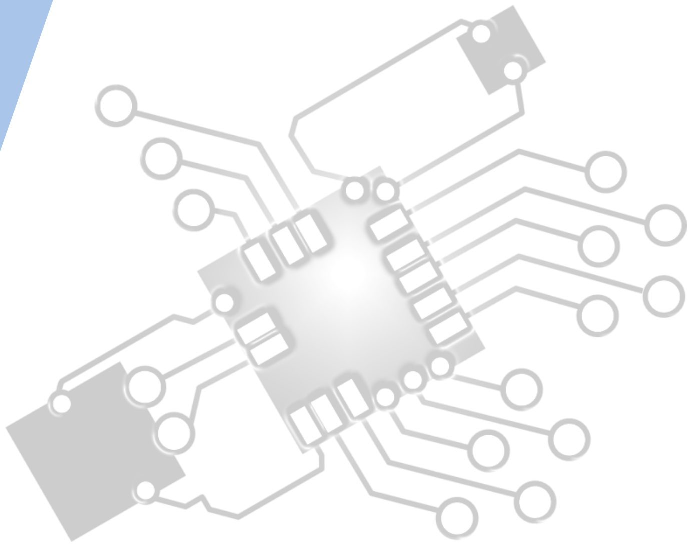
Computational thinking, problem-solving and programming: General Principals

IB Computer Science



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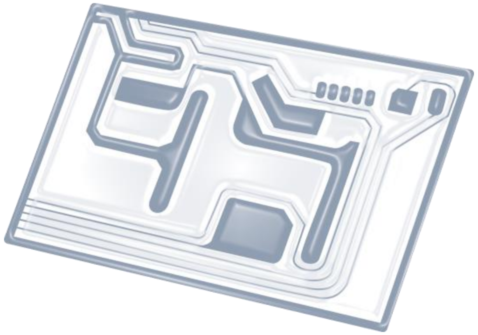
HL Topics 1-7, D1-4



1: System design

2: Computer Organisation

3: Networks

4: Computational thinking

5: Abstract data structures

6: Resource management

7: Control

D: OOP

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HL & SL 4.1 Overview

Thinking procedurally

4.1.1 Identify the procedure appropriate to solving a problem

4.1.2 Evaluate whether the order in which activities are undertaken will result in the required outcome

4.1.3 Explain the role of sub-procedures in solving a problem

Thinking logically

4.1.4 Identify when decision-making is required in a specified situation

4.1.5 Identify the decisions required for the solution to a specified problem

4.1.6 Identify the condition associated with a given decision in a specified problem

4.1.7 Explain the relationship between the decisions and conditions of a system

4.1.8 Deduce logical rules for real-world situations

Thinking ahead

4.1.9 Identify the inputs and outputs required in a solution

4.1.10 Identify pre-planning in a suggested problem and solution

4.1.11 Explain the need for pre-conditions when executing an algorithm

4.1.12 Outline the pre- and post-conditions to a specified problem

4.1.13 Identify exceptions that need to be considered in a specified problem solution

Thinking concurrently

4.1.14 Identify the parts of a solution that could be implemented concurrently

4.1.15 Describe how concurrent processing can be used to solve a problem

4.1.16 Evaluate the decision to use concurrent processing in solving a problem

Thinking abstractly

4.1.17 Identify examples of abstraction

4.1.18 Explain why abstraction is required in the derivation of computational solutions for a specified situation

4.1.19 Construct an abstraction from a specified situation

4.1.20 Distinguish between a real-world entity and its abstraction

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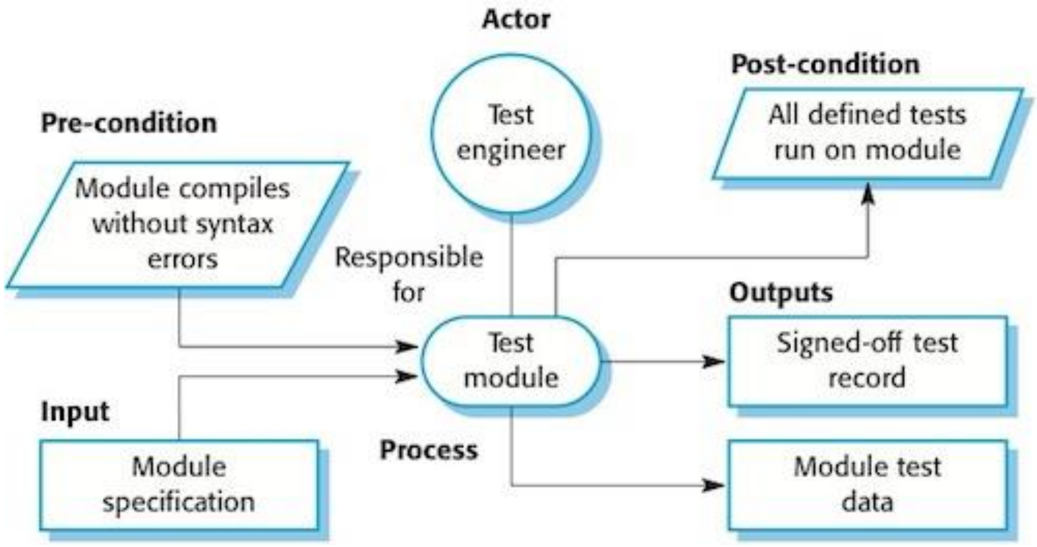
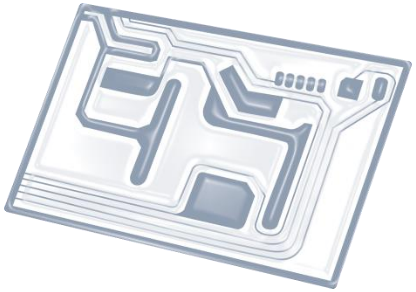
Topic 4.1.12

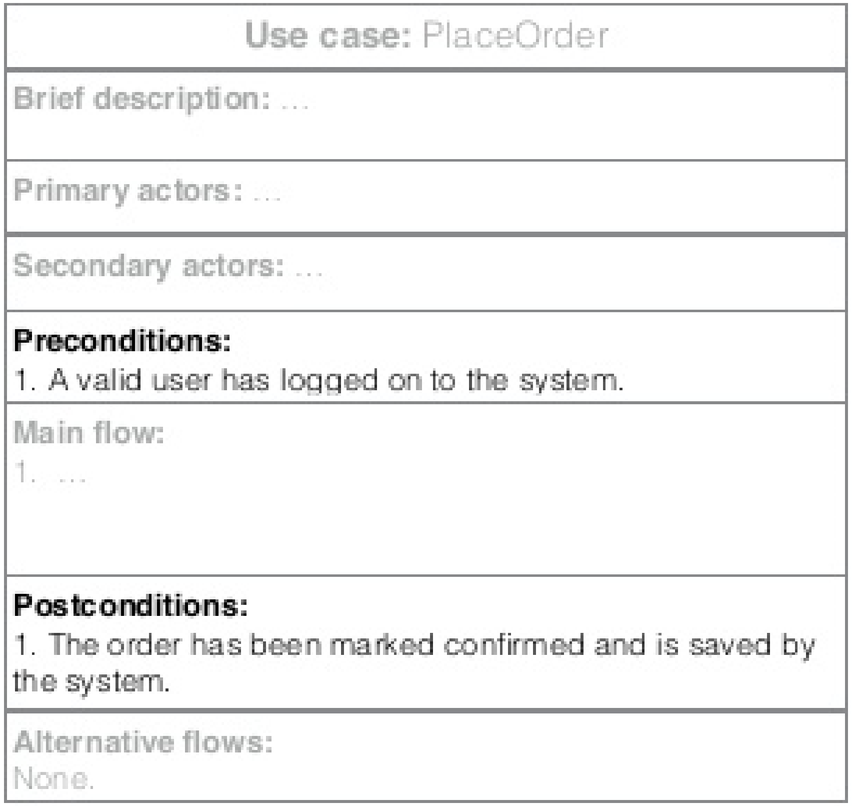
Outline the **pre-** and **post-conditions** to a specified problem





Pre & post conditions

- Preconditions and postconditions are constraints
- Preconditions constrain the state of the system *before* the use case can start
- Postconditions constrain the state of the system *after* the use case has executed
- If there are no preconditions or postconditions write "None" under the heading



Use case: PlaceOrder
Brief description: …
Primary actors: …
Secondary actors: …
Preconditions: 1. A valid user has logged on to the system.
Main flow: 1. …
Postconditions: 1. The order has been marked confirmed and is saved by the system.
Alternative flows: None.

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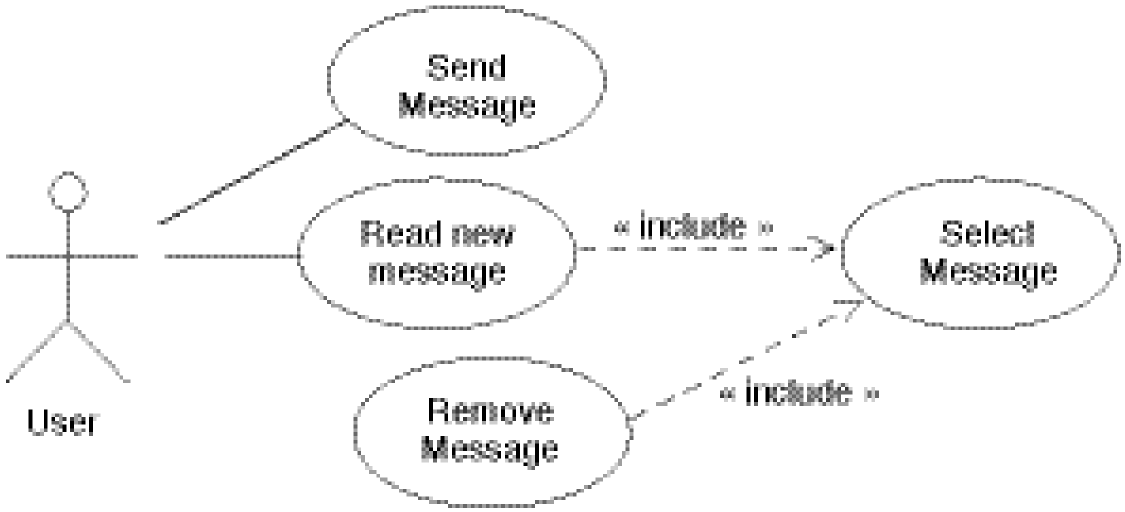

Name: Send Message
Actor: user

Goal: The user sends a message

Precondition: User is known as a Person in the system
Postcondition: A new message has been created and sent.

Scenario:
1. User gives command "new message"
2. System creates new empty message and shows it to the user
3. User types the name of the addressee
4. User types message text
5. User gives command "send"
6. System delivers message to the addressee