

# **System Requirements Specification**

(TINF21C, SWE)

**Project:** Modelling Wizard Improvements

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## **Change History**

Version	Date	Author	Comment
0.1	07.10.2022	Dana Frey	created
0.2	14.10.2022	Dana Frey	Added 'Introduction' and 'Use Cases'
0.3	17.10.2022	Dana Frey	Added ,Features'
0.4	19.10.2022	Dana Frey	reworks
0.5	20.10.2022	Dana Frey	Added ,Enhancements' and did reworks
0.6	10.05.2023	Dana Frey	Updates for each chapter
1.0	12.05.2023	Dana Frey	Updates for the final version

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### 1. Introduction

Our project deals with the already existing program called "Modelling Wizard". The program can create a device model in a graphical user interface (GUI). It is possible to add device interfaces (such as physical ports) or file attachments to the created device model. If the user already owns descriptive files, those files can be used to create a device model as well. The current version of the Modelling Wizard is capable of handling AMLX, AML, EDZ, IODD and GSD import.

The goal of our project is to create a more user-friendly version of the Modelling Wizard which includes an improved version of the GUI as well as fixing bugs and refactoring the code by the team beforehand.

#### 1.1 Product Environment

AutomationML (AML) is the short form of Automation MarkUp Language and is used to describe parts of automation plants as objects. These objects can consist of multiple other objects and can be part of a larger assembly of objects. That way AML can be used to describe a single screw or an entire robot with the necessary level of detail. AML makes use of various standards to describe the following plant components:

- 1. CAEX (Computer Aided Engineering Exchange) to describe attributes of objects and their relations in a hierarchical structure. This is called a system topology. In this respect, CAEX forms the overarching integration framework of AutomationML.
- 2. COLLADA to describe the geometry and 3D Models of an object
- 3. COLLADA also integrates motion planning. It describes the connections and relations of moveable objects, which is called Kinematics.
- 4. PLCopen XML describes the logic. Internal behavior and states if objects, action-sequences and I/O connections are implemented via this format. An IODD (IO Device Description) file describes the sensor and actuator of a plant or component. It also contains information on identify, parameters, process data, communication and more. It is written in XML-format, same as AML, which ensures a conversion.

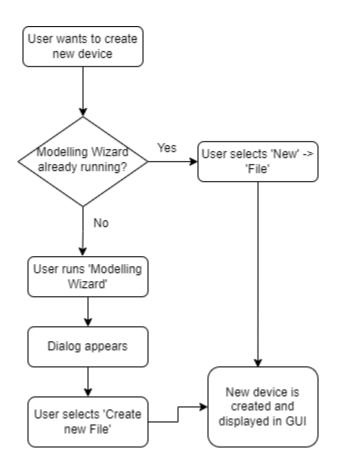
#### 2. Use Cases

Our project doesn't include new added Use Cases and focuses more on the improvement of the given project. Therefore, the following Use Cases have been taken over by the previous team to still be able to visualize the current program's Use Cases.

#### 2.1 <UC.001> Create new device

Use Case's Objective:	User wants to create a device
System Boundary:	The application itself

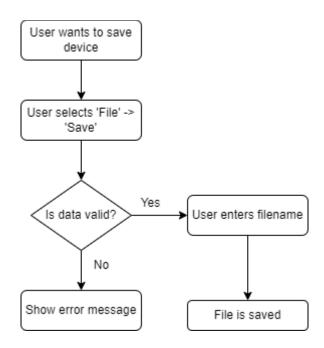
Precondition:	The user needs to have the minimal required data for the
	device on hand. The program needs to be installed on the
	user's system and opened.
Postcondition on	The entered data is displayed completely and correctly
success:	
Involved Users:	Every end-user of the application
Triggering Event:	When the user opens the application and uses the 'New'
	function to create a new device



#### 2.2 <UC.002> Save device

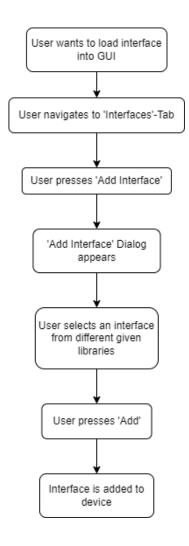
Use Case's Objective:	User wants to save a device by using the 'Save' function
System Boundary:	The application itself
Precondition:	The user created a device
Postcondition on	The user created or loaded at least one device successfully
success:	

Involved Users:	Every end-user of the application
Triggering Event:	When the user has an opened device, which the user wants to
	save



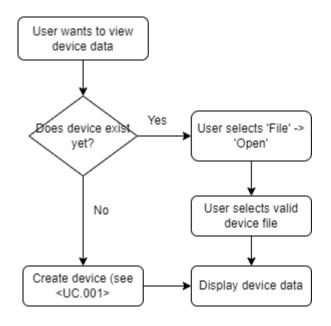
## 2.3 <UC.003> Create interface from existing library

Use Case's Objective:	User wants to create a device interface by adding an interface
	from one of the existing libraries
System Boundary:	The application itself
Precondition:	The user needs to have the minimal required data for the device or interface to be added.
	device of interface to be added.
Postcondition on	The user has successfully added an interface to his device
success:	
Involved Users:	Every end-user of the application
Triggering Event:	When the user wants to add a device interface



### 2.4 <UC.004> View device data

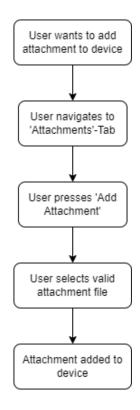
Use Case's Objective:	After at least one device was successfully created, the device
	data should be visible and editable on the user interface
System Boundary:	The application itself
Precondition:	The user created or loaded a device
Postcondition on	The user created or loaded at least one device successfully and
success:	its data is visible on the screen
Involved Users:	Every end-user of the application
Triggering Event:	When the user wants to view device data



Supported import formats are: AMLX, AML, EDZ, IODD, GSD

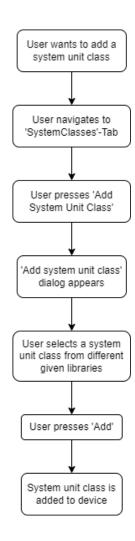
#### 2.5 <UC.005> Add attachments to device

Use Case's Objective:	It is possible to add an attachment to the object, such as a manufacturer's icon
System Boundary:	The application itself
Precondition:	The user created or loaded a device
Postcondition on success:	The user has successfully added an attachment to his device
Involved Users:	Every end-user of the application
Triggering Event:	When the user has the need to edit device data and add attachments such as icons.



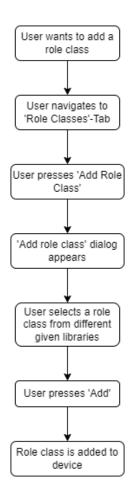
### 2.6 <UC.006> Add system unit classes to device

Use Case's Objective:	User wants to add a system unit class to existing device
System Boundary:	The application itself
Precondition:	The user created or loaded a device
Postcondition on	The user has successfully added a system unit class to his
success:	device
Involved Users:	Every end-user of the application
Triggering Event:	When the user has the need to add a system unit class to his
	device



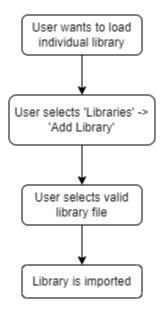
## 2.7 <UC.007> Add role class to device

Use Case's Objective:	User wants to add a role class to existing device
System Boundary:	The application itself
Precondition:	The user created or loaded a device
Postcondition on	The user has successfully added a role class to his device
success:	
Involved Users:	Every end-user of the application
Triggering Event:	When the user has the need to add a role class to his device



### 2.8 <UC.008> Add individual library

Use Case's Objective:	User wants to add an individual library to application
System Boundary:	The application itself
Precondition:	The user created or loaded a device
Postcondition on	The user has successfully added an individual library to
success:	application
Involved Users:	Every end-user of the application
Triggering Event:	When the user has the need to add an own library



#### 3. Functional Features

#### 3.1.1 < LF11 > Import

The application should be able to import a file by the absolute path to the file. This import supports files of the file types AMLX, AML, EDZ, IODD and GSD.

#### 3.1.2 <LF12> File validation

The system shall be able to detect wrongly formatted imported files and throw an error to the user.

#### 3.1.3 < LF13 > Error handling

The system shall be able to handle errors (unexpected shut down, wrongly formatted files, ...) and throw an error to the user. If an error appears to be in a specific part of the program, the cursor should be pointed to that exact location.

#### 3.1.4 <LF14> Edit device

When the attributes of a loaded device are displayed to the user, the user should be able to edit every attribute he wants to change.

#### 3.1.5 <LF15> Create device

When the application is started, the user should be able to create a new and empty device model.

#### 3.1.6 < LF16 > Export device

When the user has edited a device, he should be able to save the device to a file.

#### 3.1.7 < LF17 > Easy Mode

When the user wants to hide additional attribute information -visible in the "System Classes"-Tab-, he can press the 'Easy Mode'-button. 'Easy mode' is the default mode.

#### 3.1.8 <LF18> Expert Mode

When the user wants to display additional attribute information -which was not visible in the "System Classes"-Tab before-, he can press the 'Expert Mode'-button.

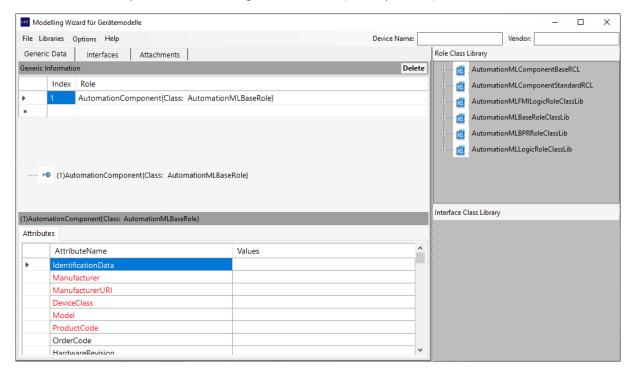
#### 4. Non-functional Features

#### 4.1.1 < NF11 > GUI

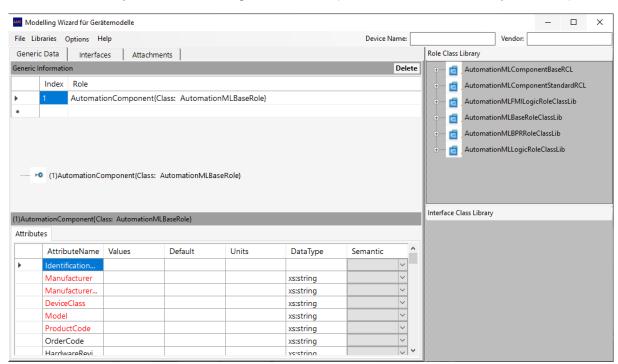
The system should display a graphical user interface after startup of the standalone application. The user will interact with this GUI for every other functionality of the application. The first prototype includes the changes in the existing UI and is shown in the Usability Concept

(https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/wiki/New-Usability-Concept). The final prototype is a complete redesign of the old interface.

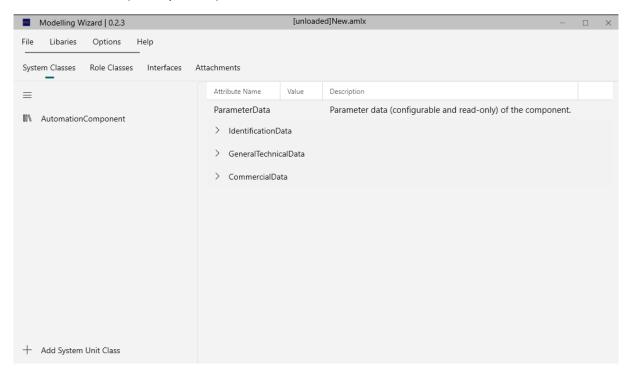
#### Old GUI from the previous Modelling Wizard team (in easy mode):



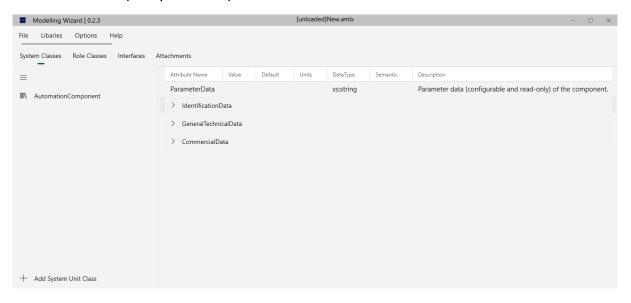
#### Old GUI from the previous Modelling Wizard team (in "advanced" mode = expert mode):



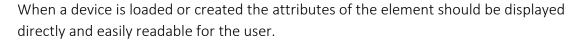
#### Final GUI version (in easy mode):



#### Final GUI version (in expert mode):



The graphical user interface should be user friendly. There should not be an overwhelming amount of information, button areas should easily be clickable, there should be no unnecessary buttons, etc..



#### 4.1.2 < NF12 > Portable

The program should be runnable without any installation.

#### 4.1.3 < NF13 > Performance

The application should respond instantly after a user's action.

#### 4.1.4 < NF14 > Compatibility

The application should be executable on every current system such as Windows 10 or higher. Furthermore, the application is only executable on the Windows platform.

### 5. Bug fixes

#### 5.1 < BUG10 > Data Models

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/12

#### 5.2 <BUG20> Open Saved Files

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/5

#### 5.3 < BUG30 > Delete without Confirmation

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/27

5.4 <bug40></bug40>	Deleted	Interface

5.5 < BUG50 > List View for Attributes

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/75

5.6 <BUG60> Separate Menu Bar

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/72

5.7 < BUG70 > Visual Displacement

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/71

5.8 <BUG80> Text Colours removed

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/68

5.9 <BUG90> Theme changes Dialog

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/66

5.10 < BUG100 > Wrong Colouring

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/62

5.11 <BUG110> Semantic

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/60

5.12 <bug120></bug120>	Content	Dia	log	size
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5.13 <BUG130> Visual Feedback

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/134

5.14 <BUG140> Crash while Edit

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/130

5.15 <BUG150> Attribute Highlight

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/115

5.16 < BUG160 > Library Visualization

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/114

5.17 <BUG170> Local Storage

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/97

5.18 < BUG180 > Wrong Text

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/82

5.19 <BUG190> Window Refactoring

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/132

5.20 < BUG200 > Dialog Cance	5.	20	<bu< th=""><th>G200&gt;</th><th>Dia</th><th>log</th><th>Cance</th></bu<>	G200>	Dia	log	Cance
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5.21 <BUG210> Change Filename

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/135

5.22 <BUG220> Data Grid size

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/136

5.23 <BUG230> Update Status

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/137

5.24 <BUG240> Add Role Class

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/85

6. Enhancements
6.1 <enh10> Data Models</enh10>
https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/
6.2 <enh20> Device Name</enh20>
https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/11
6.3 <enh30> Easy Mode</enh30>
https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/10
6.4 <enh40> Error Handling</enh40>
https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/
6.5 <enh50> Remove Input Fields</enh50>
https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/8
6.6 <enh60> Save Buttons</enh60>

7

6.8 < ENH80 > Load Library Repositioning

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/40

6.9 <ENH90> Mode Indicator

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/41

6.10 <ENH100> Remove About

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/42

6.11 <ENH110> Attributes Button

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/43

6.12 <ENH120> Remove Interface Class Library

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/44

6.13 <ENH130> Remove Column

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/45 6.14 <ENH140> Remove Table Display

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/46

6.15 <ENH150> Edit Data Types

https://github.com	/rohinziegler/TINE21C Tea	am4 Modelling Wizard	Improvements/issues/47
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6.16 <ENH160> Delete Option

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/48

6.17 <ENH170> Remove Textfields

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/49

6.18 <ENH180> Information Texts

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/50

6.19 <ENH190> Dialog

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/51

6.20 <ENH200> Adding Interfaces

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/53

6.21 <ENH210> Add Table

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/54

6.22 <ENH220> AML Files

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/57

6.23 <ENH230> Attachments

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/58

6.24	<enh240></enh240>	Dark	Light	Mode
0.2	- LI 11 12 10	0111		111000

6.25 <ENH250> Title Bar

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/63

6.26 <ENH260> Update Tables

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/64

6.27 <ENH270> Replace List View

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/70

6.28 <ENH280> About Dialog

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/73

6.29 <ENH290> Filename

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/76

6.30 <ENH300> Unsaved Changes

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/77

6.31 <ENH310> Value Validation

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/78

6.32 <enh320> Start Dialo</enh320>	6.	32	<enh< th=""><th>1320&gt;</th><th>Start</th><th>Dia</th><th>log</th></enh<>	1320>	Start	Dia	log
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6.33 <ENH330> Visual Loading

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/88

6.34 <ENH340> Save Options

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/89

6.35 <ENH350> Automatic Expansion

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/112

6.36 < ENH360 > NavBar Icons

https://github.com/robinziegler/TINF21C\_Team4\_Modelling\_Wizard\_Improvements/issues/113

6.37 <ENH370> Back Arrow

https://github.com/robinziegler/TINF21C Team4 Modelling Wizard Improvements/issues/116

#### 7. References

- [1] https://github.com/H4CK3R-01/TINF20C ModellingWizard Devices/wiki/1.-Software-Requirements--Specification#UC3
  - [2] Software Engineering lessons by Markus Rentschler and Christian Holder

## 8. Glossary

AML Automation Markup Language is an open standard data format for storing and

exchanging plant planning data

AMLX AML Package

CAEX Computer-Aided Engineering Exchange

EDZ EPLAN Electric P8 Data Archive Zipped File

GSD General Station Description

GUI Graphical User Interface

IODD Input/Output Device Description