ADC Drivers

For

AVR Microcontrollers

Nti Team

Software Requirement Specification Document

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1. Scope of Document

This document specifies requirements on the module ADC 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. Acronyms and Abbreviations

The following expressions are used within the ADC driver:

Expression	Explanation
HW Unit	Represents a microcontroller input electronic device that includes all parts necessary to perform an “analogue to digital conversion”.
ADC channel	Represents a logical ADC entity bound to one port pin. Multiple ADC entities can be mapped to the same port pin.
ADC channel group	A group of ADC channels linked to the same ADC hardware unit (e.g. one Sample & Hold and one A/D converter). The conversion of the whole group is triggered by one trigger source.
ADC result buffer	The user of the ADC Driver has to provide a buffer for every group. This buffer can hold multiple samples of the same channel group if streaming access mode is selected. If single access mode is selected one sample of each group channel is held in the buffer.
Trigger Source	Source event that starts a single conversion or a continuous series of conversions
Conversion Time	Time during which the sampled analogue value is converted into digital representation
Acquisition Time	Sample Time + Conversion Time
Sampling Time	Time during which the analogue value is sampled (e.g. loading the capacitor, …)

4. Functional Overview

The ADC driver initializes the Analogue Digital Converter unit(s) of the microcontroller. It provides services to start and stop a conversion respectively to enable and disable the trigger source of a conversion. Furthermore, it provides services to enable and disable a notification mechanism and routines to query the status and result of a conversion. The ADC Driver shall work on so called ADC Channels. An ADC channel combines an analogue input pin, the needed ADC circuitry itself and a conversion result register into an entity that can be individually controlled and accessed via the ADC Driver.

5. Requirement Specification

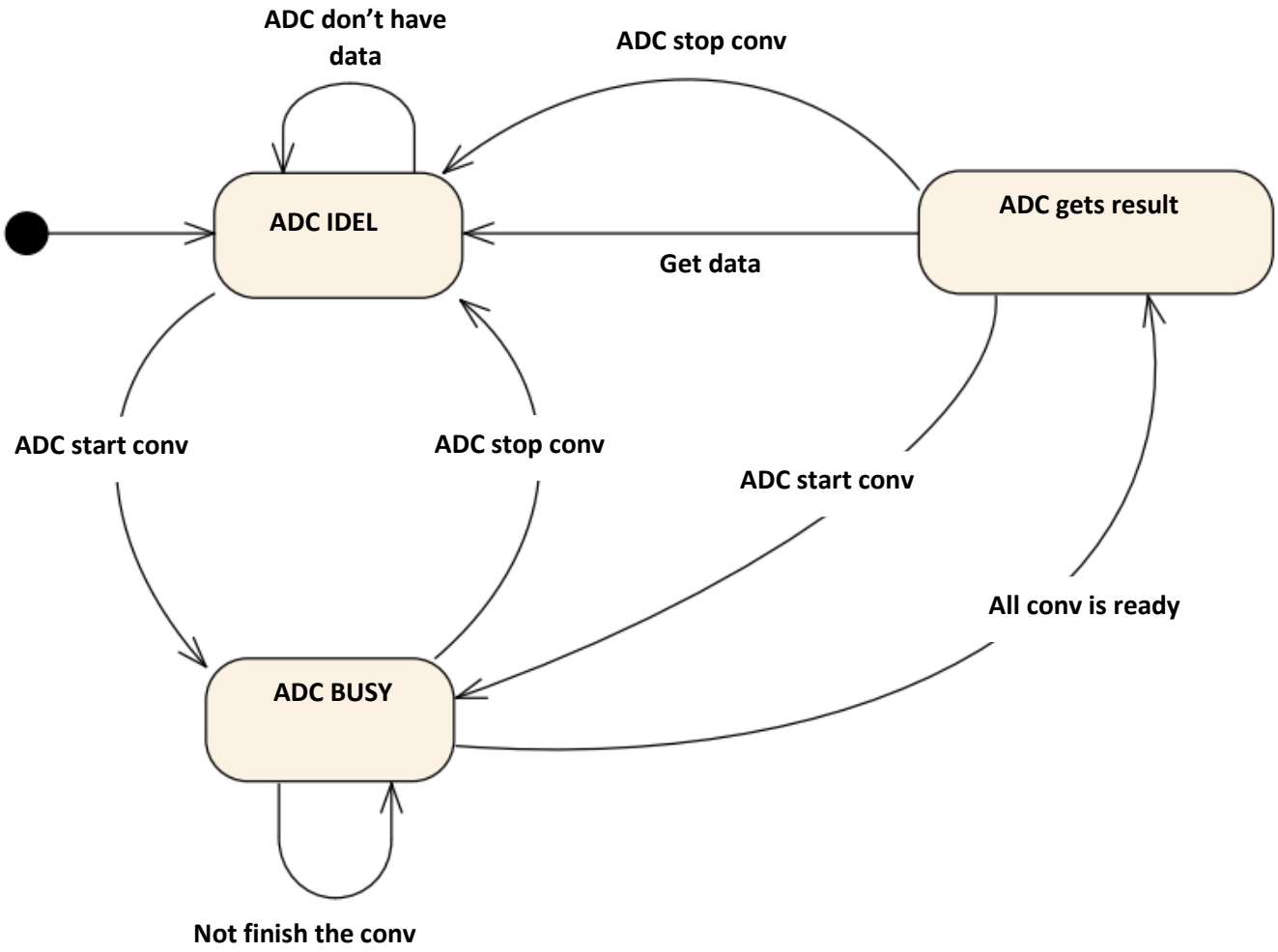
5.1 Functional Requirements

- The ADC Driver shall support a function to initialise the ADC by choose the Vref and set value to the prescaler
- The driver shall be compatible with all AVR microcontrollers.
- The ADC Driver shall support a specific basic static configuration.
- The ADC Driver shall allow a specific result access mode for ADC .
- The result alignment shall be configurable between right-adjustment and left-adjusment.
- The ADC Driver shall provide notification functions to inform the caller about the end of a conversion for a Channel Group.
- The ADC Driver shall support functions that make ADC enable or disable.
- The ADC Driver shall support functions that control the interrupt to make it enable or disable.
- The ADC Driver shall support a function that chooses the number of prescaler.
- The ADC Driver shall support a function that gets the result.
- The ADC Driver shall support a configuration to the timeout for the ADC.
- The ADC Driver shall support a MASK to compute the value of prescaler and the channel.

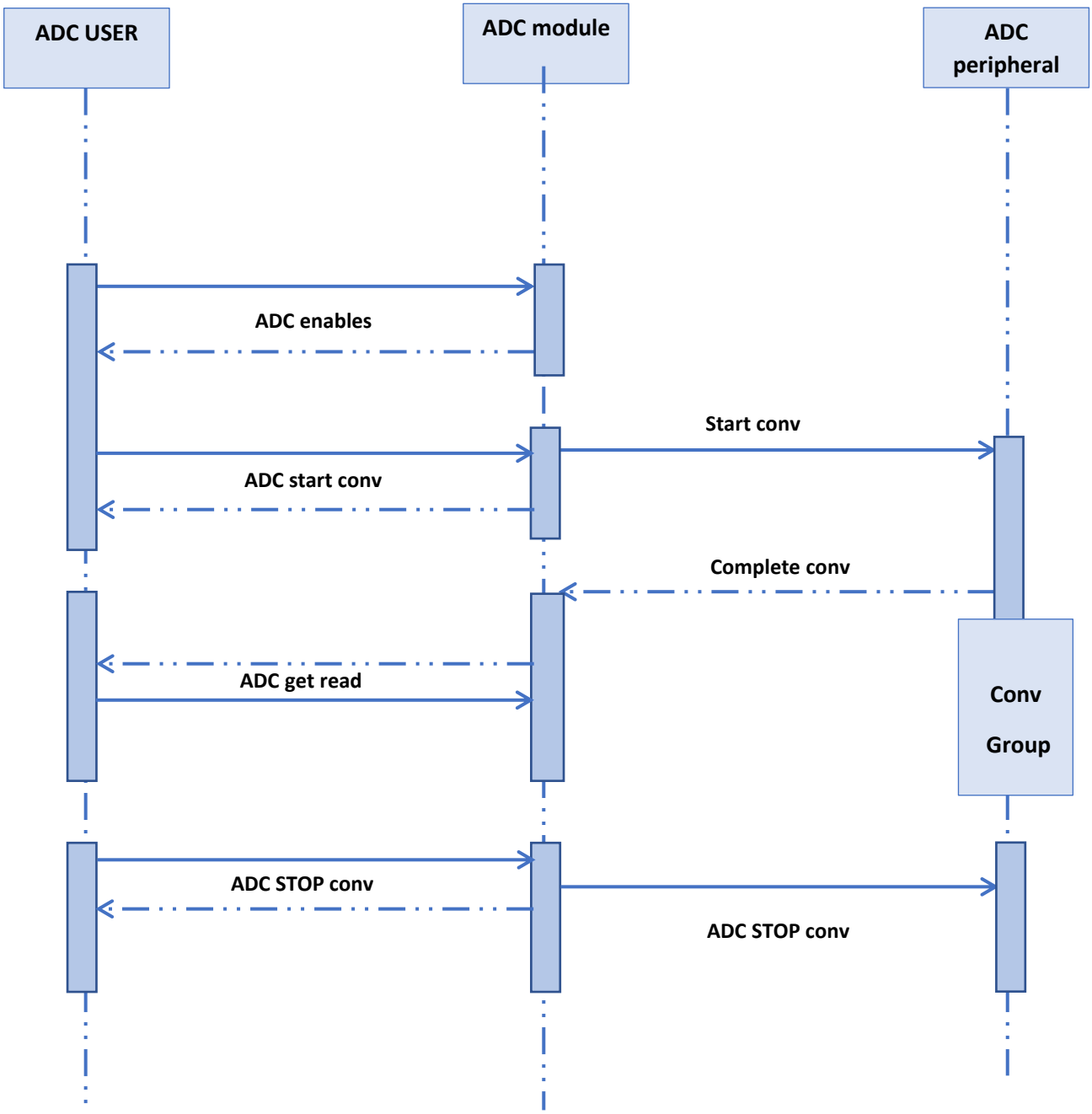
5.2 Non-functional requirements

- 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 ADC 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.

6. State Machine



7. Sequence diagram



8. 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.

9. References

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