🇬🇧 **IT and Automotive**

Transforming a vision into success

A journey through the history of INCA

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On April 17, 1997, ETAS launched a new product: INCA V1.0. The developers' vision – a tool for ECU calibration that could be used by any automaker in the world – must initially have seemed like an unattainable dream. Today, this vision has been more than realized. Yet there is still more to be done, with technical innovations and the future of the automobile posing new challenges for developers on a daily basis.

Calibrating ECUs was possible even before INCA V1.0 was introduced – but it certainly wasn't simple or efficient. From today's perspective, the operation of INCA's MS-DOS-based predecessor VS100 seems almost absurd. Performing measurement and calibration in parallel was impossible. This made the work very time-consuming. Graphics capabilities were also very limited.

But 1997 marked the start of a new era in ECU development with the launch of INCA V1.0.

By taking full advantage of the computing power available at the time, INCA V1.0 finally enabled developers to perform this parallel operation. This significantly boosted the efficiency of ECU development. The software also offered numerous other benefits: INCA V1.0 allowed calibration engineers and developers to rapidly process much larger quantities of measurement data. They could focus their work on the exact parameters they chose. What's more, the software was compatible with ECUs from many different vendors. This gave automakers greater flexibility in selecting components and considerably facilitated their collaboration with ECU manufacturers and other suppliers. INCA had established itself as a major force in ECU development – a position it continues to hold today.

Expanding INCA to meet new requirements

Stricter emission standards and steadily increasing complexity have always been the drivers behind ECU development. Nowadays, it is standard to have an ECU network with a multitude of function areas and mutually dependent parameters. Whenever one variable is changed, this has an impact across the whole network.
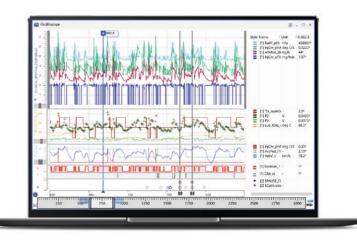
As the years have passed, this has placed significantly greater demands on INCA. Yet this steady increase in requirements has also led to INCA becoming increasingly powerful. INCA's success since 1997 in establishing itself

as an industry-standard tool for ECU calibration largely comes down to ETAS software developers. By putting themselves in the shoes of calibration engineers and developers and understanding their tasks in detail, they are able to offer them appropriate solutions.

The focus has always been on the user – as the following overview shows:

- Data export and import features to simplify collaboration between colleagues were introduced in INCA V2.0. This version also included the database concept that enables users to store experiments and hardware configurations and then reuse them for a range of development tasks.

- The workspace concept introduced in version 3.0, which was released in the year 2000, combined the experiment, hardware configuration, and ECU project into an INCA workspace element. This made it much easier for users to work with the artefacts and clearly track the dependencies between them. It also allowed newly created workspaces and experiments to be reused in other development tasks.

- Launched in 2002, version 4.0 was the first to offer the function of calculated signals based on available measured values – a major advantage for certain tasks, for example helping to identify a specific ECU behavior and subsequently analyze it. This version

also introduced Ethernet to replace the RS-232 and Centronics interface previously used for the measuring hardware. This allowed users to simultaneously operate several measuring instruments and calibrate ECUs on one and the same computer.

- Released in 2004, version 5.0 achieved even bigger time savings for users. By linking the INCA experiment to the corresponding ECU documentation, the software enabled experts to skip from a measured value to the corresponding place in the relevant documentation at the press of a key. This allowed functions and relationships to be understood more quickly and tasks to be completed more rapidly.

- Version 6.0 added even more benefits for users in the form of the Variable Selection Dialog and the Multi-Recorder. The dialog simplifies configuration by enabling the targeted selection of variables and verifies whether the measurement is possible with the available hardware.

- Version 7.0 introduced open hardware and software interfaces to make both INCA and ETAS measurement hardware compatible with products from other vendors. This gives users flexibility in choosing their working environment. Regular service packs were introduced from version 7.1. This allows ETAS to respond quickly to customer requirements and bring changes to market.

- The revised Calibration Data Manager in version 7.2 includes an improved table view that now shows parameters of two or more data sets.

- Version 7.3, the most recent release, is the first native 64-bit version of INCA and another major step forward. By making full use of the available RAM, it opens the door to more elaborate experiments, more project files (which can also be bigger), and a measuring rate of up to 40 MByte/s with parallel adjustment of the calibration parameters.

Forging the future of ECU development with INCA

Today, this efficient ECU development tool is used by almost every OEM and supplier. More than 50,000 users all over the world use it in their day-to-day work. The INCA software interface is now available in German, English, French, Japanese, and Chinese.

A comprehensive set of tools based on INCA has long been available for measurement, ECU calibration, and diagnostics. Current development work focuses on meshing these products together to facilitate end-to-end data management and evaluation. This gives users huge benefits in terms of convenience and time savings.

One of the cornerstones of this approach was the decision in 2016 to make versions of the completely revamped Measure Data Analyzer V8 available to users on a quarterly basis; the V8.4 version replaced its predecessor, MDA V7, at the end of 2019. An interface has already been established between INCA and the EHANDBOOK-NAVIGATOR, making it possible to easily link measurement data with the interactive ECU documentation. This interaction provides a much faster means of finding critical parameters and errors. It also allows measurement results to be verified and a report generated immediately after data acquisition in INCA. This is completely automated thanks to the link with the Enterprise Analytics Toolbox EATB. The next major development step will be a new Calibration Data Manager.

INCA also has a vision for other challenges that will arise in the future. Examples include working with virtual ECUs and buses in scalable simulation environments, domain controllers with microprocessors in new AUTOSAR Adaptive software architectures, and cloud capabilities for applications. All these things are already being addressed and taken forward by INCA developers.

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