Plateau d'Architecture des Systèmes Orbitaux

BE CIC / Tutorial VTS-CIC

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Creating a visualization scenario

Steps :

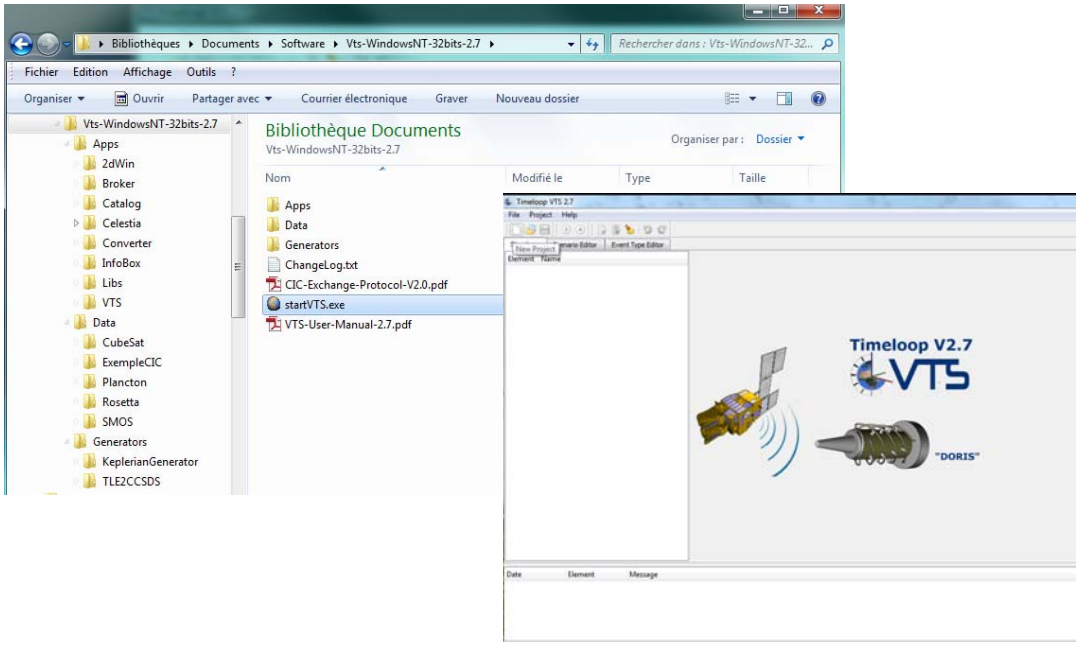
- Identify the satellite's geometric model
- Identify the satellite's position and attitude ephemeris
- Select the visualization tools
- Define the solar generator kinematics
- Simulate a radio signal emission

Installing & Launching the tool

No installation required – Portable tool

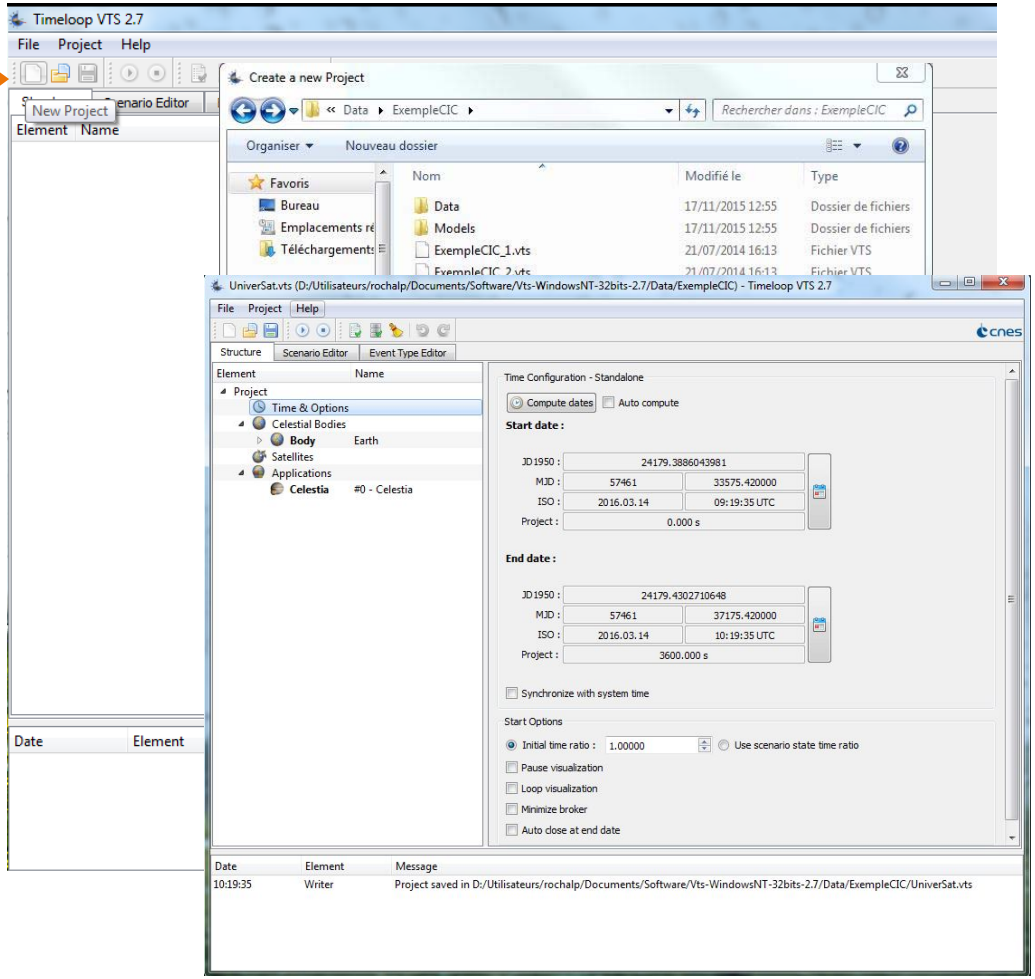
Preparing the tool: unzip the archive into a folder

Launching the tool: Double click on “startVTS.exe”



Creating a new project

1. Creating the “UniverSat” project



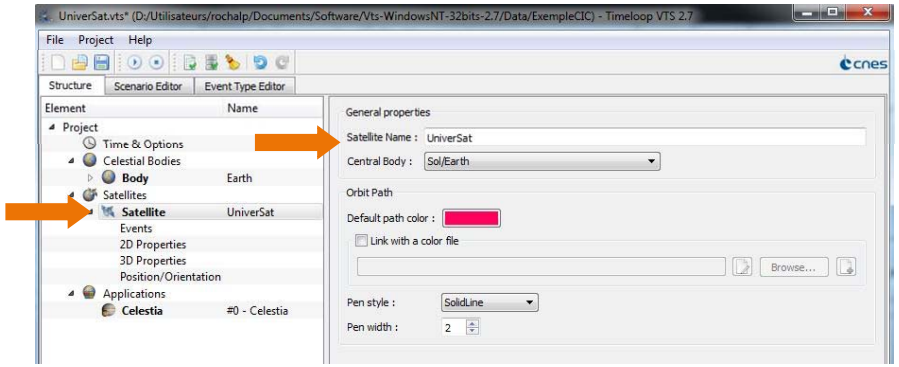
- Menu “New Project”
  - Select the folder “*Data/Exemple CIC*”
  - Create the ”UniverSat” project

The “project folder” is the root folder that contains the project file (.vts).
To avoid portability issues, all data files (CIC files, 3D models, textures) should be in sub folders inside the project folder.

Adding a satellite to the visualization scenario (1/2)

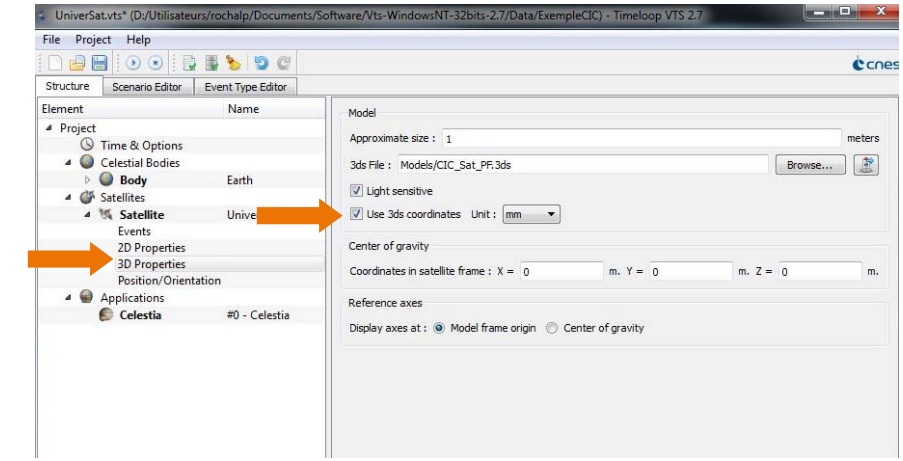
2. Adding a satellite

1. Right click on the group ***Satellites***
2. Click on "*Add satellite*" on the menu
3. Rename it "*UniverSat*"



3. Defining the satellite's geometrical model

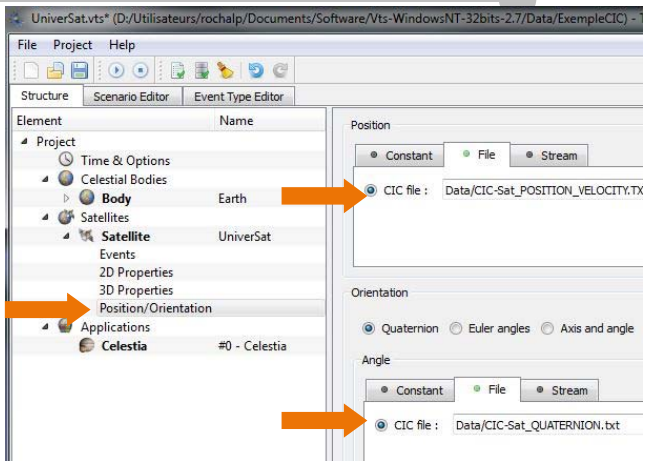
1. Click on "*3D properties*"
2. Select the file "*Models/CIC_Sat_PF.3ds*"
3. Change the units to *mm*



Adding a satellite to the visualization scenario (2/2)

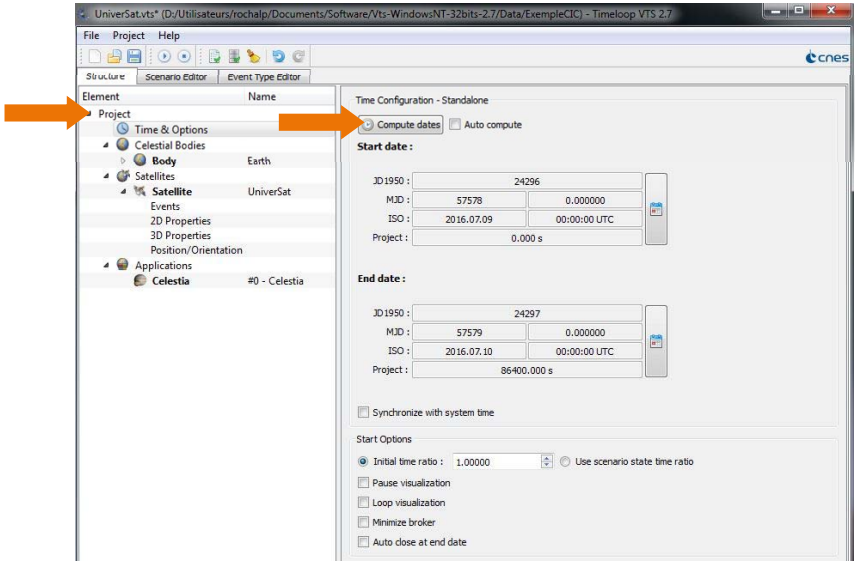
4. Defining the satellite's position/orientation

1. Click on *Position/Orientation*
2. Select the "File" tab option for the "Position"
3. Select the file "*Data/CIC-Sat_POSITION_VELOCITY.TXT*"
4. Select the "File" tab option for the "Orientation/*Quaternion*"
5. Select the file "*Data/CIC-Sat_QUATERNION.TXT*"



5. Calculating the files time range

1. On the project's tree view click on *Project*
2. Click on the button *Compute dates*.

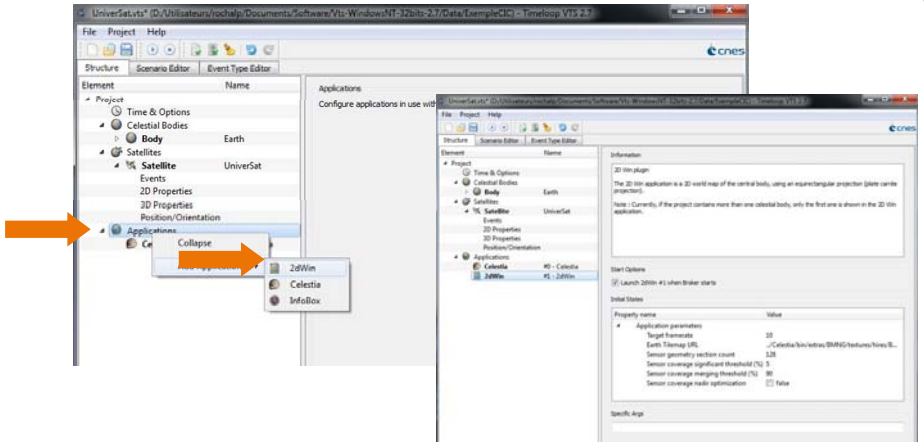


*The **Compute Dates** button calculates the time intersection ranges for the files used on the project.*

Adding applications for scenario visualization

6. Adding the 2dwin tool

1. Right click on **Applications**
2. Click on "*Add Application*"
3. Select "*2dWin*"

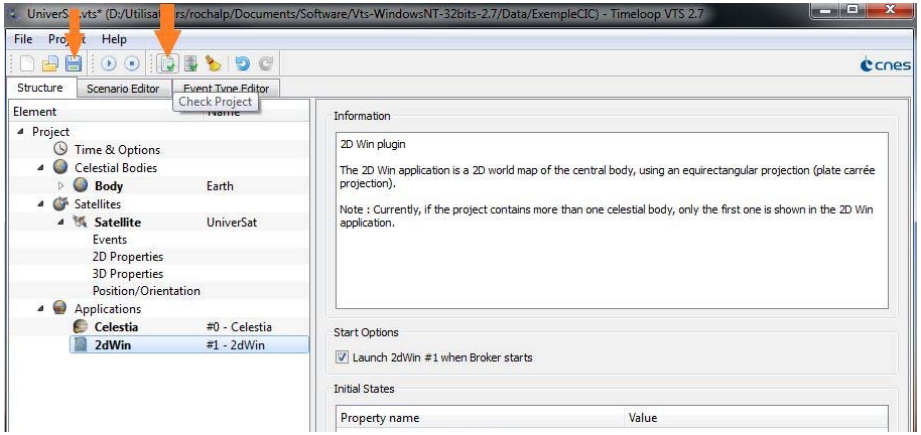


7. Configuration validation

- Click on **Check project**

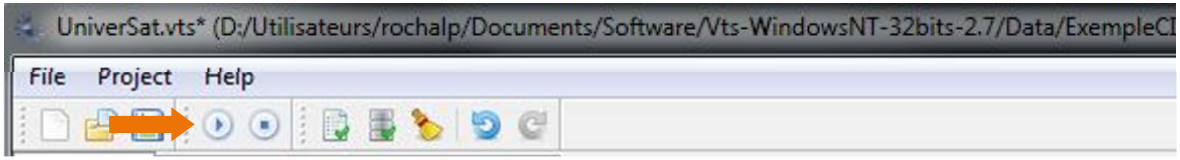
8. Saving the configuration

- Click on **Save**



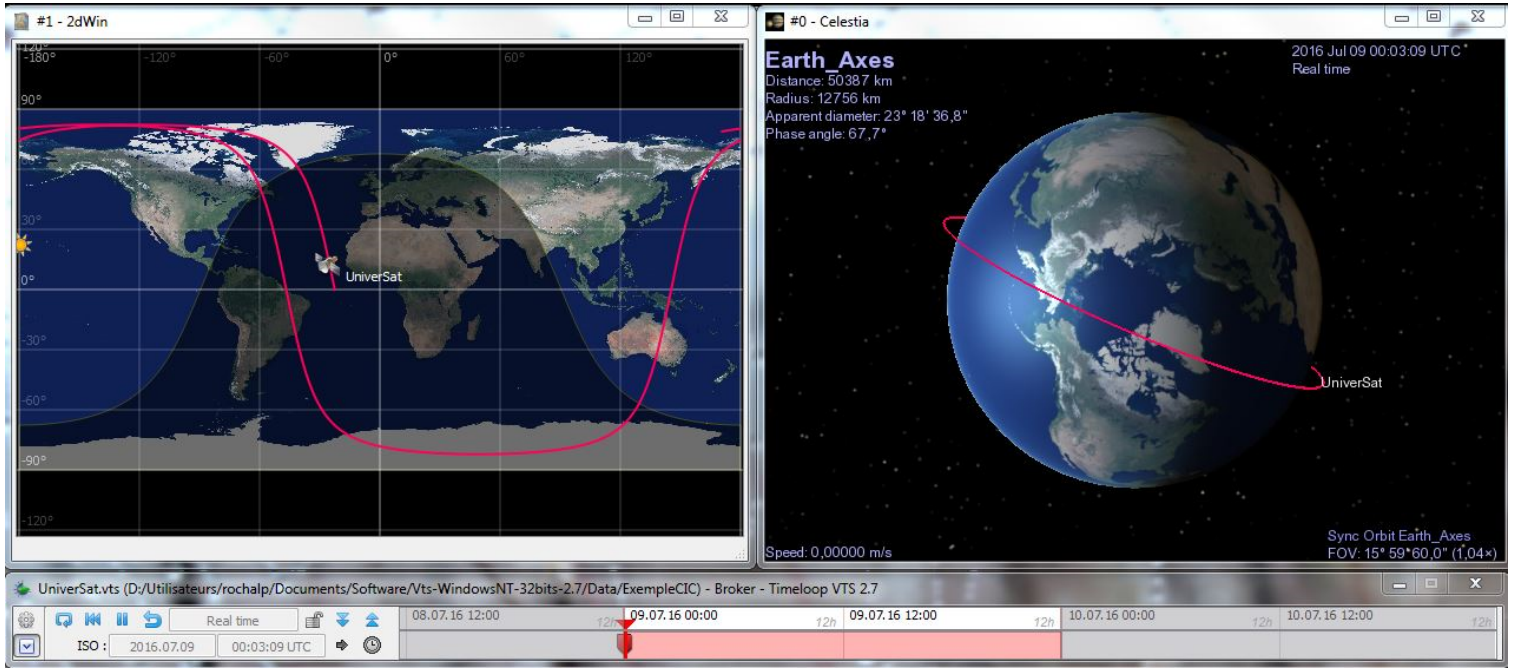
*Once an error is detected by the **Check Project** (or **Run** when a visualization is launched) procedure, the error messages are displayed on the **Logger** on the lower part of the configuration window. Double clicking the message will open the configuration panel where the error was found.*

Launching a visualization



9. Launching a visualization

1. Click on **Run**
2. The configuration window will be minimized
3. The Broker launches
4. 2dWin and Celestia visualization windows are launched

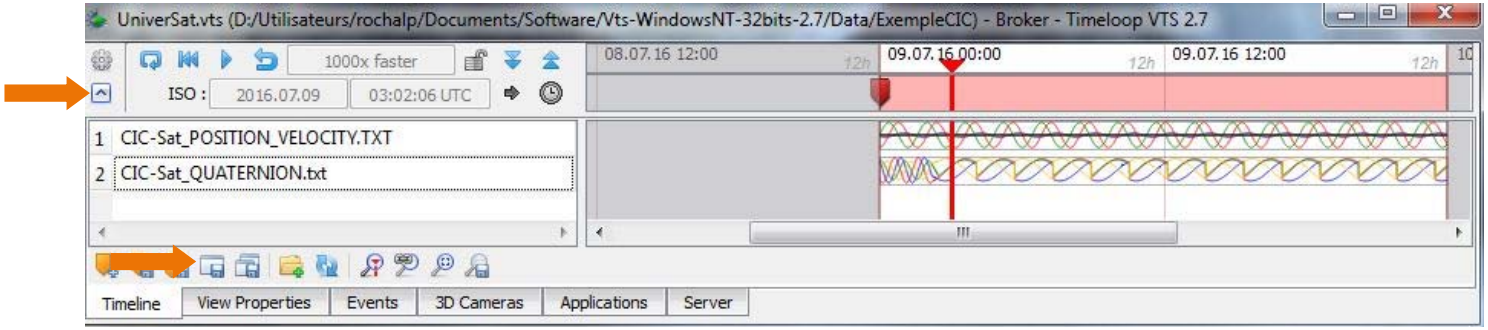


Celestia and 2dwin window's position is not yet saved, so both applications will launch with the same size and position. Change the position of the window on the first plane to view the other.

Visualization (1/4)

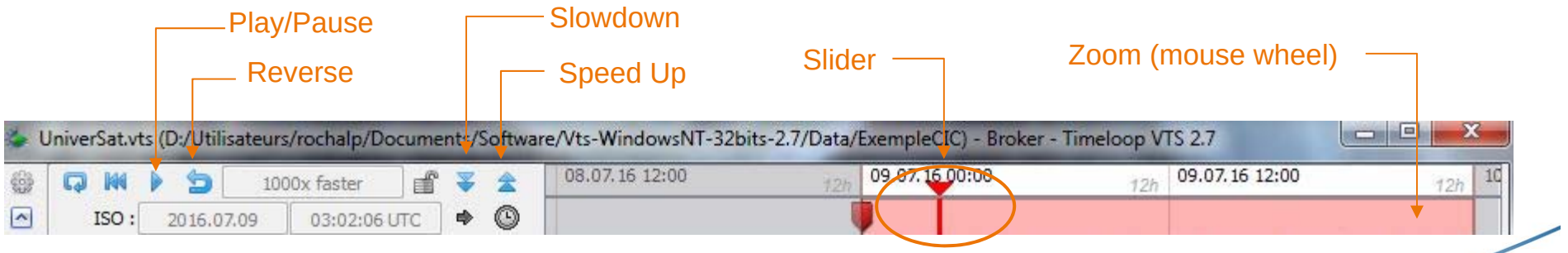
10. Window placement

1. Click on  to show the complete Broker's interface
2. Move and resize Celestia and 2dWin windows
3. Click on "  *Save window positions for current state only*"



With VTS it is possible to change the position and size of each window for specific events of the visualization scenario, giving a better focus of those mission phases.

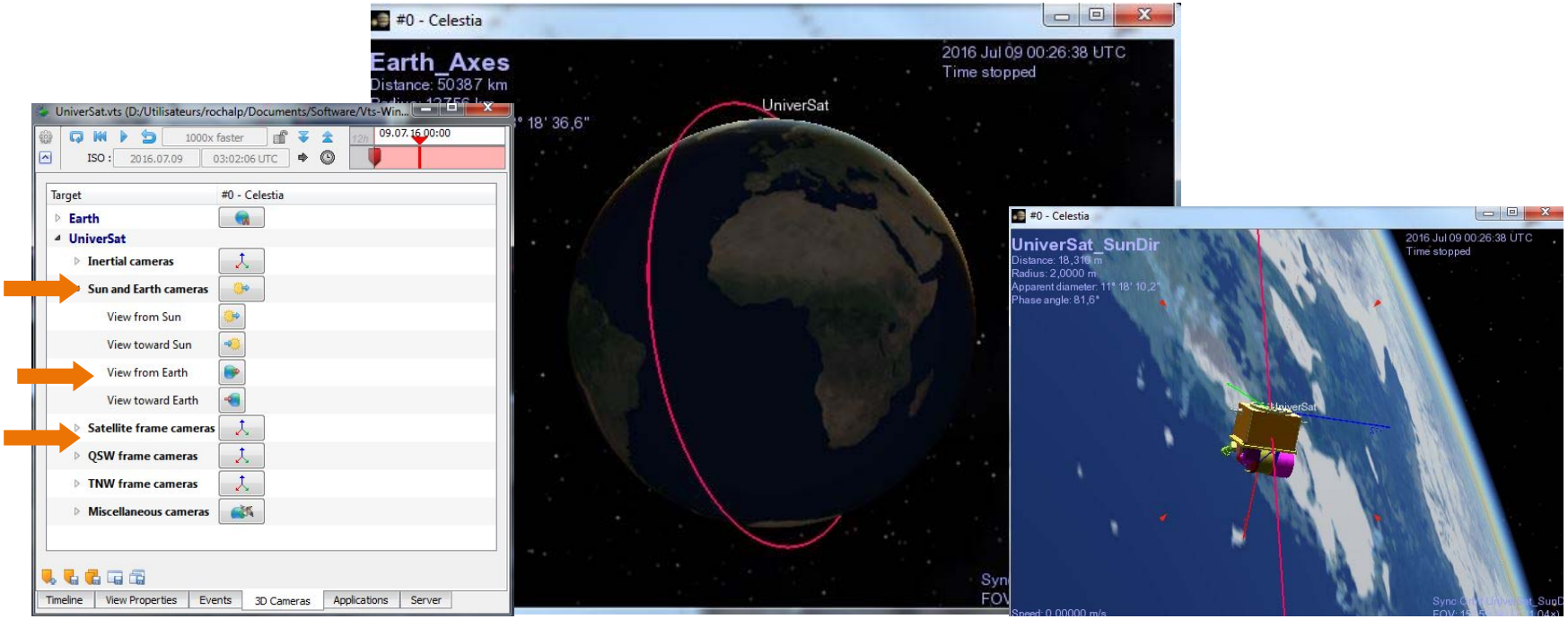
11. TimeLine Control



Visualization (2/4)

12. Changing Celestia's Cameras

1. Click on the Broker's tab "*3D Cameras*"
2. Click on the different cameras to see the options



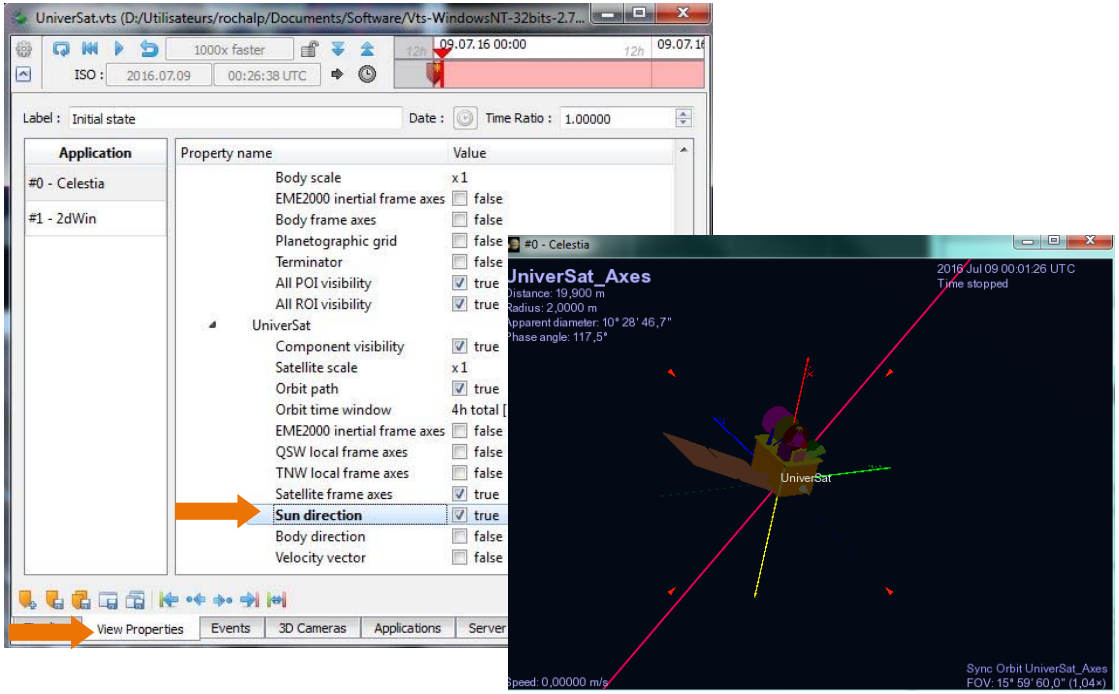
Controlling Celestia's camera with the mouse:

1. *Hold the right mouse button to orbit around the selected object ;*
2. *Hold the left mouse button to pan the camera up/down, left/right;*
3. *Use the mouse wheel to zoom in and out.*

Visualization (3/4)

13. Visualization Options

1. Click on the tab “*View Properties*”
2. Activate the option “*Sun direction*“ *(yellow arrow on the visualization)*



14. Stopping the Visualization

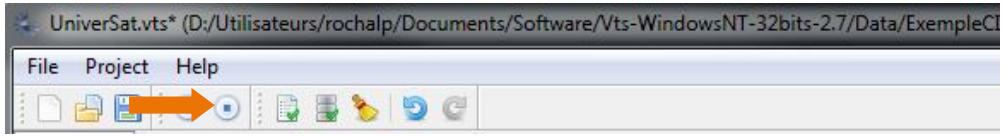
- Close the Broker window

or

- Close all the applications windows

or

- Click on the *Stop* button in the Configurator

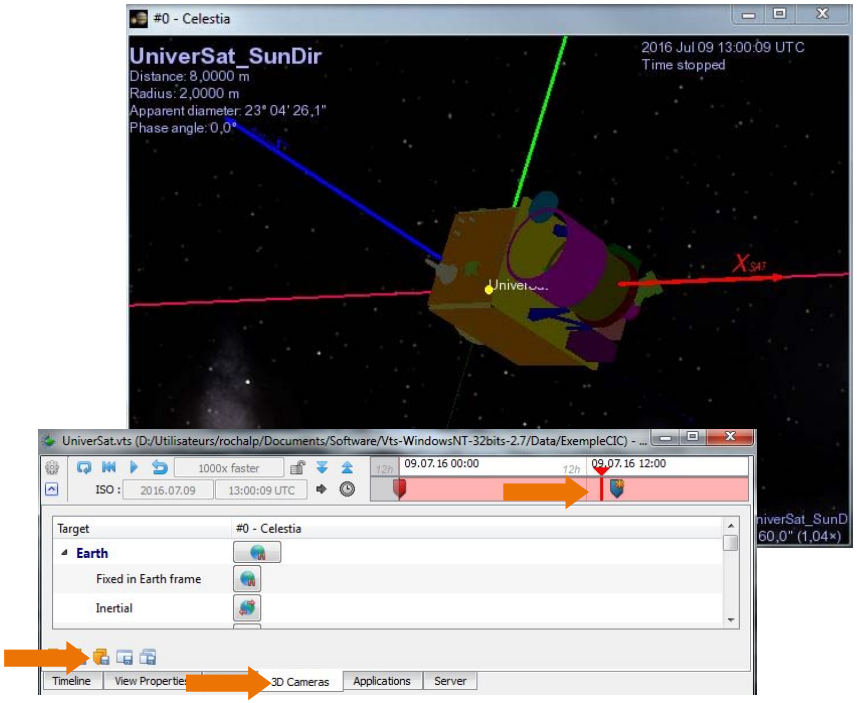


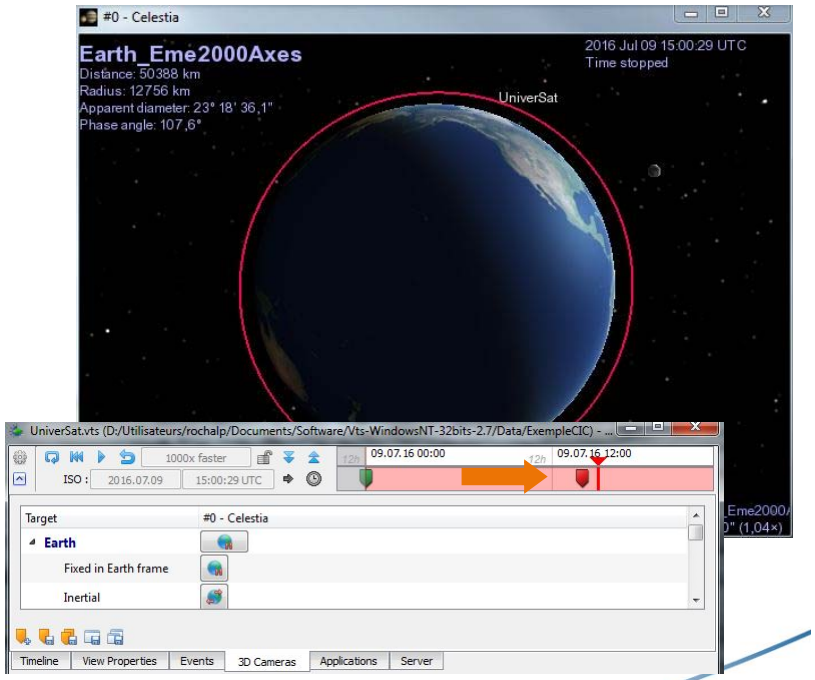
- Save all modifications

Visualization (4/4)

15. Creating the visualization states

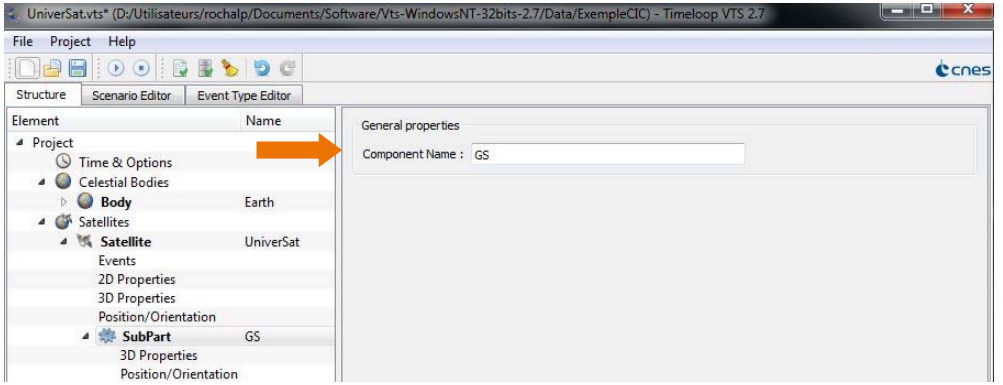
1. Launch the visualization and right click in the Timeline (pink zone)
2. Click on "*Create state*"
3. Select the tab "*3D Cameras*"
4. Select " *Earth / Inertial*"
5. Click on " *Save all states*"
6. Observe how Celestia's camera changes when the state changes
7. Stop the visualization



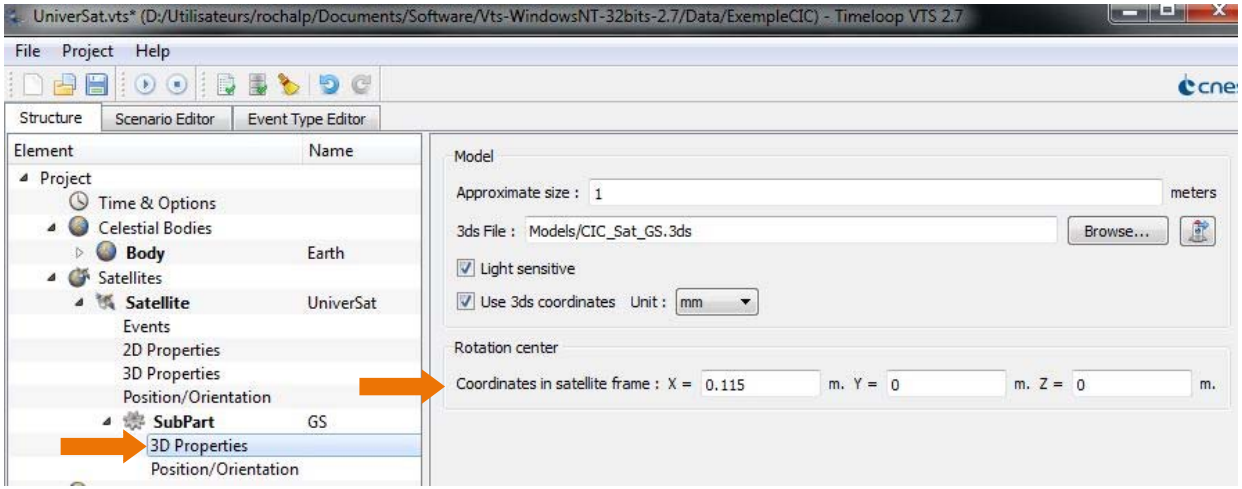


Animating a solar panel (1/2)

16. Adding a Subpart: Solar Panel (GS)

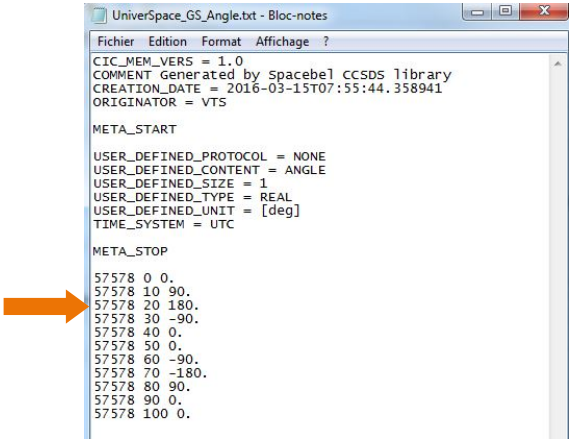


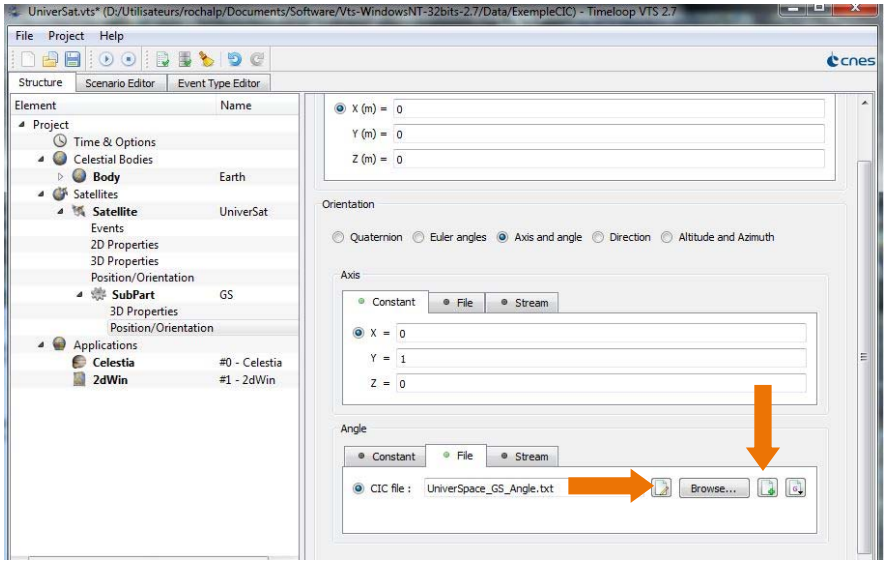
1. Right click on " *Satellite Universat*"
2. Click on the menu "*Add Subpart*"
3. Rename the new component "*GS*"
4. Select the CAD model:
   1. *Models/CIC_Sat_GS.3ds*
   2. *Unit : mm*
   3. *Rotation center : X= 0,115; Y=0; Z=0*
5. Define the orientation axis as Y (button "*Axis and angle*")



Animating a solar panel (2/2)

1. Edit a test file to define the rotation angle:
   1. Select the tab “*File*”
   2. Click on the “*New file* “ button … *then* “ *Edit file* ”
   3. Write the necessary values to perform:
      1. 1 turn in 40 s in one direction
      2. Stopping for 10 s
      3. Then 1 turn in 40 s in the opposite direction
2. Launch the visualization in order to observe the animation
3. Replace the test file by:
   “*Data/CIC-Sat_ROTATION_ANGLE_SA_1.txt*”
4. Click on the “*Save* “ button to save the configuration.

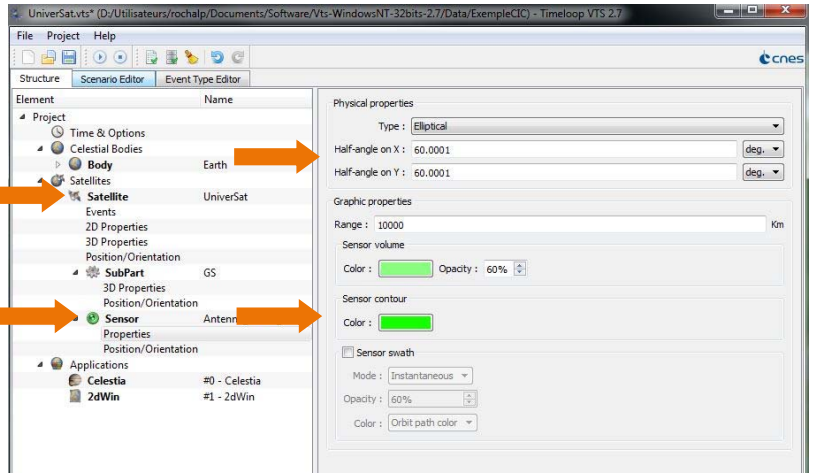




Simulation of a RF emission (1/3)

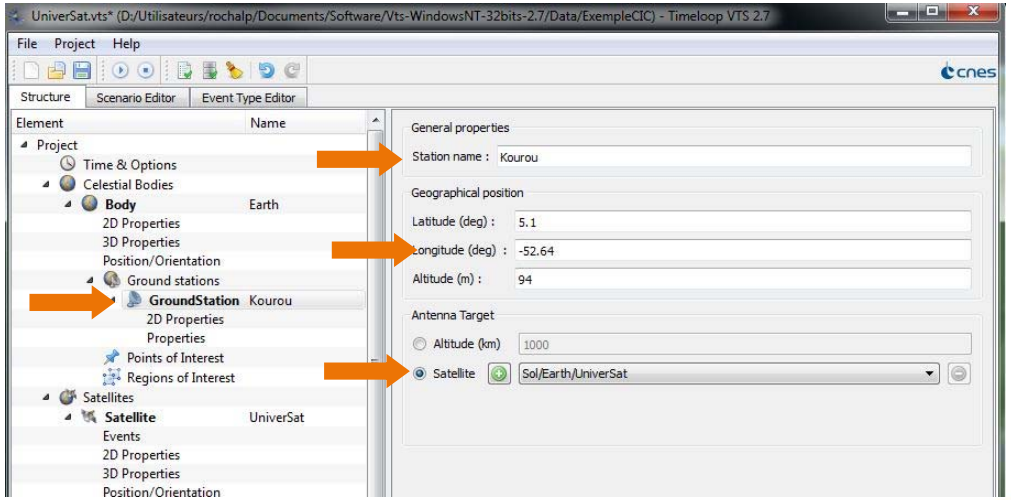
17. Adding a sensor

1. Right click on “ *Satellite Universat*”
2. Select the menu “*Add Sensor*”
3. Rename the sensor *“S_Band_Antenna”*
4. Define an half angle of 60° on X and Y
5. Choose a color for the visualization



18. Creating a ground station

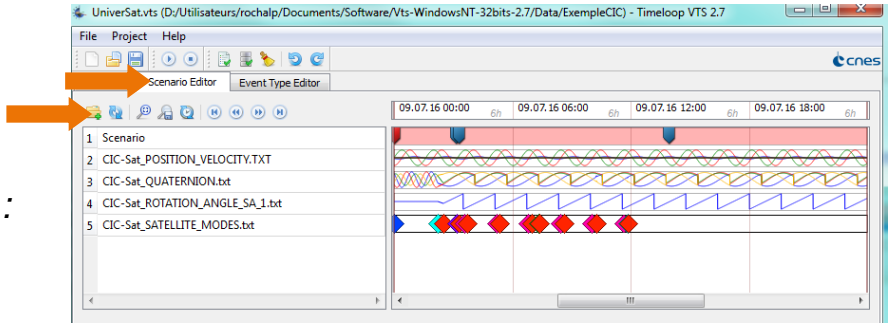
1. Right click on “Body/ *Ground stations”*
2. Select the menu “*Add Ground Station”*
3. Rename the station “*Kourou”*
4. Define the position and the target (satellite) :
5. Long. : -52,64 °; Lat.: 5,1° ; Alt. : 94m



Simulation of a RF emission (2/3)

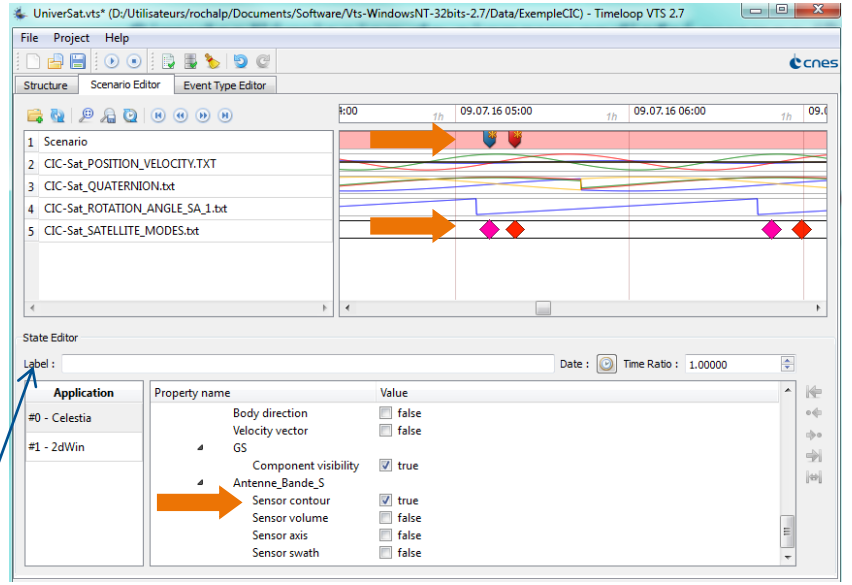
19. Adding the states

1. Select the "*Scenario Editor*" tab on your configurator
2. Add the file with the satellite modes (Add files…) *: Data/CIC-Sat_SATELLITE_MODES_EN*
3. Right click on the event "S_BAND_*TRANSMISSION*"
4. Select the menu "*Create state at event*"
5. Create a second state for the next event (*STANDBY)*



20. Defining the visualization parameters for each state

1. Click on first state on the Timeline
2. Tick the case *Sensor volume* to make the sensor visible
3. Remove the *Sensor volume* for the second state



When adding a state to the timeline, think about adding a label to better identify the event.

Simulation of a RF emission (3/3)

21. Visualization