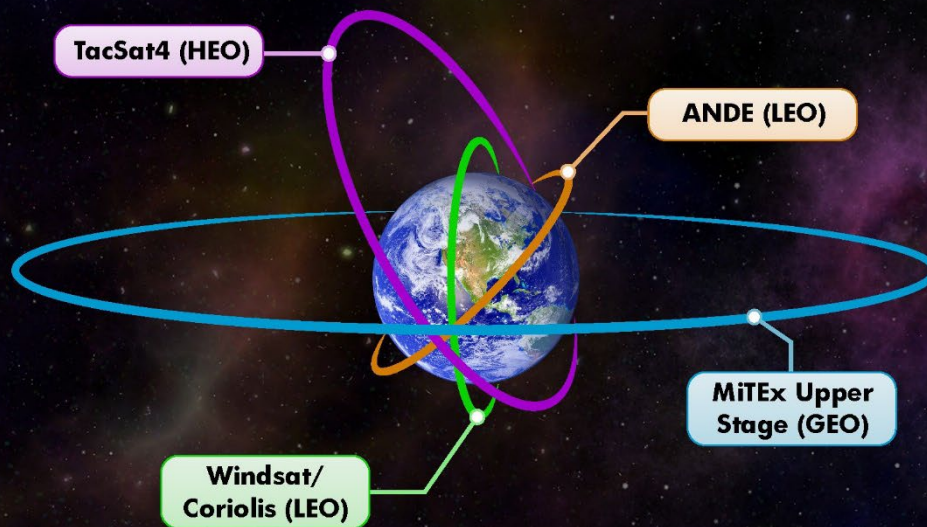Orbit/Covariance Estimation and ANalysis (OCEAN) is a state-of-the-art orbit determination, ephemeris propagation, and timing calibration software suite. OCEAN applies high fidelity models and advanced estimation techniques to provide precise and accurate satellite ephemeris, orbit predictions, and covariance products throughout the mission lifetime.

Mission Support

TacSat4 (HEO)

ANDE (LEO)

MiTEx Upper Stage (GEO)

Windsat/ Coriolis (LEO)

Products:

- Ephemeris Products
  - Post-processed ephemeris and orbit predictions
  - OLES and TLES
  - Ephemeris comparisons
  - Full covariance history and propagation
- Analysis Products
  - Bias estimates
  - Measurement residuals
  - Maneuver estimation
  - Satellite clock calibration
  - Products customized to user needs

In addition to these missions, OCEAN has supported numerous National Asset Programs

The OCEAN Advantage: Low Cost, Precise, Accurate Orbit Determination

OCEAN offers proven high performance government-off-the-shelf software to meet your precision orbit determination needs for less than the licensing costs of competing products.

- Tailored to meet mission needs and desired products
- Individual and multi-satellite/constellation orbit determination products
- Easily scripted for automated operations
- 15+ years of operational mission support

- Highly configurable, database-driven software
- Heritage use with Blossom Point Tracking Facility's Neptune® software for reliable lights-out operations
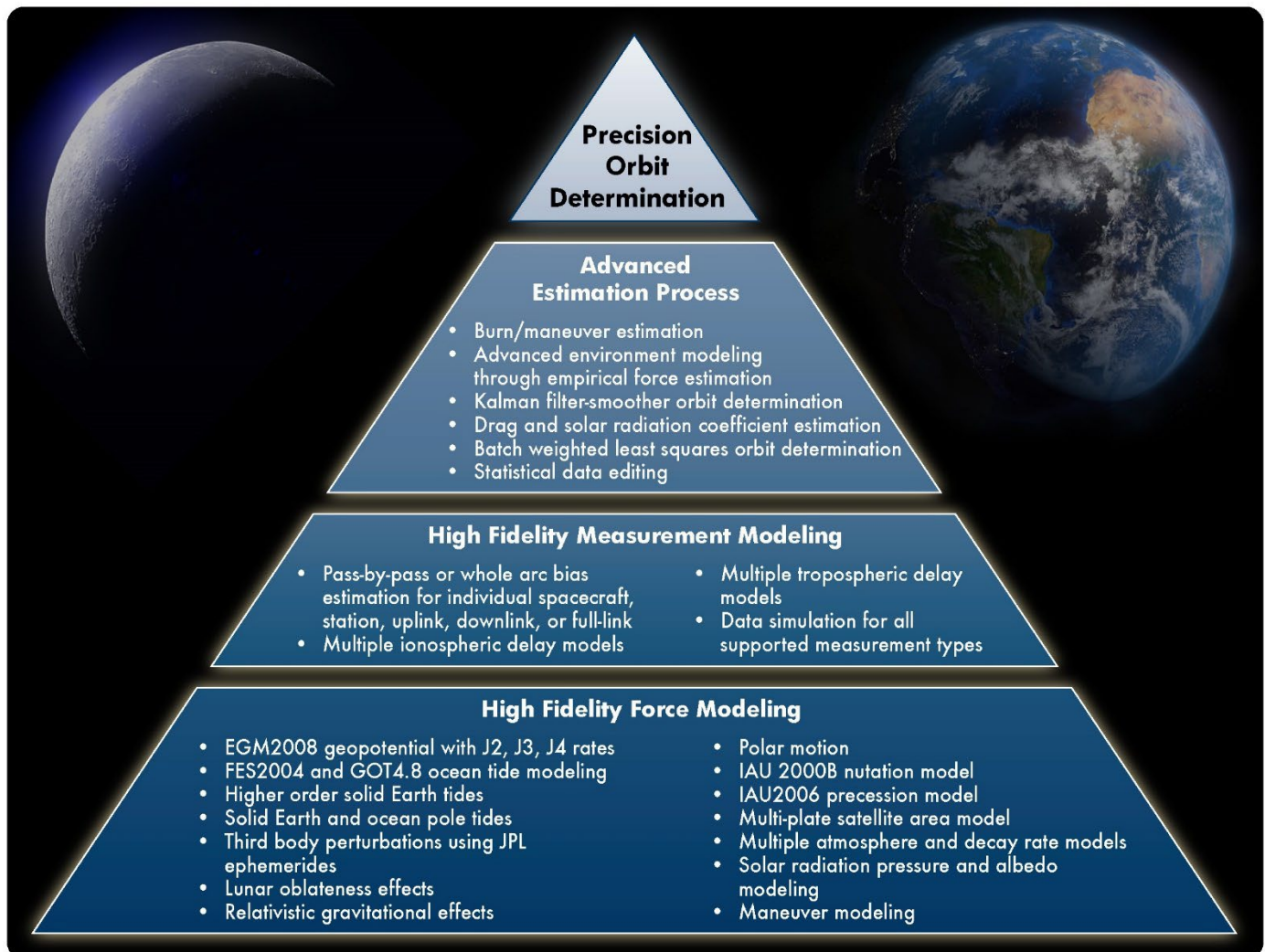
Measurement Types:

OCEAN supports over 25 measurement types and employs robust data editing techniques to reliably generate precise and accurate orbit solutions.

- SSN and AFSCN Range, Range-Rate, Azimuth, and Elevation
- GPS Single and Double Differenced Pseudorange
- Bi-Static (3-Way) Absolute and Differential Range
- Satellite Laser Range
- Intersatellite Ranging

Precision Orbit Determination

Advanced Estimation Process

- Burn/maneuver estimation
- Advanced environment modeling through empirical force estimation
- Kalman filter-smoother orbit determination
- Drag and solar radiation coefficient estimation
- Batch weighted least squares orbit determination
- Statistical data editing

High Fidelity Measurement Modeling

- Pass-by-pass or whole arc bias estimation for individual spacecraft, station, uplink, downlink, or full-link
- Multiple ionospheric delay models
- Multiple tropospheric delay models
- Data simulation for all supported measurement types

High Fidelity Force Modeling

- EGM2008 geopotential with J2, J3, J4 rates
- FES2004 and GOT4.8 ocean tide modeling
- Higher order solid Earth tides
- Solid Earth and ocean pole tides
- Third body perturbations using JPL ephemerides
- Lunar oblateness effects
- Relativistic gravitational effects
- Polar motion
- IAU 2000B nutation model
- IAU2006 precession model
- Multi-plate satellite area model
- Multiple atmosphere and decay rate models
- Solar radiation pressure and albedo modeling
- Maneuver modeling

Configuring and Using OCEAN:

Built for speed using FORTRAN code, OCEAN can be easily deployed to Linux workstations using open source compilers. Standard file input/output means that OCEAN can be quickly integrated into existing systems for efficient, cost-effective orbit determination performance.

For more information, please contact ocean@nrl.navy.mil