Mission Design Visualization in GMAT

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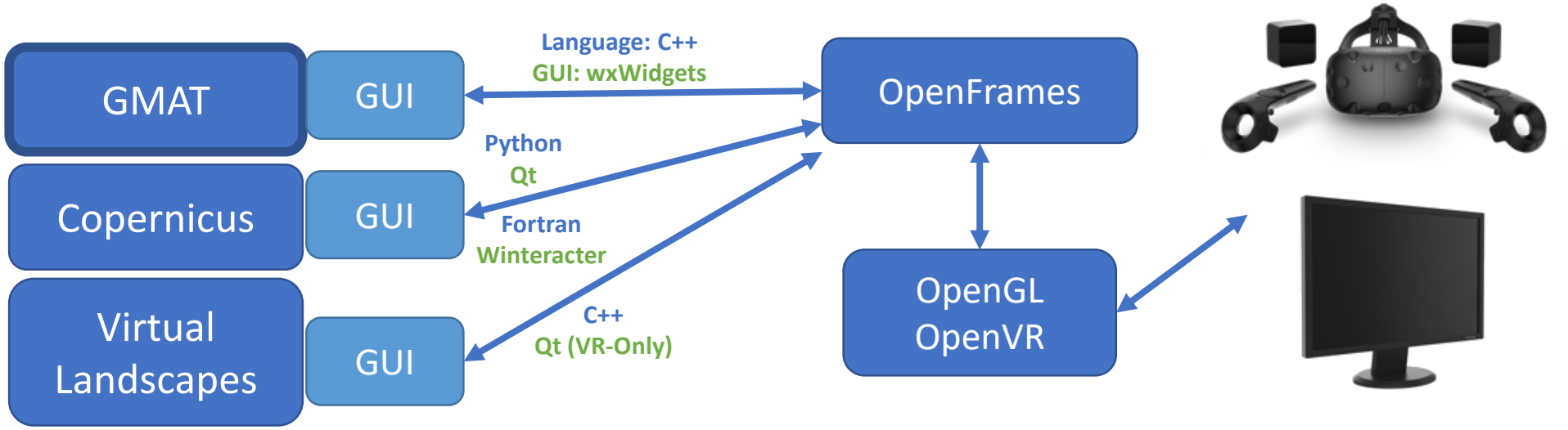
Background: OpenFrames 3D Visualization API

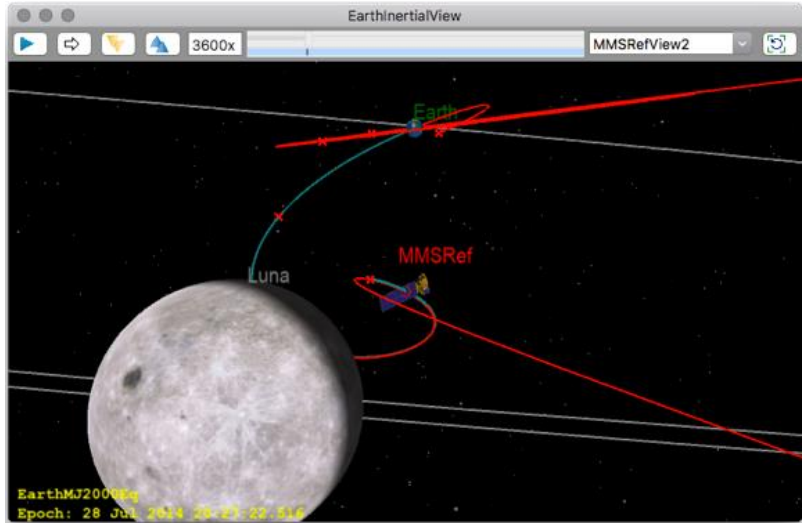
- Add 3D interactive visualizations to science/engineering software
  - No computer graphics knowledge required
  - No significant software architecture changes required
  - Multithreaded: visualizations don't significantly slow down sim
- Open Source: Apache v2.0
- https://github.com/ravidavi/OpenFrames

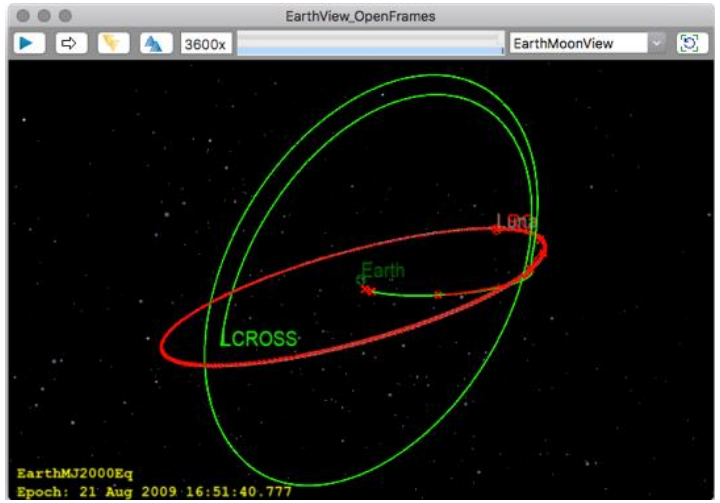


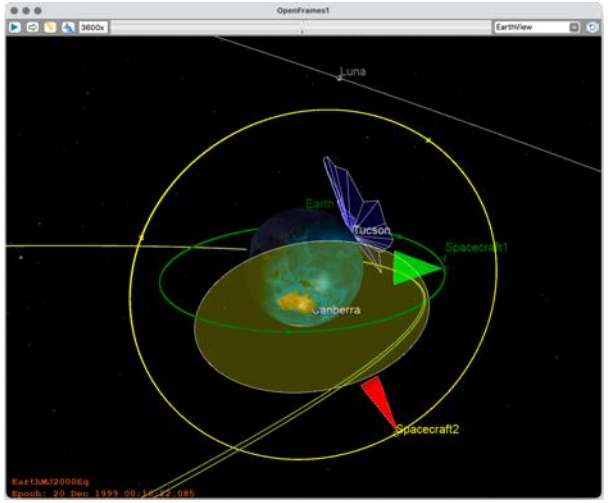
The OpenFramesInterface (OFI) Plugin for GMAT

- ”Old” GMAT graphics: OrbitView
  - Very hard to maintain or upgrade
  - Slows down propagation significantly
- OFI: Open Source (Apache 2.0) plugin for GMAT
  - Owned/managed by Emergent
  - High fidelity graphics, fast performance
  - Included with GMAT R2020a (also works with ThinkSys’ AWB)
- Compatible with existing GMAT scripts
  - Uses existing settings for spacecraft, bodies, propagators, etc…
- Includes GMAT sample scripts
- Tested on Mac, Windows, Linux

https://gitlab.com/EmergentSpaceTechnologies/OpenFramesInterface

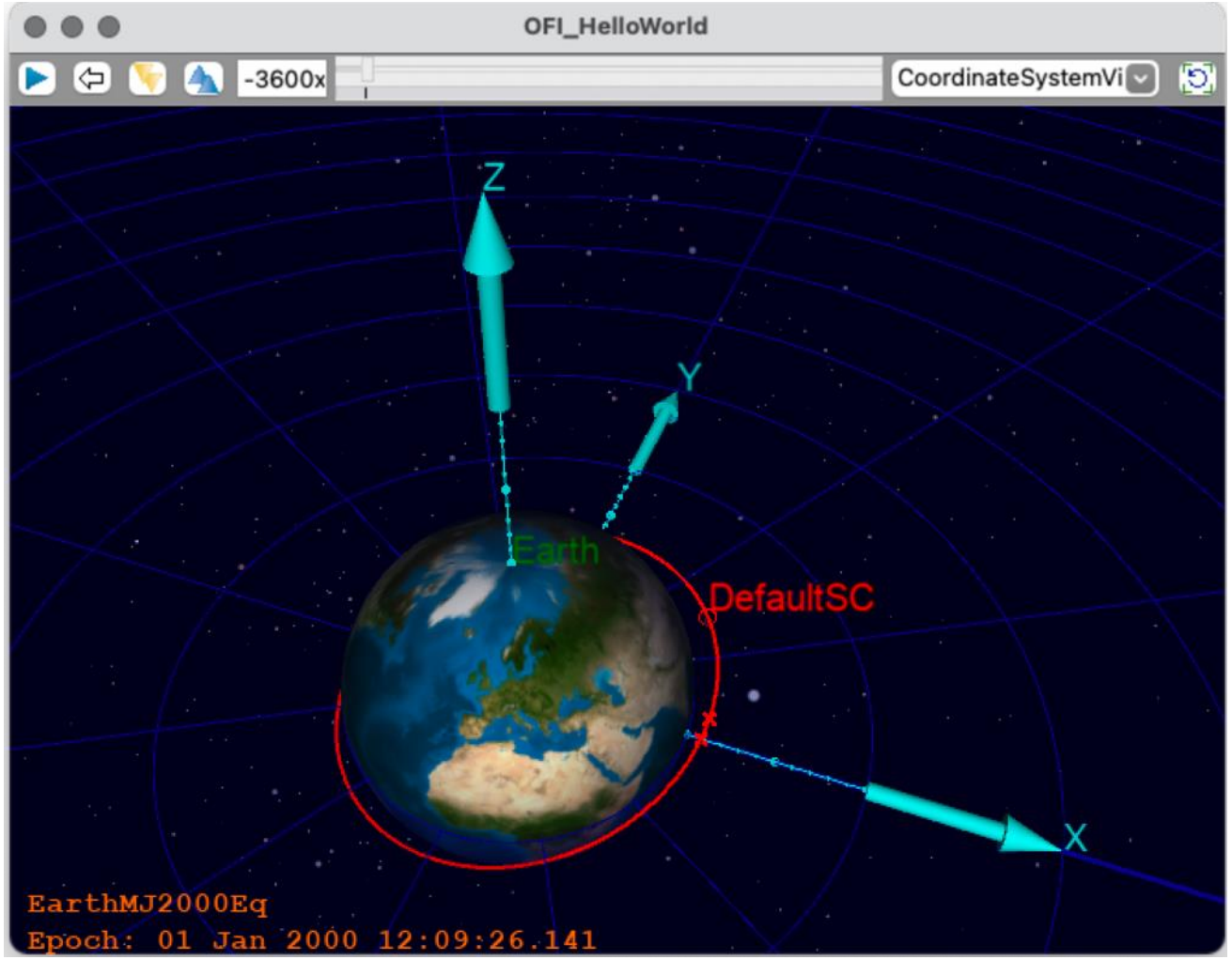






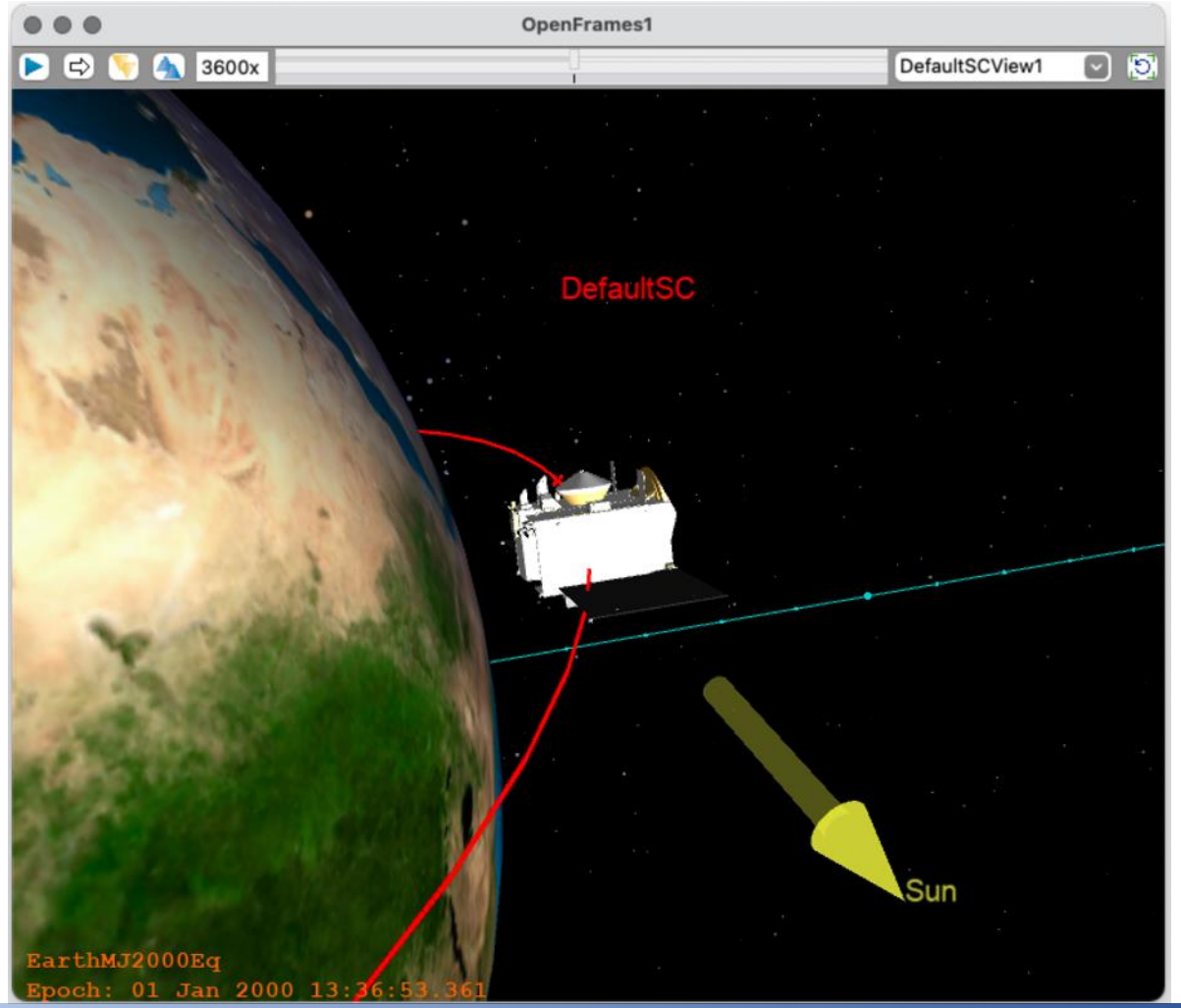
OFI: Hello World!

- Goal: Create your first OFI window
- Learn how to:
  - Change views
  - Control time and animation
  - Synchronize time between OFI windows
  - Enable VR headsets
    - On Windows & Linux via SteamVR
  - Switch to printer-friendly mode
    - Conference or journal papers
  - Quickly get to the OFI help page



OFI: Let There Be Light…

- Goal: Enhance situational awareness
- Learn how to:
  - Add the Sun for simple lighting
    - Shadows in a future version of OFI
  - Add vectors pointing to other objects
  - Change the spacecraft model
    - R2020a model formats: 3ds, lwo, obj, shp, stl
    - More formats coming in future OFI versions
    - NOTE: If using non-3ds model, you must remove all OrbitView outputs! OrbitView does not gracefully ignore unsupported formats.

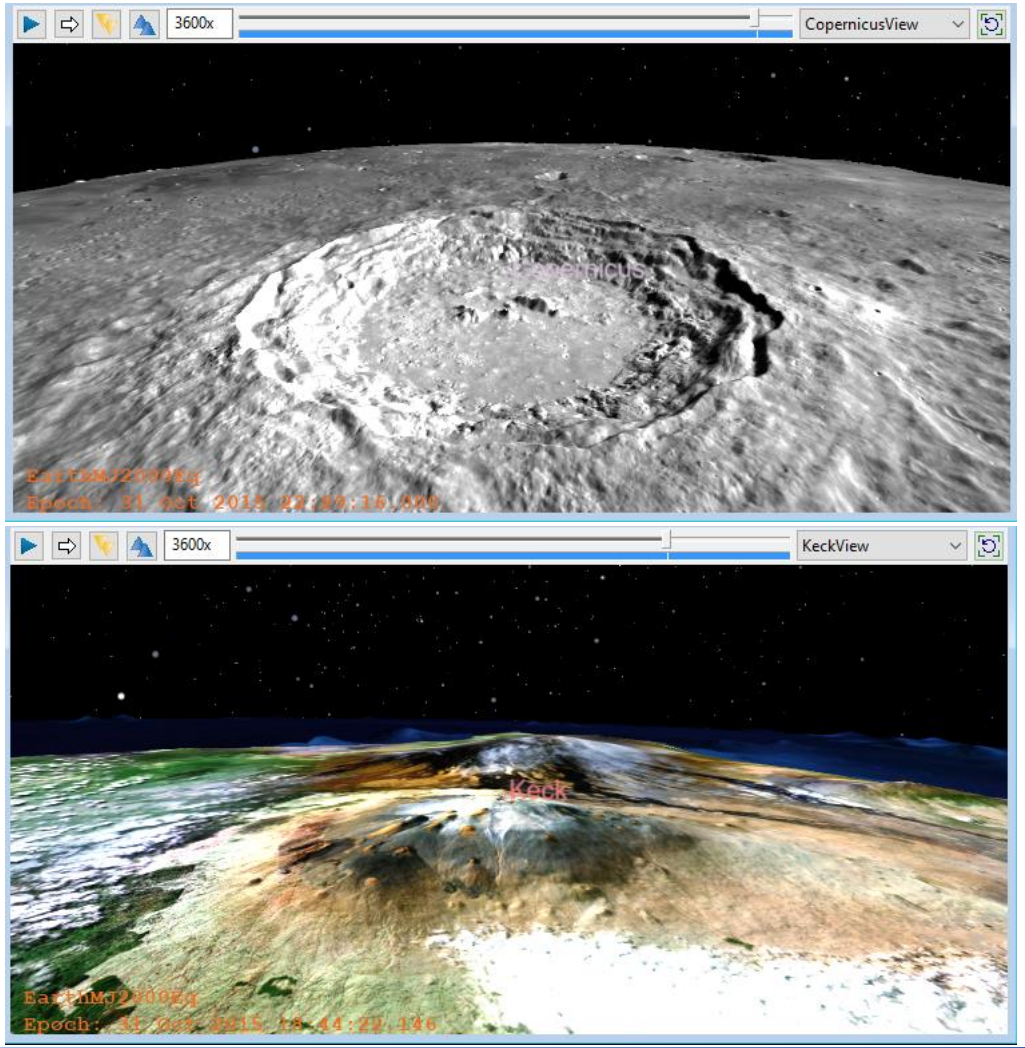


OFI: Do You See What I See?

- Goal: Visualize what a sensor sees
- Learn how to:
  - Add sensor masks to the OFI
    - On a ground station or a spacecraft
  - ”See” the sensor’s point of view

OFI: Watch Out For The Ground!

- Goal: Use high-fidelity terrain models
- Learn how to:
  - Use real terrain for celestial bodies in GMAT
- Requires:
  - Terrain add-on to OFI
    - Ask Ravi or Fabrizio for this
  - Windows 10
    - Roadblocks on macOS
    - Linux support coming in the future…



OFI: Future Work

- Terrain as part of next GMAT/OFI release
- Trajectory trails/traces
- Visual Interactive Trajectory Design
  - Grab and drag trajectories and spacecraft!
- Lots of bug fixes
  - Reported over past 2 years by end users
- Performance improvements
- More OpenFrames & OFI videos at:

https://www.youtube.com/user/EmergentSpace

Questions?

Thank You!

For OFI Questions or Feedback: ravi.mathur@emergentspace.com