

Software
Architecture

Data Flow Software
Architectures

Process Control Architecture Style

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Types of Data Flow Architecture Style

- Batch Sequential
- Pipe and Filter
- Process Control

Process Control Architecture Style



Process control software architecture

- Synopsis
 - suitable for the **embedded system software design** where the system is manipulated by a process control variable data
 - Process control architecture decomposes the whole system into subsystems (modules) and connections between subsystems.

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=> process control software architecture

Process control: Applicable Domains

- Applicable domains
 - Embedded software systems involving **continuing actions**
continuous action
 - Systems that need to maintain an output data at a stable level
 - The system can have a set point: the goal the system will reach at its operational level.
- Examples
 - Car cruise-control systems km 가 , process control
setting
 - Building temperature control systems threshold가

Process control: Structure

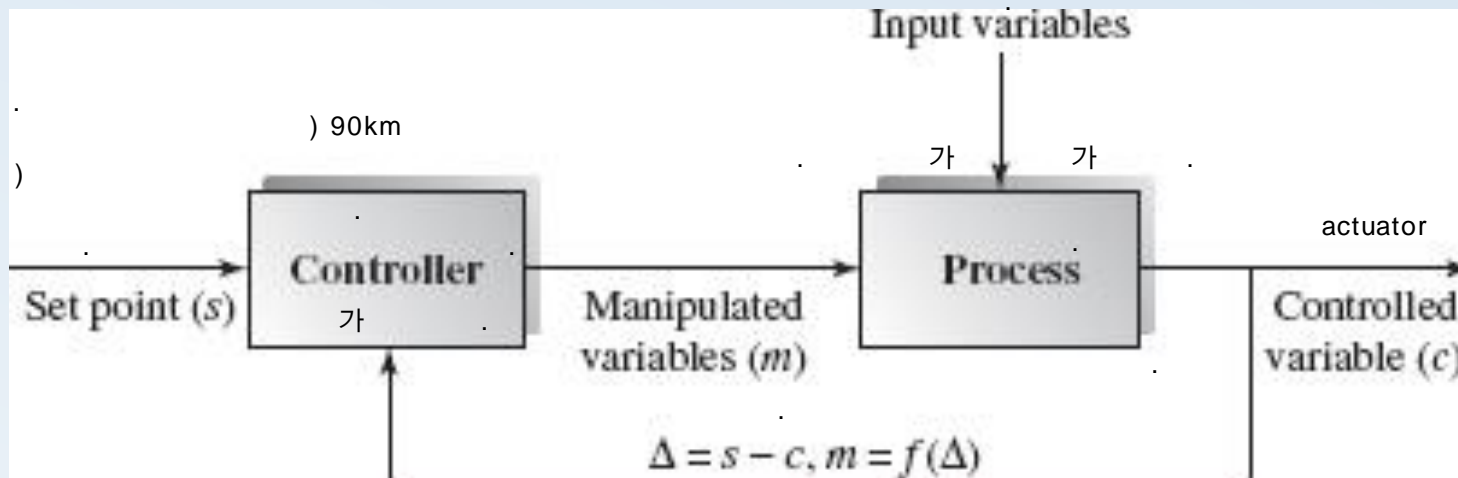
- Structure

- decomposes the whole system into subsystems (modules) and connections between subsystems.
- There are two types of subsystems:
 - an **executor processing unit** for changing process control variables and
 - **controller unit** for calculating the amounts of the changes.

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- 1. task assignment :
- 2. task decomposition() :

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Process control: Structure



- Structure(Cont'd)
 - *Controlled variable:* variable.
 - a **target controlled variable** such as speed in a cruise control system or the temperature in an auto H/A system.
 - It has a **set point goal** to reach.
 - The controlled variable data should be measured by sensors as a feedback reference to recalculate manipulated variables.
 - *Input variable:*
 - a **measured input data** such as the temperature of return air in a temperature control system.
 - *Manipulated variable:*
 - can be **adjusted** by the controller.

Process control: Benefits

- Benefits of close-loop feedback process control architecture over open forward architecture:
 - It offers a better solution to the control system where no precise formula can be used to decide the manipulated variable.

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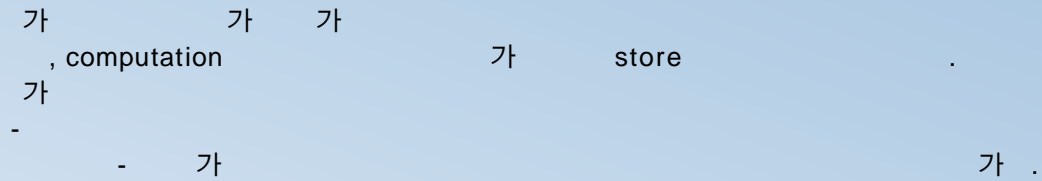
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Summary of Data Flow Software Architectures



Summary of DFA



- Structure

- decomposes a system into a fixed sequence of transformations and computations.
- There is no direct interaction between any two consecutive subsystems except for the exchange of data through data flow links.
- No data sharing occurs among subsystems in data flow architecture.
- It is not suitable for interactive business processing.

Summary of DFA

- Three Variants
 - pipe and filter 가
 - an incremental data transformation processing model and runs concurrently.
 - The data is pipelined streamed
 - The data flow and the control flow are implicit
 - batch sequential 가
 - The data is batch sequential.
 - Reading and writing I/O files drive the data flow explicitly.
 - cause bottlenecks because it requires batched data as input and output.
 - process control 가
 - the data is neither batched sequential nor pipelined streamed.
 - The mechanism to drive the data flow comes from a set of variables that controls the process execution.

Summary of DFA

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- Design Guidelines
 - Decompose the system into a series of process steps; each step takes the output of its previous step.
 - Define the output and input data formats for each step.
 - Define the data transformation in each step.
 - Design pipelines if concurrency is necessary.