ERIKA Enterprise

RETIS Laboratory,
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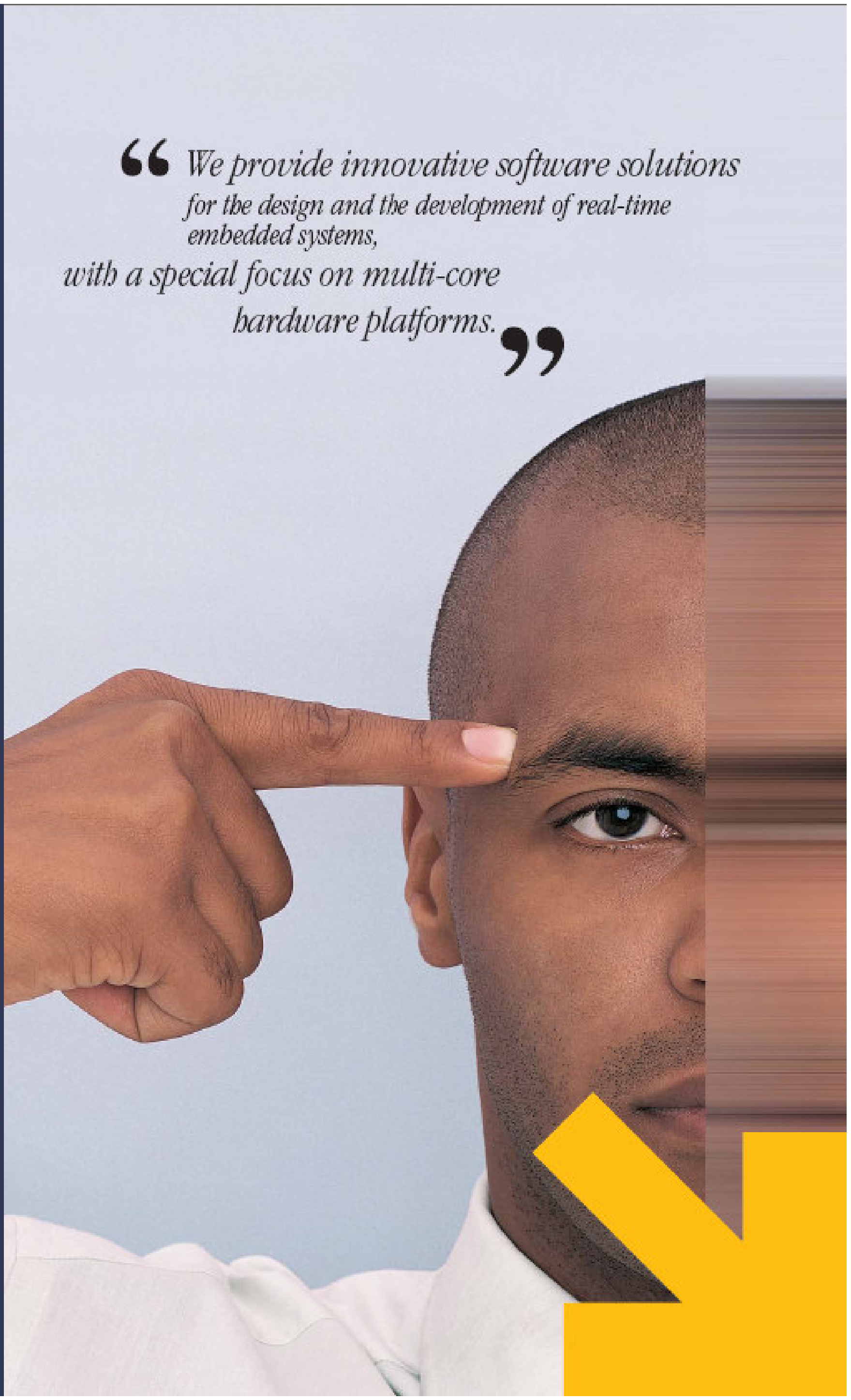
“We provide innovative software solutions
for the design and the development of real-time embedded systems,
with a special focus on multi-core hardware platforms.”

Incubatore Pont-Tech - Viale R. Piaggio, 32 - 56025 Pontedera (PI) - Italy

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summary

- ERIKA Enterprise features
- comparison of the various versions
- OIL definition for Microchip dsPIC ® DSC

It's time for

real-time solutions

ERIKA Enterprise

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features

supported API

- OSEK OS (BCC1, BCC2, ECC1, ECC2)
- OSEK OIL 1.4.1
- OSEK ORTI 2.1.1 for Lauterbach Trace32

support for

- basic (with stack sharing) / extended tasks
- resources
- events
- hooks
- alarms

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availability

currently available for

- Microchip dsPIC

also available for

- ARM7TDMI
  (Samsung KS32C50100, Triscend A7, ST Janus, ST STA2051)
- Tricore 1
- PPC 5xx (PPC 566EVB)
- Hitachi H8 (RCX/Lego Mindstorms)
- C167/ST10 (Ertec EVA 167, tiny/large mem. model)
- AVR
- Altera NIOS II
  - with multi-core support!

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licensing and RT-Druid

ERIKA is distributed under the GPL with linking exception license (also known as GNU Crosstool license)

ERIKA Enterprise is available together with the RT-Druid IDE code generator

- integrated into Eclipse
- code generation for ERIKA Enterprise

comparison

CC

Conformance classes

- BCC1, BCC2, ECC1, ECC2

Startup /Shutdown

- StartOS, application modes, StartupHook, autostartSystem Shutdown
- ShutdownOS and ShutdownHook

FP, EDF, FRSH

- FP (similar to BCC2, or ECC2 if multistack), EDF, FRSH
- No, the main is already the main thread!
- No

comparison (2)

CC	*FP, EDF, FRSH*
Error Handling and Hooks	
• error codes, standard and extended status	• No
• support for ErrorHook and macros	• No
PreTaskHook / PostTaskHook	
• Support for PreTaskHook and PostTaskHook / nothing	• No
ORTI	
• Yes (Nios II)	• No

comparison (3)

CC	*FP, EDF, FRSH*
Task	
• TerminateTask and ChainTask	• No (less RAM!)
Informations on tasks	
• GetTaskID and GetTaskState	• No (monostack does not have a task state!)
Basic / extended tasks	
• Basic and Extended Tasks	• blocking primitives to be called within tasks with a private stack

comparison (4)

CC	*FP, EDF, FRSH*
Number of pending activations	
• BCC1 and ECC1 = only one pending activation. BCC2 and ECC2 = more than one (in OIL file), activations of tasks with same priorities in FIFO order	• the number of pending activations as an integer value, maximum value is implementation dependent. No FIFO order.
Events	
• Yes, in ECC1 and ECC2	• No

comparison (5)

CC	*FP, EDF, FRSH*
Blocking / non-blocking semaphores	
• ECC1/ECC2 Blocking and non blocking semaphores	• Semaphore primitives only in multistack configuration.
• BCC1/BCC2 non blocking semaphores	
Primitives for disabling interrupts	
• Yes	• No

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minimal OSEK footprint on dsPIC30

- 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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minimal footprint on dsPIC30

- FP kernel, monostack, 4 tasks, 1 resource

Code footprint (24-bit instructions):	244 (732 bytes)
• ISR2 stub (for each IRQ)	24
• IRQ end	23
• kernel global functions	67
• ActivateTask	43
• GetResource + ReleaseResource	42
• Task end	45

Data footprint (bytes)	
• ROM	26
• RAM	42

board support

with Microchip dsPIC ® DSC

ERIKA Enterprise supports the following boards:

- Evidence / Embedded Solutions FLEX board
  - supported devices: LEDs, various external devices using add-on boards
- Microchip Explorer 16
  - both PIC33 and PIC24
  - supported devices: LEDs, Buttons, LCD, Analog
- Microchip dsPICDEM 1.1 Plus
  - supported devices: LEDs, Buttons, LCD, Analog, Audio (tbd)

OIL

for EE

- the OIL presented in the following slides is a subset of the OSEK OIL standard
- it is a quick tutorial to the OIL definition which can be used for ERIKA Enterprise on the Microchip dsPIC ® DSC
- two columns
  - the first column contains the definition
  - the second column contains examples

OIL

OS object

definition

```
OIL_VERSION = "2.4";
IMPLEMENTATION ee {
OS {
  STRING EE_OPT[];
  STRING CFLAGS[];
  STRING ASFLAGS[];
  STRING LDFLAGS[];
  STRING LDDEPS[];
  STRING LIBS[];
  BOOLEAN USERESSCHEDULER =
   TRUE;
  […]
```

example

```
CPU mySystem {

OS myOs {
  EE_OPT = "DEBUG";
  EE_OPT = “MYDEFINE”;

  CFLAGS =
   "-IC:/…/scicos";

  USERESSCHEDULER = FALSE;
```

OIL

OS Object : CPU data

definition

```
ENUM [
  […]
  PIC30 {
    STRING APP_SRC[];
    BOOLEAN [
      TRUE {
        BOOLEAN [
          TRUE {
            UINT32 SYS_SIZE;
          },
          FALSE
        ] IRQ_STACK;
      },
      FALSE
    ] MULTI_STACK = FALSE;
    BOOLEAN ICD2 = FALSE;
    BOOLEAN ENABLE_SPLIM =
   TRUE;
  },
] CPU_DATA[];
```

example

```
CPU_DATA = PIC30 {
  APP_SRC = "code.c";
  MULTI_STACK = FALSE;
  ICD2 = TRUE;
};
```

```
CPU_DATA = PIC30 {
  APP_SRC = "code.c";
  MULTI_STACK = TRUE {
    IRQ_STACK = TRUE {
      SYS_SIZE=64;
    };
  };
  ICD2 = TRUE;
  ENABLE_SPLIM = TRUE;
};
```

OIL

OS Object: MCU data

definition

```
ENUM [
  PIC30 {
    ENUM [
      CUSTOM {
        STRING MODEL;
        STRING LINKERSCRIPT;
        STRING DEV_LIB;
        STRING INCLUDE_C;
        STRING INCLUDE_S;
      },
      PIC24FJ128GA006,
      PIC24FJ128GA008,
      […]
    ] MODEL;
  }
] MCU_DATA;
```

example

```
MCU_DATA = PIC30 {
  MODEL = PIC33FJ256GP710;
};
```

```
MCU_DATA = PIC30 {
  MODEL = CUSTOM {
    LINKERSCRIPT =
      "p33FJ256GP710.gld";
    DEV_LIB =
      "libp33FJ256GP710-
   elf.a";
    INCLUDE_C =
      "p33FJ256GP710.h";
    INCLUDE_S =
      "p33FJ256GP710.inc";
  };
};
```

OIL

OS Object: board data

definition

```
ENUM [
  NO_BOARD,
  EE_FLEX {
    BOOLEAN USELEDS;
  },
  MICROCHIP_EXPLORER16 {
    BOOLEAN USELEDS;
    BOOLEAN USEBUTTONS;
    BOOLEAN USELCD;
    BOOLEAN USEANALOG;
  }
  MICROCHIP_DSPICDEM11PLUS {
    BOOLEAN USELEDS;
    BOOLEAN USEBUTTONS;
    BOOLEAN USELCD;
    BOOLEAN USEANALOG;
    BOOLEAN USEAUDIO;
  }
  …
] BOARD_DATA = NO_BOARD;
```

example

```
BOARD_DATA =
  MICROCHIP_EXPLORER16 {
    USELEDS = TRUE;
    USEBUTTONS = TRUE;
    USELCD = TRUE;
    USEANALOG = TRUE;
  };

BOARD_DATA = EE_FLEX {
  USELEDS = TRUE;
};

BOARD_DATA =

   MICROCHIP_DSPICDEM11PLUS
   {
  USELEDS = TRUE;
  USEBUTTONS = TRUE;
  USELCD = TRUE;
};
```

OIL

OS Object: libraries and kernel type

definition

```
  ENUM [
    ENABLE {
      STRING NAME;
    }
  ] LIB;

  ENUM [
    FP {
      BOOLEAN NESTED_IRQ;
    },
    BCC1,
    BCC2,
    ECC1,
    ECC2
  ] KERNEL_TYPE;
};
```

example

```
  LIB = ENABLE {
    NAME = SCICOS;
  };

  KERNEL_TYPE = FP;
};
```

OIL

tasks

definition

```
TASK {
  UINT32 PRIORITY;
  UINT32 ACTIVATION = 1;
  ENUM [NON, FULL] SCHEDULE;
  TYPE RESOURCE[];
  ENUM [
    SHARED,
    PRIVATE {
      UINT32 SYS_SIZE;
    }
  ] STACK = SHARED;
};
```

example

```
TASK TaskFlash {
  PRIORITY = 1;
  STACK = SHARED;
  SCHEDULE = FULL;
};

TASK Producer {
  PRIORITY = 2;
  STACK = PRIVATE {
    SYS_SIZE = 64;
  };
  SCHEDULE = FULL;
};
```

OIL

resources

definition

```
RESOURCE {
  ENUM [
    STANDARD {
      STRING APP_SRC[];
    },
    […]
  ] RESOURCEPROPERTY;
};
```

example

```
TASK LowTask {
  RESOURCE = "myResource";
  […]
};

RESOURCE myResource {
  RESOURCEPROPERTY=STANDARD;
};
```

OIL

counters and alarms

definition

```
  COUNTER {
    […]
  };
  ALARM {
    COUNTER_TYPE COUNTER;
    ENUM [
      ACTIVATETASK {
        TASK_TYPE TASK;
      },
      […]
      ALARMCALLBACK {
        STRING
          ALARMCALLBACKNAME;
      }
    ] ACTION;
  };
};
```

example

```
COUNTER myCounter;

ALARM AlarmFlash {
  COUNTER = "myCounter";
  ACTION = ACTIVATETASK {
    TASK = "TaskFlash";
  };
};
```

the end

Questions ?