REAL TIME OPERATING SYSTEM PROGRAMMING-II: Windows CE, OSEK and Real time Linux

Lesson-11:

Automobile Application Standards and OSEK-OS

Standards

- TTP (Time Triggered Protocol)
- CAN (Controller Area Network) Bus
- MOST (Media Oriented System Transport)

Standards . . .

- IEE (Institute of Electrical Engineers) guidance standard for EMC (Electromagnetic Magnetic Control) and functional safety guidance

Standards…

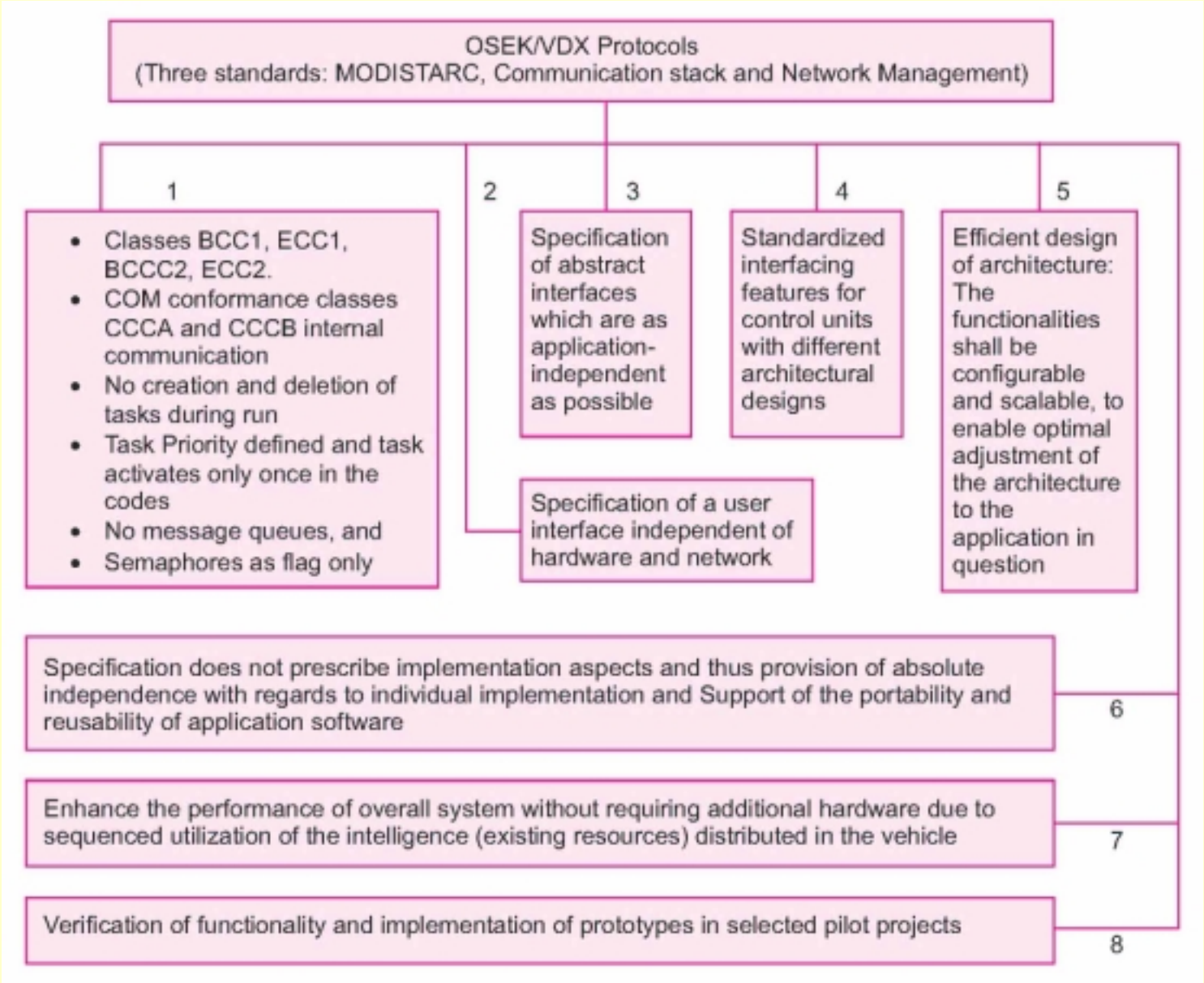
- AMI-C (Automotive Multimedia Interface Collaboration) [http://www.ami-c.org],
- MISRA-C (Motor Industry Reliability Association standard for C language software guidelines for automotive systems) [http://www.misra.org.uk]

Standards…

- OSEK/VDX RTOS communication and network management

[http://www.osek-vdx.org]

OSEK Basic Features



OSEK

- OSEK - named after the German words for Open (Offene) System (System) for Electronic (Electronik) embedded component and interface Crafts (Kraftfahrzeugen).

OSEK …

OSEK defines three standards -

- OSEK-OS for operating system, which gives greater reliability than other OSs – an essentiality in automobile applications

OSEK …

- OSEK-NM architecture for network management.
- OS divides tasks into four types, and the NM divides the architecture into two types — (i) Direct transfer and interchange of network messages (ii) Indirect transfer and interchange, both between the nodes.

OSEK …

- OSEK-COM architecture for IPCs between the same and different CPUs control unit tasks. Between the different unit tasks, there exists data-link and physical layers. Different CPU physical layers interface though CAN bus.

OSEK-OS features

- **Language** can be application-specific, need not be just C or C++ and data Types are also be application specific and not RTOS specific.

OSEK-OS features …

- For example, VxWorks STATUS is RTOS specific. OSEK- OS does not permit, RTOS specific data type.

OSEK-OS features …

- OS each method, class and run-time library should be scalable. This optimizes the memory needs.
- Tasks are classified into four types. This gives for a clear-cut distinction to programmer: which class to use for what modules in the system.

OSEK-OS features —Four Type of Tasks definitions

- Basic class — one task of each priority and single activation - called BCC 1 (Basic Conformance Class 1)
- Extended class— one extended task of each priority and single activation. It is called ECC 1 (Extended Conformance Class 1)

OSEK-OS features Four Type of Tasks definitions …

Extended task means, for example, a task created by FirstTask in Example 9.17.

- Basic with multiple tasks of each priority and multiple times activation during run. It is called BCC 2.

OSEK-OS features Four Type of Tasks definitions …

- Extended with multiple tasks of each priority and multiple times activation during run. It is called ECC 2.

OSEK-OS features …

- OS schedules ISRs and tasks in distinct ways. [VxWorks scheduler also does so].
- Interrupt system disables at the beginning of the service routine and enables on return. This lets the task run in real-time environment.

OSEK-OS features …

- Task can consist of three type of objects, *event* (semaphore), *resource* (statements and functions) and devices. A port device exemplary device object *alarm*- Displays the pictograms, messages and flashing messages as well as sounds buzzer and beeps.

OSEK-OS features …

- Task can be scheduled in real-time.
- Timer, task or semaphore objects run-time creation and deletion cannot be allowed. A run-time bug may lead to uncalled deletion of a timer or semaphore. That is the potential source of problem and thus unreliable.

OSEK-OS features …

- IPC-message queue posting by a task is not allowed as a waiting task may wait indefinitely for its entire message needs. RTOS queue types, waiting infinitely or for a time out for message can be potential source of trouble and thus unreliable.

OSEK-OS features …

- Similar risks may arise with semaphore as a resource key or counter - therefore not used.

OSEK-OS features …

- Before entering a critical section and when executing a service routine, all interrupts must disable and enable on return only.

Summary

We learnt

- RTOS - OSEK for automotive electronics.
- OSEK defines four types of classes BCC1, ECC1, BCCC2, ECC2COM and conformance classes CCCA and CCCB for internal communication, specifies that there should be no creation and deletion of tasks during run.
- Task Priority must be defined and task activates only once in the codes.
- There must not be used message queues, and Semaphores as flag only

End Lesson-11 on Automobile Application Standards and OSEK-OS