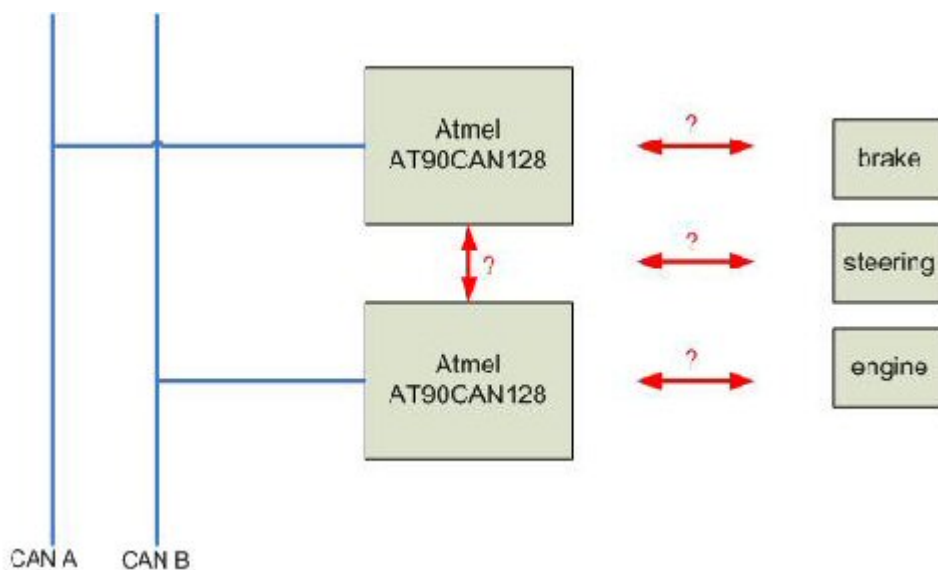


# Design of Safety-Critical Embedded Systems using Design Patterns

## Task

The implementation of safety-critical functionalities in the embedded systems domain demands specific requirements considering hardware and software. Most of the times, there are multiple possibilities that need consideration for the concrete realization. Design patterns that can be adjusted to different applications and thus can support the developer during the design of safety-critical embedded systems in a constructive way, would be desirable.

During this diploma thesis, different architectures (HW and SW!) shall be designed taking the actuator-control (brakes, steering, drive) on our model vehicle as an example. Furthermore, an evaluation of the designed architectures considering safety and reliability should be carried out. The architecture should be based on the following hardware if possible (redundant control units being accessed through a redundant CAN bus):



In a further step, you will have to examine how far general design patterns for safety-critical embedded systems can be derived from that.

The best appraised architecture has to be implemented on our model vehicle. In doing so, speed measurement (you can use the preparatory work of the diploma thesis Design and Accomplishment of the Speed Measurement in a Vehicle Prototype Applying the IEC 61508) and - if required - a simple ABS algorithm should be integrated.

The implementation of the ATMEL AT90CAN128 8bit microcontroller can be simulated on Atmel Studio

which is available for free. Read more at [www.atmel.com](http://www.atmel.com).

Concerning safety, we recommend the book *Sichere und fehlertolerante Steuerungen* by Sergio Montenegro as an introduction. Furthermore, you will have to use the norm [IEC 61508](#).

- Notice: safety is meant in terms of 'functional safety'.
- Link on CAN: [Atmel Microcontrollers for Controller Area Network](#)
- More links on this topic can be found [here](#).

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Last update: 2011/11/21 17:27

