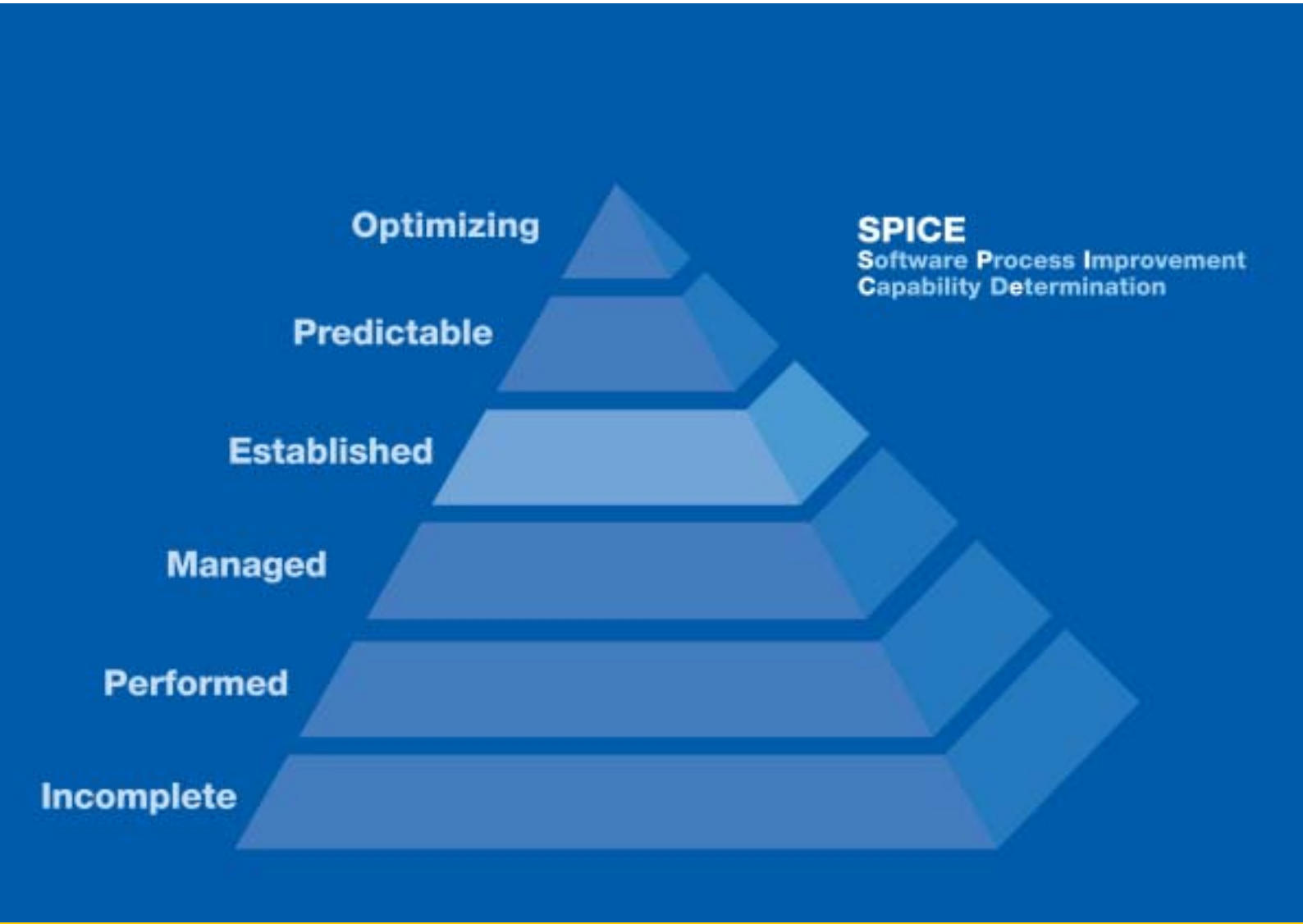
Technical Information

Electronics – Software Strategy

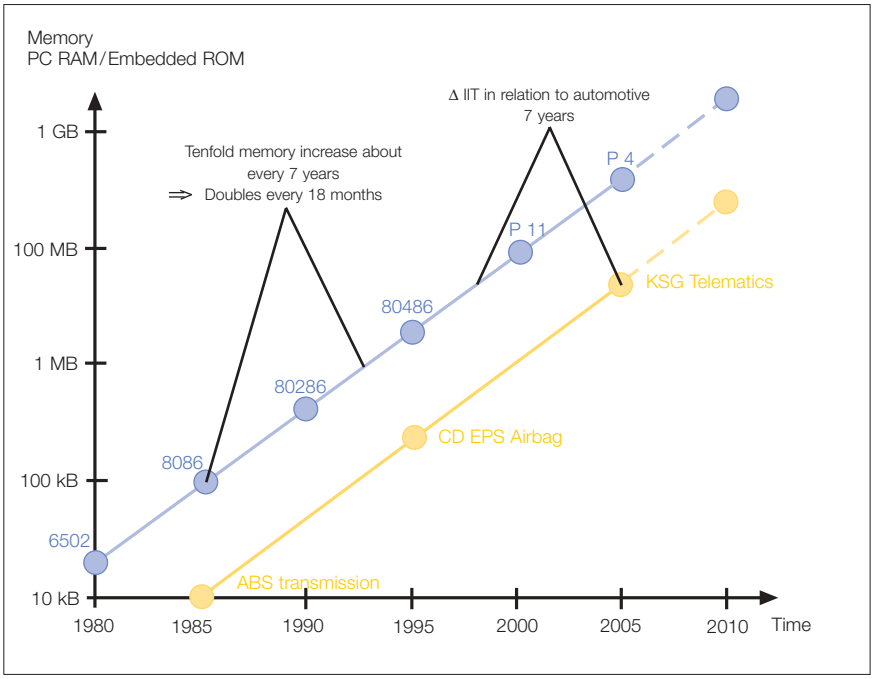


HELLA®

Ideas today for the cars of tomorrow

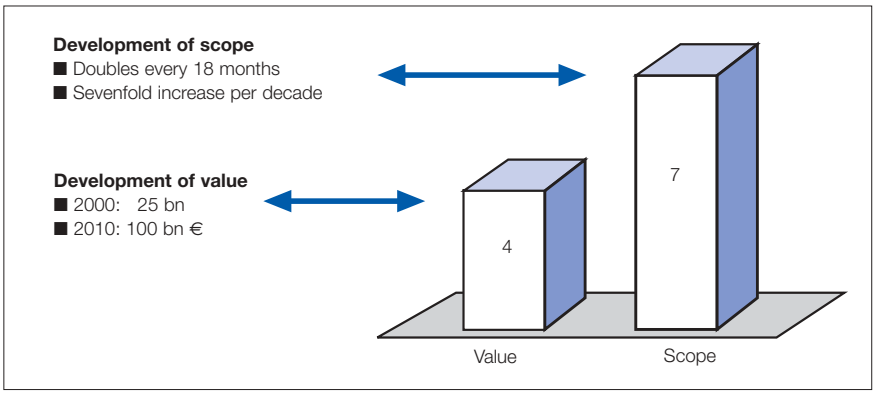
Current situation/introduction

During the last couple of years, the complexity of electrical and electronic systems has increased dramatically. The advancing degree of complexity is illustrated not only by an ever-growing number of functions but also by their increasingly complex interlinking and interaction, which occurs at two different levels. The first level is that of the bus systems used to network the control units. Inside the actual control unit, functions interact via shared resources. The ensuing increase in complexity is reflected by the exponential growth of memory capacity required by vehicle electronics. Moore's law* on memory capacities doubling every 18 months also applies to the automotive industry:



Memory capacity of standard PCs compared with that of a vehicle

Opposing that, the value of the software increases more slowly than its scope:



Moore's Law on the development of value compared with the development of scope

Whereas, within a decade, the scope of the software increases sevenfold, its value multiplies by only four. At the same time, car manufacturers are expecting control units of a high level of product maturity to be available at an early stage of development already. Advancing efficiency and productivity are the challenges that will sharpen the competitive edge.

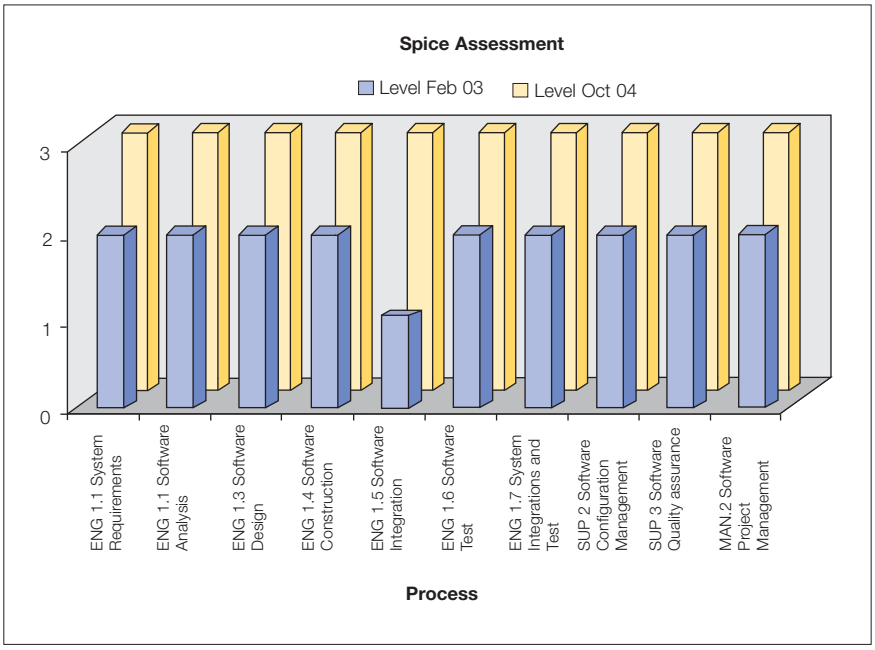
Hella is accepting these challenges. A range of standard software modules and tools have been established and introduced to product line use. Migration and extensions to the functionality helped Hella develop devices which multiply the scope of their software by six from one generation to the next. Development processes have a high level of maturity based on applicable standards as amended, such as ISO TR 15504, ISO 16949, CMMI or VDA.

*** Gordon Moore, co-founder of Intel, observed that the density of transistors on an IC doubles every 18 months. His publication from the year 1965 is called "Moore's Law".**

Process maturity

A high level of process maturity and the deployment of standard software modules are the means by which Hella ensures that best-in-class software is available on time. In addition, the processes enable Hella to react flexibly in the case of modifications, without comprising quality.

SPICE In 2004, Hella reaped the reward of its consistent development of standardized processes, with customer assessments ranking it as the first company to reach SPICE Level 3 in all processes chosen by the Manufacturers' Software Initiative.

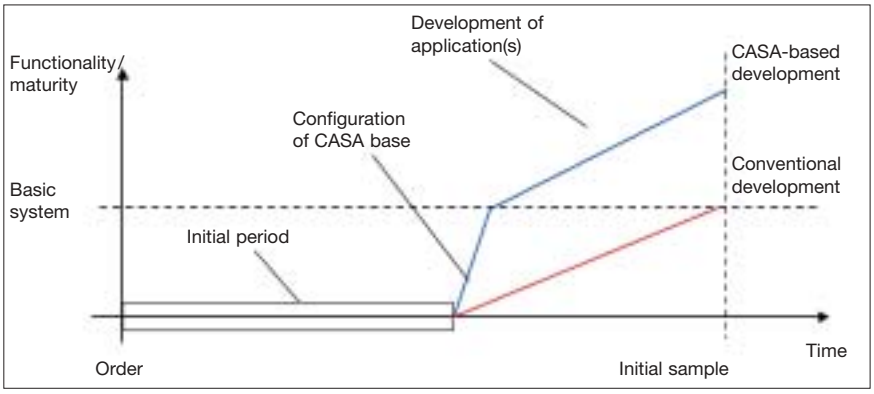


Products and process maturity

Common Automotive Software Architecture

In its Common Automotive Software Architecture project (CASA), Hella created a basic software system developed to valid standards such as the Manufacturers' Software Initiative and currently being optimized in the style of AUTOSAR. CASA provides a tool kit system of standardized software modules which closely interact with the hardware. Selecting and combining any of these modules helps developers quickly set up an executable basic system for any specific development project.

Believing that configuring is better than programming, the CASA operating system and basic software package configuration tool supports consistent configurations of the software components installed by taking the interdependencies of the modules into account and checking the plausibility of chosen settings.



Product maturity by configuration

Further benefits of the approach:

- Predefined interfaces allow modules and functions to be developed at the same time and to integrate them into the open, standardized software architecture.
- Using standard modules can be shown to shorten development times and to quickly obtain the demanded product maturity.
- Networked configuration tools help to quickly provide an executable system.

Hella used CASA to establish a library of reusable modules with standardized interfaces which reduce the efforts of series product development and provide an efficient basis for mastering the increasing complexity of automotive software challenges.

Successful series products with such software modules in them furnish evidence of these modules greatly contributing to lowering the efforts while increasing the product quality.

Tools and methods

Apart from and along with establishing the CASA software standard modules, Hella has been successfully deploying the options of model-based software development for many years. Its tools significantly help developers to accomplish their tasks, starting out from the requirements management performed together with the car manufacturer. Firmly established methods include the automatic generation of code and final testing of the previously generated code. The tools of model-based software development allow key stages of a project to be aligned with those of the manufacturer, thus making the development process more transparent and optimizing the tasks of requirements management.

Hella is facing the future challenge of completely interlinking the tools of model-based software development with the other tools of the development process. This will not only get the best out of the existing tools but provide model-based software development with an unbroken chain of tools which in itself is a great contribution to improving the efficiency and quality of development.

Model-based software development

Functional safety

New technologies and the expansion of vehicle functions result in the implementation of safety-critical systems. Hella's objective is to harmonize the methods relevant to functional safety and, once harmonized, apply them to the entire process of development. This involves customizing the requirements of generic standard IEC 61508 on Functional Safety and integrating them into Hella's product development process.

Careful analysis of the entire system to be developed, with all stages of its area of application, taking into account safety-relevant aspects in the product life-cycle (system life-cycle), as well as risk analysis and further supplementary development steps and measures for guaranteeing system safety, form the prerequisite of a development in accordance with IEC61508 and the state of the art.

Applying the systematic, standardized approach to systems that are not safety-critical will improve the robustness and reliability of new products since that approach helps to reduce the probability of failures due to an early quantity assessment of safety-relevant malfunctions. Moreover, a systematic approach benefits the overall system because it forces developers to properly think it through.

As a member of the Fakra Functional Safety Initiative, Hella is dedicated to adapting generic standard IEC61508 to the needs and requirements of the automotive industry by making available its experience and competency gained through practical development work.

The function “actuation of an electronic steering column lock” is a prime example of a product developed and assessed on the basis of IEC 61508. It meets the highest safety demands.

Functional safety of an electronic steering column lock

Outlook

The industry-wide definition, introduction and establishment of automotive software standards, from the development processes, to module interfaces, to software architecture are the key topics in automotive development, and are prerequisites for mastering the increasing complexity of complex systems.

Since innovations are largely realized by software, the industry focuses on mastering the software. Software as a product (SWaP) is gaining more and more importance: through standardized interfaces, new functions become hardware-independent software packages which are easily integrated into different control units. In its development of new functions and their meeting new requirements and standards, Hella has already fully adopted this view of modularity.

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