SVIL GPSIIR Modernization Using NI Technology

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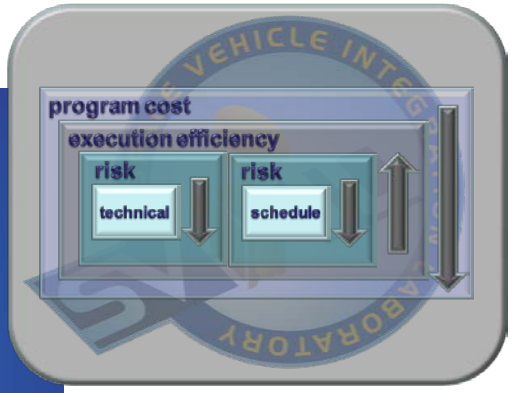
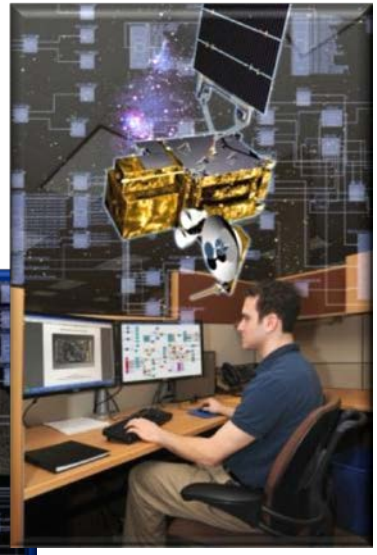
SVIL Business Case - Executive Summary

Four foundational SVIL capabilities promise to increase execution efficiency and lower program costs:

1. **Model-Based Graphical Software with Autocode capability for Embedded Systems Software**
2. **Low-Cost Test Beds introduced early in the lifecycle that fill a crucial gap in a suite of simulation capabilities currently on typical programs**
3. **Risk Reduction testing using Rapid Prototyping with Models and Test Beds in critical risk areas**
4. **Early Lifecycle Testing on heritage and new software products to gain customer confidence and mature the end software product**





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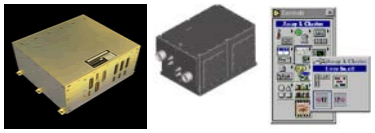
SVIL Architecture, Products & Services

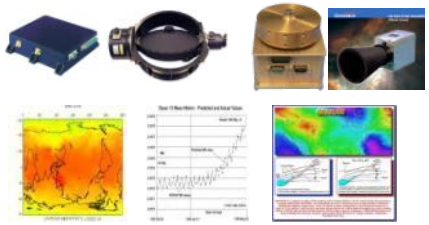
Model Domain

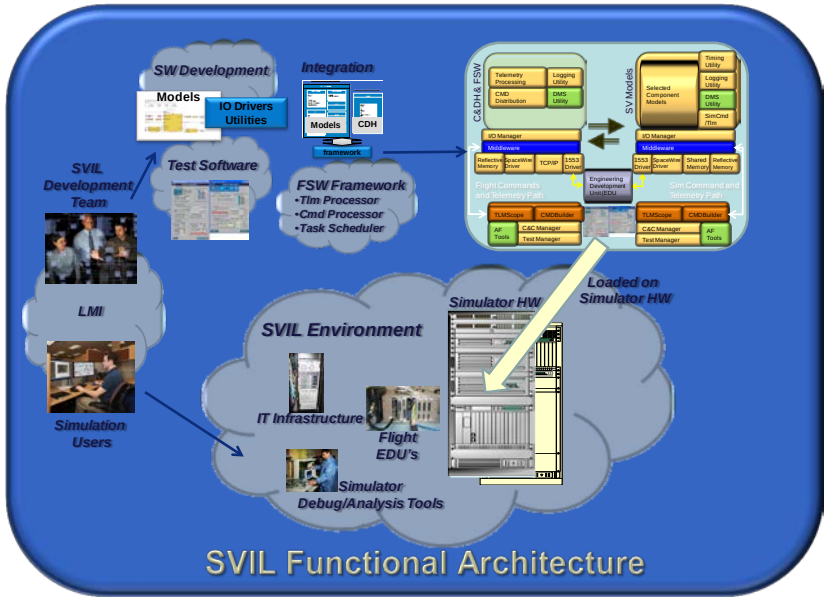
Flight Software

C&DH Models



SV Component Models



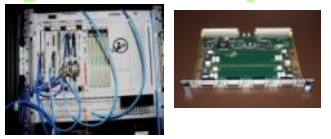


Simulator

User Interface

SVIL Simulator Hardware Platforms

Physical I/O Capabilities



SVIL Simulation Framework

Services/Other

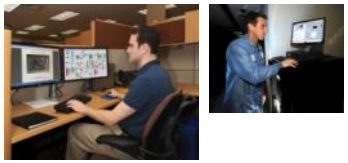
Website/Sharepoint

Lab Management

Marketing

SVIL
SPACE VEHICLE INTEGRATION LABORATORY

SVIL Services



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Project Background

- **GPSIIR SPU/STE**
  - **simulation platform for validating FSW prior to uploading to on orbit satellite**
- **GPSIIR STE Enhancements**
  - **Current Hardware Architecture:**
    - **STE – Specialized Test Equipment**
    - **SPU – Spacecraft Processing Unit**

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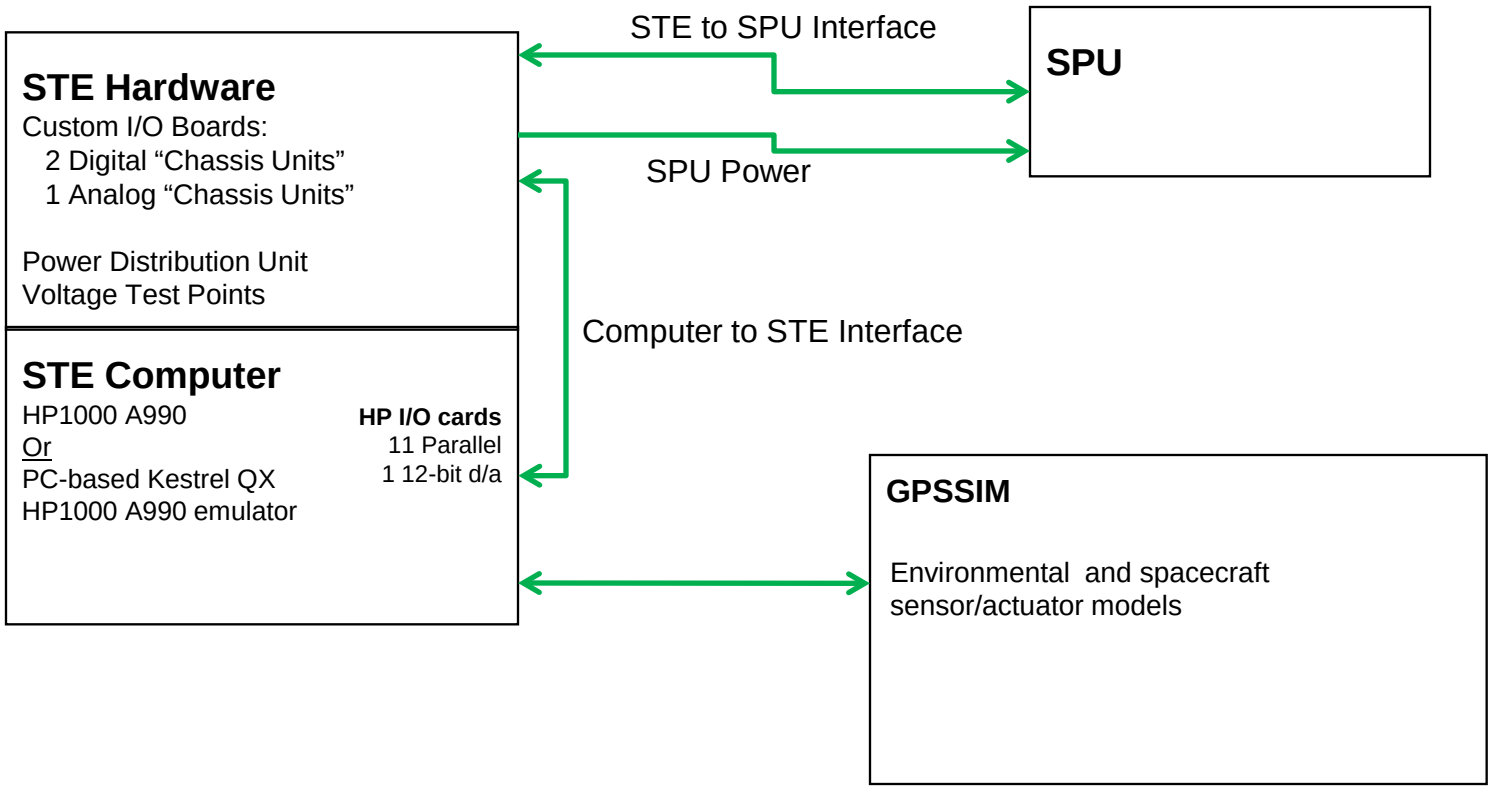
Current System Architecture



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Current STE Computer

- **HP 1000 A990**
  - **Functions as I/O host for STE**
  - **Circa 1990 hardware/software**
  - **HP parallel interface cards**
  - **Not easily configurable**
    - **Must disable certain features to test flight software, can't "test like you fly"**
  - **Requires unique skill sets**

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GPSIIR Architecture Trades

- **Solution #1 – Hardware Interface Box (HIB)**
  - **Not deterministic**
  - **Not enough TTL I/O**
  - **Want a solution we can maintain ourselves**
  - **Need better growth potential**

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GPSIIR Architecture Trades

- **Solution # 2 - VME COTS**
  - **FPGA Integration relatively difficult**
  - **Requires ‘traditional’ development toolsets**
  - **Low backplane throughput**
  - **Less growth capability**

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GPSIIR Architecture Trades

- **Solution #3 – NI PXIe System**
  - **Easiest FPGA Integration**
  - **Simplified Technical Design**
    - **Much higher throughput than we need – room to grow**
    - **Point to point bus topology**
  - **More Rapid Development Time**
    - **One environment - LabView**
    - **Free from burden of low level software elements**
      - **Focus effort on specific challenges related to program**
      - **Prototyped with multiple architectures**

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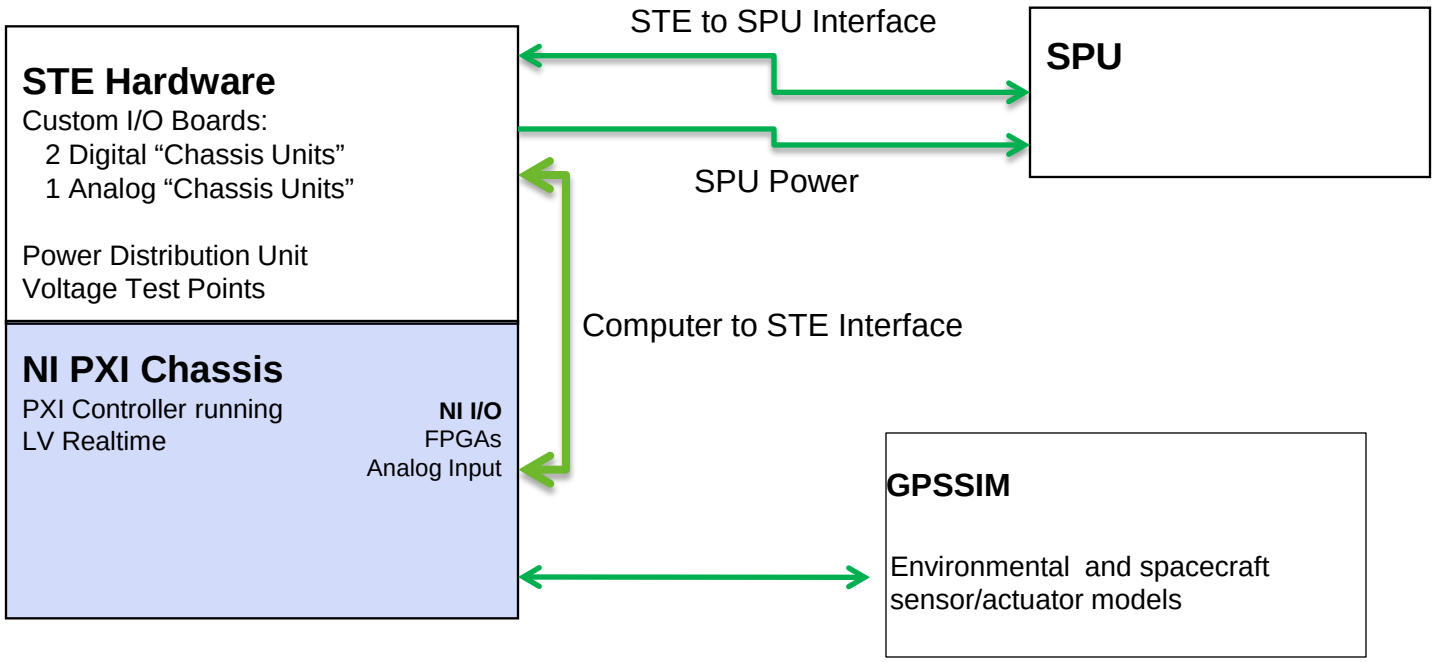
System Architecture



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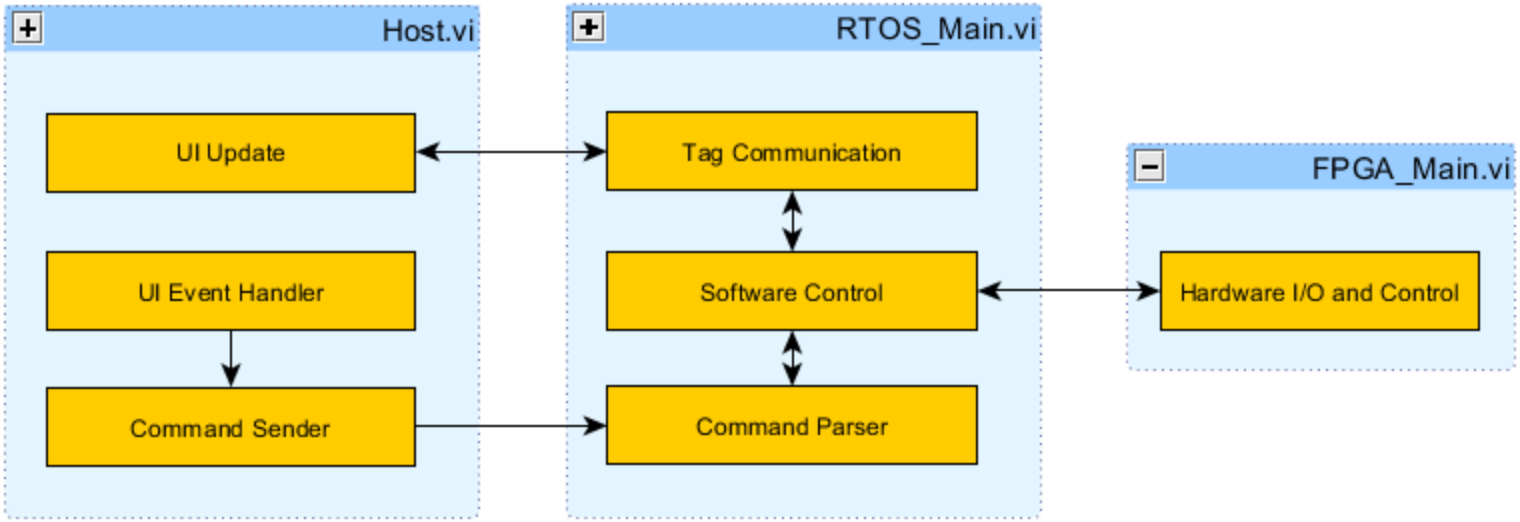
System Architecture

- **Typical Real Time/FPGA Architecture**
  - **External Command Host**
  - **Real Time Controller**
  - **7854R RIO FPGAs**
  - **6255 Analog Input Card**



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NI Support

- **Loaner equipment**
  - **Lowers cost**
  - **Removed procurement from development process**
  - **Technical Support**
    - **Design Reviews**

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Maintenance

- **NI Premium System Assurance**
  - **5 year warranty service**
    - **After warranty period system evaluated for active products**
  - **5 years calibration**
- **NI Yearly Software Support Plan**

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STE Enhancements

- **Reduced risk to on-orbit assets**
  - **Faster patch development & validation**
  - **“Test like you fly”**
    - **No longer will need to disable large portions of FSW to run on SPU-STE**
  - **Patches can be fully validated on ground**

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SVIL Benefits

- **Introduces new capability to SVIL Simulator domain**
- **Pioneering LabVIEW and NI hardware for HWIL testing**
- **Entry into adjacent market**
  - **New product possibilities**
  - **Potential for growth and expanded capabilities**

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