National Aeronautics and Space Administration



Katherine Johnson Independent Verification and Validation (IV&V) Facility

Jon McBride Software Test and Research Laboratory

Distributed Systems Missions (DSM) and NOS3

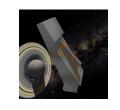
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August 9th, 2023



NOS3 Architecture

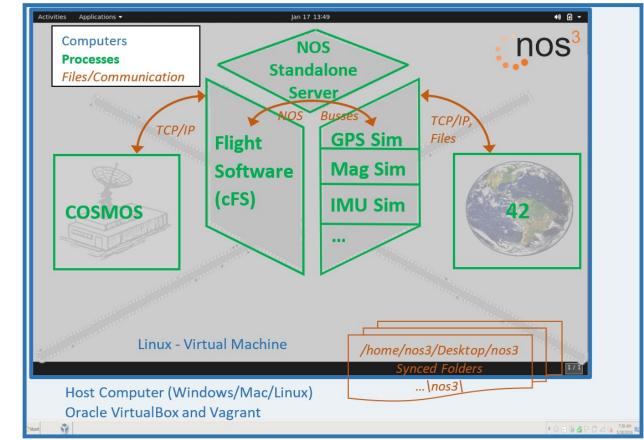
- Combination of multiple pieces of open-source software
 - A virtual spacecraft!
- Flight Software
 - Core Flight System (cFS)
- Ground Stations
 - OpenC3 COSMOS
 - JPL AMMOS Instrument Toolkit
- Dynamics Engine
 - 42
 - Provides visualization
- NOS Engine
 - Communication protocols
 - Hardware abstraction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



COSMOS



NASA IV&V JSTAR





- 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



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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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