

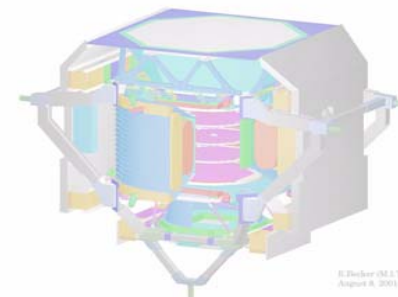
AMS-02 Flight and Commanding Software Development

Peter Dennett
PADSOFT, Inc

@ CERN

Jul 2004

Which Software Is This?



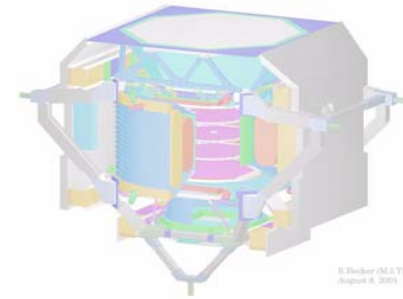
Flight Segment - Software that runs on the JMDC

- ❖ JROM - "BIOS" code A. Kounine
- ❖ JOS - Operating system X. Cai
- ❖ JAP - Applications software X. Cai

Ground Segment - Command construction and delivery within the POCC

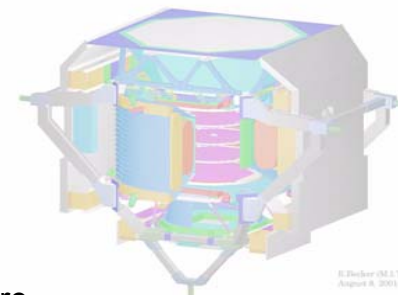
- ❖ Commanders A. Lebedev
- ❖ Near Real-time monitors A. Lebedev
- ❖ Interfaces to STS and ISS
command acceptance systems,
POCC H&S distribution. A. Lebedev

Management Process

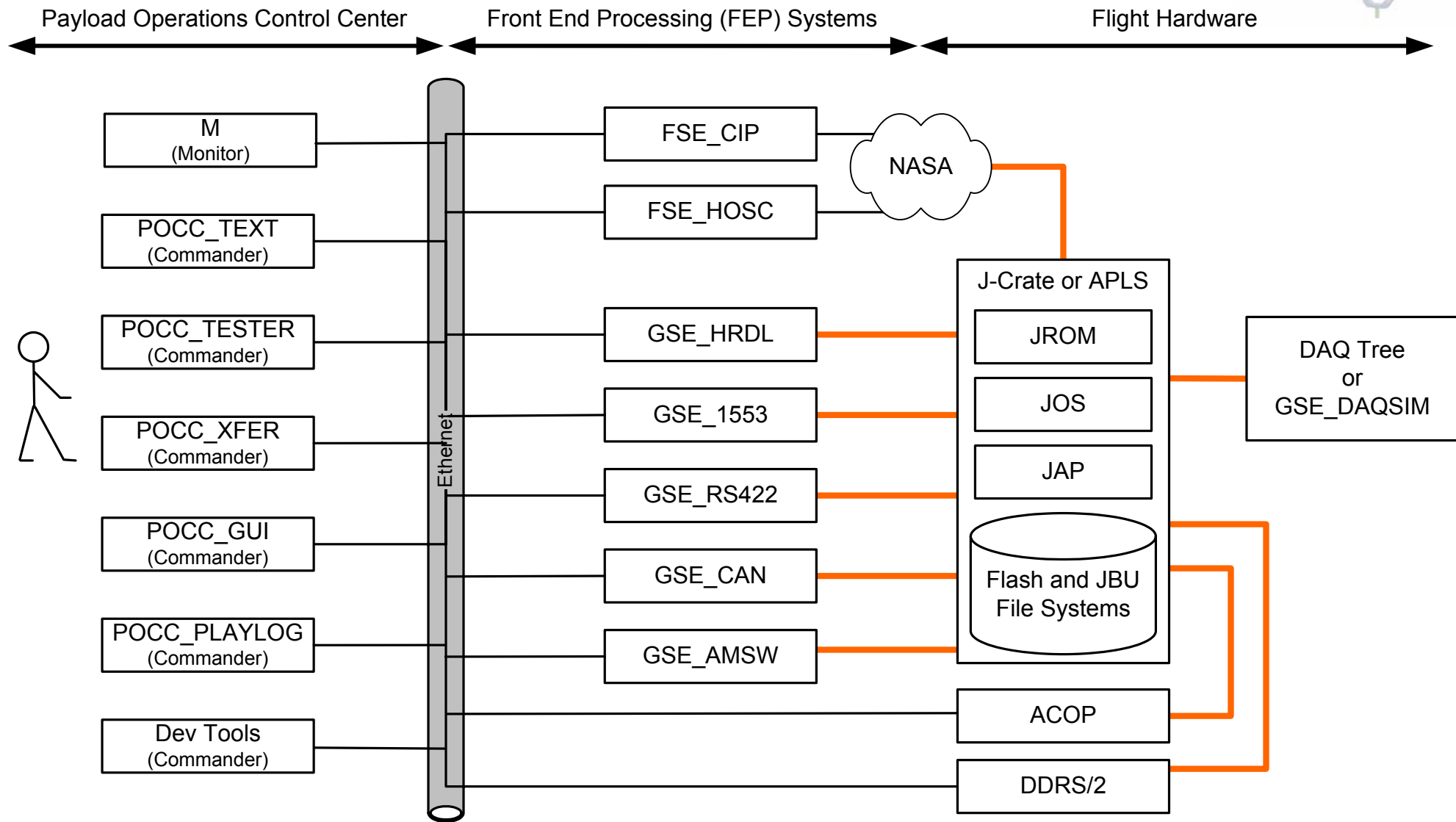


- ❖ Avionics software developed under AMS-02 internal document: "AMS-02 Command and Data Handling ICD" Current Rev 05j. This has been reviewed informally by ISS avionics book managers.
- ❖ Monthly software interchange meetings (SIM) tracking schedule and design issues.
- ❖ Early testing with ISS program as risk mitigation

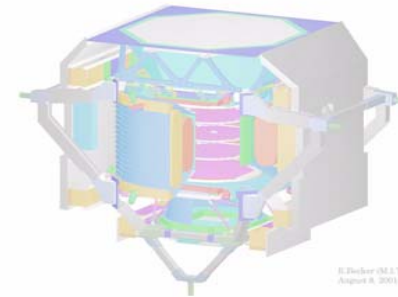
Network Design



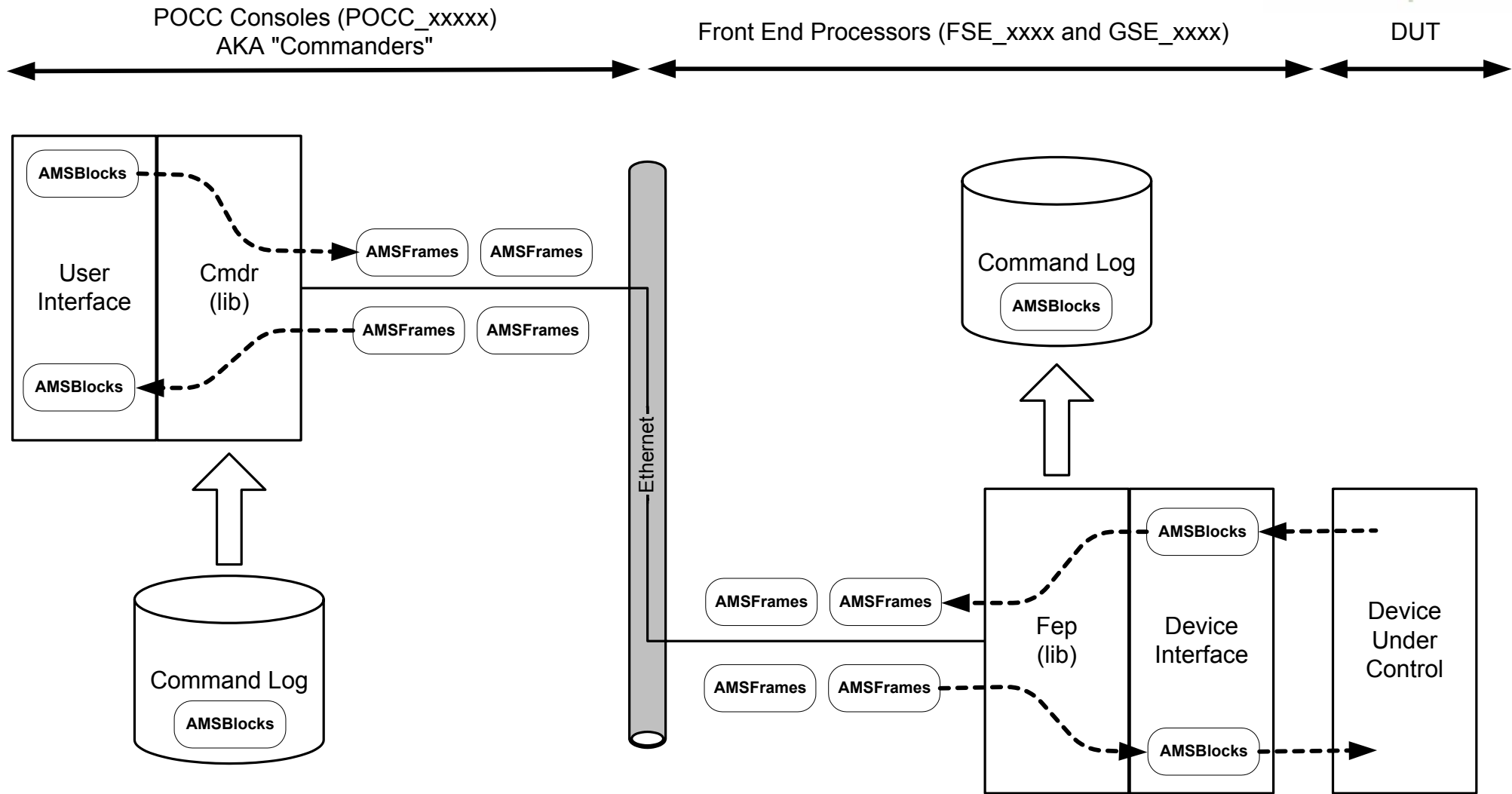
© Lockheed Martin
August 8, 2004



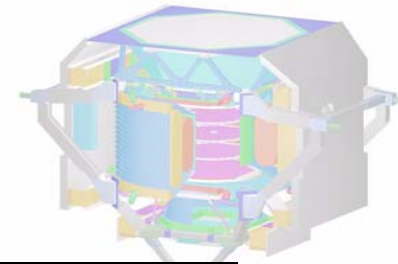
POCC Console to FEP Design



© Padsoft (M.S.T.)
August 8, 2004

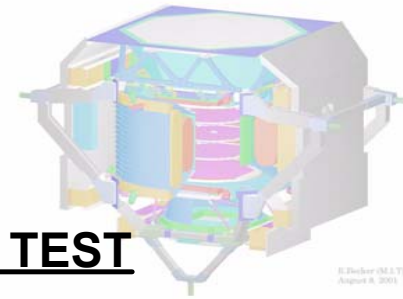


Development Schedule



Name	Description	Rev Level	Responsible	Target Date
JROM	J-Crate Rom Monitor	R00	AK	1-Aug-04
JOS	J-Crate Operating System LINUX	R00	XC	10-Jun-04
JAP	J-Crate Applications Program(s)			
	- AMSW & HRDL	R00	XC	10-Jun-04
	- CAN (Master)	R01	XC	19-Jun-04
	- CAN (Slave) & 1553	R02	XC	30-Jul-04
GSE-HRDL	Ground support for HRDL testing	R00	AL	30-Jul-04
GSE-BC	Ground support for 1553 testing	R00	AL	15-Aug-04
GSE-DAQSIM	Event simulator	R00	AK & XC	30-Aug-04
GSE-CAN	USCM emulator testing tool	R00	??	??
Commanding	POCC commanding applications			
	- Graphical test tool	R00	AL	30-Aug-04
	- Text test tool (hex data entry)	R00	AL/PD	15-Aug-04
	- Tester tool (cycles tests)	R00	AL	30-Aug-04
	- File Transfer test tool	R00	AL/PD	30-Jun-04
eCOS	- JOS (and JROM) candidate	R00	XU	15-Aug-04
	- JAP candidate AMSW, HRDL, & CAN			
ACOP/PFM	ACOP Pico FM HRDL testing tool	R00	PD	30-Aug-04
DDRS/2	RS422 testing tool	R00	PD	30-Aug-04
DIT	Detector Interface Test		VK	15-Sep-04
	Selection of JOS and JAP designs		all	15-Aug-04
FIT	Functional Integration Tests		XC	15-Jan-05
FSE_HOSC	Flight support for HOSC interfaces (TReK or "generic user")	R00	PD	1-Oct-04

Avionics Test Time Line



Preliminary Interface Tests (PIT)

- Completed June-2003.
- Low level design validation tests for LRDL (1553) and HRDL hardware.
- Functional test of HRDL via APS.
- Low fidelity functional tests of LRDL via STEP and OIU lab.

NASA TEST

© Lockheed Martin
August 2004

❖ **Functional Integration Tests (FIT)**

- Targeted for: Q1 2005 at KSC PTCS.
- Equivalent to ISS Program CDH "Multi Element Integration Tests" (MEIT).
- Functional tests to verify the AMS-02 Command and Data Handling system, the AMS-02 ground segment, and their relationships to HOSC/POIC.

AMS TEST



❖ **Johnson Integration Tests (JIT)**

- L-6 months.
- Integration tests of POCC in JSC MCC. CIP & HOSC communications checks.

AMS TEST



❖ **Mating Integration Tests (MIT)**

- L-4 months
- Free standing J-Crate QM and ROEU units mated to Shuttle at OPF during mission processing

AMS TEST

❖ **Kennedy Integration Tests (KIT)**

- L-3 months.
- Final integration tests perform in SSPF. ISS Program checkout of flight systems.

NASA TEST



❖ **Shuttle Operations Checkout (SOC)**

- L+90 minutes

AMS TEST

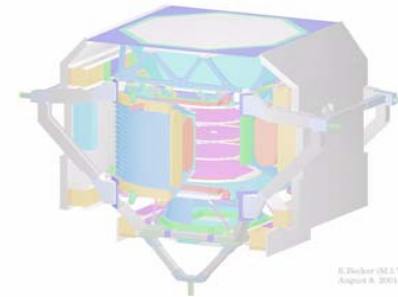


❖ **ISS Operations Checkout (IOC)**

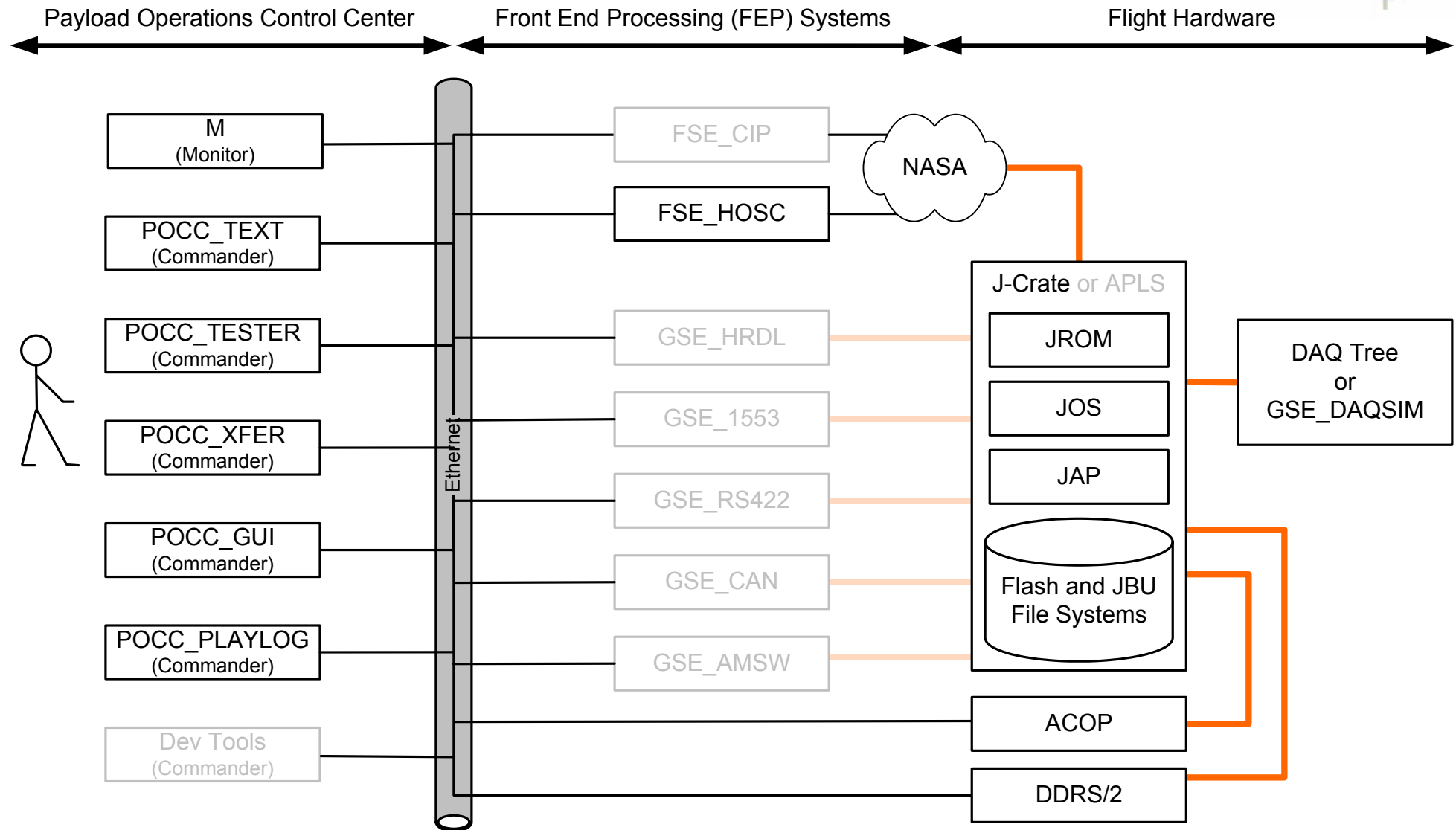
- Transfer + 90 minutes and as needed

AMS TEST

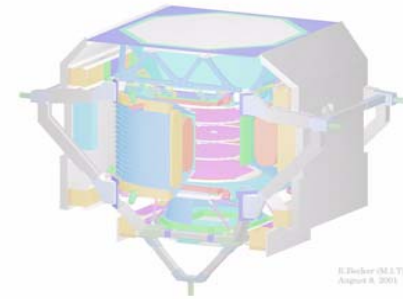
FIT - Software Under Test



© Lockheed Martin
August 8, 2004



FIT - Test Segments



- ❖ Offline checkout test
- ❖ Interface Compliance test
- ❖ Ground segment commanding test
- ❖ PDL command test
- ❖ Housekeeping data test
- ❖ Cold start and initialization test
- ❖ PDL telemetry test
- ❖ HRDL end to end test
- ❖ ACOP operations test
- ❖ Nominal operations test
- ❖ Telemetry recording session
- ❖ Telemetry loading test
- ❖ T-0 1553 and RS422 operations test
- ❖ OIU 1553 operations test