Plug&Play Software Architecture (GM CADA)

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Project ID #VSS020
Project Description

- Develop software architecture & environment to Plug-and-Play hardware & software models
  - Enable efficient, seamless Math-Based control system design process
  - Enables efficient Re-Use of models
  - Share modeling expertise across the organization(s)
Funding

- Present (FY08) DOE funding ($500K)
- Expected future DOE funding ($500K/yr) for one more year
- Total funding prior to FY08 ($500K)
Objectives

Develop Software Architecture & Environment to Plug-and-Play Hardware & Software Models

- Maximize Reusability
- Maximize Flexibility
- Select Complexity
- Code Neutral

Graphical User Interface

- Models, Data
  - Setup Simulation
  - Generic Processes
  - Results Visualization
  - Linkage with Other Tools

Database

- User Access Control
- Enterprise Wide Solution
- Version Control
- Database Search

Maximize Flexibility

Linkage with Other Tools
Milestones

Year 1
- Define Data Organization
- Define Model Organization
- Validate Model Organization
- Implement Controls
- Validate Vehicle Model
- Implement Drive Quality
- Implement Emission Models
- Modify and Refine Proposal for Industry Standard

Year 2
- Define Data Organization
- Define Model Organization
- Validate Vehicle Model
- Implement Drive Quality
- Implement Emission Models
- Modify and Refine Proposal for Industry Standard

Year 3
- Define Data Organization
- Define Model Organization
- Validate Model Organization
- Implement Controls
- Validate Vehicle Model
- Implement Drive Quality
- Implement Emission Models
- Modify and Refine Proposal for Industry Standard

Current Status
Relevance

- Bring technologies to market faster to maximize fuel displacement
  
  - Evaluation of component technologies in a vehicle system context during early stage of development
  - Use of a single tool from simulation to hardware through SIL, HIL and RCP
  - Automotive industry, universities and national laboratories will benefit from this study as the main outcomes will be shared:
    - Model organization
    - Common nomenclature,
    - Processes (e.g., validation, tuning...),
    - Linkage with other tools
      (e.g., GTPower, AMESIM, ADAMS, AVL Drive...)
Barriers

- Develop organization generic enough to be able to handle any future evolutions of technologies.
- Convince other OEMs of the benefits of the approach.
Approach

- Build any system at any level
- Users can integrate their own systems
Accomplishments and Progress

- Developed the Graphical User Interface (GUI) and algorithm to build a vehicle according to the new specifications.
- Defined nomenclature (e.g., model organization, naming convention...)
- Defined new database organization (e.g., XML files)
Intra-Governmental Collaboration

- The future software will allow for integration of more detailed models developed under other DOE activities.
- Increase reusability of models by the industry due to common formalism.
- Streamline SIL/HIL/RCP processes.
Industry Collaboration

- Development performed with inputs and guidance from GM.
- Several automotive companies and suppliers have already expressed interest in learning more about the project. Several meetings have taken place and are planned in near future.
Benefits and Market Penetration Potential

- Bring technology to the market faster by allowing analysis and selection of the most suitable options prior to hardware testing.
- Facilitate exchange of models and controls between experts.
Future Plans

- Provide a Beta version by end of December
- Integrate models and controls from ANL & GM
- Demonstrate linkage with other tools including co-simulation
- Integrate processes (e.g., tuning, validation, drive quality...)
- Provide new software by September 2009.