



SVG for Automotive User Interfaces

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Introduction

HMI: human-machine interfaces

- Design of HMI displays for car cockpits:
 - EDONA for automotive on-board systems,
 - HMI project: deliver an design tool chain.
- HMI Modeling:
 - SVG for HMI graphic content,
 - domain-specific extensions.

3M/Visteon X-Wave I

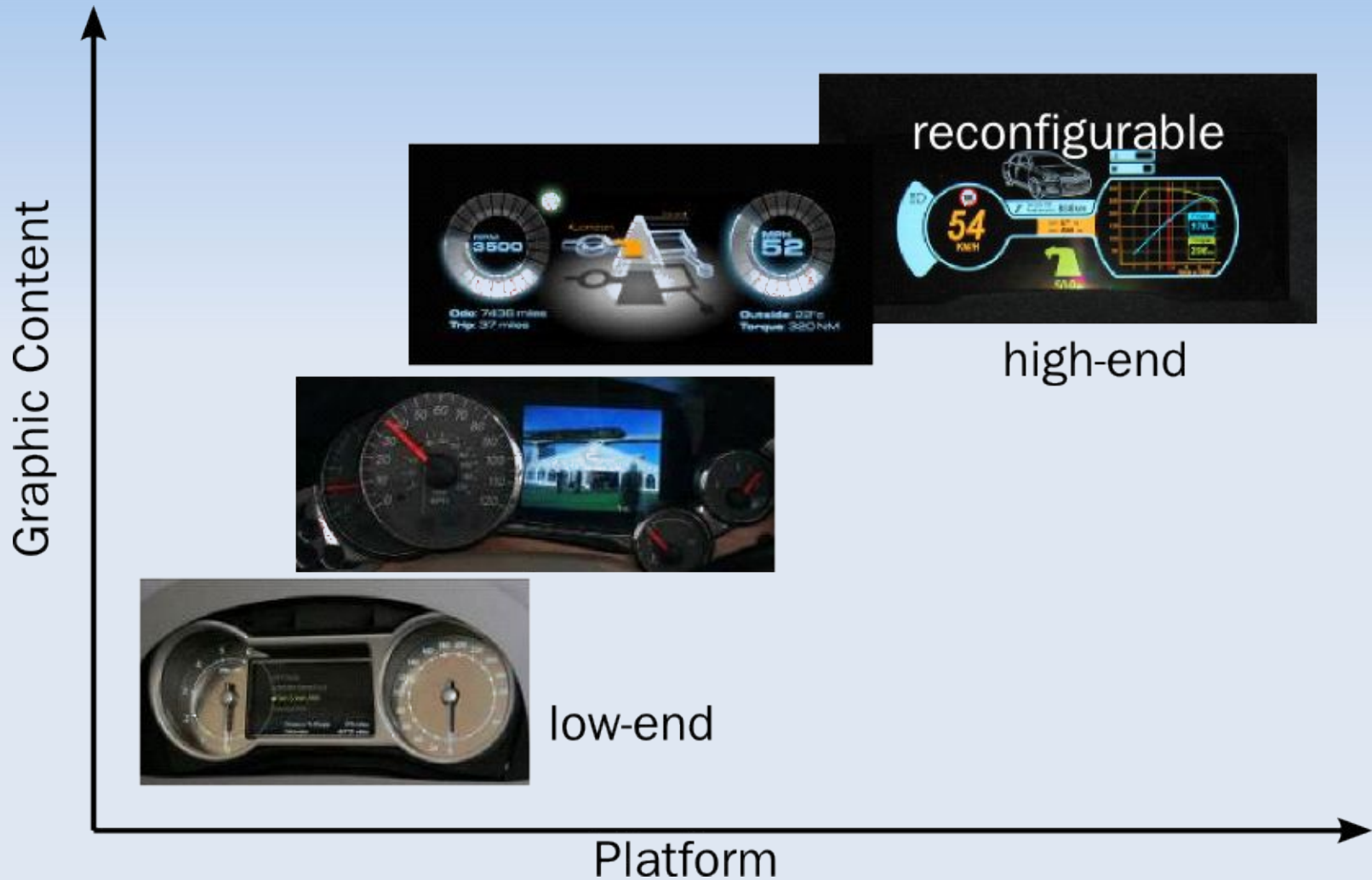


<http://www.visteon.com/innovate>

3M/Visteon X-Wave II



Display Configuration Range



Instrument Clusters



EDONA

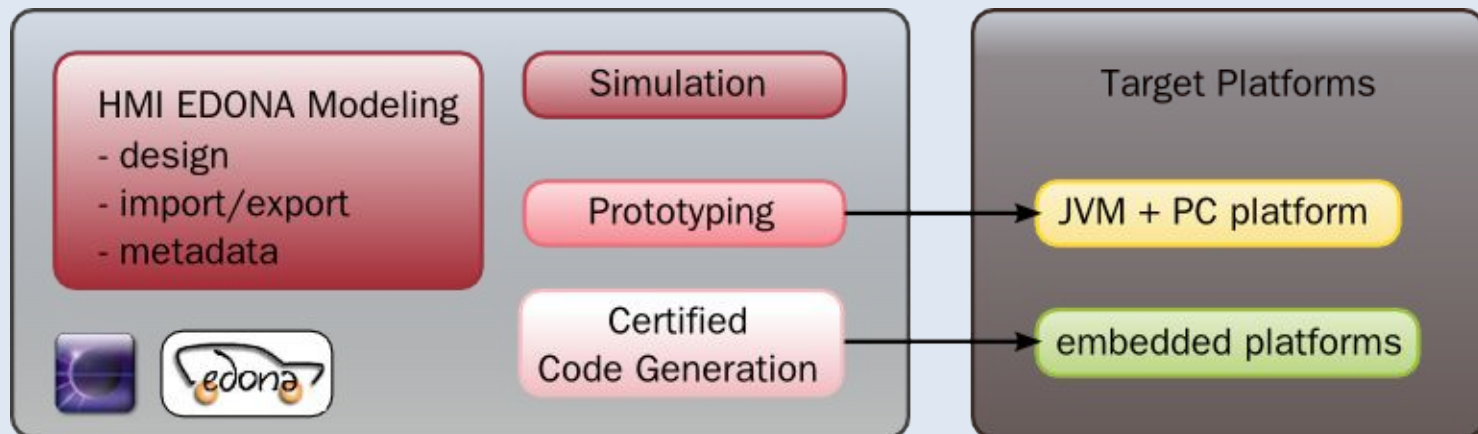
Design of on-board software systems:

- Interoperability and standards,
- Safety-related application development,
- Diversity of platform configurations.



EDONA HMI Environment

- Model-based tool chain,
- Integrated environment,
- Several runtimes.



HMI Design and Tools Survey

- HMI Model Structure:
 - Graphics Layer,
 - Component Interface,
 - Micro-functional,
 - Metadata.

Graphic Model I

The screenshot displays the SCADE Display 6.0 software interface. The main window shows a detailed graphic model of a car dashboard. The dashboard includes three gauges: an RPM gauge on the left (0-8), a central speedometer (0-210 km/h), and a gear indicator on the right (P, R, N, D). Below the gauges are several indicator lights and a blue 'CRUISE CONTROL' button. The software interface includes a menu bar (File, Edit, View, Layer, Object, Transform, Project, Tools, Window, Help), a toolbar with various drawing and editing tools, and a right-hand panel with tabs for Structure, Properties, Plugs, Feedbacks, Comments, and Traceability.

The Structure panel shows the following hierarchy:

- CruiseControl
 - LeftPart
 - RightPart
 - CenterPart
 - Back
 - SpeedNeedle
 - needle
 - Top
 - CruisePanel
 - Back
 - CruiseSpeed
 - CruiseState
 - LightsPanel

The Properties panel shows the following data for the selected 'Cruise Control' container:

Property	Value
Origin	0 -8
Application ID	1
Layer ID	1
Priority depth	1
Ratio	0.20406 x 0.203894
User unit	156.718 x 81.558
Specification size	768 x 400 pixels

Graphic Model II

- Enable common patterns and new designs:
 - low-level graphic vector model,
 - list of supported graphic constructs.
- Dynamic appearance:
 - direct access to relevant parameters,
 - structure, style, transformation, etc.

Graphics: HMI SVG Profile

- Why SVG ?
 - W3C authoritative standards,
 - Adequate graphic model,
 - Profiling and extensions policies,
 - Software support (authoring & toolkits)

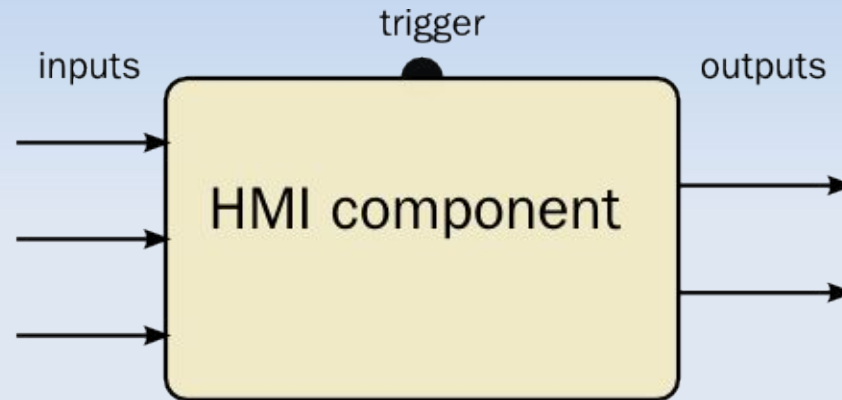
Graphics: HMI SVG Profile

SVG Tiny 1.1 reference basis,

- PLUS opacity, gradient and clipping,
- MINUS declarative animations,

Signals and Interfaces

- Component interface:



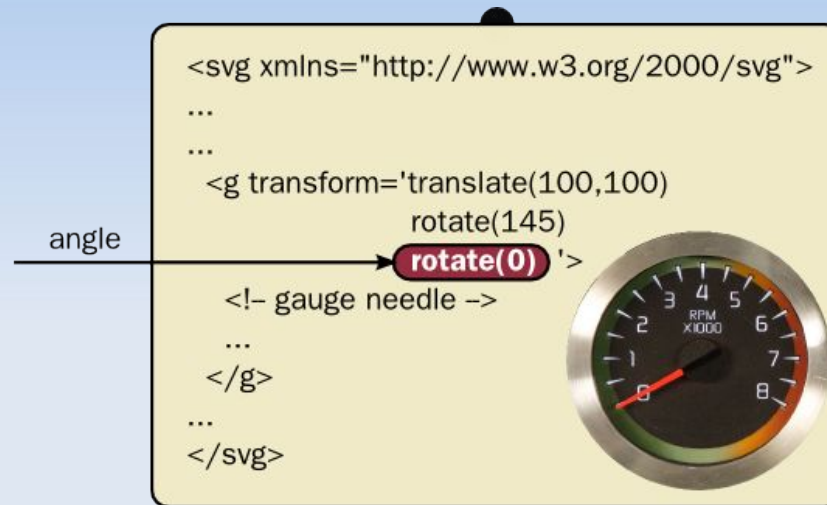
- Synchronous input and output signals,
- Trigger controls activation (logical time)

Graphic Data Access II

- Dynamic Data:
 - Transformations,
 - Shapes,
 - Styling,
 - Text.



Graphic Data Access II

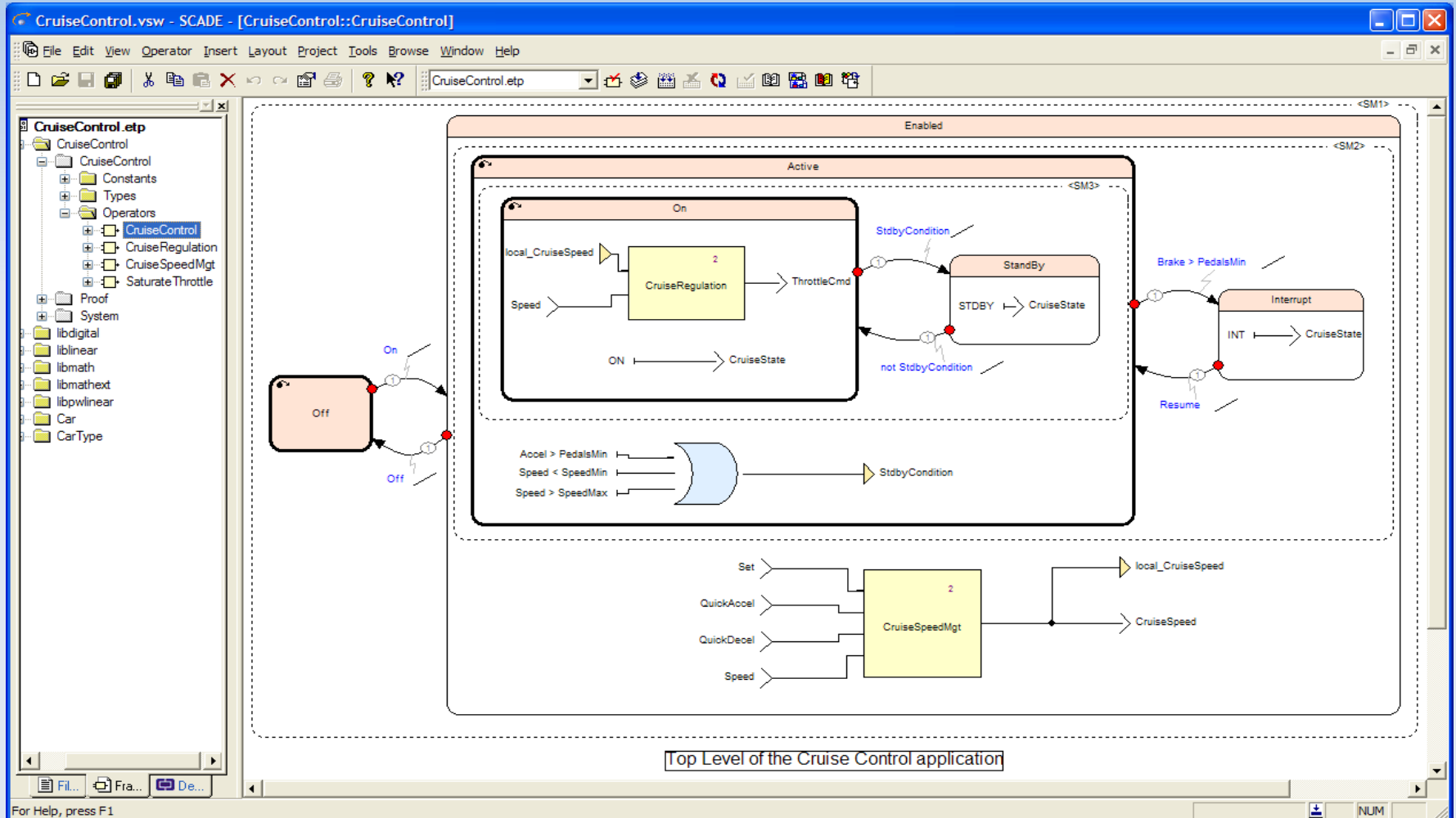


- Static XML structure and array-like attrs,
- Label the data for read/write,
- Expose in component interface.

Functional Model I

- No Embedded ECMAScript,
- Instead:
 - domain-specific functional models,
 - graphical modeling and editors,
 - synchronous models of computation:
 - data-flow diagrams,
 - finite-state machines (state charts).

Functional Models II

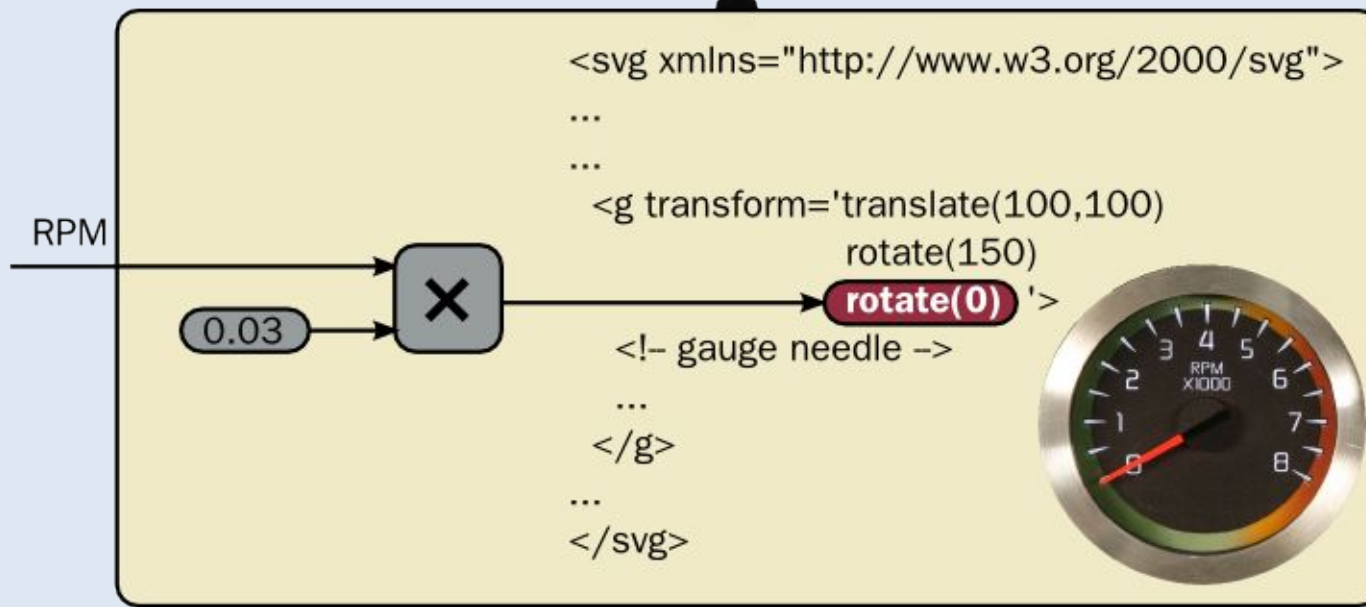


Functional Model II

- Simple model of computation
 - Enables Model Verification,
 - Supports Graphic Modeling:
 - rapid application development (RAD),
 - better integration with specifications.
 - Automatic Code Generation:
 - deterministic, bounded memory, etc.
 - efficient and optimized code.

Micro-Functional Constructs

- Complex functional modeling excluded,
- Some basic functional support necessary.

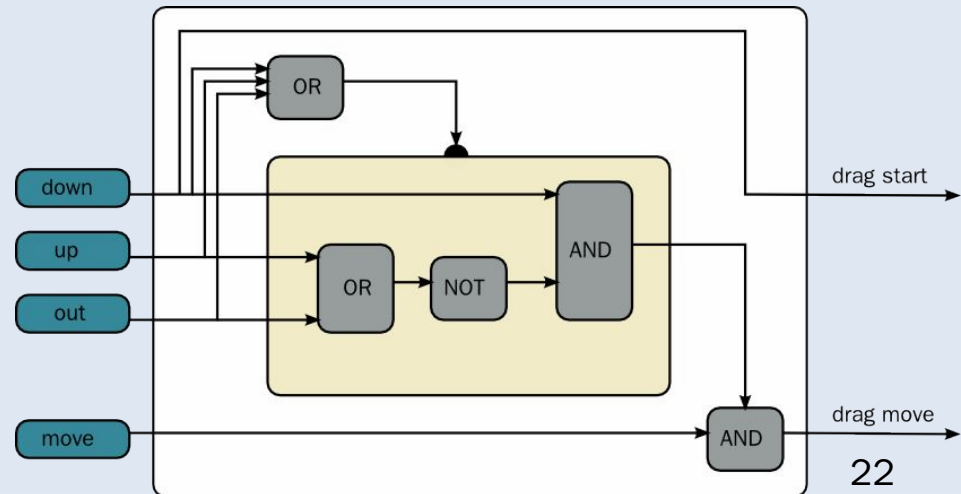
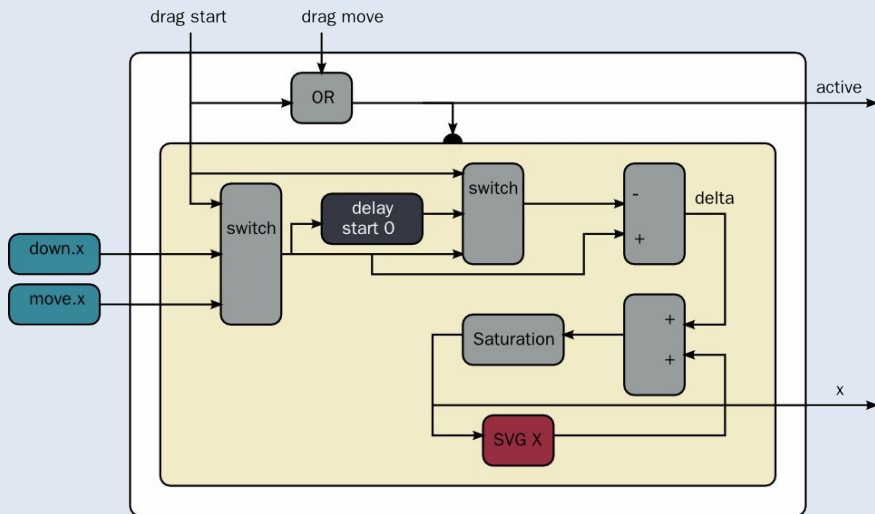
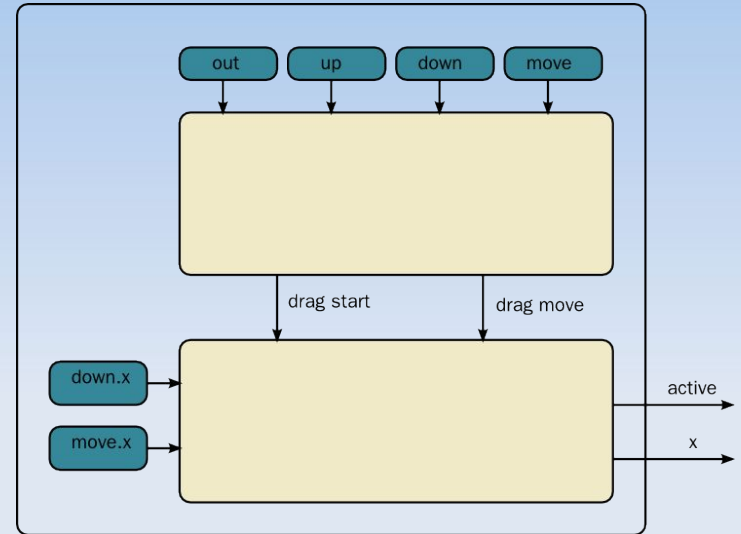
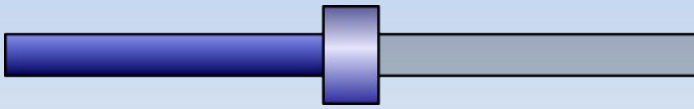


Micro-Functional Constructs

Supported data-flow entities:

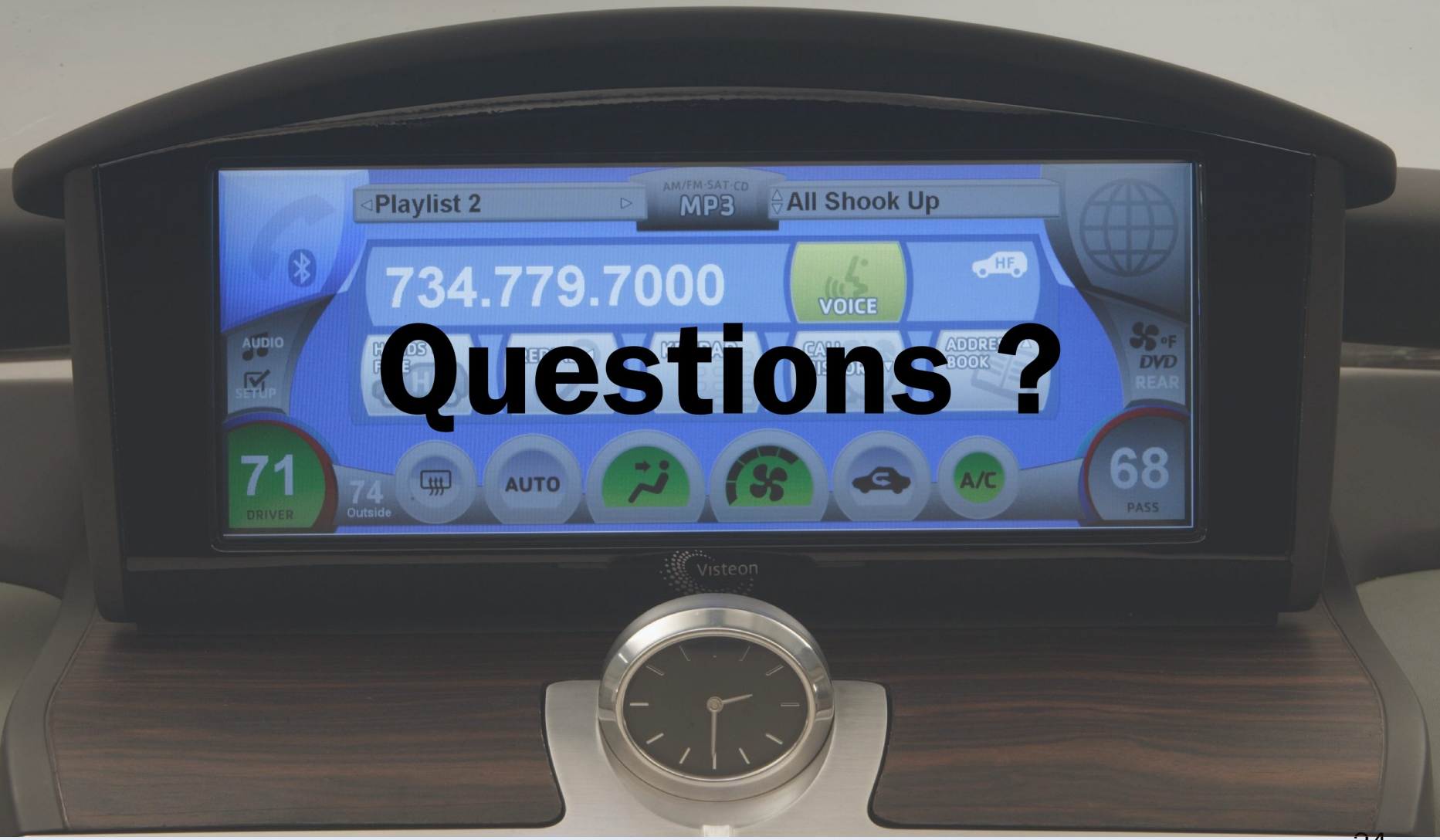
- Input/Output signals and links,
- Components: trigger activation and nesting,
- Constants, functions and delays.

Micro-functional: slider example



Conclusions and Future

- EDONA started in sept. 2007,
- So far, survey and HMI modeling,
- By the end of 2010, complete tool chain with two demonstration designs:
 - Intelligent transportation system prototype,
 - Certified industrial project.



Questions ?