**Servo Software Design**

***SteerTurnIllum***



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| Version: |  | 1.0 |

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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 ***Servo*** SWC for the ***SteerTurnIllum*** embedded academy project.

## Overview

The ***Servo*** SWC implements a simple control interface, through transforming from degrees into PWM duty cycles, for positioning servomotors.

# Design Requirements

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

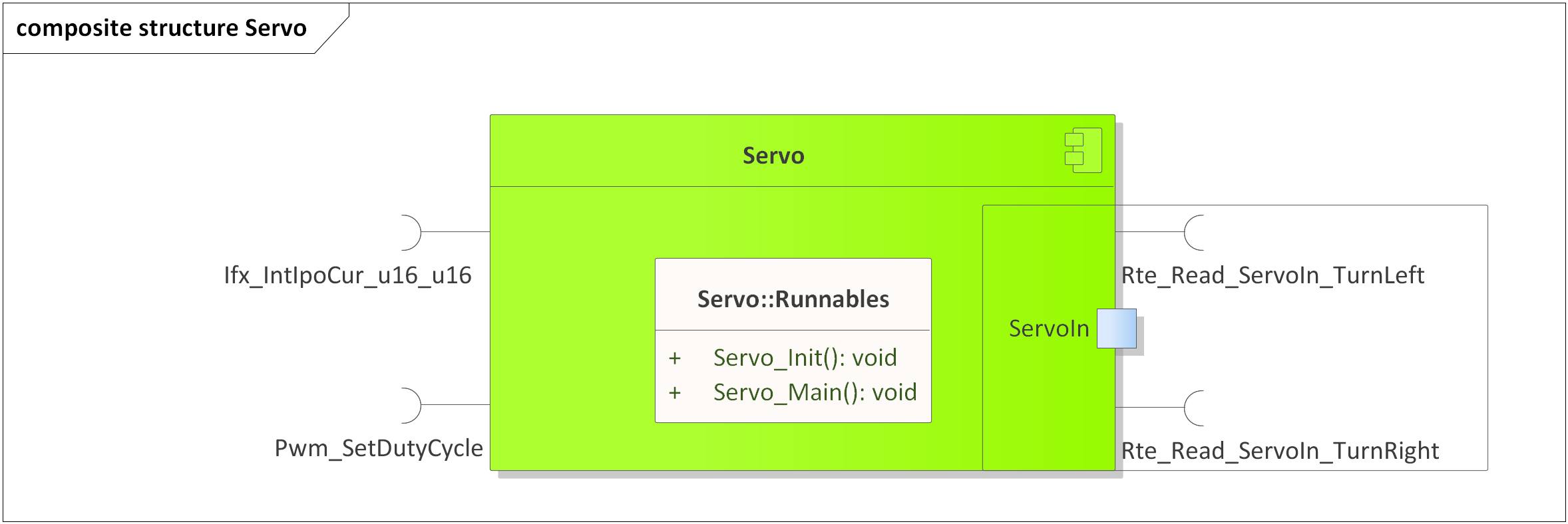


Figure 1 - Servo composite structure diagram.

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

* In *Servo\_Cfg.h*:
  + *SERVO\_NUMBER\_OF\_INSTANCES*: macro defining the number of servomotor instances to be processed in the main function.
  + *SERVO\_\*\_INSTANCE*: zero based macros defining unique IDs of all the servomotor instances, needed for the interaction between the core and RTE.
* In *Servo\_Cfg.c*:
  + *Servo\_gkat\_Config*[SERVO\_NUMBER\_OF\_INSTANCES]: internal global constant array defining the configuration of Ifx degrees to PWM duty cycles interpolation curves and PwmIf channels for all servomotor instances. The Ifx configuration shall contain at least 3 points: 0 degrees, 90 degrees and 180 degrees.

1. The Servo SWC shall implement the *void Servo\_Init(void)* runnable for initializing all the internal static and global variables and setting the servomotors to point forwards through *Pwm\_SetDutyCycle()*.
2. The Servo SWC shall implement the *void Servo\_Main(void)* runnable for implementing the processing of all the servomotor instances as follows:
   * Reads the servomotor degrees input control data through *Rte\_Read\_ServoIn\_\*()*.

* Converts from degrees input in the [0, 18000] interval (0 - pointing right, 9000 - pointing forward, 18000 - pointing left), to [3 ... 12] % PWM duty cycles, through Ifx interpolations, and applies them to the servomotor PwmIf channels through *PwmIf\_SetDutyCycle().* Degrees inputs > 18000 shall be ignored.

*Note*: in the servomotor datasheet the [5 ... 10] % PWM duty cycle control interval is specified, but this interval is not enough for reaching 180 degrees.

1. The Servo SWC shall include *PwmIf.h* and directly use the *PwmIf\_SetDutyCycle()* functionfor writing the PwmIf channels of the servomotors.
2. The Servo SWC shall include *Ifx.h* and directly use the *Ifx\_IntIpoCur\_u16\_u16()* function for transforming from degrees to PWM duty cycles.

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## Version Index

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| **Version** | **Date** | **Author** | **Chapter** | **Modification description** |
| 1.0 | 10.07.2021 | Nicolae-Bogdan Bacrău | All | Created. |

Table 2 - Version Index.