# AUTOMOTIVE

SYSTEM ENGINEERING
SOFTWARE DEVELOPMENT
PROCESS & RAMS CONSULTING
VALIDATION & VERIFICATION
EMBEDDED SOFTWARE

**intecs** Solutions

*the Brainware company*

**Intecs Solutions**, founded in 1974, is an Italian private Company at the forefront in the design and implementation of high-tech electronic systems for the AeroSpace, Defence, Transportation and Telecommunication markets, where safety, reliability, innovation and quality are the key ingredients for success.

**Intecs Solutions** designs and develops applications, tools and software components for complex electronic systems in cooperation with major European and Italian Industries, Organizations, Universities and Research Centers.

In 2015 **Intecs Solutions** reached the Automotive SPICE maturity level 3.

### ECU SOFTWARE: FROM REQUIREMENTS TO CODE

*Intecs Solutions* engineers support their customers in all phases of software life cycles, starting from requirements to code development and testing, applying traditional hand-coding or automatic code generation with, for example, Simulink models.

All *Intecs Solutions* activities are based either on customer or *Intecs Solutions* quality standards, depending on the customer requirements, in order to be compliant with international recommendations (e.g. Automotive SPICE). New technologies like model driven engineering and AUTOSAR compliant architecture are well mastered by *Intecs Solutions* engineers, who are ready to efficiently support customers at their premises or in house at Intecs laboratories.

The scope of Intecs design and development activities within the electronic car architecture ranges from very complex ECUs (e.g. body computer or powertrain) to small units (e.g. infotainment devices).

### *Experiences on Body Computer*

Model driven engineering is the best approach to deal with the design of body computer functionalities: our engineers support the most important Italian OEM and TIER1 companies in the design and specification phase.

*Intecs Solutions* performs:
• High level vehicle function specification, using natural language but also with auxiliary Simulink model development
• Software requirement specification
• Software design and development
• Model-In-the-Loop (MIL), Software-In-the-Loop (SIL) and Hardware-In-the-Loop (HIL) validation.
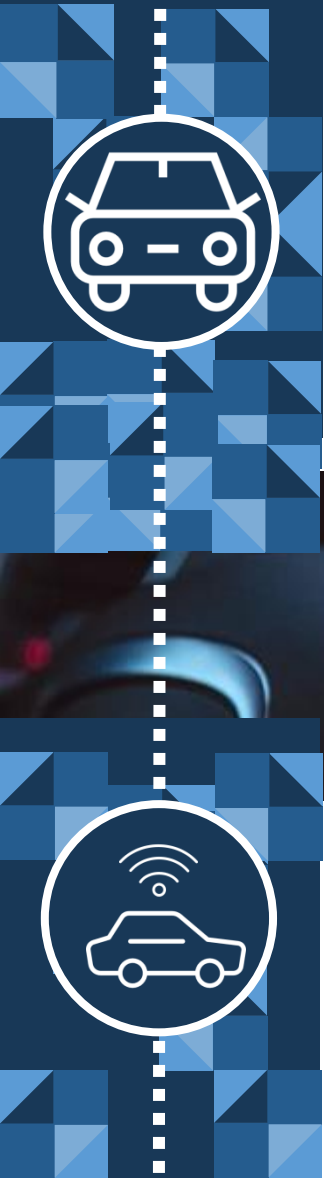
### Experiences on Instrument Panel Cluster

The traditional approach starting from requirements analysis to hand-coding is usually applied by our engineers involved in the activities for the development of IPC software (from low level driver to application layer).

### Experiences on In-Vehicle Infotainment

*Intecs Solutions* is the best partner for a customer who decides to develop a winning infotainment product.

*Intecs Solutions* engineers are employed in the development phase following the technical specification (requirements) and processes provided by the customer. These applications are mainly devoted to the management of multimedia files (MP3, MP4, etc.) and the management of information exchanged through wireless networks (UMTS, GSM, etc.).

### Experiences on PowerTrain

The projects in the powertrain domain arose from a strict and long collaboration with an important Italian TIER1. Our engineers are mainly involved in the following activities:

• Starting from high level specifications, models are developed and then the code is automatically generated

• Starting from third party models, automatic code generation and software module integration activities are performed

• Design and development of low level drivers is also carried out

### ECU SOFTWARE: VERIFICATION AND VALIDATION

*Intecs Solutions*, due to its consolidated experience in rigorous and normative domains, is able to offer support to its customers for all activities required for product (Software, Hardware + Software) Verification and Validation.

The *Intecs Solutions* contribution begins with Unit and Integration Testing support and terminates with full system black box testing (System Validation).

### Simulator and A.T.E. Development

Design and development of Automated Test Equipment, i.e. systems in charge of emulating the external environment and behaviour of an electronic unit to be validated. Typically, these systems are electrically interfaced directly with the equipment under test and provide functionalities for:

i) definition of the single test scenario,

ii) execution of the single or multiple test scenarios,

iii) visualization of the results.

Our A.T.E.s are generally based on either customer-proprietary or COTS (Commercial Off the Shelf) software and hardware architecture (National Instruments or dSpace products).

One significant example of A.T.E. designed and realized by *Intecs Solutions* is the D.I.A.N.A. bench, a system specifically designed to automatically execute tests for validating the car 's CAN network.

D.I.A.N.A. is not a simple test bench, but is a system customizable in HW and SW to meet customer needs.

### ECU SYSTEM VALIDATION

ECU system validation includes:
i) Document analysis and review, e.g. to verify conformance and source code alignment to the specified standard
ii) Source code analysis, e.g. static analysis to verify MISRA compliance
iii) Test design, coding and execution, e.g. unit and integration testing design, development and execution in a real or emulated environment
iv) System validation, e.g. design and execution of black-box testing necessary to verify the correct behaviour of the system with respect to its specification
The output of each of these activities is a report where the results of the tests and /or review are presented.
*Intecs Solutions* has successfully offered this kind of service to its customers since 2001

### VEHICLE INTEGRATION & VALIDATION

The activity consists of the definition of the test cases necessary to verify the correct integration of the electronics involved for each function, the installation and configuration in the laboratory of all of the electronics systems, and the validation of the full system.
The starting points are the specifications of each function (Vehicle Function) and the customer standards to be respected. The activity is done on the vehicle itself or on the electronic architecture reproduced at bench.

### ECU HARDWARE DESIGN

*Intecs Solutions* support all the needs of the automotive markets with complete hardware solution:
• Definition Specification (low and high level design specification)
• Simulation, implementation and test of electronic equipment
• Mechanical, Thermal and Eco design support
• EMC design, test and verification
• Environmental, test and verification

The high level skills of *Intecs Solutions* engineers (knowledge of electrical circuit design, integrated circuits, microprocessors, mechanical and EMC/EMI) guarantee top quality products and services.
They have extensive experience in requirements analysis, creation and simulation of circuit designs or adaptation of platform designs for specific applications, worst case analysis, creation of test equipment specifications and test plans with FMEA.

*Intecs Solutions* performs:
• Card unit design (schematic and pre-layout analysis)
• Printed circuit board (PCB) design and post-layout analysis (signal integrity and power integrity)
• Mechanical design (board outline definition and connector placements for layout activity, thermal analysis and simulation, reliability, innovative cooling and ventilation concepts)
• Test and debug
Furthermore, Intecs works on control technologies for hybrid electric vehicles and plug-in hybrid electric vehicles with motors, battery and system management electronics.
Important experience has been acquired in:
• Selection of the microcontroller
• Power circuits
• Communication system (CAN, TCP/IP)
• Sensor Input
• Driving Output

## PROCESS & SAFETY CONSULTING

*Intecs Solutions* unique value proposition in running process improvement programs for its customers stems from its 40 years of quality practice on its own projects and from its independence from any specific standard or certification scheme (SPICE, CMMI, etc.).

*Intecs Solutions* coaches automotive suppliers on set-up and roll-out of mature processes, methods and tools with special attention paid to pursuing quality and discipline without losing efficiency and flexibility. We call it 'disciplined agility'.

Our consultants judiciously adapt IEC 61508, ISO 25119 and ISO 26262 in order to set-up a proper and efficient safety process.

Compliance with safety standards is enforced through rigorous application of techniques tailored to the relevant ASIL (Automotive Safety Integrity Level), with most critical car systems (e.g. brake-by-wire or ADAS) requiring a mix of sophisticated techniques like Defensive Programming, Redundancy and Diversity.

In 2015 *Intecs Solutions* achieved the Automotive SPICE maturity level 3; its matured experience in SPICE projects helps *Intecs Solutions* to suggest to customers the correct working process.

## PRODUCTS

### D.I.A.N.A./A.T.E.N.A.
Digital Instrument for Automatic Network Analysis

D.I.A.N.A./A.T.E.N.A. is a test bench completely designed and developed by *Intecs Solutions* with the aim of validating the ECU CAN network in compliance with the automotive standard. In particular D.I.A.N.A. is the version of the bench customized to support the network norms specifically required by an important Italian O.E.M..

The hardware is a mixture of commercial hardware and custom hardware, while the software is completely designed and developed by Intecs engineers.

There are three different standard configurations available: light, two CAN and three CAN. Starting from the standard configurations, it is possible to customize the system to satisfy customer needs.

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## TRAINING

Trainings about different subjects are held :
- CyberSecurity
- ISO 26262 / ISO 25119
- Automotive ASpice

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