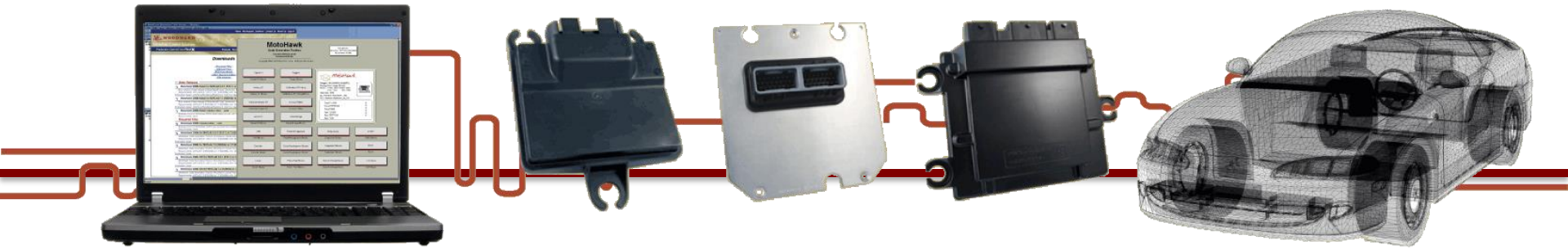
New Eagle

Raptor

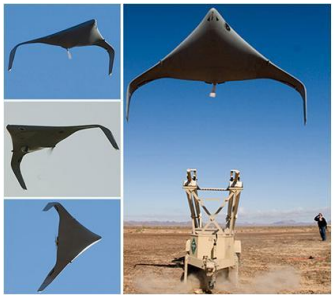
Model-Based Control System Development Platform



New Eagle

Raptor Overview

Vehicle, Industrial & Power Generation Controls



New Eagle 3588 Plymouth Road, Box #272 Ann Arbor, MI 48105-2603 PH: 877.234.1410 FAX: 270.964-8706

New Eagle

Raptor Overview

Development Platform for Full System Lifecycle

- Control system development tool suite for taking a project from start to finish including:
  - Concept, ECU & Component Specification
  - Design & Software Development using Model-Based Development
  - Hardware / Wiring Development
  - System Integration and Calibration
  - Validation
  - Production
  - Service

Raptor Control Development System

- The Raptor development system allows customers to bring new products and features to market quickly
  - Fast development cycle times
  - High flexibility
  - Customer ownership of control strategy IP
- Comprises a suite of controller products, industry-standard software tools and application engineering expertise
- End-to-end suite of tools for full product lifecycle

Prototype on Production Hardware

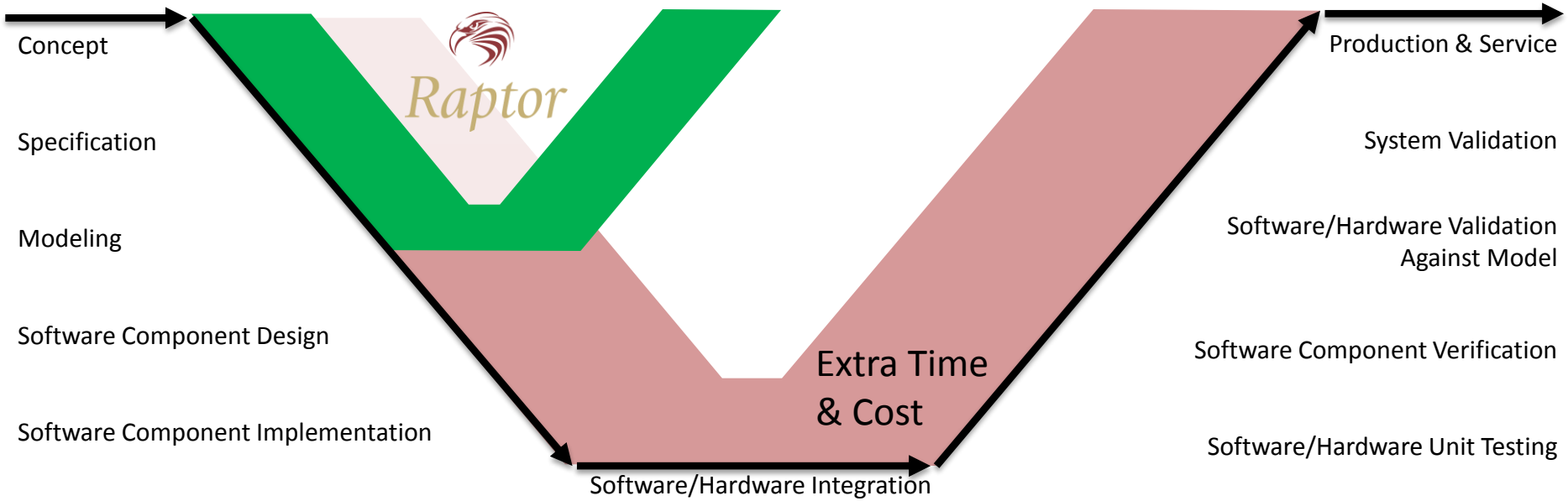
- Achieve both cost and time savings using the same hardware through the whole system lifecycle
- Avoid extra iteration cycles needed to convert (shoe-horn) prototype design to production hardware
- Harness / physical design can run parallel to controls development

Raptor Overview

- Model-based controls development environment for simulation, rapid prototyping, and production controls development
- Built upon MATLAB, Simulink, and Simulink Coder
- Raptor Build Engine handles the setup and configuration of all processor resources and includes XCP support for secure calibration of the ECU
- Allows the same software to be targeted/compiled to multiple ECUs with minimal changes to the model

Why Model-Based Development?

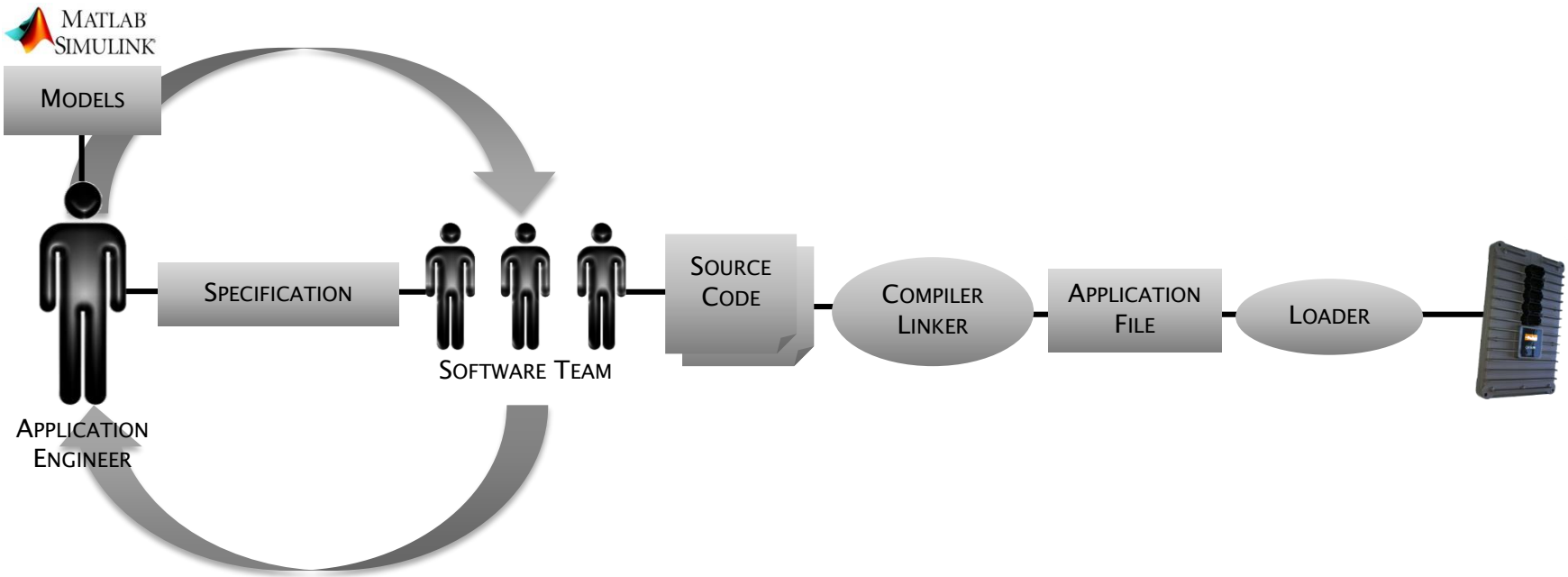
- Shortened V-Cycle for Model-Based Software Development



- Leverage proven design elements & code-generation to create software vs. one-off hand created elements & source code
- Proven ECU hardware reduces H/W verification efforts

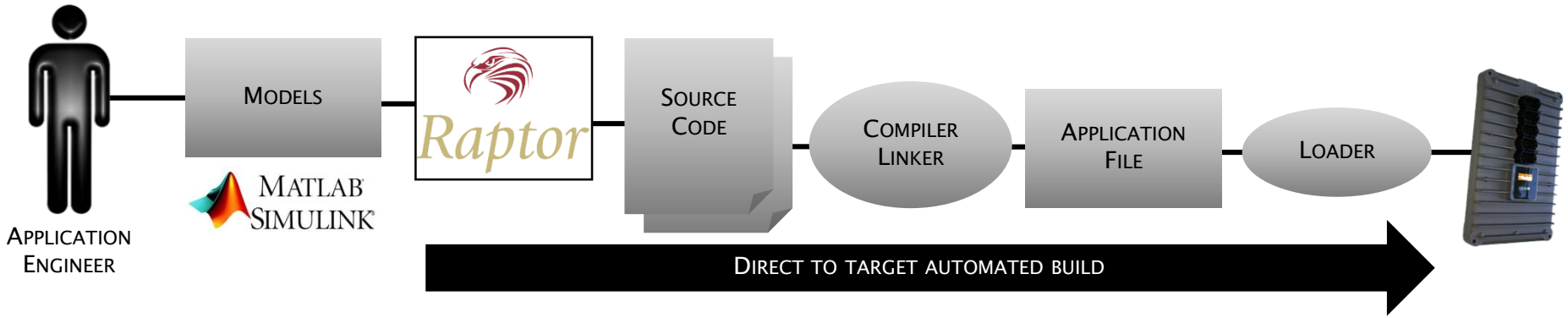
Why Model-Based Development?

- Traditional Development Process
  - 'Paper' handoffs, opportunity for misunderstanding from person to person
  - Opportunity for variability in tool-chain from ECU to ECU, project to project



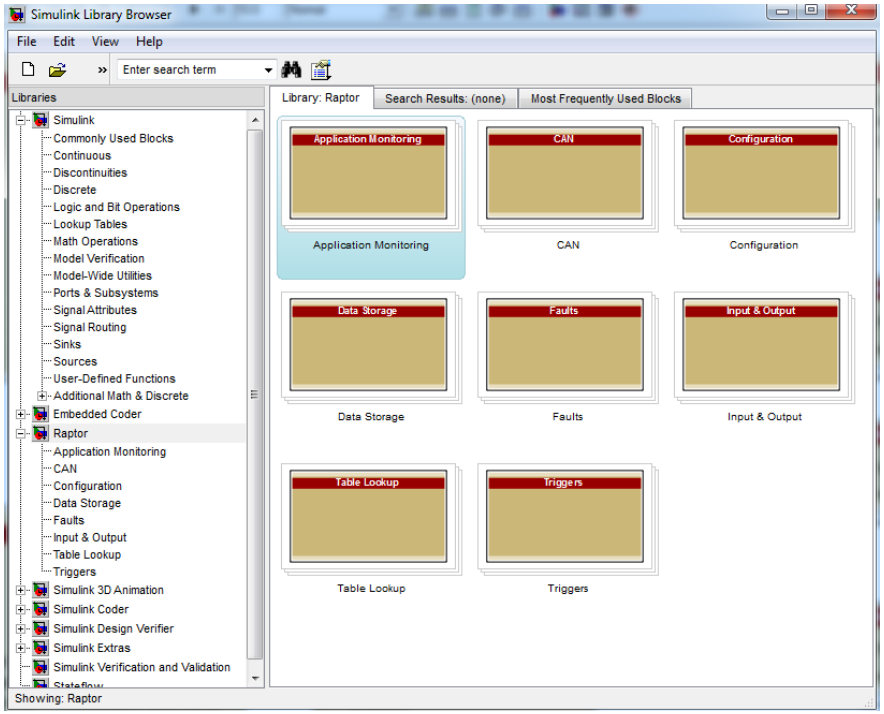
Why Model-Based Development?

Automated Model-to-Executable Build Engine



Why Model-Based Development?

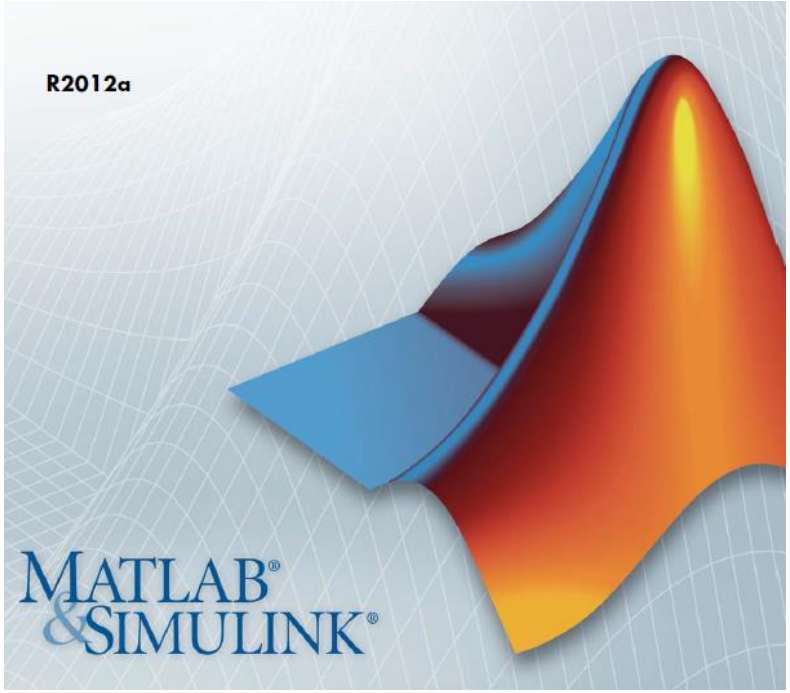
- Consistent application development interface across ECU hardware
  - Software portability across Raptor hardware platforms (libraries, software subsystems)
  - Leverage training & infrastructure across products / platforms



Model-based Tools

Built on latest MathWorks Toolset

- Targets 2012a+ Simulink, Simulink Coder, Embedded Coder
  - Improved code efficiency over prior releases
  - Code generation report enhancements
- Possible support of Model Reference for enhanced software modularity & build efficiency
  - Incremental code generation for top-level models



Raptor Architecture

Application Layer

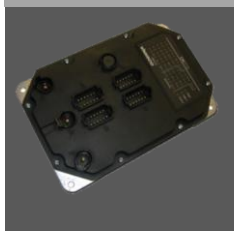
Sensor Software Component	Control Application Software Component	Actuator Software Component	MATLAB SIMULINK Model-Based System Architecture	Re-useable Customer Libraries	Raptor Application Libraries & Protocols (J1939, XCP, OBD, etc..)
Raptor Blocks	Raptor Blocks	Raptor Blocks			

Raptor Build Engine

ECU SDK Layer

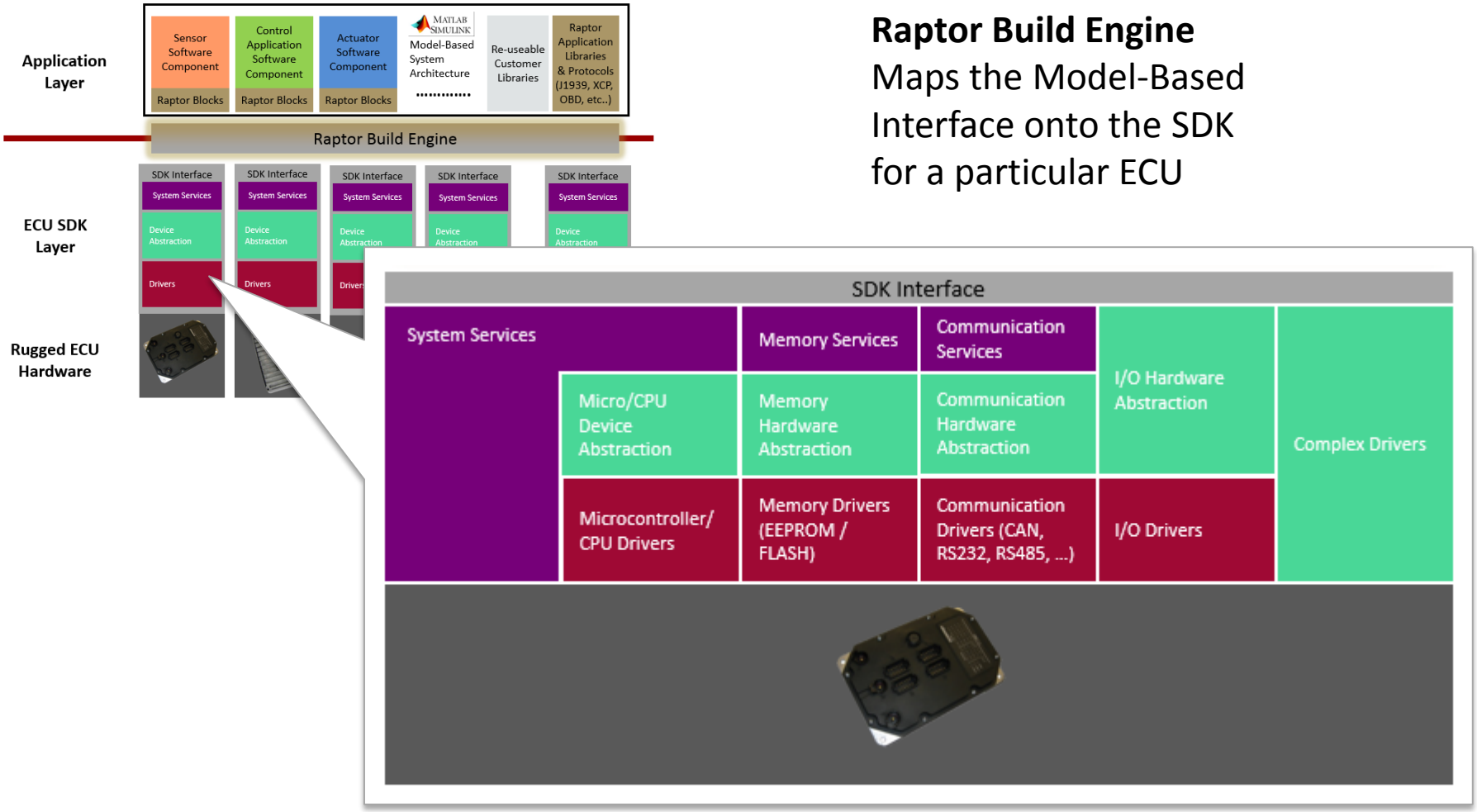
SDK Interface	SDK Interface	SDK Interface	SDK Interface	...	SDK Interface
System Services	System Services	System Services	System Services		System Services
Device Abstraction	Device Abstraction	Device Abstraction	Device Abstraction		Device Abstraction
Drivers	Drivers	Drivers	Drivers		Drivers

Rugged ECU Hardware





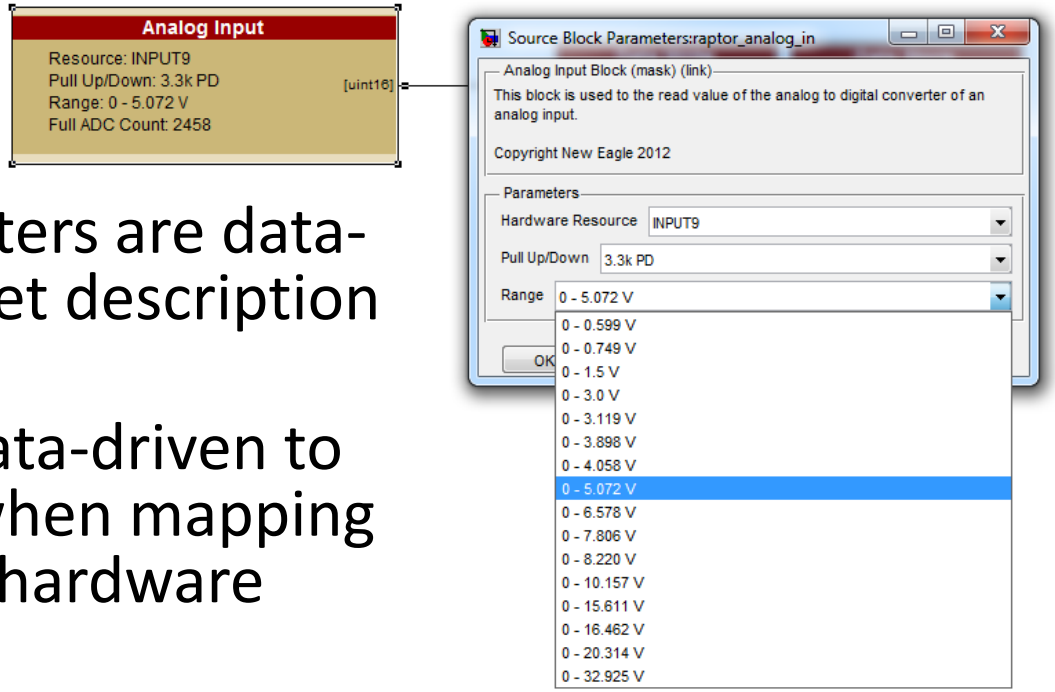
Raptor Architecture



Raptor Build Engine
Maps the Model-Based Interface onto the SDK for a particular ECU

Raptor Architecture

Raptor Build Engine



- Raptor block parameters are data-driven from ECU target description file (XML)
- Code generation is data-driven to maximize flexibility when mapping onto different target hardware interface (SDK)

→ Allows for efficient new target ECU integration

Development Features

Comprehensive Set of Application Development Features

- Timer / Trigger blocks
- Target Definition
  - Stack(s), Heap Definition
  - RAM, FLASH, EEPROM Configuration
  - Build output artifact configuration
- Industry-standard calibration protocol (XCP)
  - Measurement points
  - Calibration points
  - 1D, 1D interpolation table lookups
  - 2D, 2D interpolation table lookups
  - Scalar, Enum, Array calibration tables
  - User configurable read/write access level per parameter
  - Absolute / relative signal overrides
  - ASAP2 file generation
- Analog input
- Digital input
- Frequency input
- PWM output
  - Current feedback
- Model-based CAN bus interface
  - Configurable baud rate / bit timing
  - Raw transmit / receive interface
  - DBC message transmit /receive interface
  - Automated parsing / message generation
- Fault Management (Standard and OBD)
- Efficient Simulink Coder generated application algorithm code integration
- Build engine hooks for target-specific post-build executable file manipulations

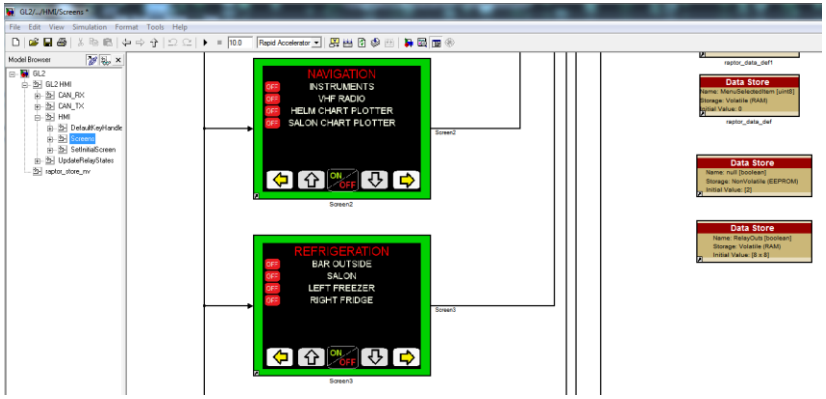
ECU Target Showcase

In addition to targeting rugged control hardware, Raptor also targets embedded displays

- Automated Bitmap code generation
- Exposes user input (buttons) via standard trigger mechanism
- PC based simulation of application created during Simulink build
  - CAN input to simulator via Kvaser Cable
  - I/O input via system

  →Allows rapid system display development & iteration
- VEECAN320
  - 2 CAN buses
  - 2 digital inputs
  - 7 analog inputs
  - 4 relay outputs
  - 1 frequency input
  - USB port

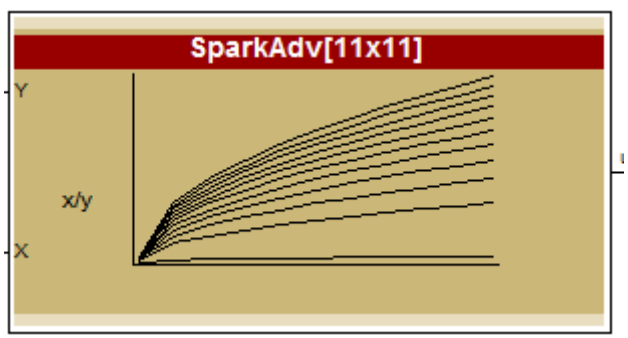
USB Port is exposed via file-based blockset in Raptor which allows data logging of system data

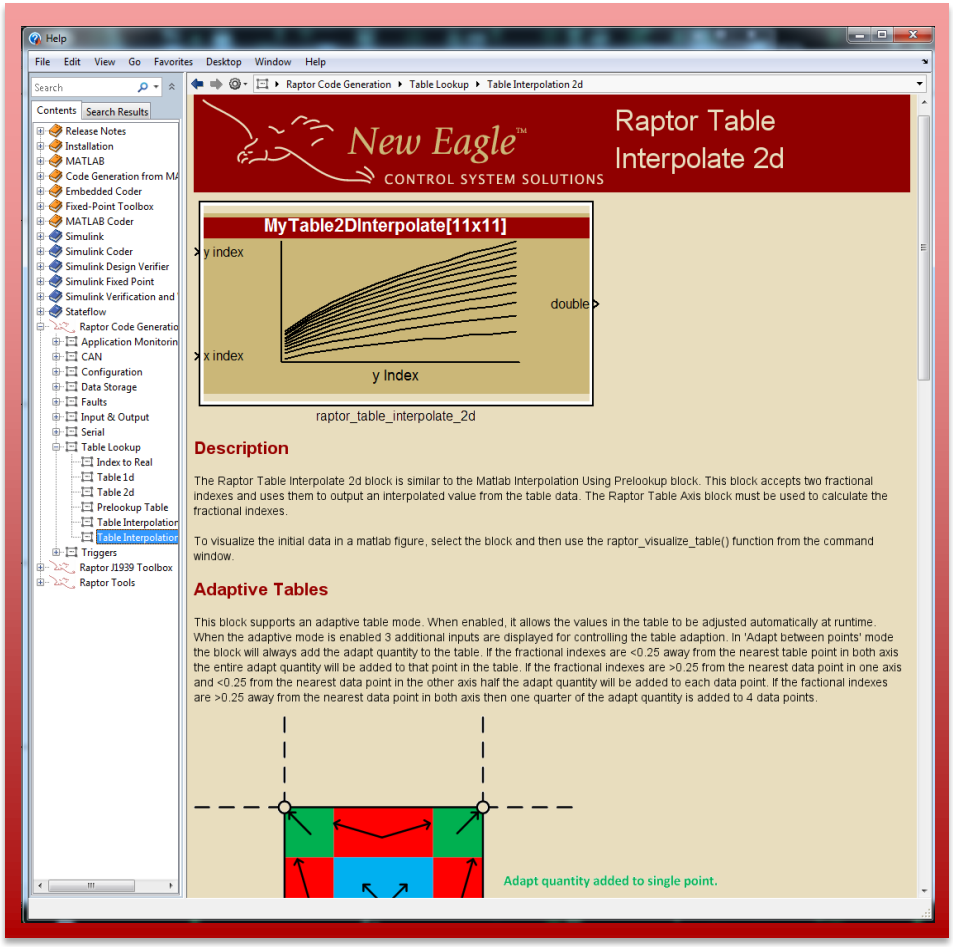


Integrated Help

Easy to use documentation

- Integrated with Simulink Help
- Block by block documentation

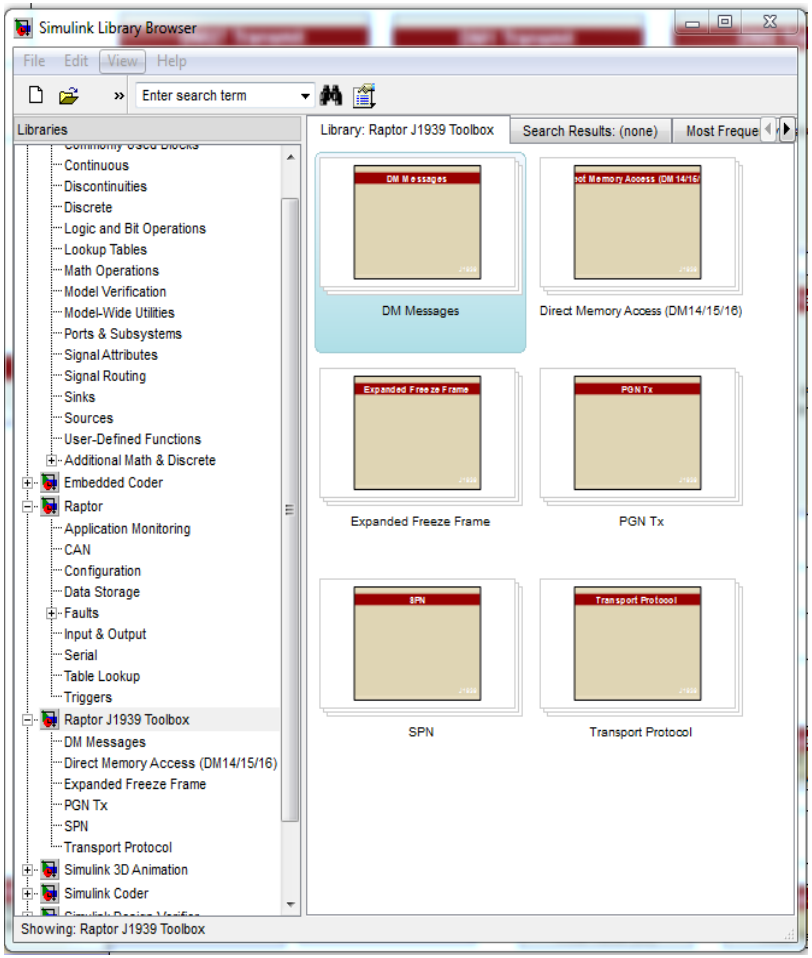




Raptor Libraries

Raptor J1939 Library

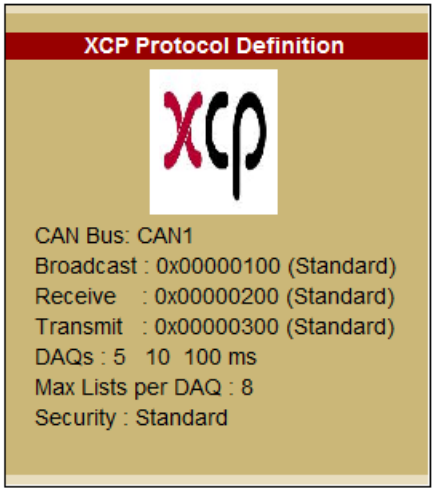
- Easily add J1939 transport protocol to an application
- Designed to meet OBD-HD compliance for an engine application
- Supports DTC based DM messages via seamless integration with the Raptor OBD fault manager

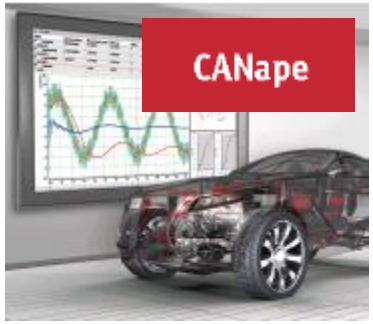


Calibration

Industry Standard Tools Support

- Raptor exposes XCP, industry standard calibration protocol
- Automated A2L file generation during model build
- Efficient data transfer offers improved logging throughput vs. proprietary protocols
- Customer-specific security option available to protect your intellectual property
- Most common calibration tools supported

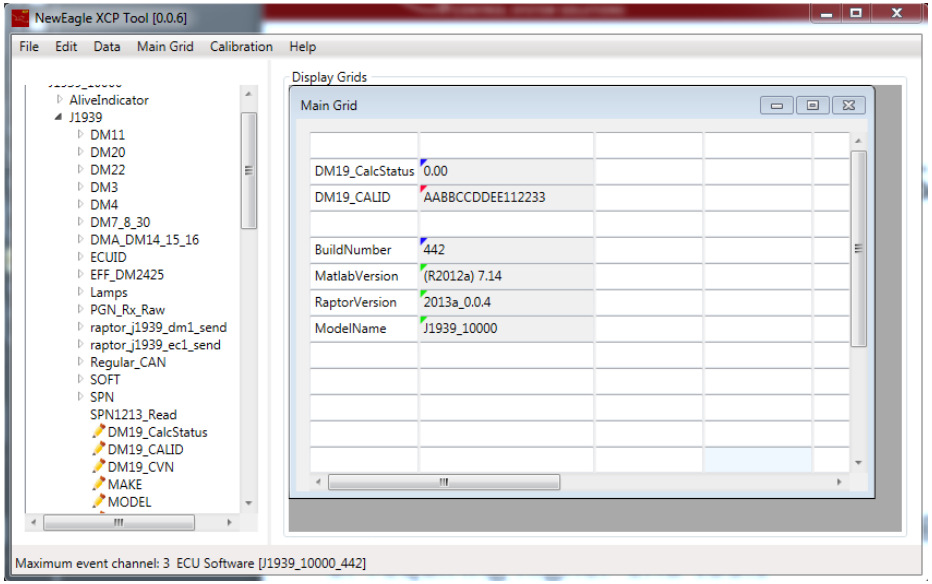




New Eagle Calibration Tool

- Utilizes industry standard XCP calibration protocol
- Lower-cost option provides many of the features of the higher-end tools
  - Data-efficient logging
- Also will offers integrated ECU reflash (Planned Q3 2014)
- Support customer-specific security

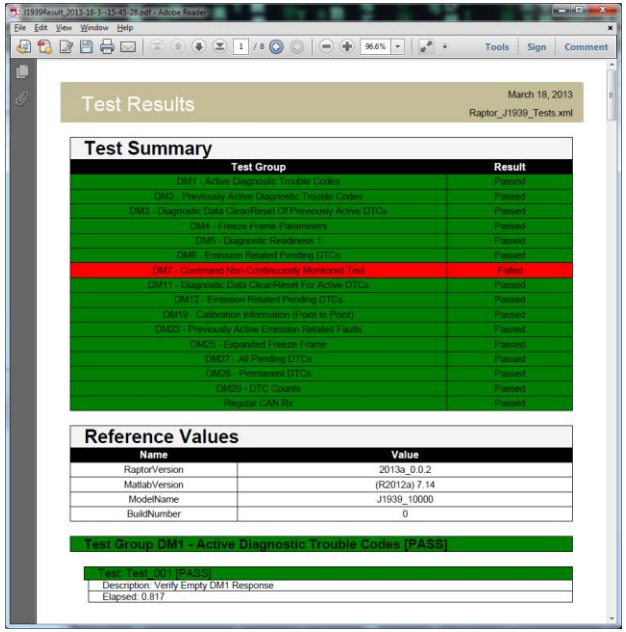
→Lower startup costs/training if you are not already using or requiring higher-end tools



Application Validation

New Eagle Automated Testing Framework (NEAT)

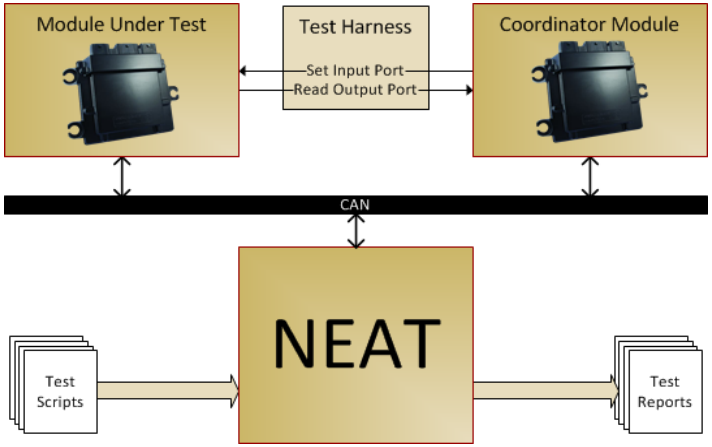
- Target-in-the-Loop Framework
- Provides automated script driven testing of Control Algorithm & State Machines
- Repeatable tests for validation and regression
- Supports XCP and raw CAN for facilitating a wide variety of test scenarios
- Built-in support for macros
- Automated PDF report generation

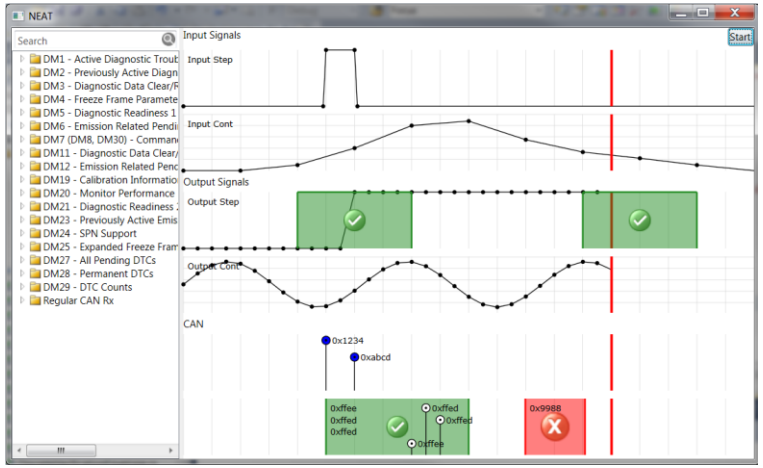


Application Validation

New Eagle Automated Testing Framework (NEAT)

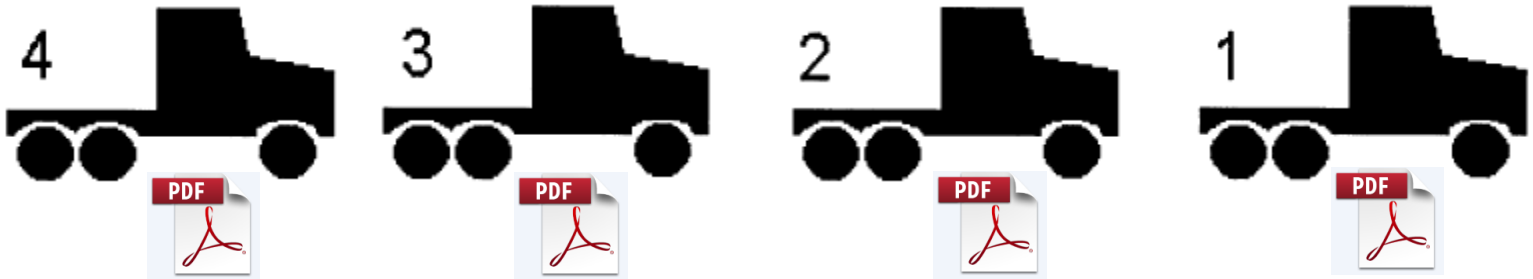
- Built-in Support for a coordinator ECU to provide plant model/environment
- Graphical Test Creation
- Intuitive 'Test-Runner' interface
- Allows traceability from requirements to validation tests





End of Production Utility

Automated End-of-Line Configuration/Unit Configuration Manifest



- NEAT serves as a programming utility for production end-of-line, can be integrated into OEM assembly operations
- Provides script-based, automated end-of-line configuration of parameters, with confirmation
- PDF report for each unit with configuration settings, and identifying values (VIN, Serial Number etc..)

Cost-Effective Tools for Service Fleet Deployment

- Supports the use of heavy-duty industry-standard RP1210 adaptor(s) commonly found at service shops today
- Also supports low-cost Kvaser CAN hardware
- Graphical interface for technicians to perform troubleshooting & field software upgrade packages
- Software-configurable access levels
  - Software Developer
  - Calibrator
  - Dealer/Service Technician
  - Consumer
- Supports customer-specific security to protect your application from tampering