CS3213: Foundations of Software Engineering

Requirements Engineering Specification

Requirements Specification

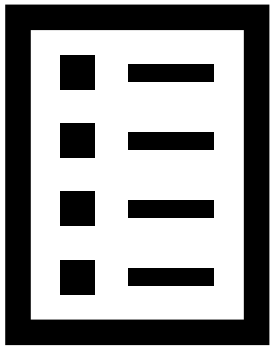
Image generated by ChatGPT

Requirements Specification

Converting the requirements into a standard form

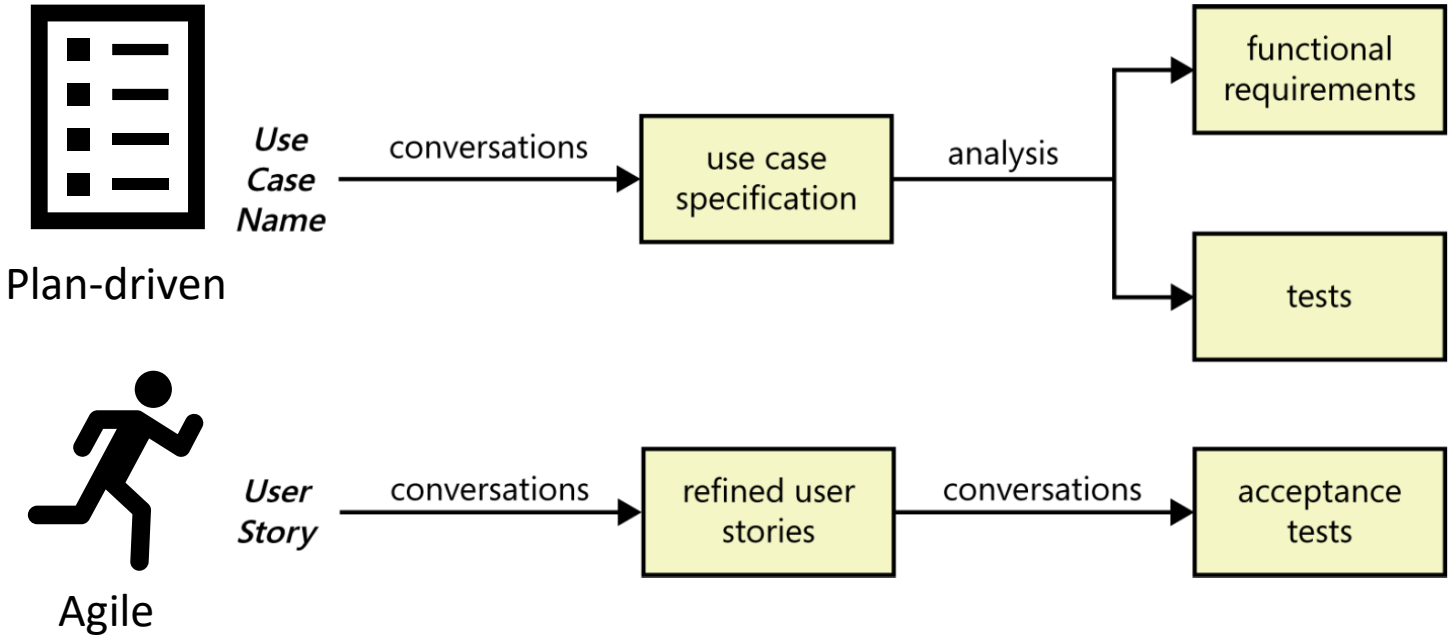
Requirements Specification

Agile



Plan-driven

Use Cases and User Stories



"Software Requirements". Third Edition. Wiegers and Beatty

User Stories

Image generated by Gemini

Example: Job Search Site

As a <type of user>, I want <some goal> so that <some reason>.

As a company, I can post job openings to hire new employees

As a job seeker, I can search for a job that I can subsequently apply for.

User Stories: Three Cs

C **ard**: A **written description** of the story used for planning and as a reminder

C **onversation:** verbal exchange with the customer to flesh out the details of the story

C **onfirmation**: *acceptance tests* specified by the customer can be used to determine when a story is complete

https://ronjeffries.com/xprog/articles/expcardconversationconfirmation/

Key Activities

- Conversation → **Elicitation and analysis**
- Card → **Specification**
- Confirmation → **Validation**

Acceptance Tests

Front

Users can view information about each job that is matched by a search.

- The system displays a job title, company name, and location for each result.
- The system displays key job attributes such as salary (if available), job type (full-time/part-time/contract), and posting date.
- The system displays a brief job summary/description snippet.
- The system displays the job’s main skills or requirements (if available).

Back

Epics

Epic

As a job seeker, I can search for jobs by attributes like location, salary range, job title, company name, and the date the job was posted.

As a job seeker, I can view information about each job that is matched by a search.

As a job seeker, I can view detailed information about a company that has posted a job.

Notes

Users can view information about each job that is matched by a search.

Dylan says show description, salary, and location.

Non-Functional Requirements and User Stories

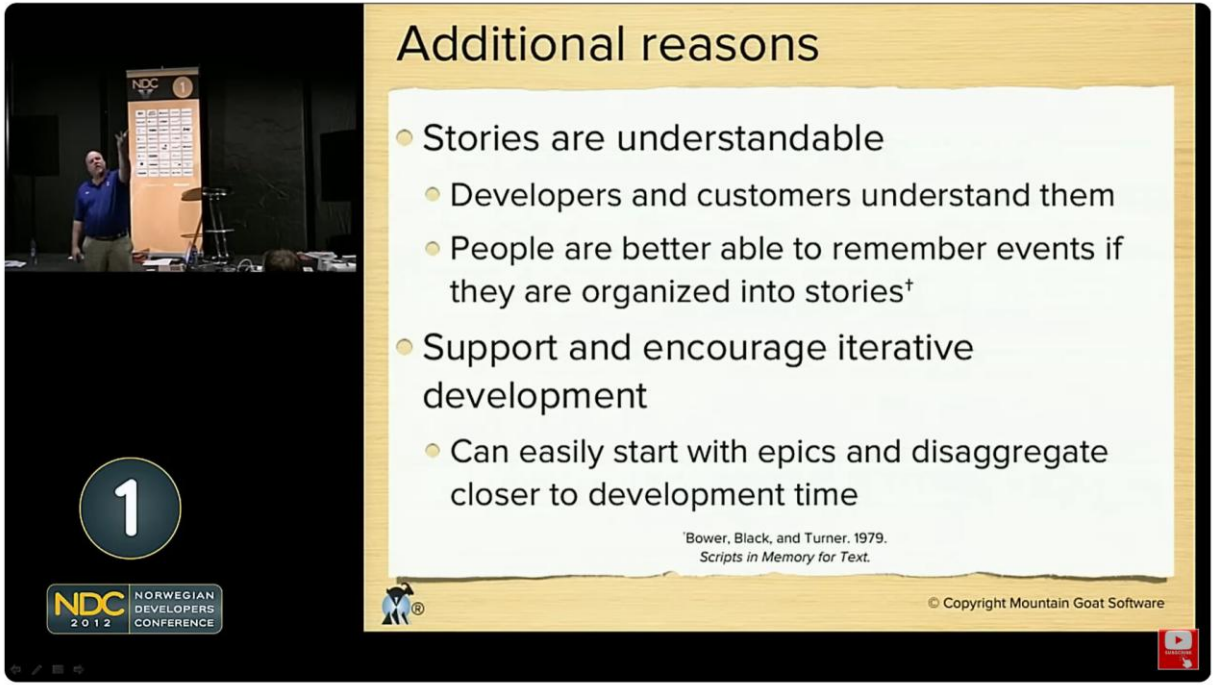
The system should be available 99.999% of the time.

Constraint

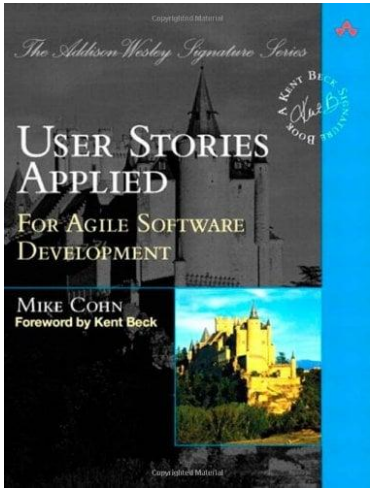
User Stories and Agile

- User stories were originally developed as part of *Extreme Programming*
- User stories are often combined with Scrum
- Can also be integrated into other agile processes

Agile Approach: RE using User Stories

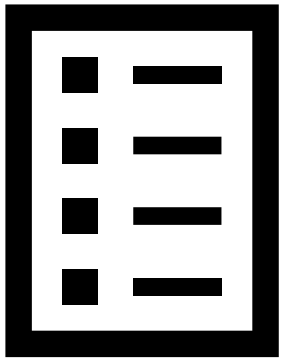


User Stories: What they are, how to write them, and why they work.



https://www.youtube.com/watch?v=6q5-cVeNjCE

Plan-driven Requirements Specification



Software Requirements Specification (SRS)

SRS Template

1. **Introduction**
   - 1.1 Purpose
   - 1.2 Document conventions
   - 1.3 Project scope
   - 1.4 References
2. **Overall description**
   - 2.1 Product perspective
   - 2.2 User classes and characteristics
   - 2.3 Operating environment
   - 2.4 Design and implementation constraints
   - 2.5 Assumptions and dependencies
3. **System features**
   - 3.x System feature X
     - 3.x.1 Description
     - 3.x.2 Functional requirements
4. **Data requirements**
   - 4.1 Logical data model
   - 4.2 Data dictionary
   - 4.3 Reports
   - 4.4 Data acquisition, integrity, retention, and disposal
5. **External interface requirements**
   - 5.1 User interfaces
   - 5.2 Software interfaces
   - 5.3 Hardware interfaces
   - 5.4 Communications interfaces
6. **Quality attributes**
   - 6.1 Usability
   - 6.2 Performance
   - 6.3 Security
   - 6.4 Safety
   - 6.x [others]
7. **Internationalization and localization requirements**
8. **Other requirements**

Appendix A: Glossary

Appendix B: Analysis models

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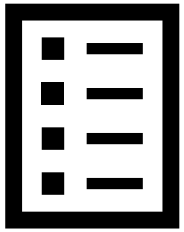
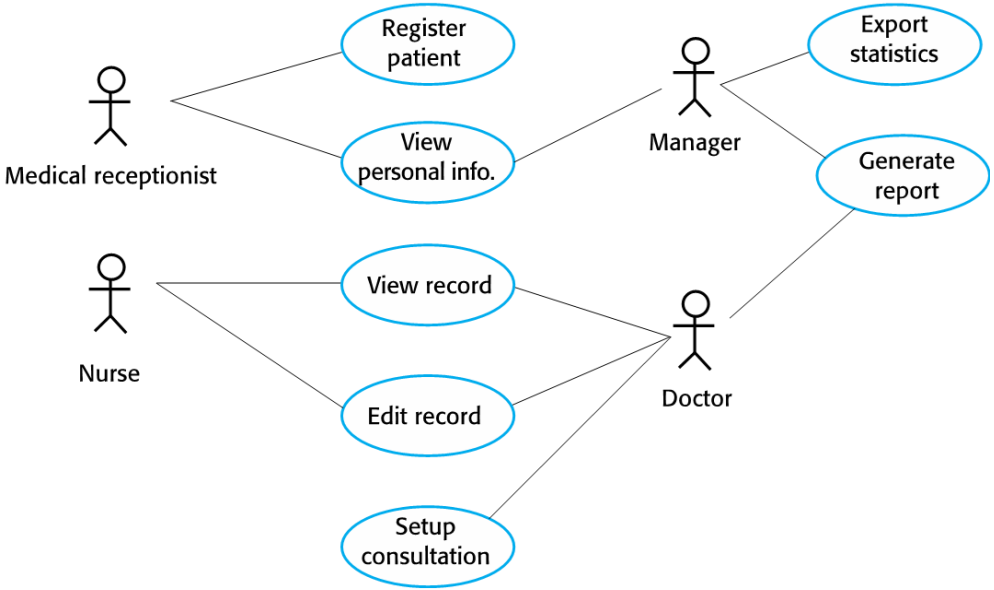
Use Cases



Plan-driven

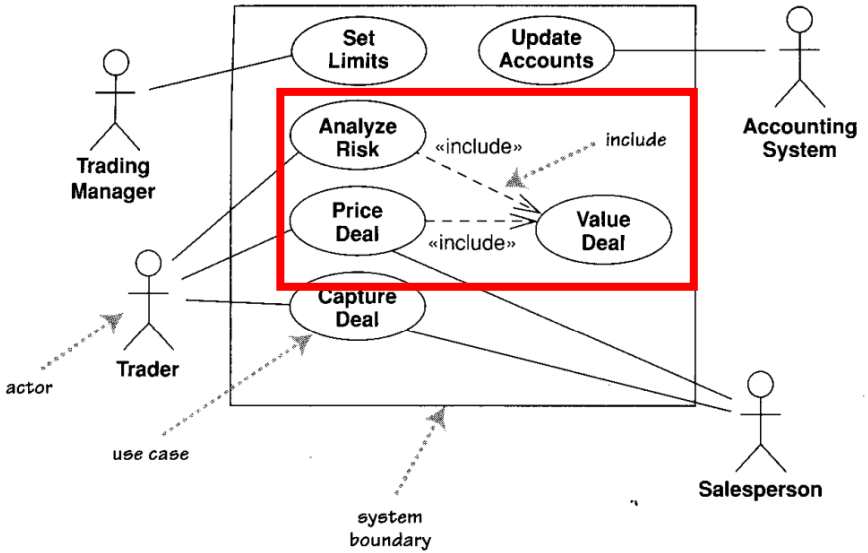
- **Use case**: describes an interaction between an *actor* and the *system*
- Typically: verb followed by an object
- Example of uses cases for an airport kiosk
  - Check in for a flight
  - Print boarding pass
  - Change seats
  - Purchase an upgrade

Use Case Diagram in UML



A use case diagram relates shows *actors* and *use cases*

Use Case Diagram in UML

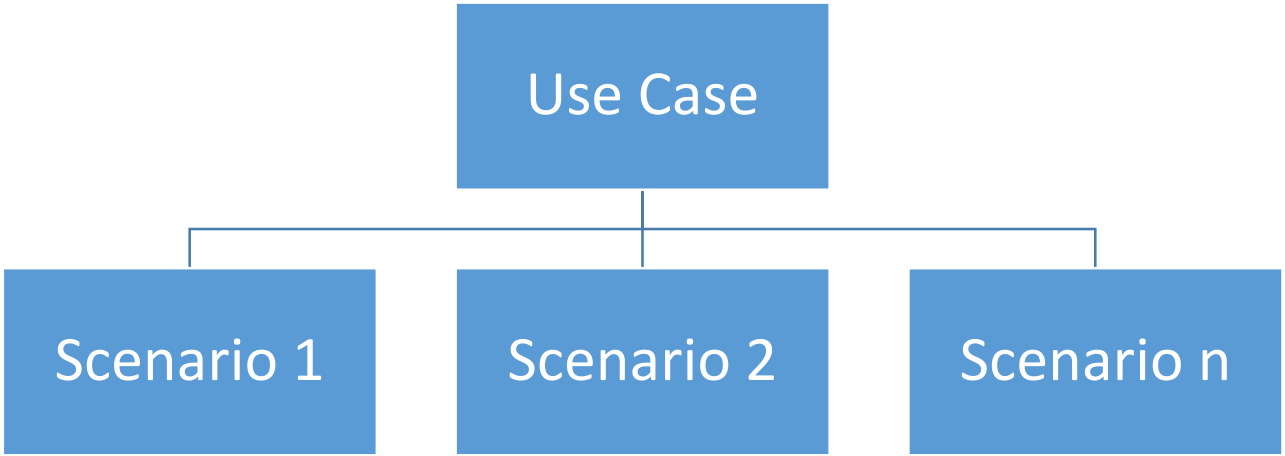


A use case can include another use case (for decomposition)

Use Case

MHC-PMS: Transfer data	
Actors	Medical receptionist, patient records system (PRS)
Description	A receptionist may transfer data from the Mentcase system to a general patient record database that is maintained by a health authority. The information transferred may either be updated personal information (address, phone number, etc.) or a summary of the patient's diagnosis and treatment.
Data	Patient's personal information, treatment summary
Stimulus	User command issued by medical receptionist
Response	Confirmation that PRS has been updated
Comments	The receptionist must have appropriate security permissions to access the patient information and the PRS.

Use Case and Scenarios



ID and Name:	UC-4 Request a Chemical		
Created By:	Lori	Date Created:	8/22/13
Primary Actor:	Requester	Secondary Actors:	Buyer, Chemical Stockroom, Training Database
Description:	The Requester specifies the desired chemical to request by entering its name or chemical ID number or by importing its structure from a chemical drawing tool. The system either offers the Requester a container of the chemical from the chemical stockroom or lets the Requester order one from a vendor.		
Trigger:	Requester indicates that he wants to request a chemical.		
Preconditions:	PRE-1. User's identity has been authenticated. PRE-2. User is authorized to request chemicals. PRE-3. Chemical inventory database is online.		
Postconditions:	POST-1. Request is stored in the CTS. POST-2. Request was sent to the Chemical Stockroom or to a Buyer.		
Normal Flow:	**4.0 Request a Chemical from the Chemical Stockroom** 1. Requester specifies the desired chemical. 2. System lists containers of the desired chemical that are in the chemical stockroom, if any. 3. System gives Requester the option to View Container History for any container. 4. Requester selects a specific container or asks to place a vendor order (see 4.1). 5. Requester enters other information to complete the request. 6. System stores the request and notifies the Chemical Stockroom.		
Alternative Flows:	**4.1 Request a Chemical from a Vendor** 1. Requester searches vendor catalogs for the chemical (see 4.1.E1). 2. System displays a list of vendors for the chemical with available container sizes, grades, and prices. 3. Requester selects a vendor, container size, grade, and number of containers. 4. Requester enters other information to complete the request. 5. System stores the request and notifies the Buyer.		
Exceptions:	**4.1.E1 Chemical Is Not Commercially Available** 1. System displays message: No vendors for that chemical. 2. System asks Requester if he wants to request another chemical (3a) or to exit (4a). 3a. Requester asks to request another chemical. 3b. System starts normal flow over. 4a. Requester asks to exit. 4b. System terminates use case.		
Priority:	High		
Frequency of Use:	Approximately 5 times per week by each chemist, 200 times per week by chemical stockroom staff		
Business Rules:	BR-28, BR-31		
Other Information:	The system must be able to import a chemical structure in the standard encoded form from any of the supported chemical drawing packages.		
Assumptions:	Imported chemical structures are assumed to be valid.		

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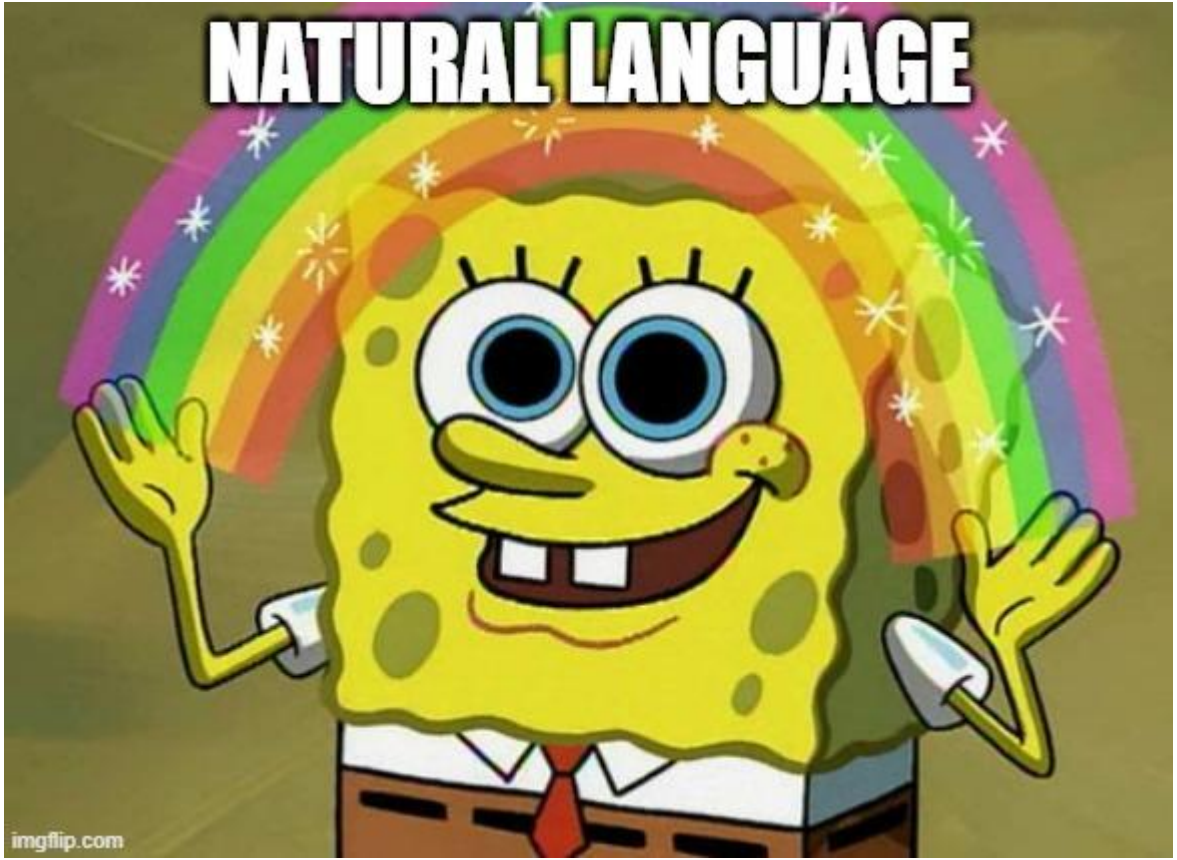
Scenarios as User Stories

Epic

As a chemist, I want to request a chemical so that I can perform experiments.

As a chemist, I want to request a chemical from the Chemical Stockroom so that I can use it immediately.

As a chemist, I want to request a chemical from a vendor because I don’t trust the purity of any of the samples available in the Chemical Stockroom.


NATURAL LANGUAGE
imgflip.com

Natural Language: Guidelines

- Invent a **standard format** and ensure that all requirement definitions adhere to that format.
- Use text highlighting (**bold**, *italic*, or color) to pick out key parts of the requirement.
- Wherever possible, you should **avoid the use of jargon**, abbreviations, and acronyms.

Natural Language: Guidelines

- Use **language consistently** to distinguish between **mandatory** and **desirable** requirements: “shall” vs. “should”

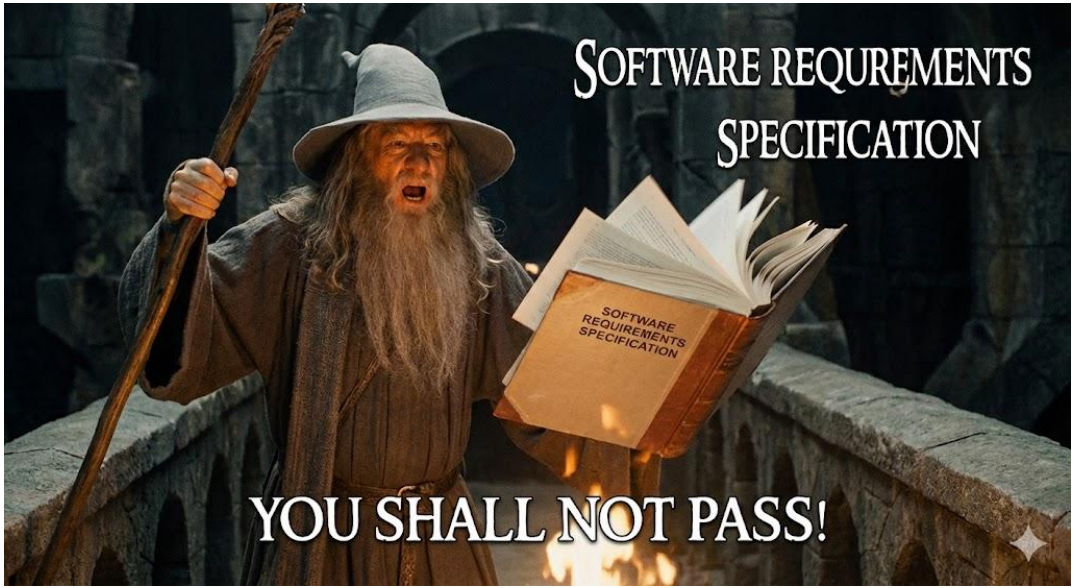


Image generated by Gemini

Natural Language: Guidelines

- Whenever possible, you should try to associate **a rationale** with each user requirement.

https://tenor.com/de/view/why-huh-but-why-gif-13199396

Natural Language: Example

3.2 The system shall measure the blood sugar and deliver insulin, if required, every 10 minutes. (*Changes in blood sugar are relatively slow, so more frequent measurement is unnecessary; less frequent measurement could lead to unnecessarily high sugar levels.*)

3.6 The system shall run a self-test routine every minute with the conditions to be tested and the associated actions defined in Table 1. (*A self-test routine can discover hardware and software problems and alert the user to the fact the normal operation may be impossible.*)

Additional Information: Tables

Condition	Action
Sugar level falling ($r2 < r1$)	CompDose = 0
Sugar level stable ($r2 = r1$)	CompDose = 0
Sugar level increasing and rate of increase decreasing ($(r2 - r1) < (r1 - r0)$)	CompDose = 0
Sugar level increasing and rate of increase stable or increasing $r2 > r1$ & $((r2 - r1) \geq (r1 - r0))$	CompDose = round $((r2 - r1)/4)$ If rounded result = 0 then CompDose = MinimumDose

Summary and Key Points

- Plan-driven: use cases
- Agile: user stories
- Use of natural language