Function-Oriented Design

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Function-Oriented Design

Design with functional units which transform inputs to outputs

... consists of module definitions
with each module supporting a functional abstraction

... views a system as a set of modules
with clearly defined behaviour
   — the services —
that interact with each other in a clearly defined manner
   — the interface
Function-Oriented Requirements

Requirements = WHAT
Data processing applications focus on
- data input flows
- data output flows
- data stores
- functional processes transforming inputs to outputs

Modeling
In old days ... as data flow diagrams
Today ... using UML activity diagrams
Problem Partitioning and Hierarchy

Divide and Conquer

Decompose system into smaller and smaller pieces
Ideally, each piece can be designed separately
Ideally, each piece can be modified independent of other pieces

Each piece must communicate with other pieces
Modularity

A system is modular if it consists of discrete components so that each component can be implemented separately and a change to one component has minimal impact on other components.

Each component needs to support a well-defined abstraction ... and have a specific interface ... that other modules use to interact with it

“Modularity is where abstraction and partitioning come together.”
Stepwise Refinement

... a top-down approach that starts with the system as a whole, and decomposes it into subcomponents that exist at lower levels of abstraction.
A module is a logically separable part of a program.

A module is a program unit that is discrete and identifiable with respect to compiling and loading.

A module can be a function, a procedure, a process, or a package.
Cohesion is a concept that tries to capture intra-module bonds.

Cohesion shows how closely the elements of a module are related to each other.

A highly cohesive module has attributes and behaviour that relate only to one task or concern.

compare to the concept of responsibility
Coupling is “how strongly” different modules are dependent.

Definition
“Coupling between modules is the strength of interconnections between modules
or
a measure of interdependence among modules.”

... not easy to quantify
We talk about “loose coupling”
Information Hiding, David Parnas 1972

Hide things that are likely to change behind interfaces as internal secrets of a module
Encapsulation

... the **only way**

... to access information in a module is using the interface