

A Model Based Toolset for Supporting Rapid Integration and Verification of Spacecraft Electronics

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Friday, February 02, 2007

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Overview

- CASM
- Goal: Support online verification of rapidly integrated spacecraft
- Visual Design Environment for modeling devices
- Platform Specific Middleware
- On board Self – test

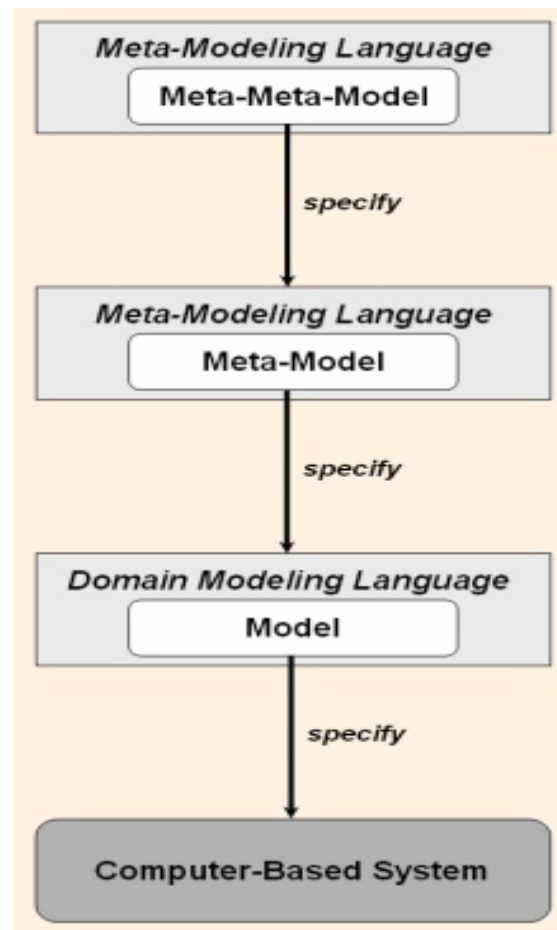
Challenges in Rapid Integration

- Responsive Space Initiative: USB-based plug-n-play electronics
 - Rapid System Integration
 - xTED: Electronic Data Sheet
 - Middleware for dynamic device integration
- Question: How to verify the integrated system?
 - Were the proper devices “plugged in”?
 - Does the system have all the necessary components?
- Our Approach:
 - Model-based toolset for capturing integrated system
 - Synthesis of platform-specific communications middleware
 - Generation of on-board-self-test for verifying system integration

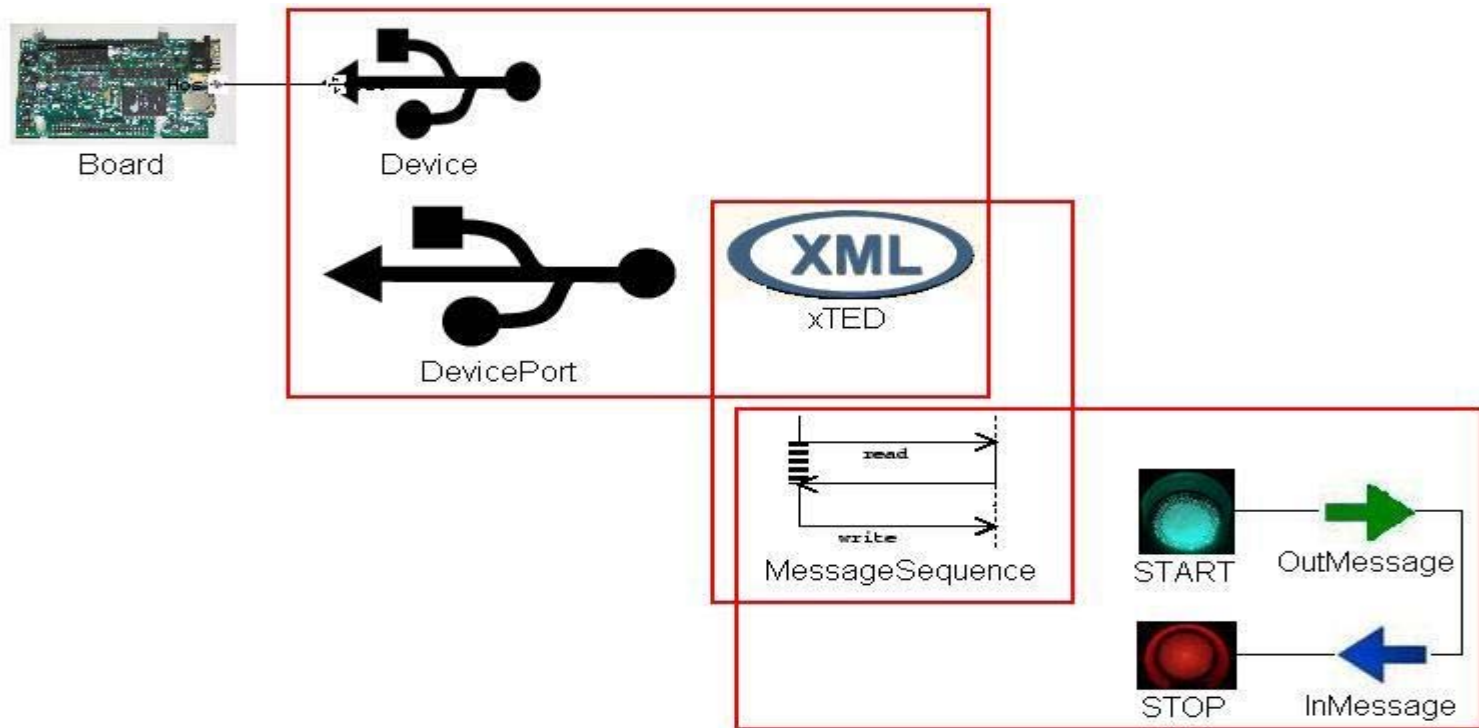
GME: Generic Modeling Environment

- Visual modeling tool to create graphical models
- Capable of creating a domain – specific modeling environment
- It has the capabilities for rapid code generation

Working of the GME

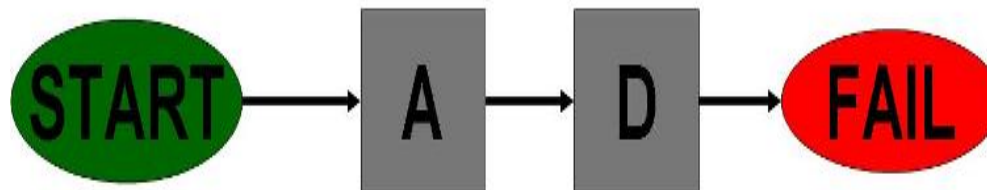
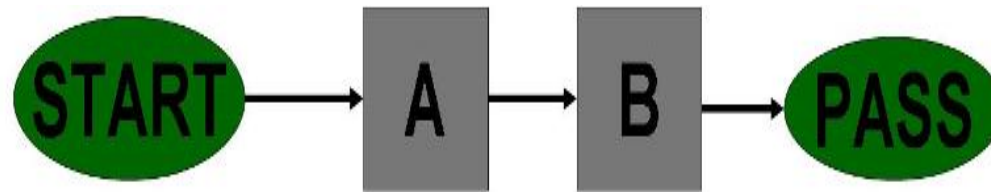


Using GME for Modeling Spacecraft Electronics



Modeling Device Communication

- Device-specific message sequences
- Facilitate determining health status of device



USB

- USB host controller provides device recognition and enumeration for plug and play
- **libusb** is used to write user space drivers for device I/O
- libusb gives us the capability to read and write directly to the endpoints of USB devices
- libusb is cross-compiled for the target platform and ported onto the target platform

xTED

- Models the USB device completely
- Contains all information about configurations, interfaces and endpoints of the device.
- xTED augmented to contain message sequences for each device

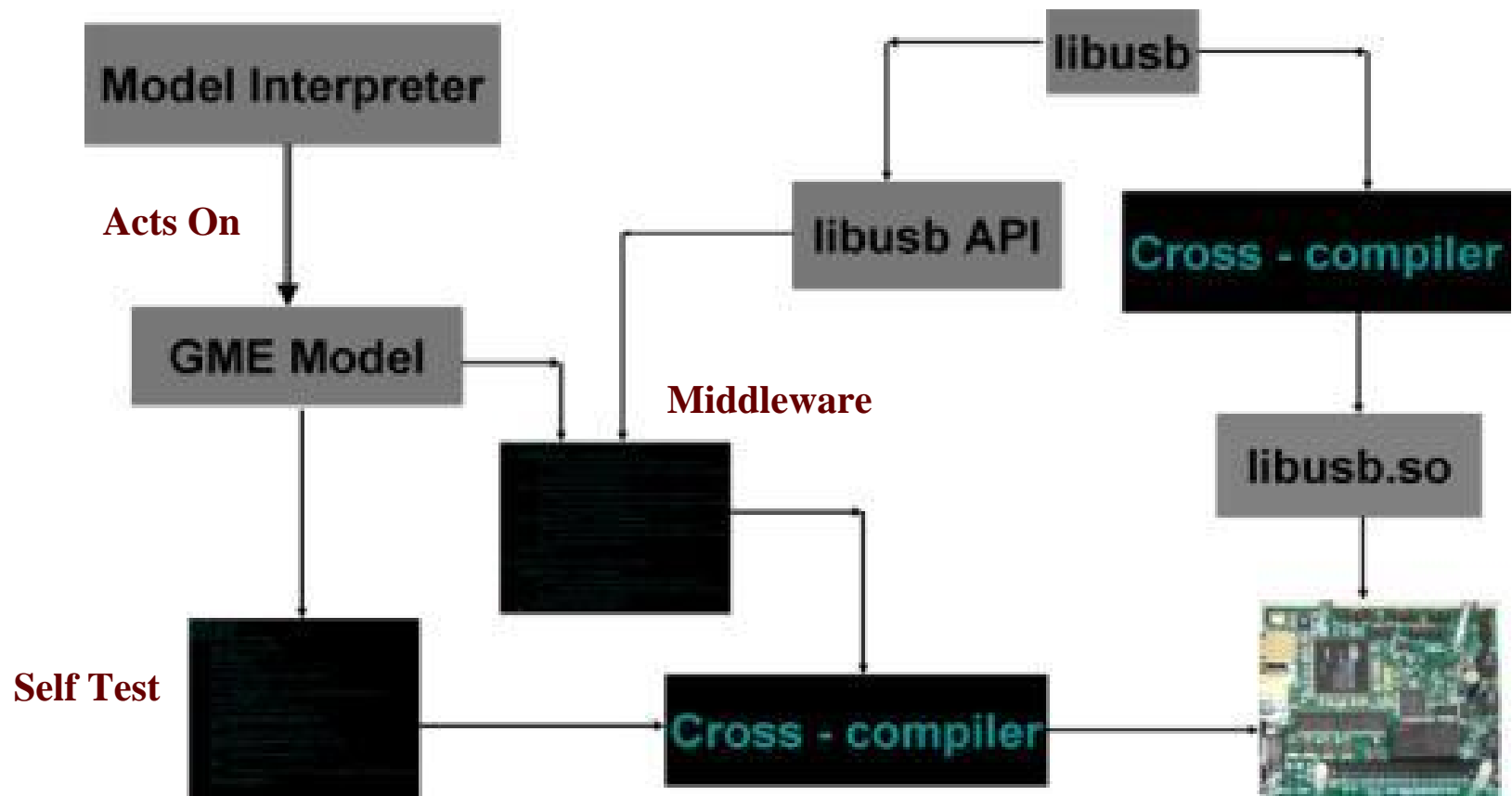
Platform-Specific Middleware Generation

- Device communication middleware automatically generated from system models
- Built on libusb infrastructure
- Middleware is user-accessible for data and control I/O

Program Synthesis



Process Flow



Target platform

- TS – 7260
 - ARM based processor
 - Linux



USB Device

- DLP Sensor
 - Temperature Sensor
 - Re – programmable PIC
 - USB-Serial Interface





Questions
