



## ***INCODIO***<sup>®</sup>

- Integration & Simulation of automotive C-Code -

ETAS Seminar - Tokyo, November 2007, 22nd  
by Dr. Thomas Zurawka

## Overview

- SYSTECS is a specialist for **innovative Software Technology**
  - founded in 1994; independent
  - 35 highly qualified Employees
  - Location Leinfelden-Echterdingen, Germany
  - Portfolio includes **Services and Products**



SYSTEMCS

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Overview

SYSTECS

Innovative Software Technology

Tools

Embedded Software

- **Software Engineering Tools**
  - with SYSTECS .NET Technology
  - with SYSTECS AUTOCAD-3D Technology

Service

- **INCODIO®**  
*Embedded Software*  
*-> Tools*
  - Integration & Simulation of C-Code

Product

- **Consulting & Workshops**
  - Development Methods & Tools
  - Software Architecture, Product Lines
  - **AUTOSAR**

Service

## Customers



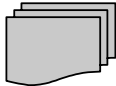
## Partners

- SYSTECS is a **member** of the **Partner Program**

of 

# Overview INCODIO®

Automotive  
**C-Code**



**ASAM-MCD  
AUTOSAR**



INCODIO®

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### INTECRIO

The INTECRIO interface displays several data windows: a top window with a blue waveform plot, a middle window with a 3D surface plot, and a right window with a table of parameters. The table contains the following data:

Parameter	Value
LL	false
LLF	false
LFZ	false
evr_adb	89.0000
evr_adb	33.0000
FLR_AP	401.0000
FR	101.0000
KamalC	0.7882
KamalA	2.7382
KamalB	0.0039
KamalC	3.5196

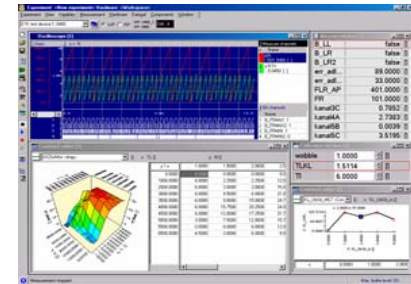
Below the windows are icons for a laptop, a hard drive, and a car chassis diagram.

Prototyping, Test, Calibration

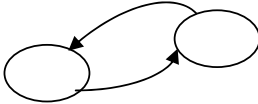
## Key Features

- **INCODIO® Version V1**

- supports **INTECRIO** from **ETAS**
  - enables **Simulation** of production C-Code in the Loop with Vehicle Models (**SIL**)
  - ... together with Simulink or ASCET Models



# Key Features



ASCET

MATLAB / Simulink

**C-Code**  
c=a+b;

C-Code IDE

INTECRIO  
ASCET Connector

INTECRIO  
Simulink Connector



**Tools for ECU Software Development**

INTECRIO

***INCODIO**® enables the integration of **C-Code** into the ETAS tool **INTECRIO***



## INCODIO® V1 – Use Cases

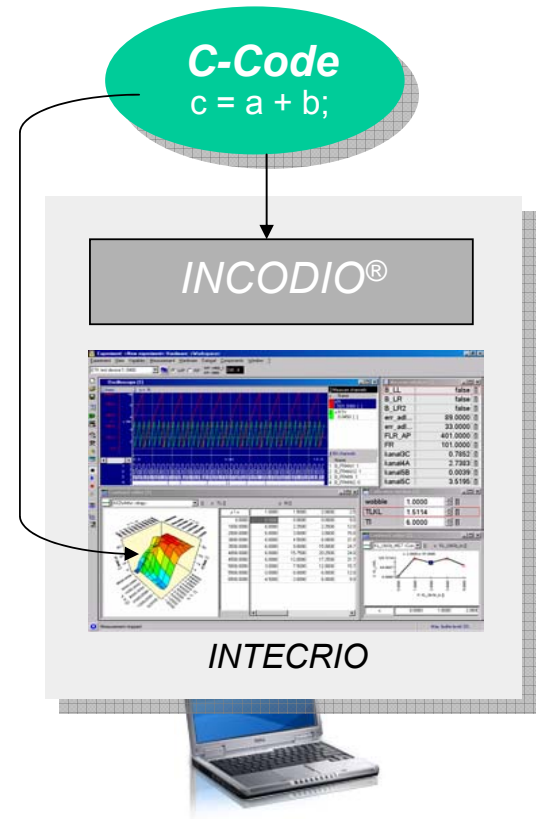
- Which Customers will use *INCODIO*®?



Development of C-Code

- Your benefit

- Rapid Design and Verification of C-Code in a **real-time** simulation environment



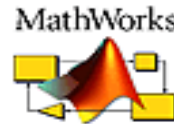
# INCODIO® V1 – Use Cases

- Which Customers will use **INCODIO®**?



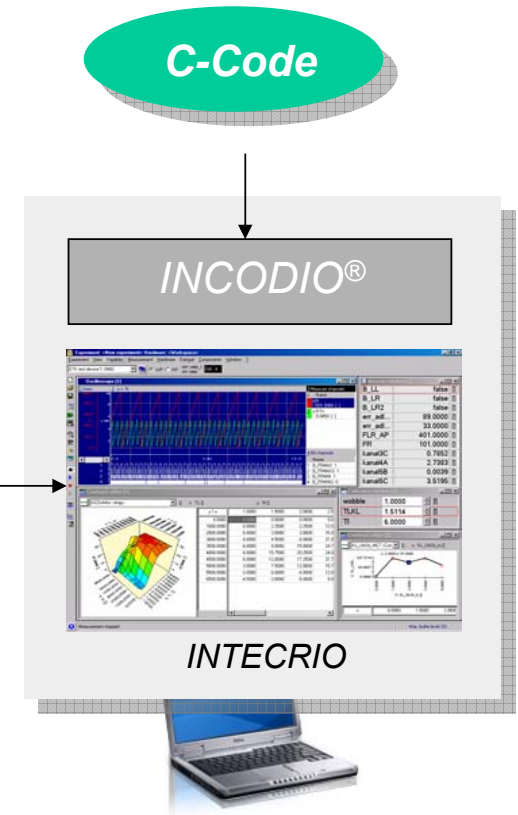
**Simulation & Validation of Production C-Code**

ASCET or

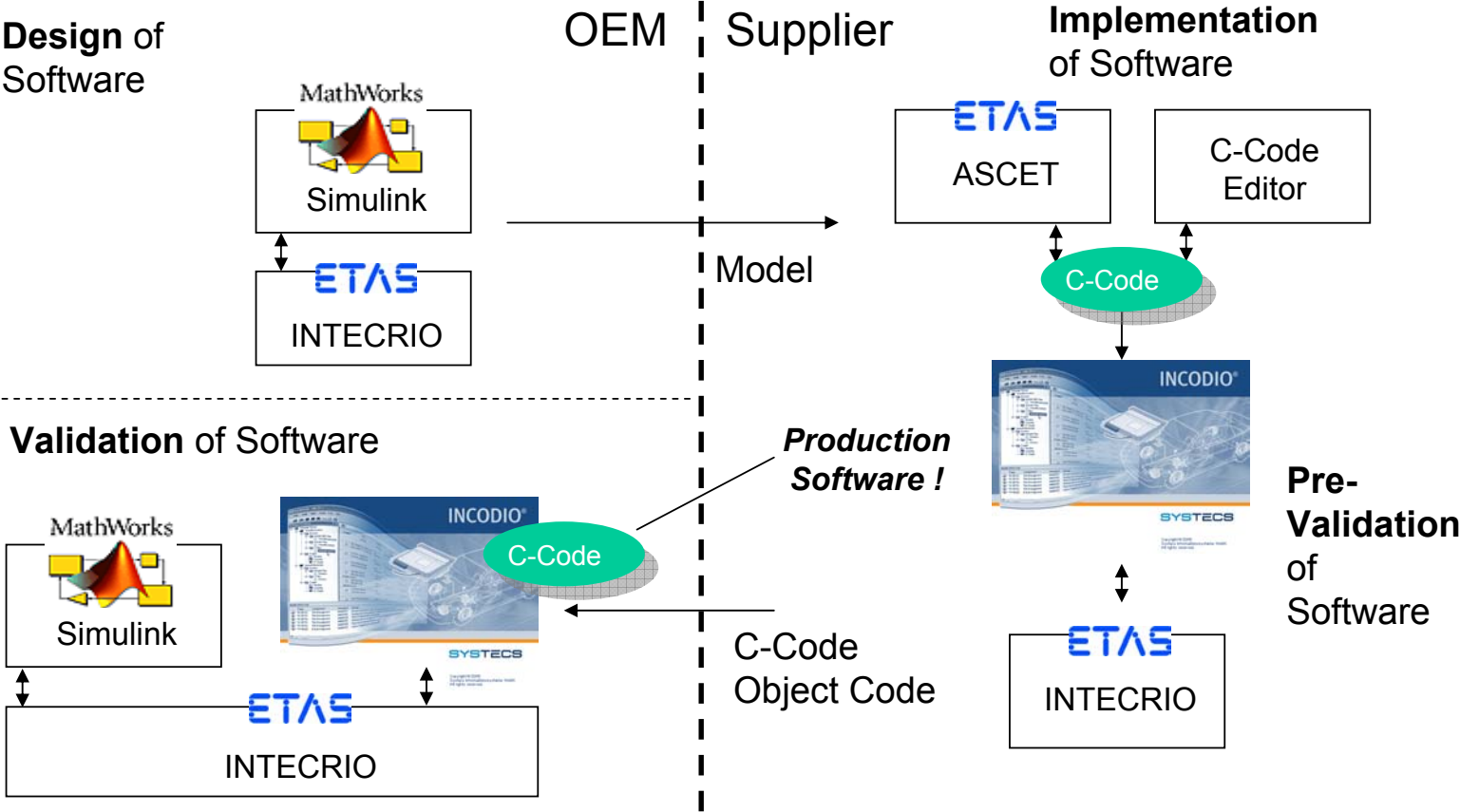


- Your benefit**

- fast integration of Production C-Code
- ... and simulation in the Loop with ECU Software Models and / or Vehicle Models



# INCODIO® V1 – Use Cases



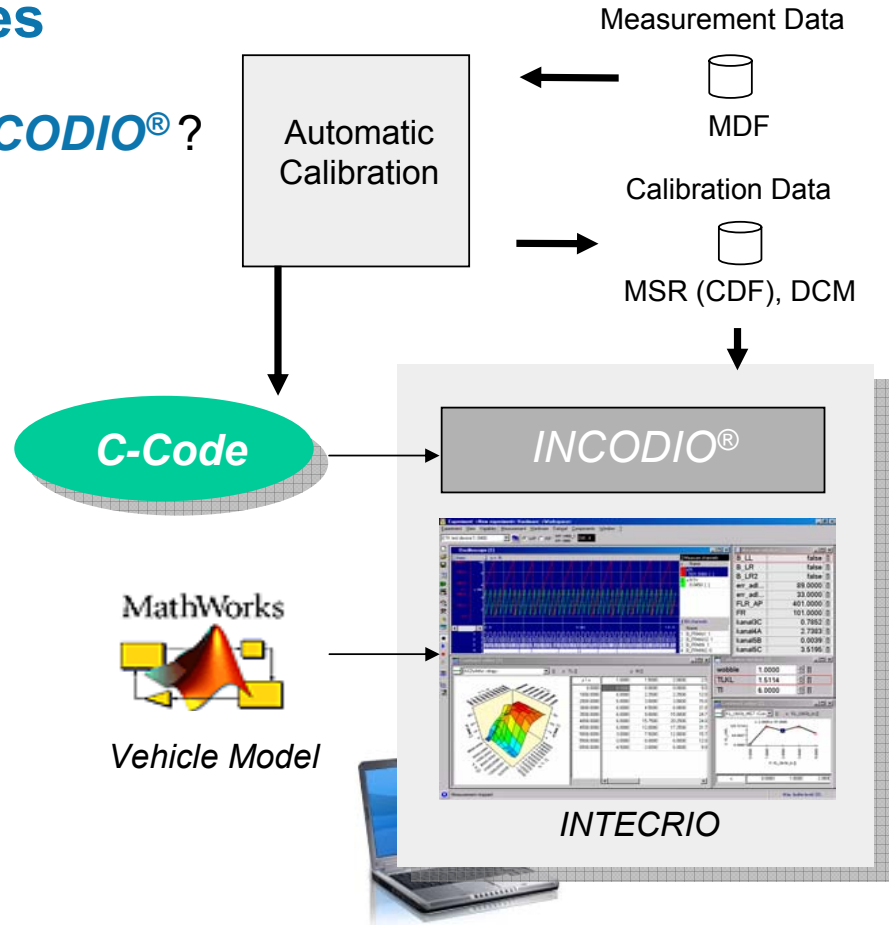
# INCODIO® V1 – Use Cases

- Which Customers will use **INCODIO®**?



- Your benefit

- (automatic) Calibration of Production Software in the Lab



## INCODIO® V1 – Use Cases

- Which Customers will use **INCODIO®**?



... who  
**already use**  
**INTECRIO** for  
 Model-based Rapid  
 Prototyping



- Your benefit**

- Excellent migration from verified legacy C-Code to model based development
- Simulation of C-Code together with Models for ECU Software and Vehicles

## Key Features

- **INCODIO® Version V1**
  - Supports full **parsing** of C-Code
    - enables direct integration of C-Code into INTECRIO **without additional effort**
      - no additional Function & Variable definition in INTECRIO
      - no consistency problems with redundant definitions in INTECRIO



## Key Features

- **INCODIO® Version V1**
  - Supports full **parsing** of C-Code
    - Supports unions, struct, ...
    - Supports redefinition of ECU specific declarations
      - E.g. CONST -> VOLATILE redefinition

➤ **makes C-Code ready for simulation !**



## Key Features

- **INCODIO® Version V1**
  - Supports **ASAM-MCD-2MC**
    - enables display of **physical Values** of ECU Software variables
    - allows identification of **Input/Output** signals of Software Components
    - allows **Calibration** of production Parameters, Curves and Maps during Simulation
      - **Arbitrary Record Layouts supported**



## Key Features

- **INCODIO® Version V1**
  - Supports specification of **Real-time behavior**
    - Automatic identification of Processes & Additional Functions
    - Specification of Priority, Trigger Mode, Period, ... for Processes



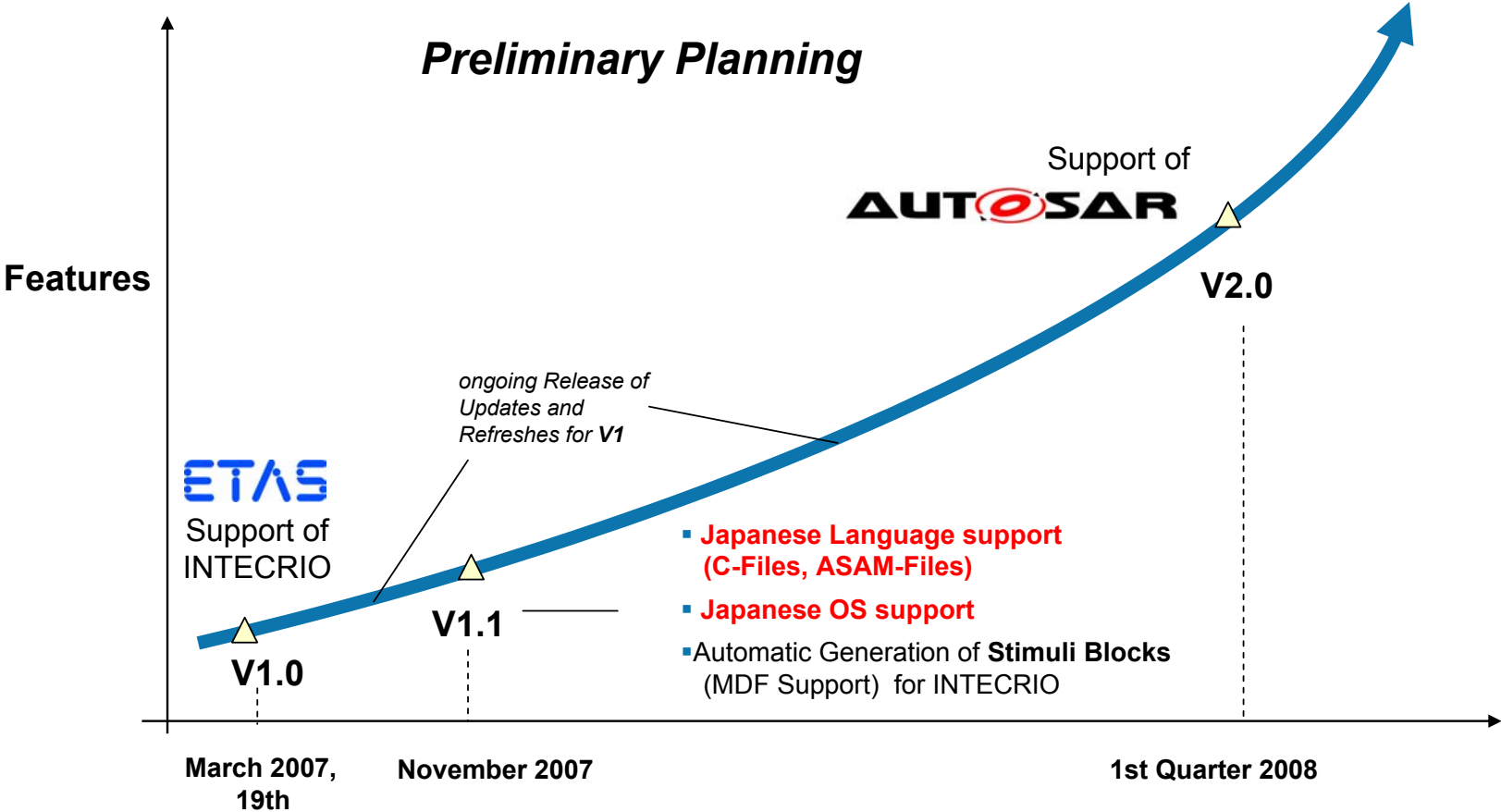
## Key Features

- **INCODIO® Version V1 (.1)**
  - supports Japanese Language for C-Files and ASAM-Files
    - especially Comments and Long names

```
/begin CHARACTERISTIC bp4bData N 0 SW          /* name */  
"j ETASグループは、自動車業界に特化した価値あるパートナー
```

- supports Japanese Windows OS

# INCODIO® – Roadmap



Thank you for your Attention

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