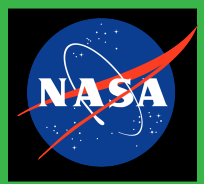National Aeronautics and Space Administration

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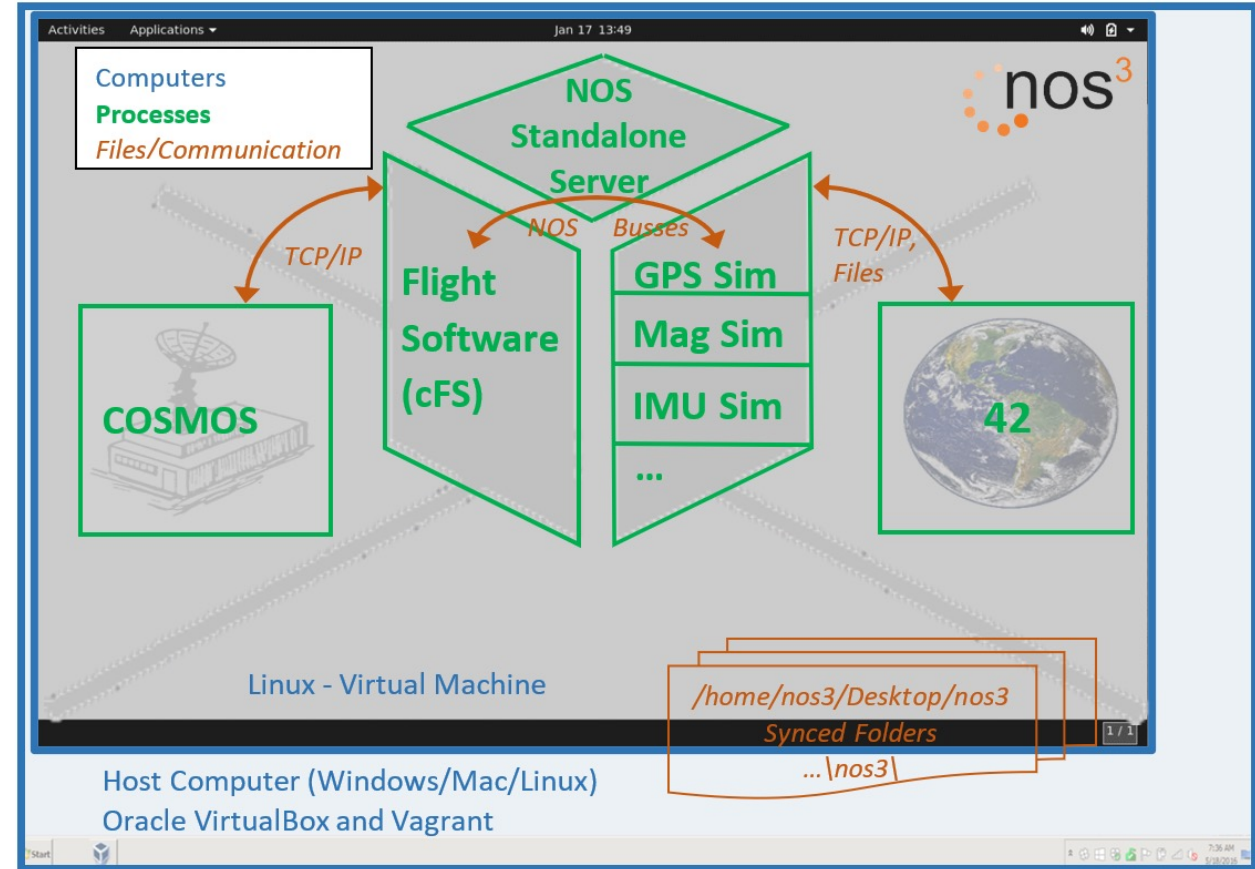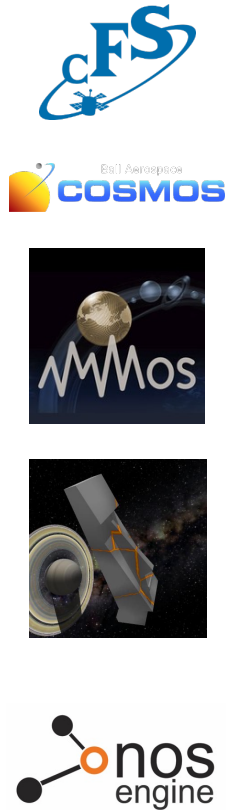# Distributed Systems Missions (DSM) and NOS3

John.P.Lucas@nasa.gov

August 9th, 2023

NOS3 Architecture

- Combination of multiple pieces of open-source software
  - A virtual spacecraft!
- Flight Software
  - Core Flight System (cFS)
- Ground Stations
  - OpenC3 COSMOS
  - JPL AMMOS Instrument Toolkit
- Dynamics Engine
  - 42
  - Provides visualization
- NOS Engine
  - Communication protocols
  - Hardware abstraction layer
  - Component simulators
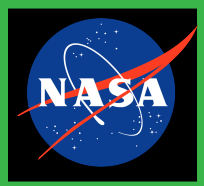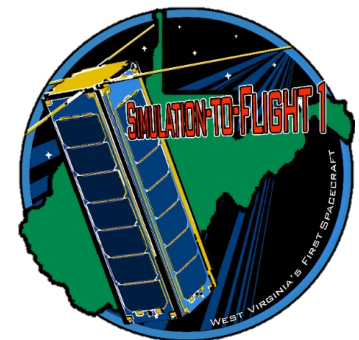
Distributed Systems Missions (DSMs)

- Combinations of spacecraft, ground stations, relays, rovers, drones, etc.
  - A spacecraft constellation with multiple ground stations
  - Lunar missions with relay satellites
- NASA GSFC has invested in various efforts to enable these types of missions
  - Including NOS3 support and maintenance on the open-source GitHub
- The largest DSM developments to date have been:
  - Generic components for typical actuators / sensors used by spacecraft
  - Establishing a generic attitude determination and control system
  - Containerizing NOS3 and enabling multiple spacecraft to be launched
  - Upgrading versions of underlying software (cFS and COSMOS)
- Details at the presentation on Thursday!
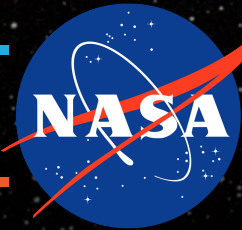
NOS3 Support of DSM
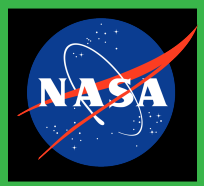
Path Forward

- We want to hear from the community on where to go next!
- Plans (when these slides were produced):
  - Simplify the configuration
    - Provide a simple GUI or means to reconfigure for X spacecraft or just Y apps running without having to edit all Z files
  - Provide documentation and all the references to training materials used
    - Generate a design reference mission concept of operations and limited performance test plan and provide a script to simulate those used during AI&T
  - Support more software, both flight and ground in the architecture
  - Increase generic simulator fidelity
  - Hardware In The Loop
  - STF-2

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