



Flight Software

Matthew Hayden
Software Engineer
NRL
202 767-9196
Hayden@nrl.navy.mil



Top Level Requirements



- **Five Software CSCIs**
 - **System Resource Manager (SRM)**
 - **Command and Telemetry (C&T)**
 - **Stored Commanding (SC)**
 - **Attitude Determination and Control (ADAC)**
 - **Orbit Propagation (OP)**
 - **Payload Controller (PC)**
 - **Fault Detection Isolation and Recovery (FDIR)**
- **Six Hardware Functions**
 - **Uplink/Downlink Module (UDM)**
 - **Spacecraft I/O (SCIO)**
 - **ACS/RCS Module**
 - **Data Recorder and I/F Module (DRIM)**
 - **Power Converter and Time Distribution (PCOXO)**
 - **Flight Processor (FP)**
- **Configuration Management, Quality Control, Safety, Security**



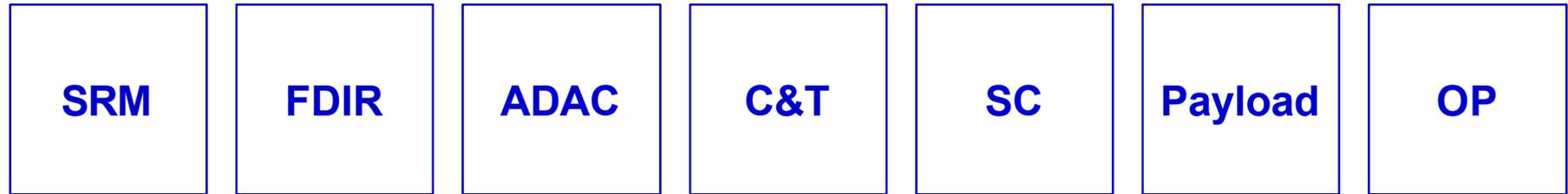
Current Baseline Approach (1 of 2)



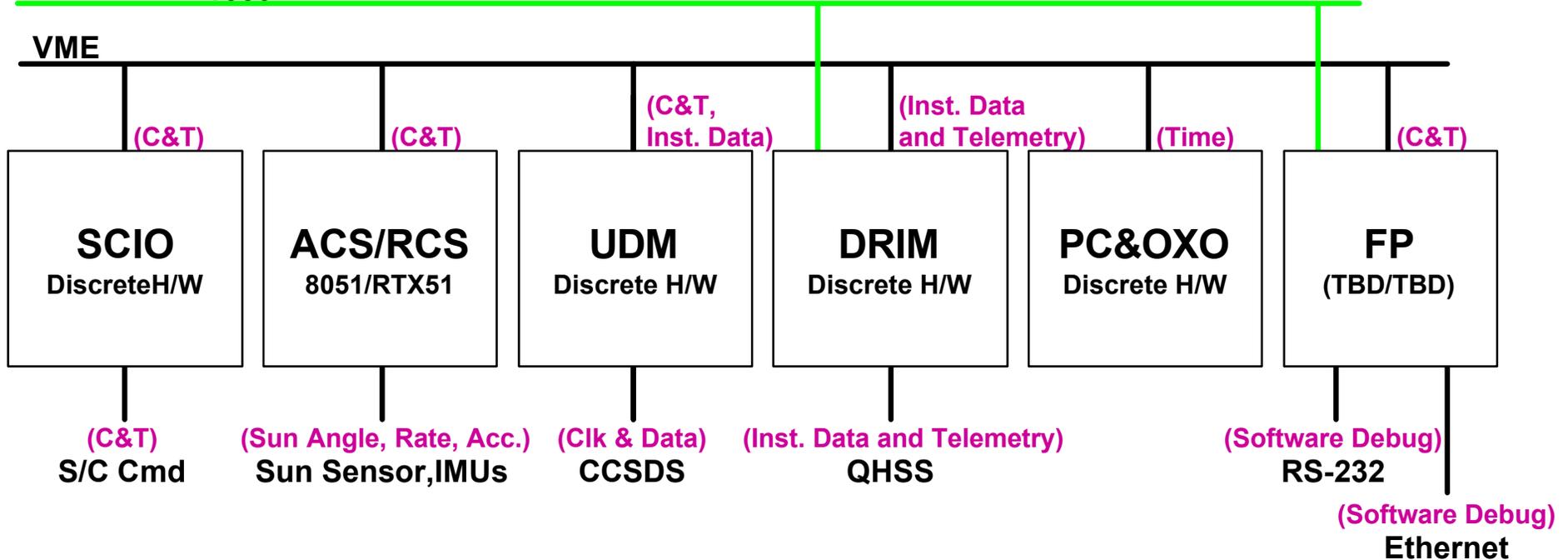
- **Implement a Forward Design Process**
 - Document the Process With SRS/SDP, SPS, STP
 - Current Industry Design Standards (UML)
 - Current Industry Coding Standards (GNU, Metrics)
 - Use Automated Design Tools
- **Configuration Management**
 - For Source Code, Design, and Documentation
- **Hardware and Software Reuse**
 - Telemetry, SCL, Orbit Propagator, ADAC
 - ISC: Flight Processor, DRIM, SCIO, UDM
- **Integrated Test Environment**
 - Plan Ahead for Fluctuating Hardware/Software Platforms



Current Baseline Approach (2 of 2)



(Instrument C&T, Star Tracker Data)
1553





Trade Studies



Evaluate the Design/Develop Suite for future NRL Growth
Maturity, flexibility, Ease of Use, Performance, Cost

- **Design Tools**
 - Visio, Rose, OO CASE Tools
- **Software Development Tools (Compilers, Debuggers, cm Tools)**
 - Green Hills, Wind River, ClearCase/Multisite, GNU
- **Database Tools**
 - Access, Rhapsody
- **Test Tools**
 - Legacy Tools Available
- **Operating System**
 - VxWorks vs ECOS



Issues



- **SOW in Place for Software Development and Training?**
- **Personnel and Availability?**
 - **Impacted By the Results From the Trade Studies**
- **Software Development System**
 - **Should Be in Place Before Design Is Started**
- **Is the Legacy Hardware and Software Useable?**
 - **VME and 1553**
 - **Flight Processor Selection**
 - **Software Design Portable to New Hardware**



Top Level Schedule



- **FAME Milestones**
- **Flight Software Milestones**
- **09/00 - Project Start**
- **11/00 - Draft SDD to include Software Requirements (SRS)**
- **11/00 - System Requirements Review**
- **12/00 - Draft CM Plan**
- **01/01 - ICS selection, OS Selection, toolset selection**
- **05/01 - Preliminary Design Review**
- **06/01 - Working SDD, Working CM Plan, Draft STP**
- **09/01 - Breadboard ICS/FP available**
- **01/02 - Working STP**
- **02/02 - Critical Design Review**
- **05/02 - Software Build 0 on Breadboard - Initial Software Testing**
- **01/03 - Software Build 1 on Flight Hardware**
- **06/03 - Software Build 2 on S/C**