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ERIKA Enterprise: Operating system and open-source components for automotive systems

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agenda

- (brief) Evidence company profile

- AUTOSAR and OSEK/VDX

- make, buy, or…

- open platforms and ERIKA Enterprise

- first experiences in automotive systems
  with Cobra-AT and Freescale

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company profile

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Evidence profile

- Founded in 2002, spin-off company of the Scuola Superiore S.Anna

- 15 people

- **Mission**: design and development of software for small electronic devices

- Evidence won the first prize at Start Cup Pisa 2005

- selected by "*Corriere della Sera*" as one of the most innovative Italian young entrepreneurs

SpinOff
Impresa Spin-Off della Scuola Sant'Anna

PПI
PREMIO
NAZIONALE INNOVAZIONE

Sondaggio Un panel di dieci esperti elegge per il Corriere Economia il Gotha degli under 50. Che saranno famosi

Imprenditori emergenti: ecco i 30 più innovativi

Hanno una forte propensione internazionale. Sanno usare gli strumenti finanziari, dal private equity alla Borsa. Nuovi prodotti, nuovi processi, old economy reinventata

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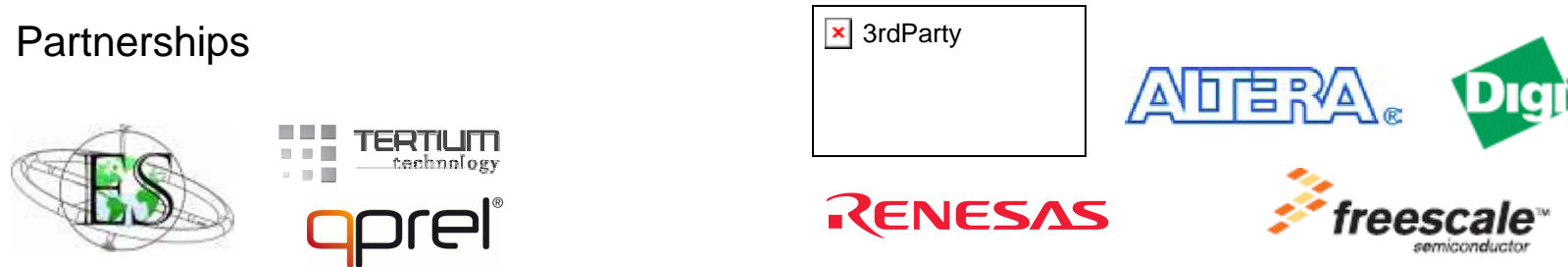
(some) customers and partners

OSEK,
microcontrollers,
schedulability analysis

Linux,
SW devel.

Partnerships

3rdParty

Products

Real-Time Operating Systems:

- ERIKA Enterprise   – Tiny RTOS
- Embedded Linux   – High performance OS

Development tools:

- RT-Druid   – For ERIKA Enterprise
- Evelin SDK   – For Embedded Linux

Hardware:

- Flex   – Electronic board with ERIKA

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the future is AUTOSAR…

- the AUTOSAR initiative started to increase portability and reuse of functional components

- AUTOSAR is based on a system-level view integrating software components allocated on hardware of choice of the car manifacturer

- from **federated architectures**

  – ECUs connected to a network

- to **integrated architectures**

  – hardware hosting cooperating software components

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AUTOSAR goals

- In the long term
  - the hardware designs will be optimized
  - less ECUs
  - more competition among providers of
    - subsystem producers
    - base software
    - application software

- objective:

cost reduction

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the present… is OSEK/VDX!

- most developers currently use OSEK/VDX
  - OSEK/VDX is a subset of AUTOSAR OS
  - AUTOSAR is in any case expected to come for future projects

- smaller projects do not use operating systems

Why?

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nothing!

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AUTOSAR and COTS software

- AUTOSAR is enabling software to become a **commodity**
- a set of common components is being developed and proposed to subsystem makers

but

- what currently happens is that, if not required by the customer, developers sometimes **do not buy** components to avoid royalties and license costs
  - RTOS
  - diagnostic protocols (KWP2000, …)

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share!

we believe that
there is space for
openly sharing
software components
not in the core business

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Linux and Android

- This is already happening in the automotive industry
- Android is being considered as an alternative to proprietary solutions for infotainment systems
- This is not happening (yet) on smaller microcontroller systems
- Why?

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Open Platforms

- what we need is an open platform
  - supporting a wide range of microcontrollers
  - implementing a set of basic services
  - enabling companies to **share components** which are not part of the core business

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the first building block

- the first building block is an OSEK/VDX RTOS

- Many projects started to provide an Open OSEK/VDX operating system
  - Arctic Core
  - http://en.wikipedia.org/wiki/OSEK

- some of them are
  - at the early stage
  - available for i386 only
  - not commercially supported by a company

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ERIKA Enterprise

- we propose

ERIKA ENTERPRISE

- an open-source RTOS
- implementing the OSEK/VDX standard
- Made in Italy
- as the base platform to build a set of open components for automotive systems

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OSEK/VDX API support

ERIKA Enterprise supports the OSEK/VDX API

Complete implementation of the following components:

- OSEK OS (BCC1, BCC2, ECC1, ECC2)
- OSEK OIL
- OSEK ORTI using Lauterbach Trace32
- Additional conformance classes (FP, EDF, FRSH)

Prototype implementation of:

- OSEK COM (CCCA, CCCB, CCC0, CCC1),
  no OIL support

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microcontrollers

currently available for

- Microchip dsPIC
- Altera NIOS II (with multi-core support!)
- Atmel AVR

existing support (not yet mainline)

- ARM7TDMI (Samsung KS32C50100, Triscend A7, ST Janus, ST STA2051, UniBO MPARM)
- Tricore 1
- PPC 5xx (PPC 566EVB)
- Hitachi H8 (RCX/Lego Mindstorms)
- C167/ST10 (Ertec EVA 167, tiny/large mem. model)

under development

- Microchip PIC32 (done by SSSA)
- Tricore2 (done in the PREDATOR FP7 Project)

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Microchip dsPIC, BCC1

OSEK BCC1, monostack, 2 Tasks, 1 resource

Code footprint (24-bit instructions):   379 (1137 bytes)
- ISR2 stub (for each IRQ)   27
- IRQ end   36
- kernel global functions   99
- ActivateTask   57
- GetResource   12
- ReleaseResource   41
- StartOS   26
- Task end (TerminateTask)   81

Data footprint (bytes)
- ROM   18
- RAM   52

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RT-Druid

RT DRUID

- Development environment for Erika Enterprise

- Compliance with OSEK OIL

- Schedulability analysis plugin

- Integration with AUTOSAR XML

- Template applications support

- Easy development:

  – Multicore support: multicore issues automatically handled

  – Support for hardware debugging LAUTERBACH

  – Based on the well-known Eclipse IDE eclipse

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licensing

ERIKA Enterprise is available under the
GPL + Linking Exception

- http://en.wikipedia.org/wiki/GPL_linking_exception
- possibility to statically link a proprietary application with the source code

RT-Druid IDE is currently with a demo license, will be released soon under EPL

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community

http://erika.tuxfamily.org

- SVN repository, Wiki, Forum
- More than 15 universities using ERIKA
- Application notes
- available libraries

  console

  802.15.4 (with beaconed mode / GTS support)

  Scilab/Scicos

  Motor control

  TCP/IP, and others

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INTERESTED Project

http://www.interested-ip.eu/

- RT-Druid is used in the INTERESTED FP7
  by Magneti Marelli, AbsInt, CEA
- Used for:
  - Specification of the mapping of the various functionalities
  - Schedulability analysis
  - Sensitivity analysis
  - Integration into the AUTOSAR build flow

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ERIKA Enterprise on Freescale S12

- ERIKA Enterprise has been selected by Cobra-AT
- porting on Freescale S12XS
- released open-source as part of ERIKA Enterprise

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