**Led Software Design**

***SteerTurnIllum***



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# Glossary

This section contains a glossary of all the important terms and acronyms used inside the document.

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| **Term / Acronym** | **Description** |
| AUTOSAR | AUTomotive Open System ARchitecture |
| VFB | Virtual Functional Bus |
| SWC | Software Component |
| RTE | Runtime Environment |
| BSW | Basic Software |
| OS | Operating System |
| S/R | Sender / Receiver |
| C/S | Client / Server |
| ECU | Electronic Control Unit |
| uC | Microcontroller |
| ADC | Analog Digital Converter |
| DIO | Digital Input / Output |
| PWM | Pulse Width Modulation |

Table 1 - Glossary.

# Introduction

## Purpose of the Document

The purpose of the document is to define the software design of the ***Led*** SWC for the ***SteerTurnIllum*** embedded academy project.

## Overview

The ***Led*** SWC implements an unitary control interface for LEDs that are connected to DIO and PWM channels.

# Design Requirements

1. The Led SWC shall adhere to the structure illustrated in the composite structure diagram from **Figure 1**.

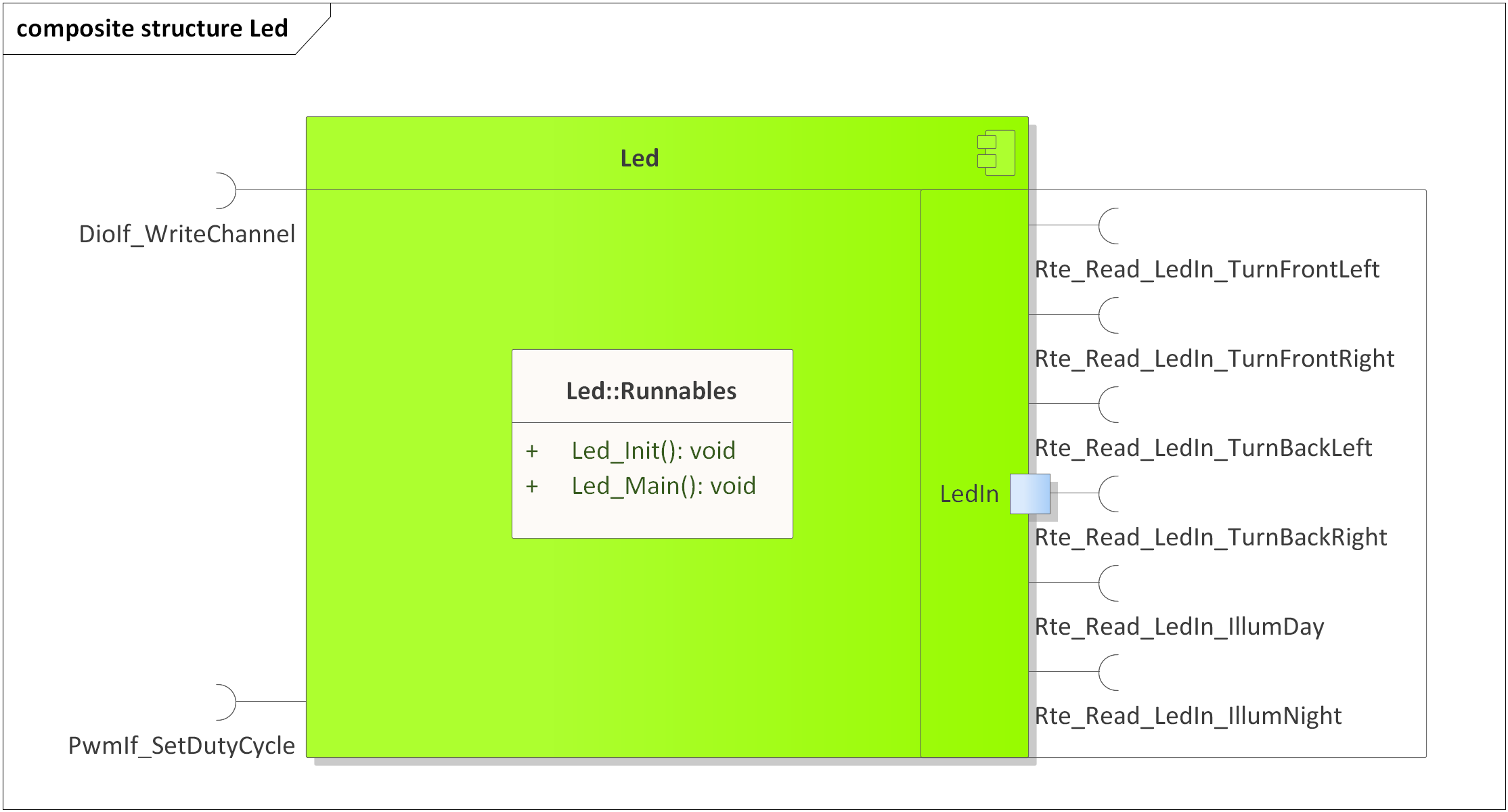


Figure 1 - Led composite structure diagram.

1. The Led SWC shall adhere to the SWC file structure template from 4\_Engineering\1\_Software\2\_Development\1\_Sources\8\_Templates\Swc\Code.
2. The Led SWC shall contain the following configuration parameters:

* In *Led\_Cfg.h*:
  + *LED\_DIO\_NUMBER\_OF\_INSTANCES*: macro defining the number of DIO LED instances to be processed in the main function.
  + *LED\_DIO\_\*\_INSTANCE*: zero based macros defining unique IDs of all the DIO LED instances, needed for the interaction between the core and RTE.
  + *LED\_PWM\_NUMBER\_OF\_INSTANCES*: macro defining the number of PWM LED instances to be processed in the main function.
  + *LED\_PWM\_\*\_INSTANCE*: zero based macros defining unique IDs of all the PWM LED instances, needed for the interaction between the core and RTE.
* In *Led\_Cfg.c*:
  + *Led\_gkat\_DioConfig*[LED\_DIO\_NUMBER\_OF\_INSTANCES]: internal global constant array defining the DioIf channels and active levels (STD\_HIGH or STD\_LOW) for all DIO LED instances.
  + *Led\_gkat\_PwmConfig*[LED\_PWM\_NUMBER\_OF\_INSTANCES]: internal global constant array defining the PwmIf channels and active levels (PWMIF\_HIGH or PWMIF\_LOW) for all PWM LED instances.

1. The Led SWC shall implement the *void Led\_Init(void)* runnable for initializing all the internal static and global variables and turning off all the LEDs through *DioIf\_WriteChannel()* and *PwmIf\_SetDutyCycle()*.
2. The Led SWC shall implement the *void Led\_Main(void)* runnable for implementing the processing of all the LED instances as follows:
   * Reads the LED input control data through *Rte\_Read\_LedIn\_\*()*.
   * For DIO LEDs, depending on the LED state input state control data and on the configured active levels turns the LEDs ON if the state is RTE\_LED\_ON or OFF if the state RTE\_LED\_OFF, through *DioIf\_WriteChannel()*. Any other input states shall be ignored. The duty cycle from the input control data shall be ignored.

* For PWM LEDs:
  + Transforms the duty cycle input control data from the [0, 10000] interval to the AUTOSAR duty cycle format in the [0, 0x8000] interval.
  + If the LED state input control data is RTE\_LED\_ON applies the calculated duty cycle or 0x8000 minus the calculated duty cycle, depending on the configured active level, through *PwmIf\_SetDutyCycle().*
  + If the LED state input control data is RTE\_LED\_OFF applies 0 or 0x8000 duty cycle, depending on the configured active level, through *PwmIf\_SetDutyCycle().*
  + Duty cycle inputs > 10000 and state inputs different than RTE\_LED\_ON and RTE\_LED\_OFF shall be ignored.

1. The Led SWC shall include *DioIf.h* and directly use the *DioIf\_WriteChannel()* functionfor writing the DioIf channels of the DIO LEDs.
2. The Led SWC shall include *PwmIf.h* and directly use the *PwmIf\_SetDutyCycle()* functionfor writing the PwmIf channels of the PWM LEDs.

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## Version Index

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| 1.0 | 10.07.2021 | Nicolae-Bogdan Bacrău | All | Created. |

Table 2 - Version Index.