



IT Entrepreneurship and Management

Day 4 Designing

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Thank to Tsuneo Yamaura



Designing

A bride between specification
and source code.



Software design

- Requirement spec. phase
 - The process define “WHAT” of developed software
 - Determines the OUTER interface and function.
 - If you fail in this process, The entire software development will be collapsed.
- Then move next to Design phase



Software design (con't)

- Design phase
 - The process that defines “HOW” of the developed software.
 - Determines the INTERNAL interface and function
 - If you fail in this process, you can recover.

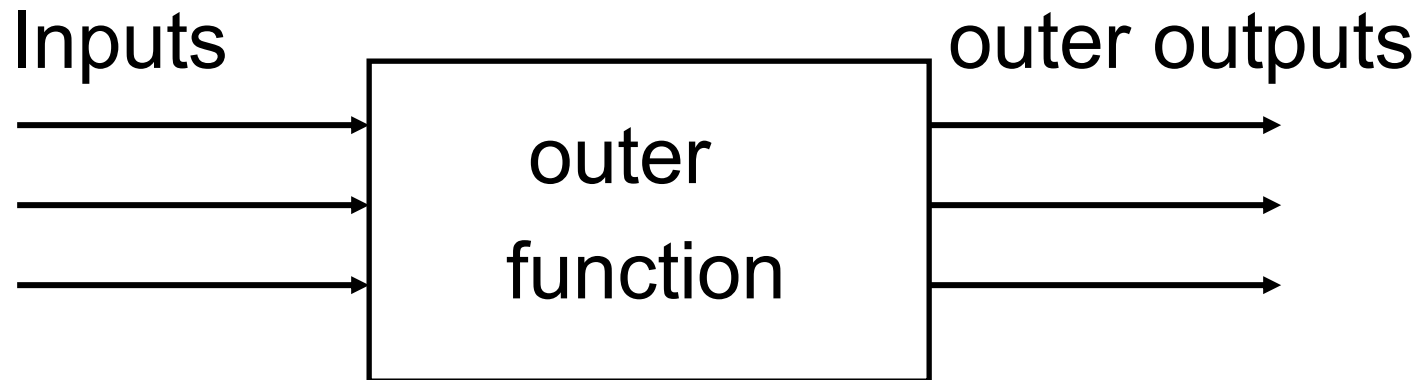
Func. Spec.	Design	Coding Debug	Test	Maintenance
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Design Methodology

- In design, do the following based on the required spec.
 1. Structural design
 2. Modularization
- Picks up algorithm and determine data structure.
- Requirement spec. define inputs and outputs.
- Design phase, define internal inputs and outputs.

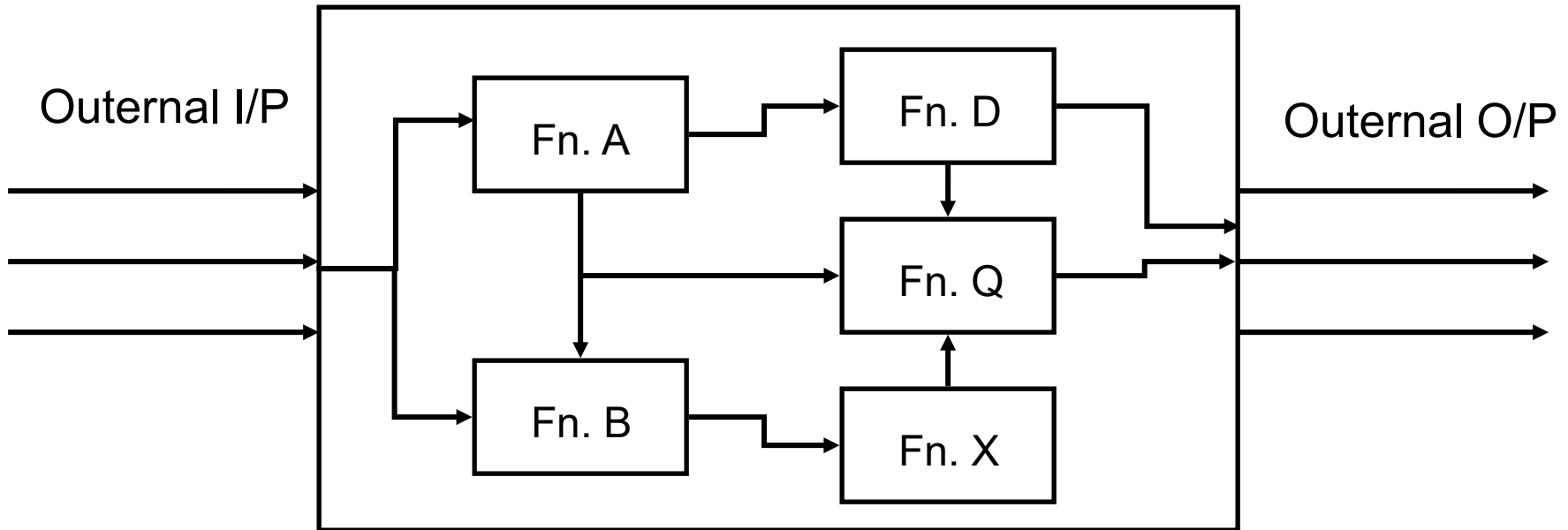
Requirement spec.



define by the requirement specification



Design phase



Breaking the req spec into
internal function seamlessly



Design process

1. Requirement specification
2. Structural design
 - Describe the structure of the entire module
 - Step wise decomposition
3. Detailed design
 - Describe the detail of each module
 - charts, figures, pseudo-code, etc.



What is Modules?

Modules : the smallest unit of the software

Ex. subroutine of ASM, function of C,
Java class



How to modularize?

Modularization : For handling the complexity of the software.

1. Layering
2. Modeling
3. Separation
4. Abstraction
5. Isolation



Modularization

1. Layering

Step wisely breaking the software abstraction → one way

2. Modeling

Replace a part of the software with know model of easier analysis.

Both are vertical



Modularization

3. Separation

Break the software function to smaller piece (function wise)

4. Abstraction

Hide something should not know (information hiding)

5. Isolation

Get a single function

All are horizontal



Software design method

- Step wise refinement
- The oldest method (Wirth 1971)
- Use flowcharts, pseudo-language, natural language to refine and break the spec.
- When to stop?
 - when you think, you can code.

Four criteria's of modularization



1. Module size
2. Level of information hiding
3. Module coupling
4. Module cohesion

Criteria's of modularization



1. Module size

Module should be small around 100LOC

2. Level of information hiding

- Replace with the known module and analyze the model
- Encapsulation

Criteria's of modularization



3. Module coupling

- How the functions and instructions in module are couple
- Module independence (Higher the better)

4. Module cohesion

How two modules are related (Lower the better)

- Coincidental cohesion
- Inter-module coupling
- Data coupling (the best one)



Data coupling

- Passes only necessary part of data
- The callee uses all of the data structure
- All the module should be “Data coupling”

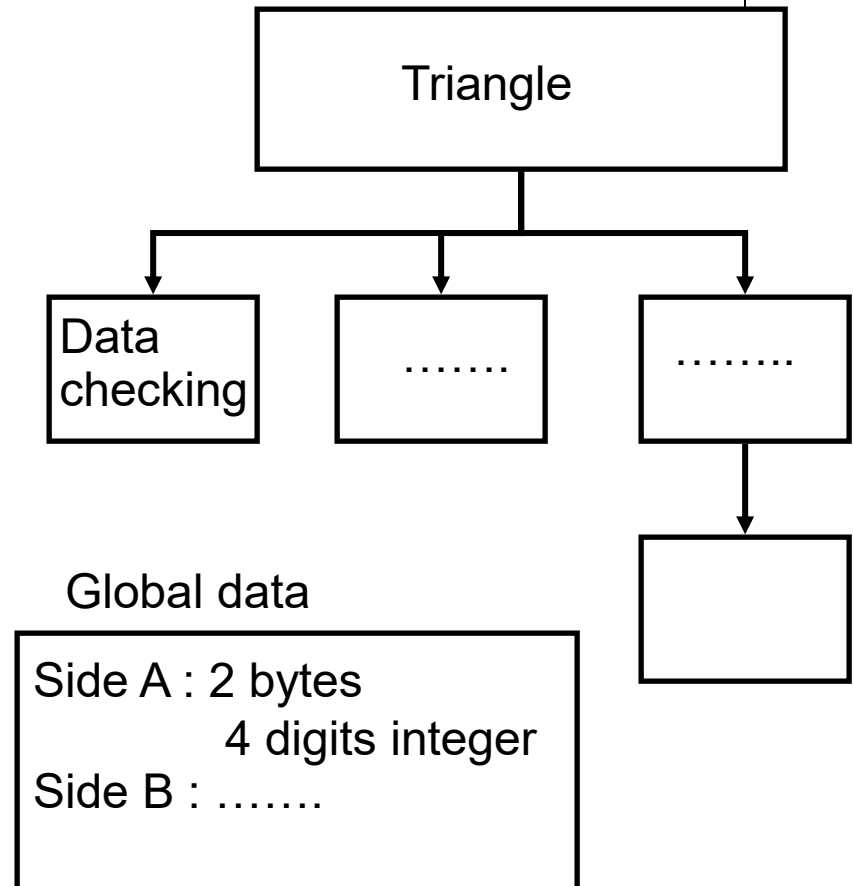
Example



Module name
Description
Input data xxxx : used for
Output data yyyy : used for
Details of functions
Callee/ Caller

Module description

Module Relation





Practice

**Design the Triangle program
from your previous
specification.**