SENSOR INTERFACE

- RDDF database
- Laser 1 interface
- Laser 2 interface
- Laser 3 interface
- Laser 4 interface
- Laser 5 interface
- Camera interface
- Radar interface
- GPS position
- GPS compass
- IMU interface
- Wheel velocity
- Brake/steering

PERCEPTION

- Road finder
- Laser mapper
- Vision mapper
- Radar mapper
- UKF Pose estimation
- Surface assessment

PLANNING&CONTROL

- Top level control
- Path planner
- Steering control
- Throttle/brake control

USER INTERFACE

- Touch screen UI
- Wireless E-Stop

VEHICLE INTERFACE

- Touareg interface
- Power server interface

GLOBAL SERVICES

- Process controller
- Health monitor
- Data logger
- File system
- Inter-process communication (IPC) server
- Time server

Labels on connections:
- corridor
- RDDF corridor (smoothed and original)
- pause/disable command
- driving mode
- road center
- laser map
- map
- vision map
- obstacle list
- trajectory
- vehicle state (pose, velocity)
- vehicle state
- velocity limit
- heart beats
- Linux processes start/stop
- emergency stop
- health status
- power on/off
- data
- Communication requests
- Communication channels
- clocks

from Thrun et al, JFR 23(9) 2006

SENSOR INTERFACE

- RDDF database
- Laser 1 interface
- Laser 2 interface
- Laser 3 interface
- Laser 4 interface
- Laser 5 interface
- Camera interface
- Radar interface
- GPS position
- GPS compass
- IMU interface
- Wheel velocity
- Brake/steering

PERCEPTION

- Road finder
- Laser mapper
- Vision mapper
- Radar mapper
- UKF Pose estimation
- Surface assessment

PLANNING&CONTROL

- Top level control
- Path planner
- Steering control
- Throttle/brake control

USER INTERFACE

- Touch screen UI
- Wireless E-Stop

VEHICLE INTERFACE

- Touareg interface
- Power server interface

corridor

RDDF corridor (smoothed and original)

pause/disable command

driving mode

road center

laser map

map

vision map

obstacle list

vehicle state (pose, velocity)

vehicle state

vehicle state (pose, velocity)

velocity limit

trajectory

GLOBAL SERVICES

heart beats

Linux processes start/stop

Process controller

health status

Health monitor

emergency stop

power on/off

data

Data logger

File system

Communication requests

Communication channels

clocks

Inter-process communication (IPC) server

Time server

EE 192 Mechatronics Design Lab

adapted from Thrun et al, JFR 23(9) 2006
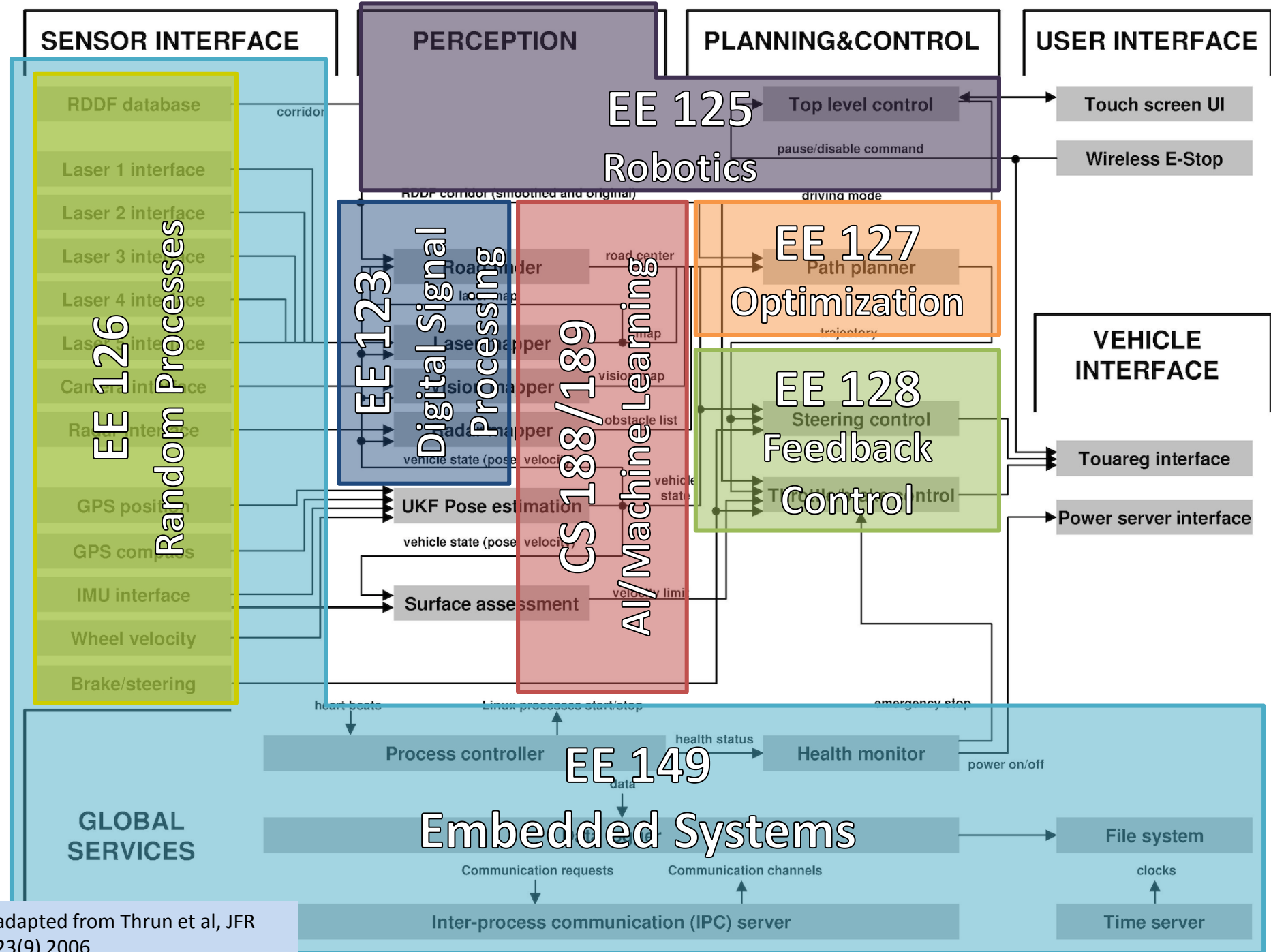
4   FRDM-KL25Z Hardware Overview

The features of the FRDM-KL25Z include:

- MKL25Z128VLK4 in an 80 LQFP package
- Capacitive touch slider
- MMA8451Q accelerometer
- Tri-color (RGB) LED
- Flexible power supply options – USB, coin cell battery, external source
- Battery-ready, power-measurement access points
- Easy access to MCU I/O via Arduino ™ R3 compatible I/O connectors
- Programmable OpenSDA debug interface with multiple applications available including:
    - Mass storage device flash programming interface
    - P&E Debug interface provides run-control debugging and compatibility with IDE tools
    - CMSIS-DAP interface: new ARM standard for embedded debug interface
    - Data logging application

Figure 1 shows a block diagram of the FRDM-KL25Z design. The primary components and their placement on the hardware assembly are pointed out in Figure 2.
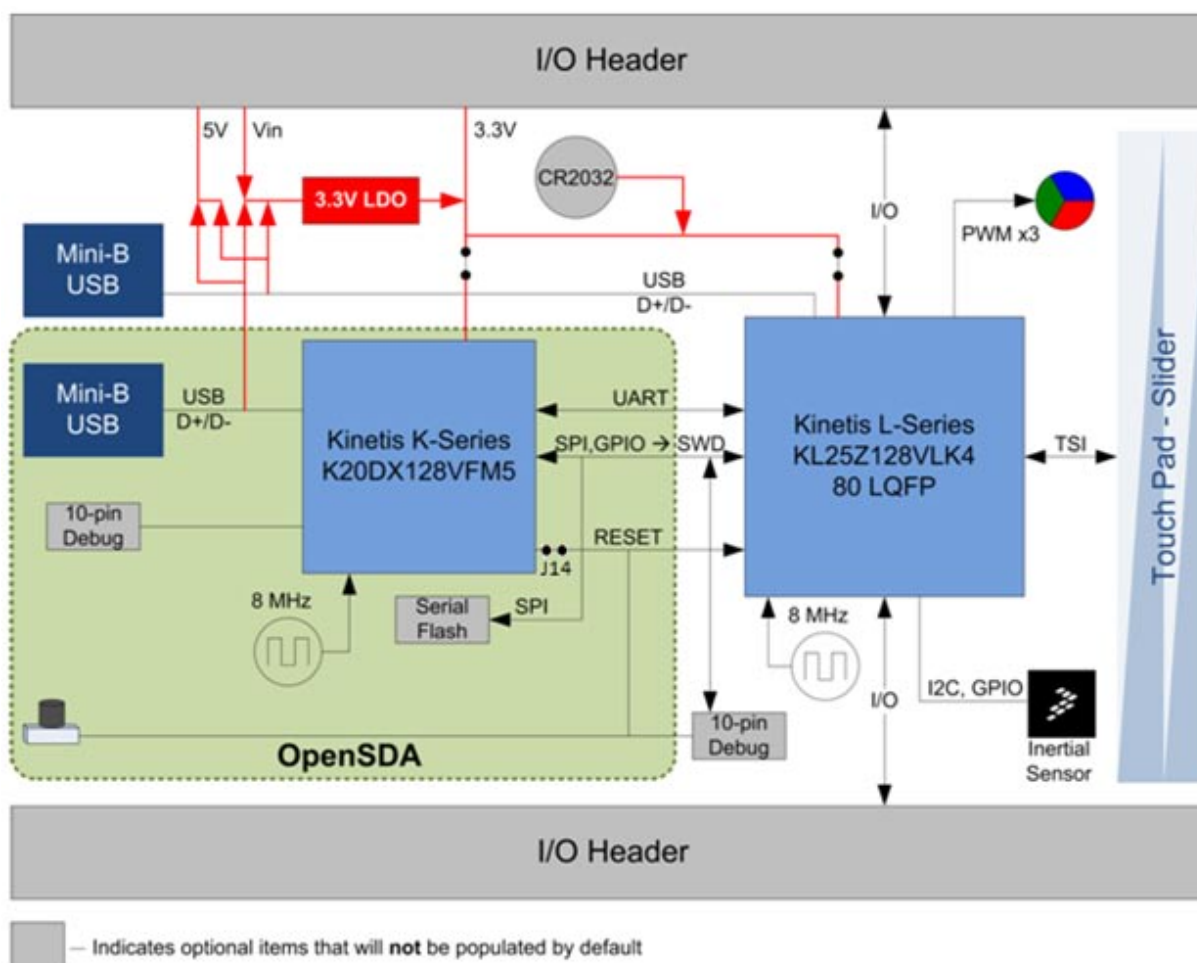
Figure 1. FRDM-KL25Z Block Diagram

Kinetis KL25 Family

ARM®Cortex™-M0+ Core	System	Memories and Memory Interfaces	Clocks
Debug interfaces	Internal watchdog	Program flash	Phase-locked loop
Interrupt controller	DMA	RAM	Frequency-locked loop
MTB	BME		Low/high frequency oscillator
			Internal reference clocks

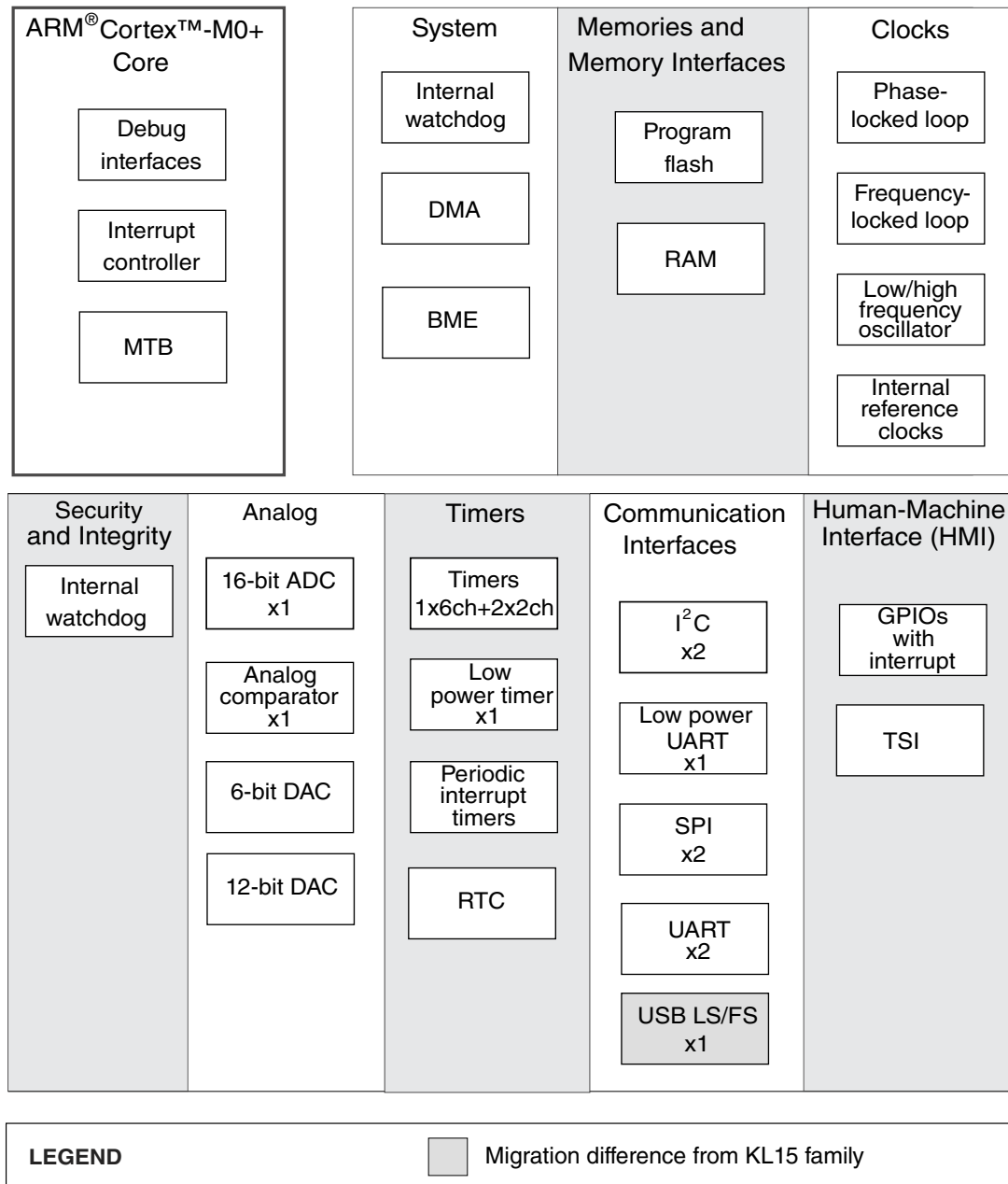| Security and Integrity	Analog	Timers	Communication Interfaces	Human-Machine Interface (HMI)
Internal watchdog	16-bit ADC x1	Timers 1x6ch+2x2ch	I²C x2	GPIOs with interrupt
	Analog comparator x1	Low power timer x1	Low power UART x1	TSI
	6-bit DAC	Periodic interrupt timers	SPI x2	
	12-bit DAC	RTC	UART x2	
			USB LS/FS x1	

LEGEND		Migration difference from KL15 family

Figure 1. Functional block diagram