

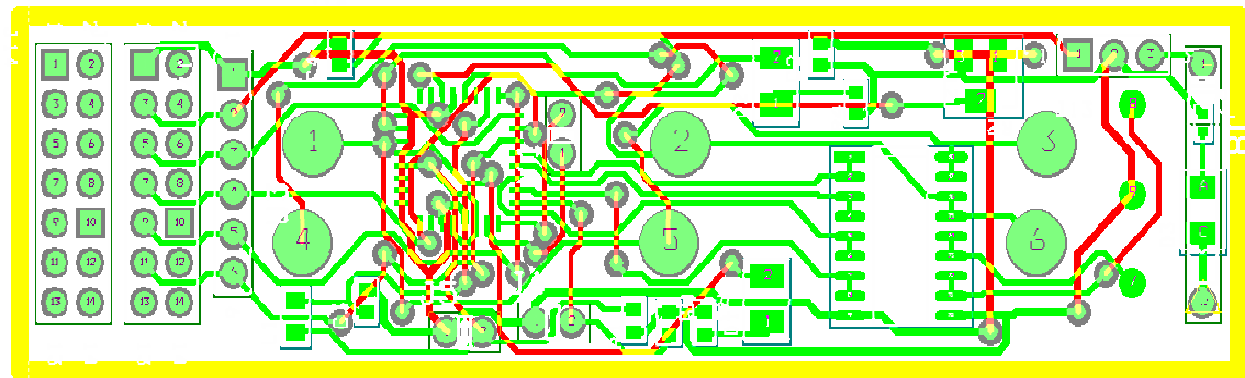
# Requirements



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## Outline

- Announcements
- What are requirements
- What makes a good requirement
- Exercise



## Requirements (from Wikipedia)

A requirement is a singular documented need of what a particular product or service should be or do

It is most commonly used in a formal sense in systems engineering or software engineering.

A lack of requirements or poorly-defined requirements are cited as the most common reason a project fails (is late, is over budget, and/or has reduced functionality)

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## Requirements?

Requirements Engineering is the disciplined application of scientific principles and techniques for developing, communicating, and managing requirements

Requirements will serve as the rubric by which Company ABC can verify that the end device has all the functionality the customer desires

To this end, the Principal Engineer (PE) will need to ensure the following tasks are followed (Hint – one person in your group should be assigned to maintain these requirements)

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## Steps for Requirements

1. Capabilities Gathering
  2. Capabilities Demonstration Test Plan
  3. Requirements Gathering
  4. Requirements Analysis
  5. Requirements Management
  6. Requirements Verification – Acceptance Test Plan
  7. Development Steps
  8. Using this Guideline for Requirements Refinement
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## Capabilities

- What will the device be capable of doing, in general terms
  - Identifies constraints of the device
  - Describes the operation of the device
  - Describes how you will demonstrate the device
  
  - Sources include all documentation, interviews
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## Capabilities Examples

CAPMECH01: The module shall fit inside of the payload enclosure in a space allocated. A small size is desired.

CAPMECH02: The module shall not generate an excessive amount of heat.

CAPMECH03: All cabling connections shall have locking parts.

CAPMECH04: The module is not expected to be waterproof.

CAPMECH05: Cabling from the main vehicle to the module should not require additional wires or holes beyond what is currently available with the current vehicle.

CAPELEC01: The module shall be powered via the main vehicle power; therefore there is no need for an additional power switch.

CAPELEC02: The module will be provided raw battery power from the vehicle power source and will be responsible for converting this raw voltage to useable, regulated voltages. It will not have its own power supply.

## Requirements Gathering

1. Identifying relevant sources of requirements (capabilities, Statement of Work, Proposals, and people).
  2. Determining what information is needed.
  3. Analyzing the gathered information, looking for implications, inconsistencies, or unresolved issues.
  4. Confirming the understanding of the requirements with the source.
  5. Synthesizing appropriate statements of the requirements.
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## Requirements Example

Top-level function: The system shall hold together 2 to 20 pieces of 8½ by 11-inch, 20 pound paper.

Alternatives: stapler, paper clip, fold the corner, put them in a folder

The deficiency: My reports are typically composed of 2 to 20 pieces of 8½ by 11-inch, 20 pound paper. The pages get out of order and become mixed up with pages of other reports.

Alternatives: stapler, paper clip, fold the corner, put them in a folder, number the pages, put them in an envelope, throw away the report, convert it to electronic form, have it bound as a book, put it on audio tape, distribute it electronically, put it on a floppy disk, put it on microfiche, transform the written report into a videotape.

## **Characteristics of Requirements**

- 1. Describes What, Not How**
- 2. Atomic**
- 3. Unique**
- 4. Traceable**
- 5. Necessary**
- 6. Complete.**
- 7. Semantic Usage**
- 8. Is Not Always Written**
- 9. Quantitative and Testable**
- 10. Identifies Applicable States**
- 11. States Assumptions**
- 12. Use of Shall, Should, and Will**
- 13. Avoids Certain Words**
- 14. Might Vary in Level of Detail**
- 15. States its Rationale**

## Requirement Examples

“Reliability shall be at least 0.999” is a good requirement because it is testable, quantified, and the value is fully described as a minimum.

“The car's gas mileage should be about 30 miles per gallon” is not a good requirement as it establishes an approximate performance measure and not a specific expected value.

“The antenna shall not deflect by more than 0.5 degrees in spite of 0.5 G forces, 100 knot steady winds or gusts of up to 150 knots.

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## Exercise #1

1. Form 4-person groups
  2. Interview me for capabilities
  3. Write capabilities with group
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## Exercise #2

1. With same group
  2. Interview me for requirements
  3. Write requirements with group
  4. Share with class
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