


SCC.211 Software Design

(Software Requirements II)

School of Computing and Communications
InfoLab21

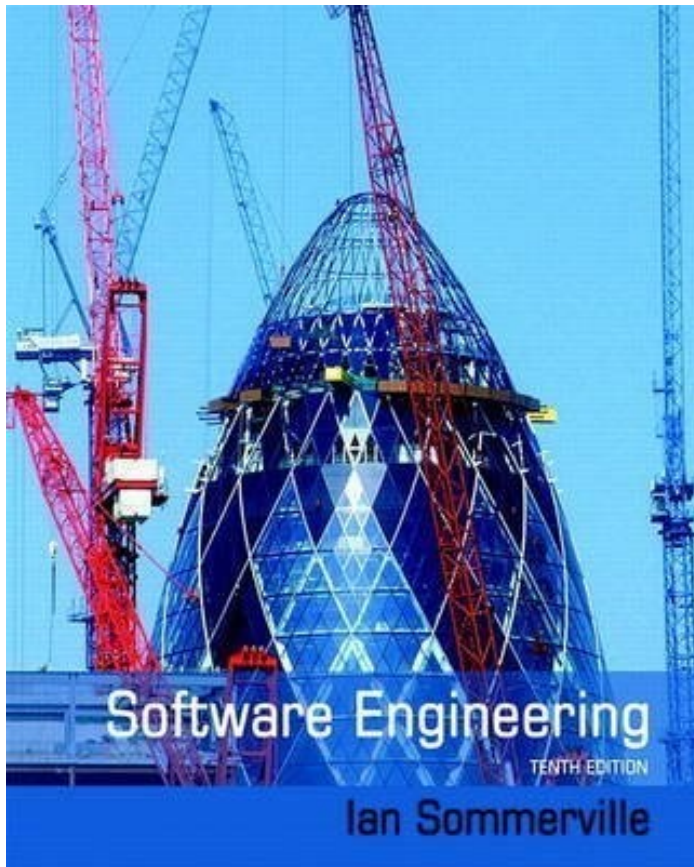


Announcement:

SCC Student Rep deadline approaching!

- The deadline for expressing interest in being a student representative for your cohort is fast approaching!
- **Deadline is start of Monday morning (13th Oct 2025)**
 - Technically it's Friday but we won't process them until Monday so you can sneak in :)
- Please email to **scc-teaching-office@lancaster.ac.uk** with your **name**, your **course** and **year**, and up to **250 words on why you would be a great Academic Rep!**
 - (Statements will be made public if there are more volunteers than places and we need to run an election to decide who to select.)
- Reps meet with us every Tuesday lunchtime and 1 committee meeting a term.
- <https://lancastersu.co.uk/rep>

Recommended Reading



“*Software Engineering*”, 10th edition,
by **Ian Sommerville**. (Ch. 1 and 4.)

Lancaster University Library link:

https://lancaster.primo.exlibrisgroup.com/permalink/44LAN_INST/1h0hp1j/alma9930582110301221



Short recap

Requirements

- *Descriptions of **what** the system under development should do and **any constraints** under which it must do it*

Why are requirements important? (Many reasons...)

- They serve as a **contract** between the customer and the development team
- They guide the development process (provide a roadmap for the development team)
- They are helpful in the design of test cases, etc.
- A good set of requirements helps deliver large projects on time, within budget and to high standards of quality.
- *A bad set of requirements can lead to disaster*

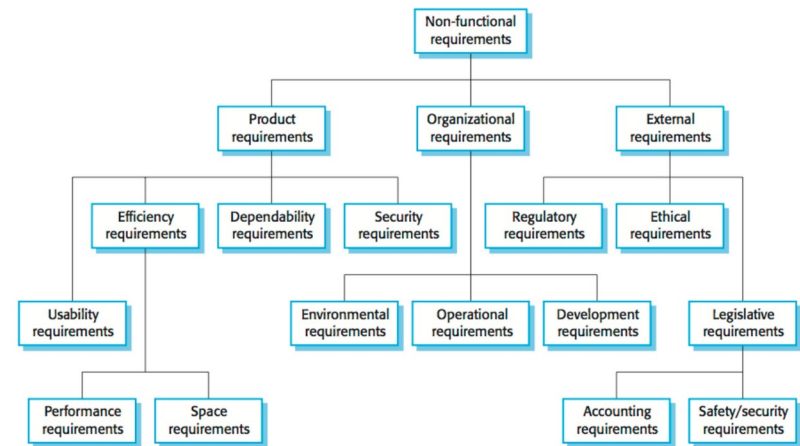


Mars Polar Lander (1999)

“It is necessary to slow the spacecraft down to land safely. Ways to do this include using the Martian atmosphere, a parachute and descent engines (controlled by software). As soon as the spacecraft lands, the software must immediately shut down the descent engines to avoid damage to the spacecraft. Some very sensitive sensors on the landing legs provide this information. But it turned out that noise (sensor signals) is generated when the legs are deployed. *This expected behavior was not in the software requirements*. Perhaps it was not included because the software was not supposed to be operating at this time, but the software engineers decided to start early to even out the load on the processor. *The software thought the spacecraft had landed and shut down the descent engines while the spacecraft was still 40 meters above the planet surface.*”

Recap 1: Functional requirements (FR) and Non-Function requirements (NFR)

- FR specify the services that a system should deliver.
 - For example, The ATM shall enable users to withdraw cash
- NFR specify the quality with which a system delivers its services. Typical examples include:



Three classes of non-functional requirements:

- For example:
 - Cash withdrawal service shall be available for at least 23 hrs a day
 - The ATM system shall be delivered in no more than 5 months
 - All customer data shall be stored in an encrypted form to protect against unauthorised access or processing

Recap 2: Guidelines for writing requirements

- Use language in a consistent way.
 - Use **shall** for mandatory requirements, **should** for desirable/useful requirements.
 - Consider an App for buying train tickets. The App might have the following three requirements:
 - The App **SHALL** enable the user to buy trains tickets (**mandatory**)
 - The App **SHALL** support accessibility in accordance with the 2018 accessibility regulation (**mandatory**)
 - The App **SHOULD** allow users to share their experience of using it
- Use text highlighting to identify key parts of the requirement.
- Don't make assumptions about the reader's knowledge.
- Involve as many **stakeholders** as possible
- Include an explanation (rationale) of why a requirement is necessary.

Recap 3: Stakeholders

- You need to identify the important stakeholders in a system to discover their requirements
- System stakeholders: Any person or organisation who is affected by the system in some way and so has a legitimate interest
- They include
 - End users of the system
 - Managers and others involved in the organisational processes influenced by the system
 - Engineers responsible for the development and maintenance
 - People responsible for systems that will interface with the system under development
 - External bodies such as regulators or certification authorities

Problem 1: Mary's Smart Home

- Mary is 65 years old and lives alone. She has several health problems including high blood pressure and high cholesterol levels. Mary gets a smart fridge to help her manage her health.
 - The fridge is able to read, store, and communicate RFID (Radio Frequency Identification) information on food packages.
 - The fridge communicates with a smart home control system in the home. In particular, it detects the presence of spoiled food and receives a diet plan from Mary's dietician. The fridge uses Mary's diet plan to monitor what food items she is consuming and sends a weekly report to her GP (doctor).
 - An important part of Mary's diet is to ensure minimum liquid intake. The intelligent fridge monitors Mary's liquid consumption and notifies the emergency services in case the liquid intake falls consistently below a minimum threshold.
 - Mary is concerned about her health, but worried about her personal details falling into wrong hands

Problem 1: Mary's Smart Home

- There are a number of stakeholders interested in the development and smooth running of healthcare smart home system (SHS):
 - **Age Concern representative (AC)** who represents Mary and others like her. AC must best represent Mary's desires and concerns.
 - **Government Health Committee member (GHC)**: a government representative well versed in NHS procedures and policies whose chief role is to ensure that NHS practices are being abided by.
 - **System Developer (SD)**: a system developer who knows about smart home technologies and how much they cost etc. SD's role is to suggest possible technologies and keep the team grounded in reality.

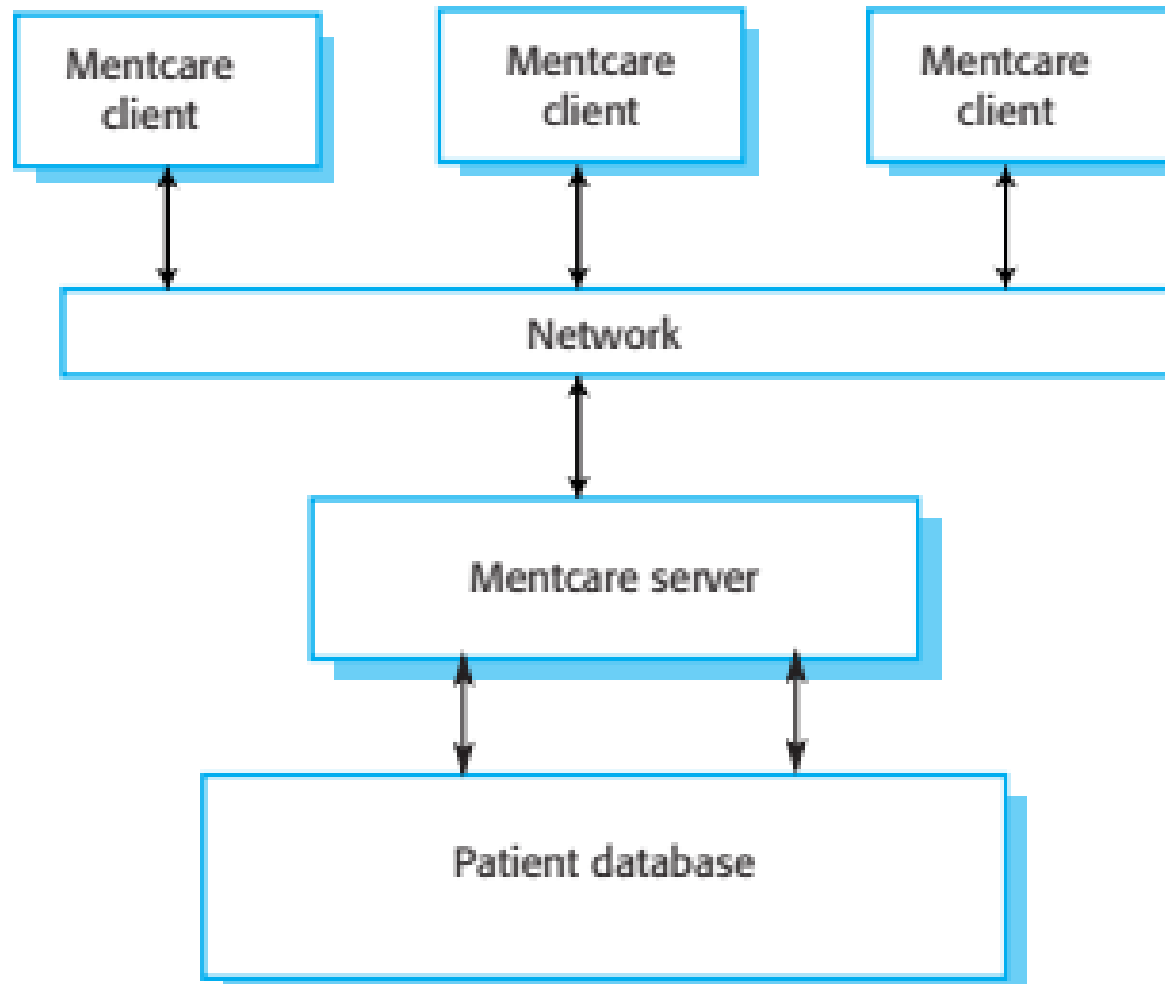
Questions: Mary's Smart Home

1. For EACH stakeholder, write down TWO possible requirements for the SHS, in the form of SHALL statements.
 - Each set of requirements should be written from the perspective of the chosen stakeholder.
 - Your requirements should (a) avoid including design details; (b) avoid vague requirements such as “the system should be secure” or “the system should be user-friendly”.
 - For each requirement identified above, state whether it is a functional or non-functional requirement.
2. Identify any potential conflicts between requirements from different stakeholders. Suggest how you might resolve these conflicts.
3. Write down your final list of non-conflicting SHALL statements (revised requirements).

Problem 2: Mentcare – A Patient Information System for Mental Health

- A patient information system to support mental health care is a medical information system that maintains information about patients suffering from mental health problems and the treatments that they have received.
- Most mental health patients do not require dedicated hospital treatment but need to attend specialist clinics regularly where they can meet a doctor who has detailed knowledge of their problems.
- To make it easier for patients to attend, these clinics are not just run in hospitals. They may also be held in local medical practices or community centres.

Organisation of the Mentcare System



Problem 2: Mentcare System

- Mentcare is an information system that is intended for use in clinics.
- It makes use of a centralized database of patient information but has also been designed to run on Personal Computers (PCs), so that it may be accessed and used from sites that do not have secure network connectivity.
- When the local systems have secure network access, they use patient information in the database but they can download and use local copies of patient records when they are disconnected.

Questions: Mentcare System

- Write down three possible stakeholders for the Mentcare system
 - System stakeholders: Any person or organisation who is affected by the system in some way and so has a legitimate interest
- Write down at least two functional and two non-functional requirements for the Mentcare system
 - Ensure your requirements are testable

Unified Modelling Language

- An ISO standard **ISO/IEC 19505-1:2012**



“ The objective of UML is to provide system architects, software engineers, and software developers with tools for analysis, design, and implementation of software-based systems as well as for modeling business and similar processes. ”

“ it serves a variety of purposes including, but not limited to, the following:

- a means for communicating requirements and design intent,*
- a basis for implementation (including automated code generation),*

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- In SCC.211 we will use **PlantUML** to draw UML diagrams
 - <https://plantuml.com/>
 - A domain-specific language for UML diagrams
 - Popular in the software industry (where UML is used)
 - Many plugins (the lab computers use a Net Beans plugin)

Thank you!