DIO Drivers

For

AVR Microcontrollers

Nti Team

Software Requirement Specification Document

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Version: 1st **Date: 26/10/2023**

1. Scope of Document

This document specifies requirements on the module DIO Driver.

1.1 Constraints

First scope for specification of requirements on basic software modules is systems which are not safety relevant. For this reason safety requirements are assigned to medium priority.

2. Requirements Structure

Each module specific chapter contains a short functional description of the Basic Software Module. Requirements of the same kind within each chapter are grouped under the following headlines (where applicable):

Functional Requirements: -

- Configuration (which elements of the module need to be configurable).
- Initialization.
- Normal Operation.
- Shutdown Operation.
- Fault Operation.
- …….

Non-Functional Requirements:-

- Timing Requirements.
- Resource Usage.
- Usability.
- Output for other WPs (e.g. Description Templates, Tooling,...).
- …….

3. Functional Overview

The DIO Driver abstracts the access to the microcontroller's hardware pins. Furthermore, it allows the grouping of those pins.

4. Requirement Specification

5.1 Functional Requirements

- [DIO_001] the driver shall be compatible with all AVR microcontrollers.
- [DIO_002] The AVR DIO driver shall not buffer data when providing read and write services.
- [DIO_003] The AVR DIO driver shall provide synchronous read/write/toggle services.
- [DIO_004] The AVR DIO driver shall only use the STD_HIGH and STD_LOW values for the software level of pins.
- [DIO_005] The AVR PORT module shall configure a DIO pin as input or output.
- [DIO_006] It shall be possible to group several DIO pins by hardware in the AVR DIO driver to represent a DIO port.
- [DIO_007] The AVR Dio module shall configure a DIO port as input or output.

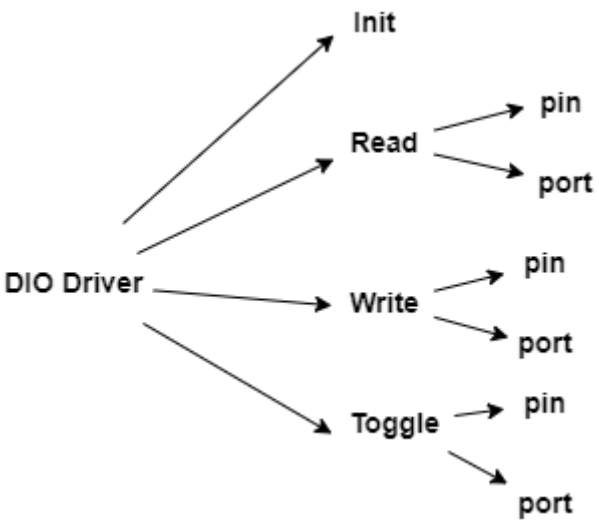

Figure 1: DIO Services

5.2 Non-functional requirements

- The driver shall be easy to use and understand.
- The driver shall be well-documented.
- The driver shall be efficient and use minimal resources.
- The driver shall be reliable and robust.
- In addition to the above requirements, the DIO driver should also meet the following non-technical requirements.
- The driver should be open source and freely available to use.
- The driver should be actively maintained and supported by the community.
- The driver should be well-tested and documented.
- The driver should be compatible with a variety of development tools and environments.

File Structure

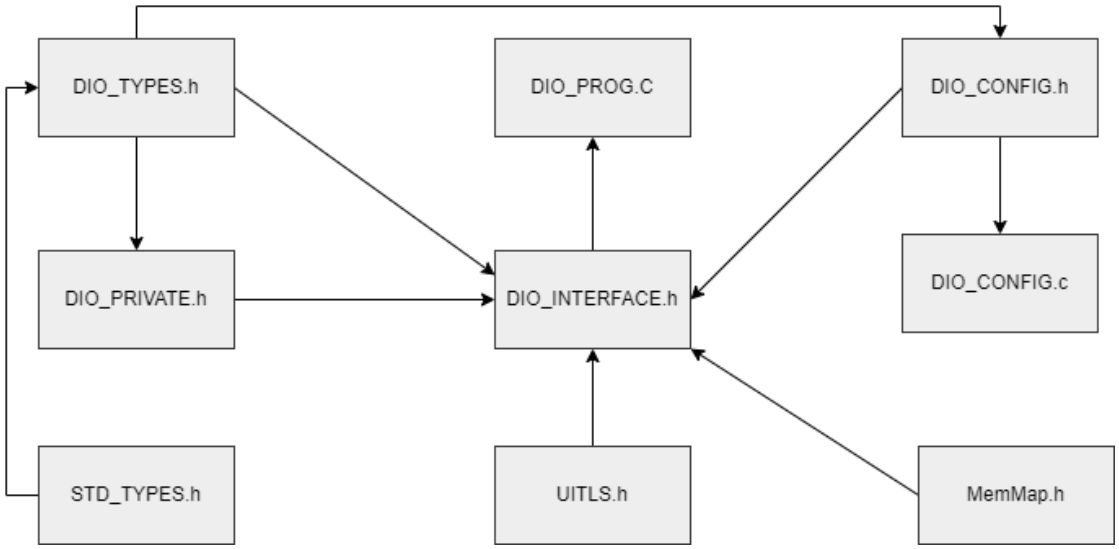

Figure 2: DIO Files

5. State Machine

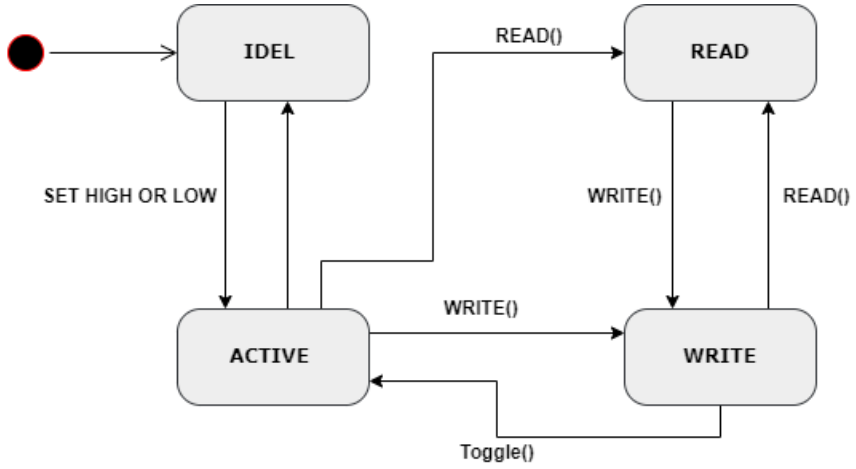

Figure 3: DIO States Machine

Sequence diagram

- **Write a value from a digital I/O**

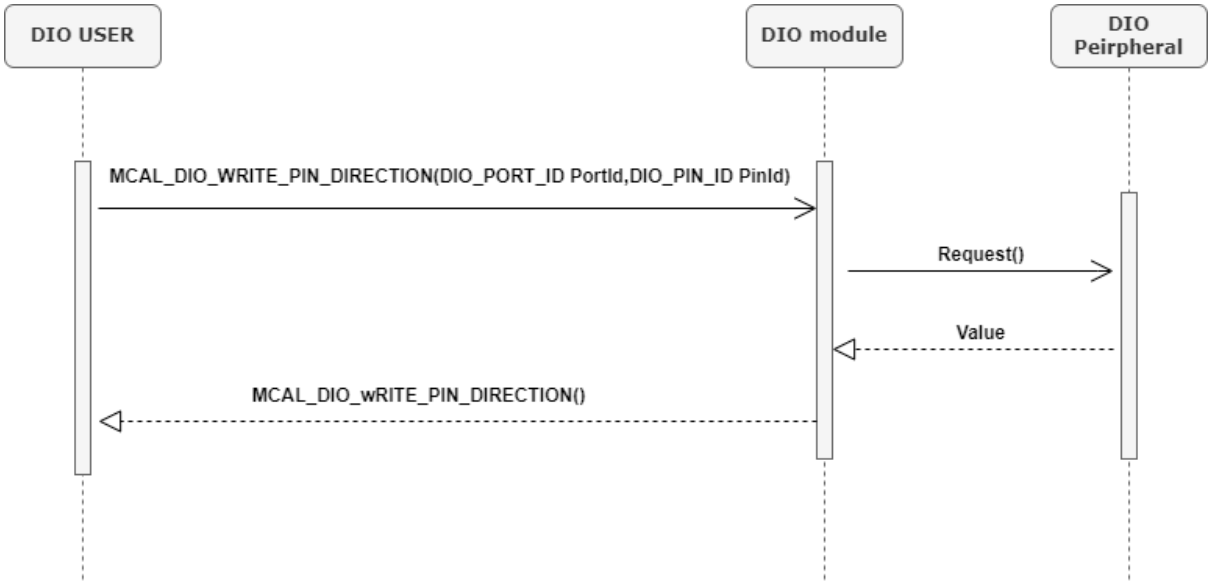

Figure 4: DIO Write pin.

- **Read a value from a digital I/O**

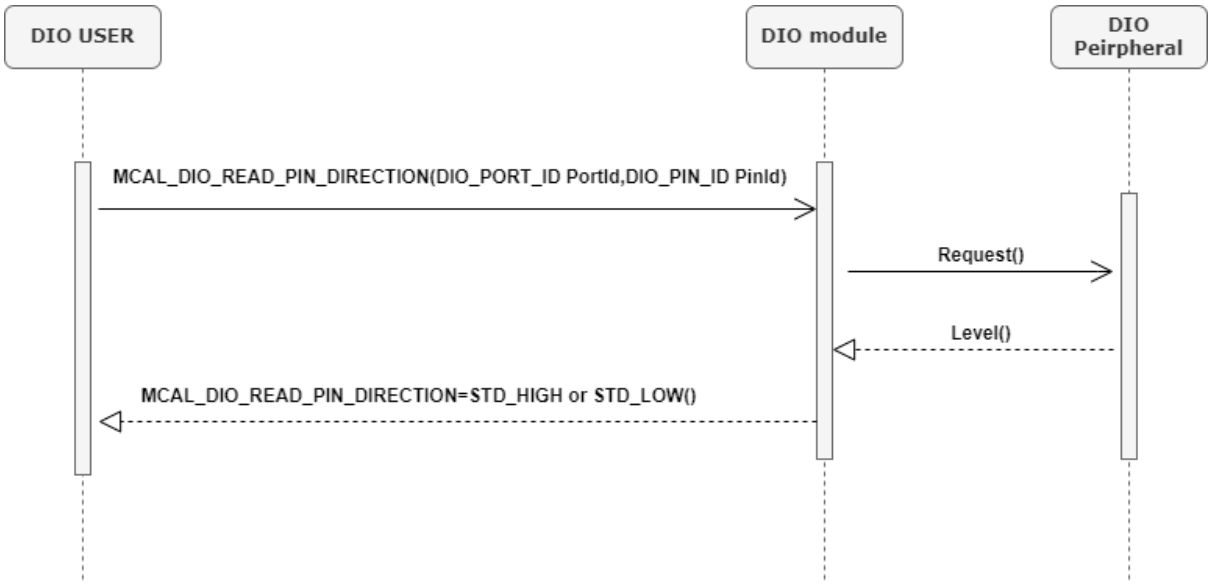

Figure 5: DIO Read pin

Acceptance Criteria

The ADC driver shall be accepted when it meets the following criteria:

- The driver shall compile and run without errors on all AVR microcontrollers.
- The driver shall pass all unit tests.
- The driver shall pass all integration tests.
- The driver shall pass all system tests.

6. References

1. Developers of NTI team.
2. AVR Microcontroller Datasheets.