Assisting Test Development with Architecting Techniques

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Agenda

- Introduction to JPSS
- MBSE application
- Views utilized
- Modeling methodology
- Current work
- Path forward
- Conclusion
- Questions

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Introduction to JPSS

- Joint Polar Satellite System
  - Collaboration between NOAA and NASA
  - Provide weather and climate observations from Low-earth orbit
  - Replacement for Polar-Orbiting Operational Environmental Satellites (POES)
  - Advance weather, climate, environmental, and oceanographic science
- Suomi National Polar-Orbiting Partnership (Suomi NPP) on-orbit
- JPSS-1 set to launch in early 2017

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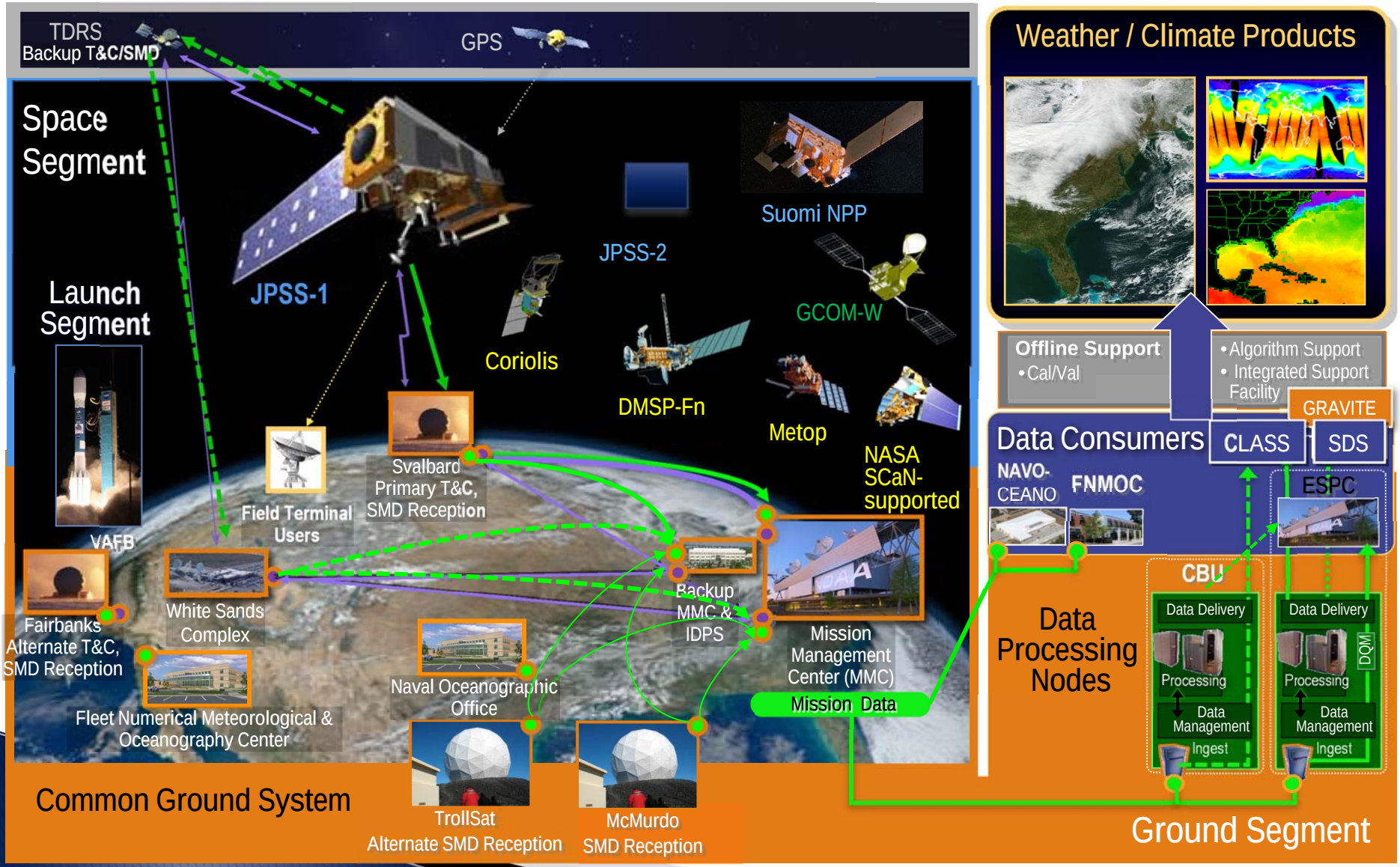
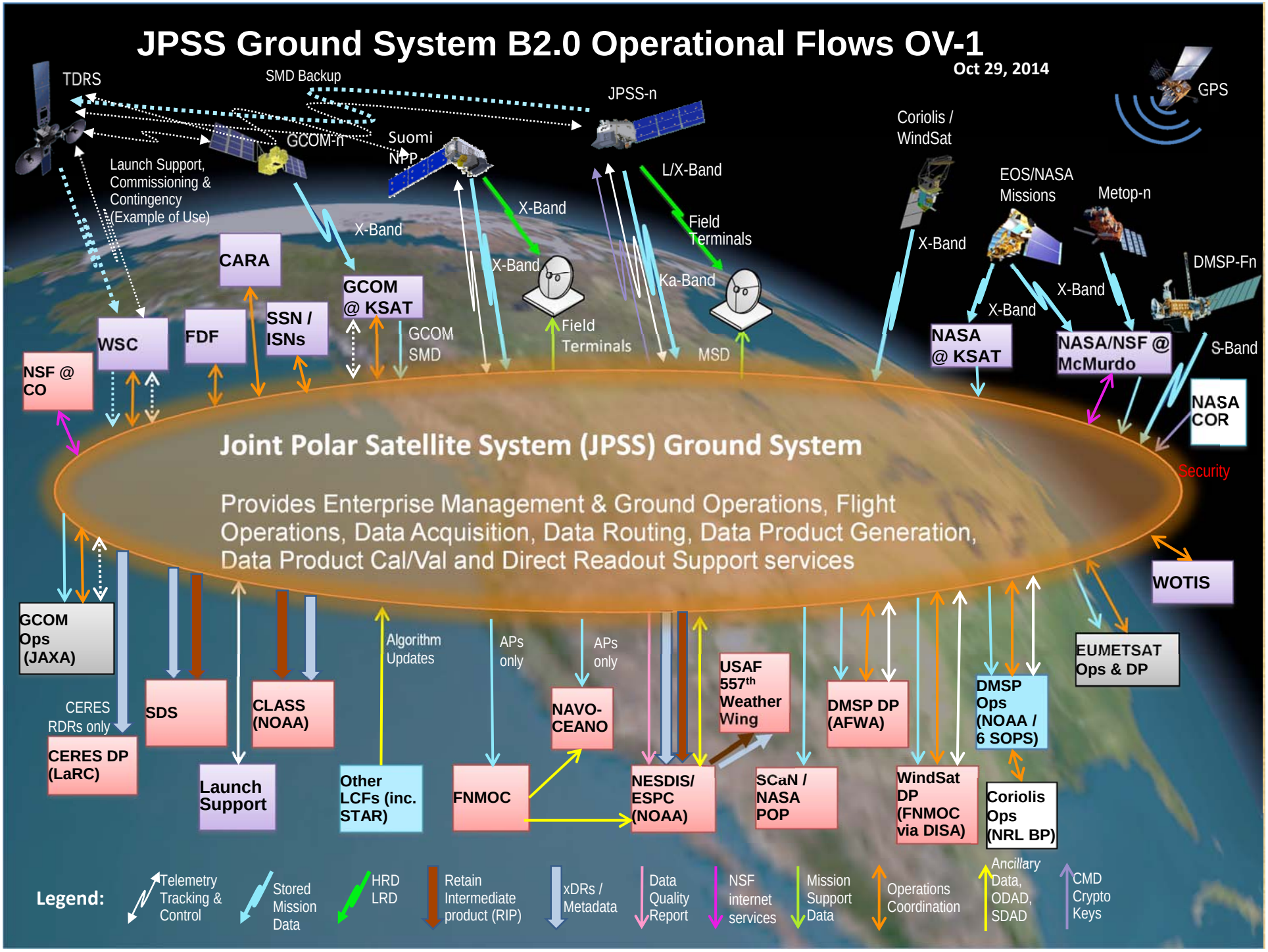
Joint Polar Satellite System
High Level Overview – OV-1




JPSS Ground System B2.0 Operational Flows OV-1
Oct 29, 2014
TDRS
SMD Backup
JPSS-n
GCOM-n
Suomi NPP
Launch Support, Commissioning & Contingency (Example of Use)
X-Band
L/X-Band
Field Terminals
Ka-Band
MSD
Coriolis / WindSat
GPS
EOS/NASA Missions
Metop-n
DMSP-Fn
S-Band
CARA
GCOM @ KSAT
GCOM SMD
WSC
FDF
SSN / ISNs
NSF @ CO
NASA @ KSAT
NASA/NSF @ McMurdo
NASA COR
Security
Joint Polar Satellite System (JPSS) Ground System
Provides Enterprise Management & Ground Operations, Flight Operations, Data Acquisition, Data Routing, Data Product Generation, Data Product Cal/Val and Direct Readout Support services
WOTIS
GCOM Ops (JAXA)
CERES RDRs only
CERES DP (LaRC)
SDS
CLASS (NOAA)
Launch Support
Algorithm Updates
Other LCFs (inc. STAR)
APs only
FNMOC
NAVO-CEANO
NESDIS/ ESPC (NOAA)
USAF 557th Weather Wing
SCaN / NASA POP
DMSP DP (AFWA)
WindSat DP (FNMOC via DISA)
DMSP Ops (NOAA / 6 SOPS)
Coriolis Ops (NRL BP)
EUMETSAT Ops & DP
Legend:
Telemetry Tracking & Control
Stored Mission Data
HRD LRD
Retain Intermediate product (RIP)
xDRs / Metadata
Data Quality Report
NSF internet services
Mission Support Data
Operations Coordination
Ancillary Data, ODAD, SDAD
CMD Crypto Keys

MBSE Application

- Leverage the Concept of Operations baseline to drive our “test as you fly” philosophy
- Map ConOps to the System Under Test, and identify Ops Procedures to leverage for test Sequence of Events
- Support mapping requirements from ConOps to Test Scenario for verification (ensures coverage) and identify verification products
- Develop detailed SV-4 views of the System Under Test to ensure Test Engineers understand the full scope of the system, scenario inputs and scenario outputs they need to address in their test

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MBSE Application

- Framework : DoDAF 2.1, UPDM 2.1
- Tool : MagicDraw 17.0.5
- Team size : 3-5 architects
- Modeling concurrently (Teamwork Server)
- 300+ diagrams created

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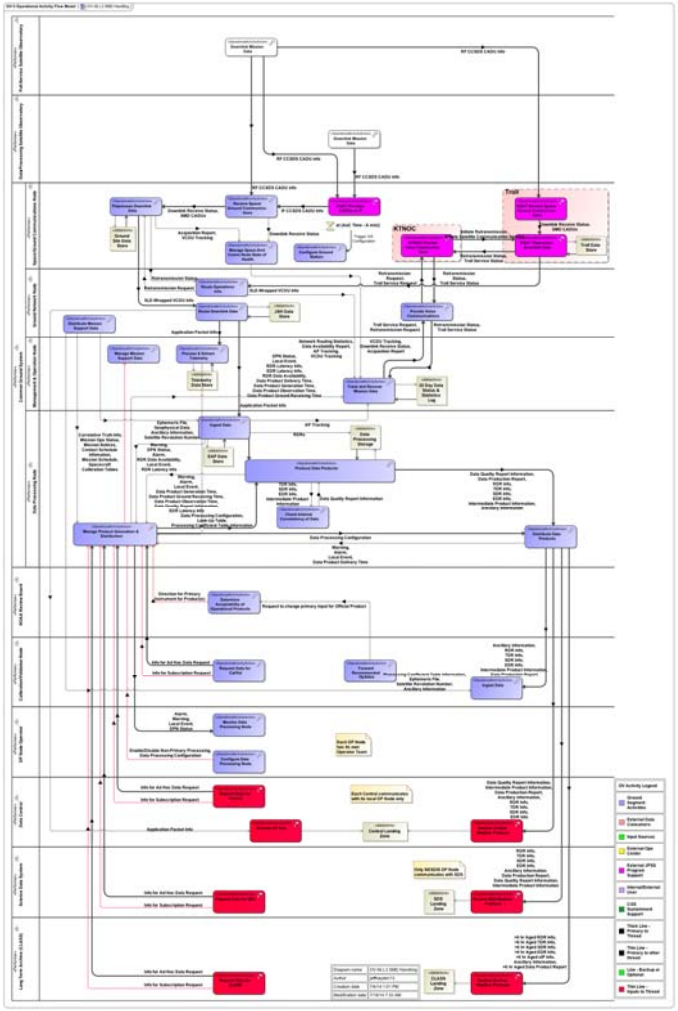
Views Utilized – OV-5b

- Describes operational activities between JPSS performers and external partners
- Exchanges show data passed between activities
- Became artifacts used in ConOps documents



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Views Utilized – SV-4

- Describes systems and functions
- Exchanges show data passed between functions
- SV-4s created from OV-5s to show allocated systems and functions

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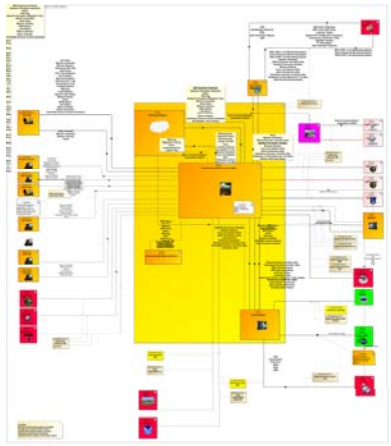
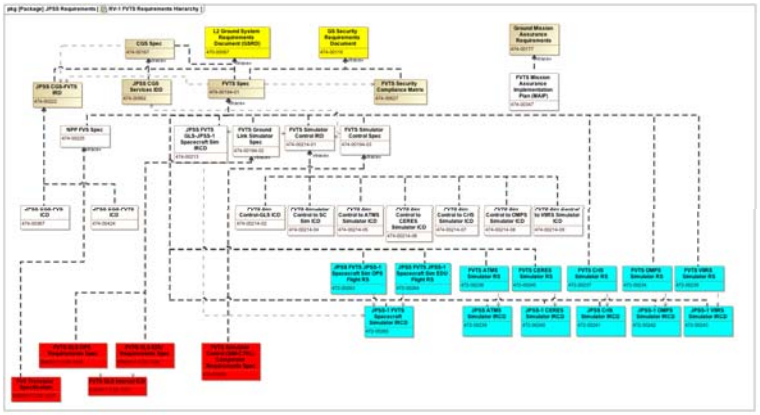
Views Utilized – Others

- SV-1
  - Included in JPSS IRDs
  - Used to develop ICDs
- RV-1 (Custom view)
  - Describes requirement hierarchy
- OV-5a
  - Operational activity decomposition
- SV-6
  - System resource matrices
  - Formatted list of all systems interactions
- Many more…





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Modeling Methodology

- Standard modeling technique
  - Critical for remote modelers
  - Diverse team skill
  - Diagrams are congruent to stakeholder audience

- JPSS architecture team methods
  - System Hierarchy
  - Legend formatting
  - Commit descriptions
  - Note/Comment
  - Layout inheritance

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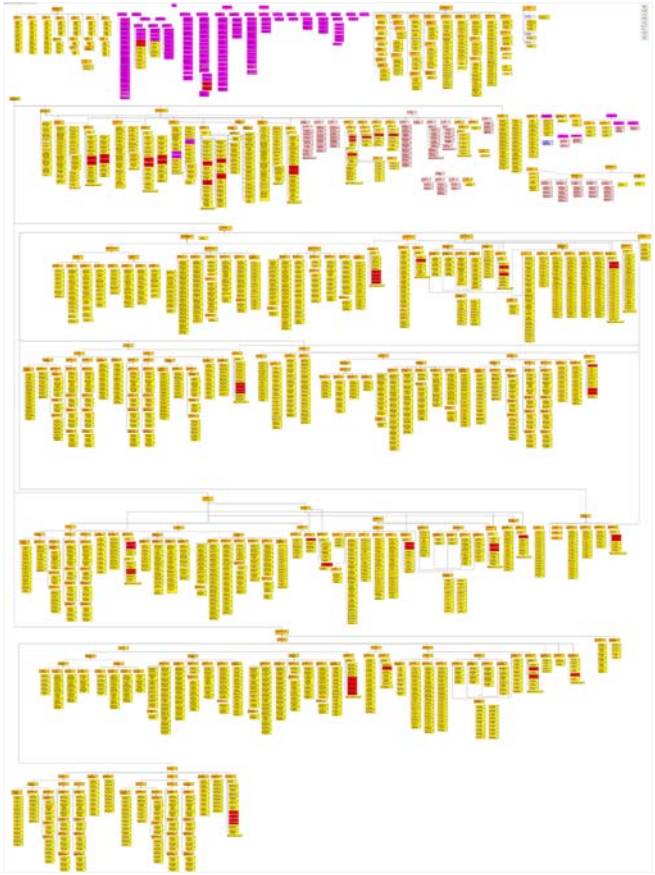
Team Methods – System Hierarchy

- All SV-4s populated from this hierarchy
- Maintains coherence throughout the model
- Describes internal and external systems



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Test as You Fly

- Functional validation inherent with verification program since the test program is driven from the ConOps work
- Existing ties via architecture between ConOps (OV-5b's) and Requirements helped with the mapping of requirements to Test Scenarios
- Modeling work
  - Architecture team modeling test scenario SV-4s
  - Test scenario SV-4s show input and output to other scenarios/activities
  - Currently being reviewed and finalized

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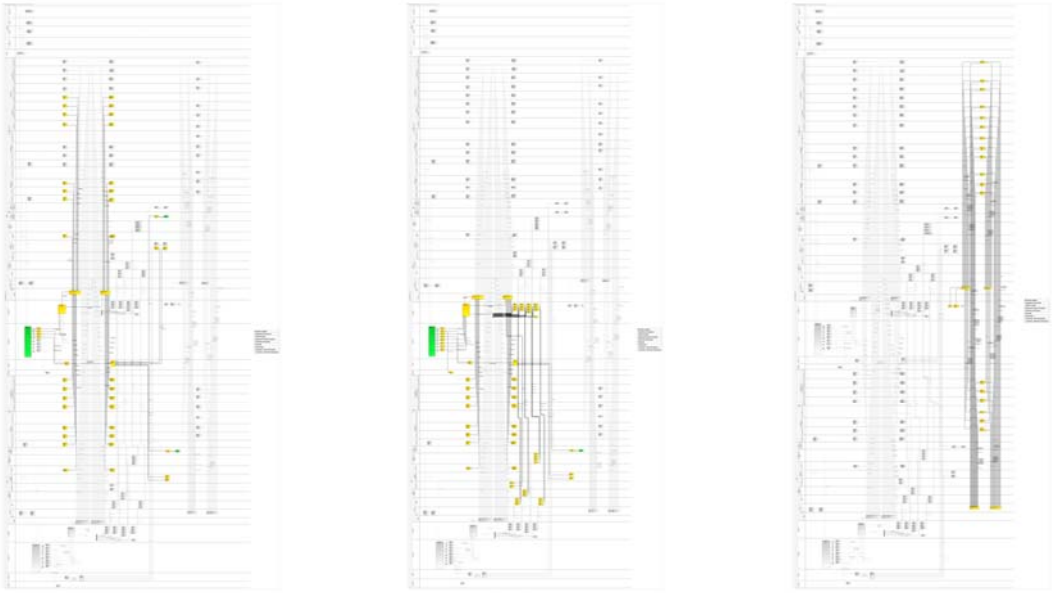
Current work – SV-4 inheritance

- Manage complexity through parent SV-4s
- Test scenarios inherited from parent SV-4s
- Each scenario is “highlighted” from the parent to show what functions will be tested; while still keeping context



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Path Forward

- **Test Procedures**
  - Test procedures needed to be created for test team
  - Each SV-4 test scenario describes several test procedures
  - Diagram each test procedure separately in the same inherited fashion

- **Model CM**
  - Model clean up
  - Baseline current version
  - Move to next revision

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Conclusion

- JPSS architecture modeling continues to be crucial to the development lifecycle
- Large model to get larger
- Early creation of modeling methodologies allows continued work with small team
- MBSE ensures consistency across SE domains

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Questions

- Thank you for listening

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