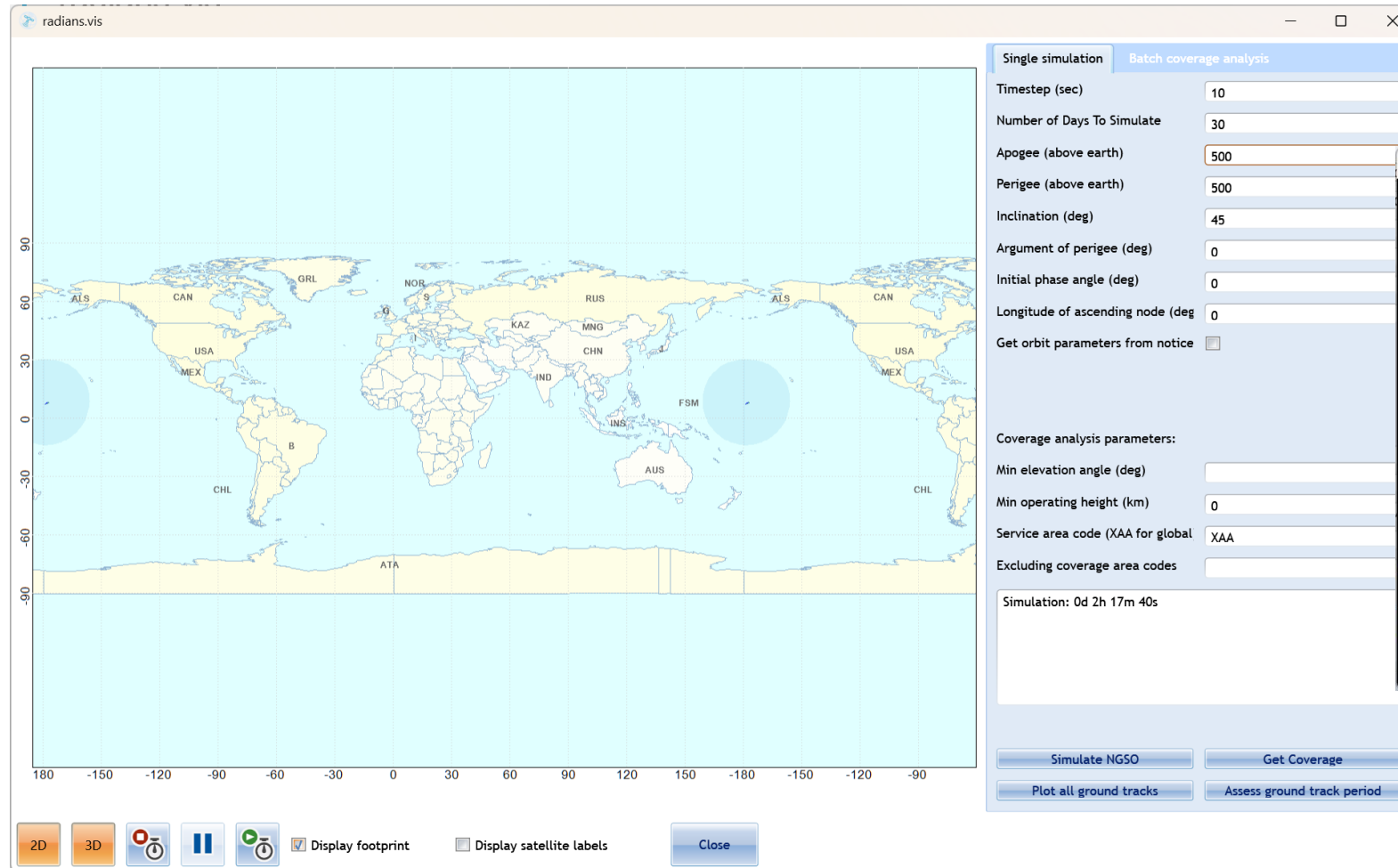


Additional options

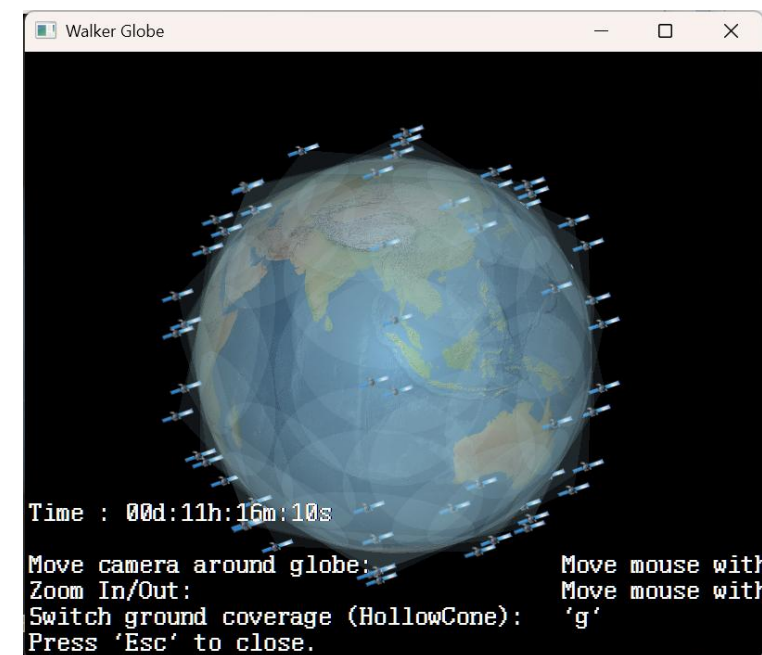
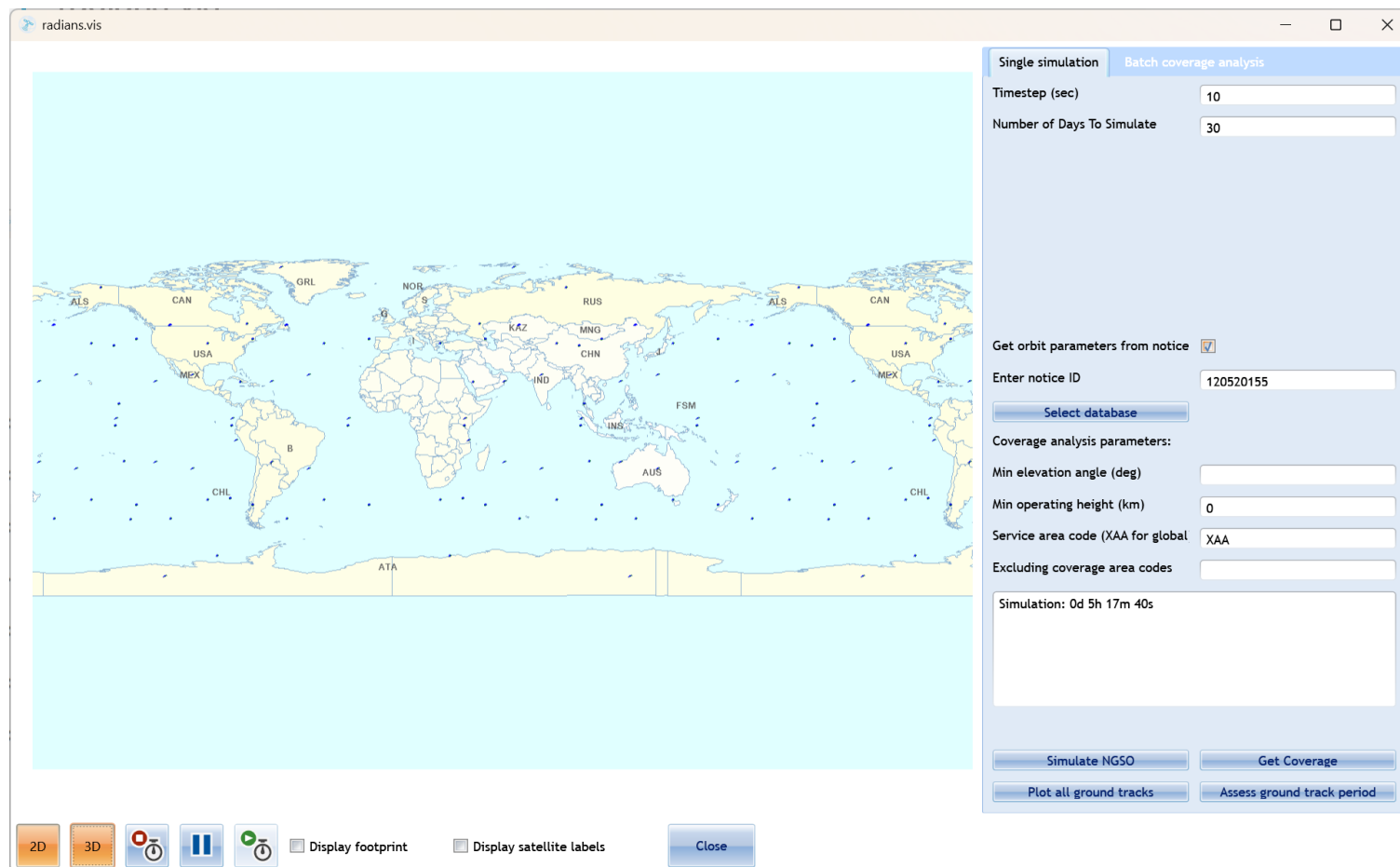
1. Display simulation in 2D and/or 3D
2. Display satellite footprints (defined by minimum elevation angle)



Example orbit simulation – using single satellite



Example orbit simulation – using orbit parameters from notice



Example orbit simulation – coverage analysis

