Building Embedded Displays Using Model-Based Design

Jason Moore
Pilot Engineering
Example Target Applications

- Instrument Cluster
- Center Stack
- Heads-up display
- Command/Control Center
**Traditional Display Design Process**

- **Visual Design**: Graphical Illustrations
- **Graphics**: Embeddable Graphics
- **Business Logic**: Embeddable Algorithms
- **Other Application**: Embeddable Algorithms

**Manual Integration**
- Cumbersome to map components
- Error-prone to keep make changes

**Physical Prototypes**
- Hardware/drivers not available early
- Low-level designs prevent rapid iteration

**Traditional Testing**
- Design and integration issues found late

**INTEGRATION AND TEST**
Model-Based Design of Displays

**SPECIFICATIONS**

- **Visual Design**
  - Graphical Illustrations

- **Graphics**
  - Embeddable Graphics

- **Business Logic**
  - Embeddable Algorithms

- **Other Application**
  - Embeddable Algorithms

**Display**

**INTEGRATION AND TEST**

- **Manual Integration**
  - Cumbersome to map components
  - Error-prone to keep make changes

- **Physical Prototypes**
  - Hardware/drivers not available early
  - Low-level designs prevent rapid iteration

- **Test requirements and analyze behavior of complete design using simulation on desktop**

- **Verify and validate designs using testing and error detection through desktop simulation**

- **Out-of-the-box integration of business logic with graphics tools through published API**

- **Model-Based Design of Displays**
  - Model-based approach allows for early integration of business logic with graphics tools through published API.

- **Traditional Testing**
  - Design and integration issues found late
DiSTI GL Studio Integration for HMI Applications

Purpose: Demonstrate a workflow that is tailored to developers who focus on embedded HMI applications

Focal point of the demonstration is on early validation and verification in Simulink for HMI development
Key Takeaways

• Co-Simulation/Development Environment in Simulink
• Automated Test Case Execution

<table>
<thead>
<tr>
<th>Input Vectors</th>
<th>Simulink Simulation</th>
<th>Expected vs Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SDI Signal Comparison</td>
</tr>
</tbody>
</table>

- Test Point
  - Expected
  - Actual
  - Comparison Image
  - Pass/Fail

- Deployment to Target
  - Embedded Coder code and GL Studio code can be built into a single application
  - Application can deploy to an embedded target or desktop
# Existing Automotive Graphic Vendor Integrations

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>DiSTI (GL Studio)</td>
<td><a href="http://www.disti.com/">http://www.disti.com/</a></td>
</tr>
<tr>
<td>Digia Qt (technology)</td>
<td><a href="http://www.qt.io/">http://www.qt.io/</a></td>
</tr>
<tr>
<td>Fujitsu (CGI-Studio)</td>
<td><a href="http://www.cgistudio.at/">http://www.cgistudio.at/</a></td>
</tr>
</tbody>
</table>