nos3

NASA Operational Simulator for Small Satellites

Mark Suder

Mark.D.Suder@nasa.gov

www.nos3.org

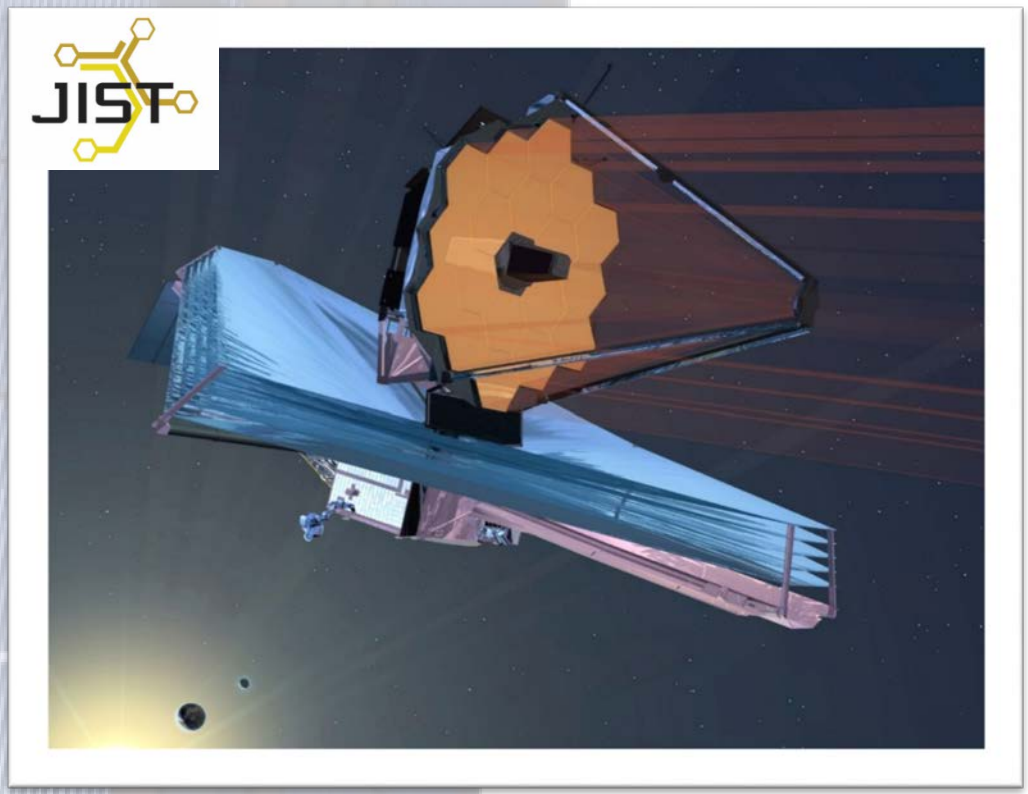
Overview

- JSTAR ITC Introduction
- STF-1 and NOS^3
- Components
- Architecture
- Hardware Model
- Build System
- Demonstration

Independent Test Capability

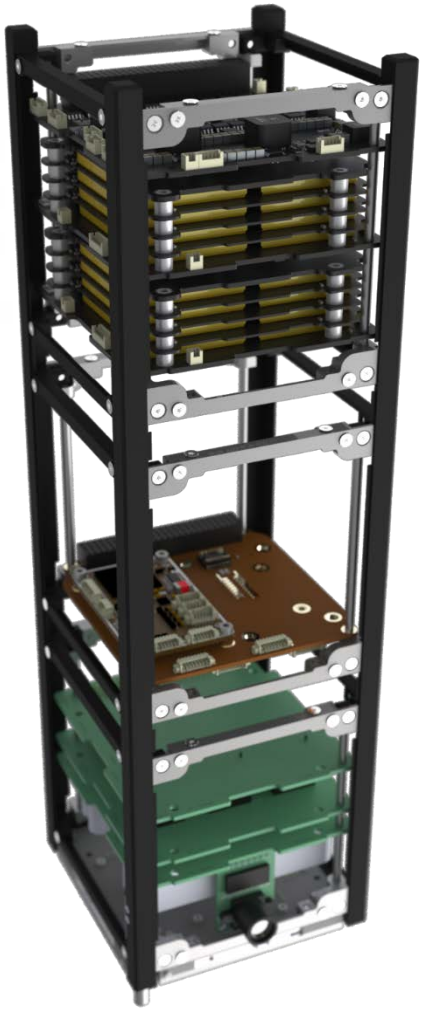
NASA IV&V – JSTAR ITC

- Acquire, develop, and manage adaptable test environments that enable the dynamic analysis of software behaviors for multiple NASA missions .



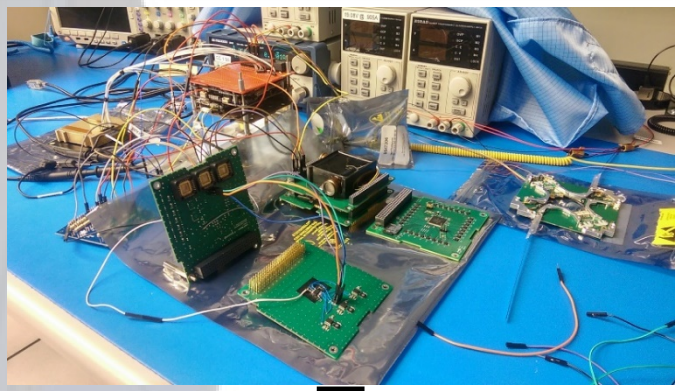
Simulation To Flight - 1

- First CubeSat from West Virginia
- Current launch ready date is April 2017
- ITC team:
  - C&DH, FSW, Integration, and Testing
- West Virginia University:
  - CSEE, GPS, IMU, and Space Weather
- **Primary Objective**
  - **Showcase simulation technologies developed at NASA IV&V while demonstrating and improving utility from concept to operations.**
- Secondary Objectives
  - WVU Research Payloads



NASA Operational Simulator for Small Satellites

- Uses:
  - Early Development
  - Integration
  - Mission Planning
  - Training
  - Verification and Validation
- Simulated Components:
  - Cadet UHF Radio
  - Clyde Space Batteries / EPS
  - Generic Science
  - GomSpace Nanomind A3200 Sensors
  - ISISpace Antenna
  - Novatel GPS

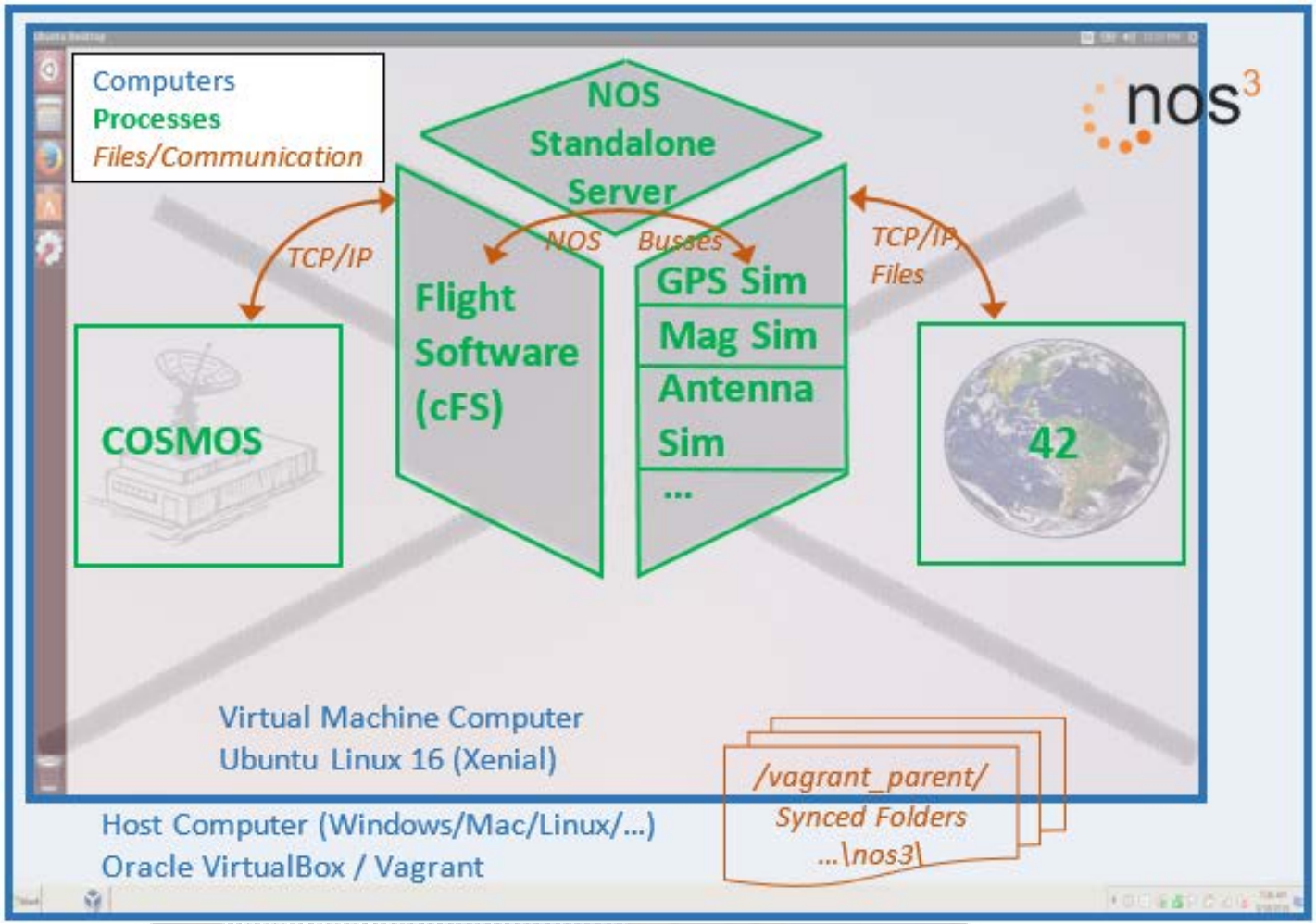


Components

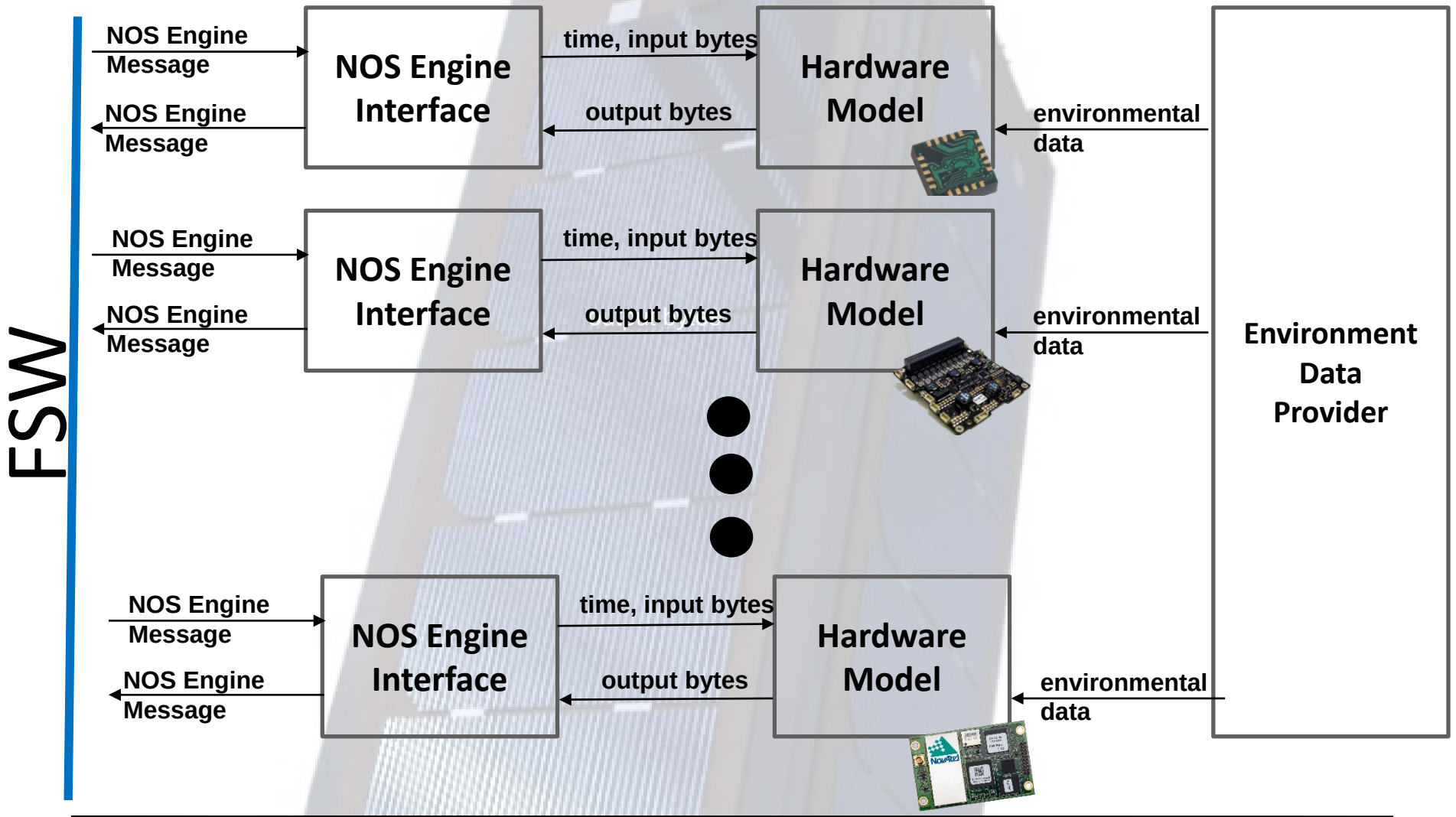
- 42, Dynamics Simulation and Visualization
- cFS, Core Flight System
- COSMOS, Ground Station Software
- Vagrant
- Virtual Machine

- FSW Hardware Abstraction Layer
- Hardware Simulators
- NOS Engine Middleware
- Orbit Inview & Power Prediction (OIPP) Tool
- Scripts

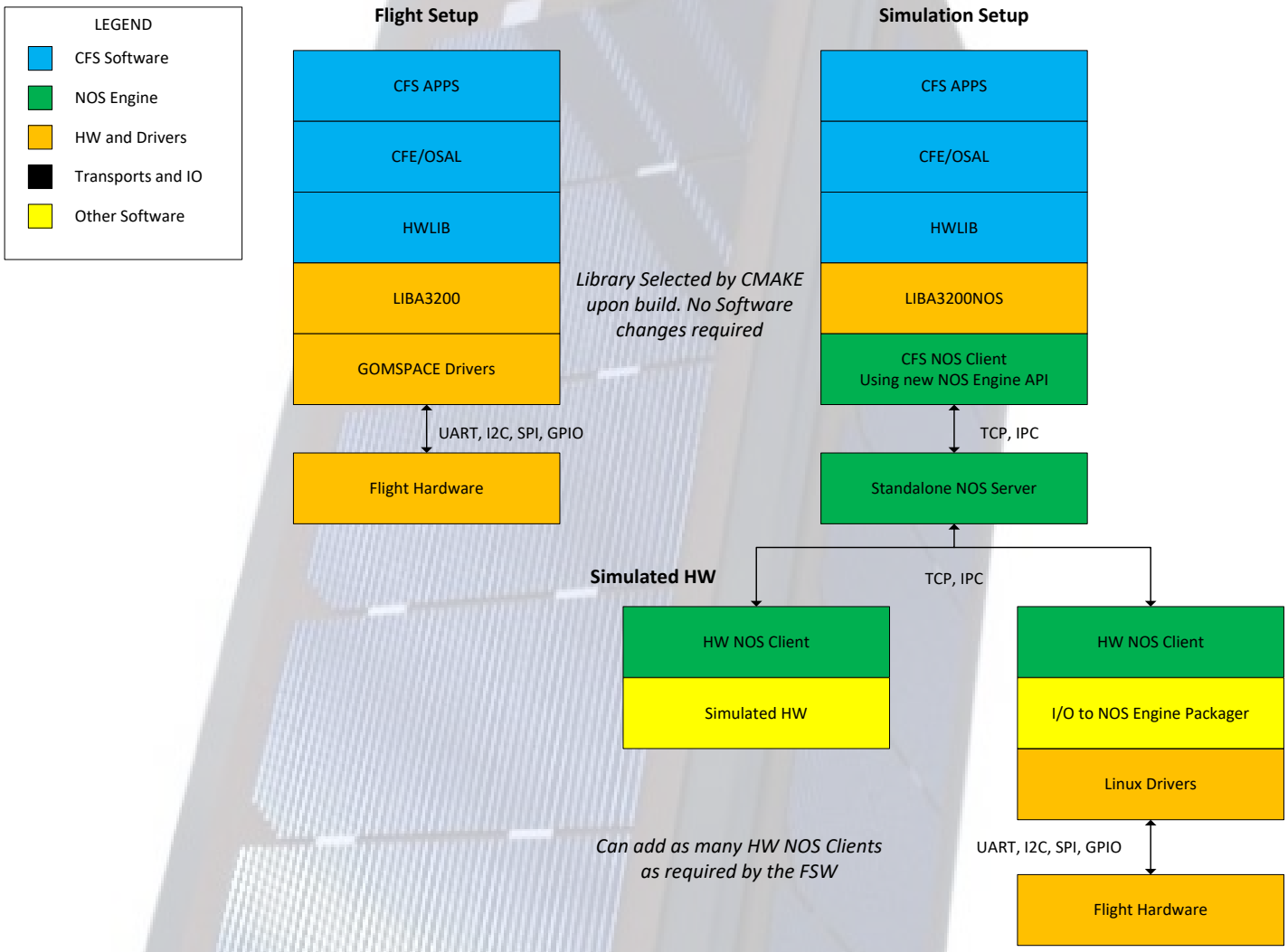
Architecture



Hardware Model



Build System



Framework for Spacecraft Security

- Simulation Test Bed for Security Technologies
- Realistic Spacecraft Operations – End-to-End
- CryptoLib integration design complete
  - Will demonstrate AES encryption on the downlink
  - Software encryption – no specialized hardware needed
  - Integrates with cFS
  - Coding has started, will wrap up by September
- Demonstrates Real-World Standards Based Spacecraft Security
  - Does not have to be expensive
  - Does not have to be time consuming
  - Can be applied to both large and small systems

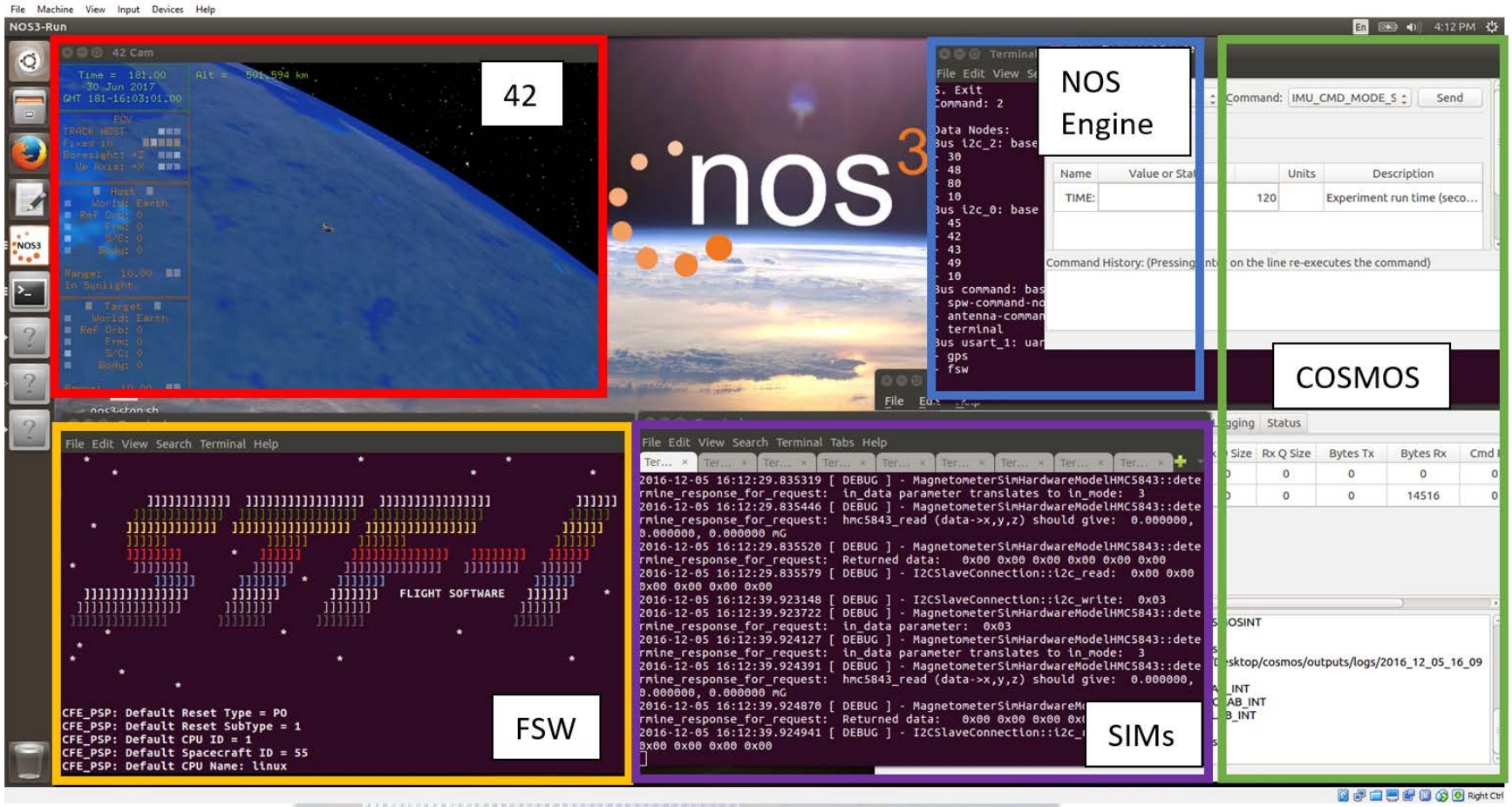
Questions?

NASA Operational Simulator
for Small Satellites

Mark Suder
Mark.D.Suder@nasa.gov

www.nos3.org

Backup


42
NOS Engine
COSMOS
FSW
SIMs
FLIGHT SOFTWARE
CFE_PSP: Default Reset Type = PO
CFE_PSP: Default Reset SubType = 1
CFE_PSP: Default CPU ID = 1
CFE_PSP: Default Spacecraft ID = 55
CFE_PSP: Default CPU Name: linux